LS Research, LLC

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ENGINEERING TEST REPORT # 307238 TX TCB
LSR Job #: R-363

Compliance Testing of:
Zigbee™ Base Station Transceiver
Inverted F antenna & Nearson Dipole

Test Date(s):
June 5, 12, and 19, 2007; May 23; and June 2, 2008

Prepared For:
SpeakerCraft®
Attn: Gilbert Liu
940 Columbia Avenue
Riverside, California 92507

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Transmitters (DTS) Operating in the
Frequency Band 2400 MHz – 2483.5 MHz

This Test Report is issued under the Authority of:
Brian E. Petted, VP of Engineering

Signature:  Date: July 7, 2008

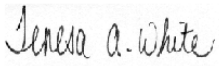
Test Report Reviewed by:	**Tested by:**
Teresa A. White, Quality Manager	Ryan M. Urness, EMC Laboratory Manager
Signature: 	Signature:  Date:07.08.08
Date: July 8, 2008	

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.247
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Digital Modulation Transmitters operating in the Frequency Band of 2400 MHz – 2483.5 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, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2007	Code of Federal Regulations - Telecommunications
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 16-1-1	2006 A1: 2007	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 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.
FCC Procedures	2007	Measurement of Digital Transmission Systems operating under Section 15.247.

1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.lsr.com. Accreditation status can be verified at A2LA's web site: www.a2la2.net.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	SpeakerCraft®
Address:	940 Columbia Avenue Riverside, CA 92507
Contact Person:	Gilbert Liu

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Zigbee™ Base Station Transceiver
Model Number:	HDW14411
Serial Number:	07100672 & 07100675

2.3 ASSOCIATED ANTENNA DESCRIPTION

Configuration A: Inverted F PCB Antenna

Configuration B: 90° Half Wave Dipole Antenna.

Frequency Range:	2.4-2.5 GHz
Gain:	2dB
VSWR:	<2.0:1
Radiation:	Omni
Impedance:	50Ω Nominal

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

	Configuration A	Configuration B
Frequency Range (in MHz)	2400-2480 MHz	2400-2480 MHz
RF Power in Watts	0.102 W	0.102 W
Conducted Output Power (in dBm)	20.2 dBm	20.2 dBm
Field Strength (and at what distance)	112.2 dBµV/m @ 3m	116.0 dBµV/m @3m
Occupied Bandwidth (99% BW)	2.37 MHz	2.37 MHz
Type of Modulation	O-QPSK	O-QPSK
Emission Designator	2M37G1D	2M37G1D
EIRP (in mW)	49.77 mW	119.39 mW
Transmitter Spurious (worst case)	58.95 dBµV/m	72.81 dBµV/m
Frequency Tolerance %, Hz, ppm	<100 ppm	<100 ppm
Microprocessor Model # (if applicable)	Ember EM250	Ember EM250
Antenna Information		
Detachable/non-detachable	Non-detachable	Detachable
Type	Inverted F PCB	Nearson 90° Half Wave Dipole
Gain (in dBi)	3.5 dBi (±1dB) typical	2.0 dB
EUT will be operated under FCC Rule Part(s)	FCC 15.247	FCC 15.247
Modular Filing	☒ Yes ☐ No	☒ Yes ☐ No
Portable or Mobile	Portable	Portable

RF Technical Information:

Type of Evaluation (check one)		SAR Evaluation: Device Used in the Vicinity of the Human Head
		SAR Evaluation: Body-worn Device
	X	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: FCC 15.247
- Measurement Distance: 3 m
- RF Value: 0.630 ☒ V/m ☐ A/m ☐ W/m^2
  ☐ Measured ☐ Computed ☒ Calculated

2.5 PRODUCT DESCRIPTION

This is a home entertainment system comprised of a Base Station transceiver and numerous remote control transceivers. The wireless control units may be battery operated (in which case the RF module is operational) or line powered when 'docked' (in which case the radio module is disabled).

The RF transceiver in either end of the system is the Ember EM250 Zigbee™ radio IC. This chip is incorporated into a self contained RF Module which sends and receives data, control signals and power over a single multi-pin connector.

The unit is powered from a single cell lithium battery when operational. If the unit is docked in a charging cradle or into a wall mount docking station, the communications to the host system are wired and the radio is turned off. The radio module is powered and operational only when under battery power.

The unit is intended to be placed on a horizontal surface, such as a kitchen counter-top or a coffee table. It may also be operated while held in the hands, such as to make a music selection or to change the volume of the stereo sound system. When not in active use, it would be set on a table surface.

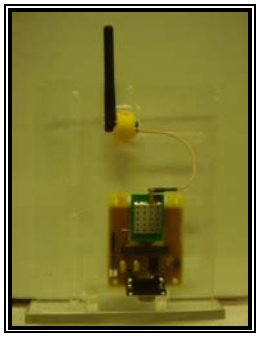
The transceiver employs Direct Sequence Spread Spectrum operation with a 250kbps data rate, 2 MChips/sec chip rate. The modulation is O-QPSK with half sine pulse shaping. The band plan is for 15 channels spaced 10 MHz apart beginning at 2405 MHz and ending at 2475 MHz.

Resident software in the host processor allows for a remote terminal to be connected through the serial RS-232 port on the test adapter board. There are ASCII commands which can be issued to the radio under a Hyperterminal link.

PHOTO (Optional)

Inv. F Ant. EUT SN: 07100672 (Configuration A)

Cond. EUT SN: 07100675



Dipole EUT SN: 07100675 (Configuration B)

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	24°C
Humidity:	33%
Pressure:	101.5 kPa

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
15.207	Power Line Conducted Emissions Measurements	Yes
15.247(a)(2)	6 dB Bandwidth of a Digital Modulation System	Yes
15.247(b) & 1.1310	Maximum Output Power	Yes
15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
15.247(c)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers. The Receiver Test Report is available upon request.		

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☐ **None** ☒ **Yes (explain below)**

The Inverted F antenna module was operated in reduced power setting on several channels:

Channel	Power Setting
11 (2405MHz)	+3dB
18 (2440MHz)	+3dB
24 (2470MHz)	+3dB
25 (2475MHz)	-14dB
26 (2480MHz)	-27dB

The Dipole antenna module was operated in reduced power setting on several channels:

Channel	Power Setting
11 (2405MHz)	+3dB
18 (2440MHz)	+3dB
24 (2470MHz)	+3dB
25 (2475MHz)	-14dB
26 (2480MHz)	-27dB

The power levels stated above shall be set in firmware and non-configurable. Channels allocated at 2475MHz and 2480MHz shall also be removed in firmware, and not utilized.

Note: Power levels of +3dB will hence be called full power in the remainder of this report.

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☐ **None** ☒ **Yes (explain below)**

Although the fundamental and the band edge measurements were made on 5 channels, the harmonics measurements were made on the lowest, medium and highest channel at full power (instead of reduced power on the highest channel). Based on sound engineering principles, it would be valid to conclude that if the harmonics on the highest channel operating at full power are below the limit, the harmonics of the channels operating at reduced power levels will also.

EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210, Issue 7 (2007), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in continuous transmit mode, using power as provided by a laboratory grade power supply. The unit has the capability to operate on 15 channels, controllable via Hyperterminal laptop PC.

The applicable limits apply at a 3 meter distance. Measurements above 5 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (2405MHz), middle (2440MHz) and high (2480MHz) to comply with FCC Part 15.35. The channels and operating modes were changed via Hyperterminal laptop PC interface.

5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 25000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 18 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. From 18 GHz to 25 GHz, the EUT was measured at a 0.3 meter separation, using a standard gain Horn Antenna and pre-amplifier.

The EUT was rotated along three orthogonal axes during the investigations to find the highest emission levels.

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz From 5 GHz to 18 GHz, an HP E4407B Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the HP E4407B Spectrum Analyzer with a standard gain horn, and preamp were used.

Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for a DTS transmitter [Canada RSS-210, Issue 7 (2007), Annex 8 (section 8.2). The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 2400-2483.5 MHz band, as specified in Title 47 CFR 15.247 (b)(3), is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c).

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands.

Frequency (MHz)	3 m Limit μV/m	3 m Limit (dBμV/m)	1 m Limit (dBμV/m)	30 cm Limit (dBμV/m)
30-88	100	40.0	-	-
88-216	150	43.5	-	-
216-960	200	46.0	-	-
960-24,000	500	54.0	63.5	74

Sample conversion from field strength μV/m to dBμV/m:
$dB\mu V/m = 20 \log_{10} (100)$
= 40 dBμV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

960 MHz to 10,000 MHz
500μV/m or 54.0 dB/μV/m at 3 meters
54.0 + 9.5 = 63.5 dB/μV/m at 1 meter

For measurements made at 0.3 meter, a 20 dB correction has been invoked.

960 MHz to 10,000 MHz
500μV/m or 54.0 dB/μV/m at 3 meters
54.0 + 20 = 74 dB/μV/m at 0.3 meters

5.6 RADIATED EMISSIONS DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.205 and 15.247(DTS)
Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	SpeakerCraft®						
Date(s) of Test:	June 1, 2007						
Test Engineer(s):	Ryan Urness						
Voltage:	3.0 VDC						
Operation Mode:	Continuous transmit						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:		Single Phase ___VAC			3 Phase ___VAC		
		Battery		X	Other: DC Supply		
EUT Placement:	X	80cm non-conductive table			10cm Spacers		
EUT Test Location:	X	3 Meter Semi-Anechoic FCC Listed Chamber			3/10m OATS		
Measurements:		Pre-Compliance		Preliminary		X	Final
Detectors Used:	X	Peak	X	Quasi-Peak		X	Average

The following table depicts the level of worst case radiated RF fundamental emissions (Horizontal Axis & Straight Dipole):

Frequency (MHz)	Ant./EUT Polarity	Antenna	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
2.405	Horiz/Horiz	Inv F	1.14	319°	111.6	125.23	13.63
2.405	Vert/Horiz	Inv F	1.20	0°	107.6	125.23	17.63
2.405	Horiz/Horiz	Dipole	2.35	257°	115.3	125.23	9.93
2.405	Vert/Horiz	Dipole	1.04	147°	112.2	125.23	13.03
2.440	Horiz/Horiz	Inv F	1.11	351°	110.3	125.23	14.93
2.440	Vert/Horiz	Inv F	1.22	354°	106.2	125.23	19.03
2.440	Horiz/Horiz	Dipole	2.31	260°	115.2	125.23	10.03
2.440	Vert/Horiz	Dipole	1.02	144°	116.0	125.23	9.23
2.480	Horiz/Horiz	Inv F	1.10	342°	94.6	125.23	30.63
2.480	Vert/Horiz	Inv F	1.20	360°	86.4	125.23	38.83
2.475	Horiz/Horiz	Inv F	1.11	351°	101.2	125.23	24.03
2.475	Vert/Horiz	Inv F	1.22	0°	97.6	125.23	27.63
2.470	Horiz/Horiz	Inv F	1.11	321°	112.2	125.23	13.03
2.470	Vert/Horiz	Inv F	1.45	0°	106.6	125.23	18.63
2.480	Horiz/Horiz	Dipole	2.70	242°	92.7	125.23	32.53
2.480	Vert/Horiz	Dipole	1.00	125°	88.2	125.23	37.03
2.475	Horiz/Horiz	Dipole	2.27	247°	103.2	125.23	22.03
2.475	Vert/Horiz	Dipole	1.00	125°	99.1	125.23	26.13
2.470	Horiz/Horiz	Dipole	2.27	254°	113.8	125.23	11.43
2.470	Vert/Horiz	Dipole	1.00	130°	109.9	125.23	15.33

Notes:

1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 5 GHz were made at 1 meters of separation from the EUT, and at 0.3 m separation for frequencies between 18 – 25 GHz.
3) Measurement at receiver system noise floor.
4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=3 MHz.

