# SURFACE MEASUREMENT OF THE 45 METER RADIO TELESCOPE

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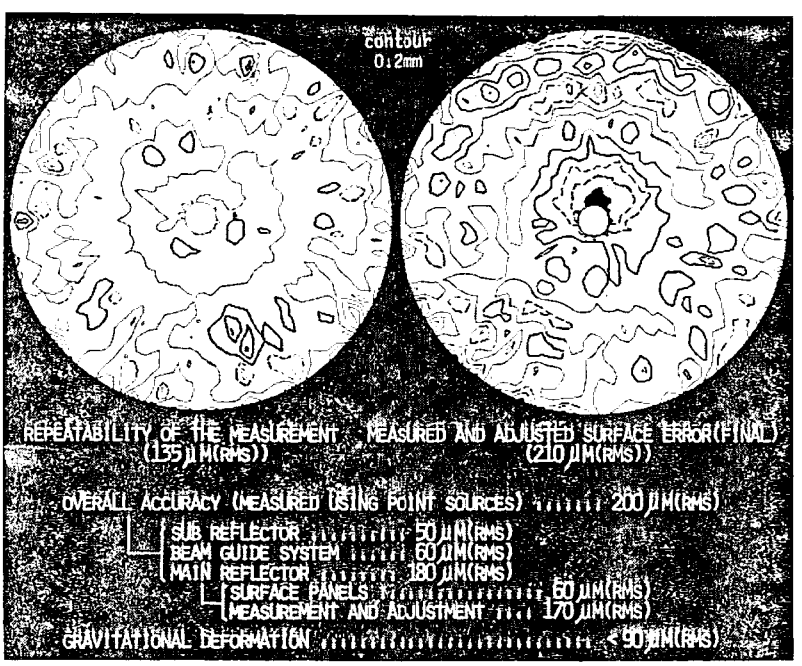
Surface measurement of the Nobeyama 45 meter radio telscope has been made in the past three years, and at present the telescope has an overall surface accuracy of about 0.20 mm (rms) just a step of our goal.

Figure 1.SURFACE MEASUREMENT OF THE 45-M TELESCOPE




EXPLANATION: Surface accuracy of the 45-m telescope was successfully improved (200 μm(rms) overall) using the three-dimensional laser-beam measurement system. The repeatability and measurement error of the system were estimated to be 135 μm(rms, shown above-left) and 170 μm(rms), respectively. The gravitational deformation was also measured to be less than 90 μm(rms).

The motorized supports, for which individual reflector panels are attached, carry reflecting corner-cube targets for measuring the shape of the reflecting surface with a laser-ranging theodolite specially developed for this purpose. Accuracies of 0.1 mm in distance and 2 arc seconds in direction can be attained, corresponding to a surface error of 0.1 mm (rms).

Figure 1. shows a result of measurement of the main reflector obtained in November 1983. 0.18 mm (rms) error for the main reflector surface was derived from this measurement. Figure 2. shows results of the observational efficiency measurements with the Mars and the Venus at the frequencies of 43 GHz and 75 GHz, filled circles and open circle are showing the new results in 1983 and the previous one in 1982 respectively. Observational results are in good coincidence with the mechanically measured one as the surface error of 0.21 mm (rms), Figure 1.

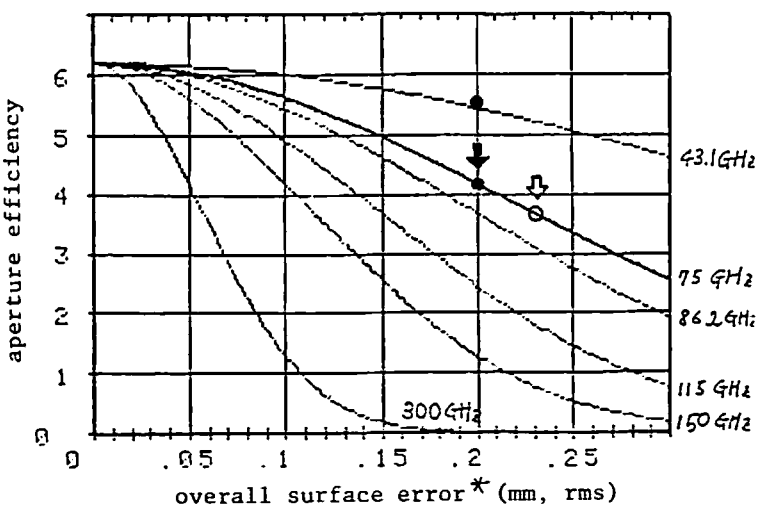



Figure 2.
Expected antenna efficiency with the total surface errors.

*Reflecting surfaces include those of main reflector, sub-reflector and other 8 mirrors for the beam transmission to receivers.

Figure 3. shows the variation of antenna gain at 75 GHz with the changing elevation angle of the antenna. The measurement was made with the use of radio source 3C84, and the maximum variation can be estimated to be less than 10 % including the observational errors. This result is reduced to a performance of the grvitational homologous deformation of the main reflector, and the deformation surface error could be estimated to be less than 90$\mu$m (rms) as given in Figure 1.

Instrumental polarization error at the top of antenna beam was estimated to be less than 0.5% at the 10 GHz band.

Figure 3.
75 GHz antenna gain variation with various elvation angles.