Report on the FCC and IC Testing of the Future-Shape GmbH Base station for wireless sensor floor. Model: SE10 In accordance with FCC 47 CFR Part 15C and Industry Canada RSS-210 and Industry Canada RSS-GEN

Product Service

Choose certainty.
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Prepared for: Future-Shape GmbH
Altlaufstr. 34
85635 Höhenkirchen-Siegertsbrunn
Germany

FCC ID: 2ARCY-FSSE10
IC: 24167-FSSE10

COMMERCIAL-IN-CONFIDENCE

Date: 2018-09-25
Document Number: TR-26044-36040-01 | Issue: 04

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Matthias Stumpe	2018-09-25	
Authorised Signatory	Markus Biberger	2018-09-25	

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

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthias Stumpe	2018-09-25	

Laboratory Accreditation	Laboratory recognition	Industry Canada test site registration
DAkkS Reg. No. D-PL-11321-11-02	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, Industry Canada RSS-210 and Industry Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014).

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HRB 85742
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DL-InfoV (Germany) at
www.tuev-sued.com/imprint

Supervisory Board:
Holger Lindner (Chairman)
Board of Management:
Dr. Peter Havel (CEO)
Dr. Jens Butenandt

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

TÜV SÜD Product Service GmbH

Äußere Frühlingstraße 45
94315 Straubing
Germany

Contents

1 Report Summary 2

1.1 Report Modification Record 2
1.2 Introduction 2
1.3 Brief Summary of Results 3
1.4 Application Form 4

Test sample basic information 4

1.5 Product Information 9
1.6 Deviations from the Standard 9
1.7 EUT Modification Record 9
1.8 Test Location 9

2 Test Details 10

2.1 AC Power Line Conducted Emissions 10
2.2 20 dB Bandwidth 16
2.3 Restricted Band Edges 20
2.4 Authorised Band Edges 25
2.5 Field Strength of Fundamental 30
2.6 Field Strength of Emissions 35
2.7 RF Exposuere and SAR Exemption 40

3 Photographs 41

3.1 Equipment Under Test (EUT) 41

4 Measurement Uncertainty 43

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	2018-07-13
2	FCC and IC IDs added	2018-08-29
3	1. Unit for 99% Bandwidth corrected from Hz to kHz 2. FCC RF exposure calculation distance corrected from 20 mm to 5 mm.	2018-09-17
4	FCC ID changed	2018-09-25

Table 1

1.2 Introduction

Applicant	Future-Shape GmbH
Manufacturer	Future-Shape GmbH
Model Number(s)	SE10
Serial Number(s)	C000FFFB
Hardware Version(s)	NA
Software Version(s)	NA
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN:2016, Issue 09 (08-2016) and Issue 04 (11-2014)
Test Plan/Issue/Date	---
Order Number Date	--- 2018-05-11
Date of Receipt of EUT	2018-07-04
Start of Test	2018-07-04
Finish of Test	2018-07-12
Name of Engineer(s)	Matthias Stumpe
Related Document(s)	ANSI C63.10 (2013)

1.3 Brief Summary of Results

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

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Normal operation - Continuous Transmission				
2.1	15.207, N/A and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.2	15.215 (c), N/A and 6.6	20 dB Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.205, 4.1 and 8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.4	15.249 (a), B.10(b) and N/A.	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.5	15.249 (a), B.10 (a) and N/A.	Field Strength of Fundamental	Pass	ANSI C63.10 (2013)
2.6	15.249 (a)(d), B.10 (a) and N/A	Field Strength of Emissions	Pass	ANSI C63.10 (2013)
2.6	15.209, 4.3 and 6.13	Field Strength of any Emission	Pass	ANSI C63.10 (2013)
2.7		RF Exposuere and SAR Exemption	Pass	---

Table 2

1.4 Application Form

Test sample basic information

Please enter the information below in english language, since it is directly copied to the reports, thank you!

General information (for report)	
Ordernumber (your PO number)	5062028-b
Applicant (incl. address and contact person)	Dr. Axel Steinhage, Director R&D Future-Shape GmbH, Altlaufstrasse 34 85635 Hoehenkirchen-Siegertsbrunn, Germany axel.steinhage@future-shape.com, Tel.: +49 8102 89638 66
Manufacturer (when different to applicant)	
Name and address of factory(ies)	Future-Shape GmbH

Equipment characteristics:			
Type of equipment:	Base station for wireless sensor floor		
Type designation*:	SE10		
***Please consider:**	If the type designation has to be changed in the report the whole test of the product has to be repeated! More Info: Only available in german language: http://www.dakks.de/sites/default/files/dokumente/71_sd_0_019_beschluesse_horizontal_20160914_v1.0.pdf		
Parts of the system:	Raspberry Pi®, expansion-board, Real Time Clock, DIN-rail compartment		
Commercial value:	Sales price 300€		
Version of EUT: In case of already tested products please describe the differences to the original sample	920 MHz version of a device tested and certified in the EU at 868.3 MHz		
Serial number:	C000FFFB		
Power supply:	☐ AC Nominal: V Minimum: V Maximum: V Nominal frequency: Hz	☒ DC Nominal: 5.0 V Minimum: 4.4 V Maximum: 5.5 V	☐ Battery Nominal: V
highest frequency generated or used within the EUT	920 MHz ☐ < 108 MHz		

Marking plate (may only be a draft)

SensFloor-Receiver Model SE10

S/N: C000FFF3 Address: FFF3 8000
Radio: 920 MHz, 10dBm max. Power: 5VDC, 50mA max.
Relays: 60VAC/DC, 1A max.

Future-Shape GmbH
Altlauftsrasse 34
D-85635 Höhenkirchen-Siegertsbrunn
Made in Germany

Operating mode(s) // Methods of Observation	
Operating mode(s) for emission tests:	10 ping messages per second (TX), GFSK, 250 kBaud, channel spacing 200kHz, deviation 31.7kHz, TX Power Setting: +5dBm
Operating mode(s) for immunity tests:	
Methods of observation during immunity tests	

List of ports and cables					
No.	*Description*	*Classification*[1]	*Cable type*	*Cable length*	
				used	*maximum*[2]
A1		ac power	Unshielded	. m	. m
D1	5V power supply for Raspberry Pi	dc power	Unshielded	1 m	. m
S1		signal/control port	Shielded	. m	. m
S2		signal/control port	Unshielded	. m	. m
S3		signal/control port	Unshielded	. m	. m

List of devices connected to EUT				
No.	*Description*	*Type designation*	*Serial no. or ID*	*Manufacturer*
1	power supply provided by tester			
2				
3				

List of support devices				
No.	*Description*	*Type designation*	*Serial no. or ID*	*Manufacturer*
1				
2				
3				

[1] Ports shall be classified as ac power, dc power or signal/control port.
[2] As specified by applicant

1.5 Product Information

1.5.1 Technical Description

Base station for wireless sensor floor (SE10) is the radio interface to the large area capacitive sensor floor (SF-HR and SF-LR). EUT was configured during testing as follows: 10 ping messages per second (TX), GFSK, 250 kBaud, channel spacing 200kHz, deviation 31.7kHz, TX Power Setting: +5dBm

1.6 Deviations from the Standard

1.7 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

1.8 Test Location

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

Test Name	Name of Engineer(s)
Configuration and Mode: Normal operation - Continuous Transmission	
AC Power Line Conducted Emissions	Matthias Stumpe
20 dB Bandwidth	Matthias Stumpe
Restricted Band Edges	Matthias Stumpe
Authorised Band Edges	Matthias Stumpe
Field Strength of Fundamental	Matthias Stumpe
Field Strength of Emissions	Matthias Stumpe
Field Strength of any Emission	Matthias Stumpe

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN, Clause 15.207, N/A and 8.8

2.1.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.1.3 Date of Test

2018-07-04

2.1.4 Environmental Conditions

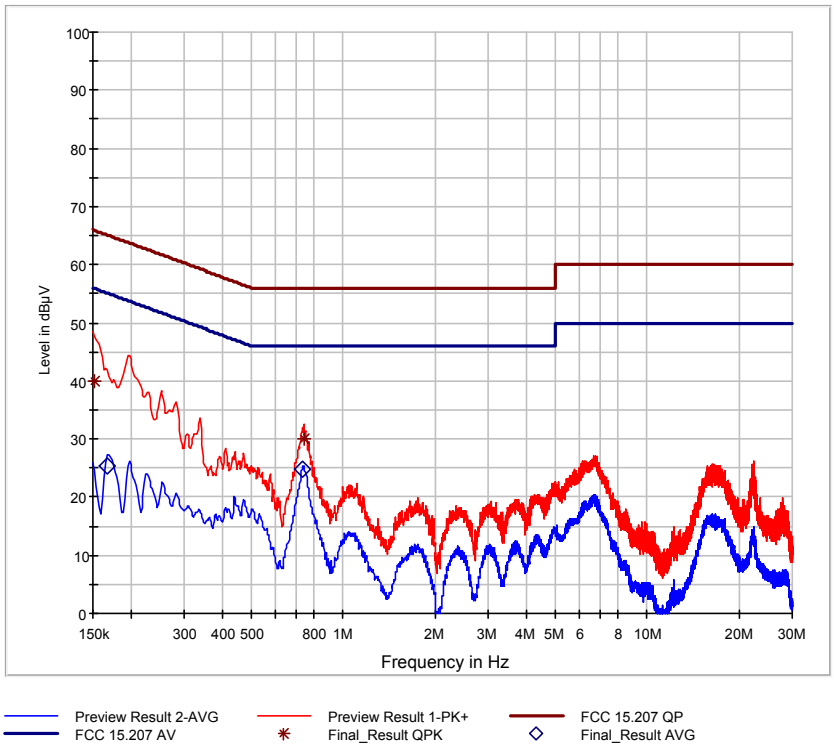
Ambient Temperature	26,0 °C
Relative Humidity	45,0 %

