Abstracts

FDTD Verification of Deep-Set Brain Tumor Hyperthermia Using a Spherical Microwave Source Distribution

D. Dunn, C.M. Rappaport and A.J. Terzuoli, Jr.. "FDTD Verification of Deep-Set Brain Tumor Hyperthermia Using a Spherical Microwave Source Distribution." 1996 Transactions on Microwave Theory and Techniques 44.10 (Oct. 1996, Part II [T-MTT] (Special Issue on Medical Application and Biological Effects of RF/Microwaves)): 1769-1777.

Although use of noninvasive microwave hyperthermia to treat cancer is problematic in many human body structures, careful selection of the source electric field distribution around the entire surface of the head can generate a tightly focused global power density maximum at the deepest point within the brain. An analytic prediction of the optimum volume field distribution in a layered concentric head model based on summing spherical harmonic modes is derived and presented. This ideal distribution is then verified using a three-dimensional finite difference time domain (FDTD) simulation with a discretized, MRI-based head model excited by the spherical source. The numerical computation gives a very similar dissipated power pattern as the analytic prediction. This study demonstrates that microwave hyperthermia can theoretically be a feasible cancer treatment modality for tumors in the head, providing a well-resolved "hot-spot" at depth without overheating any other healthy tissue.

❑ Return to main document.