

MAY 1979

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NATIONAL RADIO ASTRONOMY OBSERVATORY

MAY PROGRESS REPORT

VLA PROGRAM

June 15, 1979

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JUN 19 1979

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

MAY 1979

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 50 percent of the time; 33 percent went to astronomical programs and the remaining 17 percent to tests. The average downtime for the month was approximately 14.8 percent.

Antenna 17 was moved to W8 on May 29. Antenna 1 was moved to N14 on May 30. First fringes were obtained with Antenna 20 on May 7. The twenty antennas currently outfitted with electronics are located at stations N14, W32, E1, W16, E2, W24, E4, W40, W48, E3, E8, E16, E12, W56, W64, E18, W8, N4, N6, and W10. These stations are positioned approximately 1.14, 5.22, 0.08, 1.59, 0.04, 3.19, 0.15, 7.66, 10.47, 0.09, 0.48, 1.59, 0.97, 13.64, 17.16, 1.95, 0.48, 0.13, 0.27, and 0.71 km respectively from the array center. Our longest astronomically usable baseline is approximately 18 km. Antenna 12 was decommissioned for cryogenics retrofit on May 8. Antennas 5 and 9 are presently decommissioned for electronic retrofits and Antenna 3 has been decommissioned for electronic tests. Antennas 19 and 20 are in the shakedown stage. The test array consists of Antennas 3, 5, and 11.

ELECTRONIC DIVISION

During the month first fringes were obtained on Antenna 20 and Antenna 17 completed its operation checkout. In the front end area tests on the new-style AIL paramp circulator show that demagnetization starts to occur after 20 thermal cycles. An agreement has been reached with AIL to replace all old style circulators with new style circulators. Front end construction is currently being held up by delays in paramp delivery from AIL who are having difficulty obtaining varactors from their suppliers.

Examination of the cathodic protection system for the waveguide has shown that, in places on the North arm where the soil water content is high, the zinc has already corroded away. Electrical measurements of the protection system are being made to determine the best solution to this problem.

In the new baseband system, a redesign of the power amplifiers in the T5 (Baseband driver) module has considerably reduced the compression that was found in the prototype module. Production of the system is starting in Charlottesville.

In the monitor and control area a problem has been found in the A/D converter portions of the Data Set (M1) modules. With the current design, if any one analog input goes over voltage, all other analog inputs on the same multiplexer channel are contaminated. A modification to cure this problem has been designed and tested and will be retrofitted into all data sets.

A survey of the temperature stability in all vertex rooms shows that the best antennas have a very good stability of 0.3°C ptp measured in the B rack. Several antennas have much worse stability than this and the causes for this spread in performance are being investigated.

COMPUTER DIVISION

The on-line programs which provide displays of the correlation data have been modified to provide real-time monitor of the data from the interim spectral line system.

An RSX-11M system has been generated for the spectral line sorting computer. Preliminary tests show that communications with the DEC-10 and storage of data on the Century discs are working correctly.

Further application programs have been developed for the image processing system. Images can now be combined and compared; and such quantities as the spectral index and polarization parameters can be derived and displayed. Images may now be taken from the Comtal picture screen and written directly on film using the Dicomed film writer.

The order for the VAX 11/780, to be used for VLA post processing, has been placed. Delivery in Charlottesville is expected in the Fall.

ANTENNA DIVISION

Status of work of the Antenna Division as of the end of May was as follows:

Antenna No. 21

Mechanical outfitting on the maintenance pad approximately 90% complete. Remaining to be installed is the L-Band feed, some electrical cabling and touch-up painting.

Antennas No. 22 and 23

Awaiting mechanical outfitting.

Antenna No. 24

Servo tests and mechanical inspection completed and antenna accepted on May 25, 1979. Servo tests exhibited natural frequencies of 2.26 Hz in elevation and 2.47 Hz in azimuth.

Antenna No. 25

Pedestal completed through yoke arms and elevation wheel and reflector completed. On May 17, the reflector and pedestal were mated. Panel installation completed and panel alignment in progress.

Antenna No. 26

Trial assembly completed and first shipment of reflector to Site.

Miscellaneous

Antenna 1 moved to Station CN7 and Antenna 17 moved to Station DW8 on May 30, 1979.

