FDTD Calculations of Specific Energy Absorption Rate in a Seated Voxel Model of the Human Body

R. P. Findlay and P. J. Dimbylow
Health Protection Agency, UK

Finite-difference time-domain (FDTD) calculations have been performed to investigate the frequency dependence of the specific energy absorption rate (SAR) in a seated voxel model of the human body. The seated model was derived from the anatomically realistic voxel phantom NORMAN in the standard standing position with arms to the side. Exposure conditions studied were vertically polarised plane-wave electromagnetic fields between 10 MHz and 3 GHz. The frequency range chosen incorporates the whole-body SAR resonance region. The resolution of the voxel model was 4 mm for frequencies below 100 MHz and 2 mm for those above this. Additionally, the 4 mm and 2 mm calculations were overlapped in the 100 MHz to 300 MHz range to investigate the dependence of SAR on voxel resolution. A reduction in the voxel size from previous work at 4 mm allowed the whole-body SAR to be calculated at these higher frequencies.

SAR values are presented as a function of frequency. Results show that the whole-body SAR resonance peak for the seated adult model occurs at a higher frequency and is less well defined than that of the standard standing adult phantom. Additionally, in the sitting posture a second, smaller resonance peak is found to occur at a slightly higher frequency than that of the main resonance condition. Layer absorption plots and images of SAR absorbed in individual voxels demonstrate the way in which the body, when in a sitting posture, absorbs the incident electric field at these frequencies.