

FRESNEL-ZONE MEASUREMENT AND ANALYSIS OF A DUAL- POLARIZED METEOROLOGICAL RADAR ANTENNA

D.B. Hayman, T.S. Bird and
G.C. James

CSIRO* Telecommunications and
Industrial Physics

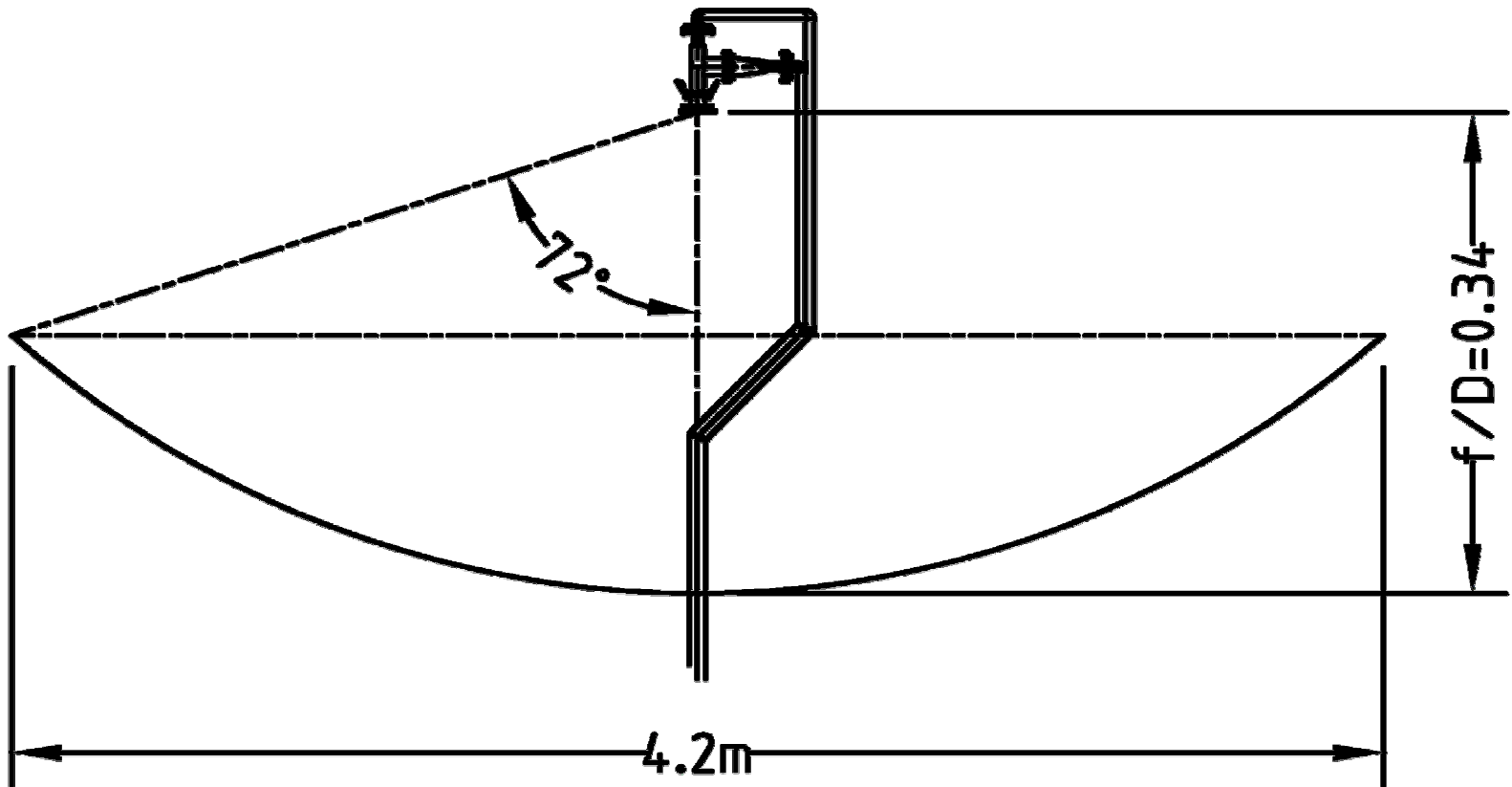
*Commonwealth Scientific and Industrial Research Organization, Australia





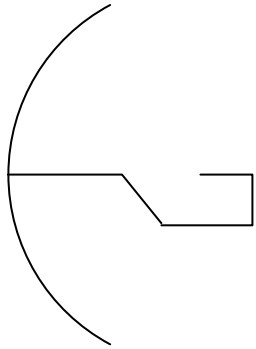
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Dish Geometry



