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National Radio Astronomy Observatory

Quarterly Status Update 2 FY2016

January – March 2016

PREPARED BY	ORGANIZATION	DATE
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NRAO Quarterly Status Update (QSU2 FY2016) January - March 2016

				Q1 Performance Assessment		Q2 Performance Assessment			
POP Section	POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope	Cost	Schedule	Scope
Number		Atacama Lawa Millimator/submillimator Away (ALMA)							
2.0		Observations							
			12/31/2015						
			3/31/2016						
	I	Cycle 3 observing & operations begin Q1, ongoing through Q4	6/30/2016						
			9/30/2016						
			12/31/2015						
	2	Cycle 3 IAO Support: AoD support shifts at the OSE	3/31/2016						
	2	Cycle 3 JAO Support AOD Support Sinits at the OSI	6/30/2016						
			9/30/2016						
			12/31/2015						
	3	Support Extension of Capability efforts at the JAO	3/31/2016						
			8/30/2016						
	4	Cycle 4: Participate in the Obsmode go / no-go meeting	12/31/2015						
	5	Cycle 4: s/w tests, documentation, CfP	3/31/2016						
	6	Offer data reduction workshop in Charlottesville	12/31/2015						
	7	Cycle 4: CDEs, User Support, Proposal Deadline Supp.	3/31/2016						
		Development							
	16	NA ALMA Development Projects for FY2014/2015 will be completed	3/31/2016						
		NRAO-Chile Office							
	18	Completion of the succession and management plan 2015-2016 including the	12/31/2015						
	.0	incorporation of a new Business Manager	123112013						
			12/31/2015						
	19	Implementation and monitoring of the new Collective Contract signed with the	3/31/2016						
		A DI UNION 45 & RESULT OF THE REGOLIATIONS CONDUCTED IN 2015	6/30/2016						
		Renewal of the NRAO/ALII Office of Chilean Affairs leave for a new period of	7/30/2016						
	20	three years	12/31/2015						
3.4		New Mexico Operations							
		VLA Science Operations							
	I	Define VLA capabilities to be offered for semester 2016B	12/31/2015						
	3	Update VLA documentation to support 2016B Call for Proposals, perform	3/31/2016						
	3	proposal technical reviews	3/31/2018						
	5	Determine baselines and pointing for antennas moving into their D	12/31/2015						
		Determine baselines and pointing for antennas moving into their DnC and C							
	6	configuration locations	3/31/2016						
		VLA Array Operations							
	8	Complete reconfiguring array to D configuration	12/31/2015						
	9	Reconfigure array to DnC, then C configuration	3/31/2016						
	11	Release Operations GSA vehicle(s)	12/31/2015						
		VLA Antenna Maintenance							
	14	Perform preventive maintenance on each of two transporters prior to array	12/31/2015						
		reconfiguration							
	10	VLA Site infrastructure Maintenance	12/21/2015						
	10	VI A Technical Ubgrades and Enhancements	12/31/2013						
	20	L-Band solar upgrade, 2 additional receivers with full RF upgrade installed	3/31/2016						
	25	FE card cage upgrades, 35 units installed	3/31/2016						
		YLA Operational Enhancements							
	31	Implement continuous slew tipping scans	3/31/2016						
		VLBA Science Operations							
	34	Define VLBA capabilities to be offered for semester 2016B	12/31/2015						
	36	Update VLBA documentation to support 2016B Call for Proposals, perform	3/31/2016						
		proposal technical reviews							
	41	Renew Jesse for Pie Town (PT)	12/31/2015						
5.3	-11	Central Development Laboratory	12/31/2013						
		Rebair, Maintenance, Production, Subbort							
	2		10010015						
	2	Define and finalize Band-2 prototype cartridge configuration for final evaluation	12/31/2015						
	3	Complete evaluating Band-2 prototype in the ALMA test cryostat	3/31/2016						
T	4	Pending success of foundry run, CRAL evaluation of new MMIC wafer	3/31/2016						
		complete							
		Complete RF characterization of a HERA 14 meter dish equipped with							
	7	modified PAPER dipole feed. This include development of an electromagnetic	12/31/2015						
		model, reflection coefficient measurements, and beam maps							
T	8	Complete the refurbishment of 24 PAPER dipole active baluns for use with	12/31/2015						
		new HEKA antennas Regin development of a new broadband feed for the HERA 14m dick with							
	9	electromagnetic simulations and basic construction details	3/31/2016						
	12	Further tests of cross-polarization contributions to Band 2 optics	12/31/2015						
		Research and Development							
	13	Design prototype 35-50 GHz feed horn and phase-shifter for new VLA	12/31/2015					Cancelled	
	13	receiver	12/31/2015					Cancelled	
		Resolve suspected packaging/heat sink issues with BAE MHEMT MMICs and	2/21/2011						
	16	conduct further cryogenic tests to see if noise temperature can be improved	3/31/2016						
		If new 35pm CRAI wafer run producer comparitive Rand 2 MMIC shine							
	25	another Band 2 MMIC LNA module will be built and cryogenically tested	3/31/2016						
		Design and prototype 65-90 GHz amplifier with 2 mil substrate thickness							
	26	(compare to current 3 mil). Goal is improved reliability and performance	12/31/2015						
		reproducibility							
	28	Implement advanced topologies and miniaturized packaging of reflectionless	3/31/2016						
65		Science Support & Research							
0.5		Telescope Time Allocation (TTA)							
	1	CfP for semester 2016B	3/31/2014						
	3	SRP and tech review process semester 2014B	3/31/2016						
			2.3.72010	I	l	l			

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				QI Performance Assessment		Q2 Performance Assessment		ment	
POP Section Number	POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope	Cost	Schedule	Scope
	5	TAC meeting for semester 2016A	12/31/2015						
	7	Update SW tools requirements for TAC support 2016A	12/31/2015						
	8	Update SW tools requirements for PST 2016B	3/31/2016						
-	11	Lindate documentation for CfP and tools 2016B	3/31/2016						
		Science Liter Subbort (SLIS)							
	15	NAASC states and science workshap	12/21/2015						
	15	INAASC sponsored science workshop	12/31/2015						
	16	Testing of version 2 of PPI and NRAO archive	3/31/2016						
	18	Summer student selection	3/31/2016						
	19	Summer student offers	3/31/2016						
	23	Update CASAGUIDES	12/31/2015						
	24	Review ALMA user documents	3/31/2016						
		SSR Support							
	26	Library contracts negotiated	3/31/2016						
7.4		Data Management & Software							
		AI MA System Software							
	2		12/21/2015						
	3		12/31/2013						
	-	VLA/VLBA System Software							
	5	Deploy software to support Semester 2015B observing	3/31/2016						
	6	Deploy software to support Semester 2016A commissioning	3/31/2016						
		GBT System Software							
	11	Vegas Pulsar Modes	3/31/2016						
1	12	NRQZ Software	3/31/2016					cancelled	
		Software Development							
	17	Leverage NGAS for Green Bank data archive	12/31/2015						
	18	Storage upgrade review	3/31/2016						
	19	New NRAQ Archive software	3/31/2016						
	17	ALMA Cycle 3 Pipeline Belezen	12/21/2015						
	21	Disolino Cycle 3 ripetitie Release	2/31/2015						
L	22	ripenne Kererence imaging	3/31/2016		-				
L	23	CASA reliability initiative	12/31/2015						
	24	Release CASA version 4.5	12/31/2015						
	26	Implement PST updates for Semester 2016B Call for Proposals	12/31/2015						
	28	Implement PHT updates for Semester 2016B TAC Meeting	3/31/2016						
	30	Implement OPT updates for Semester 2016A VLA Observing	12/31/2015						
	32	Tool redesign – deliver design	3/31/2016						
	34	Deliver iOS App for Public Outreach	3/31/2016						
8 5		Program Management Department							
0.5		Headsusstan							
		Headquarters	12/21/2015						
			12/31/2015						
	1	Ouarterly Status Updates	3/31/2016						
			6/30/2016						
			9/30/2016						
		New Mexico							
	5	Finalize NM Ops and DMS Training Plan (2nd Phase)	3/31/2016						
	7	DMS Group Practices Assessment	12/31/2015						
	9	Host learning session	12/31/2015						
	10	Host learning session	3/31/2016						
			5/5//2010						
	12	DM/SE Twining downloament	12/21/2015						
	13		12/31/2015						
	14	PM/SE Training development	3/31/2016						
	19	Facilitate gate review	12/31/2015						
		Green Bank							
	22	Host learning session	12/31/2015						
	23	Host learning session	3/31/2016						
10.3		Education & Public Outreach							
		STEM Education and Outreach							
	1	Translation of SJS curriculum to 4H project books complete	3/31/2016						
	2	SIS instructional videos complete	3/31/2016		1				
	-		12/31/2015						
	3	Final round of SIS professional development meetings for educators	3/31/2014						
	5	man cours or ajo professional development meetings for educators	4/20/2017						
L			0/30/2016						
1	6	VLA Visitor/Education Center Education and Interpretive Plan completed	12/31/2015						
	7	VI & Visitor/Education Conten analitaatural ashar	3/21/2014						
	,	Parahanan Cause Calanan F	3/31/2016						
L	11	Pocanontas County Science Fair	12/31/2015						
L	12	Hour of Code Event	3/31/2016						
	16	Recruit additional SPOT undergraduate ambassadors	12/31/2015						
	17	Additional training for SPOT ambassadors	3/31/2016						
		News & Public Information							
	19	WordPress site specified	12/31/2015						
	20	WordPress site design elements completed	3/31/2016						
	21	Orion videos specification and scripts completed	12/31/2015						
	23	ALMA Explorer filming	3/31/2016						
	25	Reta version iOS "RadioSky" and ready for testing	12/31/2015						
L	22	PadioSky" app locked ready for distribution	3/31/2013						
	20		3/31/2016						
11.4		Computing & Information Services			_				
L	I	Business software review and strategic alignment	3/31/2016						
	3	RHEL 7 Unix OS upgrade	3/31/2016						
	5	Selection of Green Bank phone system	12/31/2015						
	9	Business services capacity review	3/31/2016						
	10	Review and consolidation of backup solutions	12/31/2015						
12.3		Diversity							
		Diversity Council							
-			12/21/2015						
<u> </u>			2/31/2013						
	I.	Diversity Council Meeting	3/31/2016						
		-	6/30/2016						
1	1		9/30/2016		1	1			

