

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

PROPERTY OF THE U.S. GOVT
NATIONAL RADIO ASTRONOMY OBSERVATORY
CHARLOTTESVILLE, VA

Quarterly Report

APR 13 1976

January 1, 1976 - March 31, 1976

RESEARCH PROGRAMS

| <u>140-foot Telescope</u> | <u>Hours</u> |
|---|--------------|
| Scheduled observing | 2011.75 |
| Scheduled maintenance and equipment changes | 139.75 |
| Scheduled tests and calibration | 13.00 |
| Time lost due to: equipment failure | 62.25 |
| power | 15.25 |
| weather | 23.00 |
| interference | 0.00 |

The following line programs were conducted during this quarter.

| <u>Observer</u> | <u>Program</u> |
|----------------------------|---|
| N. Thonnard (DTM) | Search at 1421 MHz for neutral hydrogen emission from 12-14 magnitude spiral galaxies, and a study of high velocity hydrogen around the dwarf irregular galaxy WLM. |
| V. Rubin (DTM) | |
| K. Ford (DTM) | |
| M. Roberts | |
| G. Knapp (Caltech) | Observations of 4830 MHz H ₂ CO (formaldehyde) near early-type stars embedded in dark clouds. |
| R. Brown | |
| R. Dickman (Aerospace) | Observations of 4830 MHz H ₂ CO in interstellar clouds for comparison with visual extinction and CO abundance. |
| M. Kutner (Rensselaer) | |
| F. Clark (Kentucky) | Observations at 6-cm wavelength to study the H ₂ CO velocity structure in the Taurus dark cloud complex, and a search for the SO-dimer in Sgr B2. |
| F. Lovas (NBS) | |
| D. Johnson (NBS) | |
| H. Liszt (Pittsburgh) | Observations at 6-cm wavelength of H ₂ ¹² CO and H ₂ ¹³ CO in absorption toward a number of strong sources. |
| P. Wannier (Massachusetts) | |

| <u>Observer</u> | <u>Program</u> |
|--|---|
| P. Myers (MIT) M. Schneps (MIT) | Observations at 4830 MHz of H ₂ CO toward dark clouds with high electron density, and toward reddened globular clusters previously observed at the 21-cm hydrogen line. |
| E. Chaisson (Center for Astrophys.) | Observations at 6-cm wavelength to map H ₂ CO absorption in M20 and Orion, to complete H ₂ CO maps of several other molecular clouds, and measurements of H110 α in NGC 7027. |
| R. Tully (Hawaii) J. R. Fisher | Extension of a 1421 MHz hydrogen survey of galaxies to declinations south of those attainable with the 300-foot telescope. |
| P. Schwartz (NRL) D. Thacker (NRL) J. Dowell (International Research and Technology Corp.) | Search in OH maser sources for 6-cm vibrationally excited OH. |
| F. Clark (Kentucky) D. Johnson (NBS) | Additional observations to confirm the detection of S0 at 13 GHz, and an attempt to detect S ₂ O and (S0) ₂ in the frequency range of 12-14 GHz. |
| E. Grayzeck (Nevada) | Observations of 1421 MHz hydrogen to map the NGC 7822 region, to measure the absorption at the position of NGC 7822, and to measure emission at the positions of OB and X-ray stars. |
| E. Chaisson (Center for Astrophys.) | Observations at 6-cm wavelength to map 110 α recombination lines and H ₂ CO in M8, to complete an H ₂ CO study of W3, to measure H ₂ CO toward several near infrared sources, and to complete a Stark effect study in Ori A through observations of higher order recombination lines. |
| P. Myers (MIT) P. Ho (MIT) | Observations of 1421 MHz hydrogen in self-absorption toward molecular clouds and related objects. |

