

NATIONAL RADIO ASTRONOMY OBSERVATORY
Charlottesville, Virginia

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RADIO ASTRONOMY OBSERVATORY
CHARLOTTESVILLE, VA.

Quarterly Report

JAN 29 1982

October 1, 1981 - December 31, 1981

RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1955.75
Scheduled maintenance and equipment changes	179.25
Scheduled tests and calibration	1.00
Time lost due to: equipment failure	34.75
power	9.50
weather	133.25
interference	0.00

The following line programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
T-156	I. Kazes (Meudon, France) B. Turner	Observations to study giant molecular clouds at the main 18 cm OH line frequencies.
T-145	B. Turner	Search within the 13-16 GHz range for new molecular species.
S-233	L. Buxton (Illinois) E. Campbell (Illinois) W. Flygare (Illinois) P. Jewell (Illinois) M. Schenewerk (Illinois) L. Snyder (Illinois)	Observations at 20.9 and 24.4 GHz to search for the HCN dimer (HCN) ₂ .
B-381	R. Brown	Observations at 5-cm to confirm and extend the detection of recombination line emission from 3C 245 and a search for this type of emission from other QSOs.
S-246	M. Bell (NRC, Canada) E. Seaquist (Toronto)	Search at 5 cm for recombination lines in compact extragalactic sources.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-176	L. Avery (NRC, Canada) N. Broten (NRC, Canada) J. MacLeod (NRC, Canada) H. Matthews (NRC, Canada) T. Oka (Chicago)	Observations at 18.2 GHz of the J=2→1 transition of HC ₃ N, generally toward dark clouds.

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
C-194	M. Condon (unaffiliated) J. Condon K. Kellermann	Survey at 14.5 cm of extragalactic sources at all right ascensions whose $b > 10^\circ$ in the declination range of $30^\circ < \delta < +40^\circ$.
W-159	D. Wilkinson (Princeton) J. Uson (Princeton)	Observations at 1.3 cm to search for small-scale anisotropies in the cosmic microwave background.
K-273	J. Knapp (Princeton) D. Spergel (Princeton)	Observations at 1.3 cm of the "halo" planetary nebulae.

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

B - Effelsburg 100-m	J _{II} - Jodrell Bank MkII 80X120-ft
C - Algonquin 150-ft	N _{II} - NRL Maryland Point 85-ft
D5 - Madrid DSN 64-m	O - Owens Valley 130-ft
E - South Africa Aries	R - Crimea USSR 30-m
F - Fort Davis 85-ft	So - Onsala 26-m
Km - Haystack 120-ft	
Kw - Westford 60-ft	

G - Green Bank 140-ft
 H - Hat Creek 85-ft
 I - Iowa 60-ft

Wn - Westerbork n=1-9x26m
 Yn - VLA Socorro n=1-27x25m

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-19V	F. Mantovani (MPIR) R. Porcas (MPIR) J. Romney (MPIR)	Observations at 2.8 cm of faint radio sources having strong low-frequency variability with telescopes B, F, Km, O, and G.
P-26V	R. Porcas (MPIR)	Observations at 2.8 cm of the quasar 3C 179 with telescopes B, Km, O, and G.
P-25V	H. Aller (Michigan) R. Mutel (Iowa) R. Phillips (Kansas)	Monitoring at 2.8-cm of apparent superluminal expansion in BL Lac with telescopes B, F, Km, O, and G.
L-12V	S. Unwin (Caltech) R. Laing	Observations at 2.8 cm of the central components in extended extragalactic radio sources with telescopes Km, O, and G.
G-21V	B. Burke (MIT) G. Garay (CFA) A. Garcia (MIT) J. Moran (CFA) M. Reid (CFA) M. Schneps (CFA)	Observations at 18 cm to determine the spatial distribution of OH maser emission with telescopes F, Km, O, Yn, and G.
H-3V	D. Backer (Berkeley) M. Hodges (Iowa) R. Mutel (Iowa)	Polarization maps at 18 cm of compact extragalactic radio sources with telescopes F, H, Yn, and G.
J-13V	A. Witzel (MPIR) K. Johnston (NRL) J. Spencer (NRL) W. Cotton E. Fomalont R. Perley	Observations at 18 cm of a sample of compact radio sources with telescopes B, F, H, Km, N, O, Yn, and G.
B-23V	J. Broderick (VPI & SU) A. Marscher (Boston)	Observations at 18 cm of the extremely luminous X-ray quasar NRAO 140 with telescopes B, F, H, Km, O, and G.
S-17V	T. Jones (Minnesota) R. Mutel (Iowa) S. Spangler	Observations at 18 cm to test models for compact source spectral shapes with telescopes B, F, H, I, O, Yn, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
W-12V	F. Briggs (Pittsburgh) K. Johnston (NRL) A. Wolfe (Pittsburgh)	Observations at 18 cm to measure the structure of A 0235+164 with telescopes B, Wn, F, H, Km, N, O, Yn, and G.
R-15V	N. Bartel (MIT) R. Fanti (Bologna, Italy) A. Ficarra (Bologna Italy) L. Padrielli (Bologna, Italy) J. Romney (MPIR) K. Weiler (NSF)	Observations at 18 cm of sources having superluminal flux variations with telescopes of the European VLB network; the Crimea, USSR; the Hartebeesthoek, South Africa; the U.S. telescopes F, O, and G.
S-16V	G. Kaplan (USNO) C. Ma (Goddard) D. Shaffer (Phoenix Corp.)	Observations at 6 and 18 cm of lunar occultations of radio sources with telescopes F, Km, O, and G.
E-2V	P. Biermann (MPIR) A. Eckart (MPIR) K. Johnston (NRL) A. Witzel (MPIR)	Observations at 18 cm of 13 compact radio sources whose declinations are $> +70^{\circ}$ with telescopes of the European VLB network and the U.S. telescopes O, and G.
D-130	A. de Bruyn (NFRA, Netherlands) P. Wilkinson (Manchester)	Mapping at 18 cm of M82 with telescopes of the European VLB network and G.
G-256	L. Baath (Chalmers) D. Graham (MPIR)	Observations at 18 cm of the radio galaxy DA 240 with telescopes of the European VLB network and G.
V-41	J. Ball (CFA) R. Capallo (Haystack) W. Carter (NGS) T. Clark (Goddard) R. Coates (Goddard) C. Knight (Phoenix Corp.) G. Lundqvist (Chalmers) C. Ma (Goddard) D. Robertson (Nat. Geo. Survey) A. Rogers (Haystack) B. Rönnäng (Chalmers) J. Ryan (Goddard) D. Shaffer (Phoenix Corp.) I. Shapiro (MIT) N. Vandenberg (Phoenix Corp.) J. Webber (Haystack) A. Whitney (Haystack)	Observations at S and X bands to study tectonic plate stability and relative motion, UT1 and polar motion, and a survey for reference source with telescopes So, F, Km, Kw, O, and G.

