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Test Report: 88791-5R2TRFWL

Applicant: Verint Systems Canada Inc.
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LAVAL, QC
H7L 4S4

Apparatus: S1100-12VDC-24-RX, S1100-12VDC-24-TX, S1100-12VDC-5x-RX, S1100-12VDC-5x-TX, S1100-24VAC-24-RX, S1100-24VAC-24-TX, S1100-24VAC-5x-RX, S1100-24VAC-5x-TX, S1100w-12VDC-24, S1100w-12VDC-5x, S1100w-24VAC-24, S1100w-24VAC-5x, S1100-12VDC-RX, S1100-24VAC-RX, S1100-12VDC-TX, S1100-24VAC-TX

FCC ID: VKHCM9S1100

In Accordance With: FCC Part 15 Subpart E, 15.407
Unlicensed National Information Infrastructure
Devices

Tested By: Nemko Canada Inc.
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Ottawa, Ontario
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Authorized By: 
Xu Jin, Wireless Specialist

Date: October 22, 2007

Total Number of Pages: 74

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart E, 15.407. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

- Apparatus Assessed:** S1100-12VDC-24-RX, S1100-12VDC-24-TX, S1100-12VDC-5x-RX, S1100-12VDC-5x-TX, S1100-24VAC-24-RX, S1100-24VAC-24-TX, S1100-24VAC-5x-RX, S1100-24VAC-5x-TX, S1100w-12VDC-24, S1100w-12VDC-5x, S1100w-24VAC-24, S1100w-24VAC-5x, S1100-12VDC-RX, S1100-24VAC-RX, S1100-12VDC-TX, S1100-24VAC-TX
- Specification:** FCC Part 15 Subpart E, 15.407
- Compliance Status:** Complies
- Exclusions:** None
- Non-compliances:** None
- Report Release History:** Original Release

Author: Roman Kuleba, EMC/Wireless Specialist

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.

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Section 1: Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

S1100-12VDC-5x-RX and
S1100-24VAC-5x-RX (AC Power Lines Conducted Emissions Test only)

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	S1100-12VDC-5x-TX	P/N: 21-640-1027
2	S1100-12VDC-5x-RX	P/N: 21-640-1026
3	S1100-24VAC-5x-TX	P/N: 21-640-1031
4	S1100-24VAC-5x-RX	P/N: 21-640-1030
5	S1100-12VDC-24-RX	P/N: M640-1016
8	"A Qualities" 120VAC / 60Hz to 12VDC Power Adaptor	Model: MD481210
9	"A Qualities" 120VAC / 60Hz to 24VAC Power Adaptor / Transformer	Model: MA572416
11 & 12	Antenna 13 dBi / 5.150-5.875 GHz, Huber & Suhner AG, SPA 5600/40/14/0/V	Batch Nr: 713095 & 713101
13 & 14	Antenna 19 dBi / 5.15-5.875 GHz, Wireless Edge, MT-485001	01060 & 01071

The first samples were received on: June 26, 2007

1.3 Theory of Operation

The S1100 is an 802.11g (OFDM) W-LAN wireless device designed for operation in the 5.725 – 5.825 GHz (U-NII-3) band.

1.4 Technical Specifications of the EUT

Operating Frequency:	5745 – 5805 MHz
Peak Output Power:	5.725 – 5.825 GHz Band: 16.88 dBm Conducted
Emission Designator:	W7D
Rated Power:	5.725 – 5.825 GHz Band: 36 dBm EIRP
Modulation:	802.11a (OFDM)
Antenna Data:	13 dBi / 5.150-5.875 GHz, Huber & Suhner AG, SPA 5600/40/14/0/V 19 dBi / 5.15-5.875 GHz, Wireless Edge, MT-485001
Antenna Connector:	F-SMA
Power Source:	120 VAC

Section 2: Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart E, 15.407

Unlicensed National Information Infrastructure Devices

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range : 15 – 30 °C
 Humidity range : 20 - 75 %
 Pressure range : 86 - 106 kPa
 Power supply range : +/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rhode & Schwarz	FSP40	FA001920	Mar. 19/08
Spectrum Analyzer	Rhode & Schwarz	FSU	FA001877	Jan. 16/08
Spectrum Analyzer/EMI Receiver	Rhode & Schwarz	ESU	FA002043	Oct. 24/07
Signal Generator	Rohde & Schwarz	SMR40	FA001879	Jul. 27/07
Power Meter	Agilent	N1911A	FA001946	Jan. 23/08
Power Sensor	Agilent	N1922A	FA001947	Jan. 23/08
RF AMP	JCA	1 – 2 GHz	FA001498	Aug. 2/07
RF AMP	JCA	2 – 4 GHz	FA001496	Aug. 2/07
RF AMP	JCA	4 – 8 GHz	FA001497	Aug. 2/07
RF AMP	Narda	5 – 18 GHz	FA001409	COU
RF AMP	Narda	18.0 – 26.0 GHz	FA001550	COU
Bi-Conical Antenna #2	EMCO	3109	FA000904	Sep. 12/07
Log Periodic Antenna #1	EMCO	3148	FA001355	Sep. 12/07
Horn Antenna #2	EMCO	3115	FA000825	Jan. 30/08
Horn 18 – 26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU

* COU (Calibrate on Use)

** NCR (No Calibration Required)2.5 Measurement Uncertainty

2.5 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 3: Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

Section 4: Results Summary

This section contains the following:

FCC Part 15 Subpart E: Test Results

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

- N No: not applicable / not relevant.
- Y Yes: Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart E, 15.407: Test Results

Part 15	Test Description	Required	Result
§15.403(i)	26dB Emission Bandwidth	Y	PASS
§15.407(a)(3)&(4)	Power Limits and Maximum Conducted Output Power (for the band 5.725–5.825 GHz)	Y	PASS
§15.407(a)(3)&(5)	Peak Power Spectral Density (for the band 5.725–5.825 GHz)	Y	PASS
§15.407(a)(6)	Peak Excursion Measurement	Y	PASS
§15.407(b)(4)	Undesirable Emissions (5.725–5.825 GHz band)	Y	PASS
§15.407(b)(6)	Unwanted emissions below 1 GHz	–	–
§15.207	AC Power Line Conducted Emissions	Y	PASS
§15.209	Radiated Emission Limits (general requirements)	Y	PASS
§15.407(7)	Restricted Bands of Operation (see §15.205)	Y	PASS
§15.407(g)	Frequency Stability	Y	PASS

Appendix A: Test Results

§15.403(i) 26dB Emission Bandwidth

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre 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.

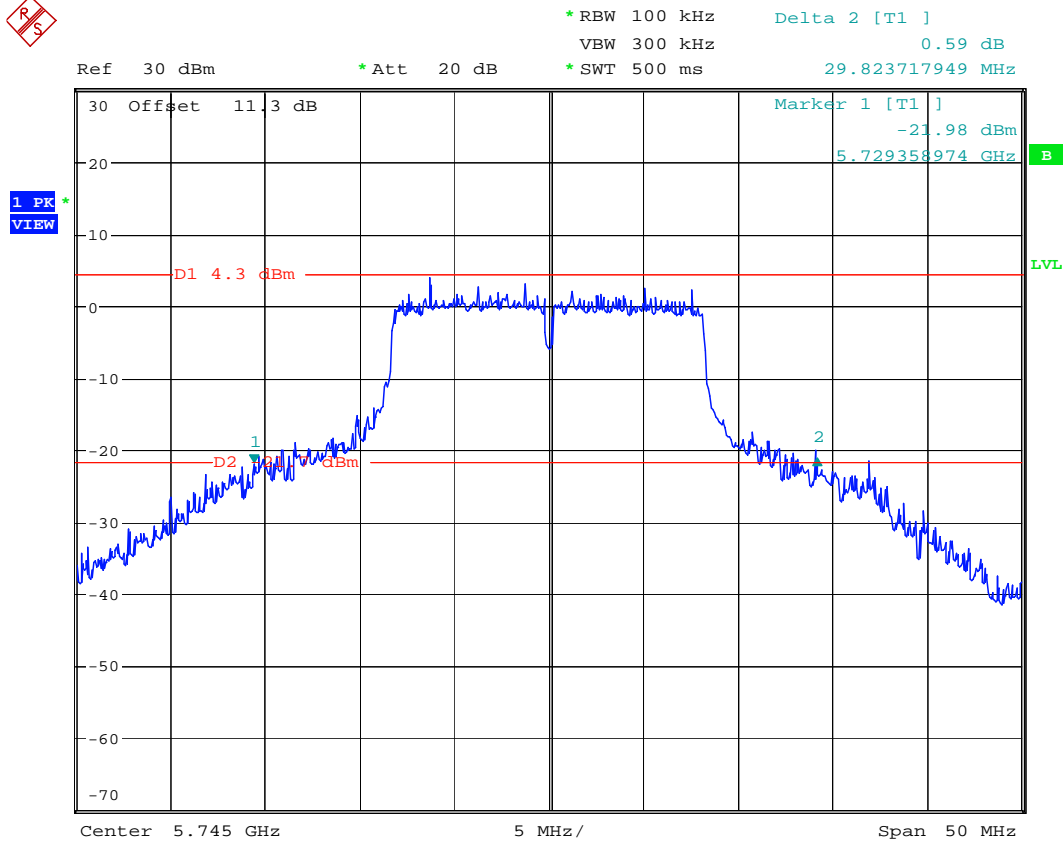
Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 4, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See plots.

26dB Emission Bandwidth, continued

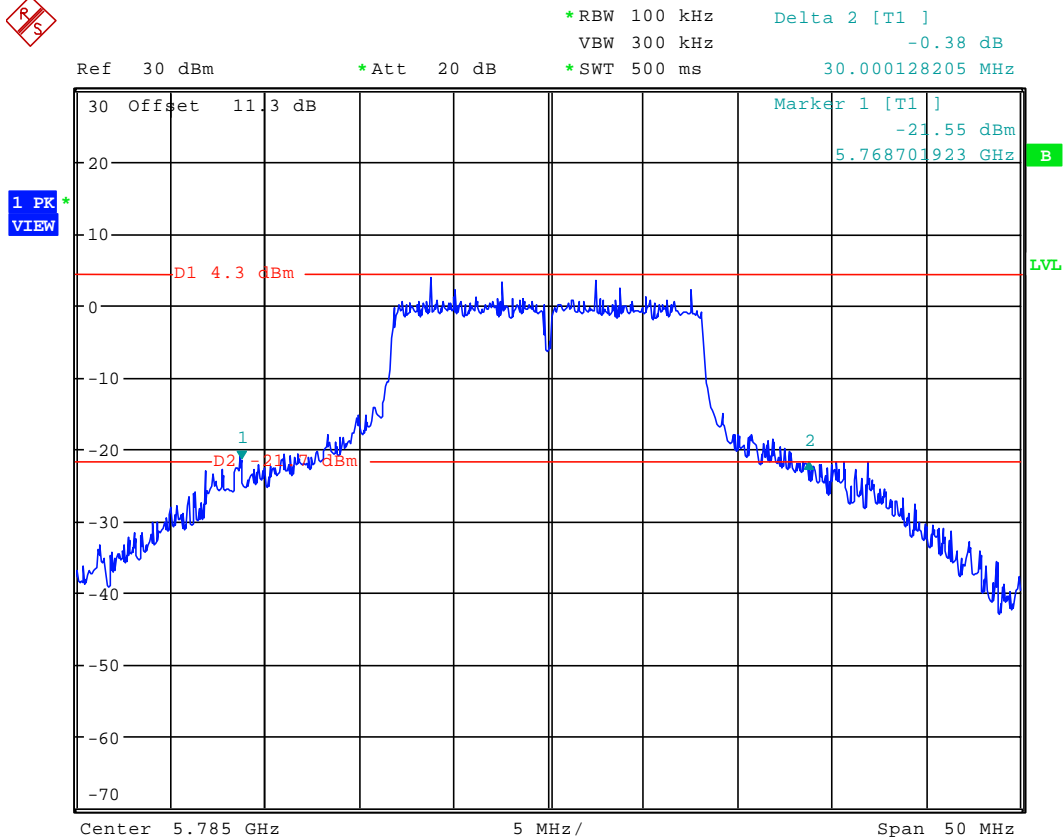
Operating Band: 5.725–5.825 GHz
TX Frequency: 5.745 GHz
Measured Bandwidth: 29.8 MHz



Date: 4.JUL.2007 19:20:11

26dB Emission Bandwidth, continued

Operating Band: 5.725–5.825 GHz
TX Frequency: 5.785 GHz
Measured Bandwidth: 30.0 MHz



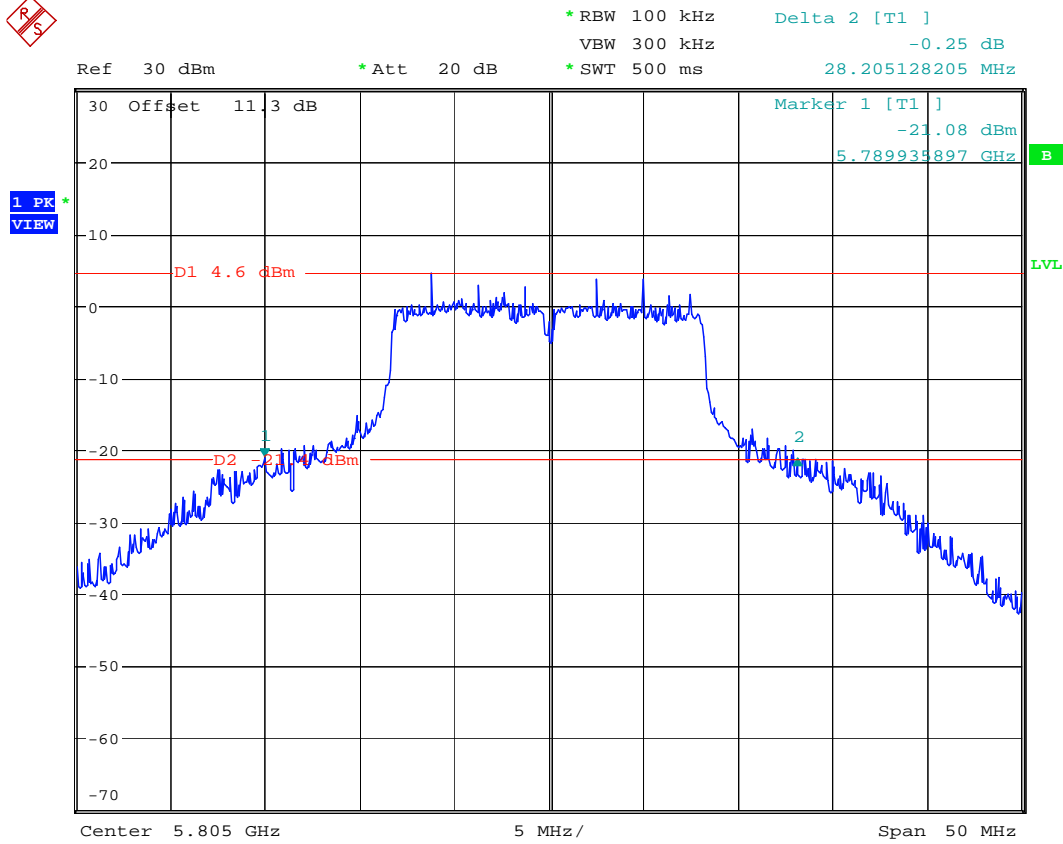
Date: 4.JUL.2007 19:15:55

26dB Emission Bandwidth, continued

Operating Band: 5.725–5.825 GHz

TX Frequency: 5.805 GHz

Measured Bandwidth: 28.2 MHz



Date: 4.JUL.2007 19:11:09

§15.407(a) Power Limits and Maximum Conducted Output Power

§15.407(a)(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz 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.

§15.407(a)(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.

§15.407(a)(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the above definitions for the emission in question.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 4 – Oct. 9, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Method: FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power in UNII Bands

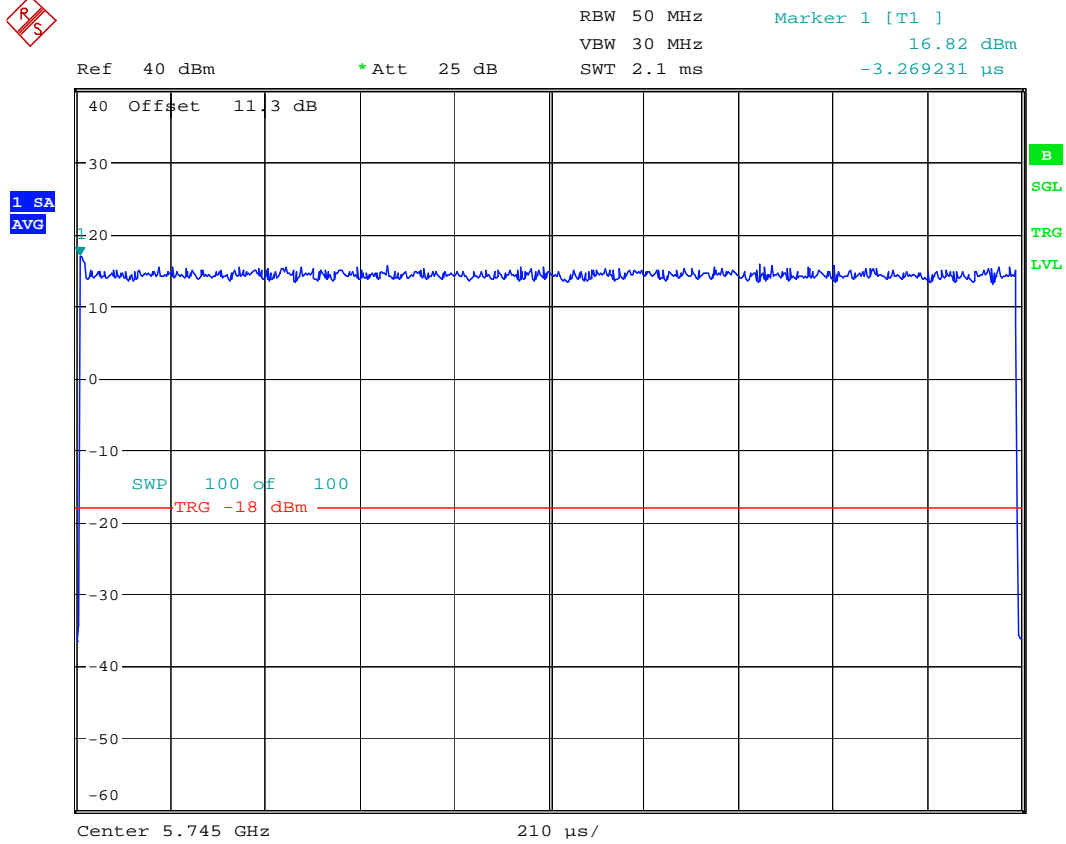
Test Results: Pass (see plots and tables).

