does not underestimate that on the real heterogeneous model and first of all, the flat model similar with the phantom shape for the compliance test of body-mounted devices, using the same homogeneous material offers the desirable SAR level for both 1 g and 10 g SARs.

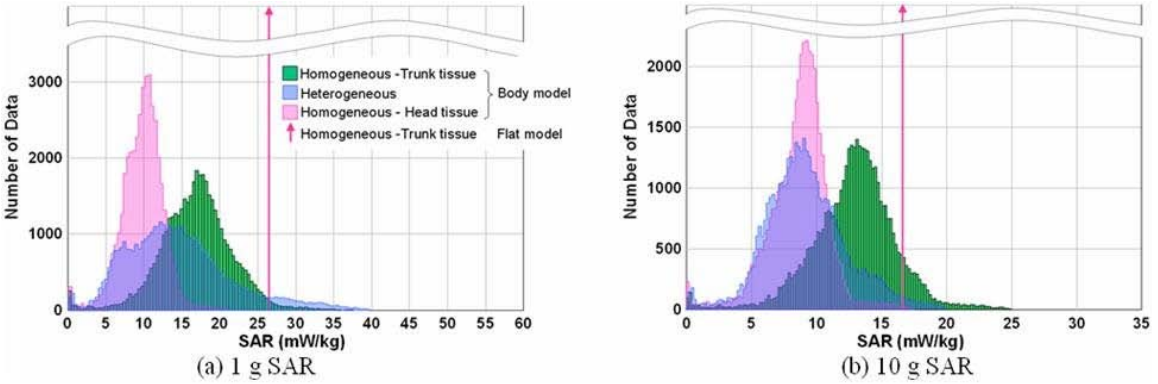

FIGURE 2. SAR values on the trunk surface of the human body and the flat models under the plane wave 1.0 W/m^2 incidence at 835 MHz.

PA-29 ASSESSMENT OF THE SAR IN THE SAM HEAD PHANTOM FOR A PMR446 RADIO HELD IN FOUR TYPICAL POSITIONS CLOSE TO THE HEAD

Gunter Vermeeren[1], Luc Martens[1] (1) Ghent University, Department of Information Technology, Ghent, Belgium.

Objectives. The PMR446 radios communicate at 446 MHz with a maximum effective radiated power of 500 mW. Therefore, the PMR446 radios demand an evaluation of the absorbed electromagnetic energy in the human head in terms of mass-averaged SAR.

Methods. A model of a PMR446 radio has been described in [1]. This model comprises of a ground plane and a helical antenna. The model of the PMR446 is placed in four test positions in the proximity of the SAM head as shown in Figure 1: vertical frontal face (Pos 1), backward tilted frontal face (Pos 2) and two cheek (Pos 3 and Pos 4) positions. These test positions represent four typical positions of a walkie-talkie held close to the head. For each case, the mass-averaged SAR in 1 g and 10 g has been evaluated as well as the input impedance Z_{in} and the power balance (The input power equals the sum of the radiated power and the absorbed power in the head). Because the communication channel for PMR446 radios are of the half duplex type, a duty-cycle of 50 % has been taken into account. The SAM head has been filled with homogeneous head tissue which has been assigned the dielectric prroperties recommended by the IEEE [2]. At the frequency

of 450 MHz, ϵ_r equals 43.5 and σ 0.87 S/m. The results for the SAM head have also been compared with the oval flat phantom setup. Figure 2 depicts this setup. The model of the PMR 446 radio has been placed at a distance d of 15 mm from the shell-liquid interface. The oval flat phantom has been filled with the same homogeneous head tissue as the SAM head phantom. The FDTD tool SEMCADX has been used to run the simulations.

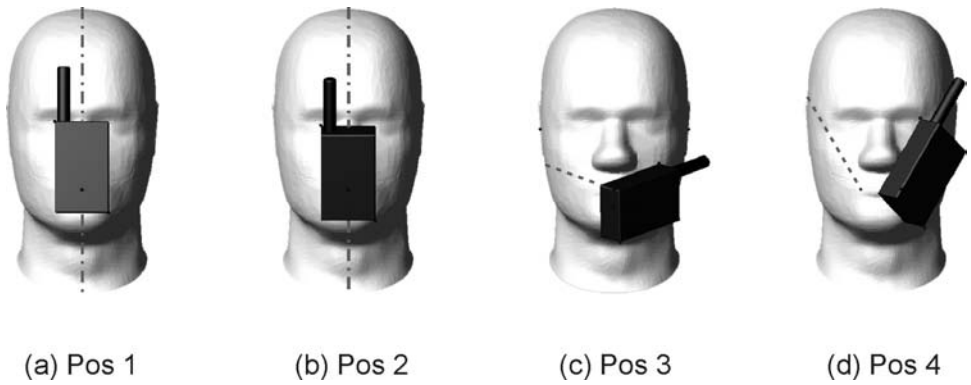

FIGURE 1. Typical test positions for a PMR446 radio held close to the head

Results. Figure 3 shows the mass-averaged SAR in 1 g and 10 g normalized to an input power of 500 mW and an input current of 176.4 mA. The normalized input current has been determined as the required current which has to be imposed to the input terminals of the model of the PMR446 radio placed in free space, to obtain an input power of 500 mW. The mass-averaged SAR for constant P_{in} in the SAM head if the PMR446 radio is held in Position 3, exceeds the value observed in the oval flat phantom. Holding the walkie-talkie in Position 2 yields the lowest mass-averaged SAR for the considered setups. The mass-averaged SAR in 1 g SAR_{1g} for constant input power, exceeds the limit of 1.6 mW/g in the SAM head Position 1 and Position 3) as well as in the oval flat phantom. For constant input current, SAR_{1g} in the flat phantom is higher than the 1.6 mW/g-limit.

