



NRAO NEWSLETTER

1981 September 1

No. 2

VLA

COMPUTER CHANGES AT THE VLA SITE IN 1981

The VAX-based post-processing system has been operating at the site since the beginning of this year and is already heavily scheduled in some periods.

High-density (6250 bpi) tape units have now been added to the PDP/11's and the VAX post-processing system. Between May and August this summer, the DEC-10 KI was upgraded to a DEC-10 KL processor. This will increase the number of computer cycles available in the DEC-10 by a factor between 2.5 and 3. At the same time we replaced NRAO's HARVEY communication network by DEC's DECNET system and changed to a new structure and job scheduling system on the PDP 11/70's. The DEC-10 KI was removed during the week of July 27.

A VAX computer has also been purchased as part of this upgrade and will be added to the network towards the end of this year. Also, later in 1981, the PDP 11/70's plus AP's and transpose memory ("the pipeline") will be completed. This will give a very large increased capacity for continuum reduction and mass storage. Sometime in 1982 line software will be implemented for this system.

R. D. Ekers

VLA SOFTWARE ERRORS

Since at least November 1979, and possibly before, the 2 cm sky frequency has been incorrectly calculated. The baseband center frequency has been added to, rather than subtracted from, the signed sum of local oscillators. Net apparent effect: the scale of 2 cm maps is wrong by a factor of 1.003 at 50 MHz bandwidth; smaller bandwidths have factors correspondingly closer to unity. The effect has not yet been corrected, but probably will be in late August 1981.

Before June 24, 1981, the on-line calculation for sources moving in RA-Dec was improperly done. The correction for motion within a 10-seconds integration interval was applied in the wrong direction. The net effect is that maps of planets or satellites will be displaced by 10 seconds motion and smeared in the direction of motion by convolution with a box of width equal to 20 seconds motion.

Barry Clark

FACELIFT FOR VLA PROPOSALS

A standard cover sheet is now available for use with all new VLA proposals. Proposers are asked to summarize critical observing requirements, logistic information, and a brief science abstract in the standard format of the cover sheet so as to expedite processing of the rapidly increasing number of VLA proposals now passing through the scheduling process. Forms will be mailed to all previous VLA users, but may also be obtained from the VLA or Charlottesville offices.

R. J. Havlen

THE VLA REMOTE OBSERVING AND REDUCTION PROGRAM

A trial program of remote observing and calibration has now been inaugurated at the VLA. The goals of this program are to save NRAO the expense of transporting observers to the VLA, the observers the time and trouble in making the journey, and the computers the extra load of data reduction (assuming that specially trained data reducers are more efficient than less-trained scientists).

Currently, this program will set up the OBSERV file, edit and calibrate the data, back-up the calibrated data, and write an EXPORT tape if requested. The observer will receive, in addition to the export tape, the database history file, plus all relevant output pertaining to the calibration process. The observer need not go to the VLA. The program is presently limited to continuum observations, preferably fairly simple types. No maps will be made, except in the case of detection programs. Interested observers should contact Rick Perley, who currently directs the program, with the actual work being done by the operators.

Rick Perley

NEW TRAVEL PROGRAM FOR VLA DATA REDUCTION

The NRAO is initiating an experimental program to support VLA observers who desire to reduce VLA data during times not directly connected to their original observing run. The program will be equally applicable to the NRAO computing facilities in Charlottesville or at the VLA site. Similar computing capability for processing VLA export tapes exists at both locations, but in view of the heavy usage of the VLA facility, observers are strongly encouraged to use the Charlottesville computer for subsequent reductions.

All of the general rules that apply to reimbursement for observing travel will also apply to this new program with the addition of the following specific guidelines:

- NRAO will reimburse the user's institution for all airfare in excess of a 25 percent deductible.
- Each scientific proposal carried out with the VLA will be entitled to support for one processing visit for two scientists.
- At the VLA, scientists are responsible for room and board charges; the same applies in Charlottesville, but a \$20/day per person allowance is available for a maximum of up to 10 days, reflecting the increased room costs there.
- Ed Fomalont in Charlottesville (804 296-0262) will coordinate the scheduling of both facilities and should be contacted to arrange for scheduling; however, processing time at the VLA site will be more limited than in Charlottesville.