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.745 GHz

Antenna Gain: 13 dBi



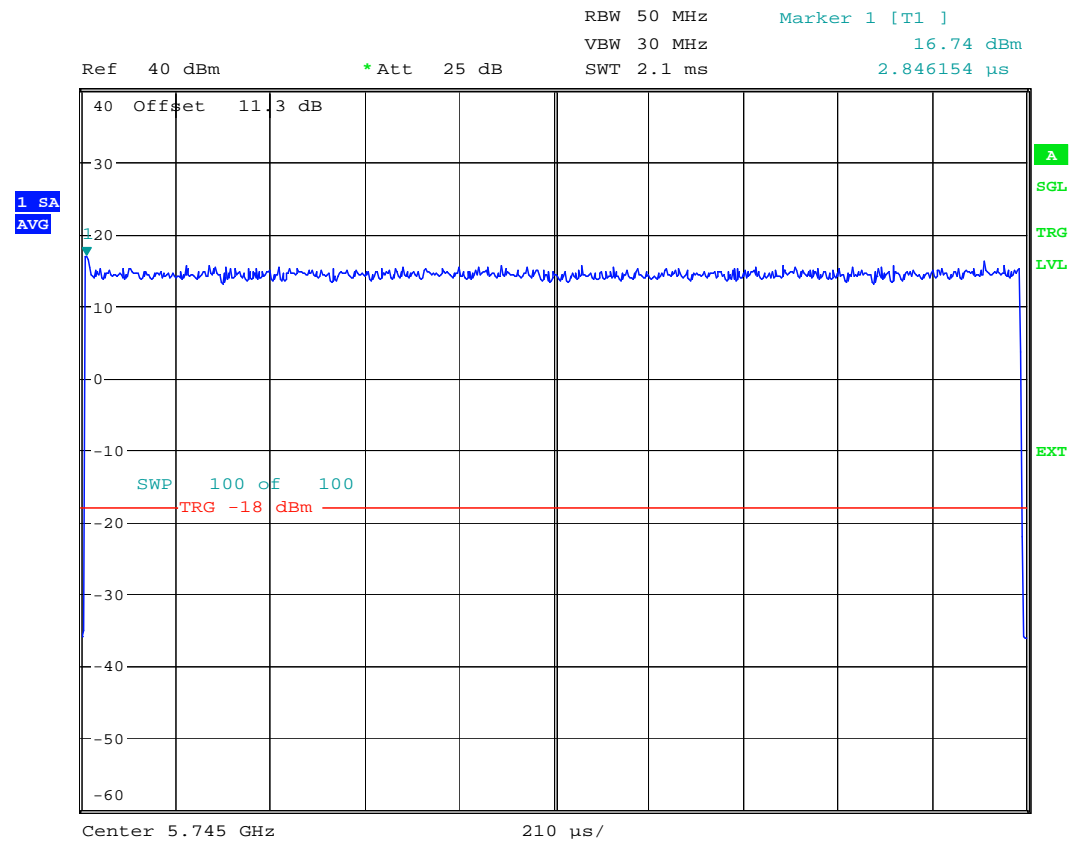
Date: 4.JUL.2007 13:56:49

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.745 GHz

Antenna Gain: 19 dBi



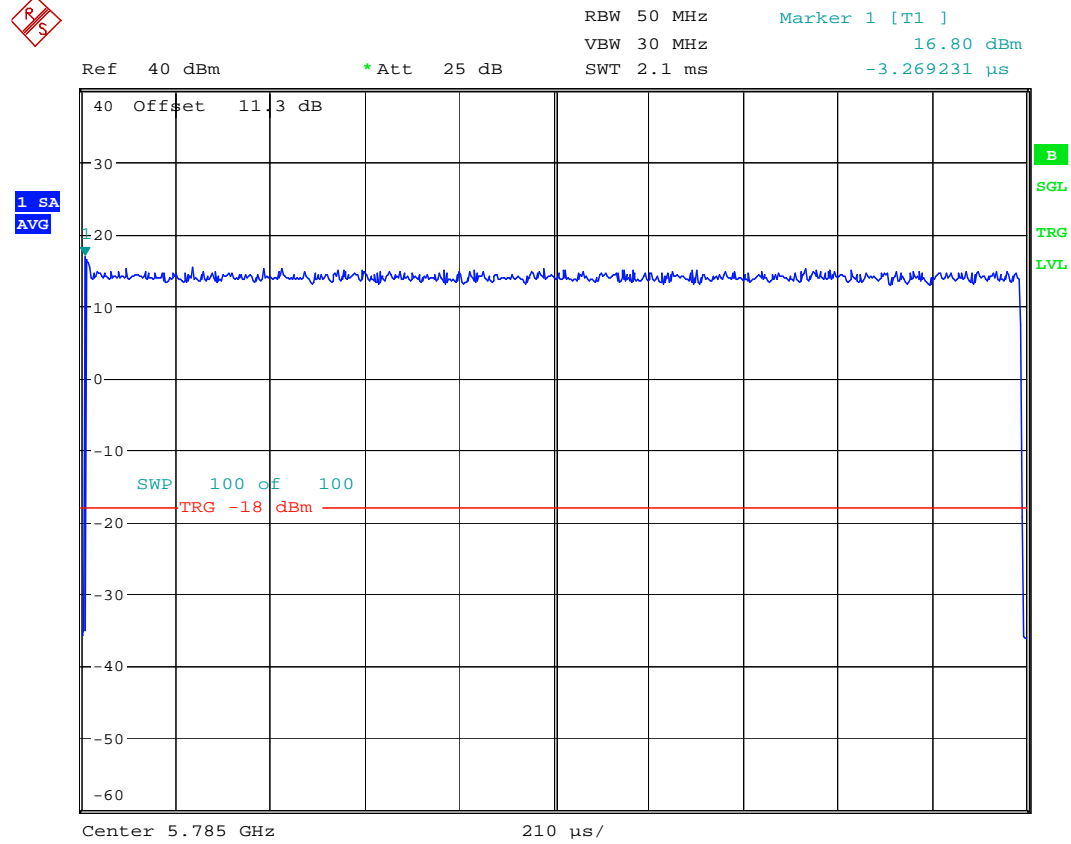
Date: 9.OCT.2007 17:49:28

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.785 GHz

Antenna Gain: 13 dBi



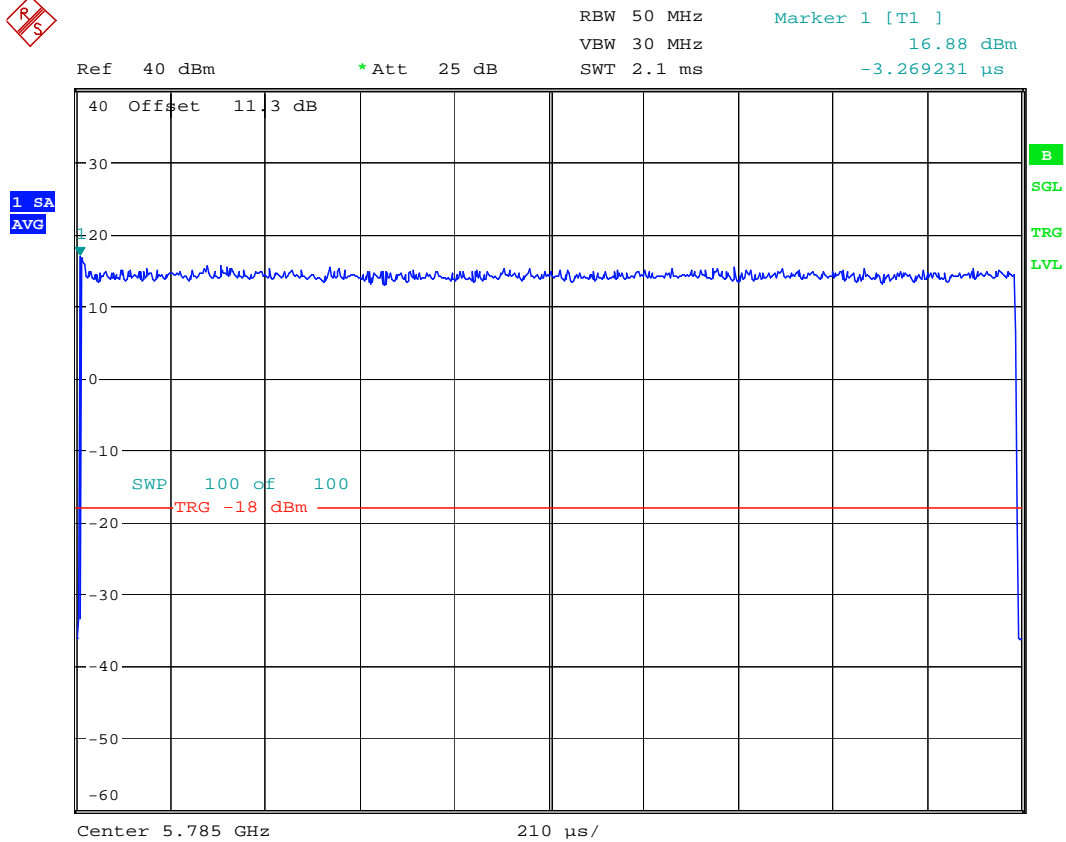
Date: 4.JUL.2007 14:05:31

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.785 GHz

Antenna Gain: 19 dBi



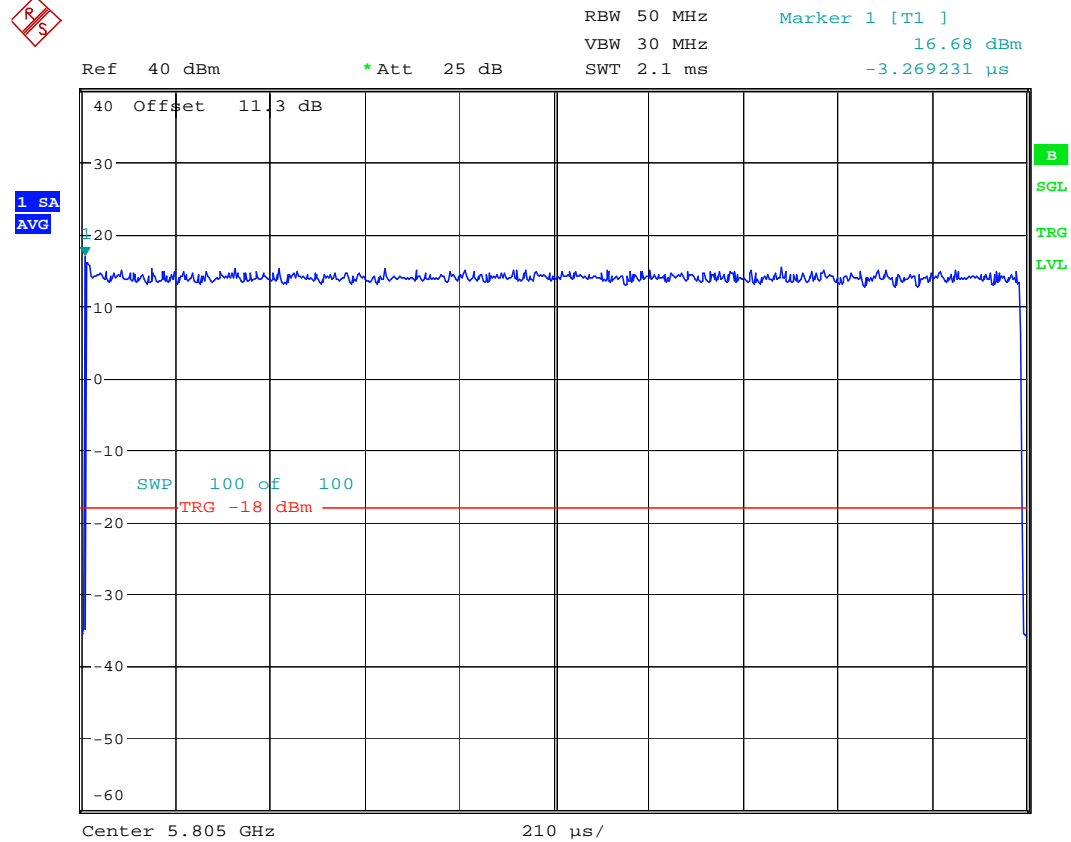
Date: 4.JUL.2007 14:18:38

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.805 GHz

Antenna Gain: 13 dBi



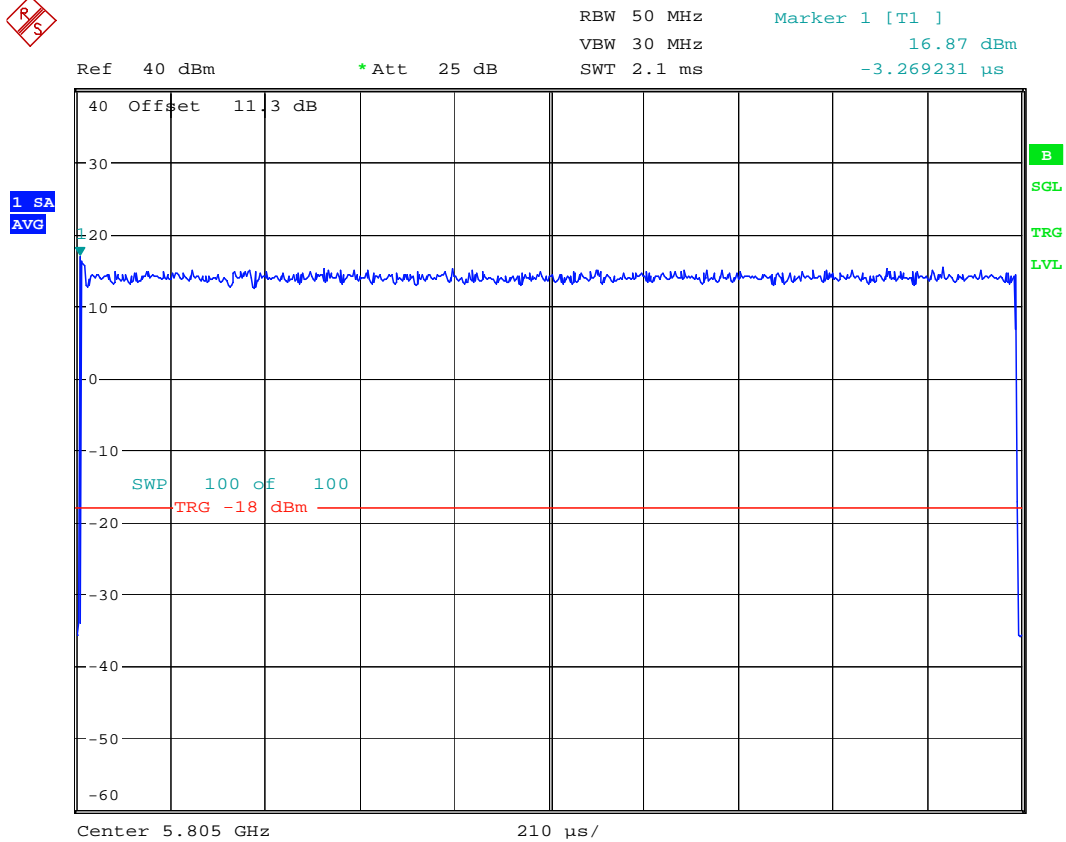
Date: 4.JUL.2007 14:09:27

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.805 GHz

Antenna Gain: 19 dBi



Date: 4.JUL.2007 14:24:35

Maximum Conducted Output Power, continued

Operating Band: 5.725 – 5.825 GHz

Ch. #	Freq. MHz	P _{TX} Cond. dBm	P _{TX} Limit dBm	Margin dB	G _{ANT} dBi	EIRP dBm	EIRP Limit dBm	Margin dB
149	5745	16.82	30.0	13.18	13.0	29.82	36.0	6.18
157	5785	16.80	30.0	13.20	13.0	29.80	36.0	6.20
161	5805	16.68	30.0	13.32	13.0	29.68	36.0	6.32
149	5745	16.74	30.0	13.26	19.0	35.74	36.0	0.26
157	5785	16.88	30.0	13.12	19.0	35.88	36.0	0.12
161	5805	16.87	30.0	13.13	19.0	35.87	36.0	0.13

§15.407(a) Peak Power Spectral Density

§15.407(a)(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407(a)(3) For the band 5.725–5.825 GHz, 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 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.

§15.407(a)(5) The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 5 & 15, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Method: FCC Public Notice Ref: DA: 02-2138
 Measurement Procedure Updated for Peak Transmit Power in the
 Unlicensed National Information Infrastructure (U-NII) Bands

Test Results: Pass (see tables and plots).

Peak Power Spectral Density, continued

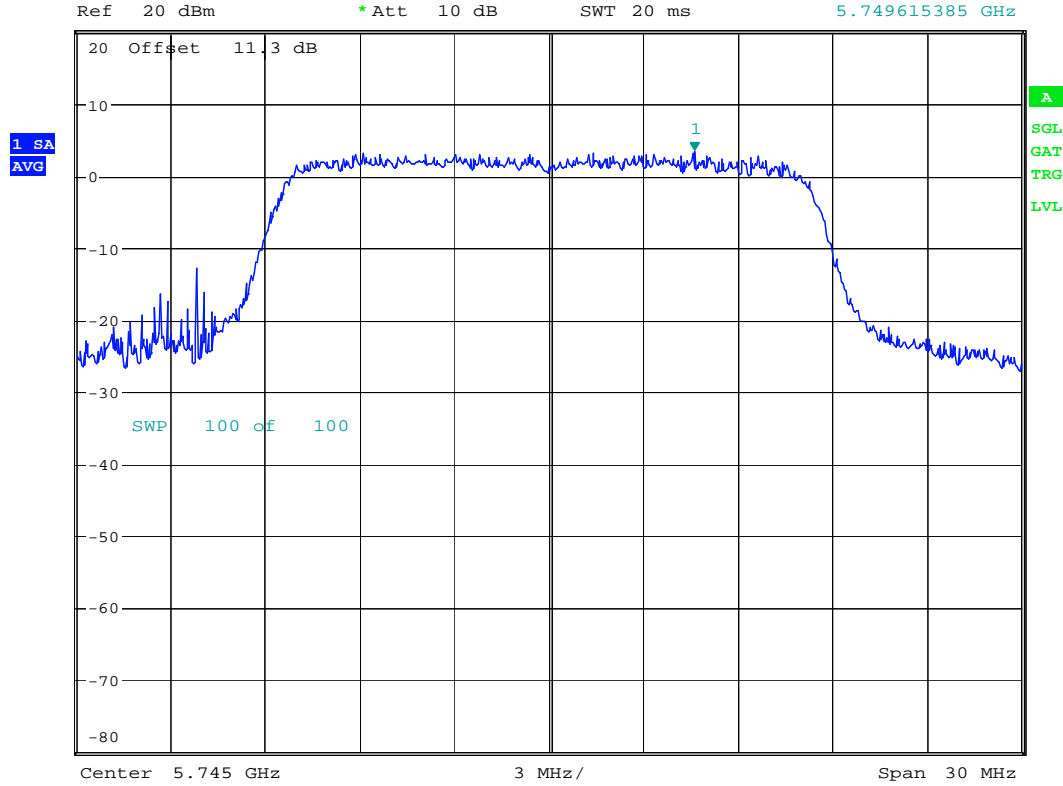
Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.745 GHz

Antenna Gain: 13 dBi



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 3.22 dBm
SWT 20 ms 5.749615385 GHz



Date: 5.JUL.2007 11:27:40

Peak Power Spectral Density, continued

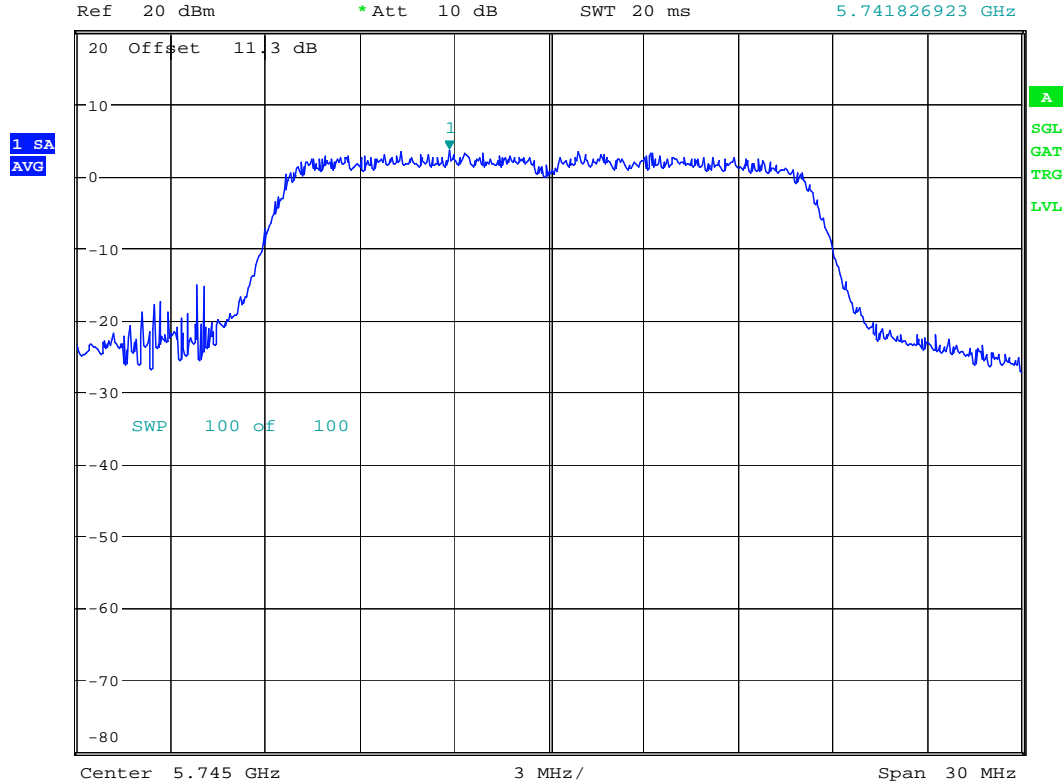
Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.745 GHz

