

# Test report

**359758-2TRFWL**

Date of issue: March 6, 2019

Applicant:

**eers Global Technologies Inc.**

Product:

**High-noise hearing protective communication device**

Model:

**SonX**

FCC ID:

**2ANPP-SONXA10**

IC Registration number:

**2ANPP-23228**

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.249**

Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz and 24.0–24.25 GHz

◆ **RSS-210, Issue 9, December 2016, Annex F**

Devices operating in frequency bands 902–928, 2400–2483.5 and 5725–5875 MHz for any application

#### Test location

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Company name:	Nemko Canada Inc.
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Telephone:	+1 613 737 9680
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Toll free:	+1 800 563 6336
Website:	www.nemko.com
Site number:	FCC: CA2041; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by:	Avul Nzenza, EMC Specialist
Reviewed by:	Andrey Adelberg, Senior Wireless/EMC Specialist
Date:	March 6, 2019
Signature:	

#### Limits of responsibility

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Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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## Section 1 Report summary

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### 1.1 Applicant/Manufacturers

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Company name	eers Global Technologies Inc.
Address	355, rue Peel, Bureau 710 H3C 2G9 Montréal QC Canada

### 1.2 Test specifications

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FCC 47 CFR Part 15, Subpart C, Clause 15.249	Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz and 24.0–24.25 GHz
RSS-210, Issue 9 Annex B.10	Devices operating in frequency bands 902–928, 2400–2483.5 and 5725–5875 MHz for any application

### 1.3 Test specifications

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ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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### 1.4 Statement of compliance

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In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

### 1.5 Exclusions

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None

### 1.6 Test report revision history

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Revision #	Details of changes made to test report
TRF	Original report issued

## Section 2 Summary of test results

### 2.1 FCC Part 15 Subpart C – general requirements, test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable
§15.215(c)	20 dB emission bandwidth	Pass

Note: The EUT uses a 3.7 Vdc cell battery.

### 2.2 FCC Part 15 Subpart C – Intentional Radiators, test results

Part	Test description	Verdict
§15.249(a)	Field strength of fundamental and harmonics emissions	Pass
§15.249(d)	Spurious emissions (except harmonics)	Pass

### 2.3 IC RSS-GEN, Issue 5, test results

Clause	Test description	Verdict
6.7	Occupied bandwidth	Pass
7.3	Receiver Radiated Limits	Not applicable
7.4	Receiver Conducted Limits	Not applicable
8.8	AC power lines conducted emission limits	Not applicable

Note: 1 According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.  
The EUT uses a 3.7 Vdc cell battery.

### 2.4 RSS-210, Issue 9, test results

Part	Test description	Verdict
§B.10 (a)	Field strength of fundamental and harmonics emissions	Pass
§B.10 (b)	Spurious emissions (except harmonics)	Pass

## Section 3 Equipment under test (EUT) details

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### 3.1 Sample information

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Receipt date	August 27, 2018
Nemko sample ID number	#1

### 3.2 EUT information

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Product name	High-noise hearing protective communication device
Model	SonX

### 3.3 Technical information

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Operating band	902–928 MHz
Operating frequency range	908.9–920.4 MHz
Modulation type	FSK
Occupied bandwidth (99 %)	274.0 kHz
Emission designator	274KF1D
Power requirements	3.4–4.1 VDC (Battery)
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

### 3.4 Product description and theory of operation

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The product is intended to act as a radio communication and hearing protective device in noisy industrial environments.

It is composed of a lapel-mounted processing unit (including user-replaceable battery) and two wired earpieces with noise-attenuating earplugs that are intended to be worn in the outer ear canal.

Each earpiece has an in-ear microphone (for voice pick-up), an outer-ear microphone (for ambient noise pick-up), and a speaker for transmission of incoming signals to the ear canal.

The device is used as a push-to-talk radio, allowing half-duplex broadcast communications up to 25 meters.

It supports several different radio channels, with channel selection left at the discretion of individual users.

