



Project Management

Mark McKinnon
Project Manager



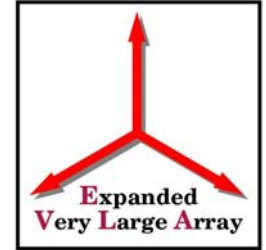
Outline



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- General management
 - Staffing
 - Risk management and contingency
 - Earned value and performance metrics
 - Descope options



Management: Cost & Scope Control



- Project book: defines scope (www.aoc.nrao.edu/evla/pbook.shtml)
- Semiannual updates of work breakdown structure (WBS)
- Changes to the project book or changes resulting from WBS updates (> \$50K) must be brought before the change control board (CCB) for approval. Membership:
 - Project Manager – McKinnon
 - Project Scientist – Perley
 - Hardware Systems Engineer – Jackson
 - Division Head for EVLA Computing– Butler
 - Assistant Director for NRAO-NM Operations – Ulvestad/Dickman
- Budget status summarized monthly
- High level decisions: Project Manager acts on advice of NRAO upper management, advisory committees, and review panels.



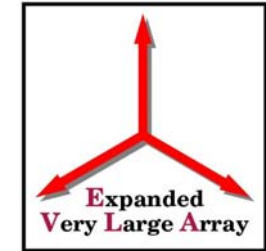
Management: Track Progress



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- Weekly milestone update
 - Updated from overall schedule and input from WBS level 2 task leaders
 - Semiannual WBS updates and earned value analysis
 - Reporting
 - Quarterly reports to AUI/NSF
 - Semiannual progress reports to NSF
 - Annual Government Performance and Reporting Act (GPRA) report to NSF
 - Annual reports to AUI Visiting Committee and NRAO Users Committee
 - Bimonthly status updates to NRAO Director's Office
 - EVLA Advisory Committee



Management Tools



EVLA Project Coordination Meeting Summary
for Monday 8/20/07

Begin	End	Description	Target Dates	Location	Coordinator	Original
Wed 8/15/07		Project book updates			Perley	8/01/07
Mon 8/20/07		Last date for purchase requisitions requiring an RFQ			Reasner	8/20/07
Wed 8/22/07		Rehearsals for Advisory Comm. Meeting		AOC	McKinnon	8/22/07
Thu 8/23/07		Flooring for the Deformatter rack move completed			Stanzione	8/23/07
Fri 8/24/07		4/P-band receiver system restored			Cotter/Kutz	8/24/07
Fri 8/24/07		EVLA Science Data Model (SDM) review to ALMA		VLA	Rupen	8/10/07
Fri 8/24/07		Ref. transmitter/RTP Rack 1 ready for use			Cotter/Koski	8/24/07
Fri 8/24/07		Rehearsals for Advisory Comm. Meeting		AOC	McKinnon	8/24/07
Mon 8/27/07		Change Control Board meeting		AOC	Cole	8/27/07
Mon 8/27/07		L352 redesign lab test begin			Cotter/Morris	8/13/07
Tue 8/28/07		Network rack and fiber ready inside correlator room		VLA	Robnett	8/15/07
Thu 8/30/07		*Complete lab testing of the prototype Ka-band receiver			Hayward	6/11/07
Thu 8/30/07		Common ALMA+EVLA BDF			Rupen/Pokorny	8/01/07
Thu 8/30/07		EVLA comments on ALMA Calibration Data Model (CalDM)			Rupen	7/20/07
Thu 8/30/07		Review of proposed hardware solutions for phase instability		AOC	Jackson/Morris	7/20/07
Fri 8/31/07		L350 IPPS test			Cotter/Abeyta	7/09/07
Tue 9/04/07		Agreement on common ALMA+EVLA SDM			Rupen	9/01/07
Wed 9/05/07		Issue FY08 budget plan			Cole	9/05/07
Thu 9/06/07	9/07/07	Advisory Committee Meeting		AOC	McKinnon	9/05/07
Fri 9/14/07		Correlator room IF cabling to BE built and installed		VLA	Cotter	9/15/07
Fri 9/14/07		Status of hardware solutions for phase instability			Jackson/Morris	9/14/07
Mon 9/17/07		Last date for purchase requests in FY 2007			Reasner	9/17/07
Mon 9/17/07		Plan for production of L-band receivers			Hayward	7/30/07
Wed 9/19/07		*Hardware acceptance tests complete		Ant 25	Jackson/Durand	9/14/07
Thu 9/20/07		*Antenna Turnover to Operations		Ant 25	Durand	9/17/07
Mon 9/24/07	9/27/07	Install Deformatter, Demux & EDFA racks into correlator room		VLA	Gerrard/Jackson	9/24/07
Wed 9/26/07		C-band OMT - broadband test in receiver			Hayward	8/31/06
Thu 9/27/07		L-band dewar design completed			Dinwiddie	9/27/07
Fri 9/28/07		*12 antennas retrofitted to EVLA design			McKinnon	9/28/07
Sun 9/30/07		*CASA Beta release			Rupen	9/28/07
Mon 10/01/07		Begin Lockdown of new correlator room		VLA	Gerrard	5/14/07
Tue 10/23/07		*Install C-band receiver w/ new OMT on antenna		Ant 21	Hayward	9/26/06
Tue 10/30/07	10/31/07	*Science Support System PDR			Butler	3/13/07
Mon 11/05/07		Draft of new correlator room procedures available			P.Perley/Durand	11/05/07
Wed 11/07/07	1/18/08	Install TP & shielding in IF (BD) pair of T304 modules			Cotter/Morris	5/07/07
Thu 11/08/07		L-band dewar mechanical drawings ready for fabrication			Dinwiddie	11/08/07
Fri 12/07/07		Complete stringent cleaning of new correlator room			Stanzione	12/07/07
Fri 12/07/07		Finalize production design of C-band OMT			Hayward/Dinwiddie	10/09/06
Tue 12/18/07		Delivery of high speed cables from Penticton			Revnell	7/02/07
Mon 12/31/07		*Common ALMA+EVLA SDM (v. 3.0) accepted			Rupen	12/31/07
Mon 12/31/07		Common ALMA+EVLA CalDM accepted			Rupen	12/31/07
Mon 1/07/08		*Begin production of C-band OMT			Dinwiddie	2/28/07
Fri 1/25/08		Report on RTP measurement resolution limits			Durand/Morris	1/25/08
Tue 3/18/08		*Delivery of correlator racks from Penticton			Revnell	2/20/08
Tue 6/10/08	6/11/08	Widar Correlator CDR		CAN	McKinnon/Rupen	6/10/08
Wed 7/09/08		*Begin testing of prototype correlator		VLA	McKinnon	2/18/08

