

# National Radio Astronomy Observatory

# Quarterly Status Update (QSU) | FY2021

# October – December 2020

PREPARED BY	ORGANIZATION	DATE
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# NRAO Quarterly Status Update October - December 2020 QSUI FY2021

			QI P	erformance Assess	sment
POP	Milestone	Completion Date	Cost	Schedule	Scope
Milestone					•
2.5	NA ALMA Operations				
		12/21/2020			
3	Advertise for new ALMA Ambassadors	12/31/2020			
3		12/31/2020			
4	Advertise two calls for proposals to co-sponsor topical scientific or technical workshops	12/31/2020			
7	Cycle & Development Study Programs Regin	12/31/2020			
/	Maintenance Renewal and Warranty Claims	12/31/2020			
12	Complete engineering package for AOS TB improvements	12/31/2020			
	Chile Office				
14	Rebaseline multicancha project	12/31/2020		L Cancelled, FY2022 POI	)
15	Collaborate with JAO and unions to define guidelines for work-from-home for OCA and JAO employees	12/31/2020			
16	Address Local Staff Member (LSM) issues arising from return to full operations after COVID-19	12/31/2020			
17	Strengthen Provoca initiative in collaboration with underserved high school(s) and/or universities	12/31/2020			
3.4	New Mexico Operations				
	Very Large Array				
	Operations				
I	Define VLA GO and SRO capabilities to be offered for Semester 2021B	12/31/2020			
3	X-Proposal test observing complete	12/31/2020			
8	Determine baselines and pointing for antennas moving into their BnA and A configuration locations	12/31/2020			
12	Reconfigure from B to BnA and BnA to A configuration	12/31/2020			
16	Scientific validation and documentation updates for the VLA observing software (OPT 1.28.00 release)	3/31/2021			
	Maintenance and Renewal				
24	Perform preventive maintenance on each of two transporters prior to array reconfiguration to BnA	12/31/2020			
30	Perform preventive maintenance on the next configuration VLA antenna transformers prior to array	12/31/2020			
	Operations				
44	Define VLBA GO and SRO capabilities to be offered for semester 2021B	12/31/2020			
48	Update the VLBA calibrator list in the online search tool	12/31/2020			
	Technical Upgrades and Enhacements				
58	Support 4 Gbps recording at Arecibo for HSA observations	9/30/2021		Cancelled	
4.3	Central Development Laboratory				
	Operations				
	Build and test ALMA Band I local oscillators	12/31/2020			
	Development				
8	Demonstrate 40 km unformatted serial link	12/31/2020			
	Maintenance Renewal, and Warranty Claims				
15	VLA/VLBA multichip module support	12/31/2020			
5.7	Science Support and Research				
5	TAC Monting Semester 2021A	12/31/2020			
7	Undate SW requirements for TAC 2021A	12/31/2020			
· ·	Science Ready Data Products				
16	Complete VLASS 2.1 Observation	12/31/2020			
17	Complete VLASS 2.1 Quick Look Imaging	3/30/2021			
19	TTA Tools Implementation Kickoff	12/31/2020			
	Scientific User Support				
22	NM Symposium	12/31/2020			
23	CASA validation	12/31/2020			
24	Publish CASAGuides	12/31/2020			
	Scientific Staff and Jansky Fellows				
27	SciStaff performance reviews	12/31/2020			
31	Jansky Fellows selection completed	12/31/2020			
	Student Programs				
35	Student Observing Support selection (VLA)	12/31/2020			
6.5	Data Management and Software				
2		12/21/2020			
5		12/31/2020			
	SDM update	12/31/2020			
1	ALMA Helpdesk migration	3/30/2020			
	New Mexico Systems Software	5,50,2021			
16	OPT release 1.28.00	12/31/2020			
	CASA				

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			QI P	erformance Asses	sment
POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope
24	CASA 5.8/6.2 release	12/31/2020			
	CASA Pipeline				
29	Pipeline ALMA Cycle 7 update	12/31/2020			
	Science Support and Archives				
33	Update proposal and observing tools	12/31/2020			
39	CARTA support	12/31/2020			
	Algorithm Research and Development				
42	Commission Full-Polarization Primary Beam Modeling Algorithm	12/31/2020			
	VLASS SE Imaging				
45	Demonstrate 100 square degrees of imaging	12/31/2020			
7.5	Program Management Department				
	PMD Operations				
I	HQ PM/SE Project Leadership	12/31/2020			
2	NM PM/SE Project Leadership	12/31/2020			
3	CDL PM/SE Project Leadership	12/31/2020			
	Proposal Development				
4	HQ Proposal Development	12/31/2020			
5	NM Proposal Development	12/31/2020			
6	CDL Proposal Development	12/31/2020			
	PM Activities				
7	HQ Continuing Education	12/31/2020			
	PM/SE Activities				
16	Band I LO Production Complete	12/31/2020			
8.5	Education and Public Outreach				
	News and Public Information				
I	Publish Feature story on Website and distribute through Newswise	12/31/2020			
2	Publicize press services through NRAO eNews	12/31/2020			
3	Identify staff for media experts list	12/31/2020			
	Multimedia Team				
5	Identify topic for hosted video	12/31/2020			
6	Produce hosted video	12/31/2020			
7	Edit scripts from a variety of influencers for Year in Review videos	12/31/2020			
9	Determine themes and authors for blogs	12/31/2020			
10	Schedule and host quarterly Facebook Live event	12/31/2020			
	Research best practices for influencers	12/31/2020			
	STEAM Ed				
16	Decision about whether to develop virtual outreach with partner organizations	12/31/2020			
21	Complete science writing for at least one object on the colorizing app	12/31/2020			
	VLA VC Operations				
23	Survey advertising options	12/31/2020			
9.4	Computing and Information Services				
	Observatory-Wide Support				
4	Standard install of RHEL 8 systems	12/31/2020			
7	Installation of vulnerability scanning tool	12/31/2020			
10.2	Office of Diversity and Inclusion				
	Local and National Programs				
	NAC Annual Meeting	12/31/2020			
4	D&I Cultural Training and Education	12/31/2020			
5	Partnership MOUs RADIAL	12/31/2020			
11.7	Human Resources				
	Workforce Management				
I	GBO Five-Year Proposal Workforce Management Plan	12/31/2020			
	Training and Development				
2	DISC Team Assessments	12/31/2020			
3	Observatory Leadership Cohort II Adaptation	12/31/2020			
4	EverFi Foundry Online Training Platform Migration and Usage	12/31/2020			
	Recruitment Employment				
9	Update New Hire Experience	12/31/2020			
12.2	Science Communications				
I	Redesign NRAO exhibits	12/31/2020			
13.6	Administration				
	Administration				
1	Plan and Initiate New Virtual Internal Science Series	12/31/2020			

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			QIP	erformance Asses	sment
POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope
14.1	Budget				
I	Implement FY2021 Budget	12/31/2020			
6	FY2020 ICC Final Rate Submission to AUI	12/31/2020			
16.2	Director's Office				
	ALMA				
I	ALMA Board Meeting	12/31/2020			
	Corporate Meetings				
3	AUI Board of Trustee Meeting	12/31/2020			
4	AUI Executive Committee Meeting	12/31/2020			
5	AUI Visiting Committee	12/31/2020			
	Science Community				
6	Appoint new Users Committee Members	12/31/2020			
	Management Reviews				
8	NSF Annual Program Review	12/31/2020			

