

# NRAO Users Committee Report 2008

August 7, 2008

## 1 Executive Summary

The NRAO Users Committee (UC) met May 20th and 21st, 2008, in Green Bank, WV. The scope of the meeting included all aspects of ongoing user interactions with the Observatory as well as future plans.

We were immediately presented with NRAO's new Mission Statement: *"The National Radio Astronomy Observatory enables forefront research into the Universe at radio wavelengths. In partnership with the scientific community, we: provide world leading telescopes, instrumentation and expertise, train the next generation of scientists and engineers, and promote astronomy to foster a more scientifically literate society."* The UC thinks this is an excellent summary of the goals of NRAO and hopes that it will be used by funding agencies as well as the Observatory to guide the future development of NRAO. On both short and long timescales, increased funding support will be needed to ensure that NRAO can continue to fulfill its mandate to the astronomical community.

The science produced by NRAO telescopes is often of ground-breaking quality; this is made possible by the excellent telescopes, instrumentation and user support provided by NRAO. The upgrades to the existing telescopes and the construction of new ones hold great promise for further innovation.

NRAO accomplishes an enormous range of work in a highly efficient fashion. We are pleased to have the opportunity to praise its accomplishments, suggest paths for improvement, and provide guidance where requested. Full details of our recommendations are provided throughout this report; here we summarize the most important issues.

- We strongly endorse the NSF's plan, arrived at after discussions with NRAO and its committees, to form a grant allocation panel focused on preparatory work for ALMA. This is a tremendous step in the right direction of ensuring adequate grant funding for US users of ALMA.
- End-to-end (e2e) operations are proceeding well, with the implementation of image and data archives, and upgraded webpages, although it was disappointing to learn of the lack of success of several external funding requests. We encourage NRAO to continue to improve pages requiring attention and expand the data archive.
- The CASA software package needs more full-time staff. We urge NRAO to commit to having CASA ready to support EVLA data reduction from the beginning; any plan that relies on AIPS as a stop-gap measure will discourage the new users that the EVLA should be attracting.
- We encourage NRAO to continue tracking the outcomes of its various training programs and to continue to aggressively raise its visibility and attract new users.
- In our view, NRAO operations are very efficient. Nevertheless, the Observatory has been asked to plan for a potential budget cut in FY 2010. As this cut could affect NRAO's user programs, we advocate that these programs be given the following priority for preservation:

Jansky postdoctoral fellowships, staff-based observer support, financial support for student observing, scientific visitor support, observer travel support, and the predoctoral program.

- The New Initiatives Office is making good attempts to attract external funding for continued VLBA operations and to plan for relations with future radio and multiwavelength observations. A fundraising staff member would be a good addition to the office.
- The open skies policy continues to be an important positive aspect of NRAO operations, guaranteeing that the best possible science is done. We encourage NRAO to seek partners and funding models that respect the open skies policy. The UC requests that we remain involved in discussions as new funding models are taken into consideration.
- We encourage NRAO to ensure that the effort toward the SKA builds on the strengths of current and future NRAO telescopes and becomes a highly-ranked project in the next Decadal Report.
- We are encouraged by the progress in ALMA construction but are concerned about the reported accidents. We encourage regular review of safety in the construction operations. We emphasize that a primary goal of ALMA science planning should be to enable use by multi-wavelength (non-interferometer-expert) astronomers early on.
- Science at the GBT appears to be thriving, with the track repair successfully completed and several NRAO and user-community instruments coming online. Spectral line data reduction is still a difficult task. We request updates on the progress of the dynamic scheduling trial.
- The EVLA antenna refurbishment is going well, and we are pleased to see the budget contingency restored. We request updates on the progress of the WIDAR correlator as it is installed and tested. The SAGE committee needs to be revitalized so that it can help prioritize the early science on the EVLA.
- We are pleased to see the upgrades occurring to the VLBA despite the threat to its continued operation. We strongly support NRAO's efforts to seek outside funding, even if this results in reduced observing time for US/open-skies observers.
- We recommend that the Central Development Laboratory work closely with the NIO and possibly an external expert committee to plan future directions for technology development.
- The Education and Public Outreach Office is doing excellent work and we encourage the continuation of all its efforts. We are particularly pleased with the positive environmental statement being made by the recent move to eNews.
- The time allocation process continues to evolve, and we appreciated the opportunity to talk to the chair of the VLA TAC. We recommend broadening the referee pool and increased transparency at all stages of the process, as well as the adoption of an external TAC for all NRAO telescopes.
- The wealth of activity at NRAO is very difficult to convey to the UC over a 1.5 day period. We recommend both a focus during presentations on issues directly relevant to users as well as an expansion of the meeting duration to 2 full days.