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			QI Performance Assessme		sment	ent Q2 Per		rformance Assessment	
POP Section	POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope	Cost	Schedule	Scope
number		National/Domestic Outreach							
	2	SEDLIER & PING Program Plan complete	12/31/2015						
	3	SEDUIP Expansion Plan complete	3/31/2016						
	4	LSAMP, AATF, & SYEP Program Plans in place	3/31/2016						
	5	Initiate recruitment activities	12/31/2015						
	6	Summer Program Orientations	3/31/2016						
		International Outreach							
	9	NINE Program Plan (existing partners) complete	12/31/2015						
	10	NINE Program Plan draft (new partners) complete	3/31/2016						
	12	NINE conference held	9/30/2016						
			12/31/2015						
	12	NINE Virtual Classrooms/Learning Venues Program Plan developed and	3/31/2016						
	13	implemented	6/30/2016						
			9/30/2016						
		Diversity and Cultural Awareness							
			12/31/2015						
	14	DCA Program Plan developed and implemented	3/31/2016						
			6/30/2016						
10.7		Linner December 2	9/30/2016						
13.7		Training & Davalahmant							
		I raining & Development Deliver two new Management/Supervisor development courses: 1							
	I	Performance Management, and 2. Comp 101	3/31/2016						
		Compensation							
	3	Annual Performance Review Process	12/31/2015						
	A	All preparations complete and salary review worksheets are open to pay	3/31/2014						
	*	decision managers for final merit review decisions	3/31/2016						
	5	FLSA regulation changes anticipated and analyzed	3/31/2016						
		Benefits							
	7	TR prepares and distributes all open enrollment materials to employees and	12/31/2015						
		makes emoiment changes into JDE and with vendors							
	8	Benefits programs for critical illness, accident and LT care voluntary benefits	12/31/2015						
	9	Assistance program for NRAO employees and retirees for hardship or	3/31/2016						
	,	catastrophic events	5/5/12010						
		Recruitment and Employment							
	11	Design and implement a comprehensive recruitment toolkit for hiring managers	12/31/2015						
		Assess current applicant tracking system and determine need and/or feasibility							
	12	for improved system	3/31/2016						
	13	Implement an Observatory-wide On-Boarding program	3/31/2016						
		Human Resources							
14.1		Communications							
		Science Communications							
	I	Update Research Facilities brochure	12/31/2015						
15.7		Administration							
		CAP							
	5	Update manual. Review and approval by Assoc. Director of Administration.	3/31/2016						
		ES&S							
	7	Determine technical solution to Safety Recordkeeping requirements	12/31/2015						
		MIS							
	10	Prepare list of possible improvements, upgrades and additions Calculate effort,	3/31/2014						
L	iv	cost, and benefit of each change.	5/31/2010						
		110							
16.5		Spectrum Management							
		Spectrum Management	12/21/2015						_
	1	WV Padia Quiet Zone	12/31/2015						
	2	WV Radio Quiet Zones	3/31/2014						
17.1	-	Director's Office	5/5//2010						
		ALMA							
			12/31/2015						
			3/30/2016						
	I	ALMA Board Meeting	6/30/2016						
			9/30/2016		1				
			12/31/2015						
	2	Al MA Director's Council	3/30/2016						
	4		6/30/2016						
			9/30/2016						
		Corporate Meetings							
			12/31/2015						
L	3	AUI Board of Trustees meetings	3/30/2016						
			6/30/2016						
		ALI Everything Committee meetings	12/31/2015						
	4	Noi Executive Committee méétings	6/30/2016						
		Science Community	9/30/2016						
	4	Appoint new Likers Committee members	12/31/2015						_
	0	Management Review	12/5//2015						
	8	NSF Annual Program Review	2/3 /2015						
	,		12/31/2015						
	9	All Hands presentation	6/30/2016						
1			i	÷	1				



COST:			SCOPE:		
2,000,000 1,800,000 1,400,000 1,200,000 1,000,000 1,000,000 1,000,000 1,000,000 Balance \$ 24,840 600,000 200,000 0 Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar			The ALMA Fiber Optic communications network is fully functional. Deliverable: Hardware – OSF/AOS/SCO Fiber Optic communications network		
SCHEDULE			RISK:		
Critical Path	Schedule	Target	Risk	Mitigation	
License	TBD	09/30/16	I. Continuing delay	AUI OCA assisting in	
Milestone	Schedule	Target	postpones Project	lobbying Bienes	
I. Bienes Nationales TBD 09/30/16		close-out Nationales			

COST: \$24K underrun being held in reserve against potential close-out costs. None identified at this time.

SCHEDULE: All legal requirements fulfilled. Waiting on issuance of Operating License from *Bienes Nationales*.

SCOPE: N/A

- Microwave link (100Mbps) will be maintained by Silica at no cost to ALMA through the end of CY2016. This includes use of the fiber and DWDM equipment.
- Silica bank guarantees are valid through June 2016
- AUI has agreed to suspend performance penalties so long as the FO link is available and the bank guarantees are valid.

