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Test Report: 88791-3R2TRFWL

Applicant: Verint Systems Canada Inc.
1800 Berlier
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 C, 15.247
FHSS System and Digitally Modulated Radiators
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

Tested By: Nemko Canada Inc.
303 River Road
Ottawa, Ontario
K1V 1H2

Authorized By: 
Xu Jin, Wireless Specialist

Date: October 22, 2007

Total Number of Pages: 59

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. 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 C, 15.247
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-24-RX and
S1100-24VAC-24-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
10	Ault Inc I.T.E Power Supply (P.O.E.)	Model: PW130
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 802.11 (OFDM) W-LAN wireless device designed for operation in the 2400 – 2483.5 MHz band.

1.4 Technical Specifications of the EUT

Operating Frequency:	2412 – 2462 MHz
Peak Output Power:	23.4 dBm (Conducted at Antenna Port) 35.7 dBm (EIRP)
Emission Designator	W7D
Rated Power:	30 dBm EIRP
Modulation:	802.11g
Antenna Data:	8.5 dBi / 2.3-2.5 GHz, Huber & Suhner AG, SPA 2400/75/9/0/V 16 dBi / 2.4-2.5 GHz, Wireless Edge, MT- 30081/A
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 C, 15.247

FHSS System and Digitally Modulated Radiators
902-928MHz, 2400-2483.5 MHz, 5725-5850MHz

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
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

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 C: 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 C: Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of power supply	YES	PASS
15.207(a)	Powerline Conducted Emissions	YES	PASS
15.209(a)	Radiated Emissions within Restricted Bands	YES	PASS
15.247(a)(1)	Frequency hopping systems	N	N/A
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	N	N/A
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N	N/A
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	N	N/A
15.247(a)(2)	Systems using digital modulation techniques	YES	PASS
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	N	N/A
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	N/A
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	YES	PASS
15.247(b)(4)	Maximum peak output power	YES	PASS
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	N/A
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	N/A
15.247(d)	Radiated Emissions Not in Restricted Bands	YES	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	YES	PASS
15.247(f)	Time of Occupancy for Hybrid Systems	N	N/A
2.1055	Measurements required: Frequency stability	YES	PASS

Notes:

Appendix A: Test Results

Clause §15.207(a) AC Powerline Conducted Emissions

§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.

Test Conditions:

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

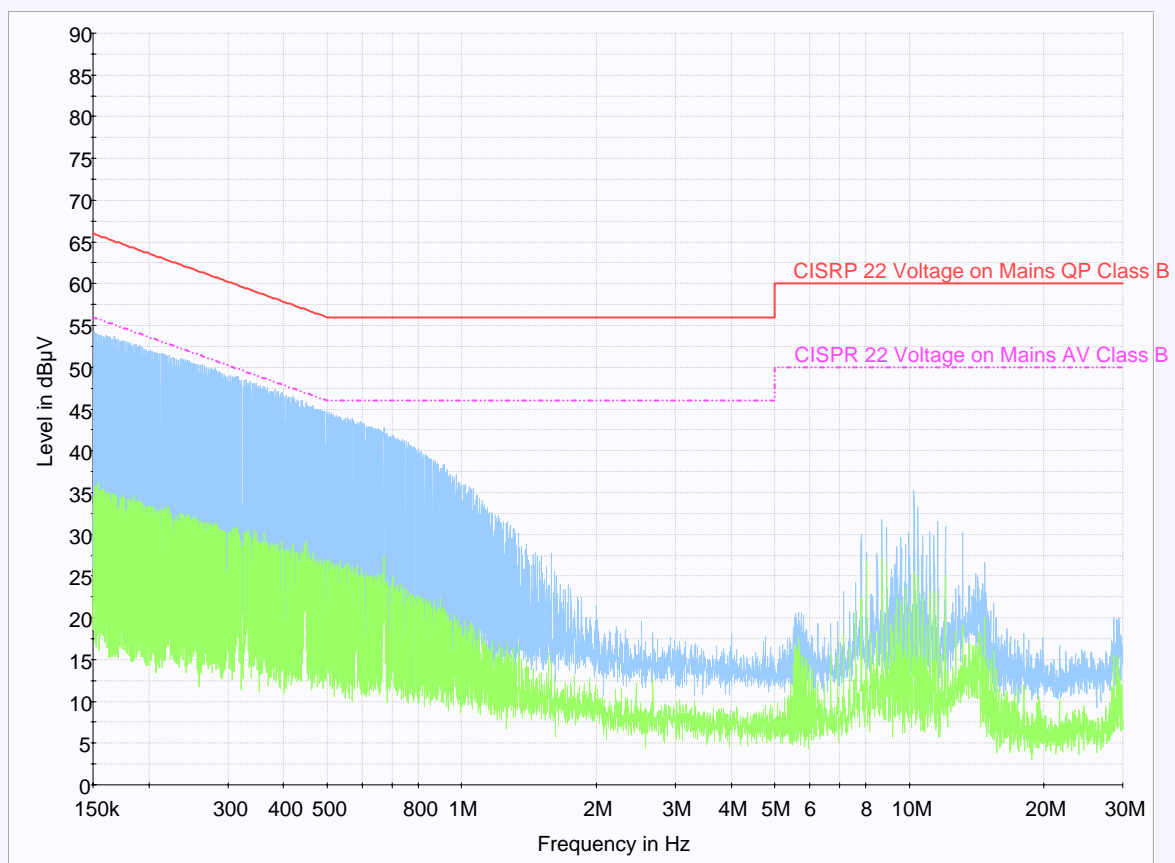
Test Results: Pass (see attached plots).

AC Power Lines Conducted Emission, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/12VDC Adapter

Line: LIVE



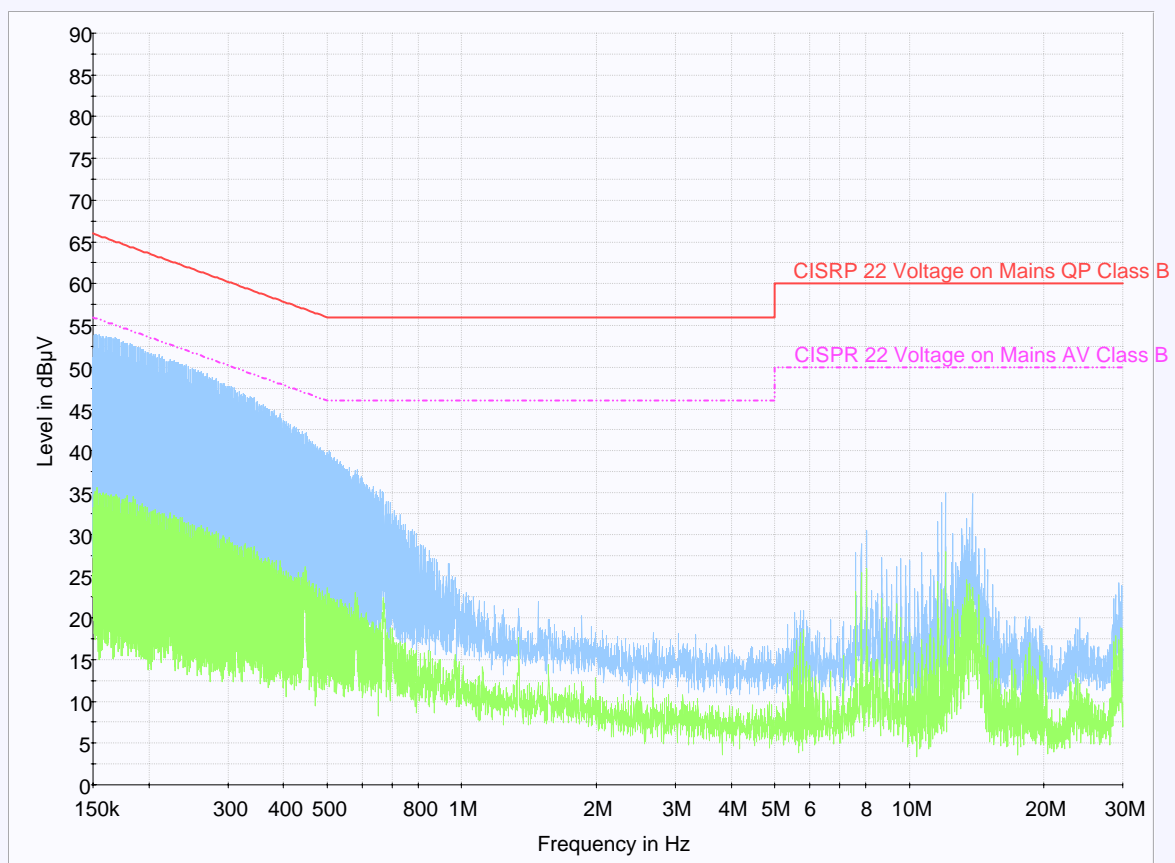
— CISRP 22 Voltage on Mains QP Class B
— Preview Measurement Peak Detector
— CISRP 22 Voltage on Mains AV Class B
— Preview Measurement Average Detector

AC Power Lines Conducted Emission, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/12VDC Adapter

Line: NEUTRAL



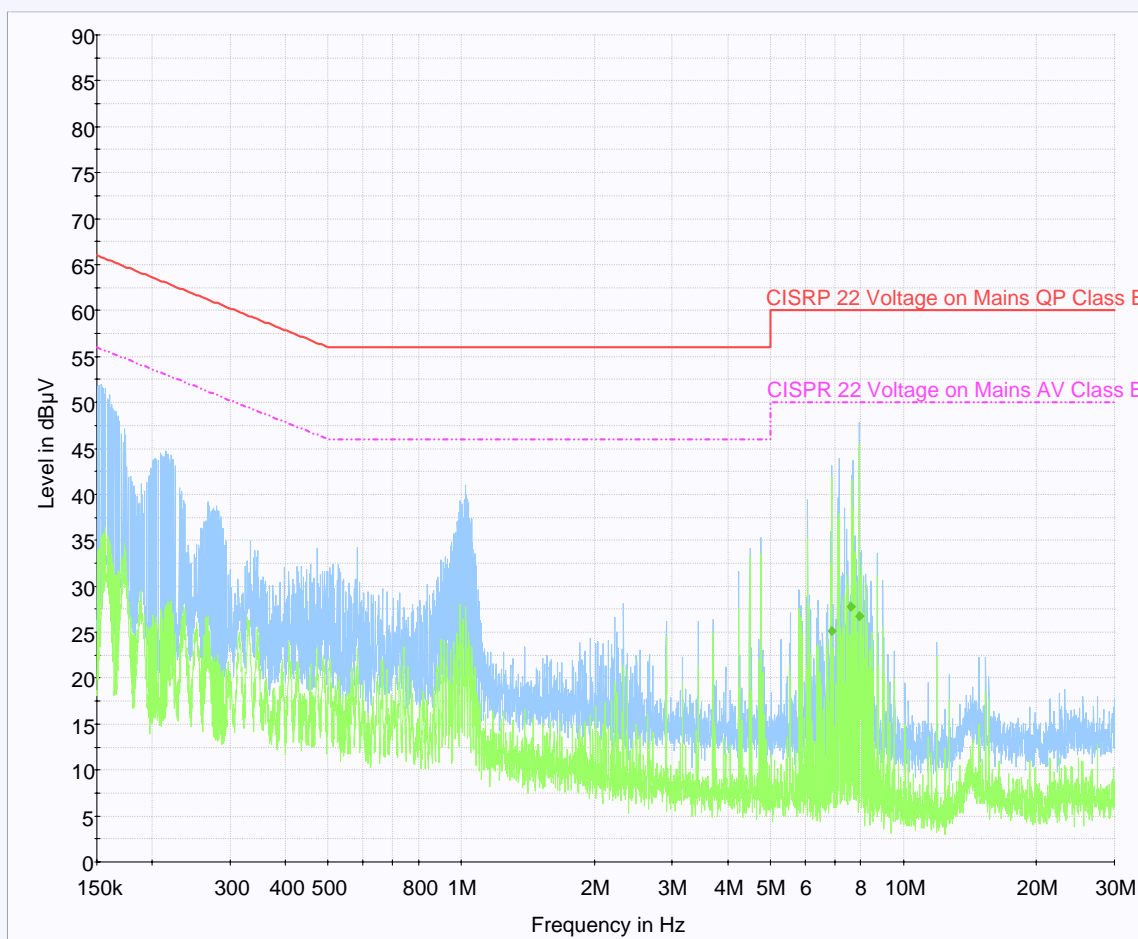
— CISRP 22 Voltage on Mains QP Class B - - - CISPR 22 Voltage on Mains AV Class B
— Preview Measurement Peak Detector — Preview Measurement Average Detector

AC Power Lines Conducted Emission, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/24VAC Adapter (Transformer)

Line: LIVE



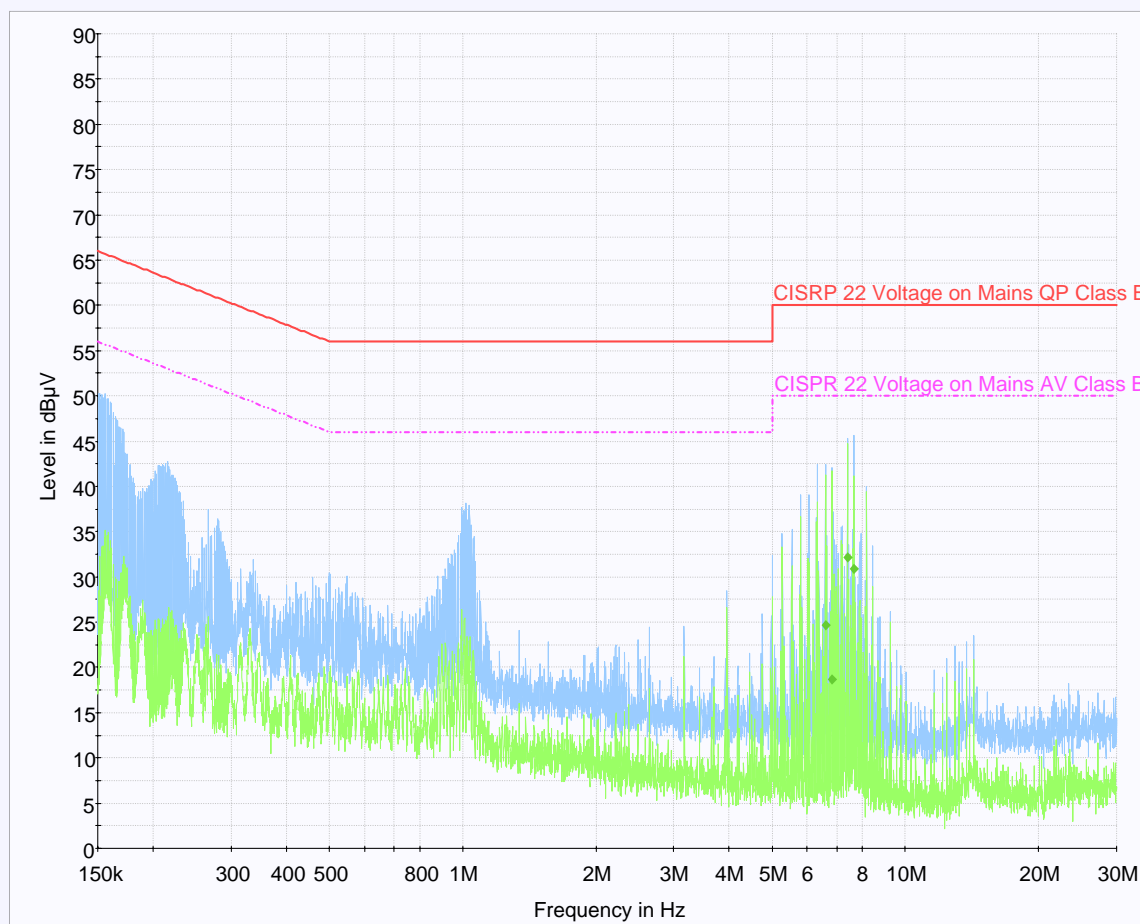
— CISRP 22 Voltage on Mains QP Class B - - - CISPR 22 Voltage on Mains AV Class B
— Preview Measurement Peak Detector — Preview Measurement Average Detector
◆ Final Measurement Average Detector

AC Power Lines Conducted Emission, continued

§15.207 AC Power-line Conducted Emissions

S1100 with 120VAC/24VAC Adapter (Transformer)

Line: NEUTRAL



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

Clause 15.209(a) Radiated Emissions within Restricted Bands

§ 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 5 – Oct.12, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass.
See attached table and plots for results.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

No harmonics were found within 20dB below the limit.

