

EMC TEST REPORT – 337515-7TRFWL

Applicant:

BOT Home Automation Inc.

Product name:

Ring

Model:

Base Station

FCC ID:

2AEUPBHABS001

IC Registration number:

20271-BHABS001

Specifications:

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

Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

◆ **RSS-210 Issue 9, August 2016, Annex B.10**

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

Date of issue: **October 5, 2017**

Test engineer(s):

David Duchesne, Senior EMC/Wireless Specialist

Signature:



Reviewed by:

Andrey Adelberg, Senior Wireless/EMC Specialist

Signature:



Lab and test locations

Company name	Nemko Canada Inc.		
Facilities	Ottawa site:	Montreal site:	Almonte site:
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Test site registration	Organization	Recognition numbers and location	
	FCC	CA2040 (Ottawa); CA2041 (Montreal)	
	ISED	CA2040A-4 (Ottawa); CA2040G-5 (Montreal); CA2040A-3 (Almonte)	
Website	www.nemko.com		

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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August 21, 2017	
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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	BOT Home Automation Inc.
Address	1523 26 th Street, Santa Monica, California United States 90404

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.249	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.
RSS-210 Issue 9, August 2016, Annex B.10	Devices operating in 902–928, 2400–2483.5 and 5725–5875 MHz

1.3 Test methods

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

None

1.5 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.

1.6 Test report revision history

Table 1.6-1: Test report revision history

Revision #	Date of issue	Details of changes made to test report
TRF	October 5, 2017	Original report issued

Section 2. Summary of test results

2.1 Testing period

Test start date	August 25, 2017
Test end date	August 30, 2017

2.2 FCC Part 15 Subpart C, general requirements test results

Table 2.2-1: Result summary for Subpart C, general

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass ¹
§15.203	Antenna requirement	Pass ²
§15.215(c)	20 dB bandwidth	Pass

Notes: ¹ Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed
² The antennas are located within the enclosure of EUT and not user accessible.

2.3 FCC Part 15 Subpart C, intentional radiators test results

Table 2.3-1: Result summary for Subpart C, intentional radiator

Part	Test description	Verdict
§15.249(a)	Radiated emissions not in restricted bands	Pass
§15.249(b)	Fixed Point-to-Point operation in the 24.0–24.25 GHz band	Not applicable
§15.249(d)	Spurious emissions (except harmonics)	Pass

Notes: None

2.4 ISED RSS-GEN, Issue 4, test results

Table 2.4-1: Result summary for ISED RSS-GEN

Part	Test description	Verdict
6.6	Occupied bandwidth	Pass
7.1.2	Receiver radiated emission limits	Not applicable
7.1.3	Receiver conducted emission limits	Not applicable
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.

2.5 ISED RSS-210, Issue 9, test results

Table 2.5-1: Result summary for ISED RSS-210

Section	Test description	Verdict
4.1	Emissions Falling Within Restricted Frequency Bands	Pass
B.10a	Fundamental and harmonics emissions limits	Pass
B.10b	Spurious emissions (except harmonics) limits	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	August 21, 2017
Nemko sample ID number	Item # 3

3.2 EUT information

Product name	Ring
Model	Base Station
Serial number	BHHB11731PG000029

3.3 Technical information

Applicant IC company number	20271
IC UPN number	BHABS001
All used IC test site(s) Reg. number	2040A-4
RSS number and Issue number	RSS-210 Annex B.10 Issue 9, August 2016
Frequency band (MHz)	902–928
Frequency Min (MHz)	908.4
Frequency Max (MHz)	916.0
RF power Max (W), Conducted	N/A
Field strength, Units @ distance	93.9 dB μ V/m at 3 m
Measured BW (kHz) (99%)	111.54
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	2FSK
Emission classification	F1D
Transmitter spurious, Units @ distance	40.8 dB μ V/m Peak and 35.1 dB μ V/m Average at 2725.26 MHz @ 3 m
Power requirements	5 V _{DC} (via external 100–240 V _{AC} , 50/60 Hz power adapter)
Antenna information	Antenna gain is 1.2 dBi (Inverted F) The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.
Hardware and software details	1.0-x

3.4 Product description and theory of operation

Communications Hub for Home Security Products

3.5 EUT exercise details

The EUT was setup in continuous transmit state.

3.6 EUT setup diagram

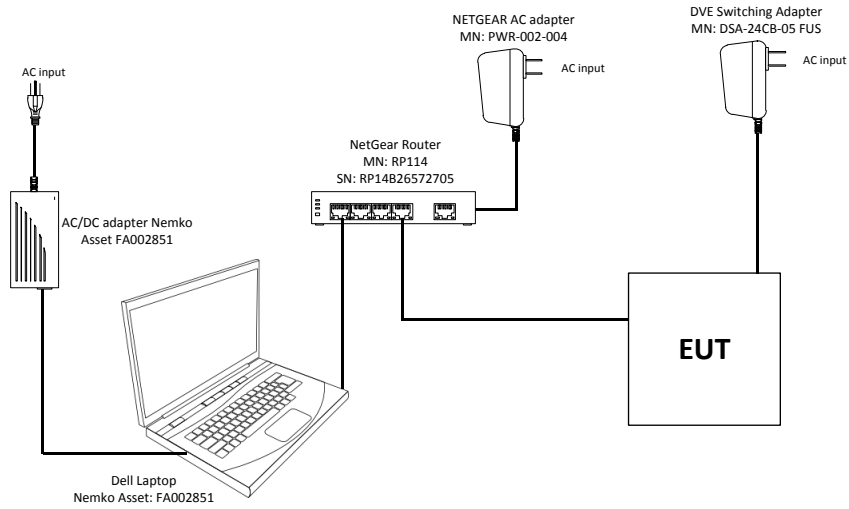


Figure 3.6-1: Setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT for compliance

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

4.2 Technical judgment

None

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	86–106 kPa

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

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

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
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 31/18
AC Power source	Chenwa	2700M-10k	FA002716	—	VOU
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	May 19/18
50 Ω coax cable	C.C.A.	None	FA002556	1 year	May 2/18
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 1/17
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 31/18
Horn with Preamp	ETS-Lindgren	3117-PA	FA002840	1 year	Nov. 11/17
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	June 27/18
50 Ω coax cable	Huber + Suhner	None	FA002830	1 year	May 12/18
50 Ω coax cable	C.C.A.	None	FA002555	1 year	May 2/18

Notes: NCR - no calibration required, 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 §15.207:

- a) 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 RSS-GEN Section 8.8:

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: AC power line 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

Notes: * - 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	August 25, 2017	Temperature	22 °C
Test engineer	David Duchesne	Air pressure	1002 mbar
Test location	Ottawa	Relative humidity	67 %

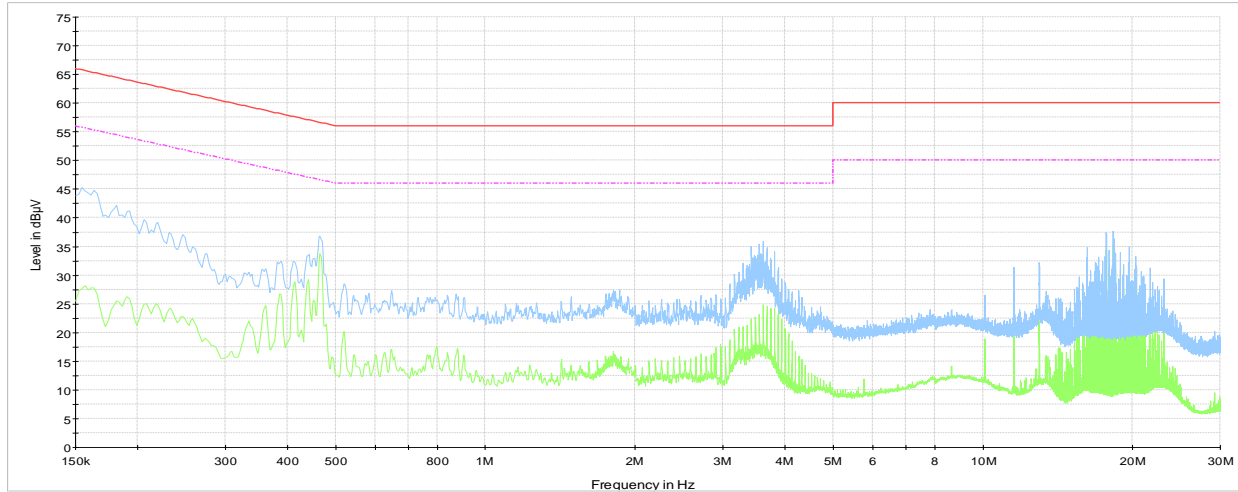
8.1.3 Observations, settings and special notes

