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Radiocommunication Sector of ITU

Report ITU-R SM.2153-9
(07/2022)

Technical and operating parameters and spectrum use for short-range radiocommunication devices

SM Series

Spectrum management

Foreword

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***Note**: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

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REPORT ITU-R SM.2153-9*, **

Technical and operating parameters and spectrum use for short-range radiocommunication devices***

(2009-2010-2011-2012-2013-2015-2017-2019-2021-2022)

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* This Report replaces Recommendation ITU-R SM.1538.

** Radiocommunication Study Group 1 made editorial amendments to this Report in year 2023.

*** Unless otherwise specified by mutual agreement between given administrations, status given to SRDs in individual country does not engage any other countries.

1 Introduction

This Report sets out common technical and non-technical parameters for short-range radiocommunication devices (SRDs) and widely recognized approaches for managing their use on a national basis. When using this Report, it should be remembered that it represents the most widely accepted views, but it should not be assumed that all given parameters are accepted in all countries.

It should also be remembered that the pattern of radio use is not static. It is continuously evolving to reflect the many changes that are taking place in the radio environment; particularly in the field of technology. Radio parameters must reflect these changes and the views set out in this Report are therefore subject to periodic review.

Moreover, almost all administrations still have national regulations. For these reasons, those wishing to develop or market SRDs based on this Report are advised to contact the relevant national administration to verify that the position set out herein applies.

SRDs are used virtually everywhere. For example, data collection with auto identification systems or item management in warehousing, retail and logistic systems, baby monitors, garage door openers, wireless home data telemetry and/or security systems, keyless automobile entry systems and hundreds of other types of common electronic equipment rely on such transmitters to function. At any time of day, most people are within a few metres of consumer products that use SRDs.

SRDs operate on a variety of frequencies. They must share these frequencies with other radio applications and are generally prohibited from causing harmful interference to or claiming protection from those radio applications. If an SRD does cause interference to authorized radiocommunications, even if the device complies with all of the technical standards and equipment authorization requirements in the national rules, then its operator will be required to cease operation, at least until the interference problem is solved.

However, some national administrations may establish radiocommunication services, using SRDs, whose importance to the public requires that these devices be protected to some degree from harmful interference, without any adverse effect on other administrations. One example for this kind of arrangement is the ultra-low power active medical implant communication device as defined below, which is governed by national regulations.

This Report has two Annexes. Annex 1 contains technical parameters of several types of additional applications. Annex 2 provides information on national/regional rules which contain technical and operational parameters and spectrum use: those are given in the Attachments to Annex 2.

2 Definition of short-range radio devices

For the purpose of this Report the term short-range radio device is intended to cover radio transmitters which provide either unidirectional or bidirectional communication and which have low capability of causing interference to other radio equipment.

Such devices are permitted to operate on a non-interference and non-protected basis.

SRDs use either integral, dedicated or external antennas and all types of modulation and channel pattern can be permitted subject to relevant standards or national regulations.

Simple licensing requirements may be applied, e.g. general licences or general frequency assignments or even licence exemption, however, information about the regulatory requirements for placing short-range radiocommunication equipment on the market and for their use should be obtained by contacting individual national administrations.

3 Applications

Due to the many different applications provided by these devices, no description can be exhaustive; however, the following categories are amongst those regarded SRDs:

3.1 Telecommand

The use of radiocommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance.

3.2 Telemetry

The use of radiocommunication for indicating or recording data at a distance.

3.3 Voice and video

In connection with SRDs, voice covers applications like walkie-talkie, baby monitoring and similar use. Citizen band (CB) and private mobile radio (PMR 446) equipment is excluded.

With video applications, non-professional cordless cameras are meant mainly to be used for controlling or monitoring purposes.

3.4 Equipment for detecting avalanche victims

Avalanche beacons are radio location systems used for searching for and/or finding avalanche victims, for the purpose of direct rescue.

3.5 Broadband radio local area networks

Broadband radio local area networks (RLANs) were conceived in order to replace physical cables for the connection of data networks within a building, thus providing a more flexible and, possibly, a more economic approach to the installation, reconfiguration and use of such networks within the business and industrial environments.

These systems often take advantage of spread spectrum modulation or other redundant (i.e. error correction) transmission techniques, which enable them to operate satisfactorily in a noisy radio environment. In the lower frequency bands, satisfactory in-building propagation may be achieved but systems are limited to low data rates (up to 1 Mbit/s) because of spectrum availability.

To ensure compatibility with other radio applications in the 2.4 GHz and 5 GHz band a number of restrictions and mandatory features are required. Other studies on RLANs are going on in the Radiocommunication Study Groups.

WRC-03 decided to allocate the bands 5 150-5 350 MHz and 5 470-5 725 MHz to the mobile except aeronautical mobile service with a primary status for the implementation of wireless access systems including RLANs. In these bands, simple licensing requirements are applied, e.g. general licences or general frequency assignments or licence exemption by most national administrations, similar to SRDs.

3.6 Railway applications

Applications specifically intended for use on railways comprise mainly the following three categories:

3.6.1 Automatic vehicle identification

The automatic vehicle identification (AVI) system uses data transmission between a transponder located on a vehicle and a fixed interrogator positioned on the track to provide for the automatic and unambiguous identification of a passing vehicle. The system also enables any other stored data to be read and provides for the bidirectional exchange of variable data.

3.6.2 Balise system

Balise is a system designed for locally defined transmission links between train and track. Data transmission is possible in both directions. The physical data transmission path length is of the order of 1 m, i.e. it is significantly shorter than a vehicle. The interrogator is secured under the locomotive and the transponder is positioned at the centre of the track. Power is supplied to the transponder by the interrogator.

3.6.3 Loop system

The loop system is designed for the transmission of data between train and track. Data transmission is possible in both directions. There are short loops and medium loops which provide for intermittent and continuous transmissions. In case of short loops the contact length is of the order of 10 m. The contact length in the case of medium loops is between 500 m and 6 000 m. No train location functions are possible in the case of continuous transmission. The contact length is greater than in the case of intermittent transmission and generally exceeds the length of a block. A block is a section of the track in which only one train may be situated.

3.7 Road transport and traffic telematics

(Also referred to as dedicated short-range communications for transport information and control systems (TICSs).)

Road transport and traffic telematics (RTTT) systems are defined as systems providing data communication between two or more road vehicles and between road vehicles and the road infrastructure for various information-based travel and transport applications, including automatic toll-collection, route and parking guidance, collision avoidance and similar applications.

3.8 Equipment for detecting movement and equipment for alert

Equipment for detecting movement and equipment for alert are low power radar systems for radiodetermination purposes. Radiodetermination means the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.

3.9 Alarms

3.9.1 Alarm in general

The use of radiocommunication for indicating an alarm condition at a distant location.

3.9.2 Social alarms

The social alarm service is an emergency assistance service intended to allow people to signal that they are in distress and allow them to receive the appropriate assistance. The service is organized as any assistance network, generally with a team available on a 24 h basis in a station where alarm signals are received and appropriate steps are taken to provide the required assistance (calling a doctor, the fire brigade, etc.).

The alarm is usually sent via the telephone line, automatic dialling being ensured by fixed equipment (local unit) connected to the line. The local unit is activated from a small portable radio device (trigger) worn by the individual.

Social alarm systems are typically designed to provide as high a level of reliability as is practically feasible. For radio systems, the interference risk would be limited if frequencies were reserved for their exclusive use.

3.10 Model control

Model control covers the application of radio model control equipment, which is solely for the purpose of controlling the movement of the model (toy), in the air, on land or over or under the water surface.

3.11 Inductive applications

Inductive loop systems are communication systems based on magnetic fields generally at low RF frequencies.

The regulations for inductive systems are different in various countries. In some countries this equipment is not considered as radio equipment, and neither type approval nor limits for the magnetic field are set. In other countries inductive equipment is considered as radio equipment and there are various national or international type approval standards.

Inductive applications include for example car immobilizers, car access systems or car detectors, animal identification, alarm systems, item management and logistic systems, cable detection, waste management, personal identification, wireless voice links, access control, proximity sensors, anti-theft systems including RF anti-theft induction systems, data transfer to handheld devices, automatic article identification, wireless control systems and automatic road tolling.

3.12 Radio microphones

Radio microphones (also referred to as wireless microphones or cordless microphones) are small, low power (50 mW or less) unidirectional transmitters designed to be worn on the body, or handheld, for the transmission of sound over short distances for personal use. The receivers are more tailored to specific uses and may range in size from small hand units to rack mounted modules as part of a multichannel system.

3.13 RF identification systems

The object of any RF identification (RFID) system is to carry data in suitable transponders, generally known as tags, and to retrieve data, by hand- or machine-readable means, at a suitable time and place to satisfy particular application needs. Data within a tag may provide identification of an item in manufacture, goods in transit, a location, the identity of persons and/or their belongings, a vehicle or assets, an animal or other types of information. By including additional data, the prospect is provided for supporting applications through item specific information or instructions immediately available on reading the tag. Read-write tags are often used as a decentralized database for tracking or managing goods in the absence of a host link.

A system requires, in addition to tags, a means of reading or interrogating the tags and some means of communicating the data to a host computer or information management system. A system will also include means for entering or programming data into the tags if this is not undertaken at the source by the manufacturer.

Quite often an antenna is distinguished as if it were a separate part of an RFID system. While its importance justifies this attention it should be seen as a feature that is present in both readers and tags, essential for the communication between the two. While the antenna of tags is an integral part of the device, the reader or interrogator can have either an integral or separate antenna in which case it shall be defined as an indispensable part of the system (see also § 7).

3.14 Ultra low power active medical implant

The ultra-low power active medical implant (ULP-AMIs) is part of a medical implant communication systems (MICS) for use with implanted medical devices, like pacemakers, implantable defibrillators, nerve stimulators, and other types of implanted devices. The MICS uses transceiver modules for radiofrequency communication between an external device referred to as a programmer/controller and a medical implant placed within a human or animal body.

These communication systems are used in many ways, for example: device parameter adjustment (e.g. modification of the pacing parameters), transmission of stored information (e.g. electro-cardiograms stored over time or recorded during a medical event), and the real time transmission of monitored vital life signs for short periods.

MICS equipment is used only under the direction of a physician or other duly authorized medical professional. The duration of these links is limited to the short periods of time necessary for data retrieval and reprogramming of the medical implant related to patient welfare.

3.15 Wireless audio applications

Applications for wireless audio systems include the following: cordless loudspeakers, cordless headphones, cordless headphones for portable use, i.e. portable compact disc players, cassette decks or radio receivers carried on a person, cordless headphones for use in a vehicle, for example for use with a radio or mobile telephone, etc., in-ear monitoring, for use in concerts or other stage productions.

Systems should be designed in such a way that in the absence of an audio input no RF carrier transmission shall occur.

3.16 RF (radar) level gauges

RF level gauges have been used in many industries for many years to measure the amount of various materials, primarily stored in an enclosed container or tank. The industries in which they are used are mostly concerned with process control. These SRDs are used in facilities such as refineries, chemical plants, pharmaceutical plants, pulp and paper mills, food and beverage plants, and power plants among others.

All of these industries have storage tanks throughout their facilities where intermediate or final products are stored, and which require level measurement gauges.

Radar level gauges may also be used to measure the level of water of a river (e.g. when fixed under a bridge) for information or alarm purposes.

Level gauges using an RF electromagnetic signal are insensitive to pressure, temperature, dust, vapours, changing dielectric constant and changing density.

The types of technology used in RF level gauge products include:

- pulsed radiating; and
- frequency modulated continuous wave (FMCW).

4 Technical standards/regulations

There are a number of conformity assessment standards on SRDs produced by various international standards organizations, and national standards that have gained international recognition. These are, *inter alia*, the European Telecommunications Standards Institute (ETSI), International Electrotechnical Commission (IEC), European Committee for Electrotechnical Standardization (CENELEC), International Organization for Standardization (ISO), Underwriters Laboratories Inc. (UL), Association of Radio Industries and Business (ARIB), Federal Communications Commission (FCC) Part 15, among others. In many cases there are mutual agreements of the recognition of these standards between administrations and/or regions which avoids the need to have the same device assessed for conformity in each country where it is to be deployed (see also § 8.3).

It should be noted that in addition to the technical standards on the radio parameters of devices there may be other requirements which have to be met before a device can be placed on the market in any country such as electromagnetic compatibility (EMC), electrical safety, etc.

5 Common frequency ranges

There are certain frequency bands which are used for SRDs in all regions of the world. These common bands are indicated in Table 1. Although this table represents the most widely accepted set of frequency bands for SRDs it should not be assumed that all of these bands are available in all countries.

However, it should be noted that SRDs may generally not be permitted to use bands allocated to the following services:

– radio astronomy;

– aeronautical mobile;

– safety of life services including radionavigation.

It should further be noted that the frequency bands mentioned in RR Nos. 5.138 and 5.150 are designated for industrial, scientific and medical (ISM) applications (see RR No. 1.15 for definition of ISM). SRDs operating within these bands must accept harmful interference which may be caused by these applications.

Since SRDs generally operate on a non-interference, no protection from interference basis (see definition of SRDs in § 2), ISM bands, among others, have been selected as home for these devices.

In the different regions there are a number of additional recommended frequency bands identified to be used for short-range radio applications. Details of those frequency bands may be found in the appendices.

TABLE 1

Commonly used frequency ranges

ISM within bands under RR Nos. 5.138 and 5.150	
6 765-6 795 kHz	
13 553-13 567 kHz	
26 957-27 283 kHz	
40.66-40.70 MHz	
2 400-2 483.5 MHz	
5 725-5 875 MHz	
24-24.25 GHz	
61-61.5 GHz	
122-123 GHz	
244-246 GHz	
Other commonly used frequency ranges	
9-135 kHz:	Commonly used for inductive short-range radiocommunication applications
3 155-3 195 kHz:	Wireless hearing aids (RR No. **5.116**)
402-405 MHz:	Ultra low power active medical implants Recommendation ITU-R RS.1346
5 795-5 805 MHz:	Transport information and control systems Recommendation ITU-R M.1453
5 805-5 815 MHz:	Transport information and control systems Recommendation ITU-R M.1453
76-77 GHz:	Transport information and control system (radar) Recommendation ITU-R M.1452

NOTE 1 – See also Recommendation ITU-R SM.1756 – Framework for the introduction of devices using ultra-wideband technology.

6 Radiated power or magnetic or electric field strength

The radiated power or magnetic or electric field-strength limits shown in Tables 2 to 5 are the required values to allow satisfactory operation of SRDs. The levels were determined after careful analysis and are dependent on the frequency range, the specific application chosen and the services and systems already used or planned in these bands.

6.1 European Conference of Postal and Telecommunications Administrations member countries

Radiated power and magnetic or electric field-strength limits for SRDs in CEPT countries can be found amongst frequency bands and other parameters in Table 9, Attachment 1 to Annex 2 of this Report.

6.2 United States of America Federal Communications Commission (FCC), Brazil and Canadian general limits

TABLE 2

General limits for any intentional transmitter

Frequency (MHz)	Electric field strength (μV/m)	Measurement distance (m)
0.009-0.490	2 400/*f* (kHz)	300
0.490-1.705	24 000/*f* (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

The emission limits shown in the above Table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Exceptions or exclusions to the general limits are listed in Attachment 2 to Annex 2.

6.3 Japan

TABLE 3

Tolerable value of electric field strength 3 m distant from a radio station emitting extremely low power

Frequency band	Electric field strength (μV/m)
$f \leq 322$ MHz	500
322 MHz < $f \leq 10$ GHz	35
10 GHz < $f \leq 150$ GHz	$3.5 \times f$ [(1), (2)]
150 GHz < f	500

(1) f (GHz).

(2) If $3.5 \times f > 500$ μV/m, the tolerable value is 500 μV/m.

6.4 The Republic of Korea

TABLE 4

The limit of electric field strength of the low power device

Frequency band	Electric field strength measured at the distance of 3 m (μV/m)
f < 322 MHz	Less than 500 (1)
322 MHz ≤ f < 10 GHz	Less than 35
10 GHz ≤ f < 150 GHz	Less than 3.5 × f (2) If 3.5 × f > 500, it should be 500.
f ≥ 150 GHz	Less than 500

(1) The measured value for the frequency lower than 15 MHz should be multiplied by the near field measurement compensation factor ($6\pi/\lambda$), where λ is wavelength (m).

(2) Frequency in GHz.

7 Antenna requirements

Basically, three types of transmitter antennas are used for short-range radiocommunication transmitters:

- integral (no external antenna socket);
- dedicated (type approved with the equipment);
- external (equipment type approved without antenna).

In most cases short-range radiocommunication transmitters are equipped with either integral or dedicated antennas, because changing the antenna on a transmitter can significantly increase, or decrease, the strength of the signal that is ultimately transmitted. Except for some special applications, the RF requirements are not based solely on output power but also take into account the antenna characteristics. Thus, a short-range radiocommunication transmitter that complies with the technical standards with a particular antenna attached could exceed the power limits given if a different antenna is attached. Should this happen a serious interference problem to authorized radiocommunications such as emergency, broadcast and air-traffic control communications could occur.

In order to prevent such interference problems, short-range radiocommunication transmitters shall be designed to ensure that no type of antenna can be used other than one which has been designed and type approved by the manufacturer to show conformity with the appropriate emission level. This means that normally short-range radiocommunication transmitters must have permanently attached, or detachable antennas with a unique connector. A unique connector is one that is not of a standard type found in electronic supply stores or not normally used for RF connection purposes. National administrations may define the term unique connector differently.

It is recognized that suppliers of short-range radiocommunication transmitters often want their customers to be able to replace an antenna in case of breakage. With this in mind, manufacturers are allowed to design transmitters in such a way that the user can replace a broken antenna with an identical one.

8 Administrative requirements

8.1 Certification and verification

8.1.1 CEPT countries

CEPT countries that are not EU/EFTA member states and have not implemented the Radio Equipment Directive (RED), have national regulations and use specifications for radio equipment which are based on transposed ENs or still in some cases based on their predecessors as CEPT Recommendations or fully national standards. Within European Union and European Free Trade Association (EFTA) member states, the RED defines the rules for placing on the market and putting into service most products using the radio frequency spectrum. Each national authority is responsible for transposing the provisions of the RED into its legislation.

The easiest route for a manufacturer to demonstrate compliance with the RED is to comply with a relevant harmonized standard which, for spectrum aspects, are developed by ETSI. It is now possible to send notifications of the intention to place equipment on the market electronically using a one-stop procedure to a number of spectrum authorities simultaneously.

The purpose of marking equipment is to indicate its conformance to relevant European Union (EU) Directives.

8.1.2 United States of America FCC

A 47 Code of Federal Regulations Part 15 transmitter must be tested and authorized before it may be marketed. There are two ways to obtain authorization: certification and Supplier's Declaration of Conformity (SDoC).

Certification

Certification is the most rigorous approval process for RF Devices with the greatest potential to cause harmful interference to radio services. It is an equipment authorization issued by an FCC-recognized Telecommunication Certification Body (TCB) based on an evaluation of the supporting documentation and test data submitted by the responsible party (e.g. the manufacturer or importer) to the TCB. Testing is performed by an FCC-recognized accredited testing laboratory. Information including the technical parameters and descriptive information for all certified equipment is posted on a Commission-maintained public database. In addition, equipment subject to approval using the Supplier's Declaration of Conformity (SDoC) procedure can optionally use the Certification procedure.

Supplier's Declaration Of Conformity

Supplier's Declaration of Conformity (SDoC) is a procedure that requires the party responsible for compliance ensure that the equipment complies with the appropriate technical standards. The responsible party, who must be located in the United States, is not required to file an equipment authorization application with the Commission or a TCB. Equipment authorized under the SDoC procedure is not listed in a Commission database. However, the responsible party or any other party marketing the equipment must provide a test report and other information demonstrating compliance with the rules upon request by the Commission. The responsible party has the option to use the certification procedure in place of the SDoC procedure.

A detailed description of the certification and SDoC procedures as well as marking requirements is contained in Attachment 2 to Annex 2. Additional guidance on authorization processes for specific low power devices can be found in Part 15 of the FCC rules.

8.1.3 The Republic of Korea

The broadcasting and communication equipment conformity assessment system has been implemented according to Article 58-2 of the Radio Waves Act. The conformity assessment system is divided into the certification of conformity, registration of compatibility, and interim of conformity. A party intending to manufacture, sell or import broadcasting and communication equipment must have one of these three types of conformity assessment. The conformity assessment test is carried out by designated test laboratories.

TABLE 5

Conformity assessment system in Korea

Conformity Assessment	Specification	Examples of certification-targeted equipment
Certification of Conformity	A party intending to manufacture, sell, or import equipment that can harm the radio environment, the broadcasting communication network, or others, as well as those whose normal operation can be affected by radio waves can apply for the certification of conformity by attaching the related documents to the NATIONAL RADIO RESEACH AGENCY (RRA).	– Wireless telephone alarm automatic receiver, radar equipment for ships, telephone, modem, etc.
Registration of Compatibility	A party intending to manufacture, sell, or import broadcasting and communication equipment that is not subject to certification of conformity can register the equipment by attaching the letter of confirmation that verifies the compatibility to RRA over the Internet.	– Computing device and peripheral, and broadcasting set-top box – Measuring instrument, industrial device, connector, etc.
Interim of Conformity	If there are no criteria for assessing the conformity of the broadcasting and communication equipment or if it is difficult to assess the conformity for whatever reason, the conformity can be assessed using the standard, specification or technical criteria of Korea or other countries and then attaching the region, period of validity, and condition of certification to the manufactured, sold, or imported equipment.	– Newly developed equipment with no technical regulation for conformity assessment

8.1.4 Brazil

The Regulation on Restricted Radiation Radiocommunications Equipment, approved by Resolution No. 680[1], establishes technical characteristics and operating conditions to consider a radio transmitter as restricted radiation radiocommunications equipment. The restricted radiation equipment classified by this regulation encompasses short-range devices and other equipment, in which its operation is allowed with an exemption of licenses.

All telecommunication products to be commercialized and to be permanently used in Brazil must be certificated, including those classified as restricted radiation communications equipment, according to the General Telecommunications Law No. 9 742. The Regulation on Conformity Assessment and

[1] https://informacoes.anatel.gov.br/legislacao/resolucoes/2017/936-resolucao-680

Approval of Telecommunications Products, approved by Resolution No. 715[2], establishes the general principles and rules related to conformity assessment and approval of telecommunication products.

In order to simplify regulatory procedures and updates, all technical requirements related to Regulation on Restricted Radiation Radiocommunications Equipment, Anatel published the Act 14 448/2017[3]. Likewise, Anatel published the Act 237/2022[4] related to test requirements and procedures for conformity assessment and approval of this sort of equipment.

More detailed description of the certification and authorization procedures is contained in Attachment 6 to Annex 2.

8.1.5 People's Republic of China

In 2019, China issued No. 52 Notice of MIIT. This Notice updates technical parameters requirements and regulations of the SRDs.

This Notice establishes that the domestically produced or imported radio transmitting devices in 'the Catalogue and technical requirements of SRDs' for sale and use in China does not need to obtain radio frequency using license, radio station license and radio transmitting device type approval. However, it shall in line with laws and regulations such as product quality, national standards and national radio administration relevant regulations. The detailed description is contained in Attachment 3 to Annex 2.

8.2 Licensing requirements

Licensing is an appropriate tool for administrations to regulate the efficient use of the frequency spectrum.

There is a general agreement that when the efficient use of the frequency spectrum is not at risk and as long as harmful interference is unlikely, the installation and use of the spectrum or radio equipment may be exempt from a general licence or an individual licence.

SRDs are generally exempt from individual licensing. However, exceptions may be made based on national regulations.

When radio equipment is subject to an exemption from individual licensing, generally speaking, anyone can buy, install, possess and use the radio equipment without any prior permission from the administration. Administrations will not register the individual equipment but the use of the equipment can be subject to national provisions. Furthermore, the sale and possession of some short-range radiocommunication equipment such as ultra-low power active medical implant devices may be controlled by either the manufacturer or the national administration.

8.3 Mutual agreements between countries/regions

Administrations have in many cases found it beneficial and efficient to establish mutual agreements between countries/regions providing for the recognition by one country/region of the conformity test results of a recognized/accredited test laboratory in the other country/region.

The EU, inspired by this approach, has now established, on a broader basis, mutual recognition agreement (MRAs) between the EU on the one hand and the United States of America, Canada, Australia and New Zealand on the other.

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[2] https://informacoes.anatel.gov.br/legislacao/resolucoes/2019/1350-resolucao-715

[3] https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2017/1139-ato-14448

[4] https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2022/1629-ato-237

These MRAs enable manufacturers to have the conformity of their products assessed in accordance with the regulatory requirements of the relevant third country by appropriately designated laboratories, inspection bodies and conformity assessment bodies (CABs) in their own countries, hence reducing the costs of such assessments and the time needed to access markets.

The agreements comprise a framework agreement which establishes the mutual recognition principles and procedures, and a series of sectoral annexes which detail, for each sector, the scope in terms of products and operations, the respective legislation, and any specific procedures.

8.3.1 The MRA with the United States of America

The MRA between the EU and the United States of America entered into force on 1 December 1998.

The MRA aims to avoid duplication of controls, increase transparency of procedures, and reduce time-to-market for products in six industrial sectors: telecommunications equipment, EMC, electrical safety, recreational craft, medicinal products, and medical devices. The Agreement should benefit manufacturers, traders and consumers.

8.3.2 MRAs − Canada

Canada has entered into MRAs with the EU, European Economic Area − European Free Trade Association (EEA-EFTA), the Asia-Pacific Economic Cooperation (APEC), Switzerland and the Inter-American Telecommunication Commission (CITEL). By virtue of these agreements manufacturers in these countries will be able to have the conformity of their products assessed in line with Canadian regulatory requirements by appropriately recognized laboratories and certification bodies. This reduces assessment costs and time-to-market, while Canadian manufacturers will benefit from the same advantages in respect of their market.

8.3.3 The MRAs with Australia and New Zealand

The MRAs between the EU and Australia and New Zealand entered into force on 1 January 1999.

The agreements provide for the reciprocal acceptance of the testing, certification and approval of products by each party against the regulatory requirements of the other party. Products can therefore be certified by recognized CABs in Europe to Australian and New Zealand requirements and then be placed on those markets without the need for any further approval procedures.

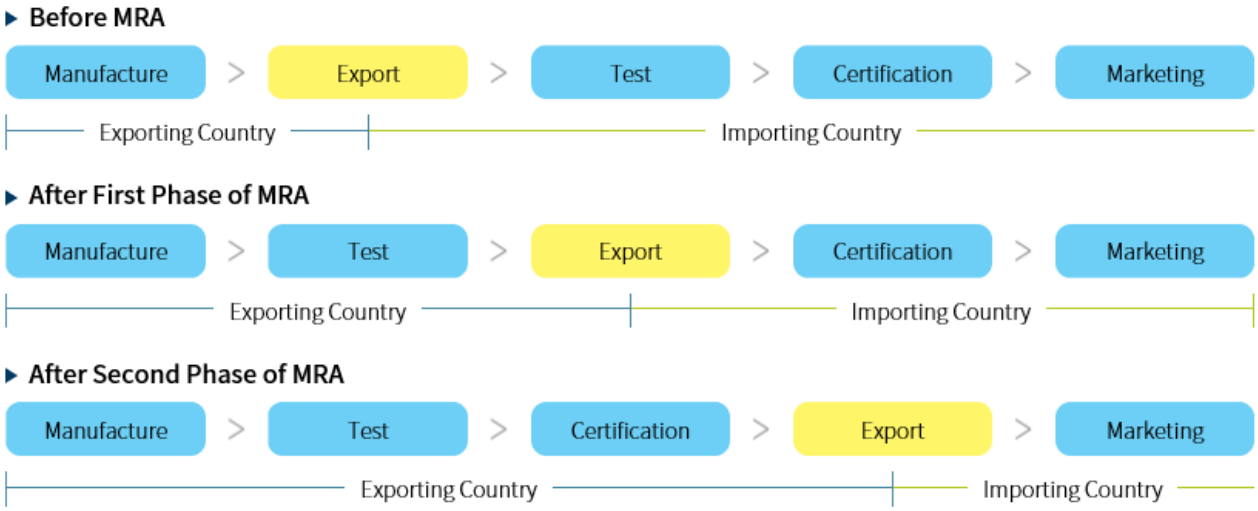
8.3.4 MRAs − The Republic of Korea

Korea has entered into Phase I of the MRAs with Canada, the United States of America, Viet Nam, the Republic of Chile and the EU since 2001. And Korea signed Phase II of the MRA between Canada in 2017, and it has entered into force on 15 June 2019[5]. The MRAs between countries is divided into Phase I of the MRA in which the products that are intended to be exported are tested at the designated laboratories in exporting countries according to the technical standards of the importing countries, and Phase II of the MRA in which the products that are intended to be exported are tested and issued certificates by the exporting countries.

5 https://ccac.rra.go.kr/en/index.do

FIGURE 1

Comparison of procedures according to MRA phases



8.3.5 Global harmonization of regulations

As long as the regulations in the countries/regions are not globally harmonized in the same way as the RED provides for EEA-wide harmonization, MRAs are the next best solution to facilitate trade between countries/regions for the benefit of manufacturers, suppliers and users.

9 Additional applications

Additional applications of SRDs continue to be developed and implemented. Annex 1 contains the technical parameters of several types of these additional applications. These so far are SRDs operating in 57-64 GHz band for use for high-speed data communications and RF level gauges.

Annex 1

Additional applications

1 SRDs operating in the 57-64 GHz band

SRDs transmitting in the 57-64 GHz oxygen absorption band will make use of large amounts of contiguous spectrum for very high-speed data communications at rates of 100 Mbit/s to greater than 1 000 Mbit/s.

Applications may include digital video links, position sensors, short-range wireless point to multipoint data links, wireless local-area networks, and broadband wireless access for both fixed and mobile information appliances.

In many cases, the proposed applications will operate over the 57-64 GHz band with broadband or swept signals. Often, due to the very high data rates, or the large number of frequency channels required for a network, the entire 57-64 GHz spectrum will be used by a pair, or group, of SRDs. Also, short-range position sensors used to generate accurate position information for machine tools operate with swept signals, could encompass the entire 57-64 GHz band.

In Europe, SRDs power limits in the band 61-61.5 GHz are: e.i.r.p. = 100 mW.

2 RF level gauges

The operating parameters and spectrum use of RF level gauges which are in operation today throughout the world are indicated in Tables 6 to 8.

2.1 Pulsed systems

Pulsed systems are low cost and have low power consumption. Today they operate at 5.8 GHz which is the centre frequency of the ISM allocation. However, manufacturers are expecting products in the 10 GHz, 25 GHz, and 76 GHz ranges. The exact frequency of operation will depend on a particular product. Typical characteristics are in Table 6.

TABLE 6

Characteristic	Value
Bandwidth	0.1 × frequency
Tx power (peak) (dBm)	0 to 10
Pulse width	200 ps to 3 ns
Duty cycle (%)	0.1 to 1
Pulse repetition frequency (MHz)	0.5 to 4

Pulse RF systems radiate a pulse with or without a carrier through air.

