Report No. **383891-09-R01**

Test Report

Product	Communications Headset with 915MHz Transceiver
Name and address of the applicant	3M Svenska AB Box 2341, 331 02 Värnamo Sweden
Name and address of the manufacturer	3M Svenska AB Box 2341, 331 02 Värnamo Sweden
Model	MT14H41A-300NA
Rating	3.0V_{DC} (2x AAA cells, Alkaline Batteries)
Trademark	Comtac VII
Serial number	NI-B-4
Additional information	NIB, NFMI
Tested according to	**FCC Part 15.249** Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz **Industry Canada RSS-210, Issue 10, Annex B10** Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5875 MHz
Order number	383891
Tested in period	2020-02-25
Issue date	2020-06-09
Name and address of the testing laboratory	Nemko Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50 ilac-MRA NORWEGIAN ACCREDITATION TEST 033 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [Frode Sveinsen]	Approved by [G.Suhanthakumar]

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1 INFORMATION

1.1 Test Item

Name	**Comtac VII**
FCC ID	**Y9ZMT14H4130**
ISED ID	**4406A-MT14H4130**
Model/version	**MT14H41A-300NA**
Serial number	**NI-B-4**
Hardware identity and/or version	**K409 AVE**
Software identity and/or version	**K409-sku 3.3.0**
Frequency Range	**915.500 MHz**
Channel Spacing	**N/A**
Number of Channels	**1**
Operating Modes	**Digital Modulation**
Type of Modulation	**FSK**
User Frequency Adjustment	**None**
Type of Power Supply	**Primary Batteries (2x AAA alkaline cells)**
Antenna Connector	**None (Integral Antenna)**
Number of Antennas	**1**
Desktop Charger	**N/A**
Interfaces	**Proprietary connector for connecting to SCU300**

Description of Test Item

This is a personal communications headset with 915MHz NIB transceiver for communication with other COMTAC VII headsets nearby and 10MHz NFMI transceiver for communication with the SCU300 System Control Unit.

1.2 Normal test condition

Temperature:	**20 - 24 °C**
Relative humidity:	**20 - 50 %**
Normal test voltage:	**3.0V_{DC} (Nominal Voltage)**

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 Antenna Requirement

Is the antenna detachable?	☐ **Yes**	☒ **No**
If detachable, is the antenna connector non-standard?	☐ **Yes**	☐ **No**

Type of antenna connector: Integral Antenna

Ref. FCC §15.203

1.5 Worst-Case Configuration and Mode

Radiated Emissions were tested with the EUT transmitting continuously with a modulated signal.

1.6 Comments

All measurements were performed with the EUT powered from new batteries.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.249 and Industry Canada RSS-210 Issue 10 and RSS-GEN Issue 5.

Tests were performed in accordance with ANSI C63.4-2014 and and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m.

A description of the test facility is on file with FCC and ISED.

☐ **New Submission**	☒ **Production Unit**
☒ **Class II Permissive Change**	☐ **Pre-production Unit**
DXT Equipment Code	☐ **Family Listing**

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in “Summary of Test Data”.

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 10, RSS-GEN Issue 5 reference	ANSI C63.10-2013 Reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	5.13	N/A
Number of Frequencies	15.31(m)	6.9 (RSS-GEN)	N/A	N/A
Antenna Requirement	15.203	6.8 (RSS-GEN)	5.8	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	6.2	N/A
Occupied (Emission) Bandwidth	15.215(c) 15.249 (b)	6.7 (RSS-GEN) B.10 (b) (RSS-210)	6.9.3	Complies
Field Strength of Fundamental	15.249(a)(c)(e)	B.10 (a) (RSS-210)	6.6	Complies
Radiated Emissions	15.249(a)(c)(d)(e) 15.209(a)	B.10(a)(b) (RSS-210) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	6.3, 6.5, 6.6 6.10	Complies

Revision history

Revision	Date	Comment	Sign
00	2020-04-28	First edition	FS
01	2020-06-09	Corrected Duty Cycle	FS

3 TEST RESULTS

3.1 Occupied (Emission) Bandwidth

FCC Part 15.249 (d)

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

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3

Test Results: Complies

Measurement Data:

Carrier Frequency	OBW (99% BW)
915.500 MHz	249.2 kHz

Carrier Frequency	50 dBc Frequency cross	Limit	Margin
915.500 MHz	915.059 MHz	902.000 MHz	13.059 MHz
915.500 MHz	915.909 MHz	928.000 MHz	12.091 MHz

See attached plots.

