



NRAO NEWSLETTER

1987 July 1

No. 32

VLBA

SELECTED VLBA ITEMS

With painting and a number of final "punch list" items now completed, the Pie Town antenna has been accepted. The surface has been set such that the rms deviation in the positions of the 820 optical targets used for setting is approximately 0.004 inch. "Outfitting" by NRAO personnel has begun, comprising installation of all cables, cryogenics, electronics and other equipment required for operation. At Kitt Peak (#2), site preparation and building are complete, the antenna structure is erected, surface panels have been installed, and setting of the surface is in progress. The Los Alamos (#3) site and building were ready on schedule. However, although the antenna has been manufactured, its shipment to site was delayed until late June for lack of an erecting crew. At North Liberty (#4), site work, save for the building, is complete. Manufacture of the antenna for this station is well along.

Site construction at both Fort Davis (#5) and Brewster (#6) is on schedule. However, manufacture of antennas for these two stations has only recently been authorized, due to the length of the negotiations to reduce antenna

procurements from three to two per year. A site on St. Croix, USVI (#7) has been chosen, and negotiations for its acquisition are in progress.

The first focus and rotation mount (FRM) for the subreflector was delivered. In testing, however, it was found that some redesign is necessary, and this is in progress. The mold for the subreflector itself was completed. The first unit, to be completed shortly, will be carefully measured both at the plant and in the facility at the University of Arizona.

Electronics for both Pie Town and Kitt Peak will be at the VLA during part of June and July for comparative stability tests as temperature of one set is varied.

Design of the FX Correlator has progressed far enough to permit the first well-considered estimate of costs. The total hardware cost appears to be less than half that estimated for the lag correlator design of 1985.

Paul Sebring

12-Meter

3 mm VLBI AT THE 12 METER

The 12 meter successfully participated in a 3 mm VLBI session in March with Hat Creek, Owens Valley, and Quabbin. The 12 meter was configured with a dichroic grid that allowed simultaneous measurements at 3 mm and 6 cm. The 3 mm observations were made with the SIS receiver using a circular polarizing plate and the 6 cm

observations used a room temperature FET. The observers report that fringes were detected at both wavelengths on all available baselines.

D. T. Emerson, P. R. Jewell, and
J. M. Payne

FOUR BEAM RECEIVER TEST RESULTS

A 230 GHz, four-beam receiver was tested on the 12 meter in April. The receiver performed flawlessly. The aperture efficiencies were as good as or better than with the standard single beam receiver and there was no crosstalk between beams. The beams were oriented in a linear array with a separation of 80" (three beamwidths). The array was tested in both spectral line and continuum modes.

The four-beam receiver is one-half of an eight-beam receiver presently under construction. The beam configuration of the eight-beam receiver will be a 2 x 4 array. This receiver should be ready for testing in the fall of this year. A servo-controlled beam rotator has been incorporated in the eight-feed receiver and will allow the beams to maintain a constant parallactic angle orientation as the source moves across the sky. As an alternative technique, we also plan to develop software to compensate for the parallactic angle rotation.

The date when the device will be released to observers depends not only on the

completion of the receiver but also on the completion of spectral line and continuum backends that can accommodate eight independent IF channels. The hybrid spectrometer is progressing in Tucson and Charlottesville and is expected to be completed by the end of this year. The device will be tested at the telescope in the winter and spring of 1988. An eight channel digital continuum backend is expected to be completed by year's end. Both devices are microprocessor controlled and will dump their data directly into the VAX 11/750 along standard bus systems. This is in keeping with the new control system philosophy.

The NRAO has given high priority to the development of multibeam receiver systems. Over the next few years, we expect to expand the number of beams several-fold and convert from Schottky to SIS mixers. We are also initiating a concomitant program of spectrometer development.