2.2 FMCW systems

This type of system is well developed. The FMCW is robust and uses advanced signal processing which provides good reliability. The characteristics of FMCW systems are in Table 7.

TABLE 7

Characteristic	Value
Frequency (GHz)	10, 25
Bandwidth (GHz)	0.6, 2
Tx power (dBm)	0 to 10

2.3 RF level gauge operating parameters and spectrum use

TABLE 8

Frequency band (GHz)	Power	Antenna	Duty cycle (%)
0.5-3	10 mW	Integral	0.1 to 1
4.5-7	100 mW		0.1 to 1
8.5-11.5	500 mW		0.1 to 1
24.05-27	2 W		0.1 to 1
76-78	8 W		0.1 to 1

NOTE 1 − Operation of these gauges may not be possible and/or may require certification in certain portions of these frequency ranges in accordance with existing national and international regulations.

NOTE 2 − The frequency band 0.5-3 GHz will not be assigned in CEPT countries for RF level gauges.

NOTE 3 − The frequency band for operation of RF level gauges in the 10 GHz range is limited within CEPT countries to frequency band 8.5-10.6 GHz.

Annex 2

This Annex provides information on national/regional rules which contain technical and operational parameters and spectrum use. Those are given in Attachments 1 through 9 to this Annex.

Attachment 1 to Annex 2

(Region 1; CEPT countries)

Technical and operating parameters and spectrum use for SRDs

1 Recommendation CEPT/ERC/REC 70-03

Recommendation CEPT/ERC/REC 70-03 – Relating to the use of short-range devices (SRD), sets out the general position on common spectrum allocations for SRDs for countries within the CEPT. It is also intended that it can be used as a reference document by the CEPT member countries when preparing their national regulations. The Recommendation describes the spectrum management requirements for SRDs relating to allocated frequency bands, maximum power levels, equipment antenna, channel spacing, duty cycle, licensing and free circulation.

2 Frequency bands and corresponding parameters

The SRD applications and frequency bands are covered in detail by annexes of Recommendation CEPT/ERC/REC 70-03 which can be downloaded from the website of the European Communications Office: (http://www.cept.org/eco). This Recommendation covers the updated information about the SRD – Regulation in CEPT countries and is directly accessible via the following link: http://www.erodocdb.dk/Docs/doc98/official/pdf/REC7003E.PDF*.

It should be remembered that it represents the most widely accepted position within the CEPT member states but it should not be assumed that all frequency allocations are available in all countries. Appendix 1 of ERC Recommendation 70-03 provides the detailed implementation information within CEPT member countries.

It should be noted that Attachments 1 and 3 are presenting the most recent available information which ECO (the European Communications Office of the CEPT) regularly updates.

European SRD information in EFIS in the future

The ERC Recommendation 70-03 (including the national implementation information) will also be available in data format in the near future (implementation is underway) in the ECO Frequency Information System (www.efis.dk; SRD related information can be found under the link: http://www.efis.dk/sitecontent.jsp?sitecontent=srd_regulations EFIS SRD Regulations). This means that the information can soon be exported in csv (excel) format.

Users will be able to select, search and compare SRD related implementation information in Europe amongst countries (according to application term and/or frequency range) for all SRD applications. All other related information within the same frequency range for all or the specific application (e.g. ETSI System Reference Documents explaining the technical characteristics of SRD applications, ECC Reports, EC or ECC Decisions, class 1 equipment classes, third party documentation, other studies, CEPT questionnaires, national information etc.) can be easily shown on request (i.e. selectable by the user) in EFIS. If needed, users can also use the EFIS online translator to show the information in other languages than English (already implemented). Detailed information is also available under Applications and Radio Interfaces on national implementation. Users should select an application term and/or frequency range as well as the country and search for national radio interface information.

The European Common Allocations table is also integrated in EFIS and can be downloaded (just select ECA). It contains all the SRD related ECC harmonization measures and applicable ETSI Harmonized European Standards. The Table is available under in the ECO Frequency Information System (EFIS) under the link: http://www.efis.dk/sitecontent.jsp?sitecontent=ecatable.

3 Technical requirements

3.1 ETSI standards

The ETSI is responsible for producing harmonized standards for telecommunications and radiocommunications equipment. These standards which are used for regulative purposes are known as European Norms (prefixed with EN).

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* This document is provided in English only for information and its most recent version is available on the above-mentioned web link. Users of the ECO Frequency Information database can also select other languages to show information in their language of choice by using an online translator.

Harmonized standards for radio equipment contain requirements relating to effective use of the spectrum and avoidance of harmful interference. These can be used by manufacturers as part of the conformity assessment process. The application of harmonized standards developed by ETSI is not mandatory, however where they are not applied a notified body must be consulted. The national standardization organizations are obliged by EU law to transpose European Standards for Telecommunications (ETSs or ENs) into national standards, and to withdraw any conflicting national standards.

With regard to SRDs, ETSI developed four generic standards (EN 300 220; EN 300 330, EN 300 440 and EN 305 550) and a number of specific standards covering specific applications. All SRDs relevant standards are listed in Appendix 2 of Recommendation CEPT/ERC/REC 70-03.

3.2 EMC and safety

3.2.1 EMC

All CEPT countries have EMC requirements, mostly based on IEC and CISPR standards or in some cases on CENELEC and ETSI EMC standards. In the EU/EFTA, the European harmonized standards from ETSI and CENELEC are the reference documents for presumption of conformity with the essential requirements of EMC Directive 2004/108/EC (most of these European standards are referred to in Recommendation CEPT/ERC/REC 70-03). The manufacturer has to affix the CE marking to his electrical products and has to have available a CE declaration, signed by himself and a technical file. He can, base those documents on a conformity investigation carried out by himself. Most European harmonized standards in the EEA are based on IEC/CISPR standards.

The CEPT countries outside the EU/EFTA mostly accept a test report from an accredited EEA laboratory in the EU/EFTA as proof of conformity. However, some request a conformity test report from one of their national laboratories.

3.2.2 Electrical safety

In general, the European countries have (electrical) safety requirements, based on IEC standards. In most cases IEC 60950 + amendments apply to radiocommunication equipment.

In the EEA the European harmonized standards from CENELEC are the reference documents for presumption of conformity with the essential requirements of the low voltage Directive 2006/95/EC. The most relevant European harmonized standard for radiocommunication equipment is EN 60950 + amendments, which is based on IEC 60950.

The CEPT countries outside the EU/EFTA usually require, a CB scheme certificate (international certification scheme under IECEE), granted by one of the members of the CB scheme as proof of conformity to IEC 60950.

NOTE 1 − Most customs authorities of the EU, require that equipment coming from outside the EEA, should be CE-marked for EMC and (electrical) safety and that an EC declaration of conformity (of the manufacturer) should be presented, before they grant an import licence.

3.3 National type approval specifications

Members of CEPT that are no EU/ EFTA member states and have not implemented the RED, have national regulations, sometimes based on this Directive, and use specifications for radio equipment which are based on transposed ENs or still in some cases based on their predecessors as CEPT Recommendations or fully national standards.

4 Additional spectrum use

4.1 Radiated power or magnetic field strength

The radiated power or H-field-strength limits mentioned in Recommendation CEPT/ERC/REC 70-03 are the maximum values allowed for SRDs. The levels were determined after careful analysis within ETSI and CEPT ECC (respectively ERC) and are dependent on the frequency range and the applications chosen. The average H-field strength/power level is 5 dB(μA/m) at 10 m.

4.2 Transmitter antenna source

Basically, three types of transmitter antennas are used for SRDs:

− integral (no external antenna socket);

− dedicated (conformity assessment type approved with the equipment);

− external (equipment type approved without an antenna).

Only in exceptional cases can external antennas be used and these will be mentioned in the appropriate Annex to Recommendation CEPT/ERC/REC 70-03.

4.3 Channel spacing

Channel spacings for SRDs are defined according to the needs of the different applications. They may vary between 5 kHz and 200 kHz or in some cases even "no channel spacing − whole stated frequency band may be used" apply.

4.4 Duty cycle categories

ETSI EN 300 220-1 defines the duty cycle as follows:

For the purposes of this present text the duty cycle is defined as the ratio, expressed as a percentage, of the maximum transmitter "on" time monitored over one hour, relative to a one-hour period. The device may be triggered either automatically or manually and depending on how the device is triggered will also depend on whether the duty cycle is fixed or random.

For automatic operated devices, either software controlled or pre-programmed devices, the provider shall declare the duty cycle class or classes for the equipment under test, see Table 9.

TABLE 9

	Name	Transmitting time/full cycle (%)	Maximum transmitter "on" time[(1)] (s)	Minimum transmitter "off" time[(1)] (s)	Explanation
1	Very low	< 0.1	0.72	0.72	For example, 5 transmissions of 0.72 s within 1 h
2	Low	< 1.0	3.6	1.8	For example, 10 transmissions of 3.6 s within 1 h
3	High	< 10	36	3.6	For example, 10 transmissions of 36 s within 1 h
4	Very high	Up to 100	−	−	Typically, continuous transmissions but also those with a duty cycle greater than 10%

(1) These limits are advisory with the view to facilitating sharing between systems in the same frequency band.

For manually operated or event-dependant devices, with or without software-controlled functions, the provider shall declare whether the device, once triggered, follows a pre-programmed cycle, or whether the transmitter remains on until the trigger is released or the device is manually reset. The provider shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the provider shall be used to determine the duty cycle and hence the duty cycle class.

Where an acknowledgement is required, the additional transmitter "on" time shall be included and declared by the provider.

For devices with a 100% duty cycle transmitting an unmodulated carrier most of the time, a time-out shut-off facility shall be implemented in order to improve the efficient use of the spectrum. The method of implementation shall be declared by the provider.

5 Administrative requirements

5.1 Licensing requirements

Licensing is an appropriate tool for administrations to regulate the use of radio equipment and the efficient use of the frequency spectrum.

There is a general agreement that when the efficient use of the frequency spectrum is not at risk and as long as harmful interference is unlikely, the installation and use of radio equipment can be exempted from a general licence or an individual licence.

In general, the CEPT administrations apply similar systems of licensing and exemption from individual licensing. However, different criteria are used to decide whether radio equipment should be licensed or exempted from an individual licence.

Recommendation CEPT/ERC/REC 01-07 lists harmonized criteria for administrations to decide whether an exemption of individual licensing should be applied.

SRDs are generally exempted from individual licensing. Exceptions are stated in the annexes and Appendix 3 of Recommendation CEPT/ERC/REC 70-03.

When radio equipment is subject to an exemption from individual licensing, anyone can buy, install, possess and use the radio equipment without any prior permission from the administration. Furthermore, the administration will not register the individual equipment. The use of the equipment can be subject to general provisions.

5.2 Conformity assessment, marking requirements and free circulation

The purpose of marking an equipment is to indicate its conformance to relevant EC Directives, ECC or ERC Decisions or Recommendations and national regulations.

In almost 100% of cases, requirements for marking and labelling of approved and licensed equipment is set in national law. Most administrations require at least that the logo or name of the approval authority is shown on the label, along with the approval number which may also indicate the year of approval.

Recommendation CEPT/ERC/REC 70-03 recommends three different possibilities of marking and free circulation for SRDs dependent on the conformity assessment used.

For EU/EFTA member states the placing on the market and free movement of SRDs is covered by the RED (see § 7).

6 Operating parameters

SRDs in general operate in shared bands and are not permitted to cause harmful interference to other radio services.

SRDs cannot claim protection from other radio services.

The technical parameter limits should not be exceeded by any function of the equipment.

When selecting parameters for new SRDs, which may have inherent safety of human life implications, manufacturers and users should pay particular attention to the potential for interference from other systems operating in the same or adjacent bands.

7 The Radio Equipment Directive (RED)

Within European Union and EFTA countries, the Radio Equipment Directive (RED) now defines the rules for placing on the market and putting into service most products using the radio frequency spectrum. Each national authority has transposed the provisions of the RED into its legislation.

The easiest route for a manufacturer to demonstrate compliance with the RED is to comply with relevant harmonized standards which, for spectrum aspects, are developed by ETSI.

Further information on the implementation and application of the RE Directive can be found at (https://ec.europa.eu/growth/sectors/electrical-engineering/red-directive_en).

Attachment 2
to Annex 2

(United States of America)

Understanding the FCC rules for low-power, non-licensed transmitters

1 Introduction

Part 15 of the Rules, Code of Federal Regulations (CFR) Title 47 Telecommunication, permits the operation of low power radio frequency devices without a licence from the Commission or the need for frequency coordination. The technical standards for Part 15 are designed to ensure that there is a low probability that these devices will cause harmful interference to other users of the spectrum. Intentional radiators, i.e. transmitters, are permitted to operate under a set of general emission limits or under provisions that allow higher emission levels, than those for unintentional radiators, in certain frequency bands. Intentional radiators generally are not permitted to operate in certain sensitive or safety-related bands, designated as restricted bands, or in the bands allocated for television broadcasting. The measurement procedures for determining compliance with the technical requirements for Part 15 devices are provided or referenced within the rules.

Low-power, non-licensed transmitters are used virtually everywhere. Cordless phones, baby monitors, garage door openers, wireless home security systems, keyless automobile entry systems, wireless access systems including radio local area networks and hundreds of other types of common

electronic equipment rely on such transmitters to function. At any time of day, most people are within a few metres of consumer products that use low-power, non-licensed transmitters.

Non-licensed transmitters operate on a variety of frequencies. They must share these frequencies with licensed transmitters and are prohibited from causing interference to licensed transmitters. Licensed primary and secondary services are protected from Part 15 devices.

The FCC has rules to limit the potential for harmful interference to licensed transmitters by low-power, non-licensed transmitters. In its rules, the FCC takes into account that different types of products that incorporate low-power transmitters have different potentials for causing harmful interference. As a result, the FCC's Rules are most restrictive on products that are most likely to cause harmful interference, and less restrictive on those that are least likely to cause interference.

FCC rules for low power radio frequency devices may be downloaded free of charge from: https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-15?toc=1

2 Low-power, non-licensed transmitters − general approach

The terms low-power, non-licensed transmitter, and Part 15 transmitter, both refer to the same thing: a low-power, non-licensed transmitter that complies with the Rules in Part 15 of the FCC Rules[6]. Part 15 transmitters use very little power, most of them less than 1 mW. They are non-licensed because their operators are not required to obtain a licence from the FCC to use them.

Although an operator does not have to obtain a licence to use a Part 15 transmitter, the transmitter itself is required to have an FCC authorization before it can be legally imported into or marketed in the United States of America. This authorization requirement helps ensure that Part 15 transmitters comply with the Commission's technical standards and, thus, are capable of being operated with little potential for causing interference to authorized radiocommunications.

Persons operating Part 15 transmitters shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment. Operation is subject to the conditions that no harmful interference is caused, and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator. The operator of a radio frequency device shall be required to cease operating the device upon notification by an FCC representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

3 Definition list

Auditory assistance device: An intentional radiator used to provide auditory assistance communications (including but not limited to applications such as assistive listening, auricular training, audio description for the blind, and simultaneous language translation) for persons with disabilities (section 3(2)(A) of the Americans with Disabilities Act of 1990 (42 U.S.C. 12102(2)(A)).

Biomedical telemetry device: An intentional radiator used to transmit measurements of either human or animal biomedical phenomena to a receiver.

Cable locating equipment: An intentional radiator used intermittently by trained operators to locate buried cables, lines, pipes and similar structures or elements. Operation entails coupling a RF signal onto the cable, pipe, etc., and using a receiver to detect the location of that structure or element.

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6 Unlicensed devices may also operate under other rule parts, for which rules and requirements may differ.

Carrier current system: A system, or part of a system, that transmits RF energy by conduction over the electric power lines. A carrier current system can be designed such that the signals are received by conduction directly from connection to the electric power lines (unintentional radiator) or the signals are received over-the-air due to radiation of the RF signals from the electric power lines (intentional radiator).

Cordless telephone system: A system consisting of two transceivers, one a base station that connects to the public switched telephone network (PSTN) and the other a mobile handset unit that communicates directly with the base station. Transmissions from the mobile unit are received by the base station and then placed on the PSTN. Information received from the switched telephone network is transmitted by the base station to the mobile unit.

NOTE 1 − The domestic public cellular radio telecommunications service is considered to be part of the switched telephone network. In addition, intercom and paging operations are permitted provided these are not intended to be the primary modes of operation.

Field disturbance sensor: A device that establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range.

Harmful interference: Any emission, radiation or induction that endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunications service operating in accordance with FCC Rules.

Level Probing Radar (LPR): A short-range radar transmitter used in a wide range of applications to measure the amount of various substances, mostly liquids or granulates. LPR equipment may operate in open-air environments or inside an enclosure containing the substance being measured.

Perimeter protection system: A field disturbance sensor that employs RF transmission lines as the radiating source. These RF transmission lines are installed in such a manner that allows the system to detect movement within the protected area.

Spurious emission: Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

4 Technical standards

4.1 Conducted emission limits

47 CFR Section 15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535-1 705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535-1 705 kHz, as measured using a 50 μH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in Section 15.205, Section 15.209, Section 15.221, Section 15.223, or Section 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

4.2 Radiated emission limits

Section 15.209 contains general radiated emission (signal strength) limits that apply to all Part 15 transmitters using frequencies at 9 kHz and above. There are also a number of restricted bands in which low power, non-licensed transmitters are not allowed to operate because of potential interference to sensitive radiocommunications such as aircraft radionavigation, radio astronomy and search and rescue operations. If a particular transmitter can comply with the general radiated limits, and at the same time avoid operating in one of the restricted bands, then it can use any type of modulation (AM, FM, PCM, etc.) for any purpose.

Special provisions have been made in the Part 15 Rules for certain types of transmitters that require a stronger signal strength on certain frequencies than the general radiated emission limits provide. For example, such provisions have been made for cordless telephones, auditory assistance devices and field disturbance sensors, among other things.

TABLE 10

General limits for any intentional transmitter

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009-0.490	2 400/*f* (kHz)	300
0.490-1.705	24 000/*f* (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

The emission limits shown in the above Table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Table 11 contains exceptions or exclusions (indicated) to the general limits, otherwise the general limits can still be used.

TABLE 11

Exception or exclusions from the general limits

Frequency band	Type of use	Emission limit	47 CFR sections
9-45 kHz	Cable locating equipment	10 W peak output power	15.213
45-490 kHz	Cable locating equipment	1 W peak output power	15.213 See also Table 12
160-190 kHz	Not specified	1 W input to final RF stage	15.217
510-1 705 kHz	Not specified	100 mW input to final RF stage	15.219
525-1 705 kHz	Transmitters on grounds of educational institutions	24,000/*f* (kHz) μV/m at 30 m outside of campus boundary	15.221
525-1 705 kHz	Carrier current and leaky coax systems	15 μV/m at 47,715/*f* (kHz) m from cable	15.221
1.705-10 MHz	Not specified with bandwidth ≥ 10% of the centre frequency	100 μV/m at 30 m	15.223 See also Table 12
1.705-10 MHz	Not specified with 6 dB bandwidth < 10% of centre frequency	15 μV/m or bandwidth in (kHz)/*f* (MHz) at 30 m	15.223 See also Table 12

TABLE 11 (*continued*)

<table>
<tr><th>Frequency band</th><th>Type of use</th><th>Emission limit</th><th>47 CFR sections</th></tr>
<tr><td>13.110-13.410 MHz
13.710-14.010 MHz</td><td>Not specified</td><td>106 μV/m at 30 m</td><td>15.225
See also Table 12</td></tr>
<tr><td>13.410-13.553 MHz
13.567-13.710 MHz</td><td>Not specified</td><td>334 μV/m at 30 m</td><td>15.225</td></tr>
<tr><td>13.553-13.567 MHz</td><td>Not specified</td><td>15,848 μV/m at 30 m</td><td>15.225</td></tr>
<tr><td>26.96-27.28 MHz</td><td>Not specified</td><td>10,000 μV/m at 3 m</td><td>15.227</td></tr>
<tr><td>40.66-40.7 MHz</td><td>Not specified</td><td>1,000 μV/m at 3 m</td><td>15.229</td></tr>
<tr><td>40.66-40.7 MHz
Above 70 MHz</td><td>Periodic transmissions for control signals</td><td>
<table>
<tr><th>Fundamental frequency (MHz)</th><th>Field strength of fundamental (microvolts/ metre)</th><th>Field strength of spurious emissions (microvolts/ metre)</th></tr>
<tr><td>40.66-40.70</td><td>2,250</td><td>225</td></tr>
<tr><td>70-130</td><td>1,250</td><td>125</td></tr>
<tr><td>130-174</td><td>[1]1,250 to 3,750</td><td>[1]125 to 375</td></tr>
<tr><td>174-260</td><td>3,750</td><td>375</td></tr>
<tr><td>260-470</td><td>[1]3,750 to 12,500</td><td>[1]375 to 1,250</td></tr>
<tr><td>Above 470</td><td>12,500</td><td>1,250</td></tr>
</table>
[1]Linear interpolations.
</td><td>15.231</td></tr>
<tr><td>40.66-40.7 MHz
Above 70 MHz</td><td>Periodic transmissions for any type of operation</td><td>
<table>
<tr><th>Fundamental frequency (MHz)</th><th>Field strength of fundamental (microvolts/ metre)</th><th>Field strength of spurious emission (microvolts/ metre)</th></tr>
<tr><td>40.66-40.70</td><td>1,000</td><td>100</td></tr>
<tr><td>70-130</td><td>500</td><td>50</td></tr>
<tr><td>130-174</td><td>500 to 1,500[1]</td><td>50 to 150[1]</td></tr>
<tr><td>174-260</td><td>1,500</td><td>150</td></tr>
<tr><td>260-470</td><td>1,500 to 5,000[1]</td><td>150 to 500[1]</td></tr>
<tr><td>Above 470</td><td>5,000</td><td>500</td></tr>
</table>
[1]Linear interpolations.
</td><td>15.231</td></tr>
<tr><td>43.71-44.49 MHz
46.60-46.98 MHz
48.75-49.51 MHz
49.66-50.00 MHz</td><td>Cordless telephones</td><td>10,000 μV/m at 3 m</td><td>15.233</td></tr>
<tr><td>49.82-49.9 MHz</td><td>Not specified</td><td>10,000 μV/m at 3 m</td><td>15.235</td></tr>
<tr><td>54-72 MHz
76-88 MHz
174-216 MHz
470-608 MHz
614-698 MHz</td><td>Wireless microphones</td><td></td><td>15.236</td></tr>
</table>

TABLE 11 (*continued*)

<table>
<tr><th>Frequency band</th><th>Type of use</th><th>Emission limit</th><th>47 CFR sections</th></tr>
<tr><td>54-72 MHz
76-88 MHz
174-216 MHz
470-614 MHz
617-652 MHz*
657-663 MHz
* Some locations</td><td>Unlicensed intentional radiators that operate on available TV channels in the broadcast television frequency bands, the 600 MHz band (including the guard bands and duplex gap), and in 608-614 MHz</td><td></td><td>15.709</td></tr>
<tr><td>72-73 MHz
74.6-74.8 MHz
75.2-76.0 MHz</td><td>Auditory assistance devices</td><td>80 mV/m at 3 m</td><td>15.237</td></tr>
<tr><td>88-108 MHz</td><td>Not specified
(≤ 200 kHz bandwidth)</td><td>250 μV/m at 3 m</td><td>15.239</td></tr>
<tr><td>174-216 MHz</td><td>Biomedical telemetry devices with bandwidth ≤ 200 kHz</td><td>1,500 μV/m at 3 m</td><td>15.241</td></tr>
<tr><td>174-216 MHz
470-668 MHz</td><td>Biomedical telemetry devices</td><td>200 mV/m at 3 m</td><td>15.242</td></tr>
<tr><td>433.5-434.5 MHz</td><td>RF identification for commercial shipping containers</td><td>11,000 μV/m at 3 m (Avg.)
55,000 μV/m at 3 m (Peak)</td><td>15.240</td></tr>
<tr><td>890-940 MHz</td><td>Signals used to measure the characteristics of a material</td><td>500 μV/m at 30 m</td><td>15.243</td></tr>
<tr><td>902-928 MHz
2 435-2 465 MHz
5 785-5 815 MHz
10 500-10 550 MHz
24 075-24 175 MHz</td><td>Field disturbance sensors</td><td>
<table>
<tr><th>Fundamental frequency (MHz)</th><th>Field strength of fundamental (millivolts/ metre)</th><th>Field strength of harmonics (millivolts/ metre)</th></tr>
<tr><td>902-928</td><td>500</td><td>1.6</td></tr>
<tr><td>2 435-2 465</td><td>500</td><td>1.6</td></tr>
<tr><td>5 785-5 815</td><td>500</td><td>1.6</td></tr>
<tr><td>10 500-10 550</td><td>2 500</td><td>25.0</td></tr>
<tr><td>24 075-24 175</td><td>2 500</td><td>25.0</td></tr>
</table>
</td><td>15.245</td></tr>
</table>

TABLE 11 (*continued*)

<table>
<tr><th>Frequency band</th><th>Type of use</th><th>Emission limit</th><th>47 CFR sections</th></tr>
<tr><td>902-928 MHz
2 400-2 483.5 MHz
5 725-5 850 MHz</td><td>Frequency hopping intentional radiators.</td><td></td><td>15.247</td></tr>
<tr><td>902-928 MHz
2 400-2 483.5 MHz</td><td>Digitally modulated intentional radiators.</td><td>Maximum peak conducted output power 1 watt</td><td>15.247</td></tr>
<tr><td>902-928 MHz
2 400-2 483.5 MHz
5 725-5 875 MHz
24.0-24.25 GHz</td><td>Not specified</td><td><table><tr><th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/ metre)</th><th>Field strength of harmonics (microvolts/ metre)</th></tr><tr><td>902-928 MHz</td><td>50</td><td>500</td></tr><tr><td>2 400-
2 483.5 MHz</td><td>50</td><td>500</td></tr><tr><td>5 725-
5 875 MHz</td><td>50</td><td>500</td></tr><tr><td>24.0-
24.25 GHz</td><td>250</td><td>2 500</td></tr></table></td><td>15.249</td></tr>
<tr><td>1.920-1.930 GHz</td><td>Unlicensed personal communications service devices.</td><td>100 µW times the square root of the emissions BW in hertz peak; PSD limit of 3 mW in any 3 kHz bandwidth</td><td>15.319</td></tr>
<tr><td>2.9-3.26 GHz
3.267-3.332 GHz
3.339-3.3458 GHz
3.358-3.6 GHz</td><td>Automatic vehicle identification systems</td><td></td><td>15.251</td></tr>
<tr><td>5.15-5.35 GHz
5.47-5.895 GHz
5.925-7.125 GHz</td><td>Unlicensed national information infrastructure devices</td><td></td><td>15.407</td></tr>
<tr><td>5 925-7 250 MHz</td><td>Wideband systems</td><td>The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following RMS average limits based on measurements using a 1 MHz resolution bandwidth:<table><tr><th>Frequency in MHz</th><th>e.i.r.p. in dBm</th></tr><tr><td>960-1 610</td><td>−75.3</td></tr><tr><td>1 610-1 990</td><td>−63.3</td></tr><tr><td>1 990-3 100</td><td>−61.3</td></tr><tr><td>3 100-5 925</td><td>−51.3</td></tr><tr><td>5 925-7 250</td><td>−41.3</td></tr><tr><td>7 250-10 600</td><td>−51.3</td></tr><tr><td>Above 10 600</td><td>−61.3</td></tr></table>In addition to the radiated emission limits specified in the Table in paragraph (d)(1) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:</td><td>15.250</td></tr>
</table>

TABLE 11 (*end*)

<table>
<tr><th>Frequency band</th><th>Type of use</th><th>Emission limit</th><th>47 CFR sections</th></tr>
<tr><td></td><td></td><td><table><tr><th>Frequency in MHz</th><th>e.i.r.p. in dBm</th></tr><tr><td>1 164-1 240</td><td>−85.3</td></tr><tr><td>1 559-1 610</td><td>−85.3</td></tr></table></td><td></td></tr>
<tr><td>5.925-7.250 GHz
24.05-29.00 GHz
75-85 GHz</td><td>Level probing radars</td><td>The emission limits specified below are based on boresight measurements (i.e. measurements performed within the main beam of an LPR antenna).
LPR e.i.r.p. emission limits<table><tr><th>Frequency band of operation (GHz)</th><th>Average emission limit (e.i.r.p. in dBm measured in 1 MHz)</th><th>Peak emission limit (e.i.r.p. in dBm measured in 50 MHz)</th></tr><tr><td>5.925-7.250</td><td>−33</td><td>7</td></tr><tr><td>24.05-29.00</td><td>−14</td><td>26</td></tr><tr><td>75-85</td><td>−3</td><td>34</td></tr></table></td><td>15.256</td></tr>
<tr><td>57-71 GHz</td><td>Not specified and fixed field disturbance sensors; however, operation on satellites or airborne aircrafts not permitted.</td><td></td><td>15.255</td></tr>
<tr><td>92-95 GHz</td><td>Fixed indoor devices</td><td>9 μW/cm^2 at 3 m average power and 18 μW/cm^2 peak power density</td><td>15.257</td></tr>
<tr><td>116-123 GHz, 174.8-182 GHz, 185-190 GHz and 244-246 GHz.</td><td>Not specified, no operation on board an aircraft or satellite</td><td></td><td>15.258</td></tr>
<tr><td rowspan="8">Ultra-Wideband Operation</td><td>Ground penetrating radars and wall imaging systems</td><td></td><td>15.509</td></tr>
<tr><td>Through-wall imaging systems</td><td></td><td>15.510</td></tr>
<tr><td>Surveillance systems.</td><td></td><td>15.511</td></tr>
<tr><td>Medical imaging systems.</td><td></td><td>15.513</td></tr>
<tr><td>Vehicular radar systems</td><td></td><td>15.515</td></tr>
<tr><td>Indoor UWB systems</td><td></td><td>15.517</td></tr>
<tr><td>Hand held UWB systems</td><td></td><td>15.519</td></tr>
</table>

5 Antenna requirements

Changing the antenna on a transmitter can significantly increase, or decrease, the strength of the signal that is ultimately transmitted. Except for carrier current devices, tunnel radio systems, cable locating equipment or operation in the bands 160-190 kHz, 510-1 705 kHz, the standards in Part 15 are not based solely on output power but also take into account the antenna characteristics. Thus, a low power transmitter that complies with the technical standards in Part 15 with a particular antenna attached can exceed the Part 15 standards if a different antenna is attached. Should this happen, it could pose a serious interference problem to authorized radiocommunications such as emergency, broadcast and air-traffic control communications.

In order to prevent such interference problems, each Part 15 transmitter must be designed to ensure that no type of antenna can be used with it other than the one used to demonstrate compliance with the technical standards. This means that Part 15 transmitters must have permanently attached antennas, or detachable antennas with unique connectors. A “unique connector” is one that is not of a standard type found in electronic supply stores.

