US/GR BK/

NATIONAL RADIO ASTRONOMY OBSERVATORY

QUARTERLY REPORT

July 1, 1995 - September 30, 1995

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A. TELESCOPE USAGE

The following telescopes have been scheduled for research and maintenance in the following manner during the third quarter of 1995.

	140 Foot	12 Meter	VLA	VLBA
Scheduled observing (hours)	1672.00	653.75	1736.9	1006
Scheduled maintenance and equipment changes	312.75	6.00	233.1	336
Scheduled tests and calibration	212.00	1536.25	244.1	332
Time lost	59.50	57.50	86.8	40.6
Actual observing	1612.50	596.25	1650.1	965.4

B. 140 FOOT OBSERVING PROGRAMS

The following continuum programs were conducted during this quarter.

No	Observer(s)	Program
D186	de Pater, I. (Calif., Berkeley) Heiles, C. (Calif., Berkeley) Maddalena, R. Wong, M. (Calif., Berkeley)	21 cm monitoring of the Comet-Jupiter crash.

The following line programs were conducted during this quarter.

No.	Observer(s)	Program
A123	Azcarate, I. (IAR, Argentina) Cersosimo, J. (Univ. Puerto Rico) Wilkes, L. (Univ. Puerto Rico)	21 cm search for new evidence of the warping in the galactic plane. Part II.
B609	Bania, T. (Boston) Rood, R. (Virginia) Balser, D.	X-band measurements of the cosmic abundance of ^{3}He.
B643	Braatz, J. (Maryland) Wilson, A. (Maryland)	Monitoring of H_2O megamasers in active galaxies.
G343	Gibson, S. (Wisconsin) Wood, D. Holdaway, M. Nordsieck, K. (Wisconsin)	21 cm mapping of galactic neutral hydrogen in the Pleiades region.

No.	Observer(s)	Program
273	Lockman, F. J.	HI mapping of Ursa Major.
L305	Liszt, H. Lucas, R. (IRAM)	18 cm observations for C II and CH toward Zeta Ophiuchi.
M385	Murphy, E. (Virginia) Lockman, F. J.	The magnetic field in galactic HI.
M391	Magnani, L. (Georgia) Hartmann, D. (CFA) Dame, T. (CFA) Thaddeus, P. (CFA)	A search at 3.335 GHz for CH emission from diffuse molecular gas.
P176	Patel, N. (Massachusetts) Goldsmith, P. (Cornell)	Monitoring a water maser system towards IC 1396 region.
S399	Shah, R. (Boston) Bania, T. (Boston) Jackson, J. (Boston)	C91α studies of photodissociation regions: Density and temperature structure of the partially ionized medium.
T359	Thaddeus, P. (CFA)	H_2C_7 search toward TMC-1 and IRC+10216.
V082	Verschuur, G. (Rhodes College)	Tests of a new 18 cm feed to measure the Zeeman effect in thermal OH sources.
W280	Wootten, H. A.	H_2O monitoring in star forming cores in Rho Oph.

The following pulsar programs were conducted during this quarter.

No.	Observer(s)	Program
A116	Arzoumanian, Z. (Cornell) Nice, D.	Observations at 550 MHz of the orbital fluctuations in the eclipsing pulsar.
A118	Arzoumanian, Z. (Cornell) Nice, D. Taylor, J. (Princeton) Taylor, H. (Princeton)	Bimonthly timing of 63 pulsars at 810 MHz.
B617	Backer, D. (Calif., Berkeley) Sallmen, S. (Calif., Berkeley) Foster, R. (NRL) Matsakis, D. (NRL)	Pulsar timing array observations at 800 and 1395 MHz.
B644	Backer, D. (Calif., Berkeley) Zepka, A. (Calif., Berkeley) Sallmen, S. (Calif., Berkeley)	Pulsar flux density and pulse morphology observations at 3 GHz.

No.	Observer(s)	Program
M386	McKinnon, M. Fisher, J. R.	A 1.3-1.8 GHz polarization model test and timing of young pulsar PSR B1823-13.
S400	Sayer, R. (Princeton) Taylor, J. (Princeton) Nice, D.	370 MHz timing observations of a new relativistic binary pulsar.
S401	Sayer, R. (Princeton) Shrauner, J. (Princeton) Camilo, F. (Princeton) Taylor, H. (Princeton) Taylor, J. (Princeton) Thorsett, S. (Princeton) Arzoumanian, Z. (Cornell) Nice, D.	370 MHz observations measuring the relativistic effects in binary pulsars and timing of recently discovered pulsars.

C. 12 METER TELESCOPE

The following line programs were conducted during this quarter.

No.	Observer(s)	Program
A129	Apponi, A. (Arizona State) Ziurys, L. (Arizona State)	Evaluating the nitrogen/oxygen chemical network: additional mapping of NO and N_2O in Sgr B2.
B648	Bieging, J. (Arizona)	Mapping CO emission toward four AGB stars.
E61	Evans, A. (Hawaii) Sanders, D. (Hawaii) Mazzarella, J. (Caltech)	CO (1→0) observations of powerful radio galaxies detected by IRAS.
H305	Hughes, D. (Oxford) Rawlings, S. (Oxford) Dunlop, J. (Liverpool) Eales, S. (Cardiff)	A CO survey of the only complete sample of high-redshift radio galaxies.
H306	Hughes, D. (Oxford)	Study of blue compact galaxies as templates for high-redshift galaxies: the gas-to-dust ratio in a low metallicity environment.
K350	Kutner, M. (RPI) Mead, K. (Union College)	A new look at molecular ring clouds.
L304	Liszt, H.	^{13}CO and CS maps of Sgr D and Sgr E.
L313	Charnley, S. (NASA/Ames) Latter, W. (NASA/Ames)	Study of methanol in IRC+10216.
M394	Murphy, E. (Virginia)	A search for molecular gas in galactic high velocity clouds.
O44	Young Owl, R. (Illinois) Meixner, M. (Illinois)	Determination of the structure of the molecular gas in the reflection nebula NGC 2023.

No.	Observer(s)	Program
T350	Turner, B.	Sulfur chemistry of translucent clouds: a search for SO^+.
T358	Tielens, A. (NASA/Ames) Boogert, A. (Leiden) Wesselius, P. (Groningen) van Dishoeck, E. (Leiden) Latter, W. (NASA/Ames)	Study of the physical conditions and carbon budget around YSOs with ice bands.
W350	Welch, G. (St. Mary's Univ., N.S.) Mitchell, G. (St. Mary's Univ., N.S.) Sage, L. (Nature)	Study of molecular gas and star formation in NGC 205.
W356	Walker, C. K. (Arizona) Narayanan, G. (Arizona)	Study of the effects of clustered star formation on molecular outflow activity.

D. VERY LARGE ARRAY

Third quarter 1995 was spent in the following configurations: A configuration from July 1 to September 5, and BnA configuration from September 5 to September 31.

No.	Observer(s)	Program
AA187	Akujor, C. (MPIR, Bonn) Garrington, S. (Manchester)	Polarization observations of compact steep spectrum sources at 22 GHz. 1.3 cm
AA188	Anglada, G. (Barcelona) Estallella, R. (Barcelona) Villuendas, E. (Barcelona) Rodriguez, L. (Mexico/UNAM) Girart, J. (CFA) Torrelles, J. (IAA, Andalucia)	Imaging of thermal jets in low luminosity molecular outflow sources. 3.6 cm
AA189	Acord, J. (MPIR, Bonn) Hofner, P. (Koln) Afflerbach, A. (Wisconsin) Churchwell, E. (Wisconsin) Walmsley, C.M. (Koln)	Water masers in UC HII regions: disks or outflows? 1.3 cm
AA193	Anantharamaiah, K. (Raman Institute) Roy, A. (Raman Institute) Goss, W. M. Zhao, J.-H. (SA/IAA, Taiwan)	Recombination lines from external galaxies. 20 cm line
AB705	Burke, B. (MIT) Becker, D. (MIT) Lehar, J. (CFA) Hewitt, J. (MIT) Roberts, D. (Brandeis)	Time delay of the gravitational lens 0957+561. 3.6, 6 cm

No.	Observer(s)	Program
AB740	Baum, S. (STScI) Colbert, E. (Maryland) O'Dea, C. (STScI) Pedlar, A. (Manchester)	Three archetypical Seyferts: MKN 6, NGC 3079, MKN 231. 6, 20 cm
AB746	Birkinshaw, M. (CFA) Worrall, D. (CFA)	HI absorption line feature in NGC 6251. 20 cm
AB747	Baan, W. (NAIC) Uglesich, R. (Columbia) Haschick, A. (Haystack)	Nuclear dynamics of NGC 6240. 20 cm
AB748	Braatz, J. (Maryland) Wilson, A. (STScI)	Mapping of H_2O megamasers in active galaxies. 1.3 cm
AB749	Barthel, P. (Groningen/Kapteyn) Hoekstra, H. (Groningen/Kapteyn) Hes, R. (Groningen/Kapteyn)	Beamed 60 micron radiation in lobe dominated quasars? 1.3, 2, 6 cm
AB750	Barthel, P. (Groningen/Kapteyn) Lonsdale, C. (Haystack) Vestergaard, M. (CFA) Miley, G. (Leiden)	High redshift quasar morphologies. 6, 20 cm
AB751	Butler, B. Muhleman, D. (Caltech) Slade, M. (JPL)	Goldstone/VLA radar imaging of Mercury. 3.6 cm
AB755	van Breugel, W. (LLNL) Dey, A. (LLNL) Dickinson, M. (STScI) Spinrad, H. (Calif., Berkeley)	Deep VLA imaging of two z ~ 1 radio galaxies. 3.6, 6 cm
AB756	Bagchi, J. (NCRA, India) Chandra, I. (NCRA, India) Kapahi, V. (NCRA, India)	A peculiar radio source. 6, 20 cm
AB759	Browne, I. (Manchester) Wilkinson, P. (Manchester) Sykes, C. (Manchester)	Ring and halo in the gravitational lens B0218+357. 6, 20 cm
AB760	Browne, I. (Manchester) Wilkinson, P. (Manchester) Sykes, C. (Manchester) Muxlow, T. (Manchester) Jackson, N. (Manchester) Myers, S. (Caltech) Fassnacht, C. (Caltech) Readhead, A. (Caltech) Pearson, T. (Caltech) de Bruyn, A. (NFRA) Snellen, I. (Leiden)	Deep imaging of the new quadruple lensed system 1608+656. 1.3, 2, 3.6, 6, 20 cm

