BOTSWANA COMMUNICATIONS REGULATORY AUTHORITY

Guidelines On The Use Of Short-Range Devices (SRDs) In Botswana

February 2022

Table of Contents

1. INTRODUCTION

1.1. The purpose of this guideline is to guide frequency bands, technical standards and regulatory requirements for the use of Short-Range Devices (SRDs) in Botswana, to the extent possible.

1.2. SRDs are usually labelled as “short-range” or sometimes “low-power” devices since they generally have low-power transmissions and are therefore confined in their area of operation. Considering however the list of SRD devices and their respective emissions, (see Annexure A), it is evident that it is not possible to place a specific distance or power limit on SRDs to define these devices.

1.3. What then differentiates SRDs from radio communications systems and applications? The main characteristic of an SRD is its low probability of causing harmful interference, either to other SRDs or radiocommunication services operating following the National Table of Frequency Allocations. Furthermore, the amount of these devices deployed and used, frequently as consumer devices, makes it very difficult and unnecessarily burdensome for the regulator to licence such devices. Because of the widespread use of these devices, and the fact that the probability of causing interference is very low, SRDs can generally be used without the need for a radio frequency spectrum licence except for an authorisation letter from the regulator. In some countries, therefore, these devices are regulated through spectrum licence-exempt regulations. Another characteristic of certain SRDs is the fact that it can be taken across national borders, making it more difficult to regulate and/or control. For example, laptops and cell phones have built-in Wi-Fi and

Bluetooth capabilities which are taken across borders as embedded devices, which cannot in practice be stopped at national borders. The same applies to many other types of SRDs such as certain RFID devices used for tracking cargo, medical implants, etc. Section 3 contains a more detailed list of characteristics of SRDs.

1.4. Internationally, there is an increase in demand for the use of SRDs for various applications and services operating in a range of radio frequency bands. SRDs are used in a variety of applications including, amongst others, household appliances, toys, medical devices and instruments, warehouse management and logistics, wireless telemetry and telecommand, vehicular applications, railway applications, alarms and security systems and applications, remote controls, radio frequency identification systems, wireless audio systems, cordless telephones and local area networks. SRDs have become such a part of our daily lives that the use of these devices is often taken for granted or in many cases, people do not even realise that they are using a radio device.

2. BACKGROUND

2.1. Short Range Devices have been in use in Botswana for many years. Most SDRs came already embedded in consumer products which were developed following internationally recognised standards. In recent years, there is interest from the local community to develop their own Low Power Wide Area Networks (LPWANs) in Botswana for use in different application, especially smart metering. This called for the development of guidelines for the local community on the use of SRDs in Botswana.

2.2. The Communication Regulatory Association of Southern Africa (CRASA) has developed harmonised framework for the harmonisation of frequencies for short-range devices for use in SADC. The harmonisation of the use of SRDs in the SADC region benefits circulation of equipment, economies of scale and improved interference management. This guideline has been adapted from the framework for the harmonisation of frequencies for short-range devices in SADC.

3. KEY CHARACTERISTICS OF SRDs

3.1. Key characteristics of SRDs include, amongst others:

a) SRDs are not defined as a radiocommunication service in Article 1 of the ITU Radio Regulations although some devices may operate under a radiocommunication service (e.g. the fixed or mobile service);

b) SRDs have a low probability of causing harmful interference;

c) SRDs operates on a non-interference and non-protection (NINP) basis unless specific protection is afforded due to national importance;

d) Since SRDs operate on a NINP basis they are generally required to cease operation when causing harmful interference (or eliminating the harmful interference), even if operating within the defined technical and operational parameters;

e) SRDs generally operate on a radio frequency spectrum licence exempted basis (unless otherwise specified);

f) SRDs are not ISM applications as defined in Article 1.15 of the ITU Radio Regulations; SRDs should therefore also accept interference from ISM devices;

g) SRDs could be used virtually everywhere; movement can generally not be controlled including cross-border movement in some cases;

h) Some devices are stand-alone whereas others are integrated into other equipment, devices, appliances or objects or could even be implanted in humans or animals;

i) SRDs can provide either unidirectional or bidirectional communications;

j) SRD devices generally use integral[1] or dedicated[2] antennae; external[3] antennae could be used in some cases if allowed;

k) The use of SRDs are generally controlled through certain technical, regulatory and operational restrictions;

l) Type approval or conformance testing is generally required to ensure that SRDs operates within the prescribed technical criteria;

