Report on the FCC and IC Testing of the FMTec GmbH Security Lock. Model: SL1001 In accordance with FCC 47 CFR Part 15C and ISED Canada RSS-210 and ISED Canada RSS-GEN

Product Service

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Prepared for: FMTec GmbH
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FCC ID: 2ARNI-19SL100X001
IC: 24508-19SL100X001

COMMERCIAL-IN-CONFIDENCE

Date: 2019-08-20
Document Number: TR-35329-30371-06 | Issue: 03

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Michael Ingerl	2019-08-20	M.
Authorised Signatory	Martin Steindl	2019-08-20	Steindl Martin

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 Canada RSS-210 and ISED Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Michael Ingerl	2019-08-20	M.

Laboratory Accreditation
DAkkS Reg. No. D-PL-11321-11-02
DAkkS Reg. No. D-PL-11321-11-03

Laboratory recognition
Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration
3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014).

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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	2018-06-28
2	FCC ID and IC ID added to test report	2019-05-06
3	Added the test “Exposure of Humans to RF Fields and SAR exclusion threshold”	2019-08-20

Table 1

1.2 Introduction

Applicant	FMTec GmbH
Manufacturer	FMTec GmbH
Model Number(s)	SL1001
Serial Number(s)	SL1001 0000005503
Hardware Version(s)	SL1001-15
Software Version(s)	2e.0b
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014), FCC rule Part 2.1093, KDB 447498 D01, RSS-102 Issue 5
Test Plan/Issue/Date	---
Order Number	---
Date	2018-06-20
Date of Receipt of EUT	2018-04-27
Start of Test	2018-05-04
Finish of Test	2018-08-19
Name of Engineer(s)	Matthias Stumpe, Michael Ingerl
Related Document(s)	ANSI C63.10 (2013)

Product Service

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED Canada RSS-210 and ISED Canada RSS-GEN is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: UHF Transmitting, with modulated				
2.1	15.249 (a), B.10(b) and N/A.	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.2	15.249 (a), B.10 (a) and N/A.	Field Strength of Fundamental	Pass	ANSI C63.10 (2013)
2.3	15.209, 4.3 and 6.13	Field Strength of any Emission	Pass	ANSI C63.10 (2013)
2.4	15.205, 4.1 and 8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.215 (c), N/A and 6.6	20 dB Bandwidth	Pass	ANSI C63.10 (2013)
2.6	15.225 (a)(b)(c)(d), B.1 to B.9, 6.4 and 6.5.	Field Strength of any Emission	Pass	ANSI C63.10 (2013)
2.7	15.225 (e), B.1 to B.9 and 6.11.	Frequency Tolerance Under Temperature Variations	Pass	ANSI C63.10 (2013)
2.8	15.107 and 6.1	Exposure of Humans to RF Fields and SAR exclusion threshold	Pass	ANSI C63.4: 2014

Table 2

1.4 Product Information

1.4.1 Technical Description

EUT is a Security Lock using following three different radio technologies.
1. Reception of “LF-Marker” on 125 kHz. - receive only
2. Reading/Polling of RFID-Tags on 13.56 MHz – Transmit and receive capability
3. Data communication with an Access Point on 919 MHz – Transmit and receive capability

EUT has configured for testing as follows:
- Mode: Continuous Transmission of Random Packet Data
- RF-Power: 12 dBm
- Frequency: 919 MHz (FCC-Testing)
- Packet Length: 60 Bytes

1.5 Deviations from the Standard

1.6 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
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.7 Test Location

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

Test Name	Name of Engineer(s)
Configuration and Mode: UHF Transmitting, with modulated	
Authorised Band Edges	Matthias Stumpe
Field Strength of Fundamental	Matthias Stumpe
Field Strength of any Emission	Matthias Stumpe
Restricted Band Edges	Matthias Stumpe
20 dB Bandwidth	Matthias Stumpe
Field Strength of any Emission	Matthias Stumpe
Frequency Tolerance Under Temperature Variations	Matthias Stumpe
Exposure of Humans to RF Fields and SAR exclusion threshold	Matthias Stumpe, Michael Ingerl

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany

2 Test Details

2.1 Authorised Band Edges

2.1.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.249 (a), B.10(b) and N/A.

