

VS 7 CIRCULAR

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

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

January 1, 1981 - March 31, 1981

APR 20 1981

RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1932.75
Scheduled maintenance and equipment changes	211.25
Scheduled tests and calibration	0.00
Time lost due to: equipment failure	43.00
power	0.00
weather	49.25
interference	4.00

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
I-1	P. Friberg (Chalmers) A. Hjalmarson (Chalmers) W. Irvine (Chalmers) M. Guelin (Observatoire de Paris)	Search at 19.0 GHz for the N=2→1 transition of C ₄ H, and at 19.8 GHz for the N=2→1 transition of C ₃ N in dark clouds.
M-168	P. Myers (MIT) P. Benson (MIT) D. Murphy (MIT)	Observations of the (J,K)=(1,1) and (2,2) rotation inversion lines of NH ₃ at 23.69 and 23.72 GHz, and the J=9→8 transition of HC ₅ N at 23.96 GHz.
B-367	R. Brown	Search for the 327 MHz hyperfine transition of deuterium.
B-311	P. Bowers (NRL)	Studies of 18-cm OH emission from unidentified Type II OH/IR stars.
W-154	R. Willson (Tufts)	Search for the 17-cm hyperfine transition of neutral sodium in dense clouds.
J-90	P. Jackson (Maryland) E. Dahlstrom (Maryland) I. Mirabel (Puerto Rico)	Observations of galactic hydrogen in front of normal galaxies having well determined colors (B-V).
R-174	L. Rickard (Howard)	Search at 1406.2 MHz for C ⁺ 265 α emission.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
D-117	J. Benson J. Dickey	Interferometric observations between the 300-ft and 140-ft of 21-cm hydrogen absorption toward extra-galactic continuum sources.
T-143	T. Thuan (Virginia) D. Crocker (Virginia)	Measurements of the 21-cm hydrogen content of blue compact dwarf galaxies.
L-150	B. Ganzel (Minnesota) J. Lockman	Mapping of 21-cm hydrogen in the Mon OB1 and OB2 associations.
F-79	K. Fox (Tennessee) D. Jennings (NASA, Goddard)	Observations to confirm the detection of interstellar CH ₄ by the measurement of transitions near 19 GHz.
M-169	A. Winnberg (MPIR) F. Olzon (Leiden) H. Matthews (NRC, Canada) B. Baud (Calif., Berkeley) A. Sargent (Caltech)	Survey at 22 GHz for H ₂ O sources over a part of the galactic plane.
S-233	L. Buxton (Illinois) E. Campbell (Illinois) W. Flygare (Illinois) P. Jewell (Illinois) L. Snyder (Illinois)	Observations at 20.9 and 24.4 GHz to search for the HCN dimer (HCN) ₂ .
B-347	R. Brown	Observations at 1.3-cm to measure H and He recombination lines in 28 of the brightest Galactic HII regions.
S-237	F. Schloerb (Massachusetts) R. Snell (Massachusetts) J. Young (Massachusetts) W. Langer (Princeton)	Search at 22.88 GHz for the J=9→8 transition of DC ₅ N in the TMC 1 interstellar cloud.
B-351	B. Balick (Washington) E. Wollman (Bates College)	Observations at 22 GHz of the H66α recombination line.

The following continuum program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
W-159	D. Wilkinson (Princeton) J. Uson (Princeton)	Search at 1.3-cm for small scale anisotropies in the cosmic microwave background.

The following pulsar program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-149	P. Backus (Massachusetts) R. Burkhardt (Massachusetts) J. Taylor (Massachusetts) M. Damashek	Observations at 390 MHz to determine pulse arrival times of PSR 0655+64 and PSR 0820+02.

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

A - Arecibo 1000-ft	J25 - Jodrell Bank 25-m
B - Effelsburg 100-m	J76 - Jodrell Bank 76-m
C - Algonquin 150-ft	Km - Haystack 120-ft
Ds - Madrid 210-ft	N - Maryland Point 85-ft
Dm - Goldstone 210-ft	O - Owens Valley 130-ft
E - South Africa 26-m	R - Crimea 22-m
F - Fort Davis 85-ft	So - Onsala 26-m
G - Green Bank 140-ft	Wd - Dwingeloo 25-m
H - Hat Creek 85-ft	Y - Socorro 25-m
I - Iowa 60-ft	

