NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

January 1, 1980 - March 31, 1980

RESEARCH PROGRAMS

140-Foot Telescope		Hours
Scheduled observing		1941.75
Scheduled maintenance and equipment changes		153.00
Scheduled tests and calibration		67.75
Time lost due to:	equipment failure	52.25
	power	0.00
	weather	139.00
	interference	1.00

The following line programs were conducted during this quarter.

Observer(s)	Program
M. Reid (SAO) P. Bowers	Studies of the time variations of H_2O masers in late-type stars at 22.24 GHz.
P. Myers (MIT) J. Benson T. Armstrong (MIT)	Observations to search for NH_3 (J,K) = (1,1) emission at 23.694 GHz and to search for and study already known HC_5N J = 9 → 8 emission at 23.964 GHz in opaque spots found in dark clouds.
J. van der Hulst (Minnesota)	Observations of 21-cm hydrogen in spiral and irregular galaxies.
J. Dickey	Observations of 21-cm hydrogen in the northern tip of the Magellanic Stream.
W. Ford (DTM) V. Rubin (DTM) N. Thonnard (DTM) M. Roberts	Observations of 21-cm hydrogen in spiral galaxies to study the correlation with accurate optical rotation curves.
R. Hobbs (NASA Greenbelt) J. Hollis (NASA Greenbelt) S. Maran (NASA Greenbelt) J. Brandt (NASA Greenbelt) P. Feldman (Johns Hopkins)	Observations at 6-cm to search for excited OH in Comet Bradfield (1979L).

Observer(s)	Program
P. Bowers	Studies of 18-cm OH emission from unidentified Type II OH/IR.
E. Cohen (JPL) B. Turner	Confirmation of the detection of vibrationally excited NH_3 at 20.655 GHz.
K. Fox (Tennessee) D. Jennings (NASA Greenbelt)	Observations of interstellar methane and cyanodiacetylene radio emission lines found in the frequency range 18.5-21.9 GHz.
D. Matsakis (USNO) P. Schwartz (NRL)	Preliminary survey at 23.7 GHz of NH_3 in the galactic plane; observations between 18.4 and 25.4 GHz to search for highly redshifted absorption lines of O_2, ^{13}CO, and H_2O in the spectra of quasars and other galactic sources.

The following continuum studies were conducted during this quarter.

Observer(s)	Program
P. Crane	Observations at 6-cm of edge-on spiral galaxies whose southern declinations are beyond the southern limit of the NRAO 300-ft telescope.
R. Hobbs (NASA Greenbelt) S. Maran (NASA Greenbelt) B. Margon (UCLA) R. Brown	Observations at 22 GHz of the thermal component in SS 443.
R. Hobbs (NASA Greenbelt) P. Marionni (NASA Greenbelt) R. Sinha	Flux density measurements at 22 GHz of planetary nebulae.
F. Kerr (Maryland) R. Hobbs (NASA Greenbelt) R. Sinha	Mapping of the galactic center at 22 GHz.

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

A - Algonquin, Canada 150-ft
B - MPIR Bonn, FRG 100-m
C - Chilbolton, England 25-m
D - Dwingeloo, Netherlands 25-m
E - Jodrell Bank, England 250-ft
F - Harvard, Fort Davis 85-ft
G - NRAO 140-ft
H - Hat Creek 85-ft
HR - Hartebeesthoek, South Africa 26-m
I - Iowa, NLRO 60-ft
K - Haystack 120-ft
N - NRL 85-ft
O - OVRO 130-ft
R - Simeis, Crimea, USSR 22-m
S - Onsala, Sweden 84-ft
W - Westerbork Synthesis Radio Telescope, Netherlands

