



Test Report: 6W74699


Applicant: Redline Communications
302 Town Centre Blvd.
Markham, Ontario
L3R 0E8

Apparatus: AN-80i

FCC ID: QC8AN80IA

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

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

Date: December 11, 2006

Total Number of Pages: 90

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:	AN-80i
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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TABLE OF CONTENTS

Report Summary 2
Section 1 : Equipment Under Test..... 4
1.1 Product Identification4
1.2 Samples Submitted for Assessment.....4
1.3 Theory of Operation4
1.4 Technical Specifications of the EUT5
Manufacturer:.....5
1.5 Block Diagram of the EUT.....5
Section 2 : Test Conditions..... 6
2.1 Specifications6
2.2 Deviations From Laboratory Test Procedures6
2.3 Test Environment6
2.4 Test Equipment.....7
Section 3 : Observations 8
3.1 Modifications Performed During Assessment8
3.2 Record Of Technical Judgements8
3.3 EUT Parameters Affecting Compliance8
3.4 Test Deleted.....8
3.5 Additional Observations8
Section 4 : Results Summary 9
4.1 FCC Part 15 Subpart E §15.407: Test Results10
Appendix A : Test Results 11
Section 1: AC power line conducted emissions.....11
Section 2: Radiated emissions below 1 GHz, general requirements.....15
Section 3: Undesirable emission limits (above 1GHz)17
Section 4: Spurious emissions within restricted bands (radiated).....22
Section 5: Emission Bandwidth.....38
Section 6: Peak Conducted Transmit Output Power.....46
Section 7: Peak Power Spectral Density48
Section 8: Peak Excursion Measurement.....56
Section 9: Transmit Power Control (TPC).....81
Section 10: Frequency Stability83
Section 11: Supply Voltage Variation84
Appendix B : Setup Photographs 85
Appendix C : Block Diagram of Test Setups 88
Test Site For Radiated Emissions88
Power Line Conducted Emissions88
RF Conducted Measurements89
TIA/EIA 603, Signal Substitution Method89
EIRP of Radiated Emissions90

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: Redline AN-80i 5.4 GHz Radio

1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
2	Redline AN-80i 5.4 GHz Radio	Prototype 1, ECO-814
3	Redline AN-80i 5.4 GHz Radio	Prototype 2, ECO-814
4	Power over Ethernet (PoE) AC Adapter, 100 – 240VAC/ 47 – 63Hz to 48VDC Cincon Electronics Co., Ltd., Model: TR60A-POE-L	000626
5	Power over Ethernet (PoE) AC Adapter/ Injector, 100 – 240VAC/47 – 63Hz to 48VDC Cincon Electronics Co., Ltd., Model: TR60A-POE-L	002183
6	RF Coaxial Cable, N-male/N-male, Harbour Industries HPF240, 1 ft	30-00-122-00-01
7	9°/22 dBi/5.15 – 5.875 GHz Antenna, P/N: 48-00021-02	01380

The first samples were received on: November 7, 2006

1.3 Theory of Operation

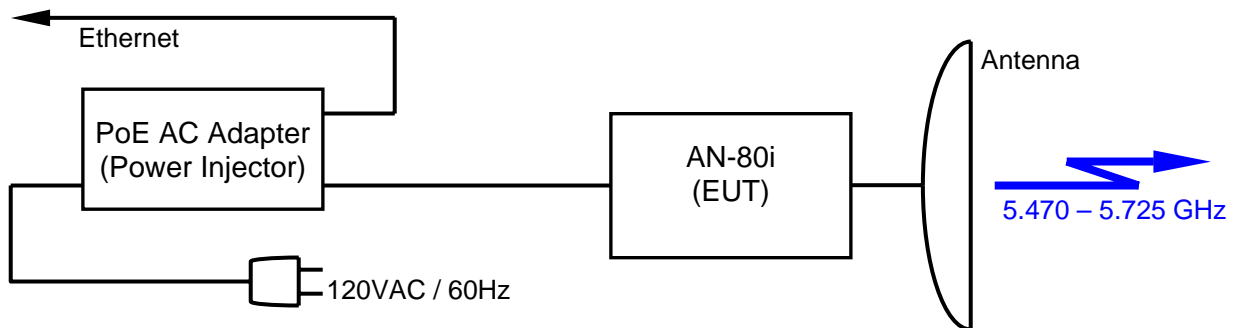
The AN-80i radio is a point-to-point OFDM broadband wireless infrastructure communication device operating in the 5.470 to 5.725 GHz band, designed to provide wireless high-speed Ethernet connection.

1.4 Technical Specifications of the EUT

Manufacturer:	Redline Communications		
Operating Frequency:	5.475 – 5.720 GHz (Channel Spacing: 10MHz) 5.480 – 5.715 GHz (Channel Spacing: 20MHz) 5.490 – 5.705 GHz (Channel Spacing: 40MHz)		
Peak Output Power:	Channel Spacing: 10MHz:	Conducted:	4.0 dBm
		Radiated:	26.0 dBm (EIRP)
	Channel Spacing: 20MHz:	Conducted:	6.9 dBm
		Radiated:	28.9 dBm (EIRP)
	Channel Spacing: 40MHz:	Conducted:	7.9 dBm
		Radiated:	29.9 dBm (EIRP)
Emission Designator:	D7W		
Rated Power:	-3 dBm ⁽¹⁾		
Modulation:	BPSK, QPSK, 16QAM, 64QAM		
Antenna Data:	9° / 22dBi Panel Antenna, Redline P/N: 48-000021-02		
Antenna Connector:	N-female		
Power Source:	Power over Ethernet (PoE) AC Adapter/ Injector, 100–240VAC / 47–63Hz to 48VDC		

Note (1): Manufacturer’s rated power is software power setting representing average (mean) RF power based on conducted measurement with a thermocouple detector and a wide-band power meter.

1.5 Block Diagram of the EUT



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.	Last Cal.	Next Cal.
Spectrum Analyzer	Rhode & Schwarz	FSU	FA001877	May 10/06	May 10/07
Spectrum Analyzer	Rhode & Schwarz	FSP 40 GHz	FA001920	March 17/06	March 17/07
Signal Generator	Rhode & Schwarz	SMIQ 06B	FA001878	June 28/06	June 28/07
Signal Generator	Rhode & Schwarz	SMR40	FA001879	July 27/06	July 27/07
RF Power Meter	Agilent	N1911A	FA001946	Dec. 28/05	Dec. 28/06
RF Power Sensor	Agilent	8487A	FA001947	Dec. 8/05	Dec. 8/06
Thermometer	Fluke	16	FA001831	Jan. 11/06	Jan. 11/07
Power Divider/Combiner	Mini Circuits	ZN2PD-9G	Client	COU	COU
Directional Bridge	Hewlett Packard	HP86205A	Client (S/N: 3140A 02798)	COU	COU
Fixed Attenuator 10dB	Narda	768-10	-	COU	COU
Climate Chamber	Tenney	TJR	27330-08	COU	COU
Climate Chamber	Tenney	T10RC-1.5	29108	COU	COU
RF AMP	JCA	1-2 GHz	FA001498	Aug. 2, 06	Aug. 2, 07
RF AMP	JCA	2-4 GHz	FA001496	Aug. 2, 06	Aug. 2, 07
RF AMP	JCA	4-8 GHz	FA001497	Aug. 2, 06	Aug. 2, 07
RF AMP	Narda	5 - 18GHz	FA001409	COU*	COU*
Bi-Conical Antenna #1	EMCO	3109	FA000805	May 03/06	May 03/07
Log Periodic Antenna #2	EMCO	3148	FA001355	May 16/06	May 16/07
Horn Antenna #2	EMCO	3115	FA000825	Dec. 16/05	Dec. 16/06
Horn Antenna (18 – 40 GHz)	EMCO	3116	FA001847	May 3/06	May 3/07
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 16/06	May 16/07
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 16/06	May 16/07
Receiver	Rohde & Schwarz	ESVS-30	FA001445	July 14/06	July 14/07

* COU (Calibrate on Use)

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

Section	Part 15	Test Description	Required	Result
1	§15.407(b) (6)	Unwanted emissions below 1 GHz	–	–
2	§15.207(a) §15.209	AC power line conducted emissions Radiated emission limits, general requirements	Y Y	PASS PASS
3	§15.407(b) §15.407(b) (3) & (5)	Undesirable emission limits (above 1 GHz) Emissions outside of the 5.47–5.725 GHz band (not in restricted bands, radiated)	– Y	– PASS
4	§15.407(b) (7) & §15.205	Spurious Emissions within Restricted Bands (radiated)	Y	PASS
5	§15.403(i)	Emission Bandwidth	Y	PASS
6	§15.407(a) (2) & (4)	Peak Conducted Transmit Output Power	Y	PASS
7	§15.407(a) (2) & (5)	Peak Power Spectral Density	Y	PASS
8	§15.407(a) (6)	Peak Excursion Measurement	Y	PASS
9	§15.407(h) (1)	Transmit Power Control (TPC)	Y	PASS
10	§15.407(g)	Frequency Stability	Y	PASS
11	§15.31(e)	Supply Voltage Variation	Y	PASS

Appendix A : Test Results

Section 1: AC power line conducted emissions

§ 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.

Test Conditions:

Sample Number:	2	Temperature:	23°C
Date:	November 21, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

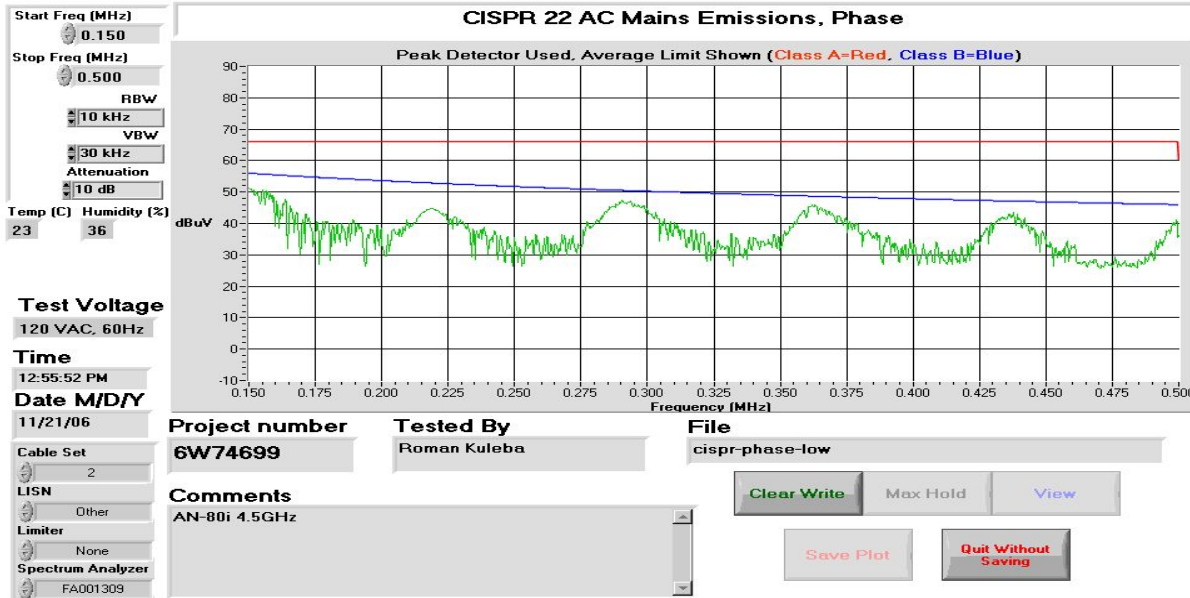
Test Results: Pass (see attached plots and table).

Additional Observations:

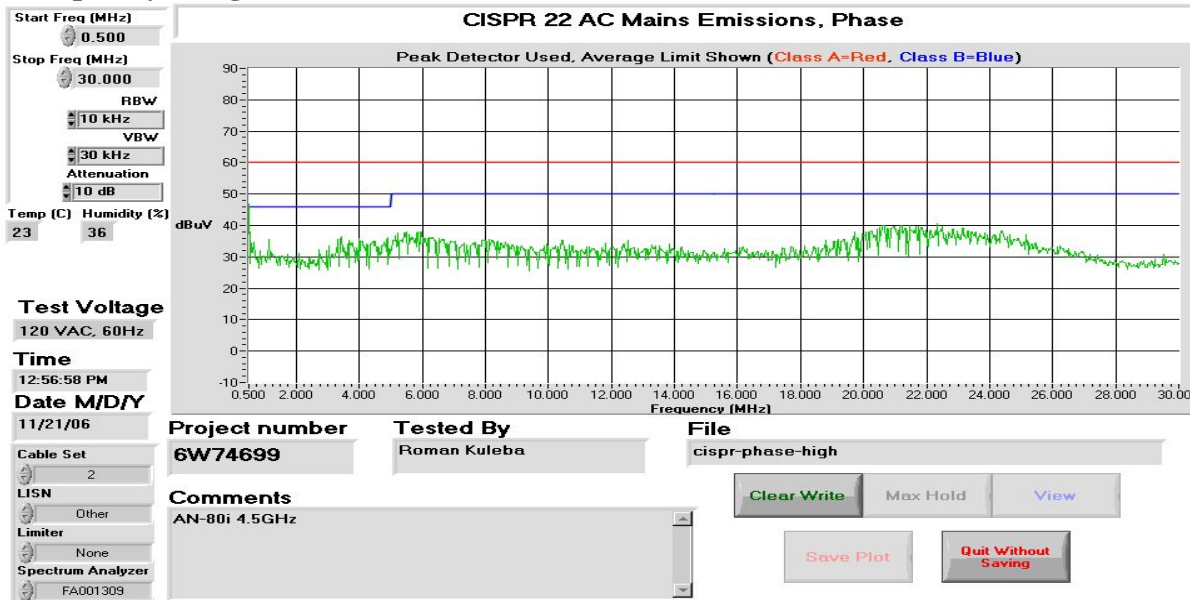
Emissions on the plots enclosed below were measured with Peak Detector and compared against average limits.

