

ALMA Rebaselining Plan

V1 JAO 2004Dec14

Introduction

The scope, budget and schedule of the Atacama Large Millimeter Array (ALMA) project are being reviewed in late 2004/early 2005 by the Joint ALMA Office (JAO) at the request of the ALMA Board, the National Science Foundation and the European Southern Observatory. The objectives of this process are:

- To provide a comprehensive understanding of the current scope of the ALMA construction project. Project development was distributed between the North American and European Executives in 2002; subsequent changes to the project definition, and improvements in the understanding of the scientific and technical requirements, need to be considered and budgeted.
- To generate a bottom-up cost and schedule estimate for the current scope, including costs associated with design and development, production, assembly, integration and verification (the baseline plan).
- To identify modifications or deletions to the ALMA baseline plan that may be selected to enable the construction project to meet budgetary or schedule constraints; review and implement them.

There are three steps in this process:

1. Estimate the Current Scope: Clear documentation, definition, costing and scheduling of the currently agreed-to ALMA construction project scope, including basis-of-estimate comments, contingency analysis and risk information.
2. Integrate the Current Project Information: Implementation of an Integrated Project Schedule and COBRA-based project budget to provide development analysis and tracking, and a framework within which to consider rescope options. Implement an Earned-Value Management System (EVMS) to enable tracking against the baseline.
3. Generate a New Baseline for the Project: Selection of rescope options via scientific and management review; upgrade project information in IPS/COBRA (rebaseline); update EVMS tracking.

This document outlines the tools and procedures with which these goals will be achieved. The revised baseline for the project will be referred to as the JAO baseline.

Tools for IPTs

To assist the Integrated Product Team (IPT) leads and deputies in carrying out (1) above, the following tools have been produced:

Cost Estimation Spreadsheets: These Excel spreadsheets are simplified IPT-extracted versions of the centralized project budget spreadsheet that has been the primary repository of budget information since project inception. These should look familiar to all IPTs. A column has been added to allow IPTs to explicitly enter a contingency percentage associated with line items in the budget (the percentage is estimated using the Contingency/Risk spreadsheet described below).

These spreadsheets include two copies of the IPT budget; one which cannot be modified to show the current baseline estimate, and a second copy (containing the same information, initially) which will be modified by IPTs to reflect your updated cost estimates. A document describing the cost estimation spreadsheets and their use accompanies this document.

Statement of Work Documents: One of the largest concerns to management about the current baseline plan is “hidden scope”; areas where executing the currently-understood global scope of the construction project actually requires more labor/materials/travel than the sum of the IPT definitions. To expose these areas; we are requesting the IPTs produce Statements of Work (SOWs) for their deliverables to the ALMA project. The list of requested SOWs can be found in Appendix B, which was distributed for comment in early December. An example SOW for the Front End Assembly was recently distributed.

Each IPT typically has between 5-15 SOW documents to produce; in many cases much of the requested information for a given IPT will be identical across multiple SOWs. In Appendix B is an “ABC” ranking of the IPT SOW areas; please devote your initial attention to the A-listed SOWs (which the JAO suggests are the areas of the project that may contain significant hidden scope).

These documents will continue to be updated and referred to beyond this rebaselining effort as part of the project configuration.

Contingency Analysis/Risk Estimate Spreadsheet: This Excel spreadsheet provides: (a) a way for IPTs to estimate the contingency that should be associated with particular line items of the project cost estimates; and (b) a way to expose and discuss program risks associated with the IPT programs. Each IPT (and the project) is dealing with risks that cannot be adequately described or made visible as a contingency percentage on the budget line items. Using the risk estimation sheet each IPT should list their perceived risks and concerns, including options for mitigation. The risk estimation sections from these spreadsheets will be collected and used to generate a Risk Register for management of the risks.

10% Rescope options: Each IPT has been requested to produce a short document addressing the following question:

If we allowed the current scientific, technical or operational specifications of ALMA to be reasonably changed or redefined, what changes to the scope or execution of your development program could be made to allow a 10%+ reduction in the cost of your IPT?

The goal here is to identify those areas of development where the cost-return curve is steep, and present options for rescoping the project to fit within budgetary constraints. Each response to the question must include some estimate of the scope, budget and schedule impact of the proposed modification (order of magnitude or better), and discuss potential impacts to other IPTs. Once all these documents are in hand, the JAO+MIPT will review them and initiate further discussion with the IPTs on selected items.

Integrated Project Schedule: Over the past few months the IPTs have been working with the Project Management Control System (PMCS) consultants to develop an integrated project schedule (IPS) for ALMA. The first draft of the IPS was delivered in early December; it contains detailed information about the work associated with the known scope of the IPTs, and indicates the relationships and handovers of materials and services between the IPTs. Examination of the IPS should expose hidden scope associated with the interface milestones between the IPTs, and expose “marching army”-type problems; places where assumptions about the duration of budgeted activities are incorrect due to changes in external dependencies (late deliveries, decisions in other IPTs, etc.).

