

NRAO User's Committee Report 2002

Introduction: Executive Summary

The Committee was very impressed at the May 2002 User's Committee Meeting with the depth and breadth of work that the Observatory has done in the past year. Morale at the Observatory seems higher than it has for some time, and is surely related to the funding success of projects such as the EVLA and ALMA, and the impressive commissioning work of the GBT. We were saddened that Paul VandenBout was unable to be at this User's Committee meeting, but understand that he was hard at work on issues related to ALMA, and we appreciate that Bob Brown stepped in to take his place. However, we note that the President's FY2003 budget, operating funds are down \$800,000, which has caused a hiring freeze, and impeded progress on several projects. We hope that the final budget approved by Congress will be at FY2002 levels or greater.

We would like to pause in this report to reflect upon Paul's impressive record of leadership over the past seventeen years. Under his watch, the National Radio Astronomy Observatory has continued to thrive and grow, and two of the world's premier radio telescopes, the Very Long Baseline Array and the Green Bank Telescope, were commissioned. We, the committee, would like to express our profound appreciation for the work that Paul has done to insure that the great discoveries in astronomy in the coming decades will continue to include those made at radio frequencies, and that all radio astronomers in the country and the world, no matter their institutional affiliation, will have equal access to the some of the finest radio telescopes in the world. Perhaps most importantly, his tireless efforts on behalf of ALMA are one of the primary reasons that construction of this world-class instrument is now underway. His enthusiasm, intelligence and leadership truly have made NRAO a better place.

As we have in past years, we include in this introductory section a list of highlights in the full report that follows. The sections are in no particular order, but cover the topics presented to the Committee on May 20-21, 2002. We must say that the entire committee was impressed by the quality of the presentations, although as in past years, we would have liked to have slightly less time devoted to formal presentations, and more time reserved for informal question and answer.

HIGHLIGHTS

- The Committee is happy with the transition plan to the new EVLA correlator, which appears to minimize as much as possible the "down time" of the telescope for current users.

- We hope that as ALMA moves closer to operations, the Observatory will extend its Open Skies policy to this new and impressive instrument
- We are pleased that the transition plan to the EVLA is being coordinated closely with current VLA staff, and that the VLA continues to be such a productive instrument. We particularly feel that the linked proposal process recommended has the potential to increase "usership" of Observatory telescopes.
- While the Committee understands the benefits of the E2E project, we are concerned that a project of this scope has the potential to become a drain on already strained resources. We heartily endorse the "three important principles" for the E2E project: (1) keep it simple, (2) reuse as much as possible, and (3) deliver new capabilities soon and often.
- We applaud the Observatory's efforts to increase awareness of the VLBA in both the astronomical community and the general public through improved public relations and EPO programs.
- From all the Committee has heard, it seems likely that the GBT will meet or exceed its design goals and become a productive scientific instrument for the future.
- The Committee feels that acceleration of the maturation of AIPS++, though not at the expense of other key software efforts at NRAO, is of considerable importance to the user community. We were concerned at the level of problems being experienced even with the single dish applications in AIPS++.
- It is vital that the NRAO AIPS++ User's Group (NAUG) be independent of the AIPS++ development group to maximize its effectiveness, and to maintain an ability to supply critical assessment of the software.
- The committee endorses the proposed program for joint Chandra-VLA/VLBA observing proposals, as described in the report to the committee.
- The committee was extremely pleased with the progress made in a number of EPO areas in the last year and applauds the NRAO staff members who dedicated themselves to improving the EPO efforts of the observatory.

1. EVLA

The Users Committee considered reports on the VLA Expansion project, which is now broken into two stages of work, EVLA I and EVLA II. Overall, the VLA expansion has a very high priority for all VLA users. We applaud the progress the NRAO staff has made over the past year, and we strongly support their efforts to secure funding to complete the job. We note that the EVLA project was highly ranked by the most recent decadal review. Thus, the scientific importance of the project has been recognized by the entire US astronomical community. Since the schedule of EVLA does not lag too far behind ALMA, we encourage the development of software for EVLA data that will be ready when the instrument comes on line.

EVLA I

Almost all aspects of this project have been through preliminary design review, and they are well on track for a prototype system to be installed on one VLA antenna starting in mid 2003. These include new feeds and receivers which will give continuous frequency coverage from 1 to 50 GHz, a new LO system, a new fiber optic transmission system, a new IF system, new telescope control and monitoring hardware and software, and a new correlator. The last item is to be constructed by the Herzberg Institute of Astrophysics, which is the Canadian partner institution in the EVLA project. All of this hardware development seems to be advancing on schedule and with good promise for successful integration.

