

DEPARTMENT OF THE U.S. GOVERNMENT
 NATIONAL RADIO ASTRONOMY OBSERVATORY
 CHARLOTTESVILLE, VA.

NATIONAL RADIO ASTRONOMY OBSERVATORY
 Charlottesville, Virginia

AUG 3 1982

Quarterly Report

January 1, 1982 - March 31, 1982

RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1948.50
Scheduled maintenance and equipment changes	152.50
Scheduled tests and calibration	17.00
Time lost due to: equipment failure	17.50
power	6.00
weather	149.50
interference	2.50

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-176	L. Avery (Herzberg) N. Broten (Herzberg) J. MacLeod (Herzberg) H. Matthews (Herzberg) T. Oka (Chicago)	Observations at 18.2 GHz of the J=2-1 transition of HC ₃ N, generally toward dark clouds.
M-177	H. Matthews (Herzberg) T. Oka (Chicago)	Search at 18.4 GHz for the J=1-0 transition of CH ₃ CN.
M-184	H. Matthews (Herzberg) T. Oka (Chicago) T. Sears (NRC, Canada)	Observations at 1.5 cm to investigate the properties of the lowest rotational transitions of CH ₂ CHCN (vinyl cyanide).
L-157	P. Ho (Calif., Berkeley) R. Loren (Texas) M. Scholtes (Texas) H. Wootten (Caltech)	Search at 23.69 GHz for NH ₃ in selected clouds which have CO or HCO ⁺ self reversals.
M-174	C. Henkel (MPI, Bonn) H. Matthews (Herzberg)	Observations of IRC+10216 and other selected sources in the J=1-0 lines of SiS at 18 GHz.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
L-156	R. Loren (Texas) L. Mundy (Texas) M. Scholtes (Texas) H. Wootten (Caltech)	Observations of the hyperfine structure of the 2 cm H_2CO transition in selected molecular clouds.
W-156	P. Palmer (Chicago) L. Rickard (Howard) A. Winnberg (MPI, Bonn)	Observations at 2.2 cm of the $2\pi_{4/2}$, $J=7/2$ OH absorption lines toward compact HII regions.
K-278	M. Kutner (Rensselaer) D. Machnik (Illinois)	Search at 2 cm for HDCO.
B-381	R. Brown	Observations at 2.1 cm to confirm and extend the detection of recombination line emission toward 3C 245.
L-159	F. J. Lockman	Deep systematic 2.8-cm recombination line survey of continuum sources in the Galaxy.
R-179	T. Bania (Boston U.) R. Rood (Virginia) T. Wilson (MPI, Bonn)	Search at 8.7 GHz for ^3He returned to the interstellar medium by low-mass stars.
M-175	A. Barrett (MIT) P. Myers (MIT)	Search for ortho- H_2O maser emission at 12 GHz.
J-100	D. Buhl (NASA-Goddard) G. Chin (NASA-Goddard) J. Hillman (NASA-Goddard) D. Jennings (NASA-Goddard)	Search at 2 cm for the $0^{00}-1^{10}$, $\tau=4-2$ transition of H_2O_2 (hydrogen peroxide).
F-79	K. Fox (Tennessee) D. Jennings (NASA-Goddard)	Observations of interstellar CH_4 (methane) transitions near 14 GHz.

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

B - Effelsberg MPIfR 100 m	I - Iowa 60 ft
C - Algonquin 150 ft	JII- Jodrell Bank MKII 8X120 ft
Ds - Madrid 64 m	K - Haystack 120 ft
E - South Africa 25 m	O - Owens Valley 130 ft
F - Fort Davis 85 ft	R - Crimea 30 m
G - Green Bank 140 ft	So - Onsala 25 m
H - Hat Creek 85 ft	U - Chilbolton 26 m
	Yn - Socorro VLA Y=1-27X25 m

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
C-24V	R. Booth (Manchester) M. Cohen (Caltech) A. Niell (JPL) R. Simon (Caltech) S. Unwin (Caltech) P. Wilkinson (Manchester) L. Young (JPL)	Observations at 13 cm of the superluminal sources 3C 273 and 3C 245 with telescopes Ds, E, F, H, J _{II} , O, So, and G.
P-29V	R. Porcas (MPI, Bonn)	Observations at 2.8 cm of the compact cores associated with the quasars 0833+65 and 1732+65 with telescopes B, K, O, and G.
C-25V	M. Cohen (Caltech) D. Jones (Caltech) R. Moore (Caltech) T. Pearson (Caltech) A. Readhead (Caltech) G. Seielstad (Caltech) R. Simon (Caltech) S. Unwin (Caltech)	Observations at 2.8 cm to monitor the superluminal sources 3C 29, 3C 273 and 3C 345 with telescopes B, C, F, H, K, O, and G.
U-9V	T. Pearson (Caltech) A. Readhead (Caltech) S. Unwin (Caltech)	Studies at 2.8 cm of the milli-arc-second structure of 0710+439 and 2021+614 with telescopes B, F, K, O, and G.
R-17V	W. Alef (MPI, Bonn) L. Matveyenko (IFSR, USSR) I. Pauliny-Toth (MPI, Bonn) E. Preuss (MPI, Bonn) J. Romney (MPI, Bonn) K. Kellermann	Studies at 2.8 cm of the structural evolution of 3C 84 with telescopes B, C, F, K, O, R, U, and G.
P-27V	H. Aller (Michigan) R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 2.8 cm to measure the apparent superluminal expansion of BL Lac with telescopes B, C, F, H, K, O, and G.
Z-IV	I. Pauliny-Toth (MPI, Bonn) R. Porcas (MPI, Bonn) A. Zensus (MPI, Bonn)	Observations at 2.8 cm of 3C 454.3 with telescopes B, F, H, K, O, and G.
L-13V	R. Linfield (Caltech) R. Simon (Caltech)	Observations at 91 cm of the compact structure of hot spots in nearby radio galaxies with telescopes F, H, I, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-25V	B. Burke (MIT) V. Dhawan (MIT) D. Roberts (Brandeis)	Observations at 50 cm to study the structures of high luminosity quasars with telescopes K, O, and G.
M-13V	D. Downes (IRAM, France) G. Garay (CFA) R. Genzel (CFA) A. Haschick (Haystack) J. Moran (CFA) M. Reid (CFA) B. Rönnäng (Chalmers) M. Schneps (CFA)	Observations at 22 GHz to determine distances by the measure of proper motions in H ₂ O maser sources with telescopes K, O, So, Yn, and G.