| <u>Observer</u> | <u>Program</u> |
|---|---|
| W. B. Burton | Additional 1421 MHz neutral hydrogen observations to confirm or reject the suggestion of a new, nearby galaxy. |
| J. Gallagher (Minnesota) W. B. Burton | High sensitivity 1421 MHz hydrogen study of the inner region of the galaxy. |
| T. Bania (Virginia) | Studies of 1421 MHz hydrogen emission between galactic coordinates of $l = \pm 10^\circ$, at $b = 0.0^\circ$. |
| B. Balick (Washington) S. Faber (California, Santa Cruz) L. Robinson (California, Santa Cruz) J. Gallagher (Minnesota) | Observations of 1421 MHz hydrogen in early type galaxies. |
| F. Levinson (Virginia) P. Seitzer (Virginia) S. Goldstein (Virginia) | Observations of 1421 MHz hydrogen toward selected nearby clusters of galaxies. |
| F. J. Lockman (Massachusetts) R. Brown | Observations of $\text{He76}\alpha$ at 14.696 GHz and $\text{H76}\alpha$ at 14.690 GHz to study the helium abundance in galactic HII regions, and a search for H_2CO in Comet West at 14.488 GHz. |
| B. Balick (Washington) E. Wollman (California, Berkeley) | Observations of Sgr A to study $\text{H76}\alpha$ at 14.690 GHz and to search for $\text{He76}\alpha$ at 14.696 GHz. |

The following continuum programs were conducted.

| <u>Observer</u> | <u>Program</u> |
|--|---|
| J. Stocke (Arizona) | Observations at 6-cm wavelength of double galaxies previously detected at 11-cm wavelength. |
| G. Bath (Oxford, England) G. Wallerstein (Washington) | Search at 6-cm wavelength for emission from a number of peculiar stars. |
| P. Myers (MIT) P. Ho (MIT) N. Thonnard (DTM) | Observations of a source (MXB 1730-33.5) exhibiting X-ray bursts at $\text{RA} = 17^{\text{h}}30^{\text{m}}26^{\text{s}}$ and $\text{DEC} = -33^\circ29'$ in an attempt to detect 1400 MHz emission from this object. |

| <u>Observer</u> | <u>Program</u> |
|---|---|
| B. Rönnäng (Onsala Space Observatory, Sweden) | Flux density measurements at 18-cm wavelength of radio galaxies and quasars observed in a VLB experiment. |
| R. Schilizzi (Caltech) | |
| D. Shaffer | |

The following very long baseline observations were conducted.

| <u>Observer</u> | <u>Program</u> |
|--|--|
| M. Cohen (Caltech) | Observations at 2.8-cm wavelength to monitor 3C 120 to observe structure and flux changes, using the OVRO 130-foot telescope, the Fort Davis 85-foot telescope and the NRAO 140-foot telescope. |
| R. Schilizzi (Caltech) | |
| A. Maxwell (Harvard, Fort Davis) | |
| K. Kellermann | |
| D. Shaffer | Observations at 2.8-cm wavelength to determine the structure of NGC 1275, BL Lac, 3C 345, and M87, using the MPIR 100-meter telescope, the Fort Davis 85-foot telescope, the OVRO 130-foot telescope, and the NRAO 140-foot telescope. |
| I. Pauliny-Toth (MPIR, Bonn, W. Germany) | |
| E. Preuss (MPIR, Bonn, W. Germany) | |
| M. Cohen (Caltech) | |
| R. Schilizzi (Caltech) | |
| A. Maxwell (Harvard, Fort Davis) | |
| D. Shaffer | Observations at 2.8-cm wavelength of compact nuclei of extended radio sources, using the MPIR 100-meter telescope, and the NRAO 140-foot telescope. |
| K. Kellermann | |
| I. Pauliny-Toth (MPIR, Bonn, W. Germany) | |
| E. Preuss (MPIR, Bonn, W. Germany) | |
| D. Shaffer | Observations at 2.8-cm wavelength of variable complex extragalactic objects using the Fort Davis 85-foot telescope, the OVRO 130-foot telescope, and the NRAO 140-foot telescope. |
| K. Kellermann | |
| M. Cohen (Caltech) | |
| A. Moffet (Caltech) | |
| J. Romney (Caltech) | |
| R. Schilizzi (Caltech) | |
| G. Seielstad (Caltech) | Observations at 2.8-cm wavelength to determine the structure of OJ 287 using the OVRO 130-foot telescope and the NRAO 140-foot telescope. |
| P. Wilkinson (Caltech) | |
| M. Cohen (Caltech) | |
| A. Moffet (Caltech) | |
| R. Schilizzi (Caltech) | |
| D. Shaffer | |
| K. Kellermann | |

| <u>Interferometer</u> | <u>Hours</u> |
|---|--------------|
| Scheduled observing | 1780.00 |
| Scheduled maintenance and equipment changes | 115.50 |
| Scheduled tests and calibration | 255.50 |
| Time lost due to: equipment failure | 25.75 |
| power | 13.50 |
| weather | 40.50 |
| interference | 0.50 |