<u>No.</u>	<u>Observer(s)</u>	<u>Program</u>
M-13V	D. Downes (IRAM, France) G. Garay (CFA) R. Genzel (CFA) A. Haschick (Haystack) J. Moran (CFA) M. Reid (CFA) R. Ronnang (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 B, R, So, Km, O, Yn, and G.
L-11V	D. Backer (Berkeley) K. Lo (Caltech) J. Moran (CFA) M. Reid (CFA)	Observations at 1.3 cm of the Galactic Center with telescopes Km, Yn, and G.
M-23V	A. Moffet (Caltech) R. L. Moore (Caltech) A. Readhead (Caltech) R. Walker	Observations at 1.3 cm of 3C 84 and 3C 345 with telescopes B, C, Km, O, Yn, and G.
R-16V	B. Burke (MIT) R. Potash (Brandeis) D. Roberts (Brandeis) A. Rogers (Haystack) J. Wardle (Brandeis)	Polarization measurements at 6 cm of strong extragalactic radio sources with telescopes Km, 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, Km, O, Yn, and G.
U-6V	S. Unwin (Caltech)	Observations at 6 cm of the NGC 6251 jet with telescopes B, F, Km, O, and G.
P-24V	I. Pauliny-Toth (MPIR) R. Porcas (MPIR) F. Mantovani (MPIR)	Observations at 6 cm of 3C 216 with telescopes B, F, Km, O, and G.
N-2V	S. Neff (NFRA, Netherlands) R. Brown	Observations at 6 cm to study "S" shaped radio morphologies in quasars with telescopes B, J _{II} , F, Km, O, Yn, and G.
J-16V	D. Jones (Caltech)	Observations at 6 cm of NGC 1052,
W-15V	D. Shaffer (Phoenix Corp.) J. Wrobel (Toronto)	0812+20, and the SO galaxy N 3894 with telescopes F, H, Km, O, Yn, and G.

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 at $0^{\circ} < \delta < 20^{\circ}$.
G-255	P. Gregory (British Columbia) R. Taylor (British Columbia)	Variable source survey of the Galactic Plane at 6 cm.
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.
A-56	D. Altschuler (Puerto Rico)	Resurvey at 5 GHz of the NRAO 5 GHz Radio Source 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.

The following pulsar 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 (Vermont) D. Stinebring (Cornell) J. Weisberg (Princeton)	Pulsar polarization studies over the range of 350 - 410 MHz simultaneous with observations conducted at Arecibo at 1420 and 1667 MHz.
T-149	P. Backus (NASA, Ames) J. Taylor (Princeton) R. Burkhardt (Massachusetts) M. Damashek	Observations at 300 - 410 MHz to determine pulse arrival times of PSR 0655+64 and PSR 0820+02.