It is strongly recommended that scientists wishing to participate in this program make scheduling arrangements and travel plans at least one month in advance in order to ensure the availability of the computing facilities and to minimize the travel costs. This program, which will be subject to review at a later date, becomes effective on August 15, 1981.

R. J. Havlen

VLA USER INFORMATION DOCUMENTATION

The main sources of written information for VLA observing and data reduction are found in the following manuals located in the observers' rooms at the VLA site and in the Socorro office. Requests for parts or all of these documents should be made to Carl Bignell; when the observer is at the site, instructions for obtaining copies can be found in each of the manuals.

The Introduction to the NRAO Very Large Array (Green Book) has general introductory information on the VLA. Topics include theory of interferometry, hardware descriptions, observing preparation, data reduction, map making and display. The book is currently under revision. Many details about applications programs are out of date in the present edition.

The Observers' Reference Manual contains all the information on individual computer programs and utilities run from the DEC-10. IMPS features and the most current information on the DEC/PDP 11 computer communication are also included.

The Cookbook contains some recipes on the initial data reductions of continuum, polarization, spectral line, VLBI and solar observations. In addition, some observing strategies (for polarization, VLBI, spectral line and solar) and information on observing preparation are included.

The VLA Calibrator Book contains the list of VLA calibrators.

The UV Coverage Book contains the UV coverage at about a dozen declinations for all configurations (this does not apply to inner stations in D array). The coverages for long and short intervals are included.

IMPS: a description of the IMPS software can be found in the Observers' Reference Manual.

Post-Processing System: The AIPS Manual, Volume 1, describes the post-processing features available on the VAX computer in the Library Office Building. There also exists a "COOKBOOK" description for first-time users (see A. Bridle).

Observational Status Report: Upon arrival at the VLA site, the observer receives some information with his room key, which includes:

- general information on cafeteria hours, VLA transportation, VSQ checkout rules, telephone calls, laundry;
- a list of available user documentation;
- recent developments which affect observing, data reduction, mapping, and map display;
- problems and limitations in the software; and
- an observers' questionnaire.

Carl Bignell

1.3 CM MASER PREAMPLIFIER

A 1.3 cm wavelength maser receiver is being installed on antenna 09 as a preamplifier ahead of the standard cooled mixer receiver. This is a dual-channel amplifier so that both polarizations should have system temperatures below 100° at K band on this antenna. The improved sensitivity should benefit VLBI experiments or spectral line experiments that use small numbers of antennas. The maser should be operational on 1 September 1981.

P. Napier

AUTOCORRELATION MODE

Tests have shown that the "autocorrelation mode" is a useful observing technique for some types of spectral line observations. In this mode, the IF's from many antennas are added together at the output of the digital delay lines to form an analog sum. The autocorrelation of this analog sum is then obtained by feeding it into the correlator system in place of antenna IF's. An alternative observing method is to cross-correlate the analog sum obtained from separate arms of the array. This observing mode will be considered for "non-computer intensive" time on the VLA.

P. Napier

Green Bank

21 CM AND 18 CM FRONT-END IMPROVEMENTS

The 21 cm and 18 cm dual-channel cryogenic front-ends originally built in the early 1970s are now undergoing extensive modifications to improve their sensitivity, bandwidth, stability, reliability, versatility, and ease of maintenance. These expected improvements reflect the recent advancements made in the development of cryogenically-cooled gallium-arsenide field-effect transistor amplifiers (GaAsFET amplifiers).

