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ENGINEERING TEST REPORT # 306171

Compliance Testing of:
UbiDuo
Model 200A

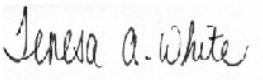
Test Date(s):
January 25th, February 21st, 22nd, 23rd and 26th 2007

Prepared For: sComm, Inc.
c/o Pivot International,
14125 West 95th Street,
Lenexa, KS 66215

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: March 1, 2007

Test Report Prepared by:	**Tested by:**
Teresa A. White, Document Coordinator	Khairul Aidi Zainal, EMC Engineer
Signature: 	Signature: 
Date: March 1, 2007	Date: March 1, 2007

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LSC Revision Control

Date	Revision #	Revised By
9-06-06	2.0	AS/TAW

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)	2005	Code of Federal Regulations - Telecommunications
ANSI C63.4	2004	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	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 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	2005, 03-23	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:	**Pivot International**
Address:	**14125, West 95th Street, Lenexa, KS 66215**
Contact Person:	**Lesley Longstaff**

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	UbiDuo
Model Number:	200A
Serial Number:	823064400056 for Radiated emissions measurements. 823064400015 for Conducted RF measurements.

2.3 ASSOCIATED ANTENNA DESCRIPTION

The only antenna available for this device is an inverted-F PCB trace antenna.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	2405 MHz to 2480 MHz
RF Power in Watts	0.096 Watts
Field Strength (and at what distance)	124.6 dBµV/m at 1m (2405MHz)
Occupied Bandwidth (99% BW)	2.83 MHz
Type of Modulation	O-QPSK
Emission Designator	G1D2M83
Transmitter Spurious (worst case)	72.4 dBµV/m at 1m (4810MHz) Note: 20 dB relaxation factor invoked.
Frequency Tolerance %, Hz, ppm	Better than 100 PPM
Microprocessor Model # (if applicable)	M9SBGT60
EUT will be operated under	47 CFR 15.247 RSS 210
Modular Filing	☐ Yes ☒ No

RF Technical Information:

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

SAR Evaluation test result data is located in test report UbiDuo SAR Report-REVISED.pdf

SAR Evaluation testing was performed by PC Test Engineering Laboratory, Inc. located at:

PC Test Engineering Laboratory, Inc.
6660-B Dobbin Road
Columbia Maryland 21045

Phone: 410-290-6652 or on the web at: http://www.pctestlab.com

2.5 PRODUCT DESCRIPTION

The UbiDuo, Model 200A (EUT), is a face-to-face communication system for people who are hearing impaired. The sComm Ubi is a multi-user chat system with two distinct use model sets. The first use model set facilitates face-to-face communications between deaf and hearing. The second use model facilitates communications between users in remote locations across public networks. Face-to-face communication with hearing individuals is via keyboard and display. Face-to-face communication with hearing individuals who may have never seen a sComm unit is facilitated by a feature set referred to as "Chat System Partner". This feature gives the owner of the system remote control over the unit used by the hearing individual, allowing the hearing individual to focus on the conversation and not be distracted by operational issues. Communications between the deaf user and individuals (hearing or deaf) in remote locations is via a modem or wireless phone.

The transceiver used in the EUT is a FreeStar module which is a direct sequence spread spectrum transceiver operating in the 2400 – 2483.5 MHz ISM band. The FreeStar module is based on the MC13192/3 RF transceiver from Freescale, operating within the IEEE 802.15.4 standard, with channels spaced at 5 MHz intervals in the ISM band. The module implements a propietary communications protocol with the MC13192 and the Zigbee-compliant stack with the MC13193. The system operates at a chip rate of 2 Mcps, a symbol rate of 62.5 ksps, and a bit rate of 250kbps. O-QPSK modulation is used with 16-ary orthogonal symbols. It transmits with a maximum power of 100 milliwatts (+20 dBm) into a printed circuit board inverted-F antenna.

The receiver is a low-IF receiver. The received RF signal is amplified by a low noise amplifier and down-converted to a 1st IF of 65MHz and then down-converted in quadrature (I and Q) to the intermediate frequency (IF) of 1 MHz. The digital back end performs Differential Chip Detection, the correlator de-spreads the Direct Sequence Spread Spectrum O-QPSK signal, determines the symbols and packets, and detects the data.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	72º
Humidity:	34%
Pressure:	740 mmHg

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 power level for channel 15 was set to level 3 on the EUT.

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☐ **None** ☒ **Yes (explain below)**

The manufacturer had declared that while the ports on the EUT were populated, it would be stationary and its normal use would be on a flat and horizontal surface (please refer to appendix D for manufacturer declarations). Due to this declaration, the EUT was investigated in the Horizontal orientation for frequencies below 1 GHz. For frequencies above 1 GHz, all three orthogonal axes were investigated.

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 (2005), 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 for final testing. The EUT power was provided by a120 VAC adapter and an on board 9.6 VDC NiMH rechargeable battery pack. The unit has the capability to operate on 15 channels, controllable via 'test mode' software incorporated onto the EUT.
The EUT operates on two sources (AC and Battery) therefore it will be treated as two (2) separate EUTs for compliance investigation. Two sets of data will be presented corresponding to the two different modes of the EUT.

The applicable limits apply at a 3 meter distance. Measurements above 1 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 4 (4) standard channels: 0 (2405MHz), 7 (2440MHz), 14 (2475MHz), and 15 (2480MHz) to comply with FCC Part 15.35. The channels and operating modes were changed using 'test mode' software incorporated onto the EUT.

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. However, the manufacturer had declared that while the ports on the EUT were populated, it would be stationary and its normal use would be on a flat and horizontal surface (please refer to appendix D for manufacturer declarations). Due to this declaration, the EUT was tested in the Horizontal orientation for frequencies below 1 GHz. For frequencies above 1 GHz, all three orthogonal axes were investigated.

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 are 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 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 (2005), Annex 8 (section 8.2). The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

5.4 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

5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The manufacturer of the EUT has requested the use of a relaxation factor based on the worst case transmit time of the EUT over a 100ms period. The EUT transmits at most one 1.7ms data packet in a 100ms span thus allowing a maximum of 20dB of relaxation. Please refer to appendix D for the manufacturer declaration and appendix E for justification.

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)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-24,000	500	54.0	63.5

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 25000MHz

5.6.1: AC source

Manufacturer:	Pivot International.						
Date(s) of Test:	January 25th , February 20th ,21st ,23rd and 26th 2007						
Test Engineer(s):	Khairul Aidi Zainal						
Voltage:	120 VAC						
Operation Mode:	Continuous transmit, modulated.						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:	√	Single Phase 120 VAC		3 Phase ___VAC			
		Battery		Other:			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:		Peak	√	Quasi-Peak	√	Average	

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.205 Limit (dBμV/m)	Margin (dB)
39.0	V/H	1.00	303	34.5	40.0	5.5
45.0	V/H	1.00	325	36.7	40.0	3.3
112.5	V/H	1.00	187	33.6	43.0	9.4
192.0	V/H	2.59	254	27.9	43.0	15.1
288.0	V/H	2.51	34	33.8	46.0	12.2
384.0	H/H	1.00	213	37.8	46.0	8.2
480.0	H/H	1.96	81	38.5	46.0	7.5
863.9	H/H	1.00	134	32.8	46.0	13.2

Note:
1. The spurious emissions listed in the table were present in all channels under investigation.
2. The spurious emissions do not qualify for relaxation factor since it is not a phenomenon of the transmitter.

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 0:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2405	H/S	1.28	126	124.6	134.8	154.8	30.2
4810	H/V	1.24	0	69.6	63.5	83.5	13.9
7215	V/S	1.32	275	63.1	104.6	124.6	61.5
9620	V/S	1.24	274	61.3	104.6	124.6	63.3
12025	H/V	1.19	140	60.7	63.5	83.5	22.8
14430	V/S	1.00	289	56.4	104.6	124.6	68.2
16835	H/H	1.04	203	51.3	104.6	124.6	73.3
19240	V/S	1.03	351	41.7	63.5	83.5	41.8
21645	H/S	1.18	130	46.7	104.6	124.6	77.9
24050	H/S	1.20	320	41.1	104.6	124.6	83.5

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 7:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2440	H/S	1.22	133	124.4	134.8	154.8	30.4
4880	H/V	1.21	0	71.5	63.5	83.5	12.0
7320	V/S	1.35	276	65.9	63.5	83.5	17.6
9760	V/S	1.50	138	56.0	104.4	124.4	68.4
12200	H/V	1.12	123	56.2	63.5	83.5	27.3
14640	V/S	1.11	273	54.5	104.4	124.4	69.9
17080	H/H	1.00	237	48.3	104.4	124.4	76.1
19520	V/S	1.05	335	46.0	63.5	83.5	37.5
21960	H/S	1.19	29	46.6	104.4	124.4	77.8
24400	H/S	1.09	352	46.0	104.4	124.4	78.4

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 14:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2475	H/S	1.30	126	124.3	134.8	154.8	30.5
4950	H/V	1.29	215	72.4	63.5	83.5	11.1
7425	V/S	1.05	156	64.9	63.5	83.5	18.6
9900	V/S	1.17	225	54.6	104.3	124.3	69.7
12375	H/V	1.00	120	60.4	63.5	83.5	23.1
14850	V/S	1.09	280	54.5	104.3	124.3	69.8
17325	H/H	1.11	246	51.4	104.3	124.3	72.9
19800	V/S	1.10	189	41.2	63.5	83.5	42.3
22275	H/S	1.12	216	45.1	63.5	83.5	38.4
24750	H/S	1.10	352	44.1	104.3	124.3	80.2

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 15:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2480	H/S	1.25	130	107.4	134.8	154.8	47.4
4960	H/V	1.00	165	52.9	63.5	83.5	30.6
7440	V/S	1.39	277	38.6	63.5	83.5	44.9
9920	V/S	Note 3					
12400	H/V	Note 3					
14880	V/S	Note 3					
17360	H/H	Note 3					
19840	V/S	Note 3					
22320	H/S	Note 3					
24800	H/S	Note 3					

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 1 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.
5) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time**.**

5.6.2: Battery source

Manufacturer:	Pivot International.						
Date(s) of Test:	January 25th , February 20th ,21st ,23rd and 26th 2007						
Test Engineer(s):	Khairul Aidi Zainal						
Voltage:	9.6 VDC						
Operation Mode:	Continuous transmit, modulated.						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:		Single Phase ___VAC		3 Phase ___VAC			
	√	Battery		Other:			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:		Peak	√	Quasi-Peak	√	Average	

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.205 Limit (dBμV/m)	Margin (dB)
42.0	V/H	1.00	271	33.1	40.0	6.9
45.0	V/H	1.00	306	34.9	40.0	5.1
57.0	V/H	1.14	294	29.1	40.0	10.9
114.6	V/H	1.00	272	31.7	43.0	11.3
192.0	V/H	1.00	42	32.2	43.0	10.8
384.0	H/H	1.00	205	35.8	46.0	10.2
480.0	H/H	1.94	94	33.3	46.0	12.7
768.0	H/H	1.12	93	25.7	46.0	20.3

Note:

1. The spurious emissions listed in the table were present in all channels under investigation.
2. The spurious emissions do not qualify for relaxation factor since it is not a phenomenon of the transmitter

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 0:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2405	H/S	1.28	124	124.3	134.8	154.5	30.5
4810	H/V	1.22	0	70.4	63.5	83.5	13.1
7215	V/S	1.30	269	63.2	104.3	124.3	61.1
9620	V/S	1.00	284	61.3	104.3	124.3	63.0
12025	H/V	1.15	138	59.9	63.5	83.5	23.6
14430	V/S	1.00	285	56.1	104.3	124.3	68.2
16835	H/H	1.04	203	51.0	104.3	124.3	73.3
19240	V/S	1.03	355	41.6	63.5	83.5	41.9
21645	H/S	1.15	162	46.9	104.3	124.3	77.4
24050	H/S	1.20	317	40.9	104.3	124.3	83.4

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 7:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2440	H/S	1.24	132	124.5	134.8	154.8	30.3
4880	H/V	1.22	0	71.7	63.5	83.5	11.8
7320	V/S	1.32	275	66.0	63.5	83.5	17.5
9760	V/S	1.48	140	55.9	104.5	124.5	68.6
12200	H/V	1.15	119	56.2	63.5	83.5	27.3
14640	V/S	1.14	281	54.6	104.5	124.5	69.9
17080	H/H	1.00	235	48.3	104.5	124.5	76.2
19520	V/S	1.04	329	46.1	63.5	83.5	37.4
21960	H/S	1.21	31	46.7	104.5	124.5	77.8
24400	H/S	1.07	350	46.0	104.5	124.5	78.5

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 14:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2475	H/S	1.30	128	124.2	134.8	154.8	30.6
4950	H/V	1.28	212	72.1	63.5	83.5	11.4
7425	V/S	1.00	152	64.8	63.5	83.5	18.7
9900	V/S	1.21	225	54.4	104.2	124.2	69.8
12375	H/V	1.00	121	59.9	63.5	83.5	23.6
14850	V/S	1.11	275	53.2	104.2	124.2	71.0
17325	H/H	1.09	241	51.5	104.2	124.2	72.7
19800	V/S	1.10	218	41.3	63.5	83.5	42.2
22275	H/S	1.11	189	45.0	63.5	83.5	38.5
24750	H/S	1.09	352	44.2	104.2	124.2	80.0

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 15:

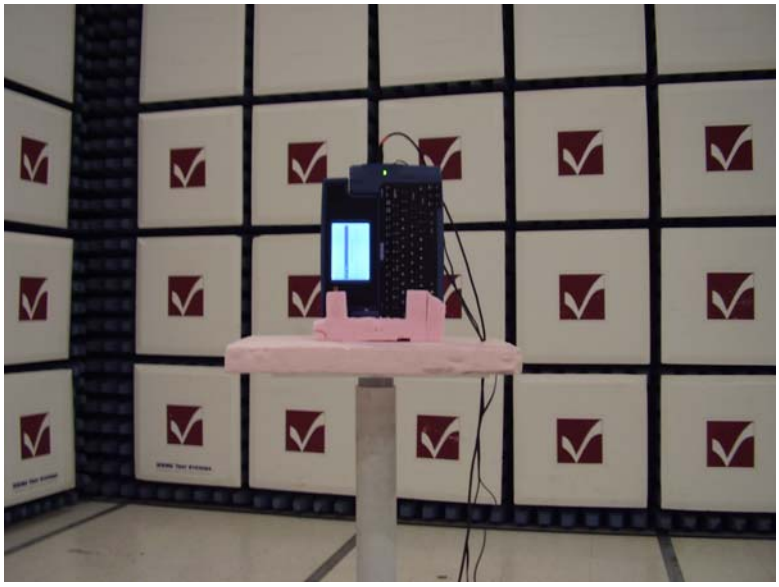
Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Limit with relaxation (dBμV/m)	Margin (dB)
2480	H/S	1.28	128	107.5	134.8	154.8	47.3
4960	H/V	1.00	159	52.5	63.5	83.5	31.0
7440	V/S	1.36	279	38.6	63.5	83.5	44.9
9920	V/S	Note 3					
12400	H/V	Note 3					
14880	V/S	Note 3					
17360	H/H	Note 3					
19840	V/S	Note 3					
22320	H/S	Note 3					
24800	H/S	Note 3					

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 1 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.
5) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time.

5.7 Test Setup Photo(s) – Radiated Emissions Test

Side Orientation



Horizontal Orientation

Vertical Orientation

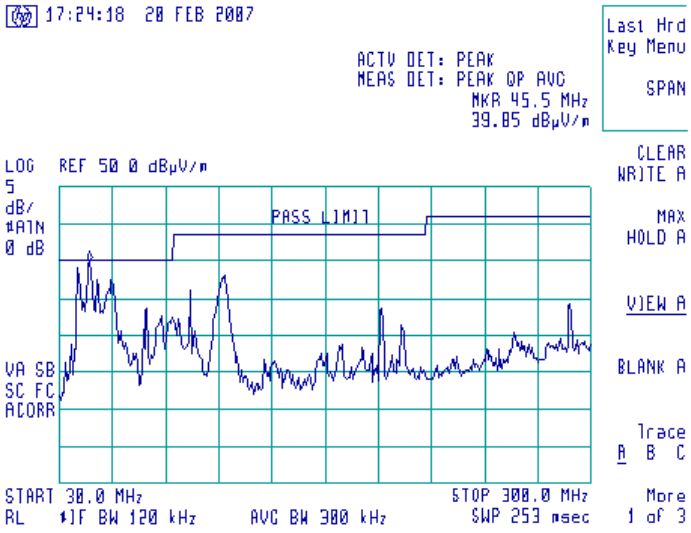
5.8 Screen Captures - Radiated Emissions Testing

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.