# Color code: Cost/Schedule/Scope Cells

Blue - early

Green - on track

Yellow - expected to miss an <u>upcoming</u> milestone and/or not meet scope, and/or be underspent or overspent on budget **Red** - not completed by due date and/or overspent on budget, and/or unable to perform to the scope

Grey - completed





COST:			SCOPE:			
Labor Actuals \$ Material Actuals \$ Travel Actuals \$	Expected    Expected    Expected    Expected		Contractor was demo 2020 due to COVID-I suspended for up to I October 2020. Given pandemic and the JAC works is not foreseen Milestone is cancelled.	Contractor was demobilized in late March 2020 due to COVID-19. Contract is legally suspended for up to 18 months, from October 2020. Given the evolution of the pandemic and the JAO RTO, resumption of works is not foreseen in FY2021. Milestone is cancelled.		
SCHEDULE:			RISK & MITIGATION:			
Milestone	Schedule	Target	Risk	Mitigation		
<ol> <li>Rebaseline project</li> </ol>	QI-Q3	FY2022	<ol> <li>Deterioration of materials and critical items.</li> <li>Contractor goes out of business during suspension.</li> <li>Longer time to complete</li> </ol>	<ol> <li>Proper storage and frequent inspections. Accept risk.</li> <li>Accept risk; rebid if necessary.</li> <li>Accept risk; regular inspections</li> </ol>		

COST: The terms of the contract suspension are summarized below:

- One-time payment to cover the costs of equipment removal in December 2020, perishables and legal obligations such as salaries, severance, and vacations (~USDII0k).
- AUI/NRAO will be responsible for custody and maintenance of equipment and infrastructure.
- Balance of unpaid performance bonus (from 2019) added to the value of the contract; subject to milestones completion once work resumes.
- Remaining value of the contract in CLP now indexed to Chilean CPI.
- Joint inspection and mutually agreed report to establish status of works at time of suspension.

Costs of suspension not associated with the contractor:

- Retention of project staff.
- Cleanup mission campaign: during Q2 FY2021, estimated at USD50k.
- Site inspections every two months.
- SCOPE: The scope of the project remains the same as originally planned with an earned value of 75% to date.

SCHEDULE: Due to the current situation in Chile, with a second covid-19 wave and the strict measures the ALMA observatory has adopted, the resumption of the construction is not envisioned to take place during FY2021, hence the cancellation of this POP milestone for this fiscal year.

### **RISKS & MITIGATION:**

- I MATERIALS & INFRASTRUCTURE DETERIORATION:
- Long-term exposure could damage critical materials, most notably the wooden beams and membranes, could add cost if replacements or repairs are necessary.
- Another risk is that the contractor goes out of business during the suspension, forcing NRAO/AUI to rebid the remaining construction at a substantially higher cost than the balance of the current turnkey contract.

MITIGATION

Cleanup mission: To sustain the long-term suspension and have better storage conditions for critical items, during FY2021 Q2 the site will be cleaned, removing debris and rubble, applying plague control, enhancing perimeter fence and moving some items to the ALMA warehouse. Proper storage of critical materials will mitigate, but not eliminate, risk of deterioration (e.g. long-term folding of membrane may damage it, and wooden beams deformation).

### 2- SCHEDULE

This risk is twofold:

- a) Ability to resume work depends on the evolution of the pandemic and vaccination campaigns in Chile.
- b) Deterioration of materials may require major repairs or ordering of long lead-time items, such as the wooden beams and membranes.

### MITIGATION

- a) Pandemic and JAO RTO are outside our control; no mitigation is possible.
- b) Periodic inspections to the site to identify problems in a timely manner so that any contingencies can be considered in planning.

			in scope.	J. J
SCHEDULE:			RISK & MITIG	ATION:
Milestone	Schedule	Target	Risk	Mitigation

SCOPE: No Impact.

SCHEDULE: There has been a delay in releasing OPT 1.28.00 due to some technical issues and limited availability of testers toward the end of Q1 FY2021. The release is now planned for Q2 FY2021.

RISK & MITIGATION: There is no risk in this delay. OPT 1.28.00 includes various performance improvements enhancements and bug fixes, but no major capability changes. Until the release is out, the mitigation is to keep using OPT 1.27.00.

COST:			SCOPE:		
There are no char	changes in budget.		NRAO to work with the Arecibo Observatory to enable the 4Gbps capability and move it from Resident Shared Risk to Shared Risk observing in Q4 FY2021.The collapse of the platform on Dec. 1, 2020 unfortunately requires NRAO to cancel this milestone.		
SCHEDULE:			RISK & MITIGATIC	N:	
Milestone	Schedule	Target	Risk	Mitigation	
<ol> <li>Support for 4 Gbps a Arecibo</li> </ol>	t 30 Sept 2021	Cancelled	<ol> <li>Impact to future HSA observations</li> </ol>	<ol> <li>Discuss possible futureVLE options with Arecibo</li> </ol>	

SCOPE: The original scope of this milestone was for NRAO to work with the Arecibo Observatory to enable the 4Gbps capability on the 305-m telescope and to move this capability from Resident Shared Risk to Shared Risk Observing for High Sensitivity Array (HSA) observations in Q4 FY2021. Unfortunately, on Dec. 1, 2020, the platform of the 305-m Arecibo Telescope collapsed. We are therefore forced to cancel this milestone.

SCHEDULE: Milestone cancelled.

RISK & MITIGATION: The risk of the loss of the Arecibo 305-m telescope for VLBI is lost future science opportunity for both the HSA and global cm VLBI. In order to mitigate this NRAO has started discussions with Arecibo Observatory regarding possible future VLBI options at Arecibo.

40 km unfor	matted se	erial link	Joi acoi y	Scope		
COST: Not App	licable (see r	notes)	SCOPE:	as encountered with the fiber		
Labor Actuals	Expected		transceivers – they h	ad odd reset behavior.		
\$	\$		<ul> <li>Could have worked a to check off the mile</li> </ul>	around it and got the test data stone, but it was important to		
Material Actuals	Expected		take the time to und	erstand the behavior. This has		
\$	\$		<ul> <li>Manufacturer was contacted and we have the official remedy to cure the issue</li> </ul>			
Travel Actuals	Expected		<ul> <li>official remedy to cure the issue.</li> <li>Code will be revised and the transceivers will be programed and the link tested in the next few weeks. Original scope will be completed.</li> </ul>			
\$	\$					
SCHEDULE: Add	ditional sche	dule required	RISK & MITIGATIO	N:		
Milestone	Schedule	Target	Risk	Mitigation		
<ol> <li>40 km unformatted serial link – test dat showing matched transmit and receiv data streams.</li> <li>Additional quarte milestone.</li> </ol>	e   12/31/2020	03/31//2021	<ol> <li>Implementation of the manufacturer recommended work around might expose other hidden issues/problems.</li> </ol>	<ol> <li>Will contact manufacturer and work with them to resolve all issues/problem till we get satisfactory performance.</li> </ol>		

COST: Not applicable. Required transceiver hardware already procured.

