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POSTER

PLATFORM PRESENTATION

Exposure Of Children In The Vicinity Of A Transformer Substation

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Introduction

Transformer substations located close to living areas have been identified as a source of high long-term exposures to extremely low frequency magnetic fields. Epidemiological studies have shown increased risk for childhood leukaemia for such exposures yet the mechanisms are still unknown. In the study we analyzed the exposure of adult and 6 years old children due to a transformer substation, located in the basement of a residential apartment building.

Materials and methods

In the apartment above the typical transformer substation spot and 24-hours measurements were carried out to evaluate the space and time variability of the magnetic field and determine worst case conditions. During the measurements, the maximum current in the low voltage busbar was estimated to be 200 A, which is much smaller than the nominal load of 900 A.

Based on the results of measurements we numerically calculated current densities and electric field strengths for three different exposure scenarios; one for an adult model sitting on the floor and two for 6 years old children; laying 10 cm above the floor and standing.

Results

Results of the 24-hours measurements of the magnetic flux densities show that the highest measured value of the magnetic flux density in the living room was 15.6 μT with the highest 24-hour average 9.4 μT . During spot measurements in the whole living room the magnetic flux density was higher than 1 μT .

The results of the numerical calculation of the current density for the measured worst case situation show that the highest whole body current density for the sitting man was 0.58 mA/m^2 and in the central nervous system it was 0.02 mA/m^2 . For the 6 years old children laying 10 cm above the floor the highest whole body current density was 0.14 mA/m^2 and 0.12 mA/m^2 in the central nervous system; in the case when he was standing it was much lower (0.03 mA/m^2 for the whole body and 0.02 mA/m^2 for the central nervous system).

Conclusions

Results show that the ratio between the highest whole body current density and the highest current density in the central nervous system is much higher for the adult than for the child. Nevertheless, the current density is in general higher for the adults, as the induction loop is greater in the case of the larger body, the highest values of the current density in the central nervous system are still higher in the children model.