ENGINEERING TEST REPORT

Yapalong 3000
Model No.: 3000

FCC ID: UJW-YAPALONG3000

Applicant:

Nautic Device Inc.
642 Driftcurrent Drive
Toronto, Ontario
Canada L4Z 4A4

In Accordance With

FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SECTION 15.247
Digital Modulation Systems
Operating in the Frequency Band 2405-2475 MHz

UltraTech's File No.: NATC-001F15C247

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: March 26, 2007	
Report Prepared by: JaeWook Choi Issued Date: March 26, 2007	Tested by: Hung Trinh, RFI Technologist Test Dates: March 19 ~ 20, 2007

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

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EXHIBIT 1 INTRODUCTION

1.1 SCOPE

Reference:	Part 15, Subpart C, Section 15.247
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Equipment Authorization for Digital Modulation Systems Operating in the Frequency Band 2405-2475 MHz.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	Commercial, light industry & heavy industry

1.2 RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3 NORMATIVE REFERENCES

Publication	Year	Title
FCC 47CFR Parts 0-19	2006	Code of Federal Regulations, Title 47 – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 +A1 EN 55022	2003-04-10 2004-10-14 2003	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement
CISPR 16-2-3	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-3: Radiated disturbance measurement
FCC Public Notice DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
KDB Publication No. 558074	2005	Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

EXHIBIT 2 PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

APPLICANT:	
Name:	Nautic Device Inc.
Address:	642 Driftcurrent Drive Mississauga, ON Canada, L4Z 4A4
Contact Person:	Mr. Ki Yuen Phone #: 905-712-8766 Fax #: 905-712-8766 Email Address: kiyuen@nauticdevices.com

MANUFACTURER:	
Name:	Nautic Device Inc.
Address:	642 Driftcurrent Drive Mississauga, ON Canada, L4Z 4A4
Contact Person:	Mr. Ki Yuen Phone #: 905-712-8766 Fax #: 905-712-8766 Email Address: kiyuen@nauticdevices.com

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Nautic Device Inc.
Product Name:	Yapalong 3000
Model Name or Number:	3000
Serial Number:	PreProduction
Type of Equipment:	Wireless Short Range Voice Communication System
Input Power Supply Type:	2 × AA batteries.
Primary User Functions of EUT:	Voice Communication

2.3 EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	2.95V/2.55V
RF Output Power Rating:	44.36 mW peak conducted
Operating Frequency Range:	2405-2475 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	5 MHz
Duty Cycle:	18.9%
Modulation Type:	Digital, DSSS
Antenna Connector Type:	Integral (the antenna component is soldered onto the radio printed circuit board and located inside the enclosure)
Antenna Description:	Manufacturer: LINX Type: Chip Antenna (PC Mount) Part No.: ANT-2.45-CHP-X Frequency Range: 2400 – 2488 MHz Gain: 0.8 dBi

2.4 LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Audio Jack	1	2.5 mm Audio Jack	Non-shielded

2.5 ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Earbud-microphone
Brand name/Model Number:	MSEBM-008D01-012
Serial Number:	
Connected to EUT's Port:	Audio Jack

2.6 TEST SETUP BLOCK DIAGRAM

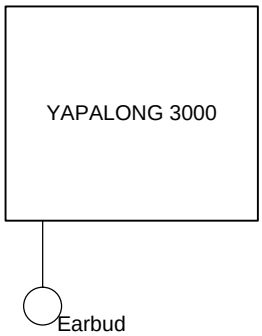


EXHIBIT 3 EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1 OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements.
Special Test Software:	None
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals	
Frequency Band(s):	2405 - 2475 MHz
Frequency(ies) Tested: (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	2405, 2440 & 2475 MHz.
Rated RF Power Output:	44.36 mW peak conducted
Normal Test Modulation:	DTS, DSSS
Modulating Signal Source:	Internal

EXHIBIT 4 SUMMARY OF TEST RESULTS

4.1 LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: June 20, 2006

4.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.107(a) /15.207(a)	AC Power Conducted Emissions	N/A
15.109(a)	Class B Radiated Emissions	Yes (Note 1)
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Output Power	Yes
15.247(d), 15.209 & 15.205	Spurious Conducted & Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i), 1.1310 & 2.1091	RF Exposure	Yes

Notes:

(1) A separate engineering test report for compliance with FCC Part 15, Subpart B – Class B Unintentional Radiators will be provided upon request.

4.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5 MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1 TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4; KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247); FCC Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

5.2 MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document LAB 34 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

5.3 MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1.

5.4 COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: • The application (or intended use) of the EUT • The installation requirements of the EUT • The method by which the EUT will be marketed	The integral antenna is permanently mounted on the printed circuit board and located inside the enclosure
15.204	Provided the information for every antenna proposed for use with the EUT: (a) type (e.g. Yagi, patch, grid, dish, etc…), (b) manufacturer and model number (c) gain with reference to an isotropic radiator	Manufacturer: LINX Type: Chip Antenna M/N: ANT-2.45-CHP-X Frequency Range: 2400 – 2488 MHz Gain: 0.8 dBi

5.5 6 dB Bandwidth [§15.247(a)(2)]

5.5.1. Limits

- For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 KHz.

5.5.2. Method of Measurements

Refer to FCC Public Notice DA 00-705, KDB Publication No. 558074 and ANSI C63.4 for measurement methods.

5.5.3. Test Arrangement

See Section 2.6 of this test report.

5.5.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

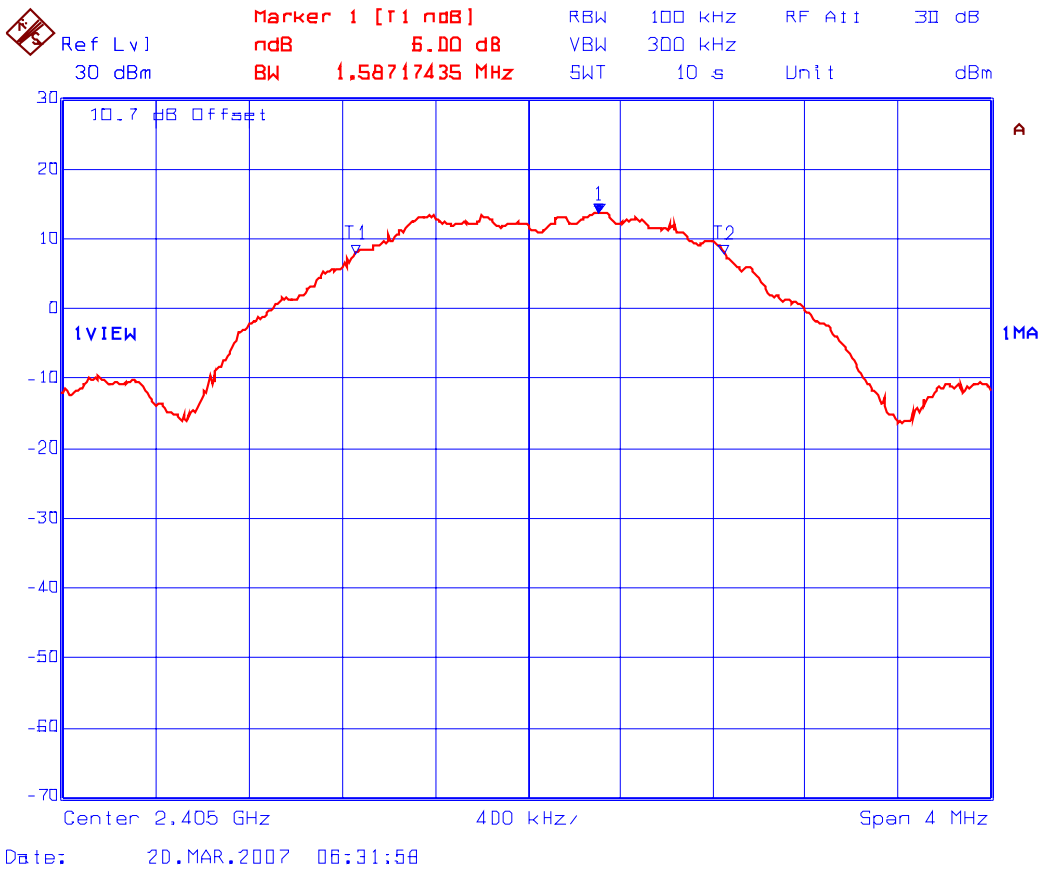
5.5.5. Test Data

Note: Bandwidth measurements were done using the built-in auto function of the analyzer.

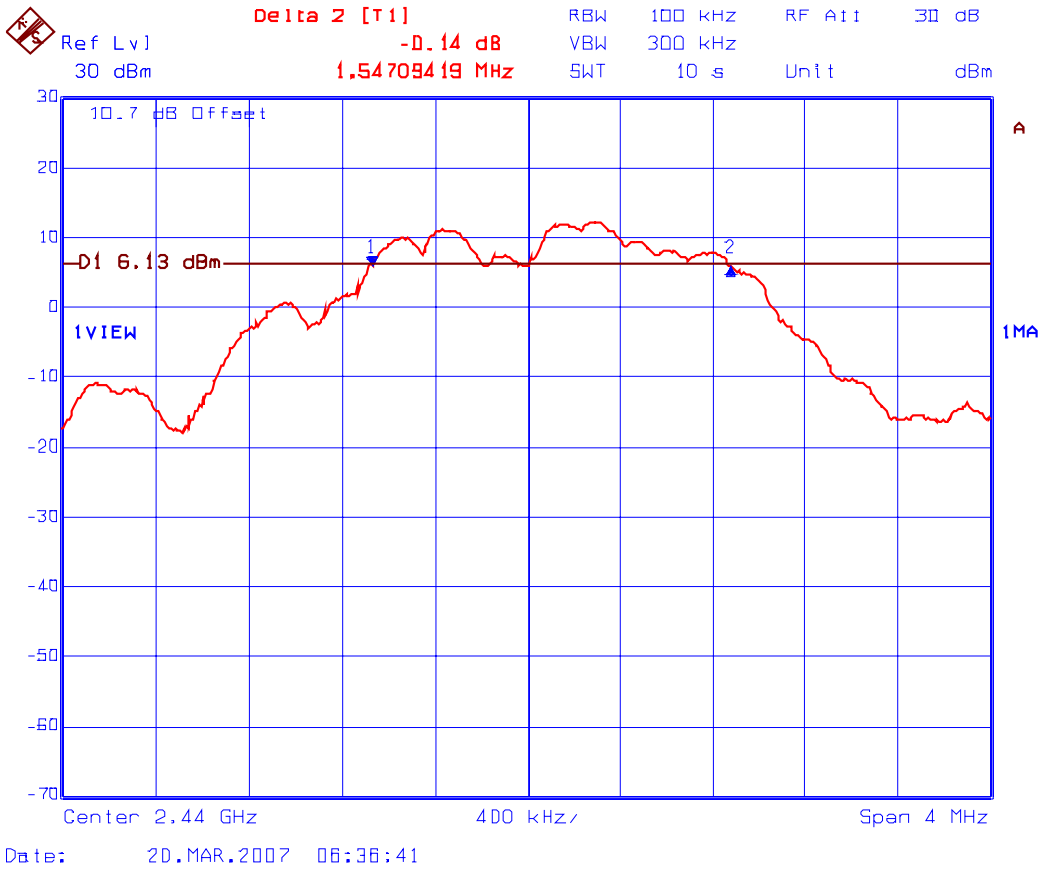
Frequency (MHz)	6 dB Bandwidth (kHz)
2405	1587.17
2440	1547.09
2475	1547.09

See the following plots for detailed measurements.