Requirements:

FCC 15.249 (d)

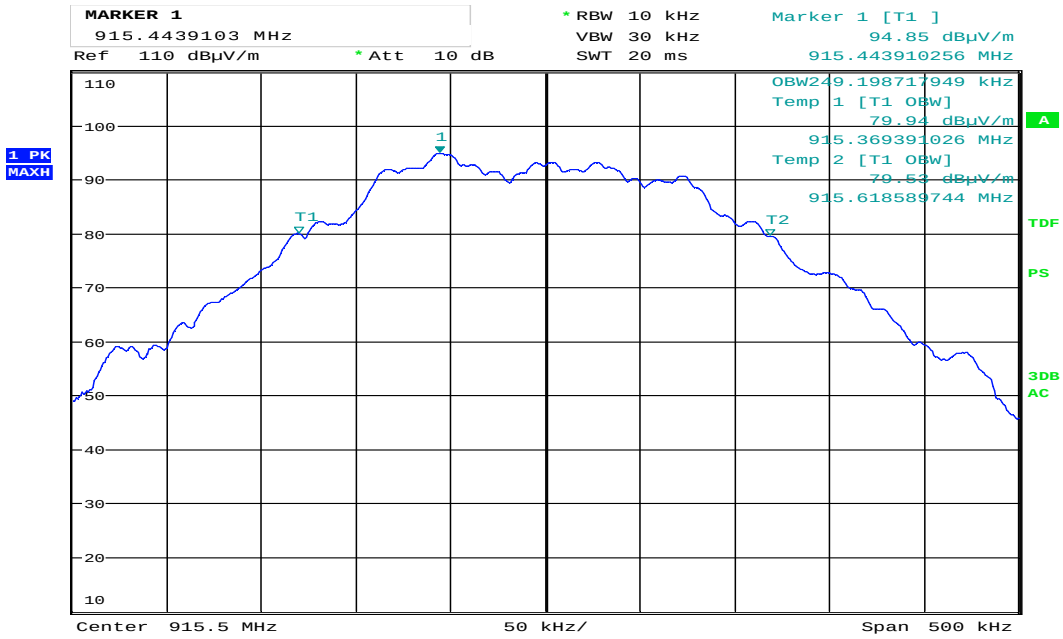
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

ISED RSS-GEN Issue 5, Clause 6.7

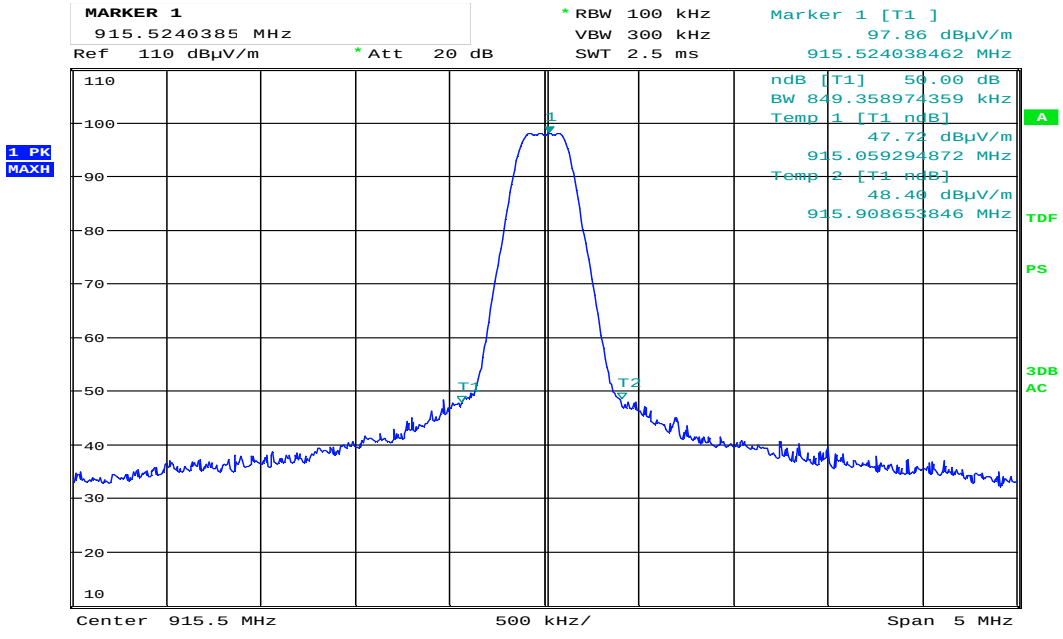
The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

ISED RSS-210 Issue 10, 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.



Occupied BW (99% BW)



Emission BW (50 dB BW)

3.2 Field Strength of Fundamental

FCC 15.249 (a)(c)(e)

Ised Canada RSS-210 Issue 10, B.10(a)

Test Results: Complies

Measurement Data:

Maximum Field Strength @3m, Max Power	
Carrier Frequency	**915.500 MHz**
Peak Field Strength	**97.9 dBµV/m**
Average Field Strength	**78.7 dBµV/m**
Limit, Average Field Strength	**94 dBµV/m**
Margin	**15.3 dB**

Field Strength reported is Maximum Field Strength.