[1] SRD has no external antenna socket
[2] SRD is type approved with specific antenna
[3] SRD is type approved without specific antenna

m) The pattern of use of SRDs is not static and is always evolving necessitating defining radio parameters as broadly as possible; periodic review of SRD rules and regulations is therefore necessary;

n) The use of SRDs differs between applications and locality as well as between countries;

o) In certain frequency bands, specific interference mitigation techniques apply to SRDs to allow SRD devices to operate without causing harmful interference; some SRDs may also employ advanced spectrum access techniques;

p) The uncontrolled circulation and use of SRDs may cause harmful interference to licensed radiocommunication services in some frequency bands;

q) International harmonisation of frequency bands and standards, or as a minimum on a regional level, will facilitate market development of SRDs and reduced incidence of harmful interference.

4. TECHNICAL STANDARDS AND OPERATIONAL LIMITS

4.1. As indicated, SRDs generally operate on a Non-Interference-No-Protection (NINP) basis and therefore also do not require a radio frequency spectrum license (authorization may be required). It is therefore important to ensure that, under normal operating conditions, SRDs do not cause harmful interference to licensed radiocommunication services operating in the same and adjacent

frequency bands. It is therefore important to specify technical and operation limits for all SRDs.

4.2. Technical limits (e.g. maximum radiated power or magnetic field strength, interference mitigation techniques, channel spacing's, duty cycles, etc.) and operational restrictions (e.g. indoor only, area restrictions) were developed in the various regions following rigorous frequency sharing analysis between the specific SRDs and the radiocommunication systems operating in a particular frequency bands. This also applies to the technical and operational standards applicable to Europe, as contained in ERC/REC 70-03[4]. Other regions have adopted other or similar technical and operational specifications and regulations.

4.3. SRD standards have been developed by international bodies such as ISO[5], ETSI[6], ANSI[7], CENELEC[8], FCC[9] and others. Since SADC is part of ITU Radio Region 1 (see ITU RR Article 5.2), and since both the Botswana 2018 National Radio Frequency Plan and SADC Frequency Allocation Plan 2020 are based on the Radio Regulations Region 1 ITU Article 5, It is important that BOCRA also adopts the European standards and limits for SRDs. In cases that SRD standards from Regions other than Radio Region 1 are required and adopted, these should be carefully analysed, in detail, to ensure that the technical and

[4] Relating to the use of short range devices (SRD), version 13 October 2017
[5] International Organisation for Standardisation
[6] European Telecommunications Standards Institute
[7] American National Standards Institute
[8] European Committee for Electrotechnical Standardisation
[9] Federal Communications Commission (in its part 15 rules)

operational limits are appropriate so that harmful interference is not caused to licensed radio communication services. This is important in particular where the particular frequency band is allocated to different radio communication services (different from Radio Region 1), resulting in a different sharing environment and therefore different protection criteria requirements.

4.4. Concerning SRDs, ETSI adopted three generic standards namely:

a) EN 300 220 (for radio equipment to be used in the 25 MHz-1000 MHz frequency range with power levels up to 500 mW);

b) EN 300 330 (for radio equipment to be used in the 9 kHz-25 MHz frequency range and inductive loop systems in the 9 kHz – 30 MHz frequency range);
c) EN 300 440 (for radio equipment to be used in the 1 GHz to 40 GHz frequency range).

4.5. ETSI also adopted several SRD device-specific standards. See Annexure C for a complete list of the relevant ETSI standards.

4.6. Apart from radio standards as indicated above, compliance with other standards may also be required before an SRD device can be placed onto the market, for example, standards on electrical safety and EMC[10]. These are also indicated in Annexure A as

[10] Electromagnetic compatibility

required (mostly ETSI standards) and are also listed in Annexure C.

5. CONFORMANCE TESTING AND MARKET ACCESS

5.1. Adherence to the stipulated technical and operational criteria is critical for a radio device to operate on a radio frequency licence-exempt basis and to qualify as an SRD. Type Approval or conformance testing of all SRD devices, following the stipulated technical limits and standards, it is therefore essential before an SRD device is placed onto the market.

5.2. BOCRA has a clearly defined type approval process that guides what needs to be type-approved. SRDs should follow the Type-approval procedures before use.