COST:			SCOPE:	
2,000,000 1,800,000 1,600,000 1,400,000 1,200,000 1,000,000 800,000	\$991, <u>\$882,</u> Balance \$115,4	160 784 876	• N/A	
400,000 200,000 0 Apr May Jun	Jul Aug Sep Oct Nov	Dec Jan Feb Mar	Deliverable: Software – ADMIT so integrated with ALMA CASA program.	ftware package
400,000 200,000 0 Apr May Jun	Jul Aug Sep Oct Nov	Dec Jan Feb Mar	Deliverable: Software – ADMIT so integrated with ALMA CASA program. RISK:	ftware package
400,000 200,000 Apr May Jun SCHEDULE Critical Path	Jul Aug Sep Oct Nov	Dec Jan Feb Mar	Deliverable: Software – ADMIT so integrated with ALMA CASA program. RISK: Risk Mitigati	ftware package ion
Apr May Jun SCHEDULE: Critical Path SW stress test	Jul Aug Sep Oct Nov Schedule 03/31/16	Dec Jan Feb Mar Target 09/30/16	Deliverable: Software – ADMIT so integrated with ALMA CASA program. RISK: Risk Mitigati	ftware package
Apr May Jun SCHEDULE Critical Path SW stress test Milestone	Jul Aug Sep Oct Nov Schedule 03/31/16 Schedule	Dec Jan Feb Mar Target 09/30/16 Target	Deliverable: Software – ADMIT so integrated with ALMA CASA program. RISK: Risk Mitigati	ftware package ion

COST: Final payment (\$115K) will be released upon receipt of the field-tested Tool Writer's Guide.

SCHEDULE: Software module is written; integration work sub-awarded to NRAO by U. Maryland is late. Request for a No-cost Extension is in work.

SCOPE: N/A

RISK & MITIGATION: Late delivery has no impact to near-term ALMA Science Operations as there are no extant data sets compatible with ADMIT.

			nt Project Scope			
COST:			SCOPE:			
1,800,000 1,600,000 1,400,000 1,200,000 1,200,000 1,000,000 1,000,000 1,000,000 1,000,000 1,000,000 0 origin: 800,000 600,000 0 Apr May Jun Ju	→ Budget 1,800,000 1,200,000 1,000,000 1,000,000 600,000 400,000 Constrained \$248,409 award) for implementation Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar			 A high-fidelity, simulated AOS operating environment cannot be created at HIA and, therefore, laboratory test results are inconclusive. In-situ, verification testing is required. Deliverable: Hardware - engineering design change and modified Band 3 Cold Cartridge Assembly. 		
SCHEDULE:			RISK:			
Critical Path	Schedule	Target	Risk	Mitigation		
Verification test	06/01/16	06/01/16	I. Verification test failure	TBD		
Milestone	Schedule	Target	2. Insufficient	HIA preparing detailed		
I Installation PM-03 05/13/16		05/12/14	implementation	implementation cost		
I. Installation PM-03	05/13/16	05/13/16	funding	estimate		

COST: Sufficient funds are available to support verification testing. TBD if parts procurement and modification of 72 CCAs (by JAO personnel) can be accomplished with remaining funds.

SCHEDULE: B3 CCA Unit No. 33 has been modified and installed into FE 43. FE 43 will be installed into antenna PM-03 for verification testing.

SCOPE: HIA highly confident that the heater will remedy the accumulated flux problem. Uncertain about heater efficacy in solving the total power variation (as a function of azimuth) problem since they are unable to simulate AOS magnetic field variations in their laboratory. (Allen Variance specification)

- Verification test failure TBD
- Insufficient implementation funding detailed cost estimate forthcoming from HIA

Expansion	of Centr	al LO to	o 5 Subarrays			
PI: C. Jacq	ues (NR	AO)		Schedule		
Project No	. 195 (C)	cle 2 A	LMA Dev. Proje	ect) Scope		
COST:			SCOPE:			
1.800,000 1,600,000 1,400,000 1,200,000 800,000 800,000 400,000 200,000 0 Apr May Jun J	2,000,000 1,800,000 1,600,000 1,400,000 1,200,000 800,000 6 month, No-Cost Extension; \$73,116 balance 600,000 200,000 0 Arr May Jun Jul Aug Sep Oct Noy Dec Jap Feb Mar			er module has a faulty fests are currently mine if it can meet all only three lasers. stalled and engineering design change Oscillator.		
SCHEDULE:			RISK:			
Critical Path	Schedule	Target	Risk	Mitigation		
Performance tests	April 2016	04/15/16	I. Laser Synthesizer does	Return to manufacturer		
Milestone	Schedule	Target	not meet specification	ior repair		
 Submit PAS document 	04/15/16	04/15/16				
2. Review Meeting	TBD	04/22/16				
		OSU	2 EY2016			

COST: Estimated cost to return and repair is less than \$10K.

SCHEDULE: No impact within the extended period of performance.

SCOPE: Desirable to have all four lasers fully functional. Engineering analysis indicates that the Synthesizer will meet specification with three lasers without compromising operating safety margin. Verification tests in progress. Returning the Synthesizer to the manufacturer for repair (to Canada and return to Chile) may cause additional damage.

RISK & MITIGATION: No impact to Cycle 3 Observing Campaign.

Prototype B Pl: K. Saini (and 2 (Cartridg	je	Cost Schedule	
Project No.	197 (C	ycle 2 Al	LMA Dev. Proje	ct) Scope	
COST:			SCOPE:		
2,000,000 1,800,000 1,200,000	No-Cost Ex 07,794 bala	tension nce Dec Jan Feb Mar	 Chip & wire work-around does not meet noise temperature specification. Deliverable: hardware – engineering design and bettette Band 2 Cold Certifice Accemble. 		
SCHEDULE:			RISK:		
Critical Path	Schedule	Target	Risk	Mitigation	
Cryogenic test	04/30/16	04/30/16	I. Late delivery impacts	Re-negotiated Caltech	
Milestone	Schedule	Target	B2 Project Proposal	payment schedule	
 Ist generation amplifier modules 	08/31/16	08/31/16	2. Cryogenic test failure	2 nd wafer run in work	
2. 2 nd generation amplifier modules	03/31/17	03/31/17			
	·	QSU	2 FY2016	2 🐼 🐔	

COST: N/A

SCHEDULE: Caltech/CRAL significantly behind schedule due to wafer production problems. CDL developed a "chip & wire" (versus printed circuit) work-around to enable development of other aspect of the Band 2 CCA design.

SCOPE: Chip and wire alternative does not meet noise temperature specification. Room temperature performance of CRAL's MMIC is acceptable; cryogenic performance TBD

- Late delivery of amplifier modules jeopardizes submittal of CDL's ALMA Development Cycle 4 Project proposal. Re-negotiated final payment terms with Caltech. 50% of final payment (originally due in January 2016) will be paid during April, and 50% will be paid upon delivery of the 1st generation MMICs.
- A second wafer run is in progress and should be ready for test during QI FY2017.

PI: E. Rosolo Project No.	owsy (l 196 (C	J. Albert ycle 2 Al	a) LMA Dev. Proj	ect) Scope	
COST: 2,000,000 1,800,000 1,600,000 4,000,000 5 for month, No-Cost Extension 1,000,000 \$169,253 balance			 SCOPE: Virtual servers will be used in lieu hardware servers CARTA software will be implemented first at NBAQ and then propagated to 		
1,000,000 800,000 600,000 400,000 200,000 0 Apr May Jun Jul	Aug Sep Oct Nov	Dec Jan Feb Mar	first at NRAO and then propagated to other sites Deliverable: Software – three virtual server software packages and tested CARTA software suite.		
SCHEDULE:		1	RISK:	200	
Critical Path	Schedule	Target	Risk	Mitigation	
Portal / archive test	06/10/16	06/10/16	I. Deceleration of work	Expedite Change	
Milestone	Schedule	Target	pace	Kequest	
I. Milestone 3 Review	07/25/16	07/25/16	2. Low performance on	Leverage SKA	
2. Doc. & training 08/01/16 08/01/16			large-scale data sets	experience	

COST: N/A

SCHEDULE: Delay due to underestimation of effort required to interface new code with existing CASA code.

SCOPE: changes authorized per NRAO CR 192.2

- Virtual servers will be used in lieu hardware servers (technically superior solution). This also facilitates implementation of CARTA software package at the other two ARCs (ESO and JAO).
- Software will be delivered first to the NRAO archive and then propagated to other sites. Original plan was to implement at the JAO ALMA archive.

RISK & MITIGATION: No impact to Cycle 3 Observing Campaign.

