



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

Cycle 5 CALL FOR PROJECT PROPOSALS

Continuing hardware and software developments and infrastructure enhancements are essential to maintain ALMA as the state-of-the-art and world leading facility for millimeter/submillimeter astronomy over the course of its projected life of 30+ years. This Call invites proposals for enabling, improving, or extending current ALMA capabilities and/or promoting greater efficiency of current ALMA operations.

Project deliverables may be implemented at the conclusion of the project, or further developed and implemented in a subsequent funding cycle. Some projects may not realize the planned objectives. Nonetheless, important knowledge will be gained; such is the nature of the development process. It is, therefore, the general aim of this Call for Project Proposals 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 results of completed projects will be used, together with project results from 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 Institute of Astronomy and Astrophysics (ASIAA) in Taiwan. ALMA 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 Office (JAO) provides the unified leadership and management of the ALMA Observatory. 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, and with due consideration of life-cycle costs.

Upgrade priorities are science-driven, and are established by the collective input from the ALMA Science Advisory Committee (ASAC), the ALMA Management Team (AMT), 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 are governed by an established ALMA process which includes review and approval by the ALMA Director and, in some cases, the ALMA Board. 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 FY2017 program cycle (Cycle 5). 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 “*Project Proposal Template*”, provides all information required to prepare and submit a Project Proposal.

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 Cycle 5 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.

Project topics of particular interest are set forth in **APPENDIX A**. While Proposers are encouraged to align their interests with these goals, they should not be construed as hard constraints. Novel ideas for new or enhanced scientific capabilities are welcome.

I.3 CURRENT PROGRAM STATUS

The first North American ALMA Development Program cycle began in FY2012. Three projects (3) 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 have completed the authorized scope of work.

The Second North American ALMA Development Program cycle began in FY2014. Five (5) Projects were funded. Two of the five (2 of 5) funded Projects were internal (North American ALMA partnership) awards; the other three (3) were external awards to various academic institutions. Two (2) Projects continue on a No-cost extension basis.

The third North American ALMA Development Program cycle began in FY2015 and the fourth Program cycle began in FY2016. No projects were solicited or funded during Cycles 3 and 4.

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 CYCLE 5 CALL FOR PROJECT PROPOSALS

2.1 CYCLE 5 CALL RELEASE DATE

The release date for the Cycle 5 Call for Project Proposals is October 10, 2016. The typical period of performance for funded Projects will run from the award date (December 01, 2017) to no later than January 02, 2020 (approximately two years). Some projects may be awarded longer periods of performance.

2.2 NOTICE OF INTENT

Prospective Proposers are requested to submit a **Notice of Intent no later than October 28, 2016**. Please communicate your intent, and intended proposal category, online, at <https://science.nrao.edu/facilities/alma/alma-develop/alma-development-notice-of-intent>.

A Proposer's Notice of Intent is non-binding. Submitting a *Notice of Intent* will ensure that Proposers are included in the mailing list for replies to Proposers' questions and other correspondence related to the Cycle 5 Call for Project Proposals.

2.3 COORDINATION MEETING

A **Coordination Meeting** will be held in Charlottesville, Virginia **on November 09, 2016**. Interested parties may attend via telecon, videocon, or in person, and are requested to communicate their intention to participate (preferably no later than close of business on November 04, 2016) to the North American ALMA Science Center at <mailto:almainfo@nrao.edu>. Dial-in details will be directly communicated to all parties that submitted a Notice of Intent, or expression of intent to participate in the Coordination Meeting. This information and will also be posted on the NRAO website.

2.4 CYCLE 5 CALL DEADLINE

The deadline (closing date) is January 30, 2017. Proposals received after the deadline may be rejected, at NRAO's sole discretion. Requests to postpone the deadline will not be considered.

2.5 ELIGIBILITY

NRAO welcomes proposals or expressions of interest from members of the North American ALMA Operations partnership and their at-large, radio astronomy communities.

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.

The Principal Investigator need not be an astronomer.

2.6 FUNDING

Award pool – a total of eleven million U.S. dollars (\$11.0M) is available for funding Cycle 5 Projects. As a guideline, the NRAO anticipates that these resources are sufficient to fund a portfolio of up to three (3) Projects. Applicants may contribute funds from independent sources, combine them with solicited Project funds, and thereby pursue more aggressive goals.

