

Issue 98

# **RECENSION**

e202412064

e1-e3

Resumen del Informe "Estudio piloto sobre la exposición ambiental a los campos magnéticos de frecuencia extremadamente baja (CEM-FEB). FASE I."



### ARTICLE DATA

### **Authors**

Francisco Vargas Marcos (1) [ORCID: 0000-0003-3945-4686]; Marian Mendoza García (1) [ORCID: 0000-0002-5947-517X].

### Affiliations

General Subdirectorate of Environmental Health and Occupational Health. General Directorate of Public Health and Health Equity. Ministry of Health. Madrid. Spain.

#### **Author contributions**

Francisco Vargas: design and writing of the manuscript; Marian Mendoza: revision and writing of the manuscript.

**Year** 2024

Pages 65

#### (eywords

Extremely low-frequency electromagnetic fields (ELF-EMFs); Non-ionizing radiation; Exposure assessment; Environmental exposure; Public Health.

## Correspondence

Francisco Vargas Marcos SG Sanidad Ambiental y Salud Laboral. DG de Salud Pública y Equidad en Salud. Ministerio de Sanidad, Paseo del Prado 18-20. CP 28014. Madrid. Spain. f Vargas@sanidad.gob.es

Online edition



cities, Albacete, Cáceres and Madrid, with the aim of studying the levels emitted by different infrastructures and those observed in different population environments, taking into account the variety and wide distribution of emission sources of this type of frequency (50 Hz).

To this end, a pilot study (8) was carried out in a limited number of Spanish

Synthesis of the Report Pilot study on environmental exposure to Extremely Low Frequency Magnetic Fields (ELF-EMF). PHASE I

The exposure of the population to extremely low frequency magnetic fields (ELF-EMF) from 1 Hz to 100 kHz has prompted concern among certain social groups due to the hypothetical relationship between low levels of 50 Hz/60 Hz EMF exposure (0.3  $\mu$ T-0.4  $\mu$ T) and childhood leukaemia.

The limits for population exposure were set by the Council of Health Ministers of the European Union in *Recommendation 199/519/EC (1)*, which established the theoretical reference levels for EMF exposure in relation to 50 Hz magnetic fields based on the available scientific evidence at the time of publication (2).

In Spain, EMF exposure levels are regulated by *Royal Decree 1066/2001*, *of 28 September* (3). However, in view of the passage of time and the published evidence (4,5,6), a review and update of the same is necessary.

For these reasons, one of the key objectives of the *Strategic Health and Environment Plan 2022-2026* (7) is to update *Royal Decree 1066/2001* in accordance with the latest guidelines, recommendations and scientific knowledge.

The main objective is to analyse the level of environmental exposure of the Spanish population to extremely low frequency electromagnetic fields (ELF-EMF), to establish specific regulations and to facilitate coordination and cooperation between the Ministry of Health and the Autonomous Communities.

The measurement protocol developed was based on the relevant national and international regulations (9,10,11), and on the *technical document TR 170* of ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) (12).

https://ojs.sanidad.gob.es/index.php/resp

RE SD

The main objective focused on the measurement and analysis of EMF levels in public spaces and sensitive areas, including universities, schools, health centres, nursing homes, etc. at the specified populations. In addition, the surroundings of the emission sources were investigated, mainly in the vicinity of infrastructures related to the generation and distribution of electrical energy and electrified means of transport.

As can be observed, the measured magnetic field levels were found to be considerably below the recommended limit of 200  $\mu$ T, as proposed by the ICNIRP. Similarly, ambient levels of ELF-EMF in public areas in Spain were observed to range between 0.05 and 0.2  $\mu$ T, with the highest recorded values (in close proximity to the source of production) exhibiting a notable decline below the recommended limit of 200  $\mu$ T.

With regard to ELF-EMF measurements in public areas of urban settlements, the data indicate that the mean values in areas with lower population density are approximately 25% lower than those observed in more densely populated areas. Conversely, the mean current value recorded in public buildings was 26% higher than that observed in the surrounding area (0.129  $\mu$ T and 0.096  $\mu$ T). This may indicate the significant contribution of electronic equipment, which is a necessity in certain buildings, such as hospitals. It would therefore be advisable to conduct further investigations which take into account the specific

use of each building in order to obtain more objective results.

In contrast, the investigation of ELF-EMF levels from diverse emission sources revealed that the highest average value was observed in the electrical connections of buildings (3.28  $\mu$ T), followed by high-voltage lines and transformation centres. However, due to the substantial decrease in the magnetic field with distance, the level at 50 m from the power lines was found to be similar to that observed in an urban environment (public spaces), about 0.1  $\mu$ T.

The results of exposure to ELF-EMF from high-voltage power lines are highly analogous to those of a similar study conducted in France (13), despite differences in the sample size. No statistically significant differences were observed in the levels of emission of 400 kV power lines. In light of these results, it would be highly beneficial to expand the sample size of this pilot study with additional records from other locations across the country. In addition, it would be very desirable to gain a more detailed understanding of the levels of exposure to ELF-EMF in other indoor environments, such as means of transportation, workplaces, homes and private residences, as these are the environments where the majority of the population spends most of their time.

## **ACKNOWLEDGMENTS**

......

To Paloma Sanz Cameno.

Synthesis of the Report Pilot study on environmental exposure to Extremely Low Frequency Magnetic Fields (ELF-EMF). PHASE I.