2.1.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.1.3 Date of Test

2018-05-04

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

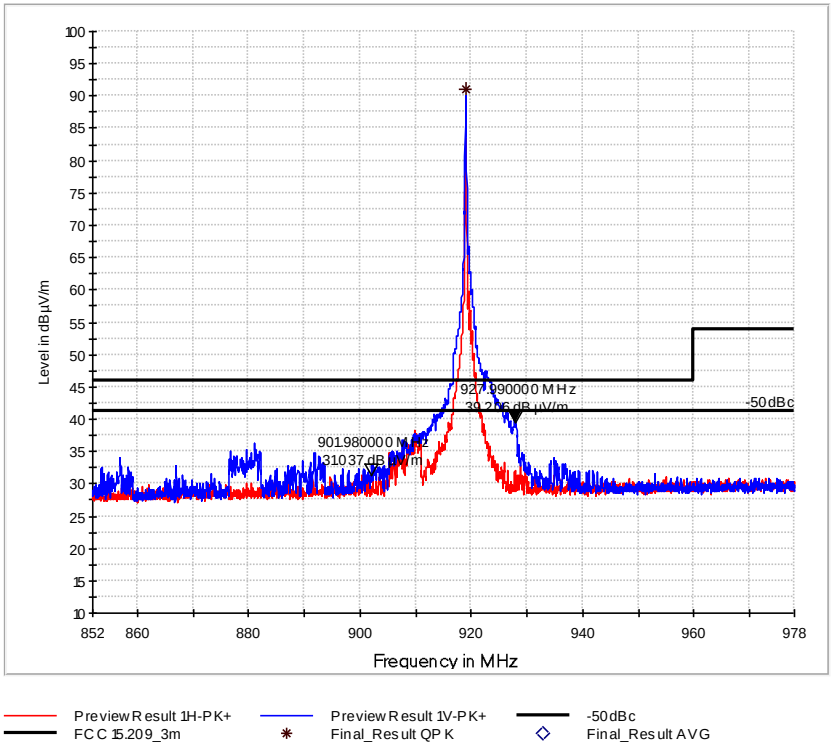
2.1.5 Environmental Conditions

Ambient Temperature	22.0 °C
Relative Humidity	45.0 %

2.1.6 Test Results

UHF Transmitting, with modulation

No emission above -50 dBc or above § 15.209 limit detected at band edges.



FCC 47 CFR Part 15, Limit Clause 15.249 (d)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

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 5

ISED Canada RSS-210, Limit Clause B.10 (b)

Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

ISED Canada RSS-GEN, Limit Clause 8.9

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 6

2.1.7 Test Location and Test Equipment Used

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

Instrument	Manufacturer	Type No	T-ID	Calibration Period (months)	Calibration Due
Double ridged horn antenna	Rohde & Schwarz	HF907	2073	24	2019-06-30
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

Table 7

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

2.2 Field Strength of Fundamental

2.2.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.249 (a), B.10 (a) and N/A.

2.2.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.2.3 Date of Test

2018-05-04

2.2.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

2.2.5 Environmental Conditions

Ambient Temperature 22.0 °C
Relative Humidity 45.0 %

2.2.6 Test Results

UHF Transmitting, with modulation

Frequency MHz	Field Strength
919 MHz	91.1 dBµV/m (equal to 36 mV/m)

Table 8
FCC 47 CFR Part 15, Limit Clause 15.249 (a)

Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m)
902 to 928	50
2400 to 2483.5	50
5725 to 5875	50
24000 to 24250	250

Table 9
ISED Canada RSS-210, Limit Clause B.10 (a)

The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.

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	T-ID	Calibration Period (months)	Calibration Due
Double ridged horn antenna	Rohde & Schwarz	HF907	2073	24	2019-06-30
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

Table 10

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

2.3 Field Strength of any Emission

2.3.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.209, 4.3 and 6.13

2.3.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.3.3 Date of Test

2018-05-04

2.3.4 Test Method

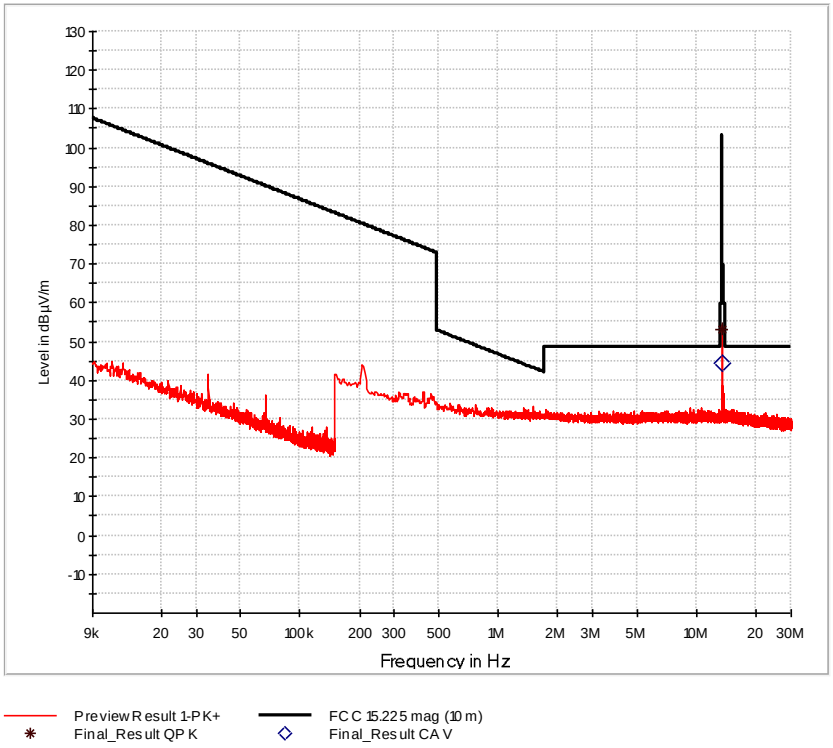
This test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5. and ISED Canada RSS-Gen clause 6.13.
Measurements were made at a distance of 3 m. The limit lines shown on the plot were extrapolated from either 300 m or 30 m to the measurement distance of 3 m in accordance with ANSI C63.10 Clause 6.4.4.2.
For any emissions detected within 20 dB of the limit, a final measurement was made and recorded in the table below. The detector used for these measurements was a quasi-peak detector except for emissions within the bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where a CISPR average detector was used.

