ETSI EN 302 208 V3.3.1 (2020-08)

Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W and in the band 915 MHz to 921 MHz with power levels up to 4 W; Harmonised Standard for access to radio spectrum

Reference
REN/ERM-TG34-265

Keywords
harmonised standard, ID, radio, RFID, SRD

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.10] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.3].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

The present document replaces all previous versions of ETSI EN 302 208.

National transposition dates	
Date of adoption of this EN:	4 August 2020
Date of latest announcement of this EN (doa):	30 November 2020
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 2021
Date of withdrawal of any conflicting National Standard (dow):	31 May 2022

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies technical characteristics and methods of measurements for Radio Frequency Identification (RFID) devices used in the frequency ranges 865 MHz to 868 MHz and 915 MHz to 921 MHz.

Power limits up to a maximum of 2 W e.r.p. are specified for this equipment in the frequency band 865 MHz to 868 MHz and up to a maximum of 4 W e.r.p. in the frequency band 915 MHz to 921 MHz.

NOTE 1: The term frequency band is typically used for reference to dedicated bands as described in CEPT/ERC/REC 70-03 [i.9], while frequency range is used in the other cases.

The frequency usage conditions for RFID are EU wide harmonised in the band 865 MHz to 868 MHz according to [i.15] and in the band 915 MHz to 921 MHz according to [i.14]. According to [i.14] EU member states are requested to implement 3 channels only in the 915 MHz to 921 MHz band.

It should be noted that the frequency band 915 MHz to 921 MHz has only a limited implementation status within the European Union and the CEPT countries. CEPT/ERC/REC 70-03 [i.9] provides in appendix 1 an overview of countries where the band is implemented.

The present document applies to RFID interrogators and tags operating together as a system. For each specified band, multiple high power channels are made available for use by interrogators. The tags respond with a modulated signal preferably in the adjacent low power channels. Interrogators may be used with either integral or external antennas.

The types of equipment covered by the present document are as follows:

- fixed interrogators;
- portable interrogators;
- batteryless tags;
- battery assisted tags;
- battery powered tags.

These types of radio equipment are capable of operating in the frequency ranges given in table 1 and table 2.

The present document contains requirements to demonstrate that the specified radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

NOTE 2: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.3] is given in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] Void.

[2] IEEE/ANSI C63.5-2017: "American National Standard for Electromagnetic Compatibility--Radiated Emission Measurements in Electromagnetic Interference (EMI) Control--Calibration and Qualification of Antennas (9 kHz to 40 GHz)".

[3] Void.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Void.

[i.2] Void.

[i.3] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.4] IEC 60489-3 Appendix J Second edition (1988): "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions" (pages 156 to 164).

[i.5] Void.

[i.6] Void.

[i.7] Void.

[i.8] Void.

[i.9] CEPT/ERC/REC 70-03: "Short Range Devices (SRD)".

[i.10] Commission implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

[i.11] Void.

[i.12] Void.

[i.13] ETSI TR 102 273 (all parts) (V1.2.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

[i.14] Commission implementing Decision (EU) 2018/1538 of 11 October 2018 on the harmonisation of radio spectrum for use by short-range devices within the 874-876 and 915-921 MHz frequency bands.

[i.15] Commission implementing Decision (EU) 2017/1483 of 8 August 2017 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing Decision 2006/804/EC.

[i.16] ERC Recommendation 74-01: "Unwanted emissions in the spurious domain", Approved 1998 amended 29 May 2019.

[i.17] ISO/IEC 18046-2: "Information technology - Radio frequency identification device performance test methods - Part 2: Test methods for interrogator performance".

[i.18] ISO/IEC 18046-3: Information technology - Radio frequency identification device performance test methods - Part 3: Test methods for tag performance".

[i.19] ETSI EG 203 336: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".

[i.20] ISO/IEC 18000-63: "Information technology - Radio frequency identification for item management - Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

adaptive frequency agility: technique that allows an interrogator to change its frequency of operation automatically from one channel to another

battery assisted tag: transponder that includes a battery to enhance its receive performance and power its internal circuitry

batteryless tag: transponder that derives all of the power necessary for its operation from the field generated by an interrogator

battery powered tag: transponder that uses the power from its battery to perform all of its operational functions

conducted measurements: measurements which are made using a direct 50 Ω connection to the equipment under test

dedicated antenna: removable antenna supplied and type tested with the radio equipment, designed as an indispensable part of the equipment

dense interrogator mode: RFID operating mode in which multiple interrogators can transmit simultaneously in the same channel while tags respond in the adjacent channels

designated frequency band: frequency band within which the emission by a device is authorized

effective radiated power: product of the power supplied to the antenna and its gain relative to a half wave dipole in the direction of maximum gain

ER-GSM: extended band of 918 MHz to 921 MHz used by the railways

external antenna: antenna that may be connected to an interrogator via its external connector

Full Tests (FT): all tests specified in the present document

global scroll: test mode in which an interrogator is able to read the same tag continuously

integral antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

interrogator: equipment that will activate an adjacent tag and read its data

NOTE: It may also enter or modify the information in a tag.