Disclaimer – awards are merit-based and, therefore, the entirety of available funds will not necessarily be awarded; acceptance of the Project proposal and granting an Agreement for the Project does not imply that the upgrade will be implemented at the Observatory as part of the ALMA Development Plan. Nor, if selected as part of the Development Plan, will the institution or consortium which carried out the Project be automatically selected to undertake the next phase of the development process.

2.7 AMENDMENTS TO THE CYCLE 5 CALL FOR PROJECT PROPOSALS

NRAO reserves the right to issue amendments to the present Call for Project Proposals at any time prior to the deadline for the submission of Project Proposals (January 30, 2017.) Any such amendment will be communicated to all Prospective Proposers that have submitted a *Notice of Intent*.

2.8 VALIDITY DATE OF CYCLE 5 PROJECT PROPOSALS

A proposal submitted to this Call for Project Proposals shall bind the Proposer to the contractual terms, conditions and total cost presented therein, until December 01, 2017; i.e. no amendments to the Proposal within this period of time will be accepted without the express consent of the NRAO.

2.9 CLARIFICATION OF PROJECT PROPOSALS

NRAO reserves the right to ask Proposers for clarifications of their Proposal(s) during the evaluation period. Proposers responses, addressed to William Randolph, Development Program Manager (<mailto:wrandolp@nrao.edu>), must be received within five (5) business days of dispatch of the request, if no other period is stated.

2.10 AMENDMENT, WITHDRAWAL OR RESUBMISSION OF PROJECT PROPOSALS

Requests for amendment, withdrawal or resubmission of the Proposal will be granted if the Proposer can complete the associated action before the Closing Date.

2.11 INTELLECTUAL PROPERTY MANAGEMENT

Confidentiality of NRAO Information - Release of confidential ALMA documentation and drawings may be requested by the Proposer and will be contingent upon execution of a *Mutual Non-Disclosure Agreement* available for review at <https://science.nrao.edu/facilities/alma/alma-develop/call-for-proposals-projects> (refer to the “Post Award Documents” table.)

Confidentiality of Proposer Information - Proposers may wish, in connection with work contemplated under the Proposal, to disclose confidential information to NRAO personnel. To protect the confidentiality of such information, a Proposer may ask NRAO to enter into a *Mutual Non-Disclosure Agreement*.

Intellectual Property (IP) Rights - Proposers’ IP rights pertaining to technical data, copyrightable material, patents, and utilization of subject inventions are subject to the terms of the NRAO’s standard *Subrecipient Agreement* and any negotiated amendments thereto.

SECTION 3.0 VIABILITY OF PROPOSALS

3.1 PROJECT CATEGORIES

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

While the Cycle 5 Call does not emphasize, or prefer, one Project category over another,

special consideration will be given to those Project proposals that address the topics of particular interest listed in **APPENDIX A**.

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.

Principal Investigators anticipating that the product(s) of his/her project will be suitable for use by the Joint ALMA Observatory must prepare (on a best-effort basis) a proposed implementation schedule and estimates of implementation and life-cycle costs (further defined in Section 8.10 of this document.) If a Project Proposal is provisionally accepted by the ALMA Management Team, the Principal Investigator will be required to collaborate with the NRAO and JAO in preparation of a refined implementation schedule and refined estimates of implementation and life-cycle costs.

SECTION 4.0 PREPARATION OF CYCLE 5 PROJECT PROPOSALS

The Project Proposal shall be composed in accord with the *Project Proposal Template* available at <https://science.nrao.edu/facilities/alma/alma-develop/call-for-proposals-projects> (refer to the “Project Proposal Documents” table). **Proposals that do not make use of, or conform to the format and conventions of this template will not be considered.**

Even if financial support is not requested for the Project, financial data (contributions in kind) must be included in order to assess all Proposals fairly in the context of the ALMA Development Plan.

The Project Proposal shall not exceed one hundred (100) pages in length.

Curriculum Vitae and Appendices are excluded from the page count.

