Terapass Jariyanorawiss 2010: Implementation of Perfectly Matched Layer (PML) in the Finite Difference Time Domain (FDTD) Simulation of a Mobile Phone Operating near a Metal Wall. Doctor of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Associate Professor Nuttaka Homsup, Ph.D. 231 pages.

In recent years, the Finite Difference Time Domain (FDTD) is the most often used method for evaluating of electromagnetic fields in human tissue. This research presents a study of heating effects resulted from using a mobile phone operating near a Metal Wall. Apparently, the FDTD is suitable for this model because the FDTD technique allows the users to specify any material at all points within the computational physical domain and the absorbing layer. The simulated physical domain consists of a mobile phone, an artificial human head and a Metal Wall. Obviously, the dipole antenna is presented as a mobile phone and it operates on 900 MHz and 1.8 GHz. In this case, the absorbing boundary condition is implemented using Perfectly Matched Layer (PML). The Specific Absorption Rate (SAR) is computed and averaged on a tissue mass of one gram and ten grams which are specified as SAR 1-g and SAR 10-g, respectively. The main purpose of this research is to compare SAR resulted from a mobile phone operated at two different frequencies, 900 MHz and 1.8 GHz, in the close proximity to a Metal Wall. Correspondingly, the average power ($P_{avg}$) absorbed in various human tissues is computed with a distance between an antenna and a Metal Wall as a varying parameter ($\Delta l$). In this case, results from the simulation show that the computed SAR 1-g and SAR 10-g are not exceed the limitation value established by various standard institutes, 1.6 watts per kilogram, but it is dramatically decreasing as the distance get shorter. Last but not least, the average power absorbed in all tissue models with a mobile phone operated at 1.8 GHz has an average power lower than those operated at 900 MHz except for the average power absorbed in muscle ($6 < \Delta l < 8$ cm) and eye ($6 < \Delta l < 10$ cm).

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