



NATIONAL RADIO ASTRONOMY OBSERVATORY

POST OFFICE BOX 0 SOCORRO, NEW MEXICO 87801-0387
TELEPHONE 505 772-4011 TWX 910 988-1710

May 11, 1987

Donald W. Brown
TDA Engineering
MS264-803
JPL/CALTECH
4800 Oak Grove Dr.
Pasadena, CA 91109

REF: VLA-GDSCC Telemetry Array Project

Dear Mr. Brown:

Here is the Quarterly Status Report for January-March, 1987. I leave to you the distribution of copies within JPL.

Sincerely yours,

A handwritten signature in cursive script that reads "William D. Brundage".

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

WDB/pl

cc: W/REPORT
M. Balister
C. Bignell
L. Beno
E. Callan
J. Campbell
W. delGiudice
M. Dinius
R. Ekers
R. Ferraro
P. Hicks
G. Hunt
S. Lagoyda
R. Latasa
P. Lilie
T. Riffe
K. Sowinski
R. Sramek
P. Vanden Bout
D. Van Horn
D. Weber
S. Weinreb

NATIONAL RADIO ASTRONOMY OBSERVATORY

VLA-GDSCC TELEMETRY ARRAY PROJECT

VLA-JPL VOYAGER 2 AT NEPTUNE

QUARTERLY STATUS REPORT

JANUARY - MARCH 1987

Prepared by:

William D. Brundage

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

Approved by:

Richard A. Sramek

Richard A. Sramek
VLA Deputy Site Manager

During this first quarter of 1987, JPL and VLA staff continued testing the antennas operating at X-band. NRAO continued procuring materials and constructing front-ends and receivers for installation in 1987 and 1988.

CDL

The Central Development Laboratory delivered three more front-ends (#10, #11, and #12) to the VLA this quarter. Serial #13 and #14 will be shipped in April. Serial #15 and #16 will be tested soon and may be shipped in April also. Shipping to the VLA in groups of two or three proves more efficient and eases pickup in Albuquerque.

Most of the parts are on hand for the completion of the remaining front-ends by the end of 1987.

TESTS

In February and March, JPL used four to six hours of array test time to examine the phase stability of the "phased-up" array as a function of the gain parameter in the autophase algorithm. JPL also measured the performance of the eight and nine X-band antennas in pointing at radio sources, in tracking the Voyager 2 spacecraft in a phased-up array, in aperture efficiency, and in system noise temperature at low elevation angles.

SCHEDULE

The seventh and eighth X-band system became operational this quarter following the delivery of new band-switches. We expect eleven antennas to be operational at X-band by the end of next quarter, with ten of them utilizing lower noise HEMT amplifiers. The current schedule has a total of 15 operational antennas (all with HEMTs) by the end of 1987, 20 by mid 1988, and all 28 by the first of 1989.

FEEDS

VLA received four production feeds, #9 - #12, from JPL. We expect the remaining 16 feeds next quarter.

RECEIVER SYSTEM

VLA completed the seventh production receiver system this quarter. Delivery of the electromechanical coaxial band-switches allowed the outfitting of antennas to return to schedule except for antenna #26. VLA installs these switches as part of the on-going upgrading of the receiver front-ends in Rack-A. Several 4-week cycles in upgrading must occur before antenna #26 can get its band-switch.

ELECTRIC POWER GENERATION

The power line monitor provided more data on voltage sags, spikes and dropouts on the VLA power source (Socorro Electric Cooperative). JPL and VLA completed planning for on-site diesel electric power generation which will substitute for commercial power during telemetry reception in 1989. Installation will start in April.

RELIABILITY

Following the Reliability Review No. 1, VLA continued to monitor downtime statistics and explore possible mitigations. We will continue periodic reviews. To help achieve the goal of 98% availability and 4 hour mean-time-to-recover, VLA ordered a backup on-line computer, as recommended by JPL, with funds NASA transferred to NSF-NRAO-VLA. It was delivered this quarter, and will be installed in April.

