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CHARLOTTESVILLE, VA.

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

AUG 3 1982

Quarterly Report

April 1, 1982 - June 30, 1982

RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1870.00
Scheduled maintenance and equipment changes	177.75
Scheduled tests and calibration	107.25
Time lost due to: equipment failure	92.25
power	2.50
weather	12.00
interference	0.50

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
G-236	S. Goldstein (Virginia) G. Miller (Virginia) J. Wadiak (Virginia)	Search for 21-cm neutral hydrogen in or near clusters of galaxies.
R-189	L. Rickard (Howard)	Search at 1073 MHz for the C ⁺ 290 α transition.
L-150	B. Ganzel (Minnesota) F. J. Lockman	Mapping of neutral hydrogen in the MON OB1 and OB2 associations.
M-185	I. Mirabel (Puerto Rico) A. Wilson (Maryland)	Survey of 21-cm hydrogen in Seyfert galaxies.
M-186	I. Mirabel (Puerto Rico) R. Morras (Puerto Rico)	Search for high-velocity hydrogen clouds in the declination range -40° < δ < -10°.
J-103	M. Jura (Calif., Los Angeles) M. Morris (Columbia) F. Youssefzaden (Columbia) B. Zuckerman (Maryland)	Search for 21-cm hydrogen in the circumstellar shell and around the perimeter of IRC+10216.
H-171	L. Hobbs (Chicago) F. J. Lockman	Observations of neutral hydrogen toward high-latitude OB stars.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
K-265	J. Gunn (Caltech) J. Knapp (Princeton)	Search for HI emission from luminous elliptical galaxies.
J-105	P. Jewell (Illinois) M. Schenewerk (Illinois) L. Snyder (Illinois)	Search in the range of 4660-4765 and 6016-6049 MHz for rotationally excited OH from planetary nebulae and other high-excitation objects.
M-182	M. Bell (Herzberg) H. Matthews (Herzberg) T. Sears (Herzberg)	Survey between 4815 and 4905 MHz and 14730 and 14820 MHz for excited rotational states of CH.
A-58	L. Avery (Herzberg) N. Broten (Herzberg) J. MacLeod (Herzberg)	Search at discrete frequencies between 18.6 and 25.4 GHz for the carbon chain molecules HC_{11}N , HC_{13}N , and HCCNC in TMC-1, IRC+10216, and Sgr B2.
T-164	N. Rieu (Meudon Obs.) B. Turner	Observations at 18.067 and 18.155 MHz of SiS in the ground and excited states.
R-187	L. Rickard (Howard)	Observations at 2326 MHz to search for the $\text{C}^{+}224$ transition.
B-357	R. Brown	Observations at 1238 MHz of hydrogen fine structure lines.
M-162	D. Matsakis (USNO) P. Schwartz (NRL)	Observations over the frequency range 1.0-1.45 GHz to search for the highly redshifted absorption lines of H, OH, CH, and CH_2O .
M-189	D. Machnik (Illinois) M. Kutner (Rensselaer)	Continued studies of 3-cm carbon recombination lines in reflection nebulae.

The following continuum observation was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
V-42	S. Haarala (Tukru, Finland) H. Lehto (Tukru, Finland) P. Teerikorpi (Tukru, Finland) M. Valtonen (Tukru, Finland) W. Saslaw (Virginia)	Monitor at 10500 MHz BL Lac objects for short-term variations.

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

A - Arecibo 1000-ft
 B - Effelsburg MPIfR, Bonn 100-m
 C - Algonquin 150-ft
 F - Fort Davis 85-ft
 G - Green Bank 140-ft
 H - Hat Creek 85-ft
 I - Iowa 60-ft

J - Jodrell Bank 250-ft
 K - Haystack 120-ft
 N - Maryland 85-ft
 O - Owens Valley 130-ft
 R - Crimea, USSR 30-m
 S - Onsala 25-m
 Yn - Socorro VLA $n = 1 - 27 \times 25$ -m