Priority Action Items; * Milestones

Task Name	WBS Number	WBS Name	Start	End	Estimate	% Complete
EVLA Correlator	027 05 10	ASCRN	06/07	03/10/10		
Name/Estimator		Steven Dungan			1005-838-7103	
Phone		1005-838-7103				
Version Date		11/20/07				
Basis of Estimate		Engineering Practices				
Technical		1.2,3.4 & 8.8.10.15			2.45	
Cost		1.2,3.4 & 8.8.10.15			1.25	
Schedule		(2.4.8)			0.0%	

Employee Name	Job Title	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total PTEs
Tim Edlin	EV	1.0												1.0
Gary Dale	EV													
Linda Major	EV													
Ronald Kuchler	EV													
Donna Mitchell-Field	EV													
Ann Jackson	EV													
Michael Vessing	EV													
Steve Thompson	EV													
Brian Goodwin	EV													
Patrick Peterson	EV													
Kerry Shores	EV													
Mike Rowan	EV		4.0	4.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
Steve Grayson	EV													
Eric Chivvis	EV													
Steve Tenoris	EV													
EVLA Tech (P)	EV													

Material Description	2001 Cost	2002 Cost	2003 Cost	2004 Cost	2005 Cost	2006 Cost	2007 Cost	2008 Cost	2009 Cost	2010 Cost	2011 Cost	2012 Cost	Total Cost
Deformatter: 120 units			10.0	207.5	80.7	31.8	72.7	72.7	78.8				620.0
Penticton and Enclosures: 24 units			12.0	54.0									66.0
TP racks			0.0										0.0
Wave Cables			20.0										20.0
EDFA			78.2			10.5	30.5	10.1	50.5				169.8
Materials Total (PTE)	0.0	0.0	148.2	261.5	80.7	31.8	143.2	143.2	149.3	50.5	0.0	0.0	1076.2

Contract Description	2001 Cost	2002 Cost	2003 Cost	2004 Cost	2005 Cost	2006 Cost	2007 Cost	2008 Cost	2009 Cost	2010 Cost	2011 Cost	2012 Cost	Total Cost
Contracts Total (PTE)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Total (PTEs)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Cost
Cost:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1076.2

