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Compliance test report ID: **182563-5TRFWL**

Date of issue
October 28, 2011

FCC 47 CFR Part 15 Subpart E

Unlicensed National Information Infrastructure Devised

Applicant **BelAir Networks Inc.**
Product **DRUE 5.8 GHz radio**
Model **B5CH118AA**
FCC ID **RAR50005001**

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada. The tests included in this report are within the scope of this accreditation

SCC Accredited LAB
LAB Accrédité CCN

Test location

Nemko Canada Inc.
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Test site FCC ID: 176392 (3 m semi anechoic chamber)

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Tested by Andrey Adelberg, Senior Wireless/EMC Specialist

Reviewed by

David Duchesne, Senior Wireless/EMC Specialist

October 28, 2011
Date:

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.

Copyright notification

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Section 1: Report summary

1.1 Applicant

BelAir Networks Inc.
603 March Road,
Ottawa, ON, Canada
K2K 2M5

1.2 Test specifications

FCC 47 CFR Part 15 Subpart E

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1.3 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.

1.4 Test report revision history

Original report issued

Section 2: Summary of test results

2.1 FCC Part 15 – General requirements, test results

Part	Test description	Verdict
§15.31(e)	Variation of power source	See Notes 1
§15.31(m)	Number of operating frequencies	See Notes 2
§15.203	Antenna requirement	See Notes 3
§15.207(a)	Conducted limits	Pass

Notes:
1. Transmit output power was measured while supply voltage was varied from 102 to 138 V_{AC} (85 to 115 % of the nominal rated supply voltage). No change in transmit output power was observed
2. The frequency range over which the device operates is greater than 10 MHz. Tests were performed on three operating channels. (low, mid and high)
3. This requirement does not apply to intentional radiators that must be professionally installed

2.2 FCC Part 15, Subpart E, test results

Part	Test description	Verdict
§15.403(i)	Emission bandwidth	–
§15.407(a)(1)	5.15–5.25 GHz band power and density limits	N/A
§15.407(a)(2)	5.25–5.35 GHz and 5.47–5.725 GHz bands power and density limits	N/A
§15.407(a)(3)	5.725–5.825 GHz band power and density limits	Pass
§15.407(a)(6)	Peak excursion	Pass
§15.407(b)(1)	5.15–5.25 GHz band undesired emission limits	N/A
§15.407(b)(2)	5.25–5.35 GHz band undesired emission limits	N/A
§15.407(b)(3)	5.47–5.725 GHz band undesired emission limits	N/A
§15.407(b)(4)	5.725–5.825 GHz band undesired emission limits	Pass
§15.407(b)(6)	Unwanted emissions below 1 GHz	Pass
§15.407(b)(7)	Radiated emissions within restricted bands	Pass
§15.407(e)	5.15–5.25 GHz band operational restriction	N/A
§15.407(f)	Radio frequency radiation exposure	Pass
§15.407(g)	Frequency stability	Pass
§15.407(h)(1)	Transmit power control (TPC)	N/A
§15.407(h)(2)	Dynamic Frequency Selection (DFS)	N/A

Section 3: Equipment under test (EUT) details

3.1 Sample information

Receipt date	July 28, 2011
Nemko sample ID number	1

3.2 EUT information

Product name	DRUE 5.8 GHz radio
Model	B5CH118AA
Serial number	M1817E0018

3.3 Technical information

Operating band	5725–5825 MHz
Operating frequencies	5740–5805 MHz
Modulation type	802.11n
Channel bandwidth	20 MHz
Emission designator	W7D
Power requirements	120 V_{AC}, 60 Hz
Antenna information	
Type:	Omni-directional (professionally installed)
Gain:	6.5 dBi.
Model:	BMAG00291-A
Manufacturer:	BelAir Networks

3.4 Product description and theory of operation

The EUT is a 3×3 MIMO combo Wi-Fi module designed to operate in the 2.4–2.4835 GHz band, and 5.725–5.85 GHz band. There are two independent radio units. This report covers only the 5.8 GHz radio UNII band.

3.5 EUT exercise details

The EUT was controlled to transmit ad desire frequency and modulation from laptop using Art GUI software and telnet session.

3.6 EUT setup diagram

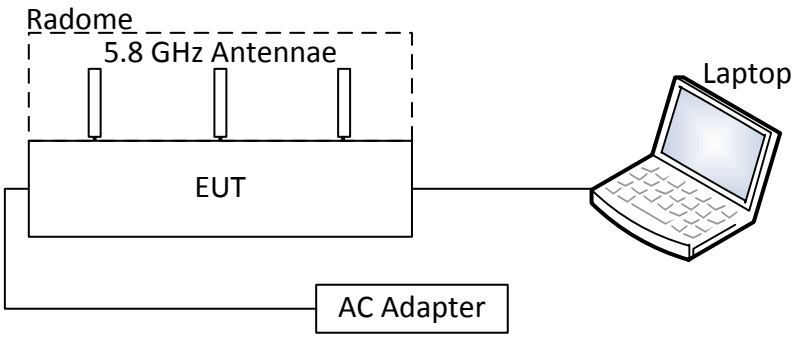


Diagram 3.6-1: Setup diagram

Section 4: Engineering considerations

1.4 Modifications incorporated in the EUT

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

1.5 Technical judgment

None

1.6 Deviations from laboratory tests procedures

No deviations were made from laboratory test 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 ±5 %, for which the equipment was designed.

Section 6: Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

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	Mar. 09/12
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Power supply	California Inst.	3001I	FA001021	1 year	Jan. 26/12
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	April 27/12
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Dec.06/11
Bilog antenna	Sunol	JB3	FA002108	1 year	Jan. 31/12
Horn antenna #2	EMCO	3115	FA000825	1 year	Feb. 04/12
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	Sept. 23/11
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
Multimeter	Fluke	16	FA001831	1 year	Jan. 26/12
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	May 20/12
18–26 GHz pre-amplifier	Narda	BBS-1826N612	FA001550	—	VOU
26–40 GHz pre-amplifier	Narda	DBL-2640N610	FA001556	—	VOU

Note: NCR = no cal required, VOU = verify on use

Section 8: Testing data

8.1 Clause 15.207(a) Conducted limits

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 µH/50 ohms 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.

Table 8.1-1: Conducted emissions limit

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
*-Decreases with the logarithm of the frequency.		