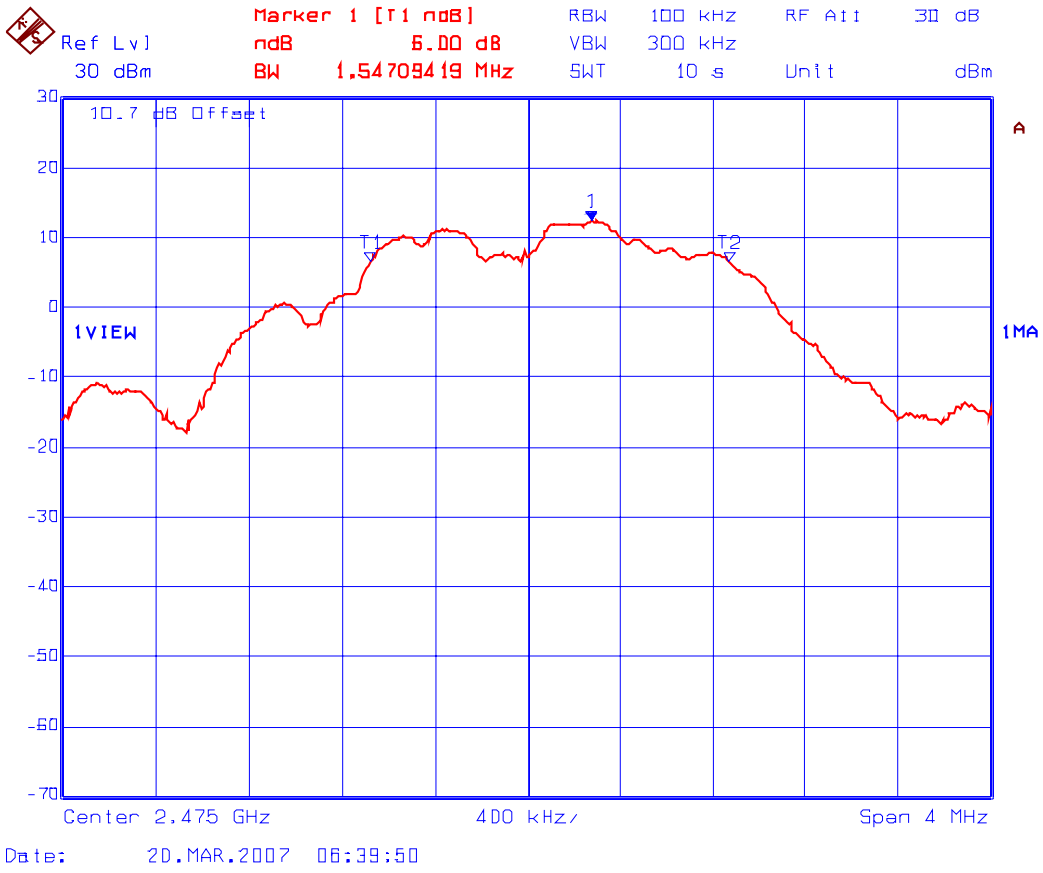
Plot 1.: 6 dB Bandwidth
Test Frequency: 2405 MHz



Plot 2.: 6 dB Bandwidth
Test Frequency: 2440 MHz



Plot 3.: 6 dB Bandwidth
Test Frequency: 2475 MHz



5.6 PEAK OUTPUT POWER [§§ 15.247(b)(3)]

5.6.1. Limits

- **FCC 15.247(b)(3):** Maximum peak output power of the transmitter shall not exceed 1 Watt.

5.6.2. Method of Measurements

Refer to FCC Public Notice DA 00-705, KDB Publication No. 558074 and ANSI C63.4 for measurement methods.

- **Option (1):** Set the RBW greater than 6 dB bandwidth of the emission or use a peak power meter.

5.6.3. Test Equipment List

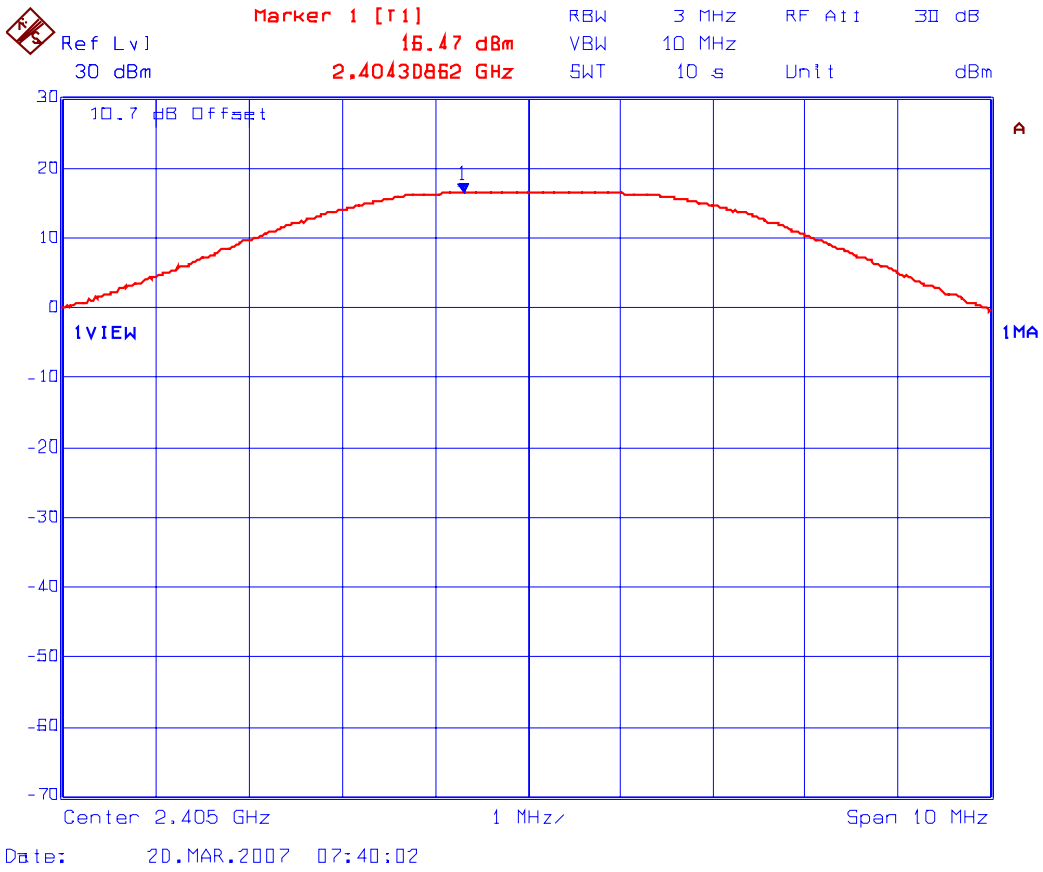
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

5.6.4. Test Data

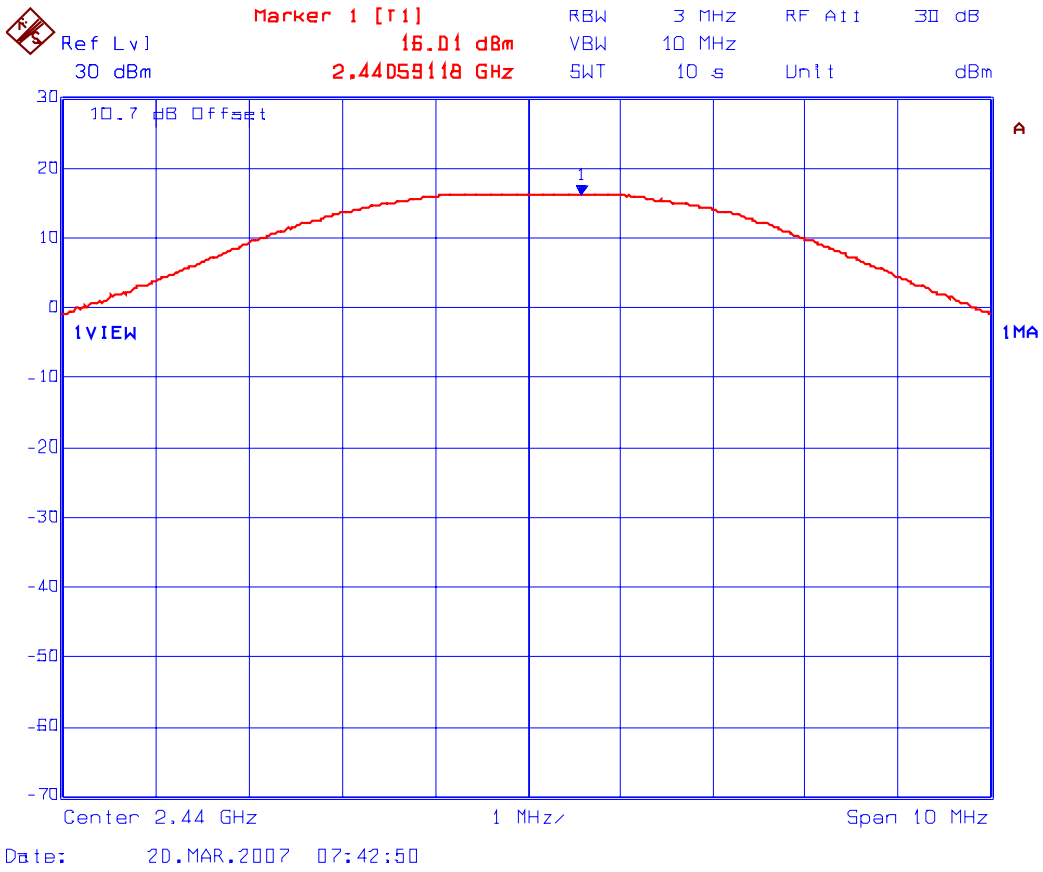
Frequency (MHz)	Measured Peak Power (dBm)	Peak Output Power Limit (dBm)
2405	16.47	30
2440	16.01	30
2475	16.01	30

See the following plots for measurement details.