5600-5625 MHz, 0.9° beamwidth, 45 dBi gain
Horizontal and vertical polarizations

Range Length



Fresnel Zone
Criterion



$$\frac{\sqrt[3]{D^4/\lambda}}{2} = 9\text{m}$$

Length used:
19m



Raleigh
Criterion

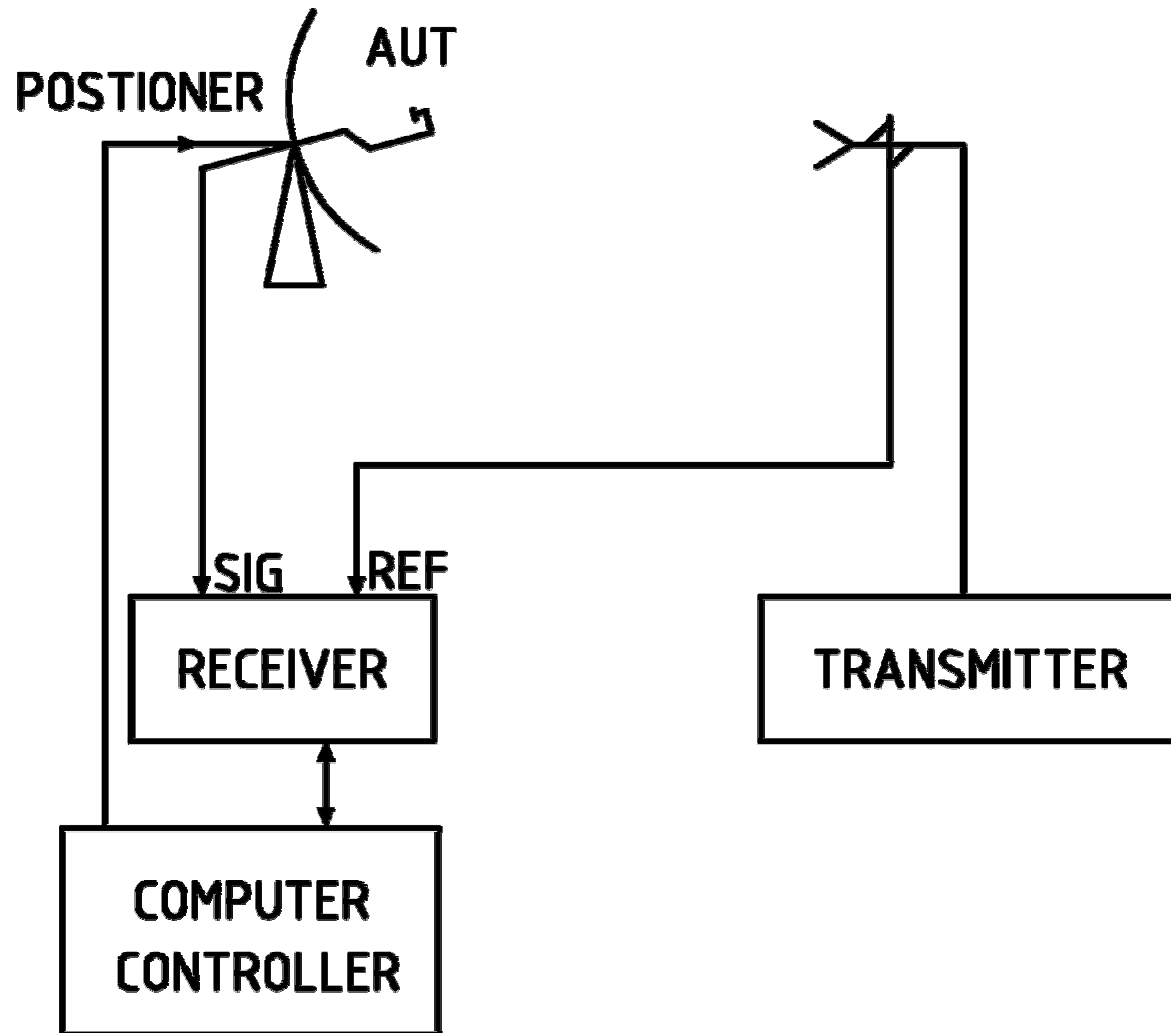


$$2D^2/\lambda = 600\text{m}$$

