

Temperature rise for the human head for cellular telephones and for peak SARs prescribed in safety guidelines (Sep. 2001 [T-MTT])

O.P. Gandhi, Qing-Xiang Li and Gang Kang. "Temperature rise for the human head for cellular telephones and for peak SARs prescribed in safety guidelines (Sep. 2001 [T-MTT])." 2001 Transactions on Microwave Theory and Techniques 49.9 (Sep. 2001 [T-MTT] (Mini-Special Issue on the 2001 IEEE Radio Frequency Integrated Circuit (RFIC) Symposium)): 1607-1613.

The bioheat equation is solved for an anatomically based model of the human head with a resolution of 3 /spl times/ 3 /spl times/ 3 mm to study the thermal implications of exposure to electromagnetic (EM) fields typical of cellular telephones both at 835 and 1900 MHz. It is shown that similar to the measured data, up to 4.5/spl deg/C temperature elevation may be caused for locations of the pinna by a cellular telephone warmed by electronic circuitry to temperatures as high as 39/spl deg/C with temperature increases for the internal tissues such as the brain and eye that are no more than 0.1/spl deg/C-0.2/spl deg/C higher than the basal values. Similar to previous studies by other authors, additional temperature increases due to EM fields of cellular telephones are fairly small and typically less than 0.1/spl deg/C. Another objective was to study the thermal implications of the SAR limits for the occupational exposures of 8 W/kg for any 1 g, or 10 W/kg for any 10 g of tissue suggested in the commonly used safety guidelines. Such specific absorption rates (SARs) would lead to temperature elevations for the electromagnetically exposed parts of the brain up to 0.5/spl deg/C with 10 W/kg for any 10 g of tissue resulting in somewhat higher temperatures and for larger volumes. Similar temperature increases are also calculated by increasing the arterial blood temperature, except that the temperature increases due to the SAR are for the more limited volume rather than the entire brain.

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