LS Research, LLC

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TEST REPORT #: 306439 TX TCB v4

Compliance Testing of:
CHV-TSTATRF

Test Date(s):
August 16th, 17th and 23rd, 2006

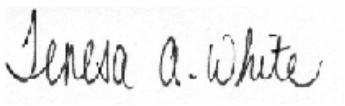
Prepared For:

Crestron Electronics, Inc.
6 Volvo Drive
Rockleigh, NJ 07647

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: August 30, 2006

Test Report Prepared by:	**Tested by:**
Teresa A. White, Document Coordinator	Khairul Aidi Zainal, EMC Engineer
Signature: 	Signature: 
Date: August 30, 2006	Date: August 30, 2006

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LSC Revision Control

Date	Revision #	Revised By
Aug 19th 2006	Version 0	
Sept. 1, 2006	Version 1	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:	**Crestron**
Address:	**6 Volvo Drive, Rockleigh, NJ 07647**
Contact Person:	**Sam Yogasuntharam**
Contact Phone:	**201-750-7004 x11350**
Contact Email:	**syoga@crestron.com**

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	infiNET
Model Number:	CHV-TSTATRF
Serial Number:	1

2.3 ASSOCIATED ANTENNA DESCRIPTION

The antenna used on the Crestron infiNET Thermostat is a 2.4 GHz ISM-band chip style antenna permanently mounted onto the PCB. The antenna is manufactured by Yageo (Part number: 4311-111-00245) and has a declared maximum gain of 1.2 dBi with linear polarization.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	2.4 GHz to 2.4835 GHz inclusive.
RF Power in Watts	0.012
Field Strength (and at what distance)	109.2 dBµV at 1m
Occupied Bandwidth (99% BW)	4.3 MHz
Type of Modulation	MSK
Emission Designator	F1D4M30
Transmitter Spurious (worst case)	61.3 dBµV at 7425 MHz (1m)
Frequency Tolerance %, Hz, ppm	< 100 ppm
Microprocessor Model # (if applicable)	ATMEG128L
EUT will be operated under FCC Rule Part(s)	15.247, 15.205, 15.207,15.209 IC: RSS-GEN and 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

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: RSS 210, FCC 15.247
- Measurement Distance: 1m
- RF Value: 0.29 ☒ V/m ☐ A/m ☐ W/m^2
  ☒ Measured ☐ Computed ☐ Calculated

2.5 PRODUCT DESCRIPTION

The infiNET Thermostat is a wall mounted, battery powered, wireless thermostat operating in the 2.4 GHz ISM band from 2.4GHz to 2.4835 GHz. In operation, the unit communicates to a gateway unit which itself would be connected to a HVAC equipment with wire lines. The unit can, however, operate with a wired connection (8 contact closure ports) to HVAC equipment and has a provision for wired interface. The type of modulation is MSK Direct Sequence Spread Spectrum per IEEE 802.15.4 standards. The assigned channels range from 2.405 GHZ to 2.480GHz inclusive with 5MHz increments. The occupied bandwidth is assigned as 3MHz. There are no external ports to accept a data terminal.

Power to the product is supplied by 2 AA alkaline batteries. Internal to the unit, a DC-DC voltage regulator provides constant 3.3 VDC to the electronics with allowance for a wide variation on the battery voltage.

PHOTO

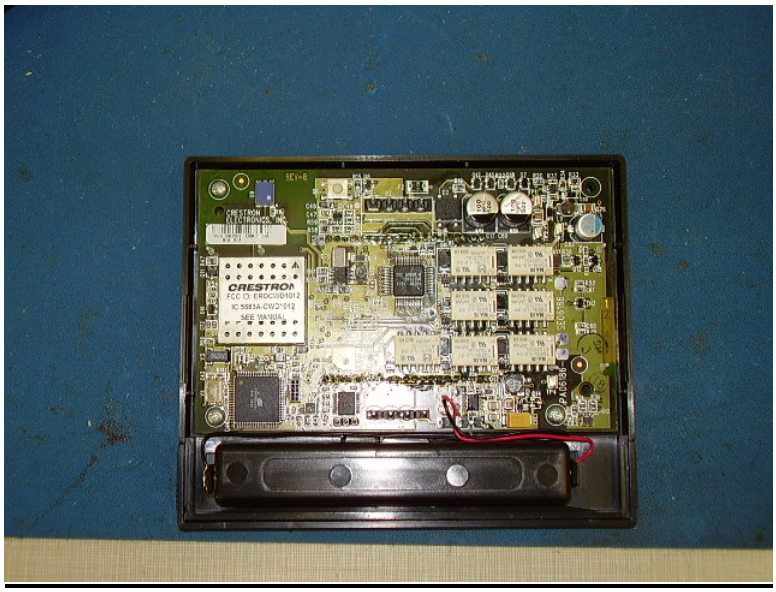


EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	72º Fahrenheit
Humidity:	51%
Pressure:	746.9 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 transmit PA level was set to 22 for channels 11 to 25 while on channel 26, the transmit PA level was set to 4.

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ **None** ☐ **Yes (explain below)**

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 final testing was performed using Continuous transmit mode, using power as provided by two (2) AA alkaline battery. The unit has the capability to operate on 16 channels, controllable via buttons on the faceplate of the EUT. 4 buttons are used to control the transmit/receive function, modulation function, power setting and channel.

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 four (4) standard channels: low (2405 MHz), middle (2440 MHz), high (2475 MHz) and final (2480 MHz) to comply with FCC Part 15.35. The channels and operating modes were changed using a button on the faceplate of 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 1000 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 at 1.0 meter separation. 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 battery voltage was checked frequently, and the batteries were replaced as necessary.

The EUT was rotated along three orthogonal axis 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). From 1 GHz to 18 GHz, an HP E4446A Spectrum Analyzer and an EMCO Horn Antenna were used with a resolution bandwidth of 1 MHz (video bandwidth 1MHz). From 18 GHz to 25 GHz, the HP E4407B Spectrum Analyzer with a standard gain horn, and preamp were used.

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 (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.

5.5 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)
30-88	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 25000 MHz

Manufacturer:	Crestron			
Date(s) of Test:	August 16th to August 17th and August 23rd 2006			
Test Engineer(s):	Khairul Aidi Zainal			
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		Other:
EUT Placement:	√	80cm non-conductive table		10cm Spacers
EUT Test Location:	√	3 Meter and 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	Channel	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.205 Limit (dBμV/m)	Margin (dB)
220.6	V/V	26	1.00	253	38.8	46.0	7.2
227.5	V/V	25	1.00	280	36.9	46.0	9.1
301.0	V/V	26	2.19	167	32.0	46.0	14
307.0	V/V	11	2.17	164	30.1	46.0	15.9
311.0	V/V	18	1.00	247	31.5	46.0	14.5

Note: 1. All other spurious emissions are better than 15 dB below limit.
2. Spurs listed above are present in all channels.

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
2405	H/S	1.00	338	108.8	134.8	26
4810	H/V	1.00	330	49.8	63.5	13.7
7215	V/V	1.26	330	54.8	88.8	34
9620	H/S	1.08	166	62.3	88.8	26.5
12025	H/S	1.00	128	45.5	63.5	18
14430	H/S	1.00	164	43.6	88.8	45.2
16835				Note 3		
19240				Note 3		
21645				Note 3		
24050				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 18:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
2440	H/S	1.00	342	107.3	134.8	27.5
4880	H/V	1.00	237	49.8	63.5	13.7
7320	V/V	1.00	184	53.1	63.5	10.4
9760	H/S	1.08	166	62.3	87.3	25
12200	H/S	1.00	119	46.0	63.5	17.5
14640	H/S	1.00	164	42.1	87.3	45.2
17080				Note 3		
19520				Note 3		
21960				Note 3		
24400				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 25:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
2475	H/S	1.00	333	109.2	134.8	25.6
4950	H/V	1.00	0	50.2	63.5	13.3
7425	V/V	1.29	357	61.3	63.5	2.2
9900	H/S	1.00	147	58.6	89.2	30.6
12375	H/S	1.00	113	41.4	63.5	22.1
14850	H/S	1.00	161	39.9	89.2	49.3
17325				Note 3		
19800				Note 3		
22275				Note 3		
24750				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 26:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
2480	H/S	1.00	337	96.3	134.8	38.5
4960	H/V	1.00	0	50.1	63.5	13.4
7440	V/V	1.00	0	31.6	63.5	31.9
9920				Note 3		
12400				Note 3		
14880				Note 3		
17360				Note 3		
19840				Note 3		
22320				Note 3		
24800				Note 3		

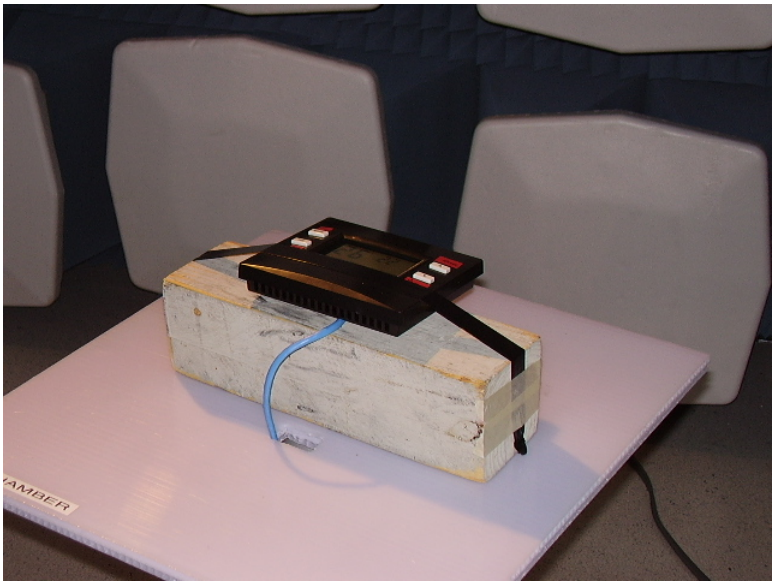
Note:

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.

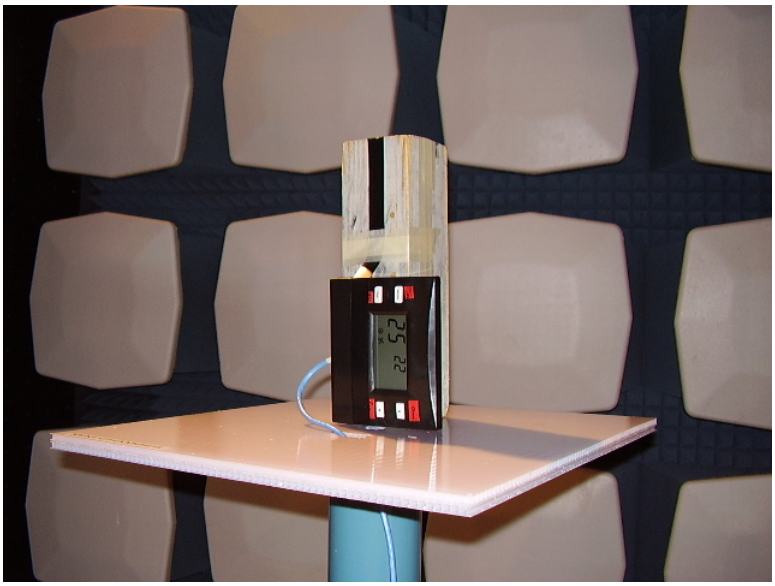
5.7 Test Setup Photo(s) – Radiated Emissions Test

Vertical Orientation

Horizontal Orientation



Side Orientation

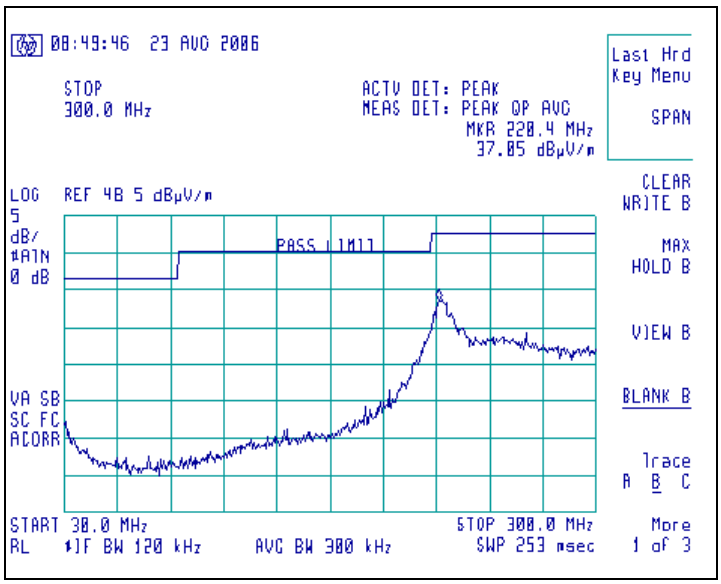


5.8 Screen Captures - Radiated Emissions Testing

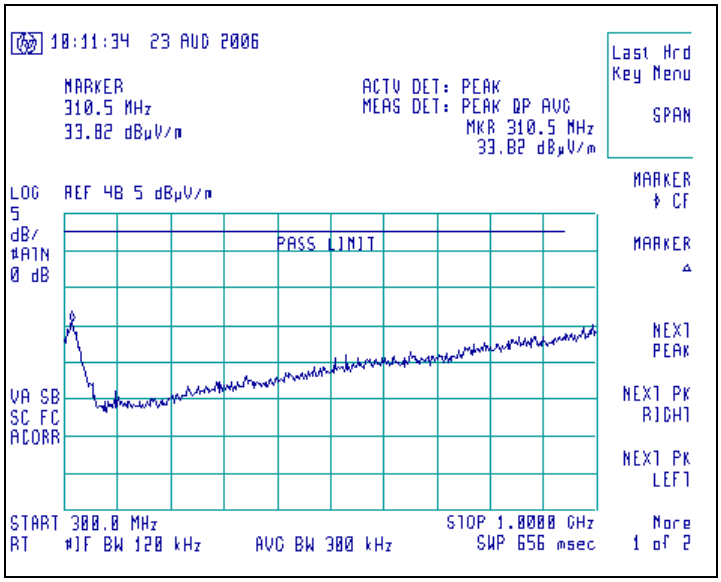
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 11, 18, 25 or 26 with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Channel 26, Antenna Horizontally Polarized, 30-300 MHz, at 3m