Observer(s)	Proposal
R. Booth (Jodrell Bank) G. Miley (Leiden) E. Preuss (MPIR, Bonn) R. Schilizzi (Leiden)	Observations at 6-cm of the cores of extended quasars with telescopes at B, W, and G.
Gopal-Krishna (MPIR, Bonn) R. Porcas (MPIR, Bonn) E. Preuss (MPIR, Bonn)	Observations at 6-cm of CTD 93 with telecopes at B, S, W, O, and G.
W. Altenhoff (MPIR, Bonn) I. Pauliny-Toth (MPIR, Bonn) R. Porcas (MPIR, Bonn) J. Romney (MPIR, Bonn) A. Rogers (Haystack) A. Whitney (Haystack) I. Shapiro (MIT) T. Clark (Goddard) D. Shaffer (Phoenix Corp.) K. Kellermann	Observations at 6-cm of weak compact radio sources including galactic nuclei, central components of quasars and radio stars with telescopes at B, K, and G.
I. Pauliny-Toth (MPIR, Bonn) P. Stumpff (MPIR, Bonn) A. Witzel (MPIR, Bonn) K. Johnston (NRL) J. Spencer (NRL) T. Jones (Minnesota) G. Kaplan (USNO) W. Klepczynski (USNO)	Observations at 6-cm to monitor structure variations in sources with simple components (doubles), and to evaluate the use of phase in determining the relative positions of nearby compact sources with telescopes at B, F, K, N, O, and G.
B. Geldzahler (MIT) E. Fomalont	Studies of Sco X-1 at 6-cm with telescopes at K, O, and G.
S. Neff (Virginia) R. Brown	Observations at 6-cm of the radio structure of quasars to be compared with their optical spectra with telescopes at H, K, O, and G.

Observer(s)	Proposal
R. Schilizzi (Leiden) M. Reid (SAO) K. Johnston (NRL) D. Shaffer (Phoenix Corp.) P. Hardee (Virginia) F. Owen	Observations at 18-cm of M87 with telescopes at F, D, I, K, O, and G.
R. Mutel (Iowa) R. Phillips (Brandeis)	Observations at 18-cm to generate hybrid maps of 3C 84, 0735+178, and DA 344 with telescopes at B, F, I, O, and G.
N. Bartel (MPIR, Bonn) J. Romney (MPIR, Bonn) K. Weiler (NSF) L. Baarth (Chalmers, Sweden) A. Ficarra (Bologna, Italy) L. Padrielli (Bologna, Italy) G. Nicholson (CIRS, Johannesburg) L. Kogan (Inst. for Space Research, USSR) V. Kostenko (Inst. for Space Research, USSR) L. Matveyenko (Inst. for Space Research, USSR)	Observations at 18-cm of radio sources showing "superluminal flux variations" with telescopes at B, HR, R, S, F, O, and G.
J. Fouquet (Radcliffe) J. Moran (SAO) M. Reid (SAO)	Observations to determine the relative positions of all 4 ground-state OH maser transitions in W3 (OH) and Sgr B2 with telescopes at F, O, and G.
J. Campbell (U. Bonn, W. Germany) K. Johnston (NRL) J. Spencer (NRL) W. Klepczynski (USNO)	Observations at 18-cm to determine the accuracy of time transfer via VLB techniques with telescopes at N and G.
W. Beyer (U. Bonn, W. Germany) P. Brosche (U. Bonn, W. Germany J. Campbell (U. Bonn, W. Germany) M. Geffert (U. Bonn, W. Germany) E. Preuss (MPIR, Bonn) W. Fricke (ARI, Heidelberg) H. Walter (ARI, Heidelberg) G. Nicholson (CISR, Johannesburg) K. Johnston (NRL) J. Spencer (NRL)	Observations at 18-cm to measure absolute positions of compact radio sources at 18-cm to determine geodetic baseline parameters, to study the geophysical effects on the delay and fringe rate observables, and to investigate the possibility of the use of the phase observable for baseline and position determination with telescopes at B, HR, S, and G.

Observer(s)	Program
R. Booth (Jodrell Bank) I. Browne (Jodrell Bank) D. Walsh (Jodrell Bank) P. Wilkinson (Jodrell Bank) L. Baarth (Chalmers, Sweden) R. Porcas (MPIR, Bonn) R. Schilizzi (Leiden)	Observations at 18-cm of the double quasar 0957+561 with telescopes at B, D, E, S, and G.
W. Alef (MPIR, Bonn) I. Pauliny-Toth (MPIR, Bonn) E. Preuss (MPIR, Bonn) J. Romney (MPIR, Bonn) A. Witzel (MPIR, Bonn) A. Yen (MPIR, Bonn)	Observations at 22 GHz to map 3C 84 and 3C 273 with telescopes at A, B, C, F, K, S, and G.

In addition to the above, tests were conducted using part of the NRAO VLA antennas as a very long baseline station, and tests were conducted to determine the signal strengths and potential interference from 146 MHz amateur repeater stations within and on the fringes of the Radio Quiet Zone.

