

Electromagnetic Wave Analysis of Waveguide and Shielded Microstripline

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Introduction: Electromagnetic wave analysis of waveguide and shielded microstrip transmission line has been done in this paper with the help of Finite Element Method (FEM) based COMSOL Multiphysics software.

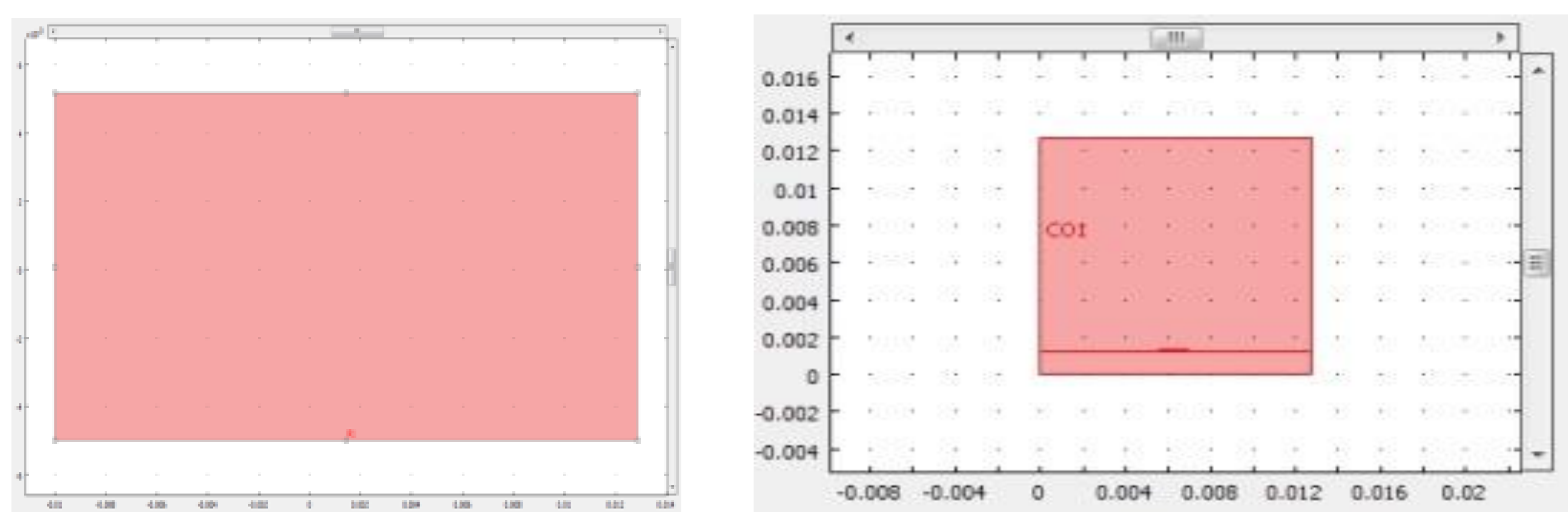


Fig.1 Geometry of waveguide and shielded microstrip transmission line

Finite Element Methods: Electromagnetic energy can propagate in the waveguide, in the form of TE or TM waves and in the shielded microstrip transmission line, in the form of hybrid waves.

$$\partial^2 E / \partial x^2 + \partial^2 E / \partial y^2 + (k_0^2 - \beta^2) E = 0$$

Above equation is known as Wave Equation. FEM can be used for solving the Wave Equation and the analysis of the field distribution inside a waveguide and shielded microstrip transmission line.

Simulation Results: The generated model is solved to obtain the computational result in the form of visualization of the field power density distribution of the different modes in the transversal cross section of the waveguide depicted in fig. 2.