DATA CHART-RADIATED EMISSIONS TEST *(continued)*

The following table depicts the level of worst case radiated RF emissions seen on Channel 11 (90° for Dipole):

Frequency (GHz)	Ant./EUT Polarity	Antenna	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
4.810	Horiz/Horiz	Inv F	1.16	0°	45.33	54.00	8.67
7.215	Horiz/Horiz	Inv F	1.11	106°	55.43	105.23	49.80
14.43	Horiz/Horiz	Inv F	1.00	101°	58.95	105.23	46.28
16.835	Horiz/Horiz	Inv F	1.00	104°	54.99	105.23	50.24
19.24	Horiz/Horiz	Inv F	1.00	360°	65.59	74.00	8.41
4.810	Vert/Vert	Dipole	1.00	55°	53.50	63.50	10.00
7.215	Vert/Vert	Dipole	1.04	13°	56.22	105.23	49.01
9.620	Vert/Vert	Dipole	1.00	343°	72.81	105.23	32.42
12.025	Vert/Vert	Dipole	1.00	55°	48.30	63.50	15.20
14.430	Vert/Vert	Dipole	1.00	300°	57.72	105.23	47.51
16.835	Vert/Vert	Dipole	1.00	297°	54.15	105.23	51.08
19.240	Vert/Vert	Dipole	1.00	11°	59.65	74.00	14.35
21.645	Vert/Vert	Dipole	1.00	353°	60.49	105.23	44.74
24.050	Vert/Vert	Dipole	1.00	38°	50.01	105.23	55.22

The following table depicts the level of worst case radiated RF emissions seen on Channel 18 (90° for Dipole):

Frequency (GHz)	Ant./EUT Polarity	Antenna	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
4.880	Vert/Vert	Dipole	1.00	55°	52.03	63.50	11.47
7.320	Vert/Vert	Dipole	1.04	171°	48.76	63.50	14.74
9.760	Vert/Vert	Dipole	1.00	348°	71.11	105.23	34.12
12.200	Vert/Vert	Dipole	1.00	59°	49.77	63.50	13.73
14.640	Vert/Vert	Dipole	1.00	300°	52.71	105.23	52.52
17.080	Vert/Vert	Dipole	1.00	323°	54.61	105.23	50.62
19.520	Vert/Vert	Dipole	1.00	348°	61.83	74.00	12.17
21.960	Vert/Vert	Dipole	1.00	280°	57.72	105.23	47.51
24.400	Vert/Vert	Dipole	1.00	41°	49.81	105.23	55.42

The following table depicts the level of worst case radiated RF emissions seen on Channel 26 (90° for Dipole):

Frequency (GHz)	Ant./EUT Polarity	Antenna	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
4.960	Horiz/Vert	Dipole	1.00	20°	50.58	63.50	12.92
7.440	Horiz/Vert	Dipole	1.00	7°	47.90	63.50	15.6
9.920	Vert/Vert	Dipole	1.00	338°	68.43	105.23	36.8
12.400	Horiz/Vert	Dipole	1.00	0°	46.39	63.50	17.11
14.880	Horiz/Vert	Dipole	1.00	0°	55.66	105.23	49.57
17.360	Horiz/Vert	Dipole	1.00	323°	51.75	105.23	53.48
19.840	Vert/Vert	Dipole	1.00	295°	60.90	74.00	13.10
22.320	Vert/Vert	Dipole	1.00	0°	54.15	74.00	19.85
24.800	Vert/Vert	Dipole	1.00	333°	51.52	105.23	53.71

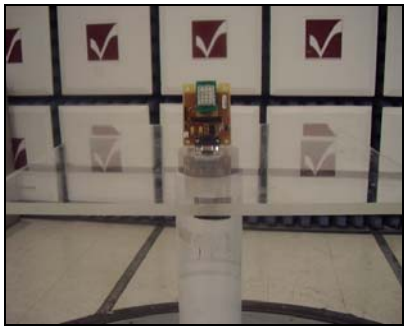
Notes:

5) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.

6) Measurements above 5 GHz were made at 1 meters of separation from the EUT on configuration A, measurements above 4 GHz were made at 1 meters of separation from the EUT on configuration B, and at 0.3 m separation for frequencies between 18 – 25 GHz.

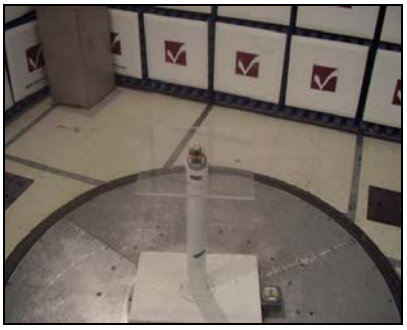
5.7 Test Setup Photo(s) – Radiated Emissions Test

Horizontal Orientation

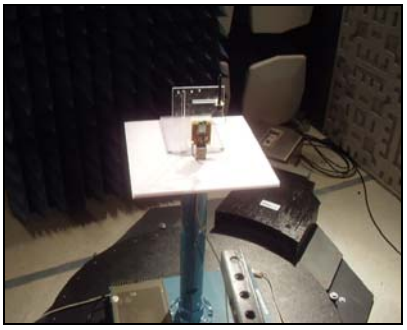


Vertical Orientation

Side Orientation



Exemplar Inverted F Configuration A



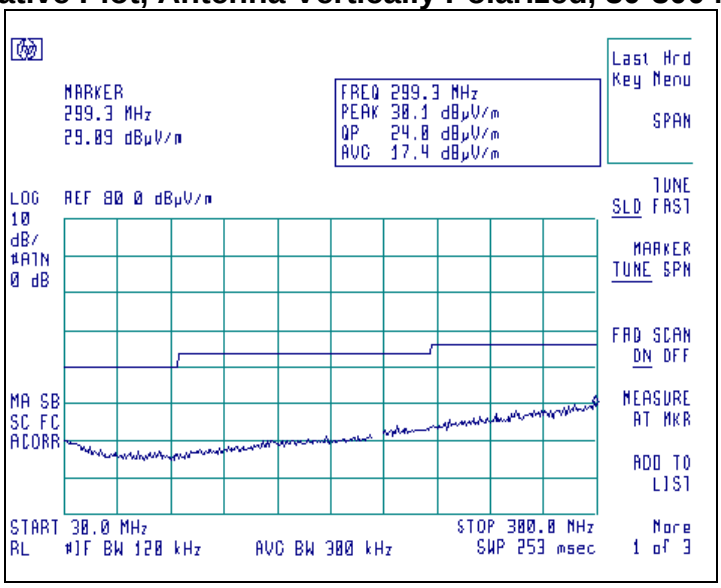
Exemplar Dipole Configuration B

5.8 Screen Captures - Radiated Emissions Testing

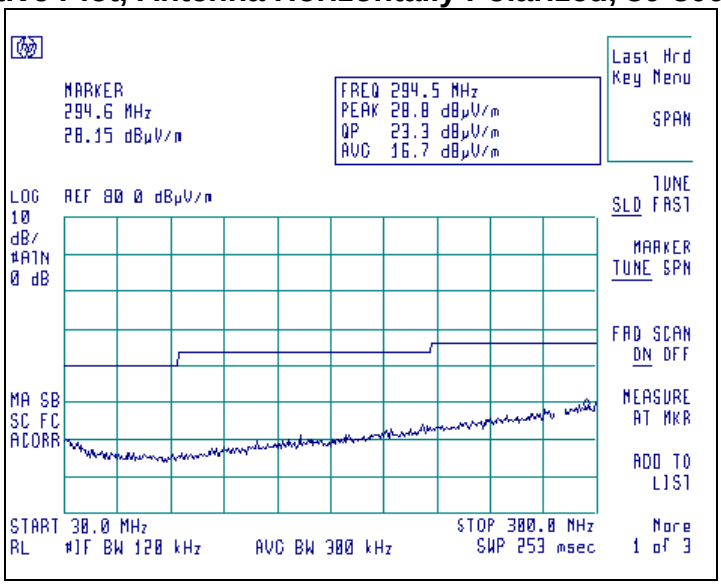
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 11, 18, or 26, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Representative Plot, Antenna Vertically Polarized, 30-300 MHz, at 3m