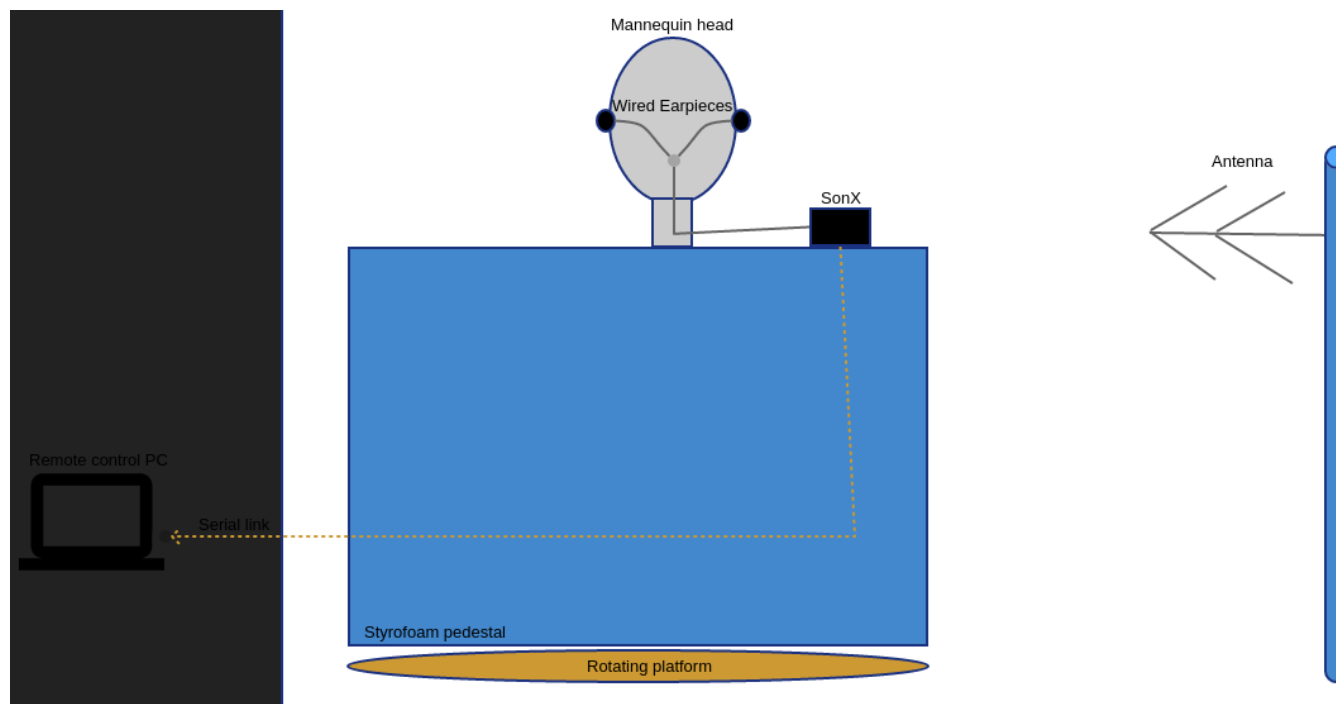
The product also includes Bluetooth Classic/LE connectivity, allowing data communication with a web platform, and voice communication with cellular phones or hand-held radio systems for long-range operation.

### 3.5 EUT exercise details

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The unit is activated with a continuous transmissions signal using FSK modulation.

### 3.6 Block Diagram



## Section 4 Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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There were no modifications performed to the EUT during this assessment.  
Just before the assessment, a cable was added to connect the unit to the computer.

### 4.2 Technical judgment

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None

### 4.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.



## Section 5 Test conditions

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### 5.1 Atmospheric conditions

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Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6 Measurement uncertainty

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### 6.1 Uncertainty of measurement

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Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of  $K = 2$  with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

## Section 7 Test equipment

### 7.1 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002532	2 year	June 5/19
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	Sept. 18/18
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Dec. 6/18
Horn antenna (1–18 GHz)	EMCO	3115	FA001451	1 year	April 27/19
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	Sept. 21/18

Note: VOU - verify on use, NCR - no calibration required

## Section 8 Testing data

### 8.1 FCC Clause 15.215(c) Emission bandwidth and RSS-Gen Clause 6.7 Occupied bandwidth

#### 8.1.1 Definitions and limits

##### FCC Part 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that 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. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

##### RSS-Gen Clause 6.7 Occupied bandwidth

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

#### 8.1.2 Test summary

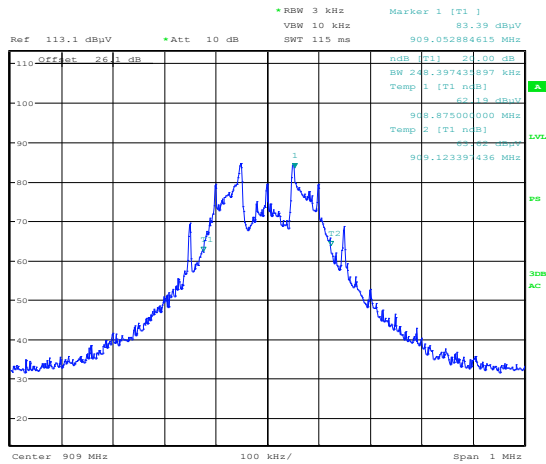
Verdict	Pass		
Test date	August 28, 2018	Temperature	24 °C
Test engineer	Avul Nzenza	Air pressure	1011 mbar
Test location	Ottawa	Relative humidity	51.0 %

#### 8.1.3 Observations, settings and special notes

Spectrum analyzer settings:

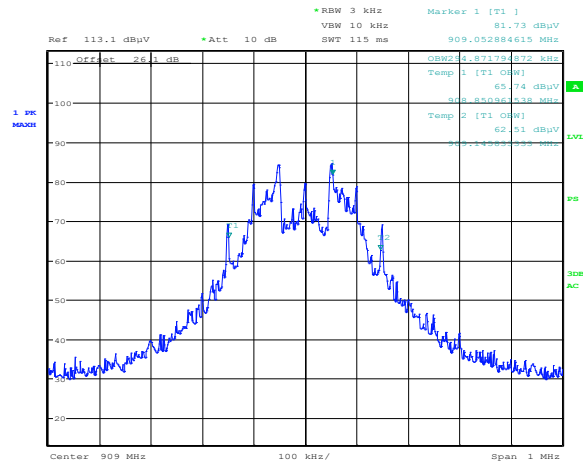
Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Detector mode:	Peak
Trace mode:	Max Hold
Function:	20 dB BW (for FCC); 99 % bandwidth (for IC)

