

ABSTRACT

Mechanical Alignment of Solid Reflector Antennas on Spacecraft

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The mechanical alignment of a reflector antenna involves both the reflector shape and also the relative orientation of the feed and subreflector. The requirements for alignment are derived from the system requirements for antenna functional performance, including pointing.

A typical alignment plan includes the following alignment operations:

- o Component inspection of reflector, subreflector and feed.
- o Antenna assembly, including a final baseline measurement.
- o Alignment to a positioner for antenna range tests.
- o Alignment checks before and after environmental exposures.
- o Installation on spacecraft, including receiving inspection, adjustment to a specific orientation, and structural distortion checks.
- o Alignment checks on spacecraft.

Six tooling balls on the back of the reflector are commonly used as a reference for both pointing and structural distortion. Additional references may be provided by mirrored surfaces, auxiliary tooling balls, machined edges, scribe lines and mounting surfaces.

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Special fixtures for holding the antenna throughout its test sequence have proved useful. These fixtures are designed to provide a rigid support with a minimum of mounting stresses. They also have provisions for fine angular adjustments on antenna positioners.

Analytic aids include:

- o Calculation of the Best-Fit-Paraboloid to the measured points on the reflector surface.
- o Use of beam deviation factors to calculate the predicted electrical beam from mechanical measurements.
- o Transformation of coordinates from one system to another.

The measurement methods and analytic techniques that are used for a typical set of alignment operations are described.