

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

April 1, 1979 - June 30, 1979

RESEARCH PROGRAMS

<u>140-Foot Telescope</u>	<u>Hours</u>
Scheduled observing	1832.75
Scheduled maintenance and equipment changes	246.00
Scheduled tests and calibration	93.75
Time lost due to: equipment failure	10.00
power	2.00
weather	3.75
interference	2.75

The following line programs were conducted during this quarter.

<u>Observer</u>	<u>Program</u>
J. Moran (Center for Astrophys.)	Observations at 18-cm to search for
L. Rodriguez (Center for Astrophys.)	OH masers associated with new compact HII regions.
L. DeNoyer (Cornell)	Observations of 1612, 1667, and 1720 MHz in shocked, expanding hydrogen clouds within IC 443 to complete a map of the shocked OH and to investigate unusual velocity structure in the OH to the northeast of this remnant.
R. Brown	Study of 18-cm recombination line emission toward Sgr A.
F. J. Lockman	
P. Bowers	Search at 18-cm for Type I OH supergiants and studies of 18-cm OH emission from unidentified Type II OH/IR stars.
J. MacLeod (Herzberg Inst., Canada)	Search at 2160 MHz for vibrationally excited water and a search at 2800 MHz for the $J = 1 \rightarrow 0$ line of C_5N .
L. Avery (Herzberg Inst., Canada)	
N. Broten (Herzberg Inst., Canada)	
T. Oka (Herzberg Inst., Canada)	
A. McKellar (Herzberg Inst., Canada)	

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RADIO ASTRONOMY OBSERVATORY
CHARLOTTESVILLE, VA.

JUL 17 1979

<u>Observer</u>	<u>Program</u>
P. Palmer (Chicago) L. Rickard	Observations to confirm the detection of the $^2\pi_{1/2}$, $J = 3/2$ state of OH at 7.8 GHz.
B. Turner	Observations between the frequencies of 700 and 730 MHz to search for the $\pi_{3/2}$, $J = 3/2$ excited state of CH.
F. J. Lockman	Study at 3173 MHz of the distribution of the H127 α recombination line in the galactic plane and near the Rosette nebula.
H. Liszt	Study at 3335 MHz of the CH distribution toward ζ Oph.
P. Crane	Search at 1627 MHz for redshifted OH absorption in the IO galaxy NGC 6240.
B. Bowers M. Reid	Studies of the time variations of H ₂ O masers in late-type stars at 22.24 GHz.
L. Davis (Toronto) E. Seaquist (Toronto)	Measurements of 21-cm hydrogen in close interacting pairs of galaxies.
I. Mirabel (Maryland) P. Jackson (Maryland)	Observations of 21-cm hydrogen in high-velocity clouds and in the "Puppis Window" section of the Galaxy.
R. Crutcher (Illinois)	Observations of 21-cm hydrogen self-absorption toward stars contained in an extended cold hydrogen cloud.
T. Army (Massachusetts) K. Gordon (Hampshire)	Study of 21-cm hydrogen in the region of the Pleiades.
F. J. Lockman	Studies of the 21-cm hydrogen line and H166 α recombination line near the Galactic Plane and studies of the H166 α recombination line near the Rosette Nebula to determine the bulk motion in the ionized gas.

The following continuum programs were conducted during this quarter.

<u>Observer</u>	<u>Program</u>
R. Hobbs (Goddard) P. Marionni (Maryland) R. Sinha	Flux density observations of planetary nebula at 2.8 cm.

The following very-long baseline programs were conducted, and the stations used in the experiments are coded as follows:

B - MPIR, Bonn, W. Germany 100-m	K - Haystack 120-ft
D - Dwingeloo, The Netherlands 25-m	M - Madrid, Spain 64-m
F - Harvard, Fort Davis 85-ft	O - OVRO 130-ft
G - NRAO 140-ft	P - Puerto Rico 1000-ft
HR - Hartebeesthoek, South Africa 26-m	S - Onsala, Sweden 84-ft
I - Iowa NLRO 60-ft	T - Tidbinbilla, Australia 64-m
J - Goldstone 64-m	V - Illinois VRO 120-ft
JB - Jodrell Bank, England 25-m	