2.3.5 Environmental Conditions

Ambient Temperature	22.0 °C
Relative Humidity	45.0 %

2.3.6 Test Results

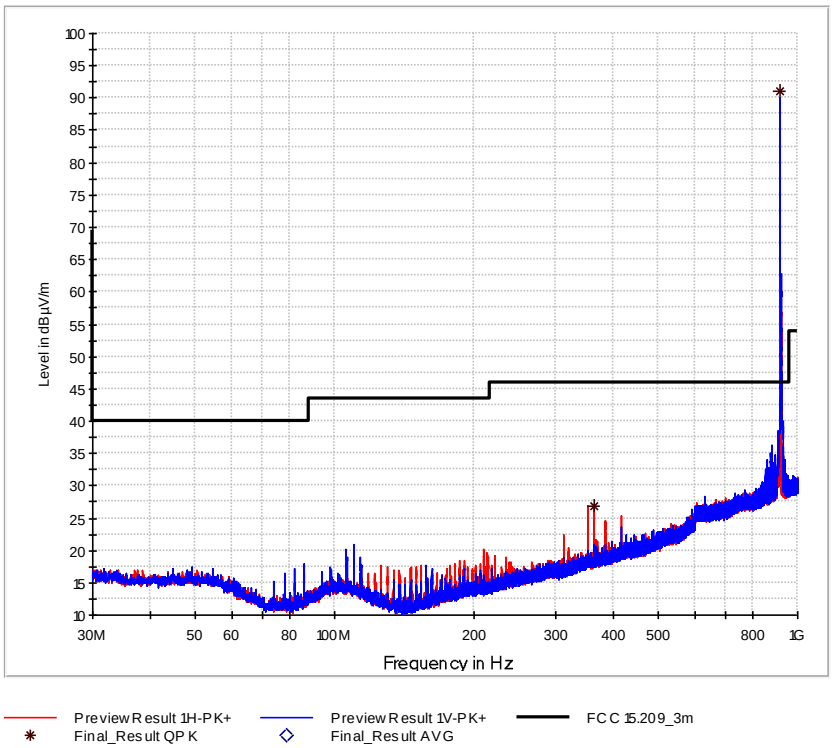
RFID and UHF Transmitting, with modulation (Result includes Co-Transmission)



Final Results:

Frequency MHz	*QuasiPeak* dBµV/m	*CAverage* dBµV/m	*Limit* dBµV/m	*Margin* dB	*Meas. Time* ms	*Bandwidth* kHz	*Pol*	*Azimuth* deg	*Corr.* dB
13.560000	*#2* 53.27	---	*#1*	*#1*	1000.0	9.000	H	30.0	20.0
13.560000	---	*#2* 44.38	---	*#1*	1000.0	9.000	H	30.0	20.0

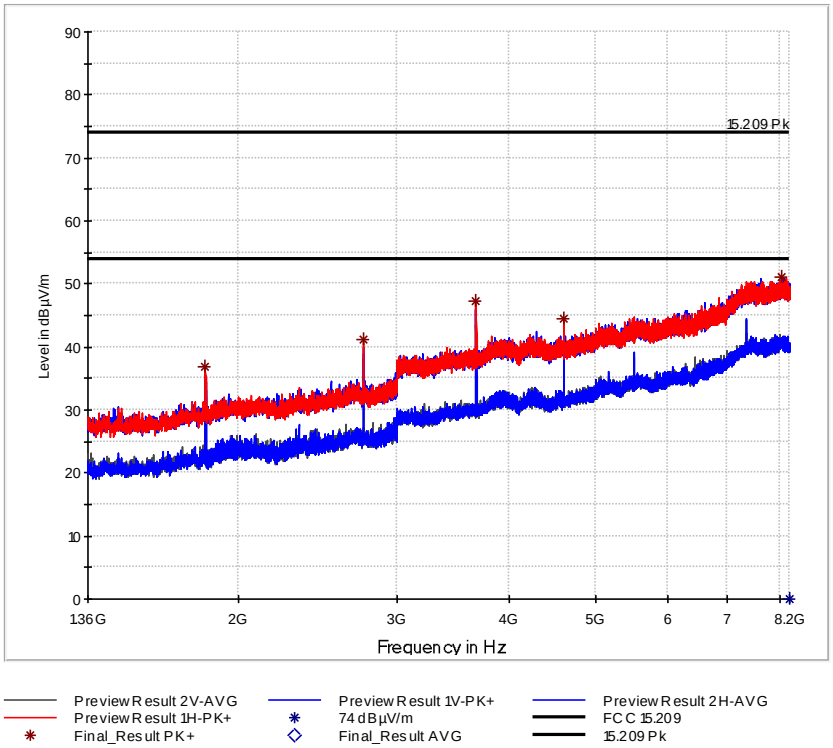
#1: Intentional Radiation on 13.56 MHz (RFID tag reader).
#2: Test has been performed with 10m test distance. Test result has been calculated from 10m to 30m (-9.5dB).