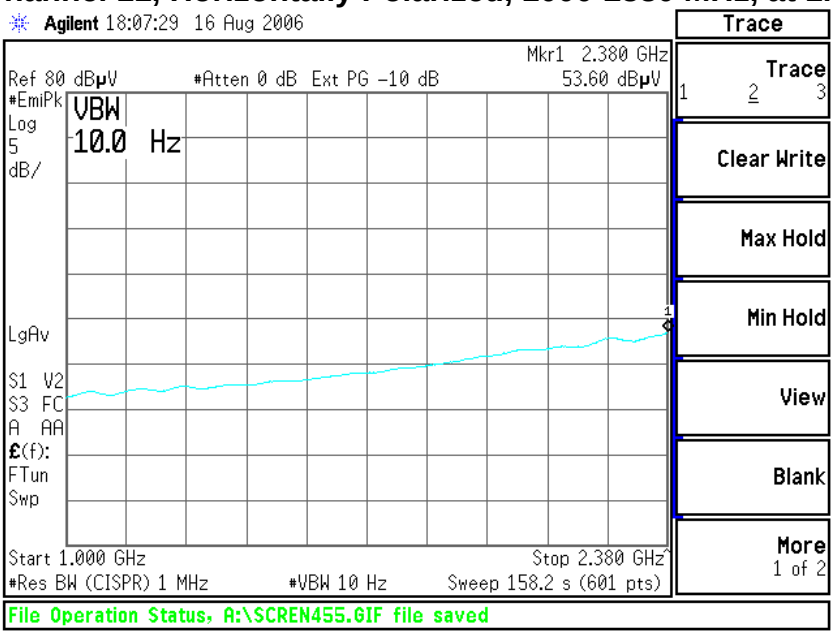


Channel 11, Antenna Vertically Polarized, 300-1000 MHz, at 3m

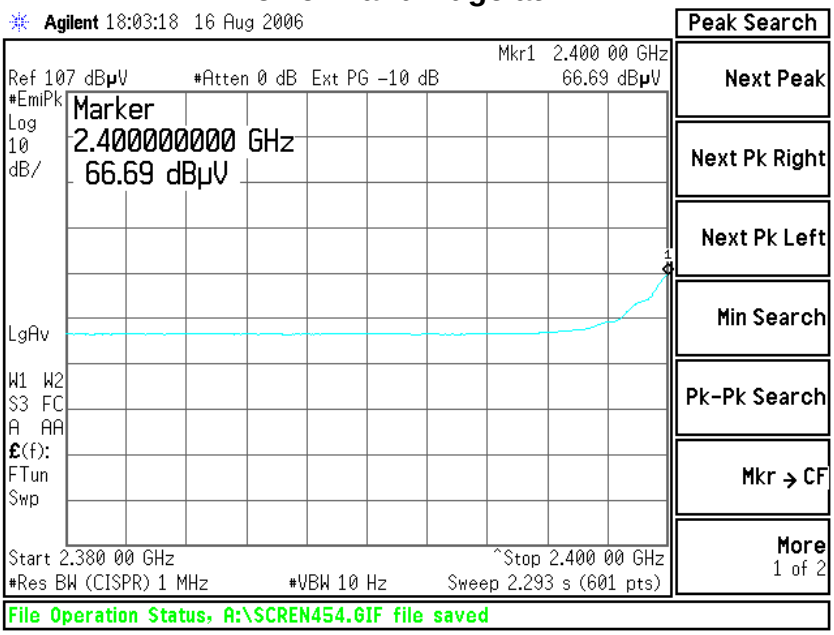


Screen Captures - Radiated Emissions Testing ***(continued)***

Channel 11, Horizontally Polarized, 1000-2380 MHz, at 1m



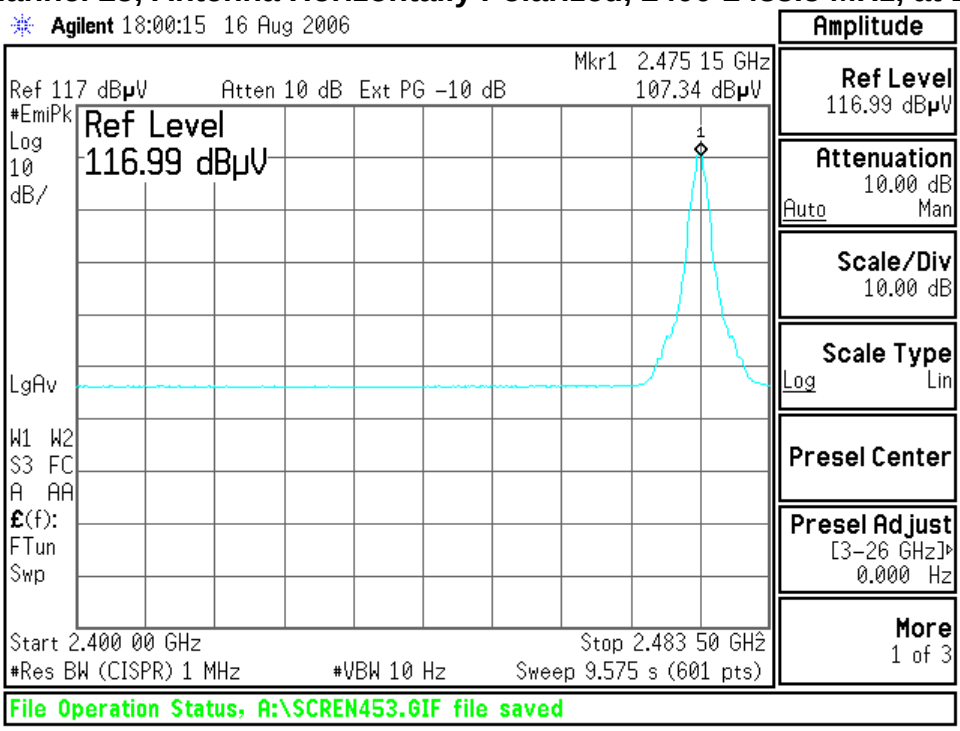
Channel 11, Antenna Horizontally Polarized, 2380-2400 MHz, Lower Band Edge at 1m



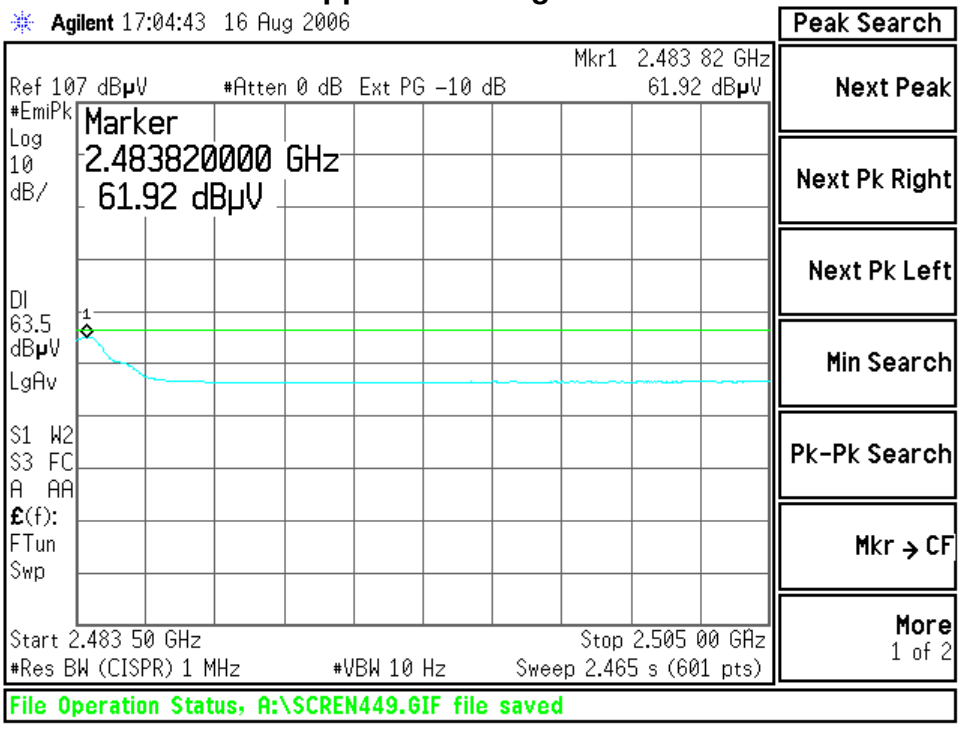
Note: The restricted band limit at 1 meter is 63.5 dBµV/m. 5 boxes below the reference is at 57 dBµV/m. In the range of 2380 MHz to 2390 MHz (5 boxes left of 2380MHz), it shows that emissions in that range is below the limit by at least 5 dB.

Screen Captures - Radiated Emissions Testing *(continued)*

Channel 25, Antenna Horizontally Polarized, 2400-2483.5 MHz, at 1m

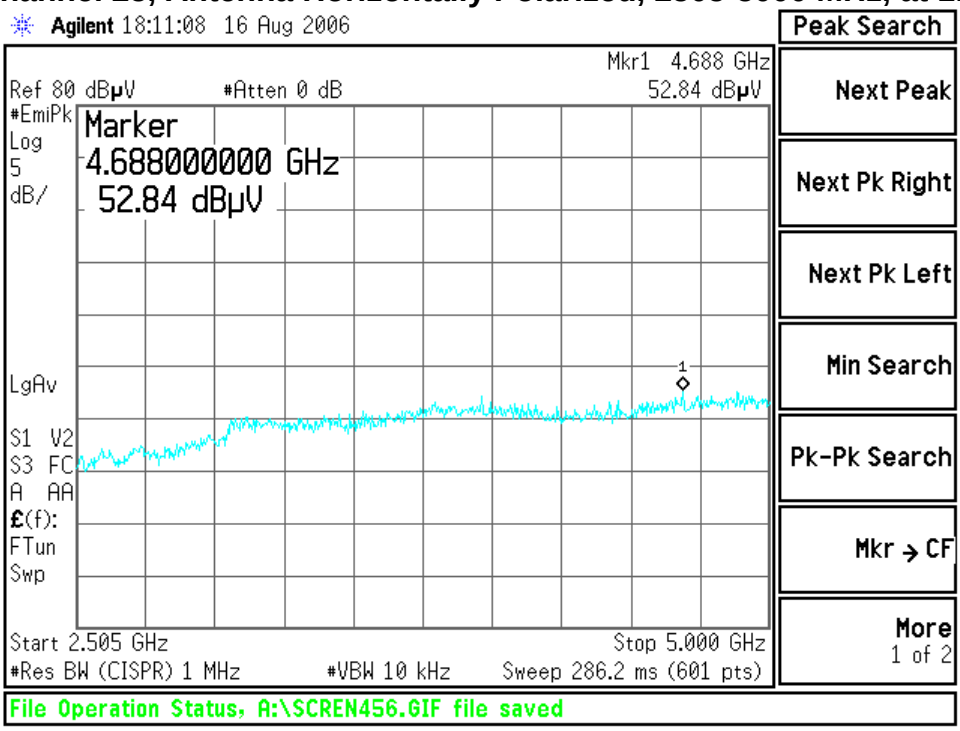


Channel 25, Antenna Horizontally Polarized, 2483.5-2505 MHz, Upper Band Edge at 1m