AC power line conducted emissions, continued

Line: PHASE
Frequency Range: 150 – 500 kHz

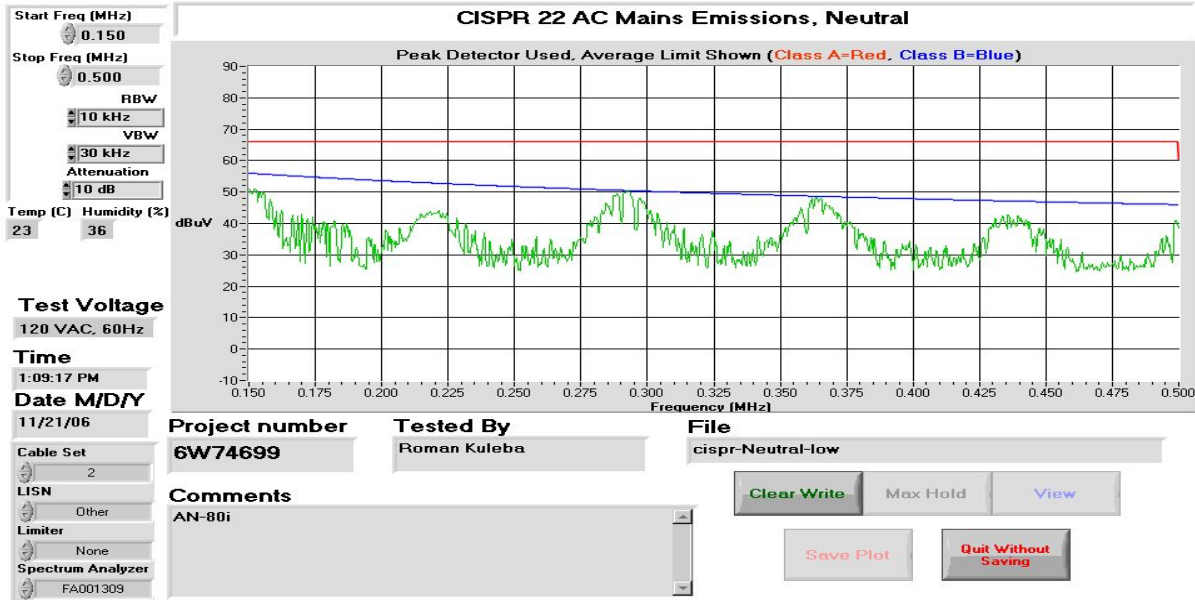


Line: PHASE
Frequency Range: 500 kHz – 30 MHz

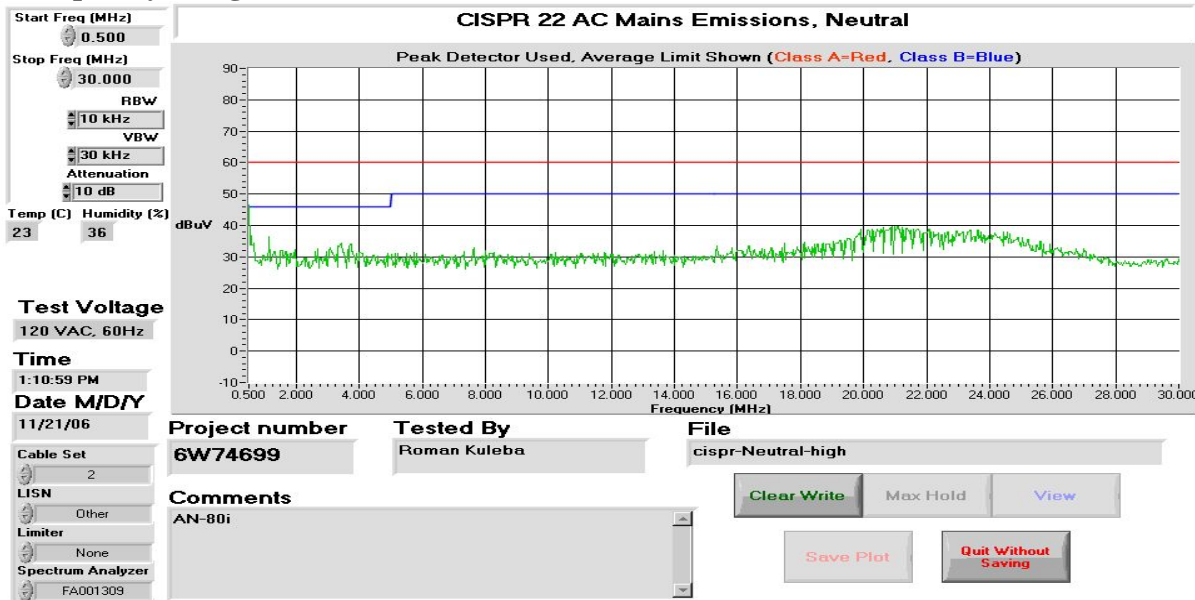


AC power line conducted emissions, continued

Line: NEUTRAL
Frequency Range: 150 – 500 kHz



Line: NEUTRAL
Frequency Range: 500 kHz – 30 MHz



AC power line conducted emissions, continued

Conductor		Frequency (MHz)	Detector	Emission Level (dBµV)	LISN Loss (dB)	Cable Loss (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	Phase	0.1500	Quasi Peak	36.6	9.82	0.00	46.42	66.0	19.6
			Average	25.8	9.82	0.00	35.62	56.0	20.4
2	Phase	0.2184	Quasi Peak	33.0	9.89	0.04	42.93	62.9	19.9
			Average	22.5	9.89	0.04	32.43	52.9	20.4
3	Phase	0.2914	Quasi Peak	32.1	9.89	0.01	42.00	60.5	18.5
			Average	25.7	9.89	0.01	35.60	50.5	14.9
4	Phase	0.3642	Quasi Peak	28.3	9.89	0.03	38.22	58.6	20.4
			Average	19.5	9.89	0.03	29.42	48.6	19.2
5	Phase	0.4370	Quasi Peak	25.6	9.90	0.04	35.55	57.1	21.6
			Average	16.0	9.90	0.04	25.95	47.1	21.2
6	Neutral	0.1500	Quasi Peak	36.7	9.79	0.00	46.49	66.0	19.5
			Average	26.0	9.79	0.00	35.79	56.0	20.2
7	Neutral	0.2187	Quasi Peak	32.9	9.87	0.04	42.81	62.9	20.1
			Average	22.4	9.87	0.04	32.31	52.9	20.6
8	Neutral	0.2914	Quasi Peak	32.0	9.87	0.01	41.88	60.5	18.6
			Average	25.6	9.87	0.01	35.48	50.5	15.0
9	Neutral	0.3643	Quasi Peak	28.3	9.87	0.03	38.20	58.6	20.4
			Average	19.5	9.87	0.03	29.40	48.6	19.2
10	Neutral	0.4370	Quasi Peak	25.6	9.89	0.04	35.54	57.1	21.6
			Average	16.1	9.89	0.04	26.04	47.1	21.1

Section 2: Radiated emissions below 1 GHz, general requirements

§ 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.

§ 15.209 (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:	2	Temperature:	23°C
Date:	November 22, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see attached table)

Additional Observations:

The Spectrum was searched from 30MHz to 1GHz. All measurements were performed at a distance of 3 meters using a test receiver in Peak Detector mode with 120 kHz RBW.

Radiated emissions below 1 GHz, 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	320.0000	LP2	V	10.0	14.9	1.9	26.8	46.0	19.2	Peak
2	560.0000	LP2	V	25.0	18.4	2.4	45.8	46.0	0.2	Peak
3	666.6652	LP2	V	15.0	20.5	2.6	38.1	46.0	7.9	Peak
4	320.0000	LP2	H	9.0	15.1	1.9	26.0	46.0	20.0	Peak
5	560.0000	LP2	H	24.0	19.2	2.4	45.6	46.0	0.4	Peak
6	666.6652	LP2	H	20.0	21.6	2.6	44.2	46.0	1.8	Peak

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
 Note 2: Positive Peak detector used

Section 3: Undesirable emission limits (above 1GHz)

§ 15.407 (b) (3) Emissions outside of the 5.47–5.725 GHz band, not in restricted bands (radiated):
 For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band 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:	2	Temperature:	23°C
Date:	November 22, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

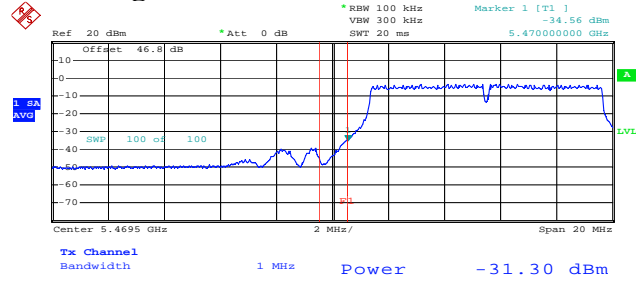
Test Results: Pass (see attached table and plots).

Additional Observations:

The Spectrum was searched from 1GHz to the 40 GHz.
 Measurements were performed at a distance of 3 meters using a Sample Detector with 1 MHz RBW and VBW ≥ RBW.

Undesirable emission limits (above 1GHz), continued

Band Edge Check:

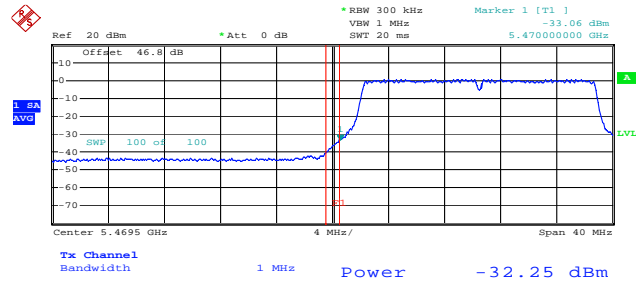


Lower Band Edge (5.47 GHz)

Antenna Gain: 22 dBi
 Channel Spacing: 10 MHz
 Software (GUI) Power Setting: -8 dBm

Integration Interval: 5469 – 5470 MHz
 Measured Emission: -31.30 dBm/MHz
 Limit: -27.0 dBm/MHz
 Margin: 4.30 dB

RedLine
 Date: 30.NOV.2006 05:45:29



Lower Band Edge (5.47 GHz)

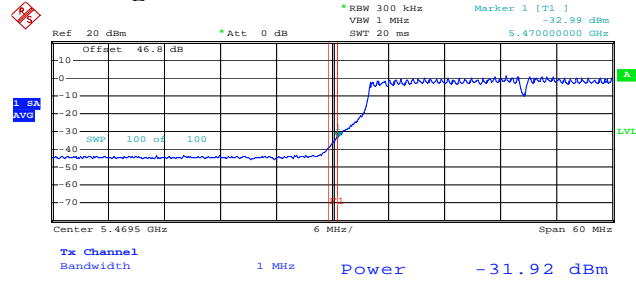
Antenna Gain: 22 dBi
 Channel Spacing: 20 MHz
 Software (GUI) Power Setting: -5 dBm

Integration Interval: 5469 – 5470 MHz
 Measured Emission: -32.25 dBm/MHz
 Limit: -27.0 dBm/MHz
 Margin: 5.25 dB

RedLine
 Date: 30.NOV.2006 06:00:25

Undesirable emission limits (above 1GHz), continued

Band Edge Check:

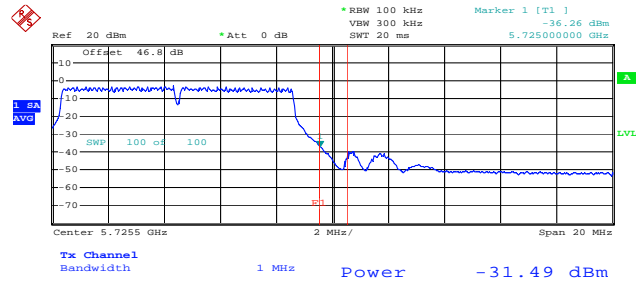


Lower Band Edge (5.47 GHz)

Antenna Gain: 22 dBi
Channel Spacing: 40 MHz
Software (GUI) Power Setting: -3 dBm

Integration Interval: 5469 – 5470 MHz
Measured Emission: -31.92 dBm/MHz
Limit: -27.0 dBm/MHz
Margin: 4.92 dB

RedLine
Date: 30.NOV.2006 05:58:38



Upper Band Edge (5.725 GHz)

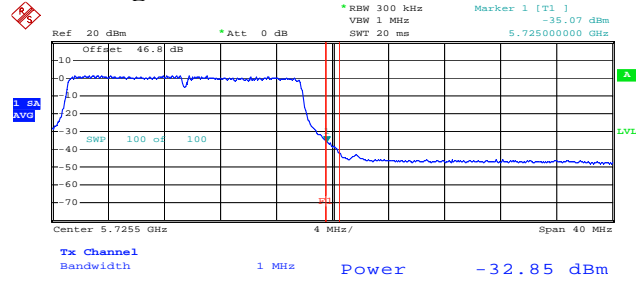
Antenna Gain: 22 dBi
Channel Spacing: 10 MHz
Software (GUI) Power Setting: -8 dBm

Integration Interval: 5725 – 5726 MHz
Measured Emission: -31.49 dBm/MHz
Limit: -27.0 dBm/MHz
Margin: 4.49 dB

RedLine
Date: 30.NOV.2006 06:04:33

Undesirable emission limits (above 1GHz), continued

Band Edge Check:

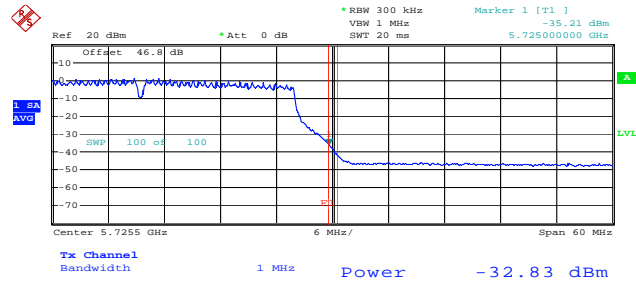


Upper Band Edge (5.725 GHz)

Antenna Gain: 22 dBi
Channel Spacing: 20 MHz
Software (GUI) Power Setting: -5 dBm

Integration Interval: 5725 – 5726 MHz
Measured Emission: -32.85 dBm/MHz
Limit: -27.0 dBm/MHz
Margin: 5.85 dB

RedLine
Date: 30.NOV.2006 06:07:13



Upper Band Edge (5.725 GHz)

Antenna Gain: 22 dBi
Channel Spacing: 40 MHz
Software (GUI) Power Setting: -4 dBm

Integration Interval: 5725 – 5726 MHz
Measured Emission: -32.83 dBm/MHz
Limit: -27.0 dBm/MHz
Margin: 5.83 dB

RedLine
Date: 30.NOV.2006 06:12:27

Undesirable emission limits (above 1GHz), continued

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Sig. Sub. Factor	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Detector
1	1840.0000	Horn1	V	61.6	-115.5	-53.9	-27.0	26.9	Peak
2	1840.0000	Horn1	H	58.0	-114.6	-56.6	-27.0	29.6	Peak

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
 Note 2: Peak detector used

Section 4: 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:	2	Temperature:	23°C
Date:	November 22, 2006	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 (radiated), continued

Frequency (MHz)	Antenna	Polarity (V/H)	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Reading (Peak/Average)	
1	1040.0000	Horn1	V	60.5	24.9	48.5	N/A	3.4	40.3	74.0	33.7	Peak
	1040.0000	Horn1	V	60.5	24.9	48.5	0	3.4	40.3	54.0	13.7	Average
2	1200.0000	Horn1	V	64.8	25.0	49.2	N/A	3.7	44.3	74.0	29.7	Peak
	1200.0000	Horn1	V	64.8	25.0	49.2	0	3.7	44.3	54.0	9.7	Average
3	1360.0000	Horn1	V	63.5	25.1	48.9	N/A	4.0	43.7	74.0	30.3	Peak
	1360.0000	Horn1	V	63.5	25.1	48.9	0	4.0	43.7	54.0	10.3	Average
4	1520.0000	Horn1	V	55.2	27.0	49.0	N/A	4.2	37.4	74.0	36.6	Peak
	1520.0000	Horn1	V	55.2	27.0	49.0	0	4.2	37.4	54.0	16.6	Average
5	1600.0000	Horn1	V	53.7	27.1	49.0	N/A	4.3	36.2	74.0	37.8	Peak
	1600.0000	Horn1	V	53.7	27.1	49.0	0	4.3	36.2	54.0	17.8	Average
6	1040.0000	Horn1	H	57.6	24.9	48.5	N/A	3.4	37.4	74.0	36.6	Peak
	1040.0000	Horn1	H	57.6	24.9	48.5	0	3.4	37.4	54.0	16.6	Average
7	1200.0000	Horn1	H	65.7	25.0	49.2	N/A	3.7	45.2	74.0	28.8	Peak
	1200.0000	Horn1	H	65.7	25.0	49.2	0	3.7	45.2	54.0	8.8	Average
8	1360.0000	Horn1	H	60.2	25.1	48.9	N/A	4.0	40.4	74.0	33.6	Peak
	1360.0000	Horn1	H	60.2	25.1	48.9	0	4.0	40.4	54.0	13.6	Average
9	1520.0000	Horn1	H	52.1	27.1	49.0	N/A	4.2	34.4	74.0	39.6	Peak
	1520.0000	Horn1	H	52.1	27.1	49.0	0	4.2	34.4	54.0	19.6	Average
10	1600.0000	Horn1	H	51.0	27.2	49.0	N/A	4.3	33.5	74.0	40.5	Peak
	1600.0000	Horn1	H	51.0	27.2	49.0	0	4.3	33.5	54.0	20.5	Average

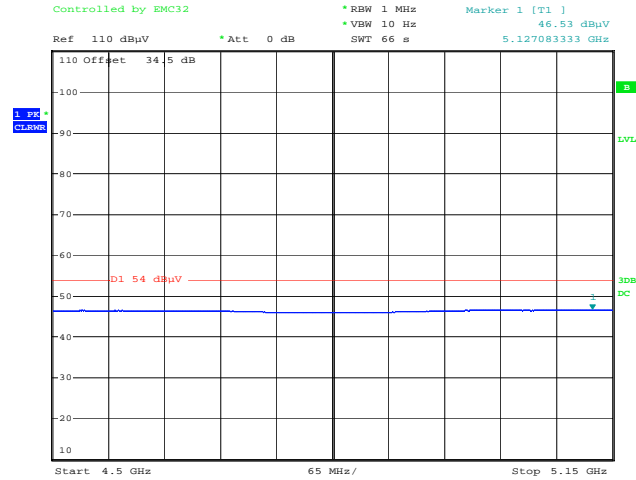
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Peak detector used

Note 3: Signals presented in the table were steady signals i.e. correction for duty cycle is 0 dB.

Spurious emissions within restricted bands (radiated), continued

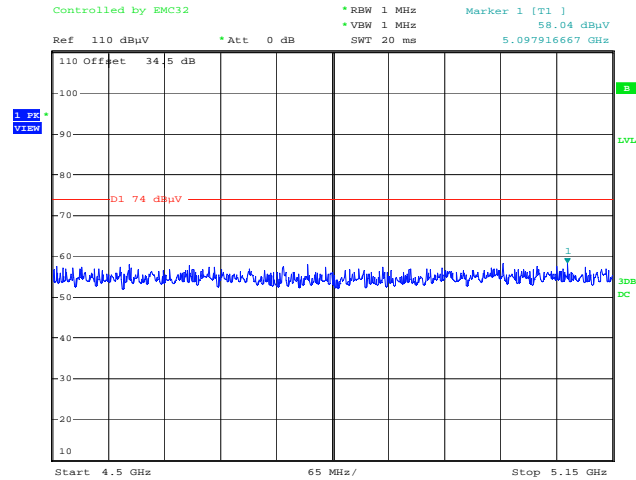
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
Low Channel (5.475 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:51:56



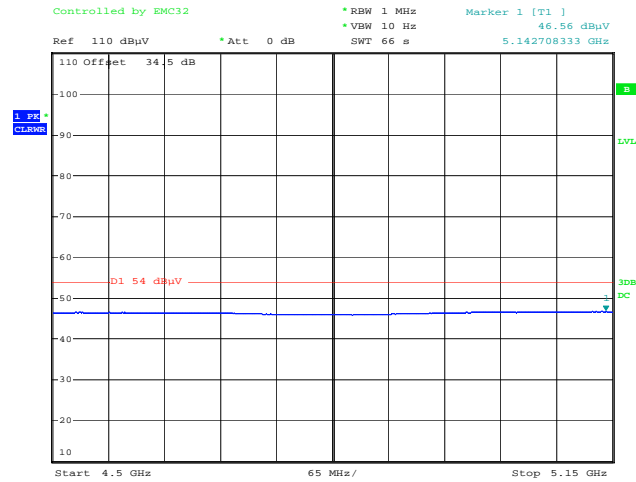
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
Low Channel (5.475 GHz)

