EuCAP 2009

3rd European Conference on Antennas and Propagation

PROGRAM

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EuCAP 2009

3rd European Conference on Antennas and Propagation

23 - 27 March 2009, Berlin, Germany

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WELCOME ADDRESS BY EUCAP 2009 GENERAL CHAIR

Klaus Solbach, Universität Duisburg-Essen

Dear EuCAP 2009 Delegate

On behalf of the EuCAP 2009 Steering and Organizing Committees I would like to take this opportunity to welcome you to Berlin and the European Conference on Antennas and Propagation. Following the success of the previous editions, the European Association on Antennas and Propagation (EurAAP) has organized this conference for the third time and has chosen the German Association for Electrical, Electronic & Information Technologies (VDE) with its Information Technology Society (ITG) as the responsible local organizer.

For all practical work, advised by the permanent EuCAP Steering Committee, an Organizing Committee has been set up to manage the scientific, financial and venue aspects, the exhibition, workshops and courses and the coordination with sponsoring and cooperating organizations. In support of the next coming EuCAP events, the Antenna track and the Propagation track were co-chaired by representatives from Spain (EuCAP 2010) and Italy (EuCAP 2011). The Measurements track was chaired by members of AMTA Europe, also actively involved in the organization of the exhibition.

About 500 high quality oral and 400 poster presentations, high caliber Invited Speakers and a full range of IEEE Distinguished Lecturers will analyze the impact and role of antennas and propagation technology in present and future applications. Special sessions and workshops have been arranged in cooperation with URSI, AMTA and ESA and this year's European Workshop on Conformal Antennas (EWCA) has been integrated into the conference in the form of Special Convened Sessions. As you can see from the program schedule, in addition there will be a number of workshops and side meetings, emphasizing various activities of EurAAP committees and of other organizations.

About 20% of all papers to be presented at our conference come from outside Europe, with Asia / Pacific authors at 9% and US and Canada authors at 8% of the total number of authors. It is interesting to find that about three quarters of the authors come from the academia (with 21% of "student" status) while about 15% come from industry. The paper topics are clearly dominated by the Antenna track with about 65%, with the Propagation track following at 25% and the Measurements track at 10%.

The technical program has been put together after a paper review cycle with about 270 reviewers scoring each up to 15 papers and after a selection process these regular papers were combined with the submissions from about 40 conveners who initiated and collected more than 200 contributions from experts in various fields; the organizing committee particularly appreciates the devotion of conveners and the board of reviewers to their important tasks.

Hopefully, at the end of this week you will agree that the members of the committees, boards and many individuals have done a great job in arranging a superb conference, including the social program which will give delegates the opportunity to experience Berlin, the most dynamic region in Germany after the unification.
Finally, I would like to thank all others who have contributed to the success of the conference, including the keynote and invited speakers, session chairs, EuCAP 2009 sponsors and conference exhibitors and last not least you, the delegates and presenters of posters and papers who actually make up the conference.

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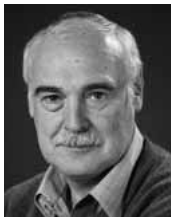
Klaus Solbach

EurAAP Chair



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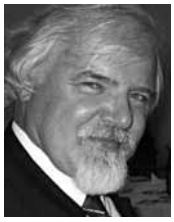

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Southeast University, China (CN)

Yue Ping Zhang
Nanyang Technological university (SG)

Zhenwei Zhao
China Research Institute of Radiowave propagation (CN)

Thomas Zwick
Universität Karlsruhe (TH) (DE)

Invited Speakers

Makoto Ando received the B.S., M.S. and D.E. degrees from Tokyo Institute of Technology(Tokyo Tech), Japan in 1974, 1976 and 1979, respectively. From 1979 to 1983, he worked at Yokosuka ECL, NTT. He was a Research Associate at Tokyo Tech from 1973 to 1985, and is currently a Professor. He is also serving as the Program Officer for JSPS (Electrical and Electronics Engineering) since 2007.
He served as the Chair of ISAP2007, the technical program Co-chair for the 2007 IEEE AP-S Symposium and also the Chair of 2004 URSI EMT Symposium.
He served as the guest editor and the guest editor-in-chief for seven special issues in Radio Science, IEEE Trans. AP and IEICE Transactions since 2001.
He was the President of IEICE Electronics Society 2007-2008, the member of Scientific Council for Antenna Centre of Excellence in EU's 6'th framework programme 2004-2007, the Chair of Commission B of URSI 2002-2005 and also the AdCom member of IEEE Antennas and Propagation Society 2004-2006. He is currently the President of IEEE Antennas and Propagation Society. He is the member of IEE, IEICE Japan and is the Fellow, IEEE

Bertram R. Arbesser-Rastburg studied Electrical Engineering at the Technical University of Graz, Austria. In his first position at the Technical University of Graz, he

was involved in the design of a C-band weather radar for propagation studies. In 1983 he became Propagation Engineer at INTELSAT in Washington, D.C., taking responsibility for propagation experiments in tropical regions. In 1988 he joined the European Space Agency where he was responsible for the planning and implementation of wave propagation studies for all aspects of satellite communication and navigation as well as wave interaction studies for earth observation. End of 2007 he was appointed Head of the Electromagnetics and Space Environment Division of the European Space Agency, responsible for R&D and project support in the fields of Antennas, Propagation, EMC and Space Environment. He is Chairman of ITU-R SG3 (Propagation), Coordinator of the European part of the international SBAS-IONO Group and Executive Secretary of the Galileo Science Advisory Committee. He serves as member of the editorial boards of the "International Journal of Satellite Communications and Networking" and as member of the Scientific Advisory Board of "Annals of Telecommunications". He is Senior Member of IEEE, URSI Radioscientist and Member of IEICE.

Henry L. Bertoni received the B.S. degree in Electrical Engineering from Northwestern University, Evanston, IL. in 1960 and the Ph.D. degree in Electrophysics in 1967 from the Polytechnic Institute of Brooklyn (now Polytechnic Institute of NYU).
After graduation he joined the faculty of the Polytechnic and is now Emeritus Professor of ECE. He has served as the Director of the Wireless Internet Center for Advanced Technology (WICAT) (2006 - 07 and 2008 - Present), as Head of the ECE Department (1990-95 and 2001 - 06), and as Vice Provost of Graduate Studies (1995-96). His research has dealt with theoretical aspects of wave phenomena in electromagnetics, ultrasonics, acoustics and optics. He has authored or co-authored over 85 journal papers and 9 book chapters on these topics as well as the book Radio Propagation for Modern Wireless Systems, Prentice Hall PTR, 2000. Five journal articles have received best paper awards. During 1982-83 he spent sabbatical leave at University College London as a Guest Research Fellow of the Royal Society. His current research deals with the theoretical prediction of UHF propagation characteristics in urban environments. He and his students were the first to explain the mechanisms underlying characteristics observed for propagation of the Cellular Mobile Radio signals. This work has been incorporated into design tools for PCS cellular systems, and has earned him the 2003 James R. Evans Avant Garde Award for Contributions to Standard Propagation Models for the Wireless Telecommunications Industry of the IEEE Vehicular Technology Society.
Dr. Bertoni is a Life Fellow of the IEEE. He was the first Chairman of the Technical Committee on Personal Communications of the IEEE Communications Society. From 1998-2001 he was a Distinguished Lecturer of the IEEE Antennas and Propagation Society.

Christophe Caloz received the Diplôme d'Ingénieur en Électricité and the Ph.D. degree from École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, in 1995

and 2000, respectively. From 2001 to 2004, he was a Postdoctoral Research Engineer at the Microwave Electronics Laboratory of University of California at Los Angeles (UCLA). In June 2004, Dr. Caloz joined École Polytechnique of Montréal, where he is now an Associate Professor, a member of the Microwave Research Center Poly-Grames, and the holder of a Canada Research Chair (CRC). He has authored and co-authored 350 technical conference, letter and journal papers, 6 book and book chapters, and he holds several patents. He is a Senior Member of the IEEE, a Member of the Microwave Theory and Techniques Society (MTT-S) Technical Coordinating Committee (TCC) MTT-15, a Speaker of the MTT-15 Speaker Bureau, and the Chair of the Commission D (Electronics and Photonics) of the Canadian Union de Radio Science Internationale (URSI). He is a member of the Editorial Board of the International Journal of Numerical Modelling (IJNM), of the International Journal of RF and Microwave Computer-Aided Engineering (RFMiCAE), of the International Journal of Antennas and Propagation (IJAP), and of the journal "Metamaterials" of the

Metamorphose Network of Excellence. He received the UCLA Chancellor's Award for Post-doctoral Research in 2004 and the MTT-S Outstanding Young Engineer Award in 2007. His research interests include all fields of theoretical, computational and technological electromagnetics engineering, with strong emphasis on emergent and multidisciplinary topics.

Laurent CASTANET received the B. S. Degree in Microwave Engineering from TELECOM Bretagne in 1991 and the M. S. Degree in Space Telecommunications from TELECOM Paris in 1992. He received the PhD Degree "Signals, Communications and Images" from SUPAERO ; the title of his document was "Fade Mitigation Techniques for new SatCom systems operating at Ka and V bands".
From 1994, he has worked as research engineer in the radiowave propagation field at ONERA Toulouse. His main research interests are Earth-Space propagation (more particularly the dynamics and spatial variability of the propagation channel) and Fade Mitigation Techniques (design and performance simulation). Since beginning of 2008, he is Head of "Radio-Communication and Propagation" Research Unit (RCP) of the Electromagnetics and Radar department of ONERA.
He was involved in propagation and Fade Mitigation Techniques studies for satellite telecommunications systems at Ku-band for the Skybridge project (Alcatel Alenia Space), at Ka-band (French RNRT program SAGAM and FP5 IST project GEOCAST with Alcatel Alenia Space), at EHF-band (Syracuse 3 French MoD system). He participated to the design of the STENTOR EHF propagation payload and on the preparation of the EXperimentation of PRopagation in the EHF band with the Satellite STENTOR (EXPRESS). He is now involved in the preparation of the GSAT-4 propagation experiment of the Indian Space Research Organisation (ISRO) in the framewoirk of a MoU between ISRO, CNES and ONERA.
He has been working in several studies for ESA and CNES devoted to the modelling of the propagation channel (prediction methods, simulation of the time, frequency and space variations of the channel), to the design and optimisation of Fade Mitigation Techniques and to the definition, processing and analysis of propagation experiments.
He was a French expert in the COST 255 European action, "Radiowave propagation modelling for new SatCom services at Ku-band and above", and in the COST 280 European action "Channel modelling and Mitigation techniques for mm-wave radio systems". At the moment, Laurent Castanet is involved in the European Network of Excellence "SatNEx", in which he chairs the Joint Activity "Channel modelling and propagation impairment simulation", and participate to the Physical layer and Access Joint Activities. He is also a French representative in ITU-R Study Group 3 which deals with radiowave propagation (he has been regularly involved in the French delegation since 1998). He is also member of the European network of propagation experts, setup by ESA. He was the Technical Program Chairman of the IEEE conference IWSSC 2008 (International Workshop on Satellite and Space Communications) held between 1st and 3rd October 2008 in Toulouse, France.
He has been supervisor of several Ph'Ds : Bruno AUDOIRE and Frederic LACOSTE (related to impairment time series synthesis), Laurent FERAL (related to rain attenuation field generation), Nicolas JEANNIN (related to attenuation space-time modelling), Ana BOLEA-ALAMAÑAC and Anbazhagan AROUMONT (related to Fade Mitigation Techniques design and performance assessment).
He teaches radiowave propagation at SUP'AERO and TELECOM Paris Engineering schools as well as link analysis at SAE Training institution.

Evert DUDOK
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Qualifications:
Electrical Engineering
Technical University of Eindhoven
1984, The Netherlands

CAREER: as of 11 June 2007
- Chairman of the Managing Board, Astrium GmbH
- CEO Astrium Satellites
- Member of the Board of Directors, EADS Astrium

07/2005 - 06/2007
- Chairman of the Managing Board, Astrium GmbH
- President, Space Transportation EADS Astrium
- Member of the Board of Directors, EADS Astrium

03/2002 - 06/2005
- Director of the Business Division Earth Observation, Navigation & Science
- Member of the Board of Directors, EADS Astrium
- Managing Director, EADS Astrium GmbH
- Associate / Partner, Galileo Industries S.A.

11/2000 - 03/2002
- Director, Business Unit Navigation & Constellations, Astrium

01/2000 - 03/2002
- Director & Chairman, Galileo Industries S.A.

01/2000 - 10/2000
- Director Navigation, DASA Munich

03/1995 - 12/1999
- Director, Business Unit Antennae & Payload Components, DASA Munich

01/1992 - 02/1995
- Head of Antenna Products & Technologies, DASA Munich

01/1984 - 12/1991
- DASA Development Engineer / Project Manager

Michael H. Francis has been a member of the of the IEEE since 1982 and the Antenna Measurement Techniques Association since 1983. From 1976 to 1980 he was a Research Assistant at the University of Colorado. During that time he worked on the Orbiting Solar Observatory 8 satellite taking data and modeling the solar atmosphere. Since 1980 he has worked as a physicist in the Electromagnetics Division of the National Institute of Standards and Technology (U.S.). He led the development of standards for circularly polarized antennas and the development of antenna measurement services at NIST for the frequency range 33 - 75 GHz for which he received the NIST Measurement Services Award. He helped develop a correction method for probe-position errors in planar and spherical near-field measurements. In 2007, he was a co-recipient of the U.S. Dept. of Commerce's Gold Medal. In 2004, he received the Antenna Measurement Techniques Association Distinguished Service Award. He is currently the Chair of the IEEE Antenna Standards Committee.

Peter Hall is Professor of Communications Engineering, leader of the Antennas and Applied Electromagnetics Laboratory, and Head of the Devices and Systems Research Centre in the Department of Electronic, Electrical and Computer Engineering at The University of Birmingham. After graduating with a PhD in antenna measurements from Sheffield University, he spent 3 years with Marconi Space and Defence Systems, Stanmore working largely on a European Communications satellite project. He then joined The Royal Military College of Science as a Senior Research Scientist, progressing to Reader in Electromagnetics. He joined The University of Birmingham in 1994.

He has researched extensively in the areas of antennas, propagation and and antenna measurements. He has published 5 books, over 250 learned papers and taken various patents. These publications have earned 6 IEE premium awards, including the 1990 IEE Rayleigh Book Award for the Handbook of Microstrip Antennas.

Professor Hall is a Fellow of the IEE and the IEEE and a past IEEE Distinguished Lecturer. He is a past Chairman of the IEE Antennas and Propagation Professional Group and past coordinator for Premium Awards for IEE Proceedings on Microwave, Antennas and Propagation. He is a member of the IEEE AP-S Fellow Evaluation Committee. He chaired the 1997 IEE ICAP conference, was vice chair of EuCAP 2008 and has been associated with the organisation of many other international conferences. He was Honorary Editor of IEE Proceedings Part H from 1991 to 1995 and currently on the editorial board of Microwave and Optical Technology Letters. He is a past member of the Executive Board of the EC Antenna Network of Excellence.

Doren W. Hess received his Bachelor of Science degree from Duke University in 1965 and his Ph.D. from The University of North Carolina at Chapel Hill in 1973. Following two years as a Postdoctoral Research Associate at Chapel Hill, he joined Scientific-Atlanta in 1974 where his work was centered on industrial applications of compact ranges and near-field scanning. He was responsible for final development of the first Scientific-Atlanta compact range product, and for the first commercial spherical near-field product offered by Scientific-Atlanta and was the senior technical member of a design team for Scientific-Atlanta's planar near-field system. He is the author of articles and conference presentations on spherical and planar near-field scanning, compact range measurements, and automatic antenna measurements. His professional interests include electromagnetic scattering and radar cross-section, radome and antenna measurements. Dr. Hess is a member of the IEEE Antenna and Propagation Society, where he has served as a member of the AdCom. He is a past editor of the Measurements Column of the AP-S Magazine and a past President of the Antenna Measurement Techniques Association. In 1997 the Antenna Measurement Techniques Association honored him with its Distinguished Achievement Award. In 1998, he joined Aeroflex Lintek Corporation in Powell, Ohio as Executive Vice President. In the Fall of 2000 he left Lintek to become a consultant for Microwave Instrumentation Technologies. In October 2001, he joined MI Technologies, now located in Suwanee, Georgia as a Senior Staff Engineer. His work there is focused on near-field scanning and compact range applications.

Erich Lutz received the Dipl.-Ing. degree from the Technical University Munich in 1977 and the Dr.-Ing. degree from the University of the Armed Forces, Munich in 1983. Since then, he has been with the Institute of Communications and Navigation of the German Aerospace Center (DLR) in Oberpfaffenhofen, Germany, and from 1986 until 2008, he was head of the Digital Network section of this institute. He has participated in a large number of international studies and research projects. Currently he is coordinator of the Satellite Communications Network of Excellence SatNEx funded by the European Commission.

His research interests include networking aspects in mobile and broadband satellite communication systems. Prof. Lutz has published numerous journal and conference papers, and is the principal author of a book on satellite systems for personal and broadband communications published by Springer in 2000. He holds a honorary professorship at the Technical University Munich where he lectures on satellite communication networks. Prof. Lutz is a member of the Editorial Panel of the International Journal of Satellite Communications.

Antonio Martellucci received the Laurea degree in electrical engineering and the Ph.D. degree in applied elctromagnetics from University of Rome "La Sapienza", Rome, Italy in 1987 and 1992 respectively.
In 1988 he joined as optical engineer for Selenia (now part of Finmeccanica) group where he worked on the development of optical active systems. From 1989 to 2000 he worked at the Fondazione Ugo Bordoni "Radio communication Systems Division", Rome, Italy as a researcher on atmospheric propagation effects for terrestrial and spatial radio communication systems. During this period he participated the OLYMPUS and ITALSAT propagation experiments (through the ESA OPEX and Italian CEPIT working groups) for the measurement and modelling of the atmospheric attenuation and depolarization at Ka, Q and V frequency bands. He also took part to European COST 210 and 255 projects and various ESA projects on rain scatter, clear air propagation modelling and climatological databases. Since 2001 he joined the European Space Agency, ESA-ESTEC, The Netherlands, Directorate of Technical and Quality Management, as a radiowave propagation engineer where he is currently involved in ESA Telecommunication (ARTES and Alphasat), Navigation (Galileo), Earth Observation (ENVISAT) and Science (Gaia, Bepi Colombo) Programmes. At ESA he is currently involved on models for multimedia SatCom systems, including fade mitigation techniques, modelling and characterization of tropospheric effects for navigation systems and development of ground propagation equipment.
Dr. Martellucci was the recipient of the Young Scientist Award of XXV URSI General Assembly in 1996. He has been the general editor of the EU COST 255, member of the COST 280 Management committee and WG chairman and he is currently chairman of the COST action IC0802. He is also member of the ESA delegation at ITU-R SG3 and he contributed to various ITU-R P recommndations. He is author of more than 90 publications in books, International Journals and conference proceedings

Raj Mittra is Professor in the Electrical Engineering department of the Pennsylvania State University. He is also the Director of the Electromagnetic Communication Laboratory, which is affiliated with the Communication and Space Sciences Laboratory of the EE department. Prior to joining Penn State he was a Professor in Electrical and Computer Engineering at the University of Illinois in Urbana Champaign. He is a Life Fellow of the IEEE, a Past-President of AP-S, and he has served as the Editor of the Transactions of the Antennas and Propagation Society. He has been awarded the Guggenheim Fellowship, the IEEE Centennial and Millennium Medals, the IEEE/AP-S Distinguished Achievement Award and the AP-S Chen-To Tai Distinguished Educator Award, and the Electromagnetics Award of the IEEE. He has over 1,000 publications to his credit, as well as more than 30 books or book chapters on electromagnetics, antennas, microwaves and electronic packaging. He has supervised over 100 Ph.D. theses, an equal number of M.S. theses, and has mentored over 50 postdocs.
Raj is the President of RM Associates, which is a consulting organization that provides services to industrial and governmental organizations, both in the U. S. and abroad.

David M. Pozar received the PhD degree from Ohio State University, and joined the faculty at the University of Massachusetts Amherst in 1980. In 1988 he spent a sabbatical leave at Ecole Polytechnique Federale de Lausanne, in Lausanne, Switzerland. He is presently Professor Emeritus at the University of Massachusetts, having retired in 2004.
Professor Pozar is a Fellow of the IEEE. He has served as an Associate Editor of the IEEE Transactions on Antennas and Propagation (1983-1986 and 1989-1992), as a member of the IEEE AP-S AdCom (1989-1991), and as an Associate Editor of the IEEE AP-S Newsletter (1982-1984). In 1981 he received the Outstanding Professor for 1981 award from Eta Kappa Nu, the student honor society. In 1984 he received an NSF Presidential Young Investigator Award, and the Keys to the Future Award from the IEEE Antennas and Propagation Society. In 1985 he received the University of Massachusetts Engineering Alumni Association Outstanding Junior Faculty Award. In 1986 he received the R.W.P. King Best Paper Award from the IEEE Antennas and Propagation Society. In 1987 he received the URSI Issac Koga Gold Medal for his work on printed antennas and phased arrays. He again received the R.W.P. King Best Paper Award in 1988. In 1989 he received the United Technologies Corporation Outstanding Teaching Award. He served as a Distinguished Lecturer for the IEEE Antennas and Propagation Society in 1993-1995. In 1995 he received the College of Engineering Outstanding Senior Faculty Award. He received the College of Engineering College Outstanding Teacher Award in 1997. In 1998 he received the H. A. Wheeler Applications Prize Paper Award from IEEE Antennas and Propagation Society. He received an IEEE Third Millennium Medal in 2000. In 2003 he was awarded the Chancellor's Medal and was a Distinguished Faculty Lecturer at the University of Massachusetts. In 2004 he received the S. A. Schelkunoff Transactions Prize Paper Award from the IEEE Antennas and Propagation Society. Professor Pozar has published over 100 papers on microstrip antennas and phased arrays, and is the author of Microwave Engineering, 3rd ed (Wiley, 2004), Microstrip Antennas (IEEE Press, 1995), and Microwave and RF Design of Wireless Systems (Wiley, 2000).

Jussi Rahola obtained the D.Sc. (Tech.) degree in numerical mathematics from Helsinki University of Technology in 1996. From 1989 to 1999 he was working as an application specialist and a development manager in CSC-Scientific Computing Ltd., the Finnish center for information technology in science. During 1997-1998 he also worked in CERFACS, Toulouse, France as a post-doctoral researcher in the field of computational electromagnetics. He joined Nokia Research Center in 2000 and has worked as senior research engineer and research manager. He is currently working as a principal scientist in Nokia Devices R&D. He has over 30 publications in international journals and conference proceedings. His research interests include antennas, computational electromagnetics and numerical mathematics.

Peter Thoma received the Diploma and PhD degrees from the Technical University of Darmstadt in 1992 and 1997, respectively. During his PhD work he focused on time domain simulation of electromagnetic fields. His major contributions include the development of the PBA technique as well as a stable sub-gridding scheme for FDTD. Afterwards he joined CST GmbH (now CST AG) as a managing director and is since then in charge of CST's R&D activities.

Ingo Wolff studied Electrical Engineering at the Technical University Aachen, Germany. He received his Diplom-Engineer degree in 1964, his doctoral degree (Dr.-Ing.) in 1967 and his Habilitation degree in 1970, all from the Technical University in Aachen. From 1974 to 2003 he has been a full professor for Electromagnetic field Theory at the Duisburg University, Duisburg, Germany. In 1999 to 2002 he has been the elected president (rector) of the Duisburg University. Since 1992 he is (in parallel to his activities at the Duisburg University) the president of IMST GmbH, Kamp-Lintfort, Germany, a research and development company in wireless technologies.
Ingo Wolff is the author of more than 460 research publications in international journals and at international conferences. He is author of eight books on fundamental electrical engineering, electromagnetic field theory, microwave circuits and microwave techniques. He is a Life-Fellow of the IEEE, a member of the VDE/ITG and the recipient of the Microwave Career Award of the IEEE MTT-Society. Since 2009 he is the chairman of the Informationstechnische Gesellschaft (ITG) of the VDE.

Short Courses

Short Courses can be booked at the registration desk for 150,- € each.

23 March 2009
14:00 - 18:00 Room: Hall C1
SC1 - Microwave/mmW Photonic Feed Architectures for Large Phased Arrays

Dilip Paul, ACES, 8006 Thornley Court, Bethesda, MD 20817, USA

This half-day short course will discuss several novel antenna feed architectures that are deemed immensely suitable for large and/or space-based arrays constrained by a host of critical requirements. Often, these stringent specifications such as compactness, light-weight, and prime power efficiency of the beam forming network (BFN) with much sought after capability for steering, nulling, reconfiguring, frequency agility, etc. render conventional RF/MW/mmW technologies unattractive. Whereas, judicious optical implementations of various signal processing functions such as generation, transmission, up/down block conversion, and distribution of high dynamic range MW/mmW signals have demonstrated elegant solutions to such feeds.

An overview of the innovative application of advanced photonics technology augmented by assessment of capability and market feasibility will be presented in this course. Relevant state-of-the-art optical technologies (fiber optics, laser optics, integrated optics, wavelength division multiplexer/demultiplexer (WDM), optical add-drop module (OADM), filters, optical amplifier, etc.), high speed optoelectronics (silicon photonics, optoelectronic integrated circuits (OEICs), analog-to-digital converter (ADC), modulator, demodulator, etc.), micro-opto-electro-mechanical (MOEM) switch matrix, and BFN subsystems and systems, including reliability and radiation hardness will be described in detail. Also, results of proof-of-concept demonstration and field deployment will be included. Recent advances in novelty nano-devices and technology bode well for all-optically implemented RF/MW/mmW systems

23 March 2009
14:00 - 18:00 Room: Hall C2
SC2 - High resolution radio propagation prediction techniques and planning of GSM and UMTS/HSDPA networks

Karim Rizk, Wavecall, Lausanne, Switzerland

The complexity of wireless network design has led operators to adopt or explore new simulation techniques. Signal-strength prediction system lies at the foundation of every wireless network simulator. High resolution prediction in urban environments is one of the techniques being examined because classical models fall short of the required accuracy in dense urban environments where most traffic is situated.

Urban prediction requires that account be taken of various mechanisms of propagation. An overview of the most relevant mechanisms will be given :
- Interaction with terrain, in flat and hilly environments.
- Interaction with vegetation,
- Effect of transmitter height ranging from micro to macrocell

The impact of the prediction accuracy on the network cost and network performance then will be investigated through two GSM and UMTS case studies.

24 March 2009
14:00 - 18:00 Room: Hall C1
SC3 - UWB Antennas and Channel Characterization for Communication and Radar

Werner Wiesbeck, Universität Karlsruhe, Germany

Spectrum is presently one of the most valuable goods worldwide as the demand is permanently increasing and it can be traded only locally. Since the United States FCC has opened the spectrum from 3.1 GHz to 10.6 GHz, i.e. a bandwidth of 7.5 GHz, for unlicensed use with up to -41.25 dBm/MHz EIRP, numerous applications in communications and sensor areas are showing up. All these applications have in common that they spread the necessary energy over a wide frequency range in this unlicensed band in order to radiate below the limit. The results are ultra wideband systems. These new devices exhibit especially at the air interface, the antenna, quite surprising behaviors. This talk presents an insight into design, evaluation and measurement procedures for Ultra Wide Band (UWB-) antennas as well as into the characteristics of the UWB radio channel as a whole. UWB antenna basics and principles of wideband radiators, transient antenna characterization and UWB antenna quality measures, derived from the antenna impulse response, are topics. EM simulations and measurements of transient antenna properties in frequency domain and in time domain are included. Different antennas, based on different UWB principles, will be presented. Depending on the interest there are: ridged horn antenna, Vivaldi antenna, logarithmic periodic antenna, mono cone antenna, spiral antenna, aperture coupled bowtie antennas, multimode antennas, sinus antenna and impulse radiating antennas. The channel characterization comprises ray-tracing tools for deterministic indoor UWB channel modeling and measurements. The advantages and drawbacks of the UWB transmission will be discussed, depending on interest. The radiation from different antennas will be demonstrated by movies with a pulse excitation.

24 March 2009
14:00 - 18:00 Rom: Hall C2
SC4 - Dielectric Resonator Antennas, Theory, Design and Applications with the Latest Developments

Ahmed A. Kishk, University of Mississippi

Recently, interest in dielectric resonator antennas has increased because of their attractive features such as small size, high radiation efficiency (98%), wide bandwidth, and high power capability for radar applications and base stations. The dielectric resonator antenna is made from high dielectric constant materials and mounted on a ground plane or on a grounded dielectric substrate of lower permittivity.

The short course will start by an overview for the development of the dielectric resonator antennas. The theory of operation will be discussed step by step to provide basic understanding. The discussion is provided in simple forms to satisfy audience of different background levels. Design curves will be provided for the circular disc and hemisphere dielectric resonators. Use of these models with other geometries is discussed.

Different excitation mechanisms are demonstrates such as the probe, slot, image line and waveguides. Applications of dielectric resonators in arrays are provided with discussion on the mutual coupling level and the wide scanning capabilities of the dielectric resonator antenna array. The array bandwidth limit is discussed based on the element size and the spacing between the array elements.

The problems related to the practical implementations are considered. Results of a numerical study pertaining to the effect of an air gap, between the dielectric disc and the ground plane or an air gap surrounding the feed probe, on the input impedance and resonant frequency of a cylindrical DRA operating in the TM01ä mode or HEM11ä mode as a function of dielectric constant will be presented. Some of the numerical results are validated experimentally.

Techniques for broadband applications are discussed. Some of the techniques are based on the material properties and some depends on the DRA shape. Several examples are provided. Some elements would provide a matching bandwidth over 40% with reflection coefficients better than -10dB for 50 Ohms ports. Finally, Techniques for size reduction of the DRA are presented to demonstrate the flexibility of the DRA to satisfy the required small size for some applications. The technique will result in small size and keeping wide bandwidth. The applications of the DRA for spatial power combiners are presented. The DRAs are placed in an oversized hard horn to provide uniform field distribution. Resent developments of the dielectric resonators as a multifunction device will be also provided. In this application we will show the use of the same DR as an antenna with low quality factor and as a resonator with high Q-factor.

25 March 2009
14:00 - 18:00 Room: Hall C1
SC5 - Small Antenna Design for Mobile Handsets, UWB, Sensors, RFID tags and other Applications, and their Performance Enhancement by using EBGs and Metamaterials

Raj Mittra, Pennsylvania State University, Zhinong Ying, Sony Ericsson

Since the 1980's, the mobile industry has experienced a dramatic growth. The first step was the transition from analog to digital standards. For instance, analog standards such as AMPS (Advanced Mobile Phone System), NMT (Nordic Mobile Telephone) and ETACS were replaced by digital ones, e.g., GSM, D-AMPS and CDMA. The second step was the move to antennas from single to multiple frequency bands, owing to growing capacity requirements. For example, DCS (GSM 1800) and PCS (GSM1900), GSM850 were introduced since the middle of the 1990's. The third step was the development from voice to multimedia system, 3G systems such as WCDMA and their enhanced systems, introduced shortly after the beginning of the 21st century. Furthermore, the WCDMA system has been proposed to be expanded to all cellular bands during the coming years. At the same time, an increasing number of non-cellular communication wireless standards have been introduced to the handset, such as FM radio, GPS, Bluetooth, WLAN, Wi-Fi, DVB-H RFID and UWB. The trend of future mobile handsets would be a need of more integrated antennas

for cellular and non-cellular bands, diversity or MIMO applications. A combination of the problem of integration and the demand of an attractive industry design in the mobile terminals, has made the practical antenna design work increasingly challenging.

This course will discuss some fundamentals of small antenna theory and the multi-frequency band antenna technologies for mobile handset; size reduction techniques; antenna integration techniques; antennas for GPS; multi-channel system; diversity, MIMO in the mobile terminals; human body effect; and, measurement techniques. Part 1 will deal with some fundamental issues of small terminal antennas; Part 2 will describe the progress of different multi-frequency band techniques for handset antennas; Part 3 will discuss the antenna integration issues and some practical engineering issues for the mobile terminal antennas; next, Part 4 will describe GPS, multi-channel antenna systems, diversity and MIMO; Part 5 will examine the use of metamaterials for handset antennas; and, finally in Part 6, the human body effect and some measurement techniques will be discussed.

26 March 2009
14:00 - 18:00 Room: Hall C1
SC6 - The Art and Science of Antenna Near-Field Measurements and Diagnostics: From Fundamentals to Recent Developments

Yahya Rahmat-Samii, University of California, Los Angeles

This short course will provide the participants with a novel way to understand the fundamental concepts behind modern antenna near field measurement and diagnostic techniques. Starting from basic electromagnetic principles, the underlying concepts governing simulations, designs and operations of planar near field measurements and diagnostics techniques will be reviewed. Modern measurement schemes such as plane-polar and bi-polar scanning will be highlighted. Advances in applying these techniques to millimeter-wave measurements will be reviewed. Representative measurement results of reflector and array antennas will be presented. The importance of near field diagnostic techniques will be discussed through some unique test cases. Finally, the topic of phaseless measurement techniques and algorithms will be presented demonstrating the potential applications of these techniques in modern antenna measurements. The following topics will be presented: (a) Fundamental of EM concepts for antenna characterizations including antenna radiated fields, ideal dipole, solution of wave equations and special functions, (b) fundamentals of various near-field measurement techniques including equivalence theorem, spectral formulation and probe corrections, (c) Understanding antenna near-field diagnostic techniques including simulation models, back-projections, sampling theorems, (d) Case studies of several reflector and array antenna measurements and diagnostics, and (e) Phaseless measurements and recent advances including why phaseless measurements, phase retrieval algorithms and measured results.

26 March 2009
14:00 - 18:00 Room Hall C2
SC7 – Atmospheric attenuation on micro- and mm-waves

Ondrej Fiser, Institute of Atmospheric Physics, Czech Academy of Science

The aim of this course is to show the physical principles of atmospheric attenuation of mm and cm waves aiming at the practical attenuation computation. The relation between physical properties of atmosphere (meteorological parameters) and radio wave attenuation is also scheduled in the programme. The most important phenomena, such as rain, cloud and water vapour will be emphasized. Course participants will be able to estimate the cumulative distribution of atmospheric attenuation as well as its instantaneous values on terrestrial (LOS) and satellite links for frequencies 10-100 GHz.

Content:

1. Prediction (estimation) of atmospheric attenuation as a part of the radio-relay or satellite link planning, overview of attenuation effects based on physical reasons
2. Rain attenuation
   - Important properties of rain drops and rain volume
   - Scattering of electromagnetic wave on a single rain drop (Rayleigh approximative scattering, Mie approximative scattering, exact scattering) and practical computations with respect to the frequency and temperature
   - Deduction of formula to compute specific attenuation and phase delay due to rain, approximative formulas according to the ITU-R
   - Short description of rain depolarisation
   - Overview of models (prediction methods) for cumulative distribution (CD) of rain attenuation on microwave and mm links (ITU-R model, Misme-Fimbel model and many others)
   - Details of rain attenuation estimation on satellite (slant) paths respecting the height profile of the atmosphere
   - Measurement and processing of rain rate aiming at attenuation prediction, analytical models of rain rate distribution
   - Focus on drop size distribution (DSD) and its importance in radio wave propagation, analytical models of DSD
   - Practical computation of rain attenuation, examples of results, annual statistics, worth month statistics, diurnal and seasonal variation
   - Verification of attenuation prediction methods
3. Cloud attenuation
   - Physical structure of cloud, cloud droplet size distribution
   - Derivation of formulas computing instantaneous cloud attenuation
   - Engineering methods estimating cloud attenuation distribution, examples
   - Meteorological parameters necessary to predict cloud attenuation
4. Water vapour attenuation
   - Formulas computing the specific water vapour attenuation
   - Practical methods estimating distribution of water vapour attenuation
   - Meteorological parameters to derive water vapour attenuation
5. Combination of attenuation effects
6. Site diversity - a powerful mitigation technique
7. Summary

Monday, March 23 · 09:00 - 10:00

Room: Hall A+B

Opening and Keynote Address

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany), Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)

9:00 Opening Address
Klaus Solbach (Universität Duisburg-Essen, Germany); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)

9:10 Welcome Address
Peter Hintze, State Secretary in the German Ministry of Economics and Technology

9:25 European Antenna Capabilities in Telecommunications, Navigation, Earth Observation and Science
Evert Dudok (President EADS Astrium, Germany)
Antennas are key factors in designing satellite solutions and consequently enormous efforts have been undertaken to push technology. The paper provides the state-of-the-art of flown satellite antenna technology and highlights recent applications on Astrium spacecraft such as Eurostar, TerraSAR-X and TanDEM-X, and Galileo satellites. The paper addresses also the high-performance testing of spacecraft antennas in compact antenna test ranges.

10:00 - 10:30 Coffee Break
(will be served in the Delegates Coffee Area at the Exhibition)

Monday, March 23 · 10:00 - 12:00

Room: Hall A+B

Plenary Session: Plenary Talks

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany), Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)

10:30 Recent Developments in Antennas and Propagation for Space Missions
Bertram Arbesser Rastburg (ESA - Estec, The Netherlands)
The European Space Agency has a wide range of applications for space antennas and for propagation models - spanning telecommunication, space science, satellite navigation, earth observation, launchers and manned space missions. In addition to the development of new antennas and new propagation models, ESA is also active in the area of antenna measurement techniques and in conducting propagation experiments. The presentation will provide an overview of the most recent successful activities and will address the areas of priority for the coming years.

11:15 From Antennas to Microwave Systems – LTCC as an Integrating Technology for Space Applications
Ingo Wolff (IMST, Germany)
LTCC technology has large benefits in microwave and millimeterwave applications. In this presentation an overview is given on application of LTCC technology for the integration of microwave and millimeter-wave systems.

12:00 - 13:30 Lunch Break
(will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 1

Mon-Inv1: Invited Papers
Antennas

Chair: Manuel Sierra-Perez (Universidad Politécnica de Madrid, Spain)

14:00 Reflectarray Antennas
Antoine Roederer (Technical University of Delft - IRCTR, The Netherlands)
The paper reviews some innovative concepts and techniques, as well as architectures and realisations developed for both passive and re-configurable reflectarray antennas, mostly for space applications. Some trends and perspectives are discussed in the conclusion.

14:45 High Gain planar slotted Waveguide Arrays for Micro- and Millimeter-Wave systems
Makoto Ando (Tokyo Institute of Technology, Japan); Jiro Hirokawa (Tokyo Institute of Technology, Japan)
Single-Layer Waveguide Slot Arrays and Their System application are discussed. Design of high gain and high efficiency planar antennas is important in millimeter wave communication systems. Unique antennas utilizing cost effective single layer waveguides are developed in Tokyo Tech. Key features as well as the advantages in terms of mass production and fabrication costs, have been demonstrated. The author leads a Millimeter Wave Project which includes indoor and outdoor wireless systems. A test network, utilizing these antennas for the medium range backhaul links, are now installed in Tokyo Tech Oookayama campus.

Room: Hall A

Mon-Inv2: Invited Papers
Electromagnetics and Channel Modelling

Chair: Aldo Paraboni (Polytechnic of Milan, Italy)

13:30 Making a Case for Analytical Methods in Field Theory in Today's World of Electromagnetics dominated by Computational EM
Raj Mittra (Penn State University, USA)
We all have seen the trend and the proverbial handwriting on the wall-The EM world is going totally cyber. In this paper we will attempt to make a strong case for a slightly different strategy, where we think "Theory" first, before jumping headlong into the digital world with our eyes closed.

14:15 Multi-Scale Electromagnetic Simulation of Large and Complex Systems
Peter Thoma (CST-Computer Simulation Technology AG, Germany); Thomas Weiland (CST, Germany)
The presentation will provide an overview of several EM based system level simulation approaches, highlighting the particular strengths and limitations of each of these techniques. In addition to the analysis of multi-scale problems, the presentation will show a range of methods for large scale system optimization.

14:45 The Land Mobile Channel - Recording and Modelling
Erich Lutz (DLR, Germany)
This paper describes measurement and modelling techniques regarding the land mobile satellite channel. The land mobile satellite channel is discussed, and a narrowband channel model is introduced. Measurement results are fitted to the channel model, and resulting model parameters are presented. A four-state model for dual channel diversity is represente

14:00 - 15:30 **Room: Hall C 1**

Mon-SC1 - Microwave/mmW Photonic Feed Architectures for Large Phased Arrays (Part 1)

Dilip Paul, ACES, USA

This half-day short course will discuss several novel antenna feed architectures that are deemed immensely suitable for large and/or space-based arrays constrained by a host of critical requirements. Often, these stringent specifications such as compactness, light-weight, and prime power efficiency of the beam forming network (BFN) with much sought after capability for steering, nulling, reconfiguring, frequency agility, etc. render conventional RF/MW/mmW technologies unattractive. Whereas, judicious optical implementations of various signal processing functions such as generation, transmission, up/down block conversion, and distribution of high dynamic range MW/mmW signals have demonstrated elegant solutions to such feeds.

An overview of the innovative application of advanced photonics technology augmented by assessment of capability and market feasibility will be presented in this course. Relevant state-of-the-art optical technologies (fiber optics, laser optics, integrated optics, wavelength division multiplexer/demultiplexer (WDM), optical add-drop module (OADM), filters, optical amplifier, etc.), high speed optoelectronics (silicon photonics, optoelectronic integrated circuits (OEICs), analog-to-digital converter (ADC), modulator, demodulator, etc.), micro-opto-electro-mechanical (MOEM) switch matrix, and BFN subsystems and systems, including reliability and radiation hardness will be described in detail. Also, results of proof-of-concept demonstration and field deployment will be included. Recent advances in novelty nano-devices and technology bode well for all-optically implemented RF/MW/mmW systems.

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Monday, March 23 · 13:30 - 15:30

14:00 - 15:30 **Room: Hall C2**
Mon-SC2 - High resolution radio propagation prediction techniques and planning of GSM and UMTS/HSDPA networks (Part 1)

Karim Rizk, Wavecall, Lausanne, Switzerland

Abstract: The complexity of wireless network design has led operators to adopt or explore new simulation techniques. Signal-strength prediction system lies at the foundation of every wireless network simulator. High resolution prediction in urban environments is one of the techniques being examined because classical models fall short of the required accuracy in dense urban environments where most traffic is situated.

Urban prediction requires that account be taken of various mechanisms of propagation. An overview of the most relevant mechanisms will be given :

- Interaction with terrain, in flat and hilly environments.

- Interaction with vegetation,

- Effect of transmitter height ranging from micro to macrocell

The impact of the prediction accuracy on the network cost and network performance then will be investigated through two GSM and UMTS case studies.

14:00 - 18:00 **Room: Hall C4**
WS-AMTA1: AMTA Workshop-1
Calibration and certification of ranges for antenna measurements (Part 1)

The 2009 AMTA Workshop at EuCap is dedicated to the Calibration and certification of ranges for antenna measurements. The participants at this Workshop are:

- Dr. Phil Miller, from National Physics Laboratory (NPL) at UK.

- Dr. David Novotny, from National Institute of Standards and Technology (NIST) at USA.

- Dr. Håkan Eriksson, from SAAB Microwave Systems, at Sweden.

The participants from NIST and NPL will share their experience on the standardization of Antenna Measurements Procedures, while Dr. Eriksson will explain the SAAB Microwave Systems' experience on the ISO17025 certification of their Measurement Procedures.

All EuCap participants are very welcome to attend this Workshop.

Monday, March 23 · 16:00 - 18:00

16:00 - 18:00 **Room: Hall C3**
WS-GIGACOMP:
System Tests with an Emulated Radio Channel

EB (Elektrobit) and GIGACOMP will hold a free workshop on how to test wireless systems with an emulated radio channel.
We will discuss the following topics:

- The influence of radio channel disturbances on the performance of wireless systems
- System optimization with an emulated radio channel
- Performance requirements for next generation wireless systems (e.g. LTE, 802.11n)
- Capabilities of the EB Propsim C8 in radio channel emulation (e.g. MIMO)

During a hands-on demonstration participants will be able to see the influence of the following effects on the system performance:

- Doppler spread
- Fast fading (reflections)
- Slow fading (shadowing)
- Additive white Gaussian noise

Discussions can be continued at GIGACOMP's booth #49.

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

16:00 - 18:00 **Room: CC Rom 2**
EurAAP
Delegate Meeting

16:00 - 18:00 **Room: Hall A**
IEEE-DL1:
IEEE AP-S Distinguished Lecturers-1

Chair: J (Yiannis) Vardaxoglou (Loughborough University, United Kingdom) , Matthias Geissler (IMST, Germany)

16:00 3D Propagation Modeling and Characteristics for High Speed Mobiles (C2C, C2X)
Werner Wiesbeck (University of Karlsruhe (TH), Germany)
In existing wireless telecommunication systems a user can choose either a high data rate or a high mobility. For various applications it would be desirable to have both at the same time: the freedom to move with a very high velocity without loosing the high data rate. Systems based on Orthogonal Frequency Division Multiplexing (OFDM) seem to be suitable to satisfy these conditions. However, the high-speed aspect has to be considered more closely. High-speed links between receivers and transmitters cause varying Doppler, delay and angular spread, which may result in inter-carrier in-terference (ICI) and inter-symbol interference (ISI). ICI and ISI are both a challenge and a limiting factor for a wireless communication system. Applications for high-speed mobile stations are for example on planes, fast cars, high-speed trains and so on. Several scenarios are chosen for the simulations and partly verified by measurements. For cars these are urban and a high way scenarios, for trains high speed tracks with buildings or forest environment are chosen. For the wave propagation a 3D ray-tracing tool, based on the theory of geometrical optics (GO) and the Uniform Theory of Diffraction (UTD), is used. The model includes modified Fresnel reflection coefficients for the reflection and the diffraction based on the UTD. The propagation channels are characterized by delay spread, Doppler spread and angular spread for different situations. These statistical parameters are compared to measurements. Dynamic simulations will be illustrated by movies. The traffic scenarios are real world with multiple lanes, line of sight and non line of sight.

16:00 - 18:00 **Room: Hall C 1**
Mon-SC1 - Microwave/mmW Photonic Feed Architectures for Large Phased Arrays (Part 2)

Dilip Paul, ACES, USA

This half-day short course will discuss several novel antenna feed architectures that are deemed immensely suitable for large and/or space-based arrays constrained by a host of critical requirements. Often, these stringent specifications such as compactness, light-weight, and prime power efficiency of the beam forming network (BFN) with much sought after capability for steering, nulling, reconfiguring, frequency agility, etc. render conventional RF/MW/mmW technologies unattractive. Whereas, judicious optical implementations of various signal processing functions such as generation, transmission, up/down block conversion, and distribution of high dynamic range MW/mmW signals have demonstrated elegant solutions to such feeds.

An overview of the innovative application of advanced photonics technology augmented by assessment of capability and market feasibility will be presented in this course. Relevant state-of-the-art optical technologies (fiber optics, laser optics, integrated optics, wavelength division multiplexer/demultiplexer (WDM), optical add-drop module (OADM), filters, optical amplifier, etc.), high speed optoelectronics (silicon photonics, optoelectronic integrated circuits (OEICs), analog-to-digital converter (ADC), modulator, demodulator, etc.), micro-opto-electro-mechanical (MOEM) switch matrix, and BFN subsystems and systems, including reliability and radiation hardness will be described in detail. Also, results of proof-of-concept demonstration and field deployment will be included. Recent advances in novelty nano-devices and technology bode well for all-optically implemented RF/MW/mmW systems.

18:00 - 20:00 Welcome Reception in the Exhibition Area

16:00 - 18:00 Room: Hall C2
Mon-SC2 - High resolution radio propagation prediction techniques and planning of GSM and UMTS/HSDPA networks (Part 2)

Karim Rizk, Wavecall, Lausanne, Switzerland

The complexity of wireless network design has led operators to adopt or explore new simulation techniques. Signal-strength prediction system lies at the foundation of every wireless network simulator. High resolution prediction in urban environments is one of the techniques being examined because classical models fall short of the required accuracy in dense urban environments where most traffic is situated.

Urban prediction requires that account be taken of various mechanisms of propagation. An overview of the most relevant mechanisms will be given :

- Interaction with terrain, in flat and hilly environments.
- Interaction with vegetation,
- Effect of transmitter height ranging from micro to macrocell

The impact of the prediction accuracy on the network cost and network performance then will be investigated through two GSM and UMTS case studies.

Room: CC Room 5
Mon-S1:
Metamaterial-based Gap Waveguides

Chair: Per-Simon Kildal (Chalmers University of Technology, Sweden) , Stefano Maci (University of Siena, Italy)

16:00 Numerical analysis of a metamaterial-based ridge gap waveguide with a bed of nails as parallel-plate mode killer
Esperanza Alfonso (Universidad Politécnica de Valencia, Spain); Per-Simon Kildal (Chalmers University of Technology, Sweden); Alejandro Valero-Nogueira (Universidad Politécnica de Valencia, Spain); José Ignacio Herranz-Herruzo (Universidad Politécnica de Valencia, Spain)
A numerical analysis of a rigde gap waveguide, a new metamaterial-based waveguide technology for millimetre and submillimiter waves, is presented. The PMC condition has been realized by means of a bed of nails as a parallel-plate mode killer.

16:20 Three Metamaterial-based Gap Waveguides between Parallel Metal Plates for mm/submm Waves
Per-Simon Kildal (Chalmers University of Technology, Sweden)
This paper introduces three types of waveguides that can be formed in a narrow open gap between smooth and textured metal surfaces: the ridge gap waveguide, the groove gap waveguide and the microstrip gap line. They are very cheap to manufacture in particularly above 30 GHz.

16:40 Cut-off bandwidth of metamaterial-based parallel plate gap waveguide with one textured metal pin surface
Eva Rajo-Iglesias (University Carlos III of Madrid, Spain); Per-Simon Kildal (Chalmers University of Technology, Sweden)
This work explores the possibilities of creating stop bands (or bandgaps) in parallel plate waveguides by using a periodic structure at one of the plate. Particularly, a textured surface made of metal pins. A parametric study of in terms of the size of the achieved bandgap is presented.

17:00 Local Wave Green's Functions of Parallel Plate Metamaterial-Based Gap Waveguides with One Hard Wall
Zvonimir Sipus (University of Zagreb, Croatia); Marko Bosiljevac (University of Zagreb, Croatia); Per-Simon Kildal (Chalmers University of Technology, Sweden)
Derivation of the Green's functions for oversized waveguides with one hard wall is given. Several different realizations of the hard wall are considered: idealized PEC/PMC model, corrugated hard surface, strip-loaded hard surface, fakir-bed structure and mushroom structure. The Green's functions are derived using the approximate boundary conditions approach.

17:20 Analysis of Global Eigenmodes in an Oversized Rectangular Waveguide with a Hard Surface on One Broad Wall for Planar Slot Array Antenna Applications
Sergei Skobelev (Company "Radiophyzika", Russia); Per-Simon Kildal (Chalmers University of Technology, Sweden)
An oversized rectangular waveguide with hard surface on one broad wall is considered. An appropriate dispersion equation for the waveguide eigenmodes is derived and solved. The results are used for determining the eigenmode field structure and for drawing conclusions on applicability of the waveguide in the slot array technology.

16:00 - 18:00 Room: Hall C4
WS-AMTA2: AMTA Workshop-2
Calibration and certification of ranges for antenna measurements (Part 2)

The 2009 AMTA Workshop at EuCap is dedicated to the Calibration and certification of ranges for antenna measurements. The participants at this Workshop are:

- Dr. Phil Miller, from National Physics Laboratory (NPL) at UK.
- Dr. David Novotny, from National Institute of Standards and Technology (NIST) at USA.
- Dr. Håkan Eriksson, from SAAB Microwave Systems, at Sweden.

The participants from NIST and NPL will share their experience on the standardization of Antenna Measurements Procedures, while Dr. Eriksson will explain the SAAB Microwave Systems' experience on the ISO17025 certification of their Measurement Procedures.

All EuCap participants are very welcome to attend this Workshop.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Antenna Theory-1

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany) , Bruce Piper (University of Queensland, Australia)

1.1
Binary Particle Swarm Optimization of FSS Using a CG-FFT Modelling
Angel Gutiérrez (University of Cantabria, Spain); Jesus Perez Lopez (University of Cantabria, Spain); Jose Basterrechea (University of Cantabria, Spain)
A method that combines a binary version of PSO with the CG-FFT is presented and applied to carry out the optimization of frequency selective surfaces.

1.2
A Parallel implementation of the Multilevel Characteristic Basis Function Method
Jaime Laviada (Universidad de Oviedo, Spain); Raj Mittra (Penn State University, USA); Marcos Pino (Universidad de Oviedo, Spain); Fernando Las-Heras (Universidad de Oviedo, Spain)
Parallel issues related to a parallel implementation of a nested technique based on the Characteristic Basis Function Method is presented. Direct solution of problems up to 1,000,0000 of unknowns is presented.

1.3
Efficient and fast procedure for the calculation of electric and magnetic energies
Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium)
New expressions are derived for the reactive energy stored in the electromagnetic field surrounding an electromagnetic device. Thye are simple, general, rigorous in terms of currents, and fast. The new procedure is feasible to be used in cases where the reactive energies are important, for example with antennas.

1.4
A Circuit Model to Compute Impedance of Electromagnetically Coupled Ring Antenna
Sunil Khah (Jaypee University of Information Technology, India)
A new method of computation for impedance of electromagnetically coupled ring antenna is presented. The method is based on cavity model in conjunction with circuit theory. The impedance and resonant resistance of TM11 and TM21 modes is observed and compared with simulated(IE3D)results and validated through measurements.

1.5
Using B-Splines to Entirely Model the Scattering of Thin Wires
Bruce Piper (University of Queensland, Australia); Nick Shuley (University of Queensland, Australia)
This paper investigates if the MPIE can be calculated entirely using B-Splines and adapted to the Method of Moments technique eliminating the use of conventional numerical Gauss-Quadrature integration. An alternative method for the integration of the thin-wire approximation of the Greens function when it became singular was developed.

1.5 a
An application of the multi-level DG-FDTD to the analysis of the transmission between a dipole in free-space and an implanted antenna in a simplified body model with various positions
Céline Miry (IETR, France); Raphael Gillard (IETR, France); Renaud Loison (IETR, France)
We propose to use the advantages of the multi-level DG-FDTD method to determine, in a short computation time, the transmission coefficient between an antenna implanted in a simplified homogeneous body model and a dipole located in free space, for four different positions of the body.

1.6
Effect of Problem Size on PML Performance in Compact-FDTD Waveguide Models
Mohammed Hadi (Kuwait University, Kuwait)
Sensitivity analysis is conducted via an optimization procedure where actual Compact-FDTD waveguide simulations serve as input and optimum PML parameters as output. This analysis affirms a critical need to vary PML parameters as the waveguide's operating frequency renders it electrically large.

1.7
Combined Field Integral Equation Technique to Model Fine Slots Embedded in Laterally Shielded Multilayered Media
Laleh Golestanirad (ecole polytechnique federal de lausanne (EPFL), Switzerland)
This paper presents the details of development and computer implementation of the Combined Field Integral Equation (CFIE) technique numerically solved applying Method of Moments to address the problem of simulating fine slots appearing in grounded screens embedded in laterally shielded multilayered media.

1.8
Analysis of electromagnetic scattering from bodies of revolution using the fictitious circular loop currents model
Chen Ding (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China); Zhang Qiang (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China); He Bing Fa (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
bodies of revolution scattering problem are sloved by method of auxillary sources,with continuous circular loop currents are used as auxillary sources

1.9
Software tool for the leaky-mode analysis of waveguides loaded with frequency selective surfaces
María García-Vigueras (Technical University of Cartagena, Spain); Jose-Luis Gomez-Tornero (Polytechnic University of Cartagena, Spain); George Goussetis (Heriot-Watt University, United Kingdom); Alejandro Alvarez-Melcon (Polytechnic University of Cartagena, Spain)
We present an analysis procedure (implemented in a software tool) to obtain dispersion curves of structures based on the introduction of metallodielectric frequency-selective surfaces inside rectangular waveguides. These structures can be used to conceive Electromagnetic-Band Gap waveguides and leaky-wave antennas. Comparisons with full-wave simulations are presented to validate this analysis.

1.10
Solving electromagnetic scattering by multiple targets with surface equivalence principle algorithm
Pasi Ylä-Oijala (Helsinki University of Technology, Finland); Matti Taskinen (Helsinki University of Technology, Finland)
The surface equivalence principle algorithm (EPA) is applied to solve electromagnetic scattering by multiple targets of arbitrary shape. A novel EPA, called TEPA, is introduced to increase the accuracy of the solution.

1.11
Wideband analysis of electromagnetic scattering from partially inhomogeneous dielectric bodies-of-revolution with the use of macromodels
Andrzej Kucharski (Wroclaw University of Technology, Poland)
Integral Equation Macromodels are applied to problems involving scattering from inhomogeneous dielectric bodies-of-revolution. Starting from the volume-surface integral equation, the domain-decomposition method (DDM) is applied. Next, DDM is combined with the asymptotic waveform evaluation (AWE) method, resulting in a scattering model valid over certain frequency interval.

1.12
Synthesis of EBG surfaces using evolutionary optimization algorithms.
Luisa Deias (University of Cagliari, Italy); Giuseppe Mazzarella (University of Cagliari, Italy); Nicola Sirena (Dep. of Electric and Electronic Engineering University of Cagliari Italy, Italy)
In this paper evolutionary computation is applied to the synthesis of planar periodic EBG. We constrained our evolutionary design to the unit cell geometry and used a full-wave MoM to evaluate all individuals. Results show that the resonant frequency is able to approach the desired value, improving the bandwidth.

1.13
Simultaneous Shape and Topology Optimization for the Design of Patch Antennas
Naotaka Uchida (Kyoto University, Japan); Shinji Nishiwaki (Kyoto university, Japan); Kazuhiro Izui (Kyoto university, Japan); Masataka Yoshimura (Kyoto university, Japan); Tsuyoshi Nomura (Toyota Central R&D Labs, Japan); Kazuo Sato (Toyota Central Research and Development Laboratories, Inc., Japan)
This paper discusses a simultaneous shape and topology optimization method for the design of patch antennas.

1.14
Computational efficiency of the extended three-dimensional Stationary Phase Method enhanced by Fresnel functions (3D-SPM-F)
Charalampos Moschovitis (National Technical University of Athens, Greece); Hristos Anastassiu (Hellenic Aerospace Industry, Greece); Panayiotis Frangos (National Technical University of Athens, Greece)
This paper quantifies the computational efficiency of the extended, three-dimensional SPM method, enhanced by Fresnel functions, recently developed by our research group for the fast, yet accurate characterization of electromagnetic scattering from finite, perfectly conducting plates. The improvement in computational cost is demonstrated via comparison to standard numerical integration.

1.15
Accurate Software Tool for the Prediction of RF Breakdown in Microstrip Transmission Lines
Francisco Perez Soler (Technical University of Cartagena, Spain); Sergio Anza Hormigo (Aurorasat Software and Testing, Spain); Michel Mattes (EPFL, Switzerland); Carlos Vicente Quiles (Aurorasat Software and Testing, Spain); Fernando Quesada Pereira (Technical University of Cartagena, Spain); Benito Gimeno (Universidad de Valencia, Spain); Vicente Boria (Universidad Politécnica de Valencia, Spain); Alejandro Alvarez-Melcon (Polytechnic University of Cartagena, Spain); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland); David Raboso (European Space Agency, The Netherlands)
In this paper, a full-wave software tool for the accurate prediction of the RF breakdown in microstrip transmission lines is presented. The main objective of the project is to develop a software tool capable to predict the Multipactor and Corona breakdown onsets in shielded microstrip devices.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Antenna Theory-1

1.16
Scattering with Reinforced Concrete Wall in 900-MHz Band Using MOM/CI Method
Abdorreza Torabi (Sharif University of Technology, Iran); Amir Ahmad Shishegar (Iran Telecommunication Research Center, Iran)
This paper is about scattering of electromagnetic wave by reinforced concrete walls. It is considered in 900-MHz band used in mobile communication. The techniques used here is method of moment complex image (MOM/CI). It inspects the wires and concrete effects and also talks about the scattering pattern of these walls.

1.17
Accurate solution of helical antenna as benchMark for validation of thin-wire modeling
Branko Kolundzija (University of Belgrade, Yugoslavia (defunct)); Svetislav Ponjavic (University of Belgrade, Yugoslavia (defunct))
The first goal of the paper is to obtain precise model of helical antenna including into account proximity effect of wire and higher order modes at coaxial line opening. The second goal of this paper is to compare the results obtained by precise model and thin wire approximation.

1.18
Bio-Inspired Algorithms and 2D Finite Element Method Applied to Electromagnetic Bandgap Structures Design
Carlos Silva-Santos (Universidade Estadual de Campinas, Brazil); Marcos Gonçalves (Universidade Estadual de Campinas, Brazil); Aldário Bordonalli (Universidade Estadual de Campinas, Brazil); Hugo Hernández-Figueroa (Unicamp, Brazil); Kleucio Claudio (Unicamp, Brazil)
This work has the objective to analyze Genetic Algorithms, Evolution Strategies and Artificial Immune Systems, with FEM, to optimize 2D EBG structures. There is interest in analyze the convergence efficiency and computational performance of bio-inspired algorithm applied to EBG structures design, presenting convergence efficiency of bio-inspired algorithms in EBG optimizations.

1.19
A Distributed Memory Multilevel Fast Physical Optics Algorithm
Christian Parrot (Institut National des Télécommunications, France); Daniel Millot (INF/INT/GET, France); Christine Letrou (Institut TELECOM SudParis, France); Amir Boag (Tel Aviv University, Israel)
The MultiLevel fast Physical Optics algorithm is based on hierarchical domain decomposition and phase compensated interpolation approach. We present a distributed memory algorithm, partitioning both the radiating aperture and the grid of far field directions, to improve speed and reduce memory requirements. It is tested on large reflector antenna problems.

1.20
Analysis of Arbitrarily Shaped Waveguide Eigenvalue by the MOM/BI-RME Method
Xiaolin Xu (Nanjing Research Institute of Electronic Technology, P.R.China, P.R. China); Zhang Qiang (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
The presented method here is MO/BI-RME, expanding the field by waveguide modes in the enlarged defined domain. Simultaneity, BI-RME permits basis and Green function be represented by a simple sequences with more rapid convergence. Finally, it has been verified that the high precision and efficiency of solving arbitrary shaped waveguide.

1.21
Analytical approach to low-frequency scattering and homogenisation of split ring elements
Johan Sten (Technical Research Centre of Finland, Finland); Daniel Sjöberg (Lund University, Sweden)
Low-frequency electromagnetic scattering by a split ring, modelled as a perfectly conducting wire ring furnished with a narrow gap, is presented and analytical results are given for the electric and magnetic dipole moments. Through the process of homogenisation, these results are linked with the macroscopic constitutive equations for the medium.

1.22
A small signal analysis of statistical antenna modelling
Alain Sibille (ENSTA, France)
The paper addresses the new topic of statistical antenna modelling, and proposes a method to reduce the spanning of the stochastic space, when the perturbations around the mean of the antenna parameters are sufficiently small to allow a small signal analysis.

1.23
MONURBS, a parallelized Moment Method code that combines FMLMP, CBF and MPI
Iván González Diego (Universidad de Alcalá, Spain); Josefa Gómez Pérez (Universidad de Alcalá, Spain); Abdelhamid Tayebi (University of Alcala, Spain); Felipe Catedra (University of Alcala, Spain)
A computer code based on the Method of Moment with Fast Multilevel Multipole, Characteristic Basis Functions is presented. It is parallelized using Message Passing Interface. it is a powerful tool to analyze complex antennas, antennas on board and electromagnetic compatibility. Conducting, dielectric or composite media can be treated

1.24
Second order Fast Physical Optics
Felipe Vico_Bondía (Universidad Politécnica de Valencia, Spain); Miguel Ferrando (Universidad Politecnica De Valencia, Spain); Esperanza Alfonso (Universidad Politécnica de Valencia, Spain); Daniel Sanchez Escuderos (Universidad Politécnica de Valencia, Spain)
This paper shows a fast and efficient algorithm to compute the Physical Optics integral on smooth large surfaces of arbitrary shape. The algorithm is applied to several nurbs surfaces. The algorithm consist of dividing the surface in smaller triangles and apply a quadratic approximation for each triangle.

1.25
Discussion On The Efficient Evaluation Of The Green's Functions Of Point Sources Inside In finite Parallel Plate Waveguides
Francisco Perez Soler (Technical University of Cartagena, Spain); Fernando Quesada Pereira (Technical University of Cartagena, Spain); Alejandro Alvarez-Melcon (Polytechnic University of Cartagena, Spain); Francisco Eden Sorolla Rosario (EPFL, Switzerland); Benito Gimeno (Universidad de Valencia, Spain)
We examine several techniques for computing the Green's functions inside infinite parallel plate waveguides considering point sources. The basic spectral and spatial domain approaches are reviewed, showing their main particularities. The Ewald and Kummer's methods are applied for the evaluation of these functions. Convergence and validation results are included.

1.26
Green Function for a Horizontal Source on a Dielectric Slab with a PEMC Ground
Javad Komijani (University of Tehran, Iran); Jalil Rashed Mohassel (Electrical and Computer Department, Faculty of Engineering, University of Tehran, Iran, Iran); Hadi Aliakbarian (ESAT, Katholieke Universiteit Leuven, Belgium); Ali Mirkamali (Zanjan University, Iran)
in this paper we have presented Green function in integral form for a horizontal source over a dielectric slab with a PEMC as ground,this Green function can be applied to analyze patch antenna with PEMC ground.

1.27
Compression of the MoM Matrix Using Macrobasis Functions with a Full-Controlable Accuracy
Jose M. Tamayo (Universitat Politècnica de Catalunya, Spain); Alexander Heldring (Polytechnical University of Catalunya, Spain); Juan M. Rius (Universitat Politècnica de Catalunya, Spain)
A new accuracy-controlable method for compressing the MoM impedance matrix of an electromagnetic problem based on a basis change plus a truncation with a threshold. The idea is to switch to singular basis functions, which are defined on relatively large subdomains of the object.

1.28
Imperfect Strip Gratings Near Wood Anomalies
Alex Schuchinsky (Queen's University of Belfast, United Kingdom); Constantine Talalaev (Queen's University Belfast, United Kingdom)
A new technique for analysis of periodic gratings with imperfect strip conductors gives well-conditioned, uniformly convergent and numerically stable solutions. Separation of the spectral and spatial singularities in Green function enables problem regularisation in vicinities of Wood's anomalies and provides insight in the mechanisms of loss in strip gratings.

1.29
Efficiency Treatment of Two Closely Spaced Metal Sheets by Characteristic Mode Theory
Pavel Hamouz (Czech Technical University in Prague, Czech Republic); Milan Polivka (Czech Technical University in Prague, Czech Republic); Pavel Hazdra (Czech Technical University in Prague, Czech Republic)
After brief recapitulation of Theory of Characteristic Modes basics we apply the method for radiation efficiency treatment of two closely spaced metal sheets with very low relative height d over the ground plane tuned to resonate at 2.45 GHz. This sheets arrangement can represent for example patch type antenna.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Joint A-P-M Topics-1

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany) , Konstantinos Gotsis (Aristotle University of Thessaloniki, Greece)

1.30 Wearable EBG Antennas
Richard Langley (University of Sheffield, United Kingdom); Qiang Bai (University of Sheffield, United Kingdom)
The bending and crumpling of dual band ebg antennas is presented.

1. 31
Improved Neural Network DoA Estimation for a Switched-Beam System in a Multipath DS-CDMA Scheme
Konstantinos Gotsis (Aristotle University of Thessaloniki, Greece); George Kyriacou (Democritus University of Thrace, Greece); John Sahalos (Aristotle University of Thessaloniki, GR-54124, Thessaloniki, Greece, Greece)
In previous works the authors introduced the Neural Network (NN) Direction of Arrival (DoA) estimation method for a Switched-Beam DS-CDMA system. In this paper the method's performance has been significantly improved, enabling its application not only to the desired signal's main path but also to its strong multipaths.

1.32
Classification of UWB Multipath Clusters and Its Distortion Effects on Positioning Error
Khajitpan Makaratat (Centre for Communication Systems Research, University of Surrey, United Kingdom); Tim Brown (University of Surrey, United Kingdom); Stavros Stavrou (University of Surrey, United Kingdom); Barry Evans (University of Surrey, Italy)
UWB multipath clusters are characterised and classified regarding to cluster types and scenarios. PPM-TH-UWB signal is generated and transmitted over synthesised multipath channels including distortion effects. Consequently, positioning error is considered to quantify distortion impacts. Comparison of pulse distortion effects on each MPC at each propagation channel is also presented.

1.33
Influence of Insulation for Implanted Antennas
Francesco Merli (Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland); Benjamin Fuchs (EPFL, Switzerland); Anja Skrivervik (EPFL, Switzerland)
This work presents the effects of real biocompatible insulation layers on implanted antennas. An analytical tool, based on spherical wave expansion, is developed to model the human body. The study aims to discuss the insulation's characteristics that enhance the radiation of ideal sources embedded in a muscle shell.

1.34
Time Domain Detection of Interference Signals Using Ultra Wideband Techniques
Robert Urban (Czech Technical University in Prague, Czech Republic); Stanislav Zvanovec (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic)
A specific time domain approach to the detection of services within a particular channel using ultra wideband pulse techniques is introduced. The investigation is based on measurements and propagation simulations of several ultra wideband pulses spreading and reflecting within a particular scenario and received together with the interfered narrowband signal.

1.35
Complement Pattern on Metamaterial Antenna for Reducing Mutual Coupling in MIMO System
Soon Ho Hwang (Telecommunication R&D Center, Samsung Electronics, Korea); Taesik Yang (Telecommunication R&D Center, Samsung Electronics, Korea); Joon Ho Byun (Telecommunication R&D Center, Samsung Electronics, Korea); Austin S Kim (Telecommunication R&D Center, Samsung Electronics, Korea)
Proposed antennas are composed of metamaterial structure for size reduction and have complement pattern in order to improve mutual coupling in MIMO system. It is able to achieve both very small size and highly improved performance as MIMO antennas.

1.36
2.45 GHz plaster antennas for health monitoring
Tiiti Kellomäki (Tampere University of Technology, Finland); William Whittow (Loughborough University, United Kingdom); Jouko Heikkinen (Tampere University of Technology, Finland); Lauri Kettunen (Tampere University of Technology, Finland)
We present antennas made on a plaster substrate. The antennas are attached directly on the skin. Breathability is achieved by cutting holes in the antennas. The design is a trade-off between user comfortability and antenna performance. Results for impedance, radiation, and SAR are presented and the body effect examined.

