Exposure Assessment of a WPT System to Recharge a Compact Electric Vehicle

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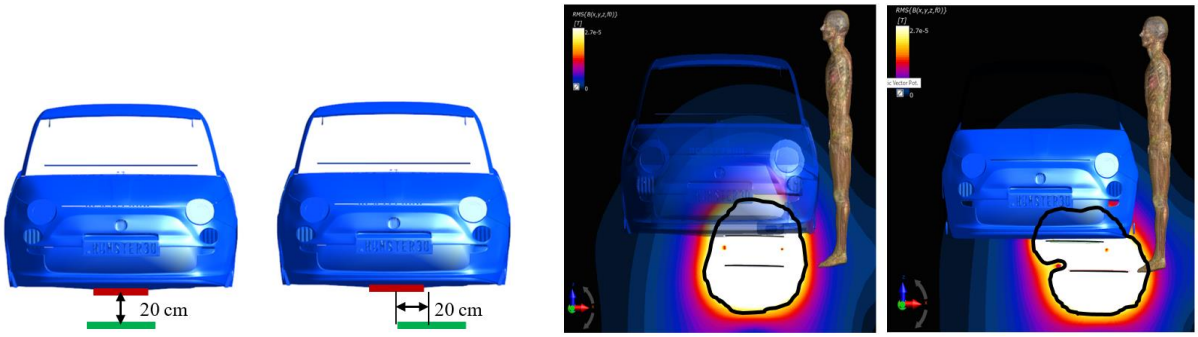
In this work, the magnetic field distribution emitted by a wireless power transfer (WPT) system to recharge the batteries of a compact electric vehicle, namely a FIAT 500 car, is addressed.

The CAD model of the FIAT 500 has been obtained by [1], while the WPT electro-geometrical details are taken by [2]. Both aligned and misaligned coils are considered (see Fig. 1(a)).

Due to the limitations of commercial software, a two-step approach has been used. The magnetic flux density and/or the magnetic vector potential is computed with a formulation that can handle the thin car body in an open domain (e.g., [3]). Then, the dosimetric assessment is performed exploiting the fact that the presence of the human body does not perturb the applied external field [2].

Specifically, several dosimetric exposure scenario will be considered in the extended version. Posable models of the Virtual Population (ViP) from the IT'IS Foundation (Zurich, Switzerland) will be employed in the driving position (e.g., Ella or Duke) or lying in the posterior seats (e.g., Roberta).

Figure 1(b) shows the magnetic field distribution of the WPT system. From this figure it is evident as ICNIRP reference levels are exceeded, requiring the assessment of compliance against basic restrictions. A numerical dosimetric analysis will be therefore presented in the extended version.



(a) (b)

Figure 1. (a) EV-WPT system for both aligned and misaligned coils. (b) Magnetic field distribution for both cases. Black line is the ICNIRP reference level limit.

References

[1] https://hum3d.com/3d-models/fiat-500-san-remo-2014/.

[2] V. De Santis, T. Campi, S. Cruciani, I. Laakso, and M. Feliziani, "Assessment of the induced electric fields in a Carbon-Fiber Electrical Vehicle equipped with a Wireless Power Transfer system," *Energies*, vol. 11, no. 3, pp. 684-692, Mar. 2018.

[3] F. Freschi, L. Giaccone, M. Repetto, "Algebraic formulation of non-linear surface impedance boundary condition coupled with BEM for unstructured meshes," *Engin. Analysis Bound. Elem.*, vol. 88, pp. 104-114, Mar. 2018.