

Digital Computer Laboratory  
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SUBJECT: A SQUARENESS RATIO FOR COINCIDENT-CURRENT MEMORY CORES

To: Group 63 Staff

From: David R. Brown

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Abstract: A quantitative index of hysteresis-loop squareness is defined. It can be determined directly from the hysteresis loop or by pulse test.

This engineering note defines a squareness ratio for coincident-current memory cores. The following discussion considers only a two-to-one selection ratio; however, the definition can easily be extended to other selection ratios.

Figure 1 illustrates the measurement of the squareness ratio from the hysteresis loop. The squareness ratio,  $R$ , has upper and lower bounds of plus and minus one; in the ideal case, it would be plus one. The larger the squareness ratio, the better the core. Note that  $R$  will be a function of  $I$ , the peak ampere turns. If  $R$  is plotted as a function of  $I$ , a single maximum will be found. The maximum squareness ratio,  $R_{max}$ , and the  $I_{max}$  at which  $R_{max}$  occurs, are usually figures of greatest significance.

Figure 2 illustrates the measurement of squareness ratio by a pulse test. Here again,  $R$  will be a function of  $i$ . The ratio  $R_{max}$ , and its  $i_{max}$ , should be determined. The rise time of the flux,  $\tau$ , can also be determined.

Squareness ratios for ferrites have been determined from 60-cycle hysteresis loops. The best specimen of MF-1118 has an  $R_{max}$  of 0.80. The optimum  $I$ , as determined by measurement of  $R_{max}$ , agrees with the optimum operating point as determined by the pulse measurements for ferrites. The validity of measurements of squareness ratios from 60-cycle hysteresis loops for metallic cores has not yet been established.

The measurement of squareness ratio by pulse test may offer some advantage over the presently used pulse tests. This advantage would be due to the fact that the determination would be dependent upon fewer variables. The measurement is not intended as a substitute for the present pulse test, but should be investigated and the results correlated with the results of our present pulse tests.

DRB/jk

Attached:

SA-51967 SA-51968

Signed

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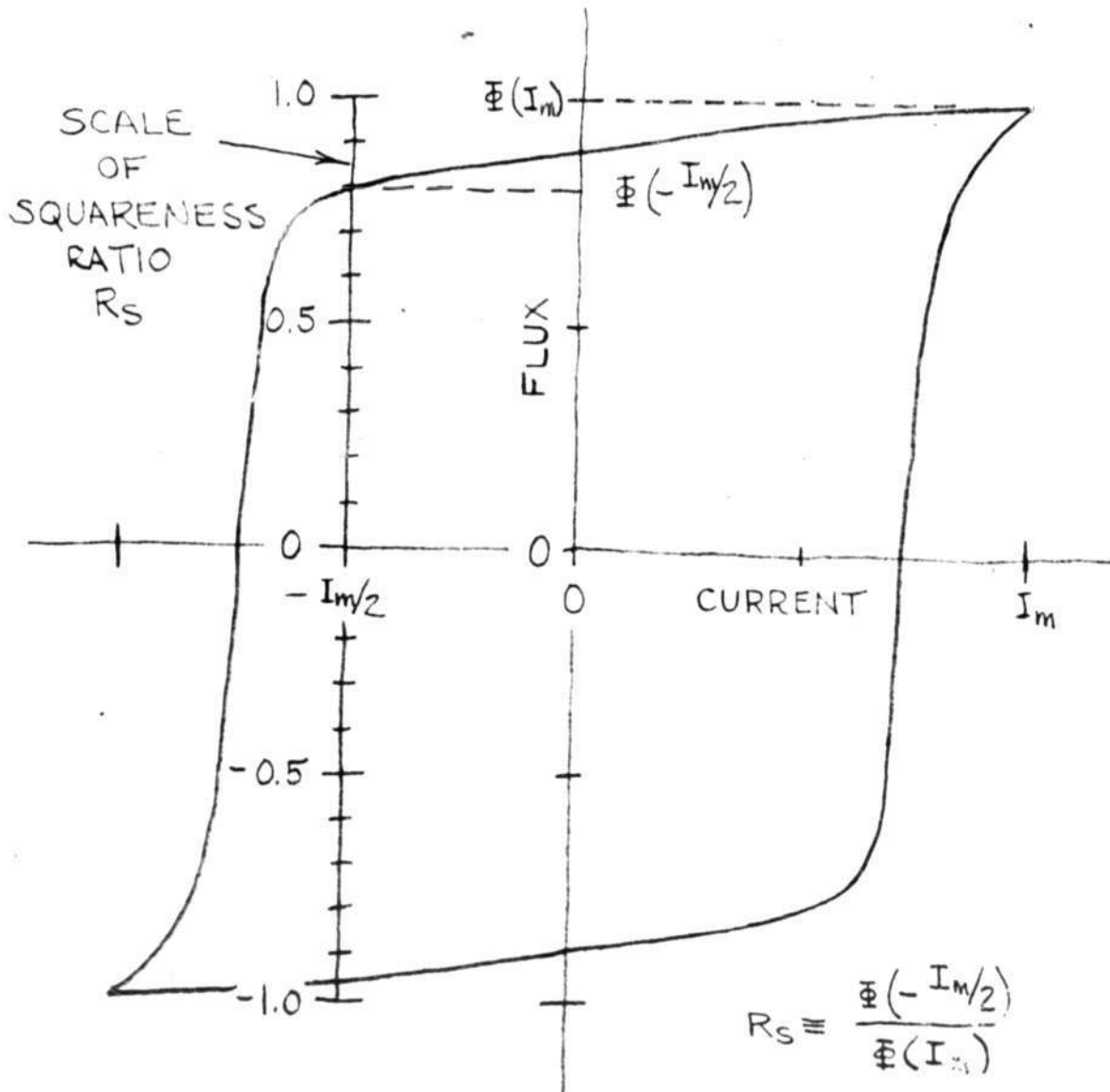


