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 RADIO ASTRONOMY OBSERVATORY  
 CHARLOTTESVILLE, VA.

NATIONAL RADIO ASTRONOMY OBSERVATORY  
 Charlottesville, Virginia

Quarterly Report

AUG 05 1981

April 1, 1981 - June 30, 1981

RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1948.50
Scheduled maintenance and equipment changes	212.00
Scheduled tests and calibration	6.00
Time lost due to: equipment failure	48.25
power	1.50
weather	2.50
interference	1.50

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-347	R. Brown	Observations at 2.8 and 6-cm to measure H and He recombination lines in 28 of the brightest galactic HII regions.
S-224	P. Jewell (Illinois) L. Snyder (Illinois)	Observations at 5 and 6-cm to search for excited OH emission from late-type stars.
B-361	W. B. Burton (Minnesota) Y. Zhang (Nankai U., Peoples Republic of China)	Sensitive broadband survey of HI at $b \leq 20^\circ$ .
H-164	R. Hobbs (NASA, Goddard) J. Hollis (NASA, Goddard)	Observations at 20-cm of selected dark clouds and planetary nebulae to ascertain the presence of $H_2^+$ .
L-164	F. J. Lockman	Observations of the 21-cm $H166\alpha$ recombination line in selected areas in the Galactic plane.
K-249	M. Kutner (Rensselaer) D. Machnik (Rensselaer) K. Mead (Rensselaer)	Observations of neutral hydrogen in the Canis Major R1 region.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
S-227	J. Kwan (Bell Labs) N. Scoville (Massachusetts) F. J. Lockman	Search for high velocity 21-cm hydrogen emission from the KL nebula.
R-182	L. Rickard (Howard)	Observations at 21-cm to evaluate $C^+$ 265 $\alpha$ , $C^+$ 266 $\alpha$ , and $H\alpha$ 406 (15) transitions in Ori A and M17.
B-377	R. Brown	Search at 91-cm for the hyperfine transition of interstellar deuterium and measurements of hydrogen in the searched areas.

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

B - Effelsburg 100-m	O - Owens Valley 130-ft
C - Algonquin 150-ft	R - Crimea 22-m
F - Fort Davis 85-ft	So - Onsala 26-m
G - Green Bank 140-ft	Wn - Westerbork, n=1-14x26m
H - Hat Creek 85-ft	Yn - VLA Socorro, n=1-27x25m
Km - Haystack 120-ft	

