Report on the FCC and IC Testing of the ABS Protection GmbH Avalance Airbag Electronic. Model: ABS P.ride In accordance with FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS-GEN

Prepared for: ABS Protection GmbH
Gundelindenstraße 2
80805 München / Munich
Germany

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Martin Steindl	2020-02-25	Steindl Martin SIGN-ID 332466
Authorised Signatory	Matthias Stumpe	2020-02-25	Stumpe SIGN-ID 332489

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT
The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C and ISED RSS-247 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Martin Steindl	2020-02-25	Steindl Martin SIGN-ID 332467

Laboratory Accreditation	Laboratory recognition	ISED test site registration
DAkkS Reg. No. D-PL-11321-11-02 DAkkS Reg. No. D-PL-11321-11-03	Registration No. BNetzA-CAB-16/21-15	3050A-2

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C:2019, ISED RSS-247 Issue 2 (2017-02) and ISED RSS-GEN Issue 5, Amendment 1 (2019-03).

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Information pursuant to Section 2(1)
DL-InfoV (Germany) at
www.tuev-sued.com/imprint

Dr. Peter Havel (CEO)
Dr. Jens Butenandt

Fax: +49 (0) 9421 55 22-99
www.tuev-sued.de

Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2018-04-10
2	Added FCC-ID and IC-ID, changed Industry Canada to ISED. (*Li.An.*)	2019-08-06
3	Changed applicant from “ABS Protection GmbH” to “ABS Protection GmbH” and update IC-identifier and address accordingly.	2019-11-20
4	Added plots for 99 % bandwidth and RF exposure Extracted plots and photos in to two separate annexes.	2020-02-25

Table 1

1.2 Introduction

Applicant	ABS Protection GmbH
Manufacturer	ABS Protection GmbH
Model Number(s)	ABS P.ride
Serial Number(s)	310-801p10-4 BLE
Hardware Version(s)	N/A
Software Version(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C:2019, ISED RSS-247 Issue 2 (2017-02) and ISED RSS-GEN:2016 and Issue 5 Amendment 1 (2019-03)
Test Plan/Issue/Date	
Order Number Date	2017-12-08
Date of Receipt of EUT	
Start of Test	2018-01-30
Finish of Test	2018-04-10
Name of Engineer(s)	Martin Steindl
Related Document(s)	ANSI C63.10 (2013) KDB 662911 D01 v02r02

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED RSS-247 and ISED RSS-GEN is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Stand alone Transmitting continuously				
2.1	15.207, N/A and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.2	15.247 (b), 5.4 and 6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.3	15.247 (e), 5.2 and 6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.4	15.247 (a)(2), 5.2 and 6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.5	15.247 (d), 5.5 and N/A	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.205 N/A and 8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.7	15.247 (d), 15.205, 5.5 and 6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)

Table 2

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1.4 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: 310-801p10-4 BLE			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.5 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

Test Name	Name of Engineer(s)
Configuration and Mode: Stand alone Transmitting continuously	
AC Power Line Conducted Emissions	Martin Steindl
Maximum Conducted Output Power	Martin Steindl
Power Spectral Density	Martin Steindl
Emission Bandwidth	Martin Steindl
Authorised Band Edges	Martin Steindl
Restricted Band Edges	Martin Steindl
Spurious Radiated Emissions	Martin Steindl