Final Results:

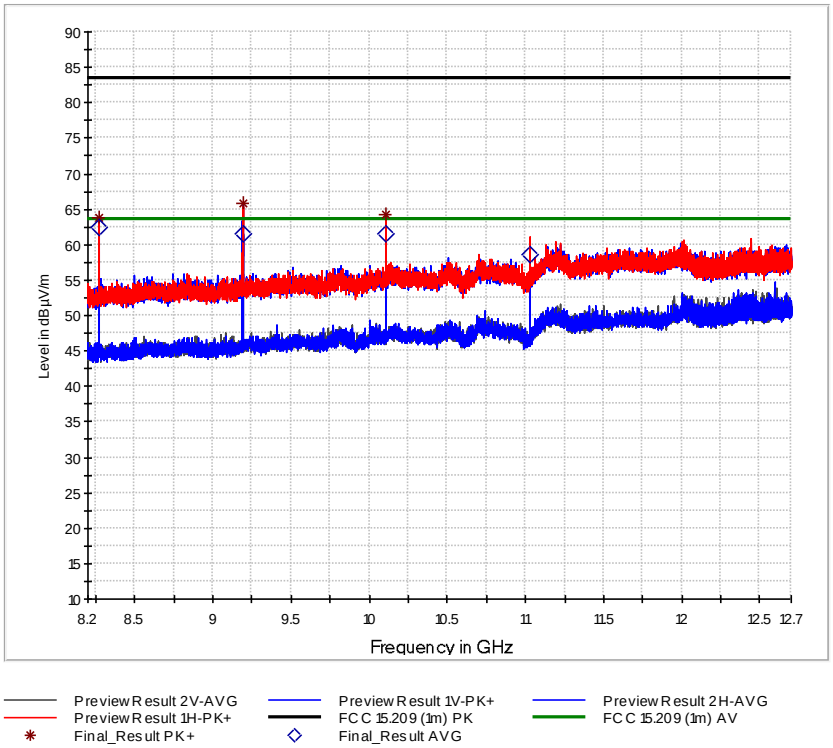
Frequency MHz	*QuasiPeak dBµV/m*	*Average dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Pol*	*Azimuth deg*	*Corr. dB*
363.995	26.82	---	46.00	19.18	1000.0	120.000	H	170.0	17.0
919.060	91.13	---	*#1*	*#1*	1000.0	120.000	V	-40.0	25.6

#1: Intentional Radiation on 919 MHz (UHF Access Point).



Final Results:

Frequency MHz	*MaxPeak dBµV/m*	*Average dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Pol*	*Azimuth deg*	*Corr. dB*
1838.00	36.75	---	54.00	17.25	2.5	1000.000	H	138.0	-2.6
2757.50	41.23	---	54.00	12.77	2.5	1000.000	H	106.0	0.6
3676.00	47.25	---	54.00	6.75	2.5	1000.000	H	97.0	3.9
4595.50	44.44	---	54.00	9.56	2.5	1000.000	H	5.0	6.1
8019.40	51.23	---	54.00	2.77	2.5	1000.000	H	223.0	13.7



Final Results:

Frequency MHz	*MaxPeak* dBµV/m	*Average* dBµV/m	*Limit* dBµV/m	*Margin* dB	*Meas. Time* ms	*Bandwidth* kHz	*Pol*	*Azimuth* deg	*Corr.* dB
8270.65	---	62.41	63.50	1.09	2.5	1000.000	H	18.0	12.9
8271.10	63.86	---	83.50	19.64	2.5	1000.000	H	15.0	12.9
9190.90	65.78	---	83.50	17.72	2.5	1000.000	V	89.0	14.4
9190.90	---	61.60	63.50	1.90	2.5	1000.000	V	89.0	14.4
10109.00	64.33	---	83.50	19.17	2.5	1000.000	H	63.0	16.3
10109.00	---	61.43	63.50	2.07	2.5	1000.000	H	63.0	16.3
11029.00	---	58.55	63.50	4.95	2.5	1000.000	H	69.0	16.4

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1705 to 30	30	30
30 to 88	100**	3
88 to 216	150**	3
216 to 960	200**	3
Above 960	500	3

Table 11 - FCC Limit

NOTE: The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

ISED Canada RSS-210, Limit Clause 4.4

Under no circumstance shall the level of any unwanted emissions exceed the level of the fundamental emissions.

ISED Canada RSS-Gen, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1705 to 30	30	30

Table 12 - IC Limit, Below 30 MHz

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

Table 13 - IC Limit, Above 30 MHz

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	T-ID	Calibration Period (months)	Calibration Due
Double ridged horn antenna	Rohde & Schwarz	HF907	2073	24	2019-06-30
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

Table 14

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

2.4 Restricted Band Edges

2.4.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.205, 4.1 and 8.10

2.4.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.4.3 Date of Test

2018-05-04

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.13.1.

2.4.5 Environmental Conditions

Ambient Temperature	22.0 °C
Relative Humidity	45.0 %

2.4.6 Test Results

No emission above FCC 47 CFR §15.209 found outside of operational frequency band 902 MHz to 928 MHz. See chapter ‘2.3 Field Strength of any Emission’ and ‘2.1 Authorised Band Edges’.

2.5 20 dB Bandwidth

2.5.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.215 (c), N/A and 6.6

2.5.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.5.3 Date of Test

2018-05-11, 2018-06-28

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.9.1.