5.3. Annexure A contains a list of frequency bands for SRD applications in Botswana. This table was prepared based on PDNR ITU-R SM.[SRD] and the Botswana National Frequency Plan of 2019. The technical parameters are taken from ITU-R Report SM.2153 and CEPT ERC/REC 70-03 (edition 07 June 2019) and include technical limits such as maximum power levels, antenna characteristics, and channel spacing and duty cycles.

6. ANNEXURE A: BOCRA FREQUENCY BANDS FOR SRD APPLICATIONS

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
8.3-9kHz	Inductiveapplications	82 dBµA/m at 10m	None	None	EN 300 330	Antenna size of < 1/20 λ (see note 1)
9-90 kHz		72 dBµA/m at 10m				RFIDs operating in the frequency sub-band 119-135 kHz shall meet the spectrum mask given in EN 300 330. This will permit simultaneous use of the various sub-bands within the range 90 – 148.5 kHz (Note 11)
90-119 kHz		42 dBµA/m at 10m				
119-135 kHz		66 dBµA/m at 10m				
135-140 kHz		42 dBµA/m at 10m				
140-148.5 kHz		37.7 dBµA/m at 10m				
9-315 kHz	Active medical implants	30 dBµA/m at 10m	<10%	None	EN 302 195	

[11] See Annexure B for definitions
[12] For list of ETSI Standards see Annexure C

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
400-600 kHz	Inductive applications	-8 dBµA/m at 10 m				For RFID only
442.2-450 kHz	Tracking, Tracing and Data Acquisition	7 dBµA/m at 10m	None	Continuous-wave (CW) - no modulation, channel spacing ≥ 150 Hz		
456.9-457.1 kHz	Tracking, Tracing and Data Acquisition	7 dBµA/m at 10 m	None	Continuous-wave (CW) at 457 kHz - no modulation		
3 155-3 400 kHz	Inductive applications	13.5 dBµA/m at 10m	None	None	EN 300 330	ITU-R M.1076 applies RR No. **5.116** applies
6 765-6 795 kHz	- Inductive applications - Non-specific SRDs	42 dBµA/m at 10m	None	None	EN 300 330	ISM band (RR No. **5.138**)
7 400-8 800 kHz	Inductive applications	9 dBµA/m at 10m	None	None	EN 300 330	
10200-11000kHz	Inductive applications	9 dBµA/m at 10m	None	None	EN 300 330	
13553-13567 kHz	Inductive applications	42 dBµA/m at 10m 60 dBµA/m at 10m (for RFID and EAS only)	None	None	EN 302 291	ISM band (RR No. **5.150**)
	Non-specific SRDs	10 mWe.r.p	None	None	EN 300 330	ISM band (RR No. **5.150**)

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
26957-27283 kHz	Inductive applications	42 dBμA/m at 10m	None	None	EN 300 220	ISM band (RR No. **5.150**) ERC/DEC/(01)16
	Model control (26990-27200 kHz)	100 mW e.r.p	None	10 kHz	EN 300 220	ERC/DEC/(01)10 (26.995 MHz, 27.045 MHz, 27.095 MHz, 27.145 MHz, 27.195 MHz
	Non-specific SRDs	10 mW e.r.p.	None	None	EN 300 220 EN 300 330	ERC/DEC/(01)02
26990-27200 kHz	N0n0specific SRDs	100 mWe.r.p	≤ 0.1 %	None		
29.7-47 MHz	Radio Microphones	10 mW e.r.p.	None	≤ 50 kHz		
30-37.5 MHz	Active Medical Implants	1 mW e.r.p.	≤ 10%	None		
34.995-35.225 MHz	Model Control	100 mW e.r.p	None	10 kHz		Only flying models
40.66-40.7 MHz	Non-specific SRDs	10 mW e.r.p.	None	None	EN 300 220	ISM band (RR No. **5.150**) ERC/DEC/(01)03
	Model control	100 mW e.r.p	None	10 kHz	EN 300 220	ERC/DEC/(01)12 (40.665 MHz, 40.675 MHz, 40.685 MHz, 40.695 MHz)
138.2-138.45 MHz	Non-specific SRDs	10 mW e.r.p.	≤ 1%	None		
169.4-174 MHz	Radio Microphones	10 mW e.r.p.	None	≤ 50 kHz		

