



NATIONAL RADIO ASTRONOMY OBSERVATORY

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May 9, 1988

Donald W. Brown
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Ref: VLA-GDSCC Telemetry Array Project

Dear Mr. Brown:

Here is the Quarterly Status Report for January-March, 1988.

Sincerely yours,

Bill Brundage

William D. Brundage
VLA-Voyager Preparation
Manager and Project Engineer

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cc: W/Report

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NATIONAL RADIO ASTRONOMY OBSERVATORY

VLA-GDSCC TELEMETRY ARRAY PROJECT

VLA-JPL VOYAGER 2 AT NEPTUNE

QUARTERLY STATUS REPORT

JANUARY - MARCH 1988

Prepared by:

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SUMMARY

During this first quarter of 1988, JPL and VLA continued testing all antennas operating at X-band. NRAO completed construction of thirty cooled front-ends and continued constructing receivers for installation in 1988. Two more antennas became operational at X-band, for a total of 18, with two more expected in early April. Installation of the power generation system continued. Following review of the VLA Revised Budgetary Estimate, NASA authorized committing existing funds, with assurance of additional funding, for replacing critical VLA power cables in 1988. Trenching and cable installation began this quarter.

RECEIVER INSTALLATION

The Central Development Laboratory (CDL) delivered the last three cooled front-ends (#28, #29, and #30) to the VLA this quarter. The latest receivers use GE HEMTs and have a typical $T_r \leq 13$ Kelvin at 8.4 GHz. CDL repaired a broken connector in front-end #9 and shipped it to the VLA in March. Two front-ends (#7 & #27) await repair until the CDL technician comes to the VLA next quarter to train VLA technicians on internal repair.

The front-end (FE), cryogenics (CRYO), local oscillator (LO), and digital control system (DCS) groups completed and installed the 16th, 17th, and 18th production receiver systems this quarter. The cryo group has installed 9 backup cryogenic compressors.

The DCS group continued construction of the Analog Sum Switch this quarter and began constructing Analog Sum #3.

The LO group received the remaining 81 IF bandpass filters from JPL and will install them next quarter.

ON-LINE SYSTEM

The new on-line system took total control of the array in early January. The old system Modcomp computers and peripherals will be donated to JPL early next quarter. New displays of monitor data and performance data became available in January, and will evolve according to users' needs.

A computer programmer, provided by JPL via the DSN Telos Software Support contract, assisted with software development until the end of February.

In a February memo, JPL summarized their on-line system requirements as seven critical items and seven not so critical for summer 1988. All critical items except those involving the autophasing algorithm will be completed in April. A sub-optimum algorithm will be available in May and the optimum algorithm in August.

A potentially serious problem appeared with the new system. Apparently a problem on the bus interfacing BOSS and SPECTRE causes intermittent data gaps. Additional software error messages and hooks installed recently should lead to the cause and suggest a fix. This problem will be pursued vigorously until solved, which should be next quarter.

POWER GENERATION

JPL continued its share of installing the on-site diesel electric power generation system which will substitute for commercial power during telemetry reception in 1989. The two 1400 kW generators, fuel system, transformer, and control panels are in place. The high voltage contractor installed the switch gear. Generator electrical system installation and high voltage installation began in March. System testing will begin in May.

POWER CABLE REPLACEMENT

NASA will provide special funding so that VLA can complete replacement of buried power cable by December 1988, at least to the end of the C-array, which will be used during most of the Voyager telemetry reception in 1989. One buried power cable failure, within the C-array, occurred this quarter.

Trenching for the feeder cables (switch gear to center of wye) began. VLA rejected one hundred thousand feet of new cable when tests of samples showed they failed to meet industry standards. A partial shipment of cable from another manufacturer allowed cable laying to start only three weeks late. Good weather helped to recover one week of the delay by quarter end. Feeder cables should be completed by mid April, and D-array cables by mid May.

RELIABILITY

Following the Reliability Review No. 1, VLA continued to monitor downtime statistics and explore possible mitigations. We began a detailed reliability analysis this quarter, and will issue another review next quarter.

