

Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: MF-1326B, F-291, Life Test No. 1 -- Initial Tests

To: Group 63 Staff

From: James R. Freeman

Date: February 6, 1953

Abstract: Pulse tests were performed on twenty-four Lot 0, MF-1326B, F-291, ferrite cores preliminary to long-life tests. Cores of various disturbed one outputs as selected by the production tester were chosen for investigation. Measurements were made at several values of magneto-motive force between 1.0 and 1.5 ampere-turns. The maximum peak disturbed one was found to occur between 1.1 and 1.3 ampere-turns. Curves are plotted of the peak undisturbed one, peak disturbed one, peak disturbed zero, and disturbed zero at the time of peak disturbed one as well as the times associated with these outputs. The correlation between the peak undisturbed one and the core cross-sectional area is demonstrated.

Twenty-four MF-1326B, F-291, ferrite cores were selected from Lot 0 for pulse testing and subsequent life tests. These cores were originally checked at 1.0 ampere-turns by the production tester and sorted according to nominal values of disturbed one at 0.57 microseconds. Two cores each were selected from the following outputs: 60, 70, 80, 90, 100, 130, 140, and 150 millivolts; and in addition eight production selected cores were chosen. These are cores with outputs of 110 or 120 millivolts as measured by the production tester.

Physical measurements of inside diameter, outside diameter, and thickness were made with calipers. The cores were also B-H loop tested. A special rack was constructed to mount cores for pulse testing. This rack enables half the cores to remain unpulsed while on life test.

Pulse output measurements were made on the cores at four points between 1.0 and 1.5 ampere-turns. A pulse duration of 10 microseconds and rise time of 0.2 microseconds was used for all tests. Complete data were taken for all cores. Due to the extensive amounts of data obtained only representative data are presented in this report.

Two objectives are to be realized from the tests: first, information on the response of cores of different disturbed one outputs with variations in magneto-motive force; and second, a controlled check on the long-life characteristics of the cores.

Figure 1 shows the peak disturbed one output versus ampere-turns for five of the twenty-four cores. The five characteristics plotted were

chosen to indicate the variations among cores. Core 20 is the strongest core for peak disturbed one, notwithstanding the fact that several cores have a greater peak undisturbed one at certain currents, and one core is uniformly stronger in peak undisturbed one.

Core 2 is the weakest core in peak disturbed one at the lower values of magneto-motive force, although its output is greater than at least half of the cores at 1.4 ampere-turns and above. This is due to the fact that some cores reach maximum peak disturbed one at lower values of magneto-motive force. Core 14 is the extreme example of this.

Core 5 has the most typical peak disturbed one characteristic. It has a relatively low output at 1.0 ampere-turns and is therefore a rejected core by the production test specifications. It peaks at 1.25 ampere-turns as do the strongest and weakest cores.

Figure 2 shows the various pulse characteristics of core 5. At 1.0 ampere-turns the peak disturbed one and peak undisturbed one outputs are nearly equal. They converge at lower values of magneto-motive force. The peak disturbed zero characteristic is relatively small over the lower range but breaks sharply where the peak disturbed one is maximum. Beyond this point, the peak disturbed zero rises rapidly to converge with the peak undisturbed one; while the peak disturbed one drops off at an equally rapid rate. The disturbed zero output at the time of peak disturbed one does not exhibit such a marked rise at the higher values of magneto-motive force as does its peak.

Figure 3 shows a plot of the times associated with the pulse outputs in Figure 2. The total switching time for the disturbed and undisturbed core is also shown. A seemingly anomalous effect has been observed here. In all pulse measurements performed by the writer, the disturbed pulses have lagged the undisturbed pulses in time. It would seem that a disturbed core being initially partly switched would tend to switch more rapidly than one not so disturbed. However, the contrary is observed.

A correlation between the peak undisturbed one and the cross-sectional area as determined from the caliper measurements is shown in Figure 4. Such a correspondence between pulse output and core cross section is to be expected.