The committee is particularly gratified to note that the transition plan for installation of the new correlator now provides for astronomical observations to continue with no major interruptions during this period (expected to cover the years 2006 - 2009). We note that The EVLA plan requires significantly more funds in early years of the project in order to have, for example, enough antennas retrofitted before the new correlator comes on line. The NSB plan gives relatively constant funding over the project, which will ultimately reduce the quality of the instrument that NRAO gets for the money.

EVLA II

The second stage of the VLA expansion project has not yet been funded by the NSF. We hope that the NRAO will be successful in funding the expansion of EVLA capabilities once Phase I is underway. The Committee recognizes that there is considerable disagreement within the community as to the importance of various aspects of the Phase II proposal as currently outlined, and we would hope that at next year's meeting, we might have a more thorough presentation/discussion of the Phase II plans.

Two questions arose in the Users Committee discussion of the

EVLA II plans. We do not have answers for these, but we hope there will be careful consideration of these issues over the coming year.

The first is the possibility of speeding up the construction of the E array stations. Although this is nominally part of EVLA II, it is relatively inexpensive and technically routine, so it might be possible to begin early on this portion of the project. The other part of EVLA II, the New Mexico Array, is so much larger and more complicated both technically and managerially, that it may take several years before work on it can begin. We would hate to see construction of the E array delayed just because it has been grouped with the New Mexico Array as part of EVLA II. The scientific capabilities that the E array will bring strongly justify its construction at the earliest possible time.

The second question relating to EVLA II is its overlap with technology development for the Square Kilometer Array. The US radio astronomy community has undertaken to design and prototype the "Large N" concept for the design of this future international project. The EVLA II project could be an opportunity for the NRAO to take a leadership position in this effort, and to devise solutions to some of the many technical problems that are still unsolved. The justification for the EVLA II proposal might be strengthened through this connection to an ambitious future international effort.

2. ALMA

The committee is excited that US funding for the first year of ALMA construction has been approved, and that the US funding profile for years 2003 and beyond will be included in the FY2003 budget request. This is a major milestone for the ALMA project, and congratulations are in order for the NRAO ALMA staff! With funding from the European partners nearing approval, the baseline ALMA project can be started.

Our excitement is tempered with the news that Japan's involvement will be more limited than foreseen last year. Japan will possibly join the project in 2004, but will be less than a full equal partner. While the inclusion of Japan in the ALMA project may allow for some of the sought "enhancements" to the baseline project (extra receiver bands, future correlator, compact array), it is unlikely that all could be obtained. It is clear that the ALMA management will have to consider carefully what future enhancements might be brought to the project, and at what cost. Since many types of observations will need short spacing information, the capabilities of the compact array may have to be provided by more antenna stations allowing short baseline observations.

The Vertex Prototype antenna was just starting to be assembled at the VLA site at the time of our meeting, and it appears that the manufacturer is confident that the strict ALMA antenna specifications can be met. We look forward to hearing about testing progress at our next meeting.

All major areas of ALMA development appear to be heading in the right direction, although the committee is somewhat concerned that the software development, particularly for science software, may be lagging. Several documents related to software engineering and the definition of priorities have evolved in the past year, but there is still much work to be done.

3. VLA and AIPS

The VLA has continued to provide users with a first-rate interferometer facility, and we applaud the administration's focus on the scientific productivity of the telescope. The receiver additions and upgrades and antenna surface corrections that are proceeding apace, as well as the much more ambitious EVLA project, are very important to keeping the VLA at the cutting edge of capability and efficiency. The users deeply appreciate the efforts being planned to minimize the down-time during the transition to EVLA so that science can continue throughout this period. We recognize the conflict between new projects and maintenance when funds are limited, and appreciate the effort to identify and execute essential maintenance to prevent more serious problems in the future.

On specific issues:

1) Observing tools:

We appreciate the new high frequency web page, efforts on the calibrator database, and the new JObserve program. These items help observers prepare for observations. In addition the VLA/VLBA polarization calibrator web page provides an important service and is greatly appreciated by users of the VLBA with polarization observations.

