

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

Quarterly Report

July 1, 1981 - September 30, 1981

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

NOV 04 1981

RESEARCH PROGRAM

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1799.00
Scheduled maintenance and equipment changes	221.00
Scheduled tests and calibration	188.00
Time lost due to: equipment failure	154.75
power	5.50
weather	0.50
interference	0.50

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
R-172	L. Rodriguez (Mexico) G. Garay (CFA)	Observations at 3.3 GHz of the H125 α recombination line in extended HII regions.
B-346	R. Brown	Search at 9 cm for stimulated radio recombination line emission from quasars.
W-161	S. Federman (Texas) R. Willson (Tufts)	Observations at 3.335 GHz of the F=1-1 transition of CH in the direction of bright stars.
B-311	P. Bowers (NRL)	Studies of 18 cm OH emission from unidentified Type II OH/IR stars.
R-166	L. Rickard (Howard)	Observations at 6.3 cm to measure the $^2\pi_{1/2}$, $J=1/2$ transition of OH in DR21.
R-170	B. Lewis (Carter Obs., New Zealand) L. Rickard (Howard)	Observations at 4990 MHz to search for H ₂ CO in anomalous absorption in the disks of other galaxies.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
G-201	M. Claussen (Iowa) J. Fix (Iowa) M. Cobb (Iowa)	Observations at 5 cm of excited state OH maser emission from AU Gem.
V-38	R. Loren (Texas) P. Vanden Bout (Texas) R. W. Wilson (Bell Labs) H. Wootten (Caltech)	Observations of 6.3 GHz H ₂ CS (thio- formaldehyde) in selected molecular clouds.
S-224	P. Jewell (Illinois) L. Snyder (Illinois) M. Schenewerk (Illinois)	Observations at discrete frequencies in the range of 5 to 6 cm to search for excited OH emission toward late-type stars.
B-347	R. Brown	Observations at 2.8 and 9 cm to measure H and He recombination lines in 28 of the brightest galactic HII regions.
T-156	I. Kazes (Meudon, France) B. Turner	Study of extended 1720 MHz OH emission in the galactic plane and a survey of the new spiral arm beyond the sun in the 18-cm OH lines.
K-262	M. Kutner (Rensselaer) D. Machnik (Illinois)	Search at 10.5 GHz for carbon recombination lines in reflection nebulae.
M-182	M. Bell (NRC, Canada) H. Matthews (NRC, Canada) T. Sears (NRC, Canada)	Survey near 7.3 GHz for excited rotational states of CH.
M-184	H. Matthews (NRC, Canada) T. Oka (NRC, Canada) T. Sears (NRC, Canada)	Search at 9.48 GHz for the lower rotational states of H ₂ C = CH-CN (vinyl cyanide).
R-173	L. Rickard (Howard)	Search for the 3-cm fine structure transi- tion of hydrogen.

The following continuum program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
P-125	R. Price (New Mexico) P. Crane	Observations at 10.52 GHz to search for a suspect gamma ray source.

The following pulsar program was conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-149	J. Taylor (Princeton) P. Backus (Massachusetts) R. Burkhardt (Massachusetts) M. Damashek	Observations at 300-410 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:

B - Effelsburg 100-m	J - Jodrell Bank 250-ft
F - Fort Davis 85-ft	K - Haystack 120-ft
G - Green Bank 140-ft	O - Owens Valley 130-ft
H - Hat Creek 85-ft	Wn - Westerbork, n=1-14x26m
I - Iowa 18-cm	Yn - VLA Socorro, n=1-27x25m

