NRAO NEWSLETTER

1 April 1992 No. 51

GREEN BANK

GREEN BANK TELESCOPE CONSTRUCTION

After an absence of almost three months, the field engineer from the prime contractor, Radiation Systems, Inc. (RSI), returned to Green Bank on April 6, 1992. The subcontractor for the foundation, Vecellio and Grogan, is due to arrive April 13. First task is to install the three remaining concrete grade beams (one is in place) between the foundation for the pintle bearing and that for the azimuth track.

Once the GBT's foundation is completed, work on a foundation for a derrick tower and for an assembly pad can begin. At the same time, the azimuth rail can be installed atop its foundation. Alignment and leveling of the rail to NRAO's specification will be demanding processes. Grout beneath the rail must be hand-packed.

Although the contractor's work in Green Bank has had an intermission, work has proceeded elsewhere. The steel box beams that will be used in construction of the alidade have been fabricated at an RSI subsidiary's plant in Mexia, Texas. The alidade itself will be assembled at Mexia, then disassembled into units capable of being shipped to Green Bank.

The actuators for moving the primary mirror's panels and the transducers for reading their positions are being assembled into units at Industrial Devices Corporation (IDC). Meanwhile, electronics to control these surface adjusters is under construction at Transition Technologies, Inc. (TTI).

NRAO work has accelerated and changed from design to implementation. A pair of receivers is under construction, one (680-920 MHz) for the prime focus and the other (18-26 GHz) for the turret at the secondary focus. Prototype feeds have been constructed and tested. The correlator for holography measurements is nearing completion. A synthesizer has been purchased to constitute the heart of the local oscillator system.

Four test panels with nine actuators and retroreflectors are being constructed for placement in the field as a real test of the surface adjustment concept. Software for controlling the actuators has been developed. Three laser rangers are being tested in the field. These constitute the surveying instrument that should determine the distance from a reference plane defined by the three lasers to any of several retroreflectors.

An autocollimator, which will help hold the alidade stable to the height of the elevation axis, has yielded encouraging results. Provided the light beams pass through well insulated pipe in which the air is sealed and quiescent, collimation to < 1 arcsecond can be achieved over a path of about 50 meters.

The design of the GBT's monitor and control system has advanced significantly. User requirements have been specified and, based upon them, seven modules have been proposed, one each for the antenna, its electronics, monitoring, controlling, data acquisition, engineering access, and user interface. Models for the first four modules are nearly complete, lacking mainly mechanisms for error analysis and security. The data acquisition and engineering access modules are actively being developed, and the user interface module is in the discussion stage. As the models near completion, they, with their documentation, can serve as vehicles for detailed input from all potential GBT users.

G. A. SEIELSTAD

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NEW JOINT OPERATIONS CENTER

Debra Riddle, project engineer for the new Center, from the Atlantic Division of the Naval Facilities Engineering Command (LANTDIV), has informed NRAO that the architecture engineering firm will be Forrest Coile Associates from Newport News, Virginia. Coile's project manager is Kenneth W. Cogan. On March 18, 1992, seven representatives of Coile Associates and Debra Riddle met in Green Bank with representatives from the Naval Observatory, NRAO, and NSF. Design requirements were discussed for a full day. The Operations Center will be adjoined to the Jansky Lab, with its long axis perpendicular to the line of sight to the Green Bank Telescope. A separate clock building will be built into the hillside approximately south of the new Operations Center. It will be accompanied by a building for backup diesel power generators. Both buildings will be rfi shielded. The Operations Center will include a control room for the GBT with an adjacent GBT equipment room; control and equipment rooms for the other Green Bank activities--antennas operated for the Naval Observatory, the Orbiting VLBI communications station, and the 140 Foot Telescope; offices for resident staff, visitors, and telescope users, an auditorium, and an indoor antenna test range.

G. A SEIELSTAD

GBT MONITOR AND CONTROL REQUIREMENTS ANALYSIS

Analysis of the user requirements for the GBT monitor and control software is progressing. This exercise consists of a rigorous restatement of the needs and requests of users in a form that both satisfies the user's concerns and provides a precise description that can be carried over into design. This restatement results in three types of system models which describe what the system will do, rather than how it will be implemented. The object model abstracts the static structures of the system and their relationships. The dynamic model consists of state transition diagrams, much like the more traditional flow diagrams. The functional model describes data transformations in terms of data flow diagrams.

Our analysis has resulted in the definition of seven modules, each of which is described by the above models. Definition of the modules describing the antenna, electronics, monitoring, and control are currently being reviewed and iterated. A prototype system is currently being implemented for a new receiver. Development of the models for data acquisition and engineering access is just being started, while the user-interface module is at the discussion stage.

The sources of information for defining user requirements have been NRAO staff members for engineering needs, Green Bank telescope operations personnel for operator needs, and the document on "Observer Monitor and Control Requirements" by J. R. Fisher and F. J. Lockman for observer needs.

This exercise in model building has driven us to generate detailed questions whose answers, later in the development cycle, should contribute toward avoiding surprises, both for the designers and the users. It is anticipated, and welcomed, that as the models and their documentation near completion, they can serve as vehicles for encouraging detailed input from all interested parties.

M. H. CLARK

GREEN BANK UPGRADES INTERNET CONNECTION

In mid-February, the Green Bank site upgraded its connection to the Internet. Our connection to the rest of the world is now a 56 kilobits/second line to West Virginia University in Morgantown, replacing the old Proteon box and 19.2 kilobits/second line to Charlottesville. This upgrade has greatly improved the speed of communications for remote observing or for logging in to work on one's account after returning home from an observing run.

