VLBA ACQUISITION MEMO #187

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To: VLBA Data Acquisition Group

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Subject: Tape noise measurements of D1K and S-VHS

1] Electronic noise

This is covered in Acquisition Memos 185 and 186.

2] Noise on blank tape - Erasure noise

There is a significant amount of broadband noise on blank D1K tape. Figure 1 shows the noise spectrum on D1K with blank tape running and stopped (electronic noise only). The erasure noise on S-VHS tape is much lower. In terms of added power over the full equalized bandwidth (relative to electronic noise of the cascode preamp described in Acquisition Memo #186) the results are as follows:

Tape	Erasure Noise	Conditions
Sony D1K	5 dB	160 IPS 56Kb/s equalizer
Maxell S-VHS	1 dB	160 IPS 56Kb/s equalizer

3] Multiplicative (or D.C. noise)

When a low frequency square wave is recorded the noise level on the peaks and valleys of the wave is larger than the erasure noise level. This noise can also be observed on a spectrum analyzer at frequencies between the rails formed by the square wave. Figure 2 shows the spectrum of this noise on D1K tape. This D.C. noise (as it is called in Jorgensen's book) dominates in the middle and lower frequency range and presumably results from irregularities in the magnetization. Again the D.C. noise is much lower on S-VHS tape and in terms of added power (relative to erasure noise level) the results are as follows:

Tape	"D.C." Noise
Sony D1K	6 dB
Maxell S-VHS	2 dB

4] Modulation noise

The last type of noise measured is that which produces noise sidebands on a recorded square wave. This noise is predominately the result of a modulation of the spacing loss due to mechanical roughness of the tape which in turn modulates the amplitude and phase (to a smaller degree) of

the reproduced square wave. The ratio of integrated sideband power to carrier power can be measured on the spectrum analyzer and the results were as follows:

Tape	Wavelength	Noise/Carrier	Noise BW
D1K	1 μm (4 MHz)	30 dB	500 KHz
	8 μm (500 KHz)	50 dB	50 KHz
S-VHS	1 μm	35 dB	500 KHz

It is not clear that modulation noise at the levels observed will have any significant influence on error rates although very low frequency components of modulation noise are dropouts which probably arise when a dust particle or large asperity lifts the tape away from the gap.

5] Conclusions

When the noise properties are considered S-VHS is significantly superior to D1 tape.

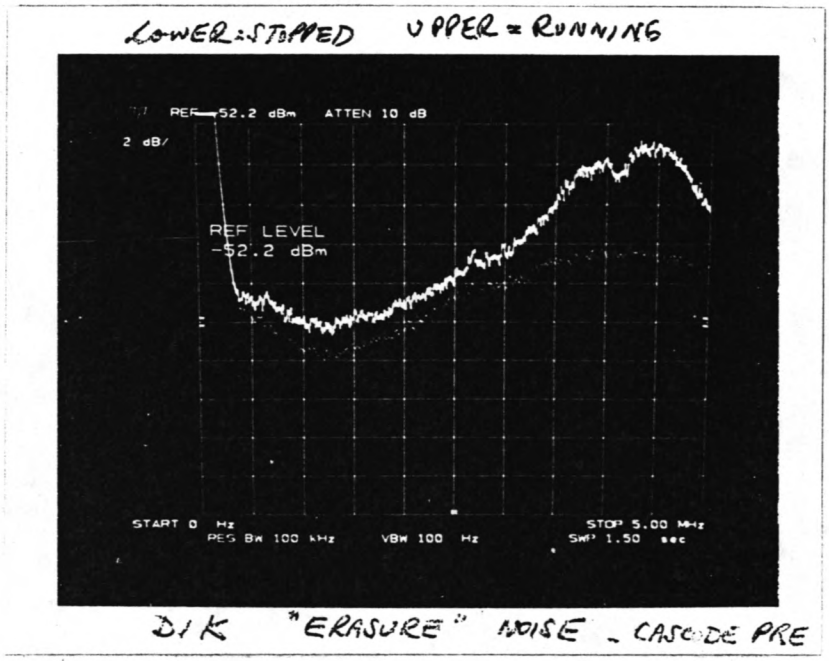

FIGURE 1.

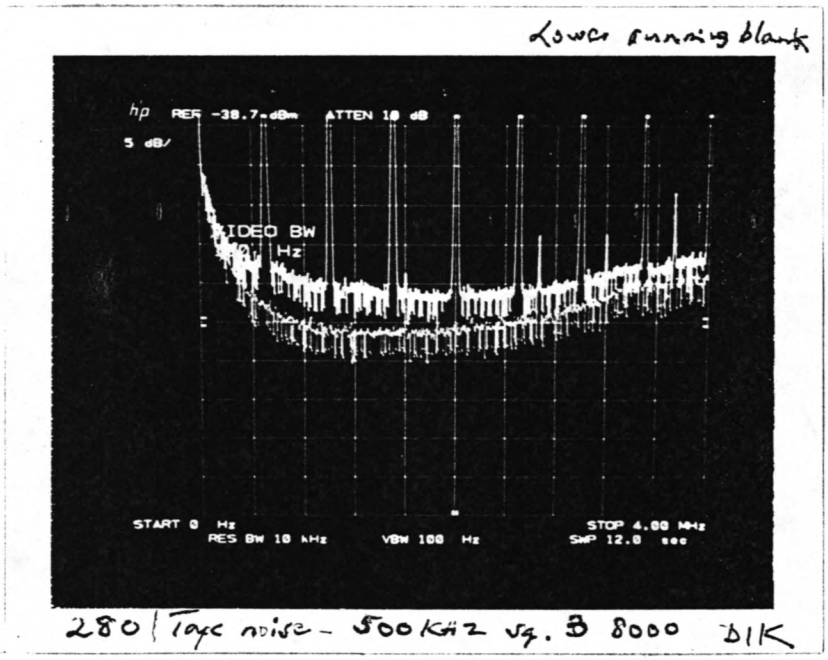

FIGURE 2.