

February 1

NATIONAL RADIO ASTRONOMY OBSERVATORY  
Charlottesville, Virginia

RADIO ASTRONOMY CENTER  
CHARLOTTESVILLE, VA.

Quarterly Report

JAN 23 1984

October 1, 1983 - December 31, 1983

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RESEARCH PROGRAMS

<u>140-foot Telescope</u>	<u>Hours</u>
Scheduled observing	1750.75
Scheduled maintenance and equipment changes	247.75
Scheduled tests and calibration	75.50
Time lost due to: equipment failure	24.00
power	1.00
weather	48.75
interference	0.50

The following line programs were conducted during this quarter:

<u>No.</u>	<u>Observer</u>	<u>Program</u>
B410	L. Avery (Herzberg) N. Broten (Herzberg) J. MacLeod (Herzberg)	Observations over the range 19.6-21 GHz to search for carbon molecules in IRC+10°216.
H184	D. Hegyi (Michigan) M. Kutner (Rensselaer) B. Rauscher (Rensselaer)	Observations at 10.7 GHz for small-scale anisotropy in the cosmic background radiation.
L159	F. J. Lockman	A deep, systematic recombination-line survey at 3 cm of continuum sources in the galaxy.
L184	R. Loren (Texas) L. Mundy (Texas) H. A. Wootten	Search at 24.4 GHz for the symmetric top molecule methyldiacetylene.
M179	A. Baudry (Bordeaux I) S. Guilloteau (Bordeaux I) H. Matthews (Herzberg) A. Winnberg (Chalmers)	Observations of OH maser emission in the $2\pi_{3/2}$ , $J = 7/2$ lines at 13.4 GHz.
M213	W. Irvine (Massachusetts) H. Matthews (Herzberg) C. McGunigle (Massachusetts) P. Friberg (Massachusetts) T. Sears (Herzberg)	Observations at 1.5 cm of interstellar acetaldehyde and ketene.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
R175	L. Rickard (Howard) B. Turner	Search at 4 frequencies between 7274 and 7396 MHz for the $2\pi_{1/2}$ , $J = 3/2$ state of CH.
Z45	L. Ziurys (Calif., Berkeley) K. Evenson (Calif., Berkeley) G. Fuller (Calif., Berkeley) R. Saykally (Calif., Berkeley) J. Brown (Calif., Berkeley)	Search at 2.97 GHz for interstellar silicon hydride (SiH).

The following Very Long Baseline programs were conducted, and the stations used in the observations are coded as follows:

A - Arecibo 1000 ft	N - NRL Maryland Point 85 ft
B - Effelsberg MPIR 100 m	O - Owens Valley 130 ft
C - Algonquin 150 ft	P - Penticton, B.C. 85 ft
F - Fort Davis 85 ft	R - Crimea USSR 30 m
G - Green Bank 140 ft	Sk - Kirunda, Sweden 60 ft
H - Hat Creek 85 ft	Sn - Onsala 20 m
I - Iowa 60 ft	So - Onsala 25 m
Jb - Jodrell Bank MK II	Wd - Dwingeloo 25 m
Jm - Jodrell Bank 250 ft	Wn - Westerbork $n = 1 - 14 \times 26$ m
Km - Haystack 120 ft	Yn - Socorro $n = 1 - 27 \times 25$ m
L - Bologna 25 m	