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
P-30V	T. Pearson (Caltech) A. Readhead (Caltech)	Observations at 6 cm to study the milliarcsecond structure of a complete sample of sources, with telescopes B, F, K, O, and G.
M-24V	R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 6 cm to determine component spectral indices and to search for weak central sources in "compact doubles", with telescopes F, K, O, Yn, and G.
P-27V	H. Aller (Michigan) R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 6 cm to measure the apparent superluminal expansion of BL Lac, with telescopes B, F, H, K, O, and G.
S-19V	D. Shaffer (Phoenix Corp.) D. Weistrop (NASA-Goddard)	Mapping at 6 cm of 1219+285, with telescopes B, F, H, K, O, and G.
W-16V	G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson R. C. Walker	Observations at 6 cm of the superluminal motions in 3C 120, with telescopes A, B, C, F, H, I, K, O, S, and G.
L-14V	R. Linfield (Caltech) K. Johnston (NRL)	Observations at 6 cm of the milliarcsecond structure of 4C 49.22, with telescopes F, H, K, O, and G.
B-28V	P. Barthel (Leiden) G. Miley (Leiden) E. Preuss (MPIfR, Bonn) R. Schilizzi (NFRA, Netherlands)	Search at 6 cm for superluminal motion in the cores of extended quasars, with telescopes B, O, S, Yn, and G.
G-16V	B. Geldzahler (NRL) E. Fomalont	Observations at 6 cm of Sco X-1, with telescopes K, O, Yn, and G.
M-21V	L. Molnar (CFA) J. Moran (CFA) M. Reid (CFA) M. Schneps (CFA) J. Schmitt (CFA)	Observations at 18 cm to synthesize the polarization of BL Lac objects, with telescopes F, K, O, Yn, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
S-18V	R. Booth (Manchester) M. Reid (CFA) D. Shaffer (Phoenix Corp.) J. Schmitt (CFA) P. Wilkinson (Manchester) F. Owen	Observations at 18 cm of jets in active galactic nuclei, with telescopes B, F, H, J, K, N, O, Yn, and G.
F-5V	J. Fix (Iowa) R. Mutel (Iowa) J. Benson	Observations at 18 cm to measure the four Stokes parameter polarimetry of OH masers in W51 and VY CMa, with telescopes F, H, I, O, Yn, and G.
P-28V	R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 18 cm to search for compact double sources, with telescopes F, H, I, O, Yn, and G.
B-29V	J. Broderick (VPI & SU) K. Mitchell (Penn State) R. Brown	Observations at 18 cm to measure fine structure in 3C 196, with telescopes F, H, I, K, O, Yn, and G.
T-1V	J. Taylor (Princeton) J. Weisberg (Princeton)	Observations at 18 cm to measure the parallaxes with proper motions of pulsars, with telescopes A and G.
K-10V	I. Pauliny-Toth (MPIfR, Bonn) E. Preuss (MPIfR, Bonn) K. Kellermann	Observations at 1.3 cm of nearby compact nebulae, with telescopes K, O, Yn, and G.
M-29V	H. Aller (Michigan) R. Edelson (Caltech) R. Mutel (Iowa) R. Phillips (Kansas)	Mapping at 1.3 cm of three rapidly varying variable BL Lac objects, with telescopes K, O, Yn, and G.
A-3V	W. Alef (MPIfR, Bonn) K. Kogan (IFSR, USSR) V. Kostenko (IFSR, USSR) L. Matveyenko (IFSR, USSR) I. Pauliny-Toth (MPIfR, Bonn) J. Romney (MPIfR, Bonn) K. Kellermann	Observations at 1.3 cm of NGC 1275, with telescopes B, K, O, R, S, Yn, and G.
M-26V	M. Ewing (Caltech) D. Hough (Caltech) A. Moffet (Caltech) R. Moore (Caltech) A. Readhead (Caltech) J. Romney (MPIfR, Bonn) R. C. Walker	Hybrid mapping of 3C 84, with telescopes C, K, O, Yn, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-31V	L. Baath (Chalmers)	High-resolution observations at 1.3 cm of the QSO's 3C 345 and 4C 39.25, with telescopes C, K, O, R, S, Yn, and G.
P-31V	L. Baath (Chalmers) I. Pauliny-Toth (MPIfR, Bonn) A. Zensus (MPIfR, Bonn)	Observations at 1.3 cm of 3C 454.3, with telescopes K, O, S, and G.
M-28V	A. Downes (MPIfR, Bonn) R. Genzel (CFA) A. Haschick (Haystack) J. Moran (CFA) M. Reid (CFA) B. Ronnang (Chalmers) M. Schneps (CFA)	Observations at 1.3 cm to determine the distances and proper motions in H ₂ O maser sources, with telescopes K, O, S, Yn, and G.
U-9V	T. Pearson (Caltech) A. Readhead (Caltech) S. Unwin (Caltech)	Observations at 2.8 cm of the milli-arcsecond structure of 0701+439 and 2021+614, with telescopes B, F, K, O, and G.
S-21V	J. Marcaide (MIT) J. Romney (MPIfR, Bonn) D. Shaffer (Phoenix Corp.) K. Kellermann	Observations at 2.8 cm of 4C 39.25, with telescopes B, F, H, I, K, O, and G.
H-4V	D. Hough (Caltech)	Observations at 2.8 cm of 3C 219 and 3C 388, with telescopes B, K, F, O, and G.

<u>300-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1906.75
Scheduled maintenance and equipment changes	132.50
Scheduled test and calibration	144.75
Time lost due to: equipment failure	13.25
power	4.75
weather	11.75
interference	2.00

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
H-160	W. Huchtmeier (MPIfR, Bonn) O. Richter (MPIfR, Bonn)	Studies of the global parameters of galaxies and clusters of galaxies from neutral hydrogen observations.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
L-150	B. Ganzel (Minnesota) F. J. Lockman	High angular resolution measurements of neutral hydrogen in areas of special interest in the Mon OB1 and OB2 associations.
H-171	L. Hobbs (Chicago) F. J. Lockman	Observations of neutral hydrogen toward high latitude OB stars.
S-255	R. Sanders (Leiden)	Observations of neutral hydrogen in a number of S0 galaxies.
G-259	R. Giovanelli (Arecibo) M. Haynes	Observations of neutral hydrogen in galaxies that are found in a super-cluster in Lynx-Ursa Major.
G-265	R. Giovanelli (Arecibo) M. Haynes	Continued observations of hydrogen in galaxies found in clusters and superclusters.
G-263	E. Grayzeck (Nevada, Las Vegas)	Studies of the hydrogen distribution across OB associations found in the Galaxy.
L-147	B. Lewis (Carter Obs.) P. Crane	Observations to complete the detection of and to study Shapley Ames galaxies by the use of hydrogen-line observing techniques.