It is recognized that suppliers of Part 15 transmitters often want their customers to be able to replace an antenna if it should break. With this in mind, Part 15 allows transmitters to be designed so that the user can replace a broken antenna. When this is done, the replacement antenna must be electrically identical to the antenna that was used to obtain FCC authorization for the transmitter. The replacement antenna also must include the unique connector described above to ensure it is used with the proper transmitter.

6 Restricted bands

Intentional radiators are not permitted to operate in the following bands:

TABLE 12

Restricted bands − spurious emissions only with limited exceptions (not indicated)

(MHz)	(MHz)	(MHz)	(GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1 240	7.25-7.75
4.125-4.128	25.5-25.67	1 300-1 427	8.025-8.5
4.17725-4.17775	37.5-38.25	1 435-1 626.5	9.0-9.2
4.20725-4.20775	73-74.6	1 645.5-1 646.5	9.3-9.5
6.215-6.218	74.8-75.2	1 660-1 710	10.6-12.7
6.26775-6.26825	108-121.94	1 718.8-1 722.2	13.25-13.4
6.31175-6.31225	123-138	2 200-2 300	14.47-14.5
8.291-8.294	149.9-150.05	2 310-2 390	15.35-16.2
8.362-8.366	156.52475-156.52525	2 483.5-2 500	17.7-21.4
8.37625-8.38675	156.7-156.9	2 655-2 900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3 260-3 267	23.6-24.0
12.29-12.293	167.72-173.2	3 332-3 339	31.2-31.8
12.51975-12.52025	240-285	3 345.8-3 358	36.43-36.5
12.57675-12.57725	322-335.4	3 600-4 400	(2)
13.36-13.41			

(2) Generally above 38.6 GHz.

7 Equipment authorization

RF devices are required to be properly authorized under 47 CFR part 2 prior to being marketed or imported into the United States. The Office of Engineering and Technology (OET) administers the equipment authorization program under the authority delegated to it by the Commission. This program is one of the principal ways the Commission ensures that RF devices used in the United States operate effectively without causing harmful interference and otherwise comply with the Commission's rules. All RF devices subject to equipment authorization must comply with the Commission's technical requirements prior to importation or marketing.

Equipment that contains an RF device must be authorized in accordance with the appropriate procedures specified in 47 CFR part 2, subpart J as summarized below (with certain limited exceptions). These requirements not only minimize the potential for harmful interference, but also ensure that the equipment complies with the rules that address other policy objectives – such as human RF exposure limits and hearing aid compatibility with wireless handsets.

The Commission has two different approval procedures for equipment authorization – Certification and Supplier's Declaration of Conformity (SDoC). The required procedure depends on the type of equipment being authorized as specified in the applicable rule part. In some instances, a device may have different functions resulting in the device being subject to more than one type of approval procedure.

Steps to obtain an equipment authorization

The following steps summarize the process to obtain the required equipment authorization for your product (device):

Step 1 – Determine FCC rules that apply

– Determine if device is a RF device subject to the FCC rules.

– Determine all applicable technical and administrative rules that apply to the device requiring an equipment authorization.

– The technical requirements are generally specified in the applicable FCC rule parts and the administrative rules are specified in 47 CFR part 2, subpart J.

Step 2 – Equipment authorization procedures

– If a device is subject to FCC rules, determine the specific type of equipment authorization that applies to the device. Become familiar with all the basic marketing, equipment authorization, and importation rules. In some instances, a device may have different functions resulting in the device being subject to more than one type of approval procedure.

  • Determine the applicable equipment authorization procedure for your device.

    – Supplier's Declaration of Conformity (SDoC)

    – Certification

Step 3 – Compliance testing

– Perform the required tests to ensure the device complies with the applicable technical requirements (as determined in step 1).

– The qualifications of the testing laboratory used to demonstrate compliance is based on the approval procedure you are required to use (as determined in step 2):

  • **<u>Supplier's Declaration of Conformity (SDoC)</u>**

    Equipment approved using SDoC is required to be tested, however, it is not necessary to use an FCC-recognized accredited testing laboratory. However, as minimum the testing

laboratory used is required to maintain a record of the measurement facilities as specified in Section 2.948 and a record of the measurements made as specified in Section 2.938.

- **Certification**

  Equipment approved under the Certification procedure is required to be tested by an FCC-recognized accredited testing laboratory. For a list of FCC-recognized accredited testing laboratories, see https://apps.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm.

Step 4 – Approval

– After the testing is complete and your device is found to be in compliance, finalize the approval process based on the applicable approval procedure:

- **Supplier's Declaration of Conformity (SDoC)**
  - The responsible party, as specified in the rules, warrants that each unit of equipment complies with the applicable FCC rules.
  - The responsible party maintains all of the required documentation demonstrating compliance with the applicable FCC rules.
  - The responsible party prepares a compliance information statement to be supplied with the product at the time of marketing.
- **Certification**
  - The responsible party, typically the manufacturer, obtains an FCC Registration Number (FRN) for a device requiring Certification. The FRN is a 10-digit number used to identify the individual or organization doing business with the FCC. The same FRN will be used for future approvals.
  - After obtaining an FRN, the responsible party obtains a Grantee Code from the Commission by applying online at https://apps.fcc.gov/eas/RegisterGrantee.do. A grantee code is required the first time a party applies for certification and can be used for all future approvals.
  - The responsible party files with a TCB an application for a grant of certification. An application for equipment authorization requires submission of information about the product, as listed in Section 2.1033. The applicant must submit the required information to a TCB for review as part of the certification process. For a list of FCC recognized TCBs, see https://apps.fcc.gov/oetcf/tcb/reports/TCBSearch.cfm.
  - The TCB reviews all of the supporting information and the evaluation results to determine if the product complies with the FCC requirements.
  - Once the TCB makes a decision to certify the product the supporting information is uploaded to the FCC Equipment Authorization Electronic System (EAS) – Database.
  - A grant of certification is issued by the TCB on the FCC EAS – Database.

Step 5 – Label/Manual/Record Retention

– Label the product and provide the required customer information.

– For more information see Labelling Guidelines – KDB Publication 784748.

- Maintain all documentation as part of the responsibility for the retention of records and ensure that the manufactured products are in compliance.
- Section 2.938 – Requirements for the retention of records of equipment subject to FCC approval.

Step 6 – Manufacture/Import/Market

– When importing products into the United States, follow the FCC importation requirements.

– Importation – Frequently Asked Questions.

– Marketing of radio frequency devices prior to equipment authorization.

• NOTE – Determining all applicable technical and administrative rules requires a technical understanding of the electrical functions of the device and an understanding of the FCC rules. For assistance, we recommend that you work with one of the FCC recognized accredited testing laboratories or TCBs. Questions can also be submitted through the Knowledge Database (KDB) at https://apps.fcc.gov/oetcf/kdb/index.cfm

Step 7 – Modifications to approved products

Changes to your product design may require an additional approval. KDB Publication 178919 gives general guidance when making changes to a previously approved product. See the permissive change rules in Section 2.1043 for:

– Modifications that may be made to an RF device without filing for a new equipment authorization;

– Three different types of permissive changes, and

– Identifies when a permissive change filing with the Commission is required.

8 Special cases

8.1 Cordless telephones

Cordless telephones are required to incorporate circuitry that uses digital security codes to help prevent the phone from unintentionally connecting to the PSTN when it encounters RF noise from another cordless phone or from some other source. Cordless phones that do not have this circuitry (phones that were manufactured or imported prior to 11 September 1991) are required to have a statement on the package in which they are sold that warns of the danger of unintentional line seizures and indicates what features the packaged phone has to help prevent them.

8.2 Tunnel radio systems

Many tunnels have naturally surrounding earth and/or water that attenuate radio waves. Transmitters that are operated inside these tunnels are not subject to any radiation limits inside the tunnel. Instead, the signals they produce must meet the Part 15 general radiated emission limits on the outside of the tunnel, including its openings. They also must comply with the conducted emission limits on the electric power lines outside of the tunnel.

Buildings and other structures that are not surrounded by earth or water (e.g. oil storage tanks) are not tunnels. Transmitters that are operated inside such structures are subject to the same standards as transmitters operated in an open area.

8.3 Home-built transmitters that are not for sale

Hobbyists, inventors and other parties that design and build Part 15 transmitters with no intention of ever marketing them may construct and operate up to five such transmitters for their own personal use without having to obtain FCC equipment authorization. If possible, these transmitters should be tested for compliance with the Commission’s rules. If such testing is not practicable, their designers and builders are required to employ good engineering practices in order to ensure compliance with the Part 15 standards.

Home-built transmitters, like all Part 15 transmitters, are not allowed to cause interference to licensed radiocommunications and must accept any interference that they receive. If a home-built Part 15 transmitter does cause interference to licensed radiocommunications, the Commission will require its operator to cease operation until the interference problem is corrected. Furthermore, if the Commission determines that the operator of such a transmitter has not attempted to ensure compliance with the Part 15 technical standards by employing good engineering practices then that operator may be fined.

Non-residential operation is permitted under limited circumstances. For example, these home-built transmitters may be demonstrated at a trade show, but marketing is not allowed until authorization is obtained.

8.4 Cable locating equipment

An intentional radiator used intermittently by trained operators to locate buried cables, lines, pipes, and similar structures or elements. Operation entails coupling a radio frequency signal onto the cable, pipes, etc. and using a receiver to detect the location of that structure or element. It may be operated on any frequency within the band 9-490 kHz, subject to the limits defined under Part 15. If provisions are made for connection of the cable locating equipment to the AC power lines, then there are additional limits that are applied to this equipment, also defined under Part 15.

9 Commonly asked questions

9.1 What happens if one sells, imports or uses non-compliant low-power transmitters?

The FCC rules are designed to control the marketing of low-power transmitters and, to a lesser extent, their use. If the operation of a non-compliant transmitter causes interference to authorized radiocommunications, the user should stop operating the transmitter or correct the problem causing the interference. However, the person (or company) that sold this non-compliant transmitter to the user has violated the FCC marketing rules in Part 2 as well as federal law. The act of selling or leasing, offering to sell or lease, or importing a low-power transmitter that has not gone through the appropriate FCC equipment authorization procedure is a violation of the Commission's rules and federal law. Violators may be subject to an enforcement action by the Commission that could result in:

- forfeiture of all non-compliant equipment;
- a criminal penalty for an individual/organization;
- a criminal fine totalling twice the gross gain obtained from sales of the non-compliant equipment;
- administrative fines.

9.2 What is the relationship between μV/m and W?

Watts (W) are the units used to describe the amount of power generated by a transmitter. Microvolts per metre (μV/m) are the units used to describe the strength of an electric field created by the operation of a transmitter.

A particular transmitter that generates a constant level of power, W, can produce electric fields of different strengths (μV/m) depending on, among other things, the type of transmission line and antenna connected to it. Because it is the electric field that causes interference to authorized radiocommunications, and since a particular electric field strength does not directly correspond to a particular level of transmitter power, most of the Part 15 emission limits are specified in field strength.

Although the precise relationship between power and field strength can depend on a number of additional factors, a commonly used equation to approximate their relationship is:

$$PG/4\pi D^2 = E^2/120\pi$$

where:

P: transmitter power (W)

G: numerical gain of the transmitting antenna relative to an isotropic source

D: distance of the measuring point from the electrical centre of the antenna (m)

E: field strength (V/m)

$4\pi D^2$: surface area of the sphere centred at the radiating source whose surface is D m from the radiating source

120π: characteristic impedance of free space (Ω).

Attachment 3 to Annex 2

(People's Republic of China)

Provisions and technical parameters requirements for SRDs in China

1 Catalogue and technical parameters requirements

1.1 Generic SRDs

− CLASS A:

Operating frequency band (kHz):	9 to 190
Magnetic field-strength limit at 10 m:	≤ 72 dB(μA/m) (in the frequency band of 9 to 50 kHz, quasi-peak detector)
	≤ 72 dB(μA/m) (in the frequency band of 50 to 190 kHz, descending 3 dB/octave, quasi-peak detector)

− CLASS B:

Operating frequency bands (MHz):	in the frequency bands of 1.7 to 2.1, 2.2 to 3.0, 3.1 to 4.1, 4.2 to 5.6, 5.7 to 6.2, 7.3 to 8.3, 8.4 to 9.9
Magnetic field-strength limit at 10 m:	≤ 9 dB(μA/m) (quasi-peak detector)
Maximum 6 dB bandwidth:	≤ 200 kHz
Frequency tolerance:	100×10^{-6}

– CLASS C:

Operating frequency bands (MHz):	6.765 to 6.795, 13.553 to 13.567, 26.957 to 27.283
Magnetic field-strength limit at 10 m:	42 dB(μA/m) (quasi-peak detector)
Frequency tolerance:	100×10^{-6}
Spurious emission limit:	In the frequency band of 13.553 to 13.567 MHz, 140 kHz from the both band edges with maximum magnetic field-strength 9 dB(μA/m) at 10 m quasi-peak detector)

– CLASS D:

Operating frequency band:	315 kHz to 30 MHz (excluding CLASS A, B, C)
Magnetic field-strength limit at 10 m:	−5 dB(μA/m) (in the frequency band of 315 kHz to 1 MHz, quasi-peak detector)
	−15 dB(μA/m) (in the frequency band of 1 to 30 MHz, quasi-peak detector)

– CLASS E:

Operating frequency band (MHz):	40.66 to 40.70
Transmitted power limit:	10 mW (e.r.p.)
Frequency tolerance:	100×10^{-6}

– CLASS F (excluding digital cordless telephone, Bluetooth equipment, model remote-control devices and unmanned aerial vehicle (UAV) equipment):

Operating frequency band (MHz):	2 400 to 2 483.5
Transmitted power limit:	10 mW (e.i.r.p.)
Frequency tolerance:	75 kHz

– CLASS G (excluding Bluetooth equipment and UAV equipment):

Operating frequency band (MHz):	5 725 to 5 850
Transmitted power limit:	25 mW (e.i.r.p.)
Frequency tolerance:	100×10^{-6}

– CLASS H:

Operating frequency band (GHz):	24.00 to 24.25
Transmitted power limit:	20 mW (e.i.r.p.)

1.2 General radio remote-control devices

– Operating frequency bands (MHz):	314 to 316, 430 to 432, 433.05 to 434.79
Transmitted power limit:	10 mW (e.r.p.)
Maximum occupied bandwidth:	400 kHz
– Operating frequency bands (MHz):	470 to 566, 614 to 698
Transmitted power limit:	5 mW (e.r.p.)

	Maximum occupied bandwidth:	1 MHz
–	Operating frequency bands (MHz):	868.0 to 868.6
	Transmitted power limit:	5 mW (e.r.p.)
	Frequency tolerance:	100×10^{-6}
	Maximum duty ratio of transmitting signal:	1%

1.3 Wireless audio transmitters

–	Operating frequency band (MHz):	87 to 108
	Transmitted power limit for mobile phone wireless audio transmitters:	45 nW (e.r.p.)
	Transmitted power limit:	3 mW (e.r.p.)
	Maximum occupied bandwidth:	200 kHz
	Frequency tolerance:	100×10^{-6}
–	Operating frequency band (MHz):	75.4 to 76.0, 84 to 87, 189.9 to 223.0
	Transmitted power limit:	10 mW (e.r.p.)
	Maximum occupied bandwidth:	200 kHz
	Frequency tolerance:	100×10^{-6}
–	Operating frequency bands (MHz):	470 to 510, 630 to 698
	Transmitted power limit:	50 mW (e.r.p.)
	Maximum occupied bandwidth:	200 kHz
	Frequency tolerance:	100×10^{-6}

1.4 Measuring devices for civilian purposes

Operating frequency bands (MHz):	470 to 510
Transmitted power limit:	50 mW (e.r.p.)
Transmitted power spectrum density limit for occupied bandwidth lower or equal to 200 kHz:	50 mW/200 kHz (e.r.p.)
Transmitted power spectrum density limit for occupied bandwidth from 200 kHz to 500 kHz:	10 mW/100 kHz (e.r.p.)
Maximum duration of single transmission:	1 s
Maximum occupied bandwidth:	500 kHz
Frequency tolerance:	100×10^{-6}

1.5 Biomedical telemetry devices and medical implants with their associated peripherals

– **Biomedical telemetry devices**

Operating frequency bands (MHz):	174 to 216, 407 to 425, 608 to 630
Transmitted power limit:	10 mW (e.r.p.)
Frequency tolerance:	100×10^{-6}

– **Medical implants with their associated peripherals**

	Operating frequency bands (MHz):	401 to 406
	Transmitted power limit of Listen Before Transmit (LBT) protocol devices:	25 μW (e.r.p.)
	Transmitted power limit of devices with maximum duty ratio 0.1%:	250 nW (e.r.p.)
	Maximum occupied bandwidth of devices with frequency (MHz) 401 to 402, 405 to 406:	100 kHz
	Maximum occupied bandwidth of devices with frequency (MHz) 402 to 405:	300 kHz
	Frequency tolerance:	100×10^{-6}

1.6 2.4 GHz digital cordless telephone

–	Operating frequency band (MHz):	2 400 to 2 483.5
	Transmitted power limit:	25 mW (e.i.r.p.)
	Frequency tolerance:	20×10^{-6}

1.7 Radio remote-control devices used in industry

–	Operating frequencies (MHz):	418.950, 418.975, 419.000, 419.025, 419.050, 419.075, 419.100, 419.125, 419.150, 419.175, 419.200, 419.250, 419.275
	Transmitted power limit:	20 mW (e.r.p.)
	Maximum occupied bandwidth:	16 kHz
	Frequency tolerance:	4×10^{-6}

1.8 Model remote-control devices

–	27 MHz boat model / car model remote-control devices	
	Operating frequencies (MHz):	26.975, 26.995, 27.025, 27.045, 27.075, 27.095, 27.125, 27.145, 27.175, 27.195, 27.225, 27.255
	Transmitted power limit:	750 mW (e.r.p.)
	Maximum occupied bandwidth:	8 kHz
	Frequency tolerance:	100×10^{-6}
–	40 MHz boat model / car model remote-control devices	
	Operating frequencies (MHz):	40.61, 40.63, 40.65, 40.67, 40.69, 40.71, 40.73, 40.75
	Transmitted power limit:	750 mW (e.r.p.)
	Maximum occupied bandwidth:	20 kHz
	Frequency tolerance:	30×10^{-6}
–	40 MHz aircraft model remote-control devices	
	Operating frequencies (MHz):	40.77, 40.79, 40.81, 40.83, 40.85
	Transmitted power limit:	750 mW (e.r.p.)

	Maximum occupied bandwidth:	20 kHz
	Frequency tolerance:	30×10^{-6}
–	72 MHz aircraft model remote-control devices	
	Operating frequencies (MHz):	72.13, 72.15, 72.17, 72.19, 72.21, 72.79, 72.81, 72.83, 72.85, 72.87
	Transmitted power limit:	750 mW (e.r.p.)
	Maximum occupied bandwidth:	20 kHz
	Frequency tolerance:	30×10^{-6}
–	2 400 MHz model remote-control devices	
	Operating frequencies (MHz):	2 400.0 to 2 483.5
	Transmitted power limit:	10 mW (e.r.p.)
	Maximum occupied bandwidth:	3 MHz
	Frequency tolerance:	100×10^{-6}

2 Operating parameters requirements

2.1 When using the SRDs listed below, the followed regulations must be applied

2.1.1 General radio remote-control devices

These devices cannot be used for radio remote-control toys or models.

It shall be equipped with automatic remote-control device, so that the duration of radio wave transmission of periodically operated radio remote-control devices shall not exceed 1 second, and the interval time between two transmissions shall not be less than 60 minutes; or the duration of each radio wave transmission of non-periodic working devices shall not exceed 5 seconds, and the interval time between two times shall not be less than 60 minutes.

These devices cannot be used locally when the used frequency is the same as the frequency of local sound broadcasting or television broadcasting stations. Their operation must be stopped if they cause harmful interference to local sound broadcasting or television broadcasting stations. They can be reused only after removing the interference by adjusting the equipment to the frequency without interference.

2.1.2 Wireless audio transmitters

It is used for audio-visual training for education and cultural departments, audio assistance for people with disabilities in public places such as cinemas, concert halls and meeting rooms. It is used in the tourist areas as a small broadcast device.

These devices cannot be used locally when the used frequency is the same as that of the local sound broadcasting or television broadcasting stations. Their operation must be stopped if they cause harmful interfere to local sound broadcasting or television broadcasting stations. They can be reused only after removing the interference or adjusting the device to the frequency without interference.

2.1.3 Measuring devices for civilian purposes

It is limited to networking application in small areas such as buildings, residential quarters and villages, and the transmission is limited to a single channel at any time.

Civil measuring instruments shall be equipped with interference avoidance functions such as LBT which cannot be adjusted or turned off by users.

These devices cannot be used locally when the used frequency is the same as the frequency of local sound broadcasting or television broadcasting stations. Their operation must be stopped if they cause harmful interference to local sound broadcasting or television broadcasting stations. They can be reused only after removing the interference or adjusting the device to the frequency without interference.

2.1.4 Biomedical telemetry devices and medical implants with their associated peripherals

2.1.4.1 Biomedical telemetry devices

Radio devices for transmitting measurement signals of either human or animal biomedical phenomena are only allowed to be used for medical and medical research purpose.

These devices cannot be used locally when the used frequency is the same as the frequency of local sound broadcasting or television broadcasting stations. Their operation must be stopped if they cause harmful interference to local sound broadcasting or television broadcasting stations. They can be reused only after removing the interference or adjusting the device to the frequency without interference.

2.1.4.2 Medical implants with their associated peripherals

Medical devices with wireless function, which are completely or partially entered into the human body or cavity (mouth) with the aid of surgery, or used to replace the human epithelial surface or ocular surface, and remain in the human body for more than 30 days (include the 30th day) or absorbed by the human body after the end of the operation process, shall only be used for medical treatment or medical research.

2.1.5 2.4 GHz digital cordless telephone

It shall work with frequency hopping and use at least 75 frequency hopping channels.

The average time of occupancy on any channel shall not be greater than 0.4 s within a period of 60 s.

2.1.6 Radio remote-control devices used in industry

It must be used inside the industrial workshop (or inside the building). The interval between the two transmissions shall not be less than 5 seconds.

2.1.7 Model remote-control devices

Unmanned remote-control models, such as aircraft models in the air, ship models over and under the water surface and automobile models on land, cannot be used for other types of radio devices or UAV.

The remote controller of the model must be a one-way controller. It is not allowed to transmit voice and image communication signal, and radio transmission equipment is not allowed to be set on the model.

The 2 400 MHz band model radio remote-control device shall adopt frequency-hopping operation mode.

2.2 The domestically produced or imported radio transmitting devices in ‘the Catalogue and technical requirements of SRDs’ for sale and use in China does not need to obtain radio frequency using license, radio station license and radio transmitting device type approval, however, it shall in line with laws and regulations such as product quality, national standards and national radio administration relevant regulations.

2.3 The using of SRDs are prohibited from causing harmful interference to other authorized radio stations or claiming protection from other authorized radio stations. If SRDs causes harmful interference to authorized radio stations, its operator shall cease operation immediately until the harmful interference has been removed.

2.4 The use of SRDs shall be subject to interference from other authorized radio stations. The use of in the frequency band of Industrial, Scientific and Medical (ISM) application band specified on the division of radio frequencies regulations of China shall also subject to the interference from emission interference from ISM devices. There is no authorized protection for SRDs when it encounters interference. But the user can make an appeal to the local radio regulatory office.

2.5 The adjustment or remote-control devices shall only be adjusted or controlled within the scope of the technical indicators specified in the technical requirements. The use of devices shall not arbitrarily change the use scene, expand the transmitting frequency range, increase the transmitting power (including the addition of RF power amplifier), and shall not alter the transmitting antenna.

2.6 The use of equipment in the aircraft and in the electromagnetic environment protection areas of military and civil radio stations (stations) and airports, such as radio observatories, weather radar stations, satellite earth stations (including controlling, ranging, receiving and navigation stations), airports and other military and civil radio stations (stations) set up in accordance with laws and regulations, relevant national regulations and standards, shall in line with the provisions of electromagnetic environmental protection and relevant industry competent departments. Without approval, model remote-control devices are forbidden in aviation and military control zones.

2.7 The SRDs shall indicate the following information in the product instructions (including the electronic instruction manual):

2.7.1 The specific terms and use scenarios of Catalogue and Technical Requirements of SRDs, which it shall comply with. The type and performance of antennas adopted, and the use methods such as control, adjustment and switching of the device.

2.7.2 It shall not change the scene or conditions of use, expand the range of transmitting frequency, increase the transmitting power (including the addition of RF power amplifier), or alter the transmitting antenna without authorization.

2.7.3 The using of SRDs are prohibited from causing harmful interference to other authorized radio stations or claiming protection from other authorized radio stations.

2.7.4 It shall subject to the interference from other authorized radio stations or emission interference from ISM devices that radiate RF energy.

2.7.5 If it causes harmful interference to other authorized radio stations, its operator shall cease operation immediately until the harmful interference has been eliminated.

2.7.6 The use of equipment in the aircraft and in the electromagnetic environment protection areas of military and civil radio stations (stations) and airports, such as radio observatories, weather radar stations, satellite earth stations (including controlling, ranging, receiving and navigation stations), airports and other military and civil radio stations (stations) set up in accordance with laws and regulations, relevant national regulations and standards, shall in line with the provisions of electromagnetic environmental protection and relevant industry competent departments.

2.7.7 The use of all kinds of model remote-control devices is forbidden within the area of 5 000 metres radius circle from the centre point of the airport runway.

2.7.8 Environmental conditions of temperature and voltage when the device is in use.

2.8 In case of national major tasks or radio control, the use of device shall comply with the radio management regulations issued during the national major tasks, or obey the relevant radio control orders and radio control instructions.

3 General requirements

3.1 Frequency ranges of measurement for radiated spurious emissions

TABLE 13

Operating frequency range	Lower frequency of measurement range	Upper frequency of measurement range
9 kHz-100 MHz	9 kHz	1 GHz
100-600 MHz	30 MHz	10th harmonic
600 MHz-2.5 GHz	30 MHz	12.75 GHz
2.5-13 GHz	30 MHz	26 GHz
Above 13 GHz	30 MHz	2nd harmonic

3.2 Radiated spurious emission limits

The dividing point between radiated spurious and out of band emission is at ±2.5 times of carrier frequency.

3.2.1 Radiated spurious emission limits are shown in Table 14 when a transmitter is in the state of maximum emission power.

TABLE 14

Frequency range	Testing bandwidth	Emission limit	Detector
9-150 kHz	200 kHz (6 dB)	27 dB(μA/m) at 10 m (descending 3 dB/octave)	Quasi-peak
150 kHz-10 MHz	9 kHz (6 dB)		
10-30 MHz	9 kHz (6 dB)	−3.5 dB(μA/m) at 10 m	Quasi-peak
30 MHz-1 GHz	100 kHz (3 dB)	−36 dBm	RMS
1-40 GHz	1 MHz (3 dB)	−30 dBm	RMS
Above 40 GHz	1 MHz (3 dB)	−20 dBm	RMS

3.2.2 Radiated spurious emission limits are shown in Table 15 when a transmitter is in idle or standby state.

TABLE 15

Frequency range	Testing bandwidth	Emission limit	Detector
9-150 kHz	200 kHz (6 dB)	6 dB(μA/m) at 10 m (descending 3 dB/octave)	Quasi-peak
150 kHz-10 MHz	9 kHz (6 dB)		
10-30 MHz	9 kHz (6 dB)	−24.5 dB(μA/m) at 10 m	Quasi-peak
30 MHz-1 GHz	1 kHz (3 dB)	−47 dBm	RMS
Above 1 GHz	1 MHz (3 dB)		

NOTE 1 – Magnetic field-strength measurement shall be made on an open field site or in a half anechoic chamber. Transmitted power measurement shall be performed in a fully anechoic chamber.

NOTE 2 – The state of a transmitter operating at frequencies below 30 MHz can be set up in the state single carrier transmission.

NOTE 3 – If the concrete technical parameter does not comply with the general requirements, the former shall be adopted.

3.2.3 Radiated spurious emission shall not exceed −54 dBm in 48.5-72.5 MHz, 76-108 MHz, 167-223 MHz, 470-566 MHz, and 606-798 MHz bands.

3.2.4 Conducted disturbance emissions at power ports, signal ports and telecommunication ports shall comply with GB9254: "Information technology equipment-Radio disturbance characteristics − Limits and methods of measurement". This technical standard was issued by former State Administration of Quality and Technology Supervision of China in 1998.

3.2.5 For the bands above 30 MHz within operating frequency ranges mentioned above, transmitted power cannot exceed −80 dBm/Hz (e.i.r.p.) at the band edges. For the bands below 30 MHz, the edges of the occupied frequency bandwidth on any operating channel (99% of energy) cannot exceed operating frequency ranges mentioned above.

3.2.6 Manufacturers of SRDs shall announce the temperature and voltage condition of operating environment, the transmit power and frequency tolerance under the general and extreme use condition should satisfy requirements mentioned above.

Attachment 4
to Annex 2

(Japan)

Japanese requirements for short-range radio devices

In Japan, establishment of a radio station requires a license from the ministry of Internal Affairs and Communications (MIC). However, radio stations listed in §§ 1) and 3) of Article 4 of the Radio Law (radio stations emitting extremely low power and low-power radio stations) can be established without obtaining a license from the minister of the MIC. A license, for a radio station which has had all its equipment granted certification of conformity with the required technical standards, can be obtained without a provisional license or radio station inspection.

Radio stations listed in §§ 1) and 3) of Article 4 of the Radio Law.

1 Radio stations emitting extremely low power

A radio station license is not required if the electric field strength meets the tolerable maximum value shown in Fig. 2 and Table 16 at a location 3 m distant from the radio equipment.