No.	Observer(s)	Program
AB761	Burke, B. (MIT) Ekers, R. (CSIRO) Wright, A. (CSIRO) Fletcher, A. (MIT) Conner, S. (MIT) Griffith, M. (CSIRO)	PMN-VLA snapshot survey. 3.6, 6 cm
AB762	Barnbaum, C. Morris, M. (UCLA)	Circumstellar OH maser of extraordinary star, U Equ. 20 cm
AB766	Blundell, K. (Oxford) Rawlings, S. (Oxford) Lacy, M. (Oxford) Littlewood, C. (Oxford) Willott, C. (Oxford) Serjeant, S. (Oxford)	The evolution of radio quasars and their environments from z = 0.5-3. 3.6, 6, 20 cm
AB768	Brown, A. (Colorado/JILA) Deeney, B. (Colorado/JILA) Gudel, M. (SFIT, ETH) Skinner, S. (Colorado/JILA) Stewart, R. (CSIRO)	Simultaneous radio (VLA+AT) and EUV from binary flare star CC Eri. 3.6, 20 cm
AC420	Carilli, C. (CFA) Rottgering, H. (Cambridge) Best, P. (Cambridge) Owen, F.	Two classic "alignment effect" high-z radio galaxies. 3.6, 6, 20 cm
AC424	Callcut, J. (Michigan State) Winfrey, S. (Michigan) Wootten, H. A.	Determining characteristics of S106FIR using water masers. 1.3 cm
AC427	Crane, P. (Interferometrics) Cowan, J. (Oklahoma) Primini, F. (CFA) Roberts, D. (Illinois) Dickel, J. (Illinois)	Variability of the nuclear source in M31. 3.6 cm
AC429	Cowan, J. (Oklahoma) Branch, D. (Oklahoma)	Search for extragalactic intermediate age supernovae. 20 cm
AC430	Chambers, K. (Hawaii)	6C radio soures suitable for study with adaptive optics. 3.6 cm
AC432	Capetti, A. (STScI) Axon, D. (STScI) Macchetto, D. (STScI) Pedlar, A. (Manchester)	Radio outflow in Seyfert galaxies. 2 cm
AC434	Curiel, S. (CFA) Rodriguez, L. (Mexico/UNAM) Moran, J. (CFA) Canto, J. (Mexico/UNAM)	Radio monitoring of the Serpens radio jet. 2, 3.6, 6 cm

No.	Observer(s)	Program
AC435	Curiel, S. (CFA) Rodriguez, L. (Mexico/UNAM) Pedlar, A. (Manchester) Canto, J. (Mexico/UNAM)	On the nature of the double radio source associated with L1551 IRS5. 2, 3.6 cm
AC437	Curiel, S. (CFA) Eiroa, C. (Madrid Obs) Canto, J. (Mexico/UNAM)	Circumstellar disk structures around very YSOs. 0.7, 1.3, 3.6 cm
AC438	Carilli, C. (CFA) Perlman, E. (Maryland) Stocke, J. (Colorado/JILA) van Langevelde, H.	Search for OH absorption in PKS 1413+135, a galaxy at z = 0.25. 20 cm
AC440	Claussen, M. Hofner, P. (Koln)	Search for non-thermal continuum emission from hot molecular outflow. 20 cm
AC441	Cotton, W. Swain, M. (Rochester) Bridle, A. Kassim, N. (NRL)	J2146+82 – large radio galaxy with misaligned outbursts? 3.6, 6 cm
AC442	Conner, S. (MIT) Garnavich, P. (CFA) Turner, E. (Princeton) Schechter, P. (CFA) Burke, B. (MIT)	New gravitational lens candidates from the MIT-Green Bank-VLA survey. 2, 3.6, 6 cm
AC444	Colomer, F. (Yebes Obs) Cernicharo, J. (Yebes Obs) Baudry, A. (Bordeaux) Gonzales-Alfonso, E. (Yebes Obs) Alcolea, J. (Yebes Obs) Marvel, K. (New Mexico State) Herpin, F. (Bordeaux)	Study of high velocity SiO and H_20 maser emission from evolved stars. 0.7 cm
AC455	Camilo, F. (Princeton) Lundgren, S. (NRL) Foster, R. (NRL)	Accurate position for PSR J1022+1001. 20 cm
AD361	Dahlem, M. (STScI) Dettmar, R.-J. (Bochum) Golla, G. (Toronto)	Search for radio knots in NGC 891. 6 cm
AD363	Dressel, L. (ARC) Jones, D. (JPL)	Compact radio sources associated with nuclear emission line regions. 20 cm
AD364	De Pree, C. (North Carolina) Cecil, G. (North Carolina) Greenhill, L. (CFA) Moran, J. (CFA)	High resolution continuum imaging of the large scale jet in NGC 4258. 20 cm

No.	Observer(s)	Program
AD365	Duric, N. (New Mexico) Perley, R. Kassim, N. (NRL)	75 MHz observations of galactic supernova remnant W49B. 90, 400 cm
AD366	De Pree, C. (North Carolina) Gaume, R. (USNO) Goss, W. M.	High resolution line and continuum observations of Sgr B2. 0.7 cm
AD368	Domgorgen, H. (Bonn U.) Dahlem, M. (STScI) Golla, G. (Toronto)	The ISM in NGC 2188: a case study for disk-halo interaction. 3.6 cm
AD369	Danner, R. (Caltech) Kulkarni, S. (Caltech)	Soft X-ray sources in high galactic latitude clouds. 6, 20 cm
AD372	De Pree, C. (North Carolina)	Variable source in NGC 6951. 6, 20 cm
AE101	Echevarria, L. (UCLA) Morris, M. (UCLA)	Probing the nature of the galactic center threads. 3.6, 6 cm
AE104	Erickson, W. (Maryland) Perley, R. Kassim, N. (NRL) Jacobson, A. (LANL)	Improving ionospheric models for low frequency VLA observations. 90, 400 cm
AE105	Elias, N. (USNO)	Monitoring Algols KX And and V367 Cyg. 6 cm
AF292	Fruchter, A. (STScI) Thorsett, S. (Princeton) Goss, W. M.	Pulsar proper motions. 20 cm HTRP
AF294	Frail, D. Kulkarni, S. (Caltech) Vasisht, G. (Caltech)	The soft gamma ray repeater SGR 1806-20. 3.6, 6 cm
AF295	Fomalont, E. Goss, W. M.	Finding list of background sources for pulsar astrometry. 90 cm
AF298	Frail, D. Goss, W. M.	An unusual head-tail source in the galactic plane. 20 cm
AG415	Gomez, Y. (Mexico/UNAM) Rodriguez, L. (Mexico/UNAM) Moran, J. (CFA)	Angular expansion of compact planetary nebulae. 3.6 cm
AG421	Gaume, R. (USNO) Fischer, J. (NRL)	Monitoring the radio continuum flux density of NGC 2024-IRS2. 1.3, 2, 3.6, 6, 20 cm
AG443	Gray, R. (Gray Data)	High-sensitivity search of the "Wow" locale for 21 cm radio signals. 20 cm

No.	Observer(s)	Program
AG448	Greenhill, L. (CFA) Henkel, C. (MPIR, Bonn)	Monitoring the acceleration of water megamaser features in NGC 4258. 1.3 cm
AG449	Gizani, N. (Manchester) Leahy, J. (Manchester) Garrington, S. (Manchester) Perley, R.	Faraday rotation in Hercules A. 20 cm
AG450	Green, D. (Cambridge) Cowan, J. (Oklahoma)	Search for young galactic SNRs: a follow-up. 20 cm
AG452	Gerritsen, J. (Groningen/Kapteyn) Barthel, P. (Groningen/Kapteyn) Sramek, R. Sanders, D. (Hawaii)	Radio emission in radio-quiet QSOs – starburst or AGN? 3.6 cm
AG453	Gaume, R. (USNO) Martin-Pintado, J. (Yebes Obs) Planesas, P. (Yebes Obs) Goss, W. M.	Radio continuum spectral index of NGC 7538 IRS 1. 0.7, 1.3, 2, 3.6, 6 cm
AG454	van Gorkom, J. (Columbia) Baum, S. (STScI)	HI absorption in elliptical radio galaxies. 20 cm
AG456	Gregg, M. (LLNL) Becker, R. (Calif., Davis)	Radio haloes around late-type stars. 6 cm
AG457	Girart, J. (CFA) Curiel, S. (CFA) Rodriguez, L. (Mexico/UNAM)	The exciting sources of HH objects. 3.6 cm
AG461	Gomez, Y. (Mexico/UNAM) Rodriguez, L. (Mexico/UNAM)	Water maser emission in selected OH/IR stars. 1.3 cm
AG462	Gallimore, J. (Maryland) Baum, S. (STScI) Claussen, M.	Enigmatic H_2O masers in the hidden Seyfert 1 nucleus of NGC 1068. 1.3 cm
AG464	Gothaskar, P. (NCRA, India) Anantharamaiah, K. (Raman Institute) Rao, A. P. (NCRA, India)	Scattering in the solar wind. HTRP 2, 3.6, 6, 20, 90 cm
AG466	Golla, G. (Toronto) Kronberg, P. (Toronto)	Supernova remnants in NGC 4631. 3.6, 6 cm
AH492	Hjellming, R. Gehrz, R. (Minnesota) Seaquist, E. (Toronto) Taylor, A. R. (Calgary)	Image and light curve evolution of radio novae. 1.3, 2, 3.6, 6, 20 cm

No.	Observer(s)	Program
AH528	Harvanek, M. (Colorado/JILA) Stocke, J.(Colorado/JILA) Ellingson, E. (Colorado/JILA)	Morphology of 3CR radio galaxies at z = 0.15-0.65. 20 cm
AH546	Harper, G. (Colorado/JILA) Brown, A. (Colorado/JILA) Hummel, C. (USNO) Walder, R. (SFIT, ETH)	Search for radio emission from eclipsing binary Zeta Aurigae. 3.6 cm
AH549	Hughes, V. (Queens) MacLeod, G. (HartRAO)	Search for time-dependent sources in star forming regions. 6 cm
AH551	Ho, L. (Calif., Berkeley) Van Dyk, S. (Calif., Berkeley)	Survey of nearby galactic nuclei. 6 cm
AH552	Hewitt, J. (MIT) Langston, G. Burke, B. (MIT) Trotter, C. (MIT)	Completion of a flux-limited sample of the MG survey. 6 cm
AH554	Holdaway, M. Kobulnicky, H. (Minnesota)	Flat spectrum extragalactic sources behind the plane. 1.3, 3.6 cm
AH557	Hofner, P. (Koln) Stecklum, B. (MPIR, Bonn)	M8 revisited: What is ionizing the hourglass? 3.6, 6 cm
AH558	Ho, L. (Calif., Berkeley) Maoz, D. (Tel-Aviv U.) Barth, A. (Calif., Berkeley)	UV-dark LINERs: Obscured AGNs? 3.6, 6 cm
AH559	Ho, L. (Calif., Berkeley) Van Dyk, S. (Calif., Berkeley)	The nature of low luminosity active galactic nuclei. 3.6 cm
AH564	Higdon, J. Wallin, J. (George Mason)	Radio continuum study of the cartwheel ring galaxy. 20 cm
AI057	Ivison, R. (Royal Obs) Seaquist, E. (Toronto)	Second-epoch imaging of RX Puppis during a phase of low excitation. 3.6 cm
AI059	Ishwara-Chandra, C. (NCRA, India) Kapahi, V. (NCRA, India) Saikia, D. (NCRA, India) Subrahmanya, C. (NCRA, India)	Polarization studies of Molonglo complete sample. 3.6, 20 cm
AJ245	Johnston, H. (Utrecht) Strom, R. (NFRA) Verbunt, F. (Utrecht)	An X-ray knot expelled by the Vela supernova. 20 cm
AJ246	Jura, M. (UCLA) Turner, J. (UCLA) Ghez, A. (UCLA)	HR 4796B: nearby pre-main sequence star. 3.6 cm

