

## CALIFORNIA INSTITUTE OF TECHNOLOGY

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SUBJECT Performance of OVRO 40-m Telescope at 43 GHz.

Summary: The surface accuracy of the 40-m telescope has been measured interferometrically and found to be adequate, at least to 20 m diameter, for use at 43 GHz. The aperture efficiency has been measured and found to be consistent with the results of the surface measurements. The peak aperture efficiency is 7.5% at zenith angle 43°. The beam is clean and free of high level sidelobes. The pointing offsets varied smoothly with zenith angle changes, but the relative pointing accuracy ( $3\sigma$ ) is only 0.4, so that an upgrade to the pointing is needed for efficient operation at this frequency.

### 1) Surface Accuracy

The surface accuracy of the 40 m telescope was measured by the interferometric technique described by Scott and Ryle (M.N. 1977, 178), using a 26 m reference antenna. Measurements were made in 3 zenith angle ranges: 5° - 25°, 25° - 45° and 45° - 65°. Maps of the surface were then made from these 3 sets of data. The observing frequency was 8.1 GHz, and the feed was tapered to 10 dB at the edge of the antenna. Thus accurate data were only obtained out to 30 m diameter. Further observations are planned this summer, with a feed which will permit us to map the annulus between 30 m and 40 m diameter. The results were very encouraging. In Fig. 1 is shown the map of the surface relative to the ideal (parabolic) surface at zenith angle 45°. The rms surface deviation is 0.8 mm, which implies an aperture efficiency of ~30% over the inner 20 m. There are a few high and low points which are seen at all zenith angles. Thus it would be possible to improve the aperture efficiency by adjusting some of the panels.

### 2) Aperture Efficiency

We have measured the aperture efficiency with feed horns designed to illuminate 40 m, 30 m and 20 m, respectively. The "20 m feed horn" gave the highest absolute gain. This was consistent with the results of the surface measurements which showed that at diameters  $\gtrsim 25$  m there were some fairly large areas of the dish which were high or low by  $\gtrsim \lambda/4$ . The aperture efficiency measured with this feed is shown in Fig. 2. Flux densities of 66 Jy, 45 Jy, 45 Jy and 11 Jy were assumed for Venus, 3C84, 3C273 and 3C345, respectively.

The peak aperture efficiency of 7.5% (corresponding to 30% for a 20 m aperture) is in fair agreement with that inferred from the surface measurements.

- 3) The aperture efficiency dropped by about a factor 2 at sunrise. We have not yet had time to test the performance of the telescope in a wide range of conditions, but further tests are scheduled this month. It is clear that this telescope can operate effectively at 43 GHz, and it is now a high priority of the OVRO to upgrade the telescope to improve the operation at this frequency.

