NATIONAL RADIO ASTRONOMY OBSERVATORY

Quarterly Report

October 1, 1994 - December 31, 1994

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A. TELESCOPE USAGE

The following telescopes have been scheduled for research and maintenance in the following manner during the fourth quarter of 1994.

	140 Foot	12 Meter	VLA	VLBA
Scheduled observing (hours)	1838.25	1904.00	1633.1	848.8
Scheduled maintenance and equipment changes	186.00	68.00	254.2	221.0
Scheduled tests and calibration	75.75	163.75	270.0	292.0
Time lost	55.50	416.75	62.0	34.0
Actual observing	1782.75	1487.25	1571.1	814.8

B. 140 FOOT TELESCOPE

The following continuum programs were conducted during this quarter.

No.	Observers	Program
A124	Albright, G. (Virginia) Richards, M. (Virginia) Murphy, E. (Virginia)	8.4 GHz radio survey of flaring events on Algol secondaries.
D186	de Pater, I. (Calif., Berkeley) Heiles, C. (Calif., Berkeley) Maddalena, R. Wong, M. (Calif., Berkeley)	21 cm monitoring of the Comet-Jupiter crash.
F123	Frail, D. Kulkarni, S. (Caltech) Fishman, G. (NASA/MSFC) Kouveliotou, C. (NASA/MSFC) Meegan, C. (NASA/MSFC)	A 6 cm search for the radio counterparts to gamma ray bursters.

The following line programs were conducted during this quarter.

No.	Observer(s)	Program
A119	Avery, L. (NRC, Herzberg) Bell, M. (NRC, Herzberg) Feldman, P. (NRC, Herzberg) MacLeod, J. (NRC, Herzberg)	A search for C_6H and C_8H to verify the identity of carriers of the diffuse interstellar bands.

No.	Observer(s)	Program
B609	Bania, T. (Boston) Rood, R. (Virginia) Balser, D.	X-band measurements of the cosmic abundance of ^{3}He.
B623	Braatz, J. (Maryland) Wilson, A. (Maryland)	A survey of H_2O megamasers in nearby AGN.
B626	Bell, M. (NRC, Herzberg)	8 GHz observations of the excitation temperature of long carbon-chain molecules in W51.
B628	Burton, W. B. (Leiden)	Observations of broad HI emission accelerated away from star-forming regions.
F124	Frayer, D. (Virginia) Brown, R. Vanden Bout, P.	A 12-20 GHz survey of molecular oxygen at high redshift.
G343	Gibson, S. (Wisconsin) Wood, D. Holdaway, M. Nordsieck, K. (Wisconsin)	21 cm mapping of galactic neutral hydrogen in the Pleiades region.
H293	Haynes, M. (Cornell) Hogg, D. Maddalena, R. Roberts, M.	Evaluating galactic HI envelopes and a search for faint companions.
L292	Lewis, B. M. (NAIC)	1612 MHz observations of color-selected IRAS sources.
M373	Murphy, E. (Virginia) Lockman, F. J. Savage, B. (Wisconsin)	A 21 cm deep search for high velocity clouds.
S385	Sato, F. (Tokyo U.)	Mapping the structure and motion of the HI gas in the Scorpius-Ophiuchus region.
S386	Stocke, J. (Colorado)	21 cm search for metal absorption line in quasar ZW2.
T344	Thuan, T. (Virginia)	21 cm observations of a blue compact dwarf galaxy for total HI flux.
V083	van Zee, L. (Cornell) Haynes, M. (Cornell) Maddalena, R.	HI observations of galaxies with extended hydrogen envelopes.
W280	Wootten, H. A.	H_2O monitoring in star-forming cores in Rho Oph.
A117	Arzoumanian, Z. (Cornell) Nice, D. Taylor, J. (Princeton)	Timing of seven newly discovered millisecond pulsars at 575. and 810 MHz.

No.	Observer(s)	Program
A118	Arzoumanian, Z. (Cornell) Nice, D. Taylor, J. (Princeton)	Bimonthly timing of 63 pulsars at 810 MHz.
B617	Backer, D. (Calif., Berkeley) Sallmen, S. (Calif., Berkeley) Foster, R. (NRL) Matsakis, D. (USNO)	Pulsar-timing, array observations at 800 and 1395 MHz.
G336	Gwinn, C. (Calif., Santa Barbara) McKinnon, M. Desai, K. (Calif., Santa Barbara) Diercks, A. (Calif., Santa Barbara)	Observations of the scattering of young pulsars and supernova remnants at 0.32 and 1.42 GHz.
M368	McKinnon, M.	Timing the young pulsar PSR B1823-13.
N011	Nice, D. Sayer, R. (Princeton) Taylor, J. (Princeton)	A 350-420 MHz survey of the northern sky for millisecond pulsars.
N014	Navarro, J. (Caltech) Kulkarni, S. (Caltech) de Bruyn, G. (NFRA)	400 MHz observations of PSR 0214+42 – a new field millisecond pulsar.

The following very long baseline interferometry programs were conducted.

No.	Observers	Program
C288	Clark, T. (NASA/GSFC) Gordon, D. (Hughes STX) Vandenberg, N. (NVI. Inc.)	VLBI S/X band monitoring of the North American plate stability.
GL015	Lonsdale, Colin *et al.*	Imaging of OH megamasers in three ultraluminous infrared galaxies.
GL016	Lonsdale, Colin *et al.*	Survey for compact OH megamaser emission in IR galaxies.
GR004	Rupen, M. *et al.*	VLBI imaging of supernovae 1993J in M81.
GZ011	Zensus, A. J. *et al.*	Monitoring the parsec-scale jet structure of 3C 345.

C. 12 METER TELESCOPE

The following line programs were conducted during this quarter.

No.	Oberver(s)	Programs
B630	Bååth, L. (Chalmers, Onsala) Wright, M. (Calif., Berkeley) Emerson, D. Carlstrom, J. (Calif., Berkeley) Woody, D. (Caltech) Lerner, M. (Chalmers, Onsala) Rantakyrö, F. (Chalmers, Onsala) Booth, R. (Chalmers, Onsala) Doeleman, S. (Haystack) Rogers, A. (Haystack) Jewell, P. Zensus, J. A. Backer, D. (Calif., Berkeley) Padin, S. (Caltech)	A global high-frequency VLBI study of AGN's.
B631	Boselli, A. (Paris Obs) Casoli, F. (Paris Obs) Gavazzi, G. (Brera Obs, Italy) Buat, V. (Lab. Astron. Spatiale) Donas, J. (Lab. Astron. Spatiale) Dickey, J. (Minnesota)	Study of CO(1-0) in a complete sample of spiral galaxies in the Coma superclusters.
B632	Balonek, T. (Colgate) Dent, W. (Massachusetts)	Study of the evolution of extragalactic radio sources at millimeter wavelengths.
C289	Casoli, F. (Paris Obs) Boselli, A. (Paris Obs) Dickey, J. (Minnesota) Lequeux, J. (Paris Obs)	Study of the CO luminosity of isolated spirals.
C290	Charnley, S. (NASA/Ames) Latter, W.	Study of organic molecules in oxygen-rich circumstellar envelopes.
C291	Clancy, R. T. (Colorado) Sandor, B. (Colorado)	Microwave spectroscopy of terrestrial planetary atmospheres.
E58	Evans, A. (Hawaii) Sanders, D. (Hawaii) Mazzarella, J. (Caltech) Graham, J. (Calif., Berkeley)	CO observations of high-z, powerful radio galaxies (z=1-4): 3C 368 (z=1.1), 3C 68.2 (z=1.6), 4C 48.48 (z=2.3), 4C 23.56 z=2.4) and 4C 41.17 (z=3.8).
F119	Fuente, A. (Yebes Obs) Martin-Pintado, J. (Yebes Obs) Gaume, R. (NRL)	A chemical study of the reflection nebulosities NGC 2023, NGC 2068, VDB 118, and NGC 6914B.
F127	Fuller, G. Latter, W.	The high-velocity HCO^+ in HH7-11: Stellar wind or shocked cloud material?

No.	Observer(s)	Program
G341	Gao, Y. (SUNY) Solomon, P. (SUNY)	An HCN survey in CO and IR bright/luminous galaxies.
G342	Guélin, M. (IRAM) Ziurys, L. (Arizona State)	Confirmation of ^{26}AlF: Testing nucleosynthesis in AGB Stars I.
H297	Higdon, J. Lord, S. (IPAC) Rand, R. (Maryland)	Study of the molecular gas content of ring galaxies.
H301	Hogg, D. Roberts, M.	Are there molecular clouds in the star-forming regions of Sa galaxies?
H302	Holdaway, M. Owen, F. Rupen, M.	Study of strong continuum sources at 90 GHz.
H303	Holdaway, M. Rupen, M. Conway, J. Beasley, A. Owen, F.	Simultaneous millimeter to centimeter flux measurements of AGN.
K346	Krichbaum, T. (MPIR, Bonn) Bååth, L. (Chalmers, Onsala) Grewing, M. (IRAM) Emerson, D.	The origin of jets: Sensitive imaging with VLBI at 86 GHz.
K348	Kutner, M. (RPI) Mead, K. (Union College) Carey, S. (RPI)	Study of dense cores in outer galaxy molecular clouds.
L297	Liszt, H. Lucas, R. (IRAM)	Study of λ 3 mm HCO^+ and other emission lines toward ζ Oph.
L300	Levine, D. (UCLA) Hurt, R. (UCLA) Martin, R. (Arizona) Turner, J. (UCLA)	Molecular mapping of the barred spiral IC 342.
M375	Meixner, M. (Illinois) Welch, J. (Calif., Berkeley) Likkel, L. (Washington State)	Imaging the history of mass loss of evolved stars using the ^{12}CO J=1-0 line.
M376	Mangum, J. (Arizona) Latter, W. McMullin, J. (Maryland) Mundy, L. (Maryland)	A derivation of the physical conditions in the Serpens molecular cloud.
M378	Moriarty-Schieven, G. (DRAO) Butner, H. (DTM/Carnegie) Wannier, P. (JPL) Zhou, S. (Illinois)	CS mapping of circumprotostellar environments.