<u>No.</u>	<u>Observer</u>	<u>Program</u>
B47V	N. Bartel (CFA)	Observations at 6 cm of SN 1979c, with telescopes B, G, Km, O, and Yn.
B48V	L. Baath (Chalmers) J. Campbell (Bonn) D. Graham (MPIR, Bonn)	Observations at 6 cm of the Abell Cluster 2634, with telescopes B, F, G, Jb, Km, L, O, So, Wn, and Yn.
B50V	A. de Bruyn (NFRA) S. Neff (NFRA)	Study at 6 cm of the core-jet structure of the variable radio source in the Seyfert 2 galaxy Markarian 348, with telescopes B, F, G, Jb, Km, L, O, So, Wn, and Yn.
B382V	L. Baath (Chalmers) F. Briggs (Pittsburgh) M. Davis (NAIC) K. Johnston (NRL) D. Jones (Caltech) J. Romney (MPIR, Bonn) B. Ronnang (Chalmers) S. Unwin (Caltech) A. Wolfe (Pittsburgh)	Monitoring the 932 MHz absorption line in AO 0235+164, with telescopes A, B, G, O, and Sk.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
B385V	L. Baath (Chalmers) F. Briggs (Pittsburgh) M. Davis (NAIC) K. Johnston (NRL) D. Jones (Caltech) J. Romney (MPIR, Bonn) B. Ronnang (Chalmers) S. Unwin (Caltech) A. Wolfe (Pittsburgh)	Monitoring of low-frequency variables at 932 MHz, with telescopes A, B, G, O, and Sk.
D2V	G. de Waard (Leiden) G. Miley (Leiden) E. Preuss (MPIR, Bonn) R. Schilizzi (NFRA)	Observations at 6 cm, with telescopes B, G, So, and Yn.
D3V	R. Booth (Chalmers) P. Diamond (Chalmers) D. Graham (MPIR, Bonn) K. Johnston (NRL) R. Norris (Manchester)	Global VLBI observations at 1.3 cm of the H <sub>2</sub> O masers associated with evolved stars, with telescopes B, G, Jb, Km, N, R, and Sn.
E7V	A. Eckart (MPIR, Bonn) K. Johnston (NRL) A. Witzel (MPIR, Bonn)	Observations of complete sample of extragalactic sources at 6 cm, with telescopes B, G, Jb, Km, O, So, and Wn.
G35V	B. Geldzahler (NRL) K. Johnston (NRL) J. Spencer (NRL) E. Waltman (NRL)	Observations of CTA 26 at 18 cm, with telescopes B, F, G, H, I, Km, N, O, P, and Yn.
H8V	D. Hough (Caltech) A. Readhead (Caltech)	Mapping at 2.8 cm the central components of the double-lobed quasars 3C 245 and 3C 249.1, with telescopes B, F, G, Km, and O.
H9V	M. Hodges (Iowa) S. Novotny (Massachusetts) R. Phillips (Haystack)	Observations at 18 cm to the "Corkscrew" source NRAO 150, with telescopes B, F, G, H, I, Jm, Km, N, O, P, So, Wn.
L22V	R. Linfield (Calif., Berkeley) R. Simon (NRL)	Mapping at 90 cm of the lobes of 3C 234, with telescopes F, G, H, I, Jm, Km, N, O, and Yn.
L25V	J. Lestrade (JPL) J. Doiron (Iowa) R. Mutel (Iowa) A. Niell (JPL) R. Preston (JPL)	Observations of RSCVn binary systems at 18 cm, with telescopes B, F, G, Km, O, and Yn.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
M47V	R. Moore (Caltech) L. Baath (Chalmers) A. Readhead (Caltech)	Observations at 1.3 cm of the structure and alignment of 3C 345, with telescopes B, C, G, Km, O, Sn, and Yn.
M50V	A. Marscher (Boston) B. Geldzahler (NRL) R. Booth (Chalmers) D. Shaffer (Interferometrics)	Search at 1.3 cm for the "cores" of the subluminal quasars 4C 39.25 and PKS 2134+004, with telescopes B, G, Km, N, O, Sn, and Yn.
M51V	L. Molnar (CFA) M. Reid (CFA) J. Romney (MPIR, Bonn)	Polarization synthesis of "core-jet sources" at 18 cm, with telescopes B, F, G, Km, O, N, and Yn.
N7V	R. Norris (Manchester) P. Diamond (Chalmers) D. Graham (MPIR, Bonn) K. Johnston (NRL) R. Booth (Chalmers) T. Perry (Manchester)	Observations at 1612 MHz of the compact OH maser in OH 127.8, with telescopes B, G, Jm, O, R, and So.
N8V	S. Neff (NFRA) T. Muxlow (NFRA)	Observations at 6 cm of proper motions in 3C 418, with telescopes B, F, G, Jb, Km, O, So, and Yn.
P42V	R. Phillips (Haystack) R. Mutel (Iowa) M. Hodges (Iowa)	Observations at 2.8 cm to study a new BL Lacertae outburst, with telescopes B, F, G, H, Km, and O.
P44V	I. Pauliny-Toth (MPIR, Bonn) L. Baath (Chalmers) R. Porcas (MPIR, Bonn) W. Sheng-Yin (MPIR, Bonn) A. Zensus (MPIR, Bonn) K. Kellermann	Observations of 3C 454.3 at 1.3 cm, with telescopes B, F, G, H, Km, and O.
P45V	R. Porcas (MPIR, Bonn)	Observations of 3C 179 at 1.3 cm, with telescopes B, G, Km, and O.
P46V	T. Pearson (Caltech) A. Readhead (Caltech)	Second epoch observations at 6 cm of a complete sample of radio sources, with telescopes B, G, I, Km, O, and Yn.
P49V	I. Pauliny-Toth (MPIR, Bonn) R. Porcas (MPIR, Bonn) W. Sheng-Yin (MPIR, Bonn) A. Zensus (MPIR, Bonn) K. Kellermann	Observations at 6 cm of the 3C 454.3 jet, with telescopes B, F, G, I, Jb, Km, O, So, and Wn.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
P50V	G. Pilbratt (Chalmers) R. Booth (Chalmers) I. Browne (Manchester) L. Baath (Chalmers) R. Porcas (MPIR, Bonn)	High-resolution monitoring at 6 cm of 3C 279, with telescopes B, G, Jb, Km, N, O, So, Wn, and Yn.
R26V	D. Roberts (Brandeis) R. Potash (Brandeis) B. Burke (MIT) A. Rogers (Haystack) J. Wardle (Brandeis)	Linear polarization measurements at 6 cm of strong extragalactic radio sources, with telescopes G, Km, O, and Yn.
S33V	R. Simon (NRL) A. Readhead (Caltech) M. Chown (Caltech) R. Spencer (Manchester) P. Wilkinson (Manchester)	Observations at 90 cm of compact extragalactic radio sources, with telescopes F, G, H, I, Jb, Km, N, O, and Yn.
T3V	J. Taylor (Princeton) C. Gwinn (Princeton) J. Weisberg (Princeton)	Pulsar astrometry observations at 18 cm, with telescopes A, G, and O.
W23V	R. C. Walker S. Unwin (Caltech) J. Benson G. Seielstad (Caltech)	Monitor 3C 120 at 6 cm, with telescopes A, B, F, G, H, I, Km, and So.
W24V	J. Wrobel (Caltech) R. Simon (NRL)	Observations at 90 cm of compact radio sources in galaxy pairs, with telescopes F, G, H, I, Km, N, O, and Yn.
X14V	L. Baath (Chalmers) R. Estalella (Barcelona) A. Rius (Madrid) J. Romney (MPIR, Bonn) M. Sanroma (Barcelona) W. Cotton	Observations at 18 cm of the "optically quiet quasar" 1958+171, with telescopes B, G, Jb, So, and Wd.
X15V	B. Dennison (VPI & SU) B. Geldzahler (NRL)	Observations at 2.8 cm to observe sources 1819-096 and 1829-106, with telescopes F, O, G, and Km.
X16V	B. Geldzahler (NRL) K. Johnston (NRL) J. Spencer (NRL) E. Waltman (NRL)	Observations at 1.3 cm of CTA 26, with telescopes G, Km, N, O, and Yn.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
X19V	N. Bartel (MIT) C. Bennett (MIT) R. Bonometti (MIT) B. Burke (MIT) E. Falco (CFA) M. Gorenstein (CFA) J. Hewitt (MIT) C. Lawrence (Caltech) L. Molnar (CFA) M. Reid (CFA) A. Rogers (Haystack) J. Romney (MPIR) I. Shapiro (CFA) E. Turner (Princeton)	Observations at 6 cm of 2016+112A,B,C, with telescopes B, F, G, Km, and So.
X21V	S. Neff (NFRA)	Observations at 6 cm of MK 231, with telescopes I, G, K, and O.
Z6V	A. Zensus (MPIR, Bonn) R. Porcas (MPIR, Bonn)	Observations at 2.8 cm of 1206+43, with telescopes B, G, Km, and O.