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany

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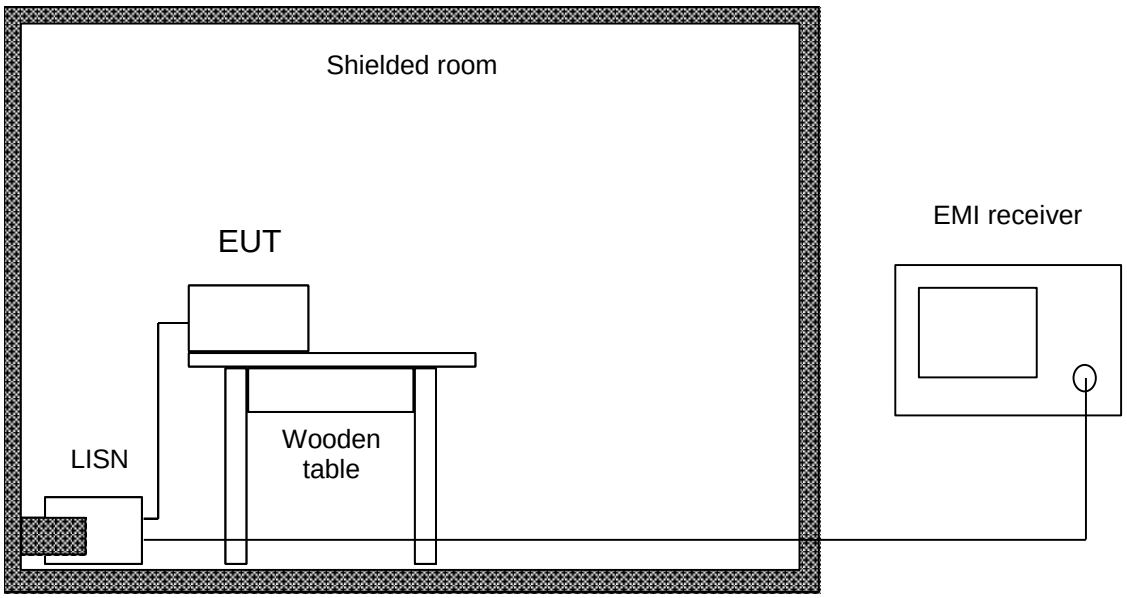
1.6 Measurement procedures

1.6.1 s



Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak.
If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.

According to ANSI C63.10, section 6.2.5, testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended.
Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.

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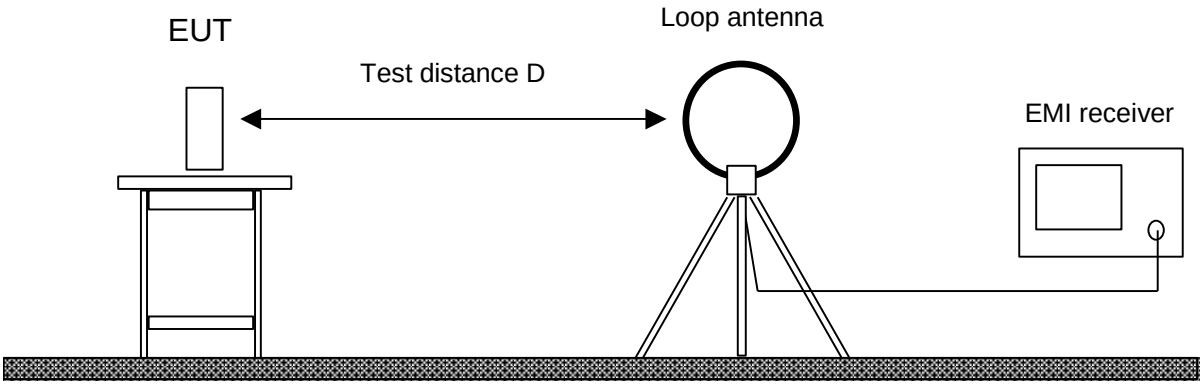
1.6.2 Radiated emissions 9 kHz – 30 MHz



Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.
If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

