ASSESSMENT OF WORKERS EXPOSURE TO ELECTROMAGNETIC FIELDS WITH THE USE OF HUMAN BODY MODEL OF REALISTIC POSTURE

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Introduction

Numerical methods can be successfully used for calculating the parameters of exposure results in workers body, fixed as the set of internal measures of exposure (specific absorption rate *SAR* or induced current density *J*). These quantities can be calculated using anatomically and electrically realistic models of the body and computational methods, which have a high degree of anatomical resolution (ICNIRP, 1998; IEEE, 2005; Directive 2004/40/WE).

Because of the electrical heterogeneity of the body, current densities should be calculated as averaged over a cross-section of 1 cm^2 perpendicular to the current direction. Localised *SAR* averaging mass is any 10 g of contiguous tissue, with nearly homogeneous electrical properties. Available international standardisation results do not covers sufficiently the practical problems existing while workers exposure modelling. Very important problem is how accurate model of the workplace environment and worker's body is needed for satisfactory representation of realistic case. Also the use of a realistic model of a worker plays a very important role in that context.

Method

An ergonomically realistic homogenous model of human body (CIOP-MAN model) was compiled for an analysis of workers' exposure. The posture of the CIOP-MAN model can be adjusted according to the characteristics of a worker's occupational activities. The results of simulations of *SAR* in various models (CIOP-MAN, anatomical HUGO, cylindrical human body models; grounded or insulated) will be presented for exposure to plane wave with vertical polarization of *E* vector (27 MHz) or exposure to realistic *E*-field from dielectric heater.

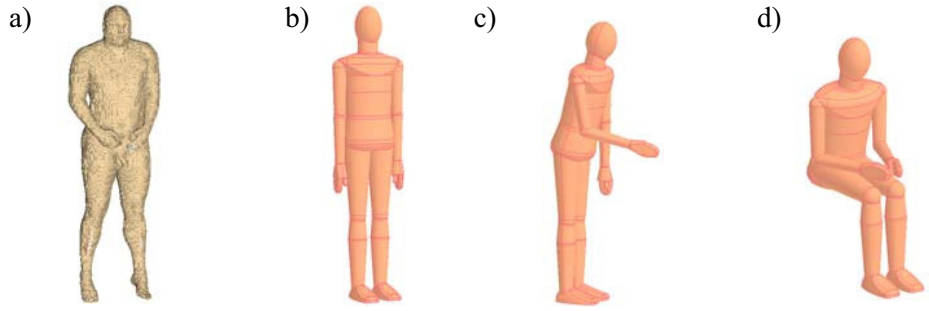

Fig. Human body models - HUGO (a), CIOP-MAN in various postures (b-d).

Results

SAR averaged in whole body and local *SAR* in head or limbs were chosen as the base for analysis of obtained results of numerical calculation. The CIOP-MAN model was confirmed as very useful for analysis of spatial distribution of *SAR* in the body. Distribution of relative *SAR* in torso, head and legs in CIOP-MAN and HUGO is similar and corresponding to the published data. The use of cylindrical model did not give such conformity. Advantage of CIOP-MAN model is the possibility of modification of model's posture adequately to realistic situation of worker's posture (eg. sitting position). Obtained results shown that *SAR* depends on the posture of model even in the case of exposure to uniform field. This variability is higher in non-uniform field. The analyzing of the usefulness of various models is continuing.

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