



Atacama Large Millimeter Array

Rebaselining Status

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ALMA PM



ALMA

- Successes
 - Technical
 - Funding
 - Collaboration

- Issues
 - Budget
 - Schedule
 - Scope
 - Collaboration

- Process: rebaselining



History

- ALMA scope/budget/schedule preliminary description – March 2002.
- October 2002 – substantial revision...
- Bilateral agreement (ESO/NSF) – Feb 2003
- Project management structure defined
- Ongoing informal modification of contingency to stay within \$\$ envelope
- Many rough estimates... new areas



Bilateral budget (March 2002)

Schedule of Values and Cost Summary for ALMA Phase 2 Construction (Y2000 K\$)

Level-1 WBS Task	Total Project			North American Tasks			European Tasks		
	Cost	Contingency	Value	Cost	Contingency	Value	Cost	Contingency	Value
1. Management/Administration	\$16,470	5.1%	\$17,313	\$8,440	5.0%	\$8,861	\$8,030	5.3%	\$8,452
2. Site Development	\$61,154	14.6%	\$70,049	\$23,418	14.4%	\$26,787	\$37,736	14.6%	\$43,262
3. Antenna Subsystem	\$198,022	15.0%	\$227,739	\$96,925	14.8%	\$111,299	\$101,097	15.2%	\$116,440
4. Front End Subsystem	\$90,800	20.0%	\$108,982	\$43,886	21.4%	\$53,291	\$46,914	18.7%	\$55,691
5. Back End Subsystem	\$40,777	22.0%	\$49,765	\$24,004	18.4%	\$28,416	\$16,773	27.3%	\$21,349
6. Correlator	\$13,204	12.5%	\$14,856	\$12,675	12.8%	\$14,294	\$529	6.2%	\$562
7. Computing Subsystem	\$29,843	15.5%	\$34,468	\$15,905	14.4%	\$18,199	\$13,938	16.7%	\$16,269
8. System Eng. & Integration	\$18,172	10.8%	\$20,125	\$9,358	10.4%	\$10,335	\$8,814	11.1%	\$9,790
9. Science	\$8,721	5.2%	\$9,173	\$4,527	5.0%	\$4,753	\$4,194	5.4%	\$4,420
Total	\$477,163	15.8%	\$552,470	\$239,138	15.5%	\$276,235	\$238,025	16.1%	\$276,235

Value-balanced...

Revised budget (October 2002)

ALMA				North America			Europe		
	Task Subtotal Y2K \$k	Cont %	Task Total Y2K \$k	Task Subtotal Y2K \$k	Cont %	Task Total Y2K \$k	Task Subtotal Y2K \$k	Cont %	Task Total Y2K \$k
Management	23,592	4.0%	24,536	11,796	4.0%	12,268	11,796	4.0%	12,268
Site	62,998	8.0%	68,056	22,873	5.5%	24,140	40,124	9.5%	43,916
Antenna	202,756	9.0%	221,095	98,095	6.8%	104,768	104,662	11.1%	116,327
Front End	100,416	12.2%	112,713	47,628	10.6%	52,669	52,788	13.7%	60,045
Backend	49,144	10.0%	54,061	33,052	8.4%	35,821	16,092	13.4%	18,240
Correlator	12,815	6.6%	13,655	12,148	6.7%	12,962	667	4.0%	694
Computing	31,789	9.9%	34,943	16,158	8.0%	17,445	15,631	11.9%	17,498
System Eng. & Integration	22,410	7.1%	23,993	10,839	5.7%	11,455	11,571	8.4%	12,538
Science	9,055	4.0%	9,417	4,527	4.0%	4,708	4,527	4.0%	4,708
	514,975	9.2%	562,470	257,110	7.4%	276,230	257,859	11.0%	286,230



2003-2004

- October 2002 – budget & scope changing..
- 2004 – Project Management Control System introduced (+)
- 2003-2004: information flow, fiscal control issues
- Deviation from baseline (schedule, level of contingency ↓)...
- 2004: rebaseline (Budget, Schedule, Scope)
- Here: Antenna budget (risk, largest piece, longest span, industrial link) isolated from the rest of the project (8 IPTs)
- Assumption necessary after contract deferral in Nov 2004



Rebaselining

- Schedule

- Original level I milestones
- \Rightarrow Integrated Project schedule (underway) (diagram)
- Best forecast to complete current scope...

- Budget

- Decompose into Executive components
- Simplify tools for cost/contingency/risk estimation
- Regenerate bottoms-up estimates for identified baseline scope
- Give IPT ownership of budget/contingency

Project: IPS
 Time Now: 11Mar2005
 Printed: 20Mar2005
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Integrated Project Schedule WBS Level 1 Summary

