

2007 Users Committee Report to the National Radio Astronomy Observatory

August 6, 2007

1 Executive Summary

The Users Committee (UC) of the National Radio Astronomy Observatory (NRAO) met in Charlottesville, VA on 17 and 18 May, 2007. Presentations were made by the NRAO management and staff on a broad range of topics related to the operations, development, and vision of the Observatory.

NRAO continues to operate and develop radio telescope facilities that are the best of their kind. These facilities and the scientific and operational support provided by NRAO enable the US and international community to produce results and discoveries of importance to the entire scientific community. Many of these results could only be obtained using NRAO facilities and operational and scientific support. All NRAO facilities in operation are producing high quality science. This tradition of excellence is expected to continue as NRAO upgrades the capabilities of existing instruments, brings online new telescopes, and develops the human and technical resources necessary to fully exploit these facilities.

This progress has been made in spite of an environment of limited resources and limited staffing. NRAO has shown innovative responses to these pressures, enabling it to maintain its core missions and grow the Observatory. But the UC cautions that the breadth and excellence of NRAO's mission cannot be maintained indefinitely without greater support.

NRAO is demonstrating a new level of engagement with the full astronomical community on matters ranging from telescope operations to new technology to public outreach to direction of the scientific enterprise. Along with this, the UC sees significant progress on issues of concern and interest to

users of NRAO facilities. We commend NRAO for its responsiveness to issues raised by the UC in previous reports and through other communications.

NRAO has shown a willingness to experiment with traditional approaches to funding, scheduling, and operations. The UC encourages NRAO to continue in this vein in response to the rapidly shifting landscape of national and international facilities, funding, and scientific goals.

The detailed recommendations, requests, and comments of the UC are summarized below. Further discussion including additional recommendations can be found in the main body of the report.

- The UC strongly supports the “One Observatory” concept and efforts to integrate activities across sites and projects.
- The UC strongly supports the newly formed New Initiatives Office. NRAO’s external funding initiatives for the VLBA as well as additional efforts to attract grants from a variety of sources are essential steps toward addressing the NSF Senior Review recommendations and the changing landscape of funding. The UC recommends that NRAO explore new funding options on a case-by-case basis with significant opportunity for feedback from the UC and the broader user community.
- Understaffing remains a problem for the Observatory. The UC recommends that a long-term strategic recruitment plan for NRAO be developed and presented at the next meeting, integrating the efforts and requirements of different facilities and sites. The UC requests more details about the role of the North American ALMA Science Center, its staffing, and its relation to the planned Array Science Center in Socorro.
- The VLA remains the premier centimeter wavelength interferometer. Significant progress has been made in recovering the EVLA schedule. Improved communication with users is necessary to address VLA/EVLA transition issues.
- The transition to disk-based recording for the VLBA is a significant accomplishment enabling new science and reducing operating costs. We encourage NRAO to continue pushing for greater sensitivity through increased bandwidth.

- The GBT has produced high quality results in a number of areas, cleared its backlog of high frequency proposals, and is aggressively handling the issue of track repair. The UC is concerned about the proposed implementation of dynamic scheduling for the GBT and requests regular updates on progress and decisions in this area.
- The UC is excited by the progress made on ALMA. The UC endorses the ANASAC report on the ALMA Users Grant program at NSF. The UC was unanimous in the recognition that ALMA represents an entirely new facility which will require substantial new support to the observing community in order to take advantage of its new capabilities. User support should be tied to observing time. We strongly encourage NSF to support users of other NRAO facilities with the same level and mode of support.
- NRAO has made significant progress in implementing basic functioning of CASA and e2e. Pipeline processing of data in the VLA archive is a significant achievement. The UC requests a report for the next meeting on the future plans for developing new tools and algorithms.
- The expansion of the large project program offers opportunities for a new class of science with NRAO facilities. The UC encourages NRAO to continue expansion of this program.
- We recommend a move to six-month cycles for NRAO facilities to facilitate more comprehensive proposal evaluation and to align the proposal cycle with the grant proposal cycle. The UC was divided on whether longer intervals between proposals would benefit or harm users. We encourage NRAO to experiment with scheduling and time allocation during this transitional time between the VLA and EVLA.
- NRAO has made a significant effort to include non-radio astronomers on a number of important committees: the VLA/VLBA scheduling committee, the Large Project Review Committee, and the UC, for example. This brings a broad perspective that is healthy for the Observatory.
- The NRAO Newsletter was seen as a valuable means of communicating with the user community. The UC recommends that NRAO pursue several means of communicating important details to observers through

a combination of the Newsletter, e-mail, and updated web pages. In particular, targeted e-mail with descriptive subject lines is viewed as an effective tool.