No.	Observer(s)	Program
AJ248	Johnston, K. (USNO) De Vegt, C. (Hamburg U.) Florkowski, D. (USNO)	Radio positions and proper motions of optically bright stars. 6 cm
AJ249	Johnston, K. (USNO) De Vegt, C. (Hamburg U.) Gaume, R. (USNO) Fey, A. (USNO)	Radio emission of the T Tau system. 0.7, 1.3, 2, 3.6, 6, 20 cm
AJ251	Jura, M. (UCLA) Balm, S. (UCLA) Turner, J. (UCLA) Kahane, C. (Grenoble)	Big grains around the red rectangle? 0.7, 1.3, 2, 3.6 cm
AK376	Kulkarni, S. (Caltech) Frail, D.	Search for the radio counterparts of gamma ray bursters. 20 cm
AK394	Kukula, M. (Liverpool JMU) Pedlar, A. (Manchester) Hamilton, N. (Manchester) Baum, S. (STScI) O'Dea, C. (STScI)	Seyferts from the 12-micron galaxy sample. 3.6 cm
AK401	Kobulnicky, H. (Minnesota) Dickey, J. (Minnesota) Holdaway, M.	Molecular absorption survey toward scatter-broadened radio sources. 2, 3.6, 20 cm
AK403	deKoff, S. (STScI) Biretta, J. (STScI) Baum, S. (STScI) Sparks, W. (STScI) Miley, G. (Leiden) Macchetto, D. (STScI)	HST/VLA snapshot survey of 3CR radio galaxies. 2, 3.6 cm
AK404	King, L. (Oxford) Browne, I. (Manchester) Patnaik, A. (MPIR, Bonn) Wilkinson, P. (Manchester)	1938+666: an intriguing gravitationally lensed source. 2 cm
AK405	Kraemer, K. (Boston) Jackson, J. (Boston) Ho, P. (CFA) Zhang, Q. (CFA) Davis, C. (MPIR, Bonn)	Search for shock-excited NH_3 (3,3) masers in outflow sources. 1.3 cm
AK406	Kukula, M. (Liverpool JMU) Dunlop, J. (Liverpool JMU) Rawlings, S. (Oxford) Hughes, D. (Oxford) Taylor, G. (Liverpool JMU)	Radio properties of radio-quiet quasars – AGN or starburst? 3.6, 6 cm

No.	Observer(s)	Program
AK407	Kukula, M. (Liverpool JMU) Pedlar, A. (Manchester) Holloway, A. (Manchester) Meaburn, J. (Manchester) Baum, S. (STScI)	Unusual shells in the Seyfert galaxy Markarian 6. 3.6, 20 cm
AK409	Kenny, H. (Canadian Military) Taylor, A. R. (Calgary) Eyres, S. (Manchester) Ivison, R. (Royal Obs) Seaquist, E. (Toronto) Davis, R. (Manchester)	CH Cygni: stellar jet imaging. 1.3, 3.6, 20 cm
AK410	Knopp, G. (Hawaii) Chambers, K. (Hawaii)	High redshift radiogalaxies – morphology and polarization. 3.6, 20 cm
AK411	Kassim, N. (NRL) Reynolds, S. (North Carolina State) Moffett, D. (NMIMT)	330 MHz observations of bright supernova remnants. 90 cm
AK413	Kassim, N. (NRL) Perley, R. Erickson, W. (Maryland)	74 MHz observations of strong sources – large angular size objects. 90, 400 cm
AK414	Kronberg, P. (Toronto) Allen, M. (Toronto)	High resolution radio spectral index studies of the nucleus of M82. 3.6 cm
AK420	Kollgaard, R. (Penn State) Ghisellini, G. (Torino) Maraschi, M. (Genova U.) Pesce, J. (STScI) Sambruna, R. (STScI) Urry, C.M. (STScI)	Multifrequency monitoring of blazars. 1.3, 2, 3.6, 6, 20 cm
AK421	Kobulnicky, H. (Minnesota) Skillman, E. (Minnesota)	HI mapping of the nearby peculiar starburst galaxy NGC 5253. 20 cm
AL353	Ludke, E. (UFSM, Brazil)	Faraday effect in CSS sources. 1.3 cm
AL355	Lacy, M. (Oxford) Rawlings, S. (Oxford) Blundell, K. (Oxford)	A new Einstein ring: 6C 0551+587. 3.6, 6 cm
AL357	Lehar, J. (CFA) Kochanek, C. (CFA)	Gravitationally lensed radio source MG0751+2716. 2, 3.6 cm
AL361	Lim, J. (SA/IAA, Taiwan) White, S. (Maryland)	Radio luminosity function of F-M dwarf stars in the Pleiades. 3.6 cm
AM474	Marvel, K. (New Mexico State) Diamond, P.	Monitoring masers in AGB stars. 0.7, 1.3, 20 cm

No.	Observer(s)	Program
AM480	Miranda, L. (Madrid Obs) Torrelles, J. M. (IAP, Granada) Eiroa, C. (Madrid Obs)	Spatio-kinematical structure of compact very young PNs. 3.6 cm
AM481	Mirabel, I. F. (CNRS, France) Chaty, S. (CNRS, France) Rodriguez, L. (Mexico/UNAM) Marti, J. (Barcelona)	Hard X-ray sources in the galactic bulge. 6 cm
AM482	Mirabel, F. (CNRS, France) Rodriguez, L. (Mexico/UNAM)	Monitoring the superluminal source GRS 1915+105. 3.6 cm
AM483	Miralles, M. (Massachusetts) Ho, P. (CFA)	UC HII region IRAS 18057+0121. 3.6 cm
AM484	Myers, S. (Caltech) Jackson, N. (Manchester) Blandford, R. (Caltech) Browne, I. (Manchester) de Bruyn, A. (NFRA) Fassnacht, C. (Caltech) Miley, G. (Leiden) Nair, S. (Manchester) Pearson, T. (Caltech) Readhead, A. (Caltech) Schilizzi, R. (NFRA) Sykes, C. (Manchester) Wilkinson, P. (Manchester)	Cosmic Lens All Sky Survey (CLASS). 3.6 cm
AM486	Martin-Pintado, J. (Yebes Obs) Gaume, R. (USNO) Johnston, K. (USNO)	The CRL 618 molecular outflow. 1.3 cm
AM487	Masson, C. (CFA) Kawamura, J. (CFA)	Expansion of compact HII regions. 2, 3.6 cm
AM488	Martin-Pintado, J. (Yebes Obs) Gaume, R. (USNO) Planesas, P. (Yebes Obs) Johnston, K. (USNO) Thum, C. (IRAM)	Neutral circumstellar disk in MWC 349. 20 cm
AM490	Muxlow, T. (Manchester) Pedlar, A. (Manchester) Wilkinson, P. (Manchester) Axon, D. (STScI)	Combined 5 GHz VLA-MERLIN image of starburst activity in M82. 6 cm
AM492	Moran, E. (LLNL) van Bruegel, W. (LLNL)	Peculiar IRAS galaxies of unusual X-ray brightness. 6, 20 cm
AM494	Menten, K. (CFA) Reid, M. (CFA)	Wide field observations of the compact radio sources in Orion Nebula. 1.3, 3.6 cm

No.	Observer(s)	Program
AM495	Menten, K. (CFA) Reid, M. (CFA)	Using H_2O masers around the galactic center as astrometry tools. 1.3 cm
AM496	Marscher, A. (Boston) Moore, E. (Boston) Bania, T. (Boston)	Variable molecular absorption toward extragalactic continuum sources. 6 cm line
AM497	Migenes, V. (CSIRO) Bowers, P. (NRL) Cohen, R. (Manchester) Shepherd, M. (Caltech) Ludke, E. (UFSM, Brazil)	High dynamic range maps of OH maser shells. 20 cm
AM501	Morganti, R. (Bologna) Killeen, N. (CSIRO) Tadhunter, C. (Sheffield) Clark, N. (Sheffield)	Powerful radio galaxy PKS 2250-41. 1.3, 2, 3.6, 6 cm
AM506	McMahon, R. (Cambridge) Beeharry, G. (Cambridge)	Radio properties of radio quiet quasars at $z > 4$. 20 cm
AM508	Menten, K. (CFA) Reid, M. (CFA)	Molecular absorption in lens B0218+357. 2 cm
AN066	Navarro, J. Bailes, M. (CSIRO) Bell, J. (Mt. Stromlo)	Accurate positions for three millisecond pulsars. 20 cm HTRP
AO122	Owen, F. Perley, R. Cotton, W. Postman, M. (STScI) Condon, J.	Deep A-array survey near 1015+51. 20 cm
AP296	Preston, R. (JPL) Folkner, W. (JPL)	Earth-based observation of Galileo probe for Jupiter wind estimation. 3.6 cm
AP302	Pooley, G. (Cambridge) Hardcastle, M. (Cambridge) Alexander, P. (Cambridge) Riley, J. (Cambridge)	Jets in nearby FRI radio galaxies. 3.6, 20 cm
AP315	Pooley, G. (Cambridge) Hardcastle, M. (Cambridge) Riley, J. (Cambridge) Alexander, P. (Cambridge)	Constraining the luminosity function of jets in FRII radio galaxies. 3.6 cm
AP319	dePater, I. (Calif., Berkeley)	Jupiter patrol: aftermath of Comet-Jupiter crash. 20, 90 cm
AP320	dePater, I. (Calif., Berkeley) Dickel, J. (Illinois)	Saturn's atmosphere during ring plane crossing. 6, 20 cm

No.	Observer(s)	Program
AP322	Patel, N. (CFA) Zhang, Q. (CFA) Ho, P. (CFA) Goldsmith, P. (NAIC)	Water maser emission from IC 1396E. 1.3 cm
AR334	Roser, H.-J. (MPIA, Heidelberg) Perley, R. Meisenheimer, K. (Royal Obs)	High frequency mapping of the jet of 3C 273. 0.7, 1.3, 2, 3.6, 6, 18 cm
AR335	Rawlings, S. (Oxford) Lacy, M. (Oxford) Blundell, K. (Oxford) Serjeant, S. (Oxford)	An HST sample of quasars at $0.5 < z < 0.7$. 3.6, 6, 20 cm
AR338	Reipurth, B. (ESO) Marti, J. (Barcelona) Rodriguez, L. (Mexico/UNAM)	High velocity proper motions in the HH 80-81 thermal radio jet. 3.6 cm
AR339	Rawlings, S. (Oxford) Serjeant, S. (Oxford)	Is FSC 10214+4724 gravitationally lensed? 3.6, 6 cm
AR341	Reid, M. (CFA) Masson, C. (CFA) Menten, K. (CFA) Moran, J. (CFA) Wilner, D. (CFA)	Synchrotron emission from the H_2O maser source in W3OH. 3.6 cm
AR342	Ratner, M. (CFA) Bartel, N. (York U.) Lebach, D. (CFA) Lestrade, J.-F. (Paris Obs) Shapiro, I. (CFA)	Survey of radio sources near candidate guide stars for GP-B. 3.6 cm
AR343	Rengelink, R. (Leiden) Bremer, M. (Leiden) Rottgering, H. (Cambridge) Miley, G. (Leiden)	Finding the most distant galaxies from WENSS. 20 cm
AR344	Rucinski, S. (York U.)	Close binary ER Vul: a multi-wavelength campaign. 3.6 cm
AS516	Shaver, P. (ESO) Wall, J. (RGO) Kellermann, K.	Accurate positions of unidentified flat-spectrum Parkes sources. 3.6 cm
AS559	Steffen, W. (Manchester) Holloway, A. (Manchester) Pedlar, A. (Manchester) Dyson, J. (Manchester) Meaburn, J. (Manchester) Axon, D. (STScI)	Radio outflow in Seyfert galaxy IRAS 0421+040P06. 3.6, 20 cm