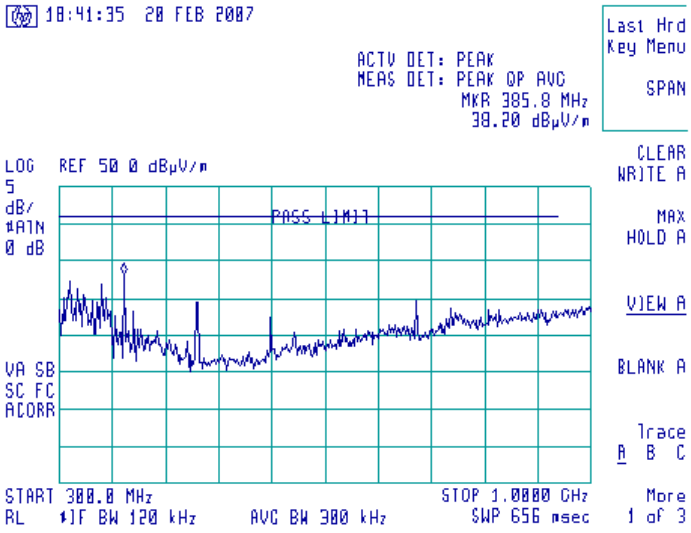
The signature scans shown here are from worst-case emissions, as measured on channels 0, 7, 14 or 15, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

5.8.1 AC source

Channel 0, Antenna Vertically Polarized, 30-300 MHz, at 3m

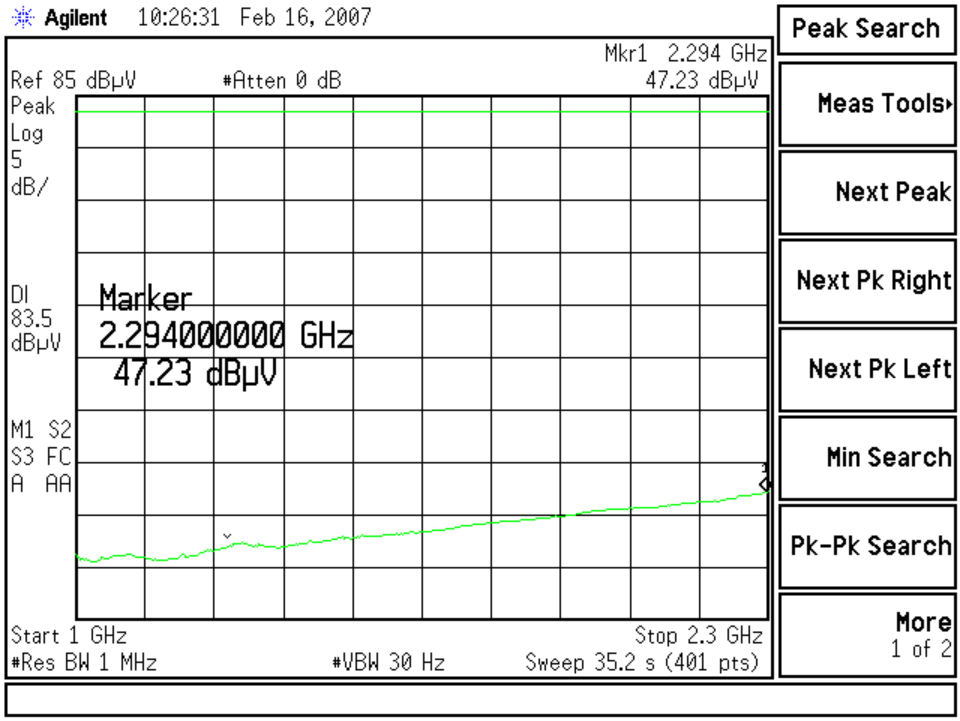


Channel 0, Antenna Horizontally Polarized, 300-1000 MHz, at 3m

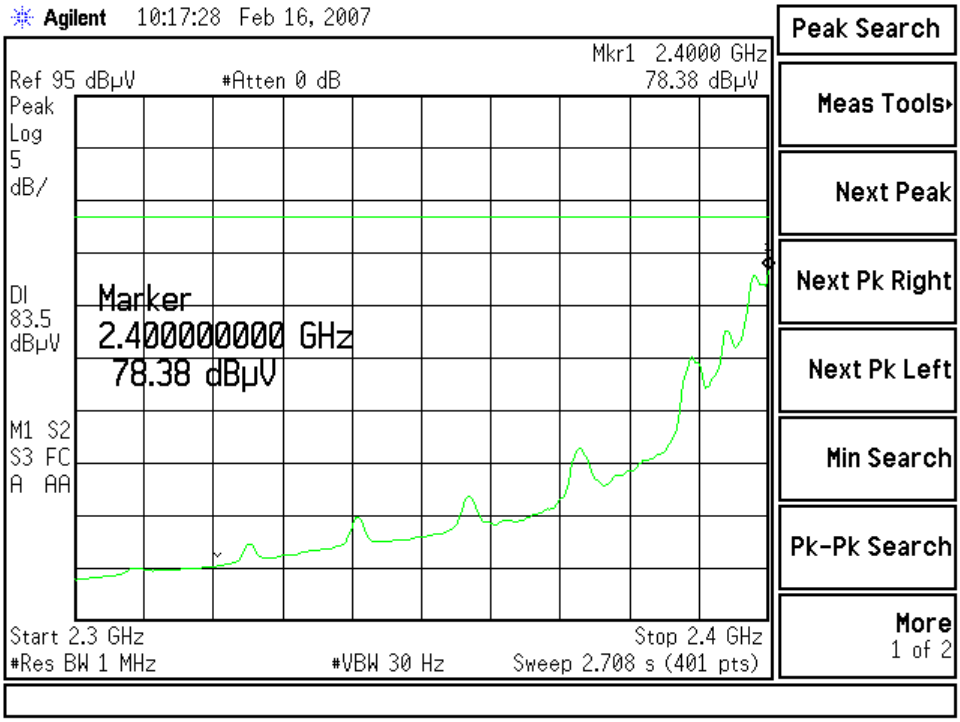


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 0, Antenna Horizontally Polarized, 1000-2300 MHz, at 1m

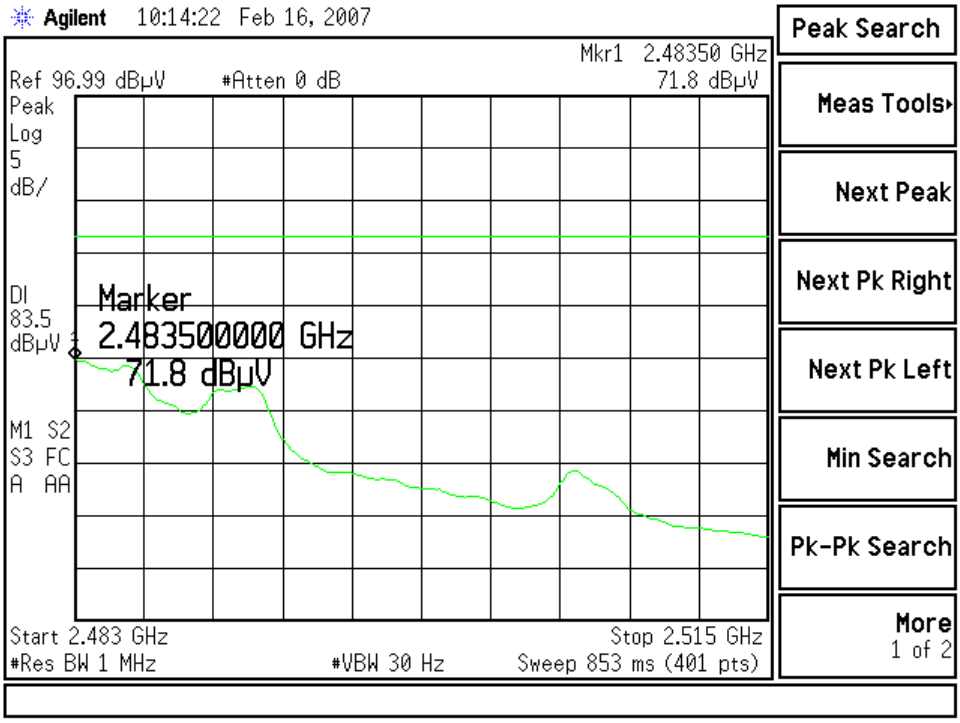


Channel 0, Antenna Horizontally Polarized, 2300 - 2400 MHz, at 1m

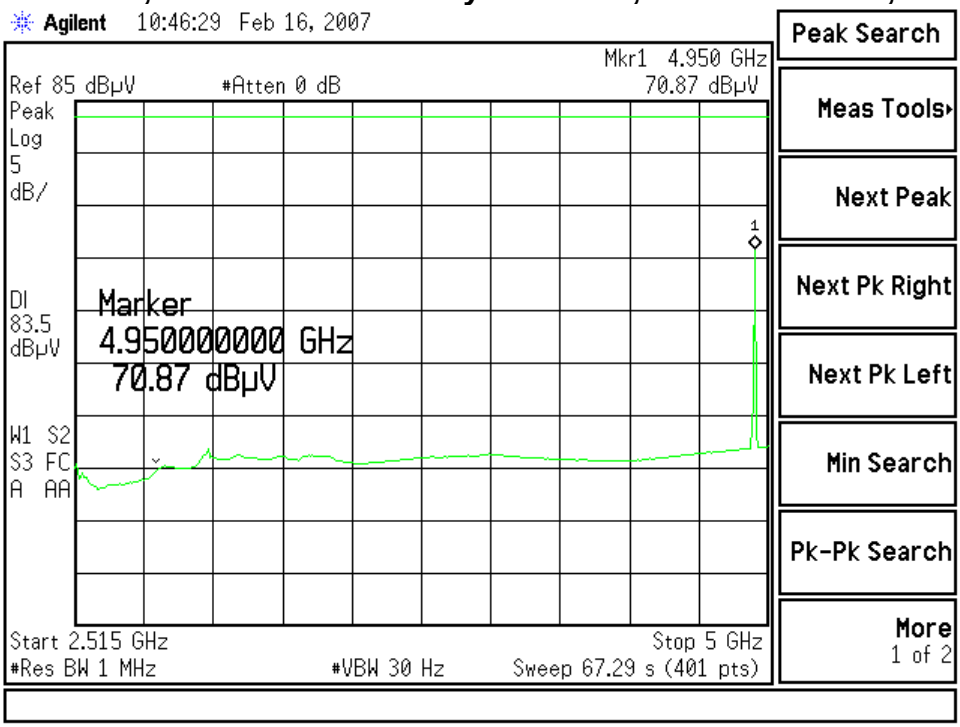


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 14, Antenna Horizontally Polarized, 2483.5 - 2515 MHz, at 1m

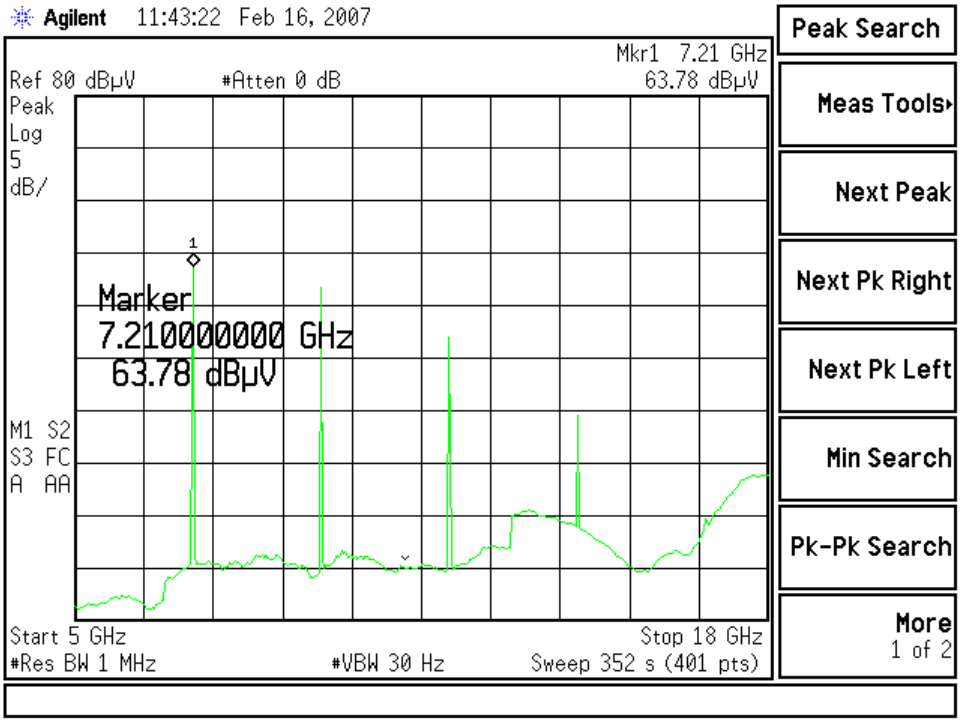


Channel 14, Antenna Horizontally Polarized, 2515 -5000 MHz, at 1m

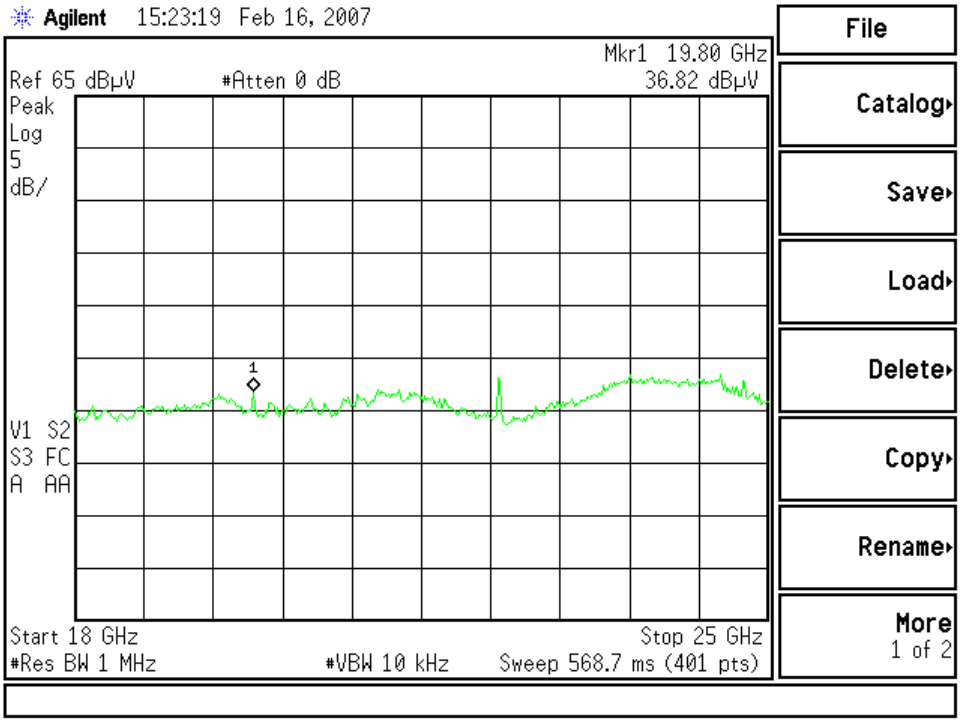


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 0, Antenna Vertically Polarized, 5000-18000 MHz, at 1m