## 2 User and Scientific Support

### 2.1 User Grants

The UC continued its discussion of the desirability of a Users Grants program for ALMA, i.e., grants from NSF tied directly to awards of observing time on ALMA.

The availability of ALMA represents a tremendous opportunity for the entire US astronomical community. However, US astronomers will need to make significant investments in the early years in order to use this facility optimally. For example, users will be required to learn an array of new software, including the CASA data reduction and analysis environment. This is expected to present a significant investment for seasoned radio astronomers, but doubly so for astronomers with negligible radio observing experience.

In order for the US to capitalize on its investment in ALMA, it is critically important that the NSF provide support tied to successful ALMA observing proposals. This is important both so that the US radio community is not at a disadvantage relative to international radio astronomers, but also so that ALMA is accessible to the entire US astronomical community.

Fortunately, Vern Pankonin of the NSF attended the UC meeting, and thus, was able to hear these arguments first hand. This resulted in later discussions within NSF/AST which produced a proposal that a special panel on pre-ALMA science can be specifically formed. The UC is encouraged by this progress and looks forward to further details and involvement as the process matures. We recommend that efforts be made to ensure that there mechanisms in place to accommodate users requesting both small and large amounts of observing time. We encourage NRAO to make every effort to reach out to the broad astronomical community as early as is feasible to advertise this pre-ALMA science opportunity.

### 2.2 e2e

The UC is impressed at the wide variety of successful projects which have been implemented by the Office of End-to-End Operations (OEO) in the last year. The successful outsourcing of the PST and the small number of bugs in the last proposal round are especially impressive.

The submission of several external funding proposals to support the planned work is also to be commended, even with somewhat disappointing results. The UC recommends continuing these efforts, as this model of funding might become increasingly important for specific projects, and because of the added benefits of visibility and collaboration outside of the radio astronomy community.

The new NRAO webpages are a huge improvement, although they still need work, specifically in checking links, and in creating a single and easy-to-find interface with the archive/vault from the NRAO home page. The UC members were impressed with work on the image archive. It is felt that providing FITS images may be especially useful as a way to expand the user community outside of traditional radio astronomers and greatly increase the scientific value of NRAO observations. The UC would like to know what fraction of the total number of images is represented by the 72000 images that were mentioned. Is there a plan to do pipeline processing in real time for users?

The UC believes the general archive is just as important and effective at expanding the user community as the image archive (as proof, consider the number of citations for surveys like NVSS and FIRST). The UC strongly recommends that NRAO increase efforts to expand the archive to include non-imaging data. We are also concerned that the interface to the archive needs work, including advanced search capabilities and name resolution. While the UC recognizes that initiatives such as Google Sky bring NRAO data to wider awareness in the general public, and are important as outreach efforts, we recommend that NRAO strives to strike a balance in efforts where the archive improvement takes additional priority over such initiatives.

## 2.3 CASA

Following a request made by the UC last year, an update of CASA was presented. We thank Jon Hibbard for making this presentation in lieu of the initially scheduled speaker Crystal Brogan. The UC was pleased to see the progress made on the development of CASA, and recognizes the efforts invested in reaching important milestones (e.g. the ALMA and EVLA fillers) and designing strategies towards future goals (particularly the Terabyte Initiative). We also applaud the decision to use this software during this year's summer school. This will certainly help potential young users feel comfortable with the software from the outset and ought to ensure a smoother insertion of CASA within the community. Comments heard from some of the students who attended the schools are very positive; the "user-friendliness" of the software seemed particularly welcome. The UC recommends that the webpage of tutorial lectures resulting from this course be more prominently linked from the main astronomy web page.

We view positively the move towards targeted testing of the software, and recommend the implementation of easy channels for the users to send their feedback to the developers (e.g. through a helpdesk). CASA will accept scripts written in python and we also recommend the creation of an organized script repository. This might prove particularly useful since other interferometry software packages are also configured to accept python scripts.

We strongly support NRAO's decision to seek a permanent replacement for Joe McMullin.

Last year's report inquired about the role that CASA might play for the community outside of ALMA and the EVLA, given that other new facilities chose other software packages (e.g. MIRIAD for the ATA). This year's presentation mentioned that cross-compatibility with other telescopes is considered low priority, and that information on baseline delay lengths is currently not dealt with. This will make it difficult for CASA to be used routinely for instruments other than ALMA and the EVLA, including other NRAO instruments such as the VLBA.