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-13V	B. Rönnang (Chalmers) D. Downes (IRAM, France) G. Garay (CFA) R. Genzel (CFA) A. Haschick (Haystack) J. Moran (CFA) M. Reid (CFA) M. Schneps (CFA)	Observations at 22 GHz to determine distances by the measure of proper motions in $H_2O$ maser sources with telescopes B, R, So, Km, O, Yn and G.
R-14V	A. Readhead (Caltech) R. C. Walker	Observations at 22 GHz to exploit a new mapping technique observing 3C 84, 3C 273, and 3C 345 with telescopes B, C, Km, O, G, and Yn.
P-16V	I. Pauliny-Toth (MPIR) E. Preuss (MPIR) K. Kellermann	Observations at 6-cm of 3C 147 and NGC 315 with telescopes B, F, Km, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-21V	L. Baath (Chalmers) B. Rønnang (Chalmers) D. Graham (MPIR) R. Schilizzi (NFRA, Netherlands) G. Seielstad (Caltech)	Studies at 6-cm of the structural variations in the BL Lac type objects MK 421, 1749+70.1, and BL Lac with telescopes B, So, Wn, Km, O, and G.
C-22V	M. Cohen (Caltech) T. Pearson (Caltech) A. Readhead (Caltech) G. Seielstad (Caltech) S. Unwin (Caltech) R. Linfield (Caltech) R. Simon (Caltech)	Observations at 6-cm of superluminal radio sources with telescopes F, H, Km, O, and G.
F-3V	N. Cohen (Cornell) P. Feldman (Johns Hopkins) P. Crane	Observations at 6-cm of RS CVn and similar binaries with telescopes F, Km, O, and G.
K-8V	A. Downes (MPIR) I. Pauliny-Toth (MPIR) E. Preuss (MPIR) D. Shaffer (Phoenix Corp.) K. Kellermann (Caltech) R. C. Walker	Observations at 6-cm of Cyg A with telescopes B, F, H, Km, O, and G.
M-18V	P. Barthel (Leiden) G. Miley (Leiden) E. Preuss (MPIR) R. Schilizzi (NFRA, Netherlands)	Observations at 6-cm of the cores in extended quasars with telescopes B, So, O, and G.
M-171	G. Miley (Leiden) R. Schilizzi (NFRA, Netherlands) P. Wilkinson (Jodrell Bank)	Observations at 6-cm of the structure of 3C 236 with telescopes of the European VLB network and G.
B-372	B. Burke (MIT) C. Bennett (MIT) A. Garcia (MIT) C. Lawrence (MIT) W. Williams (MIT)	Observations at 610 MHz of the quasar 0957+561 with telescopes Km, O, and G; flux measurements of sources from the Arecibo survey.
W-8V	D. Shaffer (Phoenix Corp.) J. Wrobel (Toronto)	Observations at 2.8-cm of active E/SO galaxies with telescopes C, Km, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
L-10V	D. Backer (Calif., Berkeley) K. Lo (Caltech)	Observations at 2.8-cm of the Galactic center with telescopes Km, O, and G.
G-13V	N. Cohen (Cornell) B. Geldzahler (MIT) D. Shaffer (Phoenix Corp.)	Observations at 2.8-cm of 3 compact radio sources in the direction of supernova remnants with telescopes F, Km, O, and G.
U-3V	R. Linfield (Caltech) S. Unwin (Caltech)	Observations at 2.8-cm of 3C 111 with telescopes F, Km, O, and G.
U-7V	T. Pearson (Caltech) A. Readhead (Caltech) S. Unwin (Caltech)	Studies at 2.8-cm of the morphology and spectral index distribution of 3 complex sources with telescopes B, F, Km, O, and G.
C-20V	B. Corey (MIT) I. Shapiro (MIT)	Observations at 2.8-cm to determine absolute motions of features in 3C 345 with telescopes B, F, Km, O, and G.
P-20V	I. Pauliny-Toth (MPIR) K. Kellermann	Observations at 2.8-cm of 3C 454.3 and 2134+004 with telescopes B, F, Km, O, and G.
P-24V	I. Pauliny-Toth (MPIR) R. Porcas (MPIR) F. Mantovani (MPIR)	Observations at 2.8-cm of CTD 93 with telescopes B, F, Km, O, and G.
G-17V	Gopal-Krishna (MPIR) R. Porcas (MPIR)	Observations at 2.8-cm of CTD 93 with telescopes B, Km, O, and G.
B-23V	J. Broderick (VPI & SU) A. Marscher (Calif., San Diego)	Observations at 2.8-cm of the extremely luminous X-ray quasar NRAO 140 with telescopes B, F, Km, O, and G.
P-23V	H. Aller (Michigan) R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 2.8-cm to continue the monitoring of the apparent superluminal expansion of BL Lacertae with telescopes B, F, Km, O, and G.
S-17V	T. Jones (Minnesota) R. Mutel (Iowa) S. Spangler	Observations at 2.8-cm to test models for compact source spectral shapes with telescopes B, F, Km, O, and G.

The following pulsar program was conducted during this quarter.

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

<u>300-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1973.25
Scheduled maintenance and equipment changes	146.75
Scheduled test and calibration	64.00
Time lost due to: equipment failure	30.25
power	1.75
weather	2.00
interference	0.00

The following line programs were conducted during this quarter.