See attached plots.

Duty Cycle from Operational Description:

EUT transmits 1 burst per 10 ms, Burst length = 1.1 ms

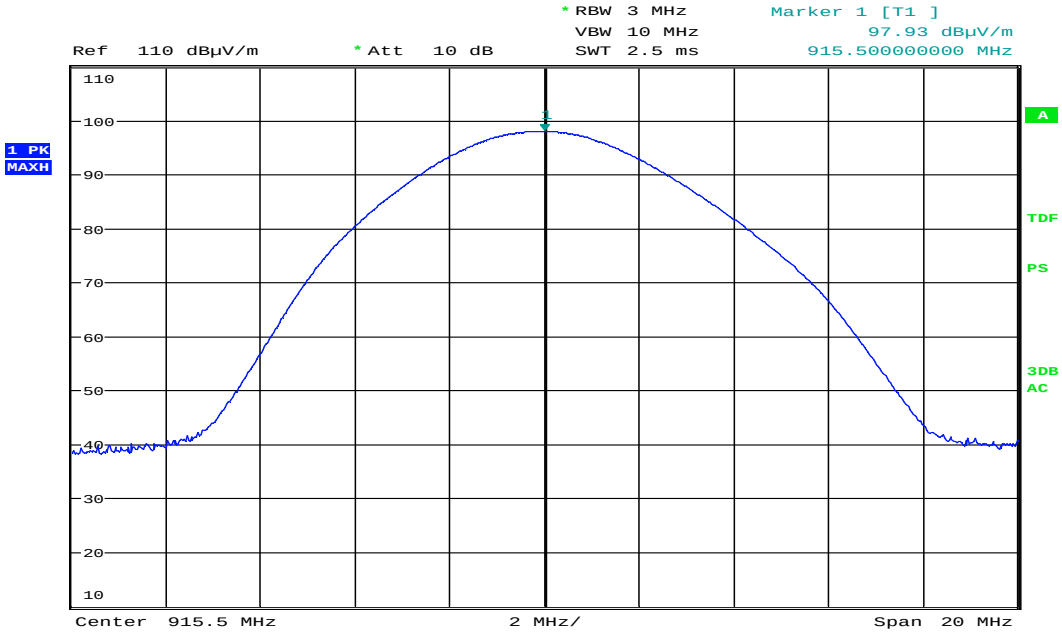
Duty Cycle = 10x 1.1ms / 100ms = 11 %

Duty Cycle Correction Factor = 19.2 dB

Requirements:

The field strength of fundamental, measured at 3 m, shall not exceed 50 mV/m (94 dBµV/m).

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.



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Field Strength of Fundamental

3.3 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		**0.96-1.24** **1.3-1.427**	**0.96-1.427**
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		**2.69-2.9**	**2.655-2.9**
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		**3.6-4.4**	**3.5-4.4**
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 **123-138**	**108-138**	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

3.4 Radiated Emission, 30 – 1000 MHz

FCC Part 15.209(a) / 15.249(a)

ISED Canada RSS-210 issue 10, B.10 (a)(b)

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

Measurement procedure: ANSI C63.10-2013 Clause 6.5

Test Results: Complies

Measurement Data:

Detector: Peak (found frequencies were measured with Quasi-Peak Detector)

Measuring distance: 3 m

No emissions found.