SITE AND WYE DIVISION

Waveguide Installation

Installed approximately 2144 feet of waveguide, set to line and grade and backfilled between AE7 and AE8. Moved to North arm and trenched 620 feet. Installed zinc ribbon from AN7 to AN8. Moved construction camp to North Arm.

Phase IV

Overall completion 82%. Track work on the West arm is still 98% complete with small modifications required before final acceptance. Track work has started on the East arm and is partially complete to AE6. First lift of ballast has been placed to AE5. Round Place Construction is 99% complete with the earthwork. Subgrade preparation is complete and is ready for trackage. All antenna foundations are complete with the exception of the grouting of the base plates which is 90% complete. Electric work is progressing and is 85% complete.

Phase V

Overall completion 2%. Mountain States, the dirt work subcontractor has completed the clearing and grubbing work on the North arm. He is proceeding with the earthwork on the North and is constructing the detour on Highway 60.

PROJECT MANAGEMENT

General

Land Acquisition: The Land Commission has scheduled a second hearing for June 25 in Albuquerque to assess the effect leased State land should have on the before and after valuation of the ranches.

NRAO has scheduled a meeting June 7th to discuss the land acquisition case with Mr. R. E. Thompson, U. S. Attorney for the State of New Mexico.

Procurement: The AIL Division of Cutler Hammer has fallen far behind schedule on the delivery of parametric amplifiers. Principal problem is their inability to obtain acceptable diodes from their suppliers. We are now held up on electronic work for Antenna Nos. 22, 23 and 24 and are retrofitting the Com Tech amplifiers on Antenna Nos. 1, 2, 3, 4, 6 and 9. We are expediting to the extent possible.

Personnel

The personnel changes as of May 31, 1979 are as follows:

Division	Budgeted 12/79 Level	4/30/79 Level	Additions	Reductions	5/31/79 Level
Site & Wye	9	9	0	0	9*
Antenna	17	14	0	0	14
Electronics	54	54	1	0	55*
Operations Management	3	3	0	0	3
Computer	14	12	0	0	12
Array Operations	11	9	0	0	9*
Program Management	28	27	1	1	27**
Totals	136	128	2	1	129

* Does not include one part-time employee

** Does not include three part-time employees

5/31/79

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
VLA-5 Amend. #12	BWH/CVA Joint Venture	E/A Title I and II	6/11/73	\$ 1,090,684		Title I -Completed Title II -Completed Title III -Completed Title IV -VLA-325 Supervision
VLA-6 Amend. #21	E-Systems, Inc.	28 Radio Telescopes	10/18/73	\$ 18,156,054		Delivery in Progress.
VLA-29 Amend. #5	Sterling-Detroit	Focusing Feed Mounts thru Antenna 28 plus spares	6/17/74	\$ 1,002,380		Delivery in Progress. (Mounts for Antennas 23-28 complete by 7/13/79. Amend. #5 issued 11/9/78.
VLA-70 P.O. 52322 CO. #7	Sumitomo Electric USA, Inc.	3000 pieces of waveguide and 3900 pieces of coupling sleeves.	11/03/78	\$ 3,215,847	7/31/79; 10/31/79; and 1/31/80	Next 1000 pieces of waveguide and coupling sleeves to arrive Oakland port by 7/31/79.
VLA-233 P.O. S-02611	Silicon Systems, Inc.	Custom Integrated Circuits	12/12/76	\$ 206,375	5/31/79	Complete except for 468 each of Item 4.
VLA-256	New Mexico State University	Archaeological Exca- vation	9/20/77	\$ 107,000	2/20/79 Completion	\$80,633 invoiced thru 12/31/78 Final reports expected by 7/79.
P.O. S-07990	AIL Division Cutler- Hammer	Parametric Amplifiers	9/21/78	\$ 197,600	Complete by 1/21/80	4 received. No additional delivery promised.
P.O. S-08085	AIL Division Cutler- Hammer	Parametric Upconverters	10/23/78	\$ 102,525	4/13/79 thru 8/13/79	
P.O. S-08510	RLC Electronics, Inc.	Switch filter assemblies and filters	12/12/78	\$ 193,943	Start 4/3/79	RLC has received 700 diodes to allow them to proceed with filter production.
P.O. S-08535	RF Systems, Inc.	Ku and K Band Feed Horns	12/14/78	\$ 71,554	5/15/79	Promised to complete by 6/15/79.
P.O. S-08558	Allen Avionics	L.C. Filters	1/08/79	\$ 69,500	Complete by 6/30/79	