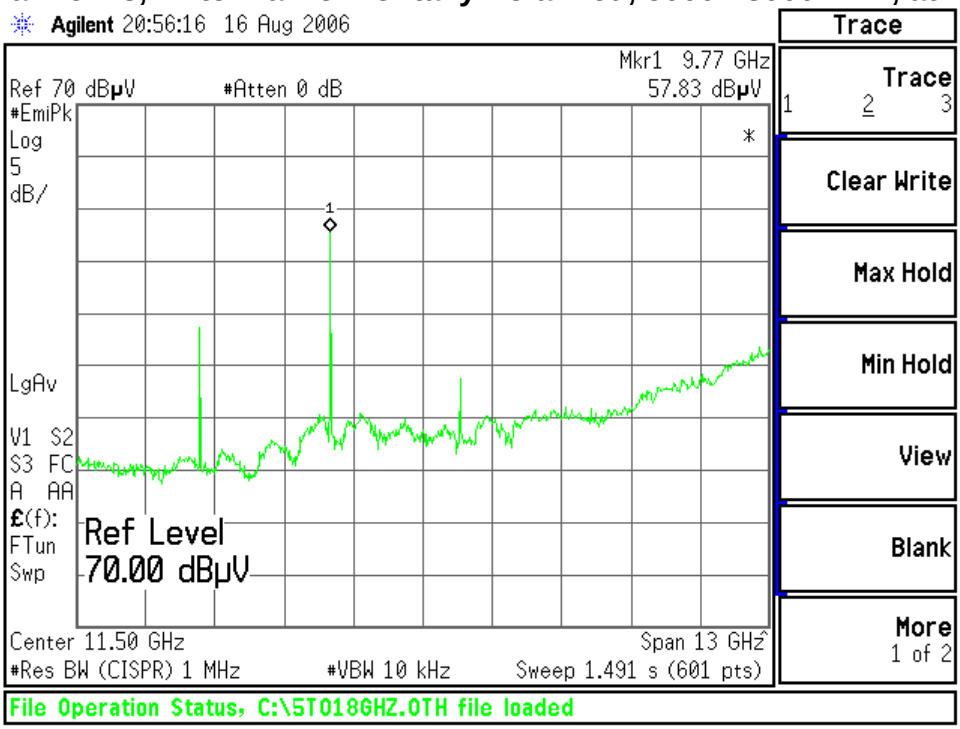


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 25, Antenna Horizontally Polarized, 2505-5000 MHz, at 1m



Channel 18, Antenna Horizontally Polarized, 5000-18000 MHz, at 1m



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

Channel 18, Antenna Horizontally Polarized, 18000-25000 MHz, at 30cm

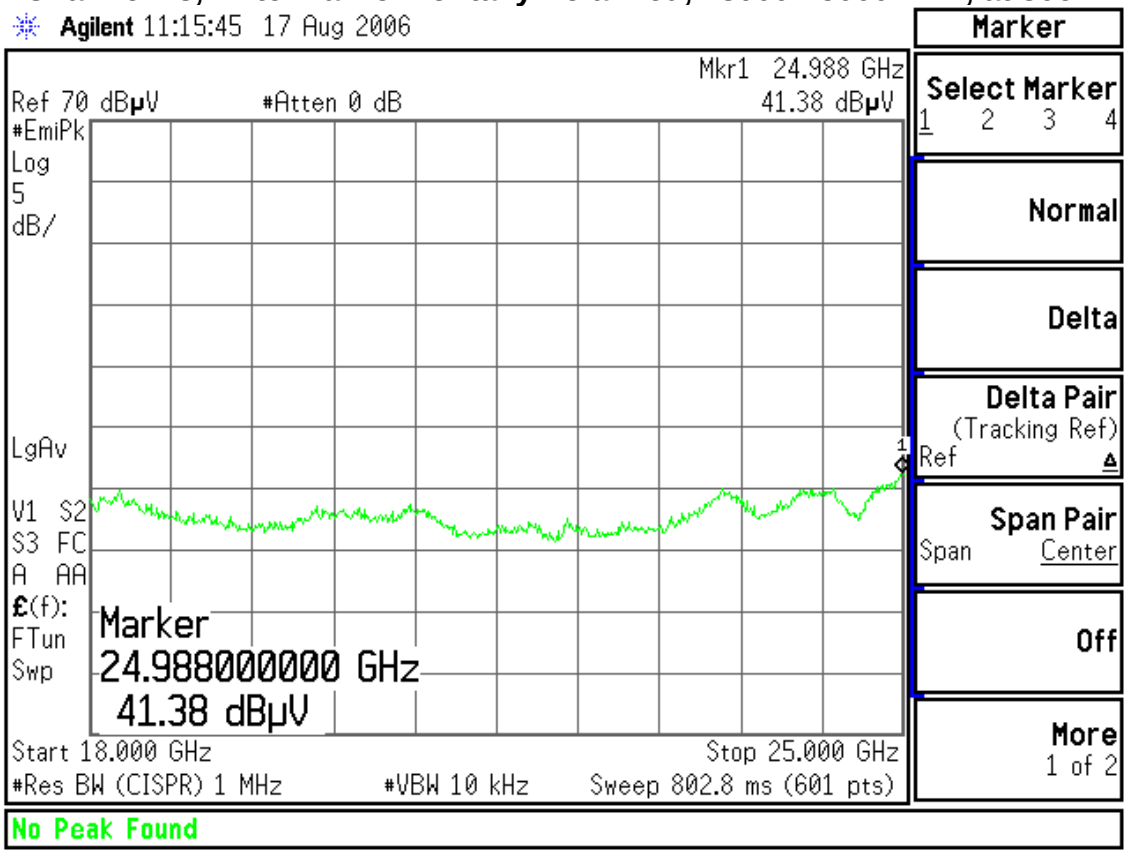


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

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 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 inside the 3 Meter Semi-Anechoic Chamber 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.
Since the EUT runs on 24VAC supply, a generic step-down transformer (120VAC – 24VAC) was used. The transformer was plugged into the 16Amp LISN while the EUT was connected to the transformer. Transformer number: TC 7609511

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:	Crestron					
Date(s) of Test:	December 11th 2006					
Test Engineer:	Khairul Aidi Zainal					
Model #:	CHV-TSTATRF					
Serial #:	1					
Voltage:	27 VAC					
Operation Mode:	Continuous transmit					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	AC Mains Conducted Test Area				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

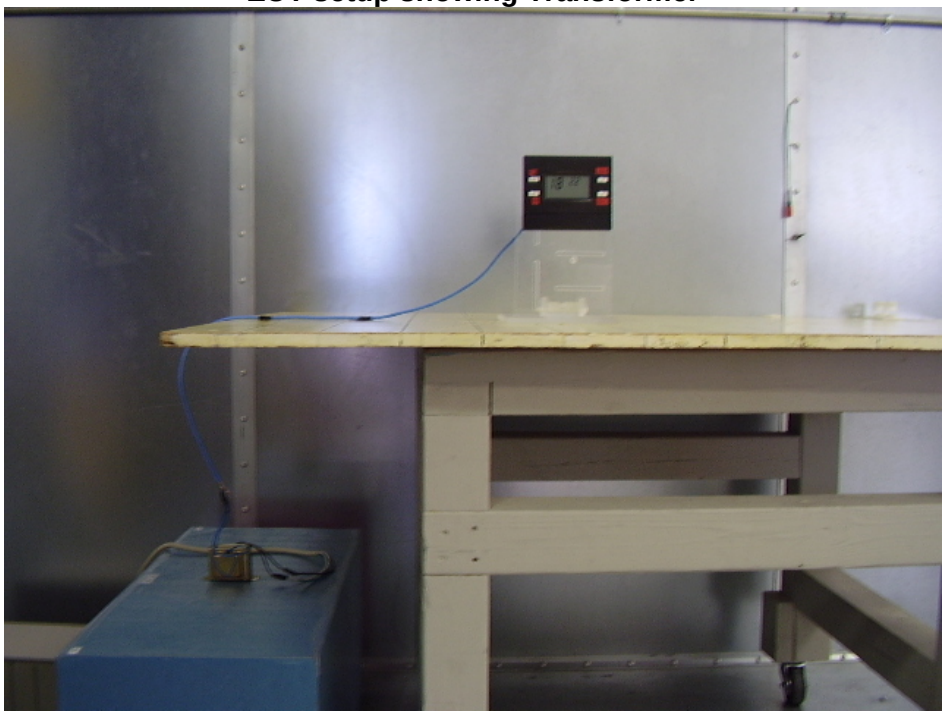
		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
0.328	L1	35.0	59.5	24.5	22.2	49.5	27.3
0.368	L1	37.6	58.5	20.9	26.2	48.5	22.3
0.565	L1	20.1	56.0	35.9	2.6	46.0	43.4
0.258	L2	35.6	61.5	25.9	24.1	51.5	27.4
0.333	L2	37.8	59.4	21.6	26.3	49.4	23.1
0.663	L2	25.3	56.0	30.7	14.4	46.0	31.6

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 and High channels tested.

6.6 Test Setup Photo(s) – Conducted Emissions Test

EUT setup showing Transformer



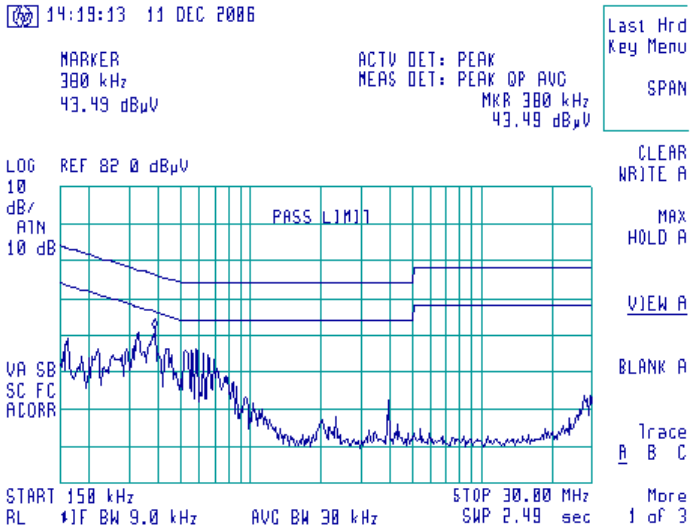
Transformer used to power EUT

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 18, chosen as being a good representative of channels.

Channel 18, 2440 MHz, Line 1



Channel 18, 2440 MHz, Line 2

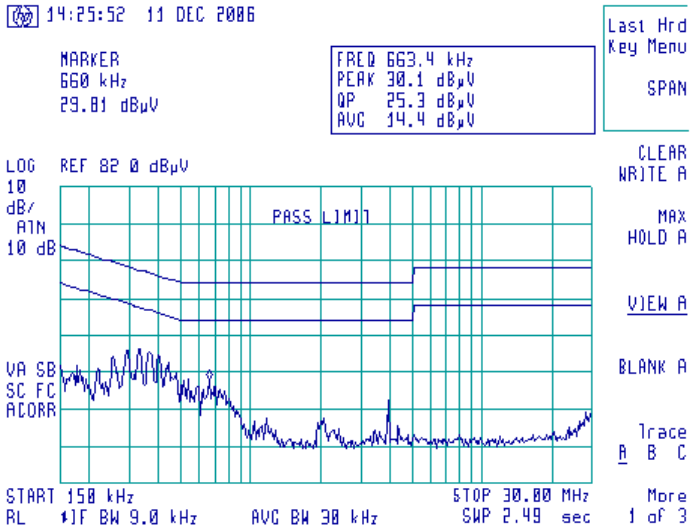


EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(2)

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 made the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 1 MHz 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 1.9MHz, which is above the minimum of 500 kHz.