SECTION 5.0 SUBMITTAL OF CYCLE 5 PROJECT PROPOSALS

Submit the completed Cycle 5 Project Proposal (**with signatures**), in “.pdf” format, online at <https://science.nrao.edu/facilities/alma/alma-develop/call-for-proposals-projects> (refer to the “Submitting a Development Cycle 5 Project Proposal” section).

SECTION 6.0 AWARD OF CYCLE 5 PROJECTS

6.1 EVALUATION PROCESS

Preliminary evaluation will be conducted by a committee of non-NRAO reviewers with the technical input of independent persons familiar with ALMA technical matters. The membership of the Review Committee will be determined by NRAO management, with

the consent of the National Science Foundation (reference **Figure I.**) Members of these groups who are involved in competing proposals will be recused from judging their own, or closely-related, proposals.

“Down-selected” proposals will be forwarded to the ALMA Management Team (composed of representatives of all three ALMA Partners and the Joint ALMA Office.) The AMT will collaborate with the Principal Investigator, the JAO Observatory Scientist, the JAO Observatory System Engineer, and the appropriate ALMA Integrated Product Team(s) to:

- assess the science case and its relevance for the vision and aims of the ALMA Development Program;
- prepare a refined Implementation Plan (schedule and budget);
- prepare a Technology Readiness Assessment that determines if the proposed Project is technically feasible;
- prepare an Operational Impact Assessment that defines requisite facilities and estimates the total life-cycle cost of the Project including operation, maintenance, decommissioning and telescope time; and
- consider the development capabilities in the Partnership regions so that ALMA enhancements and renewal can be sustained in the long-term.

A set of Projects with suggested prioritization will be recommended by the AMT, together with the JAO Observatory Scientist and the JAO Observatory System Engineer, to the ALMA Director.

Final review and approval by the ALMA Director (in consultation with the ALMA Science Advisory Committee), and in some cases the ALMA Board, are required.

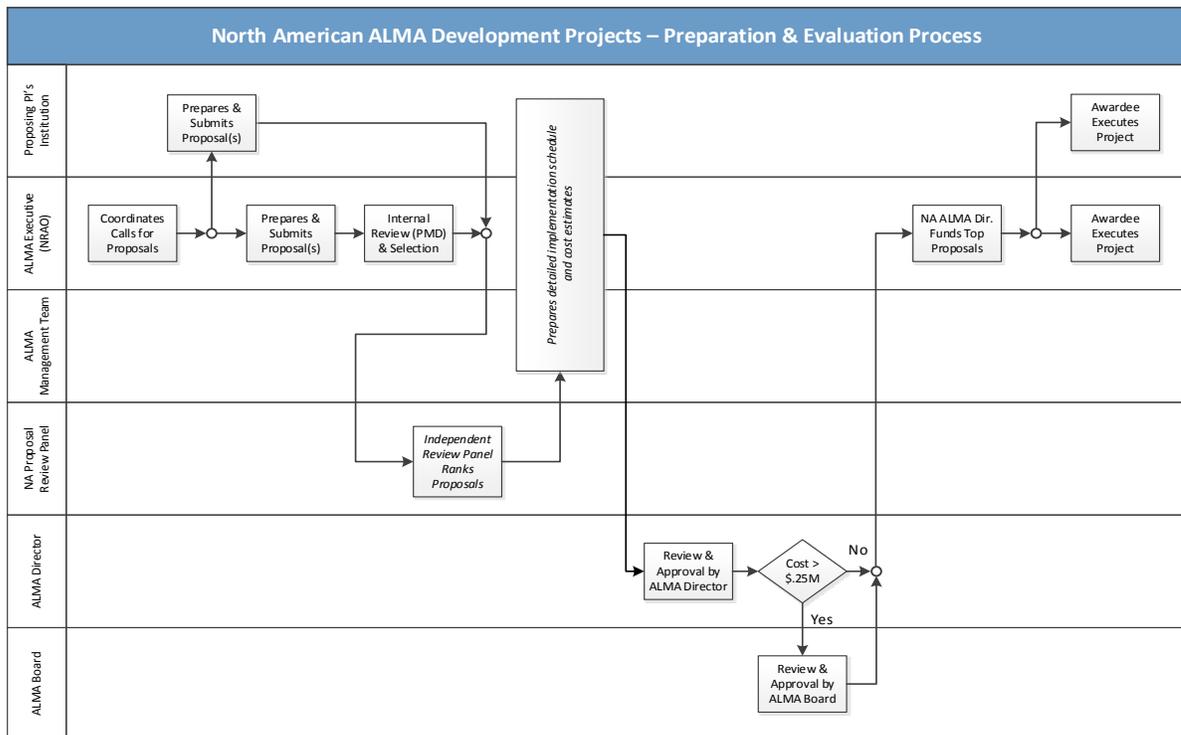


Figure 1: North American ALMA Development Projects – Preparation & Evaluation Process.