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-339	J. Broderick (VPI & SU) B. Dennison (VPI & SU) J. Ledden (VPI & SU) S. O'Dell (VPI & SU) H. Payne (VPI & SU) J. Condon	Observations at 900 and 1400 MHz of low-frequency variables.
B-359	C. Bennett (MIT) B. Burke (MIT) J. Hewitt (MIT) C. Lawrence (MIT)	Survey at 6 cm for sources at declinations $0^\circ < \delta < 20^\circ$.
B-335	T. Balonek (New Mexico) W. Dent (Massachusetts) W. Kinzel (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measurements of variable radio sources at 2695 MHz.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
K-266	C. Aumann (Wisconsin) P. Chute (Wisconsin) J. Harlander (Wisconsin) G. Kojoian (Wisconsin) J. Muth (Wisconsin)	Observations at 4.7 GHz of those galaxies exhibiting strong ultraviolet continua and high surface brightness.

The following pulsar program was conducted during this quarter.

T-166	P. Backus (NASA-Ames) R. Burkhardt (Massachusetts) J. Taylor (Princeton) M. Damashek	Observations in the range of 340-410 MHz for an improved northern hemisphere pulsar survey.
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<u>36-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1789.00
Scheduled maintenance and equipment changes	99.75
Scheduled test and calibration	295.25
Time lost due to: equipment	47.25
weather	51.50
power	0.25
interference	0.00

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
A-064	T. Armstrong (MIT) A. Barrett (MIT)	HNCO and CO observations in galactic and extragalactic sources.
B-383	D. Backer (Calif., Berkeley) A. Readhead (Caltech) A. Moffet (Caltech) A. Rogers (Haystack) J. Moran (SAO)	3-mm VLBI observations.
B-386	L. Blitz (Maryland) D. Gezari (NASA, Goddard) C. Lada (Arizona)	Study the star-forming region in NGC 6334 in CO, HCN, HCO ⁺ and CS molecules.
C-199	F. Clark (Kentucky) T. Troland (Kentucky) D. Johnson (NBS)	Systematic study of SiO maser processes.
C-203	E. Churchwell (Wisconsin) P. Angerhofer (USNO) C. Walmsley (MPIfR, Bonn)	Mapping of HC ₃ N near Sgr A.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
C-206	E. Churchwell (Wisconsin) J. Hollis (NASA, Goddard)	Determination of temperature profiles in molecular clouds.
F-083	J. Fix (Iowa) M. Claussen (Caltech)	A map of CO emission near OH 351.8-0.54.
H-169	J. Hollis (NASA, Goddard) P. Rhodes	Search for sodium hydroxide in the ISM.
J-102	D. Jaffe (Chicago) J. Keene (Caltech) R. Hildbrand	Measurement of physical properties of selected sub-millimeter continuum sources.
K-281	M. Kutner (RPI) D. Machnik (Illinois)	Observations of formaldehyde in reflection nebulae.
K-282	M. Kutner (RPI) K. Mead (RPI)	CO observations in the outer galaxy.
L-166	S. Lichten (Caltech)	Study of turbulence and mass motion in molecular clouds.
L-168	C. Leung (RPI) M. Kutner (RPI) K. Mead (RPI)	Study of the dynamical and evolutionary state of dark globules.
L-169	C. Lada (Arizona) B. Wilking (Texas)	Study of ^{13}CO in recent open clusters.
L-171	R. Loren (Texas) H. Wootten (RPI)	DCO^+ and H^{13}CO^+ emission in ρ Ophiuchus complex.
L-172	H. Liszt W. B. Burton (Minnesota)	^{12}CO emission from the vicinity of SGR complex.
L-174	C. Lada (Arizona) B. Campbell (Arizona)	Study of high-velocity gas flows from NGC 2024 and S235B.
S-241	S. Spangler W. Cotton	Multi-frequency monitoring of low- frequency variables.
S-251	M. Simon (SUNY, Stony Brook) J. Fischer (Maryland) D. Sanders (SUNY, Stony Brook)	High-sensitivity observations of CO in supersonic flows.
T-163	H. Thronson (Wyoming)	A new search for CO emission from planetary nebulae.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-165	S. Tereby (Calif., Berkeley) M. Fich (Calif., Berkeley) L. Blitz (Maryland)	Observations of molecular clouds in the outer galaxy.
U-014	N. Ukita (IRAM, France) M. Morris (Columbia)	H ² S in the envelopes of late-type stars.

Very Large Array

The quarter was scheduled 100 percent of the time.

	<u>Hours</u>
Astronomical observing	1562.6
Tests	626.3

The average downtime was 3.33%.

