GBT Monthly Report
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GBT commissioning observations began on the evening of February 5 by pointing and focusing the telescope with the prime focus receiver at a frequency of 800 MHz. By February 23, the GBT commissioning team had completed most of its prime focus work, and turned its attention to commissioning observations with the subreflector and S-band receiver at 2 GHz.

The preliminary results from the commissioning observations indicate that the performance of the GBT is as good as might be expected. Local pointing corrections at both 800 MHz and 2 GHz do not vary by more than +/- two arcminutes over the range of azimuths and elevations where observations have been made. The results from the prime focus observations show that the pointing curves are smooth, predictable, and repeatable, and that the residual pointing errors may be no larger than eight arcseconds rms in each of azimuth and elevation. The first observations with the S-band receiver showed that the aperture efficiency of the telescope is approximately 70 percent, the system temperature is about 20 K, and the first sidelobes are about 30 dB down from the main beam. The focusing parameters for the subreflector and prime focus box have been determined to an accuracy that maintains aperture efficiency to within five percent of its optimum value. These encouraging results indicate that the optical alignment of the telescope is very good. The commissioning observations have also demonstrated that the software written for tracking, pointing, focusing, and mapping observations is working very well.

A number of software modifications and enhancements have aided the commissioning observations. Antenna trajectories have been refined for smoother transitions between antenna positions. The processing of observational data has been streamlined within AIPS++ to match observing techniques so that results can be produced quickly. A timing offset between the antenna and DCR was found to be a major contributing factor to the apparent hysteresis shown by telescope cross scans in pointing observations. Security checks have been added to the antenna manager so that telescope operators can control access to the telescope control system.

RFI surveys and commissioning observations with the GBT have revealed a number of sources of RFI. An unusually broad spectral feature at 1400 MHz was caused by a resonance within the dewar of the L-band receiver. After the resonance was removed by installing absorber material and a resistive card in the dewar, the L-band receiver was reinstalled in the GBT Receiver Room on February 20. Defective switches in the electrical heaters in local construction buildings produced broadband RFI that severely hampered initial observations at prime focus. The electrical power to these temporary heaters is turned off when observations are in progress. Initial observations with the S-band receiver were saturated by the 2310-2335 MHz transmissions from the Sirius satellite. This satellite was placed in operation last November and provides digital radio broadcasts for automobiles in the continental United States. The effects of the Sirius transmissions were temporarily suppressed by using an 80 MHz wide IF filter. Unfortunately, the use of the filter also suppresses the IF power to a level that is marginally useful for commissioning observations. The servo system for the prime focus boom and subreflector produce broadband RFI. Personnel in the electronics division are in the process of identifying the precise sources of this interference and rectifying them.

Tests of the azimuth track in late January showed that welding consecutive baseplates together could effectively reduce baseplate motion as the telescope was rotated in azimuth. The welding of the remaining baseplates in the track began on February 5, and is approximately 50 percent complete.

Lockheed Martin (LM) attempted to secure the azimuth track wear strips to the track baseplates by installing two, one-inch diameter dowels on each end of a wear strip. As a test on February 8 showed, this modification to one of the wear strips did not constrain the motion of the wear strip. Apparently, the force that causes the wear strip to move caused the soft baseplate material at the dowels to yield. As the holes containing the dowels became elongated due to the yielding baseplate material, the dowels began to bend and ultimately broke. The fact that the dowels broke at two or three locations is consistent with the bending hypothesis. Had the dowels failed in shear, they would have broken in one place at the interface between wear strip and baseplate. This means that the force which caused the failure does not exceed the shear strength of the dowels. LM and NRAO are investigating the use of larger dowels and shims to solve this problem.

Nine of the GBT azimuth bearings will be replaced in May. The new bearings were shipped from the SKF manufacturing facility in Sweden during the week of February 20, and should arrive at an SKF receiving facility in Tennessee by the end of March.

LM delivered CDs and a zip disk that contain as-built drawings for the GBT. The CDs contain structural and mechanical drawings, as well as the structural and mechanical portion of the GBT O&M manual. The zip disk contains the electrical drawings. LM's servo contractor, PCD, submitted its final version of the GBT Site Acceptance Test Procedure that documents the results of GBT servo tests. LM also submitted invoices for the installation of conduit and cable tray for the lower feed arm lasers and for the completion of the structural analysis of the telescope. The laser invoice has been approved for payment, and the structural analysis invoice will be approved once the analysis has been reviewed for completeness and accuracy.

The inability of the GBT HVAC system to adequately cool the Receiver Room on warm days has been attributed to air in the coolant lines. The small bleeder valve on the coolant lines was replaced with a large, 2-inch valve to aid in the removal of air from the system. The larger valve has already allowed for the addition of over 40 gallons of coolant into the HVAC system. A number of small bleeder valves will be installed at other locations in the system where air is likely to accumulate. LM is also providing a portable pump for charging the system with coolant from level one of the alidade so that air can be forced from the system.

Tests of the active surface system revealed that 25 of the 2209 actuator motors had seized because of water seeping into the motor housings. These motors will be repaired, and all actuator motors need to be resealed.

Experiments were made to test the ability of the ground laser rangefinders to automatically acquire targets on the structure at different orientations of the telescope. The rangefinders used the structural model of the telescope and readings from the telescope azimuth and elevation encoders to perform the experiment. When the telescope was stationary, the structural model was able to predict target locations to within two arcminutes of the laser pointing, which is sufficiently accurate for the lasers to acquire their targets. The lasers were also able to acquire and track targets as the telescope was tipped in elevation from 5 to 95 degrees.

Outfitting activities completed over the past month include the installation of the reference horn for the holography receiver and the installation of conduit and cable tray for the lower feed arm lasers. Cables are currently being routed to the locations of these lasers. The spillover shield was removed so that it can be modified for subreflector clearance problems. The installation of a fence around the entire GBT site was started during the week of February 26. The prime focus receiver was reinstalled on the telescope on February 5 after a problem with its cryogenics system was repaired.

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