<u>36-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1753.00
Scheduled maintenance and equipment changes	121.50
Scheduled test and calibration	282.25
Time not scheduled	51.25
Time lost due to: telescope	17.50
equipment	33.25
weather	131.75

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
C-202	R. Crutcher (Illinois) You-Hau Chu (Illinois)	Interstellar line observations toward optical objects.
D-126	W. Dent (Massachusetts) R. Hobbs (Goddard) T. Balonek (Massachusetts)	Evolution of extragalactic radio sources at millimeter wavelengths.
G-253	B. Geldzahler (MPIR) H. Kuehr (MPIR)	Nine millimeter observations of sources in the 6 cm NRAO-MPI survey.
H-167	J. Hollis (Goddard) L. Snyder (Illinois) F. Lovas (NBS) R. Suenram (NBS)	Confirmation of further transi- tions of new interstellar molecules.
H-168	P. Huggins (SUNY, Stony Brook)	Search for C ₂ H in circumstellar envelopes and hot molecular clouds.
J-101	P. Jewell (Illinois) L. Snyder (Illinois)	Search for HCN and HC ₃ N in circum- stellar shells.
K-274	M. Kutner (Rensselaer) D. Machnik (Rensselaer) K. Mead (Rensselaer) N. Evans (Texas)	Observations of DCO ⁺ in NGC 1977 as a test of fractionation.
K-275	M. Kutner (Rensselaer) D. Machnik (Rensselaer)	Study of 2 mm formaldehyde in lines in reflecton nebulae.
K-276	M. Kutner (Rensselaer) K. Mead (Rensselaer)	Further observations of CO clouds in the inner galaxy.
K-277	M. Kutner (Renssaler) K. Mead (Rensselaer)	Observations of 2 millimeter formaldehyde in molecular clouds in the outer galaxy.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
L-152	R. Landau (Minnesota) E. Epstein (Aerospace Corp.) T. Jones (Minnesota) J. Puschell (Calif., San Diego) J. Rather (W.J. Schafer & Assoc.)	Study of spectral distributions of extragalactic compact sources.
L-165	C. Lada (Arizona)	Study of high velocity gas toward broad-wing CO sources.
P-115	J. Puschell (Calif., San Diego)	Millimeter wave observations of optically selected QSOs.
P-120	J. Puschell (Calif., San Diego) D. Heeschen	Bolometric observations of E/SO galaxies at 1 and 3 mm.
P-121	J. Puschell (Calif., San Diego) J. Condon T. Jones (Minnesota) S. O'Dell (VPI & SU) F. Owen L. Rudnick (Minnesota) W. Stein (Minnesota)	Bolometric observations of optically selected quasars.
P-123	J. Philips (Queen Mary College, England) G. White (Queen Mary College, England)	Detection of shock enhanced molecules in supernovae remnants.
R-162	L. Rickard (Howard) J. van der Hulst (Minnesota)	Study of millimeter continuum emission from spiral galaxies.
R-184	L. Rickard (Howard)	CO studies of galaxies.
S-241	S. Spangler W. Cotton	Multi-frequency monitoring of low frequency variables.
S-243	P. Schwartz (NRL) B. Zuckerman (Maryland) J. Bologna (NRL)	Search for 1 mm lines of SiO in late-type stars.
S-245	M. Scholtes (Texas) M. Kutner (Rensselaer) N. Evans (Texas) L. Munday (Texas)	Re-examination of the orth/para ratio of formaldehyde.

THE VERY LARGE ARRAY

The quarter was scheduled 97.2 percent of the time.

Astronomical	1446.13 hours	(67.2 percent)
Test	706.87	(32.8 percent)

The average downtime was 4.55 percent.