A major concern expressed by the UC is the fact that CASA is not currently anticipated to be ready to deal with EVLA data from the outset. This may strongly affect the appeal of the EVLA to the astronomical community at large because many people might not be willing to learn first AIPS and then CASA in order to have access to the EVLA. This seems to be odds with NRAO's overall strategy to broaden its pool of potential users, particularly outside of the traditional radio community. Although we understand that NRAO faces staffing and budgetary difficulties and has (correctly) made ALMA its absolute number one priority, we strongly recommend that all efforts be made to have CASA ready to deal with EVLA data from the very beginning.

## 2.4 Science and Academic Affairs

The UC was very pleased to hear about recent activities in the Science and Academic Affairs office, especially in tracking the health and growth of the NRAO user community and investigating models for integrated NRAO operations. It is impressive to see that NRAO users constitute 1/2-1/3 of the "active" astro community. As pointed out at the meeting, the challenge remains as to how to reach the non-traditional NRAO users. User grants (e.g. for ALMA, EVLA, and possibly other NRAO facilities) would be a great way to attract new users. We also encourage NRAO to take a proactive approach in advertising the existing and future observing capabilities through dedicated visits to astronomy departments and research institutions, special workshops at the AAS meetings, NRAO-hosted scientific meetings and topical schools etc.

The UC is very enthusiastic about the NRAO training program, especially student observing support, the "PhD friendly policy", and travel/page charges. We suggest that NRAO maintains the wide advertisement of these programs in the astronomical community.

The UC recommends that NRAO review how it keeps in touch with observers who have already taken their data. There is a concern that people who have taken data but never published may simply be stuck with data reduction and not know who to contact for help. This will become a larger problem if NRAO succeeds in its goal of attracting many more users from outside the traditional

radio community. NRAO might consider sending occasional email reminders offering help with data reduction. It is also important to keep visible and up-to-date online listings of who users should contact for help with post processing issues, and NRAO might also consider occasionally emailing this information out to recent observers.

We encourage NRAO to continue with the highly successful Jansky postdoctoral program. We repeat that allowing the choice of host institution is the most important way to attract the best candidates.

The UC would like to hear more about the long term recruitment and hiring strategies of NRAO at the next meeting. The UC notes and is concerned about the two NRAO tenure-track position searches which have been canceled in the past few years (this year and two years ago). Canceling job searches frequently is detrimental to the goal of attracting the best applicants in future, and does not reflect well on the Observatory in the eyes of the community. The UC recommends that before advertising any future positions, NRAO should make every effort to be sure they will not need to cancel the searches for budget reasons.

The UC is also concerned about the impact of multiple committees on NRAO senior management time. While we recognize the importance of committee meetings to provide input to NRAO we suggest that a streamlining of such meetings be considered. We recommend that NRAO consider developing a general set of reports and supporting figures/documentation that are supplied on a password-protected website. Where possible, these documents could be used by multiple review committees and reduce the load on staff of producing such reports and presentations for each visit.

## 2.5 NRAO Visibility

The UC commends the efforts NRAO has made to increase the visibility of the observatory both among the general public and the scientific community. We are glad to see this in the strategic plan, because both types of community development are important to the future of US radio astronomy. Restructuring the newsletter as eNews is both environmentally responsible and allows for more rapid release of interesting developments. The new website has many good features that allow the engagement of the public; however, the scientific users information is not as clearly organized and some links are not functional. We recommend that NRAO undertake regular (preferably automated) checks of all links on their site to quickly identify broken links.

The UC encourages NRAO to pursue opportunities for special AAS (or other meeting) sessions highlighting NRAO capabilities and upcoming instrumentation, particularly as the EVLA and ALMA come online. Since so much has been invested in developing these facilities, the committee wants to ensure that there is a broad user base with strong scientific objectives eager to use these instruments from the beginning. We suggest that the observatory develop and maintain a list of scientists (both staff and external users) who are capable of giving talks summarizing the capabilities of newer telescopes/instruments, and publicize this list so that members of the community can select colloquium speakers from it.

The UC recognizes the importance of showcasing the early science of the EVLA to the user community. Although the development of the SAGE committee appears as a positive step, the UC is disheartened by the lack of visible impact of this committee so far. The UC strongly encourages NRAO to push forward with this initiative even if this requires modifications to the membership of the committee. We would like to see focus in SAGE, developing powerful scientific strategies as EVLA development transitions to early science. We encourage members of this committee and NRAO staff to engage the astronomical community's attention to the EVLA through talks at meetings and workshops. This effort could be made easier through the development of an NRAO talk repository.

