

Author's Research Note:
Observations Regarding The ESD Continuum.

The research reports published in 1981 and 1982 (by King and Reynolds) provided indications that the electrostatic field displacements, commonly known as “electrostatic discharge” (ESD) from personnel, altered the concept that the displacements could be described by a simple resistor-capacitor network that was only referenced to earth ground. In place, a dynamic spectral continuum was observed as derived from the displacement events, with many variations evident of the “equivalent network” yielding the discharge. Some of these observations were noted to be attributable to spatial impedance transfers and not only conducted currents in R-C networks.

Specifically, as suggested by the report (by King) in 1987, the ESD initialization amplitude to resultant spectral inter-relationships indicated that variations of system or product response could be anticipated due not to ESD amplitude, as previously thought, but rather to spectral profile shapes. Separately from the efforts of King and Reynolds, William W. Byrne (then of the Southwest Research Institute – SWRI – San Antonio, Texas) produced two reports that tended to imply veracity of the experimental data. The reports are recommended for review:

- a. Byrne, William W., “Development of Design and Test Procedures to Meet Electrostatic Discharge (ESD)”, Proceedings of the 1982 MIDCON Convention, Dallas Texas, Session 28/4; and,
- b. Byrne, William W., “The Meaning Of Electrostatic Discharge (ESD) In Relations to Human Body Characteristics And Electronic Equipment”, Proceedings of the 1983 IEEE International Symposium on Electromagnetic Compatibility, Pgs 369-380.

In the above reports, Byrne suggested a delineated multi-element model that in general agreed with the block model suggested by King & Reynolds in the 1981 report. The study of this model is suggested to understand the dynamics of the ESD continuum with the related effect on spectral displacements.

Other valuable and foundational references include:

- c. Mardiguian, Michel, “Electrostatic Discharge, Understand, Simulate and Fix ESD Problems”, 2nd Ed., 1992, Published by Interference Control Technologies, Inc., Gainesville Virginia (ISBN 0-932263-27-5); and,
- d. American National Standard Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment, ANSI, C63.16 – 1994, Published by the IEEE New York, N.Y.

The work by Mardiguian provides valuable insight into the history and evolution of ESD information and processes combined with a wide overview of applications and descriptions of effects. The ANSI guide is particularly informative on comparisons between ESD events as they develop in nature against the results of various “standards” approaches, and between air-discharge events and artificial “contact” discharge simulations.

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