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

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AA-12	H. Andernach (MPIR) R. Schilizzi (NFRA, Netherlands) J. Wall (Royal Greenwich Obs.)	Wide-angle tail source 3C 40. 6 and 20 cm.
AA-14	H. Andernach (MPIR)	Large head-tail source NGC 7385. 20 cm.
AB-60	R. C. Bignell E. Seaquist	Supernova remnant in NGC 4449. 2, 6 and 21 cm.
AB-129	B. Burke (MIT) D. Roberts (Brandeis) P. Greenfield (MIT)	Monitoring double QSO 0957+561. 6 cm.
AB-133	R. Becker (Columbia) D. Helfand (Columbia) A. Szymkowiak (Goddard)	Crab-like SNR--3C 58 and Vela X. 2 and 6 cm.
AB-134	G. Bothum (Washington) B. Balick (Washington)	HI extent in highly inclined late- type galaxies. 21 cm line.
AB-141	R. Brown F. J. Lockman	HII region emission measure distri- bution. 6 cm.
AB-145	A. Bosma (Columbia)	Barred spiral NGC 1389. 21 cm line.
AB-150	P. Bowers (NRL) G. Knapp (Princeton)	HI in circumstellar envelopes. 21 cm line.
AB-151	R. Brown J. van Gorkom	Recombination lines of young, com- pact HII regions. 2 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AB-158	J. Basart (Iowa State) M. Andrews (Iowa State) R. Lamb (Iowa State)	Dark cloud Rho Ophiuchi. 6 and 20 cm.
AB-159/ AH-76	F. Bertola (Padua, Italy) R. Laing R. Ekers E. Hummel (New Mexico) C. Kotanyi (Groningen)	Elliptical galaxies with dust lanes. 6 and 20 cm.
AB-161	S. Bowyer (Calif., Berkeley) P. Henry (CFA) J. Clarke (Calif., Berkeley)	X-ray sources detected in deep Einstein exposure on 3C 295. 6 and 20 cm.
AB-162	J. Bally (Bell Labs) R. Snell (Massachusetts) R. Predmore (Massachusetts)	Ionized gas associated with high velocity overflow in molecular clouds. 1.3, 2 and 6 cm.
AC-34	J. Condon M. Condon (unaffiliated) K. Mitchell (Penn State)	Deep survey of background sources. 20 cm.
AC-36	J. Condon M. Condon (unaffiliated)	Spiral galaxies with high disk brightness temperature. 20 cm.
AC-37	T. Cornwell A. Bridle (Queen's, Canada) E. Fomalont	Large-scale bridge and lobe structure of 3C 293. 6 and 20 cm.
AC-41	G. Chincarini (Oklahoma) R. Giovanelli M. Haynes	HI distribution in cluster galaxies. 21 cm line.
AC-42	E. Churchwell (Wisconsin) D. Abbott (Colorado) J. Bieging (Calif., Berkeley) R. C. Bignell	Variation of flux and spectral index in P Cyg, 9 Sgr, VI Cyg Nos. 9 and 12. 2 and 6 cm.
AD-30	J. Dreher (MIT)	Class II double sources. 2 cm.
AD-50	L. Dressel (Goddard) R. Ekers	Extended sources in S0 galaxies. 20 cm.
AD-52	P. Dewdney (DAO, Canada) R. Roger (DAO, Canada)	HI-HII interface surrounding Lk H alpha 101. 21 cm line.
AD-53	G. Dulk (Colorado) G. Chanmugam (Louisiana State)	AM Herculis binary stars. 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AD-54	G. Dulk (Colorado)	Particle acceleration in solar flares. 2 and 6 cm.
AD-56	J. Dreher (MIT) R. Ekers P. Kronberg (Toronto) S. Simkin (Michigan State)	Hydra A. 6 cm.
AD-57	J. Dreher (MIT) R. Laing	Spectrum of hot spots in extra-galactic sources. 2 cm.
AE-11	R. Ekers W. M. Goss (Groningen) U. Schwarz (Groningen)	Sagittarius A. 6 cm.
AE-14	R. Ekers G. Bicknell (Mt. Stromlo) N. Killeen (Mt. Stromlo)	Southern jet radio galaxies; IC 4296. 2, 6, and 21 cm.
AF-32	D. Florkowski (USNO)	Mass loss from Zeta Puppis. 2 and 6 cm.
AF-36	E. Feigelson (MIT) J. Burns (New Mexico) E. Schreier (CFA)	The jet in Centaurus A. 6 cm.
AF-39	D. Florkowski (USNO)	W Ursae Majoris stars. 6 cm.