The following pulsar program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-149	P. Backus (NASA Ames) R. Burkhardt (Massachusetts) J. Taylor (Princeton) M. Damashek	Observations at 300-410 MHz to determine pulse arrival times of PSR 0655+64 and PSR 0820+02.

The following special monitoring program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
V-42	H. Lehto (Turku, Finland) P. Teerikorpi (Turku, Finland) M. Valtonen (Turku, Finland) W. Saslaw (Virginia)	Monitor at 4995 and 10500 MHz BL Lac objects for short term variations.

<u>300-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1983.50
Scheduled maintenance and equipment changes	124.25
Scheduled test and calibration	36.25
Time lost due to: equipment failure	14.25
power	12.00
weather	15.50
interference	5.50

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
K-279	C. Heiles (Calif., Berkeley) S. Kulkarni (Calif., Berkeley) J. Dickey J. van Gorkom	Measurements of neutral hydrogen emission toward approximately 83 sources located within a few degrees of the galactic plane.
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-257	G. Chincarini (Oklahoma) P. Fontanelli (Arcetri, Italy) R. Giovanelli (Arecibo) M. Haynes	Neutral hydrogen observations of galaxies in clusters and superclusters.
H-160	W. Huchtmeier (MPI, Bonn) O. Richter (MPI, Bonn)	Studies of the global parameters of galaxies and clusters of galaxies from neutral hydrogen observations.
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.

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-359	C. Bennett (MIT) B. Burke (MIT) J. Hewitt (MIT) C. Lawrence (MIT)	Survey at 6 cm of sources found at $0^{\circ} < \delta < 20^{\circ}$.
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 variable sources.
B-335	T. Balonek (Massachusetts) W. Dent (Massachusetts) W. Kinzel (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measurements of variable radio sources at 2695 MHz.

The following pulsar program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
T-166	P. Backus (NASA-Ames) R. Burkhardt (Massachusetts) J. Taylor (Princeton) M. Damashek	Preliminary observations in the range 340-410 MHz for an improved northern hemisphere pulsar survey.

<u>36-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1892.25
Scheduled maintenance and equipment changes	130.75
Scheduled test and calibration	113.00
Time not scheduled	24.00
Time lost due to: telescope	2.75
equipment	2.25
weather	303.00
interference	0.00