8.1.1 Test summary

Test date	August 5, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	25 °C	**Air pressure**	1005 mbar	**Relative humidity**	45 %

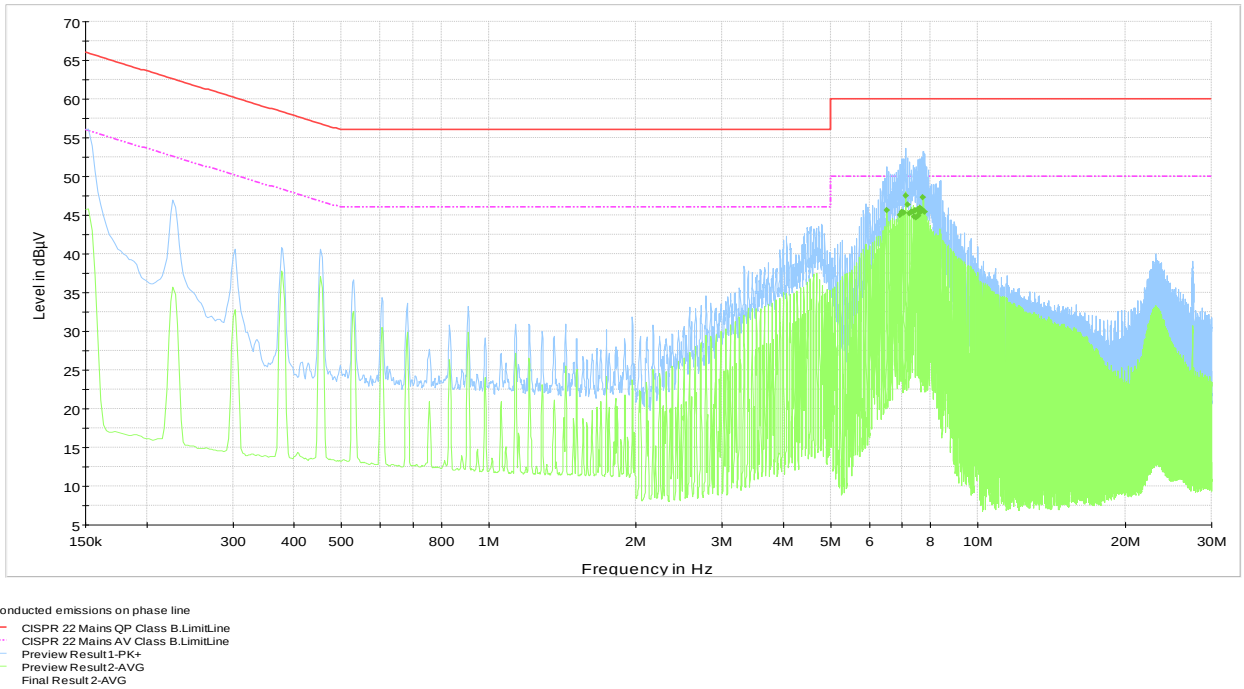
8.1.2 Observations/special notes

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.

8.1.3 Test data



Plot 8.1-1: Conducted emissions on phase line

Frequency range	0.15 MHz to 30 MHz
Preview measurements	Receiver: 9 kHz RBW, Peak (blue) and Average (green) detector, max hold
Final measurement	Receiver: 9 kHz RBW, Quasi-peak and Average (green) detector
Measurement time	100 ms

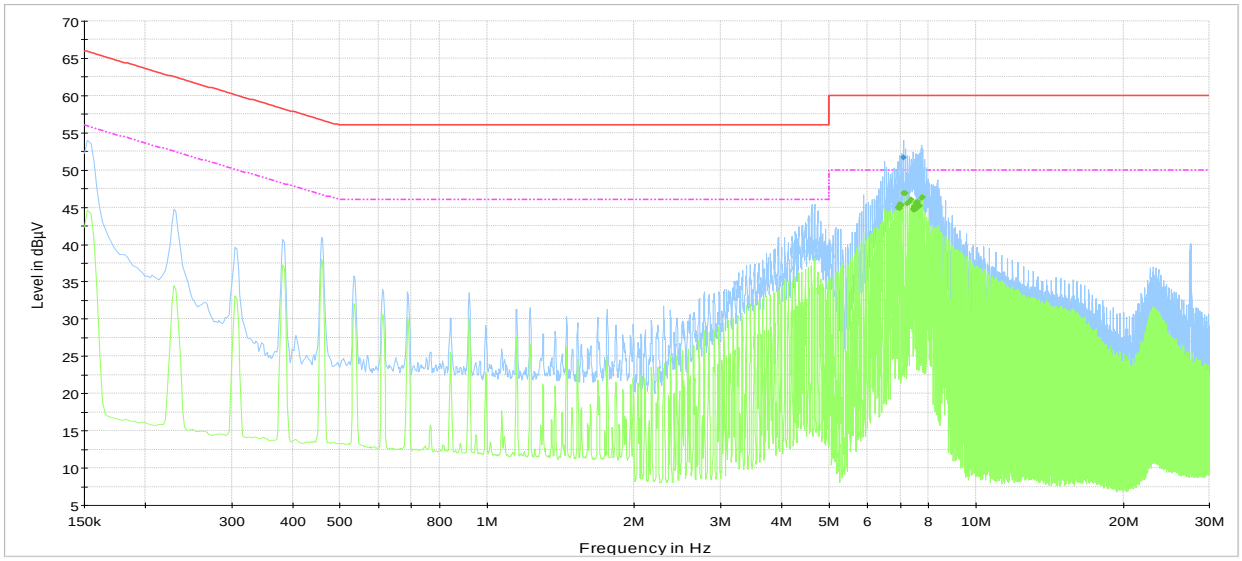
Table 8.1-2: Average conducted emissions results on phase line

Frequency (MHz)	Average result (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Conductor	Correction (dB)	Margin (dB)	Limit (dBµV)
7.480500	44.7	100.0	9.000	On	Phase	10.2	5.3	50.0
7.419750	44.8	100.0	9.000	On	Phase	10.2	5.2	50.0
7.541250	44.9	100.0	9.000	On	Phase	10.2	5.1	50.0
6.931500	45.0	100.0	9.000	On	Phase	10.2	5.0	50.0
7.248750	45.2	100.0	9.000	On	Phase	10.2	4.8	50.0
7.602000	45.3	100.0	9.000	On	Phase	10.2	4.7	50.0
6.992250	45.4	100.0	9.000	On	Phase	10.2	4.6	50.0
7.053000	45.4	100.0	9.000	On	Phase	10.2	4.6	50.0
7.316250	45.4	100.0	9.000	On	Phase	10.2	4.6	50.0
7.383750	45.4	100.0	9.000	On	Phase	10.2	4.6	50.0
7.791000	45.4	100.0	9.000	On	Phase	10.2	4.6	50.0