NM OPS	EST	ONE #	3.4.11	Cost Schedule	
Release Op COST:	erations	s GSA vehi	SCOPE:	Scope	
Labor ActualsExpected\$0\$0Material ActualsExpected\$0\$0Travel ActualsExpected\$0\$0		The release of the vehicle is part of an over- all plan to move evening and night VLA operator presence to the DSOC. Eliminating the dedicated operator vehicle covers the cost of hiring an additional guard, one of 2.5 FTEs needed to fully implement remote			
SCHEDULE:	1		RISK & MITIGATION:		
Milestone	Schedule	Target	Risk	Mitigation	
I Cancel GSA-lease on VLA op.vehicle	03/31/2015	06/30/2016	I Cannot hire additional guards needed to meet goal	I Delay implementation of remote operating.	
		Q	SU2 FY2016	0 *	

COST: The release of the vehicle will enable NM Ops to pass the cost savings on the GSArental to hire an additional guard/custodian for the VLA. The goal to achieve remote telescope operations for the evening and midnight shifts needs to comply with the twoman rule for those time periods, and requires the hiring of additional guards. The release of the GSA rental of a dedicated Operator vehicle will cover the cost of one full-time (40 hours) guard.

SCOPE: Remote operation of the VLA is desirable for a number of reasons. It will enable cross-training of VLA and VLBA operators; it will provide a proof of concept for remote operations of the ngVLA; it may create some small cost savings that will be used to create additional support to the guard/custodial staff at the VLA; it will also offer flexibility to the operator staff to avoid dangerous driving conditions.

SCHEDULE: For safety reasons, we require two persons on site at all times. Turn-over in the guard/custodial staff has left that group short-handed, so the operator continues to serve as the second person on site.

RISK & MITIGATION: The risk of not meeting this goal delays the transition of the evening and night shifts of the VLA operators to the DSOC. Although desirable, remote operations can be implemented at a later date, when resources are available, or if there are continued difficulties in hiring guards.

Implement C	Continuous S	lew Tip	pping Scans	Scope	
Budget Actual There are no chang	Budget Planned es in budget.		For those VLA observations when atmospheric opacity is needed a ti be used to derive this quantity. W implemented old-style "stepped" t they are inefficient, taking longer ti "Continuous slew" tipping scans a and so preferred.	e an estimate of ipping scan can le have tipping scans, but han needed. re much faster	
SCHEDULE:			RISK & MITIGATION:		
Milestone	Schedule	Target	Risk	Mitigation	
I System implementation 2 Post processing *Completed	03/31/2016 03/31/2016	03/10/16* 06/30/16	I Continuous slew tipping scans have taken longer than planned to implement and so users continue to use correlations between weather data and opacities derived some years ago, with the associated increase in the uncertainty in the absolute flux density scale.	The mitigation of this problem is for users to ensure they observe their flux density calibrator at a similar elevation as their source	



SCOPE: No changes in scope

SCHEDULE: Stepped tips are supported in the OPT, and data is properly written into the SDM. Continuous slew tips are properly supported in the low-level online software, and data is properly written into the SDM, but it is not possible to set them up in the OPT. Requirements have been written for the necessary changes, but the SSA group has higher priorities right now (namely AAT phase 2 implementation). Until we can get SSA group support to implement the needed changes in the OPT, it will not be possible for users to observe continuous slew tips. In neither case (stepped or continuous slew) is the necessary post-processing software in place. We believe that both of these will be solved and the work will be completed in Q3 FY2016.

RISK & MITIGATION: Continuous slew tipping scans take longer than planned to fully implement. This will mean the users will continue to use the correlations between weather data and opacities derived some years ago for the old VLA, with the associated increase in the uncertainty in the absolute flux density scale. The mitigation of this problem is for users to ensure they observe their flux density calibrator at a similar elevation as their source. Advice for observers is incorporated in the "calibration" section of the online "Guide to Observing with the VLA"

COST: Labor Actuals \$ Material Actuals \$ Travel Actuals	Expected \$ Expected \$ Expected e		SCOPE: Design 35-50 GHz I shifter for use in pr receiver to replace Q-band receiver Milestone is cance	norn and phase rototype EVLA existing 40-50 GHz lled
		RISK & MITIGATION:		
Milestone I Design horn and phase shifter	Schedule 12/31/15	Target Cancelled	Risk I Minimal, since customer has changed priorities	Mitigation

COST: No separate project for this, but included in the CDL budget.

SCOPE: Designs were completed and drawings for these components were sent to Socorro before the due date, but no hardware was actually built.

This task was to prototype a retrofitted EVLA Q-band receiver to replace existing 40-50 GHz Q-band designs in the VLA:

improve bandwidth and noise performance.

- use existing OMT design (already built and tested for Q-band)
- design Q-band phase shifter (frequency-scaled from the EVLA Ku/K/Ka band type)
- design feed horn for 35-50 GHz to replace existing 40-50 GHz design.

SCHEDULE: Cancelled – Higher priorities at Socorro have resulted in this task being delayed, although it is a longer-term priority as the existing Q-band receivers continue to age.

RISK & MITIGATION: Risks are minimal since Socorro considers this a long-term project and they now have higher priorities (such as the VLBA Ka-Band upgrade).

another Band 2 M COST:	IMIC LNA 1	n produces con module will be	built and cryogenically test SCOPE:	ed Scope		
Labor ActualsExpected\$\$Material ActualsExpected\$\$Travel ActualsExpected\$\$		CRAL's evaluation of at cryo temperatures promising gain and n CRAL is behind sched blocks containing a c and an equalizer. CR effort"	CRAL's evaluation of the latest MMIC wafers at cryo temperatures on 4/10/16 showed promising gain and noise temperatures ,but CRAL is behind schedule in delivering LNA blocks containing a cascade of these chips and an equalizer. CRAL's contract is "best effort"			
SCHEDULE:			RISK & MITIGATIO	RISK & MITIGATION:		
Milestone I Deliver MMIC LNA	Schedule 3/31/16	Target 8/31/16	Risk I Miss August target date	Mitigation Include only cryogenic measurements of the chips in the ALMA Dev Band 2 Cartridge report.		

COST: A no-cost extension was filed by CRAL (NRAO change request NRAO-115-4) to deliver production quantities of MMICs by 3/31/17. Half of the final milestone payment was withheld to encourage CRAL to ultimately deliver the MMICs.

SCOPE: There are no scope changes associated with this milestone.

SCHEDULE: The delivery of an LNA block that includes CRAL's latest MMIC chips is expected by Aug 2016, and that date allows sufficient time to test the Band 2 cartridge with these LNAs and include the results in the ALMA development project that we intend to submit in Oct 2016.

RISK & MITIGATION: If CRAL is late delivering this LNA block, then we will include only the cryogenic measurements to date in the Band 2 Cartridge report.

F	OP MILESTONE # 5.3.26CostCentral Development LabSchedule65-90GHz LNA w/ 2mil substrateScope								
	COST:								
	Labor Actuals	Expected							
	\$ see notes \$ see notes				No Change – Desig	gn is complet	e,		
	Material Actuals	Expected			Prototyping will commence when devices				
	\$ \$ Travel Actuals Expected				are available				
	\$	\$							
	SCHEDULE:				RISK & MITIGATION:				
	Milestone Schedule Target			Risk	Mitigation				
	I Prototype LNA	2015Dec31	Q4 FY16		I Device is sole sourced	Accept			
12			QS	U2	FY2016		Q 😸 💮		

COST: Effort is funded from CDL research account.

SCOPE: No Change - Design and prototype 65-90 GHz amplifier with 2 mil substrate thickness (compare to current 3 mil). Goal is improved reliability and performance reproducibility.

SCHEDULE: Negotiations for these sole source devices are in progress. Experience has shown that these negotiations do not always conclude in a predetermined time frame.

RISK & MITIGATION: These devices have a sole source, available only from JPL. We can only accept this risk as JPL has been our sole source for similar devices for decades. A secondary risk is identified as field failures that require the same device, which would compete with the prototype in the event of field failures. In the interest of supporting components in the field, prototyping this amplifier has been delayed until an adequate supply of devices is available.