1.37
Performance Analysis and Implementation of Spatial and Blind Beamforming Algorithms for Tracking LEO Satellites with Adaptive Antenna Arrays
Alberto Antón (Universidad Politécnica de Madrid, Spain); Ramón Martínez Rodríguez-Osorio (Technical University of Madrid. ETSI de Telecomunicacion, Spain); Miguel Salas Natera (Universidad Politectica de Madrid, Spain); Alberto Torre (Ingeniería y Servicios Aeroespaciales, S.A. (INSA), Spain)
Arraying technology presents several advantages over traditional reflector antennas in the context of satellite communications. Beamforming algorithms will be compared so as to decide the most suitable for a given simulated and real scenario. Calibration and signal tracking topics will also be considered.

1.38 Synthesizing realistic environments in anechoic chamber
Lionel Rudant (CEA-LETI, France); Christophe Delaveaud (CEA-LETI, France); Meryam AbouElAnouar (CEA-LETI, France)
In this paper, we present an experimental setup in anechoic chamber for investigating the impact of spatial, delay and polarization properties of the environment on diversity performances for DVB-SH.

1.39
User Interaction with Antenna Arrays in MIMO-Enabled Laptops
Jerzy Guterman (Instituto de Telecomunicacoes, IST/UTL, Portugal); Antonio Moreira (IST - Tech Univ Lisbon, Portugal); Custodio Peixeiro (IST-TUL, Portugal); Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA)
The effects of the electromagnetic interaction between the human body and a laptop integrated MIMO antenna array operating in the popular ISM 2.4 GHz band are numerically studied from the viewpoint of array performance and EM dosimetry.

1.40
2-D Field Reconstruction: A Measurement "Sandbox" for Spatial Correlation Analysis
Ryan Pirkl (Georgia Institute of Technology, USA); Gregory Durgin (Georgia Tech, USA)
Typical measurements of spatial correlation obtained by moving an antenna array through a wireless channel cannot be generalized to other antenna arrays having different geometries. In contrast, the complete 2-D spatial channel provided by an electromagnetic field reconstruction allows researchers to evaluate channel correlation matrices for arbitrary array geometries.

1.41
Time domain analysis of fields reflected from model of human body surface using artificial neural network
Oleksandr Dumin (V.N.Karazin Kharkiv National University, Ukraine); Olga Dumina (Ukrainian State Academy of Railway Transport, Ukraine); Dmitrij Shyrokorad (Zaporizhzhya National Technical University, Ukraine)
The impulse fields reflected from the model of human body surface are analyzed by artificial neural network in time domain. The reflected electromagnetic field is obtained by FDTD method. The network is trained to determine the thickness of one of the layers of the medium.

1.42
Novel Two-layer 4x4 SIW Nolen matrix for Multi-beam Antenna Application in Ku Band
Ahmed Ali (University of Toulouse, France); Nelson Fonseca (CNES, France); Fabio Coccetti (Laboratory of Analysis and Architecture of Systems, France); Hervé Aubert (Laboratory of Analysis and Architecture of Systems, France)
A novel double-layer Nolen matrix structure is presented in SIW technology. The matrix is expected to be used with a planar multi-beam antenna in Broadcast Satellite Systems (BSS) at 12.5 GHz.

1.43
Radio Waves Scattering Dependence on the Statistical Parameters of Classical and Fractal Rough Surfaces
Alexander Laktyunkin (Institute of radio engineering and electronics, Russia); Alexander Potapov (Institute of radio engineering and electronics, Russia)
It has been numerically studied in this work how the statistical parameters of irregularities of classical and fractal rough surfaces affect the radio waves diffuse scattering.

1.44
Multiple Antennas effect in UWB spatial multiplexing
Raffaele D'Errico (Ecole Nationale Supérieure de Techniques Avancées, France); Alain Sibille (ENSTA, France)
In this paper we investigate the impact of multiple antenna design on UWB spatial multiplexing performance. The investigation is based on measured indoor channels with real arrays. We highlight the effect of mutual coupling for a variety of UWB linear array desgins with different inter-element separations.

1.45
Impulse Response of the UWB channel with conducting and dielectric convex obstacles.
Piotr Górniak (Pozna? University of Technology, Poland); Wojciech Bandurski (Pozna? University of Technology, Poland)
The paper deals with deterministic modeling of UWB channels containing conducting and dielectric convex obstacles. It fucuses on deriving time domain expressions for transition zone diffraction coefficients. The key task here is to find the way of transforming frequency domain espessions containing transition zone diffarction parameters into the time domain.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Joint A-P-M Topics-1

1.46
Human Head Electromagnetic Scattering
Miguel Garcia-Fernandez (Technical University of Cartagena, Spain); Juan Valenzuela-Valdes (Emite Ing, Spain); David Sanchez-Hernandez (Universidad de Cartagena, Spain)
After exposing a human head to 125 mW at 1800 MHz, a matching effect and the skull being a protection for thermal stress due to EMF exposure have been confirmed, suggesting that a combined EM-thermal basic restriction would represent more accurate safety limits, reducing uncertainties for deriving the reference levels.

1.47
Dispersive Breast Models for Efficient FDTD Simulation
Guangran Zhu (McGill Universtiy, Canada); Boris Oreshkin (McGill University, Canada); Emily Porter (McGill Universtiy, Canada); Mark Coates (McGill University, Canada); Milica Popovic (McGill University, Canada)
This paper presents the development of dispersive human breast models suitable for the finite-difference time-domain electromagnetic simulator, SEM-CAD. The three-dimensional breast models are derived from magnetic resonance images (MRIs). We apply regression tree analysis to reduce the complexity of the model without sacrificing significant structural accuracy.

1.48
Reflection Coefficient of the Human Thorax: Sensitivity to Intrathoracic Displacements and Incorporation into an Ultra-Wideband Channel
Florian Thiel (PTB Berlin, Germany)
To investigate the sensitivity of the reflection coefficient of the human thorax to the displacement of intrathoracic layers we implemented an analytical model. The stratified arrangement of the thorax model accounts for the dispersive behaviour of the different tissues in a broad frequency range by utilizing the Cole-Cole model.

1.49
Development of Flexible, Wearable Antennas
James Matthews (BAE Systems, Advanced Technology Centre, United Kingdom); Gary Pettitt (DSTL, United Kingdom)
This paper presents a summary of the work performed to generate flexible, body wearable antennas which are integrated into clothing. The antenna design process and numerical simulation is presented. The manufacturing processes used are described and reviewed. The measurement results will be presented to demonstrate the performance of the antennas.

1.50
High-Gain On-Chip Antennas for LSI Intra-/Inter-Chip Wireless Interconnection
Kentaro Kimoto (Hiroshima University, Japan)
A wireless interconnection using on-chip antennas has been proposed for 3-D packaging of LSI chips. The issues of on-chip antennas are extremely low gain due to lossy Si substrate. In this study, we developed high gain on-chip antennas by thinning of Si substrate thickness and optimizing interposer thickness.

1.51
Inverse Problem Solution of Radio-Waves Scattering on Soil by Minimization of Regularizing Functional
Alexander Shibelgut (Tomsk University of Control Systems and Radioelectronics, Russia); Rudolph Litvinov (Tomsk University of Control Systems and Radioelectronics, Russia); Anatoly Zadorin (Tomsk University of Control Systems and Radioelectronics, Russia)
To determine an one-dimensional continual permittivity profile of layered medium with a scale of inhomogeneity in 1 cm has been considered a data processing procedure of waves reflection from a half-infinite medium with heterogeneous permittivity that depends on a depth.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Propagation-1

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany) , Erich Lutz (DLR, Germany)

1.52
Influence of Polarization on the Above Ground Surface Electric Field for Vehicular Applications
Sebastien Palud (University of Rennes I, France); Franck Colombel (Université de Rennes 1, France); Mohamed Himdi (Université de Rennes 1, France, France); Cyrille Le Meins (Tjales Communications, France)
The impact of polarization on the distribution of the above ground surface (AGS) electric field is presented for vehicular applications. It is demonstrated that the homogenization of the E-field components, directly over the ground, can be optimized by a judicious choice of polarization. Simulations and measurements demonstrate these results.

1.53
A Study of the "Slack-String" Knife-Edge Diffraction Model
Teresa Rusyn (Institute for Telecommunication Sciences, USA)
This paper presents the results of an investigation of a multiple knife-edge diffraction model, the "slack-string" model. The model is tested here using a subset of a database of knife-edge profiles that was specifically assembled for the purpose of comparative analysis of different diffraction models' predictive accuracies.

1.54
Excitation and Propagation of Whistler Waves in Density Depletion Ducts in a Magnetoplasma
Alexander Kudrin (University of Nizhny Novgorod, Russia); Pavel Bakharev (University of Nizhny Novgorod, Russia); Tatyana Zaboronkova (Technical University of Nizhny Novgorod, Russia)
Excitation and propagation of whistler-mode waves in an unbounded magnetoplasma in the presence of a cylindrical density-depletion duct are studied. Using a rigorous solution for the total source-excited field, the characteristics of a loop antenna located in such a duct are found under ionospheric and laboratory conditions.

1.55
New Czech Rain Data and Methods Applied to Radiowave Propagation
Ondrej Fiser (Institute of Atmospheric Physics, Czech Republic); Ondrej Fiser jr. (Czech Technical University, Czech Republic)
Continuous rain rate measurement in the Czech Republic is analysed by a new original method. Many useful parameters from rain statistics were evaluated. A way to use it in rain attenuation prediction is shown.

1.56
Route Diversity Simulations in Multi-HAP Networks during Heavy Rainstorms
Stanislav Zvanovec (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic); Milos Mazanek (Czech Technical University in Prague, Czech Republic)
Route diversity is one of available techniques to improve system availability of High Altitude Platform networks during rainstorms. Route diversity was simulated in both time and space using radar rainfall data. Propagation aspects of inter-HAP connections and interference from HAP station as observed at the Earth user station were analyzed.

1.57
ITU Attenuation Model Evaluation With a New 4 Years ka-Band Database
Armando Rocha (U. Aveiro / IT Aveiro, Portugal); Pedro Gaspar (University of Aveiro, Portugal); José Carlos Neves (U. Aveiro / I.T. Aveiro, Portugal)
A new ka beacon experiment is described: equipment and data processing. The propagation database that comprises 3 years of rain rate and attenuation is presented. The ITU attenuation model is tested with rain rate maps and locally measured Rain. The model accuracy, by using the recommended metrics, is then evaluated.

1.58
The Effect of Raindrop Size Distribution Variability on the Estimation of Attenuation
Adrian Townsend (The University of Bath, United Kingdom); Robert Watson (The University of Bath, United Kingdom); Duncan Hodges (University of Bath, United Kingdom)
A key problem in determining rain attenuation from rainfall rate is the considerable variability of the raindrop size distribution. Based on analysis of disdrometer and numerical weather prediction model data, the aim of this work is to constrain the parameters of the raindrop size distribution and generate probabilistic attenuation forecasts.

1.59
Spatial characterization and downscaling of rain attenuation fields from numerical weather prediction models
Mario Montopoli (University of L'aquila, Italy); Frank Marzano (Sapienza University of Rome, Italy)
The spatial characterization of rain fields from weather forecast models simulations will be done. The associated attenuation field (f>10GHz)are derived from a numerical scattering simulator(T-matrix).A stochastic spatial downscaling technique will be described and used to provide an ensemble of possible realizations at higher spatial resolution.

1.60
The Investigation of Phase Synchronization of Reference Oscillators Through Atmospheric Channel
Igor Shirokov (Sevastopol National Technical University, Ukraine); Igor Serdyuk (Sevastopol National Technical University, Ukraine)
Presented paper is devoted to the theoretical modeling and experimental investigation of transferring of initial phase of low frequency oscillations with modulation of carrier oscillations in separate high frequency link from one part of testing link to another.

1.61
Measurement based capacity analysis of beam steering in the 60 GHz band
Mikko Kyrö (TKK Helsinki University of Technology, SMARAD/Radio laboratory, Finland); Sylvain Ranvier (Helsink University of Technology, Finland); Clemens Icheln (Helsinki University of Technology, Finland); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
This paper presents the performance evaluation of a system using beam steering technique at RX, based on 60 GHz MIMO measurement data. The mutual information of this system is compared to the one of a traditional MIMO system, considering ideal and realistic phase shifters.

1.62
Use of the 50-90 GHz Frequency Bands in Feeder Networks
László Csurgai-Horváth (Budapest University of Technology and Economics, Hungary); Istvan Frigyes (Budapest University of Technologies, Hungary); János Bitó (Budapest University of Technology and Economics, Hungary); Balázs Héder (Budapest University of Technology and Economics, Hungary)
With the rapid development of the wireless communication the networks become so crowded that the extending of the current systems is impossible. The operators are obliged to introduce new frequencies, undertaking their difficulties. This paper shows what are the advantages of the usage of high frequency bands between 50-90 GHz.

1.63
Short-term prediction of atmospheric attenuation in Q band from Ka band measurements in Earth-to-Satellite links
Louis DeMontera (CETP, France); Laurent Barthes (University of Versailles Saint Quentin, France); Peter Gole (CETP, France); Thierry Marsault (CELAR, France); Cecile Mallet (CETP, France)
The results of a FMT system on a 20/44 GHz satellite link. The presented model allows the Margin to be estimated so that a given percentage of availability is reached of the uplink a few seconds in advance with respect to the downlink measurement.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Propagation-1

1.64
Proragation in an Azimuthally Magnetized Circular Ferrite-Dielectric Waveguide
Georgi Georgiev (University of Veliko Tirnovo "St. St. Cyril and Methodius", Bulgaria); Mariana Georgieva-Grosse (Meterstr. 4, Germany)
The normal propagation of TEon modes is investigated in an infinitely long, perfectly conducting circular waveguide, loaded with adielectric cylinder, surrounded by a latching ferrite tube, magnetized in azimuthal direction to remanence by an infinitely thin central wire. It is a suitable device configuration for a remanent nonreciprocal phase shifter.

1.65
The Simulation of Rain Fade on Arbitrary Microwave Link Networks
Kevin Paulson (University of Hull, United Kingdom); Xiaobei Zhang (University of Hull, United Kingdom)
This paper describes a system to predict the joint rain fade time-series on arbitrary networks of microwave links, with time resolution of the order of seconds. This allows the Quality of Service available at a node in an arbitrary network to be simulated for a range of climatic conditions.

Lobby 1

Mon-Poster:
Poster Session-Small Antennas-1

Chair: Klaus Solbach (Universität Duisburg-Essen, Germany) , Markus Berg (University of Oulu, Finland)

1.66
High Degree of Miniaturization with Asymmetric Rectangle Resonators
Ibraheem Al-Naib (TU Braunschweig, Germany); Christian Jansen (TU Braunschweig, Germany); Martin Koch (Technische Universität Braunschweig, Germany)
In this paper, we discuss the spectral response of new rectangular asymmetric resonators and compare it to the characteristics of conventional circular structures. The rectangular design offers a miniaturization of 23% and features an improved transmission roll-off. Frequency selective surfaces and thin-film sensors could benefit from these novel structures.

1.67
Modelling of the Monopole Interaction with a small Chassis
Umut Bulus (National Research Institute of Electronics and Cyrptology, Tubitak, Turkey, Turkey); Klaus Solbach (Universität Duisburg-Essen, Germany)
The modelling of the self- and mutual impedances of a monopole and a flat dipole leads to an over-all equivalent circuit model for the monopole mounted on a small chassis. The transition from the flat dipole as an intermediate step to the rectangular monolithic chassis employs the chassis mode theory.

1.68
Multiband antenna for WLAN applications using a fractal-based ground plane
Joan Gemio Valero (Universitat Autònoma de Barcelona, Spain); Josep Parrón (Universitat Autonoma de Barcelona, Spain); Jordi Soler Castany (Universitat Autònoma de Barcelona, Spain)
A multiband antenna for WLAN applications will be presented. It is based on a Sierpinski monopole on a fractal-based ground plane. Simulations and measurements show as the use of the fractal-based ground plane can improve the input reflection coefficient bandwidth of the Sierpinski monopole while maintaining similar radiation patterns.

1.69
Combined multi-band antenna for GPS and WLAN applications
Jean-Marc Ribero (Université de Nice Sophia Antipolis, France); Robert Staraj (University of Nice-Sophia Antipolis, France); Georges Kossiavas (University of Nice, France); Emilie Fond (RADIALL, France)
We propose a new complex multi-band antenna working simultaneously in linear and circular polarizations for GPS1, GPS2 and WLAN applications. This antenna is a combination of stakked patches, printed on ceramic substrates, with a metallic structure within a cavity placed in the center of the previous patches.

1.70
A Study of Parameter Changes on the Characteristics of Planar Inverted-F Antenna
Hassan Chattha (University of Liverpool, United Kingdom); Yi Huang (University of Liverpool, United Kingdom); Yang Lu (University of Liverpool, United Kingdom); Zhen Ming Huang (University of Liverpool, United Kingdom)
This paper represents a simulated and experimental study of the Planar Inverted-F antenna (PIFA) involving the changes in some parameters to observe their effects on the characteristics of PIFA.

1.71
Coupling Minimization between RH and LH/RH Curl Antennas Positioned over a Ground Plane
Sean O'Kane (Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom)
Two printed curl antennas operating above a ground plane and each of opposite polarisations are deployed for transceiver use.

1.72
Dual linear/circular polarization patch antenna with broadband polarizer for 3.5 GHz WiMAX systems
Jose Luis Masa-Campos (Autonoma University of Madrid, Spain); Fenando Gonzalez-Fernandez (Autonoma University of Madrid, Spain)
In this paper a broadband patch antenna is presented for WiMAX applications in the 3.5 GHz band. The aim of the design is to provide the antenna with linear or circular polarization with a broadband polarizer. A 2x2 array prototype has been manufactured and measured with satisfactory results.

1.73
A miniaturization technique of a compact omnidirectional antenna
Christophe Delaveaud (CEA-LETI, France); Sarah Sufyar (CEA-LETI, France)
This paper discusses a new technique to miniaturize a low-profile omnidirectional antenna structure. size reduction effects are carefully studied and compared to well known fundamental limits of electrically small antennas

1.74
Design of a Broadband Half-Cylindrical DRA for Future WLAN Applications
Ahmed Abumazwed (Concordia University, Canada); Osama Ahmed (Concordia University, Canada); Abdel R. Sebak (Concordia University, Canada)
A half-cylindrical DRA is presented in this paper. It is fed by an aperture coupling rectangular and U-shaped slots. An impedance bandwidth of 40.5% which covers the frequency band for future WLAN applications is achieved. The antenna has good radiation characteristics within the band of interest.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Small Antennas-1

1.75
An Integrated Antenna-Filter with Harmonic Rejection
Djuradj Budimir (University of Westminster, United Kingdom)
In this paper we present the possibility to integrate microstrip bandpass filter and patch antenna in order to suppress spurious harmonics of antenna. Compact microstrip pseudo-interdigital stepped impedance bandpass filter with improved stopband was designed. As a result of integration full suppression of first two spurious harmonics was achieved.

1.76
Miniature narrow band PIFA antenna for high
Ignacio Garcia Zuazola (University of Kent, United Kingdom); John Batchelor (University of Kent, United Kingdom); Jaafar Elmirghani (University of Leeds, United Kingdom)
This paper introduces a miniature narrow band antenna for high performance systems using the WiMAX band. The antenna return loss, VSWR circle and Q factor contour will be shown. Owing to its compact design this antenna is suitable for equipment integration in small handsets.

1.77
A Novel Approach to Enhance the Bandwidth of Miniaturized Microstrip-fed Dielectric Resonator Antennas
Atabak Rashidian (University of Saskatchewan, Canada); David Klymyshyn (University of Saskatchewan, Canada)
This paper presents the concept and implementation of microstrip-fed, miniaturized broadband dielectric resonator antennas (DRAs). Miniaturization and the possibility of utilizing microstrip line as a feed are achieved by the high permittivity of the resonator; wideband operation is attained by merging the resonances of two appropriate modes of DRA.

1.78
New physical bounds on elliptically polarized antennas
Mats Gustafsson (Lund University, Sweden); Christian Sohl (Lund University, Sweden)
In this paper a newly developed physical bound on antennas of arbitrary shape is generalized to elliptical polarizations. The new bounds are comparable with the classical limitations for spherical geometries but provide sharper inequalities for other geometries. The theoretical results are illustrated with numerical results for various antennas.

1.79
Design of A Dual Band Equatorial Helix Antenna for TTC of Satellites
Iván González Diego (Universidad de Alcalá, Spain); Abdelhamid Tayebi (University of Alcala, Spain); Josefa Gómez Pérez (Universidad de Alcalá, Spain); José Manuel Gómez (University of Alcalá, Spain); Felipe Catedra (University of Alcala, Spain)
A dual band equatorial helix antenna design for TTC applications is presented. The design process and predicted and measurement results will be presented. The goal is the design of a small antenna for TTC for an ESA Project operating in two bands: 1.810 GHz and 2.250 GHz

1.80
Dual band a-Si-H Solar-Slot Antenna Design for 2.4/5.2GHz W-LAN Applications
Shynu Nair (Dublin Institute of Technology, Ireland); Maria Ons (Dublin Institute of Technology, Ireland); Max Ammann (Dublin Institute of Technology, Ireland); Sarah McCormack (Dublin Institute of Technology, Ireland); Brian Norton (Dublin Institute of Technology, Ireland)
The idea of integration of solar cells with microwave antennas offers wide range of advantages in terms of surface coverage and electric performance. In the present approach, amorphous silicon solar cells are used to design compact dual band microwave slot antennas operating at 2.4/5.2GHz WLAN application.

1.81
The Optimization of Microwave On-Body Antenna of the Sensor of Cardiac Rhythm
Igor Shirokov (Sevastopol National Technical University, Ukraine); Rostyslav Dubrovka (Queen Mary, University of London, United Kingdom); Igor Serdyuk (Sevastopol National Technical University, Ukraine)
In the paper discussed the method of improving of functioning of the sensor of heart rhythm due to creation of relative immunity of patch antenna to human body. The antenna is supplied with dielectric cover which decreases the influence of human body.

1.82
Designing Maximal Resolution Loop Sensors for Cryptographic Analysis
Wim Aerts (Katholieke Universiteit Leuven, Belgium); Elke De Mulder (K.U.Leuven, Belgium); Bart Preneel (Katholieke Universiteit Leuven, Belgium); Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium); Ingrid Verbauwhede (UCLA, USA)
In this paper, the maximal spatial resolution of a loop sensor is investigated. This will result in a practical limit determined by the desired signal amplitude and working frequency band.

1.83
Rectangular Reconfigurable Antenna (RRA) with Ultra Wideband Tuning Ability
Shishir Punjala (Florida International University, USA); Kia Makki (Florida International University, USA)
A rectangular reconfigurable antenna (RRA) is presented.The antenna consists of 8 rectangular radiating components.The power radiated equation and the equivalent circuit for the antenna is presented.Each rectangular radiating part has its own substrate so that it functions independently.The S parameters and the radiation characteristics are presented.

1.84
Small Meandered PIFA for Wireless Interrogation of Passive Sensors in a Cavity
Stephane Tourette (University of Nice Sophia Antipolis, France); Gwladys Collin (LEAT, France); Philippe Lethuc (University of Nice, France); Cyril Luxey (University of Nice, France); Robert Staraj (University of Nice-Sophia Antipolis, France)
We present a meandered PIFA with a small ground plane dedicated to be associated with a SAW sensor and positioned in cavity for temperature wireless measurements. A capacitive technique is proposed to feed the PIFA. The design of the antenna is presented along with wireless interrogation results of the sensor.

1.85
Decomposition of electrically Small Resonant Antennas into their electric and magnetic Part by Far Field Polarisation Analysis
David Pouhè (Technical University Berlin, Germany); Gerhard Mönich (Technical University Berlin, Germany)
The paper aims at decomposing the radiation of electrically small resonant antennas into the radiation from an electric and magnetic dipoles. Criteria based on the polarisation state of the field are derived to determine the dominant dipole moment.

1.86
Compact Dielectric Resonator Antenna for Broadband Applications (5.2/5.8GHz)
Ahmed Abumazwed (Concordia University, Canada); Abdel R. Sebak (Concordia University, Canada)
Compact DRA for the future WLAN (5.2/5.8 GHz) is presented. It has elliptical half cylinderical shape for size reduction. The antenna feeding is aperture coupling, U slot is for bandwidth enhancement. Although antenna size is small, the Antenna impedance bandwidth is 30% and the radiation patterns are omnidirectional.

1.87
Experimental Study of Hand and Head Effects to Mobile Phone Antenna Radiation Properties
Markus Berg (University of Oulu, Finland); Marko Sonkki (University of Oulu, Finland); Erkki Salonen (University of Oulu, Finland)
This paper presents the experimental results of hand and head effects to mobile phone antenna performance. Head and hand losses as well as the impedance mismatch of a triple resonance Planar Inverted F-Antenna are measured and evaluated with six different hand grips.

1.88
Compact X-band Coaxial Monopole Antenna
Maksym Khruslov (?. Usikov Institute of Radio Physics and Electronics, Ukraine); Nina Popenko (?. Usikov Institute of Radio Physics and Electronics, Ukraine); Igor Ivanchenko (?. Usikov Institute of Radio Physics and Electronics, Ukraine)
Computational modelling and measurements of the plug-shape ground plane monopole antenna is carried out. Based on the near-field distributions of this antenna the configuration and mutual arrangement of antenna elements are chosen in order to shape the mono-beam radiation pattern.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Lobby 1

Mon-Poster:
Poster Session-Small Antennas-1

1.89
MEMS-Based Filter With A reconfigurable Bandpass
Giuseppina Monti (University of Salento, Italy); Luciano Tarricone (University of Lecce, Italy); Laura Corchia (University of Salento, Italy)
In this paper a band-pass filter with a reconfigurable working frequency is presented. The proposed device is based on a signal interference approach combined with Micro Electro Mechanical System switches resulting in a high performance and compact device.

1.90
The influence of the user hand on mobile phone antenna performance in data mode
Chung-Huan Li (IT'IS Foundation, ETH Zurich, Switzerland); Erdem Ofli (Schmid & Partner Engineering AG, Switzerland); Nicolas Chavannes (Schmid & Partner Engineering AG, Switzerland); Niels Kuster (IT'IS Foundation, ETH Zurich, Switzerland)
The aim of this paper is to investigate the influence on the antenna performance criteria of the position and grip of the hand on the phone in data mode to support the standardization process of the hand phantom.

18:00 - 20:00 Welcome Reception in the Exhibition Area

Room: CC Room 1

Tue-S2A2: Convened: Array Antennas-1

Chair: Makoto Ando (Tokyo Institute of Technology, Japan), Gerard Caille (Thales Alenia Space France, France)

8:30 A 76-GHz Antenna with Highly-Tapered Aperture for Collision Avoidance Systems
Amir Zaghloul (Virginia Polytechnic Institute and State University, USA); Thoedore Anthony (US Army Research Laboratory, USA)
A 76 GHz antenna for collision avoidance systems is designed, simulated, and fabricated. The array of horns is integrated with a waveguide power divider, providing tapered aperture distribution needed for low sidelobes. The results show broad matching and a 1.9-degree beam, meeting the requirements for the radar system.

8:50 Non-Iterative Design of a 2-D Array of Waveguide Slots with Cavities to give Active Admittance equal to an Isolated Slot
Jiro Hirokawa (Tokyo Institute of Technology, Japan); Takehito Suzuki (Tokyo Institute of Technology, Japan); Makoto Ando (Tokyo Institute of Technology, Japan)
This paper proposes the non-iterative design of a two-dimensional array of waveguide slots with cavities. The cavity size is determined so that the active slot admittance is equal to the admittance of an isolated slot. This method is adopted for a uniform distribution and a Taylor one with -35dB sidelobes.

9:10 Millimeter-Wave Waveguide-Type Array Antennas Using Low-Loss Engineering Plastics
Yoshihiko Konishi (Mitsubishi Electric Corporation, Japan); Yoji Aramaki (Mitsubishi Electric Corporation, Japan); Satoshi Yamaguchi (Mitsubishi Electric Corporation, Japan); Izuru Naito (Mitsubishi Electric Corporation, Japan); Naofumi Yoneda (Mitsubishi Electric.Corporation, Japan); Masataka Ohtsuka (Mitsubishi Electric Corporation, Japan)
This paper presents two types of millimeter-wave waveguide-type array antennas using low-loss engineering plastics. The first one is a Cyclo-Olefin Polymer waveguide horn array antenna fabricated by injection molding process. The second one is a post-wall slotted waveguide array antenna using a Grafted Olefin-Styrene resin printed circuit board.

9:30 Broadband Cross-dipole Element with Four Polarization Reconfigurations for Mobile Base Station Antenna
Soon Young Eom (Electronics and Telecommunications Research Institute (ETRI), Korea); Ic Pyo Hong (Kongju National University, Korea); Soon Ik Jeon (ETRI Radio Technology Group, Korea)
This paper describes about a broadband cross-dipole element with four polarization reconfigurations (BCDE_PR). The BCDE_PR can configure two linear and two circular polarizations in the operating band of 1.7~2.5 GHz.

9:50 Comparison Between CRLH Zeroth Order Antenna and Series-Fed Microstrip Patch Array Antenna
Thorsten Liebig (University of Duisburg-Essen, Germany); Andre Rennings (University of Duisburg-Essen, Germany); Simon Otto (IMST GmbH, Germany); Christophe Caloz (Ecole Polytechnique de Montreal, Canada); Daniel Erni (University of Duisburg-Essen, Germany)
A metal-insulator-metal (MIM) composite right/left-handed (CRLH) series-mode zeroth-order resonant antenna (ZORA) optimized for the 24 GHz ISM band is presented and compared to a conventional series-fed patch array (SFPA) antenna.

Room: CC Room 2

Tue-S7P1: Convened: COST2100 - Vehicular Radio Channels

Chair: Alain Sibille (ENSTA, France) , Christoph Mecklenbräuker (Vienna University of Technology, Austria)

8:30 Influence of Antennas Placement on Car to Car Communications Channel
Lars Reichardt (University of Karlsruhe, Germany); Thomas Fuegen (University of Karlsruhe, Germany); Thomas Zwick (Universität Karlsruhe (TH), Germany)
With the growing demand for wireless communications, a concept for Car to Car Communications (C2C) becomes interesting. The goal of this paper is to present for the first time results of the channel behavior for different antenna positions.

8:50 Car-to-Car Channel Models based on Wideband MIMO Measurements at 5.3 GHz
Olivier Renaudin (Université Catholique de Louvain (UCL), Belgium); Veli-Matti Kolmonen (TKK Helsinki University of Technology, Finland); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland); Claude Oestges (Université catholique de Louvain, Belgium)
In this paper, we describe results of a measurement campaign for 30x30 multiple-input multiple-output car-to-car radio channels in the 5 GHz band for various environments. We first investigate the validity of the wide-sense stationarity assumption using the local scattering functions. Then, we develop statistical channel models for various environments.

9:10 UWB Channel Measurements Inside Different Car Types
Moritz Schack (TU Braunschweig, Germany); Robert Geise (TU Braunschweig, Germany); Ingo Schmidt (TU Braunschweig, Germany); Radoslaw Piesiewicz (Create-Net, Italy); Thomas Kürner (Technische Universität Braunschweig, Germany)
Due to the offered data rates of up to 1.32 Gbps and very low cost devices, ultra-wideband (UWB) systems become more and more attractive for the automotive environment. The influence of different car types on the UWB propagation channel inside the vehicle is investigated in this paper.

9:30 Characteristics of urban vehicular MIMO channels at different frequencies
Tricia Willink (Communications Research Centre, Canada)
MIMO channel measurements have been made at different frequencies in an urban environment. Analysis shows that the spatial diversity decreases with frequency but the channel's spatial structure changes more slowly. Thus, while the capacity is smaller at lower frequencies, it degrades less when the channel state information is outdated.

9:50 Modelling of MIMO Vehicle-to-Vehicle Fading Channels in T-Junction Scattering Environments
Zhiyi He (Wuhan university of technology, P.R. China); Wei Chen (Wuhan University of Technology, P.R. China); Zhou Wei (Wuhan University of Technology, P.R. China); Matthias Pätzold (University of Agder, Norway); Ali Chelli (University of Agder, Norway)
A new wideband MIMO fading channel model for vehicle-to-vehicle (V2V) communications is proposed. The MIMO V2V channel model captures the propagation effects that occur if vehicles move towards a junction with a side road and corner buildings. The MIMO V2V channel model takes into account single- and double-bounce scattering mechanisms.

Room: CC Room 3

Tue-S8P10: Measurement and Statistics of Propagation Data

Chair: Erkki Salonen (University of Oulu, Finland) , Jose Riera (Universidad Politécnica de Madrid, Spain)

8:30 Measured attenuation data and predictions for a gigabit radio link in the 80 GHz band
Terje Tjelta (Telenor R&I, Norway)
Discussion of gigabit single channel radio links. Measurments (> 14 months) of radio and meteorological data. Results to be contributed for ITU-R validation and compared with ITU-R predictions, where possible.

8:50 Outage Intensity Due to Rain in Terrestrial Line-of-Sight Links
Erasmus Miranda (Catholic University of Petropolis, Brazil); Marlene Pontes (Pontifical Catholic University of Rio de Janeiro, Brazil); Luiz Silva Mello (Pontifical Catholic University of Rio de Janeiro, Brazil)
This paper presents results of long-term measurements of outage intensity due to rainfall attenuation in terrestrial line-of-sight links operating at 15 GHz, 18 GHz, 23 GHz and 36 GHz in tropical regions.

9:10 Global prediction of cumulative rainfall statistics from the simple knowledge of the yearly rain amount
Carlo Capsoni (Politecnico di Milano, Italy); Lorenzo Luini (Politecnico di Milano, Italy); Marlene Pontes (Pontifical Catholic University of Rio de Janeiro, Brazil); Luiz Silva Mello (Pontifical Catholic University of Rio de Janeiro, Brazil)
This paper presents a new global model for the prediction of cumulative rainfall statistics based on the simple knowledge of the yearly cumulated rain.

9:30 Development of a new global rainfall rate model based on ERA40, TRMM, GPCP and GPCC products
Giulio Blarzino (ONERA, France); Laurent Castanet (ONERA, France); Lorenzo Luini (Politecnico di Milano, Italy); Carlo Capsoni (Politecnico di Milano, Italy); Antonio Martellucci (European Space Agency, The Netherlands)
The objective of this paper is to present the analysis carried out to improve the prediction method of rainfall rate statistics in Recommendation ITU-R 837-4 (P.837-5 since end of 2007) and to present a new analysis allowing seasonal variations to be predicted.

9:50 Micro Rain Radar Measurements of Rainfall in Madrid
Ana Benarroch (Universidad Politécnica de Madrid, Spain); Pedro Garcia del Pino (Universidad Politecnica de Madrid, Spain); Pilar Garcia-Vila (Universidad Politécnica de Madrid, Spain); Jose Riera (Universidad Politécnica de Madrid, Spain)
A Micro Rain Radar, is being used to obtain information on rainfall as part of a propagation experiment. The MRR provides profiles of drop size density distributions, radar reflectivity, etc. Radar data statistics are being compared with rain gauge and disdrometer statistics. Results will be applied to analyse propagation events.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 4

Tue-S1A1:
Convened: Optimization Techniques

Chair: Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA) , Riccardo Zich (Politecnico di Milano, Italy)

8:30 GA Design of Large Thinned Arrays
Chen Ding (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China); Li Jian xin (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
Large thinned arrays are synthesized by using genetic algorithms. In order to obtain good solutions in reasonable time, fitness function must be properly chosen. To accelerate the convergence of GA, statistical thinning technique can be used to generate the initial populations of genetic algorithms.

8:50 Simulation and Optimization Technique for a Multi-mirror MM Wave Reflector Radio Telescope with FPA
Vladimir Khaikin (2Special Astrophysical Observatory of the Russian Academy of Science, Russia); Michael Lebedev (St.Petersburg State University, Russia); Andrey Nosich (Kharkiv National University, Ukraine)
The ray tracing and integral equation methods are used to optimize focal optics and FPA configuration of the multi-mirror mm-wave RATAN-600 radio telescope. Simulation and optimization techniques are considered, results of beam tracing, multibeam simulation, FPA optimisation and far and near-fields for a multi-mirror radio telescope are presented.

9:10 Design of sparse arrays using binary genetic algorithms
Chen Ding (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China); Li Jian xin (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
binary GAs are modified to maintain the constraints include the number of elements,minimum element spacing.results better than that obtained by real GA are reported.

9:30 Multi-Objective Meta-PSO Techniques for Optimization of Antenna Arrays
Marco Mussetta (Politecnico di Torino, Italy); Paola Pirinoli (Politecnico di Torino, Italy); Stefano Selleri (University of Florence, Italy); Riccardo Zich (Politecnico di Milano, Italy)
In recently published open literature the results of the application of the Meta-PSO to the optimization of single-objective problems have been shown. Here we will prove their enhanced properties also for the optimization of multi-objective problems, trough their test in multi-objective optimization of a planar array.

9:50 Can Tournament Selection Improve Performances of the Classical Particle Swarm Optimization Algorithm?
Ruzica Golubovic (Ecole Polytechnique Federale de Lausanne, Switzerland); Ivica Stevanovic (Freescale Semiconductor, Switzerland); Dragan Olcan (University of Belgrade, Yugoslavia (defunct)); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)
Particle Swarm Optimization (PSO) algorithm is known to be a very good optimization algorithm for various multidimensional problems. We apply binary tournament selection strategy to classical PSO algorithm to see if it can further improve its performances. Both algorithms are then applied to several layered media to compare their performances.

Room: CC Room 5

Tue-S6A6:
Convened: Metamaterials-1

Chair: Sergei Tretyakov (Helsinki University of Technology, Finland) , Christophe Caloz (Ecole Polytechnique de Montreal, Canada)

8:30 Novel Passive and Active Composite Right/Left-Handed Leaky-Wave Antennas
Mohammed Reza Hashemi (University of California, Los Angeles, USA); Tatsuo Itoh (UCLA, USA)
In this paper several novel passive and active composite right/left-handed (CRLH) leaky-wave (LW) antennas are discussed. In each of these cases both left-handed and right-handed properties of the structure allow the designers to achieve extraordinary phenomena.

8:50 A Ka-Band Low-Profile Beam Steering Slot Antenna Using a CRLH Substrate Integrated Waveguide
Atsushi Sanada (Yamaguchi University, Japan)
A low-profile beam steering slot antenna using a CRLH substrate integrated waveguide is designed and implemented at 35GHz band with the total thickness of 0.3 mm. Numerical simulations reveal a beam steering operation within -30 to +30 deg with a frequency sweep from 34.8 to 35.22 GHz.

9:10 Overview of Resonant Metamaterial Antennas
Christophe Caloz (Ecole Polytechnique de Montreal, Canada); Andre Rennings (University of Duisburg-Essen, Germany)
Composite right/left-handed (CRLH) resonant antennas (RAs) have been less studied than their leaky-wave antennas (LWAs) counterpart. However, they exhibit equally interesting features, which are in fact complementary to those of LWAs. This paper presents an overview of recent works on CRLH RAs, in comparison with CRLH LWAs.

9:30 Application of Wire-based Metamaterials for Antenna Miniaturization
Silvio Hrabar (University of Zagreb, Croatia); Davor Bonefacic (University of Zagreb, , Faculty of Electrical Engineering and Computing, Croatia); Damir Muha (University of Zagreb, Croatia)
It is shown both numerically and experimentally that with the help of a wire medium slab it is possible to construct a rather short horn antenna (down to 33% of the length of the optimal horn) that yields almost the same gain as optimal horn in a narrow band (8%).

9:50 Transmission-line lens antenna with embedded source
Pekka Alitalo (TKK Helsinki University of Technology, Finland); Frédéric Bongard (Ecole Polytechnique Fédérale de Lausanne, Switzerland); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland); Sergei Tretyakov (Helsinki University of Technology, Finland)
We demonstrate how the recently proposed approach to create artificial "materials" with so-called transmission-line networks can be used in microwave lens antenna design. A transmission-line lens antenna is designed in such a way that the transmission-line network is well matched to the surrounding medium.

Room: Hall A

Tue-S4A4: Convened: UWB Radar and Remote Sensing-1

Chair: Alexander Yarovoy (Delft University of Technology, The Netherlands) , Claire Migliaccio (Université Nice Sophia Antipolis, France)

8:30 UWB Dual Polarised Planar Phased Array
Antonio Manna (Elettronica SpA, Italy); Paolo Baldonero (Elettronica SpA, Italy); Marco Bartocci (Elettronica SpA, Italy); Fabrizio Trotta (Elettronica S.p.A., Italy); Andrea Pantano (Elettronica SpA, Italy)
UWB Phased Array for EW application are presented. Two radiating elements have been designed: Vivaldi with stripline feeder and dual Sinuous with double integrated balun. Both elements are promising candidate in terms of RF performances. Return loss, gain pattern and beamwidth have been simulated and optimized considering all mutual coupling.

8:50 Exploration of multiobjective particle swarm optimization (MO-PSO) on the design of UWB antennas.
Javier Espigares Martín (University of Granada, Spain); Mario Fernández Pantoja (University of Granada, Spain); Amelia Rubio Bretones (University of Granada, Spain); Salvador G. García (University of Granada, Spain); Carlos Moreno de Jong van Coevorden (University of Granada, Spain); Rafael Gómez Martín (Universidad de Granada, Spain)
Within this paper we explore the response of Multiple Objective Particle Swarm Optimization for designing Ultra Wide Band planar antennas. In particular we pay special attention to the influence of geometrical and physical characteristics of the Antennas in parameters such as directivity, gain, side lobe level reduction, ...

9:10 Broadband Differentially Fed Tapered Slot Antenna Array for Radio Astronomy Applications
Michel Arts (Netherlands Institute for Radio Astronomy, The Netherlands); Rob Maaskant (Netherlands Institute for Radio Astronomy, The Netherlands); Eloy de Lera Acedo (University of Cambridge, United Kingdom); Jan Geralt bij de Vaate (Netherlands Institute for Radio Astronomy, The Netherlands)
This paper describes the design of differentially tapered slot antenna for radio astronomy applications. Results on the effective area and the common-mode scan impedance will be presented.

9:30 Optimization of Multifunctional UWB Planar Phased Arrays
Alessandro Galli (Sapienza University of Rome, Italy); Guido Valerio (Sapienza University of Rome, Italy); Davide Tallini (Computer Simulation Technology, CST GmbH, Germany); Angelo De Luca (Selex Sistemi Integrati S.p.A., 'Sistemi Radianti', Italy); Maurizio Cicolani (SELEX - Sistemi Integrati, Italy)
A planar topology of multifunctional C-X band wide-scan array is analyzed, based on the class of the aperture-coupled stacked patch antennas. Performance is aimed at achieving both wide-band and wide-scan capabilities. The theoretical and the technological aspects that affect correct design and effective realization of the array structure are addressed.

9:50 Analysis and Synthesis of Circular UWB arrays
Gaetano Mahrocco (University of Rome Tor Vergata, Italy)
Pulsed arrays are collecting growing interest in many application fields such as automotives, ground penetrating radar, Tera-Hertz imaging, and indoor tracking. This contribution will present the analytic derivation of the energy pattern of a pulsed circular array by means of the Generalized Hypergeometric Series and introduce a general synthesis formulation

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall B

Tue-S3A3: Novel Concepts for Handset Antennas

Chair: Jussi Rahola (Nokia, Finland) , Dirk Manteuffel (University of Kiel, Germany)

8:30 Printed lumda/8-PIFA for Internal Penta-Band Mobile Phone Antenna
Kin-Lu Wong (National Sun Yat-Sen University, Taiwan)
A printed PIFA operated at its lumda/8 mode as the fundamental mode for penta-band operation in the mobile phone is presented. The PIFA comprises two radiating strips of length about lumda/8 at 900 MHz and occupies a small area of 465 mm2 on the circuit board of the mobile phone.

8:50 Effects of Nearby Metallic Patches on an Antenna Based on Segmented Mobile Terminal Chassis
Risto Valkonen (Helsinki University of Technology, Finland); Juho Poutanen (Helsinki University of Technology, Finland); Jari Holopainen (Helsinki University of Technology, Finland); Clemens Icheln (Helsinki University of Technology, Finland); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
This paper discusses the effects of nearby conductive objects, such as display or battery on the performance of the very compact direct feed -based cellular antennas, and a method using inductive loading to partly compensate these effects, allowing a compact antenna solution for e.g. GSM850 and E-GSM900 systems.

9:10 Hybrid of Monopole and Dipole Antennas for Concurrent 2.4- and 5-GHz WLAN Access Point
Saou-Wen Su (Lite-On Technology Corp., Taiwan)
A hybrid of a monopole and dipole antenna is presented for concurrent 2.4/5 GHz band operation for access-points. The antennas are closely set with distance of 1 mm, yet good port isolation can be obtained. The design allows the dual-band signals to be simultaneously received/transmitted without external diplexer required.

9:30 New balanced mobile antenna with wide bandwidth performance
Dawei Zhou (University of Bradford, United Kingdom); Raed Abd-Alhameed (University of Bradford, United Kingdom); Chan See (University of Bradford, United Kingdom); A Alhaddad (Mobile and Satellite Communications Research Centre,, United Kingdom); Peter Excell (Glyndwr University, United Kingdom)
This paper presents the design and analysis of a novel and low profile balanced-dipole antenna with multiple-frequency operations for wireless communication. Basically, the proposed antenna is a planar dipole with folded structure, in which each monopole represented by a dual arm thin plates.

9:50 A Simple Wideband Antenna For Mobile Handset
Houda Halheit (Instrumentation Laboratory, Electronic and Computer Faculty, USTHB University, Algeria)
A simple Broadband planar inverted F antenna is presented covering pluarity of frequency bands. Its size is 40x10x12 mm3 and is suitable to be embedded in a mobile phone. Wide bandwidth of 820 MHz (1780-2610 MHz)is achieved by simply using two slots on the radiating plate.

Room: Hall C1

Tue-S5A5: Convened: Antennas for Space Applications-1

Chair: Cyril Mangenot (European Space Agency (ESTEC), The Netherlands) , Eric Amyotte (MDA, Canada)

8:30 Large Membrane Reflectors
Leri Datashvili (LLB-TUM, Germany); Horst Baier (LLB-TUM, Germany)
Investigation results will be presented performed under Shell Membrane Antenna Refelctor Technology (SMART). In Particular SAFIRS, FLAME and RECORA reflectors wich use a CFRS reflecting surface will be addressed. Paper covers manufacturing technology for the (shell) membranes, thermo-elastic and RF tests and accuracy investigations in 1g and 0g conditions

8:50 The Alphasat-XL Antenna Feed Array
Jean Dallaire (MDA Corporation, Canada); Sylvain Richard (MDA Corporation, Canada); Gerard Senechal (MDA Corporation, Canada)
MDA Montreal is a world-leading independent antenna supplier. After realizing some of the most challenging diplexed PIM-free high-power feed arrays on Inmarsat-4 a few years ago, MDA is now taking the technology to the next level to address even more stringent requirements on Alphasat-XL.

9:10 Unfurlable Reflector SAR Antenna at P Band
Roberto Mizzoni (Thales Alenia Space Italia, Italy); Giuseppe Orlando (ThalesAleniaSpace Italia, Italy); Paolo Valle (ThalesAleniaSpace Italia, Italy); Kees Van 't Klooster (European Space Agency, The Netherlands)
An antenna S/S based on the 12m unfurlable reflector technology already developed within a previous ESA contract is here proposed for a P-band SAR. In this paper, several reflector based SAR configurations will be examined and a novel feed system for cancelling the cross-polization of the offset reflector is proposed.

9:30 The GLOBALSTAR 2 Antenna Sub-System
Frederic Croq (Thalesaleniaspace, France)
The GLOBALSTAR 2 program aims at replacing the Globalstar1 current constellation in order to maintain and develop current operational services. This paper deals with the antenna mission.

9:50 Broadband Dual-Polarized Active Phased Microstrip Patch Antenna Array for Future SAR Applications
Wei Wang (East China Research Institute of Electronic Engineering, P.R. China); Lei Li (East China Research Institute of Electronic Engineering, P.R. China)
A broadband dual polarized phased antenna array for X-band application are designed, fabricated and tested, which will form an excellent basis for future SAR projects.The measured results show good performances are achieved.

Room: Hall C2

Tue-S9M1: Measurements of Antennas and Radar Scattering

Chair: Carlo Rizzo (MI Technologies (Europe), United Kingdom) , Achim Dreher (German Aerospace Center (DLR), Germany)

8:30 "Convened" - On the Sources Reconstruction Method application for a reflectarray antenna characterization
Yuri Alvarez Lopez (Universidad de Oviedo, Spain); Manuel Arrebola (Universidad de Oviedo, Spain); Fernando Las-Heras (Universidad de Oviedo, Spain); Jose Encinar (Universidad Politecnica de Madrid, Spain)
A practical application of the Sources Reconstruction Method for a reflectarray antenna characterization and diagnostics is presented. The goal is to compare the field distribution on the reflectarray plane calculated using different feed horn models and those ones directly reconstructed from the reflectarray measured field.

8:50 Comparative Gain Measurements of a High Gain CFRP Reflector Antenna at Ka-Band
Dietmar Fasold (University of Applied Sciences München, Germany); Engin Guelten (TÜV SÜD Industrie Service GmbH, Germany)
Two gain measurement methods with VNA and Power Meter are compared for precision high-gain measurements of CFRP spacecraft reflector antennas operating in Ka-, Q/V-bands. The test setup installed in a Compensated Compact Test Range applies harmonic mixers, diplexers and a calibration cable to allow efficient 'One-Cable Measurements' with rotary joints.

9:10 Validation of a 3-D Near-Field ISAR Imaging Technique with Far-Field RCS Extraction by Means of a Hybrid GO-PO/PTD Ray Tracing Algorithm
Thomas Vaupel (FGAN, Germany); Frank Weinmann (FGAN-FHR, Germany)
The paper presents a combination of scattering simulations on the basis of a ray-tracing algorithm and three-dimensional evaluation of scattering data by using a 3-D near-field ISAR imaging technique, which is a very powerful tool in order to examine the scattering properties of arbitrary complex objects.

9:30 A contact-less small antenna characterization through impedance modulation
Beatriz Monsalve (Universitat Politècnica Catalunya, Spain); Sebastian Blanch Boris (Universitat Politècnica de Catalunya, Spain); Jordi Romeu (Universitat Polytecnica de Catalunya, Spain); Luis Jofre (UPC, Spain)
In this paper a novel measurement system is developed in order to be able to measure the characteristic input impedance of a small antenna. The method is based on the RCS measurement method using impendance modulation.

9:50 Validation of a New Small Antenna Radiated Testing Range
Tian Hong Loh (UK, National Physical Laboratory, United Kingdom); Martin Alexander (UK, National Physical Laboratory, United Kingdom); Fabien Widmer (France, Cesi Engineering School, France); Philip Miller (UK, National Physical Laboratory, United Kingdom); David Knight (National Physical Laboratory, United Kingdom)
We present in this work a unique small antenna radiated testing range which employs a wireless RF-to-optical transducer link. This paper examines the performance of the minimally reflecting antenna mount and the level of reflections from the absorber lining the chamber surfaces through validation measurements.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Tuesday, March 24 · 08:30 - 10:10

Room: Hall C3

Tue-S10J1: Convened: Body Area Networks and Medical Implants-1

Chair: Peter Hall (University of Birmingham, United Kingdom) , Raj Mittra (Penn State University, USA)

8:30 Challenging Problems Arising in the Simulation of Body Area Networks (BANs)
Jonathan Bringuier (Penn State University, USA); Raj Mittra (Penn State University, USA)
Simulation of Body Area Networks (BANs) comprising of antennas and sensors mounted on human torsos is a very challenging and difficult task, owing to the multiscale nature of the antennas and the environment in which they operate.

8:50 Effect of the Indoor Environment on the UWB On-Body Radio Propagation Channel
Andrea Sani (Queen Mary University of London, United Kingdom); Akram Alomainy (Queen Mary, University of London, United Kingdom); Yang Hao (Queen Mary, University of London, United Kingdom)
This paper presents the effect of the indoor environment in the UWB on-body radio channel. A Measurement campaign was performed in the anechoic chamber and in an indoor environment for comparison. The propagation along the front part of the body and around the trunk are analyzed

9:10 Numerical Characterization of the Radiation from Implanted Wireless Sources Considering Different Digital Body Phantoms
Andrea Sani (Queen Mary University of London, United Kingdom); Akram Alomainy (Queen Mary, University of London, United Kingdom); Yang Hao (Queen Mary, University of London, United Kingdom)
This paper presents numerical investigation of the radiation performance from stomach, bladder and heart implanted wireless sources using the Finite-Differences Time-Domain (FDTD). Simulations were performed at the Medical Implanted Communication Systems (MICS) frequency of 402 MHz, using two male and one female digital body phantoms.

9:30 Investigation and Design of Wearable Multi-Band Antennas
Thomas Thalmann (EPFL, Switzerland); Zoya Popovic (University of Colorado at Boulder, USA); Branislav Notaros (Colorado State University at Fort Collins, USA); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)
In this document, wearable antennas in close proximity of a human body are considered, focusing on portions of the frequency range between 200MHz and 2700MHz. In specific, nonpatch type antennas with multi-band operation, light weight, easy integration, low obstruction and impedances are studied.

9:50 Investigation of Channel Polarization in On-Body Communications
Lida Akhoondzadeh-Asl (Birmingham University, United Kingdom)
in this paper, the effect of the polarization of the antennas on the body communication channels is investigated.

Room: Hall C4

Tue-S11S1: Convened: DLR SatCom Day-1

Chair: Siegfried Voigt (Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany)

8:30 Introduction to the DLR and to the Heinrich Hertz Satellite Mission
Siegfried Voigt (Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany)
The DLR-Satcom Day gives an overview about the funding and supporting activities of the antenna development in the satellite communication department of the German space agency. Most of this technology research will be qualified in space using the German Heinrich-Hertz Mission for technology verification.

8:40 SANTANA: Advanced Electronically Steerable Antennas at Ka-Band
Alexander Stark (TU Hamburg-Harburg, Germany); Achim Dreher (German Aerospace Center (DLR), Germany); Horst Fischer (IMST GmbH, Germany); Alexander Geise (Technical University Hamburg-Harburg, Germany); Roman Gieron (IMST, Germany); Marcos Heckler (German Aerospace Center (DLR), Germany); Sybille Holzwarth (IMST GmbH, Germany); Christian Hunscher (EADS/astrium, Germany); Arne Jacob (Technische Universität Hamburg-Harburg, Germany); Karsten Kuhlmann (TU Hamburg-Harburg, Germany); Oliver Litschke (IMST GmbH, Germany); Dirk Lohmann (IMST GmbH, Germany); Winfried Simon (IMST, Germany); Frank Woetzel (EPAK GmbH, Germany)
This paper presents the background, the vision, and the motivation of the SANTANA project (Smart Antenna Terminal). Recent realizations of electronically steerable receive (Rx) and transmit (Tx) antennas for satellite communications at Ka-Band are shown.

9:10 Compact antenna arrays with enhanced diversity performance
Matthias Hein (Ilmenau University of Technology, Germany); Ralf Stephan (Technische Universität Ilmenau, Germany); Christian Volmer (Ilmenau University of Technology, Germany); Jörn Weber (Technische Universität Ilmenau, Germany)
Small antenna arrays, eg. for mobile terminals, suffer from diversity loss due to mutual radiator coupling. We describe the design and characterization of compact arrays with enhanced diversity performance employing decoupling and matching networks. Essential information on the radiation properties are obtained from the scattering parameters of the antenna system.

9:30 Innovative Technologies for RF Circuitry in Satellite Payload
Matthias Rittweger (IMST GmbH, Germany); Reinhard Kulke (IMST GmbH, Germany); Rüdiger Follmann (IMST GmbH, Germany); Ingo Wolff (Gerhard-Mercator-University, Germany)
This paper integrates different research activities. Goals and recent work are shown whereby a focus is set on a possible use of the introduced technologies in the framework of the German Telecommunication Mission.

9:50 Presentation of the Project Satcom-On-The-Move in ND SatCom
Gerold Jäger-Waldau (ND SatCom GmbH, Germany)
In this paper a closer look to the synchronisation and re-synchronisation behaviour in case of or after loss of line-of-sight to the satellite should be done, based on ND SatCom's modem SkyWAN, to gather more information about a stable or fast re-synchronized 2-way connectivity via satellite von SOTM/COTM applications.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 1

Tue-S13A8:
Convened: Array Antennas-2

Chair: Makoto Ando (Tokyo Institute of Technology, Japan) , Gerard Caille (Thales Alenia Space France, France)

10:40 Waveguide-Fed Conformal Microstrip Patch Antenna Array
Mou-ping Jin (East China Research Institute of Electronic Engineering, P.R. China); Wei Wang (East China Research Institute of Electronic Engineering, P.R. China); Mei-qing Qi (East China Research Institute of Electronic Engineering, P.R. China)
A Ku-band microstrip patch conformal array is presented. The array consists of 12 1×10 element microstrip linear antennas in which the radiating patch excited in series with microtrip line, while the linear array excited by a waveguide. The measured results of the demonstration array are provided.

11:00 GEODA: adaptive antenna of multiple planar arrays for satellite communications.
Ignacio Montesinos-Ortego (Technical University of Madrid, Spain); Manuel Sierra-Perez (Universidad Politécnica de Madrid, Spain); Fernandez-Jambrina (, ?); Jose Luis Masa-Campos (Autonoma University of Madrid, Spain); Ramón Martínez Rodríguez-Osorio (Technical University of Madrid. ETSI de Telecomunicacion, Spain)
A new ground-based antenna is being developed in order to receive several satellite signals at the same time and to be able to track them along satellite flights. On this respect, a specific and complex antenna is required to facilitate the constellation tracking.

11:20 Spatial density tapered sunflower antenna array
Maria Carolina Vigano (Technical University of Delft, The Netherlands); Giovanni Toso (Esa/Estec, The Netherlands); Gerard Caille (Thales Alenia Space France, France); Cyril Mangenot (European Space Agency (ESTEC), The Netherlands); Ioan Lager (Delft University of Technology, The Netherlands)
A deterministic procedure to design a not periodic planar array radiating a rotationally symmetric pencil beam pattern with an adjustable sidelobe level is proposed. The positions of the elements are derived by modifying the typical locations of the sunflower seeds deployed on a particular Fermat spiral.

11:40 Array Technology in ThalesAleniaSpace Italia
Roberto Mizzoni (Thales Alenia Space Italia, Italy)
This paper provides an overview of array products and technologies for space developed in ThalesAleniaSpace Italia (TAS-I)in the last decade.

12:00 Broadband (GSM-UMTS) planar patch array with complex amplitude feed distribution.
Mahiano Barba (Universidad Politecnica de Madrid, Spain); Juan Page (Universidad Politecnica de Madrid, Spain)
This paper shows the design and measurements of a 10-element linear array for GSM-UMTS base station antennas based on patch antennas. The most relevant features of this array are found in the radiating elements and the manifold feed network. It provides complex amplitude feed distributions in a very feasible way.

Room: CC Room 2

Tue-S18P3:
Vehicular Channels

Chair: Pertti Vainikainen (Helsinki University of Technology (TKK), Finland) , Uwe-Carsten Fiebig (German Aerospace Center (DLR), Germany)

10:40 Airport Channel Measurements at 5.2 GHz
Snjezana Gligorevic (German Aerospace Center (DLR), Germany); Richard Zierhut (German Aerospace Center (DLR), Germany); Jost Thomas (German Aerospace Center (DLR), Germany); Wei Wang (German Aerospace Center (DLR), Germany)
A new technology based on IEEE 802.16e will be applied for airport data link applications. To determine the most adequate parameters for the physical layer system design, it is important to consider the propagation channel characteristics. The paper presents the result of the channel measurement campaign at Munich airport.

11:00 Influence of Passengers on the UWB Propagation Channel within a Large Wide-Bodied Aircraft
Martin Jacob (Technische Universität Braunschweig, Germany); Kin Lien Chee (Technische Universität Braunschweig, Germany); Ingo Schmidt (TU Braunschweig, Germany); Jens Schüür (TU Braunschweig, Germany); Wolfgang Fischer (Airbus Deutschland GmbH, Germany); Martin Schirrmacher (Airbus Deutschland GmbH, Germany); Thomas Kürner (Technische Universität Braunschweig, Germany)
UWB technology offers high potential for airlines and at last the airline passenger. It can provide a reliable wireless link at each seat, making wireless in-flight entertainment possible for example. Our channel model deals with the UWB channel modeling and the influence of passengers in a wide-bodied aircraft.

11:20 Propagation Measurements inside Different Civil Aircrafts and Comparison with EM Techniques
Nektarios Moraitis (National Technical University of Athens, Greece); Philip Constantinou (National Technical University of Athens, Greece); Fernando Pérez-Fontán (University of Vigo, Spain); Pavel Valtr (University of Vigo, Spain)
This paper has two goals. The first is to describe the measurement campaign and provide propagation results and comparisons of the indoor cabin environment for personal wireless communications inside civil aviation aircrafts. The second goal is to compare the measurement results obtained using Fresnel-Kirchhoff techniques for the specific aircraft types.

11:40 Directional Polarimetric Characteristics of the Urban Mobile Propagation Channel at 2.2 GHz
Mir Ghoraishi (Tokyo Institute of Technology, Japan)
In this conference paper we try to analyze the propagation physical phenomenas for each of co- and cross-polarized channels in the perpendicular and parallel streets of urban macrocell.

12:00 Experimental study of propagation characteristics for wireless communications in high-speed train cars
Naoki Kita (NTT Access Network Service Systems Laboratories, Japan); Toshio Ito (NTT Access Network Service Systems Laboratories, Japan); Shinji Yokoyama (NTT Advanced Technology Corporation, Japan); Ming-Chien Tseng (Industrial Technology Research Institute, Taiwan); Yuichi Sagawa (NTT Access Network Service Systems Laboratories, Japan); Mamoru Ogasawara (Nippon Telegraph and Telephone Corporation, Japan); Masashi Nakatsugawa (NTT, Japan)
This paper presents the results of a measurement campaign for the 2.2 and 5.2 GHz wireless communication channels in actual high-speed train cars. In the measurements, we focused on the propagation loss aspects for intra-car communications using a 2-GHz band and inter-car communications using a 5-GHz band.

Room: CC Room 3

Tue-S19P11: Convened: Large Scale and Multidisciplinary Propagation Projects

Chair: Antonio Martellucci (European Space Agency, The Netherlands) , Susanne Crewell (Universität Köln, Germany)

10:40 A new propagation campaign in tropical areas: the Ka-band Propagation experiment over India with the GSAT-4 satellite
Laurent Castanet (ONERA, France); Joel Lemorton (ONERA, France); Guillaume Carrie (ONERA, France); Frederic Lacoste (CNES, France); Françoise Carvalho (CNES, France); Jean-philippe Taisant (CNES, France); Ks Dasgupta (ISRO, India); Ashok Charania (ISRO, India); Ashish Shukla (ISRO, India); Rajat Acharya (ISRO, India); Kalyankumar Bandyopadhyay (ITT Kharagpur, India)
The objective of this paper will be to present the GSAT-4 propagation experiment: the main objectives of the campaign, the performance of the propagation beacons and the ground segment with all instruments to be distributed over India.

11:00 Monitoring Rain Rate with Data from Networks of Microwave Transmission Links
Christian Mätzler (University of Bern, Switzerland)
Attenuation measurements of signals at 38 GHz of directional microwave links are optimal for monitoring path-averaged rain rate. The application to networks of commercial microwave links allows cost-effective monitoring for meteorology where rain radar data are missing. We will report on a project proposed in Switzerland.

11:20 Propagation and Radar Measurements performed in Spino d'Adda and the Italian Planning for the Alphasat TDP5 Scientific Experiment
Aldo Paraboni (Polytechnic of Milan, Italy); Carlo Riva (Politecnico di Milano, Italy); Carlo Capsoni (Politecnico di Milano, Italy); Giuseppe Codispoti (Italian Space Agency, Italy); Lamberto Zuliani (Italian Space Agency, Italy); Victor Speziale (Space Engineering s.r.l., Italy); Stefano Falzini (Space Engineering s.r.l., Italy); Antonio Martellucci (European Space Agency, The Netherlands); Enrico Colzi (European Space Agency, The Netherlands)
Propagation and Radar Measurements performed in Spino d'Adda and the Italian Planning for the Alphasat TDP5 Scientific Experiment

11:40 Ground-based atmospheric remote sensing in The Netherlands; potential for satellite applications.
Herman Russchenberg (Delft University of Technology, The Netherlands)
This paper describes the Dutch multi-instrumental CESAR research site for atmospheric processes and its use for space-oriented satellite validation through the characterization the applications: satellite navigation by using the ground observations to estimate atmosphere; satellite communication by using the observations to predict path-delays; satellite signal properties.

12:00 Cloud Observations with MERIS and SEVIRI
Jürgen Fischer (Freie Universitaet Berlin, Germany)
Clouds are highly important for the earth weather and climate. They regulate the earth radiation budget and they play a major role in the earth energy and water cycle.This paper focuses on recent research activities for the remote sensing of cloud top pressure and cloud microphysical properties.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: CC Room 4

Tue-S12A7:
EM Theory for Imaging

Chair: Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland) , Raphael Gillard (IETR & INSA, France)

10:40 Time Domain Inverse Problem of a Buried Dielectric Cylinder
Chung-Hsin Huang (Tamkang Univeristy, Taiwan)
This paper presents an image reconstruction approach based on the time-domain and particle swarm optimization (PSO) for a 2-D dielectric cylinder buried in a half-space. The computational method combines the FDTD method and the PSO to determine the shape and location of the subsurface cylindrical scatterer with arbitrary cross section.

11:00 Imaging inhomogeneous targets from intensity only measures of their diffracted fields
Michele D'Urso (SeleX Sistemi Integrati, Italy)
The problem of imaging inhomogeneous targets from their diffrated fields is ddressed in this paper. This situation is of interest in optical applications where the availability of inversion strategies based on phaseless measures can open the way to very interesting applications.

11:20 Exploiting Markov Random Fields and an Extended Range Linear Approximation for 2D inverse scattering problems
Michele D'Urso (SeleX Sistemi Integrati, Italy); Roberta Autieri (University Parthenope of Naples, Italy)
An inversion approach which takes advantage from the joint use of an extended range linear approximation and from a Markov Random Field based Maximum A Posteriori is prosed and discussed.

11:40 Application of the Adaptive Cross Approximation Algorithm to the Sources Reconstruction Method
Yuri Alvarez Lopez (Universidad de Oviedo, Spain); Fernando Las-Heras (Universidad de Oviedo, Spain); Marcos Pino (Universidad de Oviedo, Spain)
The Adaptive Cross Approximation algorithm is applied to the Sources Reconstruction Method, an integral-equation technique for antenna diagnostics. The goal is to reduce the SRM computational cost by means of the compression of the impedance matrix appearing on the system of equations relating fields and equivalent currents.

12:00 Comparison between different methods for small scatterers detection and localization
Raffaele Solimene (Second University of Naples, Italy); Aniello Buonanno (Second University of Naples, Italy); Rocco Pierri (SUN, Italy)
The problem of detecting and localizing "small" perfect electric conducting objects from the scattered far-field is considered. The problem is cast as the inversion of a linear integral operator we tackle by means of the Truncated-Singular Value Decomposition. The performance achievable by the inversion procedure are compared to other methods.

Room: CC Room 5

Tue-S17A12:
Convened: Metamaterials-2

Chair: Sergei Tretyakov (Helsinki University of Technology, Finland) , Christophe Caloz (Ecole Polytechnique de Montreal, Canada)

10:40 Increasing the Supergain of Electrically Small Antennas Using Metamaterials
Arthur Yaghjian (Research Consultant, USA)
In this paper we consider the possibility of increasing the supergain of electrically small two-element endfire arrays with the use of magnetodielectric materials.

11:00 Planar metamaterial transverse equivalent network and its application to low-profile antenna design
Filippo Capolino (University of California Irvine, USA)
We propose a novel metamaterial made of arrayed pairs of tightly coupled dogbones or Jerusalem crosses. It is used as a high impedance surface for low profile dipoles, or as a reflective superstrate for directive Fabry-Perot cavity antennas. A few antenna designs will be shown.

11:20 Electrically small metamaterial-based antennas - have we seen any real practical benefits?
Pekka Ikonen (Nokia Corporation, Finland)
Electrically small metamaterial-based antennas are discussed from the industrial point of view using mobile phones as the application example. The importance of proper experimental demonstrations of the proposed theoretical findings is highlighted. Some issues potentially helping to improve the industrial acceptability of metamaterial-based antennas are discussed.

11:40 Spatial-Temporal Talbot Effects in Impulse-Regime Metamaterial Leaky-Wave Antennas
Juan Sebastián Gomez-Diaz (Technical University of Cartagena, Spain); Shulabh Gupta (École Polytechnique de Montréal, Canada); Alejandro Alvarez-Melcon (Polytechnic University of Cartagena, Spain); Christophe Caloz (Ecole Polytechnique de Montreal, Canada)
A spatial-temporal Talbot phenomenon, based on metamaterial composite right/left-handed (CRLH) leaky-wave antennas (LWAs), is presented. The phenomenon is based on the combination of the regular spatial Talbot effect and the transient character of the pulse radiation phenomenon in the LWA structure, and it is localized both in space in time.

12:00 Enhanced radiation from resonator-slot antenna with metamaterial shell
Boris Panchenko (Radio Engineering Institute, Ural State Technical University, Yekaterinburg, Russia); Marat Gizatullin (Ural Technical Institute of Communication and Information Science, Yekaterinburg, Russia); Nikolai Knyazev (Radio Engineering Institute, Ural State Technical University, Yekaterinburg, Russia)
A new type of subwavelength antenna on base of resonator-slot antenna (Stretton's-Chu's spherical antenna) with two layers shell of conventional dielectric and metamaterial is analyzed. The gain of antenna is decreased.

Room: Hall A

Tue-S15A10:
Convened: UWB Radar and Remote Sensing-2

Chair: Alexander Yarovoy (Delft University of Technology, The Netherlands) , Claire Migliaccio (Université Nice Sophia Antipolis, France)

10:40 Differentially Fed Array for UWB Radar Applications
Elena Pancera (University of Karlsruhe, Germany); Thomas Zwick (Universität Karlsruhe (TH), Germany); Werner Wiesbeck (University of Karlsruhe (TH), Germany)
In this paper a novel array structure for Ultra Wideband Radar applications is presented. The array is characterized by having a differential feeding structure. Furthermore, the particular array configuration permits to obtain dual orthogonal polarization. The paper presents the mathematical background of the developed structure together with measurement results.