Redline AN-80i
Date: 22.NOV.2006 18:56:46

Spurious emissions within restricted bands (radiated), continued

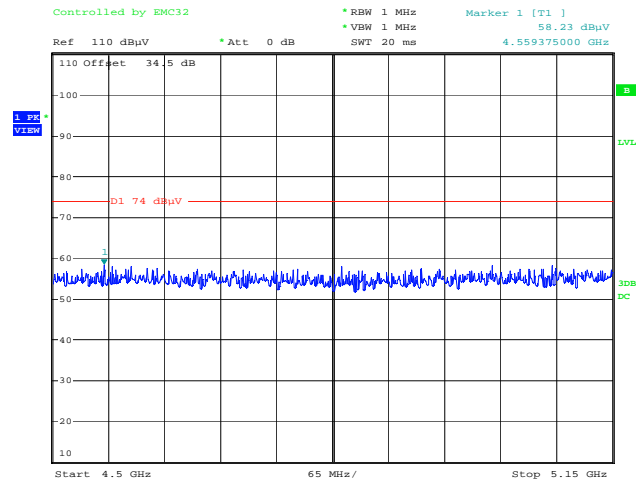
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
Low Channel (5.480GHz)

Redline AN-80i
Date: 22.NOV.2006 19:56:00



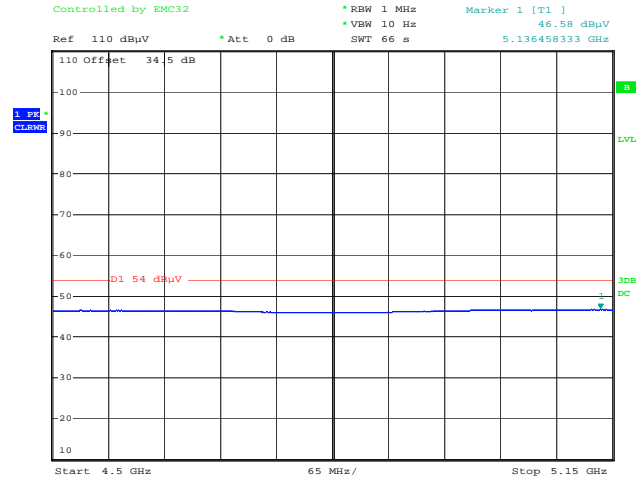
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
Low Channel (5.480GHz)

Redline AN-80i
Date: 22.NOV.2006 19:01:23

Spurious emissions within restricted bands (radiated), continued

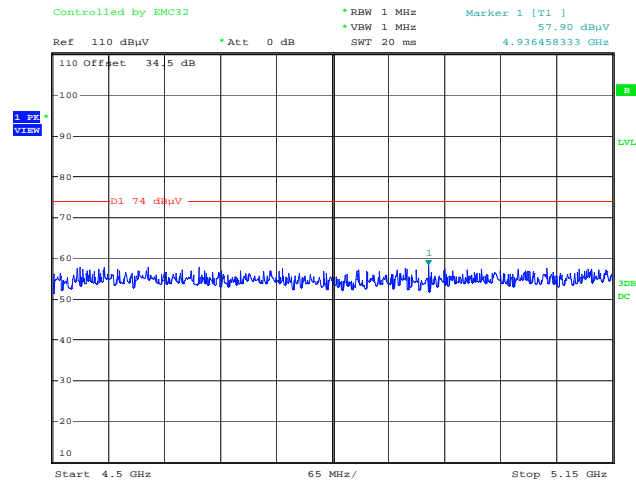
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -3 dBm
Channel Spacing: 40 MHz
Low Channel (5.490 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:48:53



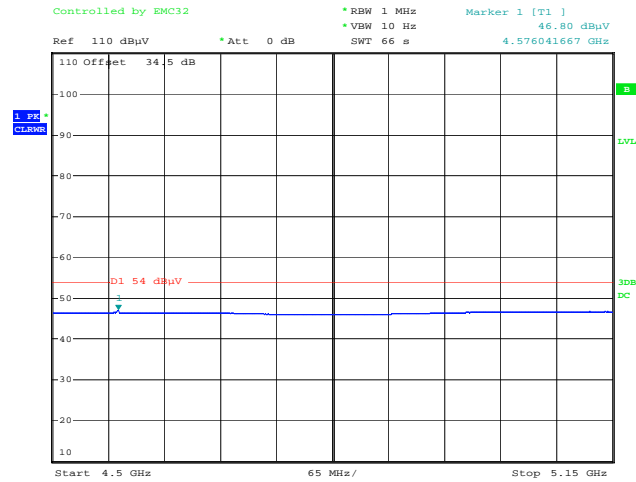
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -3 dBm
Channel Spacing: 40 MHz
Low Channel (5.490 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:03:36

Spurious emissions within restricted bands (radiated), continued

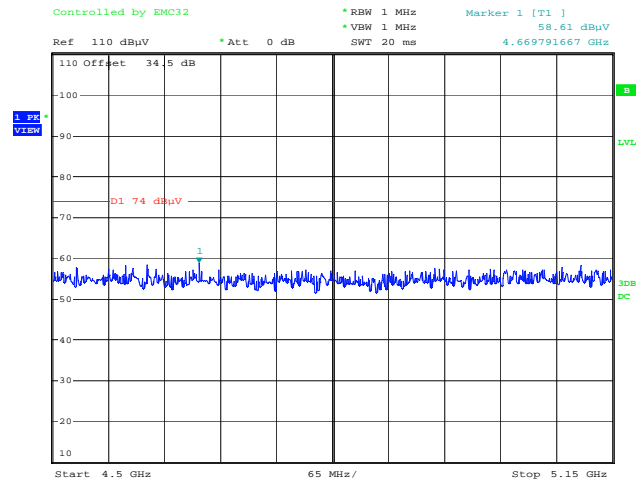
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
High Channel (5.720 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:59:40



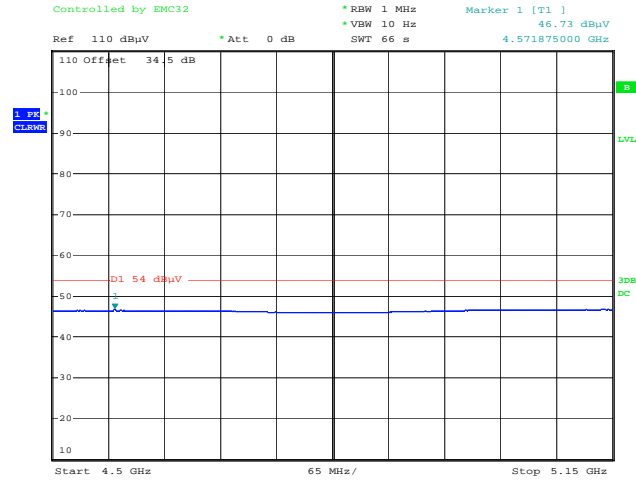
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
High Channel (5.720 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:08:56

Spurious emissions within restricted bands (radiated), continued

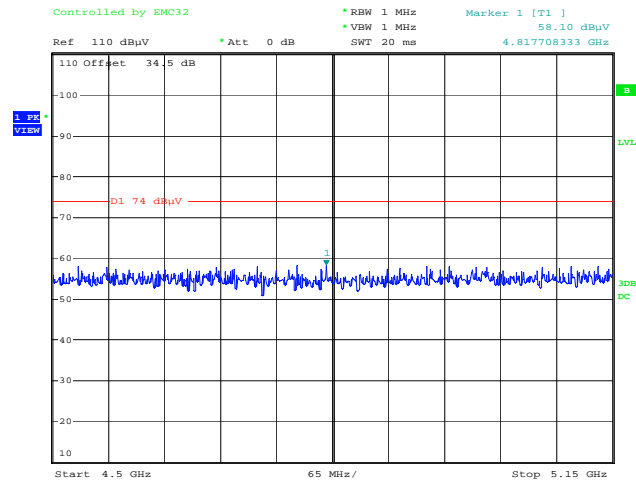
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
High Channel (5.715 GHz)

Redline AN-80i
Date: 22.NOV.2006 20:03:02



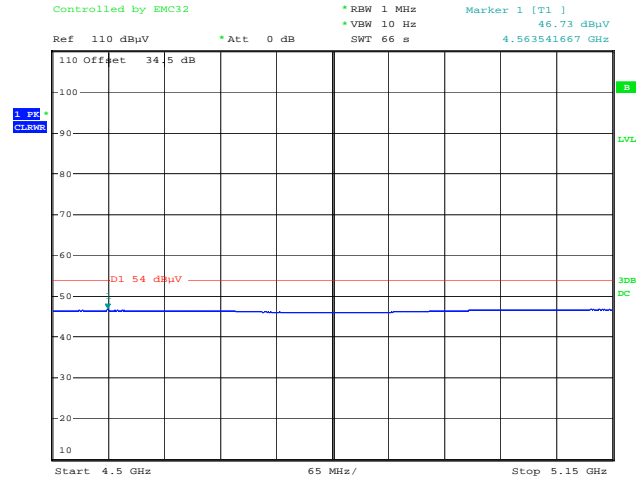
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
High Channel (5.715 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:11:03

Spurious emissions within restricted bands (radiated), continued

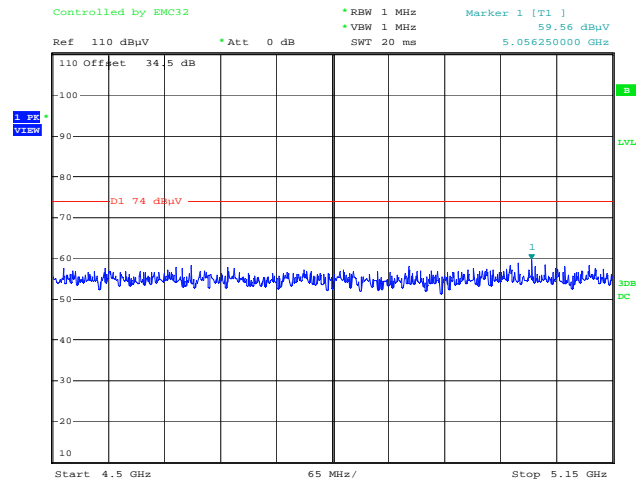
Restricted Bands of Operation:



Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -4 dBm
Channel Spacing: 40 MHz
High Channel (5.705 GHz)

Redline AN-80i
Date: 22.NOV.2006 20:07:43



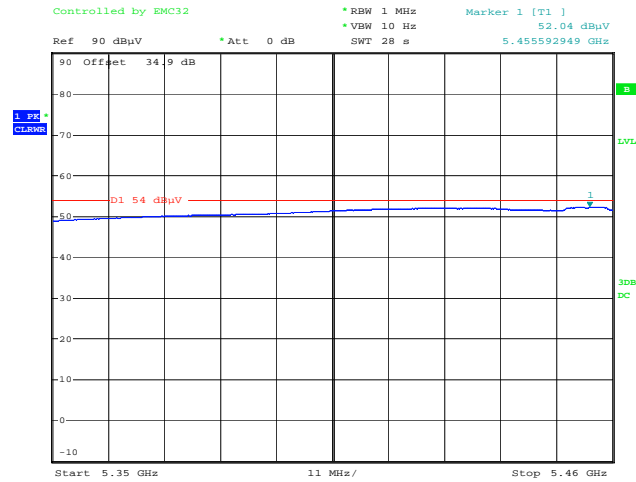
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -4 dBm
Channel Spacing: 40 MHz
High Channel (5.705 GHz)

Redline AN-80i
Date: 22.NOV.2006 19:19:31

Spurious emissions within restricted bands (radiated), continued

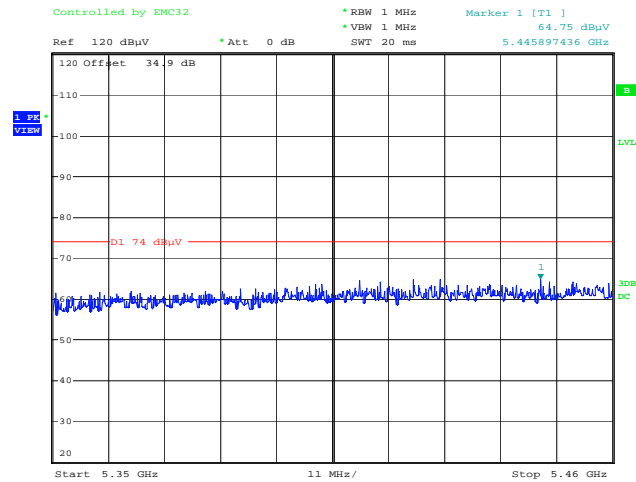
Restricted Bands of Operation:



Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
Low Channel (5.475 GHz)

Redline AN-80i
Date: 22.NOV.2006 15:50:03



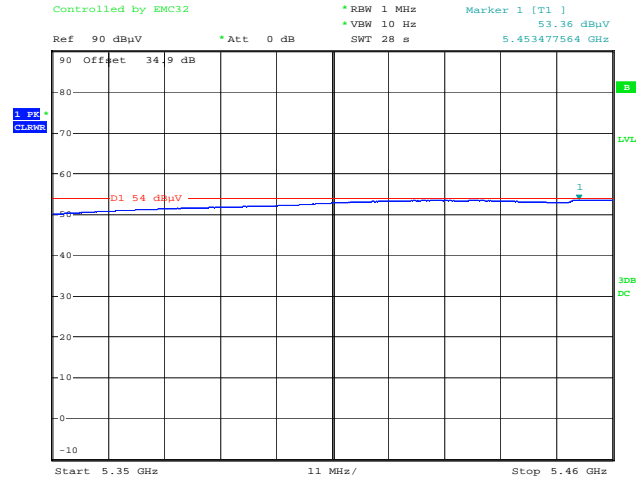
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
Low Channel (5.475 GHz)

Redline AN-80i
Date: 22.NOV.2006 17:24:45

Spurious emissions within restricted bands (radiated), continued

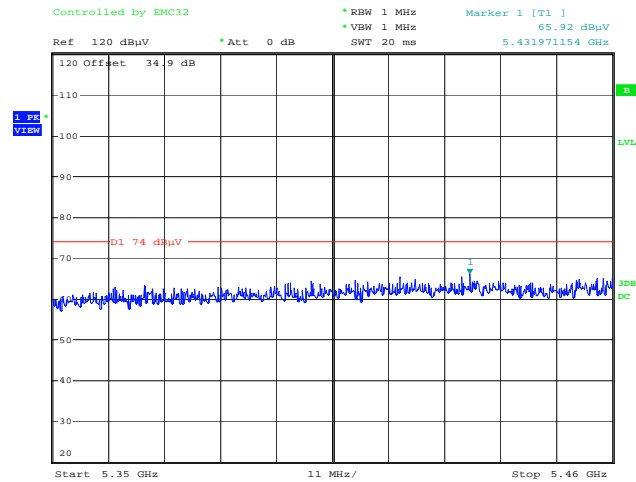
Restricted Bands of Operation:



Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
Low Channel (5.480 GHz)

Redline AN-80i
Date: 22.NOV.2006 15:53:26



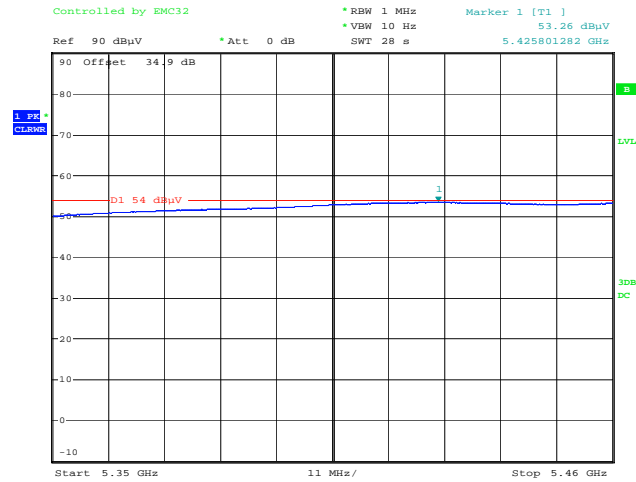
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -5 dBm
Channel Spacing: 20 MHz
Low Channel (5.480 GHz)

Redline AN-80i
Date: 22.NOV.2006 17:30:52

Spurious emissions within restricted bands (radiated), continued

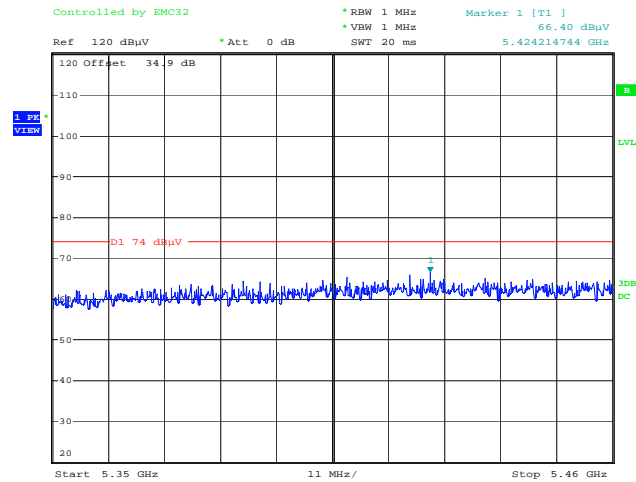
Restricted Bands of Operation:



Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -3 dBm
Channel Spacing: 40 MHz
Low Channel (5.490 GHz)

Redline AN-80i
Date: 22.NOV.2006 15:46:19



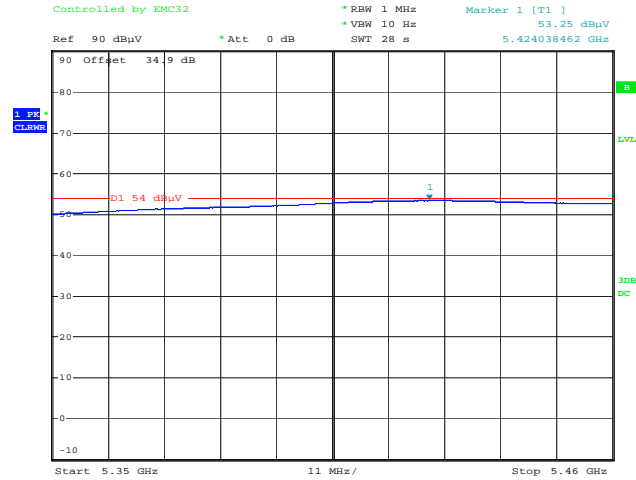
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -3 dBm
Channel Spacing: 40 MHz
Low Channel (5.490 GHz)