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
169.4-169.5875MHz	Assistive listening devices	500 mW e.r.p.	None	≤ 50 kHz		
169.4-169.475 MHz	Tracking, Tracing and Data Acquisition	500 mW e.r.p.	≤ 10%	≤ 50 kHz		
169.4-169.4875 MHz	Non-specific SRDs (169.4-169.475 MHz)	500 mWe.r.p	≤ 1%	≤ 50 kHz		
	Non-specific SRDs (169.4-169.4875 MHz)	10 mW e.r.p.	≤ 1%			
169.4875-169.5875 MHz	Non-specific SRDs	10 mW e.r.p.	≤ 0.001% duty cycle except for 00:00 h to 06:00 h local time where the duty cycle the limit is ≤ 0.1%			
169.5875-169.8125 MHz	Non-specific SRDs	10 mW e.r.p.	≤ 0.1%			
173.965-216 MHz	Assistive listening devices	10 mW e.r.p.	None	≤ 50 kHz		
174-216 MHz	Radio Microphones	50 mW e.r.p.	None	None		
433.05-434.79 MHz	Non-specific SRDs	10 mW e.r.p. (433.05-434.79 MHz)	<10% (Note 1)	None	EN 300 220	(Note 2)

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
		1 mW e.r.p. -13 dBm/10 kHz (433.05-434.79 MHz)	None	None	EN 300 220	Power density limited to -13 dBm/10 kHz for wideband modulation with a bandwidth greater than 250 kHz (Note 5)
		10 mW e.r.p. (434.04-434.79 MHz)	None	Up to 25 kHz	EN 300 220	(Note 5)
401-402 MHz	Active medical implants and associated peripherals	25 µW e.r.p.	LBT or duty cycle ≤0.1% (Note 3), p21	25 kHz	EN 302 537	ITU-R RS.1346[13] Max occupied BW = 100 kHz
402-405 MHz		25 µW e.r.p.	(Note 4), p21	25 kHz	EN 301 839	ITU-R RS.1346 Max occupied BW = 300 kHz ERC/DEC/(01)17
405-406 MHz		25 µW e.r.p.	LBT or duty cycle ≤0.1% (Note 4), p21)	25 kHz	EN 302 537	ITU-R RS.1346 Max occupied BW = 100 kHz
446 – 446.2 MHz	PMR446	500 mW		12.5 kHz	EN 300 296	
470-786 MHz	Radio Microphones	50 mW e.r.p.	None	None		
862-863 MHz	Non-specific SRDs	25 mWe.r.p	≤ 0.1%	≤ 350 kHz		

[13] Sharing between the meteorological aids service and medical implant communication systems (MICS) operating in the mobile service in the frequency band 401-406 MHz.

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
863-865 MHz	Wireless Audio applications	10 mW e.r.p.	None	None	EN 301 357	
	Non-specific SRDs	25 mW e.r.p.	≤ 0.1% duty cycle or LBT+AFA			
864.8-865 MHz	Wireless Audio applications	10 mW e.r.p.	None	50 kHz	EN 300 220	Narrowband analogue voice devices (only this band)
865-868 MHz	Non-specific SRDs	25 mW e.r.p.	≤ 1% duty cycle or LBT +AFA			
	Tracking, Tracing and Data Acquisition	500 mW e.r.p.	Adaptive Power Control (APC) required for spectrum sharing (note 1) and the following duty cycle restrictions also apply: ≤ 10% the duty cycle for network access points; ≤ 2.5% duty cycle otherwise	≤ 200 kHz		
865.0-865.6 MHz	RFID	100 mW e.r.p.	None	200 kHz	EN 302 208	(Note 13)
865.6-867.6 MHz		2 W e.r.p.	None	200 kHz	EN 302 208	

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
867.6-868.0 MHz		500 mW e.r.p.	None	200 kHz	EN 302 208	
863-870 MHz	Non-specific SRDs	≤ 25 mW e.r.p.	≤ 0.1% or LBT (notes 1 and 5)	≤ 100 kHz for 47 or more channels (note 3)	EN 300 220	FHSS modulation Note4, Note 2, Note 7 and Note 9
863-870 MHz	Non-specific SRDs	≤ 25 mW e.r.p. (note 7) Power density : - 4.5 dBm/100 kHz (note 8)	≤ 0.1% or LBT+AFA (notes 1, 6 and 7)	No spacing	EN 300 220	DSSS and other wideband modulation other than FHSS (Notes 2, 4, 7 and 9)
		≤ 25 mW e.r.p.	≤ 0.1% or LBT+AFA (notes 1 and note 6)	≤ 100 kHz, for 1 or more channels. Modulation bandwidth ≤ 300 kHz (note 3)		Narrow/wide-band modulation (Notes 2, 4, 7 and 9)
868-868.6 MHz	Non-specific SRDs	≤ 25 mW e.r.p.	≤ 1% or LBT+AFA (note 1)	No spacing, for 1 or more channels (note 3)	EN 300 220	Narrow / wide-band modulation. No channel spacing, however, the whole stated frequency band may be used (Note 2)
868.6-868.7 MHz	Alarms	10 mW e.r.p.	≤ 1%	25 kHz	EN 300 220	Or whole band may be used as 1 channel
868.7-869.2 MHz	Non-specific SRDs	≤ 25 mW e.r.p.	≤ 0.1% or LBT+AFA (note 1)	No spacing, for 1 or more channels (note 3)	EN 300 220	Narrow / wide-band modulation. No channel spacing, however, the whole stated frequency band may be used

