



NORTH AMERICAN ARC
ALMA Regional Center

North American
ALMA Science
Center



Development Upgrades of the Atacama Large Millimeter/submillimeter Array (ALMA)

Call for Project Proposals

This Call is to invite proposals to conduct studies of ideas that may be further developed and implemented in a subsequent funding cycle. The primary aims of this Call for Project Proposals are to:

- encourage the flow of development ideas from the North American ALMA community into the ALMA Development Program Plan;
- support the development of conceptual and detailed designs by the North American ALMA community for possible future inclusion in the ALMA Development Program Plan; and
- support ALMA-relevant, long-term research and development by the North American community.

The completed Projects will be used, together with similar projects from the other ALMA partners, to prepare and implement the ALMA Development Plan. Limited funding is available from NRAO to support North American-based projects and will be allocated on a competitive basis. Projects partly or fully supported from external sources are also solicited and, if presented, will be considered in the preparation of the ALMA Development Plan.

SECTION 1.0 ALMA DEVELOPMENT PROGRAM

1.1 PROGRAM DEFINITION

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 prototype/pre-production and full production initiatives (hereafter referred to as "Projects") every two (2) years. Calls for Projects (and subsequent funding of selected Projects) will be governed by, and conducted through, a process whereby Project Proposals progress through a series of successive reviews. Generally, the process proceeds as follows:

1. An independent Review Committee evaluates, scores, ranks, selects, and recommends Project Proposals for funding (reference Section 3.3 SELECTION CRITERIA).
2. The recommendations are reviewed and endorsed/rejected by the ALMA Development Steering Committee (ADSC).
3. The ADSC presents its' recommendations to the ALMA Director.
4. The recommendations are reviewed and endorsed/rejected by the ALMA Director and the Directors Council.
5. The ALMA Director presents his recommendations to the ALMA Board of Directors for final review and approval (the National Science Foundation is represented on the Board).
6. The NA ALMA Program Director and Development Program Office are notified of the Board's decision and proceed accordingly.

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.

In this context, this Call solicits Project proposals for the FY2014 program cycle. Applicants may answer this Call by requesting full (or partial) support to conduct a Project or by stating their intention to submit an ALMA upgrade project based on existing work, perhaps funded from other sources. NRAO/AUI will oversee this process on behalf of the North American partnership. This document, together with the accompanying “*Conditions Governing the Call for Project Proposals*” provides all information required to prepare and submit a Project Proposal.

1.2 TECHNOLOGY ROADMAP

The ALMA Technology Roadmap matches short-term and long-term goals with specific technology solutions to help meet those goals. The Roadmap serves three, major purposes; (1) it helps reach a consensus about a set of needs and the technologies required to satisfy those needs, (2) it provides a framework to help plan and coordinate technology developments, and (3) it provides a mechanism to help forecast when those developments can be expected to be available.

In the context of this Call, goals are expressed as general capabilities, and the content of a Project Proposal should represent a potential solution to one, or more, of these goals.

The FY2014 Call for Project Proposals seeks to enhance, or develop new means to, the following general capabilities:

- sensitivity,
- angular resolution,
- field of view,
- spectral coverage,
- simultaneous frequency coverage,
- imaging quality,
- accuracy of amplitude,
- accuracy of phase,
- accuracy of polarization,
- flexibility, and
- usability.

While Proposers are encouraged to align their interests with these goals (general capabilities), they should not be construed as hard constraints. Novel ideas for new or enhanced scientific capabilities are welcome.

1.3 CURRENT PROGRAM STATUS

The first North American ALMA Development Program cycle began in FY2012. Three (3) Projects were funded. One (1) funded Project was an internal (North American ALMA partnership) award; another supplementally-funded Project was an external award to an academic institution. The third funded Project was an external award to a commercial construction contractor. All of the funded Projects are on schedule to complete by the end of Q3 FY2015 (June 30, 2015).

The North American ALMA Development Program seeks to maintain a portfolio of Projects that balances internal and external awards, technology readiness, cost, and risk.

SECTION 2.0 CALL FOR FY 2014 PROJECT PROPOSALS

The release date for the FY2014 Call for Project Proposals is June 03, 2013. The period of performance for funded Projects will run from the award date (October 04, 2013) to no later than September 30, 2015 (approximately two years).

Proposers are requested to submit a **Notice of Intent by June 17, 2013.**

The closing date is August 16, 2013. Proposals received after the closing date may be rejected, at NRAO's sole discretion.