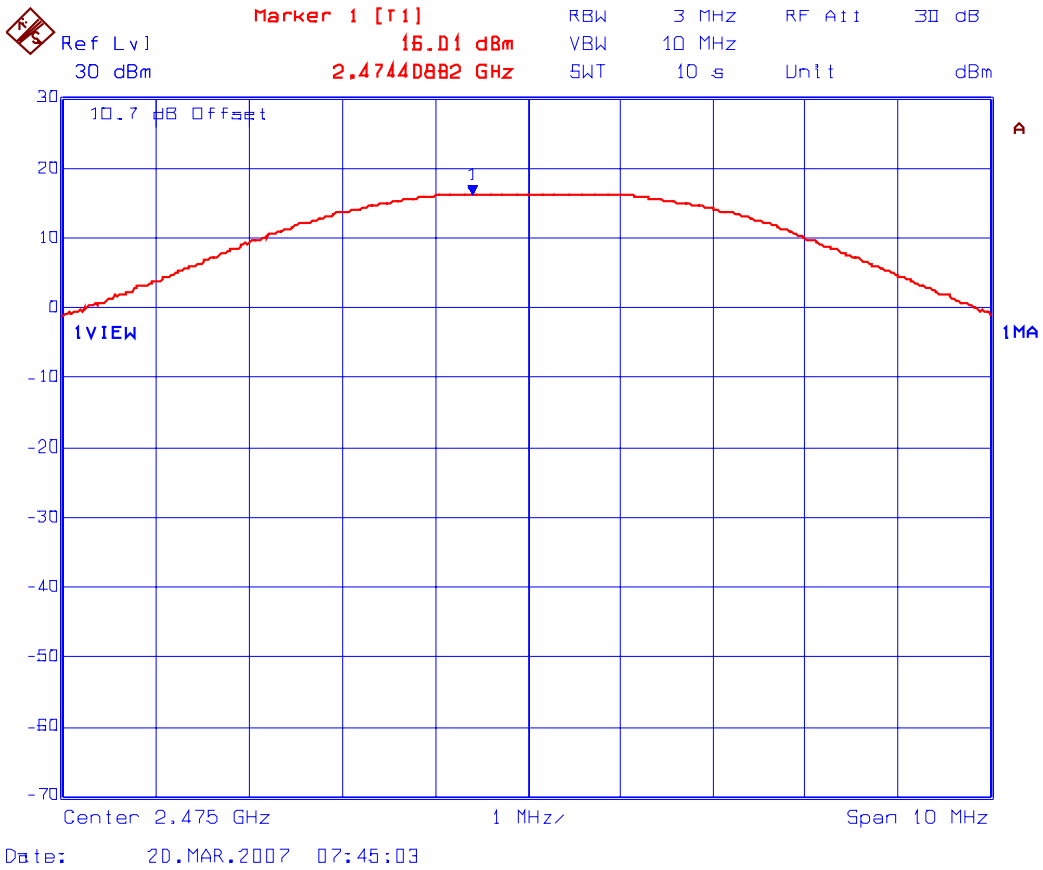
Plot 4.: Peak Output Power
Test Frequency: 2405 MHz



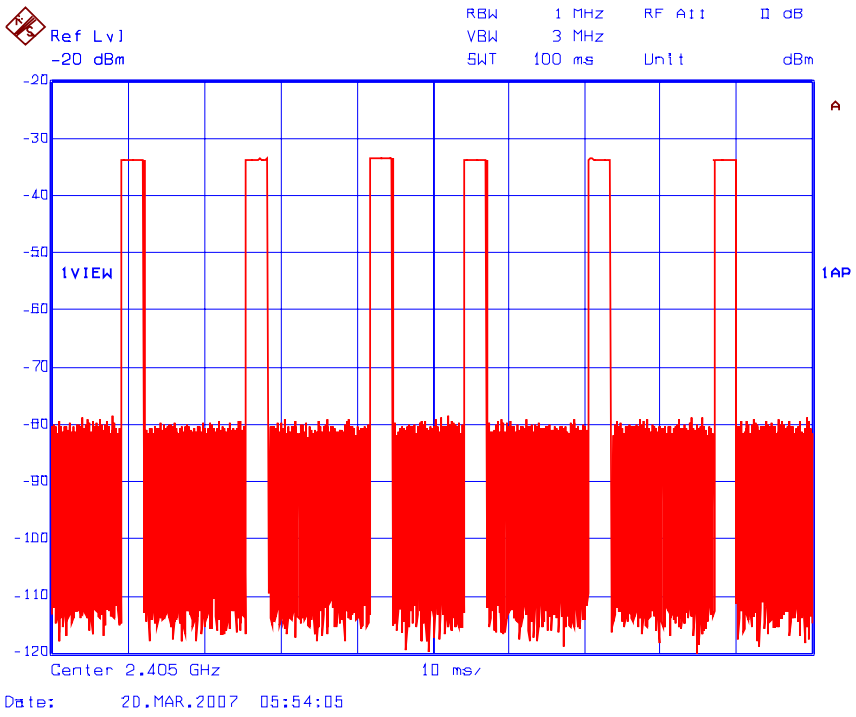
Plot 5.: Peak Output Power
Test Frequency: 2440 MHz



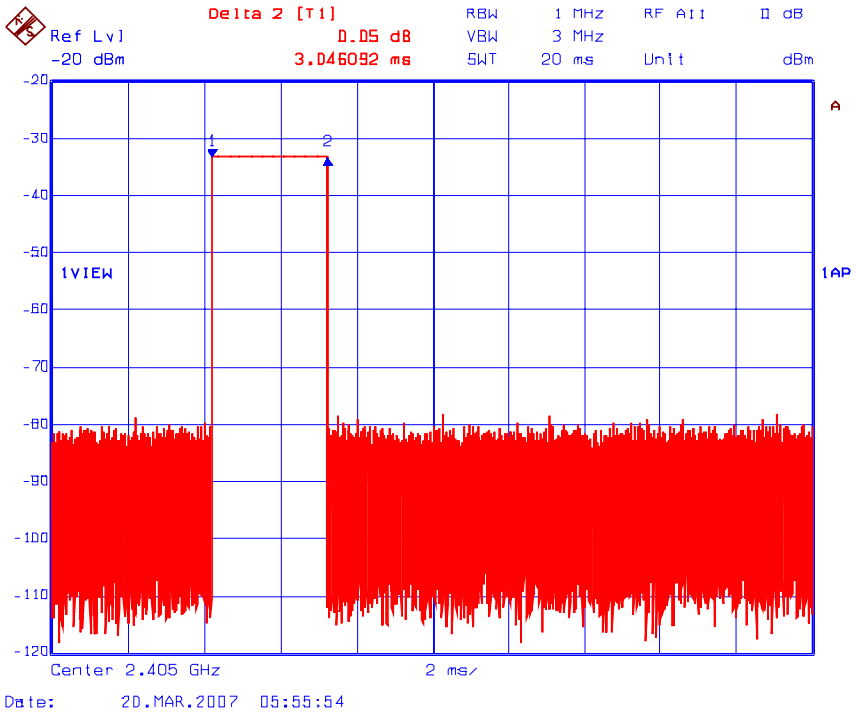
Plot 6.: Peak Output Power
Test Frequency: 2475 MHz



Plot 7. Duty Cycle. #1



Plot 8. Duty Cycle. #2



Peak-Average correction factor for field strength measurement:

$$\frac{Time\,On}{(Time\,On + Time\,Off)} = \frac{(6 \times 3.05ms)}{100ms} = 18.9\% \Rightarrow 20 \cdot \log(0.189) = -14.47\text{dB}$$

5.7 SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

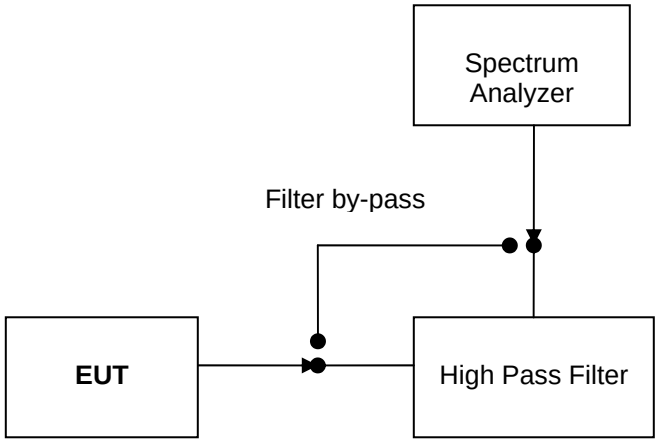
5.7.1. Limits

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.7.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247) and Section 8.3 of this test report.

5.7.3. Test Arrangement



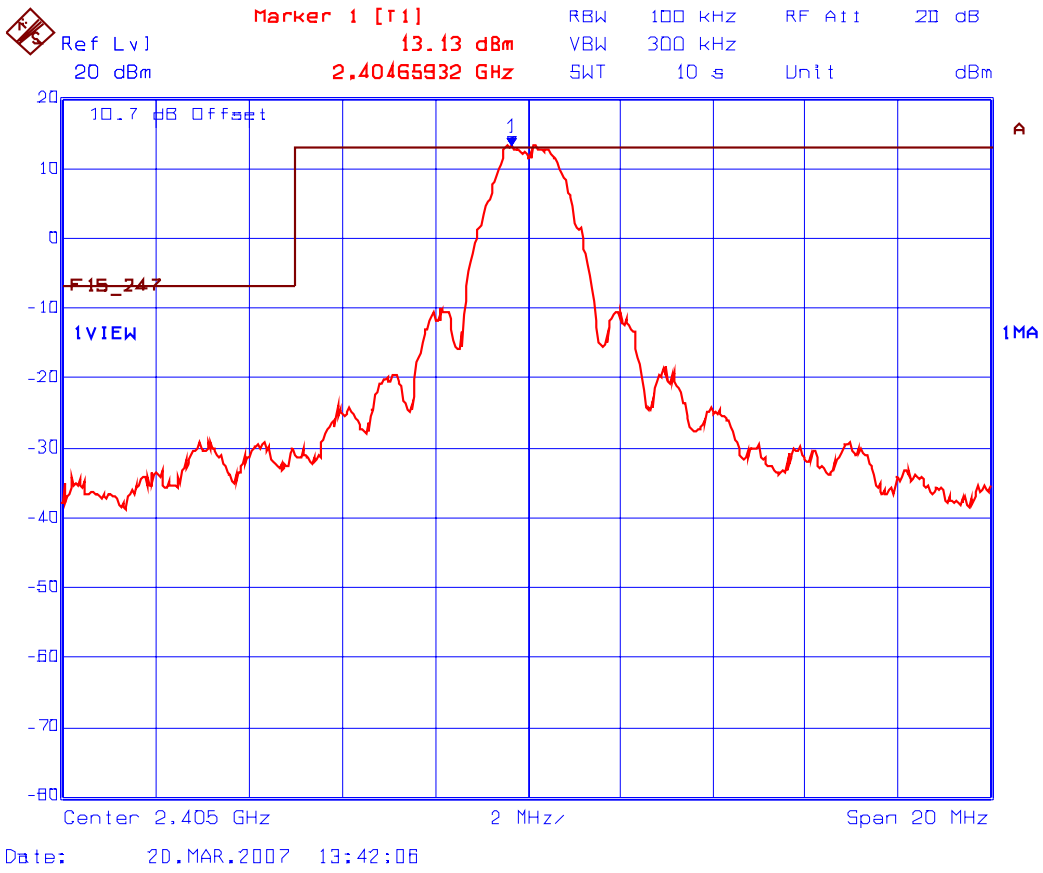
5.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9 kHz- 40 GHz
Highpass Filter	K & L	11SH10-4000/T12000-0/0	4	2 – 26 GHz