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
S-14V	P. Wilkinson (Manchester) C. Bennett (MIT) B. Burke (MIT) R. Mutel (Iowa) A. Moffet (Caltech) A. Readhead (Caltech) R. Simon (Caltech)	Observations at 329 MHz of 5 quasars, a part of a mapping program of radio sources over a wide range of frequencies with telescopes F, H, I, J76, K, O, and G.
B-372	C. Bennett (MIT) B. Burke (MIT) A. Garcia (MIT) C. Lawrence (MIT)	Observations at 610 MHz of the quasar 0957+561 with telescopes Km, O, and G.
M-16V	J. Broderick (VPI & SU) A. Marscher (Calif., San Diego)	Observations at 2.8-cm of selected X-ray quasars with telescopes B, F, Km, O, and G.
C-22V	M. Cohen (Caltech) R. Linfield (Caltech) T. Pearson (Caltech) A. Readhead (Caltech)	Observations at 2.8-cm of superluminal radio sources with telescopes F, H, Km, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
	G. Seielstad (Caltech) R. Simon (Caltech) S. Unwin (Caltech)	C-22V, continued
K-9V	I. Pauliny-Toth (MPIR) E. Preuss (MPIR) J. Romney (MPIR) K. Kellermann	Observations at 2.8-cm of the nucleus of NGC 1275 with telescopes B, F, Km, O, and G.
W-10V	G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson R. Walker	Observations at 2.8-cm of superluminal motions in 3C120 with telescopes B, C, F, Km, O, Y, and G.
F-4V	M. Claussen (Iowa) J. Fix (Iowa) R. Mutel (Iowa) J. Benson	Mapping of 1665 and 1667 MHz OH emission from stellar sources with telescopes F, I, O, Y, and G.
M-12V	J. Marcaide (MIT) I. Shapiro (MIT)	Observations at 18-cm of the double quasar 1038+528 with telescopes B, F, Km, O, So, and G.
H-1V	M. Gorenstein (MIT) R. Hohlfield (MIT)	Observations at 18-cm of SS443 with telescopes F, Km, O, and G.
J-11V	B. Geldzahler (MIT) K. Johnston (NRL) J. Spencer (NRL) D. Kjer (Pennsylvania) E. Fomalont J. Puschell	Measurements at 18-cm of the polarized radio emission from 0735+178 and 3C286 with telescopes B, F, H, Km, N, O, Y, and G.
C-18V	L. Baath (Chalmers) N. Cohen (Cornell) B. Geldzahler (MIT) M. Gorenstein (MIT) J. Marcaide (MIT) J. Burns (New Mexico)	Small scale structure measurements at 18-cm of NGC 1265, IC310, and 1159+583 with telescopes B, Km, O, So, and G.
C-23V	L. Baath (Chalmers) J. Romney (MPIR) B. Geldzahler (MIT) K. Johnston (NRL) W. Cotton F. Owen	Observations at 18-cm of the "optically quiet QSO" 2147+147 with telescopes B, Wd, J25, So, F, Km, N, O, Y, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-17V	L. Baath (Chalmers) B. Ronnang (Chalmers) G. Nicholson (CSIR, Johannesburg) E. Preuss (MPIR) L. Kogan (Inst. for Space Res., USSR) V. Kostenko (Inst. for Space Res., USSR) L. Matveyenko (Inst. for Space Res., USSR)	Observations at 18-cm of 3C84 and 3C345 with telescopes B, E, J25, R, So, F, O, and G.
P-122	I. Pauliny-Toth (MPIR) R. Porcas (MPIR)	Mapping at 18-cm of 3C216 with telescopes B, J76, So, Wd, and G.
F-81	R. Booth (Manchester) J. Forster (NFRA) W. Goss (Leiden) R. Graham (MPIR)	Observations at 18-cm of the spatial structure of the OH maser in NGC 7538 with telescopes B, J76, So, Wd, and G.
S-238	R. Mutel (Iowa) S. Spangler (Iowa)	Observations at 18-cm of the angular broadening of extragalactic radio sources at low galactic latitudes with telescopes I and G.
K-256	S. Kent (Iowa) R. Mutel (Iowa)	Measurements at 18-cm to determine the relative positions of OH masers with telescopes I and G.
W-140	F. Briggs (Pittsburgh) A. Wolfe (Pittsburgh)	Observations at 430 MHz of quasars that are candidates for redshifted 21-cm hydrogen absorption with telescopes A and G.
G-251	R. Porcas (MPIR) N. Cohen (Cornell) B. Corey (CFA) R. Preston (JPL) E. Falco (MIT) M. Gorenstein (MIT) J. Marcaide (MIT) I. Shapiro (MIT)	Studies of the double quasar 0957+561 and a search for variability and superluminal effects in the quasar pair 1038+528A, B at 2.3 and 8.1 GHz with telescopes B, Ds, Dm, So, O, and G.
B-374	D. Graham (MPIR) J. Romney (MPIR) R. Preston (JPL) N. Bartel (MIT) C. Counselman (MIT) J. Marcaide (MIT)	Observations at 2.3 and 8.1 GHz to accurately measure the positions of pulsars at several epochs with telescopes B, Dm, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
	I. Shapiro (MIT)	B374 continued
	C. Knight (Phoenix Corp.)	
	N. Vandenberg (Phoenix Corp.)	
M-13V	B. Ronnang (Chalmers)	Observations at 22 GHz to determine
	D. Downes (IRAM, France)	distances by the measure of proper
	G. Garay (CFA)	motions in H ₂ O maser sources with
	R. Genzel (CFA)	telescopes B, So, R, Km, O, Y, and G.
	A. Haschick (CFA)	
	J. Moran (CFA)	
	M. Reid (CFA)	
	M. Schneps (CFA)	

