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P-11 DEVELOPMENT OF ANATOMICAL CAD MODELS OF CHILDREN FOR THE ASSESSMENT OF EM FIELD EXPOSURE

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Summary of Abstract. This study presents the development of six anatomical CAD models of children covering an age range of 5 to 14 years. The models are used to discuss age-dependent changes of the exposure to ELF and RF sources using the finite element method and the FDTD algorithm.

Objectives. Most current studies on the whole-body exposure of children use prevoxeled adult models scaled to the body dimensions of children, or models of children that are composed of CT image sets from different bodies. In order to minimize the exposure to ionizing radiation during the CT scan, the resolution of these models along their body axes is frequently lower than 5mm. Higher resolutions and improved soft tissue contrast can be reached using MR scans. In order to complement the two child models of the Virtual Family Project [1], four new anatomical models of children of both sexes have been developed. The models are used to study EM field absorption for various types of sources, such as induction cooking hobs, MRI scanners, and various RF transmitters, covering a frequency range from ELF to several GHz.

Methods. The models of the children are developed from high-resolution MR images of four volunteers. The images were taken on a 1.5T Siemens Avanto Scanner at resolutions of 0.5 x 0.5 x 1.0mm³ for the head and 0.9 x 0.9 x 2.0mm³ for the body. The segmentation of the images distinguishes 84 different tissues. For all organs and tissue layers, CAD objects with smoothed surfaces were reconstructed. This technique allows the discretization of the body models in the computational grid at an arbitrary resolution without loss of information due to the multiple sampling of the fine tissue structures.

For the calculation of the current densities in the low frequency range, a finite element solver has been developed for magneto-quasistatic simulations.

Results. The developed anatomical models of children cover an age range of 5 to 14 years, body masses of 16kg to 50kg, and body heights of 1.07m to 1.55m (Figure 1). The magneto quasistatic solver uses inhomogeneous rectilinear meshes, which allow the straightforward representation of fine anatomical details and an easy integration into the FDTD environment.

Conclusions. Age-dependent changes in induced current density and SAR for the various applications listed above will be discussed in detail.

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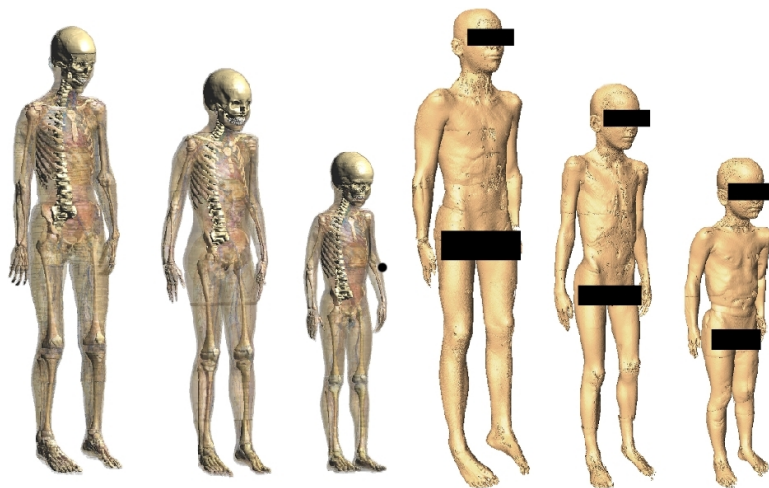


FIGURE 1. Anatomical models of children (left to right): 11-year-old girl, 8-year-old girl, 6-year-old boy, 14-year-old boy, 8-year-old boy, 5-year-old girl.

P-12 ANALYSIS OF POWER ABSORBED BY CHILD HEADS AS A RESULT OF NEW USAGES

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Summary of Abstract. This paper gives a first comparison of specific absorption rate (SAR) induced in different heads as a result of new usages of mobile phone. The new usage different from the primary usage, i.e. voice call and phone near to the ear, is the text messaging which implies the phone to be in front of the head. For this purpose two child head models 9 and 15 years old and one adult head model “the visible human” are considered. Two sources are used in this study, a tri-band mobile having a patch antenna and the IEEE mobile phone