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
W-11V	R. Booth (Manchester) P. Wilkinson (Manchester) T. Pearson (Caltech) A. Readhead (Caltech)	Observations at 609 MHz of suspected low-frequency variable radio sources with telescopes J, F, I, O, and G.
V-1V	T. Clark (Goddard) W. Erickson (Maryland) C. Knight (Phoenix Corp.) D. Shaffer (Phoenix Corp.) N. Vandenberg (Phoenix Corp.)	Observations at 610 MHz to measure apparent angular diameters and proper motions of selected pulsars with telescopes F, K, O, and G.
S-17V	T. Jones (Minnesota) R. Mutel (Iowa) S. Spangler	Observations at 6 cm to test models for compact source spatial shapes with telescopes B, F, H, I, K, O, Yn, and G.
W-12V	F. Briggs (Pittsburgh) K. Johnston (NRL) A. Wolfe (Pittsburgh)	Observations at 6 cm to measure the structure of A0235+164 with telescopes B, Wn, F, K, N, O, Yn, and G.
W-14V	G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson R. Walker	Observations at 6 cm of superluminal motions in 3C 120 with telescopes B, F, H, K, O, Yn, and G.
P-20V	I. Pauliny-Toth (MPIR) K. Kellermann	Observations at 6 cm of 3C 454.3 and 2134+004 with telescopes B, F, H, K, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
P-19V	R. Porcas (MPIR)	Observations at 6 cm of "optically quiet quasars" with telescopes B, F, K, O, and G.
P-22V	B. Corey (MIT) I. Pauliny-Toth (MPIR) R. Porcas (MPIR) D. Shaffer (Phoenix Corp.)	Observations at 6 cm of "optically selected quasars" with telescope B, K, and G.
P-23V	H. Aller (Michigan) R. Mutel (Iowa) R. Phillips (Kansas)	Observations at 6 cm to continue the monitoring of the apparent superluminal expansion of BL Lac with telescopes B, F, H, I, K, O, Yn, and G.
R-13V	T. Pearson (Caltech) A. Readhead (Caltech)	Observations at 4990 MHz of sources selected from the S4 and S5 catalog with telescopes B, F, K, O, and G.

300-foot TelescopeHours

Scheduled observing	1743.50
Scheduled maintenance and equipment changes	289.00
Scheduled test and calibration	175.50
Time lost due to: equipment failure	9.50
power	3.00
weather	0.00
interference	0.00

The following line program was conducted during this quarter.

<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 hydrogen absorption lines toward bright quasars.

The following continuum programs were conducted during this quarter.

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

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
D-128	B. Dennison (VPI & SU)	Observations at 1400 MHz to confirm highly extended structures in 3C 293 and 3C 345.
B-339	J. Broderick (VPI & SU) B. Dennison (VPI & SU) J. Ledden (VPI & SU) S. O'Dell (VPI & SU) H. Payne (VPI & SU) J. Condon	Observations at 900 and 1400 MHz of low-frequency variables.
SS-1	D. Crocker (Virginia) J. Lewis (Virginia) R. Nakatsuka (Virginia) E. Sturgis (Michigan) R. Skuppin (Iowa) D. Tucker (Stanford) S. Ratcliff (Princeton) D. Wolpert (Princeton) G. Gisler	Observations at 6 cm of selected BL Lac objects and QSOs.
B-359	C. Bennett (MIT) B. Burke (MIT) J. Hewitt (MIT) C. Lawrence (MIT)	Survey at 6 cm of sources at $0^{\circ} < \delta < 20^{\circ}$.
B-335	T. Balonek (Massachusetts) W. Dent (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measurements of variable radio sources at 2695 MHz.
G-255	P. Gregory (British Columbia) R. Taylor (British Columbia)	Variable source survey of the galactic plane at 6 cm.

36-foot Telescope

	<u>Hours</u>
Scheduled observing	862.00
Scheduled maintenance and equipment changes	1221.50
Scheduled tests and calibration	124.50
Time lost due to: telescope	1.50
equipment	17.50
weather	77.50
interference	0.00

