VLBA Acquisition Memo # 095

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TO: VLBA recorder group

FROM: John C. Webber

SUBJECT: REC # 1 acceptance tests

Integrated testing of the prototype VLBA recorder began in the middle of September and has continued through this date as bugs have been found and improvements made. This brief report summarizes the results I have obtained on various subsystems.

Tape control on the transport now works quite well thanks to Roger Cappallo's extensive efforts. Tape moves flawlessly and *a priori* positioning is good to within a few feet on long moves. All the advertised features, including reel pack count and low tape sensing, work well. The only problem we have seen is a very occasional refusal of the transport to load tape even though vacuum is adequate. CPU control of the vacuum level works well.

Head motion control is in good shape. Even though the Inchworm speed varies by 30% from one end of travel to the other, head positioning is rapid and repeatable. I can find no sensitivity to ambient or head temperature, and re-mount of the same tape on different days gives tracking offsets repeatable at the 2 μ level. Played back on Mark III processor drive 4, the tracking adjustments required during playback of a full length tape were a maximum of 4 μ from the mean position. The linearity of the LVDT *vs.* distance scale is better than 2 μ over a range of 4 head pitches and is certainly adequate to support 16-pass operation.

All the data paths through the recorder and back to the outside world are as advertised and work well. I see no errors in bypass mode operation. The on-board bit sync and mini-decoder work well and are useful. The decoder board in the formatter works perfectly on bypass data and gives reasonable numbers on data read from tape.

The write/read performance of the recorder has been tested at various record voltages and the best compromise used for more extensive testing. High error rates obtained in early testing (including the fringe test) are no longer present. No difference is discernible in the results using the pseudo-random number generator *vs.* real, digitized noise. Head # 2 is electrically connected but will neither write nor read; its data must be spared to a system track. This head is not used for Mark III and the problem thus has no effect on early operations.

Error rates have been investigated by making a recording and playing it back on the VLBA machine for spot checks, then on the processor for a real-world environment. The on-machine data for the 28 Mark III heads show an average parity error rate of 0.2×10^{-4} with the worst-case track 0.7×10^{-4} and very low re-sync rates (about 1 in 20,000 frames). You may recall that the VLBA specification is a bit error rate of 3×10^{-4}. The real test, of course, is on the processor where cross-machine differences come into play. The results for the 28 Mark III heads, discarding accumulation periods with re-syncs, is a mean p.e.r. of 0.3×10^{-4} and 1 re-sync per 13,000 frames. The worst-case track still meets the VLBA spec with a p.e.r. of 1.2×10^{-3} and 1 re-sync per 2200 frames.