- We recommend selection of the date of the 2008 UC meeting be made by January 2008.

2 Future of NRAO

NRAO faces a number of challenges and opportunities in the coming years. The UC commends NRAO for its proactive approach to technology development, forming collaborations with university researchers and other observatories, and identification of new sources of funding. The new mode of operations demanded by the changing landscape also raises some risks. We encourage NRAO to adopt an experimental, case-by-case approach with ample input from the UC and others in the user community.

The NRAO mission statement, of not only providing telescopes, but also training scientists and engineers and promoting astronomy to the public, is important to broadcast as it showcases the breadth and depth of NRAO's role within the US astronomical community.

2.1 Response to the Senior Review

Since the last UC meeting, the NSF Senior Review report has been released. In general the NSF report was very positive about NRAO and recognized the unique capabilities of the NRAO facilities. While ALMA, EVLA and the GBT were categorized as part of the Radio, Millimeter and Submillimeter base program, the VLBA was placed in a transition program with the recommendation that half of the operations costs be secured through outside means by FY2011. Further cost saving recommendations were suggested in the areas of administration, scientific staff and GBT operations at NRAO. The UC is heartened by the positive steps being taken by NRAO in light of the results of the NSF Senior Review. Jim Ulvestad is to be commended for his pro-active role in seeking outside funding for the VLBA. In the same vein we also commend Nicole Radziwill and the e2e division for their innovative approach to grantsmanship.

In terms of the NSF pressure to reduce non-ALMA operating budgets within NRAO, the UC suggest that NRAO query users for feedback on es-

sential versus nonessential user support as one way to address some of the shortfalls in operations that would come under a flat budget profile. The UC stresses that the EVLA, GBT, and VLBA are of general interest to the astronomical community as well and ease of use applies to these facilities as well as to ALMA. Ease of use of all NRAO facilities for non-radio astronomers is key to the successful future of NRAO.

2.2 New Initiatives & Outside Funding Sources

The UC reiterates its commendation about the positive steps being taken by various members of NRAO's staff to seek outside funding. On the other hand, if such proposals seek funding for broad initiatives rather than focused scientific inquiries, the UC feels that it is critical to have some kind of unified oversight and review of such proposals. Without stifling initiative, such review should ensure that a consistent mission and vision is projected, because - even if unfunded - a well-crafted proposal can initiate an important relationship, whereas a poorly-crafted proposal can do a lot of harm.

There was extensive discussion amongst members of the UC about the impact of seeking outside funding sources, particularly as it impacts observing time on telescopes. There seems to be a tension between the Open Skies policy and the impact of securing additional funding for facilities, equipment, or operating expenses. There was no clear consensus of the UC about what level of resource commitment in terms of telescope time would be detrimental to the telescope user base.

The distinction between major and minor partners is important. Major partner agreements have models from the past and are unlikely to be controversial. Minor partner agreements raise more complex issues. Maintaining peer-reviewed access to observing time is an important goal; a significant fraction of observing time and observatory support must remain open to all users regardless of whether they can make a financial contribution. This will maintain the high caliber of science and the reputation of NRAO for scientific excellence. A model for minor partner contributions might include support — in cash or in kind — that impacts more than just the experiment that the minor partner is pursuing. Contribution of disks for the VLBA recording system that are reused for other experiments is an example.

The UC recommends that NRAO seek input at very early stages about possible channels for support, including a variety of options for purchase or exchange of observing time, from other observatories that have sought outside

support for similar reasons. The UC strongly recommends that NRAO keep the UC and the user community as a whole informed while evaluating sources of outside funding which may impact observing and access to telescopes. A broader policy for named facilities or staff positions should be considered early, if only to avoid such a policy being set by precedence of a single early negotiation. Policy should evolve over the coming years on the basis of available partners and their needs, NRAO goals and needs, and community response.

