



Posture and chassis influence on the EMF safety of a WPT system for a compact EV

V. De Santis^{*(1)}, L. Giaccone⁽²⁾ and F. Freschi⁽²⁾

(1) University of L'Aquila, 67100, Italy; e-mail: valerio.desantis@univaq.it;

(2) Politecnico di Torino, 10129, Italy; e-mail: luca.giaccone@polito.it; fabio.freschi@polito.it

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

The CAD model of the FIAT 500 EV has been obtained by [1], while the WPT electro-geometrical details are taken by [2, 3]. Both aligned and misaligned coils are considered (see Fig. 1(a) and (b), respectively).

Due to the limitations of commercial software, a two-step approach has been used. The magnetic flux density and the magnetic vector potential are computed with a formulation that can handle the thin car body in an open domain [2, 3]. The dosimetric assessment is performed then with the commercial software Sim4Life (Zurich Med Tech, Switzerland) exploiting the fact that the presence of the human body does not perturb the applied external field.

Specifically, several dosimetric exposure scenario are investigated to assess the influence of the chassis material [2] and of the human postures [3]. In the former case, steel, aluminum or carbon fiber is considered, while in the latter possible models of the Virtual Population from the IT'IS Foundation (Zurich, Switzerland) are employed in the driving position (e.g., Ella) or lying on the ground floor (e.g., Duke) or in the posterior seats (e.g., Roberta).

Figure 1(c) and (d) show the magnetic field distribution of the WPT system for both aligned and misaligned configurations highlighting as ICNIRP reference levels are exceeded, thus requiring the assessment of compliance against basic restrictions.

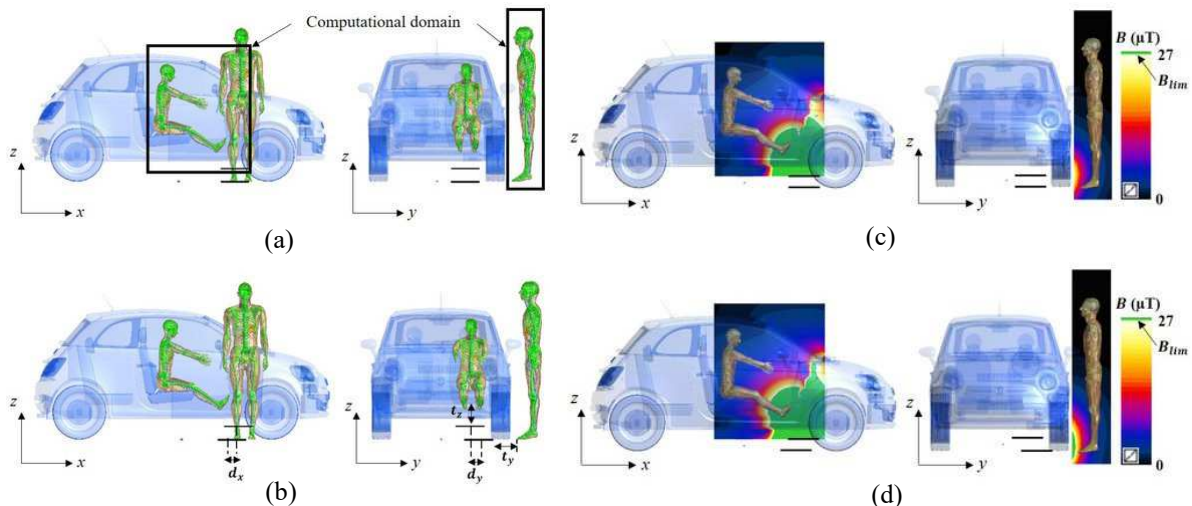


Figure 1. EV-WPT system for aligned (a) and misaligned coils (b). Magnetic field distribution for aligned (c) and misaligned coils (d).

1. <https://github.com/cadema-PoliTO/vehicle4em>.

2. V. De Santis, L. Giaccone, and F. Freschi, "Chassis influence on the exposure assessment of a compact EV during WPT recharging operations," *Magnetochem.*, 7, Feb. 2021, p. 25, doi: 10.3390/magnetochemistry7020025.

3. V. De Santis, L. Giaccone, and F. Freschi, "Influence of posture and coil position on the safety of a WPT system while recharging a compact EV," *Energies*, 14, 21, November 2021, p. 7248, doi: 10.3390/en14217248.