## 2.6 Budget Impact on User Programs

At the UC meeting, we were informed that it is possible that NRAO will suffer a substantial (roughly 10%) budget cut to non-ALMA operations effective in FY 2010, and were asked to consider prioritizing various user-community programs currently in place, in case some of these programs must be trimmed. Before proceeding to such a prioritization, the UC would like to state that we are strongly of the opinion that NRAO operations are already very cost-efficient, and in fact in many areas NRAO is actually somewhat short-staffed relative to community needs. We therefore advocate *against* any substantial cuts to the NRAO operating budget and even encourage increases in targeted areas. We would like to be advised of any changes to the current funding levels in these programs, and could convene a sub-panel to discuss options with NRAO if necessary.

For the programs we have been asked to prioritize, we provide the following ranking, starting with the *most important* programs to maintain or increase.

1. Jansky postdoctoral fellowships, specifically those not connected to ALMA. The Jansky program is a great success and is the observatory's most effective way of pipelining users into permanent North American and worldwide positions, ensuring the training of future generations of NRAO users.
2. Observer support (staff) for both observing and data reduction. This is crucial to ensuring the best possible science is extracted from the NRAO telescopes. The UC is concerned that this area is in fact somewhat short-staffed, as exemplified by the current plans not to have CASA immediately available for EVLA data reduction.
3. Student observing support (financial). This program is fairly new but is already considered to be vitally important by both graduate students and their advisors at US institutions. It is clear that this is a good use of funds.
4. Scientific visitor support. This is useful for extended stays at the observatory, for revitalizing and maintaining user connections to NRAO.
5. Observer travel support. Presumably some of this item is already subsumed into the student observing support listed above. The possibility of doing remote observing also decreases the urgency of this particular line item, although it is clear that being present at the observatory is often helpful for reliable data acquisition and/or analysis.
6. Predoctoral program. This program appears to be of somewhat mixed success, as reported by both NRAO staff and students who have passed through the program. If this program continues, we suggest that clear expectations be articulated to students starting the program, and that additional efforts be made by NRAO and the home institution to closely monitor the student progress.

## 3 Future of NRAO

### 3.1 New Initiatives Office

We applaud the creation of the New Initiatives Office (NIO), headed by Jim Ulvestad. The NIO has been very successful in connecting NRAO operations with current and future activities of the developing multiwavelength-astronomy community (GLAST), as well as with aspects of future radio-astronomical projects and user concerns (VSOP-2, SKA). The UC recognizes the strong attempts of the NIO to find external partners for NRAO, in particular with respect to the senior-review recommendation regarding the future funding of the VLBA. The UC recommends that NRAO should intensify these efforts. We also strongly suggest that a specialist in scientific fund raising be

hired as a member of the NIO to help Jim Ulvestad with the task of raising external money to keep the VLBA running during the 2009 – 2012 period.

The UC was very impressed by the impact of the NRAO-GLAST MOU on the activities of the multiwavelength blazar community. A considerable number of successful GLAST AO1 proposals have made use of the opportunity to obtain observing time on NRAO facilities. Two large VLBA projects (one of which has been approved through the NRAO-GLAST MOU) are monitoring the (sub-)parsec scale structure of the very same jets that provide the dominant class of anticipated GLAST point sources and a large amount of regular proposals (both “classical” NRAO proposals and NRAO-GLAST MOU proposals) have been successful in gathering observational data in support of or in the framework of GLAST multiwavelength observations. The UC recognizes that the VLBA and GBT play particularly important roles in correlated observations with GLAST. After the successful launch of GLAST in June 2008, we do now anticipate that these multiwavelength activities involving NRAO facilities will be further intensified in the coming years.

The UC was alarmed to learn that the VLBA’s future continues to be imperiled. The UC recommends that NRAO and NIO should increase the effort to secure financial support and widen the pool of potential supporters. This should include participation in conferences and workshops, articles in high-profile journals such as *Nature* and *Science*, private meetings with potential supporters, and creation of a special web-site devoted to the VLBA’s future. In addition, efforts should be made to organize discussions with individual universities. The UC recognizes that successful negotiations will come with a decrease in the observing time available to the general scientific community. However, because of the uniqueness of the VLBA’s capabilities, closing the facility would have a huge negative impact on current and future astronomers both in the US and abroad and would severely imperil the future of multiwavelength and multi-messenger astronomy as a whole.