While most programs used the 45-foot telescope over a 35-km baseline, only those specifically requiring its use are indicated in the program descriptions.

The following continuum programs were conducted at 2695 and 8085 MHz unless otherwise indicated.

| <u>Observer</u> | <u>Program</u> |
|--|--|
| K. Johnston (NRL) C. Wade | Observations of astrometric positions and a study of time and polar motion, using the 45-foot telescope. |
| K. Lo (Caltech) R. Brown | Study of the time variations of the compact radio sources in Sgr A, and a short search for radiation from Comet West, using the 45-foot telescope. |
| R. Hjellming | Detailed measurements of the radio properties of Nova Cygni 1975, using the 45-foot telescope. |
| J. Wardle (Brandeis) D. Altschuler (Maryland) | Monitor the variability of flux and polarization in approximately 80 sources. |
| J. Wardle (Brandeis) R. Potash (Brandeis) | Study of the structure, polarization, and spectra of a complete sample of quasars for which there is accurate optical data, using the 45-foot telescope. |
| K. Johnston (NRL) E. Devinney (South Florida) | Attempt to detect emission from close binary systems. |
| F. Owen L. Rudnick | Observations of sources lying in the direction of Abell clusters of galaxies, and structure and polarization maps of the head-tail galaxy NGC 1265, using the 45-foot telescope. |

| <u>Observer</u> | <u>Program</u> |
|--|--|
| P. Feldman (NRC, Canada) C. Purton (York, Canada) K. Marsh (Caltech) | Study of early-type emission-line stars which exhibit strong infrared radiation. |
| J. Smolinski (Torun Observatory, Poland) L. Higgs (NRC, Canada) P. Feldman (NRC, Canada) | Observations to confirm possible radio emission from HD 18381 and HD 217476. |
| P. Crane (MIT) R. M. Price (NSF) | Monitor the flux density variations of compact sources in spiral galaxies, using the 45-foot telescope. |
| R. Conway (Jodrell Bank, England) R. Porcas | Study of the structure of 3C 273. |
| G. Knapp (Caltech) J. Broderick (VPI&SU) R. Brown | Study of reflection nebulae. |
| W. Gilmore (Maryland) B. Zuckerman (Maryland) R. Brown | Observations to search for compact HII regions embedded in dark clouds. |
| B. Zuckerman (Maryland) R. Brown | Search for compact continuum sources in dense molecular clouds. |
| J. Dickel (Illinois) E. Greisen | Aperture synthesis of Cas A. |
| F. Owen L. Rudnick | Observations of low brightness radio structure in rich clusters of galaxies. |
| D. Gibson (Jodrell Bank, England) F. Owen | Continuation of a survey to study the radio properties of RSCVn binaries. |
| G. Miley (Leiden, Netherlands) F. Owen L. Rudnick | Observations, using the 45-foot telescope, to map three objects which show radio tails that have been found in Abell clusters of galaxies. |
| R. Hobbs (NASA-Greenbelt) S. Maran (NASA-Greenbelt) J. Brandt (NASA-Greenbelt) | Observations in an attempt to detect Comet West, using the 45-foot telescope. |