7.3 Test Data

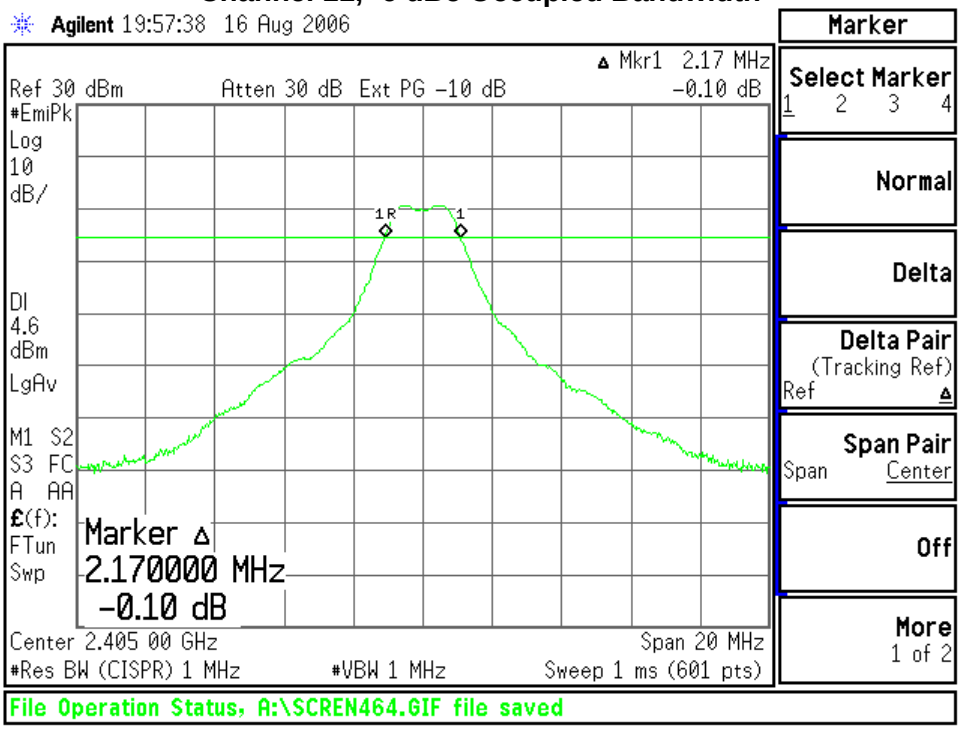
Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (MHz)	Minimum -6 dBc Limit (MHz)	Measured -20 dBc Occ.Bw (MHz)
11	2405	2.2	.500	4.0
18	2440	2.2	.500	4.3
25	2475	2.2	.500	4.2
26	2480	1.9	.500	4.0

7.4 Test Equipment List

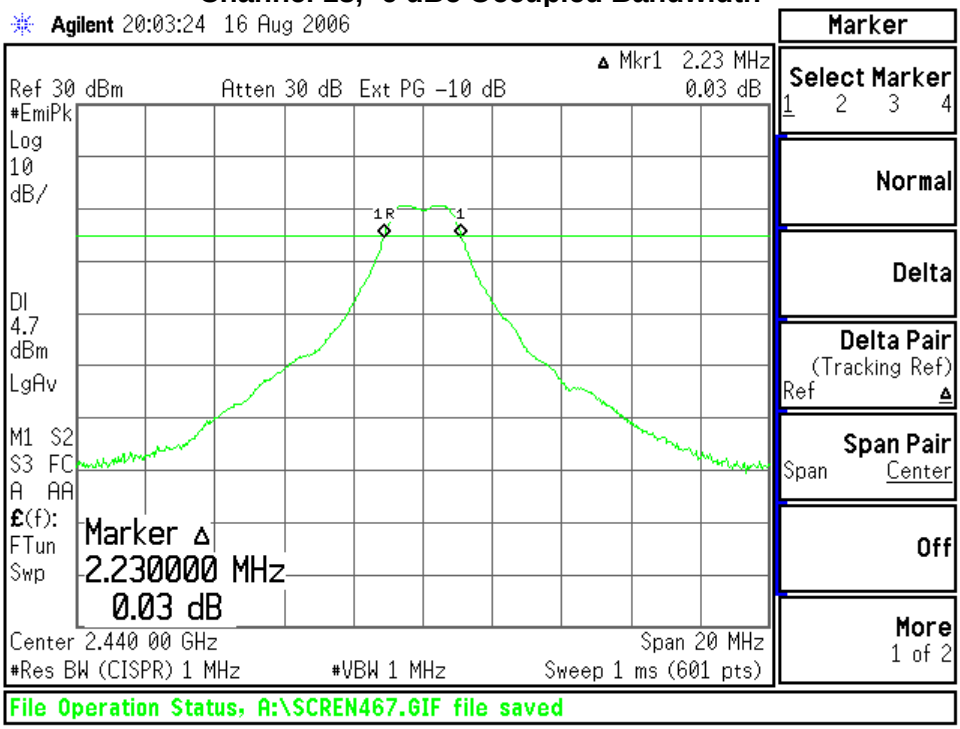
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