D. T. Emerson, P. R. Jewell, and
J. M. Payne

1987 SUMMER SHUTDOWN PLANS

The 1987 summer shutdown will be from July 14 to September 23. The project list for this year's shutdown is particularly extensive and includes:

1. Construction of a new equipment room, a new observers' work room, and an observers' work station. The old observers' work room is being remodeled as an equipment room. All computers and disk drives, the hybrid spectrometer, and the digital backend will be moved to the new room. This will substantially reduce the fan noise in the control room and will alleviate the shortage of rack space. The new observers' work room has been set up one room to the east of the old work room, and a work station will be set up near the control room where the VAX is currently placed.

2. The telescope control PDP 11/40 minicomputer will be replaced with a PDP 11/44. The PDP 11/44 will run the existing FORTH control software, although our long-range plans are to gradually phase out this system.

3. The feed leg insulation will be modified in an effort to reduce daytime pointing and focus changes. More temperature sensors will be added to the feed legs to improve our monitoring capabilities.

4. A mechanical map of the reflector surface will be made. This map will be used in conjunction with holography maps made in June to assess the need for surface resettings. Because of the press of activities during the shutdown period,

we will not attempt to reset the surface then. If the mechanical and holographic maps are in good agreement and if a significant increase in performance seems likely, we will consider a surface readjustment later in the year.

to allow more extensive control of frequency synthesizers via IEEE 488 busses. In addition, we plan revisions to the Users Manual and the Spectral Line Data Reduction Manuals.

D. T. Emerson and P. R. Jewell

5. Receiver upgrades are planned for the 3 mm SIS and the 200-270 GHz Schottky mixers. Also planned are software changes

VLA

VLA CONFIGURATION SCHEDULE

I. 1987/88

Quarter	Configuration	Antennas Available*			Proposal Deadline
		<u>327 MHz</u>	<u>8.4 GHz</u>	<u>23 GHz</u>	
1987 Q3	A	21+	11	6	March 15, 1987
1987 Q4	A/B, B	22+	13	9	June 15, 1987
1988 Q1	B, B/C, C	25+	16	12	September 15, 1987
1988 Q2	C, C/D, D	27+	18	15	December 15, 1987

Maximum antenna separation for the four VLA configurations are: A-36 km, B-11 km, C-3 km, D-1 km. Further information is summarized in the "VLA Observational Status Report"; the new edition is now available from Alison Patrick, National Radio Astronomy Observatory, P.O. Box 0, Socorro, New Mexico 87801, Telephone: (505) 772-4240.

*All 27 antennas are available at 1.4, 5, 15 GHz. At 23 GHz receivers the number given is the number of antennas with new receivers, approximately three times more sensitive than current ones.

*Subject to budgetary limitations.

II. Approximate Long Term Schedule

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>
1987	C	D	A	B
1988	B	C [#]	D	A
1989	A ⁺	B	C*	D
1990	D	A	B	C

[#]All antennas equipped for 327 MHz operation.

⁺All antennas equipped for 8.4 GHz operation.

*Voyager-Neptune encounter.

R. D. Ekers

VLA STUDENT OBSERVERS

I would like to remind VLA users or potential users that any students who are part of an observing program and are inexperienced VLA users must be accompanied by their supervisor when they

plan to use VLA facilities either for observing or data processing.

Carl Bignell

NEW ROOM CHARGES

Effective August 1, 1987, the VLA will change its daily rate for use of the Visiting Scientist Quarters. Currently there is one charge category for each type of room, but in response to users suggestions a two-category system has been implemented in which student observers will receive a special rate. The new rate structure is:

Room	Rate/Night	
	Regular	Student
Single	\$20.00	\$9.00
Double	\$12.00	\$6.00
Bunkhouse	\$ 8.00	\$5.00

The current daily rate of \$3.50 for the use of the Observer's Kitchen will remain unchanged.

Carl Bignell

VISITORS TO THE VLA

Anyone who is planning to visit the VLA for the purpose of observing, data reduction, or any other reason which requires the use of the computing facilities or a stay in our Visiting Scientist Quarters is required to make reservations with the VLA reservationist (505) 772-4357 at least two weeks in advance of their trip.

transportation between Albuquerque and the VLA site. (2) scheduling of the VSQ rooms, and (3) management of the VLA computer resources.