Some of the changes and features of the modified systems are:

- GaAsFET amplifiers will replace the existing parametric amplifiers, resulting in improved gain stability, and the elimination of refrigerator gain modulation inherent in paramps. It will also increase the system frequency range and instantaneous bandwidth, and improve the system noise temperature and overall sensitivity.
- Selection of either linear or circular polarization is available via a switch on the control panel. This is accomplished with a 90° hybrid, remotely adjustable phase shifter, and transfer switches. In the circular polarization mode, adjustments from the control room can be made to optimize the circular polarization ratio in the frequency range of interest.
- Either a common or separate LO for each receiver channel may be used. The choice is dictated by a cable change within the front-end box.
- A choice of either a high cal (approximately 500 K) or a low cal (approximately 4 K) is available.

SPECIFICATION TABLE

Receiver	Frequency Range (MHz)	Instantaneous Bandwidth (MHz)	System Noise Temperature (°K)
21 cm before modification	1375 - 1435	20	50 - 60
21 cm after modification	1200 - 1500	300	40 - 50*
18 cm before modification	1610 - 1720	30	60
18 cm after modification	1610 - 1750	140	50*

*Estimated.

George Behrens

140-FOOT CONTINUUM CALIBRATION ERROR

A problem of long standing in the 140-foot continuum calibration routine CDCL has been resolved. The problem was responsible for producing bad noise-tube calcs in 5-10% of CDCL cal scans.

M. Damashek

THE NEW 300-FOOT TRAVELING FEED SYSTEM

A new traveling feed system for use at frequencies below 1000 MHz is operational on the 300-foot telescope. It will accommodate existing low frequency front-ends in the same general fashion as the old system and has the added feature of handling a cryogenically cooled front-end over a limited portion of the total travel.

The total travel span of 700 cm results in $\pm 34^m 45^s$ of hour angle tracking at the equator for non-cryogenically cooled front-ends.

For cooled front-ends, the travel span of ± 335 cm results in $\pm 16^m 49^s$ of hour angle tracking for center located feeds. However, the only existing cooled front-end for this system has two feeds, each of which is offset 86.4 cm from center. The resultant hour angle capability is $-21^m 09^s$ to $+12^m 29^s$ for frequencies from 700-1000 MHz and $-12^m 29^s$ to $+21^m 09^s$ for frequencies from 350-410 MHz. In all the above cases, a beam deviation factor of 0.850 has been assumed.

The slew speed or return to start rate is 239 cm/min.

As always, for this type of system, one should be aware of gain reduction, sidelobe enhancement, and possible depolarization effects at large off-axis angles.

Other performance data will be available in the future. Potential users should contact Pat Crane for performance characteristics, Jim Coe for cooled receiver information, and Bob Vance for computer software information.

Fred Crews

USER MANUALS

The present manuals used for observing and data reduction at the single dish telescopes in Green Bank are being updated. The new editions will reflect equipment and software changes. The manuals under revision are:

- | | |
|--|---------------------------------|
| - 140-foot Computer Assisted Observing | (revised version available now) |
| - 300-foot Observer's Manual | (available mid-September) |
| - On-Site Spectral Line Reduction | (available mid-September) |

Bobby D. Vance

JANSKY LAB PANDORA TERMINALS

Two Pandora terminals are located in Room 211 of the Jansky Lab. These are identical to terminals found in Charlottesville. Information pertaining to use can be found in the manual titled Pandora Guide by the NRAO Computer Division.

Bobby D. Vance

GREEN BANK EMI SURVEYS

Recent surveys of potential interfering signals were made at Green Bank in the 1000 to 2000 MHz range. The 1000 to 1500 MHz range was surveyed from 27 March to 7 April 1981. The 1500 to 2000 MHz range was surveyed from 21 to 24 April. Numerous strong signals were recorded. A few appeared occasionally in the HI and OH radio astronomy bands. Very strong TACAN/VORTAC signals were continuous in the 1030 to 1150 MHz range. FAA radar was continuously very strong at 1275 and 1285 MHz. Interested persons may get copies of the Green Bank EMI survey memos dated April 16 and May 22 by calling or writing Bill Brundage or Carolyn Dunkle in Green Bank.