2) Interference notices:

Observers do sometimes find the notification of upcoming interference to be useful in planning their observations. However, to minimize the resources needed to conduct this notification, we recommend that the notices be automatically posted to a web page rather than emailed. There should be a one-time email directing users to the web site. The burden is then on the observer to check this web page prior to their observing.

3) Classic AIPS:

Support of Classic AIPS continues to be essential to the science of most VLA users. Thus, we encourage continued support of

Classic AIPS. We are grateful for the heroic efforts of the AIPS group in providing user support and program capabilities.

4) Large proposals:

We view Large Proposals as providing databases for the benefit of the entire community. As a result, we recommend that there be no proprietary period for these data, and that there be a web page advertising the existence of these data. The web page should include at least the title and abstract of the proposal, the observing details, and target lists so that the community has enough information to judge if there are data there that would be useful for their science.

The VLA has proposed that the Skeptical Review Committee meet every proposal cycle and that the chair sit in on the Scheduling Committee's deliberations in order to allow the Large Proposals to be judged in the context of smaller proposals. It seems reasonable that the Skeptical Review Committee should meet as often as Large Proposals are accepted. However, it was not obvious to all how the chair participating in the Scheduling Committee's meeting would have the desired effect. If the Skeptical Committee has already met, the chair could not undo their recommendation and it might work to harm small proposals instead. On the other hand, if the Skeptical Committee does not meet until after the Scheduling Committee meets, then it is not clear how the Large Proposals would be folded into the scheduling.

We applaud NRAO for the inclusion of a non-NRAO member in the scheduling committee's deliberation. We encourage NRAO to seek more non-NRAO members in this important committee. We believe that with the video conferencing, NRAO could have a more balanced distribution of NRAO and non-NRAO members in this committee. Ultimately, if resources permit, NRAO might consider a system in which the referees discuss proposals face to face (video conferencing) and recommend proposals that should get observing time.

5) Visitor facilities at the AOC:

We have noted no harmful impact of a decrease from 12 to 10 visitor computers at the AOC. As space becomes more and more at a premium, however, we do urge the AOC to protect adequate space for visitors.

This is especially important to users from smaller departments who use VLA observing trips as a way to touch base with the scientific community. It will also be important as the VLA seeks to enlarge its user base to include those who might not have the expertise to function independently at home.

6) Emails on status of proposals:

We appreciate receiving email rather than paper copies of the disposition of proposals. We recommend similarly that a notice of the posting of the observing schedule to the VLA web site be sent out via email rather than sending out paper copies of the schedule itself.

7) Services to users:

We are happy with the services to users, and appreciate the emphasis that the VLA places on the user and on facilitating the science that they do. The analysts provide excellent and much appreciated assistance to users at various stages of the planning and observing process. We are especially grateful to them for checking our observe files and for putting our data on disk with very rapid turnaround. We understand the manpower limitations and EVLA construction that have led to the policy of a maximum of 5 antennas being down, instead of 3, before servicing is triggered. We hope that the impact to observing programs will be minimal.

4. E2E and Archiving

The E2E project is an ambitious project that has the potential to increase the user base of NRAO facilities. As such, E2E is important for NRAO to pursue. At the same time, we are concerned that a project of this scope has the potential to become too complex and a drain on already strained resources. In that vein, we heartily endorse the "three important principles" for the E2E project: (1) keep it simple, (2) reuse as much as possible, and (3) deliver new capabilities soon and often.

We are also pleased that E2E will have an external advisory committee to assist in setting priorities and to build connections with similar projects in the astronomical community. We note that it is vital that each product within the E2E project be tested by an independent group (similar to the AIPS++ NAUG) and that each product is verified to work at a satisfactory level before moving on to the next stage of the project.

It is extremely important that a data reduction pipeline produces a readable, well-documented log. The log should explain the scientific assumptions and procedures used for each step in addition to the AIPS++ commands and outputs. The user should be able to reproduce it by hand.

We reiterate that the online archive of raw VLA data, archive of GBT data, and a calibrator search tool are the highest priorities. We are particularly concerned about the timeline for the GBT archive; this archive must be available for general use by the end of the first proprietary period. We stress that online (raw) data archives should not be delayed by the development of the data reduction pipeline. Further, in the interest of expedience, we recommend that the addition of current

and recent data should have priority in the archives. However, all of the data are of importance: older data should be added as resources permit, working backwards from the present.

We look forward to seeing a detailed timeline of what capabilities will be delivered in each cycle of the E2E project at the next users meeting.

