Holography Measurements of ALMA Production Antennas

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The ALMA project is under construction, and expected to enter into full operational phase in about 2012. ALMA is a multi-national collaborative project, calling currently for a total of 54 12-meter antennas and 12 7-meter antennas. The frequency coverage extends from ~31 GHz to ~950 GHz, which calls for an antenna surface precision no worse than 25 microns rms. The antennas will be located in northern Chile at the Array Operations Site (AOS) at an altitude of 5000 meters. Development work, and initial testing of antennas and other equipment, is taking place now at the Operations Support Facility (OSF) at an altitude of 2900 meters. This presentation describes some results of holography measurements on the first production antennas, at the OSF.

The measurement of the antennas is carried out using near-field holography, at either ~104 or ~78 GHz, using a tower-mounted transmitter some 300 meters from the antenna. This uses the same measurement and analysis system as was originally tested with prototype antennas at the ALMA Test Facility (ATF) in New Mexico, and which has been described elsewhere (e.g. Baars et al., IEEE Antennas & Propagation Magazine, **49**, No. 5, October 2008).

The antenna panels are first set to an approximate surface using photogrammetry. Holography measurements start with the usual round of instrumental debugging, in particular to reduce the impact of unwanted reflections. After several iterations of holographic measurement and panel setting, the necessary precision in the absence of thermal deformations is, hopefully, achieved. From that point, the surface is measured under varying environmental conditions to confirm whether the surface remains within specification in the presence of deformations from wind and temperature variations.

So far, the first antennas from Vertex and from Melco have been measured and characterized at the OSF. Some results are presented.