	OP MILESTONE # 6.5.16								
Science Su	Nont 8	Researc	h	Schedule					
Testing of v	Testing of version 2 of PPI and NRAO archive								
COST:			SCOPE:						
Labor Actuals	Expected								
DMS funds this activity at a higher WBS level.			Testing of version 2	2 of PPI and NRAO					
Material Actuals	Expected		archive tool						
\$	\$								
Travel Actuals	Expected								
\$	\$								
SCHEDULE:			RISK & MITIGATIC	DN:					
Milestone	Schedule	Target	Risk	Mitigation					
I Test as delivered	3/31/2016	5/27/2016	I Lack of timely testing to identify issues in utility and performance	l See 7.4.19					
	'								
		Q	SU2 FY2016	0 0 0					

COST: no cost implications.

SCHEDULE: Delivery of the archive was delayed due to lack of requirement clarity and due to resources being diverted to other urgent issues. Work was completed to clarify requirements. Additional resources have been drawn from the team to make Archive/RPI delivery the teams #1 priority for delivery, after service outages (see Milestone 7.4.19).

SCOPE: no change in scope.

RISK: lack of timeline testing to identify issues in utility and performance.

DMS Softv	EST vare	ONE #	7.4.12	Cost Schedule	
COST:	ware		SCOPE:		
Labor Actuals DMS funds this ac	Labor Actuals Expected DMS funds this activity at a higher WBS level.			nize the existing system	
Material Actuals \$	erial Actuals Expected \$		the National Radio Quiet Zone (NRQZ).		
Travel Actuals \$	Expected \$		Milestone cancelled		
SCHEDULE:			RISK & MITIGATI	ION:	
Milestone	Milestone Schedule Target		Risk	Mitigation	
I Start development	3/31/2016	Cancelled	1 Missed opportunity	l Current system works, accept risk	
4		OS	U2 FY2016	0 #	

SCHEDULE: Cancelled – This requires a science resource (project scientist) to provide requirements and ongoing assistance with development, in addition to effort from DMS to do the work. No resource availability is anticipated to address this.

SCOPE: Replace and optimize the existing system used for propagation path analysis within the National Radio Quiet Zone (NRQZ) and West Virginia Radio Astronomy Zone (WVRAZ).

RISK & MITIGATION: This is an opportunity to re-design the NRQZ approval process which would streamline it and reduce current staff effort. However, the effort gain would not cover the cost of additional scientific staff. An additional engineer was offered a position in anticipation of restarting this project in FY16, but the offer was not accepted.

The existing system, while not optimal, will continue to meet the need for NRQZ request review.

F	OP MILESTONE # 7.4.18									
	DMS Softw	DMS Software								
	NGAS – Sto	orage up	ograde rev	iew	Scope					
	COST:			SCOPE:						
	Labor Actuals	Expected								
	DMS funds this act	tivity at a high	her WBS level.	Review the potenti	al need for refactoring of					
	Material Actuals	Expected		NGAS ingestion and retrieval programs.						
	\$	\$								
	Travel Actuals	Expected								
	\$	\$								
	SCHEDULE:			RISK & MITIGATION:						
	Milestone	Milestone Schedule Target		Risk	Mitigation					
	I Review and report	3/31/2016	4/29/2016	I Knowledge and capacity lost to retirement	Ia Review to facilitate knowledge transfer Ib Start development work on new process Ic Recruit replacement Id Continue part-time work					
15			Q	SU2 FY2016						

SCHEDULE: The NGAS software and supporting processes have been reviewed. Work has started on a more organized and robust ingestion processes for the archive, and as part of the New Archive work, on an improved retrieval process. The report and plan was not completed by the due date, however, the milestone has now been completed.

SCOPE: Review the potential need for refactoring of NGAS ingestion and retrieval programs.

RISK & MITIGATION: The current primary NGAS support resource (John Benson) retires at the end of April. He will continue to work ¹/₄-time until a replacement is found. The review, along with development work on ingestion and retrieval, has spread much of the knowledge to others on the team. Recruiting for a replacement is actively underway.

	LEST	ONE #	7.4.19	Cost		
DMS Softy	ware			Schedule		
New NRAG	O Archiv	e – Phase	2 testing	Scope		
COST:			SCOPE:			
Labor Actuals	Expected					
DMS funds this ac	tivity at a high	her WBS level.	Operationalize the	New NRAO Archive and		
Material Actuals	Expected		RPI previously prototyped – Step 1: make Phase 2 software available for testing.			
\$	\$					
Travel Actuals	Expected					
\$	\$					
SCHEDULE:			RISK & MITIGATION:			
Milestone	Schedule	Target	Risk	Mitigation		
I Deliver software for testing	3/31/2016	5/27/2016	I Operational issues with existing NRAO archive	I Standardize NGAS infrastructure, ingestion, and retrieval		
		Q	SU2 FY2016	2 😔 🌐		

SCHEDULE: Delivery of the archive was delayed due to lack of requirement clarity and due to resources being diverted to other urgent issues. Work was completed to clarify requirements. Additional resources have been drawn from the team to make Archive/RPI delivery the teams #1 priority for delivery, after service outages (see Milestone 6.5.16).

SCOPE: Operationalize the New NRAO Archive and RPI previously prototyped – Step I: make Phase 2 software available for testing.

RISK & MITIGATION: Operational issues with the existing NRAO archive may divert attention from this effort and delay the schedule. To the extent possible, this risk will be mitigated by a separate effort to standardize the NGAS infrastructure and to simplify the ingestion and retrieval processes.

Risk to the revised delivery date has been mitigated by applying additional resources mentioned above, and by clarifying delivery requirements with stakeholders.

COST: SCOPE:: Labor Actuals Expected DMS funds this activity at a higher WBS level. Review the current design of user facing tools, in particular the PST, PHT, and OPT. Develop an architecture for improvement. \$ \$ Travel Actuals Expected \$ \$ SCHEDULE: Schedule Milestone Schedule 1 Create Design 3/31/2016 5/13/2016 5/13/2016	DMS Softw Tool Redes	vare ign – Cr	eate Desig	n	Schedule Scope	
\$ \$ SCHEDULE: RISK & MITIGATION: Milestone Schedule Target 1 Create Design 3/31/2016 5/13/2016 1 Create Design 3/31/2016 5/13/2016	COST: Labor Actuals DMS funds this act Material Actuals \$ Travel Actuals	Expected tivity at a high Expected \$ Expected	her WBS level.	Review the current design of user facing tools, in particular the PST, PHT, and OPT. Develop an architecture for improvement.		
Milestone Schedule Target I Create Design 3/31/2016 5/13/2016 I Continuing user frustration with tools 2 Focus on New Archive and RPI I Prioritize/address key issues 2 Accept	\$ SCHEDULE:	\$		RISK & MITIGATIO	ON:	
	Milestone I Create Design	Schedule 3/31/2016	Target 5/13/2016	Risk I Continuing user frustration with tools 2 Focus on New Archive and RPI	Mitigation 1 Prioritize/address key issues 2 Accept	

SCHEDULE: Schedule was initially delayed due to lack of clear input on requirements. In the intervening period more discussions have taken place and work has been done on a roadmap for development and potential restructuring. Other priorities (VLASS, New NRAO Archive/RPI) have been higher and compete for resources with this. With the anticipated delivery of the Archive/RPI Phase 2 and the end of design work for VLASS, more resources will be available to address this work.

SCOPE: Review the current design of user facing tools, in particular the PST, PHT, and OPT. Develop an architecture for improvement. No scope issues.

RISK & MITIGATION: The Users Committee and other similar groups have pointed out deficiencies in the toolset. These have been prioritized by the Committee and evaluated by the development team. High priority/low effort items will be implemented in the current software.

Focus on New Archive and RPI will continue to delay this, as the resources required for development and testing are for the most part the same people needed for providing input to and developing the architecture/direction for this toolset. However, the creation and filling of the DMS architect role last year will help alleviate the design workload, and the

reduction of archive work in 4QFY16 will free resources to start on tool refactoring and development when the design is completed.