AF-41	E. Feigelson (MIT) G. Clark (MIT)	Middle NE radio lobe of Centaurus A. 6 and 20 cm.
AG-48	P. Gregory (British Columbia)	SNR G109.1-1.0. 20 cm.
AG-74	R. Genzel (Calif., Berkeley) P. Ho (Calif., Berkeley) D. Downes (IRAM, Grenoble)	Ammonia inversion lines in the Orion-KL region. 1.3 cm line.
AG-78	D. Gary (Colorado) J. Linsky (Colorado)	Stellar coronal radio sources. 6 and 21 cm.
AG-79	F. Ghigo (Minnesota) J. van der Hulst (Minnesota) B. Hine (Minnesota)	HI in ring galaxy NGC 2793. 21 cm line.
AG-81	S. Gottesman (Florida) T. Hawarden (Royal Obs., Scotland)	HI in galaxies NGC 1512/10 and NGC 5291. 21 cm line.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AG-83	D. Gordon (Sys. & App. Sci.) S. Gottesman (Florida)	HI in blue compact galaxies. 20 cm line.
AH-50	T. Heckman (Arizona) W. van Breugel (KPNO) G. Miley (Leiden) B. Balick (Washington)	3C 305--a spiral radio galaxy. 2 cm.
AH-59	P. Ho (Calif., Berkeley) R. Genzel (Calif., Berkeley)	Mass outflow in the W51-IRS2 region. 1.3 cm line.
AH-63	E. Hummel (New Mexico) J. van der Hulst (Minnesota) G. S. Shostak (Leiden)	Spiral arms in NGC 1961 and NGC 4414. 6 and 20 cm.
AH-66	C. Heiles (Calif., Berkeley) T. Troland (Kentucky) W. M. Goss (NFRA) R. Forster (NFRA)	Structure of Zeeman splitting in Orion A absorption line. 21 cm line.
AH-68	D. Hogg A. Wilson (Maryland)	Crab Nebula. 2, 6, and 20 cm.
AH-72	D. Hogg	Radio spectral index of WR stars. 1.3, 2, 6, and 20 cm.
AH-75	P. Ho (Calif., Berkeley) A. Haschick (Haystack) J. van Gorkom	Recombination lines in compact HII structures in G10.6-0.4. 2 and 6 cm line.
AH-78	E. Hummel (New Mexico) C. Kotanyi (Groningen)	Disk component of S0 galaxies. 20 cm.
AH-80	E. Hummel (New Mexico) M. Zeilik (New Mexico)	Selected area in M31. 6 cm.
AJ-68	K. Johnston (NRL) T. Wilson (MPIR) C. Henkel (MPIR) J. Martin (MPIR) J. Bieging (Calif., Berkeley)	Formaldehyde in molecular clouds. 6 cm line.
AJ-72	M. Janssen (JPL) D. Muhleman (Caltech) G. Berg (Caltech) M. Klein (JPL)	"Weather" on Venus. 1.3 and 2 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AJ-73	D. Jaffe (Chicago) D. Harper (Chicago) C. Telesco (Hawaii)	Nearby spiral galaxies. 6 cm.
AJ-74	K. Johnston (NRL) P. Seidelman (USNO) C. Wade M. A'Hearn (Maryland)	Radio brightness of Ceres and Pallas. 2 and 6 cm.
AJ-75	K. Johnston (NRL) P. Angerhofer (USNO) R. Hjellming	Rapidly variable stellar sources. 2, 6, and 20 cm.
AK-47	S. Kwok (NRC, Canada) R. C. Bignell	AFGL 618--nascent planetary nebula? 1.3, 2, 6 and 20 cm monitoring.
AK-50	S. Kwok (NRC, Canada) H. Matthews (NRC, Canada)	Circumstellar envelopes about late-type stars. 1.3 cm line.
AK-51	M. Kundu (Maryland) E. Schmahl (Maryland) M. Bobrowsky (Maryland) F. Erskine (Maryland)	Solar active regions and flares. 1.3, 2, 6, and 20 cm.
AK-52	G. Knapp (Princeton) D. Spergel (Princeton)	Envelopes of Red Giant stars. 6 cm.
AL-25	R. Landau (Minnesota) E. Epstein (Aerospace Corp.) T. Jones (Minnesota) J. Puschell (Calif., San Diego) J. Rather (BDM Corp.)	Spectra of compact sources. 1.3, 2, 6 and 20 cm monitoring.
AL-39	K. Lo (Caltech) W. Sargent K. Young (Caltech)	HI in four faint dwarf galaxies. 21 cm line.
AL-40	R. Laing A. Bridle (Queen's)	Outer lobes of M84. 6 cm.
AL-41	R. Laing	3C 20. 2 cm.
AM-30	G. Miley (Leiden) W. van Breugel (KPNO) H. Butcher (KPNO) E. Fomalont T. Heckman (Arizona)	Coma A. 2 cm.

