GBT Monthly Report
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The first three weeks of March were dedicated to GBT commissioning observations at 2 GHz. The initial S-band observations concentrated on accurately positioning the GBT subreflector. Although the subreflector positioning system has six degrees of freedom, the primary motion of the GBT focal point occurs along the subreflector X and Y axes, which are elevation dependent primarily because of the gravitational flexure of the telescope feed arm. Observations were made to empirically determine the elevation dependent focal point, and the resulting focus tracking model was incorporated into the telescope monitor and control software.

The first all-sky pointing observation of the GBT using automatic focus tracking and refraction correction was made on March 9-10. After fitting the pointing data to a traditional pointing model that consists of eight physical terms, the all-sky residual pointing error of the telescope was found to be 8.5 arcseconds rms. The pointing model is now incorporated into the telescope's monitor and control system for automatic pointing corrections.

The first scientific observations for the GBT were successfully conducted on March 24-26. The observations used bi-static S-band radar to image regions of Venus and a close-passing asteroid (2001 EC 16). The observations were made in conjunction with the Arecibo Observatory. The observations demonstrated the ability of the telescope's monitor and control software to accurately track a solar system object.

The Venus observations required accurate estimates of the GBT's location and the signal time delay between the telescope and the Jansky laboratory. Measurements made by Dave Parker and a coordinate conversion made by Frank Ghigo show that the geocentric location of the intersection of the GBT elevation and azimuth axes is X = 882590.171m, Y = -4924873.510m, and Z = 3943729.225m. These coordinates will be useful for initial VLBI observations with the GBT. Roger Norrod found the time delay between the S-band receiver cal control switch and the converter rack in the Electronics Room to be 14,230ns +/- 100ns.

The ability of all 12 ground laser rangefinders to measure ranges to all spherical retroreflectors on the structure was successfully verified on March 14. The target ranges acquired during this experiment will be used to determine the Cartesian coordinates of the retroreflectors. The resulting coordinates can be used to refine the structural model of the telescope.

The azimuth encoder failed on the evening of March 7 and was replaced with a spare encoder the following day. This is the second encoder failure since August 2000. The encoder will be returned to BEI for repairs. An apparent failure of the elevation encoder occurred on March 26. This problem was caused by a temperature switch on the encoder power supply that protects the unit from excessively low temperatures. The power supply was cold because a Lockheed Martin (LM) painter had left the door open on the encoder shelter.

Miscellaneous outfitting activities continue on the telescope. Welders from the Green Bank machine shop are making a number of safety enhancements to the telescope. The C-band receiver was cooled down. A suspected vacuum leak has prevented efforts to cool down the X-band receiver. A new 5 HP cryogenic compressor was completed and tested in the cryogenics laboratory. The routing of cables to the lower feed arm lasers is now essentially complete. The lasers will be installed after these cables are terminated. The spillover shield was modified to accommodate a clearance problem with the subreflector. The installation of the fence around the GBT site is over 50 percent complete.

The welding of the azimuth track baseplates was completed the week of March 12. Two large dowels (1.5 inch diameter x 4 inches long) were then installed in either end of an azimuth track wear strip, and the motion of the wear strip relative to the baseplate was measured when the telescope was rotated in azimuth. The dowels initially constrained the wear strip motion to about 0.020 inches, but subsequent tests revealed additional motion, suggesting that the baseplate material was yielding as in a previous test. An inspection of the baseplate showed that the dowel holes were elongated in the direction of telescope motion as suspected. But unlike the previous test, the large dowels did not break, probably because of a combination of their larger size, their softer material, and their location in the track. On March 15, an attempt by LM to minimize wear strip motion by installing shims in the gaps between strips also failed. With the failure of these attempts to secure the wear strips and given the fact that additional wear strip hold-down bolts were breaking, LM recommended that motion of the telescope in azimuth should be suspended until a solution for the track problem could be found. NRAO-GB has approached consulting engineers for recommendations on how to solve this problem. In the meantime, other commissioning tasks and systems tests that do not require azimuth motion are being undertaken.

Nine new bearings that will be used to replace substandard azimuth wheel bearings on the telescope arrived at the GBT site on March 29. FEMCO, the subcontractor who will replace the bearings, will begin its work on April 30.

The installation of additional air bleeder valves on the coolant lines of the GBT HVAC system is complete. A portable charge pump was used to add additional coolant and force any remaining air out of the lines. The lines should now be completely charged with coolant, and the HVAC system should be able to adequately cool the Receiver Room.

Two items on the GBT punch list require that paint and insulation deficiencies be identified and rectified. A list of painting and insulation concerns was developed by NRAO and forwarded to LM for review.

To satisfy a requirement of its insurance company, LM used a special machine to physically verify that all main circuit breakers in the telescope electrical system trip at the appropriate current.

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