No.	Observer(s)	Program
M381	Maiolino, R. (Arizona) Rieke, G. (Arizona) Ruiz, M. (Arizona)	Study of relation between Seyfert activity and circumnuclear star formation.
M384	Mangum, J. (Arizona)	A study of the dense core structure in DR21(OH).
O43	Young Owl, R. (Illinois) Meixner, M. (Illinois) Tauber, J. (ESTEC) Tielens, A. (NASA/Ames)	HCO^+, HCN, and ^{13}CS images of the photodissociation region in the Orion bar.
P170	Pound, M. (Calif., Berkeley) Lada, E. (Maryland) Mundy, L. (Maryland) Gruendl, R. (Maryland)	An investigation of cluster formation in Orion.
R260	Regan, M. (Maryland)	CO imaging of NGC 1530.
S389	Smith, B. (Texas) Walker, C. E. (Arizona)	CO (1-0) observations of the QSO-galaxy pair 3C 232/NGC 3067.
S390	Sage, L. (Nature) Salzer, J. (Wesleyan U.) Knezek, P. (Michigan) Bothun, G. (Oregon)	Study of molecular gas in dwarf elliptical galaxies.
T296	Turner, B. Amano, T. (NRC, Herzberg) Avery, L. (NRC, Herzberg) Feldman, P. (NRC, Herzberg)	2 mm spectral survey of Orion, SgrB2, W51M, and IRC 10216.
T338	Turner, B.	Study of the chemistry of cirrus cores and small galactic plane clouds: sulfur chemistry.
T339	Trapero, J. (Chicago) Hobbs, L. (Chicago) Beckman, J. (Inst. de Canarias, Spain) Sempere, M. (Meudon)	CO measurements in a massive cold cloud very close to the sun.
T340	Turner, B. Steimle, T. (Arizona State)	A search for $Si(H_2)Si$ in IRC 10216.
T341	Thornley, M. (Maryland) Wilson, C. (McMaster U.)	Study of the distribution of molecular gas in the flocculent galaxy NGC 2403.
V84	van Breugel, W. (Calif., Berkeley) Lehnert, M. (Calif., Berkeley) Dey, A. (Calif., Berkeley)	CO observations of radio/IRAS post-starburst AGN and high z quasars.
W342	Wilner, D. (CFA) Reynolds, S. (North Carolina State) Moffett, D. (NMIMT)	Interaction of the supernova remnant 3C 391 with a molecular cloud?

No.	Observer(s)	Program
W346	Womack, M. (Penn State)	Study of the dominant carbon-bearing molecules in comets and implications for protostar nebula chemistry.

D. VERY LARGE ARRAY

The fourth quarter was spent in CnB configuration, September 12-October 12; C configuration, October 12 - December 31. The following research programs were conducted.

No.	Observer(s)	Program
AA156	Antonucci, R. (Calif., Santa Barbara) Barvainis, R. (Haystack)	Molecular gas in high-redshift quasars. 2 cm line
AA176	Avery, L. (NRC, Herzberg) Bell, M. (High Altitude Obs) Feldman, P. (High Altitude Obs) MacLeod, J. (High Altitude Obs)	Search for large molecules in low-density ISM. 2, 3.6 cm line
AA177	Afflerbach, A. (Wisconsin) Churchwell, E. (Wisconsin)	Radio recombination lines toward G10.62 and G29.96. 1.3, 2 cm line
AA181	Alexander, P. (Cambridge) Green, D. (Cambridge) Clemens, M. (Cambridge)	The star-formation history of the interacting galaxy pair NGC 4490/NGC 4485. 3.6, 6, 20 cm line
AA182	Afflerbach, A. (Wisconsin) Churchwell, E. (Wisconsin)	H93α observations of twenty ultra-compact HII regions. 3.6 cm line
AB705	Burke, B. (MIT) Becker, D. (MIT) Lehar, J. (Cambridge) Hewitt, J. (MIT) Roberts, D. (Brandeis)	Time delay of the gravitational lens 0957+561. 3.6, 6 cm
AB718	Brinks, E. Kunth, D. (IAP, Paris) Lequeux, J. (Meudon) Mas-Hesse, M. (Madrid) Sargent, W. (Caltech)	Neutral gas in blue compact galaxies. 20 cm line
AB725	Bastian, T. Chiuderi-Drago, F. (Florence) Alissandrakis, C. (Athens)	Search for linearly polarized microwave emission from the sun. 3.6, 6 cm line
AB727	Bosma, A. (Marseille Obs) Freeman, K. (Mt. Stromlo) Athanassoula, E. (Marseille Obs)	HI in two low surface brightness, giant spiral galaxies. 20 cm

No.	Observer(s)	Program
AB728	Baumgardt, K. (Cornell) Broeils, A. (Cornell) Haynes, M. (Cornell)	HI study of the internal kinematics of Sa galaxies. 20 cm line
AB729	Bloemhof, E. (CFA)	Radio survey of Herbig-Haro objects. 3.6 cm
AB731	Barnbaum, C. Zuckerman, B. (UCLA) Palmer, P. (Chicago)	Ultra-cold molecular clouds in the outer galaxy? 6, 20 cm line
AB732	van Breugel, W. (LLNL) Lehnest, M. (LLNL) Day, A. (Calif., Berkeley)	Flux measurements of radio-loud IRAS galaxies and quasars. 6, 20 cm
AC385	Chen, H. (CFA) Umemoto, T. (Nobeyama Obs) Zhao, J-H. (CFA)	Shock morphology near young stars and pre-protostellar clumps. 1.3 cm line
AC396	Cox, A. (Wisconsin) Sparke, L. (Wisconsin) van Moorsel, G.	Continuum survey of polar-ring galaxies. 6 cm
AC399	Cayatte, V. (Paris Obs) Balkowski, C. (Paris Obs) Boselli, A. (Paris Obs) van Gorkom, J. (Columbia)	HI distribution in the anemic galaxy NGC 4548. 20 cm line
AC400	Claussen, M. Beasley, A. Sahai, R. (JPL)	Radio continuum and water maser emission from proto-planetaries. 1.3 and 3.6 cm line
AC401	Crutcher, R. (Illinois) Fiebig, D. (Heidelberg) Troland, T. (Kentucky)	Zeeman observations of H_20 masers. 1.3 cm line
AC404	Codella, C. (Florence) Cesaroni, R. (Arcetri) Testi, L. (Florence)	NH_3 observations towards H_2O masers. 1.3 cm line
AC405	Charmandaris, V. (Iowa State) Appleton, P. (Iowa State)	Preliminary HI mapping of the ring galaxies Arp 10 and VIIZ. 20 cm line
AC406	Herold, L. (MIT) Conner, S. (MIT) Burke, B. (MIT)	Large, angular-size sources in the MG-VLA lens search sample. 3.6, 6 cm line
AC407	Curiel, S. (CFA) Canto, J. (Mexico/UNAM) Eiroa, C. (Madrid)	Circumstellar disk structures around very young stellar objects. 0.7, 1.3 cm
AC410	Cox, A. (Wisconsin) Sparke, L. (Wisconsin) van Moorsel, G.	HI mapping of the polar-ring galaxies NGC 5122 and UGC 9562. 20 cm line

No.	Observer(s)	Program
AC410	Conway, J. Taylor, G. (Caltech) Readhead, A. (Caltech)	Search for molecular and atomic absorption in compact symmetric objects. 6, 20 cm line
AD324	De Pree, C. (North Carolina) Goss, W. M. Mehringer, D. (Illinois)	H92α and H66α radio recombination line observations of W49. 3.6 cm line
AD341	Dettmar, R. (STScI) Domgorgen, H. (Bonn U.) Dahlem, M. (Johns Hopkins)	ISM in NGC 2188: A case study for disk-halo interaction. 20 cm line
AD344	dePater, I. (Calif., Berkeley) Heiles, C. (Calif., Berkeley) Bolton, S. (JPL) Klein, M. (JPL)	Comet-Jupiter crash. 20, 90 cm
AD346	Dahlem, M. (Johns Hopkins)	Extent of the radio halo of NGC 4666. 20 cm
AD349	Durouchoux, P. (CNRS, France) Wallyn, P. (CNRS, France) Chapuis, C. (CNRS, France) Dwarakanath, K.	Search for structures in radio counterpart of EXS 1737-2952. 6, 20 cm
AD350	De Pree, C. (North Carolina) Cecil, G. (North Carolina) Goss, W. M. Mehringer, D. (Illinois)	H92α and He92α observations of K3-50A. 3.6 cm line
AE097	Eilek, J. (NMIMT) Loken, C. (New Mexico State) Owen, F.	The ends of type FR I radio tails. 90 cm
AE099	Edge, A. (Cambridge) Crawford, C. (Cambridge) Fabian, A. (Cambridge) Allen, S. (Cambridge) Bohringer, H. (MPIfEP, Garching) Voges, W. (MPIfEP, Garching)	Radio observations of X-ray selected clusters at redshifts of 0.15. 6 cm
AF246	Frail, D. Cornwell, T. Goss, W. M.	Does the crab have a shell? 90 cm
AF263	Feretti, L. (Bologna) Giovannini, G. (Bologna) Parma, P. (Bologna) Laing, R. (RGO) Bridle, A. Perley, R.	Tests for kiloparsec-scale jet deceleration using 3C 31. 3.6, 6, 20 cm