W. D. Brundage

IF YOU HAVE SPARE TIME

Observers interested in visiting points of interest, natural areas, historic spots, national parks, national forests, state parks, state forests, fairs, festivals, and events in the general area of the Observatory, will find The Potomac Highlands of West Virginia brochure a handy and informative guide. The brochure is available from Becky Warner, Room 112, First Floor, Jansky Lab.

Wally Oref

EXPENSES AT GREEN BANK

The Cafeteria operates on a cash basis except for intra NRAO site visitors. Prices are nominal. Payment for lodging expenses should be made, if at all possible, prior to departure with the secretary in the Business Office, Room 112, Jansky Lab, between the hours of 8:00 A.M. and 4:30 P.M. Monday through Friday. We are trying to reduce administrative expenses. Paying your bill before departure will help us.

R. K. Moore

36-Foot

THE NEW 200-235 GHz RECEIVER

The new 200-235 GHz cooled mixer receiver has been tested at the telescope. The receiver has a noise temperature of 800 K S.S.B., and we measure an aperture efficiency of 5.5% and a beam efficiency of 40%.

John M. Payne

FAST BEAM SWITCHES

A fast beam switcher, designed for use in continuum observations, has been tested. It may be used at any wavelength, and we measure an increase in the sensitivity of our 3 mm receiver of a factor of two. The sensitivity is now 1.3 Jy in one second of integration and we should be able to increase the sensitivity to 1 Jy by increasing the I.F. bandwidth to 1 GHz.

John M. Payne

BOLOMETER RECEIVER UPDATE

Work on increasing the sensitivity of the bolometer system has continued. Our previous telescope tests had indicated that with the efficient bandpass filters we use, the bolometer sensitivity could be increased by weaker thermal coupling to the 0.3 K station. The group at Queen Mary College has recently produced a bolometer that has a factor of five increase in sensitivity. Use of the fast beam switcher should increase the sensitivity by a further factor of 1.7, giving a sensitivity at $\lambda = 1.2$ mm of 3.5 Jy in one second and 2 Jy in one second at $\lambda = 2$ mm. Telescope tests were scheduled in August to verify these sensitivities.

John M. Payne

SUMMER SHUTDOWN PLANS

This summer, again, a large number of projects have been scheduled for the 36-foot telescope.

A new large-capacity (10 kVA) Uninterruptible Power Supply is being installed. This unit can protect all electronics and all computers from the wild power fluctuations characteristic of Kitt Peak.

The drive system and truss of the dome door will be taken out for reworking.

A new switching system for the telescope drive system will be installed.

The separate room for the analysis computer will be completed. The FORTH program will be changed to accommodate spectral mapping without the need for myriad of cards.

Many other tests, changes, and repairs will also be made, including

- repair of filter banks and installation in new rack for better cooling
- modifications to the IF system
- installation of a new motor generator switching network
- installation of 3 mm doubler and new L0 plate in 3 mm receiver
- installation of a new sunscreen
- installation of a new encoder electronics package
- tests of new drive servo hardware and software.

Mark Gordon

MEAL AND LODGING CHARGES

Meal and lodging charges have changed for users of the 36-foot telescope:

Lodging	\$4.20	Lunch	\$3.50	Night Lunch	\$3.50
Breakfast	\$3.00	Dinner	\$5.50		

Please pay for these services at our Forbes offices before leaving.

Mark Gordon

VLBI

VLBI SUPPORT AT THE VLA

The VLBI MkIII Recording System arrived in May and is ready for use. Other VLBI equipment available for use is a MkII cassette recording system and a hydrogen maser clock on loan from SAO. The phased outputs from any number of antennas can be added together at the output of the digital delay lines.