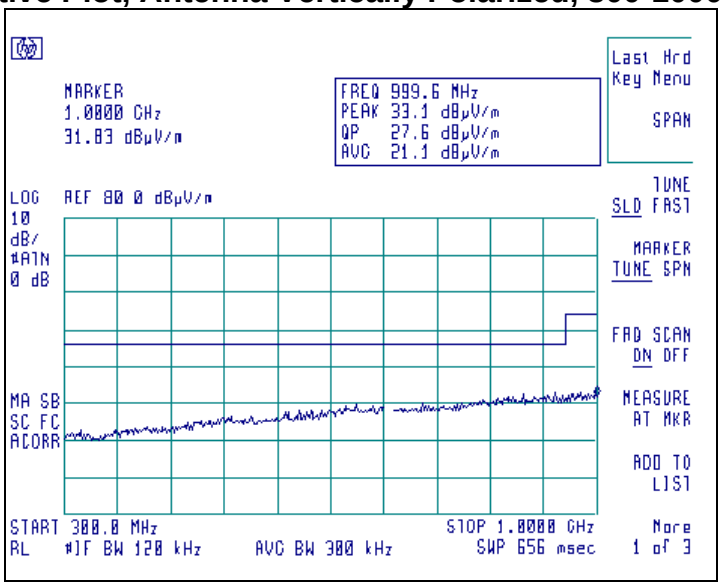


Representative Plot, Antenna Horizontally Polarized, 30-300 MHz, at 3m

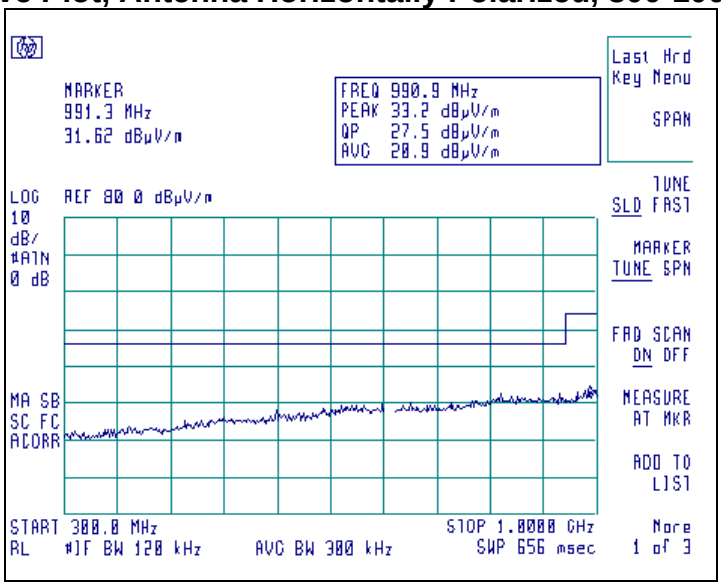


Screen Captures - Radiated Emissions Testing *(continued)*

Representative Plot, Antenna Vertically Polarized, 300-1000 MHz, at 3m

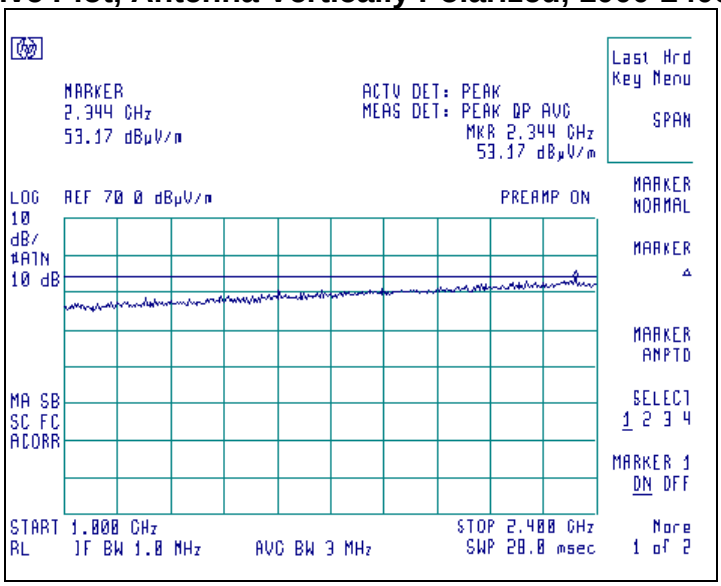


Representative Plot, Antenna Horizontally Polarized, 300-1000 MHz, at 3m

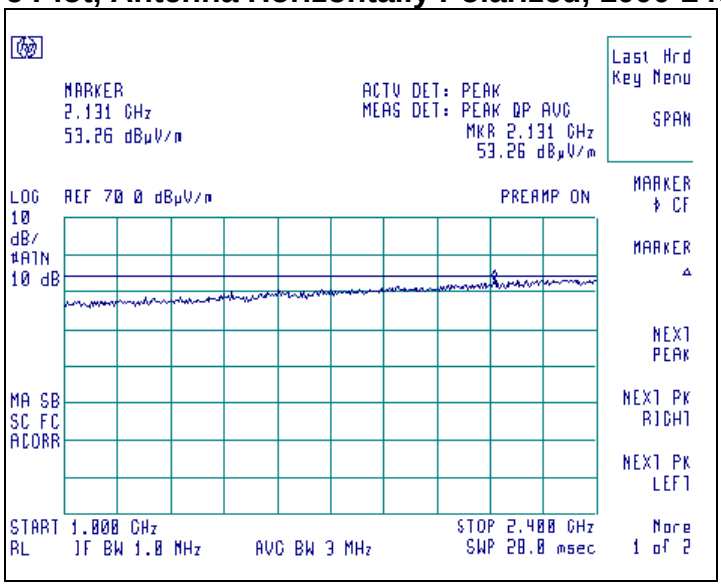


Screen Captures - Radiated Emissions Testing *(continued)*

Representative Plot, Antenna Vertically Polarized, 1000-2400 MHz, at 3m

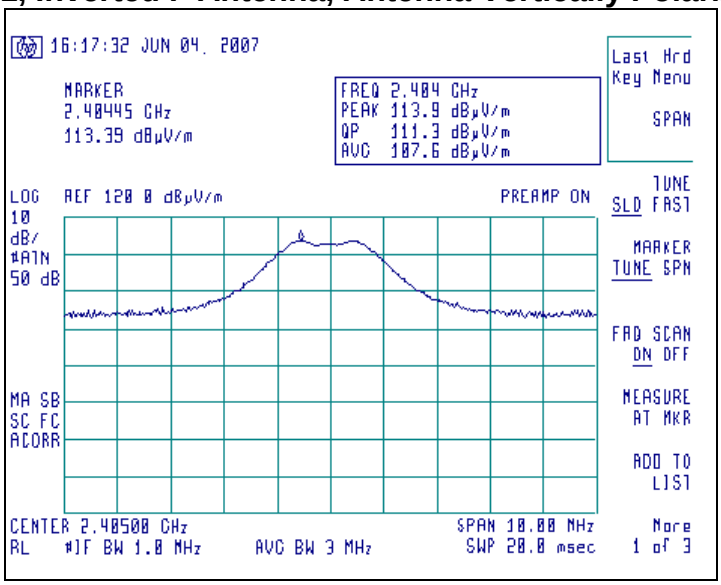


Representative Plot, Antenna Horizontally Polarized, 1000-2400 MHz, at 3m

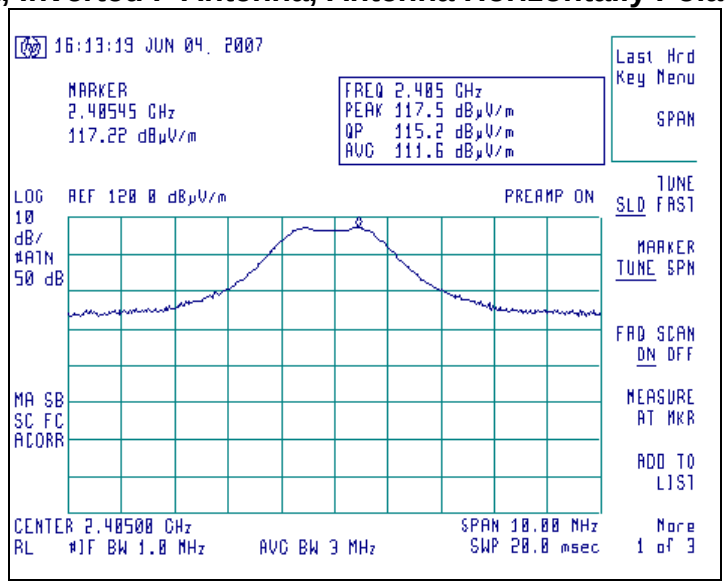


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 11, Inverted F Antenna, Antenna Vertically Polarized, at 3m

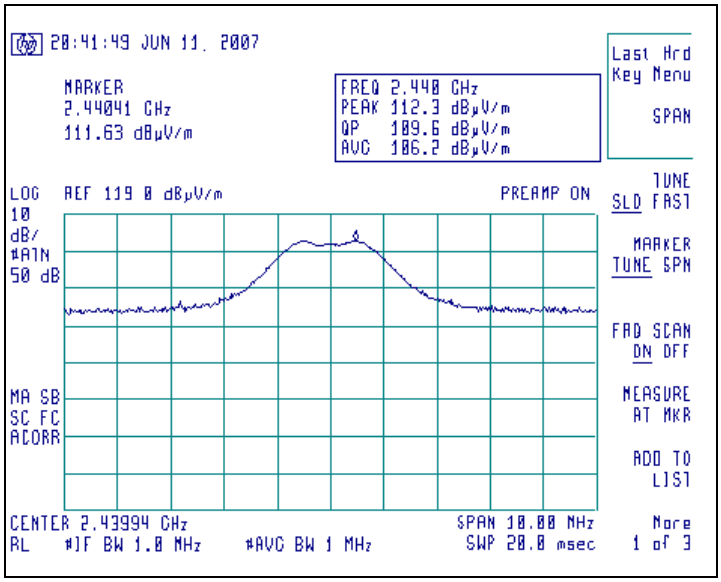


Channel 11, Inverted F Antenna, Antenna Horizontally Polarized, at 3m

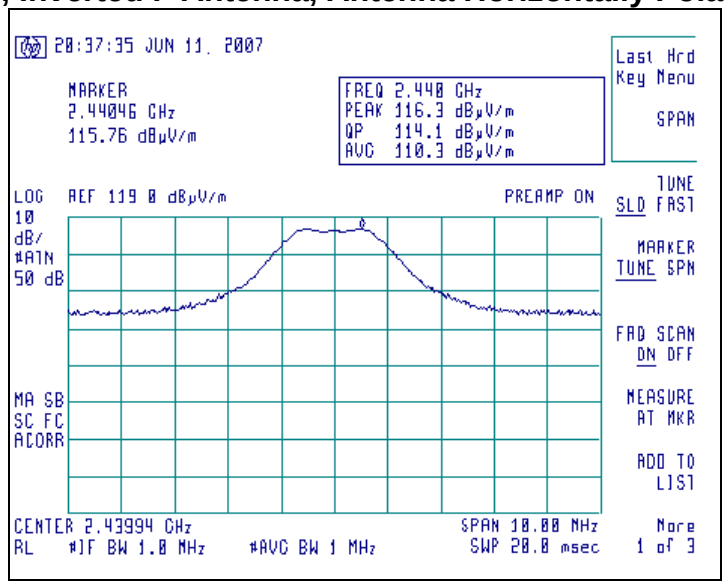


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 18, Inverted F Antenna, Antenna Vertically Polarized, at 3m

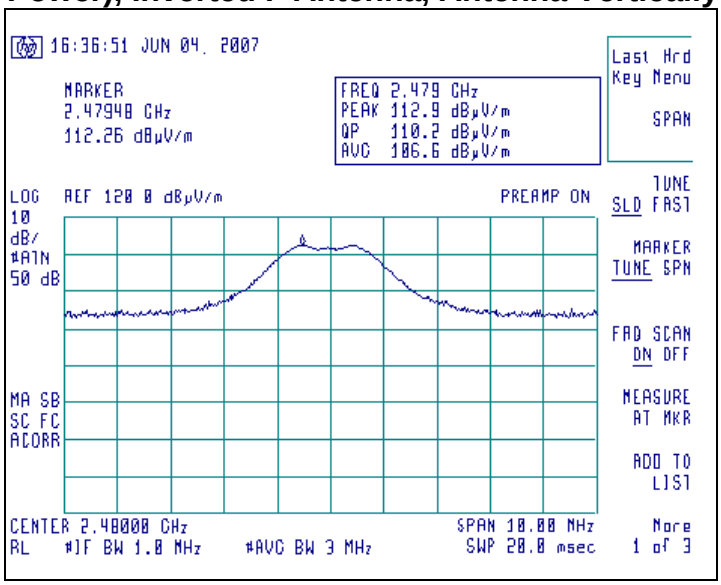


Channel 18, Inverted F Antenna, Antenna Horizontally Polarized, at 3m

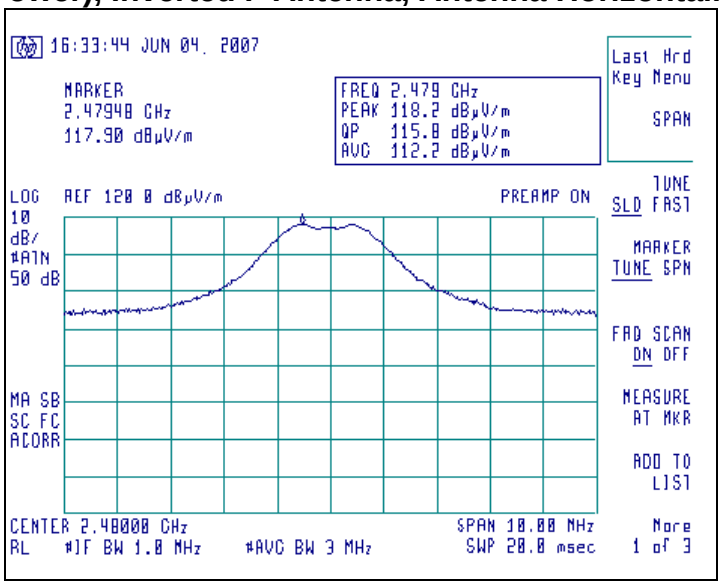


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 26 (Full Power), Inverted F Antenna, Antenna Vertically Polarized, at 3m

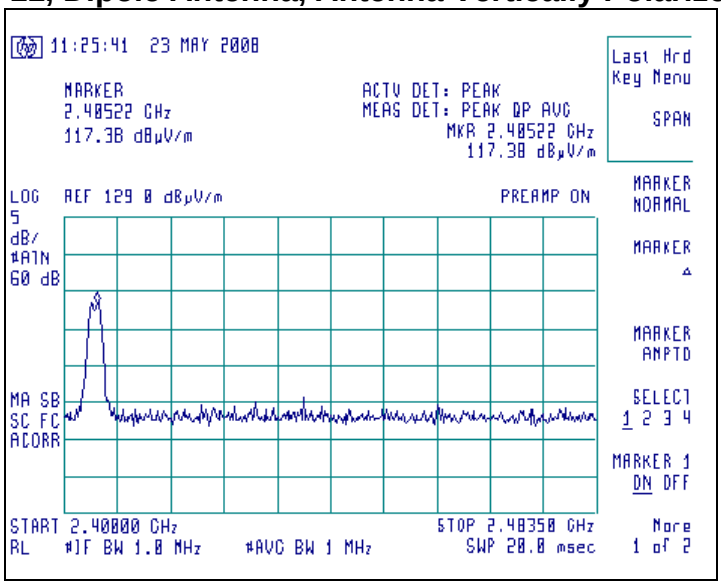


Channel 26 (Full Power), Inverted F Antenna, Antenna Horizontally Polarized, at 3m

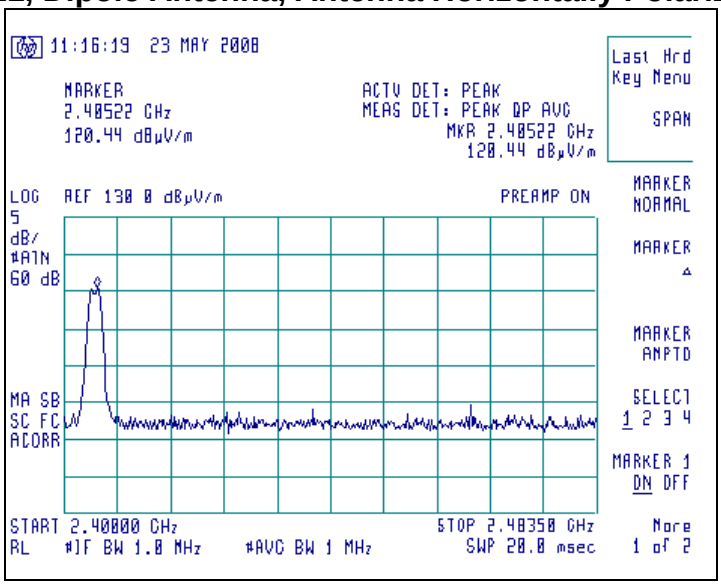


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 11, Dipole Antenna, Antenna Vertically Polarized, at 3m

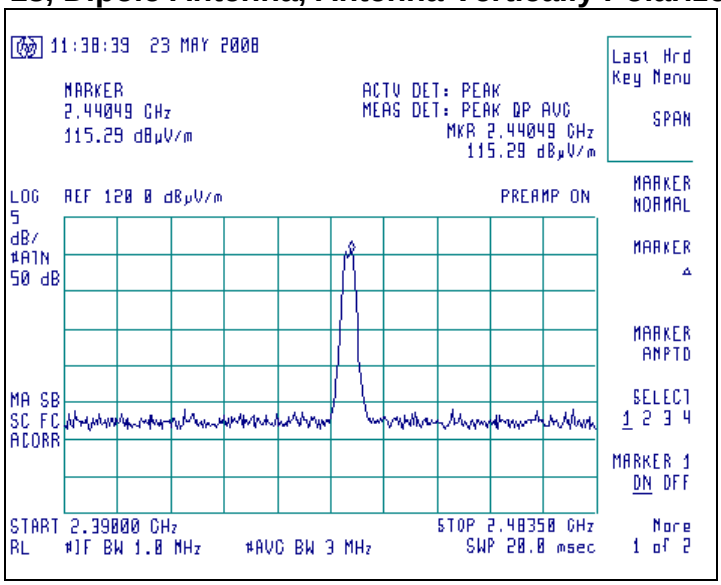


Channel 11, Dipole Antenna, Antenna Horizontally Polarized, at 3m

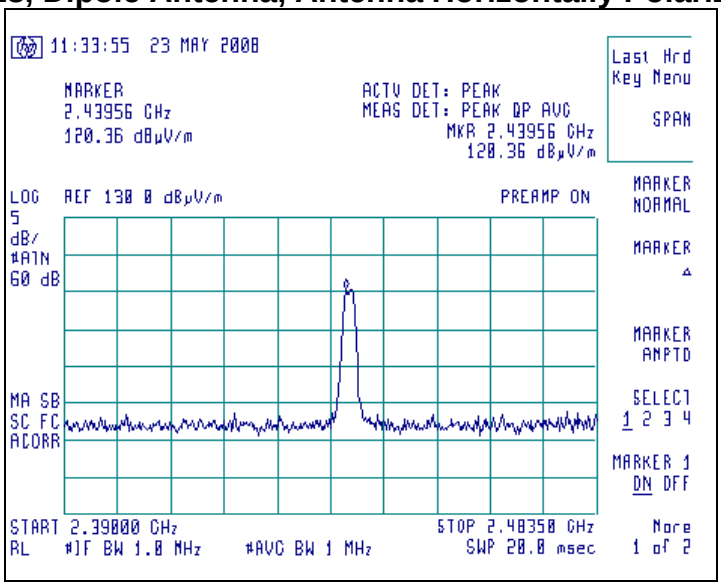


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 18, Dipole Antenna, Antenna Vertically Polarized, at 3m