See attached plots

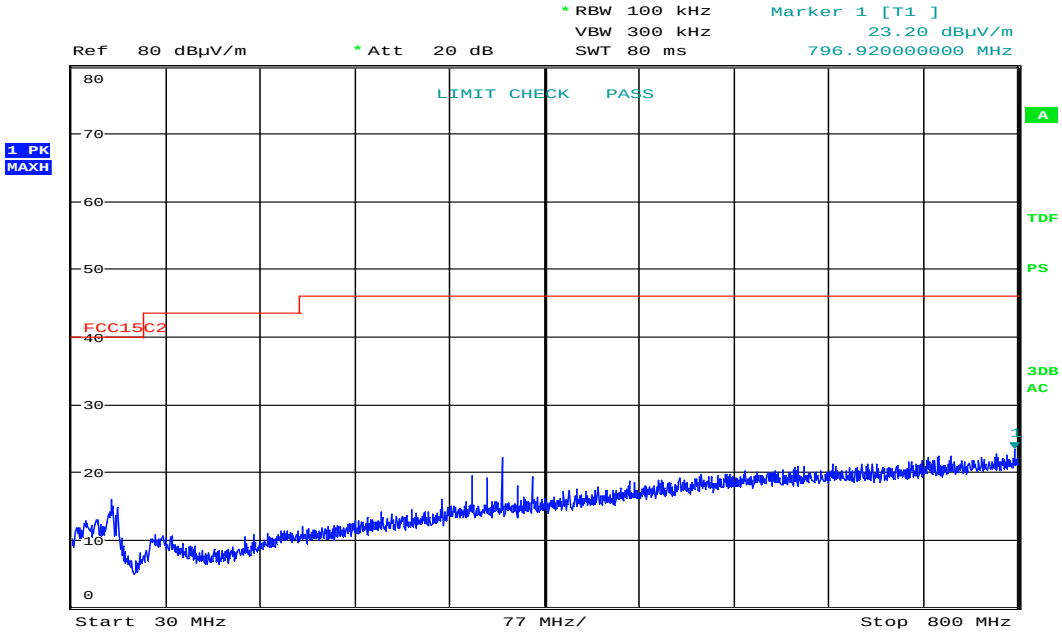
Requirements/Limit

The field strength of harmonic emissions, measured at 3 m, shall not exceed 0.5 mV/m (54 dBµV/m).

The field strength limits shall be measured using an average 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 or §15.209, whichever is less stringent.

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 µV/m	40.0 dBµV/m
88 – 216 MHz	150 µV/m	43.5 dBµV/m
216 – 960 MHz	200 µV/m	46.0 dBµV/m
960 – 1000 MHz	500 µV/m	54.0 dBµV/m
	Limits above are with Quasi Peak Detector	



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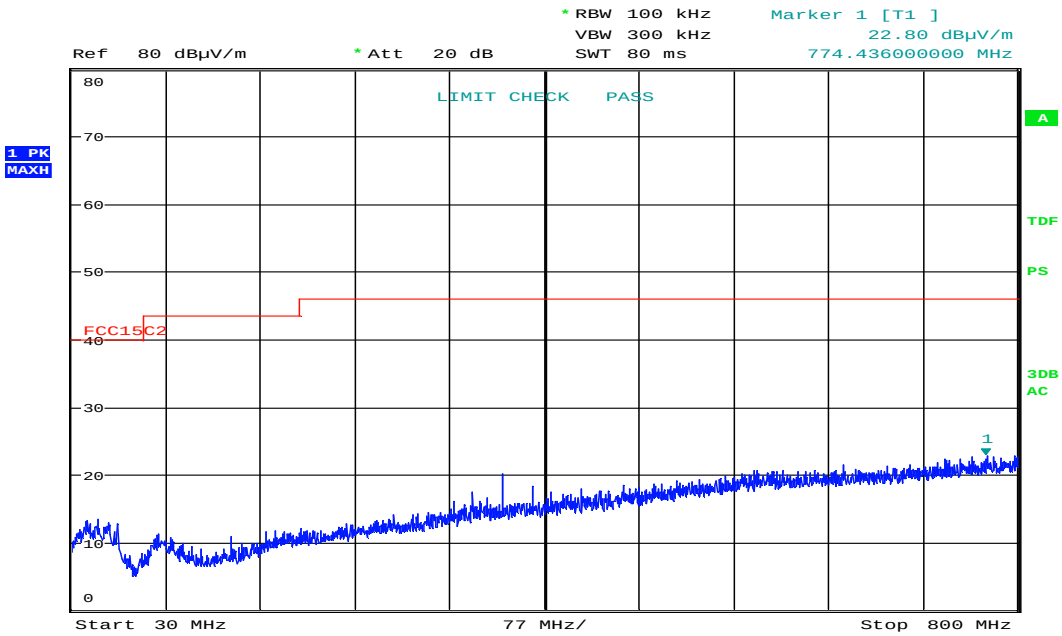
Radiated Emissions, 30 -800 MHz, 915.500 MHz, VP



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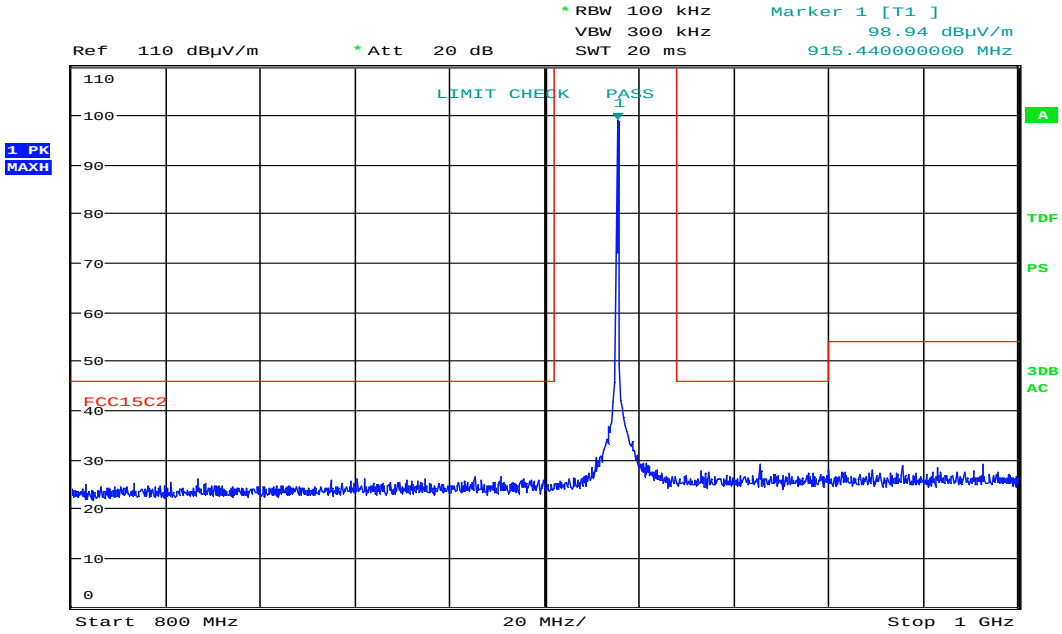
Radiated Emissions, 30 -800 MHz, 915.500 MHz, HP