7.5 Screen Captures - OCCUPIED BANDWIDTH

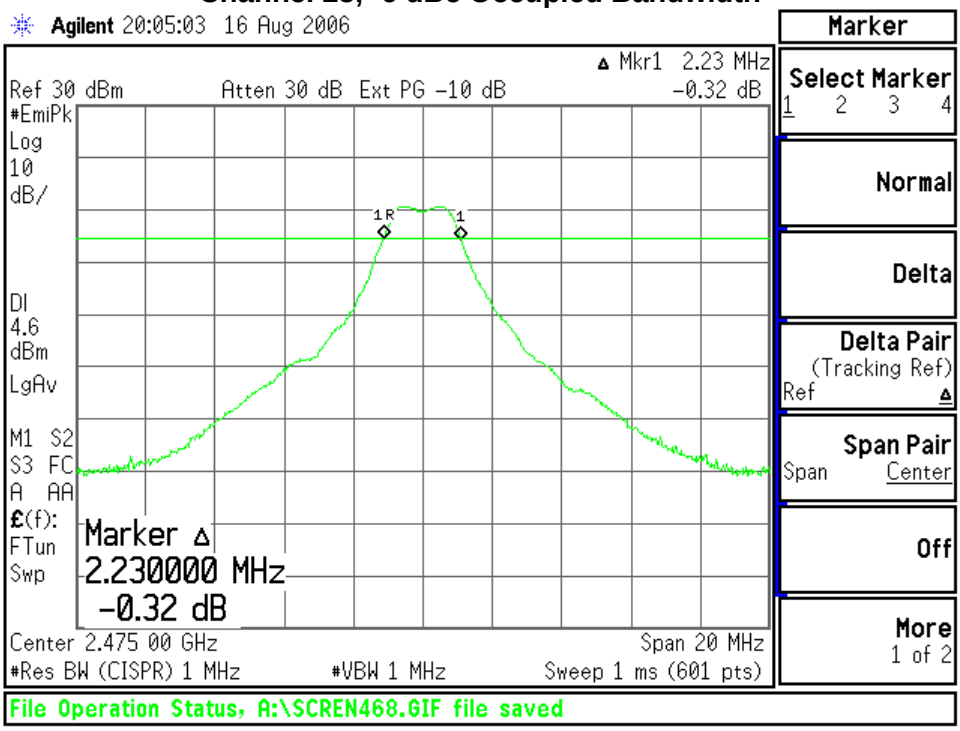
Channel 11, -6 dBc Occupied Bandwidth



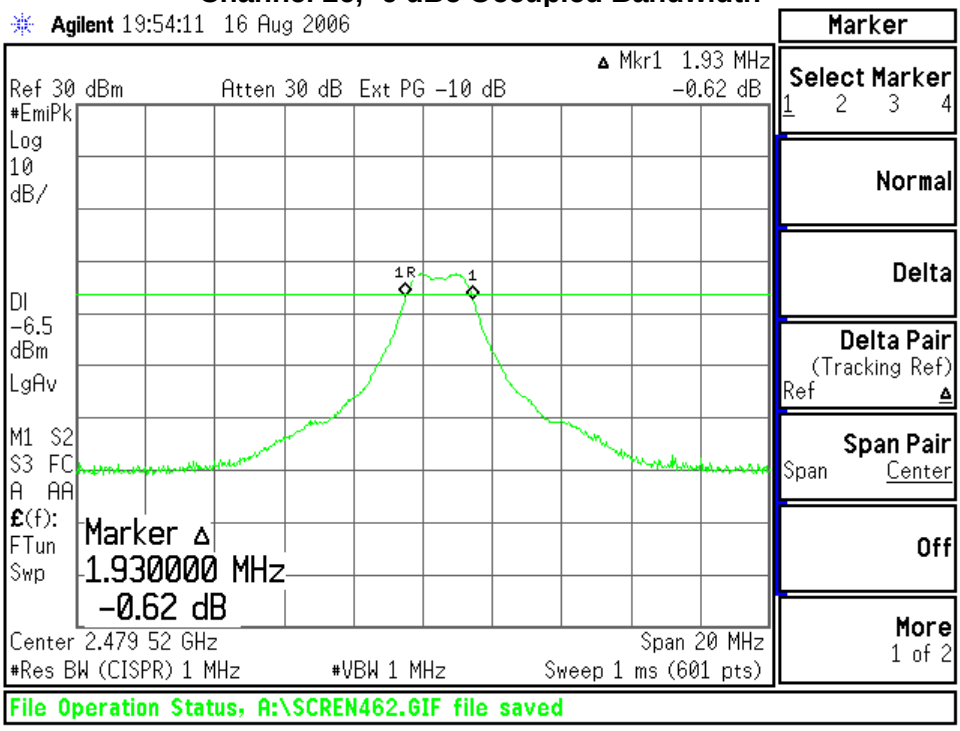
Channel 18, -6 dBc Occupied Bandwidth



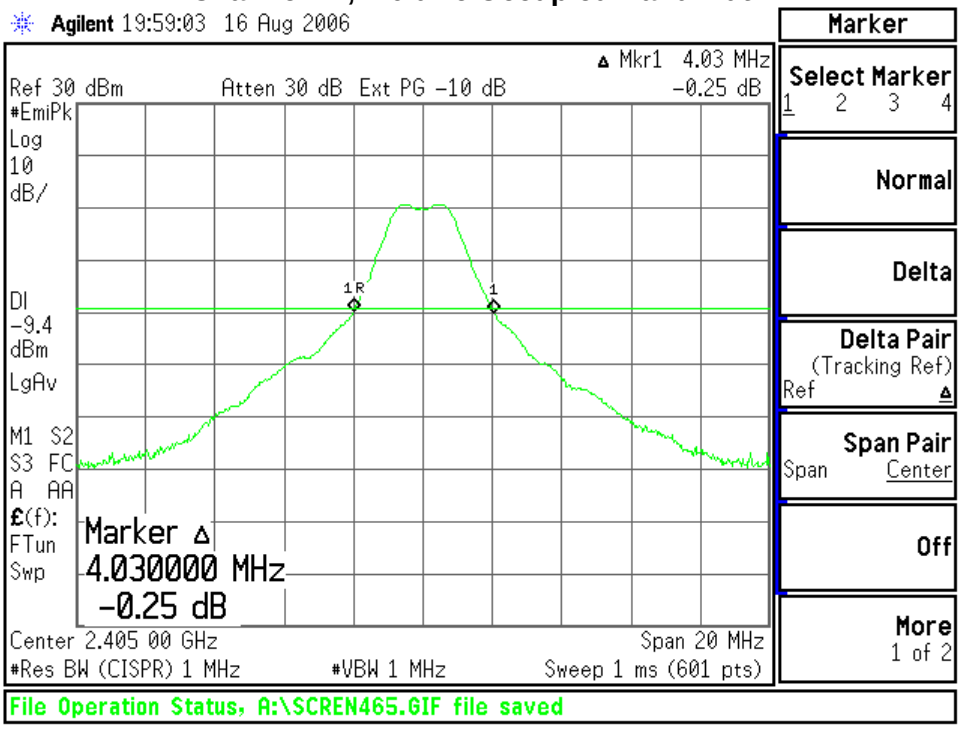
Channel 25, -6 dBc Occupied Bandwidth



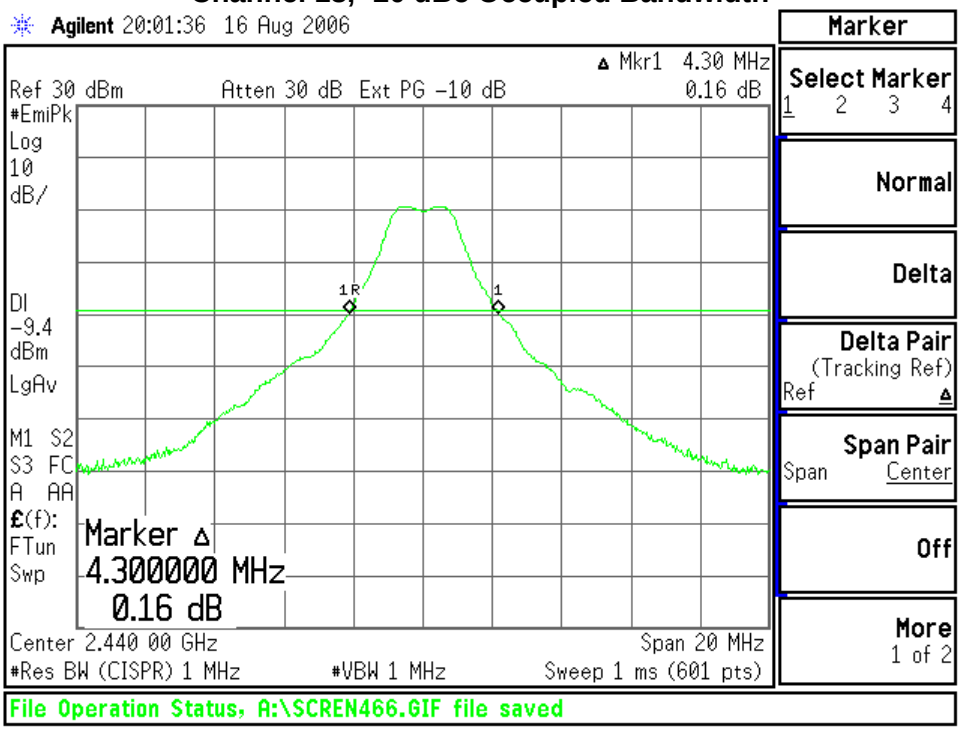
Channel 26, -6 dBc Occupied Bandwidth



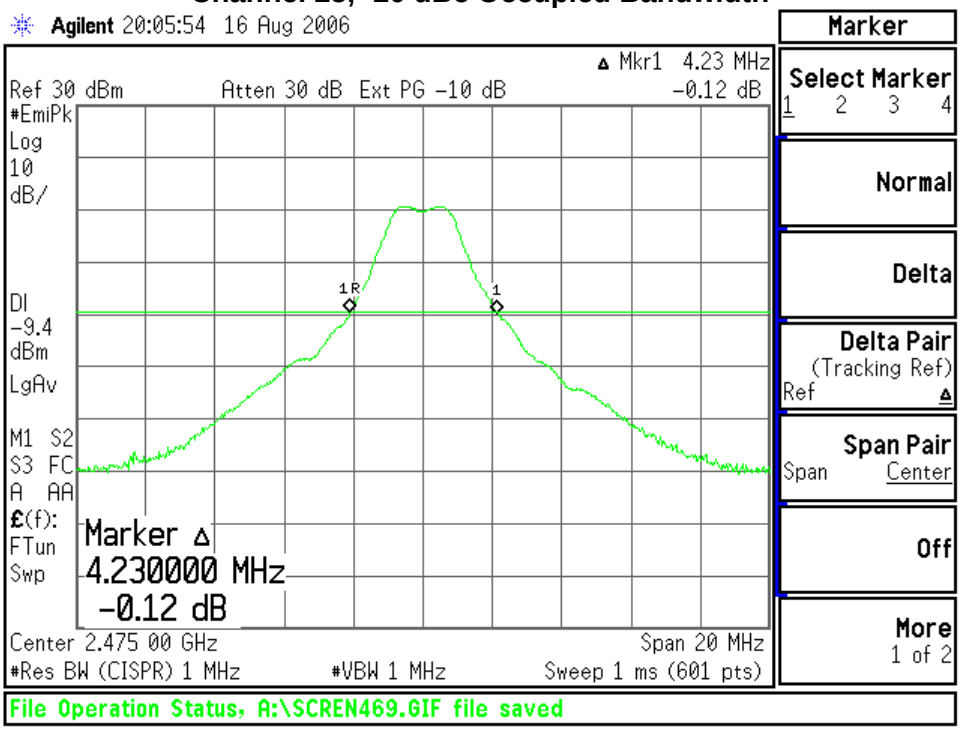
Channel 11, -20 dBc Occupied Bandwidth



Channel 18, -20 dBc Occupied Bandwidth



Channel 25, -20 dBc Occupied Bandwidth



Channel 26, -20 dBc Occupied Bandwidth

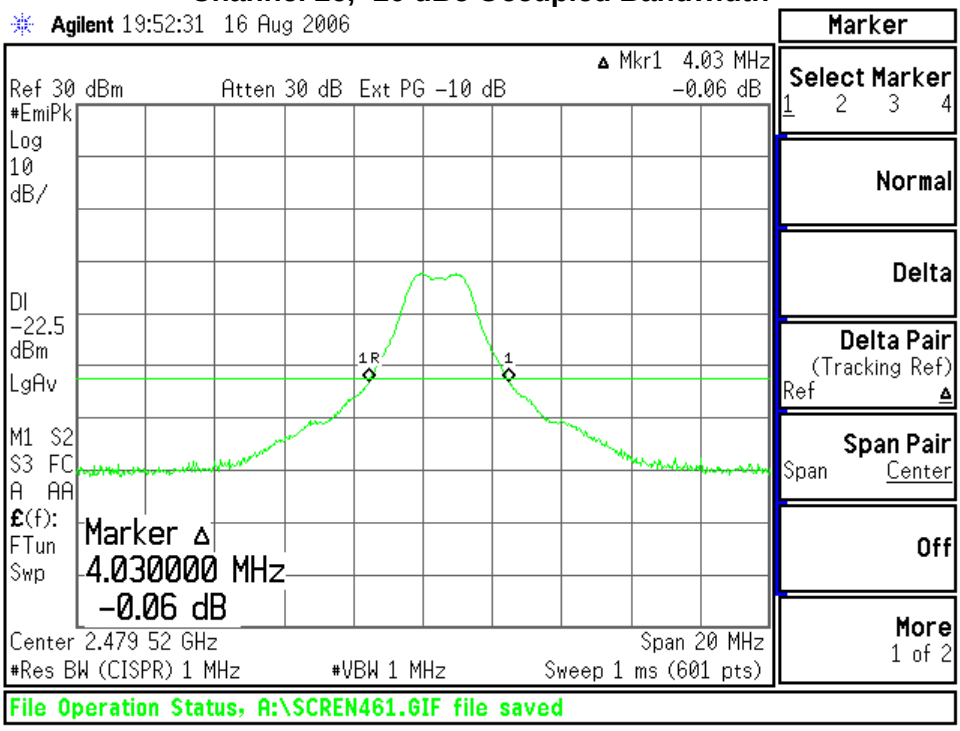


EXHIBIT 8. BAND-EDGE MEASUREMENTS

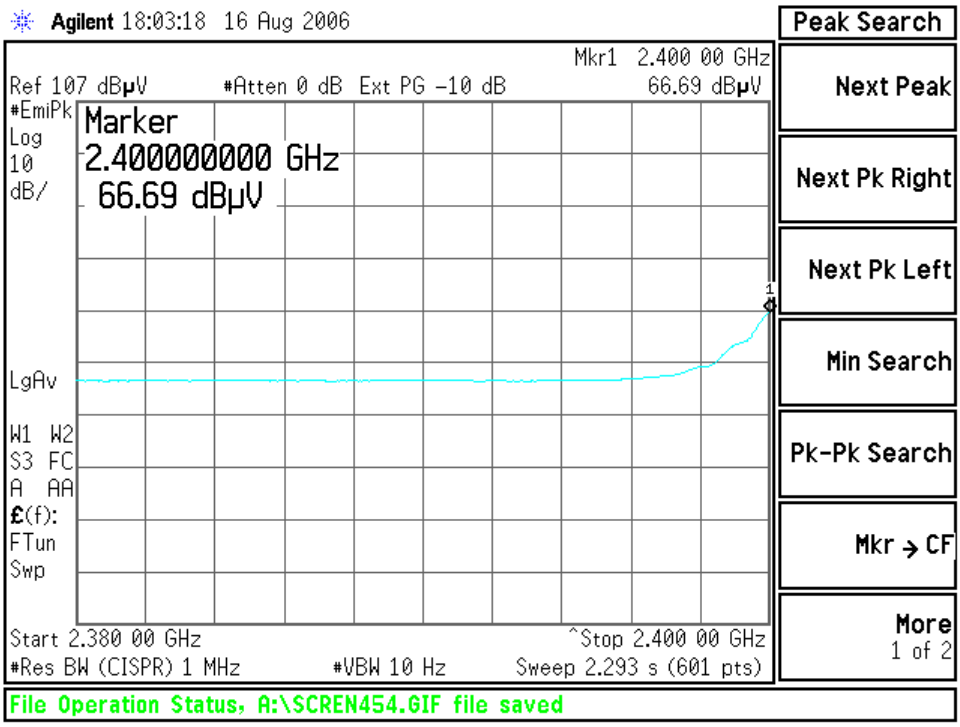
8.1 Method of Measurements

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 + 88.8 dBµV/m at 1m.

The Upper Band-Edge limit, in this case, would be + 63.5 dBµV/m at 1m.

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Capture Demonstrating Compliance at the Higher Band-Edge

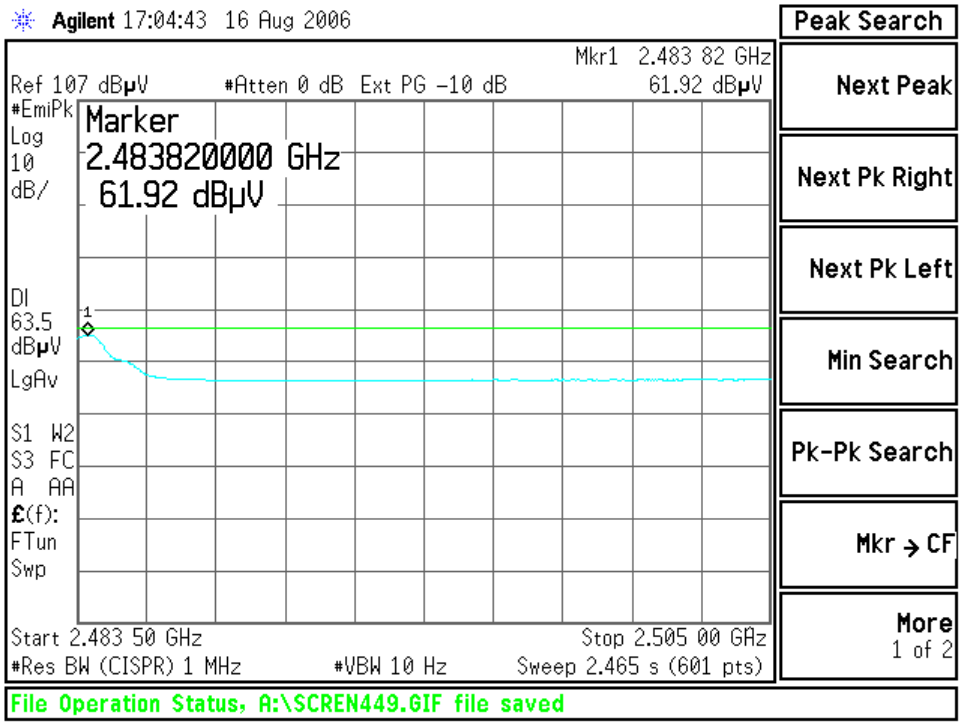


EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

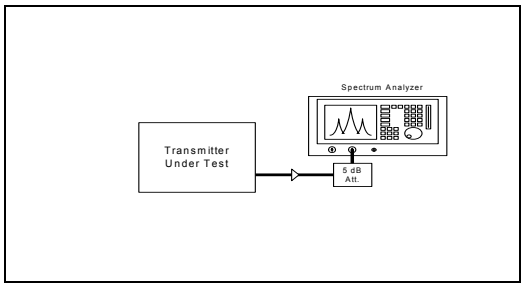
9.1 Method of Measurements

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 15 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	10.9	19.1
18	2440	+30 dBm	10.8	19.2
25	2475	+30 dBm	10.8	19.2
26	2480	+30 dBm	-2.2	32.2

9.2 Test Data



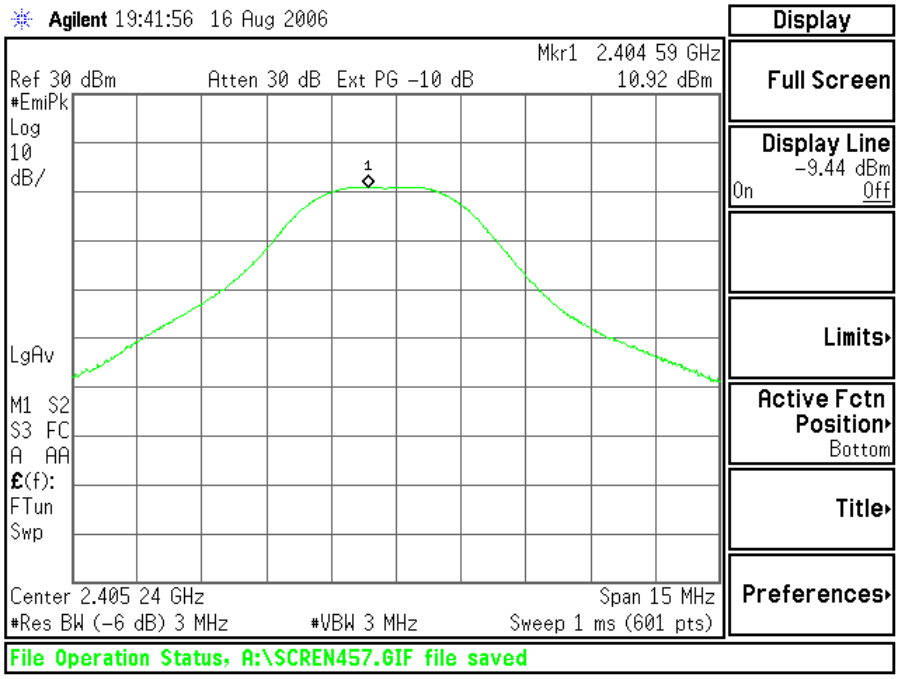
Measured radiated RF power output (in watts): 0.025
Measured conducted RF Power Output (in Watts): 0.012
Declared RF Power Output (in Watts): 0.01