Redline AN-80i
Date: 22.NOV.2006 17:37:18

Spurious emissions within restricted bands (radiated), continued

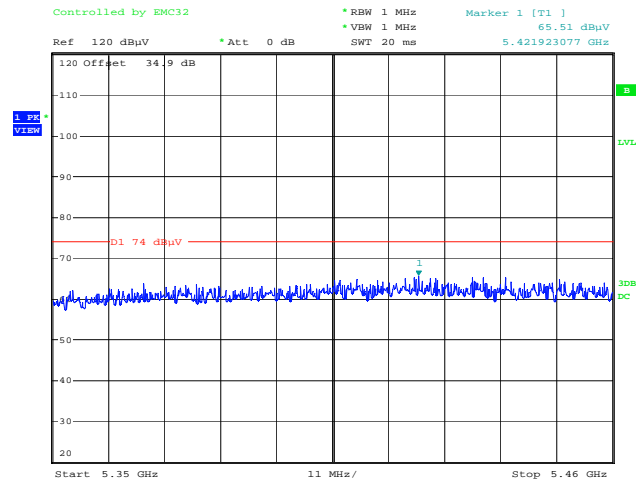
Restricted Bands of Operation:



Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
High Channel (5.720 GHz)

Redline AN-80i
Date: 22.NOV.2006 15:56:30



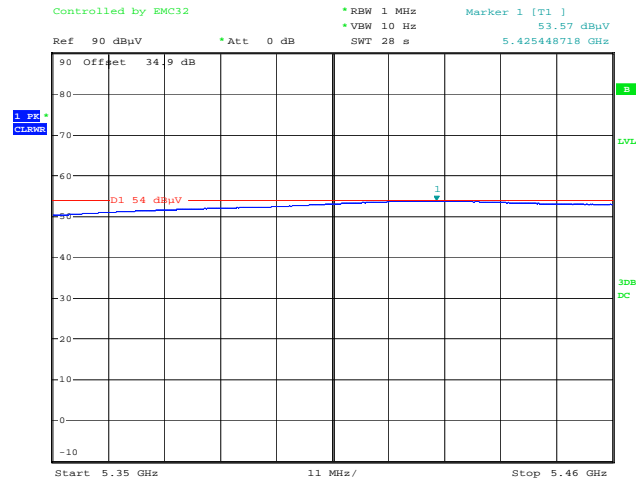
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -8 dBm
Channel Spacing: 10 MHz
High Channel (5.720 GHz)

Redline AN-80i
Date: 22.NOV.2006 17:47:12

Spurious emissions within restricted bands (radiated), continued

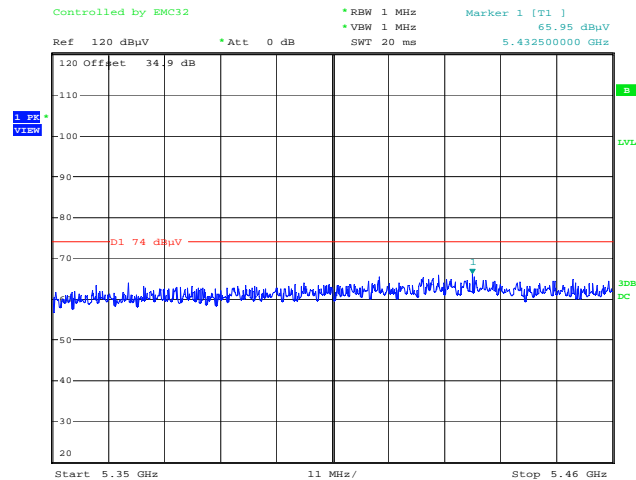
Restricted Bands of Operation:



Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -4 dBm
Channel Spacing: 40 MHz
High Channel (5.705 GHz)

Redline AN-801
Date: 22.NOV.2006 16:03:52



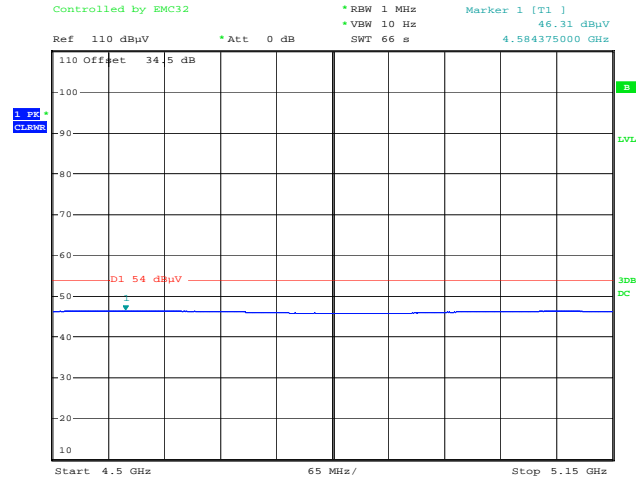
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Antenna Gain: 22 dBi
Software (GUI) Power Setting: -4 dBm
Channel Spacing: 40 MHz
High Channel (5.705 GHz)

Redline AN-801
Date: 22.NOV.2006 17:57:00

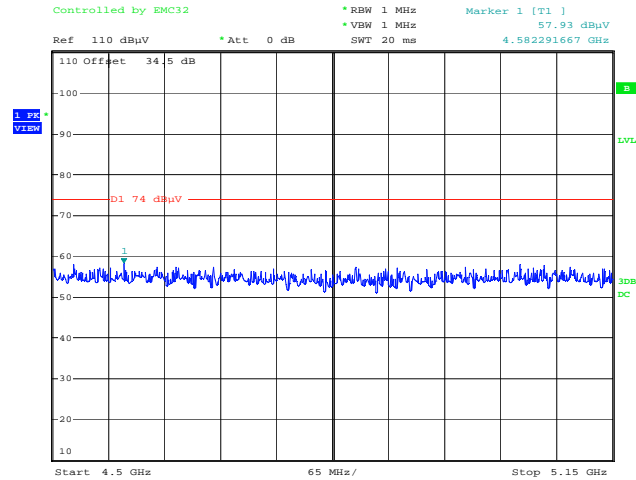
Spurious emissions within restricted bands (radiated), continued

Restricted Bands of Operation – Ambient Noise



Noise Floor
Restricted Band: 4.50–5.15 GHz
Signal Reading: AVERAGE

Redline AN-80i
Date: 22.NOV.2006 11:01:14

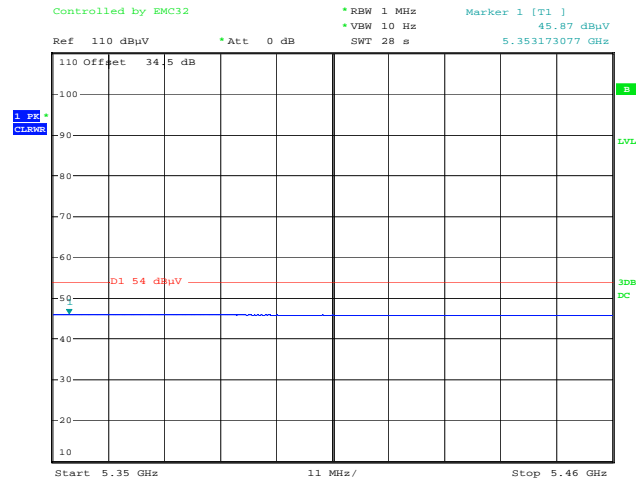


Noise Floor
Restricted Band: 4.50–5.15 GHz
Signal Reading: PEAK

Redline AN-80i
Date: 22.NOV.2006 11:05:22

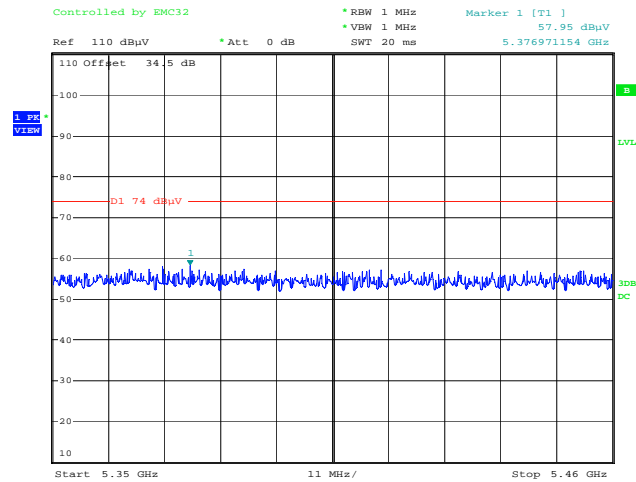
Spurious emissions within restricted bands (radiated), continued

Restricted Bands of Operation – Ambient Noise



Noise Floor
Restricted Band: 5.35–5.46 GHz
Signal Reading: AVERAGE

Redline AN-80i
Date: 22.NOV.2006 11:02:41



Noise Floor
Restricted Band: 5.35–5.46 GHz
Signal Reading: PEAK

Redline AN-80i
Date: 22.NOV.2006 11:04:31

Section 5: Emission Bandwidth

§15.403(i) Emission bandwidth.

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

Test Conditions:

Sample Number:	2	Temperature:	23°C
Date:	November 7, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

Test Results: See tables and plots.

Emission Bandwidth, continued

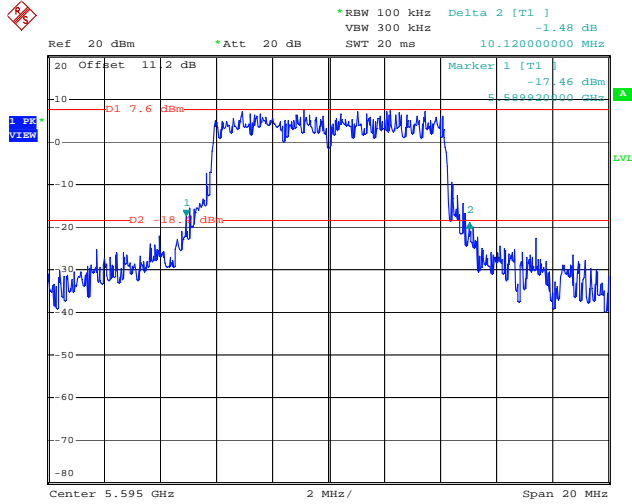
26dB Occupied Bandwidth:

Channel Spacing: 10 MHz				
Freq.	BPSK	QPSK	16QAM	64QAM
(GHz)	BW (MHz)	BW (MHz)	BW (MHz)	BW (MHz)
5.475	9.80	9.84	9.76	9.60
5.595	9.92	9.88	10.12	9.84
5.720	10.92	10.56	11.20	10.92

Channel Spacing: 20 MHz				
Freq.	BPSK	QPSK	16QAM	64QAM
(GHz)	BW (MHz)	BW (MHz)	BW (MHz)	BW (MHz)
5.480	18.3	18.3	17.9	17.8
5.595	18.9	18.9	19.0	19.3
5.715	20.1	20.4	20.7	20.8

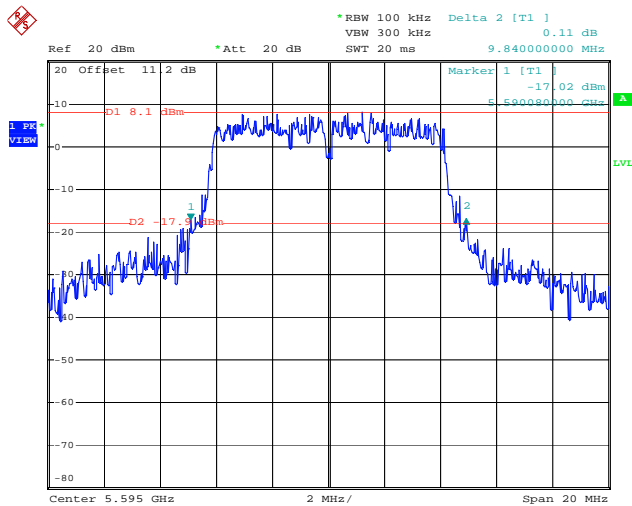
Channel Spacing: 40 MHz				
Freq.	BPSK	QPSK	16QAM	64QAM
(GHz)	BW (MHz)	BW (MHz)	BW (MHz)	BW (MHz)
5.490	38.6	37.2	37.0	36.8
5.595	38.0	38.0	38.0	38.2
5.705	39.4	41.6	43.2	38.4

Emission Bandwidth, continued



Measurement: 26dB Occupied BW
Channel spacing: 10 MHz
Channel: Mid (5.595 GHz)
Modulation: 16QAM

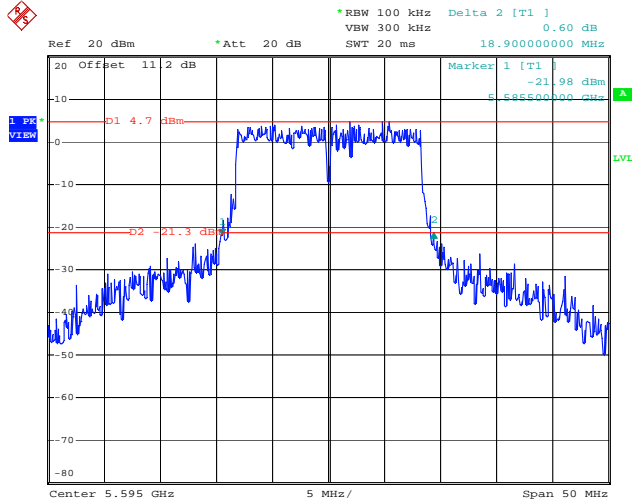
Date: 7.NOV.2006 07:25:25



Measurement: 26dB Occupied BW
Channel spacing: 10 MHz
Channel: Mid (5.595 GHz)
Modulation: 64QAM

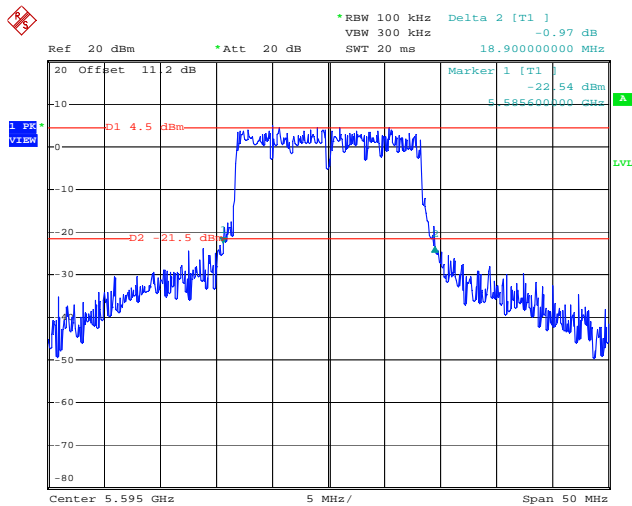
Date: 7.NOV.2006 07:21:20

Emission Bandwidth, continued



Measurement: 26dB Occupied BW
Channel spacing: 20 MHz
Channel: Mid (5.595 GHz)
Modulation: BPSK

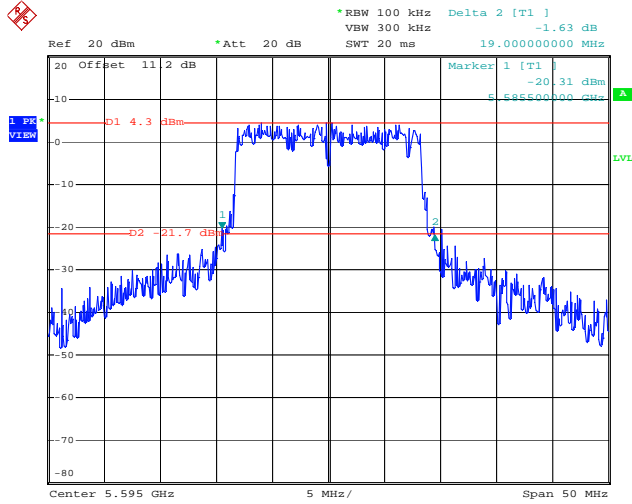
Date: 7.NOV.2006 09:48:45



Measurement: 26dB Occupied BW
Channel spacing: 20 MHz
Channel: Mid (5.595 GHz)
Modulation: QPSK

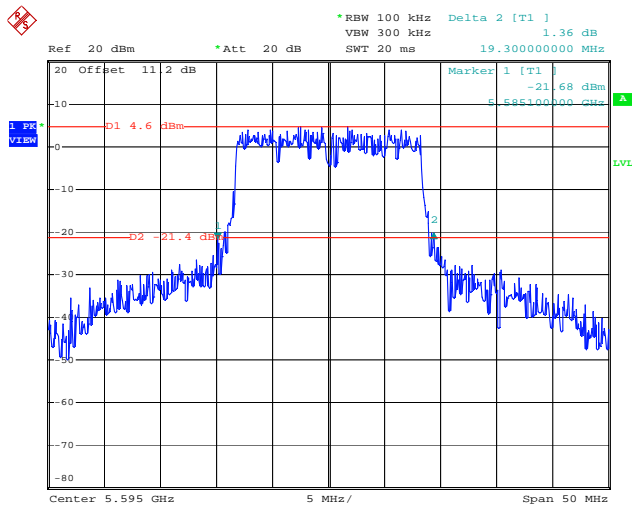
Date: 7.NOV.2006 09:51:14

Emission Bandwidth, continued



Measurement: 26dB Occupied BW
Channel spacing: 20 MHz
Channel: Mid (5.595 GHz)
Modulation: 16QAM