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
869.25-869.3 MHz	Alarms	10 mW e.r.p.	< 0.1%	25 kHz	EN 300 220	
869.2-869.25 MHz	Alarms	10 mW e.r.p.	< 0.1%	25 kHz	EN 300 220	Social alarms
869.3-869.4 MHz	Alarms	10 mW e.r.p.	< 1%	25 kHz	EN 300 220	
869.400-869.650 MHz	Non-specific SRDs	≤ 500 mW e.r.p.	≤ 10% or LBT+AFA (note 1)	25 kHz (for 1 or more channels)	EN 300 220	Narrow / wide-band modulation The whole stated frequency band may be used as 1 channel for high-speed data transmission
869.65-869.7 MHz	Alarms	25 mW e.r.p.	< 10%	25 kHz	EN 300 220	
869.700-870.000 MHz	Non-specific SRDs	≤ 5 mW e.r.p.	No requirement	No spacing (for 1 or more channels)	EN 300 220	Narrow / wide-band modulation. No channel spacing, however, the whole stated frequency band may be used (Note 5)
		≤ 25 mW e.r.p.	up to 1% or LBT+AFA (note 1)			
870-874.4 MHz	Tracking, Tracing and Data Acquisition	500 mW e.r.p.	Adaptive Power Control (APC) required for spectrum sharing (note 1) and the following duty cycle restrictions	≤ 200 kHz		

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
			also apply: ≤ 10% the duty cycle for network access points; ≤ 2.5% duty cycle otherwise			
	Non-specific SRDs.	25 mW e.r.p.	≤ 1% duty cycle. For ER-GSM protection (873-876 MHz, where applicable): the duty cycle is limited to ≤ 0.01% and to a maximum transmit on time of 5ms/1s	≤ 600 kHz		
2 446-2 454 MHz	RFID	≤ 500 mW e.i.r.p.	None	None	EN 300 440	2 400-2 500 is an ISM band (RR No. **5.150**) (Note 12)
2 446-2 454 MHz		> 500 mW – 4 We.i.r.p.	≤ 15% FHSS techniques should be used	None	EN 300 440	2 400-2 500 is an ISM band (RR No. **5.150**) Power levels above 500 mW are restricted to be used inside the boundaries of a building and the duty cycle of all transmissions shall, in this case, be ≤15 % in any 200 ms period (30 ms on /170 ms off). (Note 12)

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
2 400-2 483.5 MHz	Non-specific SRDs	10 mW e.i.r.p.	None	None	EN 300 440	2 400-2 500 is a ISM band (RR No. **5.150**)
	Wideband Data Transmission systems (WAS/RLANs)	100 mW e.i.r.p.	See Rec 70-03 note 1 (p9)	None	EN 300 328	2 400-2 500 is an ISM band (RR No. **5.150**) ERC/DEC/(01)07
	Radiodetermination	25 mW e.i.r.p.	None	None	EN 300 440	2 400-2 500 is a ISM band (RR No. **5.150**) ERC/DEC/(01)08
2483.5-2500 MHz	Active Medical Implants	10 dBm e.i.r.p.	LBT+AFA and ≤ 10% duty cycle. The equipment shall implement a spectrum access mechanism as described in the applicable harmonised standard or an equivalent spectrum access mechanism	1 MHz		For Low Power Active Medical Implants and associated peripherals, covered by the applicable harmonised standard. Individual transmitters may combine adjacent channels on a dynamic basis for increased bandwidth higher than 1 MHz. Peripheral units are for indoor use only.