<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-153	B. Burke (MIT) A. Haschick (Haystack) P. Crane	Observations to confirm possible neutral hydrogen absorption features in quasar/galaxy pairs.
H-160	W. Huchtmeier (MPIR) O. Richter (MPIR)	Studies of the global parameters of galaxies and cluster of galaxies from neutral hydrogen observations.
L-147	B. Lewis (Carter Obs.) P. Crane	Observations to detect and study sources contained in the Shapley-Ames Catalog at the 21-cm line of neutral hydrogen.
L-163	T. Bania (Virginia) F. J. Lockman	Studies of galactic rotation at locations away from the galactic plane by the use of neutral hydrogen observations.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-348	K. Mitchell (Penn State) R. Brown	Search between 1000 and 1420 MHz for redshifted 21-cm absorption lines toward bright quasars.
T-135	T. Thuan (Virginia)	Observations at 21-cm to measure the hydrogen width for a complete sample of 725 edge-on spiral galaxies selected from the Nilson Catalog.
T-142	C. Hazard (Cambridge) R. Terlevich (Cambridge) T. Thuan (Virginia)	Measurements of the neutral hydrogen content of blue compact objects found on UK Schmidt plates.
T-141	T. Thuan (Virginia)	Measurements of the neutral hydrogen content and redshift of the Magellanic-type galaxies found in the Nilson Catalog.

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-335	W. Dent (Massachusetts) T. Balonek (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measurements of variable radio sources at 2695 MHz.
M-172	T. Menon (British Columbia)	Observations at 11-cm of sources selected from the 327 MHz Ooty radio telescope survey.
B-339	J. Broderick (VPI & SU) B. Dennison (VPI & SU) J. Ledden (VPI & SU) S. O'Dell (VPI & SU) J. Condon H. Payne (VPI & SU)	Observations at 900 and 1400 MHz of low frequency variables.
K-266	G. Kojoian (Wisconsin)	Observations at 4.7 GHz of those galaxies exhibiting strong ultraviolet continua and those of high surface brightness.

The following pulsars programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
C-193	V. Boriakoff (Cornell) J. Cordes (Cornell) J. Rankin (Cornell) D. Stinebring (Cornell) J. Weisberg (Massachusetts)	Pulsar polarization studies over the range 350-410 MHz simultaneous with observations conducted at Arecibo at 1420 and 1667 MHz.
C-195	J. Armstrong (JPL) V. Boriakoff (Cornell) V. Cordes (Cornell) J. Weisburg (Massachusetts) J. Dickey	Interstellar scintillation measurements over the range of 350-410 MHz of a large sample of pulsars.

36-foot TelescopeHours

Scheduled observing	1754.00
Scheduled maintenance and equipment changes	89.75
Scheduled test and calibration	291.75
Time not scheduled	49.00
Time lost due to: telescope	7.50
equipment	10.75
weather	116.00
interference	0.00

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
A-055	L. Avery (NRC) J. MacLeod (NRC) N. Broten (NRC) J. Ramsey (NRC)	Test of dicarbon sulfide as a source of some U-lines.
A-057	T. Armstrong (MIT) A. Barrett (MIT)	CO survey at high angular resolution and search for C <sup>18</sup> O in Sag A West.
B-363	W. B. Burton (Minnesota) H. Liszt	Search for CO counterparts to cos-B gamma-ray sources.
B-371	L. Blitz (Calif., Berkeley)	Search for extragalactic CO in M33, Seyferts and Zwicky 18 and 40.
B-373	L. Blitz (Calif., Berkeley) R. Mathieu (Calif., Berkeley)	Search for continuum emission from spirals with flat rotational curves.
C-197	E. Churchwell (Wisconsin) A. Merer (British Columbia)	Search for iron oxide.
C-198	E. Churchwell (Wisconsin) C. Walmsley (MPIR)	Observations of H <sup>13</sup> CN in molecular clouds.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
D-126	W. Dent (Massachusetts) R. Hobbs (NASA, Goddard) T. Balonek (Massachusetts)	Evolution of extragalactic radio sources at millimeter wavelengths.
D-127	J. Dickel (Illinois) L. Denoyer (Cornell)	CO observations of molecular clouds near the Cygnus Loop.
F-080	J. Fix (Iowa)	Search for CO emission from near IRC+10420.
G-252	E. Grayzeck (Nevada) P. Angerhofer (USNO) G. Rossano (unaffiliated)	CO observations of the CEP IV star formation region.
H-166	L. Blitz (Calif., Berkeley)	A test of the usefulness of $^{12}\text{CO}$ as a galactic tracer.
J-098	P. Jewell (Illinois) L. Snyder (Illinois) D. Blake (Chicago)	Search for circumstellar $\text{HC}^3\text{N}$ .
J-099	D. Jaffe (Chicago) R. Hildebrand (Chicago) J. Keene (Chicago)	CO observations of galactic submillimeter continuum sources.
K-269	M. Kutner (Rensselaer) D. Macnick (Rensselaer) N. Evans (Texas)	Observations of $\text{DCO}^+$ as a test of fractionation theories.
K-272	M. Kutner (Rensselaer) K. Mead (Rensselaer)	Further CO observations of molecular clouds outside the solar circle.
L-162	H. Liszt W. B. Burton (Minnesota)	Study of the spatial and kinematics of CO emission in the galactic core.
M-178	M. Morris (Columbia) R. Maddalena (Columbia)	Observations of filamentary molecular clouds with high spatial resolution.
P-115	J. Puschell F. Owen J. Condon T. Jones (Minnesota) L. Rudnick (Minnesota) W. Stein (Minnesota)	Millimeter wave observations of optically selected QSO's.
S-239	P. Schwartz (NRL) J. Spencer (NRL) P. Bowers (NRL) B. Zuckerman (Maryland)	Study of intensities and velocity structure of SiO masers.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
S-242	P. Schwartz (NRL)	Observations of torsionally excited methanol.
W-162	P. Wannier (Caltech) N. Scoville (Massachusetts)	Study of magnetic fields and millimeter polarization.