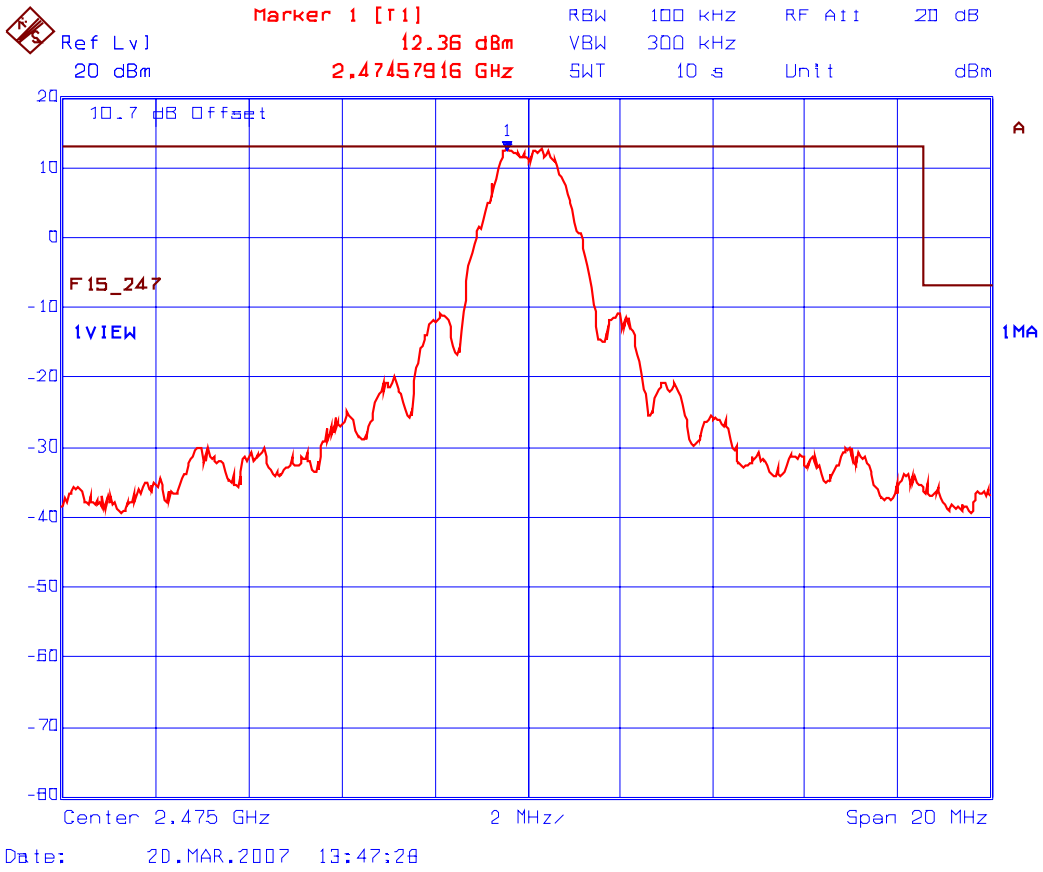
5.7.5. Test Data

5.7.5.1. Band-Edge Conducted Emissions

Plot 9.
Band-Edge Conducted Emissions
Low End of Frequency Band
Frequency: 2405 MHz



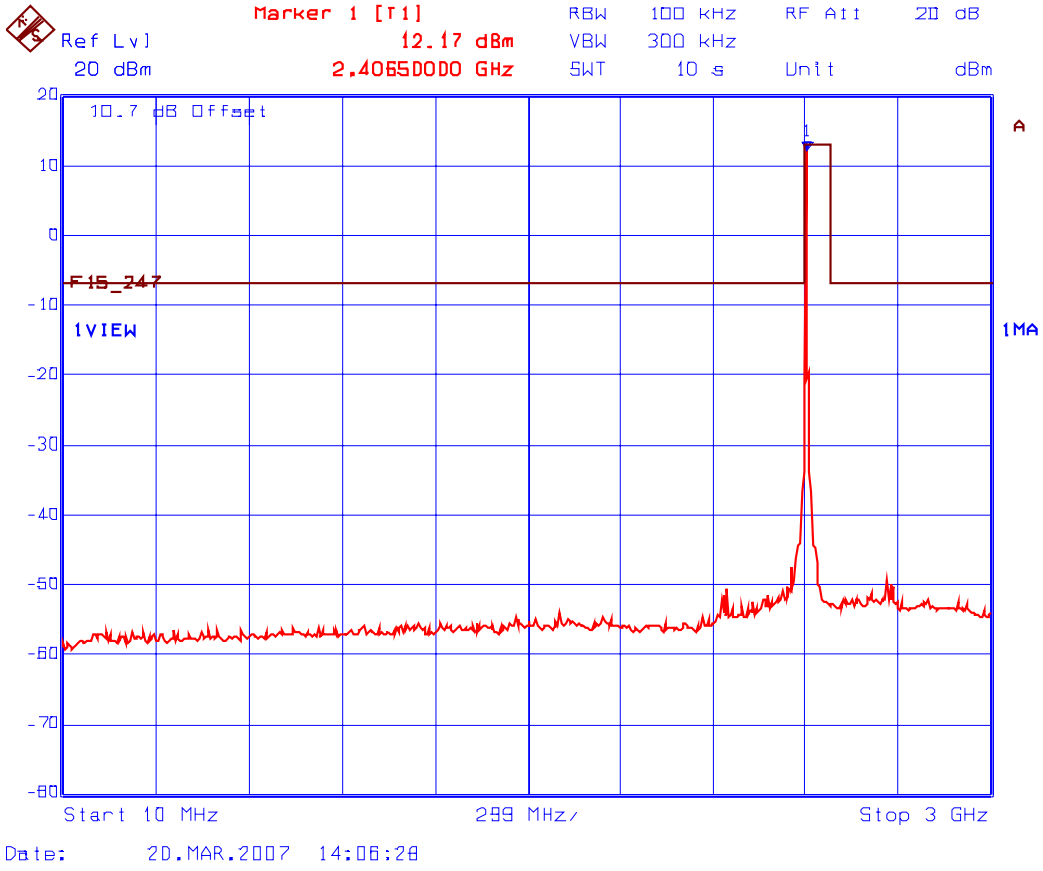
Plot 10.
Band-Edge Conducted Emissions
High End of Frequency Band
Frequency: 2475 MHz



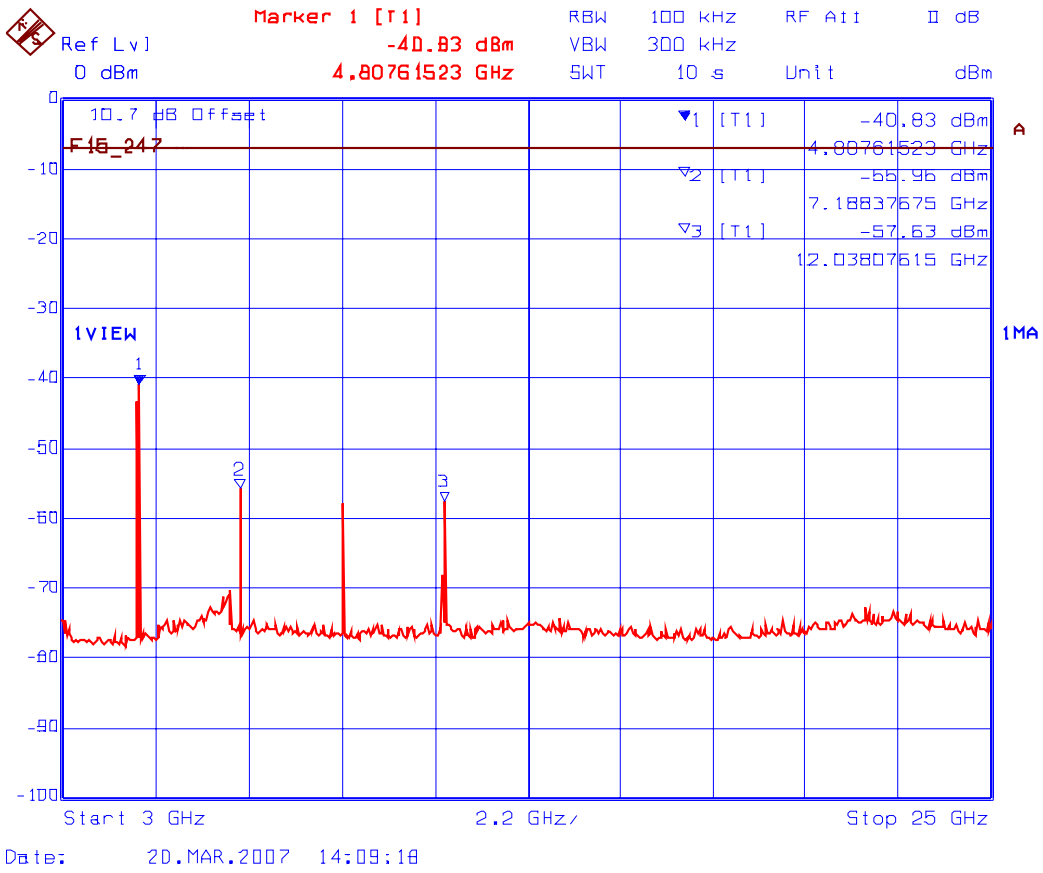
5.7.5.2. Spurious Conducted Emissions

Remark: The spurious conducted emissions were scanned from 10 MHz to 25 GHz with the analyzer set at Max Hold while the EUT operating at all applicable modulation types and data rates. The following resultant plots represent the worse case measurements.