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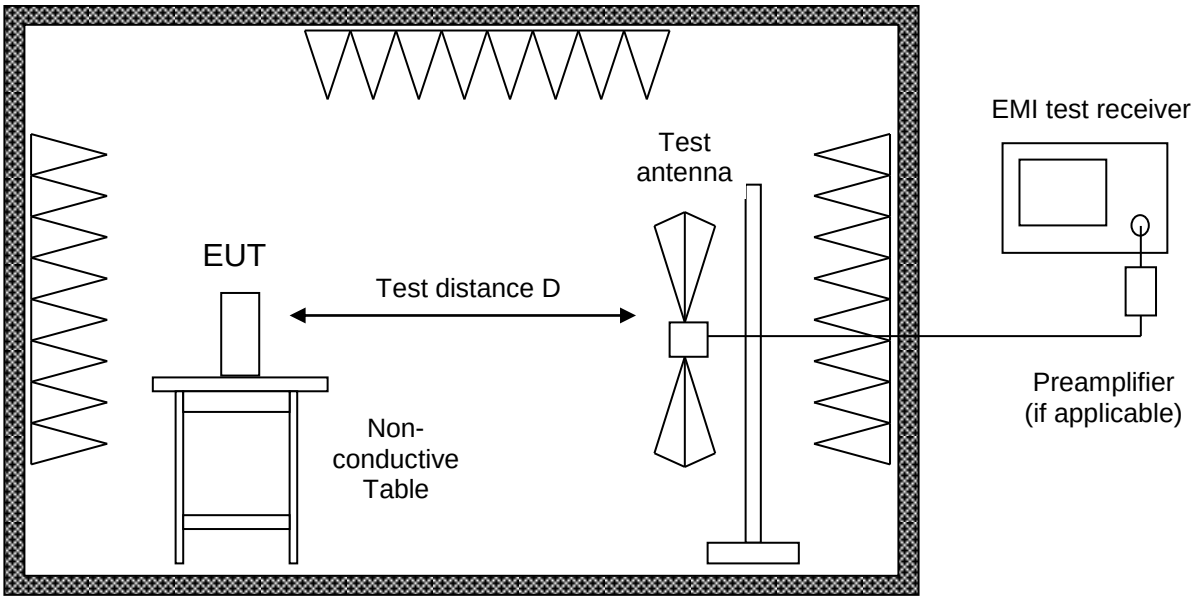
1.6.3 Radiated emissions on alternative test site 30 MHz to 1 GHz



Alternate test site (semi anechoic room)

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 respectively ANSI C63.10 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

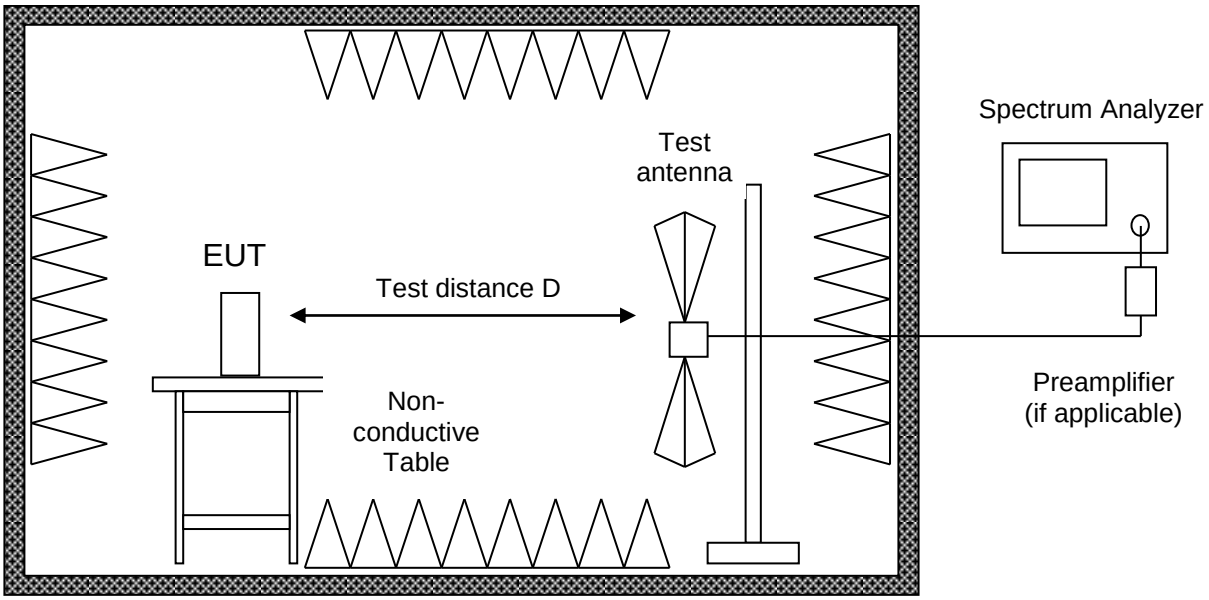
In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall

Product Service

be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.

1.6.4 Radiated emissions in fully anechoic room (above 1 GHz



Fully or semi anechoic room

Radiated emission in fully or semi anechoic room is measured in the frequency range from 1 GHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33. According to ANSI C63.10 for tests above 1 GHz the table height is 1.5 m.

Measurements are made in both the horizontal and vertical planes of polarization using a test receiver with the detector function set to peak and average and resolution set to 1 MHz (above 1 GHz).

All tests below 13 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

Product Service

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, §15.207;
ISED RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.1.3 Date of Test

2018-02-16

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

2.1.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

Product Service

2.1.6 Test Results

Stand alone Transmitting continuously

Applied supply Voltage: 60 Hz
Applied supply frequency: 120 Vac

See Annex A.1 for test plots

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.269250	36.36	---	61.14	24.78	1000.0	9.000	0.0
0.411000	33.65	---	57.63	23.98	1000.0	9.000	0.0
0.548250	32.85	---	56.00	23.15	1000.0	9.000	0.0
0.982500	30.37	---	56.00	25.63	1000.0	9.000	0.0
12.000750	38.72	---	60.00	21.28	1000.0	9.000	0.1
12.000750	---	21.33	50.00	28.67	1000.0	9.000	0.1
24.009000	15.85	---	60.00	44.15	1000.0	9.000	0.3
24.011250	---	7.18	50.00	42.82	1000.0	9.000	0.3

Table 5 - Live Line Emissions Results

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.269250	38.98	---	61.14	22.16	1000.0	9.000	0.0
0.404250	37.00	---	57.77	20.77	1000.0	9.000	0.0
0.982500	35.52	---	56.00	20.48	1000.0	9.000	0.0
3.999750	---	29.16	46.00	16.84	1000.0	9.000	0.3
3.999750	45.05	---	56.00	10.95	1000.0	9.000	0.3
20.006250	---	14.13	50.00	35.87	1000.0	9.000	0.2
20.008500	39.65	---	60.00	20.35	1000.0	9.000	0.2

Table 6 - Neutral Line Emissions Results

FCC 47 CFR Part 15, Limit Clause 15.207 and ISED RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 7

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 9.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
ESU8	Rohde & Schwarz	100232	19904	12	2018-12
ESH3-Z5	Rohde & Schwarz	862770/021	108920	36	2020-06

Table 8

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.2 Maximum Conducted Output Power

2.2.1 Specification Reference

FCC 47 CFR Part 15C, §15.357(b);
ISED RSS-247, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.2.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.2.3 Date of Test

2018-04-10

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.9.1.1. as equivalent radiated power
Test was performed on EUT position with maximum emission.

2.2.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

2.2.6 Test Results

Stand alone Transmitting continuously

See Annex A.2 for test plots

Frequency (MHz)	dBm (e.i.r.p.)	mW (e.i.r.p.)
2402	-28.5	1.41 µW
2441	-29.9	1.02 µW
2480	-29.2	1.20 µW

Table 9

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

ISED RSS-247, Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

Product Service

2.2.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
ESW26	Rohde & Schwarz	101315	28268	12	2018-06
HF907	Rohde & Schwarz	100154	19933	24	2019-06

Table 10

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.3 Power Spectral Density

2.3.1 Specification Reference

FCC 47 CFR Part 15C, §15.247 (e)
ISED RSS-247, Clause 5.2 and
ISED RSS-GEN, Clause 6.12

2.3.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.3.3 Date of Test

2018-04-10

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.2.