Example WBS cost data sheet (162)

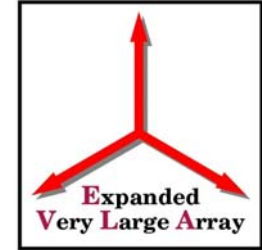
Example of weekly milestone update

M. McKinnon

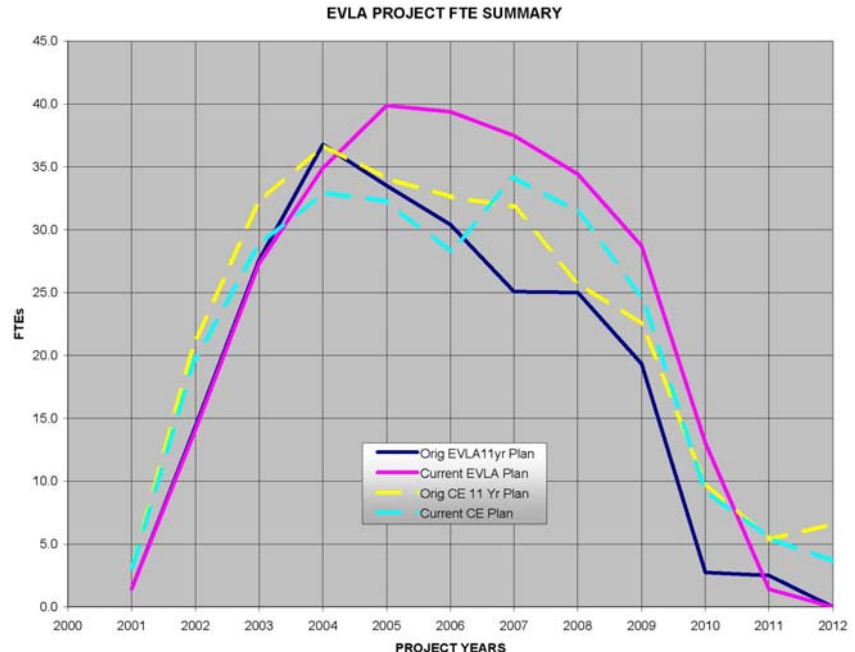
EVLA Advisory Committee Meeting
September 6-7, 2007



Staffing

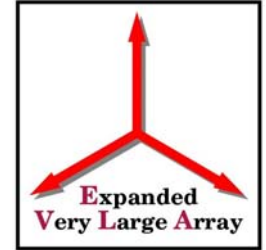


- Project has always been heavily dependent upon effort contributed from operations
 - Original 11-year, project plan
 - 219 FTE from project
 - 262 FTE contributed
 - Current project plan
 - 272 FTE from project
 - 254 FTE contributed
- Project success is intimately tied to continued support of both project and operations funding





