TIME-DOMAIN CHANNEL MODELING OF MICROCELLULAR PROPAGATION ENVIRONMENTS

DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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OF

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IN
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This is to certify that the thesis titled **“Time-Domain Channel Modeling of Microcellular Propagation Environments”** submitted by Manish Goyal, Roll. No. 2K12/SPD/10, in partial fulfillment for the award of degree of Master of Technology in Signal Processing & Digital Design at **Delhi Technological University, Delhi**, is a bonafide record of student’s own work carried out by him under my supervision and guidance in the academic session 2013-14. The matter embodied in dissertation has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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ABSTRACT

A comparative analysis of time-domain (TD) solution, based on an established UTD diffraction model, are presented for modeling of Ultra-wideband (UWB) signal for lossy dielectric obstacles which gives accurate result to any arbitrary position of transmitter and receiver in a complex channel environment. Obstacles considered in the work include dielectric Wedge with homogenous, isotropic, low-loss dielectric characteristics. Different UTD-TD Diffraction Coefficients are proposed and compared with the IFFT of rigorous (i.e., Maliuzhinets) diffraction coefficient (RDC). The proposed work provides an in-depth analysis of the UTD model and presents an accurate and computationally more efficient TD solution for the available UTD diffraction coefficients for lossy dielectric medium, for both soft and hard polarizations. Moreover the reciprocity and symmetry for the diffraction coefficient in the time-domain have been proven for different position of transmitter and receiver. The time-domain modeling for transmission and reflection of UWB signals for 2-D & 3-D multi-modeled obstacle is also done. The obstacle is called multi-modeled since the obstacle consists of two entirely different structure i.e. dielectric wedge followed by dielectric slab. The comparison between the TD solution and the numerical inverse fast Fourier transform of the FD (IFFT-FD) solution proves the accuracy of the proposed solution. The significant gain in the computational speed achieved through the proposed TD solution is demonstrated by comparing its computation time with that of the exact IFFT-FD solution.