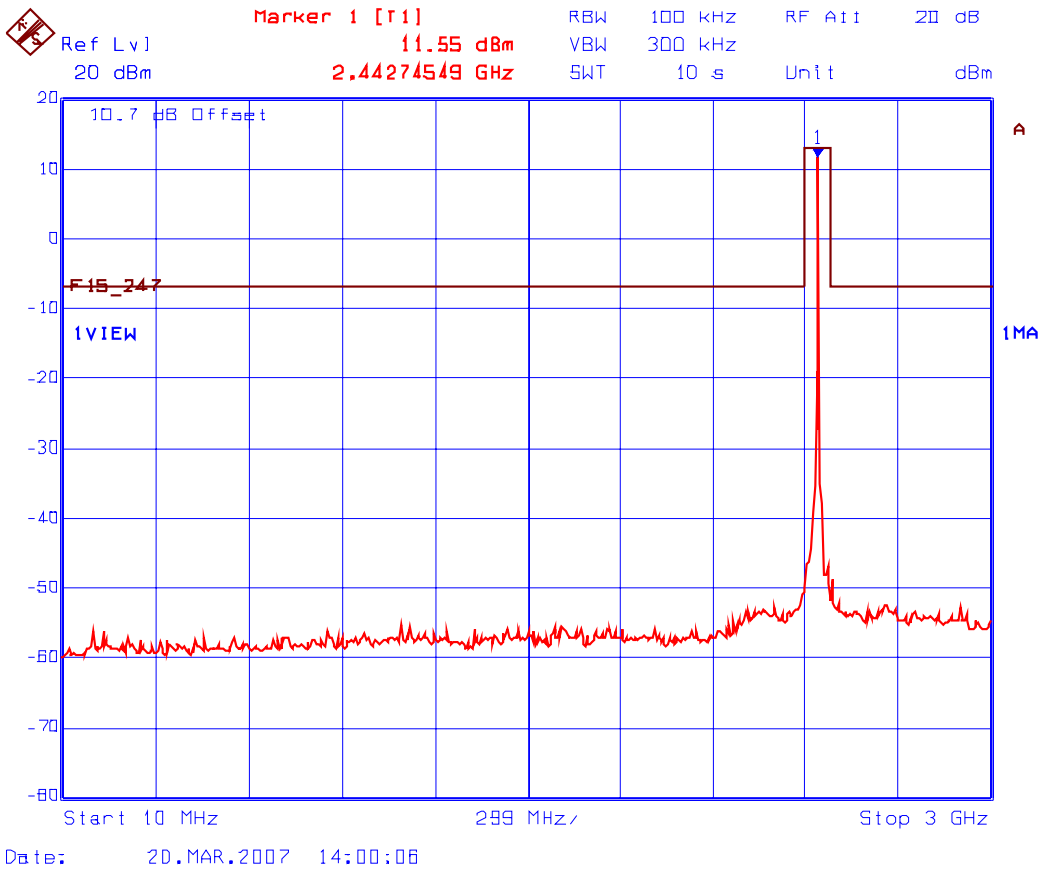
Plot 11.
Spurious Conducted Emissions
Test Frequency: 2405 MHz
Test Setting: Analyzer at Max Hold



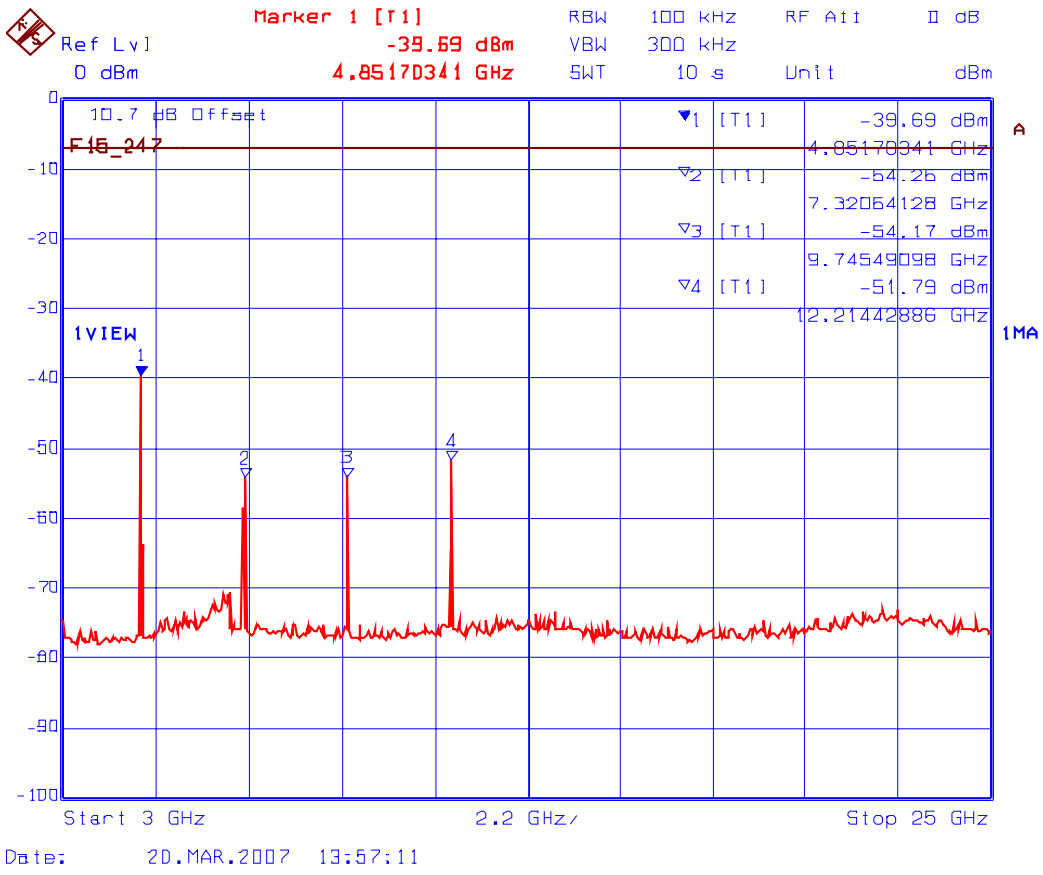
Plot 12.
Spurious Conducted Emissions
Test Frequency: 2405 MHz
Test Setting: Analyzer at Max Hold



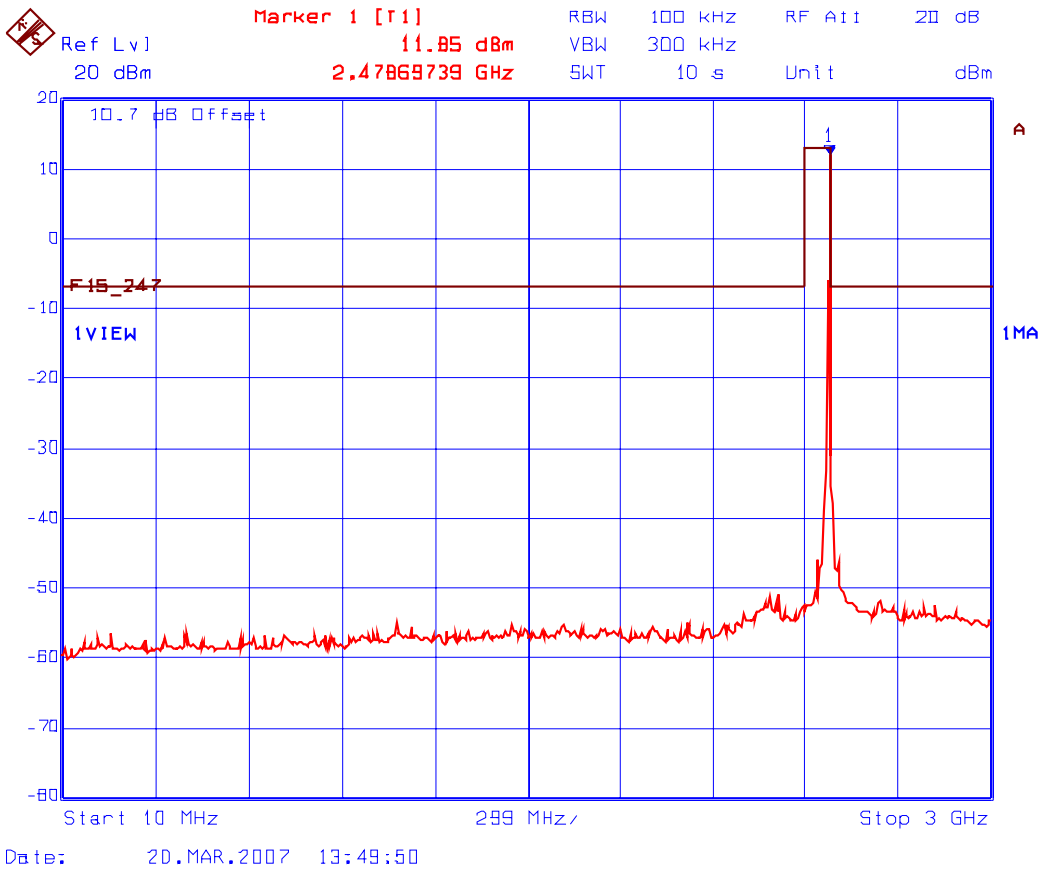
Plot 13.
Spurious Conducted Emissions
Test Frequency: 2440 MHz
Test Setting: Analyzer at Max Hold