Antenna Gain: 19 dBi



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 3.47 dBm
SWT 20 ms 5.741826923 GHz



Date: 5.JUL.2007 11:32:35

Peak Power Spectral Density, continued

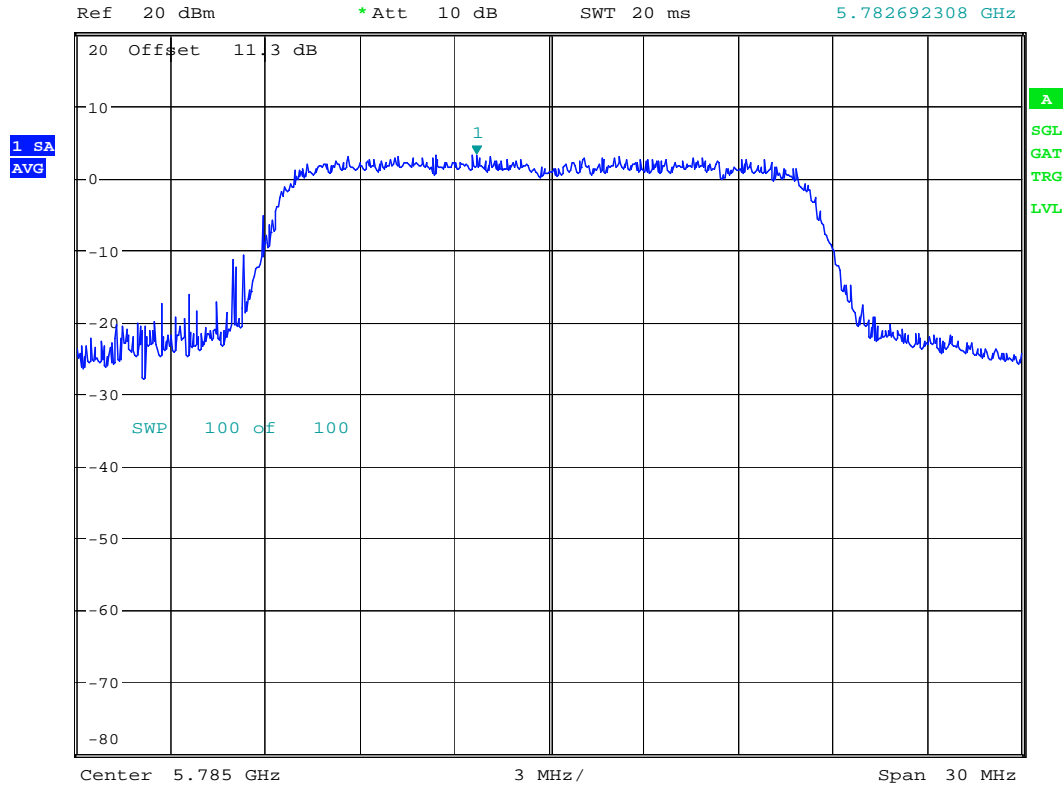
Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.785 GHz

Antenna Gain: 13 dBi



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 3.15 dBm
SWT 20 ms 5.782692308 GHz



Date: 5.JUL.2007 11:40:57

Peak Power Spectral Density, continued

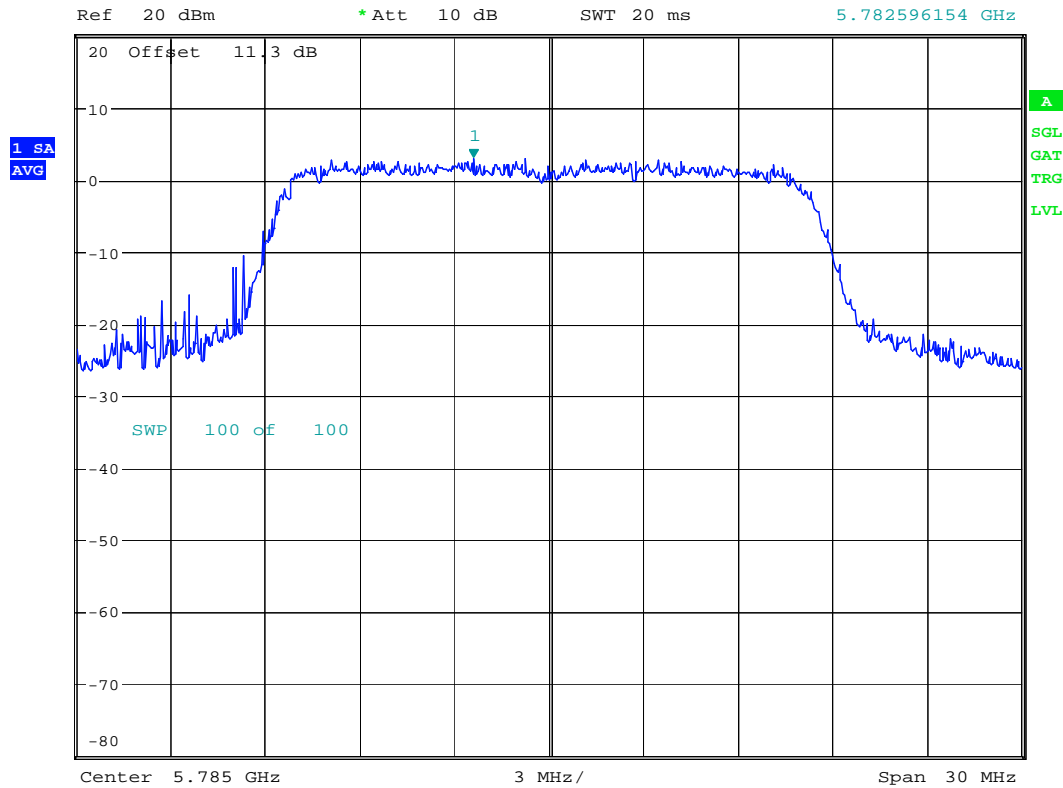
Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.785 GHz

Antenna Gain: 19 dBi



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 2.83 dBm
SWT 20 ms 5.782596154 GHz



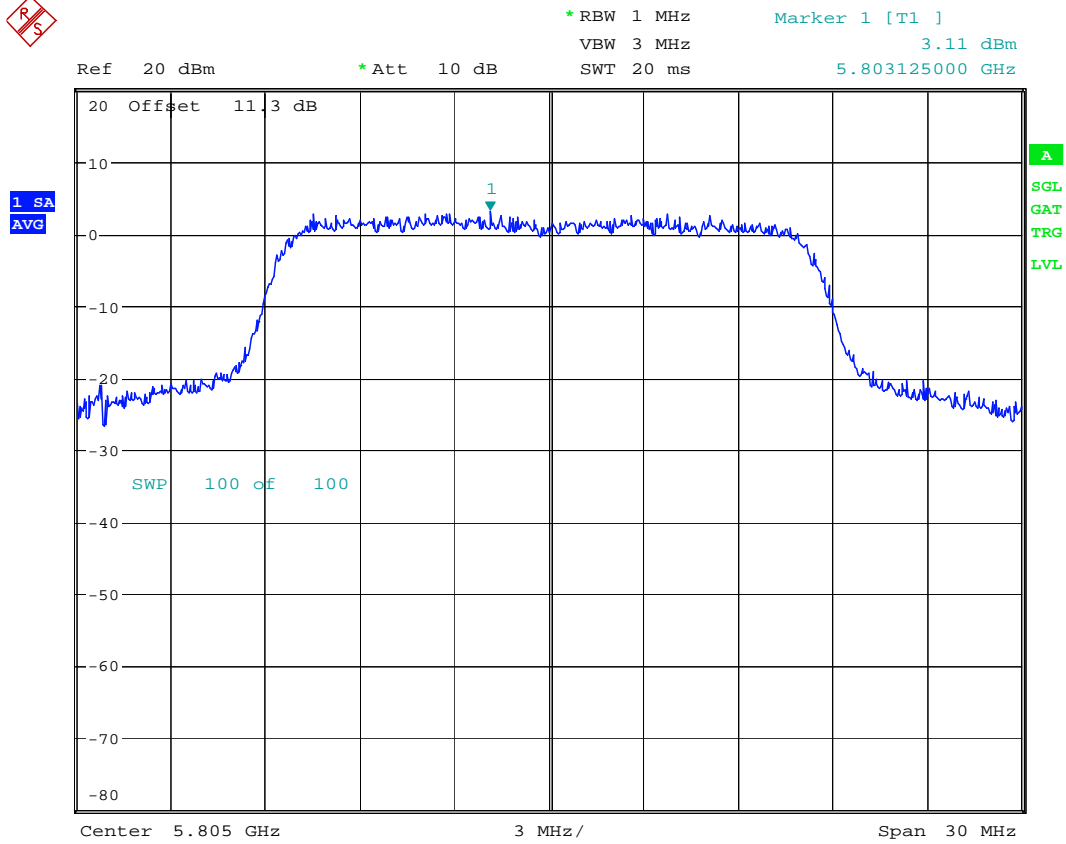
Date: 5.JUL.2007 11:44:28

Peak Power Spectral Density, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.805 GHz

Antenna Gain: 13 dBi



Date: 5.JUL.2007 12:02:20

Peak Power Spectral Density, continued

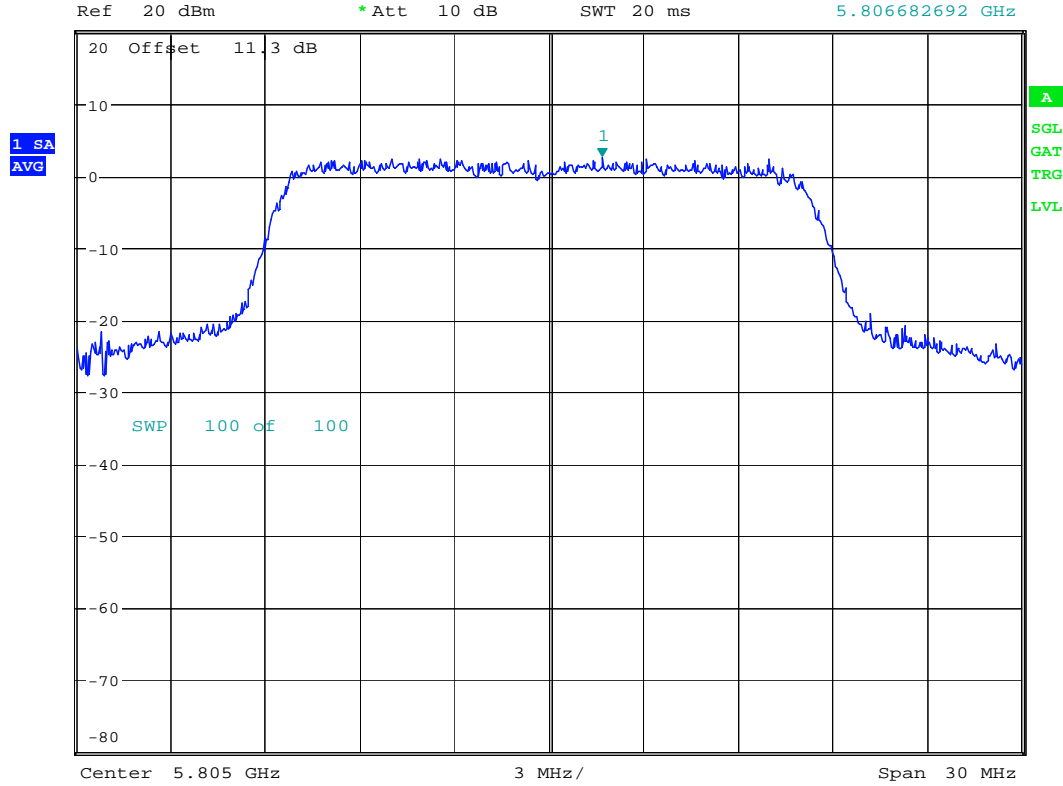
Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.805 GHz

Antenna Gain: 19 dBi



*RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 2.36 dBm
SWT 20 ms 5.806682692 GHz



Date: 5.JUL.2007 12:05:53

Peak Power Spectral Density, continued

Operating Band: 5.725 – 5.825 GHz

Ch. #	Freq. MHz	PPSD dBm/MHz	PPSD Limit dBm/MHz	Margin dB	G _{ANT} dBi	EIRP dBm/MHz	EIRP Limit dBm/MHz	Margin dB
149	5745	3.22	17.0	13.78	13.0	16.22	23.0	6.78
157	5785	3.15	17.0	13.85	13.0	16.15	23.0	6.85
161	5805	3.11	17.0	13.89	13.0	16.11	23.0	6.89
149	5745	3.47	17.0	13.53	19.0	22.47	23.0	0.53
157	5785	2.83	17.0	14.17	19.0	21.83	23.0	1.17
161	5805	2.36	17.0	14.64	19.0	21.36	23.0	1.64

§15.407(a)(6) Peak Excursion Measurement

§15.407(a)(6) 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 Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 6, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Method: FCC Public Notice Ref: DA: 02-2138
Measurement Procedure Updated for Peak Transmit Power in the
Unlicensed National Information Infrastructure (U-NII) Bands

Test Results: Pass (see plots).

Peak Excursion Measurement, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.745 GHz



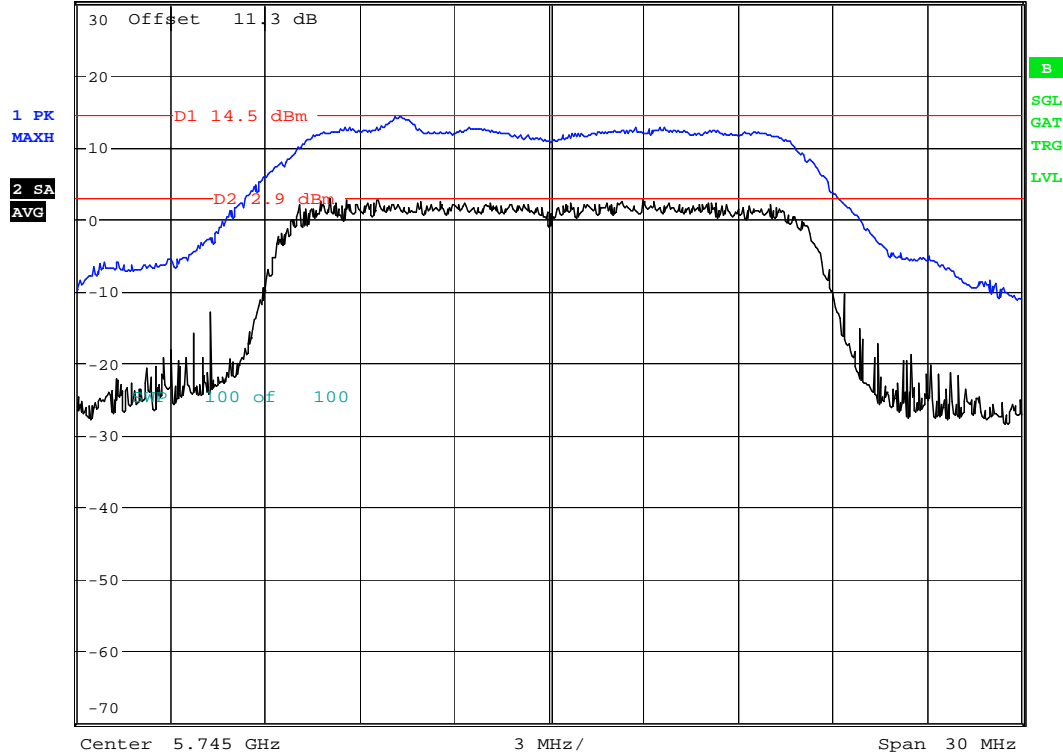
* RBW 1 MHz

VBW 3 MHz

SWT 20 ms

Ref 30 dBm

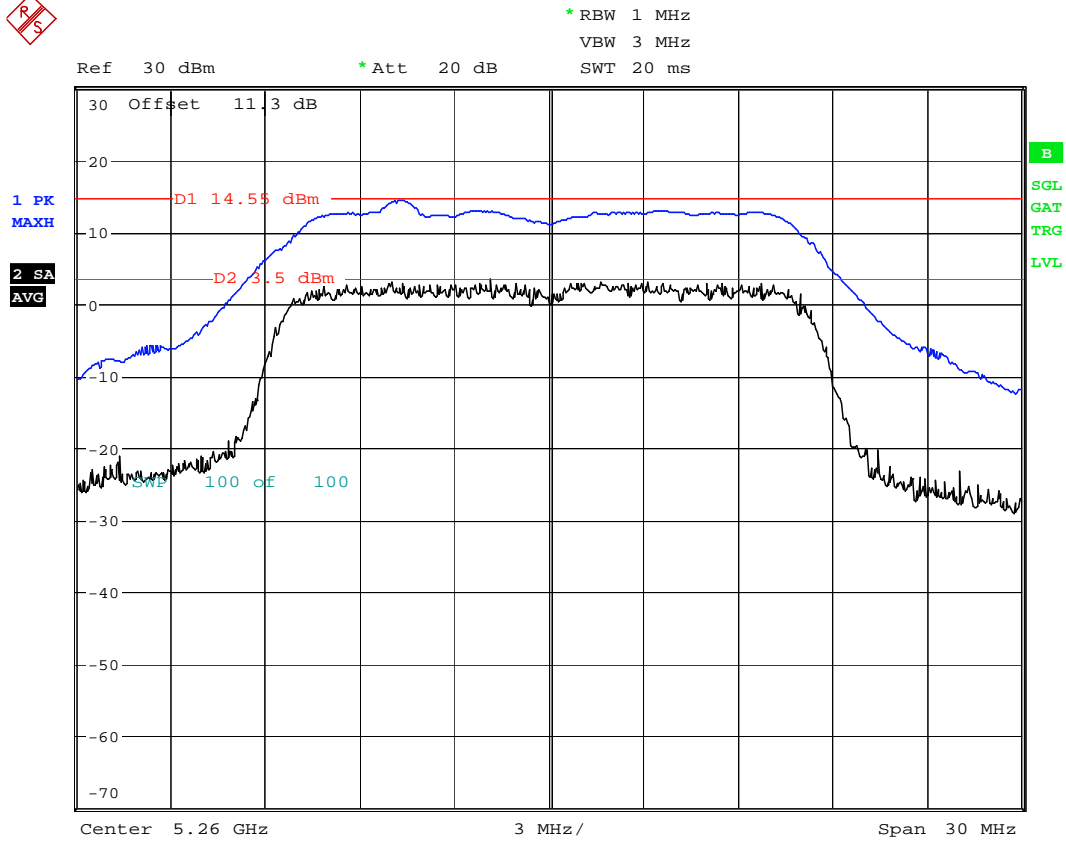
* Att 20 dB



Date: 6.JUL.2007 14:34:54

Peak Excursion Measurement, continued

Operating Band: 5.725 – 5.825 GHz
TX Frequency: 5.785 GHz

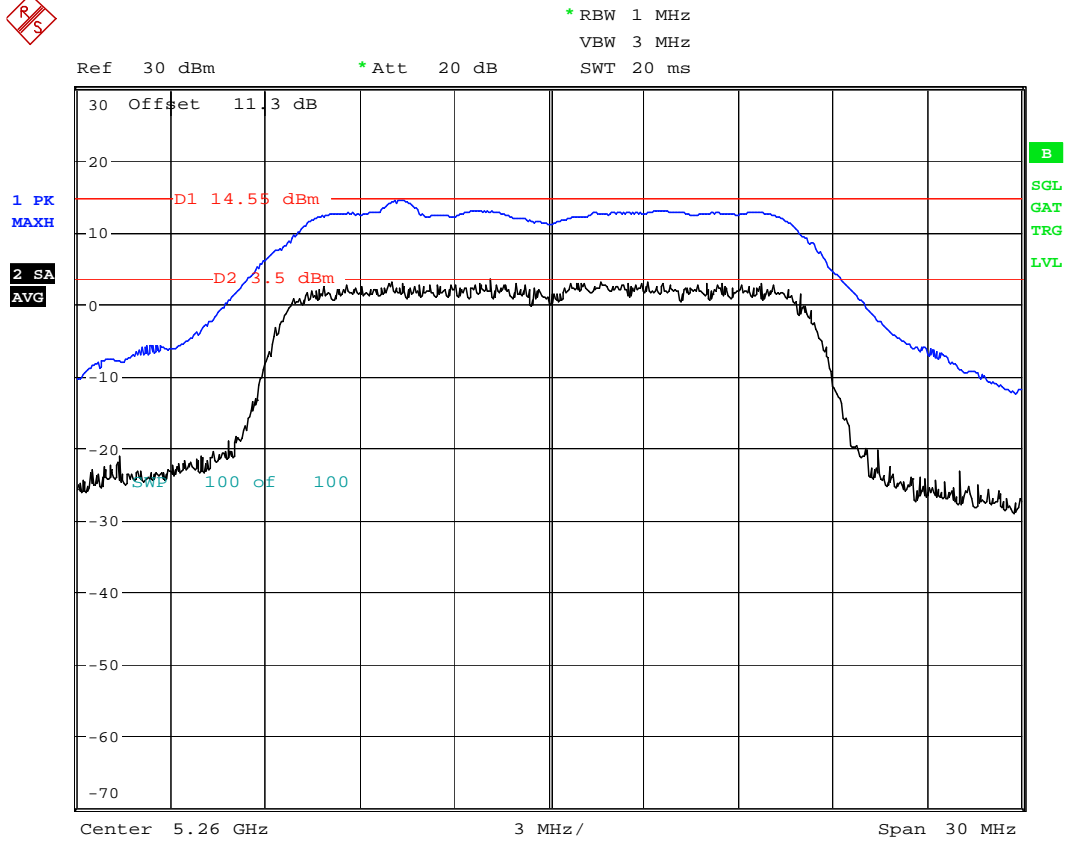


Date: 6.JUL.2007 14:46:33

Peak Excursion Measurement, continued

Operating Band: 5.725 – 5.825 GHz

TX Frequency: 5.805 GHz



Date: 6.JUL.2007 14:46:33

§15.407(b) Undesirable Emissions

§15.407(b) Undesirable emission limits: Except as shown in paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

§15.407(b)(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band.

