ECC Recommendation (25)01

Emission limit requirements for Wireless Power Transmission (WPT)

**approved 14 February 2025**

# Introduction

This Recommendation specifies the limits of the operating and unwanted emissions of non-beam Wireless Power Transmission (WPT) applications. However, the current version only covers the use of WPT applications for medical implantable devices as well as for generic WPT applications, including portable and mobile WPT applications.

WPT applications bring together a number of different technologies to transmit energy through electromagnetic fields with or without the use of beams (beam or non-beam), inductive or capacitive coupling, magnetic resonance, etc. The concept consists of a transmitter device connected to an energy source, which is converted into an electromagnetic field directed towards a receiving device, which receives energy and converts it to be stored in its battery or to power the device directly. The WPT applications may also include data communications and/or radiodetermination simultaneously. Data can be transmitted on the same frequency or on a different frequency band or even with any other technology.

Operating emissions refer to radiated emissions resulting from the operation of the WPT transmitter at the frequencies used for the purpose of transmitting energy towards a WPT receiving device. Unwanted emissions refer to radiated emissions that are typically dominated by harmonics caused by the type of power feed of the charging coil (i.e. power transmission).

Two main types of non-beam WPT applications are considered:

* **Inductive coupling** is widely used for charging electronic devices where electrical power is transferred over a small air gap between wire coils. The primary coils and secondary coils are designed to, and need to have, strong inductive coupling. It is characterised by the fact that the efficiency of the energy transfer reduces rapidly as the air gap between the coils increases and the strength of the inductive coupling weakens;
* **Magnetic resonance coupling** technique uses a coil and a capacitor as a resonator. Electrical power is transferred over an air gap between two magnetically resonant wire coils. Electrical power can be transferred over a larger air gap, compared to inductive coupling, by matching the resonant frequency of the two coils. This technique allows flexibility in the physical arrangement of the primary coil relative to the secondary coil.

Where a difference between the limits for a particular standard and this Recommendation might exist, in particular if the limits are less stringent, the iterative, consultative procedure given in the ETSI/ECC Memorandum of Understanding[[1]](#footnote-2) should be followed. This procedure should consider the interaction between technical parameters, spectrum efficiency, as well as regulatory and economic aspects.

Considering that generic portable and mobile devices using WPT technologies are already available on the market and may not be able to meet the recommended values of this recommendation, it is suggested that CEPT countries may consider allowing them to remain operational even after the implementation of this recommendation.

It is considered appropriate that this Recommendation should be reviewed at least every three years, in light of changing WPT technologies and regulatory requirements. This review should involve consultation with the relevant technical bodies and working groups within CEPT/ECC, ETSI and CENELEC.

# ECC Recommendation (25)01 of 14 February 2025 on Emission limit requirements for Wireless Power Transmission (WPT)

“The European Conference of Postal and Telecommunications Administrations,

*considering*

1. that the radio frequency spectrum is a common resource, and it is necessary to avoid harmful interference;
2. that CEPT countries need to define common limits of operating and unwanted emissions for all WPT applications that may be put into operation with a view to prevent interference to radiocommunication services;
3. that CEPT, ETSI and CENELEC have signed Memoranda of Understanding describing the relative responsibilities of the three bodies1;
4. that emission limits are usually reflected in the ETSI Harmonised Standards;
5. that this Recommendation assumes that WPT emissions are measured with a peak detector;
6. that ETSI, CENELEC and TCAM consider that WPT applications are part of the radiocommunication framework, considering that every WPT application holds the functionality of detecting foreign objects and manages the transfer of energy simultaneously;
7. that ECC Report 333 [4] considers low power non-beam generic WPT applications operating in various frequency bands below 30 MHz;
8. that existing non-beam generic WPT applications, complying with the limits in ERC Recommendation 70-03, annex 9 [1] and ERC Recommendation 74-01 [2], showed no problem to any other existing system or existing radiocommunication service;
9. that Eurobalise tele-powering and applications based on RFID or NFC (communication and tele-powering combined) are inductive short-range devices subject to ERC Recommendation 70-03;
10. that Recommendation ITU-R SM.2129 [3] provides guidance on frequency ranges for the operation of non-beam WPT applications for mobile and portable devices;
11. that, under specific protection criteria and assumptions, some study results in ECC Report 333 [4] found limits to protect certain radio communication services that are lower than those in this Recommendation;

