

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING

Report No. 46

Prepared by: R.F. Markel

Progress Report to the Department Committee on Graduate Study and Research
Subject of Research: Gas-Discharge Gaps for Data Storage in Electronic
Computers.

Period covered by this report September 30 to October 17, 1947

Student(s) working on research:

Noted by:

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Expected date of completion January 1948

Supervisor

Supervisor Jay W. Forrester

DETAIL OF WORK CURRENTLY ACTIVE Calculation of Static Breakdown Charac-
teristics.

Expected date of completion of this detail: October 25, 1947

STATEMENT OF PROGRESS SINCE LAST REPORT. Discrepancies between calculated results and the experimental data obtained last term have indicated the need for a more searching analysis of the problem. A more accurate calculation of the electrostatic field existing in the gap was the first step in this direction.

1. Conformal mapping was first employed to represent the electrostatic field (Ref. C) with results that indicate that the anode edges must be rounded considerably to eliminate high field concentrations.
2. Assuming that the anode is rounded, the electrode structure was then represented by con-focal hyperboloids, and the field problem was solved by using spheroidal coordinates (References A,B). The results show that the field distribution is quite different from that of a cylindrical system.
3. The effect of placing dielectric boundaries on the gap was investigated, and the conclusion was reached that by making the reasonable assumption that the dielectric boundaries are normal

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to the equipotential lines, their effect on the electrostatic field strength in the gap could be neglected.

4. Calculation of the static breakdown characteristics, making use of the above results, is now under way.
5. The following references have been helpful in this analysis:
 - A. J.A. Stratton, "Electromagnetic Theory" pp 47-59, 194-201.
 - B. H. Bateman, "Partial Differential Equations of Mathematical Physics", Chap. 8.
 - C. Rothe, Ollendorf, Pohlhausen, "Theory of Functions as Applied to Engineering Problems", pp 125-145

Signed Richard F. Markel