No.	Observer(s)	Program
AS561	Stockton, A. (Hawaii) Ridgeway, S. (Hawaii)	Radio-optical survey of a complete z ~1 3CR sample of galaxies. 3.6, 20 cm
AS562	Stocke, J. (Colorado/JILA) Rector, T. (Colorado/JILA) Perlman, E. (Maryland)	High dynamic range mapping of 1 Jy BL Lac objects. 20 cm
AS564	Slysh, V. (Lebedev) Kalenskii, S. (Lebedev) Valts, I. (Lebedev) Dzura, A. (Lebedev) Kogan, L.	Imaging of Class I methanol masers. 0.7 cm
AS567	Sramek, R. Weiler, K. (NRL) Van Dyk, S. (Calif., Berkeley) Panagia, N. (STScI)	A revisit to possible radio supernovae. 3.6 cm
AS572	Saikia, D. (NCRA, India)	Mildly active galaxies with nuclear radio rings and spirals. 2, 3.6, 6 cm
AS573	Saikia, D. (NCRA, India) Jeyakumar, S. (NCRA, India) Thomasson, P. (Manchester)	Three highly distorted compact steep-spectrum radio galaxies. 2, 3.6, 6 cm
AT165	Taylor, G. (Caltech) Readhead, A. (Caltech) Vermeulen, R. (Caltech) Pearson, T. (Caltech) Henstock, D. (Manchester) Wilkinson, P. (Manchester)	Kiloparsec-scale structure of the second Caltech-Jodrell Bank survey. 20 cm
AT176	Thorsett, S. (Princeton) Taylor, J. (Princeton) McKinnon, M. Hankins, T. (NMIMT) Stinebring, D. (Oberlin College)	Timing fast pulsars at the VLA. HTRP 6, 20, 90 cm
AT181	Torrelles, J. (IAP, Granada) Rodriguez, L. (Mexico/UNAM) Ho, P. (CFA) Gomez, J. (Boston) Garay, G. (Chile) Curiel, S. (CFA)	The powerful thermal radio jet in Cep A HW 2. 1.3 cm
AT182	Thomson, R. (Cambridge) Mackay, C. (Cambridge) Wright, A. (CSIRO)	Polarization mapping of the jet of the quasar 3C 273. 6 cm

No.	Observer(s)	Program
AT183	Tyson, A. (Bell Labs) Stocke, J. (Colorado/JILA) Harvanek, M. (Colorado/JILA) Rhee, G. (Nevada)	Deep VLA imaging of 0957+561. 3.6, 20 cm
AU062	Ulvestad, J. (JPL) Antonucci, R. (Calif., Santa Barbara)	Monitoring of compact sources in NGC 253. 3.6, 6 cm
AU063	Umana, G. (CNR/IRA-Frascati) Trigilio, C. (Bologna) Franciosini, E. (Florence) Chiuderi-Drago, F. (Florence)	Radio spectra of active binaries during flares. 1.3, 2, 3.6, 6, 20 cm
AW362	White, S. (Maryland)	The stellar activity cycle on active stars. 3.6, 6, 20 cm
AW411	Warner, P. (Cambridge) Minns, A. (Cambridge) Riley, J. (Cambridge)	The structures and spectra of a homogeneous sample of radio sources. 3.6, 20, 90 cm
AW416	Wiercigroch, A. (JPL) Ulvestad, J. (JPL)	Compact radio sources in LINERS. 3.6 cm
AW418	van der Werf, P. (Leiden)	The starburst nucleus in M83. 6 cm
AW424	Winnberg, A. (Chalmers) Engels, D. (Hamburg U.)	Water maser flare in RX Boo. 1.3 cm
AY069	Yusef-Zadeh, F. (Northwestern) Roberts, D. (Illinois) Biretta, J. (STScI)	Proper motion of ionized gas at the galactic center. 2, 6 cm
AZ072	Zhang, Q. (CFA) Ho, P. (CFA) Kraemer, K. (Boston) Jackson, J. (Boston)	Ammonia masers associated with mass outflow in star-forming regions. 1.3 cm

E. VERY LONG BASELINE ARRAY

No.	Observer(s)	Program
BA013	Aaron, S. (Brandeis) Wardle, J. (Brandeis) Roberts, D. (Brandeis)	Quest for helical jets. 18 cm
BB023	Beasley, A. Conway, J. (Chalmers, Onsala) Dhawan, V. Walker, R. C. Wrobel, J. Patnaik, A. (MPIR, Bonn) Muxlow, T. (Manchester)	VLBA calibrator survey. 3.6 cm, with VLA single antenna

No.	Observer(s)	Program
BB042	Bondi, M. (Manchester) Junor, W. (New Mexico) Mantovani, F. (Bologna)	Compact steep-spectrum sources with very high rotation measures. 3.6 cm, with VLA single antenna
BB043	Beasley, A. Bastian, T. Niell, A. (Haystack)	High frequency VLBA observations of AE Aqr. 1.3 cm
BB046	Bower, G. (Calif., Berkeley) Backer, D. (Calif., Berkeley) Wright, M. (Calif., Berkeley)	High frequency mapping of nearby active galactic nuclei. 1.3 cm
BB047	Baudry, A. (Bordeaux) Diamond, P.	Mapping a new OH maser line with the VLBA. 2 cm
BB050	Blundell, K. (Oxford) Lacy, M. (Oxford)	PC-scale jets and core of the radio-quiet quasar E 1821+643. 3.6, 6 cm with phased VLA
BB051	Barsony, M. (Calif., Riverside) Lonsdale, C. (Haystack) Phillips, R. (Haystack)	Protostellar outflow source L1551/IRS5. 20 cm
BB053	Bower, G. (Calif., Berkeley) Backer, D. (Calif., Berkeley) Wright, M. (Calif., Berkeley)	Dramatic flare in the extremely flat-spectrum QSO NRAO 530. 1.3, 3.6 cm with VLA single antenna
BC040	Clark, T. (NASA/GSFC) Corey, B.E. (Haystack) Eubanks, T. (USNO) Fomalont, E. Gipson, J. (Interferometrics) Gordon, D. (NASA/GSFC) Himwich, W. (Interferometrics) Ma, C. (NASA/GSFC) MacMillan, D. (Interferometrics) Niell, A. (Haystack) Potash, R. (Interferometrics) Rogers, A. (Haystack) Ryan, J. (NASA/GSFC) Vandenberg, N. (Interferometrics) Walker, R. C.	NASA space geodesy program geodetic observations for 1995. 3.6 cm
BC043	Conway, J.(Chalmers, Onsala) Venturi, T. (Bologna) Giovannini, G. (Bologna) Feretti, L. (Bologna) Beasley, A.	HI absorption observations of the nearby CSO 4C31.04. 18 cm with VLA single antenna
BC044	Conway, J. (Chalmers, Onsala) Wrobel, J. Carilli, C. (CFA) Blanco, P. (Calif., San Diego)	HI absorption toward the nucleus of Cygnus A. 18 cm with phased VLA

No.	Program	Program
BC045	Coles, B. (Calif., San Diego) Grall, R. (Calif., San Diego) Klingesmith, M. (Calif., San Diego)	Interplanetary scintillation measurements of the solar wind speed. 1.3, 6, 3.6, 2 cm
BC047	Coles, B. (Calif., San Diego) Grall, R. (Calif., San Diego) Klinglesmith, M. (Calif., San Diego)	Interplanetary scintillation measurements of the solar wind speed. 2, 3.6 cm
BC048	Clark, T. (NASA/GSFC) Ryan, J. (NASA/GSFC) Ma, C. (NASA/GSFC) Vandenberg, N. (Interferometrics) Gipson, J. (Interferometrics) Himwich, W.E. (Interferometrics) Mac Millan, D.S. (Interferometrics) Potash, R. (Interferometrics) Gordon, D. (NASA/GSFC) Neill, A. Haystack) Corey, B. (Haystack) Rogers, A. (Haystack) Eubanks, T. (USNO) Fomalont, E. Walker, R. C.	Revised: NASA space geodesy program observations for June-December, 95. 3.6 cm
BC049	Cawthorne, T. (Lancashire) Hutchison, J. (Lancashire)	Polarization sensitive observations of 4C 71.07. 3.6, 6 cm
BD021	Diamond, P. Kemball, A. Benson, J. Junor, W. (New Mexico) Dhawan, V.	Monitoring stellar SiO masers. 0.7 cm VLA single antenna
BD023	Denn, G. (Iowa) Mutel, R. (Iowa)	Monitoring BL Lac, with polarization. 1.3, 2, 3.6 cm
BD026	Diamond, P. Kemball, A. Goss, W. M. Taylor, G. (Caltech)	Mapping the small scale structure of the interstellar HI. 18 cm with phased VLA
BF013	Fomalont, E. Goss, W. M. Lyne, A. (Manchester) Manchester, R. (CSIRO)	Pulsar parallax and proper motions: Second and third epochs. 18 cm
BF014	Fix, J. (Iowa) Claussen, M.	Secular variations in the OH line profiles of U Her. 18 cm with VLA single antenna
BF015	Fomalont, E. Bradshaw, C. (George Mason) Geldzahler, B. (George Mason)	The parallax of Sco X-1. 6 cm with VLA single antenna

No.	Observer(s)	Program
BG015	Greenhill, L. (CFA) Diamond, P. Gwinn, C. (Calif., Santa Barbara) Moran, J. (CFA)	Tracing the dynamics of a protoplanetary disk. 0.7 cm
BG030	Gabuzda, D. (Lebedev) Cawthorne, T. (Lancashire)	Linear polarization of BL Lacertae objects. 1.3 cm with EB
BG043	Giovannini, G. (Bologna) Cotton, W. Feretti, L. (Bologna) Lara, L. (Bologna) Marcaide, J. (Valencia) Venturi, T. (Bologna)	VLBA observations of six low power compact radio galaxies. 6, 18 cm with VLA single antenna
BG045	Greenhill, L. (CFA) Moran, J. (CFA) Danchi, W. (Calif., Berkeley) Bester, M. (Calif., Berkeley)	Snapshot survey of SiO maser stars at maximum and minimum luminosity. 0.7 cm with VLA single antenna
BH010	Hewitt, J. (MIT) Haarsma, D. (MIT) Katz, C. (MIT) Moore, C. (MIT) Trotter, C. (MIT)	Gravitational lens monitoring with the VLBA. 3.6, 18 cm
BH011	Hough, D. (Trinity U.) Vermeulen, R. (Caltech) Readhead, A.(Caltech)	Search for superluminal motion in lobe-dominated quasars. 3.6 cm
BJ018	Jones, D. (JPL) Jauncey, D. (CSIRO) Meier, D. (JPL) Murphy, D. (JPL) Preston, R. (JPL) Reynolds, J. (CSIRO) Tingay, S. (Mt. Stromlo) Tzioumis, A. (CSIRO)	Confirmation of a counterjet in Centaurus A. 3.6 cm
BK033	Kollgaard, R. (Penn State) Gabuzda, D. (Lebedev) Feigelson, E. (Penn State)	The parsec-scale morphology of X-ray selected BL Lacertae objects. 6 cm
BL016	van Langevelde, H. Schilizzi, R. (NFRA) Israel, F. (Leiden) Diamond, P. Beasley, A. Conway, J. (Chalmers, Onsala)	OH lines in Centaurus A. 18 cm