Conclusions:

1. Lot 0 cores operated with pulses of 10 microseconds duration exhibit maximum peak disturbed one outputs between 1.1 and 1.3 ampere-turns, 1.25 ampere-turns being the mean.
2. On the basis of reasonable discrimination between disturbed one and disturbed zero outputs, MF-1326B, F-291, cores will not operate satisfactorily at values of magneto-motive force exceeding 1.1 ampere-turns.

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3. Undisturbed cores peak and switch faster than disturbed cores. Work should be done to investigate the reasons for this phenomenon.

4. The magnitudes of the undisturbed one outputs vary proportionately with the cross-sectional areas of the cores.

Signed James R. Freeman
James R. Freeman

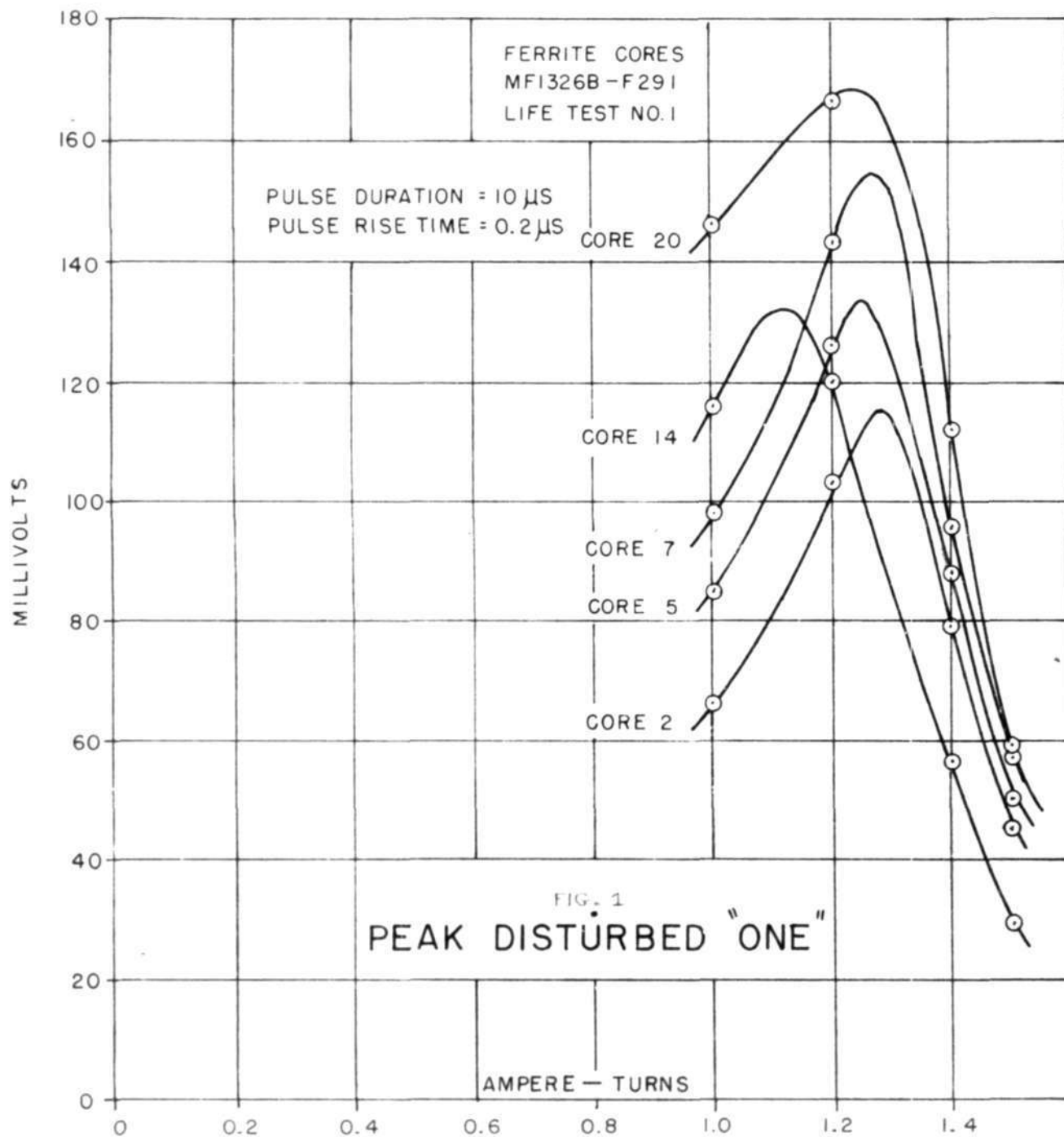
Approved DRB
David R. Brown

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Drawings attached:

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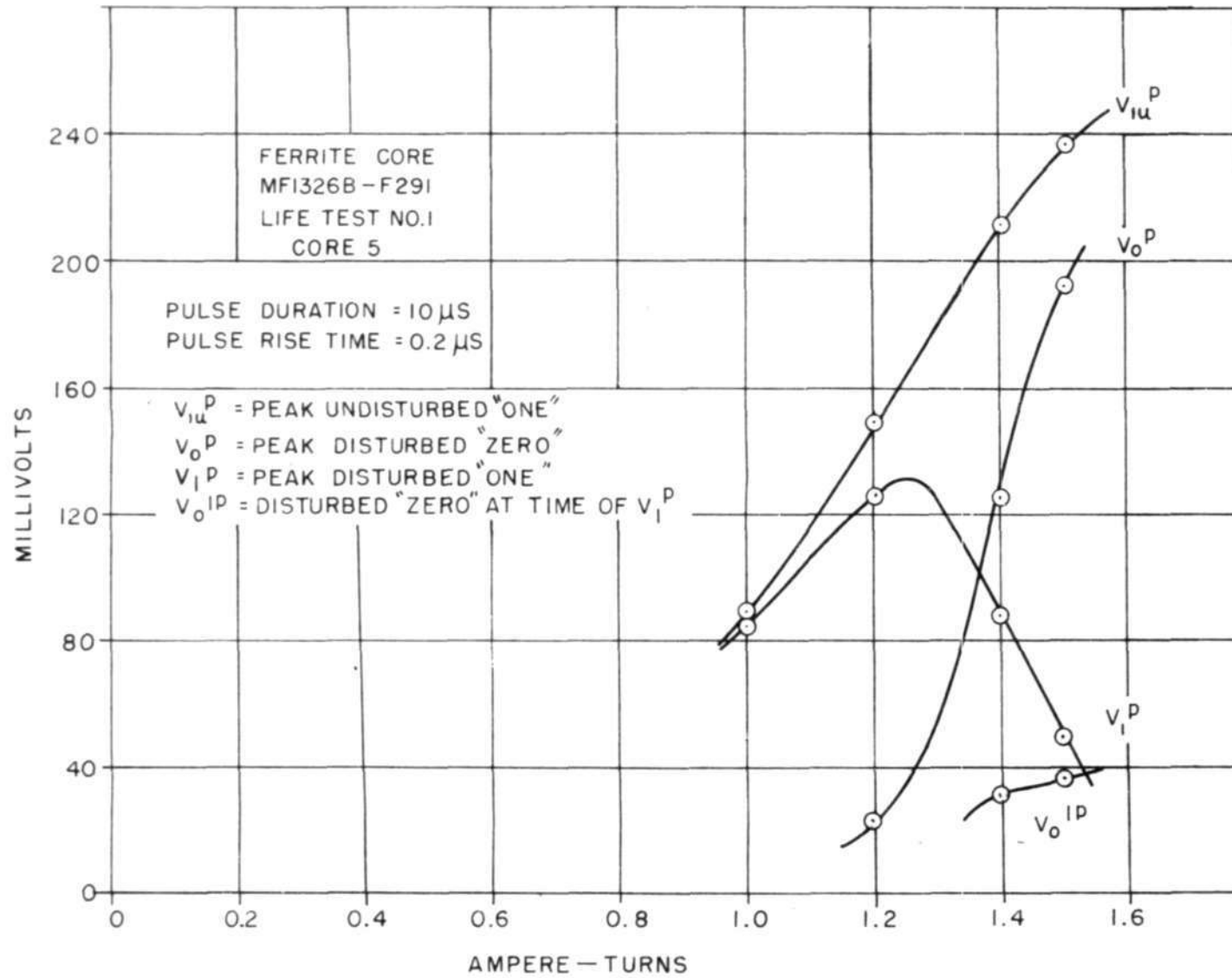