SCOPE: Not applicable. Original scope will be met.

SCHEDULE: We've had some unexpected problems with the fiber transceivers, specifically them having some odd reset behavior. We could have just worked around it and got the test data to check off the milestone, but the PI thought that it important to take the time to understand what was going on first. Jason was in contact with the manufacturer over the holidays, and we think we know what we need to do. Revised code will be implemented in the next few weeks, but to be safe we have requested that the milestone be moved back by one quarter. The schedule delay shouldn't have any impact on budget.

RISK & MITIGATION: One risk has been identified in the four-square above and its mitigation explained.

SCHEDULE: Milestone	Schedule	Target	RISK & MITIGATIO	N: Mitigation		
Travel Actuals	Expected		this in early			
Material Actuals \$ N/C	Expected \$		Congratulations to the operation team leads, scientists, and analysts for bringing			
\$ N/C	\$		VLASS Epoch 2.1 obs	VLASS Epoch 2.1 observation cycle		
Lobor Actuals	Europeted		SCOPE:			

SCOPE: Complete Quick Look images for VLASS Epoch 2.1

SCHEDULE: Q2 FY2021.

RISK & MITIGATION: Early completion of this milestone provides an opportunity to increase community confidence, especially in the wake of delay in the SE imaging. Images are made available to the community as soon as the QA process completes.

COST:	ine Alloca		SCOPE:		
Labor Actuals	Expected		Kickoff meeting to de	fine an	
\$ N/C	\$		implementation plan	and schedule	
Material Actuals	Expected				
\$ N/C	\$				
Travel Actuals	Expected				
\$ N/C	\$				
SCHEDULE:			<b>RISK &amp; MITIGATIO</b>	N:	
Milestone	Schedule	Target	Risk	Mitigation	
I. Kickoff Meeting	12/31/2020	01/31/2021	<ol> <li>Schedule risk, availability of DMS resources</li> </ol>	1. Accept and prioritize	

COST: No changes to project cost, resources are in-kind effort.

SCOPE: No change to scope of milestone; meeting is to define implementation plan and schedule.

SCHEDULE: We have experienced a delay due to delays with adequate staffing within DMS.

RISK & MITIGATION: DMS has now reached expected staffing, but risk of further delay persists until new hires come up to speed. The TTAT team participates in DMS quarterly planning to ensure project tasks are reviewed for scheduling.

COST:			SCOPE:		
Labor Actuals	Expected		Release of CA	ASA v5.8/6.2 has not yet	
\$	\$		occurred. Vali	dation will happen after the	
Material Actuals	Expected		release, which	is estimated to be in March	
\$	\$		2021.		
Travel Actuals	Expected				
\$	\$				
SCHEDULE:	CHEDULE:		RISK & MITIGATION:		
Milestone	Schedule	Target	Risk	Mitigation	
<ol> <li>Validation for CASA 5.8 and 6.2 releases</li> </ol>	Q1 FY2021	Q3 FY2021	I. Low	<ol> <li>Offer users existing software until release of 5.8/6.2.</li> </ol>	

SCOPE: No impact.

SCHEDULE: Validation for CASA v5.8/6.2 was not possible in Q1 as scheduled, as the CASA release has not yet happened. Validation will occur after the release, which is estimated to be in March 2021. To give sufficient time, we now have a target for completion of validation of Q3 FY2021.

RISK & MITIGATION: Users can use existing CASA versions, and v5.8/6.2 will be validated when ready.

COST:			SCOPE:	
Labor Actuals	Expected		Release of CA	SA v5.8/6.2 has not yet
\$	\$		occurred. The	user documentation will be
Material Actuals	Expected		produced afte	the release, which is
\$	\$		estimated to t	e in March 2021.
Travel Actuals	Expected			
\$	\$		-	
SCHEDULE:			RISK & MITIC	ATION:
Milestone	Schedule	Target	Risk	Mitigation
I. User documentation for CASA 5.8 and 6.2 releases	QI FY2021	Q3 FY2021	I. Low	I. Offer users existing software until release of 5.8/6.2.

SCOPE: No impact.

SCHEDULE: User documentation for CASA v5.8/6.2 will be published after the software release, which is estimated to be in March 2021. To give sufficient time, we now have a target for completion of Q3 FY2021.

RISK & MITIGATION: Users can use existing CASA versions, and the new versions will be documented when ready.

COST:	111 () () () () () () () () () () () () ()		SCOPE:	
Labor Actuals	Expected		No change in scope	with an orderly
\$	\$		transition from the	commercial Moab
Material Actuals	Expected		resource scheduling	tool to HTCondor
\$	\$			
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			RISK & MITIGATIO	DN:
Milestone	Schedule	Target	Risk	Mitigation
I. HTCondor for VLASS	Q1 FY2021	Q3 FY2021	1. Need resource schedul	er I. Continue to use Moab

COST: No impact until annual Moab commercial license expires in July: \$18k for NM, \$17k for CV.

SCOPE: No impact.

SCHEDULE: Slipped into Q3 for resource coordination with SSA.

RISK & MITIGATION: Continue to use current resource scheduling solution.

COST:			SCOPE:	
Labor Actuals	Expected			
DMS funds this activit	ty at a higher \	WBS level.	The ALMA and	NRAO Helpdesks are
Material Actuals	Expected		software to De	vay from the Kayako eskPro.
\$	\$			
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			RISK & MITIC	GATION:
Milestone	Schedule	Target	Risk	Mitigation
I. Helpdesk migration	3/31/2021	Complete	I. None	

SCOPE: The ALMA and NRAO Helpdesks are transitioning away from the Kayako software to DeskPro, to be completed by Q2.

SCHEDULE: Helpdesk migration was completed early, in Q1.

RISK & MITIGATION: No impact.

COST:			SCOPE:	
Labor Actuals	Expected			
DMS funds this activ	vity at a higher	WBS level.	The OPT softw	are will be updated to release
Material Actuals	Expected		1.28.00 in suppo	ort of observing.
\$	\$			
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			RISK & MITIG	ATION:
Milestone	Schedule	Target	Risk	Mitigation
1. OPT release 1.28.00	12/31/2020	03/31/2021	I. None	1. Continue to use OPT 1.27.00 until 1.28.00 is released

SCOPE: The OPT software will be updated to release 1.28.00 in support of observing.

SCHEDULE: There has been a delay in releasing OPT 1.28.00 due to some technical issues and limited availability of testers toward the end of Q1 FY2021. The release is now planned for Q2 FY2021.

RISK & MITIGATION: There is no risk in this delay. OPT 1.28.00 includes various performance improvements enhancements and bug fixes, but no major capability changes. Until the release is out, the mitigation is to keep using OPT 1.27.00.

