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Holographers

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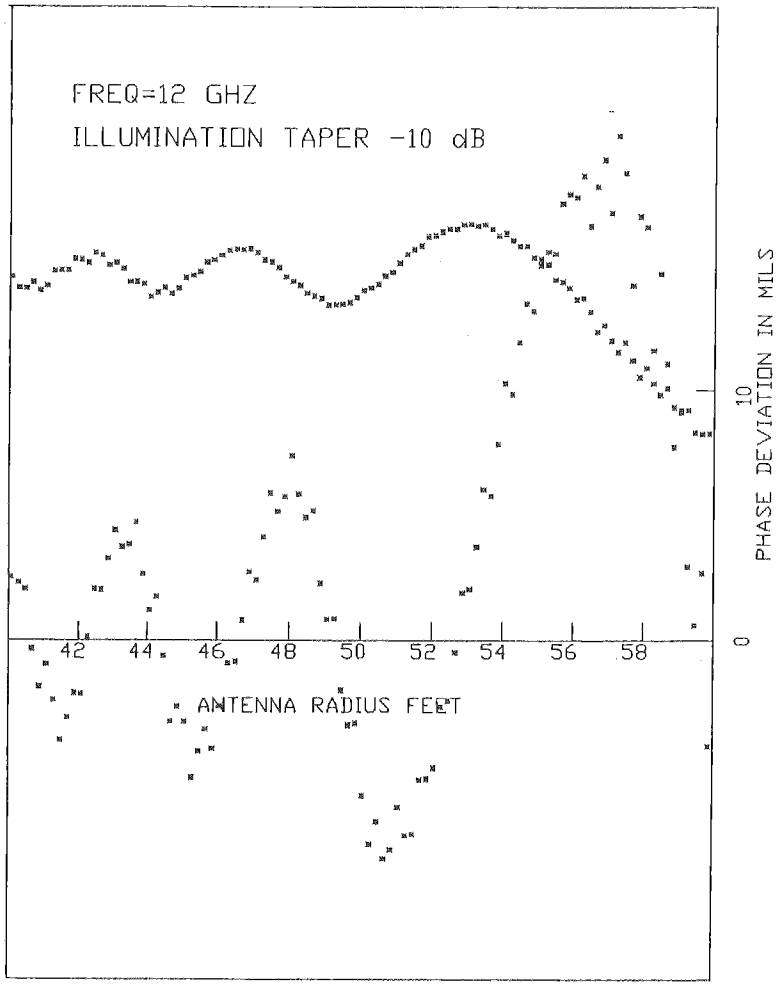
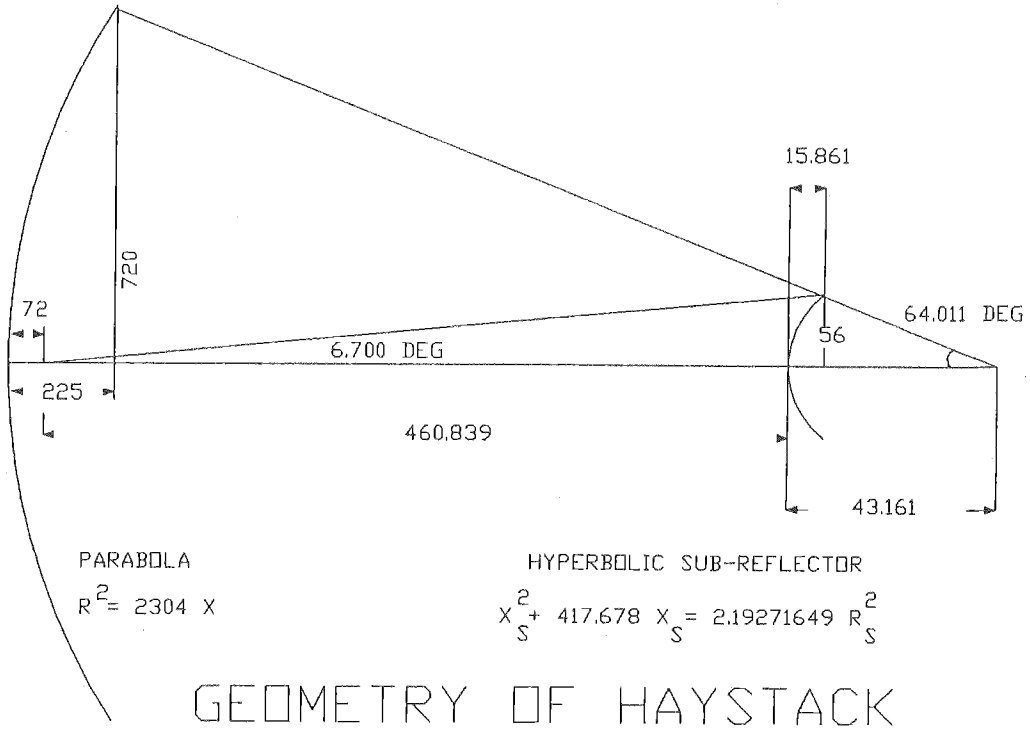
Subject: Correction for diffraction by the edge of the subreflector