Several members of the UC noted that other organizations hire staff specifically for the purpose of identifying sources of outside funding. The UC recommends that NRAO consider identifying or hiring a grants development staff-person to assist efforts in finding appropriate new funding lines. Again, experts at other astronomical centers should be consulted at the outset. A staff development person may be part-time to start, but salary for such a position should follow standard ethical and practical guidelines both to attract the best candidates and to avoid the potential that donors may fear conflicts of interest or inflated costs (e.g., if salary were tied to gifts brought in). Funding for such a position might best be obtained via a capacity-building grant.

2.3 Square Kilometer Array

The US and international radio astronomy community are actively engaged in the design and technology development of next generation meter- and centimeter-wave radio telescopes under the banner of the Square Kilometer Array (SKA). The conceptual design of the SKA promises two orders of magnitude improvement in sensitivity over existing telescopes, as well as leveraging new technologies to provide a broad array of new capabilities. Members of the UC are enthusiastic about the long-term opportunities for new and transformational science that the SKA will offer and encourage NRAO's interest in participating in the SKA initiative.

Further, the UC believes that US and international interests in the SKA would be well-served by NRAO's participation in development of SKA technology and science goals. This is based on the proven capabilities of NRAO in designing, manufacturing, managing, and operating world-leading facilities as well as the scientific and technical excellence of the NRAO staff. Many of the technologies required by the SKA are an outgrowth of technologies in use or developed by NRAO. The activity of NRAO should be in concert

with university-based activities in the US, including, in particular, those of the SKA Technology Development Proposal, and of the international community. NRAO, of course, has substantial commitments with its existing facilities that limit resources that can be devoted to SKA. Nevertheless, it would be a mistake for NRAO not to have any engagement with SKA. NRAO involvement in the SKA must be recognized as investment in the future of radio astronomy and the future of NRAO.

3 Scientific Affairs

3.1 Science Community Development

The UC was very pleased to hear about recent changes in the Science and Academic Affairs office, particularly regarding the student observing support and restructuring of the programs aimed for graduate students.

We are enthusiastic about the opportunities for Student Observing Support for VLBA, GBT and Large Projects. We recommend that NRAO continue to make these widely advertised. Listing successful Support Recipients and their project titles on the NRAO webpage is an effective way to do this. Additional advertisement can be made through pamphlets handed out at AAS meetings. In addition, for regular VLA proposals, we commend NRAO for providing travel support and publication costs. This support, also, should continue to be widely advertised in the astronomical community.

The Graduate Student Internship program appears to be a real success, we agree that this is a good way to introduce students to radio astronomy through small projects, while still keeping a strong connection with home universities. Although the NRAO pre-doctoral program has been slightly less popular we still think this is an important way to promote and retain young astronomers. At the next UC meeting we would like to hear more about the effectiveness of this program, and possibilities for future modifications. We would also like to suggest a closer evaluation of pre-doc students, possibly in the form of biannual reports written by the NRAO advisors. As some students require a closer educational guidance it is important to frequently monitor their progress.

The Jansky postdoctoral fellowships have now been well established as prestigious positions and are well accepted in the community. This is especially successful due to the new arrangement allowing some fellows to choose

a host institution other than NRAO. We would like to encourage NRAO to continue with this very successful program.

One proposal put forward to counter the lack of sufficient staff at NRAO was to encourage Jansky Fellows to be based at NRAO during the time that EVLA and ALMA begin operations. The UC feels strongly that it is not a good idea to explicitly encourage Jansky Fellows to base themselves at an NRAO site. The UC felt that the explicit connection of the Jansky Fellow program to the commissioning phase of new facilities would strongly impact the perception of the independence of the Jansky Fellows. The success of the Jansky program comes, in part, from the independence of its Fellows, and this independence in turn attracts the best applicants in subsequent cycles. Hopefully future Jansky Fellow applicants will recognize the great opportunity to be involved in the commissioning phases of the EVLA and ALMA. However, the possibility to increase the number of NRAO fellows, targeted toward commissioning needs, even at the expense of the number of “traveling” Jansky fellows was a possibility that the UC found acceptable.

