

USE OF PHOTOGRAMMETRY AT THE ATA

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For rigged and outfitted antennas, photogrammetry is a good complementary tool to microwave holography measurements to determine the figure of the optics. However, in developing the process to mass produce antennas (for example the tool used to hydroform dishes) holography is not an option and photogrammetry is the preferred technique over other surveying methods. At the Allen Telescope Array, we have used photogrammetry in both ways. Our photogrammetric system uses a specially modified Nikon D1 digital camera and proprietary software from Geodetic Services Inc. (Melbourne, FL) along with reference-length bars (scale bars), a reference-origin bar (autobar) and retro-reflective dots. Our own software then analyzes the photogrammetric output data to determine the topological profile of the dish and aggregate surface roughness. These data are then used to provide feedback to the tuning of the hydroforming tool, done at Andersen Manufacturing (Idaho Falls, ID), as well as to verify the rigging of our offset Gregorian optical system.

The data are acquired by taking many (on the order of 40) pictures of the antenna from a variety of positions and orientation. The software then iteratively solves for the position of the retro-reflective dots, as well as the position and orientation of the camera for each picture. An arbitrary number of dots may be placed (we typically have between 200 and 400, depending on the specific goal). The centroid of each dot is located in three dimensions to an accuracy to about 1 part in 80,000 over the field of view of the pictures, which equates to an absolute accuracy of about 50 microns for our application. Results from the Allen Telescope Array will be presented.

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