Port under test – Coupling device	AC Input – Artificial Mains Network (AMN)
EUT power input during test	5 V _{DC} (Powered via external power adapter @ 120 V _{AC} 60 Hz)
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 10 dB or above the limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average (Preview measurement), Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	<ul style="list-style-type: none">– 100 ms (Peak and Average preview measurement)– 100 ms (Quasi-peak final measurement)– 160 ms (CAverage final measurement)

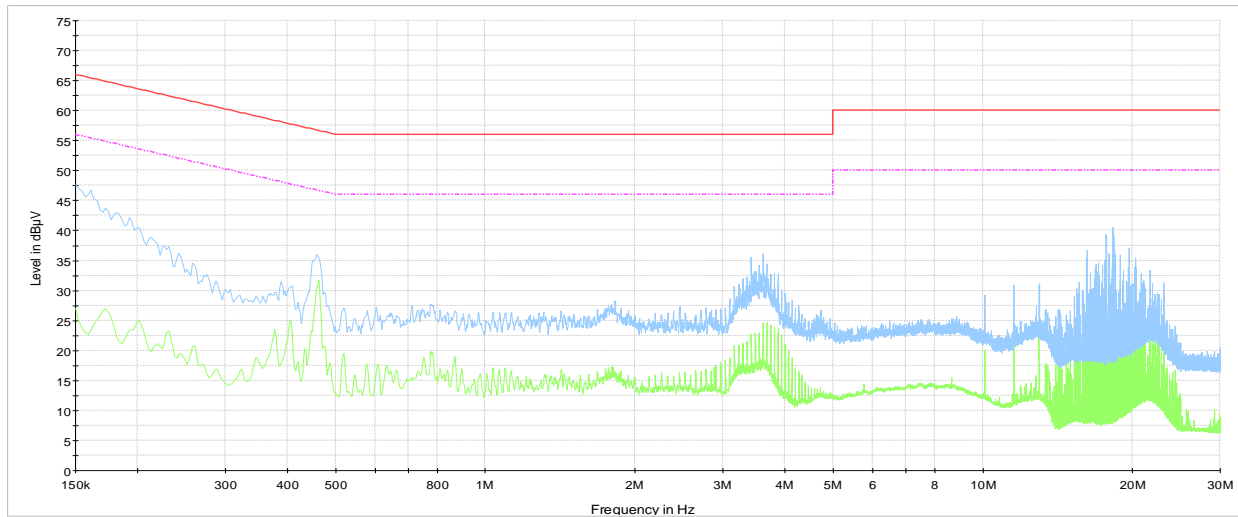
8.1.4 Test data



120VAC 60Hz, Phase
Preview Result 2-AVG
Preview Result 1-PK+
CISPR 22 Mains Q-Peak Class B Limit
CISPR 22 Mains Average Class B Limit

The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-1: AC power line conducted emissions – spectral plot on phase line



120VAC 60Hz, Neutral
Preview Result 2-AVG
Preview Result 1-PK+
CISPR 22 Mains Q-Peak Class B Limit
CISPR 22 Mains Average Class B Limit

The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-2: AC power line conducted emissions – spectral plot on neutral line

8.2 FCC 15.215(c) and RSS-Gen Section 6.6 Occupied (Emission) bandwidth

8.2.1 Definitions and limits

FCC §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 a 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.

IC RSS-GEN Section 6.6:

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

8.2.2 Test summary

Verdict	Pass		
Test date	September 1, 2017	Temperature	23 °C
Test engineer	David Duchesne	Air pressure	1000 mbar
Test location	Ottawa	Relative humidity	44.6 %

8.2.3 Observations, settings and special notes

None

Spectrum analyser settings:

Detector mode	Peak
Resolution bandwidth	1 % to 5 % of OBW
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.2.4 Test data

Table 8.2-1: Occupied bandwidth results

Frequency, MHz	Baud rate, k	20 dB bandwidth, kHz	99% bandwidth, kHz
908.42	9.6	73.07	78.21
908.42	40	91.66	86.54
908.4	9.6	73.08	74.36
916.0	100	126.28	111.54

