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Electromagnetic Simulators: A Review

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ABSTRACT: The computer Aided tools used in the design and testing of circuits can be utilized for solving various electromagnetic field problems and design of Radio Frequency and Microwave antennas. The Method of Moments, Finite Element and Finite difference Time domain solutions are the important technologies in the development of Electromagnetic simulations. This paper aims to explore the various tools available for the electromagnetic simulations for both research and commercial purposes.

KEYWORDS: electromagnetic fields, computer aided tools, spectrum etc.,

I.INTRODUCTION

The packaging of more components in a single chip for various applications increases the electromagnetic interference and radiation which increases the noise and distortion. Hence it is mandatory to study about the electromagnetic interference and compatibility. The various computer aided tools which are used for the past twenty years, offers wide range of analysis facilities. The boom in the software tools for analyzing the electromagnetic characteristics has been increasing in the recent days. Hence this paper aims at exploring various electromagnetic simulators available for the student as well as researcher community.

II.AVAILABLE SIMULATORS

In this section, the simulators to be discussed are openEMS, SONNET, Lorentz Solution, Finite Element Method Magnetics. The openEMS is a open source free software which uses Finite difference Time domain solutions written using C++. It has the MATLAB – interface with a fully graded Mesh and has 3 D cylindrical co - ordinates and remote simulations are possible.[1]
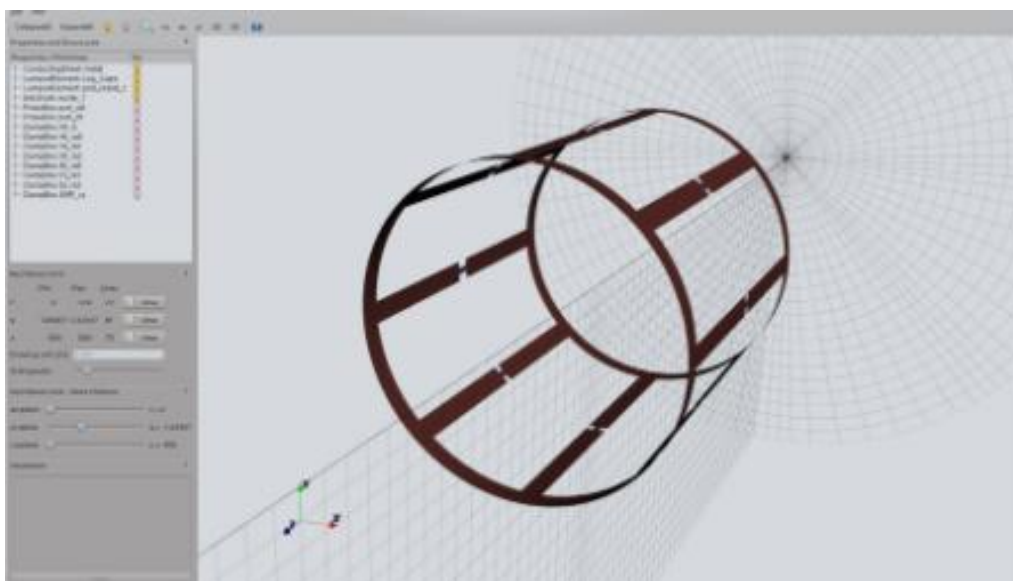

Figure 1. openEMS Solutions (copyrighted to openEMS)

Sonnet is a free software for the EM analysis for high-frequency components and boards and for the analysis of predominantly planar high-frequency designs from 1 MHz through several THz.Sonnet is used to analyze planar structures like Microstrip matching networks, coupled transmission line analysis, Broadside-coupled transmission lines etc.,[2]
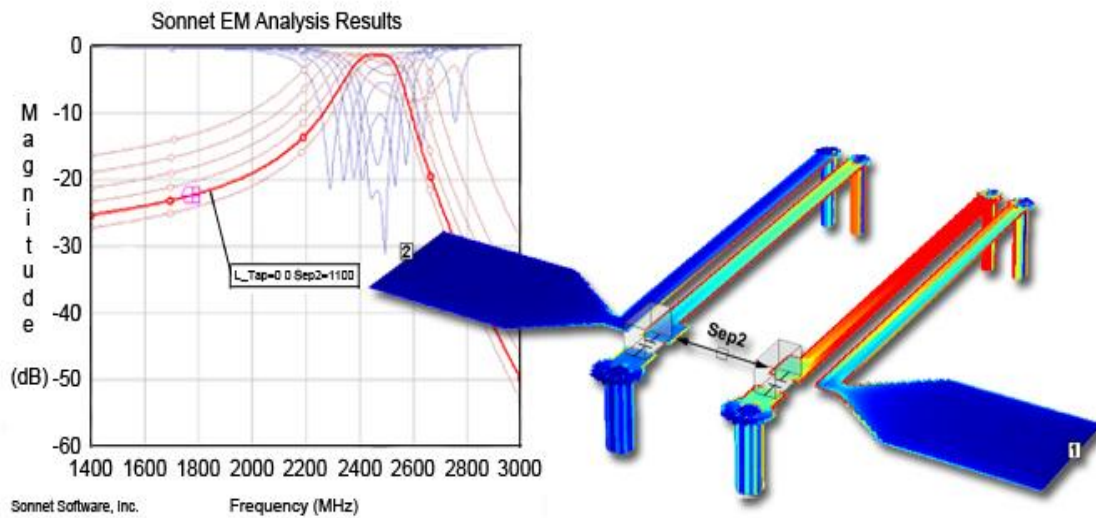