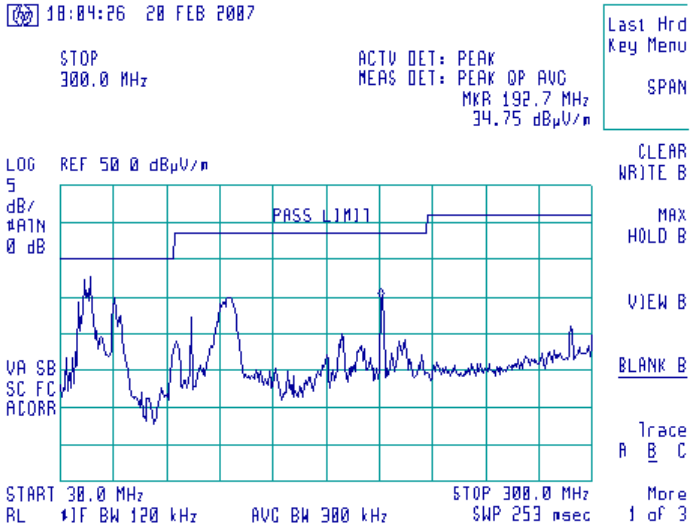


Channel 14, Antenna Vertically Polarized, 18000-25000 MHz, at 30cm

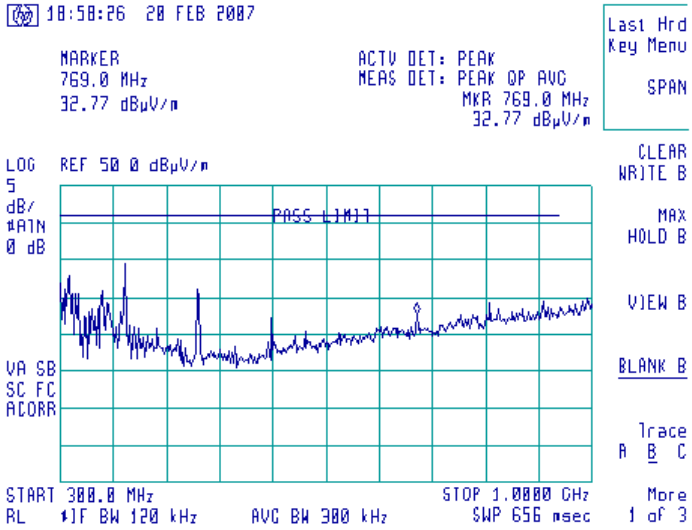


5.8.2 Battery source

Channel 0, Antenna Vertically Polarized, 30-300 MHz, at 3m

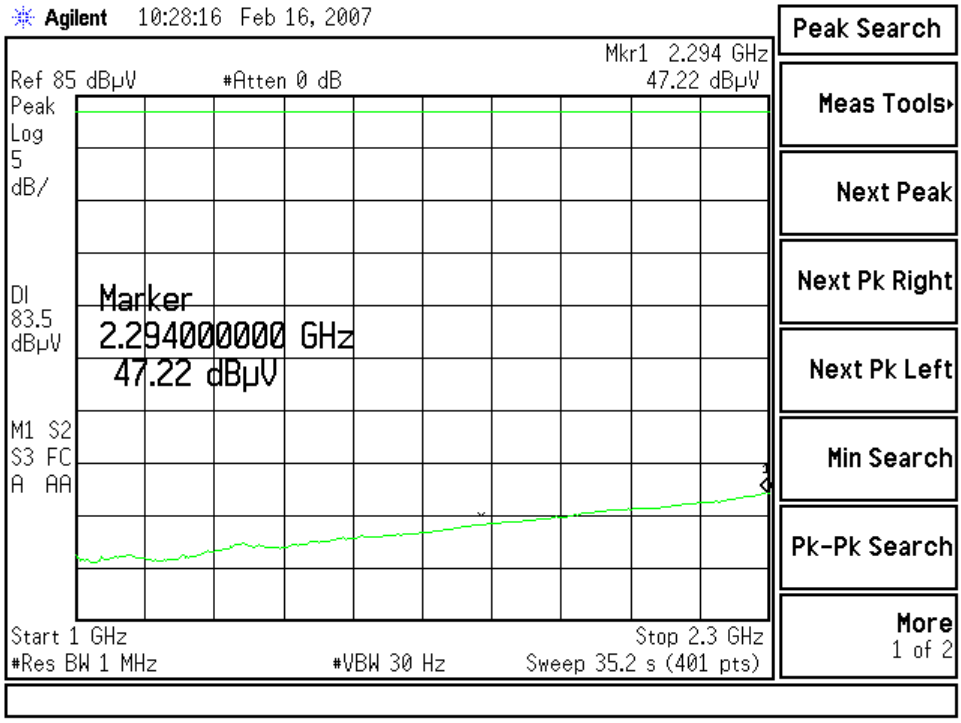


Channel 0, Antenna Horizontally Polarized, 300-1000 MHz, at 3m

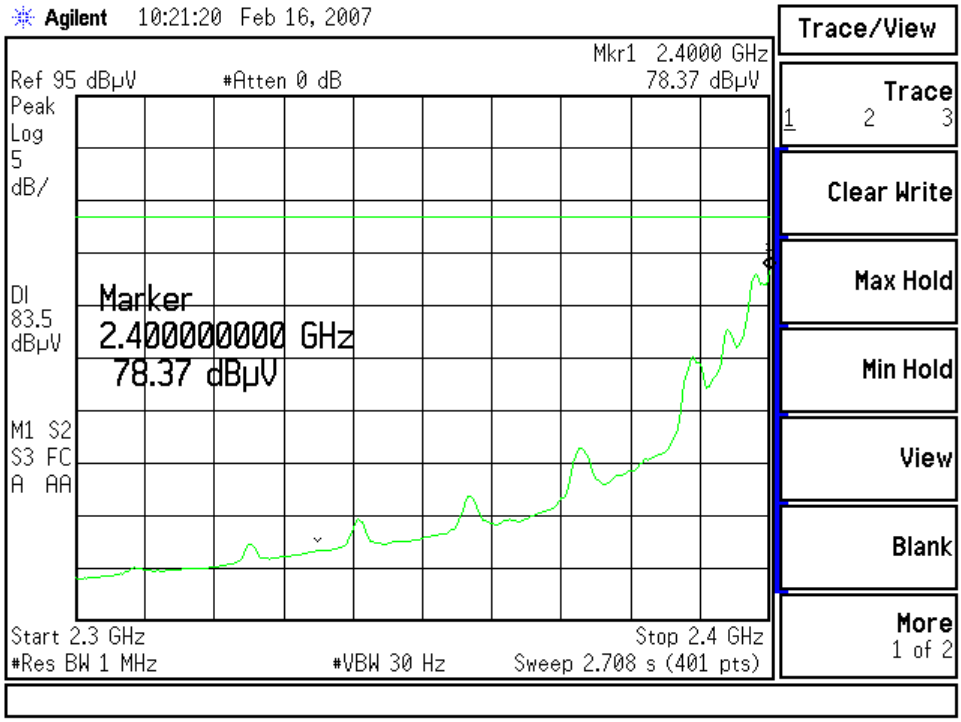


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 0, Antenna Horizontally Polarized, 1000-2300 MHz, at 1m

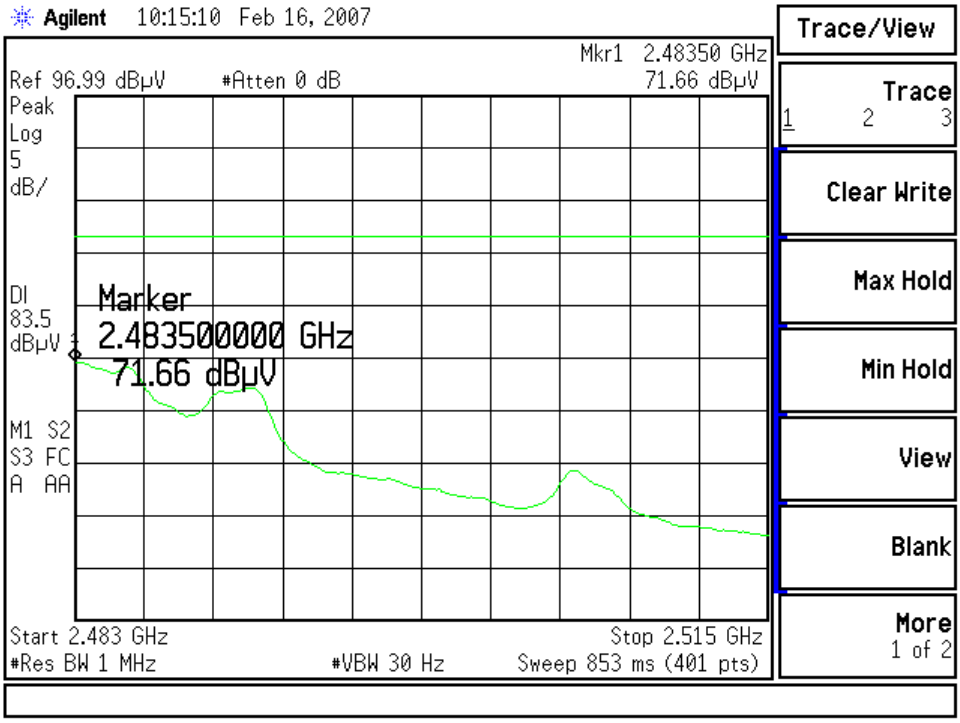


Channel 0, Antenna Horizontally Polarized, 2300 - 2400 MHz, at 1m

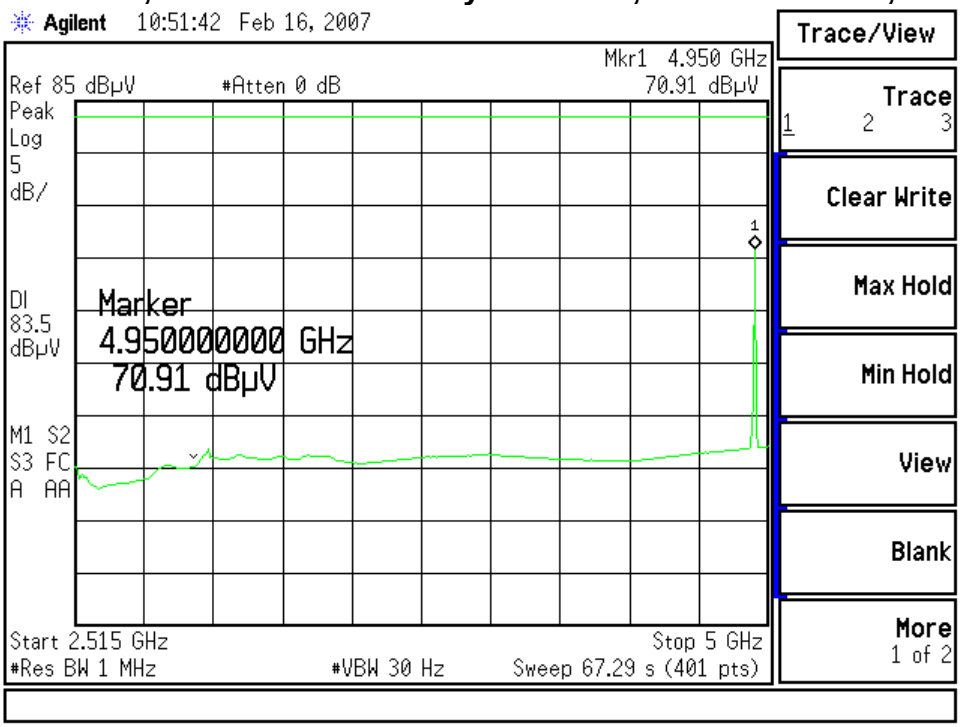


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 14, Antenna Horizontally Polarized, 2483.5 - 2515 MHz, at 1m

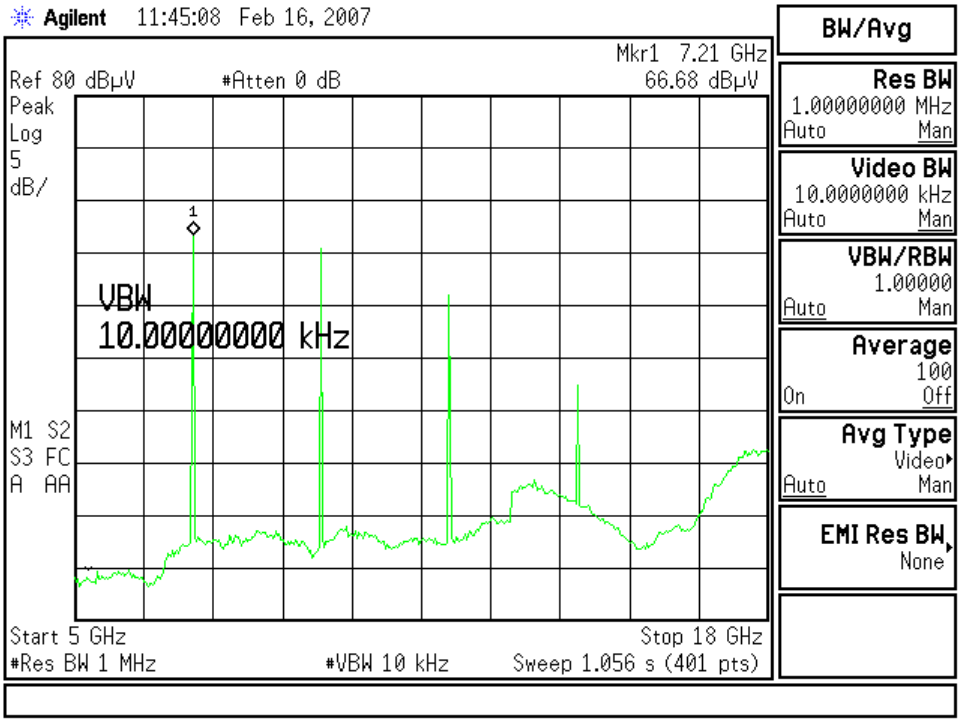


Channel 14, Antenna Horizontally Polarized, 2515 -5000 MHz, at 1m



Screen Captures - Radiated Emissions Testing *(continued)*

Channel 0, Antenna Vertically Polarized, 5000-18000 MHz, at 1m



Channel 14, Antenna Vertically Polarized, 18000-25000 MHz, at 30cm

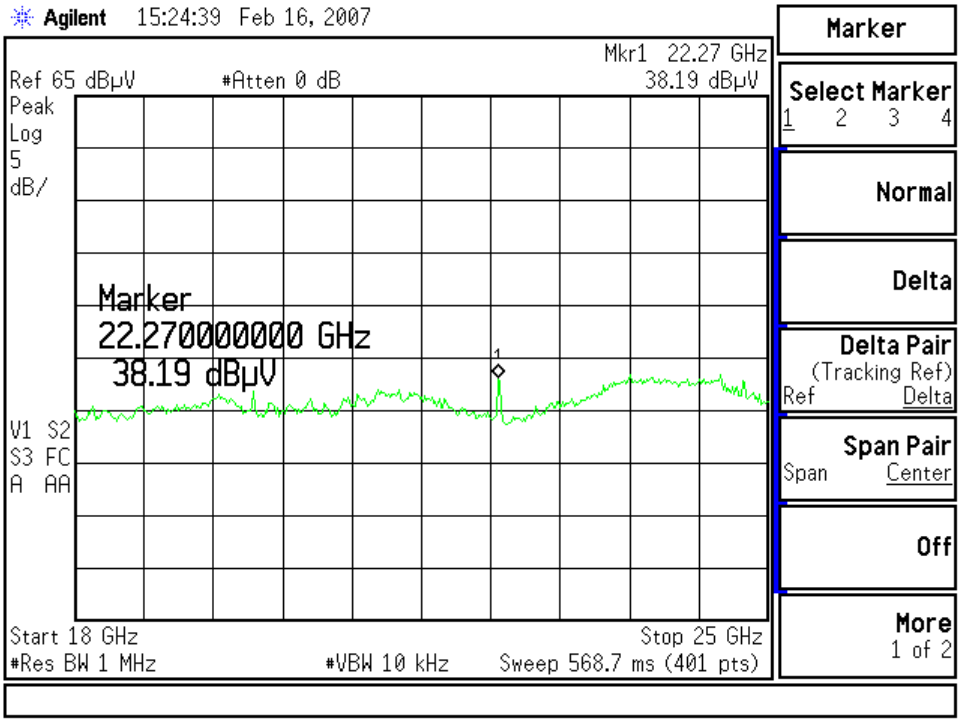


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

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 6). 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 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.

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.

6.3 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

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.

6.4 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.			