All radiated measurements were performed at a distance of 3 meters using a test receiver in 'Peak' detector mode with 120 kHz RBW / VBW ≥ RBW below 1 GHz and 'Average' detector mode with 1MHz RBW / VBW ≥ RBW above 1 GHz.

These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

Radiated Emissions within Restricted Bands, continued

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	972.0000	LP1	V	8.0	23.5	3.2	34.7	54.0	19.3	Q-Peak
2	999.1100	LP1	V	10.1	23.8	3.3	37.2	54.0	16.7	Q-Peak
3	972.0000	LP1	H	9.4	24.2	3.2	36.8	54.0	17.2	Q-Peak
4	999.1100	LP1	H	11.6	24.7	3.3	39.6	54.0	14.3	Q-Peak

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

Note 2: Peak detector used below 1GHz and average detector above 1GHz

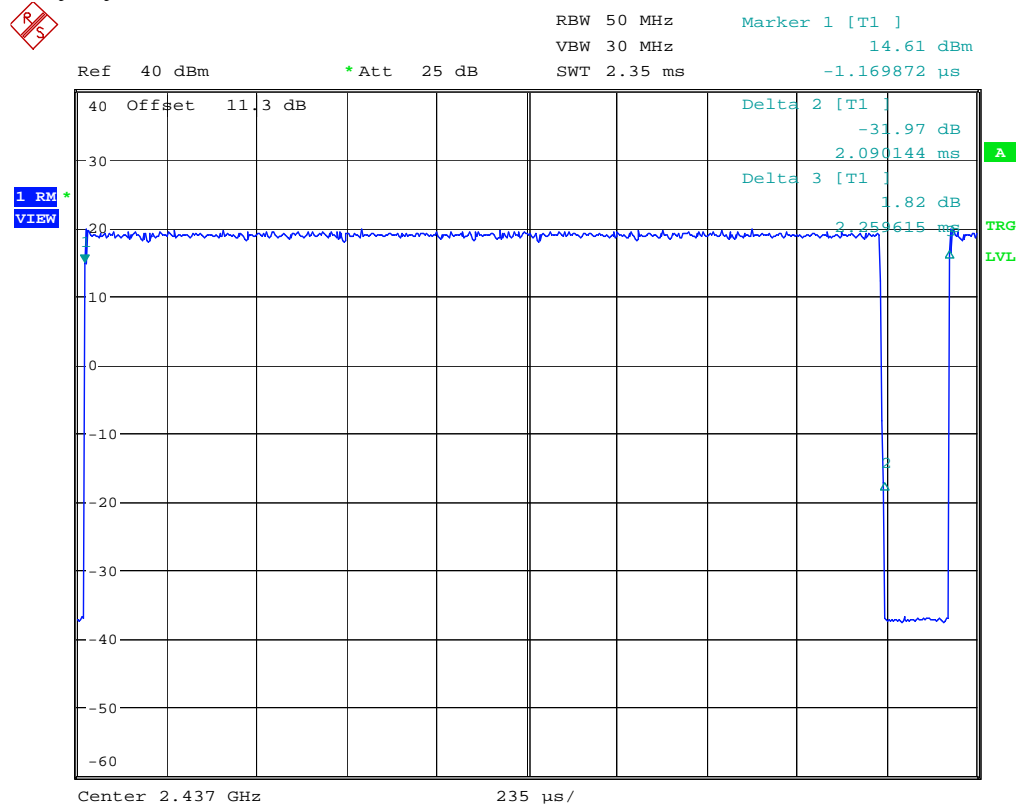
Note 3: Tested with the highest gain antenna connected to the EUT.

The Spectrum was searched from 30MHz to the 10th Harmonic.

No harmonics were found within 20dB below the limit.

Radiated Emissions within Restricted Bands, continued

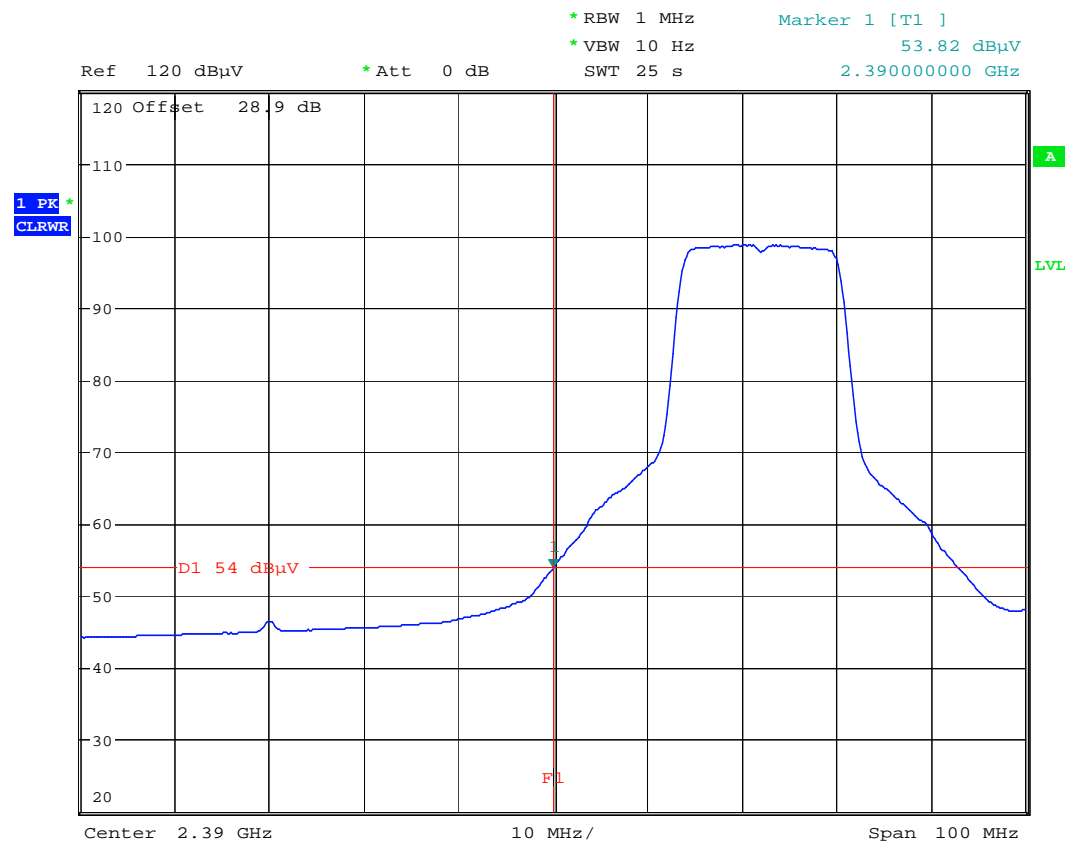
Duty Cycle:



Date: 5.JUL.2007 09:47:06

Radiated Emissions within Restricted Bands, continued

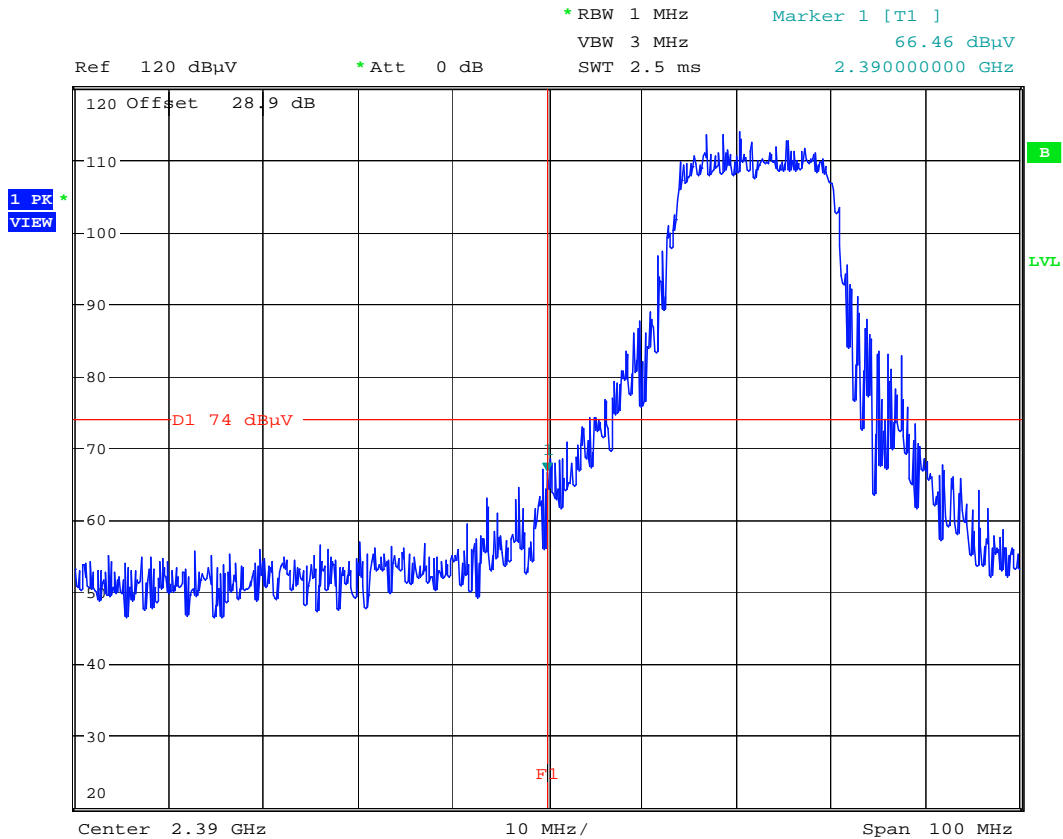
Antenna Gain: 8.5 dBi
2390 MHz Band Edge Check
Average Limit: 54 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 10:45:09

Radiated Emissions within Restricted Bands, continued

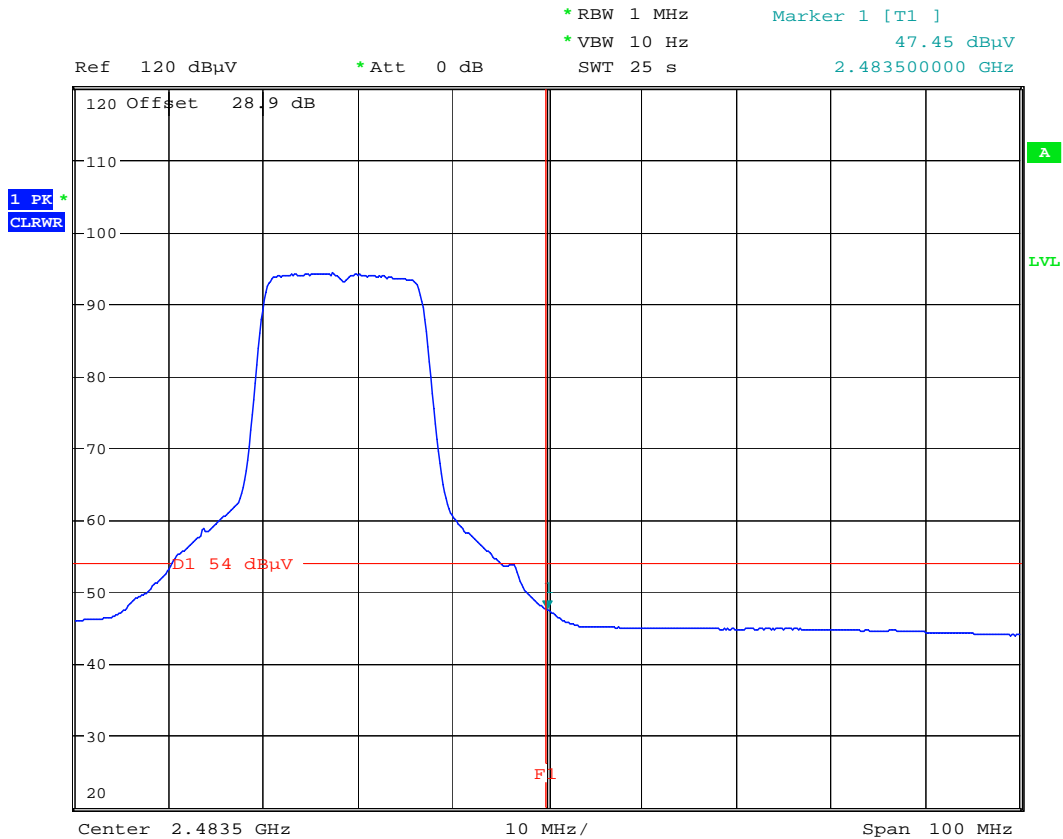
Antenna Gain: 8.5 dBi
2390 MHz Band Edge Check
Peak Limit: 74 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 10:50:41