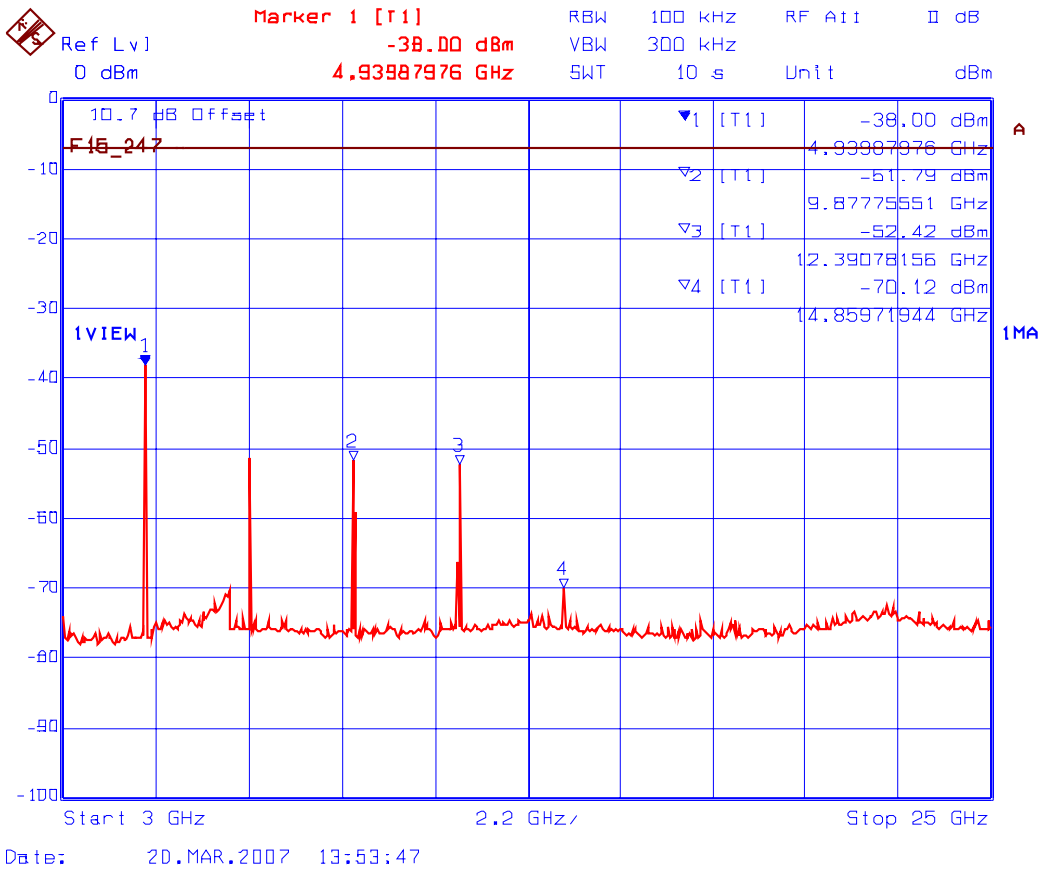
Plot 14.
Spurious Conducted Emissions
Test Frequency: 2440 MHz
Test Setting: Analyzer at Max Hold



Plot 15.
Spurious Conducted Emissions
Test Frequency: 2475 MHz
Test Setting: Analyzer at Max Hold



Plot 16.
Spurious Conducted Emissions
Test Frequency: 2475 MHz
Test Setting: Analyzer at Max Hold



5.8 SPURIOUS RADIATED EMISSIONS @ 3 METERS [§ 15.247(d)]

5.8.1. Limits

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

47 CFR 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41			

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

47 CFR 15.209(a) - Radiated emission limits, general requirements

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 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.		

5.8.2. Method of Measurements

Refer to Ultratech Test Procedures, Files # ULTR P002-2004 or ULTR P003-2004 and ANSI C63.4 for measurement methods

5.8.3. Test Arrangement

Refer to Section 2.6 of this test report for test setup.

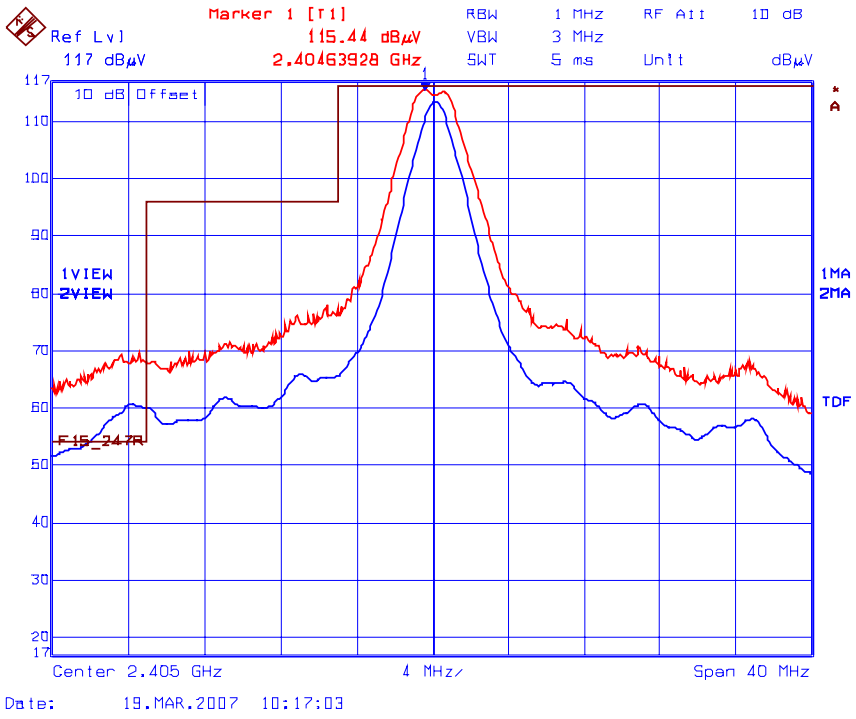
5.8.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3160-09	..	18 GHz – 26.5 GHz
Horn Antenna	EMCO	3160-10	..	26.5 GHz – 40 GHz
Mixer	Tektronix	118-0098-00	..	18 GHz – 26.5 GHz
Mixer	Tektronix	119-0098-00	..	26.5 GHz – 40 GHz

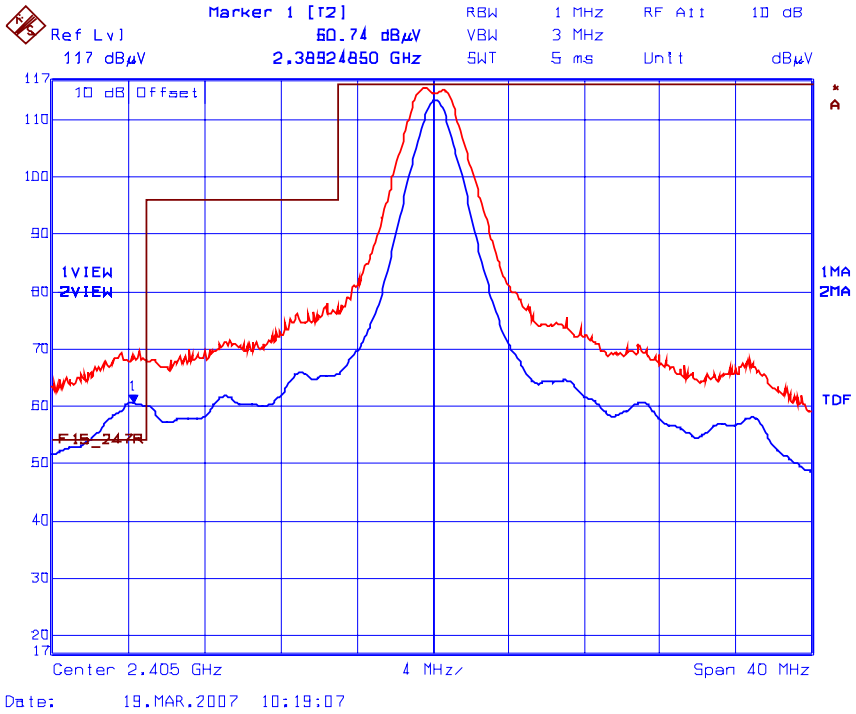
5.8.5. Test Data

5.8.5.1. Band-edge Radiated Emissions

Plot 17.: Band-Edge Radiated Emissions
Vertical Polarization, Low End of Frequency Band #1

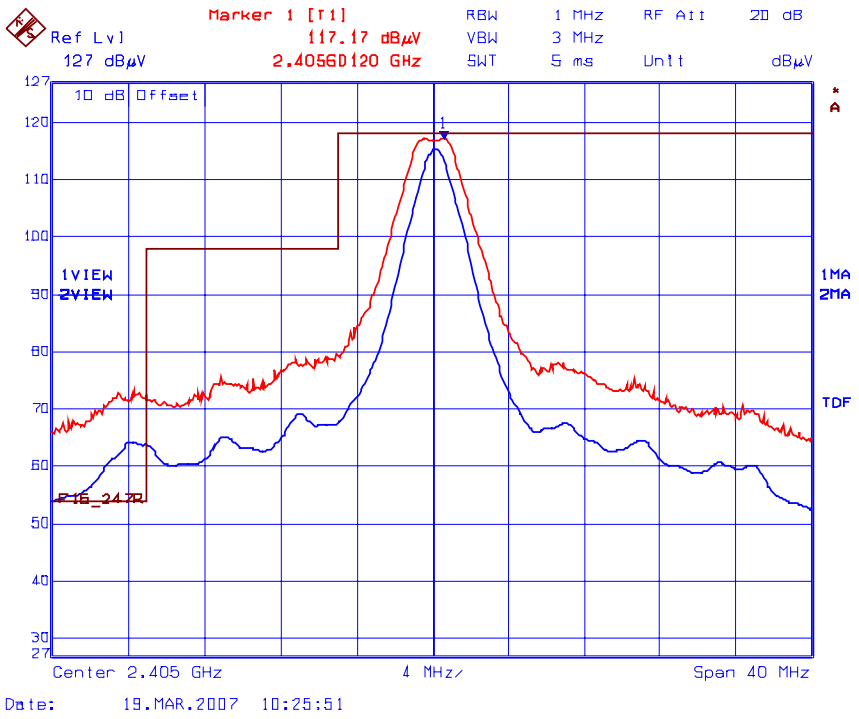


Plot 18.: Band-Edge Radiated Emissions
Vertical Polarization, Low End of Frequency Band #1

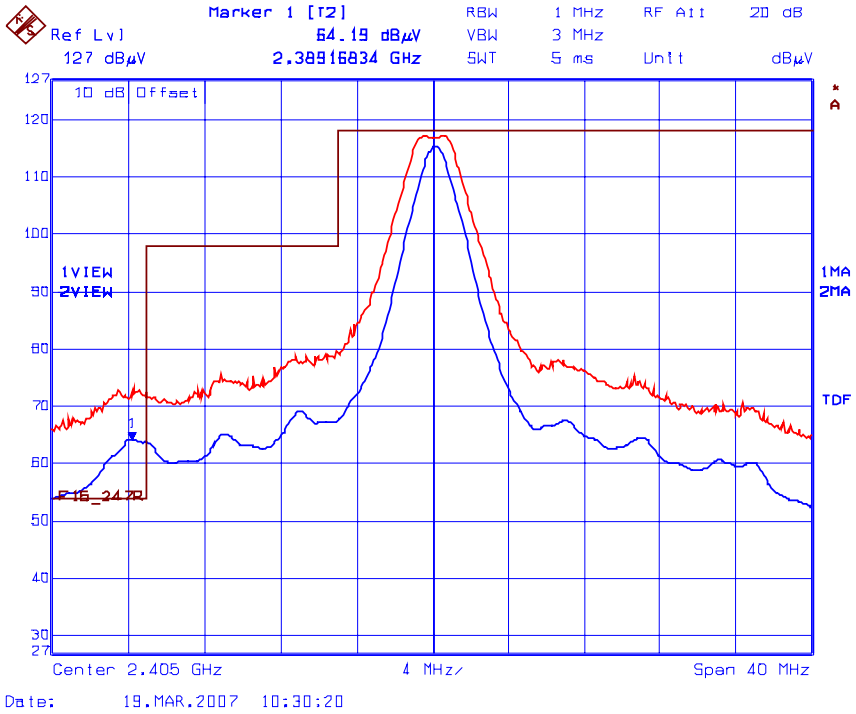


Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz
Duty Cycle 18.88%= -14.47db
Band-Edge Level at 2389 MHz: 60.74dBuV/m – 14.47 dB= 46.27dBuV/m (Limit 54dBuV/m)
Average