COST:			SCOPE:	
Labor Actuals	Expected			
DMS funds this activ	vity at a higher	WBS level.	In Q2, the 5.8/6.2 dual	release will be delivered,
Material Actuals	Expected		implementation, a new	allel imaging weighting option, and
\$	\$		enhancements to the s	imulator.
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			<b>RISK &amp; MITIGATIO</b>	N:
Milestone	Schedule	Target	Risk	Mitigation
I. Finish code development		01/31/2021	<ol> <li>Delay in release affects ALMA Pipeline delivery</li> </ol>	<ol> <li>Much testing has been completed, pre-release to be</li> </ol>
<ol> <li>Finish testing and release</li> </ol>	12/31/2020	03/01/2021	1	available for Pipeline development.
development 2. Finish testing and release	12/31/2020	03/01/2021	ALMA Pipeline delivery	completed, pre-release to l available for Pipeline development.

SCOPE: In Q2, the 5.8/6.2 dual release will be delivered, with a re-designed parallel imaging implementation, a new weighting option, and enhancements to the simulator.

SCHEDULE: In this release, we increased the scrutiny in testing as part of our ongoing strategy to increase release quality. This required more effort than anticipated in the testing schedule, and uncovered issues that then extended the development period in order to resolve the issues.

RISK & MITIGATION: This CASA release is the basis for the Cycle 8 Pipeline development, so delays could affect the amount of time Pipeline developers have available to achieve their deliverables. The testing that has already been completed reduces this risk significantly. Also, the stable code pre-release will be available for pipeline development at the end of January.

COST:	ne Cycle	7 Update	SCOPE:	Scope
Labor Actuals DMS funds this active Material Actuals	Expected ity at a higher Expected	WBS level.	Release of pipeline sof mid-cycle update.	tware for ALMA Cycle 7
Travel Actuals \$ SCHEDULE:	<pre> Fxpected  \$ </pre>		RISK & MITIGATIO	N:
Milestone I. Pipeline developmen 2. VLA/SRDP deployment 3. ALMA deployment	Schedule t 09/30/2020 12/31/2020	Target Complete Complete	Risk I. Reduced operational experience needed for next development cycle.	Mitigation 1. Begin operations with this release in March.

SCOPE: The CASA pipeline will continue to evolve to support ALMA, VLA operations, and SRDP/VLASS. A major release is scheduled Q1 to coincide with extended ALMA Cycle 7 and SRDP Wave-2, supporting ALMA and VLA Operations.

This release will include, for ALMA, pipeline-assisted polarization calibration heuristics and improved Quality Assurance 2 (QA2) scores, as well as many smaller bug fixes and feature improvements. For VLA, calibration updates will improve support multi-band datasets and add capability for continuum target imaging. A major effort for this release is the transition from Python 2 to Python 3 and a transition from CASA 5.6 to a refactored CASA 6."

SCHEDULE: Pipeline software has been delivered, but a small numerical error bug was discovered in the underlying CASA 6.1 software. The bug was judged to be minor for the VLA/SRDP and the new pipeline software has been deployed there. Further investigation has determined that this will not impact ALMA data processing, so it will be included in the February ALMA software bundle to be released in March.

RISK & MITIGATION: This is the initial release of the ALMA pipeline with CASA 6/Python3. It was intended to provide operational experience with CASA 6 before the inclusion of the next CASA 6 pipeline version planned for Cycle 8, based on CASA 6.2. Delays in deployment reduce the potential experience and feedback into CASA 6.2 and Cycle 8 Pipeline development. Determination of the bug's effects and potential remedies, if needed, will continue to be addressed at a high priority.

COST:			SCOPE:	
Labor Actuals	Expected			
DMS funds this activit	y at a higher	WBS level.	Initial support fo	or the CARTA viewer will be
Material Actuals	Expected		added to the Ar	chive in Q1. This will provide a ving capability with improved
\$	\$		integration follo	wing in FY2022.
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			RISK & MITIG	ATION:
Milestone	Schedule	Target	Risk	Mitigation
<ol> <li>Deploy support infrastructure</li> <li>Deploy initial viewer</li> </ol>	12/31/2020 12/31/2020	02/05/2021 04/30/2021	I. None	1. Use CARTA independently

SCOPE: Initial support for the CARTA viewer will be added to the Archive in Q1. This will provide a basic image viewing capability, with improved integration following in FY2022.

SCHEDULE: The start of this task was delayed by unfilled open positions and high priority VLASS work, but has picked up momentum since the positions have been filled. It involves I) creation of an infrastructure layer to support its use with the NRAO cluster, and 2) support and deployment of the viewer capability. This infrastructure work is close to completion and the deployment as a user-facing feature has been rescheduled.

RISK & MITIGATION: As this is a new capability for the archive and SRDP, the delay does not present a risk. CARTA can still be used to view images independently.

0001.			SCOPE:	
Labor Actuals	Expected			
DMS funds this activ	vity at a higher	WBS level.	Demonstrate I	00 square degrees of VLASS SE
Material Actuals	Expected		imaging.	
\$	\$			
Travel Actuals	Expected			
\$	\$			
SCHEDULE:			RISK & MITIG	GATION:
Milestone	Schedule	Target	Risk	Mitigation
<ol> <li>Demonstrate 100 square degrees of imaging</li> </ol>	12/31/2020	03/01/2021	I. None	

SCOPE: Demonstrate the practicality of VLASS Single Epoch (SE) imaging by completing 100 square degrees of processing.

SCHEDULE: Earlier attempt in 2020 did not produce the desired result, but learnings were applied and a workable processing method was assembled. Currently all 100 square degrees are either finished or processing, so they should all be done by the third week of February.

**RISK & MITIGATION:** No impact.

Appoint nev COST:	v UC mer	mbers	SCOPE:		Scope
Labor Actuals	Expected		No change		
\$	\$		, to change		
Material Actuals	Expected				
\$	\$				
Travel Actuals	Expected				
\$	\$				
SCHEDULE:			RISK & MITIG	ATION:	
Milestone	Schedule	Target	Risk	Mitigation	
I. Appoint new UC members	12/31/2020	02/28/2021	I. None		

SCOPE: No impact.

SCHEDULE: The appointment of new members to the Users Committee has been delayed by  $\sim$ 2 months in an effort to examine membership needs and make necessary appointments after the start of the new year.

**RISK & MITIGATION: No impact.** 



# ngVLA FY2021 Milestones

ngVLA	FY2021 POP		QI Perf	ormance As	sessment
POP Milestone	Milestone	Completion Date	Cost	Schedule	Scope
2	ngYLA Conceptual Design Development				
2.2	Antenna Subsystem				
15	Conduct antenna sub-system requirements review	12/31/2020			
2.3	Antenna Electronics				
19	Engineering Guide lines Document review	12/31/2020			
20	Select a SADC vendor	12/31/2020		Cancelled	
2.5	Computing and Software Subsystem				
33	M&C protocol selection	12/31/2020			
3	Community Engagement				
41	Hold special session at winter AAS meeting	12/31/2020			
4	Broader Impacts				
43	Publish call for applications for student summer program	12/31/2020			
46	Complete BI toolkit research	12/31/2020			
55	Participate in career fairs	12/31/2020			
58	Convert CAD drawings to 3D graphics	12/31/2020			
62	Upload/print updated BI brochure	12/31/2020			

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COST:			SCOPE:	
Labor Actuals	Expected		Restart the devel	opment of the ngVLA
There are no ch	anges in budget	t	with a new vendo	Dr.
SCHEDULE:			RISK & MITIGAT	ION:
SCHEDULE: Milestone	Schedule	Target	RISK & MITIGAT Risk	ION: Mitigation

SCOPE: In FY2019-FY2020, NRAO commissioned a vendor to develop the SADC. The SADC combines downconversion, sampling, and data transmission in a light weight, compact package that offers advantages in cost, performance, and reliability. In FY2020, NRAO was unable to verify the SADC's performance due to unrecoverable errors that the vendor had made in the production of the chip. Work with that vendor came to an end in Q4 FY2020, and the POP milestone associated with that work (FY2019 4.6.31) was cancelled. The intent of milestone #20 in the FY2021 ngVLA POP was to resume the work with a different, more experienced vendor.