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
A-52	P. Ade (Queen Mary, UK) I. Nolt (Queen Mary, UK) J. Radostitz (Oregon) L. Caroff (NASA-Ames)	Observations of galactic and extragalactic sources.
A-60	M. Allen (Caltech) D. Muhleman (Caltech) R. Clancy (Caltech)	Search for sulfur and chlorine compounds in the Venusian atmosphere.
A-62	L. Avery (Herzberg) N. Broten (Herzberg) J. MacLeod (Herzberg)	Age and electron density of molecular clouds.
B-365	B. Ulich (Arizona) P. Boynton (Washington) R. Schommer (Chicago) S. Murray (CFA) S. Radford (Washington) R. Partridge (Haverford) A. Stark (Bell Labs)	Search for Sunyaev-Zel'dovich effect at 3 mm.
B-378	A. Barrett (MIT) T. Armstrong (MIT)	Study of Sgr A clouds in ^{13}CO , C^{18}O , and HNC O .
B-380	L. Blitz (Maryland) R. Mathieu (Calif., Berkeley)	Observations of Seyfert galaxies.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
C-199	F. Clark (Kentucky) T. Troland (Kentucky) D. Johnson (NBS)	Systematic study of SiO maser processes.
D-126	W. Dent (Massachusetts) T. Balonek (Massachusetts) R. Hobbs (NASA-Goddard)	The evolution of extragalactic radio sources at millimeter wavelengths.
J-102	D. Jaffe (Chicago) J. Keene (Chicago) R. Hildebrand (Chicago)	Measurement of physical properties of selected submillimeter continuum sources.
K-277	M. Kutner (Rensselaer) K. Mead (Rensselaer)	Observations of 2-mm formaldehyde lines in molecular clouds in the outer galaxy.
K-280	M. Kutner (Rensselaer) K. Mead (Rensselaer)	Further CO observations of clouds in the outer parts of the galaxy.
L-167	C. Leung (Rensselaer) M. Kutner (Rensselaer) K. Mead (Rensselaer)	Further studies of broad CO lines in T-Tauri stars.
L-168	C. Leung (Rensselaer) M. Kutner (Rensselaer) K. Mead (Rensselaer)	Study of the dynamical and evolutionary state of dark globules.
M-160	R. Martin (MPIFR, Bonn) E. Kreysa (Bologna, Italy)	Observations of thermal emission from small dark clouds.
M-188	H. Matthews (Herzberg) T. Sears (Herzberg) P. Bunker (Herzberg) A. McKellar (Herzberg) J. MacLeod (Herzberg) N. Broten (Herzberg) L. Avery (Herzberg) K. Evenson (NBS)	Search for methylene (CH ₂) in the ISM.
M-190	D. Muhleman (Caltech) R. Clancy (Caltech)	Search for J=1-1 line of CO in the Martian atmosphere.
P-124	G. Cavallo (Bologna, Italy) N. Mandolesi (Bologna, Italy) R. Partridge (Haverford)	Search for a new emission mechanism in clusters of galaxies.
P-126	R. Padman (Cambridge, UK) P. Scott (Cambridge, UK) A. Webster (Cambridge, UK)	Observations of CS in hot molecular cloud cores.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
R-191	L. Rodriguez (Mexico) J. Torrelles (Mexico) J. Marcaide (MIT)	Spectral-line search for high-velocity CO wings near peculiar nebulosities.
S-220	G. Sandell (Stockholm Obs.)	Observations of dark cloud condensations at 1 mm.
S241	S. Spangler W. Cotton	Multifrequency monitoring of low-frequency variables.
S247	M. Schenewerk (Illinois) J. Hollis (NASA-Goddard) L. Snyder (Illinois)	Determination of HCO abundances and intensities in selected galactic sources.
S248	P. Schwartz (NRL) H. Smith (NRL)	Search for broad SiO lines from CO outflow sources.
S249	P. Schwartz (NRL)	Observations of CS emission in a selection of galactic objectives.
S254	P. Schwartz (NRL)	CO observations of the interaction between a stellar wind and NGC 1333.
T157	S. Tereby (Calif., Berkeley) M. Fich (Calif., Berkeley) L. Blitz (Maryland)	Observation of the sizes, etc., of molecular clouds in the outer galaxy.
T167	P. Thaddeus (Inst. for Space Studies)	Confirmation of molecular line.
V40	S. Vogel (Calif., Berkeley) W. Welch (Calif., Berkeley)	High-velocity gas in K3-50.

THE VERY LARGE ARRAY

The quarter was scheduled 100 percent of the time.

	<u>Hours</u>
Astronomical observing	1578.25
Test	571.5

The average downtime was 6.39 percent.