Sample calculation:
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
Result (dBµV) = XX dBµV (reading from receiver) + XX dB (Correction factor)

Example:
43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

8.1.3 Test data, continued



Plot 8.1-2: Conducted emissions on neutral line

Frequency range	0.15 MHz to 30 MHz
Preview measurements	Receiver: 9 kHz RBW, Peak (blue) and Average (green) detector, max hold
Final measurement	Receiver: 9 kHz RBW, Quasi-peak (blue) and Average (green) detector
Measurement time	100 ms

Table 8.1-3: Average conducted emissions results on neutral line

Frequency (MHz)	Average result (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Conductor	Correction (dB)	Margin (dB)	Limit (dBµV)
7.480500	44.6	100.0	9.000	On	Neutral	10.2	5.4	50.0
7.541250	44.7	100.0	9.000	On	Neutral	10.2	5.3	50.0
7.419750	44.8	100.0	9.000	On	Neutral	10.2	5.2	50.0
6.976500	44.9	100.0	9.000	On	Neutral	10.2	5.1	50.0
6.931500	45.0	100.0	9.000	On	Neutral	10.2	5.0	50.0
7.451250	45.1	100.0	9.000	On	Neutral	10.2	4.9	50.0
7.602000	45.1	100.0	9.000	On	Neutral	10.2	4.9	50.0
7.653750	45.2	100.0	9.000	On	Neutral	10.2	4.8	50.0
7.053000	45.3	100.0	9.000	On	Neutral	10.2	4.7	50.0
6.992250	45.4	100.0	9.000	On	Neutral	10.2	4.6	50.0
7.246500	45.5	100.0	9.000	On	Neutral	10.2	4.5	50.0

Table 8.1-4: Quasi-peak conducted emissions results

Frequency (MHz)	Quasi-peak result (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Conductor	Correction (dB)	Margin (dB)	Limit (dBµV)
7.113750	51.6	100.0	9.000	On	Neutral	10.2	8.4	60.0

Sample calculation:
Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
Result (dBµV) = XX dBµV (reading from receiver) + XX dB (Correction factor)

Example:
43.5 dBµV = 23.2 dBµV (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

8.2 Clause 15.403(i) Emission bandwidth

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

8.2.1 Test summary

Test date	September 26, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	21 °C	**Air pressure**	1002 mbar	**Relative humidity**	43 %

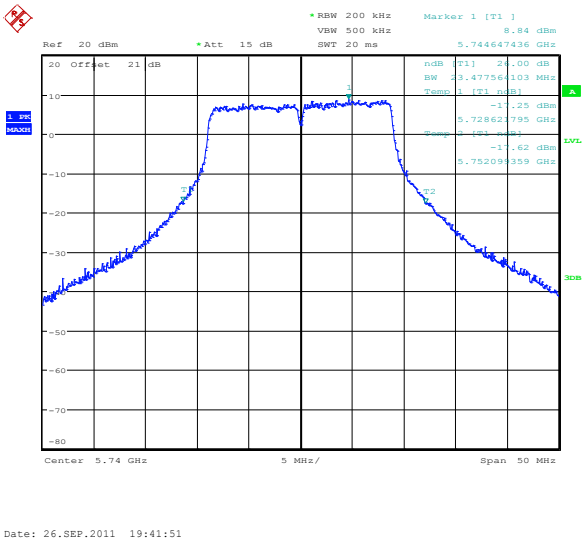
8.2.2 Observations/special notes

A peak detector with 200 kHz RBW and 500 kHz VBW was used to perform measurement.

8.2.3 Test data

Table 8.2-1: 26 dB bandwidth results

Frequency, MHz	26 dB BW, MHz
5740	23.48
5785	23.32
5805	23.48



Sample plot 8.2-1: 26 dB BW

8.3 Clause 15.407(a)(3) 5.725–5.825 GHz band output power and spectral density limits

(3) For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

8.3.1 Test summary

Test date	September 26, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	22 °C	**Air pressure**	1001 mbar	**Relative humidity**	42 %

8.3.2 Observations/special notes

The test was perform using FCC Public Notice Ref: DA: 02-2138: Measurement Procedure for Peak Transmit Power in UNII Band

Due to 100 % duty cycle (Sweep time <T) and EBW < largest available RBW on the Analyzer, conducted output power was measured on the antenna port by means of a spectrum analyzer and following the *'Method 1'* procedure.

8.3.3 Test data

Table 8.3-1: Output power and EIRP results (SM-MIMO and STBC operation)

Frequency (MHz)	SW setting	Conducted Avg. Power ANT 1 (mW)	Conducted Avg. Power ANT 2 (mW)	Conducted Avg. Power ANT 3 (mW)	Combined Output Power (dBm)	Conducted Output Power Limit (dBm)	Conducted Output Power Margin (dB)	Antenna Gain (dBi)	Cable loss (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
5740	21.5	154.195	139.172	143.151	26.40	30.00	3.60	6.5	0.5	32.40	36.00	3.60
5785	21.0	214.642	205.475	159.745	27.63	30.00	2.37	6.5	0.5	33.63	36.00	2.37
5805	21.5	213.854	182.772	181.802	27.62	30.00	2.38	6.5	0.5	33.62	36.00	2.38

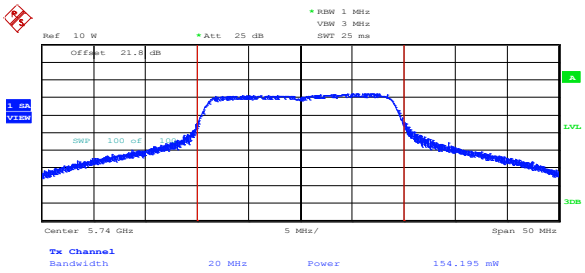
– Combined output power (dBm) = 10×Log_{10} (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW) + Conducted Avg. Power ANT-3 (mW))
– EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))
– EIRP Limit (dBm) = output power limit + 6 dB
– Measured 26 dB bandwidth = 23.48 MHz
– Output power shall not exceed the lesser of 30 dBm or 17 dBm + 10×Log_{10} B, where B is the 26-dB emission bandwidth in MHz.
– Output power limit: = 30.71 dBm = (17 dBm + 10×Log_{10} (23.48 MHz)) > 30 dBm, therefore the final limit is 30 dBm
– Output power limit: = 30.71 dBm – ((antenna gain - cable loss) – 6 dBi) [for antennas greater than 6 dBi]