Notes: None

8.2.4 Test data, continued

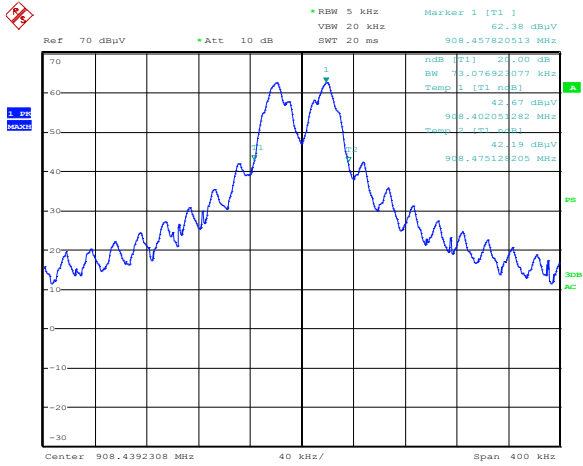


Figure 8.2-1: 20 dB bandwidth @ 908.42 MHz, 9.6k baud rate

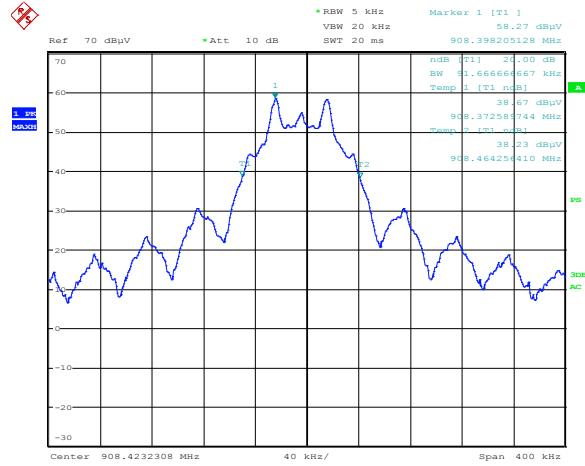


Figure 8.2-2: 20 dB bandwidth @ 908.42 MHz, 40k baud rate

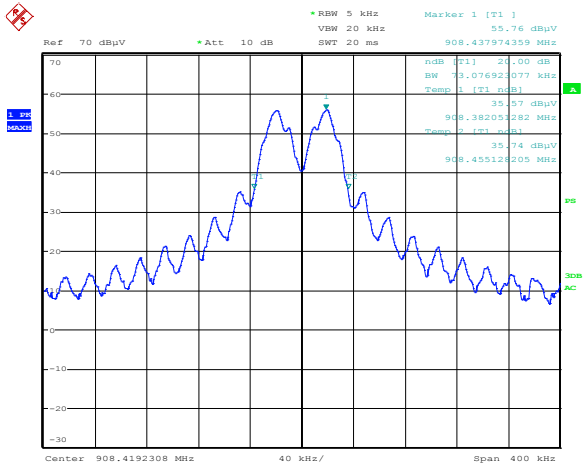


Figure 8.2-3: 20 dB bandwidth @ 908.4 MHz, 9.6k baud rate

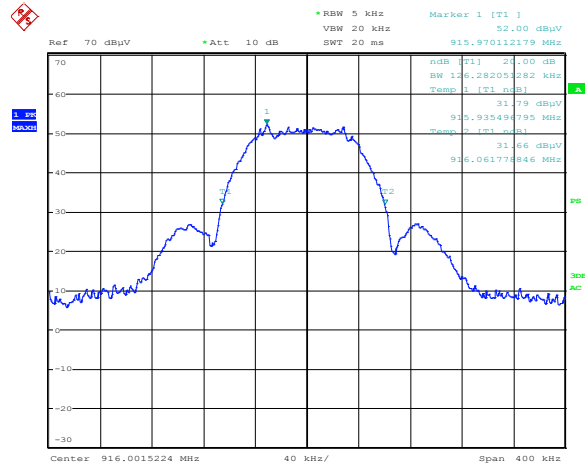


Figure 8.2-4: 20 dB bandwidth @ 916.0 MHz, 100k baud rate

8.2.4 Test data, continued

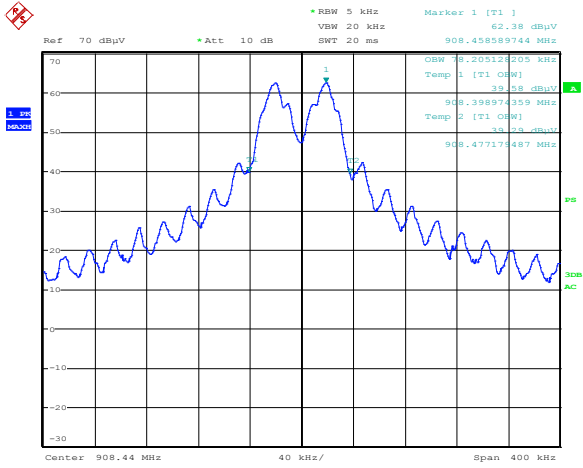


Figure 8.2-5: 99% bandwidth, @ 908.42 MHz, 9.6k baud rate

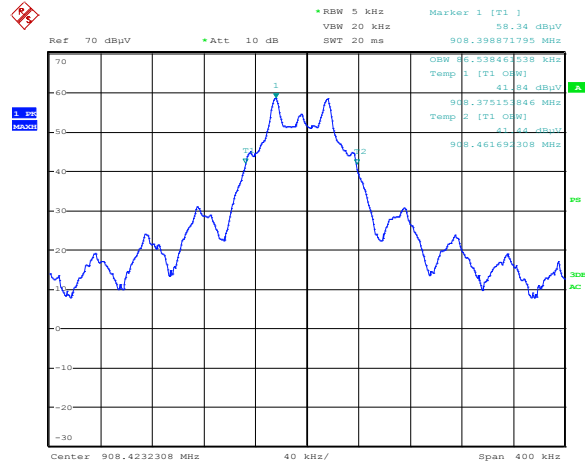


Figure 8.2-6: 99% bandwidth, @ 908.42 MHz, 40k baud rate

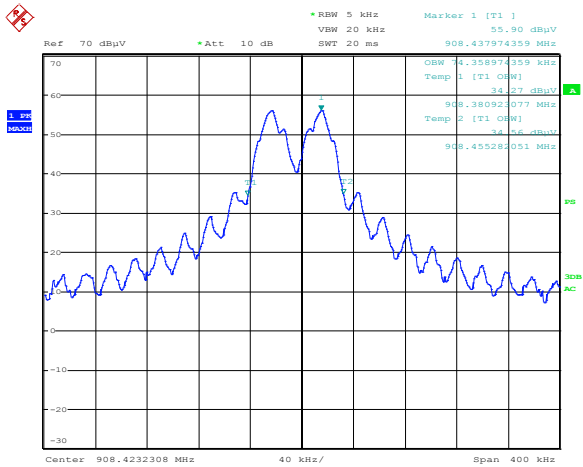


Figure 8.2-7: 99% bandwidth, @ 908.4 MHz, 9.6k baud rate

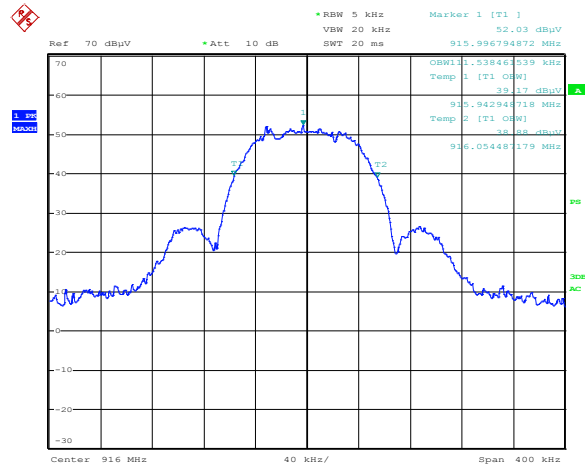


Figure 8.2-8: 99% bandwidth, @ 916.0 MHz, 100k baud rate



8.3 FCC 15.249(a) RSS 210 and Section B.10(a) Field strength of fundamental and harmonics outside restricted bands

8.3.1 Definitions and limits

FCC §15.249 (a):

The field strength of emissions from intentional radiators shall comply with the following table. Field strength limits are specified at a distance of 3 meters.

IC RSS-210 Section 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. See table below.

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
24000–24250	250	108	2500	68

- Notes:
- 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.
 - 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	September 1, 2017	Temperature	23 °C
Test engineer	David Duchesne	Air pressure	1000 mbar
Test location	Ottawa	Relative humidity	44.6 %

Section 8 Testing data
Test name FCC 15.249(a) and RSS 210 Section B.10 (a) Field strength of fundamental and harmonics outside restricted bands
Specification FCC Part 15 Subpart C and RSS-210 Issue 9 Annex B.10



8.3.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to 10th harmonic of fundamental frequency.
- EUT was set to transmit with 100 % duty cycle.
- Radiated measurements were performed at a distance of 3 m.
- The spectral plots have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators)

Spectrum analyzer settings for Q-peak measurements at the frequencies from 902 to 928 MHz:

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

Spectrum analyzer settings for peak measurements at the frequencies above 1000 MHz:

Detector mode	Peak
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Trace mode	Max Hold

Spectrum analyzer settings for average measurements at the frequencies above 1000 MHz:

Detector mode	Average
Resolution bandwidth	1 MHz
Video bandwidth	10 Hz
Trace mode	Max Hold

8.3.4 Test data

Table 8.3-2: Field strength of fundamental results

Frequency, MHz	Baud rate, k	Power setting	Q-Peak field strength at 3 m, dB μ V	Q-Peak field strength limit at 3 m, dB μ V/m	Margin, dB
908.42	9.6	12	93.3	94.0	0.7
908.42	40	12	93.7	94.0	0.3
908.4	9.6	12	93.9	94.0	0.1
916.0	100	15	93.1	94.0	0.9

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

Table 8.3-3: Radiated field strength of harmonics results

Tx freq., MHz	Baud rate, k	Frequency, MHz	Peak Field strength, dB μ V/m		Peak margin, dB	DCCF, dB	Average Field strength, dB μ V/m		Margin, dB
			Measured	Limit			Calculated	Limit	
908.42	9.6	2725.26	40.8	74.0	33.2	-5.7	35.1	54.0	18.9
908.42	40	2726.26	40.7	74.0	33.3	-11.4	29.3	54.0	24.7
908.40	9.6	2726.00	40.9	74.0	33.1	-5.7	35.2	54.0	18.8
916.00	100	2748.00	41.9	74.0	32.1	-17.9	24.0	54.0	30.0

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
 Average field strength calculation was performed using the following formula: Average Field strength = Peak Field strength + Duty cycle correction factor

All other emissions were greater than 20 dB form limit.

Section 8

Testing data

Test name

FCC 15.249(a) and RSS 210 Section B.10 (a) Field strength of fundamental and harmonics outside restricted bands