9.3 Test Equipment List

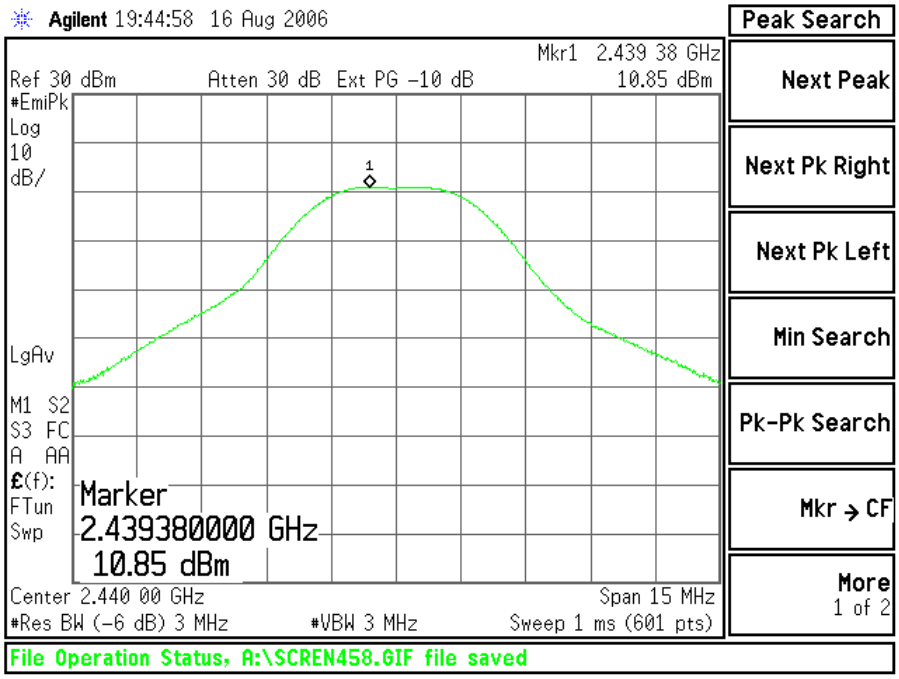
Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4446A	US45300564	3Hz to 44 GHz

9.4 Screen Captures – Power Output (Conducted)

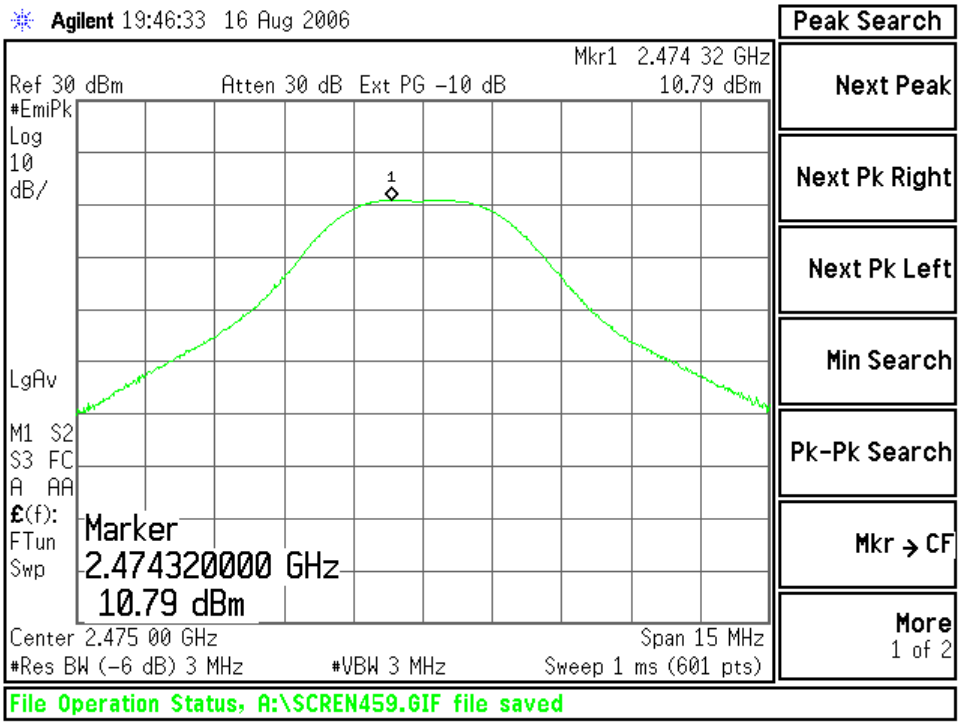
Channel 11



Channel 18



Channel 25



Channel 26

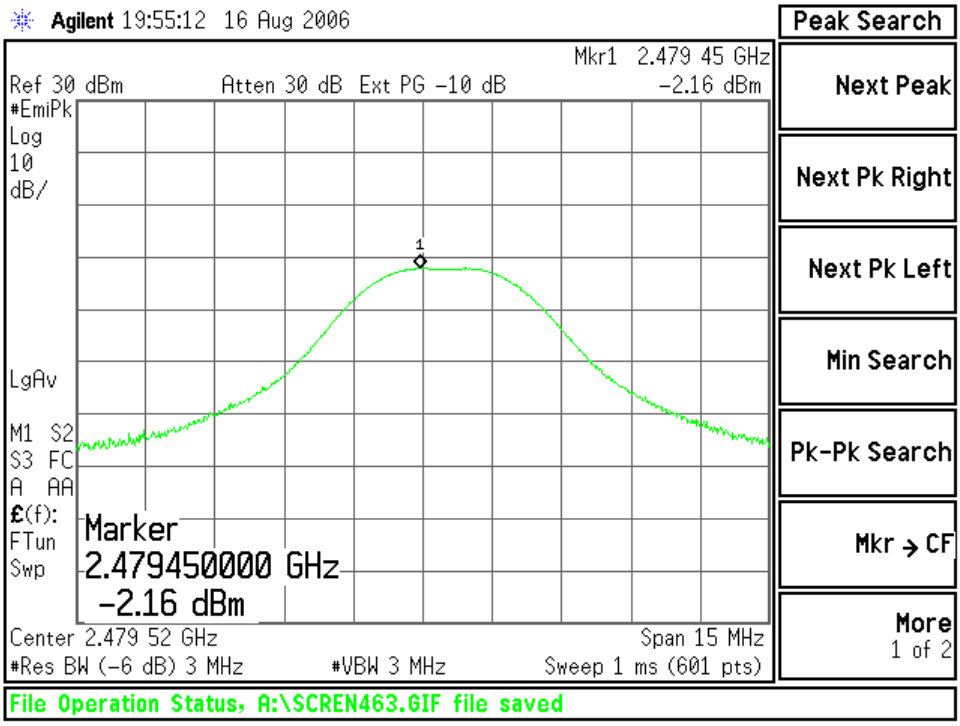


EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

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, and a power density measurement was performed. The highest density was found to be no greater than -3.25 dBm, which is under the allowable limit by 11.2 dB.

10.2 Test Equipment List

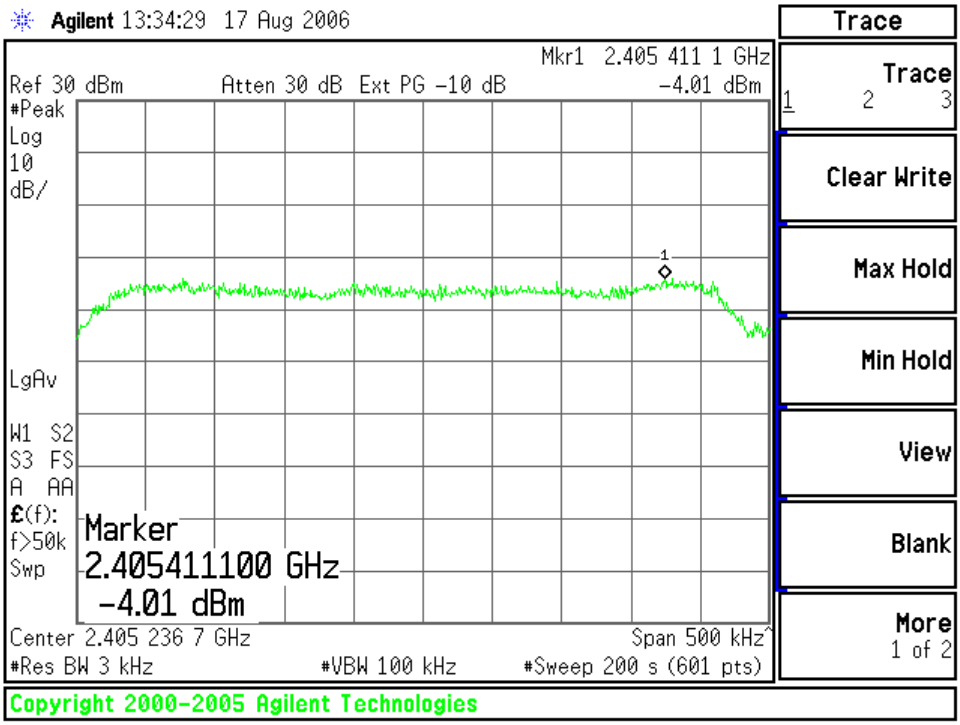
Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4446A	US45300564	3 Hz To 44 GHz

10.3 Test Data

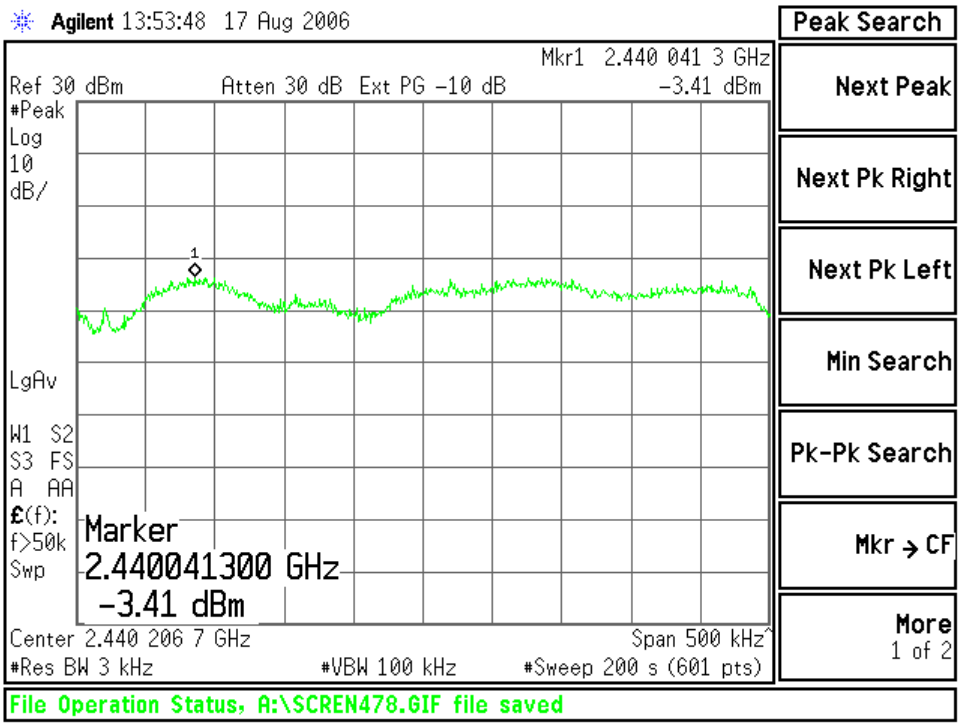
Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
11	2405	-4.0	+8.0	12.0	Pass
18	2440	-3.4	+8.0	11.4	Pass
25	2475	-3.2	+8.0	11.2	Pass
26	2480	-17.0	+8.0	25.0	Pass