11:00 UWB Stacked Patch Antenna Element Design for Impulse Near-field Imaging Radar Antenna Array
Bill Yang (TU Delft, The Netherlands); Alexander Yarovoy (Delft University of Technology, The Netherlands); Leo Ligthart (Delft University of Technology, The Netherlands)
A UWB ASP antenna designed to radiate frequencies in the range 10GHz-18GHz for short range IR radar is presented. This antenna is served as an element of a previously published antenna array topology. The antenna as well as the antenna array will be manufactured to experimentally verify the simulated results.

11:20 Sectored Antenna Array for Monostation UWB Indoor Positioning System
Xianming Qing (Institute for Infocomm Research, Singapore, Singapore); Zhi Ning Chen (Institute for Infocomm Research, Singapore); Terence See (Institute for Infocomm Research, Singapore)
A sectored antenna array is presented for mono-station ultra-wideband (UWB) indoor positioning application. The antenna array is composed of six elements which are hexagonally positioned to provide 360° coverage. Each antenna element features VSWR less than 2 over 2.9-6.0 GHz and peak pattern beamwidth of 69°.

11:40 Investigation of Wideband Millimetre-Wave Reflectarrays for Radar Applications Operating in the W Band
Claire Migliaccio (Université Nice Sophia Antipolis, France); Jerome Lanteri (Université Nice Sophia Antipolis, France); Jean-Yves Dauvignac (Université de Nice-Sophia Antipolis, France); Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France); Peter Feil (University of Ulm, Germany); Wolfgang Menzel (University of Ulm, Germany)
Two wideband reflectarrays were investigated. The first one is an offset reflectarray operating at 94 GHz with a prolate horn as primary feed for wideband operation purpose. 17% gain bandwidth at 3 dB was obtained. The second one is a cosecan square folded reflectarary operating in the76-81 GHz band.

12:00 Rolled-Dipole Array for GPR with Multiple Footprints
Andaya Lestari (Delft University of Technology, The Netherlands); Yuyu Wahyu (LIPI, Indonesia); Alexander Yarovoy (Delft University of Technology, The Netherlands); Leo Ligthart (Delft University of Technology, The Netherlands)
In this work we introduce a specially designed array antenna for GPR applications consisting of a number UWB radiating elements which exhibits multiple footprints. In this way, the size of the antenna footprint can be adjusted to remain comparable with the cross section of targets for minimizing clutter.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: Hall B

Tue-S14A9:
Small Reconfigurable Antennas

Chair: Alain Sibille (ENSTA, France) , Symeon Nikolaou (Frederick University Cyprus, Cyprus)

10:40 A Reconfigurable Multi-Band Microstrip Antenna based on open ended microstrip lines
Joseph Costantine (University of New Mexico, USA); Damien Ressiguier (Universite des sciences Montpelier 2, France); Youssef Tawk (University of New Mexico, USA); Christos Christodoulou (University of New Mexico, USA)
The new approach presented in this paper is based on replacing the patch in a microstrip antenna by many open ended microstrip lines intersecting with each other. Keeping the feeding position fixed, switches connect different stubs to the body of the antenna achieving resonance tuning and radiation pattern reconfigurability.

11:00 Optimization of a Multi-Band Reconfigurable PIFA Antenna
Sylvain Loizeau (ENSTA, France); Alain Sibille (ENSTA, France)
In this paper we discuss the optimization of a reconfigurable multiband PIFA antenna through random then gradient optimizer. The proposed antenna features two microwave switches. The goal function focuses on frequency matching in different bands. The optimized antenna will then be prototyped and measured.

11:20 Adaptive Matching Circuitry for Compensation of Finger Effect on Handset Antennas
Prasadh Ramachandran (Pulse Finland Oy, Finland); Zlatoljub Milosavljevic (Pulse Finland Oy, Finland); Claes Beckman (University of Gavle, Sweden)
In this paper evaluation of hand effect on the performance of terminal antenna and a method to compensate for the impedance mismatch is presented. Using the dynamic antenna matching employed, we can see an improvement in efficiency of 2-4dB for the low-band and about 2dB for high band.

11:40 Study on tunable electrically small antennas
Richard Langley (University of Sheffield, United Kingdom); Luyi Liu (University of Sheffield, United Kingdom)
In this paper results of a study of two antenna tuning techniques are presented here. The first tunable antenna is a liquid crystal (LC) tuned microstrip patch antenna operating in the 5 GHz range. The second antenna is a reconfigurable PIFA covering 7 frequency bands by changing 4 MEMS switches.

12:00 A Dual Port Wide-Narrowband Antenna for Cognitive Radio
Elham Ebrahimi (University of Birmingham, United Kingdom); Peter Hall (University of Birmingham, United Kingdom)
The structure is a combination of wideband and narrowband antennas into the same volume. The wideband antenna is a CPW fed printed hour-glass shaped monopole. The narrowband antenna is a microstrip patch printed on the reverse side of the substrate. This design can be suitable for cognitive radio applications.

Room: Hall C1

Tue-S16A11:
Convened: Antennas for Space Applications-2

Chair: Cyril Mangenot (European Space Agency (ESTEC), The Netherlands) , Eric Amyotte (MDA, Canada)

10:40 Novel Out of the Box Concepts for Future Space Antennas
Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA)
This paper presents an overview of several novel "out of the box" concepts for future spaceborne antennas. Examples address utilization of sub-reflectarrays in both reconfigurable and static modes for surface distortion compensation and also as corrective mechanism for spherical reflectors with very wide scan angle capabilities.

11:00 A Comparison of Density and Amplitude Tapering for Transmit Active Arrays
Giovanni Toso (Esa/Estec, The Netherlands); Piero Angeletti (European Space Agency, The Netherlands); Cyril Mangenot (European Space Agency (ESTEC), The Netherlands)
The objective of the paper is to offer a preliminary assessment of the benefits of active direct radiating arrays based on non regular lattices (i.e. sparse arrays) for multibeam transmit antenna applications.

11:20 Contoured-beam reflectarray for DBS application including copolar isolation requirements between missions
Manuel Arrebola (Universidad de Oviedo, Spain); Jose Encinar (Universidad Politecnica de Madrid, Spain); Luis de la Fuente (EADS-CASA Espacio, Spain); Giovanni Toso (Esa/Estec, The Netherlands)
In this paper, the performances of a reflectarray for fulfilling both coverage and isolation requirements of a commercial DBS mission are shown.

11:40 Active And Highly integrated antenna studies supported by CNES
Isabelle Albert (CNES, France); Francis Gizard (CNES (french spatial agency), France); Jean-Marc Lopez (CNES, France)
This paper gives examples of the developments supported by CNES in the field of active and active integrated antennas. Topics are related to Multibeam focal array fed reflector antenna in Receive mode integrating LNA's and Digital Beam Forming Antennas including new technologies for highly integrated active antennas.

12:00 Low cost, short lead-time feed chain components for multi-beam satellite antennas
Paul Booth (Astrium Ltd, United Kingdom); Malcolm Skeen (Astrium Ltd, United Kingdom); Simon Stirland (Astrium Ltd, United Kingdom)
A novel manufacturing process which allows batches of satellite antenna feed chain components to be manufactured quickly and economically is presented. It is suited to waveguide components and allows complex parts to be realised monolithically. RF measurements are presented for a batch of Ka-band OMTs and design constraints discussed.

Room: Hall C2

Tue-S20M2:
Convened: Special Compact Range Topics

Chair: Hans-Juergen Steiner (Astrium GmbH & Measurement Technology, Germany) , Doren Hess (MI Technologies, USA)

10:40 Quiet Zone Field Enlargement of Dual Reflector Compact Ranges for Testing of Complex Satellite Antenna Farms
Jürgen Habersack (EADS Astrium, Germany); Hans-Juergen Steiner (Astrium GmbH, Germany); Juergen Hartmann (EADS Astrium, Germany)
Within this paper, the improvements of the RF performance as well as enlargement of the quiet zone size of the modified Compensated Compact Range of Astrium GmbH will be described. The performed analyses with the simulation tool GRASP as well as serration optimization steps will be given in detail.

11:00 Electronically scanned arrays as probe system in compact ranges
Marcel Boumans (ORBIT/FR-Europe GmbH, Germany); Luc Duchesne (SATIMO main Office, France)
This paper will contemplate the use of multi probe technology in compact ranges. Multiple positions of a single probe have been used extensively, in particular in the satellite antenna testing community.It allows angular diagrams without moving the test object as well as system level testing

11:20 Quiet Zone characterisation at mm-wave Frequencies in Compact Ranges
Maurice Paquay (European Space Agency, The Netherlands); Luca Salghetti (European Space Agency-ESTEC, The Netherlands); Luis Rolo (European Space Agency, The Netherlands); Xavier Allart (European Space Agency, The Netherlands); Elena Saenz (European Space Agency, The Netherlands)
Recently, ESTEC characterised the Quiet Zone of its large CPTR (up to 40 GHz) and smaller CATR (up to 90GHz). Experience with two methods has been obtained and this paper will compare them in terms of practical aspects, like measurement time, field of view, full/ partial characterisation

11:40 Utilization of Compact Range Collimator for Radar Cross-Section Measurements
Donald Hillard (Naval Air Warfare Center, California, USA); Dean Mensa (Naval Air Warfare Center, California, USA)
The principal utilization of ompact Range involves RCS imiging which combines wideband and ISAR processing to produce two-dimensional images displaying the spatial distribution of scattering features on complex objects. The combination of far-field illumination and high resolution ISAR imagíng provides a diagnostic feature.

12:00 A new Compact Range Facility for Antenna and Radar Target Measurements
Mike Shields (MIT Lincoln Laboratory, USA)
A new compact range at Lincoln Laboratory for antenna and radar cross section measurements will be presented. This compact range operates over the 400MHz to 100GHz band, and consists of a temperature-controlled large rectangular chamber lined with radar absorbing materials that is specially arranged to reduce scattering.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Tuesday, March 24 · 10:40 - 12:20

Room: Hall C3

Tue-S21J2: Convened:
Body Area Networks and Medical Implants-2

Chair: Peter Hall (University of Birmingham, United Kingdom) , Raj Mittra (Penn State University, USA)

10:40 Estimating Diversity for Body-Worn Antennas
Dimitris Psychoudakis (The Ohio State University, USA); Gil Young Lee (The Ohio State University, USA); Chi-Chih Chen (The Ohio State University, USA); John Volakis (Ohio State University, USA)
In this work, we present the challenges for on-body antenna systems and introduce design techniques for evaluating body-worn antenna configurations. Specifically, we describe a diver-sity evaluation technique for optimizing wearable antenna mounting and feed scenarios. The formulation utilizes channel capacity and diversity gain to describe the overall effectiveness.

11:00 Analysis of Wave Propagation for BAN Applications
Farshad Keshmiri (Universite catholique de Louvain, Belgium); Andrew Fort (IMEC and Vrije Universiteit Brussel (VUB), Belgium); Christophe Craeye (Université Catholique de Louvain, Belgium)
In this paper we consider the body as a lossy cylinder and the antenna as a point source near the body. The wave propagations around and inside the body have been analytically studied for line source, point source, and plane wave excitations.

11:20 Meshed ground plane structures for textile antennas
Tomasz Maleszka (Wroclaw University of Technology, Poland); Michal Preisner (Wroclaw University of Technology, Poland); Pawel Kabacik (NUS, Singapore)
This paper describes the performance and possible advandages of periodic meshed structures applied to textile and flexible antennas. Measured and simulated S-parameters of two simple microstrip antennas on cotton fabric are presented and discussed.

11:40 An Implanted Cavity Slot Antenna for Medical Communication Systems
Koichi Ito (Chiba University, Japan)
In this study, we propose an implanted cavity slot antenna for short-rang wireless communication systems. The antenna is designed to operate at 2.45 GHz, one of the ISM (Industrial, Scientific and Medical) bands, and is investigated by using FDTD (Finite Difference Time Domain) calculation.

12:00 Characterization of the On-Body Channel in an Outdoor Environment at 2.45 GHz
Simon Cotton (Queen's University, Belfast, United Kingdom); William Scanlon (Queen's University Belfast, United Kingdom)
A characterization of the fading observed in an 8-node wireless body area network in an outdoor environment is presented. The results include level crossing rates which were used to estimate the maximum Doppler frequency for each individual on-body channel.

Room: Hall C4

Tue-S22S2:
Convened: DLR SatCom Day-2

Chair: Siegfried Voigt (Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany)

10:40 The Multiple Spot Beam Antenna Project "Medusa"
Michael Schneider (Astrium GmbH, Germany); Christian Hartwanger (Astrium GmbH, Germany)
This paper describes the design of a multiple spot beam satellite antenna with overlapping beams in Ka-band. It has been designed in the frame of the DLR granted R&D program "Medusa".

11:00 Manufacturing Technologies for "LISA"; Light-weight InterSatellite Antenna operating in Ka-Band
Michael Trümper (Dr. Natrath, Trümper, Partnerschaft - NTP, Germany); Jan Harder (Technische Universität München, Germany)
Investigation of manufacturing technologies for a compact intersatellite link antenna system in the Ka-Band.

11:20 Innovative phased array antenna for Maritime satellite communications
Matthias Geissler (IMST, Germany); Frank Woetzel (EPAK GmbH, Germany); Martin Boettcher (IMST GmbH, Germany); Stephan Korthoff (IMST, Germany); Andreas Lauer (IMST GmbH, Germany); Michael Eube (IMST, Germany); Roman Gieron (IMST, Germany)
This paper describes an innovative phased array antenna for Maritime satellite communications. The antenna consists of a near spherical aperture that allow very good hemispherical coverage and a nearly constant gain down to very low elevation angles. The antenna is suitable for L-band satellite systems like Inmarsat or Thuraya.

11:40 Light Weight - Low Loss Beam Forming Networks for Space Applications
Peter Uhlig (IMST GmbH, Germany); Jens Leiß (IMST GmbH, Germany); Robert Marek (Elekonta Marek GmbH & Co. KG, Germany); Johann-peter Sommer (Fraunhofer IZM, Germany); Helmut Wolf (EADS Astrium, Germany)
Within the framework of the project VERSA, a new approach to beam forming networks is investigated. The aim is to combine structural and electrical functions in one multilayer to gain electrical performance and to save weight. A library of components and the fabrication technology are presented.

12:00 Highly Stable Lightweight Antennas for Ka/Q/V-Band and Other Advanced Telecom Structure Concepts
Ernst Pfeiffer (HPS GmbH, Germany)
More and more new satellites use higher frequency bands such as Ka-Band up to Q/V-Band. These antennas require a very high in-orbit thermo-mechanical stiffness having in parallel very low mass budget and. Recent developments at HPS aimed e.g. for a 1,2m Q/V-Band reflector with a weight of 3,0 kg only, and with an in-orbit stability of 30-50 µm. Scaled to a complete antenna-system, a maximum mass of 4 kg of a 0,7m dual reflector Ka-Band Gregorian antenna can be reached. Other emerging structural technologies are e.g. new grounding concepts for satellite composite panels, CFRP honeycomb cores for mass reduction, or advanced modeling techniques for supporting the design phase.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: CC Room 1

Tue-Inv1: Invited Papers
Antennas

Chair: Matthias Geissler (IMST, Germany)

14:00 Bandwidth Potential and Electromagnetic Isolation: Tools for Analyzing the Impedance Behaviour of Antenna Systems
Jussi Rahola (Nokia, Finland)
The concepts of bandwidth potential and electromagnetic isolation speed up the comparison of antenna systems by using automatically generated matching circuits. The concept of power waves simplifies the analysis of power propagation in microwave networks.

14:45 Antenna Challenges in Cognitive Radio
Peter Hall (University of Birmingham, United Kingdom)
Future radio systems, such as software defined radio and cognitive radio concepts, give rise to significant challenges for antennas and in particular for reconfigurable antenna design. In this paper the challenges are outlined and some demonstrator antennas that begin to address these challenges are described.

Room: Hall A

Tue-Inv2: Invited Papers
Propagation

Chair: Thomas Kuerner (Braunschweig Technical University, Germany)

14:00 Constraints and Challenges for Theoretically Modeling Wireless Propagation
Henry Bertoni (Polytechnic University, USA)
Physics based prediction of radio channel characteristics has proven to be statistically meaningful. However achieving high prediction accuracy and finding compelling applications remain elusive. Some of the outstanding issue regarding accuracy will be discussed, and new applications suggested.

14:45 Rain Impairment Mitigation
Laurent Castanet (ONERA, France)
The objective of this presentation is to detail the main assets of designing rain attenuation mitigation techniques : what is the impact of the propagation channel, what are the basic principles of such mitigation techniques, how to implement them and the way to assess their performances.

14:00 - 16:45 **Room: CC Room 3**
ESoA:
Session

14:00 - 15:30 **Room: Hall C1**
Tue-SC3 - UWB Antennas and Channel Characterization for Communication and Radar (Part 1)

Werner Wiesbeck, Universität Karlsruhe, Germany

Spectrum is presently one of the most valuable goods worldwide as the demand is permanently increasing and it can be traded only locally. Since the United States FCC has opened the spectrum from 3.1 GHz to 10.6 GHz, i.e. a bandwidth of 7.5 GHz, for unlicensed use with up to -41.25 dBm/MHz EIRP, numerous applications in communications and sensor areas are showing up. All these applications have in common that they spread the necessary energy over a wide frequency range in this unlicensed band in order to radiate below the limit. The results are ultra wideband systems. These new devices exhibit especially at the air interface, the antenna, quite surprising behaviors. This talk presents an insight into design, evaluation and measurement procedures for Ultra Wide Band (UWB-) antennas as well as into the characteristics of the UWB radio channel as a whole. UWB antenna basics and principles of wideband radiators, transient antenna characterization and UWB antenna quality measures, derived from the antenna impulse response, are topics. EM simulations and measurements of transient antenna properties in frequency domain and in time domain are included. Different antennas, based on different UWB principles, will be presented. Depending on the interest there are: ridged horn antenna, Vivaldi antenna, logarithmic periodic antenna, mono cone antenna, spiral antenna, aperture coupled bowtie antennas, multimode antennas, sinus antenna and impulse radiating antennas. The channel characterization comprises ray-tracing tools for deterministic indoor UWB channel modeling and measurements. The advantages and drawbacks of the UWB transmission will be discussed, depending on interest. The radiation from different antennas will be demonstrated by movies with a pulse excitation.

15:30 -16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

14:00 - 1530 Room: Hall C2
Tue-SC4 - Dielectric Resonator Antennas, Theory, Design and Applications with the Latest Developments (Part 1)

Ahmed A. Kishk, University of Mississippi

Recently, interest in dielectric resonator antennas has increased because of their attractive features such as small size, high radiation efficiency (98%), wide bandwidth, and high power capability for radar applications and base stations. The dielectric resonator antenna is made from high dielectric constant materials and mounted on a ground plane or on a grounded dielectric substrate of lower permittivity.

The short course will start by an overview for the development of the dielectric resonator antennas. The theory of operation will be discussed step by step to provide basic understanding. The discussion is provided in simple forms to satisfy audience of different background levels. Design curves will be provided for the circular disc and hemisphere dielectric resonators. Use of these models with other geometries is discussed.

Different excitation mechanisms are demonstrates such as the probe, slot, image line and waveguides. Applications of dielectric resonators in arrays are provided with discussion on the mutual coupling level and the wide scanning capabilities of the dielectric resonator antenna array. The array bandwidth limit is discussed based on the element size and the spacing between the array elements.

The problems related to the practical implementations are considered. Results of a numerical study pertaining to the effect of an air gap, between the dielectric disc and the ground plane or an air gap surrounding the feed probe, on the input impedance and resonant frequency of a cylindrical DRA operating in the TM01ä mode or HEM11ä mode as a function of dielectric constant will be presented. Some of the numerical results are validated experimentally.

Techniques for broadband applications are discussed. Some of the techniques are based on the material properties and some depends on the DRA shape. Several examples are provided. Some elements would provide a matching bandwidth over 40% with reflection coefficients better than -10dB for 50 Ohms ports. Finally, Techniques for size reduction of the DRA are presented to demonstrate the flexibility of the DRA to satisfy the required small size for some applications. The technique will result in small size and keeping wide bandwidth. The applications of the DRA for spatial power combiners are presented. The DRAs are placed in an oversized hard horn to provide uniform field distribution. Resent developments of the dielectric resonators as a multifunction device will be also provided. In this application we will show the use of the same DR as an antenna with low quality factor and as a resonator with high Q-factor.

Room: Hall C3
EurAAP:
Software Meeting

14:00 - 15:30 Room: Hall C4
WS-BLUETEST:
Workshop on very fast measurements of wireless devices with small antennas (Part 1)

The Bluetest reverberation chamber technology is used to measure the total RF performance of wireless devices with small antennas. In the past two years the sales of Bluetest products have accelerated and in a few years we believe most companies working with products using small antennas will use this technology. This workshop will explain why reverberation chambers are to be preferred to anechoic chambers. It will give detailed information of how antenna diversity gain and MIMO capacity, both of which are key technologies for new (e.g. HSPA, 802.11n) and future (WiMAX, LTE) wireless broadband systems, can be tested in minutes with high repeatability. The workshop will also describe how traditional parameters like antenna efficiency, TRP and TIS measurements can be measured with high accuracy in a very small and cost effective test chamber and give comparison to measurements of the same wireless devices in large CTIA approved anechoic chambers.

15:30 -16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

End at 16:45 **Room: CC Room 3**
ESoA:
Session

17:00 - 18:00
EurAAP:
General Assembly

Room: Hall A
IEEE-DL2:
IEEE AP-S Distinguished Lecturers-2

Chair: J (Yiannis) Vardaxoglou (Loughborough University, United Kingdom) , Matthias Geissler (IMST, Germany)

16:00 Electromagnetic Band Gap (EBG) Structures in Antenna Engineering: From Fundamentals to Recent Advances
Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA)
Periodic structures are abundant in nature, which have fascinated artists and scientists alike. When they interact with electromagnetic waves, exciting phenomena appear and amazing features result. In particular, characteristics such as frequency stop bands, pass bands, and band gaps could be identified. Reviewing the literature, one observes that various terminologies have been used depending on the domain of the applications. These applications are seen in filter designs, gratings, frequency selective surfaces (FSS), photonic crystals and photonic band-gaps (PBG), etc. We classify them under the broad terminology of "Electromagnetic Band Gap (EBG)" structures. EBG structures have provided promising paradigm for novel antenna designs. Due to the complexity of the EBG structures, it is usually difficult to characterize them through purely analytical methods. Instead, full wave simulators that are based on advanced numerical methods have been used in EBG analysis. Dispersion diagram, surface impedance, and reflection phase features are revealed for different EBG structures. These analysis tools have been integrated with modern optimization techniques such as genetic algorithms and particle swarm optimization to synthesis unique EBG structures. The applications of EBG structures in antenna designs have become a thrilling topic for antenna scientists and engineers. This is the central focus of this presentation by initially reviewing the fundamentals and then demonstrating recent advances. Utilizing several representative antenna examples it will be demonstrated that proper utilizations of EBG structures could enhance the performance of low profile antennas; however, considerable care must be exercised to fully appreciate their advantages and disadvantages

16:40 Antennas & RF Sensors: Changing the Way We Live (from mobile communications to electronic textiles and RFIDs)
John Volakis (Ohio State University, USA)
We already print more transistors than letters per year [IEEE Spectrum, 2008; www.ieee.org]. But to the average person, a more tangible technological impact has come from the proliferation of wireless devices that have truly changed our way of living, habits and business culture worldwide. Indeed, over the next decade, wireless devices and connectivity are likely to have transformational impact on our everyday life. Key to the wireless revolution is the implementation of multifunctionality and broadband reception at high data rates. This was a neglected area for several years as the industry was focusing on compact low noise circuits, and low bit error modulation techniques. However, as noted in a recent RF & Microwaves Magazine (www.mwrf.com) article, nearly 50% of a system-on-chip is occupied by the Radio Frequency (RF) front-end. Not surprising, the need for small antennas and RF front ends without compromising performance has emerged as a key driver in Marketing and realizing next generation devices. The challenge in miniaturizing the RF front end was already highlighted by Harold Wheeler, one of the pioneers of optimal size antennas. He noted that "… [Electrical Engineers] embraced the new field of wireless and radio, which became a fertile field for electronics and later the computer age. But antennas and propagation will always retain their identity, being immune to miniaturization or digitization." However, novel materials, either natural or in synthetic (metamaterials) form and a variety of synthesized anisotropic media are changing the status-quo. Also, materials such as modified polymers (friendly to copper) for silicon chip integration, high conductivity carbon nanofibers and nano-tubes, all coupled with 3D packaging are providing a new paradigm of integration attractive to the IC industry. Certainly, low loss magnetics, such as multiferroics or synthetic structures emulating magnetic structures, when and if realized, will provide one of the most transformational design impacts in the wireless industry. This presentation will provide an overview of the upcoming wireless applications and challenges. We will then discuss efforts towards the realization of novel materials (metamaterials and crystals, carbon nano-tubes, carbon nano-fibers and body worn devices, printing on polymers, multiferroics, etc) for RF miniaturization, including antennas that reach the optimum size limits.

17:20 Microwave Antennas for Medical Applications
Koichi Ito (Chiba University, Japan)
In recent years, various types of medical applications of antennas have widely been investigated and reported. Typical recent applications are: (1) Information transmission: - RFID (Radio Frequency Identification) / Wearable or Implantable monitor - Wireless telemedicine / Mobile health system (2) Diagnosis: - MRI (Magnetic Resonance Imaging) / fMRI - Microwave CT (Computed Tomography) / Radiometry (3) Treatment: - Thermal therapy (Hyperthermia, Coagulation, etc) - Microwave knife In this presentation, three different types of antennas which have been studied in our laboratory are introduced. Firstly, a pretty small antenna for an implantable monitoring system is presented. An H-shaped cavity slot antenna is a candidate for such a system. Some numerical and experimental characteristics of the antenna are demonstrated. Secondly, some different antennas or "RF coils" for MRI systems are introduced. In addition, SAR (specific absorption rate) distributions in the abdomen of a pregnant woman generated in a bird cage coil are illustrated. Finally, after a brief overview of thermal therapy and microwave heating, coaxial-slot antennas and array applicators composed of several coaxial-slot antennas for minimally invasive microwave thermal therapies are introduced. Then a few results of actual clinical trials by use of the coaxial-slot antennas are demonstrated from a technical point of view. Other therapeutic applications of the coaxial-slot antennas such as hyperthermic treatment for brain tumor and intracavitary hyperthermia for bile duct carcinoma are introduced.

16:00 - 18:00 Room: Hall C1
Tue-SC3 - UWB Antennas and Channel Characterization for Communication and Radar (Part 2)

Werner Wiesbeck, Universität Karlsruhe, Germany

Spectrum is presently one of the most valuable goods worldwide as the demand is permanently increasing and it can be traded only locally. Since the United States FCC has opened the spectrum from 3.1 GHz to 10.6 GHz, i.e. a bandwidth of 7.5 GHz, for unlicensed use with up to -41.25 dBm/MHz EIRP, numerous applications in communications and sensor areas are showing up. All these applications have in common that they spread the necessary energy over a wide frequency range in this unlicensed band in order to radiate below the limit. The results are ultra wideband systems. These new devices exhibit especially at the air interface, the antenna, quite surprising behaviors. This talk presents an insight into design, evaluation and measurement procedures for Ultra Wide Band (UWB-) antennas as well as into the characteristics of the UWB radio channel as a whole. UWB antenna basics and principles of wideband radiators, transient antenna characterization and UWB antenna quality measures, derived from the antenna impulse response, are topics. EM simulations and measurements of transient antenna properties in frequency domain and in time domain are included. Different antennas, based on different UWB principles, will be presented. Depending on the interest there are: ridged horn antenna, Vivaldi antenna, logarithmic periodic antenna, mono cone antenna, spiral antenna, aperture coupled bowtie antennas, multimode antennas, sinus antenna and impulse radiating antennas. The channel characterization comprises ray-tracing tools for deterministic indoor UWB channel modeling and measurements. The advantages and drawbacks of the UWB transmission will be discussed, depending on interest. The radiation from different antennas will be demonstrated by movies with a pulse excitation.

16:00 - 18:00 Room: Hall C2
Tue-SC4 - Dielectric Resonator Antennas, Theory, Design and Applications with the Latest Developments (Part 2)

Ahmed A. Kishk, University of Mississippi

Recently, interest in dielectric resonator antennas has increased because of their attractive features such as small size, high radiation efficiency (98%), wide bandwidth, and high power capability for radar applications and base stations. The dielectric resonator antenna is made from high dielectric constant materials and mounted on a ground plane or on a grounded dielectric substrate of lower permittivity.

The short course will start by an overview for the development of the dielectric resonator antennas. The theory of operation will be discussed step by step to provide basic understanding. The discussion is provided in simple forms to satisfy audience of different background levels. Design curves will be provided for the circular disc and hemisphere dielectric resonators. Use of these models with other geometries is discussed.

Different excitation mechanisms are demonstrates such as the probe, slot, image line and waveguides. Applications of dielectric resonators in arrays are provided with discussion on the mutual coupling level and the wide scanning capabilities of the dielectric resonator antenna array. The array bandwidth limit is discussed based on the element size and the spacing between the array elements.

The problems related to the practical implementations are considered. Results of a numerical study pertaining to the effect of an air gap, between the dielectric disc and the ground plane or an air gap surrounding the feed probe, on the input impedance and resonant frequency of a cylindrical DRA operating in the TM01ä mode or HEM11ä mode as a function of dielectric constant will be presented. Some of the numerical results are validated experimentally.

Techniques for broadband applications are discussed. Some of the techniques are based on the material properties and some depends on the DRA shape. Several examples are provided. Some elements would provide a matching bandwidth over 40% with reflection coefficients better than -10dB for 50 Ohms ports. Finally, Techniques for size reduction of the DRA are presented to demonstrate the flexibility of the DRA to satisfy the required small size for some applications. The technique will result in small size and keeping wide bandwidth. The applications of the DRA for spatial power combiners are presented. The DRAs are placed in an oversized hard horn to provide uniform field distribution. Resent developments of the dielectric resonators as a multifunction device will be also provided. In this application we will show the use of the same DR as an antenna with low quality factor and as a resonator with high Q-factor.

Room: Hall C3
Tue-S23:
Body Area Networks

Chair: Koichi Ito (Chiba University, Japan) , Andrea Sani (Queen Mary University of London, United Kingdom)

16:00 Body Channel Characterisation Using Dual Band Button Antennas
Jonathan Miller (University of Kent, United Kingdom); John Batchelor (University of Kent, United Kingdom)
A small, unobtrusive, dual-band antenna is used in the measurement and characterisation of On-body communication channels. Measurements are performed on a human subject and a free space phantom model with the effects of the body on the communication channel being discussed.

16:20 A Multi-band Printed Monopole Antenna
Lei Ma (Loughborough University, United Kingdom); Robert Edwards (Loughborough University, United Kingdom); William Whittow (Loughborough University, United Kingdom)
This paper adapts a rectangular monopole by adding wings to the ground plane and slots to the antenna. The resultant antenna is multiband and covers GSM900, DCS, PCS, UMTS and WLAN2.4GHz. The antenna is small with a low profile and would be suitable for wearable applications.

16:40 Ban antenna design using ferrite polymer composite
Thierry Alves (University of Paris-Est Marne-la-Vallée, France); Robin Augustine (University of Paris-Est Marne-la-Vallée, France); Marjorie Grzeskowiak (University of Paris-Est Marne-la-Vallée, France); Benoit Poussot (University of Paris-Est Marne-la-Vallée, France); David Delcroix (University of Paris-Est Marne-la-Vallée, France); Stephane Protat (University of Paris-Est Marne-la-Vallée, France); Jean-Marc Laheurte (Université de Paris Est Marne La Vallée (UPEMLV), France); Patrick Quéffélec (LEST - UBO University of Brest, France)
Wireless body area networks require body worn antennas that can suffer from reduced efficiency, radiation pattern fragmentation and variations in feed point impedance. In this paper, stress is made to reduce the influence of human body on antenna characteristics by introducing polymeric ferrite on the antenna backside.

17:00 Fading Correlation Measurement and Modeling on the Front Side of a Human Body
Lingfeng Liu (Université catholique de Louvain, Belgium); Philipe De Doncker (ULB, Belgium); Claude Oestges (Université catholique de Louvain, Belgium)
In this paper, measurements for fading correlations of on-body propagation channels at 2.45GHz along front side of a human body have been presented. A first attempt to simulate the on-body propagation for a walking body has been introduced. Comparison between the simulation and the measurement shows a reasonable similarity.

17:20 Analytical Propagation Models for Body Area Network Channel Based on Impedance Boundary Condition
Da Ma (Southeast University, P.R. China); Wen-Xun Zhang (Southeast University, China, P.R. China)
Analytical propagation model deduced from Maxwell's equations for BAN channel is proposed. Antenna is considered as points source and human body is treated as an elliptical cylinder with infinite length, An impedance boundary condition is employed. The characteristics of channels can be described by numerical calculation in elliptic-cylindrical coordinate.

16:00 - 18:00 **Room: Hall C4**
WS-BLUETEST:
Workshop on very fast measurements of wireless devices with small antennas (Part 2)

The Bluetest reverberation chamber technology is used to measure the total RF performance of wireless devices with small antennas. In the past two years the sales of Bluetest products have accelerated and in a few years we believe most companies working with products using small antennas will use this technology. This workshop will explain why reverberation chambers are to be preferred to anechoic chambers. It will give detailed information of how antenna diversity gain and MIMO capacity, both of which are key technologies for new (e.g. HSPA, 802.11n) and future (WiMAX, LTE) wireless broadband systems, can be tested in minutes with high repeatability. The workshop will also describe how traditional parameters like antenna efficiency, TRP and TIS measurements can be measured with high accuracy in a very small and cost effective test chamber and give comparison to measurements of the same wireless devices in large CTIA approved anechoic chambers.

Lobby 1
Tue-Poster: Poster Session - mm-Wave, Remote Sensing & Space Antennas

Chair: Tudor Palade (Technical University of Cluj-Napoca, Romania) , Stephan Stanko (FGAN-FHR, Germany)

2.1
SIW- Series Fed RDRA Array System for Millimeter-Wave Applications
Wael Abdel Wahab (University of Waterloo, Canada); Safieddin Safavi-Naeini (University of Waterloo, Canada); Dan. Busuioc (University of Waterloo, Canada)
A simple, low cost novel series feeding scheme to rectangular dielectric resonator antenna linear array (RDRA) is proposed at millimeter wave frequency range. The coupling to resonator is achieved through narrow slots cut on the substrate integrated waveguide (SIW) broad wall excited by the waveguide dominant mode.

2.2
Design of multilayer stacked patch array with waveguide feeding network for high power SAR system.
Saray Sanchez Sevilleja (INTA, Spain); Juan Ramón Larrañaga Sudupe (INTA, Spain)
A multilayer stacked patch antenna for high power SAR system has been designed. This antenna is fed by a waveguide feeding network. It works in Ku Band with a bandwidth of 2GHz. Expected results have been obtained.

2.3
A new astronomical receiver for ASTROPEILER
Stephan Stanko (FGAN-FHR, Germany); Anke Pagels (FGAN - Research Institute for Applied Science, Germany); Winfried Johannes (FGAN-FHR, Germany)
We describe the development and design of the new 21-cm Receiver for the 25-m ASTROPEILER radio telescope located on the Stockert, near Bad-Münstereifel, Germany.

2.4
Terahertz conical horn antenna
Di Li (University of Liverpool, UK, United Kingdom); Yi Huang (University of Liverpool, United Kingdom); Yao-Chun Shen (University of Liverpool, United Kingdom)
This paper presents a new structure of photoconductive antenna which consists of a photoconductive emitter and a conical horn antenna. This kind of structure can radiate THz wave into desired direction. The simulated and measured results are used to support the theory in this paper.

2.5
Elliptical Ring Slots Antenna for Wireless Personal Area Network
Abbas Ali Lotfi Neyestanak (Islamic Azad University, Shahr_e_Rey Branch, Iran); Arghavan Emami Forooshani (University British Columbia, Canada)
In this paper a novel design approach of the elliptical elliptical ring slots Antenna is presented. Details of the antenna design approach is presented and discussed. This Antenna has a stripline feed structure that eliminates the above limitations of probe-fed patch antennas. Simulation Result illustrates about 7.3% fractional bandwidth.

2.6
G-band Bowtie Dipole Antenna
Adel Emhemmed (Glasgow university, United Kingdom); Khaled Elgaid (Glasgow, United Kingdom)
we have proposed 3D micromachining 210GHz elevated bowtie dipole antenna fed by a coplanar waveguide. The antenna is designed for MMICs applications at G-band. The antenna is composed of coplanar waveguide (CPW) feed line, air-bridges, a feeding post, supporting posts, and a radiators.

2.7
Measurement of a 60 GHz Antenna Array fed by a Planar Waveguide-to-Microstrip Transition Integrated in Low-Temperature Co-fired Ceramics
Frank Wollenschläger (Ilmenau University of Technology, Germany); Matthias Hein (Ilmenau University of Technology, Germany)
The frequency range around 60 GHz imposes challenges for the experimental determination of the radiation patterns of the antennas. We have designed, fabricated, and applied a low-loss planar waveguide-to-microstrip transition for measurements of the radiation pattern of a 60 GHz 2x2 patch antenna array.

Lobby 1

Tue-Poster:
Poster Session-Joint A-P-M Topics-2

Chair: Tudor Palade (Technical University of Cluj-Napoca, Romania) , Marcel Blech (Universität Stuttgart, Germany)

2.8
A Two Octave Bandwidth Dielectric Loaded Biconical Antenna with High Sidelobe Suppression
Marcel Blech (Universität Stuttgart, Germany); Arndt Ott (Technische Universität München, Germany); Thomas F. Eibert (Technical University of Munich, Germany)
This omnidirectional antenna exhibits a two octave bandwidth of 2-8GHz. An input reflection below -10dB and a gain from 0.4-3.9dBi is achieved. Its pattern maintains almost constant in the E-plane and the shape of its normalized impulse response varies only in its scale in a wide angular range.

2.9
Small-Scale Variations of Cross-Polar Discrimination in Polarized MIMO Systems.
François Quitin (Université Libre de Bruxelles (ULB), Belgium); Claude Oestges (Université catholique de Louvain, Belgium); François Horlin (Université Libre de Bruxelles, Belgium); Philipe De Doncker (ULB, Belgium)
The small-scale variations of the XPD of dual-polarized MIMO systems is investigated. It is shown that the XPD has a doubly non-central F-distribution around its mean value. This distribution links the Ricean K-factors with the variations of the XPD. Measurements results are compared with the model and show good agreement.

2.10
A Textile Patch Antenna with Dual Polarization for Rescue Workers' Garments
Luigi Vallozzi (Ghent University, Belgium)
In the context of wearable textile systems, antennas are needed that exploit diversity and exhibit robustness to harsh environmental conditions. A novel dual-polarized, textile patch antenna, on a fire-retardant and water-repellent substrate, was designed and realized. Extensive performance measurements and simulations in open-space and on-body situations showed promising results.

2.11
User's Proximity Effects in Mobile Phones
Mauro Pelosi (Aalborg University, Denmark); Ondrej Franek (Aalborg University, Denmark); Mikael Knudsen (Infineon Technologies, Denmark A/S, Denmark); Gert Pedersen (Aalborg University, Denmark)
Thanks to a recent grip study, CAD models of the human hand have been generated, investigating user's proximity effects in mobile phones. The hand exhibit a major contribution for total loss when compared to the head alone.The palm-handset gap influence both absorption and mismatch loss.

2.12
Statistical Analysis of Correlated MIMO Channels with A Pinhole
Tetsuki Taniguchi (University of Electro-Communications, Japan); Makoto Tsuruta (The University of Electro-Communications, Japan); Yoshio Karasawa (The University of Electro-Communications, Japan)
This paper presents statistical distributions of SNR (signal to noise ratio) in correlated double fading environments which is typically found in MIMO (multiple input multiple output) pinhole channels. The effectiveness of equations given in this work and natures of correlated pinhole channels are investigated through computer simulations.

2.13
Extremely Low-Profile, Wideband Spiral Antenna with Absorbing Material
Hisamatsu Nakano (Hosei University, Japan); Hiroshi Oyanagi (College of Engineering, Hosei University, Japan); Junji Yamauchi (College of Engineering, Japan)
This paper presents the radiation efficiency and other characteristics of a unidirectional spiral antenna, where the antenna height above a conducting reflector is chosen to be extremely small (0.07 wavelength) and a ring-shaped absorbing material is attached under the outer spiral arms.

2.14
Evaluation of Mutual Coupling Models for Calibrating the Antenna Arrays for DOA Estimation
Ali Mirkamali (Zanjan University, Iran); Jafar Nateghi (Iran Telecommunication Research Center, Iran); Lida Akhoondzadeh-Asl (Birmingham University, United Kingdom)
Performance of the mutual coupling models based on the estimation of the current distribution on the array element for DOA estimation are evaluated and compared with each other. It is shown that the model proposed by Hui for compensating the mutual coupling effect has a better performance than other models.

2.15
Measurement of Diversity Gain and Capacity on a MIMO-OFDM Channel Comparing Different Types of Antennas
Carlos Gómez Calero (Universidad Politecnica de Madrid, Technical University of Madrid, Spain); Jonathan Mora-Cuevas (UPM, Spain); Luis Cuéllar Navarrete (Polytechnic University of Madrid, Spain); Ramón Martínez Rodríguez-Osorio (Technical University of Madrid. ETSI de Telecomunicacion, Spain); Leandro de Haro (Universidad Politécnica de Madrid, Spain)
Measurements of diversity gain and channel capacity of different types of MIMO antennas using a MIMO-OFDM Testbed at 2.45 GHz in indoor scenarios are presented in this paper.

2.16
Effect of Mutual Coupling and Human Body on MIMO Performances
Carlos Gómez Calero (Universidad Politecnica de Madrid, Technical University of Madrid, Spain); Nima Jamaly (Chalmers University of Technology, Sweden); Luis González Díaz (UPM, Spain); Ramón Martínez Rodríguez-Osorio (Technical University of Madrid. ETSI de Telecomunicacion, Spain)
The effect of mutual coupling and user body on MIMO performances are presented in this paper. The results have been obtained from simulation ans measurement of a Planar Inverted-F Antenna.

2.17
Pattern and polarization reconfigurable circular patch for MIMO systems
Daniele Piazza (Drexel University, USA); Prathaban Mookiah (Drexel University, USA); Michele D'Amico (Politecnico di Milano, Italy); Kapil Dandekar (Drexel University, USA)
We propose a reconfigurable circular patch antenna (RCPA) for MIMO systems that can be reconfigured both in pattern and polarization. The peroformance offered by the proposed antenna design when used in 2x2 MIMO systems has been characterized in terms of channel capacity using experimental field-testing in an indoor environment.

2.18
New antenna diversity front-end using code multiplexing
Matthieu Gautier (Université de Lyon, INRIA, INSA-Lyon, CITI, France); Ioan Burciu (France Telecom R&D, France); Guillaume Villemaud (Université de Lyon, INRIA, INSA-Lyon, CITI, France)
In this paper, we address the architecture of antenna diversity receiver and we aim to reduce the complexity of the analog front-end. To this end, an innovative architecture is introduced based on code multiplexing. Simulation results show that the bit error rate doesn't increase with the multiplexing.

2.19
Performance Evaluation of the 802.11n Compact MIMO DRA in an Indoor Environment
Imran Shoaib (Queen Mary, University of London, United Kingdom); Yue Gao (Queen Mary, University of London, United Kingdom); Ying Zhinong (Sony Ericsson Mobile Communications AB, Sweden); Katsunori Ishimiya (Tokyo Institute of Technology, Japan); Xiaodong Chen (Queen Mary, University of London, United Kingdom)
This paper features some of the recent advances in study of the Compact MIMO DRA, developed at the Sony Ericsson Research Centre and Queen Mary, University of London. The indoor channel capacity is analysed, and the performances of the 3-element DRA are compared with a 3-element dipole uniform linear array.

2.20
Enhancement of the Intelligent Quadrifilar Helix using MIMO Antenna Selection at a WLAN Access Point
Tim Brown (University of Surrey, United Kingdom)
The intelligent quadrifilar helix antenna (IQHA) is a compact antenna that can be used with multiple IQHAs to provide the benefit of antenna selection. Results are presented to show that having two IQHAs at the access point and a single IQHA at the mobile creates an improved 4x4 MIMO link.

2.21
An Extension of the 3GPP Spatial Channel Model in Outdoor-to-Indoor Environments
Shichuan Ma, Deborah Duran-Herrmann, Hamid Sharif, Yaoqing (Lamar) Yang (University of Nebraska-Lincoln, USA)
This paper proposes a novel outdoor-to-indoor MIMO statistical channel model which integrates the 3GPP SCME and a spherical power spectrum model at the mobile terminal. Simulation results based on the proposed model are presented, including the multipath intensity profile, the temporal and frequency correlation function, and the outage capacity.

2.22
Radiated Performance Testing of Diversity Enabled Terminals
Per Iversen (SATIMO, USA); Kim Krutkowski (SATIMO, USA); Stefan Issartel (SATIMO, France); Alessandro Scannavini (SATIMO, Italy); Lars Foged (SATIMO, Italy)
This paper discuss general methods for test and design engineers for testing radiated performances of multi-antenna enabled terminals in a controlled environment such as anechoic chambers. Methods for testing MIMO (Multi-input Multi-output) performances in both passive and active way are highlighted.

2.23
A Dual Circularly Polarised Contrawound Quadrifilar Helix Antenna for Land Mobile Satellite MIMO Terminal
Mohd Fais Mansor (University of Surrey, United Kingdom); Tim Brown (University of Surrey, United Kingdom); Barry Evans (CCSR, University of Surrey, United Kingdom)
A dual circularly polarised printed Contrawound Quadrifilar Helix Antenna (CQHA) with low mutual coupling and correlation is proposed for Land Mobile Satellite (LMS) MIMO terminal. Evaluation for its MIMO potential is investigated. A deployment configuration of the CQHA for vehicular rooftop antenna is also studied.

2.24
On the Capacity Evaluation of a Land Mobile Satellite System Using Multiple Element Antennas at the Receiver
Nektarios Moraitis (National Technical University of Athens, Greece); Péter Horváth (Budapest University of Technology and Economics, Hungary); Philip Constantinou (National Technical University of Athens, Greece); Istvan Frigyes (Budapest University of Technologies, Hungary)
A satellite downlink is investigated and our goal is to determine the capacity. The investigated system is SIMO having one transmit antenna onboard the satellite and a uniform linear array receive antenna at the terminal. The study is performed at 1.8 GHz, 2.4 GHz and 14 GHz.

2.25
Characterisation of 4x4 Dual Polarised LOS MIMO
Sahaya Kulandai Raj Joseph (Technical University of Braunschweig, Germany); Schoebel Joerg (Technical University of Braunschweig, Germany)
we derive the distance criteria and minimum capacity expressions of a dual polarized 4x4 Line Of Sight MIMO channel with linear arrays. The effect of beamwidth of the individual elements on the capacity is analyzed.

Lobby 1

Tue-Poster:
Poster Session-Joint A-P-M Topics-2

2.26
Repeatable Performance Measurements of MIMO Systems in Connected Reverberation Chambers with Controlled Keyhole Effect
Charlie Orlenius (Bluetest AB, Sweden); Mats Andersson (Bluetest AB, Sweden)
The present paper describes an extended MIMO measurement setup utilizing reverberation chambers, where the so called keyhole effect can be controlled by varying the connection between the two chambers.

2.27
Doubling MIMO Capacity for handset MIMO using true polarization diversity
Juan Valenzuela-Valdes (Emite Ing, Spain); Miguel Garcia-Fernandez (Technical University of Cartagena, Spain); Antonio Martínez-González (Universidad de Cartagena, Spain); David Sanchez-Hernandez (Universidad de Cartagena, Spain)
Results to be presented in this contribution demonstrate that under Rayleigh-fading scenarios TPD can be effectively combined with spatial diversity to nearly double the diversity gain and MIMO capacity for the same available volume

2.28
Antenna diversity measurements in an urban Single Frequency Network at S band
Frederic Lacoste (CNES, France); Lionel Rudant (CEA-LETI, France); Gaël Scot (CNES, France); Françoise Carvalho (CNES, France); Christophe Delaveaud (CEA-LETI, France)
This paper presents a new concept of compact multi antenna system that has the same diversity performances than a more voluminous classical spatial diversity system. These performances have been measured in an actual urban environment.

2.29
A new method to increase the port-to-port isolation of a compact two-antenna UMTS system
Anissa Chebihi (University of Nice-Sophia Antipolis, France); Cyril Luxey (University of Nice, France); Aliou Diallo (University of Nice, France); Philippe Le Thuc (University of Nice-Sophia Antipolis, France); Robert Staraj (University of Nice-Sophia Antipolis, France)
In this paper, We propose a new method to increase the port-to-port isolation of a compact system composed by two very closed PIFAs (Planar Inverted-F Antenna) integrated on the same PCB (Printed-Card Board) of a mobile phone and operating in the UMTS band [1.92-2.17] GHz.

2.30
Magnetic Resonance Imaging Compatible Ultra-Wideband Antennas
Ulrich Schwarz (Ilmenau University of Technology, Germany); Florian Thiel (PTB Berlin, Germany); Ralf Stephan (Technische Universität Ilmenau, Germany); Matthias Hein (Ilmenau University of Technology, Germany); Frank Seifert (Physikalisch-Technische Bundesanstalt Berlin, Germany)
We have studied the performance of ultra-wideband (UWB) antennas for biomedical imaging inside the 3-Tesla magnetic resonance imaging (MRI) system of PTB Berlin. This approach opens the potential for using UWB radar as a navigator technique for improved magnetic resonance imaging.

2.31
A MIMO WiMAX-OFDM based System Measurements in Real Environments
Adil Belhouji (Xlim, France); Cyril Decroze (XLIM, France); David Carsenat (3IL, France); Moctar Mouhamadou (XLIM-UMR 6172-CNRS, University of Limoges, France); Sébastien Reynaud (CISTEME, France); Thierry Monediere (XLIM-UMR 6172-CNRS, University of Limoges, France)
Performances of a MIMO OFDM system based on the 802.16d (WiMAX) specifications is studied in reverberation chamber and outdoor to indoor context at 3,5GHz

2.32
A Comparative Study of WiMAX Subscriber Equipment Antennas
Umesh Navsariwala (Motorola, Inc., USA); Matthew Schirmacher (Motorola, Inc., USA); Nicholas Buris (Motorola, Inc., USA); Mark Schamberger (Motorola, Inc., USA)
MIMO antenna systems can take advantage of rich multipath and offer significant cost-performance benefits. This paper presents a study of WiMAX MIMO antenna modules in various multi-path environments. It is shown that lower gain antennas in rich multipath environments offer cost efficient alternatives to higher gain antennas.

2.33
Mutual Coupling in Multi-Antenna Systems: Figures-of-Merit and Practical Verification
Christian Volmer (Ilmenau University of Technology, Germany); Jörn Weber (Technische Universität Ilmenau, Germany); Ralf Stephan (Technische Universität Ilmenau, Germany); Matthias Hein (Ilmenau University of Technology, Germany)
The simple evaluation of mutual coupling effects is essential to the optimisation of antenna arrays for small mobile communications devices. We propose novel figures-of-merit in terms of the scattering matrix of the array that quantify the impact on diversity reception. The practical signification is proved by diversity measurements.

2.34
Channel Capacity Maximization in MIMO antenna system by Genetic Algorithm
Andrea Farkasvolgyi (Budapest University of Technology and Economics (BME), Hungary); Róbert Dady (BUTE, Hungary); Lajos Nagy (Budapest University of Technology and Economics, Hungary)
We present our results of channel capacity maximization by indoor environment. We investigated a 3×3 MIMO system. In this simulation antenna structure isn't fixed, but they can be taken free position within fixed space. We looked for antenna structure for maximal channel capacity by analysis with genetic algorithm.

2.35
On the realization of 4-Port Antennas for MIMO Antenna Systems
Christos Oikonomopoulos (RWTH Aachen University, Germany); Bernhard Rembold (RWTH Aachen University, Germany)
A multiport antenna for MIMO systems will be presented. It consists of elementary antenna types such as a patch, a monopole and a magnetic dipole. The return loss coefficient, the decoupling between the ports and the radiation pattern are some of the results that will be given in this paper.

2.36
Polarization Diversity Analysis in Rural Scenarios Using 3D Method-Of-Images Model
Koby Shoshan (Tel-Aviv University, Israel); Ofer Amrani (Tel Aviv University, Israel)
Polarization diversity analysis of co-located dipoles antenna configurations in Rural scenarios using 3D Ray-Tracing Method-Of-Images model.

Lobby 1

Tue-Poster:
Poster Session-Large Antennas-1

Chair: Tudor Palade (Technical University of Cluj-Napoca, Romania) , Simon Otto (IMST GmbH, Germany)

2.37
Non-Linear Waveguide-Fed Slot Antenna Array: Analysis and Synthesis
Elias Rachid (Saint Joseph University, USJ, Lebanon); Dalia Mattar (ESIB, Lebanon); Michele Rouhana (ESIB, Lebanon)
Proposed antennas have a symmetric and uniplanar geometry with both curved convex and concave microstrips for 4 slots etched on the conducting plane. They are excited by a coplanar-waveguide(CPW) and placed in the direction perpendicular to the transmission line. Numerical results are compared to those for the linear CPW.

2.38
Hybrid Particle Swarms Applied to the Synthesis of Planar Array Feeds
Marta Lanza Diego (University of Cantabria, Spain); Jesus Perez Lopez (University of Cantabria, Spain); Ivan Lopez (University of Cantabria, Spain); Jose Basterrechea (University of Cantabria, Spain)
Classical PSO schemes have been modified by introducing one of the most effective selection strategies commonly used in genetic algorithms (GA), the tournament selection strategy, and the new hybrid schemes have been applied to several planar array synthesis problems in order to weigh up the improvements achieved.

2.39
Synthesis and Optimization of Microstrip Antennas Array using Minimax Method
Bouyeddou Benamar (Abou Bekr Belkaid university Tlemcen, Algeria); Harrou Fouzi (Université de technologie de troyes, France); Sidi Ahmed Djennas (Télécom laboratory, Algeria); Lotfi Merad (CNTS algeria, Algeria)
This paper present a Minimax approach for the synthesis and optimization of linear and planar microsrip antennas array. This approach allows to seek the law of optimal feed and the space distribution of the radiant elements so that the synthesised diagram is closed as possible as an optimal desired diagram.

2.40
Single-Layer Unit Cells with Optimized Phase Angle Behavior
Sabine Dieter (University of Ulm, Germany); Christoph Fischer (University of Ulm, Germany); Wolfgang Menzel (University of Ulm, Germany)
Single-layer coupled FSS reflection type structures for reflectarrays are investigated resulting in an increased range and smaller slope of their phase angle performance as a function of structure size. Their improved performance is also demonstrated with three test reflectarrays using these novel structures.

2.41
Analysis, Design and Measurement of a Series-Fed Microstrip Array Antenna for X-band INDRA: The Indonesian Maritime Radar
Mostafa Hajian (TU Delft, The Netherlands)
Linear series center-fed patch array antenna as sub-array feed of a cylindrical reflector is presented. The design of a 1x8-elements sub-array is performed. Number of arrays have been built and measured. Return loss of -25dB, with a maximum gain of 16dBi were simulated and measured over a bandwidth of 200MHz.

2.42
Reconfigurable Reflectarray Antenna Loaded With Active Varcator
Mostafa Hajian (TU Delft, The Netherlands)
The design of an active reconfigurable reflectarray antenna has been proposed. The radiators are hollow patch loaded with varactor-diode. The phase alteration is based on the variation of the capacitance. The active reflectarray has been built and tested at 6 GHz. Good agreement between the simulations and measurements are observed.

Lobby 1

Tue-Poster:
Poster Session-Large Antennas-1

2.43
Dual Polarized Subarray for Spaceborne SAR at X-band
María Isabel Martín (EADS CASA Espacio, Spain); Fernando Monjas (EADS CASA Espacio, Spain)
Following EADS CASA Espacio heritage on spaceborne SAR radiators, the technology is applied to the antenna of the SEOSAR/PAZ SAR instrument.It consists of 384 subarrays working at X-band and performing in dual linear polarization. Tests on first subarray breadboards show low losses, good polarization purity and good bandwidth performances.

2.44
A Linear Microstrip Antenna Array Having Low Sidelobe Level
Yoseaf Asad (Sami Shamoon, Israel); Najeb Fahoum (Sami Shamoon, Israel); Haim Matzner (HIT-Holon Institute of Technology, Israel)
A microstrip antenna array having 5 elements, fed by Dolph-Chebyshev amplitude weights is proposed. The antenna elements and the divider strips are located in opposite sides of a common ground. The antenna array was simulated and measured, having approximate measured bandwidth of 18% and sidelobe level of about 17 dB.

2.45
A Dual-Frequency Series-Fed Patch Array Antenna
Simon Otto (IMST GmbH, Germany); Andre Rennings (University of Duisburg-Essen, Germany); Oliver Litschke (IMST GmbH, Germany); Klaus Solbach (Universität Duisburg-Essen, Germany)
A novel dual-frequency concept for series-fed microstrip patch array antennas is proposed. An identical near field distribution following an identical far field characteristic was achieved at two different frequencies.

2.46
A Deployable Reflector Antenna with a Simplified X/Ka Simultaneous Feed-System
Christophe Granet (BAE Systems Australia Ltd, Australia); Ian Davis (BAE Systems Australia Ltd, Australia); John Kot (BAE Systems Australia Ltd, Australia); Greg Pope (BAE Systems Australia Ltd, Australia)
A lightweight, low-cost, simultaneous X-band and Ka-band feed-system has been designed and matched to a deployable flyaway SATCOM antenna. The performance of the complete antenna assembly has been simulated and the results show that very good performance can be achieved in both X and Ka-band from a relatively small antenna.

2.47
A Simultaneous S/X Feed-System for a LEO-Satellite-Tracking Reflector Antenna
Christophe Granet (BAE Systems Australia Ltd, Australia); Ian Davis (BAE Systems Australia Ltd, Australia); John Kot (BAE Systems Australia Ltd, Australia); Greg Pope (BAE Systems Australia Ltd, Australia)
S-band has been used for satellite Telemetry, Tracking and Control (TT&C) applications for many years and more recently X-band has also been deployed. A theoretical design for a new dual S/X-band feed-system for a ground station with S-band transmit and receive capabilities and X-band receive capabilities is presented.

2.48
Novel Phased Array Antenna for mobile satellite communications
Yasuhiro Kazama (Japan Aerospace Exploration Agency, Japan)
Mobile station points a satellite in elevation range from 30deg. to 60deg. with its radiation beam. We propose a solution against the problem to use an element antenna which has the main beam in the satellite direction.

2.49
Array Antenna Composed of Bent Four-Leaf Elements
Hisamatsu Nakano (Hosei University, Japan); Yoshiki Ogino (College of Engineering, Hosei university, Japan); Junji Yamauchi (College of Engineering, Japan)
This paper presents a one-dimensional array composed of newly developed bent four-leaf antennas. A fan-beam is obtained with a gain of 19 dBi: the radiation pattern in the x-z plane is wide (HPBW = 68 deg) and that in the x-y plane is narrow (HPBW = 6 deg).

2.50
Design and demonstration of an X-band transmit-array
Hamza Kaouach (CEA-Léti / Minatec, France); Laurent Dussopt (CEA-léti / Minatec, France); Ronan Sauleau (University of Rennes 1, France); Thierry Koleck (CNES Toulouse, France)
This article presents the design, realization and experimental characterization of a new planar transmit-array at 9.6 GHz with a 10% -3dB gain bandwidth. Beam-steering up to 30° is demonstrated by shifting the feed source. This work is a first step toward the development of future reconfigurable transmit-arrays.

2.51
High-performance Uniformly Excited Linear and Planar Arrays Based on Linear Semiarrays Composed of Subarrays with Different Uniform Spacings
Marcos Álvarez-Folgueiras (University of Santiago de Compostela, Spain); Juan Rodríguez-González (University of Santiago de Compostela, Spain); Francisco Ares-Pena (University of Santiago de Compostela, Spain)
This work shows that linear arrays with the design described in the title can outperform both uniformly and nonuniformly spaced arrays designed by other published methods. Furthermore, the linear model can be extended to planar arrays in ways that achieve excellent antenna performance.

2.52
Ku band active transmitarray based on microwave phase shifters
Alfonso Muñoz-Acevedo (Universidad Politécnica de Madrid, Spain); Pablo Padilla de la Torre (Technical University of Madrid, Spain); Manuel Sierra-Castaner (Universidad Politécnica de Madrid, Spain)
The aim of this paper is to introduce a novel 12 GHz transmitarray antenna. This structure can flexibly reconfigure incident radiation with microwave circuitry based on phase shifters. Circuits and radio interface design are presented in the article.

2.53
Narrow-band microstrip antenna array for a robust receiver for navigation applications
Marcos Heckler (German Aerospace Center (DLR), Germany); Wahid Elmarissi (German Aerospace Center (DLR), Germany); Lukasz Greda (German Aerospace Center (DLR), Germany); Manuel Cuntz (German Aerospace Center (DLR), Germany); Achim Dreher (German Aerospace Center (DLR), Germany)
This paper discusses the design of a microstrip antenna array for navigation applications operating at the L1 band of the Galileo system.

2.54
An active, C-band array antenna with integrated electronics
Magnus Eriksson (Saab Microwave Systems, Sweden); Klas Axelsson (Saab Microwave Systems, Sweden); Andreas Wikström (Saab AB, Sweden); Bengt Svensson (Saab Microwave Systems, Sweden)
A concept of building a low cost integrated AESA has been investigated. A C-band active array antenna board has been designed, built and tested. Measurements of the C-board antenna agree well with the simulated results.

2.55
Unit cells for dual-polarized and polarization-flexible reflectarrays with scanning capabilities
Julien Perruisseau-Carrier (Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain, Spain); Pablo Pardo (Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain, Spain)
This paper presents dual-polarized and polarization-flexible reflectarray (RA) unit cells with phase reconfiguration capabilities. A RA using such cells could scan/form independently two beams corresponding to each linear polarization. The proposed element could also be used as a reflective cell simultaneously providing phase control and full linear/dual/circular polarization flexibility.

2.56
Scanning Performances of Wide Band Connected Arrays of Slots and Dipoles
Daniele Cavallo (TNO, The Netherlands); Andrea Neto (TNO, The Netherlands); Giampiero Gerini (TNO - Defence, Security and Safety, The Netherlands); Giovanni Toso (Esa/Estec, The Netherlands)
The scanning performances of connected arrays with backing reflectors are investigated. A comparison between connected dipoles and slots reveals that dipoles are better suited for wide scan (45º), retaining the minimal number of Transmit/Receive modules. Eventually, the design of a 40% bandwidth planar array of dipoles is presented.

2.57
A Compact Rx/Tx Dual Polarization Antenna Array Element Including Diplexers
Per Magnusson (Ruag Aerospace Sweden AB, Sweden)
New systems for satellite based Personal Mobile Communication are expected to use the S-band in addition to the L-band systems used today. Ruag Aerospace Sweden (previously Saab Space) is currently developing a novel compact antenna element for such an application at the S-UMTS frequencies

2.58
Efficient optimization of the phase diagram in digitally-controlled reflective cells
Julien Perruisseau-Carrier (Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain, Spain); Apostolos Georgiadis (CTTC, Spain)
We present an efficient method to optimize the phase states distribution, or phase diagram, of a digitally-reconfigurable reflective cell (e.g. application: reflectarray). The method is based on a genetic algorithm and a least-squares optimization, and solely requires running a very small number of full-wave simulations prior to the optimization.

2.59
Onset & Offset Configuration for Ka-Band Reflectarray Antenna
Juri Zuccarelli (INAF-IASF Bologna, Italy); Valerio Martorelli (INAF-IASF Bologna, Italy); Ocleto D'Arcangelo (IFP CNR Milano, Italy); Adriano De Rosa (INAF-IASF Bologna, Italy); Enrico Pagana (Radio engineer consultant, Italy); Nazzareno Mandolesi (INAF-IASF Bologna, Italy); Luca Valenziano (INAF-IASF Bologna, Italy)
This paper presents the first results of the study for the best configuration of a reflectarray antenna developed for a radiometer system working at 35 GHz named ViKy project.

2.60
Substrate Effect on X-band Design of End-Wall Double Slit Microstrip-to-Waveguide Splitter
Hadi Aliakbarian (ESAT, Katholieke Universiteit Leuven, Belgium); Amin Enayati (ESAT, Katholieke Universiteit Leuven, Belgium); Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium); Walter Raedt (IMEC, Belgium)
The paper investigates the effect of different types of substrates on the performance of a new kind of end-wall transition between waveguide and microstrip line which is favorable for feeding of series fed microstrip arrays.

Lobby 1

Tue-Poster:
Poster Session-Large Antennas-1

2.61
On the Design of a Direct Radiating Array by Using the Fractal Technique
Katherine Siakavara (Aristotle university of Thessaloniki, Greece); John Sahalos (Aristotle University of Thessaloniki, GR-54124, Thessaloniki, Greece, Greece); Elias Vafiadis (Aristotle University of Thessaloniki, Iceland)
The fractal technique is introduced as an efficient method for the design of Direct Radiating Arrays(DRAs) which produce multiple beams for satellite communications systems. High directivity, low SLL and small number of control points were obtained, by further modification of the geometry and the feeding of the array.

2.62
Design of a Ka-band wide scanning phased array antenna
Thomas Lambard (I.E.T.R., France); Olivier Lafond (IETR, France); Mohamed Himdi (Université de Rennes 1, France, France); Herve Jeuland (ONERA, France); Sylvain Bolioli (ONERA, France); Laurent Le Coq (University of Rennes 1, France)
The general issue of this paper deals with the design of a Ka-band phased array antenna. This paper presents a comparative study of possible antenna element candidates. It presents also a new low loss analog phase shifter. This will lead to the conception of a phased array antenna

2.63
Fast Calculation of Wide Angle ARC for Broadband Antenna Arrays Based On Interpolation Techniques
Sheng Wang (Queen Mary, University of London, United Kingdom)
The polynomial and Padé rational function fitting models were employed to interpolate the scanned wide-angle ARC of radiating element in array environments as spatial dependence. Its efficiency and applicability was also proved in the calculation of mutual coupling between elements in large arrays with sparse samples of scanned ARC.

2.64
Adjustable High Impedance Surface for Active Reflectarray Applications: Performances Optimisation of the Unit Cell
Philippe Ratajczak (Orange Labs, France); Jean-Marc Baracco (Mardel, France); Patrice Brachat (France Telecom, France); Jean-Marc Fargeas (Orange Labs, France)
In this paper, the latest developments concerning the design of the unit cell of one adjustable HIS using varactor diodes are presented. The HIS obtained with this new unit cell is used in the design of a centred reflectarray antenna able to generate various types of radiation pattern beam.

2.65
A Ring-coupled Patch Antenna for Broadband Polarization Multiplex at Ka-Band
Alexander Geise (Technical University Hamburg-Harburg, Germany); Arne Jacob (Technische Universität Hamburg-Harburg, Germany)
A multilayer patch antenna with polarization multiplex is presented. The key element is a resonant feed ring which provides both circular polarizations. The arrangement features the compactness required for highly integrated antenna arrays. The design procedure is outlined. Measurements compare well with simulated S-parameters, gain, axial ratio and far-field patterns.

2.66
Dual Polarization Microstrip Patch Array Antenna for WLAN Application
Mohd Syaiful Redzwan Mohd Shah (Universiti Teknikal Malaysia Melaka, Malaysia)
This paper present design of array antenna from type of inset-fed microstrip patch antenna oriented at 45° and -45°. The antennas are capable to generate dual linearly polarization oriented at desired location.The simulation and measurement results have been compared. The designs of array antennas yield a gain ? 12 dBi.

2.67
Single Frequency 2-D Leaky-Wave Beam Steering Using an Array of Surface-Wave Launchers
Symon Podilchak (Queen's University, Canada)
A planar antenna is presented that utilizes an array of surface-waves launchers. By varying the phase difference between elements, the excited surface-waves can be controlled. With the addition of circular gratings, cylindrical leaky-waves (LWs) can be steered producing far field beam patterns that can be controlled at a single frequency.

2.68
Investigation of a Horn Antenna Fed by Several Waveguides
Haim Matzner (HIT-Holon Institute of Technology, Israel); Rami Mashiah (HIT-Holon Institute of Technology, Israel)
A horn antenna fed by four rectangular waveguides is discussed. The measured gain of the antenna is greater than the gain of a conventional horn antenna having the same volume by more than 4 dB, and low sidelobe level has been achieved. The simulation and measurement were in good agreement.

2.69
Low-Cost Wideband Antenna Arrays on Glass Substrate for ISM Band Applications
Theodore Vasiliadis (Trinity Systems, Greece); George Sergiadis (Aristotle University of Thessaloniki, Greece)
Methodology and guidelines are presented for fabricating wideband planar antenna arrays on glass substrates, for ISM band applications. Fabrication is carried-out by hand using off-the-shelf components, ensuring an extremely low-cost process and rapid prototyping. The methodology is addressed to radio amateurs wishing to deploy WLAN networks quickly and inexpensively.

2.70
Single Layer Reactively Steered Passive Array Radiator
M. G. Sorwar Hossain (Fujitsu Laboratories Ltd., Japan); Maniwa Toru (Fujitsu Laboratories LTD., Japan)
A passive array radiator has been proposed in a single layer configuration that consists of the inset fed microstrip patches and the control reactance varying RF circuit. The RF part is designed in a folded line configuration such that it does not contribute to the spurious radiation of the antenna.

2.71
A Study on Phased Array Antenna Using Bi-layered MSA
Takenori Yasuzumi (Aoyama Gakuin University, Japan); Yasuhiro Kazama (Japan Aerospace Exploration Agency, Japan)
We propose a new type microstrip antenna with bilayered structure as a element antenna. As the measured result, scanning of the beam in the direction of hope has been achieved by adequately adjusting the phase machine.

