

A novel magnetic field sensor for the compliance with EMF Directive 2013/35/EU

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In July 2016, the Directive 2013/35/EU (named EMF Directive later on) has become in force posing new requirements on European Union (EU) employers to evaluate the exposure of workers to electromagnetic fields (EMFs) [1]. Implementation of these requirements is a significant challenge and could lead to a disproportionate burden for the EU economy [2].

For a large number of workplaces at industries utilizing EMFs, such as in the power electronics, automotive and metal fabrication, the current instrumentation used for the EMF evaluation is insufficient to fully demonstrate compliance with exposure limits [3]. This is particularly true in the low frequency (LF) range (0-100 kHz), where localized or highly non-uniform in space and time field sources are often encountered. Indeed, existing commercial field sensors have large probe dimensions making the measurement of near-field magnetic field sources not reliable.

The aim of this study is to develop a novel magnetic field sensor to facilitate the compliance assessment against the EMF Directive limits in the LF range. Specifically, a very small probe of diameter equal to 2 cm (see Fig. 1) has been realized thanks to 3D printing technology. A measurement setup with a Helmholtz coil magnetic field source has then been carried out to calibrate the proposed sensor. Finally, some measurement tests have been performed with realistic LF sources, such as wireless power transfer (WPT) systems to recharge electric vehicle (EV) or pacemaker batteries. In the extended version, more details about the sensor and measurement results will be provided.

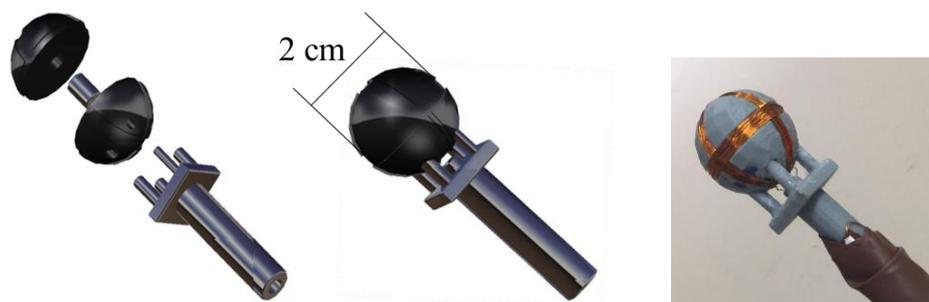


Figure 1. Left to right: design of the sensor, final 3D CAD model and realized sensor.

- [1] EN Directive 2013/35/EU, “on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual directive within the meaning of article 16(1) of directive 89/391/EEC) and repealing directive 2004/40/EC,” 2013.
- [2] Health and Safety Executive Board, “Physical Agents (Electro-Magnetic Fields) Directive - Progress and Next Steps in Influencing,” Technical Report HSE/09/110, 25 November 2009.
- [3] V. De Santis, T. Campi, S. Cruciani, and M. Feliziani, “Novel sensor concepts for the compliance with the EMF Directive 2013/35/EU,” 2016 IEEE Sensors Applications Symposium, 20-22 April 2016, Catania, Italy.