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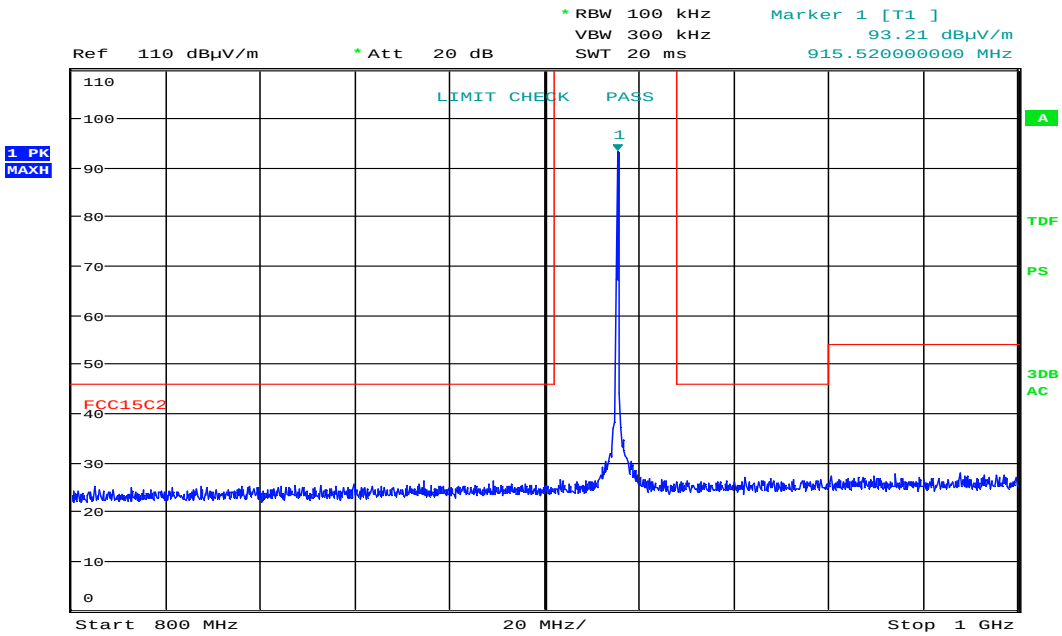
Radiated Emissions, 800 -1000 MHz, 915.500 MHz, VP



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Radiated Emissions, 800 -1000 MHz, 915.500 MHz, HP

3.5 Radiated Emissions, 1-10 GHz

FCC Part 15.209(a) / 15.249(a)

ISED Canada RSS-210 issue 10, B.10 (a)(b)

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

Measurement procedure: ANSI C63.10-2013 Clause 6.6

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 10 GHz)

Spurious Frequency	Carrier Frequency	Polarization	Detector	Measured Value (dBµV/m)	Limit (dBµV/m)	Margin
8.24 GHz	915.5 MHz	HP	Pk	50.9	74	23.1

All emissions are below the Average limit even when measured with Peak Detector.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer “Transducer factor”.

See plots.

