Abstracts

FDTD Analysis of Power Deposition Patterns of an Array of Interstitial Antennas for Use in Microwave Hyperthermia

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In earlier contributions where the Method of Moments (MOM) was used to model and calculate the electromagnetic (EM) power distribution pattern in tumors heated using interstitial antennas, some modeling difficulties were encountered. This includes inaccuracies at dielectric interfaces when pulse basis functions were used for expansion and the inability to model large tumors because of the increasingly large matrices involved. In this paper, we use the Finite-Difference Time-Domain (FDTD) method to calculate EM power deposition patterns in inhomogeneous tissue models of tumors. The radiated near-field patterns from an array of uniformly and step-insulated interstitial antennas were used as incident fields on the excitation planes to calculate the scattered fields and total SAR patterns in tumors. Comparison of FDTD data with results from the Method of Moments show that FDTD solution, in this particular application, overcomes some of the modeling difficulties encountered in the Method of Moments. Results for some specific tumor geometries are also presented to show the effectiveness of the microwave interstitial heating techniques in treating large tumors. Other advantages of the FDTD method, such as improved accuracy in modeling dielectric interfaces and the ability to model large tumors, are also illustrated.

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