VLBA TEST MEMO NO. 11

National Radio Astronomy Observatory *MEMORANDUM*

To: VLBA Project *Date:* December 9, 1987

From: Craig Walker

Subject: VLBA Test Coordination Meetings for Oct. and Nov.

Alan Rogers sent a note with a couple of comments on the minutes of the Sept. meeting:

1) While 1.5 deg/deg C/GHz is better than current geodetic systems - this is only true without phase calibration - with phase calibration current geodetic systems are about 2 deg/deg C/GHz. Further the calibrator is maintained at a constant temperature in an enclosure within the receiver.

2) The BBC L.O. phase settling is the result of changes in the thermal conditions within the ICs when the frequency is changed. In the MK 1 days we used frequency switching with an HP5100 synthesizer which exhibited 50 deg phase settling without problems since the settling repeats for each switching cycle. I will try and improve the performance - but settling times are not so bad if you are willing to live with a few degrees repetative phase drift.

Oct. 20, 1987 Meeting. Thompson, Seibring, Benson, King, Crane, Napier, Clark, Lilie, Campbell, Hunt, Rhodes, Ruff, Bagri, Walker.

Ruff and King discussed the tilt meter results. It is possible that beam vibrations are being seen although the measurements are not yet understood. Measurements high on the antenna are planned.

Bagri continued his report from last time on the tests done on the VLBA system in the lab at the VLA.

He found phase jumps (about 1 degree at baseband) when the monitor and control system is talking to the data aquisition rack. It is probably related to a voltage drop and Alan Rogers is looking into it.

Spurious responses are seen in the 327/610 system (terminated on input). Added filters help.

Spurious responses are seen at 1.5 and 4.8 GHz at multiples of 500 MHz. These are not thought to be serious.

The 2-16 GHz locking seems reasonable. If the 500 MHz signal changes more than 2 db, this is no longer true.

Blowing hot air on the 2-16 GHz synthesizer suggests that the temperature sensitivity is less than 0.2 deg/GHz/degC. Also a change of voltage of 200 mV caused a phase change of less than a few tenths of a degree at 5 GHz.

Tests of relative phase changes of cables on Pie Town antenna at 500 MHz showed less than 1 degree change over night. Clark suggested that tests of the relative stability as the antenna is moved about would be more interesting.

The trials and tribulations of getting Pie Town working at 327 MHz were reviewed.

Nov. 17, 1987 meeting. Benson, Romney, Clark, Bagri, Crane, Campbell, Stetten.

I reviewed the current status of Pie Town tests. By this time, two successful fringe test experiments have been done and we are about to attempt our first NUG observations. The Mark II system has been giving considerable trouble. Most of the problems were traced (on Nov 18) to severe temperature sensitivity in the anti bit

crowding circuit, compounded by proximity to a hot power supply in the temporary rack arrangement at Pie Town. This explains why things seemed to work on the bench at the VLA. Herb Winchell and Wayne Koski found the problem at the start of the NUG run. Afterwards, the system seemed to work well.

Bagri mentioned that beam measurements showed that the beam is not very clean. More work is needed on this.

Bagri has made cable stability measurements while moving the antenna. Large (6 deg peak-peak) variations between cables are seen with changes in azimuth. The variations seem repeatable at the 0.5-1.0 degree level. The sensitivity to elevation is small. For geodesy, the sensitivity will have to be reduced or the cables calibrated. We probably should test a phase cal system, both to see how well such a system can be used to calibrate the cables and to provide a way of measuring the full system. Bagri will contact Rogers about borrowing one.

RFI testing was done with a dipole at various places on the antenna. The interference was low. However at 75 MHz, there was high interference that seemed to be harmonics of about 450 kHz. The source could not be found. Could it be the telephone system down the road?

The station timer had not been on UPS, which means that the one second tic, and hence station time, was lost whenever there was a power glitch. Since establishing the tic again is difficult, the timer was moved to the UPS. However time was lost at least twice after this was done for reasons that are not yet understood.

Some improved way of setting time at Pie Town is needed. While it is possible to establish a LORAN one second tic (if the station clock can be set to about 50 ms mannually - hard), there is no way to remove the LORAN delay. A traveling crystal clock, brought from the VLA has been used to set the time, but something better is needed in the long run.

No one was there to discuss the azimuth rail (tilt meter) problems. Stetten suggested that we talk to others with wheel and track antennas about their experience.