

APRIL 1980

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NATIONAL RADIO ASTRONOMY OBSERVATORY

MAY 28 1980

APRIL PROGRESS REPORT

VLA PROGRAM

May 20, 1980

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

APRIL 1980

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 57 percent of the time; 37 percent went to astronomical programs and the remaining 20 percent went to tests. The average downtime for the month was approximately 16.6 percent.

First fringes were obtained using antenna 26 on April 14, 1980. The maximum number of antennas used for an astronomical observing program during the month of April was 23. Antennas 1 and 11 are currently unavailable for observation. Antennas 23, 25 and 26 are in the shakedown stage. The test array consists of antennas 3 and 5.

The furthest station on each arm occupied by operating antennas are currently located at a distance of 6.9, 10.5 and 17.2 km from the array center along the north, southeast and southwest arms respectively. Our longest astronomically usable baseline is approximately 24 km.

ELECTRONICS DIVISION

In the Front End area, the Front End for Antenna 26 was installed in the antenna and first fringes were obtained. The cryogenics retrofit on Front End 11 was completed and the Front End was undergoing final test, ready for reinstallation in the antenna in early May. AIL is continuing to produce parametric amplifiers at about one per week which is barely enough to allow the FE Group to keep to their construction schedule. As a result of the high "infant mortality" rate experienced on L Band parametric upconverters at the VLA and Westerbork, AIL has made a significant design change to the upconverter. The change, which should improve reliability, involves mounting the varactors on a separate sub-carrier in a well controlled semiconductor laboratory environment. This sub-carrier is then mounted on, and bonded to, the upconverter substrate.

In the local oscillator area the new back-up master LO system is now approximately 25% complete. The new modules needed for this system, CMD/MON Interface (M10), Synthesizer Control (L16) and MLO Switch Monitor (L23) are now designed and under construction.

Phase stability tests on Antenna 5 are continuing. These tests are made by injecting cw signals, derived from the local oscillator at the antenna, into the front end input and measuring the phase of these signals at baseband in the Control Building. Several phase stability problems have been discovered from these tests, the most significant being a system wide problem of lost commands resulting from a timing incompatibility between the Serial Line Controller and the Synchronous Computer.

In the waveguide area, continuing measurements on the cathodic protection system show that there is little protection in the central area of the array where the protective zinc is sacrificing to the closely spaced antenna grounding systems. Plans are underway to upgrade the protective system in this area.

COMPUTER DIVISION

The additional memory for the DEC-10 has now been installed. Initial feelings are that it improves the system performance, but a quantitative measurement is very difficult, if not impossible.

As a temporary expedient, the local oscillator computation program, LOSER, has been added to the set of standard system programs. This calculates to a limited accuracy the L.O. settings required for spectral line observations.

The spectral line reduction programs have been extended to allow the computation of a normalized passband for all baselines. Optionally, all spectral line data may now normalize using this information.

The tape drives for the PDP-11's and the VAX have been received, but the installation is not yet complete.

The new version of the RSX-11M operating system (3.2) has now been successfully installed on the PDP-11/70 (MAPPER). Work is in progress to make this the standard operating system on all PDP-11's at the VLA and at NRAO, Tucson.

ANTENNA DIVISION

Antenna Moves

Three antennas were moved during the month.

Outfitting

Antenna No. 27 was completed on 21 April, 1980 and moved to CW6. Antenna no. 28 outfitting was started on 23 April, 1980.

Major Overhaul

The weather finally cooperated and allowed completion of the painting of Antenna No. 1.

Transporter No. 2

Logemann Brothers Co. had the men and parts on site 4/15/80 and assembly was started. All mechanical and welding was complete 4/24/80 and LBC left the site. LBC returned to the site on 4/29/80 with electricians and hydraulic technicians. On April 30th power was applied and the hydraulic system checking was started.

Miscellaneous

Sun Shields were installed on the pedestal tubes of Antenna No. 17.

SITE AND WYE DIVISION

Waveguide Installation

Installed approximately 7,710 feet of waveguide past AN8 on the North arm and 960 feet on East arm. Trenched approximately 8,700 feet past AN8 and tranced approximately 1,200 feet on East arm.

PHASE IV

Overall completion 99%. Track modification on the West arm is 90% complete. Main track work on the East arm is substantially complete to AE8 and interchanges are 99% complete. All Antenna spur tracks have been installed. Final grading work is substantially complete. Electric work is 99% complete.

PHASE V

Overall completion of the total contract is 89%. Track rough layed to AW9 and is ready for ballast. All ballast is in place on the North arm except on most antenna spur tracks. Track materials have been layed out to approximately 1.3 miles from A9 on the East arm. Maintenance vehicle spur track is ready for ballast. Electrical work is 91% complete.

P.O. S11480, CASCO FIRE PROTECTION SYSTEMS

Installation of the sprinkler systems for the Tech. Service Bldg. Shop, Warehouse, Library Bldg. and VSQ 1 & 2 commenced during the month and is 55% complete.

PROJECT MANAGEMENT

General

Contract for the construction of the Visiting Scientists Quarters No. 3 and the VAX computer addition to the Library-Office Building was awarded to Total Service Company, Inc. of Albuquerque, whose bid was \$123,500.

