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To: SRT Group

From: L. Kimball and A.E.E. Rogers

Subject: Feed support blockage on SRT

The loss from blockage by the feed supports is given by equation 1.3.14 of section 1.3 of Analysis of Parabolic-Reflector Systems by W.V.T. Rusch of Methods of Experimental Physics vol. 12 part B edited by M.L. Meeks. In the limit of supports with a radius a much less than a wavelength $|IFR_E a|$ tends $\approx 0.2\lambda$ so that for a wavelength of 8" the equivalent geometrical blockage for a 10 foot dish is approximately $2 \times 0.2 \times 8 \times 10 \times 12 = 384$ square inches or about 3% of the area for a loss of about 6%.

We measured the antenna temperature on the Sun using dielectric feed supports for which the $|IFR_E|$ is much smaller than the metal support and then taped the metal feed supports to the dielectric supports and re-measured the antenna temperature on the sun. With 2 measurements in each state we conclude that the efficiency loss with the metal supports is

$$3.5 \pm 1.0\%$$

relative to using the dielectric supports. The measured loss is probably less than the theoretical value because the feed polarization is approximately 45 degrees to the feed supports and the cables run along one of the feed supports making it equivalent to a metal support which cannot be replaced with dielectric. With a 7 foot dish we would expect the feed support blockage to increase by 10/7 or to about 5% if we use the measured loss value on the 10 foot dish.