

# A Future Development Project The L-S band upgrade

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## Summary

The AT antennas (Mopra and Narrabri) suffer significant off-axis polarisation at S-band frequencies (near 2.4 GHz).

The problem has been traced to the OMT (the polariser).

The repair is straightforward, but tedious. Since the repair requires the receiver to be dismantled, it is suggested that the LNAs be upgraded at the same time.

The costs (detailed in AT/39.3/054) are:

- 33 man-weeks to rebuild the OMTs
- 16 man-weeks to upgrade the LNAs
- \$4100 for materials

## 1 Background

Routine pointing observations on 11/may/1955 (D.McKay) showed that the S-band beams were not circular; it was soon demonstrated that the major axis of the X-polarisation was orthogonal to the Y-band's major axis. These results suggested that the antennas would exhibit spurious off-axis polarisation.

R.Sault has conducted a series of observations to investigate this matter. Figs. 1 to 4 show the off-axis performance at the centres of the AT bands. The S-band observations are in a class of their own.

## 2 The problem

B.Thomas suggested that the OMTs were the probable cause of the problem, and this was demonstrated by C.Granet (RPP. 3794).

The OMTs used in the AT are a "quad-ridge" design (see G.James - 1992, IREE special issue, p. 137). The critical feature of the design is a set of four orthogonal fins positioned axially in the waveguide. The C/X band OMTs have the fin profile defined by K.Skinner and G.James; these systems appear to work satisfactorily. The fin profiles were modified for the L/S band systems in an attempt to

improve the wide band performance, and to reduce the tuning problems which were encountered. C.Granet showed that an L/S band OMT fitted with fins cut to the C/X profile do not exhibit the cross-polarisation characteristics of the current L/S fins.

