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SUBJECT: NEW METALLIC CORES FROM MAGNETIC METALS

To: David R. Brown

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Abstract: A preliminary test on 12, 1/4-mil molybdenum permalloy cores from Magnetic Metals indicates that signal ratios are unsatisfactory for memory application. Disturbed-one-to-disturbed-zero ratio is about 35; disturbed-one-to-delta-one* ratio is about 50; and disturbed-one-to-delta-two* ratio is about 250. A slight disturb sensitivity was observed at moderate currents for most cores tested. Improved uniformity, however, is indicated.

One thousand 1/4 mil, square mu, 5 wraps, EA microcores were received from Magnetic Metals. These 1,000 cores were shipped on the annealing fixture so that they would arrive at this laboratory untouched by human hands. This was done to eliminate possible damage and change in characteristics due to handling. A preliminary test of 12 cores was made; average results are as follows:

Driving Current	$T_{1d(peak)}$	T_{1d}	1_d	$(0_d)T_{1d(peak)}$	Slight DS	$1_d/0_d$ $T_{1d(peak)}$
170	6.2	22.3	6.2	.15	50%	41
180	5.4	18.0	7.7	.19	58%	41
190	4.6	15.1	9.9	.32	83%	31
200	4.0	12.7	11.1	.41	83%	28

Driving Current in milliamperes.

$T_{1d(peak)}$ = time in microseconds the voltage output peaks.

T_{1d} = switching time, time voltage output decays to 10%

1_d = output voltage for disturbed one in millivolts.

0_d = output voltage for disturbed zero in millivolts at $T_{1d(peak)}$

* See Engineering Note E-448, "Delta$_{ns}$ in Ceramic Array #1"

DS = percentage of cores disturbed sensitive

$1_d/0_d$ = ratio of output voltage for disturbed one and disturbed zero at $T_{1d(peak)}$

For 170 milliamperes driving current:

$NS_1^1 - NS_0^1 = \delta_{NS}^1 = 0.22$ millivolts per core

$NS_1^2 - NS_0^2 = \delta_{NS}^2 = 0.022$ millivolts per core

1_d peak = 5.8 millivolts per core

$\left(\frac{1_d}{\Delta 1}\right)_{T_{1d(peak)}} = 41; \left(\frac{1_d}{\Delta 2}\right)_{T_{1d(peak)}} = 263; \quad (\delta_{NS}^2 = \delta_{NS}^3 \ldots)$

For 200 milliamperes driving current:

$NS_1^1 - NS_0^1 = \delta_{NS}^1 = 0.17$ millivolts per core

$NS_1^2 - NS_0^2 = \delta_{NS}^2 = 0.050$ millivolts per core

$NS_1^3 - NS_0^3 = \delta_{NS}^3 = 0.031$ millivolts per core

1_d peak = 10.0 millivolts per core

$\left(\frac{1_d}{\delta_{NS}^1}\right)_{T_{1d(peak)}} = 57; \left(\frac{1_d}{\delta_{NS}^2}\right)_{T_{1d(peak)}} = 200; \left(\frac{1_d}{\delta_{NS}^3}\right)_{T_{1d(peak)}} = 327$

$(\delta_{NS}^3 = \delta_{NS}^4 = \delta_{NS}^5 \ldots)$

The tests indicate that the uniformity is very good. A sample of switching time and disturbed-one output voltage for 180 milliamperes is as follows:

Switching Time in Microseconds	One Disturbed in Millivolts
23.1	5.4
18.0	7.8
18.0	8.2
18.2	8.0
20.0	7.0
20.4	7.0
18.0	8.0
16.6	9.0
16.6	9.0
20.6	7.8
16.6	9.2
20.2	6.2

Below 160 milliamperes, the disturbed-one output did not reach a peak but dropped off immediately. Most of the cores were slightly disturb sensitive at 190 milliamperes, and at 30 disturbs the outputs were slightly unstable. The ratio of disturbed-one to Δns showed that the cores would be unsatisfactory for a large array. In general, the only promising aspect of these cores are their uniformity.

Signed Arthur D. Hughes
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Approved DRB
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ADH/jk