Specification

FCC Part 15 Subpart C and RSS-210 Issue 9 Annex B.10



8.3.4 Test data

Duty Cycle

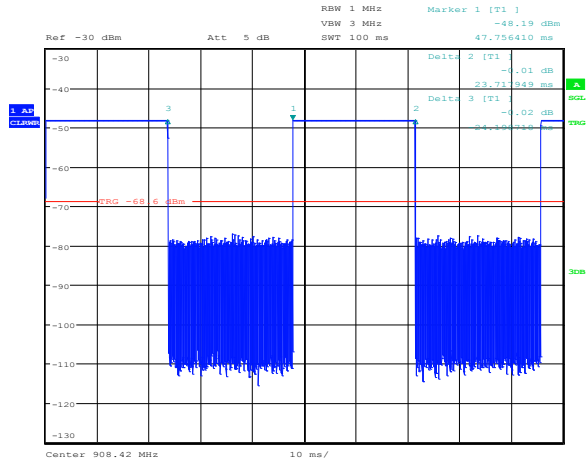


Figure 8.3-1: 908.42 MHz, 9.6k baud rate

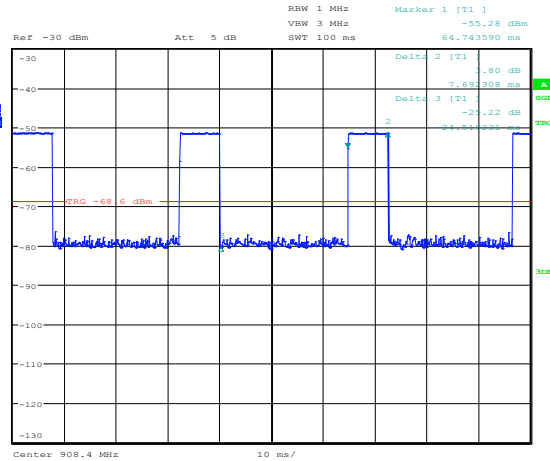


Figure 8.3-2: 908.4 MHz, 40k baud rate

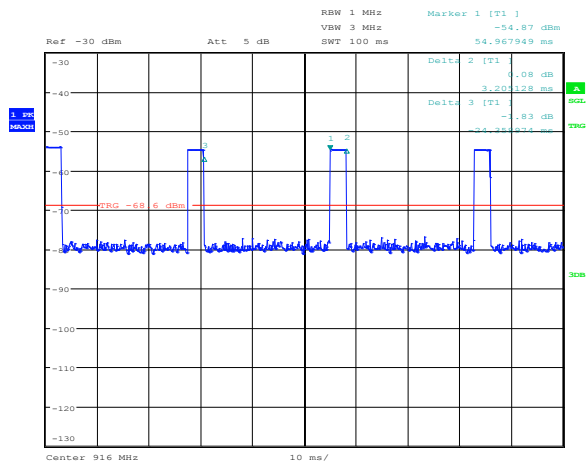


Figure 8.3-3: 916 MHz, 100k baud rate

Duty cycle calculation:

908.42 MHz, 9.6k baud rate

Tx on Time: 51.6 ms

Duty cycle correction factor: $20 \times \log_{10} [(51.6) / 100] = -5.7 \text{ dB}$

908.40 MHz, 40k baud rate

Tx on Time: 26.9 ms

Duty cycle correction factor: $20 \times \log_{10} [(26.9) / 100] = -11.4 \text{ dB}$

908.42 MHz, 100k baud rate

Tx on Time: 12.8 ms

Duty cycle correction factor: $20 \times \log_{10} [(12.8) / 100] = -17.9 \text{ dB}$

Section 8

Testing data

Test name

FCC 15.249(a) and RSS 210 Section B.10 (a) Field strength of fundamental and harmonics outside restricted bands