6.5 TEST DATA CHART CONDUCTED EMISSION

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

Manufacturer:	Pivot International					
Date(s) of Test:	February 22nd 2007					
Test Engineer:	Khairul Aidi Zainal					
Model #:	200A					
Serial #:	823064400056					
Voltage:	120 VAC					
Operation Mode:	Continuous transmit, modulated					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	AC Mains test bench				Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane				10cm Spacers
	√	80cm above Ground Plane				Other:
Measurements:		Pre-Compliance		Preliminary	√	Final
Detectors Used:		Peak	√	Quasi-Peak	√	Average

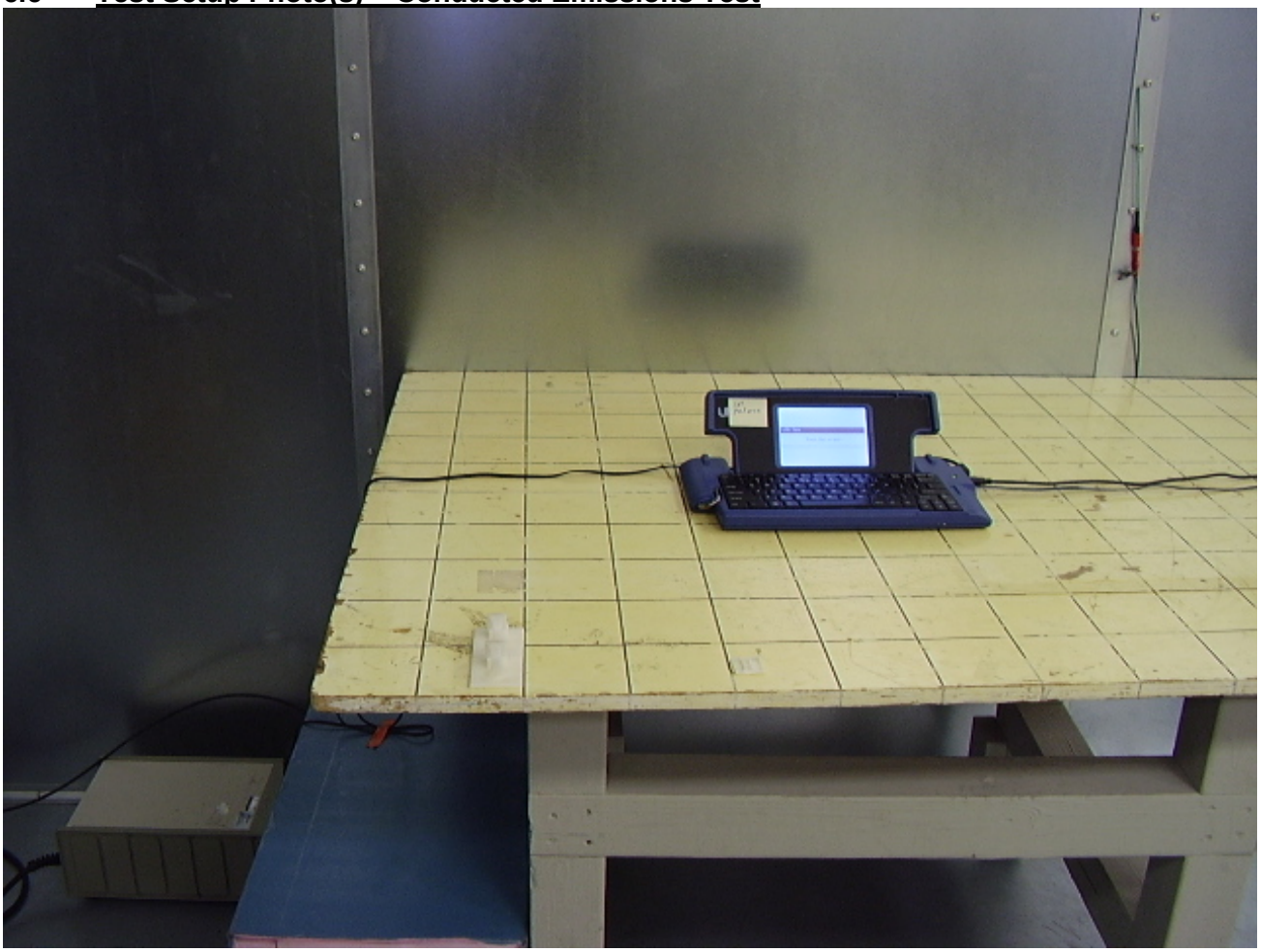
		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
0.163	1	47.1	65.3	18.2	30.5	55.3	24.8
0.238	1	37.5	62.2	24.7	28.7	52.2	23.5
4.521	1	34.0	56.0	22.0	27.4	46.0	18.6
0.160	2	47.2	65.5	18.3	32.3	55.5	23.2
0.193	2	41.7	63.9	22.2	33.9	53.9	20.0
4.551	2	33.1	56.0	22.9	26.2	46.0	19.8

Notes:

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

2) The EUT exhibited similar emissions in transmit and receive modes, and across the 0, 7, 14 and 15 channels tested.

6.6 Test Setup Photo(s) – Conducted Emissions Test

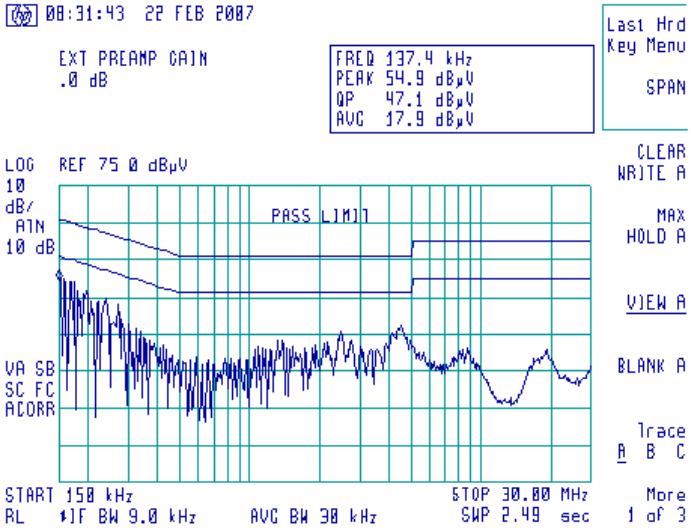


6.7 Screen Captures – Conducted Emissions Test

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 7, chosen as being a good representative of channels.

Channel 7, 2440 MHz, Line 1



Channel 7, 2440 MHz, Line 2

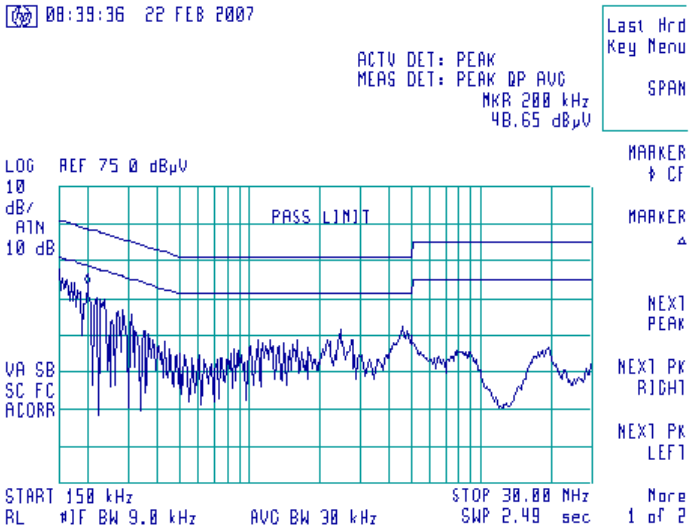


EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(2)

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 and FCC Procedures (March 23, 2005) 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=300 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 1680 kHz, which is above the minimum of 500 kHz.

Test Data

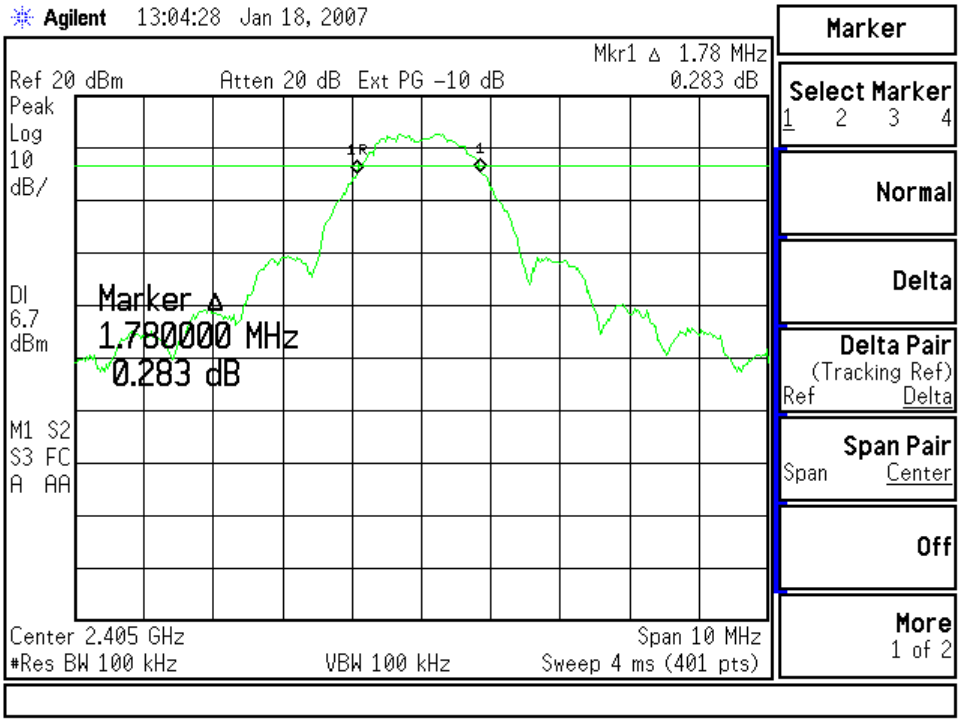
Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc Occ.Bw (MHz)
0	2405	1780	500	2.83
7	2440	1730	500	2.75
14	2475	1730	500	2.73
15	2480	1680	500	2.75

7.3 Test Equipment List

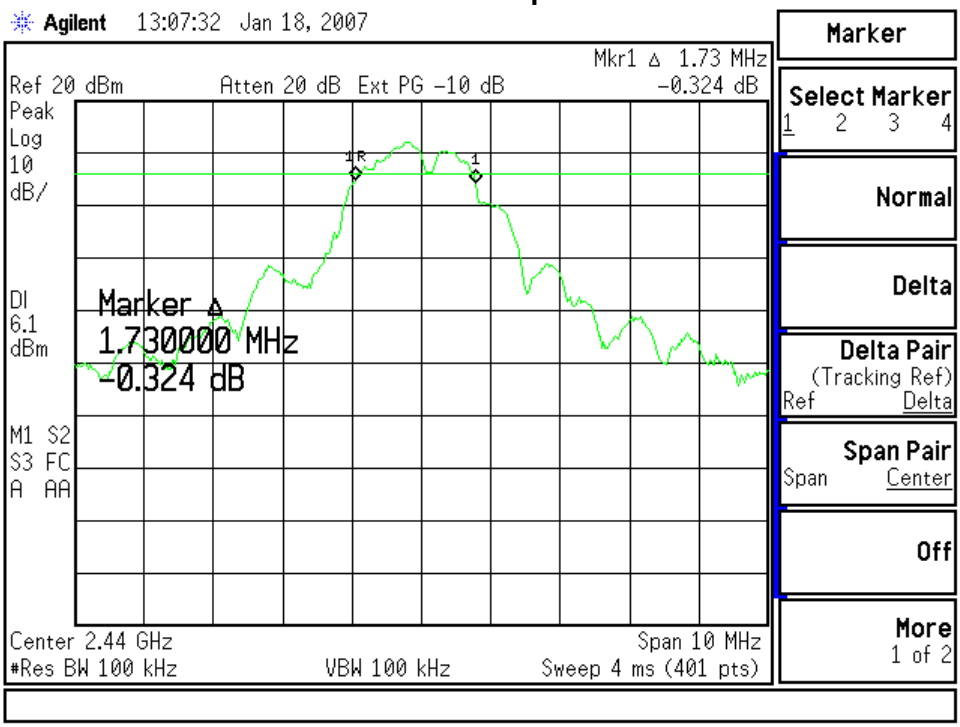
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

