MASSACHUSETTS INSTITUTE OF TECHNOLOGY
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TO : VLBA Acquisition Group

FROM : Dan Smythe

SUBJECT : 16 Passes with a 2 μm Guard Band

VLBA Acquisition Memo #119 reported good performance with a 5 μm guard band. I have discovered that peaking is possible, and error rates are low, even with a negative guard band. To better understand what happens when tracks are put close together, I measured the total power at 160 ips, for an isolated track and for a track with adjacent tracks recorded at ± 40 μm. The results are shown in Fig. 1, where the solid curves are sums of squared triangles, since the recorded waveforms are uncorrelated. Note that the power drops 3 dB between tracks and provides a good signal for peaking, even at offsets as small as 3 μm.

Error rates for two tracks on these two recordings are shown in Fig. 2. For the narrow guard band, errors start to rise at an offset of 4 to 6 μm, and time is not decoded at offsets greater than ± 12 μm; whereas for an isolated track, errors stay low for offsets as high as 12 μm. The conclusion is that guard bands as low as 2 μm, for passes in the same direction, are possible, provided the peaking algorithm does not stray more than 5 μm from the center of the track.

For passes in opposite directions, the minimum guard band is determined by anisotropies in the tape, as described in VLBA Acquisition Memo #129, and by the accuracy in calibrating the forward-reverse offset. For Mark IIIA Mode A, the reverse guard band is 35.5 μm, and all over-writing noticed at the correlator has been the result of calibration problems, rather than tape anisotropies.

A track spacing of 45 μm would provide 14 passes with a same-direction guard band of 7 μm and an opposite-direction guard band of 41 μm. A track spacing of 40 μm would provide 16 passes with a same-direction guard band of 2 μm and an opposite-direction guard band of 31 μm, which is probably acceptable, provided the recorders are kept well-calibrated and well-maintained.