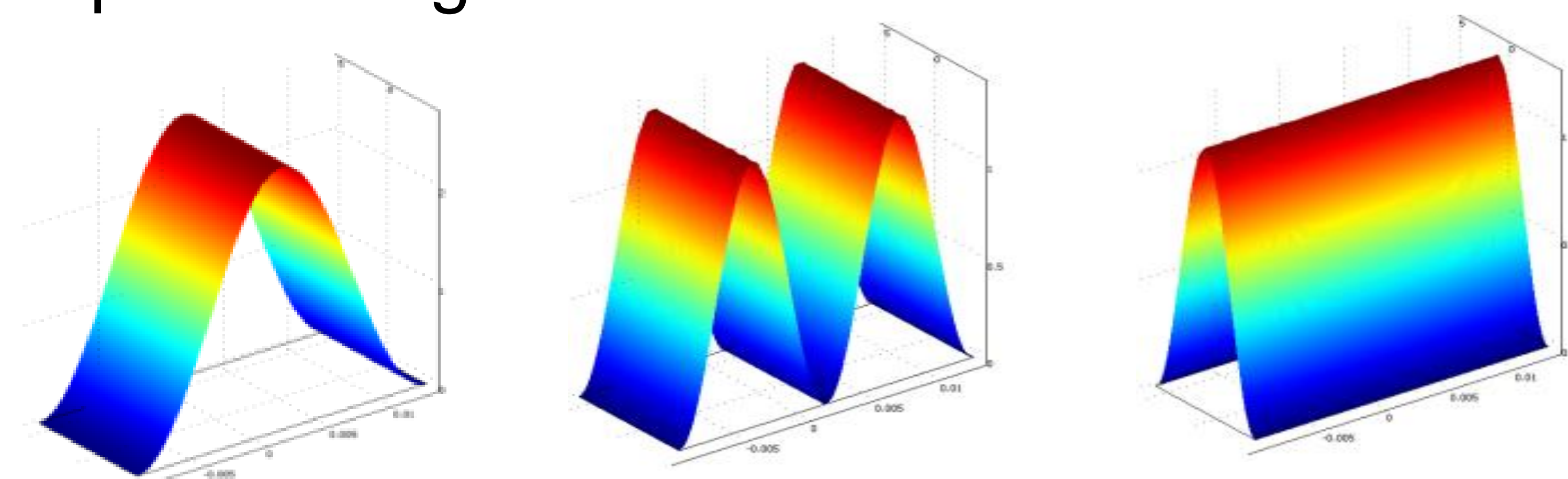


Fig.2 Field power density distribution of the modes TE₁₀, TE₂₀, TE₀₁

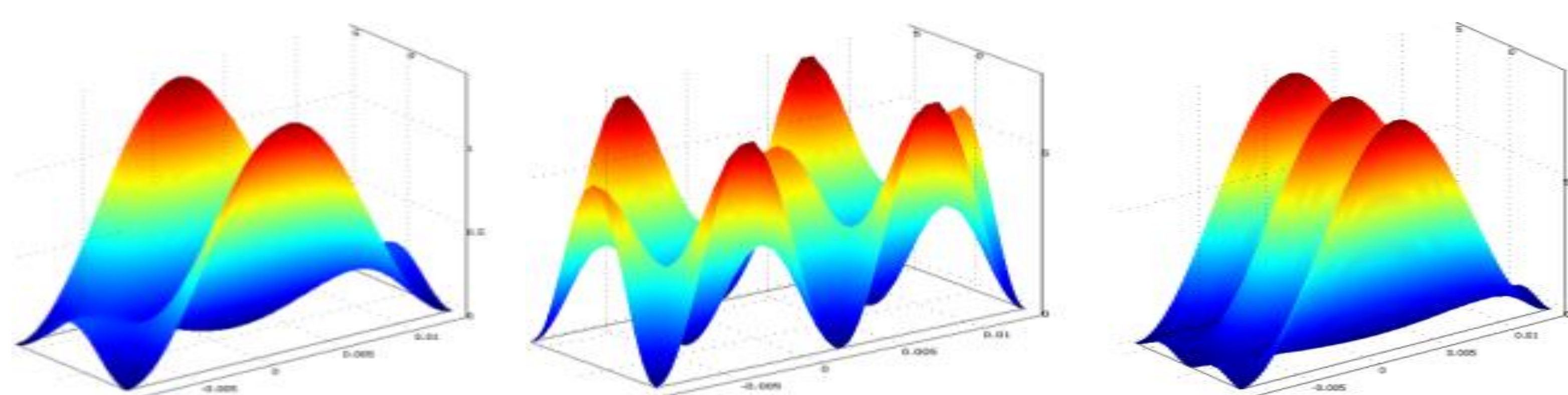


Fig.3 Various field power density distribution of TM modes

The 3D and arrow plots of field power density