



NRAO NEWSLETTER

1982 March 1

No. 5

In General

THE 25-METER MILLIMETER WAVE TELESCOPE

NRAO is seeking funding within the FY 1984 budget to start construction of the 25-meter telescope on Mauna Kea. We are suggesting a two-year funding schedule both to lessen the total cost and to speed construction. That NRAO seek such funding was proposed by a majority of an ad hoc committee convened by AUI/NRAO on January 25, 1982. The membership of the committee included: B. Burke, R. Dicke, G. Field, H. Friedman, D. Hogg, J. Taylor, P. Thaddeus, and R. W. Wilson.

M. S. Roberts

THE TRANSCONTINENTAL RADIO TELESCOPE (TRT)

Previously called the Very Long Baseline Array (VLBA), this project has been rechristened TRT to better describe the telescope system and to avoid continual confusion with yet another acronym, VLA. The TRT was discussed at length by the ad hoc committee described above. It was highly regarded--as it has been by the Astronomy Survey Committee. NRAO is preparing a proposal for the TRT to be submitted to the NSF in the near future. An external Planning Group has been working with Observatory staff under the overall guidance of H. Hvatum and K. Kellermann on this proposal.

M. S. Roberts

UNIQUE FOREIGN TELESCOPE - TRAVEL FUND

Although several successful observing runs on foreign telescopes have been carried out under support from this program, which was announced during the summer of 1980, some meritorious programs have not received support because the telescope systems proposed for use were not listed in the original announcement. In keeping with the original intent of the program, future applicants for these funds should plan on submitting a statement in support of the "uniqueness" of the telescope/receiver system they plan to use. The official list of unique foreign instruments will no longer be sacrosanct, and it will be the responsibility of each applicant to defend the appropriateness of the instrumentation required by his program.

R. J. Havlen

BLURRED PROPOSALS

Proposals for telescope time have occasionally been hastily sent to the Director of NRAO by telecopy in order to meet a specific deadline. Regretfully, these will no longer be acceptable owing to their poor quality and the innumerable reproductions they must endure in the reviewing process. An alternate rapid solution for staff or visitors at the VLA is the use of DECNET to connect the VLA VAX to the Charlottesville VAX. The other obvious solution is to plan ahead.

R. J. Havlen

COMMENTS TO THE USERS' COMMITTEE INVITED

The NRAO Users' Committee meets semiannually in Charlottesville in order to advise the Director and Observatory staff on all aspects of Observatory activities that affect the users of the telescopes. Current and future observing equipment, telescope operations, computers and support facilities, and scientific priorities and directions come under regular discussion. Members of the user community are encouraged to participate in this open forum through contacts with representative members on the Committee, which is partially reappointed annually. The next meeting is scheduled for May 6, 1982. Current Users' Committee members are listed below:

G. L. Berge	CIT	J. M. Moran	CFA
L. Blitz	Maryland	R. L. Mutel	Iowa
A. H. Bridle	Queens	P. C. Myers	MIT
F. H. Briggs	Pittsburgh	R. B. Partridge	Haverford
E. B. Churchwell	Wisconsin	R. B. Phillips*	MIT
J. M. Cordes	Cornell	R. M. Price	New Mexico
B. K. Dennison	VPI	M. J. Reid*	CFA
G. A. Dulk*	Colorado	L. Rudnick*	Minnesota
R. Giovanelli*	Arecibo	P. R. Schwartz	NRL
D. J. Helfand*	Columbia	N. Z. Scoville	Massachusetts
P.T.P. Ho*	Berkeley	D. B. Shaffer	Phoenix Corp.
C. J. Lada	Steward	W. J. Welch*	Berkeley
R. A. Linke	BTL	A. S. Wilson*	Maryland
F. J. Lovas	NBS	H. F. Zirin	CIT
A. P. Marscher*	Boston U.		