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
5 150-5 350 MHz	Wideband Data Transmission systems (WAS/RLANs)	200 mW mean e.i.r.p. See note 4, p9	See notes 1 and 3 (p9)	None	EN 301 893	ECC/DEC/(04)08 Restricted to indoor use. The maximum mean e.i.r.p. density shall be limited to 10 mW/MHz in any 1 MHz band For RLANs Resolution 229 (WRC-19) applies.
5 470-5 725 MHz	Wideband Data Transmission systems (WAS/RLANs)	250 mWe.r.p	See notes 1 and 3 (p9)	None	EN 301 893	ECC/DEC/(04)08 Indoor as well as outdoor use allowed. The maximum mean e.i.r.p. density shall be limited to 50 mW/MHz in any 1 MHz band
5 725-5 875 MHz	Wideband data transmission BFWA is limited to 5725 - 5850 MHz (to protect satellite)	PTP/PTMP: max mean e.i.r.p = 4 W Mesh/AP-MP: max mean e.i.r.p = 2 W			EN 302 502	ISM band (RR No. **5.150**) One of the main bands for wideband data transmission and BFWA (incl. Wi-Fi in laptops, cell phones, etc.) ECC/REC(06)04 refers
5725-5875 MHz	Tracking, Tracing and Data Acquisition	400 mW e.i.r.p. Adaptive Power Control (APC) required	Adequate spectrum sharing mechanisms (e.g. DFS and DAA) shall be implemented	≥ 1 MHz and ≤ 20 MHz		
5 725-5 875 MHz	Non-specific SRDs	25 mW e.i.r.p.	None	None	EN 300 440	

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
5 795-5 805 MHz	RTTT	2 W e.i.r.p. 8 W e.i.r.p.	None	None	EN 300 674	ECC/DEC/(02)01 Note 10
5 805-5 815 MHz			None	None	EN 300 674	ECC/DEC/(02)01 For this band, an individual licence is required in the EU Note 10
24.00-24.25 GHz	Non-specific SRDs	100 mW e.i.r.p.	None	None	EN 300 440	ISM band (RR No. **5.150**)
	Radiodetermination	100 mW e.i.r.p.	None	None	EN 300 440	
	RTTT (24.05-24.075 GHz)	100 mW e.i.r.p.	None		EN 300 440	For vehicle radars
	RTTT(24.075-24.15 GHz)	0.1mW e.i.r.p.	None		EN 300 440	For vehicle radars
24.15-24.25 GHz	RTTT	100 mW e.i.r.p.	None)		EN 300 440	For vehicle radars. The spectrum access and mitigation requirement are given for devices mounted behind a bumper. If mounted without a bumper, the requirement should be 3μs/40kHz maximum dwell time every 3ms
		100 mW e.i.r.p.	≤ 1ms/40kHz dwell time every 40ms (note 1)		EN 300 440	The spectrum access and mitigation requirement is given for devices mounted either behind a bumper or mounted without a bumper
			None		EN 300 440	For vehicle radars

Frequency band	Typical Applications[11]	Maximum power or magnetic field strength	Duty Cycle restriction	Prescribed Channel Spacing	Harmonised Standard[12]	Notes (Additional information)
57-64 GHz	Non-Specific SRDs	100 mW e.i.r.p. 10 mW output power	None			
61.0-61.5 GHz	Non-specific SRDs	100 mW e.i.r.p.	None	None		ISM band (RR No. **5.138**)
76-77 GHz	RTTT	55 dBm peak e.i.r.p.	None	None	EN 301 091	ECC/DEC/(02)01 Power level 55 dBm peak power e.i.r.p. 50 dBm average power - 23.5 dBm average power for pulse radar only Vehicle and infrastructure radar systems
77-81 GHz	Automotive Short-Range Radars				EN 302 264	
122-122.25 GHz	Non-Specific SRDs	10 dBm/250MHz e.i.r.p. -48 dBm/MHz at >30° elevation	None	None		
122.25-123 GHz	Non-Specific SRDs	100 mW e.i.r.p.	None	None		
244-246 GHz	Non-Specific SRDs	100 mW e.i.r.p.	None	None		

7. Footnotes

7.1. **Note 1:** When either duty cycle, Listen-Before-Talk (LBT) or equivalent technique applies then it shall not be user-dependent/adjustable and shall be guaranteed by appropriate technical means. For LBT devices without Adaptive Frequency Agility (AFA), or equivalent techniques, the duty cycle limit applies. For any type of frequency-agile device, the duty cycle limit applies to the total transmission unless LBT or equivalent technique is used.