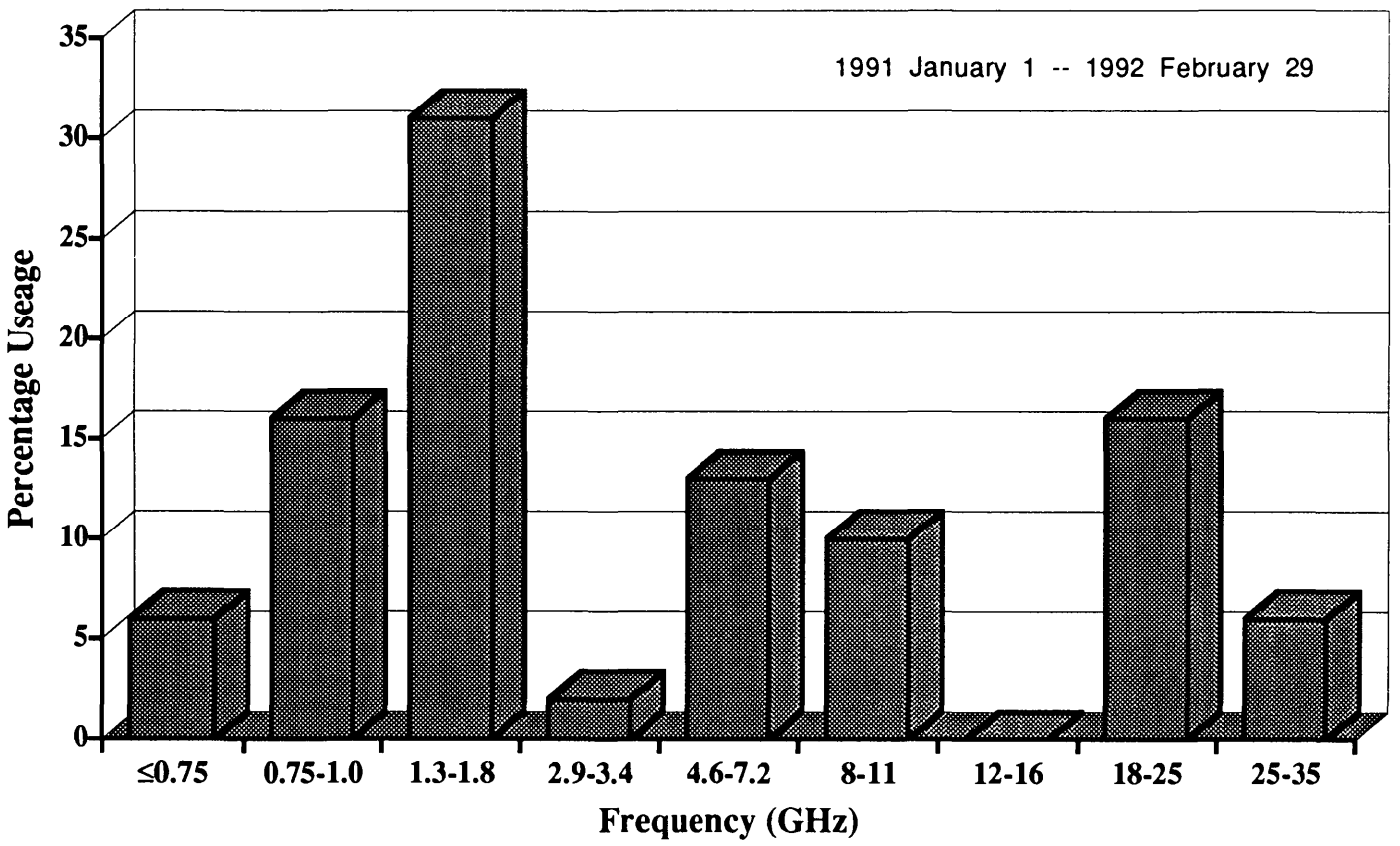
N. D. MADDALENA

STATISTICS OF 140 FOOT TELESCOPE USE

The graph summarizes use of the 140 Foot Telescope by frequency band. The bands are those of the available receivers. Statistics were compiled between January 1, 1991 and February 29, 1992. All experiments, including Network VLBI, are summarized. The receiver most in demand over this period is the L-band one, covering 1.3-1.8 GHz. Heaviest demand on it is for observations of neutral hydrogen in external galaxies and for pulsar research. The contribution of the latter research is approximately the same as for the 0.75-1.0 GHz band.

The only surprise is the fact that no observations were made over the band 12-16 GHz during the 14 months summarized. There are, however, proposals in the queue requesting 2 cm formaldehyde observations.

G. A. SEIELSTAD



CHANGES IN THE GREEN BANK LIBRARY

A number of changes have taken place in the Green Bank library over the past year, all of which should benefit present and future users of the telescopes at this site. Sufficient shelving is now available to contain the journal holdings for the next five years, and the book collection for somewhat longer. The book collection has begun to undergo considerable updating in the areas of astronomy and astrophysics, electronics and computing, with the emphasis being towards the needs and interests of observers and staff at the Observatory, and the continuing development of the GBT.

A computer terminal has been installed in the library through which the user can consult the central library

catalogs in Charlottesville via an INTERNET connection. As this can sometimes be rather slow in operation, it is intended soon to install a replica of the Charlottesville PC system in the Green Bank library. The databases on this will be updated regularly from Charlottesville.

However, perhaps the single most important move has been the employment of a librarian at Green Bank for the first time since 1986. Presently, Alesia Wayne (Lisa) is working at the Observatory on Monday mornings and Wednesday afternoons. Lisa is a graduate in library studies from Syracuse University, and holds a Master of Library Science degree. It is our good fortune that she lives locally with her husband, John, and daughter, Rachael.

It is anticipated that the library will expand in floor area, convenience, scope, and comfort over the next couple of years to meet the challenge of the GBT. The optimum siting of the library is currently under discussion as part of the planning for the Jansky building extension.

Throughout the above changes, Ellen Bouton and Mary Jo Hendricks in Charlottesville have been continual sources of encouragement, advice, and assistance. Suggestions are especially encouraged from all Green Bank visitors concerning the library holdings, its services, and operation. All ideas should be communicated through Lisa, or any member of the library committee (Frank Ghigo, Roger Norrod, Chris Salter, and Doug Varney).

C. J. SALTER

VLBA

NUG TO VLBA TRANSITION PLAN

For the past two years, the procedures used to apply for and to schedule time on the U.S. VLBI Network ("NUG") have remained largely the same. During this same period, the VLBA, when used in a stand-alone mode, has been scheduled separately. With the continued ramp-up of the VLBA, and the concomitant decrease in the number of NUG stations, the time has come to meld the proposal and scheduling procedures of the VLBA and NUG. As detailed by Barry Clark in the January 1992 NRAO newsletter, all VLBI proposals involving VLBA antennas will be handled by the NRAO, beginning with the June 1 proposal deadline. Note that proposal deadlines for both the VLA and the VLBA are the same: the 1st of February, June, and October. Details of the proposal process are given in the accompanying article by Wrobel and Walker.