Further details are can be found in the "Conditions Governing the Call for Project Proposals" (available at <https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals>; refer to the "Project Proposal Documents" table).

2.1 ELIGIBILITY

NRAO welcomes proposals or expressions of interest from members of the North American partnership and the at-large, North American radio astronomy community. Collaborative efforts are encouraged.

Proposers who do not require financial support to complete the Project are also invited to respond to this Call. If no support is requested, the final Project will be subject to review in the same manner as funded proposals before being considered for inclusion in the ALMA Development Plan.

2.2 FUNDING

Award pool – a total of four million, three hundred thousand U.S. dollars (\$4.3M) is available for funding Projects during the FY2014 Development Program cycle (subject to the FY2013 Federal Budget and allocation of funds). As a guideline, the NRAO expects to fund at least two (2) Projects. No individual Project will be funded in excess of one million, five hundred thousand U.S. dollars (\$1.5M).

Disclaimer - the entirety of available funds will not necessarily be awarded; acceptance of the Project proposal and granting an Agreement for the Project does not guarantee that the upgrade will be implemented at the Observatory as part of the ALMA Development Plan.

SECTION 3.0 VIABILITY OF PROPOSALS

3.1 PROJECT CATEGORIES

The North American ALMA Development Program seeks to maintain a portfolio of Projects that also 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.

The FY2014 Call does not emphasize, or prefer, one Project category over another.

3.2 PROJECT PROPOSAL CONTENT

Viable proposals will define an approach, or approaches, to new or enhanced scientific capabilities of the ALMA Observatory. The manner of approach may be direct (by enabling new science) or indirect (e.g., by improving operations efficiency or calibration accuracy). The Call does not identify specific science cases to be addressed by the Project, nor does it include a set of technical specifications. These topics must form part of the proposal itself.

Potential Projects may vary enormously in terms of scientific gain, technical maturity, difficulty, cost, and timescale. Very different levels of detail will therefore be appropriate for the Projects. In any case, the Project Proposal (Proposal Form and Project Plan combined) should not exceed one hundred (100) pages in length.

Detailed instructions on how to prepare and submit a Project Proposal are set forth in the Project Proposal Form, the Project Plan template, and in the document “*Conditions Governing the Call for Project Proposals*”. All of these resources are available at <https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals> (refer to the “Project Proposal Documents” table).

3.3 SELECTION CRITERIA

Selection of Proposals will be made using an evaluation matrix (or “scorecard”) based on the following criteria:

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

SECTION 4.0 CONTRACTUAL REQUIREMENTS

4.1 FEDERAL FUNDING ACCOUNTABILITY AND TRANSPARENCY ACT (FFATA) COMPLIANCE

Each successful Proposer (hereafter referred to as the “Offerer”) will be a subrecipient to Federal Award number AST-0836064, entitled “*Management and Operation of the National Radio Astronomy Observatory FY 2010-2015*”, a Cooperative Agreement awarded to Associated Universities, Inc. by the National Science Foundation. The Federal Award is identified under Code of Federal Domestic Assistance (CFDA) number 47.049, Mathematical and Physical Sciences, for R&D.

Subrecipients will be required to complete a *Federal Funding Accountability and Transparency Act (FFATA) Subrecipient Profile Questionnaire* so NRAO can report subaward information to the FFATA Subrecipient Reporting System (FSRS) website, in accordance with the FFATA Act of 2006, the associated 2008 amendment, and the OMB Memorandum dated August 27, 2010.

The *FFATA Subrecipient Profile Questionnaire* is available for review at <https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals>; refer to the “Post-Award Documents” table).

4.2 TERMS AND CONDITIONS

The principal Institution associated with each selected Proposal will be required to engage with the NRAO by means of a *Subrecipient Agreement* (available for review at <https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals>; refer to the “Post-Award Documents” table). This Agreement is subject to Article 8.a.4 of the current and future NSF Cooperative Agreement Financial & Administrative Terms and Conditions (CA-FATC) and as such, requires Subrecipients to follow the Federal laws, regulations, and provisions of the federal award. Subrecipients will also be bound by supplemental requirements imposed by the NRAO (and negotiated amendments thereto).