10.4 Screen Captures – Power Spectral Density

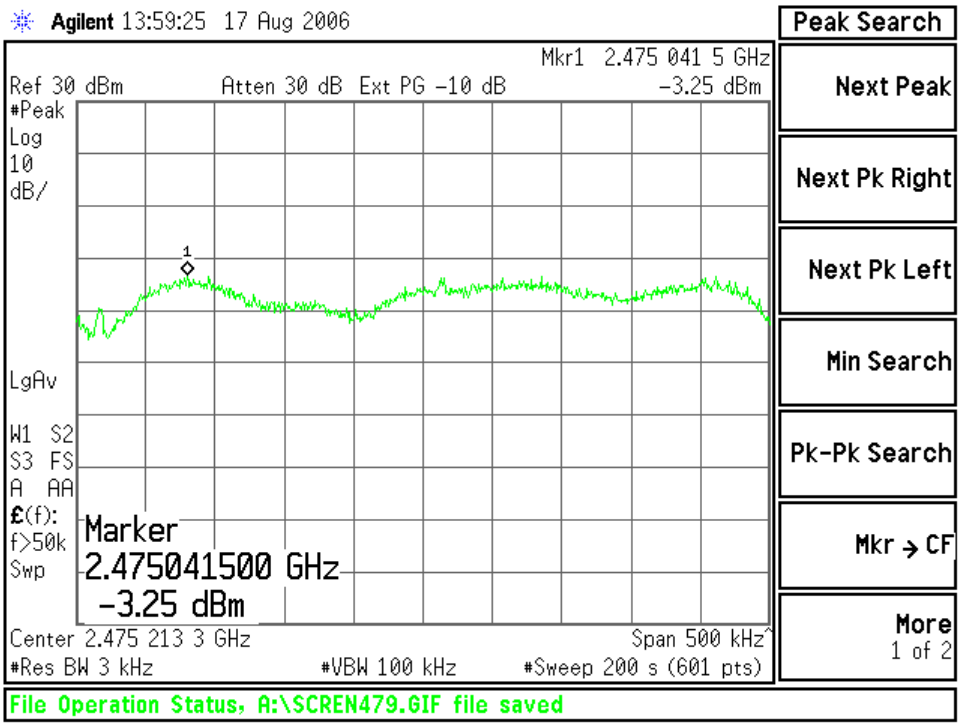
Channel 11



Channel 18



Channel 25



Channel 26

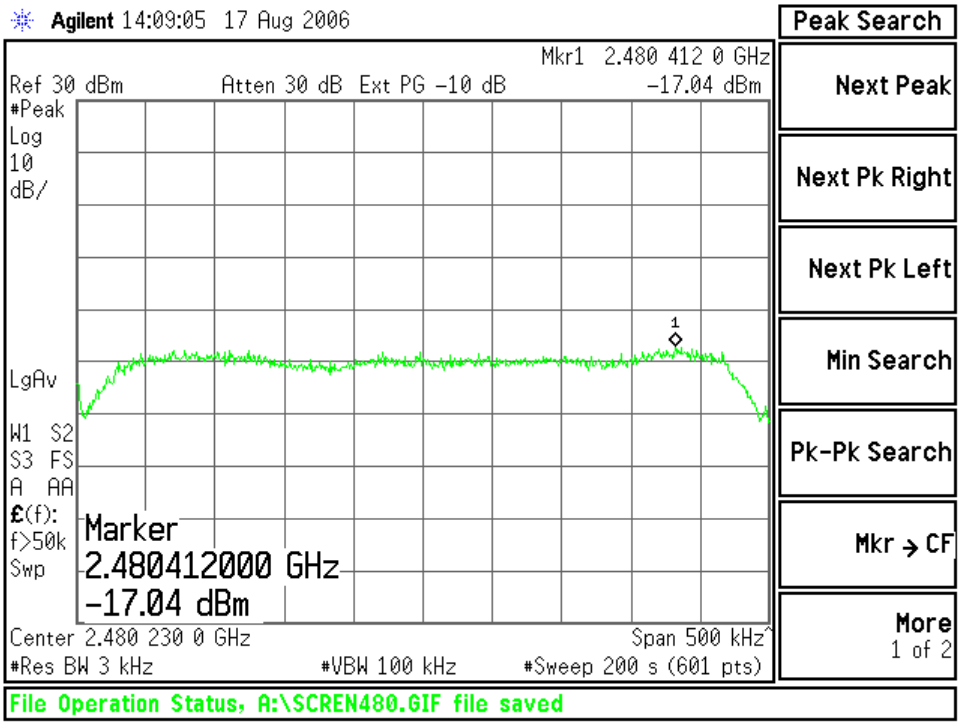


EXHIBIT 11. SPURIOUS RADIATED EMISSIONS: 15.247(d)

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.

In addition, radiated emissions, which fall in the restricted band, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(e)

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 -40 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	E4446A	US45300564	3 Hz To 44 GHz

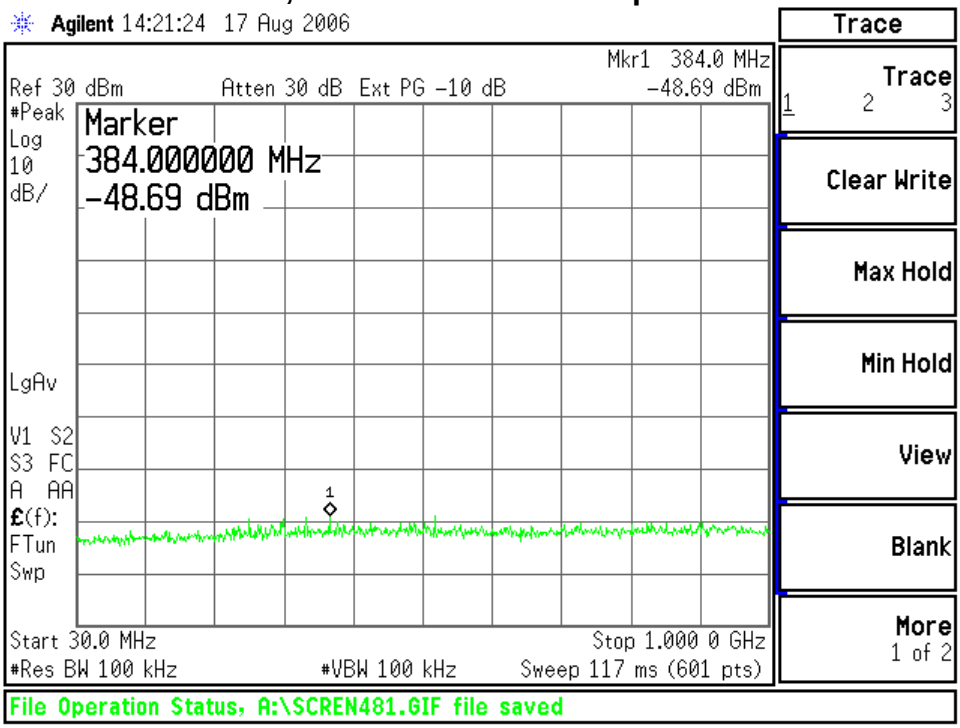
11.3 Test Data

	Channel 11	Channel 18	Channel 25	Channel 26
Fundamental	+ 7.3 (dBm)	+ 7.7 (dBm)	+ 7.3 (dBm)	+ -6.2 (dBm)
2nd Harmonic	- -46.0 (dBm)	- 46.8 (dBm)	- 44.8 (dBm)	- 47.7 (dBm)
3rd Harmonic	- 45.5 (dBm)	- 46.1 (dBm)	- 46.5 (dBm)	- 46.7 (dBm)
4th Harmonic	- 47.2 (dBm)	- 46.9 (dBm)	- 47.2 (dBm)	- 46.9 (dBm)
5th Harmonic	- 46.1 (dBm)	- 45.0 (dBm)	- 45.4 (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)

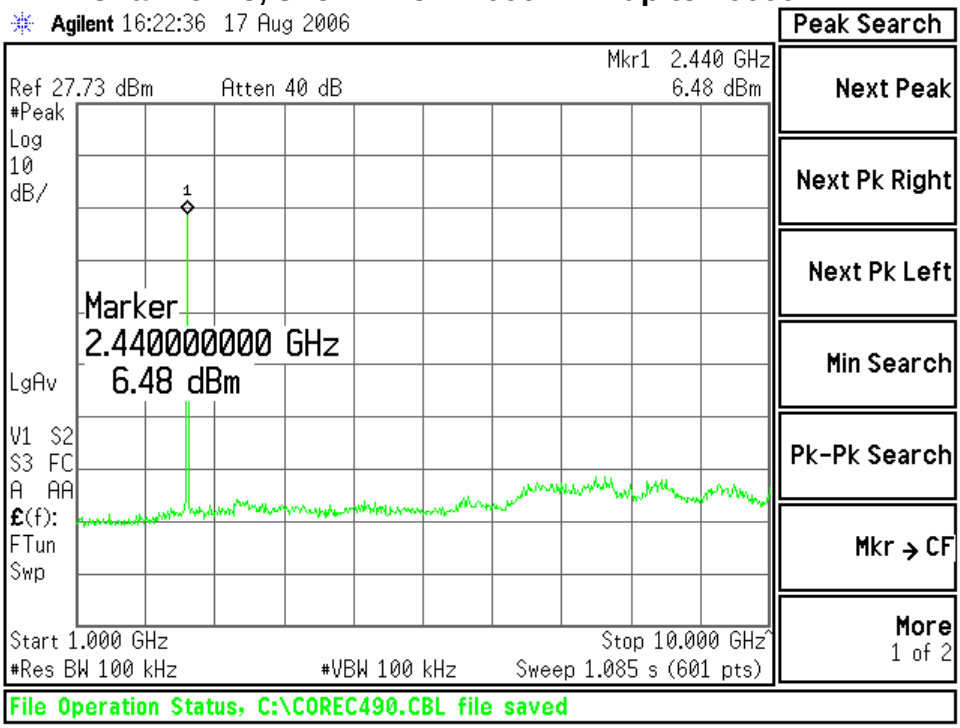
Notes:
(1) Measurement at system noise floor.

11.4 Screen Captures – Spurious Emissions

Channel 18, shown from 30 MHz up to 1000 MHz



Channel 18, shown from 1000 MHz up to 10000 MHz



Channel 18, shown from 10000 MHz up to 25000 MHz

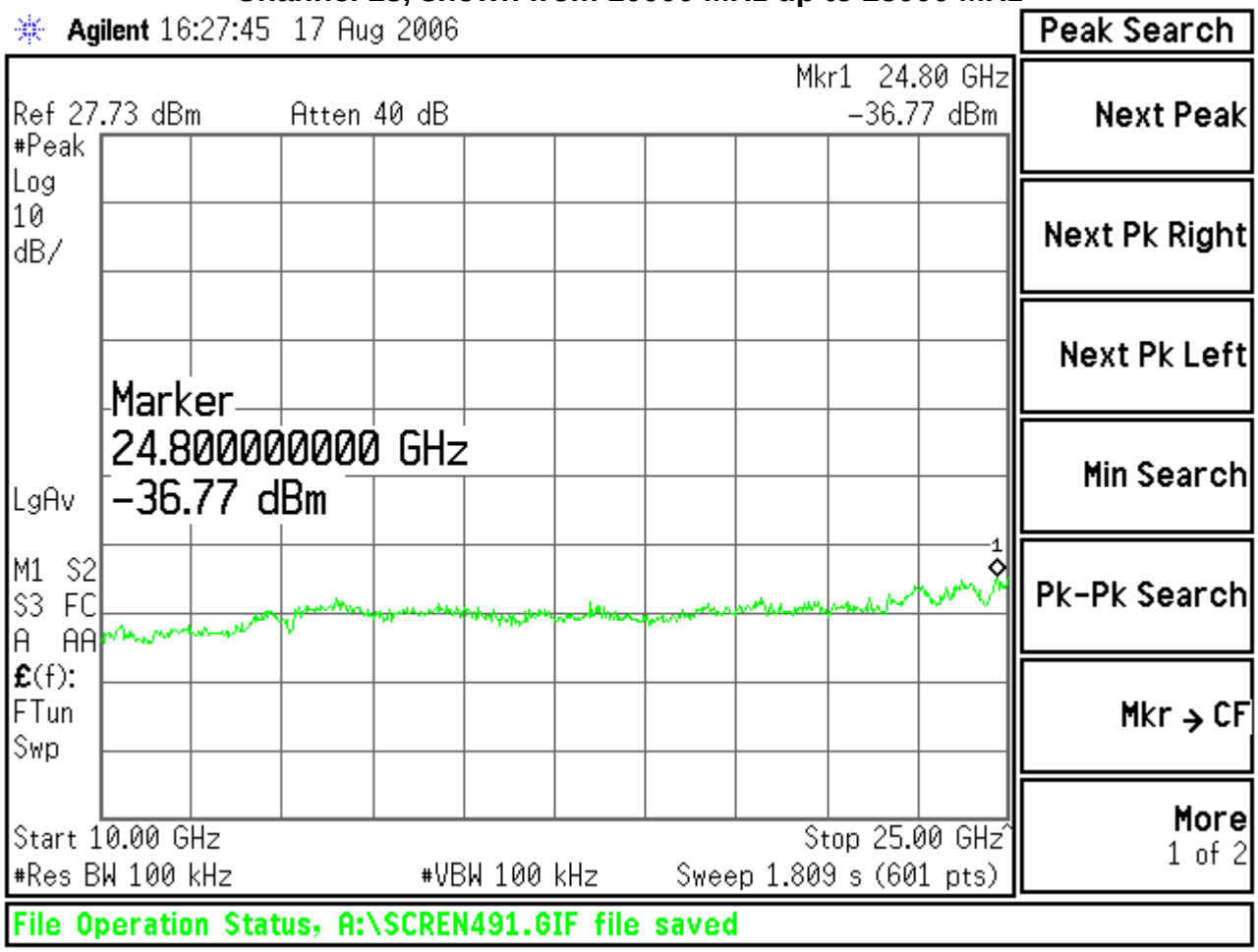


EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

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. For this test, the transmitter portion of the EUT placed in CW modulated 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.

In this case, the EUT uses two (2) AA alkalinebattery, with a nominal voltage of 3.0 VDC. Internal to the unit, A DC to DC voltage regulator provides constant 3.3 VDC to the electronics with allowance for a wide variation on the battery voltage.

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=3MHz settings while the voltage was varied.

	DC Voltage Source		
	2.55 VDC	3.00 VDC	3.54 VDC
Channel 11	2405 (MHz)	2405 (MHz)	2405 (MHz)
Channel 18	2440 (MHz)	2440 (MHz)	2440 (MHz)
Channel 25	2475 (MHz)	2475 (MHz)	2475 (MHz)
Channel 26	2480 (MHz)	2480 (MHz)	2480 (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	3.54 VDC
Channel 11	+10.8 (dBm)	+10.9 (dBm)	+10.8 (dBm)
Channel 18	+10.8 (dBm)	+10.8 (dBm)	+10.8 (dBm)
Channel 25	+10.8 (dBm)	+10.8 (dBm)	+10.7 (dBm)
Channel 26	-2.2 (dBm)	-2.2 (dBm)	-2.2 (dBm)

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics 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 13. CHANNEL PLAN AND SEPARATION

The EUT is a DTS system thus this test is not required.

EXHIBIT 14. MPE CALCULATIONS

The following MPE calculations are based on a surface mount ceramic style multilayer antenna.