6.2 EVALUATION CRITERIA

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

- alignment with 2030 Pathway to developing ALMA;
- 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 Project;
- 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);
- strength of the scientific team supporting the Project;
- level of support guaranteed by collaborating institutions (if applicable);
- total Project costs and a preliminary estimate of life-cycle costs, by class of cost
 - *labor*
 - *materials and services*
 - *travel*
 - *overhead*
- Operational Impact of non-recurring and recurring requirements.
 - *integration*
 - *verification*
 - *commissioning (including telescope time)*
 - *maintenance*
 - *decommissioning.*

Final evaluation of Proposals will be based upon the refined implementation schedule, detailed estimates of implementation and life-cycle costs, and overall benefit/impact to the ALMA Science Program.

6.3 NO INFORMATION (“BLACK OUT”) DURING PRELIMINARY EVALUATION PROCESS

NRAO staff will not respond to questions about proposals or proposal status during the preliminary evaluation and selection period. NRAO reserves the right to eliminate from the evaluation any Proposer contravening this provision.

6.4 RESULTS AND NOTIFICATION OF AWARD AGREEMENT

Proposers will receive written notification of **provisional acceptance, or rejection**, by the ALMA Development Steering Committee **no later than May 30, 2017**.

Contending Proposers will receive written notification of **final acceptance, or rejection, no later than December 01, 2017.**

Decisions will be made in consultation with, and the consent of, the National Science Foundation. Rejection decisions cannot be appealed, and NRAO will not enter into correspondence on decision rationale.

SECTION 7.0 CONTRACTUAL REQUIREMENTS

7.1 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 2010-2016*”, 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 awarded twenty-five thousand dollars U.S. (\$25K) or more (likely all 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-develop/call-for-proposals-projects> (refer to the “*Post Award Documents*” table).

7.2 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-develop/call-for-proposals-projects>:refer to the “*Post Award Documents*” table). This Agreement is subject to Article 8.a.4 of the current 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).

7.3 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-develop/call-for-proposals-projects>: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.

7.4 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 8.0 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 Closeout Report are required. The Purchase Order will clearly define the associated deliverables and delivery schedule.

8.1 PROGRESS REPORTS

Monthly feedback is required from the Project Principal Investigator 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 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 2**, on following page.)

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 2: “4-Square” Progress Report Format.

The NRAO will complete the Cost Performance quadrant and the Principal Investigator 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.

8.2 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 having been provided by the NRAO at the outset of the Project), that specification shall be written and delivered in an ALMA-approved format (including .pdf files for universal readability). NRAO will provide an ALMA document template, and advice upon request.

8.3 HARDWARE

As required by Contract/Purchase Order.

8.4 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 the 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 upon request.

8.5 SOFTWARE AND/OR FIRMWARE

As required by Contract/Purchase Order.

8.6 SOFTWARE AND/OR FIRMWARE DESIGN DOCUMENTATION

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

- a software and/or firmware design description;
- test routine(s)/model(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 upon request.

8.7 INTERFACE CONTROL DOCUMENTATION

Interface Control Documents (ICDs) are key elements of the ALMA Systems Engineering function. The ICDs define and control the interface(s) between and among systems, and thereby bound the subsystem requirements. An ICD should only describe the interface itself, 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 archived.

If any hardware, software, or firmware 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, software, or firmware 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 ...);
- physical system interfaces (affected subsystems);
- software and/or firmware control functional interface(s);
- safety interfaces; and
- new requirements (if relevant.)

NRAO will collaborate with the Principal Investigator to produce new, or updated, Interface Control Documents.