2.1.5 Test Results

Normal operation - Continuous Transmission

Applied supply Voltage: 60 Hz
Applied supply frequency: 115 V AC

LIVE - Emissions Results

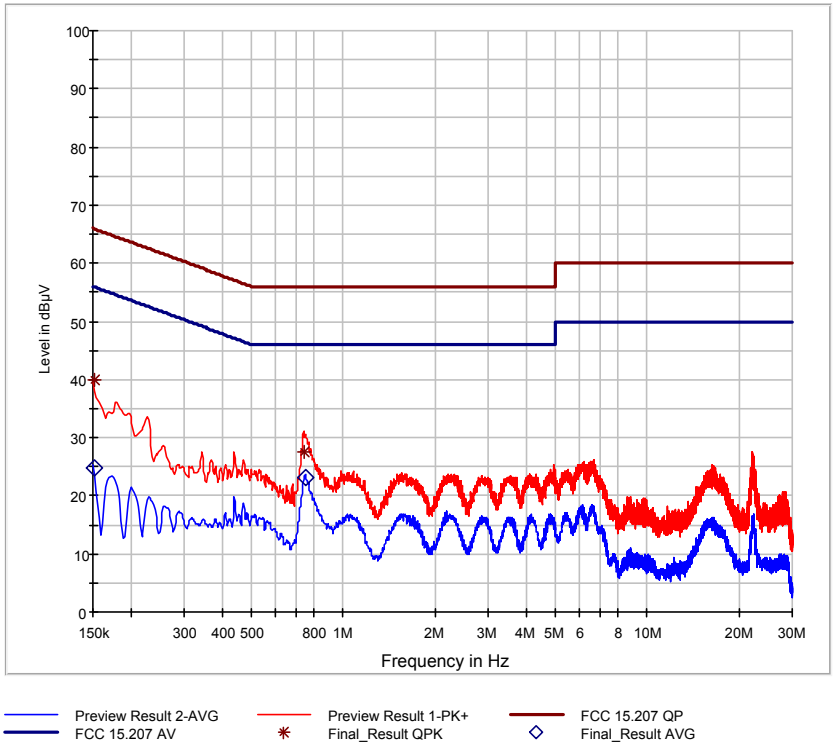


Final Results:

Frequency MHz	*QuasiPeak dBµV*	*Average dBµV*	*Limit dBµV*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Line*	*PE*	*Corr. dB*
0.152250	40.02	---	65.88	25.86	1000.0	9.000	L1	GND	0.0
0.168000	---	25.45	55.06	29.61	1000.0	9.000	L1	GND	0.0
0.737250	---	24.90	46.00	21.10	1000.0	9.000	L1	GND	0.0
0.741750	30.09	---	56.00	25.91	1000.0	9.000	L1	GND	0.0

LIVE- - 150 kHz to 30 MHz

NEUTRAL - Emissions Results



Final Results:

Frequency MHz	*QuasiPeak dBµV*	*Average dBµV*	*Limit dBµV*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Line*	*PE*	*Corr. dB*
0.152250	---	24.77	55.88	31.10	1000.0	9.000	L1	GND	0.0
0.152250	39.84	---	65.88	26.04	1000.0	9.000	L1	GND	0.0
0.739500	27.62	---	56.00	28.38	1000.0	9.000	L1	GND	0.0
0.748500	---	23.21	46.00	22.79	1000.0	9.000	L1	GND	0.0

NEUTRAL - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada 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 5

*Decreases with the logarithm of the frequency.

2.1.6 Test Location and Test Equipment Used

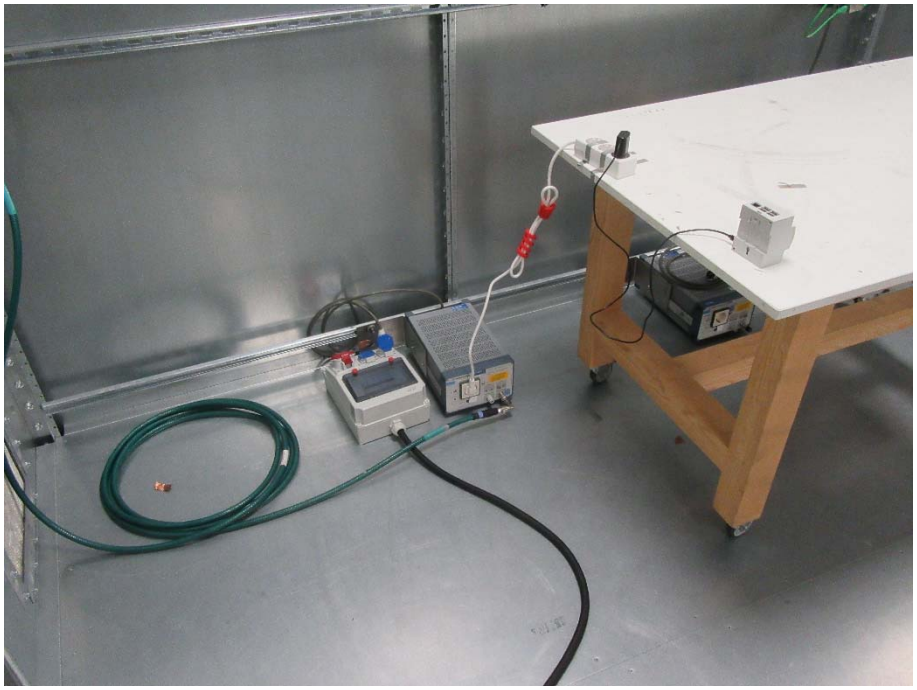
This test was carried out in Shielded room - cabin no. 9.

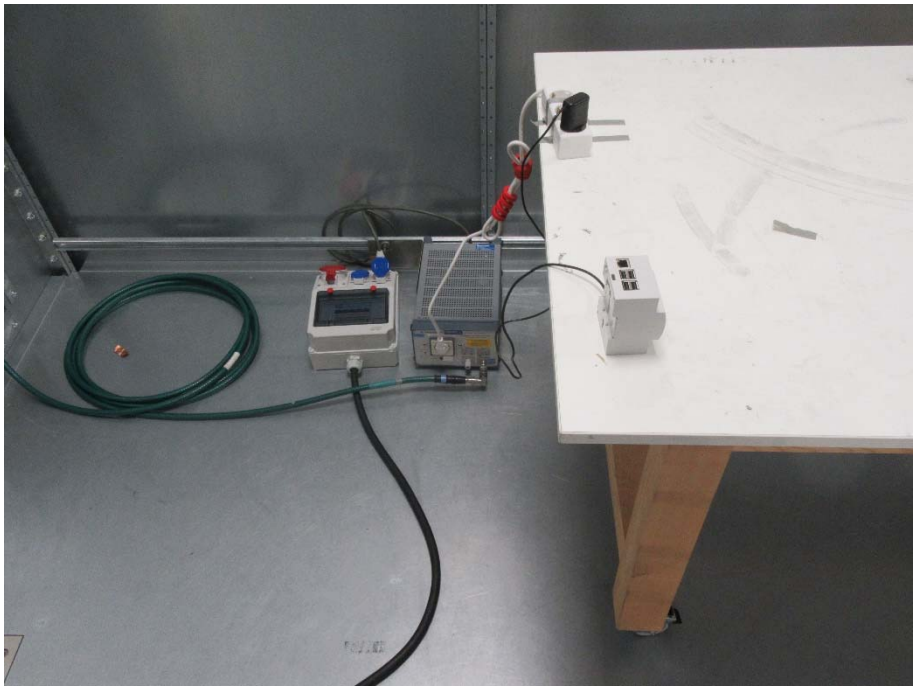
Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	100008	19730	12	2018-10-31
V-network	Rohde & Schwarz	894785/005	18919	36	2019-10-31