7.2. **Note 2:** Audio and video applications are allowed provided that a digital modulation method is used with a maximum bandwidth of 300 kHz. Analogue and digital voice applications are allowed with a maximum bandwidth of ≤ 25 kHz.

7.3. **Note 3:** The preferred channel spacing is 100 kHz allowing for a subdivision into 50 kHz or 25 kHz.

7.4. **Note 4:** Sub-bands for alarms are excluded (see ERC/REC 70-03 Annex 7).

7.5. **Note 5:** Audio and video applications are excluded. Analogue or digital voice applications are allowed with a maximum bandwidth ≤ 25 kHz and with spectrum access technique such as LBT or equivalent. The transmitter shall include a power output sensor controlling the transmitter to a maximum transmit period of 1 minute for each transmission.

7.6. **Note 6:** Duty cycle may be increased to 1% if the band is limited to 865-868 MHz.

7.7. **Note 7:** For other wide-band modulation than FHSS and DSSS with a bandwidth of 200 kHz to 3 MHz, duty cycle can be increased to 1% if the band is limited to 865-868 MHz and power to ≤10 mW e.r.p.

7.8. **Note 8:** The power density can be increased to +6.2 dBm/100 kHz and -0.8 dBm/100 kHz, if the band of operation is limited to 865-868 MHz and 865-870 MHz respectively.

7.9. **Note 9:** Certain channels may be occupied by RFID operating at higher powers (See Annex 11 for further details). To minimise the risk of interference from RFID, SRDs should use LBT with AFA or observe suitable separation distances. (In the high power RFID channels typically these may vary from 918 m (indoor) to 3.6 km (rural outdoor). In the remaining 2.2 MHz, where tags at -20 dBm e.r.p. occupy the spectrum, this may vary from 24 m (indoor) to 58 m (rural outdoor)). The adjacent frequency bands below

862 MHz and above 870 MHz may be used by high power systems. Manufacturers should take this into account in the design of equipment and choice of power levels.

7.10. **Note 10:** The frequency band 5795-5805 MHz is intended for road to vehicle systems, particularly (but not exclusively) road toll systems. The frequency bands 5795-5805 MHz and 5805-5815 MHz are recommended for 5 MHz channel spacing systems with the frequencies: 5797.5 MHz, 5802.5 MHz, 5807.5 MHz and 5812.5 MHz. For 10 MHz channel spacing systems 5800 MHz and 5810 MHz. 5805 - 5815 MHz on a national basis for multi-lane road junctions, particularly, but not exclusively road toll systems. The use of 8 W e.i.r.p. allows for 1 Mbit/s in accordance with ETSI standard ES 200 674-1. 2W e.i.r.p. allows for 500 kbit/s downlink and 250 kbit/s uplink in accordance with EN 300 674-1 and for low data rates (31 kbit/s) in accordance with EN 300 674-2.

7.11. **Note 11:** RFIDs operating in the frequency sub-band 119-135 kHz shall meet the spectrum mask given in EN 300 330. This will permit a simultaneous use of the various sub-bands within the range 90 – 148.5 kHz.

7.12. **Note 12:** To assist enforcement authorities any emissions due to the RFID device when measured outside of the building at a distance of 10 metres shall not exceed the equivalent field strength for a 500 mW RFID device mounted outside the building when measured at the same distance. Where a building

consists of a number of premises, such as shops within a shopping arcade or Mall then the measurements shall be referenced to the boundary of the user's premises within the building. In addition, antenna beamwidth limits shall be observed as described in the standard EN 300 440. In addition, for an RFID device which can exceed 500 mW, the device should be fitted with an automatic power control to reduce the radiated power below 500 mW; this automatic power control shall guarantee the reduction of the power to a maximum of 500 mW in cases where the device is moved and used outside the boundary of the user's building or premises as described above.

7.13. **Note 13:** Channel centre frequencies are 864.9 MHz + (0.2 MHz * channel number). The available channel numbers for each sub-band are:

a) Band 865.0-865.6 MHz – channel numbers 1 to 3
b) Band 865.6-867.6 MHz – channel numbers 4 to 13
c) Band 867.6-868.0 MHz – channel numbers 14 to 15

7.13.1. The same equipment is allowed to operate in several sub-bands. Frequency hopping or other spread spectrum techniques shall not be used.

