

HOLOGRAPHY

*Antonio Perfetto & Darrel Emerson
Last revised 2000-Sep-28*

Revision History

2000-09-28: First draft version

Summary

Holography, using a terrestrial transmitter, will be used as the prime measurement tool for antenna adjustment. The system has already been developed for the Test Interferometer antenna measurements at the VLA site in New Mexico. Essentially the same measurement hardware will be used for the initial antenna adjustments as antennas are assembled at the Operations Center in San Pedro, prior to being transported to the high site at Chajnantor.

Measurement System

The holography hardware and software used for antenna evaluation at the VLA site will also be used in Chile. This is described in detail in the [Chapter 5 \(Holography\)](#) of the [ALMA Test Interferometer Project Book](#). The holography transmitter is mounted on a tower, some 50 meters high, and about 300 meters from the antenna. The corrections, to be applied in the reduction software, for the transmitter being in the near field of the antenna are very important. Dual frequencies, of ~80 GHz and ~104 GHz are used. The dual frequency measurements give extra information that will confirm many aspects of the near field correction, and also of other corrections applied to allow for various diffraction artifacts. Please see the above reference for details.

Operational Considerations

The antenna manufacturer will be responsible for the initial antenna adjustment, to a precision of around 100 microns rms surface error. The specification for the final antenna surface precision is 25 microns, with a goal of 20 microns. The holography measurement system has a specified error of 10 microns rms, with a goal of 5 microns.

In practice, the antennas at the San Pedro center will be handed over to NRAO with a 100 micron surface precision, and then holography using the transmitter on the 50-meter tower will be used to measure the surface to a precision of ~10 microns. The measurement requires that the antenna control system and data acquisition system will support the holography observing mode. For each antenna, it is anticipated that two or three iterations of measurement, adjustment, and measurement will be required in order to reach the necessary antenna surface precision. It is assumed that transportation to the high Chajnantor site can be made in a way not detrimental to the surface precision. In the current operational plan, there is no intention to perform further single-dish holography at the high site using the dedicated holography receiver and transmitter. Interferometric holography, using celestial sources, will be carried out at the

high site, using standard ALMA receivers, as soon as the system in place there permits.