300-Foot Telescope		Hours
Scheduled observing		2007.75
Scheduled maintenance and equipment changes		128.50
Scheduled tests and calibration		31.75
Time lost due to:	equipment failure	47.50
	power	0.00
	weather	19.50
	interference	0.00

The following line programs were conducted during this quarter.

Observer(s)	Program
B. Peterson (Ohio State)	Search at 740-1000 MHz and at 1150 MHz for redshifted HI absorption in the spectra of QSOs which have low ionization-level absorption systems in their optical spectra.
T. Heckman (Leiden) B. Balick (Washington)	Attempt at 1358 MHz to detect low redshift HI emission from the x-ray quasar 4HU0241+61.

Observer(s)	Program
B. M. Lewis (Carter Observatory, New Zealand) P. Crane	Observations to detect and to study sources contained in the Shapley-Ames Catalog at the 21-cm line of neutral hydrogen.
B. Burke (MIT) A. Haschick (Center for Astrophys.) P. Crane	Observations to confirm possible 21-cm hydrogen absorption features in quasar/galaxy pairs.
P. Jackson (Maryland) I. Mirabel (Maryland) F. Kerr (Maryland) M. Siegel (Maryland) S. Walter (Maryland) E. Dahlstrom (Maryland) G. de Vaucouleurs (Texas) P. Bowers	Observations of galactic HI in front of normal galaxies which have well determined colors $(B-V)_T$.
D. Burstein	Survey of the thinnest galaxies found in the Uppsala General Catalog for 21-cm hydrogen.
D. Hunter (Illinois) A. Wirth (Illinois) J. Gallagher (Illinois)	Studies of 21-cm hydrogen in non-interacting galaxies which have peculiar stellar populations; search for extended hydrogen halos in a sample of late-type galaxies; studies of the extended hydrogen structure of the spheroidal component of a variety of morphological types of galaxies.
B. M. Lewis (Carter Observatory, New Zealand)	Observations of 21-cm hydrogen galactic absorption and extinction relations and their relation with the column density of hydrogen, search for hydrogen self absorption in galaxies having strong continuum sources; search for hydrogen absorption in the Coma Cluster.

The following continuum programs were conducted this quarter.

Observer(s)	Program
J. Dickel (Illinois) S. D'Odorico (Asiago Observatory, Italy) F. Sabbadin (Asiago Observatory, Italy)	Study at 6-cm of a faint filament near IC 443.
C. Bennett (MIT) B. Burke (MIT) C. Lawrence (MIT)	Observations at 6-cm of sources found in the Arecibo 611 MHz sky survey; search at 6-cm for new compact sources.
J. Broderick (VPI & SU) B. Dennison (VPI & SU) J. Ledden (VPI & SU) S. O'Dell (VPI & SU) J. Condon	Observations at 880 MHz and 1400 MHz of low frequency variables.
J. Burns	Mapping at 9-cm the head-tail galaxy NGC 1265.
J. Cordes (Cornell) J. Dickey	Studies at 850 MHz of galactic confusion: small scale structure of the galactic background.

The following pulsar programs were conducted during this quarter.

Observer(s)	Program
P. Backus (Massachusetts) J. Taylor (Massachusetts) M. Damashek	Observations at 410 and 610 MHz to determine periods, period derivatives, positions and dispersion measures of known pulsars.

36-Foot Telescope		Hours
Scheduled observing		2184.00
Scheduled maintenance and equipment changes		77.50
Scheduled tests and calibration		79.00
Time lost due to:	equipment	25.25
	weather	338.25
	power	0.00
	interference	0.00

Observer(s)	Program
L. Blitz (Calif., Berkeley)	Systematic survey of giant molecular clouds in M31 in CO.
L. Blitz (Calif., Berkeley) J. Bieging (Calif., Berkeley) C. Lada (Arizona) S. Strom (KPNO)	Search for CO in external galaxies with strong IR emission.
W. B. Burton (Minnesota) H. Liszt E. Ney (Minnesota) S. Choe (Minnesota)	Map of CO emission in the region of NGC 7023.
E. Churchwell (Wisconsin) C. Walmsley (MPIR, Bonn) C. Winnewisser (MPIR, Bonn)	Study relative abundances of HC_3N, HNC, and HCN near dark clouds.
R. Crutcher (Illinois) W. Watson (Illinois)	Study of fractionation toward Z Oph and lines towards OB associations.
J. Dickey H. Liszt	Study of the diffuse clouds in CO emission.
W. Dent (Massachusetts) R. Hobbs (NASA Greenbelt)	Evolution of extragalactic radio sources at millimeter wavelengths.
E. Epstein (Aerospace) M. Gordon	Search for CO emission from galaxies with bright clumps.
P. Ho (Calif., Berkeley) J. Moran (SAO) L. Rodriguez (Mexico)	Study of high velocity CO from region of Cepheus A.
D. Hogg	Study of mass loss near Wolf-Rayet stars by CO emission.
J. Hollis (NASA Greenbelt) F. Lovas (NBS) L. Snyder (Illinois) R. Suenram (NBS)	Confirmation of glycine in the interstellar medium.
M. Kutner (Rensselaer) C. Leung (Rensselaer) K. Tucker (Fordham) D. Machnik (Rensselaer)	Study of broad CO lines in T Tauri stars.