300-foot TelescopeHours

Scheduled observing	1877.50
Scheduled maintenance and equipment changes	128.50
Scheduled test and calibration	0.00
Time lost due to: equipment failure	37.25
power	0.00
weather	2.00
interference	0.00

The following continuum programs were conducted during this quarter.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
A59	H. Aller (Michigan) M. Aller (Michigan) R. Fanti (Bologna) A. Ficarra (Bologna) F. Mantovani (Bologna) L. Padrielli (Bologna)	Observations at 1400 and 2695 MHz of low-frequency variable sources select- ed from the Bologna-Michigan program.
B335	T. Balonek (New Mexico) W. Dent (Massachusetts) W. Kinzel (Massachusetts) C. O'Dea (Massachusetts)	Polarization and flux density measure- ments of variable radio sources at 2695 MHz.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
B389	J. Broderick (VPI & SU) B. Dennison (VPI & SU) K. Mitchell (VPI & SU) C. O'Dea (VPI & SU) J. Condon H. Payne	Observations at 606, 880, and 1400 MHz of low-frequency variable sources.
C200	J. Broderick (VPI & SU) M. Condon (unaffiliated) J. Condon	Confusion limited map at 1400 MHz of the area $R.A. = 0^h < \alpha < 24^h$ , and $Dec. -15^\circ < \delta < +85^\circ$ .
H178	D. Heeschen	Observations at 9 cm to study the variability of extragalactic radio sources.
G265	R. Giovanelli (NAIC) M. Haynes (Cornell)	Continued observations of hydrogen in galaxies found in clusters and super-clusters.
W165	J. Dickel (Illinois) H. Rood (Princeton) B. Williams	Hydrogen observations of "compact groups" of galaxies.

The following pulsar program was conducted during this quarter.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
T178	J. Taylor (Princeton) D. Segelstein (Princeton) G. Stokes (Princeton) R. Dewey (Princeton) J. Weisberg (Princeton)	Continuation of Northern Hemisphere pulsar survey at 390 MHz.

#### Very Large Array

The quarter was scheduled 97.4 percent of the time.

Astronomical	1,640.2 hours	(74.3 percent)
Test	510.3 hours	(23.1 percent)

The average downtime was 8.30 percent.

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

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AB129	B. Burke (MIT) J. Hewitt (MIT) D. Roberts (Brandeis)	Monitoring time variations in 0957+561. 2 and 6 cm.
AB182	J. Burns (New Mexico) T. Balonek (Williams) E. Hummel (MPIR, Bonn)	Monitoring the cores of extended radio sources and spiral galaxies. 2, 6, and 20 cm.
AB189	B. Burke (MIT) D. Roberts (Brandeis) J. Hewitt (MIT)	The lens galaxy and possible third OSO image in 0957+561. 6 cm.
AB213	A. Benz (ETHZ, Zurich) E. Furst (MPIR, Bonn) W. Hirth (U. Bonn) A. Kiplinger (Goddard)	Search for radio emission in different phases of dwarf novae. 6 and 2 or 18 cm.
AB228	R. White (STScI) R. Becker (VPI & SU)	Early-type stars. 2 and 20 cm.
AB239	D. Bagri (Tata) A. Ananthakrishnan (Tata)	Nearby bright galaxies with compact nuclear components. 2, 6 and 20 cm.
AB243	A. Bosma (Leiden) E. Athanassoula (Besancon) A. Rots J. van der Hulst (NFRA) P. Crane	HI in the grand design spiral galaxy M51 (NGC 5194). 21-cm line.
AB250	J. Garcia-Barreto (U. Mexico) P. Pismas (U. Mexico)	A search for incipient, compact HII regions in the bars of SB galaxies. 6 and 20 cm.
AB252	R. Becker (VPI & SU) R. White (STScI)	Spatial resolution of massive stellar winds. 2 cm.
AB255	M. Begelman (Colorado) J. Burns (New Mexico) F. Owen	Candidate magnetically-confined jets. 2 and 6 cm.
AB256	D. Branch (Oklahoma) J. Cowan (Oklahoma)	Search for supernovae in NGC 3184. 20 cm.
AB257	J. Burns (New Mexico) D. Clarke (New Mexico) E. Feigelson (Penn State) E. Schreier (STScI)	The jet in Centaurus A. 2, 6, and 18 cm.
AB259	W. Baan (Penn State) A. Haschick (Haystack) J. Schmelz (Penn State)	OH and HI absorption properties of NGC 3628. 18 and 21-cm line.