2.72
Realization of Simple Antenna System for ETS-VIII Mobile Satellite Communications
Basari (Chiba University, Japan)
The paper presents a simple antenna system for land vehicle communication aimed at Engineering Test Satellite-VIII (ETS-VIII) applications. The developed antenna system is examined in anechoic chamber and mounted into a car for outdoor measurement using ETS-VIII. The results are presented.

2.73
Investigation on Phase Quantization Effect of Synthesized Array Factor Having a Fixed Beam and a Steered Desired Null
Mathieu Caillet (Royal Military College of Canada, Canada); Michel Clénet (DRDC Ottawa, Canada); Yahia Antar (Royal Military College of Canada, Canada)
The paper presents results on the phase quantization effect on radiation pattern characteristics of phased arrays using digital phase shifters for a scenario consisting of a desired signal and a moving interferer. The synthesized radiation pattern were investigated for various array sizes and number of phase shifter bits.

2.74
Design and Fabrication of a Waveguide Two-Dimensional Slot Array with Low Sidelobe Level of -35dB
Miao Zhang (Tokyo Institute of Technology, Japan); Jiro Hirokawa (Tokyo Institute of Technology, Japan); Makoto Ando (Tokyo Institute of Technology, Japan)
A 24-by-27 elements waveguide two-dimensional slot array with low sidelobe level of -35dB is designed by using the combination of a full-wave MoM Analysis and an equivalent circuit model. The measured total reflection is suppressed below -18dB. The sidelobe levels below -33dB for E- and H-plane are realized.

2.75
The Diverging-Focusing Properties of a Tapered Leaky Wave Antennas
Onofrio Losito (Politecnico di Bari, Italy); Vincenzo Dimiccoli (ITEL Telecomunicazioni S.r.l., Italy); Domenico Barletta (1ITEL Telecomunicazioni S.r.l., Italy)
This tapered antenna lead to a quasi linear variations of the phase constant and its radiation angle. Nevertheless the variation of its cross section, allows a non-parallel emitted rays. Using a simple formula, we can be determined its beam radiation interval and its main beam radiation angle.

2.76
Optimization of large log-periodic dual-dipole antenna by using genetic algorithm on embedded element in small log-periodic array
Jian Yang (Chalmers University of Technology, Sweden); Per-Simon Kildal (Chalmers University of Technology, Sweden)
In the paper, we introduce a new method which can predict the total reflection coefficient of a large log-periodic array (with large number of elements) by calculating only several elements embedded in a small log-periodic array.

2.77
PSP Planar lens: A CORPS BFN to improve radiation features of arrays
Diego Betancourt (Public University of Navarra, Spain); Carlos Del Rio (Public Unversity of Navarra, Spain)
In this paper a CORPS BFN defined by periodic layers of patches, slots and patches, PSP (Patch-Slot-Patch) is used to improve the radiation features of arrays, specially increasing the directivities of each one of the beams keeping the original phase centres.

2.78
Differential active antennas for the SKA project
Oscar Garcia-Perez (Universidad Carlos III de Madrid, Spain); Luis-Enrique Garcia-Muñoz (University Carlos III of Madrid, Spain); Jose Serna-Puente (Observatorio Astronomico Nacional, Spain); Vicente Gonzalez-Posadas (Universidad Politecnica de Madrid, Spain); Jose-Luis Vazquez-Roy (University Carlos III of Madrid, Spain); Daniel Segovia-Vargas (Universidad Carlos III de Madrid,, Spain)
This paper describes the design of a one square meter planar-array for the low band of the Square Kilometer Array (SKA) project (300MHz-1GHz). Electromagnetic simulation results show a correct operation for scanning angles from broadside to ±45°. Typical noise temperatures around 60K for each active antenna element have been obtained.

2.79
A 77 GHz Eight-Channel Shaped Beam Planar Reflector Antenna
Peter Feil (University of Ulm, Germany); Winfried Mayer (Endress + Hauser GmbH & Co. KG, Germany); Wolfgang Menzel (University of Ulm, Germany)
An eight-channel planar dual reflector antenna to be used in a 77GHz automotive radar sensor is presented. To meet the requirements of a combined medium and long range sensor, antenna beams are shaped by the use of dielectric radiators as feeds either only in the azimuthal or in both planes.

Lobby 1

Tue-Poster:
Poster Session-Large Antennas-1

2.80
Multi-Octave BAVA Radiating Elements for use in Modular Phased Array Antennas
William Otter (Imperial College, University of London, United Kingdom); Bruno Pirollo (BAE SYSTEMS Advanced Technology Centre, United Kingdom); Robert Henderson (BAE Systems Advanced Technology Centre, United Kingdom); Rob Lewis (BAE Systems Advanced Technology Centre, UK, United Kingdom)
Simulation of BAVA antenna elements suitable for modula phased arrays.

2.81
Fast phase-only synthesis of faceted reflectarrays
Amedeo Capozzoli (Università di Napoli Federico II, Italy); Claudio Curcio (Università di Napoli Federico II, Italy); Giuseppe D'Elia (Università di Napoli Federico II, Italy); Angelo Liseno (Università di Napoli Federico II, Italy); Daniele Bresciani (Thales Alenia Space, France); Hervé Legay (Thalès Alenia Space, France)
We illustrate a fast Phase Only Synthesis approach to the power pattern synthesis of faceted, shaped-beam reflectarrays, based on a massive use of FFTs. To allow a fast design of very large antennas, a numerical code has been developed also using a fast implementation of the FFT (FFTW).

2.82
Millimeter-Wave Frequency Reconfigurable Slot Dipole Array with Packaged RF-MEMS Switches
Nihan Gokalp (Middle East Technical University, Turkey); Ozlem Civi (Middle East Technical University, Turkey)
A frequency reconfigurable slot dipole array operating at millimeter-wave frequency is designed. Dual frequency operation of the array is achieved by using packaged RF-MEMS switches. Series RF-MEMS switches located on the dipole arms control the electrical length of the dipole and enable dual frequency operation.

2.83
A dual-band low profile phased array antenna for civil aviation applications
Andrew Thain (EADS - Innovation Works, France); Harmen Schippers (National Aerospace Laboratory NLR, The Netherlands); Adriaan Hulzinga (National Aerospace Laboratory NLR, The Netherlands); Hans Gemeren (Cyner Substrates, The Netherlands)
Dual (L & Ku) phased array antenna designs are proposed for civil aviation applications. Simulations performed with Ansoft HFSS and CST Microwave Studio are compared with protptype measurements.

2.84
Concentric square ring elements for dual band reflectarray antenna
Paola Pirinoli (Politecnico di Torino, Italy); Cong Pham Thanh (Politecnico di Torino, Italy); Marco Mussetta (Politecnico di Torino, Italy); Mario Orefice (Politecnico di Torino, Italy)
A preliminary study of a dual band reflectarray antenna is presented. The resulting antenna has properties of reduced weight and thickness, and can be easily mounted (stowed) on the roof of a vehicle and deployed when in operation.

2.85
Beam Array Optimization For Smart Antenna Systems Using Stochastic Algorithms
Konstantinos Papadopoulos (National Technical University of Athens, Greece); Chrisa Papagianni (NTUA, Greece); Christos Papas (National Technical University of Athens, Greece); Dimitra Kaklamani (National Technical University of Athens, Greece); Iakovos Venieris (National Technical University of Athens, Greece)
Adaptive array antennas are a viable solution to a number of problems in mobile communications applications. The GA and PSO algorithms are used for the beam array optimization of a linear and a planar uniform circular array and are evaluated on the basis of convergence and quality of results.

2.86
Design and Measurement of a Wideband Aperture-Coupled and Polarization-Agile Stacked-Patch Antenna Array for Monopulse Radar Applications
Sebastian Methfessel (University of Erlangen-Nuremberg, Germany)
A wideband circularly-polarized stacked-patch antenna array with dual polarization capbility is presented. Monopulse functionality can be achieved with an external comparator network. A stacked-patch antenna element, quadrant and array is designed, simulated, fabricated and measured. Theoretical and measured results of S parameters and radiation patterns are presented and discussed.

2.87
Low profile bidirectional antenna for Linear Wireless Sensors Networks
Mario Orefice (Politecnico di Torino, Italy)
This paper presents a new antenna that can be used in Linear Wireless Sensors Networks (LWSN) in the ISM frequency band (2.4-2.48 GHz) with bidirectional characteristics in order to maximize the link efficiency. The antenna consists of an array of 4 transverse waveguide slots, fed out of phase.

2.88
Analysis of complex circular/square ring reflectarray elements
Mario Orefice (Politecnico di Torino, Italy); Paola Pirinoli (Politecnico di Torino, Italy); Alessandro Drocco (Politecnico di Torino, Italy)
The use of reflectarrays elements consisting of several ring patches with different shapes is considered. With an appropriate design, such elements exhibit a linear phase variation in a wide range, so that they are suitable for wideband arrays. An array of 625 elements has been designed and manufactured.

2.89
Design of Tapered-Slot Antenna Arrays
Valeri Mikhnev (Institute of Applied Physics, Belarus); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland); Yelena Maksimovitch (Institute of Applied Physics National Academy of Sciences Of Belarus, Belarus)
Two compact ultra-wideband antenna arrays built of tapered-slot antennas and intended for landmine surveys are described.

2.90
52/119 GHz Corrugated Horn Design for Earth Observation Applications
Jean-Pierre Adam (IEEA, France)
This paper describes the design of a dual frequency feed. The center operating frequencies are 52.5 GHz and 118.75 GHz. This feed is used to illuminate an offset reflector.

2.91
Active Phased Array Techniques for High Field MRI
Pedram Yazdanbakhsh (Duisburg-Essen University, Germany); Klaus Solbach (Universität Duisburg-Essen, Germany)
This paper describes recent developments in high field Magnetic Resonance Imaging (MRI) concerning the application of active phased array techniques where the pulse amplitudes and phases of currents in antenna (coil) arrays are adjusted in order to improve magnetic flux density homogeneity inside the inhomogeneous patient's body.

2.92
Aperiodic linear arrays for rectangular shaped beams
Giovanni Toso (Esa/Estec, The Netherlands); Piero Angeletti (European Space Agency, The Netherlands)
The aim of this paper is propose a new deterministic procedure for the design of linear aperiodic arrays generating a rectangular shaped beam.

2.93
Multi-Beam Lens-Reflector for Satellite Communications: Construction Issues and Ground Plane Effects.
John Thornton (University of York, United Kingdom); Andy White (University of York, United Kingdom); Derek Gray (National Institute of Information and Communications Technology, Japan)
A hemispherical lens with groundplane comprises the focussing aperture. Gain is 35.5 dBi at 11.5 GHz, equivalent to a 61cm dish. The finite ground-plane introduces scanning loss where it truncates the aperture. This was investigated from a theory for the aperture distribution; measurements; and the commercial solver FEKO.

2.94
Array design for different SLL and null directions with an interior-point optimization method from the generalized-scattering-matrix and spherical modes
Juan Córcoles (Universidad Politécnica de Madrid, Spain); Miguel A. González (Universidad Politécnica de Madrid, Spain); Jesús Rubio (Universidad de Extremadura, Spain); Juan Zapata (Universidad Politécnica de Madrid, Spain)
This work presents an optimization procedure which yields the excitations to achieve an array pattern with the requirements of different SLL in different regions and prescribed field nulls with a maximum directive gain. All interelement coupling effects from complex radiating structures used as array elements are inherently taken into account.

Lobby 1

Tue-Poster:
Poster Session-Propagation-2

Chair: Ana Benarroch (Universidad Politécnica de Madrid, Spain), Gerhard Greving (NAVCOM Consult, Germany)

2.95
Planar Two-Bit Phase Encoded Transpolarising Reflector using Textured Surface Technology
Vincent Fusco (Queen's University Belfast, United Kingdom); Achmad Munir (ECIT Institute, Queen's University Belfast, United Kingdom); Matthias Euler (ECIT, Queen's University Belfast, United Kingdom)
We show that a suitably designed textured surface can be employed as a quadrature phase-shift keying (QPSK) backscattering reflector and as an electronically agile transpolarising reflector.

2.96
Connectivity Evaluation in Millimeter Wave Wireless Multi Hop Networks above 10GHz
Georgios Pitsiladis (National Technical University of Athens, Greece); Athanasios Panagopoulos (National Technical University of Athens,, Greece); Philip Constantinou (National Technical University of Athens, Greece)
The subject of the paper is the presentation of an analytical physical propagation model for the evaluation of the connectivity of multi-hop transmission in wireless mesh networks operating above 10GHz.

2.97
A Study on the Possibilities of Providing Signal Coverage for Wireless Systems from High Altitude Platforms
Petr Horak (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic)
This paper provides a study into the possibilities of signal coverage for wireless systems provided from HAPs. The theoretical maximum cell size was analyzed based on the HAP altitude and various power budget requirements given by different system scenarios.

2.98
Special Features of Kirchhoff Method Application in Microwave Radiometry of Rough Sea Surface
Mikhail Danilytchev (Institute of Radio Engineering and Electronics, Russia); Boris Kutuza (Russian Acad. of Sciences, Russia); Alexander Nikolaev (Institute of Radio Engineering and Electronics, Russia)
Several methods for calculation of microwave radiation characteristics of the "ocean-atmosphere" system using the Kirchhoff approach are considered. Joint analysis of wave recording and radiation data obtained in the experiment of bistatic sea surface sensing is considered. As a result existing methodology of theoretical calculations is validated and noticeably enhanced.

2.99
Adaptation of Terminal to Base Station Assignment to Terminal Activities and Rain Event in Broadband Fixed Wireless Access Systems
Balázs Héder (Budapest University of Technology and Economics, Hungary); János Bitó (Budapest University of Technology and Economics, Hungary)
In BFWA systems the signal to interference and noise ratio highly depends on the assignment of terminal stations (TS) to base stations (BS). Present contribution is based on applying our special diversity method which adopts genetic algorithm to dynamically optimise TS-BS assignments in BFWA service area.

2.100
Cooperative diversity performance in millimeter wave wireless mesh networks: Outage analysis
Vasileios Sakarellos (National Technical University of Athens, Greece); Dimitrios Skraparlis (National Technical University of Athens, Greece); Athanasios Panagopoulos (National Technical University of Athens,, Greece); John Kanellopoulos (National Technical University of Athens, Greece)
In this paper, the outage performance analysis of a cooperative diversity system operating at frequencies above 10 GHz and suffering from rain attenuation is presented. The destination node combines the direct link signal with a signal received through a regenerative relay using Selection Combining.

2.101
The use of heterogeneous antenna arrays in experimental HF-MIMO links
Salil Gunashekar (University of Leicester, United Kingdom); Michael Warrington (University of Leicester, United Kingdom); Sana Salous (University of Durham, United Kingdom); Stuart Feeney (University of Durham, United Kingdom); Nasir Abbasi (University of Leicester, United Kingdom); Dominique Lemur (IETR, Universite' de Rennes 1, France); Martial Oger (Université de Rennes 1, France)
To date, MIMO research has focussed primarily on communications within the UHF band (and above) and has not been addressed in the lower frequency bands. This paper describes the results of experiments that have been performed to investigate the feasibility of utilising MIMO techniques within the HF radio band.

2.102
First Results from Remote Sensing of the Atmosphere using Artificial Neural Networks
Martin Mudroch (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic); Martin Grabner (Czech Metrology Institute, Czech Republic); Vaclav Kvicera (Czech Metrology Institute, Czech Republic)
The paper introduces first results from remote sensing of the atmosphere using artificial neural networks (ANNs). ANNs of various designs were applied for weather classification and refractivity height profiles estimations using our unique experimental wireless links.

2.103
Single Ridge Waveguide UWB Absorbent Harmonic Filters
Jinquan Shen (Nanjing Research Institute of Electronic Technology, P.R. China)
Some UWB hamonic absorbent filters are presented in this paper that constructed by a single ridge waveguide and single and/or double series rectangulat waveguide loads.They have lower SWR and inset loss.

2.104
Measurements and Prediction of Outage Intensity Due to Multipath in Terrestrial Line-of-Sight Links
Luiz Silva Mello (Pontifical Catholic University of Rio de Janeiro, Brazil); Marlene Pontes (Pontifical Catholic University of Rio de Janeiro, Brazil); Erasmus Miranda (Catholic University of Petropolis, Brazil)
This paper presents results of measurements of outage intensity due to multipath fading performed in Brazil. Experimental data were collected in 30 line-of-sight links operating in the 4 and 6 GHz bands. Based on the results, an empirical expression for predicting outage intensity from link parameters is derive.

2.105
Similarities and differences of storm time occurrence of GPS phase fluctuations at northern and southern hemispheres
Ivan Ephishov (IZMIRAN, Russia); Nadezda Tepenitsyna (IZMIRAN, Russia); Luiza Koltunenko (IZMIRAN, Russia); Irk Shagimuratov (IZMIRAN, Russia)
The paper presents the analisys of storm time occurence of Gps phase fluctuations ih high latutude ionosphere for northen and southern hemispheres.

2.106
Studies on the Schumann resonance frequency variations
Jagdish Rai (Indian Institute of Technology, Roorkee, India); Ramesh Chand (Indian Institue of Technology, Roorkee, India); M Israil (Indian Institue of Technology, Roorkee, India); S Kamakshi (Indian Institue of Technology, Roorkee, India)
Schumann resonances are the resonant frequencies of electromagnetic radiations from lightning propagating in the earth - ionosphere waveguide. The recorded data of Schumann resonances at Dharali in Himalaya were used. It has been found that power spectrum shows maximum during noon time and minimum during night time.

2.107
Markovian Channel Modeling for Multipath Mitigation in Navigation Receivers
Bernhard Krach (German Aerospace Center (DLR), Germany); Robert Weigel (Institute for Electronics Engineering, Erlangen-Nuernberg Uni., Germany)
Latest multipath mitigation algorithms are based on the concept of sequential Bayesian estimation and improve the receiver performance by exploiting the temporal constraints of the channel dynamics, which have to be characterized by a first-order Markovian model for this purpose. In this paper such a channel model is introduced.

2.107a
Testing the Markov Property of Rain Fading on Millimeter Band Terrestrial Radio Link
László Csurgai-Horváth (Budapest University of Technology and Economics, Hungary); János Bitó (Budapest University of Technology and Economics, Hungary)
This paper investigates the Markov property of the rain fading process, measured on millimeter band terrestrial radio link and determines the appropriate order of discrete state and discrete time Markov chain, which is applicable to model the original fading process.

Lobby 1

Tue-Poster:
Poster Session-UWB Antennas

Chair: Tudor Palade (Technical University of Cluj-Napoca, Romania) , Malgorzata Janson (Universität Karlsruhe (TH), Germany)

2.108
Wide-band Tulip-Loop Antenna
Muge Tanyer-Tigrek (Delft University of Technology, The Netherlands); Dani Tran (Delft University of Technology, The Netherlands); Ioan Lager (Delft University of Technology, The Netherlands); Leo Ligthart (Delft University of Technology, The Netherlands)
A small sized CPW-fed tulip-loop antenna is described. The antenna has an impedance bandwidth for VSWR ? 2 of 83% stretching between 6 GHz and 14.5 GHz. Radiation patterns shows stable co-and low cross polar characteristics within the specified bandwidth.

2.109
Investigation on Microstrip-fed Modified Elliptical Monopole Antenna for UWB Communications
Hocine Kimouche (EMP, Algeria); Djamel Abed (Ecole Militaire Polytechnique, Algeria); Atrouz Brahim (EMP, Algeria)
In this paper, we present an optimized design for a novel Printed Modified Elliptical Monopole (PMEM) antenna with a notched semi-circular ground plane for UWB applications. Using a notched semi-circular ground plane, the antenna can be miniaturized and a size reduced by 32% compared to crescent antenna.

2.110
Size Reduction of a Wideband Slot Antenna
Yang Lu (University of Liverpool, United Kingdom); Yi Huang (University of Liverpool, United Kingdom); Hassan Chattha (University of Liverpool, United Kingdom)
This paper presents a small size (41mm X 18mm) broadband slot antenna which can work from about 4.5GHz to 8.5GHz with relative constant radiation pattern.

2.111
A Trapezoidal Printed Monopole Antenna with Bell-Shaped Cut for Ultra Wideband Applications with 5.0-6.0GHz Band Rejection
Osama Ahmed (Concordia University, Canada); Ahmed Abumazwed (Concordia University, Canada); Abdel R. Sebak (Concordia University, Canada)
A novel printed UWB monopole antenna consisting of a trapezoidal patch with bell-shaped cut is proposed. It exhibits good radiation patterns and gain flatness. By embedding U-shaped slot, a notch in the 5-6GHz frequency band is obtained. It is suitable for UWB applications avoiding interference with existing wireless systems.

2.112
Ultra Wideband Stacked Microstrip Patch Antenna
Ahmed Elkorany (Faculty of electronic engineering, menouf, menoufia, egypt, Egypt); Abdelmegeed Sharshar (Faculty of electronic engineering, menouf, menoufia, egypt, Egypt); Said Ehalafawy (Faculty of electronic engineering, menouf, menoufia, Egypt)
A novel ultra wideband stacked microstrip patch antenna is proposed. The stacked patch is larger than the excited one. An impedance bandwidth of about 3:1 in the frequency range 5.6-17.2 GHz when the stacked patch center is (3,3mm) and the excited patch center is (0,0).

2.113
Stacked Patch UWB Antenna in LTCC Technology
Shenario Valavan A (Delft University of Technology, The Netherlands)
An improved stacked patch antenna design with a wide bandwidth at mm-wave frequencies, to be integrated with a RF chip is proposed. The antenna is to be manufactured in LTCC technology which simplifies integration with a RF chip.

2.114
A Novel Compact CPW-Fed Wideband Slot Antenna
Johnson William (Pondicherry Engineering College, India); Rangaswamy Nakkeeran (Pondicherry Engineering College, India)
The proposed antenna has simple structure consisting of rectangular slot, semicircular feeding structure at the anterior portion of the feed and notched ground planes. The dimension of the antenna is 19mm×20mm×1.6mm. The antenna impedance bandwidth reaches 65% over the frequency range of 5GHz to 10.3 GHz.

2.115
Performance of wavefront migration imaging in the near field of the antennas
Malgorzata Janson (Universität Karlsruhe (TH), Germany); Grzegorz Adamiuk (University of Karlsruhe, Germany); Thomas Zwick (Universität Karlsruhe (TH), Germany); Werner Wiesbeck (University of Karlsruhe (TH), Germany)
In this paper the influence of targets placed in the proximity of the antennas on the behavior of line migration imaging algorithm used for UWB imaging is presented.

2.116
Compact Printed Tapered Slot Antenna for UWB
Jorge Costa (Instituto de Telecomunicações / ISCTE, Portugal); Carla Medeiros (Instituto de Telecomunicações, Instituto Superior Técnico, Portugal); Carlos Fernandes (Instituto de Telecomunicaoes, Instituto Superior Tecnico, Portugal)
This paper presents a new antenna for the 3.1-10.6GHz UWB bandwidth. The radiation pattern presents smooth frequency dependence with a stable phase centre position and low cross-polarization for all observation angles. Link measurements between two identical antennas have shown low pulse distortion over almost all the solid angle.

2.117
Quais-millimeter wave UWB antenna
Hisao Iwasaki (Shibaura institute of tecnology, Japan)
A novel quais-millimeter wave UWB antenna has been successfully developed. This antenna was consisted of the dipole antennas with deferent lengths and intersecting angle, and each were fed by an inverted L-probe. VSWR less than 1.5 was obtained from 20 GHz to 30 GHz.

2.118
UWB dipole antenna optimization with neural network tuned algorithm
Martin Mudroch (Czech Technical University in Prague, Czech Republic); Petr Cerny (Czech Technical University in Prague, Czech Republic); Pavel Hazdra (Czech Technical University in Prague, Czech Republic); Milos Mazanek (Czech Technical University in Prague, Czech Republic)
This paper describes improved and accelerated approach in optimization of different UWB dipole antennas. General particle swarm optimization (PSO) is tuned by artificial neural network trained by simulation results.

2.119
PCB Design of Balanced Log-Periodic Antennas
Yi-Cheng Lin (National Taiwan University, Taiwan); Tzu-Hsuan Weng (National Taiwan University, Taiwan)
A planar log-periodic antenna is fed by a planar Marchand balun. The whole design is achievable on a PCB without any supporting device. The band ranges from 1.2GHz to 3.3GHz, with radiaion patterns at the broadside. Striplines are integrated in the antenna to suppress cross-polarization successfully.

Room: CC Room 1

Wed-S2A14: Phased Array Techniques

Chair: Ioan Lager (Delft University of Technology, The Netherlands) , Heinz-Peter Feldle (EADS, Germany)

8:30 A simple on-board calibration method and its accuracy for mechanical distortions of satellite phased array antennas
Toru Takahashi (Mitsubishi Electric Corporation, Japan)
In this paper, a simple on-board calibration method has been proposed for mechanical distortions of satellite phased array antennas and it has been validated by some experiment results. Also, the theoretical study has been carried out for the calibration accuracy in the proposed method.

8:50 Active compensation techniques for deformable phased array antenna
Guillaume Lesueur (Thales Air Systems, France); Daniel Caer (Thales Air Systems, France); Thomas Merlet (Thales Air Systems, France); Pierre Granger (Thales Air Systems, France)
Very thin antenna structures with integrated electronics will permit implementation on non-dedicated platforms. To cope with radiation patterns significantly degraded by mechanical distortions on thin structures, we have developed some innovative algorithms. Presented techniques permit to recover high quality patterns in all directions, including side lobes management.

9:10 Simple Notch Radiating Element for Electronically Scanned
Ronald Lyon (SELEX Galileo, United Kingdom)
A Simple Notch Radiating Element for Electronically Scanned Arrays is presented which is optimized to ensure that the active reflection coefficient is minimised over all scan angles and frequencies at which the array operates.

9:30 Design of the Time-Reversal Hyperthermia System
Hana Dobsicek Trefna (Chalmers University of Technology, Sweden); Paolo Togni (Czech Technical University, Czech Republic); Jan Vrba (Czech Technical University, Czech Republic); Mikael Persson (Chalmers University of Technology, Sweden)
A system prototype for microwave hyperthermia of deep seated tumours is presented. It is based on the near-field beam-forming approach, which employs an antenna array placed circumferentially around the object, where constructive wave interference is controlled by the amplitude and phase changes at the feed points by using the time-reversal.

9:50 Active Patch with Tunable Transmission Phase for KU Band
Pablo Padilla de la Torre (Technical University of Madrid, Spain); Manuel Sierra Castaner (Universidad Politécnica de Madrid (Technical University of Madrid), Spain)
In this paper, active radiating elements for reconfigurable patch array antennas are developed. Two options to obtain reconfigurable antennas: placing the active circuitry in the transmission lines or directly over the patch. In this document, the second option is chosen and active elements are analyzed, designed, simulated, prototyped and measured.

Room: CC Room 2

Wed-S7P5: Convened: Honorary Session on behalf of Prof. Henry Bertoni-1

Chair: Saúl Torrico (Comsearch & The George Washington University, USA), Thomas Kürner (Technische Universität Braunschweig, Germany)

8:30 Learning from a Visionary
Yoram Walfisch (Rafael-Armament Development Authority Ltd, Israel)
The author will give a brief oral introduction of the scientific career of Prof. Henry L. Bertoni.

8:50 A View of the COST 231 Bertoni-Ikegami Model
Luis Correia (IST - Tech. Univ. Lisbon, Portugal)
A view into the generation of the COST 231 Walfisch-Ikegami path loss model is given, from the roots of the model to suggestions that have been done after its conception, encompassing the contributions from the various research groups that contributed to the model, namely Henry Bertoni's one.

9:10 Application of Bertoni's Work to Propagation Models used for the Planning of real 2G and 3G Cellular Networks
Thomas Kürner (Technische Universität Braunschweig, Germany); Michaela Neuland (Technische Universität Braunschweig, Germany)
Many path loss prediction models developed by Henry Bertoni are an integral part of propagation models used in radio network planning tools. This contribution describes how his models have been integrated, extended and applied into a propagation model used by a mobile network operator for the daily radio planning process.

9:30 PO and UTD Solutions for Multiple-Diffraction Analysis in Radiowave Propagation Prediction
Leandro Juan-Llacer (Universidad Politécnica de Cartagena, Spain)
Prof. Bertoni's contributions in over-building radiowave propagation in urban environments, have been used by other researchers to compare or introduce new formulations, either based on PO or the UTD. In this paper, a review of various PO and UTD solutions, used to analyze multiple-diffraction over buildings, is presented.

9:50 Wave Propagation in a Vegetated Residential Area Using the Distorted Born Approximation and the Fresnel-Kirchhoff Approximation
Saúl Torrico (Comsearch, USA); Roger Lang (George Washington University, USA)
An improved theoretical model is proposed to include the incoherent fields along with the coherent fields to compute the excess loss in a vegetated residential environment, with particular application to mobile radio systems.

Room: CC Room 3

Wed-S7P9: Convened: Research activities on channel modelling and propagation impairment simulation within the SatNEx project

Chair: Laurent Castanet (ONERA, France) , Carlo Riva (Politecnico di Milano, Italy)

8:30 Channel modelling activities related to atmospheric effects in the SatNEx project
Laurent Castanet (ONERA, France); László Csurgai-Horváth (Budapest University of Technology and Economics, Hungary); Frederic Lacoste (CNES, France); Carlo Riva (Politecnico di Milano, Italy); Uwe-Carsten Fiebig (German Aerospace Center (DLR), Germany); Antonio Martellucci (European Space Agency, The Netherlands); Tomaz Javornik (Jozef Stefan Institute, Slovenia); Nicolas Jeannin (ONERA, France); Erich Leitgeb (TUG, Austria); Paul Thompson (University of Surrey, United Kingdom); Vicente Pastoriza (University of Vigo, Spain)
The objective of this paper is to present the activity carried out in radiowave propagation through the atmosphere in the framework of the Joint activity JA-2310 "Channel Modelling and Propagation Impairment Simulation" of the Network of Excellence SatNEx.

8:50 Channel modelling activities related to the satellite navigation channel in the SatNEx project
Uwe-Carsten Fiebig (German Aerospace Center (DLR), Germany); Géraldine Artaud (CNES, France); Jean-Luc Issler (CNES, France); Jost Thomas (German Aerospace Center (DLR), Germany); Bernhard Krach (German Aerospace Center (DLR), Germany); Frederic Lacoste (CNES, France); Fernando Pérez-Fontán (University of Vigo, Spain); Frank Schubert (DLR, Germany); Pavel Valtr (University of Vigo, Spain)
The research work within the European Satellite Communications Network of Excellence Phase II (SatNEx II) also deals with channel modelling. This contribution refers to the work on the satellite navigation channel focussing on multipath effects in differnet environments.

9:10 Investigations on Free-Space Optical Links within SatNEx II
Erich Leitgeb (TUG, Austria); Saleem Awan (TU Graz, Austria); Thomas Plank (TU Graz, Austria); Nicolas Perlot (German Aerospace Center, Algeria); Carlo Capsoni (Politecnico di Milano, Italy); Roberto Nebuloni (Ieiit - Cnr, Italy); Tomaz Javornik (Jozef Stefan Institute, Slovenia); Gorazd Kandus (Jozef Stefan Institute, Slovenia); Farukh Nadeem (University of Technology, Graz, Austria); Paul Brandl (TU Graz, Austria); Sajid Sheikh Muhammad (National University of Computer and Emerging Sciences, Pakistan); Markus Loeschnigg (University of Technology, Graz, Austria, Austria); Muhammad Saeed Khan (TUG, Austria); Elisa Duca (Italian Space Agency, Italy)
Free Space Optics (Optical Wireless) is being considered as a growing and emerging technology. Deep-space communications, long and short distance links through the troposphere are just a few examples. We show our results in SatNEx on different Optical Wireless Systems and improvements for increasing the bit rates and the reliability.

9:30 The Satellite Communications Network of Excellence "SatNEx": Channel Modelling and Propagation Impairments Simulation Activities
Anton Donner (German Aerospace Center (DLR), Germany); Laurent Castanet (ONERA, France)
SatNEx aims to rectify the fragmentation in satellite communications research by bringing together Europe's leading academic institutions and research organisations in a cohesive and durable way. The resultant pan-European network provides a collective grouping of expertise and state-of-the-art laboratory facilities that would otherwise remain dispersed throughout Europe.

9:50 Overview of activities carried out within SatNex on land mobile satellite and satellite to indoor channel modeling
Fernando Pérez-Fontán (University of Vigo, Spain); Nektarios Moraitis (National Technical University of Athens, Greece); Tim Brown (University of Surrey, United Kingdom); Istvan Frigyes (Budapest University of Technologies, Hungary); Péter Horváth (Budapest University of Technology and Economics, Hungary); Anthony Abele (ONERA Centre de Toulouse, France); Roberto Prieto Cerdeira (European Space Agency (ESA), The Netherlands)
This paper will report on the activities within SatNex on land mobile satellite and satellite-to-indoor channel modeling. Severalactivities have been carried out: 1.- Development of physical-statistical propagation LMS channel models 2.- Diversity techniques including MIMO 3.- In-cabin propagation modeling 4.- Satellite-to-Indoor studies

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 4

Wed-S1A13:
EM Theory for New Materials

Chair: Yang Hao (Queen Mary, University of London, United Kingdom) , Custodio Peixeiro (IST-TUL, Portugal)

8:30 Non-reciprocal Magnetic Frequency Selective Surface
Toshiro Kodera (Ecole Polytechnique de Montreal, Canada); Christophe Caloz (Ecole Polytechnique de Montreal, Canada)
A non-reciprocal frequency selective surface (FSS) based on ferrite Faraday rotation is presented. A specific design is demonstrated by full-wave analysis with insertion loss of 2.5 dB and isolation of 17 dB. This FSS may find applications as antenna radomes with immunity to scattering and interferences.

8:50 Salisbury Screen Absorber with Angular and Polarisation Insensitive Resonant Resonant Frequency
Fauziah Che Seman (Queen's University Belfast, United Kingdom); Robert Cahill (Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom)
The purpose of this paper is to present a new Salisbury screen absorber design which exploits the scattering properties of a High Impedance Surface to reduce the shift in the reflection minimum which is observed for conventional structures which employ a solid metal ground plane.

9:10 Efficient surface integral equation methods for the analysis of complex metamaterial structures
Pasi Ylä-Oijala (Helsinki University of Technology, Finland); Ozgur Ergul (Bilkent University, Turkey); Levent Gürel (Bilkent University, Turkey); Matti Taskinen (Helsinki University of Technology, Finland)
Efficient surface integral equation methods are developed for the analysis of complex metamaterial structures composed of (open) PEC elements. Two alternative approaches are presented. The first one is the MLFMA combined with an efficient SAI preconditioner. The second one is the surface equivalence principle algorithm (EPA).

9:30 Study of Cross-Sectional Shapes of Ideally Hard Cylinders to achieve Invisibility for Oblique Incidence
José-Manuel Fernandez Gonzalez (Universidad Politécnica de Madrid, Spain); Eva Rajo-Iglesias (University Carlos III of Madrid, Spain); Manuel Sierra-Castaner (Universidad Politécnica de Madrid, Spain)
The reduction of electromagnetic blockage is a problem that has deserved much attention in antennas since many years. We analyze oblique incidence on ideally hard PEC/PMC strip loaded struts for dual polarization. We compute ideal cases of struts because it will give some performance goals for a final realized strut.

9:50 Numerical characterization of insulator for VLF antennas
Renaud Cuggia (Université de Nice - Sophia Antipolis, CNRS, France); Jean-Lou Dubard (Université de Nice - Sophia Antipolis, CNRS, France); Michel Ney (TELECOM Bretagne Institute, France); Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France)
Numerical results of the field distribution along an insulator using the transmission line matrix (TLM) method are pesented. A capacitive electric model deducted from the voltage and current behavior is calculated. This model could be integrated as lumped component in a global TLM code to model typical VLF/LF antennas.

Room: CC Room 5

Wed-S6A18:
EBG Structures

Chair: Raj Mittra (Penn State University, USA) , Andre Rennings (University of Duisburg-Essen, Germany)

8:30 Independently tunable dual band single layer EBG
Richard Langley (University of Sheffield, United Kingdom); Kenneth Ford (University of Sheffield, United Kingdom); Hyung-Joo Lee (University of Sheffield, United Kingdom)
This paper reports a novel design approach for an independently tunable dual band single layer EBG with uniplanar resistive lumped element biasing.

8:50 Scattering by planar junctions of metamaterial slabs
Giovanni Riccio (University of Salerno, Italy); Gianluca Gennarelli (University of Salerno, Italy)
The aim of this work is to propose a UAPO solution for the scattering problem involving a planar junction formed by two lossless and isotropic double-negative slabs illuminated at normal incidence by a plane wave

9:10 Backward-wave slab with electrically tunable index of refraction
Pekka Alitalo (TKK Helsinki University of Technology, Finland); Frédéric Bongard (Ecole Polytechnique Fédérale de Lausanne, Switzerland); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland); Sergei Tretyakov (Helsinki University of Technology, Finland)
In this paper we demonstrate the electrical tunability of a backward-wave slab, composed of three-dimensionally arranged, inductively and capacitively loaded transmission lines. As the loading capacitors can be easily replaced by electrically tunable varactors, we study the tunability of the slab, i.e., the tunability of the refractive index.

9:30 Optically Controlled Negative Refractive Index Transmission Lines
Djuradj Budimir (University of Westminster, United Kingdom)
In this paper an optically reconfigurable negative refractive index transmission line (NRI-TL) was realised by inserting optical switches into the generalised negative refraction index transmission line. By changing the gap capacitance along the microstrip line, it is possible to control the opened stop-band condition of the generalised NRI-TL.

9:50 Dispersion characteristics of a metamaterial-based parallel plate ridge waveguides
Alessia Polemi (University of Modena and Reggio Emilia, Italy); Stefano Maci (University of Siena, Italy); Per-Simon Kildal (Chalmers University of Technology, Sweden)
This paper presents an approximate analysis of the quasi-TEM dominant mode in a parallel plate metamaterial-based waveguide. This waveguide is constituted by a fakir's bed plate interrupted by a metal strip, and covered by a metallic plate. This structure is simple to manufacture, especially at millimetre and sub-millimetre waves.

Room: Hall A

Wed-S4A16:
New UWB Antennas

Chair: Nicholas Buris (Motorola, Inc., USA) , Grzegorz Adamiuk (University of Karlsruhe, Germany)

8:30 A Novel Unidirectional Radiator with Superb UWB Characteristics for X-band Phased Array Applications
Dani Tran (Delft University of Technology, The Netherlands); Muge Tanyer-Tigrek (Delft University of Technology, The Netherlands); Ioan Lager (Delft University of Technology, The Netherlands); Leo Ligthart (Delft University of Technology, The Netherlands)
A compact, CPWG-fed, UWB ring slot antenna for X-band applications with the followings, never achieved, characteristics are reported: nearly perfect linear phase; negligible dispersion; constant group delay; over 94% transmission efficiency; repeatable patterns; in-band flat, balanced and ultra wideband ; unidirectional radiator with smallest-form-factor...

8:50 Sinuous Antenna fed by a Microstrip-to-CPS Balun
Mohammad Vahdani (Institut TELECOM, TELECOM ParisTech, France); Xavier Begaud (TELECOM ParisTech, France)
This article proposes a wideband microstrip-to-CPS balun that offers the advantages of easy integration with planar antennas in a compact size.The balun has been employed to feed a wideband sinuous antenna. Simulated parameters are validated by measurement and show that the balun operates well to field and impedance matching.

9:10 A Novel Reconfigurable Antenna with Low Frequency Tuning and Switchable UWB Band
Sylvain Loizeau (ENSTA, France); Alain Sibille (ENSTA, France)
In this paper we introduce a novel antenna which features both a continuous low frequency tuning through varactors and a switchable UWB band, through PIN diodes.

9:30 Low Profile and directive UWB antenna
Serge Bories (CEA, France); Christophe Delaveaud (CEA-LETI, France); Hélène Jacquinot (CEA-LETI, France)
A low protruding 2x2 UWB patchs array is designed and characterized in the 3.1-5.1 GHz frequency band. Mainlobe tilt problem is solved and gain is higher than 10 dBi over the whole bandwidth.

9:50 Planar Band-Notched UWB Antenna
James Kelly (University of Birmingham, United Kingdom); Peter Hall (University of Birmingham, United Kingdom); Peter Gardner (University of Birmingham, United Kingdom)
This paper presents a planar ultra-wideband antenna incorporating a resonator, which is used to create a band-notch at WLAN frequencies. The approach is novel in that the resonator is patterned on the reverse side of a thin, high permittivity substrate material. The structure yields a sharp notch with strong rejection.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall B

Wed-S3A15:
Multi-Antenna Systems in Handhelds

Chair: Erkki Salonen (University of Oulu, Finland) , Matthias Hein (Ilmenau University of Technology, Germany)

8:30 Improvement of Null Zone Avoidance Capability for HF-band RFID using Diversity Combining of Loop Antennas
Hiroshi Hirayama (Nagoya Institute of Technology, Japan); Yu Satake (Nagoya Insitute of Technology, Japan); Nobuyoshi Kikuma (Nagoya Institute of Technology, Japan); Kunio Sakakibara (Nagoya Institute of Technology, Japan)
A method to avoid null zone for HF-band RFID without expanding antenna size is proposed. A loop antenna is split into four parts. Combining circuit for loop antennas consists of three phase inverters. We have validated by FDTD simulation that the proposed scheme enlarges received power by 6.6 dB.

8:50 Multiport Multiband Coupling Minimization for Miniature Antenna
Raquel Serrano Calvo (Universitat Politècnica de Catalunya, Spain); Santiago Capdevila (Universitat Politècnica de Catalunya, Spain); Albert Aguasca (Universitat Politecnica de Catalunya (UPC), Spain); Jordi Romeu (Universitat Polytecnica de Catalunya, Spain); Luis Jofre (UPC, Spain)
One of the backbones of the small multiport antennas is the strong port coupling due to the reduced radiating element spacing. The aim of this work is the deep study of those equations governing the dual port dual band small antennas, in order to have designs criteria for optimum antennas.

9:10 Multi-Band Diversity Antenna Performances Evaluation for Multi-Standard Compact Wireless Terminal
Moctar Mouhamadou (XLIM-UMR 6172-CNRS, University of Limoges, France); Majed Koubeissi (University of Limoges, France); Charles Adovi Tounou (XLIM-UMR 6172-CNRS, University of Limoges, France); Cyril Decroze (XLIM, France); David Carsenat (3IL, France); Sébastien Reynaud (CISTEME, France); Thierry Monediere (XLIM-UMR 6172-CNRS, University of Limoges, France)
In this paper, a compact multiband diversity antenna system that consists of two antennas for multi-standard (WiFi-WIMAX) applications is presented and evaluated in terms of envelope correlation coefficient (ECC) and diversity gain (DG) in real indoor or outdoor to indoor communication channel.

9:30 Beam Forming Capabilities of Smart Antennas on Mobile Terminals
Tobias Michalski (Cologne University of Applied Sciences, Germany); Volker Wienstroer (Cologne University of Applied Sciences, Germany); Rainer Kronberger (Cologne University of Applied Sciences, Germany)
The paper presents investigations on small mobile terminal antennas and their beam forming capabilities. A new approach is shown to optimize antenna array characteristics (i.e. gain pattern, coupling) for individual applications. Furthermore, it is possible to investigate the full terminal model in reduced time, using the presented theoretical approach.

9:50 Performance of Closely Spaced Multiple Antennas for Terminal Applications
Anders Derneryd (Ericsson AB, Sweden); Jonas Fridén (Ericsson AB, Sweden); Patrik Persson (Ericsson Research, Sweden); Anders Stjernman (Ericsson AB, Sweden)
The influence of correlation, efficiency, and antenna branch signal unbalance on receive diversity gain and Shannon capacity is investigated. A case study using closely spaced dipoles, with mutual coupling included, is used for the analysis. These results are compared with results derived from measured embedded radiation patterns of dual-antenna mock-ups.

Room: Hall C1

Wed-S5A17:
Sub-mm-Wave & THz

Chair: Vaclav Kvicera (Czech Metrology Institute, Czech Republic), Jiro Hirokawa (Tokyo Institute of Technology, Japan)

8:30 Design of THz Antennas for a CW Interdigitated Electrode Photomixer
Muhammad Imran Kazim (Technical University of Eindhoven (TU/e), The Netherlands); Peter Uhd Jepsen (Denmark Technical University, Denmark); Viktor Krozer (Technical University of Denmark, Denmark)
The design of a dual-slot antenna integrated with an interdigitated electrode LT GaAs photomixer together with choke filters and a dielectric lens, optimized for high output power at an operating frequency of 1 THz is proposed.

8:50 A 600 GHz Dielectric Rod Antenna
Stephen Hanham (University of Sydney, Australia); Trevor Bird (CSIRO ICT Centre, Australia); Benjamin Johnson (Macquarie University, Australia); Andrew Hellicar (CSIRO ICT Centre, Australia); Robert Minasian (University of Sydney, Australia)
An array of dielectric rod antennas is a possible solution for imaging applications at terahertz frequencies. The fabrication of a prototype antenna by laser ablation is described. Theoretical and measured results are presented for a dielectric rod antenna operating at 600 GHz.

9:10 FSS based Sub-Millimetre Wave Phase Shifter
Matthias Euler (ECIT, Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom); Robert Cahill (Queens University Belfast, United Kingdom); Raymond Dickie (Queen's University Belfast, United Kingdom)
This paper describes two double layer frequency selective surfaces which can produce a differential phase shift of 180°, as the wave propagates through the polarizer at normal incidence and thereby form the basis for a phase shifter.

9:30 Complete Power Transfer between Two Dielectric Rod Waveguides at Millimetre Waves
Patrik Pousi (TKK, Finland); Antti Räisänen (TKK Helsinki University of Technology, Finland)
If two dielectric waveguides are placed closed enough cross-talk can occur between them. There can be a complete power transfer between two identical waveguides in some special cases of cross-talk. In this paper cross-talk is studied in rectangular dielectric rod waveguides for the use in millimetre waves.

9:50 Terahertz Imaging with Antenna Coupled Detectors
Andrew Hellicar (CSIRO ICT Centre, Australia); Stephen Hanham (University of Sydney, Australia)
This paper discusses work which is advancing knowledge in the terahertz area through development of antenna coupled detectors with an emphasis on their properties in an imaging system.

Room: Hall C2

Wed-S9M3:
Advances in Indoor and Outdoor Test ranges

Chair: Juergen Hartmann (EADS Astrium, Germany) , Herald Garcia (ThalesAleniaSpace, France)

8:30 Outdoor transient Ultra-wideband measurement techniques for antenna characterizations and radiation patterns
Rabia Rammal (université de Limoges, France)
This paper describes the outdoor transient ultra-wideband measurement test equipment. An ultra-short pulse generator supplies an UWB antenna. Time response of the antenna under test is collected. Time windowing eliminates parasitic reflections. Frequency response in the useful band of the antenna is computed, and field radiations are obtained.

8:50 "Convened" - Near Field Scanning With Optoelectronic E-Field Probes
Andreas Kortke (Fraunhofer Heinrich-Hertz-Institut, Germany); Wieland Mann (enprobe GmbH, Germany)
Advantages of the application of optoelectronic field probes as well as a special calibration procedure are presented. Furthermore, numeric results of a transformation procedure of measured near field distribution functions are presented to illustrate the possibilities of high resolution radiation source reconstruction.

9:10 A Far-field Measurement Method for Large Size Antenna By Using Synthetic Aperture Antenna
Ryo Yamaguchi (NTT DoCoMo, Inc., Japan); Yasuko Kimura (NTT DoCoMo, Inc., Jordan); Kazuhiro Komiya (NTT DoCoMo, Japan); Keizo Cho (NTT DoCoMo, Japan)
A new far-field measurement method for long antennas using a virtual synthetic aperture antenna and a conventional pattern measurement system with insufficient distance is proposed.

9:30 Anechoic Chamber Performance Characterization Using Spherical Near-Field Imaging Techniques
Carl Sirles (The Howland Company, Inc., USA); John Mantovani (The Howland Company, Inc, USA); Ray Howland (The Howland Company, Inc., USA); Beau Hart (The Howland Company, Inc., USA)
This paper presents an anechoic chamber characterization technique utilizing Spherical Near-Field Imaging which provides data sufficient to determine the level and direction of signals reflected from chamber surfaces and fixtures, and to determine the extraneous signal level within a specified Quiet Zone volume.

9:50 Ultra Broadband Dipole based Near Field Probe with Integrated Amplifier
Alexander Hees (Robert Bosch GmbH, Germany); Maurice Friese (EADS Deutschland GmbH, Germany); Juergen Hasch (Robert Bosch GmbH, Germany); Juergen Detlefsen (Technische Universitaet Muenchen, Lehrstuhl fuer Hochfrequenztechnik, HFS, Germany)
An ultra broadband near field probe operating in the frequency range from 2 GHz to 11 GHz was developed. The high bandwidth of the active probe allows to measure the electrical near field of UWB antennas.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall C3

Wed-S10J3: Convened: MIMO Antenna System Techniques

Chair: Ingmar Karlsson (Chalmers, Sweden) , Jan Carlsson (SP Technical Research Institute of Sweden, Sweden)

8:30 Key Generation Exploiting MIMO Channel Evolution: Algorithms and Theoretical Limits
Jon Wallace (Jacobs University Bremen, Germany); Chan Chen (Brigham Young University, USA); Michael Jensen (Brigham Young University, USA)
An emerging area of MIMO research spanning the gap between channel characterization and information theory, is the generation of secret keys based on shared knowledge of a fluctuating reciprocal channel. This work presents practical methods for key generation using MIMO channels and analyzes their performance.

8:50 Advanced Repeaters in Cellular Communication Systems
Andreas Wolfgang (Chalmers University of Technology, Sweden); Mikael Coldrey (Ericsson Research, Sweden); Patrik Persson (Ericsson Research, Sweden); Patrik Bohlin (Qamcom Technology AB, Sweden)
In this paper we investigate the effect of repeaters on the singular values of the Multiple-Input Multiple-Output (MIMO) channel matrix. Furthermore the effect of repeaters in a cellular system, the interdependence of antenna array design, and system aspects such as scheduling are highlighted

9:10 Design and evaluation of a 2x2 MIMO repeater
Patrik Persson (Ericsson Research, Sweden); Mikael Coldrey (Ericsson Research, Sweden); Andreas Wolfgang (Chalmers University of Technology, Sweden); Patrik Bohlin (Qamcom Technology AB, Sweden)
In this paper the design and evaluation of an amplify-and-forward 2x2 MIMO repeater is presented. The evaluation of the repeater was made using field trials. The overall results showed good improvement in received signal strength, ranging from only a few dB up to 25 dB depending on the particular scenario.

9:30 Circuit Based Optimization of Radiation Characteristics of Single and Multi-Port Antennas
Kristian Karlsson (SP Technical Research Institue of Sweden, Sweden); Jan Carlsson (SP Technical Research Institute of Sweden, Sweden)
A method for optimization of multi-port antennas is presented and exemplified. The method uses data from full wave solvers in combination with circuit simulations for calculations of radiation properties of multi-port antennas. In this paper a few multi-port antennas are analyzed to illustrate the potential of the method.

9:50 Pattern Diversity versus Polarization Diversity in UMTS Mobile Phones
Fabien Ferrero (University of Nice, France); Aliou Diallo (University of Nice, France); Cyril Luxey (University of Nice, France); Benoît Derat (SAGEM Communication, France)
In this paper, we describe the design of a novel two-antenna UMTS mobile phone structure able to radiate either vertically or horizontally polarized electric fields in the azimuthal plane of the phone depending which antenna is fed and we compute the diversity performance in different ideal and realistic propagation environments.

Room: Hall C4

Wed-S11S3: Convened: Antennas & Propagation Research in China-1

Chair: Wen-Xun Zhang (Southeast University, China, P.R. China) , Zhenwei Zhao (China Research Institute of Radiowave propagation, P.R. China)

8:30 Research Progress on Printed air-fed antennas (W. X. Zhang)
Wen-Xun Zhang (Southeast University, China, P.R. China)
A series of development on printed air-fed antennas from the author's Lab are described in sequence as Fresnel Zone Plate (FZP) antenna, Reflect-array (RA), Transmit-array (TA), Fabry-Perot Resonator (FPR) antenna, and Compound Air-Fed Array (CAFA) antenna.

8:50 Design of Anisotropic Metamaterials via Optical Transformation
Wei Xiang Jiang (Southeast University, P.R. China); Tie Jun CUI (Southeast University, P.R. China)
In the past two years, much attention has been paid to the optical transformation, by which anisotropic metamaterials can be designed. In this talk, we will present the recent progress we have made on this area, such as invisibility cloaks, electromagnetic concentrators, wave bending, and new lens antennas.

9:10 Intensity spectral correlation of the field scattered from randomly rough surfaces
Geng Zhang (xidian university, xi'an, shaanxi,China, P.R. China); Zhensen Wu (xidian university, xi'an, shaanxi,China, P.R. China); Mingjun Wang (XianYang Normal College,shaanxi,China, P.R. China)
Based on Kirchhoff approximation, the general expressions of the fourth order moment of the field scattered from slightly fluctuating rough surface have been driven. Based on this, the intensity spectral correlation of the backscattered field has been investigated and the numerical results and some correlation analysis have been given.

9:30 Recent Progress of Research on Tropospheric Propagation in China
Leke Lin (CRIRP, P.R. China); Zhenwei Zhao (China Research Institute of Radiowave propagation, P.R. China); Shifeng Kang (CRIRP, P.R. China); Yumei Liu (CRIRP, P.R. China)
For the proper planning of radio systems it is necessary to have appropriate tropospheric propagation data and prediction techniques. In this paper, recent research advancements are introduced on radio meteorology, radio wave propagation and remote sensing in troposphere in China.

9:50 The study on the low profile array with high gain
Sheng Ye (Shanghai Jiao Tong University, P.R. China)
This paper presents a new printed quasi-dipole antenna with a novel feeding network. The fabricated array achieved a much better performance and at the same time retain the mechanical excellence of conventional microstrip antenna.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 1

Wed-S13A20: Reflector and Lens Antennas

Chair: Andrea Neto (TNO, The Netherlands) , Ronan Sauleau (University of Rennes 1, France)

10:40 A High-Efficiency Spline-Profile Smooth-Walled 34-38 GHz Horn as an Array Feed for the Long-Focus Optics of the RATAN-600 Radio Telescope
Christophe Granet (BAE Systems Australia Ltd, Australia); Vladimir Khaikin (2Special Astrophysical Observatory of the Russian Academy of Science, Russia); Trevor Bird (CSIRO ICT Centre, Australia)
The design of a high-efficiency spline-profile smooth-walled horn covering the 34-38 GHz band to be used as an array feed for the RATAN-600 radio telescope is investigated. The feed has very high aperture efficiency across the band.

11:00 Mechanical Beam-Steerable Elliptical Dome Lens
Eduardo Lima (Instituto de Telecomunicações, Portugal); Jorge Costa (Instituto de Telecomunicações / ISCTE, Portugal); Carlos Fernandes (Instituto de Telecomunicaoes, Instituto Superior Tecnico, Portugal)
A new scanning lens concept is presented, corresponding to a completely mechanical beam steering antenna, composed by a dielectric lens pivoting in front of a single stationary feed. This non-classic configuration yields a simple, compact and low-cost solution. A prototype has been fabricated and measured for the 60GHz WirelessHD band.

11:20 78.5GHz Fresnel Reflector with Circular Polarization for Collision Avoidance Radar on Rescue Helicopters
Karim Mazouni (University of Nice-Sophia Antipolis, France); Jerome Lanteri (Université Nice Sophia Antipolis, France); Naruto Yonemoto (Electronic Navigation Research Institute, Japan); Jean-Yves Dauvignac (Université de Nice-Sophia Antipolis, France); Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France); Claire Migliaccio (Université Nice Sophia Antipolis, France)
The LEAT works in collaboration with ENRI at the design of an antenna for anti-collision radar on rescue helicopters. The system performs the data fusion between a millimeter-wave radar, a CCD camera and an IR camera. The antenna must be compact, light and very directive.

11:40 Leaky Lens Based UWB Focal Plane Arrays for Sub-mm Wave Imaging Based on Kinetic Inductance Detectors
Andrea Neto (TNO, The Netherlands); Annalisa Iacono (University of Eindhoven (TUe), The Netherlands); Giampiero Gerini (TNO - Defence, Security and Safety, The Netherlands); Jochem Baselmans (SRON, The Netherlands); Stephen Yates (SRON, The Netherlands); Henk Hoevers (SRON, The Netherlands)
A novel strategy for broad-band focal plane array design is proposed. Its purpose is to couple radiation from a Large F/D reflector system to an array of KID. To maximize the benefits from using their BW properties the idea is to use Leaky Lens based array elements as imaging pixels.

12:00 Monopulse 77GHz Fresnel Zone Plate Reflector
Truc Phong Nguyen (Université de Nice - Sophia Antipolis, CNRS, France); Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France); Claire Migliaccio (Université Nice Sophia Antipolis, France)
This paper describes the principle of combining circular or annular patches with C-patches on a Fresnel reflector which introduces radiation pattern diversity according to the polarization. Patches were designed to perform a 180° phase difference of the reflection phase between two orthogonal polarizations for a monopulse antenna purpose.

Room: CC Room 2

Wed-S18P7: Convened: Honorary Session on behalf of Prof. Henry Bertoni-2

Chair: Thomas Kürner (Technische Universität Braunschweig, Germany) , Saúl Torrico (Comsearch & The George Washington University, USA)

10:40 Radio propagation over a valley
Dmitry Chizhik (Bell Laboratories, Alcatel-Lucent, USA); Lawrence Drabeck (Bell Labs - Lucent Technologies, USA); Michael MacDonald (Bell Labs, Lucent Technologies, USA)
The work addresses prediction of radio signal strength in variable terrain, cluttered environments where the transmitter is above the clutter and the receiver is below. A simple expression was found for received signal strength which shows that terrain curvature produces significant (over 20 dB) increases in signal strength.

11:00 Mobile to Mobile Communications in a Trunk Dominated Park Environment
Roger Lang (George Washington University, USA); Saúl Torrico (Comsearch, USA); Cuneyt Utku (NASA Goddard Space Flight Center, USA); Selim Seker (Bogazici University, Turkey)
In a mobile to mobile communications application, the attenuation through a trunk dominated park is computed at UHF and SHF frequencies. The calculation shows the importance of including the effects of multiple scatter in the calculations.

11:20 A fast model for distributed scattering from buildings
Vittorio Degli-Esposti (University of Bologna, Italy); Franco Fuschini (DEIS - Bologna, Italy); Enrico Maria Vitucci (University of Bologna at Cesena, Italy)
In the present paper a novel formulation is presented which allows the fast computation of the power-delay and of the power-angle profile related to distributed scattering from a single wall adopting simple analytical formulas

11:40 Ray-Tracing in a Virtual Drive for Mobile Communications
Christian Sturm (University of Karlsruhe, Germany); Werner Wiesbeck (University of Karlsruhe (TH), Germany)
The design, placement and test of antennas for automotive applications requires enormous effort. With the proposed solution of Virtual Drive the received signals in typical traffic scenarios can be simulated. This procedure allows the test and optimization of communication antennas before the vehicle is finally built.

12:00 WiMAX Near LOS Measurements and Comparison with Propagation Models
Leandro Maciel (Alcatel-Lucent, USA)
WiMAX Near LOS Measurements and Comparison with Propagation Models WiMAX Near LOS Measurements and Comparison with Propagation Models

Room: CC Room 3

Wed-S18P4: Models and Channel Simulations in the cm- and mm Frequency Range

Chair: Emmanuel Van Lil (Katholieke Universiteit Leuven, Belgium), Aldo Paraboni (Polytechnic of Milan, Italy)

10:40 Modeling polarimetric microwave propagation parameters from globally-distributed raindrop size distribution measurements
Mario Montopoli (University of L'aquila, Italy); Giovanni Botta (Sapienza University of Rome, Italy); Frank Marzano (Sapienza University of Rome, Italy)
A large set of measured Rain Drop Size Distributions will be coupled with e.m. simulations of the scattering properties of raindrop oblate spheroids to simulate the main propagation parameters. A multivariate regression analysis to describe relations between rain-rate and propagation parameters will be accomplished.

11:00 MultiEXCELL: a new rainfall model for the analysis of the millimetre wave propagation through the atmosphere
Lorenzo Luini (Politecnico di Milano, Italy); Carlo Capsoni (Politecnico di Milano, Italy)
This paper presents MultiEXCELL, a new rainfall model that allows the analysis of the atmospheric propagation impairments by means of a cellular representation of the meteorological environment. MultiEXCELL generates synthetic rain maps such that the local rainfall statistics are preserved and the overall rainfall spatial correlation structure is realistically reproduced.

11:20 Aspects and Results of Numerical Methods and Wave Propagation Integrated into System Simulations
Gerhard Greving (NAVCOM Consult, Germany)
Navigation, radar and communication systems rely on radio signals. Objects in the vicinity of these systems can create distortions. This paper describes the advanced system simulation by the integrated scattering analysis by numerical methods. The simulation procedure and the criteria for a suitable method are described. Practical cases are outlined.

11:40 Study of Rain Attenuation Space-Time Channel Model for Tropical and Equatorial Areas
Laurent Castanet (ONERA, France); Nicolas Jeannin (ONERA, France); Guillaume Carrie (ONERA, France); Marcio da Costa Rodrigues (CETUC, Brazil); Laurent Feral (Universite Paul Sabatier, Toulouse, France); Frederic Lacoste (CNES, France)
This paper presents a new propagation channel model able to generate full space-time attenuation fields for satellite communication systems operating at Ku and Ka band in tropical and equatorial areas. The temporal resolution of the model is 1 second wereas the space resolution is 1*1 km2.

12:00 Relationships between attenuation at different frequencies, based on initial data extracted from meteorological radiosoundings and physical models.
Maria Lucas (Universidad Politécnica de Madrid, Spain); Jose Riera (Universidad Politécnica de Madrid, Spain)
Relationships between propagation parameters (attenuation or brightness temperature) at different frequencies have been investigated. The research makes use of meteorological data, obtainde from radiosoundings, and physical models of gas and cloud attenuation, at frequencies between 10 and 100 GHz.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: CC Room 4

Wed-S12A19:
EM Theory - New Concepts

Chair: Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium) , Jussi Rahola (Nokia, Finland)

10:40 Generation of Nested Characteristic Basis Functions
Jaime Laviada (Universidad de Oviedo, Spain); Raj Mittra (Penn State University, USA); Marcos Pino (Universidad de Oviedo, Spain); Fernando Las-Heras (Universidad de Oviedo, Spain)
The generation of nested Characteristic Basis Functions is presented. It allows the creation of very large CBFs which allow us to model the current using much less basis functions than traditional methods.

11:00 An overview of some recent physical bounds in scattering and antenna theory
Mats Gustafsson (Lund University, Sweden); Christian Sohl (Lund University, Sweden); Gerhard Kristensson (Lund Univ, Sweden); Sven Nordebo (Vaxjo University, Sweden); Christer Larsson (Lund University, Sweden); Anders Bernland (Lund University, Sweden); Daniel Sjöberg (Lund University, Sweden)
The objective of this paper is to give an overview of some newly developed sum rules and physical bounds in scattering and antenna theory. The sum rules are based on integral identities for Herglotz functions that relate the quantity of interest with its low and high frequency asymptotic.

11:20 Spectral Filtering of the Spatial Multi-Layered Green's Function
Francesca Vipiana (Politecnico di Torino, Italy); Alessia Polemi (University of Modena and Reggio Emilia, Italy); Stefano Maci (University of Siena, Italy); Giuseppe Vecchi (Politecnico di Torino, Italy)
The basic idea of this work is to eliminate the Green's function singularity, without affecting the stability and the accuracy of the integrals in the Method of Moments, through a proper windowing of the employed Green's function spectrum.

11:40 Analytical Form of the Quadruple Static Potential Integrals for Uniform Source Distributions on Rectangular Domains and their Application to the Resolution of 2D and 3D Antenna Problems
Sergio López-Peña (École Polytechnique Fédérale de Lausanne, Switzerland); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)
Original analytical expressions for the quadruple static potential singular integrals on rectangular domains are presented. These integrals can appear when the MoM is used to solve the MPIE. Analytical expressions have been obtained when using 3D rectangular meshes. These expressions can be used to solve an extensive range antenna problems.

12:00 Investigation of the Efficiency of MM Solutions Based on Expansion Functions Defined in an Infinite Domain
Tamir Teper (HIT - Holon Institute of Technology, Israel); Haim Matzner (HIT-Holon Institute of Technology, Israel)
A constellation of a Moment Method (MM) solution which is based on continuous expansion functions defined in an infinite domain is proposed, and checked for the age-old problem of the thin charged conducting disk. Excellent accuracy and very fast rate of convergence has been achieved.

Room: CC Room 5

Wed-S17A24:
FSS & Functional Materials

Chair: Sergei Tretyakov (Helsinki University of Technology, Finland), Rolf Jakoby (TU Darmstadt, Germany)

10:40 Miniaturised bandpass frequency selective surface
Richard Langley (University of Sheffield, United Kingdom); Kenneth Ford (University of Sheffield, United Kingdom); Huilai Liu (University of Sheffield, United Kingdom)
A miniaturised Frequency Selective Surface (FSS) loaded with lumped components is presented. The FSS uses inductors and capacitors to provide /115 with a -3dB bandwidth of a bandpass response with a unit cell size of 23.9%. Measurements validate the simulations.

11:00 Use of Multiferroic Materials in Patch Antenna Design
Theodore Zervos (NCSR "Demokritos", Institute of Informatics & Telecommunications, Greece); Dimosthenis Stamopoulos (NCSR "Demokritos", Institute of Materials Science, Greece); Fotis Lazarakis (NCSR Demokritos, Institute of Informatics & Telecommunications, Greece); Antonis Alexandridis (NCSR "Demokritos", Greece); Michael Pissas (NCSR "Demokritos", Institute of Materials Science, Greece); Tatiana Giannakopoulou (NCSR "Demokritos", Greece); Kostas Dangakis (NCSR "Demokritos", Greece)
In this paper we propose the use of multiferroics in the substrate of a patch antenna and we study the influence of the modification of the magnetic and/or dielectric properties of this multiferroic substrate on the antenna's resonance frequency and polarization.

11:20 Investigation of magneto-dielectric thin films as substrate for patch antennas
François Grange (CEA, France); Kévin Garello (CEA-LETI, France); Eve Benevent (CEA-LETI, France); Serge Bories (CEA, France); Bernard Viala (CEA-LETI, France); Christophe Delaveaud (CEA-LETI, France); Kouroch Mahdjoubi (Université de Rennes, France)
Technological advances in microelectronics allowed many research works on new materials for RF application.A new approach consist in investigating interactions between laminated magneto-dielectric materials and radiating devices.

11:40 Double layer Interwoven Frequency Selective Surfaces
Benito Sanz-Izquierdo (University of Kent, United Kingdom); Jean-Baptiste Robertson (The University of Kent, United Kingdom); Edward Parker (The University of Kent, United Kingdom); John Batchelor (University of Kent, United Kingdom)
Interweaving convoluted FSS elements allows for close packing convoluted elements and the main effect is a substantial increase in reflection bandwidth. Application of the Fabry-Perot technique to interwoven patch elements offers wide refection bands with fast roll-off rate.

12:00 Optically Transparent Antenna for Ultra Wide-Band Applications
Anestis Katsounaros (Queen Mary, University of London, United Kingdom); Yang Hao (Queen Mary, University of London, United Kingdom); Neil Collings (Center for Advanced Photonics and Electronics, United Kingdom); Bill Crossland (Center for Advanced Photonics and Electronics, United Kingdom)
We present an optically transparent UWB antenna. Both simulation and measurement results will be presented. The proposed antenna will be a coplanar waveguide (CPW) - fed circular antenna. The highly conductive AgHT-4 transparent film will be used. Comparison among different substrates is extracted analyzing the bandwidth, radiation patterns, and gain.

Room: Hall A

Wed-S15A22: Convened: UWB Antennas for Imaging/Medical

Chair: Luis Jofre (UPC, Spain), Thomas Zwick (Universität Karlsruhe (TH), Germany)

10:40 UWB BiFocusing Tomography for Breast Tumor Detection
Marta Guardiola (Universitat Politècnica de Catalunya (UPC), Spain); Santiago Capdevila (Universitat Politècnica de Catalunya, Spain); Luis Jofre (UPC, Spain)
In this paper a UWB imaging application for breast tumor detection is implemented through simulations to show the robustness of a UWB bi-focusing operator for short range encircling geometries. Some preliminary measurement results will be presented in the full conference paper.

11:00 A novel concept of a dual-orthogonal polarized ultra wideband antenna for medical applications
Grzegorz Adamiuk (University of Karlsruhe, Germany); Jens Timmermann (University of Karlsruhe, Germany, Germany); Werner Wiesbeck (University of Karlsruhe (TH), Germany); Thomas Zwick (Universität Karlsruhe (TH), Germany)
This paper describes a concept of a dual-orthogonal, linear polarized ultra wideband (UWB) antenna. The radiation principle and feeding scheme is described. Subsequently the prototype is introduced and the theoretical assumptions are verified by the measurements. A very good polarization purity was achieved over very wide frequency range.

11:20 A miniaturized antenna for UWB-based breast imaging
Giuseppe Ruvio (Dublin Institute of Technology, Ireland); Max Ammann (Dublin Institute of Technology, Ireland)
A novel wideband semi-planar miniaturized antenna is tested in different configurations in the framework of breast cancer radio detection based on UWB pulses. This recently proposed monopole antenna structure has been shown to be significantly compact and to possess stable radiation properties for different configurations.

11:40 Antennas for ultra-wideband medical sensor systems
Matthias Hein (Ilmenau University of Technology, Germany); Christiane Geyer (University Hospital Jena, Germany); Marko Helbig (Ilmenau Technical University, Germany); Ingrid Hilger (University Hospital Jena, Germany); Jürgen Sachs (Ilmenau Technical University, Germany); Ulrich Schwarz (Ilmenau University of Technology, Germany); Frank Seifert (Physikalisch-Technische Bundesanstalt Berlin, Germany); Ralf Stephan (Technische Universität Ilmenau, Germany); Florian Thiel (PTB Berlin, Germany)
We describe the design, simulation, measurement, and application of UWB antennas for the investigation of physiological signatures and navigation for magnetic resonance imaging of moving test objects. The interdependence between size, frequency dependent radiation patterns, radar signal acquisition, and compatibility with strong magnetic fields will be addressed.

