

National Radio Astronomy Observatory

MEMORANDUM

To: VLBA Project

JAN 30 1988

Date: February 8, 1988

From: Craig Walker

Subject: Test Coordination Meeting, Jan. 19, 1988

Those present: Crane, Bagri, Walker, Thompson, Romney, Clark, Napier, Wade.

I reviewed the preliminary results from the fringe search on the NUG run data in Charlottesville. Data is available from 3C345 on the Pie Town, VLA, Fort Davis triangle and from 1642-03 on the Pie Town, VLA, Green Bank (140 foot) triangle. By assuming that the sources are not resolved, it is possible to get the ratio of the sensitivities of any two antennas in a triangle from the fringe amplitudes on the baselines between those antennas and the third antenna. Ignoring the system temperatures, the results look reasonable. Pie Town is somewhat more sensitive than a VLA antenna as expected because of the displacement of the VLA feed from the prime focus. The sensitivity of Pie Town is about equal to that of Fort Davis and scales with collecting area relative to the 140'. Unfortunately, when the system temperatures from the VLBI logs are taken into account, the whole situation becomes muddled. This was done after the meeting and so is being reported here for the first time. The results are not consistent between the two sources for which I have data and do not make a great deal of sense. On 3C345, the efficiency (with effects of system temperature and collecting area removed) of Pie Town seems to be about 0.8 of that of the VLA or Fort Davis. On 1642-03, the Pie Town efficiency is about 1.4 times better than Green Bank and only about half of that of the VLA. I do not yet understand what has happened but am suspicious of the system temperature measurements, especially at the VLA (they look high and they changed significantly between sources for no obvious reason). The main effort to sort all this out will happen after the subreflector is installed.

Wade described the measurements that are being done at Fort Davis to monitor the stability of the foundation. Before the antenna is installed, a number of carriage bolts are being installed just outside the track and measured relative to a bench mark built near the site fence. Eventually, this will be done for all ten sites, but much of the interest for now is to see if anything changes when the antenna is erected. The measurements, done with a Wild N-3 level, should be good to about 0.001 inch.

Napier relayed some concerns from D'Addario. First, he feels that the stability of the cables may be marginal and should be tested before too many more are installed. We might want to use better (read "more expensive") cables in the wrap. Bagri described the measurements that he has done and plans to do. More are clearly needed to see how repeatable the differences between cables are. Second, D'Addario was concerned about the temperature stability in the maser room of the control building. His figure of ± 4 degrees is rather higher than the ± 1.5 degrees or less that various people think is being achieved. This may just be a misunderstanding.

There was some discussion of the need for the IF signals to go to the C rack before being sent to the D rack. There was also discussion of the need for two DAR's (Data Acquisition Racks) at each station. Napier suggested that, since these topics were discussed at length years ago and there is no especially new information, that we let the earlier decisions stand.

There was an extensive discussion of the need for GPS receivers at each site. Everyone seems to think that the unit that derives the station one second tick should be attached to the maser and should run off the maser's power supply. This should make the tick as reliable as the maser, which we hope is very reliable. With the current system, where the one second tick comes from the timing module in the C rack, there is too much chance of losing time by losing power to that rack.

If the one second tick becomes part of the maser unit, is there any need for the GPS receivers (which cost about \$15k per site)? Bagri argues that receivers are not needed at every site except when the maser is installed. We should be able to get along with the one that we already have. He thinks that the real time fringe checker should be sufficient to tell if the maser is working. If time is lost, it is likely that a maser expert will have to go to the site and he/she can take a receiver. If the system can be brought up quickly without outside help, a simple WWV receiver to set the one second tick approximately and a narrow bandwidth, wide delay range, real time fringe check to find where it was set, should be sufficient to get the station observing again. Several others felt rather uncomfortable with not having a secure, alternate source of time at the stations, but could not completely shoot down Bagri's arguments. The second source of time does not need to be a GPS receiver. A crystal clock on its own batteries has been used so far for Pie Town. Some other stable clock or a LORAN receiver would also do.

There seemed to be agreement that we could postpone the purchase of the remaining GPS receivers, although it is probably desirable to have one more soon. Pie Town can be supported from the VLA with the traveling clock. Kitt Peak could use the existing GPS receiver. Los Alamos could also be supported from the VLA with the traveling clock, although this might be difficult and it may be better to have another receiver here. Fort Davis and Iowa are existing VLBI sites and presumably already have sources of time. We just need to find out how to get a sync signal to our building. The LORAN receiver now at Pie Town can also be used to monitor time, perhaps at Los Alamos. To set time with it, a WWV receiver and a way to slew out the LORAN delay would be needed. For the remaining stations, Brewster, Hawaii, and the Virgin Islands will probably need receivers unless we decide to get along without any alternate time. Owens Valley and the Northeast Site can probably be supported from other observatories, if necessary. Clark estimates that we will want between 5 and 10 GPS receivers in the long run. If we wait, we might get a quantity discount. Also, there is a chance that prices will drop.