No.	Observer(s)	Program
AF275	Fomalont, E. Kellermann, K. Partridge, R. B. (Haverford College) Windhorst, R. (Arizona State)	High resolution image of deep field at 8.4 GHz. 3.6 cm line
AF279	Frail, D. Goss, W. M.	Deep VLA imaging around PSR 1823-13. 90 cm
AF280	Frail, D. Bietenholz, M. (York U.) Markwardt, C. (Wisconsin) Ogelman, H. (Wisconsin)	Matched radio/X-ray images in the vicinity of the Vela pulsar. 90 cm
AG402	Golla, G. (MPIR, Bonn) Dettmar, R. (STScI) Hummel, E. (Royal Obs) Kronberg, P. (Toronto)	Filamentary radio halos of NGC 4632 and UGC 9579. 6, 20 cm
AG412	Grossman, A. (Maryland) Clancy, R. T. (Colorado) Muhleman, D. (Caltech)	Mapping seasonal variation of Mars water vapor. 1.3 cm line
AG421	Gaume, R. (NRL) Fischer, J. (NRL)	Monitoring the radio continuum flux density of NGC 2024-IRS2. 1.3, 2, 3.6 cm
AG423	Gopalswamy, N. (Maryland) Kundu, M. (Maryland)	Investigation of umbral oscillations in sunspots.
AG425	Ghigo, F. Appleton, P. (Iowa State)	Multi-wavelength continuum maps of ring galaxies. 3.6, 6, 20 cm
AG428	de Geus, E. (Caltech) Phillips, J. (Caltech) van Langevelde, H.	Search for CS absorption in the outer galaxy. 0.7, 6 cm line
AG429	Gopalswamy, N. (Maryland) Kundu, M. (Maryland) Schmahl, E. (Maryland)	Evolution of coronal streamers. 20, 90 cm
AG430	Guedel, M. (SFIT, ETH) Schmitt, J. (MPIfEP, Garching) Kurster, M. (MPIfEP, Garching) Hatzes, A. (Texas)	Time-variable phenomena in the coronae of castor A+B+C. 6 cm
AG432	van Gorkom, J. (Columbia) Dwarakanath, K. Guhathakurra, P. (Calif., Santa Cruz) Dwarakanath, K.	HI imaging of cluster Abell 2670. 20 cm line

No.	Observer(s)	Program
AG435	Gregorini, L. (Bologna) de Ruiter, H. (Bologna) Parma, P. (Bologna) Vettolani, G. (Bologna) Sadler, E. (Sydney) Ekers, R. (CSIRO)	Dumbbell and multiple nuclei galaxies in rich clusters. 6 cm
AH492	Hjellming, R. Gehrz, R. (Minnesota) Seaquist, E. (Toronto) Taylor, A. R. (Calgary)	Image and light curve evolution of the Novae Puppis 1991 and Cgyni 1992. 1.3, 2, 3.6, 6, 20 cm
AH514	Ho, P. (CFA)	Contracting molecular cloud core in G10.6-0.4. 0.7 cm line
AH519	Hoffman, G. L. (Lafayette College) Salpeter, E. (Cornell)	Neutral hydrogen mapping of condensations in NGC 4532/DDO 137 system. 20 cm line
AH520	Hoffman, G. L. (Lafayette College) Salpeter, E. (Cornell)	Neutral hydrogen mapping of MCG 0-32-16, near line of sight to 3C 273. 20 cm line
AH521	Herbig, T. (Princeton) Myers, S. (Caltech) Readhead, A. (Caltech)	Discrete radio sources in a complete sample of SZ effect clusters. 3.6, 20 cm
AH523	Higdon, J. Wrobel, J.	HI observations of Arp 102 and Arp 104 elliptical/spiral pairs. 20 cm line
AH524	Hoernes, P. (MPIR, Bonn) Berkhuijsen, E. (MPIR, Bonn) Beck, R. (MPIR, Bonn)	Polarization and RM in the SW arms of M31. 20 cm
AH525	Higdon, J. Ghigo, F.	HI in the ring galaxy NGC 2793. 20 cm line
AH527	Hibbard, J. (Hawaii) Yun, M. (Caltech)	Mapping tidal HI in ultraluminous IR galaxies. 20 cm line
AH528	Havanek, M. (Colorado) Stocke, J. (Colorado) Ellingson, E. (Colorado)	Morphology of 3CR radio galaxies at z = 0.15-0.65. 3.6 cm
AH529	Holdaway, M. Rupen, M. Conway, J. Beasley, A. Owen, F.	Simultaneous spectra of AGN in 1 mm to 4 cm wavelength range. 0.7, 1.3, 3.6 cm
AH530	Ho, P. (CFA) Zhang, Q. (CFA) Peng, Y. (Maryland) Vogel, S. (Maryland)	Contracting molecular cloud cores. 1.3 cm line

No.	Observer(s)	Program
AH532	Holdaway, M. Beasley, A. Owen, F. Rupen, M.	VLA calibrator sources at 43 GHz. 0.7, 1.3, 3.6 cm
AH533	Holdaway, M. Owen, F. Rupen, M. Conway, J.	3CR cores at 8.4 and 43 GHz. 0.7, 3.6 cm
AI054	Irwin, J. (Queens) Giguerre, D. (Queens)	High-z HI in the edge-on galaxy, NGC 3556. 20 cm line
AI055	Ivison, R. (Royal Obs) Eales, S. (Toronto) Papdopoulos, P. (Toronto) Seaquist, E. (Toronto)	Search for CO 1 → 0 in the most distant known galaxy. 1.3 cm line
AJ238	Johnston, K. (USNO) Gaume, R. (NRL) Nedoluha, G. (NRL) Wilson, T. (MPIR, Bonn) Collison, A. (Illinois)	Spatial structure of Orion CH_3OH maser. 1.3 cm line
AJ241	Jorsater, S. (Stockholm Obs) van Moorsel, G. Kristen, H. (Stockholm Obs)	HI observations of a sample of bright barred spiral galaxies. 20 cm line
AJ242	Jones, M. (Cambridge) Birkinshaw, M. (CFA) Grainge, K. (Cambridge) Saunders, R. (Cambridge)	Diffuse emission in clusters of galaxies. 20 cm
AJ243	Jackson, J. (Boston) Kraemer, K. (Boston)	NH_3 toward NGC 6334 F: Shock excited masers? 1.3 cm line
AK331	Kobulnicky, H. (Minnesota) Dickey, J. (Minnesota) Conti, P. (Colorado)	Spectral index mapping of Wolf-Rayet galaxies. 3.6, 6 cm
AK364	Kollgaard, R. (Penn State) Feigelson, E. (Penn State) Pesce, J. (STScI) Urry, C. (STScI) Wehrle, A. (IPAC)	Intensive radio monitoring of the blazar 3C 279. 1.3, 2, 3.6, 6, 20 cm
AK365	Kliem, B. (API, Potsdam) Aschwanden, M. (Maryland) Mazets, E. (St. Petersburg) Kruger, A. (API, Potsdam)	Joint VLA-CGRO-CORONAS observations of small-scale solar structure. 20, 90 cm

No.	Observer(s)	Program
AK368	Kaufman, M. (Ohio State) Brinks, E. Elmegreen, B. (IBM) Elmegreen, D. (Vassar College) Struck-Marcell, C. (Iowa State)	Radio continuum observations of ocular and caustic galaxies. 6, 20 cm
AK369	Kenny, H. (Canadian Military) Taylor, A. R. (Calgary) Ivison, R. (Royal Obs) Seaquist, E. (Toronto)	CH Cygni: Monitoring of the radio jet in outburst. 1.3, 3.6 cm
AK372	Knapp, G. (Princeton)	Continuum observations of evolved stars. 2, 3.6, 6 cm
AK373	Koerner, D. (Caltech) Sargent, A. (Caltech) Chandler, C.	Radial structure and dust properties of protoplanetary disks. 0.7, 1.3 cm
AK374	Kundu, M. (Maryland) Robinson, R. (NASA/GSFC) White, S. (Maryland) Woodgate, B. (NASA/GSFC)	Coordinated HST, EUVE, and VLA observations of YZ C Mi. 3.6, 6, 20 cm
AK376	Kulkarni, S. (Caltech) Frail, D.	Search for the radio counterparts of gamma ray bursters. 20 cm
AL335	Longair, M. (Cambridge) Best, P. (Cambridge) Riley, J. (Cambridge) Rottgering, H. (Cambridge)	Large-scale structure of 3CR radio galaxies at $z \sim 1$. 3.6 cm line
AL337	Lim, J. (Caltech) White, S. (Maryland) Nelson, G. (CSIRO)	dMe flare star AT MIC. 3.6, 6, 20 cm
AL343	Lang, K. (Tufts) Willson, R. (Tufts) Kile, J. (Tufts) Gelfreikh, G. (Pulkova Obs) Bogod, V. (SAO, Russia)	Investigations of long-lasting, nonthermal sources on the sun. 20, 90 cm
AM437	Moffett, D. (NMIMT) Dickel, J. (Illinois) Dubner, G. (IAFE) Giacani, E. (IAFE) Goss, W. M. Reynoso, E. (IAFE) Winkler, P. F. (Middlebury College)	Expansion of Tycho's SNR, 3C 10. 20 cm
AM445	Moore, C. (MIT) Hewitt, J. (MIT)	Time delays in the gravitational lens MG0414+0534. 3.6 cm
AM453	Mirabel, I. F. (CNRS, France) Rodriguez, L. (Mexico/UNAM)	Brightening of the lobes of 1E1740.7-2942. 6 cm

