Far Sidelobes of 25m Radio Astronomy Antennas at λ 18 cm.

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Interference to Radio Astronomical observations with large reflector antennas enters the receiver mainly from the far sidelobes. The VLA and VLBA L-Bands cover about 1200-1800 MHz, and include many potential sources of interference, both terrestrial and in orbit. Detailed knowledge of the sidelobes is useful to evaluate present and future RFI levels, and build into systems some protection for Radio Astronomy.

The VLA and VLBA both use offset-Cassegrain optics. The VLA uses a lens-corrected horn, and the VLBA a corrugated horn feed. The feeds are sufficiently different that it was undertaken to measure the far sidelobes of both types of 25m antennas.

The main results are the measured sidelobe profiles, with supporting details of calibration and analysis. The main conclusion is that the CCIR model of ITU recommendation 509-1 is an appropriate representation of the sidelobe envelope of radio astronomy antennas.

The profile is well followed by the VLBA antennas, with their low-sidelobe feeds. The VLA sidelobes also follow the model, except in the range 20°-80° off axis, where they exceed the model by ~6dB. This we ascribe to the high sidelobes, in this angular range, of the unusual horn-lens feed used on the VLA.

The VLA L-band horn is being re-designed to cover 1.2-2GHz, with low sidelobes, for the EVLA upgrade. The reflector surfaces will remain unchanged, so the future sidelobe profile of EVLA antennas is expected to be close to the VLBA profile here.

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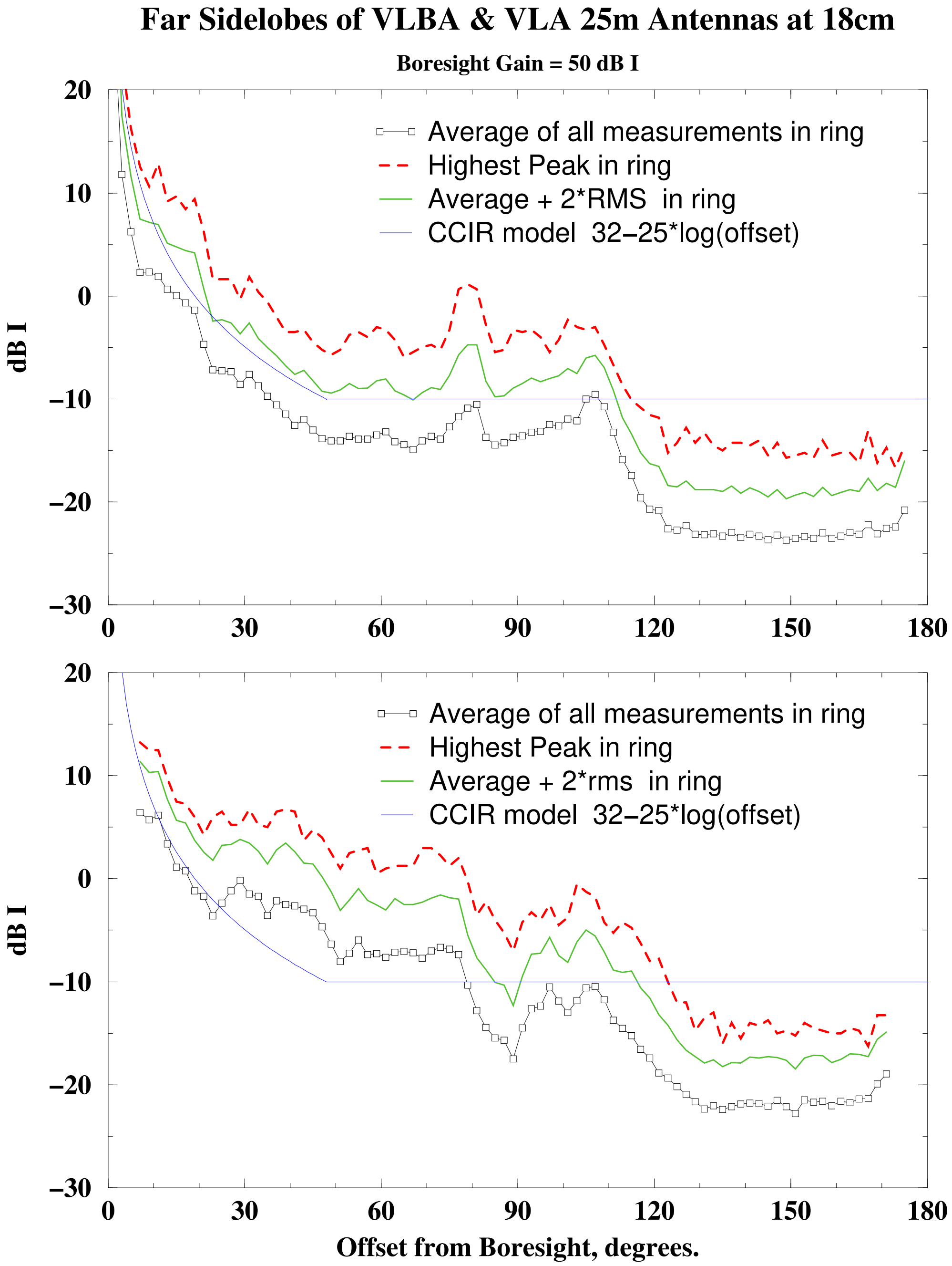

Fig. 1.— Sidelobe Profiles for VLBA and VLA antennas. The calibrated data are analyzed in 2° rings of offset from the boresight, to calculate: (A) the average of all significant measurements (above noise); (B) the highest peak in that ring; and (C) the [average + 2*RMS], below which 90% of values are expected to lie. The CCIR model is shown for comparison.