VLB ARRAY MEMO No. 130

To: VLBA DESIGN GROUP 6 OCT., 1982
From: Martin Ewing
Subj: MINUTES OF CORRELATOR GROUP MEETING OF 5 OCT., 1982

Present: Kellerman, Walker, LaCasse, Hinteregger, Rogers, Fort, Clark Ewing

The meeting began a little after 3:30 PM EDT, continuing the preceding Data Acquisition meeting. Your chairman apologized for inadvertently being out of the country at the time the last meeting was scheduled.

Ken made a few points about our purpose in these working groups. Our primary product is NOT paper for Vol. III, but a set of system specifications that will enable us to begin "real" work if funding should be available in FY84. A list of projects requiring development work should also be drawn up.

(The job for the Data Acquisition group is worse than for the Correlator group, according to KIK.)

We discussed the Peterson VLSI memo (#117). Clark commented on the 40-pin package; should we not try to make it smaller? He wondered if two phase inputs (for two antennas) might not be input and then differenced to give the baseline phase. What would it take to allow full 3-level correlation?

Ewing's response (in Peterson's absence) was that the 40-pin package allowed a more generalized chip design, with possibly a larger market and higher production runs. A system design might use the new chip carriers that can save space compared with a 40-pin DIP. The single phase input corresponds to the "standard" VLBI method of having a separate phase adder working for each baseline. The antenna-differencing method might be unwieldly because of communications problems. It looks as if 3-level capability IS present in the chip. It would, however, be nice to add extra delay flip-flops for 2x Nyquist sampling.

In response to Hinteregger's question of how "real" is this VLSI project, Ewing answered that there are genuine prototype chips of subsections of the proposed chips in existence. There is no single "driver" for this project at JPL at present, except the desire to learn the VLSI business and to be ready for the next generation of VLBI systems. The VLBA, if funded, would become a driver, and some formal links should be forged with the Lab.

There was further discussion of recirculating vs non-recirculating designs, but this appeared to be a second-order question. Once the number of frequency channels, maximum bandwidth, and IC technology questions are settled, the designers will decide if recirculation is cost-effective. Ewing pointed out that all correlator designs can be characterized by the number of accumulators required, and this number is largely independent of correlator architecture.

Hans remarked that you can do the recirculation "in the tape recorder" by recording slowly and playing back rapidly, in several passes, to obtain the full delay coverage and spectral resolution.

Barry again pleas for NOT trying to match the tape system to the correlator, or vice versa. The project is too large for such interactions to be practical, and the tape system (or the correlator) technology may change during the life of the VLBA. Ewing also hopes for a simple tape-to-processor interface, not containing the number 28, for example.

Discussion continued with Memo #121, the correlator block diagram by Clark. Rogers and others were concerned with the apparent intention to place the delay control and format decoding in the tape system, rather than in the correlator. Ewing suggested a conceptual framework for the distribution of responsibilities analogous to the "layered protocols" of other computer communication systems, such as X.25. A memo will be forthcoming.

Clark and Ewing felt that it would be worth trying to specify the transmission of a continuous and complete set of samples from the IF system to the processor. Any timing or housekeeping information passed along should be added to the IF samples and increase the total bit rate, but it should not replace IF data, as is now done in Mark II and Mark III. VLA data, for instance, is somewhat contaminated by 19 Hz blanking of times used for control functions.

Craig raised the issue of IF channelization and whether the 4 channels specified for VLBA are adequate for geodetic work. His feeling is that they are not optimal, even with possible frequency switching.

On the other hand, VLBA funding is not likely to be based on geodetic demands, so the question is really whether the geodetic programs can be done in some way, even if not optimally. The Scientific Committee will have to deliberate on this matter.

Rogers remarked that provision of frequency switching will have effects that ripple through various VLBA subsystems: LO synthesizers, data recording framing, correlator dump times, etc. However, he felt that it might be wise to provide the capability in hardware wherever possible. This would probably not be very expensive.

Burst mode recording was brought up. The Canadians apparently will use this technique to get large spanned bandwidths in their interim 12 Mb/s geodetic system. Rogers points out that burst mode is inefficient because it gives equal weight to the spanned bandwidth, when, in practice, one wants to give higher weight to the frequencies toward the edges of the band in order to achieve the highest delay resolution.

Same time, same place for the next meeting: Nov. 9.