VLBA ACQUISITION MEMO #181

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To: VLBA Data Recording Group

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Subject: Method of measuring differential tension in the tape path

Differential tension has been a problem with many MKIIIA recorders. Two of the major causes have been capstan taper and headstack tilt. Differential tension produces uneven head wear and makes the tracking more sensitive to certain tape imperfections. Normally, capstan taper or a tilted headstack will produce an abnormal tape angle (see Acquisition Memos 121 and 122) but it is possible to have defects which have equal and opposite effects on the tape angle. If the headstacks have been worn with uneven tension, the radii of curvature of the head profiles (see Acquisition Memos 141 and 179) will vary across the stack. If the heads have been worn unevenly with 1 mil (25 micron) tape it is possible to check the radii of curvature by increasing the vacuum pressure and observing the loss of high frequency response. With uneven wear the pressure at which loss of gap contact is lost will depend on the head number. Figure 1 shows the computed percentage vacuum increase at which contact is lost as a function of differential tension. If a headstack is worn with a tension that varies by 2:1 across the headstack, then increasing the vacuum from 10" to 11.5" will start to produce signal loss at one end of the headstack. [This method will not work with 13 micron thick tape since increasing the vacuum will not tend to reduce the head to tape contact owing to the relatively short characteristic bending length.] Testing the ability to record and playback with all heads is part of the "pretest" procedure (see Acquisition Memo 151) and this memo documents the reason for this test.

An actual test of this method was made on a worn headstack (serial #A31) and it was found that in practice the method is difficult because the loss of contact can only be measured from the reduction of short wavelength response using a spectrum analyzer. Figure 2 shows the loss of response across the headstack when the vacuum is increased from 10 to 13" (13" being the highest vacuum that could be obtained on the CDP test recorder). The measurements (which were only made on a few heads) are noisy and difficult to make - even so, the measurements do suggest that the profile on higher head numbers was worn with lower tension. Optical measurements on the headstack made by Peter Bolis show that MKIII head #1 is just worn through, while MKIII head #28 has about 10 microns of gap depth to go. While the optical and vacuum sensitivity test results are in agreement, the method is not really practical in the field, except as a check in the "pretest".