## 8.1.4 Test data



Date: 15.OCT.2018 14:39:41

Plot 8.1-1: 20 dB bandwidth sample plot



Date: 15.OCT.2018 14:41:24

Plot 8.1-2: 99% bandwidth sample plot

Table 8.1-1: 20 dB bandwidth results

Frequency, MHz	20 dB bandwidth, kHz
908.9	248.4
915.0	240.4
920.4	237.2

Notes: None

Table 8.1-2: 99% bandwidth results

Frequency, MHz	99 % occupied bandwidth, kHz
908.9	254.9
915.0	274.0
920.4	256.5

Notes: None

Table 8.1-3: Operation band compliance for FCC

Lower 20 dB BW frequency, MHz	Lower band edge limit, MHz	Upper 20 dB BW frequency, MHz	Upper band edge limit, MHz
908.875	>902.000	920.618	<928.000

Notes: None

Table 8.1-4: Operation band compliance for IC

Lower 99 % OBW frequency, MHz	Lower band edge limit, MHz	Upper 99 % OBW frequency, MHz	Upper band edge limit, MHz
908.850	>902.000	920.647	<928.000

Notes: None

## 8.2 FCC Clause 15.249(a) and RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions

### 8.2.1 Definitions and limits

In addition to the provisions of §15.205 and RSS Gen the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

**Table 8.2-1:** Field strength limits

Fundamental frequencies (MHz)	Field strength of fundamental		Field strength of harmonics	
	(mV/m)	(dBμV/m)	(μV/m)	(dBμV/m)
902–928	50	94	500	54
2400–2483.5	50	94	500	54
5725–5875	50	94	500	54
24.0–24.25*	250	108	2500	68

Note: \* - Only FCC band.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter (128 dBμV/m) at 3 meters along the antenna azimuth.

### 8.2.2 Test summary

Verdict	Pass		
Test date	August 28, 2018	Temperature	24 °C
Test engineer	Avul Nzenza	Air pressure	1011 mbar
Test location	Ottawa	Relative humidity	51.0 %

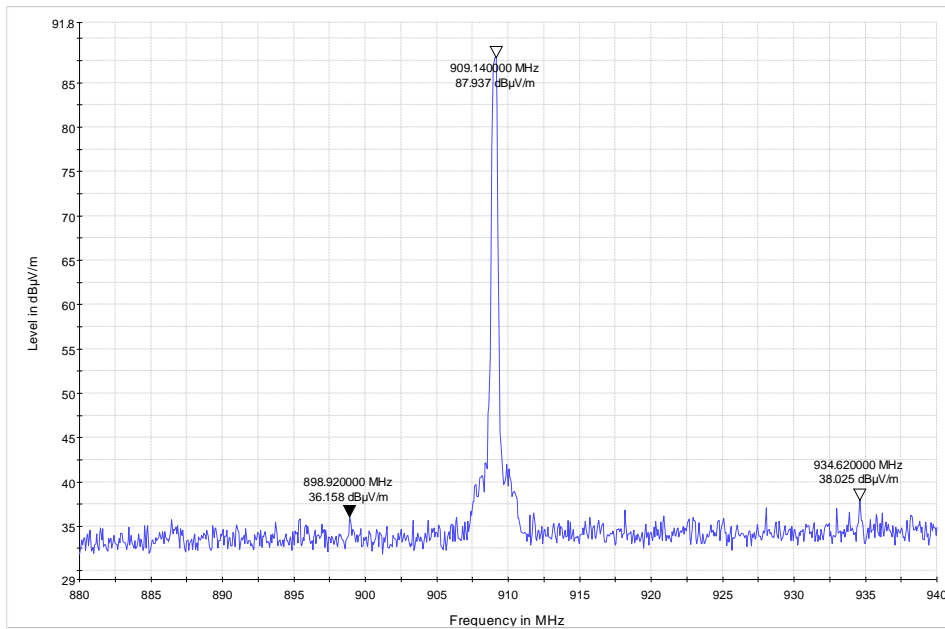
### 8.2.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic at a distance of 3 m.
- The test was performed with vertical and horizontal antenna polarizations and the EUT was measured on three orthogonal axis, only the highest emissions were reported.

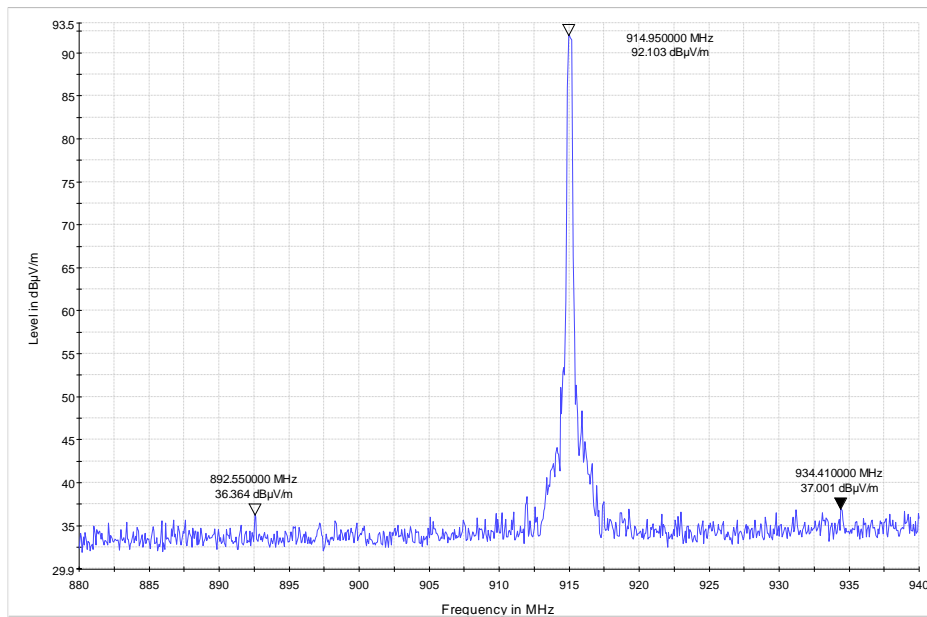
Spectrum analyzer/receiver settings:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold
Average measurements:	Average Results were measured