Observer(s)	Program
M. Kutner (Rensselaer) N. Evans (Texas) K. Tucker (Fordham)	Study of CO isotope fractionation near NGC 1977.
B. M. Lewis L. Rickard	Study of variations of the gas to dust ratio in the interstellar gas.
H. Liszt W. B. Burton (Minnesota)	Study of cloud dispersion by CO emission.
H. Liszt	Study of CO emission towards stars exhibiting optical absorption.
D. Matsakis (USNO) P. Schwartz (NRL)	Search for redshifted lines from quasars.
D. Matsakis (USNO) P. Schwartz (NRL) P. Myers (MIT)	Study of dark clouds through cyano-acetylene emission.
F. Owen J. Puschell	Observations of x-ray quasars at 90 GHz.
H. Payne (Cornell) T. Bania (Cornell) Y. Terzian (Cornell)	Investigation of 21-cm holes by observations in CO emission.
J. Puschell D. Heeschen	Bolometric observations of elliptical galaxies at millimeter wavelengths.
L. Rickard P. Palmer (Chicago)	Continued studies of molecules in external galaxies
L. Rodriguez (Mexico) J. Canto (Mexico) M. Rosado (Mexico)	CO studies of regions containing HH39, R Mon, and NGC 2261.
D. Sanders (SUNY Stony Brook) P. Solomon (SUNY Stony Brook) J. Barrett (SUNY Stony Brook)	Correlation of emission and spiral structure in near spirals.
D. Sanders (SUNY Stony Brook) P. Solomon (SUNY Stony Brook) J. Barrett (SUNY Stony Brook)	Continued studies of correlation of emission and spiral structure in nearby spirals.
P. Schwartz (NRL) B. Zuckerman (Maryland)	Monitoring emission from SiO masers.

Observer(s)	Program
B. Turner	Identification of some unexplained lines in millimeter wavelength spectra.
B. Turner	Search for isotopic ethylene and carbon dioxide.
W. Wilson (Aerospace) L. Snyder (Illinois) R. Dickman (Aerospace)	Confirmation of the detection of N_2O in the interstellar medium.
A. Winnberg W. Goss (Groningen U.)	CO studies of the dust cloud Barnard 152.
B. Zuckerman (Maryland)	Search for molecular compounds in comets.

VERY LARGE ARRAY

The array was scheduled for observations 57 percent of the time in the first quarter of 1980. Forty-three percent of the time was devoted to astronomical observing and the remaining 14 percent to instrumental development and tests. Approximately 15 percent of the observing was lost due to instrumental problems. The following research programs were conducted with the VLA during this quarter.

Observers	Program
P. Angerhofer (USNO) M. Kundu (Maryland) R. Strom (NFRA, Dwingeloo) J. Dickel (Illinois)	Peculiar galactic SNR CTB 80. 6 and 20 cm.
J. Archer R. Hjellming R. Robinson (Sacramento Peak Obs.)	Fine structure of solar active regions in brightness and circular polarization. 1.3, 2 and 6 cm.
A. Bridle (Queen's, Canada) E. Fomalont	Extended radio core and large-scale structure of 3C 293. 2, 6, and 20 cm.
A. Bridle (Queen's, Canada) J. P. Vallee (Queen's, Canada) E. Fomalont M. Valtonen (Helsinki) R. Whitehurst (Alabama) G. Byrd (Alabama)	Mapping of radio galaxy 3C 288. 6 and 21 cm.