<u>Observer</u>	<u>Program</u>
M. Cohen (Caltech)	Observations at 2.8 and 6-cm of super-luminal sources with telescopes at B, F, K, O, and G.
A. Readhead (Caltech)	
R. Walker (Caltech)	
A. Moffet (Caltech)	
G. Seielstad (Caltech)	
T. Pearson (Caltech)	
R. Simon (Caltech)	
K. Kellermann (MPIR, Bonn)	Measurements at 6-cm of the angular structure of sources selected from the NRAO-Bonn 6-cm survey which have flat spectra and whose fluxes are greater than 1 Jy with telescopes at B, G, and O.
I. Pauliny-Toth (MPIR, Bonn)	
R. Porcas (MPIR, Bonn)	
D. Shaffer	
R. Mutel (Iowa)	OH observations at 18-cm of IRC+10420 and selected low-frequency variables with telescopes at F, I, G, and V.
J. Fix (Iowa)	
M. Claussen (Iowa)	
J. Webber (Illinois)	
J. Benson	
S. Hansen	Studies at 18-cm of the Zeeman pattern in the Orion OH masers with telescopes at F, I, and G.
T. Clark (Goddard)	Observations at 3.6-cm to test the capabilities of the Mark III VLBI system and to observe the structure of galactic nuclei, low-surface brightness objects, radio stars, and to improve astrometric and geodetic measurements with telescopes at K and G.
R. Coates (Goddard)	
C. Ma (Goddard)	
J. Ryan (Goddard)	
N. Vandenberg (Goddard)	
H. Hinteregger (Haystack)	
C. Knight (Haystack)	
E. Nesman (Haystack)	
A. Rogers (Haystack)	

<u>Observer</u>	<u>Program</u>
(continued from page 3)	
A. Whitney (Haystack)	
D. Robertson (NGS, Rockville)	
K. Kellermann (MPIR, Bonn)	
I. Pauliny-Toth (MPIR, Bonn)	
B. Corey (MIT)	
W. Cotton (MIT)	
C. Counselman (MIT)	
I. Shapiro (MIT)	
J. Wittels (MIT)	
R. Mutel (Iowa)	Observations at 18-cm to accurately determine the position offsets between the satellite and main line OH masers with telescopes at I and G.
J. Benson	
D. Shaffer	Observations at 18-cm of a compact source in M82 with telescopes at V and G.
R. Brown	
R. Walker (Caltech)	Observations at 8.42 GHz of the peculiar radio source SS433 with telescopes at J, T, O, K, S, HR, M, and G.
R. Preston (JPL)	
P. Crane	
Y. Terzian (Cornell)	Observations at 1670 MHz of the nuclei of normal galaxies with telescopes at B, O, P, and G.
D. Jones (Cornell)	
R. Sramek	
G. Grove	
R. Mutel (Iowa)	Observations to produce 18-cm hybrid maps of NRAO 150 and 3C 395 with telescopes B, F, I, and G.
R. Phillips (Iowa)	
J. Benson	
C. Kotanyi (Kapteyn Labs, The Netherlands)	Observations at 18-cm of the nuclei of Vir A, 3C 236, 3C 345, and Parkes equatorial sources with telescopes at S, D, JB, and G.
R. Schilizzi (Netherlands Foundation for Radio Astronomy)	
G. Miley (Leiden, The Netherlands)	
L. Bååth (Chalmers, Sweden)	
B. Rönnäng (Chalmers, Sweden)	
P. Wilkinson (Jodrell Bank, England)	
R. Booth (Jodrell Bank, England)	
I. Browne (Jodrell Bank, England)	
K. Kellermann (MPIR, Bonn)	
I. Pauliny-Toth (MPIR, Bonn)	
E. Fomalont	

