

NATIONAL RADIO ASTRONOMY OBSERVATORY

Charlottesville, Virginia

1984 Oct 22

To: Coordinating Committee  
From: P. Sebring *Paul*  
Subject: Notes from Coordinating Meeting, 1984 Oct 19

Addressees are invited to let Paul know about errors in these notes.

Participants

- NRAO-CV
  - H. Hvatum, moderator
  - L. D'Addario
  - J. Benson
  - R. Burns
  - R. Thompson
  - C. Walker
  - P. Sebring
- NRAO-GB
  - K. Kellermann
  - B. Peery
- NRAO-SOC
  - B. Clark
  - W. Horne
  - P. Napier
- Caltech
  - M. Ewing
- Haystack
  - A. Rogers

1. Action List, 84 Oct 15 update

- 1.1. Budget Allocation. No time spent. Porter away.
- 1.2. RFI Pie Town. Item complete.

1.3. Select Antenna Computer (Station Control Computer?)  
Barry C. says we will probably go with Motorola as indicated last week, although software support is worse than Intel's. He asks that we establish a date of Nov 16 to order a software development system. Probably will have to order a modem controller elsewhere.

1.4. RFI 345 kV Power Line. Peter N. says will start next week.

1.5. Antenna Contractor Selection. Hein reported that "best and final" proposals from both bidders are in, and it looks as though we will be able to select the 0.005" rms panel option and still stay within budget. Contract Selection Committee meets Monday, Oct 22.

1.6. Specify I.F. Signal Processing. Larry D. reports this is on-track and should be complete next week.

1.7. Antenna Profile. Peter N. reports still working on it. He indicates completion of this item can be put off 1-2 months until near the time the antenna subcontractor will be starting panel drawings.

1.8. Other Action Items discussions.

1.8.1. W. Horne suggests new dates for Start Assembly Antenna #1 (15 Dec 85) and Antenna #1 Acceptance (15 Apr 86). (Editor comments that these dates don't seem to match schedules of either bidder. Possibly fix dates after contractor chosen and schedules restudied?) Napier comments that we need more antenna event dates.

1.8.2. Question arose: Could antenna servos be checked out with Antenna Control Test Unit, and will it be available? Yes, and yes, apparently.

1.8.3. Larry indicated we need standard interface design sooner than 15 Jan 85. And we need to tell the antenna servo designer more than merely the 20/sec command rate.

## 2. Pending Design Decisions - discussion

Larry brought in a list of pending decisions, copy appended, prepared at Hein's request as an aid to minimizing project delays due to critical decisions that may be overlooked or delayed.

All agreed such a list, kept updated, is an important idea. It seems that Larry is nominated to keep the list up.

Alan R. pointed out that there's a need to have a similar (perhaps the same) document to consult to see what decisions have been made. It's a real problem to keep everyone informed about the status of major technical decisions.

Larry felt that perhaps the Project Book, updated each month, would be the proper repository. Others felt updating the Project Book that often would be cumbersome. In the end,

it seems we'll stick with "Larry's List", expanded to include completed decisions.

As a spinoff, it was decided to update the Project Book each three months, beginning with a Dec 1 update. This item will appear in the Action List.

Barry C. has sent additional items for the pending decisions list, and Marty E. added the need for a spec on the maximum correlation coefficient the correlator must deal with. Also brought up was the matter of the relative importance of keeping the VLBA compatible with other "foreign" VLBI stations. Policy on this could constitute important constraints.

### 3. Other Items

Ken K. referred back to the Action List item "AOC Design Concept." When will we decide how big the building is, etc.? How do we see the division of VLBA space between Socorro and the VLA site?

Hein says the date given in the Action List, 02 Jan 85, is OK for an initial AOC design for everyone to shoot at. Buck P. is to do this in consultation with the A/E contractor. A June 85 date to complete the design is OK, since building isn't going to be available (funding restraints) for two years. Today's budget also limits funding to \$1.8 M.

### 4. Next Week

Ken said that next week's "scientific meeting" should include reports from the various working groups.

NATIONAL RADIO ASTRONOMY OBSERVATORY

Charlottesville, Virginia

1984 Oct 15

To: Coordinating Committee  
From: P. Sebring *Paul*  
Subject: Notes from Coordinating Meeting, 1984 Oct 12

Addressees are invited to let Paul know about errors in these notes.

Participants

NRAO-CV	H. Hvatum, moderator L. D'Addario M. Balister J. Benson R. Burns B. Cotton R. Thompson P. Sebring
NRAO-GB	K. Kellermann
NRAO-VLA	B. Clark P. Napier
NRAO-SOC	W. Horne
Caltech	M. Ewing D. Forrest A. Readhead
Haystack	A. Rogers

1. Action List, 84 Oct 12 update

1.1. Budget Allocation. No time spent on this.

1.2. Note was taken that "Select M/C computer\*," "First cooldown 1.5 GHz," "Select communication protocol" and "RFI Los Alamos" are now completed items.

\*As a neophyte, I have found myself confused by the terminology variously applied to VLBA computers. If I now understand Barry Clark correctly, this "M/C Computer" is really the "Array Control Computer," for which some version of VAX was reported last week as having been selected.

