

Recommendation ITU-R SM.2129-1

(09/2024)

SM Series: Spectrum management

Guidance on frequency ranges for the operation of non-beam wireless power transmission for mobile and portable devices



Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Series of ITU-R Recommendations

(Also available online at <https://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R SM.2129-1

Guidance on frequency ranges for the operation of non-beam wireless power transmission for mobile and portable devices

(2019-2024)

Scope

This Recommendation provides guidelines for the use of frequency ranges for the operation of non-beam wireless power transmission (WPT) for mobile and portable devices.

Keywords

Wireless power transmission, short-range devices, ISM, non-beam, mobile, portable

Abbreviations/Glossary

CISPR	In French “Comité International Spécial des Perturbations Radioélectriques”, International Special Committee on Radio Interference
ICNIRP	International Commission on Non-ionizing Radiation Protection
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ISM	Industrial, scientific, medical
RR	Radio Regulations
SFTS	Standard frequency and time signal
WHO	World Health Organization
WPT	Wireless power transmission

Related ITU-R Recommendations and Reports

Recommendation ITU-R SM.1056 – Limitation of radiation from industrial, scientific and medical (ISM) equipment

Recommendation ITU-R SM.1896 – Frequency ranges for global or regional harmonization of short-range devices

Report ITU-R SM.2153 – Technical and operating parameters and spectrum use for short-range radiocommunication devices

Report ITU-R SM.2303 – Wireless power transmission using technologies other than radio frequency beam

Report ITU-R SM.2449 – Impact analyses of non-beam magnetic inductive and magnetic resonant wireless power transmission for mobile and portable devices on radiocommunication services

The ITU Radiocommunication Assembly,

considering

a) that wireless power transmission (WPT) is defined as the transmission of power from a power source to an electrical load wirelessly using the electromagnetic field;

- b) that WPT technologies utilize various mechanisms, such as transmission via radio frequency radiated transmissions in the far field (beam WPT) and near-field inductive, resonant and capacitive coupling (non-beam WPT);
- c) that WPT technologies are used in applications to charge mobile and portable devices;
- d) that there is potential consumer demand for WPT technologies used for mobile and portable devices;
- e) that WPT standards are currently being developed at national, regional and international levels;
- f) that industrial alliances, consortia, and academia have investigated several frequency bands for WPT technologies, including magnetic resonant and induction technology for mobile devices in several frequency ranges;
- g) that for the purposes of WPT studies the standard frequency and time signal and the radio astronomy services are to be treated as radiocommunication service;
- h) that the Standard Frequency and Time Signal (SFTS) service is intended for general reception and could be susceptible to interference from WPT devices;
- i) that studies have been conducted on the impact of non-beam WPT for mobile and portable devices to radiocommunication services in the frequency ranges 100-148.5 kHz, 315-405 kHz, 1 700-1 800 kHz, and 2 005-2 150 kHz and can be found in Report ITU-R SM.2449;
- j) that as more WPT devices proliferate globally, ITU-R is developing guidance to minimize the impact of using WPT technologies on radiocommunication services including the standard frequency and time signal service and the radio astronomy service;
- k) that to mitigate the impact of WPT devices on the operation of radiocommunication services some solutions utilize frequency bands designated for Industrial, Scientific, Medical (ISM) applications;
- l) that issues of non-ionizing radiation exposure are dealt with by international organizations such as the World Health Organization (WHO), the International Commission on Non-ionizing Radiation Protection (ICNIRP), and International Electrotechnical Commission TC106, and that ICNIRP 2010 provides guidelines for limiting exposure (up to 10 MHz), and ICNIRP 1998 provides Guidelines for limiting exposure (up to 300 GHz);
- m) that Report ITU-R SM.2449 contains impact analyses of non-beam inductive WPT for mobile and portable devices on radiocommunication services,
recognizing
 - a) that WPT is not a radiocommunication service and has no status in the Radio Regulations (RR), but may be regarded as subject to Nos. **15.12** or **15.13** as the case may be;
 - b) that the criteria to protect various radiocommunication services from harmful interference are specified in existing ITU-R Recommendations;
 - c) that both consumers and manufacturers may benefit from harmonized frequency ranges and technical conditions for WPT technologies;
 - d) that frequency bands designated for ISM applications have been successfully used in the past for development and proliferation of innovative technologies in accordance with the RR;
 - e) that the band 6 765-6 795 kHz, which is designated for ISM use under RR No. **5.138** has been found to have advantages for WPT using magnetic resonance technologies in applications of charging of mobile/portable devices;

- f) that the band 13 553-13 567 kHz, which is designated for ISM use under RR No. **5.150** has also been found to have advantages for WPT using magnetic resonance technologies in applications of charging of mobile/portable devices;
- g) that some administrations classify the non-beam WPT energy transfer as an ISM application, even for operation outside bands designated for ISM use;
- h) that some administrations classify non-beam WPT for mobile and portable devices as radio applications such as Short-Range Devices;
- i) that some non-ISM bands are taken into consideration for the global or regional harmonized use of specific non-beam WPT for mobile and portable devices;
- j) that the WPT energy transfer can be treated separately from data communications, especially when the receiving device receives data communications at a frequency different from that for the energy transfer;
- k) that in the absence of a load, the WPT shuts off and only periodically polls or searches for the load, with very low duty cycle;
- l) that for non-beam WPT, the radiated power is much lower than RF power transferred (most power is transferred to the receiver through mechanisms such as capacitive, resonant and inductive coupling);
- m) that Recommendation ITU-R SM.1056 on the limitation of radiation from ISM equipment recommends that administrations consider the use of the latest edition of CISPR publication 11, and that these limits do not necessarily protect radio communication services,

noting

that the International Electrotechnical Commission (IEC) has published a Technical Report IEC/TR 62869 on Wireless Power Transfer for audio, video and multimedia systems and equipment developed by TC 100,

recommends

- 1 that administrations should consider as a guideline the use of the frequency ranges, or portions thereof, listed in Table 1 below for the operation of non-beam WPT for mobile and portable devices;
- 2 that necessary steps should be taken to ensure that non-beam WPT for mobile and portable devices do not cause harmful interference to radiocommunication services, including the standard frequency and time signal service as well as the radio astronomy service, so that these remain protected from radio frequency energy emanating from WPT for mobile and portable devices and falling into all bands.

TABLE 1

Frequency ranges for operation of non-beam WPT for mobile and portable devices

Frequency range	Non-beam WPT technologies
100-148.5 kHz	Inductive or magnetic resonance technology
315-405 kHz	Inductive technology
1 700-1 800 kHz	Inductive technology
2 005-2 170 kHz	Inductive technology
6 765-6 795 kHz Note: See RR No. 5.138	Inductive or magnetic resonance technology
13 553-13 567 kHz Note: See RR No. 5.150	Inductive or magnetic resonance technology

Note: Some of the frequency ranges (or parts thereof) in the above Table may not be available for non-beam WPT for mobile and portable devices in some countries, as a result of the different national allocations and regulatory conditions.