Figure 2. SONNET (copyrighted to Sonnet)

Lorentz Solution, has it PeakView™ software which is an electromagnetic design platform with a fast and completely automated IC design experience. It makes use of Method-of-Moments-based full-wave EM solver for the easy process of high frequency semiconductor design. It supports the next generation microwave and millimeter wave bands, with THz frequencies. The data generated has close correlation to silicon measurements. [3]
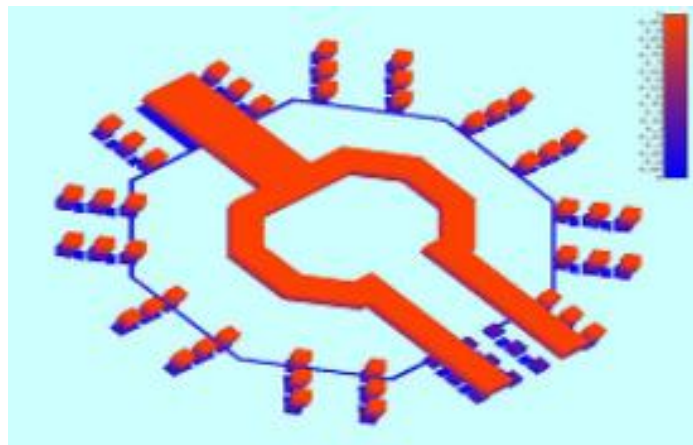

Figure 3. Lorentz Solution (copyrighted to Lorentz Solution)

The Finite Element Method Magnetics is used for solving low frequency electromagnetic problems on two-dimensional planar and axisymmetric domains. It addresses the linear/nonlinear magneto static problems, linear/nonlinear time harmonic magnetic problems, linear electrostatic problems, and steady-state heat flow problems.[4]
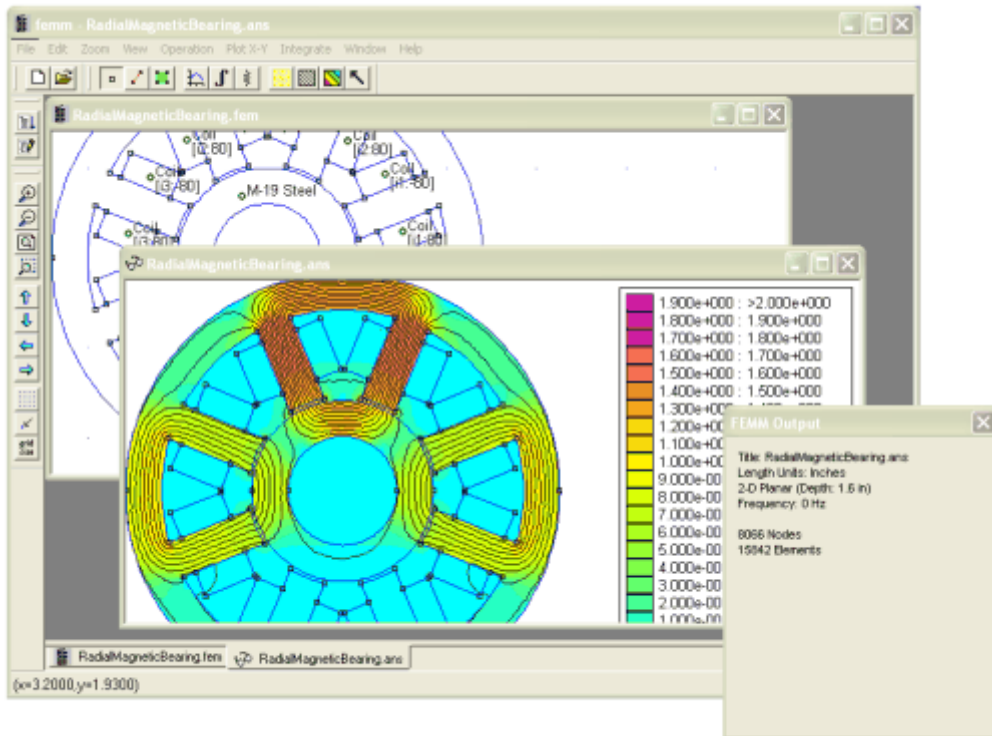
Figure 4 .Finite Element Method Magnetics (copyrighted to FEMM)