No date has yet been set for the U.S. Tenth District Court of Appeals to hear the New Mexico appeal on the Gross Receipts Tax case decision.

Approval for release of rail from Fort Sam Houston, Texas was not received from GSA and the Defense Department, so rail needed to complete construction will be purchased commercially. Order has been placed and delivery has started.

Personnel

The personnel changes as of April 30, 1980 are as follows:

| Division | Budgeted 6/30/80 Level | 3/31/80 Level | Additions | Reductions | 4/30/80 Level |
|------------------------|------------------------------|------------------|-----------|------------|------------------|
| Site & Wye | 10 | 10 | 0 | 0 | 10 |
| Antenna Division | 16 | 16 | 0 | 0 | 16 |
| Electronics | 52 | 50 | 0 | 1 | 49* |
| Site Management | 6 | 5 | 0 | 0 | 5 |
| Computer Division | 17 | 15 | 0 | 0 | 15 |
| Operations Division | 12 | 11 | 0 | 1 | 10 |
| Project Management | 26 | 25 | 0 | 1 | 24* |
| TOTAL | 139 | 132 | 0 | 3 | 129 |

*Does not include two part-time employees.

4/30/80

VLA PROGRAM

MAJOR SUBCONTRACT 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-6 Amend. #21 | E-Systems, Inc. | 28 Radio Telescopes | 10/18/73 | \$ 18,156,054 | | Deliveries are complete, but final paper work must be issued. |
| VLA-256 | New Mexico State University | Archaeological Exca- vation | 9/20/77 | \$ 107,000 | 2/20/79 Completion | \$91,245 invoice thru 2/29/80. Final reports expected in April 1980. |
| P.O. S-07990 | AIL Division Cutler- Hammer | Parametric Amplifiers | 9/21/78 | \$ 212,800 | Complete by 1/21/80 | 10 sets received. 1 set every 2 weeks to completion. |
| P.O. S-08085 | AIL Division Cutler- Hammer | Parametric Upconverters | 10/23/78 | \$ 102,525 | 4/13/79 thru 8/13/79 | 8 units received. 4 units are at AIL for repair. 2 will ship in April. No further promises. 1 new production unit to ship w/e 4/11/80 and 3/month to completion. |
| P.O. S-08329 | Contact Systems, Inc. | Various Wiring Modules | 10/31/78 1/19/79 | \$ 30,486 | | On schedule. NRAO owes them additional components for assembly. |
| VLA-323 | Logemann Bros. | Transporter | 1/17/79 | \$ 788,758 | 2/15/80 | Assembly to be completed during May, 1980. |
| S-11731 | Information Prod. Systems | Tape System | 4/11/80 | \$ 119,700 | 4/17/80 | Complete. |
| S-12394 VLA-355 | Total Systems | Motel/Office | 5/1/80 | \$ 123,500 | 7/5/80 | |

4/30/80

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-345 Amendment | G. C. Dean | Labor Hour (Waveguide Installation) | 3/19/79 | 335,000 | Two years completing 2/28/81 | |
| VLA-346 | Wm. A. Smith Contract- ing Co., Inc. | Phase V Construction | 4/26/79 | 2,820,000 | June, 1980 | Work progressing satisfactorily. |
| P.O. S-09849 | BWH/CVA Joint Ventures | A/E Service Phase V | 5/16/79 | 39,000 | June, 1980 | |
| P.O. S-11638 | DEC | Computer Maintenance | 2/13/80 | 90,024 | CY '80 | Monthly expenditure rate estimated at \$7,500. |
| P.O. S-06827 Amendment #2 | C.T.I. Cryogenics | Cryocooler | 5/23/78 | 239,760 | 2/15/80 | Complete. |
| VLA-325 | Pacific Railroad Constructors, Inc. | Phase IV Construction | 6/23/78 | 2,916,080 | 9/16/79 | Should complete 5/30/80. |
| VLA-344 P.O. S-08595 | Wheeler Construction Co. | Crushed Stone | 1/08/79 | 668,660 | 6/15/80 | |
| P.O. S-11264 | Floating Point Systems, Inc. | Array Processors | 12/10/79 | 201,092 | 4/29/80 | Complete 5/6/80. |
| VLA-354 P.O. S-11480 | CASCO Fire Protec- tion Systems | Fire Protection System for VLA Site Buildings | 2/20/80 | 57,840 | 6/09/80 | Original 6/9/80. Change Order No. 1, 9/15/80. |
| P.O. S-11481 | Century Data Systems | Disk Drives | 2/15/80 | 64,078 | 3/15/80 | |
| P.O. S-11478 | Digital Equipment Corp. | Computer Systems | 2/27/80 | 74,635 | 9/2/80 | |