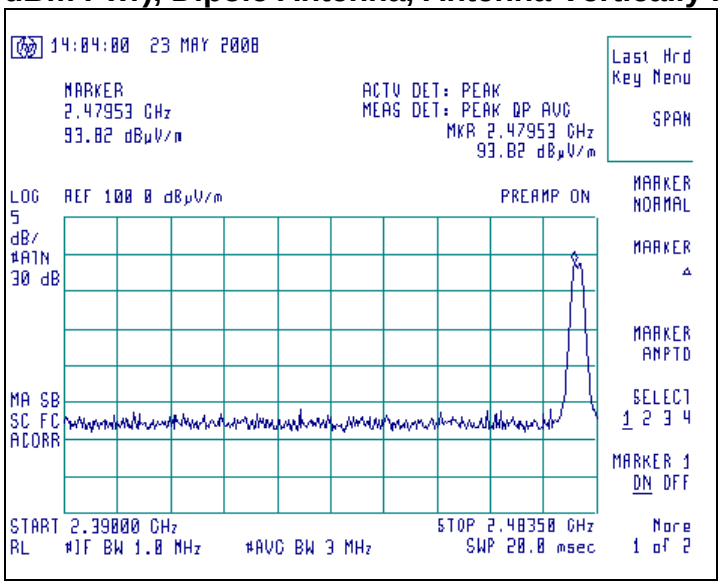


Channel 18, Dipole Antenna, Antenna Horizontally Polarized, at 3m

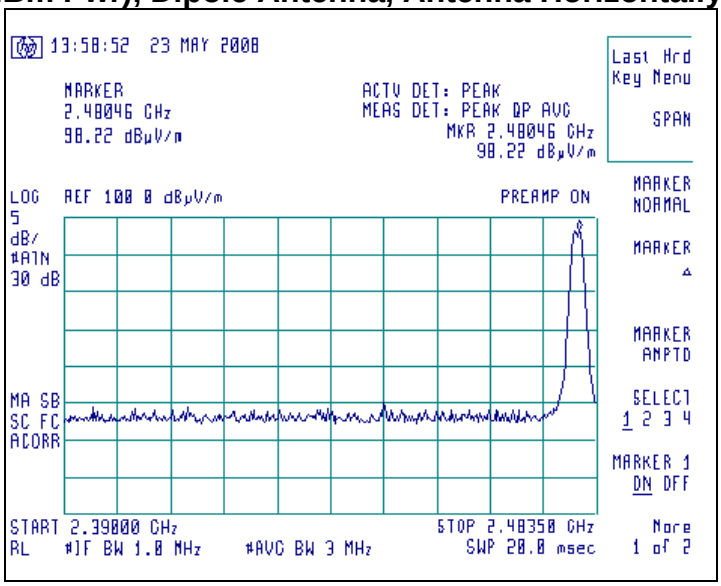


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 26 (-27dBm Pwr), Dipole Antenna, Antenna Vertically Polarized, at 3m

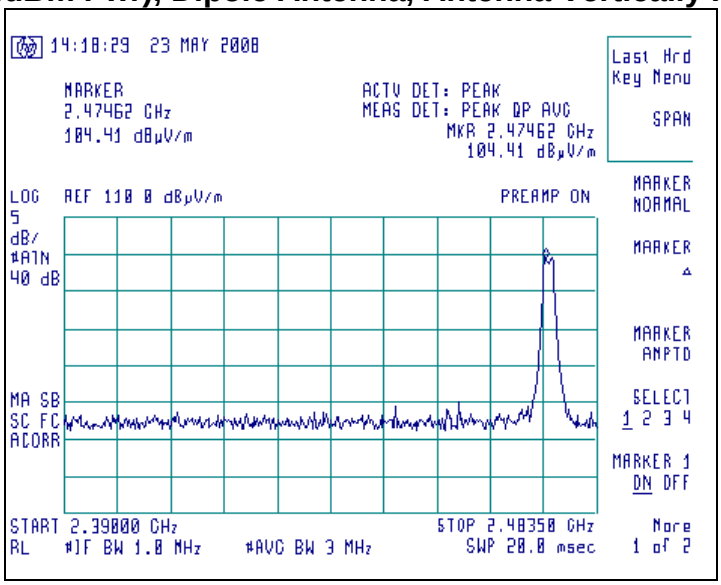


Channel 26 (-27dBm Pwr), Dipole Antenna, Antenna Horizontally Polarized, at 3m

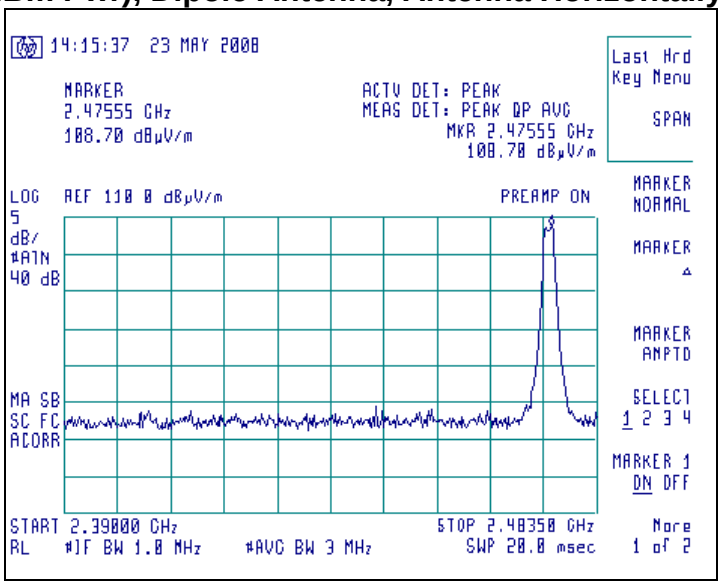


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 25 (-14dBm Pwr), Dipole Antenna, Antenna Vertically Polarized, at 3m