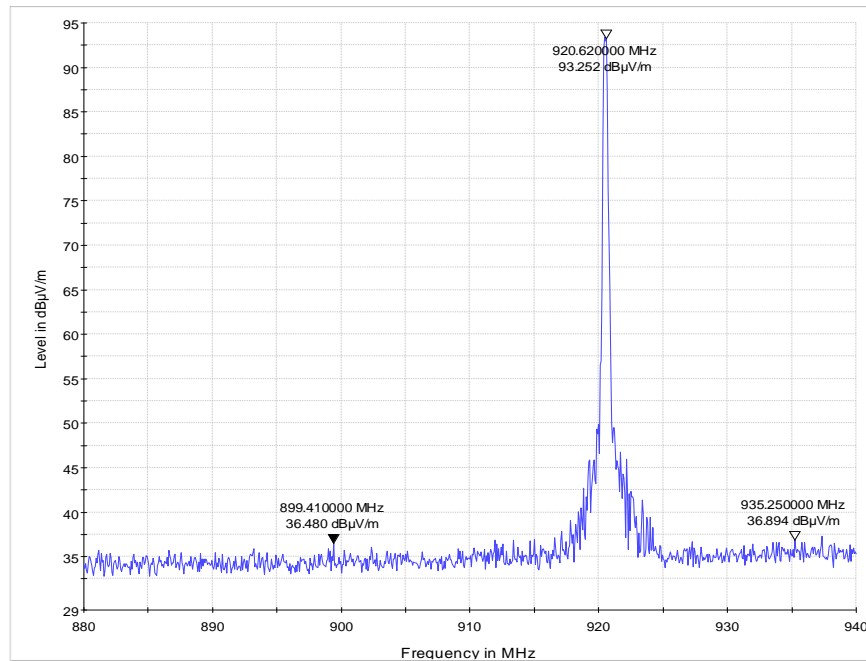
8.2.4 Test data, continued



Plot 8.2-1: Field strength of Fundamental\_Low Channel



Plot 8.2-2: Field strength of Fundamental\_Mid Channel



**Plot 8.2-3: Field strength of Fundamental \_High Channel**

**Table 8.2-2: Field strength of fundamental measurement results**

Frequency, (MHz)	Peak field strength, (dBμV/m)	Quasi-peak, (dBμV/m)	Margin, (dB)
908.9	87.9	94.0	6.1
915.0	92.1	94.0	1.9
920.4	93.2	94.0	0.8

Note: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable

**Table 8.2-3: Radiated spurious emissions test results.**

Channel	Frequency, MHz	Peak Field strength, dBμV/m		Margin, dB	Average Field strength, dBμV/m		Margin, dB
		Measured	Limit		Measured	Limit	
Low channel	1817.5	51.8	74.0	22.2	50.5	54.0	3.5
Mid channel	1829.5	51.0	74.0	23.0	49.5	54.0	4.5
High channel	1841.0	50.0	74.0	24.0	48.1	54.0	5.9

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.



### 8.3 FCC Clause 15.249(d) and RSS-210 B.10 (b) Spurious emissions

#### 8.3.1 Definitions and limits

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 FCC §15.209 and RSS-Gen, whichever is the lesser attenuation.

**Table 8.3-1:** Field strength of spurious emissions

Frequency (MHz)	Field strength		Measurement distance (m)
	( $\mu\text{V}/\text{m}$ )	( $\text{dB}\mu\text{V}/\text{m}$ )	
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes:

- In the emission table above, the tighter limit applies at the band edges.
- For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

#### 8.3.2 Test summary

Verdict	Pass		
Test date	August 28, 2018	Temperature	24 °C
Test engineer	Avul Nzenza	Air pressure	1011 mbar
Test location	Ottawa	Relative humidity	51.0 %

#### 8.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic at a distance of 3 m.  
The test was performed with vertical and horizontal antenna polarizations and the EUT was measured on three orthogonal axis, only the highest emissions were reported.