<u>300-foot Telescope</u>	<u>Hours</u>
Scheduled observing	2005.50
Scheduled maintenance and equipment changes	123.00
Scheduled test and calibration	15.50
Time lost due to: equipment failure	48.50
power	0.00
weather	3.75
interference	0.00

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-348	K. Mitchell (Penn State)	Search between 1000 and 1420 MHz for
	R. Brown	redshifted 21-cm absorption toward
		bright quasars.
L-150	B. Ganzel (Rice)	High angular resolution measurements of
	J. Lockman	neutral hydrogen in areas of special
		interest in the Mon OB1 and OB2
		associations.
H-160	W. Huchtmeier (MPIR)	Studies of the global parameters of
	O. Richter (MPIR)	galaxies and clusters of galaxies from
		neutral hydrogen observations.
H-153	B. Burke (MIT)	Observations to confirm possible 21-cm
	A. Haschick (CFA)	hydrogen absorption features in quasar/
	P. Crane	galaxy pairs.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
D-117	J. Benson J. Dickey	Interferometric observations between the 140-ft and 300-ft of 21-cm hydrogen absorption toward extragalactic continuum sources.

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
K-227	G. Kojoian (Wisconsin) D. Dickinson (JPL)	Survey at 6-cm of approximately 600 galaxies having high surface brightness.
P-117	C. Purton (York U.) S. Blackwell (York U.)	Search at 6-cm for emission from stellar planetary nebulae.
G-247	D. Gibson (NMIMT) P. Fischer (NMIMT) D. Helfand (NMIMT)	Survey at 6-cm of X-ray stars.
B-359	B. Burke (MIT) C. Bennett (MIT) C. Lawrence (MIT)	Measurements of the 6-cm fluxes of sources in the 611 MHz Arecibo Survey.
B-335	T. Balonek (Massachusetts) W. Dent (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measurements of variable radio sources at 2695 MHz.
B-339	J. Broderick (VPI & SU) B. Dennison (VPI & SU) J. Ledden (VPI & SU) S. O'Dell (VPI & SU) J. Condon	Observations at 900 and 1400 MHz of low frequency variables.
C-195	J. Armstrong (JPL) V. Boriakoff (Cornell) J. Cordes (Cornell) J. Weisberg (Massachusetts) J. Dickey	Interstellar scintillation measurements over the range of 350-400 MHz and at 890 MHz of a large sample of pulsars.