<u>Observer</u>	<u>Program</u>
R. Walker (Caltech) J. Moran (Center for Astrophys.) R. Genzel (MPIR, Bonn) M. Reid	Observations at 22 GHz of three water vapor maser sources which display high-velocity features, with telescopes at stations K, O, and G.
R. Genzel (MPIR, Bonn) D. Downes (MPIR, Bonn) J. Moran (Center for Astrophys.) R. Walker (Caltech) M. Reid	Observations at 22 GHz to investigate proper motions of high-velocity H ₂ O features in Orion with telescopes at O, K, and G.
B. Elmegreen (Center for Astrophys.) J. Moran (Center for Astrophys.) R. Genzel (MPIR, Bonn) R. Walker (Caltech) M. Reid	Observations at 22 GHz of the H ₂ O maser sources in Sgr B2 with telescopes at K, O, and G.
R. Linfield (Caltech)	Observations at 2.8-cm of the nuclei of selected radio galaxies with telescopes at B, K, O, and G.
R. Schilizzi (Netherlands Foundation for Radio Astronomy) E. Seaquist (Toronto) P. Shaver (ESO, Geneva)	Observations at 2.8-cm of the quasar DA 193 with telescopes at B, K, O, and G.
A. Simon (MPIR, Bonn) B. Geldzahler (Pennsylvania) D. Shaffer	Observations at 2.8-cm of the compact radio source in W50 with telescopes at B, K, O, and G.
K. Johnston (NRL) A. Wolfe (Pittsburgh) R. Brown	Observations at 2.8-cm of the structure of 3C 446 with telescopes at K, O, and G.
B. Burke (MIT) C. Lawrence (MIT)	Observations at 2.8-cm of the apparent binary quasar with telescopes at K, O, and G.

<u>300-Foot Telescope</u>	<u>Hours</u>
Scheduled observing	2053.75
Scheduled maintenance and equipment changes	130.25
Scheduled tests and calibration	0.00
Time lost due to: equipment failure	46.75
power	1.00
weather	0.50
interference	0.00

The following line programs were conducted during this quarter.

<u>Observer</u>	<u>Program</u>
E. Seaquist (Toronto) L. Davis (Toronto)	Observations of 21-cm hydrogen in isolated galaxies brighter than or equal to magnitude 14.0 and a search for 21-cm hydrogen absorption in compact radio sources.
J. van der Hulst (Minnesota) P. Crane	Survey of 21-cm hydrogen in IO and Irr II galaxies.
A. Haschick (Center for Astrophys.) P. Crane	Study of the variability of 21-cm hydrogen absorption in 3C 84.
P. Crane	Study of 21-cm hydrogen in a complete sample of spiral galaxies.
R. M. Price (NSF) P. Crane	Study of 21-cm hydrogen in galaxies having compact nuclei.
A. Rots (Netherlands Foundation for Radio Astronomy) P. Crane	Observations to complete the mapping of nearby galaxies in 21-cm hydrogen.
H. Richer (British Columbia) P. Crane	Search at 21-cm for a hydrogen shell around the hydrogen-deficient carbon star HD182040.
T. Thuan (Virginia) G. Martin (Virginia)	Study of the 21-cm hydrogen content of dwarf galaxies.
B. Burke (MIT)	Search for highly redshifted 21-cm hydrogen absorption lines at 594 MHz toward a newly discovered apparent QSO.

The following continuum programs were conducted during this quarter.

<u>Observer</u>	<u>Program</u>
D. Heeschen	Observations at 9-cm wavelength to monitor selected extragalactic sources for short-term variability.
B. Burke (MIT)	Observations at 5000 MHz to determine the high-frequency properties of sources found in the Arecibo 611 MHz survey.
C. Bennett (MIT)	
C. Lawrence (MIT)	
W. Dent (Massachusetts)	Study at 11-cm the polarization and flux density of known extragalactic radio sources.
T. Balonek (Massachusetts)	
M. Hartman (Massachusetts)	
R. Hobbs (Goddard)	Flux density measurements of planetary nebulae at 5000 MHz.
P. Marionni (Maryland)	
R. Sinha	

The following pulsar programs were conducted during this quarter.

