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North American ALMA Science Center

PROPOSAL EVALUATION of Studies of Proposed Development Upgrades of the Atacama Large Millimeter/submillimeter Array (ALMA)

Review Panel Instructions and Guidelines for Fifth Call ending 1 May 2017.

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1. Introduction

Continuing technical upgrades and development of new capabilities are essential to maintain ALMA as the state-of-the-art facility for millimeter/submillimeter astronomy over the course of its projected life of 30+ years. Rapid progress of relevant hardware technologies will enable new components and subsystems that can offer improved and extended performance and a higher reliability for ALMA. Equally, advances in software and computing can also offer improved performance that translate into more capabilities for scientific research and reduced costs of operation. Infrastructure upgrades may also result in qualitative and or quantitative increases in the scientific capability of ALMA.

The key principle is that the ALMA Development Program must be driven by science. Its purpose is to enhance the scientific capability and or impact of ALMA, within the bounds imposed by the availability of resources both for the development projects and for the ongoing operation of the observatory. It is also important that there is a single, coherent Program comprising a set of initiatives that are agreed to by the JAO and by all three Executives (and not three independent regional ALMA Development Programs). It is imperative that the Program involves the scientific and technical communities, and industries, of the partner regions, and competitive proposals for development initiatives will be welcomed.

1.1. Scope of ALMA Development Program

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC), and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan.

ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI), and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA. The JAO coordinates the ALMA Development Program, its' goal being to effectively manage the technological evolution of the ALMA facility. Periodically, solicitations ("calls") are issued by each of the international partners to identify and fund development initiatives ("upgrades") which will enhance the performance of the ALMA facility. The implementation of ALMA upgrades will be assigned on a competitive basis.

Upgrade priorities are science-driven, and are established by the collective input from the ALMA Science Advisory Committee (ASAC), the ALMA Development Steering Committee (ADSC), and their respective subcommittees. Upgrades typically progress through three successive phases of development, and correspond to an increasing level of technology readiness. The principal phases are:

a. conceptual study (including scientific justification, specification, and outline costing);
b. prototype/pre-production; and
c. full production and implementation.

The North American ALMA partnership typically funds conceptual studies (hereafter referred to as "Studies") every year. Prototype/pre-production and full production initiatives (hereafter referred to as "Projects") are typically funded every two (2) years. Calls for Projects will be governed by, and conducted through, a different (albeit similar) process. All members of the North American ALMA partnership, and the North American radio astronomy community at-large, are invited to participate in the ALMA Development Program.

It is essential that the three Executives (NRAO, ESO, NAOJ) and the Joint ALMA Observatory work together to ensure the delivery of a coordinated and effective ALMA Development Program. To assist this, an ALMA Development Steering Committee consisting of the ALMA Deputy Director as chair and representatives of each of the Executives (nominated by the Directors or Directors General) has been established. The ADSC will steer the overall program and manage its delivery. The ADSC will advise the ALMA Director on the prioritization of Studies and Projects. The final selection, implementation and execution of Studies is managed by the respective Executive. The final selection, implementation and execution of Projects is managed by the ADSC (the description of this process is beyond the scope of this document). The ADSC will provide specific advice in three areas: progress towards the delivery of development Projects already approved (short-range view implementation); proposals for new development Projects (mid-range view); and the status of identification of ideas for possible Projects and related research and/or feasibility studies (long-range view). The establishment of the ADSC will also help to achieve a balance across the entire program and will identify complementarity between individual proposals for ALMA development projects, and the set of projects undertaken by each of the Executives.

For FY2018 there are two types of Studies.

A. Strategic Studies. These are Studies which directly address one of the areas designated for particular attention by the ALMA Scientific Advisory Committee. Strategic Studies are in-depth studies directly aligned with the development priorities currently identified by the ASAC in the "Road Map for Developing ALMA" document (increasing throughput, improving mapping efficiency, improving spatial resolution and improving archive performance).
B. General Studies. General Studies are those which address any area of improvement for ALMA. All previous studies were general studies; reports are available for many of these as a guide.

The fifth NA ALMA Development Study Period of Performance is planned to span 12 months for general studies, and twenty four months for strategic studies. The Study program is expected to commit funds so studies can commence by October 2 2017 and finish by September 30, 2018 (for general studies) or September 30, 2019 (for strategic studies) The Studies result in a report which is published in the ALMA Memo Series for dissemination.

A total of $2.5M is available for funding Strategic Studies during the FY2018/9 Development Program cycle (subject to the FY2018/9 Federal Budget and allocation of funds). A total of $0.5M is available for funding General Studies during the FY2018 Development Program cycle (subject to the FY2018/9 Federal Budget and allocation of funds). The NRAO expects to fund several Studies; no individual Study will be funded in excess of $200K per year; one year for general studies and two years for strategic studies. As a guide, it is expected that two general studies and six strategic studies may be funded. The North American ALMA Development Program seeks to maintain a portfolio of Studies that balances development of:

a. **advanced techniques** – for example, advanced data processing/analysis tools, advanced calibration methods, or innovative observing modes;
b. **advanced hardware** – for example, advanced receiver cartridge components, cryogenic cooling apparatus, or test and measurement equipment; and
c. **advanced software** – for example, advanced user interfaces, data reduction and analysis routines, or data imaging routines.