Specification

FCC Part 15 Subpart C and RSS-210 Issue 9 Annex B.10



8.3.4 Test data, continued

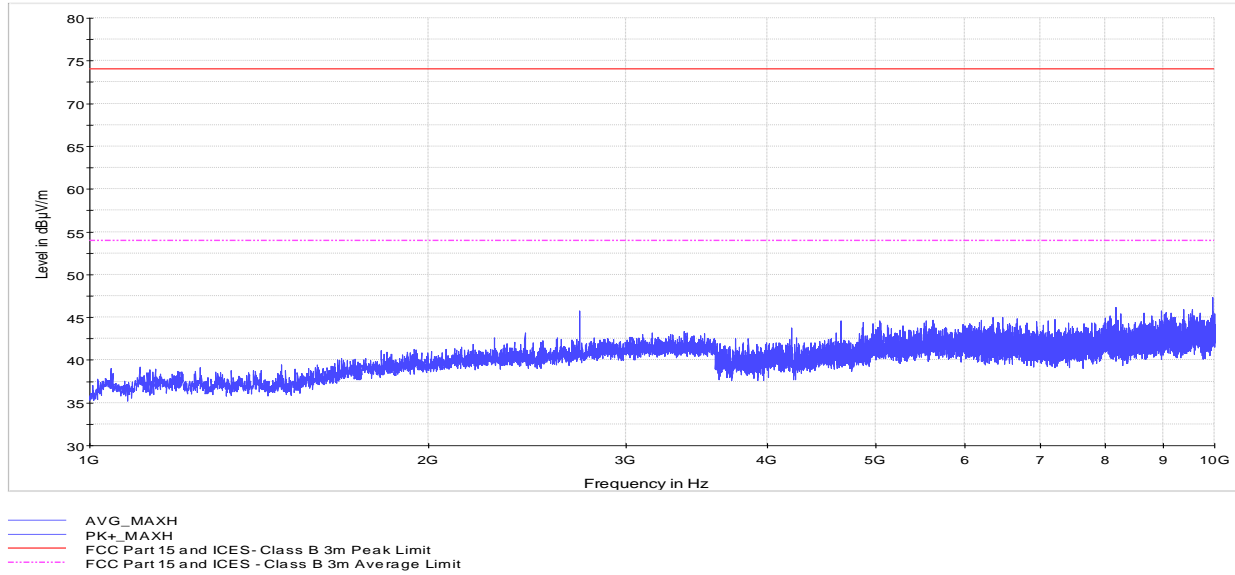


Figure 8.3-4: Field strength of harmonics, Tx 908.42 MHz, 9.6 k baud rate

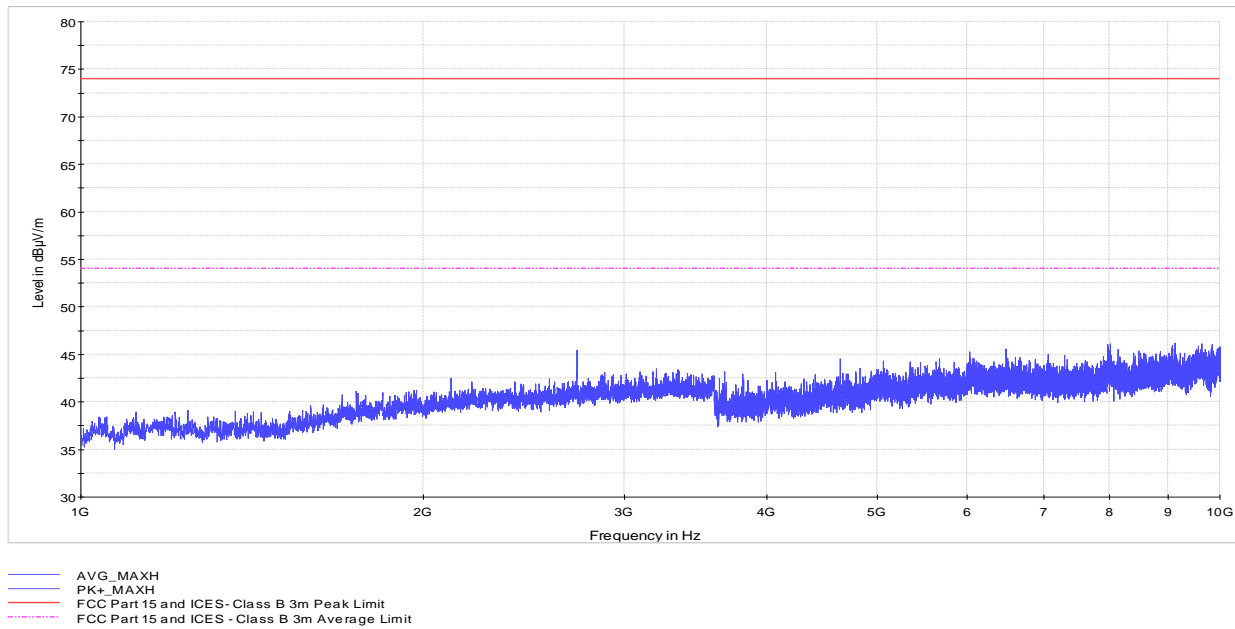


Figure 8.3-5: Field strength of harmonics, Tx 908.42 MHz, 40 k baud rate

8.3.4 Test data, continued

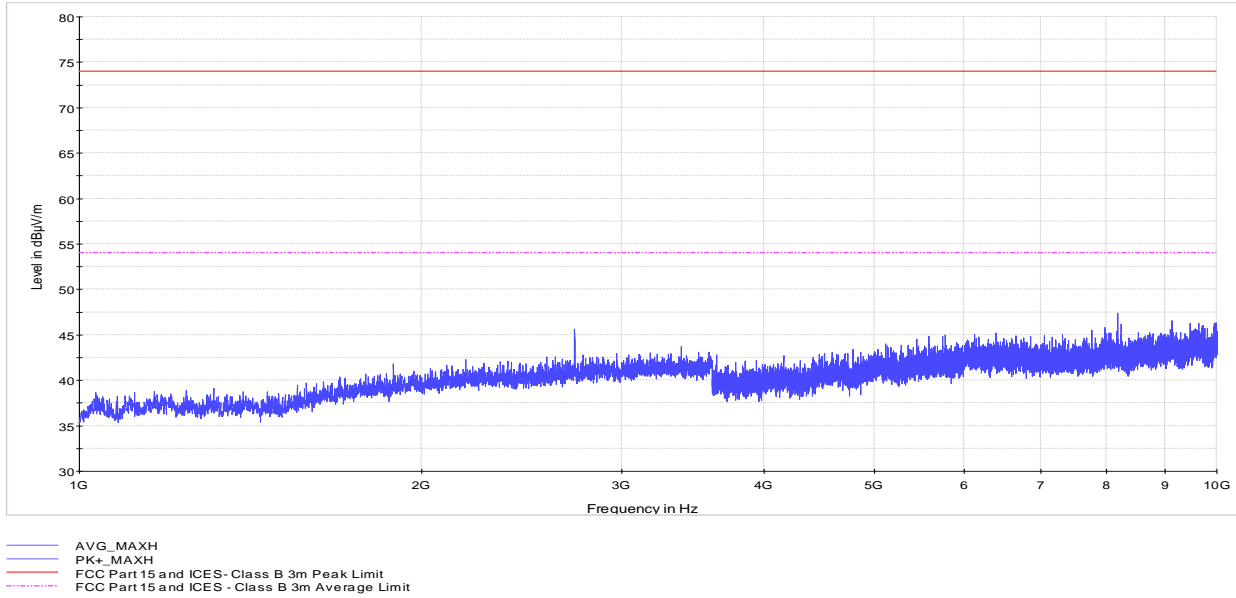


Figure 8.3-6: Field strength of harmonics, Tx 908.4 MHz, 9.6 k baud rate

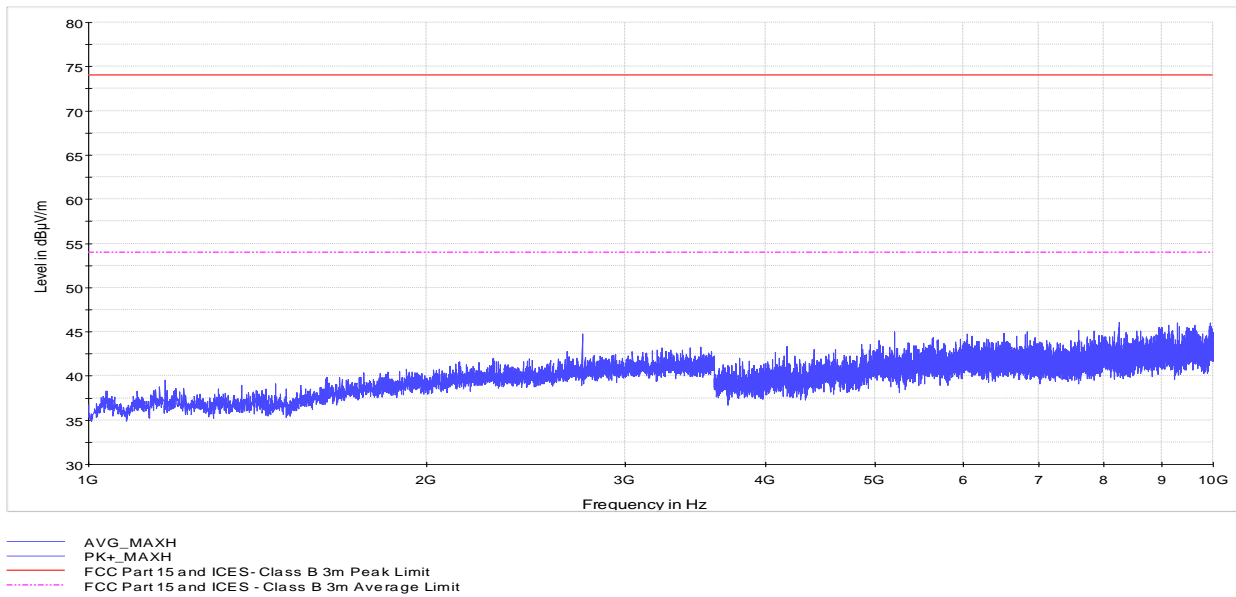


Figure 8.3-7: Field strength of harmonics, Tx 916.0 MHz, 100 k baud rate



8.4 FCC 15.249(d) and RSS-210 Section B.10 (b) Spurious emissions (except for harmonics)

8.4.1 Definitions and limits

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.

IC RSS-210 Section 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.

Table 8.4-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
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

Table 8.4-2: ISED restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677–5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Notes: None

Table 8.4-3: FCC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

Notes: None

8.4.2 Test summary

