All,

We are nearing the completion of our current tests of the Ka-band receiver. As you likely know, the receiver has been reinstalled after our recent attempts at improving its performance for detecting wide spectral lines. The recent work was unsuccessful in improving the overall system performance. In spite of this we have opted to return the receiver and its associated backends back onto the GBT to allow what science can be performed this year to be done. The system will be removed from the telescope again this summer and outfitted with a new set of hybrids with the hope that those will improve the overall system performance, and the receiver will again be install on the GBT in time for the winter 2010/2011 observing season.

Preliminary test observations with the GBT spectrometer and the UMd Zpectrometer suggest that the quality of the baseline shapes are neither significantly worse nor better than they were last season. A description of the current data quality is given in the following paragraphs. At this point we would appreciate it if you would read carefully through these results to determine if the system performance is adequate for the scientific goals of your project. If the performance is adequate, please go ahead and enable your projects sessions in the GBT Dynamic Scheduling System (http://dss.gb.nrao.edu) and your project will be scheduled. If the system performance is not sufficient for your project please notify your project "friend" and we will continue to carry your project over until the hybrid replacement at which time it can be considered again for scheduling.

Figure 1 shows the noise diode and system temperature values for both of the receiver's beams. We have also drawn on the system temperature plots the sum of the contribution that was expected from the atmosphere, spillover, and the cosmic microwave background for the weather conditions and elevation at the time of the observations. These should be compared to the measurements presented in GBT memo 255 (https://safe.nrao.edu/wiki/pub/GB/Knowledge/GBTMemos/GBT_Memo_255.pdf) - Figures 1, 3 and 4). Both the old and new observations were made in essentially the same weather conditions - tau~0.07 (moderately good), almost the same elevations, and with low winds. As you will notice, the system temperatures are currently 5-10 K higher than they were last season, most of which is not related to the weather. (There is at most a 2 K difference in Tsys due to the difference in the atmospheric conditions between the two epochs.) It also appears that the frequency structures in Tsys and in the noise diode are not as good as before. Fast gain instabilities could produce baseline shapes that are ghosts of this structure.

Figure 2 shows the results of a 2.3 hr observation of F10214 using a 200 MHz bandwidth with the GBT Spectrometer and the observing technique of Subreflector nodding. The observations were taken right after the observation in the first figure. We performed no processing other than the standard vector calibration method described in the above-mentioned memo. Since the measurement of baseline shapes was the main goal, we have not calibrated the data to anything better than about 20%. Figure 3 is the same data but after 10-channel boxcar smoothing to a velocity resolution of 3.9 MHz (33 km/s) and removal of a 5th order baseline. The time allocated for these observations was just sufficient for detection. To eye, we cannot find a significant difference in the quality of the baseline shapes when compared to our previous use of Ka-band for detecting lines from this and similarly weak objects with well-know velocities and line widths that exceed 100 km/s.

In summary, the Ka-band receiver has system temperatures that are 5 to 10 K higher than last season. If our test observations of F10214 are typical, baseline shapes with the GBT Spectrometer don't appear to

be significantly worse than before for detecting wide lines. Projects that are observing narrow lines should have little trouble with these kinds of baseline shapes.

If you have any questions please feel free to contact us.

Thanks very much,

Karen O'Neil, Toney Minter, and Ron Maddalena

koneil@nrao.edu, tminter@nrao.edu, rmaddale@nrao.edu