Plot 19.: Band-Edge Radiated Emissions
Horizontal Polarization Low End of Frequency Band #1

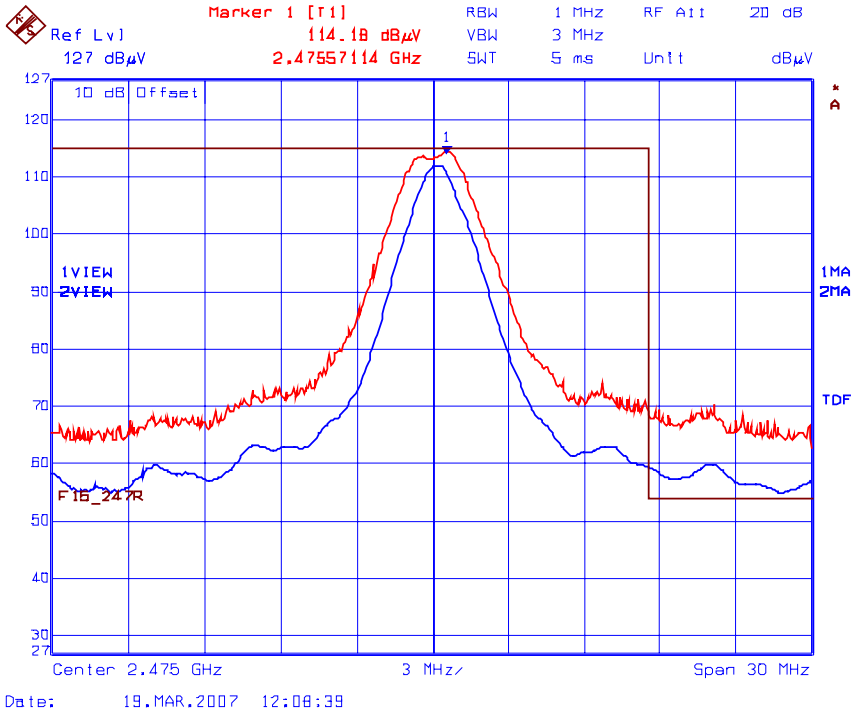


Plot 20.: Band-Edge Radiated Emissions
Horizontal Polarization Low End of Frequency Band #2

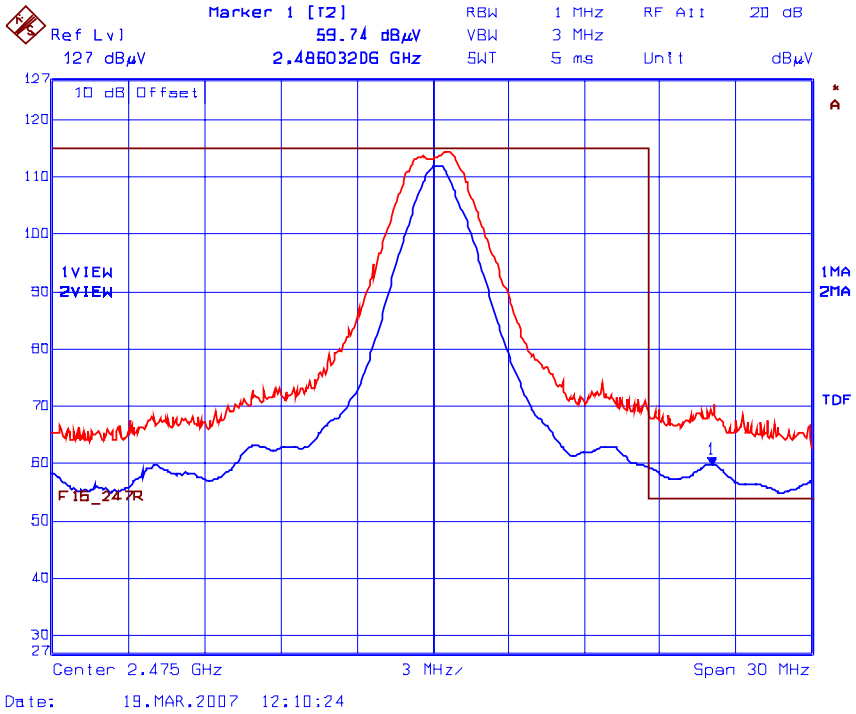


Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz
Duty Cycle 18.88%= -14.47db
Band-Edge Level at 2389 MHz: Peak: 72.92dBuV/m, Average: 64.19dBuV/m – 14.47 dB= 49.72dBuV/m (Limit 54dBuV/m)

Plot 21.: Band-Edge Radiated Emissions
Vertical Polarization Upper End of Frequency Band #1

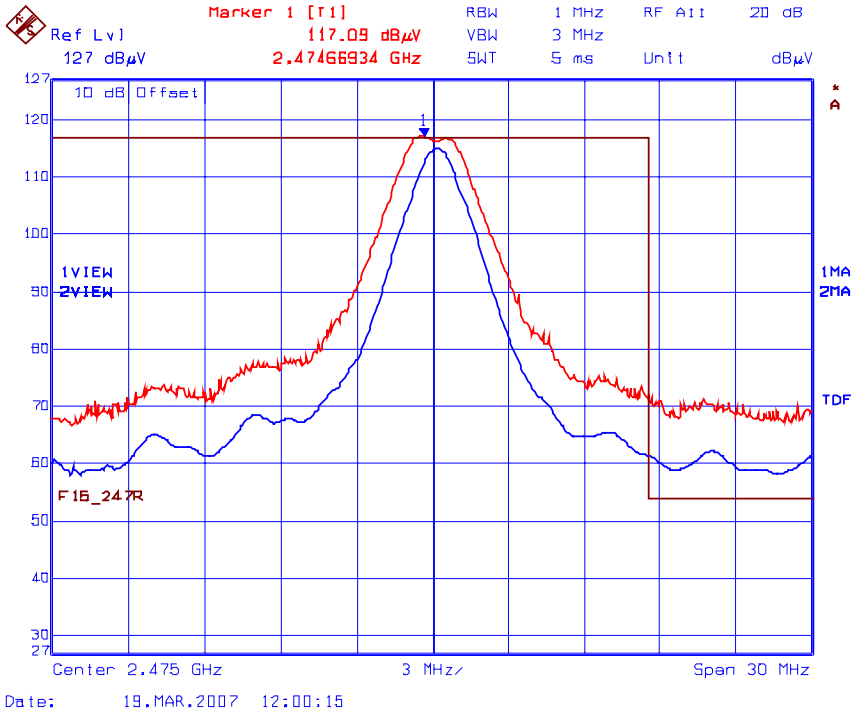


Plot 22.: Band-Edge Radiated Emissions
Vertical Polarization Upper End of Frequency Band #2

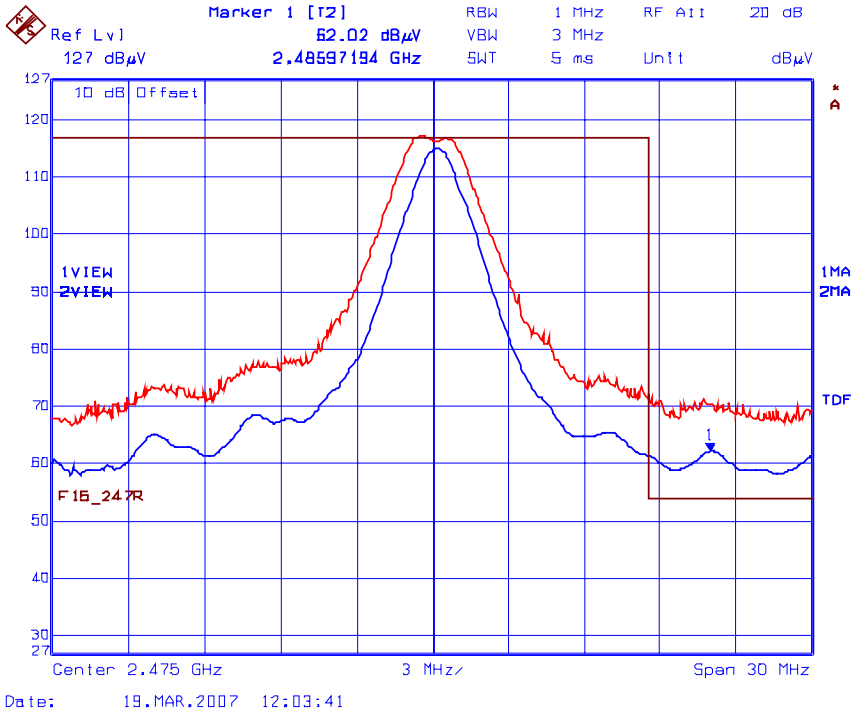


Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz
Duty Cycle 18.88%= -14.47db
Band-Edge Level at 2483.5 MHz: 59.74dBuV/m – 14.47 dB= 45.27dBuV/m (Limit 54dBuV/m)
Average

Plot 23.: Band-Edge Radiated Emissions
Horizontal Polarization Upper End of Frequency Band #1



Plot 24.: Band-Edge Radiated Emissions
Horizontal Polarization Upper End of Frequency Band #1



Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 1 MHz, VBW= 10 Hz
Duty Cycle 18.88%= -14.47db
Band-Edge Level at 2483.5 MHz: Peak: 72.15dBuV/m, Average: 62.02dBuV/m – 14.47 dB= 47.55dBuV/m (Limit 54dBuV/m)

5.8.5.2. Transmitter Radiated Spurious Emissions

1. The emissions were scanned from 30 MHz to 25 GHz; all signals within 20 dB below the permissible limit were recorded in the table below.
2. The following test results are the worst-case measurements.