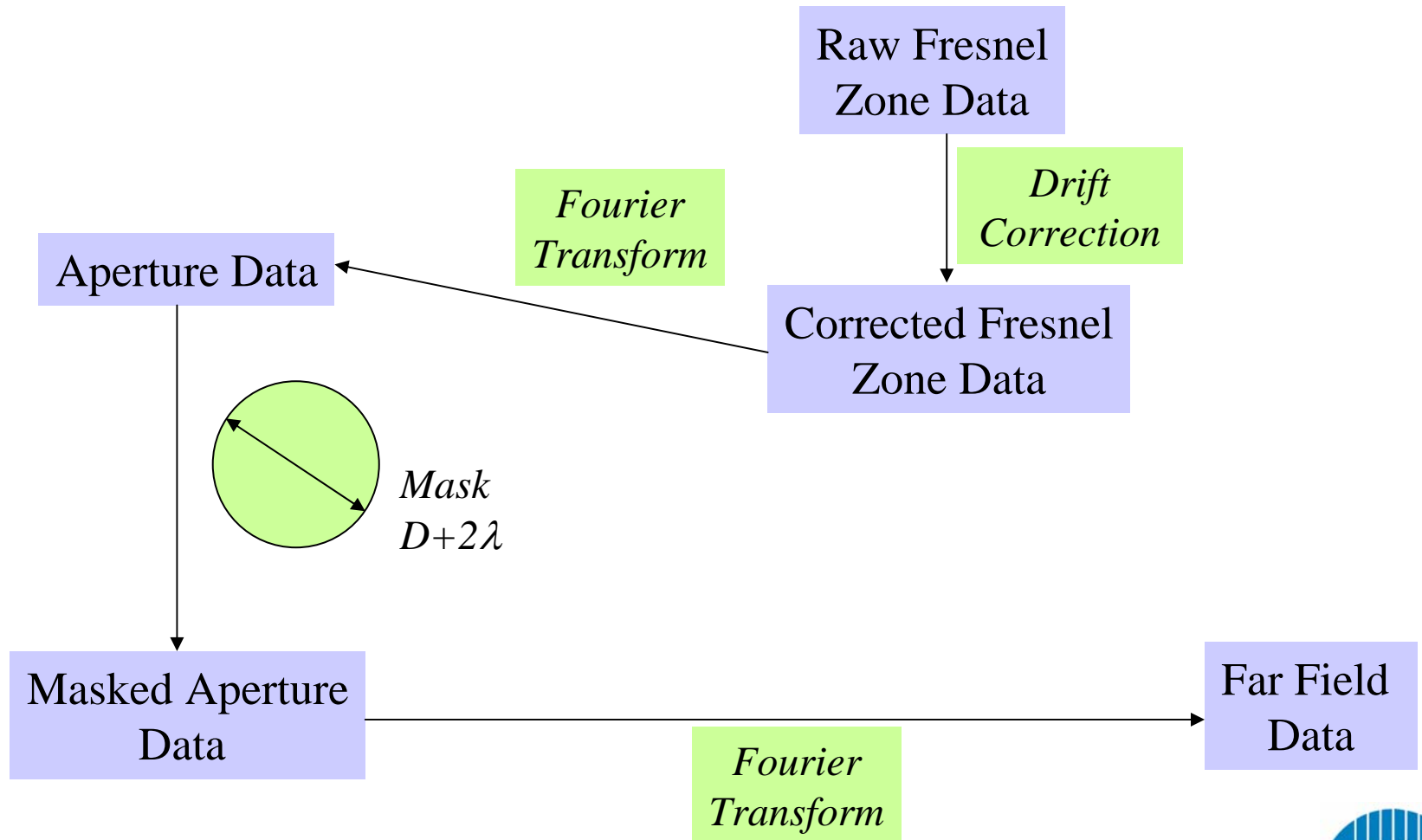


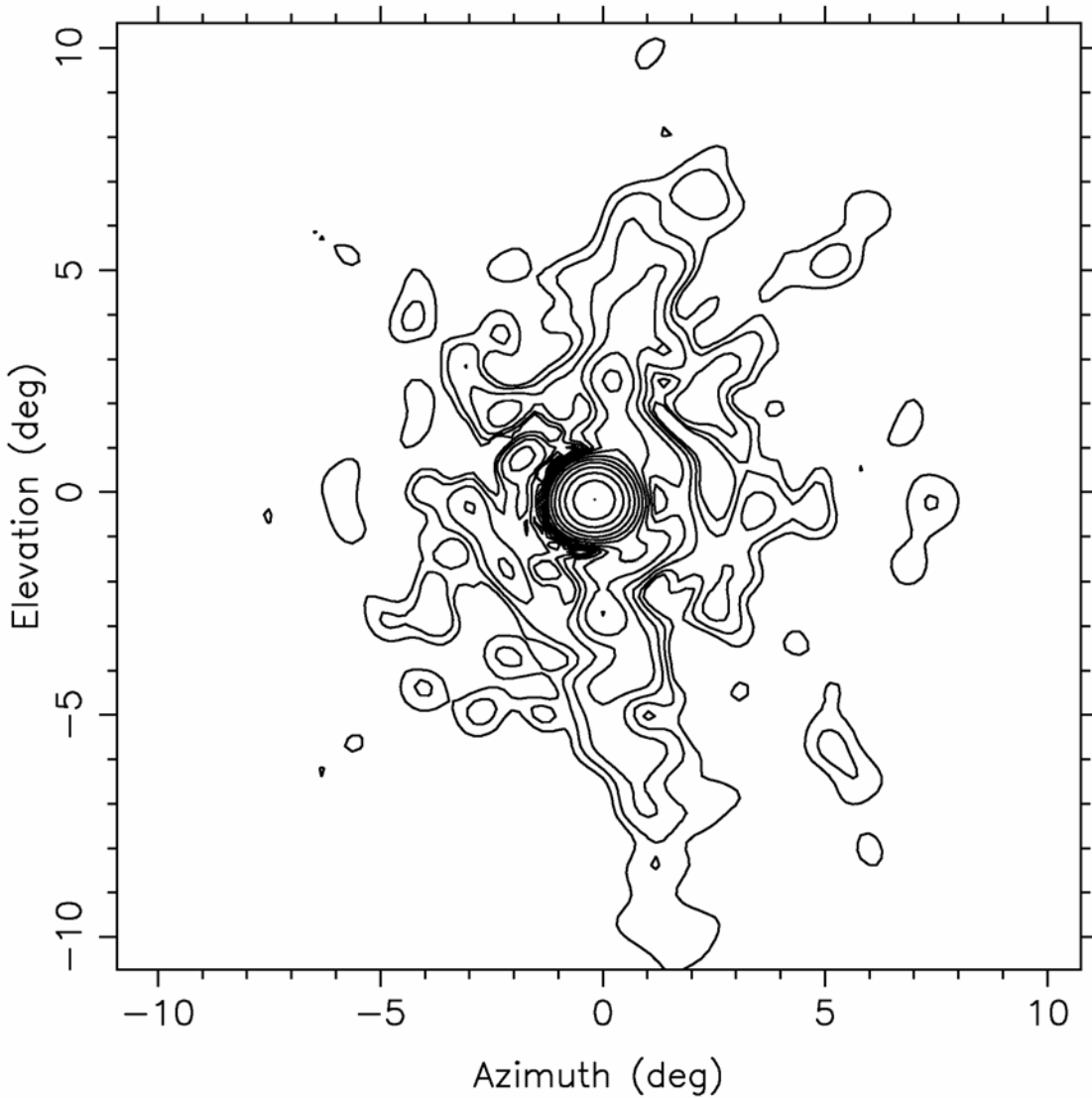
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Measurement Set-up