III. CONCLUSION

Thus, the open-source solvers in electromagnetics allow the users the flexibility utilizing these resources for solving the various electromagnetic issues beforehand so that practically the interference, radiation and compatibility can be studied beforehand.

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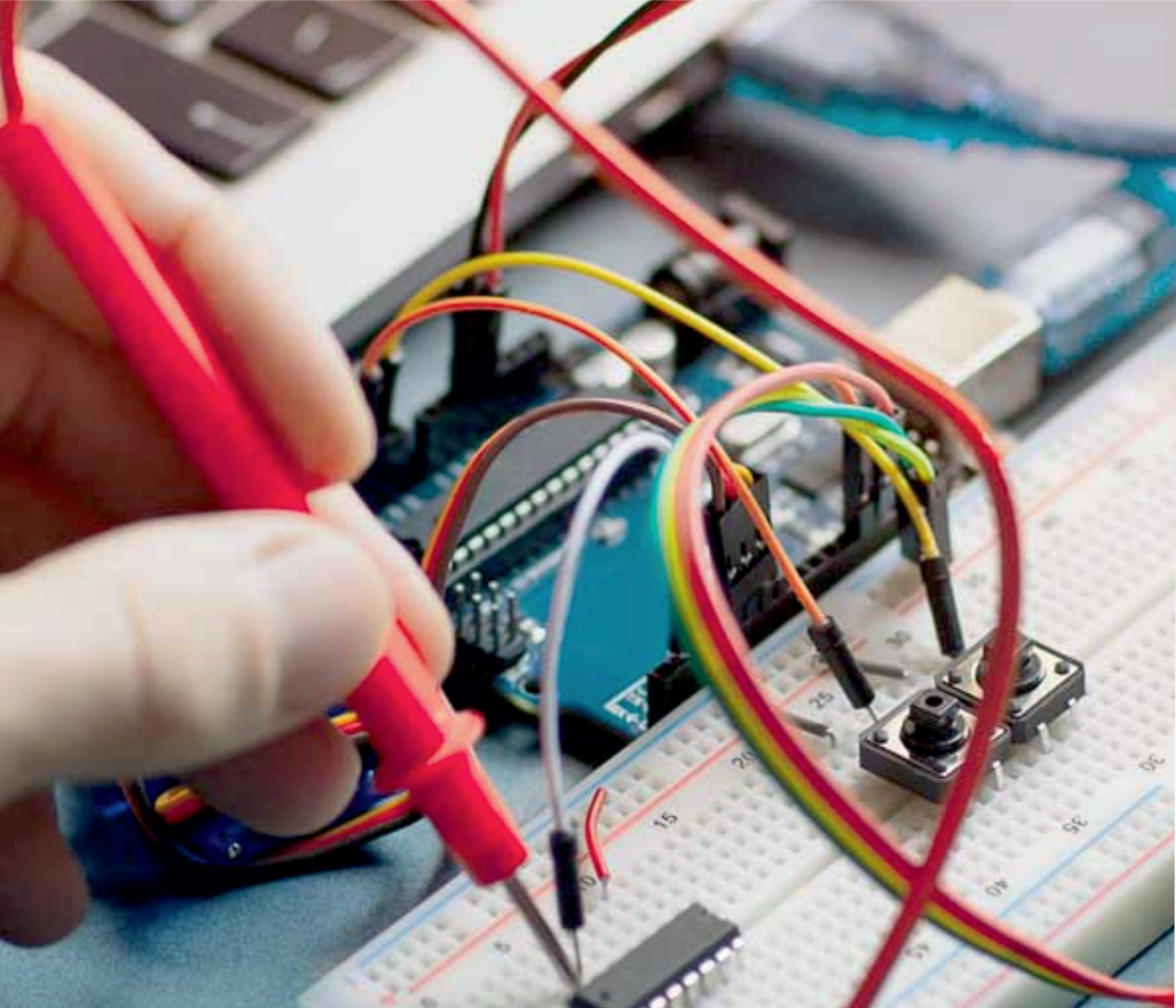
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