NRAO NEWSLETTER

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IN GENERAL

AUI Maintains Its Commitment to NRAO

On May 1 of this year Secretary of Energy Pena terminated the contract under which AUI has operated the Brookhaven National Laboratory (BNL) since its founding, 50 years ago. In doing so, he commended AUI's scientific management, but criticized our management of environment, safety and health issues, and claimed that there had been an unacceptable loss of public trust. While the Trustees of AUI strongly object to the Secretary's decision and disagree with the stated basis for termination, we have been relatively silent over the last several months, hoping that we might yet have an opportunity to continue that relationship with Brookhaven by successfully competing for the contract in collaboration with others.

On August 1 the AUI Board of Trustees made the extremely difficult decision of deciding not to submit a bid for a contract to run BNL. Despite its own evaluations over the last ten years, which regularly gave AUI grades of "Good" to "Excellent" in all categories, the Department of Energy made public statements regarding AUI's chances of success in regaining the BNL contract that effectively made it impossible for AUI to win. Specifically, it proved impossible to find partners willing to join AUI in a bid.

This means that commencing with the 1998 calendar year, AUI will be operating the NRAO and only the NRAO. To do so will require some restructuring of the corporation. That process is being planned now and it is already clear that a restructured AUI will be able to conduct all its management and oversight functions of the NRAO as it has for the past 40 years.

Over the last several months, as the situation at BNL continued to unfold, we have met with officials at the NSF, including the Director and all leadership in the Astronomy Division, to keep them up to date and to make them aware of contemplated adjustments in AUI structure, and to assure them of AUI's continuing commitment to NRAO. Although some changes in AUI policy and procedure may be required as the corporation adjusts to new circumstances, we want to assure all members of the Astronomy community that the AUI Board of Trustees has placed stewardship of the National Radio Astronomy Observatory as its top priority and that all actions considered by AUI will be examined in that context.

P. Martin (Chairman, AUI Board of Trustees)
L. Schwartz, President of AUI

The Millimeter Array

Planning for an expected start to the Millimeter Array Design and Development phase in FY98 has accelerated recently. In collaboration with the MDC universities, technical working groups have been formed that are in the process of laying out the detailed plan for development of the instrumentation that will satisfy the technical specifications of the MMA. In many cases the baseline plan includes development of competitive approaches with a decision point scheduled some time in the future for a choice to be made based on consideration of cost and performance. In other cases the approach has been to refine the instrumentation used on existing facilities. In all cases the developments will be carried through to the point that reliable cost and performance figures can be established.

An important part of the MMA development phase is the assembly of a test interferometer at the VLA site that will be used to conduct real-world performance evaluations of all the MMA instrumentation. Here the emphasis will be on validation of such things as the antenna's ability to fast switch and point accurately. Development of the software to control the test interferometer is a goal equal in importance to development of the hardware. The test interferometer will allow us to debug much of the MMA instrumentation such that the hardware sent to the array site will be, ideally, operational and easily integrated on-site.

Discussions addressed to establishing foreign partnership in the MMA continue to progress in promising ways. Development of the Atacama Array concept, a collaboration between the MMA and the Large Millimeter and Submillimeter Array, a project of the National Astronomical Observatory in Japan, will take the next steps with a technical meeting planned in December. At the same time, a partnership has been formed between the European Southern Observatory (ESO) and the NRAO to study a merger of the MMA and the European Large Southern Array. U.S. and European joint study groups are looking into questions having to do with science, technical issures, and management considerations. Talks are scheduled to continue in the fall.

In the next (December) NRAO Newsletter we hope to be able to report the results not only of the fate of the FY98 funding but also of progress in establishing partnerships for the MMA.

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operated under cooperative agreement by Associated Universities, Inc
[Contact Joanne Nance at jnance@nrao edu, if you wish to receive mailings of the Newsletter]

The Millimeter Array (cont.)

Note added: At the end of September the House-Senate Conference Committee agreed to begin the MMA Design and Development with FY98 funding of $9M. The Conference report still needs to be approved by both the Senate and the House and it must be signed by the President before it can take effect. While still preliminary, this is very positive news indeed for the MMA.

R.L. Brown

AIPS++ Second Beta Release

AIPS++ issued the second beta release on September 11. This release has improvements in a wide range of different areas. The most important for the user is that spectral line imaging is now supported, and the speed and memory use of continuum imaging have been improved substantially. AIPSView has a number of new capabilities, mostly concerning control over the appearance of plots. The robustness of Glish has been improved considerably. The image-handling tool has a number of new methods, such as Hanning smoothing, and a wide range of algorithms for producing moment images. In addition, functions of applications such as the image tool can now be run asynchronously.

Current work on the third beta release, expected 2-3 months from now, is proceeding, focusing on providing graphical user interfaces for a number of AIPS++ applications, including the image-handling tool, and the synthesis imager object. In addition, we expect that the single dish analysis environment, which is itself gui-based, will be part of the third beta release, as will a visibility visualization tool, and a significantly improved tablebrowser/editor.

We are still looking for beta-testers. If you are interested in helping, and have access to a machine with memory 64Mbytes or more running Solaris or Linux, please contact Tim Cornwell (tcornwel@nrao.edu).

The first limited public release of AIPS++ is planned to occur early next year.

T.J. Cornwell

The NRAO VLA Sky Survey (NVSS)

Observations for the 1.4 GHz NRAO VLA Sky Survey (NVSS) began in 1993 September and nearly covered sky north of -40° declination (82% of the celestial sphere) by the end of 1996. Observations to fill the few remaining gaps are scheduled for the fourth quarter of 1997. All of the data taken through 1996 have been processed. The principal data products are:

- A set of 2326 continuum map "cubes," each covering 4 deg x 4 deg with three planes containing the Stokes I, Q, and U images. They were made with a relatively large restoring beam (45 arcsec FWHM) to yield the high surface-brightness sensitivity needed for completeness and photometric accuracy. Their rms brightness fluctuations are about 0.45 mJy/beam = 0.14 K (Stokes I) and 0.29 mJy/beam = 0.09 K (Stokes Q and U). The rms uncertainties in right ascension and declination vary from < 1 arcsec for relatively strong (S > 15 mJy) point sources to 7 arcsec for the faintest (S = 2.3 mJy) detectable sources.

- A catalog of discrete sources on these images (currently containing 1.7 million sources).

- Processed (u,v) data sets. Every large image was constructed from more than 100 smaller "snapshot" images. All of the edited and calibrated single-source (u,v) data sets used to make the snapshot images contributing to each large image have been combined into a single multisource (u,v) file for users who want to investigate the data underlying the images.

The NVSS is being made as a service to the astronomical community, and the principal data products are being released as soon as they have been produced and verified. To access the NVSS data on the web, go to the NRAO home page (http://www.nrao.edu) and click on NVSS. The web pages contain a paper describing the survey, a postage-stamp image server, a catalog browser, and other software for extracting subsets of the source catalog.