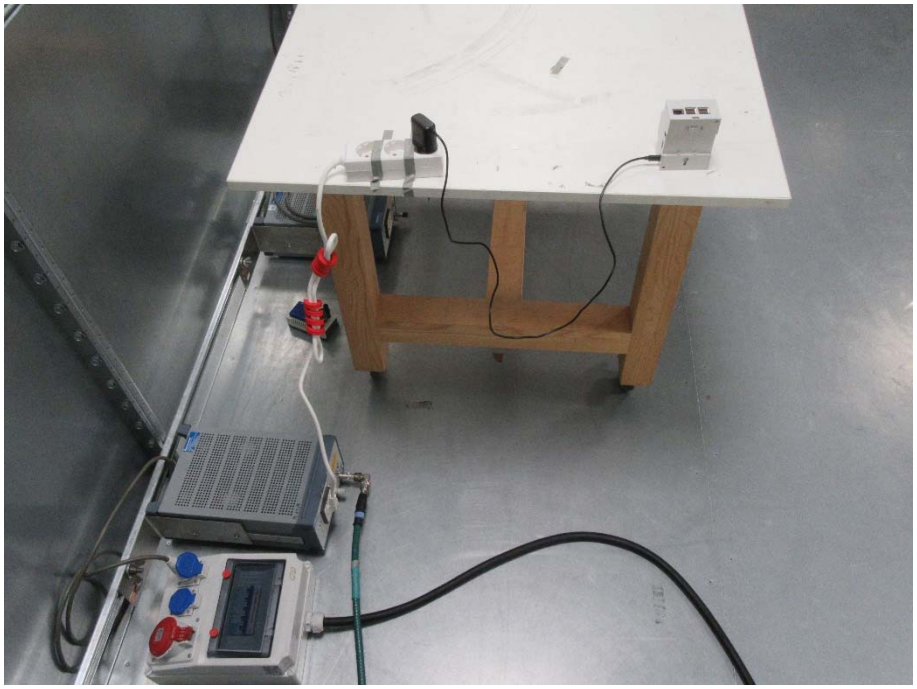
Table 6

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

2.1.7 Test Setup Photos







2.2 20 dB Bandwidth

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.2.3 Date of Test

2018-07-04

2.2.4 Test Method

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

2.2.5 Environmental Conditions

Ambient Temperature	25,0 °C
Relative Humidity	46,0 %

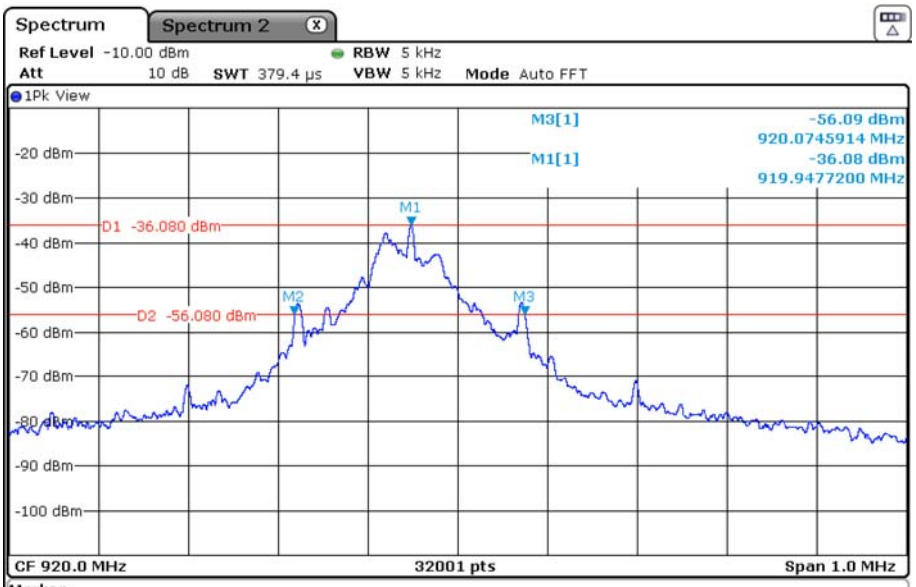
2.2.6 Test Results

Normal operation - Continuous Transmission

Frequency (MHz)	20 dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	F_{LOWER} (MHz)	F_{UPPER} (MHz)
920.0	256.3	247.0	919.818287	920.745914

Table 7

20 dB Bandwidth

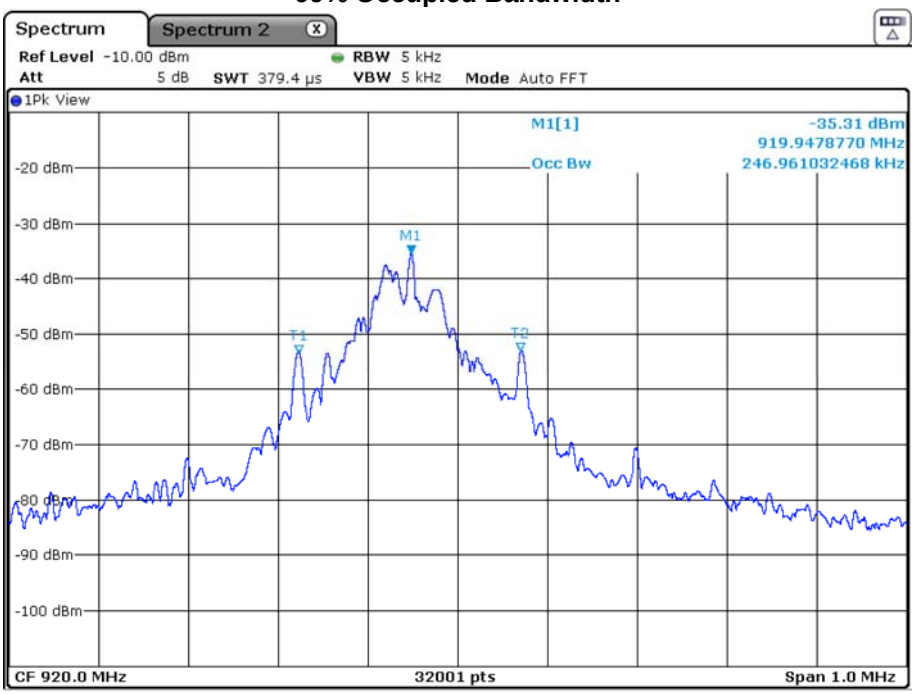


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	919.94772 MHz	-36.08 dBm		
M2		1	919.8182869 MHz	-56.11 dBm		
M3		1	920.0745914 MHz	-56.09 dBm		

Date: 4.JUL.2018 15:57:25

99% Occupied Bandwidth



Date: 4.JUL.2018 15:51:34

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.

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

None specified.

2.2.7 Test Location and Test Equipment Used

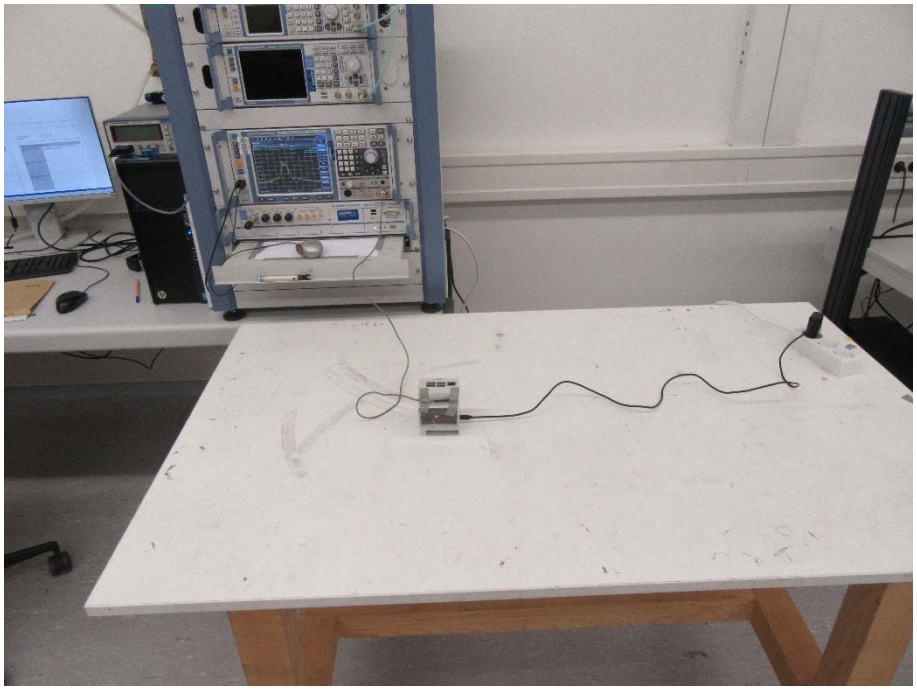
This test was carried out in Shielded room - cabin no. 9.

