GBT Monthly Report
January 2001
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The first attempt at a real pointing observation with the GBT was successfully made on January 12, 2001. The observation was made with prime focus receiver one at a frequency of 800 MHz. The received signal was transmitted over optical fiber to the electronics room in the Jansky laboratory and recorded with the digital continuum receiver. The antenna and all NRAO electronics were controlled by version 3.2 of the GBT monitor and control software. The telescope's observer interface, GO, was used to execute the pointing scans, and the operator's interface, CLEO, was used to monitor the observations.

The first release of Monitor and Control version 3.2 was made on the 7^{th} of January, with an updated version (3.2.1) released on the 18th. Version 3.2 contains support for the PF1 receiver through the IF Manager, generation of receiver calibration FITS files via the Measurements Manager, and generation of a FITS file directly by the Antenna Manager. It also incorporates more robust data collection in the Spectral Processor, together with a number of more minor enhancements and bug fixes.

A number of commissioning tests that did not require telescope motion were completed in January. The tests included frequency checks, reflectometry from the Gregorian Receiver Room, RFI surveys, IF checks, IF stability tests, baseline checks, and the measurement of clock delays. The results obtained from some of these tests are described below.

- The tuning and frequency stability of the GBT RF/IF/LO system were evaluated by injecting a test tone in the telescope's receivers and recording spectra with the spectral processor. The frequency resolution of the spectral processor was 78 Hz. For test tone frequencies near 1420 and 4500 MHz, the test tone appeared in the proper frequency channel of the spectral processor. The frequency of the test tone was also varied in 7 Hz increments, and the recorded spectra were consistent with the changes in test tone frequency. The results of these tests indicate that the tuning and frequency stability of the GBT RF/IF/LO system are very good.

- Time domain reflectometry was used to search for standing waves caused by components of the GBT structure. Reflections corresponding to the distance between the top of the receiver room and the subreflector (15 meters) were detected. The reflections will manifest themselves as a 10 MHz standing wave in GBT spectral line observations. The strength of these reflections is about 20 dB below those initially recorded on the 140-Foot telescope. Reflections from the GBT primary surface were not detected.

- An RFI survey conducted with the spectral processor and the L-band receiver showed, among other things, an unusually broad spectral feature near 1400 MHz. Further investigations suggested that the source of this signal is internal to the receiver dewar. The receiver will be removed from the telescope next month to determine the source of the RFI. The RFI survey also indicates that considerable RFI is generated by the GBT servo system.

- The GBT IF system was systematically checked for spurious spectral features by recording spectra at different combinations of LO and IF frequencies. The initial results from these IF checks are encouraging.

- The stability of GBT IF transmissions over optical fiber was tested. The tests showed that the stability is good. Excessive loss in two of the fibers was found to be caused by pinched fibers.

Outfitting activities continue on the telescope. Operational telephones were installed in the Receiver, Servo, and Actuator Control Rooms. The S-band receiver was cooled down. Computer workstations were installed in the Servo Room so that commissioning activities could be conducted from there. The spillover shield was installed below the subreflector. However, the shield will need additional modifications because it lies within the volume of space delimited by the software limits of the subreflector. The reference horn for the holography receiver and one of the feed arm lasers will be installed in February.

The first end-to-end test of the software components in the GBT spectrometer system was successfully completed. All Glish scripts that control the spectrometer in its basic modes (those identified at the 1998 GBT Science Workshop) are now working.

Tests of the actuators in the active surface system have shown that some actuator motors malfunction because water has seeped into the motor housings. The extent of this problem will be determined when the tests are completed.

To prevent the motion of the azimuth track baseplates, Lockheed-Martin (LM) welded four consecutive baseplates to the splice plates that are secured in the concrete foundation. Measurements of the track showed that the welded baseplates moved 0.003 inches relative to the foundation, whereas unwelded baseplates moved 0.055 inches. With these encouraging results, LM proceeded to secure the remaining baseplates by welding six consecutive baseplates into one super-segment. Since the azimuth track consists of 48 baseplates, the track will contain eight super-segments. The gaps between super-segments are large enough to accommodate thermal expansion of the track. LM will attempt to secure the wear strips to the baseplates by installing two, one-inch dowels on each end of a wear strip. Tests of a single wear strip will be conducted in early February to determine if the dowels secure the strip.

LM reinforced one segment of the elevation bullgear by installing Kirksite at two additional locations between the segment and the gear wheel. As in a previous test, the segment was subjected to its maximum design load of 212,000 pounds, and the resulting motion of the segment relative to the wheel was measured. The segment motion of 0.005 inches was comparable to what was measured prior to the reinforcement. A different method of reinforcing the gear may be necessary to permanently secure the segment to the wheel.

LM also completed a number of miscellaneous activities at the GBT site in January. The temporary extension to the deck at the elevation bullgear was removed. Two surface panels were reinstalled near the center of the telescope's primary reflector. One of the more severe design cases on the GBT showed that two structural members in the telescope box structure can be overstressed. Lockheed-Martin reinforced these members so that they could accommodate the design stress.

The velocity and acceleration of the azimuth and elevation drives were reduced by a factor of two to reduce forces on the azimuth track and elevation bullgear. These modifications to the telescope servo are temporary, and the original design velocities and accelerations will be restored when the problems with the azimuth track and bullgear are resolved. A number of servo tests have also been conducted to set and check azimuth and elevation limit switches, to check subreflector motion with "cube tests", and to test the servo subcontractor's software.