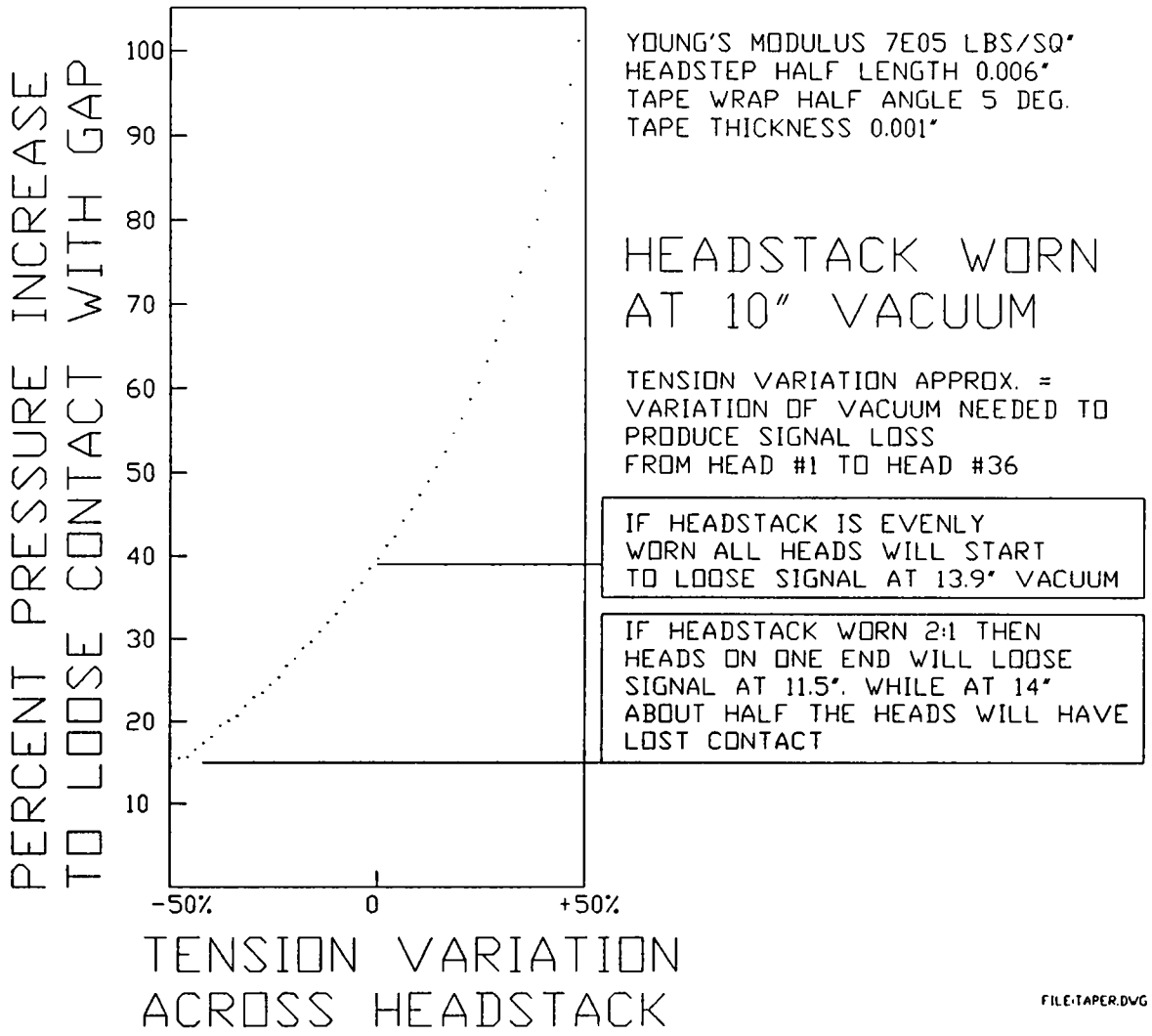

FIG.1 VACUUM INCREASE TEST FOR DIFFERENTIAL TENSION ACROSS THE HEADSTACK

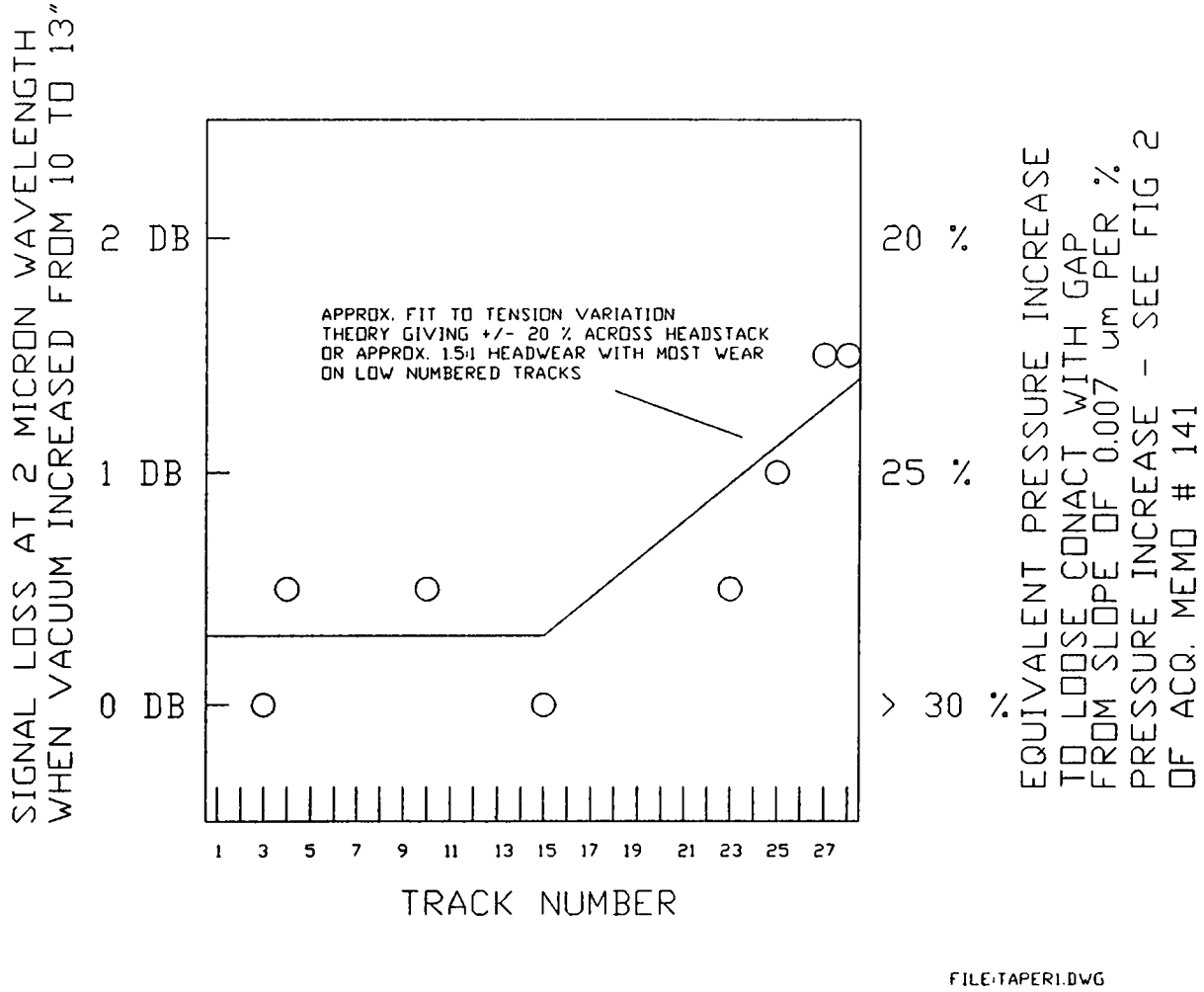

FIG. 2 MEASUREMENTS ON HEADSTACK SERIAL # A31