The following pulsar programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-150	J. Taylor (Massachusetts) P. Backus (Massachusetts) M. Damashek	Observations at 610 MHz to determine accurate periods, period derivatives and positions of newly discovered pulsars, and to extend these measurements to known pulsars.
C-193	V. Boriakoff (Cornell) J. Cordes (Cornell) J. Rankin (Cornell) D. Stinebring (Cornell) J. Weisberg (Massachusetts)	Pulsar polarization studies over the range of 350-410 MHz simultaneous with observations conducted at Arecibo at 1420 and 1667 MHz.
<u>36-foot Telescope</u>		<u>Hours</u>
Scheduled observing		1708.25
Scheduled maintenance and equipment changes		104.25
Scheduled tests and calibration		334.50
Time not scheduled		24.00
Time lost due to: telescope		12.00
equipment		19.75
weather		241.75
interference		0.00
<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-363	W. B. Burton (Minnesota) H. Liszt	Search for CO counterparts to COS-B gamma-ray sources.
B-370	F. Bash (Texas) L. Munday (Texas) R. Leverault (Texas) D. Leisawitz (Texas)	Observations of CO velocity structure in M81.
B-376	W. B. Burton (Minnesota)	Study of carbon monoxide.
D-114	W. Dent (Massachusetts) R. Hobbs (NASA-Goddard)	Evolution of extragalactic radio sources at millimeter wavelengths.
D-118	D. Dickenson (JPL) T. Kuiper (JPL)	Physical characteristics of dark clouds measured by methyacetylene.
D-122	D. Dickenson (JPL) T. Kuiper (JPL)	Search for water and silicon monoxide in variable stars.
E-37	B. Elmegreen (Columbia) D. Elmegreen (Mt. Wilson)	Maps of CO emission from barred spiral galaxies.
E-39	N. Evans (Texas) L. Munday (Texas) M. Scholtes (Texas) M. Kutner (Rensselaer)	Determination of ortho/para ratio of formaldehyde in dark clouds.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
G-250	B. Geldzahler (MPIR) H. Kuhr (MPIR)	Observations of NRAO-MPI sources at 9 millimeters.
G-246	M. Gordon	Beam switched maps at 2 millimeters.
G-249	M. Gordon E. Epstein (Aerospace) J. Heidmann (Observatory de Paris)	Search for CO emission from clumpy irregular galaxies.
H-162	P. Huggins (SUNY)	Kinematic study of small neutral clouds in HII regions.
H-163	P. Huggins (SUNY)	Observations of kinematics of the envelope of IRC +10216
K-268	M. Kutner (Rensselaer) D. Machnik (Rensselaer) N. Evans (Texas)	Study of 2 millimeter methanol lines.
K-269	M. Kutner (Rensselaer) D. Machnik (Rensselaer) N. Evans (Texas)	Observations of DCO+ as a test of fractionation theories.
K-270	M. Kutner (Rensselaer) D. Machnik (Rensselaer)	CO studies of star formation in Canis Majoris.
K-271	M. Kutner (Rensselaer) D. Machnik (Rensselaer)	Observations of 2 mm formaldehyde lines in reflection nebulae.
L-161	C. Lada (Arizona)	Study of high velocity gas towards broad wing CO sources.
L-160	R. Levreault (Texas) N. Evans (Texas)	Study of optically thin CO lines towards pre ms objects.
M-170	P. Myers (MIT)	Investigation of blue shifted lines in dark clouds.
R-178	L. Rickard (Howard) P. Palmer (Chicago)	Continued studies of CO in galaxies.
R-176	L. Rodriquez (Mexico) J. Canto (Mexico) P. Ho (Calif., Berkeley) M. Schneps (CFA)	Observations of cometary nebulae in CO emission.
R-177	L. Rodriquez (Mexico) J. Canto (Mexico) N. Calvet (Calif., Berkeley)	CO observations of molecular clouds containing T-Tauri stars.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
S-236	D. Sanders (SUNY) J. Barrett (SUNY) P. Solomon (SUNY)	A CO map of the disk of M101
S-232	L. Snyder (Illinois) J. Hollis (NASA-Goddard) D. Blake (Illinois)	Study of HNO and HCO for examination of gas-phase chemistry.
T-153	P. Thaddeus (Inst. for Space Studies)	Confirmation of the detection of C ₃ H in IRC +10216.
T-151	H. Thronson (Arizona) C. Lada (Arizona)	Study of CO emission from nebulae studies in the IR and optical.
T-152	H. Thronson (Arizona) C. Lada (Arizona)	Study of CO emission from optical infrared nebula.
W-158	B. Wilking (Arizona) C. Lada (Arizona)	Study of molecular hydrogen in Rho Ophiuchos.
X-1	D-L. Xiang (Purple Mountain) H. Liszt W. B. Burton (Minnesota)	CO map of the galactic center.

<u>Very Large Array</u>	<u>Hours</u>
Scheduled astronomical observing	856.25
Scheduled tests and calibration	407.25
Unscheduled time	896.5

Approximately 7.73 percent of the observing time was lost to instrumental, weather and power problems.