The following research programs were conducted with the VLA during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-129	B. Burke (MIT) D. Roberts (Brandeis) P. Greenfield (MIT) J. Hewitt (MIT)	Monitoring double QSO 0957+561. 20 cm.
AB-156	J. Basart (Iowa State) C. Daub (San Diego State)	High resolution Te structure of three planetary nebulae. 20 cm.
AB-172	P. Bowers (NRL) K. Johnston (NRL) J. Spencer (NRL)	Mass loss rates of late-type stars. 18-cm line.
AB-175	B. Balick (Washington) E. Skillman (Washington)	HI absorption studies of near-nuclear radial motions in nearby active and normal galaxies. 21-cm line.
AB-176	B. Balick (Washington) G. Boeshaar (Seattle)	Serendipitously discovered VLA radio sources. 6 and 21 cm.
AB-177	D. Backer (Calif., Berkeley) R. Sramek	Astrometric observations of the compact nonthermal radio source in Sagittarius A. 6 cm.
AB-178	B. Balick (Washington) R. Hjellming R. Bignell	Planetary nebulae NGC 40, NGC 6543. 6 and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-179	P. Biermann (MPIfR, Bonn) P. Kronberg (Toronto)	Arp 102B. A compact radio and X-ray source in an elliptical galaxy. 1.3, 2 and 6 cm.
AB-180	P. Bowers (NRL) M. Morris (Columbia)	Bipolar nebula OH231.8+4.2 at maximum light. 18-cm line.
AB-181	J. Burns (New Mexico) J. Basart (Iowa State) D. De Young (KPNO)	A search for radio jets in extended sources with powerful cores. 6 cm.
AB-182	J. Burns (New Mexico) T. Balonek (New Mexico) E. Hummel (New Mexico)	Monitoring the cores of extended radio sources and spiral galaxies. 2, 6, and 20 cm.
AB-183	W. Baan (Penn State) A. Haschick (Haystack)	Hydroxyl in IC 4553. 18-cm line.
AC-39	T. Cornwell R. Perley A. Willis (NFRA, Netherlands)	The jets in 3C 449. 18 and 20 cm.
AC-42	E. Churchwell (Wisconsin) D. Abbott (Colorado) J. Bieging (Calif., Berkeley) R. C. Bignell	Monitoring the flux and spectral index variability of OB supergiants. 2 and 6 cm.
AC-43	J. Condon J. Machalski (Crackow) M. Condon (unaffiliated)	Structures of intermediate-strength sources found at 1400 MHz. 20 cm.
AC-49	J. Condon H. Murdoch (Sidney)	Precessing jets in 2300-189. 6 cm.
AC-50	W. Cotton F. Owen	Very steep spectrum sources. 6 cm.
AC-51	P. Crane R. M. Price (New Mexico)	Narrow emission-line region of NGC 3031 (M81). 6 cm.
AD-62	I. de Pater (Arizona) D. Hunten (Arizona) J. Caldwell (SUNY, Stony Brook) T. Owen (SUNY, Stony Brook) W. Jaffe (Groningen) S. Gulkis (JPL)	Neptune and Uranus. 6 and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AD-71	A. Downes (Cambridge) M. Longair (Royal Obs.) J. Peacock (Royal Obs.) J. Wall (Royal Greenwich Obs.)	Structures of faint high-frequency extragalactic radio sources. 6 and 20 cm.
AD-72	A. Dupree (CFA) B. Burke (MIT)	Vela X-1. 6 and 20 cm.
AD-73	I. de Pater (Arizona) R. Brown (Arizona) J. Dickel (Illinois)	Galilean satellites. 2 and 6 cm.
AD-76	L. Dressel (NASA, Goddard) A. Wilson (Maryland)	X-ray emitting SO galaxies. 6 and 21 cm.
AD-77	J. Dreher (MIT) C. Lawrence (MIT)	Hotspots in nearby extended radio sources. 6 cm.
AF-43	M. Fich (Calif., Berkeley) C. Heiles (Calif., Berkeley) S. Kulkarni (Calif., Berkeley) M. Stevens (Calif., Berkeley)	Search for compact galactic sources. 20 cm.
AF-48	J. Fix (Iowa) R. Mutel (Iowa)	The ratio of $^{18}\text{OH}/^{16}\text{OH}$ maser emission in OH351.8-0.5. 18-cm line.
AF-49	J. Fix (Iowa)	Improved positions for unidentified OH sources. 18-cm line.
AG-66	B. Geldzahler (NRL) N. Cohen (Cornell/MIT) W. Cotton	The three binary pulsars. 20 cm.
AG-70	A. Gower (Victoria) D. Crampton (DRAO) J. Hutchings (DRAO)	Low redshift QSOs. 6 and 20 cm.
AG-80	A. Gower (Victoria)	Quasar 4C18.65. 2 and 6 cm.
AG-90	Gopal-Krishna (TIFR, India) G. Swarup (TIFR, India) R. Sramek	Structures of sources selected at 408 MHz. 6 and 20 cm.
AG-91	W. Goss (Leiden) S. Pottasch (Leiden)	14 planetary nebulae at the galactic center. 6 cm.
AG-92	J. Grindlay (CFA) E. Seaquist	Galactic bulge X-ray sources. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AG-93	D. Gibson (NMIMT)	M-dwarf flare stars. 20 cm.
AG-94	G. Garay (CFA) M. Reid (CFA) J. Moran (CFA)	The 1665-MHz line from OH masers associated with compact HII regions. 18-cm line.
AH-72	D. Hogg	Radio emission from WR stars--Gamma Velorum. 1.3, 2 and 6 cm.
AH-82	R. Hjellming K. Johnston (NRL)	Evolution of SS433 "corkscrews." 1.3, 2, 6, 18, and 22 cm.