Until the VLBA correlator is operational in Socorro, there will be no change in tape management and correlation of VLBI data at existing correlators. Thus, Haystack and Bonn will continue to manage their tape libraries and correlators as before. Barry Clark and Carl Bignell will interface with their librarians to ensure adequate tapes for scheduled VLBA sessions. The Haystack correlator will remain available for VLBA correlation until about June 1993, providing what is expected to be an adequate time for verification of the VLBA correlator. Note that since both the Bonn and Haystack correlators are working near full capacity, no increase in MkIII/VLBA format observing is planned until at least late 1992.

Preparation and execution of VLBI observations will continue as before. A new, and hopefully all-inclusive VLBI scheduling program is actively under development, and should be ready for general use late this year. Existing scheduling programs should suffice for VLBI/VLBA observations until then.

The VLBA correlator will be moved to Socorro on July 1, 1992. No processing will be possible until October at the earliest. However, as the data processing capacity increases, the number and complexity of VLBA observations will also increase. Announcements of these increases will be made in this Newsletter as soon as they are known.

R. A. PERLEY

VLBI NETWORK

Beginning with the June 1 deadline, proposals for VLBI network observing will be handled by the NRAO. In particular, for the proposal deadline of June 1, proposals will be accepted for the following sessions:

1992 Session 3, 09 Sep to 30 Sep, at 3.6, 13, 6, and 18 cm
1992 Session 4, 04 Nov to 19 Nov, at 90, 18, and 1.3 cm
1993 Sessions 1-4, dates and frequencies to be decided

Because of the short time interval between June 1 and the time that a Session 3 preliminary schedule is needed, the due date will be strictly enforced.

Any proposal requesting two or more antennas in the European VLBI network constitutes a Global Proposal. Global proposals MUST reach both Network's Schedulers on or before June 1; allow plenty of time for mailing. In general, FAX submissions of global proposals will not be accepted. For Global Proposals, or those to the EVN alone, send proposals to:

R. Schwartz
Max Planck Institut für Radioastronomie
Auf dem Hugel 69
D 5300 Bonn 1
Germany

For proposals to the US network, the VLBA only, or global network proposals, send proposals to:

Director
NRAO
520 Edgemont Road
Charlottesville, VA 22903-2475

B. G. CLARK

PROPOSING TO USE THE VLBA

REQUESTING JUST THE VLBA: Since 1990 the VLBA has conducted observing projects outside of regular VLBI Network sessions. For such pure VLBA projects NRAO has handled the proposing, refereeing and scheduling mechanisms. Proposal deadlines and observing periods for such projects are identical to those for the VLA advertised elsewhere in this Newsletter. Observing time is allocated by the VLA/VLBA Scheduling Committee. All proposals must be submitted with a VLBA Observing Application Cover Sheet, an ASCII version of which is available as described below. This cover sheet can be used to augment the VLBA request by one VLA antenna or all VLA antennas, without needing to submit a separate VLA proposal. VLBA propoals should be sent to: Director, NRAO, 520 Edgemont Road, Charlottesville, VA 22903-2475. Approved VLBA projects are scheduled by B. Clark.

REQUESTING THE VLBA IN A VLBI NETWORK PROPOSAL: Since 1987 the VLBA has participated in U.S. VLBI Network and global VLBI projects. As described elsewhere in this Newsletter, as of the 1992 June 1 proposal deadline, NRAO is assuming the functions formerly performed by the U.S. VLBI Network. Former U.S. VLBI Network antennas, including one or more VLBA antennas, may be requested with a VLBA proposal. Global VLBI observations require proposals both to the VLBA and the European VLBI Network, plus to any unaffiliated antennas.

VLBA INFORMATION: Three short documents useful to proposers are available. These documents are entitled "VLBA Astronomical Readiness", "VLBA Specifications Summary" and "VLBA Construction Status." These ASCII documents are updated regularly and are available via anonymous-guest FTP with file names "astro," "specs," and "status," respectively, in directory "vlba" on host "ccc.cx.nrao.edu" [192.33.115.10]. A brief guide to the FTP facility is available on request from the undersigned at the AOC. These documents are also distributed via the Charlottesville VLBI e-mail exploder. Anyone wanting to be added to the VLBI exploder should send an appropriate mail message to "vlbi-request@nrao.edu." Paper copies of these VLBA documents can be requested from the undersigned.

GENERIC VLBI PROPOSAL COVER SHEET: This document can serve as a VLBA Observing Application Cover Sheet, as well as a cover sheet for global VLBI proposals. This ASCII cover sheet will be distributed as described above for the VLBA documents. FTPers should look for file "vlbicover". Although the proposal cover sheet is available electronically, proposals cannot (yet) be submitted electronically.

J. M. WROBEL and R. C. WALKER

TAPES, RECORDERS, DARS, ETC., AT THE VLBA AND THE VLA

A variety of changes will be occurring during 1992 in the VLBI equipment at the VLBA sites and at the VLA. During the year the final VLBA sites should begin operation as should the VLBA correlator. The VLBA will go from an instrument that can only be used for Network projects and a small number of other projects to nearly a fully operational system. Meanwhile efforts are being made to integrate the VLBI equipment at the VLA into the VLA and VLBA systems to make VLBI observing there more easy operationally and especially to make it more reliable.

THICK vs. THIN TAPE: It became clear during 1991 that we do not have enough thin tapes to support all desired Mark III and VLBA observing at Pie Town and Los Alamos. This is partly because of the relatively long tape residence time at the correlators for Network projects compared to test projects. Also, there is concern that not all correlators have the tape drive modifications needed to prevent damage to the thin tapes that we are testing for the VLBA. Therefore, Pie Town and Los Alamos will be converted to thick tape use during the Networks sessions in 1992. They will continue to use thin tapes between sessions. This should not have a large impact on users.