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF APRIL 30, 1980

CY - 80

| <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/WYE | 1,998,942 | 284,256 | 631,416 | 1,305 | 630,111 | 739,329 | 1,370,745 | 628,197 |
| 12000 | ANTENNA | 160,000 | 16,939 | 45,723 | --- | 45,723 | 18,431 | 64,154 | 95,846 |
| 13000 | ELECTRONICS | 1,153,000 | 97,343 | 284,428 | --- | 284,428 | 102,305 | 386,733 | 766,267 |
| 14000 | COMPUTER | 1,291,000 | 34,582 | 93,926 | --- | 93,926 | 145,581 | 239,507 | 1,051,493 |
| 17000 | PROGRAM MANAGEMENT | 207,000 | 7,367 | 32,885 | --- | 32,885 | 3,149 | 36,034 | 170,966 |
| 18000 | COMMON COSTS | 401,063 | 33,023 | 115,894 | --- | 115,894 | 13,293 | 129,187 | 271,876 |
| 19000 | CONTINGENCY | 400,000 | --- | --- | --- | --- | --- | --- | 400,000 |
| TOTAL PROGRAM | | 5,611,005 | 473,510 | 1,204,272 | 1,305 | 1,202,967 | 1,022,088 | 2,226,360 | 3,384,645 |

Note: Project allocation for CY-80 consists of \$4,500,000 in new funding plus \$1,111,005 in prior year funds reallocated in February, 1980.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF APRIL 30, 1980

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 AND WYE | 26,637,172 | 532,146 | 24,962,938 | 11,506,186 | 13,456,752 | 1,022,862 | 25,985,800 | 651,372 |
| 12000 | ANTENNA | 22,721,203 | 205,893 | 22,098,767 | 17,940,920 | 4,157,847 | 524,670 | 22,623,437 | 97,766 |
| 13000 | ELECTRONICS | 17,982,546 | 126,234 | 16,938,534 | 7,913,761 | 9,024,773 | 270,293 | 17,208,827 | 773,719 |
| 14000 | COMPUTER | 6,111,066 | 340,993 | 4,541,213 | 2,874,739 | 1,666,474 | 477,509 | 5,018,722 | 1,092,344 |
| 16000 | SYSTEMS INTEGRATION | 201,022 | --- | 201,022 | 200,965 | 57 | --- | 201,022 | --- |
| 17000 | PROGRAM MANAGEMENT | 2,098,809 | 7,367 | 1,924,695 | 1,782,795 | 141,900 | 3,149 | 1,927,844 | 170,965 |
| 18000 | COMMON COST | 2,100,371 | 33,023 | 1,815,202 | 1,699,307 | 115,895 | 13,293 | 1,828,495 | 271,876 |
| 19000 | CONTINGENCY/RESERVE | 400,000 | --- | --- | --- | --- | --- | --- | 400,000 |
| | SUB TOTAL | 78,252,189 | 1,245,656 | 72,482,371 | 43,918,673 | 28,563,698 | 2,311,776 | 74,794,147 | 3,458,042 |
| 30000 | RETIREMENTS | (67,979) | --- | (67,979) | (67,979) | --- | --- | (67,979) | --- |
| | TOTAL PROGRAM | 78,184,210 | 1,245,656 | 72,414,392 | 43,850,694 | 28,563,698 | 2,311,776 | 74,726,168 | 3,458,042 |

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

Project allocation includes \$4,500,000 for CY-1980 Funding.

FINANCIAL STATUS REPORT
(in thousands)

As of: April 30, 1980

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---------------------|-----------------|----------------------------|------------------------|-------------------|----------------------|----------------------|----------------|----------------------|------|
| Item | Program Ceiling | (A) Allocation to Date (C) | | | Un-Allocated Balance | Outlook (B) | | | Note |
| | | Allocated | Expended and Committed | Allocated Balance | | Estimate to Complete | Estimate Total | (Over) Under Ceiling | |
| Site and Wye | 27,860 | 26,930 | 26,279 | 651 | 930 | 651 | 26,930 | 930 | |
| Antennas | 20,400 | 22,721 | 22,623 | 98 | (2,321) | 98 | 22,721 | (2,321) | |
| Electronics | 17,000 | 17,999 | 17,225 | 774 | (999) | 774 | 17,999 | (999) | |
| Computer | 4,850 | 6,111 | 5,019 | 1,092 | (1,261) | 1,092 | 6,111 | (1,261) | |
| Systems Integration | 400 | 201 | 201 | -- | 199 | -- | 201 | 199 | |
| Program Management | 2,650 | 2,116 | 1,945 | 171 | 534 | 171 | 2,116 | 534 | |
| Common Cost | - | 2,100 | 1,828 | 272 | (2,100) | 272 | 2,100 | (2,100) | |
| Subtotal | 73,160 | 78,178 | 75,120 | 3,058 | (5,018) | 3,058 | 78,178 | (5,018) | |
| Contingency | 2,840 | 400 | -- | 400 | 2,440 | 400 | 400 | 2,440 | |
| TOTAL | 76,000 | 78,578 | 75,120 | 3,458 | (2,578) | 3,458 | 78,578 | (2,578) | |

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 \$68K in assets which were retired in prior years.

(B) Estimate to complete is as of March 14, 1980.

(C) Includes \$4,500K in CY-80 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY VLA ACTIVITY SCHEDULE

UPDATE DATE: 05/02/80