Table 8.3-2: Power spectral density results

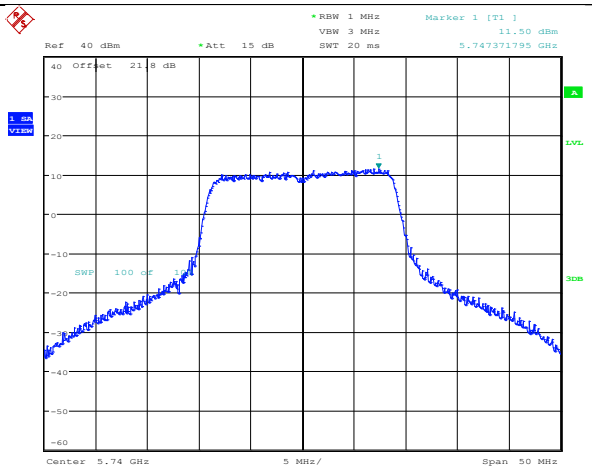
Frequency (MHz)	SW setting	Conducted PSD ANT 1 (dBm/MHz)	Conducted PSD ANT 2 (dBm/MHz)	Conducted PSD ANT 3 (dBm/MHz)	Combined PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
5740	21.50	11.50	11.39	11.04	16.09	17.00	0.91
5785	21.00	12.69	12.40	11.24	16.92	17.00	0.08
5805	21.50	12.58	12.16	11.90	16.99	17.00	0.01

PSD limit = 17 dBm – ((antenna gain - cable loss) – 6 dBi) [for antennas greater than 6 dBi]

$$\text{Combined PSD}\ {}^{\text{dBm}}_{\text{MHz}} = 10 \times log_{10}\left(10^{\frac{\text{Conducted PSD Ant 1 (dBm/MHz)}}{10}} + 10^{\frac{\text{Conducted PSD Ant 2 (dBm/MHz)}}{10}} + 10^{\frac{\text{Conducted PSD Ant 3 (dBm/MHz)}}{10}}\right)$$



Sample plot 8.3-1: Output power



Sample plot 8.3-2: PSD

8.4 Clause 15.407(a)(6) Peak excursion

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

8.4.1 Test summary

Test date	August 23, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	24 °C	**Air pressure**	1001 mbar	**Relative humidity**	42 %

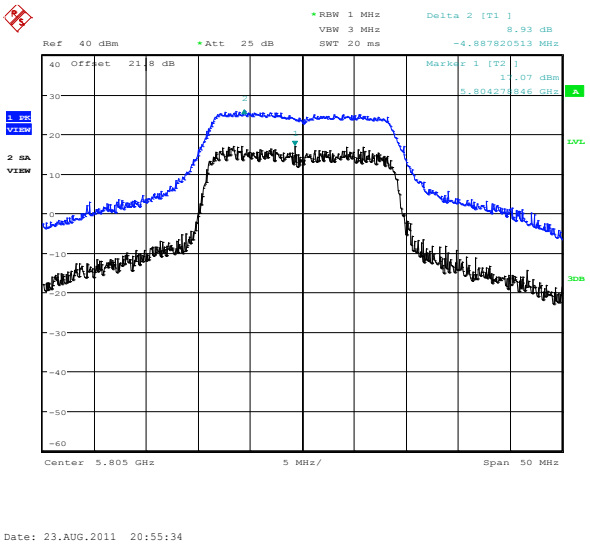
8.4.2 Observations/special notes

The test was perform using FCC Public Notice Ref: DA: 02-2138: Measurement Procedure for Peak Transmit Power in UNII Band

8.4.3 Test data

Table 8.4-1: Peak excursion results.

Frequency (MHz)	Peak excursion (dB/MHz)	Limit (dB/MHz)	Margin (dB)
5740	8.34	13.00	4.66
5785	8.61	13.00	4.39
5805	8.93	13.00	4.07



Sample Plot 8.4-1: Peak excursion

8.5 Clause 15.407(b)(4) Undesirable emissions for 5.725–5.825 GHz band

(4) For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of −27 dBm/MHz.

8.5.1 Test summary

Test date	September 26, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	23 °C	**Air pressure**	1005 mbar	**Relative humidity**	38 %

8.5.2 Observations/special notes

Clause 15.407(b)(5)

- The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

Clause 15.407(b)(8)

- When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

The spectrum was searched from 1 GHz to the 40 GHz using sample detector with 1 MHz RBW, 3 MHz VBW.
All emissions were measured using power averaging over 100 sweeps.

8.5.3 Test data

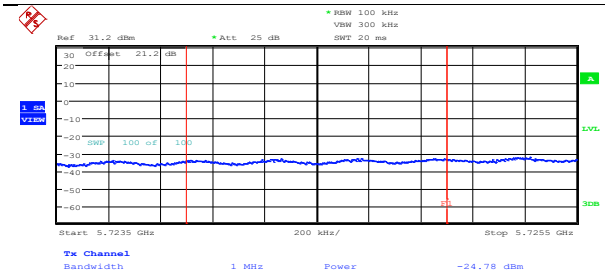
Table 8.5-1: Band edge results

Band edge frequency, (MHz)	Antenna port	Channel	Conducted power, (dBm/MHz)	Cable loss, (dB)	Antenna gain, (dBi)	EIRP, (dBm/MHz)	Limit, (dBm/MHz)	Margin, (dB)
5725	1	low	-24.78	0.50	6.50	-18.78	-17.00	1.78
5725	2	low	-24.32	0.50	6.50	-18.32	-17.00	1.32
5725	3	low	-23.05	0.50	6.50	-17.05	-17.00	0.05
5825	1	high	-23.23	0.50	6.50	-17.23	-17.00	0.23
5825	2	high	-23.85	0.50	6.50	-17.85	-17.00	0.85
5825	3	high	-23.59	0.50	6.50	-17.59	-17.00	0.59
5715	1	low	-37.18	0.50	6.50	-31.18	-27.00	4.18
5715	2	low	-38.98	0.50	6.50	-32.98	-27.00	5.98
5715	3	low	-38.05	0.50	6.50	-32.05	-27.00	5.05
5835	1	high	-34.98	0.50	6.50	-28.98	-27.00	1.98
5835	2	high	-35.25	0.50	6.50	-29.25	-27.00	2.25
5835	3	high	-38.58	0.50	6.50	-32.58	-27.00	5.58