7.4 Screen Captures - OCCUPIED BANDWIDTH

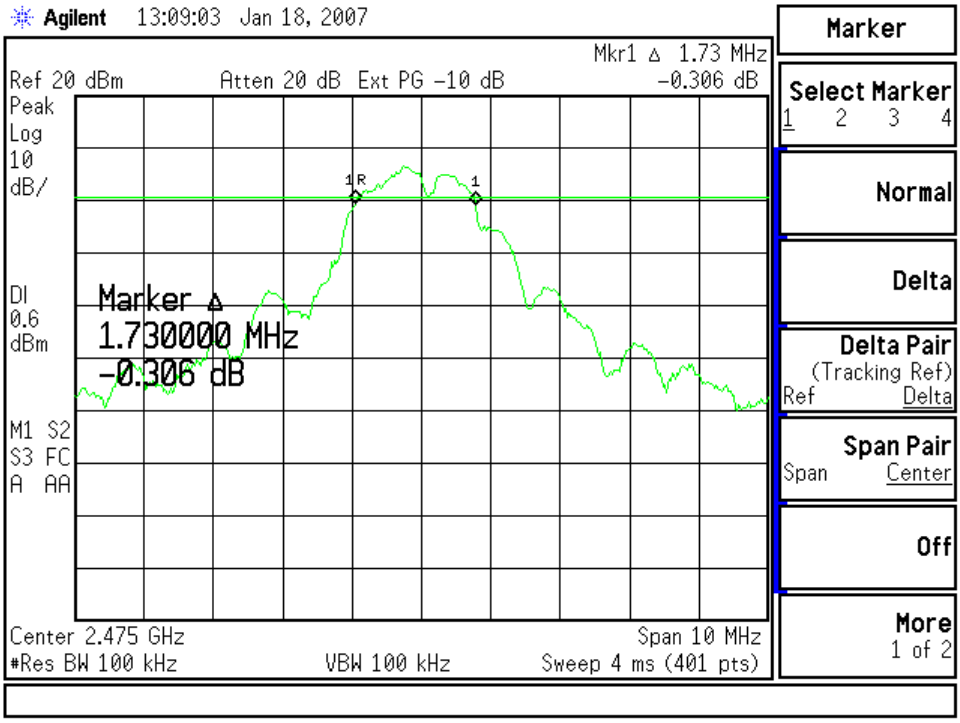
Channel 0 -6 dBc Occupied Bandwidth



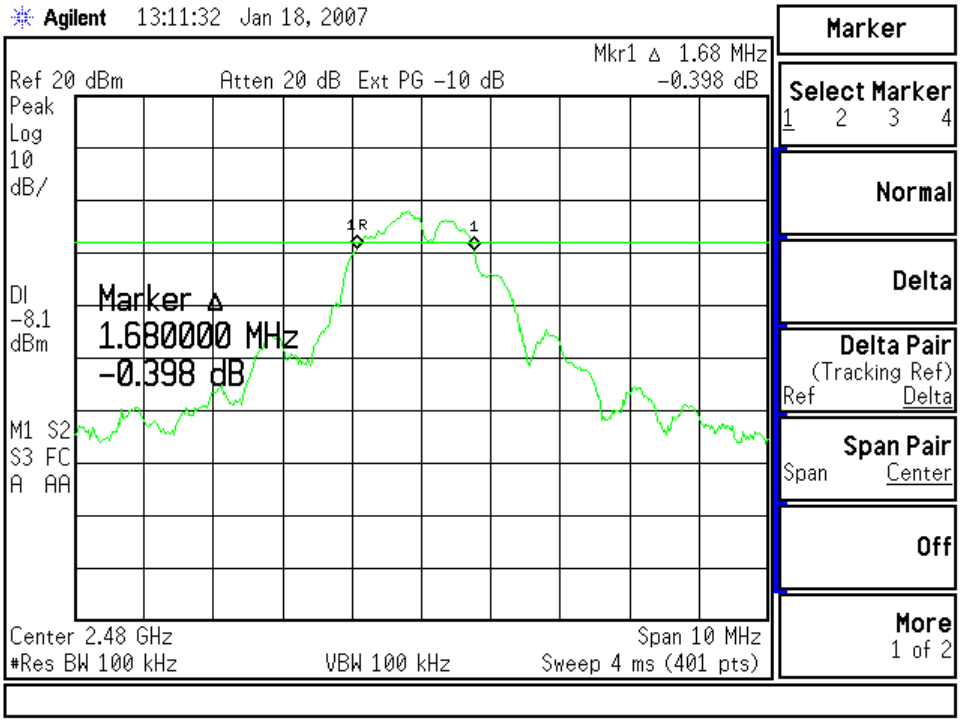
Channel 7 -6 dBc Occupied Bandwidth



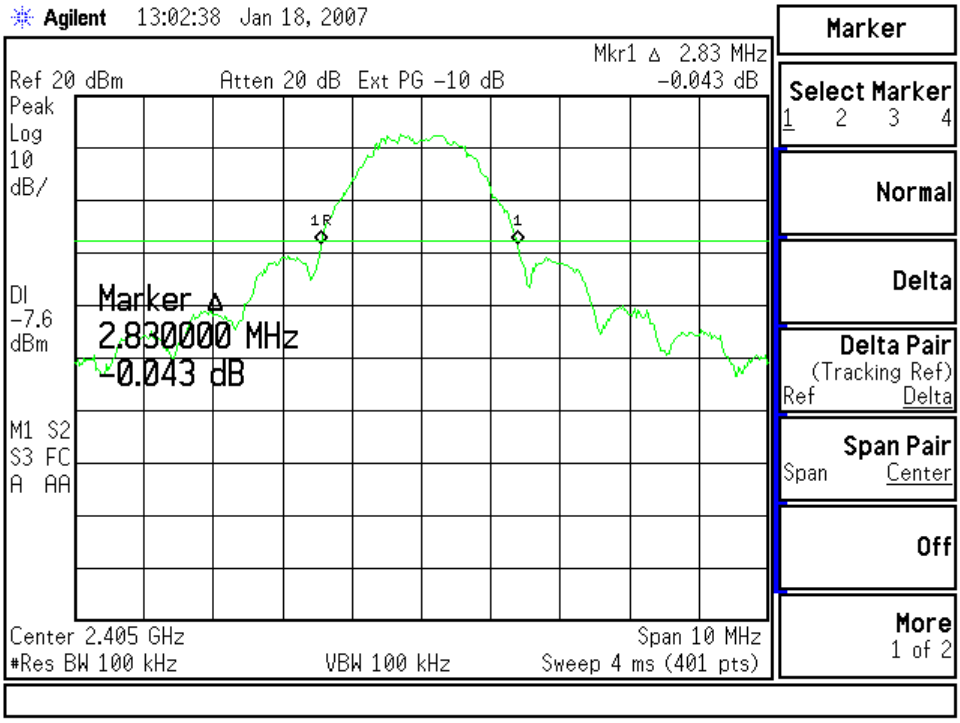
Channel 14 -6 dBc Occupied Bandwidth



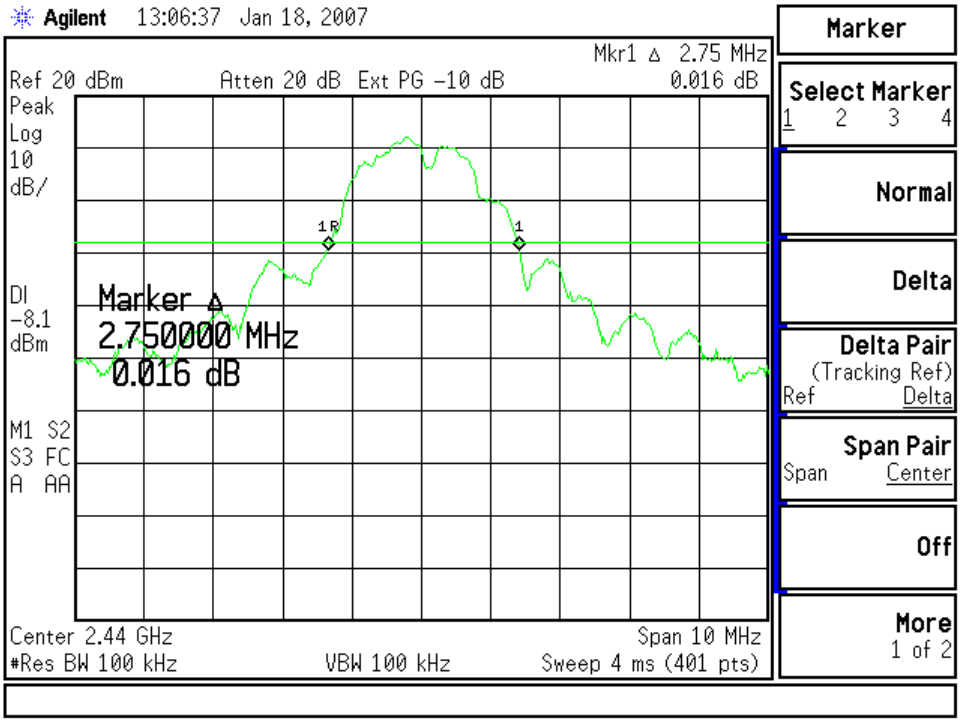
Channel 14 -6 dBc Occupied Bandwidth



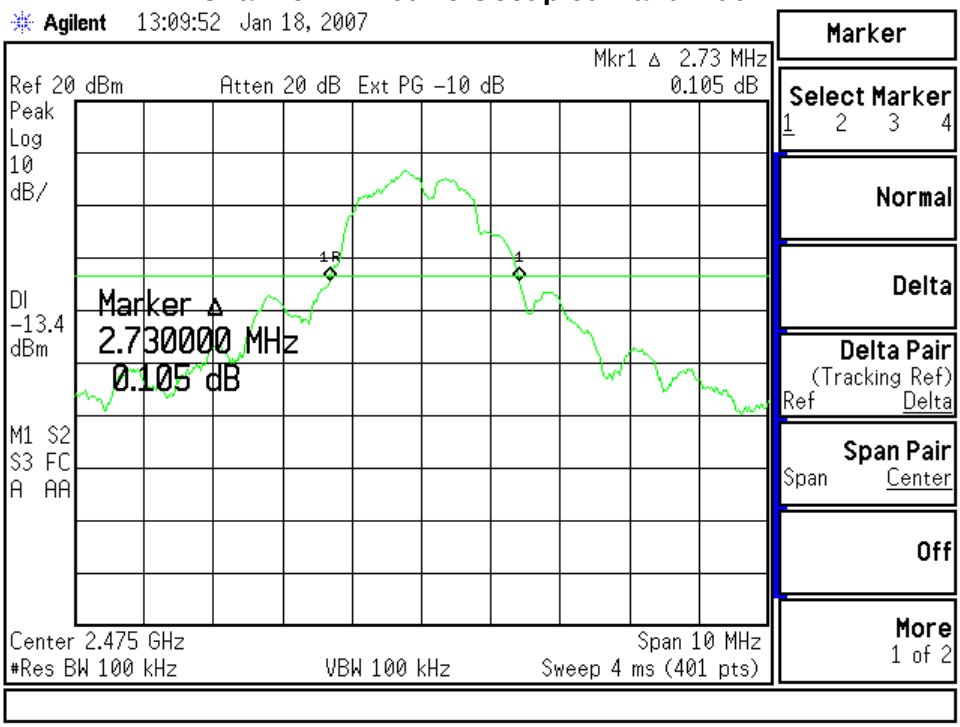
Channel 0 -20dBc Occupied Bandwidth



Channel 7 -20dBc Occupied Bandwidth



Channel 14 -20dBc Occupied Bandwidth



Channel 15 -20dBc Occupied Bandwidth

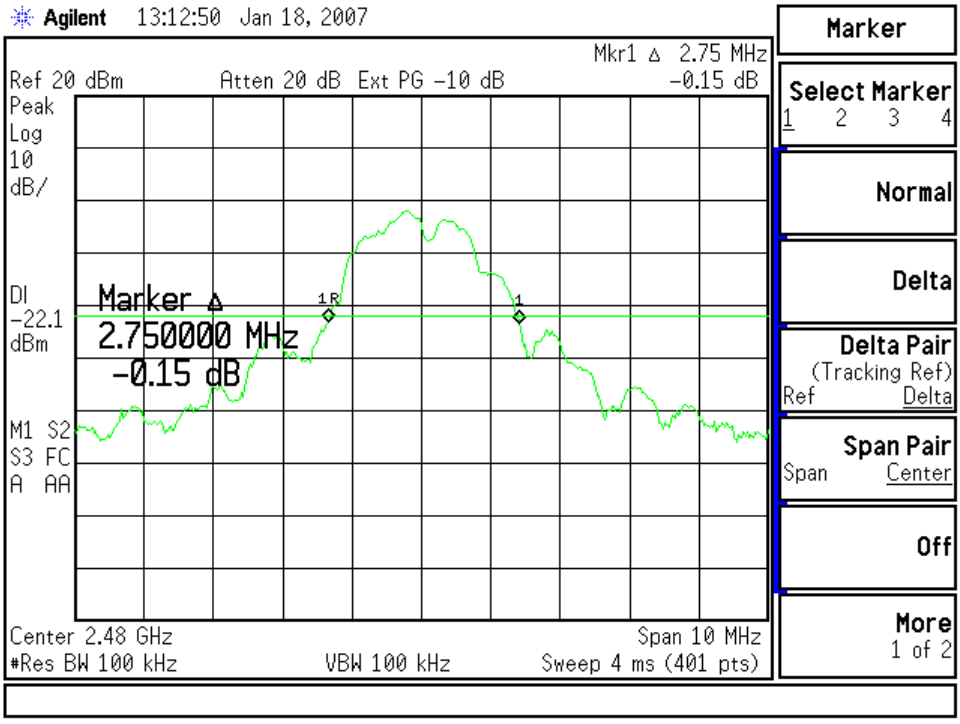


EXHIBIT 8. BAND-EDGE MEASUREMENTS

8.1 Method of Measurements

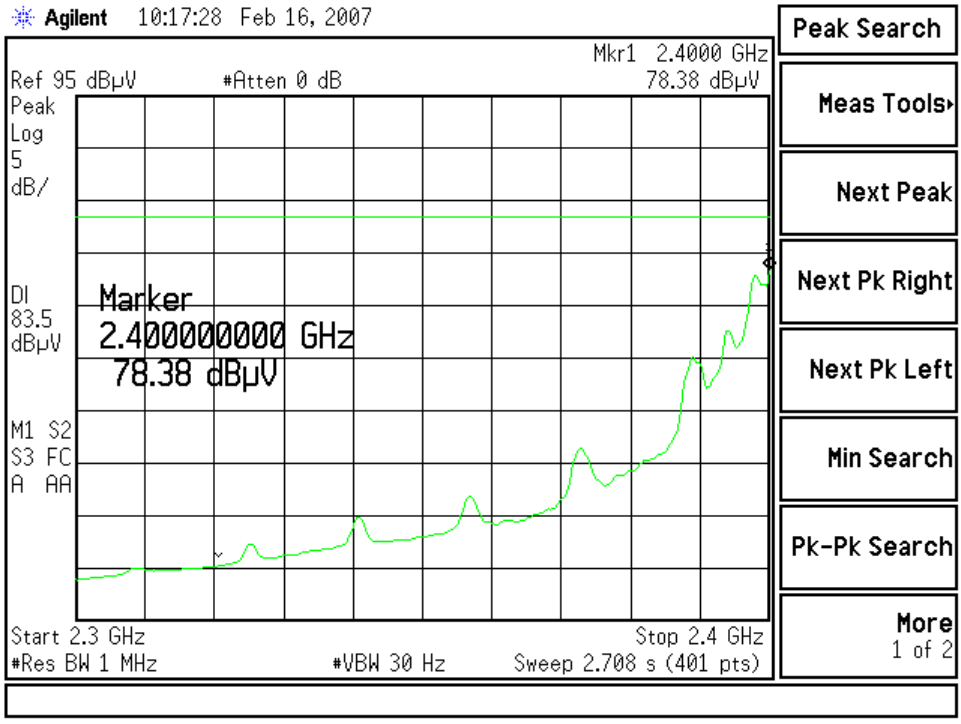
FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The following screen captures demonstrate compliance of the intentional radiator at the 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, with relaxation would + 83.5 dBµV/m at 1m.

The Upper Band-Edge limit, in this case, with relaxation would be + 83.5 dBµV/m at 1m.

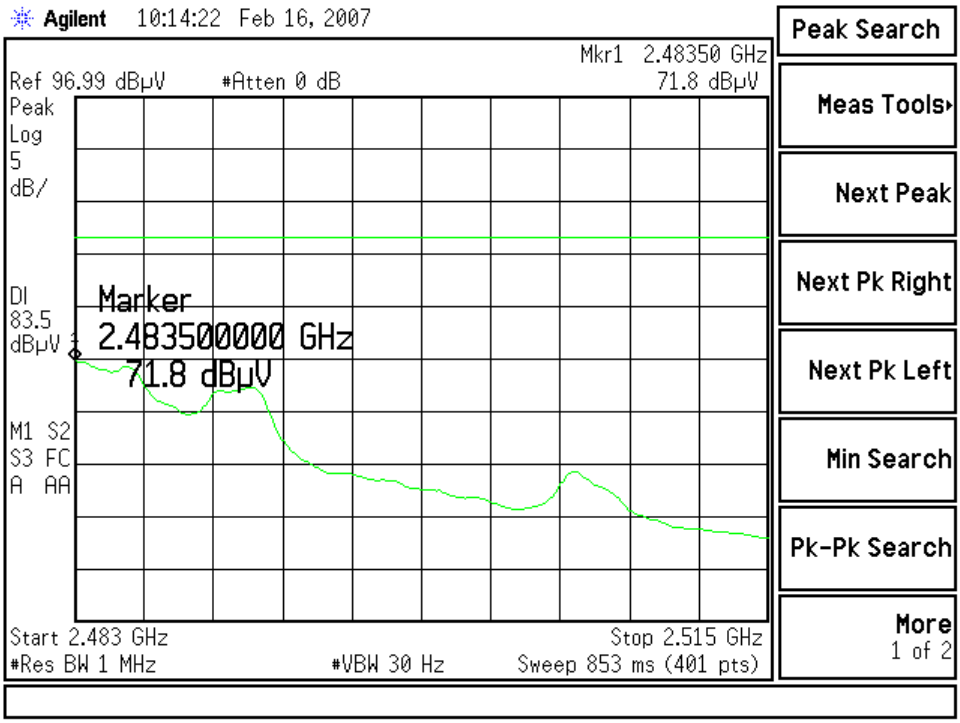
8.1.1 AC source

Screen Capture Demonstrating Compliance at the Lower Band-Edge



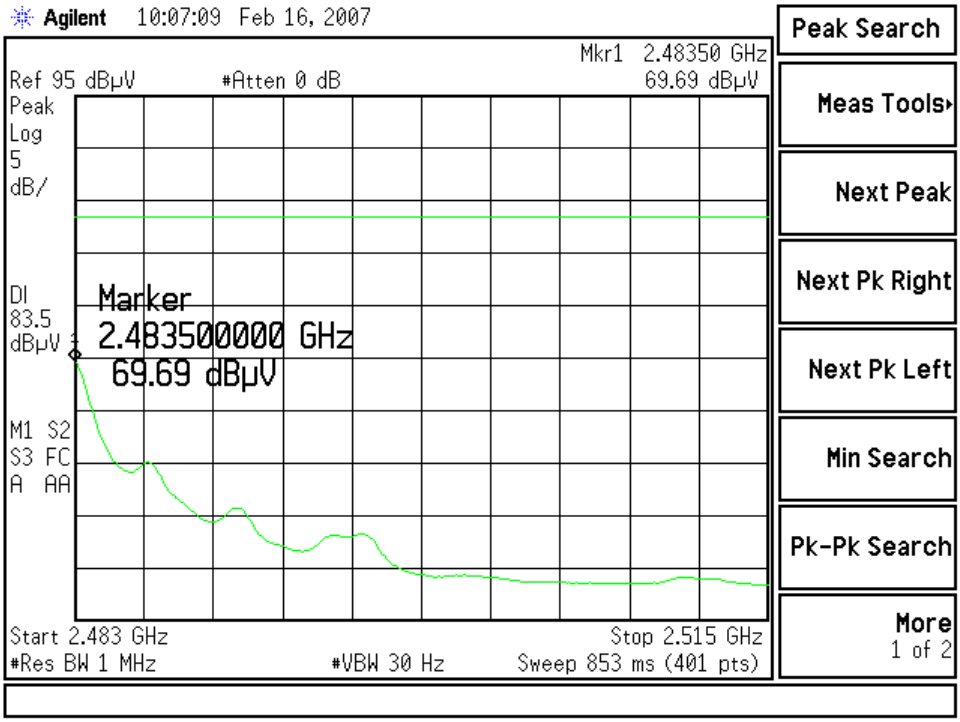
Screen Capture Demonstrating Compliance at the Higher Band-Edge