P. Napier

In General

TRAVEL SUPPORT TO UNIQUE FOREIGN TELESCOPES

Since October 1, 1980 the NRAO has administered NSF travel funds for U.S.-based radio astronomers observing at large, unique foreign radio telescopes. Only round-trip airfare of the Principal Investigator is reimbursible, and only if the presence of the PI is essential for the success of the research program. During the first seven months of the program, there have been seven successful applications for these funds. Let us know if you want further information about the program. The amount of the funds available for future years will depend on this year's response. A similar program involving unique foreign optical and infrared telescopes is administered by KPNO.

R. J. Havlen

HITHER, THITHER, AND YON

For those of you who have not yet heard, the NRAO travel deductible policy has recently been modified with the dual purpose of simultaneously bringing it up-to-date in these inflationary times and encouraging the use of discount fares. Any observer whose airfare is \$300 or less is now responsible for \$150 of the expense. For airfare above \$300, the observer is, in addition, responsible for 25% of the excess. This same formula has also been adopted by Kitt Peak National Observatory, and, although not perfect, it is the best compromise solution that we have been able to come up with.

A number of NRAO users have been quick to point out that the new policy places a premium on distance, in apparent conflict with the original intent of deductible policy when it was first established in the 1960s to equalize transportation costs for observers nationwide. Although true in principle, in practice the current wildly competitive airfare structures make many long distance routes more economical than many short hauls. The policy now encourages you to seek out these good deals, and in the process we all save money. Exceptions will be made if a discount fare booking is made impossible by delayed notification of your successful proposal.

R. J. Havlen

THE NRAO SUMMER STUDENT PROGRAM

As in years past, the arrival of summer brought several bright young minds to the various NRAO sites. The NRAO summer students spend ten to twelve weeks with us, working together with one or more staff members on projects of mutual interest. They are third or fourth year undergraduates, or first year graduate students, selected from a large pool of qualified applicants by the NRAO staff. They leave the program with some practical knowledge of radio astronomy, familiarity with the facilities and capabilities of the NRAO, and increased exposure to the world of scientific research. A series of lectures on topics in astronomy is given the students by members of the NRAO staff at the various sites. This summer we had 14 students based in Charlottesville, one in Green Bank, and six at the VLA.

Announcements for the 1982 program will be sent out in November 1981, and applications will be due by February 1, 1982. If your college or university is not on our mailing list for summer student program announcements, please let me know.

Galen Gisler

NRAO USERS' WORKSHOPS

Since the fall of 1979, four informal workshops have been organized and scheduled in conjunction with the semi-annual Users' Committee meetings. The primary rationale for these workshops has been to take advantage of the regular assemblies of NRAO users in order to discuss in detail specific topics of mutual interest and concern. Depending on the topics involved, scientists not on the Users' Committee have also been invited to participate. To date, the following workshops have been held:

- The Sensitivity and Overall Performance of the 140-foot Telescope
- Millimeter Spectral Line Calibration
- 36-foot Telescope Continuum System
- VLA Spectral Line System

Although the workshops have so far been exclusively technique and instrument oriented, no precedence for future gatherings was intended. Both NRAO and non-NRAO scientists have organized past workshops, and we hope that future meetings will receive as much enthusiastic response as their forerunners have.

Currently, no topics are under consideration for upcoming workshops, but we welcome suggestions from all members of the NRAO user community. Please contact me if you wish to take advantage of this rare opportunity to raise issues of a general nature to an audience especially familiar with the NRAO facilities.

R. J. Havlen

PREPRINT LISTING SERVICE

Although the NRAO does not have a regular preprint distribution, the Library does prepare an informal, biweekly listing of all preprints received, known as the RAPsheet (RAP=radio astronomy preprint). In addition, there are occasional unRAPsheets, which list previously announced preprints with complete publication information. Those interested in receiving these listings should contact the NRAO Librarian in Charlottesville. In exchange for the lists, we request that one copy of each radio astronomy paper you write be sent to the NRAO Library in Charlottesville.

Sarah Martin

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