J.J. Condon, W.D. Cotton, E.W. Greisen, Q.F. Yin, R.A. Perley, G.B. Taylor, and J.J. Broderick

Year 2000 Issues and the NRAO

When the Year 2000 (Y2K) arrives in just over 800 days, the potential exists for many computer systems, software, and "smart" hardware containing embedded microprocessors to malfunction. The convention of using 2 digits for the year instead of 4 has created a potential century-change time bomb inside date-aware software and hardware. Its effects may be widespread, and disastrous for organizations which are unprepared.

The NRAO has begun assessing the potential for Y2K problems in its own hardware and software. We believe that our Y2K problems will be manageable, as long as we move aggressively to address them soon. We have formed a working group with representatives from each of the NRAO's major sites, and from the Business and Personnel divisions, to identify and help mitigate potential Y2K problems. The members of this group are: R. Simon and G. Hunt (Computer Division), A. Beasley (AOC), C. Bignell (Personnel), A. Bridle (Charlottesville), J. Desmond (Fiscal), J. Hagen (Tucson), and B. Vance (Green Bank).

As part of our efforts to raise awareness and foster internal communications about Y2K matters, a web page has been created at http://www.cv.nrao.edu/y2k/. NRAO users may find this web site a useful source of links to information available on the Internet about Y2K issues.

A detailed inventory of the NRAO's possible points of exposure to Y2K problems is now underway. The observatory does not use massive amounts of customized date-aware computer software, so we should not face the severe problems which confront many businesses and financial institutions. We recognize, however, that we are not immune to such problems. The broad areas where potential risks exist are as follows:

- Fiscal, Payroll, and Personnel: These functions at the NRAO are of high priority for the smooth operation of the Observatory. Many have been outsourced to vendors with aggressive Y2K compliance efforts, and their progress will be monitored closely. Those supported by internally-written software are actively being reviewed.

- Telescope Operations: Most of NRAO's online systems should be Y2K compliant by design, because they rely on Julian dates unaffected by the century change. Because of the uniqueness and complexity of these systems we plan to evaluate their Y2K compliance by actual testing as soon as possible after an overall code review. Detailed tests will require considerable planning to ensure a straightforward return to normal operations once the tests are done.

- Embedded Chips: Many of our most complex electronics systems use embedded PC's and chips. Detailed testing will be needed to reveal if any mission-critical systems are not Y2K compliant, and thus require update or replacement. There are numerous old Intel-architecture based computers in use, many of which are not expected to be fully Y2K compliant. The essential question is "how important is their non-compliance?." We will focus our attention initially only on mission-critical systems, as identified by the site managers; others will be renovated or replaced as part of normal refurbishment.

- Communications: Our phone systems and PBX's, the NRAO Intranet linking our sites, the Internet, and long distance telephone services are all potentially vulnerable. We are reviewing the weaknesses or potential problems in the hardware that we own.

- Utilities and Other Key Outside Services: We are aware that, even if we have our own house in good order by the Year 2000, preparedness in the commercial and governmental world around us is a matter for great concern. Our Y2K contingency planning will therefore consider possible disruptions in outside services and utilities essential for our operations.

- Computing Facilities and Software: The century change problem can affect the operating systems, utility scripts, and application software run on Observatory computers, including UNIX workstations, PC's, and Fiscal systems. An initial review of NRAO's vulnerabilities in these areas is in progress. Of particular interest to users of FITS data is the fact that the original FITS specification was not Y2K compliant; a new FITS specification is now available and will be incorporated into NRAO software which reads or write FITS data (for further details see ftp://fits.cv.nrao.edu/fits/documents/proposals/year2000.txt).

The full size of the Y2K problem at NRAO can not be accurately estimated until inventory, assessment, and initial testing of critical and high priority systems has been completed. We hope to complete this phase of Y2K work at the NRAO by the end of 1997.

R.S. Simon and A.H. Bridle

Graduate Summer Research Program at the NRAO

In 1998 several summer positions at the NRAO will be available to graduate students who have completed one or two years of graduate study in radio astronomy at a U.S. academic institution. The purpose of this program is to provide students in radio astronomy with an intense research experience done in collaboration with a NRAO scientist. The graduate summer appointment is accompanied by a summer salary, transportation reimbursement to the NRAO, and use of the research facilities at the NRAO. Graduate summer appointments are available at all of the NRAO sites.

Students interested in the graduate summer program should provide the following:

- A letter expressing interest together with a CV that describes the academic background of the candidate;
- A concise statement of the research area that the candidate is interested in pursuing in his/her Ph.D. research;
- The names of three academic references whom the candidate has asked to send letters of reference to the NRAO.

Applications should be sent to:

Director's Office
Graduate Summer Research Program
National Radio Astronomy Observatory
520 Edgemont Road
Charlottesville, VA 22903

Application deadline is January 20, 1998.

We appreciate the help of graduate advisors bringing this opportunity to the attention of students in their departments who have expressed an interest in radio astronomy research.

R.L. Brown

Jansky Postdoctorals

The National Radio Astronomy Observatory awards Jansky Postdoctoral appointments which provide outstanding opportunities for research in radio astronomy. Jansky Postdoctorals formulate and carry out investigations either independently or in collaboration with others within the wide framework of interests of the Observatory. Current areas of research include: cosmology; theoretical and observational studies of radio sources; the interstellar and intergalactic medium; structure and dynamics of galactic and extragalactic sources; physics of HII regions, stars, solar system objects; and astrometry. The research staff is also involved in instrumentation development and image processing; applicants in these areas are encouraged.

Appointments, which are available at any of the major NRAO sites, are made for a term of two years and may be renewed for a third year. Successful applicants must have received their Ph.D. prior to beginning the appointment and normally within the past four years.

Application may be made to:

Director
National Radio Astronomy Observatory
520 Edgemont Road
Charlottesville, VA 22903-2475

The application should include a curriculum vitae and a brief statement of the type of research activity to be undertaken at the NRAO. (Do not staple or duplex application documents.) The applicant should have three letters of recommendation sent directly to the NRAO.

The application deadline is December 15, 1997. All letters of reference must be received by December 31, 1997. The announcement of the Jansky Postdoctoral appointments will be made in compliance with the AAS resolution on uniform notification dates for postdoctoral appointments.

R.L. Brown

1997 and 1998 Summer Students

The 1997 Research Experiences for Undergraduates at NRAO has ended with the 17 students heading for their colleges from the four NRAO sites. As examples of the sorts of research students and their advisers undertake at the four NRAO sites, we give a short summary of the research accomplished by two students—further description is available at URL http://www.cv.nrao.edu/~awootten/REU97.html.