The UC strongly supports the strong involvement of the NIO in the international preparations for the VSOP-2 space VLBI mission. VSOP-2 will address scientific key questions relevant for a wide community and NRAO facilities will substantially contribute to the success of the mission. The UC supports the NASA MoO proposal submitted by the NIO and JPL to seek funding for a tracking station and for the 2012 – 2015 operations of the VLBA. We encourage the NIO to follow up on this way of collaborating with other large international space missions.

The UC was delighted by NRAO’s agreement with the Max Planck Institut für Radioastronomie (MPIfR) for ongoing support of VLBA upgrades and operations that resulted in the recent completion of a 22 GHz sensitivity improvement on the VLBA, implemented by NRAO and funded by the MPIfR. The NIO is encouraged to pursue similar agreements with other international institutes and agencies. The active participation of members of the NIO in international conferences and meetings is greatly supported and appreciated by the UC.

The UC is excited about the involvement of NRAO in the two recently approved proposals for further development of the low-frequency radio astronomy concept for applications on the lunar surface. We support NRAO’s efforts to play a significant role as the prospects for lunar radio astronomy evolve.

### 3.2 Decadal Report

The UC recognizes that NRAO faces considerable challenges in preparing for the next decadal survey. The backlog of unfinished (or still waiting to be started) projects from the previous decadal survey will make this decadal survey difficult for all involved.

A particularly large challenge for the radio community is the fact that the next large radio astronomy observing facility has a name (SKA) but that the design goals, timeline, and cost of the SKA remain uncertain.

Nonetheless, the UC was impressed with the preparations that the NRAO is making, looking forward to the next decadal survey. The framing concept of building toward the SKA in the next decade as a realistic approach to a project that needs to be highly ranked in the subsequent decadal survey ultimately makes sense. The central theme of fully exploiting the NRAO facilities as the best

preparation for the SKA makes fundamental sense and works to benefit NRAO's goals. In particular, adding multi-beam capability to the GBT, adding a compact "E" configuration to the VLA, and expanding the VLBA bandwidth past 4 Gbps all represent significant steps toward understanding better what the optimal configuration(s) for the SKA will be. While the technical development necessary for a successful SKA has been emphasized, it is often forgotten that astronomers need to understand the nature of the signals that they will be receiving in order to truly optimize the SKA design. Each of these efforts will also result in developments of software and infrastructure which will be useful to the overall SKA effort. The UC reminds NRAO that we are available as a standing resource should they desire input on issues related to the decadal report.

Ultimately, NRAO's continuing efforts to expand the users of NRAO's telescopes remains as the most important activity for the future of radio astronomy.

## 4 Facilities

### 4.1 ALMA and NAASC

The UC is impressed with the tremendous progress made on various fronts since last year. At the same time, the UC is disturbed to hear about several accidents that took place recently in Chile and resulted in a loss of life and antenna damage. We would like to re-emphasize the need for frequent checks of safety procedures and their implementation. We do appreciate, however, the forthright manner in which NRAO presented the facts of these accidents.

The UC was delighted to hear about NAASC's activities especially concerning software development and testing, and the establishment of the CASA helpdesk. We are delighted to hear that NAASC plans to organize in the future ALMA observing and data reduction tutorials. We would like to further suggest that short training/introductory sessions be planned for future science workshops as a way of introducing ALMA and CASA to the community.

The UC is very pleased to see the five-year plan for NAASC, but would like to caution that the ramp-up staffing plan for NAASC, as well as the software/observing development plan, sounds very ambitious. We would like to remind NRAO that key user functionality should be made the highest priority, and recommend that several tiers be identified with increasing complexity. The UC would also like to remind that ALMA has great potential to attract users across a broad range of wavelengths and any software/observing development should take this into account and not rely on early ALMA users being radio/mm interferometry experts.

We would also like to encourage NRAO to explore collaborations with the community through preparatory grants and other creative means. The large breadth and complexity of ALMA data offers room for NRAO partnerships/collaborations with universities and individuals with multiple benefits.

The recent news of the special NSF panel for pre-ALMA science proposals is an important step in getting the community prepared for ALMA and we wish to emphasize again that this should be widely advertised to the astronomical community.

### 4.2 Green Bank

The UC is impressed with the success of the GBT track repair, in particular the high proportion of the repair time that was able to be used for useful science observations. It is a relief to have this major lingering design problem finally resolved. It is important to highlight science results benefiting from the improved system.