SCHEDULE: Since the FY2021 ngVLA POP was written, the ngVLA project has re-evaluated its approach to SADC development. A rigorous, five step process to bolster the successful development of the SADC has been adopted: (1) In-house Studies, (2) Front-end Development, (3) Architectural Study, (4) Prototype Wafer Run, and (5) Production Wafer Run. The in-house studies will be completed in Q3 FY2021, and the remaining steps will be undertaken in FY2022-FY2023. The development plan is documented in ngVLA document 020.30.15.00.00-0005-SOW-SADC-SOW, Serial Analog to Digital Converter. With the adoption of the new process, milestone #20 and milestone #21 (Due Q2) are cancelled.

RISK & MITIGATION: If the SADC ASIC does not perform as intended, its design could be revised to address the shortcomings identified in the characterization tests. However, this could be at considerable cost since it might require another (expensive) wafer run for the ASIC. Alternatively, the ASIC development effort could be abandoned in favor of the discrete component design, which has been demonstrated to work. However, the discrete component design will require more space and cooling, and is likely to be less reliable than the ASIC design.

COST:			SCOPE:	
Labor Actuals	Expected		Use antenna CAD d	Irawings to develop a
There are no	changes in bu	ıdget	antenna	
Noncompletion (1103				
SCHEDULE:			RISK & MITIGATIO	N:
SCHEDULE: Milestone	Schedule	Target	RISK & MITIGATIO Risk	N: Mitigation

SCOPE: No impact.

SCHEDULE: The CAD drawings from the prototype antenna design are needed to develop the 3D graphics of the antenna. We do not expect to receive the CAD drawings from the vendor until late February 2021. Assuming the CAD drawings are available in February, the 3D graphics should be complete in March.

RISK & MITIGATION: The risk in a late delivery of the antenna 3D graphics is minor, and equates to a delay in the distribution of ngVLA educational materials. The risk can be mitigated by expediting the delivery of the vendor's antenna CAD drawings.



POP	POP Milestone	Original Due	New Due	Cost	Sched	Scope	Cost	Sched	Scope
Section 1.5	NA ALMA Operations	Date	Date						
	Onla Office								-
14	Management of FEHV warranty	3/30/2020	9/30/2021						
15	Multicatcha project - delivery and insupuration	6392020	F12022				Cancell		112 806
11	New Martin Countries					-	Cances	eo, r12	122 POP
3.5	Yes Loss Aver			-	-	-		-	-
	Very Lage King		-	-	-	-	-	-	-
	VA to their if an annual collection datas for more an interaction and marked in			-	-		-	1.1	
12	for the VLA and the VLBA	6/30/2020	3/31/2021					0	
	Development							94	1
14	Reality of an and the second s	9302030	9/30/2021				-	01	
	Malana and Barrard		1,00,414.1	-			-	4	1
17	Reduce for some such as desire the same	8303030	Condend				-		-
17	Nerstrik inte anderen overstaan oversig die yeer	#392929	Completera		-		_	-	-
0	identity and referes 2000 while on granified color-per granified color-per granified to an inter-	4301020	Comprese						_
10	Fechnical Opprover and Exhancements	8303030	1000001						
14	Complete initialization of two ACUs	930/2020	1/30/2021	_					
4/	In tal network contribution conditioning system on all artemas	4307030	1/31/2021				_	Q2	-
	Very Long Baseline Array			-	-			-	-
14	Operations		h.(h.) (h.(h))						
47	Han for future KH monthring	9302030	3/21/2021				_	Q2	-
	Maintenance and Renewal				-			1	12
60	Install opgraded VLBA weather station at one site	9303030	3/17/2021					Q2	
61	Complete initialization of E-racks at all VLBA sites	9302020	9/30/2021					Q4	
4.3	Central Development Laboratory			-					
	Development			-					
4	Evaluate upgraded balanced IF amplifiers	9302020	9/30/2021			<u> </u>	_	Q4	
\$.7	Science Support and Research					1			
	Science Ready Data Products								
17	VLASS product delivery schedule	3302020	Completed						
6.6	Data Management and Software			1		1 1		1	
1 3	sis			1			-	1	1
8	Completion of VLBA fiber project	3/3/9/2/020	Completed						
	ALMA Systems Software								
12	ALMA Correlator Data Rate Testing	6/30/2020	6/30/2021						
13	ALMA Scheduling Update	9302020	12/31/2020						
	Science Support and Archives					1	1	1	1
.33	Arabive Retirement	6/39/2020	9/30/2021					Q4	
41	SRDP.Wave-2	9302020	6/30/2021					Q3	
	Algorithm Research and Development								
43	FuBy Heterogeneous Array Imaging	930/2020	9/30/2021					Q4	203
45	Commission Wide-Field Full-Mueller Imaging Algorithm	930/2020	6/30/2021			-		03	_

POP	POP Milestone	Original Due	New Due	Cost	Sched	Scope	Cost	Sched	Scop
Section	Program Management Department	Date	Date		· · · · · · · · · · · · · · · · · · ·		11000-000		
7.5	Program Hanagement Department				-			-	
10	PMISE Activities	12.01.0410	740						
10	Program Planagement Software Decision	12/31/2019	TBD					Cancelle	d
	Program Planagement Software Implementation	6/30/2020	TBD	_			-	Cancelle	d
12	Plultcancha Construction Complete	12/31/2019	TBD					Cancelle	d
13	Multicancha JAO Acceptance Complete	3/30/2020	TBD	-				Cancelle	d
15	VLBA Fiber Installation Complete	12/31/2019	12/31/2020				1	-	
16	VLBA Fiber Final Report	3/30/2020	Completed						
8.5	Education and Public Outreach		3		-		-		-
	Multimedia Team								
13	Present and Review populated style guide to EPO team	9/30/2020	3/31/2021						
9.4	Computing and Information Services								
	Observatory-Wide Support					1.000		1.	-
5	Cyber Security training	9/30/2020	Completed						1
10.2	Office of Diversity and Inclusion					0			
	Local and National Programs								
4	NAC Annual Meeting completed	9/30/2020	12/31/2020						1
11.7	Human Resources				1				
	Recruitment Employment		÷		3	-		2	1
15	Hiring Manager Training Delivery	6/30/2020	12/31/2020						
12.2	Science Communications		4		0			1	-
- 4	Publish 2019 NRAO Annual Report	9/30/2020	12/31/2020						
13,6	Administration				-		-		
	Administration								
1	Certified Meeting Professional examination	9/30/2020	12/31/2020						
FY2	018			q	4 FY20	20		21 FY20	21
POP	POP Milestone	Completion	New	Cost	Sched	Scope	Cost	Sched	Scope
	ngVLA								
4	Conceptual Design & Development								
12	Algorithmic Study released	9/30/2018	3/31/2021						
									1