Channel 14



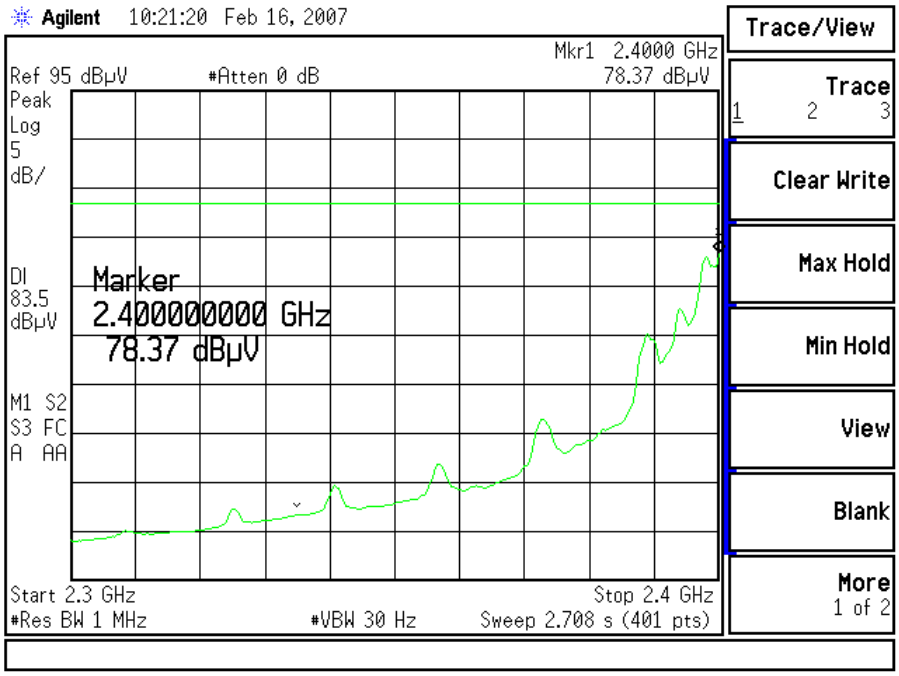
Screen Capture Demonstrating Compliance at the Higher Band-Edge

Channel 15



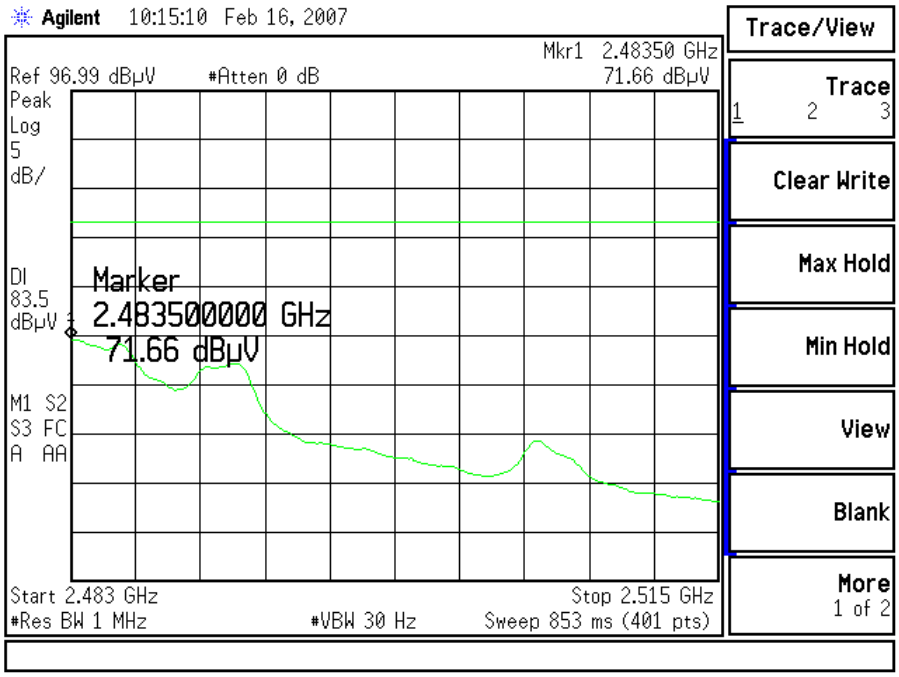
8.1.1 Battery source

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Capture Demonstrating Compliance at the Higher Band-Edge

Channel 14



Screen Capture Demonstrating Compliance at the Higher Band-Edge
Channel 15

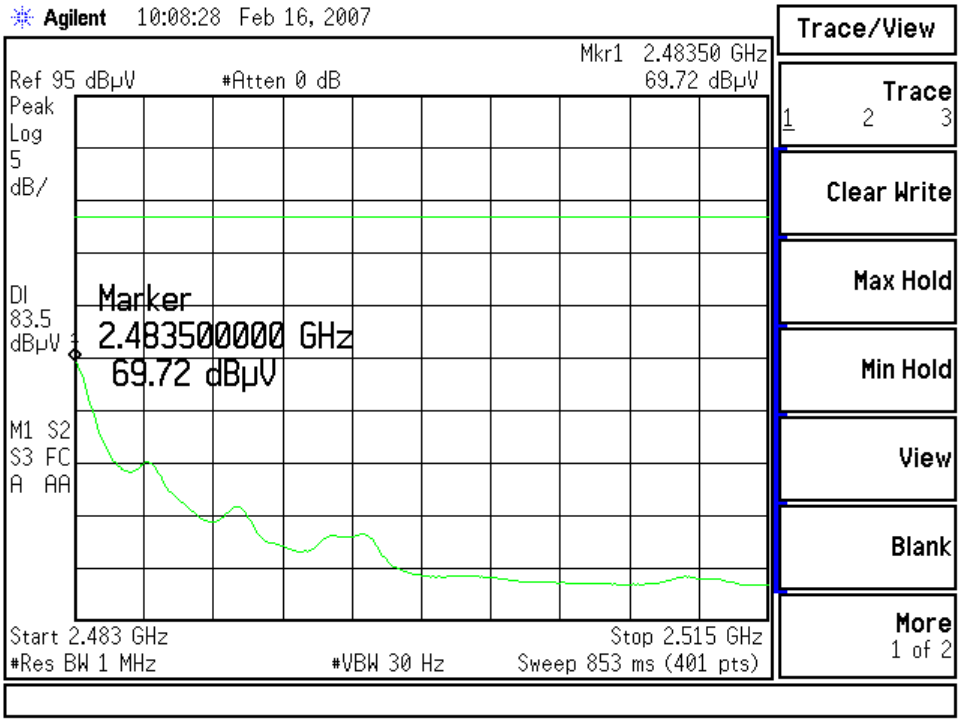


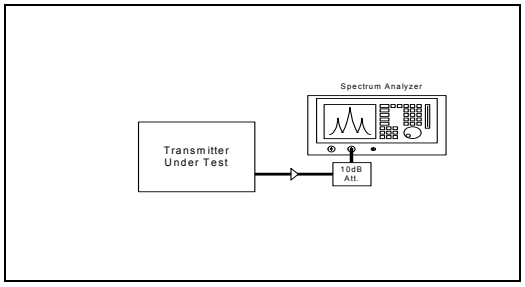
EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable 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 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 20 MHz, with measurements from a peak detector presented in the chart below.

9.2 Test Data

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
0	2405	+30 dBm	16.2	13.8
7	2440	+30 dBm	16.2	13.8
14	2475	+30 dBm	16.1	13.9
15	2480	+30 dBm	2.1	27.9



Radiated RF power output (in watts): 0.096 Watts

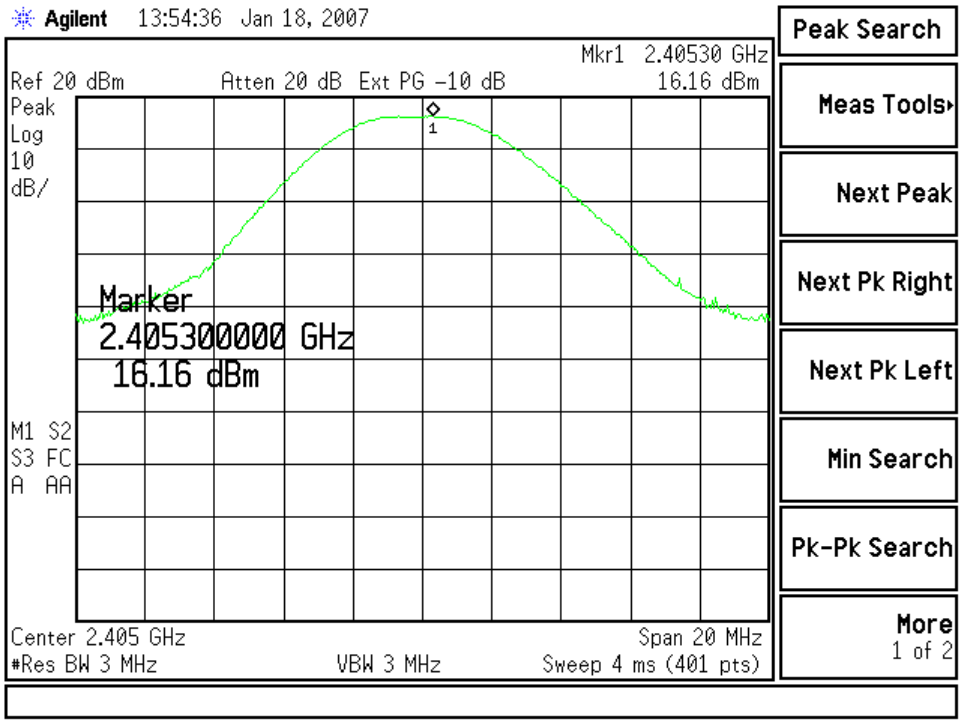
Conducted RF Power Output (in Watts) : 0.042 Watts
Declared RF Power Output (in Watts) : 0.100 Watts
Calculated Antenna Gain (in dB) : 3.62 dB

9.3 Test Equipment List

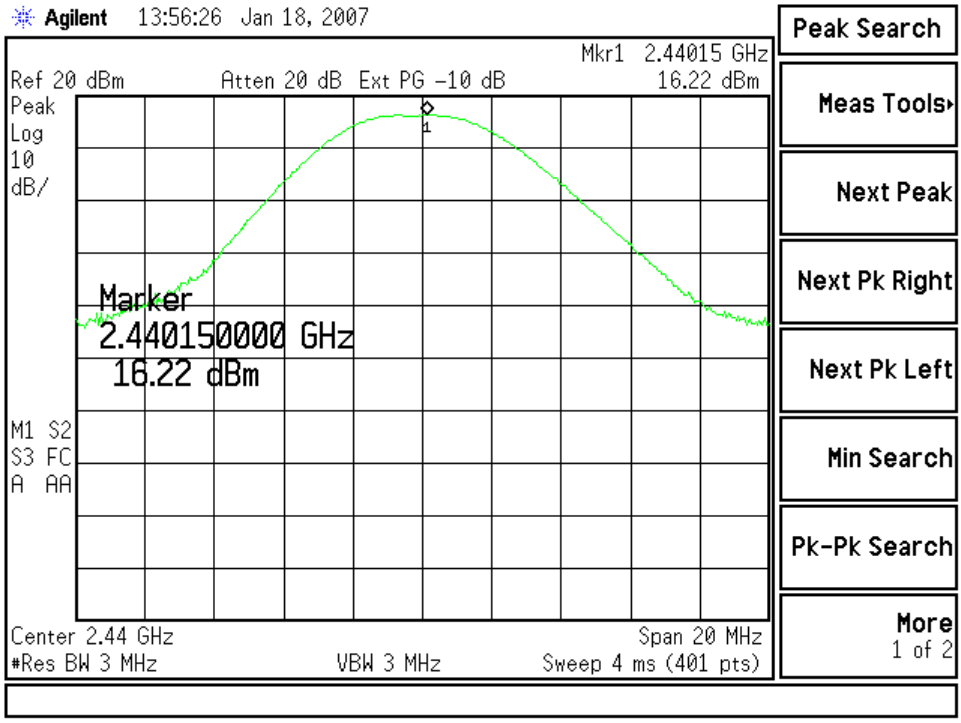
Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4407B	US39160256	Up to 26 GHz

9.4 Screen Captures – Power Output (Conducted)

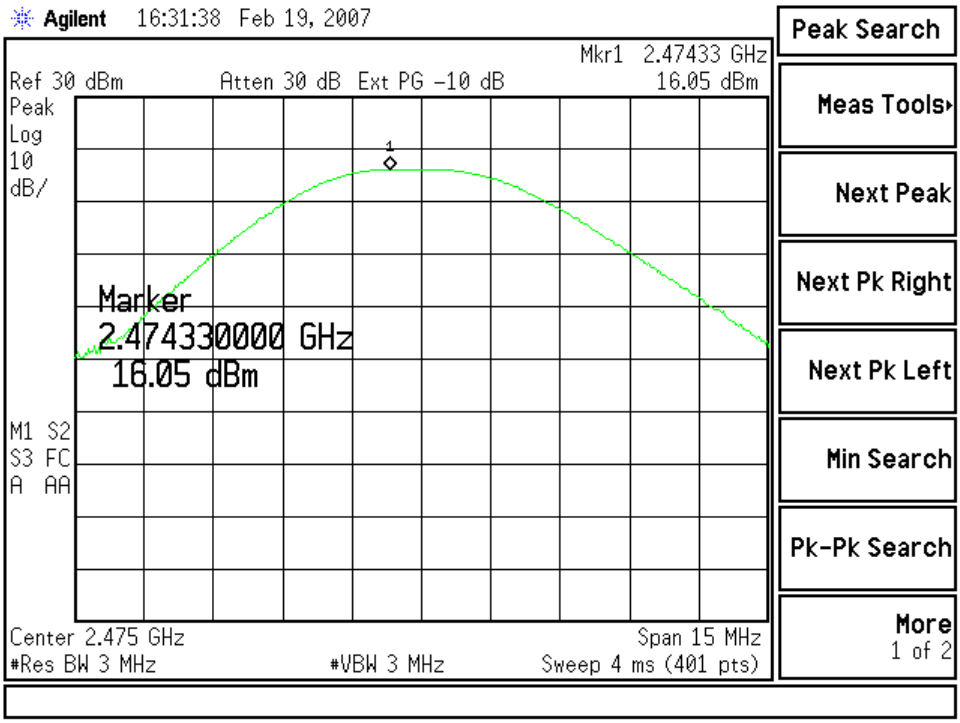
Channel 0



Channel 7



Channel 14



Channel 15

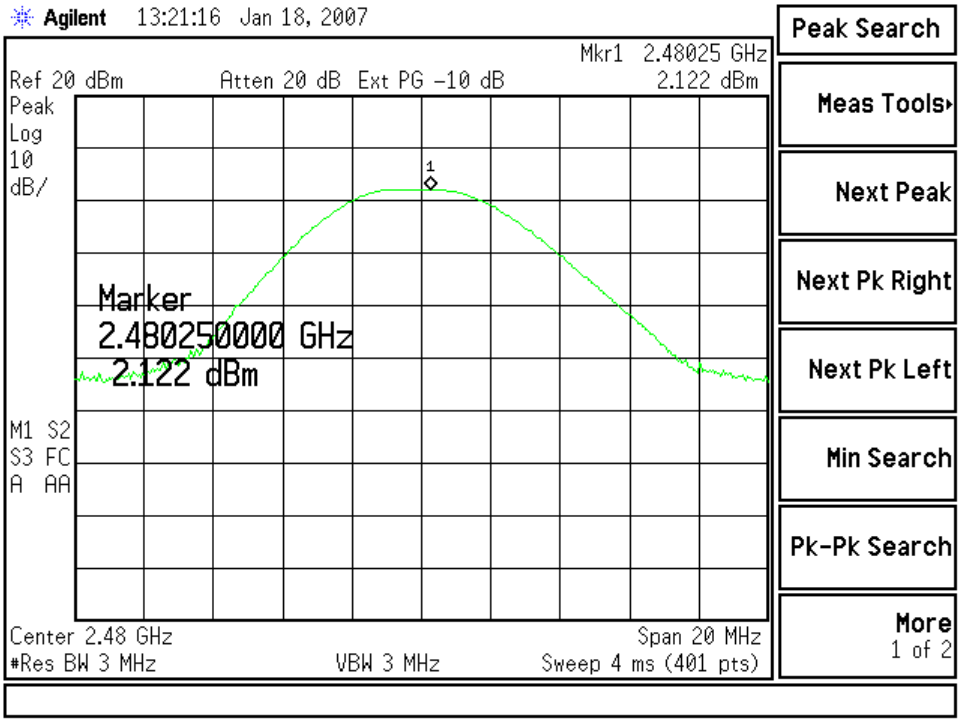


EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

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, and a power density measurement was performed. The highest density was found to be no greater than +1.7 dBm, which is under the allowable limit by 6.6 dB.