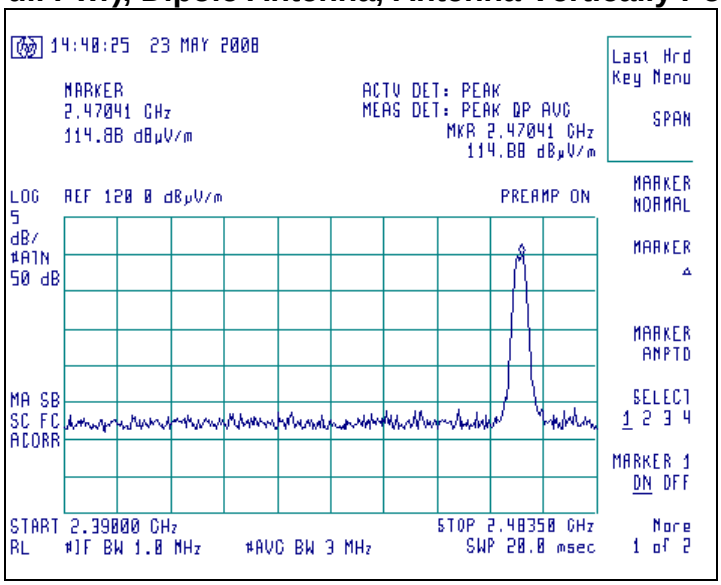


Channel 25 (-14dBm Pwr), Dipole Antenna, Antenna Horizontally Polarized, at 3m

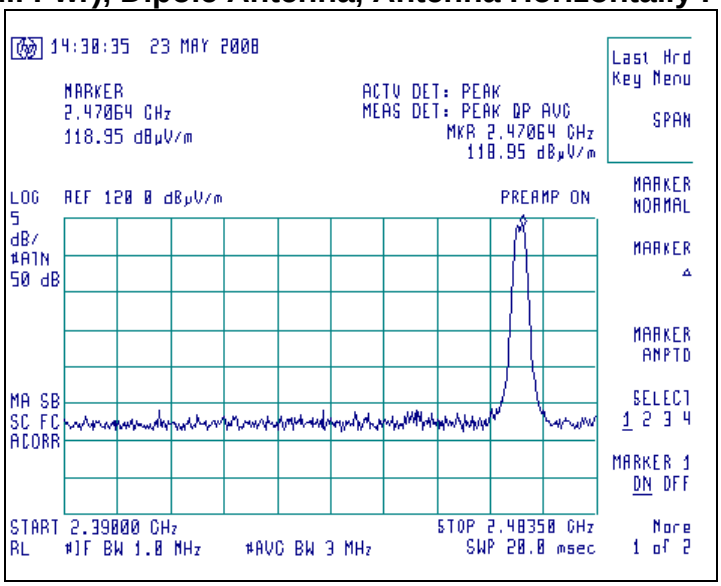


Screen Captures - Radiated Emissions Testing ***(continued)***

Channel 24 (Full Pwr), Dipole Antenna, Antenna Vertically Polarized, at 3m

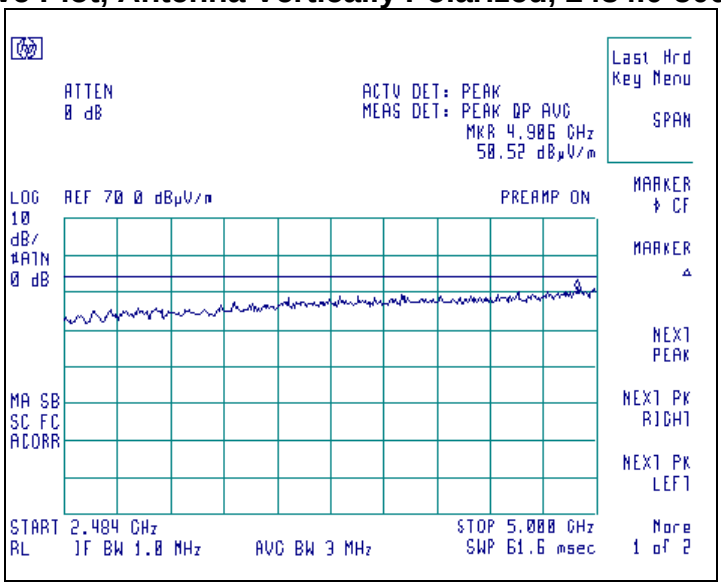


Channel 24 (Full Pwr), Dipole Antenna, Antenna Horizontally Polarized, at 3m

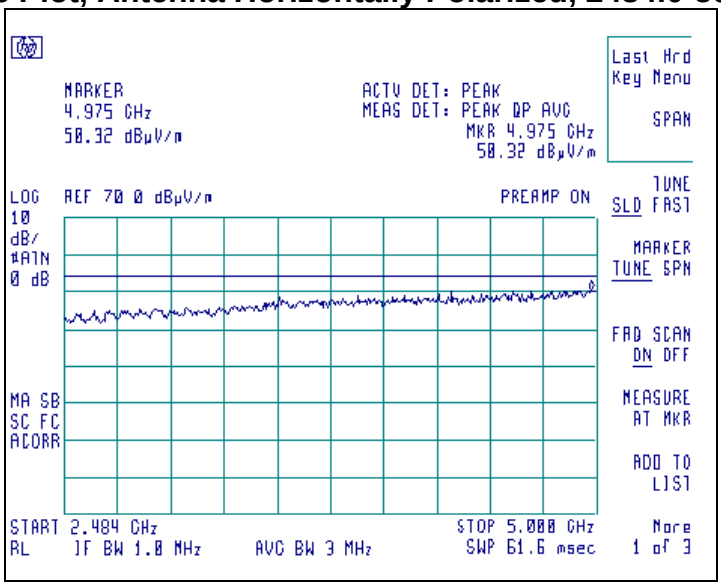


Screen Captures - Radiated Emissions Testing *(continued)*

Representative Plot, Antenna Vertically Polarized, 2484.0-5000 MHz, at 3m

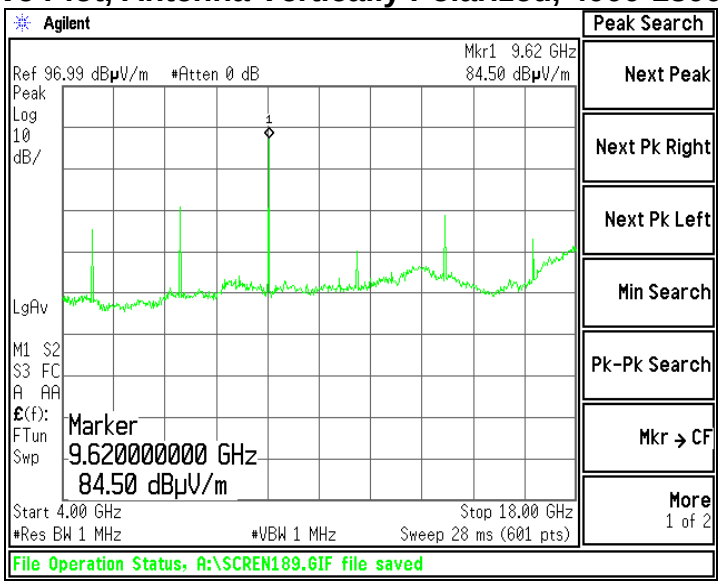


Representative Plot, Antenna Horizontally Polarized, 2484.0-5000 MHz, at 3m

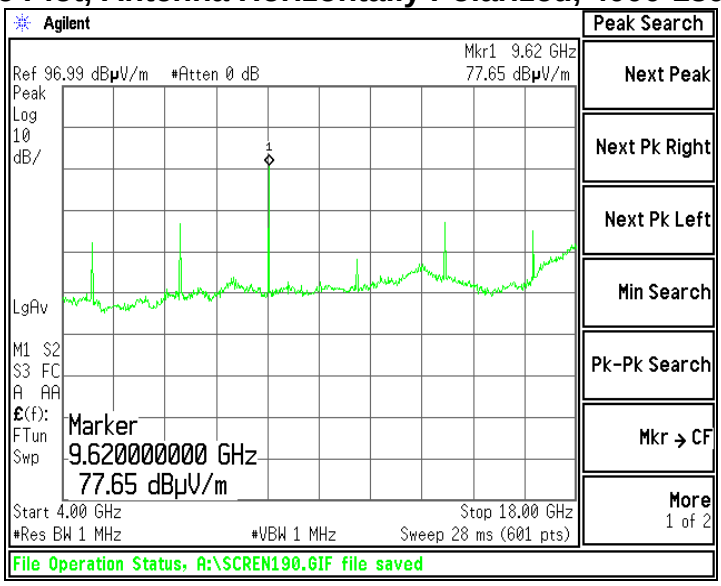


Screen Captures - Radiated Emissions Testing *(continued)*

Representative Plot, Antenna Vertically Polarized, 4000-18000 MHz, at 1m

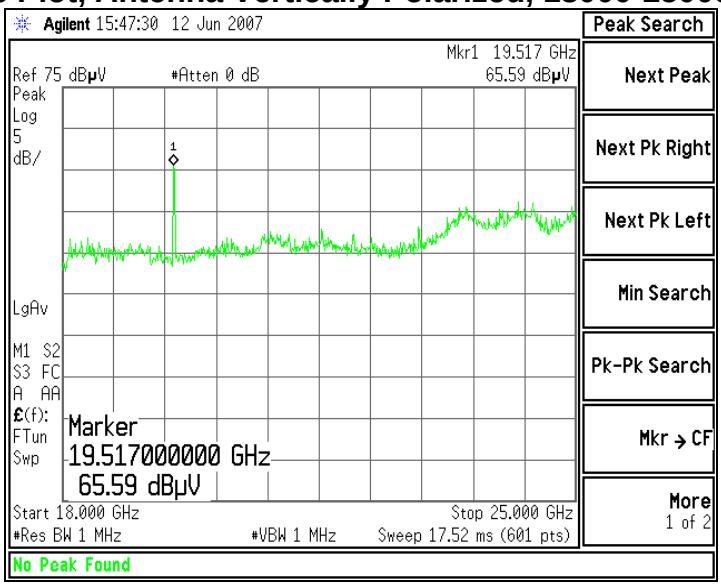


Representative Plot, Antenna Horizontally Polarized, 4000-18000 MHz, at 1m



Screen Captures - Radiated Emissions Testing *(continued)*

Representative Plot, Antenna Vertically Polarized, 18000-25000 MHz, at 30cm



Representative Plot, Antenna Horizontally Polarized, 18000-25000 MHz, at 30cm

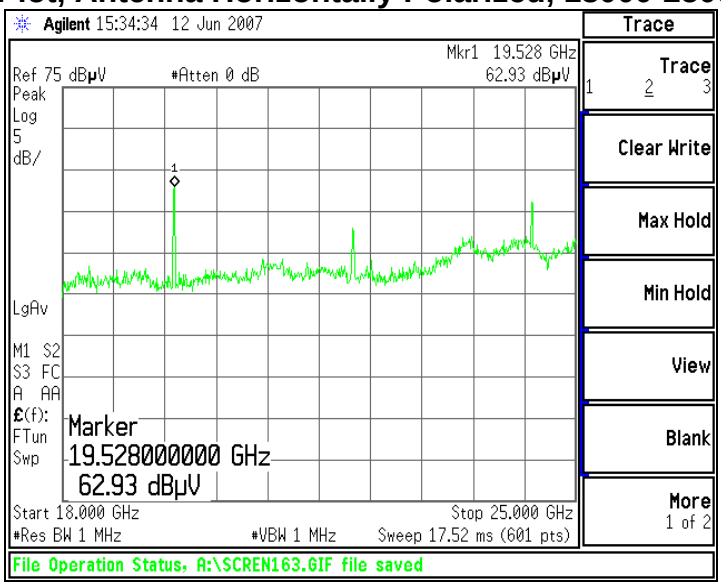


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4-2003 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 7, 2007). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided to the conducted emissions test area via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 Test Procedure

The EUT was investigated in continuous modulated transmit mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2003), Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
Spectrum Analyzer	Agilent	E4446A	US45300564
LISN	EMCO	3816/2NM	9701-1057
Transient Limiter	HP	119474A	3107A01708

6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBµV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

6.6 TEST DATA CHART CONDUCTED EMISSION

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

Manufacturer:	Speakercraft®					
Date(s) of Test:	June 11th, 2007					
Test Engineer:	Ryan Urness					
Model #:	HDW14411					
Serial #:	07100672					
Voltage:	3.0VDC					
Operation Mode:	Continuous transmit					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	X	Conducted Measurement Area				Chamber
EUT Placed On:	X	40cm from Vertical Ground Plane				10cm Spacers
	X	80cm above Ground Plane				Other:
Measurements:		Pre-Compliance		Preliminary	X	Final
Detectors Used:	X	Peak	X	Quasi-Peak	X	Average

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
0.152	L2	49.4	65.9	16.5	21.8	55.9	34.1
0.153	L1	49.4	65.8	16.4	16.7	55.8	39.1
214.0	L1	45.8	63.1	17.3	18.1	53.1	35.0
236.1	L2	44.6	62.2	17.6	16.7	52.2	35.5
4.0	L1	36.3	56.0	19.7	35.1	46.0	10.9
4.0	L2	36.3	56.0	19.7	35.1	46.0	10.9

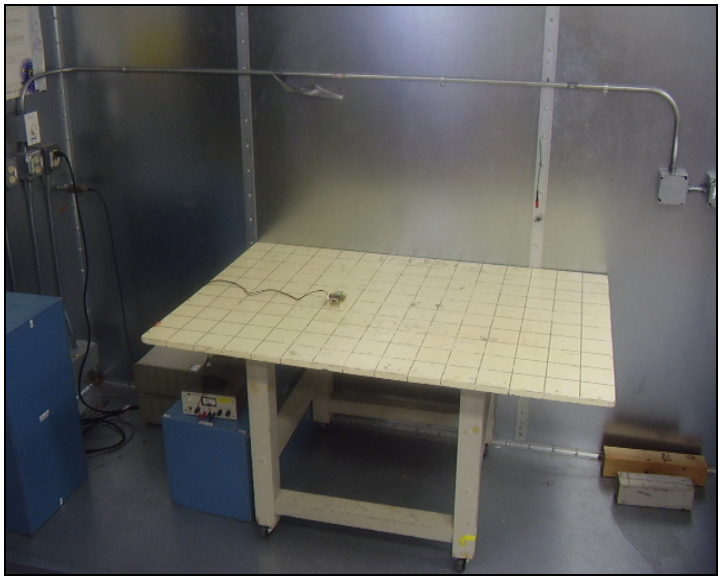
Notes:

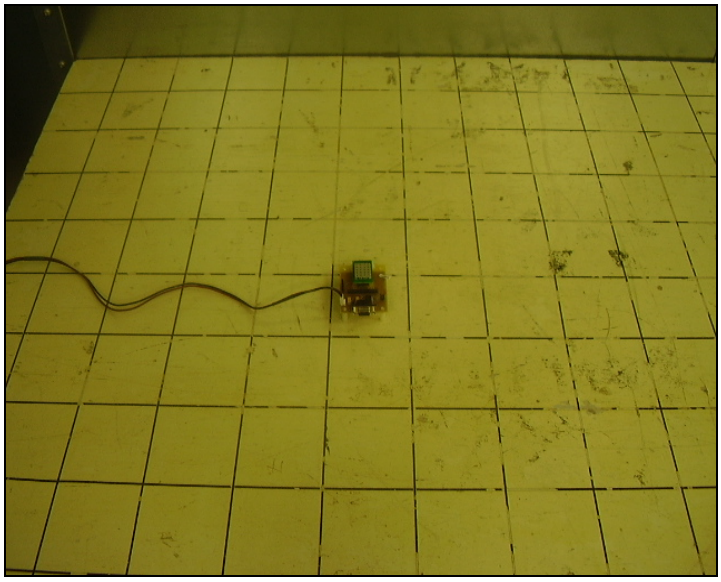
1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.

2) All other emissions were better than 20 dB below the limits.

3) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

6.7 Test Setup Photo(s) – Conducted Emissions Test



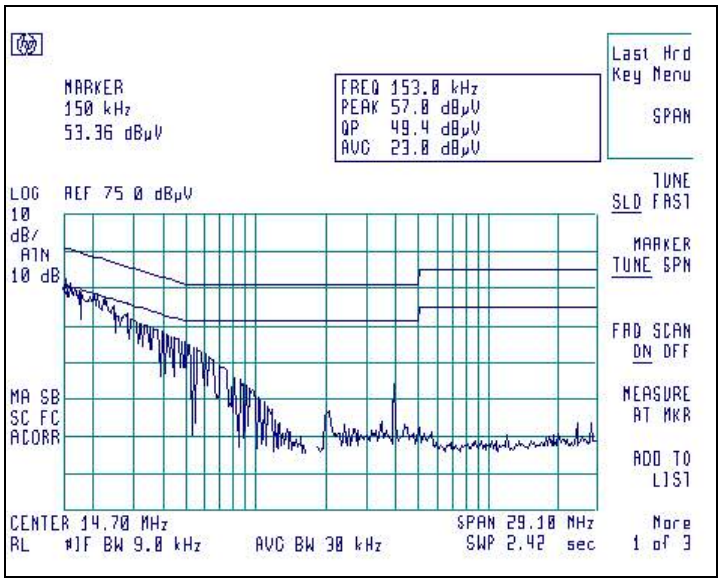


6.8 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207.

The signature scans shown here are from channel 18, chosen as being a good representative of channels.

Line 1



Line 2

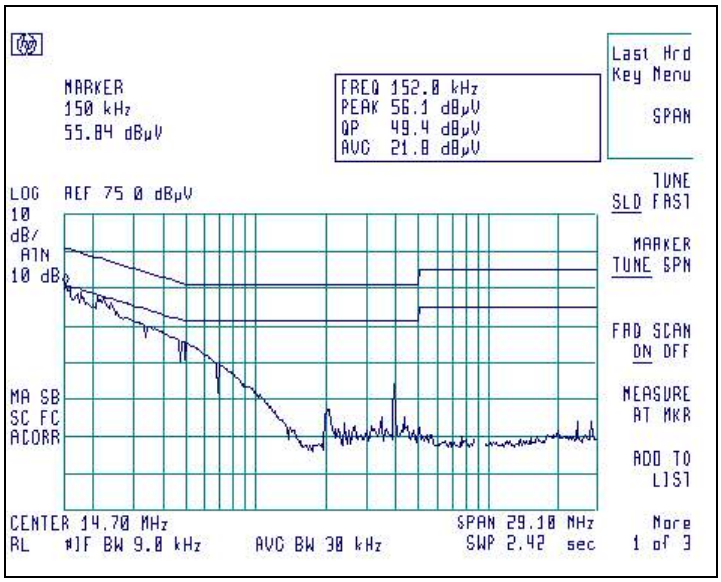


EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(2)

7.1 Limits

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

7.2 Method of Measurements

Refer to ANSI C63.4 (2003) and FCC Procedures (2007) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=100 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) requires a minimum -6dBc occupied bandwidth of 500 kHz. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the HP E4407B spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, there by allowing direct measurements, without the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement when compared to the specified limit is 1558 kHz, which is above the minimum of 500 kHz.

