VLB ARRAY MEMO No. 338

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| VLBA CORRELATOR MEMORANDUM NO. 021 |
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To: VLBA Correlator Group Date: 16 Mar 84

From: Martin S. Ewing MSE

Subject: Minutes of Corr. Group Mtg 14 Mar 84

Attending:

Pasadena: Ted Seling, Tim Pearson, Neil Brook, Martin Ewing

Charlottesville: Hein Hvatum, Craig Walker, Jon Romney, John Benson, Sandy Weinreb, Mike Balister, Larry D'Addario
Ottawa: Dave Fort
Green Bank: Ken Kellermann
Socorro: Barry Clark, Dick Thompson
Haystack: (snowed in?)

(Has memo VC020 been circulated properly? Is Romney on the list? MSE will check.)

MULTIPLE PHASE CENTERS

We attempted to reconstruct the discussion of the recent scientific meeting with mixed success. Historically, we have always required the ability to do phase referencing, but this was commonly thought to mean referencing with sources outside the main beam. Antenna nodding would be required, and there would be no special demand on the correlator.

Recent discussion has centered (no pun) on simultaneous phase referencing in which two or more sources are in the primary antenna beam. Whether the correlator must deal with such data in one pass is the current question. Most people seem to feel that if such observations are to be common (more than a few percent of the time), they should be handled in a single pass.

Would we retain full sensitivity in the multiple simultaneous phase center mode? Phase referencing experiments typically want high sensitivity; one is looking for a weak source near a strong one.

There are schemes involving using half the available 16

correlator input channels for one center and half for the other. This may not lose sensitivity compared to the normal "100 Mb/s" recording speed, since the correlator has double-rate capability. One would lose frequency resolution and/or baselines, however. The Data Playback System would have to provide a switching mode in which a given IF stream would appear at two correlator inputs with independently settable delays. (Note that at low frequencies, where the chance of finding a reference source is greatest, the greatest offset delay will be required.)

The upshot for the correlator group is unclear. My preference is still to provide as much fringe processor capability as possible within a reasonable budget. This puts minimum constraints on fringe rate. The delay dimension is more troublesome, with the burden apparently falling on the Data Acquisition group.

LOBE ROTATION

There are too many options in the lobe rotation area! In order to allow some rational decisions to be made, we need a small number of clear options. I propose two:

1. "Conventional VLBI" This is the approach indicated in all VLBA correlator designs to date. Lobe rotation is performed on a per-baseline basis in the correlator. Quadrature ("complex") correlation permits sideband discrimination in fringe processing software. Only coarse LO programming at antennas is required.

2. "Full lobe rotation at Antenna" This is the conventional approach for connected interferometers. Antenna LOs are programmed as precisely as necessary to track the fringes. There is no lobe rotation in the correlator. Only a "real" correlator is needed -- 1 accumulator per lag per baseline. Sideband discrimination comes from RF and IF filters.

Larry D'Addario has offered to analyze the system implications of option 2. There are various impacts: LO design, antenna computers, communications, logging (phase accountability), how to accomodate foreign stations, etc. For the correlator, option 2 is a proper subset of option 1. Lobe rotators are removed completely, and the number of accumulators is halved. The VLSI design will have to be redone, however, as the JPL work so far is aimed at a complex correlator with on-chip lobe rotation.

MISCELLANY

Craig Walker reiterated his need for JPL's Block II Forth information. Barry Clark also would like to see what the Block II operator interface is like.