

Conformal Array Research at FGAN-FHR

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Summary

A brief overview is given of conformal array research activities at FGAN-FHR.

The institute operates a conformal array demonstrator in an indoor antenna test range. This demonstrator system allows for measurements of radiation patterns and tests of beamforming algorithms. Several conformal test arrays were realized and measured.

Theoretical work includes electromagnetic modelling of canonical as well as non-canonical geometries. Circularly cylindrical sector arrays have been investigated in the form of a metal cylinder with radial wedge waveguides. The application of a mode-matching technique leads to modal scattering matrices. The results have been validated experimentally.

Arrays on arbitrarily shaped surfaces are modelled using a hybrid Boundary Element / Mode Matching (BEM/MM) technique.

Several pattern synthesis methods for conformal array performance prediction have been investigated. Especially 3D beamforming including direct and adaptive methods was considered.

Another field of interest is the modelling of radomes over circularly cylindrical arrays. Calculations have been done to determine the influence of radomes on antenna patterns. Measurements with various radome configurations are in progress.

Planned activities in the near future include

- Further development and validation of 3D beamforming algorithms
- Electromagnetic analysis of various arbitrarily shaped arrays
- Integration of the cylindrical sector array software into an optimisation routine based on Genetic Algorithms to facilitate radome optimisation
- Demonstration of radar operation with conformal arrays