Student Frances Ockels (U. of Arkansas, Little Rock) worked with Eric Schulman (Charlottesville) on a project to determine

if high velocity clouds of HI accompany the spiral galaxy NGC 1300. They found hints of some high-velocity gas.

Naveen Reddy (University of Texas) worked with Min Yun in Socorro. They compared the luminosity function of 1.4 GHz radio sources from the NVSS with the Strauss IRAS redshift survey. The starburst sample luminosity function agreed well with Condon's spiral galaxy luminosity function; a second radio population dominated by AGN may also be discerned.

Information and application forms will soon be mailed soliciting applications for research assistantships next summer. The majority of the assistantships will be offered to undergraduate students who are currently enrolled in U.S. undergraduate institutions and who will not receive their degrees before or during the summer of 1998. A limited number of assistantships may be available for graduate students or students from non-U.S. institutions.

Owing to the large number of applicants, and the difficulty of distributing materials among sites across the continent, the deadline for receipt of application materials will be January 20, 1998; notice of decisions will be sent by March 1, 1998. Forms are available from Department Heads, on the WWW (URL http://www.cv.nrao.edu/html/headquarters/summer-students.html), or by writing to:

Summer Student Program Director
National Radio Astronomy Observatory
520 Edgemont Road
Charlottesville, VA 22903-2475
Telephone: (804) 296-0225

H.A. Wootten

GREEN BANK

The Green Bank Telescope

The accompanying photographs of the Green Bank Telescope (GBT), taken in late September 1997, shows that major portions of the tipping structure are in place atop the alidade. These include the elevation shaft, box structure, horizontal section of the Feed Arm, and the elevation wheel. Primary elements of the servo and electrical systems have been installed on the alidade and the antenna is rotated frequently to aid in the erection process.

The reflector backup structure (BUS) has been completed on the 175-foot square concrete slab at the telescope site and lifting of its 22 modules onto the box girder has begun. The entire BUS was constructed on the ground and consists of 7,652 different members and joints weighing approximately 2.1 million pounds. During construction, all joints in the BUS were aligned with a positional accuracy of ± 0.25 inches. When finished, the jacks at the top of the 110 scaffolding towers were backed-off, leaving the BUS supported only by the 17 reinforced concrete piers on which it was built. The deflected shape of the BUS under gravity load was measured to verify the predicted values of the finite element analysis.

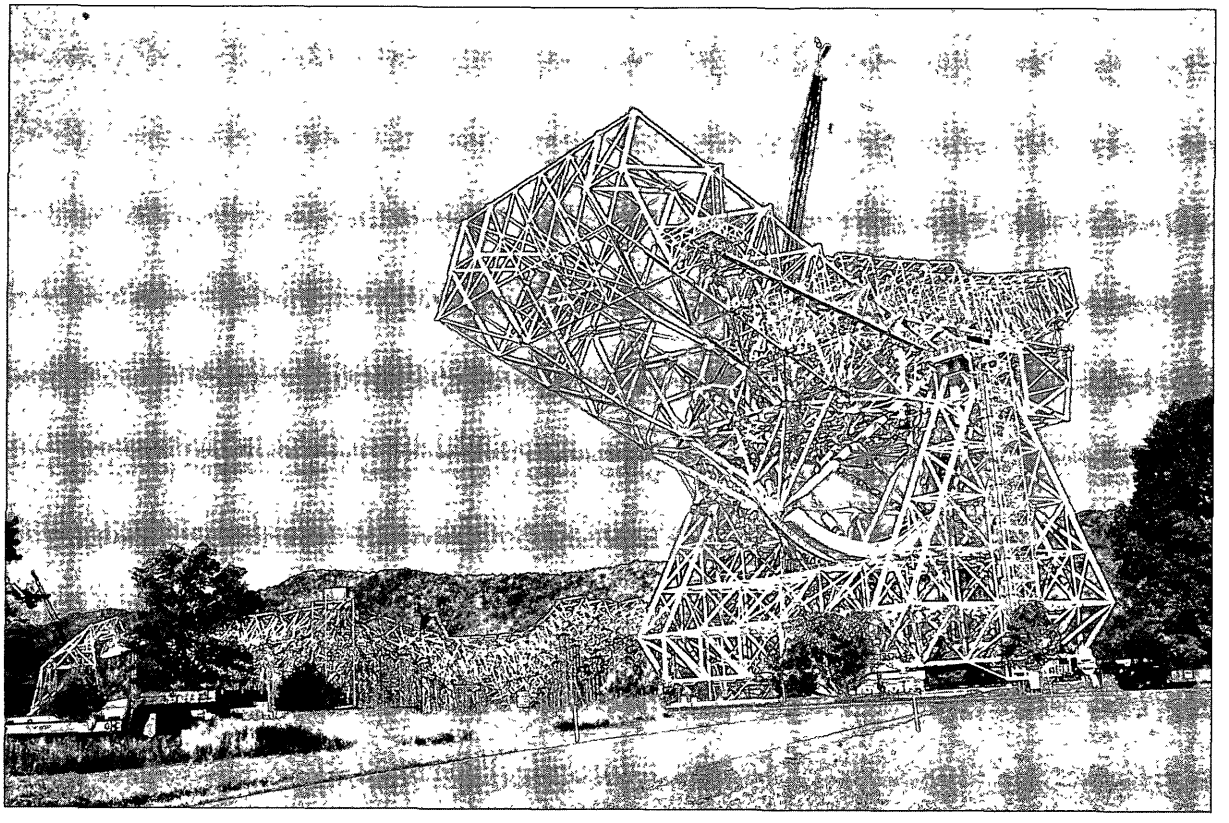
The Contractor has brought in additional heavy lifting equipment to reposition the 11 modules on the left side of the BUS because they are out of range of the main tower derrick. Individual modules will be sequentially placed at the base of the main derrick; the surface panel support actuators will be installed; and the module will then be lifted and placed on the box structure. Modules vary in weight between 25 tons and 74 tons, the rigging used for lifting weighs an additional 40 tons, making the heaviest lift 114 tons. As the modules are placed on the structure, the 1,072 interconnecting beams between the modules will be reinstalled for both stability and accurate positioning of neighboring units. Completion of the reflector BUS is scheduled for mid 1998.