2.3.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

2.3.6 Test Results

Stand alone Transmitting continuously

Modulation/Packet Type: GFSK/DH1

See Annex A.3 for plots

Frequency (MHz)	Power Spectral Density (dBm)
2441 MHz	-35.4 dBm
2480 MHz	-29.7 dBm
2402 MHz	-38.6 dBm

Table 11

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Product Service

2.3.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
FSP30	Rohde & Schwarz	100063	19533	12	2018-08
VULB9162	Schwarzbeck	1962-048	19669	36	2020-10

Table 12

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.4 Emission Bandwidth

2.4.1 Specification Reference

FCC 47 CFR Part 15C, §15.247 (a)(2)
ISED RSS-247 Clause 5.2 and
ISED RSS-GEN, Clause 6.7

2.4.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.4.3 Date of Test

2018-04-10

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.8.2.

2.4.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

2.4.6 Test Results

Stand alone Transmitting continuously

Modulation/Packet Type: GFSK/DH1

For plots see Annex A.4

Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
2402 MHz	0.527	1.84
2441 MHz	0.570	1.88
2480 MHz	0.607	1.92

Table 13 - Bandwidths

FCC 47 CFR Part 15, Limit Clause 15.247(a)(2) and ISED RSS-247, Clause 5.2(a)

The minimum 6 dB Bandwidth shall be at least 500 kHz.

Product Service

2.4.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
FSP30	Rohde & Schwarz	100063	19533	12	2018-08
VULB9162	Schwarzbeck	1962-048	19669	36	2020-10

Table 14

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.5 Authorised Band Edges

2.5.1 Specification Reference

FCC 47 CFR Part 15C, §15.247 (d)
ISED RSS-247, Clause 5.5

2.5.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.5.3 Date of Test

2018-04-10

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

2.5.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

2.5.6 Test Results

Stand alone Transmitting continuously

See Annex A.5 for plots

Modulation	Frequency (MHz)	Measured Frequency (MHz)	Peak Level (dBµV/m)
GFSK	2402 MHz	2400.0	-36.7
GFSK	2480	2483.5	-24.1

Table 15

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Product Service

2.5.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
FSP30	Rohde & Schwarz	100063	19533	12	2018-08
VULB9162	Schwarzbeck	1962-048	19669	36	2020-10

Table 16

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.6 Restricted Band Edges

2.6.1 Specification Reference

FCC 47 CFR Part 15C, § 15.205
ISED RSS-GEN, Clause 8.10

2.6.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.6.3 Date of Test

2018-04-10

2.6.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3. These are shown for information purposes and were used to determine the worst case measurement point. Final average measurements were then taken in accordance with ANSI C63.10 clause 4.1.4.2.2. to obtain the measurement result recorded in the test results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.6.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

Product Service

2.6.6 Test Results

Stand alone Transmitting continuously

See plots in Annex A.6 for details

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 17

ISED RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

Table 18

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.6.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
FSP30	Rohde & Schwarz	100063	19533	12	2018-08
VULB9162	Schwarzbeck	1962-048	19669	36	2020-10

Table 19

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.7 Spurious Radiated Emissions

2.7.1 Specification Reference

FCC 47 CFR Part 15C, §15.247 (d), 15.205
ISED RSS-247, Clause 5.5 and
ISED RSS-GEN, Clause 6.13

2.7.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 BLE - Modification State 0

2.7.3 Date of Test

2018-01-30 to 2018-03-12

2.7.4 Test Method

Testing was performed in accordance with ANSI C63.10-2013 clause 6.3, 6.5 and 6.6.