No.	Observer(s)	Program
BL020	Ludke, E. (UFSM, Brazil) Sanghera, H. (NFRA) Cotton, W.	Resolving faraday effects in CSS jets. 6 cm
BL021	van Langevelde, H. Diamond, P. Schilizzi, R. (NFRA) Cotton, W.	The parallax of nearby Miras. 18 cm
BL023	Lazio, T. (Cornell) Cordes, J. (Cornell) Frail, D.	Compact sources toward the galactic center. 1.3, 3.6 cm with phased VLA
BL025	Lazio, T. (Cornell) Cordes, J. (Cornell)	Compact doubles and AU scales in the neutral interstellar medium. 20 cm
BL030	Lonsdale, C. (Haystack) Barthel, P. (Groningen/Kapteyn)	Resolving the interaction edge of 3C 205 south. 6 cm with phased VLA
BM008	Migenes, V. (CSIRO) Bowers, P. (NRL) Cohen, R. (Manchester) Shepard, M. (Caltech)	OH maser shells. 18 cm with VLA single antenna
BM043	Marvel, K. (New Mexico State) Diamond, P.	Continued monitoring of water masers around AGB stars. 1.3 cm
BM045	Mattox, M. (NASA/GSFC) Marscher, A. (Boston) Wagner, S. (Heidelberg Obs)	Study of correlation between parsec scale radio structure and flaring in gamma ray emission of blazars. 1.3, 2 cm
BM047	Marscher, A. (Boston) Gomez, J. (Boston) Wehrle, A. (JPL) Georganopoulos, M. (Boston)	Coordinated multiband observations of blazars. 1.3 cm
BO002	Otterbein, K. (MPIR, Bonn) Krichbaum, T. (MPIR, Bonn) Witzel, A. (MPIR, Bonn) Wagner, S. (Heidelberg Obs)	Ultraluminous quasar S5 0836+710. 1.3, 3.6 cm
BP020	Patnaik, A. (MPIR, Bonn) Porcas, R. (MPIR, Bonn) Browne, I. (Manchester)	0218+357 gravitational lens images. 1.3, 2 cm
BP021	Perlman, E. (Maryland) Stocke, J. (Colorado/JILA) Carilli, C. (CFA) Conway, J. (Chalmers, Onsala)	CSO PKS 1413+135. 2, 3.6 cm

No.	Observer(s)	Program
BP022	Patel, N. (CFA) Goldsmith, P. (NAIC) Greenhill, L. (CFA) Hernnstein, J. (CFA) Ho, P. (CFA) Moran, J. (CFA) Zhang, Q. (CFA)	Water maser emission from a circumstellar disk around IRAS 21391+5802. 1.3 cm
BS020	Snellen, I. (Leiden) Fassnacht, C. (Caltech) de Bruyn, G. (NFRA) Schilizzi, R. (NFRA) Browne, I. (Manchester) Jackson, N. (Manchester) Wilkinson, P. (Manchester) Myers, S. (Caltech) Pearson, T. (Caltech) Readhead, A. (Caltech) Miley, G. (Leiden)	VLBI imaging of two new gravitational lens systems. 2, 6 cm
BS025	Shaffer, D. (Nevada) Kellermann, K.	CTD93: A gravitational minilens? 2, 3.6, 6, 18, 90 cm
BS027	Sivagnanam, P. (Meudon) Diamond, P. Etoka, S. (Meudon)	Anomalous structures and kinematics of OH circumstellar shells. 18 cm with phased VLA
BT017	Taylor, G. (Caltech) Vermeulen, R. (Caltech) Pearson, T. (Caltech) Readhead, T. (Caltech) Wilkinson, P. (Manchester) Browne, I. (Manchester)	Completing a flux limited VLBI survey of 295 flat spectrum sources. 6 cm
BV015	Vermeulen, R. (Caltech) Taylor, G. (Caltech) Cohen, M. (Caltech) Pearson, T. (Caltech) Readhead, A. (Caltech) Xu, W. (JPL) Wilkinson, P. (Manchester) Browne, I. (Manchester) Henstock, D. (Manchester)	Caltech-Jodrell snapshot survey of superluminal motion. 6 cm
BV017	Venturi, T. (Bologna) Cotton, W. Feretti, L. (Bologna) Giovannini, G. (Bologna) Lara, L. (Bologna) Marcaide, J. (Valencia)	Proper motion monitoring in two FRI radio galaxies. 3.6, 6, 18 cm with phased VLA

No.	Observer(s)	Program
BW008	Walker, R. C. Fomalont, E.	VLBA baselines. 3.6 cm
BW017	Wilkinson, P. (Manchester) Browne, I. (Manchester) Nair, S. (Manchester)	The gravitational lens B0218+357. 18, 90 cm with VLA single antenna
BZ012	Zensus. J.A. Porcas, R (MPIR, Bonn) Lobanov, A. (Lebedev) Leppanen, K. (Helsinki)	Weak cores in double lobed radio quasars. 2, 3.6 cm with EB
BZ014	Zensus, J. A. Kellermann, K. Vermeulen, R. (Caltech) Cohen, M. (Caltech)	2 cm survey.
GR010	Rupen, M. Bartel, N. (York U.) Conway, J. (Chalmers, Onsala) Beasley, A. Sramek, R. Romney, J. Bietenholz, M. (York U.) Weiler, K. (NRL) van Dyk, S. (NRL) Panagia, N. (STScI) Titus, M. (Haystack) Cannon, W. (York U.) Popelar, J. (Ottawa) Graham, D. (MPIR, Bonn) Venturi, T. (Bologna) Umana, G. (CNR/IRA-Frascati) Davis, R. (Manchester) Rius, A. (Barcelona) Altunin, V. (JPL) Jones, D. (JPL)	VLBI imaging of supernova 1993J in M81. 3.6, 6, 18 cm with phased VLA and EB

F. SCIENCE HIGHLIGHTS

Green Bank

HI emission has been detected on the 140 Foot Telescope from 25 optically selected extreme late-type galaxies that had no previous information on redshift or HI. All the galaxies appear to be Sd-Im systems, and are members of the local supercluster. One may be a new member of the local group. The observations have uncovered a diverse set of gas-rich galaxies, two of which may belong to the class of giant, low surface brightness Malin 1 type disk galaxies.

Observers: L. Matthews (SUNY Stony Brook), J. GallagherIII (U. Wisc.), and J. Littleton (WV Univ.).

Tucson

A Better Look at the Structure of Molecular Cloud Complexes – Preliminary results from the first oversampled, high spatial resolution CO map of a region of the Galactic plane show far more structure on a wider range of size scales than previous surveys. A

one square degree on-the-fly map was made with the 12 Meter Telescope in the direction of the tangent point of the Scutum Arm in order to determine cloud properties. The results will be compared with those of previous low resolution or coarsely sampled surveys.

Observers: K. Mead (NRAO) and M. Kutner (Rensselaer)

Socorro

Brightness Distribution of Jupiter's Synchrotron Radiation Changed by Comet Impacts – Analysis of VLA data obtained before, during, and after Comet Shoemaker-Levy 9 collided with Jupiter in July 1994 has revealed that the brightness distribution of Jupiter's synchrotron radiation changed significantly during the week of cometary impacts. The VLA images show a dramatic local enhancement in the radiation belts, concentrated near the magnetic equator. Predictions before the event had suggested that the planet's radio emission would decrease, but instead the radio observations with the VLA, the 140 Foot Telescope, and other instruments showed a dramatic increase in the radio flux density during the six days of cometary bombardment. Continued monitoring of the planet will help researchers gain the full yield of information from what they call "a unique experiment to unravel one of the outstanding issues in magnetospheric physics: the renergization and radial transport mechanism of the energetic electrons in Jupiter's radiation belts."

Investigators: I. de Pater, C.Heiles, and M Wong (Berkeley); R. Maddalena, (NRAO); M. Bird and O. Funke (Bonn); J. Neiderhoefer (MPIfR); R.M. Price, M. Kesteven, and M. Calabretta (CSIRO); M. Klein, S. Gulkis and S. Bolton (JPL); R. Foster (NRL); S. Sukumar (DRAO); R. Strom and T. Spoelstra (Dwingeloo); R. LePoole (Leiden Univ.); M. Robison (NM Tech); R. Hunstead, D. Campbell-Wilson, and T. Ye (Univ. of Sydney); G. Dulk (Astrophysical, Planetary and Atmospheric Sciences, Boulder, CO); and Y. Leblanc, P. Galopeau, E. Gerard,and A. Lecacheux (Observatoire de Paris).

VLBA Images Reveal Dramatic Changes in Circumstellar Maser-Ring Structure – VLBA images of the evolved M-type giant star TX Cam made at four epochs show that the circumstellar SiO maser rings change dramatically from epoch to epoch. The high-resolution VLBA images show that the environment close to this pulsating star probably changes dramatically at different points through its 557-day pulsation cycle. Further work will seek to model the dynamics of the circumstellar shell, based on monitoring the movement of individual maser spots. The VLBA images of this star, some 500 pc distant, have a resolution of approximately 170 microarcseconds.

Investigators: P. Diamond, A. Kemball, V. Dhawan, J. Benson, and A. Zensus (NRAO), and W. Junor, (UNM).

G. PUBLICATIONS

Attached as Appendix A is a tabulation of all preprints received in the NRAO Charlottesville library authored by NRAO staff or based on observations obtained on NRAO telescopes during the reporting period.

H. CHARLOTTESVILLE ELECTRONICS

Amplifier Development, Design and Production

A total of 19 amplifiers (twelve 4.0-6.0 GHz and seven 18-26 GHz) was delivered this quarter.

Work continues on the 290-395 MHz amplifier prototype. The input stage of the amplifier was designed empirically with the aid of a single-ended test fixture. This fixture was developed for use with all amplifiers in the 290-1200 MHz frequency range.

The new PC-based HFET test station is nearly completed. The dewar coaxial transitions and cold attenuator were calibrated and complete system evaluation has begun.

Development of 60-90 GHz amplifiers resumed. A WR-10 waveguide single-stage test fixture has been built and tested in order to evaluate devices and circuit models at millimeter-wave frequencies (75-110 GHz).

A total of seven 40-50 GHz amplifiers using InP devices has been delivered this quarter.