2.5.5 Environmental Conditions

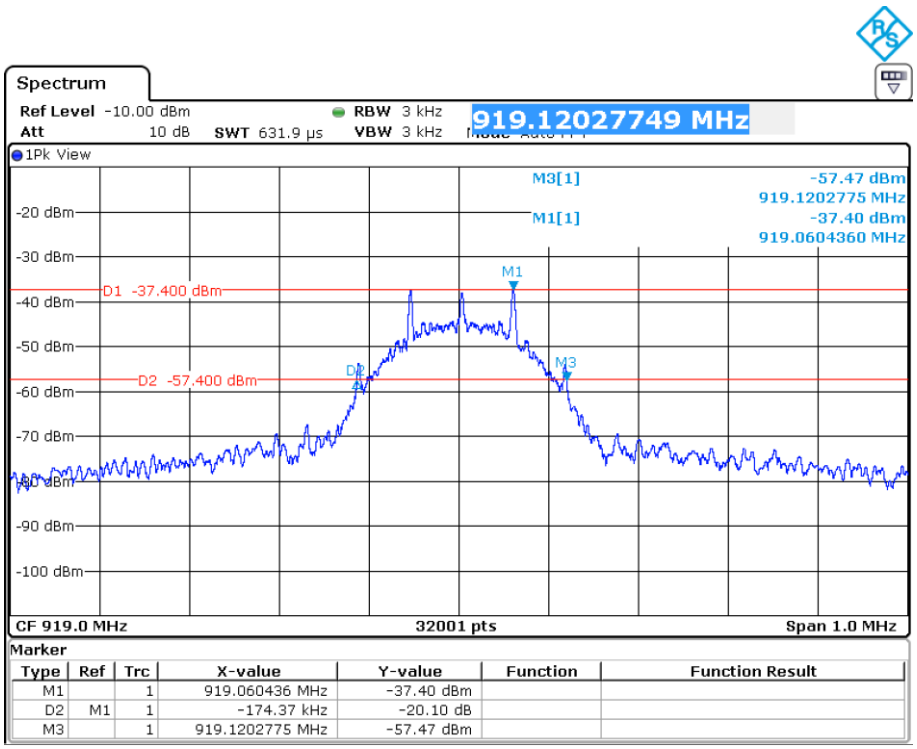
Ambient Temperature 23,0 °C
Relative Humidity 43,0 %

2.5.6 Test Results

Transmitting, with modulation

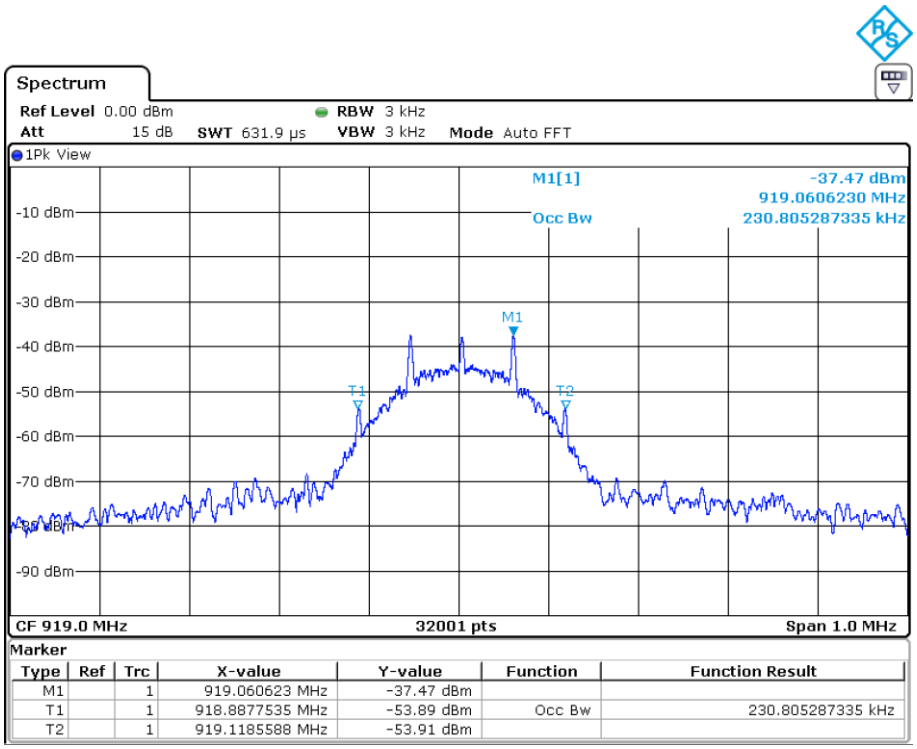
Frequency	20 dB Bandwidth	99% Occupied Bandwidth	F_{LOWER}	F_{UPPER}
919 MHz	234 kHz	231 kHz	918.888 MHz (of 20dB BW)	919.122 MHz (of 20dB BW)
13.56 MHz	118 kHz	291 kHz	13.419 MHz (of 99% BW)	13.711 MHz (of 99% BW)