* new in 1982

R. J. Havlen

THESIS WORK AT THE NRAO

When NRAO facilities are used in the pursuit of a doctoral degree, there has been an unwritten requirement that one copy of the thesis resulting from such work be sent to the NRAO Library in Charlottesville. You may now consider that a written requirement. If you or a student with whom you are working or have worked produces a thesis based in whole or in part on NRAO observations, please see that a copy of the thesis is sent to the Library as soon as possible following completion. If needed, the Library can pay for reproduction costs.

Sarah Stevens-Rayburn

7-TRACK TAPE CAPABILITY FOR THE CHARLOTTESVILLE IBM 4341

Our 7-track tape drive is seldom used. We are considering converting it to 9-track. We have talked with several users concerning this conversion and have had only favorable comments. However, we have 7-track tapes in the library that could no longer be read if this change is made. Please let us hear your objections, if any.

W. A. Davis

SOFTWARE DEVELOPMENTS ON CENTRAL IBM COMPUTER

In addition to solving several small problems associated with the computer change-over, two new developments are in progress. First, an operating system supporting interactive use will be made available on a time scale of June 1982. This system, called CMS (conversational monitor system), is an IBM supplied system and is in use at a number of similar facilities.

Second, the image processing package "AIPS" is being brought up on the IBM system. The system will not make use of either an array processor or a gray scale display. The control terminal will be a Tektronix graphics terminal which will also serve as the output device. The system is directed towards dial-in use either for processing not requiring map output or for complete processing in cases where simple contour maps serve as an adequate output. Testing should begin shortly. The program should be available for general use in the next few months.

Bob Burns

POST-PROCESSING OF VLA DATA

This is a reminder that the NRAO is supporting a data reduction trip, if necessary, to complete VLA data analysis. This trip is in addition to that for the actual observations and initial data reductions at the VLA site.

To apply for a data reduction trip, please telephone Ed Fomalont at NRAO, Charlottesville (804-296-0262 or FTS 938-1271 extension 262), who will discuss with you the alternatives for the most effective way to complete the data reductions. If such reduction includes mostly post-processing on the AIPS system, observers will be encouraged to come to Charlottesville where the computer pressure is not as severe as at the VLA.

The rules governing the reduction trips are:

1. One or two persons may apply for a trip of up to 10 days for each VLA scheduled program.
2. Three-quarters (75%) of the airfare will be paid by NRAO.
3. Motel and housing costs (only in Charlottesville) will be paid, up to \$20 a day per person.
4. Support for observers from outside the continental USA, or those working for national centers or the U.S. Government cannot be supported by NRAO.
5. Even if NRAO is not supporting the reduction trip, you should contact Ed Fomalont in order to best schedule your reduction visit for maximum efficiency.

Ed Fomalont

PAGE CHARGE PAYMENTS FOR VISITORS

The Observatory will pay one-half of the page charges for visitor publications when a significant portion of the work was done, or the observational material taken, at the NRAO. The NRAO does not distribute reprints or preprints, but does request the privilege of including visitor publications in its preprint listings.

The specific procedure to be followed is:

1. At the time of submission, please send three prepublication copies of the paper to Ms. Sarah Stevens-Rayburn, Librarian, Charlottesville, indicating journal to which paper has been submitted. One copy is for the Director's Office; two copies for the libraries. The Observatory does not desire to referee visitors' publications prior to submittal.

2. The author should include a footnote where the Observatory is first mentioned in the paper or according to journal format which reads:

"The National Radio Astronomy Observatory is operated by
Associated Universities, Inc., under contract with the
National Science Foundation".

3. At the time of acceptance for publication, please notify the Librarian in Charlottesville of proposed date of publication and apportionment of page charges, so that necessary purchase orders can be initiated.

4. All other scientific and administrative communications should be kept between the authors and the journals.

Failure to comply with the above procedure will result in nonpayment of page charges by the NRAO.