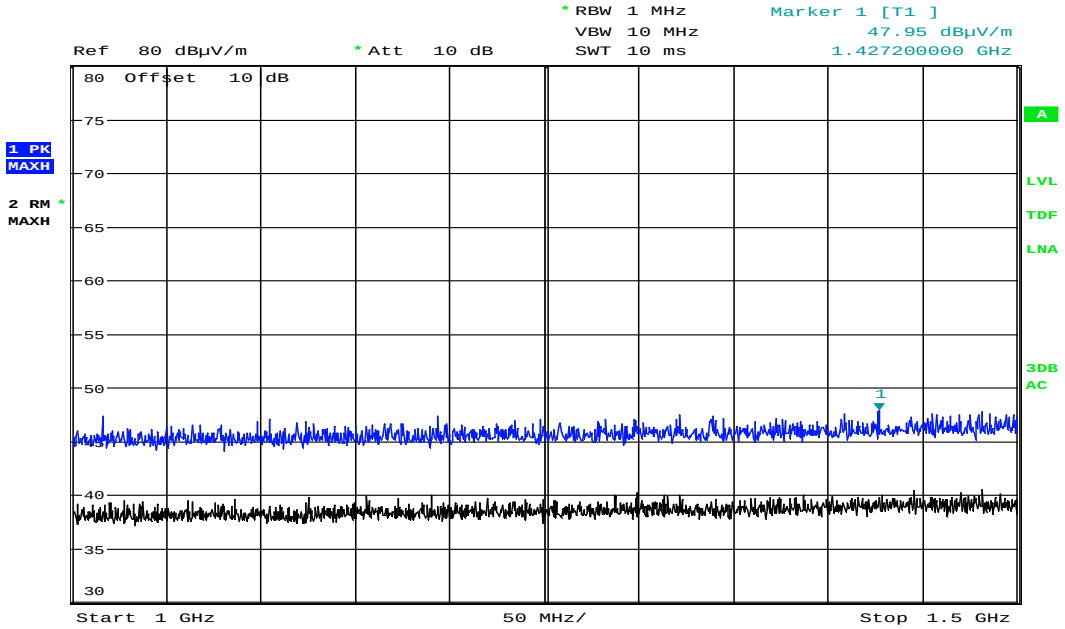
Requirements/Limit

The field strength of harmonic emissions, measured at 3 m, shall not exceed 0.5 mV/m (54 dBµV/m).

The field strength limits shall be measured using an average 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 or §15.209, whichever is less stringent.

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED Canada	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	Average Detector (dBµV/m)	Peak Detector (dBµV/m)
1 – 40 GHz	54.0	74.0



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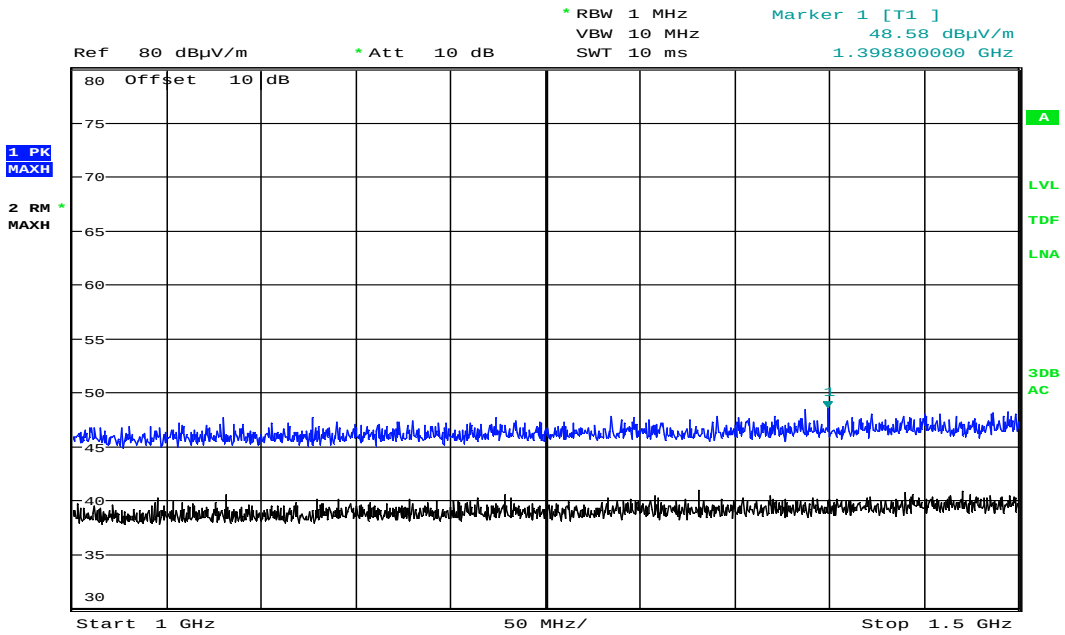
Radiated Emissions, 1000 -1500 MHz, 915.500 MHz, VP