Plots for average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.3 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (54/74 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.7.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

Product Service

2.7.6 Test Results

Stand alone Transmitting continuously

2402 MHz

Frequency (MHz)	Antenna Polarization	Detector	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.075	vertical	Quasi-Peak	27.9	53.3	25.4
44.060	vertical	Quasi-Peak	25.4	53.3	27.9
63.995	horizontal	Quasi-Peak	11.9	53.3	41.4
64.015	vertical	Quasi-Peak	27.9	53.3	25.4
68.090	horizontal	Quasi-Peak	11.1	53.3	42.2
72.000	vertical	Quasi-Peak	34.0	53.3	19.3
76.090	horizontal	Quasi-Peak	10.5	53.3	42.8
76.135	vertical	Quasi-Peak	36.6	53.3	16.7
80.000	horizontal	Quasi-Peak	40.6	53.3	12.7
80.010	vertical	Quasi-Peak	43.1	53.3	**10.2**
83.955	horizontal	Quasi-Peak	10.9	53.3	42.4
83.985	horizontal	Quasi-Peak	31.6	53.3	21.7
84.010	vertical	Quasi-Peak	33.1	53.3	20.3
87.990	vertical	Quasi-Peak	32.1	53.3	21.3
144.000	vertical	Quasi-Peak	37.2	53.3	16.1
144.010	horizontal	Quasi-Peak	40.5	53.3	12.8
156.000	horizontal	Quasi-Peak	36.2	53.3	17.2
182.010	horizontal	Quasi-Peak	35.0	53.3	18.3
858.000	horizontal	Quasi-Peak	36.6	53.3	16.7
910.015	horizontal	Quasi-Peak	25.6	53.3	27.7
962.000	vertical	Quasi-Peak	37.9	54.0	16.1
2402.000	vertical	Peak	67.9		
9762.925	vertical	Peak	49.9	63.5	13.6
10574.575	horizontal	Peak	48.3	63.5	15.2
12207.325	vertical	Peak	51.6	63.5	11.9
15193.000	vertical	Peak	53.2	63.5	10.3

See Annex A.7.1 for plots

Product Service

2441 MHz

Frequency (MHz)	Antenna Polarization	Detector	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.075	vertical	Quasi-Peak	27.9	52.5	24.5
44.060	vertical	Quasi-Peak	25.4	52.5	27.0
63.995	horizontal	Quasi-Peak	11.9	52.5	40.6
64.015	vertical	Quasi-Peak	27.9	52.5	24.6
68.090	horizontal	Quasi-Peak	11.1	52.5	41.4
72.000	vertical	Quasi-Peak	34.0	52.5	18.5
76.090	horizontal	Quasi-Peak	10.5	52.5	42.0
76.135	vertical	Quasi-Peak	36.6	52.5	15.8
80.000	horizontal	Quasi-Peak	40.6	52.5	11.9
80.010	vertical	Quasi-Peak	43.1	52.5	**9.3**
83.955	horizontal	Quasi-Peak	10.9	52.5	41.6
83.985	horizontal	Quasi-Peak	31.6	52.5	20.9
84.010	vertical	Quasi-Peak	33.1	52.5	19.4
87.990	vertical	Quasi-Peak	32.1	52.5	20.4
144.000	vertical	Quasi-Peak	37.2	52.5	15.3
144.010	horizontal	Quasi-Peak	40.5	52.5	12.0
156.000	horizontal	Quasi-Peak	36.2	52.5	16.3
182.010	horizontal	Quasi-Peak	35.0	52.5	17.5
858.000	horizontal	Quasi-Peak	36.6	52.5	15.8
910.015	horizontal	Quasi-Peak	25.6	52.5	26.9
962.000	vertical	Quasi-Peak	37.9	54.0	16.1
2441.000	horizontal	Peak	72.5		
9765.025	horizontal	Peak	48.4	63.5	15.1
9765.550	vertical	Peak	50.8	63.5	12.7
12204.175	horizontal	Peak	48.5	63.5	15.0
12204.700	vertical	Peak	49.5	63.5	14.0
12205.750	vertical	Peak	48.2	63.5	15.3