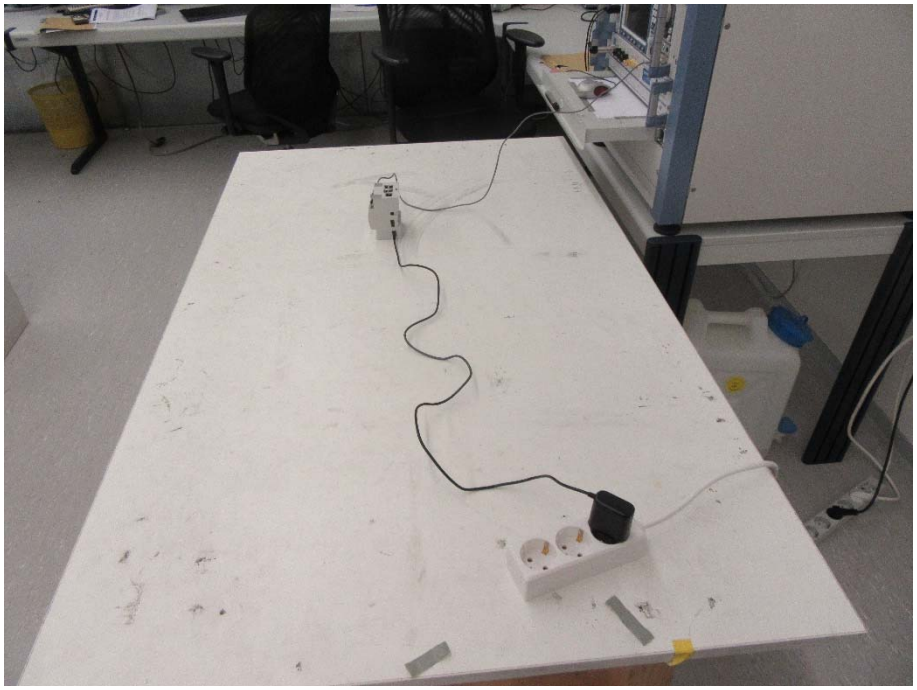
Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Spectrum Analyser	Rohde & Schwarz	FSV40	20219	12	2019-01-31

Table 8

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

2.2.8 Test Setup Photos





2.3 Restricted Band Edges

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.3.3 Date of Test

2018-07-12

2.3.4 Test Method

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

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3.

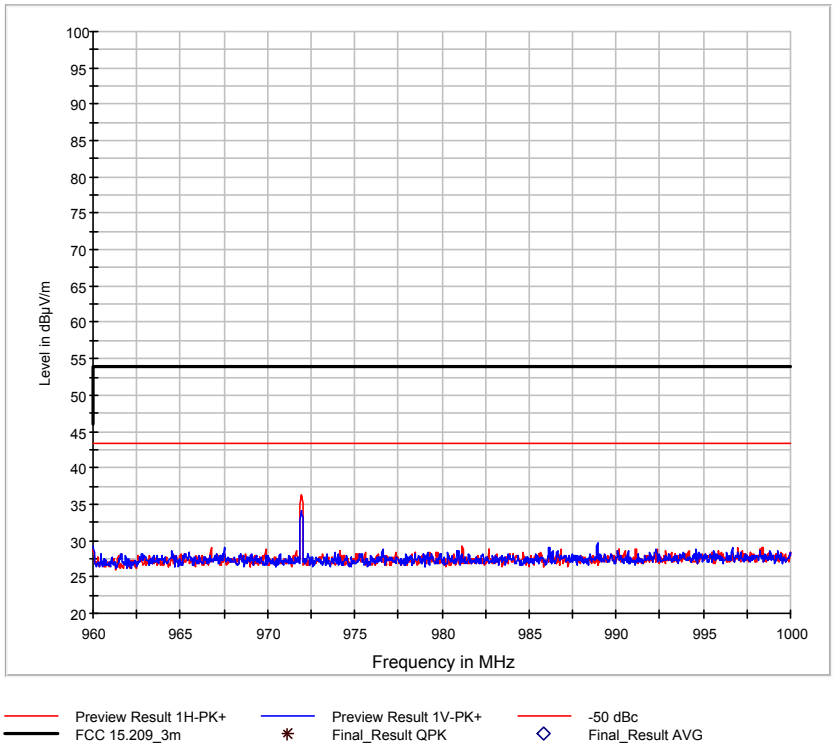
Final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

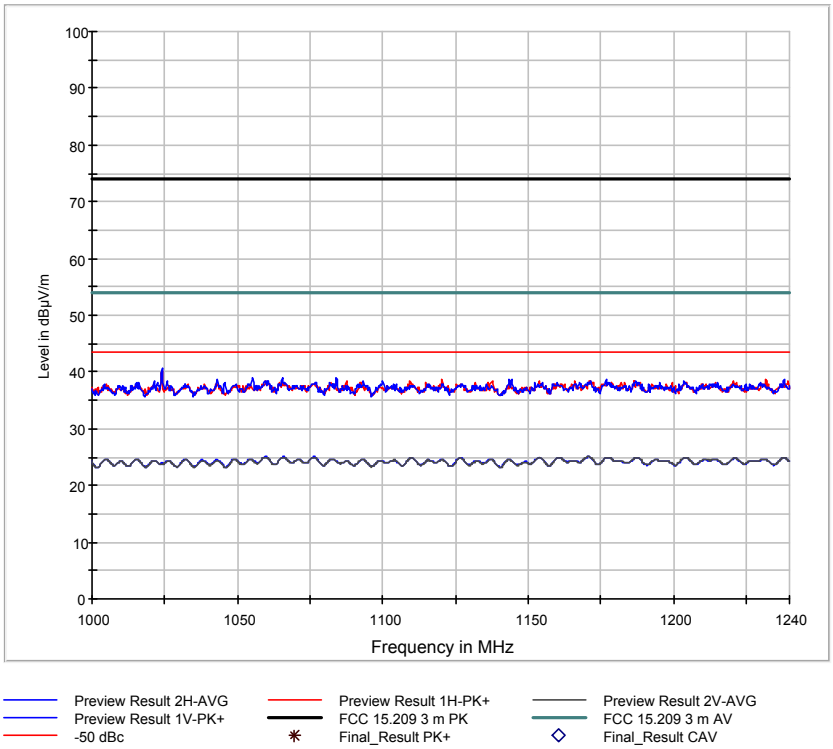
2.3.5 Environmental Conditions

Ambient Temperature	25,0 °C
Relative Humidity	44,0 %

2.3.6 Test Results

Normal operation - Continuous Transmission





Remark: No Emission above §15.209 Emission Limit found within Restricted Band 960 MHz to 1240 MHz.

FCC 47 CFR Part 15, Limit Clause 15.205

	Peak (dBµV/m)	Average (dBµV/m)
Restricted Bands of Operation	74	54

Table 9

Industry Canada 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 10

*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.

2.3.7 Test Location and Test Equipment Used

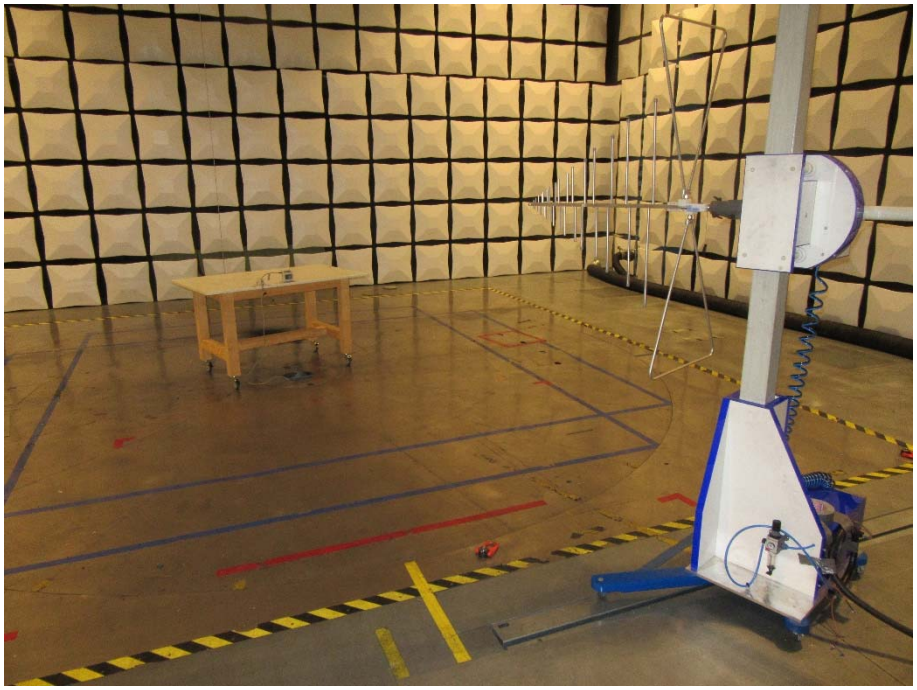
This test was carried out in Semi anechoic room - cabin no. 8.

