SHORT RANGE DEVICES (SRD)

1. Definition of short-range radio devices

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.

2. 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:

2.1 Telecommand

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

2.2 Telemetry

The use of radiocommunication for indicating or recording data at a distance. This application finds a lot of industrial use.

2.3 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.

2.4 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.

2.5 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.

2.6 Automatic vehicle identification for railways

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. Delhi Metro uses this application for its operation.

2.7 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.

2.8 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.

2.9 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 hand held, 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.

2.10 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.

2.11 Ultra low power active medical implant

The ultra low power active medical implant (ULP-AMIs) are 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.

2.12 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.

2.13 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).

3 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.

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.

4 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 (Radio Regulation) 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, 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.

5 Radiated power or magnetic or electric field strength

The radiated power or magnetic or electric field-strength limits 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. The limits imposed in Japan, for example is place in TABLE 2 below:

TABLE 2

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 $3.5 * f > 500$ μV/m, the tolerable value is 500 μV/m.

In India, the IND33 of National Frequency Allocation Plan (NFAP lays down the following limit

‘Low power short range devices may be considered in the frequency band 433-434MHz with the power output of 10mW with a channel bandwidth of 10KHz on non-interference, non-protection and non-exclusive basis’.

6 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.

7 Conclusion

Short Range Devices (SRD) are radio devices that offer a low risk of interference with other radio services, usually because their transmitted power, and hence their range, is low. Short range devices often benefit from a relaxed regulatory regime compared with other radio communications equipment. As general principle, a user is license free to operate such equipment, some specific cases may require an individual license.

However, like all radio equipment, short-range devices have to meet the regulatory requirements of the country.