7.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

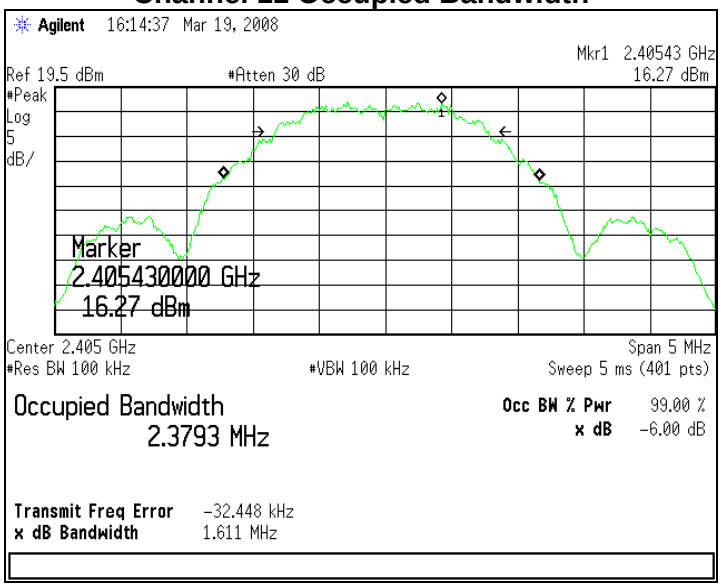
7.4 Test Data

Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc OBW (kHz)
11	2405	1611	500	2379
18	2440	1558	500	2353
25	2475	1611	500	2376
26[1]	2480	1602	500	2368

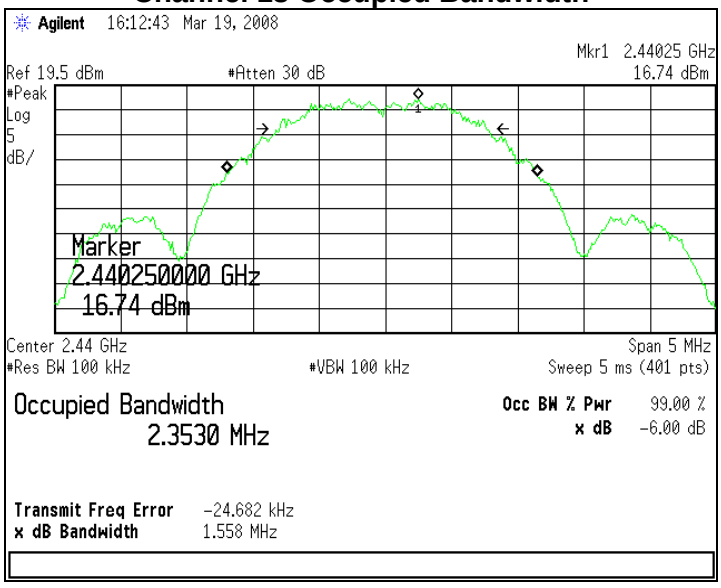
Note: 1) Power has been reduced to -14dB for band edge compliance

7.5 Screen Captures - OCCUPIED BANDWIDTH

Channel 11 Occupied Bandwidth

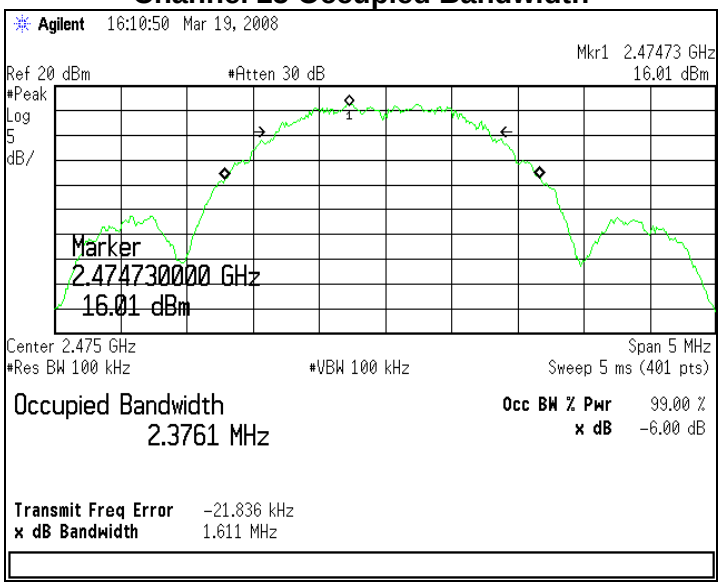


Channel 18 Occupied Bandwidth



Screen Captures - OCCUPIED BANDWIDTH (continued)

Channel 25 Occupied Bandwidth



Channel 26 Occupied Bandwidth

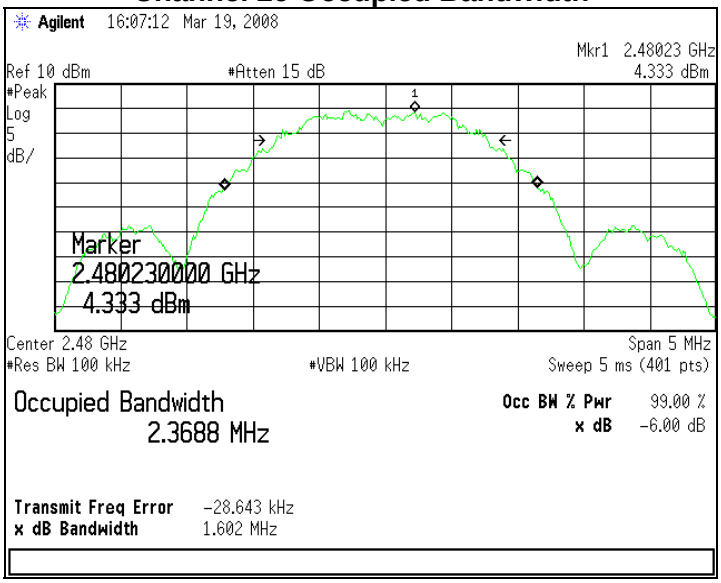


EXHIBIT 8. BAND-EDGE MEASUREMENTS

8.1 Method of Measurements

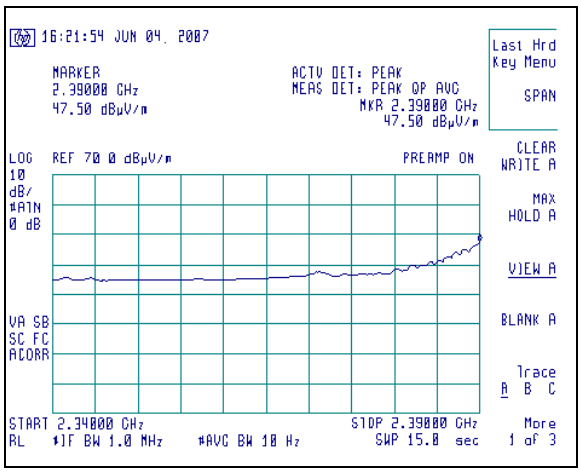
FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

The Lower Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level.

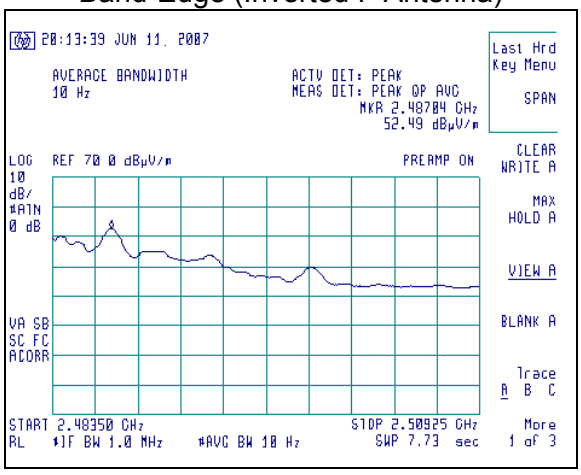
The Upper Band-Edge limit, in this case, would be + 54 dBµV/m at 3m.

****Note: All measurements were additionally verified using a peak detector with no video averaging to verify measurements were <20dB higher than the video averaged signal.***

Screen Capture Demonstrating Compliance at the Lower (Channel 11 @ Full Power) Band-Edge (Inverted F Antenna)

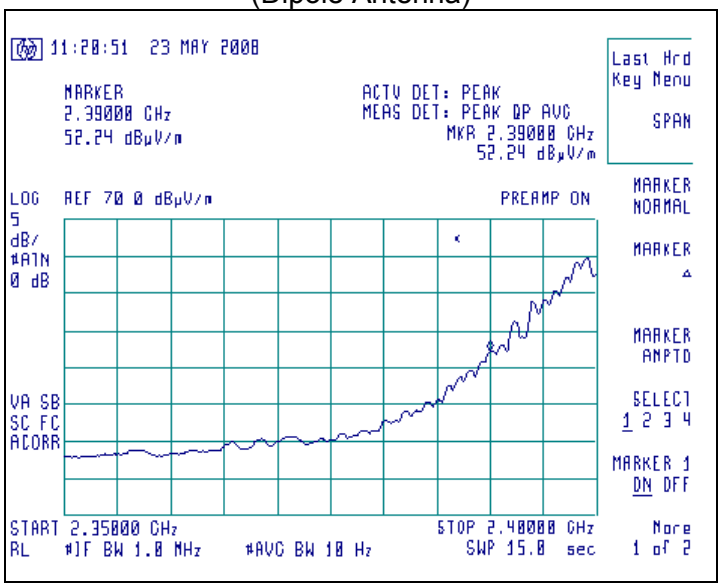


Screen Capture Demonstrating Compliance at the Higher (Channel 26 @ -27dBm Power Setting) Band-Edge (Inverted F Antenna)

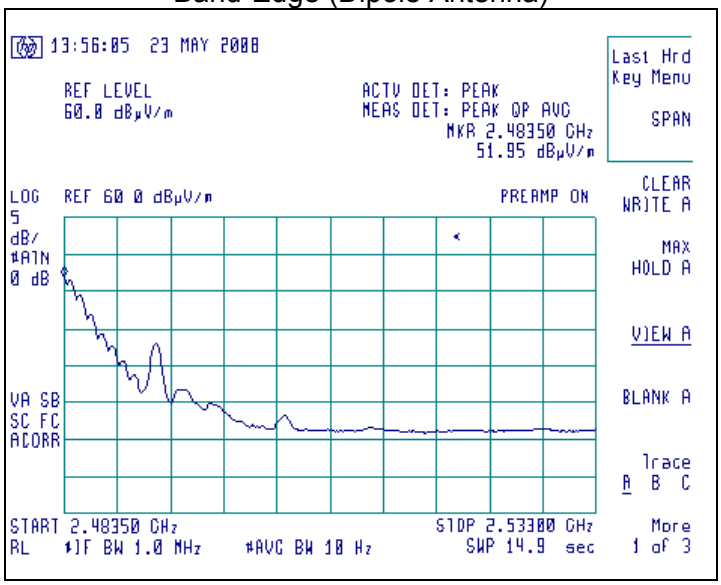


Screen Captures – Band Edge (continued)

Screen Capture Demonstrating Compliance at the Lower (Channel 11 @ Full Power) Band-Edge (Dipole Antenna)

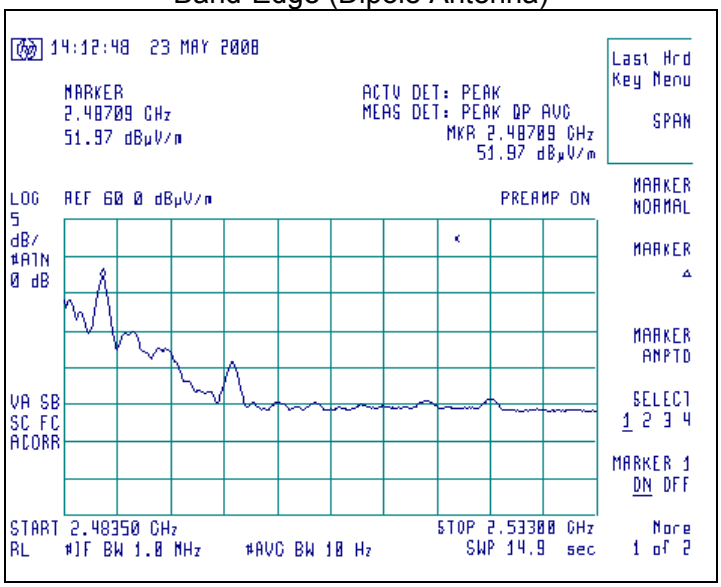


Screen Capture Demonstrating Compliance at the Higher (Channel 26 @ -27dBm Power Setting) Band-Edge (Dipole Antenna)



Screen Captures – Band Edge (continued)

Screen Capture Demonstrating Compliance at the Higher (Channel 25 @ -14dBm Power Setting) Band-Edge (Dipole Antenna)



Screen Capture Demonstrating Compliance at the Higher (Channel 24 @ +3dBm Power Setting) Band-Edge (Dipole Antenna)

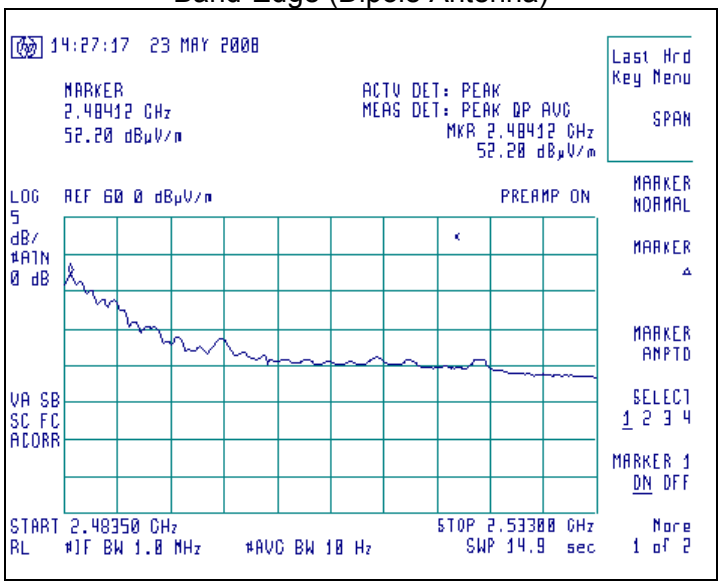


EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable. The loss from the cable was added on the analyzer as gain offset settings, there by allowing direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 3 MHz, with measurements from a peak detector presented in the chart below.

