HOLOGRAPHIC ANTENNA VALIDATION MEASUREMENTS

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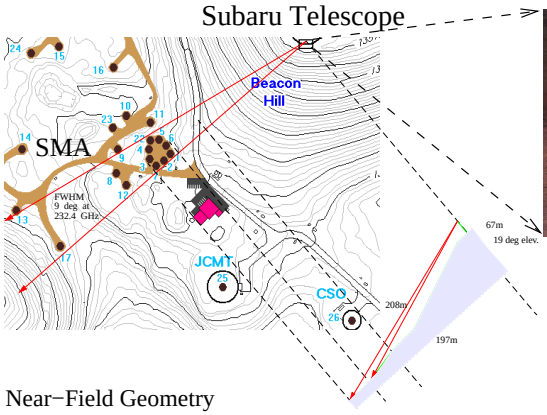
STRATEGY

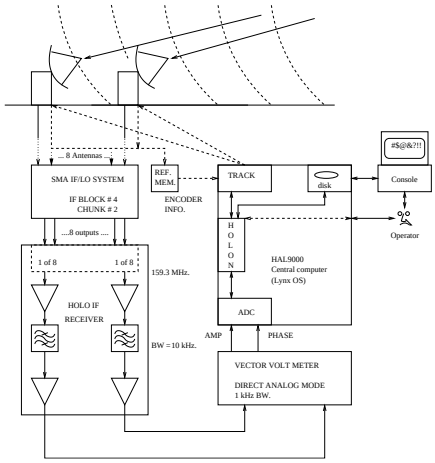
SMA high frequency operation calls for a 12 micron rms surface accuracy. High S/N, high spatial resolution (8 cm) near−field holography in the 230 GHz band is used for fine panel measurements and adjustments. Low spatial resolution (60 cm) celestial measurements are employed to assess gravitational deformation. Limited 345 & 690 GHz band measurements have been made for optics validation. All measurements use standard science recievers and optics.



Near−Field Geometry

The 232.4/332 GHz and 692 GHz beacons on Subaru

System Block Diagram

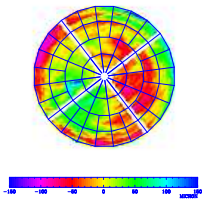


NEAR FIELD MEASUREMENTS

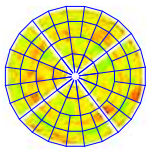
Starting from ~ 60 micron rms mechanical setting, the 12 micron goal is reached in 3 rounds of measurements and adjustments. 1 year repeatability is ~10 micron rms (on difference maps); all antennas are remeasured and adjusted on a ~2 year cycle, with a majority maintained in the 11−15 micron range. Measured illumination tapers close to 10 dB with radial profiles matching $J_0(r)$ validate feed and beam waveguide optics performance.

SURFACE ACCURACY ACHIEVEMENT

rms: 65 micron to 12 micron



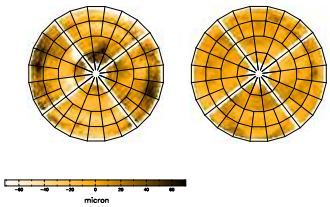
mechanical setting



final holography setting

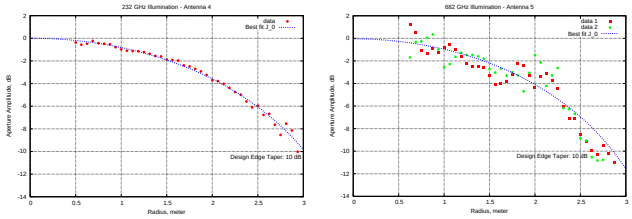
REPEATABILITY

4 yr: 24 micron 1.5 yr: 11 micron



12 transports 2 transports

RADIAL ILLUMINATION PROFILE

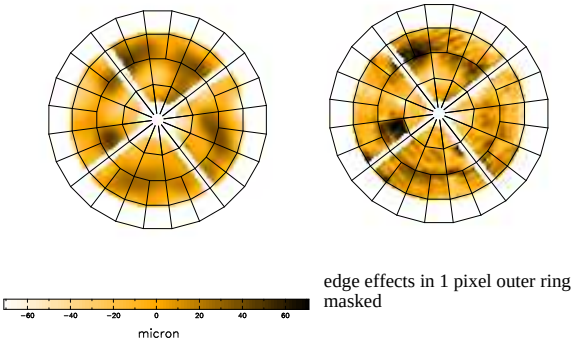


CELESTIAL MEASUREMENTS

3C454.3 was used during a ~50 Jy flare; maps correspond well with near−field data from previous month. Surface rms variations for 34 and 84 degree elevations relative to 57 degree were 9 and 11 micron for Antenna 2 and 8 micron for Antenna 6 for 84 degree elevation. A residual coma was removed for all cases, equivalent to ~ 0.1mm subreflector sag.

Antenna 6

Celestial Near−Field

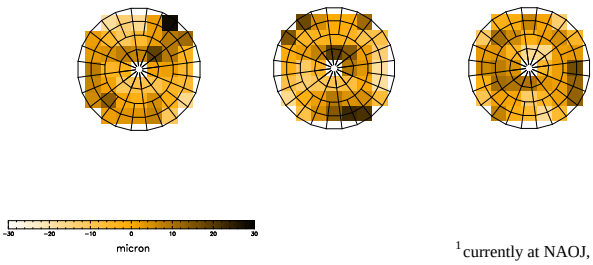


edge effects in 1 pixel outer ring masked

Antenna 2 Antenna 6

Elevation: 57−34 84−57 84−57

rms: 9 micron 11 micron 8 micron



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