§15.407(b)(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.

§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.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	October 11, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (See plots).

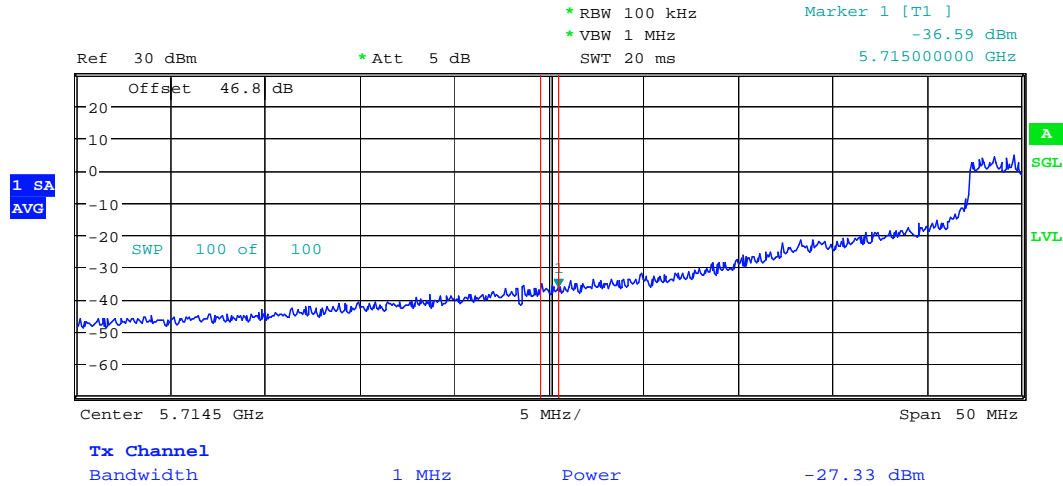
Additional Observations:

The Spectrum was searched from 1GHz to the 40 GHz.
 No harmonics were found within 20dB below the limit.
 Measurements were performed at a distance of 3 meters using a Sample Detector with 1 MHz RBW and VBW ≥ RBW.

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: 10 MHz Below Lower Band Edge (5.715 GHz)

Antenna Gain: 13 dBi
TX Frequency: 5.745 GHz



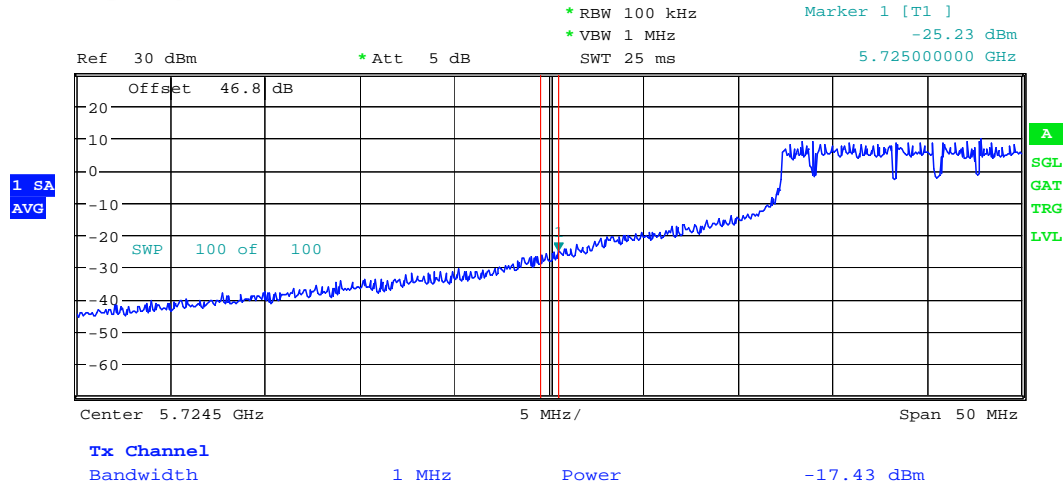
Date: 11.OCT.2007 19:17:06

Integration Interval: 5714 – 5715 MHz
Measured Emission: -27.33 dBm/MHz
Limit: -27 dBm/MHz
Margin: 0.33 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: Lower (5.725 GHz)

Antenna Gain: 13 dBi
TX Frequency: 5.745 GHz



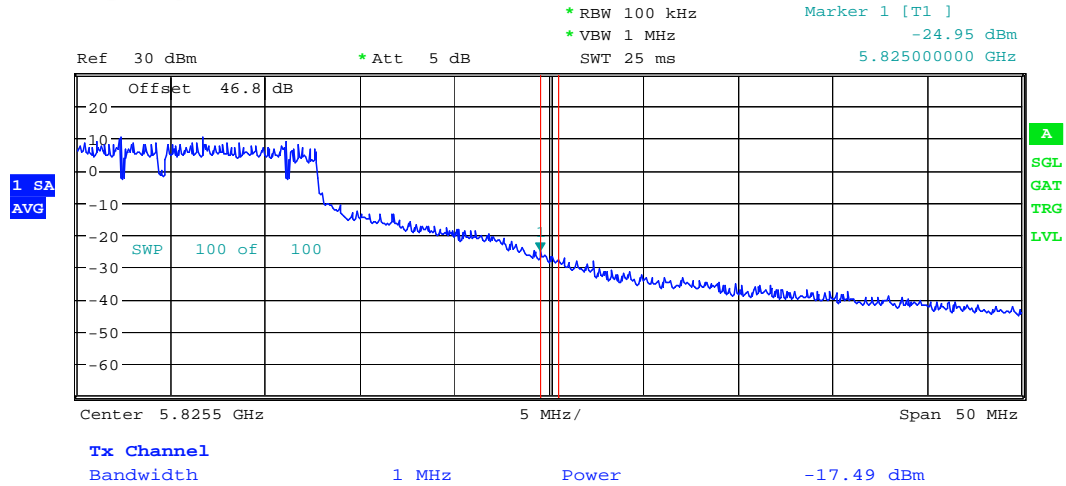
Date: 11.OCT.2007 19:20:04

Integration Interval: 5724 – 5725 MHz
Measured Emission: -17.43 dBm/MHz
Limit: -17 dBm/MHz
Margin: 0.43 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: Upper (5.825 GHz)

Antenna Gain: 13 dBi
TX Frequency: 5.805 GHz



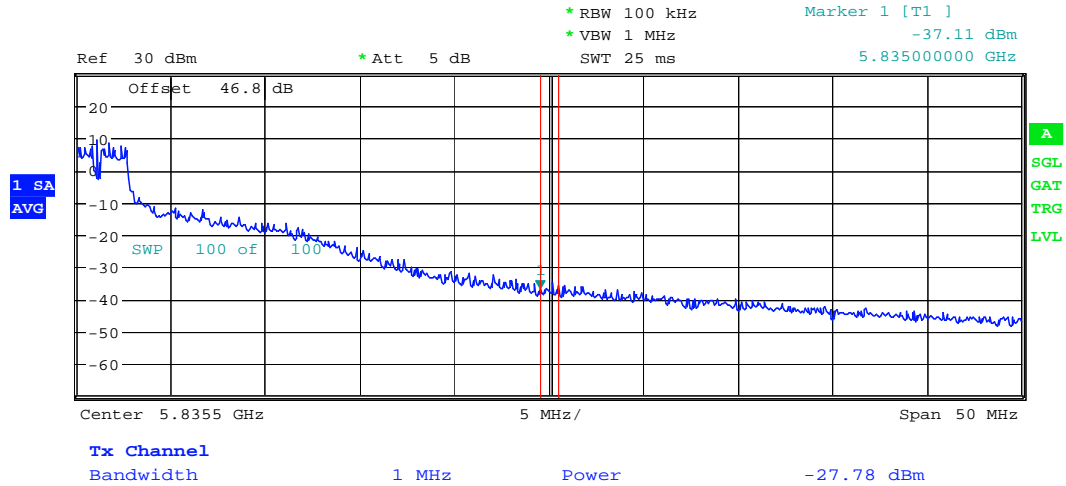
Date: 11.OCT.2007 19:24:13

Integration Interval: 5825 – 5826 MHz
Measured Emission: -17.49 dBm/MHz
Limit: -17 dBm/MHz
Margin: 0.49 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: 10 MHz Above Upper Band Edge (5.835 GHz)

Antenna Gain: 13 dBi
TX Frequency: 5.805 GHz



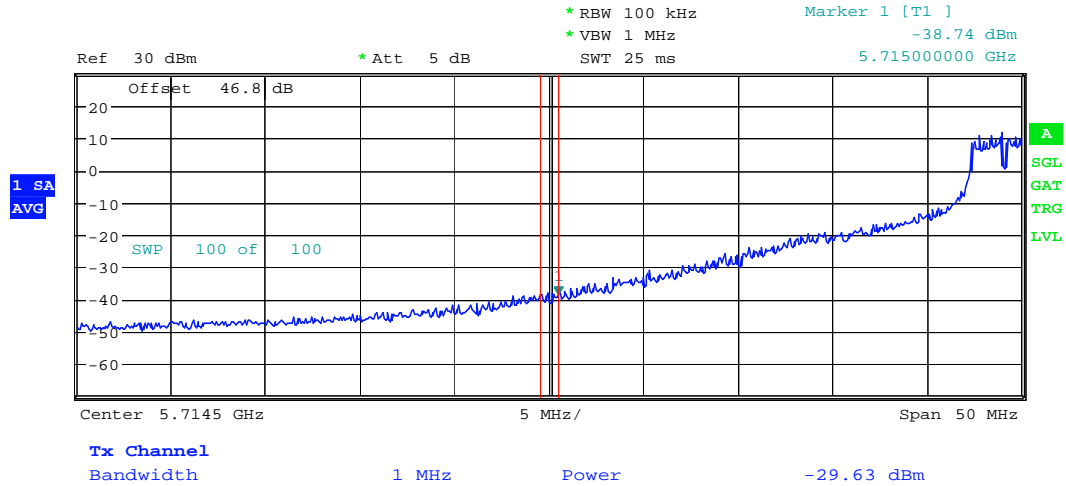
Date: 11.OCT.2007 19:27:41

Integration Interval: 5835 – 5836 MHz
Measured Emission: -27.78 dBm/MHz
Limit: -27 dBm/MHz
Margin: 0.78 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: 10 MHz Below Lower Band Edge (5.715 GHz)

Antenna Gain: 19 dBi
TX Frequency: 5.745 GHz



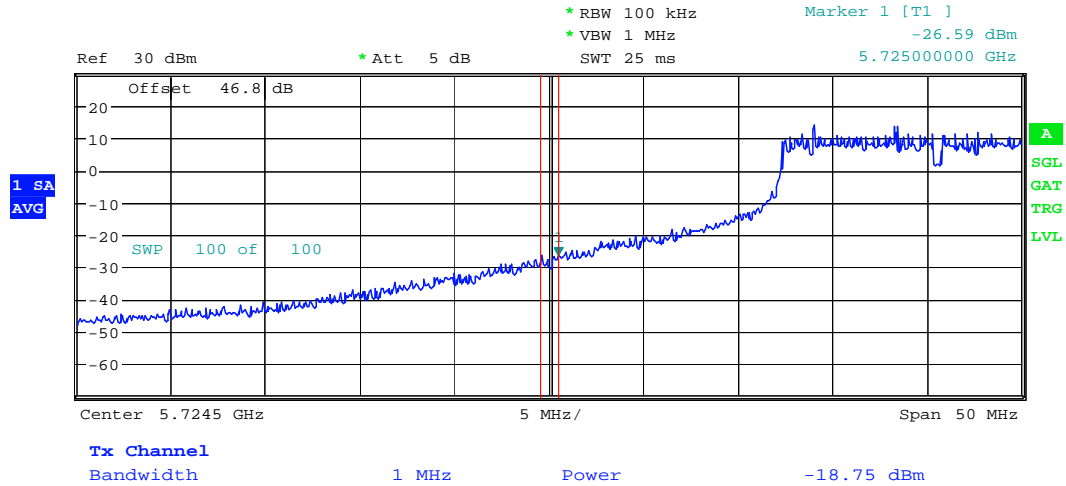
Date: 11.OCT.2007 18:13:53

Integration Interval: 5714 – 5715 MHz
Measured Emission: -29.63 dBm/MHz
Limit: -27 dBm/MHz
Margin: 2.63 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: Lower (5.725 GHz)

Antenna Gain: 19 dBi
TX Frequency: 5.745 GHz



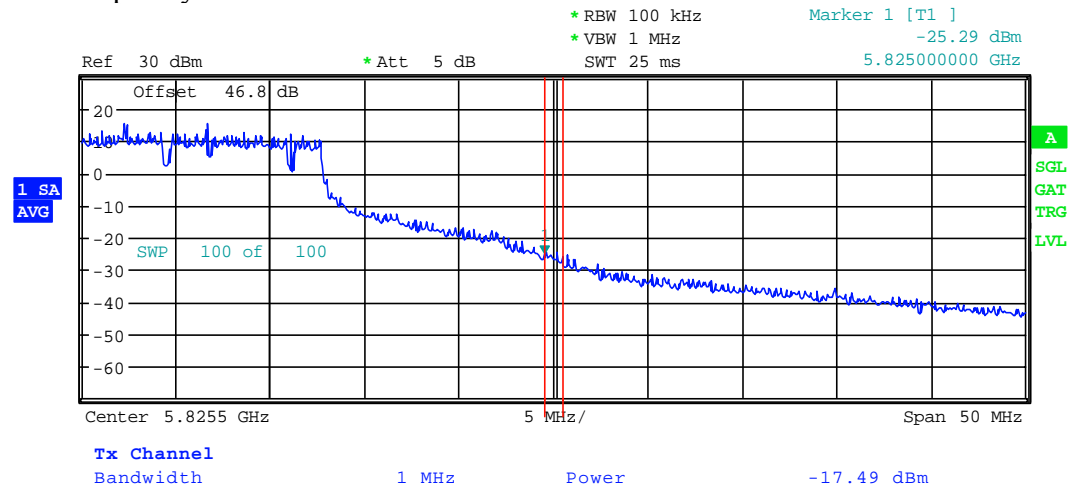
Date: 11.OCT.2007 18:16:20

Integration Interval: 5724 – 5725 MHz
Measured Emission: -18.75 dBm/MHz
Limit: -17 dBm/MHz
Margin: 1.75 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: Upper (5.825 GHz)

Antenna Gain: 19 dBi
TX Frequency: 5.805 GHz



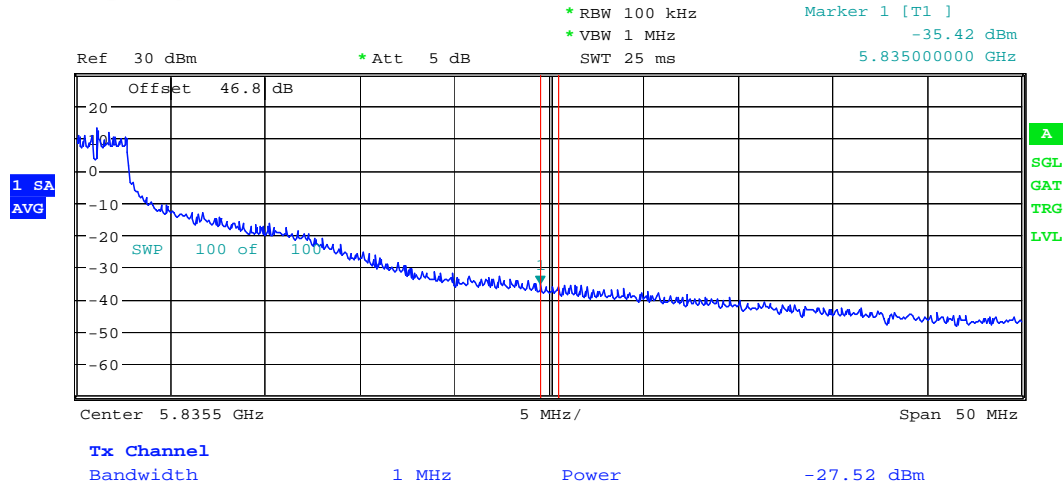
Date: 11.OCT.2007 18:25:36

Integration Interval: 5825 – 5826 MHz
Measured Emission: -17.49 dBm/MHz
Limit: -17 dBm/MHz
Margin: 0.49 dB

Undesirable Emissions, continued

Operating Band: 5.725 – 5.825 GHz
Band Edge: 10 MHz Above Upper Band Edge (5.835 GHz)

Antenna Gain: 19 dBi
TX Frequency: 5.805 GHz



Date: 11.OCT.2007 18:29:39

Integration Interval: 5835 – 5836 MHz
Measured Emission: -27.52 dBm/MHz
Limit: -27 dBm/MHz
Margin: 0.52 dB

Undesirable Emissions, continued

Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Sig. Sub. Factor	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Reading	Amp.
1 1947.835	Horn2	V	32.9	N/A	-47.9	-27.0	20.9	Average	5-18GHz
2 2469.475	Horn2	V	32.4	N/A	-52.9	-27.0	25.9	Average	5-18GHz
3 3856.735	Horn2	V	31.9	N/A	-48.4	-27.0	21.4	Average	5-18GHz
4 4886.54	Horn2	V	31.5	N/A	-44.4	-27.0	17.4	Average	5-18GHz
5 1947.835	Horn2	H	30.5	N/A	-59.4	-27.0	32.4	Average	5-18GHz
6 2469.475	Horn2	H	30.0	N/A	-58.5	-27.0	31.5	Average	5-18GHz

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: nf – noise floor

Note 3: Measurements were performed using Peak Detector and 1MHz RBW / 10Hz VBW

Harmonics:

Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Sig. Sub. Factor	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Reading	Amp.
1 11490	Horn2	V	37.0	N/A	-58.8	-27.0	31.8	Average	5-18GHz
2 11570	Horn2	V	33.6	N/A	-62.1 nf	-27.0	35.1	Average	5-18GHz
3 11610	Horn2	V	33.3	N/A	-62.4 nf	-27.0	35.4	Average	5-18GHz
4 11490	Horn2	H	37.8	N/A	-58.0	-27.0	31.0	Average	5-18GHz
5 11570	Horn2	H	34.6	N/A	-61.1 nf	-27.0	34.1	Average	5-18GHz
6 11610	Horn2	H	35.9	N/A	-59.8	-27.0	32.8	Average	5-18GHz

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: nf – noise floor

Note 3: Measurements were performed using Peak Detector and 1MHz RBW / 10Hz VBW

The Spectrum was searched from 1GHz to the 40 GHz.
 Tested with the highest gain antenna connected to the EUT.