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
B-371	L. Blitz (Calif., Berkeley)	Search for extragalactic CO in M33, Seyferts and Zwicky 18 and 14.
C-199	F. Clark (Kentucky) T. Troland (Kentucky) D. Johnson (NBS)	Systematic study of SiO maser processes.
D-126	W. Dent (Massachusetts) R. Hobbs (Goddard) T. Balonek (Massachusetts)	Evolution of extragalactic radio sources at millimeter wavelengths.
F-82	Y. Fukui (Nagoya Univ.) S. Deguchi (Haystack)	Search for interstellar diacetylene.
H-166	L. Blitz (Calif., Berkeley) P. Ho (Calif., Berkeley)	A test of the usefulness of ^{12}CO as a galactic tracer.
L-161	C. Lada (Arizona)	Study of high-velocity gas toward broadwing CO sources.
L-162	H. Liszt W. B. Burton (Minnesota)	Study of the spatial and kinematics of CO emission in the galactic core.
R-180	L. Rickard (Howard) P. Palmer (Chicago)	Search for CO emission and mapping of CO structure in galaxies
R-183	L. Rodriguez (Mexico) J. Canto (Mexico) N. Calvet (CIDA, Venezuela)	Observations of ^{12}CO and ^{13}CO in selected Be and Ae stars.
S-235	J. Sewall (Maryland) P. Wannier (Caltech) J. Stacy (Maryland)	Observations of CO associated with distant HII regions in Perseus.
S-241	S. Spangler W. Cotton	Multifrequency monitoring of low-frequency variables.
T-154	H. Thronson (Arizona) C. Lada (Arizona)	Study of high-density structure in high-velocity molecular clouds.
T-155	H. Thronson (Arizona) C. Lada (Arizona)	CO maps of molecular clouds surrounding M17.

Very Large Array

The quarter was scheduled 100 percent of the time.

Astronomical	1578.7 hours	(71.3 percent)
Test	635.3 hours	(28.7 percent)

The average downtime was 4.45 percent.