In response to specific questions, we endorse the move to http or ftp access for moderate sized data sets. We recommend a passive *deprecation* process in which data are available for ftp access unless the user requests otherwise. However, the option of physical copies should remain for large data sets, and for users at institutions without sufficient bandwidth. We hesitate to recommend a specific medium for the physical copies since media are evolving rapidly; while many of us are still tape based (exabyte/DAT/DLT), optical media (CD/DVD) are becoming more popular.

5. VLBA

In spite of increased demand on resources from new projects such as the EVLA and ALMA, NRAO continues to do an outstanding job managing and operating the world's premier facility for VLBI. The committee was pleased to learn that the VLBA is entering a productive phase of operation with a publication per proposal rate comparable to that of the VLA. NRAO has put considerable effort into making the VLBA easier to use by non-VLBI astronomers, and the committee considers an over-subscription factor of 2 (halfway between the VLA D and C configuration rates) reasonable for such an instrument. We applaud the Observatory's efforts to increase awareness of the VLBA in both the astronomical community and the general public through improved public relations and EPO programs. The committee looks forward to continued improvements in VLBA capabilities including routine incorporation of the GBT and Arecibo into VLBA observations for 2002.

Specific issues

1) Observational concerns

Given that more than half of the VLBA observations are now dynamically scheduled, the current scheduling pages could be more informative. At the very least, the current web page showing the "priority ordering of the top projects in the queue" should have a date showing when the list was last updated.

With regards to observations during the deployment of the 3mm system and complaints from users, the committee recommends that NRAO advertise the inherent risk of 3mm observing up front. This

could be done in a web page (similar to the high-frequency VLA web pages) linked to the main VLBA web page for astronomers. There is currently a "3mm Developments" page that could be expanded to cover all high-frequency 3mm/7mm/1.3cm issues, outlining various risk factors such as weather and instrumentation status. Another possibility is that 3mm observing be advertised as a shared-risk endeavor during the 3mm deployment similar to the GBT shared-risk observations during commissioning.

2) Services to users

While the committee understands the need for a VLBA data calibration service to entice non-VLBI astronomers to use the VLBA, it is unclear how many users are taking advantage of the service. The committee recommends that NRAO continue this activity provided the necessary manpower is available.

The committee welcomes the development of a VLBA data reduction Pipeline. The committee also recommends that NRAO continue VLA/VLBA polarization calibrator observations. This is an important service for users of the VLBA with polarization observations and is greatly appreciated.

3) Proposal submission/notification

The committee encourages the development of a web-based VLA/VLBA proposal submission form. The committee supports the elimination of paper mailings, and the notification of proposal results/referee comments by e-mail. We also reiterate last year's recommendation for the elimination of paper schedule mailings in favor of some form of electronic schedule either an e-mailed postscript/PDF file or by pointing the user to the appropriate web page.

4) AIPS/AIPS++ and the VLBA

AIPS continues to be the canonical reduction package for VLBA data; the committee therefore strongly recommends continued support of the package and new development within AIPS. The committee applauds the efforts of the AIPS group in providing user support and new capabilities.

5) Data transmission

In the near term, the committee recommends the migration away from the current tape-based VLBA recording system toward more cost-effective disk-based recording options (i.e. Mk5 or EVN PC systems). The committee also encourages NRAO investigations of real-time VLBI capabilities in anticipation of future integration of the VLBA with Phase II of the EVLA.GBT section of the Users Committee Report

6) VLBI Scheduling

The decision to avoid scheduling of global 3mm VLBI experiments is regrettable, but understandable from a purely VLBA

perspective. The committee welcomes and encourages the negotiations with MPIfR on making some dynamically scheduled time available with the Effelsberg telescope, but notes that the ensemble of other 3mm-capable telescopes represents significant capability beyond that offered by the VLBA alone, both in resolution and sensitivity. We urge NRAO to cooperate fully with attempts to fill the gap left by the termination of the CMVA program, wherever they originate (presumably the EVN institutes).

Dynamic scheduling of the VLBA is cited as the key reason for the decision to focus resources on a standalone 3mm VLBA capability. However, it is not clear that as currently implemented, dynamic scheduling is adequately serving the needs of 3mm observers. Arguably 3mm VLBI is, among all arrays and frequencies, that most in need of effective dynamic scheduling. We understand that there is competition within the dynamic scheduling queue for good high-frequency weather, and that there is no set fraction of time reserved for 3mm observing, but the lack of transparency in the scheduling process can lead to frustration. If a program is approved, yet suffers long, unexplained delays before scheduling, discontent is a predictable outcome.