FY2018 Call does not emphasize, or prefer, one Study category over another. The Development Program also seeks to balance the distribution of Study funds between the NRAO and external institutions, and thereby advance the capabilities of the entire North American radio astronomy community.

1.2 Development Studies

The ALMA Operations Plan provides funding for targeted exploratory research and feasibility studies aimed at facilitating or assessing the viability of possible development projects, including assessments of opportunities for collaboration. This Hardware Small Projects and Upgrades (OFF-002) budget line is equivalent to approximately nineteen percent (19%) of the funds available for the FY17 NA ALMA Development Program.

The North American ALMA Development Program Manager, in coordination with the ALMA Development Steering Committee (ADSC), issues a Call for Study Proposals annually. The Development Study Review Panel (DSRP) evaluates and ranks the proposals, and submits its recommendations to the NRAO. The NRAO reviews, endorses (with or without modification) the recommendations of the DSRP, and makes final recommendations to the North American ALMA Executive Office. The NA ALMA Executive has funding authority, and responsibility, for executing the NA ALMA Development Studies plan. A similar process is used by the other ALMA Executives.

Reports from Studies supported in previous Calls may be found at Cycle5 Call for Study Proposals.

2. NRAO Development Study Review Panel

Thank you for serving on an NRAO Development Study Review Panel. You have been invited to serve on a DSRP because of your broad knowledge and expertise in critical areas of contemporary astronomy and instrumentation. The key function of the DSRP is to review proposals for Studies of Proposed Development Upgrades to ALMA based on:

- alignment with NA ALMA Partnership strategic goals;
- strength of the scientific case for the proposed ALMA upgrade concept;
- quality of the upgrade conceptual design;
- technology readiness (the aim is to support a range of upgrades including both those which can be implemented rapidly and those requiring longer-term research and development);
- strength of the consortium organization (if applicable);
- qualifications of key personnel;
- technical expertise, past experience and technical facilities in the Institutes taking part in the Study;
- assessed level of risk inherent in the proposed design (the aim is to support a range of upgrades including both those which are judged to be low risk, high reward and those judged to be high risk, high reward); and
- strength of the scientific team supporting the Study.

The DSRP therefore plays a critical role in determining NRAO's science program, reflecting the scientific community's judgment of what investigations and capabilities are important, timely, and influential.

This brief guide provides instructions for entering your individual and independent reviews of proposals. Review guidelines are provided in Section 3.

3. Design Study Reviews

The Review will be conducted in two stages. First, each Reviewer will be assigned a set of proposals to review. Second, each Reviewer will independently judge his or her assigned proposals.

3.1 Assignments

Please use the provided spreadsheet (MS Excel workbook) to inform the NAASC of your interest and qualification to review each proposal. Complete the sections in accord with the following steps:

Step 1: Open the spreadsheet. The page displays all of the proposals assigned to the Development Study Review Panel (DSRP) of which you are a member.

- Column 1 gives the DS proposal ID.
- Column 2 gives the number of pages in the DS proposal.
- Column 3 gives the DS proposal menemonic.
- Column 4 gives the proposal title.
- Column 5 gives the proposal PI.
- Column 6 gives the proposal PI's institution.
- Columns 7 and 8 give the coI name and institution.
- Column 9 gives the requested funding.
- Column 10 provides the reported in-kind funding.
- Column 11 indicates whether the DSRP member is conflicted on a proposal (yes/no).
- Column 12 gives the reason for a given conflict.
- Column 13 gives an indicator of reviewer comfort with reviewing the proposal.
- Column 14 will eventually get a ranking of proposals.

The spreadsheet captures two kinds of conflict:

- the DSRP member is the PI or co-I on a proposal under consideration by the DSRP on which they serve and/or,
- the DSRP member is at the same institution as the PI or co-I on a proposal under consideration by the DSRP on which they serve.

If you believe that any of the conflicts identified are in error, please submit a Helpdesk ticket to the ALMA Helpdesk [category: General Queries (NA)].

Step 2: Please review all other proposal titles and author lists for which we have not identified a conflict (unchecked box) and self-declare any conflicts. Examples of conflicts that we do not (and cannot) check include circumstances under which one or more of the following is true for the PI or a co-I on a given proposal:

a) they are a spouse or other family member of the reviewer,
b) they are a close friend or active collaborator of the reviewer,
c) they are a former student or advisor of the reviewer, or
d) any other reason that leads the reviewer to believe they cannot render a fair and impartial judgment on the scientific merit of the proposal

If any additional conflicts of interest are identified, please send a notice of conflict to almainfo@nrao.edu.