Information requested will include: reason for trip (with additional details such as project code, computer resources needed, etc., where appropriate), detailed flight and travel plans, length of stay, and other miscellaneous information.

Many questions will be asked of the visitor at the time the reservation is made. The reasons for these questions include: (1) scheduling of visitors

Carl Bignell

CHECK CASHING POLICY FOR VISITING OBSERVERS

Since there are no banking facilities near the VLA site it is difficult for observers to cash checks. Anyone may cash checks with Alison Patrick between the hours of 9 a.m. and 4 p.m. on normal work days provided that the amount does not exceed

\$100 and the check is in U.S. funds drawn on a U.S. institution, including Traveler's Checks. The VLA cannot accept any foreign currency.

Carl Bignell

SHIPPING CHARGES

Effective August 1, 1987, observers will be charged for any materials which NRAO ships on their behalf. The charges will be invoiced to the observer at the time

he leaves the VLA site along with VSQ room and other charges.

Carl Bignell

RECENT VLA MEMORANDA

Since the last Newsletter there has been one VLA numbered memorandum issued:

VLA Test Memorandum No. 149, "Measurements of Flux Densities and Gain Corrections at 22485.1 MHz" (P. Crane) April, 1987.

If you want a copy of the VLA memoranda listing, or a copy of any of the memoranda previously issued, contact Alison Patrick at: NRAO, P.O. Box 0, Socorro, New Mexico 87801 [(505) 772-4240].

Alison Patrick

Green Bank

300-FOOT TELESCOPE'S SILVER ANNIVERSARY

First observations with the 300-foot telescope occurred on September 21, 1962. The twenty-five intervening years have been scientifically and technically productive. The way is now paved for the next twenty-five years.

To commemorate this significant milestone and to mark the transition into tomorrow's research world, a series of events have been scheduled, all to be held in Green Bank.

September 21: (9131 meridian crossings since the initial one). Open house for precollege students.

September 23: Open house for college and university students.

September 25-26: Symposium on significant scientific research, 1962-1987.

September 26: Public ceremony.

September 27: Public open house.

September 28-30: Workshop on astronomical surveys.

A historical committee and a technical evolution committee are busy accumulating records and equipment for display. Those who have items worthy of inclusion in the history of this major scientific instrument should submit them to Fred Crews at NRAO-Green Bank.

As with all human endeavors, a liberal dose of humorous incidents augment the 300-foot telescope's history. Fred Crews and Beaty Sheets are collecting these also, and would appreciate your favorite anecdotes.

Please join NRAO in this celebration of a glorious past and simultaneous kickoff of a promising future. Contact Beaty Sheets for additional information.

George Seielstad

HOLOGRAPHY OF 140-FOOT TELESCOPE

Ron Maddalena has completed a second set of holographic measurements of the surface of the 140-foot telescope. The results are encouraging because they agree closely with those made several months earlier and are in general in agreement with mechanical measurements made in 1978. This encourages us to believe that surface adjustments will be long-lasting improvements.

During the recent observations, "before" and "after" maps of the surface were made in which the intervening event was the movement of one panel by approximately a millimeter. The panel displacement is clearly seen. We therefore have faith in our measurement technique, and expect to make a meaningful adjustment to the telescope figure.

A significant fraction, say 25-40 percent, of the surface area deviates from the best-fit parabola by the order of a millimeter. Accordingly, we have scheduled the period August 17-September 4, 1987, for a general surface

readjustment. Panel adjustments will be made during the day and checked holographically at night.

George A. Seielstad

300-1000 MHz RECEIVER UPGRADE

The 300-1000 MHz receiver upgrade has been completed. Balanced cooled FET amplifiers were developed to provide the frequency coverage required. System temperatures on the 300-foot are now 47 to 62 degrees over the 700 to 1000 MHz band. From 280 to 420 MHz the system temperature is 105 to 50 degrees. The sky temperature near the galactic pole is approximately 35 degrees at 280 MHz and 10 degrees at 420 MHz. Because of the improved performance of the FET amps at the upper end of this band, the 350 to 410 MHz feed will be retuned to cover 350 to 420 MHz. Since the receiver was upgraded the 500 to 700 MHz

feed has not been used. System temperatures in this band will be measured when the feed is installed.