§15.407(b)(6) Unwanted emissions below 1 GHz

§15.407 (b)(6) Unwanted emissions below 1 GHz
 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 50µH/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 (a) Radiated emission limits; general requirements

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 (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100 ⁽¹⁾	3
88-216	150 ⁽²⁾	3
216-960	200 ⁽³⁾	3
Above 960	500	3

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 2 – 13, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see attached plots and table).

Additional Observations:

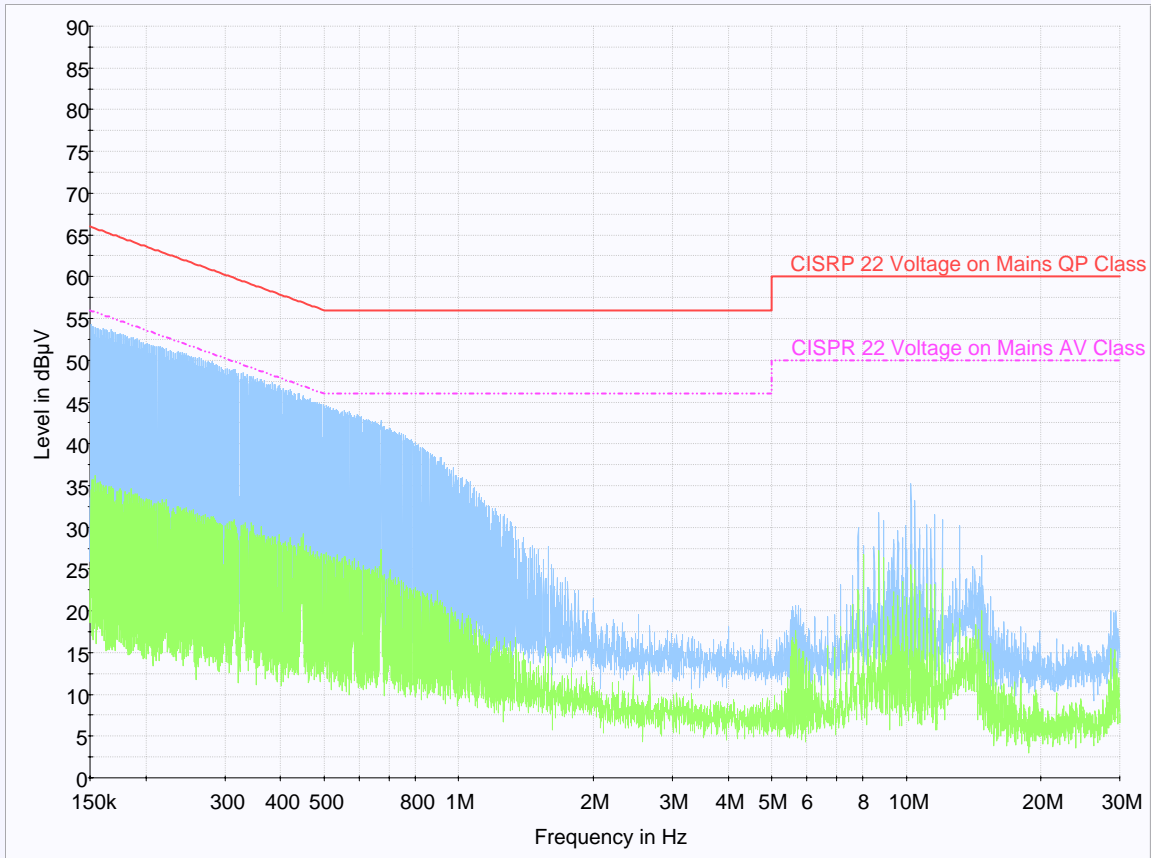
The spectrum was searched for radiated emissions from 30MHz to 1GHz. All radiated measurements were performed at a distance of 3 meters using a test receiver in Peak Detector mode with 120 kHz RBW and VBW > RBW.

Unwanted emissions below 1 GHz, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/12VDC Adapter

Line: LIVE



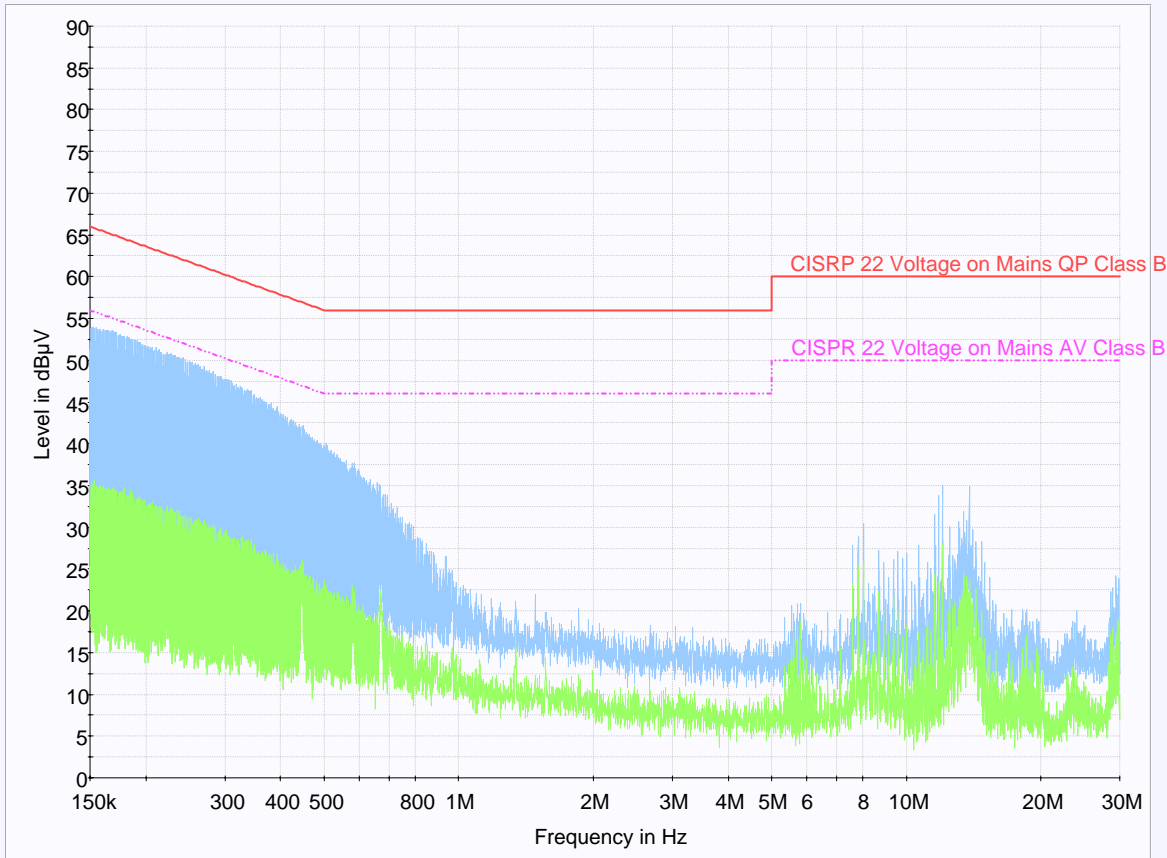
— CISRP 22 Voltage on Mains QP Class B - - - CISPR 22 Voltage on Mains AV Class B
— Preview Measurement Peak Detector — Preview Measurement Average Detector

Unwanted emissions below 1 GHz, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/12VDC Adapter

Line: NEUTRAL



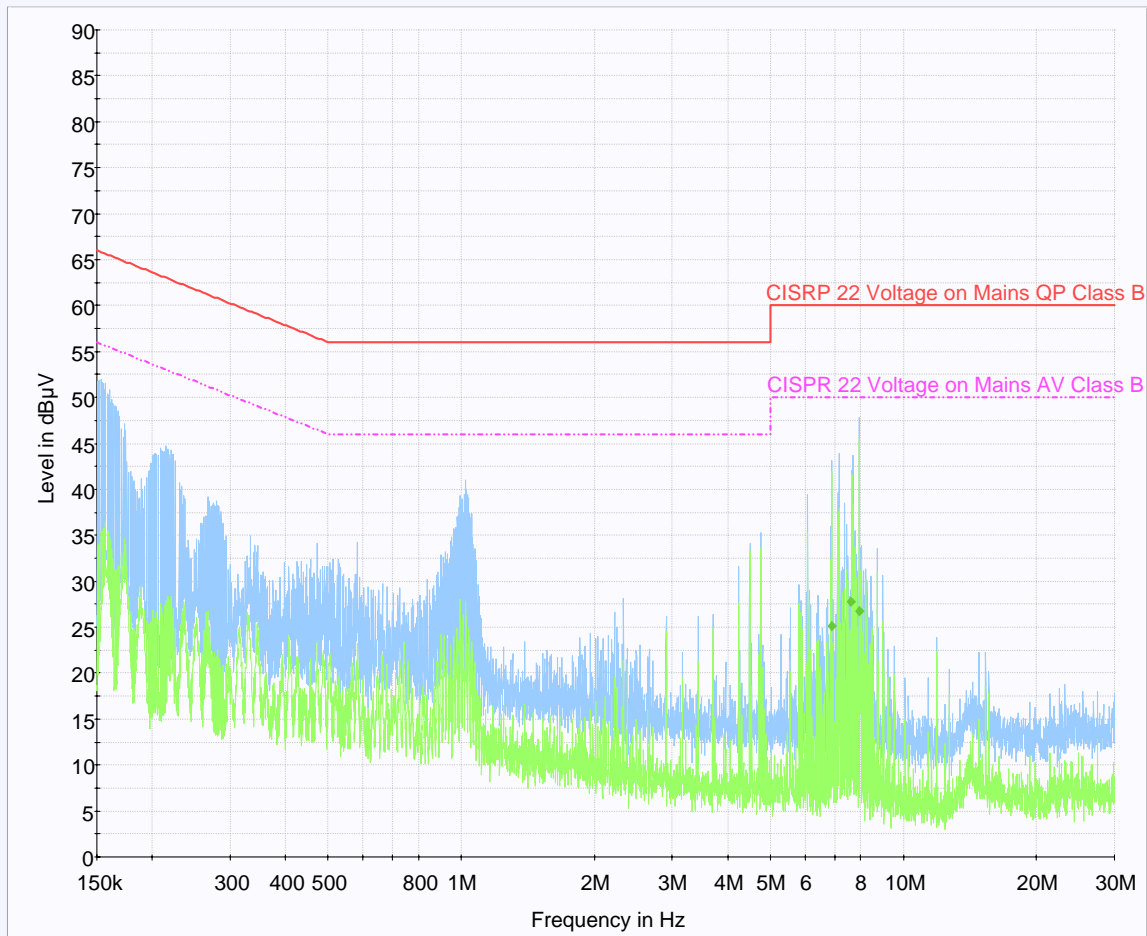
— CISRP 22 Voltage on Mains QP Class B - - - CISPR 22 Voltage on Mains AV Class B
— Preview Measurement Peak Detector — Preview Measurement Average Detector

Unwanted emissions below 1 GHz, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/24VAC Adapter (Transformer)

Line: LIVE



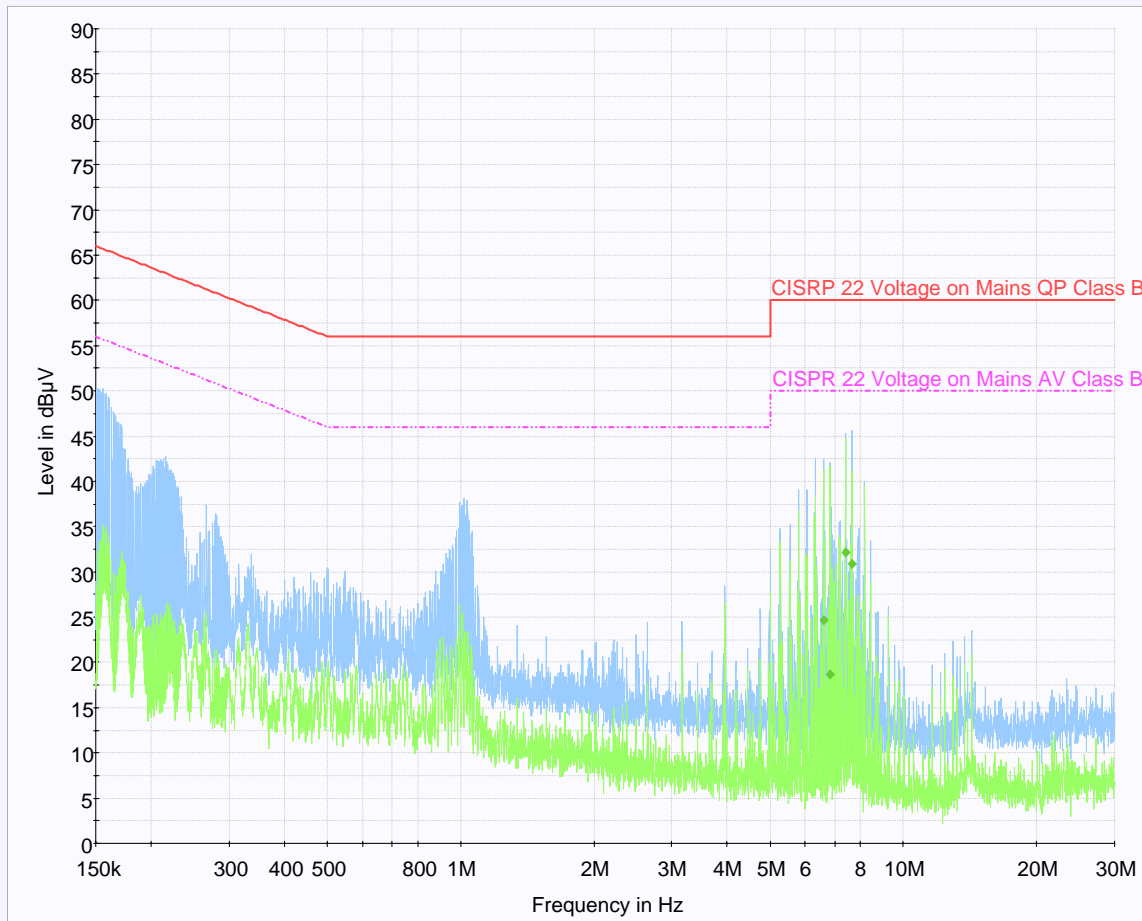
- CISRP 22 Voltage on Mains QP Class B
- CISPR 22 Voltage on Mains AV Class B
- Preview Measurement Peak Detector
- Preview Measurement Average Detector
- ◆ Final Measurement Average Detector

Unwanted emissions below 1 GHz, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/24VAC Adapter (Transformer)

Line: NEUTRAL



— CISRP 22 Voltage on Mains QP Class B - - - CISPR 22 Voltage on Mains AV Class B
— Preview Measurement Peak Detector — Preview Measurement Quasi-Peak Detector
◆ Final Measurement Average Detector

Unwanted emissions below 1 GHz, continued

15.209(a) Radiated Emissions below 1GHz – General Requirements

Tested with the highest gain antenna connected to the EUT.

Measurements were performed at a distance of 3 meters by means of a test receiver with Q-peak detector and 120 kHz RBW.

	Frequency (MHz)	Test Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	94.4950	BC1	V	22.0	9.2	1.0	32.2	43.5	11.3
2	161.9900	BC1	V	17.0	13.1	1.3	31.4	43.5	12.1
3	175.4930	BC1	V	15.5	13.6	1.3	30.4	43.5	13.1
4	188.9920	BC1	V	22.5	14.2	1.4	38.1	43.5	5.4
5	215.9910	BC1	V	19.2	15.2	1.6	36.0	43.5	7.6
6	94.4950	BC1	H	8.0	8.3	1.0	17.3	43.5	26.2
7	161.9900	BC1	H	18.1	12.2	1.3	31.6	43.5	11.9
8	175.4930	BC1	H	21.8	12.5	1.3	35.6	43.5	7.9
9	188.9920	BC1	H	25.0	13.2	1.4	39.6	43.5	3.9
10	215.9910	BC1	H	26.6	14.8	1.6	43.0	43.5	0.6
11	300.0000	LP1	V	22.9	15.1	1.5	39.5	46.0	6.6
12	377.9855	LP1	V	14.8	15.2	1.9	31.9	46.0	14.1
13	431.9829	LP1	V	15.5	16.3	2.1	33.9	46.0	12.2
14	512.9804	LP1	V	11.0	18.6	2.2	31.8	46.0	14.2
15	300.0000	LP1	H	22.5	15.4	1.5	39.3	46.0	6.7
16	377.9855	LP1	H	19.8	15.5	1.9	37.2	46.0	8.8
17	431.9829	LP1	H	17.0	16.6	2.1	35.7	46.0	10.3
18	512.9804	LP1	H	13.0	19.0	2.2	34.2	46.0	11.8

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Q-Peak detector used

§15.407 (b)(7) Spurious emissions within restricted bands (radiated)

§15.407 (b)(7) The provisions of §15.205 apply to intentional radiators operating under this section.

§15.205 (b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands (restricted bands of operation) shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	October 10, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See attached plots.

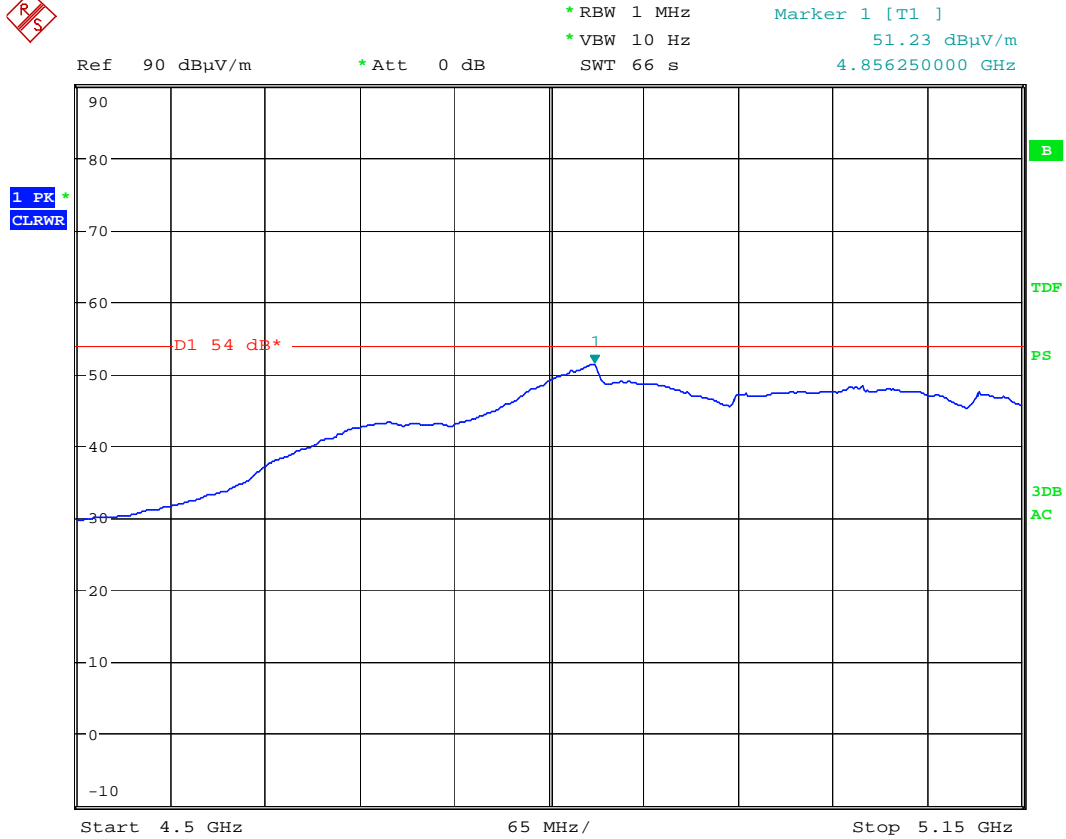
Additional Observations:

These results apply to emissions found in the Restricted Bands defined in FCC Part 15 Subpart C, 15.205.
The Spectrum was searched from 30MHz to 40 GHz.