Superconducting (SIS) Millimeter-Wave Mixer Development

Work continues on the design of an SIS image separation mixer on a chip. For the 200-300 GHz band, the mixer will be on a 2 x 1 mm quartz chip mounted in a waveguide block with separate RF and LO waveguide ports. To verify the design of the 200-300 GHz planar quadrature hybrid, a model scaled in frequency by 1/1000 was constructed. The measured results agreed well with the predictions of the electromagnetic simulator used in designing the circuit. A complete frequency-scaled image separation mixer was constructed using the model quadrature hybrid with standard (unselected) commercial 200-300 MHz mixers and (2 MHz IF) hybrid. This gave an image rejection of 15-25 dB across most of the band and 12.5 dB at the low frequency end. This is adequate for the intended purpose of suppressing atmospheric noise in the image band, which otherwise degrades the system sensitivity.

We have supplied eight very low loss vacuum windows for the 200-300 GHz receiver on the 12 Meter Telescope. These 3-inch diameter windows use a layer of expanded PTFE to support a coated polypropylene vacuum barrier.

During this quarter we have assembled and tested 11 SIS mixers, and mounted and DC-tested 25 SIS chips from UVa. We also repaired and tested one varactor multiplier from the 12 Meter Telescope.

Electromagnetic Support

Work on the phase shifter for the VLA 18-26.5 GHz band continues. Phase shifters with loads of the same type on all the four walls did not meet the bandwidth requirements. Theoretical analysis shows that a phase shifter with dielectric loading on one set of walls and corrugations on the other set of walls would give a differential phase shift of $90° \pm 3.5°$ for the two orthogonal polarizations over the entire band. A phase shifter of the kind mentioned here and transitions that are required for connection to the test setup have been fabricated.

GBT operating efficiency from prime focus was computed for frequencies between 300 and 1200 MHz. Above 680 MHz, patterns of corrugated horns have been used, while at lower frequencies short backfire feed patterns have been used.

GBT Spectrometer

During the last quarter construction of the GBT spectrometer was begun. EMI racks were received and bins for both the sampler and digital racks were mounted. All multi-layer cards were assembled and, except for some missing IC's, are ready for card testing.

All wirewrap cards in the system were sent to an outside vendor for wrapping. This includes the correlator bin back planes.

The design of a long-term accumulator card test fixture was completed and construction of the unit has begun.

The first production run of the 1024-lag correlator chip was completed in September and resulted in a much higher yield than expected. Prototype runs of the correlator chip had yields in the 15 to 19 percent range. The run just completed resulted in a yield of 63 percent. The high yield means that no additional wafer runs will have to be ordered for the GBT spectrometer.

OVLBI Earth Station

Construction of a satellite frame generator for the Russian Radioastron OVLBI antenna was started. This decoder is identical to that used in the NRAO Green Bank Earth Station and will be provided to the Russian Astro Space Center for testing of the Russian earth station.

Using an accelerometer and low frequency spectrum analyzer, a few attempts have been made to measure the vibration modes and damping of the GBT. The new lowest vibration modes were found very close to the predicted values. The data on damping is not conclusive at this point and more work is required in this area.

I. GREEN BANK ELECTRONICS

Servo System

We continue to monitor the progress of the GBT Servo system, having technical teleconferences a couple times a month with the vendor. Checkout and in-house testing for the Feed Arm servo system is scheduled to occur over the next few months.

Using an accelerometer and low frequency spectrum analyzer, a few attempts have been made to measure the vibration modes and damping of the GBT. The new lowest vibration modes were found very close to the predicted values. The data on damping is not conclusive at this point, and more work is required in this area.

Spectrometer

Construction of the 1.6 GHz filter module prototypes has begun. Two-thirds of the 1.6 GHz samplers are built, and analog cards for 100 MHz samplers are built. The third wafer run, for the correlator chip is now complete and the yield was much better then originally anticipated.

IF/Converter Racks

All purchased components required to construct the second converter rack are on order and construction of this rack has begun.

Prime Focus Receivers

One prime focus temperature controller is completed with all functions tested. Fabrication of the second controller is completed and testing has begun.

Active Surface

The interactive Status/Control software that engineers and operators will use to diagnose the 2200+ actuators on the GBT has been written and tested on a simulator.

Testing/Integration

In July and August we ran several days of tests at the 140 Foot using a significant amount of GBT Electronics hardware. Specifically two GBT receivers (X and Ku band), fiber optic IF links, the second and third LOs, 1-8 GHz Converter Modules, Square Law Detectors, and the Digital Continuum Receiver were tested. These tests focused on continuum observations of the types which will be needed during the earliest commissioning phases of the GBT, they were very successful.

Site Operations

Maintenance, repair, and installation support was supplied to the 140 Foot, the 85-2 and 3 interferometer, the USNO VLBI station, and the OVLBI earth-station terminal.

J. TUCSON ELECTRONICS

The 12 Meter summer shutdown concluded on September 12, and visitor observing resumed on that date. While the summer monsoons were in progress, the following projects were completed.

Hybrid Spectrometer On-the-Fly Acquisition. A major accomplishment of the summer was the implementation of on-the-fly (OTF) data acquisition with the hybrid spectrometer. With the hybrid spectrometer OTF capability, observers have more bandwidth and resolution options to complement the filter bank OTF acquisition. In addition, the hybrid spectrometer is essential for OTF data acquisition with the 8-beam receiver, which is expected back on the telescope in late autumn. As with the filter banks and digital continuum backend, the hybrid spectrometer dumps data every 100 milliseconds, tagged with the actual telescope position. A major component of the project was developing a digital signal processing system that is able to perform the FFTs of the autocorrelations in real-time. The implementation is ready to be used by observers while refinements continue through the autumn. Filter bank OTF acquisition continues to be available simultaneously.

With the availability of both hybrid spectrometer and filter bank OTF observing, the data rate for OTF observing goes up considerably. The sustained data rates are now 4.9 MB per minute of observing, amounting to over 5 GB of raw data per typical day. We have recently installed several more high capacity disk drives, giving the Observatory about 32 GB of total raw disk space and 9 GB of AIPS reduction storage. Although this seems a huge amount of disk space by past standards, it can be exhausted in just a few days

of OTF observing. The staff is developing data management procedures to cope with this deluge of data, but it will be essential that observers participate actively in data management if there is to be sufficient disk space.

2 and 3 mm and 1 mm Receiver Upgrades. The receiver group made a number of improvements to the 2 and 3 mm receiver package. In particular, problems with noise pickup on the bias lines to the 2 and 3 mm mixers were addressed with better connectors and grounding. The excess noise, which affected continuum observing, is now much lower, although further improvements are planned.

The window material covering the dewar ports of the 1 mm receiver was replaced with a material that is less likely to absorb ambient water vapor. This should fix the anomalous noise temperatures in the 270-300 GHz mixer set that occurred last spring. Improvements to the sideband injection tone system and the mounting of the image sideband rejection filter are also underway. This receiver will be re-installed on the telescope on the first of November.

Eight-Beam Receiver. Work on the 8-beam receiver was put on hold during the summer given the urgency of work on the other receivers. However, the receiver group has now resumed work and has completed the installation of the final four beams. As reported in the last Newsletter, the first four beams were successfully tested on the telescope in May. Work on the beam rotation system is also well toward completion. We have scheduled tests for the full receiver during several sessions in December and currently plan to release the receiver to observers in January.

Additional Computing Projects. In addition to the hybrid spectrometer OTF implementation, several other computing projects were completed. An on-line data browser for the quick display of both OTF mapping data and conventional single-point observations is available. An improved, color status display allowing numerous monitoring and status windows was also installed.

Site Maintenance and Improvements. The Operations Group was very busy this summer with the annual dome door and drive system inspection. As the result of an aggressive maintenance program, the failure rate of the dome door drive components has been brought to a very manageable level. Only a small number of failed components were found this summer. The operations group upgraded the electrical systems on the telescope and have installed a new grounding system which we hope will diminish lightning damage which has affected the telescope almost yearly. The operations group also conducted their annual painting and sprucing up campaign around the dome and laboratory and have made some improvements to the comfort of the observer dormitory.

K. SOCORRO ELECTRONICS

VLA 1.3 - 1.7 GHz Receiver Improvements

One of the two remaining spare front ends was completed and tested. The remaining spare will be used for cryogenic testing of resonance suppression in the orthomode transducer.

Prototypes of a new Walsh function phase switching scheme in the 200 MHz output of the L2 first local oscillator successfully removed the out-of-band signals which are imaged to appear in-band. The scheme also greatly reduces the 1400 MHz spurious signal in L-band. This method replaces the formerly planned frequency converter F15 with a much less expensive system which can be completed on all antennas by the end of this year.

VLA Upgrade Prototype Front End

Development work is proceeding on a full waveguide band front end in the frequency range of 18 GHz to 26.5 GHz. The design includes three sub-band system temperature monitors for estimating atmospheric phase variations. A polarizer consisting of a waveguide phase shift section and an OMT section are under development by the Central Development Lab in Charlottesville. Other components are being selected and will be ordered the first part of the next quarter. Assembly is expected to start in the first quarter in 1996.

VLA 40-50 GHz Receivers

Three additional front ends are assembled. One was installed on antenna 6 and another on antenna 11. The third for antenna 20 is waiting for repair of several failed components. All should be tested and installed by late October in time for the 1995/1996 winter atmosphere.

In order to provide adequate LO coherency after the large frequency multiplication, all 13 Q-band antennas plus 6 others have been retrofitted with low phase noise SC-cut VCXOs. The Wenzel Corp. 10 MHz units are an exact replacement in the L1 module. They have better phase noise than the original units, which have degraded over their 17 years of operation.

New VLA Correlator Controller

A new project plan was developed. Work in hardware and software areas progresses. The serial I/O will be tested in December.

VLA Antenna B-Rack Shields and Optical Fibers

Twenty-eight shields with optical fibers have been installed in antennas. The project is complete. However, tests indicated shielding effectiveness is about 15 dB at P-band instead of the expected 35 dB. Leakage paths will be located and corrected.

VLA L6 Synthesizer Upgrade

A two-year effort ended with the sixtieth L6 upgrade with a new phase lock loop board. The original boards had become unreliable causing unacceptable losses of phase lock.

VLA T4 Baseband Filter Upgrade

Investigations of poor antenna passbands resulted in the discovery of T4 baseband filter problems. Over the last 17 years, carbon composition resistors within the T4s have changed resistance as much as 50 percent and have also become reactive. Nearly all of the 115 T4 modules have been tested and repaired within the past year. Module passbands of each baseband filter now are within 0.25 dB of the average.

VLA Virtual Instrument Recorder (VIR)

This system is being developed to replace the eight channel digital data tap which uses an eight-channel analog recorder. The analog recorder has reached the end of its repairable life. This older system required engineers or technicians to travel to the VLA site to set-up and retrieve the data. We are in the process of implementing hardware and software to provide AOC access to on-line VLA site monitoring and data recording using a graphical interface. This system will provide simultaneous multichannel and multiuser capability. It was installed at the VLA for testing, and should be functional next quarter.

GPS Receivers

The effort to develop a universal interface to connect any brand/model GPS receiver to the VLBA station computer without software changes encountered unexpected setbacks. The VME computer requires faster response than the interface can provide, and the Trak GPS computes GPS – station clock time offsets incompatibly with the Odetics receivers.