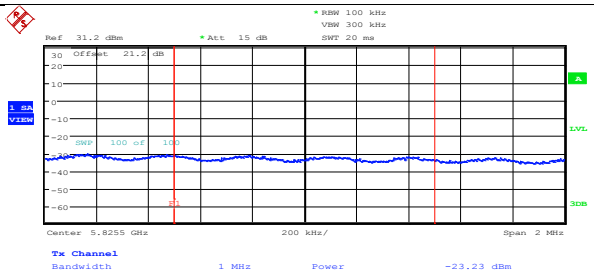
Table 8.5-2: Spurious emissions results

Channel	Antenna port	Frequency (GHz)	Conducted power, (dBm/MHz)	Cable loss, (dB)	Antenna gain, (dBi)	EIRP, (dBm/MHz)	Limit, (dBm/MHz)	Margin, (dB)
low	2	17.2238	-43.55	0.50	6.50	-37.55	-27.00	10.55
low	3	17.2238	-40.95	0.50	6.50	-34.95	-27.00	7.95
Mid	1	2.8813	-38.87	0.50	6.50	-32.87	-27.00	5.87
Mid	1	17.3607	-43.92	0.50	6.50	-37.92	-27.00	10.92
Mid	2	17.3607	-36.00	0.50	6.50	-30.00	-27.00	3.00
Mid	3	17.3607	-34.81	0.50	6.50	-28.81	-27.00	1.81
high	1	17.4233	-42.02	0.50	6.50	-36.02	-27.00	9.02
high	2	17.4107	-40.72	0.50	6.50	-34.72	-27.00	7.72
high	3	17.4107	-34.83	0.50	6.50	-28.83	-27.00	1.83

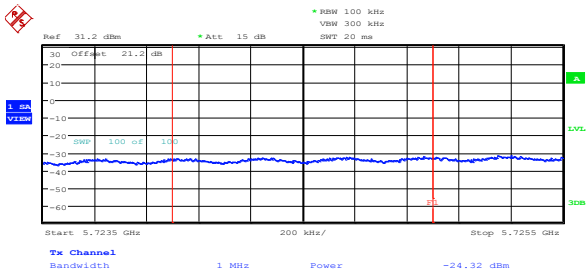
8.5.3 Test data



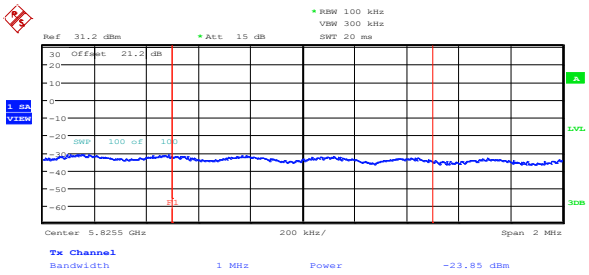
Plot 8.5-1: 5725 MHz band edge (F1), Antenna port 1, low channel



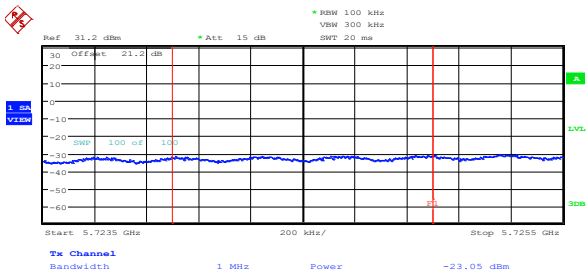
Plot 8.5-2: 5825 MHz band edge (F1), Antenna port 1, high channel



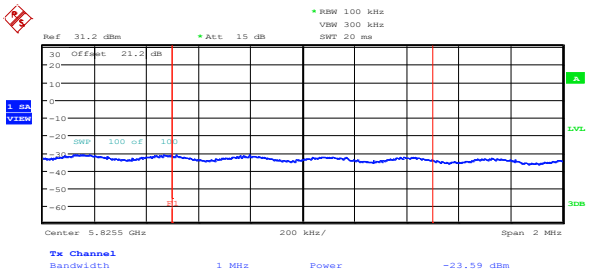
Plot 8.5-3: 5725 MHz band edge (F1), Antenna port 2, low channel



Plot 8.5-4: 5825 MHz band edge (F1), Antenna port 2, high channel

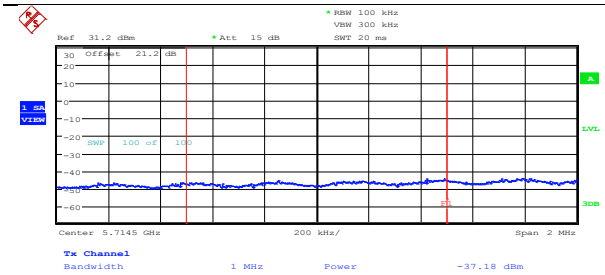


Plot 8.5-5: 5725 MHz band edge (F1), Antenna port 3, low channel

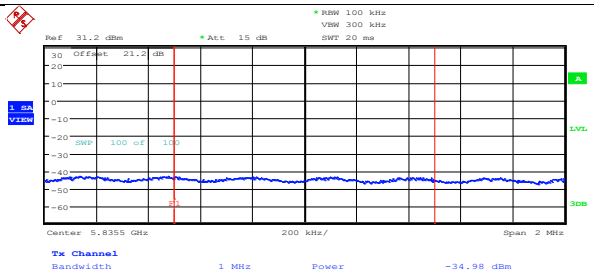


Plot 8.5-6: 5825 MHz band edge (F1), Antenna port 3, high channel

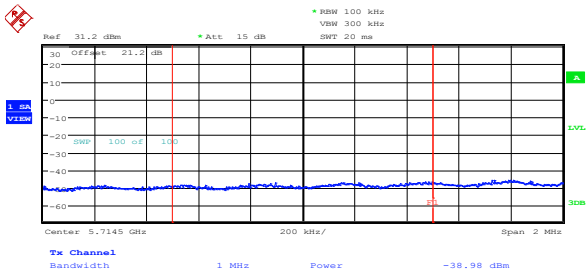
8.5.3 Test data, continued



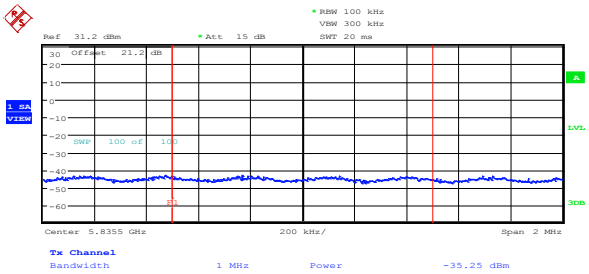
Plot 8.5-7: 5715 MHz band edge (F1), Antenna port 1, low channel



