Mark IV Memo # 263
VLBA ACQ Memo # 399

Subject: **Wear Tests of the Flat-Top Thin-Film Head by Tape Shuttling**
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Abstract

A tape was shuttled on a flat-top thin-film head for a total of 1,152 hours at low humidity. No significant change on the contour shape was observed.

Conditions and Method

The thin-film heads were subjected to tape shuttling for a total of 1,152 hours. Conditions of the test were as follows:

Temperature: 74^o F (23^o C).

Relative Humidity: $\sim$20%.

Duration of Test: 552 hours until 9/2/98 and 600 hours between 9/2/98 and 9/28/98.

Tape Tension: 10" H_2O (86.6 N/m).

Tape Speed: 270 ips (6.9 m/s).

Tape Used: Thin VLBI tape (15 μm, SVHS-like).

The test was conducted on a Metrum tape drive in the Tape Recorder Lab.'s temperature and humidity controlled room. The first part of the test lasted 552 hours between 8/11/98 and 9/2/98. The heads were scanned with a Tencor P10 stylus profiler at Quantum's Labs in Shrewsbury, MA. The second part of the test lasted 600 hours between 9/4/98 and 9/24/98. The heads were scanned again.

The head construction is depicted in Figure 1. Each one of the one inch bars contain four arrays with 16 heads. The eighth head on each one of these four arrays were scanned with the profiler. These locations are given the names A-H, in the order shown in Figure 1. A total of eight head locations were scanned in both forward and backward directions.

Results

The scans were saved to a disk, and were **leveled** with a macro. **Note that the bar containing the heads A-D has been subject to lapping with an abrasive tape prior to the tests, during manufacturing.** Therefore, its edges have been "rounded"

before the tests. The read/write performance tests by H.F. Hinteregger [1] were conducted on the bar marked with heads E-H.

Figure 2 shows the scans of the heads A-D for the 9/3/98 data. This figure shows that the profiles are fairly similar for all four locations. Plots of other scans, not shown here, have the same characteristic. Therefore, in comparing the wear history of the heads only locations B and F, chosen arbitrarily, were used.

Figure 3 shows the scans of the heads after the first 552 hours (09/03/98) and an additional 600 hours (09/28/98) of tape shuttling. For both of the bars, the profiles are virtually the same. The bar E-H shows a wear area of approximately 0.2-0.3 μm deep and 40 μm wide. This is consistent with the previous tests [2]. The initially lapped bar, A-D, also shows no effective wear.

These results indicate negligible wear in the second 600 hours of shuttling at low humidity. This result is encouraging and somewhat expected as the tape-bearing surface, Al_2O_3-TiC (Altic), is a ceramic known to be highly wear resistant. The next level of shuttling should include higher levels of humidity and regular operating conditions.

References

[1] Hinteregger, H.F. "Feasibility Tests of the Thin-Film Head Performance, Progress Report", (available from) M.I.T. Haystack Obseravtory, Westford, MA 01886, April 7, 1998.

[2] Müftü, S., Hinteregger, H.F. "The Self-Acting Subambient Foil Bearing in High Speed, Contact Tape Recording with a Flat Head," *Tribology Transactions,* Vol. 41, No. 1, pp. 19-26, 1998.

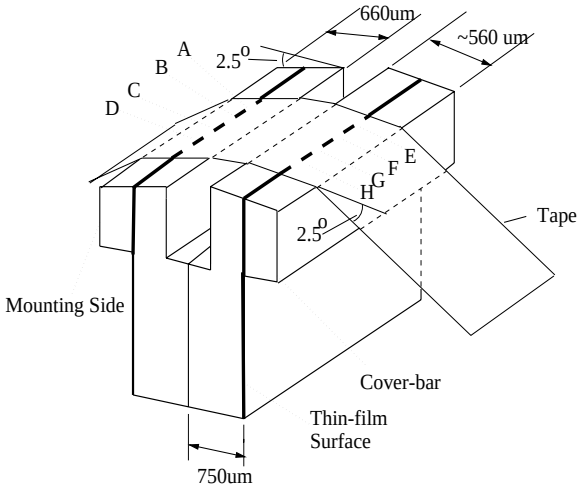

Figure 1: Schematic depiction of the dual head assembly used for the thin-film heads tested.

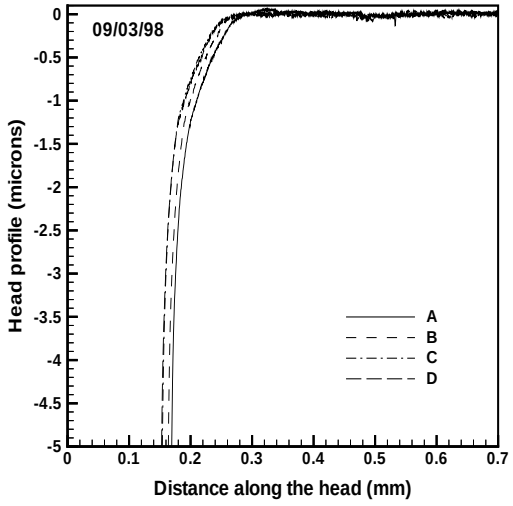

Figure 2: Profile of the head on 9/3/98, after 552 hours of lapping, along locations A-D.

