

National Radio Astronomy Observatory
Green Bank, West Virginia

Quarterly Report
January 1 - March 31, 1963

These reports will henceforth be issued quarterly to the AUI Board of Trustees, the Visiting Committee, and the National Science Foundation. They replace the old monthly reports which were dropped about a year ago. The format and content will be approximately as in this first report. We will not attempt to give details of all the scientific work in progress, but there will be included from time to time discussions of particular programs or experiments. If anything that should be included is left out, I hope the recipients of the reports will call the omission to our attention.

Personnel

Mr. Claude Bare joined the staff of the Electronics Division on March 27th. He will work primarily on digital systems. There were no other changes in the scientific or engineering staffs during the period.

The Observatory now has seven co-op students from various universities. They divide their time between the Observatory and their universities in blocks of three months. All are engaged as research assistants on observing programs or equipment development work.

Observing Programs

85-foot telescope: A summary of usage of the 85-foot telescope is as follows:

	<u>Hours</u>
Hours scheduled	1871

	<u>Hours</u>
Equipment installation and calibration	116
Time lost due to equipment failure	278
Interference	26
Weather	126

Thus, the telescope was scheduled for 87 percent of the available hours in the quarter. 15 percent of the scheduled time was lost due to equipment failure -- the bulk of it during a prolonged period of repeated failures in the traveling wave tube radiometer in January. The telescope was scheduled for various programs, as follows:

	<u>Hours</u>
Naval Research Laboratory guest observers, Jupiter polarization	72
750 Mc polarization	576
Planets, supernova remnants, miscellaneous	1223

300-foot telescope:

	<u>Hours</u>
Hours scheduled	1880
Equipment installation and calibration	112
Time lost due to equipment failure	24
Interference	0
Weather	25

Thus, the telescope was scheduled for 85 percent of the available hours in the quarter. 2.5 percent of the scheduled time was lost due to equipment failure. The schedule for various programs was as follows:

	<u>Hours</u>
Department of Terrestrial Magnetism H-line studies	276

	<u>Hours</u>
Sky survey at +40° declination	193
Survey of 3C sources	936
Survey of normal galaxies	276
Supernova remnants, M31, M33, planets	150

Equipment Development

During this period, two standard receivers were built, and two others are now 50 percent completed. Several units for the solid state receiver have been designed and tested. Crystal filters for the 20-channel multifilter receiver were received, and the receiver is now under test on the Reber telescope.

Development work on the autocorrelation receiver is continuing. The possibility of building the digital part of the receiver, using standard commercial modules, has been investigated.

A receiving system for polarization observations at 750 Mc was built during this period, and installed on the 85-foot telescope. This receiver uses a tunnel diode preamplifier. A radiometer for observations in the 200 - 400 Mc range has been built and installed on the 300-foot telescope.

The digital control unit for the 300-foot telescope has been completed, and the digital data input transfer unit is now 80 percent completed. An electronic scanner has also been designed.

Experiments with multiplier circuits for correlation radiometers have been carried out with laboratory models working at L-C-X bands and 30 Mc. The detector balance seems a problem, and will be investigated further.

The 5000 Mc maser system was tested at Airborne Instruments Laboratory with satisfactory results, except for the dewar holding time, which is 12 hours instead of 24 hours as specified.

An L-band parametric amplifier was received from Airborne Instruments Laboratory. Trouble developed in the circulator, and it was returned to the manufacturer for repair. An L-band parametric

amplifier was built here and preliminary tests made. Work on this amplifier continues.

A simple and compact front-end package, including feed horn, was designed and tested for use in a multiple feed system for the 300-foot telescope at 1400 Mc.

Construction

The major construction effort during this period was on the 140-foot diameter polar telescope. Welding of the main ring truss was carried on through the winter by utilizing a temporary canvas enclosure. By April 10th, the welding was completed and the tent dismantled. At the present time preparations are being made to move the welded assembly closer to the foundation so that the large derricks can be utilized in erecting the remainder of the superstructure, including declination shaft and bearings, counterweight housing, gear girder, and gears.

Work on the major components of the mount -- the polar shaft, spherical bearing, and yoke -- has proceeded approximately on schedule. The principal contractors for these jobs are Westinghouse and Sun Shipbuilding Corporation. The major castings have all been poured, tested, and shown satisfactory. A contract for the surface panels was given to the Kennedy Division of Electronic Specialty Co.

Antenna Design Studies

a) 400-foot transit telescope. A contract has been let with the Rohr Corporation, Chula Vista, California, for a preliminary design of a 400-foot diameter transit telescope. This would resemble the existing 300-foot in general concept, but would have the increased strength to give 10 cm operation, to withstand a greater snow and wind loading, and to cover the sky from the pole to just below the galactic center. Work on this contract is under the direction of R. D. Hall at Rohr, and is going well.

b) The cost of parabolic antennas. As part of the preliminary design study for a very large antenna, the first of a few planned

contracts to study the cost of parabolic antennas as a function of size, upper frequency limit, sky coverage, method of mounting, and general design has been let to Lear-Siegler, Inc., at El Segundo, California. Work on this contract is just starting.

c) The performance of existing antennas. A contract was let in December, and the work on it is now completed, for the measurement of the surfaces of the 85-foot and the 300-foot telescopes. The work was done through the Instrument Corporation of Florida by D Brown Associates, Eau Gallie, Florida. Measurements of the 300-foot telescope in the zenith and at 30° and 51° from the zenith were made. Contour maps, photographs, and detailed results are available, and give accuracies better than $1/4$ " for about 300 points on the surface. The 85-foot was measured, and similar results are available, at the zenith and at the horizon to accuracies better than 0.07".