WBS	Total Float	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.01 - Management	-13d	Jan2001												16Apr2012			
	-13d												23Jan2012	★	Completion of ALMA Cor		
1.02 - Site	-24d	08Aug2002												04Apr2011			
	1222d								09Aug2007	★	Initial Phase of Civil Work in Chile Complete						
	0			26Jul2003	★	Begin initial Phase of Civil Work in Chile											
1.03 - Antenna	-22d	02Jan2002												23Jan2012			
	184d							06Dec2006	★	First US Production Antenna available in Chile at OSF (Targ							
	197d							06Dec2006	★	Ready for Transporter to SI - Antenna #1							
1.04 - Front End	0	Jan2001												14Nov2011			
1.05 - Back End	17d		07Jan2003											17Feb2011			
	1439d								19Apr2006	★	Central Back End System Ready to Install at Array Site						
	262d								14Aug2006	★	First Antenna based Back End Subsystem Ready for Installati						
1.06 - Correlator	546d	01Oct2001											25Jan2010				
1.07 - Computing	2d		01Jun2002											28Jul2011			
1.08 - SE & I	-30d		01Apr2002											23Jan2012			
	0			24Mar2003	★	Start Antenna Evaluation at ALMA Test Facility											
1.09 - Science	-11d		27Nov2002											16Apr2012			
	-11d												16Apr2012	★	Start of Full Science Op		



- Scope
 - Multiple Statements of Work (SOWs) from IPTs – define deliverables, activities and interactions with the project
 - Missing scope (new)
 - Hidden scope (support visible scope)
 - Revise WBS (depth, detail - partial)
- Process
 - Prep Nov, begin Dec 2004
 - Lower project workload (?)
 - First deliverables – SOWs – Jan 15
 - Cost estimates – Feb 01 (last week...)
 - IPS – ongoing; critical path analyses underway



- Other deliverables
 - 10% descope options
 - Contingency estimate sheet (BOE)
 - Risk assessment (program risks)

- Preliminary results....

First look at rebaseline budget.... under review

IPT	Estimate	Contingency	Total		Baseline (Jul04)	Delta %
MPT	38,983	773	39,756		37,445	6.2%
SIPT	70,475	16,969	87,444		66,774	31.0%
AIPT	202,724	13,519	216,243		217,004	-0.4%
FE	124,481	18,334	142,815		109,690	30.2%
BE	51,349	3,496	54,845		53,137	3.2%
Corr	10,516	574	11,090		11,161	-0.6%
Comp	36,913	2,338	39,251		34,384	14.2%
SEI	40,933	3,746	44,679		23,620	89.2%
Sci	8,895	881	9,776		9,257	5.6%
	585,269	60,630	645,899		562,470	14.8%
						\$83,429

Recent IPT f2f meeting +\$10M, -\$5M

Decisions vs. scope clarification



Changes (first round)

- MIPT: logistics costs; phase II building
- SIPT: \$13M AOS/OSF scope; infrastructure
- AIPT: -
- FE: integration; WVR; cryostat
- BE: -
- Corr: decrease from TFB
- Computing: requirements; reestimation
- SI: CSI (draft), SE activities
- Sci: -

All: return contingency to reasonable levels



ASAC

- Antenna number – cope with 50.
- Postpone 2 sub-arrays out of 4 ...
- removing pads needed through new configuration design.
- Delaying longest (Y+) baselines.
- Operations savings?
- ST Vane (if meets specs).
- AM LO (if necessary).



Issues

- Estimate for current baseline (64 antennas, 4 bands, Early science, all Software requirements, ...)
- Conservative; inclusive (needs filtering)
- Spares policies (2-yrs); equipment lists (ok)
- Overlap between SI & Ops (infrastructure) – recently addressed.
- Weak coupling of ALMA-J/Enhanced ALMA (major opportunities or problems); overhead not assessed



- Schedule no longer defined by Level X milestones; IPS contains schedule information (correspondence will be identified)
- IPS and rebaseline CEs are IPT best forecasts for current scope; still noisy.



Future

- CE/SOW revisions (1st pass by early April, complete early May)
- Risk register (V1) – March 31st
- Separate recurring/non-recurring costs (antennas)

- Decisions: where to rebaseline to?
 - 50 vs 53 vs 64 antennas
 - incremental \$\$\$ request (how much, when)
 - Or: live within means? (~40 antenna ALMA)
 - (TB: phase II: ~52 antennas; +\$\$\$ ~\$40M Y2K; phase III remaining antennas, hardware)

- Adopt descope options: N_{ants} , subarrays, etc.



- “Virtual/managed contingency approach”
- Practical: new \$\$\$ - late 2005, 2006
- Mid April – Mid June – Install rebaseline budget in Cobra
- June 30th – live coordinated IPS, earned value reporting; proceed.
- Q4 – integrate ALMA-J



Rebaselining (Nov Board)

- Phase I: Nov 15th – Dec 31st

Resolve ALMA cost/value issues...

IPT/Execs: Info upgrade, cost evaluation, options

JAO: restructure WBS, IPS, PMCS online

(complete ~Feb 15th+))

- Phase II: Jan 1st – Feb 15th

JAO analysis & summary – current project

Proposals – rescoping options

(ongoing since ~Jan 15th)

Board (Feb 24th) + ASAC review ~March

Rebaselining



- Phase III: Feb 15th – Apr 1st
 - MIPT/Board/ASAC review of rescope options, decisions

(ongoing – ASAC, IPT done; MIPT TBD; Board proposal late April –
NEED ANTENNA CONTRACT)

- Phase IV: Apr 1st – May 15th
 - Implement in PMCS → Steady state

(TBD; EV planned for June 30th)

- Invasive review ~May+

(Construction & Ops plans; July/August?)