<u>No.</u>	<u>Observer</u>	<u>Program</u>
AB261	P. Biermann (MPIR, Bonn) A. Bridle P. Kronberg (Toronto)	EO galaxy NGC 5846. 2, 6, and 20 cm.
AB262	A. Brown (Colorado) R. Mundt (MPI, Heidelberg) S. Drake (Colorado) J. Linsky (Colorado) F. Walter (Colorado)	Jets from young stars. 6 cm.
AB263	B. Burke (MIT) D. Roberts (Brandeis) J. Hewitt (MIT)	Double quasar 0957+561--search for the third image. 2 cm.
AB265	A. Bridle G. Byrd (Alabama) E. Fomalont M. Valtonen (Turku, Finland)	Fine structure of 3C 288. 2 cm.
AB266	J. Bally (Bell Labs) N. Kylafis (IAS-Princeton)	Magnetic fields in molecular clouds. 6 cm.
AB268	J. Bookbinder (CFA) L. Golub (CFA)	Mu Orionis and the Am stars. 2, 6, and 20 cm.
AC80	M. Claussen (Caltech) K. Lo (Caltech)	The central parsec of the Galaxy. 6 cm.
AC81	M. Claussen (Caltech) K. Lo (Caltech) J. van Gorkom	Monitoring of the flux of the compact source at the Galactic Center. 1.3, 2 and 6 cm.
AC82	W. Coles (Calif., San Diego) B. Rickett (Calif., San Diego) J. Armstrong (JPL) M. Kojima (Calif., San Diego and Nagoya, Japan)	Solar wind structure and motion close to the sun. 2, 6, and 20 cm.
AC84	B. Campbell (Arizona)	Sources associated with high-velocity molecular outflows. 2 and 6 cm.
AC85	S. Colgan (Cornell) E. Salpeter (Cornell) Y. Terzian (Cornell)	Formaldehyde absorption in 3C 123. 6 cm.
AC86	J. Cowan (Oklahoma) D. Branch (Oklahoma)	Supernova 1957d in M83. 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AC89	M. Cohen (NASA Ames) J. Bieging (Calif., Berkeley)	Spectral index mapping of T Tauri stars. 2, 6, and 20 cm.
AC90	B. Clark R. Perley A. Bridle	Small B3 sources. 2 and 6 cm.
AC92	T. Cawthorne (Cambridge, UK) P. Scheuer (Cambridge, UK)	Sources of high radio luminosity. 2 and 6 cm.
AD85	I. de Pater (Arizona) D. Hunten (Arizona) J. Caldwell (SUNY, Stony Brook) J. Dickel (Illinois) T. Owen (SUNY, Stony Brook)	Planetary atmospheres: Jupiter and Saturn. 20 cm.
AD90	J. Dickey (Minnesota) R. Perley	Survey of the first quadrant of the Galactic Plane. 20 cm.
AD94	I. de Pater (Arizona) K. Weiler (NSF) R. Fanti (Bologna) C. Fanti (Bologna)	Polarization characteristics in variable radio sources. 2, 6, and 21 cm.
AD96	J. Danziger (ESO) W. M. Goss (Groningen) R. Ekers	PKS 0521-36, a BL Lac object with optical jets. 20 cm.
AD111	I. de Pater (Arizona) S. Gulkis (JPL) T. Owen (SUNY, Stony Brook) H. Smith (Texas)	Uranus. 2, 6, and 20 cm.
AD115	H. Dickel (Illinois) W. M. Goss	Continuum structure of the ultra compact HII regions W58 C1 and C2. 2 and 6 cm.
AD119	N. Duric (Toronto) E. Seaquist (Toronto) P. Crane R. C. Bignell L. Davis (KPNO)	The edge-on spiral galaxy NGC 3079. 6 and 20 cm.
AE26	R. Ekers J. van Gorkom W. M. Goss U. Schwarz (Groningen)	Sgr A West. 20 cm.
AE27	A. Eckart (MPIR, Bonn) A. Witzel (MPIR, Bonn) K. Johnston (NRL)	Quasar 1928+73. 1.3, 2, 6, and 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AE28	V. Escalante (CFA) P. Ho (CFA) A. Haschick (Haystack) L. Rodriguez (U. Mexico)	Accurate positions of H <sub>2</sub> O masers associated with young objects. 1.3-cm line.
AF51	E. Feigelson (Penn State) G. Clark (MIT) J. Dreher (MIT)	Full synthesis of the counter jet of Hercules A. 6 cm.
AF61	J. Forster (CSIRO) J. Caswell (CSIRO)	Absolute positions of OH and H <sub>2</sub> O masers. 18 cm.
AF66	J. Fix (Iowa) S. Reynolds	Crab-like supernova remnants in M33. 6 and 20 cm.
AF72	E. Fomalont B. Geldzahler (NRL) R. Hjellming C. Wade	Fourth epoch observations of Sco X-1. 2, 6, and 20 cm.
AF73	E. Fomalont B. Geldzahler (NRL)	The core of Fornax A. 2 cm.
AG116	D. Gibson (Colorado) W. Friedhorsky (Los Alamos)	Monitoring Cyg X-1. 2, 6, and 20 cm.
AG117	D. Gibson (NMIMT & Colorado) J. Linsky (Colorado) J. Warwick (Colorado) C. Hayenga (NMIMT)	Quiescent emission from dMe stars. 2, 6, and 20 cm.
AG124	Gopal Krishna (Tata)	Six flat spectrum sources. 2, 6, and 20 cm.
AG127	F. Gardner (CSIRO) J. Whiteoak (CSIRO) V. Pankonin (NSF)	<sup>13</sup> C isotope of formaldehyde; Sgr B2. 6-cm line.
AG128	F. Gardner (CSIRO) J. Whiteoak (CSIRO) J. Forster (CSIRO) V. Pankonin (NSF)	Formaldehyde masers in Sgr B2. 6-cm line.
AG129	D. Gary (Caltech) J. Linsky (Colorado)	Coordinated microwave, optical and ultraviolet observations of the eclipsing binary YY Gem. 2, 6, and 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AG130	D. Gary (Caltech) J. Linsky (Colorado) R. Willson (Tufts) D. Gibson (Colorado) C. Hayenga (NMIMT)	Coordinated microwave, optical and ultraviolet observations of UV Ceti-type flare stars. Monitoring. 2 and 6 cm.
AG131	W. M. Goss (Groningen)	Four supernova remnants in M33. 20 cm.
AG132	A. Gower (Victoria) J. Hutchings (DAO)	Structure and polarization of the quasar 0137+012. 6 and 20 cm.
AG137	D. Gibson (Colorado) J. Linsky (Colorado) F. Walter (Colorado)	Simultaneous radio, optical and UV observations of eclipses in AR Lac. 2, 6, and 20 cm.
AG138	D. Gibson (Colorado) J. Cox (NMIMT)	Survey of solar neighborhood flare stars. 2 cm.
AH122	D. Hunter (KPNO) J. van Gorkom	HI observations of non-interacting irregular galaxies. 21-cm line.
AH127	J. Herman (Leiden) H. Habing (Leiden) B. Baud (Groningen)	OH/IR stars--3-dimensional structures and distances. 18-cm line.
AH129	E. Hummel (MIPR, Bonn) C. Kotanyi (ESO)	E-SO nuclei. 2, 6, and 20 cm.
AH132	R. Hjellming	Radio diameters of Betelgeuse and Antares. 1.3 and 2 cm.
AH137	R. Hjellming	Potential cavity nebulosities in cool stellar winds. 2 and 6 cm.
AH138	R. Hjellming R. C. Bignell B. Balick (Washington)	An interacting wind shock front in IC 3568. 6 cm.
AH139	R. Hjellming K. Johnston (NRL)	SS433. 2 and 6 cm.
AH140	R. Hjellming	Known cavity nebulosities in cool stellar winds. 1.3, 2, 6, and 20 cm.
AH141	P. Ho (CFA) J. Turner (Calif., Berkeley)	Nonthermal emission from compact nuclear sources. 2 cm.
AH142	E. Hummel (MIPR, Bonn) J. van der Hulst (NFRA) R. Kennicutt (Minnesota) W. Keel (KPNO)	Survey of a complete sample of interacting and multiple galaxies. 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AH143	E. Hummel (MPIR, Bonn) J. van der Hulst (NFRA) R. Sramek	Monitoring central radio sources to search for supernovae. 6 cm.
AH145	D. Hogg	The structure of the wind of Gamma 2 Velorum. 2, 6, and 20 cm.
AH146	E. Hummel (MPIR, Bonn) P. Crane	Extended emission near compact core sources in spiral galaxies: NGC 5635 and NGC 6500. 6 and 20 cm.
AI19	F. Israel (ESTEC) J. van der Hulst (NFRA)	Continuum observations of the HII regions in NGC 1569. 20 cm.
AJ95	K. Johnston (NRL) B. Geldzahler (NRL) J. Spencer (NRL) R. Hjellming	Evolution of a flare in Cyg X-3. 1.3, 2, 6, and 20 cm.
AJ99	K. Johnston (NRL) R. Sramek E. Fomalont D. McCarthy (USNO) K. Hildrup	Monitoring baseline parameters. 6 and 20 cm.
AJ102	W. Jaegers (Leiden) H. van der Laan (Leiden) R. Sanders (Groningen) A. Bridle E. Fomalont	The 3C 130 sources. 6 and 20 cm.
AJ103	K. Johnston (NRL) P. Bowers (NRL) J. Spencer (NRL) A. Lane P. Diamond (Onsala)	Positions and spatial distribution of the emission from H <sub>2</sub> O masers in OH/IR stars. 1.3-cm line.
AJ105	N. Jeske (Calif., Berkeley) M. Davis (Calif., Berkeley) M. Stevens (Calif., Berkeley)	Ring galaxies. 20 cm.
AK84	S. Kwok (NRC, Canada) R. C. Bignell	Slow nova HM Sagittae. 1.3, 2, 6, and 20 cm.
AK90	P. Kronberg (Toronto) R. Sramek	Monitoring variable sources in M82. 2, 6, and 20 cm.
AK94	S. Kwok (Calgary) R. C. Bignell	Core-halo structure of the proto-planetary nebula GL 618. 1.3 and 2 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AK95	P. Kronberg (Toronto) E. Zukowski (Toronto)	Rotation measure maps of three extended, absorption line quasars. 6 and 20 cm.
AK96	K. Kellermann R. Sramek D. Shaffer (Interferometrics) M. Schmidt (Caltech)	Structure of optically selected quasars. 6 cm.
AK97	N. Killeen (Mt. Stromlo) G. Bicknell (Mt. Stromlo) R. Ekers	PKS 1333-33. 6 cm.
AK98	N. Killeen (Mt. Stromlo) G. Bicknell (Mt. Stromlo) R. Ekers	PKS 0336-35. 6, 18, and 20 cm.
AK100	S. Kulkarni (Calif., Berkeley) A. Purvis (Cambridge, UK) W. M. Goss (Groningen) J. van Gorkom	Search for potential fast pulsar candidates. 20 cm.
AL66	J. Linsky (Colorado) S. Drake (Colorado)	Mass loss rates from late-type giant and supergiant stars. 2 and 6 cm.
AL69	K. Lang (Tufts) R. Willson (Tufts) J. Bookbinder (CFA) L. Golub (CFA) M. Giampapa (Sacramento Peak)	The dM4.5e flare stars AD Leo and YZ CMI. 2, 6, and 20 cm.
AL70	H. Liszt W. B. Burton (Leiden) J. van der Hulst (NFRA)	HI absorption toward Sgr A. 21-cm line
AL71	J. Lestrade (JPL) R. Mutel (Iowa) R. Preston (JPL) D. Doiron (Iowa)	Southern RS CVn binaries; search for radio emission. 6 and 18 cm.
AL73	R. Laing (Royal Greenwich Obs.)	Luminous extragalactic radio sources. 2 cm.
AM65	T. Menon (British Columbia)	Structure of small angular size Ooty sources. 2 and 6 cm.
AM74	J. Moran (CFA) L. Rodriguez (U. Mexico)	Precise astrometric measurements of the maser in NGC 6334. 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AM99	S. Morris (Inst. Astron., UK) M. Ward (Inst. Astron., UK) A. Wilson (Maryland)	Barred spiral NGC 5643. 6 and 20 cm.
AM105	P. Mauersberger (MPIR, Bonn) T. Wilson (MPIR, Bonn) K. Johnston (NRL) A. Lane P. Bowers (NRL) S. Knowles (NRL)	Spatial structure of the H <sub>2</sub> O outflows in GGD 5-6, GGD 25, GGD 27-28, Ceph OB3, and W49. 1.3-cm line.
AM107	L. Molnar (Harvard) M. Reid (CFA) J. Grindlay (CFA)	Polarization monitoring of Cygnus X-3 to verify 4.8h periodicity in position angle of polarization. 2 and 6 cm.
AP67	G. Pettengill (MIT) B. Chapman (MIT)	Radio emissivity of the surface of Venus. 20 cm.
AP71	R. Perley J. Dreher (MIT)	Cygnus A. 6 cm.
AP72	R. Perley R. Ekers	Superluminal motion in 3C 273, 3C 279, and 3C 454.3? 2 and 6 cm.
AP73	A. Pedlar (Manchester, UK) R. Davies (Manchester, UK) R. Perley P. Crane	The extended structure in NGC 1275. 20 cm.
AR69	A. Rao (Tata) S. Ananthakrishnan (Tata)	Angular sizes of sources showing interstellar scattering. 1.3, 2, and 6 cm.
AR86	N. Rao (Indian Inst. Astrophys.) V. Venugopal (Tata)	Extreme hydrogen deficient stars. 2 and 6 cm.
AR94	M. Reid (SAO) P. Ho (Harvard) G. Garay (U. Chile)	Compact HII regions associated with OH masers. 18 cm.
AR99	D. Rudy (Caltech) G. Berge (Caltech) D. Muhleman (Caltech)	Mars: Latitude distribution of sub-surface temperature and radial distribution of linear polarization. 2 and 6 cm.
AS79	S. Spangler (Iowa) W. Cotton S. Allendorf (Iowa)	Monitoring low-frequency variables. 1.3, 2, 6, and 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AS80	R. Sramek J. van der Hulst (NFRA) K. Weiler (NSF)	Monitoring SN 1980k in NGC 6946 and 1979c in M100. 6 and 20 cm.
AS133	P. Lindblad (Stockholm Obs.) A. Sandqvist (Stockholm Obs.) S. Jorsater (Stockholm Obs.)	Weak radio galaxies: barred spirals NGC 1365 and NGC 6613, and cluster ellipticals NGC 3309/11. 2, 6, and 20 cm.
AS135	D. Saikia (Tata) C. Salter T. Cornwell V. Kapahi (Tata)	Possible asymmetric D2-type sources. 2 and 6 cm.
AS163	E. Seaquist (Toronto) A. Taylor (Toronto)	Spectra of symbiotic stars. 6 and 20 cm.
AS168	G. Sandell (Helsinki) L. Nyman (Onsala) A. Winnberg (Onsala) A. Haschick (Haystack)	Masers in NGC 2071. 1.3 and 18-cm line.
AS172	A. Stark (Bell Labs/Princeton) M. Vietri (Princeton)	A search for gravitational lenses: quasars with CII absorption. 1.3, 2, and 6 cm.
AS175	P. Schwartz (NRL) M. Frerking (JPL)	HI absorption against L1455. 21-cm line.
AS177	R. Schlickeiser (MPIR, Bonn) W. Sieber (MPIR, Bonn) H. Kuhr (Arizona)	Radio sources near gamma ray sources.
AS178	E. Seaquist (Toronto) M. Bell (NRC, Canada)	Recombination lines in Mkr 668 (= 00208). 2 and 6 cm.
AS180	E. Salpeter (Cornell) S. Schneider (Cornell) Y. Terzian (Cornell) G. Helou (Cornell) J. Dickey (Minnesota)	Search for absorption in tenuous envelopes of galactic disks. 21-cm line.
AT26	Y. Terzian (Cornell) R. C. Bignell J. van Gorkom	Angular exponents of planetary nebulae. 6 cm.
AT42	J. Turner (Calif., Berkeley) P. Ho (CFA)	Synchrotron emission in spiral nuclei. 20 cm.