Very Large ArrayHours

Scheduled observing	1355
Scheduled tests and calibration observing	829

Approximately 4.8 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-10	R. Antonucci (Calif., Santa Cruz) E. Fomalont	Polarization of radio cores of galaxies. 6 and 20 cm.
AA-11	D. Abbott (Colorado) J. Bieging (Calif., Berkeley)	Mass loss from association--interstellar bubbles? 6 cm.
AB-100	A. Bridle (New Mexico) E. Fomalont	Spectrum and polarization of jet in NGC 315. 6 cm.
AB-112	J. Burns (New Mexico) S. Gregory (Bowling Green State U.)	4C sources in Zwicky clusters. 20 cm.
AB-119	D. Branch (Oklahoma) J. Cowan (Oklahoma)	Search for young extragalactic SNR's. 20 cm.
AB-125	B. Baud (Calif., Berkeley) A. Sargent (Caltech) H. Habing (Leiden)	Positions of Type II OH masers. 18 cm line.
AB-129	B. Burke (MIT) D. Roberts (Brandeis) P. Greenfield (MIT)	Monitoring double QSO 0957+561. 6 cm.
AB-130	B. Burke (MIT) C. Lawrence (MIT) C. Bennett (MIT)	Snapshot of Arecibo and Green Bank survey sources. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB-132	F. Biraud (Meudon) J. Schneider (Meudon) T. Cornwell	Search for gravitationally lensed images of quasars 3C 268.4 and PKS 1311-270. 2 and 6 cm.
AC-26	W. Cotton S. Spangler	Compact sources with steep spectra. 2, 6 and 20 cm.
AC-28	M. Claussen (Iowa) R. Mutel (Iowa) R. Gaume (Iowa) J. Fix (Iowa)	Intense variable OH maser G351.8-0.5 and its continuum. 2, 6 and 18 cm line.
AC-30	T. Cornwell D. Graham (MIPR) G. Hunt C. Salter (Bologna)	3C 433--high altitude circular source. 2 and 6 cm.
AD-30	J. Dreher	Class II extragalactic sources. 21 cm.
AD-34	I. de Pater (Arizona) J. Caldwell (SUNY, (Stony Brook) W. Jaffe T. Owen (SUNY, Stony Brook)	Atmosphere and magnetosphere of Jupiter. 6 and 18 cm.
AD-38	H. Dickel (Illinois) A. Lubenow (Illinois) W. M. Goss (Leiden) A. Rots J. Forster (NFRA)	H <sub>2</sub> O absorption toward DR 21. 6 cm line.
AD-40	J. Dreher R. Laing	Spectra of hot spots in extragalactic sources. 2 and 6 cm.
AD-42	G. Dulk (Colorado)	Solar flare patrol. 6 and 20 cm.
AE-11	R. Ekers W. M. Goss (Groningen) U. Schwartz (Groningen)	Spectral index distribution in Sgr A. 21 cm.
AE-12	R. Ekers P. Shaver (Leiden) W. M. Goss (Leiden) R. Fosbury (ESO) J. Danziger (ESO) J. Wall (Cambridge) D. Malin (Anglo Australian Obs.)	Complete sample of radio galaxies. 21 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AG-57	P. Gregory (British Columbia) A. Taylor (British Columbia) A. Gower (Univ. Victoria)	Periodic radio star LSI +61°303. 6 cm.
AG-58	A. Gower (Univ. Victoria) D. Crampton (Dominion Astrophys. Obs.) J. Hutchings (Dominion Astrophys. Obs.)	Quasars with optical structure. 6 and 20 cm.
AG-60	Gopal-Krishna (MPIR) R. Sramek	Ooty occultation sources. 6 and 20 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)	3C 305. 6 and 21 cm.
AH-53	R. Hjellming S. Ewald T. Cline (NASA, Goddard)	Radio counterparts of transient gamma- ray sources. 6 and 20 cm.
AH-55	D. Helfand (Columbia) G. Chanan (Columbia) B. Margon (Washington)	X-ray selected active galaxy nuclei. 6 and 21 cm.