12:00 Broadband microwave based diagnostics and treatment
Mikael Persson (Chalmers University of Technology, Sweden); Andreas Fhager (Chalmers University of Technology, Sweden); Hana Dobsicek Trefna (Chalmers University of Technology, Sweden); Xuezhi Zeng (Chalmers University Technology, Sweden)
An efficient 3D microwave tomography system based on wide band antennas and detailed modelling using the finite difference time domain methods is presented together with a microwave based stroke detection system and a novel microwave hyperthermia cancer treatment system based on a time reversal algorithms.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: Hall B

Wed-S14A21: Convened: Small antenna design and measurements-1
Co-organized by EurAAP working group on small antennas

Chair: Koichi Ito (Chiba University, Japan) , Cyril Luxey (University of Nice, France)

10:40 Characterisation Of System Performance Of GPS Antennas In Mobile Terminals Including Environmental Effects
Masood Ur Rehman (Queen Mary University of London, United Kingdom); Yue Gao (Queen Mary, University of London, United Kingdom); Xiaodong Chen (Queen Mary, University of London, United Kingdom); Clive Parini (QMUL, United Kingdom); Ying Zhinong (Sony Ericsson Mobile Communications AB, Sweden)
Mobile terminal GPS antenna suffers from multipath effects in radio environment. Traditional approaches are therefore insufficient to evaluate GPS antenna performance in a real environment. This paper presents a new technique to characterise environmental effects on GPS antenna defined by Mean Effective Gain, Angle of Arrival distribution and Coverage Efficiency.

11:00 Optimization tool for fractal patches based on the IFS algorithm
Pavel Hazdra (Czech Technical University in Prague, Czech Republic); Miloslav ?apek (Czech Technical University in Prague, Czech Republic); Jan Kra?ek (Czech Technical University in Prague, Czech Republic)
The paper presents recent results on a specialized software tool for generation and optimalization of electrically small fractal microstrip patch antennas. The tool is able to: a) create fractal structures using interactive IFS b) export structures into EM simulators c) perform modal analysis of fractal patches d) perform PSO optimalization

11:20 Design of a multimode MIMO antenna using characteristic modes
Eva Antonino-Daviu (Universidad Politecnica de Valencia, Spain); Marta Cabedo (Universidad Politécnica de Valencia, Spain); Michele Gallo (Politecnico di Bari, Italy); Miguel Ferrando (Universidad Politecnica De Valencia, Spain); Michele Bozzetti (Politecnico di Bari, Italy)
In this paper we propose the use of the Theory of Characteristic Modes to design a compact multimode antenna for MIMO systems. By means of the characteristic modes analysis, different radiating modes can be identified and a set of feeding configurations proposed so as to excite the desired modes.

11:40 3D-Spiral Small Antenna for Biomedical Transmission operating within the MICS band
Javier Abadía (University of Zaragoza, Spain); Francesco Merli (Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland); Jean-François Zürcher (EPFL, Switzerland); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland); Anja Skrivervik (EPFL, Switzerland)
Implantable antennas, operating within the MICS band, need to be electrically small in order to reach reasonable dimensions. The goal of this paper is to design and realize an implantable antenna exploiting several possibilities to reduce its physical size and, at the same time, to improve its performances.

12:00 Simple and Improved Approach of Estimating MIMO Capacity from Antenna Magnitude Patterns
Ruiyuan Tian (Lund University, Sweden); Buon Kiong Lau (Lund University, Sweden)
This paper considers simple and improved approaches of estimating MIMO capacity from antenna magnitude patterns. The simple approach synthesizes the phases according to the antenna spacing whereas its performance can be improved by taking the magnitude pattern correlation into account. Their performance are investigated for antenna systems with matching networks.

Room: Hall C1

Wed-S16A23:
Remote Sensing & Space

Chair: Antoine Roederer (Technical University of Delft - IRCTR, The Netherlands), Per Ingvarson (RUAG Aerospace Sweden, Sweden)

10:40 Frequency Selective Surface Beamsplitter for Sub-mm Wave Polarimetric Space Science Instruments
Raymond Dickie (Queen's University Belfast, United Kingdom); Robert Cahill (Queen's University Belfast, United Kingdom); Harold Gamble (Queens University of Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom); Peter Huggard (Rutherford Appleton Laboratory, United Kingdom); Manju Henry (Rutherford Appleton Laboratory, United Kingdom); Matthew Oldfield (Rutherford Appleton Laboratory, United Kingdom); Phil Howard (EADS Astrium, United Kingdom); Yvonne Munro (EADS Astrium, United Kingdom); Peter de Maagt (European Space Agency, The Netherlands)
The purpose of this paper is to describe the design, construction and measured electromagnetic performance of an innovative FSS developed to separate TE and TM polarised signals in the frequency range 316 - 359 GHz.

11:00 Reconfigurable pyramidal antenna loaded by a cut-off waveguide-application to ARNS/RNSS services
Sami Hebib (Laas-Cnrs, France); Hervé Aubert (Laboratory of Analysis and Architecture of Systems, France); Olivier Pascal (University of Toulouse, France); Nelson Fonseca (CNES, France); Lionel RIES (CNES, France); Jean-Marc Lopez (CNES, France)
A novel reconfigurable and circularly polarized antenna topology for satellite application services, based on pyramidal geometry, is proposed. A specific application of this original topology is applied in this paper to the design of a reconfigurable dual-band antenna for Aeronautical Radio Navigation Services (ARNS) and Radio Navigation Satellite Services (RNSS).

11:20 "Convened" - Millimeter-Wave Artificial-Dielectric Gradient-Index Lenses
Vinh Nguyen (Duke University, USA); Serdar Yonak (Toyota Motor Engineering and Manufacturing North America, USA); David Smith (Duke University, USA)
We present a planar artificial dielectric gradient index lens for millimeter-wave frequencies. This lens was designed using homogenization techniques commonly used to design metamaterials but adapted to low loss artificial dielectrics. These techniques were combined with ray tracing tools to design a diffraction limited thin planar gradient index lens.

11:40 Data link antennas for moon-crashing probes
Per Ingvarson (RUAG Aerospace Sweden, Sweden); Johan Wettergren (RUAG Aerospace Sweden, Sweden); Jan Zackrisson (RUAG Aerospace Sweden, Sweden)
S-band data link antennas have been developed for two moon-crashing probes, SMART-1 and LCROSS. They are patch excited cups. High gain within a 40 degree cone, low cross polarisation and low mass are required.

12:00 Design of Inverted F Antenna for Low Earth Orbit (LEO) Satellite Application
Ahmed AlAmoudi (King Abdulaziz City for Science and Technology, Saudi Arabia)
Planer Inverted F antenna (PIFA) for Low Orbit Satellite LEO Satellite Applications. The antenna can be used for ground telemetry communication station with the satellite. CST-Microwave Studio was used for the simulation of the antenna. The measurement of the Return loss (S11) was almost coincidental with the simulation.

Room: Hall C2

Wed-S20M4: Convened: Advances in Nearfield Measurements

Chair: Thomas F. Eibert (Technical University of Munich, Germany) , Olav Breinbjerg (Technical University of DenMarchk, Denmark)

10:40 An effective nf-ff transformation with helicoidal scan tailored for elongated antennas: an experimental validation
Francesco D'Agostino (University of Salerno, Italy); Flaminio Ferrara (University of Salerno, Italy); Claudio Gennarelli (University of Salerno, Italy); Rocco Guerriero (University of Salerno, Italy); Massimo Migliozzi (University of Salerno, Italy); Giovanni Riccio (University of Salerno, Italy); Carlo Rizzo (MI Technologies (Europe), United Kingdom); Jeffrey A. Fordham (MI Technologies, USA)
A NF-FF transformation with helicoidal scan using a proper AUT modelling has been recently developed. Such a modelling is particularly suitable to deal with elongated antennas, but remains quite general and contains the spherical modelling as particular case. This work provides the experimental validation of this innovative NF-FF transformation technique.

11:00 A Portable Bi-Polar Millimetre-Wave Antenna Near-Field Measurement System
Timothy Brockett (University of California, Los Angeles, USA); Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA)
Development of a portable Bi-polar Millimetre-Wave Antenna Near-field Measurement System.

11:20 Locating the Phase Centre of Antennas in the Presence of Errors
Philip Miller (UK, National Physical Laboratory, United Kingdom); Martin Alexander (UK, National Physical Laboratory, United Kingdom); Tian Hong Loh (UK, National Physical Laboratory, United Kingdom)
It is becoming increasingly important to know where the phase centre of a measured is. One example is the calibration of high accuracy GPS antennas.ts. This paper discusses methods and the likely uncertainty in locating the phase centre in the presence of errors.

11:40 A 6-ridge horn antenna for spherical near-field antenna measurements
Tommi Laitinen (Helsinki University of Technology, Finland); Janne Ilvonen (Helsinki University of Technology, Finland)
A 6-ridge horn antenna for spherical near-field antenna measurements is introduced. It will be shown that a proper feeding of the 6-ridge horn structure allows to completely suppress the third-order (mu = ±3) azimuthal spherical modes in its pattern, thus making it a wideband quasi-first-order probe.

12:00 Sub-millimeter Wave Planar Near-field Antenna Testing
Daniel Janse van Rensburg (Near Field Systems Inc., USA)
Since the introduction of commercial near-field antenna test systems in the 1980's these systems have found application at ever higher frequencies, requiring new innovations to overcome technological limitations. This paper gives an overview of some of these systems and the techniques employed to overcome aspects like ...

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Room: Hall C3

Wed-S21J4: MIMO Antennas Systems

Chair: Christophe Delaveaud (CEA-LETI, France) , Roland Gabriel (Kathrein, Germany)

10:40 "Convened" - MIMO Beamforming Network Having Polarization Diversity
Muhammad Faiz Abdul Kadir (University of Technical Malaysia Malacca (UTeM), Malaysia)
These paper present a MIMO beamforming network that having polarization diversity at both ends.The operating frequency is 2.4 GHz. Different polarization and section array of the antenna will be measured throughout this project. The correlation coefficient of polarization diversity (PD) in MIMO environment channel will be constructed

11:00 Experimental VBLAST-MIMO and SIMO Signal Processing in a Tunnel
Concepción Sanchis (University polytechnic of Cartagena, Spain); Jose-Maria Molina-Garcia-Pardo (Universidad Politécnica de Cartagena, Spain); Martine Lienard (University of Lille, France); Leandro Juan-Llacer (Universidad Politécnica de Cartagena, Spain); José-Víctor Rodríguez (Universidad Politécnica de Cartagena, Spain)
we use the experimental data from an extensive 12x12 MIMO (Multiple-Input Multiple-Output) wideband (2.8GHz-5GHz) measurement campaign in a semicircular tunnel to study the impact of different multiantenna signal processing. We focus in the 3 and 5 GHz bands, and at different distances from the transmitter and the receiver.

11:20 Study of Excitation on Beam Ports versus Element Ports in Performance Evaluation of Diversity and MIMO Arrays
Nima Jamaly (Chalmers University of Technology, Sweden); Carlos Gómez Calero (Universidad Politecnica de Madrid, Technical University of Madrid, Spain); Per-Simon Kildal (Chalmers University of Technology, Sweden); Jan Carlsson (SP Technical Research Institute of Sweden, Sweden); Andreas Wolfgang (Chalmers University of Technology, Sweden)
The main concern of the current communication is to elicit the influences of beam-forming upon different MIMO parameters in a rich scattering environment. The particular stress is over total radiation efficiencies at Element and Beam ports.

11:40 Multi-objective Optimization of MIMO Antenna Systems
Anders Stjernman (Ericsson AB, Sweden); Anders Derneryd (Ericsson AB, Sweden); Stefan Jakobsson (Fraunhofer-Chalmers Research Centre, Sweden); Björn Andersson (Fraunhofer-Chalmers Research Centre,, Sweden); Fredrik Edelvik (Fraunhofer-Chalmers Research Centre, Sweden)
Multi-objective optimization for designing a dual antenna system for MIMO communication on a mobile platform is discussed. The performance depends on the received signal levels and correlation. There are limitations on the S-parameters and size of the antennas. Multi-objective optimization provides an insight in the possible trade-offs between conflicting requirements.

12:00 Short Range MIMO Communication
Naoki Honma (NTT corporation, Japan); Kentaro Nishimori (NTT corporation, Japan); Tomohiro Seki (NTT, Japan); Masato Mizoguchi (NTT corporation, Japan)
In this paper, a novel communication scheme, which uses near-filed MIMO transmission, is proposed. The channel properties between two facing array antennas are verified. It is indicated that the channel capacity could exceed that of the i.i.d. channel when the antenna geometry is appropriately given.

Room: Hall C4

Wed-S22S4: Convened: Antennas & Propagation Research in China-2

Chair: Wen-Xun Zhang (Southeast University, China, P.R. China) , Zhenwei Zhao (China Research Institute of Radiowave propagation, P.R. China)

10:40 Study on the Ionospheric Weather and Radio Propagation in CRIRP
Weimin Zhen (China Research Institute of Radiowave Propagation, P.R. China); Jian Feng (China Research Institute of Radiowave Propagation, P.R. China)
In this paper, we summarize the progress on ionopsheric weather and radio propagation in China Research Institute of Radiowave Propagation, including the ionospheric observations, the studies of ionospheric physics, ionospheric mapping, ionospheric modelling and artificial ionospheric modification, the ionospheric radio propagation studies, and ionospheric services.

11:00 Multi-layer TDS Approximation in Solving the Scattering from Dielectric or Metallic-Dielectric Structures
Zaiping Nie (University of Electronic Science and Technology of China, P.R. China); Shiquan He (University of Electronic Science and Technology of China, P.R. China)
This paper is a summary of the method concerning the multi-layer TDS integral approximation in solving the scattering from dielectric or metallic-dielectric objects. The purpose is to highlight the advantages and limitations of this technique, and draw some useful conclusions.

11:20 Study about Electromagnetic Wave Propagation and Scattering in Random Media Accomplished by Xidian University? An Overview
Zhensen Wu (Xidian University, Xi'an Shaanxi 710071, P.R. China); Rui Yang (Xidian University, Xi'an, Shaanxi, P.R. China); Lixin Guo (Xidian University, Xi'an Shaanxi 710071, P.R. China)
The main work about electromagnetic wave propagation and scattering in random media that we have done can reduce to four topic areas: propagation and scattering in discrete random media, Effect of optical wave propagation in atmosphere turbulence, Scattering properties of rough surface, Ionosphere properties and effect on radio propagation.

11:40 Effects of atmospheric turbulence scintillation on the error performance of partially Coherent laser communication
Rui Yang (Xidian University, Xi'an, Shaanxi, P.R. China)
The PDF for partial coherent beam propagating through atmospheric turbulence may be obtained in this paper. Then, according to the PDF, for on-off keying (OOK) modulation, the error probability performance of atmospheric optical communications using partially coherent laser beam source is studied under weak and strong atmospheric turbulence condition.

12:00 An Open Active Phased Array System
Ming-chun Hu (Nanjing Research Institute of Electronics Technology, P.R. China)
In this paper, we present an OAPAS frame, and discuss its composition and working method. Compared with traditional frame, OAPAS upgrades and expands functions, technique and flexibility. It provides a multi-functional and modularized frame for the future integrated digital phased array system.

12:20 - 14:00 Lunch Break (will be served in the Delegates Lunch Area at the Exhibition)

Wednesday, March 25 · 14:00 - 15:30

Room: CC Room 1

Wed-Inv1: Invited Papers
Small Antennas

Chair: Dirk Heberling (RWTH Aachen University, Germany)

14:00 New Results for Minimum Q, Maximum Gain, and Polarization Properties of Electrically Small Arbitrary Antennas
David Pozar (University of Massachusetts, USA)
This paper will review previous and recent work on the maximum gain and minimum Q of arbitrary lossless antennas, with the goal of trying to eliminate some of the confusion, incompleteness, and erroneous statements that sometimes occur in the literature.

14:45 Electromagnetic emissions and Performance for HF Proximity RFID
Mike Francis (NIST, USA)
We examined the electromagnetic emissions, and performance of commercial HF proximity RFID systems, including their susceptibility to jamming and eavesdropping. These systems are used in an increasing number of financial, identification, and access control applications. We investigated whether transactions can be detected and read at a distance and how they perform in adverse EM environments.

Room: Hall A

Wed-Inv2: Invited Papers
Antenna Measurements

Chair: Dieter Fasold (University of Applied Sciences München, Germany)

14:00 Speed and Accuracy - The competing Goals of Antenna Metrology - The current State of Art
Doren Hess (MI Technologies, USA)
The past decades have seen the practice of antenna metrology move from an emphasis on testing by real-time plane-wave illumination over to testing of antennas by synthesized plane-waves by near-field scanning. This transition has been driven by the digital revolution and the drastically lower costs of computerized systems that enable near-field scanning. Earlier the emphasis of near-field scanning research was on determining the accuracy achievable by near-field scanning; today, the current emphasis is on enhancing the speed of the scanning process while nevertheless expecting to see acceptable accuracies result. In this presentation I review the progress that has been made and provide examples that illustrate it. I also elaborate on the test applications where real-time plane-wave illumination techniques still dominate. Furthermore, I speculate on the directions in which that future developments may lead us.

14:45 Current and future Needs for Satellite Communication Antennas and Antenna Testing
Helmut Wolf (EADS Astrium, Germany)
Following a brief introduction on requirements and conditions specific to antenna technology on communication satellites and a concise overview on the Market trends and needs, potential development needs in the field of antenna technology and antenna testing are discussed.

Room: Hall B

WS-ESA1:
ESA recent A/P supported activities (extract)-1

Chair: Bertram Arbesser Rastburg (ESA - Estec, The Netherlands) , Cyril Mangenot (European Space Agency (ESTEC), The Netherlands)

14:00 Development of Ground Equipment for Atmospheric Propagation Assessment from 10 up to 90 GHz
Susanne Crewell (Universität Köln, Germany)
The "Atmospheric Propagation and Profiling System" (ATPROP) advanced ground-based microwave radiometer, for radiowave propagation assessment at Ku, Ka, Q/V and W bands has been developed. The design of ATPROP is based on the requirements of SatCom, SatNav systems and Space Science Missions.

14:30 Ionospheric Scintillations at L and C bands
Yannick Beniguel (IEEA, France)
This paper addresses the problem of ionospheric scintillations at L and C bands. The results of a L band scintillation measurement campaign are presented. Comparison with modeling has been done concurrently. The results presented for C band scintillations rely on cross checking the results with theoretical derivations.

15:00 Long-Period Statistics of the Power Distribution of a Multi-beam Reconfigurable Antenna for Satellite Broadcasting over the European Area
Aldo Paraboni (Polytechnic of Milan, Italy)
The paper presents long period statistics of power distribution related to a multispot reconfigurable antenna for satellite broadcasting working over the European area. The irradiation of the antenna is optimized following a set of procedures already described in literature, and based on the joint use of two standard data sources

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

14:00 - 15:30 Room: Hall C1
Wed-SC5 Small Antenna Design for Mobile Handsets, UWB, Sensors, RFID tags and other Applications, and their Performance Enhancement by using EBGs and Metamaterials (Part 1)

Raj Mittra, Pennsylvania State University, Zhinong Ying, Sony Ericsson

Since the 1980's, the mobile industry has experienced a dramatic growth. The first step was the transition from analog to digital standards. For instance, analog standards such as AMPS (Advanced Mobile Phone System), NMT (Nordic Mobile Telephone) and ETACS were replaced by digital ones, e.g., GSM, D-AMPS and CDMA. The second step was the move to antennas from single to multiple frequency bands, owing to growing capacity requirements. For example, DCS (GSM 1800) and PCS (GSM1900), GSM850 were introduced since the middle of the 1990's. The third step was the development from voice to multimedia system, 3G systems such as WCDMA and their enhanced systems, introduced shortly after the beginning of the 21st century. Furthermore, the WCDMA system has been proposed to be expanded to all cellular bands during the coming years. At the same time, an increasing number of non-cellular communication wireless standards have been introduced to the handset, such as FM radio, GPS, Bluetooth, WLAN, Wi-Fi, DVB-H RFID and UWB. The trend of future mobile handsets would be a need of more integrated antennas for cellular and non-cellular bands, diversity or MIMO applications. A combination of the problem of integration and the demand of an attractive industry design in the mobile terminals, has made the practical antenna design work increasingly challenging.

This course will discuss some fundamentals of small antenna theory and the multi-frequency band antenna technologies for mobile handset; size reduction techniques; antenna integration techniques; antennas for GPS; multi-channel system; diversity, MIMO in the mobile terminals; human body effect; and, measurement techniques. Part 1 will deal with some fundamental issues of small terminal antennas; Part 2 will describe the progress of different multi-frequency band techniques for handset antennas; Part 3 will discuss the antenna integration issues and some practical engineering issues for the mobile terminal antennas; next, Part 4 will describe GPS, multi-channel antenna systems, diversity and MIMO; Part 5 will examine the use of metamaterials for handset antennas; and, finally in Part 6, the human body effect and some measurement techniques will be discussed.

14:00 - 15:30 Room: Hall C4
WS-SEMCAD
Workshop focus: Hands-on Antenna Design with SEMCAD-X (Part 1)

SEMCAD is a Simulation platform for EMC, Antenna Design and Dosimetry, has been explicitly developed to meet the electromagnetic full wave simulation needs of the wireless industry. Latest modeling advances in antenna design using Semcad X will be presented in a free interactive workshop. The antennas will be simulated in the most challenging and complex environments including the interaction and effects on the human body. A string of complex antenna will visualize the speed and accuracy of Semcad X.

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 4

Wed-COST: The Future of Antenna Engineering - Educational Aspects

Chair: Ioan Lager (Delft University of Technology, The Netherlands)

16:00 Antenna engineering: Today and tomorrow
Ioan Lager (Delft University of Technology, The Netherlands); Marta Martinez-Vazquez (IMST GmbH, Germany); Per Ingvarson (RUAG Aerospace Sweden, Sweden)
Antenna Engineering is at a cross-road: On the one hand, the "global village", the efforts for safeguarding the environmental quality, the need for a more sustainable economical system and so many more concrete and present tasks that face our society demand a substantial progress in the realm of the Information Society, with its so important component concerning the wireless services. On the other hand, fighting with a serious image problem, Electrical Engineering, in general, and Antenna Engineering, in particular, seems to motivate increasingly less dedicated youth to choosing this topic for their career. It is the authors' conviction that identifying and confronting in a realistic and constructive manner the issues behind this paradoxical trend in the academic education is the only path to reversing it. The contribution will start from sketching the general features of the image problem around Antenna Engineering, trying to demonstrate that it is a perception issue and not a content one. It will then proceed to evaluating some statistical data concerning the higher educational offer and the employment requirements in Europe.

16:20 Attracting Student Vocations into Engineering Careers. Some Insights
Luis Jofre (UPC, Spain)

16:40 Yes we can: How Bologna is changing the German EE educational system
Gerald Gerlach (Technische Universität Dresden, Germany)
Germany's traditional educational system comprises a versatile system of different university levels (research universities, universities of applied sciences, universities of cooperative education) in the past easily to distinguish. By the majority they are public institutions governed by provisions of national law (Framework Act for Higher Education). Although the main responsibility for education lies in the hands of the federal states, the Framework Act caused a quiet uniform educational standard. Bologna and its changes for the educational system have a deep impact on the diversity of the German university landscape. In the meantime more than half of the courses are converted to consecutive Bachelor/Master courses. But to compare standards of universities as well as of their graduates it is much more difficult now. All types of university confer degrees on Bachelor and Master level as well as for Engineering or for Science. Several of them show serious deficits as can be seen for example by the drop-out rate or the decreasing numbers of exchange students. The contribution will focus on the state of this transformation process as well as on the manifold efforts to keep the high level in engineering education in Germany.

17:00 Low-demand engineering schools - The Hellenic exception
George Sergiadis (Aristotle University of Thessaloniki, Greece)
Despite the declining tendency of newer candidate students for the Electrical Engineering Schools in the western world, in Greece the tendency is positive. This presentation tries to examine the reasons, both from the University, as well as from the candidate's point of view. Additionally, it points out some of the possible future risks of this tendency.

17:20 Open Forum Discussion
Ioan Lager (Delft University of Technology, The Netherlands)

Room: Hall A

IEEE-DL3:
IEEE AP-S Distinguished Lecturers-3

Chair: J (Yiannis) Vardaxoglou (Loughborough University, United Kingdom), Manuel Sierra-Perez (Universidad Politécnica de Madrid, Spain)

16:00 Reconfigurable Multifunctional Antennas
Christos Christodoulou (University of New Mexico, USA)
The requirements for increased functionality, such as direction finding, radar, control and command, within a confined volume, place a greater burden in today's transmitting and receiving systems. A solution to this problem is the re-configurable antenna. Antennas that can be used for multiple purposes, that function over several frequency bands and that can be integrated on a package for mass-production are the ultimate goals of commercial and defense investigators. Furthermore, applications of such systems in personal and satellite communications impose the requirement for elements miniaturized in size and weight.Key-elements to obtain reconfigurability in many RF circuits are the Radio-Frequency MicroElectroMechanical Systems (RF-MEMS). Even though RF-MEMS have been used in the past to reconfigure filters, phase-shifters, capacitors and inductors, their integration in an antenna system has been limited as it faces a plethora of issues that need to be resolved. The absence of a reconfigurable RF-MEMS antenna system and the recent advances in fractal - and especially Sierpinski gasket- antennas combined with the availability of series cantilever RF-MEMS switches, sparked the pioneering idea to design a multiple-frequency antenna that will radiate on-demand the same radiation pattern at various frequencies. Such a system was designed and successfully implemented, as the first functional, fully integrated RF-MEMS reconfigurable self-similar antenna. In this talk, several reconfigurable antennas are presented and discussed. The antennas to be presented cover a wide range of designs such as fractal antennas, triangular antennas, dipoles and monopoles with variable sleeves. All these antennas make use of MEMS or PIN switches, or rotating feeds to make them reconfigurable. Some of the challenges that the designer has to face in biasing and integrating these switches with the antenna has are also presented and discussed.

16:40 Cross-Layer Design of Smart Antenna Systems
Nicholas Buris (Motorola, Inc., USA)
Smart Antenna Systems use the additional degrees of freedom offered by their multiple antennas to exploit, among other things, multipath in the propagation environment. Therefore, by construction, antenna design of smart antenna systems cannot be assessed by simple performance metrics such as gain, polarization and efficiency alone. At a minimum, performance has to be considered in the context of the nature and degree of the multipath. Capacity, the maximum possible throughput, is an appropriate performance metric when the antennas are properly combined with their propagation environment but nothing more is known about the system. When, additionally, the specific Link and Media Access Control (MAC) layer characteristics of the system are taken into account, the actual throughput of the communication link becomes a more appropriate performance metric. A Cross-Layered design approach of Multiple Input Multiple Output (MIMO) antenna systems is presented in this talk. An electromagnetics exact formulation from baseband-to-baseband of a Smart Antenna System is given. The formulation consists of full wave analyses of the antenna arrays involved on both sides of the link and a plane wave decomposition for the propagation environment. Subsequently, the baseband signals are fed into link simulators, specific for each system of interest, to provide estimates of the Bit Error Rate (BER) and throughput. Calibration and Channel estimation algorithms are described for Time Division Duplex (TDD) systems, such as the IEEE 802.16 (WiMAX). The state of the art in designing antennas for terminals and for base stations is outlined. Examples of actual product designs for WiMAX and IEEE 802.11n are also given. Finally, the talk ends with some recommendations on research topics to further the state of the art.

17:20 Higher Order Modelling for Computational Electromagnetics
Roberto Graglia (Politecnico di Torino, Italy)
The progress in the area of Computational Electromagnetics, together with the cost reduction and continuous increase of the computational speed and power of modern computers, have contributed to the development and broad diffusion of numerical software for the analysis and design of complex electromagnetic structures and systems. The geometry and the materials of these structures can nowadays be modeled by powerful pre-processor codes able to provide high order description of the problem to the electromagnetic "solver-software". To take advantage of the high quality models available by using the modern pre-processors, several researchers have also developed in the last decade high order basis functions for finite electromagnetic solver codes. This presentation is intended to provide an overview of the most recent developments obtained in this special area. After a brief overview of the fundamentals of finite methods, an in-depth coverage of higher order models for Moment Method and Finite Element Method applications is provided, thereby considering interpolatory and hierarchical higher order vector bases with a detailed discussion of the implementation problems and of the advantages provided by use of higher-order models.

16:00-18:00 **Room: CC Room 3**

EuCAP Steering Committee Meeting

19:00 - 22:30 Boat Tour "Berlin by Night"

Room: Hall B

WS-ESA2:
ESA recent A/P supported activities (extract)-2

Chair: Bertram Arbesser Rastburg (ESA - Estec, The Netherlands) , Cyril Mangenot (European Space Agency (ESTEC), The Netherlands)

16:00 Feasibility study and sensitivity analysis for a reconfigurable shaped dual reflector in Ku band
Cecilia Cappellin (TICRA, Denmark); Knud Pontoppidan (TICRA, Denmark)
A feasibility study of a shaped dual reflector equipped with a reconfigurable subreflector for a realistic mission scenario in Ku band is presented. The reconfigurable surface is modeled by a mesh of interwoven flexible wires supported by control points. A detailed sensitivity analysis to actuator settings will be performed.

16:30 Decimated array for Ku-band reconfigurable multi-beam coverage
Simon Stirland (Astrium Ltd, United Kingdom)
A recent study carried out by Astrium provided an opportunity to develop a phased array decimation concept devised earlier. For certain coverage scenarios this provides performance for a DRA superior to that of an equivalent reflector-based active antenna, while using fewer degrees of freedom in its agile beamforming.

17:00 Aperiodic Arrays for Space Applications:A combined Amplitude/Density Synthesis Approach
Giovanni Toso (Esa/Estec, The Netherlands); Piero Angeletti (European Space Agency, The Netherlands)
In this paper a deterministic technique for the synthesis of linear aperiodic arrays with an assigned number of elements and amplitude excitation is introduced. The technique is then extended for the synthesis of planar aperiodic arrays by applying different linear synthesis techniques separately, sequentially or iteratively.

17:15 Aperiodic Arrays for Space Applications:An Effective Strategy for the Overall Design
Ovidio Bucci (University of Naples, Italy); Tommaso Isernia (University of Reggio Calabria, Italy)
In active array antennas for satellite communications, one wants to reduce as much as possible the number of control points while fulfilling severe constraints on gain for each of the beams as well as on intra beams interference. A candidate architecture to perform the job is an aperiodic sparse array with isophoric or at most quantized excitations.

17:30 Geostationary Atmospheric Sounder (GAS) Demonstrator Development
Anders Carlström (RUAG Aerospace Sweden, Sweden); Jacob Christensen (RUAG Aerospace Sweden, Sweden); Per Ingvarson (RUAG Aerospace Sweden, Sweden); Johan Embretsén (Omnisys Instruments, Sweden); Anders Emrich (Omnisys Instruments, Sweden); Peter de Maagt (European Space Agency, The Netherlands)
This paper presents the ongoing development of a demonstrator for the Geostationary Atmospheric Sounder (GAS) instrument. GAS utilizes synthetic aperture radiometry to obtain desired spatial (30 km) and temporal (nowcasting) resolution for measurement of atmospheric temperature and humidity profiles under all weather conditions.

16:00 - 18:00 Room: Hall C1

Wed -SC5 Small Antenna Design for Mobile Handsets, UWB, Sensors, RFID tags and other Applications, and their Performance Enhancement by using EBGs and Metamaterials (Part 2)

Raj Mittra, Pennsylvania State University, Zhinong Ying, Sony Ericsson

Since the 1980's, the mobile industry has experienced a dramatic growth. The first step was the transition from analog to digital standards. For instance, analog standards such as AMPS (Advanced Mobile Phone System), NMT (Nordic Mobile Telephone) and ETACS were replaced by digital ones, e.g., GSM, D-AMPS and CDMA. The second step was the move to antennas from single to multiple frequency bands, owing to growing capacity requirements. For example, DCS (GSM 1800) and PCS (GSM1900), GSM850 were introduced since the middle of the 1990's. The third step was the development from voice to multimedia system, 3G systems such as WCDMA and their enhanced systems, introduced shortly after the beginning of the 21st century. Furthermore, the WCDMA system has been proposed to be expanded to all cellular bands during the coming years. At the same time, an increasing number of non-cellular communication wireless standards have been introduced to the handset, such as FM radio, GPS, Bluetooth, WLAN, Wi-Fi, DVB-H RFID and UWB. The trend of future mobile handsets would be a need of more integrated antennas for cellular and non-cellular bands, diversity or MIMO applications. A combination of the problem of integration and the demand of an attractive industry design in the mobile terminals, has made the practical antenna design work increasingly challenging.

This course will discuss some fundamentals of small antenna theory and the multi-frequency band antenna technologies for mobile handset; size reduction techniques; antenna integration techniques; antennas for GPS; multi-channel system; diversity, MIMO in the mobile terminals; human body effect; and, measurement techniques. Part 1 will deal with some fundamental issues of small terminal antennas; Part 2 will describe the progress of different multi-frequency band techniques for handset antennas; Part 3 will discuss the antenna integration issues and some practical engineering issues for the mobile terminal antennas; next, Part 4 will describe GPS, multi-channel antenna systems, diversity and MIMO; Part 5 will examine the use of metamaterials for handset antennas; and, finally in Part 6, the human body effect and some measurement techniques will be discussed.

Room: Hall C2

Wed-S24:
mm-Wave/Quasi Optical Antenna Measurements

Chair: Antti Räisänen (TKK Helsinki University of Technology, Finland)

16:00 Improvement and Validation of Design Tools for Antennas of Space Instruments working in Terahertz Frequency Range
Juergen Hartmann (EADS Astrium, Germany); Jürgen Habersack (EADS Astrium, Germany); Hans-Juergen Steiner (Astrium GmbH, Germany)
The simulation of large antennas for e.g. limb sounder working in mm-wave frequency range requires the application of highly accurate data of its subsystems. Within the paper, latest improvements in RF test setup design for feed pattern detection and surface measurements for applied antenna reflector will be presented.

16:20 Near-field Beam Pattern Measurement of ALMA Band 8 (385 - 500 GHz) #1 Cartridge
Masato Naruse (University of Tokyo, Japan)
We have established a near-field vector beam measurement system for ALMA band8 (385-500 GHz). We extensively investigated submillimeter probe horn pattern, standing wave as well as amplitude and phase stability of this system. Owing to these efforts, measured beam patterns can be compared with physical optics simulations and ALMA specifications.

16:40 IETR and TKK- MilliLab measurements cooperation in ACE 2 context : characterization of a Half Maxwell Fish Eye lens at 110 and 150 GHz
Laurent Le Coq (University of Rennes 1, France); Matti Vaaja (TKK Helsinky University of Technology, MilliLab, Finland); Benjamin Fuchs (EPFL, Switzerland); Olivier Lafond (IETR, France); Juha Ala-Laurinaho (TKK Helsinki University of Technology, MilliLab, Finland); Juha Mallat (TKK Helsinky University of Technology, MilliLab, Finland); Mohamed Himdi (Université de Rennes 1, France, France); Antti Räisänen (TKK Helsinki University of Technology, Finland)
Under ACE 2 umbrella, TKK and IETR decided to cooperate for measuring a lens in millimetric bands : in IETR far-field antenna test range at 110 GHz, and in TKK-MilliLab near-field antenna test range at 110 GHz and 150GHz.

17:00 Dedicated measurement setup for MMW silicon integrated antennas: BiCMOS and CMOS high resistivity SOI processes characterization
Romain Pilard (STMicroelectronics, Technology R&D, STD, TPS Lab, France); Sebastien Montusclat (STMicroelectronics, France); Daniel Gloria (STMicroelectronics, France); François Le Pennec (Lab-STICC/MOM UMR CNRS 3192, France); Christian Person (Lab-STICC/MOM UMR CNRS 3192, France)
We propose a full description of an anechoic chamber which has been designed for such particular environment (test of on-chip antenna, with coplanar probe access) and the associated measurement procedure (radiation pattern and return loss).

17:20 Antenna positioning check up based on radiation pattern measurements
Laurent Le Coq (University of Rennes 1, France); Olivier Lafond (IETR, France); Mohamed Himdi (Université de Rennes 1, France, France)
An easy to use procedure based on radiation pattern measurements is applied for first level check up of several mounting system axis in a far field antenna test facility. The presented results have been performed in V band.

19:00 - 22:30 Boat Tour "Berlin by Night"

Room: Hall C3

Wed-S23:
Smart Antennas

Chair: Alain Sibille (ENSTA, France) , Tudor Palade (Technical University of Cluj-Napoca, Romania)

16:00 An Adaptive Antenna Using Orthogonal Projection for OFDM Transmission
Kazunari Kihira (Mitsubishi Electric Corporation, Japan); Masataka Ohtsuka (Mitsubishi Electric Corporation, Japan); Yoshihiko Konishi (Mitsubishi Electric Corporation, Japan)
This paper proposes an adaptive array using orthogonal projection for OFDM transmission. The proposed method calculates the projection matrix by using zero carriers including interference wave.

16:20 Two port reconfigurable CRLH leaky wave antenna with improved impedance matching and beam tuning
Daniele Piazza (Drexel University, USA); Michele D'Amico (Politecnico di Milano, Italy); Kapil Dandekar (Drexel University, USA)
In this paper we propose a two port reconfigurable CRLH leaky wave antenna as a suitable solution for compact highly reconfigurable MIMO systems.

16:40 New Smart Antenna Algorithm Applied to Autonomous Area Control for Mobile Radio Network
Yuki Inoue (NTT DOCOMO, Inc., Japan); Keizo Cho (NTT DoCoMo, Japan)
In this paper, we proposed applying smart antenna technology to automated area construction(AAC) and the proposed AAC-SA(Smart Antenna)method, which is a new antenna pattern control algorithm suited to AAC. The proposed method automatically generates a high quality area even when the BS arrangement is random.

17:00 Pattern Switching Compact Patch Antenna for On-body and Off-body Communications at 2.45 GHz
Anupam Chandran (Queen's University, Belfast, United Kingdom); Gareth Conway (Queen's University, Belfast, United Kingdom); William Scanlon (Queen's University Belfast, United Kingdom)
A 2.45 GHz mode-switching wearable antenna is presented in this paper. Using active control of PIN diode shorting posts, we can switch the radiating pattern to suit both on-body and off-body communication. The antenna is wideband and has a reasonably good efficiency in both modes.

17:20 Design and Optimization of a Smart Quad-PIFA for Maximum Directionality at 2.4 GHz with the Aid of Genetic Algorithms
Themistoklis Dimousios (National Technical University of Athens, Greece)
A QuadPIFA of four PIFAs over single groundplane is presented. One PIFA is active,others remain parasitic. Optimization uses Genetic Algorithms as to have specific radiation pattern (main lobe 90 3db beamwidth at 0 degrees), impedance matching 2.4 GHz. By sweeping the active PIFA, azimuth coverage, directionality are achieved.

14:00 - 16:00 **Room: Hall C4**

WS-SEMCAD
Workshop focus: Hands-on Antenna Design with SEMCAD-X (Part 2)

SEMCAD is a Simulation platform for EMC, Antenna Design and Dosimetry, has been explicitly developed to meet the electromagnetic full wave simulation needs of the wireless industry. Latest modeling advances in antenna design using Semcad X will be presented in a free interactive workshop. The antennas will be simulated in the most challenging and complex environments including the interaction and effects on the human body. A string of complex antenna will visualize the speed and accuracy of Semcad X.

Lobby 1

Wed-Poster:
Poster Session-Antenna Theory-2

Chair: Yang Hao (Queen Mary, University of London, United Kingdom) , Andrey Nosich (Kharkiv National University, Ukraine)

3.1
Efficient Multi-Aspect RCS Simulations Based on the Shooting and Bouncing Rays Technique
Hermann Buddendick (University of Stuttgart, Germany); Thomas F. Eibert (Technical University of Munich, Germany)
An approach is presented to simulate the monostatic scattering properties of realistic objects in the high frequency regime using the well known asymptotic SBR technique in an efficient way. It employs the monostatic-bistatic equivalence principle on a ray-by-ray basis.

3.2
Radar Cross Section Prediction and Measurement at 77 GHz
Markus Treml (University of Linz, Austria); Reinhard Feger (University of Linz, Austria); Christoph Wagner (Christian Doppler Laboratory for Integrated Radar Sensors, Austria); Andreas Stelzer (University of Linz, Austria); Herbert Jäger (Danube Integrated Circuit Engineering, Austria)
This paper presents a comparison of predicted and measured radar cross sections of complex objects at 77 GHz. For computing the RCS a ray tracing algorithm combined with physical optics and incremental length diffraction coefficient is used. The simulations are compared against measurements, obtained using a 77-GHz FMCW radar sensor.

3.3
2D Imaging of Shallow Buried Objects Based On Frequency Domain Data
Mohamed Soliman (Military Technical College, Egypt); Zhipeng Wu (University of Manchester, United Kingdom); Anthony Brown (University of Manchester, United Kingdom)
A new buried object detection algorithm using Ground Penetrating Radar system based on the UWB frequency domain measurements is proposed. With the implementation of C-scan data acquisition and Wide Angle Reflection and Refraction schemes, the 2D imaging of metallic and plastic mine-like targets buried in dry soil is demonstrated.

3.4
An accurate and computationally efficient tool using UTD on large meshed geometries
Lars Foged (SATIMO, Italy)
Asymptotic analysis of antenna farms and of the scattering from complex and electrically large geometries is commonly used to predict installed antenna patterns. The typical problem is that very large computational cost is usually required. The Astigmatic Beam Tracer algorithm has been further updated to manage large meshed geometries.

3.5
Domain decomposition and wave coupling by using complex source expansions
Giacomo Carli (University of Siena, Italy); Enrica Martini (University of Siena, Italy); Mauro Bandinelli (Ingegneria dei Sistemi, IDS, Italy); Stefano Maci (University of Siena, Italy)
A domain decomposition approach based on a scattering matrix formalism using complex source point beams as ports is proposed for the analysis of complex electromagnetic problems like antennas on multiscale environments and multireflector systems.

3.6
Design of Complex Antennas Using an Efficient Rigorous Technique
Eliseo Garcia (Alcala University, Spain); Carlos Delgado (Alcala University, Spain); Felipe Catedra (University of Alcala, Spain)
A numerical scheme that combines the Multilevel Fast Multipole Algorithm (MLFMAand the Characteristics Basis Function Method (CBFM)has been developed for the analysis and design of large antennas and antennas composed by metamaterials and other finite-sized multilayered periodic structures. The method has been tested achieving good results

19:00 - 22:30 Boat Tour "Berlin by Night"

Lobby 1

Wed-Poster:
Poster Session-Antenna Theory-2

3.7
FASANT: A Versatile Tool to Analyze Antennas and Propagation in Complex Environments
Lorena Lozano (Alcala University, Spain); Maria Jesús Algar (University of Alcala, Spain); Iván González Diego (Universidad de Alcalá, Spain); Felipe Catedra (University of Alcala, Spain)
This abstract presents an overview of the new FASANT [1] code based on the combination of the Uniform Theory of Diffraction (UTD) and Physical Optics (PO) [2]. This code can be used to study large antennas and antennas interactions with complex environments like satellites, ships, aircrafts, cities

3.8
FDTD/MoM-PO Hybrid Method for Analysis of Antennas Near Combinative Objects
Artur Noga (Silesian University of Technology, Poland); Tomasz Topa (Silesian University of Technology, Poland); Andrzej Karwowski (Silesian University of Technology, Poland)
In this paper the FDTD/MoM-PO hybrid technique for analysis of antennas near combinative objects is presented. The method combines the ability of the FDTD method to deal with arbitrary material properties, and the versatility of the MoM-PO method to analyse electrically large conducting structures.

3.9
Geometrically based preconditioner for the fast multipole method
Marta G. Araújo (Universidade de Vigo, Spain); José Bértolo (University of Vigo, Spain); Luis Landesa (University of Extremadura, Spain); Jose Taboada (University of Extremadura, Spain); Fernando Obelleiro (University of Vigo, Spain); José Rodríguez (University of Vigo, Spain)
We present a multipole based preconditioning scheme involving both near-field and far-field information. The preconditioner is straightforwardly constructed from the FMM available data, without implying any further memory overload. It has proven to be more effective than the usual near-field based preconditioners for the resolution of large problems.

3.10
Hybrid Analysis Technique for Analysis and Design of Large Antennas Using Macro-Basis Functions
Carlos Delgado (Alcala University, Spain); Eliseo Garcia (Alcala University, Spain); Felipe Catedra (University of Alcala, Spain)

An efficient technique for the analysis of very large scattering or radiation problems is presented. This approach considers a partitioning of the geometry in terms of windows. A rigorous analysis is performed inside each window, while interactions bewteen windows are also considered obtaining very accurate results.

3.10 a
Fast Numerical Characterization of Non-Uniform Arrays
David González-Ovejero (Université catholique de Louvain, Belgium); Christophe Craeye (UCL, Belgium)
This paper studies the performance of the different ways of determining the Macro Basis Functions when applied to sparse arrays. Once they are determined their interactions can be computed using a baseline like technique. Speeds-up of the order of N, the number of antennas in the array, can be achieved.

3.11
Applications of the Human Eye Working Principle: CORPS-BFN
Diego Betancourt (Public University of Navarra, Spain); Carlos Del Rio (Public Unversity of Navarra, Spain)
In this work, the theory of the CORPS applied to the BFN will be presented, providing different alternatives to define such feeding networks. Measurements of a CORPS-BFN of 9x25 ports will be presented showing the overlapped beams in transmission and improving the signal noise ratio in reception.

3.12
Accurate FDTD Modelling of Resistively-Loaded Bow-Tie Antennas for GPR Applications
Diego Caratelli (Delft University of Technology, The Netherlands); Alexander Yarovoy (Delft University of Technology, The Netherlands); Leo Ligthart (Delft University of Technology, The Netherlands)
An accurate finite-difference time-domain modelling of resistively-loaded bow-tie antennas for ground-penetrating radar applications is presented. A suitable resistive loading of the radiating structures is employed to achieve an ultra-wideband behaviour, meeting demanding occupation volume requirements of modern subsurface radars.

3.13
Incremental Beam Diffraction from Flat Reflectors
Giorgio Carluccio (University of Siena, Italy); Matteo Albani (University of Siena, Italy); Stefano Maci (University of Siena, Italy)
An incremental formulation for the field of a Complex Point Source that illuminates a flat reflector is presented. The total field is reconstructed by integrating incremental contributions distributed along the scatterer edge. We also propose an analytical continuation of the object edge into a complex space.

3.14
Metal Foams for Electromagnetic Shielding: a Plasma Model
Giuseppina Monti (University of Salento, Italy); Luca Catarinucci (University of Salento, Italy); Luciano Tarricone (University of Lecce, Italy)
The shielding effectiveness of a metal foam slab is investigated on the basis of an effective medium approach. More specifically, the suitability of using a plasma model in order to describe the electromagnetic behaviour of metal foams is demonstrated by comparison with experimental data.

3.15
Far-Field of Coupled Vertical Mast Antennas: Sinusoidal Current Approximation
Milica Rančić (Faculty of Electronic Engineering, University of Niš, Yugoslavia (defunct))
Radiation field of coupled vertical monopole antennas above a lossy-half space is determined in this paper. Current distribution approximation along antenna conductors is of sinusoidal form. The far-field is determined in two ways: the first one considers the standard Wait`s model and the second one a so-called TIA model.

3.16
Hybrid MoM approaches for high fidelity and effective modeling in large antenna farm and scattering problems
Mirko Bercigli (IDS Ingegneria Dei Sistemi S.p.A, Italy); Francesca Vipiana (Politecnico di Torino, Italy); Patrizio De Vita (IDS Ingegneria Dei Sistemi, Italy); Alessandro Mori (Università di Firenze, Italy); Angelo Freni (University of Florence, Italy); Giuseppe Vecchi (Politecnico di Torino, Italy); Rodolfo Guidi (IDS Ingegneria Dei Sistemi S.p.A, Italy); Mauro Bandinelli (Ingegneria dei Sistemi, IDS, Italy)
The keyword in the actual panorama of large antenna farm and scattering problems modelling is "accuracy" or, in other words, the concept of "high fidelity modelling", the only way to cut development and/or prototyping costs.

3.17
Multilevel Fast Multipole Method for Higher Order Basis Functions Implemented in WIPL-D Pro
Branko Kolundzija (University of Belgrade, Yugoslavia (defunct)); Drazen Sumic (WIPL-D d.o.o., Yugoslavia (defunct))
We give an overview of the variant of MLFMM applied in WIPL-D Pro 3D EM solver. MLFMM is organized in two levels of grouping of higher order basis functions defined over bilinear quadrilaterals. Dramatic memory and time saving is illustrated with simulation of 160 lambda long airplane on a PC.

3.18
Complex Conical Beam Expansion for the Analysis of Beam Waveguides
Sinisa Skokic (University of Zagreb, Croatia); Massimiliano Casaletti (University of Siena, Italy); Stig Sorensen (TICRA, Denmark); Stefano Maci (University of Siena, Italy)
This paper discusses a novel method for computing propagation in a beam waveguide, by combining a new type of wave-objects with Physical Optics. The wave objects are generated starting from the electric field spectrum, launched to the reflector and reflected to the subsequent focal plane via Physical Optics.

3.19
On the far-field Kirchhoff's integral computation acceleration in time domain for Transmission-Line Matrix coupling with Physical Optics
Michel Ney (TELECOM Bretagne Institute, France); Jeremy Lanoë (TELECOM Bretagne Institute, France); Sandrick Le Maguer (TELECOM Bretagne Institute, France)
A Kirchhoff's integral formulation in time domain is used and adapted to the TLM algorithm. It is found that the minimum spatial sampling required by the TLM exhausts the computer cost. To accelerate the procedure, some alternate sampling is proposed and comparison with global full-wave analysis is presented.

3.20
Local Timestepping Discontinuous Galerkin Methods for Electromagnetic RF Field Problems
Nico Gödel (Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Germany)
A 3D Time Domain High-Order Discontinuous Galerkin Finite Element Method (DG-FEM) for high frequency electromagnetic wave computations is presented. The method is introduced and time integration is identified as the major bottleneck. A local timestepping strategy is presented to expand this bottleneck.

3.21
Modeling of the Backscatter Behavior of Typical Antipersonnel Landmines by Computer Simulations
Isam Alawneh (Ruhr Universty Bochum, Germany)
This work will focus on modelling of different types of antipersonnel land mines without environment. The received backscattered electric fields as a function of the frequency (called fingerprints) are computed at different distances above the mines by different excitations. This work is devoted to ground penetrating radar for humanitarian demining.

3.22
A boundary function for multicarrier multipaction analysis
Jean-Christophe Angevain (ESA, The Netherlands); Luca Salghetti (European Space Agency-ESTEC, The Netherlands); Pablo Sarasa (ESA, The Netherlands); Cyril Mangenot (European Space Agency (ESTEC), The Netherlands)
In recent years, much attention has been given in multipaction analysis in multicarrier systems, since very high power space communication solutions are more and more requested.

3.23
A complete approach for linear and nonlinear dispersion in EM-FTDT
Stefan Schild (Schmid & Partner Engineering AG, Switzerland)
A framework to model linear and nonlinear dispersion effects with the finite-difference time-domain (FDTD) method in electromagnetics (EM) has been developed. The package encompasses tools to setup suitable grids, compute conformal meshes and predict stability issues. The solver uses subpixel smoothing for all material combinations and supports conformal subcell processing.

3.24
Accurate modeling and optimization of metallic-plate waveguide lenses
Andrey Nosich (Kharkiv National University, Ukraine); Yuriy Gandel (Kharkiv National University, Ukraine); Ronan Sauleau (University of Rennes 1, France); Akira Matsushima (Kumamoto University, Japan)
We present a fullwave numerical study and design of the 2D model of a PEC parallel-plate waveguide lens antenna in E-polarization. It is based on the coupled Singular Integral Equations discretized using a Nystrom-type numerical algorithm. This enables us to make elementary optimization of the feed for best directivity.

19:00 - 22:30 Boat Tour "Berlin by Night"

Lobby 1

Wed-Poster:
Poster Session-Measurements

Chair: Roland Gabriel (Kathrein, Germany), Robert Geise (TU Braunschweig, Germany)

3.25
A New On-Ground-Measurement Technique for Farfield Evaluation and Possible Phased Array Effects of an Aircraft Fuselage
Robert Geise (TU Braunschweig, Germany); Jens Schüür (TU Braunschweig, Germany); Martin Schwark (TU Braunschweig, Germany); Ingo Schmidt (TU Braunschweig, Germany); Achim Enders (TU Braunschweig, Germany)
A new on-ground measurement technique is presented and verified for investigation on phased array effects of an aircraft fuselage at GSM frequencies. Measurements are conducted on a 1:10 scale model showing that phased array effects are very unlikely in practise.

3.26
Time-Reversal UWB Imaging with a Single Antenna in Multi-Path Environments
Takuya Sakamoto (Kyoto University, Japan); Toru Sato (Kyoto University, Japan)
A UWB radar imaging method with a single antenna that utilizes multi-path scatterings is proposed. The proposed method is an extension of DORT (French acronym) based on the SVD of a frequency-frequency matrix. The performance of the proposed method is confirmed in a numerical simulation and through an experiment.

3.27
Uncertainty analysis in antenna measurements
Sara Burgos (Universidad Politécnica de Madrid (Technical University of Madrid), Spain); Silvia Urosa (Universidad Politécnica de Madrid (Technical University of Madrid), Spain); Manuel Sierra Castaner (Universidad Politécnica de Madrid (Technical University of Madrid), Spain); Cristian Martinez-Portas (Universidad Politécnica de Madrid (Technical University of Madrid), Spain); Jose Luis Besada (Universidad Politécnica de Madrid (Technical University of Madrid), Spain)
There is always a difference between the true value and the measured one. Uncertainty states the range of values within which the true value is estimated to lie. This paper details the characteristics of a simulator based on spherical near-field measurements to evaluate the effect of uncertainties in antenna parameters.

3.28
DLR-HR Compact Test Range Facility
Markus Limbach (German Aerospace Center (DLR), Germany); Bernd Gabler (DLR, Algeria); Ralf Horn (German Aerospace Center (DLR), Germany); Andreas Reigber (German Aerospace Center (DLR), Germany)
A Compact Test Range (CTR) facility shall extend the measurement capabilities at the DLR Microwaves and Radar Institute in Oberpfaffenhofen. A building 'TechLab' is currently under construction. The operations shall start at the end of the year 2009. An overview of the CTR facility is the objective of this paper.

3.29
Application of diagnosis technique for reflection cancelling in antenna measurements
Francisco José Cano (Polytechnic University of Madrid, Spain); Manuel Sierra-Castaner (Universidad Politécnica de Madrid, Spain); Jose Luis Besada (Universidad Politécnica de Madrid (Technical University of Madrid), Spain)
An improvement of the traditional methods of array antenna diagnosis based on Fourier transformation and its application to the reduction of the effect of the reflections on the antenna measurement systems is proposed. This method requires a priori knowledgement of the geometry of the antenna.

3.30
A low cost extension of spectrum analysers to dosimeters
Vladimir Volski (KU Leuven, Belgium); Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium); Charles-Antoine Coget (LU Leuven, Belgium); Jelle Fondu (KU Leuven, Belgium)
The purpose of this paper is to extend spectrum analyzers to RF radiation dosimeter using the software extension.

3.31
Sar measurement for several two elements phased array antenna handsets
Jinan Moustafa (University of Bradfird, United Kingdom); Raed Abd-Alhameed (University of Bradford, United Kingdom); Dawei Zhou (University of Bradford, United Kingdom); Chan See (University of Bradford, United Kingdom); Neil McEwan (Mobile and Satellite Communications Research Centre,, United Kingdom); Peter Excell (Glyndwr University, United Kingdom); K Ramli (University of Bradford, United Kingdom); Z Zainal Abidin (University of Bradford, United Kingdom)
This paper therefore mainly deals with SAR measurement for some antenna prototypes and also includes a direct check on the excitation ratio obtained when the splitter and antenna are connected. Some of these measurements on one other form of the array (using helices) have been only optimised empirically.

3.32
Evaluation of a Near Field Scanner for TRP and Radiation Pattern Measurements of GSM Mobile Phones
Sathyaveer Prasad (University of Gävle, Sweden); Claes Beckman (University of Gavle, Sweden); Humam Halim (University of Gävle, Sweden)
In this paper, a near field scanner from EMSCAN is used to measure the radio performance of 10 commercial mobile phones in terms of TRP and radiation patterns. The obtained results are compared with the results obtained from CTIA approved Satimo SG24 chamber.

3.33
A Method for Measuring G/T Antenna Performance in an Anechoic Chamber
Rainer Wansch (Fraunhofer Institut Integrierte Schaltungen IIS, Germany)
A method for measuring the G/T of low gain antennas in an anechoic chamber is proposed. It is based on the a pattern measurement and a S/N measurement. For a small set of antennas the measurement results will be compared to the results using an outdorr setup.

3.34
On the Relevance of the Measured or Calculated RCS for Objects on the Ground - Case Wind Turbines
Gerhard Greving (NAVCOM Consult, Germany)
The RCS is a useful figure for the characterization of objects in space for radar systems. Objects on the ground, such as wind turbines WT, do not meet the basic conditions of a plane wave. Measurements of the RCS cannot be used for the safeguarding and characterization of WT.

3.35
Susceptibility of Small Reverberation Chamber Investigation
Wojciech Krzysztofik (Wroclaw University of Technology, Poland)
The aim of this article is to investigate impact of geometrical design on uniformity of E-field distribution inside the small reverberation chamber, SRC. Results are demonstrated on numerical experiments made using FEKO computer code. The SRC is designed for measurements of handset terminals of mobile communications.

3.36
Efficient Electromagnetic Modeling of Bent Monopole Antenna on Aircraft Wing Using FEKO
Steven Keller (U.S. Army Research Laboratory, USA)
A VHF bent monopole antenna mounted on an Army UAV wing platform is modeled and simulated using the FEKO electromagnetic simulation software package and the results are compared with measured radiation pattern data.

3.37
Measuring Wide Angle Antenna Performance Using Small Cylindrical Scanners
Stuart Gregson (Nearfield Systems Inc., USA); Clive Parini (QMUL, United Kingdom); John Dupuy (QMUL, United Kingdom)
A near-field measurement technique for the prediction of wide-angle far-field antenna patterns from data acquired using a small cylindrical near-field measurement system is presented. This technique utilises a change in the alignment of system to enable near-field data to be taken over the surface of a conceptual conic frustum.

3.38
ISAR Imaging of Cylindrical Objects
Vitaly Badeev (Institute of Applied Physics, Belarus); Valeri Mikhnev (Institute of Applied Physics, Belarus)
In this work, method of confocal visualization is used for the detection of small inclusions in the dielectric cylinders. To improve contrast of the image, three techniques of the air-ground response subtraction, namely matched filtering, average bakkground subtraction and principal component analysis have been applied and compared.

19:00 - 22:30 Boat Tour "Berlin by Night"

Lobby 1

Wed-Poster:
Poster Session-Propagation-3

Chair: Leandro Juan-Llacer (Universidad Politécnica de Cartagena, Spain), Christian Sturm (University of Karlsruhe, Germany)

3.39
Satellite-to-Indoor Broadband Channel Measurements at 1.51 GHz and 5.2 GHz
Jost Thomas (German Aerospace Center (DLR), Germany); Wei Wang (German Aerospace Center (DLR), Germany); Armin Dammann (German Aerospace Center (DLR), Germany)
This paper describes a broadband channel measurements performed in L-band (1.51 GHz) and in C-band (5.2 GHz). It also includes first results as well as a comparison between L-band and C-band.

3.40
Optimized implementation of the 3D MR-FDPF method for Indoor radio propagation predictions.
Guillaume de la Roche (University of Bedfordshire, United Kingdom); Jean-Marie Gorce (INSA-Lyon, France); Jie Zhang (University of Bedfordshire, United Kingdom)
MR-FDPF has been shown to be an effcient method to compute field strength predictions in complex environments. In this article a solution to reduce the complexity of this model is proposed, in order to be able to compute full 3D propagation predictions.

3.41
Application of FDTD to the Analysis of Indoor Coverage
Luis Ramirez (Pontifícia Universidade Católica do Rio de Janeiro, Brazil); Luiz Silva Mello (Pontifical Catholic University of Rio de Janeiro, Brazil); Flavio Hasselmann (Pontifícia Universidade Católica do Rio de Janeiro, Brazil)
Application of FDTD (with companion PML) to the coverage analysis of (empty and filled with wooden desks) indoor scenarios is explored and results compared, both in time and frequency domains, with those obtained via ray tracing along with UTD field calculations. Work in progress extends hybrid (FDTD + UTD) techniques.

3.42
A 3D Model for Wideband Propagation Predictions in Tunnels
Ludek Subrt (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic)
A new 3D model for wideband propagation predictions in tunnels is presented. The model is based on the Ray-Launching technique and statistics. The reflection and absorption of rays is determined on the basis of probabilistic parameters so that complicated calculations are avoided and the diffuse scattering is considered.

3.43
Hierarchic optimization for indoor application
Lajos Nagy (Budapest University of Technology and Economics, Hungary); Andrea Farkasvolgyi (Budapest University of Technology and Economics (BME), Hungary)
This paper presents an approach in optimizing the indoor radio coverage using multiple access points for indoor environments, the Genetic Algorithm and Simulated Annealing are used. Next a hierarchic optimization method is introduced and finally comparisons are made for the methods suggested.

3.44
Algorithmic complexity of FDTD and Ray Tracing method for indoor propagation modelling
Lajos Nagy (Budapest University of Technology and Economics, Hungary); Róbert Dady (BUTE, Hungary); Andrea Farkasvolgyi (Budapest University of Technology and Economics (BME), Hungary)
We focus also on the numerical comparison of FDTD and ray methods in aspects of the algorithmic complexity for indoor wave propagation problems. Based on the investigation the article gives suggestions on the practical limits for the methods and efficient interface positions for the hybrid ray+FDTD analysis method.

3.45
Medium Wave Field Strength Spatial Variability in Urban Environments
Unai Gil (University of the Basque Country, Spain); David Guerra (Univeristy of the Basque Country, Spain); David de la Vega (University of the Basque Country, Spain); Iván Peña (University of the Basque Country, Spain); Amaia Arrinda (University of the Basque Country, Spain); Pablo Angueira (Bilbao Engineering Faculty. University of the Basque Country, Spain)
This paper presents the first general empirical approach of MW field strength propagation in urban areas by means of data gathered in different field trials carried out in Mexico D.F. , Madrid and Delhi using DRM (Digital Radio Mondiale) at different frequencies within the band.

3.46
MIMO Channel Capacity Computed with 3D Ray Tracing Model
Oliver Staebler (AWE Communications GmbH, Germany); Reiner Hoppe (AWE Communications, Germany)
In this paper the MIMO channel capacity is evaluated using deterministic channel modeling. A 3D ray tracing package is utilized for the determination of the propagation paths and further crucial parameters of the radio channel, such as the angular spread at base and mobile station, respectively.

3.47
Evaluation and Improvement of the Field Prediction Method in Recommendation ITU-R P.1546-3
Peyman Hesami (University of Tehran, Iran); Narges Noori (Iran Telecommunication Research Center, Iran)
In this paper, the method of recommendation ITU-R P.1546-3 is evaluated by comparing the predicted field strengths with those measurements performed in rural Australia. This comparison shows a huge difference between the predictions and measurements. To overcome this difficulty, some modifications are proposed.

3.48
Direction of Arrival Measurements for Outdoor-to-Indoor Channel Characterization
Oussama Akhdar (University of Limoges, France); Cyril Decroze (XLIM, France); David Carsenat (3IL, France); Moctar Mouhamadou (XLIM-UMR 6172-CNRS, University of Limoges, France); Thierry Monediere (University of Limoges, France)
The aim of this paper is to establish channel models by characterising the propagation in outdoor-to-indoor case at 3.5 GHz. These models will be used to simulate a WIMAX system. An oudoor-to-indoor measurements is made and influence reception antenna is studied.

3.49
Statistical Analysis of a Wideband Multipath Propagation Channel for ToA-based Positioning System
Sebastian Kozlowski (Warsaw University of Technology, Poland); Krzysztof Kurek (Warsaw University of Technology, Poland); Rafal Szumny (Warsaw University of Technology, Poland); Jozef Modelski (Warsaw University of Technology, Poland)
This paper presents the statistical analysis of the wideband propagation channel in two different propagation environments. The presence of strong and small-delayed multipath components was of interest, since it is important factor influencing the accuracy of ToA-based positioning systems. The evaluation of positioning accuracy in considered environments is also provided.

3.50
Unleashing the Polarisation Domain for Land Mobile Satellite MIMO Systems
Unwana Ekpe (University of Surrey, United Kingdom); Tim Brown (University of Surrey, United Kingdom); Barry Evans (University of Surrey, Italy)
Dual Circular Polarisation Multiplexing (DCPM) is introduced as a simpler and easier technique, compared to MIMO, to utilise orthogonally polarised channels for capacity increase in LMS systems. This technique guarantees higher channel ergodic capacity than traditional MIMO when polarisation discrimination is high.

3.51 A Simple Synoptical Method for Path Loss Prediction for Wireless Communication Environments
David Pouhè (Technical University Berlin, Germany)
The paper provides a simple model to be used to predict the path loss in mobile radio environment. The technique based on the least square method combines a number of models applicable in the same area into one. The goal is to consider the heterogeneity and complexity of the environment.

3.52
Reflection Characteristics of Two Parallel Reinforced Concrete Slabs
Armin Parsa (Ecole Polytechnique de Montreal, Canada); Christophe Caloz (Ecole Polytechnique de Montreal, Canada)
The reflection characteristics of two parallel reinforced concrete slabs are investigated. The reinforced concrete is modelled by an array of metallic circular rods embedded inside a lossy dielectric material using a two dimensional method of moments and multilayer Green's function (MoM-MGF).

3.53
Comparisons of Multipath Modeling Strategies for the Estimation of GPS Positioning Error
Adrien Chen (ENAC, France); Alexandre Chabory (ENAC, France); Christophe Macabiau (ENAC, France); Anne-Christine Escher (ENAC, France)
For precise GPS positioning one major source of error is multipath. In this article, we aim at two main objectives. The first objective is to specify a suitable description of the 3D environment for multipath simulations. The second objective is to compare Geometrical and Physical Optics.

3.54
Concentration ellipse, a statistical method to analyze radio communications measurement-prediction pair data
Adrian Mihaiuti (Politehnica University of Timisoara, Romania); Alimpie Ignea (Politehnica University, Romania)
The aim of this paper is to present an algorithm that can be used in the detection or in identifying observation (measurement) data, which are not belonging to the pattern suggested by the majority of the prediction data.

19:00 - 22:30 Boat Tour "Berlin by Night"

Lobby 1

Wed-Poster:
Poster Session-Small Antennas-2

Chair: Yang Hao (Queen Mary, University of London, United Kingdom) , Max Ammann (Dublin Institute of Technology, Ireland)

3.55
A Novel Miniaturization Technique in Microstrip Feed Network Design
Alexander Popugaev (Fraunhofer IIS, Germany); Rainer Wansch (Fraunhofer Institut Integrierte Schaltungen IIS, Germany)
A novel original miniaturization technique for microstrip feed network design is proposed. The idea is to meander the layout using a raster consisting of ring shaped segments.

3.56
Numerical and experimental investigations of a new circularly polarized patch antenna with an integrated optical lens
Loic Bernard (ISL, France)
A circularly polarized antenna with an integrated optical lens is introduced. The vertical position of the lens in the patch affects the antenna polarization. Two positions are identified for a good AR; one for a RHCP and one for a LHCP. This solution is more convenient than in previous works.

3.57
UHF RF Identification Distance in Indoor Areas
Milan Svanda (Czech Technical University in Prague, Czech Republic); Milan Polivka (Czech Technical University in Prague, Czech Republic); Stanislav Zvanovec (Czech Technical University in Prague, Czech Republic)
Read range tests for UHF RFID of persons have been performed with a novel developed badge size antenna. Indoor and outdoor modelling and measurement have been compared.

3.58
Design of a 2.45 GHz Rectenna using a global analysis technique
Takhedmit Hakim (Université de Paris-Est Marne-la-Vallée, France)
We present in this paper a rectenna at 2.45 GHz, designed using a global analysis technique. A rectenna is an association of a receiving antenna and a rectifying circuit which converts RF power into useful DC power.

3.59
RFID Technology for the Neuroscience: Feasibility of Sleep Disease Monitoring
Cecilia Occhiuzzi (University of Roma Tor Vergata, Italy); Gaetano Marrocco (University of Rome Tor Vergata, Italy)
This contribution investigates the feasibility of the passive UHF RFID technology for the monitoring of human body movements in some common sleep disorders by means of passive tags equipped with inertial switches. Electromagnetic and mechanical models are introduced to analize all the significant issues.

3.60
Waveguide Coupled Microstrip Patch Antenna a new approach for improving Bandwidth
Nandkumar Shetti (visvesvaraya Technological University Belgaum, India)
An entirely new technique has been designed to couple the advantages of both the microstrip patch antenna and rectangular waveguide. Apart from this an very important results revealed from the study that a new technique to improve the bandwidth of microstrip patch antenna.

3.61
Process-Dependence of Inkjet Printed Folded Dipole Antenna for 2.45 GHz RFID tags
Botao Shao (Ph.D candidate, the Royal Institute of Technology, Sweden); Qiang Chen (Royal Institute of Technology, Sweden); Yasar Amin (Royal Institute of Technology, Sweden); Julius Hållstedt (Royal Institute of Technology, Sweden); Ran Liu (Fudan University, P.R. China); Hannu Tenhunen (Royal Institute of Technology, Sweden); Li-Rong Zheng (Royal Institute of Technology (KTH), Sweden)
The paper presented a simulation of folded dipole antenna by inkjet printing for RFID tags at 2.45 GHz, and studied the process-dependenc of this antenna.

3.62
A Novel "Green" Inkjet-Printed Z-Shaped Monopole Antenna for RFID Applications
Zissis Konstas (National Technical University of Athens, Greece); Amin Rida (Georgia Institute of Technology, USA); Rushi Vyas (Georgia Institute of Technology, USA); Konstantinos Katsibas (GATECH, USA); Nikolaos Uzunoglu (National Technical University Athens, Greece); Manos M. Tentzeris (Georgia Institute of Technology, USA)
A novel "green" inkjet-printed antenna for UHF Radio Frequency Identification (RFID) tags is presented. A slotted Z-shaped monopole configuration is selected and fabricated using inkjet-printing technology on a paper substrate. The design characteristics of the antenna are verified and the simulated results are compared with measurements showing good agreement.