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. Angerhoffer (USNO) B. Balick (Washington) D. Milne (CSIRO) R. Perley	Evolution of small-scale structure in Cas A and Tycho supernova remnants. 6 cm.
AA 11	D. Abbott (JILA) J. Bieging (Calif., Berkeley)	Mass loss from OB associations. 6 cm.
AA 14	H. Andernach (MPIR, Bonn)	Large head-tail source NGC 7385. 20 cm.
AB 120	B. Balick (Washington) G. Boeshaar (Washington)	Bubble nebulae: NGC 2359, 6302, 6826, 6888 and 7635. 2, 6, and 20 cm
AB 126	J. Benson K. Johnston (NRL)	Masers in compact HII regions. 1.3 and 20 cm (includes 3 ^h line).
AB 129	B. Burke (MIT) D. Roberts (Brandeis) P. Greenfield (MIT)	Monitoring double QSO 0957+561. 6 cm.
AB 136	F. Bash (Texas) M. Kaufman (Ohio State)	Central part of M81. 6 and 20 cm.
AB 137	A. Barrett (MIT) T. Armstrong (MIT) P. Ho (Calif., Berkeley) S. Vogel (Calif., Berkeley)	Ammonia in Sgr A. 1.3 cm line.
AB 140	R. C. Bignell	Dumbbell nebula (NGC 6853). 6 and 20 cm.
AB 143	B. Burke (MIT) C. Bennett (MIT)	Source survey in support of 140-ft background fluctuation measurement. 6 and 20 cm.
AB 144	B. Burke (MIT) J. van der Hulst (Minnesota)	Interacting galaxies NGC 4038-39. 21 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AB 147	B. Balick (Washington) E. Skillman (Washington)	"Jumbo" HII regions in NGC 2366 and NGC 3310. 21 cm line.
AC 32	J. Crovisier (Meudon) J. Dickey I. Kazes (Meudon)	HI toward Verschuur's Cloud A. 21 cm line.
AC 33	R. Crutcher (Calif., Berkeley) J. Bieging (Calif., Berkeley)	OH absorption toward Cas A and NGC 2024. 18 cm line.
AD 43	I. de Pater (Arizona) J. Dickel (Illinois) T. Owen (SUNY, Stony Brook) D. Hunten (Arizona) B. Smith (Arizona)	Saturn. 1.3 2, 6, and 20 cm.
AD 45	J. Dreher R. Ekers S. Simkin (Michigan State)	Hot spots in galaxies. 6 cm.
AD 46	G. Dulk (Colorado)	EUV rocket flight and search for cyclotron lines in the sun. 1.3, 2, 6, and 20 cm.
AD 49	A. Downes (Cambridge, UK) J. van Gorkom G. Hunt C. Salter (Bologna)	Total power and polarization of SNRs. 20 cm.
AD 50	L. Dressel (Goddard) R. Ekers	Extended sources in SO galaxies. 20 cm.
AD 51	J. Dickey J. van Gorkom S. Kulkarni (Calif., Berkeley) C. Heiles (Calif., Berkeley)	Low-latitude 21 cm absorption. 21 cm line.
AF 36	E. Feigelson (MIT) J. Burns (New Mexico) E. Schreier (CFA)	The jet in Centaurus A. 6 cm.
AF 37	J. Fix (Iowa)	Positions for unidentified OH sources. 18 cm line.
AF 38	M. Felli (Arcetri, Italy) M. Massi (Arcetri, Italy) H. Staude (MPIR, Bonn)	Bipolar nebula M1-19 = S106. 1.3 and 2 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AG 63	B. Geldzahler (MIT)	Central region of SNR 3C 58. 20 cm.
AG 65	B. Geldzahler (MIT)	Objects resembling Sco X-1. 6 and 20 cm.
AG 67	B. Geldzahler (MIT) N. Cohen (MIT)	HD44179, the Red Rectangle. 20 cm.
AG 68	G. Garay (CFA) J. Moran (CFA) M. Reid (CFA)	Recombination lines from compact HII regions with masers. 1.3 cm.
AG 71	A. Gower (Victoria, Canada)	IC 310. 2, 6, and 20 cm.
AG 72	D. Gibson (NMIMT) P. Fisher (NMIMT) D. Helfand (Columbia)	Confirmation of radio stars found with 300-ft telescope. 6 cm.
AH 60	V. Hughes (Queen's, Canada) J. Wouterloot (Leiden)	Cep OB-3 star formation region. 6 cm.
AH 65	D. Helfand (Columbia) R. Becker (Columbia) K. Long (Columbia)	Small diameter SNR. 2 and 6 cm.