Note that the Users Committee prioritized delivery of the AAT/RPI ahead of this work, though they would like both to happen as soon as possible.

	ESTO	NE #	7.4.34	Cost	
DMS Softy	vare			Schedule	
iOS App for	r Public C	utreach		Scope	
COST:			SCOPE:		
Labor Actuals	Expected				
DMS funds this activity at a higher WBS level.			Deliver an NRAO inf	ormational iOS mobile app	
Material Actuals	Expected \$		as a public outreach tool, in collaboration with		
\$			the Li o department.		
Travel Actuals	Expected				
\$	\$				
SCHEDULE:			RISK & MITIGATIO	DN:	
Milestone	Schedule	Target	Risk	Mitigation	
I Software & documentation Beta release delivered for testing 2 App deployed to iTunes	3/28/2016	5/13/2016 5/30/2016	I Resources availability delayed by other projects	Prioritize, focus time to finish	
		QS	U2 FY2016		

SCOPE: Deliver an NRAO informational iOS mobile app (RadioSky) as a public outreach tool, in collaboration with the EPO department.

SCHEDULE: This is a collaborative project with both DMS and EPO resources. Resources to complete the DMS work were delayed by other higher priority projects (GBT and VLA pipelines). Taking advantage of a break in that work, DMS has focused resources on this in April to drive it to completion.

RISK & MITIGATION: Resources could be delayed by other projects, as has happened previously. EPO and DMS are working together to prioritize this project in order to finish it in the anticipated new timeframe.

F	POP MIL EPO: STEM VLAVC Edu	EST 1 Educa ucation	DNE # tion and Plan Com	f I Ou	0.3.6 Itreach ted	Cost Schedule Scope			
	COST: SCOPE:								
	Labor ActualsExpected\$\$Material ActualsExpected\$\$Travel ActualsExpected\$\$				The STEM Education Officer in NM coordinates with fellow STEM experts at NRAO to produce a cookbook of programs and exhibits that can be run out of the VLA site. This plan will propose new and innovative uses for the resources and partnerships in place while suggesting new ones to pursue.				
	SCHEDULE:	,			RISK & MITIGATION:				
	Milestone Schedule Target				Risk	Mitigation			
	I.VLAVC Ed/Interp plan 2.VLAVC architectural plan	12/30/16 03/30/16	09/30/16 unknown		I Lack of key personnel 2 Lack of approval of New Idea	Accept, upgrade goes into hiatus until new hires embedded/trained Accept, improve if requested, and resubmit.			
19			Q	25U2	FY2016	Q 🐲 👄			

SCOPE: The STEM Education Officer in NM coordinates with fellow STEM experts at NRAO to produce a cookbook of programs and exhibits that can be run out of the VLA site. This plan will propose new and innovative uses for the resources and partnerships in place while suggesting new ones to pursue.

SCHEDULE: The NM STEM Education Officer is also the Gift Shop supervisor, and is delivering all tours, school programs, and Open Houses. The draft plan is already underway, and we will pick it back up if the New Idea is approved.

RISK & MITIGATION: Lack of key personnel is always a risk, and so we accept this, knowing that it puts this aspect of the project into hiatus until we can hire/train talented staff. Recruitment for an experienced STEM Dev officer is underway, and this position will contribute to this milestone. If the New Idea is not approved, then we follow desist or resubmit instructions for our next move from upper management.

EPO VLA VC Upgr COST: Labor Actuals No changes Material Actuals	Expe Expe	Archite	ectural/	Design Plan SCOPE: Schematic design draw VLA VC buildings and I	vings for upgrades to the andscape.			
\$42,581 /year Travel Actuals No changes	\$42,581 /year \$2,750 / year Travel Actuals Expected No changes				We have parking lot and new road plans, so far.			
Milestone I.VLAVC Ed/Interp plan 2.VLAVC architectural p	lan	Schedule 12/30/16 03/30/16	Target 09/30/16 unknown	Risk 1. No approval of VLAVC New Idea proposal 2. No seed funds to hire contractor	Mitigation Milestone moot. Fundraise and wait.			

COST: EPO funds this activity at a higher WBS level unless outside funding is acquired for it.

SCOPE: An architect or general contractor is required to survey the site and prepare a detailed building plan for the proposed upgrades to both indoor and outdoor features. We have such a plan for the new roads and parking lot construction aspects of the upgrade, but not the VC and classroom upgrades, or the landscaping. We have made preliminary contacts for initial walkthroughs, but lack of funding restricts further action.

SCHEDULE: This is an interdepartmental new idea that has not yet received approval from the Director, due to delays in stakeholder participation and lack of funding.

RISK & MITIGATION: If the New Idea proposal for the VLA VC is not approved, then we accept that this milestone disappears with the project. If no seed funds are available to hire the architect, then we pursue other means of raising funds for the hire, and wait until we can afford the service.

POP MII EPO: New Public Web	LEST vs & Pub	ONE #	# 10.3.20 mation ents Delivered		Cost Schedule Scope		
COST:		0	SCOPE:				
Labor Actuals \$ Material Actuals \$ Travel Actuals \$	Labor ActualsExpected\$\$Material ActualsExpected\$\$Travel ActualsExpected\$\$		With stakehol creates a desi WordPress-bu EPO WebDev, format ready	With stakeholder input, EPO Designer creates a design description for a new WordPress-built public website specified by EPO WebDev, and delivers art assets in a format ready for UX/UI.			
SCHEDULE:	SCHEDULE:		RISK & MITI	RISK & MITIGATION:			
Milestone	Schedule	Target	Risk	Mitigatio	n		
I Functional Specification Doc approved	12/31/15	03/31/16	I Lack of key per	onnel Accept, rep personnel a	lace/embed is soon as possible		
2 Design Spec delivered	03/31/16	05/31/16					
21			QSU2 FY2016		Q 🐲 🖦		

SCOPE: With stakeholder input, EPO Designer creates a design description for a new WordPress-built public website specified by EPO WebDev, and delivers art assets in a format ready for UX/UI.

SCHEDULE: The Web Dev for EPO did not come on board until the end of October, so Specification schedule is shifted from originally set. Spec was delivered in March, so draft design is in midflight, expected mid-May.

RISK & MITIGATION: With only one web developer as our resource, the loss of this resource is our greatest risk. We accept this, and hire/train as effectively as possible. Also, the Joomla site is being maintained, but retains incompatibilities with search engines and mobile platforms. We have to accept this, because we do not have access to developers who can code the fixes, but we mitigate with the help of CIS staff who are keeping it updated and security-tight.

F		EST(ONE #	10.3.21	Cost Schedule			
	Orion video	os specif	ied and so	ripts completed	Scope			
	COST:			SCOPE:				
	Labor Actuals Expected			ORIGINAL: EPO Science Writer and GB scientist				
	\$	\$ Expected		they author scripts to fo	or this online product, then llow the interactive that will be			
	Material Actuals			used by the video editor	s/animators to produce the			
	\$	\$		interactive.				
	Travel Actuals	Expected		CHANGE: Find Orion exp	erts among staff/users and When none EPO Science			
	\$	\$		Writer authors scripts to fill gaps, and record VO.				
	SCHEDULE:			RISK & MITIGATION:				
	Milestone	Schedule	Target	Risk	Mitigation			
	I Videos spec'ed and script delivered	12/31/15	06/30/16	I Lack of key personnel	Accept, and delay delivery OR Mitigate, and hire writers to support			
22	QSU2 FY2016 🔯 👾 👾							

SCOPE: Originally, EPO Science Writer works with GB scientist to determine storyboard for this online product, then authors the scripts to follow the interactive that will be used by the video editors to develop the interactive. New scope is to find actual scientists to tell us about these facets of Orion, and when there none suitable, Science Writer will author scripts and EPO will record VO for them.