<u>No.</u>	<u>Observer</u>	<u>Program</u>
AT43	B. Turner H. Matthews (NRC, Canada) A. Winnberg (Onsala)	Shell structure in ultracompact HII regions. 2 cm.
AT44	R. Tuffs (Cambridge, UK) P. Angerhofer (USNO) M. Brown (Cambridge, UK) S. Gull (Cambridge, UK) R. Perley	Structure and secular change within Cassiopeia A at high spatial and temporal resolutions. 6 cm.
AT45	C. Tadhunter (Sussex, UK) R. Laing (Royal Greenwich Obs.) R. Fosbury (Royal Greenwich Obs.)	Elliptical radio galaxies with extended emission-line regions. 6 cm.
AU15	J. Ulvestad S. Neff (NFRA) A. de Bruyn (NFRA)	Compact cores in Seyfert galaxies. 1.3 and 2 cm.
AU18	J. Ulvestad A. Wilson (Maryland)	Seyfert galaxy MCG 8-11-11. 2 cm.
AU19	S. Unger (Manchester, UK) A. Pedlar (Manchester, UK)	NGC 6500 and NGC 5506. 20 cm.
AV84	W. van Breugel (Arizona) R. Strom (NFRA) J. Dickel (Illinois)	Radio polarimetry of Tycho's SNR. 20 cm.
AV86	W. van Breugel (Arizona) T. Heckman (Maryland) G. Miley (Leiden) M. Ulrich (ESO, FRG)	Optical line emission along the radio axes of two classical doubles. 20 cm.
AV89	W. van Breugel (Arizona) C. Fanti (Bologna) R. Fanti (Bologna) R. Schilizzi (NFRA) G. Miley (Leiden) T. Heckman (Maryland)	Steep spectrum radio cores. 1.3, 2, 6, and 20 cm.
AV90	W. van Breugel (Arizona) R. Schilizzi (NFRA)	Curved jet in M81. 20 cm.
AV96	J. van der Hulst (NFRA) R. Sramek K. Weiler (NSF)	Monitoring radio supernova in NGC 4258. 6 and 20 cm.
AV97	J. van der Hulst (NFRA) E. Hummel (MPIR, Bonn) R. Kennicutt (Minnesota) W. Keel (KPNO)	Central radio sources of spiral galaxies. 20 cm.