AH 67	P. Ho (Calif., Berkeley) R. Martin (MPIR, Bonn)	Ammonia in spiral galaxy IC 342. 1.3 cm line.
AH 69	E. Hummel (New Mexico) J. van der Hulst (Minnesota)	Barred spiral NGC 1097. 6 and 20 cm.
AH 70	E. Hummel (New Mexico) J. van der Hulst (Minnesota) W. Golisch (Minnesota)	High frequency radio emission from a sample of spirals. 2 and 6 cm.
AH 71	G. Hunt C. Salter (Bologna, Italy) J. van Gorkom	Seven suspected SNR's. 21 cm.
AJ 65	K. Johnston (NRL) H. Kuhr (Arizona) P. Strittmatter (Arizona)	The S5 sample. 2, 6, and 20 cm.
AJ 67	D. Johnson (Battelle) S. T. Gottesman (Florida)	HI in NGC 185 and NGC 205. 21 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AJ 68	K. Johnston (NRL) T. Wilson (MPIR, Bonn) C. Henkel (MPIR, Bonn) J. Martin (MPIR, Bonn) J. Bieging (Calif., Berkeley)	Formaldehyde in molecular clouds. 6 cm line.
AJ 69	K. Johnston (NRL) P. Biermann (MPIR, Bonn) H. Kuhr (MPIR, Bonn) A. Witzel (MPIR, Bonn) P. Strittmatter (Arizona)	Radio emission from quasar X-ray jets. 6 and 20 cm.
AJ 70	K. Johnston (NRL) P. Palmer (Chicago) J. Bieging (Calif., Berkeley) T. Wilson (MPIR, Bonn)	Formaldehyde in Orion A. 6 cm line.
AJ 71	K. Johnston (NRL) H. Mark (NRL) J. Dreher R. C. Walker J. Welch (Calif., Berkeley)	Continuum and water masers in W49 N. 1.3 cm line and 6 cm continuum.
AK 47	S. Kwok (NRC, Canada) R. C. Bignell	AFGL 618--nascent planetary nebula? 1.3, 2, 6, and 20 cm.
AK 48	C. Kumar (Howard) L. Rickard (Howard)	SNR in M33. 6 and 20 cm.
AK 51/ AS 90	M. Kundu (Maryland) E. Schmahl (Maryland) M. Bobrowsky (Maryland) F. Erskine (Maryland)	Solar active regions and flares. 1.3, 2, 6, and 20 cm.
AL 35	K. Long (Columbia) R. Becker (Columbia)	X-ray SNR in M33. 6 and 20 cm.
AL 36	R. Laing C. Jenkins (Cambridge, UK)	Prolate jet galaxy NGC 3801. 6 and 20 cm.
AL 37	J. Linsky (JILA) D. Gary (JILA)	Coronae of late-type stars. 6 and 20 cm.
AL 42	H. Liszt R. Ekers J. van der Hulst (Minnesota) W. B. Burton (Minnesota)	Formaldehyde absorption toward Sgr A (west). 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AM 40	J. Moran (CFA) G. Garay (CFA) M. Reid (CFA) R. Genzel (CFA)	Compact HII regions in the Orion molecular cloud. 2 and 6 cm.
AM 44	R. Mutel (Iowa) S. Kulkarni (Calif., Berkeley) J. Dickey	VLB survey of Scintars. 18 cm.
AO 20	F. Owen J. Puschell	Search for central component in 3C 61.1. 2 cm.
AO 26	J. Ostriker (Princeton) E. Turner (Princeton) J. Condon	Normal high-redshift galaxies. 6 cm.
AP 37	V. Pankonin (NSF) F. Gardner (CSIRO) J. Whiteoak (CSIRO)	Formaldehyde absorption against Agr A and Sgr B2. 6 cm line.
AP 49	P. Palmer (Chicago)	Hydrogen absorption in clusters with cooling cores. 21 cm line.
AR 44	L. Rickard (Howard) T. Bania (Virginia) B. Turner	Molecular disks in the nuclei of late-type galaxies. 18 cm line.
AR 52	J. Robertson (AAO, Australia) R. Hunstead (Sydney, Australia)	Sources for the Molonglo catalog. 20 cm.
AS 75/ AW 50	D. Shaffer (Goddard) T. Clark (Goddard) N. Vandenberg (Phoenix Corp.) R. C. Walker J. Wrobel (Toronto)	Reference sources for VLBI astrometry. 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)	Supernova in M100 and NGC 6946. 2, 6, and 20 cm.
AS 85	J. Stocke (Arizona) W. Christiansen (North Carolina) J. Burns (New Mexico)	Quasars 4C 25.01 and 4C 28.59. 20 cm