Radiated Emissions within Restricted Bands, continued

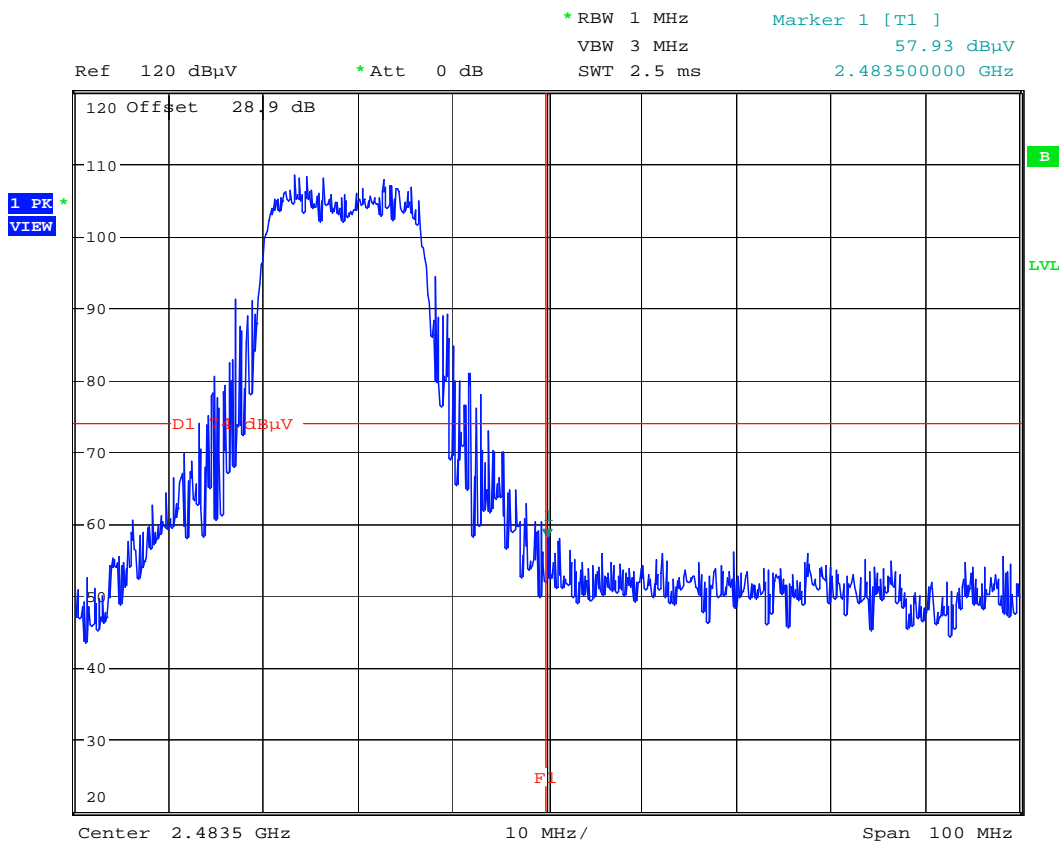
Antenna Gain: 8.5 dBi
 2483.5 MHz Band Edge Check
 Average Limit: 54 dB μ V/m
 Polarization: VERTICAL



Date: 12.OCT.2007 12:22:23

Radiated Emissions within Restricted Bands, continued

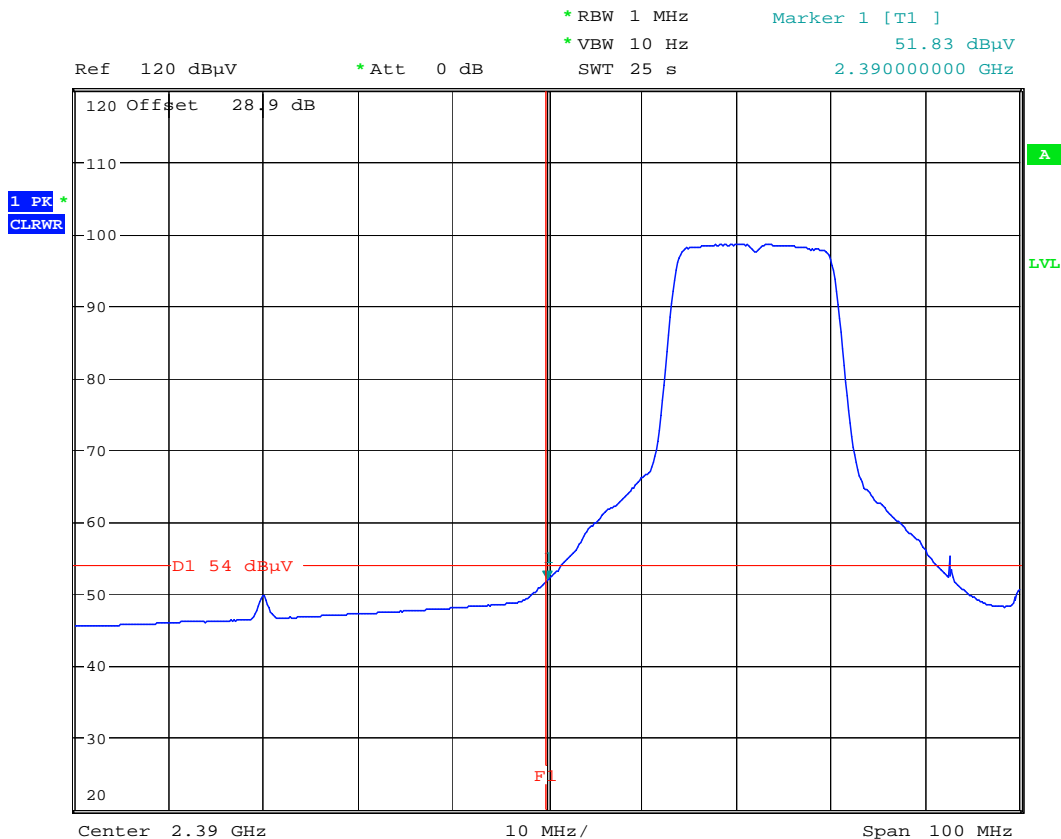
Antenna Gain: 8.5 dBi
 2483.5 MHz Band Edge Check
 Peak Limit: 74 dB μ V/m
 Polarization: VERTICAL



Date: 12.OCT.2007 12:24:29

Radiated Emissions within Restricted Bands, continued

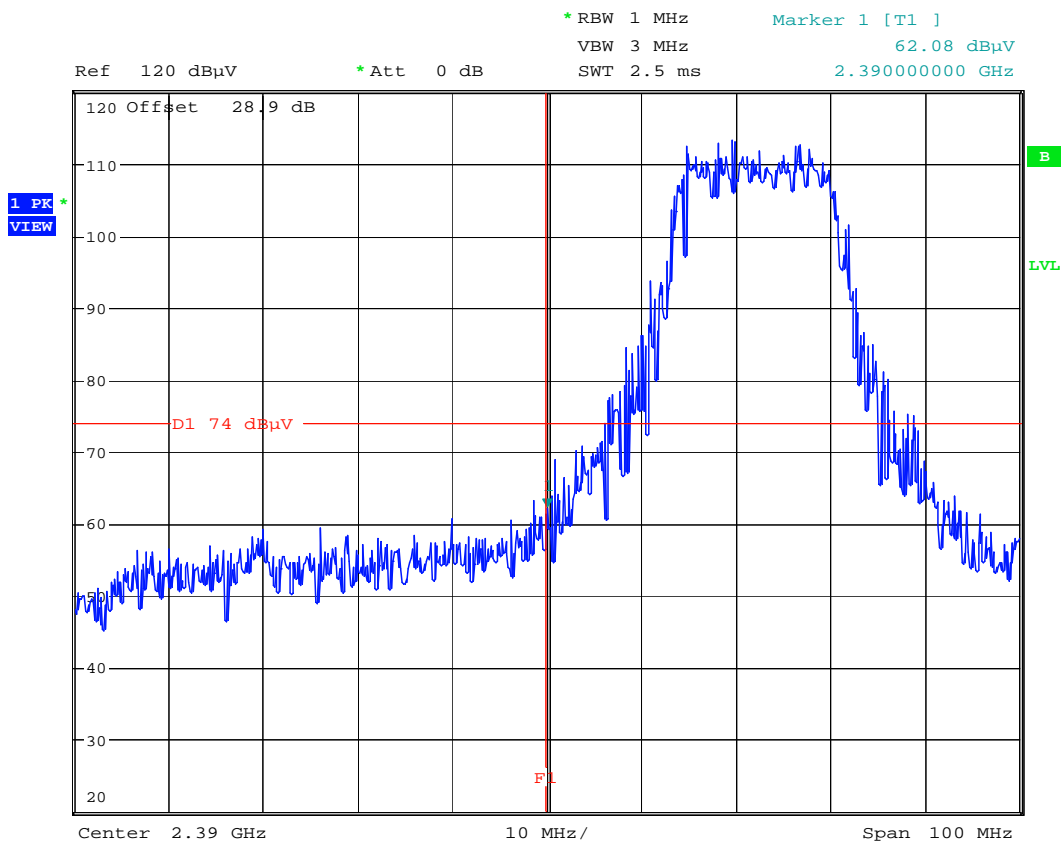
Antenna Gain: 16 dBi
2390 MHz Band Edge Check
Average Limit: 54 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 12:01:42

Radiated Emissions within Restricted Bands, continued

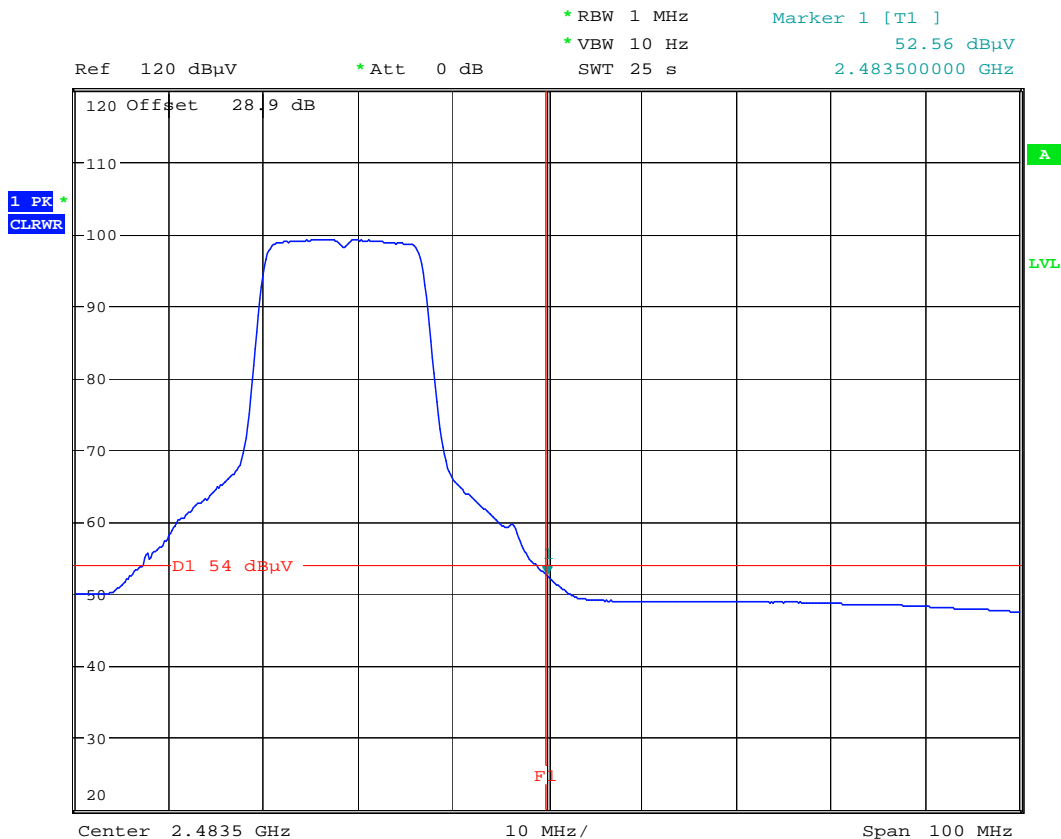
Antenna Gain: 16 dBi
2390 MHz Band Edge Check
Peak Limit: 74 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 12:02:16

Radiated Emissions within Restricted Bands, continued

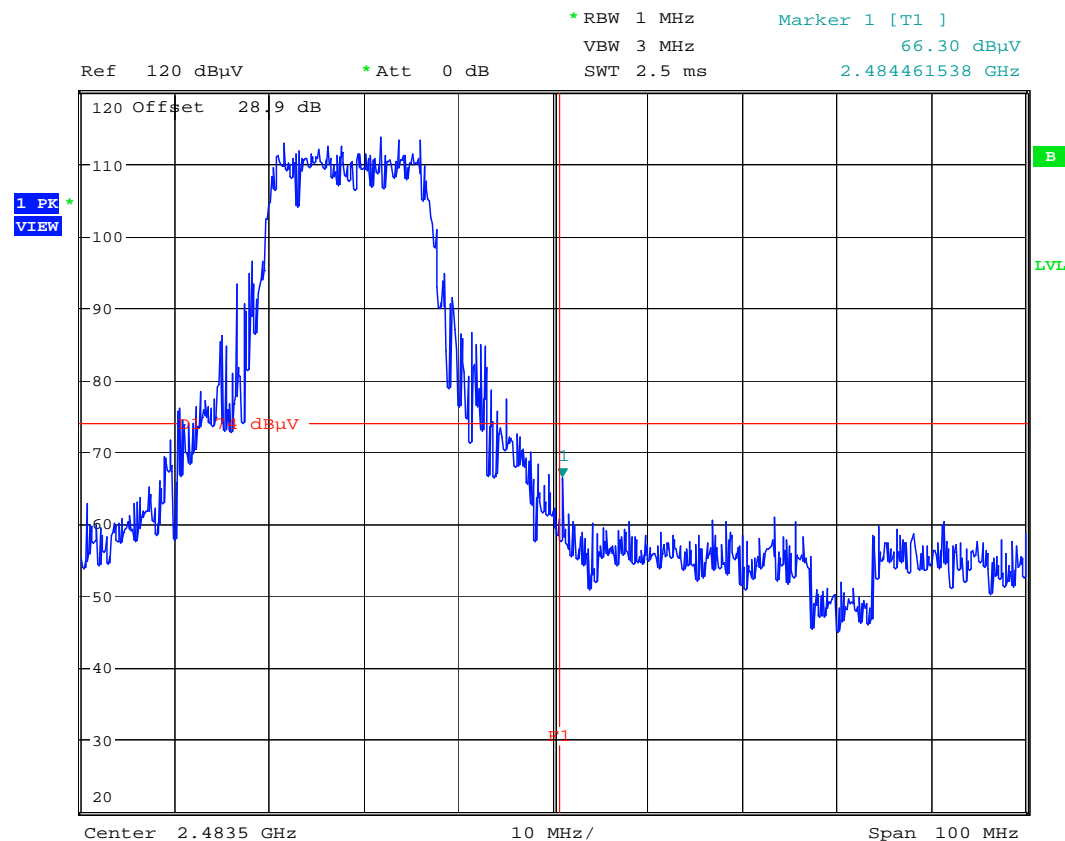
Antenna Gain: 16 dBi
2483.5 MHz Band Edge Check
Average Limit: 54 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 11:40:47