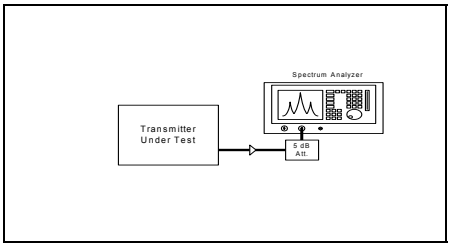
Test Data

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
11	2405	+30 dBm	19.9	10.1
18	2440	+30 dBm	20.1	9.9
25	2475	+30 dBm	20.2	9.8
26	2480	+30 dBm	8.3	21.7

9.2 Test Data

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) [1]	Conducted Power Limit (dBm)	EIRP Limit (dBm)
Lowest	2405	19.9	23.4	30.0	36.0
Middle	2445	20.1	23.6	30.0	36.0
Highest (full)	2475	20.2	23.7	30.0	36.0
Highest (red.)	2480	8.3	11.8	30.0	36.0

(1) EIRP Calculation:
EIRP = (Peak power at antenna terminal in dBm) + (EUT Antenna gain in dBi)



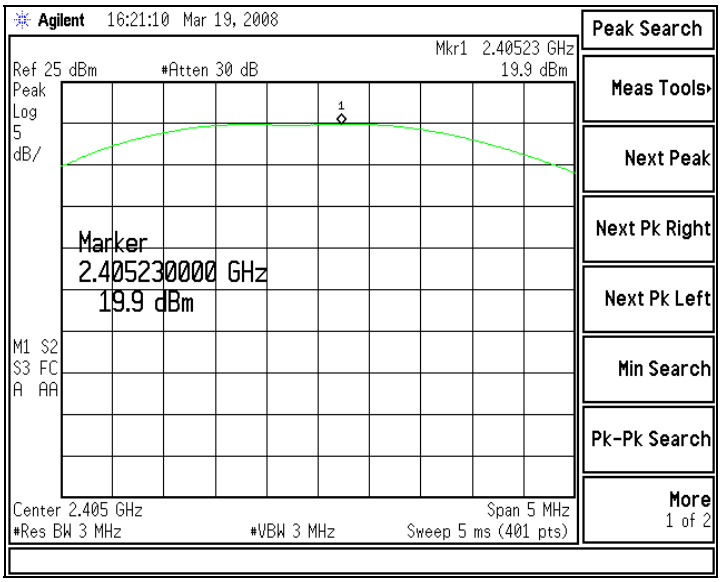
Measured RF Power Output (in Watts): 0.104
Declared RF Power Output (in Watts): 0.100

9.3 Test Equipment List

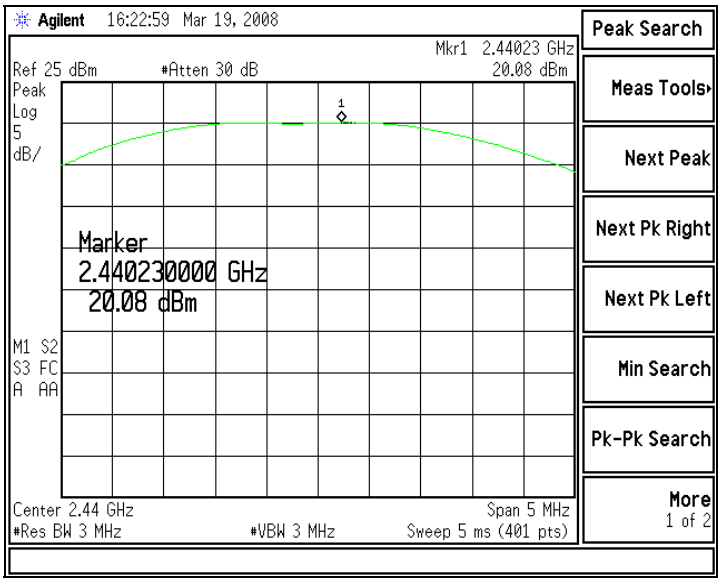
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

9.4 Screen Captures – Power Output (Conducted)

Channel 11

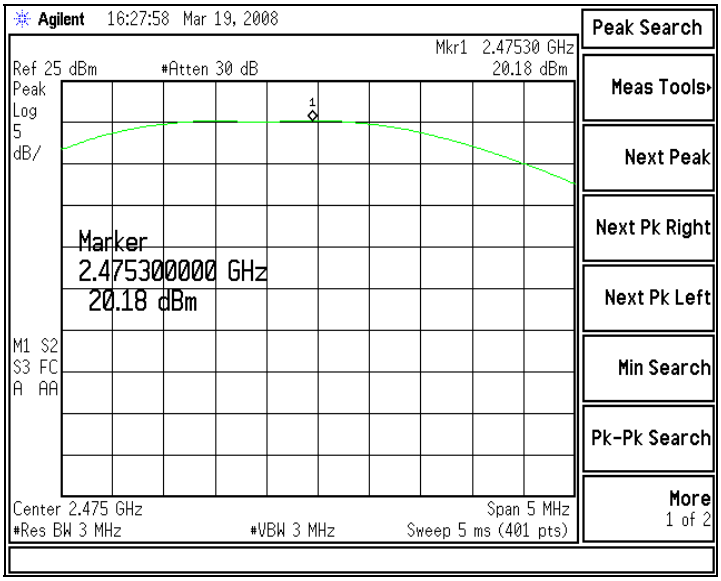


Channel 18



Screen Captures – Power Output (Conducted) (continued)

Channel 25



Channel 26

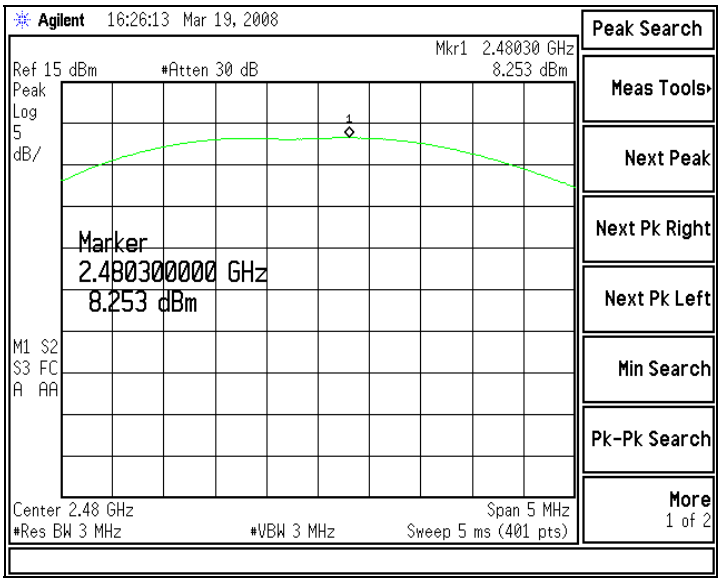


EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

10.1 Limits

For digitally modulate systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

In accordance with FCC Part 15.247(e), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep rate. The highest density was found to be no greater than 6.27 dBm, which is under the allowable limit by 1.73 dB.

10.2 Test Equipment List

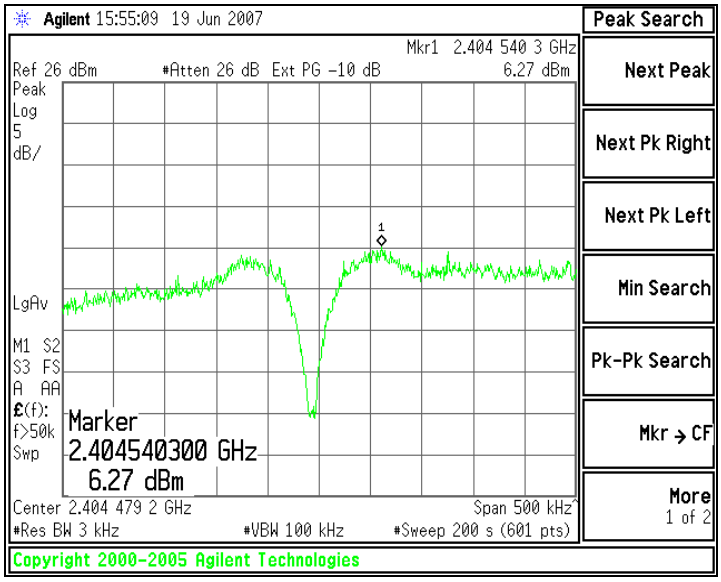
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

10.3 Test Data

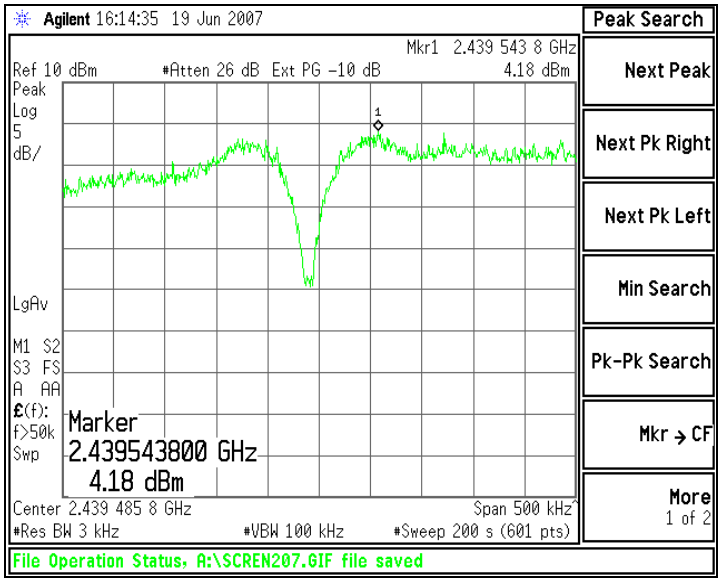
Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
Lowest	2405	6.27	8.0	1.73	Pass
Middle	2445	4.18	8.0	3.82	Pass
Highest (full)	2475	5.83	8.0	2.17	Pass
Highest (red.)	2480	-6.28	8.0	14.28	Pass

10.4 Screen Captures – Power Spectral Density

Channel 11

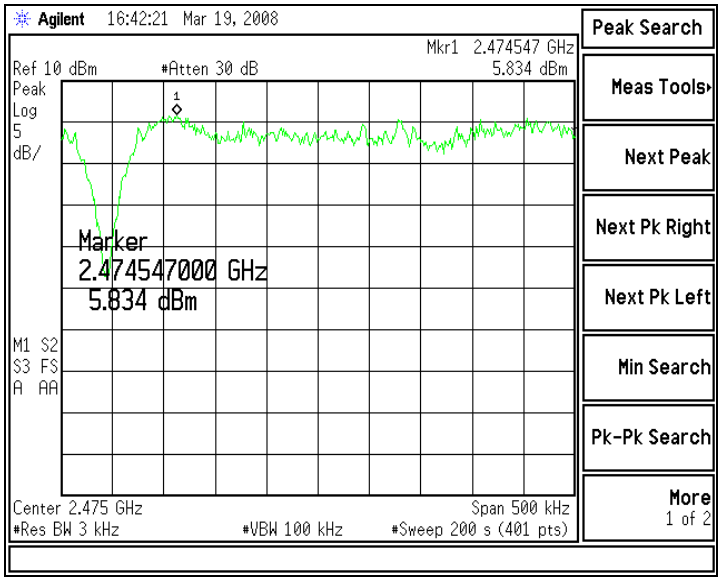


Channel 18



Screen Captures – Power Spectral Density (continued)

Channel 25



Channel 26

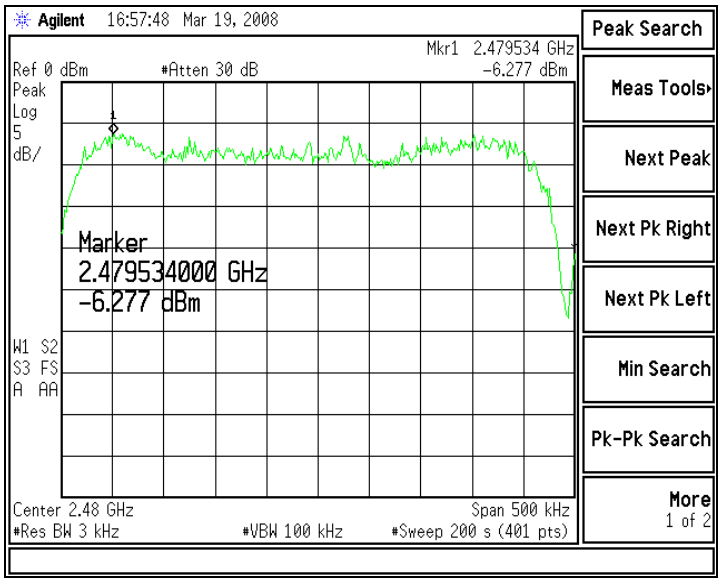


EXHIBIT 11. SPURIOUS EMISSIONS: 15.247(d)

11.1 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 lease 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.

