

EU Directive 2004/40/EC, ECC Rec. (02)04 and CENELEC prEN 50499

Workplace safety in electromagnetic fields

On 29 April, 2004, the European Parliament and the Council of Europe published “Directive 2004/40/EC ... on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)” [1]. That’s a complicated title for a simple goal: To ensure that a harmonised minimum standard applies throughout Europe for electromagnetic fields, in order to protect the working population from excessive exposure and, at the same time, to prevent competitive distortion within the EU. This is an extension consistent with the guidelines dealing with vibration and noise that have already been issued.

Initially, CENELEC was given Mandate M/351 to compile a preliminary standard (prEN) that was to describe harmonised regulations for risk assessment and compulsory measures for minimising exposure. Although the EU Guideline specifies limit values that are based on the ICNIRP limits for occupational exposure [2], it does not contain any rules on how they should be determined. The new prEN 50499 will thus play a similar role in workplace safety as prEN 50413 does in protecting the general public.

Nevertheless, the EU Guideline does contain the following statement: “For the assessment, measurement and/or calculation of worker’s exposure to electromagnetic fields, until harmonised European standards from the European Committee for Electrotechnical Standardisation (CENELEC) cover all relevant assessment, measurement and calculation situations, Member States may employ other scientifically-based standards or guidelines”.

This is helpful in several respects. As mentioned, the EU Guideline states the limit values but does not regulate how they should be determined or, indeed, the method to be used to measure them. Simply put, the guideline says measurements are needed. The CENELEC prEN 50499 will determine what is to be measured, and where. How to make the measurements is left open.

CEPT, the European Conference of Postal and Telecommunications Administrations, has produced ECC Recommendation (02)04 covering radio-frequency fields [3]. This defines generally applicable measurement methods without mentioning any limit values. For such values, it refers to e.g. the EU Council Recommendation 1999/519/EC on protection of the general public [4] and to corresponding national regulations. This has enabled CEPT to specify a strategic procedure that can be applied to public and occupational safety alike, and which does not conflict individual regulations or special local situations. Based on ECC Recommendation (02)04, health and safety executives can specify clear procedural instructions to cover their areas of responsibility without being forced into “do it yourself” solutions with the attendant risk of legal uncertainty. Since the ECC Recommendation is also valid for all CEPT Member States, it extends beyond the boundaries of the EU.

ECC Recommendation (02)04

Terminology

ECC Recommendation (02)04, originally titled “Measuring non-ionising electromagnetic radiation (9 kHz – 300 GHz)”, distinguishes between two radiation exposure level values,

- the Reference Level, and
- the Decision Level.

The Reference Level is based either on the ICNIRP limit values or on nationally-determined limit values. Calculations, tests, or worst-case studies can be used to demonstrate adherence to these limits. However, the measurement uncertainty due to the test equipment and measurement procedure must be taken into account. It is precisely for this reason that the ECC Recommendation defines the Decision Level, which is correspondingly lower than the Reference Level.

Measurement methods

The ECC Recommendation envisages three cases for evaluating situations involving exposure to electromagnetic radiation:

- Case 1: Quick overview
- Case 2: Variable frequency band scan
- Case 3: Detailed investigation

Case 1: Quick overview

This quick test is sufficient as long as all the measured values remain below the Decision Level. If any values are above it, spatial averaging is recommended. This involves making three measurements at 1.1 m, 1.5 m, and 1.7 m above the floor level and calculating the average value. In this way, the recommendation takes account of the non-homogeneous nature typical of high frequency fields in enclosed spaces. If the average value is still above the Decision Level, the next step is to obtain a variable frequency band scan as outlined in case 2.

Broadband measuring equipment, such as the EMR-300, the NBM-520/-550 or the 87XX series from Narda Safety Test Solutions, is ideal for case 1. The following properties are essential here:

- Spatial averaging
- Isotropic (non-directional) field probes
- Measuring instrument and probe must be capable of measuring the root mean square value.

Case 2: Variable frequency band scan

A selective measurement across the frequency range gives information about the contributions of each field source to the overall field exposure. The ECC Recommendation specifies suitable resolution bandwidths and a Decision Level that is 40 dB below the Reference Level. If none of the individual contributions exceeds this level, the safety conditions are deemed to be fulfilled, and it is sufficient to record the two highest individual contributions. Otherwise an exact evaluation is required, in which the individual contributions

are evaluated according to the limit values and added together to give an overall result (integration over a frequency band). If this value is below the permitted limit value, recording the results in detail completes the investigation. If the limit value is exceeded, a detailed investigation as described in case 3 cannot be avoided.

Case 2 is a typical application for selective measuring equipment with the following properties:

- Frequency-selective, isotropic (non-directional) measurement
- Portable, battery powered
- Integration over a frequency band
- Limit value comparison
- Extrapolation of radiation exposure to maximum traffic levels e.g. for GSM base stations or UMTS radio cells.

SRM-3000, the Selective Radiation Meter from Narda Safety Test Solutions, was developed especially for these tasks.

Case 3: Detailed investigation

The methods described here should be used if the values determined in case 1 and case 2 exceed the limit values or if cases 1 and 2 cannot be applied:

- If near field measurements are needed
- If strong electric or magnetic fields are to be measured
- If “special” conditions apply, such as when pulsed, time-variable or broadband emissions are present.

A full spectrum of measuring devices is needed to cover the third case:

- Personal monitors
- E- and H-field probes for near field measurements
- Thermocouple probes for radar measurements
- Selective radiation meters.

Narda Safety Test Solutions offers a complete range of test equipment that covers all three aspects of the ECC recommendation: Measuring instruments for safety assessment of electric, magnetic and electromagnetic fields.



Standards and Guidelines

- [1] Directive 2004/40/EC of the European Parliament and the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).
Official Journal of the European Union L 159 of 30 April 2004

- [2] Guidelines on Limiting Exposure to Non-Ionizing Radiation, International Commission on Non-Ionizing Radiation Protection (ICNIRP) and World Health Organization (WHO), July 1999.
ISBN 3-9804789-6-3

- [3] Revised ECC Recommendation (02)04: Measuring non-ionising electromagnetic radiation (9 kHz – 300 GHz).
Electronic Communications Committee (ECC) within the European Conference of Postal and Telecommunications Administrations (CEPT). Edition October, 2003

- [4] Council Recommendation of 12 July on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC).
Official Journal of the European Communities L 199/59, 30.7.1999