| <u>Observer</u> | <u>Program</u> |
|---|--|
| L. Rudnick | Observations of approximately 75 radio galaxies selected from the 4C catalog, using the 45-foot telescope. |
| M. Ulmer (Center for Astrophys.) R. Hjellming L. Blankenship | Observations at 8085 MHz to confirm whether Cyg X-2 is surrounded by a double source similar to Sco X-1. |
| B. Burke (MIT) T. Giuffrida (MIT) | Aperture synthesis of M31, M81, and M101 and observations of a source (MXB 1730-33.5) exhibiting X-ray bursts at RA = 17 ^h 30 ^m 26 ^s and DEC = -33°29' in an attempt to detect emission from this object. |
| C. Alissandrakis (Maryland) M. Kundu (Maryland) S. Liu (Maryland) P. Angerhofer (Maryland) | Study of the possible periodic variations in solar emission and a study of solar bursts, using the 45-foot telescope. |
| R. Porcas | Study of the structure of sources from the Jodrell Bank Mark IA survey to help with identification and to determine spectral indices of the structure, using the 45-foot telescope. |
| R. M. Price (NSF) P. Crane (MIT) | Survey of spiral galaxies, using the 45-foot telescope. |

| <u>300-foot Telescope</u> | <u>Hours</u> |
|---|--------------|
| Scheduled observing | 1992.25 |
| Scheduled maintenance and equipment changes | 133.75 |
| Scheduled tests and calibration | 20.50 |
| Time lost due to: equipment failure | 44.50 |
| power | 17.50 |
| weather | 10.00 |
| interference | 0.00 |

The following line programs were conducted during this quarter.

| <u>Observer</u> | <u>Program</u> |
|---|--|
| M. Haynes (Indiana) R. Brown M. Roberts | Search for 1421 MHz hydrogen absorption at the systemic velocity of approximately 30 clusters of galaxies. |

| <u>Observer</u> | <u>Program</u> |
|---|--|
| A. Rots | Measurement of the 1421 MHz hydrogen distribution in spiral galaxies whose angular diameters are greater than nine minutes of arc and less than 35 minutes of arc. |
| S. Peterson (Cornell) | Continuation of a survey of 1421 MHz hydrogen in a statistically complete sample of optical pairs of galaxies. |
| S. Goldstein (Virginia) T. Cram E. Greisen | Mapping of 1421 MHz hydrogen high velocity clouds. |
| A. Wolfe (Pittsburgh) M. Haynes (Indiana) A. Rots M. Roberts R. Brown | Search at 997 MHz for red-shifted hydrogen absorption in P0 735+178 and at 932 MHz red-shifted hydrogen absorption in A0 0235+16. |
| M. Burkhead (Indiana) R. Giovanelli (Indiana) M. Haynes (Indiana) | Observations of 1421 MHz hydrogen in the outer regions of nearby spiral galaxies. |
| R. Giovanelli (Indiana) M. Haynes (Indiana) | Observations of ring structures in high velocity complexes of 1421 MHz hydrogen. |
| P. Bowers (Maryland) S. Simonson (Maryland) F. Kerr (Maryland) | Observations to complete an all sky 1612 MHz OH survey, and to search for OH radiation from Comet West at 1612, 1665 and 1667 MHz. |
| N. Thonnard (DTM) V. Rubin (DTM) W. Ford (DTM) M. Roberts | Search at 1421 MHz for hydrogen emission from 12-14 magnitude spiral galaxies. |

The following continuum programs were conducted.

| <u>Observer</u> | <u>Program</u> |
|--|--|
| W. Erickson (Maryland) J. R. Fisher | An extension of the 250-1000 MHz variable source monitoring program. |

| <u>Observer</u> | <u>Program</u> |
|--|---|
| J. Armstrong | Study at 265 and 430 MHz of source brightness distributions using observations of interplanetary scintillations. |
| J. Kaptizky (Massachusetts) W. Dent (Massachusetts) T. Balonek (Massachusetts) | Polarization and flux density measurements of variable radio sources at 2695 MHz. |
| P. Usher (Penn State) R. Howard | Search at 6-cm wavelength for radio emission from sixteen optically variable "stellar" objects. |
| R. Porcas | Observations at 6-cm wavelength of selected sources observed with the Jodrell Bank MK 1A telescope and the Jodrell Bank MK 1A-MK II interferometer. |
| G. Wallerstein (Washington) | Search at 6-cm wavelength for emission from a number of peculiar stars. |

The following pulsar programs were conducted.