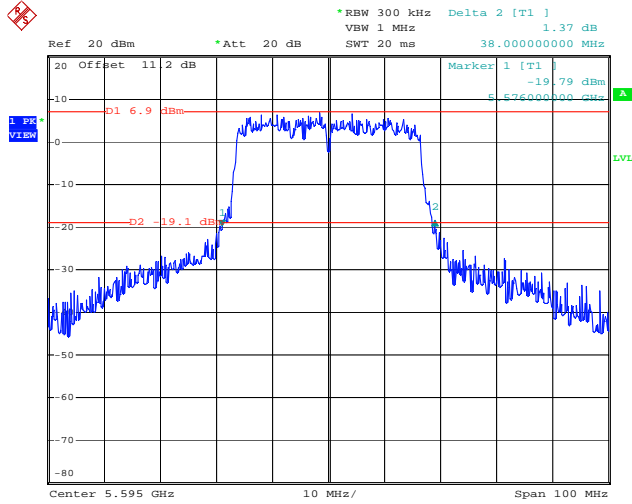
Date: 7.NOV.2006 09:56:09



Measurement: 26dB Occupied BW
Channel spacing: 20 MHz
Channel: Mid (5.595 GHz)
Modulation: 64QAM

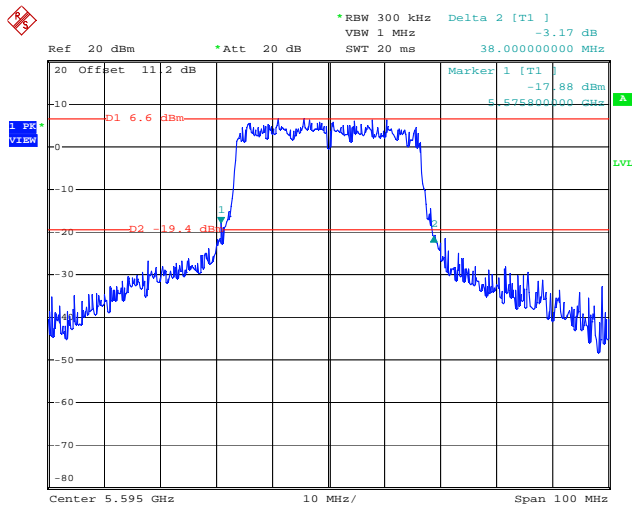
Date: 7.NOV.2006 09:59:23

Emission Bandwidth, continued



Measurement: 26dB Occupied BW
Channel spacing: 40 MHz
Channel: Mid (5.595 GHz)
Modulation: BPSK

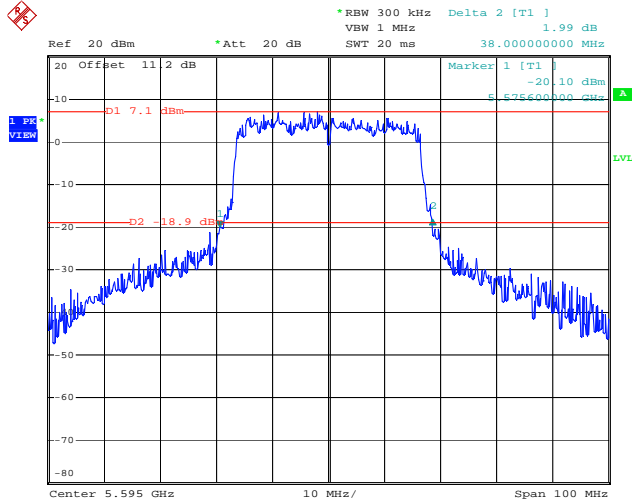
Date: 7.NOV.2006 15:00:27



Measurement: 26dB Occupied BW
Channel spacing: 40 MHz
Channel: Mid (5.595 GHz)
Modulation: QPSK

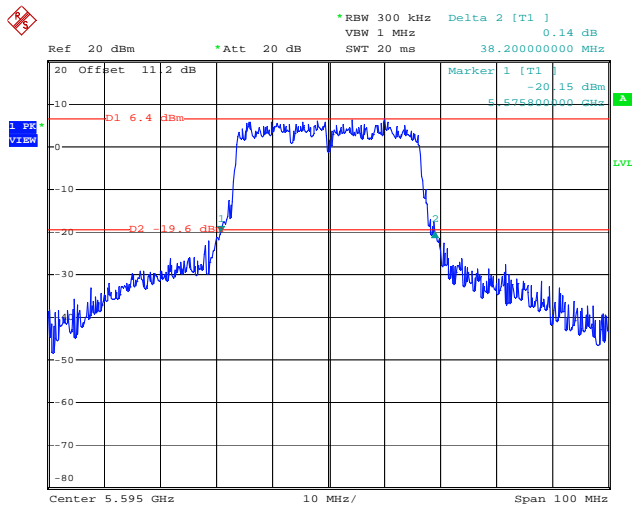
Date: 7.NOV.2006 15:02:25

Emission Bandwidth, continued



Measurement: 26dB Occupied BW
Channel spacing: 40 MHz
Channel: Mid (5.595 GHz)
Modulation: 16QAM

Date: 7.NOV.2006 15:06:11



Measurement: 26dB Occupied BW
Channel spacing: 40 MHz
Channel: Mid (5.595 GHz)
Modulation: 64QAM

Date: 7.NOV.2006 15:09:59

Section 6: Peak Conducted Transmit Output Power

§ 15.403 (n) Maximum Conducted Output Power (definition):

The total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling 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.

§ 15.407(a) Power limits:

§ 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) (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:	2	Temperature:	23°C
Date:	November 10, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

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

Test Results: Pass (see tables).

Additional Observations:

Transmit Output Power was observed to be the same for all four modulations, i.e. no measurable difference was noticed between BPSK, QPSK, 16QAM and 64QAM. The power measurement was performed with the EUT operating at the highest data rate (64QAM modulation).

Transmit Output Power, continued

Antenna Gain: 22 dBi

Channel Spacing: 10 MHz

Freq. (GHz)	G _{ANT} (dBi)	B (MHz)	Conduct. Limit (dBm)	Limit-(G _{ANT} -6dB) (dBm)	GUI Setting (dBm)	Peak P _{TX} (Cond.) (dBm)	Peak EIRP (dBm)	Margin (dB)
5.475	22.00	9.60	20.82	4.82	-8	3.00	25.00	1.82
5.595	22.00	9.84	20.93	4.93	-8	3.20	25.20	1.73
5.720	22.00	10.56	21.24	5.24	-8	4.00	26.00	1.24

Antenna Gain: 22 dBi

Channel Spacing: 20 MHz

Freq. (GHz)	G _{ANT} (dBi)	B (MHz)	Conduct. Limit (dBm)	Limit-(G _{ANT} -6dB) (dBm)	GUI Setting (dBm)	Peak P _{TX} (Cond.) (dBm)	Peak EIRP (dBm)	Margin (dB)
5.480	22.00	17.80	23.50	7.50	-5	6.6	28.60	0.90
5.595	22.00	18.90	23.76	7.76	-5	6.2	28.20	1.56
5.715	22.00	20.10	24.00	8.00	-5	6.9	28.90	1.10

Antenna Gain: 22 dBi

Channel Spacing: 40 MHz

Freq. (GHz)	G _{ANT} (dBi)	B (MHz)	Conduct. Limit (dBm)	Limit-(G _{ANT} -6dB) (dBm)	GUI Setting (dBm)	Peak P _{TX} (Cond.) (dBm)	Peak EIRP (dBm)	Margin (dB)
5.490	22.00	36.80	24.00	8.00	-3	7.8	29.80	0.20
5.595	22.00	38.00	24.00	8.00	-3	7.6	29.60	0.40
5.705	22.00	38.40	24.00	8.00	-4	7.9	29.90	0.10

Section 7: Peak Power Spectral Density

§ 15.403 Definitions:

§ 15.403 (m) Peak Power Spectral Density.

The peak power spectral density is the maximum power spectral density, within the specified measurement bandwidth, within the U-NII device operating band.

§ 15.403 (o) Power Spectral Density.

The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its peak or maximum level, divided by the total duration of the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

§ 15.407 (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 (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:	2	Temperature:	23°C
Date:	November 14, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa/ Redline R&D

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).

Additional Observations:

Peak Power Spectral Density was observed to be the same for all four modulations, i.e. no measurable difference was noticed between BPSK, QPSK, 16QAM and 64QAM. The peak power spectral density test was done with the EUT operating at the highest data rate (64QAM modulation).

Peak Power Spectral Density, continued
--

Antenna Gain: 22dBi

Channel Spacing: 10 MHz

Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)	Margin to Limit (dB)
5.475	22.00	-8	-16.40	-5.00	11.40
5.595	22.00	-8	-18.02	-5.00	13.02
5.720	22.00	-8	-16.43	-5.00	11.43

Antenna Gain: 22dBi

Channel Spacing: 20 MHz

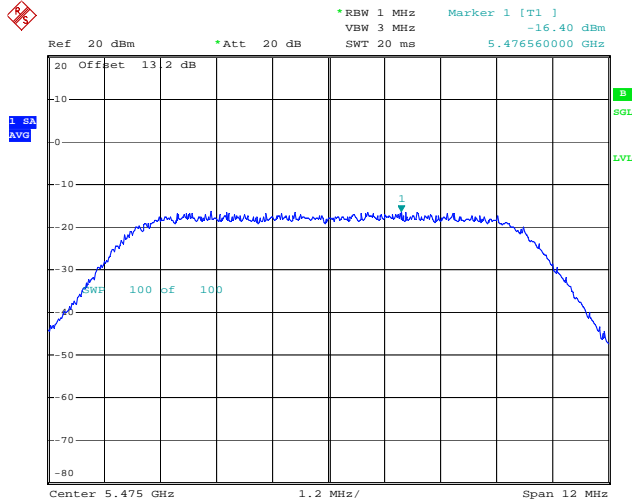
Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)	Margin to Limit (dB)
5.480	22.00	-5	-15.69	-5.00	10.69
5.595	22.00	-5	-17.27	-5.00	12.27
5.715	22.00	-5	-16.51	-5.00	11.51

Antenna Gain: 22dBi

Channel Spacing: 40 MHz

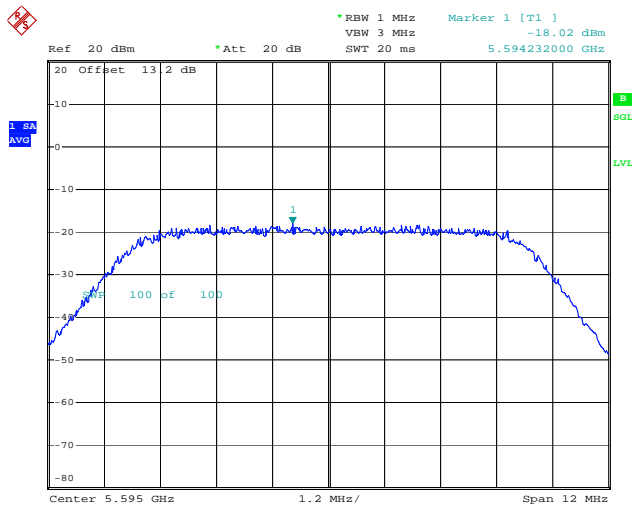
Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)	Margin to Limit (dB)
5.490	22.00	-3	-16.78	-5.00	11.78
5.595	22.00	-3	-18.19	-5.00	13.19
5.705	22.00	-4	-17.57	-5.00	12.57

Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 10 MHz
Channel: Low (5.475 GHz)

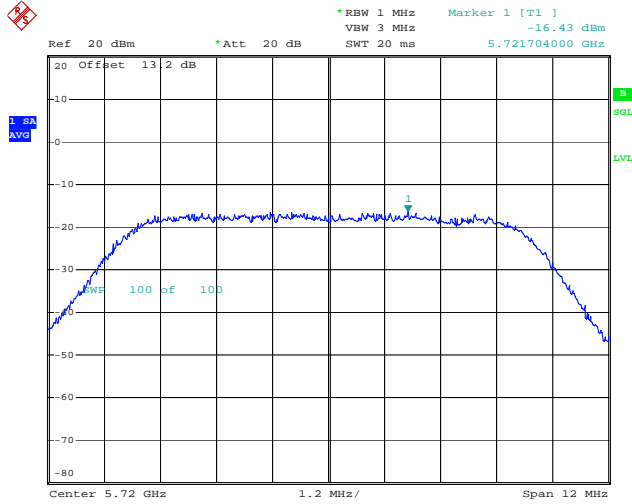
Date: 15.NOV.2006 00:00:33



Antenna Gain: 22 dBi
Channel Spacing: 10 MHz
Channel: Mid (5.595 GHz)

Date: 15.NOV.2006 00:02:26

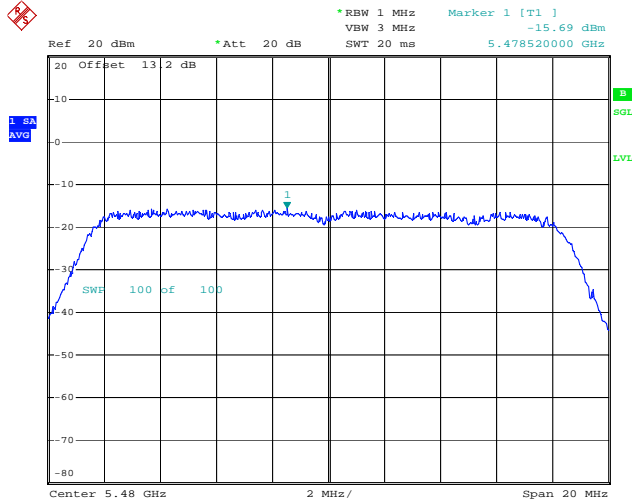
Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 10 MHz
Channel: High (5.720 GHz)

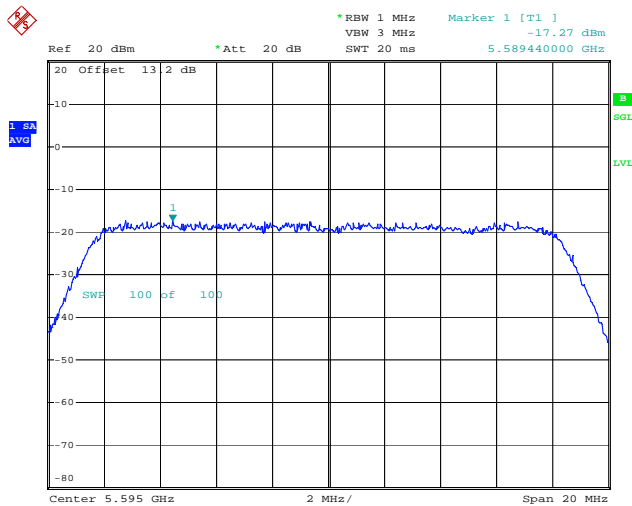
Date: 15.NOV.2006 00:04:22

Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 20 MHz
Channel: Low (5.480 GHz)

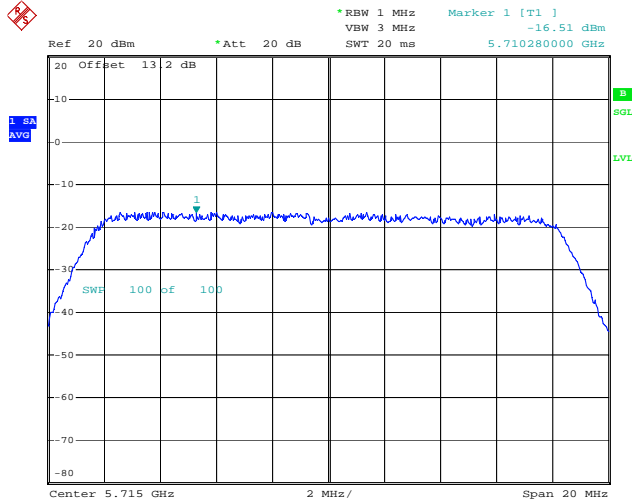
Date: 15.NOV.2006 00:06:48



Antenna Gain: 22 dBi
Channel Spacing: 20 MHz
Channel: Mid (5.595 GHz)

Date: 15.NOV.2006 00:08:45

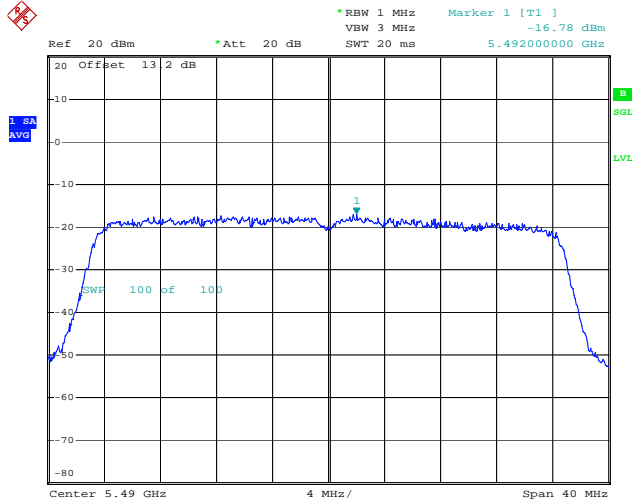
Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 20 MHz
Channel: High (5.715 GHz)