COST: Labor Actuals	Expected		SCOPE: The front end handling	g vehicles (4) were
\$	\$		accepted by the JAO i	n Q2 FY2020, and
Material Actuals	Expected		were approved for use	e. Pending actions
\$	\$		include documentation	n and resolution of
Travel Actuals	Expected		minor workmanship is	sues; these will be
\$	\$		resume after the pand	emic.
SCHEDULE:			<b>RISK &amp; MITIGATIO</b>	N:
Milestone	Schedule	Target	Risk	Mitigation
<ol> <li>Mgt of warranty issues</li> </ol>	Q2 FY2020	Q3-Q4 FY2021	<ol> <li>Interruptions in the JAO return to operations</li> </ol>	<ol> <li>Accept risk, cannot mitigate</li> </ol>

COST: No additional costs are foreseen. Associated costs (staff time and travel) remain the same.

SCOPE: This milestone assumes that the FEHV have already been fully accepted and are being used by the JAO, so that NRAO accompanies the commissioning process ensuring a successful product delivery.

SCHEDULE: Current planning considers that the JAO will restart science operations in Q3 FY2021. After this happens, the RTO should stabilize and free staff time to allow closure of the acceptance process. Assuming no setbacks in the RTO, the management of warranty issues and complete handover of the vehicles to the JAO is expected during Q3 or Q4 of FY2021.

RISK & MITIGATION: Deterioration of idle vehicles due to lack of use has been mitigated by running them monthly.

COST:			SCOPE:			
Labor Actuals  \$ Material Actuals  \$ Travel Actuals	Expected \$ Expected \$ Expected		Contractor was demobilized in late March 2020 due to COVID-19. Contract is legally suspended for up to 18 months, from October 2020. Given the evolution of the pandemic and the JAO RTO, resumption of works is not foreseen in FY2021.			
	\$			N		
Milestone	Schedule	Target	Risk	Mitigation		
1. Rebaseline project	QI	FY22	<ol> <li>Deterioration of materials and critical items.</li> <li>Contractor goes out of business during suspension.</li> <li>Longer time to complete</li> </ol>	<ol> <li>Proper storage &amp; frequent inspections. Accept risk.</li> <li>Accept risk; rebid if necessary</li> </ol>		

COST: The terms of the contract suspension are summarized below:

- One-time payment to cover the costs of equipment removal in December 2020, perishables and legal obligations such as salaries, severance, and vacations (~USD110k).
- AUI/NRAO will be responsible for custody & maintenance of equipment and infrastructure.
- Balance of unpaid performance bonus (from 2019) added to the value of the contract; subject to milestones completion once work resumes.
- Remaining value of the contract in CLP now indexed to Chilean CPI.
- Joint inspection and mutually agreed report to establish status of works at time of suspension.

Costs of suspension not associated with the contractor:

- Retention of project staff.
- Cleanup mission campaign: during FY2021 Q2, estimated at USD50k.
- Site inspections every 2 months.

SCOPE: The scope of the project remains the same as originally planned with an earned value of 75% to date. SCHEDULE: Due to the current situation in Chile, with a second covid-19 wave and the strict measures the ALMA observatory has adopted, the resumption of the construction is not envisioned to take place during FY2021, hence the cancellation of this POP milestone for this fiscal year.

**RISKS & MITIGATION:** 

I – MATERIALS & INFRASTRUCTURE DETERIORATION:

- Long-term exposure could damage critical materials, most notably the wooden beams and membranes, could add cost if replacements or repairs are necessary.
- Another risk is that the contractor goes out of business during the suspension, forcing NRAO/AUI to rebid the remaining construction at a substantially higher cost than the balance of the current turnkey contract.

### MITIGATION

 Cleanup mission: To sustain the long-term suspension and have better storage conditions for critical items, during FY2021 Q2 the site will be cleaned, removing debris and rubble, applying plague control, enhancing perimeter fence and moving some items to the ALMA warehouse. Proper storage of critical materials will mitigate, but not eliminate, risk of deterioration (e.g. long-term folding of membrane may damage it, and wooden beams deformation).

### 2- SCHEDULE

This risk is twofold:

- a) Ability to resume work depends on the evolution of the pandemic and vaccination campaigns in Chile.
- b) Deterioration of materials may require major repairs or ordering of long lead-time items, such as the

COST:			SCOPE:	
Labor Actuals	Expected		The original plan was	to install three
			FY2020. At the end o this milestone was cha ACUs.	f FY2020, the scope of anged to installing two
Milestone	Schedule	Target	Risk	Mitigation
I. Complete installation of 2 <sup>nd</sup> ACU	12/30/2020	01/30/2021	<ol> <li>Inability to operate antenna servo system due to failure of obsolete system</li> </ol>	Aaintain stockpile of components and continue installing ACUs on the array as funding and resources permit

COST: No change.

SCOPE: All legacy VLA ACUs are to be replaced with units using newer technology, including NRAO-developed all-digital Silicon Controlled Rectifiers (SCR), which enable a more supportable VLA, as well as eliminating some inherent problems with the legacy design and greatly improving the pointing and tracking capabilities of the antennas. The original plan was to install three additional units in FY2020. However, the antenna overhaul sequence was disrupted due to COVID operational delays and only two of the antennas planned for ACU replacement entered overhaul in 2020. At the end of FY2020, the scope of this milestone was changed to completing the installation of two ACUs.

SCHEDULE: The second ACU installation has been further delayed into Q2 of FY2021 due to the need to quarantine a number of staff at the VLA site, resulting in insufficient staff to perform all the overhaul tasks, including the ACU installation, before the end of December. The installation is now expected to be completed in January 2021.

RISK & MITIGATION: The primary risk is that one of the old ACUs may fail. However, now that 14 have already been replaced, a stockpile of components from the removed older systems is available for handling corrective maintenance needs.

COST:			SCOPE:				
Labor Actuals	Expected						
DMS funds this activ	ity at a higher V	VBS level.	Initial tests in Q	Initial tests in Q2 FY2020 will be conducted to			
Material Actuals	Expected		find potential b	t system with higher data rates to ottlenecks in the software. A test			
\$	\$		report will be p	produced in Q3.			
Travel Actuals	Expected						
\$	\$						
SCHEDULE:			RISK & MITIC	SATION:			
Milestone	Schedule	Target	Risk	Mitigation			
<ol> <li>Test data rates and produce report</li> </ol>	6/30/2020	TBD	I. None				

SCOPE: Initial tests in Q2 FY2020 will be conducted to test the current system with higher data rates to find potential bottlenecks in the software. A test report will be produced in Q3.

SCHEDULE: This milestone requires use of the ALMA telescope for testing. Testing is unable to proceed due to the telescope being shut down for the COVID-19 pandemic. Testing is planned resume as the telescope resumes operations and any operational issues are resolved. It is currently on the schedule for February, but at a lower priority than operational issues and delivery timing may change.