8.8 TECHNICAL MANUAL(S) AND PROCEDURES(S)

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

NRAO will provide ALMA document templates, and advice upon request.

8.9 QUALITY ASSURANCE CRITERIA AND PROCEDURE(S)

- hardware, software, and firmware acceptance procedures;
- Test Readiness Review procedures;
- acceptance test procedures; and
- hardware, software and firmware safety procedures.

NRAO will provide ALMA document templates, and advice upon request.

8.10 SAFETY PRACTICES AND PROCEDURES

If any Project activity or the use of Project deliverables creates a significant hazard or if there are circumstances that may present significant risk, then the Offerer shall provide written methods outlining how to perform the associated task with minimum risk to people, equipment, materials, environment, and processes. Particularly hazardous tasks (if any) will require detailed written procedures to guide a worker through the task from start to finish and thereby minimize potential exposure.

8.11 PROPOSED IMPLEMENTATION PLAN

The preliminary implementation plan (reference Section 6.1) shall be reviewed and updated to incorporate lessons-learned during the course of the project, and to reflect the current state of operations at the Joint ALMA Observatory.

8.11.1 Implementation schedule

Particular attention should be given to integration with the JOA operating schedule.

8.11.2 Non-recurring (implementation) cost estimate

Refined cost estimates shall be provided for:

- shipping and handling;
- integration;
- performance verification testing; and
- commissioning (including telescope time).

8.11.3 Recurring (life-cycle) cost estimate

Refined cost estimates shall be provided for:

- spare parts provisioning (with identification of critical spares);
- preventive maintenance; and
- decommissioning.

8.11.4 Site location impact statement

The Offerer shall note if the Project is dependent upon the use of existing JAO/NRAO facilities, significant modification of existing facilities, or new facilities. Estimated cost(s) of facilities modifications and/or creation of new facilities shall be included in the implementation cost estimate.

Indicate (in the implementation schedule) when these modifications and/or new facilities are required.

8.12 CLOSEOUT REPORT

A Closeout Report is required at the conclusion 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 scheduled end of the project, the 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 (e.g., engineering representative, business operations representative ... etc.), and the specific deliverables required from each functional representative.

The Close-Out 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.);
- disposition of excess materiel;
- capitalization of U.S. Government assets (if applicable);
- contract closure (completed or legally terminated);
- identification of technical and programmatic (schedule and cost) risks and a recommended risk mitigation plan;
- 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 project.

A Close-Out Report template and detailed instructions on how to complete the Close-Out Report will be made available in a separate document. It is the NRAO's intent to publish the Close-Out Report in either the ALMA Memo Series or in the North American ALMA Science Committee Memo Series.

SECTION 9.0 QUESTIONS PERTAINING TO THE CYCLE 5 CALL FOR PROJECT PROPOSALS

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 December 16, 2016. Queries will be directed to, and answered by, appropriate persons associated with this Call.

Questions shall, where possible, make reference to the specific section(s) of the solicitation document ("*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-develop/frequently-asked-questions-faq>].

SECTION 10.0 CYCLE 5 SCHEDULE SUMMARY - PROJECTS

Milestone	Date	Reference Section
Release of Call for Project Proposals	2016 October 10	Section 2.1
Notice of Intent due date	2016 October 28	Section 2.2
Coordination Meeting	2016 November 09	Section 2.3
Proposer’s Questions Submitted <i>no-later-than</i>	2016 December 16	Section 9.0
Project Proposal Deadline	2017 January 30	Section 2.3
Provisional Notification of Awards	2017 May 30	Section 6.4
Implementation Plan due	2017 August 31	Section 3.2
Final Notification of Awards	2017 December 01	Section 6.4
Validity Date of Proposals	2017 December 01	Section 2.7
Project Completion Date	2020 January 02 *	Section 2.1

** Some Projects may be granted an extended period of performance*

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APPENDIX A

PROJECT TOPICS OF PARTICULAR INTEREST TO THE NA ALMA PARTNERSHIP

1. Improvements to the ALMA Archive: enabling gains in usability and impact for the Observatory.
2. Larger bandwidths and improved receiver sensitivity: enabling gains in speed.
3. Longer baselines: enabling qualitatively new science.
4. Increasing wide field mapping speed: enabling greater mapping efficiency.

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