OVRO 40m TELESCOPE  
SURFACE ACCURACY

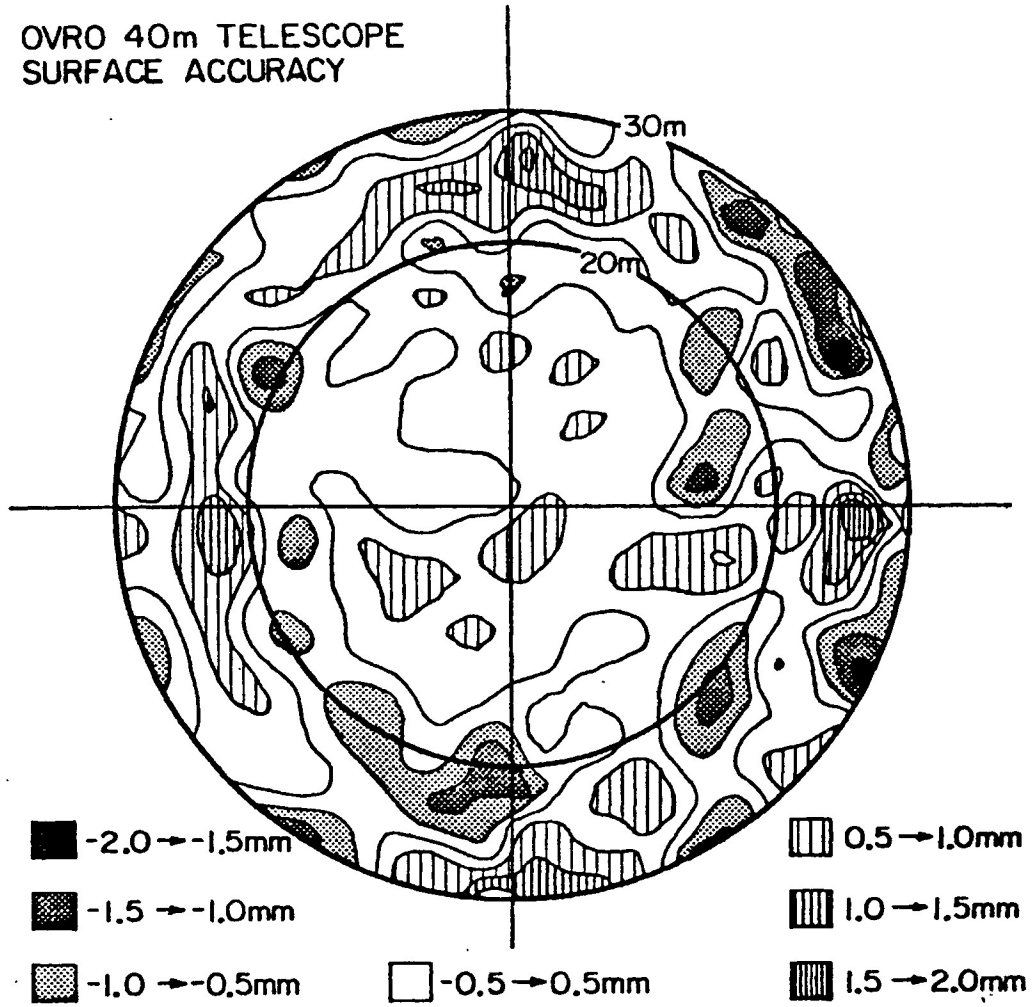


Figure 1

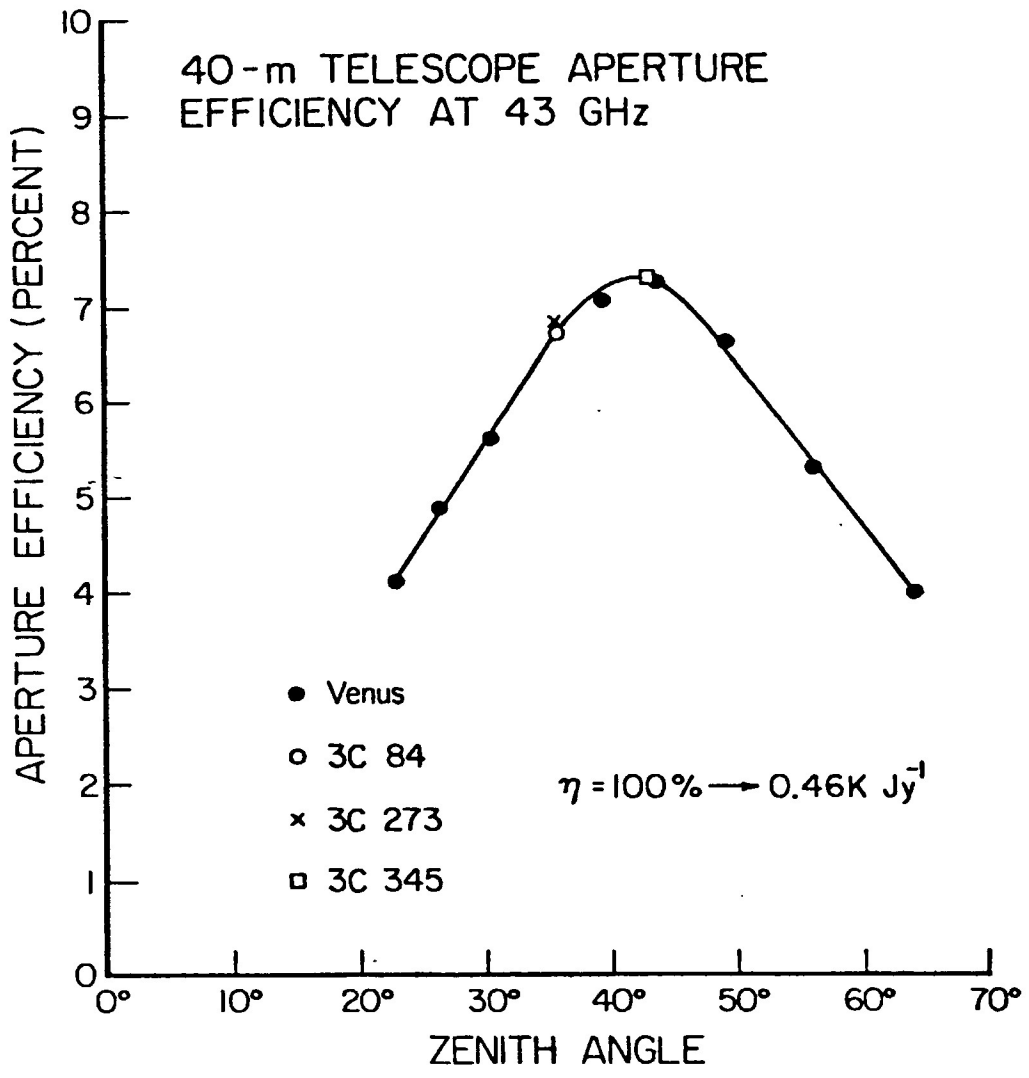


Figure 2