4.3 REPRESENTATIONS AND CERTIFICATIONS

The principal Institution associated with each selected Proposal will be required to complete a Representations & Certifications form (available for review at <https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals>; refer to the “Post-Award Documents” table). The completed form will represent and certify that the information provided (topics listed below) is current, accurate, and complete:

- labor surplus area status,
- type of business organization,
- Taxpayer Identification Number (TIN),
- Regular Dealer-Manufacturer classification,
- business size and type classification,
- Standard Industrial Classification (SIC) code, and
- compliance with other, miscellaneous Federal Acquisition Regulations.

The completed form becomes a part of the Purchase Order.

4.4 PURCHASE ORDERS

A single, fixed-price, Purchase Order (PO) will be issued for each selected Project. The PO will establish delivery and payment schedules; the latter based upon a mutually agreeable set of progress milestones. The Offerer shall commit to perform the Statement of Work (approved Project Proposal) in accord with first-class trade practice and within the prescribed time limits. Requests for no-cost extensions will be considered on a case-by-case basis.

SECTION 5.0 DELIVERABLES

The precise deliverables will vary between Projects, depending on such factors as:

- scientific justification: specific (e.g., a new receiver band) or generic (e.g., a calibration technique applicable to all observations);
- whether the Project is hardware or software oriented;
- technology readiness level (maturity);
- scope and scale of the Project; and
- cost.

In all cases, intermediate Progress Reports and a Close-Out Report are required. The Purchase Order will clearly define the associated deliverables and delivery schedule.

5.1 PROGRESS REPORTS

Monthly feedback is required from the Project Manager in order for the NRAO to fulfill its' management responsibilities, and to fulfill its' obligations to the National Science Foundation Program Manager. This feedback shall be provided in a simple, one (1) page document, commonly known as a "4-Square". Each quadrant of a 4-Square Progress Report addresses a specific aspect of Project performance (reference Figure 1.0, below).

Cost Performance: <i>actuals versus budget & explanation of variance(s).</i>	Technical Performance: <i>any technical issue(s) impeding Project progress.</i>
Schedule Performance: <i>work accomplished versus work planned (% complete).</i>	Risk Management: <i>threats to Project success and mitigating action plan.</i>

Figure 1.0; "4-Square" Progress Report Format.

The NRAO will complete the Cost Performance quadrant and the Project Manager will complete those quadrants shaded in “blue”. A Progress Report template and detailed instructions on how to complete the Progress Report will be made available in a separate document.

5.2 SPECIFICATION DOCUMENT(S)

If the technical specification of any contract deliverable (hardware and/or software) was developed during the course of the Project (as opposed to being provided by NRAO at the outset of the Project), that specification shall be written and delivered in an ALMA project-approved format (including .pdf files for universal readability). NRAO will provide an ALMA document template, and advice as required.

5.3 HARDWARE

As required by Contract/Purchase Order.

5.4 HARDWARE DESIGN DOCUMENTATION

The Offerer shall provide the following documentation for any hardware that will be integrated/incorporated into the ALMA Array:

- schematic diagrams in Initial Graphics Exchange Specification (IGES) file format, or International Organization for Standardization (ISO) Standard for the Exchange of Product model data (STEP) compliant file format (ISO 10303). These are neutral data formats facilitating digital exchange of information among Computer Aided Design (CAD) systems.
- results of Preliminary and Critical Design Reviews, Manufacturing Readiness Reviews, and Test Readiness Reviews.

NRAO will provide ALMA document templates, and advice as required.

5.5 SOFTWARE

As required by Contract/Purchase Order.

5.6 SOFTWARE DESIGN DOCUMENTATION

The Offerer shall provide the following documentation for any software that will be integrated/incorporated into the ALMA control system:

- a software design description,
- test routine(s)/module(s) to assess code functionality, and
- results of Preliminary and Critical Design Reviews, and Test Readiness Reviews.

NRAO will provide ALMA document templates, and advice as required.

5.7 INTERFACE CONTROL DOCUMENT(S)

Interface Control Documents (ICDs) are key elements of the ALMA Systems Engineering function. The ICDs define and control the interface(s) between and among subsystems, and thereby bound subsystem requirements. An ICD should only describe the interface itself, and not the internal characteristics of the associated subsystem. The function and logic of each subsystem shall be defined by its respective design specification. Thus, good modularity and abstraction, leading to easy maintenance and extensibility, are achieved.