The following research programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-129	B. Burke (MIT) D. Roberts (Brandeis) P. Greenfield (MIT)	Monitoring double QSO 0957+561. 6 cm.
AB-142	R. Brown K. Lo (Caltech) K. Johnston (NRL)	Structure of compact HII regions in Sgr A (West). 2 and 6 cm.
AB-152	P. Barthel (Leiden) G. Miley (Leiden) R. Schilizzi (Dwingeloo)	The angular size, redshift relation in quasars. 6 cm.
AB-153	J. Biegling (Calif., Berkeley) M. Cohen (NASA-Ames) P. Schwartz (NRL)	Radio emission from T Tauri stars. 2 and 6 cm.
AB-154	A. Baan (Penn State) A. Haschick (Haystack)	HI absorption structure of 3C 293. 21-cm line.
AB-155	J. Biegling (Calif., Berkeley) M. Cohen (Nasa-Ames) P. Schwartz (NRL)	Search for mass loss among T Tauri stars. 6 cm.
AB-157	F. Biraud (Meudon Obs.) J. Schneider (Meudon Obs.) T. Cornwell	Search for gravitationally lensed images of quasars. 2 and 6 cm.
AB-160	J. Biretta (Caltech) F. Owen P. Hardee (Alabama)	Structure of the jet in M87. 1.3 and 6 cm.
AB-163	B. Burke (MIT) J. van der Hulst (Minnesota) C. Bennett (MIT) C. Lawrence (MIT) J. Mahoney (Minnesota)	Interacting galaxy pair NGC 4038/9. 21-cm line.
AB-165	J. Burns (New Mexico) T. Balonek (New Mexico) C. McCallum (Sandia Labs)	Wide-angle tailed radio galaxy 1919+479. 6 and 20 cm.
AB-166	R. Brown	Search for line emission from 3C 245. 6 cm-line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-167	R. C. Bignell E. Seaquist	Monitoring the SNR in NGC 4449. 6 and 21 cm.
AB-168	R. C. Bignell E. Seaquist	SNR in NGC 4449. 2 cm.
AB-169	J. Bieging (Calif., Berkeley) R. Martin (MPI, Bonn) T. Pauls (Cologne) T. Wilson (MPI, Bonn)	Ammonia (1,1) absorption toward W3 (OH). 1.3 cm line.
AB-170	B. Burke (MIT) C. Lawrence (MIT) C. Bennett (MIT)	350 sources from the 5 GHz MIT 300-foot survey. 6 cm.
AB-173	E. Bozyan (Texas)	First ranked galaxies in faint groups. 20 cm.
AB-174	B. Burke (MIT) D. Roberts (Brandeis)	Search for radio radiation from a new gravitational lens candidate. 6 cm.
AC-38	T. Cornwell	QSO/galaxy association 4C 11.50/ 1548+115. 6 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 (Jagiellonski U.) M. Condon	Structures of intermediate-strength sources found at 1400 MHz. 20 cm.
AC-44	T. Cornwell R. Perley	Extended, steep spectrum, luminous radio sources with prominent, flat spectrum cores. 6 and 18 cm.
AC-46	B. Clark	Large-scale structure in super- luminal sources. 6 and 20 cm.
AC-47	P. Crane J. van Gorkom A. Haschick (Haystack) J. van der Hulst (Minnesota)	HI absorption in NGC 1275. 21-cm line.
AC-48	R. Crutcher (Illinois) Y. Chu (Illinois) J. Bieging (Calif., Berkeley)	OH absorption toward 3C 123. 18-cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AD-30	J. Dreher (MIT)	Class II double sources. 2 cm.
AD-59	M. de Robertis (Victoria U.)	Multiple image candidate quasars. 2 and 6 cm.
AD-60	I. de Pater (Arizona) D. Hunten (Arizona) B. Smith (Arizona) J. Dickel (Illinois) T. Owen (SUNY, Stony Brook)	Saturn. 1.3, 2 and 6 cm.
AD-61	L. Dressel (NASA-Goddard)	High-frequency spectrum of UGC 09114. 1.3 and 2 cm.
AD-64	H. Dickel (Illinois) A. Lubenow (Illinois) W. M. Goss (Groningen) A. Rots J. Forster (CSIRO)	H ₂ CO absorption toward W3(OH) and W58C. 6-cm line.
AD-65	T. de Jong (Colorado) F. Willems (Amsterdam) P. Bowers (NRL)	Position measurements of OH/IR stars. 18-cm line.
AD-66	J. Dickey C. Heiles (Calif., Berkeley)	21-cm Zeeman splitting measurement. 21-cm line.
AD-67	J. Dickey	HI absorption toward the nuclei of Seyfert and active spiral galaxies. 21-cm line.
AE-13	J. Eilek (NMIMT) F. Owen C. O'Dea J. Burns (New Mexico)	Wide-angle tail source 3C 465. 2, 6, and 20 cm.
AE-14	R. Ekers G. Bicknell (Mt. Stromlo) N. Killeen (Mt. Stromlo)	Southern jet radio galaxies. 2, 6, and 20 cm.
AF-40	E. Feigelson (MIT) E. Schreier (CFA) D. Harris (CFA)	Radio halo of M87. 6 and 20 cm.
AF-44	M. Felli (Arcetri) M. Massi (Arcetri)	Structure of the thermal unresolved source in M17. 1.3 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AF-46	E. Feigelson (MIT) G. Clark (MIT) J. Dreher (MIT)	Detailed study of Hercules A, 3C 348. 6 and 20 cm.
AF-47	E. Fomalont B. Geldzahler R. Hjellming C. Wade	Third epoch observations of Sco X-1. 6 and 20 cm.
AG-61	F. Ghigo (Minnesota) L. Rudnick (Minnesota) M. Ondrechen (Minnesota)	Quasars with faint jet-like optical structure. 6 cm.
AG-64	S. Gottesman (Florida) J. Ball (Florida) J. Hunter (Florida) J. Huntley (Bell Labs)	Neutral hydrogen in the barred spirals NGC 3092 and NGC 5291. 21-cm line.
AG-69	M. Gorenstein (MIT) N. Cohen (MIT) E. Falco (MIT) R. Schild (CFA)	New gravitational lens candidates. 6 cm.
AG-73	B. Geldzahler (NRL)	Radio sources near the compact radio source G127.61+0.54. 1.3, 2, 6 and 20 cm.
AG-77	M. Gorenstein (MIT)	Search for VLBI components ejected from SS433. 6 and 18 cm.
AG-81	S. Gottesman (Florida) T. Hawarden (Royal Obs.)	HI in galaxies NGC 1512/10 and NGC 5291. 21-cm line.
AG-82	J. Greenberg (Leiden) N. Brosch (Leiden)	Search for a very compact HII region in NGC 2264. 6 cm.