AH-84	E. Hummel (New Mexico) R. M. Price (New Mexico) C. Kotanyi (Leiden)	Radio nuclei in nearby E and SO galaxies. 2, 6, and 21 cm.
AH-87	E. Hummel (New Mexico) R. Davies (Manchester) A. Pedlar (Manchester) J. van der Hulst (Minnesota) W. Golisch (Minnesota)	Nuclei and disks of Sbc galaxies. 6 cm.
AH-91	L. Higgs (DRAO) T. Landecker (DRAO) R. Roger (DRAO)	Search for stellar remnants of supernova events. 21-cm line.
AH-93	D. Heeschen J. Heidmann (Paris Obs.)	Mkn 8 and Mkn 297. 6 cm.
AH-95	V. Hughes (Queens) J. Wouterloot (ESO) M. Greenberg (Leiden)	Star formation regions in Cep A. 6 cm.
AH-96	E. Hummel (New Mexico) R. Laing C. Kotanyi (ESO) F. Bertola (Arcetri Obs.)	Elliptical radio galaxies with dust lanes. 6 and 21 cm.
AJ-76	K. Johnston (NRL) E. Fomalont C. Wade	Astrometric positions of compact radio sources. 6 cm.
AJ-78	K. Johnston (NRL) E. Fomalont C. Wade R. Perley	Quasar reference positions. 6 cm.
AJ-79	K. Johnston (NRL) D. Florkowski (USNO) C. Wade	Astrometry of FK4 and other bright stars. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AJ-80	K. Johnston (NRL) S. Knowles (NRL)	Angular sizes of strong HII region water vapor sources. 1.3-cm line.
AK-47	S. Kwok (NRC) R. C. Bignell	Monitoring of AFGL 618. 1.3, 2, 6, and 20 cm.
AK-53	S. Kwok (NRC) H. Matthews (NRC) C. Purton (DRAO)	Emission-line stars associated with nebulosity. 20-cm line and 2, 6 and 20 cm.
AK-54	M. Kundu (Maryland) D. McConnell (Maryland) M. Bobrowsky (Maryland)	Solar active regions and flares. 1.3, 2 and 6 cm.
AK-56	K. Kellermann R. Ekers J. Ekers	Compact components of 3CR sources. 6 cm.
AK-63	G. Knapp (Princeton) D. Spergel (Princeton)	IRC+10216. Monitoring continuum flux. 6 cm.
AK-65	P. Kronberg (Toronto) R. Sramek	Small sources in M81--do they vary? 2, 6, and 20 cm.
AL-43	R. Laing	Hot spots in luminous extragalactic radio sources. 1.3, 2, 6, 18, and 20 cm.
AL-44	R. Linfield (Calif., Berkeley) R. Perley	3C 111. 2 and 6 cm.
AM-39	L. Molnar (Hycel Inc.) M. Reid (CFA) R. C. Bignell	Monitoring polarization of BL Lac objects. 2 and 6 cm.
AM-50	R. Mutel (Iowa) J. Fix (Iowa)	Four type II OH/IR stars. 18-cm line.
AM-51	T. Maccacaro (CFA) I. Gioia (CFA) P. Giommi (CFA) H. Tannanbaum (CFA) G. Zamori (Bologna)	A complete sample of X-ray selected active galactic nuclei: spectra. 2, 6, and 21 cm.
AM-53	I. McHardy (Leicester) A. Smith (Leicester)	Position and structure of radio sources with very steep low-frequency spectra. 2 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AM-55	T. Menon (British Columbia)	Small angular size Ooty sources. 2 and 6 cm.
AM-57	L. Miller (Cambridge) R. Laing	Fine-scale structure in the hot-spots of weak classical double sources. 6 cm.
AM-58	J. Moran (CFA) G. Garay (CFA) M. Reid (CFA) R. Genzel (Calif., Berkeley) P. Ho (Calif., Berkeley)	Observations of the Orion nebula. 1.3 cm.
AN-11	R. Newell R. Hjellming	Thermal stellar sources. 1.3 and 2 cm.
AO-31	C. O'Dea F. Owen	Narrow angle tailed radio sources. 20 cm.
AP-46	R. Perley A. Bridle B. Clark R. Ekers J. Burns (New Mexico) G. Greuff (Bologna) J. Douglas (Texas)	A large sample from the B3 survey. 20 cm.
AP-47	R. Perley J. Cowan (Oklahoma)	Search for radio jets in Cygnus A (3C 405). 20 cm.
AP-53	R. Perley R. Ekers	Superluminal motion in 3C 273? 1.3, 2, and 6 cm.
AP-55	R. M. Price (New Mexico) M. Zeilik, II (New Mexico)	Galactic nuclei with unusual IR properties. 6 and 20 cm.
AP-56	J. Peacock (Royal Obs.) J. Wall (Royal Greenwich Obs.) M. Longair (Royal Obs.)	Compact steep spectrum radio sources. 2 and 6 cm.
AP-57	J. Leahy (Cambridge) G. Pooley (Cambridge)	The extended radio galaxy 3C 66B-- polarization. 2, 6, and 20 cm.
AS-79	S. Spangler W. Cotton	Monitoring of low-frequency variables. 1.3, 2, 6, and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AS-80	R. Sramek J. van der Hulst (Minnesota) K. Weiler (NSF)	Supernovae: SN1980 in NGC 6946 and SN1979c in M100. 6 and 20 cm.
AS-88	K. Sellgren (Caltech) R. White (Calif., Los Angeles)	Reflection nebulae. 6 and 20 cm.
AS-92	R. Strom (NFRA, Netherlands) W. van Breugel (KPNO) J. Robertson (AAO)	Distorted source 4C 59.08. 6 and 20 cm.
AS-111	S. Spangler	Double radio sources with bridges. 6 and 20 cm.
AS-115	M. Simon (SUNY, Stony Brook) M. Felli (Arcetri Obs.) J. Fischer (Maryland)	Protostellar source M8E. 20 cm.
AS-122	P. Schwartz (NRL) M. Frerking (JPL) W. Langer (Bell Labs)	Search for T Tau-type stars in dark nebulae with bi-polar CO emission. 2 and 6 cm.