If any hardware or software deliverable constitutes a functional subsystem this will be so noted in the Purchase Order and an ICD shall be written and delivered for that subsystem. Any hardware or software deliverable that affects inter-subsystem functionality will require that its associated ICD be updated. At a minimum, the ICD shall address the following topics:

- related documents and drawings,
- facilities interfaces (e.g., electrical power, plumbing, environmental controls ... etc.),
- physical system interfaces (affected subsystems),
- software/control functional interface(s), and
- safety interfaces.

NRAO will collaborate with the Project Manager to produce new, or updated, Interface Control Documents.

5.8 TECHNICAL MANUAL(S) AND PROCEDURE(S)

The Offerer shall provide the following documentation for any hardware and/or software that will be integrated/incorporated into the ALMA control system:

- hardware handling procedures,
- hardware assembly/installation procedures,
- hardware test and verification procedures,
- hardware operating procedures,
- hardware maintenance and repair procedures,
- software installation procedures,
- software test and verification procedures, and
- a software User Manual (including software operating procedures).

NRAO will provide ALMA document templates, and advice as required.

5.9 QUALITY ASSURANCE CRITERIA AND PROCEDURE(S)

The Offerer shall provide the following documentation for any hardware and/or software that will be integrated/incorporated into the ALMA control system:

- hardware and/or software acceptance procedures,
- acceptance test procedures,

- Test Readiness Review procedures, and
- Safety procedures

NRAO will provide an ALMA document template, and advise as required.

5.10 FINAL REPORT

A Final Report is required at the end of the Project. In general, the Report shall document the formal acceptance of contract deliverables and the administrative actions taken to bring the Project to an orderly conclusion.

At least three (3) months prior to the end of the Project, the incumbent Project Manager shall prepare a Closure Team Charter and appoint members to the Closure Team. The Closure Team Charter shall define the Charges (responsibilities) to the Team, the functional composition of the Team (i.e., engineering representative, business operations representative ... etc.), and the specific deliverables required from each functional representative.

The Final Report shall include, at an appropriate level of detail:

- a compliance matrix depicting contract requirements versus status of deliverables;
- final accounting (purchase order closure, final invoices ... etc.);
- asset capitalization (if applicable);
- disposition of excess materiel;
- contract closure (completed or legally terminated);
- a proposed Preventive Maintenance schedule and requisite spare parts list;
- primary lessons learned; and
- disposition (archival and/or disposal) of Project records.

Additional elements may be appropriate depending on the type and scope of the upgrade.

A Final Report template and detailed instructions on how to complete the Final Report will be made available in a separate document.

5.11 PROJECT OUTCOMES REPORT

The Project Outcomes Report (POR) is a new requirement for National Science Foundation funded project. The report should serve as a brief summary (200-800 words), prepared specifically for the public, of the nature and outcomes of the Project. The report should also describe the project outcomes or findings that address the intellectual merit and broader impacts of the work as defined in the National Science Foundation merit review criteria.

The POR does not need to contain publications resulting from the award as NSF automatically includes publications that are provided as part of the annual and final project reports as part of Research.gov's Research Spending and Results. The report should contain information about products that have resulted from the award such as collections, data sets, software and educational materials. Additional information, and Frequently Asked Questions, on the report contents can be found in the NSF Proposal and Award Policies and Procedures Guide at <http://www.nsf.gov/pubs/policydocs/porfaqs.jsp>.

SECTION 6.0 QUESTIONS RELATING TO THE FY2014 CALL FOR PROJECT PROPOSALS

An [informational meeting](#) will be held in Charlottesville, Virginia on May 10, 2013. Interested parties may attend via telecon, videocon, or in person, and are requested to communicate their intention to participate (preferably by close of business on May 06, 2013) to the North American ALMA Science Center at <mailto:almainfo@nrao.edu>.

Please submit questions concerning the present Call for Project Proposals, including any request for documentation referred to in this document, to the [ALMA Helpdesk](#) [use Knowledgebase: *Development Program*] by June 28, 2013. Queries will be directed to, and answered by, appropriate persons unassociated with this Call.

Questions shall, where possible, make reference to the specific section(s) of the solicitation document (“*Call for Project Proposals*”, and/or “*Conditions Governing the Call for Project Proposals*”) requiring clarification. When answering, NRAO will forward replies, together with the questions received, to all Proposers who have submitted a Notice of Intent. Replies will also be posted to the “*Frequently Asked Questions*” page on the NRAO website [<https://science.nrao.edu/facilities/alma/alma-development-2014/frequently-asked-questions-faq>].