3M TAPE: There is a large supply of 3M tapes available that were used for wide track recording but are not now being used. These tapes appear to be of adequate quality for use on the VLBA while we continue testing thin tapes. This allows the VLBA construction project to postpone the major purchase of thin tapes until a variety of problems have been resolved. These tapes will be used for most projects during 1992, barring unforeseen problems. The main impact will be that tape changes will be required more than twice as often at the stations as originally planned or we will have to limit bandwidths. These impacts can be tolerated during construction but must be dealt with before the VLBA can go into full time operation.

DUAL DRIVES: Los Alamos has two working VLBA tape transports. Kitt Peak and Pie Town also have two drives and should be ready soon. We have run a test experiment using both drives at VLBA-LA and have begun regular use of both drives. This dual drive operation, which extends the time between tape changes, is critical to our goal of operating full time VLBI stations with only two full time employees.

MARK II: The first 7 stations of the VLBA have been outfitted with Mark II VLBI equipment. Our current plans do not call for outfitting any more VLBA stations with Mark II.

The first seven VLBA sites provide rather nice u-v coverage for baselines out to about 2200 km as shown in the attached figure. The figure shows the uv coverage with a maximum scale of 2500 km for full tracks on sources at 64, 30, 6, and -18 degrees declination. This coverage gives the current "Mark II subarray" some interesting scientific capabilities. It will be available until about the time the VLBA correlator comes into operation. Certainly it will be available for projects submitted for the June proposal deadline. Once the VLBA correlator is available, pure VLBA Mark II experiments should no longer be of interest. At that time, the VLBA Mark II systems can be redistributed for better interaction with the global network for the period before Mark II operations cease. One of the VLBA units, which can be monitored remotely, may be put at the VLA to enhance the reliability of Mark II observing there.

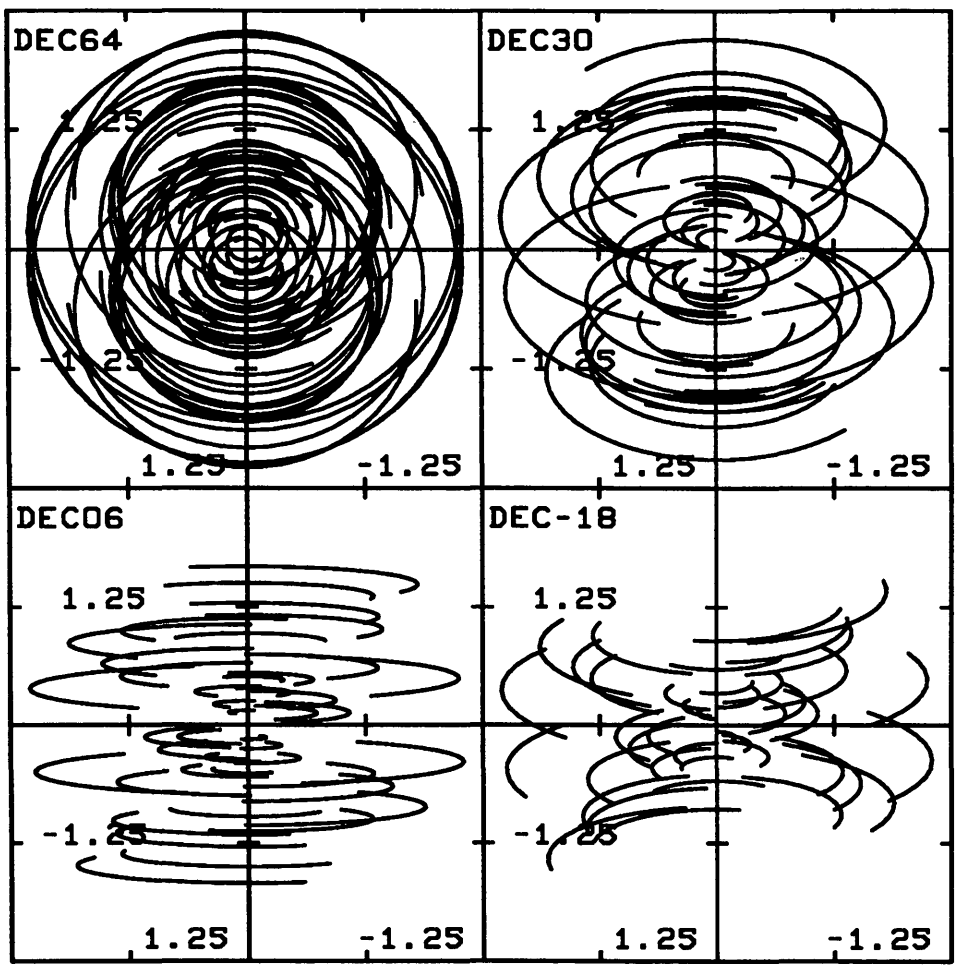
VLBI at the VLA: A VLBA data acquisition rack (DAR) is being acquired for the VLA. It will be installed during the summer of 1992 and will replace the Mark III rack (video converters, formatter). We do not intend to continue to support the Mark III rack for VLBI, although it will remain at the VLA as a filter bank for pulsar work. This intent is part of an effort to enhance the reliability of VLBI projects at the VLA.

The loss of the Mark III rack at the VLA will have an impact on some Mark III projects. In order to obtain the same bandwidth that is now used in Mode A observations, it will be necessary to use Mode B with 4 MHz channels and double speed recording. This is because of the smaller number of BBC's (video converters) in the VLBA (8) compared to the Mark III (14). It will not be possible to record the widest bandwith possible with the Mark III (4 MHz per channel Mode A) at the VLA. This mode has rarely been used at the VLA although such recordings have been made with the VLA equipment while it was located at Kitt Peak for millimeter observations. If such wide bandwidths are required, VLBA mode recording modes with wider channels (up to a total of 256 Mbits per second on one tape) must be used and the data must be

processed on the VLBA correlator. Until the Mark IV system is in use, or until a special compatibility mode is added to the VLBA correlator, all antennas in such a project must have VLBA systems.