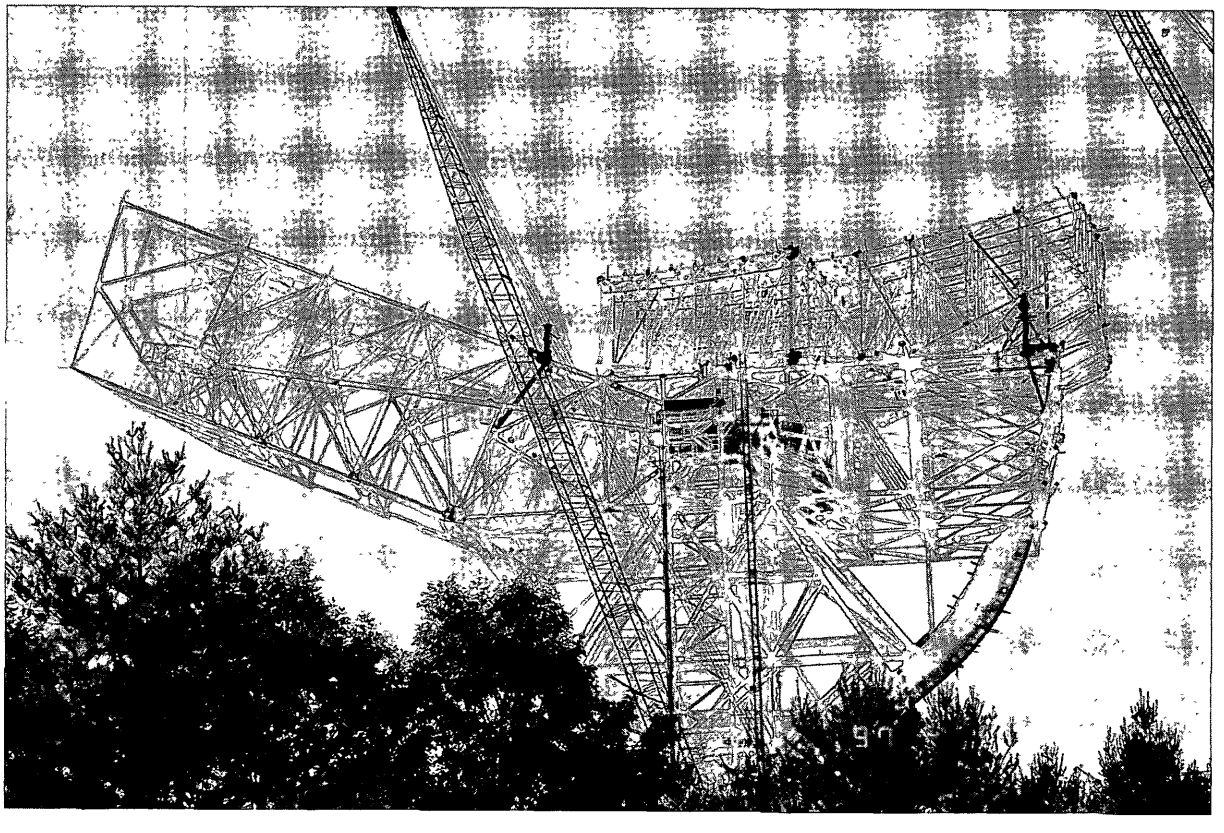
The upper 60-foot portion of the Feed Arm was trial erected at the site including the deployable prime focus boom, the prime focus rotation mount, the subreflector, and the subreflector adjustment mechanism. The feed/receiver room has been located nearby with the secondary focus feed turret in its roof. The Feed Arm servo, which controls all of the above equipment, has been installed and tested along with some of the NRAO monitor and control hardware. Photogrammetric setting of the subreflector surface and calibration of the six subreflector "Stewart platform" actuators remains to be done. These calibrations will be made by the fall of 1997.

The 200-foot dual tower section of the vertical Feed Arm was trial erected at the Contractor's fabrication plant in Mexia, Texas. It has been disassembled and shipped to the Green Bank site where final assembly will begin mid October 1997. It is scheduled for erection after the BUS is in place. At that time it will be installed on the structure along with the upper 60-foot tip of the Feed Arm.

The 2,004 main reflector panels are now in production at the Contractor's plant. Installation and alignment of the surface is scheduled for late summer of 1998.

R.D. Hall





CONSTRUCTION PROGRESS OF THE GREEN BANK TELESCOPE (GBT)

Phoenix Receiver and Signal Processor Available at Green Bank

Since October of 1996, SETI observations have been conducted using the NRAO 140 Foot Telescope in Green Bank. An innovative wideband, prime focus receiver, OMT, and a pair of corrugated feed horns cover the 1 - 3 GHz frequency range, providing a value of $\eta_{eff}/T_{sys} > 0.2\ K^{-1}$ and dual circular polarization accessible at 590 MHz as a 300 MHz wide IF. The Phoenix signal processing backend routinely provides 20 MHz, dual polarization power spectra with resolution of 0.67 Hz every 1.4 seconds and a 643 Hz resolution time-averaged spectra every 14 seconds. While the full bandwidth can be written to storage at 643 Hz resolution, only 2 subbands of width 643 Hz can be stored at the full resolution.

Observing proposals making use of the Phoenix receiver are welcomed as part of the normal 140 Foot proposal process. Observers wishing to use the Phoenix backend should arrange collaboration with one of the Phoenix scientific staff prior to proposing to Green Bank to insure that this non-standard processor is capable of producing the desired scientific results.

Jill Tarter, Director, Project Phoenix

Receivers at the 140 Foot Telescope

In August the 4-6 GHz receiver newly-built for the GBT was installed at the Cassegrain focus of the 140 Foot replacing the 12-15.4 GHz GBT system. This receiver is equipped with a local oscillator for VLBI, and will allow much more flexible scheduling of VLBI observations, particularly those involving HALCA.

The following table summarizes the receivers that will be available on the 140 Foot Telescope through 1998.

Prime Focus	Cassegrain Focus
50-500 MHz	3.95-5.85 GHz (only for VLBI)
300-1000 MHz	8-10 GHz
6/25 cm	18-22 GHz
1.3-1.8 GHz	22-26.5 GHz
2-5 GHz	

More details can be found on the Green Bank web page. Please note that the 12-15.4 GHz and 26-36 GHz receivers will not be in use during 1998.

D.S. Balser

140 Foot Telescope Data Archive

The data archive for the 140 Foot Telescope currently goes back to early 1992. Over the last few months, the approximately 250 nine-track and 170 Exabyte tapes that make up the archive have been copied to 25 compact disks. This was done in order to better preserve the data as well as to reduce the necessary storage requirements. The archive was also copied to a second set of CDs in the off chance a CD was ever to be damaged. Even though some of the original tapes had already deteriorated, we were able to copy to CD more than 95 percent of the data. Hanna Smith, a 1997 graduate of Pocahontas County High School, and Don Nelson, a 140 Foot Telescope operator, deserve our thanks for their dedication in completing an often frustrating task.

Since the format of the data on the CD is equivalent to the original Modcomp telescope tape format (see the 140 Foot manual or the UniPops cookbook for a description of the format), one simply uses the UniPops cvt.disk-disk routine to read the data off the CD. Each CD contains additional files that either summarize the contents of the CD or log every observation on the CD. The CD also contains data base files that can be read by most commercial spreadsheet and data base programs. Anyone who uses the data base files can query the contents of the archive for observations that meet a very wide range of selection criteria (see the July 1995 Newsletter for an article describing archive data base).