In addition to the FET amplifiers a new frequency-band selection system was installed. Provisions are made for an inactive mode which switches all the FET amplifiers and oscillators off to avoid interfering with other receivers, and for computer control of the band selection.

Jim Coe

HEMT UPGRADE OF 1.3-1.8 GHz RECEIVER

During April, the cooled FET amplifiers in the 1.3-1.8 GHz receiver were replaced with similar amplifiers using Fujitsu high electron mobility transistors (HEMT) in the first stages. On the 300-foot, the zenith system temperatures now measure 22 ± 2 K over the 1350-1430 MHz and the 1600-1730 MHz frequency ranges.

Measurements on the 140-foot yield zenith system temperatures of 20 ± 1.5 K over these frequency ranges. These results indicate a decrease of approximately 4 K from the previous system temperatures.

R. D. Norrod

SECONDARY SCIENCE TEACHERS' INSTITUTE

NRAO-Green Bank and West Virginia University are jointly sponsoring a two-week institute for secondary school science teachers, July 26-August 8, 1987. Twenty-five teachers from West Virginia and surrounding states will be selected to attend.

The teachers will reside at the Observatory and interact with the local support staff, as well as with visiting scientists. Locals and guests will lecture on their research and development projects.

Several demonstrations will also be presented. A working 40-foot transit

telescope will be made available to the institute participants so that they can actually perform radio observations. Those who learn to operate the instrument will be able to bring students under their supervision to use the telescope as well.

The emphasis will be on providing demonstrations and information the teachers can use in their classrooms.

NRAO and WVU look forward to this innovative attempt to assist science educators.

George A. Seielstad

In General

SUMMARY OF USERS COMMITTEE COMMENTS - APRIL 9, 1987

At its semi-annual meeting on April 8 and 9, 1987, the NRAO Users Committee met in Socorro and at the VLA site. Comments and concerns of the Committee ranged over the topics summarized below:

General Concerns - Severe budget constraints are having an impact on basic areas of the Observatory's operation, including adequate facility maintenance, visiting observer support, and state-of-the-art receiver system development. Planning for VLBA operations and computing needs are also affected by the funding restrictions. The Committee stressed its concern that ongoing NRAO programs require increased NSF funding.

Charlottesville - Continued operation of the Mark II VLBI correlator is necessary as long as it remains a unique resource for the general scientific community for correlating Mark II spectral line data. The Committee noted the invaluable contribution of the Central Development Laboratory in providing state-of-the-art receivers for NRAO facilities.

Green Bank - The new Cassegrain beam splitter on the 140-foot telescope requires additional, careful checkout and calibration. The new 7-feed receiver system shows excess system temperature, which needs to be eliminated once its source has been determined.

VLA - In discussing the new Array Operations Center for Socorro, the Committee emphasized the need to maintain an excellent environment for processing data. Consistent with NRAO's long-term computing needs, the facility needs adequate computing power for both data calibration and map making. Arrangements should also be made in Socorro to minimize the cost of lodging and meals for visiting scientists.

In anticipation of the eventual phase-out of the DEC-10 computer, the basic data tapes from the Modcomp need to be kept readable for future comparison between epochs. Additionally, the development and documentation of data calibration procedures in AIPS should be accelerated.

Priorities for continued VLA systems upgrades were recommended in the following order:

- Retrofit HEMP amplifiers at K-band and complete the P-band installation
- Implement a full 75-MHz system
- Direct-link the VLA with the VLBA Pie Town antenna
- Install a 40-GHz system
- (unprioritized but valuable): Build a short time scale backend processor for pulsar and other high time resolution observations

Tucson - A period of telescope shutdown should be avoided when the new plans for improving the 12-meter telescope control system are finally put into motion.