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AS 88	K. Sellgren (Caltech) R. White (Columbia) R. Becker (Columbia) S. Pravdo (Caltech)	Reflection nebulae NGC 7023, 2023, 2068, and 1999. 6 and 20 cm.
AS 91	E. Seaquist (Toronto) M. Bell (NRC, Canada) R. C. Bignell	H110 α recombination line maser in the nucleus of M82. 6 cm line.
AS 92	R. Strom (NFRA, Netherlands) W. van Breugel (KPNO) J. Robertson (AAO, Australia)	Distorted source 4C 59.08. 6 cm.
AS 94	M. Simon (SUNY, Stony Brook) G. Righini-Cohen (SUNY, Stony Brook) M. Felli (Arcetri, Italy)	Compact BN-type objects. 1.3 and 2 cm.
AS 95	M. Simon (SUNY, Stony Brook) L. van Speybroeck (CFA) R. Hjellming	The bulge of M31. 6 and 20 cm.
AS 97	L. Smarr (Illinois) D. Sumi (Illinois) R. Ekers	Luminosity function of contact elliptical galaxies. 6 and 20 cm.
AS 99	O. Slee (CSIRO, Australia)	Steep-spectrum sources in galaxy clusters. 20 cm.
AS 100	G. Shostak (Groningen) R. Sanders (Groningen) R. Ekers J. van Gorkom	HI absorption in radio galaxies. 21 cm line.
AS 101	G. Shostak (Groningen) E. Hummel (New Mexico)	HI absorption in halo of our galaxy. 21 cm line.
AS 102	S. Spangler R. Laing	Radio galaxy 3C 192. 20 cm.
AS 107	M. Stevens (Calif., Berkeley) C. Heiles (Calif., Berkeley) S. Kulkarni (Calif., Berkeley) J. Bieging (Calif., Berkeley) J. Dickey	OH absorption in galactic nuclei. 18 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AS 108	M. Stevens (Calif., Berkeley) B. Baud (Leiden)	OH absorption in galactic nuclei. 18 cm.
AT 19	C. Townes (Calif., Berkeley) S. Subramanian (Calif., Berkeley) D. Matsakis (USNO) A. Hjalmarson (Onsala) P. Palmer (Chicago) A. Cheung (Calif., Davis)	Ammonia in Orion. 1.3 cm line.
AT 20	C. Townes (Calif., Berkeley) R. Genzel (Calif., Berkeley) S. Vogel (Calif., Berkeley) P. Ho (Calif., Berkeley) D. Matsakis (USNO) P. Palmer (Chicago)	Ammonia in Sgr B2. 1.3 cm line.
AT 21	J. Turner (Calif., Berkeley) P. Ho (Calif., Berkeley)	Massive star formation in nearby spiral nuclei. 1.3, 2 and 6 cm.
AV 52	J. van der Hulst (Minnesota) R. Sramek K. Weiler (NSF)	Monitoring extragalactic supernovae. 2, 6, and 20 cm.
AV 53	J. van der Hulst (Minnesota) P. Crane R. Brown M. Ondrechen (Minnesota)	Central source in M31. 20 cm.
AV 55	S. Vogel (Calif., Berkeley) P. Ho (Calif., Berkeley) R. Genzel (Calif., Berkeley) D. Watson (Calif., Berkeley)	OH absorption in Sgr B2. 28 cm.
AV 57	W. van Breugel (KPNO) T. Heckman (Arizona) G. Miley (Leiden) H. Butcher (KPNO)	4C 26.42 and 4C 29.30: Radio galaxies with optical emission lines in the lobes. 6 and 20 cm.
AV 59	J. van der Hulst (Minnesota) P. Crane R. Kennicutt (Minnesota) R. Allen (Groningen)	Disks of spiral galaxies M51 and NGC 6946. 2, 6 and 20 cm.
AV 60	J. van der Hulst (Minnesota) E. Hummel (New Mexico) M. Ondrechen (Minnesota)	Halo of NGC 253. 6 and 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
AW 51	J. Wall (Royal Greenwich Obs.) E. Fomalont K. Kellermann	Deep survey. 6 cm.
AW 53	L. Weliachew (Grenoble) E. Fomalont E. Greisen	HI and OH absorption in M82. 18 and 21 cm line.
AW 56	C. Wade R. Perley	Optically flaring quasar 1156+295. 1.3, 2, 6 and 20 cm.
AZ 13	H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech) K. Topka (Caltech)	Solar flares and active regions. 1.3, 2, 6, and 20 cm.
AZ 14	H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech)	Large-scale structures of solar flares. 2 and 6 cm.
VG 13	B. Geldzahler (MIT) D. Shaffer (Goddard) N. Cohen (Cornell)	CTB 80. 6 cm Mark III VLB.
VG 16	B. Geldzahler (MIT) E. Fomalont	Sco X-1. 6 cm Mark III VLB.
VS 17	S. Spangler R. Mutel (Iowa) T. Jones (Minnesota)	Spectral component spatial isolation. 6 cm VLB.
VW 12	A. Wolfe (Pittsburgh) F. Briggs (Pittsburgh) K. Johnston (NRL)	A0235+164. 6 cm VLB.
VW 14	R. C. Walker G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson	3C 120 superluminal motion. 6 cm VLB.

