NATIONAL RADIO ASTRONOMY OBSERVATORY

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

July 16, 1986

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 are six copies of the Quarterly Status Report for April-June 1986. I leave to you the distribution of copies within JPL.

Sincerely yours,

Bill Brundage

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

WDB/lt

cc: W/REPORT
M. Balister
R. Barker
L. Beno
J. Campbell
W. delGiudice
R. Dorr
R. Ekers
G. Hunt
R. Latasa
P. Lilie
T. Riffe
K. Sowinski
R. Sramek
P. Vanden Bout
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UNDER CONTRACT WITH THE NATIONAL SCIENCE FOUNDATION

NATIONAL RADIO ASTRONOMY OBSERVATORY

VLA-GDSCC TELEMETRY ARRAY PROJECT

VLA-JPL VOYAGER 2 AT NEPTUNE

QUARTERLY STATUS REPORT

APRIL - JUNE 1986

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 second quarter of 1986, JPL and VLA staff continued testing the three antennas operating at X-band. NRAO continued procuring materials and constructing front-ends and receivers for 1986.

CDL

The Central Develpment Laboratory delivered Front Ends #2 and #3 to the VLA this quarter. Assembly of #4 is in progress and will be delivered by July 31. The current schedule calls for the delivery of 12 front ends in 1986 and the remaining 18 during 1987.

Testing of GE HEMT's from wafers #546 and #4953 continued. For good pinch off devices, the minimum noise temperature at f = 8.4 GHz and Ta = 12.5K varied ftom 8K to 13K for wafer #546 and from 6.5K to 13K for wafer #4953. The average minimum noise temperatures were 10.5K and 9.7K for wafers #546 and #4953, respectively.

CDL constructed six 3-stage amplifiers with HEMTS in input stages. The noise temperature at 8.4 GHz varied from 8.5K to 12.7K, while the average noise temperature across the 8.0 - 8.8 GHz band varied from 9.5K to 15.5K. These amplifiers were installed in Front Ends #2, #3, and #4.

TESTS

Each month JPL staff used four to six hours of array test time to examine the phase stability of the "phased-up" array of 27 antennas. They also measured the performance of the three X-band antennas in pointing at radio sources, in tracking the Voyager 2 spacecraft in a phased-up array of 3 antennas, in feed efficiency, and in system noise at low elevation angles. JPL also made preliminary tests of the DSN telemetry receiver on the Voyager signal.

SCHEDULE

The fourth X-band system should be installed on antenna #3 by the end of July. The current schedule for 1986 has twelve front-ends delivered to the VLA and six of them installed on antennas.

FEEDS

VLA received from JPL three production feed horns. SN 003 will be installed on the fifth X-band antenna #25 while in the barn for overhaul. Currently the first "preliminary" feed is in antenna #20, the "prototype" feed is in antenna #21 and "production" feeds 001 and 002 are in antennas #24 and #3.

RECEIVER SYSTEM

VLA completed the second production receiver system this quarter. After the long-delayed diode microwave switches arrive in July, it should be installed on antenna #3 by the end of July, be tested and debugged by mid-August, and be ready for JPL tests by late August. The third production receiver neared completion.

RELIABILITY OF ELECTRIC POWER

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

Concerns continued this quarter about reliability of on-site power distribution because of two additional failures of buried cables feeding the arms of the wye. JPL will assist VLA in evaluating testing and repair procedures and ways to reduce the failure rate. VLA and JPL continued investigating a track-mobile diesel generator which could reduce antenna recovery time from many hours to three or four hours.

RELIABILITY REVIEW

VLA issued Reliability Review No. 1 in May and JPL commented in June. VLA and JPL will continue to monitor downtime statistics and explore possible mitigations. We will continue periodic reviews. We established a common reliability formalism and set an availability goal of 98% and mean-time-to-recovery of 4 hours. Computer hardware, computer software, electric power source, site power distribution, human error, failure diagnoses and certain hardware in the common system appear to be the most critical areas. The purchase of of a backup on-line computer was recommended.

FUNDS

Spending by CDL and VLA is on schedule, but projections show a negative balance at the end of the project. Total funding for VLA in the Management Plan plus $100K from CDL appear to be inadequate to complete the receiver system because benefits, overhead, and receiver construction costs are higher than planned.

JPL requested that NASA:

1. Change the funding schedule to provide $100K more in FY86 and $100K less in FY89,
3. Add $250K in FY86 to purchase a backup MODCOMP on-line computer for adequate VLA reliability.

Suggestions for a revised budget will be submitted to JPL.

A fiscal statement for the project from inception thru FY 86 June 30 follows.

WDB/wdb
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VLA/CDL VOYAGER FISCAL STATEMENT

FISCAL66 INCEPTION THRU FY 86 JUNE 30 Jul 18, 1986

WDB

DESCRIPTION	ALLOCATION ITFY86 $K	EXP & COMM ITD $K	BALANCE ITD $K
CENTRAL DEVELOPMENT LAB			
WAGES	357	231	126
BENEFITS	112	62	50
COMMON COSTS	230	151	79
WBC SUBTOTAL	699	444	255
MATERIALS & SERVICES	333	330	3
EQUIPMENT	290	256	34
TRAVEL & RELOCATION	21	11	10
CDL TOTAL	1343	1041	302
VERY LARGE ARRAY			
WAGES	270	167	103
BENEFITS	82	44	38
COMMON COSTS	256	159	97
WBC SUBTOTAL	608	370	238
MATERIALS & SERVICES	464	407	57
EQUIIPMENT	78	27	51
TRAVEL & RELOCATION	25	16	9
VLA TOTAL	1175	820	355
PROJECT TOTAL	2518	1861	657
NASA FUNDS	2518		

EXP & COMM = EXPENDED & COMMITTED
IT = INCEPTION THRU
D = DATE