Measurements (on frequencies above 1GHz) were performed at 3 meter distance using Peak Detector mode with RBW = 1MHz / VBW = 1MHz to obtain peak readings and RBW = 1MHz / VBW = 10Hz to obtain average readings.

Spurious Emissions Within Restricted Bands, continued

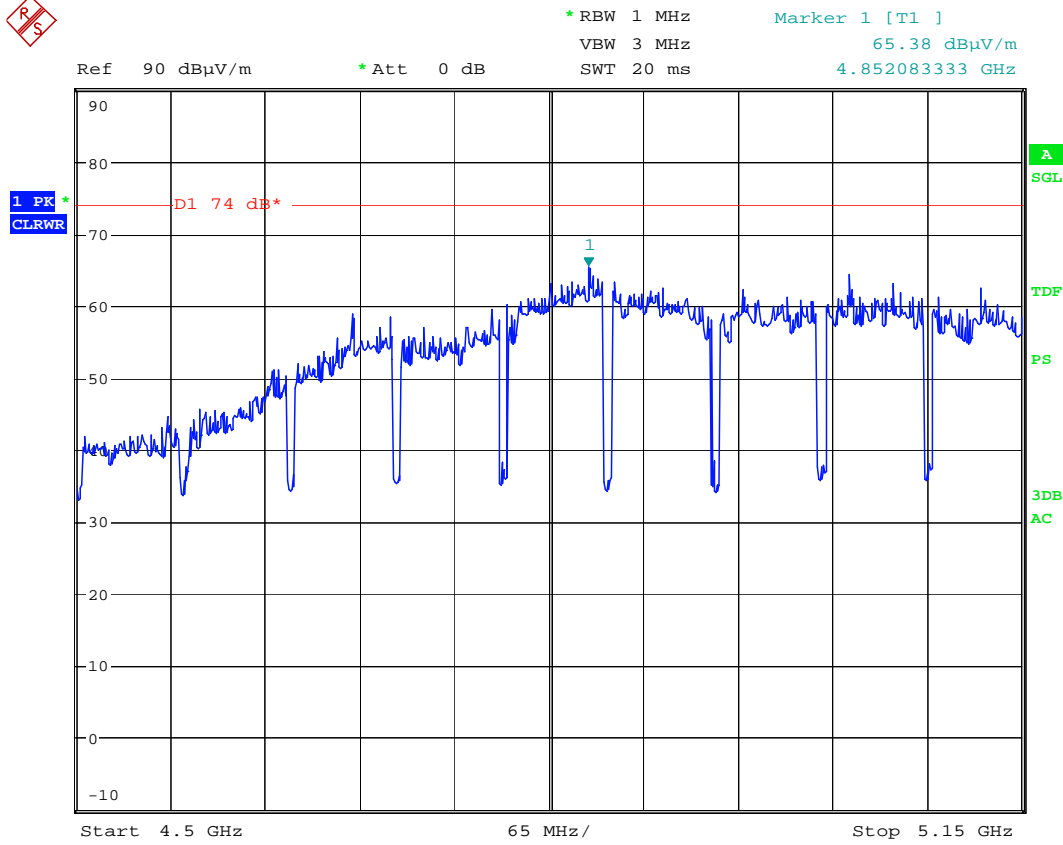
Antenna: 13 dBi
TX Frequency: 5.745 GHz
Restricted Band: 4.50 – 5.15 GHz
Average Limit: 54 dBμV/m



Date: 10.OCT.2007 20:54:58

Spurious Emissions Within Restricted Bands, continued

Antenna: 13 dBi
TX Frequency: 5.745 GHz
Restricted Band: 4.50 – 5.15 GHz
Peak Limit: 74 dB μ V/m



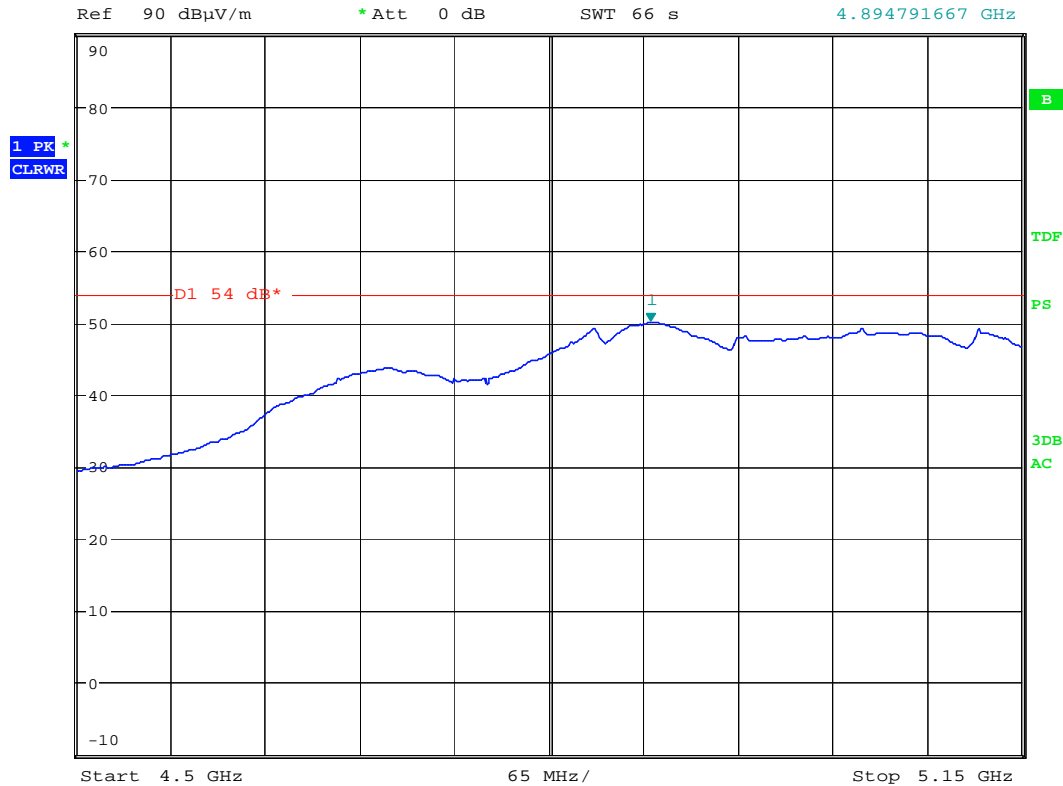
Date: 10.OCT.2007 20:53:09

Spurious Emissions Within Restricted Bands, continued

Antenna: 13 dBi
TX Frequency: 5.805 GHz
Restricted Band: 4.50 – 5.15 GHz
Average Limit: 54 dBμV/m



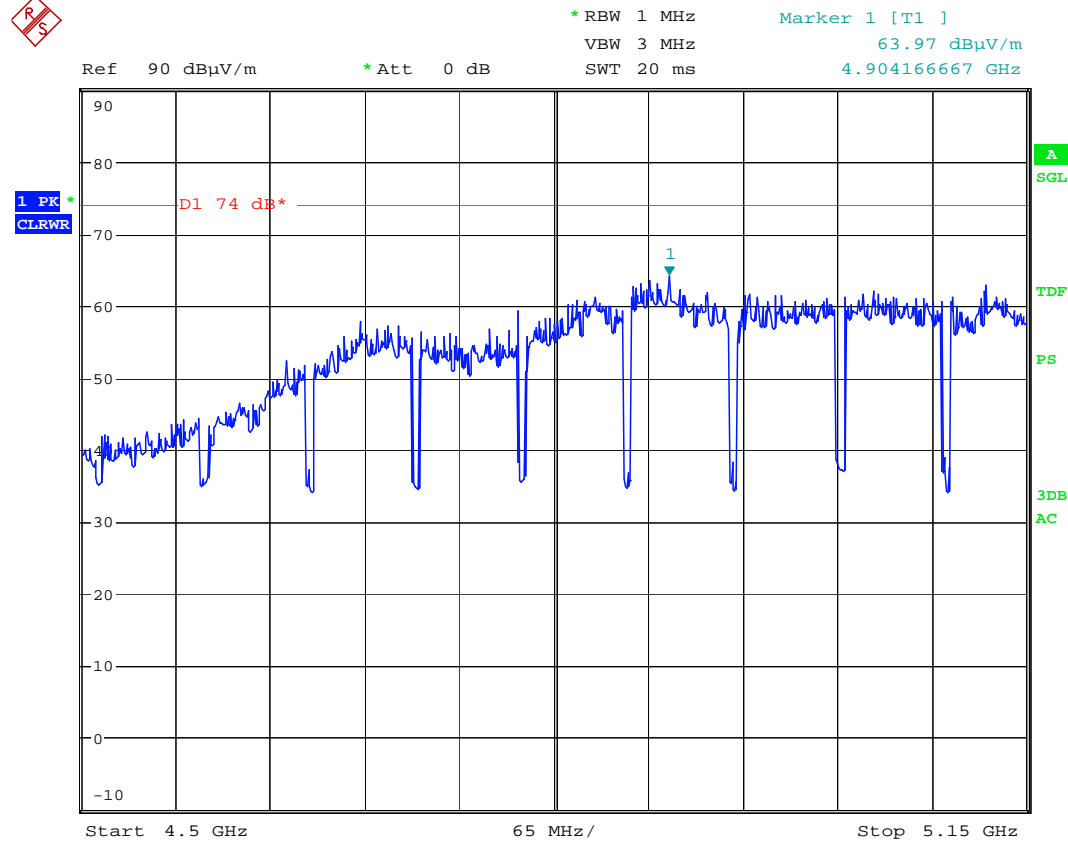
*RBW 1 MHz Marker 1 [T1]
*VBW 10 Hz 50.05 dBμV/m
SWT 66 s 4.894791667 GHz



Date: 10.OCT.2007 20:48:11

Spurious Emissions Within Restricted Bands, continued

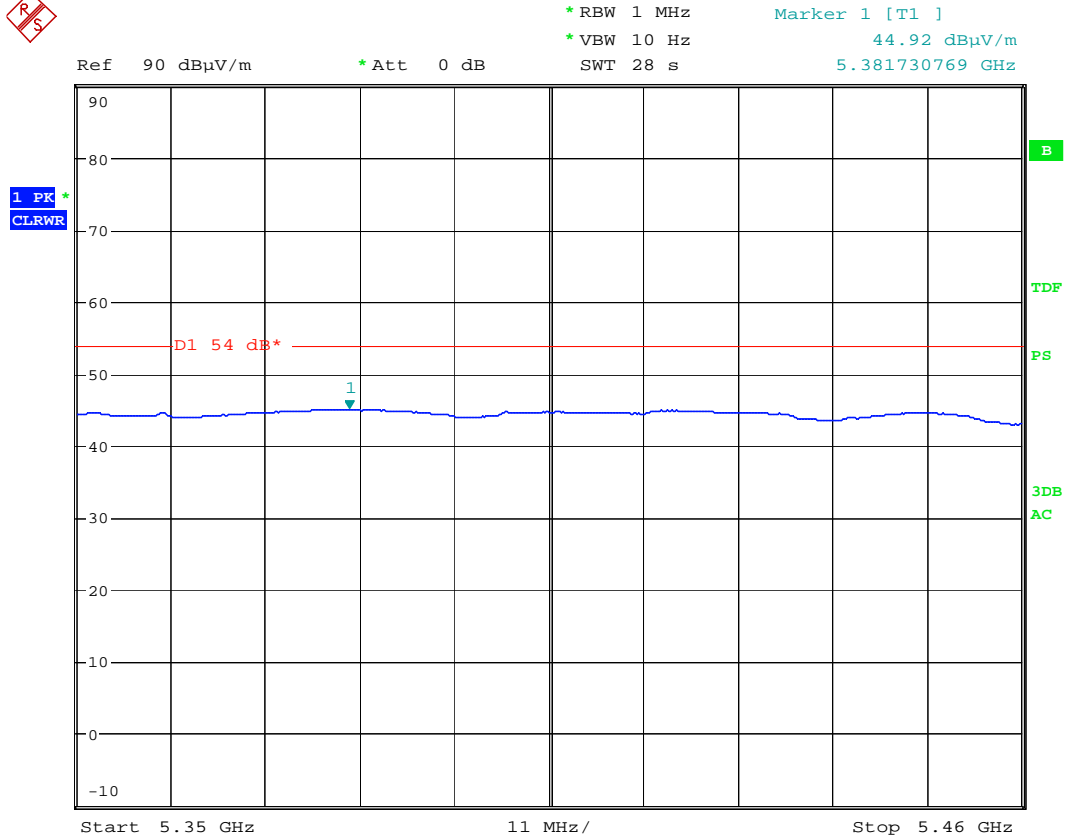
Antenna: 13 dBi
TX Frequency: 5.805 GHz
Restricted Band: 4.50 – 5.15 GHz
Peak Limit: 74 dB μ V/m



Date: 10.OCT.2007 20:49:03

Spurious Emissions Within Restricted Bands, continued

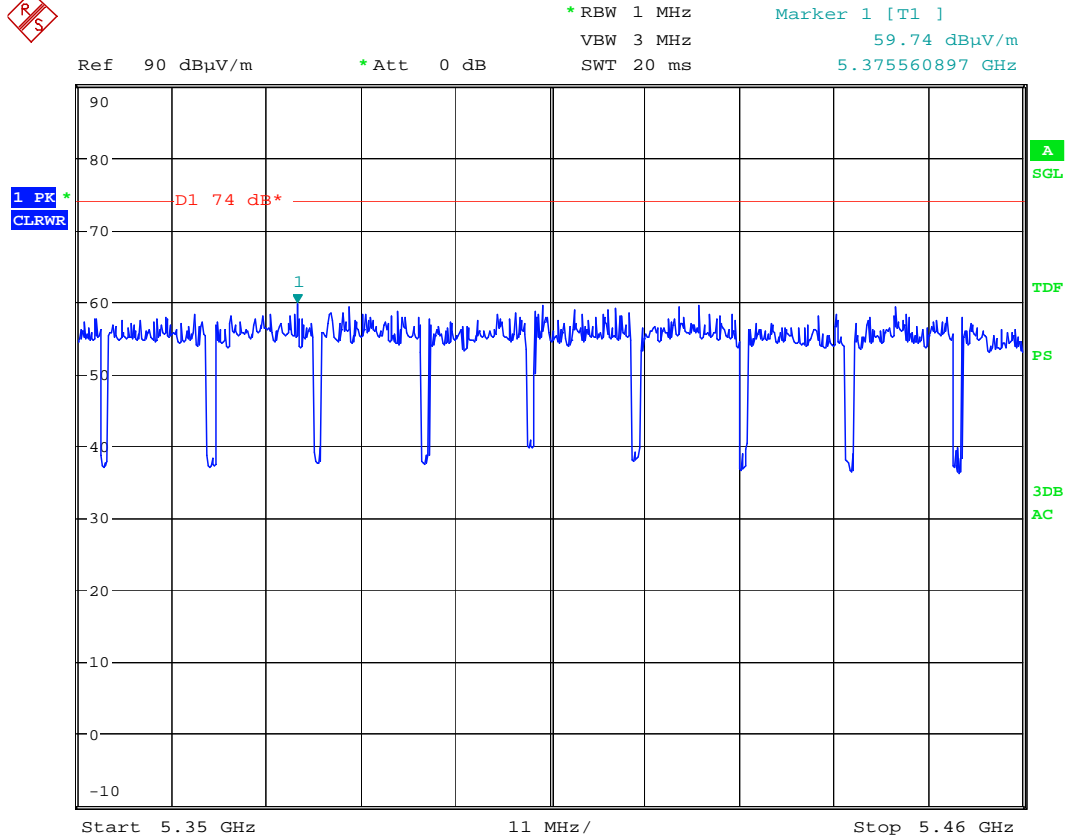
Antenna: 13 dBi
TX Frequency: 5.745 GHz
Restricted Band: 5.35 – 5.46 GHz
Average Limit: 54 dB μ V/m



Date: 10.OCT.2007 20:37:57

Spurious Emissions Within Restricted Bands, continued

Antenna: 13 dBi
TX Frequency: 5.745 GHz
Restricted Band: 5.35 – 5.46 GHz
Peak Limit: 74 dB μ V/m



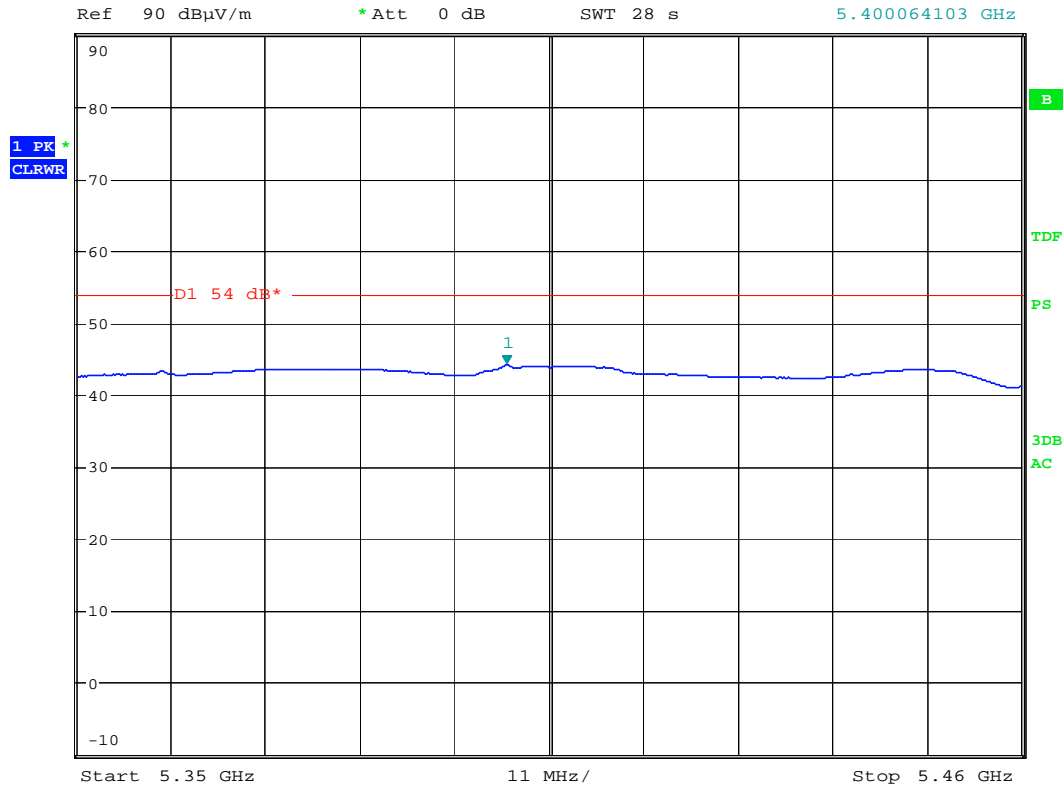
Date: 10.OCT.2007 20:36:33

Spurious Emissions Within Restricted Bands, continued

Antenna: 13 dBi
TX Frequency: 5.805 GHz
Restricted Band: 5.35 – 5.46 GHz
Average Limit: 54 dB μ V/m