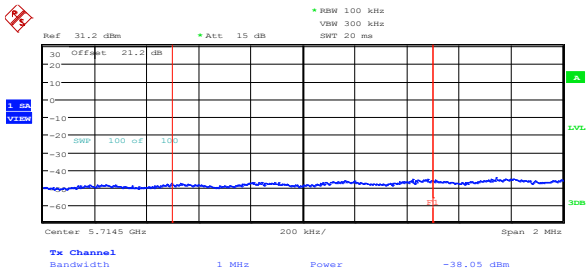
Plot 8.5-8: 5835 MHz band edge (F1), Antenna port 1, high channel



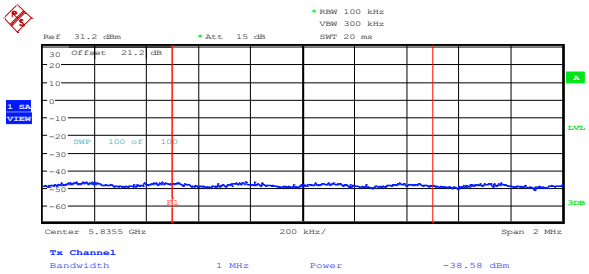
Plot 8.5-9: 5715 MHz band edge (F1), Antenna port 2, low channel



Plot 8.5-10: 5835 MHz band edge (F1), Antenna port 2, high channel

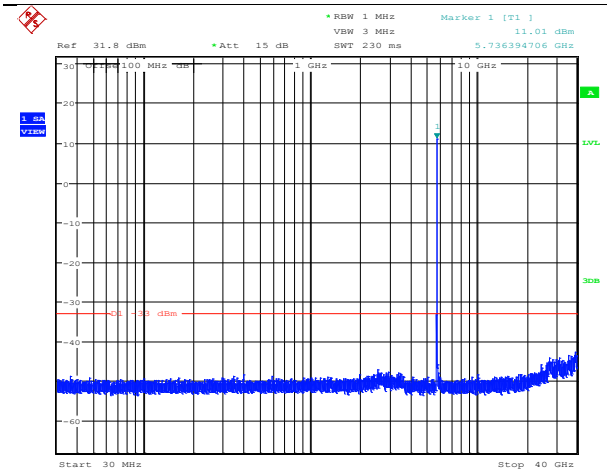


Plot 8.5-11: 5715 MHz band edge (F1), Antenna port 3, low channel

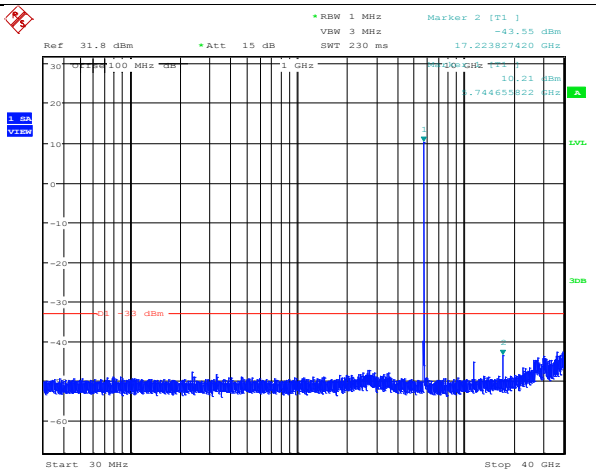


Plot 8.5-12: 5835 MHz band edge (F1), Antenna port 3, high channel

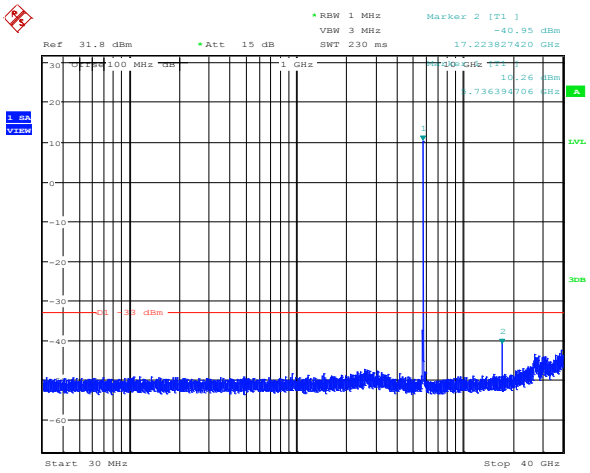
8.5.3 Test data, continued



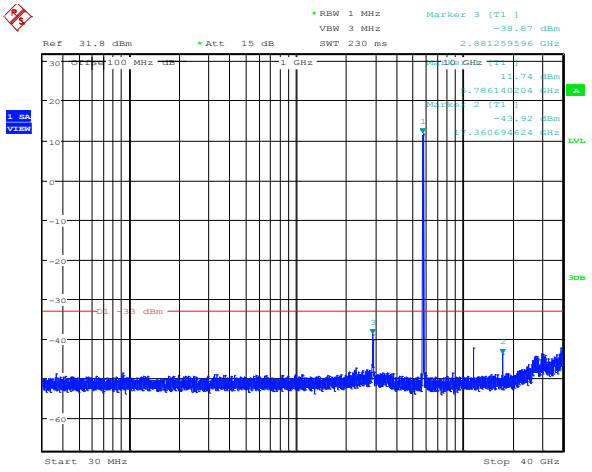
Plot 8.5-13: Conducted spurious emissions, Antenna port 1, low channel