*recommends*

1. that the operating and unwanted emission limits for non-beam WPT applications apply for the range of 100 Hz to 30 MHz;
2. that the operating emission limits for non-beam generic WPT applications and for medical implantable devices defined in Annex 1 should apply;
3. that the unwanted emission limits for non-beam generic WPT applications and for medical implantable devices defined in Annex 2 should apply;
4. that the recommended emission limits should be considered for relevant standards developed or revised after the date at which this ECC Recommendation has been approved;
5. that WPT devices which have been placed on the market before the implementation of this ECC Recommendation at the national level should be allowed to continue to operate;
6. that WPT applications permitted under this ECC Recommendation operate on a non-interference, non-protected basis.

*Note: Please check the Office documentation database* [*https://docdb.cept.org/*](https://docdb.cept.org/) *for the up to date position on the implementation of this and other ECC Recommendations.*

1. non-beam generic WPT operating emission limit requirements

Non-beam generic WPT applications cover typically: smartphones, small devices (tablets, cameras, loudspeakers), wearables, portables, small IoT devices and medical implantable devices.

* 1. Generic requirements

This section covers frequency bands and regulatory limits as well as informative parameters valid for all types of non-beam WPT applications. Alternative limits for the operating emissions may be defined for specific categories of device such as medical implants (see section A1.2).

Table 1: Operating emission limits for non-beam generic WPT

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Band** | | **Power / Magnetic Field** | **Notes** |
| a1 | 100-140 kHz | 42 dBµA/m at 10 m |  |
| a2 | 140-148.5 kHz | 37.7 dBµA/m at 10 m |  |
| b1 | 315-405 kHz | -15 dBμA/m at 10 m per 10 kHz  not exceeding -5 dBμA/m at 10 m in total  (see also Table 2) |  |
| b2 | 1700-1800 kHz |  |
| b3 | 2005-2170 kHz |  |
| c | 6765-6795 kHz | 42 dBµA/m at 10 m |  |
| d | 13553-13567 kHz | 42 dBµA/m at 10 m |  |

Table 2: Standard frequency and time signals to be protected within 9-200 kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Stations** | **Frequency** | **Protection bandwidth** | **Maximum field strength** | **Location** |
| MSF | 60 kHz | +/-250 Hz | 42 dBµA/m at 10 m | United Kingdom |
| HBG | 75 kHz | +/-250 Hz | 42 dBµA/m at 10 m | Switzerland |
| DCF77 | 77.5 kHz | +/-250 Hz | 42 dBµA/m at 10 m | Germany |
| DCF49 | 129.1 kHz | +/-500 Hz | 42 dBµA/m at 10 m | Germany |
| ALS162 | 162 kHz | +/-250 Hz | -15 dBµA/m at 10 m | France |

* 1. Specific requirements for medical implantable WPT applications

This section covers frequency bands and regulatory limits as well as informative parameters valid for medical implants, where powering the implant or charging the implant battery uses WPT applications. Medical implants may use also the parameters from Table 1.

