

NATIONAL RADIO ASTRONOMY OBSERVATORY  
GREEN BANK, WEST VIRGINIA

ELECTRONICS DIVISION TECHNICAL NOTE NO. 142

Title:                   **7-Feed/6-cm Receiver Noise Temperature Measurements  
                          made at the 140-foot Telescope**

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7-FEED/6-CM RECEIVER NOISE TEMPERATURE MEASUREMENTS  
MADE AT THE 140-FOOT TELESCOPE

George H. Behrens

Tests were performed this date to determine the following:

1. What is the difference in spillover noise contribution between the scalar feeds used in the 7-feed/6-cm receiver and the dual hybrid feed used with the 2-5 GHz receiver?
2. How much more system noise occurs at the 300-ft telescope than at the 140-ft telescope when using the 7-feed/6-cm receiver?

Test Description:

The dual hybrid mode feed was installed at the central feed location (channels 7A and 7B) and the system noise temperature was measured using the DCR. The cal values used were measured before installing the receiver at the 140-ft telescope and used as the standard in the DCR program. (Cal values for channels 7A and 7B were 5.5 K and 4.8 K, respectively.) The dual hybrid mode feed was then replaced with a small scalar feed (the one normally used with the receiver) and the system temperature remeasured. Results of this test show the scalar feed spillover temperature is approximately 10 K higher than the dual hybrid feed.

The measured system noise temperature using the small scalar feed was compared to noise temperature measurements made at the 300-ft telescope on 6 April 1987. Comparing the results of these two sets of measurements show the 300-ft telescope contributes an average of 8.2 K because of additional scatter and/or ground noise radiation passing through the reflector mesh.

Conclusions:

1. These measurements indicate the spillover noise from the small scalar feeds, averaging both planes of polarization, is about 18.7 K or about 10 K more than the dual hybrid feed.
2. The system noise temperature when measured at the 300-ft telescope increased by 8.2 K (an average of both planes) over that measured at the 140-ft telescope. The major portion of this increase in system noise temperature is thought to be from the ground radiation noise passing through the mesh of the reflector.

Summary of Results:

System Noise Temperature Budget for  
7-Feed Receiver at 140-ft  
using Scalar Feed and Dual Hybrid Feed

	Dual Hybrid Feed		Scalar Feed	
	Ch 7A	Ch 7B	Ch 7A	Ch 7B
Receiver Noise Temperature	28.3 K	25.5 K	28.3 K	25.5 K
Total System Noise	40.8 K	42.6 K	51.0 K	52.3 K
Total Feed Temperature	12.5 K	17.1 K	22.7 K	26.8 K
Background & Atmospheric Noise (estimated)	6.0	6.0	6.0	6.0
Feed Spillover & Scatter	6.5	11.1	16.7	20.8

System Noise Temperature Budget for  
7-Feed Receiver at 300-ft  
using Scalar Feed

	Ch 7A	Ch 7B	Remarks
Receiver Noise Temperature	28.3	25.5	
Total System Noise (Scalar)	58.4	61.3	Measured 6 April 1987.
Total Feed Temperature	30.1	35.8	
Background and Atmospheric Noise (Estimated)	6.0	6.0	
Feed Spillover, Scatter and Ground Radiation Thru Reflector Mesh	24.1	29.8	
Feed Spillover and Scatter	16.7	20.8	Assumes spillover and scatter same as at 140-ft.
Ground Radiation thru 300-ft Reflector Mesh	7.4	9.8	