Verdict	Pass		
Test date	September 1, 2017	Temperature	23 °C
Test engineer	David Duchesne	Air pressure	1000 mbar
Test location	Ottawa	Relative humidity	44.6 %

8.4.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to 10th harmonic of fundamental frequency.
- EUT was set to transmit with 100 % duty cycle.
- Radiated measurements were performed at a distance of 3 m.
- The spectral plots have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators)

Spectrum analyser settings for measurements below 1 GHz:

Resolution bandwidth:	100 or 120 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak or Quasi-Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak measurements above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average measurements above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	RMS
Trace mode:	Average (100 Traces)

8.4.4 Test data

- No spurious emissions detected within 10 dB of limit below 1 GHz. Emissions detected within 10 dB of limit were determined to be digital emissions not associated with the transmitter.
- No spurious emissions detected within 10 dB of limit above 1 GHz

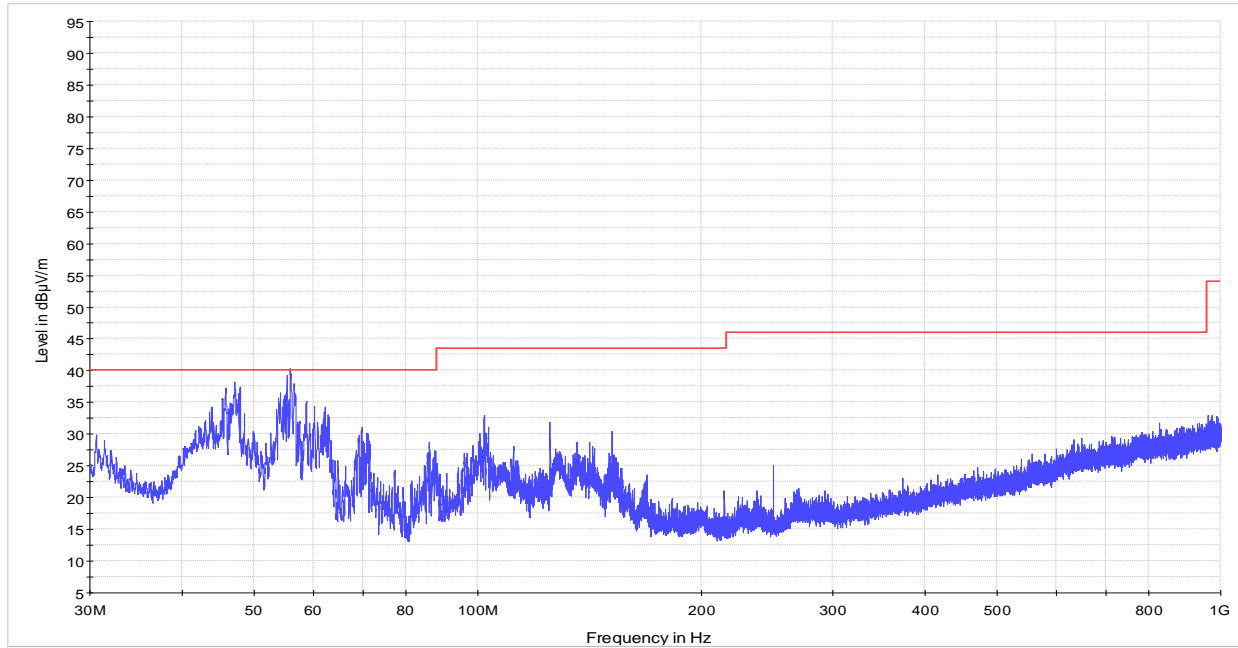
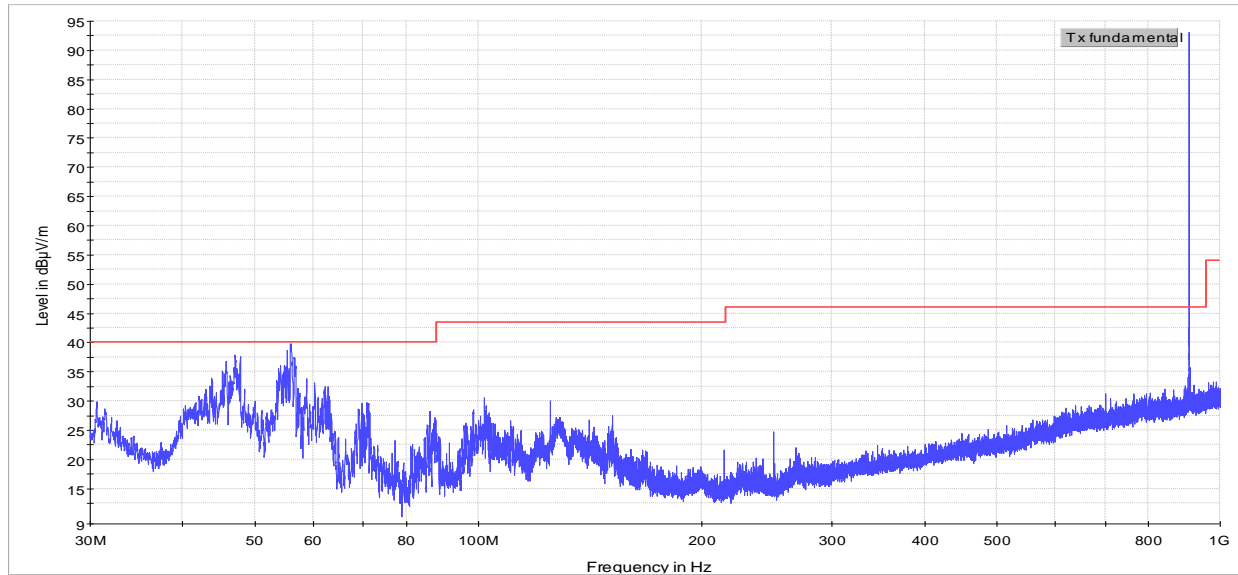