Processing

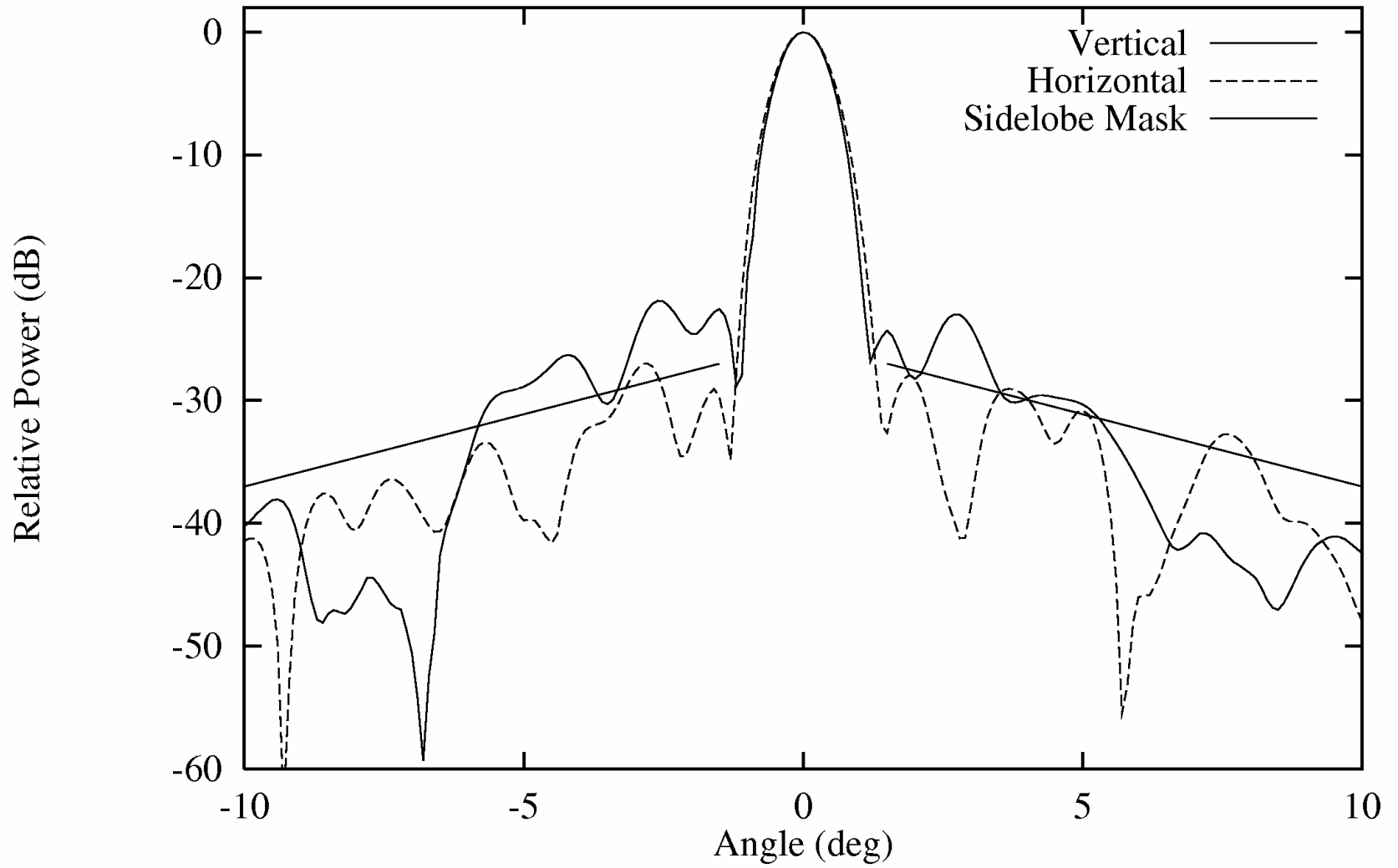




Contours
Spacing 3dB
Lowest -36dB

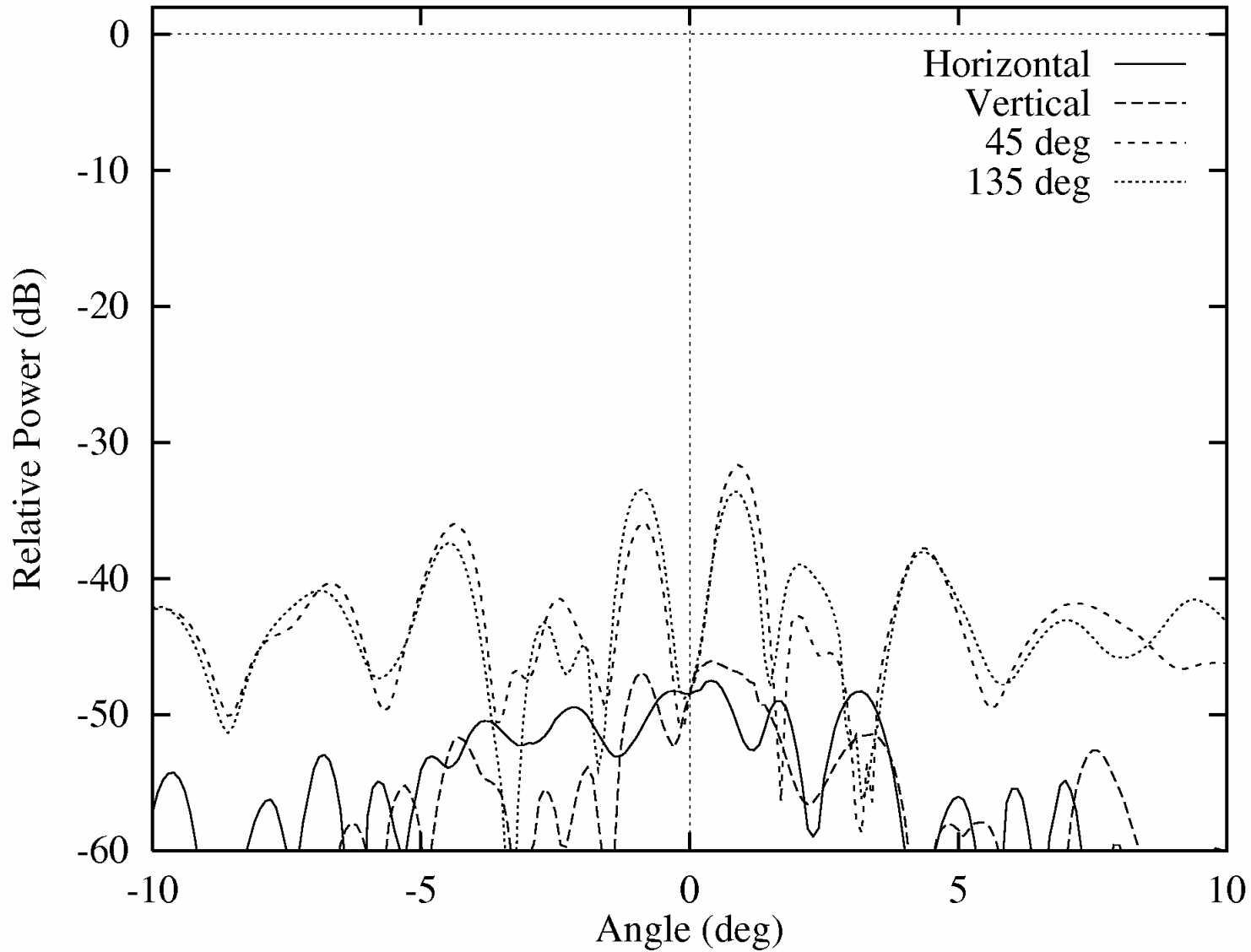
Co-polarized pattern



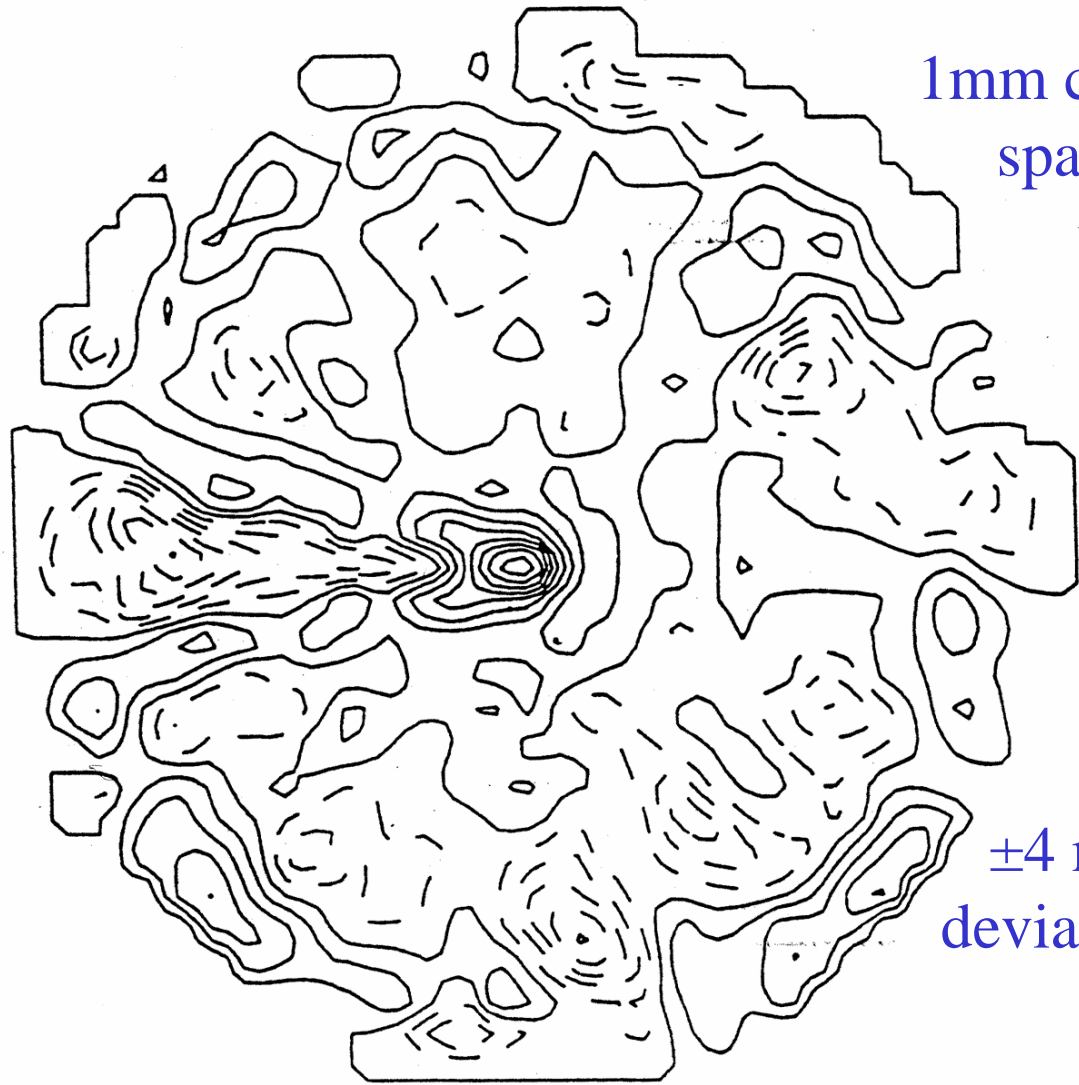


Measured Co-polar Pattern Cuts





