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Report Reference ID:	155793-5TRFWL
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Test specification:	Title 47 - Telecommunication Chapter I - Federal Communications Commission Subchapter A - General Part 15 - Radio Frequency Devices Subpart E – Unlicensed National Information Infrastructure Devised
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Applicant:	BeAir Networks Inc. 603 March Road, Ottawa, ON, Canada K2K 2M5
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Apparatus:	DRU 5 GHz radio
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Model number:	B5CH114AAA
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FCC ID:	RAR30005002
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Testing laboratory:	Nemko Canada Inc. 303 River Road Ottawa, ON, Canada K1V 1H2 Telephone: (613) 737-9680 Facsimile: (613) 737-9691
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	Name and title	Date
Tested by:	David Duchesne, Wireless/EMC Specialist	
Reviewed by:	 Richard Brazeau, Laboratory Manager	December 13, 2010



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.



Nemko Canada Inc.
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Product: DRU 5 GHz radio

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Section 1: Report summary

1.1 Test specification

FCC Part 15 Subpart E

Unlicensed National Information Infrastructure Devised.

1.2 Statement of compliance

In the configuration tested the EUT was found compliant

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart E. Radiated tests were conducted in accordance with ANSI C63.4-2003.

See "Summary of test results" for full details.

1.3 Exclusions

None

1.4 Registration number

Test site FCC ID number: 176392 (3 m Semi anechoic chamber)

1.5 Test report revision history

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

1.6 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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Section 2: Summary of test results

2.1 FCC Part 15 Subpart E – Intentional Radiators, test results

General requirements for FCC Part 15

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

Specific requirements for FCC Part 15 Subpart E

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

Notes:

1. Transmit output power was measured while supply voltage was varied from 102 to 138 VAC (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.

Section 3: Equipment under test (EUT) and application details

3.1 Product details

Product name:	DRU 5 GHz radio
Model name/number:	B5CH114AAA
Serial number:	A000141488

3.2 Sample information

Receipt date:	August 17, 2010
Nemko sample ID number:	Item # 1

3.3 EUT technical specifications

Operating band:	5725 – 5825 MHz
Operating frequency:	5740 – 5810 MHz
Modulation type:	802.11 a, and n
Occupied bandwidth:	20 MHz
Antenna type:	7 dBi, Model # BMAG00287 A (Omni antenna)
Power source:	120/60Hz VAC

3.4 EUT description

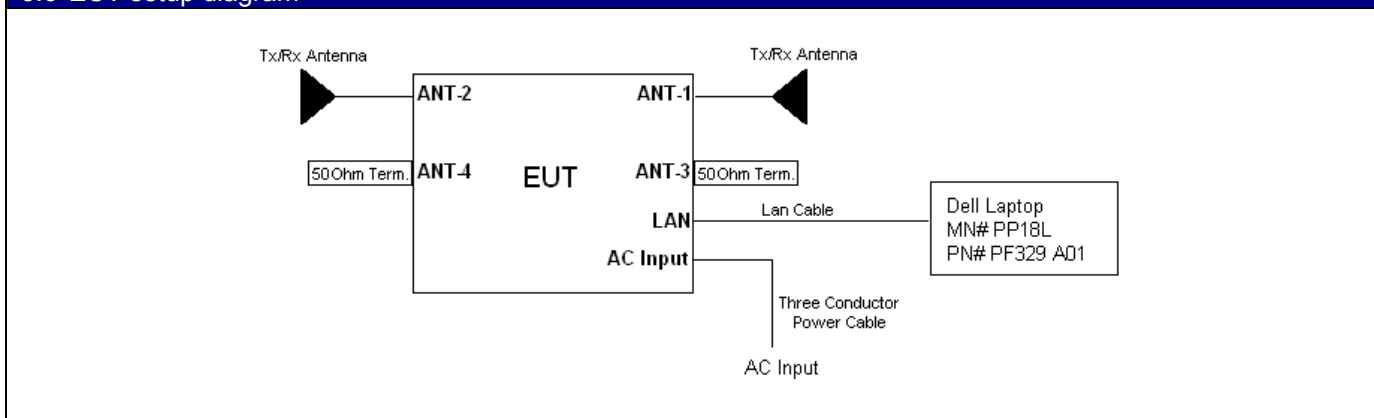
The EUT is a MIMO combo WiFi module designed to operate in the 2.4–2.4835 GHz band, and 5.725–5.85 GHz band, 2×2 MIMO for 2.4 GHz, and 2×2 MIMO for 5 GHz.

There are two independent radio units. This report covers the 5 GHz radio.

3.5 Operation of the EUT during testing

The EUT was controlled to transmit at desired frequency from laptop.

3.6 EUT 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

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

Section 5: Test conditions

5.1 Power source and ambient temperatures

Normal temperature, humidity and air pressure test 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.

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

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

Section 7: Test equipment

7.1 Test equipment list

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	Mar. 09/11
Horn Antenna #2	EMCO	3115	FA000825	Jan. 18/11
Bilog	Sunol	JB3	FA002108	Jan. 18/11
1-18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/11
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 40	FA002071	Nov. 30/10
LISN	Rohde & Schwarz	ENV216	FA002023	Sept. 08/10
International Power Supply	California Inst.	3001i	FA001021	COU
Combiner	Mini-circuits	ZA3PD-4	FA001156	COU
Attenuator	Narda	776B-20	FA001153	COU
18-40 GHz Horn Antenna	EMCO	3116	FA001847	May 13/11
18-26 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
26-40 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU
5725-5850 MHz Notch Filter	Microwave Circuits	N0257881	FA001921	COU
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR
Multimeter	Fluke	16	FA001831	Jan 12/11
Air probe	Fluke	None	FA001248	NCR
Attenuator	Narda	776B-20	FA001153	COU
Power meter	HP	E4418B	FA001678	June 16/11
Power sensor	HP	8487A	FA001741	June 16/11

Note: N/A = Not applicable, NCR = No cal required, COU = Cal on use

Section 8: Testing data

8.1 Clause 15.403(i) Emission bandwidth

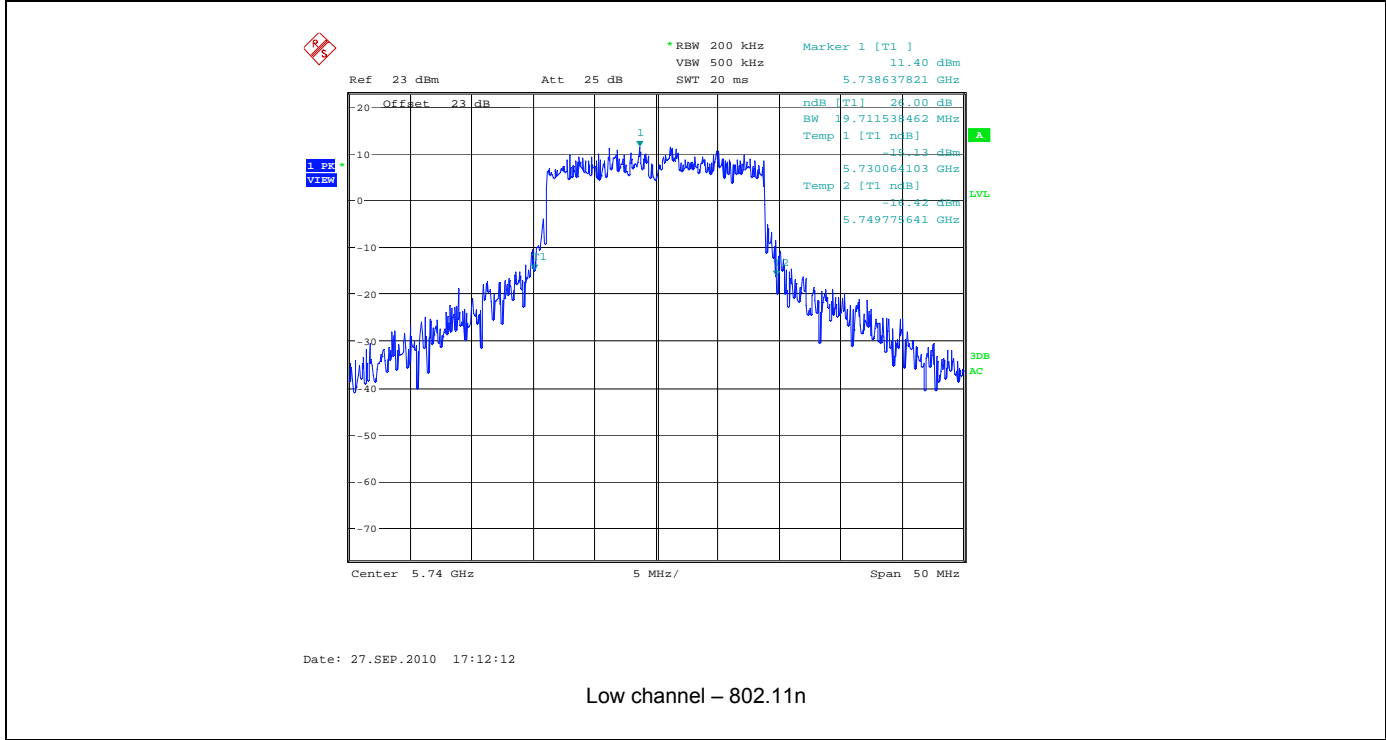
For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination 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.


Special notes
None

Test data				
Modulation	Port	Frequency (MHz)	Channel bandwidth (MHz)	Measured 26 dB bandwidth (MHz)
802.11n	ANT-2	5740	20	19.71
		5790	20	19.79
		5810	20	19.71
802.11a	ANT-2	5740	20	19.31
		5790	20	19.31
		5810	20	19.63

The test was performed using 200 kHz RBW

Sample spectral plots



 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: DRU 5 GHz radio
	Test name: Clause 15.407(a)(3) 5.725–5.825 GHz band output power and spectral density limits		
	Test date: September 27, 2010	Test engineer: David Duchesne	Verdict: Pass
	Specification: FCC Part 15 Subpart E		

8.2 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.

Special notes

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

Conducted output power was measured on the antenna port by means of a spectrum analyzer and following the 'Method 3' procedure.

- Sweep time > T
- EBW > largest available RBW on the Analyzer.

Peak power spectral density was measured on the antenna port by means of a spectrum analyzer and following the 'Method 2' procedure.



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Section 8: Testing data		Product: DRU 5 GHz radio	
Test name: Clause 15.407(a)(3) 5.725–5.825 GHz band output power and spectral density limits			
Test date: September 27, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E			

Test data

Conducted output power

Modulation	Freq. (MHz)	SW setting	Conducted Avg. Power ANT-1 (mW)	Conducted Avg. Power ANT-2 (mW)	Combined output power (dBm)	Conducted Output Power Limit (dBm)	Conducted Output Power Margin (dB)	Cable loss (dB)	Antenna Gain (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
802.11n	5740	28	158.695	129.182	24.59	29.36	4.77	0.5	7	31.09	35.86	4.77
	5790	31	221.956	217.479	26.43	29.36	2.93	0.5	7	32.93	35.86	2.93
	5810	29	169.805	181.293	25.45	29.36	3.90	0.5	7	31.95	35.86	3.90
802.11a	5740	28	160.731	132.360	24.67	29.36	4.69	0.5	7	31.17	35.86	4.69
	5790	31	224.203	210.750	26.38	29.36	2.97	0.5	7	32.88	35.86	2.97
	5810	28	169.216	156.061	25.12	29.36	4.24	0.5	7	31.62	35.86	4.24

- Measured 26 dB bandwidth = 19.31 MHz
- Output power shall not exceed the lesser of 30 dBm or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.
- Output power limit: 29.86 dBm = (17dBm + 10 Log 19.31 MHz)
- Output power limit: = 29.86 dBm – ((antenna gain - cable loss) – 6 dBi) [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))
- EIRP Limit (dBm) = output power limit + 6 dB

Power spectral density

Modulation	Freq. (MHz)	Antenna Gain (dBi)	SW power setting	Conducted PSD ANT-1 (dBm/MHz)	Conducted PSD ANT-2 (dBm/MHz)	Combined PSD (dBm/MHz)	Cable loss (dB)	PSD Limit (dBm/MHz)	Margin (dB)
802.11n	5740	7	28	11.34	10.66	14.02	0.5	16.5	2.48
	5790	7	31	12.97	12.42	15.71	0.5	16.5	0.79
	5810	7	29	12.10	12.22	15.17	0.5	16.5	1.33
802.11a	5740	7	28	13.36	10.76	15.26	0.5	16.5	1.24
	5790	7	31	13.56	13.37	16.48	0.5	16.5	0.02
	5810	7	28	13.53	12.43	16.03	0.5	16.5	0.47

- PSD limit = 17 dBm – ((antenna gain - cable loss) – 6 dBi) [for antennas greater than 6 dBi]
- Combined PSD (dBm/MHz) = 10 * Log ((10[^] (Conducted PSD Ant 1 (dBm/MHz) /10)) + (10[^]((Conducted PSD Ant 2 (dBm/MHz)/10)))

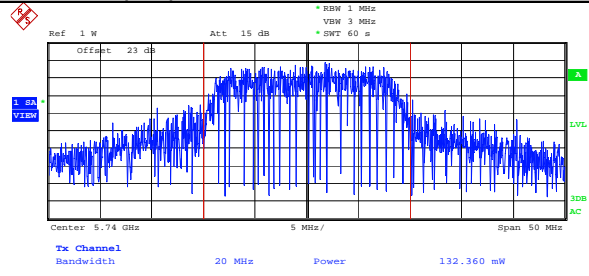


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Section 8: Testing data		Product: DRU 5 GHz radio	
Test name: Clause 15.407(a)(3) 5.725–5.825 GHz band output power and spectral density limits			
Test date: September 27, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E			

Test data, continued

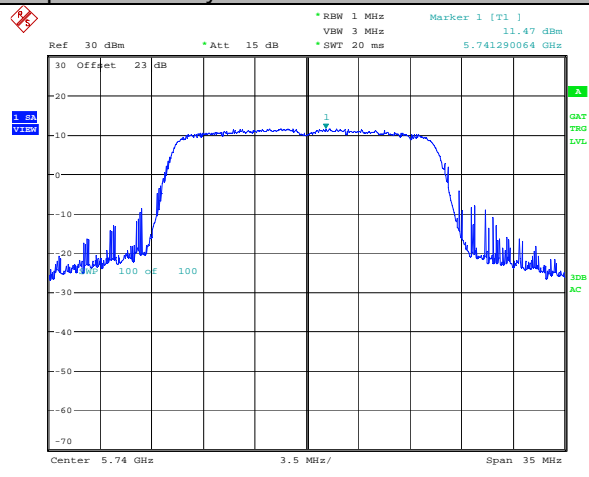
Sample spectral plots – Conducted output power



Date: 27.SEP.2010 18:21:28

Low channel – 802.11a

Sample spectral plots – Power spectral density



Date: 27.SEP.2010 19:17:22

Low channel – 802.11a

Special note: Measured value from sample plot does not reflect the worst case. Plot provided to show spectrum settings.



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Section 8: Testing data

Product: DRU 5 GHz radio

Test name: Clause 15.407(a)(6) Peak excursion

Test date: September 27, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart E

8.3 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.

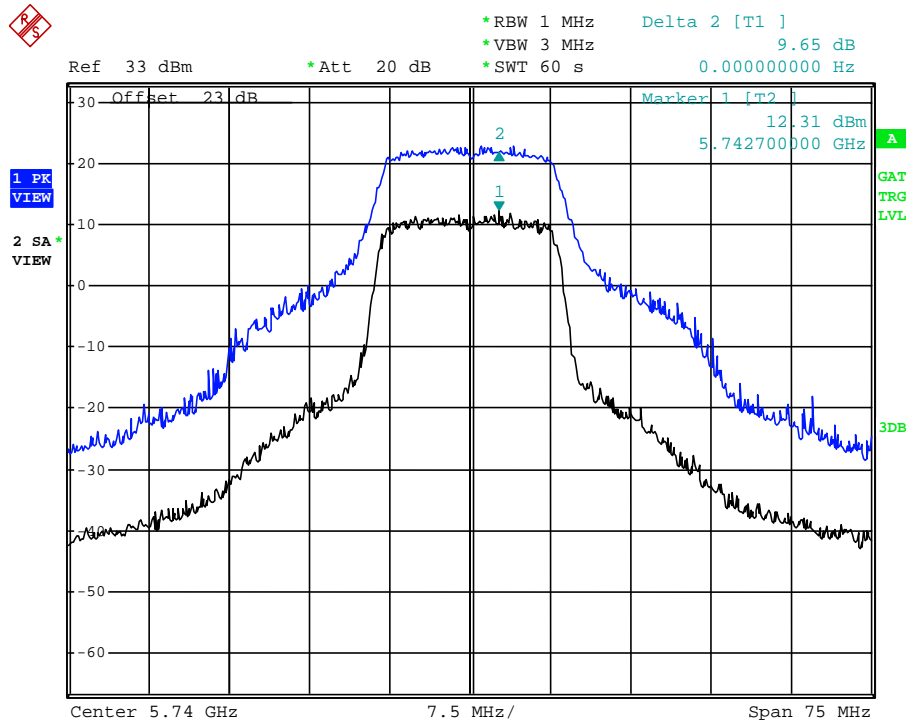
Special notes

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

Test data

Modulation	Frequency (MHz)	Port	Peak excursion (dB/MHz)	Peak excursion Limit (dB/MHz)	Margin (dB)
802.11n	5740	ANT-2	10.94	13	2.06
	5790	ANT-2	10.10	13	2.90
	5810	ANT-2	9.80	13	3.20
802.11a	5740	ANT-2	9.65	13	3.35
	5790	ANT-2	9.50	13	3.50
	5810	ANT-2	9.70	13	3.30

Sample spectral plots





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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(4) Undesirable emissions for 5.7257–5.825 GHz band		
Test date: September 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

8.4 Clause 15.407(b)(4) Undesirable emissions for 5.7257–5.825 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.

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.



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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(4) Undesirable emissions for 5.7257–5.825 GHz band		
Test date: September 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data

Conducted measurements

Lower band edge 5725 to 5715 MHz

Modulation	Freq. (MHz)	Port	Antenna port measurement (dBm/MHz)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm/MHz)	EIRP limit (dBm/MHz)	Margin (dB)
802.11n	5740	ANT-2	-26.0	7	0.5	-19.5	-17	2.5
802.11a	5740	ANT-2	-26.4	7	0.5	-19.9	-17	2.9
802.11n	5740	ANT-1	-26.1	7	0.5	-19.6	-17	2.6
802.11a	5740	ANT-1	-27.2	7	0.5	-20.7	-17	3.7
802.11n	5740	ANT-1 and ANT-2	-24.1	7	0.5	-17.6	-17	0.6
802.11a	5740	ANT-1 and ANT-2	-24.2	7	0.5	-17.7	-17	0.7

Upper band edge 5825 to 5835 MHz

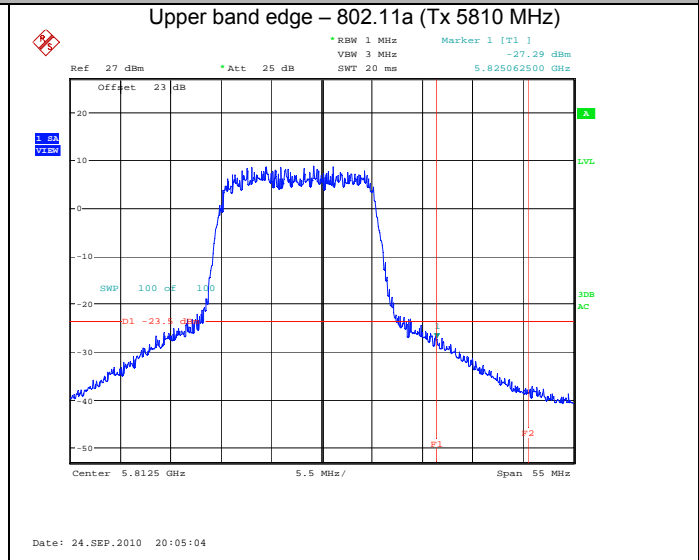
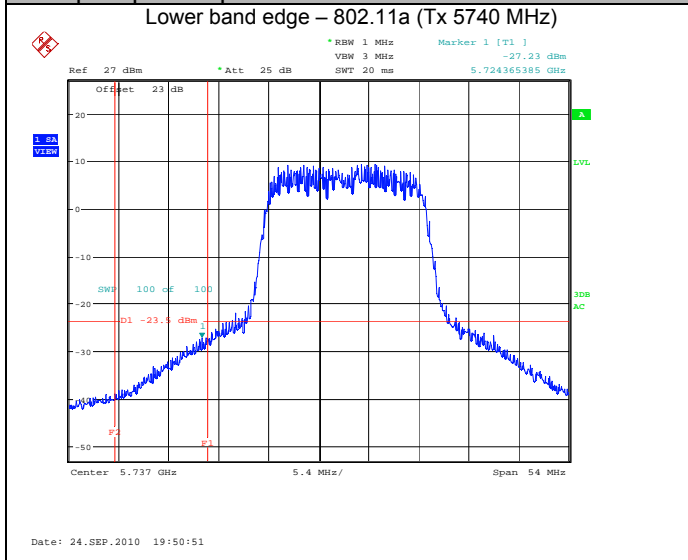
Modulation	Freq. (MHz)	Port	Antenna port measurement (dBm/MHz)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm/MHz)	EIRP limit (dBm/MHz)	Margin (dB)
802.11n	5740	ANT-2	-24.1	7	0.5	-17.6	-17	0.6
802.11a	5740	ANT-2	-24.9	7	0.5	-18.4	-17	1.4
802.11n	5740	ANT-1	-25.5	7	0.5	-19.0	-17	2.0
802.11a	5740	ANT-1	-27.3	7	0.5	-20.8	-17	3.8
802.11n	5740	ANT-1 and ANT-2	-25.1	7	0.5	-18.6	-17	1.6
802.11a	5740	ANT-1 and ANT-2	-24.6	7	0.5	-18.1	-17	1.1

EIRP (dBm/MHz) = Antenna port measurement (dBm/MHz) + (Antenna gain (dBi) - Cable loss (dB))

The test was performed conducted at the antenna port.

The nominal carrier frequency was adjusted as close to the upper and lower frequency block edges as the design of the equipment permits

Sample spectral plots



Radiated measurements

Test facility	Measuring distance (m)	Antenna height variation (m)	Turn table position (°)
3 m Semi anechoic chamber	3	1–4	0–360
Modulation	Tx freq. (MHz)	Sweep 30 to 5715 MHz	
802.11n	5740	No emissions detected within 10 dB of limit.	
802.11a	5740	No emissions detected within 10 dB of limit.	
802.11n	5790	No emissions detected within 10 dB of limit.	
802.11a	5790	No emissions detected within 10 dB of limit.	
802.11n	5810	No emissions detected within 10 dB of limit.	
802.11a	5810	No emissions detected within 10 dB of limit.	
Modulation	Tx freq. (MHz)	Sweep 5.735 to 40 GHz	
802.11n	5740	No emissions detected within 10 dB of limit.	
802.11a	5740	No emissions detected within 10 dB of limit.	
802.11n	5790	No emissions detected within 10 dB of limit.	
802.11a	5790	No emissions detected within 10 dB of limit.	
802.11n	5810	No emissions detected within 10 dB of limit.	
802.11a	5810	No emissions detected within 10 dB of limit.	

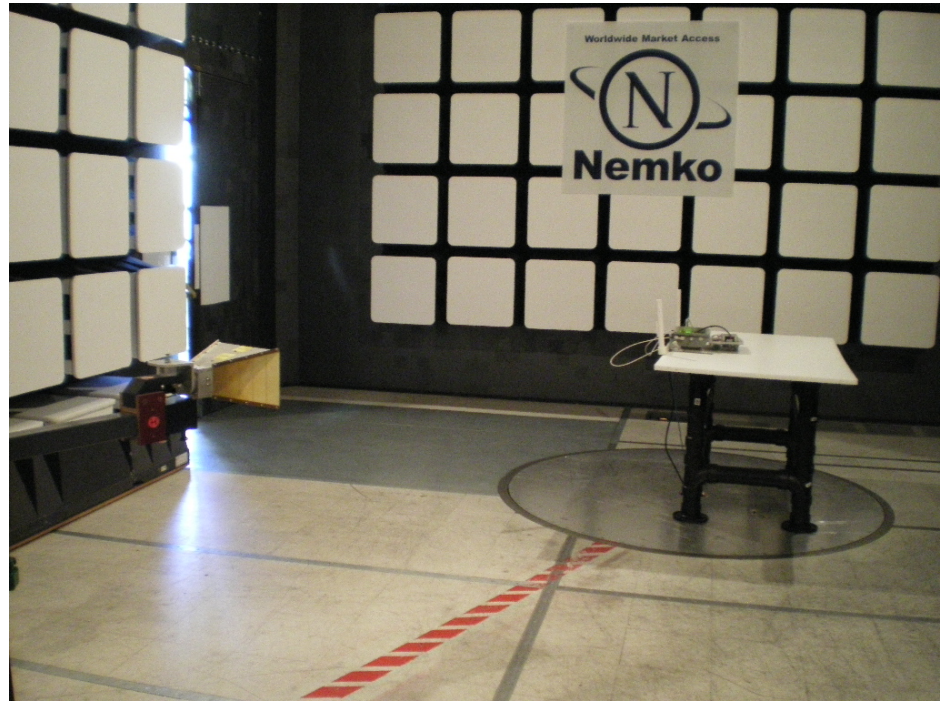
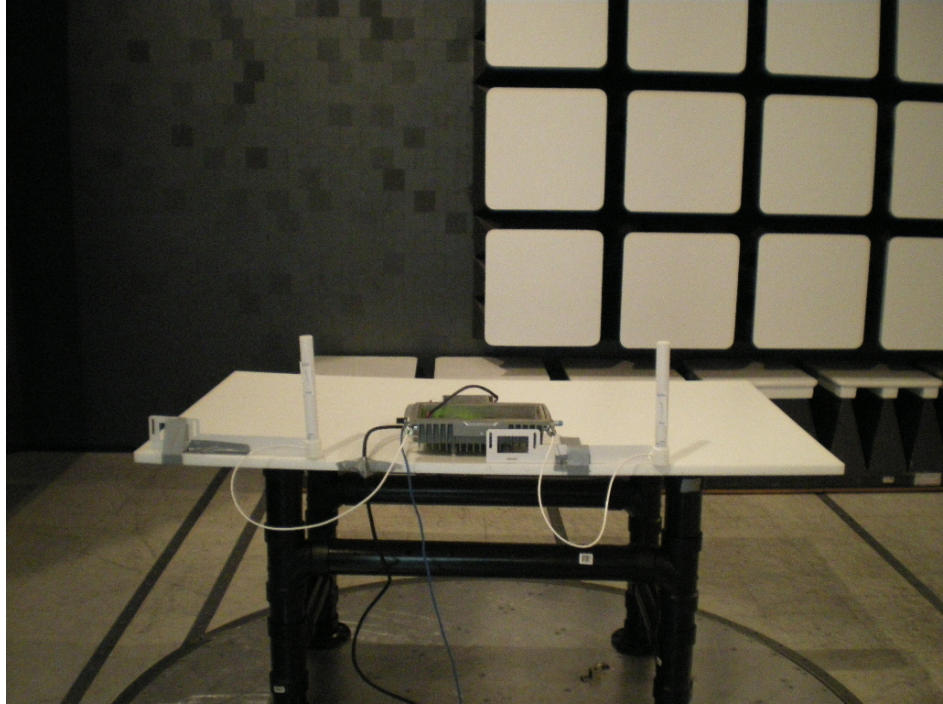


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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(4) Undesirable emissions for 5.7257–5.825 GHz band		
Test date: September 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data, continued

Setup photos - Radiated measurements





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Section 8: Testing data		Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz			
Test date: August 27, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E			

8.5 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. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

§15.209 – Radiated emission limits

Frequency (MHz)	Quasi-Peak field strength		Measurement distance (m)
	($\mu\text{V}/\text{m}$)	($\mu\text{V}/\text{m}$)	
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.

§ 15.207 Conducted limits.

Frequency (MHz)	Conducted limit (dB μV)	
	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.

Special notes

The spectrum was searched from 30 MHz to 1 GHz



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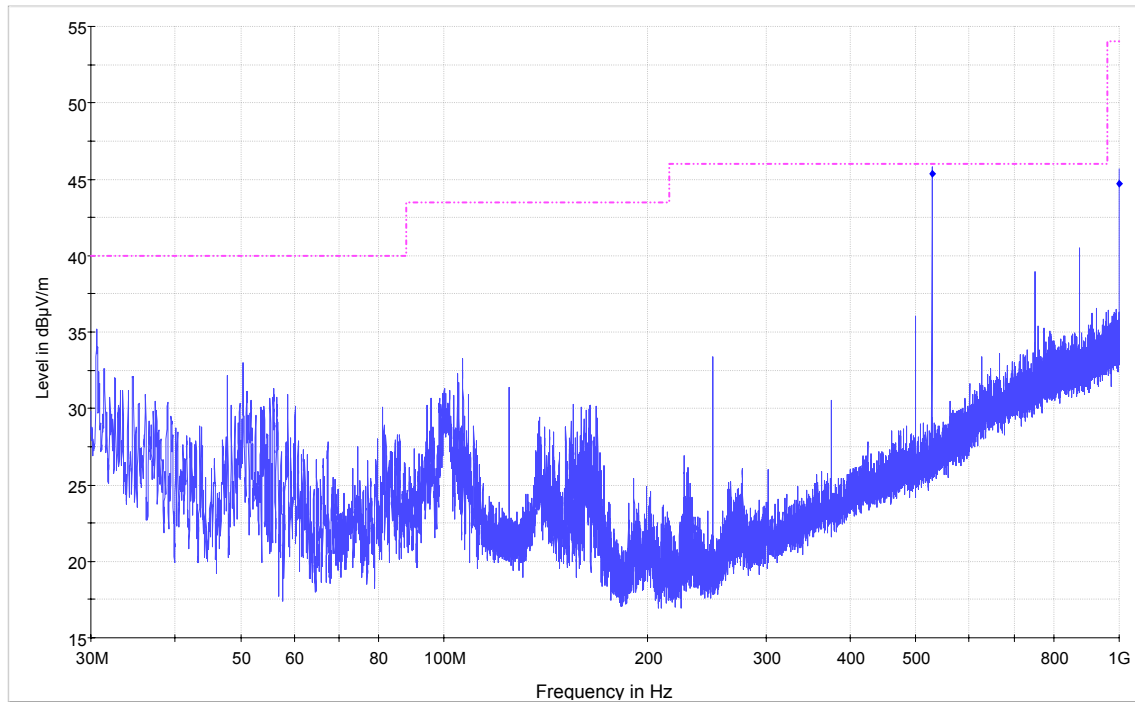
Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data

Radiated emissions

Test facility	Measuring distance (m)	Antenna height variation (m)	Turn table position (°)
3 m Semi anechoic chamber	3	1-4	0-360

Spectral plots



Vertical and Horizontal
 — Preview Peak Detector
 - - - - - FCC Part 15 Class B 3m Limit
 ◆ Final Q-Peak Detector

The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators) for determination of compliance. Limits have been adjusted to reflect 3 m requirements.

A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. 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/Spectrum analyzer settings

Preview measurements	Final measurement
Receiver: 120 kHz RBW, Peak detector, max hold	Receiver: 120 kHz RBW, Quasi-peak detector

Tabular data

Frequency (MHz)	Q-peak field strength (dBµV/m)	Meas. time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol.	Turn table position	Correction (dB)	Margin (dB)	Limit (dBµV/m)
528	45.3	100	120	100.2	V	275.0	19.9	0.7	46.0
1000	44.7	100	120	110.0	V	281.0	26.2	9.3	54.0

Correction factor includes antenna, cable loss, amplifier, and attenuators.
 Field Strength measurement is a summation of the raw measurement value and the correction factor.

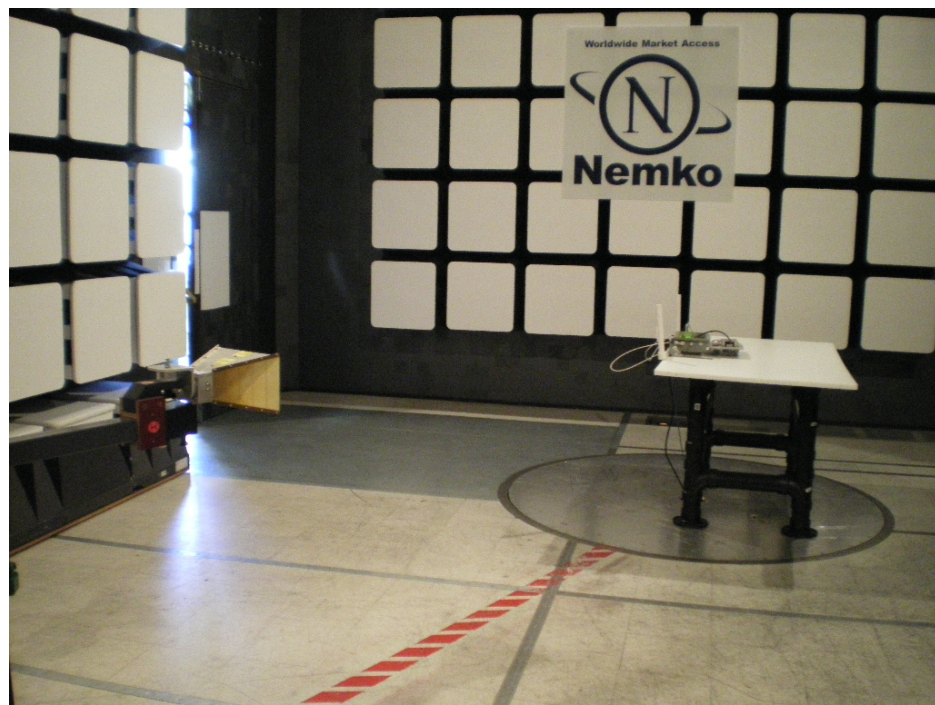
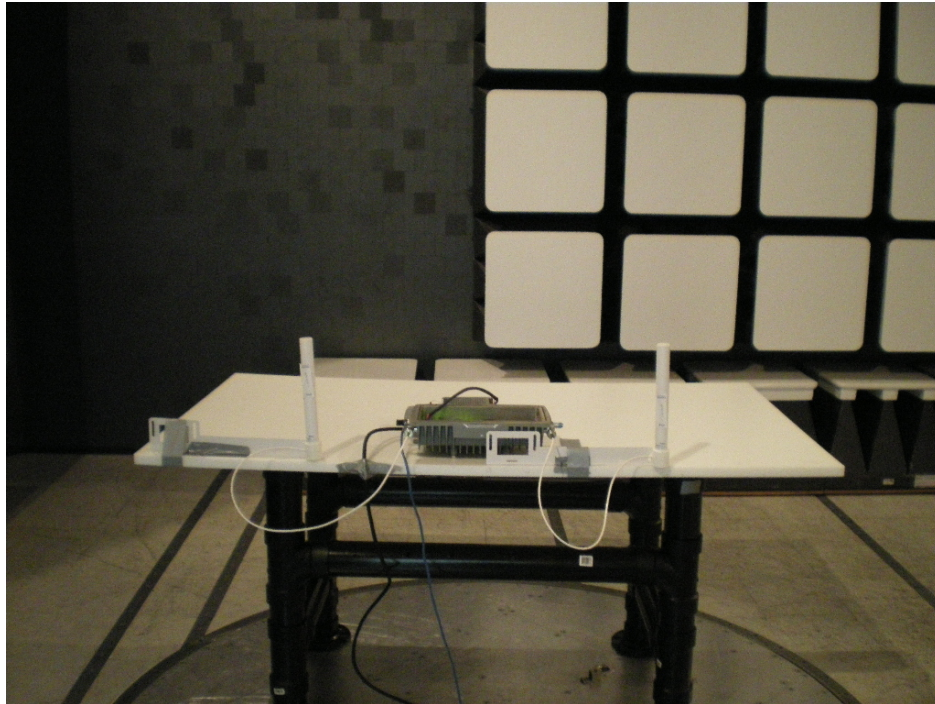


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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data, continued

Setup photos - Radiated emissions





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Section 8: Testing data

Product: DRU 5 GHz radio

Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz

Test date: August 27, 2010

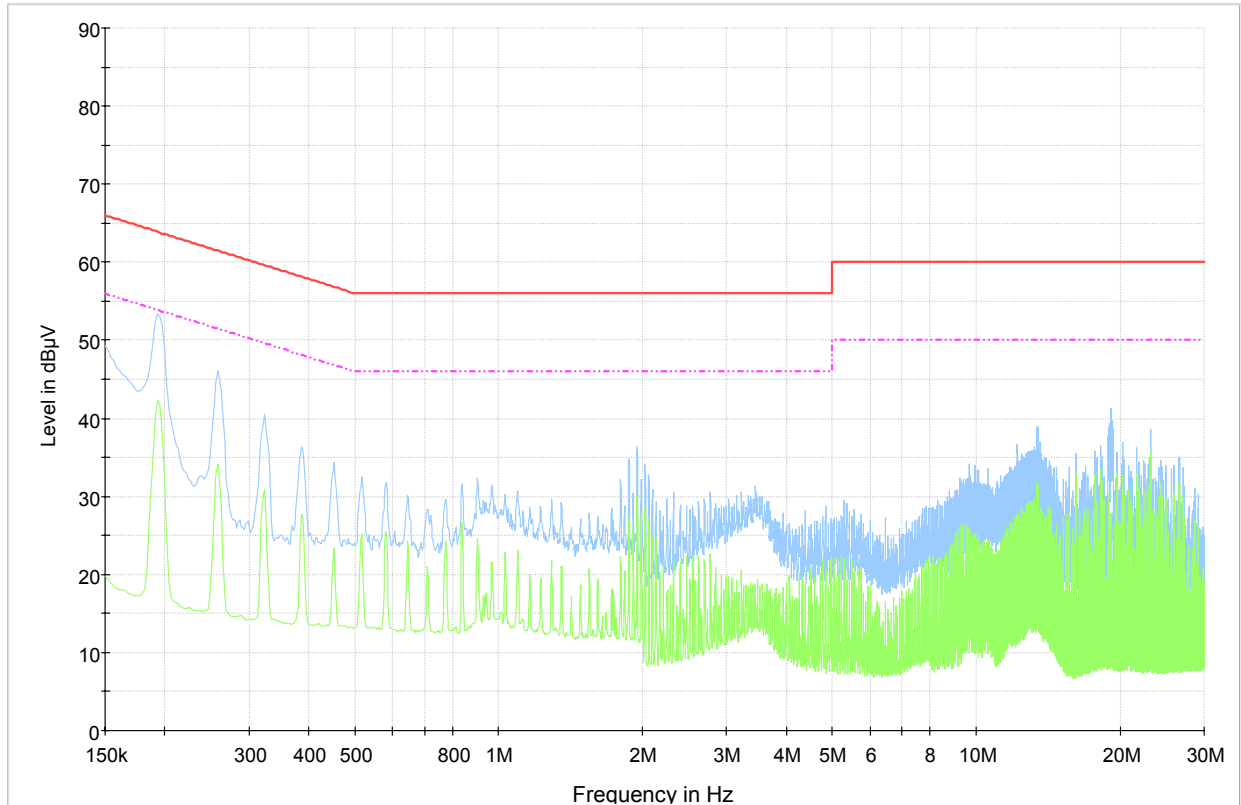
Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart E

Test data, continued

AC conducted emissions spectral plot



120VAC/60Hz, Phase
 — CISPR 22 Mains QP Class B Limit
 - - - CISPR 22 Mains AV Class B Limit
 — Preview Peak Detector
 — Preview Average Detector

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/Spectrum analyzer settings:

0.15 MHz to 30 MHz

Preview measurements

Receiver: 9 kHz RBW, Peak and Average detector, max hold

Measurement time 100 ms

Final measurement

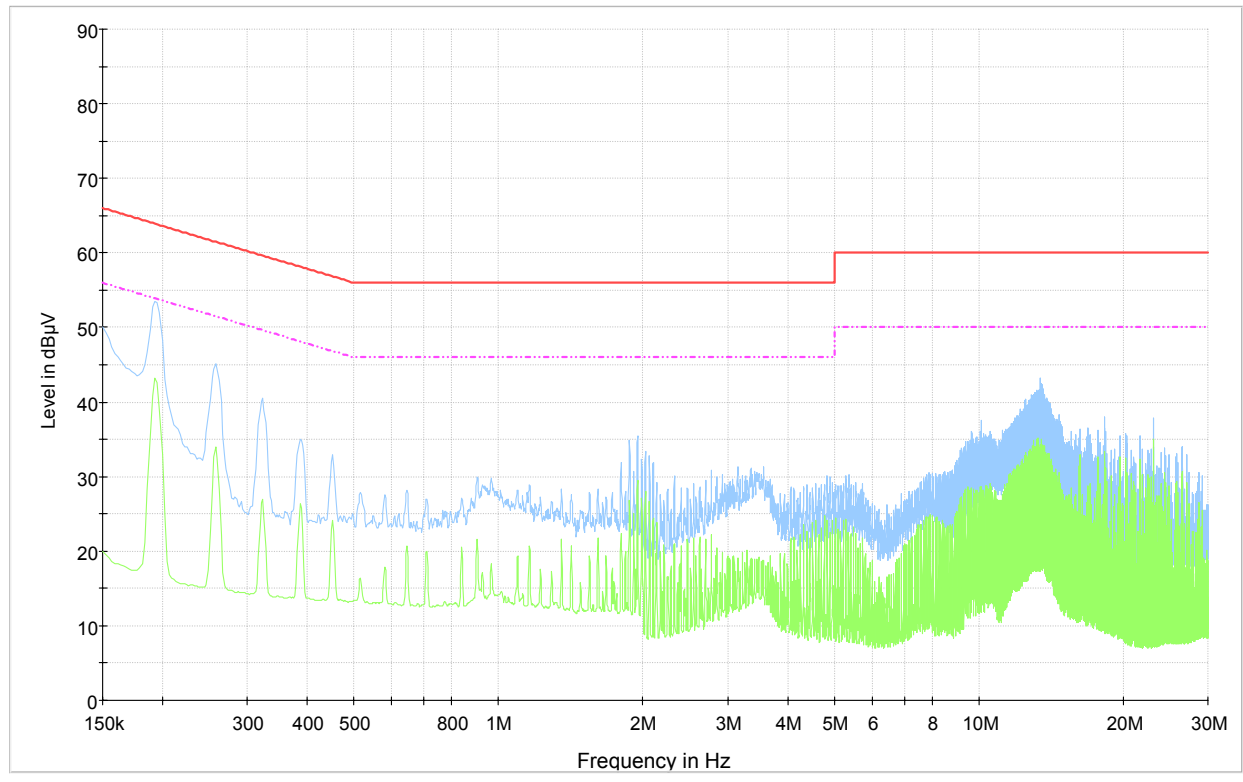
Receiver: 9 kHz RBW, Quasi-peak and Average detector



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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data, continued
AC conducted emissions spectral plot, continued



- 120VAC/60Hz, Neutral
- CISPR 22 Mains QP Class B Limit
- - - CISPR 22 Mains AV Class B Limit
- Preview Peak Detector
- Preview Average Detector

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

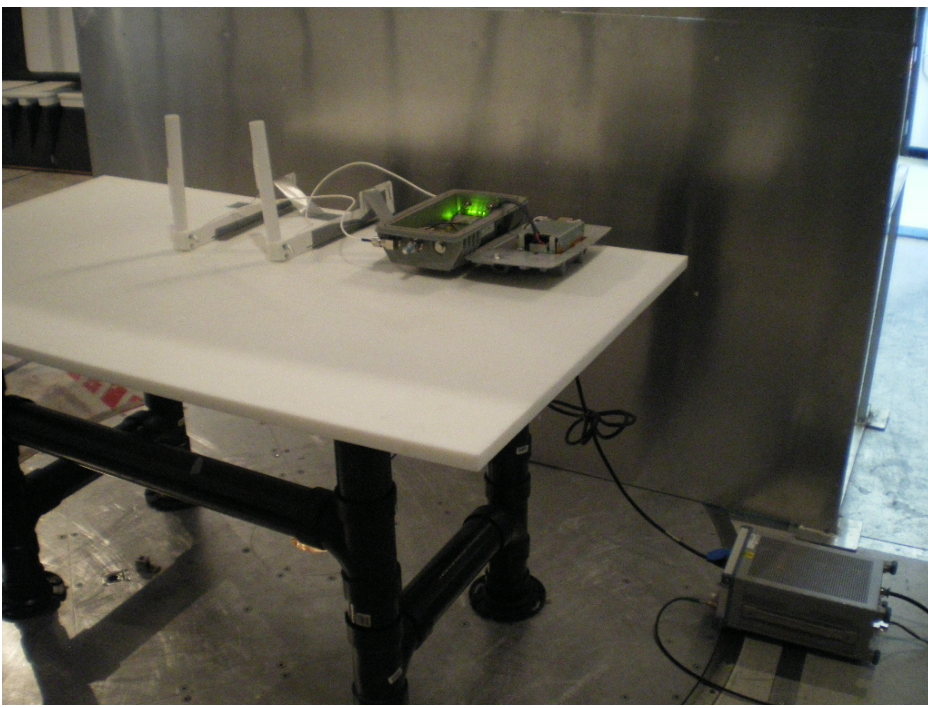
A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/Spectrum analyzer settings:	
0.15 MHz to 30 MHz	
Preview measurements	Final measurement
Receiver: 9 kHz RBW, Peak and Average detector, max hold	Receiver: 9 kHz RBW, Quasi-peak and Average detector
Measurement time 100 ms	

Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: Clause 15.407(b)(6) Unwanted emissions below 1 GHz		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data, continued

Setup photos – AC conducted emissions





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Section 8: Testing data	Product: DRU 5 GHz radio	
Test name: 15.407(b)(7) Radiated emissions within restricted bands		
Test date: September 28, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

8.6 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

§15.209 – Radiated emission limits

Frequency (GHz)	Average field strength		Measurement distance (m)
	($\mu\text{V/m}$)	($\mu\text{V/m}$)	
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.

§15.205 – Restricted bands of operation

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

Special notes

- The spectrum was searched from 30 MHz to 40 GHz for low, mid and high carrier frequencies.
- 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 MHz 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
- Only the worst-case test results are provided.

Test data

Modulation	Antenna	Fundamental Freq. (MHz)	SW PWR setting	Freq. (MHz)	FS Peak (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	FS Avg. (dBuV/m)	Avg limit (dBuV/m)	Margin (dB)
802.11n	Omni 7 dBi	5740	28		No emissions detected within 10 dB of limit within restricted bands					
802.11a	Omni 7 dBi	5740	28		No emissions detected within 10 dB of limit within restricted bands					
802.11n	Omni 7 dBi	5790	31		No emissions detected within 10 dB of limit within restricted bands					
802.11a	Omni 7 dBi	5790	31		No emissions detected within 10 dB of limit within restricted bands					
802.11n	Omni 7 dBi	5810	29		No emissions detected within 10 dB of limit within restricted bands					
802.11a	Omni 7 dBi	5810	26		No emissions detected within 10 dB of limit within restricted bands					

– Test distance = 3m
– Field strength measurement has been corrected with transducer factors (i.e. antenna, cable loss, amplifier, and attenuators)

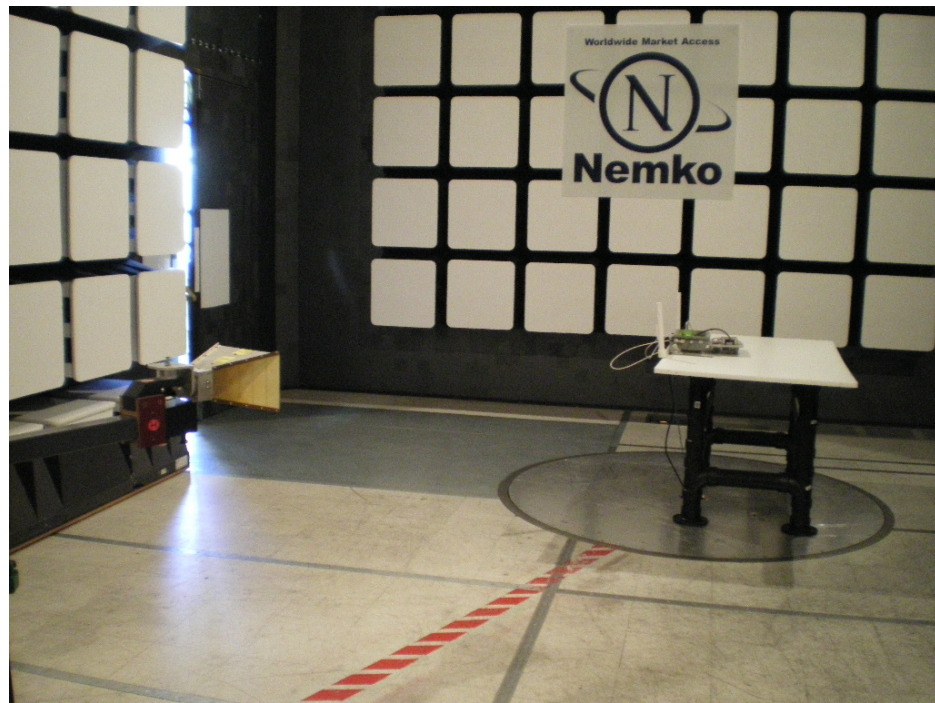
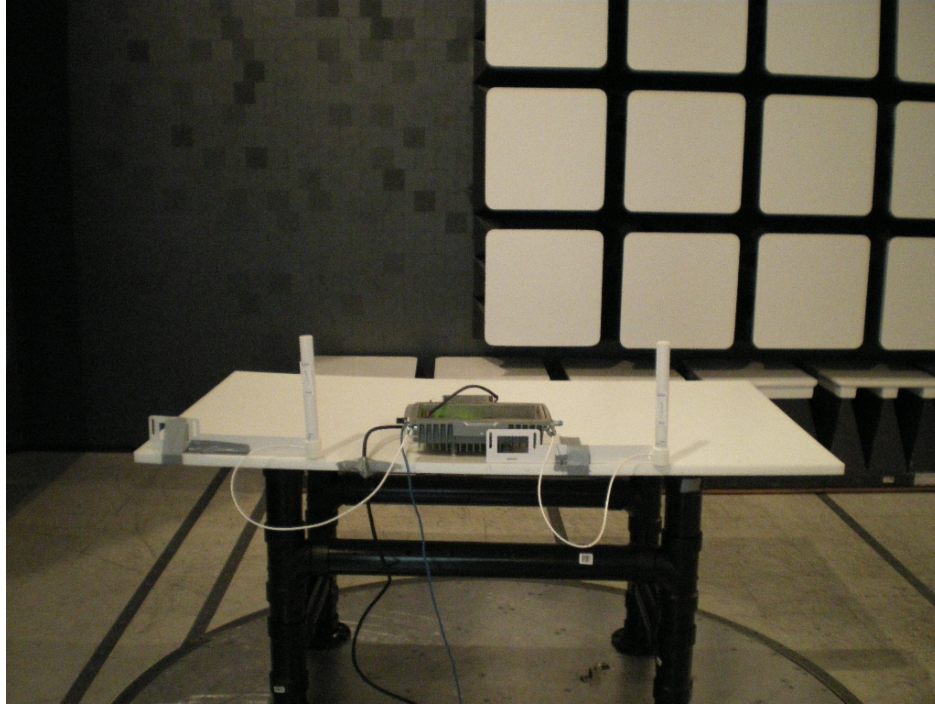


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Section 8: Testing data		Product: DRU 5 GHz radio
Test name: 15.407(b)(7) Radiated emissions within restricted bands		
Test date: September 28, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart E		

Test data

Setup photos





Nemko Canada Inc.,
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Section 8: Testing data	Product: DRU 5 GHz radio
Test name: Clause 15.407(f) RF exposure requirement	
Test date: September 28, 2010	Test engineer: David Duchesne
Verdict: Pass	
Specification: FCC Part 15 Subpart E	

8.7 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 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 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.

Special notes

See MPE exhibit attached to this application.



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Section 8: Testing data	Product: DRU 5 GHz radio
Test name: Clause 15.407(g) Frequency stability	
Test date: September 28, 2010	Test engineer: David Duchesne
Specification: FCC Part 15 Subpart E	

8.8 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 users manual.

Special notes

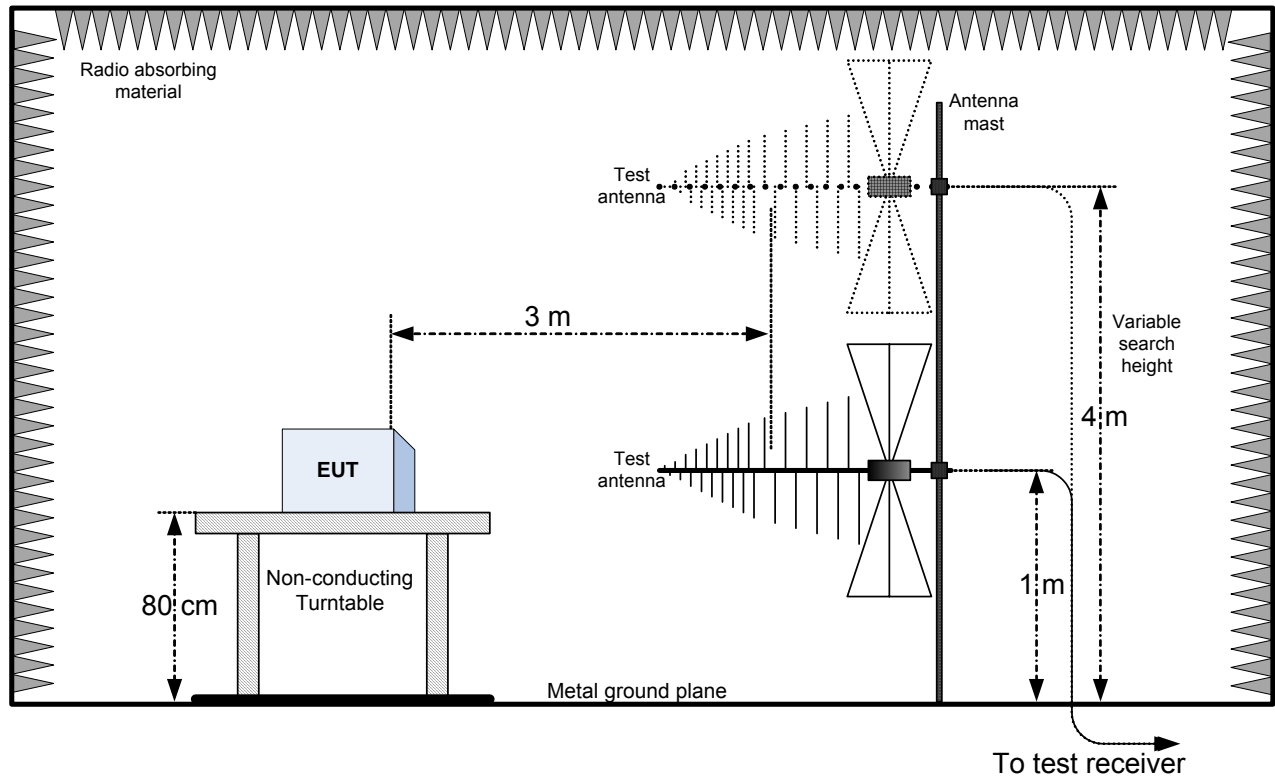
Test Conditions: Ambient Temperature: 20 °C
 Extreme Temperature: -30 °C to +50 °C
 Extreme Voltage Conditions: ±15 % of nominal voltage.

Test data

Tx 5810 MHz		
Test conditions	Measured Frequency (Hz)	Frequency Drift (kHz)
+50 °C, Nominal	5810025000	-125
+40 °C, Nominal	5810025000	-125
+30 °C, Nominal	5809900000	0
+20 °C, +15 %	5809900000	0
+20 °C, Nominal	5809900000	Reference
+20 °C, -15 %	5809900000	0
+10 °C, Nominal	5809900000	0
0 °C, Nominal	5809900000	0
-10 °C, Nominal	5809788000	112
-20 °C, Nominal	5809788000	112
-30 °C, Nominal	5809788000	112

Section 8: Block diagrams

Radiated emissions set-up block diagram



Conducted emissions set-up block diagram