MM OBSERVATIONS: A fiber optic link has been installed between the Owens Valley Radio Observatory control building and the Owens Valley VLBA site. It allows signals received on the millimeter interferometer to be recorded on the VLBA recording system without having to move any hardware. This makes millimeter VLBI observations at OVRO much easier. The system was used in a 1 mm VLBI experiment recently. Note that the system allows signals from the 40 meter antenna to be recorded at the VLBA site. In fact, real time fringes between the 40 meter antenna and another VLBA antenna were found before the millimeter experiment. Similar links between the NRAO 12 meter antenna on Kitt Peak and VLBA-KP and between the millimeter antennas on Mauna Kea and VLBA-MK are desirable but firm plans have not yet been made to build them.

R. C. WALKER



The UV coverage of the current "Mark II Subarray" of the VLBA. The scale is in thousands of km with a maximum of 2500 km. The resolution is near 1 milli-arcsecond at 1.3 cm.

VLBA_PT	34.30	108.12
VLBA_KP	31.96	111.61
VLBA_LA	35.78	106.25
VLBA_FD	30.63	103.94
VLBA_BR	48.13	119.68
VLBA_NL	41.77	91.57
VLBA_OV	37.23	118.28

SUMMER SCHOOL ON VLBI TECHNIQUES AND THE VLBA IN 1993

The NRAO will hold a summer school at the Array Operations Center in Socorro in mid-June 1993. Continuing the series of NRAO schools on synthesis imaging, this school will emphasize VLBI theory and techniques. In particular, we want to provide students and other future users with an opportunity to become familiar with the capabilities and user aspects of the VLBA. The program will include lectures and demonstrations by NRAO staff members and by several invited speakers from the VLBI community. The exact date for the school and registration information will be publicized later this year.

A. ZENSUS

VLA

VLA CONFIGURATION SCHEDULE

Configuration	Starting date	Ending date	Proposal Deadline
C	21 Feb 1992	26 May 1992	15 Oct 1991
DnC	05 Jun 1992	29 Jun 1992	01 Feb 1992
D	03 Jul 1992	28 Sep 1992	01 Feb 1992
A	23 Oct 1992	11 Jan 1993	01 Jun 1992
BnA	22 Jan 1993	08 Feb 1993	01 Oct 1992
B	12 Feb 1993	26 Apr 1993	01 Oct 1992
CnB	07 May 1993	24 May 1993	01 Oct 1992

The maximum antenna separations for the four VLA configurations are: A-36 km, B-11 km, C-3 km, D-1 km. The BnA, CnB, and DnC configurations are the hybrid configurations with the long north arm, which produce a round beam for southern sources (south of about -15 degrees declination).

APPROXIMATE LONG-TERM SCHEDULE

	Q1	Q2	Q3	Q4
1992	B,C	C	D	A
1993	B	B,C	C	D
1994	A	B	B,C	C
1995	D	A	B	B,C
1996	C	D	A	B

Observers should note that in these years of sunspot maximum, daytime observations at 327 MHz are unlikely to be successful in the smaller configurations because of solar interference and in the larger configurations because of a disturbed ionosphere. In particular, only the most urgent A configuration observations near 16^h RA should be considered, and B configuration observations near 23^h RA will also be difficult.

B. G. CLARK

PULSAR ACTIVITIES AT THE VLA

The addition of the High Time Resolution Processor to the VLA has broadened the scope of scientific activity to include pulsar studies. We outline below some of the motivation, equipment and capabilities for pulsar observing. Pulsar "backends" and supporting software will continue to evolve at the VLA, increasing the possibilities for new observations.

VLA attributes for pulsar observations:

a) Small synthesized beam
b) Large collecting area (equivalent to 130 meter dish)
c) Bandwidth diversity and dual-frequency capability (L/P mode)
d) Relative freedom from interference
e) Gated correlator capability
f) Spectrometer capability
g) VLBI terminal (fast wide-bandwidth recording)
h) Polarimetry capability

Scientific possibilities (no priority ordering implied):

a) Crab pulsar
   Intrinsic emission mechanism studies
   Correlation of Crab giant pulses with GRO, optical, and ground-based Gamma-ray photon arrival times
   Solar corona diagnostic (change in DM, polarization, arrival time, speckle interferometry)
b) Directed searches for periodic pulsations toward steep-spectrum point sources
c) Search for point sources in SNRs and globular clusters
d) HI determination of distances
e) Astrometry
f) Pulsar velocity determination from interstellar scintillation
g) Emission mechanism studies of non-Arecibo pulsars, especially at P-band, i.e., polarimetry, time signatures
h) Millisecond pulsar timing for non-Arecibo pulsars and Arecibo pulsars during the Arecibo upgrade

Status of High Time Resolution Processor (HTRP):

a) Compaq 386 Computer: Non-synchronous, continuous data logging, externally triggered by manually controlled synthesizer, up to 64 channels, maximum aggregate sample rate 50 kHz continuous to disk or Exabyte tape, and windowed burst-mode sampling up to 100 kHz, externally triggered by the NMIMT or Princeton Mk III signal averagers.
b) Filter bank and detectors: Filter bandwidths of 4 and 2 MHz now available. 1, 0.5, 0.25, 0.125 MHz on order for installation by summer '92. Square-law detectors and cross multipliers to obtain full polarization information from 14 channels of video output from the Mk III VLBI video detectors. Detector bias offset and integration time constant are computer-controlled, but detector gain is not. All detector output channels have sample-and-hold circuits to reduce the effects of the waveguide-switch transient and to allow synchronous sampling of all 64 channels.

Status of other equipment:

a) NMIMT signal averager, operational but fragile. Can produce signal-channel synchronous average profiles with sampling as fast as 60 microseconds; can produce adjustable synchronous gate for VLA correlator. Hard copy output of profiles available on networked laser printer.
b) Princeton Mk III timing machine operational (clone of device used at Arecibo and Green Bank). Can produce average profiles with absolute time stamps referenced to station clock, GPS, or maser. Can produce synchronized gating signal for VLA correlator. Has capability for two independent gating windows, not currently supported by software. Currently limited to pulsars of $P < 0.8$ sec unless master input clock frequency (usually 20.0 MHz) is changed.
c) NMIMT transient recorder, 2 channels at 200 Msamples/sec, duty cycle limited by transfer time to disk.