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:	10.90	(dBm)
Maximum peak output power at antenna input terminal:	12.303	(mW)
Antenna gain(typical):	1.2	(dBi)
Maximum antenna gain:	1.318	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2400	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.003226	(mW/cm^2)
Maximum allowable antenna gain:	26.1	(dBi)
Margin of Compliance at 20 cm =	24.9	dB

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/27/05	9/27/06
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	12/07/05	12/07/06
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/29/05	12/29/06
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)

MULTILAYER CERAMIC ANTENNA
FOR BLUETOOTH & WLAN IEEE 802.11b (2.45G Hz ISM Band)

Product Specification

QUICK REFERENCE DATA

Central Frequency*	2.45 GHz
Bandwidth	>100 MHz
Gain	1.2dBi max
VSWR	2.0 max
Polarization	Linear
Azimuth	Omni-directional
Impedance**	50Ω
Operating Temperature	-55~125 ^{O}C
Termination	Ni/Sn (Environmentally-Friendly Leadless)
Resistance to soldering heat	260^{O}C, 10 sec.
Maximum Power	1W

* Three types of antenna are available for central frequency adjustment (type 245, type 260, type 270)

** Antenna is built-in internal impedance circuit and ground point can be grounded optionally for matching free purpose.

Special Environmental Concerns- Green Products Design: The foil making process is using environmentally-friendly aqueous solvent technology. Termination is lead free (Pb free) and packing materials can be re-cycled

R&D	Print date 01/12/13			Preliminary use only				2001-2-22
	Multilayer Ceramic Antenna for Bluetooth (ISM Band 2.45GHz)			**4311 111 00245/260/270** **4312 111 00245/260/270**				2001-6-19 2001-7-10
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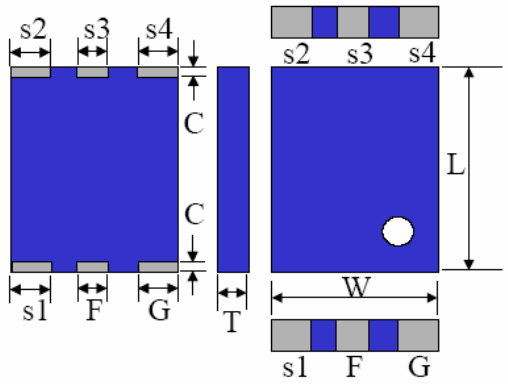
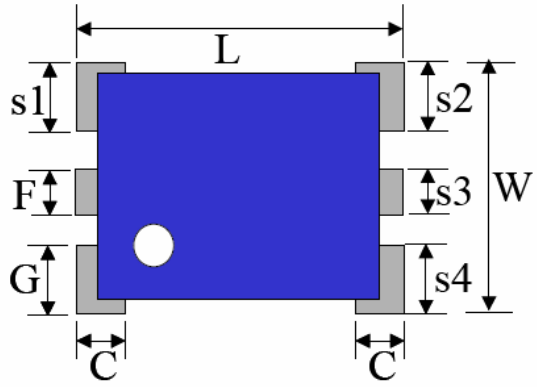
DIMENSIONAL DATA

Figure	Dimension		Port
	L	7.35±0.25 mm	-
	W	5.5±0.2 mm	-
	T	1.3±0.2 mm	-
	F	0.9±0.25 mm	Feed Termination
	G	1.25±0.35 mm	Ground Termination (Optional*)
	C	0.5±0.3 mm	-
	S1	1.25±0.35 mm	NC Solder Termination
	S2	1.25±0.35 mm	NC Solder Termination
	S3	0.9±0.25 mm	NC Solder Termination
	S4	1.25±0.35 mm	NC Solder Termination

* **Antenna has a built-in circuit at Ground Termination. However, Ground Termination is optional if good matching is attainable. If good matching is attainable during application, Ground Termination can be used as NC Solder Termination.**

SOLDER LAND PATTERN

Figure	Dimensions		Remark
	L	8.30 ± 0.10 mm	
	W	5.70 ± 0.10 mm	
	F	1.00 ± 0.10 mm	Feed Pad
	G	1.40 ± 0.10 mm	Ground Pad (Optional*)
	C	0.90 ± 0.10 mm	
	S1	1.40 ± 0.10 mm	NC Mount Pad
	S2	1.40 ± 0.10 mm	NC Mount Pad
	S3	1.00 ± 0.10 mm	NC Mount Pad
	S4	1.40 ± 0.10 mm	NC Mount Pad

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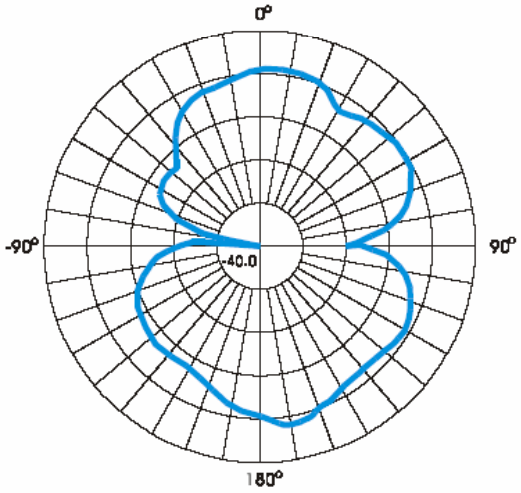
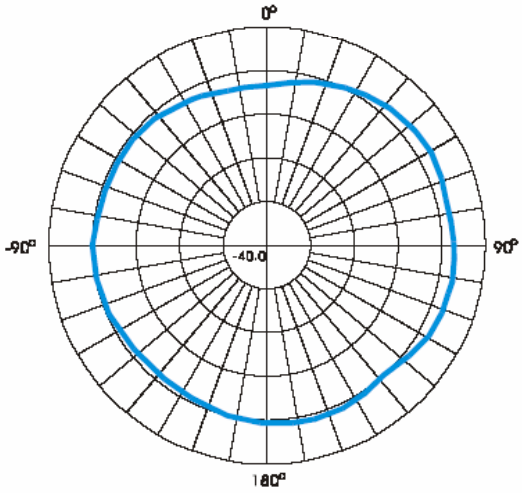
ELECTRICAL DATA

Central Frequency	2.45 GHz
Bandwidth	100 MHz
Gain	0 ~ 1.2dBi
VSWR	2.0 max
Polarization	Linear
Azimuth Beamwidth	Omni-directional
Impedance	50Ω
Operating Temperature	-55~125 ^{O}C
Termination	Ni/Sn (Environmental Friendly Leadless)
Resistance to soldering heat	260^{O}C, 10 sec.
Maximum Power	1W

Radiation Pattern Polar plot



E Plane



H Plane

R&D	Print date 01/12/13				Preliminary use only			
								2001-2-22
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RELIABILITY DATA (Reference to IEC Specification)

IEC 384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.4		Mounting	The antenna can be mounted on printed-circuit boards or ceramic substrates by applying wave soldering, reflow soldering (including vapour phase soldering) or conductive adhesive	No visible damage
4.5		Visual inspection and dimension check	Any applicable method using × 10 magnification	In accordance with specification (chip off 4mm)
4.6.1		Antenna	Frequency = 2.45 GHz; at 20 ^{o}C	Standard test board in page 4
4.8		Adhesion	A force of 5 N applied for 10 s to the line joining the terminations and in a plane parallel to the substrate	No visible damage
4.9		Bond strength of plating on end face	Mounted in accordance with CECC 32 100, paragraph 4.4	No visible damage
			Conditions: bending 1mm at a rate of 1mm/s, radius jig. 340 mm, 2mm warp on FR4 board of 90 mm length	No visible damage

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IEC 384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.10	20(Tb)	Resistance to soldering heat	260 ± 5 °C for 10 ± 0.5 s in a static solder bath	The terminations shall be well tinned after recovery and Central Freq. Change ± 6%
		Resistance to leaching	260 ± 5 °C for 30 ± 1 s in a static solder bath	Using visual enlargement of × 10, dissolution of the termination shall not exceed 10%
4.11	20(Ta)	Solderability	Zero hour test, and test after storage (20 to 24 months) in original atmosphere; un-mounted chips completely immersed for 2 ± 0.5 s in 235 ± 5°C.	The termination must be well tinned, at least 75% is well tinned at termination
4.12	4(Na)	Rapid change of temperature	-55 °C (30 minutes) to +125 °C (30 minutes); 100 cycles	No visible damage Central Freq. Change ± 6%
4.14	3(Ca)	Damp heat	500 ± 12 hours at 60 °C; 90 to 95 % RH	No visible damage 2 hours recovery Central Freq. Change ± 6%
4.15		Endurance	500 ± 12 hours at 125 °C;	No visible damage 2 hours recovery Central Freq. Change ± 6%

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	Multilayer Ceramic Antenna for Bluetooth (ISM Band 2.45GHz)			**4311 111 00245/260/270** **4312 111 00245/260/270**				2001-6-19 2001-7-10
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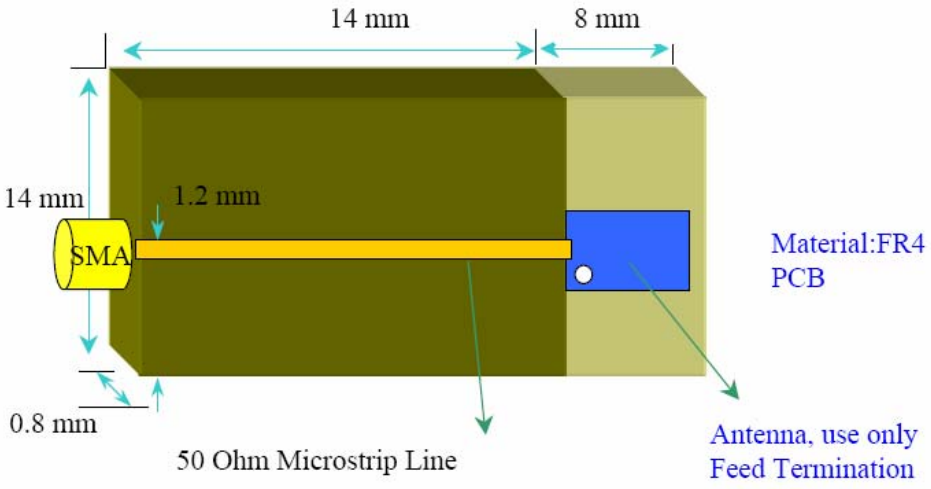
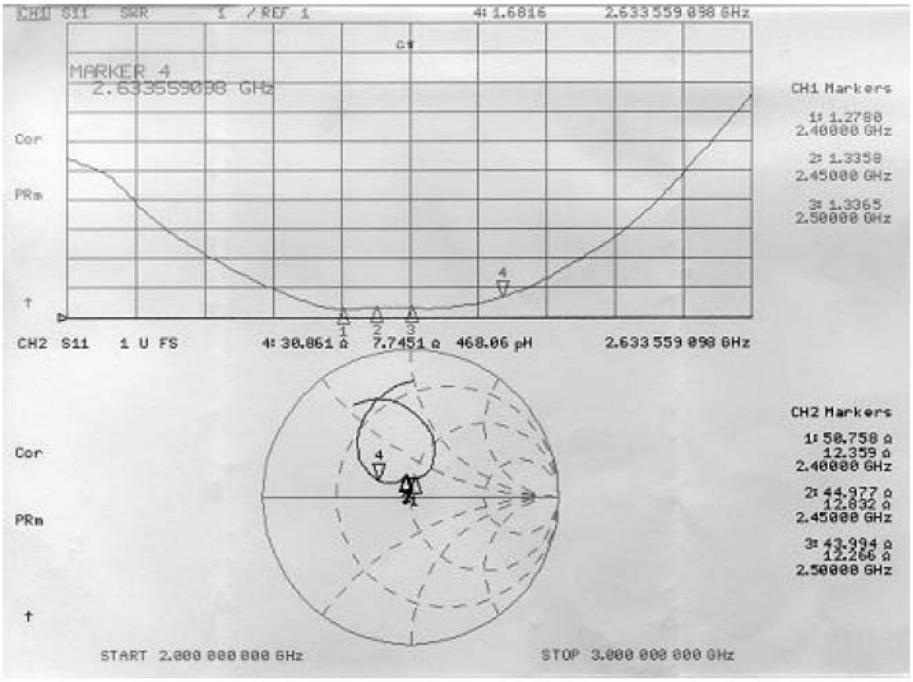
STANDARD TEST BOARD FOR RADIATION PATTERN & SWR





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Appendix C

Firmware and Setup Instructions

There are four buttons on the faceplate of the EUT that controls transmit/receive function, modulated/un-modulated signal function, power setting and channel setting. The button labeled “FAN” toggles between a modulated and un-modulated CW signal while the button labeled “MODE” toggles between transmit and receive. The “UP” button increments the channel one channel at a time until channel 26 and then resets back to channel 11. The “DOWN” button decrements the transmit PA level from 31 to 0 and then resets back to 31.
The final product will not have these functions available to the end user. These functions were made available strictly for testing purposes. Power settings, modulation, etc are preprogrammed by the manufacturer and cannot be modified by the end user.