Plot 8.5-14: Conducted spurious emissions, Antenna port 2, low channel



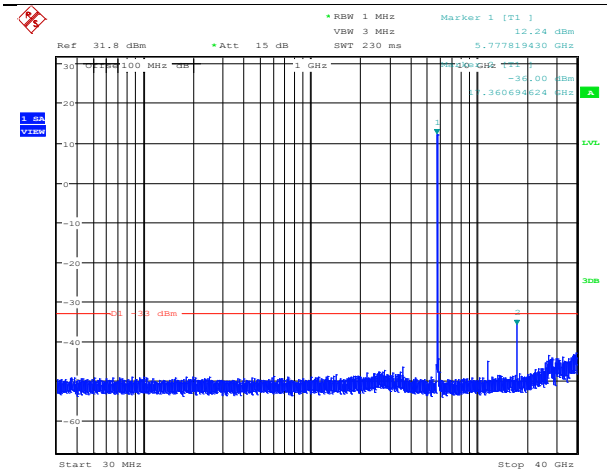
Plot 8.5-15: Conducted spurious emissions, Antenna port 3, low channel



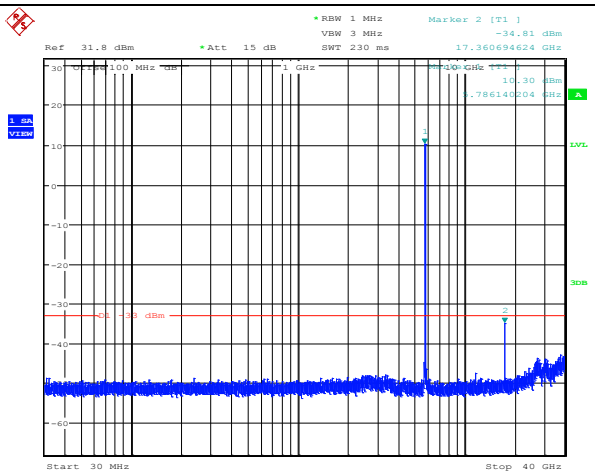
Plot 8.5-16: Conducted spurious emissions, Antenna port 1, mid channel

Note: Since the test was performed conducted, the limit line was adjusted with antenna gain and cable loss compensation: −27 dBm/MHz – 6 dBi (antenna gain and cable loss) = −33 dBm/MHz

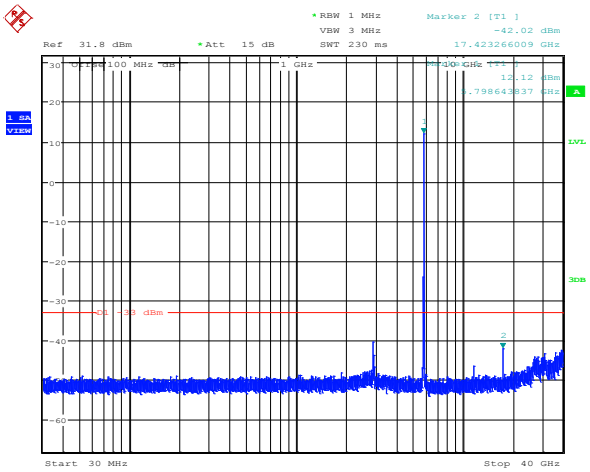
8.5.3 Test data, continued



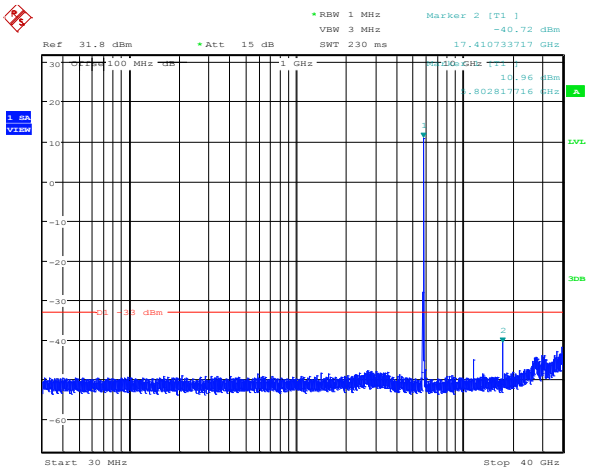
Plot 8.5-17: Conducted spurious emissions, Antenna port 2, mid channel



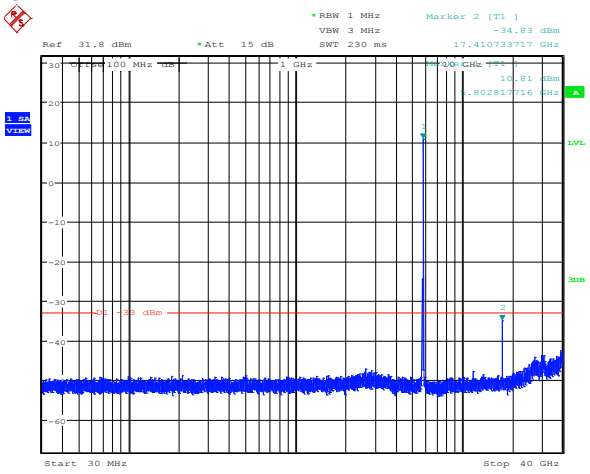
Plot 8.5-18: Conducted spurious emissions, Antenna port 3, mid channel



Plot 8.5-19: Conducted spurious emissions, Antenna port 1, high channel



Plot 8.5-20: Conducted spurious emissions, Antenna port 2, high channel



Plot 8.5-21: Conducted spurious emissions, Antenna port 3, high channel

Note: Since the test was performed conducted, the limit line was adjusted with antenna gain and cable loss compensation: −27 dBm/MHz – 6 dBi (antenna gain and cable loss) = −33 dBm/MHz, assuming the antenna gain remains the same outside its pass band. During radiated measurements no spurious emissions were observed.

8.6 Clause 15.407(b)(6) Unwanted emissions below 1 GHz

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

Table 8.6-1: Radiated emission limits §15.209

Frequency (MHz)	Quasi-Peak field strength		Measurement distance (m)
	(µV/m)	(µV/m)	
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
960–1000	500	54.0	3
Notes: In the emission table above, the tighter limit applies at the band edges.			

8.6.1 Test summary

Test date	August 23, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	24 °C	**Air pressure**	1002 mbar	**Relative humidity**	35 %

8.6.2 Observations/special notes and test results

The spectrum was searched from 30 MHz to 1 GHz.
Receiver was set to 120 kHz RBW, Peak detector, max hold

No emissions were detected within 10 dB below the limit.