**RISK & MITIGATION: None** 

COST:			SCOPE:		
Labor Actuals	Expected		Cancelled		
\$	\$				
Material Actuals	Expected				
\$	\$				
Travel Actuals	Expected				
\$	\$				
SCHEDULE:			RISK & MITIG	ATION:	
Milestone	Schedule	Target	Risk	Mitigation	
I. Program Management Software Decision	12/31/2019	Cancel	I. Low risk		
2. Program Management Software Implementation	6/30/2020	Cancel			

SCOPE: No impact.

SCHEDULE: We continue to evaluate the Oracle Prime Cloud software as it continues to develop. These milestones are cancelled until a decision is made on a future ERP.

RISK & MITIGATION: Low risk.

COST:			SCOPE:		
Labor Actuals	Expected		Cancelled		
\$	\$		Cancelled		
Material Actuals	Expected				
\$	\$				
Travel Actuals	Expected				
\$	\$				
SCHEDULE:			RISK & MITIG	ATION:	
Milestone	Schedule	Target	Risk	Mitigation	
I. Multicancha Construction Complete	12/31/2019	Cancel	I. None		
2. Multicancha JAO Acceptance complet	03/30/2020	Cancel			

SCOPE: No impact.

SCHEDULE: Construction is on hold until OSF site returns normal operations.

RISK & MITIGATION: No impact.

	: Study		SCOPE	Scope			
Labor Actuals \$ Material Actuals \$ Travel Actuals	Expected   Expected   Expected  Expected  Expected  Expected  Expected		Conduct an analysis of t requirements, define the needed in order to mee required computational necessary for calibrating synthesizing images for t	Conduct an analysis of the ngVLA imaging requirements, define the algorithms that will be needed in order to meet them, and estimate the required computational power that will be necessary for calibrating the observational data and synthesizing images for the science cases specified			
\$ SCHEDULE:	\$		RISK & MITIGATION	observing program.			
Milestone	Schedule	Target	Risk	Mitigation			
I. Algorithm study released (report/memo)	06/30/2019	03/31/2021	<ol> <li>Under-estimation of the computational resources required by the project.</li> </ol>	<ol> <li>Maintain focus of key staff involved on this activity.</li> <li>Characterize the estimation uncertainty in the ngVLA reference design and define adequate contingency budget for DS2020.</li> </ol>			

SCOPE: No impact.

SCHEDULE: Competing priorities within NRAO (e.g. algorithms for VLASS) have delayed the completion of this milestone. It also required input from the ngVLA reference observing program, which has since been completed. A draft memorandum documenting the algorithm study has been written, and was internally reviewed. Once the review comments have been incorporated into the memorandum, it should be published in Q2 FY2021. Contending with COVID over the last 10 months has also delayed the memo's review and release.

RISK & MITIGATION: The risk of not completing the algorithmic study is under-estimating the computational resources that will be required by ngVLA to produce its expected science products. In addition, a weak estimate in this area could suggest to DS2020 that the technical concept for the array is incomplete. This risk will be mitigated by maintaining the focus of the key personnel involved in writing the report. It would also be adequate to conduct a review of this report in anticipation of requests for additional information from DS2020.



### Updated 10/9/2020

COST: Future lease costs are subject to the status of Caltech's re-negotiation of the lease with Los Angeles Water and Power.

### SCOPE: No changes.

SCHEDULE: <u>Owens Valley Lease</u>: The master lease for the Owens Valley Radio Observatory is an agreement between Caltech and Los Angeles Water and Power (the lease holder). The master lease has been expired for since March 31, 2015, and renegotiating it does not appear to be a priority for LA W&P. NRAO has a sublease agreement for VLBA-OV with Caltech.

### **RISK & MITIGATION:**

- 1. Caltech 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.
- 3. An interim agreement between Caltech and NRAO regarding the sublease during this interim period has been discussed and our continued occupancy is not an issue.





# COVID Impacts: Non-Salary (all AUI Observatories)

Object Area	Oct	Nov	Dec	Total, YTD
Communications	-	2,025	1,836	3,861
Computer Hardware		600	190	790
Domestic Travel	10,461	29,717	18,477	58,655
Foreign Travel		290	370	660
Supplies		13	44	57
Supplies/Services	279	19,852	4,254	24,385
Grand Total	10,740	52,497	25,171	88,408

• Travel costs are NM transportation expenses. Revised transportation payment method in place for 1/16.

• Supplies expense includes touchless water coolers @ GBO.

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• (	Carryover is net of CSA-V revised budg commitments, and I \$1,725 revised bala	\$4M deobligat get reflects buc NRDZ Year 1 p nce includes N	ion. Iget ci progra RDZ`	uts, FY2 m. Year 2 b	.020 op oudget.	ben		
		CANA In LI:		1,725	0,070			
		FY2I, Total	39,127	41,146	7,180	17.5%		
		ngVLA	0	385	352	91.4%		
		Ed. & Public Outreach	842	837	170	20.3%		
		Director's Office	2,639	3,118	496	15.9%		
		Admin Services	10,894	11,902	2,110	17.7%		
		Science Ops	8,323	9,388	1,649	17.6%		
		Development	4,717	4,333	357	8.2%		
		Telescope Ops	11,712	11,183	2,046	18.3%		
		Total Revenues	39,127	42,871	13,856	32.3%		
		Carryforward/Other	1,107	4,851	4,851	0.0%		
		NSF	38,020	38,020	9,005	23.7%		
00			Budget	Budget	Expenses	Budget		
CS			POP	FY21 Rev.	FY2I YTD	Rev		

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	FY21			YTD %
	POP	FY2I Rev.	FY2I YTD	Rev
	Budget	Budget	Expenses	Budget
NSF	48,680	48,680	12,170	25.0%
Carryforward	3,161	10,439	10,439	100.0%
Canadian Contribution	1,596	1,596		0.0%
Other	730	2,074	1,506	72.6%
Total Revenues	54,167	62,789	24,115	38.4%
Telescope Ops	23,393	23,656	3,829	16.2%
Development	6,702	14,166	361	2.5%
Science Ops	7,657	8,503	1,387	16.3%
Admin Services	12,114	12,139	2,180	18.0%
Director's Office	3,519	3,519	726	20.6%
Education & Public Outreach	782	804	121	15.0%
FY2I, Total	54,167	62,787	8,604	13.7%
FY2I CSA-A Net	0	2	15,511	1

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CSA-L OI					
		FY21			YTD %
		POP	FY21 Rev.	FY2I YTD	Rev
		Budget	Budget	Expenses	Budget
	NSF	3,430	3,430	858	25.0%
	Telescope Time Sales	4,865	4,812	1,118	23.2%
	Carryforward	275	1,356	1,356	100.0%
	Other	300	405	90	22.2%
	Total CSA-L Revenues	8,870	10,003	3,422	34.2%
	Telescope Ops	5,686	6,673	1,083	16.2%
	Development				
	Science Ops				
	Admin Services	2,700	2,811	443	15.8%
	Director's Office	484	518	103	19.9%
	Education & Public Outreach				
	FY2I	8,870	10,002	1,629	16.3%
	FY2I CSA-L Net	0	1	1,793	
Carryover bu	dgeted to support	VNDA	progran	n.	
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# CSA-NQI

- Revised includes carryforward from FY2020.
- Large reserve for antenna contract to be awarded Q2.