Sarah Stevens-Rayburn

VLA

VLA PROPOSAL DEADLINES

If you are planning to submit a proposal for a specific VLA configuration, do not be reluctant to send it to the Director early in spite of the fact that the appropriate configuration may not be scheduled for several quarters in the future. Proposals which are submitted well in advance have the distinct advantage of passing through the review process in a timely fashion. Not only do the proposers get a chance to respond to adverse referee comments, but the NRAO receives an indication of which configurations will be in demand and can plan accordingly in scheduling future configuration changes.

R. J. Havlen

A SUMMARY OF THE VLA POINTING PROBLEM

The VLA antenna pointing specification calls for 15 arcsecond accuracy in wind up to 18 mph with temperature differences in the antenna structure up to 5 degrees Fahrenheit. Periodic pointing tests show that this specification is being met for all antennas. However, temperature measurements made at various structural points over the past eight months show that the temperature criterion in the pointing specification is unrealistic. The data show regular daily differences of 5 degrees Centigrade (9 degrees Fahrenheit) with peaks up to 8 degrees Centigrade. Pointing errors caused by the resulting thermal deformation are typically 25 arcseconds with excursions up to 50 arcseconds.

Foam insulation of the pedestal tubes and yoke is currently being evaluated as a means of improving daytime pointing accuracy. One-inch thick polyurethane foam insulation (covered with sheet aluminum) has been installed on Antenna 22. This antenna and a control antenna (Antenna 6) have been instrumented with temperature sensors and precision tiltmeters (1 arcsecond accuracy) to study thermal deformation and insulation performance. The tube insulation has proven to be effective. Maximum observed temperature differences among the tubes in the insulated antenna were 2 degrees Centigrade with corresponding thermally induced tilt maxima of 10 arcseconds for the pedestal. Yoke insulation has virtually eliminated thermal deformation of the vertical "tines". However, significant thermal differences (>3 degrees Centigrade) have been observed to develop between the broad faces at the yoke base in spite of the insulation. Preliminary tests seem to indicate that this is caused by conduction when sunshine is falling on the large platform attached to the back face of the yoke. Should this prove to be the case, it is planned that an insulated shade be installed on the platform to reduce the effect. The final configuration of the insulation should be established by late spring. Insulation will be installed on each antenna as it goes through its overhaul period.

Tiltmeter data have shown that significant tilt errors occur in winds over 20 mph with an approximate coefficient of 1 arcsecond per mph. Since VLA winds in the 20-40 mph range occur a significant fraction of the time (particularly in the spring), it is important to attempt to compensate for wind-induced pointing errors. Current plans call for using tiltmeters to measure tilt errors in real time and applying on-line corrections. It will probably require about a year of design study and testing before the feasibility of this concept can be determined.

R. T. Newell

THE VLA WORKSHOP ON SYNTHESIS MAPPING

The school/workshop on synthesis mapping will be held in Socorro on June 21-25, 1982. There will be four days of lectures by NRAO staff members and one day (June 23) for a visit to the site with group demonstrations of the use of the VLA software. A mailing giving further details and including a registration form will be sent out about the end of February. It will be sent to everyone who returned our earlier questionnaire or who has requested to be included on the mailing list.

R. Sramek and A. R. Thompson

SCIENCE ON THE VLA

The following is a rough breakdown of the type of science that has been proposed for the VLA during two periods since it first became a research tool.

