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RIT Inn & Conference Center, 5257 W. Henrietta Rd. Rochester, NY 14623

2014 IEEE JCM

Rochester Section Joint Microwave Theory and Techniques & Antennas and Propagation Society presents:

A Tale of Two Talks: The Historical Acceptance of Maxwell's Equations and their Application to Printed Circuit Board Surface Roughness Analysis

By

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Abstract:

The Historical (abbreviated version)**:**

Maxwell first published what came to be called "Maxwell's equations" in 1865. However, it was not until 1888, and Heinrich Hertz's experimental validation that Maxwell's equations were widely accepted as correct. The story of the intervening 23 years is little known. Maxwell, who died in 1879, was exceptionally modest and did not promote his own results at any time. The survival of Maxwell's equations was up to the only three researchers in the entire world who paid serious attention to Maxwell's paper in 1865 and his seminal Treatise in 1873: Oliver Heaviside, Oliver Lodge, and George Francis FitzGerald. Later, Hertz joined the group forming "The Four Maxwellians". This presentation describes the torturous 23 year path Maxwell's equations took from their creation to their initial acceptance. No mathematical knowledge is needed or expected; this presentation is ideal for a general audience.

The Technical:

A typical PCB electro-deposited foil has 3 microns RMS surface roughness, required for good adhesion. However, surface roughness increases loss. Previous models either grossly over- or under-estimate roughness loss. In addition, these old models fail to include the substantial (up to 15%) effect roughness has on effective dielectric constant. We demonstrate how these problems are now completely solved. This presentation is based on the Best Paper award winning presentation at DesignCon February 2010 written in collaboration with Rogers Corporation and is based on over 12 months of collaborative research.

Biography:

James C. Rautio (S'77–M'78–SM'91–F'00) received the B.S.E.E. degree from Cornell University, Ithaca, NY, in 1978, the M.S. degree in systems engineering from the University of Pennsylvania, Philadelphia, in 1981, and the Ph.D. degree, under Dr. Roger Harrington, in electrical engineering from Syracuse University, Syracuse, NY, in 1986.

From 1978 to 1986, he was with General Electric, initially with the Valley Forge Space Division, then with the Syracuse Electronics Laboratory. During this time, he developed microwave design and measurement software and designed microwave circuits on alumina and on GaAs. From 1986 to 1988, he was a Visiting Professor with Syracuse University and Cornell University.

In 1988, he took Sonnet Software, North Syracuse, NY, full time, a company he had founded in 1983. In 1995, Sonnet Software was listed on the Inc. 500 list of the fastest growing privately held U.S. companies, the first microwave software company ever to be so listed. Today, Sonnet Software is the leading vendor of high accuracy three-dimensional planar high-frequency electromagnetic analysis software with Dr. Rautio as CEO and president.

Dr. Rautio was the recipient of the 2001 IEEE Microwave Theory and Techniques Society (IEEE MTT-S) Microwave Application Award. He was appointed MTT Distinguished Microwave Lecturer for 2005 – 2007 lecturing on the life of James Clerk Maxwell. He received the 2014 MTT Distinguished Service Award.