Another way to involve the astronomical community in various commissioning tasks could be through the NRAO Visitor’s Program. The UC was pleased to hear that plans to re-focus and re-define the program were being considered. We suggest that NRAO could create a more thorough webpage for the Visitor’s Program which lists the most up-to-date information about new instrumentation and equipment (i.e., at GBT and at EVLA) and lists potential ways to get involved and/or needs. In addition, a listing of recent official NRAO visitors and their affiliation, dates of visit, collaborators and resulting projects/publications would be an effective way to advertise the Program and give people ideas for possible visits.

Although this was not mentioned at the meeting, several UC members were impressed with the “Essential Radio Astronomy” course posted on the NRAO web page. We think this is a great way to foster radio astronomy in the community and provide stronger links with universities. We would like to encourage further development of this, and similar courses. In this pre-ALMA era we suggest that NRAO takes a proactive role in training astronomical community for ALMA observations. This could be done in the form of dedicated summer schools, specially-dedicated radio courses, talks at various institutions and universities, and special scientific meetings.

3.2 Support of Science Research at NRAO

The UC is concerned about numerous future retirements especially in the very sensitive time-frame when two new projects are ramping up. We would like to recommend that a long-term strategic recruitment plan is developed and presented at the next meeting.

The UC would benefit from knowing more about NRAO's plan for moving from a single-telescope model to a "One Observatory" model. The UC noted that the NRAO appears to be understaffed in many of its critical needs. There appears to be a contradiction between the NSF Senior Review recommendations for trimming costs (staff) and the need for user support and development for new instrumentation.

The NRAO has made great progress in recent years regarding diversity issues, especially in broadening the representation of women and minorities in the student and postdoctoral base. But the UC has to stress that this is an area where NRAO has to continue to make active and steady progress, and especially focus on the diversity situation at the level of professional staff members.

In order to facilitate rapid response science, tools currently available for rapid response with the VLA (automatic generation of observe files based on external triggering) should be made publicly available.

3.3 User Grants

The ALMA North American Science Advisory Committee (ANASAC) report on the User Grant Program¹ recommended that NSF funding be allocated for successful ALMA programs with US investigators. The estimated funds necessary for this program are about 6M\$/year. The report further recommended that the allocations be based on amount of observing time, program complexity, and need.

The UC was unanimous in the recognition that ALMA, when it comes on-line, represents an entirely new facility which will require substantial new support to the observing community in order to take advantage of its powerful new capabilities.

Following a review of the ANASAC report, all but one of the US members of the UC endorsed the report in full. There was some discussion concerning the propriety of non-US members discussing the disbursement of NSF funds

¹http://www.cv.nrao.edu/naasc/docs/ANASAC2006_charge1_final.pdf

which resulted in the above reported number restricted to US members (although all members participated in the discussion).

A very real concern of the UC is that new NSF funding for ALMA will decrease the opportunities for support for observing on NRAO's other facilities, which, like ALMA, represent state-of-the-art capabilities in their respective observing windows. We strongly encourage NSF to support users of other NRAO facilities with the same level and mode of support.

3.4 Communication with Users

The UC believes the NRAO Newsletter to be a valuable and effective means of communicating between the NRAO and its user community and commends NRAO on the efforts put into this document. The newsletter is informative and well formatted and should probably be kept from going too far beyond its current length. The idea discussed at the meeting of an email newsletter with short titles and blurbs and links to the full story also sounds very promising and useful. Linking science feature articles through the NASA ADS server is an important way to broaden distribution of the content. We encourage maintaining distribution of the paper edition.

Discussions concerning the "best" way to communicate technical details and updates to observers lead to the consensus view was that it is very important to have up-to-date websites with all of the necessary information, but, that in the cases of important events or changes, that observers should receive specific, single topic, e-mails.

The concern expressed by the NRAO regarding flooding of e-mail boxes was not one shared by the UC. The UC felt that there is no single best way to communicate to users, and that this justifies multiple attempts at communication for important items. If the NRAO remains concerned about what justifies a specific e-mail, a useful definition of an important communication may be anything that could potentially result in flawed observe files. One potential effective remedy would be e-mails from the analysts or operators (responding to the reception of observe files) warning users about changes needed to observe files because of VLA/EVLA transition concerns.