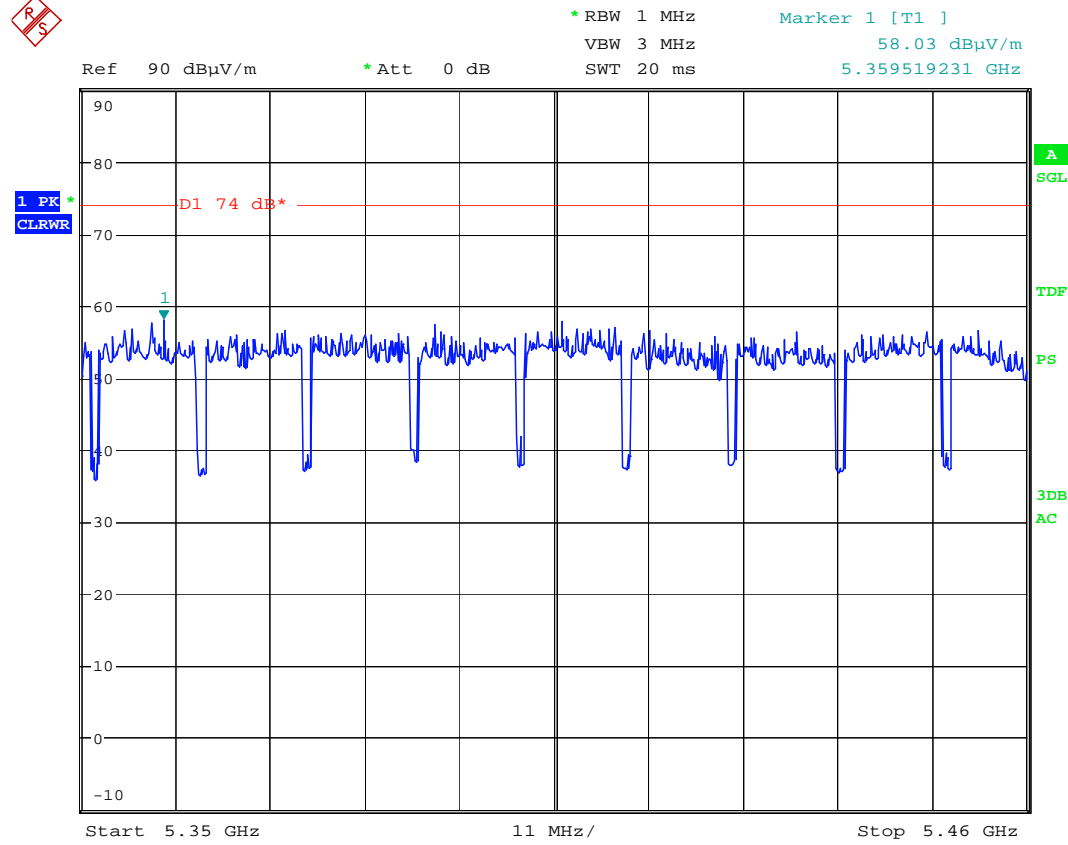
*RBW 1 MHz Marker 1 [T1]
*VBW 10 Hz 44.06 dB μ V/m
SWT 28 s 5.400064103 GHz



Date: 10.OCT.2007 20:44:41

Spurious Emissions Within Restricted Bands, continued

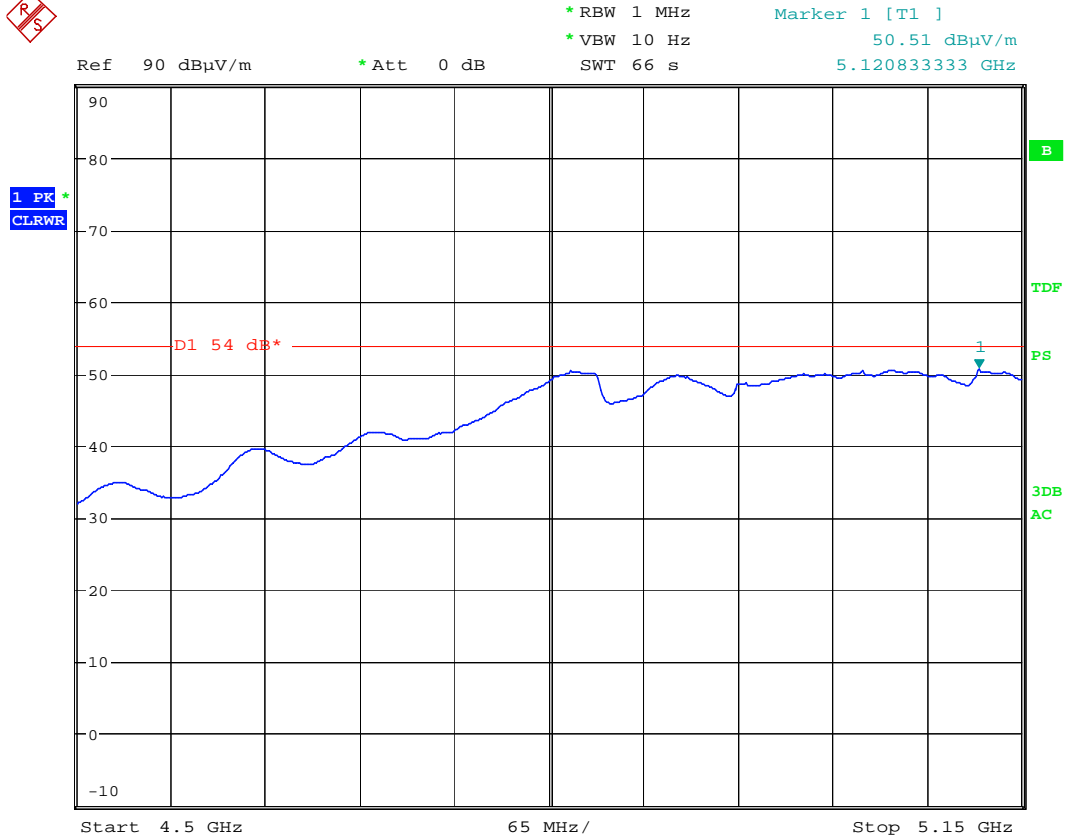
Antenna: 13 dBi
TX Frequency: 5.805 GHz
Restricted Band: 5.35 – 5.46 GHz
Peak Limit: 74 dB μ V/m



Date: 10.OCT.2007 20:45:19

Spurious Emissions Within Restricted Bands, continued

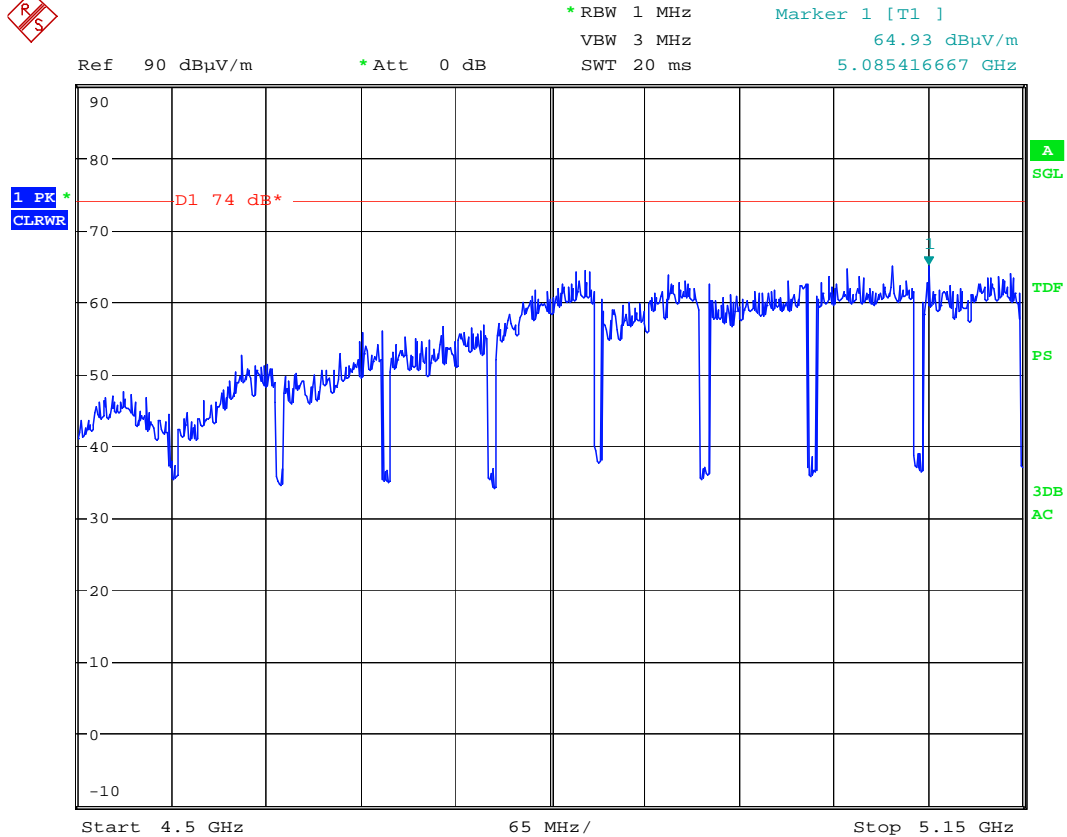
Antenna: 19 dBi
TX Frequency: 5.745 GHz
Restricted Band: 4.50 – 5.15 GHz
Average Limit: 54 dB μ V/m



Date: 10.OCT.2007 19:47:27

Spurious Emissions Within Restricted Bands, continued

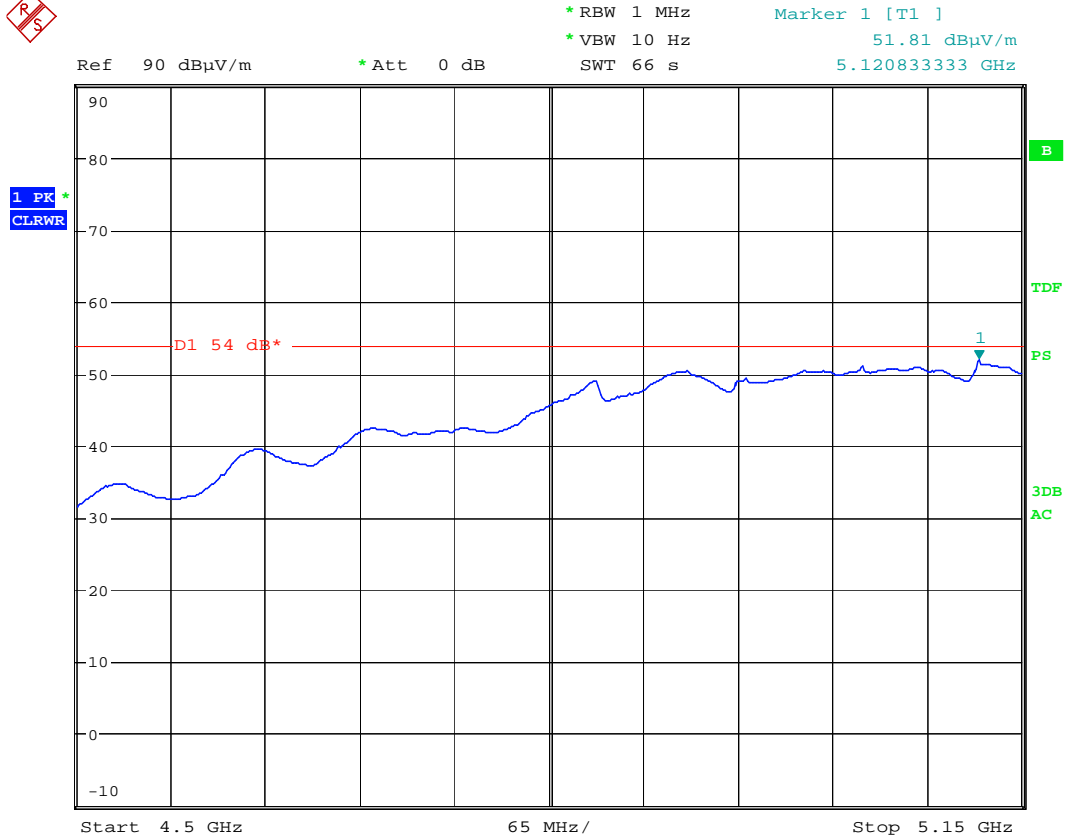
Antenna: 19 dBi
TX Frequency: 5.745 GHz
Restricted Band: 4.50 – 5.15 GHz
Peak Limit: 74 dBμV/m



Date: 10.OCT.2007 19:48:10

Spurious Emissions Within Restricted Bands, continued

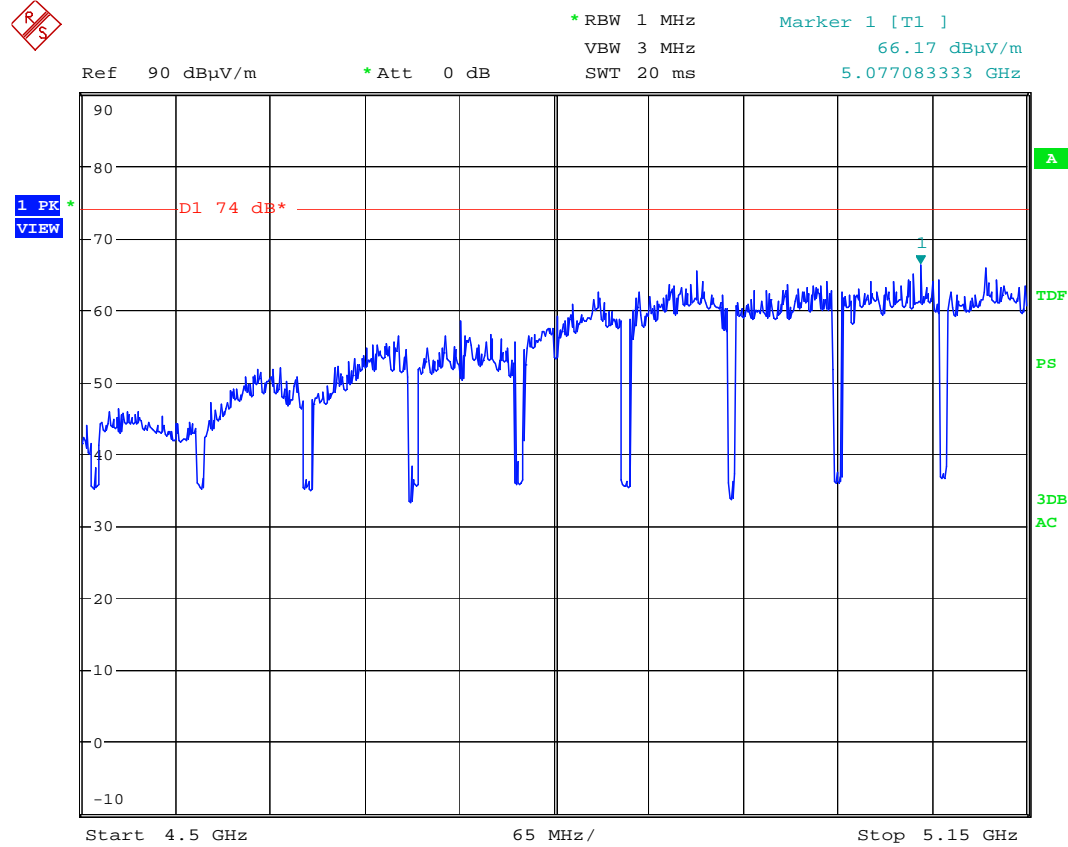
Antenna: 19 dBi
TX Frequency: 5.805 GHz
Restricted Band: 4.50 – 5.15 GHz
Average Limit: 54 dB μ V/m



Date: 10.OCT.2007 20:22:05

Spurious Emissions Within Restricted Bands, continued

Antenna: 19 dBi
TX Frequency: 5.805 GHz
Restricted Band: 4.50 – 5.15 GHz
Peak Limit: 74 dB μ V/m



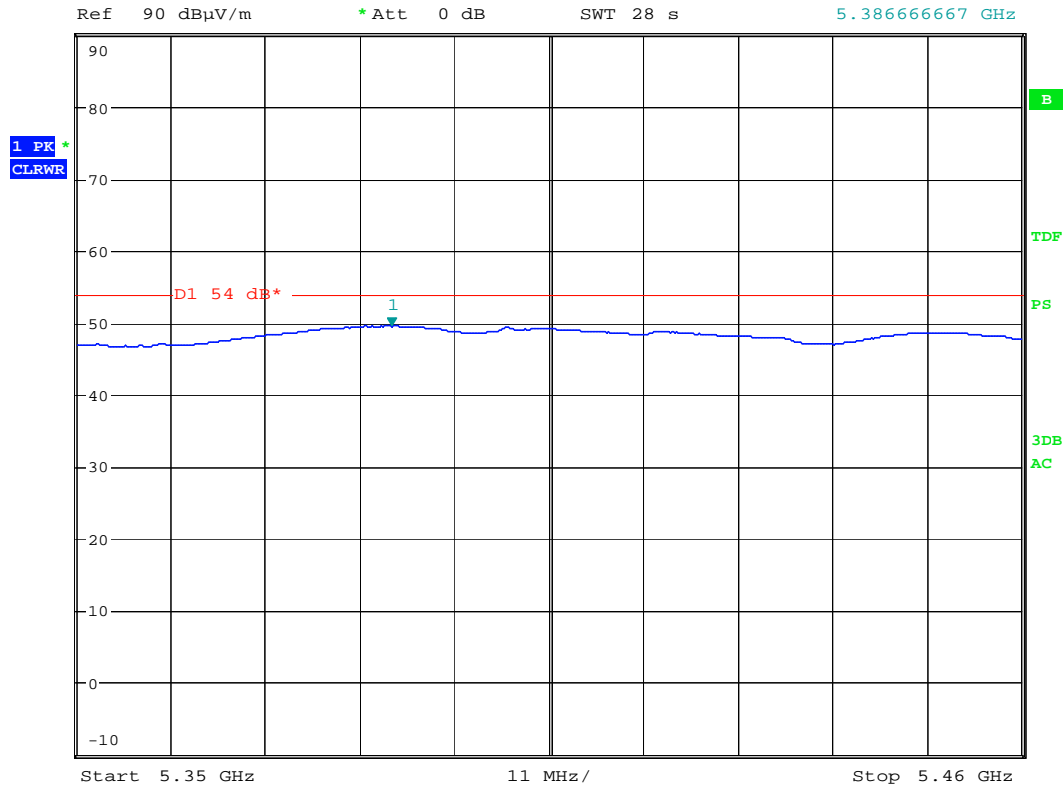
Date: 10.OCT.2007 19:52:28

Spurious Emissions Within Restricted Bands, continued

Antenna: 19 dBi
TX Frequency: 5.745 GHz
Restricted Band: 5.35 – 5.46 GHz
Average Limit: 54 dB μ V/m



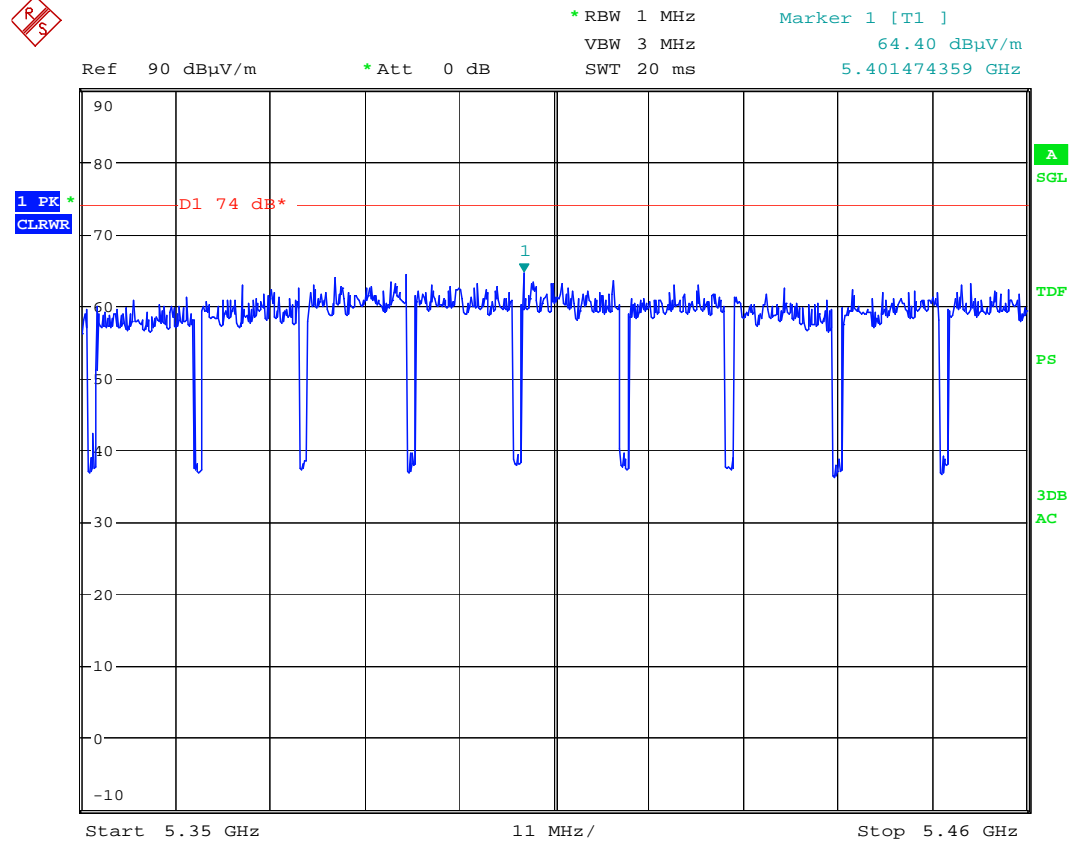
*RBW 1 MHz Marker 1 [T1]
*VBW 10 Hz 49.44 dB μ V/m
SWT 28 s 5.386666667 GHz



Date: 10.OCT.2007 19:43:14

Spurious Emissions Within Restricted Bands, continued

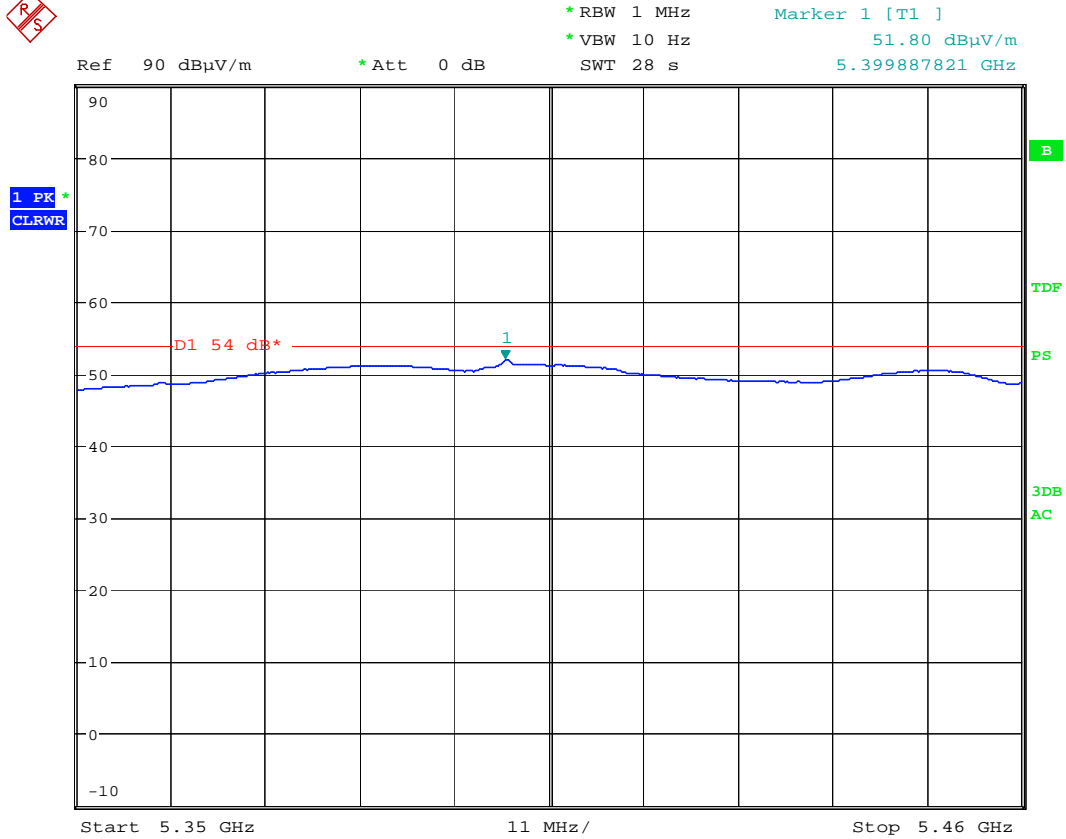
Antenna: 19 dBi
TX Frequency: 5.745 GHz
Restricted Band: 5.35 – 5.46 GHz
Peak Limit: 74 dB μ V/m



Date: 10.OCT.2007 19:41:20

Spurious Emissions Within Restricted Bands, continued

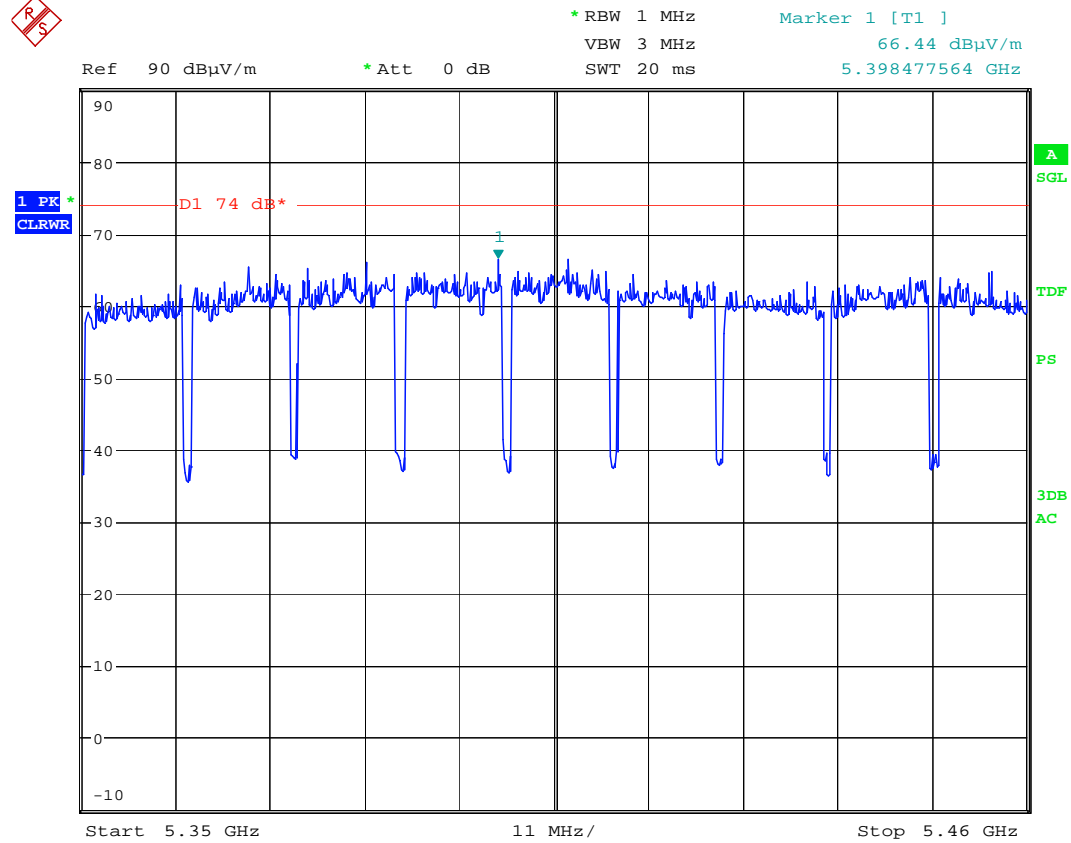
Antenna: 19 dBi
TX Frequency: 5.805 GHz
Restricted Band: 5.35 – 5.46 GHz
Average Limit: 54 dB μ V/m



Date: 10.OCT.2007 20:24:31

Spurious Emissions Within Restricted Bands, continued

Antenna: 19 dBi
TX Frequency: 5.805 GHz
Restricted Band: 5.35 – 5.46 GHz
Peak Limit: 74 dB μ V/m



Date: 10.OCT.2007 20:25:22

Spurious Emissions Within Restricted Bands, continued

Frequency (MHz)	Antenna	Pol.	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Reading	Amp.
1 242.9900	BC1	V	12.5	16.8	-	1.7	31.0	46.0	15.1	Q-Peak	-
2 242.9900	BC1	H	19.0	15.8	-	1.7	36.5	46.0	9.6	Q-Peak	-
3 323.9873	LP1	V	16.5	14.5	-	1.9	32.9	46.0	13.2	Q-Peak	-
4 404.9847	LP1	V	15.8	15.9	-	1.9	33.6	46.0	12.4	Q-Peak	-
5 323.9873	LP1	H	20.0	14.7	-	1.9	36.6	46.0	9.5	Q-Peak	-
6 404.9847	LP1	H	15.8	16.0	-	1.9	33.7	46.0	12.3	Q-Peak	-
7 3856.7350	Horn2	V	62.0	32.5	55.1	7.4	46.8	54.0	7.2	Average	2-4GHz
8 4886.5400	Horn2	V	61.8	33.4	52.9	8.5	50.8	54.0	3.2	Average	4-8GHz
9 11490.0000	Horn2	V	30.6	38.6	41.2	8.4	36.4	54.0	17.6	Average	5-18GHz
10 11570.0000	Horn2	V	27.0	39.2	41.1	8.4	33.5	54.0	20.5	Average	5-18GHz
11 11610.0000	Horn2	V	27.4	39.2	41.1	8.4	33.9	54.0	20.1	Average	5-18GHz
12 11490.0000	Horn2	H	31.4	38.6	41.2	8.4	37.2	54.0	16.8	Average	5-18GHz
13 11570.0000	Horn2	H	27.7	39.1	41.1	8.4	34.1	54.0	19.9	Average	5-18GHz
14 11610.0000	Horn2	H	29.0	39.1	41.1	8.4	35.4	54.0	18.6	Average	5-18GHz

Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

§15.407(g) Frequency Stability

§15.407(g) 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 Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 12, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See tables.

Frequency Band: 5.725 - 5.825 GHz

T (°C)	Nominal Freq. (GHz)	Measured Freq. (GHz)	Deviation (ppm)
-30	5.785	5.784992430	1.600
-20	5.785	5.784990578	1.280
-10	5.785	5.784988727	0.960
0	5.785	5.784986876	0.640
10	5.785	5.784985025	0.320
20	5.785	5.784983174	0.000
30	5.785	5.784995994	2.216
40	5.785	5.785008815	4.432
50	5.785	5.785021635	6.649

§15.31(e) Supply Voltage Variation

§15.31(e) 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.

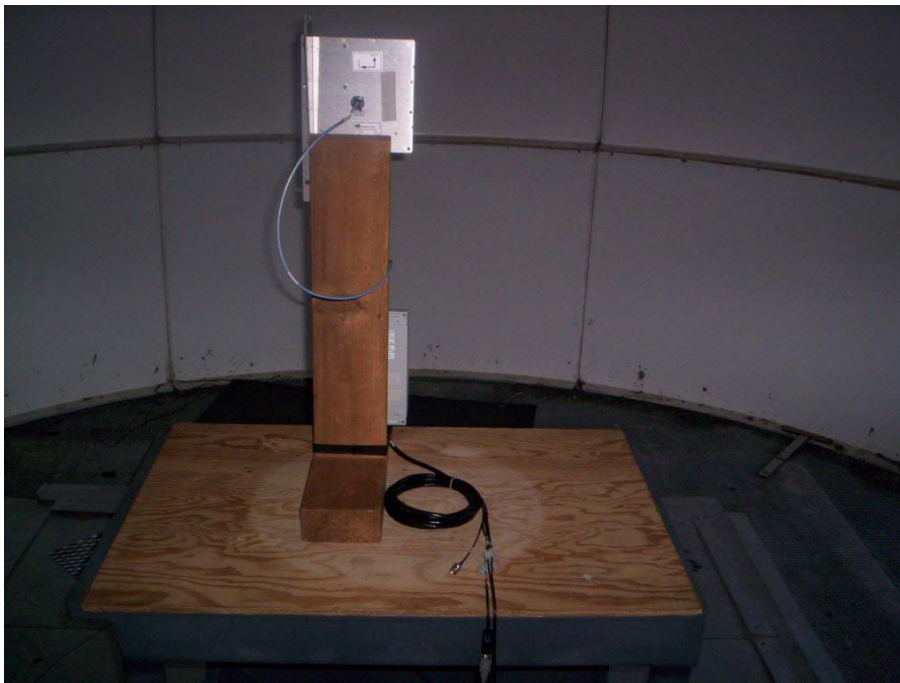
Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 4, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass.
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 measurable change in transmit output power was observed.

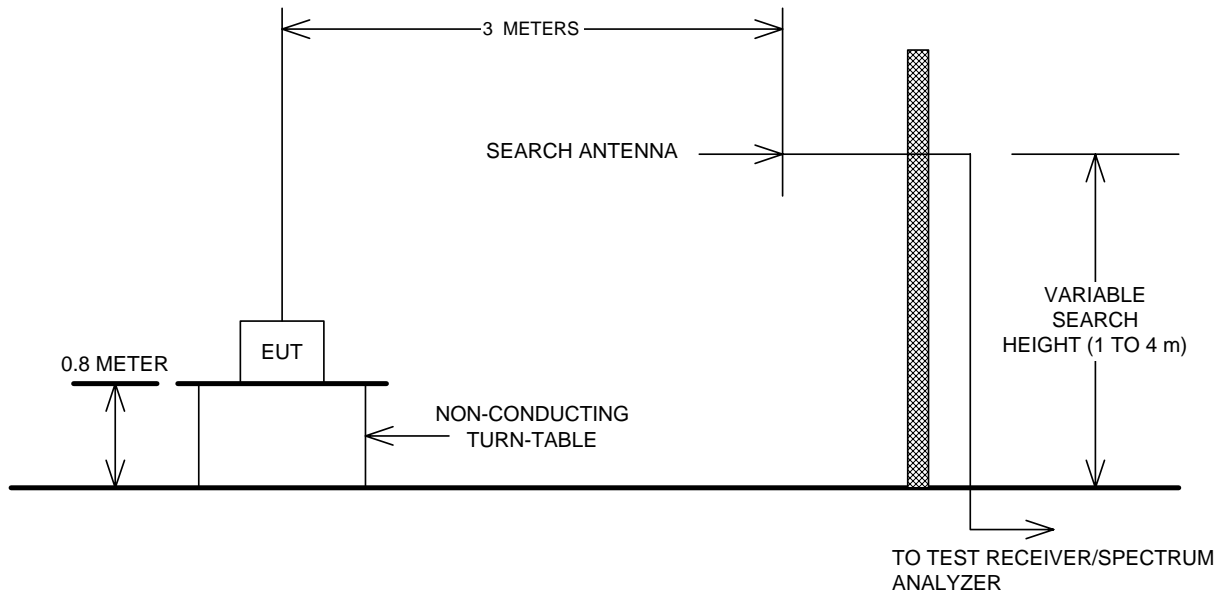
Appendix B: Setup Photographs

Spurious Emissions Setup:

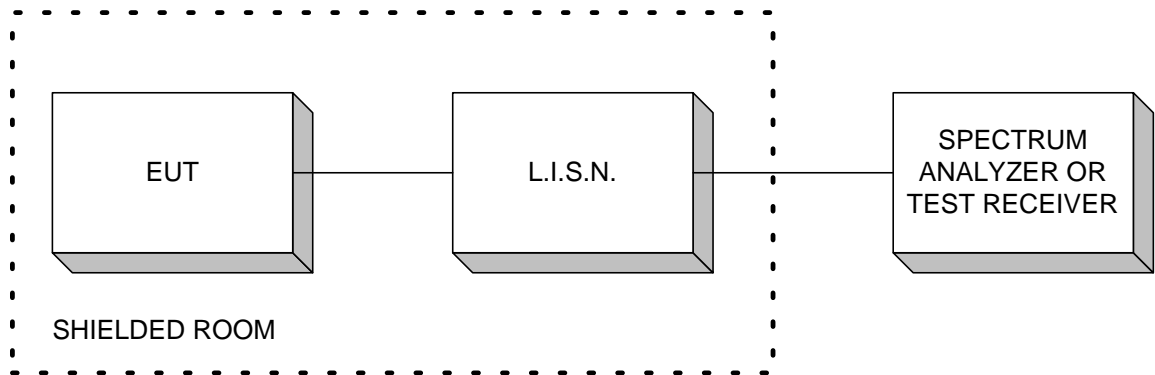


Appendix C: Block Diagram of Test Setups

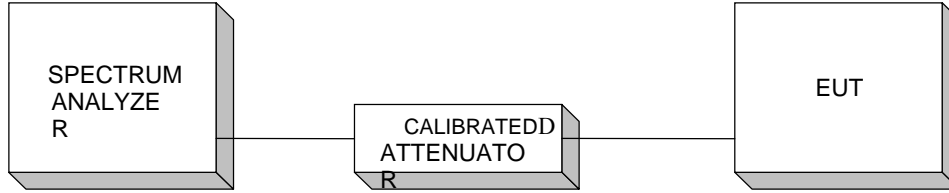
Test Site For Radiated Emissions



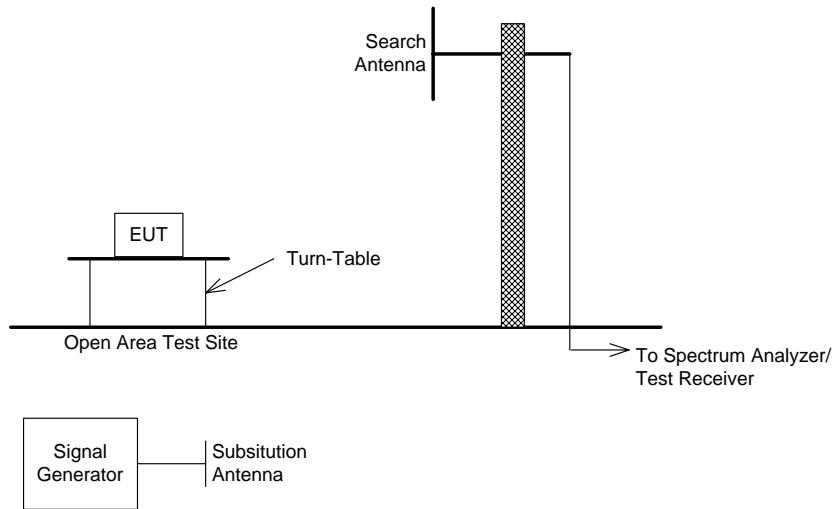
Conducted Emissions



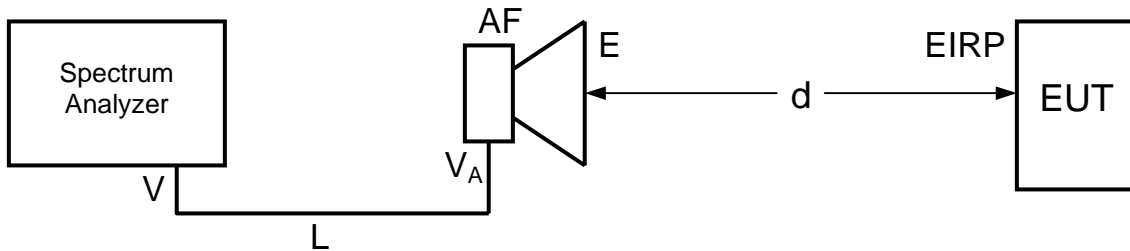
RF Conducted Measurements



TIA/EIA 603, Signal Substitution Method



EIRP of Radiated Emissions



Determining Off-set Correction Factor (in dB) needed to read EIRP of measured radiated emissions (in dBm) directly on a Spectrum Analyzer:

$$E(V/m) = \frac{\sqrt{30 \cdot EIRP(W)}}{d(m)} \Rightarrow E(dB\mu V/m) = 90 + 10 \cdot \log_{10} 30 + EIRP(dBm) - 20 \cdot \log_{10} d(m)$$

$$E(dB\mu V/m) = V(dB\mu V/m) + L(dB) + AF(dB) = P_{Read}(dBm) + 106.99 + L(dB) + AF(dB)$$

$$EIRP(dBm) = P_{Read}(dBm) + 2.22 + L(dB) + AF(dB) + 20 \cdot \log_{10} d(m)$$

$$EIRP(dBm) = P_{Read}(dBm) + \text{Off-set (dB)}$$

$$\text{Off-set (dB)} = 2.22 + L(dB) + AF(dB) + 20 \cdot \log_{10} d(m)$$

- EIRP: Equivalent Isotropically Radiated Power transmitted from EUT
- E: Electric Field Strength measured at a distance 'd' from EUT
- d: Distance (m)
- V: Voltage at Spectrum Analyzer Input (dBμV/m)
- P_{Read}(dBm): Reading on Spectrum Analyzer (dBm)
- L: Cable Loss (dB)
- AF: Antenna Factor (dB)
- Off-set: Off-set Correction Factor (in dB) needed to read EIRP of radiated emissions (in dBm) directly on Spectrum Analyzer