FIG. 2

PULSE VOLTAGE OUTPUTS

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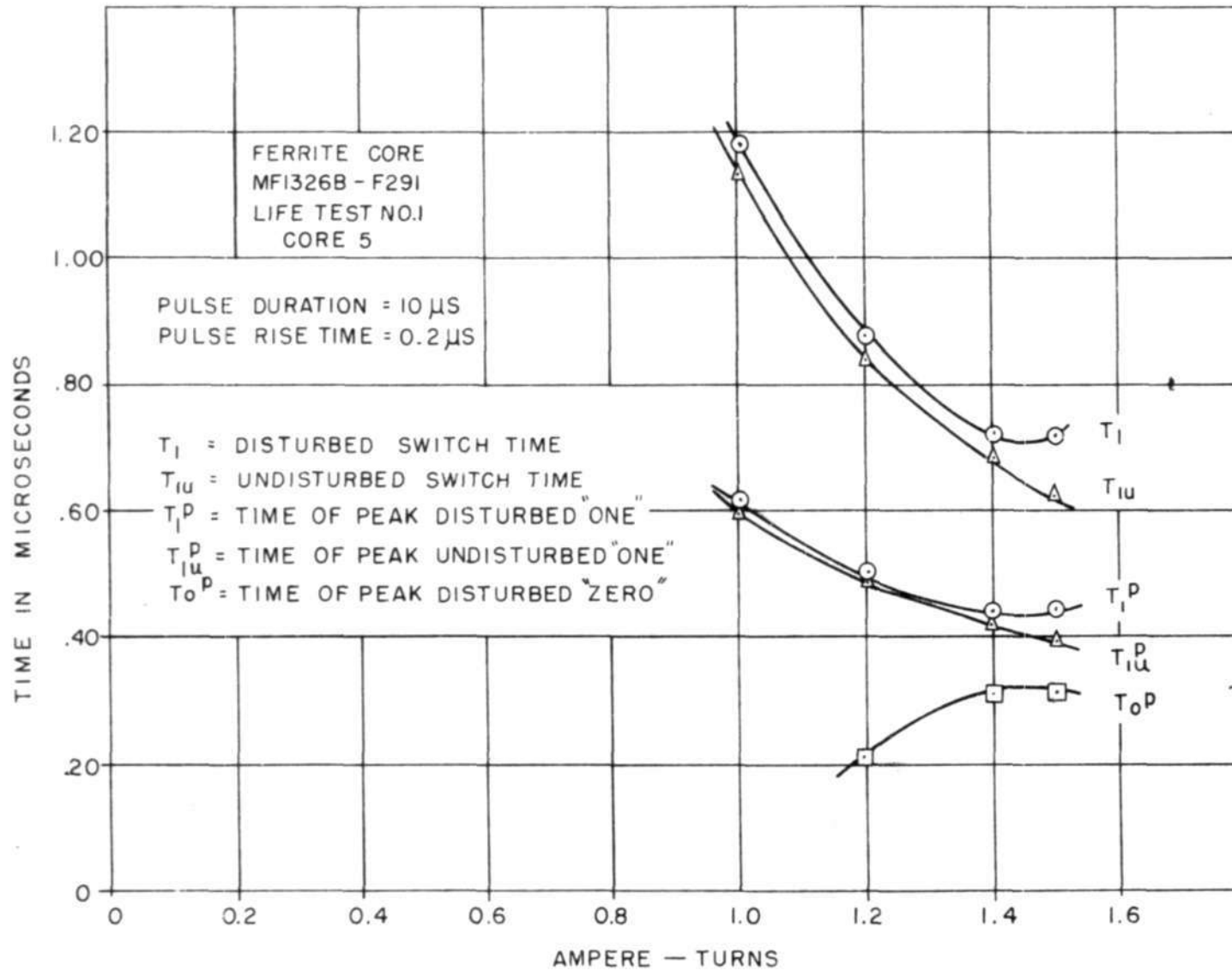