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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<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AR-43	S. Reynolds (Virginia) R. Chevalier (Virginia) S. Neff (Virginia)	Young SNRs: Kepler, Tycho, SN1006. 6 and 20 cm.
AR-54	A. Rots J. Goad (KPNO) M. Roberts	Neutral H in a super-thin galaxy, NGC 7321. 20 cm line.
AS-76	E. Seaquist (Toronto) N. Duric (Toronto) P. Crane J. Auman (British Columbia) B. Campbell (CFHT, 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.
AS-96	L. Smarr (Illinois) R. Ekers W. van Breugel (KPNO)	Dumbbell galaxies. 20 cm.
AS-102	S. Spangler R. Laing	Spectral index maps of 3C 192. 6 cm.
AS-103	J. Stocke (Arizona)	Isolated "head-tail" radio galaxy candidates. 6 and 20 cm.
AS-105	R. Sancisi (Leiden) R. Ekers M. Shapiro (NRL)	Halo of edge-on spiral NGC 4631. 6 and 21 cm.
AT-21	J. Turner (Calif., Berkeley) P. Ho (Calif., Berkeley)	Massive star formation in nearby spiral nuclei. 1.3, 2 and 6 cm.
AU-7	M. Ulmer (Northwestern) R. Brown R. Cruddace (NRL)	Possible SNR associated with X-ray/ radio complex. 6 and 20 cm.
AU-9	M. Ulmer (Northwestern) R. Hanisch (Maryland)	Survey of binary and trinary X-ray emitting rich clusters of galaxies. 20 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AV-43	J. van der Hulst (Minnesota) E. Hummel (New Mexico) J. van Gorkom C. Kotanyi (Groningen) W. Golisch (Minnesota)	Interacting galaxies--noncentral components. 6 and 20 cm.
AV-52	J. van der Hulst (Minnesota) R. Sramek K. Weiler (NSF)	The next four supernovae. 2, 6, and 20 cm.
AV-53	J. van der Hulst (Minnesota) P. Crane R. Brown M. Ondrechen (Minnesota)	Central source in M31. 6 cm.
AV-58	J. van der Hulst (Minnesota) A. Haschick (Haystack) A. Tubbs J. van Gorkom	HI emission from Centaurus A. 20 cm line
AV-59	J. van der Hulst (Minnesota) P. Crane R. Kennicutt (Minnesota) R. Allen (Groningen)	Disks of spiral galaxies NGC 5194 and NGC 6946. 6 cm.
AV-60	J. van der Hulst E. Hummel (New Mexico) M. Ondrechen (Minnesota)	Halo of NGC 253. 6 and 20 cm.
AV-62	J. van Gorkom J. van der Hulst (Minnesota) E. Hummel (New Mexico) M. Ondrechen (Minnesota)	Peculiar barred spiral NGC 1097. 21 cm line.
AV-64	W. van Breugel (KPNO) T. Heckman (Arizona) G. Miley (Leiden) H. Butcher (KPNO)	Radio galaxies 4C 26.42 and 4C 29.30 with optical emission lines in lobes. 2 cm.
AV-65	W. van Breugel (KPNO) G. Miley (Leiden) T. Heckman (Arizona) H. Butcher (KPNO)	Fine structure in 3C 310. 6 cm.
AV-66	S. Vogel (Calif., Berkeley) W. J. Welch (Calif., Berkeley)	Compact HII region K3-50. 1.3, 2, and 6 cm.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
AW-51	J. Wall (Royal Greenwich Obs.) E. Fomalont K. Kellermann	Deep survey. 6 cm.
AW-56	C. Wade R. Perley	Optically flaring quasar 1156+295. 1.3, 2, 6 and 20 cm.
AW-58	R. Windhorst (Leiden) G. Miley (Leiden) F. Owen T. Thuan (Virginia)	Deep survey of optical and X-ray selected areas. 6 and 20 cm line.
AW-61	C. Wynn-Williams (Hawaii)	Hot spots in NGC 2903. 2 cm.
AW-63	T. Wilson (MPIR) R. Martin (MPIR) T. Pauls (Koln, Germany) S. Guilloteau (IRAM, France) C. Kahane (IRAM, France)	Search for a masering transition of ammonia. 1.3 cm line.
AZ-15	B. Zuckerman (Maryland) R. Sopka (Maryland) A. Michalitsianos (Goddard) R. Hobbs (Goddard) M. Kafatos (George Mason)	Radio spectrum and extended structure of R Aquarii. 1.3, 2, 6, and 20 cm.
AZ-16	H. Zirin (Caltech) K. Marsh (Caltech) G. Hurford (Caltech) K. Topka (Caltech)	Solar flares and active regions. 2 and 6 cm.
AZ-17	H. Zirin (Caltech) K. Topka (Caltech) K. Marsh (Caltech)	Nearby O, F and dME stars. 6 and 20 cm.
VB-24	L. Baath (Chalmers) W. Cotton G. Seielstad (Caltech) D. Graham (MPIR)	Fine structure in BL Lac type objects. 1.3 cm single antenna VLB.
VG-19	B. Geldzahler (MIT) D. Shaffer (Phoenix Corp.) I. Pauliny-Toth (MPIR)	G127.11+0.54. 6 cm phased array MK III VLB.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
VG-21	G. Garay (CFA) J. Moran (CFA) M. Reid (CFA) M. Schneps (CFA) A. Garcia (MIT) B. Burke (MIT)	Polarized OH maser emission. 18 cm line MK III VLB.
VH-3	M. Hodges (Iowa) R. Mutel (Iowa) D. Backer (Calif., Berkeley)	Polarization of compact extragalactic sources. 18 cm VLB.
VJ-13	K. Johnston (NRL) J. Spencer (NRL) E. Fomalont R. Perley W. Cotton A. Witzel (MPIR)	Maps of 18 compact extragalactic objects. 18 cm VLB.
VJ-16	D. Jones (Caltech) J. Wrobel (Toronto) D. Shaffer (Phoenix Corp.)	NGC 1052. 6 cm phased array VLB.
VL-11	K. Lo (Caltech) J. Moran (CFA) D. Backer (Calif., Berkeley)	Galactic center. 1.3 cm single antenna MK III VLB.
VM-13	J. Moran (CFA) D. Downes (IRAM, France) R. Genzel (Calif., Berkeley) A. Haschick (MIT) M. Reid (CFA) R. Ronnang (Chalmers) M. Schneps (CFA)	Proper motions of water masers. 1.3 cm line single antenna VLB.
VM-23	R. Moore (Caltech) A. Readhead (Caltech) A. Moffet (Caltech)	3C 84 and 3C 345. 1.3 cm single antenna VLB.
VN-2	S. Neff (Virginia) J. Benson R. Brown	Cores of objects with "S" distortions. 6 cm single antenna VLB.
VR-16	D. Roberts (Brandeis) J. Wardle (Brandeis) R. Potash (Brandeis) B. Burke (MIT) A. Rogers (Haystack)	Polarization measurements of extragalactic sources. 6 cm phased array MK III VLB.