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4 Scheduling and Time Allocation

4.1 Proposal Evaluation

The UC applauds the inclusion of several non-radio astronomers in the VLA Scheduling Committee. The UC encourages NRAO to consider adding more 'outside' people to the pool of NRAO referees. While we realize that non-radio experts may have difficulties with some technical issues in the proposal, we feel that there should be enough experts amongst the referees who can evaluate the technical feasibility of a given proposal.

The UC thus encourages NRAO to experiment with bringing non-experts in to the evaluation process but would like to be brought up to date (the numbers of radio versus non-radio referees, etc.) at the next UC meeting.

The UC had some discussion on whether or not two independent review panels are needed for the regular and large proposals. It was noted that other observatories that also have a large proposal category do not necessarily have two separate review panels (i.e., the referee's that are in charge of the 'large' proposals could be drawn from the pool of the 'regular' referees). The UC felt that a joint review of large and small proposals may also facilitate a direct comparison of 'weak' large proposals vs 'weak' regular proposals.

There was considerable discussion amongst the UC as to whether the current single threshold (200 hours) for NRAO large projects is appropriate. The consensus, although not unanimous, was that a three level model, in which there might be normal, large and very large proposals, is not needed at this stage. However, the Committee felt that 200 hours was a somewhat small number, and that the NRAO might consider raising the threshold by which a large project is defined.

Related to this, the Committee also discussed whether it was appropriate that the large project threshold be the same across all facilities. There was no consensus on this issue. The UC would like to hear a report and evaluation of the large project program once the first round of projects have been completed. To evaluate the appropriate length for large proposals the UC thought it would be useful to get more statistics on all submitted (and accepted) proposals (such as length, LSTs) for each of NRAO's facilities.

Regarding the Large Program Review Committee: The UC strongly feels that it would be advisable to have referees on the committee for at least 2 years (and possibly 3 years) to ensure that some institutional memory is maintained in the proposal evaluation process. Such a memory would be lost

if appointments were made on a one-time basis only.

The UC was approached by some users who felt that some of the referee's reports may reflect the fact that proposals were read in a hurry - we thus encourage NRAO to remind its referees about the importance of their duty.

4.2 Proposal Deadlines

The UC (with one dissenter) felt that a move to six-month cycles would be acceptable, if this can help improve the efficiency of the review process and the quality of the reviewing. The UC had the strong opinion that an 8 month cycle would not be advisable. Worries were raised by some UC members that going for a 12 month cycle would make it more difficult to get PhD students involved and to rapidly respond to new developments. The UC is supportive of a move to longer proposal cycle if it enables further interaction between referees, i.e., through a face-to-face meeting or telecon.

The UC notes that a move to 6-month cycles could co-exist comfortably with the VLA's changing cycle of array configurations. Some arrays might be on offer in successive proposal cycles, but the UC did not see a problem with this possibility.

5 e2e and CASA

5.1 e2e

The UC continues to strongly support NRAO's effort to supply users with end-to-end software and operations across the Observatory. The current structure of the e2e operations division has been in place for more than a year. Over that time they have accomplished several important initiatives such as expanding the VLA automated data processing pipeline, integrating NRAO with the National Virtual Observatory, and submitting several external funding proposals to support their mission. In addition, the UC looks forward to the upcoming release of the re-organized NRAO web pages. This effort is key to expanding the NRAO user database by allowing clear, easy access to all information necessary for obtaining and using NRAO data in scientific studies. The UC is also encouraged by the new Google-like search engine of the NRAO archive.

5.2 CASA

In response to comments from last year's UC report, NRAO provided a more detailed presentation of CASA together with a live demonstration. CASA has the potential to follow in AIPS' footsteps by becoming a widely used piece of software for astronomical analysis. The UC encourages NRAO to seek input from their user base as to how CASA should be distributed/updated, and as to which platforms CASA should be supported in. NRAO should remain abreast of developments in operating systems and avoid situations experienced by other observatories where software support does not become available for new systems in a reasonable timescale.