ELECTRONICS DIVISION

Green Bank

Extensive performance tests of the cooled-GASFET 18-cm receiver were performed. The receiver has been installed on the telescope, has proven stable and reliable, and has achieved the expected T_{sys} of about 50 K. The bandpass is presently defined by RF filters to be 1560 MHz to 1760 MHz.

The cooled-GASFET 21-cm receiver is undergoing system integration and test. It will be ready in November.

The maser amplifier for the second channel of the 140-foot Cassegrain receiver system is complete. A decision was reached not to try to extend the bandpass of this amplifier to 26 GHz, as this required extensive redesign. This amplifier will be integrated into a system over the next 10 to 12 months.

Both TPI 1054 tape drives are now in service at the 300-foot telescope. A report documenting these is in press.

Printed circuit boards for the two 256-channel, 2 MHz/channel filter receivers are now being fabricated. An automatic test system for testing and tweaking the filters is being designed and evaluated.

The design and debug of the new interferometer inductosyn interface is complete; construction of the cards and chasses is in progress.

Possible approaches for obtaining a time/frequency standard for the VLA are being studied. These include both conventional time/frequency standards, such as hydrogen masers, and satellite-based systems.

Efforts to characterize and optimize the Q-band maser, with sufficient pump power, are underway. Preliminary results indicate a tuning range of 41.5 GHz to 44.5 GHz, with an instantaneous bandwidth of 40 MHz.

A report has been written documenting NRAO's modifications to a JPL program to calculate diffraction patterns from a generalized surface and detailing much of the theory involved.

The remainder of the hardware required to complete the Mark III VLBI system at the VLA was built, tested, and delivered. The performance of the reproduce heads turned out to be poor. However, replacement of these heads with new high-density heads about a year away has not been deemed cost-effective. Assistance was provided for the first Mark III experiment at the VLA.

System design of the additional baseline to the interferometer is progressing. Several designs for the microwave links are being evaluated.

Charlottesville

A compact, all solid-state 230 GHz receiver, giving a SSB receiver temperature of 1250 K at room temperature, has been completed. The receiver utilizes NRAO-developed Gunn oscillator, tripler, and mixer. It will be used for telescope and atmospheric tests at the 36-foot telescope. A cooled-mixer operating at 230 GHz with a 460 K SSB receiver noise temperature has been completed. This is believed to be the lowest noise mixer receiver constructed at that wavelength except for very narrow-band InSb receivers.

A new batch of superconducting tunnel junctions has been fabricated at NBS and are being evaluated. Progress is being made on fabrication of niobium-lead junctions through contract with the University of Virginia.

Development work of GASFET amplifiers at 15 GHz and, recently, 10.7 GHz continues. A 3-stage, 10.7 GHz amplifier giving 30 dB gain, 1.5 GHz bandwidth, and 30 K noise temperature has been constructed. A noise temperature of $7.2 \text{ K} \pm 0.5 \text{ K}$ has been measured for a 1.4 GHz amplifier, and two amplifiers of this type have been delivered to the VLA.

A liquid-nitrogen noise temperature standard has been developed. Investigations of a next-generation VLBI processor and also data recording techniques continue.

During this quarter, 20 technical visitors, including 14 from 8 foreign countries, came to the laboratory predominantly to look at the results which have been obtained on GASFET amplifiers and millimeter-wave mixers and multipliers.

Socorro

A dual-channel maser receiver, built at Green Bank, was installed on antenna 09 as a preamplifier ahead of the existing 22.24 GHz cooled mixer receiver. This will provide good sensitivity on one antenna for VLBI and spectral-line experiments. The system temperature of the new system is approximately 90 K, and work will continue to lower this to the goal of 70 K.