No.	Observer(s)	Program
AM459	Mehringer, D. (Illinois) De Pree, C. (North Carolina) Gaume, R. (NRL) Goss, W. M.	H66α observations of W51. 1.3 cm line
AM460	Mehringer, D. (Illinois) Kuan, Y-J. (Illinois) Miao, Y. (Illinois) Snyder, L. (Illinois)	Vinyl cyanide and methyl formate in Sgr B2. 20 cm
AM461	Mundell, C. (Manchester) Pedlar, A. (Manchester) Meaburn, J. (Manchester) Brinks, E. Baum, S. (STScI) O'Dea, C. (STScI) Gallimore, J. (STScI)	HI observations of Seyfert galaxies NGC 3281, NGC 3982, NGC 5728. 20 cm
AM462	Molinari, S. (Bologna) Brand, J. (Bologna) Cesaroni, R. (Arcetri) Palla, F. (Arcetri) Palumbo, G. (Bologna)	Radio-continuum obserations of very young, massive stars. 2, 6 cm
AM463	McMahon, R.G. (Cambridge) Lonsdale, C.J. (Caltech) Rowan-Robinson, M. (Imperial College) Beeharry, G. (Cambridge) Lehar, J. (Cambridge)	Search for high redshift infrared luminous galaxies. 20 cm
AM464	Magnier, E. (Amsterdam) Prins, S. (Amsterdam) Fox, D. (MIT) Lewin, W. (MIT) Paradijs, J. (Amsterdam)	Study of large-diameter SNRs in M31. 6, 20 cm
AM465	Mirabel, I. F. (CNRS, France) Rodriguez, L. (Mexico/UNAM)	Superluminal source GRS 1915+105. 3.6, 20 cm
AM466	Mirabel, I. F. (CNRS, France) Duc, P-A. (CNRS, France) Brinks, E.	HI in the merger Arp 105. 20 cm line
AO120	Onello, J. (SUNY/Cortland) Phillips, J. (Caltech) De Pree, C. (North Carolina) Goss, W. M.	RRL observations of a cold HII region in G70.7+1.2. 20 cm line
AO121	van Ojik, R. (Leiden) Carilli, C. (Leiden) Rottgering, H. (Cambridge) Miley, G. (Leiden)	CO (1-0) observations of a radio galaxy at z = 3.6. 1.3 cm

No.	Observer(s)	Program
AP300	Phookun, B. (NCRA, Pune) McGaugh, S. (Cambridge)	Radio emission at 1.5 GHz from low-surface-brightness galaxies. 20 cm
AP302	Pooley, G. (Cambridge) Hardcastle, M. (Cambridge) Alexander, P. (Cambridge) Riley, J. (Cambridge)	Jets in nearby FRI radio galaxies. 3.6, 20 cm
AR310	Rudnick, L. (Minnesota) Keohane, J. (Minnesota) Perley, R.	Evolutionary studies of Cas A. 6, 20 cm
AR311	Reynolds, S. (North Carolina St.) Jenkins, G. (North Carolina St.) Kassim, N. (NRL) Moffett, D. (NMIMT)	330 MHz observations of bright supernova remnants. 90 cm
AR317	Ratner, M. (CFA) Lestrade, J-F. (JPL) Lebach, D. (CFA) Shapiro, I. (CFA)	Monitor IM Peg, Lambda, for NASA/Standford gravity probe-B use. 3.6 cm
AR322	Rottgering, H. (Cambridge) Snellen, I. (Leiden) Miley, G. (Leiden) Hanisch, R. (STScI) Perley, R.	VLA observations of the rich X-ray cluster Abell 2256. 90 cm
AR323	Reipurth, B. (ESO) Rodriguez, L. (Mexico/UNAM)	New extremely young stellar object sources. 3.6 cm
AR325	Rodriguez, L. (Mexico/UNAM) Curiel, S. (CFA)	Energy sources of suspected bipolar HH objects. 3.6 cm
AR326	Ryder, S. (Alabama) McIntyre, V. (CFA) Zasov, A. (Moscow/SSAI)	Possible HI superbubble in NGC 157. 20 cm line
AS525	Sramek, R. Weiler, K. (NRL) Van Dyk, S. (NRL) Panagia, N. (STScI)	The properties of radio supernovae. 1.3, 2, 3.6, 6, 20 cm
AS536	Schiminovich, D. (Columbia) van Gorkom, J. (Columbia) van der Hulst, J. (Groningen)	HI observations of shell galaxies. 20 cm line
AS542	Scheuer, P. (Cambridge) Laing, R. (RGO) Dennet-Thorpe, J. (Cambridge) Bridle, A.	Jet and spectral index asymmetries in nearby FRII radio galaxies. 3.6, 6, 20 cm

No.	Observer(s)	Program
AS544	Scuderi, S. (STScI) Panagia, N. (STScI) Stanghellini, C. (Noto) Umana, G. (Noto) Trigilio, C. (Noto)	Radio observations of stellar winds of early type stars. 2, 3.6, 6 cm
AS545	Szomoru, A. (Groningen/Kapteyn) van Gorkom, J. (Columbia) Gregg, M. (LLNL)	HI imaging of galaxy groups in the Bootes void. 20 cm line
AT166	Taylor, G. (Caltech) Ge, J-P. (Brandeis) Barton, E. (Caltech)	Faraday rotation in cooling flow clusters A119, 3C129. 3.6, 6 cm
AT167	Tongue, T. (NMIMT) Westpfahl, D. (NMIMT) Adler, D. Henning, P. (New Mexico)	HI mapping of M33: topology of neutral medium. 20 cm line
AT170	Thuan, T. (Virginia) Brinks, E. Izotov, Y. (Kiev U.) Lipovetsky, V. (SAO, Russia) Pustil'nik, S. (SAO, Russia)	HI mapping of extremely metal-deficient, blue compact galaxies. 20 cm line
AT172	Thornley, M. (Maryland) Mundy, L. (Maryland)	Cold gas on sub-kiloparsec scales in nearby flocculent galaxies. 20 cm line
AT174	Tereby, S. (Caltech)	Low-mass protostellar source L1448 IRS3. 0.7, 1.3 cm line
AT176	Thorsett, S. (Princeton) Taylor, J. (Princeton) McKinnon, M. Hankins, T. (NMIMT) Stinebring, D. (Oberlin College)	Timing fast pulsars at the VLA. 6, 20, 90 cm
AT177	Taylor, A. R. (Calgary)	X-ray binaries – spectra from centimeter to millimeter wavelengths.
AU058	Urbanik, M. (Jagiellonian U.) Beck, R. (MPIR, Bonn) Braine, J. (MPIR, Bonn) Soida, M. (Jagiellonian U.)	Magnetic field in the flocculent galaxy NGC 4414. 6, 20 cm
AV200	Vasisht, G. (Caltech) Kulkarni, S. (Caltech) Thorsett, S. (Princeton) Rappaport, S. (MIT)	Search for pulsars in massive binaries. 20 cm
AV212	Vasisht, G. (Caltech) Kulkarni, S. (Caltech) Frail, D. Greiner, J. (MPIfEP, Garching)	Possible X-ray candidate for SGR 1900+14. 3.6, 20 cm

No.	Observer(s)	Program
AV214	Vasisht, G. (Caltech) van Kerkwijk, M. (Caltech) Kulkarni, S. (Caltech)	Enigmatic X-ray pulsar 1838.4-0301. 3.6, 20 cm
AW362	White, S. (Maryland)	The stellar activity cycle on active stars. 3.6, 6, 20 cm
AW380	Wilson, T. (MPIR, Bonn) Gaume, R. (NRL) Johnston, K. (USNO) Dickel, H. (Illinois)	Continuum emission from protostars in NGC 2024. 0.7 cm
AW389	Weiner, B. (Rutgers) Sellwood, J. (Rutgers) van Gorkom, J. (Columbia) Williams, T. (Rutgers)	Mapping the dark matter in barred spiral galaxies. 20 cm line
AW391	Wood, D. Chandler, C.	CS J =1 → 0 observations of the Orion molecular ridge. 0.7 cm line
AW392	Wood, D. Chandler, C.	Prestellar clumps in Orion. 0.7 cm
AW393	Wilcots, E. Miller, B. (Washington)	HI observations of barred magellanic-type galaxies. 20 cm line
AW394	Wootten, H. A. Bach, T. (Paris Obs) Rieu, N. (Paris Obs) Latter, W.	Distribution of cyanopolyyne molecules in CRL 2688. 0.7 cm line
AW395	White, S. (Maryland) Cully, S. (Calif., Berkeley) Lim, J. (Caltech)	White dwarf/red dwarf binary V471 Tauri. 2, 3.6, 6 cm
AX003	Xu, W. (Caltech) Pearson, T. (Caltech) Readhead, T. (Caltech) Taylor, G. (Caltech)	Search for faint extended structure in compact symmetric sources. 20 cm
AY066	Young, L. (Illinois)	HI in three local group dwarf galaxies: NGC 185, NGC 205, LGS 3. 20 cm line
AZ068	van Zee, L. (Cornell) Broeils, A. (Cornell) Haynes, M. (Cornell) Salzer, J. (Wesleyan U.)	HI mapping of extreme Mh/L galaxies. 20 cm line
AZ069	Zlotnik, E. (Lebedev) Zheleznyakov, V. (Lebedev) Kundu, M. (Maryland) White, S. (Maryland)	Temperature gradients in the atmosphere of sunspots. 2, 3.6, 6, 20 cm