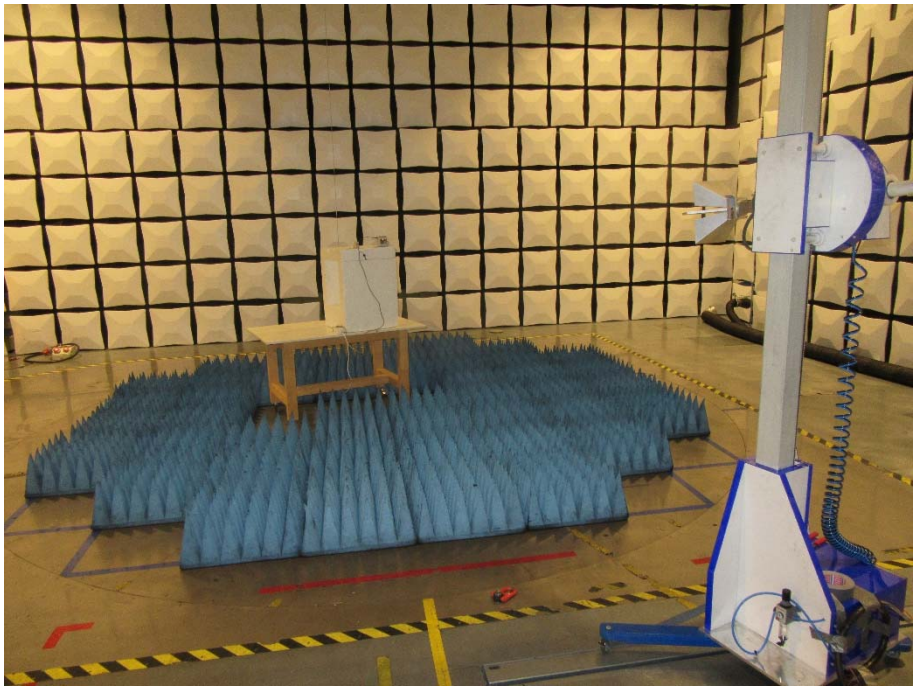
Instrument	Manufacturer	Type No	T-ID	Calibration Period (months)	Calibration Due
Horn Antenna	Rohde & Schwarz	HF907	19933	24	2019-06-30
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

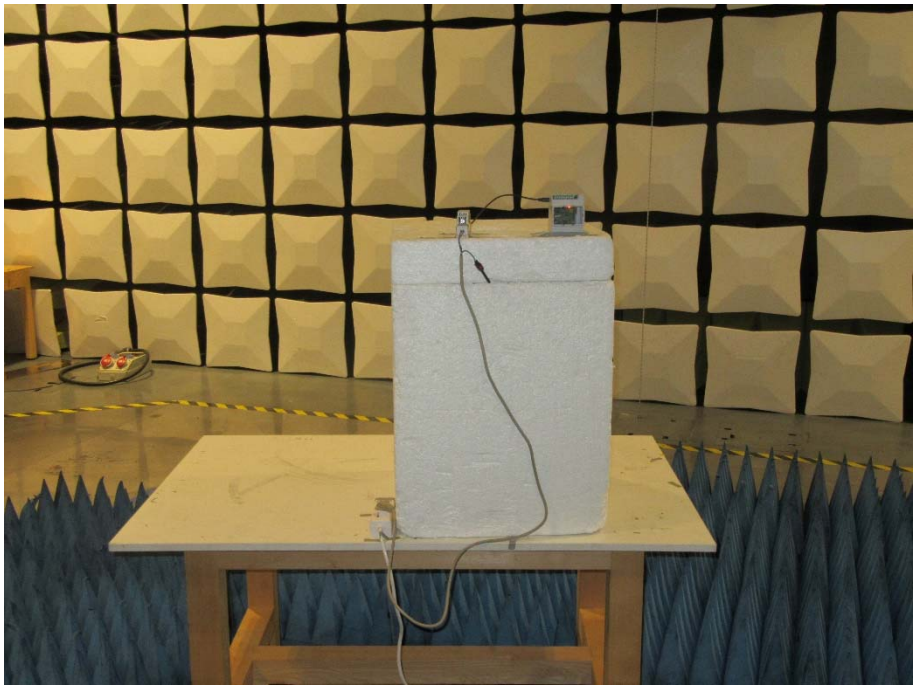
Table 11

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

2.3.8 Test Setup Photos







2.4 Authorised Band Edges

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.4.3 Date of Test

2018-07-12

2.4.4 Test Method

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

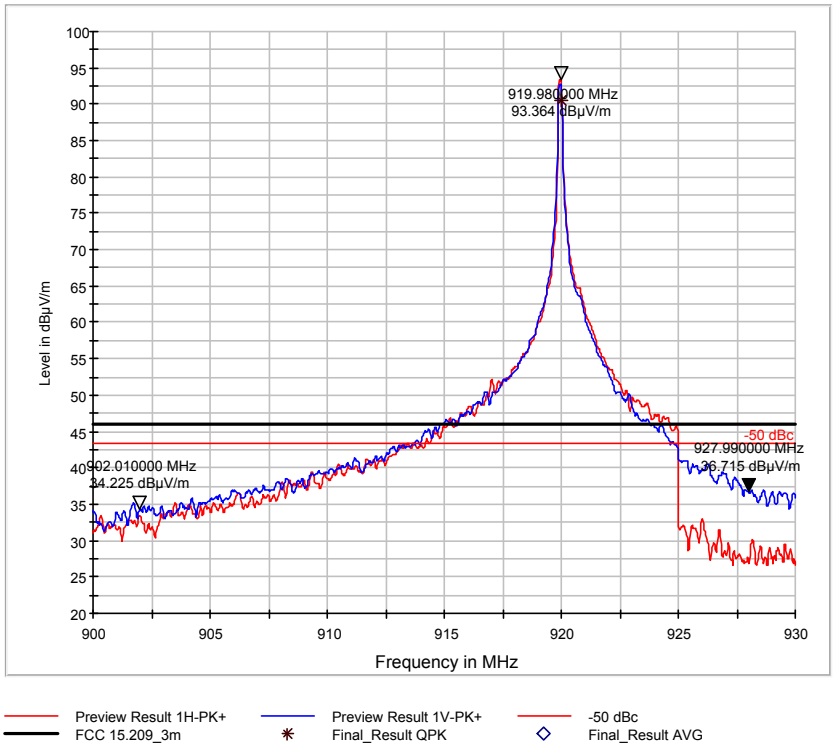
Bluetooth
The test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

2.4.5 Environmental Conditions

Ambient Temperature	25,0 °C
Relative Humidity	44,0 %

2.4.6 Test Results

Normal operation - Continuous Transmission



Remark: EUT Emission at band edges 902 MHz / 928 MHz is below -50 dBc and below §15.209 Emission Limit

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 12

Industry 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.

Industry 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 13

2.4.7 Test Location and Test Equipment Used

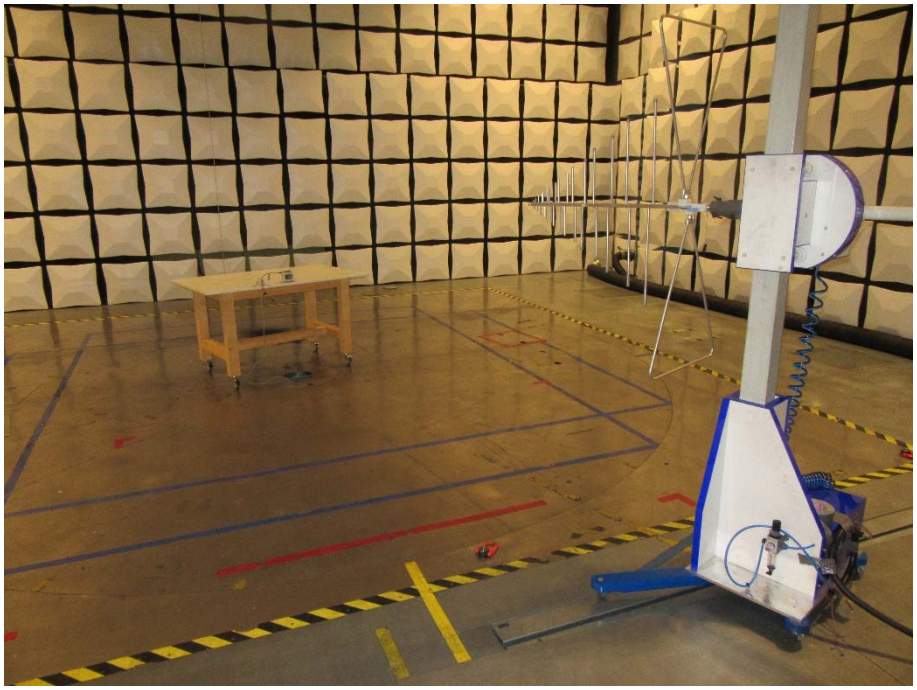
This test was carried out in Semi anechoic room - cabin no. 8.