Documentation:

a) *HTRP Operations Guide*, Mark McKinnon, November 1991 and references therein, including the NRAO HTRP Memo Series
b) Princeton MK III Timing System *A Flexible Data Acquisition System for Timing Pulsars*, D. R. Stinebring, V. M. Kaspi, D. J. Nice, M. F. Ryba, J. H. Taylor, S. E. Thorsett, T. H. Hankins (January 1992, submitted to *Reviews of Scientific Instruments)* and references therein
c) *The Intel Signal Averager: User's Guide*, Earle Horton, December 1987

Hardware and systems projects under consideration or development:

a) HTRP development:
   1) 20 MHz frequency reference for HTRP timing, phase-locked to station 5 MHz standard
   2) Cabling and buffering to allow Compaq computer and Princeton MK III timing system to sample the filter bank detector outputs simultaneously
   3) Patch panel cabling improvements
   4) Communications to on-line antenna control system
   5) Internet link
   6) Establish absolute time stamp and synchronous start for HTRP data

b) Dispersion removal projects
   Utilization of VLA recorder video converters and FX correlator boards for real time post-detection dedispersion

c) Polarization: Development of absolute position angle calibration including local ionospheric corrections

Software development projects:

Standard polarimetry reduction package
Utilities for moving HTRP data into FITS format
FITS input for ANALYZ
TOA and TEMPO for pulsar timing
Pulsar data base and data archive
Exabyte tape handling routines for Compaq PC and Unix machines

T. H. HANKINS and M. M. MCKINNON

A FURTHER NOTE ON USING DIFFERENT BANDWIDTHS WITHIN AN IF PAIR

When observing with the VLA in spectral line mode and wishing to specify different bandwidths for each of the two polarizations, one should be aware that the pointing centers for the two polarizations don't coincide (this is the so-called beam squint). VLA test memorandum No. 161 illustrates the effect that this has on the data. Any user interested in using the VLA in this highly non-standard configuration is encouraged to obtain a copy of this memo and to read the relevant item in NRAO Newsletter No. 47 (1 April 1991). For further questions, contact Elias Brinks (505-835-7029) or David Mehringer (505-835-7458).

D. MEHRINGER and E. BRINKS

FILLING OF LINE DATA BEFORE VISIT

Visitors to the AOC who request that their spectral line observations be filled ahead of time by the NRAO staff need to give some thought as to how the data should be filled. For example, the default in FILLM puts all observations at a given band into the same FQ table, makes CL table entries every 5 minutes, does no time averaging, and compresses the data. If these defaults are not satisfactory, or if observers have any questions regarding the FILLM, they should contact Peggy Perley or Dave Wunker (505-835-7359) prior to their arrival. The above defaults will be used unless the observer specifies otherwise.

P. PERLEY

TeX VERSION OF THE VLA PROPOSAL COVER SHEET

I have written a TeX version of the cover sheet used for VLA proposals. This version uses a "fill in the blanks" format and is accessible via anonymous ftp from zia.aoc.nrao.edu (146.88.1.4). Once you have logged in, change directories to pub/vlacover (cd pub/vlacover). In this directory there are three files which can be listed by using the command ls. These files are: cover1.tex (the front side of the cover sheet), cover2.tex (the back side of the cover sheet), and logo.ps (a PostScript file of the NRAO logo). These files can be retrieved with the ftp commands get or mget.

D. MEHRINGER

COMPUTING AT NRAO-NM

In the online systems area during the past few months, the SPARCstation that is intended to provide realtime access to VLA data for visualization purposes was moved to the VLA site; data were successfully filled into AIPS and ISIS. Work continues to resolve various problems uncovered during these tests and to make the system more robust. We are identifying other applications that will benefit from the near-realtime connection to the observing system.

The format of data provided by the observing system from a pointing run has been transformed to aid in the understanding of VLA pointing errors. Much of the work done in this area also lays the necessary groundwork to provide the "referenced pointing" scheme that will be necessary if the VLA is to be used at wavelengths shorter than 1 cm.

At the Array Operations Center in Socorro, new equipment from the Array Computing procurement was successfully installed this quarter. An Auspex NS/5000 high-performance NFS server was installed in late January and formally accepted at the beginning of March. This server currently provides the operating system and a large number of other programs, including AIPS, to the 24 existing Sun workstations and 23 new Sun SPARCstation IPXs which were accepted in late March. Two of the new SPARCstations are designated as reservable by visitors, and two more have been ordered. This will bring the total number of midsize public workstations to six.

Work continued on other areas of the Array Computing procurement. Proposals for visualization systems are still under evaluation due to the variety and complexity of the software involved. In addition, a Request For Proposal was issued in early March for approximately four high-performance UNIX workstations, all of which will be available to visitors.

Two of the three vacant scientific programming positions were filled, and the programmers began work, early in 1992. One has already completed the task of making substantial improvements to the software for the MANN measuring engine, while the other will be heavily involved for several months in the VLA archive tape copying project.

The NRAO has had another brush with computer hackers. This particular invasion was widespread on the Internet; three NRAO computers appear to have been broken into. On zia, which was the only AOC computer affected, this involved the replacement of the "ftp" program with a version which logged remote hostnames, usernames, and passwords. We have notified administrators of all systems which appeared in the log, but this may not be a complete list. If you ran the ftp command from zia during the first quarter of 1992, we strongly recommend you change the passwords on all of your accounts.

This incident emphasizes our vulnerability to attack. To make the NRAO systems completely secure, we would also have to block access to most, if not all, of our user community, which we cannot realistically do. We can, however, take some other precautions. Some of these will necessitate some slight inconvenience, such as changing the AIPS password more often and disabling visitor accounts which are not in regular use. Accounts can be re-activated very easily the next time you come.

We hope that those of you with computers connected to the Internet realize that we are all exposed to these threats, and that they can come from anywhere. There are some basic security precautions which must be taken even on simple Sun workstations. If you or your system administrator would like more information about this attack, or help with finding further information on basic system security, please feel free to contact me at (505)835-7282.

M. R. MILNER

VISITORS TO THE AOC

Help us make your visit to the AOC useful and productive by making your reservations early. Please note that no less than two weeks notice is required to make arrangements for a visit. Some reasons for the advance notice are: to ensure proper technical assistance, to ensure computer support (especially disk space), and to coordinate housing and transportation.

