

Test report

293977-1TRFWL

Date of issue: December 23, 2015

Applicant:

Standard Innovation Corporation

Product:

We Vibe Universal Board

Product variants:

Nova and Rave

Model:

1000

Model variants:

1000-01 and 1000-04

FCC ID:

ZUE1000

IC Registration number:

9804A-1000

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 8, December 2010, Annex 2.9**

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

Test location

Company name:	Nemko Canada Inc.
Address:	303 River Road
City:	Ottawa
Province:	Ontario
Postal code:	K1V 1H2
Country:	Canada
Telephone:	+1 613 737 9680
Facsimile:	+1 613 737 9691
Toll free:	+1 800 563 6336
Website:	www.nemko.com
Site number:	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	David Duchesne, Senior EMC/Wireless Specialist
Review date	December 23, 2015
Reviewer signature	

Limits of responsibility

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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Table of Contents

Section 1	Report summary	4
1.1	Applicant	4
1.2	Manufacturer	4
1.3	Test specifications	4
1.4	Statement of compliance	4
1.5	Exclusions	4
1.6	Test report revision history	4
Section 2	Summary of test results	5
2.1	FCC Part 15 Subpart C – general requirements, test results	5
2.2	FCC Part 15 Subpart C – Intentional Radiators, test results	5
2.3	IC RSS-GEN, Issue 4, test results	5
2.4	RSS-210, Issue 8, test results	5
Section 3	Equipment under test (EUT) details	6
3.1	Sample information	6
3.2	EUT information	6
3.3	Technical information	6
3.4	Product description and theory of operation	6
3.5	EUT exercise details	6
3.6	EUT setup Figure	7
Section 4	Engineering considerations	8
4.1	Modifications incorporated in the EUT	8
4.2	Technical judgment	8
4.3	Deviations from laboratory tests procedures	8
Section 5	Test conditions	9
5.1	Atmospheric conditions	9
5.2	Power supply range	9
Section 6	Measurement uncertainty	10
6.1	Uncertainty of measurement	10
Section 7	Test equipment	11
7.1	Test equipment list	11
Section 8	Testing data	12
8.1	FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits	12
8.2	FCC Clause 15.215(c) Emission bandwidth and RSS-Gen 4.6.1 Occupied bandwidth	15
8.3	FCC Clause 15.249(a) and RSS-210 A2.9(a) Field strength of fundamental and harmonics emissions	17
8.4	FCC Clause 15.249(d) and RSS-210 A2.9(b) Spurious emissions (except for harmonics)	19
Section 9	Block Figures of test set-ups	21
9.1	Radiated emissions set-up below 1 GHz	21
9.2	Radiated emissions set-up above 1 GHz	21
9.3	Conducted emissions set-up	22

Section 1 Report summary

1.1 Applicant

Company name	Standard Innovation Corporation
Address	Suite 330, 1130 Morrison Drive Ottawa Ontario K2H 9N6 Canada

1.2 Manufacturer

Company name	Seaco Technology Ltd.
Address	9/F, Guang Ying Building, No. 88 Di Hao Road Zhang Mu Tao Town Dong Guan Guangdong Province China

1.3 Test specifications

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 8 Annex 2.9	Devices operating in frequency bands 902–928, 2400–2483.5 and 5725–5875 MHz for any application
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

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

None

1.6 Test report revision history

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	Pass
\$15.215(c)	20 dB emission bandwidth	Pass
Notes:	None	

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
Notes:	None	

2.3 IC RSS-GEN, Issue 4, test results

Part	Test description	Verdict
6.6	Occupied bandwidth	Pass
7.1.2	Receiver radiated emission limits	Not applicable ¹
7.1.3	Receiver conducted emission limits	Not applicable ¹
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass
Notes:	¹ According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.	