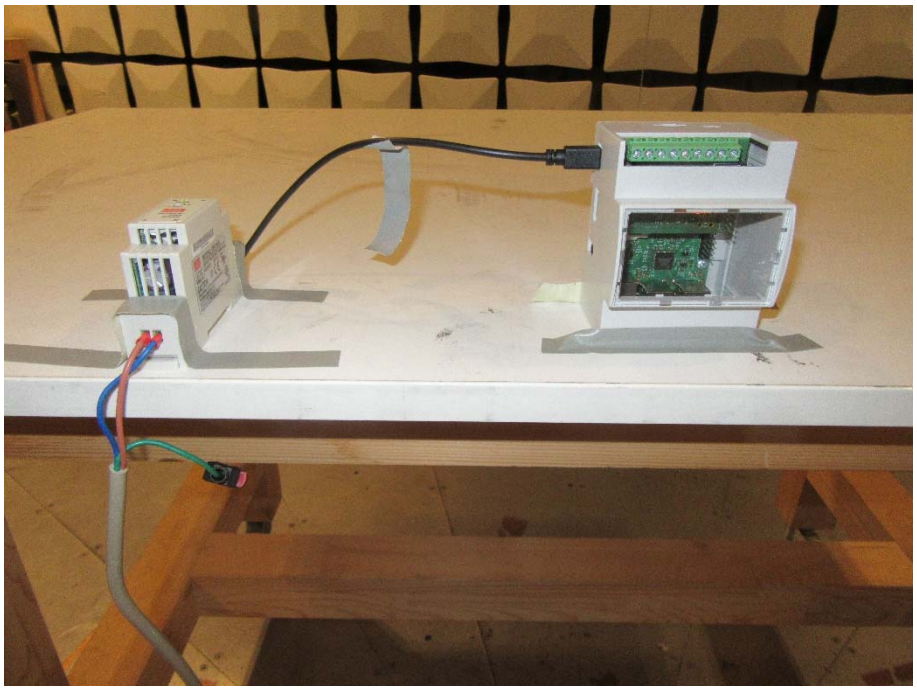
Instrument	Manufacturer	Type No	T-ID	Calibration Period (months)	Calibration Due
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

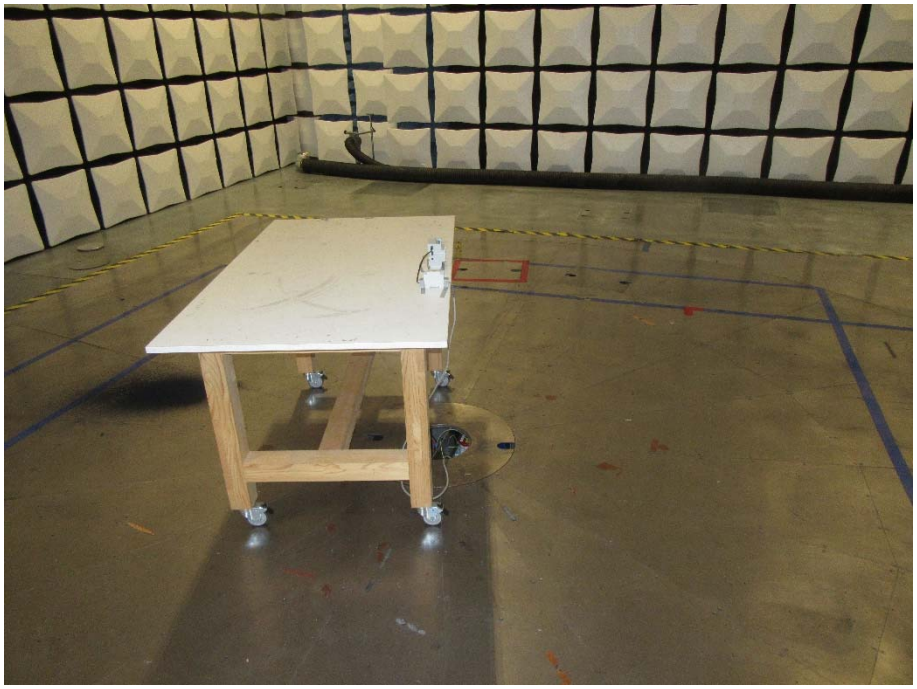
Table 14

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

2.4.8 Test Setup Photos







2.5 Field Strength of Fundamental

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.5.3 Date of Test

2018-07-12

2.5.4 Test Method

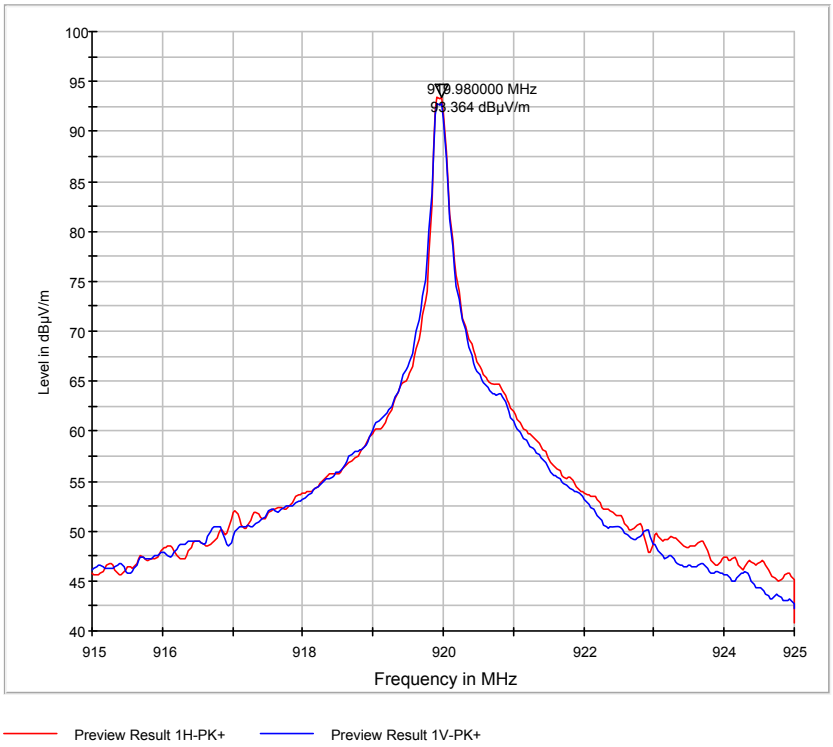
The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

2.5.5 Environmental Conditions

Ambient Temperature	25,0 °C
Relative Humidity	44,0 %

2.5.6 Test Results

Normal operation - Continuous Transmission



Final Results:

Frequency MHz	*Peak mV/m*	*Limit mV/m*	*Margin dB*
919,98	46.58 (93.364 dBµV/m)	50,00 (93.979 dBµV/m)	0.615

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 15

Industry 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.

2.5.7 Test Location and Test Equipment Used

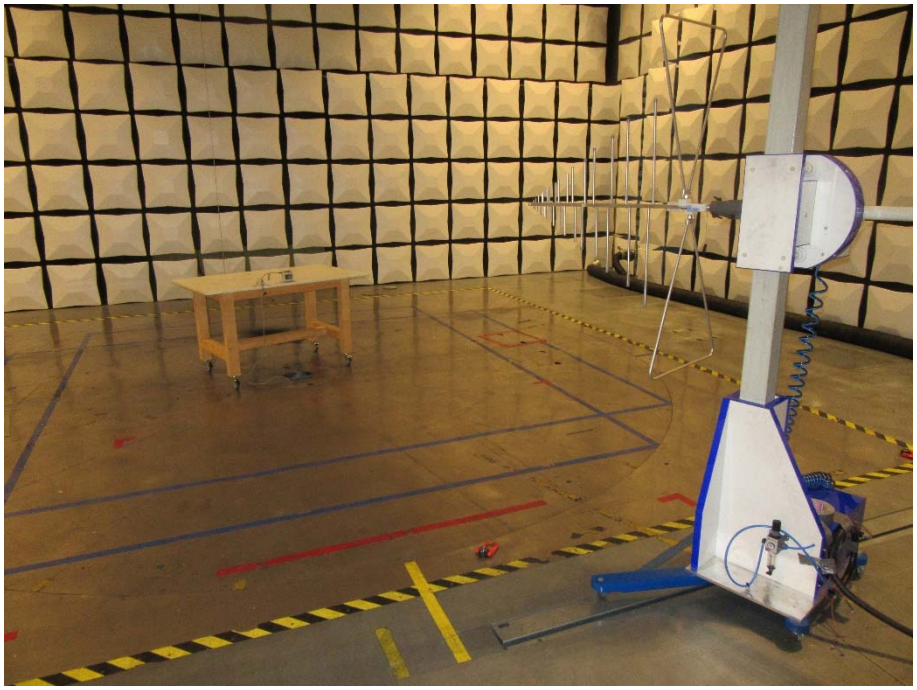
This test was carried out in Semi anechoic room - cabin no. 8.

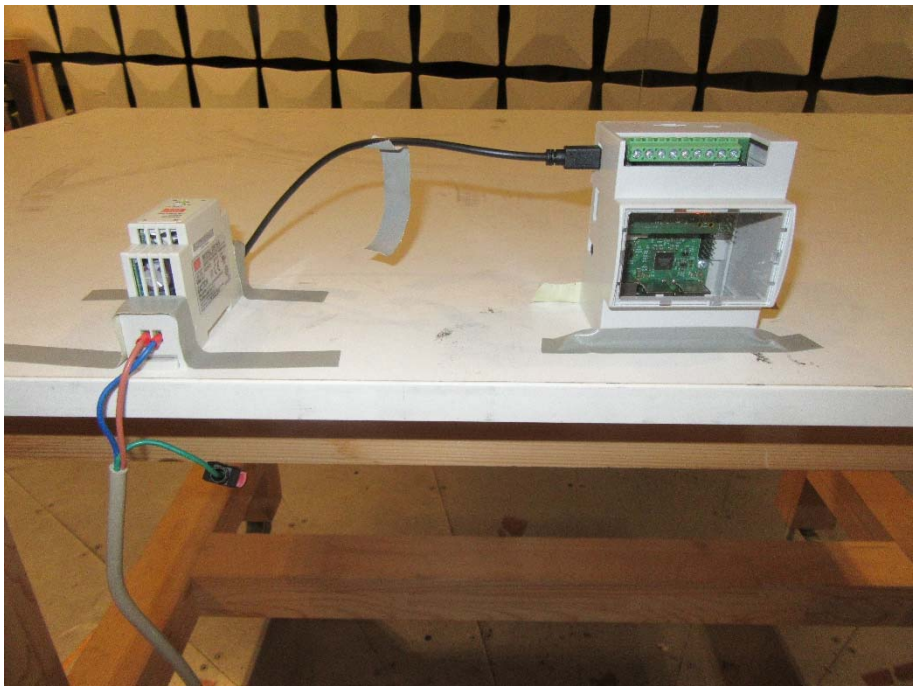
Instrument	Manufacturer	Type No	T-ID	Calibration Period (months)	Calibration Due
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2018-06-30