<u>No.</u>	<u>Observer</u>	<u>Program</u>
AV98	N. Vandenberg (Interferometrics) D. Shaffer (Interferometrics) C. Knight (Interferometrics) T. Clark (Goddard) P. Liebrecht (Goddard)	Interferometric tracking of the Tracking and Data Relay Satellite. 2 cm.
AW48	C. Wade K. Johnston (NRL) P. Seidelmann (USNO) G. Kaplan (USNO)	Astrometric observations of minor planets. 2 and 6 cm.
AW78	J. Wardle (Brandeis) R. Laing (Royal Greenwich Obs.)	Monitoring the variability of the central components of extended radio sources. 2 and 6 cm.
AW82	A. Wilson (Maryland) R. Fosbury (Royal Greenwich Obs.) E. Meurs (MPIA, FRG)	Arakelyan 102, giant radio galaxy, and ZW 1504+105, highly polarized source.
AW87	G. de Waard (Leiden) G. Miley (Leiden) R. Perley	Monitoring of IRAS active galaxies. 1.3, 2, 6, and 20 cm.
AW92	R. C. Walker J. Benson	The jet in 3C 120. 2 and 6 cm.
AW94	A. Wilson (Maryland) J. Ulvestad	The nuclear core of the Seyfert galaxy NGC 1068. 1.3 cm.
AW101	P. Wilkinson (Manchester, UK) T. Cornwell	Peculiar radio structure in QSO 1828+48 (3C 380). 1.3, 2, 6, and 18 cm.
VAH15	D. Backer (Calif., Berkeley)	The binary pulsar. 18-cm phased array MK III VLB.
VAH19	N. Bartel (CFA)	0014+81. 6-cm phased array MK III VLB.
VAH20	D. Harris (CFA) C. Costain (NRC, Canada) P. Dewdney (DRAO, Canada) M. Reid (CFA)	Test of X-ray emission process for a radio galaxy in Abell 754. 6-cm phased array MK III VLB.