R.J. Maddalena and B. Vance

140 Foot Telescope Proposal Deadline

As announced in the previous Newsletter, the 140 Foot Telescope will continue normal operations throughout 1998. There will be two deadlines for receipt of proposals to use the telescope during this period: 3 November 1997, and 30 March 1998. Successful proposals received by the November deadline will generally be scheduled during the first half of 1998. Proposal cover sheets as well as information on the telescope and its capabilities can be retrieved from the NRAO WWW site: http://info.gb.nrao.edu.

F.J. Lockman

VLBA/VLBI

Space VLBI: VSOP In-Orbit Checkout at the AOC

After detecting the VSOP mission's first VLBA-format fringes to the HALCA spacecraft and producing the first Space VLBI images in mid-June, NRAO Space VLBI Project personnel have been immersed in the in-orbit checkout (IOC) phase of the mission. A total of 16 observations has been processed at the VLBA correlator, comprising 30 partially or completely successful tracking passes and 112 hours of Space VLBI observing. (Two complete observations, and a total of 19 tracking passes either known to have failed, or searched unsuccessfully, were not correlated.) In the process, the first fringes recorded in VLBA format were detected via the tracking stations at Green Bank (6/12), Goldstone (7/8), Usuda (7/10), Tidbinbilla (9/15), and Robledo (9/25).

A major emphasis at the correlator has been completion of the operational procedures for fetching and managing the many externally-generated files necessary for correlation of VSOP observations. A few functions already have been turned over to VLBA operations. Several minor bugs also were discovered, and corrected, in the correlator's Space VLBI software, principally in the computation of the projected baseline coordinates included in every output data record. The correlator's ground-based performance was not affected by these bugs in any way, nor was the wavefront model used in Space VLBI correlation.

The VLBA correlator has also provided extensive feedback to other mission elements, principally the tracking stations, to facilitate their development of high-quality recording, and complete, accurate logs and time corrections. All these will be essential for efficient correlation, and to limit output datasets to reasonable volumes. All five tracking stations are producing excellent recordings on thin tape, although a few miscalibrated capstans remain. On the other hand, time corrections – the Space VLBI equivalent of a ground telescope's slowly and linearly varying clock offset, but allowing for large and potentially rapid variations – have turned out to be particularly difficult to implement properly, with corrections for many effects being addressed only recently. The objective is for the time corrections to leave residual delays not much larger than the 50 - 100 nanoseconds typical of ground-based VLBA observations. At present, a variety of constant offsets, glitches, oscillations, and incomplete files persist. Usable time corrections have been produced for only three of the five tracking stations, and for only two of these in multiple observations.

With early, albeit partial datasets available, it has become possible to begin exercising the new AIPS tasks developed principally for Space VLBI applications with real data for the first time. The Space VLBI material in the AIPS Cookbook chapter on VLBI has been thoroughly revised and expanded. A "VSOP Data Reduction" email exploder, vdr@aoc.nrao.edu, has been established.

The VSOP International Scientific Council (VISC) decided at its meeting in August to bring the IOC phase to a close and begin General Observing Time (GOT). Three observations already have been released to the Principal Investigators, and several more are pending. A large increase in observing rate has begun with the September European VLBI Network session, and is scheduled to continue and expand subsequently.

Users receiving VSOP datasets, and based at U.S. institutions, may wish to take advantage of the NASA-funded Space VLBI User Support facility at the AOC. The Silicon Graphics computing facility purchased for this purpose was described in NRAO Newsletter No. 71. At least one of the two front-end workstations will be available for users coming to Socorro to analyze VSOP observations, and may be requested just by indicating data type "VSOP" on the NRAO/Socorro Visitor Registration form. For a limited period, the NRAO Space VLBI Project also will pay the $150 deductible of the NSF-sponsored transportation reimbursement.

Current information on VSOP observations scheduled to be processed at the VLBA correlator is available on the NRAO Space VLBI Project web pages, accessible under "Major Initiatives" on the NRAO home page.

J.D. Romney

HALCA News

Space VLBI observations are becoming routine in Green Bank. We have now successfully found fringes between VSOP/HALCA and the 140 Foot Telescope, via the Green Bank Tracking Station at both L and C bands. The fringes have been detected at both the VLBA correlator in Socorro New Mexico and at the Canadian S2 Correlator in Penticton, Canada.

G.I. Langston

VLBI Network Call For Proposals

Proposals for VLBI Global network observing are handled by the NRAO. Global network sessions currently planned are:

Date	Bands	Proposals Due
03 Nov to 27 Nov 1997	1.3 cm, 6 cm, 18 cm, 3.6/13 cm	02 Jun 1997
11 Feb to 04 Mar 1998	1.3 cm, 6 cm, 18 cm, other?	01 Oct 1997
27 May to 10 Jun 1998	1.3 cm?, 6 cm, 18 cm, 3.6 cm?	01 Oct 1997
09 Sep to 30 Sep 1998	1.3 cm?, 6 cm, 18 cm, other?	02 Feb 1998
11 Nov to 02 Dec 1998	1.3 cm?, 6 cm, 18 cm, 3.6 cm?	01 Jun 1998

It is expected that European VLBI observing during the next year will be dominated by observations with the VSOP satellite.

It is recommended that proposers use a standard cover sheet for their VLBI proposals. Fill-in-the-blanks TeX files are available by anonymous ftp from ftp.cv.nrao.edu, directory proposal or via the VLBA home page on the web. Printed forms, for filling in by typewriter, are available on request from Betty Trujillo, AOC, Socorro.

Any proposal requesting NRAO antennas and antennas from two or more institutions in the European VLBI network constitutes a Global proposal. Global proposals MUST reach *both* Network's Schedulers on or before the proposal deadline date; allow sufficient time for mailing. In general, fax submissions of Global proposals will not be accepted. Proposals requesting use of the Socorro correlator must be sent to NRAO even if they do not request the use of NRAO antennas; proposals for the use of the Bonn correlator must be sent to the MPIfR even if they do not request the use of any EVN antennas. For Global proposals, or those to the EVN alone, send proposals to:

R. Schwartz
Max Planck Institut fur Radioastronomie
Auf dem Hugel 69
D 53121 Bonn, Germany

For proposals to the VLBA, or Global network proposals, send proposals to:

Director
National Radio Astronomy Observatory
520 Edgemont Road
Charlottesville, VA 22903-2475
USA.

Proposals also may be submitted electronically, in Adobe Postscript format, to proposevn@hp.mpifr-bonn.mpg.de or propsoc@nrao.edu, respectively. Care should be taken to ensure that the Postscript files request the proper paper size.