	FY2I			YTD %
	POP	FY21 Rev.	FY2I YTD	
	Budget	Budget	Expenses	Budget
NSF	10,000	10,000	10,000	100.0%
Carryforward		471	471	100.0%
Total Revenues	10,000	10,471	10,471	100.0%
Project Mgmt & Admin	635	635	76	12.0%
Systems Engineering	461	490	46	9.4%
Scientific Support	807	905	141	15.6%
Antenna	1,909	1,925	86	4.5%
Antenna Electronics	1,400	1,400	254	18.1%
Central Signal Processor	613	613	160	26.1%
Computing & Software	560	560	129	23.0%
Civil & Infrastructure	31	32	2	6.3%
Regulatory Compliance	160	169	4	2.4%
Broader Impacts	105	121	8	6.6%
Operations	30	30	0	0.0%
Contingency/SADC	464	766	0	0.0%
Compensation Reserve	156	156	0	0.0%
ICC/IDC	2,669	2,669	297	11.1%
FY2I, Total	10,000	10,471	1,203	11.5%
FY2I CSA-N Net	- 1	0	9,268	

QSUI FY2021

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	FY21			YTD %
	POP	FY2I Rev.	FY2I YTD	Rev
	Budget	Budget	Expenses	Budget
NRAO Recoveries	17,606	17,406	3,991	22.9%
External Recoveries	1,752	1,753	272	15.5%
Total ICC Revenues	19,358	19,159	4,263	22.3%
Telescope Ops		100	36	35.7%
Development	491	473	79	16.7%
Science Ops	2,881	2,851	613	21.5%
Admin Services	13,734	13,656	2,535	18.6%
Director's Office	2,141	2,079	372	17.9%
Education & Public Outreach				
FY2I, Total	19,358	19,159	3,635	19.0%
FY2LICC Net	0	0	628	

- Budget reductions in place (\$200K).
- Over-recovery status \$628K.

QSUI FY2021

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# Education and Public Outreach Press Products (10 NRAO + 4 Chilean Office)



# Education and Public Outreach Press Products



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Crédito: Iván López, ingeniero de ALMA, y su hija Tatiana, estudiante de ingeniería civil aeroespacial en UdeC.



# Casco Bay High School Classroom Call

Anne Loughlin, a science teacher at Casco Bay High School in Portland, Maine, has been a continuing long-distance partner with the STEAM Ed team for several years. This year, she once again requested a virtual talk and Q&A session for her astronomy class, which is being taught remotely this year, on October 6. Education Specialist Faith Vowler organized the event on NRAO's end and recruited EPO Public Information Officer Iris Nijman and her husband Christian Eistrup with the University of Virginia to be the scientific speakers for the event. Iris and Christian gave a highly engaging talk about exoplanets and stellar system formation, with emphasis on what they've learned about these topics from ALMA research, which the students in attendance greatly enjoyed. Faith and Anne acted as moderators and led the Q&A session. There were 15 people in attendance: Anne and 14 of her students.

# **SciFest Africa Virtual Tour**

On October 22, STEAM Education Manager Summer Ash and Education Specialist Faith Vowler, in collaboration with RADIAL Project Director Anja Fourie, presented a VLA virtual tour to the 2020 SciFest Africa event. They presented one of the pre-recorded tours done by Faith and Tyler from the 40th anniversary event, and then answered audience questions. SciFest estimates that 293 total households attended.

On November 18, Summer Ash and Faith Vowler gave a lecture via Zoom to a group of staff and docents of the Smithsonian's National Air and Space Museum. Summer talked about the science behind radio astronomy and explained the contrast between objects that can be seen in visible and radio light. Faith then talked about the Very Large Array and its contribution to discoveries in radio astronomy. The talk then concluded with a Q&A

session between Summer, Faith, and the audience. 41 Smithsonian employees were present.

# Education and Public Outreach Multimedia Group

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### Six News Highlights in our Year in Review video series with Phil Plait

- Measuring the wind speeds on a brown dwarf
- Nomadic black holes in dwarf galaxies
- Misaligned rings in triple star system
- Exoplanet discovered by VLBA
- ALMA observations reveal source of lo's atmosphere
- Supergiant atmosphere of Antares



NRAO's 2020 Astronomy Highlights with Phil Plait By New Jervey - Occementer 21, 2001

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shows how the star's motion around the center of mass between it and the planet causes a "wobble" in its motion through space. The VLBA's ability to detect the minimum offent measured the presence of the short.

I been a year of adaptation for enzymen. The pandemic has specified may of the ways we hundion as an organization, from the easy eminutation diseased their holdman affect of but holes are creare in our different and a confliction drauge nonego analy of the Vary orga Array's 200 to instrume allow dations to hole are creare in our different and a confliction drauge nonego (Fr, ALAA) Observation for all shift does in different analy influence). There are unaverliqued events that Had to be subtraved on the r.ALAAO Deservation for all shift does in different analy influence. And there are an an adaption -the Vary gas Array Londo Cistelar 10 The conneeronation of the anazing indication face. Then are present detailabolism is an all day (pight) and radio betweepeer work had to be encodinged by our STAAD detains have. Then an a mean encoderation is an all day (pight)

let, science still prevailed! The VLA and the Very Long Baseline Array kept observing in radio hequencies, while ALMA's treasure trove of rolvial data semained available to anyone who could utilize it. (ALMA, by the way, is preparing a plan to restart operations in March of

QSUI FY2021



# 40th Anniversary Virtual Event

The Very Large Array had its 40th birthday on October 10, 2020. In honor of this exciting occasion, EPO, led by the STEAM Ed team, hosted an all-day celebration. Faith Vowler and tour guides Tyler Cohen and Montana Williams gave two virtual VLA tours, one each at the beginning and end of the day, with VLA Operator Sylvia Kowalski serving as the special guest for the Q&A session. Throughout the day, five different NRAO employees-- Dave Finley, Chris Langley, Amy Kimball, Rob Selina, and Claire Chandler-- delivered captivating webinar talks about the past, present, and future of the VLA and answered questions from the audience. All throughout, numerous EPO staff members were present to ensure that the event ran smoothly. There were a total of 701 households that attended during the day. The STEAM Ed team fielded approximately 300 questions throughout the day, answering over 95% of them! In addition to Zoom, we had people watching via social media channels.

# You Tube

\* 580 unique subscribers watched at any given time for a period of 18 minutes.

# FB

\* 324 people watched the tour over the course of the day, but the average watch time is not recorded. About 11,000 people saw it on their feed.

# Vimeo

\* 106 different people watched the tour for an average of 32 minutes.





Our webmaster worked with the Heather Cochrane, the director of advancement, to create a giving page on the public website. It has gone live but will not be actively promoted until we can welcome visitors back to the VLA, since their primary fundraising effort is for the new VLA Learning Center.