Spectrum analyzer/receiver settings for frequencies below 1 GHz:

Resolution bandwidth:	120 kHz
Video bandwidth:	300 kHz
Detector mode:	Quasi-Peak
Trace mode:	Max Hold

Spectrum analyzer/receiver settings for frequencies above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold
Average measurements:	Average Results were measured

#### 8.3.4 Test data

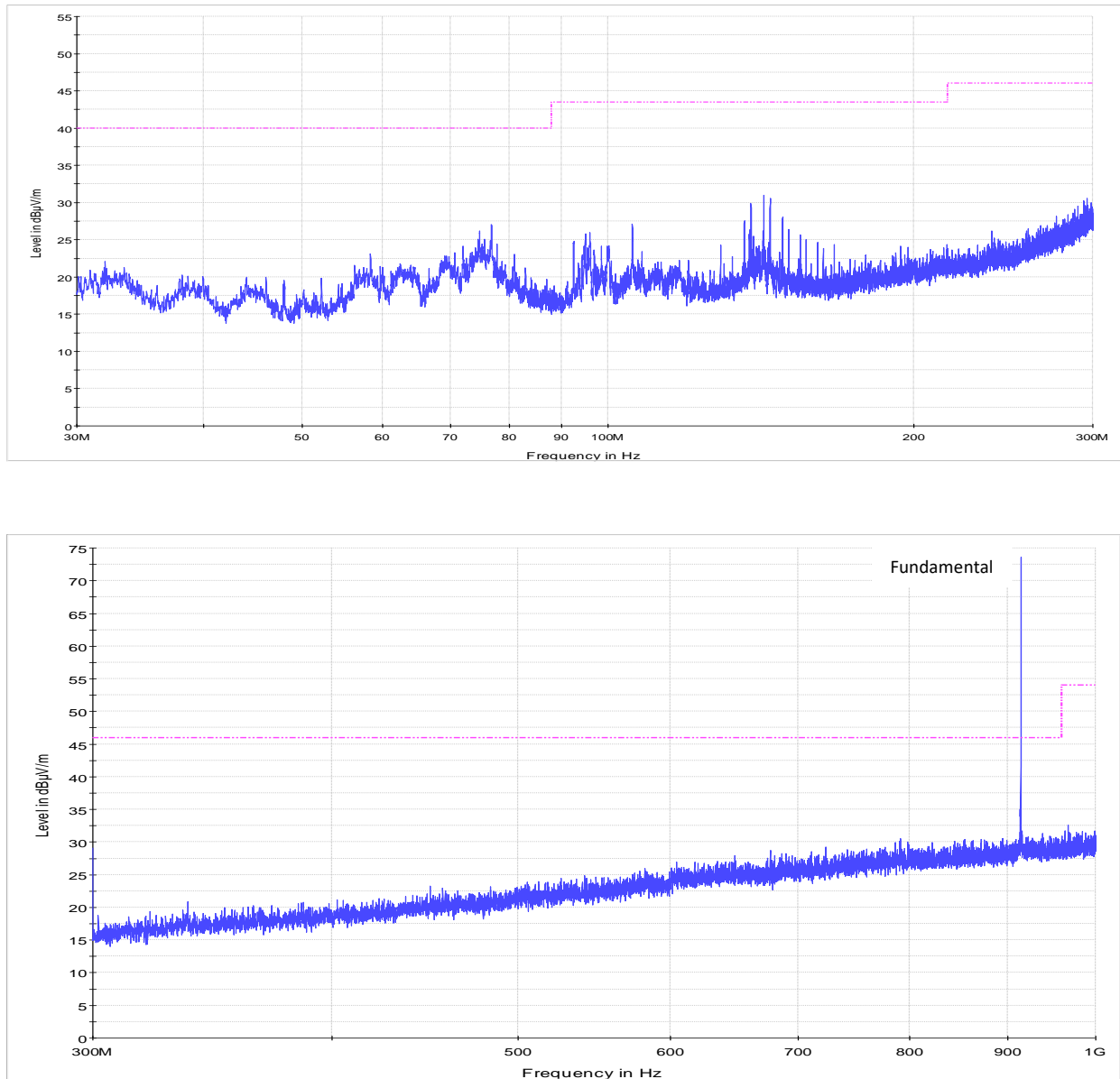


Figure 8.3-1: Radiated spurious (out-of-band) emissions, low channel, 30 to 1000 MHz