FIG. 3

TIMES OF PULSES VOLTAGES

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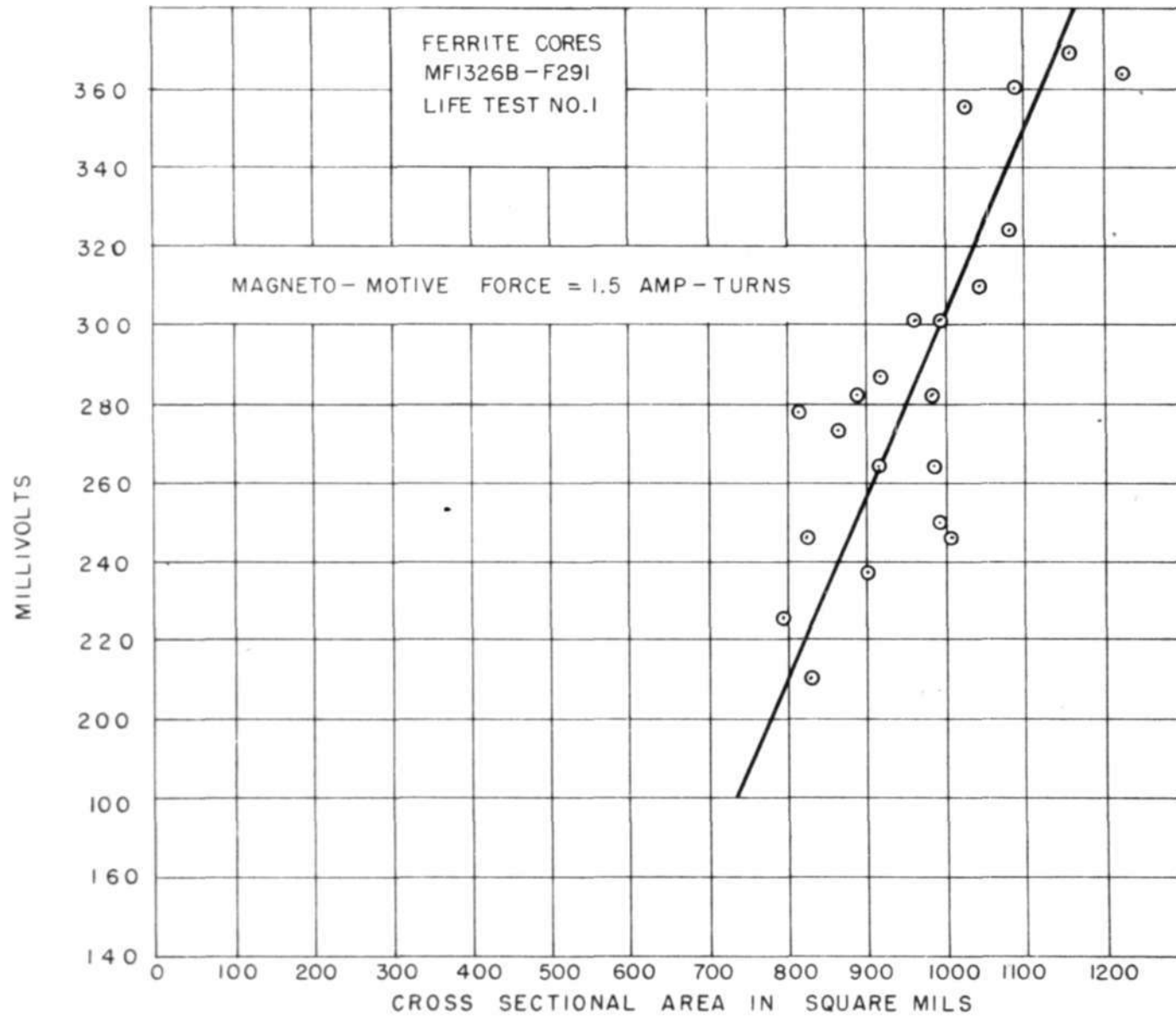


FIG. 4

PEAK UNDISTURBED "ONE" vs CROSS SECTIONAL AREA