3.63
Broadband UHF RFID/Sensor Modules for Pervasive Cognition Applications
Amin Rida (Georgia Institute of Technology, USA); Symeon Nikolaou (Frederick University Cyprus, Cyprus); Manos Tentzeris (Georgia Institute of Technology, USA)
A novel inkjet-printed broadband antenna on flexible/organic substrates for the UHF RFID/sensing is presented. Double Layer Monopole configuration is selected due to many attractive characteristics and fabricated using inkjet-printing technology on a flexible, low cost paper and LCP which works well for UHF and mm-waves. Measurement results will be presented.

3.64
IC-Card Reader Antenna and IC-Card Technology's Analysis by Wireless Communications
Donghun Yoon (Keio University of Japan, Japan)
This paper describes wireless communications study for IC-Card Reader Antenna and IC-Card. IC-Card is embedded induction coil and condenser. It is a passive device and the most successful RFID technology. This study proposes a efficient wireless communications method between IC-Card Reader Antenna and IC-Card.

3.65
On the Integration of a 2.4 GHz ISM Band Antenna in Proximity to Transmission Lines
Ivan Ndip (Fraunhofer IZM, Germany)
The interaction between a 2.4 GHz antenna and microstrip line is studied. We realized that this interaction is very strong around the resonance frequencies of the antenna, especially when the separation between antenna and line is smaller than the difference between the physical and electrical lengths of the antenna.

3.66
A Wide-Band Single-Layer Aperture-Coupled Microstrip Antenna
Naftali Herscovici (AFRL, USA); Boris Tomasic (AFRL, USA)
A new wide-band aperture-coupled fragmented patch antenna is presented. More than 40% bandwidth is achieved with only 1 patch. Compared with traditional multilayer stacked patch structures required to achieve the same bandwidth, the proposed radiator is very simple, inexpensive and efficient.

3.67
Wideband U-shaped Dielectric Resonator Antenna
Li Na Zhang (Shanghai University, P.R. China); Shun Shi Zhong (Shanghai University, P.R. China); Shen Wen Hui (Shanghai University, P.R. China); Xue-xia Yang (Shanghai University, P.R. China)
In this paper, we try to improve the bandwidth of the DRA by using a U-shaped DRA and an elliptical patch conformal on its back-side surface as a feeding mechanism. It is observed that the proposed DRA has an impedance bandwidth of 72%.

3.68
A Printed Dipole Antenna for Circular Polarization
Max Ammann (Dublin Institute of Technology, Ireland); Xiu Long Bao (Dublin Institute of Technology, Ireland)
A wideband circularly-polarized printed dipole antenna is presented. The impedance bandwidrth is 40% with respect to the centre frequency at 3.2GHz and the 3-dB axial ratio bandwidth is about or 24%.

3.69
Characteristics of a Broadband Printed Quadrifilar Helix Antenna with a Novel Compact Feeding Circuit
Mathieu Caillet (Royal Military College of Canada, Canada); Ala Sharaiha (IETR-Université de Rennes 1, France); Michel Clénet (DRDC Ottawa, Canada); Yahia Antar (Royal Military College of Canada, Canada)
This paper presents the charactericties of a broadband printed quadrifilar helix antenna (QHA) with a novel compact feeding circuit. The broadband feeding circuit has been designed to generate four outputs with equal amplitude and with 90deg. phase difference to produce when attached to the QHA good circularly polarised radiation patterns.

3.70
Design of buried antennas for underground wireless sensor networks
Daniele Trinchero (Politecnico di Torino, Italy); Riccardo Stefanelli (Politecnico di Torino - iXem Labs, Italy); Benedetta Fiorelli (Politecnico di Torino - iXem Labs, Italy)
The paper presents a full-wave approach for the design of antennas buried in the ground. The results were applied to the realization of wireless sensors able to flow through pipes used for fluid transportation.

3.71
Wide Band Strip-Fed Rectangular Dielectric Resonator Antenna
Asem Al-Zoubi (University of Mississippi, USA); Ahmed Kishk (University of Mississippi, USA)
This paper presents the design of a strip fed rectangular dielectric resonator antenna on a finite size ground plane. The return loss and radiation patterns of the antenna are simulated and measured. The results are in good agreement. The measured bandwidth of this antenna is about 7.7 GHz.

3.72
Wideband Double Slits Printed Antenna
Zinab Elsharkay (Faculty of electronic engineering, menouf, menoufia, Egypt); Abdelmegeed Sharshar (Faculty of electronic engineering, menouf, menoufia, egypt, Egypt); Hamdi Mousa (Atomic energy authority, Cairo, Egypt, Egypt)
A new wideband probe-fed printed antenna with two slits is proposed and experimentally studied. Good agreement between measured and simulated results is shown. An impedance bandwidth of about 47% is obtained experimentally. Further simple modifications in the antenna structure have been simulated and a bandwidth of about 62% is obtained.

3.73
Chalipa , A Novel Wideband Circularly Polarized Microstrip Antenna
Maryam Rahmani (AmirkabirUniversity of Technology, Iran); Ahad Tavakoli (Amirkabir University of Technology, Iran); Hamidreza AminDavar (Amirkabir University of Technology (AUT), Iran); Ali Reza Moghaddamjoo (Amir Kabir University, Iran); Parisa Dehkhoda (Amirkabir University of Technology, Iran)
An improved wideband circularly polarized microstrip antenna is proposed. The radiating structure consists of a simple patch with a basic shape "Chalipa", which has repeated by a fractal pattern achieving a multiband or even wideband, structure. This special characteristic of the antenna makes a significantly wideband circular polarization.

19:00 - 22:30 Boat Tour "Berlin by Night"

Lobby 1

Wed-Poster:
Poster Session-Small Antennas-2

3.74
A Novel Compact UHF Wideband Antenna for electrical characterization of Steel Fiber Reinforced Concrete
Gemma Roqueta Crusats (Universitat Politècnica de Catalunya, Spain); Safwat Irteza Butt (Royal Institute of Technology (KTH), Sweden); Sebastian Blanch Boris (Universitat Politècnica de Catalunya, Spain); Jordi Romeu (Universitat Polytecnica de Catalunya, Spain); Luis Jofre (UPC, Spain)
The development of a novel compact wideband antenna is presented, enabling the use of microwaves with high resolution and penetrability to ensure robustness of the Steel Fiber Reinforced Concrete slabs in terms of homogeneous fiber distribution.

3.75
Differential Antenna Design and Characterization
Raffi Bourtoutian (CEA-Léti MINATEC, France); Christophe Delaveaud (CEA-LETI, France); Serge Toutain (IREENA, France)
Differential front-end co-design presents good promises for new smart object applications. We present a characterization method that allows the measurement of differential antennas' input impedance and gain pattern without using baluns. Three miniature antennas are characterized with this method, and show good results and promises for wide band communication systems.

3.76
Experimental study of a 2D-irregular fractal-jet printed antenna
Hatem Rmili (ISSAT Mahdia, Tunisia, Tunisia); Jean-Marie Floch (IETR, France); Habib Zangar (SysCOM, Tunisia)
In this paper, we have studied the radiation properties of a natural fractal jet antenna. The measured return loss shows a multiband behavior. The radiation patterns and the gain were measured at all resonating frequencies.

3.77
Fractal Monopole Antenna for WLAN/Bluetooth Multiple-Bands Applications
Wojciech Krzysztofik (Wroclaw University of Technology, Poland)
The modified Sierpinski triangle fractal microstrip antenna is designed, analyzed, and manufactured. It covers WLAN- (2.4-2.5, and 5.725-5.825 GHz), and also 2.4-2.4835 GHz the Bluetooth bands. Antenna was manufactured on the laminate ROGERS RO-4003 (hs=0,76 mm, εr=3,38, tgδ=0,003).

3.78
Small Square Meander-line Antennas with Reduced Ground Plane Size for Multimedia WSN Nodes
Constantine Kakoyiannis (National Technical University of Athens, Greece); Georgios Stamatiou (National Technical University of Athens, Greece); Philip Constantinou (National Technical University of Athens, Greece)
We developed small printed Euclidean monopoles in accordance to the constraints of multimedia WSNs. Performance was characterized in terms of electrical size, bandwidth, and broadband radiation efficiency. The results show that the meander-line antenna with ground plane size 27mm × 18mm (0.22λ0 × 0.15λ0) provided best overall performance.

3.79
Slotted e-shape Antenna Design for Dual-frequency Operation
Maisarah Abu (Universiti Teknologi Malaysia, Malaysia); Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Osman Ayop (Universiti Teknologi Malaysia, Malaysia)
The proposed design has an e-shape slotted at the center of the patch with patch's dimension of 34 x 23 mm. The first working frequency is 2.45 GHz with good return loss of 12.48 dB and 17.65 dB at second working frequency, 5.8 GHz.

3.80
Design of Planar Meander Line Antenna
Dalila Misman (Universiti Teknikal Malaysia Melaka, Malaysia); Mohd Zoinol Abidin Abdul Aziz (Universiti Teknologi Malaysia, Malaysia)
Meander line antenna (MLA) have been designed to operate at 2.4-GHz for WLAN. The investigation has been done on the effect of adding conductor line; using two type of feeding and two difference type of impedance for both microstrip and planar.

3.81
Coplanar Antenna Miniaturization Using High Permittivity Perovskite Substrates
Solene Boucher (IETR-Université de Rennes 1, France); Ala Sharaiha (IETR-Université de Rennes 1, France); Dominique Averty (IREENA, France); Raynald Seveno (IREENA, France); Hartmut Gundel (IREENA, France)
In this paper, a compact coplanar antenna on a multilayered substrate of 29.9 mm x 34.06 mm size working in UHF band is proposed.

3.82
New Schemes of Size Reduction in Space Filling Resonant Dipole Antennas
Jalil Rashed Mohassel (Electrical and Computer Department, Faculty of Engineering, University of Tehran, Iran, Iran); Aidin Mehdipour (Department of Electrical and Computer Engineering, Concordia University, Canada); Hadi Aliakbarian (ESAT, Katholieke Universiteit Leuven, Belgium)
Several electrically small antennas have been evaluated in this paper. The resonant frequency is decreased in these antennas by altering the basic rectangular meander dipole with the same occupied area and wire length. An attempt has been made to approach the fundamental limitations of small antennas.

19:00 - 22:30 Boat Tour "Berlin by Night"

Room: CC Room 1

Thu-S2A26:
Convened: Reflect Arrays-1

Chair: Jose Encinar (Universidad Politecnica de Madrid, Spain), Alexander Martynyuk (Universidad Nacional Autonoma de Mexico, Mexico)

8:30 Recent Developments on Reflectarray antennas at Thales Alenia Space
Hervé Legay, Daniele Bresciani, Etienne Girard, Renaud Chiniard, Eric Labiole, Olivier Vendier, Gerard Caille (Thales Alenia Space France, France)
Significant progress has been reported on Reflectarray antennas this last decade : improved bandwidth, dual polarization capability, enhanced radiation efficiency, and novel functionalities such as reconfigurability or even multi-frequency behavior. Consequently, Thales Alenia Space has initiated advanced developments on reflectarray antennas, paving the way for various novel space antenna products.

8:50 Neural Network Characterization of Microstrip Patches for Reflectarray Optimization
Davide Caputo, Andrea Pirisi (Politecnico di Milano, Italy); Marco Mussetta (Politecnico di Torino, Italy); Angelo Freni (University of Florence, Italy); Paola Pirinoli (Politecnico di Torino, Italy); Riccardo Zich (Politecnico di Milano, Italy)
The increasing interest in reflectarray antennas leads to develop ad-hoc ways to optimize antenna performances, often by means of evolutionary iterative algorithms. To enhance the speed of the optimization, a Neural Network model of an annular patch antenna is presented as convenient interface between antenna design and global optimization algorithms.

9:10 Accurate synthesis of a dual linearly polarized Reflectarray
Loic Marnat, Renaud Loison, Raphael Gillard (IETR, France); Daniele Bresciani, Hervé Legay (Thalès Alenia Space, France)
This paper aims at presenting different reflectarray layouts and studying their associated synthesis and measurements. Reflectarrays measurement performance are compared to the simulated ones and to the requirements over the working frequency band.

9:30 Recent Advances on Millimetre Wave Reconfigurable Reflectarrays
Roberto Sorrentino (University of Perugia, Italy); Roberto Vincenti Gatti (University of Perugia, Italy); Luca Marcaccioli (University of Perugia, Italy)
Innovative and high-performance antenna systems are required in modern communication systems, as well as in a number of industrial and military applications. At the same time, new technologies and devices are emerging to comply with such specifications. In this context, electronically reconfigurable reflectarray antennas are receiving an increasing interest

9:50 Four-Beam Reflect-Array Antenna for Mm-waves: Design and Tests in Far-Field and Near-Field Ranges
Jerome Lanteri (Université Nice Sophia Antipolis, France); Claire Migliaccio (Université Nice Sophia Antipolis, France); Juha Ala-Laurinaho (TKK Helsinki University of Technology, MilliLab, Finland); Matti Vaaja (TKK Helsinky University of Technology, MilliLab, Finland); Juha Mallat (TKK Helsinky University of Technology, MilliLab, Finland); Antti Räisänen (TKK Helsinki University of Technology, Finland)
This paper deals with design, fabrication and measurements of a simultaneous four beams 94 GHz reflectarray. Far field and near field measurements were investigated. The latter have better accuracy because they overcome the alignment problems as well as the a large separation required between the emitting and under-test antennas.

Room: CC Room 2

Thu-S8P6:
Mobile Propagation - Outdoor

Chair: Rainer Grosskopf (IRT, Germany) , Matti Herben (Eindhoven University of Technology, The Netherlands)

8:30 Development of measurement-based ray tracer for multi-link double directional propagation parameters
Juho Poutanen (Helsinki University of Technology, Finland); Katsuyuki Haneda (Helsinki University of Technology, Finland); Veli-Matti Kolmonen (TKK Helsinki University of Technology, Finland); Jussi Salmi (Helsinki University of Technology, Finland); Andreas Richter (NOKIA, Finland); Peter Almers (Lund University, Sweden); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
In this paper a tool for linking the measurement results with the physical environment is developed. The idea of the proposed measurement-based ray tracing tool is to use the measured data as the input of the ray tracer.

8:50 Statistical study on the influence of size and distribution of windows on a building's reflection coefficient
Shermila Mostarshedi (Université Paris-Est (Marne-la-Vallée), France); Elodie Richalot (Université Paris-Est (Marne-la-Vallée), France); Joe Wiart (France Telecom R&D, France); Man-Fai Wong (France Telecom R&D, France); Odile Picon (Université Paris-Est (Marne-la-Vallée), France)
Statistical studies on the reflection coefficient of buildings are made using a fast and accurate method based on the equivalence principle and the Green's functions. The main goal is to quantify the influence of the random distribution of windows, with different sizes, on the total reflection coefficient of the facade.

9:10 Beam Tracing for Multipath Propagation in Urban Environments
Tobias Rick (RWTH Aachen, University, Germany); Arne Schmitz (RWTH Aachen University, Germany); Thomas Karolski (RWTH Aachen University, Germany); Leif Kobbelt (RWTH Aachen University, Germany); Torsten Kuhlen (RWTH Aachen, University, Germany)
We present a novel method for efficient computation of complex channel characteristics due to multipath effects in urban microcell environments. Significant speedups are obtained compared to state-of-the-art ray-tracing algorithms by tracing continuous beams and using parallelization techniques. We optimize simulation parameters using on-site measurements, and compare different optimization strategies.

9:30 Estimation of Wall-Scattering in the Urban Canyon
Antonis Dimitriou (Aristotle University of Thessaloniki, Greece); Stavroula Siachalou (Aristotle University of Thessaloniki, Greece); George Sergiadis (Aristotle University of Thessaloniki, Greece)
The scattered field from the buildings' façades can greatly affect the received field inside the "urban canyon". A model that estimates the net scattered field by a single façade is derived, assuming that the wall comprises numerous identical elementary scatterers with known scattering gain function.

9:50 Modelling and Synthesis of Dense Multipath Propagation
Martin Käske (Ilmenau University of Technology, Germany); Markus Landmann (Ilmenau University of Technology, Germany); Reiner Thomä (TU-Illmenau, Germany)
So far a simple and measurement backed model of the angular properties of "Dense Multipath Components" is not available. The paper will therefore examine the angular distribution of data obtained using channel-sounding measurements. Secondly the validity of theoretical suggested model will be discussed.

Room: CC Room 3

Thu-S8P10:
Convened: Propagation aspects beyond 50 GHz

Chair: Frank Marzano (Sapienza University of Rome, Italy), Radoslaw Piesiewicz (Create-Net, Italy)

8:30 Frequency and Path Length Scaling of Rain Attenuation from 38 GHz, 58 GHz and 93 GHz Data Obtained on Terrestrial Paths
Vaclav Kvicera (Czech Metrology Institute, Czech Republic); Martin Grabner (Czech Metrology Institute, Czech Republic); Ondrej Fiser (Institute of Atmospheric Physics, Czech Republic)
A method for frequency scaling and path length scaling of rain attenuation from 38 GHz, 58 GHz and 93 GHz data obtained on terrestrial paths.

8:50 Rain-induced bistatic scattering at 60GHz
Robert Watson (The University of Bath, United Kingdom); Henry van der Zanden (Philips Research, The Netherlands); Matti Herben (Eindhoven University of Technology, The Netherlands)
This paper considers the effects of rain-induced bistatic scattering as a source of interference on 60GHz point-to-point links.

9:10 EHF Space Systems: Experimental Missions for Broadband Communications
Tommaso Rossi (University of Rome "Tor Vergata", Italy); Marina Ruggieri (University of Roma Tor Vergata, Rome, Italy, Italy); Ernestina Cianca (Italy, Italy); Marco Lucente (University of Rome "Tor Vergata", Italy); Cosimo Stallo (University of Rome Tor Vergata, Italy); Giuseppe Codispoti (Italian Space Agency, Italy); Lamberto Zuliani (Italian Space Agency, Italy)
In the last years scientific community has been witness of the growing interest in global EHF satellite systems for broadband communications; these systems can help national and regional telecommunications service operators to provide broadband communications in areas not adequately served by terrestrial systems.

9:30 Radio Channel Characteristics for Broadband WLAN/WPAN Applications Between 67 and 110 GHz
Martin Jacob (Technische Universität Braunschweig, Germany); Thomas Kürner (Technische Universität Braunschweig, Germany)
In this paper we present a measurement based analysis of the indoor radio channel at frequencies between 67 and 110 GHz. Therefore measurement campaigns were carried out in different indoor environments such as a corridor and a fully furnished conference room.

9:50 Electromagnetic propagation at frequencies above 50 GHz: the challenge of the atmosphere
Carlo Capsoni (Politecnico di Milano, Italy); Lorenzo Luini (Politecnico di Milano, Italy); Roberto Nebuloni (Ieiit - Cnr, Italy); Aldo Paraboni (Polytechnic of Milan, Italy); Carlo Riva (Politecnico di Milano, Italy)
This contribution provides a preliminary quantification of the atmospheric impairments suffered from a radio wave at frequency above 50 GHz, as derived by extrapolating the present theoretical and experimental knowledge. Specific attention has been devoted to terrestrial millimetre wave links and to the low Margin end user satellite terminals.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 4

Thu-S1A25:
Convened: Numerical Methods-1

Chair: Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium), John Volakis (Ohio State University, USA)

8:30 Nonlinear sampling technique for microwave devices
Michel Mattes (EPFL, Switzerland)
This communication addresses the problem of any simulation tool: the accurate and efficient sampling of a physical observable with respect to a parameter

8:50 Hybrid Generalized Finite Element-Boundary Integral Method for Aperture Design
Ozgur Tuncer (Michigan State University, USA); B. Shanker (Michigan State University, USA); Leo Kempel (Michigan State University, USA)
Vector Generalized Finite Element method requires two specific advances to permit application to aperture design. These are hybridization with boundary integrals and basis function spaces to analyze inhomogeneous domains. This paper presents solutions to these problems. Results attesting to their efficacy will be presented at the conference.

9:10 On the essential dimensions of scattering problems in planar layered structures
Michele D'Urso (SeleX Sistemi Integrati, Italy); Ovidio Bucci (University of Naples, Italy)
In this paper we combine the concept of field's degrees of freedom and the representation of the stratified Green's function for a non-redundant analysis of mutual coupling in large planar antennas.

9:30 A Vector Transform for use in Solving Electromagnetic Problems in Cartesian Coordinates
Steven Weiss (US Army Research Lab, USA)
Some vector transforms of importance to solving electromagnetic problems were introduced by Chew and Habashy in 1986. This paper will discuss the analytical formulation of a variation of such a transform and demonstrate its usefulness in the development of Green's functions for a planar stratified medium.

9:50 On the degrees of freedom in the interaction between sets of elementary scatterers.
Alexander Heldring (Polytechnical University of Catalunya, Spain); Jose M. Tamayo (Universitat Politècnica de Catalunya, Spain); Juan M. Rius (Universitat Politècnica de Catalunya, Spain)
Most fast solvers for Computational Electro-Magnetics are based on the reduced number of Degrees of Freedom (DoF) in the interaction between sets of well-separated elementary scatterers. This paper discusses the relation between the DoF and the number of elementary scatterers.

Room: CC Room 5

Thu-S6A30:
Convened: Metamaterials-3

Chair: Peter de Maagt (European Space Agency, The Netherlands), Li Le-Wei (National University of Singapore, Singapore)

8:30 Improved StopBand of a Compact 1-Cell CRLH-TL UWB BandPass Filter by Forming Additional Nulls
Sungtek Kahng (University of Incheon, Korea)
We propose a new design of a very compact UWB bandpass filter, which is based on the 1-cell microstrip CRLH-TL with the widened Bandstop and the totla size still as small as guided wavelength/9.4.

8:50 Antennas combined with high impedance band gap surfaces
Richard Langley (University of Sheffield, United Kingdom)
This paper describes the performance of multiband and wide band antennas on electromagnetic band gap surfaces. The EBGs allow the antennas to be platform tolerant and hence can be used on the metal areas of automotive vehicles.

9:10 Physically flat but electromagnetic parabolic surface using EBG structure with stepped reflection phase
Kihun Chang (Yonsei University, Korea); Jihwan Ahn (Yonsei University, Korea); YoungJoong Yoon (yonsei university in Korea, Korea)
Physically flat but electromagnetic parabolic surface is presented. By tuning the individual lattice of a periodic mushroom-type texture, an EBG surface with stepped reflection phases as a function of position can be designed. Applying a parabolic gradient to reflection phase along the face, the surface can focus a reflected wave.

9:30 WAAS Space Segment Antenna Based on EBG Superstrate Gain Enhancement Technique
Yves Cassivi (MDA Corporation, Canada); Yves Demers (MDA Corporation, Canada); Peter de Maagt (European Space Agency, The Netherlands); Ramon Gonzalo (Public University of Navarra, Spain)
The design considerations for Wide Area Augmentation Service space segment antenna based on a Electromagnetic Band Gap superstrate are discussed. This technology provides attractive features like size, mass and complexity reductions. Two configurations of WAAS antenna are presented and discussed. The proposed technology look very promising for this application.

9:50 Slotted Patch Dual Band Electromagnetic band gap structure design
Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia); Osman Ayop (Universiti Teknologi Malaysia, Malaysia); Thelaha Masri (Universiti Teknologi Malaysia, Malaysia); Maisarah Abu (Universiti Teknologi Malaysia, Malaysia)
This paper describes a comparison between slotted patch EBG structure and mushroom EBG structure. The performance has been made based on forward transmission coefficient, S21. One band gap frequency has been noticed for mushroom EBG while two band gap have been noticed for slotted EBG structure.

Room: Hall A

Thu-S4A28:
UWB Analysis and Design Constraints

Chair: Milos Mazanek (Czech Technical University in Prague, Czech Republic), Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France)

8:30 Comparison of UWB Dual-Antenna Systems Using Diversity
Emmanuel Dreina (France Telecom R&D, 28 Chemin du vieux chêne, 38243 Meylan, France, France); Michel Pons (France Telecom R&D, France); Tan Phu Vuong (Grenoble INP, France); Smail Tedjini (Grenoble-inp, France)
In this paper, a theoretical method which allows to compare antenna diversity systems is described. A new metric, the "referenced diversity gain" is also introduced. A new small UWB antenna is used in a dual-antenna system which is compared with another system using an UWB antenna designed by the LCIS-laboratory.

8:50 A statistical analysis of antenna scattering in UWB arrays
Raffaele D'Errico (Ecole Nationale Supérieure de Techniques Avancées, France); Christophe Roblin (ENSTA, France); Alain Sibille (ENSTA, France)
In this paper we use a statistical approach to address the topic of scattering interactions between close radiators within UWB arrays. We present a compressed statistical model for a class of UWB planar monopoles linear arrays, based upon poles extraction of the antenna scattering coefficient via Generalized Matrix-Pencil algorithm.

9:10 Impact of Substrate Permittivity on the Performance of UWB Monopoles
Gabriela Quintero (Ecole Polytechnique Fédérale de Lausanne, Switzerland)
Microstrip and CPW-fed monopoles are designed using different substrates. Distortion in every azimuth angle of radiation is quantified with the fidelity factor. The different radiation characteristics of each antenna are discussed. A conclusion is given about the feasibility to make UWB antennas using high permittivity substrates.

9:30 A "Generic" Design of Planar UWB Antennas for Parametric or Statistical Analysis
Christophe Roblin (ENSTA, France)
It is proposed to "unify" many geometries of UWB antennas in a "generic design" based on a parameterized geometry using elementary "bricks". A systematic construction offers a performing tradeoff between versatility and simplicity. The main goal is to elaborate an antenna database devoted to a statistical analysis of UWB antennas?.

9:50 Multi-Objective Optimization of UWB Microstrip Fed Planar Monopole Antenna
Somayyeh Chamaani (K. N. Toosi Univerity, Iran); Abdullah Mirtaheri (K. N. Toosi University, Iran); mohammad Sadegh Abrishamian (K. N. Toosi Univerity, Iran)
This paper presents a novel multi-objective optimization of printed microstrip-fed monopole antenna for UWB applications. Frequency and time domain performance of an arbitrary sample of optimized antennas are evaluated. Simulation results show that optimized antenna present a higher and more uniform fidelity factor in comparison with similar UWB antennas.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall B

Thu-S3A27: Convened: Small antenna design and measurements-2

Chair: Koichi Ito (Chiba University, Japan), Cyril Luxey (University of Nice, France)

8:30 Adaptive Pattern Controlled Handset Antenna by Analog Phase Shifters
Hiroyuki Arai (Yokohama National University, Japan)
This paper presents an adaptive radiation pattern controlled antenna for handset terminals to reduce the correlation coefficient between antennas in diversity reception and to enhance the channel capacity in MIMO applications.

8:50 Considerations on configurable multi-standard antennas for mobile terminals realized in LTCC technology
Dirk Manteuffel (University of Kiel, Germany); Matthias Arnold (IMST GmbH, Germany)
Considerations on configurable multi-standard antennas for mobile terminals realized in LTCC technology

9:10 Electrically Small Meanderly Folded Patch Antennas
Alois Holub (Czech Technical University in Prague, Czech Republic); Milan Polivka (Czech Technical University in Prague, Czech Republic)
The paper introduces new small antenna structures, meanderly folded patch antennas, and discusses several levels of its miniaturization.

9:30 Wideband Characteristics and Downsizing Limitation of Planar Rectangular Disc Antennas
Toshikazu Hori (University of Fukui, Japan)
This paper describes the wideband limitation of planar rectangular disc antennas and its downsizing limitation. It was shown by the simulation results that the maximum relative bandwidth and the lowest frequency of the planar rectangular disc antennas would be 177% and 0.44 f0, respectively.

9:50 A Comparison of the Cylindrical Folded Helix Dipole Q to the Gustafsson Limit
Steven Best (The MITRE Corporation, USA)
The Q of the cylindrical folded helix is compared to the Gustafsson limit as a function of helices length-to-diameter ratio for a fixed value of ka. We show that the Q of the antenna closely approaches this limit but does not exceed it

Room: Hall C1

Thu-S5A29: Convened: Millimeter-Wave Antennas-1

Chair: Thomas Zwick (Universität Karlsruhe (TH), Germany), Ronan Sauleau (University of Rennes 1, France)

8:30 E-Shaped Slot-Coupled Dielectric Resonator Antenna
Tayeb A. Denidni (INRS-EMT, Canada); Xian-Ling Liang (INRS, Canada)
In this paper, a novel CPW-fed dielectric resonator antenna for millimeter-wave applications is presented. The antenna consists of a dielectric resonator and an E-shaped slot. The slot is used to excite the DRA. Obtained results show a good performance in terms of bandwidth.

8:50 Wideband mm-Wave Log-Periodic Antennas
Dejan Filipovic (University of Colorado at Boulder, USA)
Wideband mm-wave end-fire and planar log-periodic (LP) antennas compatible with a recently developed surface micromachined process known as PolyStrata™ are discussed in this paper. Two embodiments of each LP type are developed: 2-110GHz and a dual-band 18-50GHz and 75-110GHz planar LP; and 18-110GHz and dual-band 18-50GHz and 75-110GHz end-fire LP.

9:10 Hybrid waveguide-stripline feeding networks for Ka band and millimeter wave arrays
Emilio Arnieri (Universita' della Calabria, Italy); Ivan Russo (University of Calabria, Italy); Luigi Boccia (Università della Calabria, Italy); G. Amendola (Universita della Calabria, Italy); Antonio Borgia (University of Calabria, Italy)
In this paper is proposed an hybrid technology that combines striplines and E plane metallic waveguides to be used to realize efficient feeding network at millimeter-wave.

9:30 A Superstrate Patch Antenna for 60-GHz Applications
Duixian Liu (IBM, USA); Iwan Akkermans (Technische Universiteit Eindhoven, The Netherlands); Brian Floyd (IBM, USA)
This paper presents a balanced-fed aperture-coupled patch antenna suitable for broadband millimeter-wave communications. To improve antenna bandwidth and radiation efficiency, an air cavity has been embedded in the PCB stack. The antenna has about 7 dBi gain, with at least 12 GHz impedance bandwidth.

9:50 Stepped-Impedance Based Dual-Band And Dual-Function Balun For 20 / 44 GHz Applications
Hualiang Zhang (University of Arizona, USA); Hao Xin (University of Arizona, USA)
Dual-band Baluns with impedance transforming properties are discussed in this paper for millimeter-wave applications. Specific design equations are given for the proposed structure. A prototype working at 20 / 44 GHz is presented. The simulations results match well with the theoretical predictions.

Room: Hall C2

Thu-S9M5: Testing of Antennas and Wireless Devices in Reverberation Chambers

Chair: Jan Carlsson (SP Technical Research Institute of Sweden, Sweden)

8:30 Accuracy in Reverberation Chamber for Wireless Testing: Simple Formulas for the Number of Independent Samples
Antonio Sorrentino (Università Parthenope, Italy); Per-Simon Kildal (Chalmers University of Technology, Sweden); Ulf Carlberg (Chlamers University of Technology, Sweden); Elena Pucci (University of Siena, Italy)
This paper presents a simple and general formula for the accuracy in a reverberation chamber measurements, when different stirring approaches are employed.

8:50 Accuracy of Antenna Input Reflection Coefficient and Mismatch Factor Measured in Reverberation Chamber
Xiaoming Chen (Chalmers University of Technology, Sweden); Per-Simon Kildal (Chalmers University of Technology, Sweden)
In this paper, it is shown that the reverberation chamber can be used to measure free space antenna impedance of large directive antenna. By deploying additional complex frequency stirring, the reflection coefficients measured in the reverberation chamber and in anechoic chamber match well.

9:10 Comparison of efficiency measurements for narrow band antennas using UWB Wheeler Cap and Reverberation Chamber
Gwenn Le Fur (IETR Université de Rennes 1, France); Christophe Lemoine (IETR, France); Philippe Besnier (IETR, France); Ala Sharaiha (IETR-Université de Rennes 1, France)
UWB Wheeler Cap test bed designed for very broadband systems, can also be accurate for narrow band antennas efficiency measurement. Reverberation Chamber, first designed for EMC measurements, offers advantages to measure antenna efficiency. Results are given to assess uncertainty and accuracy of both measurement means.

9:30 Theoretical Derivation and Measurements of the Relationship between Coherence Bandwidth and RMS Delay Spread in Reverberation Chamber
Xiaoming Chen (Chalmers University of Technology, Sweden); Per-Simon Kildal (Chalmers University of Technology, Sweden)
This paper presents the derivation of the relationship of coherence bandwidth and RMS delay spread in 3D isotropic environments, and compare the theoretical result with measured results in reverberation chamber. Good agreement is observed.

9:50 Optimisation of a Stepped Permittivity Impedance Loaded (SPIL) Absorber
Daniel Holtby (University of Sheffield, United Kingdom); Kenneth Ford (University of Sheffield, United Kingdom); Barry Chambers (University of Sheffield, United Kingdom)
Improving the low frequency performance of pyramidal absorbers, for use in an anechoic chamber, by loading them with a FSS and creating a permittivity gradient through the foam. Parameters are optimised using particle swarm optimisation.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall C3

Thu-S10J5:
Convened: Automotive Antenna Systems

Chair: Richard Langley (University of Sheffield, United Kingdom), Stefan Lindenmeier (Universität der Bundeswehr, Germany)

8:30 Millimetre-wave reflectarray fed by a diffraction-shaped dielectric lens.
Robert Henderson (BAE Systems Advanced Technology Centre, United Kingdom)
A flat plate reflector antenna has been designed for use at 77GHz with a beamwidth of 1 x 2 degrees. A dielectric lens transforms the pattern of a circular waveguide feed into the required elliptical illumination.

8:50 Modeling and Comparison of Patch Antenna Configurations for 77 GHz Radar Applications
Ivan Ndip (Fraunhofer IZM, Germany)
In this work, we modeled and compared three different patch antenna configurations (suspended-patch, partially-suspended patch and the conventional patch) for 77 GHz automotive radar applications. This comparison takes into consideration not only size, cost and performance issues, but also the sensitivity of the antennas to process tolerances.

9:10 Automotive antenna-system diagnosis with source stirring technology
Michael Albrecht (Daimler, Germany)
In this paper, we present a solution how to feed a wireless signal to the antenna independent from the environmental conditions. A statistically uniform E-field is created in a service environment by using the source stirring technology and the uniformity of the E-field is theoretically evaluated.

9:30 Challenges in the Smart Antenna Integration in Vehicles: the Fractal Antenna® Technology Approach
Edouard Rozan (Ficosa, Spain); Ramiro Quintero (FICOSA, Spain)
This paper illustrates, through different examples, how the capacity of miniaturization of the fractal antenna® technology can improve smart integrated antenna solutions to address the current challenge of automotive industry namely CO^2 emission reduction.

9:50 Antenna Diversity System for the Mobile Reception of Satellite Digital Radio
Christian Heuer (Delphi Delco Electronics Europe GmbH, Germany); Stefan Lindenmeier (Universität der Bundeswehr, Germany)
Comparison of different Diversity Systems for Satellite Radio Realization of a prototype is described and test results in real scenario are discussed.

Room: Hall C4

Thu-S11S5: Convened: European Workshop on Conformal Antennas (EWCA)-1

Chair: Zvonimir Sipus (University of Zagreb, Croatia), Peter Knott (FGAN-FHR, Germany)

8:30 Input Impedance of a Probe-Fed Cylindrical Microstrip Antenna.Effective Calculation of Probe Excitation Field
Alexander Svezhentsev (Institute of Radio Physics and Electronics, NAS of the Ukraine, Ukraine)
Abstract: A probe-fed cylindrical microstrip antenna is discussed. The problem is solved by the moment method in the spectral domain using sub-domain basis functions. An effective way to improve the convergence in the calculation of the system right hand side elements related to the excitation field has been realized.

8:50 A conformal antenna on base of open-end of coaxial line with metamaterial surroundings
Boris Panchenko (Radio Engineering Institute, Ural State Technical University, Yekaterinburg, Russia); Marat Gizatullin (Ural Technical Institute of Communication and Information Science, Yekaterinburg, Russia); Sergey Knyazev (Ural State Technical University, Russia); Sergey Shabunin (Ural State Technical University, Russia)
A new kind of subwavelength antenna as coaxial line open-end embedded in hemispherical core-shell system is analyzed. The opportunity of an efficient directive radiator design theoretically and numerically is proved.

9:10 A Circular Switched Parasitic Array Antenna for High Power Data Link Applications
Thomas Bertuch (FGAN e.V., Germany)
The principle of the circular switched parasitic array (CSPA) antenna is adapted for a data link application with circumferential beam switching and high RF power handling in transmit. Design and measurement results of a built demonstrator antenna are presented.

9:30 Integration of Conformal GPS and VHF/UHF Communication Antennas for Small UAV Applications
Brandan Strojny (The Ohio State University, USA); Roberto Rojas (The Ohio State University, USA)
Conformal antennas are important for military and commercial applications. In this work two GPS and VHF/UHF antennas will be integrated to occupy the same physical space conformal to the tail of a small UAV. Successful integration requires each antenna to maintain bandwidth, gain, front-to-back ratio and polarization.

9:50 Design of Antenna Conformal to V-shaped Tail of UAV Based On the Method of Characteristic Modes
Khaled Obeidat (The Ohio State University, USA); Roberto Rojas (The Ohio State University, USA); Bryan Raines (The Ohio State University, USA)
The method of Characteristic Modes is used to design a vertically polarized communications antenna conformal to the V-shaped tail of a small UAV. The antenna must operate in the band from 50 to 90 MHz and must be omnidirectional. This antenna has a vertical dimension $\lambda/17$ at 50 MHz.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 1

Thu-S13A32:
Convened: Reflect Arrays-2

Chair: Jose Encinar (Universidad Politecnica de Madrid, Spain), Alexander Martynyuk (Universidad Nacional Autonoma de Mexico, Mexico)

10:40 Folded reflectarray antenna based on a single layer reflector with increased phase angle range
Wolfgang Menzel (University of Ulm, Germany); Jiang Li (University of ulm, Germany); Sabine Dieter (University of Ulm, Germany)
A novel approach is presented for folded reflectarray antennas based on single layer structures with an increased phase angle range for the two polarizations (allowing polarization twisting). A first antenna example at 77 GHz is presented.

11:00 Reconfigurable LC-Reflectarray Setup and Characterisation
Alexander Moessinger (TU Darmstadt, Germany); Sabine Dieter (University of Ulm, Germany); Rolf Jakoby (TU Darmstadt, Germany); Wolfgang Menzel (University of Ulm, Germany); Stefan Mueller (TU-Darmstadt, Germany)
The realisation and characterisation of an electronically tunable LC-reflectarray at 35 GHz is presented.

11:20 A X-band electronically scanned reflectarray antenna for space telemetry
Christian Renard (Thales Systèmes Aéroportés, France); Cecile Cheymol (CNES, France); Patrick Dumon (CNES, France); Thierry Dousset (Thales Systèmes Aéroportés, France); Michèle Labeyrie (Thales Systèmes Aéroportés, France)
A new X-Band high gain electronically scanned ReflectArray antenna operating in X band has been developed by CNES and TSA for a spaceborne telemetry system. Tests on a radioelectric engineering model have been performed by CNES in its Compact Antenna Test Range and have proven the validity of the concept.

11:40 Design and Measurement of a Circularly Polarized Ka-band Reflectarray Antenna
Ang Yu (The University of Mississippi, USA); Fan Yang (The University of Mississippi, USA); Atef Elsherbeni (The University of Mississippi, USA); John Huang (Jet Propulsion Laboratory, (recently retired), USA)
Reflectarray antennas are composed of phased elements to mimic a conventional curved reflector. This paper compares the characteristics of several types of elements for Ka-band operation, including the CP bandwidth, fabrication tolerance, and design flexibility. A circularly polarized reflectarray antenna is designed, fabricated, and measured at The University of Mississippi.

12:00 Reflectarray Based on Three-Bit Spatial Phase Shifters: Mathematical Model and Technology of Fabrication
Alexander Martynyuk (Universidad Nacional Autonoma de Mexico, Mexico); Jesus Rodriguez-Zamudio (DIE, Facultad de Ingenieria, UNAM, Mexico); Ninel Martynyuk (Kiev Polytechnic Institute, Ukraine)
Reflective spiraphase-type phased array based on three-bit spatial phase shifters is analyzed. A developed full-wave mathematical model is used to optimize the array element and to predict reflection characteristics. Original fabrication technology is proposed to minimize insertion loss in the bias circuits of three-bit phase shifters.

Room: CC Room 2

Thu-S19P8:
Propagation for Radio Network Planning

Chair: Joerg Pamp (RWTH Aachen University, Germany) , Lajos Nagy (Budapest University of Technology and Economics, Hungary)

10:40 An Intelligent Ray Launching for Urban Propagation Prediction
Zhihua Lai (University of Bedfordshire, United Kingdom); Nik Bessis (University of Bedfordshire, United Kingdom); Guillaume de la Roche (University of Bedfordshire, United Kingdom); Hui Song (University of Bedfordshire, United Kingdom); Jie Zhang (University of Bedfordshire, United Kingdom); Gordon Clapworthy (University of Bedfordshire, United Kingdom)
An Intelligent Ray Launching Algorithm (IRLA) is proposed to predict a huge amount of receiver pixels (few million) in a large scenario (few square kilometers) within a short amount of time, which is beneficial to relevant academics and industries.

11:00 Ray-Tracing System for Predicting Propagation Characteristics on World Wide Web
Junpei Mizuno (NTT DoCoMo, Inc., Japan); Tetsuro Imai (NTT DOCOMO, Inc., Japan); Koshiro Kitao (NTT DoCoMo, Japan)
We developed a ray-tracing system called 3D-PRISM, which uses the World Wide Web (WWW). In this paper, we present the construction and performance of our system.

11:20 GPRS network optimization based on Physical Optics approximation
Javier Gutiérrez-Meana (Universidad de Oviedo, Spain); Fernando Las-Heras (Universidad de Oviedo, Spain); Yuri Alvarez Lopez (Universidad de Oviedo, Spain); José Ángel Martinez-Lorenzo (The Gordon CenSSIS, Northeastern university, USA); Aurelio Gutiérrez-Pérez (Arcelor-Mittal R&D, Spain)
This paper presents an example of Physical Optics (PO) coverage application over a real rural scenario. The objective is to improve GSM/GPRS (1800 MHz) coverage along a railway route with the addition of reflex antennas.

11:40 Ant Colony Approach in Optimization of Base Station Position
Ivan Vilovic (University of Dubrovnik, Croatia); Zvonimir Sipus (University of Zagreb, Croatia); Niksa Burum (University of Dubrovnik, Croatia)
Base stations and access points in Wireless Local Area Networks (WLAN) need to provide good link to the communications backbone of the system. In this work determination of base station location for optimum signal coverage will be shown using one of evolutionary computational optimization techniques.

12:00 Cellular phone coverage in urban vegetation areas
Iñigo Cuiñas (University of Vigo, Spain); Paula Gomez (Universidade de Vigo, Spain); Jose Acuna (Universidad de la República, Uruguay); Manuel García Sánchez (Universidade de Vigo, Spain)
Although the propagation in vegetation environments has been widely studied, the actual situation is that mobile phone systems coverage appears to be clearly poor in vegetation than in open places within urban areas. Large measurement campaigns results are presented, providing numerical data useful to correct the radio network planning tools.

Room: CC Room 3

Thu-S19P12:
mm- and sub-mm Wave Propagation

Chair: Ondrej Fiser (Institute of Atmospheric Physics & Fac. of Electrical Engineering and Informatics/Uni of Pardubice, Czech Republic), Robert Watson (The University of Bath, United Kingdom)

10:40 Sub-Millimetre Wave Linear to Circular Polarisation Converter Study
Matthias Euler (ECIT, Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom); Robert Cahill (Queens University Belfast, United Kingdom); Raymond Dickie (Queen's University Belfast, United Kingdom)
In this paper, four novel linear to circular transmission polarizer converter designs for use in the submillimetre wave range are presented. The operation frequency selected is 325GHz selected for next generation airborne radiometer use for remote environmental monitoring of ozone indicating chemical species.

11:00 Investigation on Two Modelling Approaches for Millemetre Wave Imaging System
Feng Qi (Katholieke Universteit Leuven, Belgium)
Two models based on physical optics would be explained to model a millimetre wave system with comparisons, in both spatial and frequency domain. To call some attention when Fourier optics is applied to such a task.We should be aware of its limitations.

11:20 Millimeter-wave antenna noise temperature due to rain clouds: theoretical model and statistical prediction
Frank Marzano (Sapienza University of Rome, Italy); Mario Montopoli (University of L'aquila, Italy)
The presentation will focus on the characterization of the antenna noise temperature due to precipitating clouds at Ku band and above by deriving a closed-form solution of the scalar radiative transfer equation.

11:40 An analytical propagation based unifying approach for outage capacity achieved in SIMO and MISO broadband satellite channel configurations
Konstantinos Liolis (Space Hellas S.A., Greece); Athanasios Panagopoulos (National Technical University of Athens,, Greece); Pantelis-Daniel Arapoglou (National Technical University of Athens, Greece)
In this paper, we investigate and propose a novel unifying way to study the downlink and uplink satellite channel configurations of a site diversity system in order to analytically evaluate the outage capacity distribution for the corresponding SIMO (single-input multiple-output) and MISO (multiple-input single-output) scenarios, respectively.

12:20 - 14:00 LunchBreak (will be served in the Delegates Lunch Area at the Exhibition)

Room: CC Room 4

Thu-S12A31:
Convened: Numerical Methods-2

Chair: Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium), John Volakis (Ohio State University, USA)

10:40 SoftLAB, a European Web-Service for Antenna Software Benchmark
Raphael Gillard (IETR, France)
SoftLAB, a European Web-Service for Antenna Software Benchmark SoftLAB, a European Web-Service for Antenna Software Benchmark

11:00 Computing Electromagnetic Fields in Engineering Applications: a Diakoptic Approach
Giampiero Gerini (TNO - Defence, Security and Safety, The Netherlands)
Internationally, the Netherlands has a unique position in applied electromagnetic research, with major "players" in astronomy, radar, electromagnetic effects, space technology, optical fibres, lithography, portables and wearables, RF design, and medical applications. The authors are regularly applying their knowledge of electromagnetic fields in problems from a broad range of engineeringapplications.

11:20 Multi-scale Modeling of Antenna Structures using Nonconformal Numerical Methods
Jin-Fa Lee (Ohio State University, USA)
In this talk, we shall present our on-going efforts in combating the multi-scale electromagnetic problems through the use of non-conventional PDE methods that are non-conformal. The non-conformal numerical methods relax the constraint of needing conformal meshes throughout the entire problem domains.

11:40 Simulation of Large Multiscale Structures Using the Finite Difference Time Domain Method (FDTD) Hybridized with The Method of Moments (MoM)
Raj Mittra (Penn State University, USA)
A hybrid MoM/FDTD approach for analyzing large, multiscale structures is presented in this paper. The approach enables us to work with a coarse FDTD grid, and yet accommodates thin wire and shell geometries that may be curved in general.

12:00 High scalability multipole method for the analysis of hundreds of millions of unknowns
Jose Taboada (University of Extremadura, Spain); Luis Landesa (University of Extremadura, Spain); José Bértolo (University of Vigo, Spain); Fernando Obelleiro (University of Vigo, Spain); José Rodríguez (University of Vigo, Spain); J. Carlos Mouriño (CESGA, Spain); Andrés Gómez (CESGA, Spain)
We present a parallel MPI/OpenMP implementation of the FMM-FFT algorithm for the analysis of hundreds of millions of unknowns. The code has shown an unprecedented parallel scalability, close to 0.7 in 1024 processors. A challenging problem of more than 150 million unknowns was analyzed in the supercomputer FinisTerrae (CESGA).

Room: CC Room 5

Thu-S17A36:
Convened: Metamaterials-4

Chair: Peter de Maagt (European Space Agency, The Netherlands), Li Le-Wei (National University of Singapore, Singapore)

10:40 Planar Circularly Symmetric Electromagnetic Band-Gap Antennas for Low Cost High Performance Integrated Antennas
Andrea Neto (TNO, The Netherlands); Nuria Llombart (JPL, USA); Giampiero Gerini (TNO, The Netherlands); Peter de Maagt (European Space Agency, The Netherlands)
A review of the design the , the potentials, the anntennas and the applications of PCS EBG's is presented

11:00 3-D Electromagnetic Band-Gap Sub-millimeter wave imaging array
Ramon Gonzalo (Public University of Navarra, Spain); Peter de Maagt (European Space Agency, The Netherlands); Iñigo Ederra (Universidad Publica de Navarra, Spain)
The design, assembly process and characterisation of the first submillimetre wave heterodyne receiver array based on EBG technology will be presented.

11:20 Adaptive beam steering antenna: improvements and experimental validation.
Philippe Ratajczak (Orange Labs, France); Patrice Brachat (France Telecom, France); Jean-Marc Fargeas (Orange Labs, France)
Latest developments, concerning the performances of an adaptive beam steering antenna, are presented in this paper.

11:40 Metallic EBG Superstrates for Dual Polarized Sectoral Base Station Antennas
Mohamad Hajj (University of Limoges, France); Emmanuel Rodes (XLIM-UMR 6172-CNRS, University of Limoges, France); Dina Serhal (University of Limoges, XLIM laboratory, France); Thierry Monediere (University of Limoges, France); Bernard Jecko (University of Limoges, France); Regis Chantalat (CISTEME, France)
we present a novel approach to design a dual polarized sectoral antenna using a double layer of Metallic EBG materials working on orthogonal polarizations as a superstrate. This antenna is able to radiate with a sectoral radiation pattern, i.e. presenting at least 60° angular beamwidth in the azimuth plane

12:00 Metamaterial based antennas with super- and sub-strates
J (Yiannis) Vardaxoglou (Loughborough University, United Kingdom)
Practical demands in modern communications and on-body electronics would require antennas to be of low profile, comply with bandwidths of up to 60% and immuned from the environment. This paper will capture these issues by discussing results from low profile metamaterial based antennas on rigid, flexible(fabrics) super and substrates.

Room: Hall A

Thu-S15A34:
New Wideband Designs

Chair: Christophe Craeye (Université Catholique de Louvain, Belgium), Jean-Marc Laheurte (Université de Paris Est Marne La Vallée (UPEMLV), France)

10:40 Dual polarised multi-layer antenna with complex feeding network
Andrea Giacomini (SATIMO, Italy); Lars Foged (SATIMO, Italy); Jean-Marc Baracco (Mardel, France); Mauro Bandinelli (Ingegneria dei Sistemi, IDS, Italy); Marco Sabbadini (Esa Estec, The Netherlands)
The multi layer structure and the balanced excitation in particular of this antenna element require an accurate numerical modelling for the initial sizing, overall optimisation and feeding network design. Modular breadboards, conducted and radiated measurements and numerical modelling refinements have been used extensively in the development of the antenna element.

11:00 Broadband characteristics of Planar Folded Dipole Antenna with a Feed Line
Hisashi Morishita (National Defense Academy, Japan)
The purpose of this study is to analyze the broadband characteristics of folded dipole antenna (FDA) by using the basic Planar Folded Dipole Antenna with a feed line and to introduce the new structure of the three-dimensional FDA, which has broadband characteristics and is compact size.

11:20 Characterization of Tapered-Slot Antenna Designs for Subsurface Radar Applications
Yelena Maksimovitch (Institute of Applied Physics National Academy of Sciences Of Belarus, Belarus); Valeri Mikhnev (Institute of Applied Physics, Belarus); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
Some characteristics of UWB tapered-slot antennas important in subsurface radar applications such as VSWR, radiation pattern and stability of the antenna response with respect to variations of the distance between the antenna and reflecting surface have been analyzed. Three types of TSA opening have been studied.

11:40 A broadband antenna for AMPS and GSM900 applications
Giorgos Perikos (The University of Sheffield, United Kingdom); Jonathan Rigelsford (The University of Sheffield, United Kingdom)
This paper presents an antenna element suitable as a broadband AMPS/GSM900 antenna for cellular BTS applications. Simulated and measured data is presented.

12:00 Quantum-dot mode locked laser integrated bowtie antenna
Junghoon Kim (University of New Mexico, USA); Christos Christodoulou (University of New Mexico, USA); Luke Lester (University of New Mexico, USA); Jeongphill Kim (Chung-Ang University, Korea)
A bowtie antenna lithographically printed on a GaAs is integrated with a Quantum dot mode locked laser (QD-MLL) at its input. The antenna is designed to couple to the QD-MLL at a repetitive rate. The Fabricated antenna shows a broad frequency response, from 8 to 15 GHz.

12:20 - 14:00 LunchBreak (will be served in the Delegates Lunch Area at the Exhibition)

Room: Hall B

Thu-S14A33: RFID Antennas & Systems

Chair: Juraj Bartolic (University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia), Custodio Peixeiro (IST-TUL, Portugal)

10:40 RFID Smart Bookshelf with Confined Detection Range at UHF
Carla Medeiros (Instituto de Telecomunicações, Instituto Superior Técnico, Portugal); Jorge Costa (Instituto de Telecomunicações / ISCTE, Portugal); Carlos Fernandes (Instituto de Telecomunicaoes, Instituto Superior Tecnico, Portugal)
This paper presents a smart bookshelf for RFID application at UHF. The proposed shelf has an embedded leaking microstrip transmission line with extended ground plane and, when connected to a RFID reader, allows detecting tagged objects in close proximity with proper field confinement. The concept is validated with experimental tests.

11:00 Design and Characterization of Efficient Flexible UHF RFID Tag Antennas
Yasar Amin (Royal Institute of Technology, Sweden); Botao Shao (Ph.D candidate, the Royal Institute of Technology, Sweden); Julius Hållstedt (Royal Institute of Technology, Sweden); Satu Prokkola (University of Oulu, Finland, Finland); Hannu Tenhunen (Royal Institute of Technology, Sweden); Li-Rong Zheng (Royal Institute of Technology (KTH), Sweden)
High performance antennas on flexible substrate Kapton HN were designed and characterized. Ink LS-411AW was chosen for screen printing of antenna traces. This ink is highly durable for multiple times bending or folding which makes the proposed antennas versatile and suitable for usage on flexible articles.

11:20 RFID based probes for EM field measurements
Santiago Capdevila (Universitat Politècnica de Catalunya, Spain); Muhammad Mubeen Masud (KTH, Sweden); Raquel Serrano Calvo (Universitat Politècnica de Catalunya, Spain); Albert Aguasca (Universitat Politecnica de Catalunya (UPC), Spain); Sebastian Blanch Boris (Universitat Politècnica de Catalunya, Spain); Jordi Romeu (Universitat Polytecnica de Catalunya, Spain); Jean-Charles Bolomey (Supelec, France); Luis Jofre (UPC, Spain)
In this paper the use of RFID tags as EM-field probe is explored, and the influence of the RFID IC is studied by comparing different EM field measurement results

11:40 Metal-Mountable Microstrip RFID Tag Antenna for High Impedance Microchip
Tomi Koskinen (University of California, Los Angeles (UCLA), USA); Yahya Rahmat-Samii (University of California Los Angeles (UCLA), USA)
We consider a metal-mountable RFID (Radio Frequency Identification) tag antenna, which is designed for a high impedance microchip. The antenna consists of two microstrip patches, which are connected together by a narrow gap. The antenna has a simple, low-profile structure and it operates at the 902-928 MHz UHF band.

12:00 Compact slot antenna for 2.4GHz RFID tags
Xin Hu (Royal Institute of Technology, Sweden, Sweden); Qiaoli Zhang (Centre for Optical & Electromagnetic Research, Zhejiang University, P.R. China)
A metamaterial inspired compact slot antenna to be used as RFID tags is represented.The antenna shows high radiation efficiency and high overall efficiency with radiation efficiency of 68% at the resonant frequency 2.4GHz, and it has maximum gain of 2dBi.

Room: Hall C1

Thu-S16A35: Convened: Millimeter-Wave Antennas-2

Chair: Thomas Zwick (Universität Karlsruhe (TH), Germany), Ronan Sauleau (University of Rennes 1, France)

10:40 Flip-chip integration of differential CMOS power amplifier and antenna in PCB technology for the 60-GHz freqeuncy band
Iwan Akkermans (Technische Universiteit Eindhoven, The Netherlands); Muhammad Imran Kazim (Technical University of Eindhoven (TU/e), The Netherlands); Yikun Yu (Eindhoven University of Technology, The Netherlands); Matti Herben (Eindhoven University of Technology, The Netherlands); Peter Baltus (Eindhoven University of Technology, The Netherlands); Peter Smulders (Eindhoven University of Technology, The Netherlands)
The integration of a differential power amplifier and antenna is investigated. A PCB pakkage is presented that supports the flip-chipped amplifier and embeds the antenna.

11:00 Array Antenna for Body-Worn Automotive Harmonic Radar Tag
Shi Cheng (Uppsala University, Sweden); Paul Hallbjörner (SP Technical Research Institute of Sweden, Sweden); Anders Rydberg (Uppsala University, Sweden)
A W-band microstrip patch array antenna for body-worn automotive harmonic radar tag is presented. Port impedance and radiation patterns of the antenna are studied numerically and experimentally.

11:20 High-Gain Omni-Directional Antenna Using A Freeformed Cylindrical Cavity For High Data-Rate Short Range Communications At Millimetre-Wave Bands
Yoonjae Lee (Queen Mary, University of London, United Kingdom); Yang Hao (Queen Mary, University of London, United Kingdom); Clive Parini (QMUL, United Kingdom)
A high-gain omni-directional antenna using a freeformed cylindrical cavity is presented. The antenna is aimed for use in high data rate short range communications at millimetre-wave bands. A cylindircal cavity antenna has been designed, fabricated and tested at 95 GHz. Numerical and experimental results are presented.

11:40 Lens Antennas with Flat-Top Radiation Patterns: Benchmark of Beam Shaping Techniques at the Feed Array Level and Lens Shape Level
Ngoc Tinh Nguyen (University of Rennes 1, France); Ronan Sauleau (University of Rennes 1, France); Laurent Le Coq (University of Rennes 1, France)
The objective of this paper is to propose a new beam shaping technique for lens antenna applications. Instead of shaping the lens profile, the beam reconfiguration is ensured at the primary feed level. This technique avoids the costly fabrication of shaped lenses.

12:00 Reconfigurable antenna in mm-waves based on stratified lens and sources array
Olivier Lafond (IETR, France); Benjamin Fuchs (EPFL, Switzerland); Sebastien Palud (University of Rennes I, France); Mathieu Caillet (Royal Military College of Canada, Canada); Mohamed Himdi (Université de Rennes 1, France, France); Sébastien Rondineau (TSM - Antennas, Brazil); Laurent Le Coq (University of Rennes 1, France)
This paper deals with reconfigurable radiation pattern antennas in millimeter waves, based on inhomogeneous lens and antenna array. It is then possible to achieve high directive or sectorial beam for on-axis and off-axis configurations.

Room: Hall C2

Thu-S20M6: Measurement Error Reduction, Diagnostics and Calibration Techniques

Chair: Dietmar Fasold (University of Applied Sciences München, Germany), Philip Miller (UK, National Physical Laboratory, United Kingdom)

10:40 Calibration of multi-probe antenna measurement system using test zone field compensation
Juha Toivanen (Helsinki University of Technology, Finland); Tommi Laitinen (Helsinki University of Technology, Finland); Sergey Pivnenko (Technical University of Denmark, Denmark); Lasse Nyberg (Helsinki University of Technology, Finland)
A new method for calibrating a multi-probe antenna measurement system is presented. The method is based on the test zone field compensation technique. First experiments with the technique on a multi-probe range are presented, and they show accuracy comparable to that of a traditional measurement using the cable calibration.

11:00 "Convened" - Near-field Spherical Scanning: Test-Zone Field Evaluation
Mike Francis (NIST, USA)
Near-field Spherical Scanning: Test-Zone Field EvaluationNear-field Spherical Scanning: Test-Zone Field Evaluation

11:20 Definition of accurate reference pattern for the DTU-ESA VAST12 antenna
Sergey Pivnenko (Technical University of Denmark, Denmark); Olav Breinbjerg (Technical University of Denmark, Denmark); Sara Burgos (Universidad Politécnica de Madrid (Technical University of Madrid), Spain); Manuel Sierra-Castaner (Universidad Politécnica de Madrid, Spain); Hakan Eriksson (Saab Microwave Systems, Sweden)
A highly accurate reference pattern of the DTU-ESA VAST12 antenna was formed from the results of its measurements in 2007-2008 at the Technical University of Denmark, SAAB Microwave Systems, and the Technical University of Madrid. A comparison between the results is presented and the observed difference is analyzed and discussed.

11:40 Evaluation of the Impact of the Virtual Phase Centre Effect on the Accuracy of the Positioning System
Yevhen Yashchyshyn (Warsaw University of Technology, Poland); Marek Bury (Warsaw University of Technology, Poland); Krzysztof Kurek (Warsaw University of Technology, Poland); Pawel Bajurko (Warsaw University of Technology, Poland)
Paper presents evaluation of the impact of the phase centre misplacement caused by the virtual phase centre effect in the neighborhood of metal objects, on the accuracy of the local positioning system. Both simulation of the modeled scenarios and experimental verification of the phase centre misplacement are presented.

12:00 Facility comparison and evaluation using Dual Ridge Horns
Lars Foged (SATIMO, Italy)
Facilities comparisons involving high accuracy reference antennas are key instruments for the evaluation, benchmarking and calibration of antenna measurements systems. This paper discuss the comparisons performed using the SATIMO dual ridge horns in L, S, C, Ka and Ku band in the frame of the network "Antenna Center of Excellence".

12:20 - 14:00 LunchBreak (will be served in the Delegates Lunch Area at the Exhibition)

Room: Hall C3

Thu-S21J6: Automotive Antennas

Chair: Per Ingvarson (RUAG Aerospace Sweden, Sweden), Gerd Gottwald (Robert Bosch GmbH, Germany)

10:40 Effect of Vehicle Furnishings on Performance of Aperture Mounted Multi-band Conformal Automotive Antenna
Lester Low (University of Sheffield, United Kingdom); Hui Zhang (University of Sheffield, United Kingdom); Richard Langley (University of Sheffield, United Kingdom); Jonathan Rigelsford (University of Sheffield, United Kingdom)
The effects of vehicle furnishings on the performance of a planar multi-band window mounted automotive antenna are discussed. Simulated and measured antenna performance together with field distributions within the vehicle cabin at 900 MHz and 1800 MHz shows the importance of including sufficient cabin furnishings in an electromagnetic model.

11:00 "Convened" - Small Satellite Car Antenna for Simultaneous Reception of LHCP and RHCP Signals
Gerd Saala (University of the Bundeswehr, Germany); Jochen Hopf (University of the Bundeswehr, Germany); Stefan Lindenmeier (Universität der Bundeswehr, Germany)
For satellite radio systems with geostationary satellite a new small antenna is presented. It enables simultaneous reception of left hand and right hand circular polarized fields. The structure is discribed and the measured antenna characteristics are shown. Field tests for mobile reception scenario have been successful.

11:20 Novel fractal Solution for Integrated TMC Antenna
Malgorzata Brzeska (FICOSA, Germany); Ramiro Quintero (FICOSA, Spain)
paper describes a new solution to integrate a TMC antenna into the navigation device without increasing its volum nor changing its design

11:40 New Generation of In-Mirror Integrated Antennas
Malgorzata Brzeska (FICOSA, Germany); Ramiro Quintero (FICOSA, Spain)
Paper discusses the possibilities of integrating the antennas into the mirror of a vehicle. Therewith these antennas become "totally invisible". They have very good functionality and bring great advantages for vehicle manufacturers.

12:00 Performance of a 20 cm Short Active AM/FM Monopole Antenna for Automotive Application
Alexandru Negut (University of the Bundeswehr, Munich, Germany); Leopold Reiter (University of the Bundeswehr, Munich, Germany); Jochen Hopf (University of the Bundeswehr, Germany); Stefan Lindenmeier (Universität der Bundeswehr, Germany)
The performance of a 0.2m active monopole AM/FM antenna is investigated and presented for automotive. An advanced high impedance amplifier enables the realization. Field measurements show that the new antenna has satisfactory performance in comparison with 0.9m long passive rod antennas, both for the AM and FM range.

Room: Hall C4

Thu-S22S6: Convened: European Workshop on Conformal Antennas (EWCA)-2

Chair: Zvonimir Sipus (University of Zagreb, Croatia), Peter Knott (FGAN-FHR, Germany)

10:40 Shape optimization of conformal array antennas
Per Jacobsson (Chalmers University of Technology, Sweden); Thomas Rylander (Chalmers University of Technology, Sweden)
We present an efficient and unbiased optimization method for conformal array antennas, where the objective function is an average of the active reflection coefficient for a set of excitations that are useful for beam forming.

11:00 Design of a Structure Integrated Antenna for a Small Unmanned Aerial Vehicle
Peter Knott (FGAN-FHR, Germany); Claudius Löcker (FGAN-FHR, Germany)
The proposed paper describes the design of a distributed antenna array with large field of view (LFoV) for a communication system in C-Band. The paper includes the design of the antennas and presents simulation as well as experimental results of a demonstrator system.

11:20 On the Performance Aspects of a Cylindrical Beamforming Array
Theodoros Kaifas (Aristotle University of Thessaloniki, Greece); John Sahalos (Aristotle University of Thessaloniki, GR-54124, Thessaloniki, Greece, Greece)
A conformal beamforming cylindrical array is presented. From a total of M radiating elements N successive ones are active at each time. The selection minimizes the angle between the formed array's broadside and the DOA of the SOI. Furthermore, the enabled outputs are adaptively combined to maximize the gain.

11:40 Efficient Analysis of Curved Frequency Selective Surfaces
Marko Bosiljevac (University of Zagreb, Croatia); Zvonimir Sipus (University of Zagreb, Croatia)
The analysis of curved FSS is performed in two parts. For closely placed FSS elements the coupling is calculated with the spectral domain method. The remote elements are calculated using the free-space Green's functions corrected by the transmission coefficient of the supporting structure.

12:00 Rapid Dual Reflector Shaping Using Ant Colony Optimization, Fast Iterated PO and Asymptotic MFIE
María Graña-Varela (University of Vigo, Spain); Marcos Arias (University of Vigo, Spain); Oscar Rubiños-López (University of Vigo, Spain); Antonio García-Pino (University of Vigo, Spain)
Present communication describes a method for shaping dual reflectors reconfigurable patterns by modifying the feed position and the subreflector surface. The shaping process is made in two steps (1st, feed; 2nd, subreflector) surface, using fast specific electromagnetic analysis for each step and an optimization procedure based in Ant Colony Optimization.

12:20 - 14:00 LunchBreak (will be served in the Delegates Lunch Area at the Exhibition)

Room: CC Room 1

Thu-Inv1: Invited Papers
Antennas and Periodic Structure

Chair: Matthias Geissler (IMST, Germany)

14:00 Periodic Structures and Artificial Materials: Fundamentals and Applications
Christophe Caloz (Ecole Polytechnique de Montreal, Canada)
Although EBGs and metamaterials are different in essence, they are both generally formed by periodic arrangements of "atoms." So, what is really the difference between them? This paper presents a critical and comparative perspective of the two fields, with emphasis on fundamental concepts and practical applications.

14:45 More than 20 Antenna Elements in Future Mobile Phones, Threat or Opportunity?
Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
This paper discusses the issues in antenna design for future mobile communications terminals caused by the addition of more and more antennas into the devices. There can be more than 10 different radios in the terminal and some of them will utilise adaptive antenna systems with more than 5 antennas.

Room: Hall A

Thu-Inv2: Invited Papers
Propagation

Chair: Bertram Arbesser Rastburg (ESA - Estec, The Netherlands)

14:00 Multifrequency Microwave Radiometer as a Tool to estimate atmospheric and Radiopropagation Parameters
Nazzareno Pierdicca (Uni Roma1, Italy)
Microwave radiometers measure the incoherent radiation impinging on the receiver antenna due to the thermal emission by the surrounding environment. The instrument must be able to discriminate such a "environmental noise" from the instrument thermal noise, which is often much grater than what has to be measured. The thermal emission is dependent on the thermal state of the surrounding environment and its scattering and absorbing properties. When observing the atmosphere at microwave frequencies, those electromagnetic phenomena are related to its thermal state, the content of water vapour and the presence of liquid water, ice and hydrometers. Those phenomena also affect any radiowave propagation link, so that the microwave radiometers can at the same time be a tool for remotely sensing the atmosphere and measuring its propagation effects. A review of the capability of microwave radiometers in these two field will be given, together with some specific experience carried out by the research group.

14:45 Use and development of climatological and experimental databases for radiowave propagation modelling in SatCom and SatNav systems
Antonio Martellucci (European Space Agency, The Netherlands)
This paper presents a review of the databases currently used for the assessment of radiowave propagation effects in Satellite Communication (SatCom) and Satellite Navigation (SatNav) systems. This presentation focuses on tropospheric effects but relevant effects are also due to the ionosphere and to the environment around the receiver (i.e. multipath) for mobile and navigation systems.

14:00 - 15:30 **Room: Hall B**

WS-ARTIC: ARTIC Workshop-1
Expert Groups workshop

The workshop will take place at EuCAP2009, on Thursday 26 March at 1400-1600

The first hour will contain a presentation from the ARTIC expert group on the applicability of their knowledge to the automotive industry:

- Introduction
- High-frequency and integrated antennas
- Small antennas
- Wideband antennas
- Array antennas
- Smart antennas

The second hour will be an open forum for discussion, where we hope the automotive needs will be clearly defined.

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

14:00 - 15:30 Room: Hall C1
Thu-SC6 - The Art and Science of Antenna Near-Field Measurements and Diagnostics: From Fundamentals to Recent Developments (Part 1)

Yahya Rahmat-Samii, University of California, Los Angeles

This short course will provide the participants with a novel way to understand the fundamental concepts behind modern antenna near field measurement and diagnostic techniques. Starting from basic electromagnetic principles, the underlying concepts governing simulations, designs and operations of planar near field measurements and diagnostics techniques will be reviewed. Modern measurement schemes such as plane-polar and bi-polar scanning will be highlighted. Advances in applying these techniques to millimeter-wave measurements will be reviewed. Representative measurement results of reflector and array antennas will be presented. The importance of near field diagnostic techniques will be discussed through some unique test cases. Finally, the topic of phaseless measurement techniques and algorithms will be presented demonstrating the potential applications of these techniques in modern antenna measurements. The following topics will be presented: (a) Fundamental of EM concepts for antenna characterizations including antenna radiated fields, ideal dipole, solution of wave equations and special functions, (b) fundamentals of various near-field measurement techniques including equivalence theorem, spectral formulation and probe corrections, (c) Understanding antenna near-field diagnostic techniques including simulation models, back-projections, sampling theorems, (d) Case studies of several reflector and array antenna measurements and diagnostics, and (e) Phaseless measurements and recent advances including why phaseless measurements, phase retrieval algorithms and measured results.