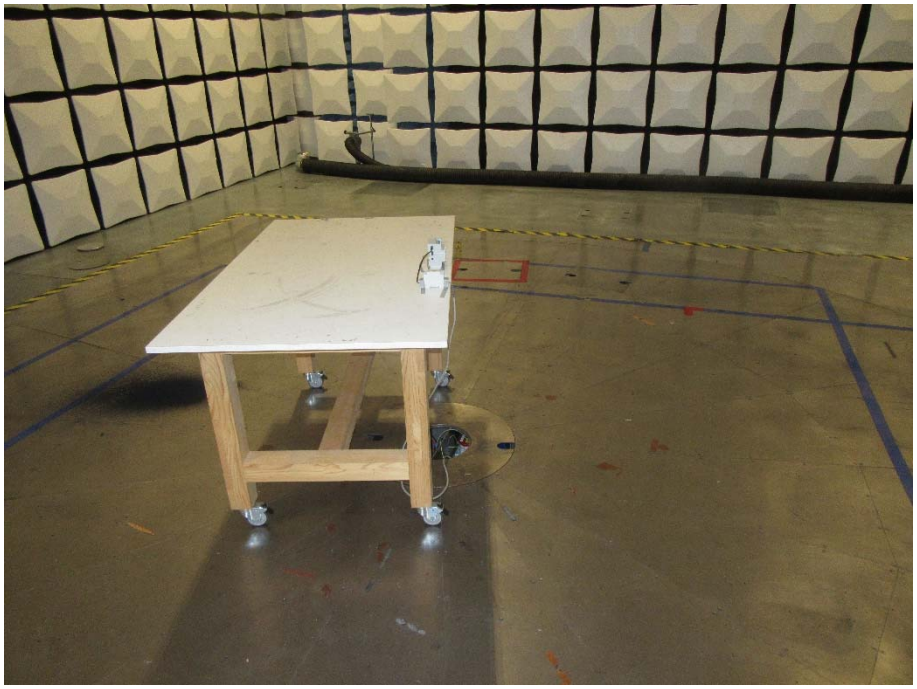
Table 16

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

2.5.8 Test Setup Photos







2.6 Field Strength of Emissions

2.6.1 Specification Reference

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

2.6.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.6.3 Date of Test

2018-07-04 to 2018-07-12

2.6.4 Test Method

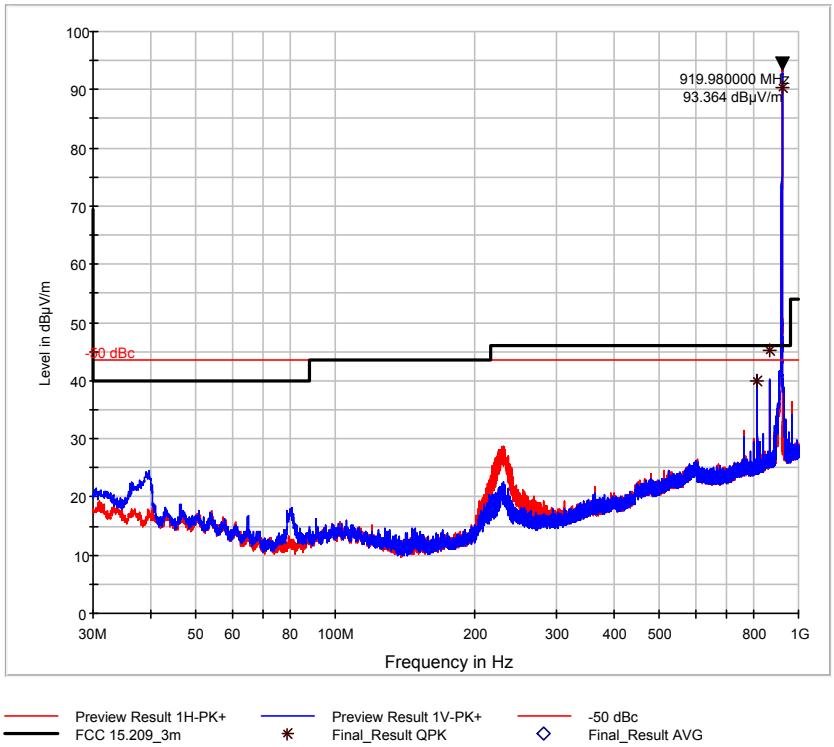
The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

2.6.5 Environmental Conditions

Ambient Temperature	24,0 °C
Relative Humidity	41,0 %

2.6.6 Test Results

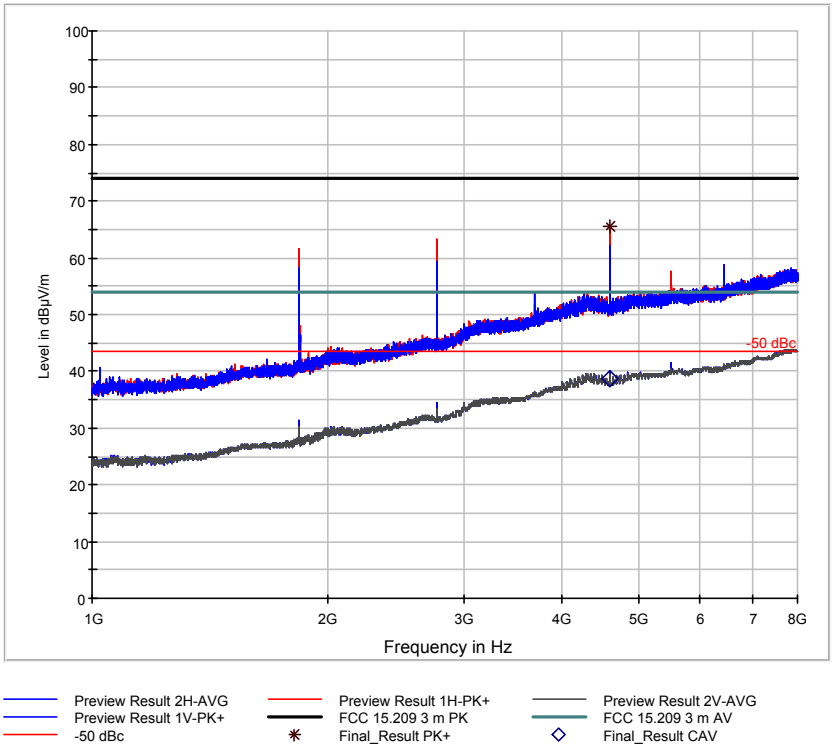
Normal operation - Continuous Transmission



Final Results:

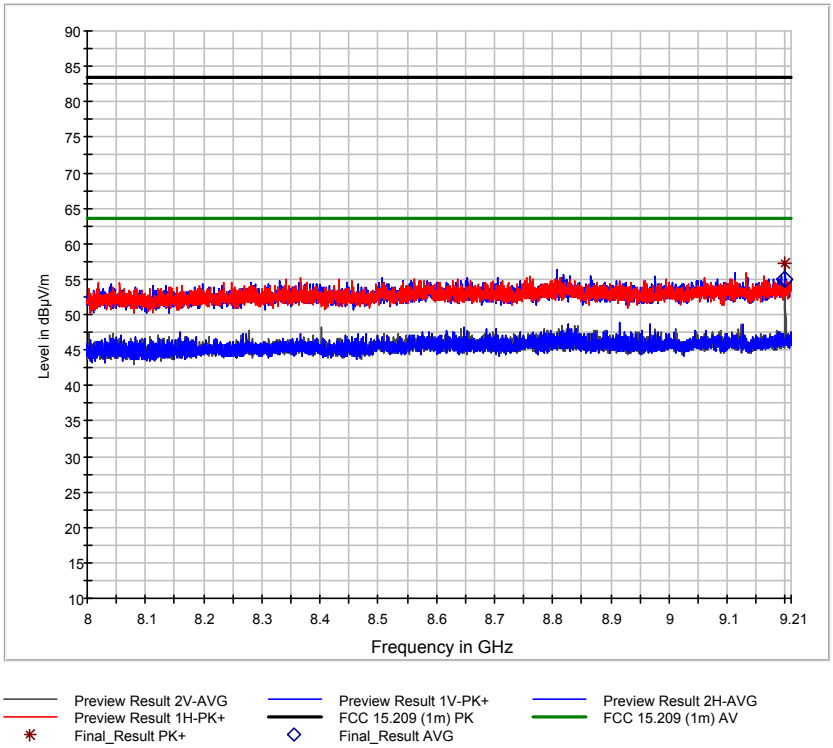
Frequency MHz	*QuasiPeak* dBµV/m	*Average* dBµV/m	*Limit* dBµV/m	*Margin* dB	*Meas. Time* ms	*Bandwidth* kHz	*Height* cm	*Pol*	*Azimuth* deg	*Corr.* dB
815.985000	39.91	---	46.00	6.09	1000.0	120.000	119.0	V	-136.0	24.1
867.915000	45.08	---	46.00	0.92	1000.0	120.000	103.0	V	-143.0	24.9
919.980000	90.49	---	#1 NA	#1 NA	1000.0	120.000	103.0	H	88.0	25.6