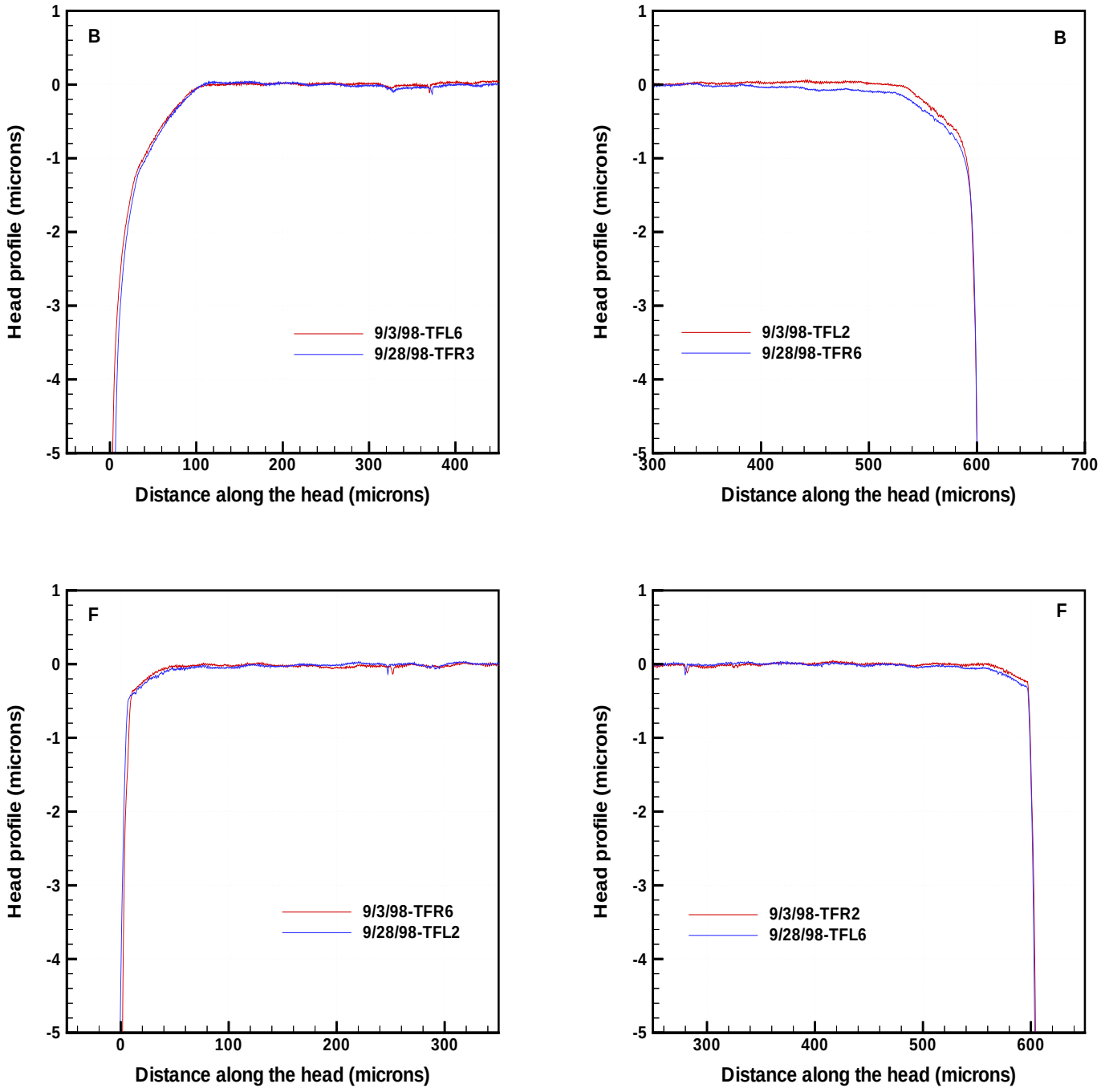

Figure 3: Figure showing the scans of the heads after 552 (09/03/98) and additional 600 (09/28/98) hours of tape shuttling. Note that the profiles are virtually the same, indicating negligible wear in the 600 hours of shuttling at low humidity. The electrical tests were performed on heads E-H. The head marked B has been subject to lapping with an abrasive tape before these tests. Some leveleing error can be seen on both figures on the right column.