FIGURE 2

Tolerable maximum value of electric field strength 3 m distant from a radio station emitting extremely low power*

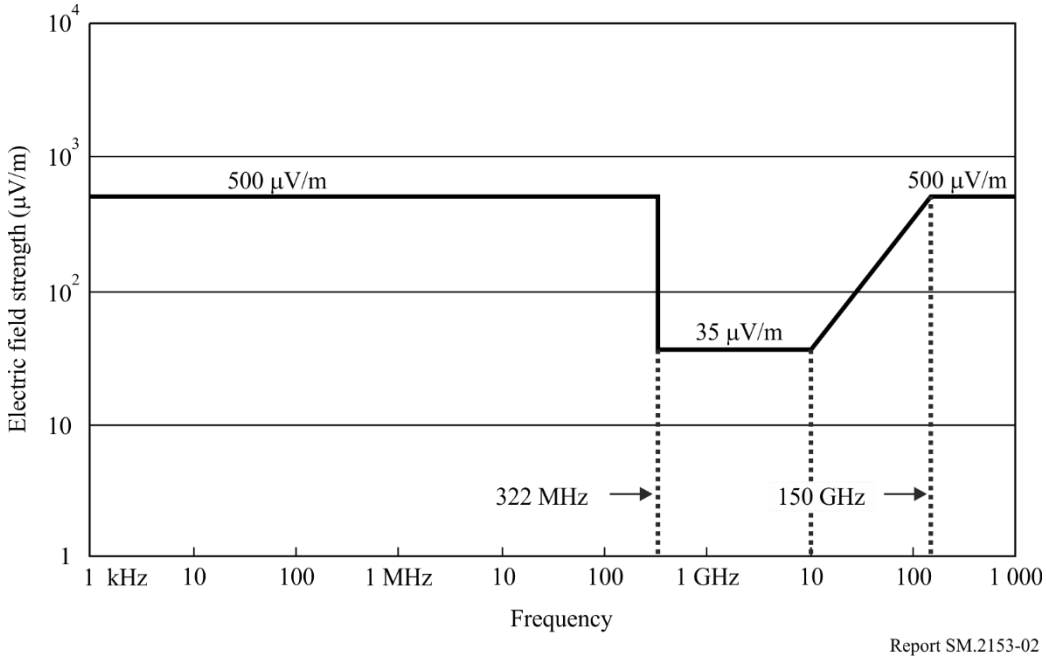

TABLE 16

Tolerable value of electric field strength 3 m distant from a radio station emitting extremely low power

Frequency band	Electric field strength (μV/m)
$f \leq 322$ MHz	500
322 MHz < $f \leq 10$ GHz	35
10 GHz < $f \leq 150$ GHz	$3.5 \times f$ (1), (2)
150 GHz < f	500

(1) f (GHz).

(2) If $3.5 \times f > 500$ μV/m, the tolerable value is 500 μV/m.

NOTE – Table 3 and Table 16 are similar.

2 Low-power radio stations

Radio stations using only radio equipment 1 W or less in antenna power and certified for technical standards compliance can be established without obtaining a license if they are intended for the following uses:

(limited only to stations using frequencies specified by the MIC)

– Telemeter and telecontrol and data transmission
– Wireless telephone
– Radio pager
– Radio microphone

– Medical telemeter
– Hearing aid
– Mobile land stations for personal handy phone (PHS)
– Radio stations for low-power data communication systems/wireless LAN
– Millimetre-wave radar
– Radio stations for cordless phones
– Radio stations for low-power security systems
– Radio stations for digital cordless phones
– Mobile land stations for dedicated short-range communication (DSRC) systems
– RF identification (RFID) systems
– Medical implant communication systems
– Sensors for detecting or measuring mobile objects
– Quasi-millimetre-wave communication systems
– Monitoring systems of animal's position
– Ultra-wide band systems

TABLE 17

Technical regulations for representative low-power radio stations

Type of emission	**Frequency band (MHz)**	**Occupied bandwidth (kHz)**	**Power level or spectral density (e.i.r.p.)**	**Antenna power and antenna gain**	**Carrier sense**
Telemeter, telecontrol and data transmission					
–	312-315.25	≤ 1 000	≤ 250 μW (−6 dBm)	–	Not required
	312-315.05		≤ 25 μW (−16 dBm)		
F1D, F1F, F2D, F2F, F7D, F7F, G1D, G1F, G2D, G2F, G7D, G7F, D1D, D1F, D2D, D2F, D7D or D7F	426.025-426.1375 (12.5 kHz spacing)	≤ 8.5	≤ 16.4 mW[(1)] (12.14 dBm)	≤ 100 mW ≤ 2.14 dBi	Not required
	426.0375-426.1125 (25 kHz spacing)	> 8.5 ≤ 16	≤ 16.4 mW[(1)] (12.14 dBm)	≤ 100 mW ≤ 2.14 dBi	Not required
	429.1750-429.7375 (12.5 kHz spacing)	≤ 8.5	≤ 16.4 mW[(1)] (12.14 dBm)	≤ 1W ≤ 2.14 dBi	7 μV
	429.8125-429.9250 (12.5 kHz spacing)				
	449.7125-449.8250 (12.5 kHz spacing)				
	449.8375-449.8875 (12.5 kHz spacing)				
	469.4375-469.4875 (12.5 kHz spacing)				

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
	916-928 (100 kHz spacing)	≤ 200	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	−75 dBm
	920.6-928 (100 kHz spacing)		≤ 40 mW (16 dBm)	> 1 mW ≤ 20 mW ≤ 3 dBi	
	916.1-927.9 (100 kHz spacing)	> 200 ≤ 400	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	920.7-927.9 (200 kHz spacing)		≤ 40 mW (16 dBm)	> 1 mW ≤ 20 mW ≤ 3 dBi	
	916.2-927.8 (100 kHz spacing)	> 400 ≤ 600	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	920.8-927.8 (100 kHz spacing)		≤ 40 mW (16 dBm)	> 1 mW ≤ 20 mW ≤ 3 dBi	
	916.3-927.7 (100 kHz spacing)	> 600 ≤ 800	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	920.9-927.7 (100 kHz spacing)		≤ 40 mW (16 dBm)	> 1 mW ≤ 20 mW ≤ 3 dBi	
	916.4-927.6 (100 kHz spacing)	> 800 ≤ 1000	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	921.4-927.6 (100 kHz spacing)		≤ 40 mW (16 dBm)	> 1 mW ≤ 20 mW ≤ 3 dBi	
	928.15-929.65 (100 kHz spacing)	≤ 100	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	928.2-929.6 (100 kHz spacing)	> 100 ≤ 200	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	928.25-929.55 (100 kHz spacing)	> 200 ≤ 300	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	928.3-929.5 (100 kHz spacing)	> 300 ≤ 400	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	928.35-929.45 (100 kHz spacing)	> 400 ≤ 500	≤ 2 mW (3 dBm)	≤ 1 mW ≤ 3 dBi	
	1 216-1 217 (50 kHz spacing)	> 16 ≤ 32	≤ 16.4 mW[(1)] (12.14 dBm)	≤ 1 W ≤ 2.14 dBi	4.47 μV
	1 252-1 253 (50 kHz spacing)				
	1 216.0125- 1 216.9875 (25 kHz spacing)				

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
	1 252.0125- 1 252.9875 (25 kHz spacing)				
Telemeter, telecontrol and data transmission					
	1 216.5375- 1 216.9875 (25 kHz spacing)	≤ 16			
	1 252.5375- 1 252.9875 (25 kHz spacing)				
Wireless telephone					
F1D, F1E, F2D, F2E, F3E, F7W, G1D, G1E, G2D, G2E, G7E, G7W, D1D, D1E, D2D, D2E, D3E, D7E or D7W	422.2-422.3 (12.5 kHz spacing)	≤ 8.5	≤ 16.4 mW[2] (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	7 μV
	421.8125-421.9125 (12.5 kHz spacing)				
	440.2625-440.3625 (12.5 kHz spacing)				
	422.05-422.1875 (12.5 kHz spacing)				
	421.575-421.8 (12.5 kHz spacing)				
	440.025-440.25 (12.5 kHz spacing)				
F2D, F3E	413.7-414.14375 (6.25 kHz spacing)	≤ 8.5	1.64 mW[3] (2.14 dBm)	≤ 1 mW ≤ (2.14 dBi)	Not required
	454.05-454.19375 (6.25 kHz spacing)				
Radio pager					
F1B, F2B, F3E, G1B or G2B	429.75 429.7625 429.775 429.7875 429.8	≤ 8.5	≤ 16.4 mW[2] (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	7 μV

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
Radio microphone					
F1D, F1E, F2D, F3E, F7D, F7E, F7W, F8E, F8W, F9W, D1D, D1E, D7D, D7E, D7W, G1D, G1E, G7D, G7E, G7W or N0N	806.125-809.75 (125 kHz spacing)	Frequency modulation (except for frequency shift keying) ≤ 110 Frequency-modulation (limited to frequency shift keying), Phase-modulation or Quadrature amplitude-modulation ≤ 192	≤ 16 mW (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	Not required
Radio microphone					
F3E, F8W, F2D or F9W	322.025-322.15 (25 kHz spacing) 322.25-322.4 (25 kHz spacing)	≤ 30	≤ 1.6 mW (2.14 dBm)	≤ 1 mW ≤ 2.14 dBi	Not required
F3E or F8W	74.58,74.64,74.70, 74.76	≤ 60	≤ 16 mW (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	Not required
Medical telemeter					
F1D, F2D, F3D, F7D, F8D or F9D	420.05-421.0375, 424.4875-425.975, 429.25-429.7375, 440.5625-441.55, 444.5125-445.5 and 448.675-449.6625 (12.5 kHz spacing)	≤ 8.5	≤ 1.6 mW (2.14 dBm)	≤ 1 mW ≤ 2.14 dBi	Not required
F7D, F8D or F9D	420.0625-421.0125, 424.5-425.95, 429.2625-429.7125, 440.575-441.525, 444.525-445.475, 448.6875-449.6375 (25 kHz spacing)	> 8.5 ≤ 16			
F7D, F8D, F9D or G7D	420.075-420.975, 424.5125-425.9125, 429.275-429.675, 440.5875-441.4875, 444.5375-445.4375, 448.7-449.6 (50 kHz spacing)	> 16 ≤ 32			

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
F7D, F8D, F9D or G7D	420.1-420.9, 424.5375-425.8375, 429.3-429.6, 440.6125-441.4125, 444.5625-445.3625, 448.725-449.525, (100 kHz spacing)	> 32 ≤ 64			
F7D, F8D, F9D or G7D	420.3, 420.8, 424.7375, 425.2375, 425.7375, 429.5, 440.8125, 441.3125, 444.7625, 445.2625, 448.925, 449.425	> 64 ≤ 320	≤ 16 mW (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	
Hearing aid					
F3E or F8W	75.2125-75.5875 (12.5 kHz spacing)	≤ 20	≤ 16 mW (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	Not required
F3E or F8W	75.225-75.575 (25 kHz spacing)	> 20 ≤ 30			
Hearing aid					
F3E or F8W	75.2625-75.5125 (62.5 kHz spacing)	> 30 ≤ 80			
F3E or F8W	169.4125-169.7875 (25 kHz spacing)	> 20 ≤ 30	≤ 16 mW (12.14 dBm)	≤ 10 mW ≤ 2.14 dBi	Not required
F3E or F8W	169.4375-169.75 (62.5 kHz spacing)	> 30 ≤ 80			
PHS (land mobile station)					
D1C, D1D, D1E, D1F, D1X, D1W, D7C, D7D, D7E, D7F, D7X, D7W, G1C, G1D, G1E, G1F, G1X, G1W, G7C, G7D, G7E, G7F, G7X or G7W	1 884.65-1 918.25	1 884.65-1 91 8.25 MHz ≤ 288 1 884.95- 1 893.05 MHz ≤ 884	≤ 25 mW (14 dBm)	≤ 10 mW ≤ 4 dBi	159 μV

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
Wireless LAN					
SS (spread spectrum) (DS (direct sequence), FH (frequency hopping), FH/DS), OFDM or others	2 400-2 483.5	FH or FH/DS: ≤ 85.5 MHz OFDM ≤ 38 MHz Others: ≤ 26 MHz	FH or FH/DS: ≤ 4.9 mW/MHz (6.9 dBm/MHz) DS or OFDM: ≤ 16 mW/MHz (12.14 dBm/MHz) Others: ≤ 16 mW (12.14 dBm/MHz)	FH or FH/DS: ≤ 3 mW/MHz DS or OFDM: ≤ 10 mW/MHz Others: ≤ 10 mW ≤ 2.14 dBi	Not required
SS (DS, FH or FH/DS)	2 471-2 497	≤ 26 MHz	≤ 16 mW (12.14 dBm/MHz)	≤ 10 mW/MHz ≤ 2.14 dBi	Not required
Wireless LAN					
SS (DS), OFDM or others	5 150-5 250 (indoor use)	20 MHz system: ≤ 19 MHz 40 MHz system: ≤ 38 MHz	20 MHz system: ≤ 10 mW/MHz 40 MHz system: ≤ 5 mW/MHz	20 MHz system by DS or OFDM: ≤ 10 mW/MHz 20 MHz system by Others: ≤ 10 mW 40 MHz system: ≤ 5 mW/MHz Antenna gain is not required.	100 mV/m DFS/ TPC is not required.
	5 250-5 350 (indoor use)		20 MHz system: With TPC: ≤ 10 mW/MHz Without TPC: ≤ 5 mW/MHz 40 MHz system: With TPC: ≤ 5 mW/MHz Without TPC: ≤ 2.5 mW/MHz		100 mV/m DFS/ TPC is required for the key station. DFS/ TPC is not required for the station controlled by the key station.
	5 470-5 725	≤ 19.7 MHz	≤ 50 mW/MHz (17 dBm/MHz)		
Millimetre-wave radar					
–	60.5 GHz 76.5 GHz	≤ 500 MHz	100 W (50 dBm)	≤ 10 mW ≤ 40 dBi	Not required
–	79.5 GHz	≤ 2 GHz	33 W (45 dBm)	≤ 5 μW/1 MHz ≤ 35 dBi	Not required
Radio stations for cordless phones					
F1D, F2A, F2B, F2C, F2D, F2N, F2X or F3E	253.8625-254.9625 (12.5 kHz spacing) 380.2125-381.3125 (12.5 kHz spacing)	≤ 8.5	≤ 10 mW (10 dBm)	–	2 μV

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
Radio stations for low-power security systems					
F1D, F2D or G1D	426.25-426.8375 (12.5 kHz spacing)	≤ 8.5	≤ 1W (30 dBm)	≤ 2.14 dBi[10]	Not required
	426.2625-426.8375 (25 kHz spacing)	> 8.5 ≤ 16			
Radio stations for digital cordless phones					
G1C, G1D, G1E, G1F, G1X, G1W, G7C, G7D, G7E, G7F, G1X or G7W	1 893.65-1 905.95 (300 kHz spacing)	≤ 288	≤ 25 mW (14 dBm)	≤ 10 mW ≤ 4 dBi	159 μV
Land mobile stations for dedicated short-range communication (DSRC) system					
A1D G1D	5.815-5.845 GHz (5 MHz spacing)	≤ 4.4 MHz	≤ 100 mW (20 dBm)	≤ 10 mW ≤ 10 dBi	Not required
RF identification (RFID) systems					
–	433.67-434.17[4]	≤ 500 kHz (Interrogator) 200 kHz (Active tag)	≤ 0.4 mW (−4 dBm)[5] (Interrogator) ≤ 1 mW (0 dBm) (Active tag)	–	Not required
N0N, A1D, AXN, H1D, R1D, J1D, F1D, F2D or G1D	916.8 918 919.2 920.4-923.4 (200 kHz spacing)	≤ 200	≤ 500 mW[6] (27 dBm)	≤ 250 mW ≤ 3 dBi	−74 dBm
	920.5-923.3 (200 kHz spacing)	> 200 ≤ 400	≤ 500 mW[6] (27 dBm)	≤ 250 mW ≤ 3 dBi	−74 dBm
	920.6-923.2 (200 kHz spacing)	> 400 ≤ 600	≤ 500 mW[6] (27 dBm)	≤ 250 mW ≤ 3 dBi	−74 dBm
	920.7-923.1 (200 kHz spacing)	> 600 ≤ 800	≤ 500 mW[6] (27 dBm)	≤ 250 mW ≤ 3 dBi	−74 dBm
	920.8-923 (200 kHz spacing)	> 800 ≤ 1 000	≤ 500 mW[6] (27 dBm)	≤ 250 mW ≤ 3 dBi	−74 dBm

TABLE 17 (*continued*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
N0N, A1D, AXN, F1D, F2D or G1D	2 425-2 475	FH: ≤ 83.5 MHz DS: ≤ 5.5 MHz	FH: ≤ 40 mW/1 MHz[7] (16 dBm/1 MHz) (2 400-2 427 MHz, 2 470.75-2 483.5 MHz ≤ 12mW/1 MHz[7] (10.8 dBm/1 MHz) (2 427-2 470.75 MHz) DS: ≤ 1 W (30 dBm)	FH: ≤ 10 mW/1 MHz (2 400-2 427 MHz, 2 470.75-2 483.5 MHz ≤ 3mW/1 MHz (2 427-2 470.75 MHz) ≤ 6 dBi DS: ≤ 10 mW ≤ 20 dBi	Not required
Medical implant communication systems					
A1D, F1D or G1D	401-402 402-405 405-406	≤ 300 kHz	≤ 25 μW (−16 dBm)	–	10 log *B* −150 + *G* dB (with 1 mW regarded as 0 dB)[8]
	403.5-403.8		100 nW (−40 dBm)		Not required
Sensors for detecting or measuring mobile objects					
–	10.525 GHz (indoor use)	≤ 40 MHz	≤ 5 W (37 dBm)	≤ 20 mW ≤ 24 dBi	–
	24.15 GHz	≤ 76 MHz			
Quasi-millimetre-wave communication systems					
OFDM or others	24.77-25.23 GHz 27.02-27.46 GHz	≤ 18 MHz	≤ 100 mW/MHz (20 dBm/MHz)	≤ 10 mW/MHz ≤ 10 dBi	460 mW/m
Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
Monitoring systems of animal's position					
F1D, F2D, A1D or M1D	142.94-142.98 (10 kHz spacing)	≤ 16 kHz	≤ 1.64 W (32.14 dBm)	≤ 1W ≤ 2.14 dBi	Not required (≤ 10 mW) 7 μV (> 10 mW)

TABLE 17 (*end*)

Type of emission	Frequency band (MHz)	Occupied bandwidth (kHz)	Power level or spectral density (e.i.r.p.)	Antenna power and antenna gain	Carrier sense
Ultra wide band systems for communication applications					
	3.4-4.8 GHz[9] 7.25-10.25 GHz	>450 MHz	≤ −41.3 dBm/MHz	–	–

OFDM: orthogonal frequency division multiplexing

PSK: phase shift keying

[1] If the e.i.r.p. of the device in operation is greater than 16.4 mW, the antenna gain should be complementally decreased to keep its e.i.r.p. of 16.4 mW. If e.i.r.p. of the device in operation is less than 16.4 mW, the antenna power can be complementally increased up to the e.i.r.p. of 16.4 mW.

[2] If the e.i.r.p. of the device in operation is less than 16.4 mW, the antenna gain can be complementally increased up to its e.i.r.p. of 16.4 mW.

[3] If the e.i.r.p. of the device in operation is less than 1.64 mW, the antenna gain can be complementally increased up to its e.i.r.p. of 1.64 mW.

[4] International logistics only.

[5] Power level (e.i.r.p.) from interrogators is limited in less than 0.1 mW (−10 dBm) when sending a signal for the start of switching active tags on.

[6] If the e.i.r.p. of the device in operation is less than 500 mW, its antenna gain can be complementally increased up to the e.i.r.p. of 500 mW.

[7] If the e.i.r.p. of the device in operation is less than 40 mW/1 MHz in the frequency band 2 400-2 427 MHz and 2 470.75-2 483.5 MHz, and 12 mW/1 MHz in the frequency band 2 427-2 470.75 MHz, its antenna gain can be complementally increased up to the e.i.r.p. of up to the 40 mW/1 MHz and 12 mW/1 MHz at each frequency band, respectively.

[8] *B* is the maximum radiation bandwidth in the communication state (which refers to the bandwidth in which the radio equipment in a living body or the radio control equipment outside the living body radiates and is the larger of either of the upper limit and the lower limit frequency width (Hz) at which the attenuation from the maximum value of the radiation power during the maximum modulation becomes 20 dB). *G* is the absolute gain of the receiving antenna.

[9] Interference mitigation function (DAA, etc.) should be adopted in the band of 3.4-4.8 GHz. But the interference mitigation function should not be adopted if the average antenna power per 1 MHz is less than 70 dB.

[10] If the e.i.r.p. of the device in operation is less than 16.4 mW, the antenna gain can be complementally increased up to its e.i.r.p. of 16.4 mW. If the e.i.r.p. of the device in operation is greater than 16.4 mW, the antenna gain should be complementally decreased to keep its e.i.r.p. of 16.4 mW.

Attachment 5
to Annex 2

(The Republic of Korea)

Technical parameters and spectrum use for SRDs in Korea

1 Introduction

The radio station installed with the following apparatus is to be exempted from individual licence according to the Radio Wave Act in Korea. This category of apparatus is the subject of certification.

- Low-power devices (LPD)
- Citizen-band transceiver
- Specified short range device
- Measurement instruments
- Receiver only
- Radio equipment used for relaying public radiocommunication service or broadcasting service to shaded area.

2 Technical parameters and spectrum use for SRDs

2.1 Low-power devices, citizen-band transceiver and specific SRDs

TABLE 18

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
1	Extremely low power devices	0-322 MHz*	500 μV/m at 3 m	The measured value for the frequency lower than 15 MHz should be multiplied by the near field measurement compensation factor ($6\pi/\lambda$), where λ is wavelength (m). 1) f: frequency (GHz).
		322 MHz-10 GHz*	35 μV/m at 3 m	
		10-150 GHz*	3.5 f 1) μV/m at 3 m	
		Above 150 GHz*	500 μV/m at 3 m	

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies		Maximum field strength/RF output power	Remarks
2	Inductive applications	9-150 kHz	9-30 kHz	72 dB(μA/m) at 10 m	Loop coil antenna may be employed. [2] f: frequency (kHz).
			30-90 kHz	$72 - 10 \log(f^{2)}/30)$ dB(μA/m) at 10 m	
			90-110 kHz	42 dB(μA/m) at 10 m	
			110-135 kHz	$72 - 10 \log(f^{2)}/30)$ dB(μA/m) at 10 m	
			135-140 kHz	42 dB(μA/m) at 10 m	
			140-148 kHz	37.5 dB(μA/m) at 10 m	
			148-150 kHz	14.8 dB(μA/m) at 10 m	
		150 kHz-30 MHz	3.155-3.4 MHz	13.5 dB(μA/m) at 10 m	Loop coil antenna may be employed. The measured value for the frequency lower than 15 MHz should be multiplied by the near field measurement compensation factor ($6\pi/\lambda$), where λ is wavelength (m).
			7.4-8.7 MHz	9 dB(μA/m) at 10 m	
			13.552-13.568 MHz	93.5 dB(μV/m) at 10 m	
			The others	500 μV/m at 3 m	
3	Radio controller for model automobile and model ship craft	26.995, …, 27.195 MHz (5 channels with 50 kHz space)		10 mV/m at 10 m	
		40.255, …, 40.495 MHz (13 channels with 20 kHz space)		10 mV/m at 10 m	
		75.630, ..., 75.790 MHz (9 channels with 20 kHz space)		10 mV/m at 10 m	
4	Radio controller for model aircraft	40.715, ..., 40.995 MHz (15 channels with 20 kHz space)		10 mV/m at 10 m	
		72.630, …, 72.990 MHz (19 channels with 20 kHz space)			
5	Radio controller for toy, security alarm or telecommand	13.552-13.568 MHz		10 mV/m at 10 m	
		26.958-27.282 MHz			
		40.656-40.704 MHz			

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
6	Data transmission	173.0250, …, 173.2750 MHz (21 channels with 12.5 kHz space)	5 mW (e.r.p.)	The maximum occupied bandwidth (OBW) is 8.5 kHz.
		173.6250, …, 173.7875 MHz (14 channels with 12.5 kHz space)	10 mW (e.r.p.)	
		219.000 (224.000), …, 219.125 (224.125) (6 pair channels with 25 kHz space)	10 mW (e.r.p.)	The frequencies of 219.000 (224.000) MHz are for channel control OBW is 16 kHz. Frequencies in ( ) are for duplex communication.
		311.0125, …, 311.1250 MHz (10 channels with 12.5 kHz space)	5 mW (e.r.p.)	The maximum OBW is 8.5 kHz
		424.7000, …, 424.9500 MHz (21 channels with 12.5 kHz space)	10 mW (e.r.p.)	The channel 424.7 MHz is for channel control. The maximum OBW is 8.5 kHz
		433.795-434.045 MHz	3 mW (e.r.p.)	For tire pressure monitoring system (TPMS), remote keyless entry (RKE), and remote car parking system only. The maximum OBW is 250 kHz
		447.6000, …, 447.8500 MHz (21 channels with 12.5 kHz space)	5 mW (e.r.p.)	The maximum OBW is 8.5 kHz
		447.8625, …, 447.9875 MHz (11 channels with 12.5 kHz space)	10 mW (e.r.p.)	The maximum OBW is 8.5 kHz

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
7	Guiding system for the blind	235.3000, MHz	10 mW (e.r.p.)	For fixed equipment only. The maximum OBW is 8.5 kHz.
		358.5000, MHz	10 mW (e.r.p.)	For mobile equipment only. The maximum OBW is 8.5 kHz.
	Passenger Guidance system for the blind	235.3125, 235.3250, 235.3375 MHz	100 mW (e.r.p.)	For fixed equipment only. The maximum OBW is 8.5 kHz.
		358.5125, 358.5250, 358.5375 MHz	100 mW (e.r.p.)	For mobile equipment only. The maximum OBW is 8.5 kHz.
8	Security application	447.2625, …, 447.5625 MHz (25 channels with 12.5 kHz space)	10 mW (e.r.p.)	The maximum OBW is 8.5 kHz.
9	Data transmission or voice radio paging	219.150, 219.175, 219.200, 219.225 MHz (4 channels with 25 kHz space)	10 mW (e.r.p.)	The maximum OBW is 16 kHz.
10	Wireless microphone or Audio transmission	72.610-73.910 MHz	10 mW (e.r.p.)	The maximum OBW is 60 kHz.
		74.000-74.800 MHz		
		75.620-75.790 MHz		
		173.020-173.280 MHz	10 mW (e.r.p.)	The maximum OBW is 200 kHz. [3)] For hearing aids and indoor use
		173.300-174.000 MHz[3)]		
		216.000-217.000 MHz[3)]		
		217.250-220.110 MHz		
		223.000-225.000 MHz		
		925.000-937.500 MHz		
11	Wireless access system including wireless LAN	5 150-5 350 MHz	10 mW/MHz[4)] 5 mW/MHz[5)] 2.5 mW/MHz[6) 7)] 1.25 mW/MHz[8)]	Nominal antenna gain is 7 dBi. [4)] In case of OBW 0.5-20 MHz [5)] In case of OBW 20-40 MHz [6)] In case of OBW 40-80 MHz [7)] In case of using some or all of spectrum in 5 230-5 250 MHz and OBW 0.5-40 MHz [8)] In case of OBW 80-160 MHz

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
		5 470-5 850 MHz	10 mW/MHz[9)] 5 mW/MHz[10)] 2.5 mW/MHz[11)] 1.25 mW/MHz[12)]	Nominal antenna gain is 7 dBi. [9)] In case of OBW 0.5-20 MHz [10)] In case of OBW 20-40 MHz [11)] In case of OBW 40-80 MHz [12)] In case of OBW 80-160 MHz
		5 925-6 425 MHz	14 dBm (e.i.r.p.) (1 dBm/MHz)	The maximum OBW is 160 MHz.
		5 925-7 125 MHz	2 dBm/MHz (e.i.r.p.)	The maximum OBW is 160 MHz. Only for indoor operations
		17 705-17 715 MHz	10 mW (e.i.r.p)	The maximum OBW is 10 MHz. Nominal antenna gain is 2.15 dBi. Only for wireless LAN
		17 725-17 735 MHz		
		19 265-19 275 MHz		
		19 285-19 295 MHz		
		17 700-17 740 MHz 19 260-19 300 MHz	1 mW/MHz	Nominal antenna gain is 23 dBi. The OBW is 10-40 MHz. Only for fixed point-to-point operation
12	Wireless data communication	2 400-2 483.5 MHz, 5 725-5 850 MHz	3 mW/MHz (for FHSS type)	The nominal antenna gain is 6 dBi. (20 dBi for point-to-point application) The peak power of a hopping channel divided by whole hopping frequency band (MHz).
			10 mW/MHz[13)] 5 mW/MHz[14)] 2.5 mW/MHz[15)] 0.1 mW/MHz[16)] (for other spread spectrum type and OFDM)	The nominal antenna gain is 6 dBi. (20 dBi for point-to-point application) [13)] In case of OBW 0.5-26 MHz [14)] In case of OBW 26-40 MHz [15)] In case of OBW 40-80 MHz [16)] Only for devices with OBW 40-60 MHz in 2.4 GHz band
			10 mW (e.r.p.) (other type)	The maximum OBW is 26 MHz for 2.4 GHz band and 70 MHz for 5.8 GHz band (Centre frequency is 5 775 MHz).

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
		2 410, 2 430, 2 450 and 2 470 MHz	10 mW	The nominal antenna gain is 6 dBi. (20 dBi for point-to-point application) The maximum OBW is 16 MHz. Only for analogue video transmission
		5 800 and 5 810 MHz	10 mW	Nominal antenna gain is 22 dBi for road side unit and 8 dBi for on-board unit. The maximum OBW is 8 MHz. Only for dedicated short range communication (DSRC).
13	Vehicle identification system	2 440 (2 427-2 453) MHz	300 mW	The nominal antenna gain is 20 dBi.
		2 450 (2 434-2 465) MHz		
		2 455 (2 439-2 470) MHz		
14	Automotive radar	24.25-26.65 GHz	−41.3 dBm/MHz (e.i.r.p.)	
		76-77 GHz	55 dBm (e.i.r.p.)	For road vehicles only The maximum antenna input power is 20 mW at each antenna port.
		77-81 GHz	55 dBm/50 MHz (e.i.r.p.)	For road vehicles only The maximum antenna input power is 20 mW at each antenna port.
15	Obstacle detection radar	34.275-34.875 GHz	55 dBm (e.i.r.p.) (8 dBm/MHz)	For monitoring road surface only
16	Radio frequency identification applications (RFID)	13.552-13.568 MHz	93.5 dB(μV/m) at 10 m	
		433.670-434.170 MHz	3.6 mW (e.i.r.p.)	
		917-923.5 MHz (32 channels, 200 kHz step)	4 W (e.i.r.p.)	Passive RFID on channel No. 2, 5, 8, 11, 14 and 17
			200 mW (e.i.r.p.)	Passive RFID Channel No. 20-32
			10 mW (e.i.r.p.)	Any on channel No. 2, 5, 8, 11, 14, 17 and 19-32
			3 mW (e.i.r.p.)	Any on channel No. 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16 and 18

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
17	Ubiquitous sensor network (USN)	917-923.5 MHz	3 mW (e.i.r.p.)	Any on channel No. 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, and 18
			10 mW (e.i.r.p.)	Any on channel No. 2, 5, 8, 11, 14, 17, and 19-32
			25 mW (e.i.r.p.)	Any on channel No. 26-32
			200 mW (e.i.r.p.)	Any on channel No. 20-32 for outdoor point-to-multi point operation only
		940.1-946.3 MHz	200 mW (e.i.r.p.)	
		1 788.478-1 791.950 MHz	100 mW (e.i.r.p.)	
18	Cordless phone (digital)	1 786.750-1 791.950 MHz	100 mW (e.i.r.p.)	The maximum OBW is 1.728 MHz.
		2 400-2 483.5 MHz	3 mW/MHz (for FHSS type)	The nominal antenna gain is 6 dBi. The peak power of a hopping channel divided by whole hopping frequency band (MHz).
			10 mW/MHz[17)] 5 mW/MHz[18)] 2.5 mW/MHz[19)] 0.1 mW/MHz[20)] (for other spread spectrum type and OFDM)	The nominal antenna gain is 6 dBi. [17)] In case of OBW 0.5-26 MHz [18)] In case of OBW 26-40 MHz [19)] In case of OBW 40-80 MHz [20)] In case of OBW 40-60 MHz
			10 mW (e.r.p.) (for non-spread spectrum type)	The maximum OBW is 26 MHz.
19	UWB device	4.2-4.8 GHz	−41.3 dBm/MHz (e.i.r.p.)	The minimum 10 dB bandwidth is 450 MHz. Interference mitigation function (DAA, LDC, etc.) should be adopted in the band of 4.2-4.8 GHz.
		6.0-10.2 GHz		6.0-7.2 GHz band is not available for fixed outdoor devices.