Table 15



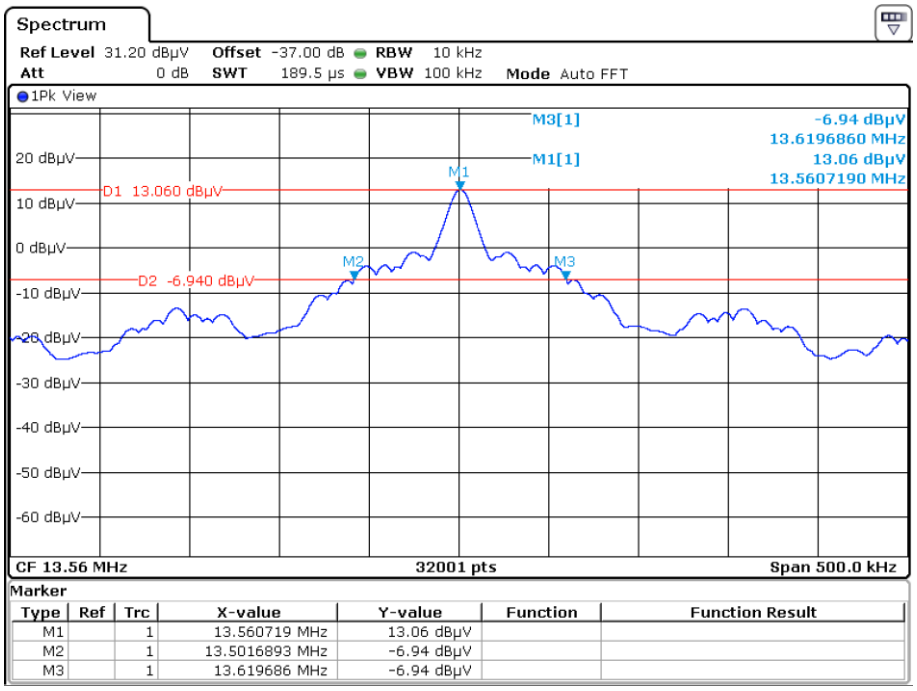
Date: 28.JUN.2018 09:59:29

20 dB Bandwidth, 919 MHz



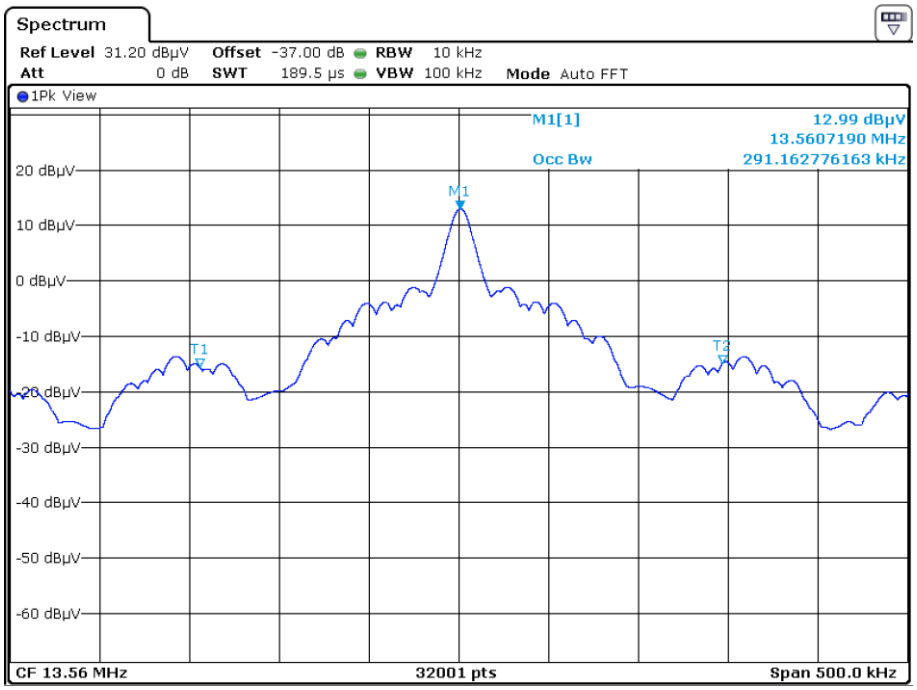
Date: 28.JUN.2018 09:57:47

99% Occupied Bandwidth, 919 MHz



Date: 11.JUN.2018 12:04:41

20 dB Bandwidth, 13.56 MHz



Date: 11.JUN.2018 12:05:57

99% Occupied Bandwidth, 919 MHz

FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

ISED Canada RSS 210 and ISED Canada RSS GEN, Limit Clause

None specified.

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	T-ID	Calibration Period (months)	Calibration Due
Double ridged horn antenna	Rohde & Schwarz	HF907	2073	24	2019-06-30
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

Table 16

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

2.6 Field Strength of any Emission

2.6.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.225 (a)(b)(c)(d), B.1 to B.9, 6.4 and 6.5.

2.6.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.6.3 Date of Test

2018-05-04

2.6.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

Measurements were made at a distance of 3 m. The limit lines shown on the plot were extrapolated from either 300 m or 30 m to the measurement distance of 3 m in accordance with ANSI C63.10 Clause 6.4.4.2.

2.6.5 Environmental Conditions

Ambient Temperature 22.0 °C
Relative Humidity 45.0 %

2.6.6 Test Results

UHF Transmitting, without modulation, Carrier Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m) at 3m	Quasi-Peak Level (dBµV/m) at 30m	Quasi-Peak Level (µV/m) at 3m	Quasi-Peak Level (µV/m) at 30m
13.56	53.91	13.91	496	4.96

Table 17

FCC 47 CFR Part 15, Limit Clause 15.225 (a)(b)(c)(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 m.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 m.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 m.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1705 to 30	30	30
30 to 88	100**	3
88 to 216	150**	3
216 to 960	200**	3
Above 960	500	5

Table 18 - FCC Radiated Emission Limit

ISED Canada RSS-210, Limit Clause B.6

The field strength of any emission shall not exceed the following limits:

(a) 15.848 mW/m (84 dBµV/m) at 30 m, within the band 13.553 – 13.567 MHz.