Observer(s)	Program
F. Briggs (Pittsburgh) J. Cuzzi (Ames) W. Welch (Calif., Berkeley)	Observation of Saturn with rings edge on. 1.3, 2, 6, and 20 cm.
B. Burke (MIT) D. Roberts (MIT/Brandeis) P. Greenfield (MIT)	Double QSO 0957+561. 2, 6, and 20 cm.
J. Burns W. Christiansen (North Carolina)	Mapping of double sources 0816+526 and 3C 388. 2 cm.
N. Cohen (MIT) W. Cotton B. Geldzahler (MIT) M. Gorenstein (MIT) J. Marcaide (MIT)	Small-scale structure of continuum emission near pulsars. 20 cm.
J. Cordes (Cornell) S. Spangler J. Dickey	Point source in or near SNR W66. 6 and 20 cm.
A. Downes (Hawaii) M. Longair (Cambridge, UK) M. Perryman (Cambridge, UK)	Radio source in 5C6 and 5C7 fields. 21 cm.
J. Dreher	Bright jet galaxy 4C 32.69. 6 and 20 cm.
J. Eilek J. Burns F. Owen	Jet radio galaxy 3C 465. 6 cm.
M. Felli (Arcetri, Italy) R. Harten (NFRA, Dwingeloo) R. Hjellming	Compact HII region S201. 2 and 6 cm.
W. Forman (SAO) C. Jones (SAO) J. Grindlay (SAO) D. Harris (DRAO, Canada)	Optically identified x-ray quasars. 6 and 20 cm.
B. Geldzahler (MIT) E. Fomalont	Mapping of Sco X-1. 20 cm.
S. Hansen K. Johnston (NRL)	OH maser associated with Orion A and W49N. 18-cm line.

Observer(s)	Program
T. Heckman (Leiden) W. van Breugel (Leiden) B. Balick (Washington)	Mapping radio galaxy 3C 305. 6 cm.
C. Heiles (Calif., Berkeley) Y. Chu (Calif., Berkeley) T. Troland (Calif., Berkeley)	Faraday rotation through HII regions. 20 cm.
D. Heeschen J. Heidmann (Meudon, France)	Clumpy irregular galaxies. 6 cm.
R. Hjellming K. Johnston (NRL) G. Miley (Leiden)	Moving jets in SS433. 2, 6 and 21 cm.
D. Hogg	Mass-loss envelopes around Wolf-Rayet stars. 6 cm.
W. Jaffe	Deep clusters of galaxies. 20 cm.
K. Johnston (NRL) E. Fomalont R. Sramek C. Wade	Astrometric measurements of VLA calibration sources. 6 and 20 cm.
K. Johnston B. Shen (Pennsylvania) D. Kjer (Pennsylvania)	Seyfert galaxy NGC 4151. 1.3, 2, 6, and 20 cm
K. Johnston (NRL) C. Wade D. Gibson (NMIMT)	Parallaxes, proper motions and positions of radio binary stars. 6 cm.
P. Kronberg (Toronto) J. Clarke (Toronto) E. M. Burbidge (Calif., San Diego)	3C9, a highly-redshifted extended QSO. 6 and 20 cm.
P. Kronberg (Toronto) J. Dreher	Mapping and rotation measure of 3C 218. 6 and 18 cm.
M. Kundu (Maryland) T. Velusamy (Maryland) F. Erskine (Maryland)	Solar observations during SMM. 1.3, 2, 6, and 20 cm.

Observer(s)	Program
K. Lang (Tufts) R. Willson (Tufts) M. Felli (Arcetri, Italy)	Solar active regions. 6 and 21 cm.
P. Myers (MIT) P. Ho (Calif., Berkeley)	Star formation region in Taurus. 20 cm.
F. Owen P. Hardee (Virginia) M. Reid (SAO)	VLBI observations of M87 nucleus. 18 cm.
R. Perley J. Cowan (Oklahoma) J. Dreher	Search for radio jets in Cygnus A. 6 and 20 cm.
R. Perley E. Fomalont K. Johnston (NRL)	Complex structure associated with compact radio sources. 6 and 20 cm.
R. Perley A. Willis (NFRA, Dwingeloo)	Further mapping of 3C 449. 6 and 20 cm.
C. Purton (York U., Canada) P. Feldman (Herzberg Inst., Canada) S. Kwok (Herzberg Inst., Canada)	Flux densities of planetary nebulae. 2 and 6 cm.
L. Rudnick (Minnesota) J. Tyson (Bell Labs) P. Crane (ESO, Switzerland) W. Saslaw (Virginia)	Radio lobes with optical counterparts in radio galaxies. 6 and 20 cm.
W. Saslaw (Virginia) L. Rudnick (Minnesota)	Two aligned groups of quasars. 20 cm.
E. Seaquist (Toronto) W. Gilmore (Toronto)	Compact sources in SNR's. 1.3, 2, 6, and 21 cm.
M. Simon (SUNY, Stony Brook) J. Fischer (SUNY, Stony Brook) G. Righini-Cohen (SUNY, Stony Brook)	Becklin-Neugebauer object. 6 cm.
M. Simon (SUNY, Stony Brook) G. Righini-Cohen (SUNY, Stony Brook) J. Fischer (SUNY, Stony Brook)	Solar active regions and flares. 6 cm.