<u>Observer</u>	<u>Program</u>
J. Taylor (Massachusetts)	Observations at 610 MHz to determine periods, period derivatives, positions, and dispersion measures of known pulsars.
P. Backus (Massachusetts)	
M. Damashek	

<u>36-Foot Telescope</u>	<u>Hours</u>
Scheduled observing	1913.25
Scheduled maintenance and equipment changes	131.00
Scheduled tests and calibration	139.75
Time lost due to: equipment failure	56.75
weather	94.75
power	3.00
interference	0.00

<u>Observer</u>	<u>Program</u>
T. Bania (Cornell)	CO investigation of the 3 kpc feature in our galaxy.
L. Blitz (California, Berkeley)	Observations of CO in R Mon.
M. Cohen (California, Berkeley)	
W. Dent (Massachusetts)	Evolution of extragalactic radio sources at millimeter wavelengths
R. Hobbs (Goddard)	

<u>Observer</u>	<u>Program</u>
M. Gordon	Measurement of cloud sizes and mass by CO lines.
C. Gottlieb (Center for Astrophys.)	Study of non-equilibrium chemistry near SiO maser sources.
E. Gottlieb (Center for Astrophys.)	
J. Hollis	Search for interstellar PN and search for continuum emission from Saturn's rings.
L. Snyder (Illinois)	
B. Ulich	
P. Ho (Massachusetts)	CO studies of Herbig-Haro objects.
J. Moran (Center for Astrophys.)	
L. Rodriguez (U. Mexico)	
D. Jaffe (Center for Astrophys.)	Observations of CO in regions of compact IR sources.
G. Fazio (Center for Astrophys.)	
D. Johnson (NBS)	Study of flux and polarization in SiO maser sources.
F. Clark (Kentucky)	
C. Heiles (California, Berkeley)	
T. Torland (California, Berkeley)	
D. Hummer (JILA)	
M. Kutner (Rensselaer)	Confirmation of detection of interstellar pyrrole.
K. Tucker (Fordham)	
R. Dickman (Aerospace)	
D. Machnik (Rensselaer)	
M. Kutner (Rensselaer)	Study of formaldehyde isotopic ratios.
K. Tucker (Fordham)	
N. Evans (Texas)	
F. Levinson (Virginia)	Comparison of kinematics of atomic and molecular gas in dark clouds.
S. Neff (Virginia)	
R. Brown	
H. Liszt	Study of molecular abundance at galactic radii of 2-4 kpc.
W. B. Burton (Minnesota)	
F. Owen	Three millimeter observations of strong millimeter quasars.
S. Spangler	
S. Perrenod (KPNO)	Search for diminution of the microwave background in super clusters.
C. Lada (Arizona)	
L. Rickard	Study of extragalactic CO in galaxies.
P. Palmer (Chicago)	
B. Turner	

<u>Observer</u>	<u>Program</u>
L. Rickard P. Palmer	Study of HCO ⁺ in galaxies.
L. Rudnick (Minnesota) T. Jones (Minnesota) W. Stein (Minnesota) J. Puschell (Minnesota)	Broadband polarimetry of compact extra-galactic objects.
P. Schwartz (NRL)	Search for continuum emission from dust in dark nebulae.
P. Schwartz (NRL) B. Zuckerman (Maryland)	Monitoring emission from SiO masers.
H. Thronson (Arizona) C. Lada (Arizona)	Study of kinematics and mass structure in IC 1795 and a search for CO in selected galaxies.
B. Turner	Follow up study of new interstellar millimeter wave lines.
P. Vanden Bout (Texas) R. Loren (Texas) R. Snell (Texas) H. Wootten (Caltech)	Observations of HC ₃ N in selected molecular clouds.
W. Wilson (Aerospace) M. Klein (JPL)	Observations of CO in the Venusian atmosphere.
H. Wootten (Caltech) R. Clegg (Texas)	Search for aluminum chloride in IRC+10216 and other related objects.

The Very Large Array

The array was scheduled for observations 51% of the time in the second quarter of 1979. Thirty-seven percent of the time was devoted to astronomical observing and the remaining 14% to instrumental development and tests. Approximately 13% of the observing time was lost to instrumental problems. The following research programs were conducted with the VLA during this quarter.

