

History of the EMP Note Series

The Road to High-Power Electromagnetics

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Abstract— This paper documents the expansion of research on the nuclear electromagnetic pulse to a much more diverse range of topics including lightning, high-power microwave devices and effects, electromagnetic effects on electronics as well as various forms of electromagnetic pulse. The expansion of the discipline took place alongside the internationalization of the cohort of researchers. This case provides an example of the movement of military research into the public domain since the 1960s. Two sources are used to track these trends: 1) the titles and authors of the Notes on EMP and Related Subjects beginning in 1964, and 2) the proceedings of the Nuclear Electromagnetic Meetings from 1978. The analysis stresses the importance of the Notes as an informal mechanism for the communication of research findings.

Keywords—EMP Note Series, EMP, High-Power Electromagnetics

I. TRENDS

In [1] we examined the various NEM, AMEREM and EUROEM publications and examined some of the trends in subject matter at these meetings over the years. Starting in 1992, there was a large increase in non-US participation. There was also a shift in the emphasis from EMP to other facets of high-power electromagnetics (HPEM) like HPM. The Notes provide additional data to examine those and more personal trends among the various authors. These trends are meant to form a foundation and motivation for future note authors.

II. WHAT IS A NOTE?

The Note series on EMP and related subjects was established in 1964 by Dr. Ralph Partridge of Los Alamos Scientific Laboratory. Editorship of the Notes shortly passed to Dr. Carl Baum of Air Force Weapons Laboratory. The aim of the Note series was to provide an informal means of disseminating research findings before the long process of publication, enabling faster communication between EMP researchers in the United States and Britain. Notes did not contain final research findings but rather sets of ideas at the mid-point of the workflow of scientific ideas outlined below:

1. Memos – Raw notes and ideas – not usually published

2. Presentation at work-in-progress conferences like NEM or URSI
3. Notes – Collection of ideas to form a finished but still evolving product
4. Presentation at Conferences designed for finished work like IEEE AP-S or ICEAA.
5. Transactions (IEEE or other peer reviewed journal)
6. Books or hardware

III. MILESTONE NOTES

There were a number of Notes that were of historical significance. The first Note was by Ralph Partridge at Los Alamos and described requirements for an EMP Simulator. Carl Baum expanded on that theme with a number of Notes through Sensor and Simulator Note 143 that stated the requirements for ATLAS-1 or TRESTLE. In this case, the final product of the theoretical work was a large wooden simulator that stands as a monument today to EMP simulation and in a large sense to the scientists of the Cold War.

Substantial basic electromagnetic interaction was key to understanding the effects of EMP and other electromagnetic threats to systems. Many of the early Notes dealt with cable coupling. Much of that early work was formalized in Interaction Note 88 that first described the Singularity Expansion Method. Note 88 was followed by Notes by Drs. R. Latham, L. Marin, and F. Tesche on various theoretical attributes of SEM. Award winning papers, by Marin and Tesche, based on this work were later published in IEEE AP-S Transactions. We will discuss these and other milestone notes during the presentation.

REFERENCE

- [1] L. A. Gardner, R. L. Gardner and Carl E. Baum, "The Internationalization of the Electromagnetics Meetings and Related Activities of the SUMMA Foundation", Proceedings of the 2011 IEEE International Symposium on Antennas and Propagation and USNC/URSI National Radio Science Meeting, Spokane WA USA, 2011.