10.2 Test Equipment List

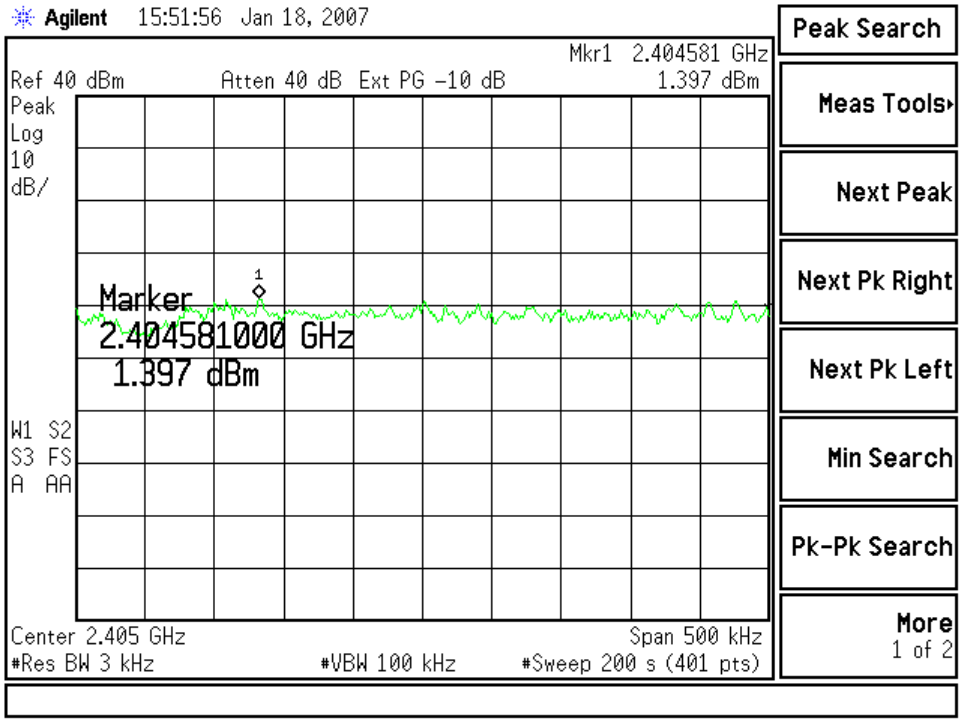
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256

10.3 Test Data

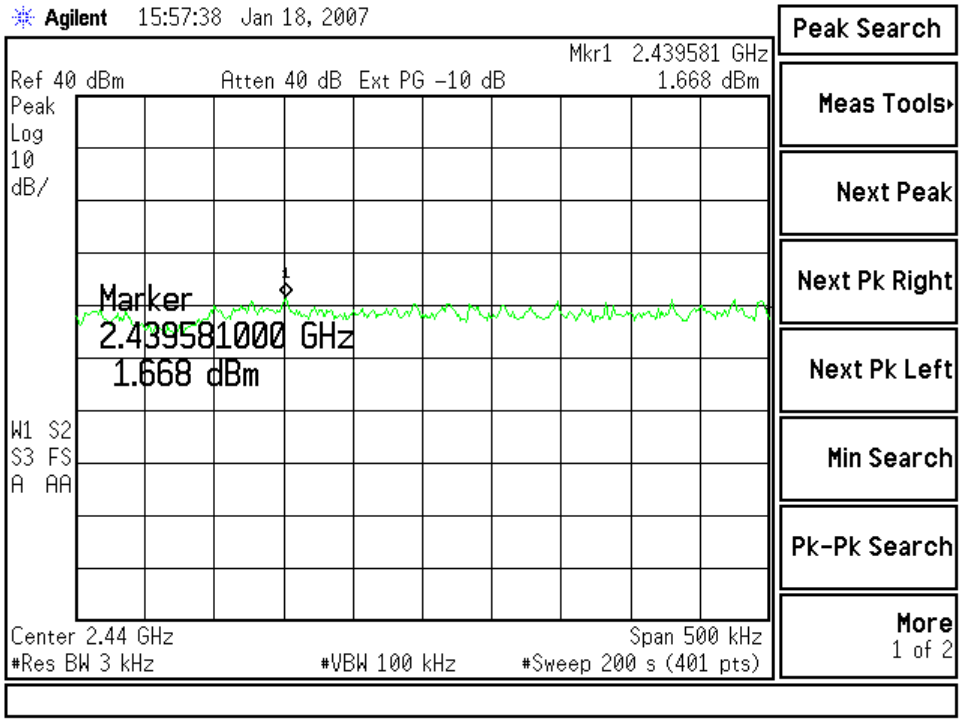
Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
0	2405	+1.4	8.0	6.6	Pass
7	2440	+1.7	8.0	6.3	Pass
14	2475	-1.1	8.0	9.1	Pass
15	2480	-8.7	8.0	16.7	Pass

10.4 Screen Captures – Power Spectral Density

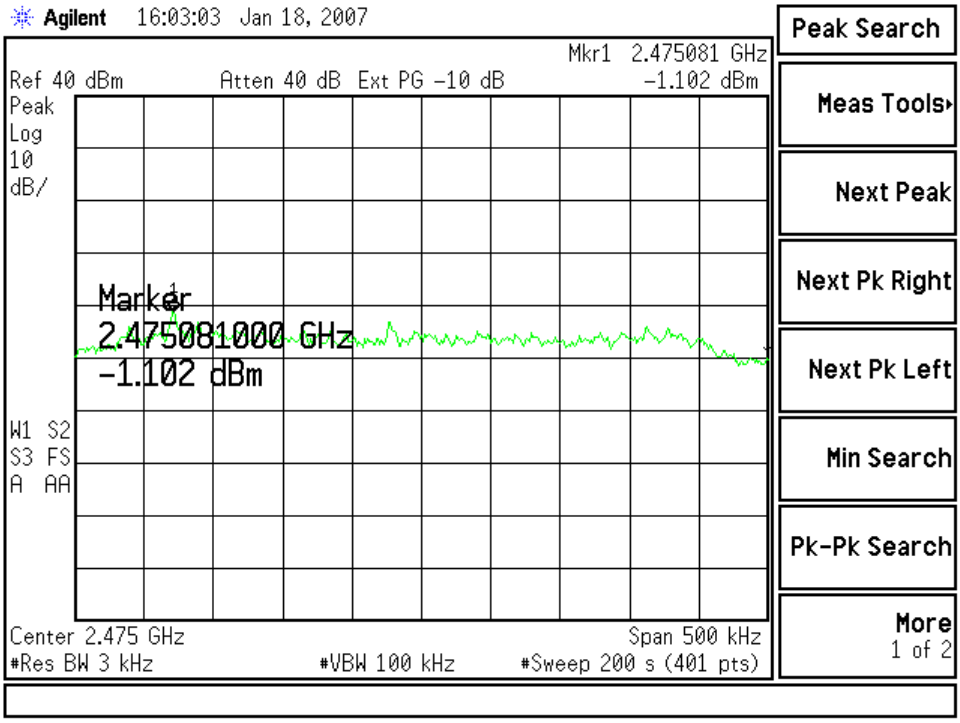
Channel 0



Channel 7



Channel 14



Channel 15

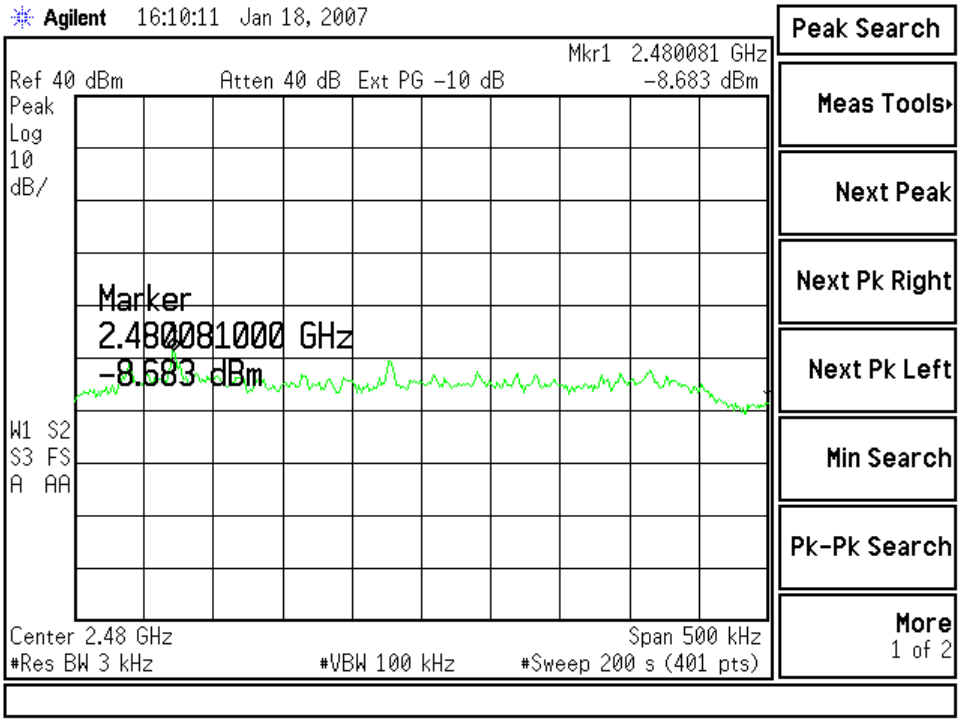


EXHIBIT 11. SPURIOUS RADIATED EMISSIONS: 15.247(d)

11.1 Limits

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 E4407B 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 -70 dBc of the fundamental level for this product.

11.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4407B	US39160256	To 26 GHz

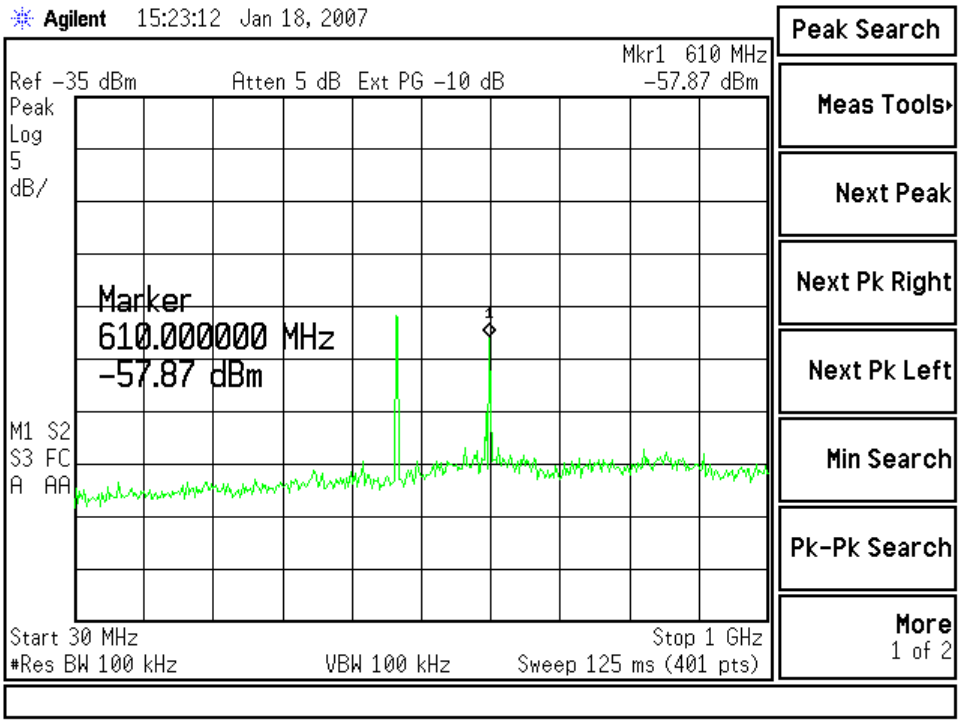
11.3 Test Data

	Channel 0	Channel 7	Channel 14	Channel 15
Fundamental	+12.6(dBm)	+ 12.4 (dBm)	+ 12.6 (dBm)	-1.2 (dBm)
2nd Harmonic	- 25.6 (dBm)	- 23.5 (dBm)	- 35.3 (dBm)	- 51.0 (dBm)
3rd Harmonic	- 57.1 (dBm)	- 54.7 (dBm)	- 53.8 (dBm)	- 70.5 (dBm)
4th Harmonic	- 41.5 (dBm)	- 44.1 (dBm)	- 68.1 (dBm)	Note (1)
5th Harmonic	- 54.1 (dBm)	- 51.0 (dBm)	- 70.4 (dBm)	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)

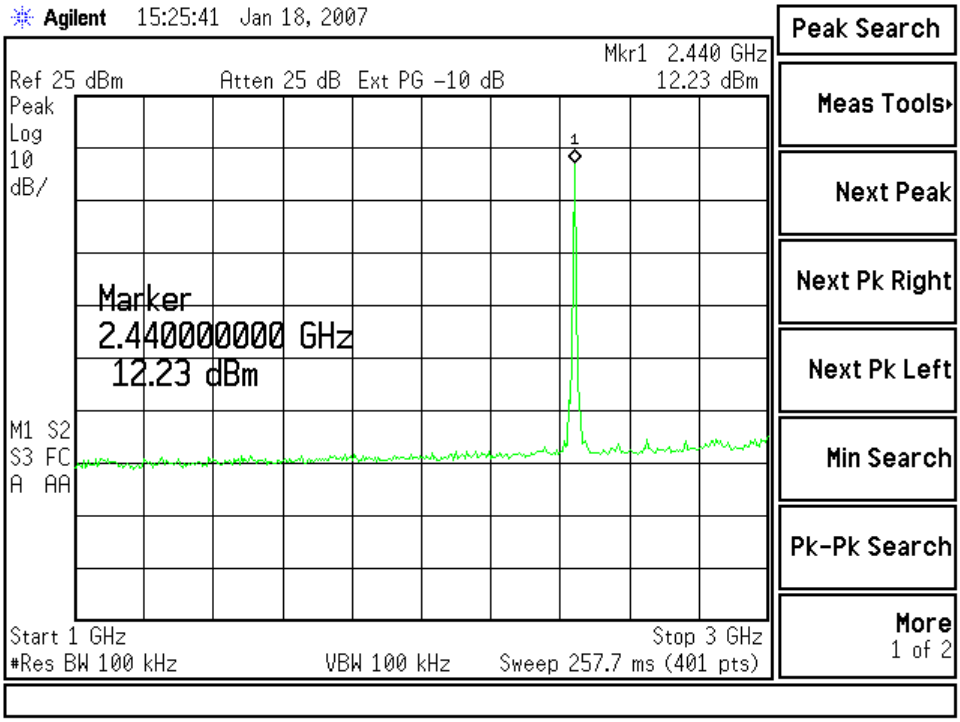
Notes:
(1) Measurement at system noise floor.