Schedule

All of the tools and information have now been distributed to the IPTs, and over the past month we have discussed many of these items in our weekly IPT meeting. The requested schedule for document production is shown below:

<i>Document</i>	<i>Due Date (2005)</i>
First draft: SOW documents (A-grade)	Jan 15 th
10% Rescope document	Jan 15 th
First draft: SOW documents (others)	Jan 25 th
Revised Cost Estimation spreadsheet	Feb 1 st
Contingency/Risk Estimation spreadsheet	Feb 1 st

A suggested sequence is: (1) Review the Cost Estimation spreadsheets in their original form, ensuring the information contained is a correct representation of your budget as you understand it; (2) Review in detail the IPS information for your IPT, ensuring it is internally consistent with your current best forecast and that all interface milestones (links to other IPTs) are present and wired together correctly; (3) Prepare the SOW documents, based on your understanding of your IPT scope and referencing the existing budget estimates and the IPS; (4) Prepare your 10% Rescope options document; [at this point there will be a JAO+MIPT review of the SOW documents and detailed discussions with the IPT leads/deputies concerning any hidden scope identified]; (5) Reestimate the budget associated with your IPT, including the contingency and preparing a list of program risks.

All completed documents should be submitted to the ALMA project manager electronically by the due date.

External Factors

In generating this information there are some significant unknowns associated with the project that may influence IPT planning:

Operations: The detailed transition from ALMA construction to operations is still being analyzed. The details of this transition can affect staffing and travel planning for the IPTs. Please reference the latest version of the ALMA Operations Plan and/or contact David Silva dsilva@eso.org (cc to the ALMA project

manager) for clarifications. In your planning efforts you should clearly state any assumptions made regarding the interface between construction and operations.

Antenna Contract: The detailed delivery schedule for the production antennas is coupled to many areas of project development. At the time of writing it appears unlikely that the antenna contract will be signed before April 2005; depending on which vendor is selected, the first production antenna may not be available for 18 to 30 months after contract signing. For planning and estimation purposes the IPTs should assume the parameterized antenna delivery schedule distributed by the JAO Nov 8th 2004 (this is what is contained in the IPS at present). Note: if the expected difference between the parameterized and expected antenna delivery schedule presents significant problems or opportunities for IPT planning please contact the ALMA project manager for further discussion.

Assistance

During this effort please feel free to contact the JAO and Executive managers to request clarification or further information.

Appendix A: Information

Cost estimation spreadsheets

These can be found at

<http://almaedm.tuc.nrao.edu/forums/alma/dispatch.cgi/bdgtpln>

The instructions for using these spreadsheets are included in the package associated with this file; this document also available at the website. Some IPTs are already using older versions of the instructions and spreadsheets; the information will be updated as needed and previous IPT estimation effort can be transferred to the updated sheets (please contact R. Simon).

Problems? Contact Richard Simon or Jean-Louis Beckers

SOW documents

A template document (the example for the FE subassembly) is included in the package associated with this file, and can be found at the website.

Problems? Contact Rick Murowinski or Tony Beasley

Contingency/Risk Estimation Spreadsheet

A blank Contingency/Risk Estimate spreadsheet is included the package, and can also be found at the website.

Problems? Contact Tony Beasley or Adrian Russell

10% Rescope Document

Please submit a pdf document.

Integrated Project Schedule

Access through the WelcomHome interface - please contact your PMCS planners and/or Richard Simon if you have problems.

Problems? Contact Richard Simon or Tony Beasley.

Appendix B: SOW + Ranking

Statements of Work (11/21/04)

Below is an attempt to identify the major deliverables from the ALMA IPTs to the construction project. Please review this list and provide comments as soon as possible (email to Tony Beasley & Rick Murowinski). The request to the IPTs will be to draft one SOW document for each line listed here. An example will be provided to help facilitate this.

1. Site IPT
 - a. AOS technical building **A**
 - b. Antenna pads **A**
 - c. OSF technical facilities **A**
 - d. AOS-OSF Data Link **B**
 - e. Infrastructure (roads, data/communications, power supply and distribution, video surveillance, meteorological, public outreach facilities, bridge(s)) **A**
 - f. Accommodations and services at OSF **C**
2. Antenna IPT
 - a. Antenna Prototypes, **C**
 - b. Production Antennas, **B**
 - c. Nutator and Optical Pointing Telescopes **A**
 - d. Antenna Transporter **B**
 - e. Antenna Foundation Design **A**
3. FE IPT
 - a. Front End Assembly (including cal, solar, WVR, all He equip and lines) **A**
 - b. Front End Service Vehicle **A**
 - c. RF lab at OSF **B**
 - d. OSF RF calibration equipment (Holography and RF source) **A**
4. BE IPT
 - a. IF and Data Transmission system **A**
 - b. LO **A+**
 - c. Digital lab at OSF (BE) **B**
 - d. Fibre Specification **A**
5. Correlator IPT
 - a. Correlator **A**
 - b. Digital lab at OSF (Correlator) **B**
6. Computing IPT
 - a. Telescope Software and associated Hardware (e.g. M&C software, on-line data reduction, correlator software, common software, etc. This is all the software needed to perform AIV and Commissioning) **A**

- b. Observatory Software (e.g. pipeline, archiving, scheduling, obs preparation, offline processing/analysis. This is all the software needed to provide Observatory services, i.e. the software needed to be in place for early science and SV) **B**

7. SE

- a. System engineering and PA **B**
- b. Prototype system integration (also includes ATF support, and delivery of all processes and documentation needed for SI) **A**
- c. Chilean system integration **A+**

8. Science IPT

- a. Project Documentation (Sci Requirements, Cal Req'ts, Cal Plan) **B**
- b. Models **A**
- c. Support in many other activities – especially antenna test and PSI **A**

9. Management IPT

- a. Project Management (JAO and Executive Project offices) **B**
- b. PMCS implementation & management **B**
- c. Education & Public Outreach (public/science community) **C**
- d. Diplomatic relations with Chile/local authorities and communities **B**
- e. Environmental Studies & Mitigations **A**
- f. Safety **A**