Figure 8.4-1: Spurious emissions – below 1 GHz, Tx disabled

8.4.4 Test data, continued



PK+ MAXH
FCC Part 15 and ICES - Class B 3m Q-Peak Limit

Figure 8.4-2: Spurious emissions – below 1 GHz, Tx 908.42 MHz, 9.6 k baud rate

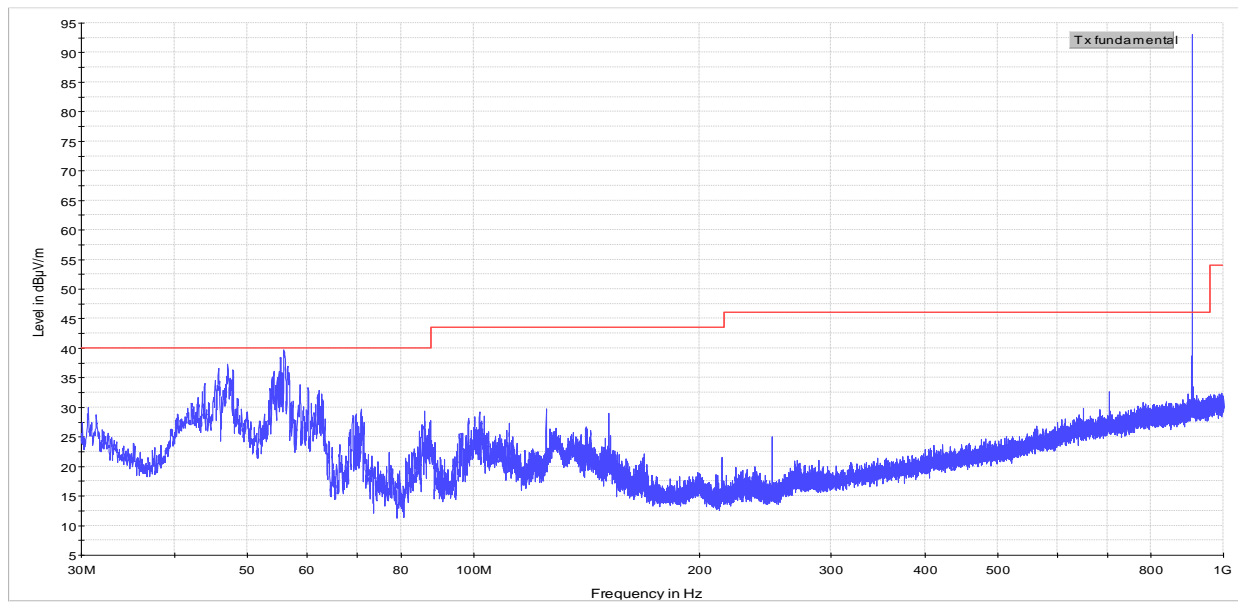


Figure 8.4-3: Spurious emission – below 1 GHz s, Tx 908.42 MHz, 40 k baud rate

8.4.4 Test data, continued

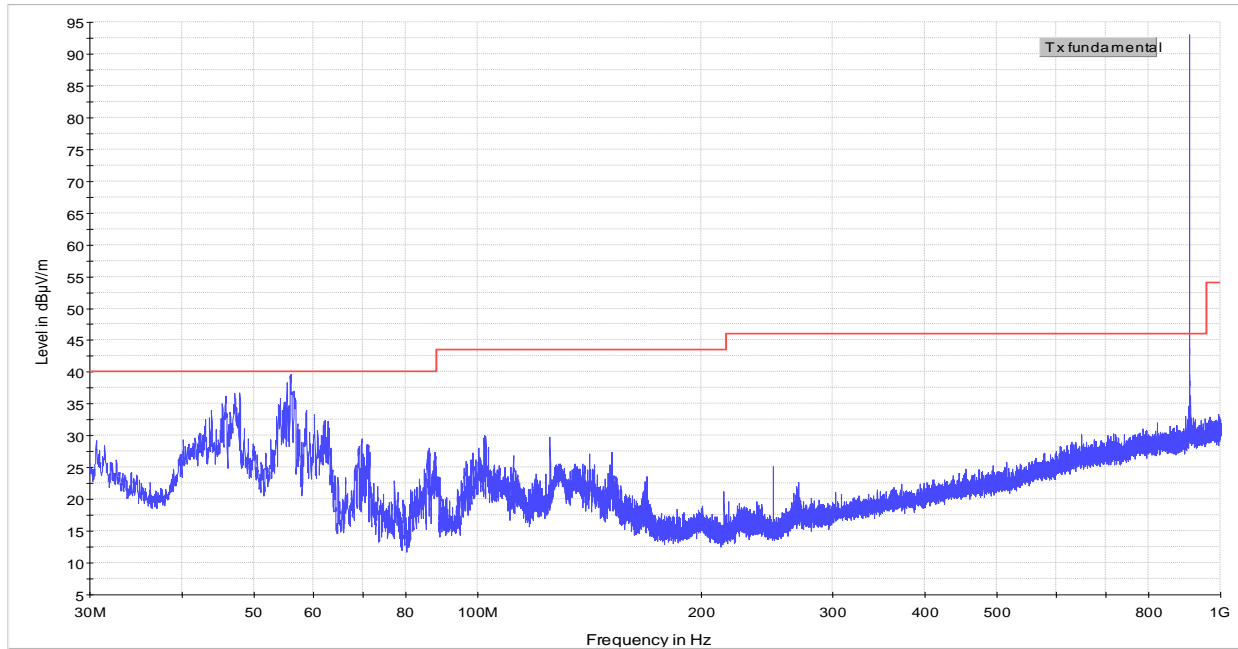
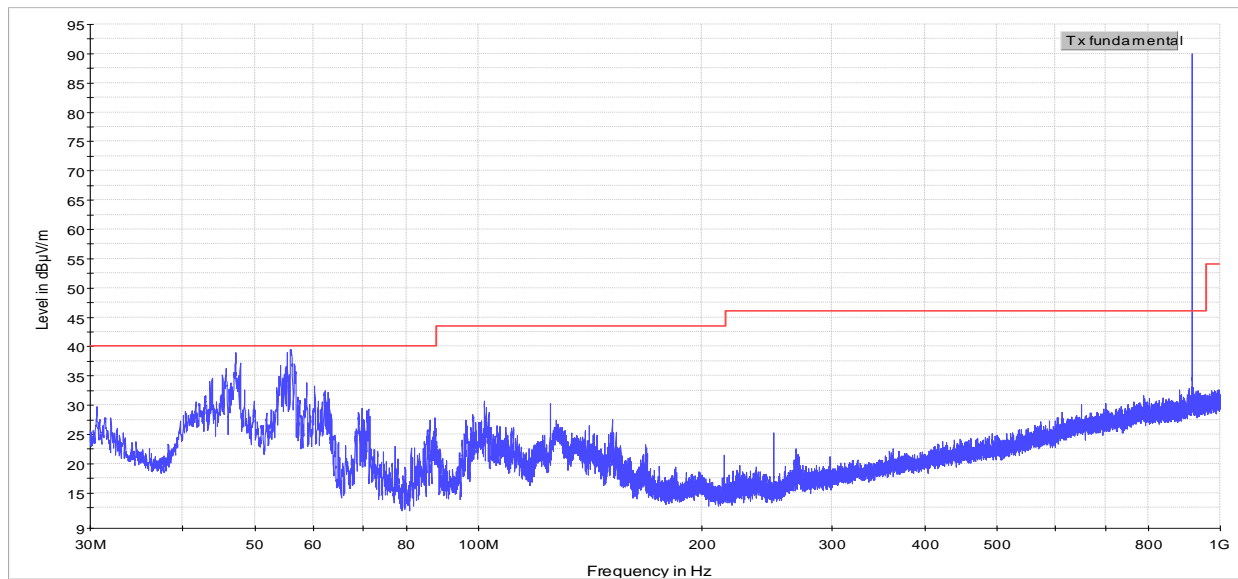