SCHEDULE: EPO Science Writer is also the Interim AD for EPO and interim project lead on VLA VC Upgrade Project. These demanding and critical administrative duties have taken priority over her Science Writer duties for longer than expected. In addition, the degree of writing partnership with a colleague in GB is no longer possible due to his reduced hours. That said, with return of video editor from leave, videos have been specified.

RISK & MITIGATION: Lack of key personnel is the issue here, and we accept that it will delay this milestone until the staffing situation in EPO settles down.

COST:			SCOPE:					
Labor Actuals	Expected		EPO and DMS work	together to complete the				
\$	\$ Expected \$ Expected \$		functionality and co	functionality and content builds. We will load all content, including final art, into the app interactive on NRAO mobile devices for testing and QA.				
Material Actuals			all content, includin					
\$			interactive on NRAC					
Travel Actuals			testing and QA.					
\$								
SCHEDULE:			Risk	Mitigation				
Milestone	Schedule	Target	I Shared resources	Accept, match PEP/POP goals				
I Beta app ready for testing	12/31/15	05/13/16	unavailable	for greater transparency/accountability				
2 All locked and uploaded	03/31/16	unknown	2 Loss of key personnel	Accept and delay project until new hires embedded				

SCOPE: Load all content, including final art, into the wireframe app interactive for testing and QA.

SCHEDULE: The milestone is typically reached by coordinated effort between EPO and DMS; GBT and VLA pipelines, transition planning, plus VEGAS spectrometer real time data display projects have been given higher priority by supervisors of the developers assigned to this project, but they were able to ringfence time in Q2 to allow concentrated dev efforts on this app.

RISK & MITIGATION: Sharing resources across two busy departments is fraught with compromise. We accept that the data pipeline takes precedence over our fledgling app activities. In future, we will think more carefully about milestones that require shared resources. Loss of key personnel is a common threat to our projects, and we accept that we cannot afford to hire contractors for this work at this time.

	pp Uplo	aded to A	scope:	Scope			
Labor Actuals	Expected \$ Expected \$		DMS posts RadioSky Apple's review and a	DMS posts RadioSky app to AppStore for Apple's review and approval. If approved, EPO markets the app to general audiences.			
Material Actuals \$			EPO markets the ap				
Travel Actuals	Expected		L I				
SCHEDULE:	s is		Rick	Mitigation			
Milestone	Schedule	Target	I Shared resources	Accept match PEP/POP goals			
I Beta app ready for testing	12/31/15	05/13/16	unavailable	for greater transparency/accountability			
2 All locked and uploaded	03/31/16	unknown	2 Loss of key personnel	Accept and delay project until new hires embedded			
			3 AppStore rejects app	Accept, try to improve and			

SCOPE: DMS posts RadioSky app to AppStore for Apple's review and approval. If approved, EPO markets the app to general audiences.

SCHEDULE: The milestone is typically reached by coordinated effort between EPO and DMS; GBT and VLA pipelines, transition planning, plus VEGAS spectrometer real time data display projects have been given higher priority by supervisors of the developers assigned to this project, but they were able to ringfence time in Q2 to allow concentrated dev efforts on this app.

RISK & MITIGATION: Sharing resources across two busy departments is fraught with compromise. We accept that the data pipeline takes precedence over our fledgling app activities. In future, we will think more carefully about milestones that require shared resources. Loss of key personnel is a common threat to our projects, and we accept that we cannot afford to hire contractors for this work at this time. The biggest risk is if Apple declines to offer our app in their AppStore, in which case, we can do our best to improve and resubmit, but it's out of our control to avoid this risk.

F	OP MIL Administra Contracts 8	LEST(ation & Procur	DNE #	ŧ I	5.7.5			Cost Sche Scop	dule e
	COST: Labor Actuals \$ Material Actuals \$ Travel Actuals	Expected \$ Expected \$ Expected			SCOPE:				
	SCHEDULE: Milestone I Finalize Review	\$ Schedule 03/31/2016	Target 05/20/2016		RISK & MIT Risk	IGATIO	N: Mitigation		
25	QSU2 FY2016								t and the second se

SCOPE: There are no scope changes associated with this milestone.

SCHEDULE: Review by Associate Director of Administration is complete. Submitted to AUI and comments from AUI are being incorporated. Expected to complete the project on or before May 20, 2016.

RISK & MITIGATION: There are no risk associated with this milestone.



POP MILEST NM OPS	ON	E # F	YI5 3.4.8	Cost Schedule			
Automate Subarra	iy Obse	erving	SCOPE:				
Budget Actual Budget Pl	anned ret.		Observations using multiple VLA subarrays were effectively done by hand during FY2014 and FY2015. This mode will be automated and incorporated into the dynamic scheduler for testing in Q2 FY2016.				
SCHEDULE:			RISK & MITIGATION:				
Milestone	Schedule	Target	Risk	Mitigation			
>1 subarray observing "by hand" >1 subarray observing automation "Completed	03/31/2014 12/1/2015	03/3/2016* 06/30/2016	I Slightly reducing user chances to observe priority C (filler projects) 2 Delay other observatory activities caused by effort being used for manual scheduling	VLA scheduler vigilance Tasks with less urgency will be delayed while subarray automation is not available			
		QSU2	FY2016	0.000			

COST: No changes in budget

SCOPE: The VLA can be split up in subarrays. That is, some of the 27 antennas and corresponding baselines can be ordered to do a completely different and independent program than other antennas. This may be the case when an observer has asked to divide up the array for a single project to observe a source simultaneously in multiple bands or to observe multiple different sources simultaneously that do not need the full array, or when one antenna is split off from the main array for inclusion in a VLBI array by another user (though this last option, also called "YI", is not currently offered for general observing).

SCHEDULE: Observations using multiple subarrays were stabilized during FY2014, but scripts must be made by hand, and they have had to be scheduled by hand and cannot go through the dynamic scheduler as well. Work on automating subarrays has been slower than planned, mostly because of staffing issues in the SSA software group, but we continue to schedule multiple subarray observing by hand quite effectively. Some progress has been made in the software recently, though, and the OPT portion of subarrays is mostly done now (some validation is missing, and some interface cleanup is needed, but those are minor issues). Continued progress is focused mostly on the OST now; recent progress indicates that we will finish this milestone by the end of Q3 FY2016.

- 1. The risk to users of not having subarray observing automated is a slightly reduced chance of observing for priority C (filler) subarray projects. Mitigation is increased VLA scheduler vigilance, to avoid this happening.
- 2. The impact on the observatory is that effort is used for manual scheduling that could be used on more important (but less urgent) tasks, while we don't have automation we will continue giving priority to manual scheduling.

COST:				SCOPE:				
Labor Actuals Expected				St. Croix, VI site land use lease has been renewed.				
No changes				Owens Valley, CA site is not renewed yet. NRAO is awaiting lease negotiation outcome by Cal Tech (we				
Material Actuals	aterial Actuals Expected 42,581 /year \$2,750 / year avel Actuals Expected							
\$42,581 /year				Kitts Peak and Los Alamos site managers have				
Travel Actuals				requested increased payments for site support. NRAO				
No changes				has asked for details of rate calculatons and continues to negotiate.				
SCHEDULE:				RISK & MITIGATION:				
Milestone		Schedule	Target	Risk	Mitigation			
1. St. Croix Lease renewe	ed.	12/31/14	12/31/14	I. Impact on VLBA operating	Adjust VLBA Operating budget.			
2. Owens Valley Lease rea	newed	03/31/15	TBD	budget (increase in lease cost)				
				2. Impact on VLBA operations	Avoid by periodic follow up of Cal Tech negotiation progress.			

COST: Information incomplete on KP and LA. KP presented an out-of-the-blue invoice for \$25,935 which we believe is based on collecting area. Additionally LA is considering bundling some their services in to an annual fee that at present has not been determined. Best estimate is additional bill is \$11,200.

<u>St Croix Lease</u>: The lease has been signed by all parties. The lease is for 10 years with two 5 year options. Its cost increased from \$2,750/yr to \$42,581/yr.