The UC would like more information at the next meeting on what sort of response mechanisms CASA will offer for bug fixes, documentation of errors, requests for new tasks, etc. We also would like an overview of NRAO's response on how they see CASA's role as a strategic program. Other observatories have already made decisions about software which don't include CASA (e.g., CONRAD for ASKAP; MIRIAD for the ATA). Is there a long-term role for CASA in radio astronomy outside of EVLA and ALMA? Will CASA be able to handle EVLA data from the outset?

Finally, the CASA demonstration that the UC were shown convinced many of us that CASA can do the same things as AIPS and MIRIAD, but do them in a more user friendly environment. The UC applauds the significant effort that has gone into bringing CASA to this stage. Looking toward the future, the UC would like to receive an update at the next meeting covering details of the plans and resources required to begin to develop new tools and algorithms within CASA. For example, EVLA and other future telescopes will have greatly enhanced polarimetric capabilities, which will require new tasks and tools that go beyond what AIPS and MIRIAD currently provide. Speed and performance of CASA relative to the existing packages is an important benchmark for evaluation.

6 ALMA

The UC was delighted to hear about the recent progress made in the ALMA project. ALMA will revolutionize (sub)mm wavelength astronomy and NRAO is truly playing a major and absolutely critical role in its construction and future operation. In the current phase of the project the UC was most im-

pressed to hear that most technical risks have been eliminated and that the receivers give T_{rec} that are significantly below specifications. This is great news which may partly recover for some losses due to the recent rebaselining within the ALMA project.

In the light of the Senior Review recommendations and the costs for ALMA operations, the UC is concerned that NRAO may not be able to provide the great demand on skilled labor in ALMA's ramp-up phase. A proposal was made that some of the work may be done by Jansky postdocs but the UC felt that those postdoctoral positions should really focus on science and not on commissioning a new telescope.

The UC shares the view that ALMA's "early science" (currently planned for Q2 2010) should only be advertised after the array provides significantly better maps/data than current millimeter interferometers (CARMA, Plateau de Bure). This timeline will let the science capabilities drive the schedule for "early science" to meet the high expectations by the community.

7 VLA & EVLA

7.1 VLA - EVLA Transition

The UC applauds the progress that is being made on EVLA construction. We commend the NRAO on resolving the problems with design and fabrication of the L-band OMT. Although receiver production is behind schedule, this can apparently be made up further in the schedule with project contingency. We applaud the NRAO staff for including the EVLA antennas in routine scientific observations. It appears that there are still some observing modes which produce bad data, and it was not clear that NRAO staff are making progress in fixing these problems. As an increasing fraction of EVLA antennas is added to the array, it will become ever more important that observing modes are checked out for scientific compatibility.

We applaud the retiring of the Modcomps. We acknowledge that NRAO staff need flexibility with the VLA antenna configuration schedule especially for testing the correlator, and urge them to use their discretion about modifying antenna configuration schedules to achieve the best situation for testing. We also commend NRAO for its call for proposals for the new C band and L band receivers to take advantage of the wider tuning range, and hope to hear some results at next year's UC meeting from these programs.

The UC heard about the development of the SAGE committee to select first scientific user observing modes, projects for early EVLA science, and priority ranking of any descoping options should they become necessary. We commend NRAO for taking this step towards developing plans for early science projects with the EVLA. We remind NRAO that we would like to see broad community involvement in the science definition for EVLA. We would like to hear more about the outcome of their meetings.

7.2 Software and Algorithm Development

Collaboration with the ALMA project to develop common tools for proposal submission, observation preparation and observation scheduling is a good use of NRAO's limited resources and will provide familiarity for EVLA users to become ALMA users (as well as vice versa) and are good steps toward the "One Observatory" Goal.

More information is needed at next year's UC meeting on how users will reduce their EVLA data. With the large data volumes which will be generated, will it be feasible to download data, or will travel to the AOC be necessary? These issues have substantial operational impact, especially for overseas users and those at the end of low bandwidth connections, and impacts the breadth of the EVLA user base.

7.3 Array Science Center

The UC heard ideas about an Array Science Center for the EVLA, which would be similar in design to the ALMA Regional Center. Such an implementation is essential to ensuring full support for EVLA users, although the UC notes that even providing the most basic level of support would require additional new staff. As this may impact implementing the full EVLA functionality, it is of considerable concern to the user community. We would like to hear more about plans for the Array Science Center.

