Temperature Increase in the Heads of Adult and Children due to Dipole Antenna

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Abstract: In recent years, there has been an increasing public concern about health implications of electromagnetic (EM) wave exposures with the use of mobile telephones. For this reason, various organizations in the world have established the safety guidelines for EM wave absorption. For near RF field exposures, these standards are based on the spatial peak SAR (specific absorption rate) for any 1 or 10g of tissues of the body. However, possible physiological damage in humans for EM wave exposures is induced by the temperature increase. The temperature increase of 4.5 [^{o}C] in the brain has been remarked to be an allowable limit, which does not lead to any physiological damage (for exposures of more than 30 minutes). Additionally, the pain in skin is induced at the temperature increase around 10 ^{o}C. In our previous paper, we attempted to correlate the maximum temperature increase in the head and brain with the peak SAR value due to handset antennas. For investigating these correlations thoroughly, the total of 660 situations was considered. Then, the numerical results were analyzed on the basis of statistical inference. The maximum temperature increases in the head and brain were found to be estimated linearly in terms of peak SARs averaged over 1g and 10g of tissue in these regions (A. Hirata et al, *URSI GA*, 2002).

In this paper, we investigate this correlation for models of 3 year-old and 7 year-old children. It should be noted that the models of children are developed from our adult head model in the same manner as in the previous paper (J. Wang and O. Fujiwara, *URSI GA*, 2002). The material constants of tissue in the children are larger than those of the adult by 20-50 % (A. Peyman, A. A. Rezazadeh, C. Gabriel, *Phys. Med. Biol.*, 2001). In our calculation, the dependency of material constants on the age is also taken into account. The numerical investigations with corresponding figures reveals that the slope correlating the peak 10-g SAR in the head and the maximum temperature increase in the head is not much affected by the models, while the correlation between the peak 1-g SAR in the brain and the maximum temperature increase in the brain is affected by the models (at most 30 %). Additionally, the effect of the material constants on them is not large, although it is not shown here because of the lack of space.