Green Bank is to be commended for a good job of clearing the backlog of high frequency proposals. We hope that dynamic scheduling will help as much as the simulations suggest to free up more observing time for this high demand area. The UC is pleased that our recommendations were considered for the trial of dynamic scheduling. We are anxious to hear results from this summer's

testing of the DSS including feedback from users in the trial. It seems like a good idea to have short (half hour) proposals to fill up available observing gaps.

The UC feels that it is a good idea to work on K-band focal plane arrays and is pleased with planned moves in that direction. Work on a 3mm VLBI receiver is also a good idea and is very important for mm VLBI. This effort is particularly appropriate at this point given the progress toward 3 mm efficiency for the GBT.

We are impressed with the concept and initial progress on GUPPI, the new pulsar backend that will use reconfigurable components (FPGAs) to rapidly develop new hardware. The many (8-12) bit character of GUPPI and its very wide bandwidth make it potentially transformative for pulsar research at Green Bank. GUPPI is also the first in a line of instruments developed within the multi-institution CICADA collaboration, and sets a new design paradigm for NRAO hardware of this type.

The UC heard concerns from some users about the flexibility and usability of GBTIDL. It was felt that for many applications in GBT spectral line observations, GBTIDL has not yet become a sufficiently convenient data reduction package. In essence, unless one conducts pointed observations towards a very small number of sources, data reduction is slow and tedious. In particular, there are missing or weak capabilities to navigate between different sources, offsets from catalogued source positions, and spectral lines.

While the GBT operations appear to be running smoothly at present without relying on e2e, the UC has some concern that e2e is not doing what it needs to do to disseminate data to the community, particularly from the new NRAO facilities or instruments (i.e. spectrometer, FPA).

The UC thanks the GB machine shop for the facilities tour. We were impressed to learn of the variety and complexity of the custom parts that are made there. Clearly the GB machine shop is an asset to the observatory as a whole and the UC recommends that it remain funded in a way that reflects its unique capabilities.

### 4.3 VLA/EVLA

The UC is extremely pleased with the hardware progress on the EVLA, with the antenna refurbishment targets being met each year, budget contingencies being addressed, and good correlator development. The committee feels that there has been adequate communication with the user community as the transition occurs, and appreciates NRAO's efforts to keep this up to date on the websites. In addition to this communication effort for the wider community, we as a committee would like to have a detailed update when the new correlator is installed, even if this occurs between our annual meetings.

We understand and applaud efforts to keep observations ongoing during the transition, though this has presented some challenges for observers as some of the functionality of the VLA antennas is not yet available in the EVLA. We have concerns regarding the scheduling of the array, and encourage NRAO to remain as flexible as possible in responding to user demand for each array configuration. In addition, once the dynamic scheduling (DSS) tests at GBT are carried out this summer, we would like to hear what lessons learned may apply to EVLA scheduling.

We recommend that there be a careful assessment of the impact of installing 74 MHz feeds on the antennas. We appreciate the efforts to quantify the efficiency effects, and would like to hear to what degree this is a problem for users, and/or what impact it will have on proposal pressure for A, BnA, and B configurations. What loss of scheduling efficiency for higher frequency observations would result from installations of the 74 MHz feeds in campaign mode? As always, we recommend open communication with any users that might be affected and for NRAO to give those for whom an efficiency loss is problematic an opportunity to be scheduled outside a 74 MHz campaign.

As discussed in the CASA section, the UC was deeply concerned that CASA does not appear to be on target to be available for early EVLA science. This may discourage new users if they must first learn a software package that is not to be supported into the future, and then learn CASA when it becomes available. We encourage investigation of the possibility for a beta release that would

suffice at least for calibration of early science data on the EVLA. It is good to see that more staff are being devoted to these tasks.

The UC would like to encourage NRAO to continue efforts to simplify use of facilities for non-radio experts. One possible avenue which could be considered as the EVLA first science begins is an operational model with two “observing” modes where there is a default “standard” and an “expert” mode. In the standard approach the desired observing parameters in the successful proposal are used by NRAO to fully prepare the observing program for the user including all necessary calibration for the proposed science. In the “expert” mode the user could decide to take more control of their observations and create their own observing plan for each successful proposal.

