



SPAIN

Report on EMF activities

Recent advances in technology and telecommunications have led to a staggering increase in environmental and occupational exposure to different types and intensities of electromagnetic fields. At the same time, the potential health effects of this non-ionizing radiation are of great concern to the public, as there is still considerable scientific controversy in this area.

Consequently, regulatory agencies need to base their decision-making on reliable scientific evidence in order to legislate and set safe and appropriate limits that provide adequate social and occupational protection for the public. Accordingly, the Council of the European Union issued Recommendation 199/519/EC (1), which was subsequently updated, establishing restrictions on induced electric current density and theoretical reference EMF levels to ensure the protection of the population from 50 Hz magnetic fields on the basis of the available scientific evidence (2,3). However, the implementation of the European Council Recommendation varies widely, as each Member State sets additional restrictions based on its own criteria, which vary widely in terms of binding force and legal force.

In our country, the criteria established for the regulation of EMF exposure levels are based on Royal Decree 1066/2001, of 28th September (4), in accordance with the scientific evidence available at that time (2). However, it needs to be revised in view of the significant evolution in the type and intensity of the emissions and the research carried out since its publication, which have been carefully analysed and collected by the official bodies competent in this field (EC, WHO and ICNIRP) (5,6,7).

For all these reasons, one line of intervention of the Strategic Health and Environment Plan 2022-2026 (8) focuses on the updating of RD1066/2001, taking into account the new guidelines and recommendations of the main institutions and expert group. In particular, it highlights the need to analyse and regulate the levels of environmental exposure of the Spanish population to Extremely Low Frequency EMF (ELF-EMF), in order to draw up specific legislation and facilitate the management and coordination of the different administrations involved.

Due to the variety and wide distribution of sources emitting this type of frequency (50 Hz), a pilot study was carried out in a limited number of Spanish localities, Albacete, Cáceres and Madrid, in order to determine the levels emitted by different infrastructures and those observed in different population environments, by establishing a measurement protocol based on the relevant national and international regulations (9,10,11), in addition to the technical document TR 170 of ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) (12).

In general, the levels have been measured and analysed inside and outside various public spaces, with special attention to sensitive places such as kindergartens, schools, health centres, nursing homes, etc., as well as the levels emitted in the vicinity of emission sources, mainly in the surroundings of infrastructure related to the generation and distribution of electrical energy and electrified means of transport.



In general, it should be noted that all the magnetic field levels measured were well below the 200 μT limit recommended by ICNIRP. In particular, it was found that the ambient levels of ELF-MC in Spanish public spaces were in the range of 0.05 to 0.2 μT , values that in the worst case (closer to the emission sources) are at least two orders of magnitude lower than the recommended value (200 μT).

As for the measurements of ELF-EMF in public spaces in urban areas it was found that the mean value in residential areas with lower population density is about 25% lower than that observed in more densely populated areas. On the other hand, measurements of mean field levels inside public buildings are 26% higher than those observed in the immediate vicinity (0.129 μT vs. 0.096 μT), probably due to the significant contribution of the electrical installations required by certain buildings, such as hospitals. In this sense, it would be desirable to study individual buildings according to their use in order to obtain more objective results.

On the other hand, the study of the ELF-EMF levels of the different emission sources showed that the average values were highest for the electrical connections of the buildings (3.28 μT), followed by those of the high-voltage lines and transformer stations. However, due to the significant decrease of the magnetic field with distance, the levels at 50 m from the power lines were found to be similar to those observed in a typical urban environment (public spaces), about 0.1 μT .

Comparative statistical analysis between ELF-EMF levels in public spaces and emission sources revealed significantly higher values for the latter (1.303 μT vs. 0.095 μT); however, these differences disappeared when considering that some of these emission sources are located in public spaces.

Interestingly, there is a remarkable similarity between the results on exposure to ELF-EMF from high-voltage power lines and those of a similar study carried out in France (13), despite the larger sample size of the latter, with no statistically significant differences in emission levels from 400 kV power lines.

In view of these results, it would be very interesting to increase the sample size of this pilot study with more records from other locations in the national territory, in order to know the general exposure of the Spanish population to environmental levels of ELF-EMF, taking into account the contribution of some emission sources, such as the electrical connections of buildings and transformer stations, to the levels of ELF-EMF exposure of the population in public spaces.

It would also be necessary to study in more detail the levels of exposure to ELF-EMF in other indoor environments, such as transport, workplaces, dwellings and private homes, where the population spends most of its time.



REFERENCES

1. Council Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). Available at: <https://eur-lex.europa.eu/eli/reco/1999/519/oj>
2. ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz) (1998). Health Physics 74 (4):494-522. Available at: <https://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf>
3. ICNIRP Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz – 100 kHz) 2010. Health Physics 99(6). Available at: <https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf>
4. Royal Decree 1066/2001, of 28th September, BOE-A-2001- 234, 36217-36227. Available at: <https://www.boe.es/eli/es/rd/2001/09/28/1066>
5. European Commission. Directorate General for Health and Consumers, Opinion on potential health effects of exposure to electromagnetic fields (EMF). LU: Publications Office, 2015. Available at: <https://data.europa.eu/doi/10.2772/75635>
6. World Health Organization (2002). Establishing a dialogue on risks from electromagnetic fields. Available at: <https://www.who.int/publications/i/item/9241545712>
7. ICNIRP. (2020). Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz). Health Phys 118 (5):483-524. PMID: 32167495. Available at: <https://doi.org/10.1097/hp.0000000000001210>.
8. Strategic Health and Environment Plan 2022-2026, PESMA. Spanish Ministry of Health and Ministry of Ecological Transition and Demographic Challenge. Available at: https://www.sanidad.gob.es/ciudadanos/saludAmbLaboral/medioAmbiente/docs/PE_SMA_EN.pdf
9. International Electrotecnic Commission. (2009). Corrigendum 1 - Electric and magnetic field levels generated by AC power systems - Measurement procedures with regard to public exposure. Available at: <https://webstore.iec.ch/publication/6473>
10. International Electrotecnic Commission. (2014). Measurement of DC magnetic, AC magnetic and AC electric fields from 1 Hz to 100 kHz with regard to exposure of human beings - Part 2: Basic standard for measurements. Available at: <https://webstore.iec.ch/publication/5907>
11. Spanish Standardization Association (2004). Standardised procedures to measure power-frequency electric and magnetic fields produced by high-voltage electrical lines. (UNE 215001:2004). Available at: <https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma?c=N0032708>
12. Karipidis, K., Tjong, L., Urban, D. (2014). Measurement of Extremely Low Frequency Electric and Magnetic Fields Associated with Electricity Supply and Distribution Infrastructure. Australian Radiation Protection and Nuclear Safety Agency. (TRS 170). Available at: <https://www.arpansa.gov.au/sites/default/files/legacy/pubs/technicalreports/tr170.pdf>



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13. Deshayes-Pinçon, F., Morlais, F., Roth-Delgado, O., Merckel, O., Lacour, B., Launoy, G., Launay, L., Dejardin, O. (2023). 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. *Environmental research*, 232. Available at:
<https://doi.org/10.1016/j.envres.2023.116425>