7.13.2. In Tanzania spectrum above 869 MHz is used for CDMA-2000 and is not available for SRDs.

8. ANNEXURE B: DEFINITIONS

8.1. This annexure contains definitions of various SRD devices and is taken mostly from ITU-R Report SM.2153.

8.2. **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.

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

8.4. **General alarms:** The use of radiocommunication for indicating an alarm condition at a distant location.

8.5. **Inductive applications:** Inductive loop systems are communication systems based on magnetic fields generally at low RF frequencies. 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.

8.6. **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.

8.7. **Non-specific SRDs:** Non-specific SRDs are generally used for telemetry, telecommand, alarms and other similar applications. Radiodetermination applications: SRD radiodetermination applications including SRD radar systems, equipment for detecting movement and alert. Radiodetermination is defined as 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.

8.8. **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.

8.9. **RFID system:** An RFID system is an automatic identification and data capture system comprising one or more RFID readers (interrogators) and one or more RFID tags (transponders) in which data transfer is achieved by means of suitably modulated inductive or radiating electromagnetic energy. A tag is attached to the item to be identified, and a transmitter/receiver unit interrogates the tag and receives identification data back from the tag. RFID devices are considered active if they are self-powered (i.e. they contain their own batteries and are always on) and passive if they receive power from an external source (i.e. radio frequencies transmitted by readers).

8.10. **RFID tag:** An RFID tag is any transponder plus the information storage mechanism attached to the object.

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).

8.11. **Road transport and traffic telematics (RTTT)[14]:** 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.

8.12. **Short-range devices:** 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.

8.13. **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

[14] RTTT is also referred to as dedicated short-range communications for transport information and control systems (TICSs).

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.

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

8.15. **Telemetry:** The use of radiocommunication for indicating or recording data at a distance.

8.16. **Voice and video**: In connection with SRDs, voice covers applications like walkie-talkie, baby monitoring and similar use.

8.17. **Ultra low power active medical implant (ULP-AMI):** The 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. 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.

8.18. **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.

9. ANNEXURE C: ETSI STANDARDS[15]

9.1. **EN 300 220:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 3: Harmonised EN covering essential requirements under article 3.2 of the R&TTE Directive.

9.2. **EN 300 330:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonised EN under article 3.2 of the R&TTE Directive.

9.3. **EN 300 440:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonised EN under article 3.2 of the R&TTE Directive.

9.4. **EN 300 328:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonised EN covering essential requirements under article 3.2 of the R&TTE Directive

[15] The list of ETSI standards are complete according to ERC/REC 70-03; the unused standards will be deleted once agreed at workshop (additional SRDs could be added)

9.5. **EN 300 674:** Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5.8 GHz Industrial, Scientific and Medical (ISM) band.

9.6. **EN 301 091:** Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for radar equipment operating in the 76 GHz to 77 GHz band.

9.7. **EN 301 357:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Analogue cordless wideband audio devices using integral antennas operating in the CEPT recommended 863 MHz to 865 MHz frequency range; Part 2: Harmonised EN under article 3.2 of the R&TTE Directive.

9.8. **EN 301 839:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio equipment in the frequency range 402 MHz to 405 MHz for Ultra Low Power Active Medical Implants and Accessories; Part 2: Harmonised EN covering essential requirements of article 3.2 of the R&TTE Directive.

9.9. **EN 301 893:** Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Harmonised EN covering essential requirements of article 3.2 of the R&TTE Directive.

9.10. **EN 302 195:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio equipment in the frequency range 9 kHz to 315 kHz for Ultra Low Power Active Medical Implants (ULP-AMI) and accessories; Part 1: Technical characteristics and test methods

9.11. **EN 302 208:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W; Part 2: Harmonised EN under article 3.2 of the R&TTE Directive.

9.12. **EN 302 291:** Close Range Inductive Data Communication equipment operating at 13.56 MHz; Part 2: Harmonised EN under article 3.2 of the R&TTE Directive.

9.13. **EN 302 372:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Equipment for Detection and Movement; Tanks Level Probing Radar (TLPR) operating in the frequency bands 5.8 GHz, 10 GHz, 25 GHz, 61 GHz and 77 GHz.

9.14. **EN 302 537:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Ultra Low Power Medical Data Service Systems operating in the frequency range 401 MHz to 402 MHz and 405 MHz to 406 MHz.

9.15. **ES 200 674:** Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 1: Technical characteristics and test methods for High Data

Rate (HDR) data transmission equipment operating in the 5.8 GHz Industrial, Scientific and Medical (ISM) band

---END ---