AS-123	D. Saikia (TIFR, India) V. Kapahi (TIFR, India)	Compact cores of extended radio sources associated with elliptical galaxies. 1.3, 2, 6, and 21 cm.
AS-124	E. Seaquist R. C. Bignell P. Napier	Circular polarization mapping: 3C 273, 3C 279, and 3C 454.3. 20 cm.
AS-125	E. Skillman (Washington) B. Balick (Washington)	Nuclei of giant extragalactic HII regions. 20 cm.
AT-24	B. Turner H. Matthews (NRC) S. Kwok (NRC) A. Winnberg (Chalmers)	Central cavities in ultra-compact HII regions. 2 cm.
AV-52	J. van der Hulst (Minnesota) R. Sramek K. Weiler (NSF)	Supernova in NGC 4536. 6 cm.
AV-65	W. van Breugel (KPNO) G. Miley (Leiden) E. Fomalont T. Heckman (Maryland) H. Butcher (KPNO)	Fine structure in 3C 310. 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AV-71	W. van Breugel (KPNO) G. Miley (Leiden) H. Butcher (KPNO) T. Heckman (Maryland) M. Ulrich (ESO)	Radio galaxies NGC 7089 and 3C 445 with extended optical line emission. 6 and 20 cm.
AV-77	J. van Gorkom D. Hunter (Illinois)	Interacting irregular galaxies NGC 4449. 20 cm.
AW-48	C. Wade P. Seidelmann (USNO) K. Johnston (NRL)	Astrometric observations of minor planets. 2 and 6 cm.
AW-56	C. Wade R. Perley	Monitoring the optically flaring quasar 1156+295 = 4C 29.45. 1.3, 2, 6, and 20 cm.
AW-66	B. Wills (Texas) D. Wills (Texas)	Radio structure of objects with broad emission lines. 6 cm.
AW-68	K. Weiler (NSF) R. Sramek J. van der Hulst (Minnesota) M. Roberts	Recent extragalactic supernovae. 6 cm.
AW-71	A. Wilson (Maryland) J. Ulvestad	Statistical studies of Seyfert galaxies. 2, 6, and 21 cm.
AW-74	W. J. Welch (Calif., Berkeley) J. Biegging (Calif., Berkeley) J. Dreher (MIT) M. Cohen (NASA, Goddard)	MWC 349. 6 cm.
AZ-18	H. Zirin (Caltech) G. Hurford (Caltech) A. Kattenberg (Caltech)	Small-scale structure of solar impulsive microwave bursts. 2 cm.
AZ-19	B. Zuckerman (Maryland) P. Schwartz (NRL) M. Dyck (Hawaii) T. Simon (Hawaii)	Astrometry and structure of T Tauri. 2, 6, and 20 cm.
AZ-20	H. Zirin (Caltech) G. Hurford (Caltech) A. Kattenberg (Caltech) R. Lin (Calif., Berkeley)	Support of HIREX, high resolution X-ray solar balloon. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
VA-3/ VM-26	W. Alef (MPIfR, Bonn) J. Romney (MPIfR, Bonn) I. Pauliny-Toth (MPIfR, Bonn) K. Kellermann L. Matveyenko (Inst. for Space Research, USSR) L. Kogan (Inst. Space for Space Research, USSR) V. Kostenko (Inst. for Space Research, USSR) R. Moore (Caltech) A. Readhead (Caltech) A. Moffet (Caltech) M. Ewing (Caltech) D. Hough (Caltech) R. C. Walker	3C 84 = NGC 1275. 1.3 single antenna VLB.
VB-28	P. Barthel (Leiden) G. Miley (Leiden) R. Schilizzi (NFRA, Netherlands) E. Preuss (MPIfR, Bonn)	Search for superluminal motion in cores of extended quasars. 6-cm phased array VLB.
VB-29	R. Brown K. Mitchell J. Broderick (VPI & SU)	3C 196. 18-cm single antenna VLB.
VB-31	L. Baath (Chalmers)	3C 345 and 4C 39.25. 1.3-cm single antenna VLB.
VF-5	J. Fix (Iowa) R. Mutel (Iowa) J. Benson	Polarimetry of OH masers in W51 and VY CMa. 18-cm phased array VLB.
VG-16	B. Geldzahler (NRL) E. Fomalont	Sco X-1. 6-cm phased array MK III VLB.
VK-10	K. Kellermann I. Pauliny-Toth (MPIfR, Bonn) E. Preuss (MPIfR, Bonn)	M87, M81. 1.3 single antenna MK III VLB.
VM-21	L. Molnar (Hycel Inc.) M. Reid (CFA) J. Moran (CFA) M. Schneps (CFA)	Polarization synthesis of BL Lac objects. 18-cm phased array MK III VLB.
VM-24	R. Mutel (Iowa) R. Phillips (Kansas)	Component spectral indices in compact doubles. 6-cm phased array MK III VLB.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
VM-28	J. Moran (CFA) D. Downes (IRAM) R. Genzel (Calif., Berkeley) A. Haschick (Haystack) M. Reid (CFA) B. Ronnang (Chalmers) M. Schneps (CFA)	Proper motions of water maser sources. 1.3 single antenna VLB.
VM-29	R. Mutel (Iowa) H. Aller (Michigan) R. Phillips (Haystack) R. Edelson (Caltech)	Rapidly varying BL Lac objects. 1.3 single antenna VLB.
VP-28	R. Phillips (Kansas) R. Mutel (Iowa)	Search for compact doubles. 18-cm single antenna VLB.
VS-18	J. Schmitt (CFA) M. Reid (CFA) F. Owen D. Shaffer (Phoenix Corp.) K. Johnston (NRL) R. Booth (Chalmers) P. Wilkinson (Manchester)	Jet in Virgo A. 18-cm phased array VLB.
VW-16	R. C. Walker G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson	3C 120. Superluminal motion. 6-cm single antenna VLB.