FIG. 1  
MEASUREMENT OF  
SQUARENESS RATIO  
FROM HYSTERESIS LOOP

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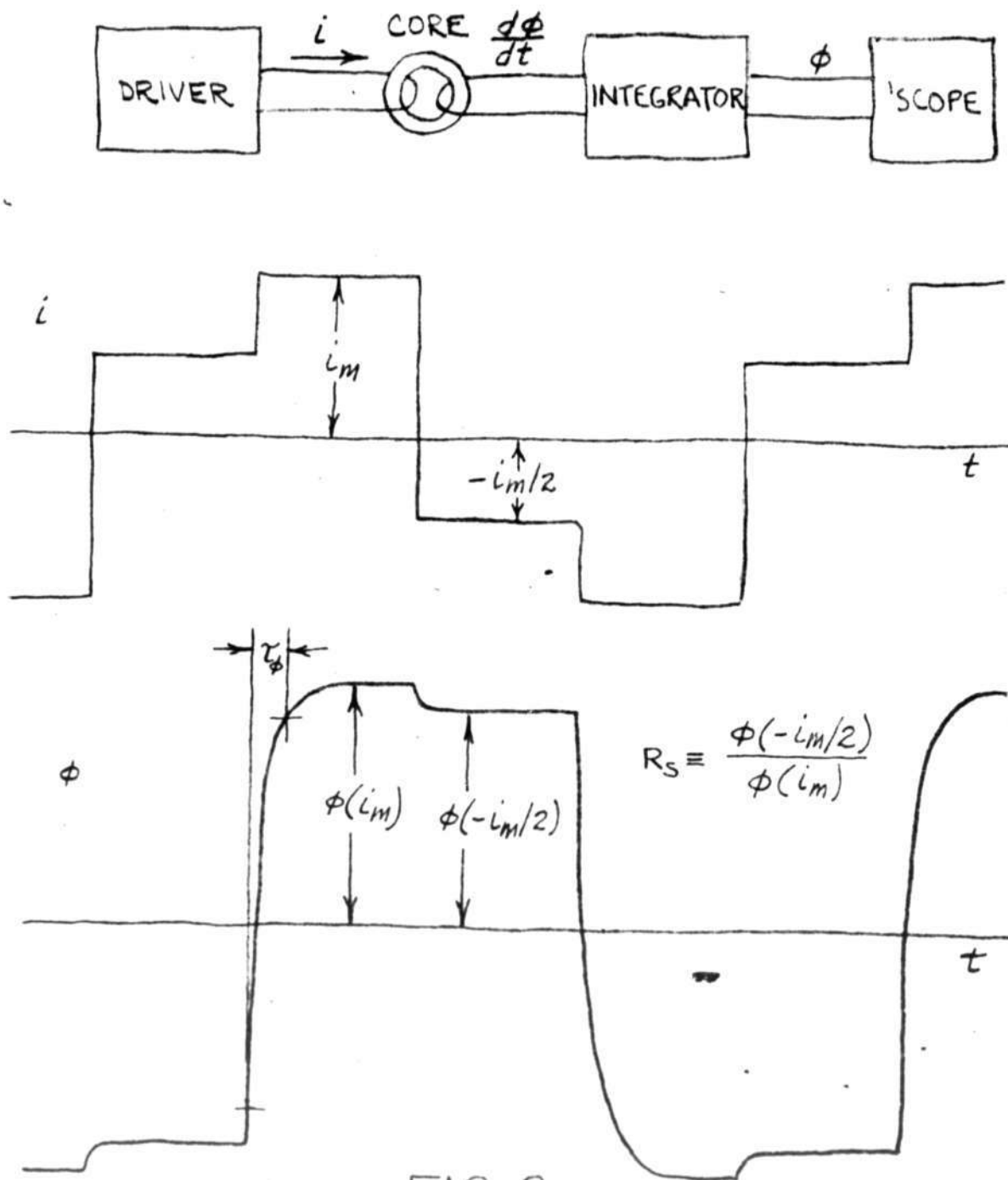


FIG. 2

MEASUREMENT OF  
SQUARENESS RATIO  
FROM PULSE TEST

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