E. VERY LONG BASELINE ARRAY

No.	Observer(s)	Program
BB014	Brown, R. Benson, J.	Brightness variations of Sgr A*. Single antenna VLBI. 3.6, 6 cm
BB020	Briggs, F. (Pittsburgh) Taramopoulos, A. (Pittsburgh)	Infalling, absorption line gas. Phased array VLBI. 20 cm
BC014	Cotton, W. Dallacasa, D. (NFRA) Fanti, C. (Bologna) Fanti, R. (Bologna) Foley, A. (NFRA) Spencer, R. (Manchester)	3C 138 and 3C 286. 6 cm
BC024	Conway, J. Cornwell, T. Briggs, D. Walker, R. C.	L-band multi-frequency synthesis of 3C 48. Single antenna VLBI. 6, 20 cm
BD005	Dallacasa, D. (NFRA) Cotton, W. Fanti, C. (Bologna) Fanti, R. (Bologna) Schilizzi, R. (NFRA) Spencer, R. (Manchester)	Compact steep-spectrum galaxies 1819+39 & 0404+76. Single antenna VLBI. 6, 20 cm
BG006	Greenhill, L. (CFA) Moran, J. (CFA) Phillips, R. (Haystack) Townes, C. (Calif., Berkeley)	SiO maser stars. Single antenna VLBI. 0.7 cm
BG012	Giovannini, G. (Bologna) Feretti, L. (Bologna) Venturi, T. (Bologna) Wehrle, A. (JPL)	NGC 315 and 3C 338. Phased array VLBI. 6 cm
BG020	Gwinn, C. (Calif., Santa Barbara) Greenhill, L. (CFA) Antonucci, R. (Calif., Santa Barbara) Barvainis, R. (Haystack)	Water masers in a hidden Seyfert nucleus: NGC 1068. Phased array VLBI. 1.3 cm
BK008	Kemball, A. Diamond, P.	SiO masers in VY CMa: Polarization calibration. 0.7 cm line
BM010	Molnar, L. (Iowa) Mutel, R. (Iowa)	Interstellar scattering in Cygnus X. Phased array VLBI. 6 cm

No.	Observer(s)	Program
BR002	Rendong, N. (Beijing Obs) Gabuzda, D. (Calgary) Inoue, M. (Nobeyama Obs) Kameno, S. (Nobeyama Obs)	VLBI polarimetry of the high rotation measure source 3C 119. Phased array VLBI. 3.6 cm
BW003	Wrobel, J. Bridle, A. Walker, R. C.	PC-scale structure of the twin-jet source M84. 3.6, 20 cm
BW009	White, S. (Maryland) Mundy, L. (Maryland) Beasley, A.	The temperature of Tauri winds. Phased array VLBI. 3.6 cm
GL009	Lestrade, J. (JPL/Paris Obs) Phillips, R. (Haystack) Jones, D. (JPL) Preston, R. (JPL)	Astrometric observations of stars to tie in HIPPARCOS. Phased array VLBI. 3.6, 6 cm
GL015	Lonsdale, Colin (Haystack) Diamond, P. Smith, H. (Calif., San Diego) Lonsdale, C. (Caltech)	Imaging of OH megamasers in three ultraluminous infrared galaxies. Phased array VLBI. 18 cm
GL016	Lonsdale, C. (Haystack) Diamond, P. Smith, H. (Calif., San Diego)	Survey for compact OH megamaser emission in IR galaxies. Phased array VLBI. 20 cm
GR004	Rupen, M. Bartel, N. (York U.) Altunin, V. (JPL) Bartel, N. (York U.) Beasley, T. Bietenholz, M. (York U.) Cannon, W. (York U.) Conway, J. Davis, R. (Manchester) Graham, D. (MPIR, Bonn) Jones, D. (JPL) Panagia, N. (STScI) Popelar, J. (Ottawa) Rius, A. (Madrid) Romney, J. Sramek, R. Titus, M. (Haystack) Umana, G. (Noto) van Dyk, S. (NRL) Venturi, T. (Bologna) Weiler, K. (NRL)	1993J in M81. Phased array VLBI. 3.6, 6 cm

No.	Observer(s)	Program
GZ011	Zensus, J. A. Lobanov, A. (Lebedev) Leppanen, K. (Helsinki) Unwin, S. (Caltech) Wehrle, A. (JPL)	Monitoring the parsec scale jet structure of 3C 345. Single antenna VLBI.

F. SCIENTIFIC HIGHLIGHTS

Green Bank

140 Foot Telescope measurements of Galactic HI in the general direction of the galaxy MKN 509 show that the galaxy lies just off the edge of a Galactic high-velocity HI cloud. The ultraviolet spectrum toward MKN 509 has strong high-velocity CVI in absorption, suggesting that it is seen behind the photoionized edge of the high-velocity cloud. The high-velocity CIV system may be a Galactic analog of quasar metal-line absorption systems.

Investigators: K. Sembach (MIT), B. Savage (U. Wisconsin), L. Lu (Caltech), E. Murphy (U. Virginia).

Tucson

On-the-Fly Imaging of the Serpens and DR 21 Molecular Clouds

Large-scale images of two molecular cloud regions have recently been obtained using the new on-the-fly imaging technique at the 12 Meter Telescope. An image of the Serpens star-formation region was obtained in the 3(03)-2(02) H_2CO transition at 218.2 GHz. The image was 7.5' x 7.5' in extent with full-sampling, which yielded a spatial resolution of 28". The raw data were composed of over a million individual spectra. The resultant rms noise in an individual spectral channel of this image cube is 0.13 K. In the resultant image, three main H_2CO components are observed: Serpens SMM2-6, Serpens FIRS1, and S68N.

A second image of the Serpens region, in the J = 3-2 CS transition at 147.0 GHz, was also obtained. The image was 9' x 9' in extent with full-sampling, giving a spatial resolution of 42". The raw data were composed of over 700,000 individual spectra, which yielded a single channel rms of 0.04 K. The same general dense gas structures as were observed in the H_2CO image are also measured in this CS data set.

Investigators: J. Mangum (U. Arizona), W. Latter (NRAO), J. McMullin (U. Arizona), L. Mundy (U. Maryland)

In addition, the DR21 region has been imaged in H_2CO 1(01)-0(00) transition at 72.4 GHz. A fully-sampled field 7' x 20' in extent was observed. Three main components of H_2CO emission are seen at DR21, DR21(OH), and DR21(FIR).

Investigator: J. Mangum (U. Arizona)

Socorro

Galactic Merger Separates Atomic, Molecular Gas

A multiwavelength investigation involving the VLA, IRAM and ESO has revealed a fascinating consequence of a galactic merger. The object Arp 105 consists of a starburst spiral galaxy that is being torn apart by a massive elliptical. Tidal tails resulting from the merger have at their ends, in one case, an irregular Magellanic-type galaxy, and in the other, a bright clump of new stars that resembles a blue compact dwarf. Observations of HI and CO show that the atomic gas has been pulled from the spiral and is

concentrated around the small galaxies at the ends of the tidal tails. The molecular gas, on the other hand, has remained concentrated near the central region of the spiral.

Investigators: E. Brinks (NRAO) and I. F. Mirabel and P-A Duc (Centre d'Etudes de Saclay)

HI Absorption Suggests Circumnuclear Obscuring Torus in Cygnus A

VLA A-array observations have detected broad HI absorption toward the compact radio nucleus of Cygnus A. This detection suggests the presence of a circumnuclear obscuring torus that may block our direct view of a buried quasar in this galaxy. It thus supports proposals that invoke such a torus as part of a unified model for FRII radio galaxies and quasars.

Investigators: J. Conway (NRAO) and P. Blanco (U. Calif., San Diego)

G. PUBLICATIONS

Attached as Appendix A is a tabulation of all preprints received in the NRAO Charlottsville 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

An initial evaluation of the AlInAs/GaInAs/InP devices ordered from Hughes has been performed. The performance is state-of-the-art, allowing for realization of amplifiers with noise temperatures of about 10 K at 40 GHz.

The following projects were continued (albeit slowly):

- 60-90 GHz and 90-120 GHz amplifiers
- Evaluation of millimeter-wave MMIC's (110 GHz and 140 GHz)
- Production of Q-band and K_u-band amplifiers; several amplifiers were rebuilt and retested
- Cryogenic S-parameter measurement setup

An initial investigation of the gain stability of several Q-band and K_u-band amplifiers has been performed.

Work continues on the 290-395 MHz balanced amplifier. The prototype unit has been evaluated at cryogenic temperatures. The minimum noise temperature is better than 5 K and bandwidth improvement is currently under way.

Work continues on the PC-based automated amplifier test station. To date software routines have been written for dewar control and amplifier I-V data acquisition.

Improvements have been made to the existing amplifier cryogenic noise measurement system. Wide bandwidth operation has been achieved through use of a commercial 0.01-26.5 GHz amplifier in the receiver. Improvements have been made in the calibration, both at room and cryogenic temperatures. These improvements will be implemented in the new PC-based test station.

86 GHz VLBA Receiver

During this quarter, the decision was made to cool the mixer and IF amplifier to 50 K. The significant improvement in mixer noise results in a lower gain requirement for the preceding LNA. The dewar modifications necessary to accomplish this are relatively minor.