11.4 Screen Captures – Spurious Radiated Emissions

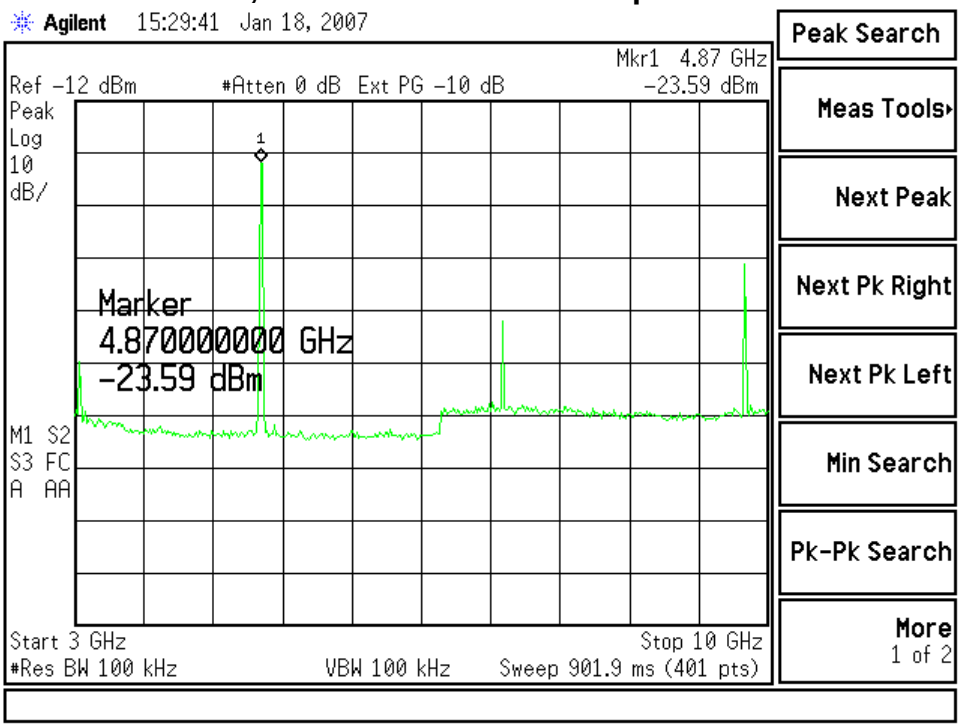
Channel 7 , shown from 30 MHz up to 1000 MHz



Channel 7, shown from 1000 MHz up to 3000 MHz



Channel 7, shown from 3000 MHz up to 10000 MHz



Channel 7, shown from 10000 MHz up to 25000 MHz

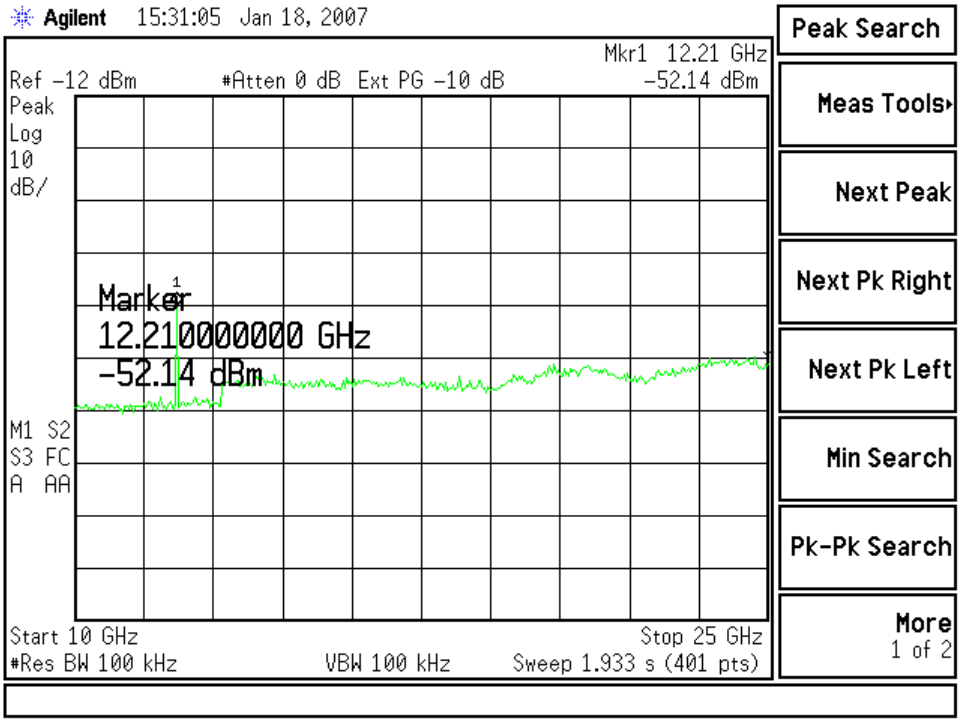


EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

In this case, the EUTwas powered by a 120 VAC adapter. 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. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=10 kHz settings while the voltage was varied.

	AC Voltage Source		
	102 VAC	120 VAC	138 VAC
Channel 0	2404.9500 (MHz)	2404.9500 (MHz)	2404.9500 (MHz)
Channel 7	2439.9500(MHz)	2439.9500(MHz)	2439.9500(MHz)
Channel 14	2474.9900(MHz)	2474.9900(MHz)	2474.9900(MHz)
Channel 15	2479.9900(MHz)	2479.9900(MHz)	2479.9900(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.

	AC Voltage Source		
	102 VAC	120 VAC	138 VAC
Channel 0	16.2 (dBm)	16.2 (dBm)	16.2 (dBm)
Channel 7	16.2 (dBm)	16.2 (dBm)	16.2 (dBm)
Channel 14	16.1 (dBm)	16.1 (dBm)	16.1 (dBm)
Channel 15	2.2 (dBm)	2.1 (dBm)	2.2 (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 0.1dB, during the voltage variation tests.

EXHIBIT 13. CHANNEL PLAN AND SEPARATION

Not Applicable to this device.

EXHIBIT 14. MPE CALCULATIONS

MPE Calculations are not applicable for this device. SAR Evaluation was required do to the proximity of typical use of the EUT to the human body.

SAR Evaluation test result data is located in test report UbiDuo SAR Report-REVISED.pdf

SAR Evaluation testing was performed by PC Test Engineering Laboratory, Inc. located at:

PC Test Engineering Laboratory, Inc.
6660-B Dobbin Road
Columbia Maryland 21045

Phone: 410-290-6652 or on the web at: http://www.pctestlab.com

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	12/6/06	12/6/07
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	7/26/06	7/26/07
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	7/20/06	7/20/07
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/4/06	12/4/07
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	11/16/06	11/16/07
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/29/05	9/29/06
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/29/05	9/29/06
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	2/01/06	2/01/07
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

Appendix B

Antenna Specification(s)

Not Applicable

Appendix C

Firmware and Setup Instructions

Pivot International Contact Information:

Jiri Orlt
Sr. Software Engineer
Pivot International
10916 Strang Line Road
Lenexa, Kansas 66215
U.S.A.

Direct: 913.312.6927
Main: 913.312.6900
Fax: 913.312.6901
Email: jorlt@pivotint.com

Operational Modes During Wireless Testing

To test typical wireless traffic between the test units do the following;

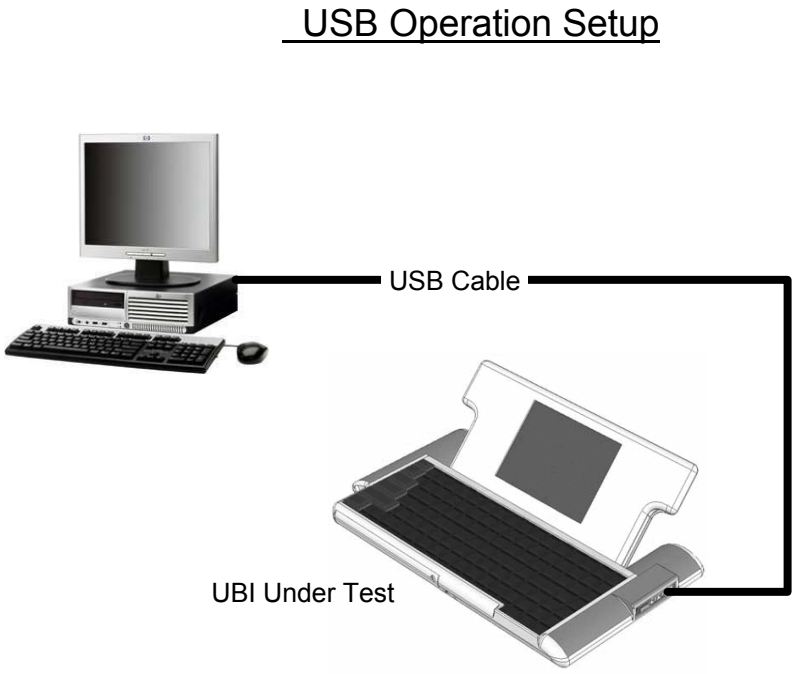
1. Power-up both UBIs
2. Once the main screen is displayed on both units a wireless chat can be initiated from either unit.
3. To start a wireless chat select the split icon on one of the powered-up units
4. Once the split chat screens are displayed on both units a wireless chat session is established.
5. Typing at the keyboard will transmit the typed characters over to the other unit.
6. To keep a steady stream of chat traffic a small weight can be placed on the keyboard, the key repeat will keep sending keys.
7. To stop the chat, press the <SHIFT> and <F6> keys together on both units.
8. This returns both units to normal steady state with just the beacon transmitting on the default channel.

To set different transmitter modes do the following;

1. Power-up the UBI
2. At the main menu screen press <Ctrl> and <F3>
3. The Test mode screen will appear and show the list of available tests that can be selected. Select test by using the arrow keys and enter key. The following tests bellow are pertinent to the Transmitter Tests;
    a. “Set Wireless Channel” – Selects the channel 0 to 15
    b. “Continuous RX” – Selects Continuous RX Mode
    c. “CW Mode” – Selects CW mode (Constant TX modulation)
    d. “TX No Mod” – Selects continuous TX mode with no modulation
    e. Set “Normal Wireless Mode” – Selects NORMAL Mode, the ID beacon is transmitted once a second on the default channel
    f. “Set PA On or Off" – Toggle PA_ON or PA_OFF
    g. “Set TX Power” – Set PA power level

h. Pressing the <Esc> key exits the test mode selection screen and displays the main screen.

Operational Mode During USB Cable Testing



To test compliance with the USB port in operation, do the following;

1. Make sure the PC is powered up and is running the operating system with the just the desktop, make sure no other applications are running.
2. Power-up the UBI
3. At the main menu screen press <Ctrl> and <F3>
4. The Test mode screen will appear and show the list of available tests that can be selected. Select a test by using the arrow keys and enter key.
5. To start the USB mode Select “USB Test” from the list.
6. The unit will display a dialog box to continue the USB test
7. Select OK to continue
8. Then the unit will display a dialog box to connect the USB cable to the PC.
9. Connect the USB cable from the UBI to an available USB port on the PC.
10. If it is the first time connecting the UBI USB cable to the PC the XP Operating system will detect a new USB device. If the driver is already loaded on the PC skip steps 11 to 21.
11. Follow the operating system instructions to add the new USB device.
12. The found new hardware wizard will pop-up.

13. Select Next to continue.
14. The “Found new hardware wizard pop-up” should have detected a USB Mass Storage Device. Make sure the “Search for suitable driver for my device” option is selected and then select next.
15. When the select location pop-up is displayed, unselect all optional search locations and select next.
16. The next pop-up should have found the default driver. [usbstor.inf]
17. Select next. When the Digital Signature pop-up is displayed select “Yes” to continue with the installation.
18. After the operating system is finished installing the driver close the Wizard by selecting finish.
19. When the Digital Signature pop-up is displayed select “Yes” to continue with the installation.
20. When the Digital Signature pop-up is displayed again just select “Yes” to continue with the installation.
21. The Op System Wizard will finish installing.
22. Start the Windows Explorer and expand the “my computer” list.
23. You should see a removable disk device in the list.
24. Select OK at the UBI
25. The UBI will display a dialog box to move file to UBI
26. At the PC copy the USB Test file from the Pivot supplied CD to the removable disk drive.
27. After copying the file to the removable disk drive on the PC, select OK at the UBI to confirm the file copy.
28. A dialog box will display to indicate that the data transfer from the PC to the UBI is in progress.
29. Pressing the <Esc> key or the <ENTER> key on the UBI exits the USB file transfer mode and the Test Menu is displayed.
30. To set the UBI into normal operating mode select Test 7.
31. This returns both units to normal steady state with just the beacon transmitting on the default channel
32. Once Test 7 is selected the main menu six icon screen will replace the test menu.

APPENDIX D.
MANUFACTURER DELCARATIONS

Jim,

This email is clarification of the operating modes for the UbiDuo.

Conversation Mode - The UbiDuo is a communication device that intended for deaf community who are for the most part highly skilled touch typist. The UbiDuo will allow the deaf to communicate with both the deaf and the hearing. The UbiDuo's will be positioned in front of the users so that up to four individuals can carry on a conversation by typing on the keyboards. This mode is employed when the device is operating from the internal batteries with no external cables attached.

Stationary Mode - The UbiDuo has the ability to have conversations with remote chat partners via a modem connection to the public switched telephone network. This connection is via a telephone patch cord from the UbiDuo to a standard wall phone jack. The UbiDuo has the ability to store conversations as log file. A USB cable can be connected between a PC and Ubi to transfer these files. UbiDuo has the ability to recharge it's internal batteries. This is accomplished by connecting to an external DC power supply. All of these functions require one or more cables to be attached to the device and are stationary operations and performed on a flat, horizontal work surface.

Regards,
Terry Muskopf - Project Manager
Pivot International, Inc.
10916 Strang Line Road
Lenexa, Kansas 66215-2322 USA
Phone: 913-312-6949
Fax: 913-312-6901
Email: tmuskopf@pivotint.com
www.PivotInt.com

Pivot International, Inc. has moved!

- **New street address:**

  10916 Strang Line Road
  Lenexa, KS 66215

- New **Main phone number**: **913-312-6900**
- New **Main fax number**: **913-312-6901**

From: Jiri Orlt [mailto:jorlt@pivotint.com]
Sent: Wednesday, February 21, 2007 12:01 PM
To: Brian Petted; Lesley Longstaff; Terry Muskopf
Subject: RE: Status

Brian

The approach you have setup is perfect. In normal use the USB is used very infrequently to upload new software to the UBI. Aidi was able to demonstrate that since he was successful in uploading the FCC test code. The user may only make a few software updates in the lifetime of the product.

DUTY FACTOR VERIFICATION:
The next step is to validate the Duty Factor. We will measure. However, Jiri please send a declaration/justification of the maximum transmit duty factor, this is essential to confirm before we start testing, since this sets the limit line.

DECLARATION OF MAXIMUM DUTY CYCLE:

The Ubi maximum throughput is limited by the the keyboard processor while a user is typing characters while in a chat with another Ubi. There is a parameter that can be set "DEFAULT KEY REPEAT". The user can press <ALT> + <F6> keys together and get to the dialog to set this parameter. The Key repeat options are FAST, MED, SLOW and OFF. The FAST setting results in the fastest repeat rate of holding down a key on the keyboard. With each repeat key pressed, a key press data message (26 bytes)is sent out from the Main processor to the wireless processor to betransmitted out over the air very 100 msec.

The 26 bytes is the maximum payload. The Transceiver chip (MC13192FC) processes this payload to form a packet that consists of a 4 Byte Preamble (PRE) + a 1 byte Start of Frame Delimiter (SFD) + a 1 byte Frame Length Indicator (FLI) + 2 bytes of the SMAC Code Word + the payload(26 bytes) + a 2 byte Frame Check Sequence (FCS).

TOTAL Bytes transmitted over the air = 36 bytes.

TOTAL Time to transmit 36 bytes:

Maximum Modulation Throughput = 250 kbits/second,

TOTAL Bits in Keypress message = 36 * 8 = 288 bits,

Total time of transmit of message = 1/250,000 * 288 = 0.001152 seconds = 1.152 msec

Maximum Duty Cycle:

Maximum Duty Cycle = 1.152 / 100 = 1.152 %

Thanks

Jiri.

Appendix E

Justifications of Average Duty Factor Calculations

Average (Relaxation) Factor

Average Factor = 20* Log_{10} (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies 1.7 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

Average Factor = 20* Log_{10} (1.7 ms / 100 ms) = -35.4 dB

A relaxation factor of 20 dB would be allowable for this product.

Screen capture verifying packet size.