<u>Observer</u>	<u>Program</u>
J. Benson R. Mutel (Iowa)	OH masers in OH/IR stars; 18 cm.
A. Bridle (Queens, Canada) E. Fomalont J. Högbom (Stockholm Obs.) A. Willis (Brandeis)	Central region of 3C 315; 2 and 6 cm.
R. L. Brown J. Broderick (VPI & SU) S. Neff (Virginia)	Simultaneous u,v and radio observations of stars; 6 cm.
R. L. Brown R. Spencer (Jodrell Bank, England) S. Neff (Virginia)	Quasar 1229-021; 20 cm.
J. Burns F. Owen J. Eilek	Observations of 3C 465; 6 and 20 cm.
J. Burns M. Ulmer (Northwestern)	X-ray cluster of galaxies; 6 cm.
P. Crane R. Perley K. Johnston (NRL)	Halo of NGC 1275 = 3C 84; 20 cm.
D. Florkowski (Florida) S. Gottesman (Florida)	Mass loss from HD193793 and other stars; 2, 6, and 20 cm.
E. Fomalont K. Johnston (NRL)	Astrometry; 6 cm.
D. Gibson (NMIMT)	Simultaneous radio and x-ray observations of RT Lac; 6 and 20 cm.
W. M. Goss (Kapteyn Labs, The Netherlands) A. Lyne (Jodrell Bank, England) E. Fomalont R. Manchester (CSIRO, Australia)	Positions of pulsars; 6 and 20 cm.
R. Hjellming N. Vandenberg (Goddard)	Nova Vulpecula 1976; 21, 6 and 2 cm.
M. Kundu (Maryland) E. Schmahl (Maryland) T. Velusamy (Maryland)	Solar observations; 2, 6 and 20 cm.

<u>Observer</u>	<u>Program</u>
K. Y. Lo (Caltech) R. L. Brown K. Johnston (NRL)	Sgr A; 1.3, 2, 6, and 20 cm.
G. Miley (Leiden, The Netherlands) R. Sramek	Cores of extended quasars; 21, 6 and 2 cm.
D. Milne (CSIRO, Australia) B. Balick (Washington) R. Perley P. Angerhofer (Maryland)	Synthesis observations of Cas A, 3C 10, 3C 58; first epoch observation for proper motion studies, 21 and 6 cm.
F. Owen J. Burns L. Rudnick (Minnesota)	Observations of NGC 1265 and 3C 129; 6 and 20 cm.
R. Potash (Brandeis) J. Wardle (Brandeis) F. Ghigo (Brandeis)	Jets in 4C 32.69 and other quasars; 6 and 20 cm.
M. Reid K. Johnston (NRL) J. Moran (Smithsonian)	OH maser emission from IR stars; 20 cm.
R. Schilizzi (Leiden, The Netherlands) V. Kapachi (Leiden, The Netherlands)	High luminosity 3CR sources; 1.3, 2 and 6 cm.
H. Schnopper (Smithsonian) J. Moran (Smithsonian) R. Hjellming	Radio spectra of x-ray sources in Seyfert galaxies; 1.3, 2 and 20 cm.
H. Schnopper (Smithsonian) J. Moran (Smithsonian) M. Roberts R. Hjellming	X-ray sources in M31; 6 and 20 cm.
E. Seaquist (Toronto) W. Gilmore (Toronto)	Compact sources in SNR; 1.3, 2, 6 and 20 cm.
R. Sramek K. Weiler (MPIR, Bonn)	Supernova in M100; 6 cm.
A. R. Thompson R. Sinha	Central stars of planetary nebulae; 6 cm.

<u>Observer</u>	<u>Program</u>
C. Townes (Berkeley)	NH ₃ and methanol; 1.3 cm.
A. Cheung (Calif., Davis)	
D. Matsakis (NRL)	
G. van Albada (Virginia)	Peculiar spiral galaxy M106 = NGC 4258;
J. van der Hulst (Minnesota)	20 cm.
W. Roberts (Virginia)	
C. Wade	Attempt to detect black hole; 1.3, 2,
	6, and 20 cm.
C. Wade	Astrometry of minor planets; 1.3, 2,
P. Seidelmann (USNO)	and 6 cm.
K. Johnston (NRL)	
A. Wilson (Maryland)	Seyfert galaxy nuclei; 6 cm.
A. Willis (Netherlands Founda- tion for Radio Astronomy)	
R. Sramek	

ELECTRONICS DIVISION

Green Bank

The development of a dual-channel upconverter-maser system to cover 5-26 GHz is progressing well. The first channel of this receiver should be installed on the 140-foot telescope by the beginning of 1980.

