

A High Performance, Offset, Shaped Antenna Design For The Next Generation VLA Project

Lynn Baker, consultant to the ngVLA project



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Shaping can be seen in the distribution of rays in the aperture. Nominal feed edge taper on the secondary is -16 db. Shaping gives a nearly uniform, high efficiency aperture illumination.



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Nearly uniform illumination gives high efficiency Sharp cutoff at the edge gives very low spillover Somewhat higher near in sidelobes result from this illumination



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Mapping shown transforms feed illumination to aperture illumination shown. Feed edge taper is -16 db. which gives high efficiency and low spillover.



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The secondary is positioned farther from the primary than in DVA-1. This gives a primary which is tilted less and smaller. The longer feed arm is a good tradeoff for the smaller primary.



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Aperture Illumination From GRASP Calculation At 5 GHz.



The intended uniform illumination is evident along with the sharp edge taper. Feed spillover past the secondary can be seen on the left.



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Main beam and near sidelobes from GRASP calculation at 5 GHz.



Peak gain is 59.0 dbi. giving an efficiency of .89 First sidelobe level is -19 db. Second sidelobe level is -27 db. Peak cross polar level is -45 db.



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Far Field Pattern From GRASP Calculation At 5 GHz.



Almost all of the feed spillover cone is seen on the left. A small portion of the spillover past the primary is on the right.



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Far Field Pattern From GRASP Calculation At 5 GHz.



Almost all of the primary spillover cone is seen on the right. A small portion of the feed spillover is on the left.



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Full pattern cuts from GRASP calculation at 5 GHz.



Outside of the main beam, the pattern is well below 0 dbi. Small peaks from cuts through both spillover cones are evident.



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There is little difference in feed up or down tipping at higher frequencies. Receiver noise temperature is not included in this plot.





Main beam and near sidelobes from GRASP calculation at 30 GHz.



Peak gain is 74.62 dbi. giving an efficiency of .905 First sidelobe level is -19 db. Second sidelobe level is -26 db. Peak cross polar level is -47 db. Ratio of gains between 5 and 30 GHz. is 6.04 squared.



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Full pattern cuts from GRASP calculation at 30 GHz.



Feed spillover lobes are about the same except for less diffraction blurring. Primary spillover is much smaller compared to 5 GHz. Main beam peak is clipped for clarity of small values.



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Full pattern cuts from GRASP calculation at 1.4 GHz.



Feed spillover lobes are diffraction blurred compared to 30 GHz. Spillover at ~80° is larger, effecting the tipping curve.



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Diffraction effects cause a small difference in tipping a lower frequencies. Receiver noise temperature is not included in this plot.



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Thank You For Attending!