See Annex A.7.2 for plots

Product Service

2480 MHz

Frequency (MHz)	Antenna Polarization	Detector	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.075	vertical	Quasi-Peak	27.9	50.8	22.9
44.060	vertical	Quasi-Peak	25.4	50.8	25.4
63.995	horizontal	Quasi-Peak	11.9	50.8	38.9
64.015	vertical	Quasi-Peak	27.9	50.8	23.0
68.090	horizontal	Quasi-Peak	11.1	50.8	39.7
72.000	vertical	Quasi-Peak	34.0	50.8	16.8
76.090	horizontal	Quasi-Peak	10.5	50.8	40.3
76.135	vertical	Quasi-Peak	36.6	50.8	14.2
80.000	horizontal	Quasi-Peak	40.6	50.8	10.3
80.010	vertical	Quasi-Peak	43.1	50.8	**7.7**
83.955	horizontal	Quasi-Peak	10.9	50.8	39.9
83.985	horizontal	Quasi-Peak	31.6	50.8	19.2
84.010	vertical	Quasi-Peak	33.1	50.8	17.8
87.990	vertical	Quasi-Peak	32.1	50.8	18.8
144.000	vertical	Quasi-Peak	37.2	50.8	13.6
144.010	horizontal	Quasi-Peak	40.5	50.8	10.4
156.000	horizontal	Quasi-Peak	36.2	50.8	14.7
182.010	horizontal	Quasi-Peak	35.0	50.8	15.8
858.000	horizontal	Quasi-Peak	36.6	50.8	14.2
910.015	horizontal	Quasi-Peak	25.6	50.8	25.2
962.000	vertical	Quasi-Peak	37.9	54.0	16.1
2480.000	horizontal	Peak	70.8		
9919.900	vertical	Peak	48.3	63.5	15.2

See Annex A.7.3 for plots

Product Service

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Product Service

2.7.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
ESW26	Rohde & Schwarz	101315	28268	12	2018-06
HFH2-Z2	Rohde & Schwarz	882964/0001	18876	24	2018-07
VULB9163	Schwarzbeck	VULB9163-408	19918	24	2019-07
HF907	Rohde & Schwarz	100154	19933	24	2019-06
3160-09	EMCO	9403-1025	19125	N/A	N/A

Table 20

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable

Product Service

2.8 SAR Evaluation – Exemption Limits

2.8.1 Specification Reference

KDB 447498 D01 V06, section 4.3.1
ISED RSS-102 Issue 5, section 2.5.1

2.8.2 Equipment Under Test and Modification State

ABS P.ride, S/N: 310-801p10-4 FW490 - Modification State 0

2.8.3 Date of Test

2018-01-30 to 2018-03-12

2.8.4 Test Method

Test results are based on radiated emission test. For details on tests please refer to section 2.7 of this test report.

2.8.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	26.0 %

Product Service

2.8.6 Test Results

$$EIRP = \frac{(E \cdot D)^2}{30}$$

Frequency f:	2441 MHz
Maximum radiated emission E:	72.5 dBµV/m = 4.217 mV/m
Test distance D:	3 m
EIRP:	5.33 µW = 1 mW
Separation distance d:	≤ 5 mm
SAR test exclusion threshold:	0.3
Limit acc. to section 4.3.1 a)	< 3.5