#1 Intentional Radiation



Final Results:

Frequency *MHz*	*MaxPeak* *dBµV/m*	*CAverage* *dBµV/m*	*Limit* *dBµV/m*	*Margin* *dB*	*Meas. Time* *ms*	*Bandwidth* *kHz*	*Height* *cm*	*Pol*	*Azimuth* *deg*	*Corr.* *dB*
4600.000000	---	38.84	53.98	15.14	1000.0	1000.000	299.0	H	37.0	41.4
4600.000000	65.55	---	73.97	8.42	1000.0	1000.000	299.0	H	37.0	41.4



Final Results:

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
9199.4125	57.21	---	83.50	26.29	2.5	1000.000	150.0	V	223.0	14.4
9199.4125	---	55.03	63.50	8.47	2.5	1000.000	150.0	V	223.0	14.4

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 17

Industry Canada RSS-210, Limit Clause B.10

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

The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

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.

Industry 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 18

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
Horn Antenna	Rohde & Schwarz	HF907	19933	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 19

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

2.7 RF Exposuere and SAR Exemption

2.7.1 Specification Reference

FCC 47 CFR Part 15C, Industry Canada RSS-102 Issue-5

2.7.2 Equipment Under Test and Modification State

SE10, S/N: C000FFFB - Modification State 0

2.7.3 Test Results

Normal operation - Continuous Transmission

Industry Canada RSS-102 Issue-5

Maximum Field strength:	46.58 mV/m at 3 m distance *(see chapter 2.5 of this report)*	
Calculated Equivalent EIRP:	650.9 µW	
SAR evaluation Exemption limits	7 mW	(Frequency 835 MHZ to 1900 MHz, separation distance of≤5 mm, acc. to RSS-102 Issue-5, Table 1)

Transmit Power is below SAR evaluation Exemption limit. No further SAR evaluation is required.

FCC KDB 447498 D01 Clause 4.3.1 a)

Maximum Field strength:	46.58 mV/m at 3 m distance *(see chapter 2.5 of this report)*
Calculated Equivalent EIRP:	650.9 µW
SAR evaluation Exemption criteria	(0.6509mW/(60/(0.92GHz)^0.5))x20mm/5mm = 0.042 ≤ 3 (Frequency 0.92 GHz, separation ≤ 5 mm)

Transmit Power is below SAR evaluation Exemption limit. No further SAR evaluation is required.

3 Photographs

3.1 Equipment Under Test (EUT)

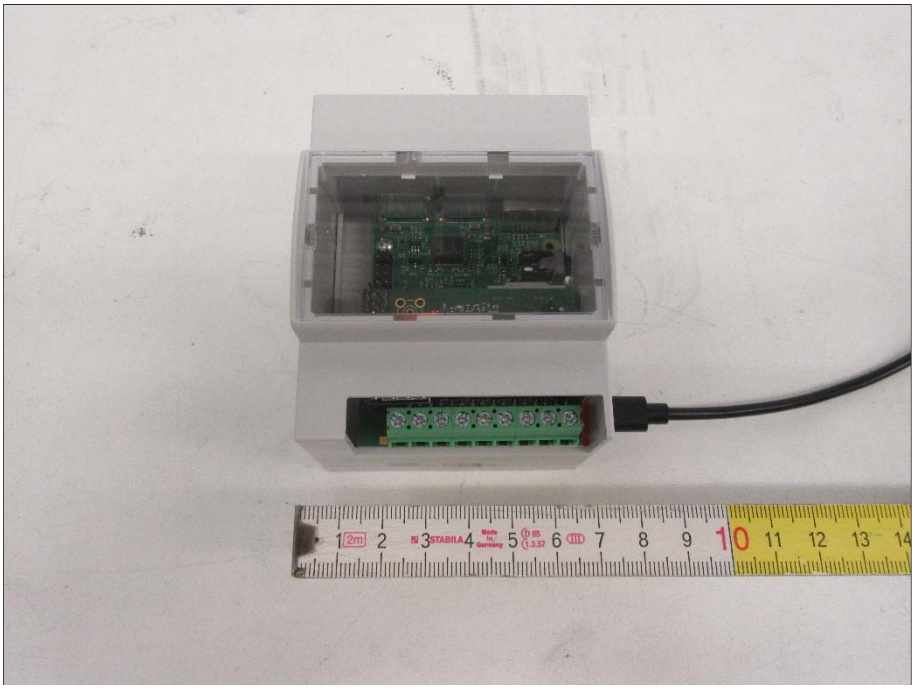


Figure 1 -

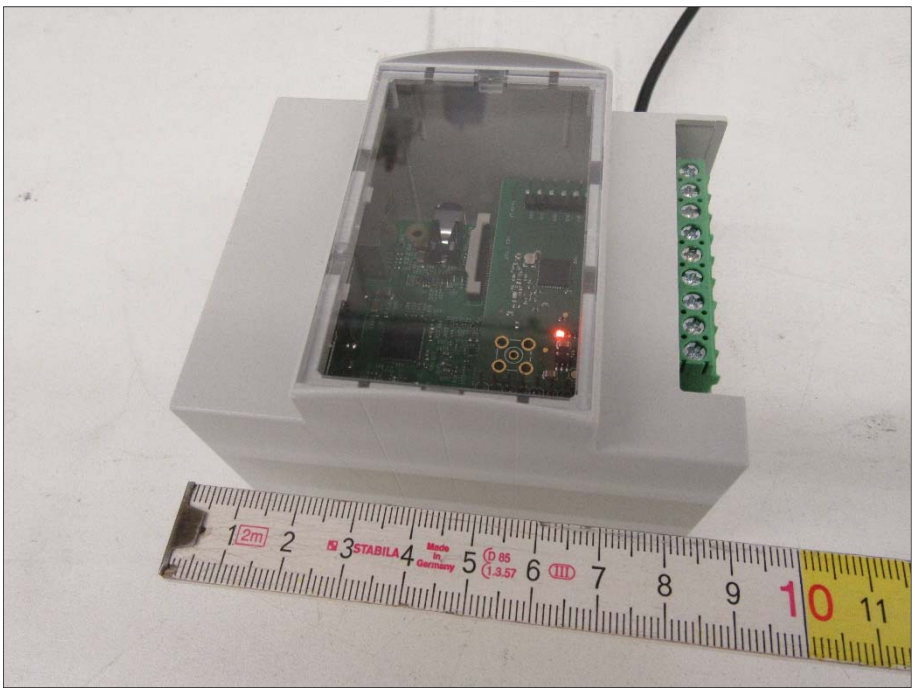


Figure 2 -

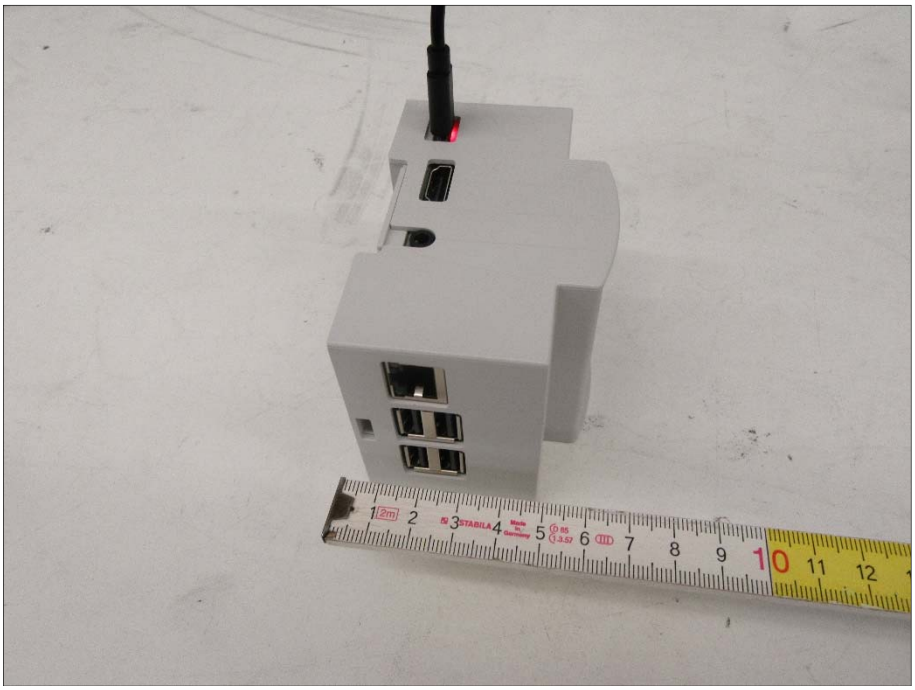


Figure 3 -

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 20

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 21

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 22

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%