AH-58	P. Hintzen (NASA, Goddard) F. Owen J. Scott (Arizona)	Search for distorted QSO's. 20 cm.
AH-62	G. Hunt C. Salter (Bologna) I. McHardy (Leicester, UK) D. Schwartz (CFA)	X-ray source 3A 0004+726 in SNR CTA 1. 2, 6 and 20 cm.
AH-63	E. Hummel (New Mexico) J. van der Hulst (Minnesota) G. Shostak (Leiden)	NGC 1961--spiral arm component. 21 cm.
AH-64	D. Helfand (Columbia) R. White (Columbia) L. Lucy (Columbia) R. Becker (Columbia)	Stellar wind of P Cygni. 6 cm.
AJ-60	K. Johnston (NRL) R. Hjellming	SS 433. 1.3, 2, 6, and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
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-45	P. Kronberg (Toronto) L. Noreau (Toronto)	Radio galaxy 3C 303. 2, 6, and 20 cm.
AK-46	S. Kwok (NRC) H. Matthews (NRC) C. Purton (NRC) T. Spoelstra (NRC) R. C. Bignell	Monitoring of HM Sge. 1.3, 2, 6 and 20 cm.
AK-47	S. Kwok (NRC) R. C. Bignell	AFGL 618--nascent planetary nebula? 1.3, 2, 6 and 20 cm.
AL-29	J. Linsky (Colorado) D. Gary (Colorado)	Late-type stars with large X-ray fluxes. 2 and 20 cm.
AL-30	K. Lang (Arcetri) F. Drago (Arcetri) R. Willson (Tufts)	Solar flares and active regions. 2 and 6 cm.
AL-31	R. Laing A. Bridle (New Mexico)	Weak jets and outer lobes in M84. 6 and 20 cm.
AL-32	R. Laing	3C 20--double source with luminous hot spots. 2 and 6 cm.
AL-33	R. Lamb (Iowa) J. Basart T. Markert (MIT)	Center for SNR W28. 2, 6 and 20 cm.
AM-30	G. Miley (Leiden) W. van Breugel (KPNO) H. Butcher (KPNO) T. Heckman (Arizona) E. Fomalont	Coma A. 6 cm.
AM-33	G. Miley (Leiden) W. van Breugel (KPNO) H. Butcher (KPNO) T. Heckman (Arizona) E. Fomalont	3C 310--relaxed wide double with complex features. 6 cm.
AM-35	H. Matthews (NRC) S. Kwok (NRC) B. Turner A. Winnberg (MPI)	Central cavities in ultracompact HII regions. 1.3 and 2 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AM-36	H. Matthews (NRC) J. van Gorkom A. Rots	Recombination lines and ammonia in W3(OH). 1.3 and 2 cm line.
AM-37	M. Morris (Columbia) P. Bowers (NRL) B. Turner B. Zuckerman (Maryland)	OH emission of bipolar nebulae. 18 cm line.
AM-38	R. Mutel (Iowa) J. Fix (Iowa)	Stellar OH masers. 18 cm line.
AN-9	R. Newell (NMIMT) R. Hjellming	Compact thermal sources made by evolved stars. 1.3 and 2 cm.
AO-16	F. Owen J. Burns (New Mexico)	NRC 1265. 6 cm.
AO-23	F. Owen R. White (NASA, Goddard) J. Burns (New Mexico)	Nearby Abell clusters. 20 cm.
AP-36	B. Peterson (Ohio State) L. Rudnick (Minnesota)	Morphology of quasars compared to absorption line systems. 6 and 20 cm.
AP-40	P. Palmer (Chicago) K. Johnston (NRL)	Accurate ground and excited state positions for OH masers in W3 and W49. 6 and 18 cm line.
AP-42	R. Potash (Brandeis) J. Wardle (Brandeis)	Jet quasar 4C 32.69. 6 cm.
AP-43	S. Pottasch (Groningen) J. van Gorkom W. M. Goss (Leiden) R. Gathier (Leiden)	Planetary nebulae near Galactic center. 6 cm.
AR-42	L. Rudnick (Minnesota) T. Jones (Minnesota) R. Fiedler (Minnesota) W. Golisch (Minnesota)	Polarization angles in compact extragalactic sources. 2, 6 and 20 cm.