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

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AA-9	P. Angerhofer (USNO) B. Balick (Washington) D. Milne (CSIRO) R. Perley	Cas A and Tycho supernova remnants. 20 cm.
AB-89	B. Burke (MIT) D. Roberts (MIT) P. Greenfield (MIT)	Search for variations in the double quasar 0957+561. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-91/ AS-60	J. Bieging (Calif., Berkeley) M. Cohen (NASA/Ames) P. Schwartz (NRL)	T Tauri stars. 6 cm.
AB-96	B. Burke (MIT) D. Roberts (MIT) E. Turner (Princeton) J. Gott (Princeton)	Search for gravitationally lensed quasars. 6 cm.
AB-98	B. Burke (MIT) D. Roberts (MIT) P. Greenfield (MIT)	Search for radio emission from triple quasar 1115+08. 6 cm.
AB-106	R. Brown K. Johnston (NRL) K. Lo (Caltech) E. Wollman (Bates College)	Observations of the Galactic Center. 1.3 and 2 cm.
AB-109	B. Burke (MIT) C. Canizares (MIT) G. Kriss (MIT) P. Winkler (MIT)	Supernova remnant G27.4+0.0. 20 cm.
AB-113	A. Bridle (New Mexico/NRAO) R. Perley R. Henriksen (Inst. Plasma Res.)	Collimation and polarization of high-luminosity radio jet in 3C 219. 6 cm.
AB-114	A. Bridle (New Mexico/NRAO) E. Fomalont J. Palimaka (Queens) R. Perley	Jet source 3C 341. 20 cm.
AB-116	J. Bally (Bell Labs) C. R. Predmore (Massachusetts)	IR sources, biconical and compact HII regions. 6 cm.
AB-117	D. Backer (Calif., Berkeley) R. Sramek	Proper motion of compact source in Sgr A. 6 cm.
AC-26	W. Cotton S. Spangler (Iowa)	Compact sources with steep spectra. 2, 6, and 20 cm.
AD-26	A. Downes (Cambridge) M. Longair (Cambridge) M. Perryman (ESTEC, Netherlands) J. Fielden (Cambridge) C. Benn (Cambridge)	Structures of low-flux density sources. 20 cm.
AD-27	I. de Pater (Arizona) R. Brown (Arizona)	Io. 21 cm. ,