The User's Committee feels that, having assumed the role of providing 3mm VLBI facilities to the community, NRAO needs to ensure that those facilities are more efficiently and effectively utilized, and that the community is appropriately served. Two specific actions would help to meet these goals. First, the transparency of the dynamic scheduling process should be improved, so that proposers can see what criteria are used to determine the scheduling priorities, and can assess the probability of their experiment being scheduled during a given time period. Second, it would be useful to refine the information requested of proposers in the case of experiments using dynamic scheduling. As an example, during the presentation to the Committee, the existence of multiple meteorological "cells" was described, which makes it very unlikely that one will get good weather everywhere. Some experiments, however, can easily tolerate poor weather at some sites. For example, a typical SiO maser experiment at 3mm will work well if only the 5 or 6 telescopes in the southwest and central US have good weather.

6. The Green Bank Telescope (GBT)

The Users Committee was impressed by the progress that has been made in commissioning the GBT, especially in light of the relatively few number of astronomical staff available for this process. We were also impressed by the honest appraisal we were given of current problems with the azimuth track. It seems very likely that the GBT will meet or exceed its design goals and become a productive scientific instrument for the future. We are particularly impressed with the level of funding for students who

receive observing time, and hope that this sort of program could eventually be extended to other NRAO telescopes.

We have several thoughts regarding GBT operations:

(1) We suggest that unsuccessful proposers to the GBT be given more feedback about the ratings of their proposals. As it is, unsuccessful proposers have no idea of the standing of their proposals relative to other proposals. Therefore, they are unable to determine if their ratings were close to or far below the cutoff for successful proposals. Perhaps the TAC could institute an A, B, C rating system used at other observatories such as Arecibo.

(2) We recommend that proposals for VLA which also request time for zero-spacing observations with the GBT be integrated into a single proposal.

(3) We recommend that software be made available to convert raw telescope data into a format accessible to IDL users. Observers who prefer to write their own reduction software in IDL should not have to master the details of AIPS++ in order to gain access to their data.

(4) At this point, the involvement of university groups in instrument development seems to be successful, and we hope this level of involvement will continue. We ask that the community be kept informed about the status of the azimuth track problem. We also ask that the community be kept informed about progress in scheduling projects for which time has already been allocated. In this way, observers with currently accepted projects and those who anticipate submitting proposals will have an idea of the time frame of their future observations.

(5) We continue to encourage the availability of the pulsar folding more.

7. Joint CHANDRA Scheduling

The committee endorses the proposed program for joint Chandra-VLA/VLBA observing proposals, as described in the report to the committee. Such a program would reduce hurdles for observers and would increase connections between the radio and x-ray communities, and has the potential to increase the VLA/VLBA user community.

Several features of the program are particularly crucial for its success. The scientific criteria (i.e. both X-ray and radio observations must be critical to the scientific success of the project) should be clearly communicated to proposers and adhered to by the review panel. NRAO must check that proposals are

technically feasible, do not duplicate past or current radio observations, and have scientific merit comparable to stand-alone proposals receiving time. At least two members of the Chandra panel reviewing joint proposals should be experienced VLA/VLBA users. The program must be evaluated, as outlined in the report, and the Users Committee would like to participate in the evaluation process. We would like to add a clause stating that funds received from NASA may be used to support reduction of the radio data as well as the Chandra data.

We note that, given the high over-subscription rate of Chandra, it will generally be harder to obtain VLA/VLBA time through this program than through regular stand-alone proposals. The program is meant only for cases where both radio and x-ray observations are essential, and is not a "back-door" to getting radio observing time. We anticipate that some observers will wish to submit similar proposals both to the joint program and to the regular stand-alone program, in order to increase their chances. In such a situation, NRAO should track both proposals in order to make sure time is not given twice. Those reviewing the stand-alone proposal will judge it solely on its merits as a radio observation, without consideration of possible future Chandra observations. Those reviewing the joint proposal will consider the necessity of both radio and Chandra observations.

For the first round of the program, we recommend that 3% of VLA time be allocated for the Chandra program, not to exceed 5% in any one LST range or VLA array. We recommend 5% of VLBA time be allocated for the program. After the program has been evaluated, the time allocation could be modified. If the program proves successful, similar programs with other telescopes and instruments could be explored.