AR-45	L. Rudnick (Minnesota) P. Crane J. Dreher W. Saslaw (Virginia) S. Simkin (Michigan State) J. Tyson (Bell Labs)	Optical-radio lobe coincidence in 3C 33. 2 and 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AR-46	V. Radhakrishnan (Raman Inst.) R. Ekers J. van Gorkom K. Johnston (NRL) C. Salter (Bologna)	Compact objects at centers of SNR. 6 and 20 cm.
AR-48	L. Rudnick (Minnesota)	Radio quiet BL Lac objects? 2 and 6 cm.
AR-49	L. Rudnick (Minnesota) J. Burns (New Mexico) W. Golisch (Minnesota) M. Ondrechen (Minnesota)	Jet widths in 3C 129. 6 cm.
AS-69	S. Spangler W. Cotton	Search for weak central components in non-variable sources. 6 and 20 cm.
AS-74	S. Spangler	Luminous jet galaxies 3C 166 and 3C 327.1. 2, 6 and 20 cm.
AS-75/ AW-50	D. Shaffer (Phoenix Corp.) T. Clark (NASA, Goddard) N. Vandenberg (NASA, Goddard) R. C. Walker	Reference sources for VLBI astrometry. 6 and 20 cm.
AS-76	E. Seaquist (Toronto) N. Duric (Toronto) P. Crane J. Auman (British Columbia) B. Campbell (CFH, Hawaii)	Peculiar spiral galaxy NGC 3310. 6 and 20 cm.
AS-79	S. Spangler W. Cotton	Multifrequency 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 in M100 and NGC 6946. 2, 6 and 20 cm.
AT-15	C. Townes (Calif., Berkeley) D. Matsakis (USNO) S. Subramanian (Calif., Berkeley) A. Hjalmarson (Chalmers) P. Palmer (Chicago) A. Cheung (Calif., Davis)	OH in DR 21. 18-cm line.
AT-16	A. Tubbs F. Briggs (Pittsburgh) J. Dickey	21-cm absorption of quasar 0241+011 by galaxy NGC 1073. 21-cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AT-17	J. Turner (Calif., Berkeley) J. Dreher B. Baud (Calif., Berkeley)	Continuum and masers in ON-1. 1.3, 2, 6 and 20-cm line and continuum.
AV-41	J. van der Hulst (Minnesota) W. B. Burton (Minnesota) M. P. Ondrechen (Minnesota) H. Liszt	21-cm 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 (Minnesota) W. Golisch (Minnesota)	Interacting galaxies. 6 and 20 cm.
AV-52	J. van der Hulst (Minnesota) R. Sramek K. Weiler (NSF)	Monitoring extragalactic supernovae. 2, 6 and 20 cm.
AW-35	J. Wall (Royal Greenwich Obs.) C. Benn (Royal Greenwich Obs.) G. Grueff (Bell Labs) M. Vigotti (Bell Labs)	Positions of sources in 5C 12 survey. 20 cm.
AW-37	J. Wardle (Brandeis) D. Roberts (Brandeis)	Quasars with jets. 6 cm.
AW-43	A. Wilson (Maryland) J. Ulvestad (Maryland)	Nuclei of Seyfert and emission line galaxies. 2, 6 and 20 cm.
AW-47	G. Wynn-Williams (IFA, Hawaii) E. Becklin (IFA, Hawaii)	Galaxies with multiple nuclear condensations. 2, 6 and 20 cm.
AW-48	C. Wade P. Sidelmann (USNO) K. Johnston (NRL)	Astrometric observations of minor planets. 1.3 and 2 cm.
AY-1	P. Young (Caltech) J. Gunn (Caltech) J. Kristian (Mt. Wilson & Las Campanas)	An ultra-deep survey. 6 and 20 cm.
AZ-13	H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech)	Solar flares and active regions. 1.3, 2, 6 and 20 cm.
EVN80-6	R. Schilizzi (Leiden) G. Miley (Leiden) T. Cornwell	VLBI observations of the core of 3C 236. 6-cm VLBI.