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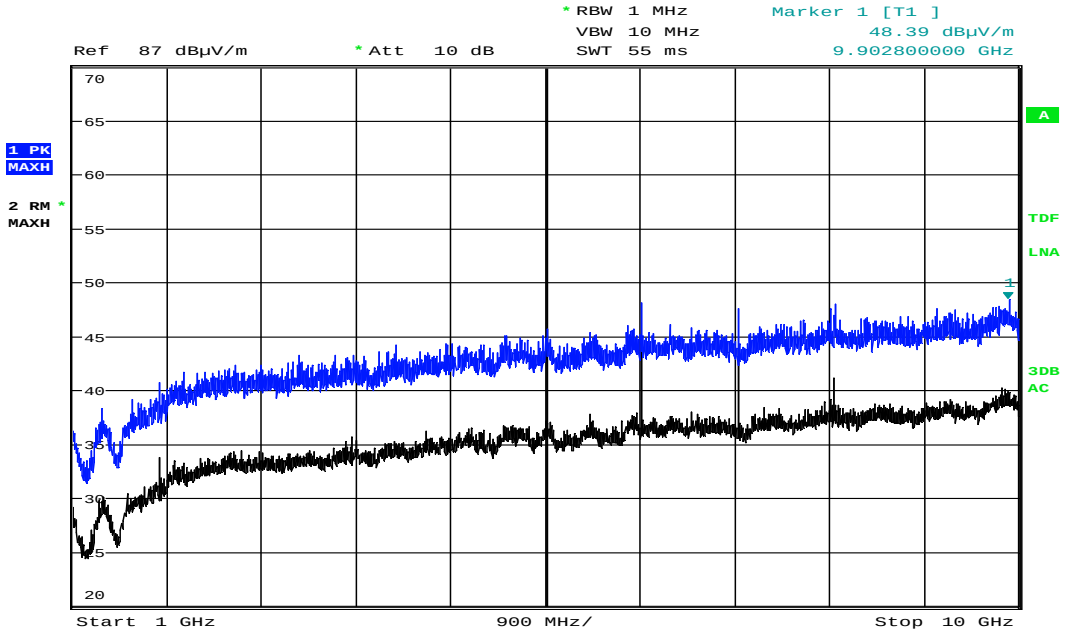
Radiated Emissions, 1000 -1500 MHz, 915.500 MHz, HP



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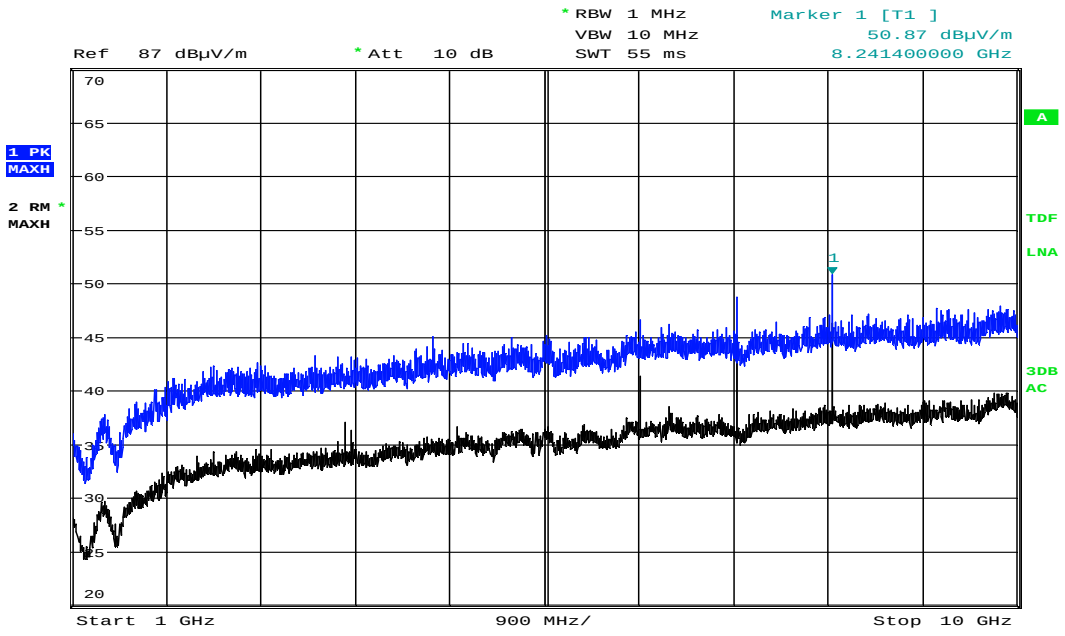
Radiated Emissions, 1500 -10000 MHz, 915.500 MHz, VP



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Radiated Emissions, 1500 -10000 MHz, 915.500 MHz, HP

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		**Uncertainty**
Spurious Emissions, Radiated	**< 1 GHz**	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