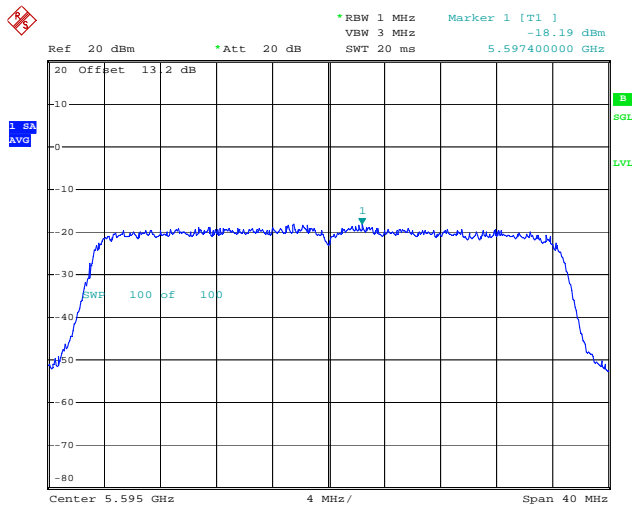
Date: 15.NOV.2006 00:11:33

Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 40 MHz
Channel: Low (5.490 GHz)

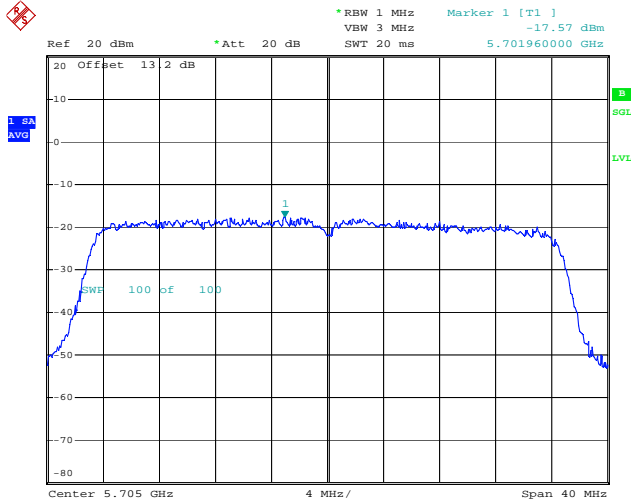
Date: 15.NOV.2006 00:14:45



Antenna Gain: 22 dBi
Channel Spacing: 40 MHz
Channel: Mid (5.595 GHz)

Date: 15.NOV.2006 00:18:14

Peak Power Spectral Density, continued



Antenna Gain: 22 dBi
Channel Spacing: 40 MHz
Channel: High (5.705 GHz)

Date: 15.NOV.2006 00:21:38

Section 8: 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:

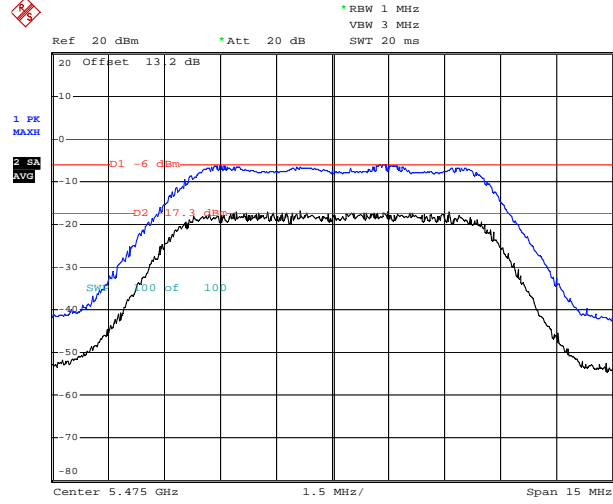
Sample Number:	2	Temperature:	23°C
Date:	November 16, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

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).