Radiated Emissions within Restricted Bands, continued

Antenna Gain: 16 dBi
2483.5 MHz Band Edge Check
Peak Limit: 74 dB μ V/m
Polarization: VERTICAL



Date: 12.OCT.2007 11:44:24

Clause 15.247(a)(2) Systems using digital modulation techniques

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.
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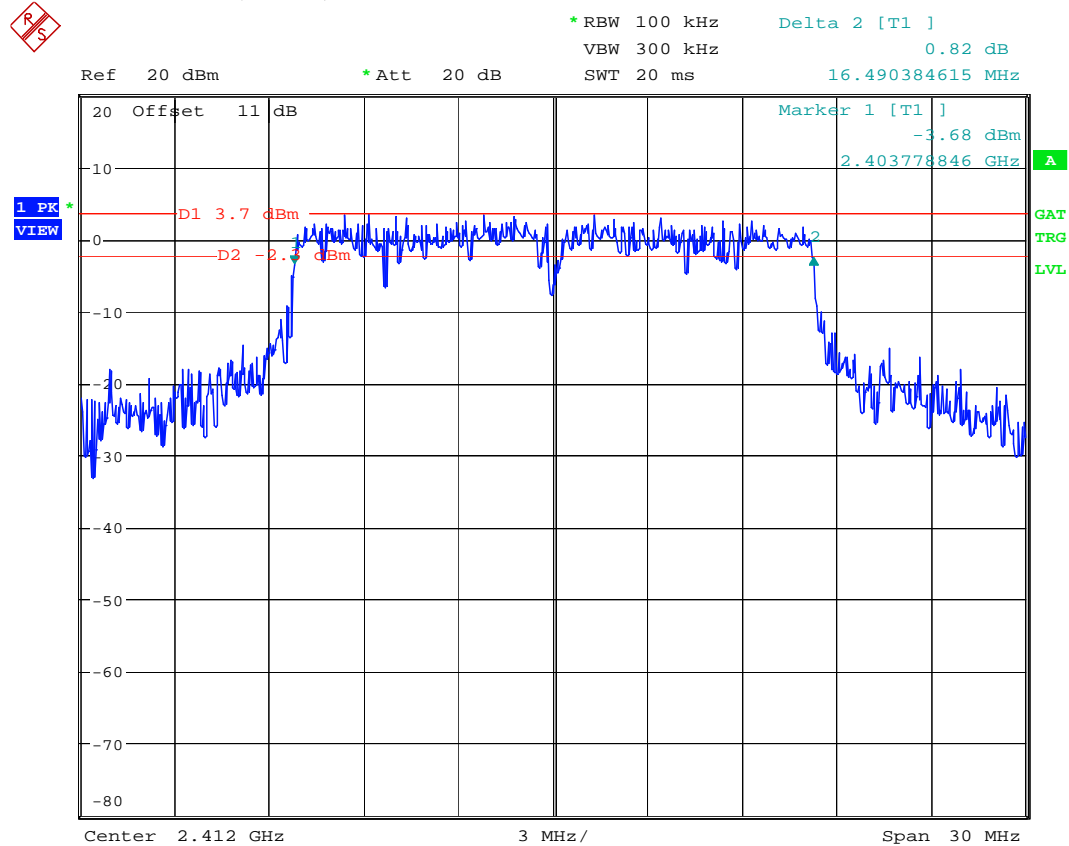
Test Conditions:

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

Test Results: See attached plots.

Systems using digital modulation techniques, continued

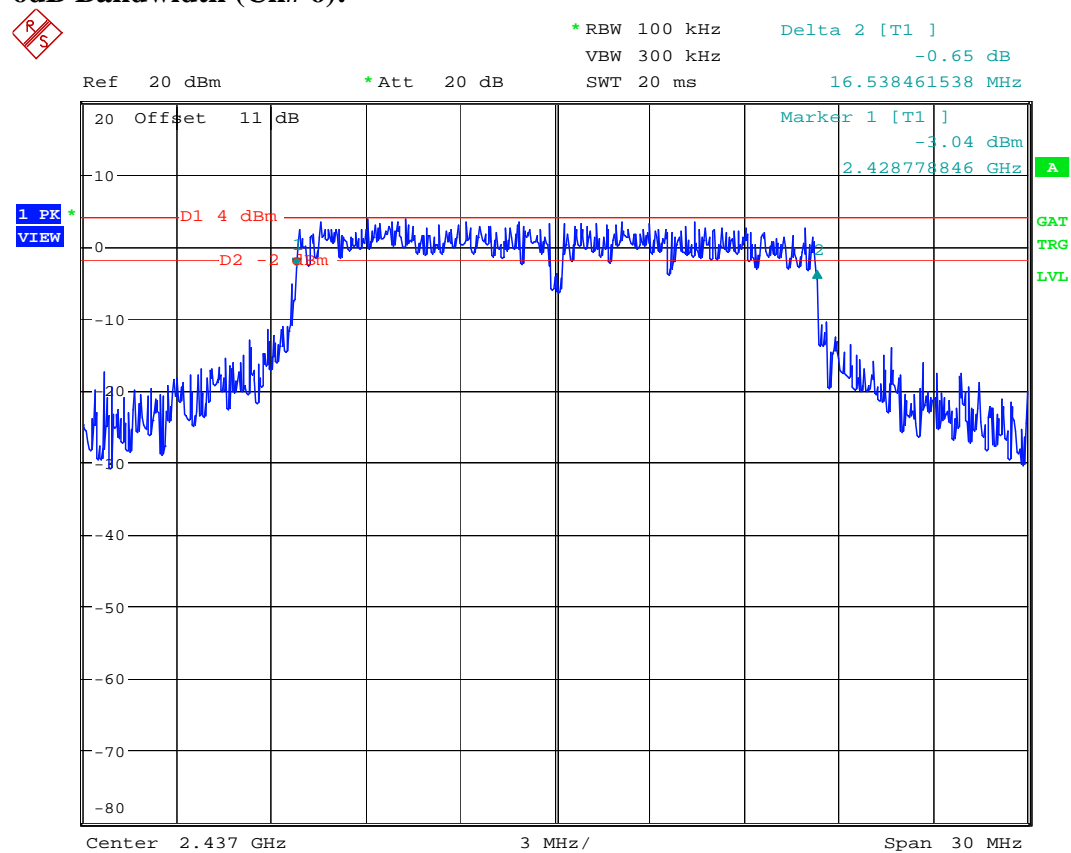
6dB Bandwidth (Ch# 1):



Date: 6.JUL.2007 13:20:31

Systems using digital modulation techniques, continued

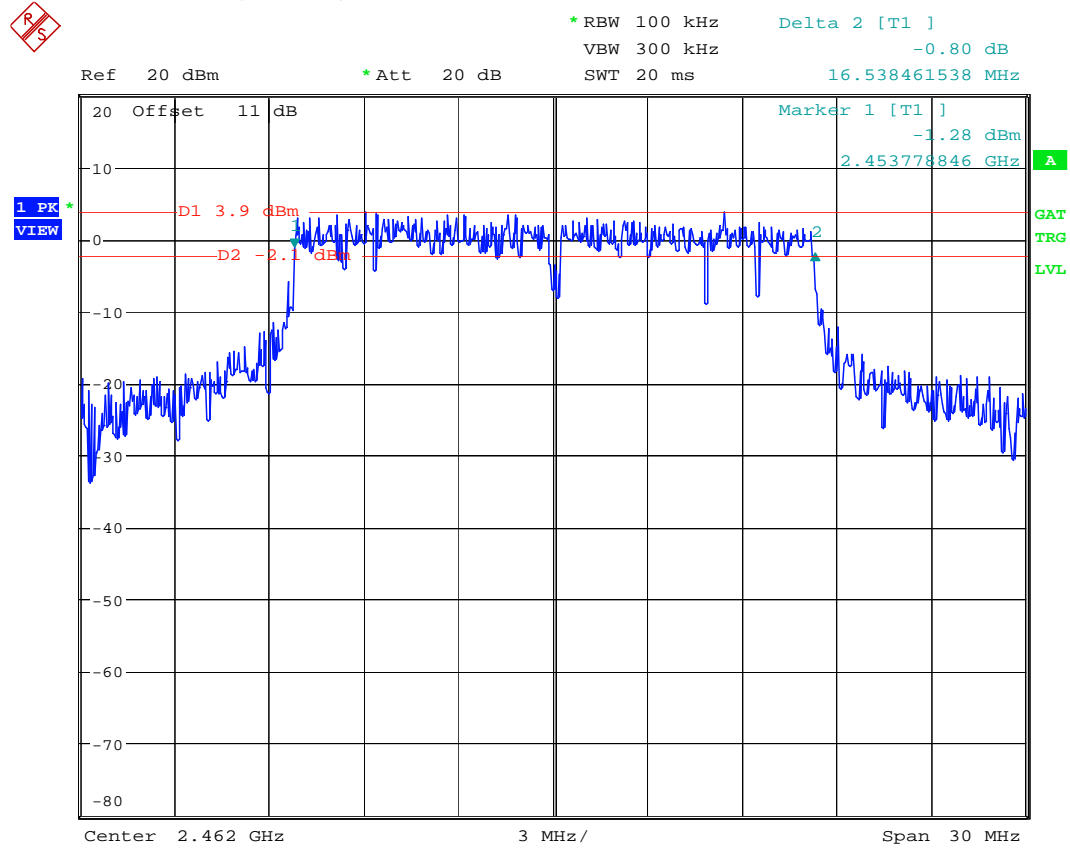
6dB Bandwidth (Ch# 6):



Date: 6.JUL.2007 13:23:50

Systems using digital modulation techniques, continued

6dB Bandwidth (Ch# 11):



Date: 6.JUL.2007 13:27:29

Clause 15.247(b)(3) Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Clause 15.247(b)(4) Maximum peak output power

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 30, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See attached plots and table.

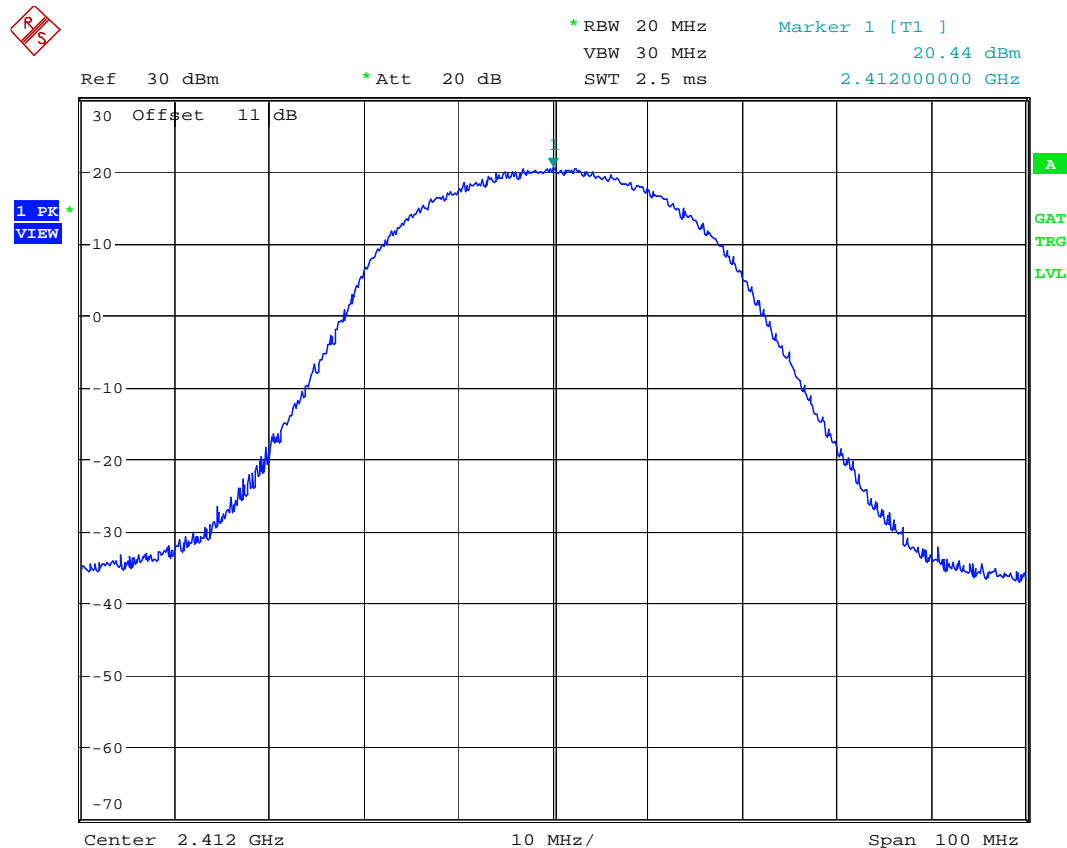
Additional Observations:

The output RF power was measured on the antenna port by means of a spectrum analyzer and following 'Power Output Option 1' from FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247.

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.

Maximum peak output power of systems using digital modulation, continued

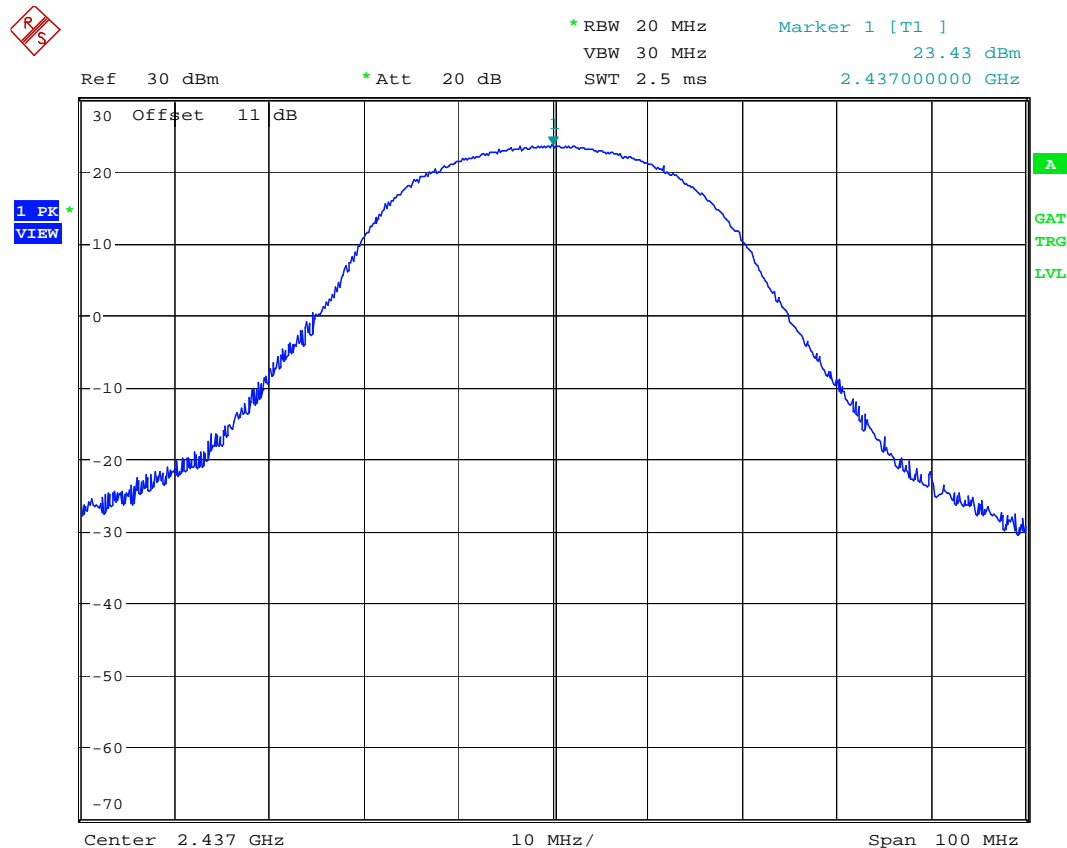
TX-channel: #1 (2412 GHz)
Antenna Gain: 8.5 dBi



Date: 30.JUL.2007 15:51:06

Maximum peak output power of systems using digital modulation, continued

TX-channel: #6 (2437 GHz)
Antenna Gain: 8.5 dBi

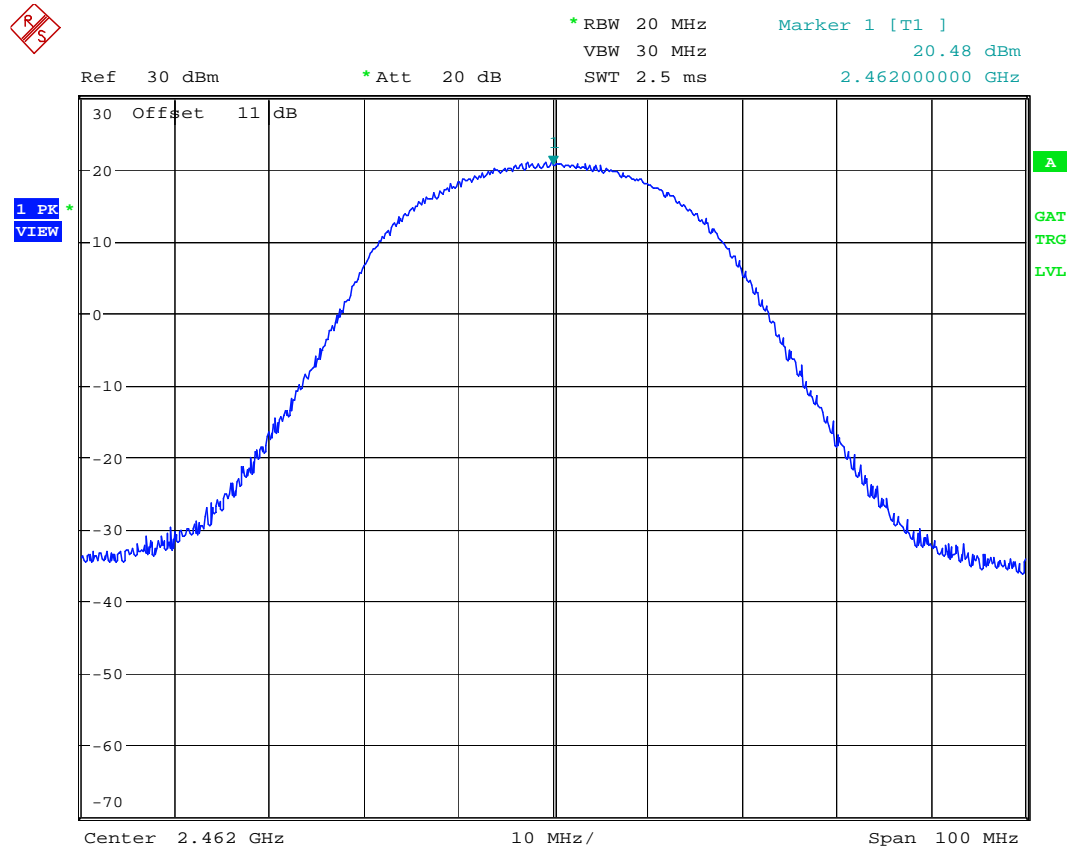


Date: 30.JUL.2007 16:03:32

Maximum peak output power of systems using digital modulation, continued

TX-channel: #11 (2462 GHz)

Antenna Gain: 8.5 dBi



Date: 30.JUL.2007 16:09:58

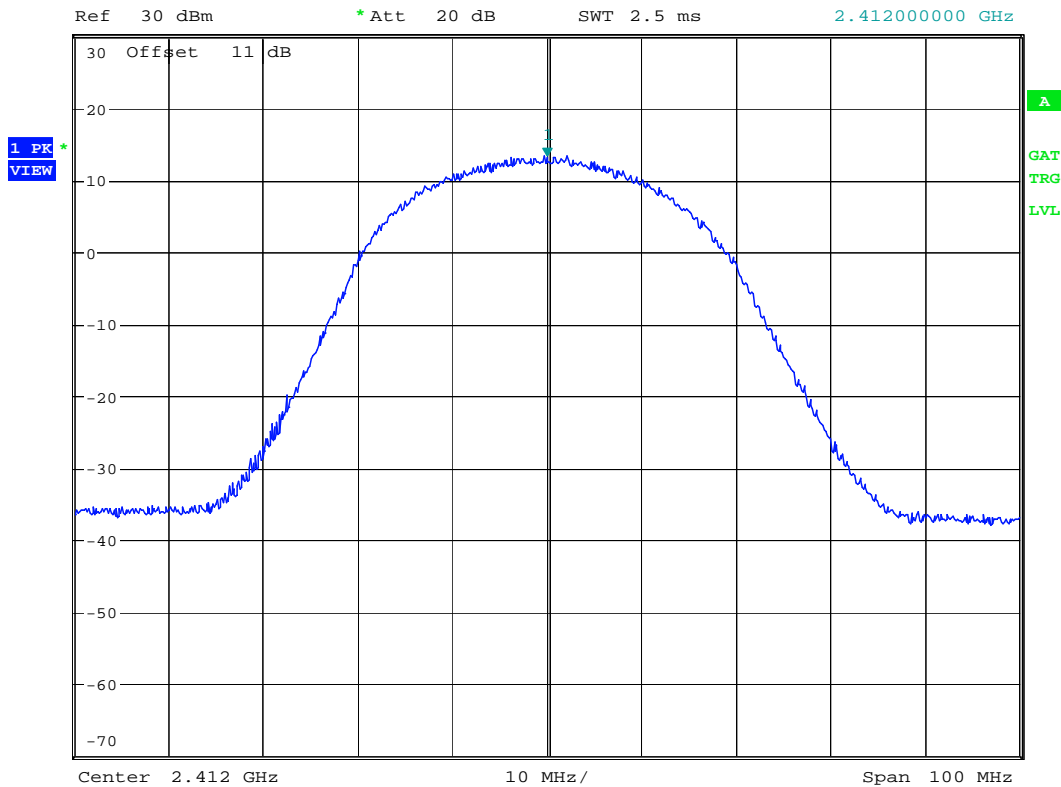
Maximum peak output power of systems using digital modulation, continued

TX-channel: #1 (2.412 GHz)

Antenna Gain: 16 dBi



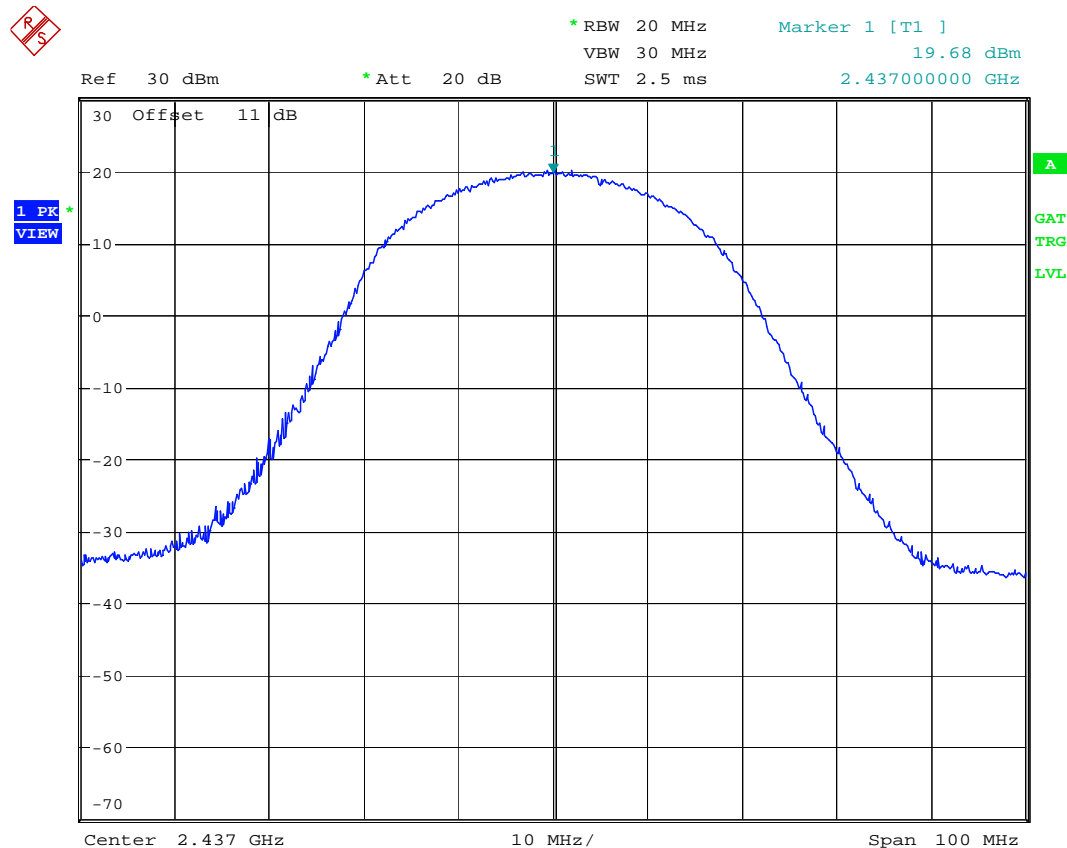
*RBW 20 MHz
VBW 30 MHz
SWT 2.5 ms
Marker 1 [T1]
13.03 dBm
2.412000000 GHz



Date: 30.JUL.2007 16:16:58

Maximum peak output power of systems using digital modulation, continued

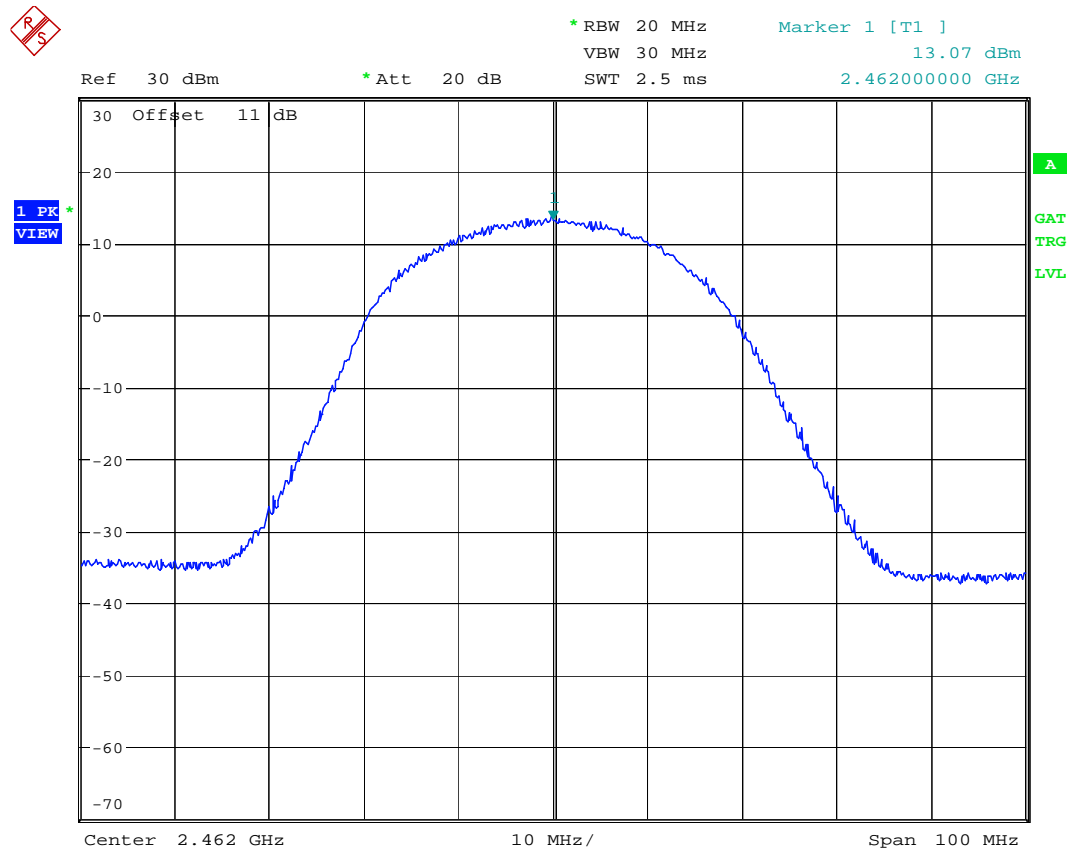
TX-channel: #6 (2.437 GHz)
Antenna Gain: 16 dBi



Date: 30.JUL.2007 16:40:15

Maximum peak output power of systems using digital modulation, continued

TX-channel: #11 (2.462 GHz)
Antenna Gain: 16 dBi



Date: 30.JUL.2007 16:50:25

Maximum peak output power of systems using digital modulation, continued
--

Ch. #	Freq. MHz	P _{TX} Cond. dBm	P _{TX} Limit dBm	Margin dB	G _{ANT} dBi	EIRP dBm	EIRP Limit dBm	Margin dB
1	2412	20.44	30.0	9.56	8.5	28.94	36.0	7.06
6	2437	23.43	30.0	6.57	8.5	31.93	36.0	4.07
11	2462	20.48	30.0	9.52	8.5	28.98	36.0	7.02
1	2412	13.03	30.0	16.97	16.0	29.03	36.0	6.97
6	2437	19.68	30.0	10.32	16.0	35.68	36.0	0.32
11	2462	13.07	30.0	16.93	16.0	29.07	36.0	6.93

Maximum Conducted PTX: 23.4 dBm (G_{ANT} = 8.5 dBi)

Maximum EIRP: 35.7 dBm (G_{ANT} = 16 dBi)

Clause 15.247(d) Radiated Emissions Not in Restricted Bands

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 2 – Oct.12, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass.
See attached table and plots for results.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.
No harmonics were found within 20dB below the limit.
All radiated measurements were performed at a distance of 3 meters using a test receiver in 'Peak' detector mode with 120 kHz RBW / VBW ≥ RBW below 1 GHz and 'Average' detector mode with 1MHz RBW / VBW ≥ RBW above 1 GHz.

Radiated Emissions Not in Restricted Bands, continued

15.209(a) Radiated Emissions – General Requirements

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	337.5000	LP1	V	20.6	14.4	1.8	36.8	46.0	9.3	Q-Peak
2	364.6000	LP1	V	20.0	15.3	1.9	37.2	46.0	8.8	Q-Peak
3	378.0000	LP1	V	20.6	15.2	1.9	37.7	46.0	8.3	Q-Peak
4	391.0000	LP1	V	19.5	15.3	1.9	36.7	46.0	9.3	Q-Peak
5	418.6000	LP1	V	17.8	16.2	2.2	36.2	46.0	9.9	Q-Peak
6	432.1000	LP1	V	18.3	16.3	2.1	36.7	46.0	9.4	Q-Peak
7	445.2000	LP1	V	16.7	16.8	2.1	35.6	46.0	10.4	Q-Peak
8	459.0000	LP1	V	16.8	16.9	2.4	36.1	46.0	9.9	Q-Peak
9	472.5000	LP1	V	16.0	17.3	2.2	35.5	46.0	10.5	Q-Peak
10	479.3000	LP1	V	15.8	17.3	2.2	35.3	46.0	10.8	Q-Peak
11	496.1000	LP1	V	17.3	17.7	2.1	37.1	46.0	8.9	Q-Peak
12	503.0000	LP1	V	13.7	17.7	2.2	33.6	46.0	12.5	Q-Peak
13	526.4000	LP1	V	13.9	17.9	2.4	34.2	46.0	11.9	Q-Peak
14	538.3000	LP1	V	14.6	18.0	2.4	35.0	46.0	11.0	Q-Peak
15	580.5000	LP1	V	17.1	18.7	2.5	38.3	46.0	7.7	Q-Peak
16	607.5000	LP1	V	17.0	19.6	2.5	39.1	46.0	7.0	Q-Peak
17	634.4000	LP1	V	17.4	19.8	2.6	39.8	46.0	6.3	Q-Peak
18	659.3000	LP1	V	15.9	20.4	2.6	38.9	46.0	7.1	Q-Peak
19	815.8000	LP1	V	8.8	21.4	3.0	33.2	46.0	12.9	Q-Peak
20	864.0000	LP1	V	8.8	22.8	3.0	34.6	46.0	11.4	Q-Peak
21	891.0000	LP1	V	8.9	22.7	3.1	34.7	46.0	11.4	Q-Peak
22	972.0000	LP1	V	8.0	23.5	3.2	34.7	54.0	19.3	Q-Peak

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

Note 2: Q-Peak detector used

Note 3: Tested with the highest gain antenna connected to the EUT.

Radiated Emissions Not in Restricted Bands, continued

15.209(a) Radiated Emissions – General Requirements

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
23	337.5000	LP1	H	21.8	14.8	1.8	38.4	46.0	7.7	Q-Peak
24	364.6000	LP1	H	20.7	15.2	1.9	37.8	46.0	8.2	Q-Peak
25	378.0000	LP1	H	22.0	15.5	1.9	39.4	46.0	6.6	Q-Peak
26	391.0000	LP1	H	21.1	16.2	1.9	39.2	46.0	6.9	Q-Peak
27	418.6000	LP1	H	19.0	16.2	2.2	37.4	46.0	8.7	Q-Peak
28	432.1000	LP1	H	19.6	16.6	2.1	38.3	46.0	7.7	Q-Peak
29	445.2000	LP1	H	17.7	16.8	2.1	36.6	46.0	9.4	Q-Peak
30	459.0000	LP1	H	17.5	17.2	2.4	37.1	46.0	8.9	Q-Peak
31	472.5000	LP1	H	16.1	17.7	2.2	36.0	46.0	10.0	Q-Peak
32	479.3000	LP1	H	16.3	17.7	2.2	36.2	46.0	9.9	Q-Peak
33	496.1000	LP1	H	18.0	18.1	2.1	38.2	46.0	7.8	Q-Peak
34	503.0000	LP1	H	14.9	18.2	2.2	35.3	46.0	10.8	Q-Peak
35	526.4000	LP1	H	14.0	18.5	2.4	34.9	46.0	11.2	Q-Peak
36	538.3000	LP1	H	15.2	18.3	2.4	35.9	46.0	10.1	Q-Peak
37	580.5000	LP1	H	17.7	19.2	2.5	39.4	46.0	6.6	Q-Peak
38	607.5000	LP1	H	17.0	20.8	2.5	40.3	46.0	5.8	Q-Peak
39	634.4000	LP1	H	18.8	20.1	2.6	41.5	46.0	4.6	Q-Peak
40	659.3000	LP1	H	17.6	20.3	2.6	40.5	46.0	5.5	Q-Peak
41	815.8000	LP1	H	10.1	22.2	3.0	35.3	46.0	10.8	Q-Peak
42	864.0000	LP1	H	10.0	23.2	3.0	36.2	46.0	9.8	Q-Peak
43	891.0000	LP1	H	8.9	23.6	3.1	35.5	46.0	10.5	Q-Peak
44	972.0000	LP1	H	9.4	24.2	3.2	36.8	54.0	17.2	Q-Peak

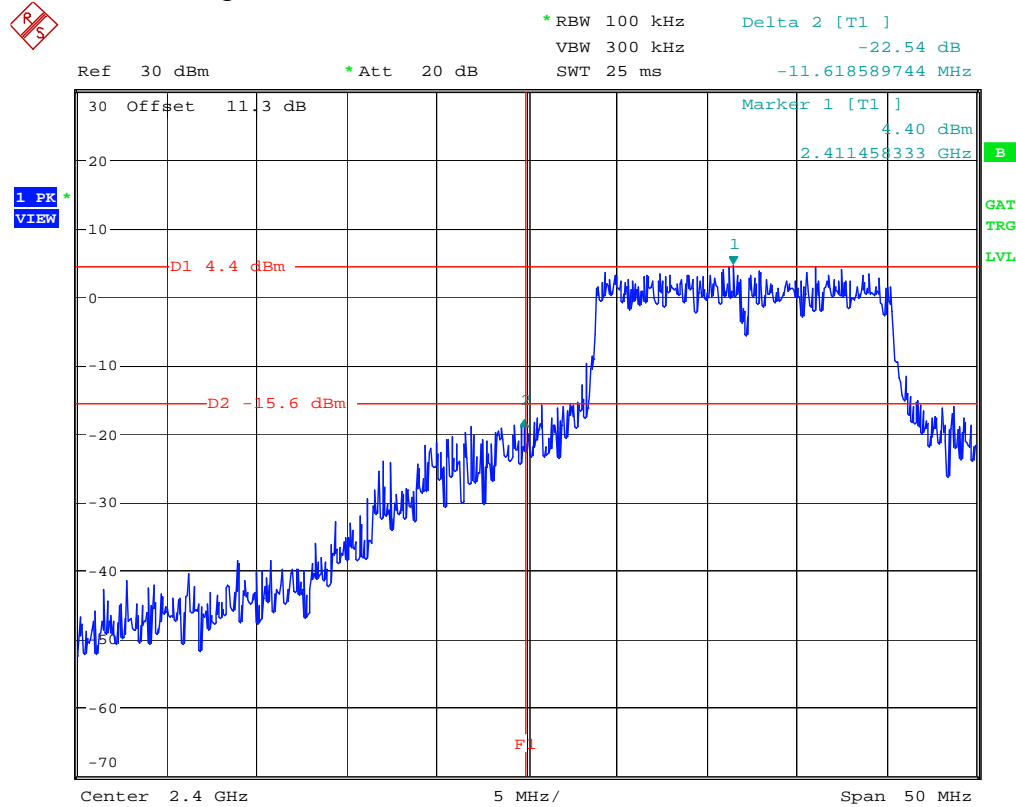
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Q-Peak detector used

Note 3: Tested with the highest gain antenna connected to the EUT.

Radiated Emissions Not in Restricted Bands, continued

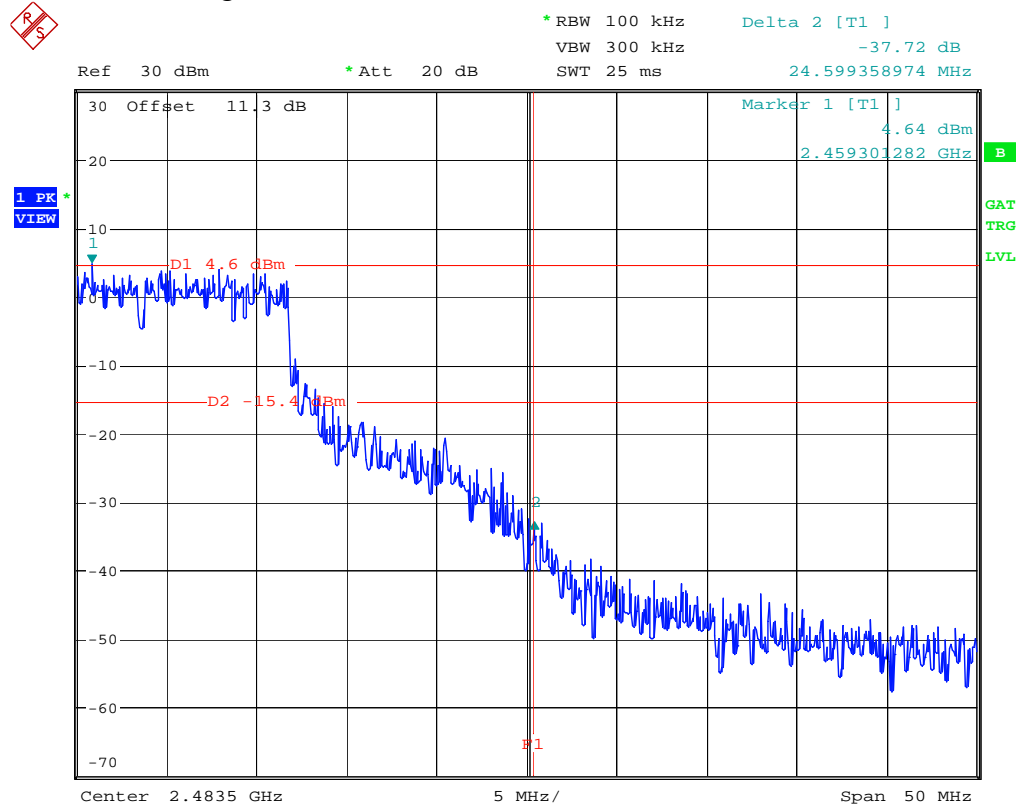
20 dBc Band-Edge Check at 2400 MHz:



Date: 6.JUL.2007 18:16:13

Radiated Emissions Not in Restricted Bands, continued

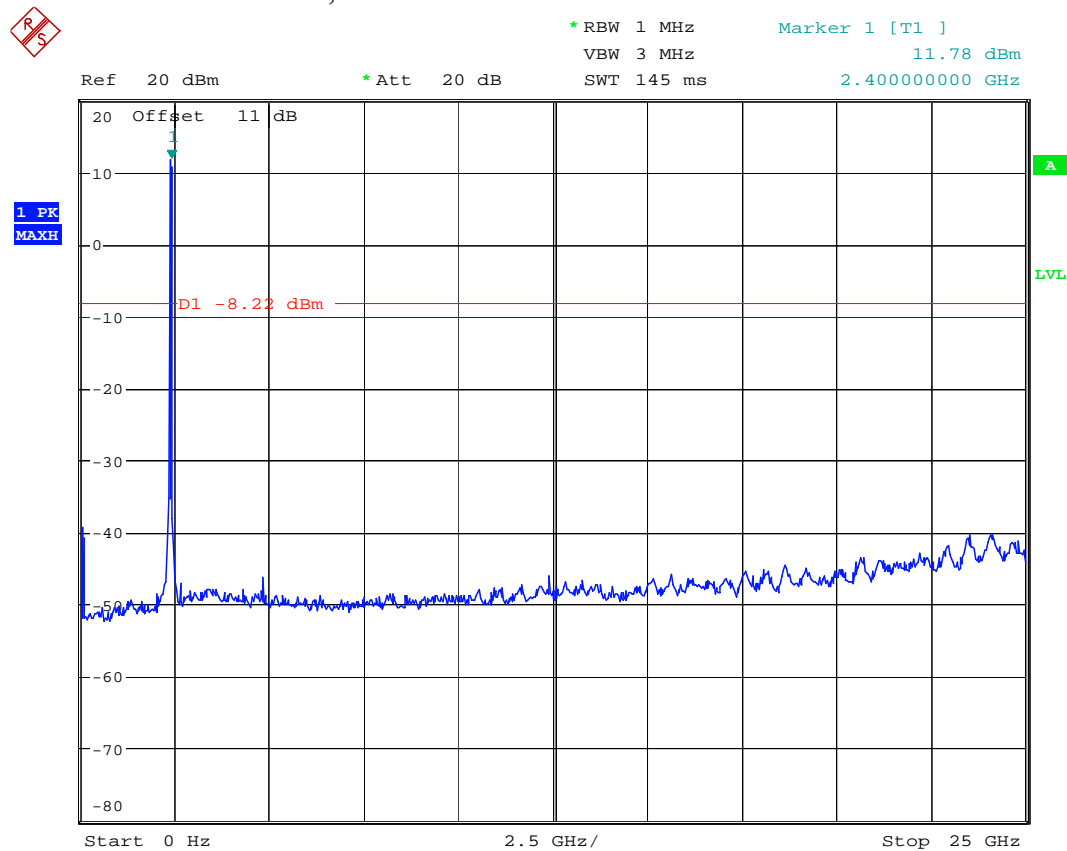
20 dBc Band-Edge Check at 2483.5 MHz:



Date: 6.JUL.2007 18:20:55

Radiated Emissions Not in Restricted Bands, continued

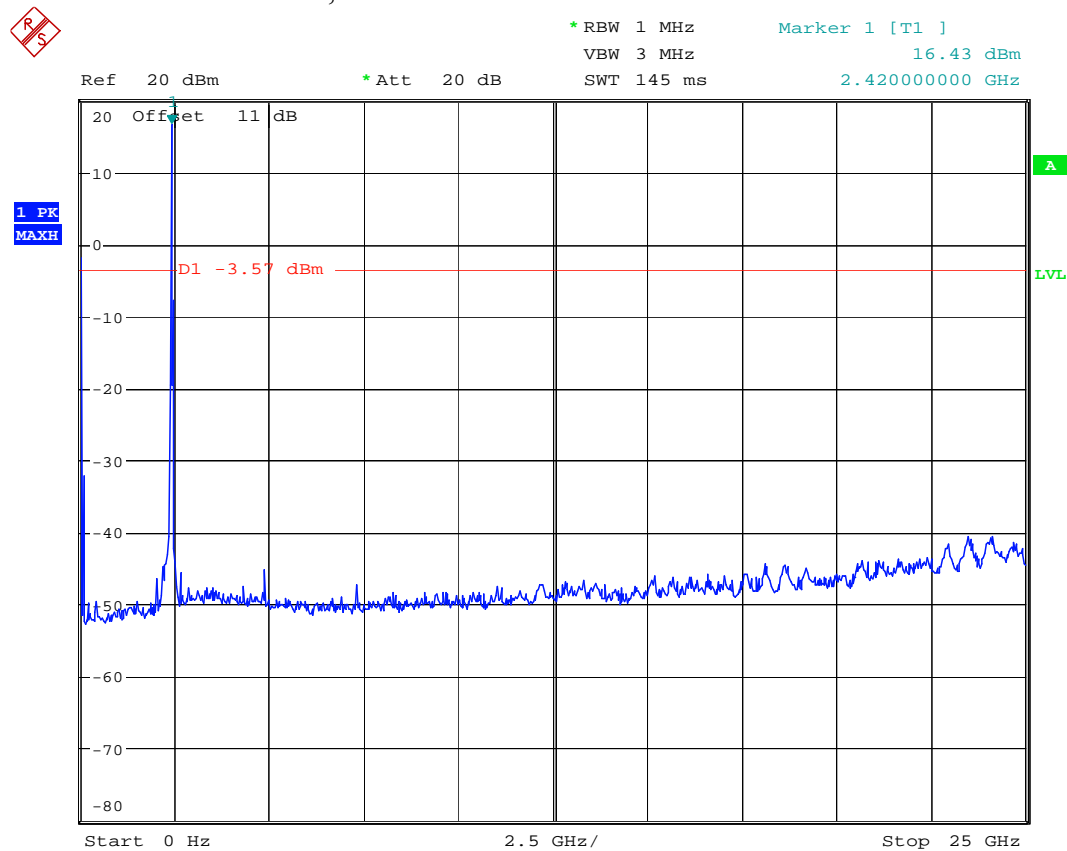
20 dBc Emissions Check, TX-channel: 2.412 GHz:



Date: 30.JUL.2007 19:32:42

Radiated Emissions Not in Restricted Bands, continued

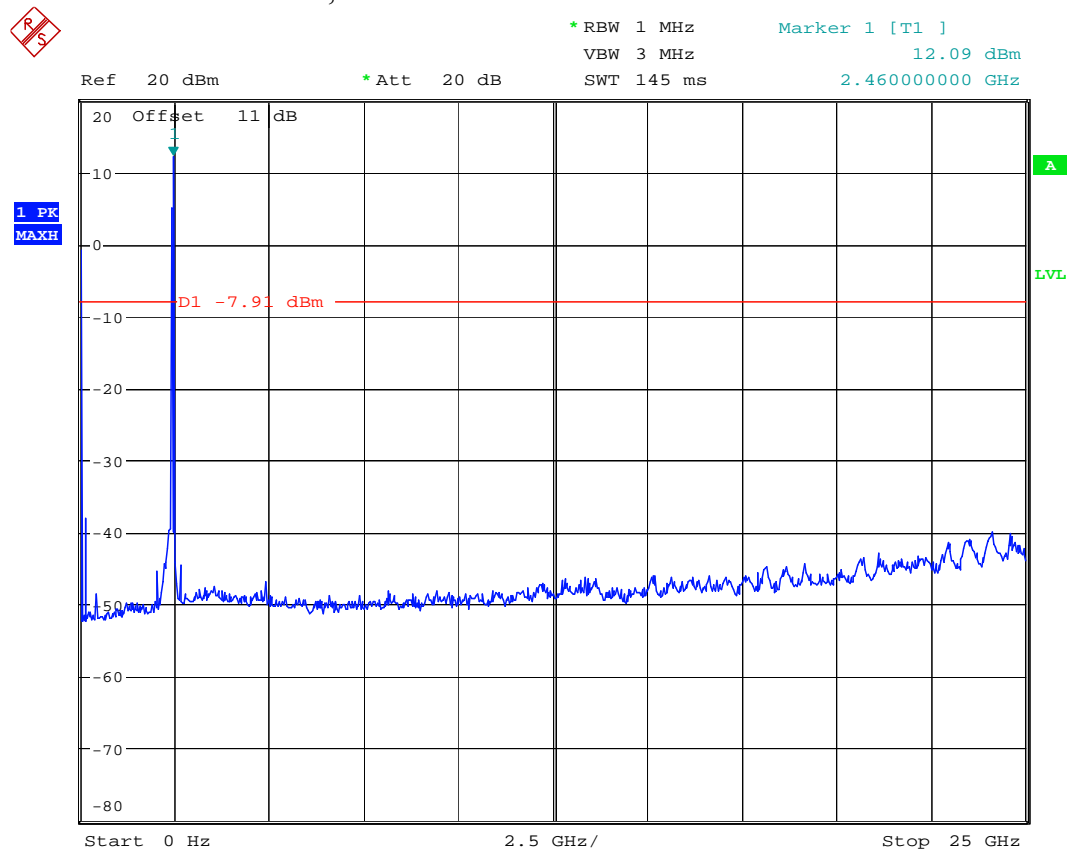
20 dBc Emissions Check, TX-channel: 2.437 GHz:



Date: 30.JUL.2007 19:35:13

Radiated Emissions Not in Restricted Bands, continued

20 dBc Emissions Check, TX-channel: 2.462 GHz:



Date: 30.JUL.2007 19:38:39

Clause 15.247(e) Power Spectral Density for Digitally Modulated Devices

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Conditions:

Sample Number:	1	Temperature (°C):	23°C
Date:	July 30, 2007	Humidity (%):	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See attached plots and table.

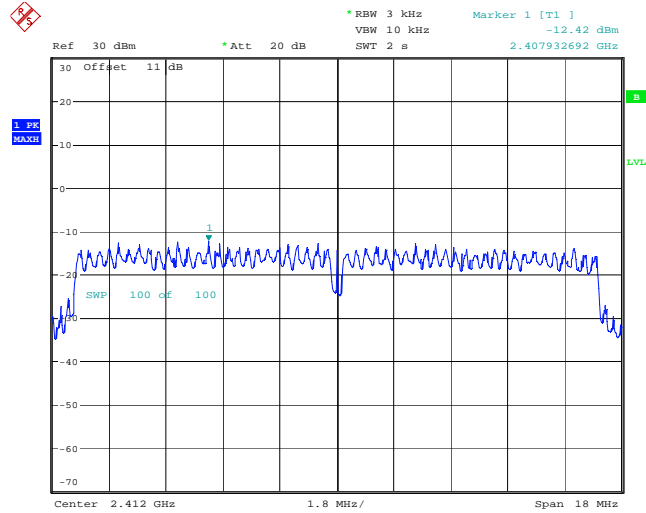
Additional Observations:

The Power Spectral Density was measured on the antenna port by means of a spectrum analyzer and following '*PSD Option 1*' from FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247.

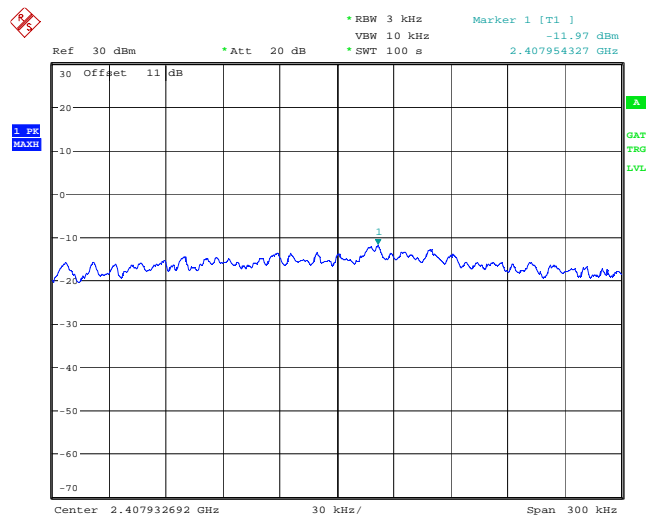
Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #1 (2.412 GHz)

Antenna Gain: 8.5 dBi



Date: 30.JUL.2007 17:17:41

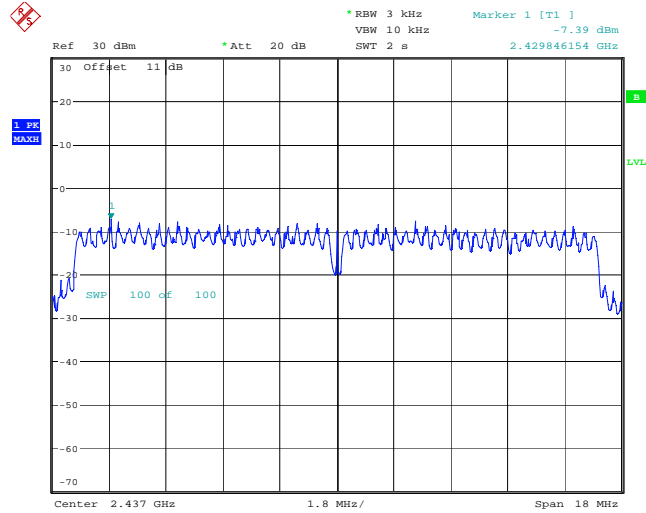


Date: 30.JUL.2007 17:31:18

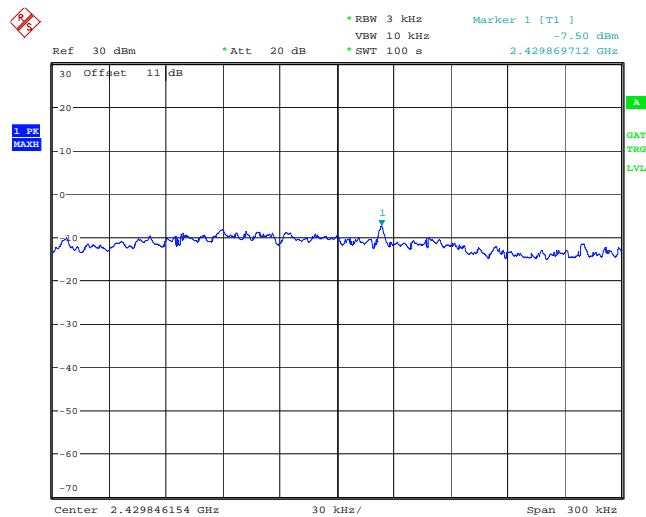
Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #6 (2.437 GHz)

Antenna Gain: 8.5 dBi



Date: 30.JUL.2007 17:44:31

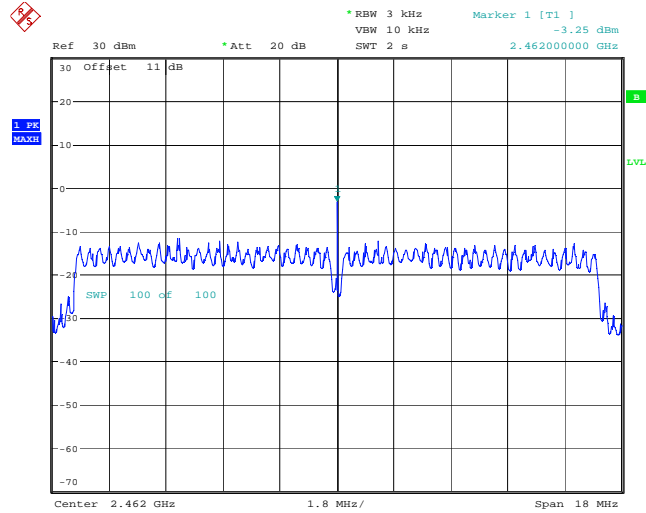


Date: 30.JUL.2007 17:49:47

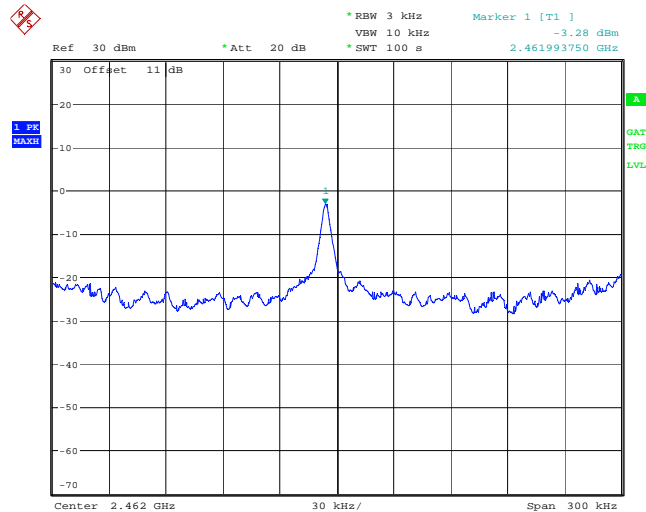
Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #11 (2.462 GHz)