(b) 334 µV/m (50.5 dBµV/m) at 30 m, within the bands 13.410 – 13.553 MHz and 13.567 – 13.710 MHz.

(c) 106 µV/m (40.5 dBµV/m) at 30 m, within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz.

(d) RSS-GEN general field strength limits for frequencies outside the band 13.110 – 14.010 MHz.

ISED Canada RSS-GEN, Limit Clause

Frequency	Electric Field Strength (µV/m)	Magnetic Field Strength (H-Field) (µA/m)	Measurement Distance (m)
9 - 490 kHz	2.400/F (F in kHz)	2.400/377F (F in kHz)	300
490 - 1.705 kHz	24.000/F (F in kHz)	24.000/377F (F in kHz)	30
1.705 kHz - 30 MHz	30	N/A	30

Table 19 - ISED Canada Radiated Emission Limit - Less than 30 MHz

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

Table 20 - ISED Canada Radiated Emission Limit - 30 MHz to 1 GHz

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	T-ID	Calibration Period (months)	Calibration Due
Double ridged horn antenna	Rohde & Schwarz	HF907	2073	24	2019-06-30
Loop antenna	Rohde & Schwarz	HFH2-Z2	18876	24	2018-07-31
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

Table 21

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

2.7 Frequency Tolerance Under Temperature Variations

2.7.1 Specification Reference

FCC 47 CFR Part 15C, ISED Canada RSS-210 and ISED Canada RSS-GEN, Clause 15.225 (e), B.1 to B.9 and 6.11.

2.7.2 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.7.3 Date of Test

2018-06-11

2.7.4 Environmental Conditions

Ambient Temperature 24,0 °C
Relative Humidity 49,0 %

2.7.5 Test Results

UHF Transmitting, with modulation

Temperature	Voltage	Measured Frequency (MHz)	Frequency Deviation (%)	Frequency Error (ppm)
-20.0 °C	3.0 V DC	13.560695	0.0051	51.3
-10.0 °C	3.0 V DC	13.560695	0.0051	51.3
0.0 °C	3.0 V DC	13.560753	0.0056	55.5
+10.0 °C	3.0 V DC	13.560753	0.0053	55.5
+20.0 °C	3.0 V DC	13.560724	0.0053	53.4
+30.0 °C	3.0 V DC	13.560695	0.0051	51.3
+40.0 °C	3.0 V DC	13.560666	0.0049	49.1
+50.0 °C	3.0 V DC	13.560695	0.0051	51.3

Table 22 - Frequency Tolerance Under Temperature Variation

Temperature	Voltage	Measured Frequency (MHz)	Frequency Deviation (%)	Frequency Error (ppm)
+20.0 °C	2.55 V DC	13.560716	0.0053	52.8
+20.0 °C	3.00 V DC	13.560724	0.0053	53.4
+20.0 °C	3.45 V DC	13.560736	0.0054	54.3

Table 23 - Frequency Tolerance Under Voltage Variation

FCC 47 CFR Part 15, Limit Clause 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

ISED Canada RSS-210, Limit Clause B.6

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm)

2.7.6 Test Location and Test Equipment Used

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

Instrument	Manufacturer	Type No	T-ID	Calibration Period (months)	Calibration Due
Climatic Test Chamber	Espec	PL-2J	18843	36	2020-03-31
Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	12	2019-01-31

Table 24

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

2.8 Exposure of Humans to RF Fields and SAR exclusion threshold

2.8.1 Specification Reference

IC RSS-GEN Issue 4, section 3.2 and
IC RSS-102, Issue 5, section 2.5
KDB 447498 D01 V06, section 4.3.1 c), a)

2.8.2 Guide

IC RSS-102 Issue 5, section 2.5

2.8.3 Equipment Under Test and Modification State

SL1001, S/N: SL1001 0000005503 - Modification State 0

2.8.4 Date of Test

2019-08-19

2.8.5 Test Results

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **..... W**			☐	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☐ the numerical antenna gain: G = **.....** $EIRP = G \cdot CP \Rightarrow EIRP$ = **..... W**		☐		
☐ the field strength[1] in V/m: FS = **..... V/m** $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **..... W**			☐	
with: Distance between the antennas in m: D = **..... m**			☐	
☒ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **0.24 mW (UHF)** = **0.0004 mW (RFID)** with: Field strength in V/m: FS = **0.028 (UHF)** = **0.0003 (RFID)** Distance between the two antennas in m: D = **10 (RFID) & 3 (UHF)**			☒ ☒	
Selection of output power				
The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.): TP = **0.24 mW (UHF)** **0.0004 mW (RFID)**				

[1] The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses.
If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.

Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is				
☒ less than or equal to 20 cm ☐ greater than 20 cm		☐		
Transmitting device is				
☐ in the vicinity of the human head ☐ body-worn		☐		
SAR evaluation				

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)[2] 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 [3]	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

				Applicable	Declared by applicant	Measured	Exemption
Carrier frequency:	f	=	**13.46 MHz (RFID) & 919 MHz (UHF)**				
Distance:	d	=	**5 mm**				
Transmitter output power:	TP	=	**0.24 mW (UHF)** **0.0004 mW (RFID)**				
Limit:	TP_{limit}	=	**7 mW (UHF)** **71 mW (RFID)**				☒
☐ SAR evaluation is documented in test report no. …							

[2] 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.

[3] 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.

