URSI GASS 2021, Rome, Italy, 28 August - 4 September 2021

Occupational exposure to electromagnetic field while the use of electric or hybrid passengers cars

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Extended Abstract
The rapid development of *e-mobility* technology and the systematically is increasing the number of electric vehicles (EV) of various configurations of drive and supplying systems: a hybrid electric vehicle (HEV), a plug-in hybrid electric vehicle (PHEV) and a plug-in electric vehicle (PEV). It does the increase in the number of electromagnetic field (EMF) sources contributing to electromagnetic emissions into the environment. The main sources of the EMF in electric vehicles are the driving systems, including alternating currents (AC) engines and their supplying installations (the set of rechargeable batteries of direct current (DC) charged from an external source of electricity) and DC/AC power inverters supplying engines from the batteries while driving. All these elements are sources of extremely low frequency (ELF) EMF – in the range from a few Hz up to 300 Hz, with dominant components in the several tens of Hz, as well as a static magnetic field component near the DC (rectified) current lines. The frequency of emitted ELF depends on the driving modes and the resulting changes in the power load of batteries.

This ongoing study is aimed at evaluating parameters of occupational EMF related to the use of EV in the public transportation (e.g. in busses or taxi passenger cars).

The investigations covered recordings of the root-mean-square (RMS) values of magnetic flux density, *B*, of ELF EMF, using broadband exposimeters EMDEX II Standard (Enertech Consultants, Campbell, CA, USA) – measurement range: (0.01 – 300) μT in the frequency band (40 – 800) Hz, 1.5 seconds sampling rate and oscilloscopic analysis of EMF changes in the time and frequency domains [doi: 10.5604/01.3001.0014.5756]. The investigations are caring out in various EV used in public transportation. Typical measurement session covers a 30-minute recordings typical city driving conditions (starting, braking, changing driving speed). EMF exposure is characterized by statistical parameters of recorded samples of RMS value of magnetic flux density. Preliminary results cover for example the recordings of B_{RMS} in passenger cars (PEV and HEV) showed at Figure 1. . In the tested vehicles, a spatially diversified exposure level was found (higher in the passengers' seats, due to the proximity of the EMF sources). The driver (the most typical occupational exposure case) was found to be significantly lower than passengers' one, however passengers may also be at work during the journey by taxi EV. This ongoing study will also cover EV used in larger EV used in public transport (such busses), using much higher electric powers in drive systems, which may be the cause of high level of exposure in the vicinity of sources located inside vehicles. EMF exposure is analysed with respect to exposure scenarios of drivers, but also other workers who may be occupationally exposed, for example during short distance business travelling over the city or during passengers tickets checking.

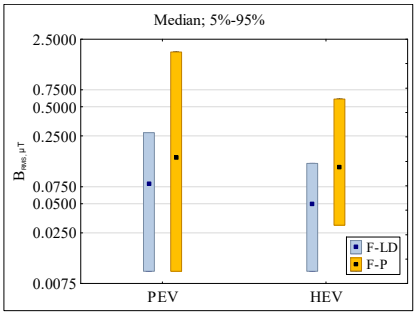

Figure 1. Statistical parameters of the magnetic flux density RMS values (B_{RMS}) recorded inside passenger cars (PEV and HEV) while city driving; F-LD - on the driver's seat; F-P - on passengers' seats

Acknowledgments
The results of the fifth stage of the National Programme "Improvement of safety and working conditions" (research task 2.SP.08; 2020-2022) - within the scope of state services — party supported by the Ministry of Economic Development, Labour and Technology. The CIOP-PIB is the Programme's main co-ordinator.