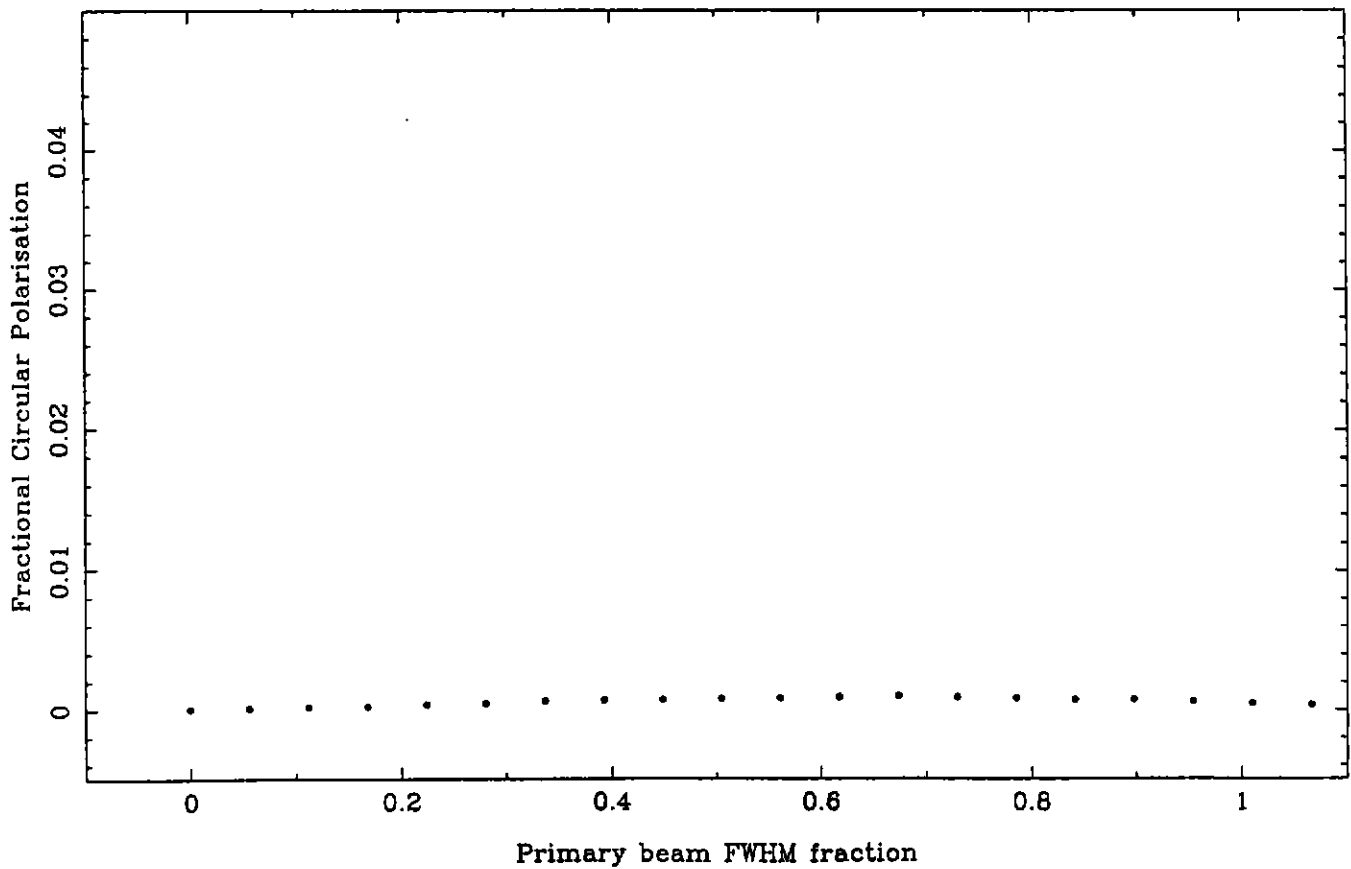
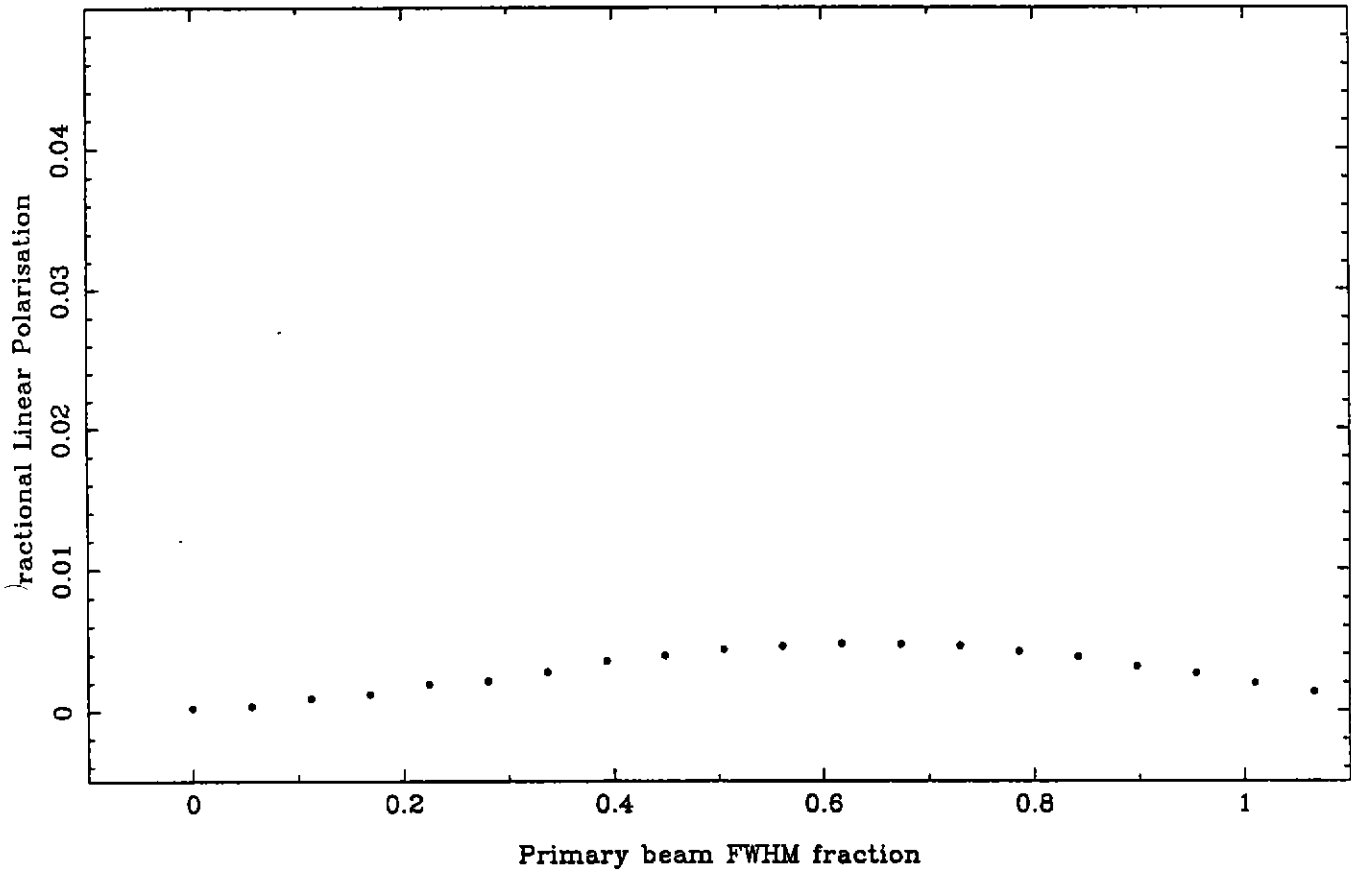
### 3 The Cure