Conclusion. The flat phantom does not always yield a conservative mass-averaged SAR value for constant input power. No clear worst-case position can be distinguished. Our model of a PMR446 radio exceeds the 1 g 1.6mW/g-limit in some cases.

REFERENCES

[1] Günter Vermeeren and Luc Martens, Assessment of the sar for a walkie-talkie setup, in BioEM 2005, Dublin, Ireland, July 2005, p. 487.

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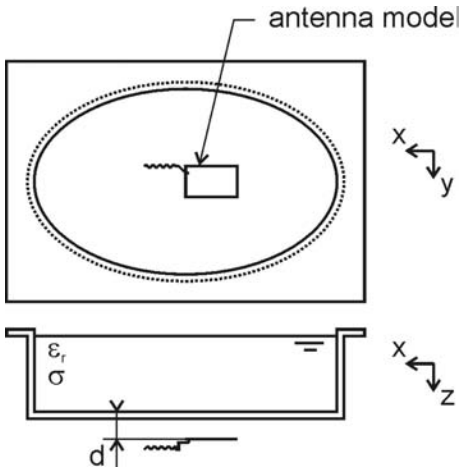

FIGURE 2. The oval flat phantom setup.

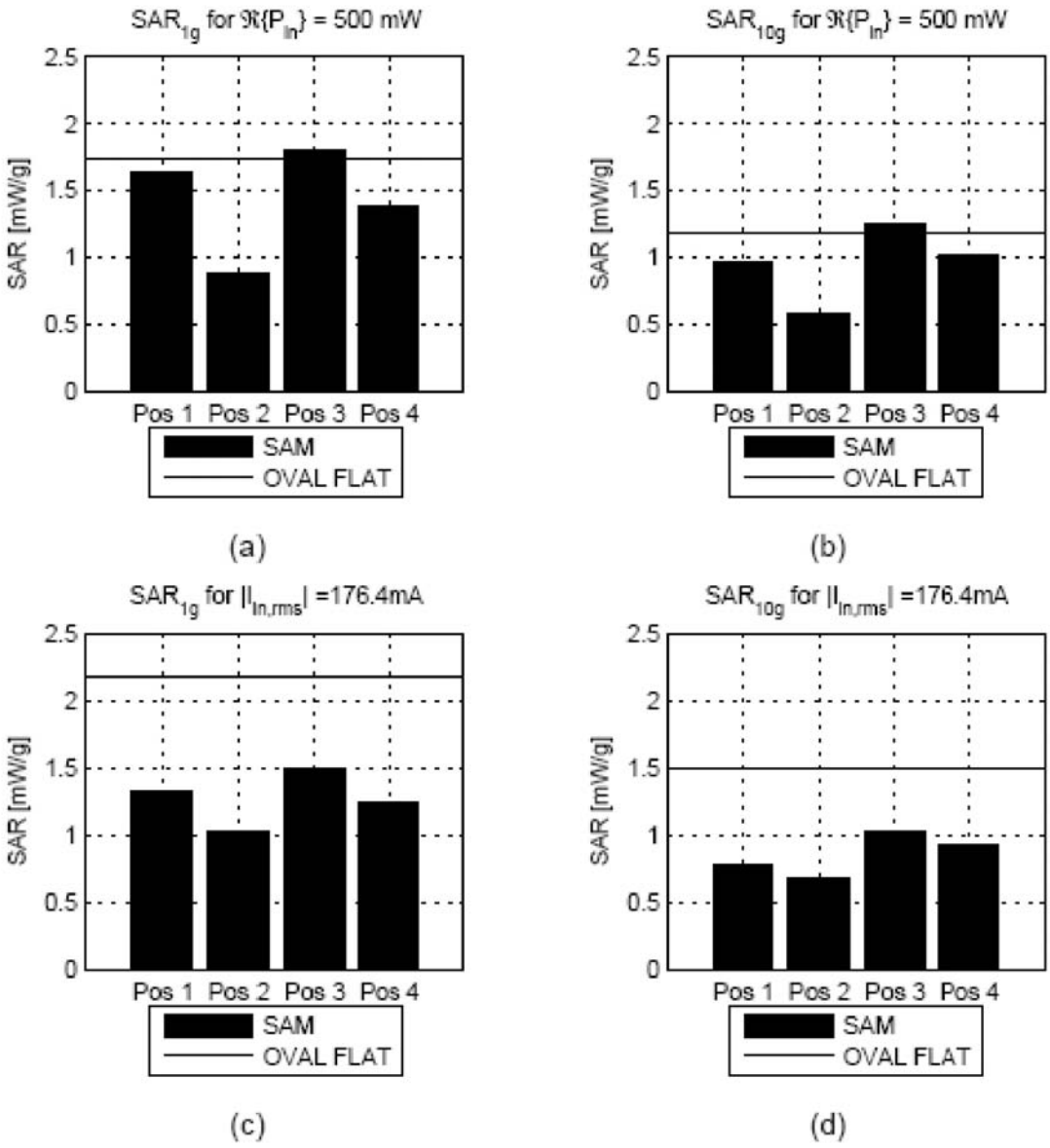

FIGURE 3. Mass-averaged SAR in 1 g and 10 g for the model placed in front of the SAM and the oval flat phantom. ((a) and (b) constant input power, (c) and (d) constant input current)

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