Interoffice

VLB ARRAY MEMO No. 215

National Radio Astronomy Observatory

Charlottesville, Virginia

April 25, 1983

To: VLBA Members

From: L. R. D'Addario

Subject: Minutes of Monitor and Control Subgroup Meeting on 830419

Persons attending: Alan Rogers, Alan Whitney (Haystack); Peter Napier, Dave Weber, Jack Campbell, Gareth Hunt, Ken Sowinski (VLA); Rich Lacasse (Green Bank); Sandy Weinreb, Mike Balister, John Romney, Ray Escoffier, Craig Walker, Ken Kellerman, Larry D'Addario (Charlottesville).

The agenda consisted mainly of the issues raised in VLBA memo #211. The list of equipment to be interfaced was augmented to include water vapor radiometers. It was pointed out that the antenna controls need to include not only pointing but also subreflector positioning, feed de-icers, and other miscellaneous equipment; and that provisions should be made to monitor structure temperatures and tilts.

There was considerable discussion of the degree of centralization that the monitor and control system should have. At one extreme is the concept that each antenna operates autonomously, under the control of its own computer, with the central computer acting as a terminal through which occasional checks can be made. This idea was expressed by Alan Whitney and supported by Alan Rogers. The other extreme contains no computers at individual antennas (except for dedicated microcomputers in some equipment), with control retained by a central computer; sufficient buffering of commands would be provided at each antenna to handle communications dropouts. This concept was advocated by Sandy Weinreb, with support from Peter Napier and Larry D'Addario. Bob Burns (not present at the meeting) has suggested that the cost of computer hardware may be similar in the two extremes, since a more powerful central computer is needed in the second case.

No consensus was reached on the amount of computing power actually required at the antennas. The group was able to identify two tasks which might require a FORTRAN-programmable machine: determining refraction corrections for antenna pointing; and extracting the phase calibration signal from digitized data in order to obtain a real-time check on receiver operation. These tasks, and possibly others, need further study in order to see how best to accomplish them.

It was generally agreed that any well-defined control tasks are best performed by dedicated ROM-programmed microcomputers. Several such tasks were identified: recorder control; antenna subreflector positioning; and antenna pointing. The latter would accept local apparent right ascension, declination and time. Phase calibration extraction is another candidate for microcomputer implementation. It was thought that the remaining equipment (including front-ends, IF/video processors, local oscillators, and the maser clock) can be controlled and monitored without the intervention of special microcomputers.

There followed some discussion of data transmission within the antenna monitor and control system. Various hardware standards were considered, including RS232, CAMAC, HP-IL, IEEE 488 and Ethernet. The latter two were considered too complicated for our purposes, with IEEE 488 also using too many wires. It was pointed out that using RS232 would allow the monitor/control bus to be plugged directly into the modem, bypassing any antenna computer, and that this would be convenient for debugging. However, RS232 cannot be used directly because it is not a bussed structure. No decision was made on adopting a particular format.

Communication protocol within the system was also discussed. It was generally agreed that the Mark III protocol is too complicated; in particular, there is no need for individual devices to send data except when polled (Mark III allows "alarms" at any time). A very simple protocol was advocated, in which all transmissions consist of a fixed-length address followed by a fixed-length data word.

Larry D'Addario agreed to draft a system description, taking into account the above discussions, and to circulate it for comments within a few weeks.