## ELECTRONICS DIVISION

Charlottesville

An 8.3 GHz, cooled FET amplifier with 30 dB gain and a noise temperature of 17 K has been constructed. Design of a cryogenics dewar to allow incorporation of this amplifier into the VLA or VLBA is proceeding. Four 327 MHz uncooled FET amplifiers with  $< 30$  K noise temperature have been completed and shipped to the VLA site for evaluation. Prototype 23-GHz amplifiers, manufactured by Hughes Aircraft, have been evaluated and a contract for 62 amplifiers is being negotiated. A contract with Cornell University to develop high-electron-mobility transistors (HEMT) is also being negotiated. The design goals for the HEMT devices are 10 K noise temperature at 8.3 GHz and 30 K at 23 GHz.

A new 115-GHz Schottky diode receiver has been completed, and initial results indicate 180 K SSB noise temperature should be feasible. Construction of a 115 K GHz superconducting junction receiver and mixers and multipliers for 240 to 350 GHz continues.

Progress has been made on the 12 Mb/s VLBI cassette recorder system, but error rates are still too high; work will continue to improve the system.

Green Bank

System tests of the additional baseline to the interferometer were nearly completed during this quarter. The receiver, LO, and link subsystems were first tested locally in Green Bank, and then installed and tested at the Monteville site. Telescope positioning servos were debugged, installed and tested, as were the weather instrumentation interfaces. Except for minor hardware and software clean-up, this aspect (Monteville site) of the project is complete. Modifications to the Huntersville link remain to be done.

Evaluation of mixers and analog-to-digital converters for use in the spectral processor are in progress. Block diagrams and more detailed designs of various subsystems are also being evaluated.

Work on improving the receiver and correlator baselines at the 140-foot telescope continues.

Design and construction of the 3.3-4.7 GHz cooled-OMT-FET receiver are in progress.

A test set-up for FET amplifiers is being assembled, primarily for VLBA use. Other VLBA related activities include some work on RFI assessment of potential VLBA sites and input to various aspects of the design.