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
Fundamental Frequency: 2405 MHz							
2405	115.44	-	V	-	-	-	-
2405	117.17	-	H	-	-	-	-
4810*	58.30	34.24	V	54.0	54.0	-19.76	Pass
4810*	60.08	36.33	H	54.0	54.0	-17.67	Pass
12025*	61.86	36.81	V	54.0	54.0	-17.19	Pass
12025*	63.47	38.07	H	54.0	54.0	-15.93	Pass
Fundamental Frequency: 2440 MHz							
2440	115.39	-	V	-	-	-	-
2440	115.89	-	H	-	-	-	-
4880*	55.79	31.56	V	54.0	54.0	-22.44	Pass
4880*	59.42	35.93	H	54.0	54.0	-18.07	Pass
12200*	63.05	36.83	V	54.0	54.0	-17.17	Pass
12200*	65.67	40.94	H	54.0	54.0	-13.06	Pass
Fundamental Frequency: 2475 MHz							
2475	114.18	-	V	-	-	-	-
2475	117.09	-	H	-	-	-	-
4950*	56.43	32.01	V	54.0	54.0	-21.99	Pass
4950*	59.13	34.73	H	54.0	54.0	-19.27	Pass
7425*	53.24	26.63	V	54.0	54.0	-27.37	Pass
7425*	53.79	26.70	H	54.0	54.0	-27.30	Pass
12375*	66.05	41.69	V	54.0	54.0	-12.31	Pass
12375*	66.08	41.38	H	54.0	54.0	-12.62	Pass

- *Emission in restricted bands.
- Peak-average correction factor: 14.47 dB is applied to the measured RF AVG Level.

5.9 POWER SPECTRAL DENSITY [§ 15.247(e)]

5.9.1. Limits

For a digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be grater than 8 dBm in any 3 KHz bandwidth within this band during any time interval of continuous transmission.

5.9.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), using Alternative Test Procedures.

5.9.3. Test Equipment List

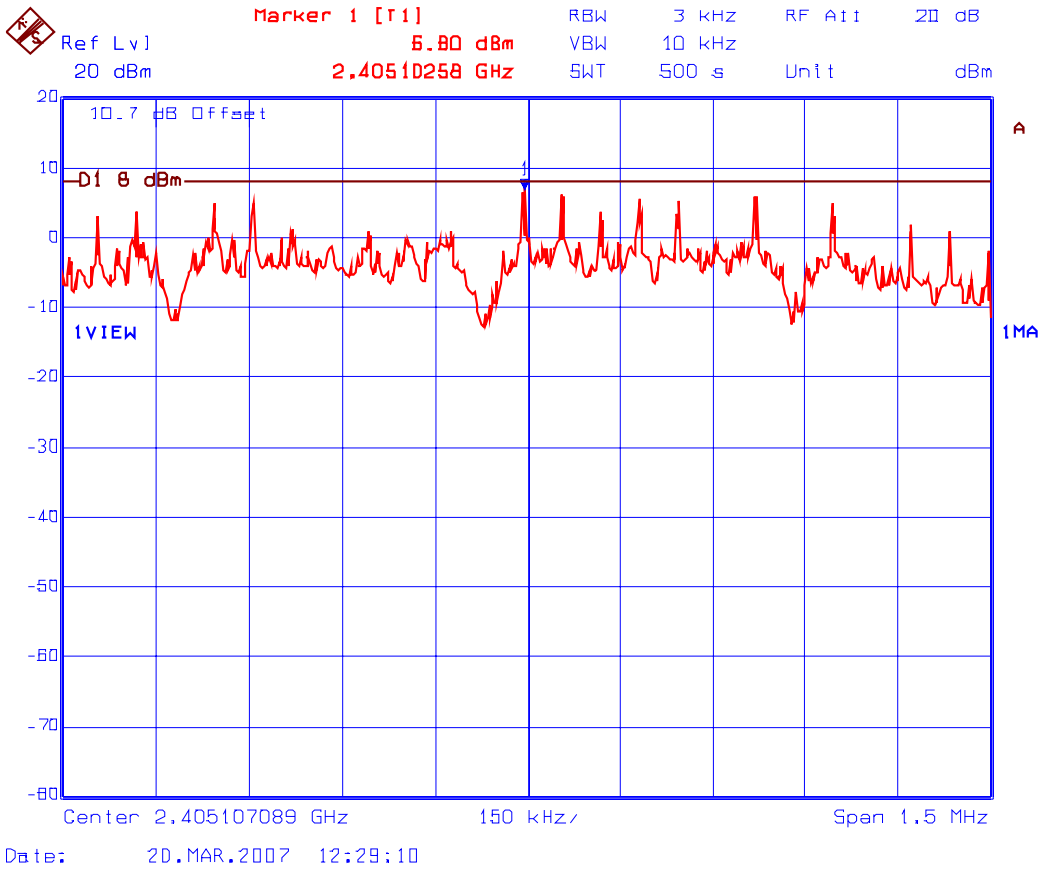
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz

5.9.4. Test Data

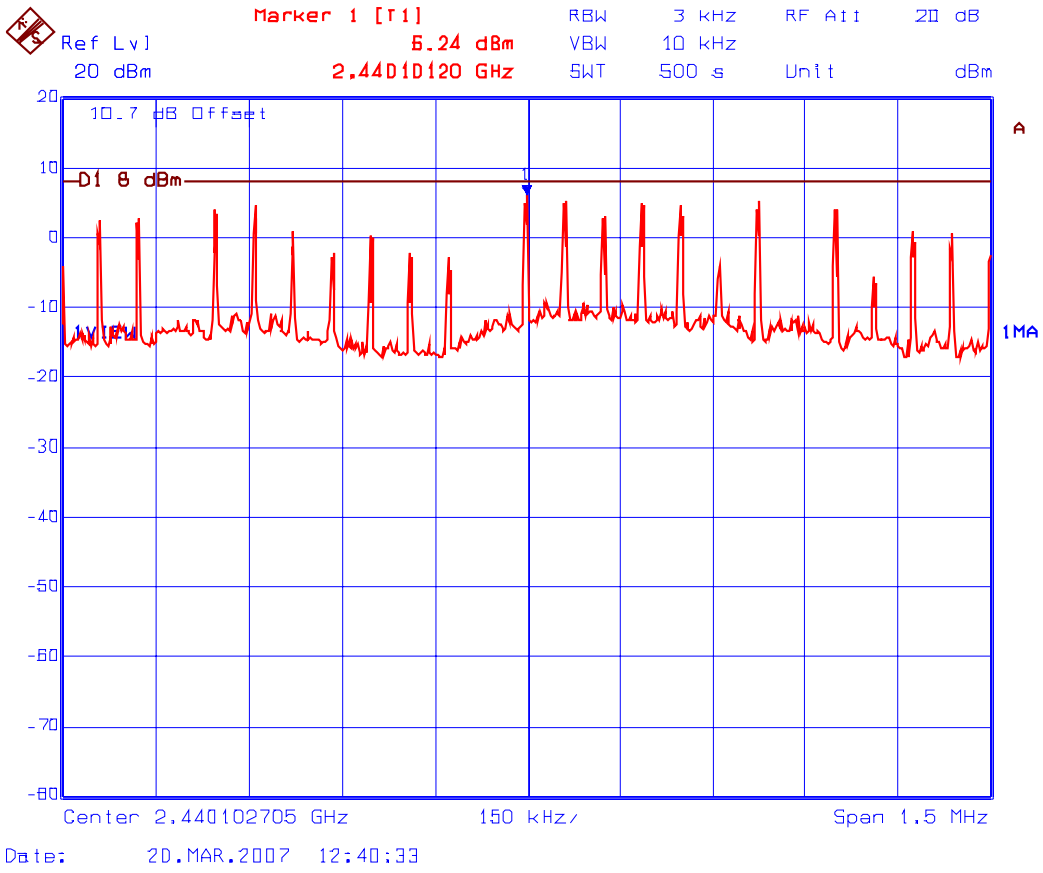
Frequency (MHz)	RF Power Level in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)	Comments (Pass/Fail)
2405	6.80	8.0	-1.20	Pass
2440	6.24	8.0	-1.76	Pass
2475	6.43	8.0	-1.57	Pass

See the following plots for measurement details.

Plot 25.
Power Spectral Density
Frequency: 2405 MHz



Plot 26.
Power Spectral Density
Frequency: 2440 MHz



Plot 27.
Power Spectral Density
Frequency: 2475 MHz

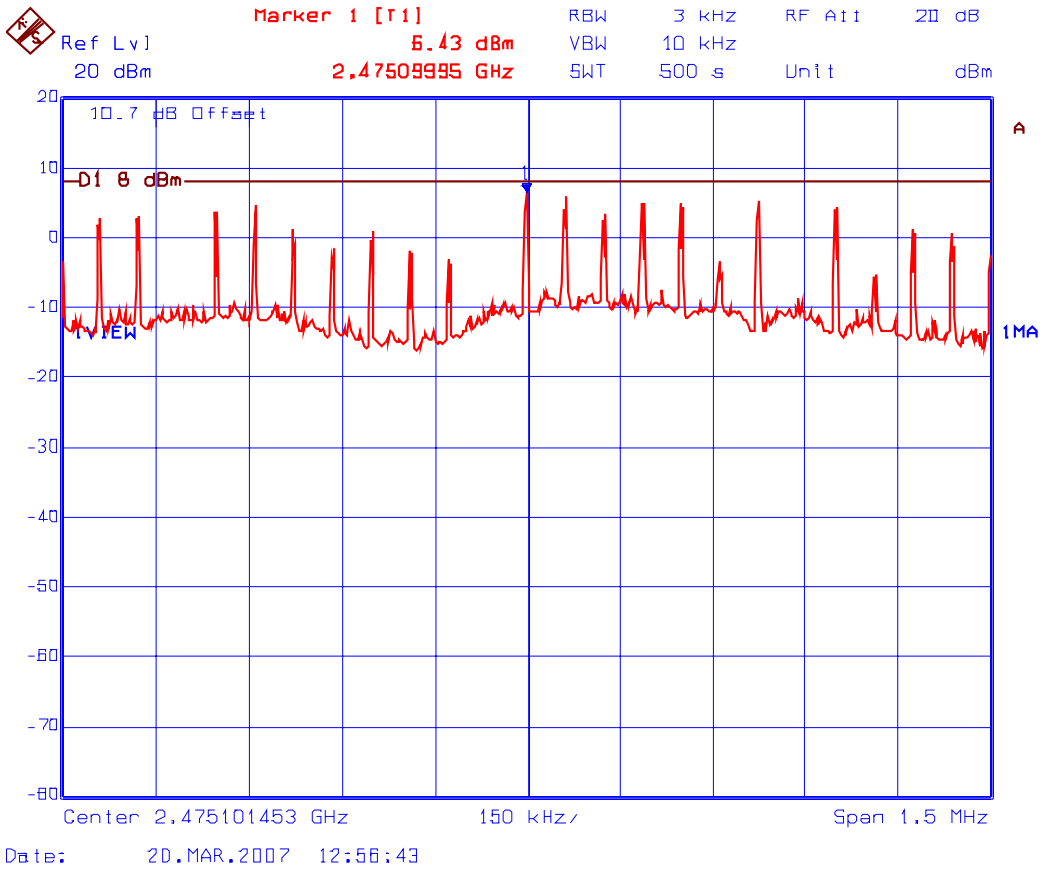


EXHIBIT 6 MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1 LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

6.2 RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB