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Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2

Report number: 134989-1TRFWL

Apparatus: VistaMax OBR5000B Base Station Transceiver

Applicant: Vecima Networks
150 Cardinal Place
Saskatoon, SK, Canada
S7L 6H7

FCC ID: OPPOBR5000B

Test specification:

Title 47-Telecommunication
Chapter I - Federal Communications Commission
Subchapter A - General
Part 15 - Radio Frequency Devices
Subpart E - Unlicensed National Information Infrastructure Devices

- **§15.407- General technical requirements**

Reviewed by: _____ March 11, 2010
Signature Date
Andrey Adelberg, Senior Wireless/EMC Specialist

Tested by: David Duchesne, EMC/Wireless Specialist

SCC Accredited LAB
LAB
Accrédité CCN

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.

Table of contents

Section 1: Report summary

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc.

Test specification:

FCC Part 15 Subpart E, 15.407
Operation within the bands 5.25–5.35 GHz, 5.47–5.725 GHz and 5.725–5.825 GHz UNII bands.

Compliance status:	Complies
Exclusions:	None
Non-compliances:	None
Report release history:	Original release
Test location:	Nemko Canada Inc. 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2
Registration number:	176392 (3 m Semi anechoic chamber)

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: Equipment under test

2.1 Identification of equipment under test (EUT)

The following information identifies the EUT under test:

Type of equipment:	Base station transceiver
Product name:	VistaMax OBR5000B Base Station Transceiver
Model number:	OBR5000B
Serial number:	1978273
Nemko sample number:	Item 1
FCC ID:	OPPOBR5000B
Date of receipt:	September 14, 2009

2.2 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

Item # 1	
Type of equipment:	Laptop
Brand name:	IBM
Model name or number:	2647
Serial number:	78-IVRMP
Connection port:	LAN
Cable length and type:	2 m
Item # 2	
Type of equipment:	Single port POE injector
Brand name:	Vecima
Model number:	PW183RB4800Fo2
Serial number:	None
Nemko sample number:	Item # 3
Connection port:	LAN + power
Cable length and type:	3 m

Section 2: Equipment under test, continued

2.3 EUT description

The VistaMAX OBR5000B is a WiMAX / IEEE 802.16-2004 outdoor base station. The OBR5000B is contained in a weatherproof sealed housing with a dual polarity integrated 60 or 90 degree antenna to offer a single box solution for WiMAX applications in the 5725 to 5875 MHz band.

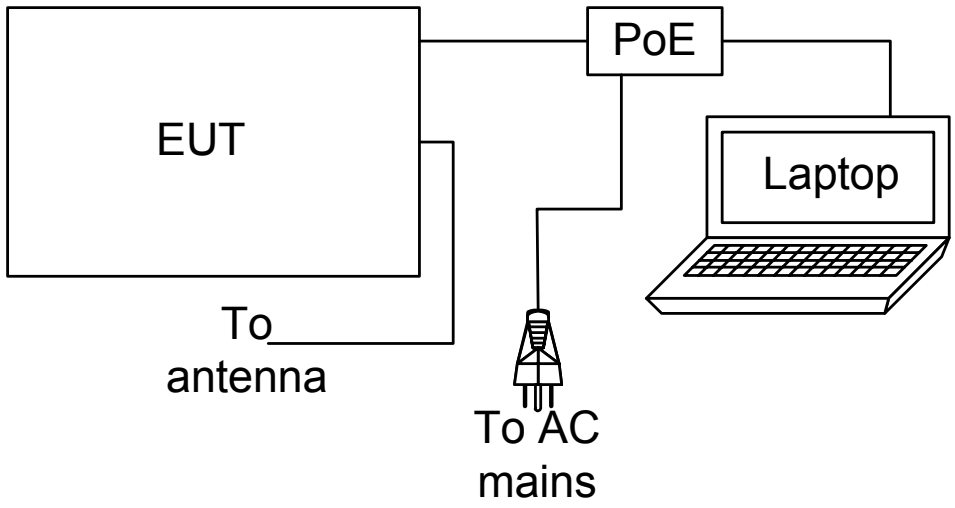
The OBR5000B offers a direct bridged 100BaseT Ethernet connection to the base station network. The only equipment required inside the base station premises is an Ethernet switch with Power over Ethernet (PoE) capability, such as provided by Vecima Networks VPN100014+ or the WES800, to supply power and provide Ethernet connectivity.

2.4 Technical specifications of the EUT

Operating band:	5725–5825 MHz
Operating frequency:	5740–5810 MHz
Modulation type:	QPSK, 16QAM, 64QAM
Channel bandwidth:	10 MHz
26 dB bandwidth:	12.24 MHz
99 % bandwidth	9.64 MHz
Emission designator:	9M64D7W
Antenna data:	External Antenna 1. 12 dBi Omnidirectional (Kenbotong, Model: TQJ580-12) 2. 18 dBi 60° (Kenbotong, Model: TDJ-4958G) 3. 17 dBi 90° (Kenbotong, Model: TDJ-4958I) 4. 15 dBi 120° (Kenbotong, Model: TDJ-4958J)
Power source	48 VDC Power over Ethernet (POE)

Section 2: Equipment under test, continued

2.5 EUT setup diagram



2.6 Operation of the EUT during testing

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

2.7 Modifications incorporated in the EUT

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

Section 3: Test conditions

3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

3.2 Test conditions, 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 ±5 %, for which the equipment was designed.

Section 3: Test conditions, continued

3.3 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.

3.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	Apr. 24/10
3 m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/10
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR
Controller	Sunol	SC104V	FA002060	NCR
Mast	Sunol	TLT2	FA002061	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 16/09
Bilog	Sunol	JB3	FA002108	Jan. 27/10
Signal Generator	Rhode & Schwarz	SMR 40	FA001879	Aug. 14/10
Horn Antenna #2	EMCO	3115	FA000825	Jan. 21/10
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 2/09

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

Section 4: Result summary

4.1 FCC Part 15 Subpart E, 15.407: Test results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	Not applicable / not relevant.
Y	Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See report summary)

Part	Test description	Required	Result
General requirements for FCC Part 15			
§15.31(e)	Variation of power source	Y	Pass
§15.31(m)	Number of operating frequencies	Y	Pass
§15.203	Antenna requirement	Y	Pass
§15.403(i)	Emission bandwidth	Y	Pass
Specific requirements for FCC Part 15 Subpart E, 15.407			
§15.407(a)	**Power limits**		
	§15.407(a)(1) For the band 5.15–5.25 GHz	N	—
	§15.407(a)(2) For the band 5.25–5.35 GHz and 5.47–5.725 GHz	N	—
	§15.407(a)(3) For the band 5.725–5.825 GHz	Y	Pass
	§15.407(a)(6) Peak excursion measurement	Y	Pass
§15.407(b)	**Undesirable emission limits**		
	§15.407(b)(1) For the band 5.15–5.25 GHz	N	—
	§15.407(b)(2) For the band 5.25–5.35 GHz	N	—
	§15.407(b)(3) For the band 5.47–5.725 GHz	N	—
	§15.407(b)(4) For the band 5.725–5.825 GHz	Y	Pass
	§15.407(b)(6) Unwanted emissions below 1 GHz set forth in §15.209	Y	Pass
	§15.407(b)(6) AC power line conducted limits set forth in §15.207	Y	Pass
	§15.407(b)(7) The provisions of §15.205	Y	Pass
§15.407(c)	Automatically discontinue transmission	Y	Pass
§15.407(e)	Within the 5.15–5.25 GHz band, U-NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations.	N	—
§15.407(g)	Frequency stability	Y	Pass
§15.407(h)	Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).		
§15.407(h)(1)	(TPC). For the band 5.25–5.35 GHz and the 5.47–5.725 GHz	N	—
§15.407(h)(1)	(DFS). For the band 5.25–5.35 GHz and the 5.47–5.725 GHz	N	—

Notes: None

Appendix A: Test results

Clause 15.31(e) Variation of the power source

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

Test date: October 19, 2009

Test results: Pass

Test data

- Transmit output power was measured while supply voltage was varied from 102 VAC to 138 VAC (85 % to 115 % of the nominal rated supply voltage). No change in transmit output power was observed.

Clause 15.31(m) Number of operating frequencies

Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz and less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Test date: October 19, 2009

Test results: Pass

Test data

The frequency band is 100 MHz therefore number of operating frequencies is 3.

Low frequency / channel	5740 MHz
Mid frequency / channel	5775 MHz
High frequency / channel	5810 MHz

Clause 15.203 Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Test date: October 19, 2009

Test results: Pass

Test data

The EUT is professionally installed.

Clause 15.403(i) Emissions bandwidth

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

Test date: October 23, 2009

Test results: Pass

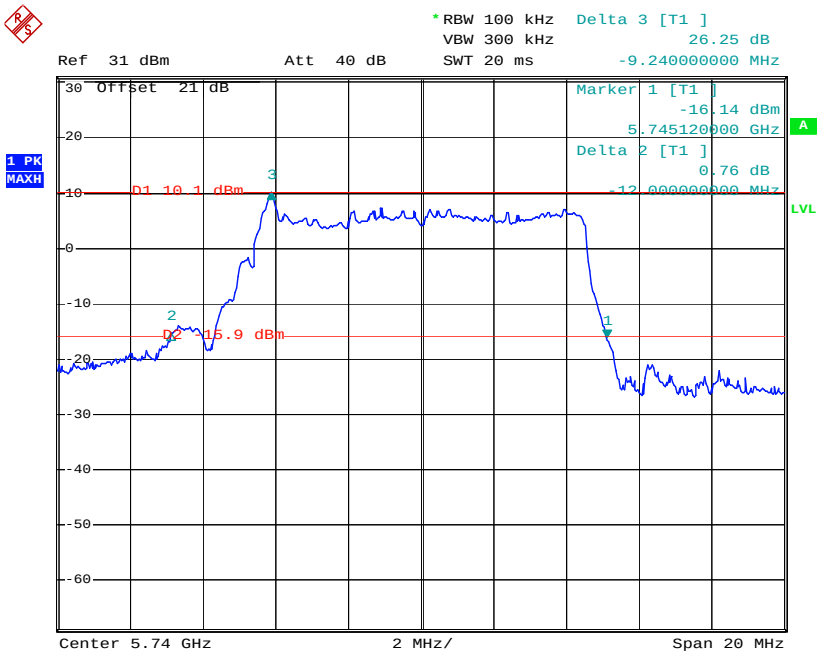
Special notes

None

Clause 15.403(i) Emissions bandwidth, continued

Test data

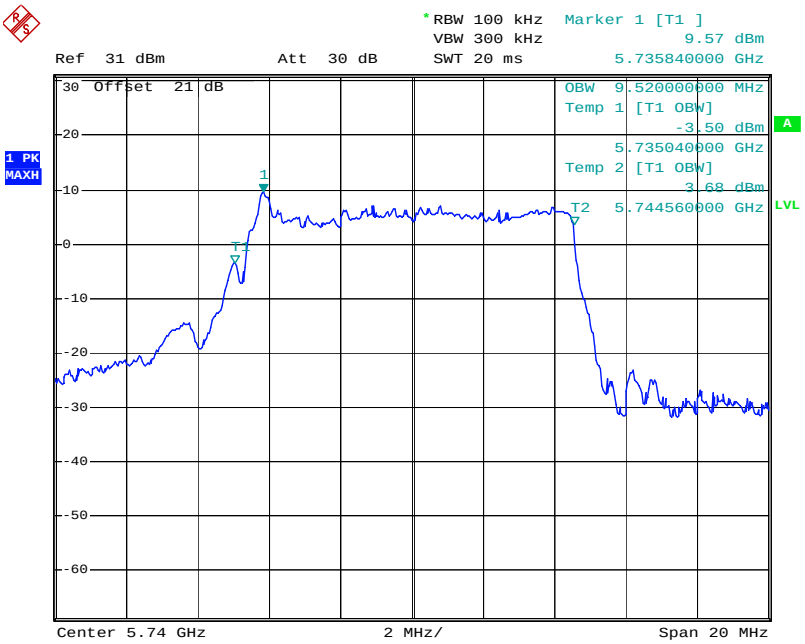
Sample plot



26 dB Bandwidth:			
Modulation	Frequency (MHz)	Channel Bandwidth (MHz)	Measured 26 dB BW (MHz)
BPSK	5740	10	12.00
BPSK	5775	10	12.24
BPSK	5810	10	12.24
64QAM	5740	10	11.90
64QAM	5775	10	12.00
64QAM	5810	10	12.20

Clause 15.403(i) Emissions bandwidth, continued

Test data, continued



Date: 23.OCT.2009 09:25:53

Modulation	Frequency (MHz)	Channel Bandwidth (MHz)	Measured 99 % BW (MHz)
BPSK	5740	10	9.52
BPSK	5775	10	9.64
BPSK	5810	10	9.56
64QAM	5740	10	9.24
64QAM	5775	10	9.32
64QAM	5810	10	9.64

Clause 15.407(a)(3) Power limits (Output power and PPSD)

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.

Test date: November 2, 2009

Test results: Pass

Special notes

Manufacturer declared the EUT provides a point-to-multipoint radio link in between 5.725–5.825 GHz

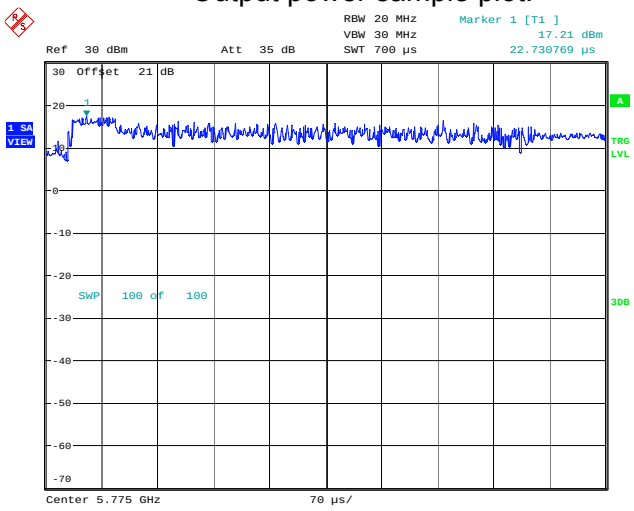
Test Method:

FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power and Peak Power Spectral Density in UNII Band.
The output RF power was measured on the antenna port by means of a spectrum analyzer and following the *'Method 2'* procedure (since the maximum resolution bandwidth of a spectrum analyzer is greater than 10 MHz channel). The PPSD was measured on the antenna port by means of a spectrum analyzer and following the *'Method 2'* procedure.

Clause 15.407(a)(3) Power limits (Output power and PPSD), continued

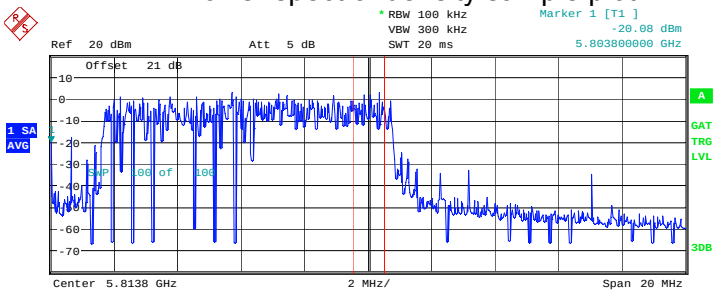
Test data

Output power sample plot.



Date: 2.NOV.2009 12:48:16

Power spectral density sample plot



Tx Channel
Bandwidth 1 MHz Power 6.34 dBm

Date: 2.NOV.2009 12:59:35

Clause 15.407(a)(3) Power limits (Output power and PPSD), continued

Test data, continued

Output Power

BPSK

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW power setting	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5740	1	12	164	21.39	21.8	0.41	33.39	33.8	0.41
5775	1	12	164	20.70	21.8	1.10	32.70	33.8	1.10
5810	1	12	164	19.98	21.8	1.82	31.98	33.8	1.82
5740	2	18	156	15.80	15.8	0.00	33.80	33.8	0.00
5775	2	18	154	14.79	15.8	1.01	32.79	33.8	1.01
5810	2	18	157	15.66	15.8	0.14	33.66	33.8	0.14
5740	3	17	156	16.14	16.8	0.66	33.14	33.8	0.66
5775	3	17	156	16.14	16.8	0.66	33.14	33.8	0.66
5810	3	17	159	16.75	16.8	0.05	33.75	33.8	0.05
5740	4	15	160	18.70	18.8	0.10	33.70	33.8	0.10
5775	4	15	160	18.36	18.8	0.44	33.36	33.8	0.44
5810	4	15	162	18.52	18.8	0.28	33.52	33.8	0.28

64QAM

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW power setting	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5740	1	12	164	20.80	21.8	1.00	32.80	33.8	1.00
5775	1	12	164	20.66	21.8	1.14	32.66	33.8	1.14
5810	1	12	164	19.40	21.8	2.40	31.40	33.8	2.40
5740	2	18	155	15.54	15.8	0.26	33.54	33.8	0.26
5775	2	18	155	15.12	15.8	0.68	33.12	33.8	0.68
5810	2	18	157	15.62	15.8	0.18	33.62	33.8	0.18
5740	3	17	156	15.94	16.8	0.86	32.94	33.8	0.86
5775	3	17	157	15.97	16.8	0.83	32.97	33.8	0.83
5810	3	17	158	16.30	16.8	0.50	33.30	33.8	0.50
5740	4	15	161	18.69	18.8	0.11	33.69	33.8	0.11
5775	4	15	161	18.41	18.8	0.39	33.41	33.8	0.39
5810	4	15	162	18.09	18.8	0.71	33.09	33.8	0.71

maximum conducted output power = (30 dBm or 17 dBm + 10 log B) – (antenna gain – 6 dBi)
maximum e.i.r.p. = (30 dBm or 17 dBm + 10 log B) + 6 dBi

Where B is the 26 dB emission bandwidth in MHz

26 dB emission bandwidth for BPSK = 12 MHz
26 dB emission bandwidth for 64QAM = 11.9 MHz

Antenna Type	Antenna Gain, dBi	Antenna number	Antenna Info
Omni directional Rod	12	1	Kenbotong, Model: TQJ580-12
60° Sectional	18	2	Kenbotong, Model: TDJ-4958G
90° Sectional	17	3	Kenbotong, Model: TDJ-4958I
120° Sectional	15	4	Kenbotong, Model: TDJ-4958J

Clause 15.407(a)(3) Power limits (Output power and PPSD), continued

Test data, continued

Power Spectral Density

BPSK

Frequency (MHz)	Antenna number	G_{ANT} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5740	1	12	164	8.72	11	2.28
5775	1	12	164	9.86	11	1.14
5810	1	12	164	8.17	11	2.83
5740	2	18	156	4.41	5	0.59
5775	2	18	154	4.67	5	0.33
5810	2	18	157	4.50	5	0.50
5740	3	17	156	4.95	6	1.05
5775	3	17	156	5.47	6	0.53
5810	3	17	159	5.58	6	0.42
5740	4	15	160	7.02	8	0.98
5775	4	15	160	7.80	8	0.20
5810	4	15	162	6.70	8	1.30

64QAM

Frequency (MHz)	Antenna number	G_{ANT} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5740	1	12	164	9.12	11	1.88
5775	1	12	164	9.52	11	1.48
5810	1	12	164	7.95	11	3.05
5740	2	18	155	4.85	5	0.15
5775	2	18	155	4.85	5	0.15
5810	2	18	157	4.39	5	0.61
5740	3	17	156	5.32	6	0.68
5775	3	17	157	5.90	6	0.10
5810	3	17	158	5.10	6	0.90
5740	4	15	161	7.36	8	0.64
5775	4	15	161	7.84	8	0.16
5810	4	15	162	7.02	8	0.98

PSD Limit = 17 dBm – (antenna gain – 6 dBi)

Used gating sweep: BPSK – 640 µs, and 64QAM – 855 µs

Antenna Type	Antenna Gain, dBi	Antenna number	Antenna Info
Omni directional Rod	12	1	Kenbotong, Model: TQJ580-12
60° Sectional	18	2	Kenbotong, Model: TDJ-4958G
90° Sectional	17	3	Kenbotong, Model: TDJ-4958I
120° Sectional	15	4	Kenbotong, Model: TDJ-4958J

Clause 15.407(a)(6) Power limits (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.

Test date: October 23, 2009

Test results: Pass

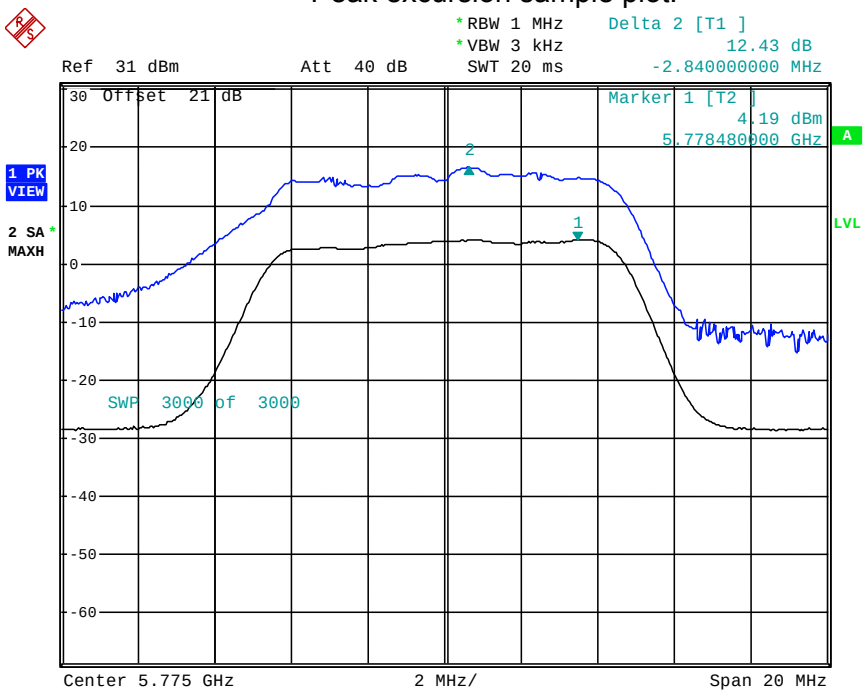
Special notes

Test Method:

FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power in UNII Band
For trace one RBW/VBW were set to 1 MHz/3 MHz using peak detector. For second trace using sample detector RBW was set to 1 MHz and VBW was set to >1/T (1/640 us); >1.5 kHz = 3 kHz

Test data

Peak excursion sample plot:



Clause 15.407(a)(6) Power limits (Peak excursion), continued

Test data, continued

Peak Excursion:						
BPSK						
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	Excursion (dB)	Limit (dB)	Margin (dB)
5740	1	12	164	12.27	13.00	0.73
5775	1	12	164	12.43	13.00	0.57
5810	1	12	164	11.91	13.00	1.09
5740	2	18	156	11.36	13.00	1.64
5775	2	18	154	12.41	13.00	0.59
5810	2	18	157	12.13	13.00	0.87
64QAM						
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	Excursion (dB)	Limit (dB)	Margin (dB)
5740	1	12	164	12.90	13.00	0.10
5775	1	12	164	12.90	13.00	0.10
5810	1	12	164	12.67	13.00	0.33
5740	2	18	155	12.90	13.00	0.10
5775	2	18	155	12.90	13.00	0.10
5810	2	18	157	12.80	13.00	0.20

Antenna Type	Antenna Gain, dBi	Antenna number	Antenna Info
Omni directional Rod	12	1	Kenbotong, Model: TQJ580-12
60° Sectional	18	2	Kenbotong, Model: TDJ-4958G
90° Sectional	17	3	Kenbotong, Model: TDJ-4958I
120° Sectional	15	4	Kenbotong, Model: TDJ-4958J

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band)

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.

Test date: October 22, 2009

Test results: Pass

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)

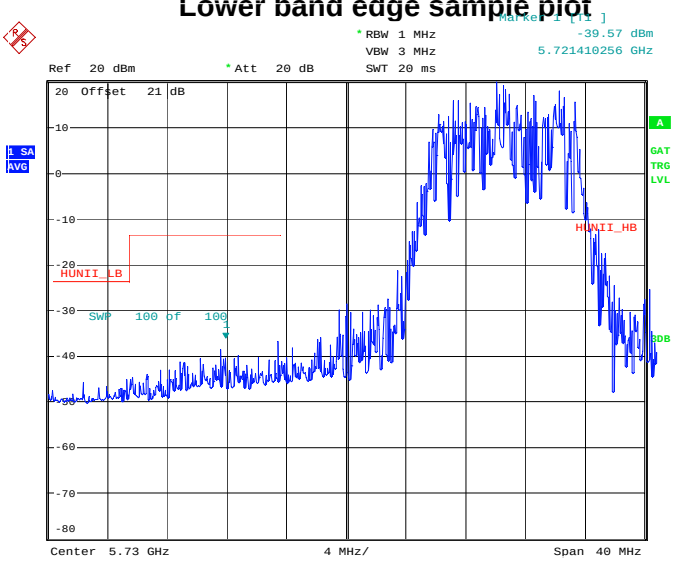
- When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

The spectrum was searched from 30 MHz to the 40 GHz using Sample detector with 1 MHz RBW, 3 MHz VBW. All emissions were measured using power averaging over 100 sweeps. The test was performed conducted at the antenna port.

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

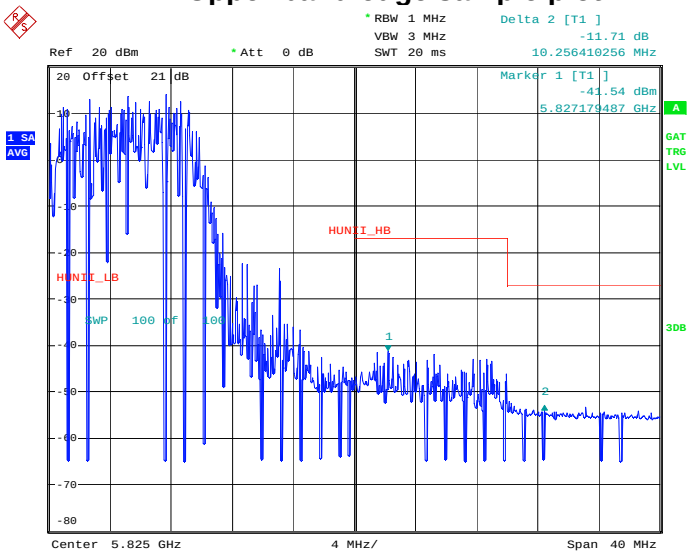
Test data

Lower band edge sample plot



Date: 22.OCT.2009 12:59:53

Upper band edge sample plot



Date: 22.OCT.2009 14:24:09

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

Test data, continued

Band edge test at the **5715 MHz**							
BPSK							
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5740	1	12	164	-46.0	-34.0	-27	7.0
5740	2	18			-28.0	-27	1.0
5740	3	17			-29.0	-27	2.0
5740	4	15			-31.0	-27	4.0
64QAM							
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5740	1	12	164	-46.3	-34.3	-27	7.3
5740	2	18			-28.3	-27	1.3
5740	3	17			-29.3	-27	2.3
5740	4	15			-31.3	-27	4.3
Band edge test at the **5725 MHz**							
BPSK							
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5740	1	12	164	-41.1	-29.1	-17	12.1
5740	2	18			-23.1	-17	6.1
5740	3	17			-24.1	-17	7.1
5740	4	15			-26.1	-17	9.1
64QAM							
Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5740	1	12	164	-40.0	-28.0	-17	11.0
5740	2	18			-22.0	-17	5.0
5740	3	17			-23.0	-17	6.0
5740	4	15			-25.0	-17	8.0
Used gating sweep: BPSK - 640µs, and 64QAM - 855µs							

Antenna Type	Antenna Gain, dBi	Antenna number	Antenna Info
Omni directional Rod	12	1	Kenbotong, Model: TQJ580-12
60° Sectional	18	2	Kenbotong, Model: TDJ-4958G
90° Sectional	17	3	Kenbotong, Model: TDJ-4958I
120° Sectional	15	4	Kenbotong, Model: TDJ-4958J

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

Test data, continued

Band edge test at the **5825 MHz**

BPSK

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5810	1	12	164	-41.8	-29.8	-17	12.8
5810	2	18			-23.8	-17	6.8
5810	3	17			-24.8	-17	7.8
5810	4	15			-26.8	-17	9.8

64QAM

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5810	1	12	164	-41.6	-29.6	-17	12.6
5810	2	18			-23.6	-17	6.6
5810	3	17			-24.6	-17	7.6
5810	4	15			-26.6	-17	9.6

Band edge test at the **5835 MHz**

BPSK

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5810	1	12	164	-53.6	-41.6	-27	14.6
5810	2	18			-35.6	-27	8.6
5810	3	17			-36.6	-27	9.6
5810	4	15			-38.6	-27	11.6

64QAM

Freq. (MHz)	Antenna number	G_{ANT} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5810	1	12	164	-52.7	-40.7	-27	13.7
5810	2	18			-34.7	-27	7.7
5810	3	17			-35.7	-27	8.7
5810	4	15			-37.7	-27	10.7

Used gating sweep: BPSK - 640µs, and 64QAM - 855µs

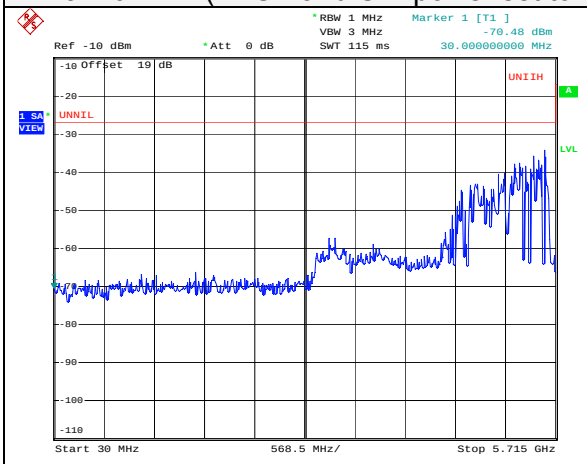
Antenna Type	Antenna Gain, dBi	Antenna number	Antenna Info
Omni directional Rod	12	1	Kenbotong, Model: TQJ580-12
60° Sectional	18	2	Kenbotong, Model: TDJ-4958G
90° Sectional	17	3	Kenbotong, Model: TDJ-4958I
120° Sectional	15	4	Kenbotong, Model: TDJ-4958J

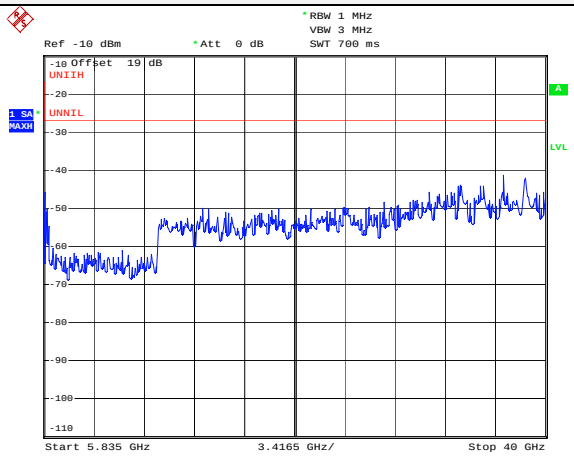
Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

Test data, continued

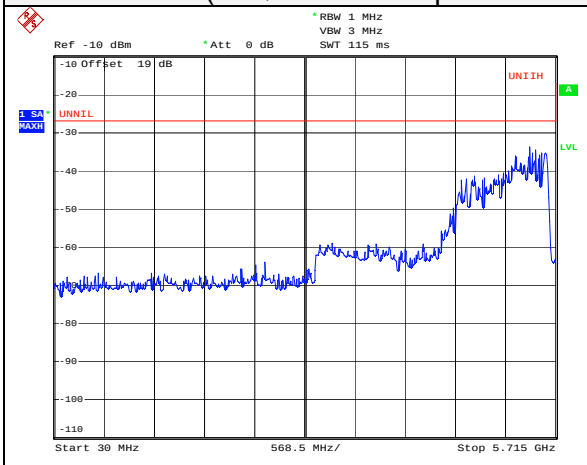
Spurious emissions

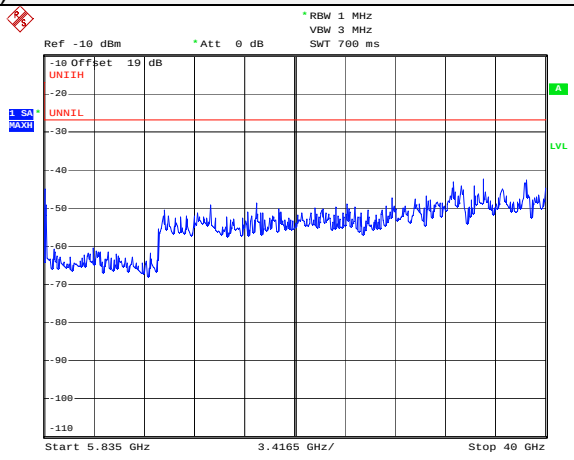
TX 5740 MHz (BPSK and SW power set to 164) Maximum Antenna Gain 18 dBi.





TX 5740 MHz (64QAM and SW power set to 164) Maximum Antenna Gain 18 dBi.





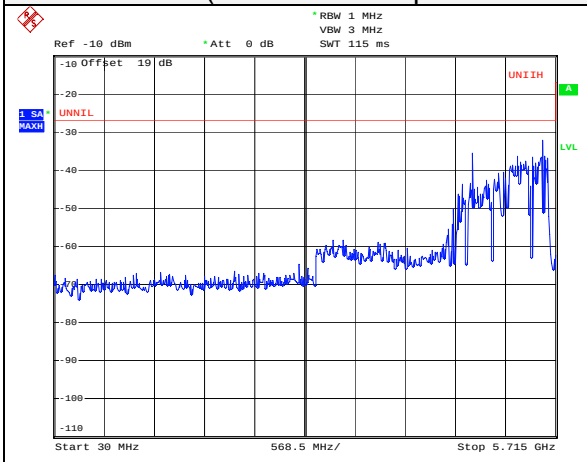
Spectral plots were corrected to include antenna gain (18 dBi) to show compliance with EIRP limit.

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

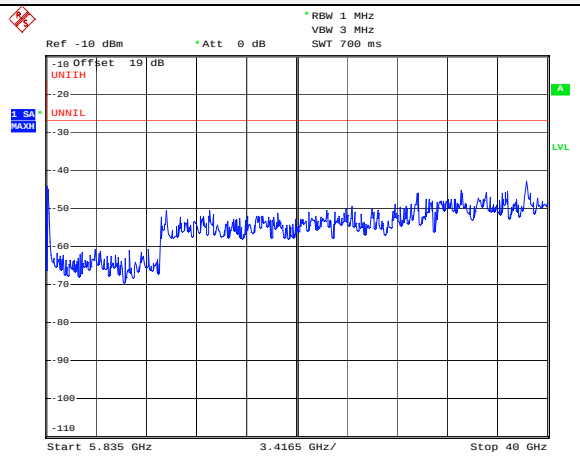
Test data, continued

Spurious emissions

TX 5775 MHz (BPSK and SW power set to 164) Maximum Antenna Gain 18 dBi.

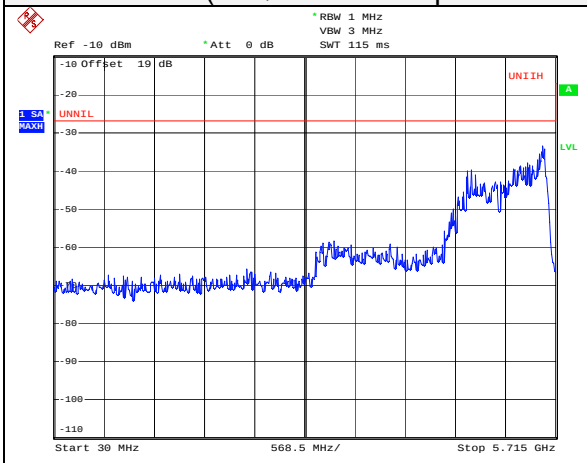


Date: 29.OCT.2009 10:40:39

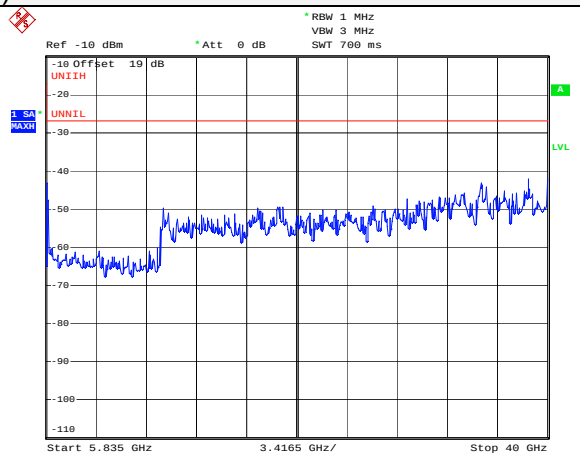


Date: 29.OCT.2009 10:41:17

TX 5775 MHz (64QAM and SW power set to 164) Maximum Antenna Gain 18 dBi.



Date: 29.OCT.2009 10:43:42



Date: 29.OCT.2009 10:43:02

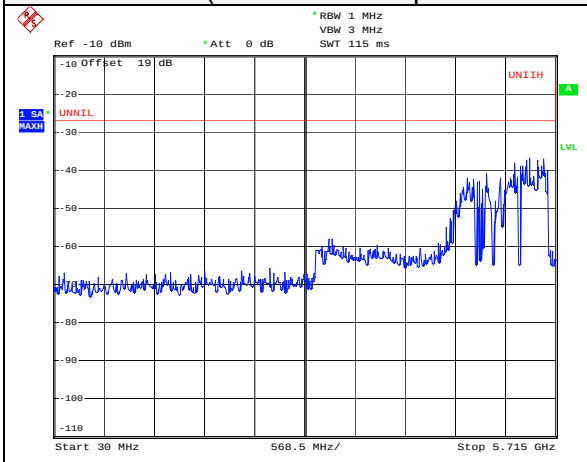
Spectral plots were corrected to include antenna gain (18 dBi) to show compliance with EIRP limit.

Clause 15.407(b)(4) Undesirable emission limits (5.725 –5.825 GHz band), continued

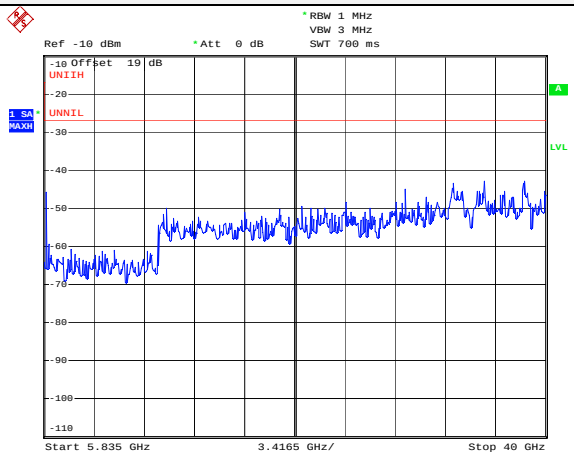
Test data, continued

Spurious emissions

TX 5810 MHz (BPSK and SW power set to 164) Maximum Antenna Gain 18 dBi.

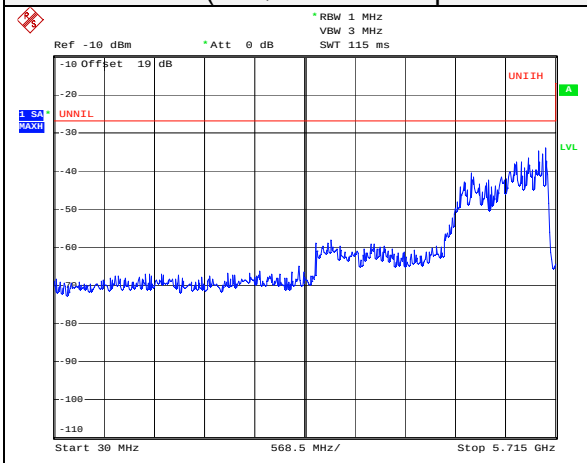


Date: 29.OCT.2009 10:45:15

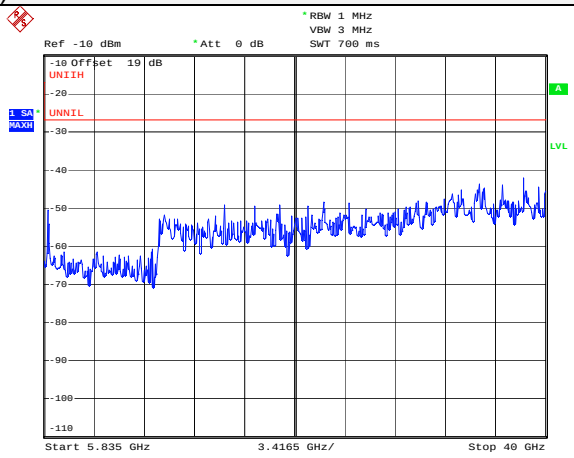


Date: 29.OCT.2009 10:46:11

TX 5810 MHz (64QAM and SW power set to 164) Maximum Antenna Gain 18 dBi.



Date: 29.OCT.2009 10:48:26



Date: 29.OCT.2009 10:47:48

Spectral plots were corrected to include antenna gain (18 dBi) to show compliance with EIRP limit.

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205)

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.

§15.207 Conducted limits

(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 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.

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.		

§ 15.209 Radiated emission limits

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field Strength (Microvoltsmeter)	Measurement Distance (meters)
0.009–0.490	2400F (kHz)	300
0.490–1.705	24000F (kHz)	30
1.705–30.0	30	30
30–88	1001	3
88–216	1502	3
216–960	2003	3
Above 960	500	3

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

The provisions of §15.205 apply to intentional radiators operating under this section.

§ 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1]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
6.215–6.218	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	([2])
13.36–13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2]Above 38.6

Test date: October 21, 2009

Test results: Pass

Special notes

- For conducted and radiated emissions the EUT was set to transmit at 5.74 GHz at maximum power.
- For radiated emissions, the EUT required a shielded CAT 5 cable from the Radio LAN + Power port of the radio to LAN + Power port of the POE

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

Test data

§15.207 Conducted emissions

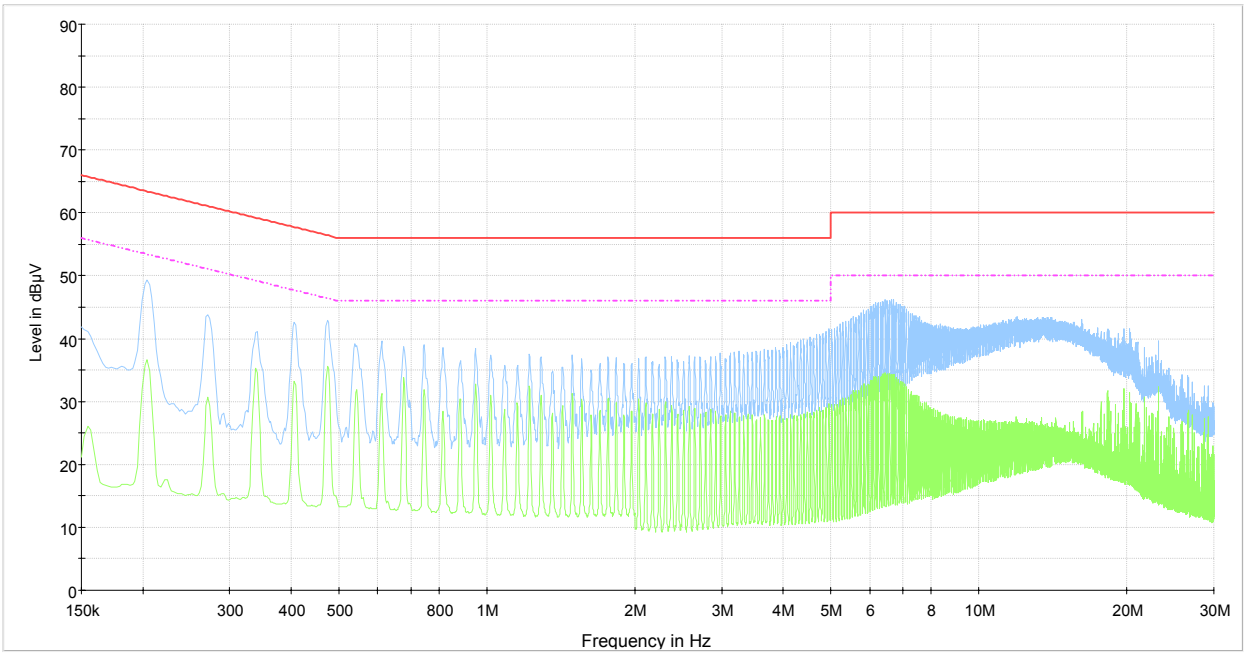
Port under test: AC input of POE

Preview measurements:
0.15 MHz to 30 MHz
Receiver settings:
– Peak and average detector
– 9 kHz RBW

Final measurement:
0.15 MHz to 30 MHz
Receiver settings:
– Q-Peak and average detector
– 9 kHz RBW

- Spectral plots have been corrected for transducer factors; cable loss, LISN, and attenuators.
- Emissions detected within 6 dB of limit were re-measured with a quasi peak or average detector for a final measurement.

Spectral plots

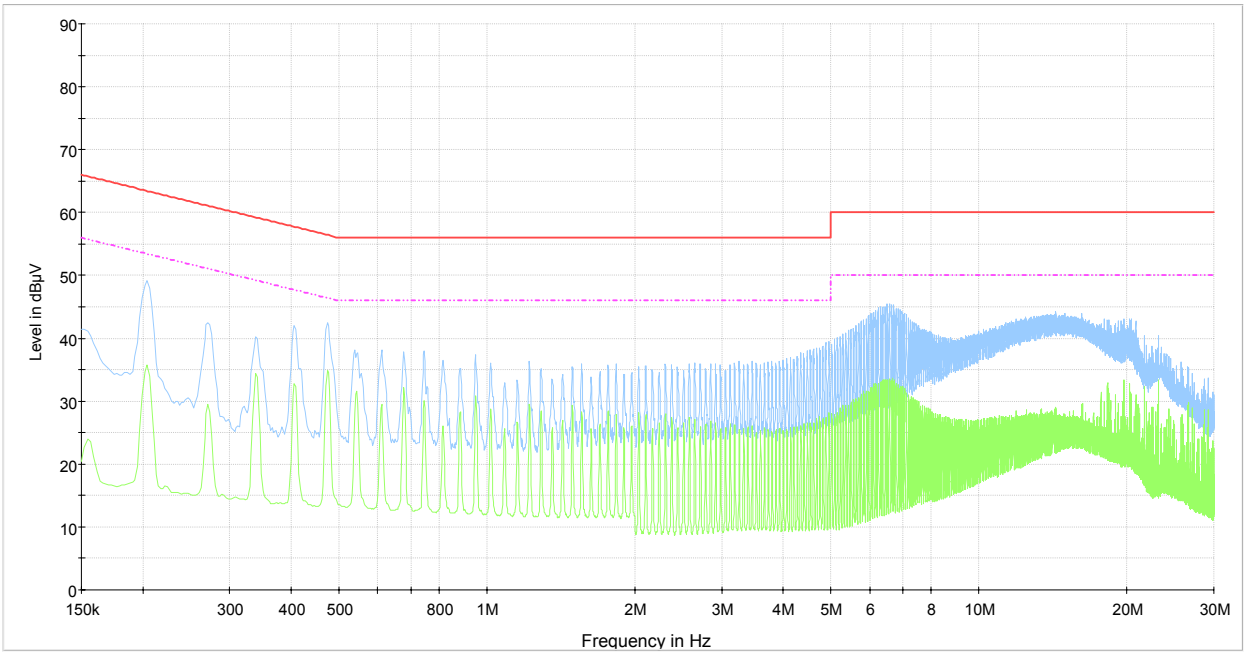


Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

Test data, continued

§15.207 Conducted emissions, continued

Spectral plots, continued



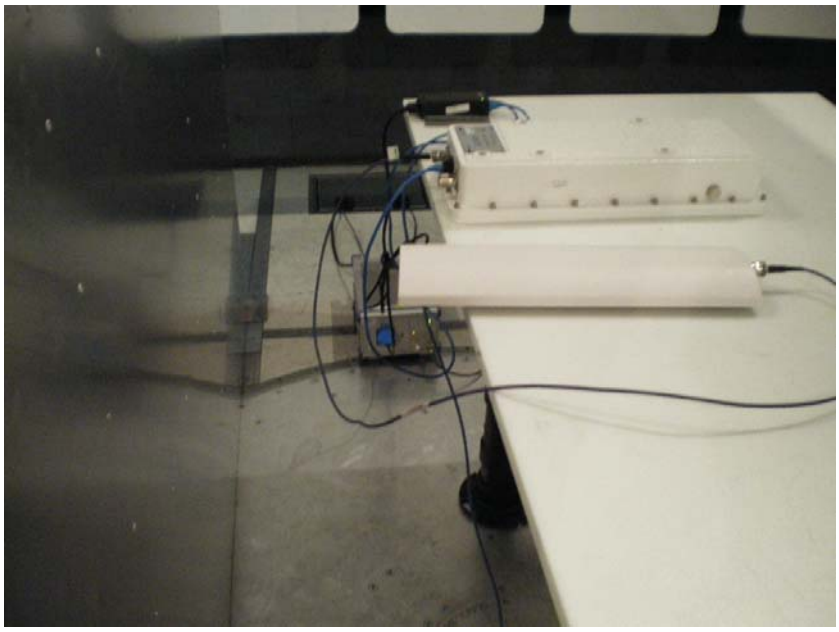
120VAC/60Hz, Neutral
CISPR 22 Mains QP Class B Limit
CISPR 22 Mains AV Class B Limit
Preview Peak Detector
Preview Average Detector

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz), continued

§15.207 Conducted emissions, continued

Setup photos



Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

Test data, continued

§ 15.209 Radiated emission

Facility: 3 m Semi anechoic chamber **Measuring distance:** 3 m **Antenna height:** 1–4 m

Preview measurements:
30 MHz to 1 GHz
Receiver settings:
- Peak detector, Max hold
- 120 kHz RBW

Final measurement:
30 MHz to 1 GHz
Receiver settings:
- Quasi-Peak detector
- 120 kHz RBW

Preview measurements:
1 GHz to 40 GHz
Receiver settings:
- Peak detector, Max hold
- 1 MHz RBW

Final measurement:
1 GHz to 40 GHz
Receiver settings:
- Peak and average detector
- 1 MHz RBW and 3 MHz VBW (Peak) / 10 Hz (Average)

- The spectral plot is a combined vertical and horizontal scan.
- Spectral plots have been corrected with transducer factors for antennas, cable loss, amplifiers, and attenuators.
- Limits have been adjusted to reflect 3 m measurement.
- The preview measurement was generated with receiver in continuous scan mode while the EUT was rotated and antenna adjusted for maximized radiated emission. Emissions detected within 6 dB of limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Special notes

The spectrum was searched from 30 MHz to the 40 GHz. Radiated emissions measurements were performed at the distance of 3 m. The assessment was performed with 12 dBi Omnidirectional antenna and with 18 dBi sectional antenna. Only the worst measurements presented.

Test data

Tabular data

Freq. (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)
32.60	35.2	100	120	100.0	V	0.0	19.1	4.8	40
39.16	35.1	100	120	100.0	V	0.0	14.4	4.9	40
51.84	36.2	100	120	98.8	V	0.0	8.3	3.8	40
54.72	33.8	100	120	100.0	V	359.0	8.0	6.2	40

Notes

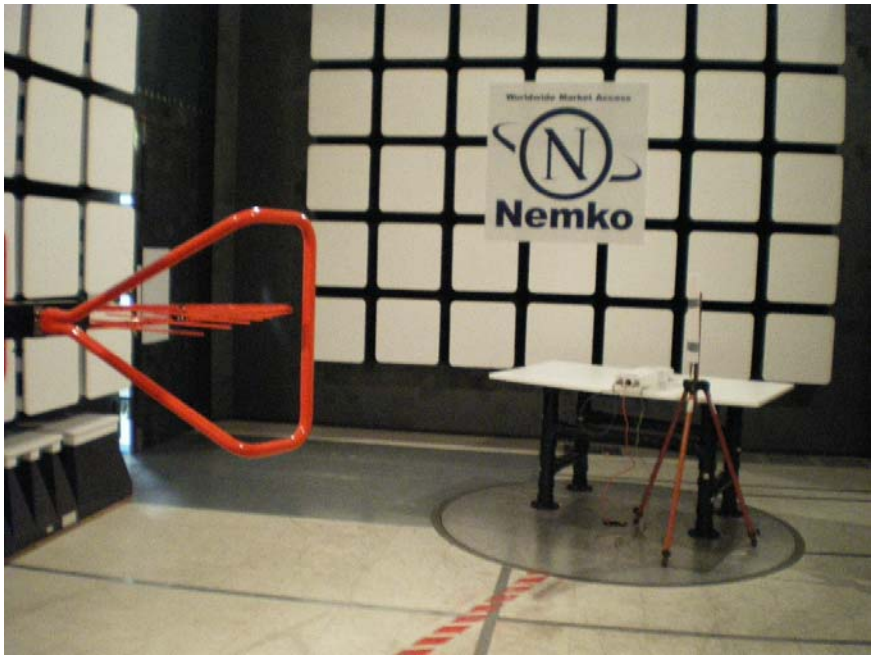
Correction factor includes antenna, cable loss, amplifier, and attenuators.
Field Strength measurement is a summation of the raw measurement value and the correction factor.

Clause 15.407(b)(6) Undesirable emission limits (General field strength limits for frequencies below 1 GHz) and Clause 15.407(b)(7) Undesirable emission limits (provisions of §15.205), continued

Test data, continued

§ 15.209 Radiated emission, continued

Setup photos



Clause 15.407(f) Radio frequency radiation exposure

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.

Test date: October 19, 2009

Test results: Pass

Special notes

None

Test data

See Nemko document 134989RADWL2 (MPE-Prediction for FCC-15 UNII) attached to this application.

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.

Test date: October 26, 2009

Test results: Pass

Special notes

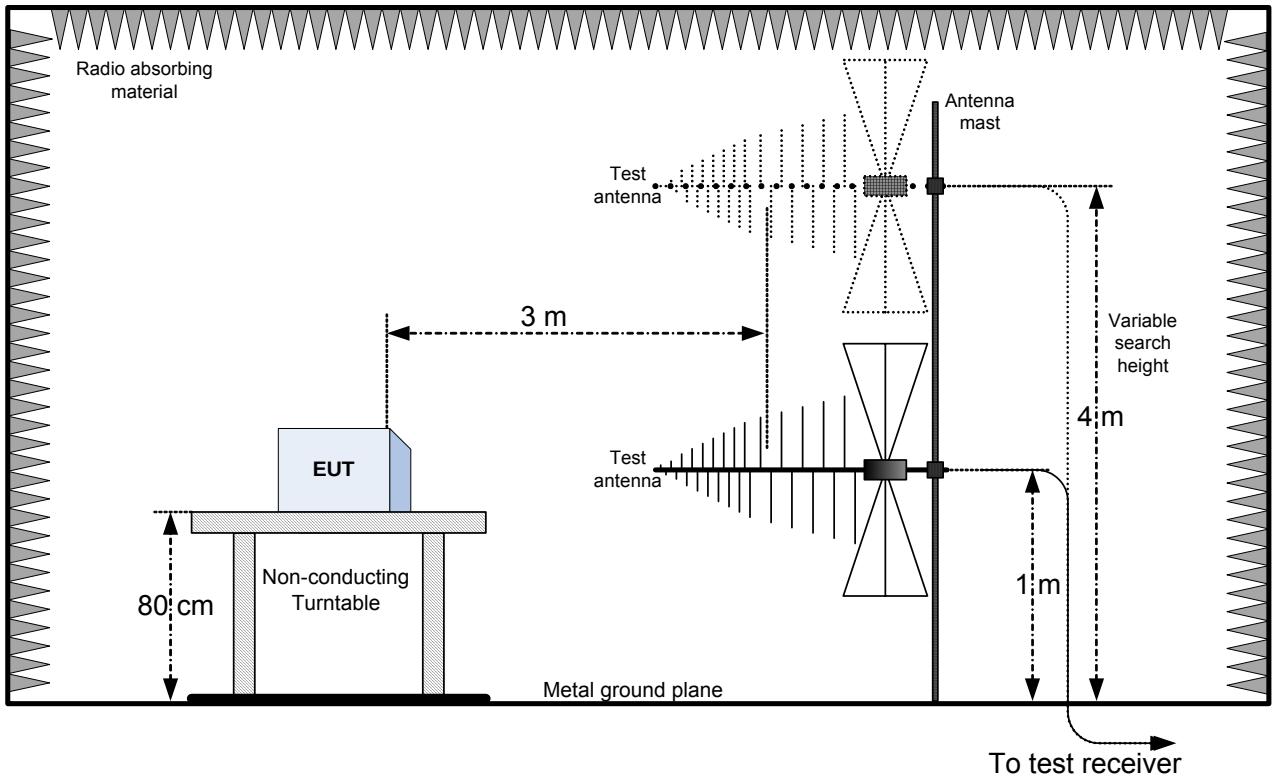
Test Conditions: Ambient Temperature: 21 °C
Extreme Temperature: −30 °C to +50 °C
Extreme Voltage Conditions: ±15 % of nominal voltage.

Test data

Frequency Stability Test Data		
Low Channel		
Test Condition	Measured Frequency (kHz)	Frequency Drift (kHz)
+21°C, 120 VAC/60 Hz VAC	5739999.40	Reference
+21°C, 102 VAC/60 Hz VAC	5739999.40	0.00
+21°C, 138 VAC/60 Hz VAC	5739999.40	0.00
+50°C, 120 VAC/60 Hz VAC	5740000.80	1.40
−30°C, 120 VAC/60 Hz VAC	5739999.84	0.44
High Channel		
Test Condition	Measured Frequency (kHz)	Frequency Drift (kHz)
+21°C, 120 VAC/60 Hz VAC	5809999.20	Reference
+21°C, 102 VAC/60 Hz VAC	5809999.20	0.00
+21°C, 138 VAC/60 Hz VAC	5809999.20	0.00
+50°C, 120 VAC/60 Hz VAC	5810000.40	1.20
−30°C, 120 VAC/60 Hz VAC	5809999.84	0.64

Appendix B: Block diagrams of test set-ups

Radiated emissions set-up



Conducted emissions set-up