8. Spectrum Management

Looking toward projects such as the full operation of the GBT and the VLA, both of which envision essentially continuous frequency coverage from 1 to 50 GHz, spectrum management will be of increasing importance to the Observatory. We see a number of both positive and negative developments regarding spectrum management activities within the Observatory.

The Observatory has a practice of coordinating its activities with other radio observatories world-wide and of working within existing national and international regulatory bodies. The importance of such work will only increase. We are heartened that the Observatory has a full-time position devoted to spectrum management. Even in the face of a restricted budget climate, maintaining such a position and providing adequate resources will be essential.

We applaud the Spectrum Management Summer School as an excellent concept. It may take a few years for this summer school to bear fruit, but we believe it to be quite worthwhile. We encourage the continuation of this summer school in future years (perhaps every other year so that it is on a schedule similar to that of the Synthesis Imaging and Single Dish Summer Schools). We also encourage engagement of the user community, above and beyond the Summer School. An example of such engagement was the exhortation that universities or other institutions with radio telescopes register these telescopes to increase the visibility of radio astronomy.

A potential beneficial side effect of spectrum management activities, possibly including the Spectrum Management Summer School, is that it may increase the involvement from non-traditional radio astronomical universities or institutions. One example of such involvement is the RFI excision techniques being studied by faculty and students at Brigham Young University, under the direction of NRAO staff through an NSF MRI.

During the spectrum management report to the Users Committee, it was noted that some satellite operators appear to be suggesting that a new operations model be adopted. In this new model, the Observatory would have to provide advance notice of observations in certain (or all) frequency bands so that satellite transmissions could occur in these bands when radio astronomical observations were not occurring. Such an operations model would have a severe impact on Observatory operations. If implemented as described, this operations model effectively would preclude dynamic scheduling. Dynamic scheduling has the promise of increasing the scientific efficiency of the Observatory's telescopes (indeed, at the VLA and VLBA, it may already be doing so). We encourage the Observatory to resist such an operations model through all reasonable means possible.

9. AIPS++

The committee is pleased to note continued progress in the capabilities and functionality of AIPS++. Members of the committee recognize and appreciate the elegance of certain aspects of AIPS++, and remain hopeful that it will eventually meet most of its ambitious goals. Unfortunately, development of the package and adoption by the astronomical community have been much slower than desired, and it is clear that AIPS++ still has a long way to go before it replaces existing packages for mainstream radio astronomical data reduction and analysis, and even several staff members expressed frustrations to members of the User's Committee about the state of GBT data reduction in AIPS++. Therefore, the committee feels that acceleration of the maturation of AIPS++, though not at the expense of other key

software efforts at NRAO, is of considerable importance to the user community.

In this regard, we applaud the formation of the NRAO AIPS++ User Group (NAUG), which we perceive to have been pivotal in many of the functionality and usability enhancements over the past year. In particular, we feel this group is the best qualified to set priorities for the development of many aspects of AIPS++ - documentation, functionality, usability. The committee recommends that this group be expanded, and their role as a source of critical feedback to the project be maintained and enhanced. Given that this is the largest software engineering project in the observatory's history, employing a number of personnel comparable to that required for a major new instrument, there has been a noticeable lack of meaningful interaction with the science staff. Like any other major engineering effort in which the Observatory is engaged, AIPS++ needs the insight of scientists on a continuous basis. The current NAUG is a good start upon which to expand.

It is vital that the NAUG be independent of the AIPS++ development group to maximize its effectiveness, and to maintain an ability to supply critical assessment of the software. To this end, the committee recommends that the NAUG report not only to AIPS++ project management, but also to one of the observatory advisory committees, in order to encourage a healthy balance of priorities. *Furthermore, it is hoped that future NAUG status reports will be authored by members of the NAUG and not members of the AIPS++ development group.*

The committee is very concerned about anecdotal reports of poor AIPS++ performance on routine radio astronomical data reduction tasks. Despite a number of different performance measures that have been presented, it is clear that AIPS++ remains significantly slower than other software packages in a number of essential areas of data reduction. We believe that this constitutes one of the most significant barriers to the migration of users from AIPS to AIPS++, and presents a public relations problem for the project that needs to be addressed. We recommend that considerable effort be devoted to accomplishing performance at least comparable with AIPS, and ideally approaching the speed of packages such as Miriad. It is encouraging that the project manager has stated such goals verbally.