Better use of available time on the 12-meter will be accomplished if high-frequency observers are required to submit low-frequency backup programs for less than optimum weather conditions.

Future Programs - The Committee encouraged the NRAO's efforts to plan for a future millimeter array similar to the VLA in power. Further efforts should entail design studies, active collaboration with outside institutions experienced in millimeter wave astronomy, and stimulation of millimeter aperture synthesis expertise.

R. J. Havlen

TED RIFFE RETIRES

It is with regret that I announce the resignation of Ted Riffe as Associate Director for Administration, effective July 1. After twenty-eight years with the Observatory, Ted has decided to retire. Few have had as much influence as Ted on the institutional character of the Observatory or have contributed as much to its success. He will be missed, and I know I speak for all the staff in wishing him the best in retirement.

I am happy to announce that on July 1 Jim Desmond will join the Observatory as Associate Director for Administration. Jim comes to the NRAO from Brookhaven National Laboratory with twenty-four years of experience in laboratory business administration. On behalf of the staff I want to welcome Jim to the Observatory.

Paul Vanden Bout

1987 JANSKY LECTURER

It is a pleasure to announce the selection of Professor H. C. Van de Hulst of Leiden University, The Netherlands, as the 1987 Jansky Lecturer.

Prof. Van de Hulst has had a long and productive career in astronomy, and he is best known for his prediction that the 21 cm line of neutral hydrogen would be observable in the radio spectra of interstellar clouds. Since its detection in 1951, the HI line has been one of radio astronomy's most important probes of the kinematics and physical properties of galactic and extragalactic interstellar material. Prof. Van de Hulst's early

theoretical work on the properties of interstellar dust particles led to often-referenced texts on the subject in 1957 and 1980. He received his degree from the State University of Utrecht and has been active in many functions promoting international cooperation in space research, acting as the first president of COSPAR. Among his many awards are the Eddington Medal of the Royal Astronomical Society and the Henry Draper Medal of the National Academy of Sciences.

We look forward to Prof. Van de Hulst's visit to the NRAO and the Jansky Lecture on October 27 in Charlottesville.

Paul Vanden Bout

IMAGE ALERT

There is no doubt that the production of radio images (i.e., "pretty pictures") has revolutionized the interface between radio astronomers and the public. As the cliché goes, "a picture is worth a thousand words." The public can now actually "see" the interesting things that radio astronomers work on. A large number of radio images from the VLA have slowly found their way into the NRAO slide file, and we are grateful to those of you who have supplied these images and helped to describe and document the objects and observations. We feel that we have only touched the tip of the iceberg, however, and that certainly there are many images

out there that we are unaware of or that represent classes of objects or phenomena that are currently unrepresented in our slide file.

Before the first decade of VLA use is over, the NRAO will be producing a new documentary brochure of images obtained with the VLA entitled "VLA Images: Radio Eyes on the Universe." This will include some of the images which have already become immortalized in the public domain (e.g., Cyg A, 3C 449, Cas A), but we are still interested in finding more VLA images that would display well in such a brochure.

If you have images that should be considered for this momentous undertaking,

please send them to us and we will see that you are duly acknowledged.

R. J. Havlen

STAFF COMINGS AND GOINGS

The following Research Associates, who have been in NRAO postdoctoral positions for up to three years, will be advancing to new opportunities during the course of the next few months:

Rich Barvainis - Haystack Observatory
Neil Killeen - University of Illinois
Chris O'Dea - NFRA, Dwingeloo
John Simonetti - VPI&SU
Jim Wadiak - Interferometrics Inc.

The following new Research Associates have accepted NRAO postdoctoral appointments beginning later this summer and fall:

Tim Bastian (University of Colorado)
plasma astrophysics; solar/stellar
radiophysics; radiative processes;

John Leahy (Jodrell Bank)
extragalactic radio source physics;
Pieter Roelfsma (University of Groningen) - radio recombination line emission of HII regions and planetary nebulae.

Other Staff Changes:

S. Weinreb will begin a leave of absence in order to teach at the University of Virginia during the 1987/88 academic year.

