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OCCUPATIONAL EXPOSURES TO QUASI-STATIC ELECTROMAGNETIC FIELDS AND THE 2004/40/EC DIRECTIVE: ASSESSMENT OF INDUCED CURRENT DENSITIES IN REALISTIC SCENARIOS USING A 3D DOSIMETRIC APPROACH BASED ON THE SCALAR POTENTIAL FINITE DIFFERENCE NUMERICAL TECHNIQUE AND A POSTURABLE DIGITAL BODY MODEL

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The problem of assessing compliance with *exposure limit values* introduced by the 2004/40/EC Directive is discussed. The main steps that compose a numerical dosimetric analysis in occupational environments at low or intermediate frequencies are considered, with reference to case-studies in realistic scenarios, whose results are presented.

First of all, techniques are shown aimed at modeling the field sources through the use of analytical methods or interpolation of measured data. Then, the problems posed by the numerical representation of the exposed body are addressed, such as the articulation process that allows particular working postures to be reproduced. Lastly, an approach to the calculation of induced current densities based on an implementation of the 3D *scalar potential finite difference* (SPFD) method is suggested and applied.

Addressed case-studies include occupational exposures to (1) magnetic induction heaters and (2) extremely high voltage power lines.

1. Induction heating is widely used for various metallurgic treatments, for instance on gold and other precious metals. A survey in a few plants of this type located in the Tuscan province of Arezzo (one of the main Italian districts of gold industry) revealed that workers involved in this treatments are often exposed to intense magnetic fields, even 100 times higher than the *action values* specified by the 2004/40/EC Directive. Induction furnaces for these applications operate in the frequency range from a few chilohertz to a few hundred kilohertz.
2. Workers assigned to 50/60 Hz power line maintenance have often to operate close to energized high power, high voltage conductors, where field levels, one again, can exceed the *action values* by up to 10 times or even more.

In both these frequency ranges, the quasi-static approximation holds, allowing coupling to electric and magnetic fields to be computed independently. Electrically induced currents turn sometimes out to be negligible, thanks to the low impedance of the source; when this condition applies, the analysis can concentrate on currents induced by magnetic fields only.

Wykład plenarny

Promieniowanie niejonizujące – Sesja II

Internal measures of occupational EMF exposure

Chemia radiacyjna i fotochemia – Sesja II

Od wody do makrocząsteczek