AG-84	W. M. Goss (Groningen) S. Pottasch (Groningen) R. Gaither (Groningen)	K 648 and four other stellar planetary nebulae. 6 cm.
AG-85	D. Garrett (Texas) J. Douglas (Texas)	Low radio frequency variables from the Texas survey. 6 and 21 cm.
AG-86	G. Garay (CFA) M. Reid (CFA) J. Moran (CFA)	Recombination lines from compact HII regions associated with OH masers. 18-cm line.
AH-59	P. Ho (Calif., Berkeley) R. Genzel (Calif., Berkeley)	Mass outflow in the W51-IRS2 region. 1.3 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AH-69	E. Hummel (New Mexico) J. van der Hulst (Minnesota)	NGC 1097. 6 and 20 cm.
AH-72	D. Hogg	Radio spectral index of radio emission from WR stars. 1.3, 2 and 6 cm.
AH-74	A. Haschick (Haystack) W. Baan (Penn State)	Structure and identification of continuum radio sources displaying HI absorption features. 2, 6, and 20 cm.
AH-75	P. Ho (Calif., Berkeley) A. Haschick (Haystack) J. van Gorkom	Recombination line studies of G10.6-0.4. 2 and 6 cm. line.
AH-79	E. Hummel (New Mexico) C. Kotanyi (Groningen) R. Laing	Elliptical galaxy NGC 4472. 6 and 20 cm.
AH-81	R. Hjellming R. Newell	α SCO radio binary. 2, 6, and 20 cm.
AH-82	R. Hjellming K. Johnston (NRL)	Mapping evolution of SS433 "cork-screws." 18, 20, and 22 cm.
AH-83	J. Herman (Leiden) H. Habing (Leiden) B. Baud (Groningen) A. Winnberg (Onsala)	OH/IR stars. 1612 MHz line.
AH-86	E. Hummel (New Mexico) J. van der Hulst (Minnesota) J. van Gorkom C. Kotanyi (Groningen) W. Golisch (New Mexico)	Central sources in interacting galaxies. 6 and 21 cm.
AH-87	E. Hummel (New Mexico) R. Davies (Jodrell Bank) A. Pedlar (Jodrell Bank) J. van der Hulst (Minnesota) W. Golisch (Minnesota)	Nuclei and disks of Sbc galaxies. 6 and 20 cm.
AH-90	A. Haschick (Haystack) W. Baan (Penn State) P. Crane	Detection and confirmation of HI absorption in 3C 268.4, 21-cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AJ-76	K. Johnston (NRL) E. Fomalont C. Wade	Astrometric positions of compact radio sources. 6 and 20 cm.
AJ-77	K. Johnston (NRL) P. Seidelmann (USNO) C. Wade	Pallas. 6 cm.
AK-47	S. Kwok (NRC) R. C. Bignell	Monitoring of AFGL 618. 1.3, 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-55	K. Kellermann P. Crane	3C 147. 1.3, 2, 6, 18, and 20 cm.
AK-56	K. Kellermann R. Ekers J. Ekers	Compact components of 3CR sources. 6 cm.
AK-57	N. Killeen (Mt. Stromlo) R. Ekers G. Bicknell (Mt. Stromlo)	Southern radio galaxy PKS 0131-36 (NGC 612). 6, 18, and 20 cm.
AK-58	P. Kronberg (Toronto) G. Swarup (Tata Inst.) E. Burbidge (Calif., La Jolla) V. Junkkarinnen (KPNO)	3C9 and 3C 280.1. 2 and 6 cm.
AK-60	S. Kwok (NRC) R. C. Bignell	HM Sagittae. 1.3, 2, 6, and 20 cm.
AK-61	C. Kotanyi (Groningen) E. Hummel (New Mexico) J. van Gorkom	Radio disks in Virgo cluster spirals. 6 and 20 cm.
AK-62	N. Killeen (Mt. Stromlo) R. Ekers	Low-luminosity radio galaxy PKS 0336-35. 6 and 20 cm.
AL-38	K. Long (Columbia) J. Dickel (Illinois) E. Greisen	Kepler's SNR. 6 and 20 cm.
AL-39	K. Lo (Caltech) W. Sargent (Caltech) K. Young (Caltech)	HI in four faint dwarf galaxies. 21-cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AL-42	H. Liszt R. Ekers J. van der Hulst (Minnesota) W. B. Burton (Leiden)	H ₂ CO absorption spectrum toward the point source in Sgr A (West). 6-cm line.
AL-43	R. Laing	Hot spots in luminous extragalactic radio sources. 1.3, 2, 6, 18, and 20 cm.
AM-39	L. Molnar (CFA) M. Reid (CFA) R. C. Bignell	Monitoring polarization of BL Lac objects. 2 and 6 cm.
AM-43	T. Maccacaro (CFA) I. Gioia (CFA) E. Feigelson (MIT) J. Kriss (MIT)	Faint extragalactic X-ray sources. 20 cm.
AM-47	T. Menon (British Columbia) H. Richer (British Columbia)	Search for an HI shell around a carbon star. 21-cm line.
AN-11	R. Newell R. Hjellming	High-resolution maps of thermal stellar sources. 1.3 and 2 cm.
AO-16	C. O'Dea F. Owen J. Burns (New Mexico)	NGC 1265. 20 cm.
AO-25	M. Ondrechen (Minnesota) J. van der Hulst (Minnesota)	HI in the spiral galaxy M83 - NGC 5236. 21-cm line.
AO-29	F. Owen J. Puschell (Calif., San Diego)	Central component of 3C 61.1. 1.3 and 6 cm.
AO-30	F. Owen J. Condon L. Ledden (VPI & SU)	"Weak" flat spectrum objects. 2, 6, and 21 cm
AO-31	C. O'Dea F. Owen	Narrow angle tailed radio sources. 20 cm.
AO-32	F. Owen R. Laing J. Puschell	Radio cores in distant 3C 12 radio galaxies. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AP-46	R. Perley A. Bridle (Queen's) B. Clark R. Ekers J. Burns (New Mexico) G. Greuff (Bologna) J. Douglas (Texas)	A large, unbiased source sample from the B3 survey. 20 cm.
AP-50	M. Phillips (Anglo-Aust. Obs.) A. Turtle (Sydney)	Nuclei of nearby Seyfert 2 galaxies. 2, 6 and 20 cm.
AP-52	P. Palmer (Chicago) J. van Gorkom C. Townes (Calif., Berkeley) S. Subramanian (Calif., Berkeley) D. Matsakis (USNO) A. Hjalmarson (Onsala) A. Cheung (Calif., Berkeley)	DR 21-OH. 1.3, 2, 6, and 18 cm.
AP-53	R. Perley R. Ekers	Superluminal motion in 3C 273? 1.3, 2, and 6 cm.
AP-54	R. M. Price (New Mexico)	Serendipitous X-ray objects. 6 and 20 cm.
AR-47	D. Roberts (Brandeis) J. Wardle (Brandeis)	Low redshift quasars in clusters and groups. 20 cm.