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
20	Non-specific SRD	262-264 MHz	100 mW (e.r.p.)	The centre frequency is 262.00625 MHz + (12.5 kHz × (N-1)). N is channel number which is not less than 1 and not more than 160.
		22-23.6GHz	100 mW (6 dBm/MHz)	Nominal antenna gain is 16 dBi.
		57-66 GHz	43 dBm (e.i.r.p.) 57 dBm (e.i.r.p.)[21)] 82 dBm (e.i.r.p.)[22)] 82-(51-antenna gain) × 2 dBm (e.i.r.p.)[23)]	[21)] For fixed point-to-point operation only [22)] Nominal antenna gain is above 51 dBi. For outdoor fixed point-to-point operation only [23)] Nominal antenna gain is below 51 dBi. For outdoor fixed point-to-point operation only
		122-123 GHz	100 mW (e.i.r.p.)	
		244-246 GHz	100 mW (e.i.r.p.)	
21	Medical implant communication system (MICS)	402-405 MHz	25 μW (e.i.r.p.)	The maximum OBW is 300 kHz.
22	Radar sensor system	5 847-5 850 MHz	10 mW (e.i.r.p.)	The maximum OBW is 3 MHz.
		10.5-10.55 GHz	25 mW (e.i.r.p.)	The maximum OBW is 50 MHz.
		24.05-24.25 GHz	10 mW (100 mW (e.i.r.p.))	The maximum OBW is 200 MHz.

TABLE 18 (*continued*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
23	Citizen band transceiver (simplex)	26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225, 27.235, 27.245, 27.255, 27.265, 27.275, 27.285, 27.295, 27.305, 27.315, 27.325, 27.335, 27.345, 27.355, 27.365, 27.375, 27.385, 27.395 and 27.405 MHz (40 channels, 10 kHz space)	3 W	The maximum OBW is 6 kHz for double side band and 3 kHz for single side band emission. The antenna should be whip type, and the limit of antenna length is 1 m for portable type, 3 m for built-in vehicle type (total height should not be higher than 4.5 m) and 6 m for fixed type. The channel 27.065 MHz is designated for emergency communication (such as fire alarm). The channel 27.185 MHz is designated for meteorological, medical, traffic guide.
		424.13750, 424.15000, 424.16250, 424.17500, 424.18750, 424.20000, 424.21250, 424.22500, 424.23750, 424.25000, 424.26250, 448.73750, 448.75000, 448.76250, 448.77500, 448.78750, 448.80000, 448.81250, 448.82500, 448.83750, 448.85000, 448.86250, 448.87500, 448.88750, 448.90000, 448.91250, 448.92500, 449.13750, 449.15000, 449.16250, 449.17500, 449.18750, 449.20000, 449.21250, 449.22500, 449.23750, 449.25000, 449.26250	500 mW	Nominal antenna gain is 2.14 dBi. The maximum OBW is 8.5 kHz.

TABLE 18 (*end*)

No.	Application	Frequency bands/ frequencies	Maximum field strength/RF output power	Remarks
		424.14375, 424.15625, 424.16875, 424.18125, 424.19375, 424.20625, 424.21875, 424.23125, 424.24375, 424.25625, 448.74375, 448.75625, 448.76875, 448.78125, 448.79375, 448.80625, 448.81875, 448.83125, 448.84375, 448.85625, 448.86875, 448.88125, 448.89375, 448.90625, 448.91875	500 mW	Nominal antenna gain is 2.14 dBi. The maximum OBW is 4 kHz.
24	Data communication devices using TV white space	470-698 MHz	1 W / 6 MHz for fixed device 100 mW / 6 MHz for mobile device	The maximum BW is 12 MHz Nominal antenna gain is 6 dBi for fixed device and 0 dBi for mobile device (*Higher antenna gain can be used if lower RF output power is used) The channel arrangement given in the Minister's Notification on broadcasting standards and technical criteria shall be used.
25	Cooperative Intelligent Transport System	5 855-5 925 MHz	10 mW / MHz (33 dBm (e.i.r.p.))	The maximum BW is 10 MHz Base station is subject to individual license.

(*) Intentional radiation is prohibited in the frequency bands specified in RR Nos. **5.82**, **5.108**, **5.109**, **5.110**, **5.149**, **5.180**, **5.199**, **5.200**, **5.223**, **5.226**, **5.328**, **5.337**, **5.340**, **5.375**, **5.392**, **5.441**, **5.444A**, **5.448B**, **5.497** and Nos. K16, K47, K63 and K116 of Table of Korean Frequency Allocation to protect safety services and passive services.

2.2 Measurement instruments

This category includes standard electric field generator, signal generator, etc.

2.3 Receiver

Receivers used for the sake of safety in maritime and aeronautical navigation or for radio astronomy/space radiocommunication services, which shall be notified to the Korean Administration according to the Radio Wave Act, are excluded from this category.

2.4 Radio equipment used for relaying public radiocommunication service or broadcasting service to shaded area

TABLE 19

Applications	Frequency	Power limit	Remark
Radio equipment for relaying public radiocommunication service or broadcasting service to indoor shaded area	The frequency assigned to the corresponding service station (broadcasting, fixed or base station)	10 mW/MHz	Radio equipment in this category cannot be installed without the agreement of the communication service provider. The spectral and technical criteria shall be the same as those applied for the radio equipment for the specific service.
Radio repeater for extending granted services into tunnel or underground space, or for relaying satellite-broadcasting services	The frequency assigned to the corresponding service station	10 mV/m @ 10 m	Unidirectional only

Attachment 6
to Annex 2

(Federative Republic of Brazil)

Regulation on restricted radiation radiocommunications equipment[7] in Brazil

1 Introduction

The Regulation on Restricted Radiation Radiocommunications Equipment[8], approved by Resolution No. 680, establishes technical characteristics and operating conditions to consider a radio transmitter as restricted radiation radiocommunications equipment. The restricted radiation encompasses short-range devices and other equipment, in which its operation is allowed with an exemption of licenses, according to Art. 163, § 2, I, of Law No. 9472, of 16 July 1997.

2 Definitions

For purposes of the Regulation on Restricted Radiation Radiocommunications Equipment, the following definitions and concepts shall apply:

Fractional bandwidth refers to the ratio of the channel bandwidth to the centre frequency of the channel expressed by 2 ($f_H - f_L$) / ($f_H + f_L$), where f_H and f_L respectively indicate the upper and lower limit of the channel.

Periodic operation device refers to systems operated discontinuously with regular periods of transmission and silence.

Restricted radiation radiocommunications equipment refers to the generic term given equipment, apparatus, or devices that use radio frequencies for a variety of applications, in which the corresponding emissions produce an electromagnetic field which strength falls within the limits established in this Regulation and meet the technical requirements for certification.

Ultra wide frequency band refers to intentional emissions with fractional bandwidth greater than or equal to 20%, or with a bandwidth, measured between the points of 10 dB of the carrier peak, greater than or equal to 500 MHz, regardless the fractional bandwidth.

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[7] In Brazil, the short-range devices (SRDs) are referred to as the “restricted radiation radiocommunications equipment”.

[8] The regulations can be found in the Anatel home page: https://www.gov.br/anatel. To facilitate access to information:
Resolution 680/2017: https://informacoes.anatel.gov.br/legislacao/resolucoes/2017/936-resolucao-680
Resolution 715/2019: https://informacoes.anatel.gov.br/legislacao/resolucoes/2019/1350-resolucao-715.
Act 14 448/2017: https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2017/1139-ato-14448
Act 3 153/2020 (related to femtocell): https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2020/1431-ato-3153
Act 237/2022: https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2022/1629-ato-237
General information for certification: https://www.gov.br/anatel/pt-br/regulado/certificacao

Femtocell refers to an accessory to private or public networks of telecommunications services, self-configurable and managed by the service provider, and which operates as a fixed station for radiocommunication with user stations.

3 General conditions

Radiocommunication stations associated with the equipment defined by Regulation No. 680 of Anatel are exempt from licensing requirements for their deployment and operation. Such stations cannot claim protection from harmful interference from any other radiocommunication station and shall not cause interference to any primary or secondary service. The equipment that causes harmful interference to any primary or secondary service shall cease operations immediately until the cause of the interference has been removed.

Devices operating in accordance with the provisions established in the Regulation on Restricted Radiation Radiocommunications Equipment shall bear a certification issued or approved by Anatel, under the terms of the directives in force.

The equipment shall bear on itself, a prominently located label, or the user's manual supplied by the manufacturer, in a prominent place, information on implications of its operation, with the following statement: "This equipment cannot claim protection from harmful interference and shall not cause harmful interference to duly licensed systems".

All equipment in compliance with this regulation must be designed to ensure that only the antenna sold with the equipment should be used, except under specific conditions stated in the technical requirements for product certification.

4 Restricted frequency bands

The use of these devices is prohibited in the frequency bands listed in Table 20. In these frequency bands, only spurious emissions from devices operating in another band shall be allowed and the field strength of spurious emissions shall not exceed the general limits of Table 21.

TABLE 20

Restricted frequency bands*

(MHz)	(MHz)	(MHz)	(GHz)
0.090-0.110	13.36-13.41	399.9-410	10.6-11.7
0.495-0.505	16.42-16.423	608-614	12.2-12.7
2.1735-2.1905	16.69475-16.69525	960-1 215	13.25-13.4
4.125-4.128	16.80425-16.80475	1 300-1 427	14.47-14.5
4.17725-4.17775	21.87-21.924	1 435-1 646.5	15.35-16.2
4.20725-4.20775	23.2-23.35	1 660-1 710	20.2-21.26
6.215-6.218	25.5-25.67	2 200-2 300	22.01-23.12
6.26775-6.26825	37.5-38.25	2 483.5-2 500	23.6-24
6.31175-6.31225	73-74.6	2 690-2 900	31.2-31.8
8.291-8.294	74.8-75.2	3 260-3 267	36.43-36.5
8.362-8.366	108-138	4 200-4 400	38.6-46.7
8.37625-8.38675	149.9-150.05	4 800-5 150	46.9-57
8.41425-8.41475	156.52475-156.52525	5 350-5 460	71-76

TABLE 20 (*end*)

(MHz)	(MHz)	(MHz)	(GHz)
12.29-12.293	156.7-156.9	8 025-8 500	Above 81
12.51975-12.52025	242.95-243	9 000-9 200	
12.57675-12.57725	322-335.4	9 300-9 500	

* Exceptionally, these systems or devices are authorized to operate in the frequency bands of this table with the following limitations: Medical Applied Systems, in the 401-405.9 MHz band, provided the equivalent isotropically radiated power is limited to 25 microwatts in a reference bandwidth of 300 kHz; Swept frequency field disturbance sensors at 1 705-37 000 kHz provided their emissions only sweep through the bands listed in this Table (21), the sweep is never stopped within the bands listed in this Table (21), and the fundamental emission is outside of the bands listed in this Table (21) for more than 98% of the time the system is actively transmitting; any devices, in bands above 78 GHz, provided it meets the technical requirement for certification; transmitters, in ultra wide frequency band; cable location equipment operating at 90-110 kHz, provided it meets the technical requirement for certification.

5 General emission limits

The emissions of the equipment shall not be greater than the field-strength levels specified in Table 21.

TABLE 21

General emission limits

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009-0.490	2 400/*f* (kHz)	300
0.490-1.705	24 000/*f* (kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

The electric field strength of any spurious or harmonic emissions shall not exceed the level of the fundamental emission. At the radiofrequency band limits of the Table 22, the most restrictive electric field strength level applies.

6 Specific conditions

Alternatively to the general emission limits of Table 21, Technical Requirements and Procedures for the Certification of Telecommunications Products shall stablish minimum specifications for radiocommunication equipment operating in specific frequency bands, as indicated in Table 22, to be classified as being of restricted radiation, and shall also establish the laboratory test procedures, whenever necessary. The technical requirements may also establish the alternative limits for out-of-band emissions, spurious emissions and frequency stability.

The telecommunications service provider is responsible for operation of a femtocell station. The installation of the femtocell may be carried out by the user, at the discretion of the service provider to which this femtocell is associated. The user of a femtocell has the right to receive guidance on its operation, limitations and service conditions; and to receive the necessary support for the installation, configuration, maintenance and replacement of the equipment made available to it. The user of a femtocell is responsible to keep the station in perfect operating conditions and within the technical specifications according to which it was certified.

TABLE 22

Frequency bands permitted, in accordance with technical and operating requirements approved by simplified orders

Frequency	Unit	Frequency	Unit
9-490	kHz	1 805-1 880	MHz
13.11-13.36	MHz	1 885-1 900	MHz
13.41-14.01	MHz	1 910-1 980	MHz
26.97-27.28	MHz	2 110-2 170	MHz
40.66-40.7	MHz	2 300-2 483.5	MHz
43.7-47	MHz	2 500-2 690	MHz
48.7-50	MHz	2 900-3 260	MHz
50.79-50.99	MHz	3 267-4 200	MHz
53.05-53.85	MHz	4 400-4 800	MHz
54-73	MHz	5 150-5 350	MHz
74.6-74.8	MHz	5 460-8 025	MHz
75.2-108	MHz	8 500-9 000	MHz
138-149.9	MHz	9 200-9 300	MHz
150.05-156.52475	MHz	9 500-10 600	MHz
156.52525-156.7	MHz	18.82-18.87	GHz
156.9-242.95	MHz	19.16-19.26	GHz
243-322	MHz	22-22.01	GHz
335.4-399.9	MHz	23.12-23.6	GHz
410-608	MHz	24-29	GHz
614-940	MHz	46.7-46.9	GHz
944-960	MHz	57-71	GHz
1 710-1 785	MHz	76-81	GHz

7 Technical requirements and procedures for the certification of telecommunications products

In addition to the conditions established in the Regulation on Restricted Radiation Radio Communications Equipment, the Act 14448/2017 also stablishes over the conformity assessment procedures the following:

In the 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-806 MHz bands, the operation of the equipment shall only be permitted under the specific conditions established in Act 14448/2017 of Anatel.

The field strength of the device operating within bands 26.96-27.28 MHz and 49.82-49.90 MHz shall not exceed:

– 10 000 (μV/m)/m at a distance of 3 m from the emitter for carrier frequency emissions;

– 500 (μV/m)/m at a distance of 3 m from the emitter for emissions appearing outside the frequency band, including harmonic frequencies, in any frequency appearing more than 10 kHz from the carrier.

The mean field strength of the device operating within band 40.66-40.70 MHz shall not exceed 1 000 (μV/m)/m at a distance of 3 m from the emitter.

The mean field strength limits measured at a distance of 3 m from the equipment operating within bands 902-907.5 MHz, 915-928 MHz, 2 400-2 483.5 MHz, 5 725-5 875 MHz, and 24.00-24.25 GHz frequency shall not exceed the levels specified in Table 23. The peak field strength of any emission shall not exceed the specified mean level by more than 20 dB. All emissions appearing outside the specified frequency bands, except for harmonics, shall be attenuated, at a minimum, 50 dB below the fundamental or adhere to the general emission limits shown in Table 21, whichever value is lower.

TABLE 23

Field strength limits for equipment operating within bands 902-907.5 MHz, 915-928 MHz, 2 400-2 483.5 MHz, 5 725-5 875 MHz and 24.00-24.25 GHz

Fundamental frequency	Field strength of fundamental frequency (μV/m)	Field strength of harmonics (μV/m)
902-907.5 MHz	50	500
915-928 MHz	50	500
2 400-2 483.5 MHz	50	500
5 725-5 875 MHz	50	500
24.00-24.25 GHz	250	2 500

The use of the 433-435 MHz band is restricted to indoor area and may be done with irradiated power limited to 10 mW (e.i.r.p.), and emissions out of the specified bands being less than 250 nW (e.i.r.p.) for radio frequencies up to 1 000 MHz and 1μW (e.i.r.p.) for radio frequencies exceeding 1 000 MHz.

For devices where radio-frequency stability is not defined, the fundamental radio frequency shall be maintained within the range defined below in order to minimize the possibility of operation out of band.

$$(f_L + 0.1\,(f_H - f_L)) < f < (f_H - 0.1\,(f_H - f_L))$$

where:

f_L = radio-frequency value of the lower limit of the band

f_H = radio-frequency value of the upper limit of the band.

TABLE 24

Exception or exclusions from the general emission limits

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
0.009-0.045 MHz	Cable location equipment	10 W	Q
0.045-0.119 MHz	Cable location equipment	1 W	Q
0.119-0.135 MHz	Cable location equipment	1 W	Q
	RFID	2 400/*f*(kHz) µV/m at 300 m	A
0.135-0.490 MHz	Cable location equipment	1 W	Q
13.11-13.36 MHz	RFID	106 µV/m at 30 m	A
13.41-13.553 MHz	RFID	334 µV/m at 30 m	A
13.553-13.567 MHz	RFID	15 848 µV/m at 30 m	A
13.567-13.71 MHz	RFID	334 µV/m at 30 m	A
13.71-14.01 MHz	RFID	106 µV/m at 30 m	A
26.960-26.995 MHz	Any	10 000 µV/m at 3 m (carrier)	A
		500 µV/m at 3 m	A
26.995-27.255 MHz	Any	10 000 µV/m at 3 m (carrier)	A
		500 µV/m at 3 m	A
	Unidirectional Telecommand	4 W at transmitter output	Q
27.255-27.280 MHz	Any	10 000 µV/m at 3 m (carrier)	A
		500 µV/m at 3 m	A
40.66-40.70 MHz	Intermittent control signals	2 250 µV/m at 3 m	A
	Periodic transmissions	1 000 µV/m at 3 m	A
	Any	1 000 µV/m at 3 m	A
	Perimeter protection systems	500 µV/m at 3 m	A
43.7-47.0 MHz	Audio, Video or Monitoring Systems	10 000 µV/m at 3 m	A or Q
48.70-49.82 MHz	Audio, Video or Monitoring Systems	10 000 µV/m at 3 m	A or Q
49.82-49.90 MHz	Any	10 000 µV/m at 3 m (carrier)	A
		500 µV/m at 3 m	A
	Audio, Video or Monitoring Systems	10 000 µV/m at 3 m	A or Q
49.90-50.00 MHz	Audio, Video or Monitoring Systems	10 000 µV/m at 3 m	A or Q
50.80-50.98 MHz	Unidirectional Telecommand	1 W at transmitter output	Q
53.10-53.80 MHz	Unidirectional Telecommand	1 W at transmitter output	Q
54-70 MHz	Exclusively non-residential perimeter protection systems	100 µV/m at 3 m	Q
	Wireless microphone	50 mW at the antenna input connector	**A or Q**

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
70-72 MHz	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
	Exclusively non-residential perimeter protection systems	100 µV/m at 3 m	Q
	Wireless microphone	50 mW at the antenna input connector	**A or Q**
72-72.01 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
72.01-72.99 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
	Unidirectional Telecommand	0.75 W at transmitter output	Q
72.99-73 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
73-74.6 MHz	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
74.6-74.8 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
74.8-75.2 MHz	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
75.2-75.41 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
75.41-75.99 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
	Unidirectional Telecommand	0.75 W at transmitter output	Q
75.99-76 MHz	Audio, Video or Monitoring Systems	80 mV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
	Periodic transmissions	500 µV/m at 3 m	A
76-88 MHz	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
	Exclusively non-residential perimeter protection systems	100 µV/m at 3 m	Q
	Wireless microphone	50 mW at the antenna input connector	A or Q
88-108 MHz	Audio, Video or Monitoring Systems	250 µV/m at 3 m	A or Q
	Intermittent control signals	1 250 µV/m at 3 m	A
	Periodic transmissions	500 µV/m at 3 m	A
138-149.9 MHz	Intermittent control signals	(f(MHz) − 108) × 625/11 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 108) × 250/11 µV/m at 3 m	A
150.05-156.524 75 MHz	Intermittent control signals	(f(MHz) − 108) × 625/11 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 108) × 250/11 µV/m at 3 m	A
156.52525-156.7 MHz	Intermittent control signals	(f(MHz) − 108) × 625/11 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 108) × 250/11 µV/m at 3 m	A
156.9-174 MHz	Intermittent control signals	(f(MHz) − 108) × 625/11 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 108) × 250/11 µV/m at 3 m	A
174-216 MHz	Intermittent control signals	3 750 µV/m at 3 m	A
	Periodic transmissions	1 500 µV/m at 3 m	A
	Wireless microphone	50 mW at the antenna input connector	A or Q
	Biomedical Telemetry	1 500 µV/m at 3 m	**A or Q**
216-225 MHz	Intermittent control signals	3 750 µV/m at 3 m	A
	Periodic transmissions	1 500 µV/m at 3 m	A
225-242.95 MHz	Audio, Video or Monitoring Systems (indoor only)	580 mV/m at 3 m	A or Q
	Intermittent control signals	3 750 µV/m at 3 m	A
	Periodic transmissions	1 500 µV/m at 3 m	A

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
243-260 MHz	Audio, Video or Monitoring Systems (indoor only)	580 mV/m at 3 m	A or Q
	Intermittent control signals	3 750 µV/m at 3 m	A
	Periodic transmissions	1 500 µV/m at 3 m	A
260-270 MHz	Audio, Video or Monitoring Systems (indoor only)	580 mV/m at 3 m	A or Q
	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
270-322 MHz	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
335.4-399.9 MHz	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
401-405.9 MHz	Medical Applied Systems	25 µW (e.i.r.p.) per 300 kHz bandwidth	Q
	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
410-433 MHz	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
433-433.5 MHz	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
	Any	10 mW (e.i.r.p.)	**Q**
433.5-434.5 MHz	Intermittent control signals	(f(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(f(MHz) − 170) × 50/3 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
	Any	10 mW (e.i.r.p.)	**Q**

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
434.5-435 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
	Any	10 mW (e.i.r.p.)	**Q**
435-462.53 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
462.53-462.74 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
	General usage radio equipment	500 mW (e.r.p.)	**A or Q**
462.74-467.53 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
467.53-467.74 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
	General usage radio equipment	500 mW (e.r.p.)	**A or Q**
467.74-470 MHz	Intermittent control signals	(*f*(MHz) − 170) × 125/3 µV/m at 3 m	A
	Periodic transmissions	(*f*(MHz) − 170) × 50/3 µV/m at 3 m	A
470-512 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Wireless microphone	250 mW at the antenna input connector	**A or Q**
512-566 MHz	Biomedical Telemetry devices for hospitals	1 500 µV/m at 3 m	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Wireless microphone	250 mW at the antenna input connector	**A or Q**

TABLE 24 (*continued*)

Frequency band	**Type of use**	**Emission limit**	**Detector A: Average Q: Quasi-peak**
566-608 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Wireless microphone	250 mW at the antenna input connector	**A or Q**
614-698 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Wireless microphone	250 mW at the antenna input connector	**A or Q**
698-860 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
860-864 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
864-868 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
	Audio, Video or Monitoring Systems	250 mW at the transmitter output	**A or Q**
868-869 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
869-890 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
890-894 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q
894-898.5 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
898.5-902 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q
902-907.5 MHz	Audio, Video or Monitoring Systems	50 000 0 µV/m at 3 m	A or Q
	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Field disturbance sensors	500 mV/m at 3 m	A
	Frequency hopping spread spectrum transmitters	At the transmitter output: 1 W for systems employing at least 35 jump channels; or 0.25 W for systems employing less than 35 jump channels	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q
907.5-915 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
915-928 MHz	Audio, Video or Monitoring Systems	50 000 0 µV/m at 3 m	A or Q
	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Field disturbance sensors	500 mV/m at 3 m	A
	Frequency hopping spread spectrum transmitters	At the transmitter output: 1 W for systems employing at least 35 jump channels; or 0.25 W for systems employing less than 35 jump channels	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	70 359 µV/m at 3 m	A
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
928-940 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Signals used to measure the characteristics of a material	500 µV/m at 30 m	A or Q
944-948 MHz	Audio, Video or Monitoring Systems	250 mW at the transmitter output	**A or Q**
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
948-960 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
1 710-1 785 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
1 805-1 880 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
1 885-1 900 MHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
1.91-1.92 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Audio, Video or Monitoring Systems	250 mW at the transmitter output	**A or Q**
1.92-1.98 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
2.11-2.17 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
2.3-2.4 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
2.4-2.435 GHz	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Frequency hopping spread spectrum transmitters	At the transmitter output: 1 W for systems employing at least 75 jump channels; or 0.25 Watt for systems employing less than 75 jump channels	
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
2.435-2.465 GHz	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Frequency hopping spread spectrum transmitters	At the transmitter output: 1 W for systems employing at least 75 jump channels; or 0.25 Watt for systems employing less than 75 jump channels	Q
	Field disturbance sensors	500 mV/m at 3 m	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A
2.465-2.4835 GHz	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Frequency hopping spread spectrum transmitters	At the transmitter output: 1 W for systems employing at least 75 jump channels; or 0.125 mW for systems employing less than 75 jump channels	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A
2.5-2.69 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
2.9-3.1 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	RFID for vehicle identification	3 000 µV/m at 3 m	A or Q
	Periodic transmissions	5 000 µV/m at 3 m	A
3.1-3.26 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID for vehicle identification	3 000 µV/m at 3 m	A or Q
	UWB	Varies(1)	
3.267-3.3 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
3.3-3.7 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
3.7-4.2 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
4.4-4.8 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
5.15-5.25 GHz	Access point transceivers inside land transport vehicles	40 mW e.i.r.p.	A
	Access point transceivers inside trains	200 mW e.i.r.p.	A
	Indoor RLAN	4 W e.i.r.p.	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Licensed-Assisted Access	Varies(1)	
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
5.25-5.35 GHz	Access point transceivers inside land transport vehicles	40 mW e.i.r.p.	A
	Access point transceivers inside trains	200 mW e.i.r.p.	A
	Licensed-Assisted Access	Varies(1)	
	Indoor RLAN	1 W e.i.r.p.	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
5.46-5.47 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
5.47-5.725 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Licensed-Assisted Access	Varies(1)	
	Periodic transmissions	5 000 µV/m at 3 m	A
	RLAN	1 W e.i.r.p.	A
	UWB	Varies(1)	

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
5.725-5.785 GHz	Direct sequence spread spectrum transmitters and other digital modulation techniques	1 W at the transmitter output	A or Q
	Frequency hopping spread spectrum transmitters	1 W at the transmitter output	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A
	UWB	Varies(1)	
5.785-5.815 GHz	Field disturbance sensors	500 mV/m at 3 m	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A
	Spread spectrum transmitters	1 W at the transmitter output	Q
	UWB	Varies(1)	
5.815-5.850 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	RFID	50 000 µV/m at 3 m	A
	Spread spectrum transmitters	1 W at the transmitter output	Q
	UWB	Varies(1)	
5.850-5.925 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Intelligent Transport Systems	23 dBm e.i.r.p.	A or Q
		26 dBm e.i.r.p. (high power)	A or Q
	UWB	Varies(1)	
5.925-7.125 GHz	Indoor RLAN	30 dBm e.i.r.p. (access point)	A
		24 dBm e.i.r.p. (client)	A
		17 dBm e.i.r.p (very low power)	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	

TABLE 24 (*continued*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
7.125-8.025 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
8.5-9 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
9.2-9.3 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
9.5-10.5 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
10.5-10.55 GHz	Field disturbance sensors	2 500 mV/m at 3 m	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
10.55-10.6 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
18.82-18.87 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
19.16-19.26 GHz	Any P-MP radio system	100 mW at the transmitter output	Q
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
19.26-20.2 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
22-22.01 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	
23.12-23.6 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies(1)	

TABLE 24 (*end*)

Frequency band	Type of use	Emission limit	Detector A: Average Q: Quasi-peak
24-24.075 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies[1]	
24.075-24.175 GHz	Field disturbance sensors	2 500 mV/m at 3 m	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies[1]	
24.175-29 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	UWB	Varies[2]	
46.7-46.9 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Vehicle-mounted field disturbance sensors	Varies[1]	
57-64 GHz	Any	9 µW/cm² at 3 m	A
		18 µW/cm² at 3 m	Q
	Field disturbance sensors	9 nW/cm² at 3 m and 0.1 mW at the transmitter output	Q
	Interactive motion sensor	10 dBm (e.i.r.p.) and −10 dBm at the transmitter output	
	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Multiple gigabit wireless	Varies[1]	
64-71 GHz	Intermittent control signals	12 500 µV/m at 3 m	A
	Periodic transmissions	5 000 µV/m at 3 m	A
	Multiple gigabit wireless	Varies[1]	
76-81 GHz	Body scanner sensor for security applications	31 405 µV/m at 3 m	A
	Intermittent control signals	12 500 µV/m at 3 m	A
	Level detection sensor	129.26 dBµV/m at 3 m and 34 dBm (outdoor)	Q
		43 dBm (e.i.r.p.) (indoor)	Q
	Periodic transmissions	5 000 µV/m at 3 m	A
	Vehicle-mounted field disturbance sensors	Varies[1]	

[1] Refer to Technical requirements for conformity assessment of restricted radiation radiocommunication Equipment's Act (https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2017/1139-ato-14448) .

8 Certification and authorization procedures

Regulation on Conformity Assessment and Approval of Telecommunications Products, approved by Anatel Resolution No. 715 of October 23, 2019, establishes the general principles and rules related to conformity assessment and approval of telecommunication products.

In order to simplify regulatory procedures and updates, all technical requirements related to Regulation on Restricted Radiation Radiocommunications Equipment are published in the Act 14 448/2017[9]. Likewise, Anatel published the Act 237/2022[10] related to test procedures for conformity assessment and approval of this sort of equipment.

8.1 Authorization validity and procedure

The conformity assessment process of a given product in relation to the regulations issued by Anatel or by it adopted constitutes the initial phase of process aimed to obtain the authorization of such product. The issuance of an authorization document is required for purposes of the commercialization and use, within the Country, of the products and technologies contained in the Reference List of Telecommunications Products, approved by Anatel Act No. 7280, of November 26, 2020[11].

This document lists all types of telecommunications products and technologies that must be approved by Anatel prior to their use or commercialization in Brazil, in addition to specifying the conformity assessment model applicable to each product or technology, and duration of validity of approval.