Observer(s)	Program
J. Stocke (Arizona) P. Kronberg (Toronto) W. Reich (U. Bonn, W. Germany) P. Kalberla (MPI, Bonn)	Very large-scale structure of QSO's; 3C 273, 3C 345, and 3C 380. 6 and 20 cm.
J. Stocke (Arizona) E. Seaquist (Toronto) W. Gilmore (Toronto)	Radio structure of SS433. 1.3 and 2 cm.
G. Swarup (Maryland)	Structure of central extended features of 3C 154, 3C 172, 3C 207, and 3C 227. 6 and 21 cm.
C. Townes (Calif., Berkeley) A. Cheung (Calif., Davis) D. Matsakis (USNO)	Interstellar ammonia. 1.3 cm.
J. van der Hulst (Minnesota) R. Sancisi (Groningen) R. Ekers (Groningen)	Central region of barred spiral NGC 5383. 20 cm.
C. Wade P. Seidelmann (USNO) K. Johnston (NRL)	Astrometry of minor planets. 1.3 and 2 cm.
A. Wilson (Maryland) J. Ulvestad (Maryland) R. Sramek	Nuclei of Seyfert galaxies. 6 and 2 cm.
R. Wolstencroft (Royal Obs., Scotland) R. Perley R. Tully (Hawaii)	Jets in NGC 1097. 20 cm.
H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech)	Solar flares and activity. 2 and 1.3 cm.

ELECTRONICS DIVISION

Green Bank

The 5-25 GHz upconverter/maser receiver is undergoing final testing prior to its installation on the 140-ft telescope this summer. The X-band

upconverter and maser have both been tested and close to the expected performance has been obtained. At K-band the room temperature flange noise temperature is between 19 K and 25 K over the 18-26 GHz frequency range. The upconverter, covering 8-11 GHz, gave noise temperatures in the range 23-35 K. It is hoped to improve on these figures in the near future. The necessary modifications to the Cassegrain house needed to fit this receiver will be done in June 1980. If testing is completed by this date, the receiver will be installed at this time.

The 300-1000 MHz cooled upconverter/GASFET amplifier receiver for the 300-ft telescope will be ready for testing within the next month. This receiver should be ready for use this summer on the 140-ft telescope and on the 300-ft telescope this fall after the new travelling feed track has been installed and checked out.

The single stage maser for 40-50 GHz has been improved and has been working for several months. The current performance is as follows:

Net gain.....	9 ± 1 dB
3 dB instantaneous bandwidth....	180 MHz (limited by pump tube)
Approximate noise temperature...	50 K

A four-stage maser is being fabricated for operation in the 40-50 GHz frequency range.

The local plane measurement receiver has been completed and is now ready for use on the 140-ft telescope.

The spectrum expander for the 36-ft telescope will be completed during the next quarter.

A second universal local oscillator rack for the 140-ft telescope has been assembled.

Charlottesville

Development of millimeter wave doublers is continuing. A unit providing > 1.5 mW from 155 to 165 GHz has been shipped to Tucson and a reduced-height waveguide unit giving > 1.0 mW from 127 to 167 GHz has been tested. The latter unit gives a peak efficiency of 20% and power output of 10 mW at 143 GHz.

A comprehensive paper describing theory, evaluation, and construction of cryogenically-cooled FET amplifiers has been written and submitted for publication. Eight 5 GHz FET amplifiers have been shipped to the VLA during this quarter.

Encouraging results have been achieved concerning a technique for increasing the tape recording density by a factor of 20 on the Mark III VLBI recording system. The technique involves modified home video-recorder (inexpensive) recording heads and a precision head-positioning mechanism. Construction of a second Mark III terminal and expansion of the Mark II processor are continuing.

