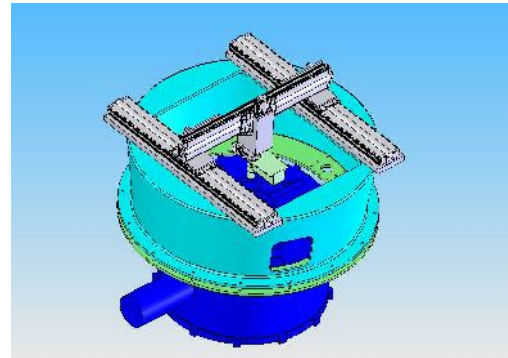




Radio Telescope Instrument Traverse

Description

The design of the ESO Atacama Large Military Array (ALMA), a movable array of 66 radio telescopes in Chile, required the radio dish instruments to be precisely calibrated and tested by various radiometric loads. This required the design and manufacture of a high precision, 4 axes traverse system to accurately position the radiometric loads over the instrument in the receiver. These were then



3D CAD Model of Traverse System on Instrument

mounted on a roll-over rig to mimic the various attitudes of the radio dish. The system was mounted on a large, conical, GFRP support structure, with a large aperture in the top face for the traverser.

The other end of the support structure was mounted directly to the front end of the instrument via the roll-over rig. Interfaces were bonded and machined aluminium faces, to ensure accuracy. The longitudinal axis consisted of 2 linear actuators at 1225 mm long, mounted directly to the support structure. The transverse axis was mounted onto these and consisted of a 1095 mm linear actuator. The vertical and rotary axes were mounted in turn to the transverse axis.

Different radiometric loads were then mounted to the rotary axis. High resolution linear and rotary encoders were used for position feedback. In addition to the design and analysis of the 4 axes traverser, significant structural analysis was required on the mounting methods to the roll-over rig, to ensure that this did not impact on overall system accuracy (typically +/- 0.1 mm). Resolution was typically 5 microns.

Disciplines Used

- Conceptual design
- Mechanical & Electro-Mechanical Design
- Stress & Vibration FEA
- Composite Design & Analysis

ALMA Radio Telescope Dish