8.3.4 Test data, continued

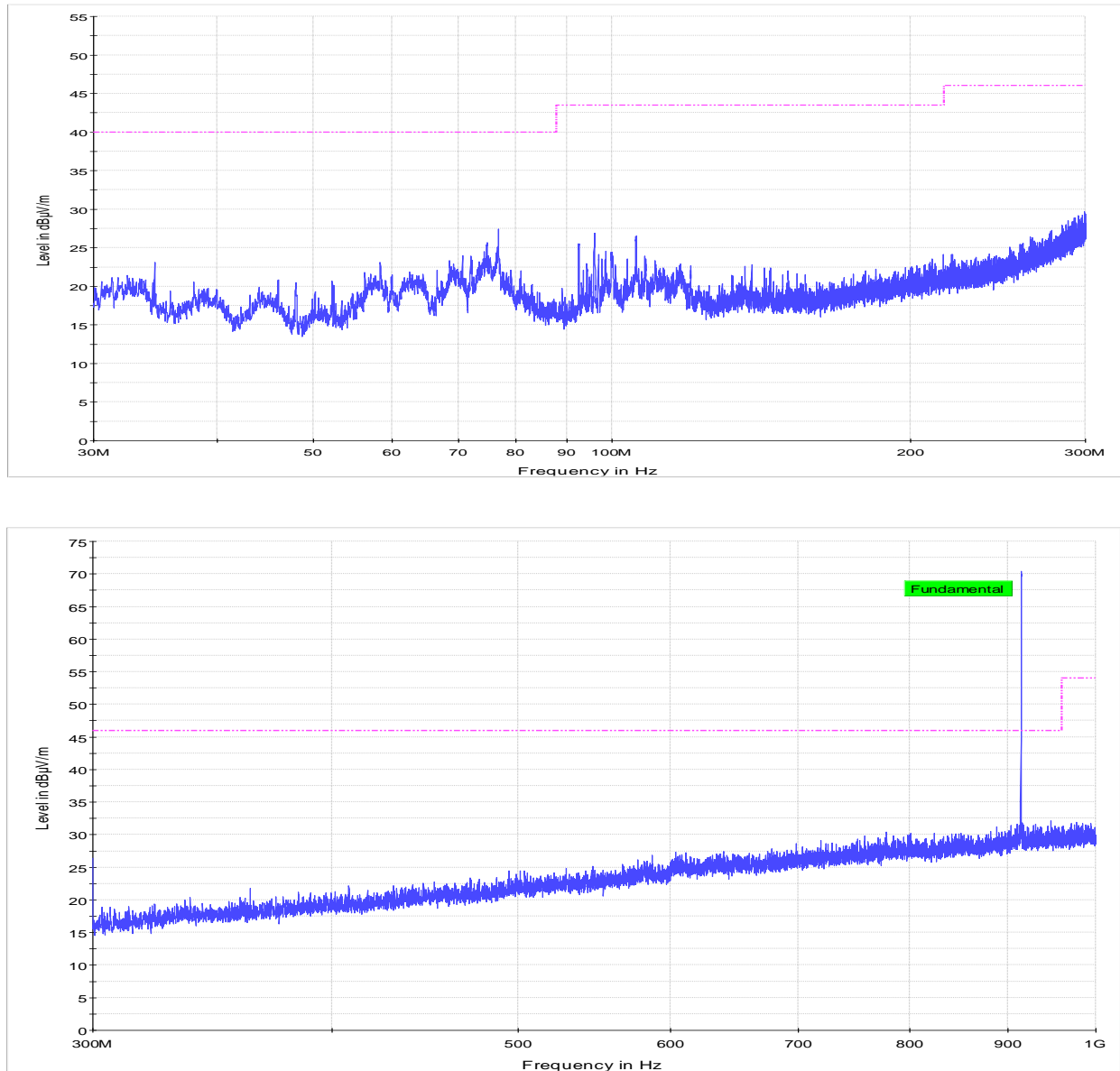


Figure 8.3-2: Radiated spurious (out-of-band) emissions, Mid channel, 30 to 1000 MHz