Science Category	Interval	
	Prior to 1981 (~4 years)	During 1981
Sun	5.0%	2.9%
Planets and Comets	2.5	2.0
Σ Solar System	8%	5%
Pulsars	1.4%	0.2%
X-ray Sources (binaries)	2.5	2.4
Planetary Nebulae	1.9	2.2
Mass Loss and Circumstellar Shells	2.9	2.7
Supernova Remnants	3.8	7.7
Novae and Supernovae	0.8	0.7
Astrometry and Geodesy	2.6	0.7
Other Stellar	3.9	4.6
Stellar Masers (late type stars)	1.1	1.7
Σ Stellar	21%	23%
Galactic Structure	0.8%	1.0%
Galactic Center	2.6	2.2
Dark Clouds - Molecular Clouds	0.7	1.5
HII Regions	2.5	1.9
Compact HII/Maser/Star Formation	6.7	6.5
Molecular Searches and Studies	1.8	1.5
Σ Galactic	15%	15%
Normal Galaxies	8.3%	9.4%
Active and X-ray Galaxies	6.4	5.8
Radio Galaxies and Sources	21.6	16.6
VLBI Studies of Radio Sources	-	5.1
Source Surveys and Variability Monitoring	5.6	5.8
Groups and Clusters of Galaxies	4.1	3.1
Quasars/BL Lac Objects/Compact Optical Objects	9.9	10.1
Σ Extragalactic	56%	57%

Σ No. of Proposals Submitted 720 415

R. J. Havlen

VLA SPECTRAL LINE SYSTEM

Since mid-November 1981 a new on-line system has been in use for VLA spectral line observations. The most important changes of interest to the user are:

1. Instead of only being able to use half the correlator, one now has the choice between full, half, or quarter correlator. As a consequence, the factors of 4 in frequency resolution steps are reduced to factors of 2. The nomenclature of observing modes has changed. The old modes 1A and 1C are now 2A and 2C. The new modes are 1A, 1C, 4, and 4A. Left circular polarization (IF C) is not available in quarter correlator mode.

The quarter correlator produces up to 128 channels, the half correlator up to 256, and the full correlator up to 512 channels. The maximum number of channels per baseline that can be preserved remains 256, however. The limitation on the number of frequency channels times the number of baselines (5120) remains the same.

In a number of cases one has the choice between two different total bandwidths for the same frequency resolution.

2. Narrower bandwidths are supported. Combined with the changes outlined under 1, this means that all frequency resolutions, in steps of factors of 2, are available from 0.4 to 6250 kHz.

3. U-band data are now being corrected such that frequency increases with channel number, as was already the case for the other bands.

4. An added feature is "band pass normalization". When this is switched on the correlated spectra are divided by the square root of the product of the (single dish) autocorrelation spectra for the two antennae involved. The result is a very flat bandpass (to a level of about 1%) for total bandwidths less than 12.5 MHz. In many cases this eliminates the need for a bandpass calibration. It should NOT be used, however, when strong line signals are expected in the single dish profiles (Galactic HI, H₂O masers, HI absorption on strong, small sources, etc.). Be aware that only the amplitude is being corrected, since the autocorrelation spectra, by their very nature, do not contain any phase information.

Arnold Rots

VLA COMPUTER TAPES

The number of computer tapes now being purchased for VLA use is reaching staggering proportions. We anticipate having to purchase between 4000 and 5000 tapes for the current year alone. At \$15 per tape, this amounts to a substantial yearly operating cost for magnetic tapes. We are currently searching for ways to make more efficient use of tapes by recycling more of them. To achieve this goal, we request that all VLA observers:

- (a) return to the VLA for recycling as many of the VLA and export tapes as possible,
- (b) use VLA tapes for storage only when absolutely necessary, and
- (c) put as much data on one tape as possible.

Although the number of tapes utilized by any one observer for any one observing run is small, the total number of tapes used is large with about one-third of all the VLA tapes leaving the VLA site. If it is not possible to achieve a more efficient use of tapes through a voluntary means, we may have to consider charging for all VLA tapes which leave the site.

36-Foot

THE 12-m TELESCOPE

The work on the 12-m telescope that will replace the old 36-ft telescope on Kitt Peak is going well. The backup structure is being built by Central Fabricators, Inc., in Lynchburg, Virginia, and is expected to be delivered in Green Bank in April. The surface panels made by ESSCO are complete and are now being shipped to Green Bank. The panels look very good, with an average rms surface error of about 30 μm . The error budget in our plans assumed 40 μm , so we are happy.