FCC Part 15.247(d) requires a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, there by allowing direct readings of the measurements made without the need for any further corrections. A Hewlett Packard model E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -45 dBc of the fundamental level for this product.

11.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

11.3 Test Data

Fundamental Frequency: 2400 - 2480
Modulation: O-QPSK
Frequency Test Range: 30 MHz – 25000 MHz

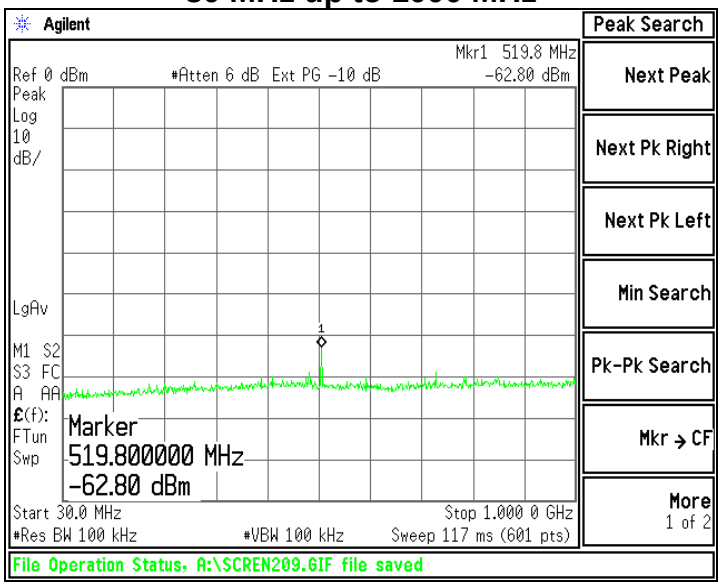
Frequency (MHz)	Peak (dBm)	Limit (-20 dBc)	Margin (dB)	Pass/ Fail
443.9	-52.7	-4.8	47.9	Pass
479.4	-60.4	-6.4	54.0	Pass
519.8	-62.8	-4.9	57.9	Pass
520.0	-63.3	-16.3	47.0	Pass
24400	-54.1	-6.4	47.7	Pass
24820	-54.2	-4.9	49.3	Pass

	Channel 11	Channel 18	Channel 25	Channel 26
Fundamental	15.23 (dBm)	13.56 (dBm)	15.07 (dBm)	3.67 (dBm)
2nd Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
3rd Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
4th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
5th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
6th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
7th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
8th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
9th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)
10th Harmonic	Note (1)	Note (1)	Note (1)	Note (1)

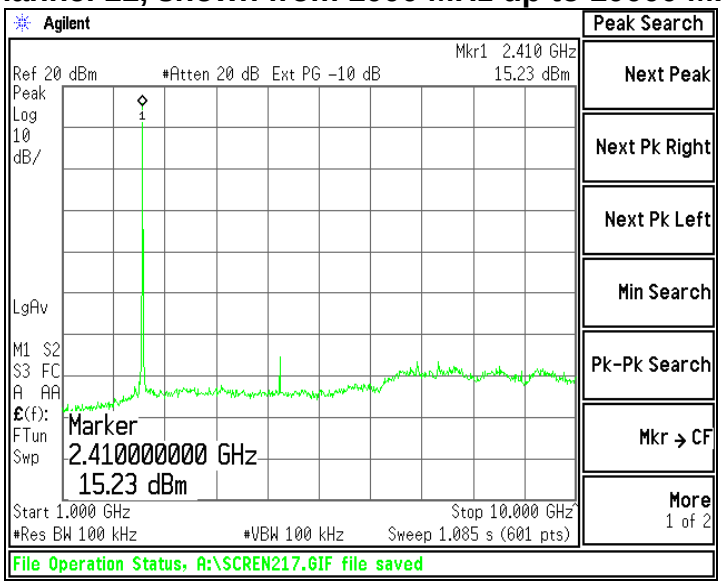
Notes:
(1) Measurement at system noise floor.

11.4 Screen Captures – Spurious Radiated Emissions

30 MHz up to 1000 MHz

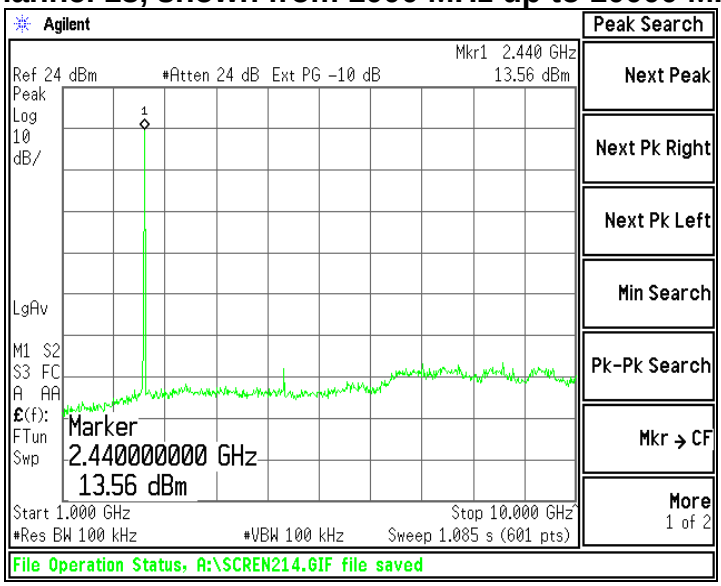


Channel 11, shown from 1000 MHz up to 10000 MHz

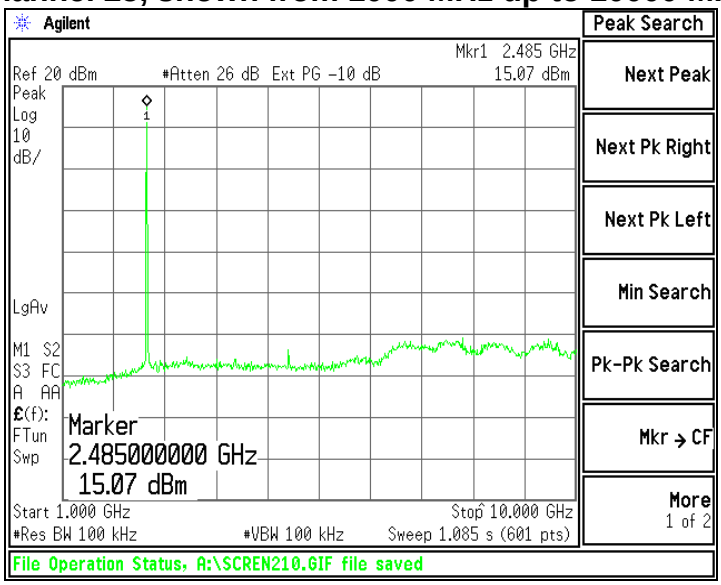


Screen Captures – Spurious Radiated Emissions (continued)

Channel 18, shown from 1000 MHz up to 10000 MHz

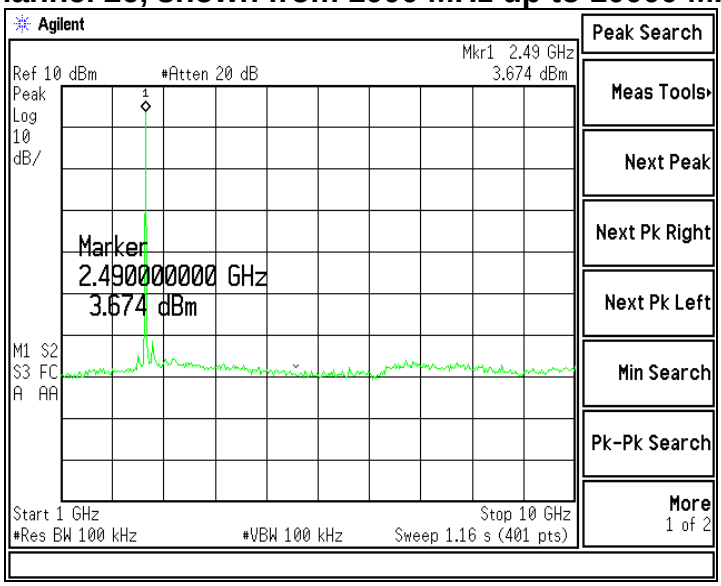


Channel 25, shown from 1000 MHz up to 10000 MHz



Screen Captures – Spurious Radiated Emissions (continued)

Channel 26, shown from 1000 MHz up to 10000 MHz



10000 MHz up to 25000 MHz

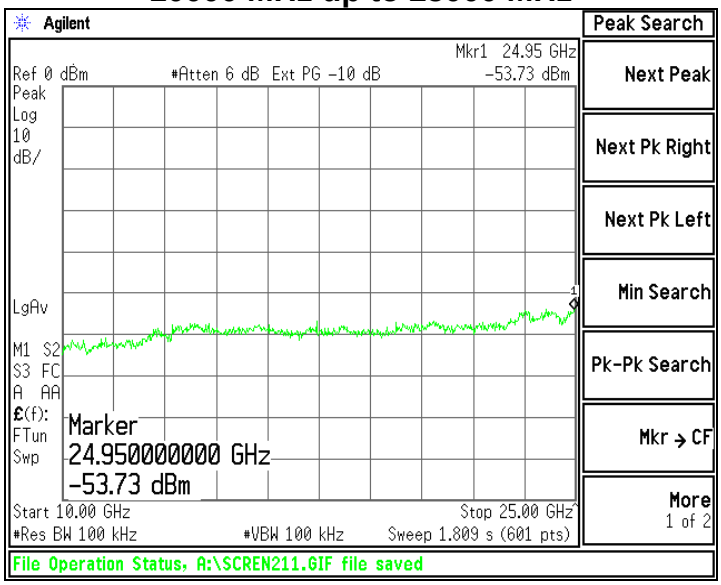


EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

The stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers. The transmitter portion of the EUT placed in continuous transmit mode. Power was supplied by an external bench-type variable power supply, and the frequency of operation was monitored using the spectrum analyzer.

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied.

	DC Voltage Source		
	2.55 VDC	3.00 VDC	3.45 VDC
Channel 11	2405.23(MHz)	2405.23(MHz)	2405.23(MHz)
Channel 18	2440.23(MHz)	2440.23(MHz)	2440.23(MHz)
Channel 25	2475.30(MHz)	2475.30(MHz)	2475.29(MHz)

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=3 MHz setting while the voltage was varied.

	DC Voltage Source		
	2.55 VDC	3.00 VDC	3.45 VDC
Channel 11	20.0(dBm)	19.9(dBm)	20.1(dBm)
Channel 18	20.0(dBm)	20.1(dBm)	20.1(dBm)
Channel 25	20.1(dBm)	20.2(dBm)	20.2(dBm)

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

No anomalies were noted; in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

EXHIBIT 14. MPE CALCULATIONS

The following MPE calculations are based on a 1.8 centimeter inverted-F printed circuit board trace antenna, with a measured ERP of 112.2 dBµV/m, at 3 meters, and conducted RF power of +20.2 dBm as presented to the antenna. The typical gain of this antenna is 3.5 dB.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	20.20	(dBm)
Maximum peak output power at antenna input terminal:	104.713	(mW)
Antenna gain(typical):	3.5	(dBi)
Maximum antenna gain:	2.239	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2405	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.046637	(mW/cm^2)
Maximum allowable antenna gain:	16.8	(dBi)
Margin of Compliance at 20 cm =	13.3	dB

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	12/6/07	12/6/08
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/19/07	9/19/08
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/19/07	9/19/08
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/04/07	12/04/08
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	1/11/07	1/11/08
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/20/07	9/20/08
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/20/07	9/20/08
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	8/17/07	8/17/08
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V