#### 8.3.4 Test data, continued

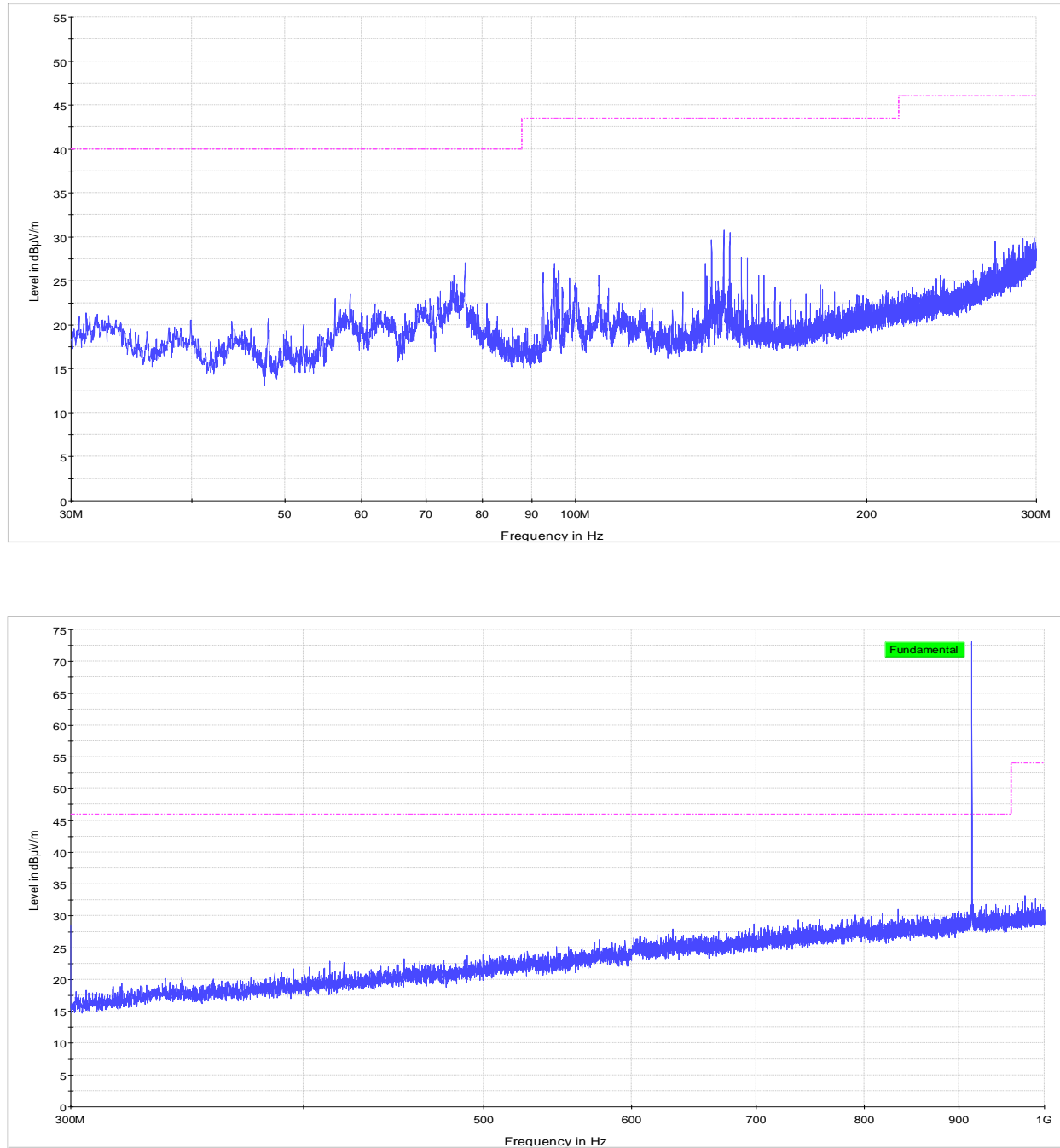


Figure 8.3-3: Radiated spurious (out-of-band) emissions, High channel, 30 to 1000 MHz

8.3.4 Test data, continued

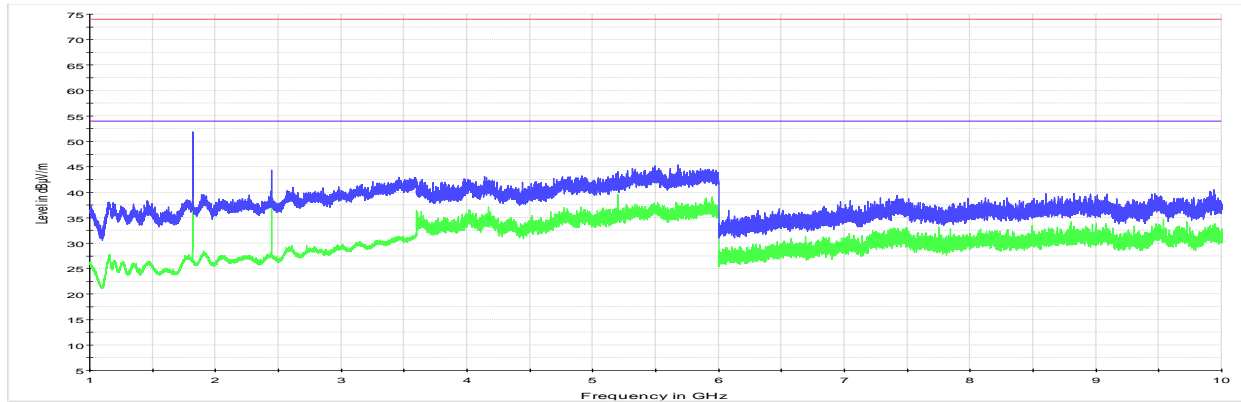


Figure 8.3-4: Radiated spurious (out-of-band) emissions, Low channel, Above 1 GHz

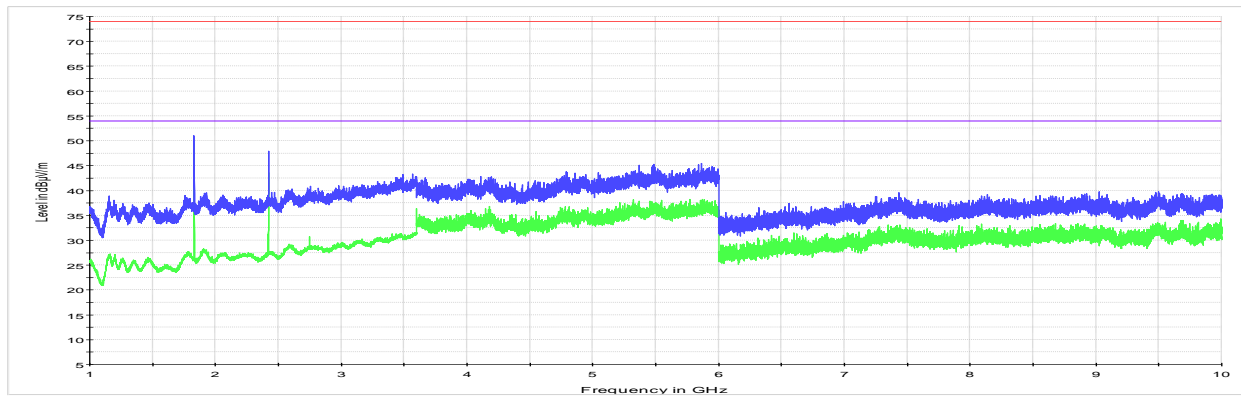


Figure 8.3-5: Radiated spurious (out-of-band) emissions, Mid channel, Above 1 GHz