VLBA Correlator

We accepted a replacement offer of 1000 VLBA1 ASIC chips, at no cost to NRAO, from LSI Logic. LSI expects 10X reduction in the failure rate of the replacements with respect to the originals. At an approximate failure rate of two chips per month, the quantity of 1000 should keep the correlator running for about 40 years. Delivery of the new chips will be February 1996. We plan to install the new chips in the FFT section of the correlator because it is easier to identify a failed chip there than in the MAC section. Three ASIC chips have failed since the new cooling units came online May 16, which translates to about 0.7 chips per month.

VLBA Data Acquisition and Playback

Work continues on improving reliability of the system and on prolonging headstack life to reduce operating cost. Tests began to identify and eliminate an intermittent "barrel roll" problem in the formatter. Also tests began to determine the maximum relative humidity (RH) which avoids excessive headstack wear. Design work began to deliver lower RH air to the area of the headstacks.

Interference Protection

One of the NSF summer student research assistants initiated a radio frequency interference (RFI) test at the VLA for the band 304-348 MHz (P-band), much like the existing RFI test for the band 1215- 1750 MHz (L-band). Like the L-band test, the results are available from the NRAO home page on the World Wide Web. Overlays with identifying text information are available for both P and L-band plots. Both snapshot tests will be made about once a month. Further details are in VLA-VLBA Interference Memo No. 9.

As a temporary means to provide some VLBA RFI information to observers, spectrum snapshots made at the VLBA 500-1000 MHz IF with a swept frequency spectrum analyzer are also available on the Web.

Tests of the new GE electrode-less RF Genura lamp show radiated emission at 2.56 MHz and its harmonics. Test data was sent to the NSF Electromagnetic Spectrum Management Office.

L. OBSERVATORY COMPUTING AND AIPS

Discussions have started with the NRAO staff this quarter regarding the long-term strategy NRAO should pursue in computing. These discussions are especially important in view of the ongoing budget constraints faced by NRAO. The broad outlines of the most critical needs and issues are clear:

The problem of an aging computer infrastructure at NRAO will become acute over the next year or two. The Observatory current replacement rate for scientific workstations is much lower than can be sustained over the long term. This is a "maintenance" problem.

There are not enough publicly available high-end workstations to meet the demand from NRAO visitors and staff members. We are close in this area, but someone keeps raising the bar! This is a "capacity" problem.

Larger problems now involve data sets so large that a small number of workstations with much greater performance than any currently at the Observatory are needed. This is a "capability" problem.

Computing personnel for support and programming are stretched extremely thin, resulting in delays dealing with problems or software development. This is a "support" problem.

Recent instrumental developments at NRAO (especially with the VLBA and the 12 Meter) have dramatically increased the typical size of data sets that users must work with. This severely strains our networking, data storage, and tape facilities. This is a "data volume" problem.

Over the next few months the above issues will guide the setting of priorities in computing for next year and beyond. The primary goals remain support of NRAO users and maximizing the science which can be done with NRAO facilities.

Delivery of all workstations ordered under the 1995 RE budget were received this quarter. New dual-processor workstations are now available for use by visitors and NRAO staff members in Socorro and Tucson; a few other machines were also upgraded. This has helped reduce the sign-up delays for using the large public workstations, but visitors to NRAO still need to make arrangements up to two months in advance to be assured access to the workstation they need.

Contacts with network providers to get a definitive bid for improved network bandwidth into Green Bank have continued. Network providers have not yet given us definitive bids. We are continuing efforts to resolve various issues and determine the actual cost of improved service into Green Bank.

Agreement was reached this quarter between NRAO and the Space VLBI project at JPL to partially fund a new position for the AIPS project which will be dedicated to supporting data reduction for Space VLBI in AIPS. This has allowed the creation of a new programming position in the AIPS group. The VSOP satellite will be launched in September 1996, so this hire will be especially timely. The recruitment process is well along.

The first release of AIPS under a "GNU General Public License" rather than a "user agreement" took place during this quarter. The 15JUL95 release became available through anonymous ftp on August 18. The source code and full binary forms for a variety of architectures are found in directory aips/15JUL95 (and below) on the computer known as baboon.cv.nrao.edu. Since then, 67 sites have copied some or all of AIPS to their machines. To provide more information on AIPS use, and to provide data which will allow us to

set priorities, a registration system has been established. Although the AIPS code is now free and anonymous, help with installation and use of AIPS requires a site "registration" which is also at no charge to institutions engaging in research in astronomy. To date, 37 non-NRAO sites have registered the 15JUL95 release, indicating that they expect to run it on 223 computers. Tape copies of AIPS are also available, currently without a media charge. So far 27 copies have been shipped on tape to 18 sites.

The change to a GNU license not only simplifies portions of the distribution. It also allows us to use other peoples' code directly when that code is also released under a GNU license. We are creating a GNU directory tree within the AIPS directory structure to support the inclusion of GNU-licensed software. The first such package is the "readline" routines used by the Bash shell to handle terminal input. (Korn and other Unix shells have similar functionality.) Users of 15JAN96 AIPS now have emacs-like (or vi-like) commands to edit the current input line, to recover and edit previous input lines, and even to do symbol completion in which a partially-typed symbol is completed by the readline software when the Tab key is hit (or a list of possible completions is shown). This function even knows that a task name cannot be the first symbol on a line.

The re-write of the CookBook continued during the quarter at a slower pace. The big change was the addition of an Index to all chapters of the CookBook. Appendix Y on file sizes was re-written and several chapters had minor revisions made to reflect the most recent changes in AIPS. All chapters of the CookBook are made available via the World Wide Web. Users can fetch the new chapters as they are actually completed by fetching the files via the WWW (or via anonymous ftp). AIPS is at WWW URL http://www.cv.nrao.edu/aips/.

VLBA data processing received a lot of attention during the quarter. Two new polarization tasks were contributed by Kari Leppanen: BLAVG which allows a more robust estimation of differential polarization delay offsets and LPCAL which calibrates polarization, allowing for spatial structure in the calibrator source. The new task PCCOR generates calibration data from the pulse-cal table to correct the instrumental delay and phase offsets between individual baseband converters. Also added was a more robust and complete method of correcting for amplitude losses due to averaging and FFTs prior to complete delay correction. The new task SNEDT allows interactive editing and smoothing of calibration tables using the TV display. A preliminary version of OMFIT was submitted by Ketan Desai, Naval Research Laboratory, to combine self-calibration with uv-plane model fitting. The plot task VPLOT was generalized to allow automatic data editing and to improve performance still further.

Of interest both to VLA and to VLBA, the new task FIXWT determines proper uv-data weights by estimating the noise in the data. Spectral bandpass calibration will soon be made more flexible with improved signal-to-noise using polynomial fits to the bandpass rather than channel-by-channel averaging. The AIPS tasks which support the 12 Meter on-the-fly imaging mode were enhanced to allow time smoothing, additional channel selection, and a wider range of convolution functions. PostScript display tasks were given the COPIES adverb, LWPLA was changed to use the full grey-scale range (avoiding a TeX bug), and TVRGB was given the ability to write a full-color PostScript output The AIPS user-number conversion procedures EHEX and REHEX were made available also as verbs inside AIPS.

M. AIPS++

Progress was made in many areas of the project. The most important achievement was the participation in the tests of the GBT Monitor and Control system on the NRAO 140 Foot Telescope. This was the first mission-critical use of AIPS++ and demonstrated the usability and reliability of several AIPS++ components: the Glish system, the Table system, and various fitting and plotting capabilities. In other areas, development proceeded as required to support this work and application development in other areas. We continue with our strategy of developing a few key applications with the goals of testing the AIPS++ infrastructure and attracting early adopters to AIPS++. The consortium interactions are working well. The Project Manager visited ATNF in August and took part in a number of useful discussions. This has led to a collaboration between ATNF and NCSA/BIMA on Image Analysis and Visualization.

The tests of the GBT monitor and control system on the 140 Foot Telescope were designed to test both the monitor and control system and various parts of the electronics. AIPS++ was to provide the analysis capabilities. The goals were to load monitor and astronomical data from a number of FITS binary tables into the AIPS++ Table system and to provide analysis and plotting capabilities. The timeline for this development was agreed in collaboration with the GBT monitor and control group in a series of meetings starting in late March 1995. The first tests took place in July 1995. This was the first "mission-critical" use of AIPS++, and so our ability to fulfill expectations was on trial. AIPS++ met all the specified goals in functionality. In addition, the combination of the Glish system and the plotting and analysis tools was found to provide an accommodating environment for debugging. To track down unexpected behavior in some of the data, the group running the tests (not from the AIPS++ group) were able to try different and unanticipated ways of plotting the data. These tests are continuing throughout the fall.

In synthesis support, we decided to adopt the Hamaker, Bregman, Sault formalism for as the basis for AIPS++ polarization calibration and imaging. A number of memos have been written on this approach. We are now embarking upon design of classes.

Glish has seen substantial enhancements and improvements. By agreement with the author of the package, Vern Paxson, we have assumed responsibility for distributing Glish. This is good for AIPS++ since Glish lies at the heart of our development strategy in both command line interface development and task control. The design of the support for task control within AIPS++ is now complete and we are starting on implementation. We made a number of substantial improvements to the Lattice and Image classes that will be vital for applications development. We completed a design for a generic filler program to load telescope data into AIPS++, and are now proceeding to implement the design. We designed and started to implement a tiled storage manager for the AIPS++ Table system. We started design and implementation of the Coordinate classes (by Wim Brouw at ATNF).

In visualization, AIPSView went through a number of alpha test phases and was released in version beta 1. In addition to the 2D display present in AIPSView, we have developed a prototype for 3D visual analysis based on the OpenGL and OpenInventor libraries.

In the system area, we participated in beta testing of the new Sun native code C++ compiler. As a result of the feedback that we gave, we are now able to adopt the compiler to some considerable advantage in speed of compilation and ease of use. We installed AIPS++ on an SGI PowerChallenge computer. We added an e-mail exploder archive. We can now do rebuilds of AIPS++ in parallel on a number of CPUs.

The Project center completed hiring of two new members in Socorro. These will bring skills in a number of areas: radio and optical synthesis, signal processing, parallel processing in C++, grand challenge computing, and numerical astrophysics.

N. SOCORRO COMPUTING

During most of the summer of 1995, a large-scale upgrade of the AOC computing facilities took place. The main aim of this upgrade was to improve computing facilities for visiting observers, but also local staff benefited from it. The improvement was threefold.

Four of the IBMs received new and faster disks. These are IBMs which are primarily used for large VLBA projects, in which AIPS task running times can be many hours, sometimes more than a day. Some of the most time-consuming tasks were limited in their speed of execution by I/O constraints. We hope that the new disks have improved that situation; we do not have any numbers on the performance improvement yet. The old disks were distributed among the public Sparc stations and AOC staff.

All public Sparc IPX workstations received an upgrade using the Weitek chip. This chip is faster than the original CPU by a factor 2. Experiences elsewhere with this Weitek chip indicate realistic performance improvements for AIPS tasks by a factor of 1.7.

Three Sparc 20s stations were added, two of which are dual processor machines, to our pool of public workstations. They replace two IPXs which are now being used for other purposes.

As a result, not only have reduction facilities for visitors improved, but we also expect a smaller demand for public workstation time from the local users. In parallel with the hardware upgrade, the operating system for most Sparc workstations was upgraded to Solaris 2.4.