During the quarter, testing continued on antenna 22 to determine if coating the antenna with thermally insulating foam improves the pointing performance of the antenna. The tests indicate that the effect of temperature differentials on this antenna are significantly reduced.

ENGINEERING DIVISION

Detail design continued on a reference jig, a template and other components to be used in measuring and setting the surface of the 12-meter diameter antenna. Preliminary design of the electronics hardware interface for the new structure was started. Design of the backup structure for the

12-meter diameter antenna was completed and drawings were sent out for proposals to fabricate the structure.

Assistance was provided 36-foot operations in overhauling and servicing the dome door.

Engineering assisted in soliciting and evaluating proposals for a new antenna for the interferometer addition.

COMPUTER DIVISION

VLBI

The cross assembler which enables Varian source code to be assembled into Varian object code on the IBM computer has been rewritten and is now capable of accepting the Sperry Univac V77-400 instruction repertoire.

An AM9511 arithmetic processing unit has been interfaced to the V77-400. Although slow by modern hardware standards, this device provides programs with floating point capability and all common transcendental functions.

As a consequence of these two improvements to the VLBI system, record averaging software has been added to the on-line program. This software is now in final checkout stage.

Green Bank

A Tektronix 4012 graphics CRT terminal has been purchased for the lab Modcomp. This terminal will also be used to communicate with the Charlottesville DEC VAX 11/780 computer, giving observers at Green Bank access to the image processing system at Charlottesville.

Image Processing

A System Industries 9-track, triple density tape drive has been added to the VAX 11/780 computer. This gives reading and recording densities of 800, 1600, and 6250 BPI. The hardware for the star chart measuring machine is basically complete. Upon completion of software, digital TV images will be read into the VAX where positions will be determined accurately and automatically.

Socorro The major event in this quarter was the completion of the DEC-10 upgrade. At the end of July, the old processor was prepared for shipment; in the second week of August the new processor was released to users. The programs that run exclusively on the DEC-10 have been running successfully since the change-over. There have been, however, several problems that have caused the communication between the DEC-10 and the other computer systems to be unreliable. The most important of these are the real-time transfer of data from the synchronous system to the DEC-10 and the transfer of mapping requests to the PDP-11/70 (MAPPER).

Since the AIPS system is gaining widespread support, both inside the Observatory and outside on other systems, due to the increased number of application programs available, the decision was made to use the VAX purchased with the new DEC-10 for post-processing under the AIPS system. The conversion will require additional hardware, which has been ordered, but will involve little software effort. It will serve to take part of the load from the DEC-10 in the area of map making rather than in calibration as was originally conceived.

The "pipeline" system comprising the PDP-11/70 (SORTER) and PDP-11/44 (GRIDER) is progressing. The system will be available for testing by users in the new year.

PERSONNEL

Appointments

E. R. Seaquist	Visiting Scientist	07/06/81
M. P. Haynes	Assistant Director, Green Bank Operations	09/14/81
R. Giovanelli	Systems Scientist	09/14/81

Changes in Status

J. M. Benson	Research Associate to Systems Scientist	07/01/81
G. C. Hunt	Associate Division Head to Head VLA Computer Division	07/01/81
J. R. Fisher	Assistant Director, Green Bank Operations to Electronics Engineer I	09/14/81

Terminations

P. E. Palmer	Visiting Scientist	09/19/81
J. J. Puschell	Research Associate	07/24/81
G. D. van Albada	Research Associate	07/28/81
J. Dreher	Research Associate	08/13/81
J. Basart	Systems Scientist	08/14/81
C. L. Sarazin	Visiting Associate Scientist	08/18/81
W. N. Brouw	Visiting Scientist	08/26/81

Leave of Absence

M. B. Hagstrom	Electronics Engineer	09/01/81
W. Jaffee	Systems Scientist	09/01/81

Return from Leave of Absence

C. R. Moore		08/01/81
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