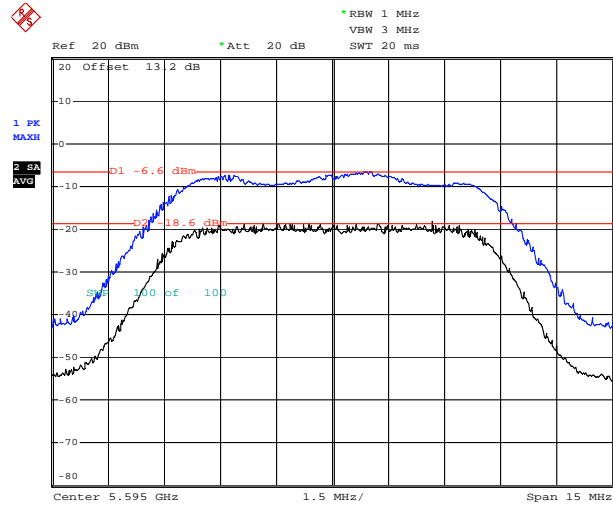
Peak Excursion Measurement, continued

BPSK



Modulation: BPSK
Channel Spacing: 10 MHz
Channel: 5.475GHz

Date: 15.NOV.2006 23:12:44

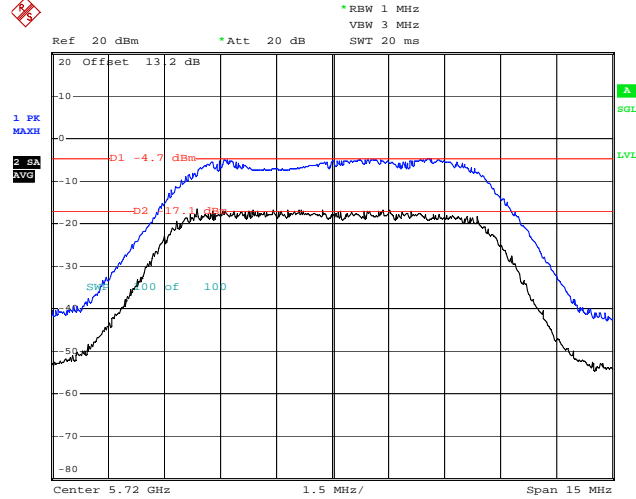


Modulation: BPSK
Channel Spacing: 10MHz
Channel: 5.595 GHz

Date: 15.NOV.2006 23:15:51

Peak Excursion Measurement, continued

BPSK

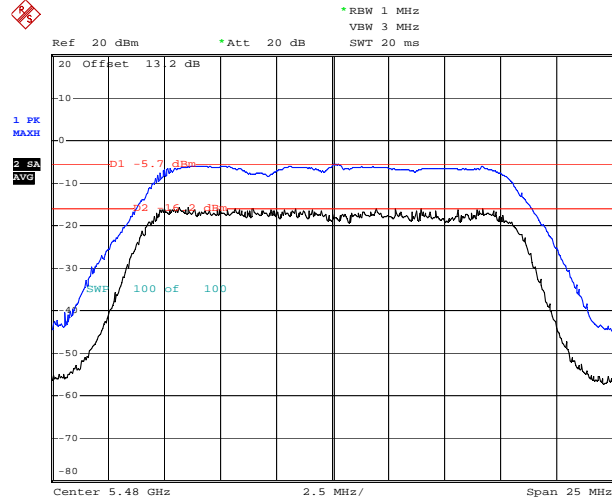


Modulation: BPSK
Channel Spacing: 10 MHz
Channel: 5.720 GHz

Date: 15.NOV.2006 23:18:55

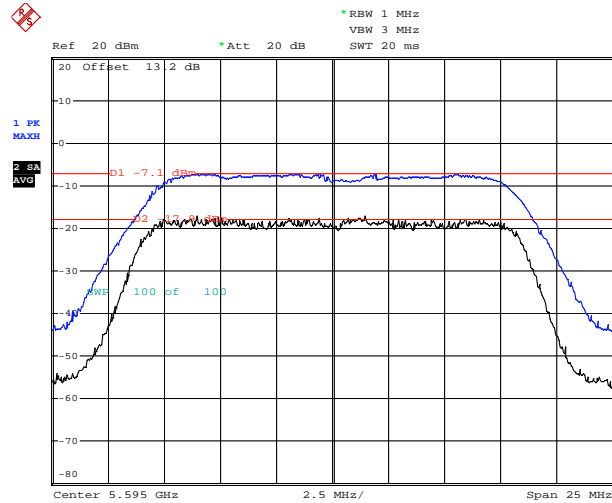
Peak Excursion Measurement, continued

BPSK



Modulation: BPSK
Channel Spacing: 20 MHz
Channel: 5.480 GHz

Date: 15.NOV.2006 23:31:20

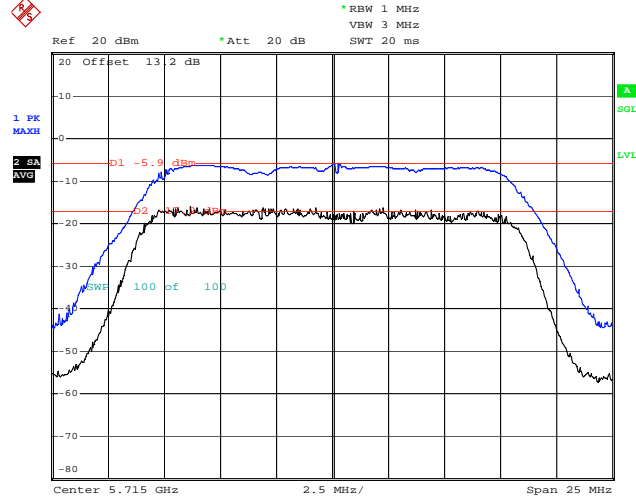


Modulation: BPSK
Channel Spacing: 20 MHz
Channel: 5.595 GHz

Date: 15.NOV.2006 23:34:20

Peak Excursion Measurement, continued

BPSK

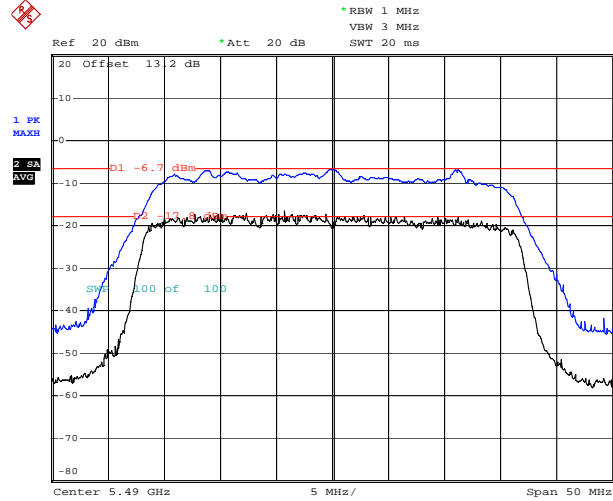


Modulation: BPSK
Channel Spacing: 20 MHz
Channel: 5.715 GHz

Date: 15.NOV.2006 23:37:51

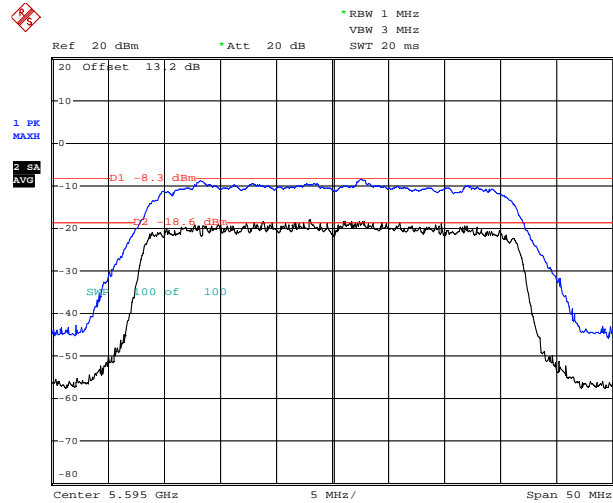
Peak Excursion Measurement, continued

BPSK



Modulation: BPSK
Channel Spacing: 40 MHz
Channel: 5.490 GHz

Date: 15.NOV.2006 23:42:37

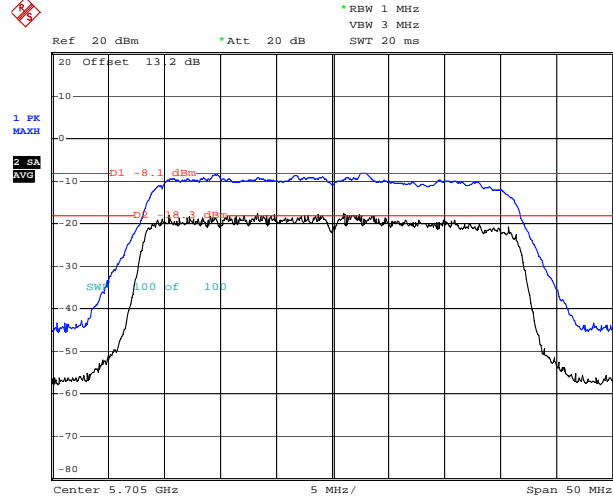


Modulation: BPSK
Channel Spacing: 40 MHz
Channel: 5.595 GHz

Date: 15.NOV.2006 23:45:45

Peak Excursion Measurement, continued

BPSK

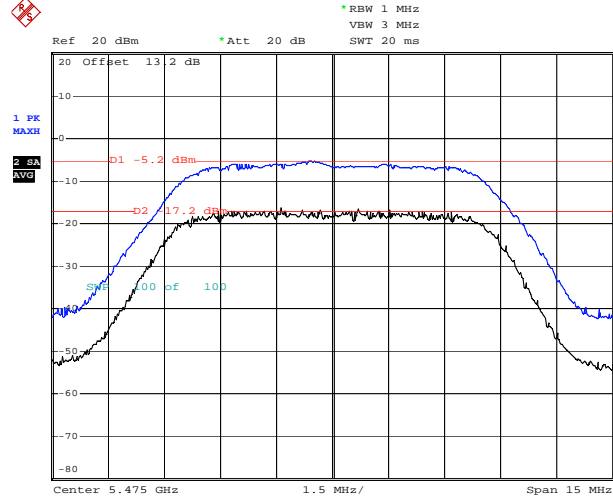


Modulation: BPSK
Channel Spacing: 40 MHz
Channel: 5.705 GHz

Date: 15.NOV.2006 23:48:59

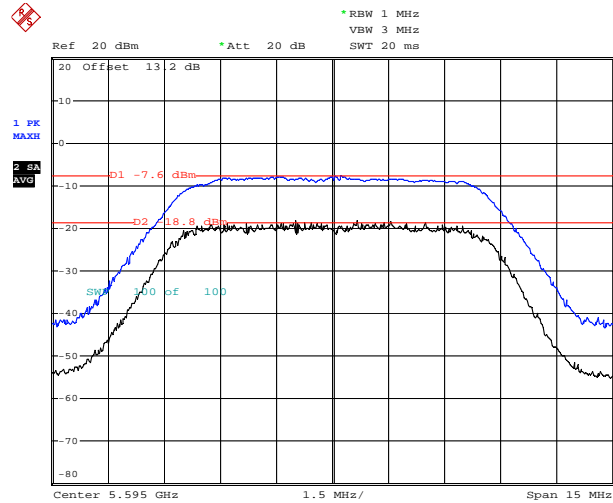
Peak Excursion Measurement, continued

QPSK



Modulation: QPSK
Channel Spacing: 10 MHz
Channel: 5.475 GHz

Date: 16.NOV.2006 00:01:00

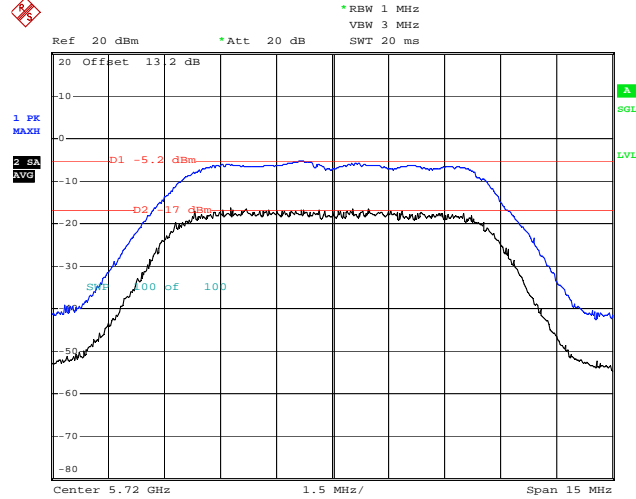


Modulation: QPSK
Channel Spacing: 10 MHz
Channel: 5.595 GHz

Date: 16.NOV.2006 00:05:07

Peak Excursion Measurement, continued

QPSK

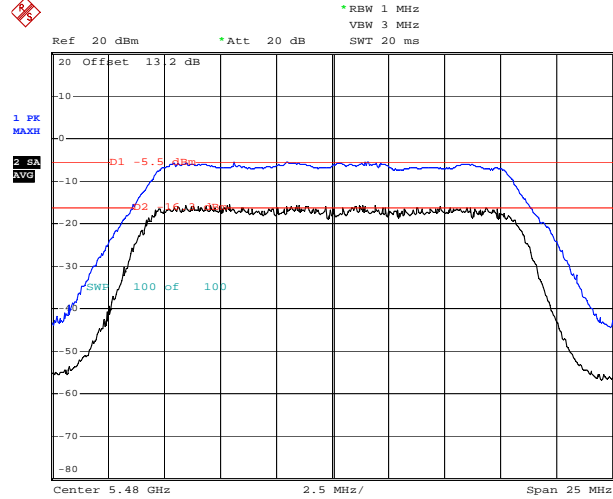


Modulation: QPSK
Channel Spacing: 10 MHz
Channel: 5.720 GHz

Date: 16.NOV.2006 00:08:43

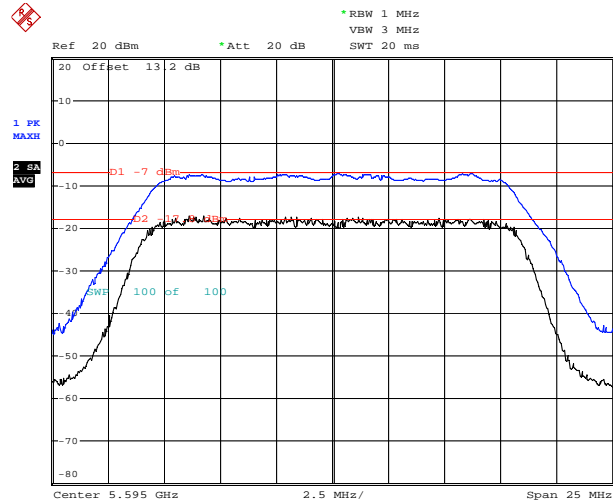
Peak Excursion Measurement, continued

QPSK



Modulation: QPSK
Channel Spacing: 20 MHz
Channel: 5.480 GHz

Date: 16.NOV.2006 00:12:14

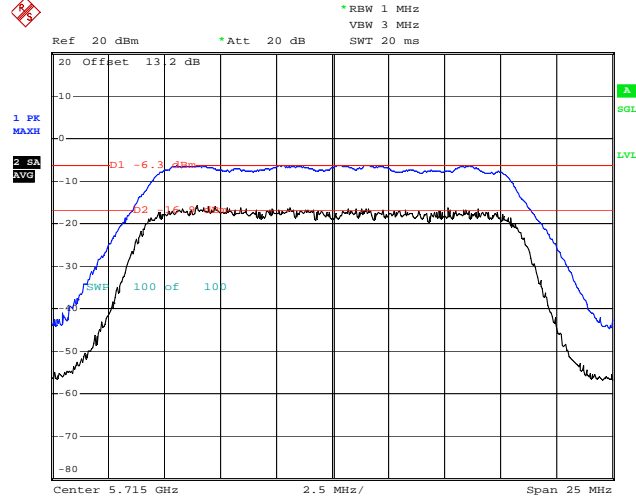


Modulation: QPSK
Channel Spacing: 20 MHz
Channel: 5.595 GHz

Date: 16.NOV.2006 00:16:49

Peak Excursion Measurement, continued

QPSK

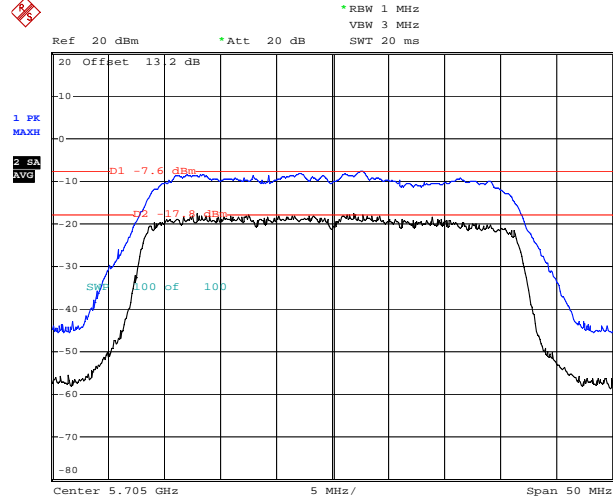


Modulation: QPSK
Channel Spacing: 20 MHz
Channel: 5.715 GHz

Date: 16.NOV.2006 00:19:28

Peak Excursion Measurement, continued

QPSK

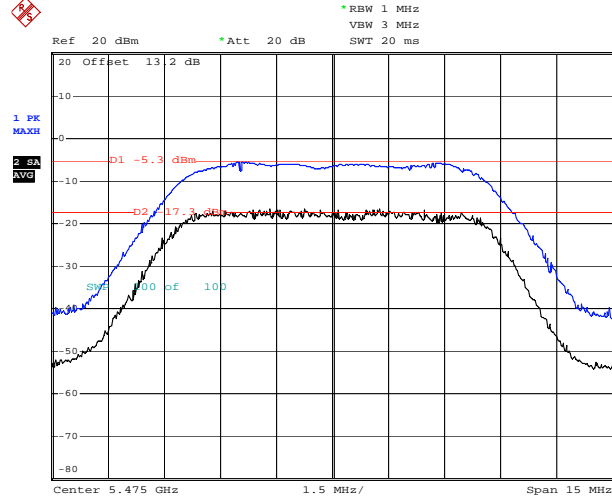


Modulation: QPSK
Channel Spacing: 40 MHz
Channel: 5.705 GHz

Date: 16.NOV.2006 00:30:16

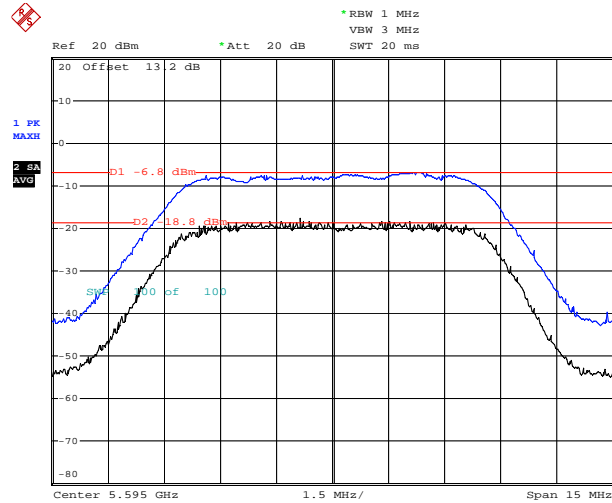
Peak Excursion Measurement, continued

16QAM



Modulation: 16QAM
Channel Spacing: 10 MHz
Channel: 5.475 GHz

Date: 16.NOV.2006 00:34:41

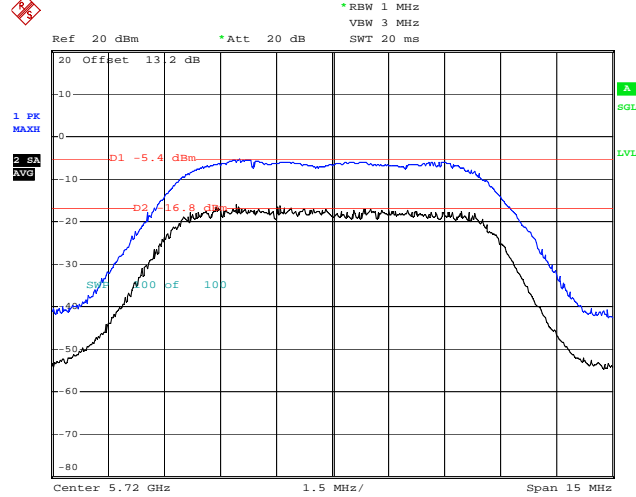


Modulation: 16QAM
Channel Spacing: 10 MHz
Channel: 5.595 GHz

Date: 16.NOV.2006 00:37:17

Peak Excursion Measurement, continued

16QAM

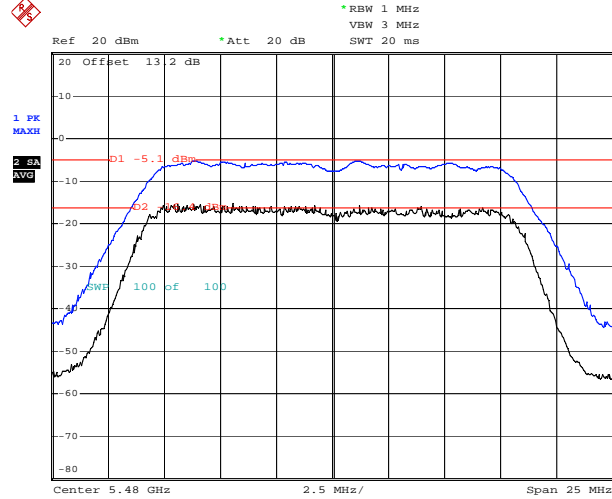


Modulation: 16QAM
Channel Spacing: 10 MHz
Channel: 5.720 GHz

Date: 16.NOV.2006 00:42:21

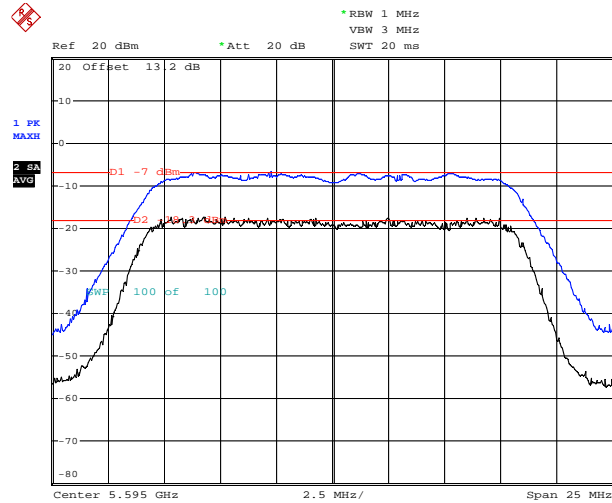
Peak Excursion Measurement, continued

16QAM



Modulation: 16QAM
Channel Spacing: 20 MHz
Channel: 5.480 GHz

Date: 16.NOV.2006 00:45:14

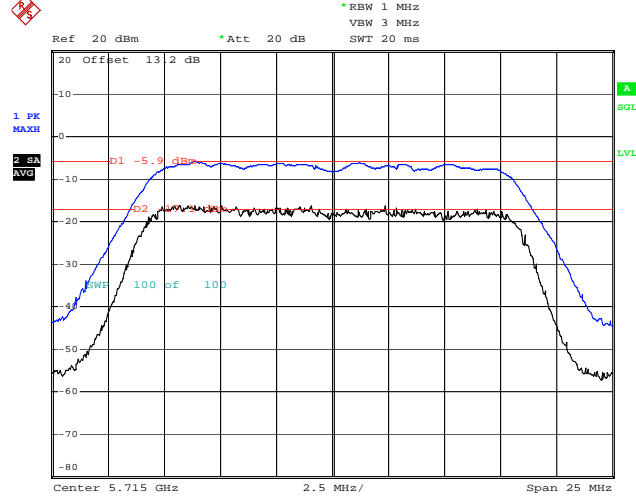


Modulation: 16QAM
Channel Spacing: 20 MHz
Channel: 5.595 GHz

Date: 16.NOV.2006 00:48:43

Peak Excursion Measurement, continued

16QAM

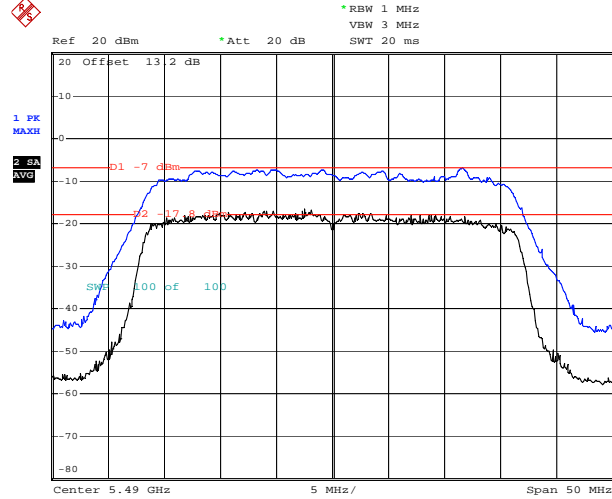


Modulation: 16QAM
Channel Spacing: 20 MHz
Channel: 5.715 GHz

Date: 16.NOV.2006 00:52:02

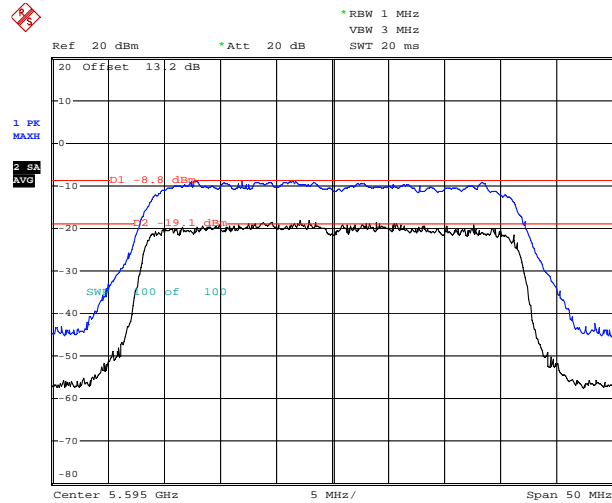
Peak Excursion Measurement, continued

16QAM



Modulation: 16QAM
Channel Spacing: 40 MHz
Channel: 5.490 GHz

Date: 16.NOV.2006 00:54:37

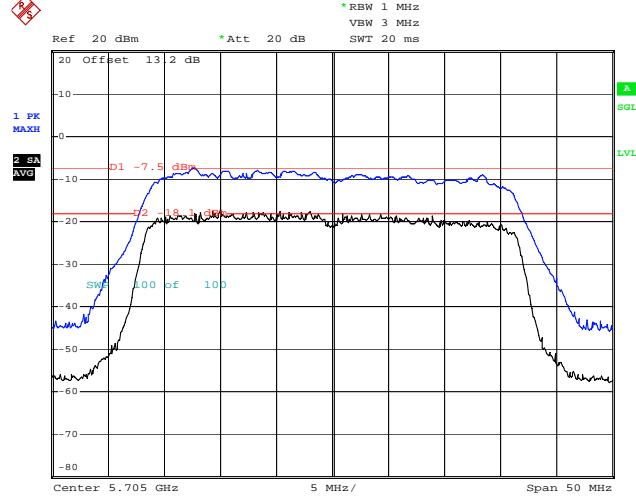


Modulation: 16QAM
Channel Spacing: 40 MHz
Channel: 5.595 GHz

Date: 16.NOV.2006 00:57:37

Peak Excursion Measurement, continued

16QAM

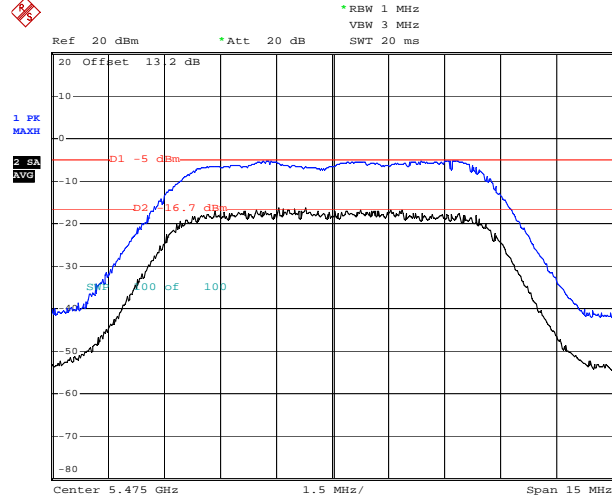


Modulation: 16QAM
Channel Spacing: 40 MHz
Channel: 5.705 GHz

Date: 16.NOV.2006 01:01:26

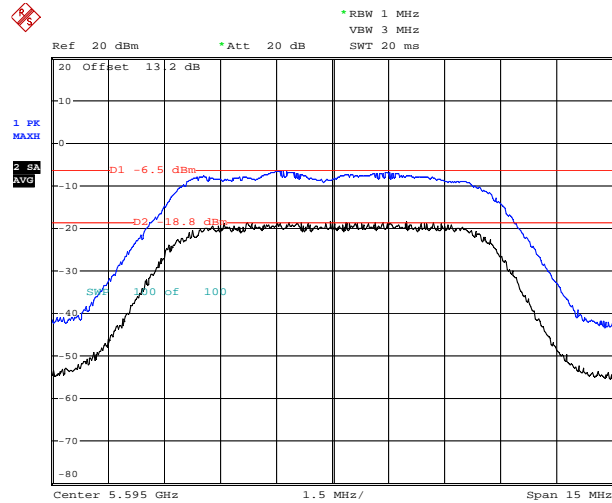
Peak Excursion Measurement, continued

64QAM



Modulation: 64QAM
Channel Spacing: 10 MHz
Channel: 5.475 GHz

Date: 15.NOV.2006 20:50:12

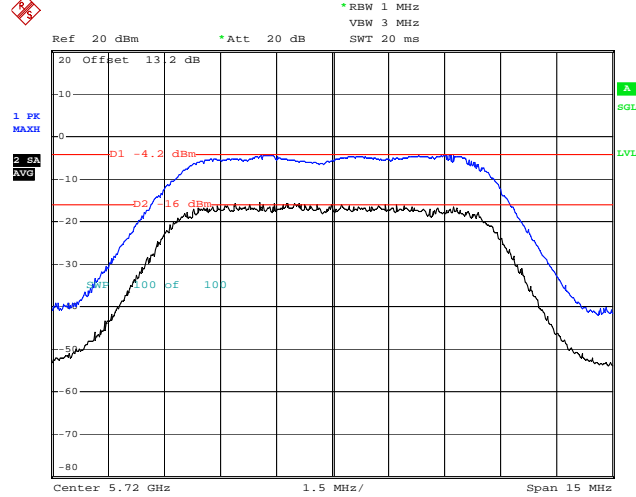


Modulation: 64QAM
Channel Spacing: 10 MHz
Channel: 5.595 GHz

Date: 15.NOV.2006 20:52:55

Peak Excursion Measurement, continued

64QAM

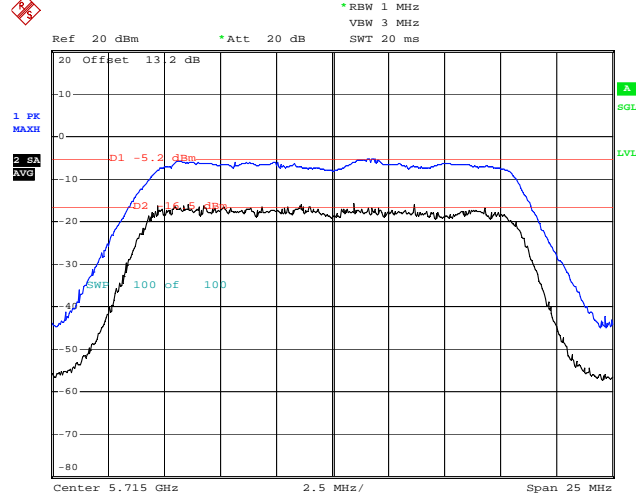


Modulation: 64QAM
Channel Spacing: 10 MHz
Channel: 5.720 GHz

Date: 15.NOV.2006 20:56:28

Peak Excursion Measurement, continued

64QAM



Modulation: 64QAM
Channel Spacing: 20 MHz
Channel: 5.715 GHz

Date: 15.NOV.2006 21:13:30

Section 9: Transmit Power Control (TPC)

§ 15.407(h) (1) Transmit power control (TPC).
 U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Test Conditions:

Sample Number:	2	Temperature:	23°C
Date:	November 13, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

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).