distribution of shielded microstrip transmission line at 10GHz and 20GHz are shown in fig.4 and fig.5

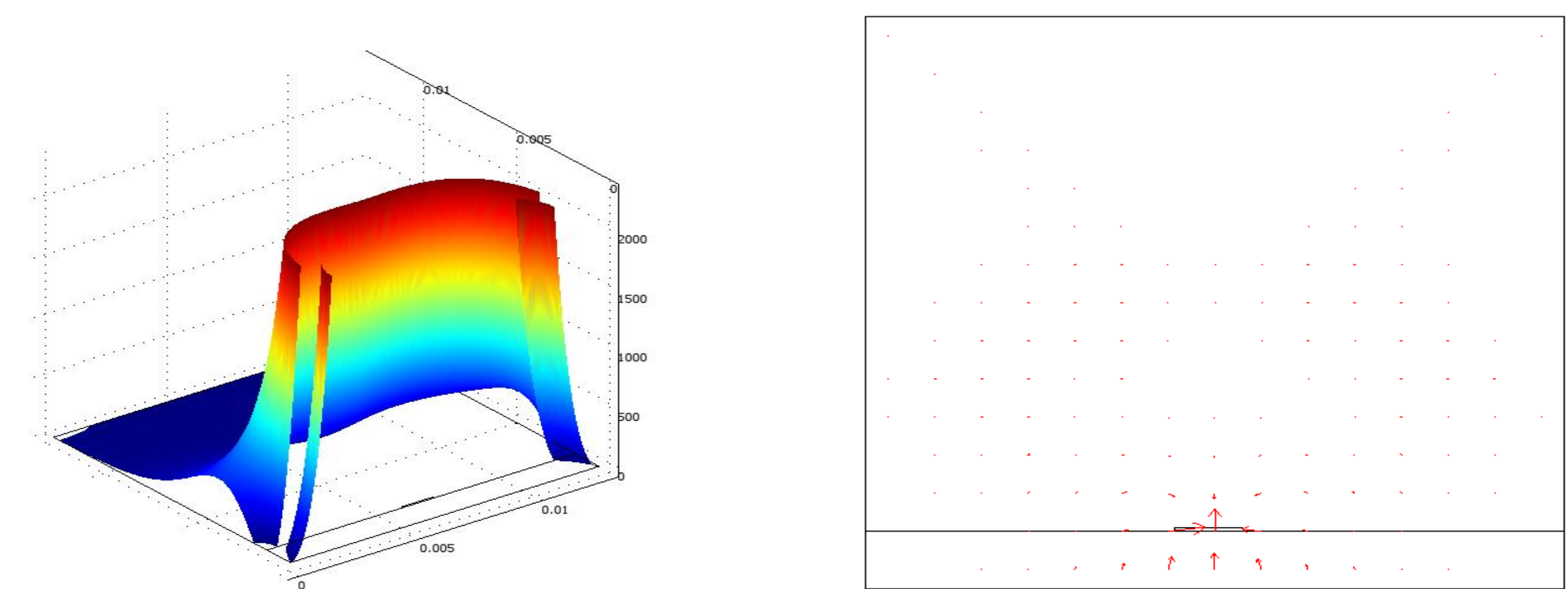


Fig.4 The 3D and arrow plots of field power density distribution of shielded microstrip transmission line at 10 GHz