### Tucson

During this quarter further analysis of the results obtained in the holographic measurements on the 12-meter surface have been made. The mechanical and holographic maps of the surface agree extremely well over about 80% of the surface. The reasons for the disagreement over the remainder of the surface are unknown at the moment and will be investigated in the near future. Agreement between different holographic maps made with the dish in the same state of adjustment is good. From this comparison an RMS on individual holographic maps of better than  $35 \mu$  can be deduced. Furthermore, for maps made over different elevation ranges, a gravitational component of deformation appears to be present which is in agreement with theoretical structural calculations.

The readjusted surface has been measured at the prime focus and at the Cassegrain focus. Prime focus receivers were constructed for the measurements, and the beamwidths at wavelengths of 3.3 mm and 1.4 mm were found to correspond to theoretical beamwidths. The efficiencies at these two wavelengths were  $0.48 \pm 0.03$  and  $0.19 \pm 0.03$ , respectively.

The beamwidths of the Cassegrain focus are slightly broader than theoretical and the efficiencies are lower than prime focus. We believe that a major part of this problem may be slow deformations in the secondary mirror resulting from incorrect stress relieving of the mirror.

Work has continued on the receivers for the resurfaced telescope. The 200-240 GHz receiver and the new IF system have been completed and fully checked out on the telescope. The new 256-channel, 2 MHz per channel filter banks have been installed and checked out. The electronics for the new inductosyn readout system is almost complete, and we hope to install the inductosyn readouts in the next few months. Work continues on the new 90-120 GHz receiver.

### Socorro

Installation of the cooled GaAsFET amplifiers for the 21-cm and 2-cm observing bands was completed on all antennas. The new 2-cm system, in particular, is proving very popular with observers and is providing a significant new observing capability. The construction of the second master local oscillator system continued during the quarter, and the new design subreflector drive system was installed on antenna 12 for testing.

Testing of the prototype 327-MHz receiver system was completed and the decision made that the off-axis feed introduced too much asymmetry in the antenna radiation pattern. Several on-axis feed systems were designed and tested on a ground-level test range. These new designs will be installed on an antenna for evaluation in early 1984. The NRAO Central Development Lab delivered several very low-noise, room temperature GaAsFET amplifiers which will be used in the receivers. Until the feed design is finalized, installation of 327-MHz receivers on all antennas cannot begin. Construction of a new antenna transporter maintenance facility was commenced and should be completed in early 1984.

At the end of the quarter the array was reconfigured from the A array to the B array.

## COMPUTER DIVISION

### Charlottesville

AIPS - AIPS has been installed at the University of Texas VAX 11/780 and is running under the 4.2 BSD UNIX operating system.

The 15 November 1983 release contained the important new task, MX, a multi-field, multi-channel combination of mapping, cleaning, and uv subtraction. A system of "wild-card" naming conventions was implemented throughout AIPS.

### Green Bank

The 14.2-meter telescope has been integrated into the interferometer, essentially replacing 85-3. Fringes have been obtained with this four-element system. Pointing and baseline calibrations are proceeding.

Two programmers have been hired to work at Green Bank. A Masscomp general-purpose computer has been installed in the lab building.

### Socorro

As a result of the recommendations of the Scientific Review Committee, the synchronous computer upgrade was started. After producing a detailed configuration, orders for the hardware and software necessary for the first stage were placed. As noted by the Committee, "the upgraded system will double the number of available frequency channels, reduce the minimum integration time, and allow improved on-line monitoring of factors involving data quality."

After many (9) years of sterling service, the lineprinter on the DEC-10 finally gave out. A faster printer has been installed in its place.

An update of the pipeline transpose memory has cured intermittent problems with the transpose memory that have been causing indeterminate results. A faster version of the CLEAN algorithm, similar to that used on AIPS, has been installed. A version of the export program (UVFITS) has been implemented, although not all of the features are yet available to the user.

### NRAO Computer Plan

On 5 October 1983, a scientific review of the NRAO's long-term computer plan was held by a number of NRAO staff and visiting observers. The purpose of this review was to assess the scientific impact of the recommendations. Members of the review committee are:

Visitors

K. Johnston  
 M. Kutner  
 P. Palmer  
 M. Reid  
 J. Taylor  
 R. Wilson

NRAO

A. Bridle  
 R. Brown  
 B. Clark  
 D. Hogg  
 H. Liszt  
 R. C. Walker

## ENGINEERING

Design studies for a limited north-south travel of the movable feed support system on the 300-foot telescope was started.

Conceptual design drawings and specifications for a VLBA antenna were prepared for use in a request for a proposal for a complete design of the antenna.

Design studies for modifications to the top of the 140-foot Cassegrain building, for mounting the mirrors for the new feed systems, continued.

Specifications and a request for a proposal were prepared and issued for a new deformable subreflector for the 140-foot telescope.

Research and data collecting continued for proposed prospective sites for the VLBA.

## PERSONNEL

New Hires

Hubert M. Martin III	Research Associate	10/03
Peter N. Wilkinson	Visiting Associate Scientist	10/17
Althea Wilkinson	Visiting Associate Scientist	10/17
Jonathan D. Romney	Systems Scientist	11/07
Richard H. Miller	Visiting Scientist	11/17
William H. Porter	Business Manager - VLBA	12/01
Christophe G. Kotanyi	Research Associate	12/07

Terminations

Antony J. Lasenby	Visiting Electronics Engineer I	10/28
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Retirements

Robert K. Moore	Business Manager - Green Bank	12/31
Arthur M. Shalloway	Electronics Engineer I	12/31

Change in Status

Jack A. Campbell	Associate Division Head/ Head, VLA Electronics	10/01
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