The surface measurement system with its reference jig and template is looking good. Test assembly, adjustment and test measurements of the surface will be done in the Green Bank warehouse this spring, and if it looks good, as we believe it will, the reflector will be disassembled, shipped to Tucson and put back together again on the old 36-ft mount this fall. The first serious observing with the new reflector is planned for early January, 1983.

Right now we feel very happy with the progress. However, only after the test assembly and adjustments in Green Bank can we safely predict the final telescope performance. So until then, we keep our fingers crossed and hope.

In the meantime, observations with the current 36-ft telescope will continue through the end of the second quarter. Scientific programs requiring telescope time after July 15 will not be accepted. Summer shutdown and resurfacing will occupy most of the third and fourth quarters of the year.

Hein Hvatum

Green Bank

RESIDENCE HALL RENTAL RATES

The Observatory is required to establish rental rates for government owned housing and to make periodic adjustments to those rates in accordance with Office of Management and Budget guidelines. A recent survey has resulted in the necessity to increase room rates at the Green Bank Residence Hall. The following rates will become effective 1 May 1982.

	<u>Present Rate</u>	<u>New Rate, May 1, 1982</u>
Room, single occupancy	\$ 7.30	\$10.00
Room, double occupancy	\$ 9.20	\$12.00
Apartment	\$11.90	\$17.00

R. K. Moore

DIGITAL CONTINUUM RECEIVER

The digital continuum backend is now available for regular observing at the 300-foot and 140-foot telescopes. It was successfully used for two nutating subreflector programs on the 140-foot in December.

The DCR is an HP9825A calculator-based, post-detection, digital integrator which can perform a variety of synchronous demodulation functions in the calculator arithmetic. Slow switch rates such as those associated with the nutating subreflector are better treated with digital integration than with the old analog system. As many as four channels with switch rates up to 500 Hz and integration times as short as 0.1 to 0.4 seconds can be handled with the DCR. The minimum integration time depends on the number of channels and the complexity of the synchronous demodulation and auxiliary monitor functions.

Calculator programs will be available for standard synchronous detection and noise adding and total power radiometry. Continuous gain calibration is an option with synchronous detection, and monitor functions including gain, system temperature, and a running rms output fluctuation value can be displayed on the calculator or on any of eight chart recorder channels.

At this time only one DCR has been built and must be shared between the two telescopes. A second unit will probably be constructed this year, and if the integration times are too slow for some observing programs with this system, an HP9826 calculator could be substituted for the 9825A.

J. R. Fisher

INFORMATION ON 140-FOOT AND 300-FOOT TELESCOPES

Recent memoranda on performance and calibration of the 140-foot and 300-foot available from the Engineering Division in Green Bank, extension 201, are as follows:

- No. 137 High-Frequency Performance of the 140-foot Telescope. III. Observations of 3C 345 at 10650 MHz, Patrick C. Crane.
- No. 139 The Performance of the 300-Foot Telescope at 1400 and 4760 MHz, Patrick C. Crane.
- No. 142 Declination Pointing of the 300-Foot Telescope, Patrick C. Crane.
- No. 143 6-cm Pointing of the 300-Foot Telescope December 1979 to August 1981, Patrick C. Crane.
- No. 144 Pointing Calibration of the New Traveling Feed on the 300-Foot Telescope, Patrick C. Crane.
- No. 145 Calibration of the Sterling Mount on the 300-Foot Telescope at 1400 MHz, Patrick C. Crane.
- No. 146 Gain Calibration of the 140-Foot Telescope at 10650 MHz - December 1980, Patrick C. Crane.
- No. 147 Calibration of the 140-Foot Telescope at 3245 MHz, 4990 MHz, and 10500 MHz, Patrick C. Crane.

G. M. Peery



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