AR-55	L. Rodriguez (Mexico) J. Moran (CFA) D. Backer (Calif., Berkeley)	NGC 6334 (B): galactic or extra-galactic? 20-cm line.
AR-57	W. Reich (MPI, Bonn) P. Kronberg (Toronto)	3C 273 "satellite source." 6 and 20 cm.
AR-59	A. Rots J. van der Hulst (Minnesota) J. Pedelty (Minnesota)	Suspected SNR in NGC 4395. 6 cm.
AR-60	L. Rudnick (Minnesota) W. Stein (Minnesota) M. Sitko (Minnesota)	The nature of low radio luminosity QSO's. 2, 6, and 20 cm.
AR-61	L. Rudnick (Minnesota) J. Burns (New Mexico) B. Hine (Minnesota) B. Edgar (Minnesota)	3C 129. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AR-62	L. Rudnick (Minnesota) D. Stannard (Manchester) W. Stein (Minnesota) M. Sitko (Minnesota)	BL Lac objects without dominant cores. 2, 6, and 20 cm.
AR-63	L. Rudnick (Minnesota) B. Edgar (Minnesota)	Pieces of jets. 2, 6, and 20 cm.
AS-79	S. Spangler W. Cotton	Monitoring of low-frequency variables. 1.3, 2, 6, and 20 cm.
AS-80	R. Sramek J. van der Hulst (Minnesota) K. Weiler (NSF)	Supernovae: SN1980 in NGC 6946 and SN1979c in M100. 2, 6, and 20 cm.
AS-98	I. Shapiro (MIT) N. Cohen (MIT) E. Falco (MIT) M. Gorenstein (MIT)	Clusters of quasi-stellar objects near M82. 6 cm.
AS-104	E. Skillman (Washington) B. Balick (Washington)	Neutral hydrogen in Irr I galaxies. 21-cm line.
AS-110	E. Seaquist L. Davis (Toronto)	Emission line object Vy 2-2. 2, 6, and 20 continuum and 18-cm line.
AS-112	E. Seaquist	Radio survey of symbiotic stars. 6 cm.
AS-113	E. Seaquist M. Bell (NRC) R. C. Bignell	Stimulated recombination lines in N82 and NGC 253. 6 and 21 cm.
AS-114	A. Stockton (Hawaii) J. Mackenty (Hawaii)	Radio studies of optical structure near QSOs. 6 and 20 cm.
AS-115	M. Simon (SUNY, Stony Brook) M. Felli (Arcetri) J. Fischer (Maryland)	Protostellar source M8E. 6 cm.
AS-116	M. Shapiro (NRL) K. Johnston (NRL) R. Ekers R. Sancisi (Groningen)	Search for radio lobes in edge-on spiral galaxies. 6 and 20 cm.
AS-118	J. Spencer (NRL) P. Bowers (NRL) K. Johnston (NRL)	H ₂ O masers in four Mira variables. 1.3 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AS-119	J. Spencer (NRL) P. Bowers (NRL) K. Johnston (NRL)	H ₂ O masers associated with the peculiar stars RX Boo and W Hyra. 1.3-cm line.
AS-121	P. Schwartz (NRL) B. Geldzahler (NRL) J. Heckathorn (CSC) H. Heckathorn (NRL)	Emission line object 0259+64. 6 and 20 cm.
AT-18	H. Tabara (Utsunomiya U.) M. Inoue (Tokyo Ast. Obs.) M. Ishiguro (Tokyo Ast. Obs.)	Blue stellar objects embedded in two cD galaxies. 6 cm.
AT-22	C. Townes (Calif., Berkeley) D. Matsakis (USNO) P. Palmer (Chicago) A. Harris (Calif., Berkeley)	NH ₃ in small clouds discovered north of the KL nebula in Orion. 1.3-cm line.
AT-23	B. Turner T. Bania (Boston) L. Rickard (Howard)	OH absorption in late-type spiral galaxies. 18-cm line.
AT-24	B. Turner H. Matthews (NRC) S. Kwok (NRC) A. Winnberg (Onsala)	Central cavities in ultracompact HII regions. 2 cm.
AU-9	M. Ulmer (Northwestern) R. Hanisch (Maryland)	Survey of binary, trinary X-ray emitting rich clusters of galaxies. 20 cm.
AU-11	J. Ulvestad A. Wilson (Maryland)	Distance-limited sample of Seyfert/emission line galaxies. 6 and 20 cm.
AV-52	J. van der Hulst (Minnesota) R. Sramek K. Weiler (NSF)	Monitoring of extragalactic supernovae: the next four. 2, 6, and 20 cm.
AV-56	J. van Gorkom B. Geldzahler	The compact radio source in the center of the SNR G127.1+0.5. 2, 6, and 20 cm.
AV-57	W. van Breugel (KPNO) H. Butcher (KPNO) T. Heckman G. Miley (Leiden)	Radio galaxies with optical emission lines in the lobes. 6 and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AV-58	J. van der Hulst (Minnesota) A. Haschick (Haystack) A. Tubbs J. van Gorkom	HI emission from Centaurus A. 20-cm line.
AV-61	J. van Gorkom U. Schwarz (Groningen) J. Bregman (Groningen)	Recombination lines in the galactic center. 2-cm line.
AV-65	W. van Breugel (KPNO) G. Miley (Leiden) E. Fomalont T. Heckman (Arizona) H. Butcher (KPNO)	Fine structure in 3C 310. 6 and 20 cm.
AV-67	J. van der Hulst (Minnesota) M. Ondrechen (Minnesota)	Kinematics of the barred spiral NGC 1365. 21-cm line.
AV-68	J. Vallee (NRC) R. C. Bignell	Gum nebula. 2, 6, and 20 cm.
AV-69	W. van Breugel (KPNO) G. Miley (Leiden) T. Heckman (Maryland)	Steep spectrum cores. 2, 6, and 20 cm.
AV-70	J. van Gorkom R. Ekers G. Shostak (Groningen) C. Kotanyi (Groningen) T. Cornwell	HI absorption in radio galaxies. 21-cm line.
AW-57	A. Wilson (Maryland) J. Ulvestad	Seyfert galaxies: detailed mapping and a search for jets. 2, 6, and 20 cm
AW-59	D. Weedman (Penn State) R. Sramek	Starburst objects. 6 and 20 cm.
AW-60	R. White (NASA-Goddard) J. Burns (New Mexico) F. Owen	Survey of high galaxy density poor clusters. 20 cm.
AW-64	C. Wade	Radio emission of Beta Lyrae. 1.3, 2, and 6 cm.
AW-65	L. Weliachew (IRAM) E. Fomalont E. Greisen	OH maser sources in the galaxy M82. 18-cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AW-67	J. Wardle (Brandeis) D. Roberts (Brandeis) R. Potash (Brandeis)	Search for very high luminosity jets. 6 and 21 cm.
AW-69	R. White (UCLA) R. Becker (VPI & SU)	Spatial resolution of the stellar winds of early-type stars. 6, 18, and 20 cm.