2.4 RSS-210, Issue 8, test results

Part	Test description	Verdict
\$A2.9a	Field strength of fundamental and harmonics emissions	Pass
\$A2.9b	Spurious emissions (except harmonics)	Pass
Notes:	None	

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date	September 25, 2015
Nemko sample ID number	133-000378

3.2 EUT information

Product name	We-Vibe Universal Board
Product variant	Nova and Rave
Model	1000
Model variant	1000-01 and 1000-04
Serial number	7C:EC:79:E6:10:09

3.3 Technical information

Operating band	2400–2483.5 MHz
Operating frequency	2402–2480 MHz
Modulation type	GFSK
Occupied bandwidth (99 %)	1.1 MHz
Emission designator	F1D
Power requirements	USB power source (5 V _{DC}) (via 120 V _{AC} 60 Hz power adapter)
Antenna information	Internal wire antenna 0 dBi gain The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

Remote Controlled Motor Drivers for personal massager

3.5 EUT exercise details

EUT was specially modified for RF testing to transmit continuously on the low, mid and high channels.

3.6 EUT setup Figure

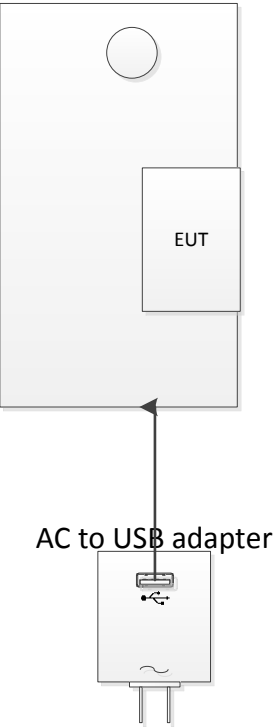


Figure 3.6-1: Setup diagram

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

The We-Vibe Universal Board was tested as representative sample for all models as requested by client, The Nova and Rave models 1000-01 and 1000-04 are depopulated versions of the test sample.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric conditions

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

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

6.1 Uncertainty of measurement

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	FA002047	1 year	Feb. 25/16
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Jan. 09/16
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/16
Horn antenna (18–40 GHz)	EMCO	3116	FA001847	1 year	Jan. 09/16
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 12/16
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 01/16
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	May 05/16
50 Ω coax cable	C.C.A.	None	FA002555	1 year	May 05/16
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	May 05/16

Notes: NCR - no calibration required and VOU - verify on use

Section 8 Testing data

8.1 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits

8.1.1 Definitions and limits

FCC:

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 8.1-1: Conducted emissions limit

Frequency of emission, MHz	Conducted limit, dB μ V	
	Quasi-peak	Average**
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - The level decreases linearly with the logarithm of the frequency.

** - A linear average detector is required.

8.1.2 Test summary

Verdict	Pass		
Test date	September 28, 2015	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1007 mbar
Test location	Ottawa	Relative humidity	41 %

8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

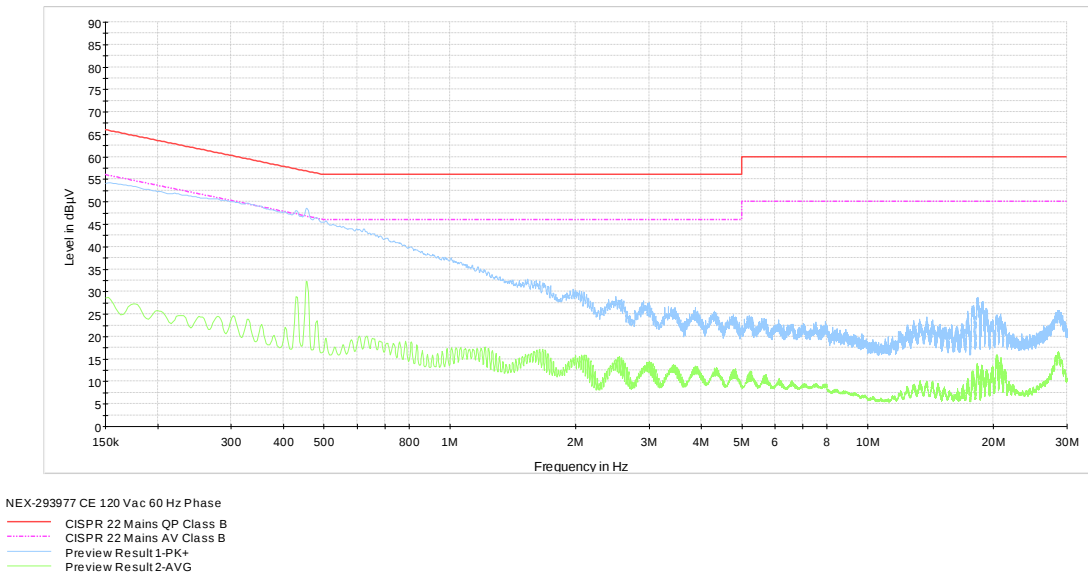
Receiver settings for preview measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