8 GBT

Overall, progress on GBT-related issues seems to be fairly good. We have been pleased to see some progress regarding the high-frequency receiver baseline problems: At the meeting, 2 new tentative CO detections of high-redshift

sources (with known redshifts) have been shown which are based on improved data reduction algorithms. Although the UC acknowledges that this is good progress, it is also clear that serious baseline issues remain, in particular if one is interested in detecting broad, faint lines (e.g. molecular gas emission at high redshifts; in principle one of the unique capabilities of the GBT). At the next meeting, the UC hopes to see more progress in beating down the unstable baselines at high frequencies. When the information becomes available, the UC would also be interested to hear about the outcome of Andy Harris' recent tests of the K_A band receiver (which were performed after the UC met) and the related potential impact on high-frequency observations at the GBT.

The azimuth track repair work, currently in progress, has long been a necessary thing, and we hope that it will solve the track problems in the long term.

Some of us expressed a need for more GBT staff support, for calibration issues in particular (and we note that support for VLA calibration, especially in the transition to EVLA, needs improvement as well). For example, daily/routine records of T_{sys} and T_{cal} for the various receivers should be logged, with all archival measurements available via the web.

In general, we find that the GBT is scientifically understaffed, rather than overstaffed as implied in the NSF Senior Review report.

The major immediate UC concern with respect to GBT operations was the proposed plan to implement dynamic scheduling with a trial in Sept. 2007. Concerns were raised regarding the requirements of observers to be constantly on call and that the best-case improvement in observing efficiency had not been demonstrated; these were described in our letter to NRAO of June 5, 2007. We now understand that statistics and simulations to demonstrate the anticipated level of improvement (for example, in scheduling Q-band in summer) will be available within a few months. We are glad to hear that some of our requests, such as more predictable windowing for pulsar observations, and the ability to have the operators run some of the simpler programs, will apparently be reasonably easy to accommodate. Finally, we request to hear the outcome of the dynamic scheduling trial now planned for January 2008, so that we can provide input on the final decision as to whether this new scheduling model will be used full-time in the future.

9 VLBA

The VLBA continues to produce science that has a broad impact. The VLBA remains the pre-eminent high resolution radio interferometer in the world. This progress and scientific stature exists in spite of a negative funding climate and limited resources for the VLBA. We encourage NRAO to continue a search for innovative funding paradigms and external partners who can invest in the future of the VLBA.

Astrometric science, in particular, represents a unique vein of research that touches broadly on many aspects of astronomy. Routine sub-milliarcsecond astrometry is unique in astrophysics. We expect that new astrometric results will continue to raise the profile of the VLBA in the US and international scientific communities.

In general, the VLBA appears to be particularly ripe for large scientific campaigns. The recently approved large programs for the measurement of the Hubble constant, the search for extrasolar planets, and the characterization of potential GLAST sources are excellent examples. We support the assistant director's interest in conducting a more extensive calibrator survey that will create a denser grid of high quality astrometric calibrators.

We commend NRAO for fully implementing the MK5 disk-based recording system. This new system, installed out of operations funding, enables NRAO to maintain its leadership in high resolution science. Increasing the recording rate of the VLBA to multi-gigabit per second rates is critical for the long-term health and scientific productivity of the instrument.

The VLBA is understaffed. We encourage NRAO to find ways to meet the challenge of allocating more staff to operations, testing, and development of the array, in spite of its constrained resources. A VLBA chief scientist and a dedicated VLBA software engineer are two important positions to fill.

NRAO has taken a proactive position regarding the comments of the Senior Review of NSF astronomical facilities and programs. In spite of its unique characteristics, the VLBA was identified as vulnerable to closure because of its relatively low level of US users. The UC strongly recommend that NRAO take dramatic and inventive steps to keep the VLBA open and available to all users. We recognize that this may lead to new arrangements of time allocation for the telescope, i.e., observing time in exchange for financial support. We endorse the exploration of these arrangements; without them, the future of the VLBA appears to be clearly imperiled.