| <u>Observer</u> | <u>Program</u> |
|--|--|
| D. Helfand (Massachusetts) P. Backus (Massachusetts) J. Taylor (Massachusetts) R. Hulse | Observations of the positions, proper motions, and timing of known pulsars; a search for new pulsars; a study of A0535+26 for pulsar-like phenomena. |
| B. Rickett (California, San Diego) J. Armstrong | Observations at 340 and 400 MHz to measure the decorrelation bandwidth caused by interstellar scintillation of large dispersion measure pulsars. |
| J. Armstrong R. Hulse | Search at 340 and 400 MHz to redetect PSR 0904+77, and if successful, to determine its dispersion measure. |

36-foot TelescopeHours

| | |
|---|---------|
| Scheduled observing | 1961.00 |
| Scheduled maintenance and equipment changes | 154.00 |
| Scheduled tests and calibration | 45.00 |
| Time lost due to: equipment failure | 128.00 |
| weather | 112.00 |
| power | 0.00 |
| interference | 4.00 |

ObserverProgram

| | |
|-----------------------------------|--|
| M. Allen (Caltech) | Search for HNC O , MgS, MgO and HC N . |
| T. Kuiper (JPL) | |
| M. Allen (Caltech) | Mapping of HCO $^+$ and N H_2^+ in regions of |
| M. Morris (Caltech) | high electron density. |
| G. Knapp (Caltech) | |
| T. Bania (Virginia) | CO maps of galactic center. |
| F. Clark (Kentucky) | Search for urea |
| R. Brown (Monash, Australia) | |
| P. Godfrey (Monash, Australia) | |
| J. Storey (Monash, Australia) | |
| W. Dent (Massachusetts) | Continuum measurements of time variable |
| R. Hobbs (NASA) | sources. |
| J. Dickel (Illinois) | Search for thermal continuum in directions |
| | of supernova remnants. |
| D. Dickinson (Harvard) | Search for SiO emission from S-type stars. |
| G. Blair (Texas) | |
| E. Epstein (Aerospace Corp.) | Search for intraday fluctuations of |
| R. Landau (FORTH, Inc.) | quasars and Seyfert galaxies. |
| M. Gordon | Map of CO along galactic equator. |
| W. B. Burton | |
| C. Heiles (California, Berkeley) | Search for CO in absorption against con- |
| T. Troland (California, Berkeley) | tinuum sources. |
| C. Leung | Observations of CO emission from Bok |
| H. Liszt (Pittsburgh) | globules. |

| <u>Observer</u> | <u>Program</u> |
|---|---|
| R. Linke (Bell Labs) A. Penzias (Bell Labs) P. Wannier (Massachusetts) R. Wilson (Bell Labs) | Search for interstellar alkyl halides. |
| R. Linke (Bell Labs) A. Penzias (Bell Labs) P. Wannier (Massachusetts) R. Wilson (Bell Labs) | Search for interstellar magnesium. |
| K. Lo (Caltech) | Search for continuum emission from Seyfert galaxies at 3 mm and 9 mm. |
| J. Lyon (Pittsburgh) P. Marionni (Maryland) S. Mufson (NASA-Marshall S.F.C.) | Further search for CO emission in planetary nebulae. |
| P. Myers (MIT) M. Schneps (MIT) P. Ho (MIT) | Maps of CO and CS to measure velocity fields in three dark clouds. |
| P. Myers (MIT) M. Schneps (MIT) P. Ho (MIT) | Spatial extent of six dark clouds in CO and CS. |
| F. Owen S. Mufson (NASA-Marshall S.F.C.) | Observations of extragalactic sources with flat spectra, and of binary stars. |
| P. Palmer (Chicago) S. Strom (KPNO) P. Nachman (Chicago) | CO maps of dark clouds. |
| T. Phillips (Bell Labs) P. Solomon (SUNY, Stony Brook) P. Wannier (Massachusetts) | Further observations of 230 GHz CO in galactic objects and search for NO ⁺ . |
| P. Schwartz (NRL) S. Mango (Ball Brothers Res. Corp.) E. Waltman (NRL) K. Johnston (NRL) | Observations of millimeter-wave recombination lines. |
| P. Solomon (SUNY, Stony Brook) N. Scoville (Massachusetts) | Maps of CO along galactic latitude. |

| <u>Observer</u> | <u>Program</u> |
|-----------------------------|--|
| P. Vanden Bout (Texas) | Observations of bright rims and elephant trunks in CO, CS and HCN. |
| W. Peters (Texas) | |
| R. Loren (Texas) | |
| W. Wilson (Aerospace Corp.) | Search for lines of OCS. |
| P. Goldsmith (Bell Labs) | |