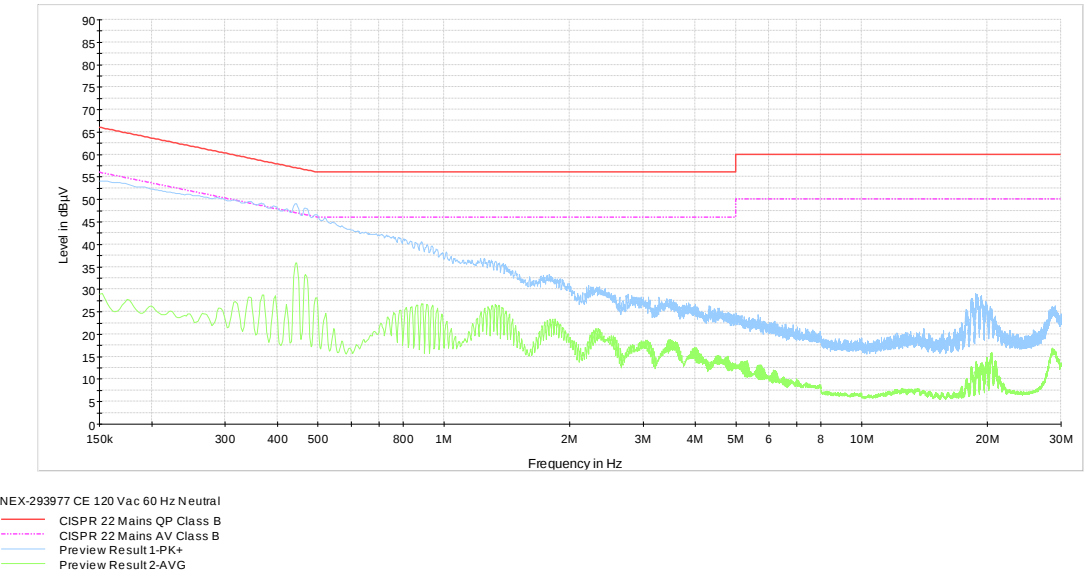
Receiver settings for final measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Quasi-Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

8.1.4 Test data



Plot 8.1-1: Conducted emissions on phase line



Plot 8.1-2: Conducted emissions on neutral line

8.2 FCC Clause 15.215(c) Emission bandwidth and RSS-Gen 4.6.1 Occupied bandwidth

8.2.1 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 4.6.1 Occupied bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

8.2.2 Test summary

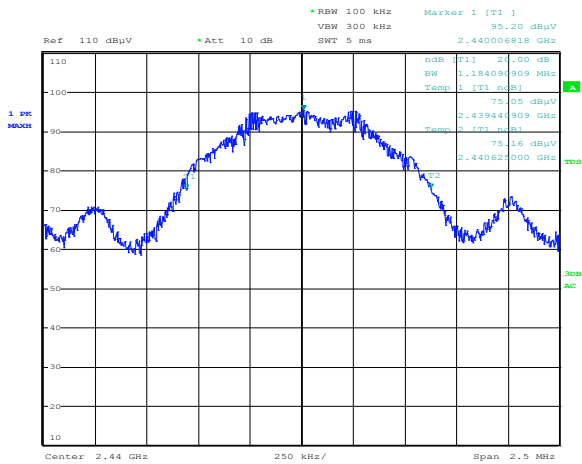
Verdict	Pass		
Test date	September 28, 2015	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1007 mbar
Test location	Ottawa	Relative humidity	41 %

8.2.3 Observations, settings and special notes

Spectrum analyzer settings:

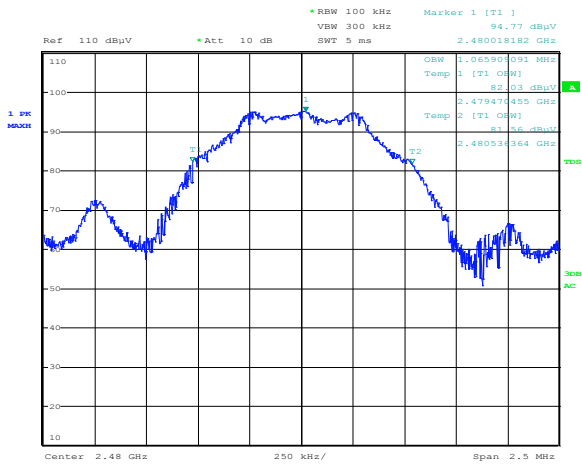
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mod	Max Hold
Function:	20 dB BW (for FCC); 99 % bandwidth (for IC)

8.2.4 Test data



Date: 28.SEP.2015 18:51:41

Plot 8.2-1: 20 dB bandwidth example



Date: 28.SEP.2015 18:53:04

Plot 8.2-2: 99 % occupied bandwidth example

Table 8.2-1: 20 dB bandwidth results

Frequency (MHz)	20 dB bandwidth (MHz)
2402	1.21
2440	1.18
2480	1.19

Notes: None

Table 8.2-2: 99% bandwidth results

Frequency (MHz)	99 % bandwidth (MHz)
2402	1.10
2440	1.11
2480	1.07

Notes: None

8.3 FCC Clause 15.249(a) and RSS-210 A2.9(a) Field strength of fundamental and harmonics emissions

8.3.1 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 8.3-1: 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

Notes: * - 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.

8.3.2 Test summary

Verdict	Pass		
Test date	September 28, 2015	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1007 mbar
Test location	Ottawa	Relative humidity	41 %

8.3.3 Observations, settings and special notes

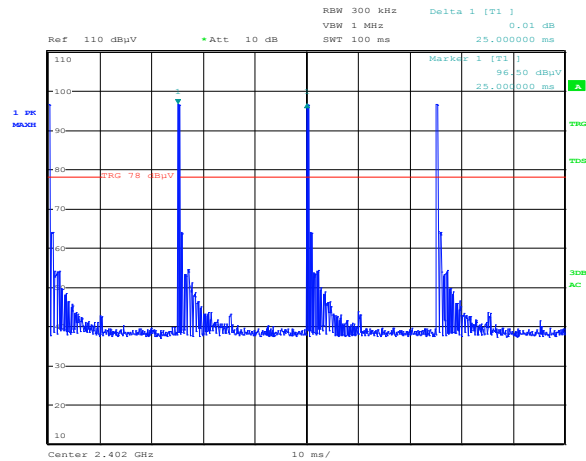
- The spectrum was searched from 2.4 GHz to the 10th harmonic at a distance of 3 m.
- The test was performed with vertical and horizontal antenna polarizations and the EUT was measured on three orthogonal axis, only the highest emissions were reported.

Spectrum analyzer/receiver settings:

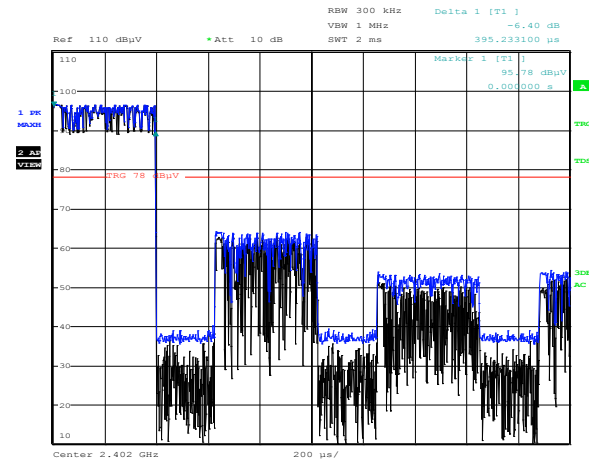
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold
Average measurements	Duty cycle/average factor was used for calculation of the average level.

