

90-5

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
RADIO ASTRONOMY OBSERVATORY

MASSACHUSETTS 01886

20 December 1990

Telephone: 508-692-4764
Fax: 617-981-0590

AR 126.90

Holographers

From: Alan E.E. Rogers

A.E.R.

Subject: Performance of multiple reflection spoiler

The multiple reflection spoiler suggested in a previous memo (dated 18 October 1990) has now been built and tested. While the performance is probably adequate, I have attempted to understand why the multiple reflections were only reduced (by a factor of 3-4 according to Rich Barvainis) and not completely eliminated. The answer appears to be in the diffraction of the unspoiled part of the main reflector.

Figure 1 shows a calculation of the amplitude of the field from the first reflection of the main onto the subreflector for various spoiler diameters. As can be seen from the figure, it is hard to completely eliminate the field which will produce a second reflection from the subreflector and while it would help to increase the spoiler diameter somewhat it is probably not worth the resulting loss in aperture. The fine scale modulation in figure 1 is the diffraction from a circular structure with diameter of the spoiler while the larger scale structure is from the "Cornu Spiral" of diffraction from a straight edge. As expected from the geometry, the spoiler reduces the multiple reflections at the edge of the subreflector by the largest factor. Figure 2 shows the Newton's rings from multiple reflections measured by holography (from Rich) before and after installation of the spoiler.