Superconducting (SIS) Millimeter-Wave Mixer Development

The long delay in SIS device fabrication at UVA appears finally to be over. Poor device characteristics were caused by a fillet of Nb remaining between the edge of the 4500 Å SiO pattern and the substrate. An additional etch appears to cure the problem.

The new tuneable 260-300 GHz mixer is now almost ready for testing. This mixer is based on our successful 2 mm design, and uses the same UVA SIS chips that are used in the (tunable) 200-260 GHz receiver.

During this quarter, we have built (or rebuilt) and tested a total of 8 SIS mixers and one frequency tripler. We have also mounted and DC-tested 22 SIS chips from UVA wafers.

Electromagnetic Support

GBT Project: The far-field copolar and cross-polar patterns of the C-band feed covering the range of 3.95-5.85 GHz were measured. Also, the phase center of the feed was located and return loss was measured. The feed pattern is about -15 dB at 15 degrees and the calculated aperture efficiency of the GBT is 71 percent.

A study to compare a linear taper horn and a profile horn for the Q-band (40 to 52 GHz) receiver was completed. The linear taper horn would have an outside diameter of 3.01" and length of 5.2", while the profile horn has a diameter of 1.97" and length of 4.50". For an array receiver with seven feeds, the beam separation using the linear taper horn is 5.4 half-power beamwidths (hpbw) and for the profile horn is 3.6 hpbws. The aperture efficiency for the profile horn would be lower by about 5 percent as compared to the linear taper horn.

The noise shields that were designed using ray tracing were analyzed further. The shields redirect the spillover energy that would otherwise be scattered by the support arm structure into the main reflector and then into the cold sky. The shields will be planar segments, each 5 degrees wide in the radial direction and wide enough in the orthogonal direction to completely shield the structure behind them. The effect on the sidelobe structure and antenna temperature of the first segment as a function of its location and orientation was studied at 1.15 GHz.

140 Foot Telescope: A feed at 1.666 GHz for Zeeman-effect measurements was measured. The feed is a prime focus feed and has a taper of -16.0 dB at the edge of the reflector. The principal plane patterns are within 0.4 dB of each other. Return loss is better than -20 dB in the 1600 to 1730 MHz range and cross-polarization is better than -33 dB in the frequency band.

GBT Spectrometer

Work on the GBT spectrometer reached the prototype stage in the last quarter of 1994. Prototypes of two multi-layer PC cards were successfully tested in December, but more testing is required before issuing final approval for the system build.

The second wafer run of the 1024-lag correlator chip to be used in the spectrometer was completed. This wafer run produced chips that ran correctly up to a 130 MHz clock rate. A possible problem with ground bounce in the CMOS chip is currently being investigated.

Successful testing of the 2 GHz sampler prototype was completed in November. A prototype of the 125 MHz sampler to be used in the spectrometer was completed, but testing on the unit has not started.

A specification for the output rate required from the spectrometer and a plan for the LTA and computer system that must provide and process it was generated in December.

OVLBI Earth Station

Test support for the OVLBI decoder and decoder test fixture has been limited to trying to fix a small residual bit error rate (about 5 in 10^8) observed in the decoder data output.

I. GREEN BANK ELECTRONICS

140 Foot Operations

Three of the Green Bank Telescope (GBT) cryogenic front-ends have been installed at the 140 Foot vertex cabin, the 18-26.5 GHz, the 8-10 GHz, and the 12-15.4 GHz receivers. All have been used in scheduled observations, and performance was as expected.

The synthesizers purchased to serve as the GBT first local oscillators were used in 140 Foot VLBI observations with the 8-10 GHz front-end, and feedback received from the correlator indicates that performance of these oscillators yields improved high-frequency VLBI results, compared with the current 140 Foot oscillators.

Nineteen receiver or feed changes were scheduled and completed this quarter.

GBT Development

The 3.95-5.85 GHz front-end assembly is complete, but not yet tested. The 1.15-1.73 GHz ortho-mode transducer fabrication was completed, but the unit has not yet been tested.

The initial 1-8 GHz converter chassis was assembled and tested. Minor problems were identified and corrected, and parts needed to complete eight more units were ordered or released to the shop for fabrication.

Extensive work was done to evaluate and correct a problem encountered in synthesizers purchased to serve as the system second local oscillator. The problem was a phase instability which would have impacted VLBI observations. The cause was identified and corrected.

Work on electronics for the open-loop active surface continued. Construction of all of the fifty-two required actuator room control panels has been completed and twenty-nine tested. Outfitting of the antenna actuator control room, to the extent possible on the ground, was completed. Additional tests on the surface actuators were initiated at the recommendation of the GBT Advisory Committee. A problem was discovered with grease migration from the actuator to the motor; this is under investigation.

Little progress was made on the GBT continuum backend, due to lack of availability of a programmer. Tests were done on the optical transmitters used to transmit the total power signals to see that they would work over a 3 km link.

Work on the new GBT spectrometer continues both at NRAO and at the correlator chip design facility. Wafers of the second iteration design were received, tested, and to date found to work as specified. A decision was made to set the correlator clock rate at 100 MHz based on these tests. Work began on the IF modules necessary to support the new spectrometer.

Site Operations

A plan has been produced, and is being implemented, for a site-wide optical fiber installation. This includes installation of a buried multi-cell conduit, and single-mode and multimode optical fiber cables to the major buildings and antennas. Site timing equipment has been consolidated at the Interferometer control building. A 1PPS measurement system has been built and installed, and allows measurements of the relative delay between 1PPS signals with 1 nanosecond resolution. The fiber cable has been installed and fusion splices completed at the junctions and end points. Completion of the electronics should happen the next quarter, along with the software system needed to read and log the measurement data.

Work continues on the construction of a S/X cryogenic receiver for the new USNO 20 meter antenna under construction in Green Bank. The receiver was completed and tested this quarter, and is scheduled for installation on the antenna in January.

Maintenance, repair, and installation support was supplied to the 140 Foot, Interferometer, and site computer facilities.

J. TUCSON ELECTRONICS

1 mm SIS Receiver Improvements

The 1 mm (200-300 GHz) SIS receiver now has a calibration tone for tuning the image sideband rejection filter. All receivers at the 12 Meter Telescope have some type of image sideband rejection capability. Restricting the response of the receiver to only the signal sideband improves the gain calibration, reduces confusion from spectral lines in molecular clouds, and eliminates the atmospheric noise from the image band, thereby improving receiver sensitivity. In the 3 mm and 2 mm receivers, the image sideband can be suppressed by mechanical tuners in the mixer blocks. The 1 mm receiver uses a quasi-optical filter to pass the signal sideband and terminate the image in a 4 K cold load inside the dewar. For the past two years, we have used calibration tables measured in the laboratory to adjust the quasi-optical filter. This season, we now have an injectable harmonic tone that allows the filter to be optimized for the signal sideband as part of the normal tuning procedure for the receiver. This tone works throughout the 200-300 GHz band.

2 mm and 3 mm SIS Receiver Upgrade

The 2 mm and 3 mm receivers have been combined into a single cryogenic and electronics package. This consolidation frees one of the four receiver bays on the 12 Meter Telescope for the eight-beam array receiver, which will be installed later this year. The 2 and 3 mm mixer inserts have been installed in a standard NRAO 8-port cryostat. The 3 mm receiver is divided into two bands, 68-90 and 90-116 GHz, and the 2 mm band covers the 130-180 GHz band. Each of the three bands have two polarization channels, so that 6 of the 8 available cryostat ports are utilized. The dewar is cooled by a J-T system and a Balzers refrigerator. In addition to the cryogenic modifications, independent local oscillator systems were installed for the two polarization channels. The two channels can now be tuned to different frequencies within the band.

Further Technical Developments in Spectral Line On-the-Fly Mapping

Spectral line on-the-fly (OTF) mapping continues to mature at the 12 Meter. As explained in past Quarterly Reports, the OTF mapping mode acquires spectra at a rapid rate (10 times/sec) taken as the telescope is scanned continuously across the field. Each spectral sample is tagged with the actual telescope encoder position; a regular grid is produced in the analysis stage in a procedure analogous to UV gridding of synthesis data. The advantage of this observing technique is that an entire imaging field can be scanned rapidly with low overhead, thereby minimizing systematic changes in atmospheric and instrumental responses.

The two largest challenges we have faced in implementing this technique are in coping with the high data rates (~1 MByte/minute, continuously) and in developing analysis tasks that can be run in quasi-real time at the telescope. In recent weeks we have acquired a single-processor Sun Sparc 20 workstation that has significantly sped up analysis. We have also obtained a 10 GByte disk drive for AIPS analysis use and have about 3 GBytes of raw data storage space. The disk storage situation has been eased, although observers must still compress their raw data files and must diligently delete unneeded intermediate analysis files. The Classic AIPS tasks used for OTF analysis have been streamlined and a few bugs have been fixed in both the control and analysis procedures. OTF data processing still requires a considerable investment of time and work, but the job is becoming faster and more pleasant. Observers not already familiar with AIPS must become so.

The benefits of this technique have already been realized. Observers are producing interesting images of several sources that are of higher quality and cover larger fields than have ever been been possible before. This technique can be used with any of the dual-polarization receivers at the 12 Meter; images at 3 mm, 2 mm, and 1.3 mm wavelengths have been made this season. The data can be taken with any of the filter bank spectrometers, but not yet with the Hybrid Spectrometer. We are working on supporting this mode with the hybrid spectrometer which will allow OTF observing with the 1.3 mm eight-feed receiver. This developement

utilizes a high-speed digital signal processing chip to perform the Fourier transforms required by the Hybrid Spectrometer. Using a separate digital continuum backend, continuum OTF mapping is also supported.