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NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
P.O. S-08645	DEC	Computer Maintenance	1/08/79	\$ 90,063	CY '79	Monthly expenditure rate estimated at \$7,500.
P.O. S-06827 Amend. #2	C.T.I. Cryogenics	Cryocooler	5/23/78	\$ 239,760	2/15/80	
VLA-325	Pacific Railroad Constructors, Inc.	Phase IV Construction	6/23/78	\$2,916,080	9/16/79	Work progressing satisfactorily.
VLA-326 P.O. S-08191 C.O. #1	California Computer Products, Inc.	Data Storage Subsystem	11/12/78 12/18/78	\$ 221,190	2/01/79	99% complete.
VLA-340 P.O. S-08227 C.O. #1	Digital Equipment Corp.	Computer System	11/06/78 12/08/78	\$ 102,977	2/09/79	Complete.
VLA-344 P.O. S-08595	Wheeler Con- struction Co.	Crushed Stone	1/08/79	\$ 668,660	Complete by 4/01/80	
P.O. S-08222	Structures, Inc.	Transition & Towers for K, Ku and C-Band Horn, L-Band Towers	10/19/78	\$ 23,955	Complete	
P.O. S-08230	Structures, Inc.	Feed Support Structures	10/23/78	\$ 26,855	Complete by 6/22/79	

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
P.O. S-08329	Contact Systems, Inc.	Various Wiring Modules	10/31/78 1/19/79	\$ 30,486	Complete by 9/30/79	
P.O. S-06387 Amend. #2	Milliflect	Subreflectors	10/23/78	\$ 61,200	Complete by 8/01/79	
P.O. S-08422	Rimo Manufacturing, Inc.	L Band Horns	12/7/78	\$ 71,190		Shipment complete.
P.O. S-08423	Rimo Manufacturing, Inc.	C Band Horns	11/17/78	\$ 36,600	Complete by 10/01/79	On schedule.
P.O. S-08443	Avantek, Inc.	Transistor Amplifiers	11/17/78	\$ 23,636	Complete	
VLA-323	Logemann Bros.	Transporter	1/17/79	\$ 788,758	1/17/80	
P.O. S-08684	A & K Railroad Materials, Inc.	Wood Cross Ties	1/17/79	\$ 375,000	Complete by 10/79	
P.O. S-08685	Standard Pipeprotection	Coating of Waveguides	2/2/79	\$ 61,793	Complete by 2/15/80	
VLA-345	G. C. Dean	Labor Hour (Waveguide installation)	3/19/79	\$ 170,000	One Year Completing 3/18/80	
VLA-346	Wm. A. Smith Contracting Co., Inc.	Phase V Construction	4/26/79	\$2,820,000	June, 1980	
P.O. S-09818	Dataram Corp.	Very Large Memory	5/22/79	\$ 161,625	8/15/79	
P.O. S-09849	BWH/CVA Joint Venture	A/E Service Phase V	5/16/79	\$ 39,000	June, 1980	

NATIONAL RADIO ASTRONOMY OBSERVATORY
 VERY LARGE ARRAY
 STATUS AS OF MAY 31, 1979
 CY - 1979

<u>PROJECT NUMBER</u>	<u>DESCRIPTION</u>	<u>ALLOCATION</u>	<u>EXPENDED MONTHLY</u>	<u>TOTAL EXPENDED</u>	<u>TRANSFER TO FIXED ASSETS</u>	<u>BALANCE CONSTRUCT. IN PROGRESS</u>	<u>TOTAL COMMITTED</u>	<u>TOTAL EXPENDED & COMMITTED</u>	<u>NET BALANCE</u>
11000	SITE AND WYE	5,356,050	118,325	515,443	3,695	511,748	4,308,103	4,823,546	532,504
12000	ANTENNA	1,549,000	59,378	393,478	23	393,455	872,443	1,265,921	283,079
13000	ELECTRONICS	2,764,000	239,414	829,533	26,153	803,380	1,006,419	1,835,952	928,048
14000	COMPUTER	1,392,000	9,677	53,556	---	53,556	211,027	264,583	1,127,417
17000	PROGRAM MANAGEMENT	120,000	9,549	49,106	---	49,106	2,136	51,242	68,758
18000	COMMON COSTS	487,752	42,892	186,975	---	186,975	15,905	202,880	284,872
19000	CONTINGENCY	504,004	---	---	---	---	---	---	504,004
	 TOTAL PROGRAM	 12,172,806	 479,235	 2,028,091	 29,871	 1,998,220	 6,416,033	 8,444,124	 3,728,682