Step 3: Please indicate which proposals you regard yourself best qualified to review by placing a "one" (1) in column 6 of the spreadsheet. Enter a zero (0) in column 6, adjacent to each of the other proposals. Please return your completed spreadsheet to almainfo@nrao.edu.

You will receive a package from the NAASC containing a selection of about five proposals to review, following your suggestions as closely as possible.

3.2 Science Reviews

To enter a science review for a proposal on which you are not conflicted, you can email the review to almainfo@nrao.edu. For each proposal, please include:

- Your name.
- Your review comments. Please type comments regarding the merit of the proposal according to the categories listed in Section 2.
- A numerical score. Please assign a score of [0.1-9.9]. **A low score is better than a high score!** Guidelines regarding the science review are provided in Section 4.
- Review status information.

NB: On rare occasions, you may encounter a proposal that you believe you are unqualified to review. If you sincerely believe that you are unable to perform a credible assessment of the merit of the proposal, make no changes to the default review information for the proposal. With a default score of 0.0, that proposal will be excluded from the score normalization process. Also submit a Helpdesk ticket to the ALMA Helpdesk [category: General Queries (NA)] stating the proposal ID and that you believe you are unqualified to review the proposal. NRAO staff will then mark that review as Complete.

Once all (unconflicted) reviews are complete, please email your review to almainfo@nrao.edu. Thank

you!

4. Guidelines for Science Reviews

The purpose of the development study selection process for ALMA is to prioritize and recommend the proposals that potentially are most valuable for the advancement of scientific knowledge. This does not necessarily mean recommending only those proposals that will provide sure results; it also includes a careful consideration of well-reasoned proposals that may be unconventional but provide opportunities for new discoveries, or which investigate paths to future developments. In the evaluation of proposals, we ask that Reviewers think about how best to exploit the full capability of the ALMA array. In this context, we ask the Reviewers to take a constructive approach. Please use the following criteria to evaluate each proposal:

1 Scientific Merit

We ask panelists to evaluate proposals, first and foremost, on the basis of their scientific merit. The Observatory seeks proposals which may result in development upgrades that may have high scientific impact, not just "sure things" with modest impact.

2 Other Review Criteria

While panelists should base their reviews above all on scientific merit, other factors should be considered.

- Alignment with 2030 Pathway to developing ALMA (see ALMA Development Documents)
- Strength of the scientific case for the proposed ALMA upgrade concept;
- Quality of the upgrade conceptual design;
- Strength of the consortium organization (if applicable);
- Qualifications of the key personnel of the Study;
- Technical expertise, past experience (also in series production, if relevant) and technical facilities in the Institutes taking part in the Study;
- Assessment of the level of risk inherent in the design;
- Strength of the Scientific Team supporting the Study;
- Level of support guaranteed by the Institutes;
- Budgeted cost of the Study;
- Proposal Length. The justification must obey page limits. Regular proposals are allowed a maximum of twenty (20) one-sided pages (US letter-sized), with 11 point font (minimum) to present the scientific justification and the technical feasibility of the study, including all figures, tables and references. Other information, such as CV or references is not counted as part of these page limits.

3 Numerical Scores

The NRAO proposal evaluation process uses a scale from 0.1 to 9.9, inclusive, with 0.1 being an outstanding proposal, and 9.9 being a very poor proposal. It is helpful if Reviewers use the available dynamic range rather than giving every proposal a score between 2.9 and 3.1! Scores are re-normalized so that each Reviewer has the same mean and standard deviation; this process works best if reviewers use the available scoring range.

If you sincerely believe that you are unable to assess the scientific or other merit of a proposal, please retain the default score of 0.0 for that proposal. This will ensure that it is excluded from

the normalization process and from the score average.

4 Comments

Comments from individual Reviewers should be brief and to the point, observing the norms of professional courtesy and providing constructive feedback as appropriate. Please be alert to the role of students in a given proposal when providing feedback.

Comments from individual Reviewers have two important roles:

1) It is not uncommon for different reviewers to come to different conclusions about a given proposal. In resolving these differences, it is important to the function of the DSRP for the individual reviewers to comment about what led them to their scoring. The comments from individual reviewers thus serve to guide the DSRP to its consensus view about a proposal.
2) Comments from individual reviewers will not be fully transmitted to the proposers. However, portions of review comments will carry over into the DSRP consensus comments, which will be fully transmitted to the proposers and should help the proposers understand the disposition of their proposals. Specific comments can be extremely helpful here, especially for proposals that are unsuccessful and need to be improved and resubmitted. The comments from individual reviewers thus serve as a source of specific points to appear in the DSRP consensus comments.

Before finalizing its rankings, the DSRP will meet via telecon to discuss the proposals and adjust the rankings to reflect consensus opinion. DSRP activities during the telecon will be described in a separate set of guidelines.