Table 3: Operating emission limits for medical implantable WPT

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Band | | Power / Magnetic Field | Notes |
| a | 8.4-9.4 kHz | 30 dBµA/m at 10 m |  |
| b | 36-46 kHz | 30 dBµA/m at 10 m |  |
| c | 47.5-52.5 kHz | 30 dBµA/m at 10 m |  |
| d | 76-87 kHz | 50 dBµA/m at 10 m  (see also Table 2) |  |
| e | 119-130 kHz | 66 dBµA/m at 10 m  descending by 10 dB/decade |  |
| f | 121-129 kHz | 50 dBµA/m at 10 m |  |
| g | 200-220 kHz | 40 dBµA/m at 10 m |  |
| h | 260-320 kHz | 30 dBµA/m at 10 m |  |
| i | 4000-5900 kHz | 9 dBµA/m at 10 m |  |
| j | 5880-7680 kHz | 9 dBµA/m at 10 m |  |

1. Unwanted emission limit requirements for wpt applications

In order to protect the existing radiocommunication services, the following emission limits should apply.

Table 4: Unwanted emission limits in the spurious domain for non-beam generic WPT

|  |  |
| --- | --- |
| **Frequency range** | **Power / Magnetic Field limit** |
| 100 Hz – 148.5 kHz | 46.5 dBµA/m per BR at 10 m  decreasing by 10 dB/decade |
| 148.5-5000 kHz | -15 dBµA/m per 10 kHz at 10 m |
| 5-30 MHz | -20 dBµA/m per 10 kHz at 10 m |
| Note 1: These limits apply to any centre frequency offset ≥ 2.5×BO where BO is the occupied bandwidth of the operational emission.  Note 2: BR values are defined in Table 6. | |

Table 5: Unwanted emission limits in the spurious domain for medical implantable WPT

|  |  |
| --- | --- |
| Frequency range | Power / Magnetic Field limit |
| 100 Hz – 10 MHz | 46.5 dBµA/m per BR at 10 m  decreasing by 10 dB/decade |
| 10-30 MHz | -3.5 dBµA/m per 10 kHz at 10 m |
| Note 1: These limits apply to any centre frequency offset ≥ 2.5×BO where BO is the occupied bandwidth of the operational emission.  Note 2: BR values are defined in Table 6. | |

Table 6: Reference bandwidth BR

|  |  |
| --- | --- |
| Frequency range | BR |
| 100-500 Hz | 10 Hz |
| 500 Hz – 9 kHz | 100 Hz |
| 9-148.5 kHz | 1 kHz |
| 148.5 kHz – 30 MHz | 10 kHz |

The limits specified in ERC Recommendation 74-01 Annex 2 row 2.1.3 [2] apply to spurious domain emissions above 30 MHz.

1. List of abbreviations

Table 7: List of abbreviations

|  |  |
| --- | --- |
| **Abbreviation** | **Explanation** |
| CENELEC | European Committee for Electrotechnical Standardization |
| CEPT | European Conference of Postal and Telecommunications Administrations |
| ECC | Electronic Communications Committee |
| ERC | Former European Radiocommunications Committee (now ECC) |
| ETSI | European Telecommunication Standards Institute |
| IoT | Internet of Things |
| ITU | International Telecommunication Union |
| MoU | Memorandum of Understanding |
| SRD | Short Range Device |
| TCAM | Telecommunication Conformity Assessment and Market surveillance committee |
| WPT | Wireless Power Transmission |

1. List of references

1. [ERC Recommendation 70-03](https://docdb.cept.org/document/845): “relating to the use of Short Range Devices (SRD), approved October 1997, latest amended February 2025

1. [ERC Recommendation 74-01](https://docdb.cept.org/document/1001): “Unwanted Emissions in the Spurious Domain”, approved October 1998, latest corrected May 2022
2. Recommendation ITU-R SM.2129: “Guidance on frequency ranges for the operation of non-beam wireless power transmission for mobile and portable devices”

1. [ECC Report 333](https://docdb.cept.org/document/26186): “Non-beam Wireless Power Transmission (WPT) applications other than WPT-EV operating in various frequency bands below 30 MHz”, approved January 2022

1. <https://www.cept.org/ecc/mous-and-lous-between-cept-ecc-former-erc-and-other-organisations> [↑](#footnote-ref-2)