K. SOCORRO ELECTRONICS

VLA 1.3 - 1.7 GHz Receiver Improvements

Simple screens to shield the feed failed to reduce the excessive increase in system temperature at low antenna elevations. We continue to consider other ways to determine the source of the spillover or backscatter.

Prototypes of the new frequency converter F15 modules were installed on three antennas and tested. In the current system, out-of-band signals are imaged to appear in-band. The current F2 converter modules must be retained until all the new F15 converter modules have been installed, since the two schemes will not fringe together because of spectral inversion. Parts were ordered to construct 10 modules early next year.

VLA 40 - 50 GHz Receivers

Parts were ordered so that three additional front ends could be built and installed in time for the 1995/1996 winter atmosphere.

New VLA Correlator Controller

A VME computer with custom cards will replace the old correlator controller which is nearing the end of its repairable life. No progress occurred this quarter.

VLA Antenna B-Rack Shields and Optical Fibers

Nineteen shields with optical fibers have been installed in antennas. We expect to complete all antenna B-racks by mid 1995.

VLA Visitor Center Radiometer

An L-band radiometer was constructed to be used as an interactive exhibit at the Visitor Center.

VLBA Maser Frequency Standard

In October, maser #2 was returned to the AOC from VLBA Fort Davis to investigate declining stability. Loss in atomic cavity power, increase in receiver noise figure, increase in receiver noise bandwidth, and loss of atomic line Q were all tested and found satisfactory. After incidental repair of a cracked solder shield on the semi rigid coax carrying the maser cavity signal, the stability tested normal. Apparently the cracked connection caused a source impedance change which degraded the noise performance of the receiver preamplifier.

VLBA Recorders and Playback Drives

A new VLBA recorder was built in Socorro and installed at the VLA. The older VLA recorder was returned to the AOC for repairs, after which it will be returned to provide two-recorder operation at the VLA. Recent work toward improving reliability of playback drives at the correlator has focused on the vacuum loss problem, and some progress occurred. Efforts will continue.

VLBA Samplers

Two sampler modules returned from Russia were checked, refurbished, and returned to the DAS for Green Bank. We began work to improve accuracy of sampling levels. A test unit for measuring two bit code level counts has been built. Measurements have started and will continue into 1995.

Data Acquisition System for Green Bank

The Russian VLBA D-rack and recorder returned to Socorro. Both the rack and recorder were refurbished to current specifications. Checkout of the DAR is complete. Checkout of the recorder is ongoing. The entire DAS will be shipped to Green Bank in January.

VLBA Correlator

Our custom integrated circuit chips in the VLBA correlator have been failing at a rate higher than expected. In the last two years, 71 of the 2640 powered chips in the correlator have failed. There are 344 chips in spare cards and 181 loose spare chips. At this failure rate, all spares will be used in fifteen years. There is a definite correlation between elevated operating temperatures and increased failure rate. IRAM has a similar problem, to which LSI Logic has acknowledged a problem with their process. The failure mechanism indicates the possibility of an accelerating failure rate over time. Our chips were made in the same process and in the same time frame. Most of our failures occur in the chip's internal RAM. We recently sent five chips to LSI Logic for failure analysis, and expect a report in January.

VLBA Site Maintenance and Inspection Visits

A maintenance/inspection team of seven New Mexico-based staff visited the Mauna Kea VLBA station during the second week of December. This team, representing mechanical, servo, HVAC, cryogenics, and electronics, spent six days performing equipment upgrades, preventive maintenance, and general station inspections.

VLBI/MKII

We ended support of the MKII formatter/recorder systems at Mauna Kea, Saint Croix, Hancock, North Liberty, Owens Valley, Brewster, Pie Town, and VLA on December 30, 1994. Some of the equipment may be donated to other observatories who can maintain it.

Interference Protection

Development of an on-line interference monitoring spectrum analyzer for the VLA continued. The first phase of development allows data retrieval and display at the AOC using the zia command ~vlarfi/if.monitor/bin/plotif MMDDhhmm.tYY, which transfers a postscript file to the user's directory, and on command will perform a screen plot via Tektronix graphics. Frequency coordination efforts through the National Science Foundation Spectrum Management Office and our informal network have concentrated on major radar installations, several military systems, and harmonic emissions from TV transmitters.

L. AIPS

By 28 December 1994, the 15JUL94 release of "Classic AIPS" had been shipped to 72 institutions, 38 by magnetic tape and 34 by electronic copies. The increase in the use of magnetic tape has been caused by our offer to shorten the installation process by sending a full binary copy of AIPS on tape. The binary versions are currently available for SunOS, Solaris (Sun), AIX (IBM), OSF/1 (DEC Alpha), Linux (PCs), and SGI.

The substantial work of rewriting the user manual called the "AIPS CookBook" continued during the quarter. Completely rewritten chapters on displaying your data and spectral-line software were released during the quarter and an additional one on VLBI data is in the last stages of editing. New chapters treating introduction to AIPS, basic tools, calibration, program lists, and the use of NRAO facilities were completed for the 15JUL94 release. 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).

The most noticeable change to AIPS during the quarter was our first major file format change in five years. Actually, the change was comparatively minor, involving only the names of files, not their contents. The change was in the number base used in file naming, from 16 to 36 (0-9, A-Z). This extended hexadecimal allows us to support user numbers higher than 4095 and, with

the addition of another character to the file names, to support file up to 46655 extension files rather than a mere 255. The latter was a serious limitation to spectral-line data reduction. This change also allows us to support up to 35 disks, rather than 15, for each AIPS user and raises other limits as well.

During the quarter, three new tasks were added to Classic AIPS. VPLOT is a new, much faster task to plot visibility data and/or models with multiple baselines per plot page. PCLOD reads the file containing phase-cal information produced by the VLBA correlator. The resulting PC file can now be plotted by SNPLT and will soon be used to calibrate VLBA data. The third new task, MOVE, is a long overdue one to copy or move image or uv data between users (i.e., to different user numbers).

Pre-existing tasks also received significant attention. The most complex change, which was completed and improved during this quarter, involved fixing bandpass calibration for the time-dependent shifts in bandpass introduced by the VLBA correlator. Another tricky improvement was the addition of amplitude corrections for VLBI data which were averaged in frequency and time while still being affected by residual delay and rate errors. A subtle bug in holding the mean gain modulus constant in self-calibration was fixed. Single-dish on-the-fly imaging was speeded up and enhanced by the addition of support for it in all flagging tasks. An input format bug was also corrected. The interactive uv data flagging tasks were improved by making the production and averaging of the master grids more reliable. More Clean boxes (50) are now available, including Clean boxes in the secondary images (50/image but in WFCLN only).

M. AIPS++

The two most exciting recent developments for the AIPS++ project are the creation of an application to do On-The-Fly (OTF) imaging for 12 Meter Telescope data, and the development of an application, AipsView, for image display and visualization. The current version of the AIPS++ OTF imaging procedure fills NRAO 12 Meter OTF data into an AIPS++ table, applies calibration, regrids the data, and produces and displays an output image cube. So far, this merely demonstrates that AIPS++ can replicate current capabilities. This capability will become very interesting in the coming months, however, because it will soon be possible to do this in near real time with AIPS++, allowing observers to see an OTF image building up while the data is being taken. This should provide an important capability for observers at the 12 Meter, and will also help bring AIPS++ into closer contact with future users. AipsView, developed by the BIMA AIPS++ group in Illinois, is a flexible tool which allows users to display and manipulate 2D and 3D images cubes easily. It will be useable in both the AIPS++ environment as well as a stand-alone image visualization tool when it is released.

During recent months several developments within AIPS++ have occurred that are of particular importance to programmers. A major revision to the AIPS++ table system (which handles data structures for AIPS++) has been completed as planned, and will provide a firm foundation for application development during 1995. The incorporation of Glish (a system which implements both command line interface and interprocess control and communications via a "software bus") into AIPS++ has proceeded well. The AIPS++ extensions to Glish (including support for multidimensional arrays, complex numbers, and command line editing) have been released by NRAO, and will be part of the next "official" release of Glish. A number of high- level routines have been bound to Glish, demonstrating that users will ultimately be able to make use of much of the AIPS++ programming library directly from the command line. In other areas: code acceptance procedures are now fully implemented, which is having the expected positive effect on coding for AIPS++, especially in areas related to documentation and testing. Related to that, a documentation extractor has been developed which can produce sensibly formatted and suitably cross linked documentation from standard AIPS++ programs.

In December there was a major review of the AIPS++ project by a panel of outside experts. The review looked at both technical and managerial aspects of the project. The panel endorsed the importance of AIPS++ to the future of radio astronomy and reacted positively to many of the technical approaches adopted by AIPS++; it also criticized the management and structure of the project and the AIPS++ Consortium. The Consortium (and the AIPS++ Steering Committee) is still digesting their advice, and expects to implement changes in the coming months to address concerns raised by the panel. The full report of the review panel will be released in January as an AIPS++ Memo. A considerable amount of documentation was prepared for the review, including a major document on the design of AIPS++.

The AIPS++ project is now nearing the end of the first major phase in its development. The focus during the coming months will be moving from primarily infrastructure development towards development of applications in selected areas.

N. SOCORRO COMPUTING

In early 1995, the AOC anonymous ftp location will move off zia.aoc.nrao.edu. After this time, only the ftp.aoc.nrao.edu address will work for retrieving files from the AOC via anonymous ftp.