R. J. Havlen

VISITING RESEARCH POSITIONS FOR WOMEN AT THE NRAO?

The NSF VPW Program is designed to provide career advancement opportunities by awarding grants to women experienced in independent research to serve as visiting professors at U.S. academic institutions. During the recent Vancouver AAS meeting a special session was organized in order to brief attendees on "Funding from NSF: Emphasis on Women" and the nature of the VPW program was described.

Normally, VPW awards are taken at academic host institutions where research is but one component of the awardees responsibilities. Lecturing, counseling and other interactive activities are also expected in order to increase the visibility of women scientists as role models and to provide encouragement for other women to pursue careers in science and engineering.

The possibility of taking a VPW award at a National Center is not explicitly

mentioned in the NSF literature describing the program, but it appears that NSF management would be receptive to such proposals if they were in keeping with the spirit and intent of the VPW program guidelines. Joint appointments between the NRAO and a nearby academic institution could probably be worked out to the NSF's satisfaction.

If you are female and interested in spending one to two years on a research visit to an NRAO facility while cooperating on a part-time teaching basis at one of the nearby academic institutions (UVA, UAZ, UNM, NMIMT), you should investigate the possibilities and requirements of the program more fully by direct contact with: Margrete Klein, Program Director, Visiting Professorships for Women, National Science Foundation, 1800 G Street, NW, Washington, D. C. 20550
Phone: (202) 357-7734.

According to Ms. Klein, the 1987 budget for her program was some \$2 million across all of the NSF disciplines. Past years have seen NSF support go to approximately

25 percent of the applicants. The application deadline for 1988 awards is October 1, 1987.

R. J. Havlen

REDUCED OPERATIONAL SUPPORT OF THE MARK II VLBI PROCESSOR

In keeping with the spirit of the recommendation of the last Users Committee, operation of the Charlottesville Mark II VLBI processor will continue in the foreseeable future for those programs which require its unique capabilities. Generally this means pulsar observations and spectral line observations. We will no longer process Mark II continuum observations which do not require some unique utility, such as the pulsar gate, of the NRAO processor.

The number of NRAO staff members available to support the Mark II processor has diminished to the point that we can no longer handle the processing for absentee investigators. In the future astronomers wishing to process at the NRAO, and who have an experiment that requires the

unique resources of the NRAO processor, will need to come to Charlottesville and personally manage the processing chore. We will provide assistance with the PREP step and we will relieve as much of the actual processing burden as our manpower permits. But even in the best of circumstances, astronomers using the processor will have all responsibility for the actual processing and will necessarily have to be prepared to invest their own time in this task.

We recognize, and regret, the inconvenience that this mode of operation may cause some of our users and we welcome your suggestions for its improvement.

R. L. Brown

BOOKS AND ATLASES AVAILABLE AT COST FROM NRAO

Serendipitous Discoveries in Radio Astronomy, ed. Kellermann and Sheets-\$7.00

*plus shipping-domestic priority \$ 3
-foreign surface \$ 3
-foreign air printed \$10

The Search for Extraterrestrial Intelligence, ed. Kellermann and Seielstad - \$10.00

**1400 MHz Atlas-foreign surface only \$10

Synthesis Imaging, ed. Perley, Schwab, and Bridle - \$10.00*

Please order these books PREPAID from:

National Radio Astronomy Observatory
Attn: Carol Ziegler
P. O. Box 2
Green Bank, WV 24944

A 1400 MHz Sky Atlas, ed. Condon and Broderick - \$10.00**

Soon to be available:

Cometary Radio Astronomy, ed. Irvine, Schloerb, and Tacconi-Garman - \$10.00*

Science with a Millimeter Array, ed. Wootten

Radio Continuum Processes in Clusters of Galaxies, ed. O'Dea and Uson - \$10.00*

The Use of Supercomputers in Observational Astronomy, ed. Cornwell.

Radio Astronomy from Space, ed. Weiler-\$10.00*

R. J. Havlen



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