ENGINEERING DIVISION

The 12-m project had top priority this quarter. The reference jig was received, the measuring template was finished, and measuring equipment and procedures were checked and improved. Preparation for receiving, assembling, and adding to the back-up structure in Green Bank were completed. Fabrication and assembly of the back-up structure by the fabrication contractor was monitored. The completed back-up structure is scheduled for shipment to Green Bank in mid-April. Design, detail drawings, and ordering of materials for the mirror selection system proceeded.

The interferometer addition project continued on schedule. The site was cleared, graded and an access road constructed. A purchase order was issued to cover the installation of a fence around the site. Design data and drawings for the antenna were reviewed and approved. Ordering of materials and fabrication was started for the antenna. Drawings and specifications for the foundations were completed and submitted to prospective contractors for proposals.

ELECTRONICS DIVISION

Charlottesville

An improved 115 GHz mixer has been completed for use at the 36-foot telescope; a SSB receiver noise temperature under 200 K is expected, compared with the present 450 K.

Two 15 GHz GASFET amplifiers have been completed and installed on a VLA antenna. The amplifier noise temperature is 50 K and the system temperature is ≤ 120 K, compared with the present value of 300 to 350 K, respectively. Further work to extend the amplifier bandwidth to cover 14.5 GHz without degradation has not been successful and specifications for production of 60 amplifiers allow for 34% higher system noise temperature than in the 14.9-15.4 GHz band. An additional fifteen 1.5 GHz amplifiers have been completed this quarter.

Work continues on testing of superconducting tunnel junctions for millimeter wave use. A large-scale model of the junction mount has revealed some impedance matching problems.

The investigation of the use of video tape recorders for recording VLBI data at a 16 mb/s rate continues. Much time has been spent preparing technical sections of a proposal for the VLBA array.

Green Bank

The 6/25-cm receiver has been modified. Upconverters in the 25-cm section have been replaced with FET's. A noise-adding capability has been added to both the 6 and 25-cm sections.