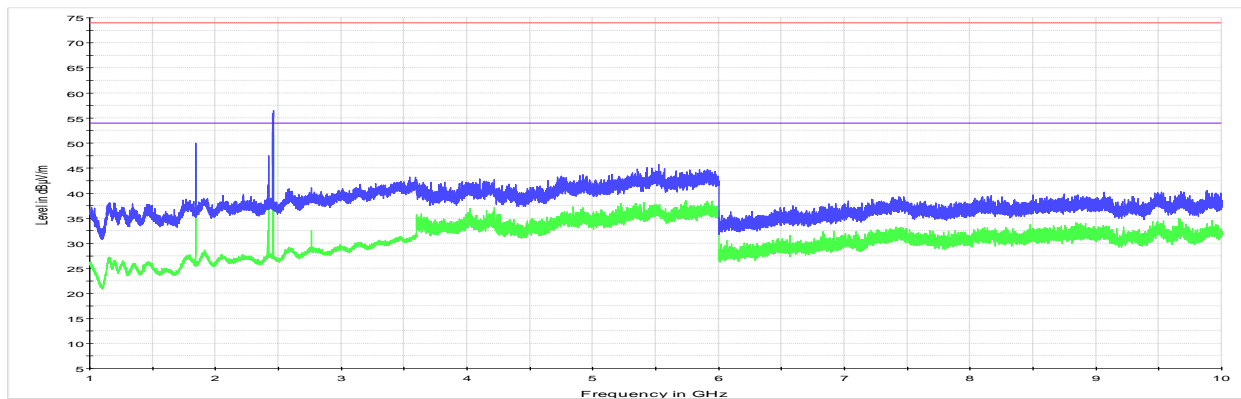
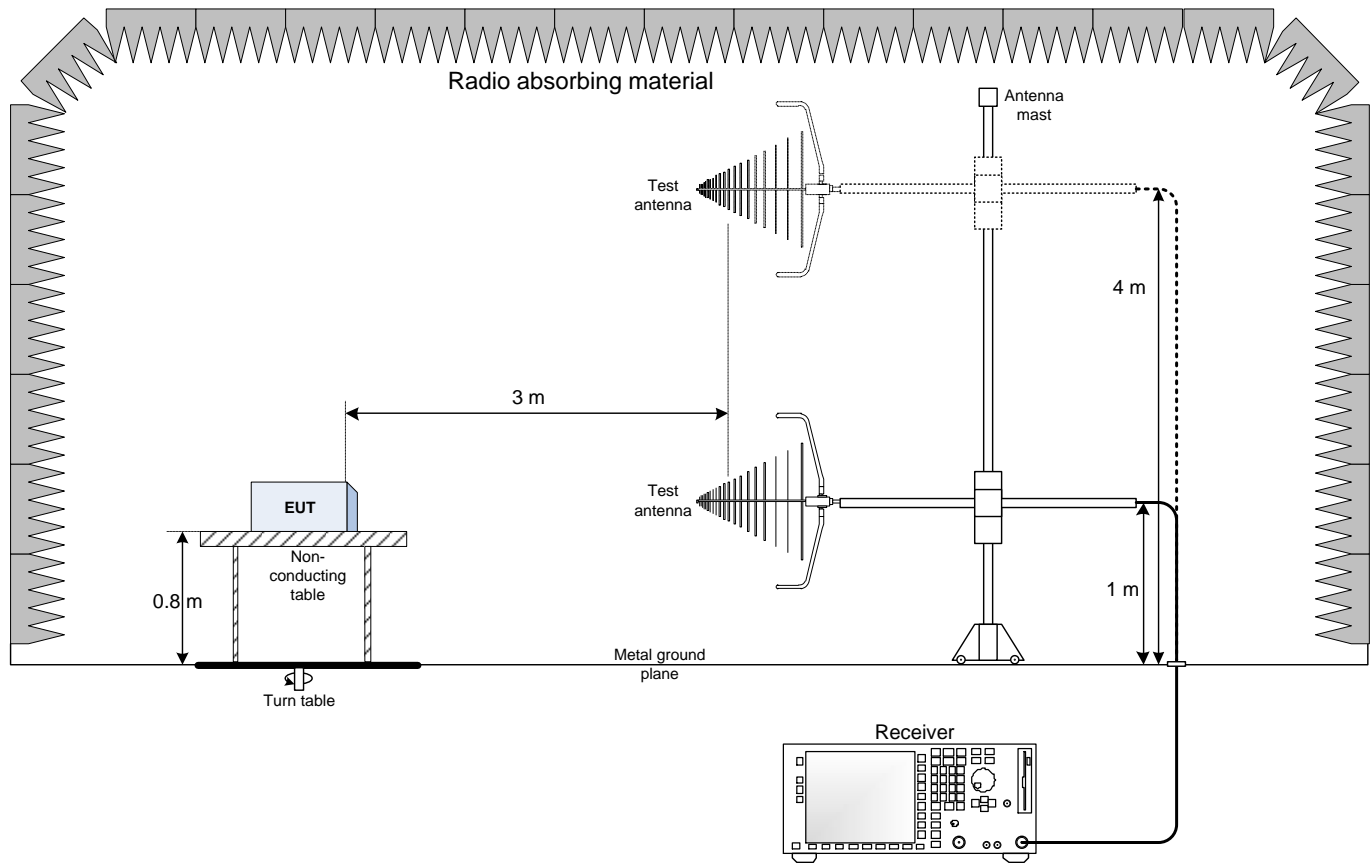


Figure 8.3-6: Radiated spurious (out-of-band) emissions, High channel, Above 1 GHz

Noe: It was verified that all emissions exceeding the limits on the plots above are from digital circuitry.

## Section 9 Block Figures of test set-ups

### 9.1 Radiated emissions set-up for frequencies below 1 GHz



## 9.2 Radiated emissions set-up for frequencies above 1 GHz