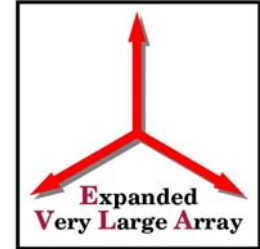
Risk Management



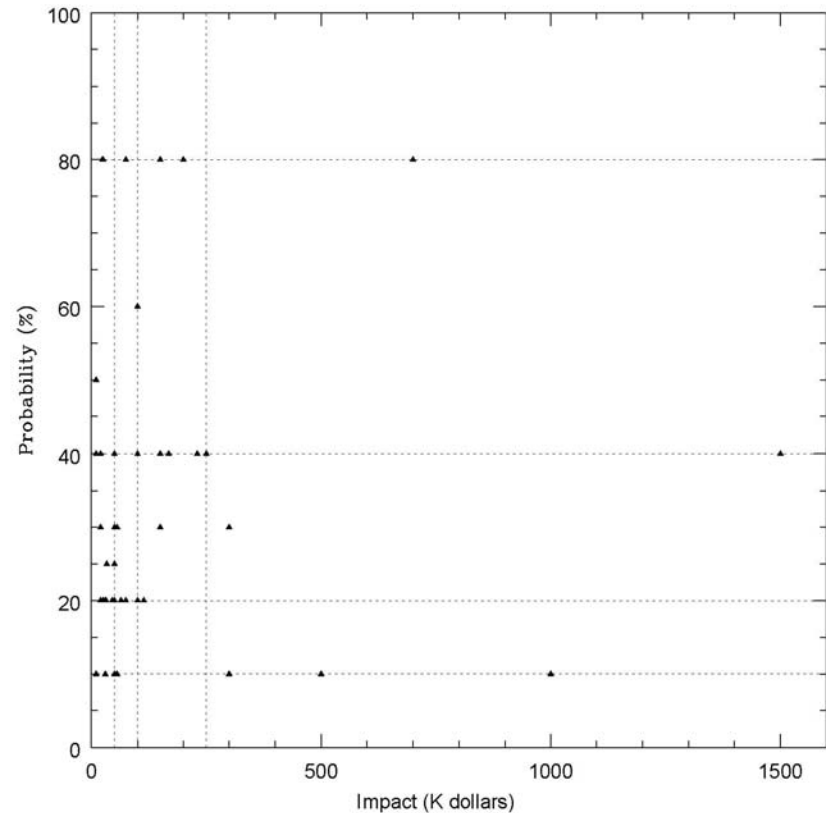
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- Project manager and project scheduler attended PMI risk management workshop on October 20, 2006
 - Developed risk management plan and conducted internal risk management workshop on December 12, 2006
 - Workshop objectives
 - Identify risks (technical, external, organizational, project management)
 - Assign risk owners
 - Estimate risk impact and probability
 - Identify risk trigger (how we know it happens)
 - Identify action plan (e.g. avoid, mitigate, research, monitor, accept)
 - Consolidate input to determine number, total impact, and weighted impact of risks
 - Risk register updated once since originally developed



Risk Register Summary

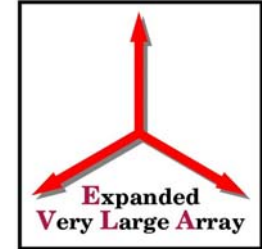


- Risk register summarized in plot of risk probability versus total impact
- Vertical and horizontal lines separate regions of low, medium, high, and very high impact
- Risk in top right quadrant are items that require significant attention of project management





Risk Register Comparison



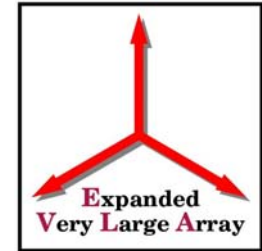
Date	Dec 2006	Aug 2007
Number	79	69
Total Impact (\$K)	11,184	8,397
Wt. Impact (\$K)	3,266	2,751

Current project contingency (\$3.40M) exceeds sum of weighted risks (\$2.75M)

Both contingency and risk will decrease as project progresses.



Project Cost Summary



EVLA PROJECT PHASE 1

PROJECT COST SUMMARY
All amounts are in \$k dollars (FY2007)