Antenna Gain: 8.5 dBi



Date: 30.JUL.2007 18:07:31

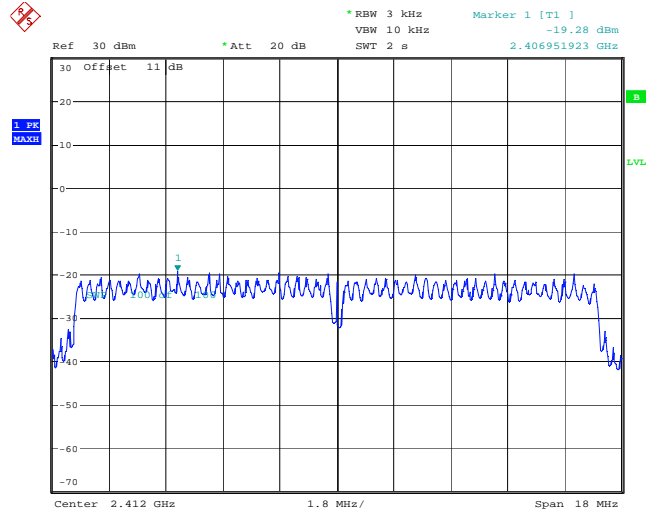


Date: 30.JUL.2007 18:13:42

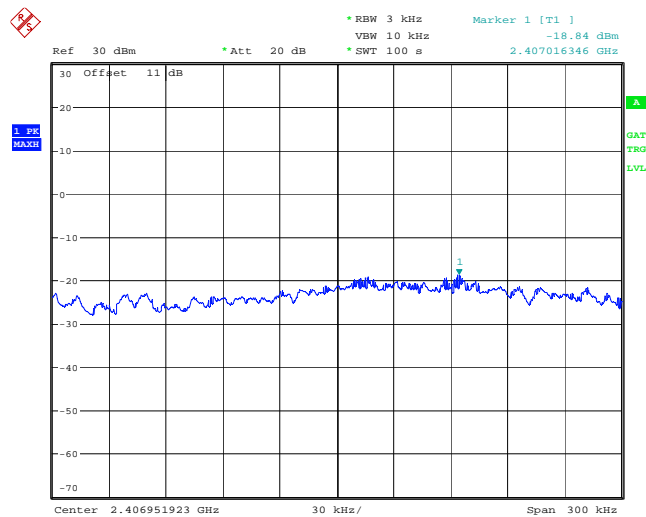
Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #1 (2.412 GHz)

Antenna Gain: 16 dBi



Date: 30.JUL.2007 18:28:52

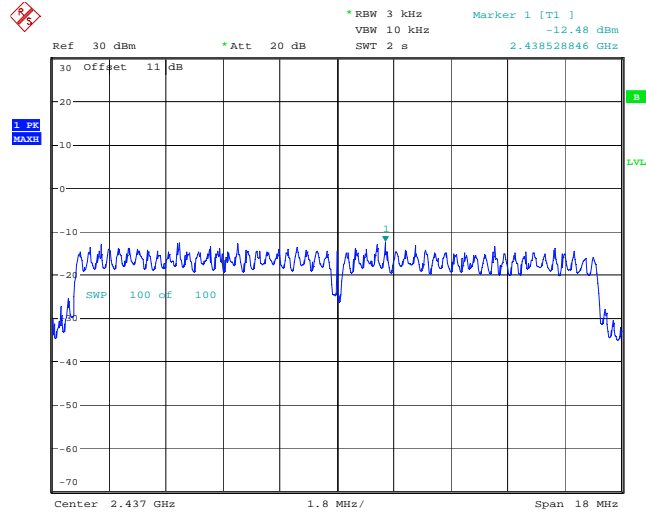


Date: 30.JUL.2007 18:34:33

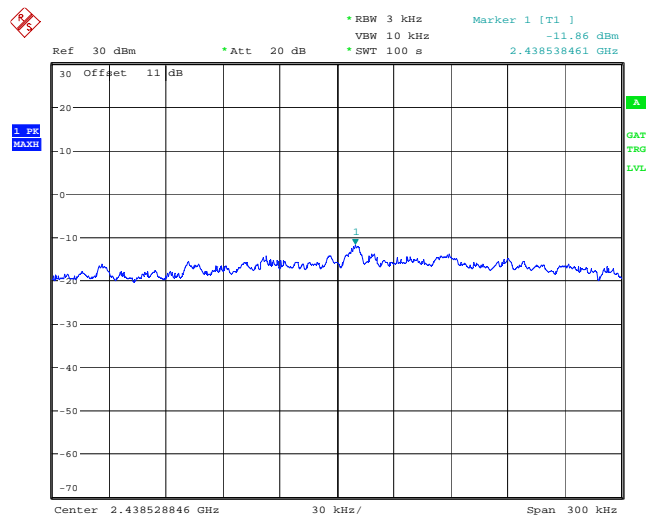
Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #6 (2.437 GHz)

Antenna Gain: 16 dBi



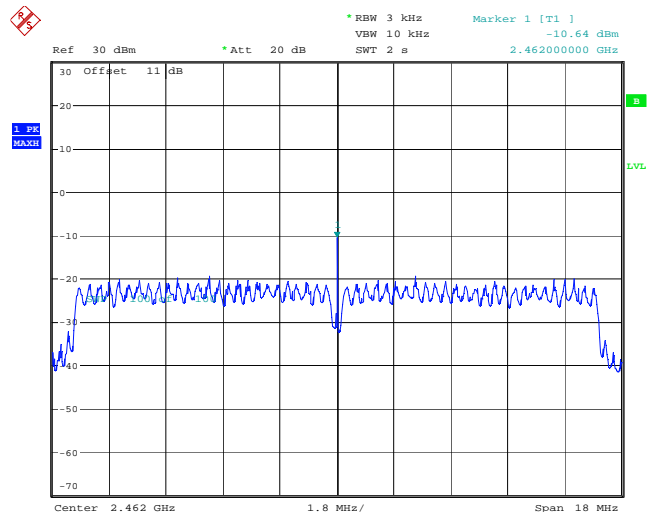
Date: 30.JUL.2007 19:09:55



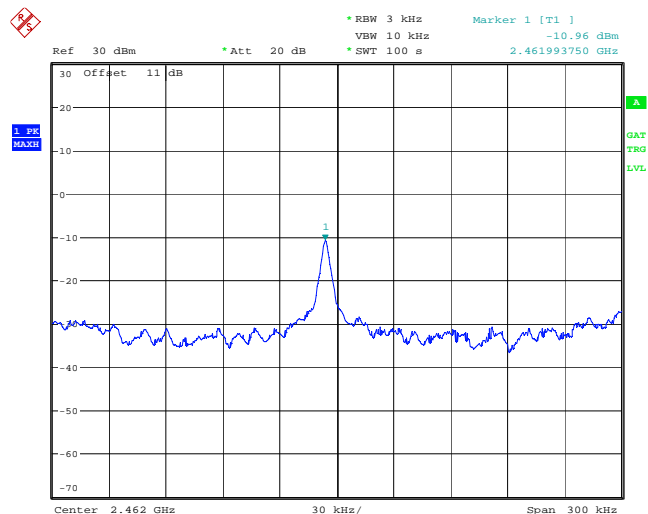
Date: 30.JUL.2007 19:14:29

Power Spectral Density for Digitally Modulated Devices, continued

TX-channel: #11 (2.462 GHz)
Antenna Gain: 16 dBi



Date: 30.JUL.2007 19:21:37



Date: 30.JUL.2007 19:25:53

Power Spectral Density for Digitally Modulated Devices, continued

Ch. #	Freq. MHz	PPSD dBm/3kHz	PPSD Limit dBm/3kHz	Margin dB	G _{ANT} dBi	EIRP dBm/3kHz	EIRP Limit dBm/3kHz	Margin dB
1	2412	-11.97	8.0	19.97	8.5	-3.47	14.0	17.47
6	2437	-7.50	8.0	15.50	8.5	1.00	14.0	13.00
11	2462	-3.28	8.0	11.28	8.5	5.22	14.0	8.78
1	2412	-18.84	8.0	26.84	16.0	-2.84	14.0	16.84
6	2437	-11.86	8.0	19.86	16.0	4.14	14.0	9.86
11	2462	-10.96	8.0	18.96	16.0	5.04	14.0	8.96

§2.1055 Measurements required: Frequency stability

- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
 (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

Test Conditions:

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

Test Results: Pass (see attached table).

T (°C)	Nominal Freq. (GHz)	Measured Freq. (GHz)	Deviation (ppm)
-30	2.437	2.436995257	4.281
-20	2.437	2.436993170	3.425
-10	2.437	2.436991084	2.569
0	2.437	2.436988997	1.712
+10	2.437	2.436986911	0.856
+20	2.437	2.436984824	0.000
+30	2.437	2.436991483	2.732
+40	2.437	2.436998141	5.465
+50	2.437	2.437004800	8.197

Additional Observations:

Frequency stability 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 frequency was observed.

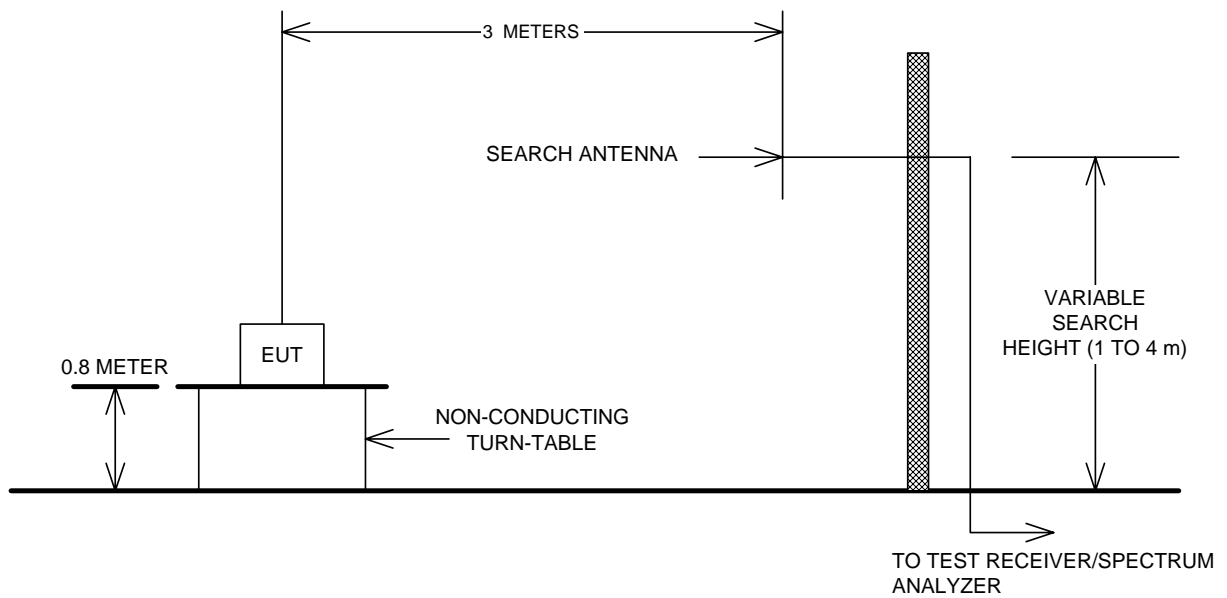
Appendix B: Setup Photographs

Spurious Emissions Setup:

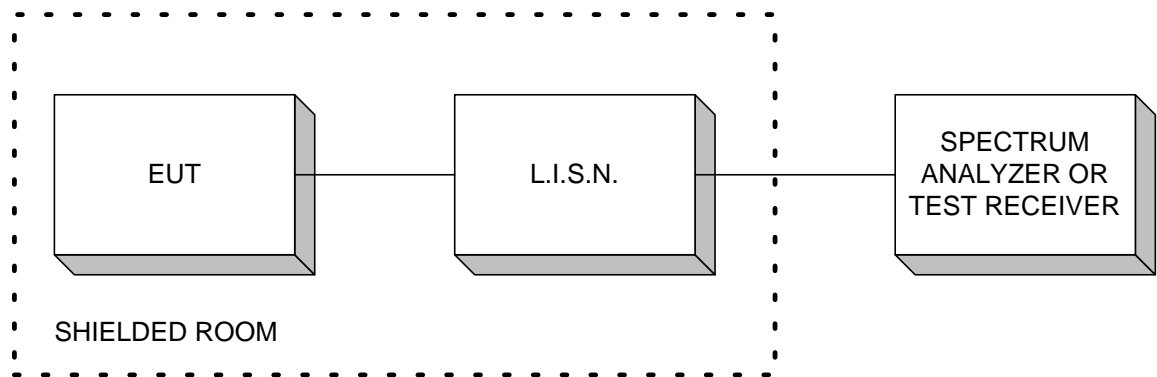


Appendix C: Block Diagram of Test Setups

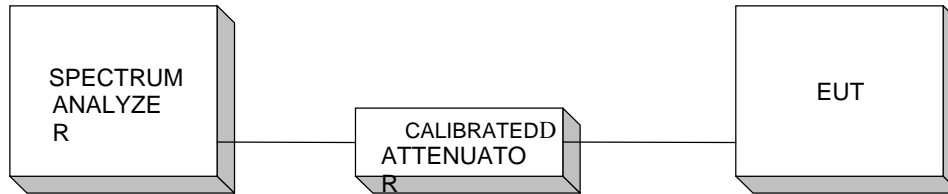
Test Site For Radiated Emissions



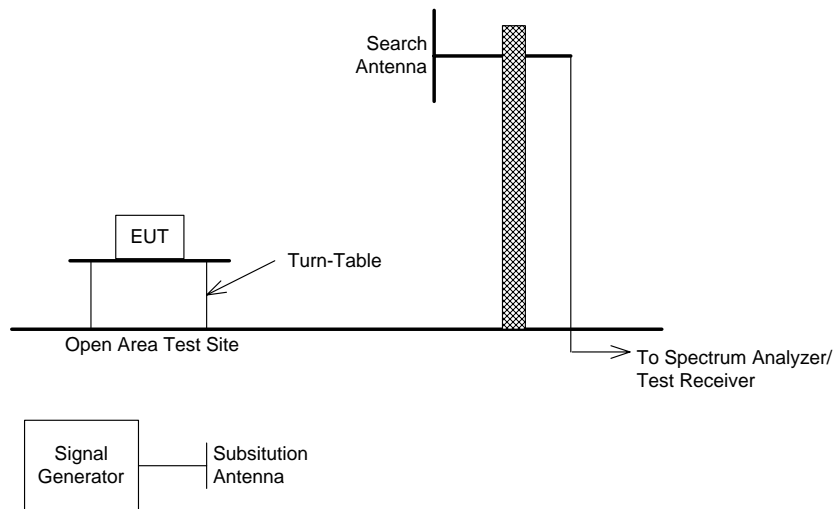
Conducted Emissions



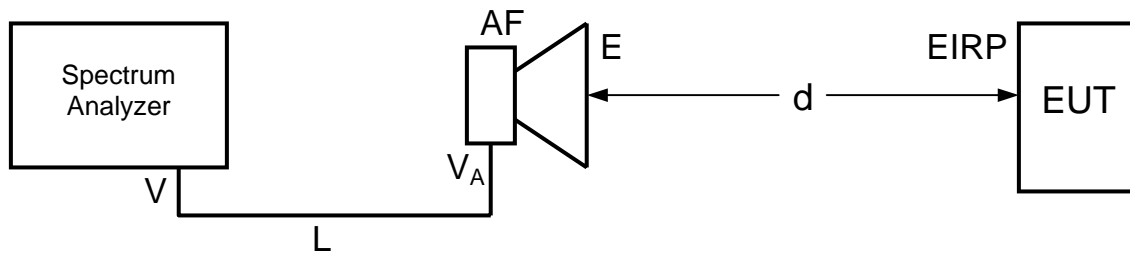
RF Conducted Measurements



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:

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

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

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

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

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

- 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