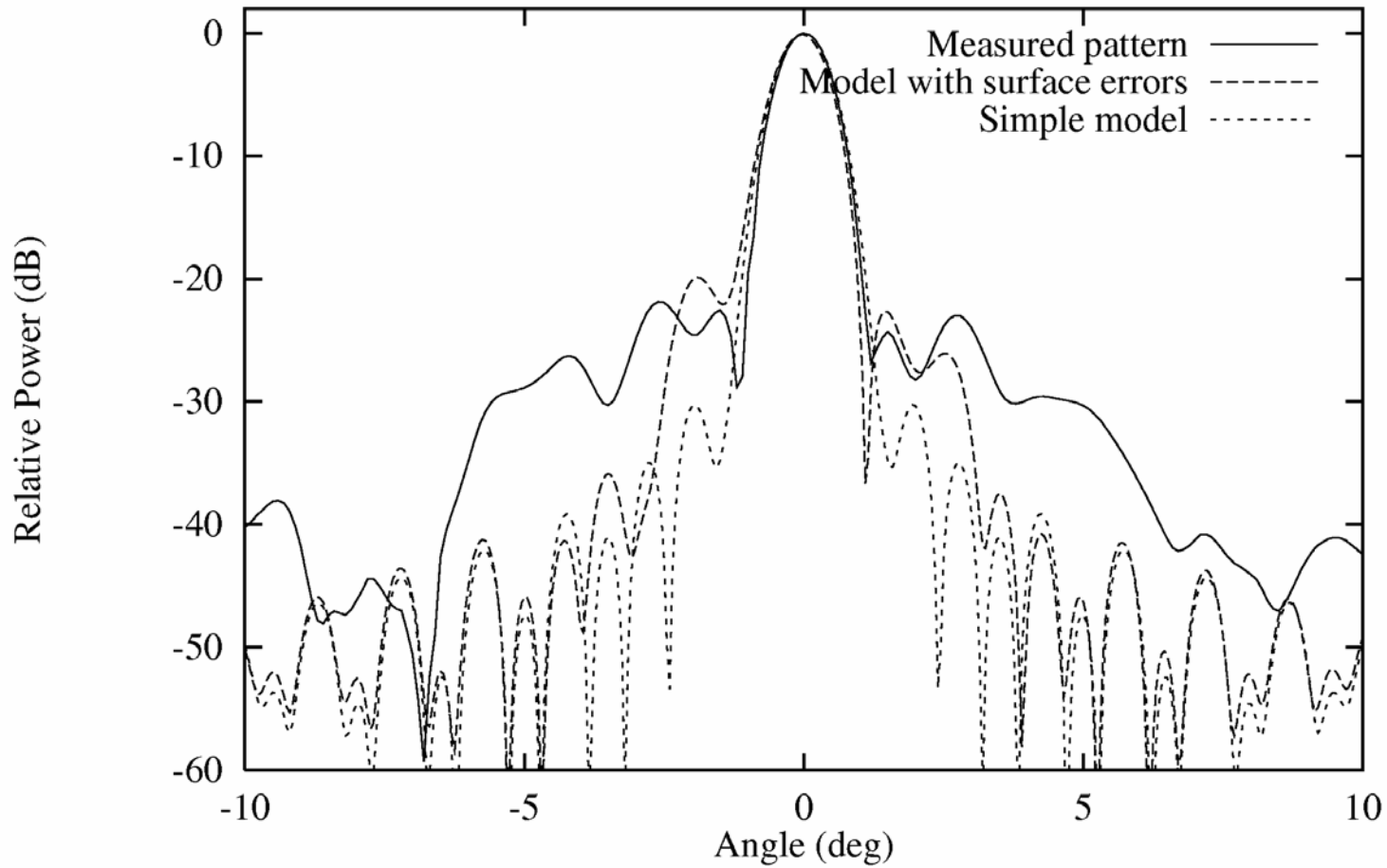
Measured Cross-polar Pattern Cuts



1mm contour
spacing

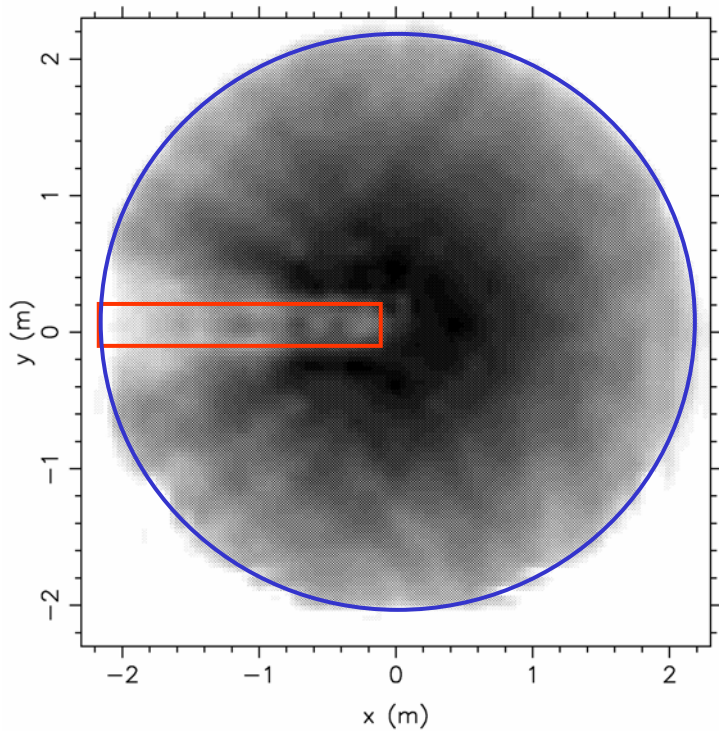
± 4 mm
deviations

Surface Errors

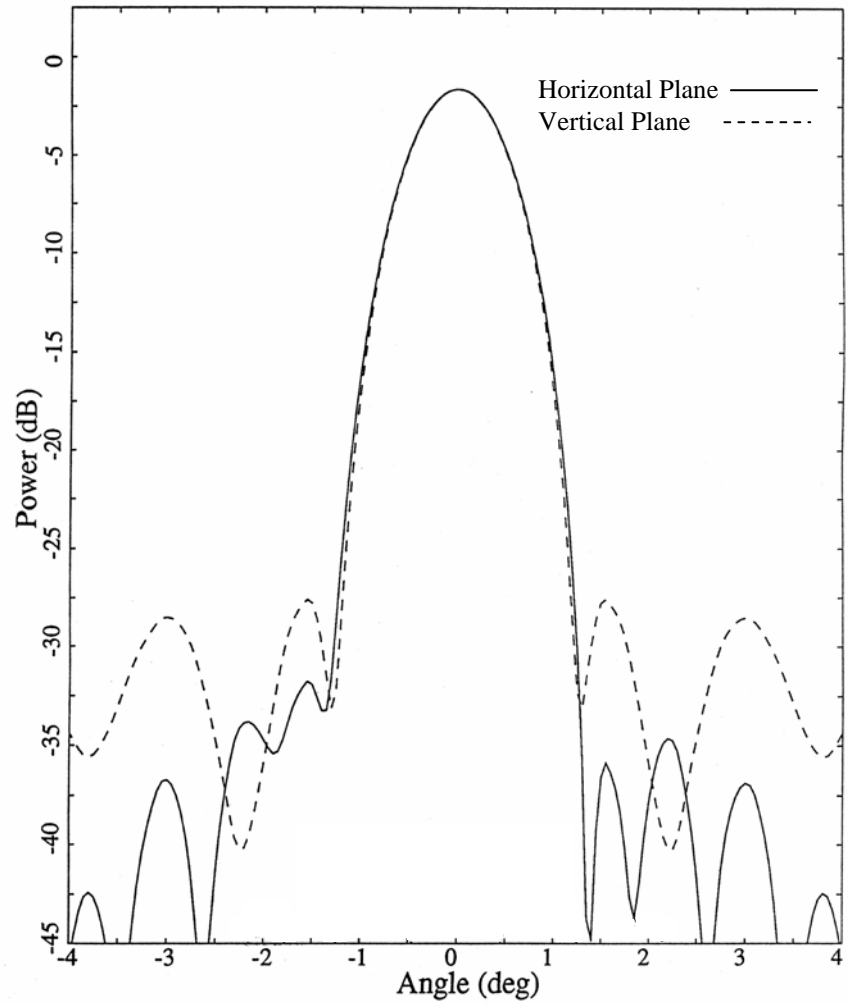


Effect of Surface Errors Vertical Cut





Aperture blockage model
superimposed on measured
aperture amplitude



Vertical sidelobes from -32 to -27 dB

Effect of Feed Blockage

Conclusions

- The Fresnel zone measurement technique was successful.
- Examination and manipulation of the aperture fields helped in analysing the sidelobes.
- The higher than expected sidelobes were due to surface errors in the dish and shadowing from the feed crook.