The 300-1000 MHz receiver is still progressing slowly. AIL has been unable to supply cooled FET amplifiers meeting the noise temperature specification. It is expected that the Charlottesville laboratory will be able to build a suitable amplifier in the near future.

A single-stage 40-50 GHz maser is now ready for testing. An initial cool-down indicated a magnet problem. However, it is expected that this will soon be remedied.

A 22-GHz focal plane measuring receiver for making antenna surface measurements of the 140-foot telescope is being developed. This receiver should be available for testing by the end of the year.

The IF interface for the Model IV autocorrelator is progressing well, and interfacing with the digital section and installation at the telescope should occur by the end of the year.

Charlottesville

Millimeter-mixer development has continued by further use and understanding of an equivalent-circuit measuring technique. Five new 70-115 GHz mounts have been fabricated and will be evaluated next quarter. Cryogenically-cooled mixers which have a SSB mixer noise temperature of 400 K at 150 GHz have been completed and shipped to Tucson.

Investigations of millimeter-wave frequency doublers have begun. A unit with 10% efficiency and 3 mW output power has been used to adequately pump a room-temperature mixer at 208 GHz. Double mounts for the 110-170 GHz range are being constructed and also high-breakdown voltage diodes are being fabricated at the University of Virginia.

A 4.5 GHz FET amplifier has been fabricated and 6 different types of FET's have been evaluated in the amplifier at temperatures from 300 K to 20 K.

Expansion of the VLBI Mark II processor and construction of the Model IV autocorrelator are continuing.

Tucson

During this quarter the cooled 2-mm receiver has been completed. The noise temperature is less than 1000 K SSB at 150 GHz, which we expect to improve somewhat in the future. Klystrons in the frequency range 130-170 GHz continue to be a big problem; this may be alleviated somewhat in the future by use of backward wave oscillators.

Construction on the He³ bolometer system has started. Dr. P. Ade of Queen Mary College in London will be working on this system for use this summer. We plan to have the bolometer installed in the refrigerator with a good set of measurements by the end of September. The He³ system will need a more rapidly switching subreflector than our present design and work has started on the procurement of a carbon fibre subreflector that will be far lighter than our existing aluminum design. A breadboard switching mechanism has been built that switches satisfactorily at 30 Hz.

Work continues on the power supply for the 190-230 GHz carcinotron. We plan tests on this tube in the next three months. Design has started on a cooled mixer receiver for this frequency range.

ENGINEERING DIVISION

Fabrication of the 300-foot traveling feed structural support, traveling feed drive system, and traveling feed mock up for testing continued, and final details and changes in the design were completed. Further

studies on the behavior of the 140-foot structure and feed support system were carried out. Modifications to the 140-foot Cassegrain house were designed. Some of the modifications were made, including removal of the L-band feed horn. Modifications were made to the deformable subreflector for the 140-foot telescope. Conceptual design for a future 25-meter millimeter wavelength telescope and its proposed site continued on a limited basis. Limited inspection assistance was given the VLA project. Routine engineering assistance was provided operations and maintenance in Charlottesville, Green Bank, and Tucson.

COMPUTER DIVISION

VLBI

The retarded baseline correction has been incorporated into the processor software and is undergoing final tests. When released, it will enable users of the NRAO VLBI processor to do phase closure on three station processing.

Video cassette tape recorders are being tested to determine their feasibility for VLBI use.

VLA

The image processing effort in Charlottesville has been placed under the direction of Ed Fomalont. Two image processing systems are being developed: (1) A Modcomp based system to remain in Charlottesville, and (2) a DEC/VAX system which will be moved to the VLA site upon completion.

The Modcomp IV/25 CPU (96 kbytes) has been replaced with a Modcomp Classic 78/60 (572 kbytes). An I²S image display unit has been added to this system. The DEC-VAX 11/780 (512 kbytes) has been ordered.