<u>No.</u>	<u>Observer(s)</u>	<u>Proposal</u>
VW-12	A. Wolfe (Pittsburgh) F. Briggs (Pittsburgh) K. Johnston (NRL)	Absorption line source A0235+164. 18 cm VLB.
VW-14	R. C. Walker G. Seielstad (Caltech) S. Unwin (Caltech) J. Benson	3C 120 superluminal motion. 6 cm phased array VLB.
VW-15	J. Wrobel (Toronto) D. Jones (Caltech) D. Shaffer (Phoenix Corp.)	NGC 3894. 6 cm phased array. MK III VLB.

ELECTRONICS DIVISION

Charlottesville

Improved mixers for use at the 36-foot telescope at 115 GHz have been fabricated and are undergoing tests and diode selection. Work is continuing on a 200-300 GHz receiver and broadband triplers.

The development of 15 GHz GASFET amplifiers for the VLA continues. Three-stage amplifiers, giving 25 dB gain and 40 K to 60 K noise temperature, have been designed, and three units are undergoing final tests. A waveguide noise standard for evaluating the amplifiers has been completed. Several more 1.4 GHz amplifiers have been completed this quarter.

Work continues on the testing of superconducting tunnel junctions for millimeter mixer use.

An investigation of the use of video tape recorders for VLBI data recording at a data rate of 16 to 20 mb/s has started.

Green Bank

The cooled-GASFET 21-cm receiver was installed on the 300-foot telescope for the first time during this quarter. As expected, the system temperature achieved at zenith was 45 K. Various sources of interference were encountered with this receiver; a detailed memo listing these was generated.

Construction of the 5-25 GHz receiver is continuing. Problems with the refrigerator on the 140-foot system have apparently been cured by replacing the 4° switch; all transitions have been installed and the system has cooled down properly and maintained temperature for the past few months.

Modification of the 4-feed, 21-cm receiver with GASFET's is in progress; this receiver will be available in late spring.

The NRAO 43 GHz maser-amplifier was integrated into a system at Haystack, with some assistance from Green Bank. From 41.5 GHz to 47.5 GHz, the receiver exhibited 20 dB of gain, an instantaneous bandwidth of 70 MHz, and a system temperature of 90 K, including the radome.

A 22 GHz maser amplifier was mechanically modified to allow testing of 1-5 GHz upconverters. Design work has been done to improve the match of these upconverters to the maser.

A 16-channel differential multiplexer which interfaces with the APPLE computer was built and tested.

Hardware improvements to the Digital Standard Receiver were made in order to improve the interface to the MODCOMP. Substantial software development has been done to accommodate various observing modes, both at the 140-foot and 300-foot telescopes. The receiver was used very successfully at the 140-foot. Benchmark tests of various computers considered for future Digital Standard receiver implementation were run. The popular home computers fared poorly against the HP 9825; details can be found in Electronics Division Technical Note 103.

Baseline stability tests of the Model IV autocorrelator have been performed. Also, tests to determine the effects of reduced clipper bandwidth in autocorrelator and other sampling systems have been performed. Reports on both these are forthcoming.

Design of the microwave link for the additional baseline to the interferometer is almost complete. Various components are now out for bid. A new reflector was installed in the existing microwave link early in the quarter. Thus far, its performance over wide extremes of temperature has been satisfactory.

Some contributions have been made to the rewriting of the VLBA proposal.

Tucson

During this quarter the telescope has been used for scheduled 1 mm programs in both line and continuum. The He₃ bolometer on the antenna achieves a sensitivity of 8 Jy in one second at 1.1 mm and the 230 GHz cooled mixer receiver has a sensitivity of 15 Jy in one second at 1.3 mm. Factors of 2-3 improvement in the bolometer performance are still possible, and the resurfacing of the antenna should give a further factor of eight.

A prototype dual polarization diplexer has been built and tested during this quarter. This device will be used for the L.O. injection and image termination in the new generation of millimeter wave receivers.

Socorro

During this quarter the array observed for the first time in the D array which is the most compact configuration. Problems with antenna

shadowing and cross-talk between the antennas were experienced for the first time.

Several new sources of radio interference in the vicinity of the protected hydrogen band of frequencies were detected. The interference problems will be solved by replacing the cooled parametric upconverters in the receiver with cooled FET amplifiers built by the Central Development Lab. This change was successfully made and tested in the receiver on antenna 10.

Finally, the hydrogen maser clock on loan to the VLA from the Smithsonian Astrophysical Observatory (SAO) was returned to them. Until a new maser can be obtained, all VLBI experiments using the VLA will use a Rubidium frequency standard.

COMPUTER DIVISION

Charlottesville

CPU Change - The IBM Model 360/65 central processing unit (CPU) has been replaced by an IBM Model 4341 Group I. With minor exceptions, the peripherals remain the same. The new CPU currently runs the same operating system and same applications software; it is plug compatible with the old system.

Work has begun on bringing up IBM's CMS software (conversational monitor system) to support interactive programming.

IBM/AIPS Development - Work has commenced on running AIPS (less array processor or I²S display tube) on the IBM system. The intent is to make the system look to the user as the one which runs on the VAX. The idea is that the user will use the VAX or MODCOMP for work requiring the I²S and the IBM for work not requiring the display system. The IBM will not have an array processor but should be considerably faster on I/O bound operations, i.e., sorts, etc.