8.7 Clause 15.407(b)(7) Radiated emissions within restricted bands

(7) The provisions of §15.205 apply to intentional radiators operating under this section within restricted bands.

Table 8.7-1: Radiated emission limits §15.209

Frequency (GHz)	Quasi-Peak field strength		Measurement distance (m)
	(µV/m)	(µV/m)	
1–40	500	54.0	3
Notes: The limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.			

Table 8.7-2: Restricted bands of operation §15.205

MHz	MHz
960–1240	5.35–5.46
1300–1427	7.25–7.75
1435–1626.5	8.025–8.5
1645.5–1646.5	9.0–9.2
1660–1710	9.3–9.5
1718.8–1722.2	10.6–12.7
2200–2300	13.25–13.4
2310–2390	14.47–14.5
2483.5–2500	15.35–16.2
2690–2900	17.7–21.4
3260–3267	22.01–23.12
3332–3339	23.6–24.0
3345.8–3358	31.2–31.8
3600–4400	36.43–36.5
4.5–5.15	Above 38.6

8.7.1 Test summary

Test date	August 23, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	24 °C	**Air pressure**	1002 mbar	**Relative humidity**	35 %

8.7.2 Observations/special notes

- These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- The spectrum was searched from 1 GHz to 10th harmonic (40 GHz max)
- All measurements were performed at a distance of 3 m
  - using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
  - and using peak detector with 1 MHz/10 Hz RBW/VBW for average results

No emissions were detected within 10 dB below the limit.

8.8 Clause 15.407(f) RF exposure requirement

(f) U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

The criteria listed in table 8.8-1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Table 8.8-1 – Limits for maximum permissible exposure (MPE) for general population/uncontrolled environment

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1 500			f/1 500	30
1 500–100 000			1.0	30

Notes: f = frequency in MHz

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

8.8.1 Observations/special notes

See MPE exhibit attached to this application.

8.9 Clause 15.407(g) Frequency stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

8.9.1 Test summary

Test date	August 23, 2011	**Test engineer**	Andrey Adelberg	**Verdict**	Pass
Temperature	24 °C	**Air pressure**	1002 mbar	**Relative humidity**	35 %

8.9.2 Observations/special notes

Test Conditions: Ambient Temperature: 20 °C
Extreme Temperature: −30 °C to +50 °C
Extreme Voltage Conditions: ±15 % of nominal voltage.

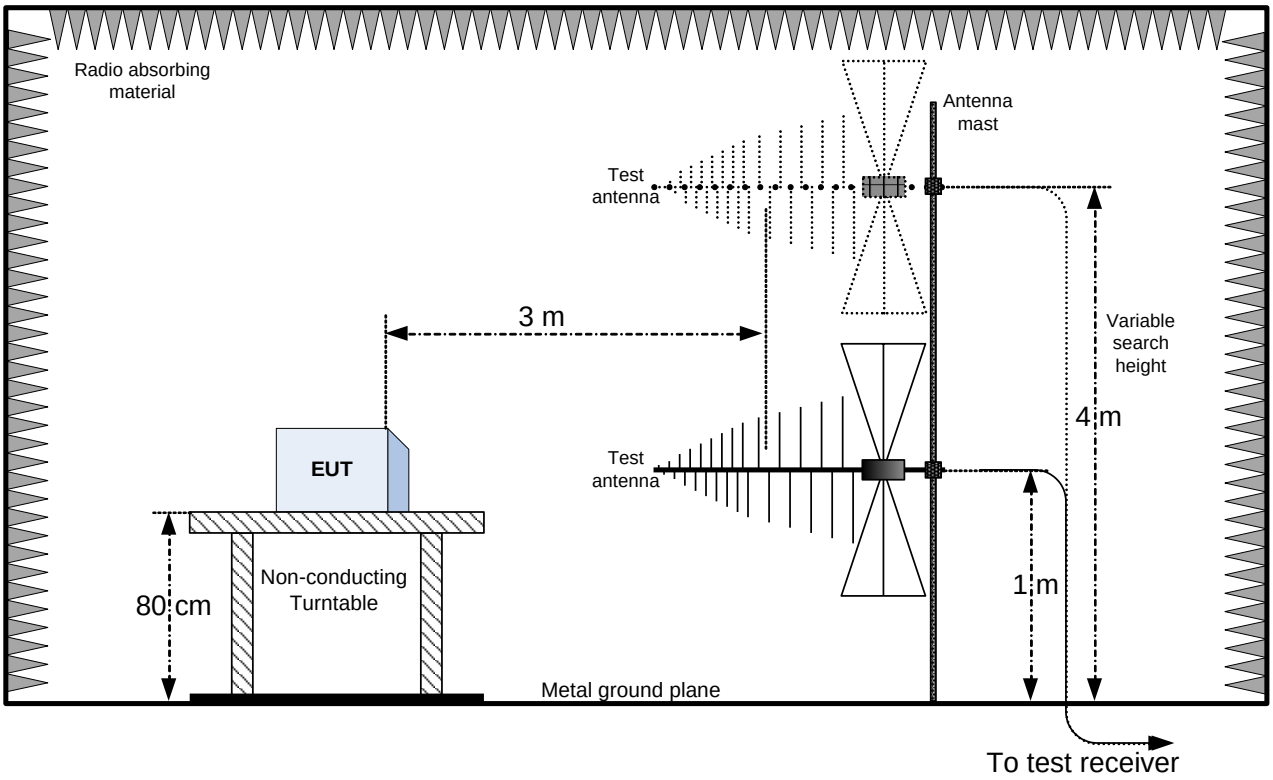
8.9.3 Test data

Table 8.9-1: Frequency stability results

Test conditions	Measured Frequency, (Hz)	Frequency Drift, (kHz)
+50 °C, Nominal voltage	5784951883	-40
+40 °C, Nominal voltage	5784951948	25
+30 °C, Nominal voltage	5784951923	0
+20 °C, Nominal voltage + 15 %	5784951930	7
+20 °C, Nominal voltage	5784951923	Reference
+20 °C, Nominal voltage − 15 %	5784951933	10
+10 °C, Nominal voltage	5784951931	8
0 °C, Nominal voltage	5784951977	54
−10 °C, Nominal voltage	5784951982	59
−20 °C, Nominal voltage	5784952025	102
−30 °C, Nominal voltage	5784952018	95

Section 9: Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up