Specifications for the second version of the digital standard receiver (DSR) have been finalized. This version will incorporate some subtle improvements which were shown to be desirable by experience. These improvements will be incorporated into the existing DSR as well. Software for a great variety of observing modes has been written and is now being documented.

Various approaches to a holographic telescope measuring system have been studied, and the required receiver performance has been specified.

All filter boards for the two 256 channel, 2 MHz per channel filter banks have been received from the assembler. Tuning and testing of the filters is in progress. One bank will be delivered to Tucson in May; the second in early summer.

Orders or RFQ's are out for most components of the microwave link for the additional baseline to the interferometer. Also, the detailed design of the interferometer inductosyn interface is complete; the first interface is also almost complete. A water vapor radiometer, provided by the Navy, has been installed at the existing interferometer 45-foot site and has been interfaced into the data link.

Drawings for a broadband orthomode transition (OMT), designed by ERA under contract with NRAO, have been received. They are being scaled for use from 1.3 to 1.7 GHz. A dewar, into which the OMT will be integrated, and a thermal transition are being designed.

Offset feeds for the 6-cm receiver have been designed. These will be used to map the position of the focus for various declinations for the 300-foot telescope.

A spoiler for the 300-foot telescope to attenuate standing waves between the focus and surface has been designed and is in the shop under construction.

The retrofit of the 4-feed 21-cm receiver with room-temperature FET's is in progress and should be complete early in the third quarter.

The commercial delay-line power supplies in the 5-25 GHz upconverter-maser receiver have had somewhat mediocre reliability records and are suspected of intermittently adding noise to the system. An

in-house design is underway to replace these. Construction and testing of the second channel of this receiver is continuing.

A 3.3 GHz to 22 GHz upconverter has been successfully tested through a few thermal cycles. Good performance data is not available yet, however.

Several internal reports and technical notes were published during the quarter.

Maintenance and support were provided at the telescopes and lab. Additionally, support was provided to the 12-m project and VLBA proposal.

Tucson

During this quarter work has progressed on the electronics for the 12-m telescope. A dual-polarization diplexer for the new receivers has been tested, both as a diplexer and an image terminator, and the performance is as it should be. A room temperature, 230 GHz receiver has been built that will enable the new surface to be evaluated both at the prime focus and the Cassegrain focus. Work has started on a new 70-120 GHz receiver that should give improved performance over our existing receiver.

Socorro

At the VLA the new 21-cm and 2-cm cooled GASFET amplifiers were installed on antennas and successfully tested. Testing continued on insulating the antenna structure to cure the thermal pointing problem. It is hoped to make the decision to insulate all antennas, starting in the second quarter 1982.

COMPUTER DIVISION

VLBI Processing

On-line record averaging is now available for three-station continuum, two-station continuum, and two-station spectral-line processing. In spectral-line processing, the Fourier transformed records are averaged.

Work is in progress to automatically compute system temperatures utilizing the noise tube calibration at the observing sites.

VLBI Fringe Fitting

Current VLBI fringe-fitting techniques have several defects. (1) There is no constraint of closure of delay and rate which for weak sources will corrupt the phase closure, and (2) data on weak baselines may not be usable even though all antenna delays and rates are known. In order to correct these problems, we have an AIPS task which takes the result of a normal fringe fit and computes antenna-based delays and rates. This information is then put back into the fringe-fitting routine and used

to constrain the results. This allows use of data which previously were too weak, and forces delay and rate closure.

We have another AIPS task nearly debugged which uses all data available to determine antenna-based delays and rates which should considerably increase the sensitivity and convenience of this process. This new routing also allows removing the effects of source structure.

Digital Communications System

We are installing multiplexers in Charlottesville, Green Bank, the VLA site, and Socorro to make better use of the existing voice communications telephone line. This equipment will essentially connect certain of the computers and terminals between sites. For example, a person at one site will be able to log-on to a computer at one of the other sites.

AIPS

Program development for the Astronomical Image Processing System (AIPS) is continuing. The most recent additions are (1) a self-calibration program for spectral-line data; (2) spectral-line software dealing with data cubes; and (3) better u-v data display. The system has been transported to ten VAX systems which are now reducing VLA data.

In AIPS a companion program to ASCAL is now available for self-calibration of spectral-line VLA data. After using ASCAL to self-cal the continuum channels, the new task, ASCOR, is used to correct the data on the line channels by interpolating the continuum channel solutions.

IBM

A computer-algebra system, the REDUCE 2 package, has been installed on the IBM. This package was developed at the University of Utah and the Rand Corporation. The Cambridge University analytic integration program is also included. The system can perform symbolic operations such as analytic differentiation, indefinite integration, calculation of series expansions, reversion of series, simplification of algebraic expressions, and vector, matrix, and tensor manipulation.

PERSONNEL

Rehires

Alan H. Bridle	Visiting Scientist	01/11/82
Robert H. Sanders	Visiting Scientist	01/28/82
Jerzy Machalski	Visiting Scientist	03/11/82

Terminations

Renzo Sancisi	Visiting Scientist	01/28/82
Henry Richards	Electronics Engineer I	01/22/82
Woon-yin Wong	Structural Engineer I	02/23/82
Manuel P. Sierra	Visiting Engineer	02/26/82

Return from Leave of Absence

Harvey S. Liszt	Scientist	01/04/82
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