In order that users can more readily compare the performance of AIPS++ with other packages, we recommend that a clearly understandable, comprehensive benchmarking suite analogous to the AIPS DDT test be developed. The results should be published, tracked and acted upon. We believe that users are interested in AIPSmarts, and would be reassured by directly comparable AIPS++ numbers on identical platforms. For this purpose, inclusion of parallel processing platforms that exploit a design foresight of

the AIPS++ project is strongly encouraged. The benchmark suite should be included with the AIPS++ distribution so that users can test the performance of AIPS++ on their own systems.

Despite the quotation of distribution statistics, it remains unclear to us how widespread AIPS++ is within the community. We recommend that some effort be devoted to tracking a meaningful measure of community usage (as opposed to, for example, a count of the many AIPS++ discs handed out at AAS meetings). Information of this type, such as has been customarily and comprehensively provided by AIPS, would represent a measure of the health of the project.

One of the impediments to the expansion of the AIPS++ user base is the lack of a "cookbook" that could guide new users through a complete data reduction. Though there are many on-line documents related to using AIPS++, most of them are written in a manner not easily interpreted by users unfamiliar with the syntax structure of AIPS++, unnecessarily increasing the difficulty of using AIPS++. We believe that this situation would be remedied with an AIPS++ cookbook, similar to the very successful AIPS cookbook written by users, not developers. The NAUG has embarked upon such an effort, and is an appropriate group to push it forward aggressively. We would also like to encourage the project to make the on-line documentation available in some standard print format, postscript and/or portable document format.

The committee welcomes the appointment of Athol Kemball as AIPS++ project manager. We see a major challenge for the project in the proper handling of external requests and recommendations, both from the NAUG and from a broadening user community. We are confident that Athol will be receptive to the wide range of ideas and suggestions that will inevitably flow from this community. It is an unhappy fact that AIPS++ has not been the most popular initiative that NRAO has undertaken. The community has polarized into believers and skeptics, with the latter outnumbering the former. Indeed, criticism of the costs and results of the AIPS++ project to date occasionally spills over into outright resentment and animosity. Responsiveness to the criticisms, suggestions and requests of the community are a sure remedy for this debilitating ailment. We caution that achieving such responsiveness may sometimes be technically difficult, expensive and unpopular among the project staff, but generally well worth the cost, because AIPS++ cannot succeed without acceptance by the user community.

10. Education and Public Outreach (EPO)

The committee was extremely pleased with the progress made in a number of EPO areas in the last year and applauds the NRAO staff members who dedicated themselves to improving the EPO efforts of the observatory. We have the following specific comments:

1. The new Green Bank visitor's center will be an extremely useful facility, and we applaud NRAO on its ambitious design and the start of construction.
2. The continued frequent press releases documented in the "NRAO in the News" pamphlet (which are vital for increasing visibility with the public) should be continued and their number increased (where appropriate). The "NRAO in the News" pamphlet should receive wider distribution and continue to be created yearly.
3. The distribution of a written report on EPO activities prior to the User's committee meeting was particularly valuable for the committee. Placing the EPO presentation at the beginning of the user's committee meeting, and therefore highlighting its importance in observatory operations, was noted and applauded by the committee.
4. Receiving a response to the detailed User's committee suggestions made last year was particularly useful and should be continued yearly.
5. The hiring of a new, dedicated and experienced EPO Director, Lee Shapiro, will enhance the newly invigorated EPO program and the committee strongly congratulates NRAO for making this new hire.
6. The development of an observatory-wide Strategic Plan for EPO is a major achievement and will guide work in this area for years to come.
7. The new small radio telescope at the VLA visitor center is a welcome improvement to the visitor experience.

The EPO program is currently undergoing a major transition with the new hire and we are therefore limiting our recommendations at this time. The Committee strongly endorses the idea of a dedicated EPO position and encourages Mr. Shapiro to think "outside the box" when considering new programs or efforts for Observatory EPO efforts. The Committee also strongly endorses the emphasis on EPO in the NRAO Long Range Plan, where it is one of four major goals for the next few years.