<u>Owens Valley Lease</u>: Cal Tech negotiates this lease and it has been expired for 2 3/4 years. Los Angeles Water and Power is the lease holder. NRAO sub leases from Cal Tech. Progress has been marginal in the last quarter, according to the Cal Tech Owens Valley Radio Observatory Executive Director. The target date is shown as TBD for now, due to the uncertainty regarding when the lease will be signed.

- 1. Cal Tech has leased Owens Valley, CA for a low yearly fee. The probability of a cost increase is low, but a budget adjustment would be needed if a cost increase occurs.
- 2. Impacts on other aspects of VLBA Operations are not likely to occur.

F	POP MIL WV Opera Milestone T COST: Labor Actuals \$ Material Actuals \$ Travel Actuals \$	OP MILESTONE F WV Operations; GBT Development Milestone Title: Commissioning COST: Labor Actuals Expected \$ \$ Material Actuals Expected \$ \$ Travel Actuals Expected \$ \$ \$ \$		YI5#4. elopment ng of ARGUS SCOPE: Update for Ex ARGUS receiv 30, 2015. Pro tests, was ins basic commin Project is not	4.2 Cost Schedule S Receiver Scope S
	SCHEDULE: Milestone I Commissioning of ARGUS Rx	Schedule 3/31/15	Target 3/10/2016	RISK & MIT Risk	IGATION: Mitigation
29			Qs	SU2 FY2016	Q 🔅 👾

COST: No Change

SCOPE: No Change

SCHEDULE: The project executed a Change Request in October 2015 for schedule extension because the Stanford led collaboration was late in their integration process. They encountered technical problems that made the integration take longer than originally planned, delaying the delivery of the receiver to NRAO. Project successfully concluded 3/10/2016.

COST:			SCOPE: The Gr	een Bank Monitor and				
Labor Actuals	bor Actuals Expected		Control release	Control release consolidates "patches"				
DMS funds this activity at a higher WBS level.			made to the sys	made to the system throughout the course				
Material Actuals	Expected		of the year, vali	of the year, validates the revision control				
\$	\$ Expected		prune obsolete subsystems					
Travel Actuals			prune obsolete	prone obsolete subsystems.				
\$	\$							
SCHEDULE:			RISK & MITIGA	RISK & MITIGATION:				
Milestone	Schedule	Target	Risk	Mitigation				
I M&C Release	9/30/2015	6/24/2016	l Technical debt	Ia) Keep entire team updated on incremental changes Ib) Stay on track for 6/24/2016 completion				

SCHEDULE: Schedule was delayed due to the higher priority of cross-training and updating an operationally critical system in anticipation of one of the staff leaving NRAO. An additional delay of one quarter was incurred due to the need to move the schedule for the Servo Replacement Project ahead to prepare for a retirement outside of the software group.

SCOPE: Update the Green Bank Monitor and Control system: The Monitor and Control release consolidates "patches" made to the system throughout the course of the year, validates the revision control system, and provides an opportunity to prune obsolete subsystems. No scope issues.

RISK & MITIGATION: Delaying the release does not have an immediate effect, but it does have an effect over time, in that further changes become more difficult and take longer. All the members of the team will be updated on each other's incremental changes via regular weekly meetings, and the release will be rescheduled for completion by 6/24/2016. Note that the cumulative changes for this M&C release will be combined with those anticipated for the release due in 4QFY16 (POP milestone 7.4.13), so both will be completed at the same time.





	POP	PYIO	PYI6	Pov
	Budget	Budget	Expenses	Budget
NSF	41,730	41,730	31,295	75.0%
Telescope Time Sale	3,596	3,596	1,503	41.8%
Carryforward/Other	3,138	4,509	4,153	92.1%
Total CSA-I Revenues	48,464	49,835	36,952	74.1%
Telescope Ops	18,723	19,729	8,469	42.9%
Development	3,535	3,618	1,441	39.8%
Science Ops	5,860	6,287	2,406	38.3%
Admin Services	15,168	14,927	7,248	48.6%
Director's Office	3,677	3,773	1,898	50.3%
FY16, Total	46,964	48,335	21,461	44.4%
FYI6 CSA-I Net	1,500	1.500	15.491	

- Plurality of telescope time sale revenue is associated with Breakthrough Foundation, time did not begin until January on schedule.
- Difference between Carryforward Budget & Revised is open commitments.
- Director's Office includes fund source adjustments of \$318K.

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FY I 6 YTI	D by Major WBS	Categ	ory	ALM	1A (Ops – Q2				
		FY16	FY16	FY16	YTD %					
		POP	Rev.	YTD	Rev					
		Budget	Budget	Expenses	Budget					
	Telescope Ops	22,851	23,424	8,963	38.3%					
	Development	5,478	9,915	724	7.3%					
	Science Ops	7,204	8,172	2,950	36.1%					
	Admin Services	5,013	5,029	2166.6	43.1%					
	Director's Office	3,447	3,503	1427.4	40.7%					
	FY16, Total	43,993	50,043	16,232	32.4%					
	Development Reserve	4,073								
	Open Commits	3,521		3,981						
	C/F for FY16 Fuel	1,800	1,215							
	C/F for Future Years	281	1,115							
	PPS Budget Adjustment	(714)								
	JAO	(581)								
	ALL ALMA Resources	52,373	52,373	20,213	38.6%					
 Development awarded \$1.1M in studies, Q1 Telescope Ops rec'd \$2.1M credit from NAOJ for FY16 activity. Below the line changes result of NSF changes in funding timing vis a vis JAO and designation of use of Canadian funds. 										
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- The original POP included expected CAD funds of 1.7M, which offset the fuel reserve.
- NSF pulled back 1.3M (714+581) and then used the Canadian contribution as the required reserve for the JAO work.
- We recognize that the remaining 575k from CAD is not coming in FY16 (rev budget).
- The fuel reserve was decreased by the difference in order to balance.

FY16YTD by Major WBS Category ICC- Q2

	FY16 POP Budget	FY16 Rev. Budget	FY16 YTD Expenses	YTD % Rev Budget
Telescope Ops	101	102	37	36.5%
Development	713	726	304	41.9%
Science Ops	1,924	1,951	866	44.4%
Admin Services	11,004	11,315	5,106	45.1%
Director's Office	1,514	1,563	838	53.6%
FY16, Total	15,256	15,656	7,152	45.7%
Admin Recoveries	13,938	14,338	6,369	44.4%
External Recoveries	1,318	1,318	485	36.8%
FY16 ICC Net	0	0	298	

- ICC currently under-recovered by \$298K due to lagging spending in the CSA's & low external recoveries. \$50K improvement over Q1.
- Fund source adjustments shown in Director's Office.

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Education and Public Outreach STEM Formal Education

- Renovation of N²I²: New Mexico Tech and NRAO Instructional Interferometer underway with PMD/NINE collaboration
- STEM-ID (New PSC) online workshop, 82 students
- 16 unique overnight student groups at 40ft for observations
- 1394 obs using 20m telescope
- · 20m radio astronomy training, 37 educators
- Starlab lessons in Saracino, 85 students
- 6th GTTP workshop with Faculty of Education and Institute of Astrophysics from Pontificia Universidad Católica de Chile

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Education and Public Outreach

STEM Informal Education

- 3846 visitors to GB
- 4255 visitors to VLA
- AAS EPO Live Events, 150 students
- Radio broadcasts on Wake-Up Call, 94.7 FM Charlottesville
- First Saturday Tours at VLA
- Exhibit Panel about VLBA in Mauna Kea Visitor Center
- Pocahontas County Social Studies Fair, 102 students
- WV Regional Math Field Day, 98 students
- Science Club Connection Skype chat with Dale Frail, 15 students
- Breakthrough Listen tour under development at Green Bank, WV
- Cosmic Park begins construction in Magdalena, NM

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Today Show: http://www.today.com/video/in-green-bank-w-va-wi-fi-and-cellphones-are-illegal-and-life-goes-on-611469379592

Great Big Story: A Telescope So Powerful, It Can See Into the Past https://www.youtube.com/watch?v=5mliMXdEaLs



