HOLOGRAPHIC ANTENNA VALIDATION MEASUREMENTS
T. K. Sridharan, M. Saito, N. Patel, Harvard–Smithsonian Center for Astrophysics

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 receivers and optics.

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

REPEATABILITY
- 4 yr: 24 micron
- 1.5 yr: 11 micron

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: 84–57
- Near-Field: 84–57
- Elevation: 57–34
- rms: 9 micron
- 11 micron
- 8 micron

1 currently at NAOJ, Japan