ELECTRONICS DIVISION

Green Bank

| <u>Manpower Assignments</u> | <u>%</u> |
|--|-------------|
| Visitor Support and Maintenance..... | 34 |
| New Receiver Development..... | 26 |
| Sick Leave and Vacation..... | 8 |
| VLBI Effort..... | 4 |
| 140-Foot Cassegrain Receiver Improvements..... | 6 |
| Digital Standard Receiver Development..... | 3 |
| VLA Support..... | 2 |
| 140-Foot Computer Hardware Support..... | 8 |
| Interferometer Digital Delay Development..... | 2 |
| Tucson Support..... | 1 |
| Improved ULO Development..... | 4 |
| 300-Foot Encoder Upgrading..... | 1 |
| Interference Control..... | 1 |
| | <u>100%</u> |

The improved 2 and 1.3-cm Cassegrain local oscillator systems are being completed, and an L-band filter has been developed and installed ahead of one upconverter for suppression of radar interference. Considerable experience has been gained at 21/18 and 6 cm with this system and improvements continue.

Much of the interface of the 140-foot electronics with the new on-line Modcomp computer has been completed and is being tested with the computer in the laboratory.

The cooled diode switch has been completed and installed in the new 25/6-cm receiver which is now undergoing system tests and is well into the final construction stage. The new 9-cm receiver schedule is following closely behind the 25/6-cm receiver. The cooled 7.8 GHz receiver has been retuned to 8.4 GHz and is under final test.

The automatically-tuned ULO multipliers are now at the 140-foot telescope and 300-foot telescope. Modification and interface of the VLA delay components for the Green Bank interferometer are underway, and the timing and interface for the IVC VLBI recorder are nearing completion.

The digital standard receiver prototype has just entered the final programming stage.

Tucson

Work continues on the 9-mm dual-feed, 4-channel receiver. The vendor has been unable to meet the specifications on the mixer pre-amps, and we are now in the process of making measurements on mixers and pre-amps on loan from different companies. There is confidence that a satisfactory combination will be found and the receiver should be finished in 2-3 months.

The 33-50/80-120 GHz receiver is being delayed somewhat due to the poor delivery on the Comtech pre-amps. The 33-50 GHz mixers are in the final testing process at Charlottesville and appear to be good. The feed system for the 33-50 GHz receiver required special design, since splitting the polarizations in a conventional manner over this wide bandwidth is impossible. This problem was overcome using quasi-optical techniques and the feed has good performance over the entire band. A similar approach will be used on the 80-120 GHz feed which will result in improved second channel performance at the high-frequency part of the band. The 30 kHz filter bank is virtually complete and will be tested on the telescope this summer.

Work continues on a new phase lock system, a quasi-optical polarizer and a new LO system.

A screened-room has been added to the downtown laboratory; this greatly facilitates working on circuitry with low power levels.

Additions to equipment at the telescope during this period include:

- 1) A new synchronous detector and load switching arrangements for continuum observations.
- 2) A new clock synchronizer.
- 3) A new digital multiplexer to extend the I/O capacity of the computer.

ENGINEERING DIVISION

The Engineering Division continued preliminary design and research on a 25-meter millimeter antenna and an associated enclosure. Design was completed for an inductosyn for the 300-foot telescope. Studies and research continued on thermal deformation of the 140 foot. Engineering assistance and inspection assistance was provided Green Bank, Tucson and Charlottesville operations and the VLA project. The revised layout of the photographic area in Green Bank, along with its associated equipment and facilities improvements, was completed. The test rack for the antenna surface measuring device was revised. A study was started of thermal deformation of the 36-foot telescope.

COMPUTER DIVISION

140-Foot/300-Foot Telescopes

It is now possible to load telescope control programs directly from disc. As such, observing modes can be changed rapidly without the risk of delays caused by card reader jams.