Figure 8.4-4: Spurious emissions – below 1 GHz, Tx 908.4 MHz, 9.6 k baud rate



PK+_MAXH
FCC Part 15 and ICES - Class B 3m Q-Peak Limit

Figure 8.4-5: Spurious emissions – below 1 GHz, Tx 916.0 MHz, 100 k baud rate

8.4.4 Test data, continued

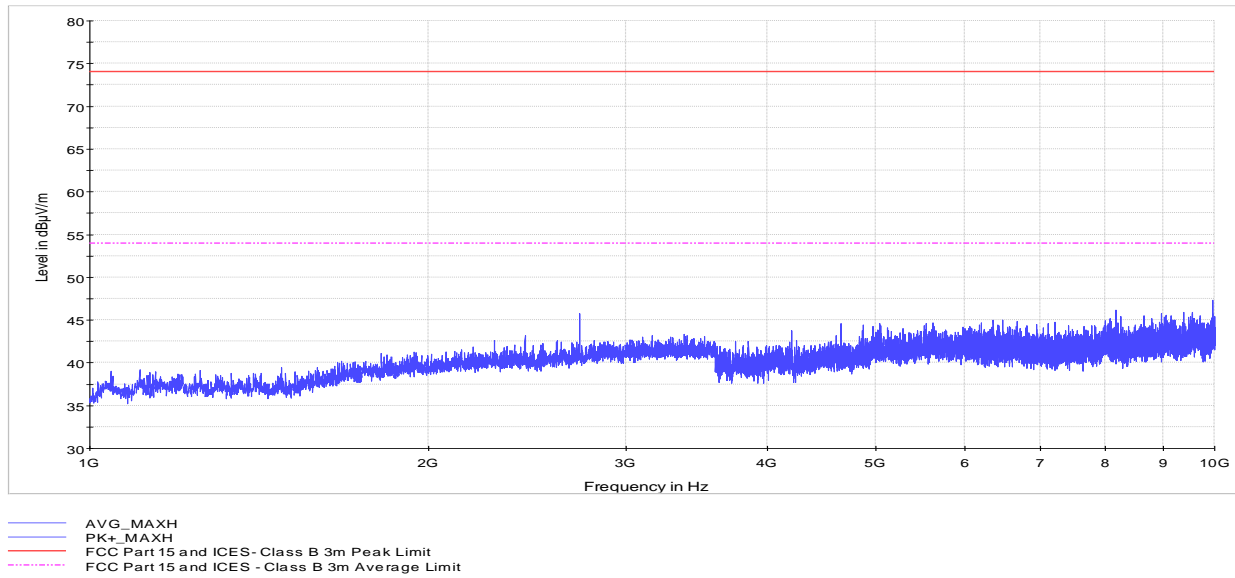


Figure 8.4-6: Spurious emissions – above 1 GHz, Tx 908.42 MHz, 9.6 k baud rate

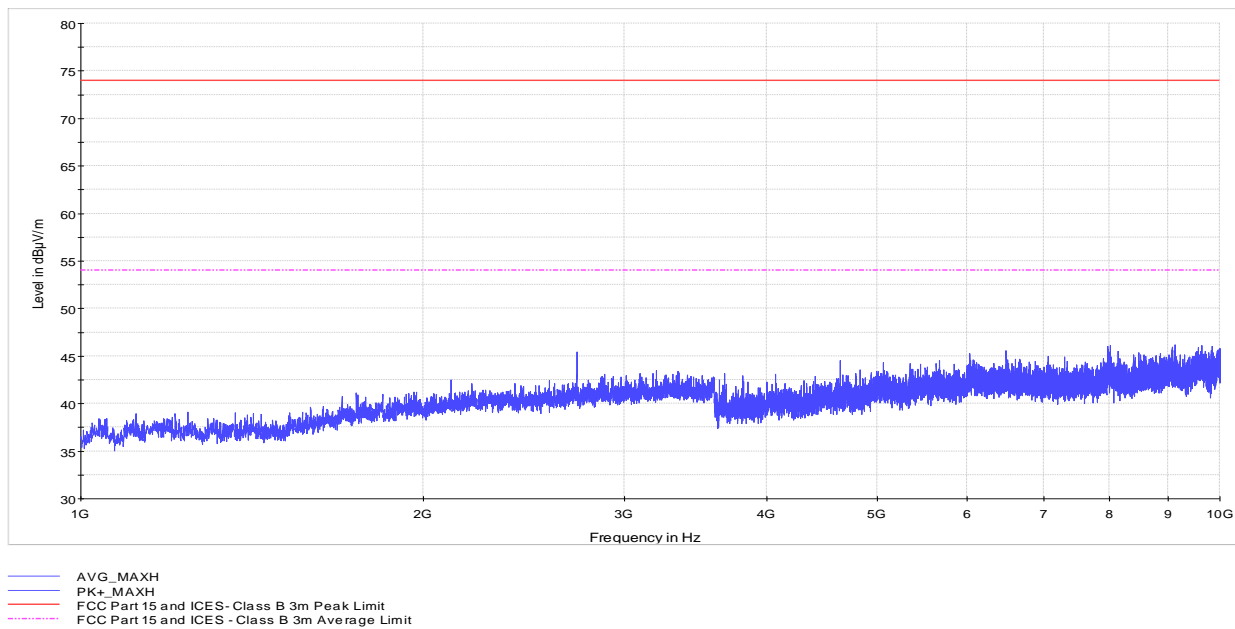


Figure 8.4-7: Spurious emissions – above 1 GHz, Tx 908.42 MHz, 40 k baud rate

8.4.4 Test data, continued

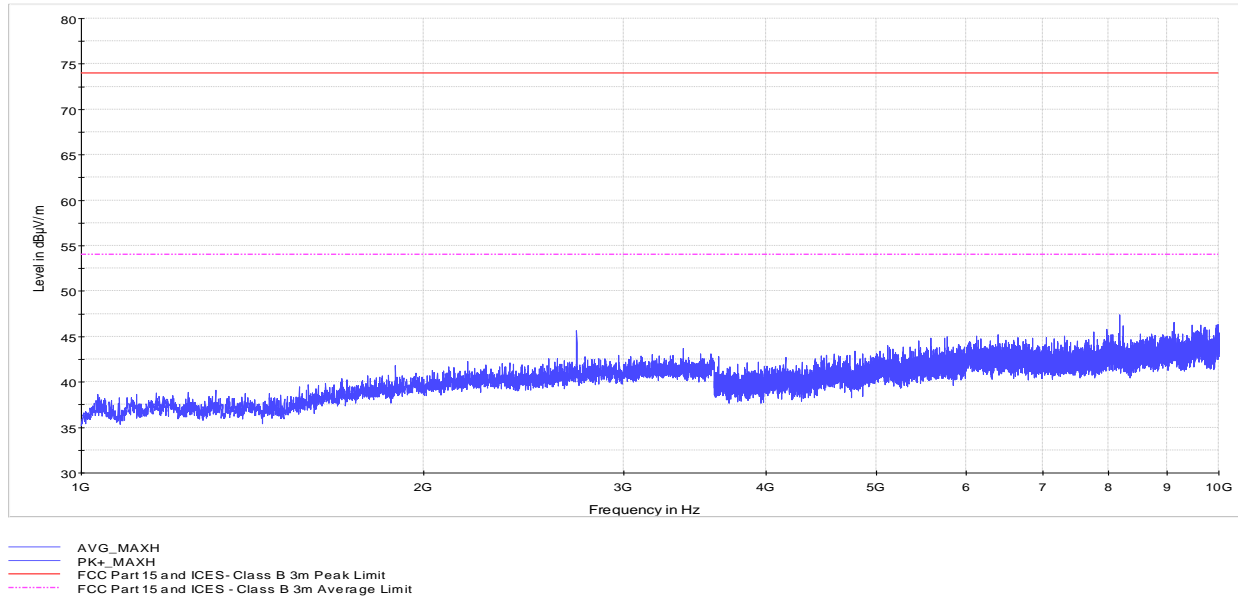


Figure 8.4-8: Spurious emissions – above 1 GHz, Tx 908.4 MHz, 9.6 k baud rate

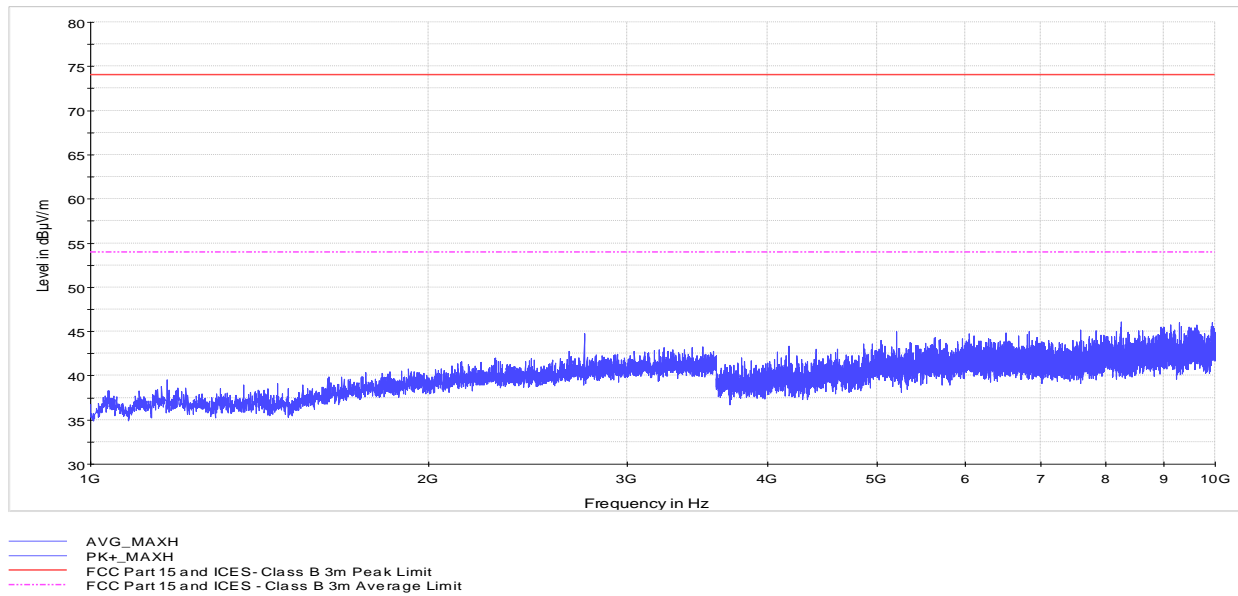
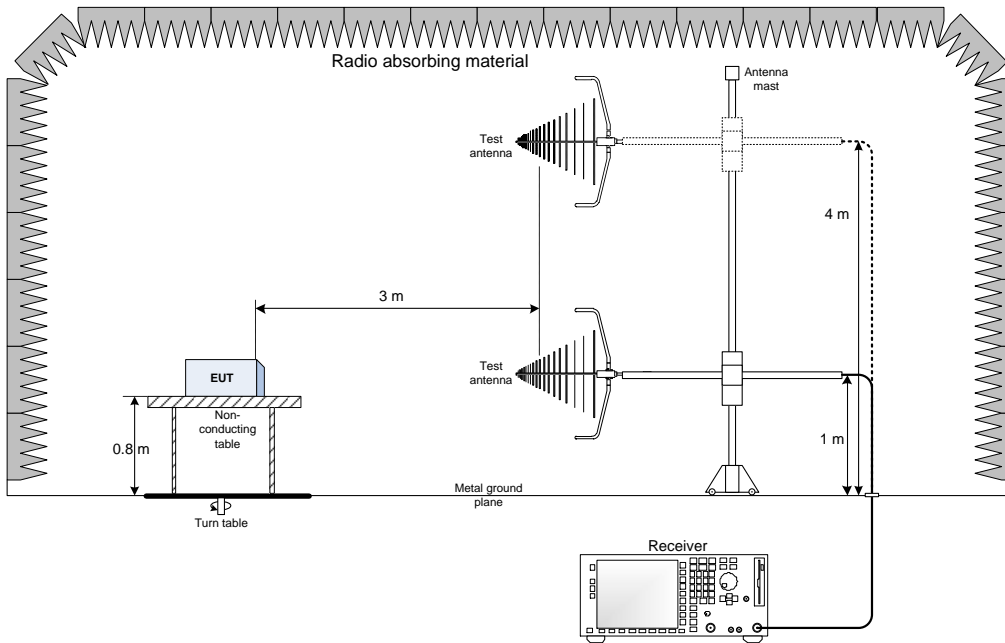


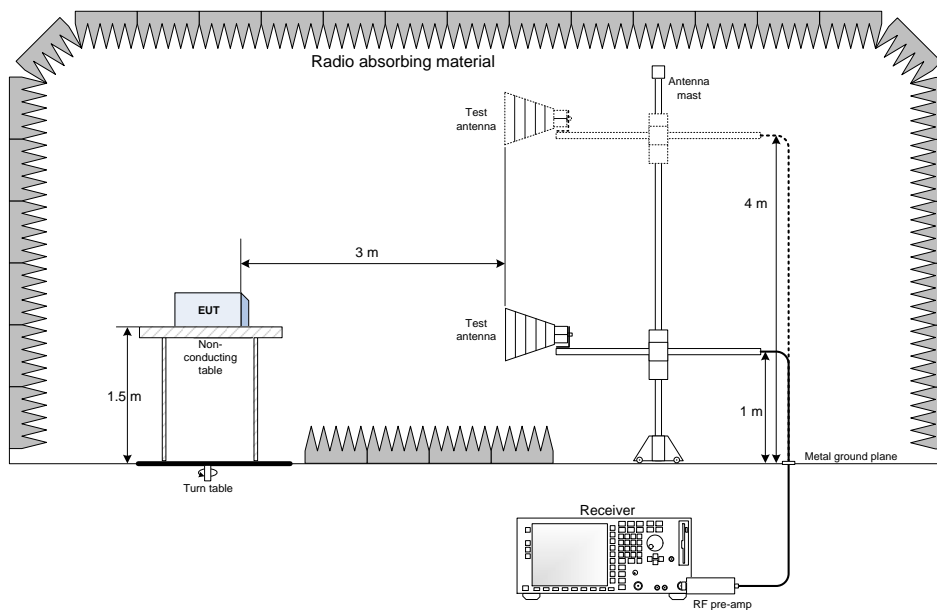
Figure 8.4-9: Spurious emissions – above 1 GHz, Tx 916.0 MHz, 100 k baud rate

Section 9. Block diagrams 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



9.3 Conducted emissions set-up