Among the products of mandatory approval by Anatel, there are terminal equipment intended for use by the general public for purposes of accessing collective interest telecommunication services; products that make use of the electromagnetic spectrum for the transmission of signals, which includes antennas and those products characterized in specific regulations as restricted radiation radiocommunication equipment; and other telecommunications products applied to networks that support telecommunications services.

The approval by Anatel aims to assure:

a) the interoperability of networks that support telecommunications services;

b) the reliability of networks that support telecommunications services; and

c) the safety of users and telecommunications services, evaluating electromagnetic compatibility, electrical safety, and safe levels of exposure to electromagnetic fields.

Regulation on Conformity Assessment and Approval of Telecommunications Products, approved by Anatel Resolution No. 715 of October 23, 2019 establishes SIX conformity assessment models for the approval of telecommunication products:

- a Declaration of Conformity;
- a Declaration of Conformity with an accompanying test report;
- a Certification of Conformity based on type-approval tests;
- a Certification of Conformity based on type-approval and periodic assessments of the product;
- a Certification of Conformity based on type-approval tests, periodic assessments of the product and with an accompanying quality system assessment; and
- Labelling.

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9 https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2017/1139-ato-14448

10 https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2022/1629-ato-237

11 https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2020/1493-ato-7280

The Declaration of Conformity is the conformity assessment model applicable under the conditions established by the operating procedure approved by Act No. 5205, of July 9, 2021[12] and to home-made products intended for individual use, which does not grant the right to authorize the commercialization of the product in the Country.

The Declaration of Conformity with accompanying test reports applies to products intended for commercialization or importation for use by the importer himself in the provision of telecommunications services under the conditions established by the operating procedure approved by Act No. 3939, of June 1, 2021[13].

The Certification of Conformity based on type-approval tests and periodic assessments of the product applies as specified in the Reference List of Telecommunications Products, approved by Anatel Act No. 7280, of November 26, 2020.

The Certification of Conformity based on type-approval tests, periodic assessments of the product and with an accompanying quality system assessment is the conformity assessment certification document applicable to equipment intended for use by the general public.

8.2 Authorization

The following parties are defined as interested or responsible parties and considered legitimate for purposes of requesting the authorization of particular products by Anatel:

- the product manufacturer;
- the supplier of the product in Brazil;
- the natural or juridical person that applies for the authorization of the telecommunications product for individual use.

If the interested party is a natural person, such person must have full legal capacity, whereas if such party is a juridical person, it must be legally constituted under Brazilian law. Foreign juridical persons interested in the authorization of products must have a commercial representative legally constituted in Brazil with the capacity to assume, within the territorial boundaries of the country, all responsibilities associated with such products' commercialization and the related customer service.

The application for product authorization must include the following documents:

- a certificate or declaration of conformity demonstrating the product's conformity;
- a user manual for the product, written in Portuguese;
- the interested party's legal information;
- proof that the interested party is legally established according to Brazilian law or that it has a commercial representative established in Brazil, in a manner that permits such party to assume responsibility for the product's quality and supply and any technical assistance related thereto within the national territory.

Anatel shall deny the authorization of products when: the request contravenes the principles established in art. 3 of the Regulation on Conformity Assessment and Approval of Telecommunications Products, approved by Anatel Resolution No. 715 of October 23, 2019; the product is used for illicit purposes, or contributes to the facilitation of a crime or criminal misdemeanour; the product may harm the provision of legally constituted telecommunications services; the certification of conformity is issued by an undesignated certification body; the certification of conformity is issued by a Designated Certification Body whose designation has been

[12] https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2021/1573-ato-5205 .

[13] https://informacoes.anatel.gov.br/legislacao/atos-de-certificacao-de-produtos/2021/1554-ato-3939

suspended or withdrawn; the certification or declaration of conformity is issued on the basis of regulations other than those applicable to the product and which are in force in the Country, in addition to others established in article 60 of the Regulation.

The product authorization subject to the certification of conformity may not be used by third parties when the product is produced in a manufacturing plant other than the one subject to evaluation, specifically in those cases involving a Certification of Conformity with an accompanying Quality System assessment; or the product is distributed in Brazil by a supplier other than the one that applied for the authorization and, in which case, this circumstance would have the effect of jeopardizing the duties of the Regulation.

Attachment 7
to Annex 2

UAE Regulations for the use of SRDs and low power equipment permitted usage

1.1 Usage of short-range devices is allowed on secondary basis: SRDs are used as fixed and mobile stations for telecommunication applications and as ISM devices for in industrial, scientific and medical (ISM) application. SRDs have applications in many fields and so generally categorized as non-specific which allows their use in diverse applications like keyless car entry, toy remotes, Bluetooth, etc.

1.2 SRDs require to be registered with the authority under the type approval regime and the use of short-range devices and ISM devices is allowed under class authorization whereby no radio-frequency authorization is required.

1.3 The use of low power wireless equipment requires radio-frequency authorization.

1.4 The wireless equipment can be identified as short-range devices, low power wireless equipment or otherwise based on the following criteria:

1.4.1 **Short-range device (SRD)**: if meet the technical condition in Table 25 of this Regulation.

1.4.2 **Low-power wireless equipment (LPWE)**: if meet the technical condition mentioned in Table 25 of this Regulation. Spectrum charges identified for LPWE shall apply.

1.4.3 Any wireless equipment which is not within the identified frequency range or radiated power exceeds the maximum radiated power criteria identified in this Regulation, will then be treated as any other fixed or mobile station. Spectrum charges identified for fixed or mobile services shall apply.

TABLE 25

Technical conditions for short-range devices

The following technical conditions shall apply on the use of SRD

Frequency range	Max radiated power or magnetic field strength	Application notes
9-315 kHz	30 dB(μA/m) at 10 m	Non-specific
9.0-59.75 kHz	72 dB(μA/m) at 10 m	Non-specific
59.750-60.250 kHz	42 dB(μA/m) at 10 m	Non-specific
60.250-70.000 kHz	69 dB(μA/m) at 10 m	Non-specific
70-119 kHz	42 dB(μA/m) at 10 m	Non-specific
119-135 kHz	66 dB(μA/m) at 10 m	Non-specific
135-140 kHz	42 dB(μA/m) at 10 m	Non-specific
140-148.5 kHz	37.7 dB(μA/m) at 10 m	Non-specific
148.5 kHz − 5 MHz	−15 dB (μA/m) at 10 m	Non-specific
400-600 kHz	−8 dB(μA/m) at 10 m	Non-specific
315-600 kHz	−5 dB(μA/m) at 10 m	Non-specific
3 155-3 195 kHz	13.5 dB(μA/m) at 10 m	Wireless hearing aids
3 195-3 400 kHz	13.5 dB(μA/m) at 10 m	Non-specific
5-30 MHz	−20 dB(μA/m) at 10 m	Non-specific

TABLE 25 (*end*)

Frequency range	Max radiated power or magnetic field strength	Application notes
6 765-6 795 kHz	42 dB(μA/m) at 10 m	Non-specific
7 400-8 800 kHz	9 dB(μA/m) at 10 m	Non-specific
10.2-11.0 MHz	9 dB(μA/m) at 10 m	Non-specific
11.1-20 MHz	−7 dB(μA/m) at 10 m	Non-specific
13.553-13.567 MHz	60 dB(μA/m) at 10 m	RFID and EAS only
26.957-27.283 MHz	42 dB(μA/m) at 10 m	Non-specific
29.7-47.0 MHz	10 mW	Non-specific
30-37.5 MHz	1 mW	Non-specific
40.66-40.7 MHz	10 mW	Non-specific
87.5-108 MHz	50 nW	Audio transmitter devices
169.4-174.0 MHz	10 mW	Non-specific
174.0-216.0 MHz	50 mW	Non-specific
312-315 MHz	50 mW	Keyless car entry
401-402 MHz 405-406 MHz	25 μW	For microphones
402-405 MHz	25 μW	For medical devices
433.050-434.790 MHz	50 mW	Non-specific
863.0-870.0 MHz	50 mW	Non-specific
870.0-875.4 MHz	10 mW	Non-specific
2 400-2 500 MHz	100 mW	Non-specific
5 725-5 875 MHz	50 mW	Non-specific
9 200-9 975 MHz	25 mW	Non-specific
13.4-14.0 GHz	25 mW	Non-specific
17.1-17.3 GHz 24.00-24.25 GHz 61.0-61.5 GHz 122-123 GHz 244-246 GHz	100 mW	Non-specific
4.5-7.0 GHz 8.5-10.6 GHz 24.05-27.0 GHz 57.0-64.0 GHz 75.0-85.0 GHz	24 dBm e.i.r.p. 30 dBm e.i.r.p. 43 dBm e.i.r.p. 43 dBm e.i.r.p. 43 dBm e.i.r.p.	For tank level probing radars only
76-77 GHz	55 dBm peak power 50 dBm average power 23.5 dBm average power	For pulsed radar only

TABLE 26

Technical conditions for low-power wireless equipment

The following technical conditions shall apply on the use of LPWE

Frequency range (MHz)	Max radiated power or magnetic field strength	Application notes
433.050-434.790	100 mW	Non-specific
470-790	10 mW/100 mW/1 W	Electronic field production
863.0-870.0	100 mW	Non-specific
2 400-2 500	100-200 mW	Non-specific
5 725-5 875	50-200 mW	Non-specific

NOTE 1 – The UAE does not allow any SRD in the frequency range of 880-960 MHz.

Attachment 8 to Annex 2

Technical parameters and spectrum use for SRDs in the Regional Commonwealth in the Field of Communications countries

Information submitted in tables reflects state of affairs about the use SRDs in the Regional Commonwealth in the Field of Communications countries.

TABLE 27

Technical parameters and spectrum use for SRDs in Armenia (Republic of)

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
6 765-6 795 kHz	In use
13.559-13.567 MHz	In use
26.957-27.283 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m. Maximum 10 mW e.r.p.
40.66-40.70 MHz	Maximum 10 mW e.r.p.
138.20-138.45 MHz	The band is unsuitable for SRDs usage.
433.05-434.79 MHz	The band 433.05-434.79 MHz can be used by low-power car alarm systems with 5 mW maximum transmitter power and by low-power data transmission systems with 10 mW maximum transmitter power. Use of 433.075-434.79 MHz frequency band by low-power radio stations, as well as by devices for processing and transmission of the bar-codes information is limited to 10 mW radiated power.
868-870 MHz	In use
2 400.0-2 483.5 MHz	In use
5 725-5 875 MHz	Maximum 25 mW e.r.p.
24.00-24.25 GHz	Maximum 10 mW e.r.p.

TABLE 27 (*continued*)

Frequency bands	Main technical parameters and notes
Railway applications	
4 510-4 520 kHz	In use
27.957-27.283 MHz	Limited to 27.095 MHz for the use of automatic identification devices at the railways.
863-868 MHz	In use
2 400-2 483.5 MHz	Limited to 2 400-2 420 MHz and 2 446-2 454 MHz for the use of automatic identification devices.
Road transport and traffic telematics	
5 725-5 875 MHz	Limited to 5 795-5 805 MHz and 5 805-5 815 MHz for telematics devices.
63-64 GHz	In use
76-77 GHz	In use
Model control	
26.957-27.283 MHz	In use
28.0-28.2 MHz	Maximum 1 W e.r.p. The band is used by SRDs for model control (in the air, over and under the water surface and so on).
30-37.5 MHz	The sub-band is limited to 34.995-35.225 MHz.
40.66-40.70 MHz	Maximum 1 W e.r.p. The band is used by SRDs for model control (in the air, over and under the water surface and so on).
Radio microphones	
66-74 MHz	Maximum transmitter power is 10 mW for radio microphones type “Karaoke”.
87.5-92 MHz	Maximum transmitter power is 10 mW for radio microphones type “Karaoke”.
100-108 MHz	Maximum transmitter power is 10 mW for radio microphones type “Karaoke”.
151-230 MHz	Concert microphones operating on the frequencies 165.70 MHz, 166.10 MHz, 166.50 MHz and 167.15 MHz. Maximum transmitter power is 20 mW. Some frequencies in the sub-bands 151-162.7 MHz, 163.2-168.5 MHz and 174-230 MHz can be used by other types of radio microphones. Maximum transmitter power is 5 mW.
174-216 MHz	The band is unsuitable for SRDs usage.
470-638 MHz	Some frequencies can be used by low-power concert radio microphones with 5 mW maximum transmitter power subject to not causing harmful interference into TV signal reception.
710-726 MHz	Some frequencies can be used by concert radio microphones with 5 mW maximum transmitter power subject to not causing harmful interference into TV signal reception.
1 795-1 800 MHz	In use
Radio-frequency identification (RFID) applications	
433.05-434.79 MHz	In use
863-868 MHz	In use
2 400-2 483.5 MHz	In use

TABLE 27 (*continued*)

Frequency bands	Main technical parameters and notes
Wireless audio applications	
87.5-92 MHz	In use
100-108 MHz	In use
863-868 MHz	Limited to sub-band 863-865 MHz.
1 795-1 800 MHz	In use
Inductive applications	
9-135 kHz	In use
6 765-6 795 kHz	In use
7 400-8 800 kHz	In use
Inductive applications	
13.559-13.567 MHz	In use
26.957-27.283 MHz	In use
Wireless applications in Healthcare	
315-600 kHz	In use
3 155-3 400 kHz	For low-power wireless hearing devices.
33.2-48.5 MHz	Hearing and speech training radio devices for hearing impaired persons on fixed frequencies. Maximum transmitter power is 10 mW.
57-57.5 MHz	Hearing and speech training radio devices for hearing impaired persons on fixed frequencies. Maximum transmitter power is 10 mW.
402-405 MHz	In use
Detection of avalanche victims applications	
315-600 kHz	SRDs can be used for detection of avalanche victims only. Centre frequency is 457 kHz.
Radiodetermination applications	
2 400-2 483.5 MHz	In use
9 200-9 975 MHz	In use
10.5-10.6 GHz	In use
13.4-14 GHz	In use
24.00-24.25 GHz	In use
Alarms	
26 945 kHz	The frequency can be used by security alarm systems. Maximum transmitter power is 2 W.
26 957-27 283 kHz	The frequency 26 960 kHz can be used by security alarm systems. Maximum transmitter power is 2 W.
149.95-150.06 MHz	In use
433.050-434.79 MHz	The band 433.05-434.79 MHz can be used by low-power car alarm systems with 5 mW maximum transmitter power. Restricted to 10 mW transmitter power for low power systems for processing and transmission information.
868-870 MHz	In use

TABLE 27 (*end*)

Frequency bands	Main technical parameters and notes
Radio local area networks	
2 400-2 483.5 MHz	Maximum transmitter power is 100 mW.
5 150-5 250 MHz	In use
17.1-17.3 GHz	The band is unsuitable for SRDs usage.
Monitoring devices	
457 kHz	The frequency is unsuitable for SRDs usage.

TABLE 28

Technical parameters and spectrum use for SRDs in Belarus (Republic of)

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
6 765-6 795 kHz	Maximum magnetic field strength is +42 dBμA/m at 10 m.
13.553-13.567 MHz	Maximum magnetic field strength is +42 dBμA/m at 10 m.
26.957-27.283 MHz	Maximum magnetic field strength is +42 dBμA/m at 10 m. Maximum 10 mW e.r.p.
38.7-39.23 MHz	Maximum 10 mW e.r.p. The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specification IEEE 802.11b/n (Wi-Fi).
40.660-40.700 MHz	Maximum 10 mW e.r.p.
138.20-138.45 MHz	Maximum 10 mW e.r.p. duty cycle less than 1.0%.
433.050-434.790 MHz	Maximum 10 mW e.r.p. duty cycle less than 10%. Maximum 1 mW e.r.p. duty cycle up to 100%. Power density is limited to –13 dBmV/10 kHz for wideband modulations with a bandwidth greater than 250 kHz.
434.040-434.790 MHz	Maximum 10 mW e.r.p., duty cycle to 100%, channel spacing to 25 kHz.
868.0-868.6 MHz	Maximum 25 mW e.r.p., duty cycle to 1%.
868.7-869.2 MHz	Maximum 25 mW e.r.p., duty cycle to 1%.
869.7-870.0 MHz	Maximum 5 mW e.r.p., duty cycle to 100%.
2 400.0-2 483.5 MHz	Maximum 10 mW e.i.r.p.
Wideband data transmission systems	
2 400.0-2 483.5 MHz	Maximum 100 mW e.i.r.p. Permitted to use SRDs (Bluetooth) for indoor and outdoor applications. The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specification IEEE 802.15 (Bluetooth).

TABLE 28 (*continued*)

Frequency bands	Main technical parameters and notes
2 400.0-2 483.5 MHz	Maximum 100 mW e.i.r.p. Permitted to use SRDs (Wi-Fi) for indoor applications. For wideband modulations, other than FHSS maximum e.i.r.p. density is limited to 10 mW/MHz. The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specification IEEE 802.11b/n (Wi-Fi).
2 400.0-2 483.5 MHz	Maximum 500 mW e.i.r.p. Permitted to use SRDs (Wi-Fi) for outdoor applications. Individual license is required.
5 150-5 350 MHz	Maximum 200 mW e.i.r.p. Restricted to indoor use. Maximum e.i.r.p. density is 10 mW/MHz.
5 470-5 725 MHz	Maximum 1W e.i.r.p. Restricted to outdoor use. Maximum e.i.r.p. density is 50 mW/MHz. Individual license is required.
5 650-5 725 MHz	Maximum 200 mW e.i.r.p. Maximum e.i.r.p. density is 50 mW/MHz.
Railway applications	
865 MHz, 867 MHz, 869 MHz	Maximum 2 W e.i.r.p., channel spacing to 200 kHz.
Road transport and traffic telematics	
5 797.5 MHz 5 802.5 MHz 5 807.5 MHz 5 812.5 MHz	Maximum 2 W e.i.r.p. Individual license is required.
76-77 GHz	Maximum 55 dBm e.i.r.p. (peak).
Radiodetermination applications	
10.5-10.6 GHz	Maximum 100 mW e.i.r.p.
24.05-24.25 GHz	Maximum 100 mW e.i.r.p.
Alarms	
26.945 MHz	Maximum transmitter power is 2 W. The frequency is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmitters and for distress signals transmission with 2 W transmitter power.
26.960 MHz	The frequency is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmitters and for distress signals transmission with 2 W transmitter power.
433.05-434.79 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmitters and for distress signals transmission with 5 W transmitter power.
868-868.2 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmitters and for distress signals transmission with 10 W transmitter power.

TABLE 28 (*end*)

Frequency bands	Main technical parameters and notes
Model control	
28.0-28.2 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with 1 W transmitter power.
40.66-40.70 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with 1 W transmitter power.
Radio microphones	
29.7-230 MHz	Some sub-bands in the range up to 230 MHz, except sub-bands 108-144 MHz, 148-151 MHz, 162.7-163.2 MHz, 168.5-174 MHz, is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for hearing and speech training radio devices for hearing impaired persons with output power no more than 10 mW.
66-74 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for radio microphones type “Karaoke” with maximum 10 mW transmitter power.
87.5-92 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for radio microphones type “Karaoke” with maximum 10 mW transmitter power.
774-782 MHz	Maximum 50 mW e.r.p.
Radio frequency identification (RFID) applications	
433.050-434.790 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 10 mW transmitter power.
865.7 MHz, 866.3 MHz, 866.9 MHz, 867.5 MHz	Maximum 2 W e.i.r.p., channel spacing to 200 kHz.
Monitoring applications	
457 kHz	Maximum magnetic field strength is +7 dB(μA/m) at 10 m. Duty cycle 0.1%. Continuous wave, no modulation. The frequency is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for detection and rescue of disaster victims.
Inductive applications	
9-59.750 kHz	Maximum magnetic field strength is +72 dB(μA/m) at 10 m.
59.750-60.250 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
60.250-70.000 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
70-119 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
119-135 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
135-140 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
140-148.5 kHz	Maximum magnetic field strength is +37.7 dB(μA/m) at 10 m.
6765-6795 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
13.553-13.567 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m. Maximum magnetic field strength is +60 dB(μA/m) at 10 m for RFID and EAS only.
26.957-27.283 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.

TABLE 29

Technical parameters and spectrum use for SRDs in Kazakhstan (Republic of)

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
38.7-39.23 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 1 W transmitter power.
40.660-40.700 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 10 mW transmitter power.
433.050-434.790 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with 10 mW transmitter power.
863.933-864.045 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 2 W transmitter power.
Wideband data transmission systems	
2 400.0-2 483.5 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specification IEEE 802.15 (Bluetooth) and according to IEEE.802.11, 802.11b, 802.11n (Wi-Fi) with maximum 100 mW transmitter power.
5 150-5 350 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specifications IEEE 802.11a, IEEE.802.11n with maximum 100 mW transmitter power.
5 650-5 725 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs according to specifications IEEE 802.11a, IEEE.802.11n with maximum 100 mW transmitter power.
Alarms	
26.945 MHz, 26.960 MHz	Frequencies are included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmission and for distress signals transmission with maximum 2 W transmitter power.
433.05-434.79 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmission and for distress signals transmission with maximum 5 mW transmitter power.
868-868.2 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for burglar alarm transmission and for distress signals transmission with maximum 2 W transmitter power.
Model control	
28.0-28.2 MHz	The band is included in the List Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 1 W transmitter power.
40.66-40.70 MHz	The band is included in the List Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 1 W transmitter power.

TABLE 29 (*end*)

Frequency bands	Main technical parameters and notes
Radio microphones	
29.7-230 MHz	Some sub-bands in the range up to 230 MHz, except sub-bands 108-144 MHz, 148-151 MHz, 162.7-163.2 MHz, 168.5-174 MHz, is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for hearing and speech training radio devices for hearing impaired persons with output power no more than 10 mW.
66-74 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for radio microphones type “Karaoke” with maximum 10 mW transmitter power.
87.5-92 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for radio microphones type “Karaoke” with maximum 10 mW transmitter power.
Radio frequency identification (RFID) applications	
13.553-13.567 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation).
433.050-434.790 MHz	The band is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for SRDs with maximum 10 mW transmitter power.
Monitoring applications	
457 kHz	The frequency is included in a List of Equipment of Custom Union (Belarus, Kazakhstan, Russian Federation) for detection and rescue of disaster victims.

TABLE 30

Technical parameters and spectrum use for SRDs in Kyrgyz Republic

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
433.050-434.790 MHz	The band is undesirable for SRDs usage.
863-870 MHz	The band is undesirable for SRDs usage.
Radiodetermination applications	
4.5-7.0 GHz	The band is undesirable for SRDs usage.
8.5-10.6 GHz	The band is undesirable for SRDs usage.
Alarms	
169.4750-169.4875 MHz	The band is undesirable for SRDs usage.
169.5875-169.6000 MHz	The band is undesirable for SRDs usage.
868.6-868.7 MHz	The band is undesirable for SRDs usage.
869.200-869.400 MHz	The band is undesirable for SRDs usage.
869.650-869.700 MHz	The band is undesirable for SRDs usage.
Model control	
34.995-35.225 MHz	The band is undesirable for SRDs usage.
Radio microphones	
3 155-3 400 kHz	Maximum transmitter power is 5 mW.
29.7-47.0 MHz	The band is undesirable for SRDs usage.
74.0-74.6 MHz	Maximum transmitter power is 5mW.
169.4-174.0 MHz	The band is undesirable for SRDs usage.
470-862 MHz	The band is undesirable for SRDs usage.
863-865 MHz	The band is undesirable for SRDs usage.
Radio frequency identification (RFID) applications	
865.0-868 MHz	The band is undesirable for SRDs usage.
Wireless applications in Healthcare	
9-315 kHz	The band is undesirable for SRDs usage.
315-600 kHz	The band is undesirable for SRDs usage.
30.0-37.5 MHz	The band is undesirable for SRDs usage.
401-406 MHz	Not be allowed the use of active medical implants because of possible harmful interference from the other stations.
Wireless audio applications	
863-865 MHz	The band is undesirable for SRDs usage.
Monitoring applications	
169.4-169.475 MHz	The band is undesirable for SRDs usage.
Inductive devices	
148.5 kHz – 5 MHz	The band is undesirable for SRDs usage.
400-600 kHz	The band is undesirable for SRDs usage.

TABLE 31

Technical parameters and spectrum use for SRDs in Moldova (Republic of)

Frequency bands	Main technical parameters and notes[(1)]
Non-specific short-range radiocommunication devices	
6 765-6 795 kHz	In use
13.553-13.567 MHz	In use
26.957-27.283 MHz	In use
40.660-40.700 MHz	In use
138.20-138.45 MHz	In use
433.050-434.790 MHz	In use
864-865 MHz	In use
2 400.0-2 483.5 MHz	In use
5 725-5 875 MHz	In use
24.00–24.25 GHz	In use
61.0-61.5 GHz	In use
122-123 GHz	In use
244-246 GHz	In use
Wideband data transmission systems	
2 400.0-2 483.5 MHz	In use
5 150-5 250 MHz	In use
5 250-5 350 MHz	In use
5 470-5 725 MHz	In use
17.1-17.3 GHz	In use
Railway applications	
4 234 kHz	In use
4 516 kHz	In use
11.1-16.0 MHz	In use
27.095 MHz	In use
2 446-2 454 MHz	In use
5 795-5 815 MHz	In use
63-64 GHz	In use
76-77 GHz	In use
Radiodetermination applications	
2 400.0-2 483.5 MHz	In use
4.5-7.0 GHz	In use
8.5-10.6 GHz	In use
9.2-9.5 GHz	In use
9.5-9.975 GHz	In use
10.5-10.6 GHz	In use
13.4-14.0 GHz	In use

TABLE 31 (*continued*)

Frequency bands	Main technical parameters and notes[1]
17.1-17.3 GHz	In use
24.05-27.0 GHz	In use
57-64 GHz	In use
75-85 GHz	In use
Alarms	
169.4750-169.4875 MHz	In use
169.5875-169.6000 MHz	In use
868.6-868.7 MHz	In use
869.200-869.400 MHz	In use
869.650-869.700 MHz	In use
Model control	
26.995 MHz, 27.045 MHz, 27.095 MHz, 27.145 MHz, 27.195 MHz	In use
34.995-35.225 MHz	In use
40.665 MHz, 40.675 MHz, 40.685 MHz, 40.695 MHz	In use
Radio microphones	
29.7-47.0 MHz	In use
169.4-174.0 MHz	In use
173.965-174.015 MHz	In use
174-216 MHz	In use
470-862 MHz	In use
863-865 MHz	In use
1 785-1 800 MHz	In use
Wireless applications in Healthcare	
9-315 kHz	In use
315-600 kHz	In use
12.5-20.5 MHz	In use
30.0-37.5 MHz	In use
401-406 MHz	In use

TABLE 31 (*end*)

Frequency bands	Main technical parameters and notes[(1)]
Radio-frequency identification (RFID) applications	
865.0-868 MHz	In use
2 446-2 454 MHz	In use
Wireless audio applications	
87.5-108.0 MHz	In use
863-865 MHz	In use
1 795-1 800 MHz	In use
Monitoring applications	
457 kHz	In use
169.4-169.475 MHz	In use
Inductive applications	
9-148.5 kHz	In use
148.5 kHz-5 MHz	In use
400-600 kHz	In use
3 155-3 400 kHz	In use
6 765-6 795 kHz	In use
7 400-8 800 kHz	In use
10.200-11.000 MHz	In use
13.553-13.567 MHz	In use
26.957-27.283 MHz	In use

(1) Main technical parameters SRDs in the Table are satisfied with requirements of ERC REC70-03.

TABLE 32

Technical parameters and spectrum use for SRDs in the Russian Federation

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
26.957-27.283 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m. Maximum transmitter power is 10 mW. Maximum antenna gain is 3 dB.
40.660-40.700 MHz	Maximum transmitter power is 10 mW. Maximum antenna gain is 3 dB.
433.075-434.790 MHz	Maximum transmitter power is 10 mW. Possible use of low power stations.
864-865 MHz	Maximum 25 mW e.r.p., duty cycle 0.1% or LBT. Forbidden to use at the airports (aerodromes).
868.700-869.200 MHz	Maximum 25 mW e.r.p.
5 725-5 875 MHz	Maximum 25 mW e.r.p., duty cycle 0.1% or LBT. Antenna height should not exceed 5 m.

TABLE 32 (*continued*)

Frequency bands	Main technical parameters and notes
Detection of avalanche victims	
456.9-457.1 kHz	Maximum magnetic field strength is +7 dB(μA/m) at 10 m. Duty cycle is 100%. Continuous wave, no modulation. Centre frequency is 457 kHz.
Wideband data transmission systems	
2 400.0-2 483.5 MHz	1. SRDs with FHSS modulation. 1.1 Maximum 2.5 mW e.i.r.p. 1.2 Maximum 100 mW e.i.r.p. Permitted to use SRDs for outdoor applications without restrictions on installation height only for purposes of gathering telemetry information for automated monitoring and resources accounting systems. Permitted to use SRDs for other purposes for outdoor applications only when the installation height is not exceeding 10 m above the ground surface. 2. SRDs with DSSS and other modulations. 2.1 Maximum mean e.i.r.p. density is 2 mW/MHz. Maximum 100 mW e.i.r.p. 2.2 Maximum mean e.i.r.p. density is 20 mW/MHz. Maximum 100 mW e.i.r.p. Permitted to use SRDs for outdoor applications only for purposes of gathering telemetry information for automated monitoring and resources accounting systems or security systems.
2 400.0-2 483.5 MHz	1. SRDs with FHSS modulation. Maximum 100 mW e.i.r.p. Indoor applications. 2. SRDs with DSSS and other modulations. Maximum mean e.i.r.p. density is 10 mW/MHz. Maximum 100 mW e.i.r.p. Indoor applications.
5 150-5 250 MHz	SRDs using DSSS and other modulations. 1. Maximum mean e.i.r.p. density is 5 mW/MHz. Maximum 200 mW e.i.r.p. Indoor applications. 2. Maximum 100 mW e.i.r.p. Permitted to use on board aircraft.
5 250-5 350 MHz	Maximum 100 mW e.i.r.p. 1. Permitted to use for local networks of aircraft crew service communications on board aircraft in area of the airport and at all stages of flight. 2. Permitted to use for public wireless access local networks on board aircraft during a flight at the altitude not less than 3 000 m.
5 650-5 825 MHz	Maximum 100 mW e.i.r.p. Permitted to use on board aircraft during a flight at the altitude not less than 3 000 m.
Road transport and traffic telematics (RTTT)	
5 795-5 815 MHz	200 mW e.r.p. An authorization for using radio frequencies or channels should be obtained in established order.
Radiodetermination applications	
24.05-24.25 GHz	Vehicle radars. Maximum 100 mW e.i.r.p. No restrictions if emission bandwidth is not less than 9 MHz. If emission bandwidth is less than 9 MHz then the requirement should be 0.14 μs/60 kHz maximum dwell time every 3 ms.