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AD-28	J. Dickey J. Benson F. Briggs (Pittsburgh)	Low latitude hydrogen absorption. 21 cm line.
AD-30	J. Dreher	Class II extragalactic sources. 21 cm.
AD-31	J. Dreher R. Laing	Spectral curvature of hot spots in extragalactic radio sources. 6 and 20 cm.
AD-32	J. Dickey H. Liszt E. Greisen	Structure of galactic HI absorption in front of 3C123. 21 cm line.
AD-35	G. Dulk (Colorado) P. Bornmann (Colorado)	Solar flares and magnetic fields in coronal active regions. 2 and 6 cm.
AE-8	R. Ekers P. Shaver (ESO) W. M. Goss (Leiden) J. Danziger (ESO) R. Fosbury (Royal Greenwich Obs.) J. Wall (Cambridge)	Spiral galaxy 0400-181. 6 and 21 cm.
AE-9	R. Ekers V. Radhakrishnan (Caltech)	X-ray/IR burster MXB 1730-33. 2 and 6 cm.
AF-28	E. Fomalont A. Bridle (New Mexico/NRAO) G. Miley (Leiden)	Extended radio core in 3C236. 1.3 and 2 cm.
AF-29	E. Fomalont W. M. Goss (Leiden) A. Lyne (Manchester) R. Manchester (CSIRO)	Accurate radio positions of pulsars. 20 cm.
AF-33	E. Fomalont B. Geldzahler (MIT)	Fornax A. 2, 6 and 20 cm.
AG-52	B. Geldzahler (MIT)	Objects resembling Sco X-1. 6 and 20 cm.
AG-53/ AH-51	B. Geldzahler (MIT) E. Fomalont R. Hjellming C. Wade	Sco X-1. 6 and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AG-56	P. Gregory (British Columbia)	X-ray source G109.1-1.0. 1.3, 6, and 20 cm.
AH-46	D. Hogg	Wolf-Rayet stars. 2 and 6 cm.
AH-48	H. Habing (Leiden) R. Issacman (Leiden)	Planetary nebulae near the galactic center. 6 cm.
AH-50	T. Heckman (Arizona) W. van Breugel (KPNO) G. Miley (Leiden) B. Balick (Washington)	Mapping of 3C305. 21 cm.
AH-52	R. Hjellming K. Johnston (NRL)	Search for jets in radio emitting x-ray stars. 2 and 6 cm.
AH-54	D. Heeschen Q-F. Yin (Peking) J. Heidmann (Meudon Obs.)	Clumpy irregular galaxies. 21 cm.
AJ-55	D. Jaffe (CFA) J. Moran (CFA) R. Genzel (CFA)	Far infrared sources containing newly formed B stars. 1.3, 2, and 6 cm.
AJ-59	K. Johnston (NRL) C. Wade D. Gibson (NMIMT)	Parallaxes, proper motions, and positions of radio binary stars. 2 and 6 cm.
AJ-60	K. Johnston (NRL) R. Hjellming	SS433. 1.3, 2, 6, and 20 cm.
AJ-62	C. Jenkins (Cambridge) R. Laing	Elliptical and SO galaxies. 6 and 20 cm.
AJ-63	W. Jaffe J. Caldwell (SUNY) T. Owen (SUNY) G. Berg (Caltech)	Uranus. 6 cm
AK-41	M. Kundu (Maryland) T. Velusamy (Maryland) E. Schmahl (Maryland) M. Bobrowski (Maryland)	Solar active regions and flares. 1.3, 2, 6, and 20 cm.
AK-43	P. Kronberg (Toronto) Gopal-Krishna (MPIR) H. Steppe (MIPR)	Double sources with unusually steep spectra. 0015+064, 2105+233 and 2302-025. 2, 6, and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AK-44	P. Kronberg (Toronto) P. Biermann (MPIR)	M82. 2 and 6 cm.
AL-19	K. Long (Columbia) J. Dickel (Illinois) E. Greisen	Kepler's supernova remnant. 6 and 20 cm.
AL-26	R. Laing	Multiple hot-spots in extra- galactic sources. 2, 6, and 20 cm.
AL-27	R. Laing	3C296, jet radio galaxy. 6, 18, and 21 cm.
AM-30	G. Miley (Leiden) W. van Breugel (KPNO) H. Butcher (KPNO) E. Fomalont T. Heckman (Arizona)	Coma A. 21 cm.
AM-32	J. Moran (CFA) L. Rodriguez (Mexico)	A high-brightness source in NGC 6334. 1.3, 2, and 6 cm.
AO-18	F. Owen J. Puschell	Jodrell Bank quasars. 6 cm.
AO-20	F. Owen J. Puschell	Search for a central component in 3C61.1. 2 cm.
AO-22	F. Owen R. Laing J. Puschell	Distant 3CR radio galaxies. 6 cm.
AP-34	R. Perley A. Readhead (Caltech) T. Pearson (Caltech)	Compact extragalactic objects. 6 and 20 cm.
AP-35	P. Palmer (Chicago)	OH in the nucleus of NGC 253. 18 cm line.
AS-63	R. Sramek K. Weiler (NSF) J. van der Hulst (Minnesota)	Supernova in M100 and NGC 6946. 1.3, 2, 6, and 20 cm.
AS-65/ AS-66	G. Swarup (MPIR) R. Sinha (Sys & Appl Sci) M. Beltrametti (MPIR)	Hot spots and radio lobes in QSOs. 2 and 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AS-67	J. Stocke (Arizona) W. Christiansen (North Carolina) J. Burns (New Mexico)	Quasars 3C270.1 and 3C275.1. 20 cm.
AS-68	J. Spencer (NRL) P. Bowers (NRL) K. Johnston (NRL)	Mapping OH and H ₂ O maser emission associated with late-type stars. 1.3 and 18 cm line.
AS-71	J. Schreier (CFA) J. Burns (New Mexico) E. Feigelson (MIT)	Centaurus A. 20 cm.
AS-72	Y. Sofue (Nagoya) Y. Fukui (Nagoya) M. Fujimoto (Nagoya) K. Wakamatsu (Gifu Inst. of Tech., Japan) S. Deguchi (Massachusetts)	Long optical jets in edge-on galaxy MCG 5-29-86. 6 and 20 cm.
AV-41	J. van der Hulst (Minnesota) W. B. Burton (Minnesota) M. Ondrechen (Minnesota) H. Liszt	HI absorption toward the Galactic Center. 21 cm line.
AV-43	J. van der Hulst (Minnesota) E. Hummel (New Mexico) J. van Gorkom C. Kotanyi (Leiden) W. Golisch (Minnesota)	Interacting galaxies. 6 and 21 cm.
AV-44/ AD-25	J. van der Hulst (Minnesota) E. Hummel (New Mexico) R. M. Price (New Mexico) W. Golisch (Minnesota) J. Dickey	Central sources in spiral galaxies. 2, 6, and 20 cm.
AV-47	W. van Breugel (KPNO) A. Willis (NFRA) R. Strom (NFRA)	Nuclear region of giant radio galaxy DA240. 2 and 6 cm.
AW-40/ AH-49	A. Wilson (Maryland) D. Hogg	Crab Nebula. 2, 6, and 20 cm.
AW-44	C. Wade	KR Aurigae, a possible black hole. 1.3, 2, 6, and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AZ-11	B. Zuckerman (Maryland) R. Spoka (Maryland) E. Dwek (Maryland) R. Hobbs (NASA, Goddard) A. Michalistianos (NASA, Goddard) M. Kafatos (George Mason)	R Aquarii and other symbiotic and infrared stars. 1.3, 2, and 6 cm.
AZ-12	H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech)	Solar flares. 2 and 6 cm.
AV-23	W. Cotton B. Geldzahler (MIT) F. Owen J. Romney (MPIR, Bonn) K. Johnston (NRL) L. Baath (Chalmers)	"Optically Quiet QSO" 2147+145. 18 cm (VLBI).
VF-4	J. Fix (Iowa) R. Mutel (Iowa) M. Claussen (Iowa) J. Benson	Main line OH emission from stellar sources. 18 cm (VLBI).
VJ-10	K. Johnston (NRL) J. Spencer (NRL) C. Walker R. Brown	Quasars 3C 279 and 3C 446. 18 cm (VLBI).
VM-13	J. Moran (CFA)	Proper motions of H ₂ O maser sources. 1.3 cm (VLBI).