Specifications:	RSS-102, Issue 5, Section 4, Table 4, Uncontrolled Environment SPR-002, Issue 1
Operation mode: *Comment:*	UHF Transmitting with modulation and RFID ---

Test procedure:	IEC 62236-1, Section 4.2 “Measurement to show accordance to the reference levels”
Test distance:	Direct contact to EUT
Limit:	*Frequency Range (MHz)* / *Electric Field (V/m_{rms})* / *Magnetic Field (A/m_{rms})* / *Peference Periode (min)* 10-20 / 27.46 / 0.0728 / 6 300-6000 / $3.142\ f^{0.3417}$ / $0.008335\ f^{0.3417}$ / 6 *f* in MHz
Test positions:	All surfaces: The antenna was moved all over the equipment under test using a test distance as stated above.

RFID

Measured maximum value (V/m)	*Maximum Limit at 13.56 MHz (V/m)*	*Margin to reference value (V/m)*
1.29	27.46	26.17

Measured maximum value (A/m)	*Maximum Limit at 21.85 kHz (A/m)*	*Margin to reference value (A/m)*
0.0034	0.0728	0.0694

UHF

Measured maximum value (V/m)	*Maximum Limit at 919 MHz (V/m)*	*Margin to reference value (V/m)*
1.46	32.34	30.88

Measured maximum value (A/m)	*Maximum Limit at 21.85 kHz (A/m)*	*Margin to reference value (A/m)*
0.0039	0.0858	0.0819

SAR Exclusion threshold

RFID

Maximum Radiated Fields Strength: (see chapter 2.1.6 of this test report)	53.27 dBµV/m (at 10 m distance and 13.56 MHz)
Calculated Equivalent Radiated Power:	0.0004 mW (e.i.r.p.) < 0.001 mW
Minimum separation distance:	5 mm (≤ 50 mm)
1-g numeric threshold:	(0.01 mW / 5 mm) · √(0.01356 GHz) = 0.0002
1-g numeric threshold limit:	0.2495

Note 1: For test distances below 5 mm according to 4.3.1 c) the test distance is fixed to 5 mm.

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

UHF

Maximum Radiated Fields Strength: (see chapter 2.1.6 of this test report)	91.13 dBµV/m (at 3 m distance and 919 MHz)
Calculated Equivalent Radiated Power:	0.24 mW (e.i.r.p.) < 1 mW
Minimum separation distance:	5 mm (≤ 50 mm)
1-g numeric threshold:	(10 mW / 5 mm) · √(0.919 GHz) = 1.92
1-g numeric threshold limit:	3.0

Note 1: For test distances below 5 mm according to 4.3.1 a) the test distance is fixed to 5 mm.

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

2.8.6 Test Location and Test Equipment Used

This test was carried out in a non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Electromagnetic radiation meter	Narda Safety	EMR-200	19590	36	2019-10-31
Electric field probe	Narda Safety	Type 8.3	19591	36	2019-10-31
Magnetic field probe	Narda Safety	Type 12.1	19592	36	2019-10-31

Table 25

3 Photographs

3.1 Equipment Under Test (EUT)

Figure 1

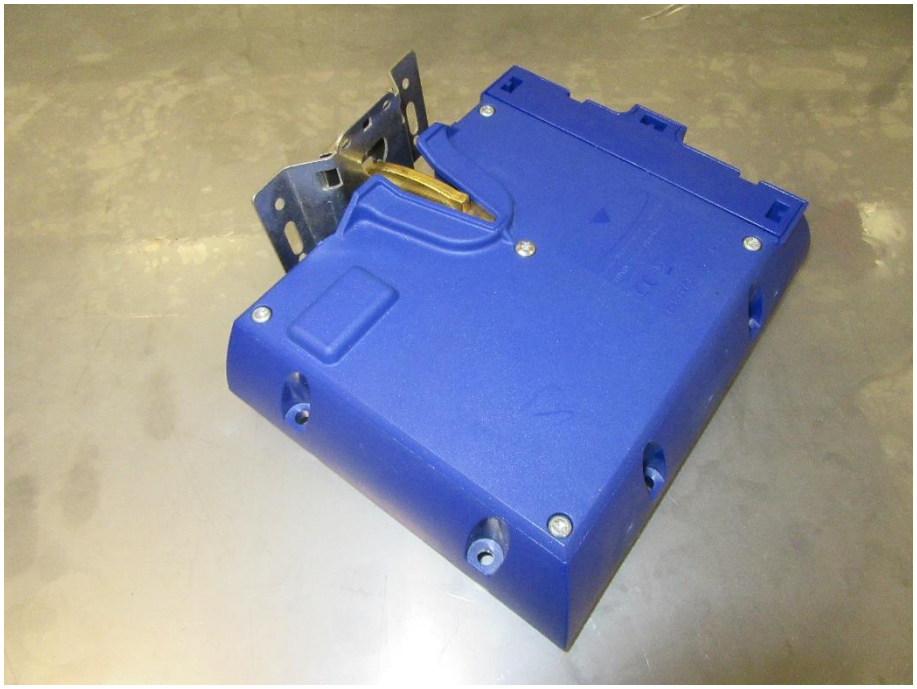


Figure 2

FMTec GmbH
www.fmtec.eu
Security Lock SL1001
Made in Austria
SL1001 0000005503
CE
RoHS

Figure 3

4 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 26

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 Field strength			
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 27

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 28

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%