INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Printed monopole antenna (PMA) is one of the most suitable antenna for achieving large bandwidth and omnidirectional radiation pattern. In the last one decade, several printed monopole antenna configurations have been proposed and such antennas have been designed using different simulation softwares (HFSS, IE3D, CST Microwave Studio etc) for various wireless communication applications such as wireless LAN, WiFi, UWB etc. However, very few theoretical works are reported for the analysis of printed monopole antennas. Our present work is devoted to development of analytical framework for investigation of printed monopole antennas. Full wave analysis using Mixed Potential Integral Equation is performed along with the derivation of spatial domain potential (scalar and vector) Green's function for horizontal electric dipole lying on an ungrounded dielectric layer. The input impedance and return loss of printed monopole antenna is calculated and validated by simulation (HFSS) and available experimental results. Approximate analysis of printed monopole antenna is also done to calculate input impedance using transmission line theory. In this, substrate is considered as a transmission line section terminated with free space characteristic impedance. The intrinsic impedance of the medium (substrate) depends on the thickness and the dielectric constant of the medium. Spectral domain Green's function for the field components is also derived in order to calculate the radiation pattern and gain of rectangular and circular printed monopole antenna and the theoretical results are validated by simulation (HFSS) and available experimental results. Next, the performance of printed monopole antenna with a magneto-dielectric cover and uniaxial substrate is investigated both in theory as well as in simulation (HFSS). Finally, appropriate circuit representation of printed monopole antenna is presented for different geometries of antenna and the ground plane, which are further verified by simulation (HFSS) and available experimental results.