#### 4.4 VLBA

The UC is very pleased that NRAO took into consideration its advice to 1) generate higher visibility of the VLBA as a unique instrument for astrometric tasks through participation of the VLBA in the PHOENIX project; 2) dedicate more of the VLBA time to large projects: currently the VLBA performs 4 large projects out of 10 carried out by the NRAO; and 3) increase the recording rate of the VLBA: in 2007 the mean data rate increased by factor of 1.5 compared with 2006. The UC was impressed by the important scientific results produced by the VLBA in the past year, e.g., the measurement of the stellar parallax in and the distance to the Orion nebula and to T-Tauri. Furthermore, the UC was captivated by the deep involvement of the VLBA in multiwavelength correlated observations projects set up in anticipation of the launch of NASA’s new gamma-ray observatory GLAST.

The UC is delighted by the significant efforts that the NRAO is undertaking to upgrade VLBA operations in the current climate of understaffing of the VLBA and constrained resources. The UC supports NRAO’s decision to skip the Mark 5B recording system and upgrade to the new Mark 5C system, although this requires additional disk recording media. We encourage NRAO to continue the Sensitivity Upgrade program, including all three steps (replacement of the existing analog baseband converters and samplers, development of a new wideband Mark 5C recording system, and replacement of the VLBA correlator). All these efforts should increase the visibility of the VLBA to a wider community.

The UC stresses the necessity to continue the antenna maintenance project and to search for ways to replace the original maser cohort. In particular, we are very pleased with the successful completion of the maintenance work on the St. Croix antenna.

These steps serve to increase the lifetime of the instrument and its performance for the next generation of astronomers. The UC recognizes that, in the coming decade, the VLBA will be crucial to attaining maximum scientific return from from the VSOP-2 space-VLBI mission and from multiwavelength astronomy together with new space missions like GLAST. The UC anticipates a key role of the VLBA in future correlative efforts between classical astronomy and observing astroparticle physics, e.g., with the neutrino telescopes Icecube and KM3NeT. This will be in addition to the unique sub-milliarcsecond astrometry and astrophysics that the VLBA produces on a routine basis.

## 5 Refereeing/Time Allocation Committee

The UC wholeheartedly endorses the NRAO’s stated dedication to review the referee/TAC/scheduling process (RTSP) by appointing a committee to investigate the issues in detail and to report back with recommendations not only to NRAO, but to the UC. During this review process, we urge the NRAO and the RTSP Committee to seriously consider changing to two proposal calls per year. We also recommend that this committee look at the feasibility of having external TACs for all NRAO telescopes.

The UC strongly encourages NRAO’s efforts to pursue a submission process that is as uniform as possible across the observatory facilities.

We also highlight the importance of impartiality and transparency in the end-to-end process of proposal evaluation. To broaden the radio user community, to promote confidence in the process, and to strengthen the feeling of investment by the referees themselves, the appearance of impartiality and transparency is as important as the reality.

The UC recommends that TAC members' (but not referees) names should become public after their term of service. The UC also discussed the issue of consensus reports on observing proposals. Although there was not unanimous agreement that this is necessary, the UC recommends that the RTSP consider the issues of referees forming a consensus scientific ranking and delivering a consensus report on the science merit of each proposal. Referee consensus both merges the expertise of reviewers and also helps ensure that their science recommendations are implemented by the TAC. The methods of composing and delivering a consensus report are most appropriately developed by the RTSP Committee. While face-to-face panel meetings may be prohibitive from the point of view of cost and/or time, a dedicated 1-day tele(video)con, or even a wiki approach should not be difficult to implement.

The UC recommends that the consensus of the referees should not be overruled either by the TAC, or during scheduling, unless serious unrecognized technical (e.g., feasibility or scheduling) issues prove paramount. In that case, the referees should be so informed, and the technical issues should be described as part of the report to the proposer.

Further in the spirit of broadening the user base, and to diffuse any lingering perception of insularity in the RTSP process, NRAO should try to enlist referees from a wide pool of expertise, including members from outside of the radio community. If the proposals must thereby appeal to a wider scientific audience, this should benefit the greater breadth and applicability of the results. We strongly support NRAO efforts to date in this direction, but we also call on the RTSP Committee to evaluate and encourage further progress.

## 6 Central Development Laboratory

The Central Development Laboratory (CDL) is critical to the mission of NRAO and as such should receive strong support for its initiatives. The UC commends the CDL on its goal to find new avenues to improve systems through new innovations. For example the new experimental MMIC designs are truly impressive.

The UC recognizes and applauds the CDL's desire to push research in the most promising future direction, yet we recognize that the expertise on the users committee is often too limited to provide significant input to the CDL. We re-iterate the recommendation from the 2007 UC report that the CDL work closely with the NIO on planning the future directions for this group. A couple of areas identified by the UC are an L-band phased array feed, and an 86 GHz receiver for the GBT. The UC recommends that NRAO consider establishing an advisory committee (similar to SAGE) which could help identify the most promising new initiatives for the CDL and help guide programs for the next step in technology development.