FRANCISCO VARGAS MARCOS &

MARIAN MENDOZA GARCÍA

Rev Esp Salud Pública Issue 98 12/11/2024 e202412064

## REFERENCES

## ......

- **1.** *EUR-Lex* 31999H0519 EN EUR-Lex [Internet]. [cited 2024 Jul 29]. Available from: <a href="https://eur-lex.europa.eu/eli/reco/1999/519/0j">https://eur-lex.europa.eu/eli/reco/1999/519/0j</a>
- 2. International Commission on Non-Ionizing Radiation Protection (ICNIRP). *Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)*. International Commission on Non-Ionizing Radiation Protection. Health Phys. 1998 Apr;74(4):494-522. Erratum in: Health Phys 1998 Oct;75(4):442. PMID: 9525427.
- 3. Royal Decree 1066/2001, of 28 September, approving the Regulation establishing conditions for the protection of the public radio domain, restrictions on radio emissions and health protection measures against radio emissions [Internet]. Sect. 1, Royal Decree 1066/2001 Sep 29, 2001 p. 36217-36227. Available from: <a href="https://www.boe.es/eli/es/rd/2001/09/28/1066">https://www.boe.es/eli/es/rd/2001/09/28/1066</a>
- **4.** International Commission on Non-Ionizing Radiation Protection (ICNIRP). *Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz)*. Health Phys. 2010 Dec;99(6):818-36. doi: <a href="https://dx.doi.org/10.1097/HP.obo13e3181f06c86">https://dx.doi.org/10.1097/HP.obo13e3181f06c86</a>. Erratum in: Health Phys. 2011 Jan;100(1):112. PMID: 21068601.
- 5. Anses-Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail [Internet]. 2019 [cited 2024 Jul 29]. Effets sanitaires liés à l'exposition aux champs électromagnétiques basses fréquences. Available from: <a href="https://www.anses.fr/fr/content/effets-sanitaires-li%C3%A9s-%C3%A0-l%E2%80%99exposition-aux-champs-%C3%A9lectromagn%C3%A9tiques-basses-fr%C3%A9quences">https://www.anses.fr/fr/content/effets-sanitaires-li%C3%A9s-%C3%A0-l%E2%80%99exposition-aux-champs-%C3%A9lectromagn%C3%A9tiques-basses-fr%C3%A9quences</a>
- **6.** European Commission. Directorate General for Health and Consumers. *Opinion on potential health effects of exposure to electromagnetic fields (EMF)*. [Internet]. LU: Publications Office; 2015 [cited 2024 Jul 29]. Available from: <a href="https://data.europa.eu/doi/10.2772/75635">https://data.europa.eu/doi/10.2772/75635</a>

- **7.** Ministry of Health-Areas-Environmental Health-PESMA [Internet]. [cited 2024 Jul 29]. Available from: <a href="https://www.sanidad.gob.es/areas/sanidadAmbiental/pesma/home.htm">https://www.sanidad.gob.es/areas/sanidadAmbiental/pesma/home.htm</a>
- **8.** Estudio piloto sobre la exposición ambiental a Campos Magnéticos de Frecuencias Extremadamente Bajas (CM-FEB). FASE I [Internet]. 2024. Available from: <a href="https://www.sanidad.gob.es/areas/sanidadAmbiental/riesgosAmbientales/cem/publicaciones/docs/IT\_CM-FEB">https://www.sanidad.gob.es/areas/sanidadAmbiental/riesgosAmbientales/cem/publicaciones/docs/IT\_CM-FEB</a> ok digital.pdf
- 9. *IEC* 62110:2009/COR1:2015 | IEC [Internet]. [cited 2024 Jul 29]. Available from: <a href="https://webstore.iec.ch/en/publication/6472">https://webstore.iec.ch/en/publication/6472</a>
- **10.** EC 61786-2:2014 | IEC [Internet]. [cited 2024 Jul 29]. Available from: <a href="https://webstore.iec.ch/en/publication/5907">https://webstore.iec.ch/en/publication/5907</a>
- **11.** UNE 215001:2004. Standardised procedures to measure power-frequency electric and magnetic fields produced by high-voltage electrical lines. [Internet]. [cited 2024 Jul 29]. Available from: <a href="https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma?-c=N0032708">https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma?-c=N0032708</a>
- 12. Urban D, Tjong L and Karipidis K. Measurement of Extremely Low Frequency Electric and Magnetic Fields Associated with Electricity Supply and Distribution Infrastructure. Australian Radiation Protection and Nuclear Safety Agency [Internet]. Available from: <a href="https://www.arpansa.gov.au/sites/default/files/legacy/pubs/technicalreports/tr170.pdf">https://www.arpansa.gov.au/sites/default/files/legacy/pubs/technicalreports/tr170.pdf</a>
- **13.** Deshayes-Pinçon F, Morlais F, Roth-Delgado O, Merckel O, Lacour B, Launoy G, Launay L, Dejardin O. Estimation of the general population and children under five years of age in France exposed to magnetic field from high or very high voltage power line using geographic information system and extrapolated field data. Environ Res. 2023 Sep 1;232:116425. doi: <a href="https://dx.doi.org/10.1016/j.envres.2023.116425">https://dx.doi.org/10.1016/j.envres.2023.116425</a>. Epub 2023 Jun 14. PMID: 37327843.

Synthesis of the Report Pilot study on environmental exposure to Extremely Low Frequency Magnetic Fields (ELF-EMF). PHASE I.

FRANCISCO VARGAS MARCOS

MARIAN MENDOZA GARCÍA