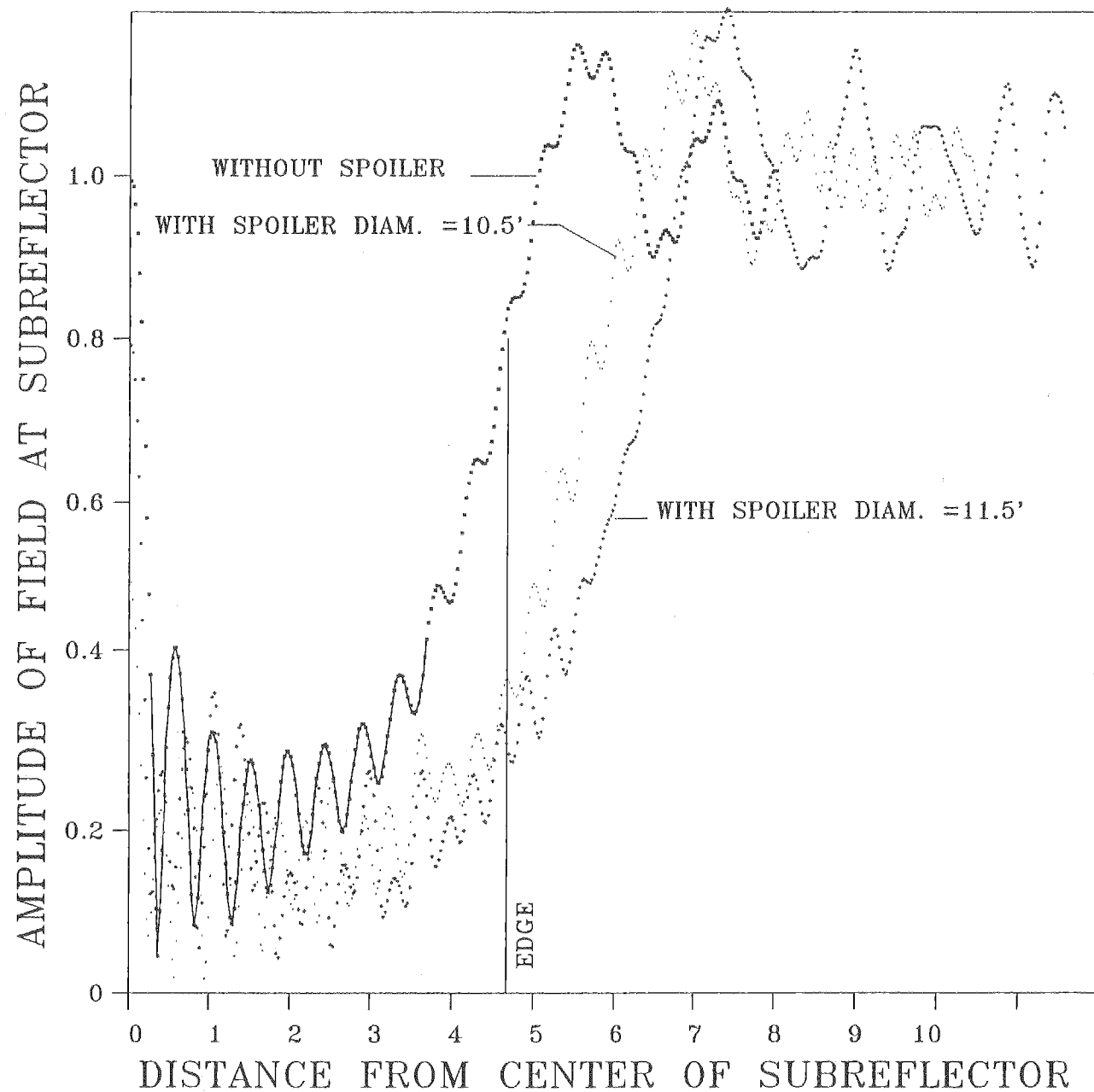


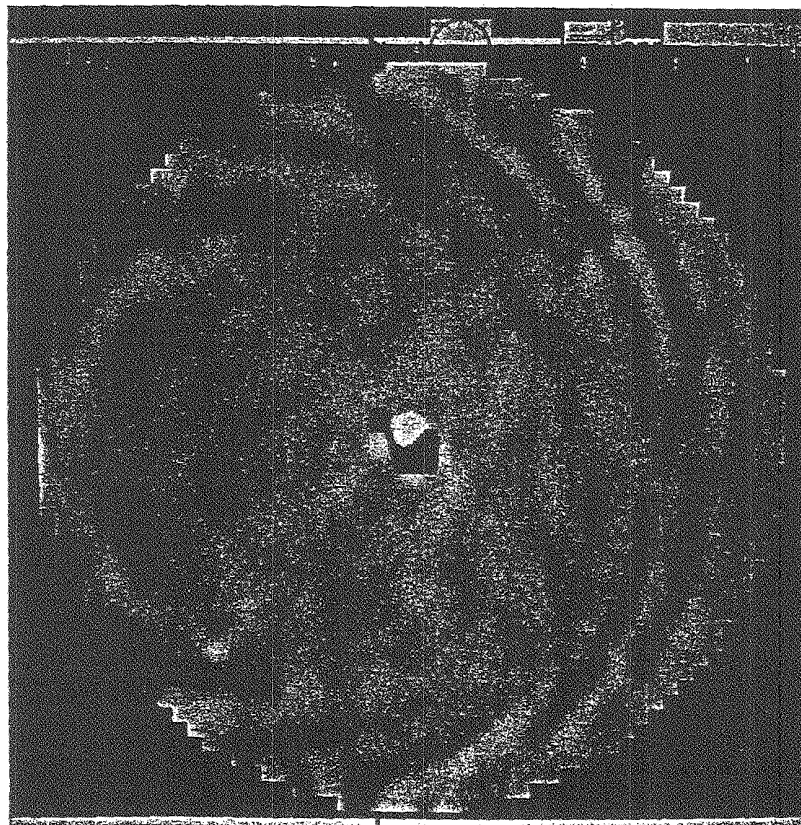
FIGURE 1. MULTIPLE REFLECTION AMPLITUDE



WITH SPOILER IN PLACE

MAD 192-171 SPOILER DIAM. 10.5'

15 degree slope -



WITHOUT SPOILER

MAD 192-171

Figure 2.