10 The Central Development Laboratory

The UC recognizes the crucial role that the Central Development Laboratory (CDL) plays in maintaining NRAO's ability for innovation and for the expansion of discovery space.

The UC strongly supports the ongoing discussion and collaboration that is taking place between the CDL and the NRAO New Initiatives Office. However, we note that some of the questions asked of the UC by each of these groups seem to be issues that can be addressed by the other group, and recommend that the current level of interaction be further expanded.

We also note the recent large allocations of funds for development of antenna and receiver technology awarded to radio astronomy groups in the US, Europe, Australia and South Africa. We encourage the CDL to explore ways in which they can contribute to these efforts, possibly through subcontracting of particular work packages to NRAO.

We also suggest that NRAO consider the possibility, once the CDL's commitments to ALMA and EVLA ramp down, that the CDL evolve to become part of the New Initiatives Office. This ties into comments discussed in the section on NRAO's involvement in the SKA.

11 EPO

The User's Committee is impressed with the effectiveness of the NRAO EPO efforts over the past few years. The NRAO image contest continues to be a great success and should be continued. Increased attendance at the visitor centers should be encouraged in creative ways as already done with the diversion of traffic past Green Bank, and ensuring that state visitor centers have NRAO press material. It would also be worthwhile to ensure USA and state guidebooks (and their electronic equivalents such as Google Earth and MapQuest) have the facilities listed as points of interest and road signs are clearly labeled with directions to the centers.

There may be a continuing decrease in school groups over the coming years, as the teachers are feeling more pressure to cover required curriculum in the limited class time. Advertising the facilities to teachers specifically in the context of these required curriculum headers would help keep school group attendance high. We encourage the efforts to create an exhibit set which will be taken to the teaching community.

With the Science Competitiveness Initiative, there should be additional grants available beyond NSF-AST that should be investigated for raising independent funds for EPO activities. The NRAO web pages represent an important link to the public and we all look forward to the release of the new webpage. This has long been a weakness of NRAO both in terms of the public and scientific web pages. In addition, posting pre-made powerpoint talks on the web for NRAO users to present the new capabilities of EVLA and ALMA to their colleagues would be a useful way of promoting these facilities.

12 Committee Membership and Business

The current members of the UC are pleased overall with the functioning and composition of the committee. NRAO has demonstrated that it is responsive to the concerns of UC members. The creation of the agenda on the basis of UC suggestions is an important example of the healthy state of this interaction. A few items deserve some consideration.

Committee composition does not reflect the investment and interest of NRAO in ALMA. We encourage NRAO to bring in new members from the millimeter interferometry community. We applaud NRAO for its efforts to include 3 members on the UC who are not self-identified as radio astronomers. They give the UC an important breadth and community-wide perspective. We are also pleased by efforts to maintain gender balance on the UC .

The UC is open to operating as a standing committee through continued interactions with NRAO outside of the scheduled annual two-day meeting. In the past year, the UC responded to NRAO requests for comments on rapid response to an unusual transient and formation of a new transient policy, the NRAO GLAST MOU, and GBT dynamic scheduling. We discuss in other sections the importance of keeping the UC engaged in decisions similar to the GLAST MOU. The UC would prefer more lead time to permit more substantive contributions, if possible. Interactions by telecon and by email (sometimes with a subset of the UC) are productive and efficient uses of time.

The UC is interested in more informal interactions with the NRAO staff during the course of the meeting. This might take the form of a special discussion section with the staff followed by dinner on the first day of the meeting. We also recommend that NRAO encourage staff to attend the committee breaks and social functions in order to facilitate more discussion

with staff members.

The earlier the date of the meeting is set, the more members can contribute. We recommend setting the meeting for two days in May and request that NRAO select the date for the next UC meeting by 1 January 2008.

13 Participating Members

The following members of the committee were in attendance for the meeting:

Robert Becker
Geoffrey Bower (chair)
Tracy Clarke
Jeremy Darling
Bryan Gaensler
Paul Green
Mike Hollis (phone)
Cornelia Lang
Karen Masters (phone)
Rachel Osten
Mary Putman
Evan Skillman
Ingrid Stairs
Snezana Stanimirovic
Fabian Walter