Additional Observations:

Transmit Output Power was observed to be the same for all four modulations, i.e. no measurable difference was noticed between BPSK, QPSK, 16QAM and 64QAM. The TPC measurement was performed with the EUT operating at the highest data rate (64QAM modulation).

Transmit Power Control (TPC), continued

Antenna Gain: 22 dBi

Channel Spacing: 10 MHz

Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	Avg. P_{TX} (Cond.) for TPC (dBm)	Mean EIRP for TPC (dBm)	Mean EIRP Limit for TPC (dBm)	Margin to Limit (dB)
5.475	22.00	-10	-8.35	13.65	24.00	10.35
5.595	22.00	-10	-10.10	11.90	24.00	12.10
5.720	22.00	-10	-8.36	13.64	24.00	10.36

Antenna Gain: 22 dBi

Channel Spacing: 20 MHz

Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	Avg. P_{TX} (Cond.) for TPC (dBm)	Mean EIRP for TPC (dBm)	Mean EIRP Limit for TPC (dBm)	Margin to Limit (dB)
5.480	22.00	-10	-9.22	12.78	24.00	11.22
5.595	22.00	-10	-9.85	12.15	24.00	11.85
5.715	22.00	-10	-7.83	14.17	24.00	9.83

Antenna Gain: 22 dBi

Channel Spacing: 40 MHz

Freq. (GHz)	G_{ANT} (dBi)	GUI Setting (dBm)	Avg. P_{TX} (Cond.) for TPC (dBm)	Mean EIRP for TPC (dBm)	Mean EIRP Limit for TPC (dBm)	Margin to Limit (dB)
5.490	22.00	-10	-9.86	12.14	24.00	11.86
5.595	22.00	-10	-10.38	11.62	24.00	12.38
5.705	22.00	-10	-7.67	14.33	24.00	9.67

Section 10: 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:	2	Temperature:	23°C
Date:	November 9, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

Test Results: Pass (see table).

T (°C)	F _{NOMINAL} (GHz)	F _{MEASURED} (GHz)	Deviation (ppm)
-40	5.595	5.594983000	-3.038
-30	5.595	5.594994000	-1.072
-20	5.595	5.594996000	-0.715
-10	5.595	5.594996000	-0.715
0	5.595	5.594996200	-0.679
+10	5.595	5.594996400	-0.643
+20	5.595	5.594996500	-0.626
+30	5.595	5.595000800	0.143
+40	5.595	5.595005200	0.929
+50	5.595	5.595005000	0.894
+60	5.595	5.595004600	0.822

Section 11: 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:	2	Temperature:	23°C
Date:	November 10, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Redline R&D

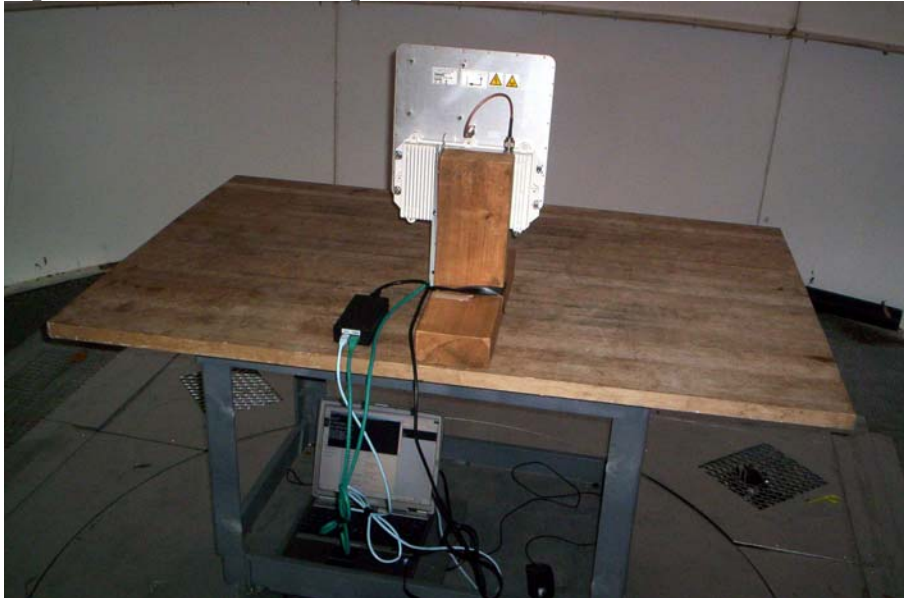
Test Results:

Pass.

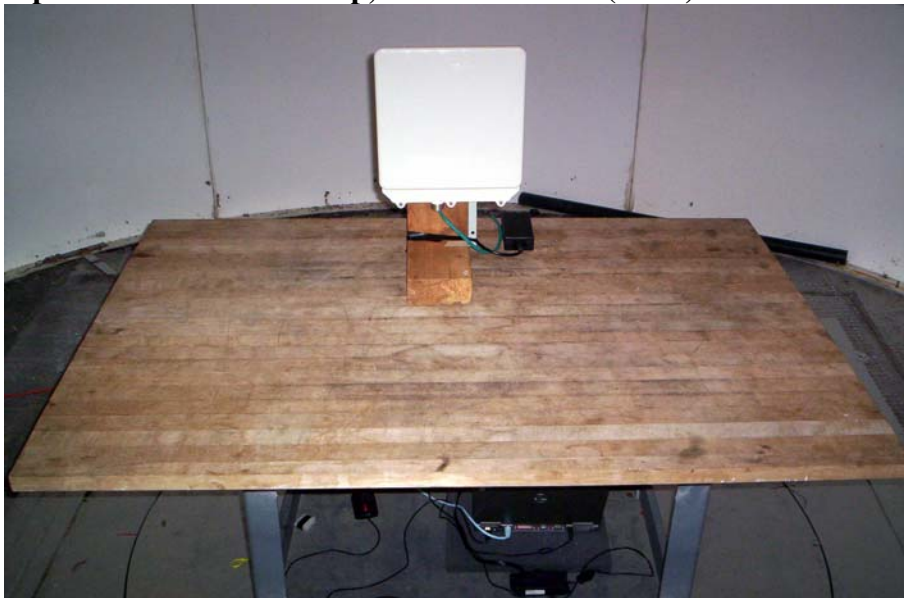
Transmit output power was measured while supply voltage was varied from 102 VAC to 138 VAC (85% to 115% of the nominal rated supply voltage). No measurable change in transmit output power was observed.

Appendix B : Setup Photographs

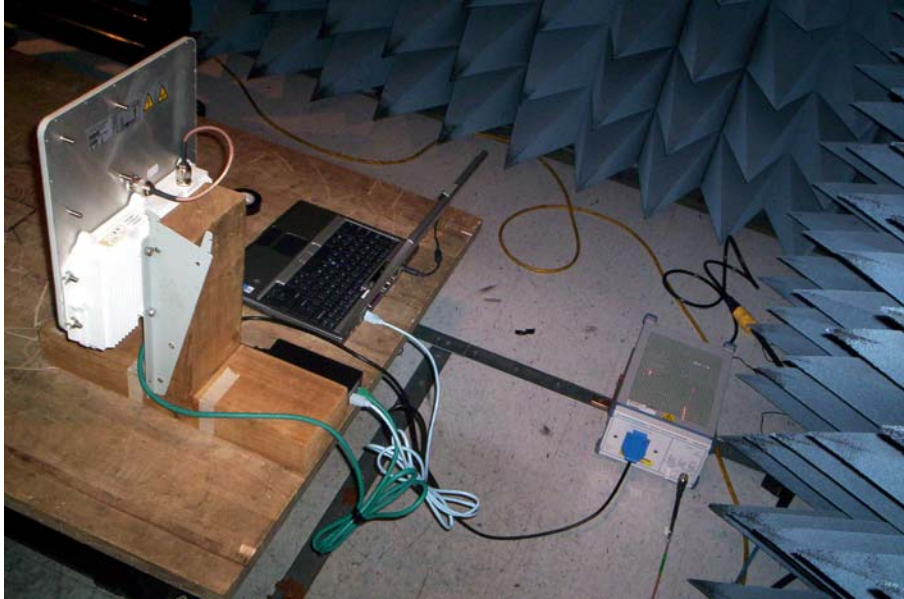
Spurious Emissions Setup, 22 dBi Antenna (rear):



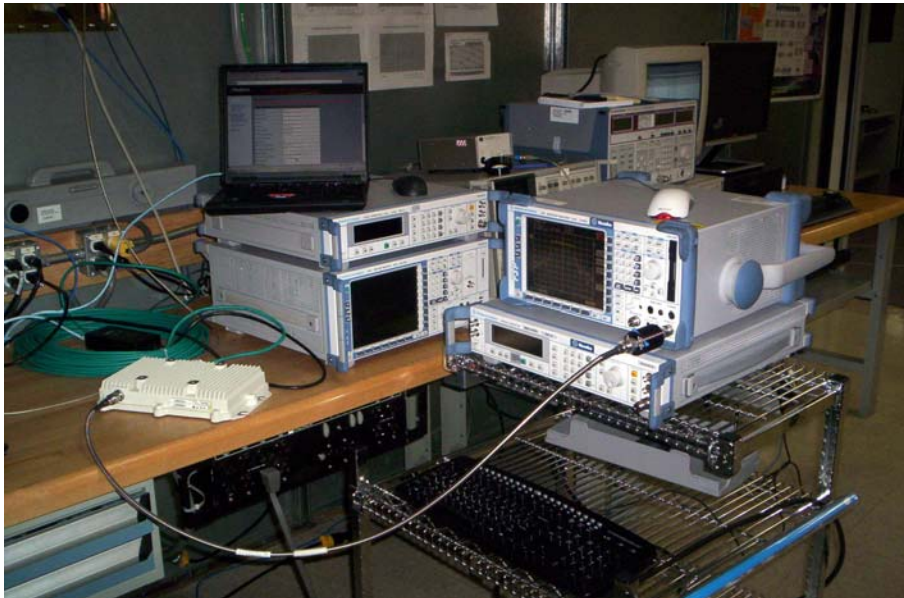
Spurious Emissions Setup, 22 dBi Antenna (front):



Power Lines Conducted Emissions Setup



RF Conducted Measurement:

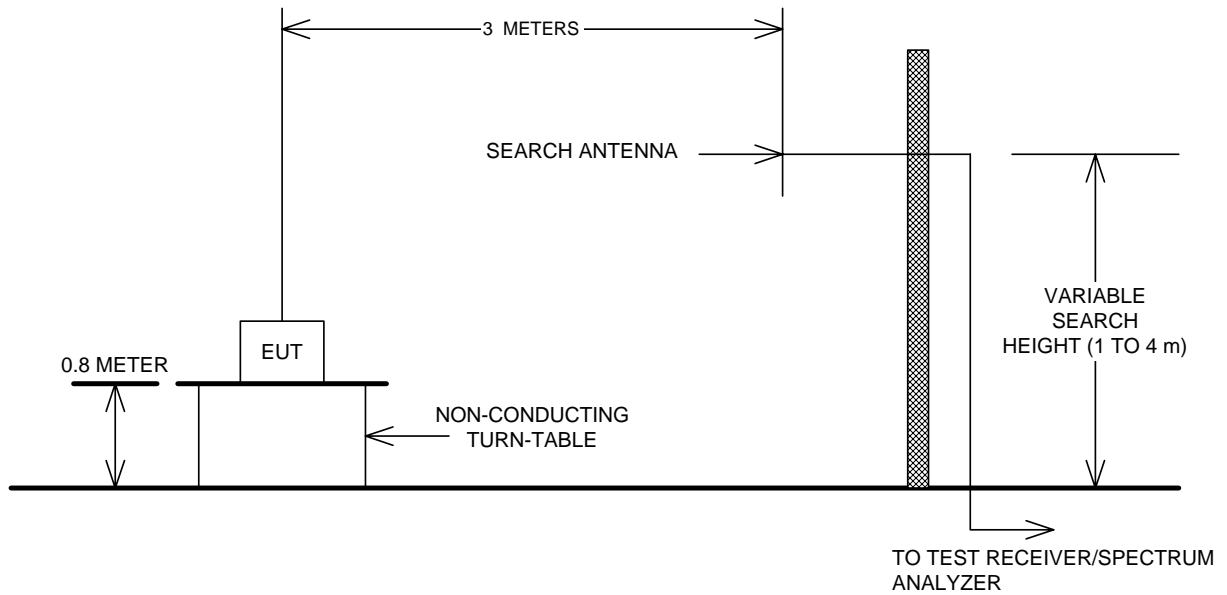


RF Conducted Measurement, Environmental Chamber:

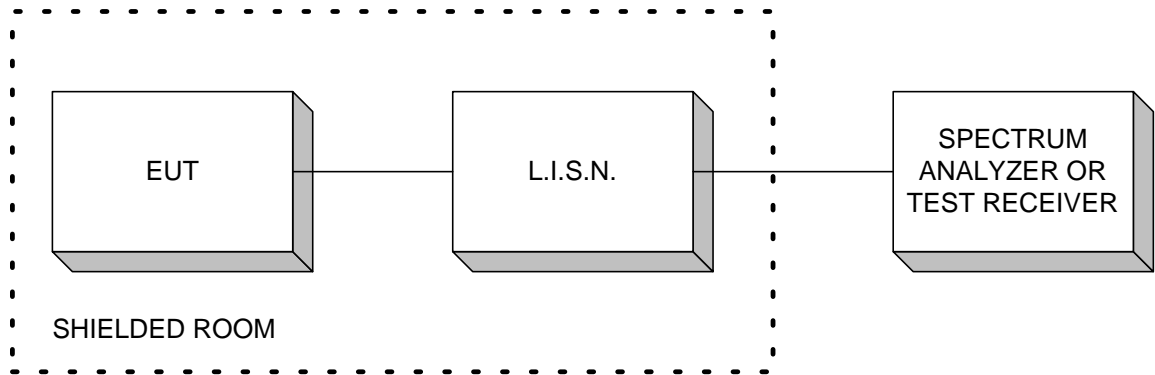


Appendix C : Block Diagram of Test Setups

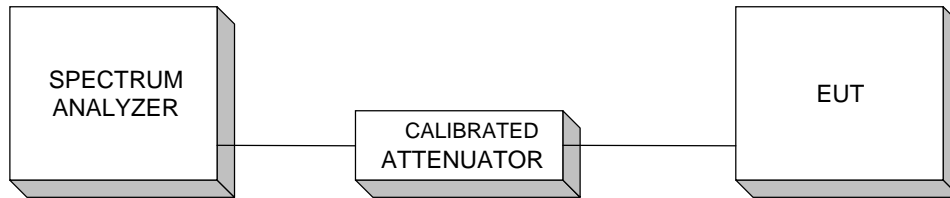
Test Site For Radiated Emissions



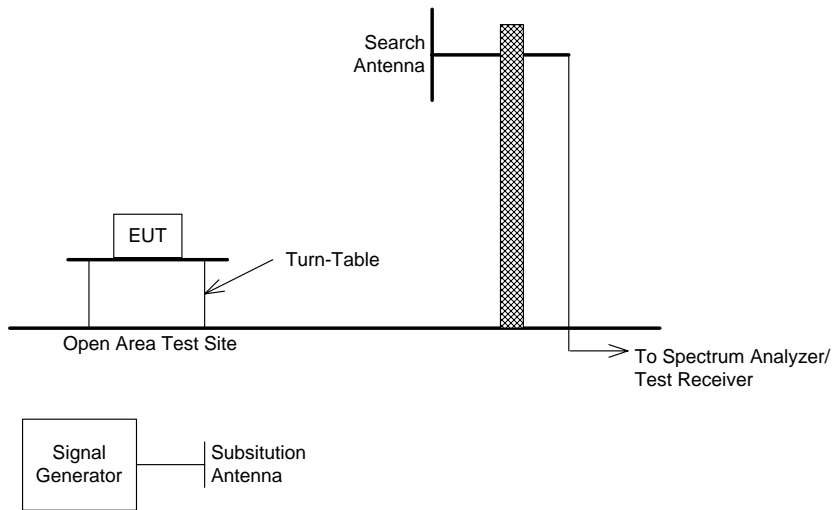
Power Line Conducted Emissions



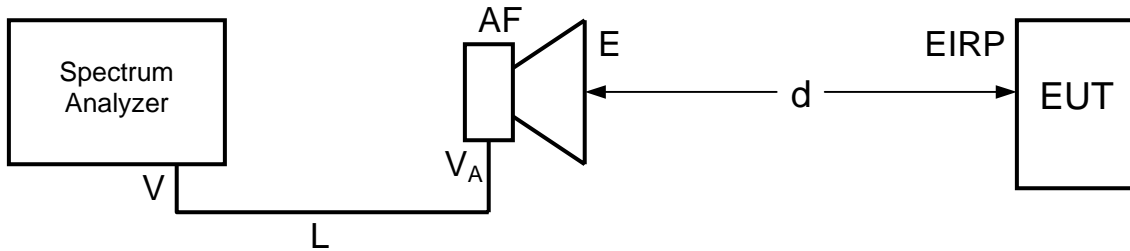
RF Conducted Measurements



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