1.3. RFI Pie Town. Nearly complete. Another two days should do it.

1.4. Larry asked to rediscuss the "completed" communication protocol item. I found I was unable to follow the discussion and I invite Larry to help with a short note I can append to next week's notes.

1.5. Select Antenna Computer. Barry says (in a later conversation) that a better term for this is "Station Controller," or "Station Control Computer," in accord with the Project Book. Another week is needed on this. Two Motorola units are being considered, 68010 and 68020. Will be some time before board level computer based upon 68020 is available, but it's more powerful, has floating point system. Want to use same unit as correlator if possible. (Sounds like more than a week to me!)

1.6. IF Signal Processing. Larry says Oct. 24.

1.7. Monitoring and Control Documentation. Barry says he needs a minimum of two weeks. Larry says pressure mounting to tie this down, because other items depend on it. Barry says problem is his time. Hein said let's call it Nov. 1. Peter asks if a change in this area would impact the servo design. Barry thinks not.

1.8. RFI 345 kV Power Line. May be delayed until about the end of October.

1.9. Specify M/C/Correlator Language & Operating System. Jon Romney and Larry asked about this. Still pending. Last week Barry said another month was needed. Much discussion over possibilities, but I could not digest it!

1.10. Hein reports successful antenna negotiations with both vendors. "Best and final" proposals due on Oct. 18. Both will include options for panels with 0.005 inch rms deviation at manufacture. Both accepted error budgets that ensure a structure sufficiently stable to support 86 GHz operation. Peter anticipates ~ 20% aperture efficiency at this frequency if we try the 0.005 inch option. He says the subreflector is emerging as a problem. It may be expensive to get the needed tolerance because it's not a surface of revolution.

## 2. Other Items

2.1. Larry states he has a prepared list of needed decisions to review next week.

2.2. Bob Burns raised matter of a leased line, Caltech to Tucson, at \$800/month. Would put Caltech on our internal digital link. Is it worth it? Will we be doing software over it?

2.3. Marty states he's just learned of the projected Nov. 9 teleconferencing/viewgraph review of playback-correlator area. Will talk to Hein by phone. Not happy to take the time for such a review just now.

2.4. Alan Rogers reports recording Polaris/IRIS data at Westford with the 40 micron tracks. Looks good. Haystack is once again issuing VLBI Notes.

## PENDING DESIGN DECISIONS

Larry R. D'Addario  
841010

This is a list of major design decisions which are presently pending, with a short discussion of each. It has been prepared at the request of Hein Hvatum in order to monitor our progress.

**QUANTIZATION:** Current plans call for three quantization options: 2-, 3-, and 4-level. However, the discussions leading up to this plan did not consider its impact on the correlator cost. We need to know the full consequences of requiring the correlator to support more than one quantization. Options: 2-lvl only; 3-lvl only; 2 and 3; 2, 3, and 4. (2,4 omitted because cost is same as 2,3,4).

**CORRELATOR ACCUMULATION TIMES:** One of the major parameters affecting the correlator cost is the minimum accumulation time. Slightly less critical is the maximum accumulation time. Both need to be cast in concrete as soon as possible.

**VARIABLE PHASE SAMPLING:** This eliminates, or at least drastically reduces, the need for bit shift corrections. It allows slower correlator dump rates with substantial savings. But these savings disappear if we must support foreign stations without this feature.

**PHASE SWITCHING:** This allows cancelling quantizer offsets, biased errors in data transmission, and some spurious signals. In my opinion, there is no question that this should be done; however, various technical details need work. One consideration is that there will be a minimum integrating time for which phase switching will be effective, and this may have to be 1 sec or more. For shorter times, the phase switch will not help as much, but neither will it hurt.

**RF PULSE CALIBRATOR:** This is sometimes called "phase calibration" (a misnomer) or "delay calibration." The questions are (a) whether to implement this at all; (b) if implemented, whether to place detectors at the stations or at the correlator; and (c) if implemented, what the parameters of the detectors should be (frequency range, integrating time, degree of multiplexing among channels). These questions are tied up with whether we must support this feature for foreign stations not conforming to the VLBA design.

**MONITOR/CONTROL BUS DETAILS:** Only a preliminary version of the M/C bus spec has been issued. Some details of the timing and protocols are under discussion and may be changed. It has also been suggested that this scheme be scrapped in favor of the Intel BitBus.

**COMPUTER SELECTIONS:** The station computer, fringe processor, and playback system controller need to be chosen. So far, each group has suggested a different microcomputer. A strong effort to make these the same (or same family) is needed. The playback controller might be excepted if its code can be considered

frozen (by moving tasks to the correlator computer if programmer intervention is contemplated in the future).

I.F. DYNAMIC RANGE: The receivers must have a large enough dynamic range to handle variations in front end gain and system temperatures, including observations of the Sun. Additional dynamic range helps with interference immunity. The exact requirements need to be specified. Some of the dynamic range will be achieved by ALC loops; how many and where? Any additional required will be achieved by programmable attenuation; how many steps? where? phase requirements? This also affects the gain calibration scheme (switched noise sources); parameters need to be specified.