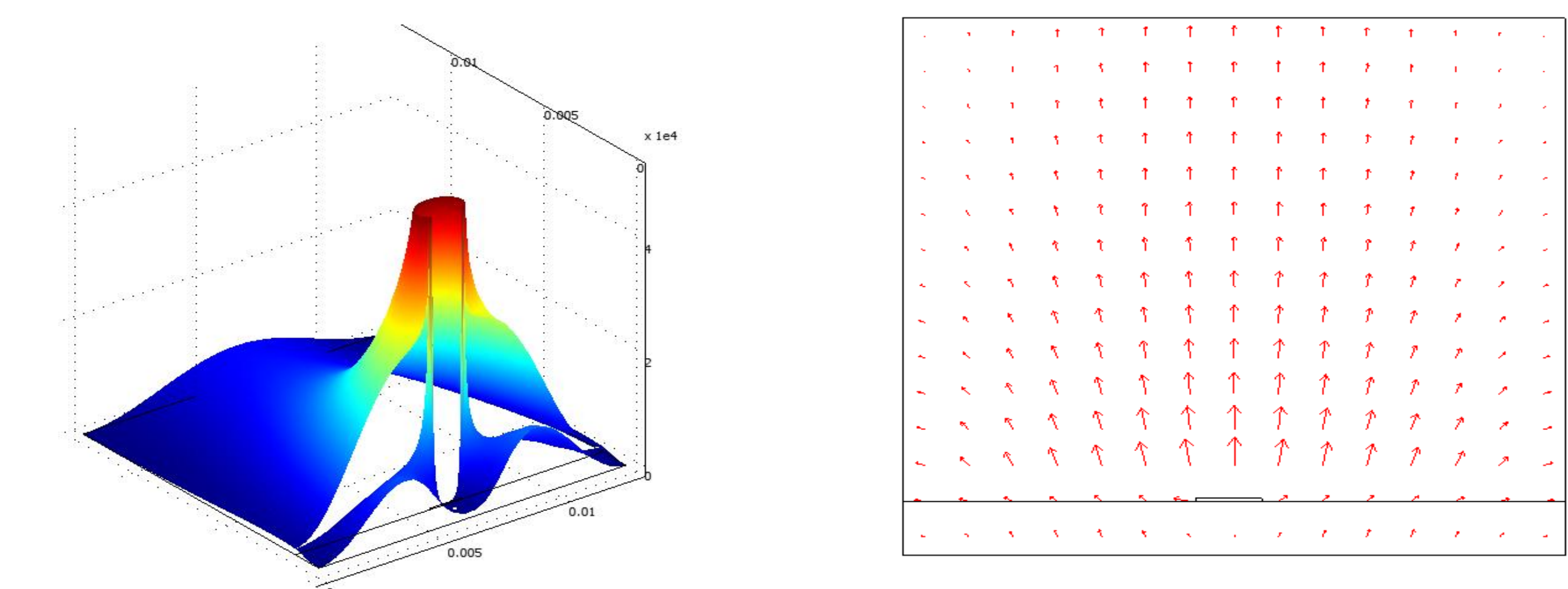


Fig.5 The 3D and arrow plots of field power density distribution of shielded microstrip transmission line at 20 GHz

Conclusion: In this paper electromagnetic analysis of waveguide and shielded microstrip transmission line are presented. Simulations are performed with the help of FEM based COMSOL Multiphysics Software.

References:

1. Jones D. C. "Methods in Electromagnetic Wave Propagation". Oxford: Clarendon Press, 1979.
2. Bharti Bhat and Shiban Koul, "Stripline -Like Transmission Lines for Microwave Integrated Circuits", Wiley Eastern Limited.
3. Musa S. M. and Sadiku M. N. O., "Modeling and Simulation of Shielded Microstrip lines," The Technology Interface Journal, vol. 8, No.1, Fall 2007.