# A Dual-Polarisation Modelling Method for Simulation-Based Propagation Models


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## Introduction

Polarised antennas are widely used in wireless communication systems. We proposed a simple and portable way to model the polarisation channel for computer simulation based propagation prediction models. The polarisation is modeled through the polarised radiation pattern of the transmitter antennas and receiver antennas. The modeling method has been integrated with existing ray-tracing method. Simulation result demonstrates the effectiveness of such a modeling method.

## Dual-Polarised Radiation Pattern

The polarised radiation patterns characterize the polarisation channel from both transmitter and receiver antenna. The dual linear polarisation type is reference polarisation and cross-reference polarisation. However, in engineering application the categorization of vertical polarisation and horizontal polarisation is widely accepted.

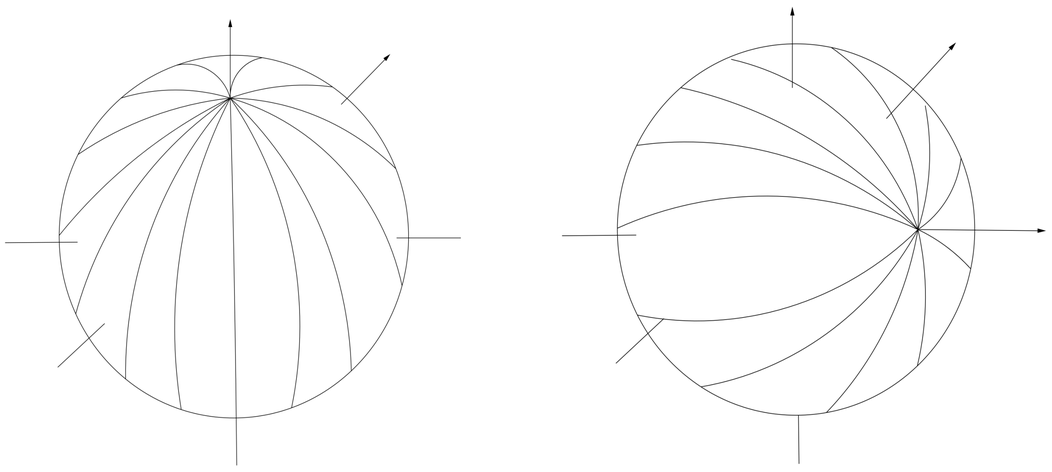


Figure.1 Two polarisation radiation patterns: reference polarisation radiation patter and cross-reference radiation pattern

For ray-based channel propagation models, the ray incorporates the two orthogonally polarised energy planes. We can see them as two “polarised” rays. GO and UTD has a complete theoretical model to incorporate the capability to model two orthogonally polarised rays.

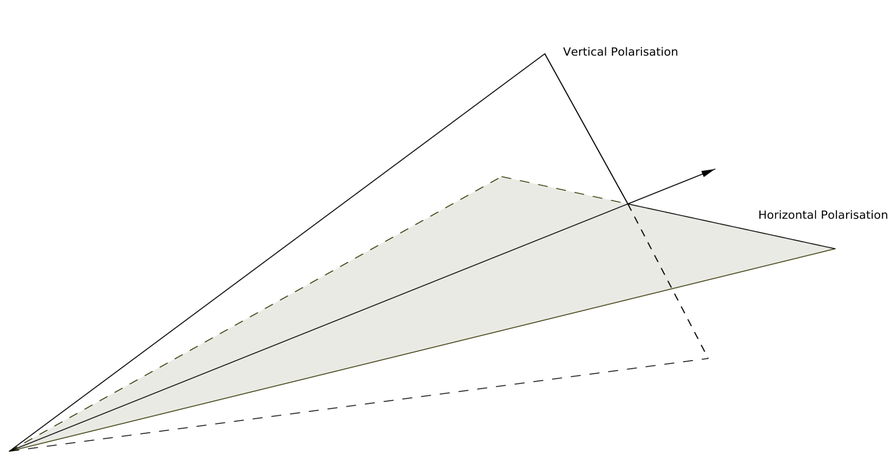



Figure. 2 Two orthogonally polarisation energy planes along the ray propagation path