A list of all public workstations and the rules for applying for time are now accessible via the NRAO home page. We plan to make the registration process available on the Web shortly.

Work continued on the VLA archive project. Currently all data from 1976 through 1983 and from 1990 to present have been converted; work on the 1989 data has just begun. The project's by-product – the archive catalog – has been available on the World Wide Web for many months now, and has become quite popular as evidenced by the one hundred queries received in an average working day.

The hardware upgrade of the VLA online system was partially concluded. The newly installed networking capabilities are expected to greatly improve the interaction between operators and the online system. Extensive tests were made to measure the performance and reliability of the new SCSI disks which are to replace the ancient Century disks. A carefully planned transition between the two systems will take place shortly. This transition is designed to take place with as little interference with VLA operations as possible, and will allow a rapid return to the old system should problems occur.

O. VLBA STATUS

During the third quarter of 1995 (period ending September 16, 1995), a total of 46 projects was correlated (36 VLBA, four tests, and six global). The scheduling committee recently increased the amount of observing and we are beginning to see the effects of this. The correlator latency (time between observation and correlation) recently increased from about 17 days to 28. This is due in part to a larger number of projects which cannot be correlated with a speed-up factor. In order to address the increased load, we have, from October 1, increased the correlator operation time to 24 hours a day, seven days a week. This will result in a 40 percent increase in the time available for astronomical correlation. In order to deal with the expected increase in data quantity, we have added a fourth VLBA scientist to the data scrutinizing team. This will keep our quality control at its present high level.

The handling of global projects is still not routine, although it is improving. The problems encountered range from the late arrival of tapes, the incompleteness of log information, and the need for clock searches to the need for an increased level of scrutinization. Improvements currently being implemented in the EVN will alleviate some of these problems shortly.

The correlator software upgrade is progressing at a steady pace and early tests have been encouraging. Until the upgrade is completed, we still cannot tackle the backlog of projects that contain source and/or frequency sub-arraying, have many short scans, or do not have synchronized tape changes.

Nature has tested the VLBA recently. The St. Croix antenna suffered a near miss by Hurricane Luis in August but was hit almost head on a few weeks later by Hurricane Marilyn. Luckily the antenna appears to have survived unscathed.

P. GREEN BANK TELESCOPE PROJECT

Antenna

Over the last quarter the visible construction activity has increased significantly at the Green Bank Telescope site. There are fabrication and erection activities underway in several areas on the ground as well as high in the air on the structure. Since the installation of the elevation shaft, completed in May, the first section of the box structure (B1) has been installed and welded. The erection of the B1 box sequence supplied sufficient stiffness to the shaft to allow removal of the temporary support scaffolding. Also, all eleven of the elevation wheel sections have now been installed in place below the shaft. Alignment and welding of the wheel are approaching completion. All six of the large W19 beams which attach the elevation wheel to the shaft have been installed and aligned, and welding is underway.

On the ground, trial erection of the box segments B2, B3, and B4 is close to completion. These segments will eventually be taken apart in large modules to be lifted into their place in the structure. Also on the ground, assembly of the back-up structure (BUS) trusses has begun. Six sections are complete and standing on the assembly pad where the entire BUS will be assembled and aligned prior to being lifted to the structure in modules. A seventh truss section is underway in the large assembly fixture. Many pieces of the feed arm structure have been fabricated and shipped to the site for storage until they are needed in the erection process.

The receiver room has been assembled and the feed turret, which will hold the Gregorian receivers and feeds, has been installed in the room. Interior finishing of the receiver room is underway. The actuator room has been outfitted with the equipment rack, the required unistrut, air conditioning, and wiring, and is ready for installation on the structure.

Approximately 800 of the total 2,000 panels have been manufactured and are stored at COMSAT/RSI's plant in Sterling, Virginia. Painting of the panels will begin soon. The subreflector back-up structure has been assembled and aligned at RSI. The subreflector panels are under production. Final alignment and testing of the completed subreflector is anticipated in November.

Open Loop Active Surface

In the software area, time was expended reviewing software written by a summer student which included a design of the master computer software and associated code.

A circuit which uses the actuator's LVDT's as position sensors is being developed. A circuit has been prototyped using an older instrumentation op-amp that was on hand. A newer instrumentation amplifier with superior specs is on order and will be used in the

circuit. There is a long delivery on this op-amp, so the final testing is on hold until the op-amp arrives. Confidence is high that the item will work as expected, so a printed circuit layout has been designed.

Closed Loop Active Surface

Instrument Optics – Engineering problems with the instrument base have been resolved and the first article has been built. The mirror, electronics, connectors, and optics have been installed on this unit and it is now undergoing mechanical and optical calibration. A new fixture, to facilitate measurement of the mechanical offsets between the fixed tooling ball and the mirror axes has been built and is being used for the calibration. Additional fixtures are being designed and built to define the true mirror axes to higher accuracy.

The decision has been made to proceed with this base design and the cover will conform to the base design. The drawings require another revision based on errors discovered while building the first article. When these revisions are made, the machine shop will start production. Extensive drawing revisions of the optical assembly have been started. When these drawings are approved, the machine shop can start production of these assemblies also. The machine shop is nearly through with production of all anodized parts for the mirror heads. These will be anodized in one lot.

140 Foot Telescope Demonstration – A modular system has been devised to facilitate use of the hydrostatic level over uneven ground. Preliminary runs have been made between ZY11-ZY12-ZY13. Closures have improved and accuracies of 25-50 microns seem reasonable. As soon as the weather permits, measurements will be made between ZY10-ZY11, and complete runs will be made at night.

Horizontal control surveys are complete and preliminary coordinates of each monument are now known with respect to the center of the spherical bearing. These will be checked against the model of the rotating structure as a function of hour angle and declination. The azimuth orientation of the monument Kelvin mountings have been measured. Following completion of the first article instrument calibration, systems tests will be conducted to point the instrument to fixed points on the structure. A CCD camera has been added for diagnostic work. With this camera we can see the beam location or look down the bore of the instrument.

Great progress has been made on the tracking software algorithm. We now have a ZY demonstration working that tracks a 3-D trajectory in sync with the site IRIG UTC time distribution. This allows any laser on any monument to track a point. Work will now concentrate on writing a ZIY program to take the hour angle and declination and convert it into 3-D trajectories for the retroreflectors on the 140 Foot Telescope.

Panel Setting Tool – The prototype tool has been modified to include suggested revisions. Work has started on the software interface between the CMT handheld computer and the dual axis inclinometer, digital indicators, and barcode reader.

Laser Locations – Drawings have been generated of the GBT site showing the ground laser locations. Work is underway on generating drawings showing the feed arm laser locations.

Servo

A conference was held to consolidate comments to the feed arm servo test procedure recently submitted by the contractor, PCD. PCD has accepted the comments submitted by NRAO and plans to update the test procedure to reflect them. A revised schedule for the feed arm servo test is being developed by PCD.

Using an accelerometer and low frequency spectrum analyzer, a few attempts have been made to measure the vibration modes and damping of the GBT. The few lowest vibration modes were found very close to the predicted values. The data on damping is not conclusive at this point, and more work is required in this area.

Electronics

Orders have been placed for all purchased components required to construct the second converter rack. Also, orders were placed for material needed to build the next five optical fiber driver and receiver modules (less optical links).

Construction has begun on the 1.6 GHz sampler filter module prototypes. Also, the noise source module has been installed in 140 Foot Telescope Cassegrain house.

Work continued on the final design of the multiplexed switching signals system.

One GBT prime focus temperature controller is completed with all functions tested. Fabrication of the other controller is completed and testing will commence soon. The design has been started of the dewar for prime focus receiver #2.

The machine shop is currently modifying the holography receiver and is scheduled to be finished by the middle of October.

On the K-band receiver the MCB interface and rack wiring were changed, four new cryogenic amplifiers were installed, and the dewar was fitted with a cold cathode tube vacuum gauge. The new MCB circuitry is now being tested, and should be completed shortly. It is expected that the receiver testing will be done by mid-October.

The failed LO amplifier from the X-band receiver was sent back to the vendor for repair. This is the second failure of the LO amplifier. We are now requesting quotes from other vendors for a spare amplifier.

The spectrometer correlator chips have undergone functional testing at low frequency. Over 63.5 percent of the chips passed this test. Some chips will be tested at full speed during October.

The software for testing the spectrometer samplers is about 80 percent complete. The only portion left is the code for reading in the data from the hardware. All other routines for the drop down menus and the FFT routines have been thoroughly tested. Print routines will also be added so that hard copies of the FFT's will be available.

The extension of the monitor and control ethernet from the 140 Foot Telescope to the Interferometer was installed. This allows the connection of the weather station SBC to the monitor and control ethernet at the 140 Foot Telescope. The ethernet was extended over fiber optic cable. Equipment was installed at the Interferometer 85-1 control room and the 140 Foot Telescope.

The round trip phase monitor testing continued this quarter. The unit was installed in the timing center rack and tested using OVLBI's MCB interface. Some problems were found, and the module was brought back to the lab for rework and further testing. It is expected that this will be complete by the end of October.

Monitor and Control

Work this quarter included modification of the control, monitor, and message libraries to allow processes and computers in the system to be started or restarted in any order. This was accomplished by having processes periodically test connections when operating and attempt re-connects when connections are lost. This work was completed and will go into alpha test in the next release.

The analysis of the imaging geometry of the subreflector ellipsoid was essentially completed, and a preliminary version of the results is now available at ftp://fits.cv.nrao.edu/pub/gbt_ellipsoid.tar.gz. The analysis of the Gregorian focus tracking algorithm, which will use results from the structural model, best-fitting paraboloid and ellipsoid analyses has been started.

Data Analysis

During September work continued on the 140 Foot Telescope integration tests. Test programs were written to test the performance of Glish and X11 events for real-time data display. Several astronomical source catalogs were written in FITS format for use during the October 140 Foot Telescope test runs. Work was done to access Fortran programs from Glish. In particular, the pulsar prediction program "tempo" and the IRAM "astro" program can now be executed from Glish. Results from these programs can be used in Glish scripts.

Future work will concentrate on support for the spectral processor used in spectral line observing. The current data reduction path using IRAF will be updated to use FITS binary tables.

Q. PERSONNEL

New Hires

P. Palmer	Visiting Scientist	07/01/95
P. Wilkinson	Visiting Scientist	07/12/95
A. Minter	Research Associate (non BR)	08/14/95
E. Schulman	Research Associate	08/28/95
A. Roy	Research Associate (non BR)	09/12/95
G. Taylor	Asst. Scientist, Socorro Operations	09/18/95

Terminations

E. Wilcots	Research Associate	07/20/95
P. Palmer	Visiting Scientist	07/31/95
K. Mead	Visiting Scientist	09/15/95

Change in Title

T. Bastian	to Scientist	07/01/95
S. Beland	to Sr. Scientific Prog. Analyst	07/01/95
D. Frail	to Associate Scientist	07/01/95
R. Norrod	to Deputy Project Mgr - NRAO Systems	07/01/95
M. Stennes	to Electronic Engineer I	07/01/95
T. Weadon	to Head/ Green Bank Electronics Division	07/01/95
A. Zensus	to Scientist	07/01/95

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