

NATIONAL RADIO ASTRONOMY OBSERVATORY

TUCSON, ARIZONA
September 15, 1981

12 METER MILLIMETER WAVE TELESCOPE

MEMO No. 79

To: J. Payne

From: R. Freund

Subject: Adaptation of the Present 9.5MM Cassegrain Receiver To The Proposed
12 Meter Telescope

Size restrictions in the receiver mounting area of the proposed 12 meter telescope will prohibit the use of the existing 9.5mm dual feed uncooled Cassegrain receiver system. It is possible to adapt this system to function on the new telescope by reverting to a configuration utilizing two receivers with a single feed horn and the nutating sub-reflector. The modification having the greatest effect on the system's performance would be the removal of the waveguide switch. This change increases the individual receiver's sensitivity by approximately 1.58 by removing the loss in the extra waveguide and switch and enables a slightly higher switching frequency thereby reducing a slight 1/F noise contribution and increasing the duty cycle of the switching waveform. Elimination of one half the number of receivers reduces the system-sensitivity by .707. The net change between the existing and proposed systems is an increase in sensitivity of 1.12 times or a factor of 1.25 in integration time.

<u>MODIFICATION</u>	<u>EXISTING SYSTEM</u>	<u>PROPOSED SYSTEM</u>	<u>ANTICIPATED EFFECT (sensitivity increase)</u>
Removal of waveguide switch and components	$T_{sys} = 735K$	$T_{sys} = 565K$	1.30
Increased switching frequency 1/F componet	$F = 2.0 \text{ Hz}$	$F = 3.0 \text{ Hz}$	1.04
switch transition (duty cycle)	switch = 75ms	subreflector = 30ms	1.17
Removal of receivers	# receivers = 4	# receivers = 2	0.707
TOTAL IMPROVEMENT			<hr/> 1.12