ELECTRONICS DIVISION

Charlottesville

Four mixers for the 230 GHz frequency range have been fabricated. Two units give $T_{MXR} = 395$ K SSB at 225 GHz and 15 K ambient and have been shipped to Tucson. These are the highest frequency mixers constructed at NRAO and give performance comparable to the best results at other observatories.

Several millimeter-wave frequency multipliers with outstanding efficiency have been completed; best results are given below:

<u>Multiple</u>	<u>Output Frequency</u>	<u>Efficiency</u>
X2	90 GHz	24%
	124 GHz	16%
X2	128-168 GHz	> 10%
X2	214 GHz	27%
X3	222 GHz	6%

These devices greatly improve the reliability and operating cost of providing local oscillators for millimeter-wave receivers.

Over 1200 SIS (superconductor-insulator-superconductor) junctions have been fabricated by NRAO, using facilities at the National Bureau of Standards. These are presently being evaluated for millimeter-wave mixer use.

Development of FET amplifiers for the 1.2-1.7 GHz range is continuing. Two matched units, having noise temperature < 10 K, have been shipped to Green Bank for use in an OH receiver; 18 more units will be constructed for use in Green Bank, the VLA, VLB stations, and as IF amplifiers for millimeter-wave receivers. Prototype FET amplifiers for the 15 GHz range have been constructed and development of a low-noise cooled amplifier using unpackaged (chip) FET's is being actively pursued.

Construction of a second VLBI Mark III terminal and expansion of the VLBI Mark II processor are continuing.

Green Bank

Four projects were completed during this quarter. The 300 to 1000 MHz receiver was completed with the addition of the 700 to 1000 MHz upconverter and an IF polarimeter. Spare upconverters are now being fabricated for this receiver. The L- and C-band cooled GASFET receiver, built for Fort Davis, was installed and tested at Fort Davis in January. The receiver performed as expected on the telescope, as best as could be determined, considering weather and cryogenic problems. The installation and testing of new discs on the 140-foot MODCOMPS and of the lab MODCOMP in the "RJE room" were completed. Finally, a new polarimeter calibrator, covering 1 to 2 GHz, was installed and tested on the 140-foot.