RECOMMENDATIONS

1. As part of the long-range plan, be sure to include an EPO component in the planning and budgeting stages for each major new instrument (EVLA, ALMA, etc.), similar to the EPO component of GBT.
2. Continue to develop programs for school children and teachers in New Mexico, similar to the programs at Green Bank.
3. Continue to update exhibits at the current VLA visitor center, as a transition to a new visitor center in the long term. Staff the visitor center full time. A new VLA center similar to the one at GB is badly needed, and we hope the observatory is able to obtain funds for construction.

4. Exhibits for the GB and VLA visitor centers could be developed with the intention of duplicating them at various NRAO sites and to have one spare display on traveling tour to small planetariums around the country.
5. We cannot overemphasize the need to have an NRAO presence in as many museums and planetariums throughout the country as possible.
6. Encourage NRAO astronomers to make digital presentations available on the web for astronomers giving EPO talks.
7. The committee notes that the summer program at Green Bank for high school science teachers, that has been in operation for some 14 years with huge success, may have to cease because of funding cutbacks from the NSF. We encourage both the NSF and the Observatory to try in any way possible to find a way to continue this program.

Web site

- Overall, the NRAO website EPO content contains good information for the general public and is indeed much improved from just a year ago (NRAO should look again at the details of prior years' reports to avoid repeating flawed design efforts).
- While there are a number of outstanding issues in terms of the quality and accessibility of captions, the search engine, and the number of available images, the updated image gallery is a vast improvement, and we hope that the number of radio images located there will increase rapidly.
- The current EPO site needs to be more unified across telescopes, as it lacks an integration of EPO components of the VLA and GBT.
- We recommend using more animation where appropriate (e.g. how the VLA site looks from different angles, etc.).
- It is essential that the position of web designer be filled as soon as possible. There are still many inconsistencies across the NRAO site (not just EPO), and we hope the new web designer will fix many of these problems by next year.

11. Targets of Opportunity, Ad-Hoc Proposals, and Flexibly Scheduled Time

The committee appreciates that NRAO is actively implementing ways to improve the efficiency and responsiveness of the VLA and VLBA. In this way, these instruments will be in a better position to accommodate requests for novel targets of opportunity (ToO) and ad-hoc proposals.

The handling of ToO events, as outlined in the current policy (at <http://www.aoc.nrao.edu/vlba/html/targetop.html>) seems somewhat too general, however. The distinction between Type 1 (common events, but specific details unknown, such as observations of the next bright comet) and Type 2 (new phenomena, or unpredicted or

rare events that require the proposal and review process itself as well as the observations to be time-critical) should be further elaborated, as well as the criteria for determining the scientific worth of a project. It is unclear, for example, if Type 1 ToO proposals are meant to only be accepted as regular proposals, go through the regular review, etc. In addition, we suggest that general rules governing selection between multiple ToO proposals be generated, instead of simply on a 'case-by-case' basis. It may be necessary/desirable to create a 'standing body' of referees to handle ToO proposals on short notice as well, given that a truly novel event (Type 2) could require the 'bumping' of previously accepted and scheduled projects.

Along these lines, we feel that a clear policy on which specific rare events NRAO would consider undertaking as 'service to the community' observing would be helpful. The example of a galactic supernova is a good one; NRAO should decide if such an event would be observed by NRAO or could be allocated to a group or set of groups.

The inclusion of ad-hoc proposals seems to be a good way to utilize the instruments to increase the amount of science done.

The concept of flexibly scheduled time (FST) is a good one, since it allows for inclusion of some time-critical ToO observations and/or to obtain high priority observations previously wiped out due to weather or instrumental problems, without necessarily needing to 'bump' other previously scheduled observations. The concept is also a first step towards dynamical scheduling in some sense. We feel that 3% (approximately one day per month) is ok for an initial start, but could be expanded to include projects that can be dynamically scheduled, once the process has been tested.

A few concerns regarding the FST as set in the documents we reviewed:

1. It is unclear if the policy is that ToO proposals will now only fit in during the FST time (nominally at the end of the month).
2. If there is going to be a set deadline for FST proposals, does this supersede the ToO and ad-hoc proposal process?
3. Also, if there is a set deadline, should there not also be a peer-review process (perhaps using just the abstract and time request)?
4. Why are some of the policies for FST projects (such as proprietary data period, 'desired rapid turn-around', need for a brief report 6 within six months, etc) different than for 'normally' scheduled projects? These seem particularly unusual if

the FST project is a 'make-up' for time lost to weather on an otherwise normal project.

Respectfully Submitted,
NRAO User's Committee 2002

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