The Mark IV 1024-channel, 80 MHz bandwidth correlator has been completed and is undergoing laboratory tests.

Tucson

During this quarter the cooled single channel 2-mm receiver has been converted to operate from a doubler instead of the expensive, unreliable fundamental klystrons. The doublers provided by the Central Development Lab in Charlottesville give good performance and are very reliable. A prototype dual polarization L.O. injection system has been built for this receiver and is now being evaluated.

The progress on the ^{3}He bolometer system has been slower than we hoped for. All the crucial components have now been fabricated and have to be integrated into the final configuration. A mechanism for beam switching at high rates (50 Hz) has been developed and tested. This quasi optical beam switching system is low loss and broad band and should prove useful for systems other than the bolometer.

Work continues on a dual channel receiver to cover the 190-250 GHz band.

ENGINEERING DIVISION

Design and fabrication was begun for a prototype measuring instrument to measure reflector surface plates. Studies and tests were performed on cast aluminum and composite reflector surface plates for the proposed 25-m millimeter wavelength telescope. The design of a new traveling feed for the 300-ft continued, incorporating latest thoughts and requirements. The design and drawings for modifications of the installation of the automated feed mount on the 140-ft were completed and sent to the shop for fabrication. Further study and research were carried out on the parts for the 140-ft braking system. Changes were made in the design for the modifications of the Cassegrain house on the 140-ft. A feasibility and cost study was prepared on the proposed addition to the interferometer baseline. Design was started on new inductosyns for the 85-ft telescope. Studies and research for the proposed 25-m millimeter wavelength telescope continued. Routine engineering assistance was provided operations and maintenance in Charlottesville, Green Bank, Tucson, and the VLA.

COMPUTER DIVISION

VLBI - Closure phase for 3-station continuum processing has been implemented. This requires a slightly different version of PREPTAPE.

The NRAO spectral line post-processing programs have been transferred to the VAX 11/780 computer. The CIT continuum post-processing programs are now running on the VAX.

IBM 360/65 - Two of the three bays of IBM core storage have been removed and the third has been deactivated. One megabyte of Electronic Memories and Magnetics (EM&M) memory has been added to the existing 1/2 megabytes of EM&M core. Total storage is now $1\frac{1}{2}$ megabytes.

VLA Post-Processing - The I^2S display device from Stanford Technology Corporation and the array processor from Floating Point Systems have arrived in Charlottesville for use with the VAX. The software development for the post-processing system is continuing. The initial file management and basic operating system are working and application software development is beginning.

THE VERY LARGE ARRAY

The array was scheduled for observations and tests for approximately 57% of the time during the first quarter. The maximum number of antennas used for an astronomical observing program during the month of March was 22. Our longest usable baseline is approximately 24 km. To date, 25 antennas have obtained first fringes.

The delivery of AIL parametric amplifiers has improved. The CTI contract is complete with all cryogenic hardware on site and the final batch of 60 mm waveguide has been accepted. All waveguide needed to complete the project is now on hand.

The order for the PDP-11/44, which will replace the PDP-11/40 as the output map display computer, was placed in January. The Modcomp Classic 7810 has now been tested satisfactorily so that appropriate software changes may proceed in order to incorporate it into the synchronous system to drive the CRT terminals. The additional memory for the DEC-10 has been received, although it has not been entirely incorporated into the system as yet.

The interim observing system for spectral line mode is currently being modified to allow the observer to select a subset of the total number of channels. This will allow observation with a larger number of antennas than at present when using the narrow filters.

The major overhaul of Antenna No. 1 was nearly complete at the end of the quarter.

By the end of the first quarter of 1980, Phase IV Site & Wye construction work was 99% complete and Phase V was estimated at 86% complete.

PERSONNEL

Appointments

William D. Cotton, Jr.	Systems Scientist	01/21/80
Patrick E. Palmer	Visiting Scientist	01/28/80
Zbigniew Nosal	Electronics Engineer	03/27/80

Changes in Status

Walter J. Jaffe	Associate Scientist/ Systems Scientist	01/01/80
Gareth C. Hunt	Scientific Programming Analyst/ Associate Division Head (VLA Computer Division)	01/01/80

Leave of Absence

Robert L. Brown	Assistant Director, Green Bank	01/01/80

Return from Leave of Absence

Robert L. Brown	Assistant Director, Green Bank	03/24/80
Kenneth I. Kellermann	Senior Scientist	01/01/80