MARK IV MEMO #293

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10 October 2006

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To: Mark 4 Formatter Users

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Subject: Timing Offset of the Mark 4 Formatter

After many years of successful operation, it has been discovered that the Mark 4 Formatter has a timing offset of +8.0 microseconds at a tape data rate of 18 MHz. This defect was not discovered earlier because none of the comparisons with other formatters had been performed at this tape data rate. This tape data rate is normally used only at a total recorded bit rate of 1024 Mb/s, and was discovered in fringe tests with the Mark 5B recording system.

On day 356 of 2005 (22 December) an SX fringe test was performed between a Mark 5A system at GGAO and Mark 5A and Mark 5B systems at Westford. Four scans were recorded, at 256 and 512 Mb/s with Mark 5A systems at both stations and again using the Mark 5B system at Westford. The 512 Mb/s scan was recorded at a tape data rate of 18 MHz on the Mark 5A recorder All scans produced fringes with an offset of 60 ns between the Mark 5A system and the Mark 5B system, except the scan recorded at a tape data rate of 18 MHz,. Since the timing offset was assumed to be the same for all scans, no fringe searches were performed.

Then on day 156 of 2006 (5 June), simultaneous Mark 5A and Mark 5B recordings were made at Westford at 256, 512, and 1024 Mb/s to evaluate performance of the Mark 5 Sampler. This time the 512 Mb/s scan was recorded at a tape data rate of 18 MHz on the Mark 5A. Initially fringes were found at 256 and 512 Mb/s, but not at 1024 Mb/s. A fringe search found fringes on the 1024 Mb/s scan at an offset of 8.0 μs, with Mark 5A delayed with respect to Mark 5B.

Bench tests were performed on a Mark 4 Formatter to measure the delay between the 1PPS and the Frame Sync as a function of tape data rate. The delay between the 1PPS and the frame sync increased by 8 μs when the Formatter tape data rate was changed from 9 MHz to 18 MHz, both at a sample rate of 16 MHz or at a sample rate of 32 MHz.

The cause of this offset is not understood, and at the present time, there are no plans to fix it.