Design of Aperture Array Antennas for Radio Astronomy*

Dr. David Zhang, Prof. A. K. Brown

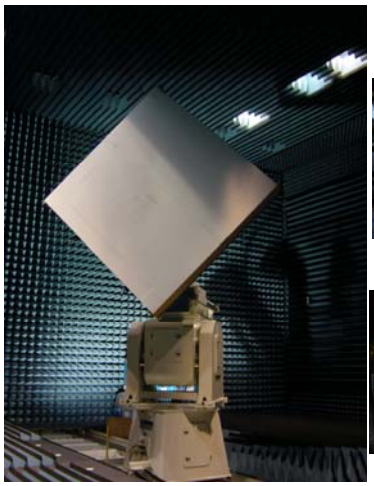
Microwave and Communication Systems Research Group

School of Electrical and Electronic Engineering

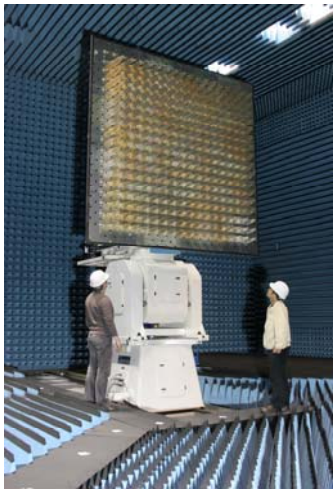
The University of Manchester, PO Box 88, Manchester, M13 9PL, UK

{david.zhang, anthony.brown@}manchester.ac.uk

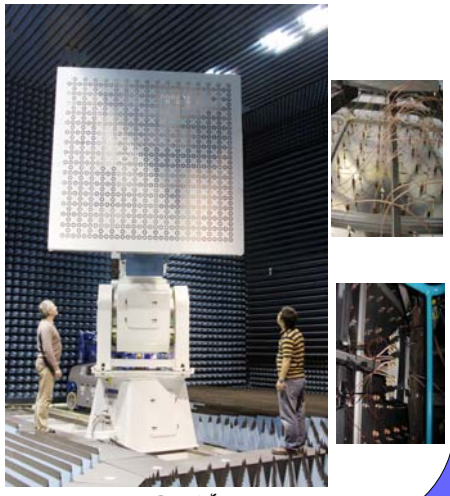
Studies of Finite Arrays



FLOTT

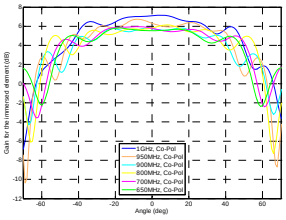


BECA

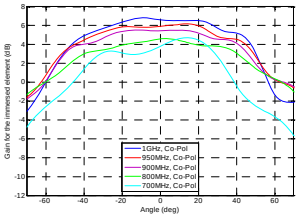


ORAζ

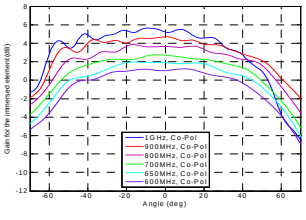
Finite Array Results



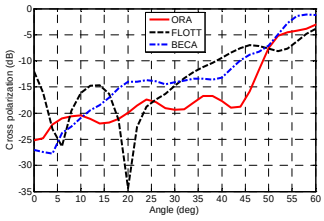
FLOTT, D-plane, Co-Pol



BECA, D-plane, Co-Pol



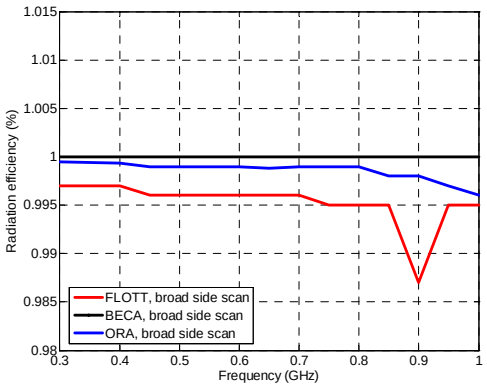
ORA, D-plane, Co-Pol

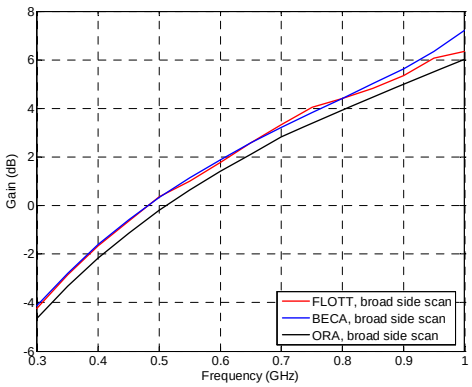


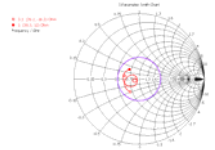
Cross polarization in the D-plane

At 1GHz

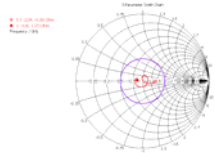
Infinite Array Results



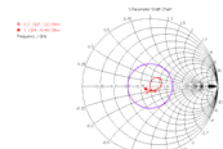




FLOTT, BS



BECA, BS



ORA, BS

$T_{sys} = T_{amb}(1-\eta_{rad})/\eta_{rad}$, if radiation efficiency η_{rad} reduces to 98%, T_{sys} increases by 6K at T_{amb}=300K. The radiation efficiency shown here is based on CST time domain simulation with a periodic boundaries.

It is noted that the accuracy of numerical simulations for the radiation efficiency is limited and degree of accuracy needs more investigation. It is pointed that BECA array is with metal conductors only.

Summary

- The 3dB angular width for the centre element in the three finite arrays at 1 GHz are: 84º for FLOTT, 86º for BECA and 94º for ORA;
- ORA structure shows a promising prospect to produce a stable cross polarization performance across the scan volume. The antennas with a tapered slot structure exhibits a faster polarization status change in the scan range.

Reference

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2. Y. Zhang, A. K. Brown, "Bunny ear combline antenna for dual-polarized aperture array," To appear in IEEE Trans. On Ante. and Propag.
3. Y. Zhang, A. K. Brown, "Octagon rings antenna for dual-polarized aperture array," To appear in IEEE Trans. On Ante. and Propag..

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ζ **A patent has been applied for, the patent application number: 0905573-2. Photos courtesy of SELEX Galileo and Astron.**