8.3.5 Test data

Duty cycle correction factor measurement:



Date: 28.SEP.2015 18:48:44



Date: 28.SEP.2015 18:47:28

Plot 8.3-1: Number of pulses within 100 ms (4 pulses)

Plot 8.3-2: Single pulse width = 0.395 ms

Duty cycle calculation: $20 \times \log_{10} (T_{x100\text{ms}} / 100 \text{ ms}) = 20 \times \log_{10} (1.58 \text{ ms} / 100 \text{ ms}) = -36.0 \text{ dB}$ (-20 dB maximum will be used Peak to Average)

Table 8.3-2: Field strength of fundamental measurement results

Channel	Polarity, (V/H)	Frequency, (MHz)	Peak field strength, (dBμV/m)	Peak limit, (dBμV/m)	Peak margin, (dB)	Duty cycle factor, (dB)	Average field strength, (dBμV/m)	Average limit, (dBμV/m)	Average margin, (dB)
Low	V	2402	96.96	114	17.04	-20	76.96	94	17.04
Mid	V	2440	96.17	114	17.83	-20	76.17	94	17.83
High	V	2480	96.09	114	17.91	-20	76.09	94	17.91

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

Table 8.3-3: Field strength of harmonics measurement results

Channel	Polarity, (V/H)	Frequency, (MHz)	Peak field strength, (dBμV/m)	Peak limit, (dBμV/m)	Peak margin, (dB)	Duty cycle factor, (dB)	Average field strength, (dBμV/m)	Average limit, (dBμV/m)	Average margin, (dB)
Low	V	4804	52.38	74	21.62	-20	32.38	54	21.62
Mid	V	4880	51.68	74	22.32	-20	31.68	54	22.32
High	V	4960	55.18	74	18.82	-20	35.18	54	18.82

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable. Average field strength was calculated as follows:
Peak field strength (dBμV/m) + duty cycle factor (dB).

8.4 FCC Clause 15.249(d) and RSS-210 A2.9(b) Spurious emissions (except for harmonics)

8.4.1 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 8.4-1: Field strength of spurious emissions

Frequency (MHz)	Field strength		Measurement distance (m)
	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)	
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.

8.4.2 Test summary

Verdict	Pass		
Test date	September 28, 2015	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1007 mbar
Test location	Ottawa	Relative humidity	41 %

8.4.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10th 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.
- For duty cycle factor calculation please refer to section 8.3.

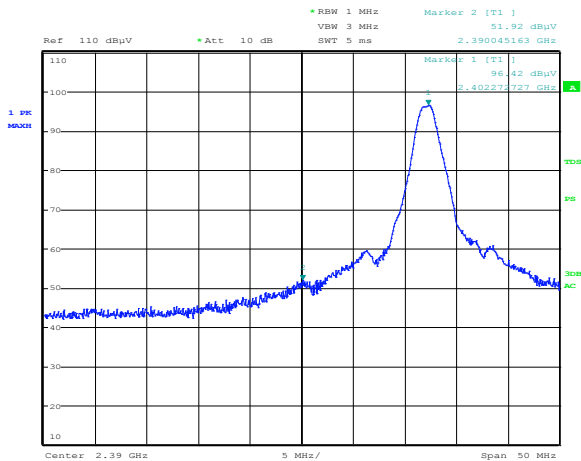
Spectrum analyzer/receiver settings for frequencies below 1 GHz:

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:

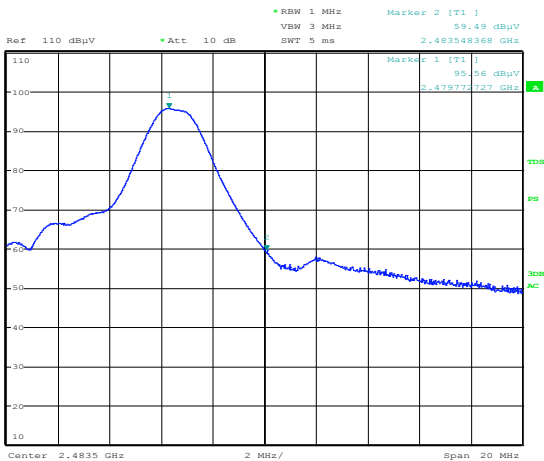
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold
Average measurements:	Duty cycle/average factor was used for calculation of the average level.