Note: Project allocation consists of \$11,500,000 in new funding, \$7,752 in Common Cost commitments carried forward, and \$665,054 in prior years funds. A portion of the prior year funds were re-allocated in February, 1979.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF MAY 31, 1979

TOTAL PROGRAM

PROJECT NUMBER	DESCRIPTION	ALLOCATION	EXPENDED MONTHLY	TOTAL EXPENDED	TRANSFER TO FIXED ASSETS	BALANCE CONSTRUCT. IN PROGRESS	TOTAL COMMITTED	TOTAL EXPENDED & COMMITTED	NET BALANCE
11000	SITE/WYE	24,541,144	738,531	19,088,752	7,226,664	11,862,088	4,921,400	24,010,152	530,992
12000	ANTENNA	22,600,391	47,606	20,167,609	11,783,289	8,384,320	2,137,829	22,305,438	294,953
13000	ELECTRONICS	16,947,720	371,291	14,523,508	6,879,362	7,644,146	1,489,883	16,013,391	934,329
14000	COMPUTER	5,126,512	9,677	3,767,372	2,503,607	1,263,765	230,918	3,998,290	1,128,222
16000	SYSTEMS INTEGRATION	201,022	---	201,022	179,370	21,652	---	201,022	---
17000	PROGRAM MANAGEMENT	1,905,296	9,987	1,833,964	1,676,390	157,574	2,574	1,836,538	68,758
18000	COMMON COST	1,723,100	42,892	1,422,323	1,235,347	186,976	15,905	1,438,228	284,872
19000	CONTINGENCY/RESERVE	504,004	---	---	---	---	---	---	504,004
	SUB TOTAL	73,549,189	1,219,984	61,004,550	31,484,029	29,520,521	8,798,509	69,803,059	3,746,130
30000	RETIREMENTS	(10,820)	---	(10,820)	(10,820)	---	---	(10,820)	---
	TOTAL PROGRAM	73,538,369	1,219,984	60,993,730	31,473,209	29,520,521	8,798,509	69,792,239	3,746,130

Note: Project allocation excludes \$325,811 withheld and paid directly to other agencies by the NSF in prior years.

Project allocation includes \$11,500,000 for CY-79 funding, of this amount, the NSF has made \$11,480,000 available.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VLA PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

As of: May 31, 1979

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	(A) Program Ceiling	Allocation to Date (C)			Un-allocated Balance	Outlook (B)			Notes
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	24,541	24,010	531	3,319	2,957	26,967	893	
Antennas	20,400	22,600	22,306	294	(2,200)	393	22,699	(2,299)	
Electronics	17,000	16,948	16,013	935	52	1,659	17,672	(672)	
Computer	4,850	5,127	3,998	1,129	(277)	1,721	5,719	(869)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	1,905	1,837	68	745	368	2,205	445	
Common Cost	-	1,723	1,438	285	(1,723)	669	2,107	(2,107)	
Subtotal	73,160	73,045	69,803	3,242	115	7,767	77,570	(4,410)	
Contingency	2,840	504	-	504	2,336	1,000	1,000	1,840	
TOTAL	76,000	73,549	69,803	3,746	2,451	8,767	78,570	(2,570)	

NOTES: (A) Includes \$293K for site acquisition, \$15.7K for ECAC Study, and \$17.1K for NSF Ad Hoc Advisory Panel. Allocated and Expended includes \$11K in assets which were retired in prior years.

(B) Estimate to complete is as of March 1979 and it excludes \$172K for airstrip. Escalation included for future years for Site/Wye work (8%); NRAO labor (6%); and certain electronic elements (8%). Antenna estimate is based upon the existing contract costs for fabrication of the antennas.

(C) Includes \$11,500K of CY-79 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY VLA ACTIVITY SCHEDULE

UPDATE DATE: 5/31/79