Several CTI 22 cryogenic refrigerators in operational antennas have failed after only 3000 hours running time. VLA explored ways to extend the MTBF to at least 8 months. Carbon bushings in all refrigerators will be replaced with polyamide bushings of Envex or Vespel. Also VLA replaced scotch-yokes in two units with a VLA design for an extended test. Implementing successful improvements to all 30 refrigerators will add more costs in 1987 and 1988.

Concerns continued this quarter about reliability of on-site power distribution in spite of no additional failures of buried cables feeding the arms of the wye. VLA issued a report to NSF on the problem, including a cable replacement schedule and cost estimate. NRAO-VLA has funding in 1987 only for adding a redundant cable between the site switch-gear and the Control Building. It will be installed this summer.

FUNDS

Spending by CDL is on schedule, and VLA is slightly beyond schedule. Projections have shown a negative balance before the ends of 1987, 1988 and 1989. Total funding for VLA in the Management Plan is inadequate to complete the receiver system because benefits, overhead, receiver construction costs, and reliability goals are higher than originally planned.

In March, VLA submitted to JPL an amendment to the revised budgetary estimate and funding schedule. The JPL Implementation Plan for VLA Power Generation requires additional funds to support construction by VLA. The amendment estimated VLA needs total additional funds of

- \$303k for 1987,
- \$206k for 1988, and
- \$262k for 1989, for \$771k total.

A fiscal statement for the project from inception thru 1987 March 31 follows. It includes total expenditures and commitments (E&C), and balance. Total allocations equal total funds. In addition it shows estimated E&C at year end, and estimated balance at year end. In order to minimize over-committing before year end, VLA will not order 12 cryo-compressors until NSF receives additional 1987 funds from NASA.

WDB/wdb
870511

DESCRIPTION	ALLOCATION	E&C	BALANCE	Est E&C	Est BAL
	IT Dec87 \$k	ITD \$k	ITD \$k	IT Dec87 \$k	IT Dec87 \$k
<u>VERY LARGE ARRAY:</u>					
WAGES	520	333	187	520	0
BENEFITS	141	85	56	141	0
COMMON COSTS	494	316	178	494	0
TRAVEL	35	24	11	60	-25
OFFICE LAB ADDITIONS	28	27	1	28	0
2 DEV'L RECEIVERS	157	157	0	157	0
CRYOGENICS & VACUUM	51	51	0	51	0
CRYO COMPRESSORS	18	21	-3	161	-143
INSTALLATION M & S	461	399	62	461	0
EQUIPMENT (TEST & TOOLS)	67	53	14	115	-48
JPL DONATED EQUIP	325	325	0	325	0
BACKUP ON-LINE COMPUTER	250	247	3	250	0
RELIABILITY IMPROVEMENTS	0	0	0	5	-5
POWER GENERATION	1	1	0	73	-72
CONTINGENCY	0	0	0	10	-10
VLA TOTAL	2548	2039	509	2851	-303
<u>CENTRAL DEVELOPEMENT LABORATORY</u>					
WAGES	654	413	241	654	0
BENEFITS	207	107	100	207	0
COMMON COSTS	423	268	155	423	0
TRAVEL	36	16	20	36	0
MATERIALS & SERVICES	455	399	56	432	23
EQUIPMENT (TEST & TOOLS)	279	302	-23	302	-23
CDL TOTAL	2054	1505	549	2054	0
VOYAGER TOTAL	4602	3544	1058	4905	-303
NASA FUNDS	4277				
JPL DONATED EQUIP	325				
TOTAL FUNDS	4602				
BALANCE =TOT FUNDS - VGR TOT	0				

E&C = EXPENDED & COMMITTED

IT = INCEPTION THRU

ITD = INCEPTION THRU DATE

Est = Estimated