140 Foot Control Computer Replacement

Software and hardware design is continuing. The Universal Local Oscillator interface hardware/software has been completed.

TPOWER-SPOWER

The plotting package has been replaced by a new version which is useful in the interim stages of data processing. The new package permits more plots per page and attaches more detailed descriptive information to each plot.

Interferometer

The new interferometer-360 reduction package is now used by almost all interferometer observers. Improvements have been made in the calibration programs for observations on both the long and short baselines.

VLA PROJECT

Site and Wye Division

Phase II construction, consisting of permanent buildings, site work, and utilities, was 98% complete at the end of the quarter. Phase III construction, consisting of 13 km of wye trackage, 49 antenna foundations, and wye utilities, is now 39% complete.

The maintenance and warehouse buildings are now 80% complete.

Additional bedding material has been added and compacted in the waveguide run between CW-2 and CW-9.

Antenna Division

Antenna No. 3 was moved to the master pad on March 29, 1976, and is ready for servo installation. Panels are set and gear alignment progressing. Acceptance tests will begin early in the second quarter.

Antenna No. 4 pedestal is complete through the bearing support housing. The reflector support structure is 70% complete at the end of March.

Electronics Division

Antenna No. 2 was moved to position CW-9 on February 2, and on February 9 the vertex room IF/LO rack was installed. Operation of the antennas as a two-element interferometer was started during the observing run of February 17-19, and fringes were first recorded in the early morning hours of February 18th from 3C 84 and 3C 273. This operation also involved the first test of the control of an antenna over the 1.24 km length of waveguide from CW-9 to the electronics/computer trailer. Subsequent testing has led to improvements in stability and reliability, and work of this nature is expected to continue throughout the year. The basic operation of the prototype electronic system has, however, now been established.

A 3-cm wavelength scale model of the J. J. Gustincic alternate design for the 18-21 cm feed was tested and found satisfactory. A contract has been let for a full-scale model, which will be evaluated.

The front end electronics for Antenna No. 3 have been completely assembled. All parametric amplifiers were tested and found to be satisfactory. This equipment is expected to be ready on time for acceptance of Antenna No. 3. Modules for antennas 3 to 6 are 95% complete and in final stages of testing.

Computer Division

Asynchronous Subsystem - The mini-base graphic system is completely installed and is being programmed. The group is continuing to improve and add to CANDID data reduction command language.

Documentation is now completely maintained in the DEC-10, using the SCRIBE test formatter. First versions of mapping programs were produced, using two-dimensional fast Fourier transforms and classical Fourier transforms.

Synchronous Subsystem - Effort has continued through the first quarter in direct support of the observations with Nos. 1 and 2 antennas. The first stage of debugging of the computer software has been completed.

Work has continued in development of module-level engineering programs, which assist engineers in investigating the function of the various modules in a convenient way. A comprehensive test program for the correlator system is under development.

Systems Integration Division

Single dish tests on Antenna No. 2 were completed in the first quarter and the antenna was incorporated into the two-element interferometer. Approximately 240 hours of interferometer tests were performed.

Project Management Division

Work on the take-up of rail at Redstone Arsenal is 90% complete, with all usable material having been delivered to the site. Rail take-up has been completed at Eglin Air Force Base, Florida, and is currently under way at Myrtle Beach Air Force Base, South Carolina, and at Bastrop, Texas. A contract has been let for take-up at two additional Texas locations and bids have been received for the take-up of 23 miles of track at Crab Orchard, Illinois. With the completion of these jobs, more than 70% of the rail needed for the wye will be on site.

The procurement effort for antennas 3 through 6 is completed and continues on the material for 7 through 10.

PERSONNEL

Appointments

| | | |
|--------------------|----------------------------|---------|
| Durgadas S. Bagri | Electronic Engineer I, VLA | 1/14/76 |
| Robert M. Mitchell | Electronic Engineer I, VLA | 1/19/76 |
| Robert E. Elcox | Electronic Engineer I | 2/17/76 |

Leave of Absence

| | | |
|-------------------|----------|--------------|
| David S. Heeschen | Director | From 2/01/76 |
| | | To 5/31/76 |