B.G. Clark

VLA

Changes to the 90 cm (P band) Default Frequencies

Due to strong and ever-present RFI at 332.7 MHz from an instrument landing system (ILS) at the Albuquerque airport, on September 10, 1997, we changed the default frequency setups for P-Band in Observe and in the on-line system. The BD IF is now set to a center frequency of 321.5625 MHz, chosen to eliminate aliasing from a birdie at 320 MHz. The AC IF has been left at 327.5 MHz which seems to be in a relatively clean part of the spectrum. As before, the default bandwidths are 3.125 MHz. New and improved plots of the spectrum from 300-350 MHz are available on the web at http://info.aoc.nrao.edu/doc/vla/html/rfi.shtml. All P band users are encouraged to consult these plots, especially if they desire to use non-standard frequencies. In Observe, the P band defaults now invoke spectral line mode 4. Spectral line mode allows for RFI to be more easily removed with less loss of data. Note, however, that in the few instances where linear polarization information is desired, correlator mode 4 cannot be used and the spectrapolarimetry mode PA is recommended. For those who don't use Observe, a band designation of PP given to the on-line system invokes the new defaults, but in continuum mode unless otherwise specified. The defaults for simultaneous 20 and 90 cm observing (designated LP), and simultaneous 90 cm and 4 m observing (designated 4P), have been modified to employ the 327.5 MHz window instead of the old 333 MHz window.

G.B. Taylor

Site Testing Interferometer

The NRAO site testing interferometer (STIfR) is now operational at the VLA, and software has been installed for real-time monitoring of the phase stability (special thanks to Tom Folkers, NRAO, Tucson). The STIfR is a device that measures the tropospheric contribution to the interferometric phase using an interferometer composed of two 1.5 m dishes separated by 300 m, observing an 11 GHz beacon from a geostationary satellite (Radford, Reiland, and Shillue 1996, PASP, 108, 441).

The STIfR measures a time series of phases with an averaging time of 1 s. The real-time analysis software accesses a 600 s time series of phases and generates a temporal root phase structure function from the data, corresponding to the root mean square (rms) of the phase differences as a function of lag-time for lags from 1 s to 300 s (Holdaway, Radford, Owen, and Foster 1995, MMA Memo Series). The software then fits for: (i) the power-law index, α, for short lags, (ii) the constant "saturation rms," ϕ_{sat}, for long lags, and (iii) the "corner time," t_{corn}, corresponding to the intersection of the powerlaw and the constant (saturation) functions. The corner time corresponds roughly to the time required for a parcel of troposphere to cross the length of the interferometer baseline. These standard data products can be used to estimate the calibration cycle time necessary to achieve the desired residual rms phase noise at a given VLA observing frequency in the case of fast-switching phase calibration (Carilli, Holdaway, and Sowinski 1996, VLA Scientific Memo Series), or the coherence in a given averaging time in the case of self-calibration.

As an example, typical values for the standard data products from the STIfR at the VLA under good weather conditions are: $t_{corn} = 20$ s, $\alpha = 0.7$, and $\phi_{sat} = 3°$. These conditions are the norm on fall and winter nights. Under these conditions, a Fast Switching phase calibration cycle time of 50 s should result in residual rms phase variations of 10° at 43 GHz, thereby limiting the image dynamic range to about 100. Under poor weather conditions (summer days), the value of ϕ_{sat} can increase to 10° or more.

The data from the STIfR are meant to be used for semi-real-time decision making by the user when observing with the VLA at high frequency. The data can be accessed via the NRAO web page at URL: http://www.nrao.edu/vla/html/PhaseMonitor.html.

The web software produces a series of X-windows plots on the user's workstation showing the current root phase structure function plus fit, a 24 hour running history of the standard data products from the STIfR, and a histogram of the rms phase stability over the last 24-hours, with current conditions high-lighted. There also is a window showing a 24 hour running history of data from the VLA weather station, including barometric pressure, temperature, dew point, and surface wind speed. The web page also has a series of help files explaining the various windows, and providing equations for converting the STIfR standard data products into VLA observing requirements.

The STIfR system for real-time monitoring of VLA observing conditions is currently experimental. Suggestions on how to improve the implementation are welcome.

C.L. Carilli, A.L. Roy, and G.B. Petencin

AOC Computing Status

After filling several vacancies, the Computer Operations Department is fully staffed again. As a result, there is excellent progress on the VLA archive project. Earlier this summer, the correction of missing antenna files for the years 1976 to 1982 was completed, and work has started on the remainder of the VLA archive project for the years 1985 to 1987. We intend to finish this project in the course of 1998, by which time the complete VLA archive will be available on 8 mm Exabyte tape, and the complete catalog of observations will be accessible on the web. Sometime before then, we will examine various possibilities (e.g., optical storage, DVD) as a possible future medium for the VLA (and possibly VLBA) archive.

During July and August, 23 new SPARC Ultra 1/170 workstations were installed on staff desktops at the AOC. The systems which were replaced, mostly SPARCstation IPXs, were in turn trickled down to staff with slower systems. In total, 60 upgrades were done, and the 23 trade-ins were all SPARCstation 1's and old IPCs. The Sun at the VLA site used for near-real-time observing and data reduction was upgraded from a SPARC 2 to a SPARC 20, with vastly improved performance. All the Suns at the VLA site now are running Solaris 2.5.1, as are the majority of systems at the AOC. All of the AOC systems reservable by visitors now are either dual-processor SPARC 20s or Ultras.

Wiring of the AOC for switched Ethernet is complete. Testing during the summer revealed that we will have to migrate all the systems on a given subnet at once, rather than individually, as we had hoped. As a result, the move was delayed until after all workstation upgrades were completed. We expect to begin this move in September; since it requires considerable coordination with staff, it probably will take a couple of months before all AOC workstation subnets are connected to switched Ethernet.

G. A. van Moorsel

VLA Configuration Schedule

Configuration	Starting Date	Ending date	Proposal Deadline
DnC	03 Oct 1997	27 Oct 1997	2 Jun 1997
D	31 Oct 1997	01 Feb 1998	2 Jun 1997
A	19 Feb 1998	01 Jun 1998	1 Oct 1997
BnA	12 Jun 1998	29 Jun 1998	2 Feb 1998
B	03 Jul 1998	21 Sep 1998	2 Feb 1998
CnB	02 Oct 1998	19 Oct 1998	1 Jun 1998
C	23 Oct 1998	11 Jan 1999	1 Jun 1999

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) and extreme northern sources (north of about 80 degrees declination).