Please inform Eileen Latasa of your proposed visit at:
Phone: (505) 835-7357
Fax: (505) 835-7027
E-Mail: elatasa@nrao.edu

T. ROMERO

DATA REDUCTION AT THE AOC

(or...the workstation cavalry has arrived!)

As part of our ongoing effort to upgrade computing power at the AOC, several new workstations have been added. We now have 4 moderately powered workstations intended primarily for use by visiting scientists. Two more will be installed shortly. Each will have approximately 2 gigabytes of local disk capacity and also be provided with a dual density Exabyte tape drive (DATs will be added later). All will have access to 9 track tape drives through the local network and server. All will also be capable of running all of the locally available versions of AIPS. The table gives names and locations of the 4 workstations. Use of these workstations will be controlled in a manner similar to that of booking reserved disk space on the two Convex machines (Cholla & Yucca). Bookings will be made on a first come-first served basis and assignment to individual workstations will be based on user load in order to maximize efficiency. A summary of public workstation rules is listed below.

NAME	CPU	LOCATION (AOC)
SPECTRA	Sun Sparcstation IPX	Rm. 211
TAOS	Sun Sparcstation 2	Rm. 211
ACOMA	Sun Sparcstation IPX	2nd Floor User Area
ZUNI	IBM RS/6000 - 320H	3rd Floor User Area

THE RULES!

FOR USE OF PUBLIC WORKSTATIONS SPECTRA, TAOS, ACOMA AND ZUNI

1. Jon Spargo will now be responsible for making ALL reservations and booking time on all four workstations.

2. Usage priorities for public workstations are:

   a. Visitors
   b. Students and staff without workstations

3. Visitors must abide by the general rules for visiting the VLA/VLBA and make their reservations at least two weeks in advance.

4. Normal sign-up durations are not expected to exceed one week. Exceptions can be made. (See #9 below.)

5. Each user will have exclusive use of their assigned workstation.

6. Any data left on disk at the end of a user's scheduled time will be immediately deleted (no exceptions).

7. Ad hoc sign-ups for vacant time must be cleared through Jon Spargo.

8. Any exchanges of signed-up time must be cleared through Jon Spargo.

9. Extenuating circumstances and special considerations will be arbitrated by Rick Perley.

J. C. SPARGO

RECENT VLA MEMORANDA

VLA Test Memoranda:
No. 161 - "Amplitude Test of the 4 IF Mode," D. Mehringer (2/92)

HTRP Memoranda:
No. 114 - "HTRP Operations Guide," M. McKinnon (1/92)

Millimeter Array Memoranda:
No. 72 - "Circular Polarization and Multi-Band Operation: Implications for MMA Receiver Design," A. R. Kerr (1/92)
No. 73 - "Mosaicing with Even Higher Dynamic Range," M. Holdaway (1/92)

No. 74 - "Surface Accuracy Requirements for Mosaicing at Millimeter Wavelengths," M. Holdaway (1/92)
No. 75 - "Lower Tropospheric Wind Speed Statistics from Rawinsonde Observations at Albuquerque, New Mexico, Winslow, Arizona and Hilo, Hawaii," F. Schwab (1/92)
No. 76 - "Radio Frequency Interference and the MMA," P. Crane (1/92)
No. 77 - "Road Feasibility Study for MMA Sites in the Magdalena Mountains," P. J. Napier (1/92)
No. 78 - "Report on Visit to Hat Creek," Lamb, Payne (2/92)
No. 79 - "A Summary of the Data Obtained During the mmA Site Survey," D. E. Hogg (2/92)
No. 80 - "Further Simulation of (Possible) MMA Configurations," J.-P. Ge (3/92)
No. 81 - "Evaluating the MMA Compact Configuration Designs," M. A. Holdaway (3/92)

Copies of VLA memoranda are available from the following:
Computer Memoranda - Theresa McBride (505-835-7000)
Electronics Memoranda - Selfa Lucero (505-835-7100)
HTRP Memoranda - Selfa Lucero (505-835-7100)
Technical Memoranda - Selfa Lucero (505-835-7100)
VLA Test Memoranda - Selfa Lucero (505-835-7100)
mm Array Memoranda - Betty Trujillo (505-835-7231)
Scientific Memoranda - Meri Stanley (505-835-7300).

M. A. STANLEY

12-METER

PROGRESS ON NEW 2 mm SIS RECEIVER

In March, the Tucson Receiver Group completed the new 2 mm SIS receiver. First tests of the receiver on the telescope were encouraging. If further tests during the next few weeks continue to go well, we will schedule a few "guinea pig" observers to use the receiver in late May and June. We expect the receiver to be available as a standard instrument this autumn.

We have not yet evaluated the receiver over the entire 130 to 170 GHz tuning range. At the J = 3-2 CS frequency near 147 GHz, the receiver noise temperatures are ~80 K (DSB). Through tuning of the backshorts, we were able to achieve a single sideband tuning with better than 15 dB image rejection. We do not yet know what the image rejection will be at other frequencies in the band. As with our other SIS receivers, this is a dual polarization receiver in a 4 K, closed-cycle cryostat. The SIS mixers were developed by the Central Development Laboratory in Charlottesville.