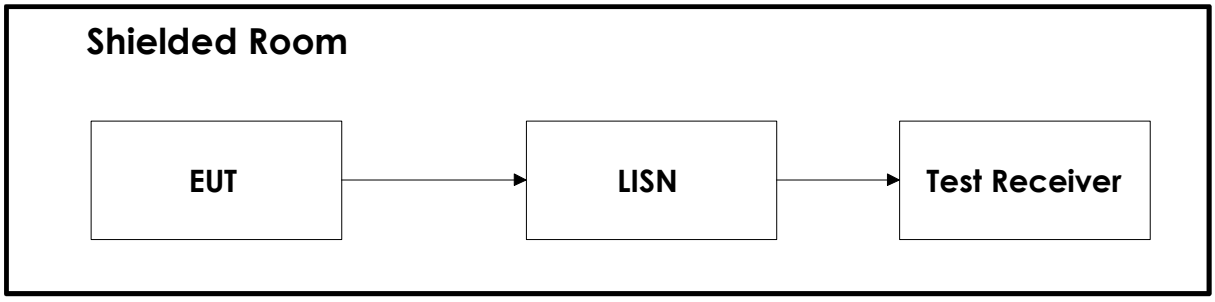
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020.01	2021.01
2	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020.01	2021.01
3	6810.17B	Attenuator	Suhner	LR 1669	2019.07	2020.07
4	VULB 9163	BiLog Antenna	Schwarzbech	LR 1616	2020-01	2023-01
5	317	Preamplifier	Sonoma Instruments	LR 1687	2019-07	2020-07
6	3117-PA	Horn Antenna with PreAmp	EMCO	LR 1717	2017-12	2020-12
7	6HC1500/18000-3-KK	High Pass Filter	Trilithic	LR 1612	2019-07	2020-07

The software listed below has been used for one or more tests.

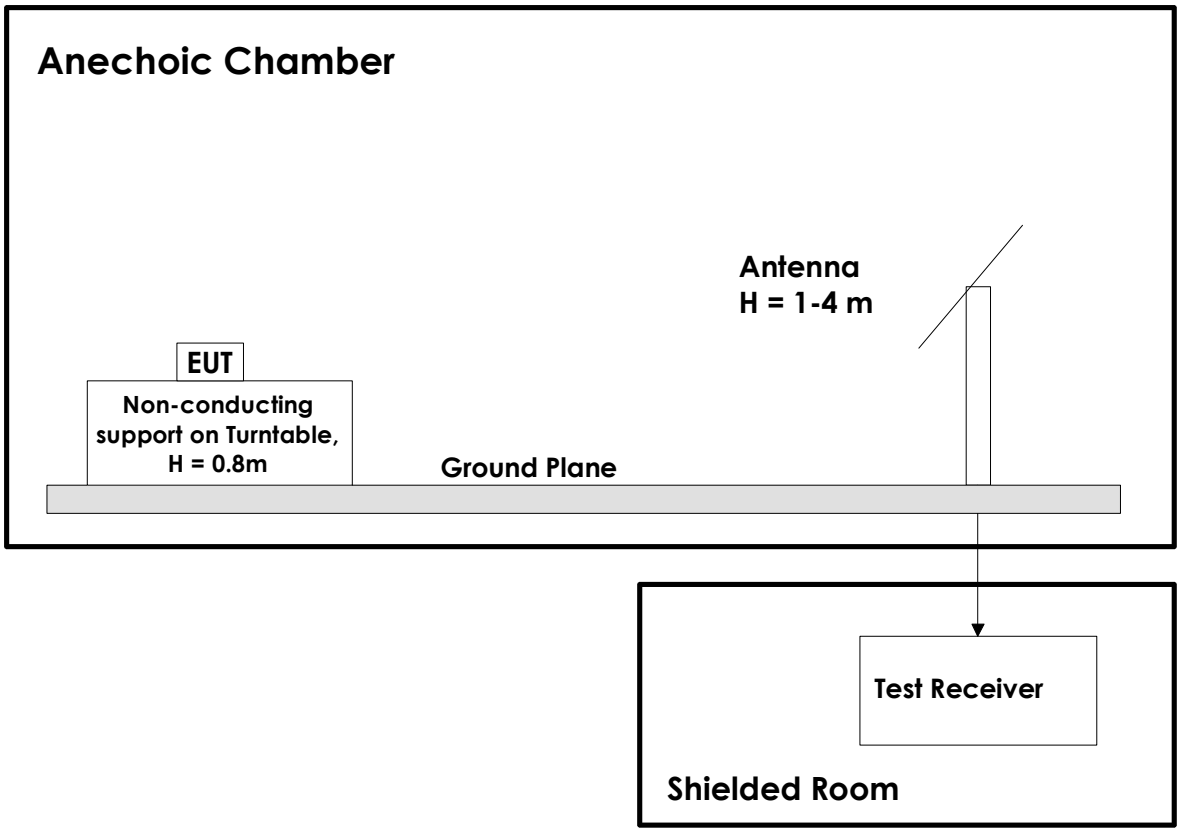
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Radiated Emission test software
2	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier was used for all measurements, and a high-pass filter was used for all harmonics.