## 7 Education and Public Outreach

The UC is very satisfied with the NRAO Office of Education and Public Outreach (EPO) in all four of its target groups: the scientific community, the media, the public, teachers and students. We appreciated Mark Adams' clear and animated presentation.

The UC was pleased with the new and improved NRAO websites for the public coming online in late February 2008. We find the general "One Observatory" layout and navigation very appealing. As discussed above, we note that the websites for astronomers can still be further improved, particularly on the lower levels with detailed information on facilities, proposals or data reduction.

The UC approves of the switch from the old quarterly hardcopy newsletter to the new monthly “NRAO eNews”, distributed electronically with targeted emails, as we recommended in 2007. We suggest that NRAO produce an audio version of eNews highlights and distribute it via podcast. The audio version could also contain footage from the ALMA construction documentary, which is in preparation and which the UC greatly supports. In addition, we encourage NRAO to keep up distributing hardcopy newsletters to institutional subscribers.

The UC is very pleased with the high output of NRAO press releases and we encourage NRAO to further improve on the distribution of such press releases to reach a larger interested audience. We support the development of the “Cosmic Radio” show and encourage NRAO to continue it, possibly by folding in press-release announcements.

The UC encourages NRAO to continue the NRAO/AUI image contest, which contributes substantially to the creation and distribution of visually compelling radio astronomical images to a wider astronomical community and to the general public. To enhance the number of image submissions (14 images in 2007, 13 in 2006, 41 in 2005), the UC would support an overall increase of the prize money. We encourage NRAO to consider a special category for VLA, VLBA, and GBT images, because e.g. the VLBA was considerably under-represented in the past years’ image contests (3 out of 15 awarded images in the 2006 and 2007 contests). We also encourage NRAO to prominently display contest winners on their web site.

The UC congratulates the EPO office on the successful NSF Information Technology Experiences for Students and Teachers program “Pulsar Search Collaboratory (PSC)’ which is a joint effort with West Virginia University, and we strongly support the longterm plans to incorporate the PSC into the Virtual Astronomical Observatory. Efforts such as these simultaneously fulfill the goals of both education and public outreach, and also encourage public support in communities local to NRAO facilities.

## 8 Miscellaneous Users Issues

The UC acknowledges the positive feedback that they receive from NRAO while preparing for the meeting. We note however that expanded efforts on all fronts at NRAO have led to a wealth of information that is very difficult to convey in the limited space of 1.5 days. We recognize the significant impact that the multitude of internal and external committees has on NRAO and encourage NRAO to continue to investigate possibilities for alleviating some of this work. The committee requests that NRAO more closely focuses talks on issues directly relevant to users. One additional consideration was to include one or more members of the UC in the Visiting Committee meetings. Some material presented at the UC meeting is really more relevant to the Visiting Committee and the ‘joint’ members could brief the UC during the opening executive session. The UC would like NRAO to consider expanding future meetings to two full days (at least during the period of rapid growth of EVLA and ALMA and continued endangerment of VLBA), and would appreciate direct communication regarding schedule changes or availability issues of key NRAO personnel.

The UC has been used more frequently by NRAO as a “standing advisory committee” for important issues during the calendar year and we feel that this has been working very well. Over the past year the committee has been consulted on several issues and we are eager to be engaged in issues which are of significant importance to the users community.

The UC requests that NRAO include a short abstract for each section of the material provided to the committee where the highlights can be easily obtained for reference.

The Users Committee wishes to note that NRAO has reached a good gender balance on the UC membership (roughly 50% female) and applauds their efforts in this regard. We also note that there is currently a good balance of non-NRAO affiliated/non-traditional radio astronomy members on the committee. The advice and insight from this extended member database has proven of significant value during meetings. We continue to encourage NRAO to expand the committee membership to include additional members of the mm/submm community.

## 9 2008 Green Bank Meeting Participants

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

Edo Berger

Tracy Clarke (Chair)

Erica Ellingson

Paul Green

Luis Ho

Mike Hollis

Svetlana Jorstad

Matthias Kadler

Laurent Loinard

Amy Lovell

Karen Masters

Rachel Osten

Evan Skillman

Ingrid Stairs (Chair-elect)

Snezana Stanimirovic

Daniel Stinebring

Lisa Storrie-Lombardi

Fabian Walter