Construction and testing is underway in several projects. The upconverter for the C-band part of the first channel of the 140-foot maser receiver was installed in preparation for tests early next quarter. An interface between the TPI 1054 tape drives and the HP 9825 calculator was completed and several diagnostics were written. The interface from the TPI 1054's to the DDP 116 is in construction. Progress is continuing on the Mark III VLB system for the VLA. Three phase calibrator modules were constructed; one power supply module was built and tested. All video converters were completed and tested, as were the head driver and analog reproduce boards. Construction of interfaces for the new interferometer encoders is also in progress. The Q-band maser noise temperature has been measured at 35 ± 3 K. Tunability from 42 to 45 GHz was demonstrated. However, oscillations were present at a few frequencies and work is underway to quell these. Development and construction of the two 256-channel, 2 MHz per channel, filter receivers is continuing. The oscillators and mixers are complete; the design of the filter boards is underway. The polarimeter calibrator for the 300-foot has been completely refurbished and installed.

The 18 and 21-cm receivers are being redesigned using cooled GASFET's as front-ends.

Routine assistance and maintenance were provided at the telescopes and lab.

Tucson

During this quarter the new 200-235 GHz receiver has been tested on the telescope. The receiver performed well, although the noise temperature was somewhat higher than expected (1000 K SSB). The receiver will be scheduled for observer use in the fall quarter.

The He_3 bolometer was tested on the antenna, and the sensitivity is improved over the previous tests, although still not as high as hoped for. Further improvements will be made during the summer.

During this quarter an interferometer system has been completed and tested. This instrument permits us to measure components over a large frequency range and should prove very useful in the development of short wavelength filters.

ENGINEERING DIVISION

Design and drawings were completed for the new inductosyns for the 85-foot antennas. Prospective sites and the possible use of a surplus antenna for the proposed addition to the interferometer baseline were reviewed. Additional measurements and checks were made on the prototype reflector plate measuring instrument. A study was started of possible methods of reducing astigmatism on the 300-foot. Calculations of VLA antennas relative to pointing characteristics were reviewed and expanded. Stability measurements of the surface conditions of the 36-foot reflector were obtained and reviewed. A program of data collection to study the effect of wind on the 36-foot was established. The design of the interface to replace the encoders with resolvers on the readout system of the adjustable feed mount on the 140 was begun. Routine engineering assistance to maintenance and operations at Charlottesville, Green Bank, Tucson, and the VLA was provided.

COMPUTER DIVISION

VLBI

The Varian 620 I minicomputer has been replaced with a Sperry-Univac V77-400 computer. Plans for the utilization of this faster computer with more memory include record averaging and blocking.

VLA Post-Processing

VAX number 2 (Digital Equipment Corporation VAX 11/780) has been installed in Room 216. In April, 1981 it will be moved to Room 214 which is now being prepared. Ultimately, the VAX and Modcomp Classic main frames and peripherals will each have individual rooms, separated by a third room. CRT terminals will be housed in this room and will enable users and programmers to have access to either machine.

Green Bank

The Modcomp II was moved from the basement of the Jansky Lab to the RJE room and is available to users for processing of 140-foot and 300-foot data.

The 25M byte disk on the 140-foot analysis computer was moved to the control computer and was replaced with a 50M byte disk. Disk dump time was increased from 6 hours to 18 hours.

VERY LARGE ARRAY PROGRAM

The array was scheduled for observations 59 percent of the time during the first quarter. The array went into full operation in January.

The post-processing system is running on the VAX 11/780 at the VLA site. It is now used regularly by astronomers for map processing.

During the quarter the waveguide to the end of the east arm and the retrofit of parametric amplifiers and cryogenics in all receivers were completed, allowing the array to be operated with 27 antennas in the full A array for the first time. This completes the construction of the electronics system except for IF's B and D, which will be brought into operation when data reduction capabilities are adequate.

PERSONNEL

Appointments

Jacqueline van Gorkom	Research Associate	01/01/81
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Changes in Status

R. C. Bignell	Systems Scientist/Head, Array Operations Division	01/01/81
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Terminations

Robert M. Mitchell	Electronics Engineer I	12/31/80
Eric D. Russell	Scientific Programming Analyst II	01/16/81
Christopher J. Salter	Scientific Programming	03/27/81

Leave of Absence

Kenneth I. Kellermann	Senior Scientist	01/01/81
Barry E. Turner	Scientist	02/01/81

Retirement

John H. Lancaster	Assistant Director/ Head, VLA Program	03/31/81
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