COMPUTER DIVISION

VLBI - System temperatures are now calculated automatically. This presumes that the noise tube at the telescope is fired at one second intervals during VLBI observations.

Green Bank - A card punch has been installed on the remote job entry station at the Jansky laboratory. This enables the IBM computer at Charlottesville to punch cards at Green Bank.

AIPS - Program development for the astronomical image processing system (AIPS) is continuing. Among recent additions are: (1) support for the uv-plane FITS format; (2) a generalized internal uv format; and (3) a more flexible task to plot self-cal grain solutions. The VLBI fringe fitting programs mentioned in the previous quarterly report now work. Several more technical areas received significant improvements, including (1) the handling of tapes on the VAX computer; (2) the treatment of array-processor tasks in batch, (3) the structure of message files; and (4) the passing of television status information between tasks. On the VAX computers, user data are now

stored in a way which allows rapid, machine-dependent backup and restore operations.

The project to bring AIPS up on the IBM under the OS operating system made rapid progress during the quarter. In fact, a somewhat out-of-date and incomplete version of AIPS now works on the IBM with only minor problems. The current AIPS code has been modified in minor, but widespread, ways to insure future IBM compatibility.

VLA - The mapping system on the PDP-11/70 (Mapper) with its control system (MAPCON) is now working successfully. Maps can now be made on this system by issuing requests from the DEC-10. One visiting observer processed 1000 maps in a week. The CLEAN and self-calibration programs are also available for use.

The image display system (IMPS) has been installed on a PDP-11/44 and is functionally identical to the previous version that ran on a PDP-11/40, but has much increased performance mainly due to the superior processor speed. The time to produce a contour diagram has been reduced by a factor of 3, and the times for some other functions are lower by as much as a factor of 4.

To increase the total available disk storage capacity on the VAX systems running AIPS at the VLA site, one disk drive has been temporarily added to each system. In addition, these drives have been configured to have a removable disk pack. This allows users with large data sets to be assigned a whole pack to keep their data permanently on disk, thus eliminating the need to perform bulk magnetic tape data transfers before and after each session.

In AIPS, the self-calibration algorithm has been implemented for spectral line data and is known to work reliably. Also available is a new color display for the spectral-line data cube. In this representation, the intensity is proportional to the integral in the velocity dimension and the hue is proportional to the mean velocity.

ELECTRONICS DIVISION

Charlottesville

Ten 15-GHz GASFET amplifiers have been completed this quarter and shipped to the VLA for use in the 2-cm sensitivity improvement program; a factor of 3 increase in sensitivity should result. Approximately thirty 1.5 GHz amplifiers for use at the VLA, Tucson, and Green Bank have also been completed. Visitors from Bell Labs, Purple Mountain Radio Observatory, Nobeyama Radio Observatory (Japan), Lawrence Berkeley Lab, Princeton, and Nagoya University (Japan) have come to the Ivy Road laboratory for aid in construction and testing of similar 1.5 GHz amplifiers.

A 200-350 GHz receiver for use with the upgraded 12-meter telescope is under construction. The receiver has 8 cooled mixer modules which can be individually serviced without warming up the remainder of the receiver.

Work continues on testing of superconducting tunnel junctions for millimeter wave use. New junctions, fabricated at NBS laboratories, have been received and show promising initial results.

The design of an archives data storage facility for the VLA has started. A machine which will allow 8 or more 6250 bit-per-inch computer tapes to be compressed on to one 4-hour video cassette is being considered. Development of a high-density VLBA recording system utilizing video cassettes is also continuing.

Green Bank

Assistance was provided to the University of Iowa and to Ft. Davis in the construction and testing of VLBI FET receivers. The Iowa receiver has dual L and C band capabilities while the Ft. Davis unit has single L, C and X band capabilities.

System tests on the 2 MHz, 256-channel filter banks revealed "birdies" at unacceptable levels coming from the oscillators. Methods to reduce their levels were found. Presently one filter bank is complete and the second nearly complete.

Tests on the 300-foot telescope, using offset feeds to track the maximum efficiency point with declination, showed that it is possible to broaden the efficiency vs declination curve.

Performance of the 6/25-cm receiver at 25 cm was evaluated on both telescopes for the first time since it was upgraded with FET's. System temperatures of 35 to 40° K were routinely measured. The bandwidth was limited to 80 MHz by an IF filter.