Diffraction by the subreflector is described by Rusch on page 50-53 of Meeks, Vol. 12, part B. Using the geometry of Haystack it can be shown that the edge of the subreflector is directly on the line between the edge of the main dish and the prime focus (see attached figure). I have computed the diffraction at 12 GHz using the GTD and plot the results in the figure. The phase effects are significant in the region from a radius of 54-58 feet and corrections should be applied to the holography to avoid trying to rig the 12 GHz diffraction at the edge of the dish. The diffraction will also result in a small loss of antenna efficiency. The loss depends on the feed illumination and decreases with the square root of frequency. When the subreflector is tilted to make the illumination uniform the diffraction is also made uniform (symmetric), at least to first order (John Ball is checking this result).

Added Note: The results depend on the holography feed taper and I show plots for -10 and -17 dB.

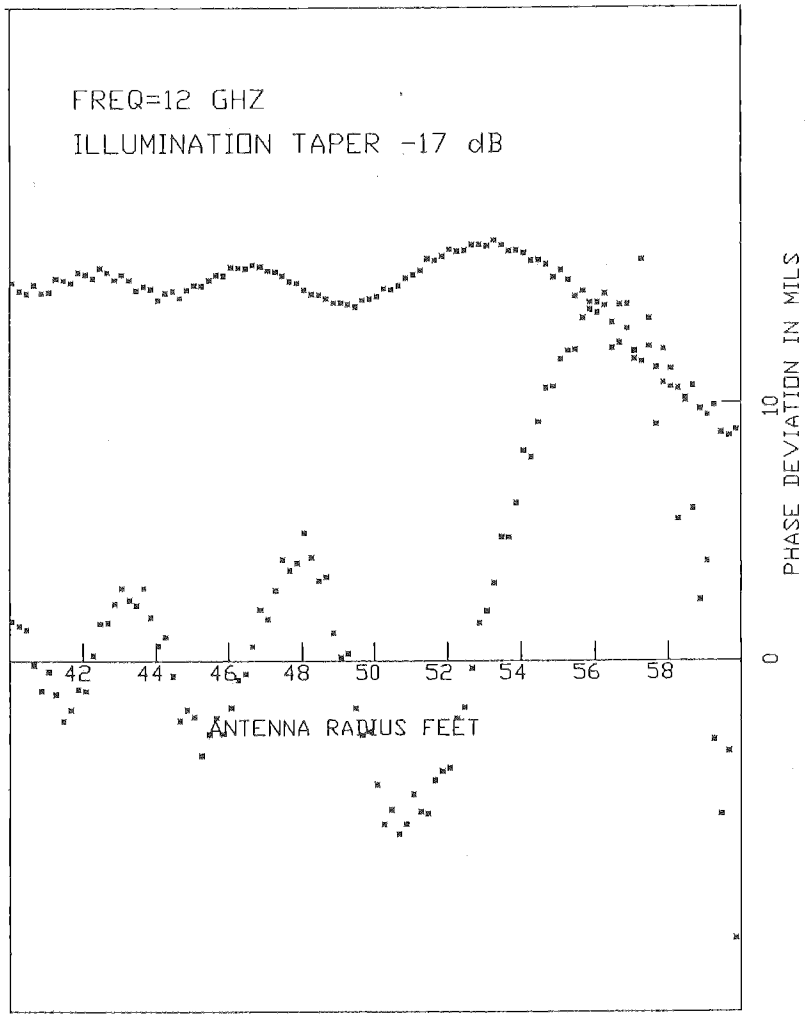


DIFFRACTION FROM THE EDGE OF SUBREFLECTOR

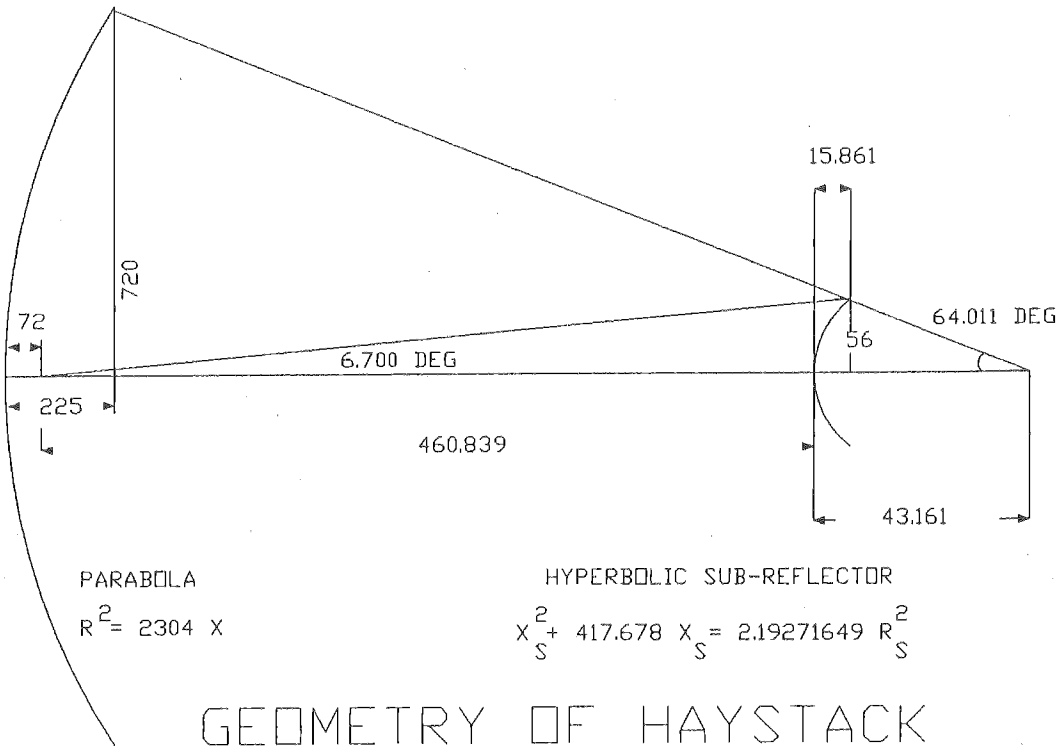


GEOMETRY OF HAYSTACK

DIFFRACTION OF SUBREFLECTOR BY GTD OF
RAYS WITH PHASE CENTER AT PRIME FOCUS



DIFFRACTION FROM THE EDGE OF SUBREFLECTOR



GEOMETRY OF HAYSTACK

DIFFRACTION OF SUBREFLECTOR BY GTD OF
RAYS WITH PHASE CENTER AT PRIME FOCUS