TABLE 32 (*continued*)

Frequency bands	Main technical parameters and notes
Radiodetermination applications	
24.05-24.25 GHz	Fixed radars. Maximum 100 mW e.i.r.p. 1. The equipment for detecting movement should be installed along roads at 4 m distance from controlled part of road. 2. The installation of equipment for detecting movement should be performed perpendicularly to movement direction of one- or multilane road with permissible deviation ±15 degrees. 3. The installation height of equipment for detecting movement should not exceed 5 m above a road. 4. The tilt angle of the main beam to horizon should be minus 20° or less.
Vehicle short range radars	
22-26.65 GHz	Spectral mean e.i.r.p. density shall be: a) $-61.3 + 20 \times (f - 21.65)/1$ GHz (dBm/MHz) for $22.0 < f < 22.65$ GHz; b) –41.3 dBm/MHz for $22.65 < f < 25.65$ GHz; c) $-41.3 - 20 \times (f - 25.65)/1$ GHz (dBm/MHz) for $25.65 < f < 26.65$ GHz; where: f: operating frequency (GHz). SRDs should be automatically switched off in the 35 km range from the following towns: Dmitrov (56°26'00" N, 37°27'00" E), Pushchino (54°49'00" N, 37°40'00" E), Kalyazin (57°13'22" N, 37°54'01" E), Zelenchukskaya (43°49'53" N, 41°35'32" E).
Alarms	
26.939-26.951 MHz	Permitted to use by car alarm systems operating on frequency 26.945 MHz. Maximum transmitter power is 2 W. Duty cycle < 10%. Maximum antenna gain is 3 dB.
26.954-26.966 MHz	Permitted to use by premises security alarm systems operating on frequency 26.960 MHz. Maximum transmitter power is 2 W. Duty cycle < 10%. Maximum antenna gain is 3 dB.
149.95-150.0625 MHz	Permitted to use by alarm systems for security of remote objects. Maximum transmitter power is 25 mW. Duty cycle < 10%. Maximum antenna gain is 3 dB.
433.05-434.79 MHz	Maximum transmitter power is 5 mW. Duty cycle < 10%. Maximum antenna gain is 3 dB.
868-868.2 MHz	Maximum transmitter power is 10 mW. Duty cycle < 10%. Maximum antenna gain is 3 dB.
Model control	
26.957-27.283 MHz	Maximum transmitter power is 10 mW. Channel spacing is 50 kHz. Maximum antenna gain is 3 dB. Operating frequencies 26.995 MHz, 27.045 MHz, 27.095 MHz, 27.145 MHz, 27.195 MHz.
28.0-28.2 MHz	Maximum transmitter power is 1 W. Maximum antenna gain is 3 dB.
40.66-40.7 MHz	Maximum transmitter power is 1 W. Maximum antenna gain is 3 dB. Channel spacing is 10 kHz.

TABLE 32 (*continued*)

Frequency bands	Main technical parameters and notes
Inductive applications	
9-59.75 kHz	Maximum magnetic field strength is +72 dB(μA/m) at 10 m. In case of external antennas only loop coil antennas may be employed. Field strength level descending 3 dB/oct at 30 kHz.
59.75-60.25 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m. In case of external antennas only loop coil antennas may be employed.
60.25-70 kHz	Maximum magnetic field strength is +69 dB(μA/m) at 10 m. In case of external antennas only loop coil antennas may be employed. Field strength level descending 3 dB/oct at 30 kHz.
70-119 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m. In case of external antennas only loop coil antennas may be employed.
119-135 kHz	Maximum magnetic field strength is +66 dB(μA/m) at 10 m. In case of external antennas only loop coil antennas may be employed. Field strength level descending 3 dB/oct at 30 kHz.
6 765-6 795 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
7 400-8 800 kHz	Maximum magnetic field strength is +9 dB(μA/m) at 10 m.
10.200-11.000 MHz	Maximum magnetic field strength is –4 dB(μA/m) at 10 m.
13.553-13.567 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
26.957-27.283 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
Radio microphones and assistive listening devices	
33.175-40 MHz, 40.025-48.5 MHz, 57-57.575 MHz	Hearing and speech training radio devices for hearing impaired persons on fixed frequencies. Maximum transmitter power is 10 mW. Maximum antenna gain is 3 dB.
66-74 MHz, 87.5-92 MHz, 100-108 MHz	Maximum transmitter power is 10 mW. Maximum antenna gain is 3 dB.
151-162 MHz, 163.2-168.5 MHz	Maximum transmitter power is 5 mW. Maximum antenna gain is 3 dB.
Radio microphones and assistive listening devices	
165.55-167.3 MHz	Concert radio microphones operating on the frequencies 165.7 MHz, 166.1 MHz, 166.5 MHz, 167.15 MHz. Maximum transmitter power is 20 mW. Maximum antenna gain is 3 dB.
174-230 MHz, 470-638 MHz, 710-726 MHz	Concert radio microphones. Maximum transmitter power is 5 mW. Maximum antenna gain is 3 dB. Channel spacing is 200 kHz.
863-865 MHz	Maximum 10 mW e.i.r.p.
Radio frequency identification (RFID) applications	
13.553-13.567 MHz	Maximum magnetic field strength is +60 dB(μA/m) at 10 m.
433.050-434.790 MHz	Maximum transmitter power is 10 mW.
866.0-867.6 MHz	Maximum 2 W e.r.p. Channel spacing is 200 kHz. The assignment of radio frequencies or channels should be performed in established order.

TABLE 32 (*end*)

Frequency bands	Main technical parameters and notes
Radio frequency identification (RFID) applications	
866-868 MHz	Maximum 500 mW e.r.p. Channel spacing is 200 kHz. The assignment of radio frequencies or channels should be performed in established order.
866.6-867.4 MHz	Maximum 100 mW e.r.p. Channel spacing is 200 kHz. The assignment of radio frequencies or channels is not required in when: a) LBT is applied; b) equipment is used at the airport.
Wireless audio applications	
87.5-108.0 MHz	Maximum –43 dBmW (50 nW) e.i.r.p. No spacing. Permitted to use inside cars and other vehicles, and also inside of the closed premises.
863-865 MHz	Maximum 10 mW e.r.p. Duty cycle 100%.

TABLE 33

Technical parameters and spectrum use for SRDs in Tajikistan (Republic of)

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
26.957-27.283 MHz	In use
Radio local area networks	
2 400.0-2 483.5 MHz	In use
5 470-5 725 MHz	In use
Model control	
26.995 MHz, 27.045 MHz, 27.095 MHz, 27.145 MHz, 27.195 MHz	In use
Radio microphones	
66-74 MHz	In use
87.5-92 MHz	In use
100-108 MHz	In use
169.4-174.0 MHz	The band is unsuitable for SRDs usage
173.965-174.015 MHz	The band is unsuitable for SRDs usage
470-862 MHz	In use
Ultra low power active medical implant	
401-406 MHz	The band is prospective for usage
Monitoring applications	
169.4-169.475 MHz	The band is unsuitable for SRDs usage

TABLE 34

Technical parameters and spectrum use for SRDs in Ukraine

Frequency bands	Main technical parameters and notes
Non-specific short-range devices	
6 765-6 795 kHz	Limited to the sub-band 6 767-6 794 kHz. Maximum magnetic field strength is +42 dB(μA/m) at 10 m
13.553-13.567 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m
40.660-40.700 MHz	Maximum transmitter power is 10 mW
138.20-138.45 MHz	The band is not used for SRDs in Ukraine
433.050-434.790 MHz	Maximum transmitter power is 10 mW. Usage of devices with maximum transmitter power more than 10 mW is carried out on licensing basis
868-868.6 MHz	Maximum transmitter power is 25 mW
2 400.0-2 483.5 MHz	Is considered to use for this category SRDs
Tracking, tracing and data acquisition	
457 kHz	Maximum magnetic field strength is +7 dB(μA/m) at 10 m.
Wideband data transmission systems	
2 400.0-2 483.5 MHz	Maximum 100 mW e.i.r.p. (for DSSS) when integrated antennas is used. For FHSS maximum 500 mW e.i.r.p. when integrated antennas is used. Facilities Std. IEEE 802.11n to be used only indoors. Total e.i.r.p. of all base stations Std IEEE 802.11n installed in the same room is no more than 100 mW.
5 150-5 250 MHz	Maximum 200 mW e.i.r.p. when integrated antennas is used. Maximum e.i.r.p. density is 10 mW/MHz. Should be used transmitter power control (TPC) and dynamic frequency selection (DFS) techniques. Facilities Std. IEEE 802.11n to be used only indoors. Total e.i.r.p. of all base stations Std IEEE 802.11n installed in the same room is no more than 100 mW. Formula for constitution channel spacing for bandwidth 40 MHz (IEEE Std 802.11n-2009) is Fn = 5 000 МГц + N*5 МГц, where N = 38, 46, 56, 64.
5 250-5 350 MHz	Maximum 200 mW e.i.r.p. when integrated antennas is used. maximum mean e.i.r.p. density is 10 mW/MHz in any 1 MHz. Should be used Transmitter Power Control (TPC) and Dynamic Frequency Selection (DFS) techniques. Facilities Std. IEEE 802.11n to be used only indoors. Total e.i.r.p. of all base stations Std IEEE 802.11n installed in the same room is no more than 100 mW. Formula for constitution channel spacing for bandwidth 40 MHz (IEEE Std 802.11n-2009) is Fn = 5 000 МГц + N*5 МГц, where N = 38, 46, 56, 64.

TABLE 34 (*continued*)

Frequency bands	Main technical parameters and notes
Wideband data transmission systems	
5 470-5 725 MHz	For the frequency range 5 470-5 670 MHz only. Maximum 1 W e.i.r.p. Maximum mean e.i.r.p. density is 50 mW/MHz in any 1 MHz when integrated antenna is used. Facilities Std. IEEE 802.11n to be used only indoors. Total e.i.r.p. of all base stations Std IEEE 802.11n installed in the same room is no more than 100 mW. Formula for constitution channel spacing for bandwidth 40 MHz (IEEE Std 802.11n-2009) is Fn = 5 000 МГц + N*5 МГц, where N = 98, 106, 114, 122, 130.
5 725-5 850 MHz	Maximum 2 W e.i.r.p. when integrated antennas is used. Facilities Std. IEEE 802.11n to be used only indoors. Total e.i.r.p. of all base stations Std IEEE 802.11n installed in the same room is no more than 100 mW. Formula for constitution channel spacing for bandwidth 40 MHz (IEEE Std 802.11n-2009) is Fn = 5 000 МГц + N*5 МГц, where N = 156, 162.
17.1-17.3 GHz	The band is not used for SRDs in Ukraine.
Railway applications	
865 MHz, 867 MHz, 869 MHz	Maximum transmitter power is 2 W.
Road transport and traffic telematics (RTTT)	
5 795-5 805 MHz	Is considered to use for this category SRDs.
5 805-5 815 MHz	Is considered to use for this category SRDs.
21.65-26.65 GHz	Only frequency 24,125 GHz. Maximum e.i.r.p. is no more than 20 dBm. Duty cycle limited to 10%.
76-77 GHz	Maximum mean e.i.r.p. is 23.5 dBm.
Radiodetermination applications	
2 400.0-2 483.5 MHz	Is considered to use for this category SRDs.
10.5-10.6 GHz	Limited to the sub-band 10.51-10.54 GHz. In use.
17.1-17.3 GHz	The band is not used for SRDs in Ukraine.
24.05-24.25 GHz	Limited to the sub-band 24.0-24.25 GHz. Maximum 100 mW e.i.r.p. The band is used for Tank Level Probing Radars.
150 MHz, 250 MHz, 500 MHz,700 MHz, 900 MHz	The frequencies are used for operating of the Earth sensing radars.
35-37.5 GHz	Maximum 100 mW e.i.r.p. The band is used for Tank Level Probing Radars.
Alarms	
868-868.6 MHz	Maximum transmitter power is 10 mW.
869.2-869.25 MHz	Maximum transmitter power is 10 mW.
869.2-869.25 MHz	Maximum transmitter power is 10 mW.
169.4750-169.4875 MHz	The bands are not used for SRDs.
169.5875-169.6000 MHz	

TABLE 34 (*continued*)

Frequency bands	Main technical parameters and notes
Model Control	
26.995 MHz, 27.045 MHz, 27.095 MHz, 27.145 MHz, 27.195 MHz	Maximum transmitter power is 10 mW.
34.995-35.225 MHz	Maximum transmitter power is 10 mW.
40.665 MHz, 40.675 MHz, 40.685 MHz, 40.695 MHz	Maximum transmitter power is 10 mW.
Inductive applications	
9-148.5 kHz	Maximum magnetic field strength is +72 dB(μA/m) at 10 m, if operating sub-bands are limited to 9-59.75 kHz and 59.75-60.25 kHz. Maximum magnetic field strength is +42 dB(μA/m) at 10 m, if operating sub-bands are limited to 59.75-60.25 kHz, 135-140 kHz and 70-119 kHz. Maximum magnetic field strength is +69 dB(μA/m) at 10 m, if operating sub-band is limited to 60.250-70 kHz. Maximum magnetic field strength is +66 dB(μA/m) at 10 m, if operating sub-band is limited to 119-135 kHz. Maximum magnetic field strength is +37.7 dB(μA/m) at 10 m, if operating sub-band is limited to 140-148.5 kHz.
3 155-3 400 kHz	Maximum magnetic field strength is +9 dB(μA/m) at 10 m.
6 765-6 795 kHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
7 400-8 800 kHz	Maximum magnetic field strength is +9 dB(μA/m) at 10 m.
10.200-11.000 MHz	Maximum magnetic field strength is +13.5 dB(μA/m) at 10 m.
13.553-13.567 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
26.957-27.283 MHz	Maximum magnetic field strength is +42 dB(μA/m) at 10 m.
Radio microphones and assistive listening devices	
29.7-47.0 MHz	Limited to the sub-band 30.01-47 MHz. Maximum transmitter power is 10 mW.
863-865 MHz	Maximum transmitter power is 10 mW.
174-216 MHz	Permitted for usage subject to not causing harmful interference into the other systems operating in this band. Maximum transmitter power is 50 mW. Maximum transmitter power in the sub-bands 174.4-174.6 MHz and 174.9-175.1 MHz is 10 mW.
470-862 MHz	Permitted for usage subject to not causing harmful interference into the other systems operating in this band. Maximum transmitter power is 50 mW.
169.4000-169.4750 MHz	The bands are not used for SRDs.
169.4875-169.5875 MHz	
169.4-174.0 MHz	

TABLE 34 (*end*)

Frequency bands	Main technical parameters and notes
Active medical implants and their associated peripherals	
402-405 MHz	Maximum transmitter power is 25 μW.
9-315 kHz	Maximum magnetic field strength is +30 dB(μA/m) at 10 m.
315-600 kHz	Maximum magnetic field strength is –5 dB(μA/m) at 10 m.
30.0-37.5 MHz	Maximum transmitter power is 1 mW.
Wireless audio applications	
863-865 MHz	Maximum transmitter power is 10 mW.
87.5-108.0 MHz	Limited to sub-bands 87.5-92 MHz; 100-108 MHz. Maximum transmitter power is 10 mW.
433.05-434.79 MHz	Maximum transmitter power is 10 mW.

TABLE 35

Technical parameters and spectrum use for SRDs in Uzbekistan (Republic of)

Frequency bands	Main technical parameters and notes
Non-specific short-range radiocommunication devices	
30-41 MHz	Maximum transmitter power is 10 mW.
46-49 MHz	Maximum transmitter power is 10 mW.
433 MHz	Maximum transmitter power is 10 mW.
433.075-434.790 MHz	Maximum transmitter power is 10 mW.
1 880-1 900 MHz	Maximum transmitter power is 250 mW.
Radio local area networks	
2 400.0-2 483.5 MHz	Used for data transmission in accordance with specifications IEEE 802.15 (Bluetooth) and IEEE 802.11 (Wi-Fi). Maximum transmitter power is 100 mW.
Alarms	
26.945 MHz	Maximum transmitter power is 2 W.
26.960 MHz	Maximum transmitter power is 2 W.
149.950-150.0625 MHz	Maximum transmitter power is 25 mW.
169.4750-169.4875 MHz	The band is unsuitable for SRDs usage.
169.5875-169.6000 MHz	The band is unsuitable for SRDs usage.
433.075-434.79 MHz	Maximum transmitter power is 10 mW.
868-868.2 MHz	Maximum transmitter power is 10 mW.
Model control	
26.957-27.283 MHz	Maximum transmitter power is 10 mW.
28.0-28.2 MHz	Maximum transmitter power is 1 W.
40.66-40.70 MHz	Maximum transmitter power is 1 W.

TABLE 35 (*end*)

Frequency bands	Main technical parameters and notes
Radio microphones	
66-74 MHz	Maximum transmitter power is 10 mW.
87.5-92 MHz	Maximum transmitter power is 10 mW.
100-108 MHz	Maximum transmitter power is 10 mW.
165.70 MHz, 166.100 MHz, 166.500 MHz, 167.150 MHz	Maximum transmitter power is 20 mW.
169.4-174.0 MHz	The band is unsuitable for SRDs usage.
173.965-174.015 MHz	The band is unsuitable for SRDs usage.
470-862 MHz	Maximum transmitter power is 5 mW.
710-726 MHz	Maximum transmitter power is 5 mW.
Ultra low power active medical implants	
30.0-37.5 MHz	Maximum transmitter power is 10 mW.
57.5 MHz	Maximum transmitter power is 10 mW.
401-406 MHz	The band is unsuitable for SRDs usage.
Monitoring applications	
169.4-169.475 MHz	The band is unsuitable for SRDs usage.

Attachment 9
to Annex 2

Technical parameters and spectrum use for SRDs in some APT member countries/territories (Brunei Darussalam, China (Hong Kong), Malaysia, Philippines, New Zealand, Singapore and Viet Nam)

Technical regulations in Brunei Darussalam

Technical regulations for short-range radiocommunication devices						
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Applicable radio standards**	**Remarks(1)**
1	Induction loop system/ RFID	16-150 kHz	≤ 66 dB(μA/m) @ 3 m	≥ 32 dB below carrier at 3 m or EN 300 224-1	EN 300 224-1	
		150-5 000 kHz	≤ 13.5 dB(μA/m) @ 10 m			
		6 765-6 795 kHz	≤ 42 dB(μA/m) @ 10 m			
		7 400-8 800 kHz	≤ 9 dB(μA/m) @ 10 m			
		13.55-13.567 MHz	≤ 94 dB(μV/m) @ 10 m			
2	Radio detection, alarm system	0.016-0.150 MHz	≤ 100 dB(μV/m) @ 3 m	≥ 32 dB below carrier at 3 m or EN 300 330-1	FCC Part 15 or EN 300 330-1	
3		13.553-13.567 MHz	≤ 94 dB(μV/m) @ 10 m			
4		240.15-240.30 MHz 300.00-300.30 MHz 312.00-316.00 MHz 444.40-444.80 MHz	≤ 100 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	FCC Part 15 or EN 300 220-1	
5	Wireless microphone	0.51-1.60 MHz	≤ 57 dB(μV/m) @ 3 m			
6		88.00-108.00 MHz	≤ 60 dB(μV/m) @ 10 m			
7		470.00-742.00 MHz	≤ 10 mW (e.r.p.)			
8	Remote controls of garage door, cameras, toys and miscellaneous devices	26.96-27.28 MHz	≤ 100 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	FCC Part 15 or EN 300 220-1	
		40.665-40.695 MHz	≤ 100 mW (e.r.p.)			
		72.13-72.21 MHz				

Technical regulations for short-range radiocommunication devices						
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Applicable radio standards**	**Remarks(1)**
9	Remote controls of aircraft and glider models, telemetry, detection and alarm systems	26.96-27.28 MHz 29.70-30.00 MHz	≤ 100 mW (e.r.p.)			
10	Medical and biological telemetry	40.50-41.00 MHz	≤ 0.01 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	FCC Part 15 or EN 300 220-1	
		216.00-217.00 MHz	> 25 μW to ≤ 100 mW (e.r.p.)			
		454.00-454.50 MHz	≤ 2 mW (e.r.p.)			
11	Wireless modem, data communication system	72.080 MHz 72.200 MHz 72.400 MHz 72.600 MHz	≤ 100 mW (e.r.p.)	≥ 43 dB below carrier over 100 kHz to 2 000 MHz; EN 300 390-1 or EN 300 113-1	EN 300 390-1 or EN 300 113-1	
12	Short-range radar systems such as automatic cruise control and collision warning systems for vehicle	76-77 GHz	≤ 37 dBm (e.r.p.) when vehicle is in motion ≤ 23.5 dBm (e.r.p.) when vehicle is stationary	FCC Part 15 § 15.253 (c) or EN 301 091	FCC Part 15 or EN 301 091	
13	Radio telemetry, telecommand system	433.05-434.79 MHz	≤ 10 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	FCC Part 15 or EN 300 220-1	
14	Radio telemetry, telecommand, RFID system	866-869 MHz 923-925 MHz	≤ 500 mW (e.r.p.)	≥ 32 dB below carrier at 3 m; EN 300 220-1 or EN 302 208	FCC Part 15; EN 300 220-1 or EN 302 208	

Technical regulations for short-range radiocommunication devices						
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Applicable radio standards**	**Remarks(1)**
15	Radio frequency identification (RFID) systems	923-925 MHz	> 500 mW (e.r.p.) ≤ 2 000 mW (e.r.p.)	≥ 32 dB below carrier at 3 m; EN 300 220-1 or EN 302 208	FCC Part 15; EN 300 220-1 or EN 302 208	Only RFID systems operating in the 923-925 MHz frequency band shall be allowed to transmit between 500 mW and 2 000 mW (e.r.p.), and approved on an exceptional basis.
16	Wireless video transmitter and other SRD applications	2.4000-2.4835 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.209; § 15.249 (d) or EN 300 440-1	FCC Part 15 or EN 300 440-1	
17		10.50-10.55 GHz	≤ 117 dB(μV/m) @ 10m			
18		24.00-24.25 GHz	≤ 100 mW (e.i.r.p.)			Radar gun devices are not allowed to operate under this provision.
19	Bluetooth	2.4000-2.4835 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.209; or EN 300 328	FCC Part 15 § 15.247 or EN 300 328	
20	Wireless LAN only	2.4000-2.4835 GHz	≤ 200 mW (e.i.r.p.)			WLAN for non-localized operations shall be approved on an exceptional basis.

Technical regulations for short-range radiocommunication devices						
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Applicable radio standards**	**Remarks(1)**
21	SRD applications	5.725-5.850 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.209	FCC Part 15 § 15.247 or 15.407	
22	Wireless LAN	5.725-5.850 GHz	≤ 1 000 mW (e.i.r.p.)			Non-localized operations shall be approved on an exceptional basis.
23		5.725-5.850 GHz	> 1 000 mW (e.i.r.p.) ≤ 4 000 mW (e.i.r.p.)			Operating under this provision shall be approved on an exceptional basis.

Technical regulations for short-range radiocommunication devices						
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Applicable radio standards**	**Remarks(1)**
24	Wireless LAN	5.150-5.350 GHz	> 100 mW (e.i.r.p.) ≤ 200 mW (e.i.r.p.)	FCC Part 15 § 15.407 (b) or EN 301 893	FCC Part 15 § 15.407 or EN 301 893	WLAN operating in 5.250-5.350 GHz under this provision shall employ dynamic frequency selection (DFS) mechanism and implement transmit power control (TPC). Non-localized operations shall be approved on an exceptional basis.
25	Wireless LAN	5.150-5.350 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.407 (b) or EN 301 893	FCC Part 15 § 15.407 or EN 301 893	WLAN operating under this provision shall implement DFS function in the frequency range 5.250-5.350 GHz. Non-localized operations shall be approved on an exceptional basis.

(1) Administrations may indicate additional information on channel spacing, necessary bandwidth and interference mitigation requirement.

Technical Regulations in China (Hong Kong)

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(2)]**
1		3-195 kHz	Electric field strength not to exceed 40 dB(μV/m) and magnetic field strength not to exceed 48.4 dB(μA/m) at 100 m from the apparatus	
2	Cordless phone	1 627.5-1 796.5 kHz	Electric field strength not to exceed 88 dB(μV/m) at 30 m from the apparatus	
3	RFID	13.553-13.567 MHz	(a) electric field strength not to exceed 80 dB(μV/m) at 30 m from the apparatus; or (b) magnetic field strength not to exceed 42 dB(μA/m) at 10 m from the apparatus	
4		26.96-27.28 MHz	Mean power not to exceed 0.5 W	
5	Wireless microphone	33-33.28 MHz	e.r.p. not to exceed 10 mW	
6	Model control	35.145-35.225 MHz	e.r.p. not to exceed 100 mW	
7	Wireless microphone	36.26-36.54 MHz	e.r.p. not to exceed 10 mW	
8	Wireless microphone	36.41-36.69 MHz	e.r.p. not to exceed 10 mW	
9	Wireless microphone	36.71-36.99 MHz	e.r.p. not to exceed 10 mW	
10	Wireless microphone	36.96-37.24 MHz	e.r.p. not to exceed 10 mW	
11	Model control	40.66-40.70 MHz	e.r.p. not to exceed 100 mW	
12		42.75-43.03 MHz	e.r.p. not to exceed 10 mW	
13	Cordless phone	43.71-44.49 MHz	Electric field strength not to exceed 10 mV/m at 3 m from the apparatus	
14		44.73-45.01 MHz	e.r.p. not to exceed 10 mW	
15	Cordless phone	46.6-46.98 MHz	Electric field strength not to exceed 10 mV/m at 3 m from the apparatus	
16		47.13-47.41 MHz	e.r.p. not to exceed 10 mW	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(2)]**
17	Cordless phone	47.43-47.56 MHz	e.r.p. not to exceed 10 mW	
18	Cordless phone	48.75-50 MHz	Electric field strength not to exceed 10 mV/m at 3 m from the apparatus	
19	Model control	72.00-72.02 MHz	Carrier power not to exceed 750 mW	
20		72.12-72.14 MHz		
21		72.16-72.22 MHz		
22		72.26-72.28 MHz		
23	Wireless microphone	173.96-174.24 MHz	e.r.p. not to exceed 20 mW	
24	Wireless microphone	187.5-188.0 MHz	e.r.p. not to exceed 10 mW	
25	Cordless phone	253.85-255 MHz	e.r.p. not to exceed 12 mW	
26		266.75-267.25 MHz	e.r.p. not to exceed 10 mW	
27		313.75-314.25 MHz	e.r.p. not to exceed 10 mW	
28		314.75-315.25 MHz	e.r.p. not to exceed 10 mW	
29	Cordless phone	380.2-381.325 MHz	e.r.p. not to exceed 12 mW	
30	Medical implant	402-405 MHz	e.i.r.p. not to exceed 25 μW	
31	Portable radios	409.74-410 MHz	e.r.p. not to exceed 0.5 W	
32	RFID	433.92 MHz centred frequency and 500 kHz occupied bandwidth	e.r.p. not to exceed 2.2 mW	
33		819.1-823.1 MHz	(a) e.r.p. not to exceed 100 mW (b) power spectral density not to exceed 10 mW per 25 kHz	
34	Cordless phone	864.1-868.1 MHz	Carrier power or e.r.p. not to exceed 10 mW	
35	RFID	865-868 MHz	e.r.p. not to exceed 100 mW	
36	RFID	865.6-867.6 MHz	e.r.p. not to exceed 2 W	
37	RFID	865.6-868 MHz	e.r.p. not to exceed 500 mW	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(2)]**
38		919.5-920.0 MHz	e.r.p. not to exceed 10 mW	
39	RFID	920-925 MHz	e.i.r.p. not to exceed 4 W	
40	Cordless phone	1 880-1 900 MHz	(a) peak power not to exceed 250 mW for apparatus with antenna output terminal; or (b) peak e.i.r.p. not to exceed 250 mW for apparatus with integral antenna	
41	Cordless phone	1 895-1 906.1 MHz	(a) carrier power not to exceed 10 mW for apparatus with antenna output terminal; or (b) e.r.p. not to exceed 10 mW for apparatus with integral antenna	
42	WLAN, RFID	2 400-2 483.5 MHz	(a) peak e.i.r.p. not to exceed 4 W for frequency hopping spread spectrum modulation or digital modulation systems; or (b) aggregate e.r.p. not to exceed 100 mW for any modulation	
43	WLAN	5 150-5 350 MHz	e.i.r.p. not to exceed 200 mW using only digital modulation	
44	WLAN	5 470-5 725 MHz	e.i.r.p. not to exceed 1 W	
45	WLAN	5 725-5 850 MHz	(a) peak e.i.r.p. not to exceed 4 W for frequency hopping spread spectrum modulation or digital modulation systems; or (b) aggregate e.r.p. not to exceed 100 mW for any modulation	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(2)]**
46		18.82-18.87 GHz	(a) e.r.p. not to exceed 100 mW (b) power spectral density not to exceed 3 mW per 100 kHz	
47	Vehicle radar	76-77 GHz	Carrier power not to exceed 10 mW	

(2) Administrations may indicate additional information on channel spacing, necessary bandwidth, interference mitigation requirement, unwanted emission limit and applicable radio standards.

