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December 6, 1989

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4800 Oak Grove Drive
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Ref: VLA-GDSCC Telemetry Array Project

Dear Mr. Brown:

Here is the Final Quarterly Report for July - October, 1989.

Sincerely yours,

William D. Brundage

William D. Brundage
VLA-Voyager Preparation
Manager

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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

FINAL QUARTERLY REPORT

JULY - OCTOBER 1989

Prepared by:

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SUMMARY

During this third quarter plus one month of 1989, JPL and NRAO-NM successfully completed operation of the Very Large Array (VLA)-Goldstone Telemetry Array (VGTA) for the Voyager 2 flyby of Neptune and Triton. NRAO devoted 340 hours of VLA observing time to VLA and VGTA system tests and reception of Voyager's telemetry. During the 40 scheduled telemetry passes from April 26 through September 28, the VLA achieved a Voyager signal availability of 0.99959 and a 25 antenna availability of 0.99989.

During October JPL staff packed equipment and supplies for return to Goldstone and JPL. In early October, JPL made presentations and lectures in the NRAO-NM celebration of our participation in the flyby of Neptune. October 31 marked the official end of the financial book with approximately $184k of unspent funds.

RECEIVER SYSTEM

Only one major receiver system failure occurred during VGTA operations, when the correlator failed but was fixed within 7.5 minutes. Many minor failures affecting individual antennas occured, and some of these were repaired during the 1.5 hour startup and test period preceding each VGTA pass.

ON-LINE SYSTEM

The on-line system hardware and software performed without failures during VGTA operations.

POWER SYSTEM

The generating system powered the entire VLA without incidents throughout VGTA operations. Several minor generator failures occurred and were repaired during non-VGTA time.

INTERFERENCE

No RFI occurred during VLA prep time or during VGTA operations.

OPERATIONS

The efforts of VLA maintenance and operations staff and JPL operations staff in developing procedures and knowledge for efficient operation and rapid diagnosis and correction of VLA failures certainly made a big contribution to the extremely high availability of the VLA.

Although the VLA maintenance staff on duty during each ten hour period of VLA-Voyager operation had little to do during VGTA operations, they frequently repaired one or more failed antennas during the 1.5 hour startup periods. Their efforts provided the high availability of the Voyager telemetry and of 25 or more VLA antennas during VGTA operations.

RELIABILITY

The previous status report listed eight major VLA spare units provided because of the VGTA. None of the spares were used, but it was comforting to have them available.

The VGTA scheduled the VLA to provide Voyager telemetry to Goldstone for a total of 18164 minutes during the 40 passes from April 26 through September 28. The VLA provided 18156.5 minutes of Voyager telemetry for a signal availability of 0.99959. The 7.5 minutes lost because of a correlator failure occurred after Australia acquired Voyager, so no telemetry was lost at JPL. The availability was 0.99989 for 25 operating antennas, 0.938 for 26 operating antennas, and 0.563 for 27 operating antennas. Because 25 antennas provided adequate signal-to-noise ratio even in poor weather, the JPL operator general removed from the array one or two antennas with any suspected problem. This practice contributed to the low availability of 27 antennas.

A video recording showed one apparent lightning strike to the overhead ground wire (OHGW) over the VLA control building. The OHGW must have diverted the lightning current to ground as intended, because the VLA experienced no effects on operations of a lightning hit then or at any other time during the thunderstorm season.

PUBLIC EDUCATION

During August, New Mexico media gave extensive coverage of the Neptune flyby. NRAO provided public viewing of slow scan TV images at the Array Operating Center (AOC) and the VLA Visitors Center. We also provided NASA Select TV broadcast on the Socorro TV cable and on a large-screen in the NMIMT Macey Center auditorium. In early October,

as part of the NRAO VLA-Voyager celebration, Dr. Ellis Miner of JPL gave illustrated talks to NRAO staff at the AOC, at the VLA, and also a public lecture that attracted an audience of over 200.

FUNDS

NASA provided total funds of $6933k to NRAO for the VLA-Voyager Project, and JPL donated equipment valued at $936k, for total funding of $7869k. At Project end, October 31, NRAO had expended a total of $7685k, leaving an unspent balance of $184k.

The following fiscal statement summarizes the total project expenditures by NRAO. NRAO total allocation equals the total funds of $7869k.

Budgt89 SUMMARY FISCAL STATEMENT IN $k VOYAGER
INCEPTION THRU END

DATE: 1989 OCTOBER 31 (END)	ALLOCATION IT END $k	EXPENDED IT END $k	BALANCE IT END $k
VERY LARGE ARRAY			
WAGES	1170	1158	12
BENEFITS	293	288	5
COMMON COSTS	1184	1320	-136
TRAVEL	46	46	0
OFFICE LAB ADDITIONS	29	29	-0
2 DEV'L RECEIVERS	157	157	0
CRYOGENICS & VACUUM	90	91	-1
CRYO COMPRESSORS	222	219	3
RCVR INSTALLATION M & S	619	618	1
EQUIPMENT (TEST & TOOLS)	150	157	-7
JPL DONATED EQUIP	936	936	0
BACKUP ON-LINE COMPUTER	255	255	0
RELIABILITY IMPROVEMENTS	68	51	17
POWER GENERATION M&S	110	113	-3
RECABLE M&S	207	207	-0
CONTINGENCY	64	0	64
PUBLIC EDUCATION	10	10	0
VLA TOTAL	5610	5655	-45
CENTRAL DEVELOPMENT LABORATORY			
WAGES	657	647	10
BENEFITS	173	164	9
COMMON COSTS	428	422	6
TRAVEL	26	22	4
MATERIALS & SERVICES	450	430	20
EQUIPMENT (TEST & TOOLS)	356	346	10
CONTINGENCY	-7	0	-7
CDL TOTAL	2083	2030	53
ADJUSTMENT FOR CY88 OVERHEAD	176	0	176
NRAO TOTAL	7869	7685	184
NASA FUNDS	6933	6933	
JPL DONATED EQUIP	936	936	
TOTAL FUNDS	7869	7869	
BALANCE = TOT FUND-NRAO TOT	0	184	

IT = INCEPTION THRU

NOTE: Allocations per NASA funding schedule 6, $6933k IT FY89