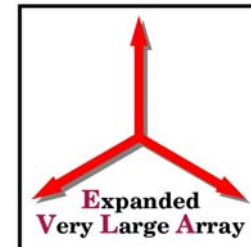
As of July 19, 2007

WBS	Task Name	Actual FY2001	Actual FY2002	Actual FY2003	Actual FY2004	Actual FY2005	Actual FY2006	Budget FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	Totals
6.01	Project Management	77.0	175.4	119.8	277.8	148.1	409.2	189.5	232.8	348.5	388.9	49.5	0.0	2416
6.02	System Integration & Testing	212.0	478.0	236.4	746.1	571.2	452.9	447.3	182.2	234.3	0.0	0.0	0.0	3560
6.03	Civil Construction	0.2	252.0	40.1	229.0	197.4	326.9	120.5	25.0	0.0	0.0	0.0	0.0	1191
6.04	Antennas	0.0	46.7	98.5	497.2	172.3	136.9	145.1	129.4	112.6	34.2	0.0	0.0	1373
6.05	Front End Systems	385.5	114.7	596.5	1312.7	1894.4	504.7	954.9	1732.2	1259.9	931.2	494.4	169.7	10351
6.06	Local Oscillator System	14.1	292.4	253.0	1188.4	357.9	307.1	393.3	301.9	155.8	0.0	0.0	0.0	3264
6.07	Fiber Optic System	4.7	603.8	735.5	1175.6	685.8	723.6	1334.4	592.0	376.2	81.1	0.0	0.0	6313
6.08	Intermediate Frequency System	0.0	105.5	327.5	215.4	819.9	353.3	566.9	418.7	273.7	0.0	0.0	0.0	3081
6.09	Correlator	277.0	336.5	192.7	759.8	883.1	3748.8	3979.0	1539.0	117.5	0.0	0.0	0.0	11833
6.10	Monitor & Control System	0.0	209.2	255.8	367.0	540.8	603.9	350.0	322.0	275.7	214.6	15.0	0.0	3154
6.11	Data Management & Computing	2.8	0.2	219.1	180.8	37.2	31.9	62.4	158.4	300.0	400.0	0.0	0.0	1393
6.12	Education & Public Outreach	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	M&S Total	973	2614	3075	6950	6311	7599	8543	5634	3454	2050	559	170	47930
	Travel	7	93	72	76	109	78	75	91	86	29	10	0	726
	Direct Labor	126	1115	1689	2297	3066	3122	2649	2213	1898	1008	130	0	19313
	NRAO Indirect Labor	195	1549	2317	2186	2000	1820	2272	2295	1883	673	421	292	17904
	NRAO Wages & Benefits	321	2664	4006	4483	5066	4943	4921	4509	3781	1680	551	292	37217
	Canadian Labor	267	353	551	687	743	676	781	801	424	0	0	0	5283
	Sub Total	1569	5724	7704	12196	12229	13297	14320	11034	7745	3759	1120	462	91156
	Contingency	0	0	0	0	0	0	0	0	514	2749	134	0	3397
	Redirected NRAO Effort	-195	-1549	-2317	-2186	-2000	-1820	-2272	-2295	-1883	-673	-421	-292	-17904
	Canadian Contribution	-544	-690	-744	-1446	-1626	-4425	-4760	-2340	-542	0	0	0	-17116
	Mexican Contribution						-1747							-1747
	EVLA Project Funds	830	3486	4643	8563	8603	5305	7288	6399	5835	5835	833	170	57786
	Carryover to next yr	2170	3685	4363	5140	1880	2017	564				170		
	Carryover from prior yr		-2170	-3685	-4363	-5140	-1880	-2017	-564				-170	
	NSF Funded	3000	5000	5322	9340	5340	5441	5835	5835	5835	5835	1003	0	57786
		FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	Totals





Risks by WBS



WBS	Risk Number	Total Impact (\$K)	Wt. Impact (\$K)
Project Management	2	2,000	450
Systems Integration	5	440	68
Civil Construction	6	280	94
Antennas	8	693	268
Front End	18	1,289	612
Local Oscillator	3	160	46
Fiber Optics	3	95	11
Intermediate Freq.	4	400	110
Correlator Interface	2	20	8
Monitor & Control	7	570	194
Data Management	11	2,450	890



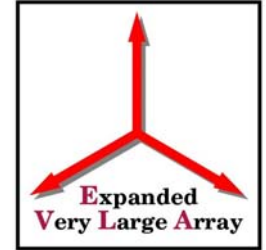
Risk Examples



- Retired risks
 - Correlator spare parts (\$200K, 40%)
 - Design path for 3-bit sampler (\$510K, 40%)
 - Extension of CASA personnel on EVLA budget beyond FY 2007 (\$1M, 20%)
- Current high impact, high probability risks
 - Inability of operations budget to sustain contributed effort in FY 2009 and beyond (\$1.5M, 40%)
 - Proposed solution to same “look & feel” requirement for ALMA & EVLA software (\$700K, 80%)
 - X-band OMT forces additional compressor per antenna (\$250K, 40%)



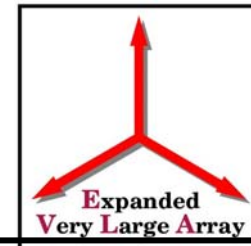
Earned Value



- Glossary of EV terms (Project Management Institute)
 - Planned Value (PV): budgeted amount for scheduled work
 - Earned Value (EV): budgeted amount for work completed
 - Actual Cost (AC): actual cost of work performed
 - Performance indices
 - Cost Performance Index, $CPI = EV/AC$
 - Schedule Performance Index, $SPI = EV/PV$
 - CPI & SPI of about 1 or more is good
 - Budget at Completion (BAC): budgeted cost to complete the work