Limited Tests (LT): Tests that include:

- transmitter frequency error and frequency stability under low voltage conditions for mains operated equipment, see clause 4.3.1 of the present document;
- transmitter frequency stability under low voltage conditions, see clause 4.3.2 of the present document;
- transmitter effective radiated power, see clause 4.3.3 of the present document.

lower band: frequency range 865,0 MHz to 868,0 MHz designated for use by RFID

manufacturer: As given in article 2 of Directive 2014/53/EU [i.3].

radiated measurements: measurements which involve the absolute measurement of a radiated field

R-GSM: interoperable band of 921 MHz to 960 MHz used by the railways

tag: transponder that holds data and responds to an interrogation signal

talk mode: transmission of intentional radiation by an interrogator

upper band: frequency range 915,0 MHz to 921,0 MHz designated for use by RFID

3.2 Symbols

For the purposes of the present document, the following symbols apply:

C_L	Total cable loss in dB
dB	decibel
d	distance
f	frequency measured under normal test conditions
fc	centre frequency of carrier transmitted by interrogator
fe	the maximum frequency error as measured in clause 5.5.2
G_{IC}	Gain of a circular antenna in dBic
G_{MR}	Gain Measurement Receiver
Ω	Ohms
P_C	Power Carrier
P_{MR}	Signal strength received at the measurement receiver
λ	wavelength

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AM	Amplitude Modulation
ANSI	American National Standards Institute
BER	Bit Error Ratio
BW	Bandwidth
CEPT	European Conference of Postal and Telecommunications administrations
e.r.p.	effective radiated power
EFTA	European Free Trade Association
EMC	ElectroMagnetic Compatibility
emf	electromotive force
ERC	European Radio communication Committee
ER-GSM	Extended Railways GSM
EUT	Equipment Under Test
FT	Full Tests
GSM	Global System for Mobile
LT	Limited Tests
OATS	Open Area Test Site
ppm	part per million
RBW	Resolution Bandwidth
RF	Radio Frequency
RFID	Radio Frequency Identification
R-GSM	Railway GSM
RMS	Root Mean Square
S_{ACH}	Selectivity Adjacent Channel
SBL	Signal Blocking Level
SRD	Short Range Device

TX	Transmitter
UHF	Ultra High Frequency
VSWR	Voltage Standing Wave Ratio

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 General requirements

4.2.1 Conformance requirements

Interrogators shall transmit only in the high power channels specified in clause 4.2.2 for the purpose of communicating with tags at power levels up to the limits specified in clause 4.3.3.3.

When operating in the lower band, 865 MHz to 868 MHz, an interrogator may transmit a continuous signal on any of the high power channels for a period not exceeding the limit defined in clause 4.3.7.3. At the end of the transmission the interrogator shall not transmit again on the same channel for the period defined in figure 7 of clause 4.3.7.3. Alternatively the interrogator may switch immediately to any one of the other high power channels and send a further continuous transmission in accordance with the requirements of clause 4.3.7.3. There is no limit to the number of times that this process may be repeated.

For the lower band interrogators shall support trigger techniques that indicate the presence or arrival of objects that may be tagged. Irrespective of the application, an interrogator operating in the lower band shall stop transmitting after it has ceased to read any further tags, as specified in clause 4.3.7.3.

For operation in the upper band, 915 MHz to 921 MHz, interrogators shall transmit on any of the high power channels but for no longer than is necessary to complete the intended operation.

NOTE 1: The frequency band 915 MHz to 921 MHz has only a limited implementation status within the European Union and the CEPT countries. CEPT/ERC/REC 70-03 [i.9] provides in appendix 1 an overview of countries where the band is implemented.

NOTE 2: According [i.14] EU member states are requested to implement 3 channels only in the 915 MHz to 921 MHz band.

In some CEPT countries the upper sub-band 918 MHz to 921 MHz or parts thereof is allocated to the railways for ER-GSM.

In some CEPT countries parts of the upper band are allocated for the exclusive use of the military and government services. This applies predominantly to the lower sub-band 915 MHz to 918 MHz.

Interrogators capable of operating in the band 915 MHz to 921 MHz shall provide a means to prevent operation at the restricted frequencies in the applicable member states.

Where an interrogator is only able to transmit on a single band, testing shall be performed in the applicable band.

In a preferred method of operation tags, which are activated by an interrogator transmitting in a high power channel, respond in the adjacent low power channels. This technique is called the dense interrogator mode. It has the benefit of separating the frequencies of transmission of the interrogators and tags, allowing multiple interrogators to share the same channel thereby improving system performance. It also minimizes the generation of inter-modulation products, which may disrupt the behaviour of tags.