## Integration With Ray-based Simulation Propagation Tools

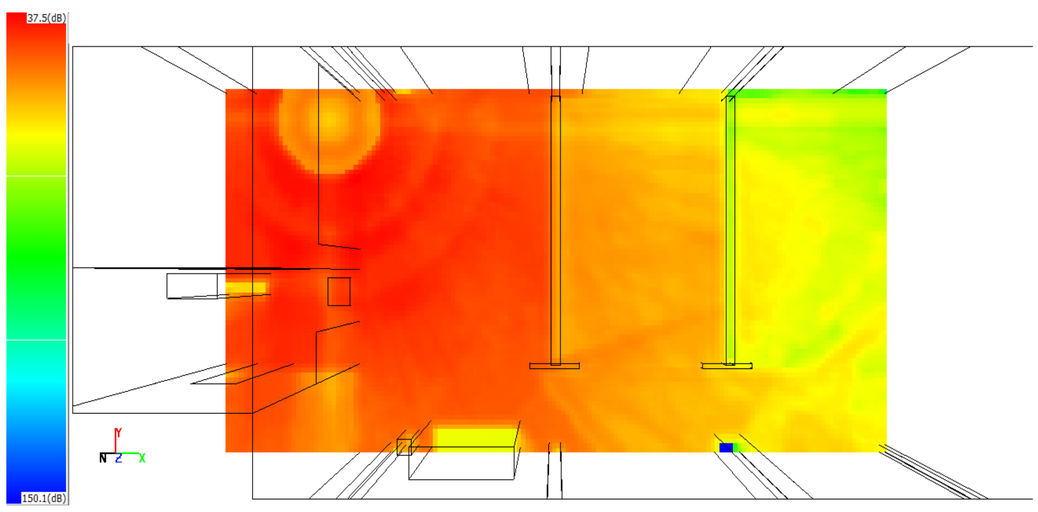



Figure. 3 Co-polarisation channel prediction

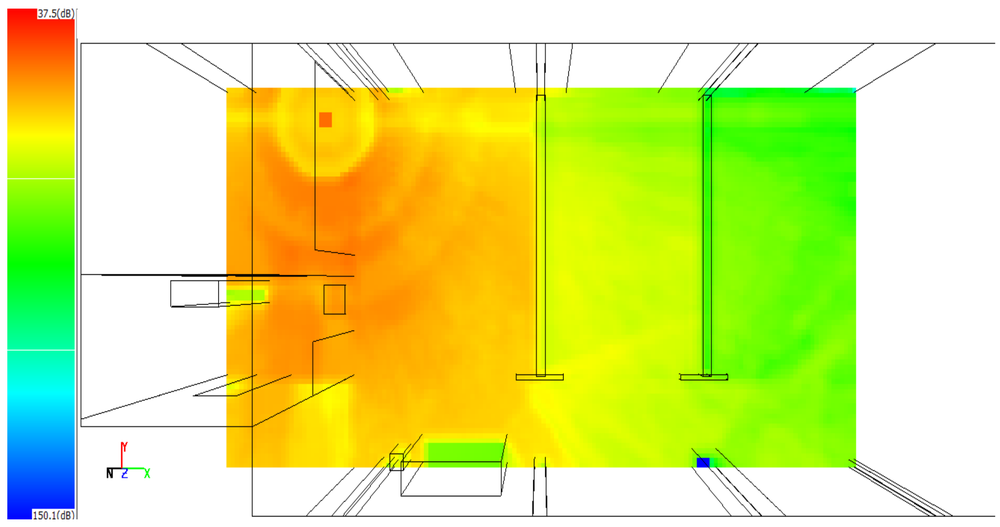
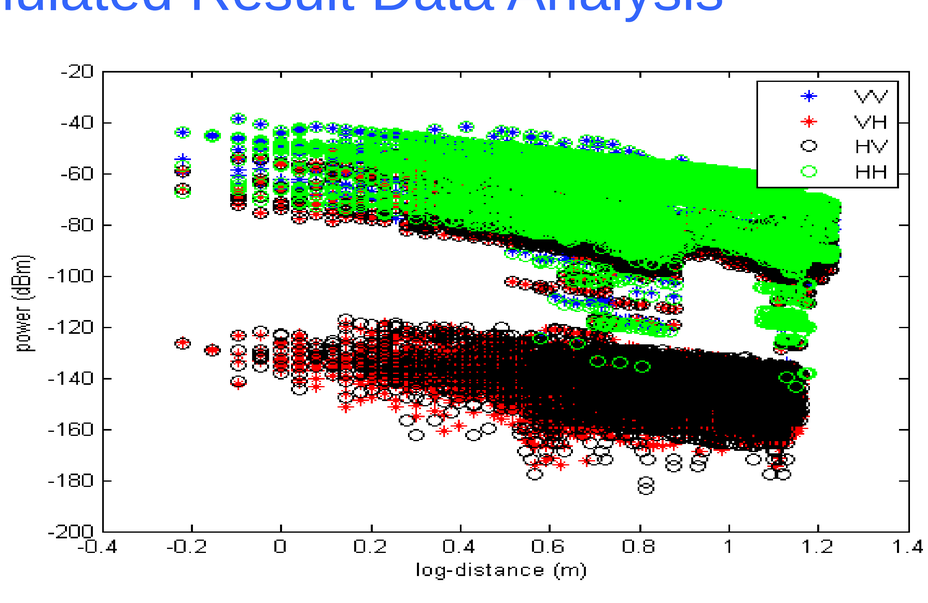



Figure. 4 Cross-polarisation channel prediction

## Simulated Result Data Analysis

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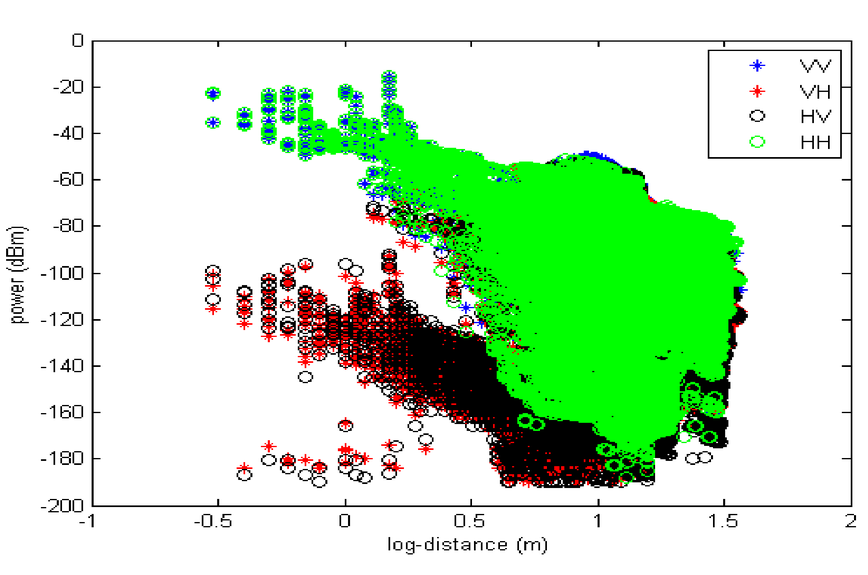


Figure. 3 Co-polarisation channel prediction

## Conclusion

We proposed a portable model for dual-polarisation in ray-based channel propagation models. We showed the integration of this model with popular ray-based propagation channel modeling tools. Simulation results demonstrate the effectiveness and potential of such a model in future applications.