KDB 447498 D01 V06, section 4.3.1

Unless specially required by the *published RF exposure KDB procedures,* standalone 1 g head or body and 10 g extremity SAR evaluation for general population conditions, be measurement or numerical simulation, is not required, when the corresponding *SAR Test Exclusion Threshold* condition(s), listed below, is (are) satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions. The minimum *test separation distance* defined in 4.1 f) is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirement, to any part of the body or extremity of a user or bystander. To qualify for SAR test exclusion, the *test separation distance* applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required *published RF exposure KDB procedures*. When no other RF exposure testing or reporting are required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for SAR test exclusion. When required, the device specific conditions described in the other *published RF exposure KDB procedures* must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops and tablets, etc.

a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1 g and 10 g SAR test exclusion thresholds are determined by the following: $\frac{P}{d}\sqrt{f} \leq 3.0$ for 1 g SAR, and ≤ 7.5 for 10 g extremity SAR, where
   - *f* is the RF channel transmit frequency in GHz
   - *P* is the power of the RF channel, including tune-up tolerance in mW, rounded to the nearest mW before calculation
   - *d* is the min. test separation distance in mm, rounded to the nearest mm before calculation
   - The test result is rounded to one decimal place for comparison

   The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.
b) For 100 MHz to 6 GHz and *test separation distances* > 50 mm: not applicable.
c) For frequencies below 100 MHz: not applicable.

Product Service

ISED RSS-102 Issue 5, section 2.5.1

$$EIRP = \frac{(E \cdot D)^2}{30}$$

Frequency f:	2441 MHz
Maximum radiated emission E:	72.5 dBµV/m = 4.217 mV/m
Test distance D:	3 m
EIRP:	5.33 µW
Separation distance d:	≤ 5 mm
Limit acc. ISED RSS-102:	< 4 mW

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table.

For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

Frequency (MHz)	Exemption limits (mW)[1] at separation distance of									
	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥50 mm
≤300 [2]	71	101	132	162	193	223	254	284	315	345
450	52	70	88	106	123	141	159	177	195	213
835	17	30	42	55	67	80	92	105	117	130
1900	7	10	18	34	60	99	153	225	316	431
2450	4	7	15	30	52	83	123	173	235	309
3500	2	6	16	32	55	86	124	170	225	290
5800	1	6	15	27	41	56	71	85	97	106

[1] The excemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separaton distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from alinear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from athird order polynomial fit.

[2] Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.

Product Service

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	±1.14 %	2
RF-Frequency error	1.96	±1 · 10-7	7
RF-Power, conducted carrier	2	±0.079 dB	2
RF-Power uncertainty for given BER	1.96	+0.94 dB / -1.05	7
RF power, conducted, spurious emissions	1.96	+1.4 dB / -1.6 dB	7
RF power, radiated			
25 MHz – 4 GHz	1.96	+3.6 dB / -5.2 dB	8
1 GHz – 18 GHz	1.96	+3.8 dB / -5.6 dB	8
18 GHz – 26.5 GHz	1.96	+3.4 dB / -4.5 dB	8
40 GHz – 170 GHz	1.96	+4.2 dB / -7.1 dB	8
Spectral Power Density, conducted	2.0	±0.53 dB	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	±2,89 %	2
6 kHz – 25 kHz	2	±0.2 dB	2
Maximum frequency deviation for FM	2	±2,89 %	2
Adjacent channel power 25 MHz – 1 GHz	2	±2.31 %	2
Temperature	2	±0.39 K	4
(Relative) Humidity	2	±2.28 %	2
DC- and low frequency AC voltage			
DC voltage	2	±0.01 %	2
AC voltage up to 1 kHz	2	±1.2 %	2
Time	2	±0.6 %	2

Table 21

Radio Interference Emission Testing			
Test Name	kp	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Table 22

Immunity Testing			
Test Name	kp	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Table 23

Note 1:
The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%
Note 2:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%
Note 3:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2.05, providing a level of confidence of p = 95.45%
Note 4:
It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95%confidence.
Note 5:
The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%
Note 6:
The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%
Note 7:
The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) to is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96, providing a level of confidence of p = 95.45%
Note 8:
The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96, providing a level of confidence of p = 95.45%