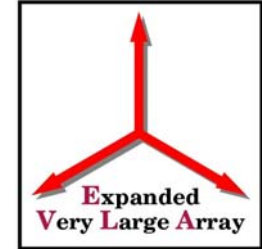
SPI & CPI by WBS



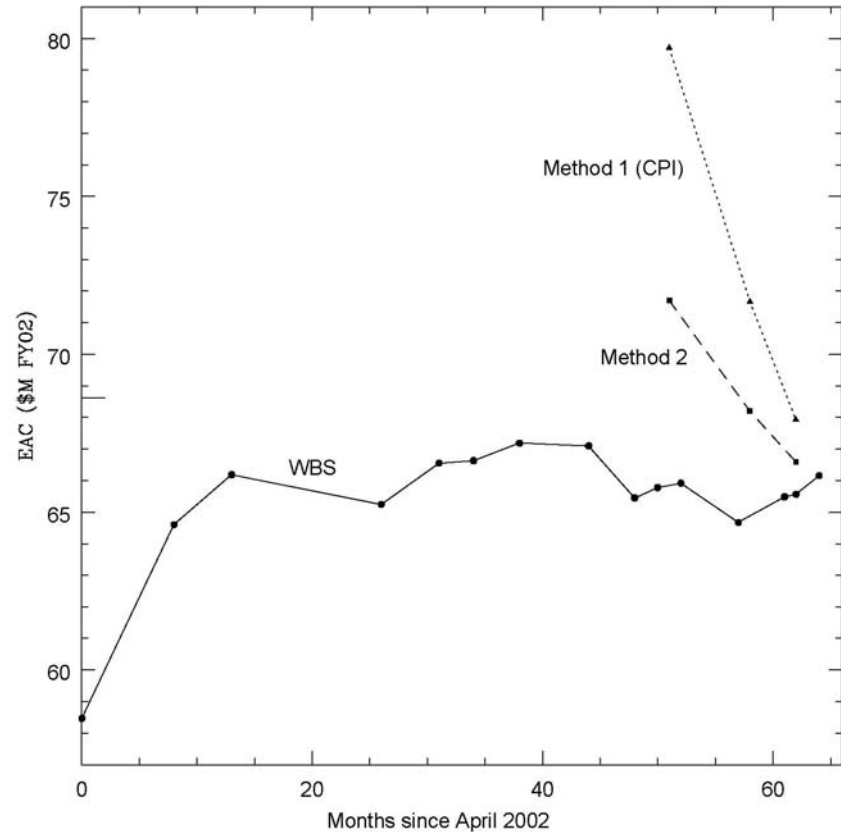
WBS	SPI	CPI
Project Management	0.93	1.03
Systems Integration	0.91	0.98
Civil Construction	0.98	1.00
Antennas	0.88	1.22
Front End	0.80	0.87
Local Oscillator	0.89	0.97
Fiber Optics	0.92	0.96
Intermediate Frequency	0.90	0.99
Correlator Interface*	0.94	1.91
Monitor & Control	0.90	0.96
Data Management	0.94	1.05
Entire Project	0.89	0.97



Estimate at Completion

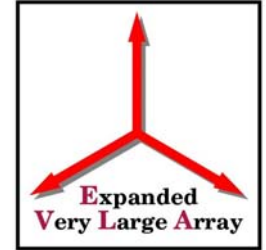


- Three different methods for computing cost estimate at completion (EAC)
 - $EAC = BAC/CPI$ (1)
 - Applicable if past performance is indicative of future performance
 - $EAC = BAC + AC - EV$ (2)
 - EAC from new estimate (WBS)
 - Historical method for EVLA





Estimate at Completion



- Results from methods are converging. Reflects:
 - Recent progress in achieving project milestones
 - Staff becoming increasingly familiar with EV methodology
- CPI method not a good predictor of EAC because current performance is much better than that of a year ago (i.e. CPI estimates have improved)
- Historical, new estimate method has continued to provide consistent estimates of cost to complete the project
 - Small scatter in EAC data over last four years



Descope Options



- Given good financial health of the project, there are no plans to exercise descope options at this time
- Descope options amount to receiver bands
 - Ka and S-bands were under consideration for descope last year, but we now plan to proceed with their full production
 - Still possible to descope X and Ku-bands
 - X-band valued at \$1.0M
 - Ku-band valued at \$1.3M
 - Could also eliminate solar observing mode: \$0.2M
- Impact
 - Advertised scientific productivity of EVLA requires all hardware and software deliverables to be met.
 - Recovering from descopes would take many years.



Summary



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- Tools, procedures, and controls are in place to properly manage the project
 - Project success highly dependent upon contributed effort
 - Earned value and risk analyses have helped to identify areas in need of management attention
 - Steps taken to eliminate risk
 - Currently, contingency appears to be adequate to cover best estimate of financial risks to the project
 - No need to consider descope options at this time