Approximate Long-Term Schedule

	Q1	Q2	Q3	Q4
1997	B	B,C	C	D
1998	D,A	A	B	C
1999	D	D,A	A	B
2000	C	C,D	D	A
2001	B	B,C	C	D

Observers should note that some types of observations are significantly more difficult in daytime than at nightime. These include observations at 327 MHz (solar and other interference; disturbed ionosphere, especially at dawn), line observations at 18 and 21 cm (solar interference), polarization measurements at L band (uncertainty in ionospheric rotation measure), and observations at 2 cm and shorter wavelengths in B and A configurations (tropospheric phase variations, especially in summer). They should defer such observations for a configuration cycle to avoid such problems. In 1998, the A configuration daytime will be about 0^h RA and the B configuration daytime will be about 8^h RA.

Time will be allocated for the VLBA on intervals approximately corresponding to the VLA configurations, from those proposals in hand at the corresponding VLA proposal deadline. Increasing amounts of VLBA observing time will be devoted to observations with the HALCA long-baseline interferometry satellite, approaching a long term average of about 30 percent of VLBA observations devoted to space VLBI.

Any proposal requesting NRAO antennas and antennas from two or more institutions affiliated with the European VLBI network is a global proposal, and must be sent to the EVN scheduler as well as to the NRAO. VLBA proposals requesting only one EVN antenna, or requesting unaffiliated antennas, are handled on a bilateral basis; the proposal should be sent both to NRAO and to the operating institution of the other antenna requested. Coordination of observations with non-NRAO antennas, other than members of the EVN and the DSN, is the responsibility of the proposer.

B.G. Clark

NRAO to Develop a Fiber Optic Link between the VLA and Pie Town

The National Science Foundation (NSF) announced September 9, 1997, that it has awarded funds to the National Radio Astronomy Observatory (NRAO) sufficient to permit the VLBA antenna at Pie Town, New Mexico, to be connected to the VLA. The NSF award is for $466,000, and the project will take three years to complete.

In February of this year, the NRAO submitted a proposal to the NSF under the Major Research Instrumentation (MRI) program to develop a fiber optic link between the VLA and the VLBA's Pie Town (PT) antenna, with a goal of doubling the VLA's resolution.

The funding of this proposal will enable the Observatory to take advantage of two very fortuitous, but non-accidental, situations: The VLBA's Pie Town antenna is located 35 km from the closest VLA antenna—exactly the diameter of the VLA's 'A' configuration, and a fiber optic line belonging to the Western New Mexico Telephone Company already joins the VLA's control room to the PT antenna. Thus, the most expensive components of such a long-line interferometer are already in place.

When completed, this link will enable operation of the PT antenna as if it were a VLA antenna, doubling the resolution of the array, while maintaining its total sensitivity. For northern objects, (declinations north of 50 degrees), the u-v coverage, and synthesized beam characteristics will be excellent. For objects south of this, the beam becomes increasingly elliptical (with the high resolution axis lying in a SE–NW line) with decreasing declination. The goal will be to provide the full current bandwidth, and possibly up to the proposed increase to 70 MHz per IF channel.

The success of this proposal is due to the hard work of many individuals. I'd like to thank Alan Bridle for his efforts on behalf of the science justification section, the technical group at the AOC, led by Dick Sramek, for their efforts on behalf of the technical sections, and Billie Rodriguez and The Director's Office for their considerable efforts in putting everything together in time for submission.

R.A. Perley

NRAO 1998 Synthesis Imaging Summer School

The Sixth Summer School in Synthesis Imaging will take place from June 17 (Wednesday) through June 23 (Tuesday) of 1998. The summer school will be hosted by NRAO and New Mexico Tech and held in the new Workman center on the Tech campus in Socorro, New Mexico. Data reduction tutorials on June 20 at the Array Operations Center (AOC) will allow attendees to get "hands-on" experience with data calibration and imaging for both VLA and VLBA data. NRAO scientific staff will be available at the AOC to aid and advise participants. A tour of the VLA site will be given on June 21.

The Summer School will cover all basic aspects of radio interferometry, including both connected element (e.g., the VLA) and Very Long Baseline interferometers (e.g., the VLBA). Lectures will be given by the NRAO staff, faculty from New Mexico Tech, Harvard, Univ. of Chicago, and Caltech, and by staff members of other observatories around the world. The range of subjects will be similar to past Summer Schools, and can be reviewed by consulting "Synthesis Imaging in Radio Astronomy," the published collection of lectures from the 3rd NRAO Synthesis Imaging Summer School (ASP Conference Series, Volume 6, 1989). The lectures will be given at a level appropriate for graduate students in astrophysics. There will be ample time for questions and discussion following each lecture. Copies of the lectures from the 1998 Summer School will be distributed to attendees in Socorro and collected and published by the Astronomical Society of the Pacific following the school.

There will be no limit on attendance. A fee of $45 will be assessed, sufficient only to cover our local expenses. No financial assistance will be possible. The registration fee will include transportation between Socorro and Albuquerque airport on June 16, and on June 24 or 25, daily transportation to/from hotels, and a tour of the VLA on June 21. A summer school dinner, held outdoors on the New Mexico Tech Campus on Friday evening also is included in the registration fee.

Rooms will be blocked out at Socorro motels for the school, and information on these motels will be sent to participants in a general mailing in February of 1998. The daily cost of a single room currently ranges from $22-$55 and sharing a double room from $16-$30 per person. Motel registration will be the responsibility of the attendees.

To indicate your interest in attending the summer school, please register electronically by directing your web browser to http://www.nrao.edu/~gtaylor/ synth98.html, and following the directions for electronic registration. More information about the meeting, hotel accommodations, and the town of Socorro is available from the web page. You also may register by filling out the accompanying registration form, and mailing it by April 1, 1998 to: Terry Romero, NRAO, P.O. Box 0, Socorro, NM 87801.

G.B. Taylor and C.L. Carilli

Sixth Synthesis Imaging Summer School
Socorro, New Mexico
June 17-23, 1998

Please return by April 1, 1998 to:

Mail: Terry Romero
National Radio Astronomy Observatory
P.O. Box 0
Socorro, NM 87801

-or-

Fax: 505-835-7027
E-Mail: tromero@nrao.edu

Do not send money with this form; invoices will be included in a future mailing to participants. If there are any subjects you wish to have discussed, please list them or E-Mail to: <gtaylor@aoc.nrao.edu>

Name: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

If your address during April/May, 1998 is different than above, please indicate that address along with applicable dates.

Check one:

( ) I definitely plan to attend
( ) I hope to attend and will confirm later

Please indicate your professional level:

( ) Undergraduate
( ) Graduate Student
( ) Postdoctoral
( ) Faculty
( ) Scientific or Engineering Staff
( ) Other

Have you observed with:

VLA ( ) Yes ( ) No
VLBA ( ) Yes ( ) No

Completed 74 MHz System on VLA Available for Trial Observing

Last month, an announcement was sent via email to announce the availability of a trial 74 MHz system on all twenty-seven VLA antennas for the upcoming A configuration. At least twenty proposals have been submitted in response to that announcement. The purpose of this note is to update the information provided in the email announcement in the light of further tests.