14:00 - 15:30 Room: Hall C2
Thu-SC7 - Atmospheric attenuation on micro- and mm-waves (Part 1)

Ondrej Fiser, Institute of Atmospheric Physics, Czech Academy of Science

The aim of this course is to show the physical principles of atmospheric attenuation of mm and cm waves aiming at the practical attenuation computation. The relation between physical properties of atmosphere (meteorological parameters) and radio wave attenuation is also scheduled in the programme. The most important phenomena, such as rain, cloud and water vapour will be emphasized. Course participants will be able to estimate the cumulative distribution of atmospheric attenuation as well as its instantaneous values on terrestrial (LOS) and satellite links for frequencies 10-100 GHz.

Content:

1. Prediction (estimation) of atmospheric attenuation as a part of the radio-relay or satellite link planning, overview of attenuation effects based on physical reasons

2. Rain attenuation
- Important properties of rain drops and rain volume
- Scattering of electromagnetic wave on a single rain drop (Rayleigh approximative scattering, Mie approximative scattering, exact scattering) and practical computations with respect to the frequency and temperature
- Deduction of formula to compute specific attenuation and phase delay due to rain, approximative formulas according to the ITU-R
- Short description of rain depolarisation
- Overview of models (prediction methods) for cumulative distribution (CD) of rain attenuation on microwave and mm links (ITU-R model, Misme-Fimbel model and many others)
- Details of rain attenuation estimation on satellite (slant) paths respecting the height profile of the atmosphere
- Measurement and processing of rain rate aiming at attenuation prediction, analytical models of rain rate distribution
- Focus on drop size distribution (DSD) and its importance in radio wave propagation, analytical models of DSD
- Practical computation of rain attenuation, examples of results, annual statistics, worth month statistics, diurnal and seasonal variation
- Verification of attenuation prediction methods

3. Cloud attenuation
- Physical structure of cloud, cloud droplet size distribution
- Derivation of formulas computing instantaneous cloud attenuation
- Engineering methods estimating cloud attenuation distribution, examples
- Meteorological parameters necessary to predict cloud attenuation

4. Water vapour attenuation
- Formulas computing the specific water vapour attenuation
- Practical methods estimating distribution of water vapour attenuation
- Meteorological parameters to derive water vapour attenuation

5. Combination of attenuation effects

6. Site diversity - a powerful mitigation technique

7. Summary

14:00 - 15:30 Room: Hall C4
Workshop on 3D EM Modeling using EMPIRE XCcel 5.20 (Part 1)

During the EUCAP 2009 a free workshop on 3D EM Modeling will be held where key features of the new EMPIRE XCcel 5.20 will be demonstrated by presentations, life demos and a hands-on tutorial where the attendees can follow a complete EM-based design of a conformal patch antenna step-by-step.
The new version EMPIRE XCcel 5.20 features the new Perfect Geometry Approximation (PGA) method which allows the accurate modelling of rounded structures with a coarse mesh and is therefore perfectly suited for conformal antennas. In addition, a comprehensive object library has been added for the easy set-up of complex shapes.

15:30 - 16:00 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 3

EWCA3: Convened: European Workshop on Conformal Antennas (EWCA)-3

Chair: Zvonimir Sipus (University of Zagreb, Croatia), Peter Knott (FGAN-FHR, Germany)

16:00 Design of a UWB Wide-Slot Antenna and a Hemispherical Array for Breast Imaging
Ian Craddock (University of Bristol, United Kingdom); David Gibbins (University of Bristol, United Kingdom); Maceij Klemm (University of Bristol, United Kingdom)
A hemispherical antenna array based around a UWB slot antenna is presented.

16:20 Broadbeam Conformal Array Antenna for WiMAX Communications
Julio Brégains (University of Santiago de Compostela, Spain); Francisco Ares-Pena (University of Santiago de Compostela, Spain)
The numerical model of a broadbeam conformal array prepared for working at the 3.4-3.6 GHz WiMAX frequency range is presented in this paper

16:40 Radiation by Conformal Patch Antennas on a Magneto-dielectric, Low-density Material
Leo Kempel (Michigan State University, USA); Ben Crowgey (Michigan State University, USA); John Xiao (University of Delaware, USA)
This paper presents simulations of conformal antennas printed on a polymer nanocomposite material. Measured data is used for the material properties.

17:00 An Efficient Hybrid Numerical-Ray based Subaperture Formulation for the Analysis of Large Convex Conformal Antenna Arrays on Large Platforms
Prabhakar Pathak (The Ohio State University, USA); Robert Burkholder (Ohio State University, USA); Jin-Fa Lee (Ohio State University, USA); Panuwat Janpugdee (National University of Singapore, Singapore)
A hybrid combination of numerical and UTD ray methods is developed within a subaperture formulation for the efficient analysis of large conformal arrays on a very large complex platform.

17:20 Comparison of Various Spherical Antenna Array Element Distributions
Leonidas Marantis (University College London, United Kingdom)
Spherical Array Antennas have been proposed for antenna applications where an omnidirectional beamsteering capability in both azimuth and elevation is required. In this paper, three different distributions (quasi-uniform, Leopardi's and spiral) are presented and investigated. Simulation pattern results of each different distribution are demonstrated and compared to test pattern results.

17:40 A Ray Description for Collective Surface Fields Produced by Large Conformal Arrays on a Convex Metallic Surface
Panuwat Janpugdee (National University of Singapore, Singapore); Prabhakar Pathak (The Ohio State University, USA); Robert Burkholder (Ohio State University, USA)
An asymptotic solution is obtained for the surface field produced by a large aperture that is conformal to a convex metallic surface. It is expressed as a few surface rays emanating from specific points on the aperture boundary to propagate along the geodesic surface ray paths to the observation point.

Room: CC Room 4

Thu-S25: Data Acquisition, Algorithms and Processing Methods

Chair: Luca Salghetti (European Space Agency-ESTEC, The Netherlands), Ronald Lyon (SELEX Galileo, United Kingdom)

16:00 Robot Controlled Data Acquisition System for Microwave Imaging
Nikola Petrovic (Mälardalen University, Sweden); Tommy Gunnarsson (Mälardalen University, Sweden); Nadine Joachimowicz (Supélec, France); Magnus Otterskog (Mälardalen University, Sweden)
Herein we validate a flexible robot controlled microwave imaging system, able to measure the vertical polarized field along both cylindrical and spherical surfaces around the object. The objective is to achieve a flexible system capable to be used in both hardware and algorithmic investigations for future microwave imaging systems.

16:20 Modelling of radiation patterns using scalar spherical harmonics with vector coefficients
Jussi Rahola (Nokia, Finland); Fabio Belloni (Nokia Corporation, Finland); Andreas Richter (NOKIA, Finland)
A method for representing radiation patterns using an expansion in scalar spherical harmonics with vector coefficients in presented. The coefficients of the expansion can be obtained using numerical integration or by a least squares technique. Rotation and interpolation of patterns is very straightforward using such expansions.

16:40 Antenna diversity measurement system
Laurent Dussopt (CEA-léti / Minatec, France); Lionel Descroix (CEA-Léti / Minatec, France)
This paper presents theoretical and experimental results to demonstrate the capabilities of an antenna-diversity measurement set-up installed in an anechoic chamber. A numerical model of the set-up has been developped and experimental tests have been performed with dipole antennas in space-diversity with good agreement with the simulations.

17:00 Near-Field Far-Field Transformation in Echoic Measurement Environments Employing Scattering Center Representations
Carsten Schmidt (Universität Stuttgart, Germany); Thomas F. Eibert (Technical University of Munich, Germany)
Near-field measurements in echoic measurement environments are disturbed by single and multiple reflection and diffraction effects. These are considered in the near-field transformation algorithm by multiple scattering centers. This allows filtering out the main echo contributions in the transformation result.

17:20 A Novel Approach to the Design of Generalized Plane-Wave Synthesizers
Amedeo Capozzoli (Università di Napoli Federico II, Italy); Claudio Curcio (Università di Napoli Federico II, Italy); Giuseppe D'Elia (Università di Napoli Federico II, Italy); Angelo Liseno (Università di Napoli Federico II, Italy); Pietro Vinetti (Università di Napoli Federico II, Italy)
We propose a novel approach for designing Plane Wave Synthesizers which properly controls the computational burden arising from the tuning of the element positions and the optimization of the excitation coefficients. The performance of the approach are verified following a numerical analysis to enlighten the key points of the problem.

Room: CC Room 5

Thu-S24: Phased Array Antenna Testing

Chair: Daniel Janse van Rensburg (Near Field Systems Inc., USA), Helmut Wolf (EADS Astrium & Communications Satellites, Germany)

16:00 Rapid method for finding faulty elements in antenna arrays using far field pattern samples
Juan Rodríguez-González (University of Santiago de Compostela, Spain); Francisco Ares-Pena (University of Santiago de Compostela, Spain); Manuel Fernández-Delgado (University of Santiago de Compostela, Spain); Roberto Iglesias-Rodríguez (University of Santiago de Compostela, Spain); Senen Barro-Ameneiro (University of Santiago de Compostela, Spain)
A simple and fast technique that allows a diagnosis of faulty elements in antenna arrays, that only needs to consider a small number of samples of its degraded far-field pattern is described. Mutual coupling as well as noise/measurement errors in the pattern samples was considered in the numerical analysis.

16:20 Antenna Characterization Approach for High Accuracy of Active Phased Array Antennas on Spaceborne SAR Systems
Marco Schwerdt (German Aerospace Center, Germany)
In example of measurements performed in space with TerraSAR-X an antenna characterization approach will be described. This approach contributes not only to the tight performance of SAR systems with high accuracy but also to an efficient way of commissioning such complex SAR systems.

16:40 Experimental Results of Non-Radiative Calibration of a Tower Top Adaptive Array
Justine Mc Cormack (National University of Ireland, Maynooth, Ireland); Gerry Corley (National University of Ireland, Maynooth, Ireland); Ronan Farrell (NUI Maynooth, Ireland)
This paper presents the experimental results of the non-radiation calibration of a tower top adaptive array. The calibration of adaptive arrays is an impediment to their implementation in wireless communication systems. This non-radiative calibration approach proposes to remove the need for matched hardware and external sources for calibration.

17:00 Compensation of Couplings in a Linear Array Antenna Measurement System
Javier Torres Martín (Indra Sistemas, Spain); Fernando Martín Jiménez (Indra Sistemas, Spain); Manuel Sierra-Castaner (Universidad Politécnica de Madrid, Spain)
A straightforward model is presented to compensate the influence of adjacent radiating elements in the measurement of a linear array. The measurement system structure and operation is reviewed. Finally, measurements of a radar monopulse array are presented to show the performance of this compensation method.

17:20 Antenna Diagnostic Applications
Bengt Svensson (Saab Microwave Systems, Sweden); Hakan Eriksson (Saab Microwave Systems, Sweden)
Different applications for antenna diagnostic tools are presented. Both theoretical and measured examples are shown

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

Room: Hall A

IEEE-DL4:
IEEE AP-S Distinguished Lecturers-4

Chair: J (Yiannis) Vardaxoglou (Loughborough University, United Kingdom), Manuel Sierra-Perez (Universidad Politécnica de Madrid, Spain)

16:00 Miniaturization of Ultra-Wideband Antennas
Zhi Ning Chen (Institute for Infocomm Research, Singapore)
Ultra-wideband (UWB) has become the promising wireless technology in commercial applications such as the next generation of short-range high data rate wireless communications, high resolution imaging, and high accuracy radar. The antenna design becomes one of key factors in UWB wireless systems due to the extremely wide operating bandwidth. This presentation starts with the brief introduction of design challenges of UWB antennas. An outlined of special design considerations are presented from a systems point of view, followed by some state-of-the-art solutions which are shown with technical details from an engineering insight. Then, the miniaturization technology of UWB antennas is addressed. The planar designs are highlighted due to their unique merits and wide adoption in practical applications. Firstly, the ground plane dependence of the antenna performance, one of the most challenging issues in small antenna design is addressed. By using a newly developed technique, the dependence of small antenna performance on system ground plane has been alleviated. A design example is used to elaborate the mechanism of the method. Based on this concept, the antenna with further reduced size is designed to fit the size of wireless USB dongle for high data-rate applications. Furthermore, an innovative compact diversity UWB antenna is studied to show the advantage of ground-independence of small antenna in diversity applications. Lastly, a UWB antenna integrated with bandpass filter is proposed to reduce the overall size of devices by using the concept of co-design. In the end of the talk, the trend of UWB antenna R&D is offered according to application and Market demands

16:40 Negative-Refraction Metamataterials and Their Applications
George Eleftheriades (University of Toronto, Canada)
Recently there has been renewed interest in man-made materials with electromagnetic properties that cannot be found in nature. Therefore these materials are referred to as "metamaterials" ("meta" means "beyond" in Greek). This lecture addresses metamaterials that can support negative refraction of electromagnetic waves. For example, the feasibility of media that simultaneously exhibit negative permittivity and negative permeability, hence a negative refractive index, has been known since the sixties. However it is only recently that people discovered how to make them. In such negative-refractive-index (NRI) or "left-handed" metamaterials, waves can be thought of as propagating backwards instead of forwards. When interfaced with conventional dielectric materials, incident waves become focused on a point instead of diverging outwards, thus suggesting the implementation of lenses with flat surfaces. In this lecture it will be demonstrated that NRI metamaterials can be synthesized using planar networks of loaded transmission lines. The resulting metamaterials can be easily constructed using embedded capacitors and inductors. Since no resonators are explicitly involved, they offer wide operating bandwidths. Based on this approach, microwave NRI metamaterial lenses that can resolve details beyond the classical diffraction limit will be presented. Alternative transmission-line metamaterials that support negative wave refraction will also be described. Moreover, a number of useful antenna and microwave devices, enabled by such negative-refraction metamaterials will be demonstrated. These enabling materials and devices can find applications in diverse areas such as wireless communications, defence, and medical imaging.

17:20 THz Technology for Space and Terrestrial Applications
Peter de Maagt (European Space Agency, The Netherlands)
The terahertz (THz) part of the electromagnetic spectrum falls between the lower frequency millimetre wave region and, at higher frequencies, the far-infrared region. The frequency range extends from 0.1 THz to 10 THz, where both these limits are rather loose. As the THz region separates the more established domains of microwaves and optics, a typical THz technique will incorporate aspects of both realms, and may even draw on the best of both. The two bounding parts of the spectrum also yield distinct sets of methods of generating and detecting THz waves. These approaches can thus be categorised as having either microwave or optical/photonic origins. As a result of breakthroughs in technology, the THz region is finally finding applications outside its traditional heartlands of remote sensing and radio astronomy. Extensive research has identified many attractive uses and has paved the technological path towards flexible and accessible THz systems. Examples of novel applications include medical and dental imaging, gene theory, communications and detecting the DNA sequence of virus and bacteria. The presentation will discuss the range of THz applications and will present the components and systems that are utilised for the frequency region.

14:00 - 15:30 **Room: Hall B**

WS-ARTIC: ARTIC Workshop-2
Expert Groups workshop

The workshop will take place at EuCAP2009, on Thursday 26 March at 1400-1600

The first hour will contain a presentation from the ARTIC expert group on the applicability of their knowledge to the automotive industry:

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- Wideband antennas
- Array antennas
- Smart antennas

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19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

16:00 - 18:00 Room: Hall C1
Thu-SC6 - The Art and Science of Antenna Near-Field Measurements and Diagnostics: From Fundamentals to Recent Developments (Part 2)

Yahya Rahmat-Samii, University of California, Los Angeles

This short course will provide the participants with a novel way to understand the fundamental concepts behind modern antenna near field measurement and diagnostic techniques. Starting from basic electromagnetic principles, the underlying concepts governing simulations, designs and operations of planar near field measurements and diagnostics techniques will be reviewed. Modern measurement schemes such as plane-polar and bi-polar scanning will be highlighted. Advances in applying these techniques to millimeter-wave measurements will be reviewed. Representative measurement results of reflector and array antennas will be presented. The importance of near field diagnostic techniques will be discussed through some unique test cases. Finally, the topic of phaseless measurement techniques and algorithms will be presented demonstrating the potential applications of these techniques in modern antenna measurements. The following topics will be presented: (a) Fundamental of EM concepts for antenna characterizations including antenna radiated fields, ideal dipole, solution of wave equations and special functions, (b) fundamentals of various near-field measurement techniques including equivalence theorem, spectral formulation and probe corrections, (c) Understanding antenna near-field diagnostic techniques including simulation models, back-projections, sampling theorems, (d) Case studies of several reflector and array antenna measurements and diagnostics, and (e) Phaseless measurements and recent advances including why phaseless measurements, phase retrieval algorithms and measured results.

16:00 - 18:00 Room: Hall C2
Thu-SC7 - Atmospheric attenuation on micro- and mm-waves (Part 2)

Ondrej Fiser, Institute of Atmospheric Physics, Czech Academy of Science

The aim of this course is to show the physical principles of atmospheric attenuation of mm and cm waves aiming at the practical attenuation computation. The relation between physical properties of atmosphere (meteorological parameters) and radio wave attenuation is also scheduled in the programme. The most important phenomena, such as rain, cloud and water vapour will be emphasized. Course participants will be able to estimate the cumulative distribution of atmospheric attenuation as well as its instantaneous values on terrestrial (LOS) and satellite links for frequencies 10-100 GHz.

Content:

1. Prediction (estimation) of atmospheric attenuation as a part of the radio-relay or satellite link planning, overview of attenuation effects based on physical reasons

2. Rain attenuation
- Important properties of rain drops and rain volume
- Scattering of electromagnetic wave on a single rain drop (Rayleigh approximative scattering, Mie approximative scattering, exact scattering) and practical computations with respect to the frequency and temperature
- Deduction of formula to compute specific attenuation and phase delay due to rain, approximative formulas according to the ITU-R
- Short description of rain depolarisation
- Overview of models (prediction methods) for cumulative distribution (CD) of rain attenuation on microwave and mm links (ITU-R model, Misme-Fimbel model and many others)
- Details of rain attenuation estimation on satellite (slant) paths respecting the height profile of the atmosphere
- Measurement and processing of rain rate aiming at attenuation prediction, analytical models of rain rate distribution
- Focus on drop size distribution (DSD) and its importance in radio wave propagation, analytical models of DSD
- Practical computation of rain attenuation, examples of results, annual statistics, worth month statistics, diurnal and seasonal variation
- Verification of attenuation prediction methods

3. Cloud attenuation
- Physical structure of cloud, cloud droplet size distribution
- Derivation of formulas computing instantaneous cloud attenuation
- Engineering methods estimating cloud attenuation distribution, examples
- Meteorological parameters necessary to predict cloud attenuation

4. Water vapour attenuation
- Formulas computing the specific water vapour attenuation
- Practical methods estimating distribution of water vapour attenuation
- Meteorological parameters to derive water vapour attenuation

5. Combination of attenuation effects

6. Site diversity - a powerful mitigation technique

7. Summary

Room: Hall C3
Thu-S23:
EM Exposure and Medical Applications

Chair: Ian Craddock (University of Bristol, United Kingdom), Christian Bornkessel (IMST GmbH, Germany)

16:00 Mutual Coupling in a Tomographic Imaging System
Paul Meaney (Dartmouth College, USA); Margaret Fanning (Dartmouth College, USA)
Mutual coupling is a significant issue in a medical tomographic imaging setting. This paper demonstrates that the circuit impedances presented to array elements and not just the structural presence of the extra antennas can have a significant impact on mutual coupling and must be accounted for.

16:20 Phantom Experiments with a Microwave Imaging System for Breast-Cancer Screening
Tonny Rubæk (Technical University of Denmark, Denmark); Vitaliy Zhurbenko (Technical University of Denmark, Denmark)
Phantom measurements with a microwave imaging system for breast-cancer screening is presented. Design issues are discussed and the impact of different configurations investigated.

16:40 Mobile Telecommunication and Health - Results of the German Mobile Telecommunication Program
Christian Bornkessel (IMST GmbH, Germany)
Between 2002 and 2008 the German Mobile Telecommunication Program was carried out. A total of 54 research projects in the fields of dosimetry, biology, epidemiology and risk communication investigated issues concerning possible health risks of RF EMF. The paper gives a comprehensive overview on the topics addressed and the results.

17:00 A simplified and conservative method for electromagnetic field assessment in the Fresnel region of the radiator
Daniele Trinchero (Politecnico di Torino, Italy); Alessandro Galardini (Politecnico di Torino - iXem Labs, Italy); Riccardo Stefanelli (Politecnico di Torino - iXem Labs, Italy); Paolo Gianola (Telecom Italia, Italy); Renato Scotti (Telecom Italia, Italy); Roberto Vallauri (Telecom Italia, Italy)
The paper illustrates an easy-to-apply method for electromagnetic field assessment in the Fresnel region of the radiator, based on a simplified approach and proved by full-wave simulations and measurements. The method allows the evaluation of the electromagnetic field in the Fresnel region, starting exclusively from far field radiation patterns.

17:20 SAR variations in the face due to semi-rimmed spectacles and polarised sources at GSM900 and GSM1800
Oluwaseun Ojerinde (Loughborough University, Nigeria); Chinthana Panagamuwa (Loughborough University, United Kingdom); William Whittow (Loughborough University, United Kingdom); Robert Edwards (Loughborough University, United Kingdom)
This paper presents experimental and simulated results on the effects of semi-rimmed spectacles on SAR levels inside a phantom head filled with brain simulating liquid. CW sources placed in front of the face were selected to be germane to GSM. A set of 14 spectacle pairs was used.

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

16:00 - 18:00 **Room: Hall C4**
WS-EMPIRE:
Workshop on 3D EM Modeling using EMPIRE XCcel 5.20 **(Part 2)**

During the EUCAP 2009 a free workshop on 3D EM Modeling will be held where key features of the new EMPIRE XCcel 5.20 will be demonstrated by presentations, life demos and a hands-on tutorial where the attendees can follow a complete EM-based design of a conformal patch antenna step-by-step.
The new version EMPIRE XCcel 5.20 features the new Perfect Geometry Approximation (PGA) method which allows the accurate modelling of rounded structures with a coarse mesh and is therefore perfectly suited for conformal antennas. In addition, a comprehensive object library has been added for the easy set-up of complex shapes.

Lobby 1

Thu-Poster:
Poster Session-Large Antennas-2

Chair: Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France), Bahram Sanadgol (IMST GmbH, Germany)

4.1
GPS Wideband Circularly Polarized Microstrip Antenna Array
Shailesh Raut (Communications Research Centre Canada, Canada); Aldo Petosa (Communications Research Centre Canada, Canada)
The paper presents a design of a broadband circularly polarized microstrip antenna that can operate over the entire designated GPS frequencies.

4.2
C-Band Dual-Polarized Stacked-Patch Antenna with Low Cross-Polarization and High Isolation
Zhu Sun (Shanghai University, P.R. China); Shun Shi Zhong (Shanghai University, P.R. China); Xiao-Rong Tang (Shanghai University, P.R. China); Jian Jun Liu (Shanghai University, P.R. China)
A dual-polarized hybrid-fed stacked-patch antenna element with very low cross-polarization and high port isolation is introduced.

4.3
Height reduction of circular-cylindrical dielectric lens antennas
Tin Komljenovic (University of Zagreb, Croatia); Ronan Sauleau (University of Rennes 1, France); Zvonimir Sipus (University of Zagreb, Croatia)
We have recently developed a fast CAD tool for synthesizing circular-cylindrical multi-shell dielectric lenses. The procedure is further enhanced by investigating two approaches for lens antenna height reduction. New height-reduced models are compared numerically to older designs while prototypes are under construction.

4.4
Improvement of the GO/PO Method for the Study of Focal Array Fed Lens Antennas
Ngoc Tinh Nguyen (University of Rennes 1, France); Ronan Sauleau (University of Rennes 1, France)
Focal array fed lens antennas are new lens configurations for beam diversity applications. We introduce a simple technique to account for mutual coupling between the array elements in the standard Geometrical Optics / Physical Optics method. The relevance of this approach is demonstrated at 28 GHz and 77 GHz.

4.5
Multibeam pattern generation using coupled oscillator arrays
Apostolos Georgiadis (CTTC, Spain); Ana Collado (CTTC, Spain)
Multibeam patterns are generated using coupled oscillator arrays. The complex excitation values for a desired pattern are determined using convex optimization. The solution is then applied to the coupled oscillator array using harmonic balance. The stability of the solution is guaranteed by proper design of the oscillator coupling networks.

4.6
Sidelobe Improvement in Small Arrays Using Z-plane Transform and Particle Swarm Optimization
Asim Khan (University of Manchester, England, United Kingdom); Anthony Brown (University of Manchester, United Kingdom)
Taylor distribution is widely used pencil beam synthesis technique. This paper is concerned with the sidelobe and beamwidth trade-off while having a small number of samples (i.e. small number of elements) of Taylor current distribution. A PSO based algorithm is developed and compared with that of other techniques.

4.7
Optimization of monopole four-square array antenna using a decoupling network and a neural network to model ground plane effects
Pedram Yazdanbakhsh (Duisburg-Essen University, Germany); Klaus Solbach (Universität Duisburg-Essen, Germany)
We propose a method to design a decoupling and matching network for the monopole four square array antenna on both an infinite and finite ground plane. The optimization of the decoupling and matching network and of the finite ground plane was performed with the artifical neural network approach.

4.8
Magnetic Bistable Switching Element Implemented on Quasi-CPW Inductively-coupled Slot Antenna
Patrick Deschênes (École Polytechnique de Montréal, Canada); Jean Jaques Laurin (École Polytechnique de Montréal, Canada)
This paper describes the design, fabrication and measurements of a bistable RF magnetically acutated switch consuming no power in its stable states.The switch is build directly from the same thin substrate of an inductively-coupled slot antenna using a quasi-CPW structure.

4.9
Algorithms for Synthesis of Radiation Patterns using Reconfigurable Reflectors
Julio Gutierrez-Ríos (Universidad Politecnica de Madrid, Spain); Juan Vassal'lo Sanz (Consejo Superior de Investigaciones Científicas, Spain)
This paper presents an evolutionary algorithm to get the configuration of a reconfigurable reflector in order to match with a predefined radiation pattern. Feeding of the reflector also is previously defined. The wanted target can be defined by means of a set of constrains or by sampling.

4.10
High Power Ferrite Phase Shifter for Electronic Steerable Antennas
Junaid Zafar (University of Manchester, UK, United Kingdom); Haroon Zafar (University of South Asia., Pakistan); Andrew Gibson (UMIST, United Kingdom)
At high power levels nonlinear loss is prevalent but this can be avoided using a technique called 'mode segregation' by biasing the ferrite above ferrimagnetic resonance. A combined magnetostatic/microwave finite element scheme is used to model this mode of operation in a high power partial height differential phase shifter.

4.11
Performance Improvement of Pyramidal Horn Using Triangular E-plane Metal Baffle
Chin Yeng Tan (The University of Nottingham Malaysia Campus, Malaysia); Selvan Krishnasamy T. (The University of Nottingham Malaysia Campus, Malaysia)
This paper presents work on triangular E-plane metal baffle-loading as an alternative approach to the planar metal baffles to improve the performance of pyramidal horns. The simulated results show the proposed horn offers better performance compared to the planar metal baffles-loaded horn with respect to cross-polarization, VSWR, gain and bandwidth.

4.12
Wireless power transfer using sheet-like waveguide
Kunsun Eom (Yokohama National University, Japan)
This paper proposes wireless power transfer using sheet-like waveguide, free access mat, which has small transmission loss, concentrates EM wave into itself and is easy to couple by external antennas. By applying two free access mats to the transmitter and the receiver, small coupling loss between two terminals is expected.

4.13
Multilayer Hemi-Spheroidal Lenses for Vehicle-Mounted Scanning Antennas
Tin Komljenovic (University of Zagreb, Croatia); Niksa Burum (University of Dubrovnik, Croatia); Zvonimir Sipus (University of Zagreb, Croatia)
Methods for designing vehicle-mounted scanning lens antennas are presented. Spectral domain analysis approach is used for spherical and hemispherical structures with ability to model different kinds of feeds. Spheroidal antennas are analyzed by high-frequency techniques and general electromagnetic solver, and some guidelines regarding the design of such antennas are given.

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

Lobby 1

Thu-Poster:
Poster Session-Large Antennas-2

4.14
Omnidirectional dual-reflector antenna with a GO shaped main reflector for an arbitrary far-field pattern in the elevation plane
Sandro Zang (PUC-Rio, Brazil); Jose Bergmann (PUC-Rio, Brazil); Fernando Moreira (Federal University of Minas Gerais, Brazil)
This work is about a omnidirectional dual-reflector antenna where the subreflector is genetared by an axis-displaced ellipse and the main reflector is shaped to achieve a prescribed far-field radiation pattern. To estimate electrical performance of the antenna , a full-wave stepped-waveguided model and MoM/HFIE method is employed.

4.15
Design of triple band antenna array for GSM/DCS/UMTS handset localization
Rémi Sarkis (Université catholique de Louvain, Belgium); Christophe Craeye (Université Catholique de Louvain, Belgium)
This communication presents the design of single feed, triple band antenna based on two micro strip feeding techniques to achieve three different radiation modes. An array of five antennas is manufactured for the localization of mobile handsets and a correction procedure is applied for the amplitude and phase errors.

4.16
Experimental Study of the Radiation Characteristics of a Finite Periodic Structure Excited by a Dipole
Mario Schuehler (Ilmenau University of Technology, Germany); Rainer Wansch (Fraunhofer Institut Integrierte Schaltungen IIS, Germany); Matthias Hein (Ilmenau University of Technology, Germany)
Planar antennas composed of finite periodically structured surfaces have been studied. Two differently sized periodic structures were measured and compared in terms of their radiation characteristics and the frequency dependence of the direction of the main beams. The implications of truncating the periodic structure are discussed in detail.

4.17
Feed Systems for Array-fed Reflector Scansar Antennas
Roberto Mizzoni (Thales Alenia Space Italia, Italy); Giuseppe Orlando (ThalesAleniaSpace Italia, Italy); Rodolfo Ravanelli (Thales Alenia Space Italy, Italy); Paolo Valle (ThalesAleniaSpace Italia, Italy)
Several dual linearly polarized feed systems suitable to X or Ku band array-fed reflector antennas for Scansar instruments are discussed and compared. Linear array cluster with elements sharing through a suitable reconfigurable beamforming network (RBFN), or multimode sectorial horns operating on a single feed per beam basis are considered.

4.18
Synthesis of smooth wall compact and light-weight circular horns using the BoR FDTD method
Anthony Rolland (IETR, France); Ronan Sauleau (University of Rennes 1, France)
The paper presents the synthesis of smooth wall compact circular horns using a CAD tool based on the combination between a BoR-FDTD solver and a genetic algorithm. Various structures are compared: horns with linear or shaped metallic profile unloaded or loaded with dielectric shaped lens.

4.19
Accurate Analysis of the Edge Taper Influence on the Performance of Hemielliptic Lens Antennas
Artem Boriskin (IRE NASU, Ukraine); Ronan Sauleau (University of Rennes 1, France); Alexander Nosich (IRE NASU, Ukraine)
The role of edge taper in the performance of hemielliptic dielectric lens antenna (DLA) is studied in 2-D by using the MBIE-based in-house software. Correlation between the lens extension size and the broadside directivity of the DLA fed by a priMary feed with variable radiation pattern is described.

4.20
Synthesis of An Array of Coupled Antennas
Ahmad El Sayed Ahmad (XLIM-UMR 6172-CNRS, University of Limoges, France); Marc Thevenot (XLIM-UMR 6172-CNRS, University of Limoges, France); Majed Koubeissi (University of Limoges, France); Eric Arnaud (University of LIMOGES, France); Thierry Monediere (University of Limoges, France)
This paper presents the design and the experimental characterization of a linear array of monopoles fed with a microstrip feed network. The whole array antenna has been optimized taking into account the strong mutual coupling between the monopoles.

4.21
Nonuniformly-Wound Helical Antennas
Ruzica Golubovic (Ecole Polytechnique Federale de Lausanne, Switzerland); Antonije Djordjevic (University of Belgrade, Serbia); Dragan Olcan (University of Belgrade, Yugoslavia (defunct)); Juan Mosig (Ecole Polytechnique Federale de Lausanne, Switzerland)
Helical antennas have been known for a long time, but the literature is overwhelmed with controversial information about their performance. The aim of the present paper is to optimize nonuniformly-wound helical antennas without ground plane with the goal to maximize the RHCP gain.

4.22
Satellite Horn Antenna Design
Jorge Teniente (Public University of Navarra, Spain); Ramon Gonzalo (Public University of Navarra, Spain); Carlos Del Rio (Public Unversity of Navarra, Spain)
In this paper a brief review of the horn antennas designed by the Antenna Group of the Public University of Navarra for Amazonas 2 satellite (to be launched in summer 2009) will be presented.

4.23
X-Ka Dual band prime focus feed for satellite earth terminals
Yogesh Karandikar (PhD student, Sweden); Per-Simon Kildal (Chalmers University of Technology, Sweden)
The paper discusses the electrical and mechanical design of Ka band Choke horn [1] integrated with X band Eleven feed [2] based on two parallel dipoles on ground plane and also compares measured results with simulations.

4.24
Dielectric Travelling Wave Antennas Incorporating Cylindrical Inserts with Tapered Cavities
Gunnar Armbrecht (Leibniz Universität Hannover, Germany); Eckhard Denicke (Leibniz Universität Hannover, Germany); Nils Pohl (Ruhr-Universität Bochum, Germany); Thomas Musch (Ruhr-Universität Bochum, Germany); Ilona Rolfes (Leibniz University of Hannover, Germany)
Regarding monostatic industrial radar level measurements, the maximum antenna dimensions are strictly limited and thus size limited directional antennas are needed allowing broadband radar operation. Hence, circular waveguide-fed travelling wave antennas are presented, incorporating cylindrical dielectric inserts with tapered cavities mounted inside a short metallic excitation horn.

4.25
Wideband Diplexed Feed Chain for FSS + BSS applications
Pierluigi Cecchini (Thales Alenia Space Italia S.p.A., Italy); Roberto Mizzoni (Thales Alenia Space Italia, Italy); Rodolfo Ravanelli (Thales Alenia Space Italy, Italy); Giuseppe Addamo (Istituto di Elettr. e di Ingegneria dell'Inform. e delle Telecom. (IEIIT- CNR), Italy); Oscar Peverini (Istituto di Elettr. e di Ingegneria dell'Inform. e delle Telecom. (IEIIT- CNR), Italy); Riccardo Tascone (Istituto di Elettr. e di Ingegneria dell'Inform. e delle Telecom. (IEIIT- CNR), Italy); Giuseppe Virone (Istituto di Elettr. e di Ingegneria dell'Inform. e delle Telecom. (IEIIT- CNR), Italy)
A novel wideband, high power, PIM free, dual polarized, diplexed feed chain has been developed in the full FSS+BSS (i.e. Tx/Rx :10.7-14.5 GHz + 17.2-18.5 GHZ) frequency spectrum. A wideband corrugated horn backed by a diplexed OMT that exstracts the BSS band first, is employed.

4.26
On Real Time Reflector Surface Distortion Determination
William Imbriale (Jet Propulsion Laboratory, USA); Vahraz Jamnejad (JPL, USA)
Gain loss in large reflector antennas due to main reflector surface distortion is a significant problem. However, distortions due to thermal effects are time varying and generally not known a priory. This paper presents techniques that determine the characteristics of the actual distortion in real time.

4.27
Method to Predict Scan Blindness in Printed Planar Phased Arrays
Bahram Sanadgol (IMST GmbH, Germany); Oliver Litschke (IMST GmbH, Germany); Klaus Solbach (Universität Duisburg-Essen, Germany)
Scan blindness is studied in relation with surface wave. Classical method, predicting blind spot using surface wave propagation constant does not include loading effect of antennas. Method based on effective propagation constant of surface wave is introduced. In this paper, printed dipole is considered as single element.

4.28
Beam-forming Networks for Scannable Multi-beam Antenna Arrays using CORPS and Differential Evolution
Marco Panduro (Professor-Researcher, Mexico); Carlos Del Rio (Public Unversity of Navarra, Spain)
The main objective of this paper is to combine technology based on CORPS to define the Beamforming Network and the Differential Evolution algorithm to look for optimal excitations to generate a scannable multibeam linear array.

4.29
Capacity of Linear Rectangular Microstrip Antenna Arrays
Christos Kalialakis (EETT-Hellenic Telecommunications and Post Commission, Greece); Apostolos Georgiadis (CTTC, Spain); Ana Collado (CTTC, Spain)
The capacity of MIMO systems will be analyzed versus the mutual coupling between the transmitting and receiving antennas. Arrays of microstrip patch antennas will be considered in the transmitter and the receiver. The effect of the mutual coupling between antenna elements on the capacity of the system will be studied.

4.30
High Gain Curl Antenna CP Lens
Sean O'Kane (Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom)
A lens based on spatially combining the outputs from a printed curl antenna operating at 2.49GHz and capable of converting either LH or RH CP incident energy into RH or LH CP is demonstrated

4.31
Field Fluctuations in the Fresnel Zone of a Circular Focused Aperture in the Presence of Phase Errors
Anna Aleksieieva (Clausthal University of Technology, Germany); Vladimir Dolzhikov (Kharkiv National University of Radio Electronics, Ukraine)
In paper the field fluctuation in the Fresnel zone of a circular focused aperture caused by the phase errors of the aperture distribution are investigated. The presented results illustrate that the performance of an antenna in its Fresnel zone is notably limited by the phase errors of the aperture distribution.

4.32
Super-Dense array emulating the human eye vision properties
Belen Andres-Garcia (Universidad Carlos III de Madrid, Spain); Luis-Enrique Garcia-Muñoz (University Carlos III of Madrid, Spain); Vicente Gonzalez-Posadas (Universidad Politecnica de Madrid, Spain); Daniel Segovia-Vargas (Universidad Carlos III de Madrid,, Spain)
A dense array based on the human eye photore-

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Lobby 1

Thu-Poster:
Poster Session-Large Antennas-2

ceptor physiology is proposed. The main purpose of this system is to achieve a high sensitivity in a given direction, while in other angles it can be reduced as it is no needed.

4.33
Exploiting multipath from airborne platform for direction of arrival estimation
Marija Nikolic (Washington University in Saint Louis, USA); Arye Nehorai (Washington University in St. Louis, USA); Antonije Djordjevic (University of Belgrade, Serbia)
Antenna arrays are typically mounted on the platforms that alter their responses. Diffractions and reflections from the platforms produce delayed and attenuated signal replicas. These signal paths contain additional information about the DOA of the incoming wave. We show that the exploitation of the multipath improves the estimation significantly.

4.34
Aerotransported Radar for Oil Spills Monitoring
Alexandre Silva (State University of Campinas, Brazil); Daniel Duplat (University of Campinas, Brazil); Luciano Oliveira (University of Campinas, Brazil); Hugo Hernández-Figueroa (Unicamp, Brazil)
The design of a sophisticated aerotransported antenna for oil spills monitoring is thoroughly presented. To attain the rigorous requirements including a squared cosecant radiation pattern in the E-plane, the antenna comprises a 32 radiant modules, whose coupling level is controlled by an efficient matching scheme.

Lobby 1

Thu-Poster:
Poster Session-New Material

Chair: Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France), Andre Rennings (University of Duisburg-Essen, Germany)

4.35
Design of an AMC Plane for a Unidirectional,Low Profile Tulip-Loop Antenna
Muge Tanyer-Tigrek (Delft University of Technology, The Netherlands); Rosa Mateos (UCL, Belgium); Christophe Craeye (UCL, Belgium); Ioan Lager (Delft University of Technology, The Netherlands)
The ways of converting a wide band, electrically small in size, bi-directional quasi magnetic antenna into an uni-directional one are investigated. The purpose is to develop a magnetic wall parallel to the antenna which provides lowprofile unidirectional designs, without sacrificing the bandwidth too much.

4.36
Electromagnetic characterization of plasma antennas
Eleonora Vecchioni (Università Politecnica delle Mare, Italy); Graziano Cerri (Università Politecnica delle Mare, Italy); Paola Russo (Università Politecnica delle Mare, Italy)
An experimental investigation of plasma antennas and a model for the ionization by an intense electromagnetic field of a weakly ionized plasma column are presented. The model is helpful in plasma antennas design: it provides the distribution of electromagnetic fields and the electron distribution function, evaluated solving the Maxwell-Boltzmann system.

4.37
Investigation of Guiding and Radiating Properties of Resonant-Slot Coupled Cavity Chain
Silvio Hrabar (University of Zagreb, Croatia); Helga Kumric (University of Stuttgart, Germany); Davor Zaluski (University of Zagreb, Croatia)
It is shown both numerically and experimentally that recently proposed Resonant-Slot Coupled Cavity Chain can act as a waveguide that supports bakkward-wave propagation, propagation with infinite wavelength and forward-wave propagation. It is also shown that this structure can be used for construction of leaky-wave antennas with backward-forward scanning capabilities.

4.38
Reduction of the mutual coupling between two adjacent patches using various ideal High Impedance Surface positionings
Nicolas Capet (ONERA, France); Cedric Martel (ONERA, France); Jerome Sokoloff (University Paul Sabatier of Toulouse, France); Olivier Pascal (University of Toulouse, France)
It will be shown that a perfectly magnetic conducting surface can be used to replicate the effects of an ideal high impedance surface (HIS). Then, an investigation of the means of minimising the mutual coupling between two patches will be carried out by varying the position of the ideal HIS.

4.39
Resonant Excitation of a Truncated Metamaterial Cylindrical Shell by a Thin Wire Monopole
Oleksiy Kim (Technical University of Denmark, Denmark); Aycan Erentok (Nokia, Germany); Olav Breinbjerg (Technical University of Denmark, Denmark)
A meta-material truncated cylindrical shell excited by a thin wire monopole is investigated using the integral equation technique as well as the finite element method. Simulations reveal a strong field singularity at the edge of the truncated cylindrical shell, which critically affects the matching characteristics of the monopole.

4.40
Study of Small-Size Stacked Fabry-Perot Cavities for Focal Array Applications
Shoaib Muhammad (Université de Rennes1, France); Ronan Sauleau (University of Rennes 1, France); Hervé Legay (Thalès Alenia Space, France)
We analyse in this paper the characteristics of small-size Fabry Perot antennas made of two-stakked cavities of different sizes and Q-factors, and compare their characteristics to standard single cavity configurations. Our results show strong improvements in terms of radiation, impedance bandwidths and side lobe level.

4.41
Characterization of Antennas on Dielectric and Magnetic Substrates Effective Medium Approximation
Damien Rialet (University of Rennes 1, France); Ala Sharaiha (IETR-Université de Rennes 1, France); Anne-Claude Tarot (University of Rennes1, France); Christophe Delaveaud (CEA-LETI, France)
This paper presents a study of the effective medium approximation of a monopole antenna printed on either a dielectric or a magnetic substrate. Simple analytical formulas to determine the effective permeability of such an antenna have been proposed and validated.

4.42
Compact CSRR-loaded Substrate Integrated Waveguide Resonators on LCP Substrate
Djuradj Budimir (University of Westminster, United Kingdom)
In this paper a compact substrate integrated waveguide resonator with CSRRs is presented. Resonators are designed and simulated. Proposed structures are 28% more compact than their conventional counterparts. This is achieved by modification of electromagnetic properties of the waveguide by means of creating artificial media inside the waveguide resonator.

4.43
Protection of RF electronics using tuneable Frequency Selective Surfaces
Stefania Monni (TNO Defence Security and Safety, The Netherlands); Dave Bekers (TNO Defence Security and Safety, The Netherlands); Maurice van Wanum (TNO Defence Security and Safety, The Netherlands); Raymond van Dijk (TNO Defence Security and Safety, The Netherlands); Andrea Neto (TNO, The Netherlands); Giampiero Gerini (TNO - Defence, Security and Safety, The Netherlands); Frank van Vliet (TNO Defence Security and Safety, The Netherlands)
In this paper the concept of limiting Frequency Selective Surface (FSS) is presented. The design of a reconfigurable FSS equipped with PIN diodes, aimed at the protection of a radar receiver from high power impinging electromagnetic waves is outlined and verified against the measurement results of a hardware demonstrator.

4.44
Low Cost Manufacturing Process for Stopband Wireless Spatial Filters
Riccardo Stefanelli (Politecnico di Torino - iXem Labs, Italy); Marco Digiovanni (Filca Spa, Italy); Daniele Trinchero (Politecnico di Torino, Italy)
This work introduces a low cost solution for the design, realization and installation of frequency selective spatial filters for wireless application. The paper focuses on the manufacturing process and the installation procedure, introduced to minimise costs and times.

4.45
Zeroth Order Resonator Antenna realized on shielded micro coplanar transmission line
David Vrba (Faculty of electrical engeneering CTU in Prague, Czech Republic); Milan Polivka (Czech Technical University in Prague, Czech Republic)
MTM ZOR antenna realized on micro-coplanar TL were designed to achieve broadside patch-type radiation pattern. The antenna footprint size without ground plane is 1/4λ0×1/6λ0, the total height is 1/20?0. Simulated radiation efficiency and gain are 69% and 1.61dBi, respectively at design frequency f=4.95GHz

4.46
Metamaterial-Based Dual-Band Circularly-Polarised Antenna for GNSS Application
David de Castro Galan, Daniel Segovia-Vargas (Universidad Carlos III de Madrid,, Spain)
In this paper, a metamaterial-based branch line is used to obtain a circularly polarised antenna at two frequencies to be used in the future navigation system Galileo's Open Service.

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4.47
Design of EBG Structure by Using a Transmission Line Model
Onofrio Losito (Politecnico di Bari, Italy); Michele Bozzetti (Politecnico di Bari, Italy); Michele Gallo (Politecnico di Bari, Italy)
An efficient circuital model based on a transmission line technique to design a planar circularly symmetric (PCS) EBG structure is shown in this paper. The EBG structure,surrounding a printed patch antenna, increases its directivity and bandwidth and prevents the propagation of surface waves on a printed board.

4.48
Transmission, magnification and demagnification of microwave near-field distributions by tapered arrays of wires
Rostyslav Dubrovka (Queen Mary, University of London, United Kingdom); Pavel Belov (Queen Mary University of London, United Kingdom); George Palikaras (Queen Mary University of London, United Kingdom); Yan Zhao (Queen Mary, University of London, United Kingdom); Constantin Simovski (Helsinki University of Technology, Finland)
The possibility to use tapered arrays of wires as devices capable of transmission, magnification and demagnification of microwave images with subwavelength resolution is discussed. Three fold magnification and magnification of an image with resolution of 1/30 wavelength is demonstrated both numerically and experimentally.

4.49
High Gain Sectoral Metallic EBG Antenna
Dina Serhal (University of Limoges, XLIM laboratory, France); Bernard Jecko (University of Limoges, France); Mohamad Hajj (University of Limoges, France)
This paper introduces a new model of high gain sectoral EBG antenna for WiMAX applications. A novel model of planar EBG structure based on Babinet principle is proposed. A prototype of sectoral EBG antenna, operating in WiMAX bandwidth and using the multi-source technique, is realized.

4.50
Tailoring the Radiation Pattern of Patch Antennas by Using Soft/Hard Surfaces
Oscar Quevedo-Teruel (University Carlos III of Madrid, Spain); Eva Rajo-Iglesias (University Carlos III of Madrid, Spain)
In this paper, the use of soft or hard surfaces for changing the radiation pattern of the fundamental modes of microstrip patch antennas will be introduced.

4.51
Gain enhancement of a multilayer microstrip patch antenna by means of a truncated planar periodic structure
Luis Inclan-Sanchez (University Carlos III of Madrid, Spain); Jose-Luis Vazquez-Roy (University Carlos III of Madrid, Spain); Eva Rajo-Iglesias (University Carlos III of Madrid, Spain)
We have investigated the gain enhancement mechanism produced by the introduction of a truncated periodic structure, in multilayer configuration, in the substrate of the patch. In the present paper we analyse the characteristics of the antenna design related to the coupling of energy between the patch and the metallic elements

4.52
New Band-Stop Filter Design By Using Compensated Microstrip Capacitor and Coupled Octagonal Defected Ground Structure (DGS)
Ahmed Boutejdar (University of Magdeburg, Germany)
In this paper, we proposed a new compact DGS band-stop filter. The philosophy of the structure behind this microstrip band-stop filter is simple as it is composed of a pair of octagonal slots. In order to validate the feasibility of the proposed design method, a filter is designed and fabricated.

4.53
Theoretical and Experimental Effective Parameters of Metamaterial
Wafa Abdouni (Université de Rennes 1, France); Anne-Claude Tarot (University of Rennes1, France); Ala Sharaiha (IETR-Université de Rennes 1, France)
The effective parameters ? and ? are fundamental quantities in the conception of materials. We use the inversion and the field summation methods to determine the effective permeability and permittivity of a metamaterial structure. A prototype is realized and we compare the theoretical to the experimental results.

4.54
Waveguide Miniaturization using Wire-based *Metamaterial with Spatial Dispersion*
Silvio Hrabar (University of Zagreb, Croatia); Davor Zaluski (University of Zagreb, Croatia); Kristijan Walter (University of Zagreb, Croatia)
It was shown both numerically and experimentally that waveguide with non-connected perpendicular wires (a wire-medium with spatial dispersion) supports subwavelength forward-wave mode. This mode could be very useful in construction of miniaturized waveguide devices and antennas.

4.55
Low Profile, Directive and Ultra Wideband Antenna on a High Impedance Surface
Aita Thior (Institut TELECOM, TELECOM ParisTech, France); Anne-Claire Lepage (Institut TELECOM, TELECOM ParisTech, France); Xavier Begaud (TELECOM ParisTech, France)
This paper describes the conception of a directive ultra wide band antenna above a high impedance surface (HIS). Radiation patterns are controlled by setting astutely resistive loads on the high impedance surface. This antenna operates from 3GHz to 5GHz with a broadside gain varying from 3.5 to 9.3dB.

4.56
Planar Antennas Integrated with Metamaterials
Francesco Caminita (University of Siena, Italy); Stefano Maci (University of Siena, Italy); Giuseppe Di Massa (University of Calabria, Italy); Sandra Costanzo (University of Calabria, Italy); Giuseppe Mauriello (Selex Galileo, Italy); Ignazio Venneri (University of Calabria, Italy); Giacomo Guarnieri (Selex Galileo, Italy)
In this paper a compact version of the planar shorted corrugations is proposed, that is suitable to be integrated with planar arrays. An additional benefit of the proposed structure is an increase of gain, that may relax the condition of interspacing free of grating lobes for fixed beam applications.

4.57
A CRLH Metamaterial based RF Coil Element for Magnetic Resonance Imaging at 7 Tesla
Andre Rennings (University of Duisburg-Essen, Germany); Jochen Mosig (IMST GmbH, Germany); Achim Bahr (IMST GmbH, Germany); Christophe Caloz (Ecole Polytechnique de Montreal, Canada); Mark Ladd (University of Duisburg-Essen, Germany); Daniel Erni (University of Duisburg-Essen, Germany)
The possibility of using zeroth-order-resonant-antennas (ZORAs) in magnetic-resonance-imaging (MRI) to provide the uniform RF magnetic field required for high-quality MRI is explored. The proposed zeroth-order-resonant-coil (ZORC) element is shown to provide a very uniform field, appropriate for sagittal/coronal MRI images, and to exhibit a favorable loaded-to-unloaded-quality-factor-ratio of around 1/2.

4.58
Design method of EBG structure with wide defect band
Lina Moustafa (University of Limoges, France)
The bandwidth of the EBG resonator is limited by the width of its material transmission peak. To enhance the resonator bandwidth, the transmission band of the antenna material has to be improved. A design method to conceive wide defect band material for broadband EBG resonator antenna applications is described.

4.59
Dual Band Dielectric EBG Resonator Antenna
Ahmad Kanso (University of Limoges, France); Regis Chantalat (CISTEME, France); Marc Thevenot (XLIM-UMR 6172-CNRS, University of Limoges, France); Thierry Monediere (XLIM-UMR 6172-CNRS, University of Limoges, France); Bernard Jecko (University of Limoges, France)
Electromagnetic Band Gap materials are dielectric or metallic structures composed of a periodic assembly of two or more materials. The insertion of a defect in the periodicity allows creating a transmission frequency band within the bandgap. By the insertion of several defects, these materials can operate on multiple frequencies.

4.60
Phase and group velocities in three dimensional ideal cloaks
Enrica Martini (University of Siena, Italy); Stefano Maci (University of Siena, Italy); Arthur Yaghjian (Research Consultant, USA)
A explicit expression is derived for phase and group velocity inside a spherical ideal cloak by assuming a realistic behaviour of the permeability and permittivity tensors with frequency.

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

Lobby 1

Thu-Poster:
Poster Session-Propagation-4

Chair: Moritz Schack (TU Braunschweig, Germany) , Tricia Willink (Communications Research Centre, Canada)

4.61
Path Loss Pattern Prediction in Tokyo City Based on Deterministic Ray Tracing and Stochastic Multi-Parametric Approaches
Nathan Blaunstein (University of Beer Sheva, Israel)
Investigation of two planning tools based on the deterministic ray tracing model, as direct computations of numerous rays arriving at the receiver, and the stochastic multi-parametric model, as combination of statistical description of the built-up rough terrain, and of radio propagation accounting for multiple reflection, scattering and diffraction.

4.62
Break Point Estimation in Train Tunnels
Javier Alonso (University, Spain); Jordi Romeu (Universitat Polytecnica de Catalunya, Spain)
In this paper a new approach to estimate break point distance inside a train tunnel at high frequencies is presented. This distance determines the change in the radio propagation loss slope and its determination allows model the received power inside the tunnel with a two slope model.

4.63
Analysis of wideband radio channel properties for planning of next-generation wireless networks
Haibin Zhang (TNO ICT, The Netherlands); Onno Mantel (TNO Information and Communication Technology, The Netherlands); Maurice Kwakkernaat (Eindhoven University of Technology, The Netherlands); Matti Herben (Eindhoven University of Technology, The Netherlands)
In this paper, we analyse the application of wideband channel properties (delay and angular spread) in the radio planning of MIMO-OFDM-based wireless systems. In particular, the following aspects are addressed: Prediction and definition of delay and angular spread; A wideband high-resolution measurement campaign in an urban area;o Prediction accuracy analysis.

4.64
High Performance parallel processing algorithms for mobile communication
Ravi Palaniappan (University of Central Florida, USA); Mohammad Ahmad (University of Central Florida, USA); Thomas Clarke (University of Central Florida, USA)
This paper demonstrates the development of a dynamically reconfigurable scalable High Performance Signal Processor architecture for mobile radio applications that significantly reduce size, weight, and power over conventional technologies. The proposed software algorithms are useful for next generation radio and communication platforms such as software defined radios.

4.65
RFID Read-region Models in Real Environments
Emidio Di Giampaolo (University of Rome Tor Vergata, Italy); Gaetano Marrocco (University of Rome Tor Vergata, Italy)
The reading range is one of the most critical performance indicators of an RFID system, depending on many physical and geometrical parameters. This paper proposes a fast prediction model, based on a small set of data, able to achieve the same accuracy of a fullwave model in realistic applications.

4.66
Diversity Benchmarking for Macrocell Environments
Juan Pontes (Universität Karlsruhe (TH), Germany)
In this paper an extensive simulation framework for cellular systems and multiple antenna systems is given. Based on it, in a summarizing attempt of previous antenna performance studies, a urban macrocell scenario is considered for benchmarking of different setups at varying base 4tation and mobile antenna distance.

4.67
Frequency Diversity for Spatial Characterization of Wideband Channel with Multiple Antennas
Jonathan Mora-Cuevas (UPM, Spain); Carlos Gómez Calero (Universidad Politecnica de Madrid, Technical University of Madrid, Spain); Leandro de Haro (Universidad Politécnica de Madrid, Spain)
New communications systems demand a better understanding of the spatial behaviour of propagation channels. For that purpose, we have designed a new OFDM-MIMO testbed with an antenna positioning system for carrying out measurements campaigns in several environments in order to properly characterize the directional properties of wideband channel.

4.68
Geometry Based Stochastic Analysis of MIMO channel performance when using Stacked Microstrip Antennas
Radovan Zentner (University of Zagreb, Croatia); Ana Katalini? (Croatian Post and Telecommunications Agency, Croatia); Robert Nagy (University of Zagreb, Croatia)
Effects of implementing broadband stacked microstrip antenna array properties into the Geometry Based Single Bounce propagation model are studied. Channel capacity for idealised antenna arrays with elements of omnidirectional radiation pattern and without mutual coupling is compared with capacity of equivalent stacked patch antenna arrays with mutual coupling between elements.

4.69
Measurements and comparison of WiMAX radio coverage at 2.5 GHz and 3.5 GHz
Bachir Belloul (Red-M Limited, United Kingdom); Alejandro Aragon-Zavala (Tecnologico de Monterrey, Campus Queretaro, Mexico); Simon Saunders (Real Wireless Limited, UK, United Kingdom)
The performance of co-located WiMAX transmitter sites operating at 2.5 and 3.5GHz are compared, based mainly on indoor penetration and outdoor coverage assessments. Comparisons with various empirical propagation models were made, and differences are reported and analysed. Impact on clutter and site configuration is also assessed.

4.70
Wideband Physical Channel Model for Indoor Static Mobile Terminals
Yoshichika Ohta (Softbank Telecom Corp., Japan); Teruya Fujii (Softbank Mobile, Japan)
In static usage, the mobile terminal itself doesn't move, but the environment around it changes, due to the movement of people. This paper proposes a novel wideband physical channel model for static mobile terminals used in indoor environment.

4.71
Radio direction finding applied to DVB-T network for vehicular mobile reception
Franck Nivole (Université de Rennes 1, France); Christian Brousseau (Université de Rennes 1, France); Stéphane Avrillon (Université de Rennes 1, France); Dominique Lemur (IETR, Universite' de Rennes 1, France); Louis Bertel (IETR, Universite' de Rennes 1, France)
Paper presents sounding methods and results for the estimation of Direction of Arrival (DoA) of DVB-T signals in mobile receiving configuration. Results in different kinds of environment (rural area, motorway, low density and high density town centres) are given and discussed.

4.72
Empirical Time-Spatial Propagation Model at BS in Outdoor NLOS Environments for Wideband Mobile Communication Systems
Teruya Fujii (Softbank Mobile, Japan); Yoshichika Ohta (Softbank Telecom Corp., Japan); Hideki Omote (Softbank Telecom Corp., Japan)
In this paper, we propose an empirical time-spatial propagation model (TSP model) based on a heuristic formula estimated from field measurement data obtained in urban and suburban areas.

4.73
Influence of Antenna Noise Temperature and Down Tilt on WCDMA Base Station Capacity
Karl-August Steinhauser (Kathrein, Germany)
The paper investigates the influence of Antenna Noise Temperature and Down Tilt on WCDMA Base Station Capacity

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

Lobby 1

Thu-Poster:
Poster Session-Special Wideband Designs

Chair: Christian Pichot (Université de Nice - Sophia Antipolis, CNRS, France), Jeremie Bourqui (University of Calgary, Canada)

4.74
The Versatile U-Slot Patch Antenna
Kai Fong Lee (University of Mississippi, USA); Shing Lung Steven Yang (University of Mississippi, USA); Ahmed Kishk (University of Mississippi, USA)
U-slot patch antenna was introduced in 1995 by Huynh and Lee with an impedance bandwidth exceeding 30%. Since then, this design has been extensively studied. The purpose of this paper is to present experimental and simulation results showing the versatility of the U-slot patch antenna.

4.75
Miniaturization of Bow-tie antenna for Pulsed UWB Transceiver in the 300-960MHz Band Communication
Soheil Radiom (ESAT, Katholieke Universiteit Leuven, Belgium); Amin Enayati (ESAT, Katholieke Universiteit Leuven, Belgium); Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium); Georges Gielen (Katholieke Universiteit Leuven, Belgium)
In this paper a technique is applied to the traditional bow-tie antenna to miniaturize the area by 68% compared to the conventional bow-tie with the same impedance behavior. This reduction has achieved while the antenna still meets the system requirements.

4.76
Constrained Wire Curl Antenna Design for Minimum Axial Ratio
Sean O'Kane (Queen's University Belfast, United Kingdom); Vincent Fusco (Queen's University Belfast, United Kingdom)
A method is presented which allows a wire curl antenna designed to be accurately scaled within the 1-20 GHz frequency range. The method is implemented such that for winding angles in the range 0.18-0.26 mm/rad geometrical dimensions that yield axial ratio <1 dB can be found.

4.77
Multipurpose Admitance Matrix Analysis Approach for the Optimization of a Frequency Notched UWB Monopole Antenna
José Martínez-Fernández (Universidad Politécnica de Madrid, Spain); Valentin de la Rubia (Universidad de Oviedo, Spain); José Gil (Universidad Politécnica de Madrid, Spain); Juan Zapata (Universidad Politécnica de Madrid, Spain)
Optimization of a frequency notched UWB monopole antenna for WLAN elimination using Genetic Algorithms and a Multipurpose Admittance Matrix Approach

4.78
Dielectric Director for Near-field Microwave Imaging
Jeremie Bourqui (University of Calgary, Canada); Michal Okoniewski (University of Calgary, Canada); Elise Fear (University of Calgary, Canada)
A balanced antipodal Vivaldi antenna is designed to be used as a sensor for a microwave breast cancer detection system. The antenna directivity is significantly improved by the inclusion of a novel feature which consists of a profiled piece of higher dielectric placed in the antenna aperture.

4.79
Reduced-order pattern representation of UWB antenna devoted to positioning
Christophe Craeye (UCL, Belgium); Pierre Gerodez (Université catholique de Louvain, Belgium)
A UWB positioning antenna is designed following a number of constraints, like limited back-radation for placement on a wall. A method is presented for reduced-order representation of the pattern based on equivalent dipoles. The number of paramaters required is near one fourth the number needed when spherical-wave decompositions are applied.

4.80
Back Radiation Minimization of Ultra Wideband Vivaldi Antenna for Radar Application
Petr Cerny (Czech Technical University in Prague, Czech Republic); Martin Mudroch (Czech Technical University in Prague, Czech Republic)
In case of through-wall radar applications, the back radiation of used antennas could have a negative impact on the received signal. The proposed paper will present a comparison of different methods of the back radiation minimization, which will be presented on the antenna radiated impulses, directional patterns and impedance matchings.

4.81
Parametric Study on Conical Log-Spiral Antenna
Petr Piksa (Czech Technical University in Prague, Czech Republic)
The paper investigates conical shapes of log-spiral antenna in the radiation pattern and the frequency independences of gain and axial ratio. Parametric study is based on numerical modelling using FEKO simulator. Unidirectional radiation pattern appears only at the lowest working frequency for a wider cone angle.

4.82
Statistical Analysis of a Parametric Model of a "population" of UWB Antennas
Christophe Roblin (ENSTA, France); Raffaele D'Errico (Ecole Nationale Supérieure de Techniques Avancées, France)
This paper deals with the statistical analysis of the parameters of a model-based representation of the FF radiation characteristics of UWB antennas.

4.83
Broadband TEM Horn Antenna with Dielectric Lens for UWB Measurement
Zdenek Hradecky (Czech Technical University in Prague, Czech Republic); Alois Holub (Czech Technical University in Prague, Czech Republic)
The paper presents broadband TEM horn antenna with dielectric lens for UWB applications in 1 - 20 GHz band.

4.84
Band Notching Ultra Wideband Microstrip Antenna with an Augmented Crescent Cut
Mohammad Jahanbakht (Islamic Azad University, Shahryar-Shahr-e-Qods-Branch, Iran); Abbas Ali Lotfi Neyestanak (Islamic Azad University, Shahr_e_Rey Branch, Iran); Iman Vakili (Islamic Azad University, Shahr_e_Rey Branch, Iran)
In this paper an ultra wideband microstrip antenna with band notching ability is proposed. It has the capability of signal rejection at almost any desired narrow or wide frequency ranges. The antenna structure includes a crescent cut in an elliptically ended feed line, which excites another subsequent radiating elliptical slot.

19:00 - 22:30 Conference Dinner in the "Deutsches Technikmuseum"

Room: CC Room 1

Fri-S2A38:
Linear and Planar Arrays

Chair: Bruno Casali (IDS, Italy), Roland Gabriel (Kathrein, Germany)

8:30 "Convened" - A Fast Synthesis Method for the cicular arrays
Chen Ding (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China); He Bing Fa (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
Circular arrays of equispaced elements are synthesised using the alternating projection method(APM).FFT can be used to exploit the symmetry of the structure.

8:50 An Aperiodic Array Antenna Using Diamond Tiles as Subarrays
Shigeru Makino (Kanazawa Institute of Technology, Japan)
This paper proposes an aperiodic array antenna using diamond tiles as subarrays, which realizes both a low cost and low side-lobe characteristics.

9:10 A Thin Antenna for 800MHz Band Base Station
Hiromi Matsuno (Yokohama National University, Japan)
We designed a antenna for 800MHz band base station. The resonance of dielectric radome contributes to the miniaturization of the antenna and we achieved a thin antenna which diameter is smaller than the half of presesent base station antenna.

9:30 "Convened" - Optimized Design of Slotted Waveguide Arrays Loaded With Parasitic Dipoles for Circular Polarization at Ka Band
José Ignacio Herranz-Herruzo (Universidad Politécnica de Valencia, Spain); Mariano Baquero (Universidad Politécnica de Valencia, Spain); Alejandro Valero-Nogueira (Universidad Politécnica de Valencia, Spain); Daniel Sanchez Escuderos (Universidad Politécnica de Valencia, Spain); Juan Vicente Balbastre (Universidad Politecnica de Valencia, Spain)
This paper describes the procedure followed to design and optimize large arrays of resonant shunt slots loaded with parasitic dipoles to achieve circular polarization. Specifically, it proposes a procedure to tune up the uniform array model design. Such method turns out to be fundamental when strong mutual couplings are presented.

9:50 Superstrate Performances and Multibeam Gain Enhancement
Senglee Foo (Powerwave Technologies, USA)
This paper studies a few possible superstrate structures and compares their performances, such as bandwidth and effect on polarization. Performance of superstrate for multi-column arrays is also examined.

Room: CC Room 2

Fri-S8P2:
Convened: Building Penetration

Chair: Yves Lostanlen (SIRADEL, France), Fernando Pérez-Fontán (University of Vigo, Spain)

8:30 Measurements of Building Penetration Loss as a Function of the Elevation Angle and Floor Level
Jaroslav Holis (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic)
The paper addresses outdoor-to-indoor penetration loss as a function of the elevation angle and the floor level. The study is based on narrowband path loss measurement trials in an urban area using a small remote-controlled airship.

8:50 DVB-SH field trial - SFN and diversity gain measurements
Michel Cohen (Alcatel-Lucent Mobile Broadcast, France); Regis Duval (Alcatel, France); Philippe Laine (Alcatel-Lucent Mobile Broadcast, France); Christian Le Floch (Alcatel-Lucent Mobile Broadcast, France); Gerard Faria (TeamCast, France); Bernard Lehembre (SFR, France); Fernando Romao (SAGEM, France)
A field test campaign of the DVB-SH technology was performed by the French MNO SFR and Alcatel-Lucent. This paper presents the results of the indoor SFN and diversity gain measurements.

9:10 Penetration Loss Measurements and Models for a DVB-H Single Frequency Network
Luc Martens (Ghent University, Belgium); David Plets (IBBT-Ghent University, Belgium); Leen Verloock (IBBT - Ghent University, Belgium); Wout Joseph (Ghent University, Belgium)
High data rate broadcast access for handheld terminals is possible using DVB-H. Building penetration loss of a DVB-H signal has been measured in 100 buildings. Models are developed to calculate the penetration loss as a function of the number of radiated walls of a room of the buildings.

9:30 Multi-Frequency Path Loss in an Outdoor to Indoor Macrocellular Scenario
Jonas Medbo (Ericsson Research, Sweden); Johan Furuskog (Ericsson Research, Sweden); Mathias Riback (Ericsson AB, Sweden); Jan-Erik Berg (Ericsson Research, Sweden)
Multi-frequency path loss measurements have been conducted in an outdoor to indoor macrocellular scenario. Four discrete CW signals were transmitted in the band 460-5100 MHz from the roof of a 29 meters tall building. Excess loss and its dependency on frequency and floor level have been studied.

9:50 Wideband Outdoor-to-indoor MIMO channel measurements at 3.5 GHz
Yves Lostanlen (SIRADEL, France); Hanna Farhat (IETR, France)
A wideband Outdoor-to-indoor MIMO channel measurements at 3.5 GHz is reported. The channel sounder and the antennas elaborated by the authors are presented. Comparison and interpretation are given using a 3D deterministic simulator based on ray-tracing.

Room: CC Room 3

Fri-S8P14:
Experiments and Databases

Chair: Danielle Vanhoenacker-Janvier (Université catholique de Louvain, Belgium) , Bertram Arbesser Rastburg (ESA - Estec, The Netherlands)

8:30 Statistical Analysis Of The SYRACUSE 3 Satellite EHF Propagation Experiment
Thierry Marsault (CELAR, France); Jean-Denis Hermant (CELAR, France); Louis DeMontera (CETP, France); Cecile Mallet (CETP, France); Laurent Barthes (University of Versailles Saint Quentin, France); Peter Gole (CETP, France)
This paper presents the results of an EHF propagation experiment obtained from a 20 GHz beacon and an onboard satellite 44GHz/20GHz repeater during the period 2006 - 2008.

8:50 Analysis of Fade Dynamics and Cloud Absorption using Beacon Data and Atmospheric Profiles
Cesar Amaya (Communications Research Centre Canada, Canada); Pierre Bouchard (Communications Research Centre Canada, Canada)
Measurements and analysis will be presented for a new propagation experiment based on data collected at CRC in Ottawa from the 20-GHz beacon of Anik-F2 satellite, a co-located multi-frequency profiling radiometer, and auxiliary meteorological equipment. Emphasis is given to the analysis of fade dynamics and to gaseous and cloud absorption.