The CRYD group's program of replacing bushings in all CTI 22 cryogenic refrigerators has extended the MTBF. Now their program includes modifying the displacer coupling to extend seal lifetime.

Other parts of this quarterly report discuss concerns about the on-line system and buried power cable.

SCHEDULE

The seventeenth and eighteenth X-band systems (antennas #14 & #17) became operational this quarter. We expect four more antennas to become operational at X-band by the end of next quarter. The schedule has a total of 22 antennas operational by mid 1988, and all 28 by the end of 1988.

The VLA Implementation Plan contains summarized schedules for the X-band system installation, back-up cryo-compressor installation, analog sum and switch construction, new on-line system implementation, power generation system implementation, power cable replacement, and array configuration. We are slightly behind the schedules for backup cryo-compressor installation, analog sum and switch construction, and power cable replacement; but we should catch up to schedule next quarter.

FUNDS

In February, NRAO submitted to JPL a revised budgetary estimate for 1988, including the buried power cable replacement for Voyager and other adjustments reflecting actual cost experience. JPL requested that NASA provide an additional \$183k in funding. We expect NSF to receive these additional funds early next quarter.

Spending by CDL and VLA is on schedule relative to this revised budgetary estimate and funding schedule, which is (in \$k):

FY	1985	1986	1987	1988	1989	TOTAL
	890	1978	1712	1297	610	6487

A fiscal statement for the project from inception thru 1988 March 31 follows. It includes total expenditures and commitments (E&C), and balance. Total allocations equal total funds plus the \$183k expected next quarter. In addition it shows estimated E&C at calendar year end, and estimated balance at year end.

Budget88

SUMMARY FISCAL STATEMENT IN \$k
INCEPTION THRU DATE

VOYAGER

DATE: 1988 MARCH 31	ALLOCATION IT Dec88 \$k	E&C ITD \$k	BALANCE ITD \$k	Est E&C IT Dec88 \$k	Est BAL IT Dec88 \$k
-----IT 1988-----					
<u>VERY LARGE ARRAY</u>					
WAGES	835	584	251	835	0
BENEFITS	226	150	76	226	0
COMMON COSTS	795	555	240	795	0
TRAVEL	65	32	33	65	0
OFFICE LAB ADDITIONS	28	27	1	28	0
2 DEV'L RECEIVERS	157	157	0	157	0
CRYOGENICS & VACUUM	99	71	28	99	0
CRYO COMPRESSORS	227	218	9	227	0
RCVR INSTALLATION M & S	648	605	43	648	0
EQUIPMENT (TEST & TOOLS)	145	68	77	145	0
JPL DONATED EQUIP	686	686	0	686	0
BACKUP ON-LINE COMPUTER	250	255	-5	255	-5
RELIABILITY IMPROVEMENTS	15	18	-3	20	-5
POWER GENERATION M&S	78	76	2	76	2
RECABLE M&S	182	81	101	182	0
CONTINGENCY	30	0	30	0	30
VLA TOTAL	4466	3581	885	4444	22
<u>CENTRAL DEVELOPMENT LABORATORY</u>					
WAGES	652	595	57	652	0
BENEFITS	172	153	19	172	0
COMMON COSTS	425	388	37	425	0
TRAVEL	23	19	4	23	0
MATERIALS & SERVICES	450	431	19	450	0
EQUIPMENT (TEST & TOOLS)	353	343	10	353	0
CONTINGENCY	22	0	22	0	22
CDL TOTAL	2097	1929	146	2075	22
NRAO TOTAL	6563	5510	1052	6519	44
NASA FUNDS	5694				
JPL DONATED EQUIP	686				
TOTAL FUNDS	6380				
BALANCE = TOT FUND-NRAO TOT	-183				

E&C = EXPENDED & COMMITTED
IT = INCEPTION THRU
ITD = INCEPTION THRU DATE
Est = Estimated

NOTE: Re-Allocated per Revised Budgetary Estimate of 88 Feb 26