Funding for this initiative has been provided by the Naval Research Lab. Namir Kassim was instrumental in obtaining this grant. Bill Erickson designed the new receivers, and both Namir and Bill have spent much time at the NRL and at the VLA in building, checking, installing, and testing these new systems. We are very grateful for the time and effort contributed by Bill and Namir to this project.

By early October, fifteen antennas were outfitted, enabling detailing imaging with the CnD array. Long observations were scheduled for three objects—Perseus A, W51, and the Sun. The data quality is extremely good—calibration is very straightforward with such short baselines—but the internally generated RFI is a severe problem which we now are addressing. We will require new software to better identify and remove these unwanted correlations. Only a few percent of the spectral channels are affected—but efficiently identifying and removing these is very laborious when done by hand. Fortunately, this RFI is not expected to be a severe problem in the A and B configurations.

The full installation plan remains the same as announced earlier—the full complement of 27 receivers and dipoles will be installed by late January for the A configuration. The dipoles will be removed when all scheduled observations are completed.

Observers interested in using this system in other configurations are encouraged to apply for time. If there is sufficient demand, the dipoles may be re-mounted near the end of the scheduled B configuration time, in order to permit B and C configuration observing.

Our new data have not yet been reduced sufficiently to give further information on system sensitivity. We are sure that a 12 hour observation will result in an rms noise less than 100 mJy. It probably is optimistic to believe that a sensitivity better than 20 mJy can be achieved.

The resolution of the array at this frequency in the B and C configurations is about 75 and 250 arcseconds, respectively. The useable bandwidth is limited to 1.6 MHz by the front-end filters, and it is strongly recommended that observations be taken in spectral line mode to permit calibration of instrumental delays and removal of any RFI. Calibration of data from the B and C configurations is not expected to be very difficult, especially the latter.

If you have any questions, please contact me by telephone (505-835-7312) or by email (rperley@ nrao.edu).

R.A. Perley

12 METER

12 Meter Participation in the Mars Global Surveyor Mission

Mars Global Surveyor (MGS), which entered Mars orbit on September 12, 1997, is an orbiter mission which will conduct, among other things, the first global mapping of the surface mineralogy and elevations, magnetic field measurements, and high/medium resolution imaging. During the next three months, Todd Clancy of the Space Science Institute and Brad Sandor of JPL will conduct observations of the martian CO absorption using the 12 Meter Telescope which are being used to provide atmospheric sounding measurements of the martian atmosphere in support of the aerobraking maneuvers of the MGS orbiter. During these aerobraking maneuvers, MGS will dip into the upper atmosphere of Mars in order to circularize it's orbit for mapping operations. Because the three month aerobraking phase of MGS coincides with the global dust storm season on Mars, it is important to obtain real-time characterizations of the Mars atmosphere during this period.

12 Meter observations of the martian atmospheric CO absorption provide measurements of the dust heating of the lower martian atmosphere (0-50 km). These measurements will provide early warning to associated changes in the atmospheric densities to be encountered by the MGS orbiter. For example, the 12 Meter observations from September 12-21 showed cold, dust free atmospheric conditions for the Mars atmosphere as MGS entered orbit. However, they also indicated a significant trend of increasing atmospheric temperatures up to September 21, which points to increasing dust loading of the lower atmosphere. This inferred increase in the martian atmospheric dust loading was consistent with the increased atmospheric density experienced by the MGS orbiter as it made its first aerobraking maneuver. Since observations of the martian atmosphere are being taken every three days at the 12 Meter, it will soon be possible to determine whether the current dust behavior is a short-term phenomenon such as observed during the March-July period, or is the beginning of truly global dust storm activity on Mars.

J.G. Mangum

Improvements to the 12 Meter Telescope

During the 1997 summer shutdown period, the following improvements were made to the 12 Meter system:

(1) New UPS system. Two Franlin UPS systems were installed this summer replacing the Atlas UPS system. These new UPS systems have larger capacity than the old system and have been installed in parallel for greater reliability. A modern lightning arresting system was installed to protect the new UPS system. These additions will help minimize observing downtime from power related failures.

(2) New low-noise mixers for the 68-90 GHz system. These new mixers yield approximately ten percent better system temperatures. At 90 GHz, the performance of these new 68-90 GHz mixers is the same as that of the mixers for the 90-116 GHz band.

(3) New analysis computer and operating system. A Sparc Ultra II dual-processor workstation (called modelo) is now the observer's main computer. We have also "upgraded" all workstations to Solaris.

(4) New central selection mirror and vane servos. The central selection mirror and hot load vane have new servo systems. These new servos should be faster and more reliable. The speed and accuracy of the central selection mirror servo system has shortened the time to switch from one receiver to another to less than 5 seconds, which will allow easier cross-correlation between pointing with the various 12 Meter receivers. For example, we are investigating the possibility of using pointing measurements at 3 mm to predict the pointing offsets for the 1 mm systems.

(5) New central cold load system. The central selection mirror has been equipped with a cold-load system which we will use to conduct more accurate receiver tuning and monitoring of the receiver temperatures. Since we will no longer need to use the sky as a cold load for tuning, the biggest immediate advantage of this new central cold load system will be in the tuning of the 1 mm receivers. We are also investigating the possibility of using this central cold load system for an improved antenna temperature calibration scheme.

(6) New digital phase lock for 2/3 mm receiver. Two new digital phase lock boxes (dplb) have been installed in the 2/3 mm receiver. These new lock boxes will allow for easier phase locking of these receivers and frequency switch throws as large as ±35 MHz. All of the 12 Meter receivers will eventually be outfitted with new dplb systems.

(7) New filter bank switcher. An electronic filter bank switcher system has been installed. It is now no longer necessary to move the multi-pin connectors which feed the filter banks, improving the reliability of these backends and minimizing the number of bad channels in these spectrometers.

(8) On-line CLASS data converter. The uni2class UniPOPS-to-CLASS data format converter is now integrated into the control system. All scans except continuum and OTF measurements are automatically converted to CLASS format and put in a file called class.12m in the observer's directory. The usual SDD-format data files which we have used for several years continue to be written, with no change. Although writing data simultaneously in both data formats does take more disk space, this is not a significant overhead.

(9) NRAO Tucson home page. We have revised the NRAO Tucson home page. New and updated information has been added to this site, including the ability to access our historical tipper data archive.

(10) User's manual update. The 12 Meter User's Manual has been revised. In addition to some minor rearranging, the continuum and spectral line observing sections have been rewritten and several new appendices have been added. Comments on this document are appreciated.

J.G. Mangum and D.T. Emerson for the Tucson Staff

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