Remote Users - Modest support for remote computing on the IBM system now exists. This will not permit general purpose computing, but will let a user run one of NRAO's standard programs on his data tape stored in the computer tape library. Eventually remote AIPS processing will be possible on the VAX computer. At present, remote use is still considered an experiment, and the procedure is somewhat clumsy.

VLBI - Remote processing is now supported on the IBM system. Eventually, remote post-processing will be available on the VAX.

Green Bank

Telephone Modem Use for Continuum Observing - It is now possible for off-site observers with the proper equipment (Racal-Vadic Modem and

Tektronix 4012 or 4010 CRTs) to process continuum data on the 300-foot telescope with the analysis MODCOMP computer utilizing commercial telephone lines.

Digital Receiver - The digital standard receiver Mark III has been interfaced to the MODCOMP computer at the 140-foot telescope and used for continuum observing.

Socorro

Communication between the VLA computers has progressed substantially with the installation of DECNET network software on all machines. The DEC-10 and PDP-11's communicate regularly, as do the VAX at Charlottesville and one VAX at the VLA. However, complete connections of all computers is awaiting further hardware to be delivered in mid-1982.

The AIPS system on the VAX continues to be heavily used and the hardware to duplicate AIPS on the second VAX at the VLA has been delivered. It will be installed during the first week of January, 1982.

Computer hardware fault/maintenance reporting has been incorporated into the system used for antennas and electronics. This allows accumulation of failure statistics for computer equipment and streamlines the reporting of hardware problems. On the DEC-10, a program now provides monthly summaries of the usage of that machine, broken down by time of day and user class; it also monitors the activity of some of the major data reduction programs.

ENGINEERING

The Engineering Division concentrated on the new 12-meter project, which included design, procurement of materials and fabrication of some components for the reference jig, measuring template, back-up structure, surface plates, mirror selection system, receiver support system and inductosyns.

Site development was started at the Monterville site for the interferometer addition. A contract was negotiated for a new antenna for the interferometer addition.

Assistance was provided other NRAO sites with their engineering problems.

PERSONNEL

New Hires

Donald S. Retallack	Assoc. Division Head, VLA Computer Division	09/22/81
Renzo Sancisi	Visiting Scientist	10/05/81
Barbara A. Williams	Research Associate	10/12/81
David R. Merritt	Research Associate	12/15/81

Terminations

Galen R. Gisler	Associate Scientist	10/31/81
Duane D. Madron	Head/Plant Maintenance	12/31/81
Albert H. Steinemann	Head/Shops Division	12/31/81
Riccardo Giovanelli	Systems Scientist	12/28/81

Retirements

Julian M. Hamed	Mechanical Engineer I	12/31/81
William D. Kuhlken	Technical Specialist I	12/31/81
Howard H. Brown	Technical Specialist I	12/31/81

Leave of Absence

Harvey S. Liszt	Scientist	11/01/81
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Return from Leave of Absence

Magne B.R. Hagstrom	Electronics Engineer	10/19/81
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APPENDIX

January 1981

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- A 1153 Balonek, T.J. and Dent, W.A. A Second Correlated Radio-Optical Outburst in the BL Lacertae-Type Quasi-Stellar Object 0235+164.
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1980. ASTROPHYS. J., 240, 828-833.
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1980. ASTROPHYS. J., 240, 751-758.
- A 1148 Elmegreen, B.G.; Elmegreen, D.M.; and Morris, M. On the Abundance of Carbon Monoxide in Galaxies: A Comparison of Spiral and Magellanic Irregular Galaxies.
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- A 1164 Fix, J.D.; Mutel, R.L.; Benson, J.M.; and Claussen, M.L. VLBI Observations of Main-Line OH Emission from U Orionis.
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- A 1136 Giovanelli, R. Studies of High-Velocity Clouds. I. A High-Sensitivity Survey.
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- A 1158 Greenfield, P.E.; Burke, B.F.; and Roberts, D.H. The Double Quasar 0957+561 as a Gravitational Lens: Further VLA Observations.
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- A 1138 Haschick, A.D.; Crane, P.C.; Greenfield, P.E.; Burke, B.F.; and Baan, W.A. High-Resolution Observations of the Neutral Hydrogen Absorption and Radio Continuum Emission of the Radio Source 3C 178.
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- B 515 Hjellming, R.M. Radio Aspects of Stellar Activity in Close Binaries.
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- A 1161 Kojoian, G.; Tovmassian, H.M.; Dickinson, D.F.; and Dinger, A.S.C. Radio Survey of Markarian Galaxies at 6 and 11 cm.
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- B 513 Liszt, H.S. Atomic and Molecular Gas in the Inner Regions of the Milky Way and Other Galaxies.
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- A 1157 Loren, R.B.; Wootten, A.; Sandqvist, Aa.; and Bernes, C. 2 Centimeter H₂CO Emission in the ρ Ophiuchi Cloud.
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- A 1155 Marsh, K.A. and Hurford, G.J. Two-Dimensional VLA Maps of Solar Bursts at 15 and 23 GHz with Arcsec Resolution.
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- A 1145 Sandqvist, Aa. and Bernes, C. Formaldehyde as a Probe of Dark Clouds.
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