THE 12 M STAFF

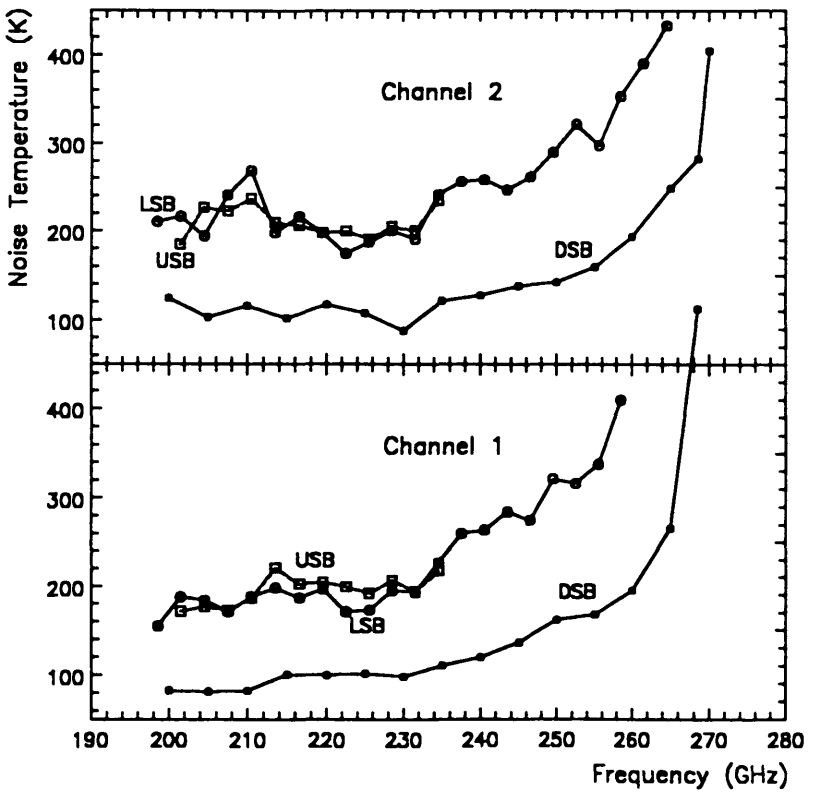
200 - 270 GHz SIS RECEIVER SIDEBAND FILTER

Single sideband filters have been installed on the two polarization channels of the 1 mm SIS Receiver. These are Martin-Puplett polarizing interferometers which are independently adjusted to the required frequency. The image is terminated in a cold load on the 4 K station inside the dewar. The filters have over 20 dB of rejection at mid-band when tuned using a signal source at the image frequency. At present there is no on-line frequency source, but one will be developed for this purpose. Setting the filter is currently done by interpolation from a calibration table and generally yields mid-band rejection in excess of 15 dB. The chart below shows the measured double and single sideband temperatures for the two channels. Lab measurements show that the image termination has an apparent temperature of about 27 K at 230 GHz, and the loss in the optics is a few percent. Single sideband temperatures are close to twice the double sideband temperatures as the mixers are optimized for the given signal sideband when the image filter has been set.

The double sideband noise temperatures shown are measured through the filters with the path difference set to zero. Another double sideband mode is available where the sideband filters are completely removed from the signal path, giving noise temperatures a few degrees lower.

TUCSON RECEIVER GROUP

TUCSON RECEIVER GROUP



200 - 270 GHz Receiver Noise Temperatures

IN GENERAL

TIMELY SUBMISSION OF PROPOSALS

Please note the proposal deadline dates and relevant arrays listed in the VLA Configuration Schedule in this newsletter. The deadlines for 12 Meter Telescope proposals are the first day of January, July, and October for the spring, fall, and winter trimesters, respectively. Proposals for the 140 Foot Telescope are accepted at any time.

Timely submission of proposals is required in order to process the proposals in a timely fashion. Proposals arriving after the deadline date will be returned to the sender.

P. A. VANDEN BOUT

DRAWSPEC AND HAZEL AVAILABLE BY FTP

I have created an anonymous ftp server for my programs drawspec and hazel. You will find them on polaris (192.33.115.101) in subdirectories below /hliszt. In each case, the server has all the files you would find on a distribution diskette. Download all files in binary mode and follow the instructions in the readme.now files.

Self-extracting zipped PostScript copies of the manuals are included. If you need printed copies, contact HLISZT@NRAO.

H. S. LISZT

DAVE HEESCHEN RETIRES

A symposium on "Extragalactic Radio Astronomy--Future Prospects," honoring Dave Heeschen, was held in Charlottesville in December 1991 on the occasion of his retirement. More than 100 participants gathered to honor Dave and to pay tribute to his many accomplishments during the past 35 years at NRAO.

Following his thesis work at Harvard University on galactic hydrogen, Dave turned his research interests to extragalactic problems, where he made valuable contributions to the study of radio source spectra and source variability. His early work provided the basis for the calibration of flux density scales at centimeter and decimeter wavelengths. He was the first to recognize the relation between radio luminosity and spectral index for radio galaxies, and he discovered the daily variation in compact radio sources known as "flicker."

Dave Heeschen came to NRAO in 1956 as employee number 3 in a series which now numbers 2692. Before becoming Director of NRAO in 1962, he was Chairman of the NRAO Astronomy Department and later Acting Director. Under his 16 years of leadership as Director, NRAO completed the construction of the 140-ft radio telescope, brought into operation the 36-ft millimeter antenna, conceived and built the VLA, and initiated planning for the VLBA. Following his resignation as Director in 1978, Dave served briefly, when he was asked, as the Assistant Director for Tucson Operations and later as Assistant Director for Socorro Operations. More recently, he was the Acting Project Manager during the initial phases of work on the Green Bank Telescope.

Dave Heeschen has also served as President of the American Astronomical Society, Vice President of the IAU, and on numerous advisory committees to international, federal, state, and private organizations, including the past three decade reviews in astronomy. In 1980 he received the NSF Distinguished Public Service Award and in 1985 the Alexander von Humbolt Distinguished Senior Scientist Award. He is a member of the American Academy of Arts and Sciences and the National Academy of Sciences.

In recognition of Dave Heeschen's contributions to astronomy, at its January 1992 meeting, the NSF Advisory Committee for Astronomical Sciences passed the following resolution:

> "During Dr. Heeschen's term as Director, the National Radio Astronomy Observatory became the most successful community-based radio observatory in the world. NRAO has and continues to serve generations of astronomers from around the world with soundly operated instruments that define many of the frontiers of research in modern radio astronomy. The ACAST wishes to express its deep appreciation of Dr. Heeschen's energetic and creative accomplishments, and we wish him an equally fulfilling and active retirement."
>
> /s/ Marcia J. Rieke
> Chair of ACAST
> January 6, 1992"

The NRAO staff wishes Dave well during his retirement, which will include increased opportunities for sailing and pursuing his amateur radio interests, and we look forward to his future association with the Observatory as he continues to pursue his research interests and contribute his expertise to NRAO projects.

P. A. VANDEN BOUT

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