The plan is to replace the fins. The profile would likely be close to the current C/X band profile. Advantage would be taken of the recent OMT work in improving the tuning of these devices. (This affects the positioning of the probes within the fins).

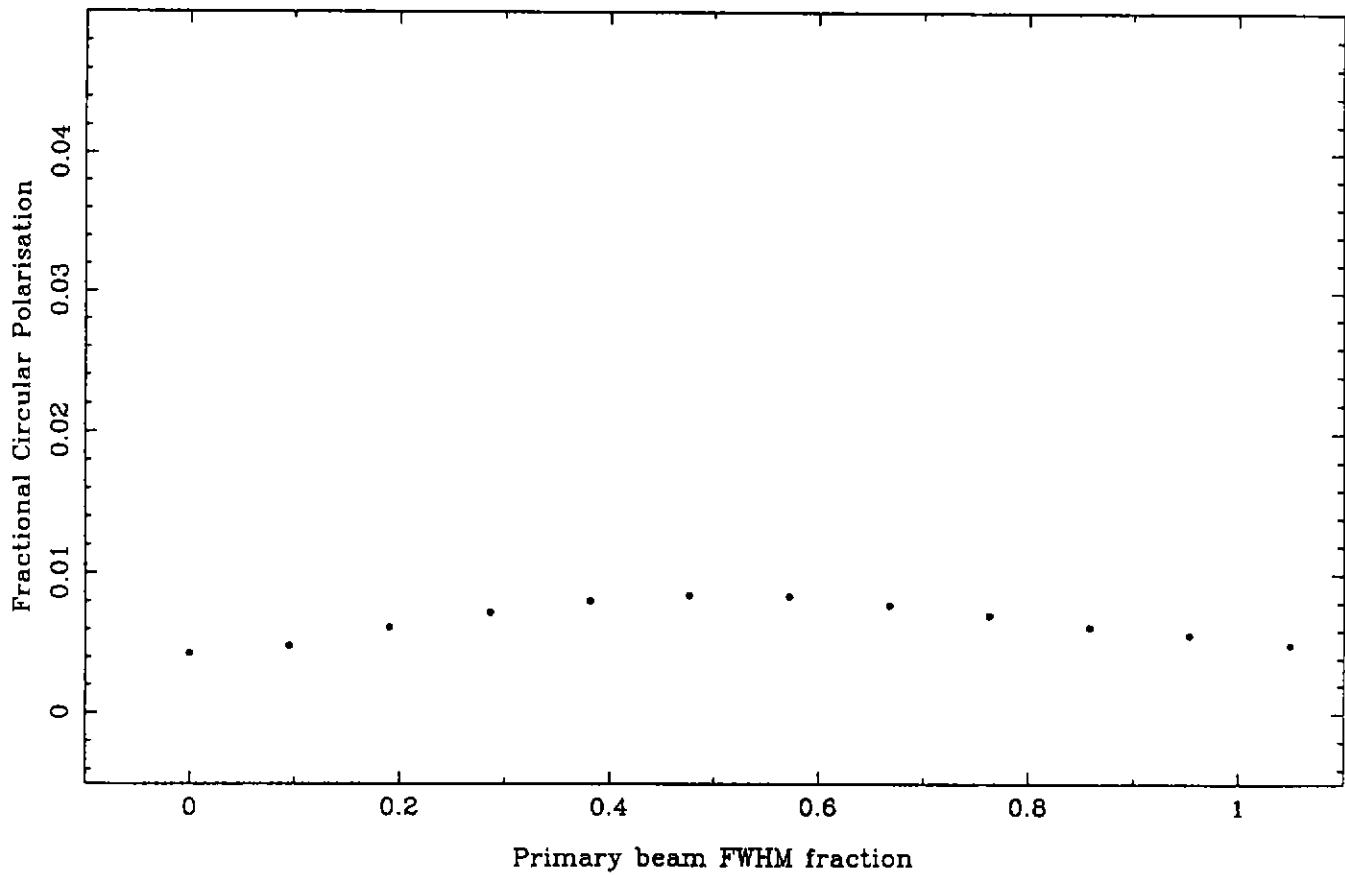
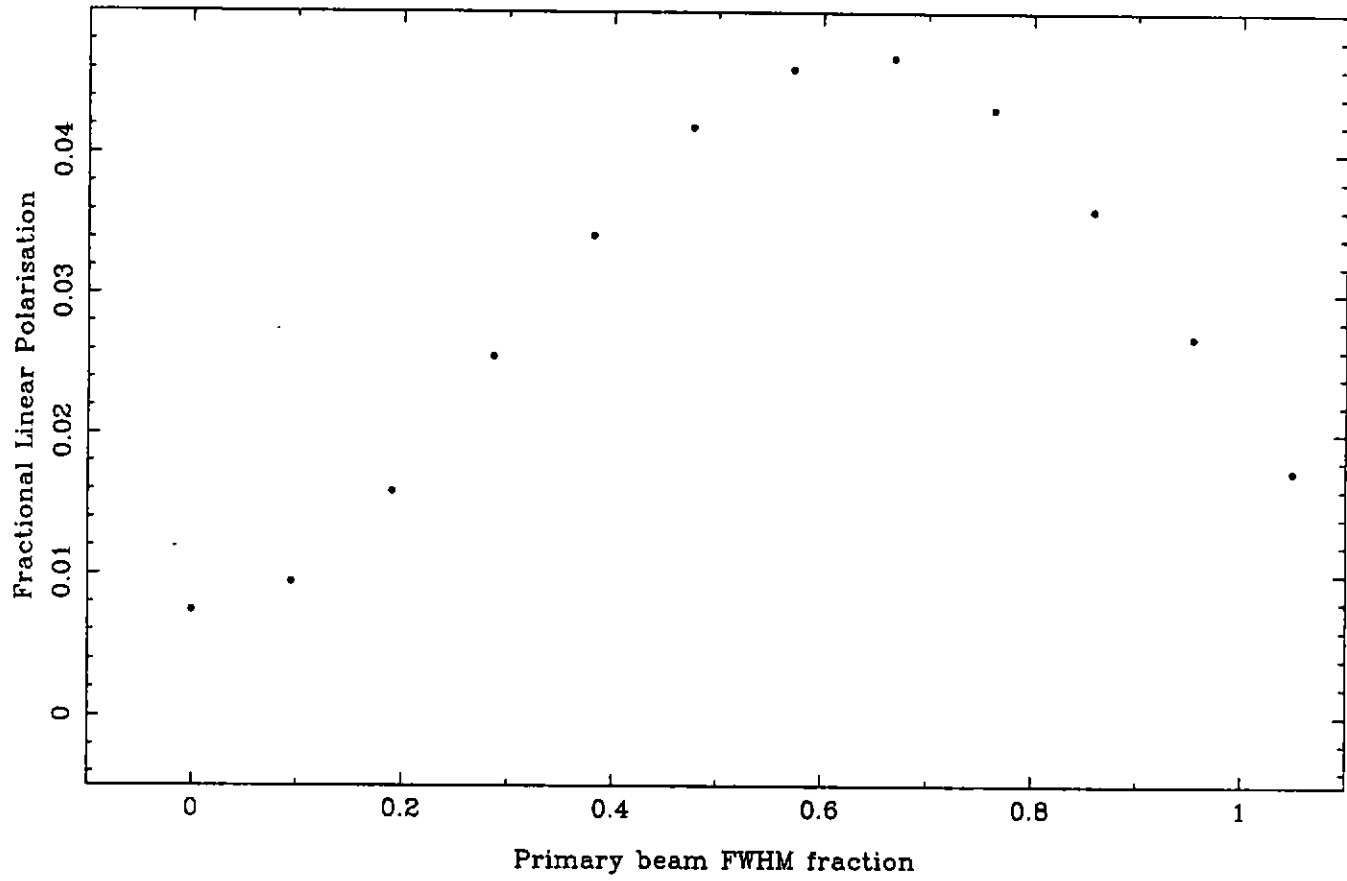
Since the receivers need to be dismantled in order to extract the OMT, it is proposed to upgrade the LNAs to HEMTs.