8.4.4 Test data



Date: 28.SEP.2015 18:22:51

Plot 8.4-1: Lower band edge measurement



Date: 28.SEP.2015 18:26:17

Plot 8.4-2: Upper band edge measurement

The spectral plots have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.)

Table 8.4-2: Field strength of spurious emissions measurement results

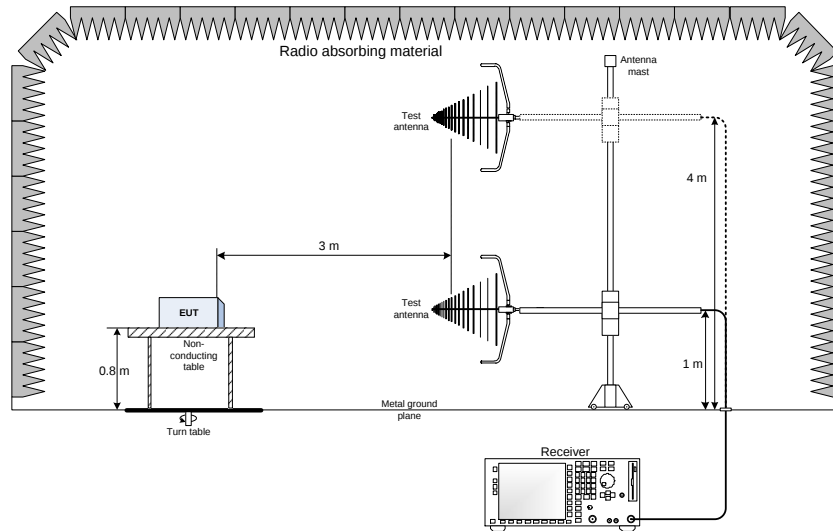
Channel	Polarity, (V/H)	Frequency, (MHz)	Peak field strength, (dBμV/m)	Peak limit, (dBμV/m)	Margin, (dB)	Duty cycle factor, (dB)	Average field strength, (dBμV/m)	Average limit, (dBμV/m)	Margin, (dB)
Low	V	2400	51.92	74	22.08	-20	31.92	54	22.08
High	V	2483.5	59.49	74	14.51	-20	39.49	54	14.51

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable. Average field strength was calculated as follows:
Peak field strength (dBμV/m) + duty cycle factor (dB).
Max duty cycle of -20 dB was used.

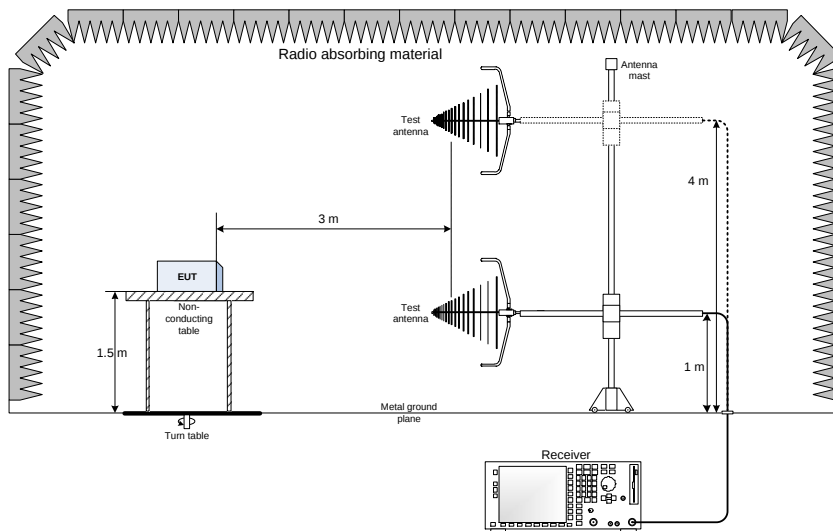
All other spurious emissions were greater 20 dB below the field strength spurious emissions limits.

Section 9 Block Figures of test set-ups

9.1 Radiated emissions set-up below 1 GHz



9.2 Radiated emissions set-up above 1 GHz



9.3 Conducted emissions set-up