In response to observations of a jump in pointing at low declinations, the 140-foot feed system was checked for rapid changes in alignment with declination. The feed system was found to vary smoothly. Subsequently, the source of the error was traced to an overflow problem in the pointing computer.

A thermal transition that will mate with the 3.3 GHz orthomode transition (OMT) has been designed and constructed. Also, two waveguide-to-coax-transition sections of the OMT, scaled to L-band, have been constructed. Performance figures are not yet available.

A detailed block diagram for a holographic telescope measurement system has been designed. RFQ's on critical components are out. However, purchase of any items is on hold until the Air Force agrees to let NRAO make use of a satellite under their control.

The interferometer additional baseline project is progressing. Most items for the microwave link have been purchased. Design of the digital link and weather instrument interface are in progress. Limited construction is underway.

Construction and testing is continuing on the second channel of the 140-foot upconverter-maser system, on the interferometer inductosyn interfaces, and on the 4-foot 21-cm receiver.

Tucson

During this quarter work has continued on the electronic and optical systems for the new surface. Work has also begun on repackaging the He³ bolometer system in a form more suitable for mounting on the new surface.

A 3-mm VLBI experiment was successfully performed during this quarter.

Socorro

A new design for the subreflector control system has been implemented and installed on antenna 12. A prototype 327-MHz feed and front end was completed and installed on antenna 12, with single-dish testing to start during the next quarter. The decision to insulate all antennas has been made. Insulation of antennas will start with antenna 14 during the last quarter of 1982.

ENGINEERING DIVISION

The back-up structure for the new 12-meter surface for Tucson was received in Green Bank for trial assembly and attaching surface panels to the structure. The back-up structure was assembled and modifications made, as needed, to the structure to interface with the surface panels and accept the measuring and adjusting system. A series of tests and measurements were made and are continuing.

The design for the main mirror selection system for the 12-meter optics was completed and sent to the shop for fabrication. Design was started for the auxiliary mirrors and their supports.

Design and construction of the antenna foundation and pedestal and all site work was completed for the interferometer addition. Fabrication of the antenna structure continued, with a schedule for shipment to the site in August.

PERSONNEL

New Hires

Willem A. Baan	Visiting Assistant Scientist	06/14/82
Marek T. Faber	Visiting Electronics Engineer I	06/28/82

Rehires

Edwin J. Grayzeck	Visiting Associate Scientist	06/03/82
Patrick E. Palmer	Visiting Scientist	06/18/82

Terminations

Robert H. Sanders	Visiting Scientist	06/04/82
Ernest R. Seaquist	Visiting Scientist	06/28/82
Ronand W. Lowe	Scientific Programmer II	06/25/82

APPENDIX I

Colloquium Speakers at the NRAO
July 1981 - June 1982Charlottesville

Baars, J.W.M.	Max-Planck-Institut fur Radioastronomie
Balick, B.	University of Washington
Bash, F. N.	University of Texas
Burbidge, G. R.	Kitt Peak National Observatory
Caldwell, N.	Dept. of Terrestrial Magnetism
Cane, H. V.	Goddard Space Flight Center
Davis, M. M.	Arecibo Observatory
de Pater, I.	University of Arizona
Erickson, W. C.	University of Maryland
Gilden, D.	University of Texas
Gregory, P. C.	University of British Columbia
Hummel, K.	University of New Mexico
Koo, D.	Dept. of Terrestrial Magnetism
Kotanyi, C. G.	University of Groningen
Marscher, A. P.	Boston University
McAdam, B.	University of Sydney, Australia
Osterbrock, D. E.	Lick Observatory
Preuss, E.	Max-Planck-Institut fur Radioastronomie
Rees, M.	University of Cambridge, UK
Rickard, L. J.	Howard University
Rudnick, L.	University of Minnesota
Schardt, A. W.	Goddard Space Flight Center
Schommer, R. A.	Rutgers
Schwarz, U. J.	University of Groningen
Schweizer, F.	Dept. of Terrestrial Magnetism
Smith, M. D.	University of Maryland
van der Hulst, J. M.	University of Minnesota
Weedman, D. W.	Pennsylvania State University
Wilson, A. S.	University of Maryland
Wootten, H. A.	California Institute of Technology

Socorro

Cohen, M.	California Institute of Technology
Downes, A.	Cambridge University, UK
Eilek, J.	New Mexico Institute of Mining & Techonolgy
Goss, W. M.	University of Groningen
Gregory, P. C.	University of British Columbia
Hewish, A.	University of Cambridge, UK
Knapp, G. R.	Princeton University
Kotanyi, C.	University of Groningen
Linsley, J.	University of New Mexico
Masson, C.	California Institute of Technology
Moffet, A. T.	California Institute of Technology

Colloquium speakers, continued:

Ostriker, J.	Princeton University
Pedlar, A.	University of Manchester, UK
Shapiro, M.	University of Iowa & U.S. Naval Research Lab
Smarr, L.	University of Illinois
Strom, S.	Kitt Peak National Observatory
Thomsen, M. F.	Los Alamos Scientific Laboratory
Tohline, J.	Los Alamos Scientific Laboratory
Woolfe, A. M.	University of Pittsburgh
Zaninetti, L	Istituto di fisica Generale of Torino, Italy