This work is described in AT/39.3/054

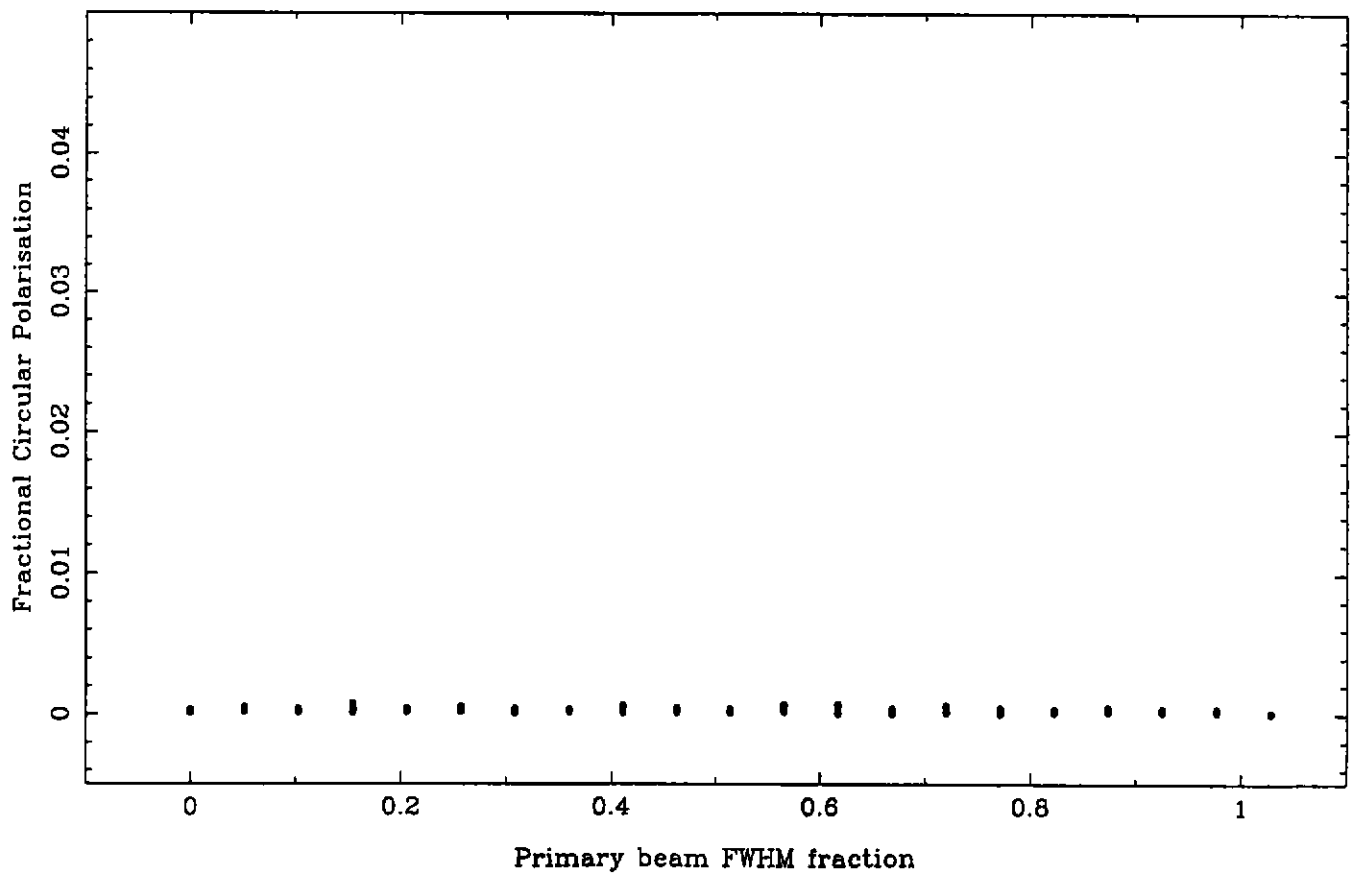
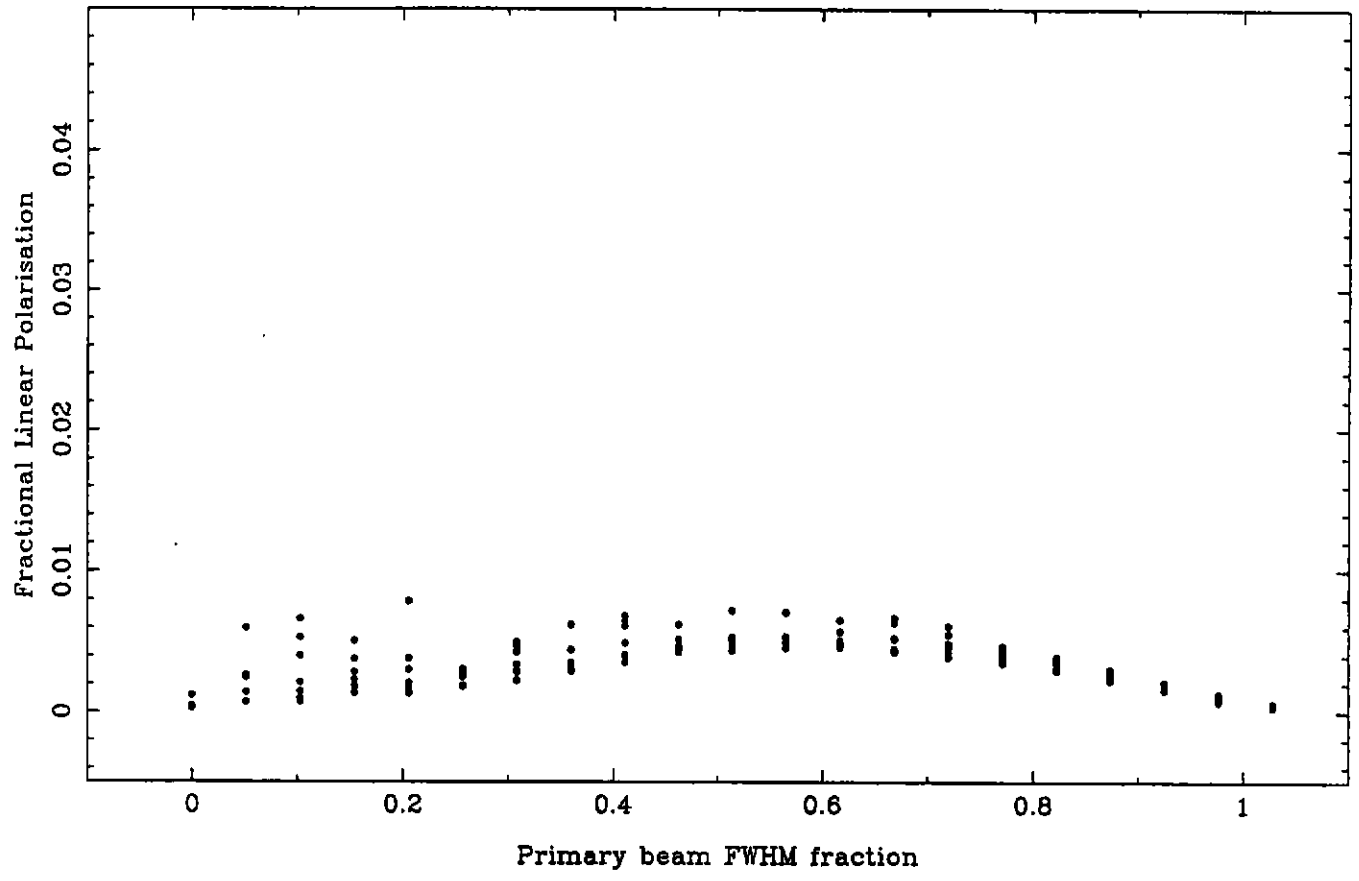
ATCA Instrumental Polarisation - 20cm



ATCA Instrumental Polarisation - Bem



ATCA Instrumental Polarisation - 6 cm



ATCA Instrumental Polarisation - 3cm