9:10 Calibration and Interferometric Data Processing from satellite ALOS (the Baikal Region)
Alexander Leonov (Buryat Scientific Centre, Russia); Dashi Darizhapov (Buryat Scientific Centre, Russia)
The project was organized together with the Japanese Space Agency ("JAXA") No05KRSTK-022935 from 01.03.2006 "Contract on measuring of reference data for a calibration and validation a synthetic aperture radar (SAR) of a L-rang with the phased antenna a lattice (PALSAR).

9:30 Global archive of propagation measurements for satellite communication systems
Joel Lemorton (ONERA, France); Laurent Castanet (ONERA, France); Giulio Blarzino (ONERA, France); Guillaume Carrie (ONERA, France); Danielle Vanhoenacker-Janvier (Université catholique de Louvain, Belgium); Belén Montenegro-Villacieros (Université catholique de Louvain, Belgium); Antonio Martellucci (European Space Agency, The Netherlands); David Wendland (APTUS, France)
This paper presents an archive of propagation data (measured time series) related to tropospheric, ionospheric and environmental effects for fixed and mobile satellite communication systems. The archive, accessible through a web interface and will be proposed for Standardization in order to ease the adoption by Industry, National and International organisations.

9:50 Estimation of 0ºC isotherm height from Vertical Profiles of Reflectivity in raining Earth-space paths
Juan Antonio Romo (University of the Basque Country, Spain); Gorka Fiel (University of the Basque Country, Spain)
The aim of the study is the precise determination of 0° isotherm height and the bright band in rain situations, based on meteorological radar measurements. In order to identify data affected by bright band, some algorithms have been applied for the previously characterized Vertical Profiles of Horizontal and Differential Reflectivity.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 4

Fri-S1A37:
EM Theory - Special Applications

Chair: Anja Skrivervik (EPFL, Switzerland), Dirk Heberling (RWTH Aachen University, Germany)

8:30 Improving Approximate 1D Bloch Analysis through simulation of truncated periodic structures
Guido Valerio (Sapienza University of Rome, Italy); Simone Paulotto (Sapienza University of Rome, Italy); Paolo Baccarelli ("Sapienza" University of Rome, Italy); Paolo Burghignoli (Sapienza University of Rome, Italy); Fabrizio Frezza (Sapienza University of Rome, Italy); Alessandro Galli (Sapienza University of Rome, Italy); Paolo Lampariello (Sapienza University of Rome, Italy)
The modal analysis of a 1D periodic structure can be performed by simulating several unit cells to model the interactions among spatial periods. Spurious solutions are nevertheless introduced: a method to choose the correct dispersive solutions, based on the comparison of simulations using different numbers of cells, is here presented.

8:50 Simulation of a lens antenna using a parallelized version of an FDTD simulator
Erik Geterud (Chalmers University of Technology, Sweden); Mats Hjelm (Mid Sweden University, Sweden); Tomasz Ciamulski (University of Bergen, Norway); Maciej Sypniewski (Warsaw University of Technology, Poland)
A parallelized version of the QW-3D electromagnetic simulation software, based on the FDTD method, is used to simulate the combination of waveguide lens antenna and sender/receiver horn for the frequency range 10-15 GHz. The usefulness of the simulator for large and complex problems is demonstrated.

9:10 Design, Optimization and Test of High-Performance Circular Corrugated Feed Horns for Full V-Band (50 to 75 GHz) Coverage
Dietmar Fasold (University of Applied Sciences München, Germany); Eberhard Kuehn (Computational Electromagnetics, Germany); Frank Klefenz (Huber + Suhner, Switzerland)
High-performance circular corrugated horns for full V-Band use are presented. Computer optimization was mandatory to cope with the manufacturing requirement for a tolerance-insensitive design exhibiting only comparatively few, but wide slots. Close agreement was obtained between theory and measurements performed on a prototype in a Compensated Compact Test Range.

9:30 Analysis of a radial probe embedded in a dielectric cylindrical substrate
Jun Wu (University of Sheffield, United Kingdom); Salam Khamas (University of Sheffield, United Kingdom); Greg Cook (University of Sheffield, United Kingdom)
In this paper a rigorous analysis is presented for a radial current source that is embedded in a cylindrical substrate with arbitrary thikness and permittivity, which employs the generalised pencil of functions (GPOF) and the method of moments (MoM).

9:50 Numerical analysis of simple TEM conical-like antennas using mode matching in time domain
Alexander Butrym (Karazin Kharkov National University, Ukraine); Bogdan Kochetov (Karazin Kharkov National University, Ukraine); Maxim Legenkiy (Karazin Kharkov National University, Ukraine)
The paper describes a numerical technique for calculating transient radiation fields (both near and far) of simple conical antennas such as bi-conical, disc-conical, TEM-horn, bow-tie antennas. The method is based on applying Time Domain mode matching technique to the junction of two conical waveguides.

Room: CC Room 5

Fri-S6A42:
EBG Antenna Design-1

Chair: George Eleftheriades (University of Toronto, Canada), Christophe Craeye (Université Catholique de Louvain, Belgium)

8:30 Design and Analysis of Metamaterial Antenna for Mobile Handset Application
Soon Ho Hwang (Telecommunication R&D Center, Samsung Electronics, Korea); Taesik Yang (Telecommunication R&D Center, Samsung Electronics, Korea); Joon Ho Byun (Telecommunication R&D Center, Samsung Electronics, Korea); Austin S Kim (Telecommunication R&D Center, Samsung Electronics, Korea)
Proposed antenna is composed of metamaterial structure for size reduction which has two different unit cells. It covers 6 bands(DCS1800, PCS1900, WCDMA2100, Wibro, Bluetooth, and Wimax). This proposed antenna is very suitable for small and slim mobile handset.

8:50 Mean Effective Gain Enhancement of Antenna Systems with EBG Ground Plane
Katherine Siakavara (Aristotle university of Thessaloniki, Greece); John Sahalos (Aristotle University of Thessaloniki, GR-54124, Thessaloniki, Greece, Greece); Theodoros Ganatsos (Aristotle University of Thessaloniki, Iceland)
Effective polarization diversity performance was obtained with an antenna of a single dipole in front of an ANN designed EBG surface. Mean Effective Gain greater than that of a dipole-PEC antenna and less sensitivity to the continuous variation of the parameters of the impinging signals were achieved.

9:10 Design of Double Layered Metamaterial Antenna
Hany AbdEl-Raouf (Associate Professor, International Islamic University (IIUM), Malaysia); Sulaiman Syed Zaheer (International Islamic University, Malaysia); Yahia Antar (Royal Military College of Canada, Canada)
A new Double Negative metamaterial antenna is presented. The design of the unit cell is based on the Composite Right/Left-Handed Transmission Line model. The antenna resonates at different frequencies. One of these resonant frequencies is the Zero-Order Resonance which depends mainly on the equivalent circuit of the unit cell.

9:30 Mutual Coupling Reduction Between Two Inverted-F Antennas Using Mushroom-Type Composite Right-/Left-Handed Transmission Lines
Jun Itoh (National Defense Academy, Japan); Naobumi Michishita (National Defense Academy, Japan); Hisashi Morishita (National Defense Academy, Japan)
This paper preents the mutual coupling reduction between two inverted-F antennas using the mushroom-type CRLH transmission lines. The operating principle of the mutual coupling reduction between inverted-F antennas is shown. The size effect of the finite ground plane is investigated to clarify the limitation of mutual coupling reduction.

9:50 Bandwidth Enhancement of a Compact Antenna Based on the Composite Right/Left-Handed (CRLH) Transmission-Line (TL)
Mimi Aminah Wan Nordin (International Islamic University Malaysia, Malaysia); Hany AbdEl-Raouf (Associate Professor, International Islamic University (IIUM), Malaysia)
A new composite right/left-handed metametrial antenna with wide bandwidth is presented. Left-handedness of the antenna is achieved by incorporating capacitance and inductance into a conventional transmission line through patches and vias respectively. The structure is based on the mushroom structure first proposed by Sievenpiper [1].

Room: Hall A

Fri-S4A40:
Convened: UWB Antennas for Communication-1

Chair: Zhi Ning Chen (Institute for Infocomm Research, Singapore), Dirk Manteuffel (University of Kiel, Germany)

8:30 Inter-Body Channel Model for UWB Communications
Terence See (Institute for Infocomm Research, Singapore)
In this paper, the transmission performance as well as a channel model for the UWB inter-body communications will be presented. Based on transmission measurements, the path loss, which is a fundamental parameter in link budget analysis, is calculated. From the path loss data, the channel model can be constructed.

8:50 UWB Antenna Impedance Matching in Biomedical Implants
Tharaka Dissanayake (University of Newcastle, Australia); Karu Esselle (Macquarie University, Australia); Mehmet Rasit Yuce (University of Newcastle, Australia)
Ultra-wideband (UWB) has been considered for the physical layer in recently proposed IEEE802.15(TG6) standard for Wireless Body Area networks. In this paper we will demonstrate a method to minimize mismatch losses of an implanted antenna, surrounded by tissue media, by loading it with high dielectric constant insulating material.

9:10 Band-Rejected Ultrawideband Planar Monopole Antenna with Bandstop-Filter-Like Response Using Inductively Coupling Scheme
Tzyh-Ghuang Ma (National Taiwan University of Science and Technology, Taiwan)
We discuss a new band-rejected ultrawideband planar monopole. By utilizing two pairs of uniplanar folded-strips with an additional inductively coupling scheme, the proposed antenna demonstrates bandstop-filter-like response at the targeted rejection band. No via hole is required in the proposed antenna. The antenna configuration is discussed carefully in this paper.

9:30 UWB Antenna Design Based on Modal Analysis
Miguel Ferrando (Universidad Politecnica De Valencia, Spain); Eva Antonino-Daviu (Universidad Politecnica de Valencia, Spain); Marta Cabedo (Universidad Politécnica de Valencia, Spain); Alejandro Valero-Nogueira (Universidad Politécnica de Valencia, Spain)
This paper proposes the use of the Theory of Characteristic Modes, defined by Harrington and Mautz, to perform a modal analysis of diverse planar monopole antennas, both with and without band-notched behavior, in order to provide more physical insight into the radiation behavior of these antennas.

9:50 Ultra Wideband Dielectric Sandwich Loaded Antennas
Antonio Moreira (IST - Tech Univ Lisbon, Portugal); Nuno Pires (IST - Tech Univ Lisbon, Portugal); Nuno Serro (IST - Tech Univ Lisbon, Portugal); Rita Santos (IST - Tech Univ Lisbon, Portugal)
Dielectric sandwich loaded UWB microstrip fed antennas were designed and tested. A small ring monopole suitable for USB dongles is proposed. A beveled antenna with extremely large bandwidth ranging from 1.7 - 10.6 GHz was built and tested. The matching behavior of handheld UWB antennas was investigated.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall B

Fri-S3A39:
Planar and Microstrip Antennas

Chair: Lars Pettersson (Swedish Defence Research Agency, Sweden), Arne Jacob (Technische Universität Hamburg-Harburg, Germany)

8:30 New Stacked Patch Antenna for Polarisation and Radiation Pattern Diversity
Branimir Ivsic (University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia); Davor Bonefacic (University of Zagreb, , Faculty of Electrical Engineering and Computing, Croatia); Juraj Bartolic (University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia)
This paper proposes a simple antenna array based on three stacked shorted patches, which could be used for GSM band (900 MHz) in indoor environments. Three same linearly polarised patches are set in three principal planes in space and several methods were considered to optimize the parameters of the patches.

8:50 Miniaturization of Multiple Layer Folded Patch Antennas
Jiaying Zhang (Technical University of Denmark, Denmark); Olav Breinbjerg (Technical University of Denmark, Denmark)
In this paper, the multiple layer folded patch antenna is evaluated and developed as the candidate in antenna miniaturization technologies, which were designed at 2.4 GHz, 915 MHz, and 415 MHz respectively for different applications. The theoretical analysis, simulations, manufacturing issues, and measurements will be presented.

9:10 Study of Active Integrated Photonic Antenna
Yevhen Yashchyshyn (Warsaw University of Technology, Poland); Sergei Malyshev (National Academy of Sciences of Belarus, Belarus); Alexandr Chizh (National Academy of Sciences of Belarus, Belarus); Pawel Bajurko (Warsaw University of Technology, Poland); Jozef Modelski (Warsaw University of Technology, Poland)
This paper presents the results of the investigation of the broad band active integrated photonic antenna consisting of photodiode integrated directly with microstrip patch radiator.

9:30 A Multi-band Microstrip Antenna Design Using Cellular Automata and Fuzzy ART-MAP Neural Network
Youssef Tawk (University of New Mexico, USA); Joseph Costantine (University of New Mexico, USA); Silvio Barbin (Univ. Sao Paulo - Escola Politécnica, Brazil); Christos Christodoulou (University of New Mexico, USA)
This paper presents a new approach for the design of a multiband antenna.A cellular automata rule is applied to determine the corresponding slot shape.The Fuzzy ARTMAP Neural Network is implemented to link the structure of the antenna to its return loss.A prototype antenna was fabricated and tested.

9:50 Optimal Dimensions of Two Microstrip Patch Antennas for Low Mutual Coupling at 5.8 GHz
Marko Sonkki (University of Oulu, Finland); Eva Antonino-Daviu (Universidad Politecnica de Valencia, Spain); Miguel Ferrando (Universidad Politecnica De Valencia, Spain); Erkki Salonen (University of Oulu, Finland)
An antenna structure with two microstrip patches is presented with optimal dimensions to achieve good matching and low mutual coupling at the studied 5.8 GHz centre frequency.

Room: Hall C1

Fri-S5A41:
mm-Wave Antennas

Chair: Rob Lewis (BAE Systems Advanced Technology Centre, UK, United Kingdom), Reiner Thomä (TU-Illmenau, Germany)

8:30 79GHz Integrated Antenna on Low Resistivity Si BiCMOS exploiting above-IC processing
Yenny Pinto (Telecom Bretagne, France); Christian Person (Lab-STICC/MOM UMR CNRS 3192, France); Daniel Gloria (STMicroelectronics, France); Andreia Cathelin (ST Microelectronics, France); Didier BELOT (ST Microelectronics, France); Sebastien Pruvost (STMicroelectronics, France); Robert Plana (Laas-cnrs, France)
An analysis of classical techniques to reduce losses in silicon antennas is presented. A solution focused on losses reduction through 'masking' technique is proposed, along with significant results (efficiency 37.5% / gain +2.65 dBi).

8:50 "Convened" - Broadband Planar Antenna for 60 GHz Radio on Characterized PCB Substrate
Alexander Vasylchenko (Katholieke Universiteit Leuven, Belgium); Steven Brebels (IMEC, Belgium); Walter Raedt (IMEC, Belgium); Guy Vandenbosch (Katholieke Universiteit Leuven, Belgium)
A 60 GHz four-element planar antenna is developed. Antenna topology is adapted to PCB technology with characterized substrate properties at 60 GHz.

9:10 Design and manufacturing of a dielectric resonator antenna for impulse radio at 60 GHz
Daniel Sjöberg (Lund University, Sweden); Mikael Nilsson (Lund University, Sweden); Mats Arlelid (Lund University, Sweden); Giuliano Vescovi (Lund University, Sweden); Lars-Erik Wernersson (Lund University, Sweden)
We report on the design and manufacturing of a dielectric resonator antenna, codesigned with an oscillator circuit for impulse radio at 60 GHz. The realization of the impulse radio function is of very low complexity, and is based on a gated tunnel diode in a GaAs substrate.

9:30 Very Low Permittivity Slot-fed Dielectric Resonator Antennas with Improved Bandwidth for Millimetre-wave Applications
Atabak Rashidian (University of Saskatchewan, Canada); David Klymyshyn (University of Saskatchewan, Canada)
This paper introduces a new and simple method to increase the bandwidth of slot-fed dielectric resonator antennas (DRAs) for millimetre-wave applications.

9:50 A Low-Cost and High Gain Dual-Polarized Wideband Millimeter-Wave Antenna
Alexandre Perron (Institut national de la recherche scientifique, Canada); Tayeb A. Denidni (INRS-EMT, Canada); Abdel R. Sebak (Concordia University, Canada)
This paper introduces a dual-fed dual-polarized antenna for millimeter-wave applications. Both a large impedance bandwidth (11.33 GHz) and a high gain (peak of 12.9 dB) are achieved with a simple hybrid configuration. The isolation between the two ports is better than 19 dB across most of the bandwidth.

Room: Hall C2

Fri-S9M7:
RCS Measurements

Chair: Doren Hess (MI Technologies, USA), Jürgen Kruse (EADS, Germany)

8:30 Measuring the Extinction Cross Section
Christer Larsson (Lund University, Sweden); Christian Sohl (Lund University, Sweden); Mats Gustafsson (Lund University, Sweden); Gerhard Kristensson (Lund Univ, Sweden)
This paper describes a method to determine the extinction cross section for a very large bandwidth. The method is based on measurements of the radar cross section (RCS) in the forward direction using the optical theorem to calculate the extinction cross section.

8:50 RCS Measurements of Small UAVS in Non-Coorperative Field Environments
Andre Bati (Radar Reflectivity Laboratory, USA); Long To (Radar Reflectivity Laboratory, USA); Donald Hilliard (Jacobs Engineering, USA)
Near-Field RCS Measurements of Small UAVS in Non-Coorperative Environments compared with far-field compact range measurements.

9:10 RCS measurement of wind turbines
Richard Rudd (Aegis Systems Ltd, United Kingdom); Bal Randhawa (ERA Technology Limited, United Kingdom)
This paper describes recent measurements of wind turbine RCS, made using a triband channel sounder

9:30 Scaled Radar Cross Section Measurements with Terahertz-Spectroscopy up to 800 GHz
Christian Jansen (TU Braunschweig, Germany); Norman Krumbholz (TU Braunschweig, Germany); Robert Geise (TU Braunschweig, Germany); Achim Enders (TU Braunschweig, Germany); Martin Koch (Technische Universität Braunschweig, Germany)
The authors suggest the use of a fiber coupled terahertz time domain spectroscopy setup for scaled RCS studies with measuring frequencies extending from 100 GHz to above 1 THz. To validate the setup's accuracy, measurements on simple metallic bodies are performed and compared to analytically derived results.

9:50 A Low-Perturbation Near-Field Imager Equipped with Optical MST Probes
Hamidreza Memarzadeh (Ecole Polytechnique de Montreal, Canada)
The focus of this paper is on the design and realization of a microwave imaging tool using an array of optically modulated probes for making accurate, reliable, and high-resolution scans. The proposed system is almost perturbation-free and exhibits a large dynamic range which is highly suitable for near-field scattering measurements.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: Hall C3

Fri-S10J7:
Convened: Smart Antennas and MIMO

Chair: Angeliki Alexiou (Bell Labs, Alcatel-Lucent, United Kingdom), Volker Jungnickel (Fraunhofer Institut für Nachrichtentechnik (Heinrich-Hertz-Institut) Berlin, Germany)

8:30 Correlation properties of large and small-scale parameters from multicell channel measurements
Stephan Jaeckel (Fraunhofer-Institute for Telecommunications, Heinrich-Hertz-Institut, Berlin, Germany); Lei Jiang (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Germany); Volker Jungnickel (Fraunhofer Institut für Nachrichtentechnik (Heinrich-Hertz-Institut) Berlin, Germany); Lars Thiele (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Germany); Carsten Jandura (Technical University of Dresden, Germany); Gerd Sommerkorn (Ilmenau University of Technology, Germany); Christian Schneider (Ilmenau University of Technology, Germany)
Based on two multicell measurement campaigns in Berlin and Dresden, correlation properties for channel parameters to different sites and adjacent sectors of the same site are investigated. Results indicate that the assumptions in the widely used 3GPP SCM form an upper bound for the multicell correlations compared to our measurements.

8:50 Optimizing a Pifa Using the Genetic Algorithms Technique for Ultra Wideband Communications Applications
Tsitouri Christina (National Technical University of Athens, Greece)
In this paper, a structure consisting of a planar inverted F antenna (PIFA) is proposed. With the use of Genetic Algorithms (GA) optimization technique, a PIFA is presented, for ultra wide band communications applications.

9:10 Adaptive Turbo Code-Multiplexed Pilot Channel Estimation for MIMO MC-CDMA Systems in Highly Time-Variant Propagation Channels
Athanasios Marousis (National Technical University of Athens, Greece)
A semi-blind channel estimator is presented for MC-CDMA systems with multiple antennas. The novel scheme uses orthogonal code-multiplexed pilots operating as virtual users and their number is determined dynamically. The superimposed pilots are used for channel estimation before despreading utilizing the unique multi-layer pattern. An iterative architecture has been incorporated.

9:30 On the sensitivity of MIMO_NC to channel estimation errors
Francesco Rossetto (German Aerospace Center (DLR), Germany); Michele Zorzi (University of Padova, Italy)
MIMO_NC is a recently proposed physical layer for wireless Network Coding. All previous work has analyzed this system under ideal Channel State Information (CSI). Instead, this paper studies MIMO_NC under imperfect CSI and as a function of the system parameters and compares it against classic Network Coding.

9:50 Compact Multi-Element Antennas of Sinusoidal Printed Monopoles for Sensors and Portable Devices
Constantine Kakoyiannis (National Technical University of Athens, Greece); Penelope Gika (National Technical University of Athens, Greece); Philip Constantinou (National Technical University of Athens, Greece)
We present small sinusoidal printed monopoles as enhanced meander-line antennas shaped after smooth curves. Their performance was characterized in terms of electrical size, bandwidth, and broadband radiation efficiency. The results show that the sinusoidal monopole achieves 68% greater bandwidth compared to the meander-line antenna of similar size and efficiency.

Room: Hall C4

Fri-S11S7: Convened: URSI Special Session-1 Polarimetric und Propagation Aspects of Radar Remote Sensing

Chair: Madhu Chandra (Technical University of Chemnitz, Germany), Bjorn Rommen (Estec & European Space Agency, The Netherlands)

8:30 The ESA METAWAVE project - correcting for atmospheric water vapour effects in InSAR products
Bjorn Rommen (Estec, The Netherlands); Leslie Gale (BMT Argoss, The Netherlands); Ramon Hanssen (Delft University of Technology, The Netherlands); Shizhuo Liu (Delft University of Technology, The Netherlands); Christian Mätzler (University of Bern, Switzerland); Agnes Mika (BMT Argoss, The Netherlands); June Morland (University of Bern, Switzerland); Maurizio Santoro (GAMMA Remote Sensing Research and Consulting AG, Switzerland); Urs Wegmüller (GAMMA Remote Sensing Research and Consulting AG, Switzerland); Charles Werner (GAMMA Remote Sensing Research and Consulting AG, Switzerland); Hein Zelle (BMT Argoss, The Netherlands)
The project intends to mitigate effects induced by atmospheric water vapour from InSAR observations (with a particular focus on C-band).

8:50 Precipitation induced Signatures in SAR Images
Andreas Danklmayer (German Aerospace Center (DLR), Germany); Madhu Chandra (Technical University of Chemnitz, Germany)
In this contribution the effect of precipitation on SAR imaging will be addressed, especially for the case of X-band. In a further step an extrapolation of the observed effects to higher nominal frequency bands is performed.

9:10 Shapes and Orientations of Raindrops from 2D video disdrometer, polarimetric radar and a wind-tunnel study
Merhala Thurai (Colorado State University, USA); Viswanathan Bringi (Colorado State University, USA)
Measurements of shapes and orientations of raindrops using 2D video disdrometer have been compared with those derived from a recent wind-tunnel study as well as those inferred from an advanced polarimetric weather radar at S-band respectively. Results are consistent with each other.

9:30 Atmospheric water-vapor effects on spaceborne Interferometric SAR imaging: data synergy and comparison with ground-based measurements and meteorological model simulations at urban scale
Nazzareno Pierdicca (DIE - Sapienza University of Rome, Italy); Fabio Rocca (Politecnico di Milano, Italy); Nico Cimini (CETEPS University of L'Aquila, Italy); Frank Marzano (Sapienza University of Rome, Italy); Mario Montopoli (CETEMPS - University of L'Aquila, Italy); Daniele Perissin (Politecnico di Milano, Italy)
In this work, related to the ESA project Metawave, high resolution Mesoscale Model (MM5), InSAR maps of excess path length variation and Global Positioning System (GPS) estimates of integrated water vapor (IWV) are analyzed to investigate the limitations of InSAR mapping due to to water vapor variability.

9:50 Simultaneous Observations of X-band polarimetric SAR and ground-based weather radar during a tropical storm to characterize the propagation effects
Chandra V Chandrasekar, Jason Fritz (Colorado State University, USA)
Simultaneous observations of a tropical storm by a dual-polarization X-band SAR and a ground based radar provide insight into the propagation affect of heavy precipitation on spaceborne radar. Using the reflectivity from the ground radar and models of observations of precipitation the attenuation and copolar phase shift are analyzed.

10:10 - 10:40 Coffee Break (will be served in the Delegates Coffee Area at the Exhibition)

Room: CC Room 1

Fri-S13A44:
Reconfigurable Reflect Arrays

Chair: Peter Balling (ASC, Antenna Systems Consulting ApS, Denmark), Wolfgang Menzel (University of Ulm, Germany)

10:40 Reflectarray Membrane Study for Deployable SAR Antenna
Alberto Di Maria (German Aerospace Center (DLR), Germany); Markus Limbach (German Aerospace Center (DLR), Germany); Ralf Horn (German Aerospace Center (DLR), Germany); Andreas Reigber (German Aerospace Center (DLR), Germany)
In this paper a reflectarray design for a membrane antenna in a typical SAR mission is presented. An L-Band reflectarray, with a dimension of 10 by 6 meters and 4976 patch elements on a Kapton substrate, has been designed. The tolerance to the membrane deformations has been analyzed.

11:00 Robustness optimization of MEMS-based reflectarray phase-shifting cells
Hassan Salti (INSA of Rennes, France); Erwan Fourn (INSA of Rennes, France); Raphael Gillard (IETR, France); Hervé Legay (Thalès Alenia Space, France)
In this paper, we investigate the possibility to optimize the number of MEMS and their positions in MEMS-based reflectarray phase-shifting cells while preserving the necessary redundancy for minimizing the impact of MEMS breakdowns

11:20 Linear Reflectarray Antenna Design Using 1-bit Digital Phase Shifters
Siamak Ebadi (University of Perugia, Italy); Roberto Vincenti Gatti (University of Perugia, Italy); Roberto Sorrentino (University of Perugia, Italy)
Design of reflectarrays using 1-bit phase shifters is reported. Using quadratic phase of the incident spherical field on the array, the quantization error caused by phase shifters is compensated. Effects of frequency squint and number of bits and elements on radiation parameters are discussed.

11:40 Dual Linear Polarized Reflectarray Element with True-Time Delay
Eduardo Carrasco (Universidad Politecnica de Madrid, Spain); Jose Encinar (Universidad Politecnica de Madrid, Spain); Mariano Barba (Universidad Politecnica de Madrid, Spain)
This contribution presents the design of a reflectarray element based on patches aperture-coupled to delay lines. The periodic element has been modified to operate in dual polarization preserving its main advantages: a wide range of phase delay, linear phase response and low reflection losses.

12:00 MEMS Breakdown Effects on the Radiation of a MEMS Based Reconfigurable Reflectarray
Hassan Salti (INSA of Rennes, France); Erwan Fourn (INSA of Rennes, France); Raphael Gillard (IETR, France); Hervé Legay (Thalès Alenia Space, France); Herve Aubert (LAAS, France)
The goal of this paper is to estimate MEMS breakdown effects on the radiation pattern of a MEMS based reconfigurable reflectarray. In addition, a correction procedure is proposed that takes advantage of the numerous possibilities offered by the cell to reach a given phase shift.

Room: CC Room 2

Fri-S18P15:
Mobile Propagation - Indoor

Chair: Martin Jacob (Technische Universität Braunschweig, Germany), Guillaume de la Roche (University of Bedfordshire, United Kingdom)

10:40 Beam Propagation Simulations of Quasioptical Systems
Stanislav Zvanovec (Czech Technical University in Prague, Czech Republic); Milan Kvicera (Czech Technical University in Prague, Czech Republic); Petr Kucharik (Czech Technical University in Prague, Czech Republic); Petr Cerny (Czech Technical University in Prague, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic)
This paper introduces results from quasioptical simulations of entire indoor wireless network in submillimeter waveband. Interactions of electromagnetic waves with surroundings were investigated both theoretically and experimentally. Results from simulations show that beam propagation approach allows more efficiently determine whole system parameters (e.g. interference aspects) compared to conventional methods.

11:00 Analysis and Comparison of Indoor Wideband Radio Channels at 5 and 60 GHz
Michael Peter (Fraunhofer HHI, Germany); Wilhelm Keusgen (Fraunhofer-Institut für Nachrichtentechnik, HHI, Germany)
In this paper we present measurement results for indoor wideband radio channels at 5 and 60 GHz. We analyze path loss, time dispersion, frequency selectivity and the impact of an obstructed line-of-sight at both frequencies. The results are compared and characteristic differences are pointed out.

11:20 A Ray Based Indoor Propagation Model Including Depolarizing Penetration
Francesco Mani (Université catholique de Louvain, Belgium); Claude Oestges (Université catholique de Louvain, Belgium)
This paper presents the results of radio channel measurements and ray tracing simulations for an indoor propagation environment. A model for depolarizing penetration is combined with a ray tracing tool to account for depolarization.

11:40 Angular Doppler Characterization in Indoor Channels
Jussi Salmi (Helsinki University of Technology, Finland); Andreas Richter (NOKIA, Finland); Visa Koivunen (Helsinki University of Technology, Finland)
This paper presents findings on directional Doppler behavior of indoor mobile radio channel. The results have impact on several applications, such as indoor localization and MIMO channel equalization.

12:00 Experimental Characterization of Indoor Multiuser Shadowing for Collaborative Cognitive Radio
Rajesh Sharma (Jacobs University, Germany); Jon Wallace (Jacobs University Bremen, Germany)
Cross-correlation of multi-user shadowing in an indoor environment at 2.55 GHz is presented, indicating that shadowing is mostly uncorrelated after 2-4 m in the indoor environment. Similar shadowing correlation was obtained for autocorrelation measurements, moving primary (versus moving secondaries), as well as near and far primary measurements.

Room: CC Room 3

Fri-S19P16:
Refractivity-related Effects

Chair: Vaclav Kvicera (Czech Metrology Institute, Czech Republic), Joel Lemorton (ONERA, France)

10:40 Scintillation prediction using improved pre-processed radiosounding data
Danielle Vanhoenacker-Janvier (Université catholique de Louvain, Belgium); Claude Oestges (Université catholique de Louvain, Belgium); Belén Montenegro-Villacieros (Université catholique de Louvain, Belgium); Roeland Van Malderen (Royal Meteorological Institute, Belgium); Hugo De Backer (Royal Meteorological Institute, Belgium)
The classical prediction models of tropospheric scintillation predict the cumulative distribution of scintillation variance using ground measured temperature and humidity. A new method for predicting the cumulative statistics of scintillation variance uses radiosonde data and pre-processed vertical humidity profiles, applying the correction algorithms proposed by Leiterer et al.

11:00 Computations of Radar Returns of Wind Turbines
Emmanuel Van Lil (Katholieke Universiteit Leuven, Belgium); Dave Trappeniers (K.U.Leuven, Belgium); Jan-willem De Bleser (K.U.Leuven, Belgium); Antoine Van de Capelle (Katholieke Universiteit Leuven, Belgium)
Two methods for estimating the RCS of wind turbines, one based on an appromated near-field RCS and one based on UTD, will be compared

11:20 Spatial Decorrelation of VHF and UHF Trans-Ionospheric Signals Measured at Ascension Island
Max van de Kamp (University of Bath, United Kingdom); Paul Cannon (QinetiQ, United Kingdom)
The decorrelating effect of equatorial ionospheric turbulence is measured by a novel method using four spaced phase-locked antennas installed on Ascension Island. The spatial decorrelation of UHF, VHF and L-band phase during scintillation is measured.

11:40 Statistics of anomalous propagation at UHF
Richard Rudd (Aegis Systems Ltd, United Kingdom)
The paper presents the results of recent measurements of propagation on sea paths to the UK and makes comparisons with existing ITU models for anomolous propagation,

12:00 Joint probability distribution and correlation of multipath signals on 10 GHz fixed terrestrial link
Martin Grabner (Czech Metrology Institute, Czech Republic); Vaclav Kvicera (Czech Metrology Institute, Czech Republic); Pavel Pechac (Czech Technical University in Prague, Czech Republic); Pavel Valtr (University of Vigo, Spain)
Received signal fluctuations caused by atmospheric multipath fading are measured on the 10 GHz terrestrial path in 4 heights. Joint probability density function and cross-power spectral density of the signals are calculated. Correlation properties of height dependent signals are analysed for selected multipath fading events.

12:20 - 13:00 Closing Session · Room: Hall A

Room: CC Room 4

Fri-S12A43: EM Theory for RCS

Chair: Yannick Beniguel (IEEA, France), Emmanuel Van Lil (Katholieke Universiteit Leuven, Belgium)

10:40 An Efficient Approach to Compute the RCS of Complex Targets Considering Multiple Bounces
Maria Jesús Algar (University of Alcala, Spain); Lorena Lozano (Alcala University, Spain); Iván González Diego (Universidad de Alcalá, Spain); Felipe Catedra (University of Alcala, Spain)
An approach for computing efficiently monostatic and/or bistatic RCS of complex targets considering multiple is presented. The approach is based on Physical Optics (PO), the Equivalent Currents Method (ECM), Geometrical Optics (GO) and a new ray-tracing accelerating algorithm. The approach is very efficient for RCS computations.

11:00 Dual Band RCS Reduction Using Planar Technology by Combining AMC Structures
JuanCarlos Iriarte (Public University of Navarra, Spain); Iñigo Ederra (Universidad Publica de Navarra, Spain); Ramon Gonzalo (Public University of Navarra, Spain); Peter de Maagt (European Space Agency, The Netherlands)
A dual band chessboard structure to reduce RCS is presented in this paper. Two AMC structures with different working frequencies have been selected to fill the cells of the chessboard. A 180º difference is introduced to the reflected wave around the resonance frequencies of both AMCs, obtaining two operational bands.

11:20 A Hybrid Method for the Analysis of Scattering from Electrically Large Objects with Deep Cavities
Arthur Enneking (Ingenieurbüro Enneking, Germany)
A hybrid technique is presented for the analysis of high frequency electromagnetic scattering from large structures with open cavities. The technique combines an efficient ray based asymptotic method for the outer region with a full wave method for the cavity region.

11:40 A Novel Numerical Method for Computing RCS of Discontinuous Characters
Liu Zhanhe (Beijing University of Aeronautics and Astronautics, P.R. China); Huang Peilin (Beijing University of Aeronautics and Astronautics, P.R. China); Gao Xu (The First Aircraft Institute of China, P.R. China)
A new numerical method named as half-measurement method basing on simple experimental result is developed to estimate the more complex discontinuous character, it is shown that half-measurement method has high calculation precision.

12:00 Analysis of Effects of Pitot-Tube on Performance of Airborne Nose Radome
Zhang Qiang (Nanjing Research Institute of Electronics Technology, Nanjing,China, P.R. China)
In this paper the effects of pitot-tube on the performance of radome are analyzed by hybrid method and BOR techniques. The electrically large size problem can be reduced to be solved ion personal computer. The numerical results are given and compared with the measured data.Good agreements are demonstrated.

Room: CC Room 5

Fri-S17A48: EBG Antenna Design-2

Chair: Thierry Monediere (University of Limoges & CNRS, France), Jean-Pierre Adam (IEEA, France)

10:40 Radiation characteristics of a dipole embedded below a HIS
Ladislau Matekovits (Politecnico di Torino, Italy); Mario Orefice (Politecnico di Torino, Italy)
Numerical investigation on the propagation and radiation characteristics of a dipole embedded between a high impedance surface and a ground plane are proposed. Slow and fast waves regions are determined, and the radiative behavior is investigated.

11:00 Cylindrical EBG multibeam antenna for Telecommunication Networks
Hassan Chreim (University of Limoges, France); Bernard Jecko (University of Limoges, France); Christophe Dall'omo (Radiall Systems, France); Philippe Dufrane (Radiall Systems, France)
We present in this paper a novel cylindrical EBG multibeam antenna with vertical polarization for telecommunication networks. The objective of our work is to conceive the antenna which can produce 18 beams in the horizontal plane (azimuth), with 50° of radiation beamwidth.

11:20 Improved self polarizing metallic EBG antenna
Eric Arnaud (University of LIMOGES, France); Regis Chantalat (CISTEME, France); Majed Koubeissi (University of Limoges, France); Thierry Monediere (XLIM-UMR 6172-CNRS, University of Limoges, France); Marc Thevenot (XLIM-UMR 6172-CNRS, University of Limoges, France); Bernard Jecko (University of Limoges, France)
The works presented in this paper have consisted to improve the self polarizing EBG antenna design and characteristics.
Ultimately, an antenna was studied at 30 GHz (29.5-30 GHz) with a directivity of 21 dBi. The axial ratio is lower than 1 dB within the frequency range.

11:40 Arrays of Dual-Band Printed Dipoles Loaded with Metamaterial Particles
Francisco Javier Herraiz-Martínez (Carlos III University in Madrid, Spain); Luis-Enrique Garcia-Muñoz (University Carlos III of Madrid, Spain); Daniel Segovia-Vargas (Universidad Carlos III de Madrid,, Spain); David González-Ovejero (Université catholique de Louvain, Belgium); Christophe Craeye (Université Catholique de Louvain, Belgium)
Dual-band printed dipoles can be developed by loading conventional printed dipoles with metamaterial particles. In this work these metamaterial loaded dipoles are used in an array configuration. Thus, these dipoles provide interesting properties such as the array miniaturizing or the bandwidth of the overall antenna broadening.

12:00 Active Integrated Antenna Using Photonic Bandgap and Defected Ground Structure
Masoud Dahmardeh (AmirKabir University of Technology (Tehran Polytechnic), Iran); Ayaz Ghorbani (Amirkabir university of thechnology, Iran); Abdolali Abdipour (Amirkabir University of Technology, Iran)
This paper presents an active integrated antenna (AIA) enhanced using photonic bandgap (PBG) and defected ground structure(DGS). Application of DGS and PBG eliminates the harmonics.

Room: Hall A

Fri-S15A46: Convened: UWB Antennas for Communications-2

Chair: Zhi Ning Chen (Institute for Infocomm Research, Singapore), Dirk Manteuffel (University of Kiel, Germany)

10:40 Reduced-Height Wideband Conical Antennas in the VHF/UHF Bands
Sebastien Palud (University of Rennes I, France); Franck Colombel (Université de Rennes 1, France); Mohamed Himdi (Université de Rennes 1, France, France); Cyrille Le Meins (Tjales Communications, France)
This paper presents two compact wideband omnidirectional antennas for applications in the VHF and UHF bands. These antennas are based on new shapes which allow a reduction of the height of the monopole without any deterioration of the radiation properties over at least one octave bandwidth.

11:00 Time-Domain Performance of Printed UWB Antennas
Max Ammann (Dublin Institute of Technology, Ireland); Matthias John (Dublin Institute of Technology, Ireland); Patrick McEvoy (Dublin Institute of Technology, Ireland); Antoine Dumoulin (Dublin Institute of Technology, Ireland)
Three different printed Ultrawideband (UWB) monopole antennas are investigated and their performance compared in terms of bandwidth, radiation pattern stability and fidelity factor

11:20 Performance Considerations for UWB MIMO Antennas with Multimode Pattern Diversity
Oliver Klemp (Delphi Delco Electronics Europe GmbH, Germany)
This paper deals with the performance evaluation of multimode diversity antennas with spatially orthogonal radiation patterns in UWB indoor communications. We will focus on the bit-error analysis of the MB-OFDM UWB link with multimode antennas in receive diversity operation. The multimode antenna patterns are modeled in terms of spherical harmonics.

11:40 Miniaturised Antennas for UWB Communications
Xiaodong Chen (Queen Mary, University of London, United Kingdom)
Since the approval by the FCC of a 3.1 GHz - 10.6 GHz frequency band allocation to the UWB radio technology, there have been considerable research efforts towards this promising technology worldwide. As is the case in conventional communication systems, antennas also plays a pivotal role in UWB systems.

12:00 UWB Antennas for Radio Positioning Applications
Yi Huang (University of Liverpool, United Kingdom); Yang Lu (University of Liverpool, United Kingdom); Hassan Chattha (University of Liverpool, United Kingdom)
We first examine some UWB antennas already developed over the years, and identify their advantages and disadvantages for the positioning application. We then propose some new antennas which offer complimentary properties to the existing antennas. The portable planar antenna of directional radiation pattern is of particular interests.

12:20 - 13:00 Closing Session · Room: Hall A

Room: Hall B

Fri-S14A45:
Reconfigurable Antennas

Chair: David Pozar (University of Massachusetts, USA), Rainer Kronberger (Cologne University of Applied Sciences, Germany)

10:40 Wireless Powering of Sensors inside Concrete using a Reconfigurable Sierpinski Gasket Antenna
Shishir Punjala (Florida International University, USA); Kia Makki (Florida International University, USA)
Sensors buried inside concrete are usually powered with batteries or wires. Sensors could be powered from the power delivered to the antenna. The antenna used in this paper is the Sierpinski Gasket Antenna (inside concrete)has to absorb power from the plane wave incident on concrete.

11:00 Reconfigurable Triangular Patch Antenna for Pattern Diversity
Daniel Kornek (Leibniz University of Hannover, Germany); Johannes Meyer (Leibniz Universität Hannover, Germany); Christian Orlob (Leibniz University of Hannover, Germany); Ilona Rolfes (Leibniz University of Hannover, Germany)
This paper presents the design of an equilateral triangular patch antenna providing diverse patterns at the same resonance frequency, which result from the excitation of two eigenmodes by switching diodes. In this design one feed point is needed and no DC network is necessary. The concept is validated by measurements.

11:20 Reconfiguring Antenna Characteristics Using PIN Diodes
Symeon Nikolaou (Frederick University Cyprus, Cyprus); Boyon Kim (Samsung, Korea); Photos Vryonides (Frederick University Cyprus, Cyprus)
Cognitive radios require agile components and therefore antennas with reconfigurable characteristics. The current paper presents three antennas that use PIN diodes to achieve frequency, pattern and polarization reconfigurability respectively.

11:40 Design and Investigation of the Leaky-Wave Antenna with Reconfigurable Operating Frequency
Pawel Bajurko (Warsaw University of Technology, Poland); Yevhen Yashchyshyn (Warsaw University of Technology, Poland)
The article presents the design and measurement results of a reconfigurable antenna based on leaky-wave microstrip line operating on a higher order mode. Frequency band of the antenna depends on the width of the antenna aperture, which is switched by changing the state of the PIN diodes.

12:00 Integrated Wide-Narrow Band Antenna for Switched Operation
James Kelly (University of Birmingham, United Kingdom); Peter Hall (University of Birmingham, United Kingdom); Peter Gardner (University of Birmingham, United Kingdom)
This paper presents a novel planar antenna which can be reconfigured between narrow and ultra-wideband, simply by activating (or deactivating) switches within the ground plane. By employing a different configuration of switches it is also possible to alter the frequency location of the UWB band.

Room: Hall C1

Fri-S16A47:
Convened: Millimeter-Wave Antennas-3

Chair: Yue Ping Zhang (Nanyang Technological university, Singapore), Duixian Liu (IBM, USA)

10:40 An Overview of Recent Antenna Array Designs for Highly-Integrated 60-GHz Radios
Yue Ping Zhang (Nanyang Technological university, Singapore)
Following the description of basic antenna specifications for 60-GHz wireless personal area network applications, we make an overview of recently-reported antenna array designs for emerging highly-integrated 60-GHz radios in this paper. We revive the grid array antenna design and report some preliminary but promising results.

11:00 Design of Circularly Polarized Antenna for 60 GHz Wireless Communications
Rongguo Zhou (University of Arizona, USA); Duixian Liu (IBM, USA); Hao Xin (University of Arizona, USA)
This paper presents the design of a packaged 60GHz circularly polarized wideband patch antenna incorporating an air cavity and a fused silica superstrate. The impact of the CPW interface is studied. The experimental results of the packaged antenna show wide bandwidth and high efficiency, agreeing well with the simulation results.

11:20 Double Resonance of Broadband Microstrip-to-Waveguide Transition in Millimeter-Wave Band
Kunio Sakakibara (Nagoya Institute of Technology, Japan)
A broadband microstrip-to-waveguide transitions are developed in the millimeter-wave band. The quite broadband transition with air backed-short and the one composed of the multi-layer substrate are developed. Double resonance is a key feature for the broadband operation. It is due to double stubs in the waveguide and the substrate.

11:40 60-GHz Microstrip Antenna with Stacked Rings using Multi-Layer LTCC Substrate
Tomohiro Seki (NTT, Japan)
This paper proposes a novel high-gain millimeter-wave microstrip array antenna formed on a multi-layer low temperature co-fired ceramic substrate. The proposed antenna employs a microstrip antenna with the metal wall constructed with stacked rings. The thikness is 0.5mm and the gain is 12.7dBi in calculation at a 60-GHz.

12:00 New technologies and antenna design concepts at millimeter-wave bands
Sandra Costanzo (University of Calabria, Italy); Ignazio Venneri (University of Calabria, Italy); Giuseppe Di Massa (University of Calabria, Italy); Antonio Borgia (DEIS - University of Calabria, Italy)
New dielectric materials with low losses and excellent frequency stability are adopted for millimeter-wave applications. A full technological process is described and tested on a V-band array. Furthermore, a hybrid approach combining microstrip manufacturing advantages with the wideband features of waveguides is proposed for the design of broadband millimeter-wave arrays.

Room: Hall C2

Fri-S20M8:
RF Material Measurements

Chair: Rolf Jakoby (TU Darmstadt, Germany) , Christof Rohner (Rohde & Schwarz, Germany)

10:40 Wide-band characterization of printable electronics materials: the effect of conductor loss and internal inductance on relative permittivity
Juha Lilja (Patria Aviation, Finland); Hannu Sillanpää (Tampere university of technology, Finland); Riku Mäkinen (Tampere University of Technology, Finland)
Modeling of printable electronics requires characterization of used materials. Wide-band measurement methods can be used for the purpose. However, typical conductivities of printed conductors affect the extracted permittivity values due to internal inductance of the line and this effect has to be taken into account when characterizing printable electronics materials.

11:00 Microwave Measurements of Dielectric Properties - A Further Study to a New Theoretical Model for a Closed Cylindrical Cavity Dielectric Resonator
Jyh Sheen (National Formosa University, Taiwan); Chin-An Chen (Oriental Institute of Technology, Taiwan); Yi Hua Chen (Oriental Institue of Technology, Taiwan); Chin-Lun Lai (Oriental Institute of Technology, Taiwan); Zuo-Wen Hong (National Formosa University, Taiwan)
A low loss measurement technique for complex permittivity, using a closed cylindrical cavity resonator, is investigated. The measurements are made at the resonant frequency of the TE01d mode with a new modified field model, which provides a very simple and clear description of the field distribution within the resonator.

11:20 Genetic Algorthim Optimisation of Pyramidal Absorbers Loaded with a Binary FSS
Daniel Holtby (University of Sheffield, United Kingdom); Kenneth Ford (University of Sheffield, United Kingdom); Barry Chambers (University of Sheffield, United Kingdom)
Improving the low frequency performance of pyramidal absorbers, for use in an anechoic chamber, by loading them with a binary FSS pattern that is optimised using a genetic algorithm.

11:40 Estimation of Effective Permittivity and Effective Thickness of Inhomogeneous Materials at 52 -- 70 GHz
Robert Felbecker (Fraunhofer Heinrich-Hertz-Institut, Germany); Wilhelm Keusgen (Fraunhofer-Institut für Nachrichtentechnik, HHI, Germany); Andreas Kortke (Fraunhofer Heinrich-Hertz-Institut, Germany); Michael Peter (Fraunhofer HHI, Germany)
In this paper, a free-space method is used to measure the reflection coefficient in the 60 GHz band of various materials. This measurement method may be used to determine the effective permittivity and effective thickness of inhomogeneous materials. The materials of interest are carbon fibre- and glass fibre reinforced plastic.

12:00 Radar Signature Reduction of Wind Turbines through the Application of Stealth Technology
Jon Pinto (BAE Systems, United Kingdom); James Matthews (BAE Systems, Advanced Technology Centre, United Kingdom); Carlos Sarno (BAE Systems, Advanced Technology Centre, United Kingdom)
The potential for wind turbines to reduce the ability of a radar to detect air vehicles or Marine craft in their vicinity is becoming an increasing issue when planning permission is sought for new generating capacity. This paper describes the application of stealth technology to reduce radar impact.

12:20 - 13:00 Closing Session · Room: Hall A

Room: Hall C3

Fri-S21J8: UWB Systems

Chair: Mario Orefice (Politecnico di Torino, Italy), Reiner Thomä (TU-Illmenau, Germany)

10:40 Influence of UWB-Antennas on UWB-Channel-Measurements in a City-Liner Coach
Robert Geise (TU Braunschweig, Germany); Ingo Schmidt (TU Braunschweig, Germany); Moritz Schack (TU Braunschweig, Germany); Jens Schüür (TU Braunschweig, Germany); Thomas Kürner (Technische Universität Braunschweig, Germany)
UWB channel measurements are conducted in a large city-liner coach with various UWB antennas with different characteristics and quality. The antenna influence on path loss and impulse response is discussed. Conclusions are drawn for a later application.

11:00 Time Domain Analysis of Band Notching UWB Antennas
Elena Pancera (University of Karlsruhe, Germany); Jens Timmermann (University of Karlsruhe, Germany, Germany); Thomas Zwick (Universität Karlsruhe (TH), Germany); Werner Wiesbeck (University of Karlsruhe (TH), Germany)
In this paper a complete time domain analysis of UWB antennas with band notching capability is presented. In order to investigate the influence on the transmitted pulse of the different UWB band notching techniques, different antennas have been fabricated and their measured time domain behaviors (impulse response duration, ringing...) compared.

11:20 Automated Identification of Clusters and UWB Channel parameters Dependency on Tx-Rx Distance
Abdelbasset Massouri (IEMN, France); Clavier Laurent (IEMN / GET, INT, TELECOM Lille 1, France); Jiejia Chen (IEMN-IRCICA University of Lille 1, France); Pierre Combeau (IRCOM SIC University of Potiers, France); Yannis Pousset (University of Poitiers, France)
This paper proposes a distance dependent channel model for UWB indoor channel communications in an adhoc context. The cluster-based model is based on ray tracing simulations to avoid expensive mesurement compaigns.

11:40 Indirect Multi-Static 2D Imaging within Wireless Sensor Networks
Ole Hirsch (Technische Universität Ilmenau, Germany); Rudolf Zetik (Technical University Ilmenau, Germany); Reiner Thomä (TU-Illmenau, Germany)
A method for imaging within wireless sensor networks is described. It utilises signals that propagate along Line Of Sight (LOS) paths between the objects. From mapping of the regions with LOS signal propagation the shape of objects is estimated. This information can be used for migration imaging with improved quality.

12:00 Performance Evaluation of Threshold-Based UWB Ranging Methods - Leading Edge vs. Search Back -
Katsuyuki Haneda (Helsinki University of Technology, Finland); Kenichi Takizawa (National Institute of Information and Communications Technology, Japan); Jun-ichi Takada (Tokyo Institute of Technology, Japan); Marzieh Dashti (Tokyo Institute of Technology, Japan); Pertti Vainikainen (Helsinki University of Technology (TKK), Finland)
Performance of two threshold-based ultra wideband ranging algorithms, leading edge and search back methods was tested against real-world measured propagation data.

Room: Hall C4

Fri-S22S8: Convened: URSI Special Session-2 Propagation Distortions and their Mitigation in Global Navigational and and Postioning Systems

Chair: Achim Hornbostel (DLR, Germany), Michael Schönhuber (Joanneum Research, Austria)

10:40 Propagation modeling in virtual environments, characterization of mobile propagation channel
Pavel Valtr (University of Vigo, Spain); Fernando Pérez-Fontán (University of Vigo, Spain); Anthony Abele (ONERA Centre de Toulouse, France)
This paper is focused on mobile channel characterization in various types of propagation environments by means of propagation simulation. Of particular interest are land mobile satellite scenarios including urban and forest areas. Simulations results of scattering from rough building facades and by vegetation are presented.

11:00 Ionospheric Perturbation Characteristics and Their Potential Impact on GNSS Applications
Norbert Jakowski (German Aerospace Center, Germany); Christoph Mayer (Institute of Communications and Navigation, Germany); Claudia Borries (German Aerospace center, Germany); Volker Wilken (German Aerospace Center, Germany); Smita Dubey (German Aerospace Center, Germany); Thomas Pannowitsch (German Aerospace Center, Germany)
Discussed are space weather induced ionospheric perturbations and their potential impact on GNSS applications.

11:20 C-Band, narrow and wideband measurement campaign for satellite to indoor and roadside tree links
Fernando Pérez-Fontán (University of Vigo, Spain)
A comprehensive measurement campaign has been carried out under ESA contract for characterizing the propagation characteristics of the satellite to indoor and roadside tree links at C-Band. Measurements have been performed using a helicopter to transport both a CW transmitter and a channel sounder operating at 5.2 GHz

11:40 Multipath Detection Metrics and Attenuation Analysis Using a GPS Snapshot Receiver in Harsh Environments
Jose A. Lopez-Salcedo (Universitat Autònoma de Barcelona (UAB), Spain); Juan Manuel Parro-Jimenez (Universitat Autonoma de Barcelona (UAB), Spain); Gonzalo Seco Granados (Universitat Autonoma de Barcelona, Spain)
This paper analyses GPS-L1 signals propagating indoors. Two criteria are proposed for detecting the presence of multipath, one of the major degradations for GPS receivers operating indoors. Real data have been used to evaluate these metrics, confirming their validity and help in understanding the underlying propagation phenomena of GPS signals.

12:00 Review of tropospheric, ionospheric and multipath data and models for Global Navigation Satellite Systems
Antonio Martellucci (European Space Agency, The Netherlands); Roberto Prieto Cerdeira (European Space Agency (ESA), The Netherlands)
The implementation of the European Galileo navigation system and the design of its future evolution require a proper modelling of the effects introduced by the atmosphere (tropospheric and ionospheric) and by multipath from the environment surrounding the navigation receiver.

Room: Hall A

Closing Session

Chairs of EuCAP2009 and EuCAP2010

GENERAL INFORMATION

EuCAP 2009 website

www.eucap2009.org

REGISTRATION FEES

	before February 23, 2009	after February 23, 2009
Associated Society Member (AMTA, EurAAP, IEEE, EUREL, VDE)*	590,-- €	680,-- €
Non member	690,-- €	780,-- €
Student/Retired member**	325,-- €	415,-- €
Dayticket		320,-- €
Exhibition only ticket	50,-- €	50,-- €
Short Courses (each)	150,-- €	150,-- €
Additional Proceedings (CD ROM)	75,-- €	75,-- €
Boat Tour "Berlin by Night" (March 25)	40,-- €	40,-- €
Conference Dinner (March 26)	60,-- €	60,-- €
Accompanying Person Boat Tour***	40,-- €	40,-- €
Accompanying Person Conference Dinner***	60,-- €	60,-- €

* Participants applying for the membership fee must include a copy of their membership card to the registration form.

** A student's certification form has to be endorsed by a supervisor or head of department and a photocopy of the student card must be included.

*** Only participation in social functions.
Presenting authors, co-authors, committee members and session chairs are not exempted from paying registration fees.

Regular Conference Registration and Student Registration
Includes admission to all technical sessions as well as to the daily luncheons and coffee-breaks, one copy of the proceedings (CD-ROM), EuCAP 2009 conference welcome reception on Monday, March 23 at the Hotel Estrel in the exhibition area and admission to the EuCAP 2009 Exhibition (March 23-26, 2009). Tickets for social functions on March 25 and 26, 2009 have to be purchased separate.

Accompanying Persons
Accompanying persons may register only in conjunction with a full delegate. The fee for accompanying persons includes admission to EuCAP 2009 conference welcome reception on Monday, March 23 at Hotel Estrel, participation in the boat tour "Berlin by Night" on March 25 or the conference dinner on March 26 at "Deutsches Technikmuseum" only.
Paticipation in technical sessions is not included.

ON-SITE COUNTER – OFFICE HOURS

The registration counter is located at the entrance to the Estrel Convention Center.

Phone: +49-(0)30-68 31-25 30 3
Fax: +49-(0)30-68 31-25 30 4
E-mail: vde-conferences@vde.com

The registration desk on site will be open as follows:

Sun,	March 22	16:00 h – 18:00 h
Mon,	March 23	08:00 h – 17:00 h
Tue,	March 24	08:00 h – 17:00 h
Wed,	March 25	08:00 h – 17:00 h
Thu,	March 26	08:00 h – 17:00 h
Fri,	March 27	08:00 h – 12:00 h

PAYMENT

Payment for registration must be made in Euro. The conference fee has to be fully paid in advance.

The following **methods of payment** are accepted:

- by credit card authorisation
- by cash payment on-site in Euro (€)

BADGES

Delegates will receive badges and vouchers for the booked events. Participants are kindly requested to wear their badges throughout the conference, even at social events. Lost badges not be replaced. A new registration will be mandatory.

CANCELLATION

In case of cancellation, provided that written notice is received at VDE Conference Services before
February 23, 2009, the registration fee will be refunded less a handling fee of Euro 60,--. When cancelling after February 23, 2009 no refund will be made. Proceedings (CD-ROM) will then be sent to the registrant after the conference.

PROCEEDINGS

All papers accepted for presentation at the conference will be published in the proceedings (CD-ROM) provided that at least one author has registered for EuCAP 2009. The proceedings will be provided on-site to all registered delegates attending the conference.

Additional proceedings (CD-ROM) will be on sale during the conference (upon availability) at 75,-- €.

OFFICIAL LANGUAGE

All sessions will be held in English, only. No simultaneous translation will be provided.

HOTEL RESERVATION / OFFICIAL TRAVEL AGENCY

Rooms may be booked in the official conference Hotel Estrel upon availability.

Further hotel accommodation may be booked through the official travel agency Dr. Kater Travel:

Dr. Kater Travel GmbH
Gormannstraße 14
10119 Berlin
Germany
Phone +49-(0)30-2010-969
Fax +49-(0)30-2044-022
E-mail: soost@kater-travel.de
Homepage: www.kater-travel.de

On the official website of Berlin
http://www.berlin.de/english/accommodation/index.html
hotels of all categories can be also booked

HOTEL BOOKING CONDITIONS

Change of reservation and cancellation
Please make your reservations, changes and cancellations directly with Hotel Estrel, Dr. Kater Travel or your selected hotel. The conference organiser is not responsible for hotel bookings.

Payment
All payments related to accommodation have to be made directly on departure in the hotel. In any case a credit card is required for guaranteed booking, otherwise no booking confirmation will be returned.

EUCAP 2009 CONFERENCE VENUE

Hotel Estrel Berlin
Convention Center
Sonnenallee 225
12057 Berlin
Germany

Phone: +49-(0)30-68 31-0
Fax: +49-(0)30-68 31-2345
Homepage: www.estrel.com
e-mail: hotel@estrel.com

The Estrel Berlin is Europe's largest convention, entertainment and hotel complex. With 1,125 rooms and suites, five restaurants, two bars, a beer garden and the daily live show "Stars in Concert", the Estrel has plenty to offer every guest. The 15,000-m2 fully air-conditioned, multi-functional Estrel Convention Center provides space for every type and size of event: international political and economic summits, trade fairs and exhibitions for companies and associations, media and gala events and concerts. The Estrel Festival Center, connected directly to the Estrel Hotel via a glass-covered bridge, is the venue for daily live entertainment Las Vegas-style. Since it opened in September 1997, the fascinating live "Stars in Concert" show, a glamourous homage to the legendary international stars of show business, has played daily. Up to 800 guests can enjoy the show in style, seated at tables and served with food and drinks.

MESSAGES

Messages for delegates may be sent to the registration counter on-site:

Phone: +49-(0)30-68 31-25 30 3
Fax: +49-(0)30-68 31-25 30 4
e-mail: vde-conferences@vde.com

TRANSPORT

By plane:

Berlin Airports ("Tegel" and "Schönefeld") allow direct access from all major national and most international airports. Taxi from the airports to the conference Hotel Estrel takes about 20 to 30 minutes.

By train:

From Frankfurt	approx. 4,5	hours
From Munich	approx. 6	hours
From Hamburg	approx. 1,5	hours
From Stuttgart	approx. 6	hours

From main station "Hauptbahnhof Berlin" via Bus M 41 until stop "Ziegrastrasse"

From train station "Ostbahnhof" via S-Bahn S3, S5, S7, S75 or S9 to S-Bahn station "Ostkreuz", switch to S41 (circle line) until S-Bahn stop "Sonnenallee".

From station "Südkreuz" via line S-Bahn S42 (circle line) until stop "Sonnenallee"

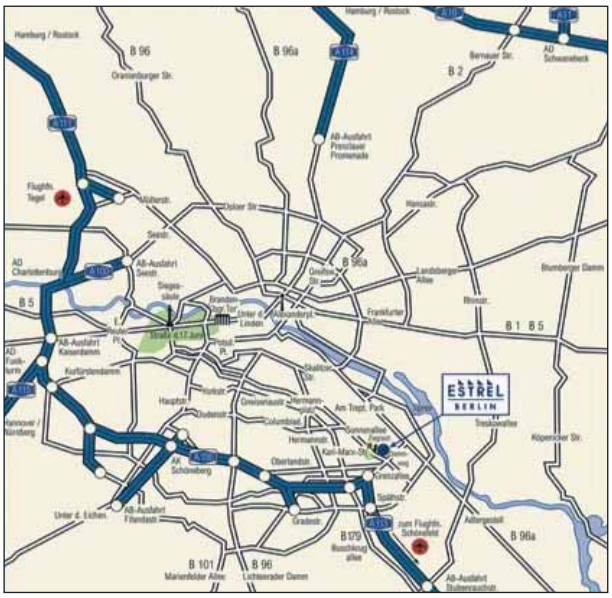
For more information on the transport network system of Berlin please see www.bvg.de

By car:

From Airport "Tegel": Highway 100/102, exit "Grenzallee", approx. 30 min.
From Airport "Schönefeld": Highway 113, exit "Grenzallee", approx. 20 min.

Parking garage is available for 15,- Euro per day.

Plese see the map below.



W-LAN ACCESS

Free W-Lan access will be provided in the Estrel Convention Center. A specific voucher with free access codes will be delivered as a part of the conference materials in the delegate bags.

EXCURSION PROGRAM

On the Tuesday afternoon of the conference there will be a Technical Tour to the big Radio Transmitter in Koenigs Wusterhausen sponsored by AMTA.

The famous 'Funkerberg' in Königs Wusterhausen is a historical museum showing the complete development from the ancient power transmitter, the transmitting station as far as to a large transmitting tower.
The first broadcasting activities in Königs Wusterhausen started in 1915 continued during the Third Empire, the German Democratic Republic (GDR) period and closed in 1995. The big radio station operated in the long-, medium- and short wave range. Beside the authentic demonstration of the broadcasting studio and the original technical instrumentation it is additionally possible for the visitors to experience the starting up of the 1000 HP Diesel engine used as emergency power supply.

Programme for the technical tour:

15:15 Leave the Estrel Convention Center
16:00 Tour at Transmitter in Koenigs Wusterhausen
17:30 Leave for Estrel Convention Center
18:00 Return to the Estrel Convention Center

Spaces on the tour are limited to 50 delegates with prebooking only.

Address:

Förderverein "Sender Königs Wusterhausen" e.V.
Funkerberg Haus 1
15711 Königs Wusterhausen

SOCIAL PROGRAM

- The welcome reception on Monday, March 23 will be held in the exhibition area at the Hotel Estrel. All delegates and their accompanying persons are welcome to join this first ice breaker.
- On Wednesday, March 25 an exciting 3h-boat tour on the river Spree and the Landwehrkanal with the "MS Mark Brandenburg" will be organised. Enjoy the enlightened city of Berlin. Snacks and drinks will be served on the boat. A shuttle service to and from the peer will be organised and is included.
  The price for this boat tour will be 40,- Euro per person.
- On Thursday, March 26 a conference dinner will be held at "Deutsches Technikmuseum" which has been developed since 1982 in Berlin's old and new centre. A cultural history of technology in historical buildings. The museum continues the tradition of the reputable museums of technology to which Berlin had been home until World War II. The Gleisdreieck location is also of historical importance: this is where Anhalter freight station, the rail depot with two circular locomotive sheds and the factory buildings of a company specialising in markets and cold stores were located. This historical ensemble of buildings is also the most valuable "object" of the museum. On completion of all development phases, the building will cover an exhibition area of over 50,000 square metres and will be one of the largest technical museums in the world.

  14 departments currently exhibit just one quarter of their treasures on 20,000 square metres: old-timers, locomotives and planes, new nautical collection, looms, household appliances and machine tools, computers, radios and cameras, Diesel engines, steam engines, scientific instruments, paper machines, printing presses and much more. The new aeronautic and space collection opens in spring 2009.

  Busses will leave at 18:30 at Hotel Estrel.

  The price for the conference dinner will be 60,- Euro per person.

The recommended dress for all EuCAP 2009 social events is business casual.

DESTINATION BERLIN

Berlin, the German capital, along with London, Paris and Rome, is one of the most visited metropolises in Europe.

The demolition of the Wall on 9 November 1989 marked the dawn of a new era for Berlin - an era in which the most significant elements have been the reunification of Germany in 1990, the decision regarding the location of the German capital in 1991 and the relocation of government and parliament to the traditional centre of the nation - in the heart of Berlin. This transfer was completed in 1999.

Berlin - in the very heart of Europe - has been, since time immemorial, a focal point for travellers from all over the world. In the 1930s, Potsdamer Platz carried a greater volume of traffic than any other square in Europe. It was here that the first traffic lights were installed, the replica of which can be admired at this same spot. After nearly three decades of desolation caused by the Wall, Potsdamer Platz has implemented new traffic engineering and town planning visions for the Berlin of the third millennium. This area mirrors the re-emergence of and sweeping changes to the entire city. After reunification Berlin is, geographically speaking, at the interface between East and West in Europe.

It was not by chance that in 1988, Berlin was officially designated Europe's "City of Culture". Unofficially, it still holds this title. Cultural events of international standing are a permanent feature of everyday life in Berlin.

The range of musical entertainment includes cabaret performances in various folklore taverns and a notable rock and jazz scene with many clubs and major events. Berlin's "Waldbühne" is the finest open-air theatre in Europe. During the summer months, it attracts up to 22,000 visitors each evening to various events ranging from classical and rock music to film shows.

Berlin is noted for its unique variety of museums, including many collections relating to archaeology and the history of art. The numerous museums and collections also include some curiosities like, for instance, a laundry museum, a hemp museum, the sugar museum or the erotic museum.

The construction work on the German capital has further raised the standing of the city on the international stage and attracted investors from all over the world (cf. Potsdamer Platz, Friedrichstadt arcades or the American Business Center at the former Checkpoint Charlie). When it comes to fashion design Berlin has become a centre in particular for young and avant-garde fashion. Berlin is once again on the way to doing its reputation justice as a city of fashion.

Berlin is also a rapidly developing city when it comes to shopping. With Kudamm (Kurfürstendamm), Friedrichstraße and Potsdamer Platz it boasts three different shopping centres. The Kurfürstendamm, a magnificent boulevard which extends for 3.5 km from the Memorial Church to Halensee, has something for everyone: from the famous department store “Kaufhaus des Westens” (KaDeWe) over the Europa-Center to the many international fashion boutiques, restaurants and cafés. During the mild summer nights, this part of Berlin (like so many others) stays open 24 hours. Closing times are practically unknown and visitors to the "Athens on the Spree" can savour the delights of its cosmopolitan character to the full.

We can, of course, provide only a rough outline here of this city and its many facets. We, therefore, extend a cordial invitation to you to come and visit Berlin so that you can explore it and come to understand and appreciate it.

Test yourself and find out five things you didn’t know about Berlin:

1. Population reached a peak of 4,5 million people in 1942
2. The city has 1.700 bridges, more than Venice
3. Berlin’s TV tower is Germany’s tallest building and one of the tallest in Europe at 368 m tall.
4. There are nine palaces in Berlin. These include Schloss Charlottenburg and the Köpenicker Schloss and the “Schlösschen” (small palaces).
5. Berlin is the city that never sleeps, with more than 5.500 pubs, bars and restaurants that are open round the clock.

We wish you a very pleasant stay.

For more details see www.berlin.de.

FOR ACCOMPANYING PERSONS

The concierge team from the “Interklassik” company in the foyer of Hotel Estrel is at your disposal at any time throughout your stay in Hotel Estrel. Whatever service you require - procuring theatre and concert tickets, organizing bus and boat trips, arranging car hire or a babysitter - there will always be someone to help you.

Please contact:

Tel.: +49 (0)30 / 68 31-22 33 2
Fax: +49 (0)30 / 68 31-23 45
Email: Interklassik@estrel.com
URL: www.interklassik.de

WEATHER

Temperatures around 10 degree Celsius may be expected in March. Rain is not uncommon during this period. Therefore a jacket and an umbrella are recommended at any time.

INSURANCE

The organisers may not be held responsible for any injury to participants or damage, theft and loss of personal belongings. Participants should therefore make their own insurance arrangements.

SHOPPING

Most shops are located in the area around the Friedrichstraße (Eastern part of Berlin) and Kurfürstendamm (Western part of Berlin). The elegant boulevards invite to shop and stroll through their boutiques and noble warehouses. You will find exquisite shops as well on the legendary avenue “Unter den Linden”. Usually, shops are open from Monday to Saturday 9:00 – 20:00. Shops are generally closed on Sunday. Friedrichstraße can be reached by S 41/42 eastbound, change trains at "Ostkreuz" to S 5, S 9, or S 75. Continue to "Zoologischer Garten" to get to the Kurfürstendamm.

CURRENCY

The official currency in Germany is the Euro. Usual credit cards (Mastercard, American Express, VISA) are accepted in hotels, department stores and restaurants. Currently (February 2009) the exchange rate is
1 Euro ≅ 1,30 U$.

ELECTRICITY/ PHONE PATCH

The mains power supply is 230 V AC, 50 Hz. Participants intending to use the internet are kindly asked to have connectors available for the mains and Texas or TAE 6 (German phone standard) to connect the phone grid on analogue basis. Digital access (ISDN) may be available on request.

Connectors are available at most international airports or department stores. Most hotels have TAE 6 plug in the rooms or business centre.

EMERGENCY SERVICES

Police	call 110
Ambulance/ Fire Brigade	call 112

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