## ELECTRONICS

Charlottesville

Development of solid-state millimeter-wave local oscillators continues. Gunn diode oscillators giving 60 mW at 72 GHz and a doubler which gives  $9.2 \pm 1.2$  dB conversion loss without tuning over the entire 80-120 GHz band have been fabricated.

SIS junctions tested for mixer use at 115 GHz have given poor results ( $\sim 10$  dB conversion loss) and poor reliability. Modifications in the junction fabrication technique are planned.

Six FET amplifiers operating in the 1.0 to 1.7 GHz range have been completed for use as replacements for paramps in Green Bank. A two-stage 15 GHz amplifier giving 60 K noise temperature and 20 dB gain has been constructed. This type of amplifier will be used to increase VLA sensitivity by a factor of 3 at a wavelength of 2 cm.

Green Bank

An investigation of a future VLBI correlator using recirculating techniques has been started.

The C-band subsystem of the 140-foot maser receiver was tested during this quarter. System temperature at zenith is 50 K or less from 4.7 GHz to 7.0 GHz, 40 K or less from 5.0 GHz to 6.1 GHz, and 34 K or less from 5.7 to 6.1 GHz.

Four receivers, the 25 cm, 4-foot 21 cm, 21 cm, and 18 cm, are being retrofitted to use GASFET's as front-ends. The 25-cm is still in the system design stage, while the latter three are under construction and will be available in the fall.

One of the TPI 1054 tape drives is ready for testing at the telescope. A spare unit is under construction.

Design of the final board, the filter/detector board, for the 256-channel, 2 MHz per channel, filter receivers is complete. The fabrication of the boards is now out for bids. All parts for these units are now in hand or on order.

Focus and polarization readouts for the 140-foot telescope have been procured and interfaced to the present system.

In an attempt to get a maser amplifier to span 18 GHz to 26 GHz, a new ruby structure was machined, with tolerances closely maintained. The new structure phased very nicely, and preliminary tests indicate that the desired frequency coverage is achievable.

Field patterns and return losses of the C and X band feeds for the 140-foot Cassegrain system have been measured to verify the design. The

radiation pattern of a 3-cm dual hybrid mode feed was optimized and its efficiency measured.

A JPL program to analyze scatter from a generalized surface, given the incident field and surface, has been modified to some extent and used to analyze the performance of the subreflector on the 140-foot telescope.

All modules, except the Analog Reproduce Modules, and heads for the second NRAO Mark.III VLB system were delivered to the VLA and tested. Except for some minor bugs, the system is operational. A second version of the Analog Reproduce Modules is now under construction, since the design of the first set resulted in poor signal-to-noise ratio. The heads have been partially tested, and no problems are anticipated with them.

A reflector for the upgraded interferometer link has been purchased. Design on both the upgraded and new links is in progress.

Spare upconverters for the 300 to 1000 MHz receiver have been fabricated and tested. A report documenting the upconverters is in press.

#### Tucson

During this quarter, the 200-235 GHz receiver has been tested on the telescope. The noise temperature was slightly over 800 K SSB, the aperture efficiency of the telescope was 5 percent and the beam efficiency approximately 40 percent.