Technical regulations in Malaysia

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power (mW)**	**Remarks[(3)]**
1	Short-range communication device	6.7650 to 6.7950 MHz 13.5530 to 13.5670 MHz 26.9570 to 27.2830 MHz 40.6600 to 40.7000 MHz 433.0000 to 435.0000 MHz	≤ 100 (e.i.r.p.)	
		2 400.0000 to 2 500.0000 MHz	≤ 500 (e.i.r.p.)	
		5 150.0000 to 5 250.0000 MHz 5 250.0000 to 5 350.0000 MHz 5 725.0000 to 5 875.0000 MHz 24.0000 GHz to 24.2500 GHz 61.0000 GHz to 61.5000 GHz 122.0000 GHz to 123.0000 GHz 244.0000 GHz to 246.0000 GHz	≤ 1 000 (e.i.r.p.)	
2	Personal radio service device	477.5250 to 477.9875 MHz	≤ 500	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power (mW)**	**Remarks(3)**
3	Cordless telephone	46.6100 to 46.9700 MHz 49.6100 to 49.9700 MHz	≤ 50 (e.i.r.p.)	
		866.0000 to 871.0000 MHz CT2/CT3 freq. Band*	≤ 50 (e.i.r.p.)	
		1 880.0000 to 1 900.0000 MHz 2 400.0000 to 2 483.5000 MHz	≤ 100 (e.i.r.p.)	
4	Two-way radio pager access device	279.0000 to 281.0000 MHz/ 919.0000 to 923.0000 MHz	≤ 1 000	
5	Radio telemetry access device	162.9750 to 163.1500 MHz	≤ 1 000	
6	Infra red device	187.5000 THz to 420.0000 THz	≤ 125	
7	Remote controlled consumer device – boat, car model/garage door/camera/toy robot, crane, etc.	26.9650 to 27.2750 MHz 40.0000 MHz 47.0000 MHz 49.0000 MHz 303.0000 to 320.0000 MHz 433.0000 to 435.0000 MHz	≤ 50 (e.i.r.p.)	
8	Security device – Radio detection and alarm	3.0000 kHz to 195.0000 kHz 228.0063 to 228.9937 MHz 303.0000 to 320.0000 MHz 400.0000 to 402.0000 MHz 433.0000 to 435.0000 MHz 868.1000 MHz 76.0000 GHz to 77.000 GHz	< 50 (e.i.r.p.)	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power (mW)**	**Remarks[3]**
9	Wireless microphone system	26.95728 to 27.28272 MHz 40.4350 to 40.9250 MHz 87.5000 to 108.000 MHz 182.0250 to 182.9750 MHz 183.0250 to 183.4750 MHz 217.0250 to 217.9750 MHz 218.0250 to 218.4750 MHz 510.0000 to 798.0000 MHz	< 50 (e.i.r.p.)	
10	Free space optics device	193.5484 THz (wavelength of 1 550 nm) 352.9412 THz (wavelength of 850 nm)	≤ 650	
11	Industrial, scientific and medical (ISM) device	6 765.0000 kHz to 6 795.0000 kHz 13.5530 to 13.5670 MHz 26.9570 to 27.2830 MHz 40.6600 to 40.7000 MHz 2 400.0000 to 2 500.0000 MHz 5 725.0000 to 5 875.0000 MHz 24.0000 GHz to 24.2500 GHz 61.0000 GHz to 61.5000 GHz 122.0000 GHz to 123.0000 GHz 244.0000 GHz to 246.0000 GHz	< 500 (e.i.r.p.)	
12	Active medical implant	402.0000 MHz to 405.0000 MHz 9.0000 kHz to 315.0000 kHz	25 μW 30 dB(μA/m) at 10 m	* planned

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power (mW)**	**Remarks[3]**
13	RFID	13.5530 MHz to 13.5670 MHz 433.0000 MHz to 435.0000 MHz 869.0000 MHz to 870.3750 MHz 919.0000 MHz to 923.0000 MHz 2 400.000 MHz to 2 500.000 MHz	100 mW 100 mW 500 mW 2 W e.r.p. 500 mW	*planned

[3] Administrations may indicate additional information on channel spacing, necessary bandwidth, interference mitigation requirement, unwanted emission limit and applicable radio standards.

Technical regulations in New Zealand

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[4]**
1	Telemetry/Telecommand	0.009-0.03 MHz	Maximum permitted field strength is 2 400 (µV/m)/ f(kHz) measured using an average detector at 300 m – where f is the centre frequency.	
2	Telemetry/Telecommand	0.03-0.19 MHz	10 mW e.i.r.p.	
3	Telemetry/Telecommand	6.765-6.795 MHz	10 mW e.i.r.p.	
4	Telemetry/Telecommand	13.55-13.57 MHz	100 mW e.i.r.p.	
5	Unrestricted	26.95-27.3 MHz	1 000 mW e.i.r.p.	
6	Unrestricted	29.7-30 MHz	100 mW e.i.r.p.	
7	Unrestricted	35.5-37.2 MHz	100	
8	Unrestricted	40.66-40.7 MHz	1 000 mW e.i.r.p.	
9	Unrestricted	40.8-41.0 MHz	100 mW e.i.r.p.	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks(4)**
10	Auditory Aids	72-72.25 MHz	100 mW e.i.r.p.	
11	Unrestricted	72.25-72.50 MHz	100 mW e.i.r.p.	
12	Audio senders	88-108 MHz	0.00002 mW e.i.r.p.	
13	Unrestricted	107-108 MHz	25 mW e.i.r.p.	
14	Unrestricted	160.1-160.6 MHz	500 mW e.i.r.p.	
15	Unrestricted	173-174 MHz	100 mW e.i.r.p.	
16	Telemetry/Telecommand	235-300 MHz	1 mW e.i.r.p.	
17	Telemetry/Telecommand	300-322 MHz	10 mW e.i.r.p.	
18	Biomedical Telemetry	402-406 MHz	0.025 mW e.i.r.p.	The maximum permitted duty cycle is 0.1%
19	Telemetry/Telecommand	433.05-434.79 MHz	25 mW e.i.r.p.	
20	Biomedical Telemetry	444-444.925 MHz	25 mW e.i.r.p.	
21	Unrestricted	458.54-458.61 MHz	500 mW e.i.r.p.	
22	Unrestricted	466.80-466.85 MHz	500 mW e.i.r.p.	
23	Biomedical Telemetry	470-470.5 MHz	100 mW e.i.r.p.	
24	Unrestricted	471-471.5 MHz	100 mW e.i.r.p.	
25	Audio/Video senders	614-646 MHz	25 mW e.i.r.p.	
26	Unrestricted	819-824 MHz	100 mW e.i.r.p.	
27	Unrestricted	864-868 MHz	1 000 mW e.i.r.p.	May operate with gain antennas provided the peak power does not exceed 4 W e.i.r.p.
28	Telemetry/Telecommand(1)	869.2-869.25 MHz	10 mW e.i.r.p.	
29	Telemetry/Telecommand	915-921 MHz	3 mW e.i.r.p.	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(4)]**
30	Unrestricted	921-929 MHz	1 000 mW e.i.r.p.	
31	Unrestricted	2.4-2.4835 GHz	1 000 mW e.i.r.p.	May operate with gain antennas provided the peak power does not exceed 4 W e.i.r.p.
32	Radiolocation	2.9-3.4 GHz	100 mW e.i.r.p.	
33	Wireless LAN	5.15-5.25 GHz	200 mW e.i.r.p.	Indoor use – The maximum permitted power density is 10 mW/MHz e.i.r.p. or equivalently 0.25 mW/25 kHz e.i.r.p.

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(4)]**
34	Wireless LAN	5.25-5.35 GHz	1 000 mW e.i.r.p.	Indoor-only systems: In the band 5 250 to 5 350 MHz the maximum permitted mean power is 200 mW e.i.r.p. and the maximum permitted mean power density is 10 mW/MHz e.i.r.p., provided dynamic frequency selection and transmitter power control are implemented. If transmitter power control is not in use, then the e.i.r.p. values shall be reduced by 3 dB. Indoor and outdoor systems: In the band 5 250 to 5 350 MHz, the maximum permitted mean power is 1watt e.i.r.p. and the maximum permitted mean power density is 50 mW/MHz, provided dynamic frequency selection and transmitter power control are implemented in conjunction with the following vertical radiation angle mask where q is the angle above the local horizontal plane (of the Earth): Maximum permitted mean power density/quotient Elevation angle above horizontal: –13 dB(W/MHz) for 0° <= θ < 8° –13 – 0.716(θ-8) dB(W/MHz) for 8° <= θ < 40° –35.9 – 1.22(θ-40) dB(W/MHz) for 40° <= θ <= 45° –42 dB(W/MHz) for 45° < θ

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(4)]**
35	Wireless LAN	5.47-5.725 GHz	1 000 mW e.i.r.p.	The maximum transmitter power is 250 mW with a maximum permitted mean power of 1 W e.i.r.p. and a maximum permitted mean power density of 50 mW/MHz e.i.r.p., provided dynamic frequency selection and transmitter power control are implemented. If transmitter power control is not in use, then the maximum permitted mean power shall be reduced by 3 dB.
36	Radiolocation	5.47-5.725 GHz	100 mW e.i.r.p.	
37	Unrestricted (refer Note 2)	5.725-5.875 GHz	1 000 mW e.i.r.p.	
38	Road transport and traffic telematics	5.725-5.875 GHz	2 000 mW e.i.r.p.	
39	Radiolocation	8.5-10 GHz	100 mW e.i.r.p.	
40	Radiolocation – Radar systems only	10-10.6 GHz	25 mW e.i.r.p.	
41	Radiolocation	15.7-17.3 GHz	100 mW e.i.r.p.	
42	Unrestricted	24-24.25 GHz	1 000 mW e.i.r.p.	
43	Radiolocation	33.4-36 GHz	100 mW e.i.r.p.	
44	Field disturbance sensors	46.7-46.9 GHz	100 mW e.i.r.p.	
45	Fixed point-to-point links	57-64 GHz	20 000 mW e.i.r.p.	The average power density of any emission, measured during the transmit interval shall not exceed 9 µW/cm^2 at a distance of 3 m and the peak power density of any emission shall not exceed 18 µW/cm^2 at a distance of 3 m. In the band 57-64 GHz, the peak total transmitter power shall not exceed 500 mW.

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks[(4)]**
				In the band 57-64 GHz, for emissions of bandwidths less than 100 MHz the transmitter peak power must be limited to 500 mW × (bandwidth (MHz)/100 (MHz)).
46	Radiolocation	59-64 GHz	100 mW e.i.r.p.	
47	Field disturbance sensors	76-77 GHz	1 000 mW e.i.r.p.	
48	Unrestricted	122-123 GHz	1 000 mW e.i.r.p.	
49	Unrestricted	244-246 GHz	1 000 mW e.i.r.p.	

(4) Administrations may indicate additional information on channel spacing, necessary bandwidth, interference mitigation requirement, unwanted emission limit and applicable radio standards.

Technical regulations in Philippines

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks**
1	Ultra-low power active MICS	9-315 kHz	30 dB(μA/m) @ 10 m	* Individual transmitters may combine adjacent channels for increased bandwidth up to 300 kHz.
		402-405 MHz*	25 μW (e.r.p.)	
2	Biomedical devices	40.66-40.70 MHz	1 000 μV/m @ 3 m	
3	Alarms	868.6-868.7 MHz	10 mW (e.r.p.)	
		869.2-869.25 MHz	10 mW (e.r.p.)	
		869.25-869.3 MHz	10 mW (e.r.p.)	
		869.65-869.7 MHz	25 mW (e.r.p.)	
4	Equipment for detecting movement and alert alarms	2 400-2 483.5 MHz	25 mW (e.i.r.p.)	
		9 200-9 500 MHz	25 mW (e.i.r.p.)	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks**
		9 500-9 975 MHz	25 mW (e.i.r.p.)	
		13.4-14.0 GHz	25 mW (e.i.r.p.)	
		24.05-24.25 GHz	100 mW (e.i.r.p.)	
5	Equipment for detecting movement and alert alarms	2 400-2 483.5 MHz	25 mW (e.i.r.p.)	
		9 200-9 500 MHz	25 mW (e.i.r.p.)	
		9 500-9 975 MHz	25 mW (e.i.r.p.)	
		13.4-14.0 GHz	25 mW (e.i.r.p.)	
		24.05-24.25 GHz	100 mW (e.i.r.p.)	
6	Inductive applications	9-59.750 kHz	72 dB(µA/m) @ 10 m	
		59.750-60.250 kHz	42 dB(µA/m) @ 10 m	
		60.250-70 kHz	69 dB(µA/m) @ 10 m	
		70-119 kHz	42 dB(µA/m) @ 10 m	
		119-135 kHz	66 dB(µA/m) @ 10 m	
		135-140 kHz	42 dB(µA/m) @ 10 m	
		140-148.5 kHz	37.7 dB(µA/m) @ 10 m	
		3 155-3 400 kHz	13.5 dB(µA/m) @ 10 m	
		6 765-6 795 kHz	42 dB(µA/m) @ 10 m	
		7 400-8 800 kHz	9 dB(µA/m) @ 10 m	
		13.553-13.567 MHz	42 dB(µA/m) @ 10 m	
		26.957-27.283 MHz	42 dB(µA/m) @ 10 m	
		10.2-11 MHz	9 dB(µA/m) @ 10 m	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks**
7	Non-specific short-range devices, telemetry, telecommand, alarms, data in general and other similar applications	6 765-6 795 kHz	42 dB(μA/m) @ 10 m	
		13.553-13.567 MHz	42 dB(μA/m) @ 10 m	
		26.957-27.283 MHz	10 mW e.r.p. / 42 dB(μA/m) @ 10 m	
		40.660-40.700 MHz	10 mW (e.r.p.)	
		138.2-138.45 MHz	10 mW (e.r.p.)	
		315 MHz	10 mW (e.r.p.)	
		433.050-434.790 MHz	10 mW (e.r.p.)	
		868.000-868.600 MHz	25 mW (e.r.p.)	
		868.700-869.200 MHz	25 mW (e.r.p.)	
		869.3-869.4 MHz	25 mW (e.r.p.)	
		869.700-870.000 MHz	5 mW (e.r.p.)	
		2 400-2 483.5 MHz	10 mW (e.i.r.p.)	
		5 725-5 875 MHz	25 mW (e.i.r.p.)	
		24.00-24.25 GHz	100 mW (e.i.r.p.)	
		61.0-61.5 GHz	100 mW (e.i.r.p.)	
		122-123 GHz	100 mW (e.i.r.p.)	
		244-246 GHz	100 mW (e.i.r.p.)	
8	Road transport and traffic telematics	5 795-5 805 MHz*	2W (e.i.r.p.)	* Individual license required.
		63-64 GHz	8W (e.i.r.p.)	
		76-77 GHz	55 dBm peak	

Technical regulations for short-range radiocommunication devices				
No.	**Typical application type**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Remarks**
9	Wireless audio applications	72.0-73.0 MHz*	80 mV/m at 3 m (field strength)	* For auditory assistance device only. In case of analogue systems, the maximum occupied bandwidth should not exceed 300 kHz.
		75.4-76.0 MHz*	80 mV/m at 3 m (field strength)	
		863-865 MHz	10 mW (e.r.p.)	
		864.8-865.0 MHz	10 mW (e.r.p.)	
10	Wireless microphones	29.7-47.0 MHz	2 mW (e.r.p.)	50 mW restricted to for body worn microphones.
		173.965-174.015 MHz	10 mW (e.r.p.)	
		174-216 MHz	10 mW (e.r.p.)/ 50 mW (e.r.p.)	
		470-862 MHz	10 mW (e.r.p.)/ 50 mW (e.r.p.)	
		863-865 MHz	10 mW (e.r.p.)	
		1 785-1 800 MHz	10 mW (e.i.r.p.)/ 50 mW (e.i.r.p.)	
11	Wireless video transmitter	630-710 MHz	76 dB(μV/m) at 3 m 5-8 MHz	
		2 400-2 483.5 MHz (Narrowband)	100 mW (e.i.r.p.)	

Technical regulations in Singapore

Technical regulations for short-range radiocommunication devices					
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Remarks**
1	Induction loop system/ RFID	16-150 kHz	≤ 66 dB(μA/m) @ 3 m	≥ 32 dB below carrier at 3 m or EN 300 224-1	
		150-5 000 kHz	≤ 13.5 dB(μA/m) @ 10 m		
		6 765-6 795 kHz	≤ 42 dB(μA/m) @ 10 m		
		7 400-8 800 kHz	≤ 9 dB(μA/m) @ 10 m		
2	Radio detection, alarm system	0.016-0.150 MHz	≤ 100 dB(μV/m) @ 3 m	≥ 32 dB below carrier at 3 m or EN 300 330-1	
3		13.553-13.567 MHz	≤ 94 dB(μV/m) @ 10 m		
4		146.35-146.50 MHz 240.15-240.30 MHz 300.00-300.30 MHz 312.00-316.00 MHz 444.40-444.80 MHz	≤ 100 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	
5	Wireless microphone	0.51-1.60 MHz	≤ 57 dB(μV/m) @ 3 m		
6		40.66-40.70 MHz	≤ 65 dB(μV/m) @ 10 m		
7		88.00-108.00 MHz	≤ 60 dB(μV/m) @ 10 m		
8		470.00-806.00 MHz	≤ 10 mW (e.r.p.)		
9	Wireless microphone, Hearing/Audio assistance aids	169.40-175.00 MHz	≤ 500 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	
		180.00-200.00 MHz 487.00-507.00 MHz	≤ 112 dB(μV/m) @ 10 m		

Technical regulations for short-range radiocommunication devices					
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Remarks**
10	Remote controls of garage door, cameras, toys and miscellaneous devices	26.96-27.28 MHz	≤ 100 mW (e.r.p.)(5)	≥ 32 dB below carrier at 3 m or EN 300 220-1	
		34.995-35.225 MHz	≤ 100 mW (e.r.p.)		
		40.665-40.695 MHz	≤ 500 mW (e.r.p.)		
		40.77-40.83 MHz			
		72.13-72.21 MHz			
11	Remote controls of aircraft and glider models, telemetry, detection and alarm systems	26.96-27.28 MHz 29.70-30.00 MHz	≤ 500 mW (e.r.p.)		
12	Remote control of cranes and loading arms	170.275 MHz 170.375 MHz 173.575 MHz 173.675 MHz 451.750 MHz 452.000 MHz 452.050 MHz 452.325 MHz	≤ 1 000 mW (e.r.p.)		Operating under these provisions shall be approved on an exceptional basis.
13	On-site radio paging system	26.96-27.28 MHz 40.66-40.70 MHz	≤ 3 000 mW (e.r.p.)(5)	≥ 32 dB below carrier at 3 m; EN 300 135-1; EN 300 433-1 or EN 300 224-1	Operating under these provisions shall be approved on an exceptional basis.
14		151.125 MHz 151.150 MHz	≤ 3 000 mW (e.r.p.)	≥ 60 dB below carrier over 100 kHz to 2 000 MHz or EN 300 224-1	

Technical regulations for short-range radiocommunication devices					
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Remarks**
15	Medical and biological telemetry	40.50-41.00 MHz	≤ 0.01 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	
		216.00-217.00 MHz	> 25 μW to ≤ 100 mW (e.r.p.)		
		454.00-454.50 MHz	≤ 2 mW (e.r.p.)		
16		1 427.00-1 432.00 MHz	> 25 μW to ≤ 100 mW (e.r.p.)	FCC Part 15 or EN 300 440-1	
17		All frequencies	≤ 25 μW (e.r.p.)	FCC Part 15; EN 300 220-1; EN 300 330-1; or EN 300 440-1	
18	Wireless modem, data communication system	72.080 MHz 72.200 MHz 72.400 MHz 72.600 MHz 158.275/162.875 MHz 158.325/162.925 MHz 453.7250/458.7250 MHz 453.7375/458.7375 MHz 453.7500/458.7500 MHz 453.7625/458.7625 MHz	≤ 1 000 mW (e.r.p.)[5]	≥ 43 dB below carrier over 100 kHz to 2 000 MHz; EN 300 390-1 or EN 300 113-1	
19	Short-range radar systems such as automatic cruise control and collision warning systems for vehicle	76-77 GHz	≤ 37 dBm (e.r.p.) when vehicle is in motion ≤ 23.5 dBm (e.r.p.) when vehicle is stationary	FCC Part 15 § 15.253 (c) or EN 301 091	

Technical regulations for short-range radiocommunication devices					
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Remarks**
20	Radio telemetry, telecommand system	433.05-434.79 MHz	≤ 10 mW (e.r.p.)	≥ 32 dB below carrier at 3 m or EN 300 220-1	
21	Radio Telemetry, Telecommand, RFID system	866-869 MHz 920-925 MHz	≤ 500 mW (e.r.p.)(5)	≥ 32 dB below carrier at 3 m; EN 300 220-1 or EN 302 208	
22	Radio frequency identification (RFID) systems	920-925 MHz	> 500 mW (e.r.p.) ≤ 2 000 mW (e.r.p.)	≥ 32 dB below carrier at 3 m; EN 300 220-1 or EN 302 208	Only RFID systems operating in the 920-925 MHz frequency band shall be allowed to transmit between 500 mW and 2 000 mW (e.r.p.) and approved on an exceptional basis.
23	Wireless video transmitter and other SRD applications	2.4000-2.4835 GHz	≤ 100 mW (e.i.r.p.)(6)	FCC Part 15 § 15.209; § 15.249 (d) or EN 300 440-1	
24		10.50-10.55 GHz	≤ 117 dB(μV/m) @ 10 m		
25		24.00-24.25 GHz	≤ 100 mW (e.i.r.p.)		Radar gun devices are not allowed to operate.
26	Bluetooth	2.4000-2.4835 GHz	≤ 100 mW (e.i.r.p.)(6)	FCC Part 15 § 15.209; or EN 300 328	
27	Wireless LAN only	2.4000-2.4835 GHz	≤ 200 mW (e.i.r.p.)		WLAN for non-localized operations shall be approved on an exceptional basis.
28	SRD applications	5.725-5.850 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.209	

Technical regulations for short-range radiocommunication devices					
No.	**Typical application types**	**Authorized frequency bands/frequencies**	**Maximum field strength/ RF output power**	**Transmitter spurious emissions**	**Remarks**
29	Wireless LAN and broadband access (WBA) only	5.725-5.850 GHz	≤ 1 000 mW (e.i.r.p.)		Non-localized operations shall be approved on an exceptional basis.
30		5.725-5.850 GHz	> 1 000 mW (e.i.r.p.) ≤ 4 000 mW (e.i.r.p.)		Operating under this provision shall be approved on an exceptional basis.
31	Wireless LAN	5.150-5.350 GHz	> 100 mW (e.i.r.p.)[(6)] ≤ 200 mW (e.i.r.p.)	FCC Part 15 § 15.407 (b) or EN 301 893	WLAN operating in 5.250-5.350 GHz under this provision shall employ dynamic frequency selection (DFS) mechanism and implement transmit power control (TPC). Non-localized operations shall be approved on an exceptional basis.
32	Wireless LAN	5.150-5.350 GHz	≤ 100 mW (e.i.r.p.)	FCC Part 15 § 15.407 (b) or EN 301 893	WLAN operating under this provision shall implement DFS function in the frequency range 5.250-5.350 GHz. Non-localized operations shall be approved on an exceptional basis.

(5) Effective radiated power (e.r.p.) refers to radiation of a half wave tuned dipole, which is used for frequencies below 1 GHz.

(6) Equivalent isotropic radiated power (e.i.r.p.) is a product of the power supplied to the antenna and the maximum antenna gain, relative to an isotropic antenna, and is used for frequencies above 1 GHz. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p. (e.i.r.p. (dBm) = e.r.p. (dBm) + 2.15).

Technical regulations in Viet Nam

The MIC's Decision 36/2009/TT-BTTTT of 03/12/2009 includes individual technical requirement for each type of SRDs. The common requirements are presented in the table below:

Technical requirements for short-range radiocommunication devices				
	Frequency band (MHz)	**Emission (maximum power)**	**Spurious emission (maximum power or minimum deterioration)**	**Type of devices or applications**
	A	**B**	**C**	**D**
1	0.115-0.150	≤ 4.5 mW e.r.p.	Details[7]	Radio alarm and detection systems
				RFID
				Radio remote control
2	10.2-11	≤ 4.5 μW e.r.p.		wireless audio system for hearing assistance aids
3	13.553-13.567	≤ 4.5 mW e.r.p.		Radio alarm and detection systems
				RFID
				Other applications
4	26.957-27.283	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio remote control
				radio telemetry
				Other applications
5	29.70-30.00	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio remote control
				Radio alarm and detection systems
				radio telemetry
6	34.995-35.225	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio remote control
7	40.02-40.98	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Remote controls of aircraft models (of radio remote control)
8	40.66-40.7	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	wireless audio system
				Radio remote control
				Other applications
9	40.50-41.00	≤ 10 μW e.r.p.	≥ 32 dBc at output of the transmitter	Medical and biological telemetry

Technical requirements for short-range radiocommunication devices				
	Frequency band (MHz)	**Emission (maximum power)**	**Spurious emission (maximum power or minimum deterioration)**	**Type of devices or applications**
	A	**B**	**C**	**D**
10	43.71-44.00 46.60-46.98 48.75-49.51 49.66-50.00	≤ 183 μW e.r.p.	≥ 32 dBc at 3 m	Cordless telephone
11	50.01-50.99	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Remote controls of aircraft models (of radio remote control)
12	72.00-72.99	≤ 1 W e.r.p.	≥ 40 dBc at output of the transmitter	Radio remote control for aircraft model (of radio remote control)
13	88-108	≤ 3 μW e.r.p.	≥ 32 dBc at 3 m	Wireless audio system (exception of FM transmitter)
		≤ 20 nW e.r.p.		FM transmitter (of wireless audio system)
14	146.35-146.50	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio alarm and detection systems
15	182.025-182.975	≤ 30 mW e.r.p.	≥ 40 dBc at output of the transmitter	Wireless audio system
16	216-217	≤ 10 μW e.r.p.	≥ 40 dBc at output of the transmitter	Medical and biological telemetry
17	217.025-217.975	≤ 30 mW e.r.p.	≥ 40 dBc at output of the transmitter	Wireless audio system
18	218.025-218.475	≤ 30 mW e.r.p.	≥ 40 dBc at output of the transmitter	Wireless audio system
19	240.15-240.30	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio alarm and detection systems
20	300.00-300.33	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio alarm and detection systems
21	312-316	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio alarm and detection systems
				Radio remote control
22	401-406	≤ 25 μW e.r.p.	Detail[8]	MICS
23	402-405 403.5-403.8 405-406	≤ 100 nW e.r.p.		MITS

Technical requirements for short-range radiocommunication devices				
	Frequency band (MHz)	**Emission (maximum power)**	**Spurious emission (maximum power or minimum deterioration)**	**Type of devices or applications**
	A	**B**	**C**	**D**
24	433.05-434.79	≤ 10 mW e.r.p.	≥ 32 dBc at 3 m	RFID
			≥ 40 dBc at output of the transmitter	Radio remote control
				Radio telemetry
25	444.40-444.80	≤ 100 mW e.r.p.	≥ 40 dBc at output of the transmitter	Radio alarm and detection systems
26	470.075-470.725	≤ 10 mW e.r.p.	≥ 40 dBc at output of the transmitter	Wireless audio system
27	482.19-488.00	≤ 30 mW e.r.p.	≥ 40 dBc at output of the transmitter	Wireless audio system
28	821-822	≤ 183 μW e.r.p.	≥ 32 dBc at 3 m	Cordless Telephone
29	866-868	≤ 500 mW e.r.p.	≥ 32 dBc at output of the transmitter	RFID
30	920-925	≤ 500 mW e.r.p.	≥ 32 dBc at output of the transmitter	RFID
31	924-925	≤ 183 μW e.r.p.	≥ 32 dBc at 3 m	Cordless Telephone
32	2 400-2 483.5	≤ 100 mW e.i.r.p. and ≤ 100 mW/100 kHz e.i.r.p. for devices using FHSS modulation ≤ 10 mW/1 MHz e.i.r.p. for devices using other modulations	Detail[9]	WLAN
				Other spread spectrum applications
		≤ 10 mW e.i.r.p.	Detail[10]	Wireless video transmitter
			Detail[11]	Other applications
33	5 150-5 250	≤ 200 mW e.i.r.p. and ≤ 10 mW/MHz	Detail[12]	WLAN
34	5 250-5 350	≤ 200 mW e.i.r.p. and ≤ 10 mW/MHz	Detail[13]	WLAN

Technical requirements for short-range radiocommunication devices				
	Frequency band (MHz)	**Emission (maximum power)**	**Spurious emission (maximum power or minimum deterioration)**	**Type of devices or applications**
	A	**B**	**C**	**D**
35	5 470-5 725	≤ 1 mW e.i.r.p. and ≤ 50 mW/MHz	Detail[14]	WLAN
36	5 725-5 850	≤ 1 mW e.i.r.p. and ≤ 50 mW/MHz	Detail[15]	WLAN
		≤ 25 mW e.i.r.p.	Detail[16]	Other applications
37	10.5-10.55	≤ 100 mW e.i.r.p.	Detail[17]	Wireless video transmitter
38	24-24.25	≤ 100 mW e.i.r.p.	Detail[18]	Wireless video transmitter
				Other applications

[7] Spurious emissions:

Frequency ranges / State	9 kHz ≤ f ≤ 10 MHz	10 MHz ≤ f ≤ 30 MHz	47 MHz ≤ f ≤ 74 MHz 87.5 MHz ≤ f ≤ 118 MHz 174 MHz ≤ f ≤ 230 MHz 470 MHz ≤ f ≤ 862 MHz	other frequencies 30 MHz ≤ f ≤ 1 000 MHz
Operating	27 dB(μA/m) descending 3 dB/8 octave	–3.5 dB(μA/m)	4 nW	250 nW
Standby	6 dB(μA/m) descending 3 dB/8 octave	–24 dB(μA/m)		2 nW

[8] Spurious emissions:

Frequency ranges / State	47 MHz ≤ f ≤ 74 MHz 87.5 MHz ≤ f ≤ 118 MHz 174 MHz ≤ f ≤ 230 MHz 470 MHz ≤ f ≤ 862 MHz	other frequencies f ≤ 1 000 MHz	other frequencies f >1 000 MHz
Operating	4 nW	250 nW	1 μW
Standby		2 nW	20 nW

(9) Spurious emissions:

Frequency ranges / State	30 MHz ≤ *f* ≤ 1 GHz		1,8 MHz ≤ *f* ≤ 1,9 GHz 5,15 GHz ≤ *f* ≤ 5,3 GHz		1 GHz ≤ *f* ≤ 12,75 GHz	
	narrow band	wide band	narrow band	wide band	narrow band	wide band
Operating	–36 dBm	–86 dBm/Hz	–47 dBm	–97 dBm/Hz	–30 dBm	–80 dBm/Hz
Standby	–57 dBm	–107 dBm/Hz			–47 dBm	–97 dBm/Hz

(10) Spurious emissions:

Frequency ranges / State	47 MHz ≤ *f* ≤ 74 MHz 87.5 MHz ≤ *f* ≤ 118 MHz 174 MHz ≤ *f* ≤ 230 MHz 470 MHz ≤ *f* ≤ 862 MHz	other frequencies *f* ≤ 1 000 MHz	other frequencies *f* >1 000 MHz
Operating	4 nW	250 nW	1 μW
Standby	2 nW	2 nW	20 nW

(11) Spurious emissions:

Frequency ranges / State	47 MHz ≤ *f* ≤ 74 MHz 87.5 MHz ≤ *f* ≤ 118 MHz 174 MHz ≤ *f* ≤ 230 MHz 470 MHz ≤ *f* ≤ 862 MHz	other frequencies *f* ≤ 1 000 MHz	other frequencies *f* >1 000 MHz
Operating	4 nW	250 nW	1 μW
Standby		2 nW	20 nW

(12) Spurious emissions:

Frequency ranges / State	47 MHz ≤ f ≤ 74 MHz 87.5 MHz ≤ f ≤ 118 MHz 174 MHz ≤ f ≤ 230 MHz 470 MHz ≤ f ≤ 862 MHz	other frequencies f ≤ 1 000 MHz	other frequencies f >1 000 MHz
Operating	–54 dBm e.r.p. (bandwidth: 100 kHz)	–36 dBm e.r.p. (bandwidth: 100 kHz)	–30 dBm e.r.p. (bandwidth: 1 MHz)

(13) Spurious emissions are the same as detail in Note (2).

(14) Spurious emissions are the same as detail in Note (2).

(15) Spurious emissions are the same as detail in Note (2).

(16) Spurious emissions are the same as detail in Note (1).

(17) Spurious emissions are the same as detail in Note (1).

(18) Spurious emissions are the same as detail in Note (1).