

**GBT Science Working Group
Minutes, October 15, 1991**

Participating: Aller, Bania, Davis, Dickey, Giovanelli, Haynes, Heiles, Magnani, Moran, Snyder, Wilkinson

The discussion centered upon the plan for receivers at the GBT's Gregorian focus, as described in GBT Memo No. 66 by Balister, Norrod, and Srikanth. Norrod briefly summarized the plan, after which the following issues were raised:

1) **Frequency Breaks.** Roberts pointed out that the GBT will be extremely valuable for measurements of HI in external galaxies. The goal should be to optimize for frequencies from 1.42 GHz down, not to compromise redshifted hydrogen performance by stretching one receiver to cover both HI and OH. Haynes and Giovanelli agreed, although Giovanelli brought up the possibility of using prime focus for frequencies < 1.2 GHz. This will indeed be possible. However, the prime focus receiver is configured into five interchangeable boxes covering 0.29 - 1.23 GHz, only 1 of which will be mounted at any time. Norrod mentioned that efficiency of the Gregorian receiver will fall off very little at 1.15 GHz. Also, the receiver turret could not house two large feeds (1.4 and 1.7 GHz) simultaneously.

Heiles offered that, if it is easy to switch between Gregorian and prime foci, it is wiser to stick with standard waveguides than to introduce breaks at unusual frequencies. Norrod said we anticipate a receiver change will take $< 5-10$ minutes.

Balister called attention to another frequency break at 22.0 GHz, near the water vapor line. Both Moran and Snyder believed this was satisfactory.

2) **Bandwidth.** Norrod answered Moran's question that the cause of the decrease in bandwidth with increasing frequency was the polarizers.

3) **Polarization.** The initial plan for Gregorian receivers above 8 GHz is to accept both circular polarizations and below 8 GHz orthogonal linear polarizations, but not to rotate the receiver package to track the parallactic angle. Heiles was concerned about the ability to measure linear polarization accurately. Nothing structurally prevents adding a rotator to some of the individual receiver packages. Consideration should be given to getting good frequency coverage for the GBT first, then adding refinements for special experiments later. Aller suggested a rotating half-wave plate in front of the feed horn instead of rotating an entire receiver package.

4) **Turret Rotation.** The SWG was assured that the turret would rotate. Heiles stated it was important that it be stoppable anyplace. Otherwise, some feeds might be slightly off axis with unknown consequences for polarization.

On one point the SWG expressed agreement: rotation of the turret when the GBT is in any elevation angle is a strong preference.

5) **Special Capabilities.** Dickey raised the desirability of arrays of feeds. If we had them, could the feeds be made to rotate to stay in the same position in the sky? Arrays are not precluded, nor is rotation of them, but they may be installed as second-generation instruments. The tradeoff, given a finite budget and staff, is between arrays at only a few frequencies or some coverage at many frequencies. Several joined a discussion that, of course, some frequencies were much more important than others, but unanimity of which frequencies were exceptionally important was lacking.