Green Bank 300-foot Telescope

An additional terminal and disk have been purchased for the Modcomp system so that a previous user of either the 300-foot or 140-foot telescope may be accommodated along with the scheduled 300-foot user.

IBM 360/65

The model 1051 Calcomp drum plotter has been delivered and installed. Software is presently being developed so that it can replace the existing plotter.

Tucson 36-foot Telescope

A two-port disk has been purchased for the 36-foot telescope. This will eventually be placed on Kitt Peak Mountain and will act as an interface between the control computer and a separate data processing computer.

VERY LARGE ARRAY PROGRAM

The array was scheduled for observations and tests an average of 50% of the time during the second quarter of 1979. First fringes were obtained on antenna 20 during May. Seventeen antennas are currently operational on the 18-km baseline. Twenty antennas are outfitted with electronics.

Antenna 25 was accepted from the subcontractor on June 28, which is six days behind the schedule adopted in June 1976.

During the quarter circular polarizers were installed on all L-band feeds. Initial astronomical tests indicate acceptable performance with respect to on-axis instrumental polarization. A major development during the quarter was the first use of two antennas in true spectral line mode.

The Versatec hard-copy peripheral for the new graphic terminal on the DEC-10 has been received. The terminal itself should arrive early in July. The work on on-line software for the spectral-line system is progressing.

Phase IV construction work was 85% complete by the end of the quarter. Phase V work was estimated 6% complete. The New Mexico Gross Receipts Tax case was heard and a final judgment in favor of the U.S. Government (VLA) was issued on April 19, 1979. The State filed an appeal of the judgment on June 15, 1979.

PERSONNEL

Appointments

Wayne A. Christiansen	Visiting Assoc. Scientist	5/14/79
Robert J. Havlen	Assistant to the Director	6/01/79
Phillip E. Hardee	Visiting Assoc. Scientist	6/01/79
Craig Sarazin	Visiting Assoc. Scientist	6/18/79

Return from Leave of Absence

Lawrence Rudnick	Associate Scientist	6/18/79
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Terminations

Ernest M. Caloccia	Electronics Engineer I	4/18/79
Stanislaw Gorgolewski	Visiting Scientist	4/05/79

STUDENT PROGRAM

Announcements of our summer student program were mailed in November, 1978 to over 100 colleges and universities. From the more than 100 applications received, 22 students were selected to participate in the program as research assistants to the scientific staff and in the electronics and computer divisions. Twelve students are working in Charlottesville, 3 in Green Bank, 1 in Tucson, and 6 in Socorro.

Twenty-one lectures will be given by the staff on various topics in radio astronomy and instrumentation. Students are encouraged to attend the regular NRAO colloquia and seminars. They will also assist as tour guides in the public education program at the Green Bank site.

The names of the 1979 students, their academic year and school are as follows:

<u>Name</u>	<u>Academic Year</u>	<u>School</u>
Anderson, J. A.	U 4	University of Virginia
Biretta, J. A.	U 4	Thomas More College
Bornmann, P. L.	U 4	Caltech
Bujarrabal, V.	G 2	Observatoire de Paris
Cook, D.	U 3	Iowa State
Edgar, B. K.	U 3	University of Iowa
Fenstermacher, D. L.	U 3	Cornell University
Fontanelli, P.	U 4	Università di Firenze
Fouquet, J. E.	U 3	Harvard-Radcliffe
Ganzel, B. L.	U 4	Rice University
Hammond, S. E.	G 1	New Mexico State
Hough, D. H.	U 3	University of Pennsylvania
Knapton, E. D.	U 3	Brandeis University
Kummerer, R. J.	U 4	Pennsylvania State
Lauer, T. R.	U 4	Caltech
Lindley, D. A.	G 1	University of Arizona
Mitchell, K. J.	U 3	Pennsylvania State
Morton, H. S.	G 2	University of Virginia
Nelson, E. R.	U 3	New Mexico Tech
Percival, T. M.	G 2	University of Sydney
Phinney, E. S.	U 3	Caltech
Walker, C. K.	U 3	Clemson University