Because of the earlier delays in the migration of the majority of AOC Suns to the Solaris 2 operating system, it now makes sense to wait for the forthcoming release, 2.4. This is expected to ship in mid-December, and we plan to install it as soon as it arrives. Migration of most Suns should begin in earnest soon after that. Version 2.4 has significant performance improvements which will benefit in-house staff and visiting observers alike.

Real-time data filling at the AOC has become a widely used method of having the data available immediately after observations end. Some remaining problems were straightened out in the past quarter. We have continued testing remote filling of VLA data at institutions around the country with variable success. At institutions located at the NSF backbone, like the University of Illinois in Champaign/Urbana, we have realized a success rate close to the local one. At other sites, further removed from the backbone, failures outnumber successes. We feel that we can widely advertise remote data filling only when the overall network situation has improved sufficiently. Users around the country still will be able to use FILLM on one of the AOC machines and then ftp their data to their home institutions.

The tape archiving project, in which all VLA data are converted to the current data format and copied to Exabyte tape, made excellent progress. Since we lack hardware to deal effectively with the low quality tapes in use in the early eighties, we have switched to archiving recent data, starting with 1992. We expect to resume the conversion of older tapes when the appropriate hardware is in place. To date all observations from 1976 to 1983 have been converted, plus all observations from 1993 and 1994; currently 1992 is in the process of being archived. Simultaneously an ever-growing database containing essentially all header information is being filled. A program which allows users easy access to this database is in the final testing stage, and we hope to announce its availability shortly.

The prolonged development stage of VLBA observe is drawing to an end. All planned capabilities are in place and testing by a select group of users is imminent. We expect an in-house beta release in January and a more general release a month after that.

O. VLBA OPERATIONAL STATUS

In the last trimester of 1994 (actually until Dec 20), we successfully correlated 60 VLBA projects (including 11 VLBA tests). This is up about fifty percent from the corresponding number (43) of the preceding trimester. Despite our success at increasing the operational efficiency of the correlation, there remains much to be done in improving throughput. Scrutinization of the data continues to be excessively time-consuming, even with the advent of a stand-alone data "sniffer" not requiring loading of the data into AIPS.

The backlog of global projects to be correlated continues to be attacked. Processing global projects continues to be labor intensive compared to VLBA only processing. Despite this, we have correlated 14 projects in the last trimester. The priority is to work backwards through 1994 (12 projects remaining) and then into 1993 and 1992 (42 projects). In doing so, we will exclude those observations that fall outside our current capabilities for correlation. Neither sub-arraying nor tape stopping and starting are currently supported in the correlator software.

The rewrite and redesign of the correlator code continues but has been slowed by the advent of a new type of bug affecting correlation of experiments at speed-up factors greater than two. In this effect, fringes would disappear after some time during a job. After much detective work, mainly by the software group, this was discovered to be due to a loss of precision in various phase calculations. A number of fixes for this are either in place to allow correlation now or are being developed for the longer term.

In the first quarter of 1995, we will take delivery of the final thin tapes that were planned as part of the VLBA construction. These will be placed in use as soon as possible. Based upon the recent progress in improving correlation efficiency, the observing rate will be increased by about 30-40 percent in the first quarter. The time allocated in the first four months will be 1420 hours (up from 1060 hours for the last trimester of 1994) for about a 50 percent observing duty cycle.

P. GREEN BANK TELESCOPE PROJECT

Antenna

The current major effort at the GBT construction site is the preparation of the elevation shaft for installation on the completed alidade. The stub shafts have been aligned and welded onto the axle and approximately 60 percent of the welds have been completed on the short members attached to the stub shaft spiders. Trial erection of the elevation wheel and box sequence B1 is underway. The shaft is scheduled to be lifted onto the alidade later this winter. Tractor trailers loaded with large fabricated steel members are arriving regularly at Green Bank. In addition, other work completed or nearing completion on the structure includes caulking of the azimuth track gaps and installation of the Level 1 HVAC equipment, electrical furnishings and servo cable trays.

At the contractor's plants, fabrication of all remaining parts of the structure continued, including the elevation wheel and box joints, beams, counterweight boxes, main reflector panels and the subreflector truss assembly, details and panels. The servo system is being prepared for acceptance testing in February.

Open Loop Active Surface

Actuator life tests to date have consisted of running two actuators under a varying load. The actuator is simply started and run to one travel limit, stopped for two seconds, run to the other limit, and so forth. This results in one start/stop cycle per 1.7" of travel. Members of the GBT Advisory Committee pointed out that it would be useful to measure the effect on brush and commutator life that a much higher number of start/stop cycles per inch would yield. As a result of this recommendation, a test was run in which three actuators were run with one start/stop cycle per 0.012" and three others were run as controls with one start/stop cycle per 1.7". The test was completed in December and motor wear measured. Test actuators were started and stopped in excess of 1,000,000 times. The basic result was that this number of start/stop cycles would not significantly affect motor life.

During the above test, grease was found to have migrated into the motor in at least three cases. An internal investigation concluded that excess grease was put into the actuator gear box by the actuator manufacturer, and that pressure generated by the meshing of the gear teeth caused the grease to work its way into the motor. The actuator manufacturer is conducting an investigation as well. In addition, work is underway in the Green Bank shop to find ways of slowing the grease migration. A resolution to this problem will be developed soon.

The construction of the actuator control panels was completed this quarter. Twenty-three of the 52 panels still need to be tested. The actuator room, which will house actuator controls on the GBT, is now available to NRAO for installation of equipment. Plans are to install mechanical and electrical equipment while the building is on the ground, and wait until the building is on the telescope and properly climate-controlled before installation of electronics. Two power supply mounting shelves were completed by the shop and installed in the room. Also, mounting brackets for the control rack were fabricated in the shop and are almost fully installed in the room.

A VME chassis, which will hold the computers and interface cards for the active surface, was placed on order.

Closed Loop Active Surface

The 20 electronic control cabinets for the laser rangefinders have been completed and placed in storage. Each unit was fully tested before being stored. The evaluation of the retrosphere produced by the Optical Science Center at the University of Arizona has continued with good results. The final tests will involve temperature shock tests as calculations indicate that the thermally induced stress in the glass may approach dangerous levels under rapid temperature changes.

Work on the absolute calibration of the laser rangefinders has continued. This involves measuring the distance between two points using a commercially available laser interferometer and comparing the result with that obtained using the rangefinder. At present there is a discrepancy between the two results that can be as high as 200 microns over the 18 meter range.

Production of the computer controlled mirror in the Green Bank machine shop continues. We anticipate finishing the parts for all 20 mirrors in the next two months. Assembly will likely take another two months. A design for the ground-based building to house the rangefinders that will encircle the GBT has been started as an in-house effort. This design will be tested on 140 Foot Telescope experiment that will commence in the spring.

Electronics

Three GBT receivers, the 8-10 GHz, 18-26.5 GHz, and the recently installed 12-15.4 GHz, are now available for routine use on the 140 Foot Telescope. Assembly of the 3.95-5.85 GHz front end is complete. Shop fabrication of the L-band receiver OMT is more than 50 percent complete and assembly of the L-band feed is nearing completion. Assembly of the initial 1-8 GHz converter module was completed and detailed testing has started. Development of the continuum backend continues. The circuit cards have been completed and tested with development software. Mechanical integration of the system in the VME chassis is proceeding. Design work continued on the LO reference distribution system and the fixed 10.50 GHz LO3 phase-locked oscillator.

Work on the GBT spectrometer is continuing, both at NRAO and the correlator chip design facility. Tests on the second wafer run correlator chips still indicate that the chip performance is acceptable for NRAO's application. A decision was made to decrease the system clock rate to 100 MHz from 125 MHz to achieve adequate performance margin. This decision means the spectrometer maximum bandwidth will be 800 MHz, which meets the original performance goal set by astronomical considerations. Setting this frequency allows design of the spectrometer IF filter/converter system to proceed.

Monitor and Control

The GBT software being implemented on the spectral processor (specifically, the software modules responsible for synchronizing the various devices involved in a scan) has passed initial tests. Testing and debugging of the data storage software on the spectral processor using FITS has been successfully accomplished and observers now are using these files. The old internal format is being written in parallel until full confidence in the new format is established.

Work continued on the message system. The application program message interface is ready for an alpha release, and work on the viewer is in the early stages of development. The first version of the weather station was completed. In addition, effort continued on the site timing center at the Interferometer building and on the receivers at the 140 Foot Telescope. Some bugs were discovered in the software libraries software which have required attention and prevented the completion of the receiver work as scheduled.

Data Analysis

Work continued on maintaining and testing the AIPS++ development installation in Green Bank. Some testing of individual classes such as the FFT server class was done in preparation for the December AIPS++ review. In coordination with Monitor and Control, the FITS format for weather station data was designed. Using PV-WAVE, a weather data plotting program was written. A significant amount of time was spent on preparing for the upgrade of the SUN workstations to the new Solaris operating system. It is planned to convert the AIPS++ development and the Monitor and Control development effort to the Solaris environment in early 1995.

Q. PERSONNEL

New Hires

E. Wollack	Research Associate	10/03
J. Navarro	Research Associate	10/03
M. Stennes	Electronics Engineer II	10/11
W. Grammer	Electronics Engineer I	10/24

Terminations

J. Conway	Research Associate (end of appointment)	12/16
K. Dwarakanath	Research Associate (end of appointment)	12/23

Other

J. A. Zensus	return from Leave for Professional Advancement	10/17
N. J. Bailey	return from Leave of Absence	12/20

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