A new, fast beam-switching device for continuum use has been tested at a wavelength of 3 mm, and we now have a sensitivity of 1.5 Jy in one second. This is an improvement of 1.4 over our present sensitivity.

A new calibration system has been tested during this quarter. This calibration scheme used a cooled chopper and will permit more accurate calibration of spectral line data.

### COMPUTER DIVISION

#### VLA Post-Processing

Two mega-bytes of solid-state memory have been added to the VAX 11/780, bringing the total capacity to three mega-bytes.

Six Visual 400 terminals have been purchased for the VAX. Four are located in the CRT room and the others will be placed in strategic locations elsewhere.

The following improvements to the astronomical imaging processing system have recently been made: Syntax modification for minimum matching, additional u-v mapping capability, implementation of a self-calibration algorithm, one-dimensional/profile software, TV wedge and Roam software.

The AIPS on the VAX at the VLA is being used to capacity. AIPS software is being exported to several institutions' VAX computers.

#### VERY LARGE ARRAY

The array was scheduled for observations 62 percent of the time during the second quarter.

During the quarter, the DEC 10 upgrade components (a DEC 10 KL and a VAX) were received. The conversion to the DEC 10 KL and the installation of the DEC NET software in the DEC computers at the site was also begun.

The array was reconfigured to the B array on 27 April. A major structural failure on transporter No. 2 was successfully repaired. A MK III VLBI terminal was delivered to the site from Green Bank in June. Installation and testing of the unit were completed, giving the VLA full VLBI observing capability with both MK II and MK III recording systems. A new observing mode --the "autocorrelation mode"--was introduced during the quarter. In this mode, the digitized IF signals from many antennas are added together to create a pseudo-IF signal. This pseudo-IF is then fed back into the correlator in place of two antennas so that its spectrum can be measured. The technique is essentially the same as using the VLA as a large single-dish spectrometer.

#### ENGINEERING DIVISION

Preliminary planning was started for the assembly and measurement of a new 12-meter surface and back-up structure for the 36-foot. Conceptual designs for a 12-meter back-up structure were developed. The conceptual designs and procedures for measuring and setting the 12-meter surface were started.

Sites for the passive reflectors and the antenna for the addition to the interferometer were reviewed and definite locations decided upon. Specifications were completed and an RFP issued for a new antenna for the interferometer addition.

A procedure was developed and parts fabricated to relocate the adjustable feed mount in the focal point structure of the 140-foot. Design of the interface for a new read-out system on the 140-foot adjustable feed mount was completed and parts fabricated.

Routine engineering assistance was provided operations and maintenance at Charlottesville, Green Bank, Tucson, and Socorro.

## PERSONNEL

Appointments

R. W. Lowe	Scientific Programmer I	04/13/81
R. P. Escoffier	Electronics Engineer I	04/27/81
C. L. Sarazin	Visiting Associate Scientist	05/18/81
D. C. Wells	Systems Scientist	06/15/81
M. P. Sierra	Visiting Elect. Engineer I	06/10/81
J. Ulvestad	Research Associate	06/23/81
P. E. Palmer	Visiting Scientist	06/19/81

Terminations

S. T. Gottesman	Visiting Scientist	05/29/81
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Return from Leave of Absence

S. R. Spangler	Associate Scientist	05/25/81
K. I. Kellermann	Senior Scientist	06/22/81

Changes in Status

B. G. Clark	Senior Scientist	07/01/81
J. M. Dickey	Associate Scientist	07/01/81
G. R. Gisler	Associate Scientist	07/01/81
R. J. Havlen	Associate Scientist	04/01/81
F. J. Lockman	Assistant Scientist	07/01/81

## SUMMER STUDENT PROGRAM

Announcements of the summer student program were sent to over 100 colleges and universities in November 1980. From the applications received, 21 students were chosen to participate in the program as research assistants to the scientific staff and in the electronics and computer divisions. Fourteen students are working in Charlottesville, one in Green Bank, and six in Socorro. A series of lectures is being given by the staff on various topics in radio astronomy and instrumentation. Students also attend the regular NRAO colloquia and seminars. They will each spend one week in Green Bank assisting in the Public Education Program of the Observatory.