LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
Testing Cert. 1255.01
W66 N220 Commerce Court ● Cedarburg, WI 53012 ● USA
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www.lsr.com

TEST REPORT # 309187 TR TCB
LSR Job #: C-647

Compliance Testing of:
Zigbee Radio Module

Test Date(s):
June 16th to August 26th 2009
September 22nd 2009

Prepared For:
Home Automation Inc.
4330 Michould Blvd.
New Orleans, LA 70129

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Industry Canada (IC) RSS 210 Annex 8
Digital Modulation Transmitters (DTS) Operating in the Frequency Band 2400 MHz – 2483.5 MHz

This Test Report is issued under the Authority of:
Ryan Urness, EMC Lab Manager

Signature:  Date: September 23, 2009

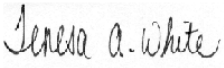
Test Report Reviewed by:	**Tested by:**
Teresa A. White, Quality Manager	Khairul Aidi Zainal, Senior EMC Engineer
Signature: 	Signature: 
Date: September 23, 2009	Date: September 23, 2009

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.247 and 15.209 FCC Part 2, Section 2.1043 paragraph (b)1. RSS GEN and RSS 210 Annex 8
Title:	FCC : Telecommunication – Code of Federal Regulations, CFR 47, Part 15. IC : Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
Purpose of Test:	To gain FCC and IC Certification Authorization for Low-Power License-Exempt Transmitters.
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)	2008-10	Code of Federal Regulations - Telecommunications
RSS 210 Annex 8	2007 June	Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	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	2008	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:	**Home Automation Inc.**
Address:	**4330 Michould Blvd, New Orleans, LA.**
Contact Name:	**Ryan Arbour**

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Zigbee Radio Module
Model Number:	65A10-1
Serial Number:	Transmitter: 1809-0039 Receiver: 1809-0076

2.3 ASSOCIATED ANTENNA DESCRIPTION

The antenna associated with this module is a PCB trace inverted F antenna.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

EUT Frequency Range (in MHz)	2405 MHz to 2480 MHz
RF Power in Watts	
Minimum:	0.00016 Watt
Maximum:	0.0025 Watt
Conducted Output Power (in dBm)	3.98 dBm
Field Strength at 3 meters	105.2 dBuV/m at 3m (2405MHz)
Occupied Bandwidth (99% BW)	2550 kHz
Type of Modulation	OQPSK
Emission Designator	2M55G1D
ERP (in mW)	9.9 mW
Transmitter Spurious (worst case) at 3 meters	46.7 dBuV/m at 3m (2351 MHz)
Receiver Spurious (worst case) at 3 meters	36.2 dBuV/m at 3m (339 MHz)
Frequency Tolerance %, Hz, ppm	Better than 100 PPM
Microprocessor Model # (if applicable)	MSP430F5435
Antenna Information	
Detachable/non-detachable	Non-detachable
Type	PCB trace inverted F antenna
Gain (in dBi) (Calculated from measurement over conducting ground plane)	5.99 dBi
EUT will be operated under FCC Rule Part(s)	15.247
EUT will be operated under RSS Rule Part(s)	RSS 210, RSS Gen
Modular Filing	☒ Yes ☐ No
Portable or Mobile?	Portable

RF Technical Information:

The device is < than necessary for SAR threshold.

2.5 PRODUCT DESCRIPTION

The product under test is a Zigbee radio designed to fit in several consumer electronics in order to achieve wireless communication to a local central controller. Several examples would be on thermostats, in home displays, and dimmers.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	72°
Humidity:	48%
Pressure:	747 mmHg

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC and IC Paragraph	Test Requirements	Compliance (yes/no)
FCC : 15.207 IC : RSS GEN sect. 7.2.2	Power Line Conducted Emissions Measurements	Yes
FCC : 15.247(a)(2) IC : RSS 210 A8.2(a)	6 dB Bandwidth of a Digital Modulation System	Yes
IC : RSS GEN section 4.6.1	20 dB Bandwidth	Yes
FCC : 15.247(b) & 1.1310 IC : RSS 210 A8.4	Maximum Output Power	Yes
FCC : 15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093 IC : RSS 102	RF Exposure Limit	Yes
FCC :15.247(c) IC : RSS 210 A8.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
FCC : 15.247(d) IC : RSS 210 A8.2(b)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
FCC : 15.247(c), 15.209 & 15.205 IC : RSS 210 A8.2(b), section 2.2, 2.6 and 2.7	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 (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers (RSS GEN and RSS 210 of IC). The Receiver Test Report is available upon request.		

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☐ **None** ☒ **Yes (explain below)**

For the highest channel (2480 MHz), the channel is operating on its lowest power level setting.

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, Issue 7 (2007), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

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

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

EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN 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 modulated transmit mode for final testing using power as provided by a bench DC supply. The unit has the capability to operate on 16 channels, controllable via a switch.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (4) standard channels: 2405 MHz, 2440 MHz, 2475 MHz and 2480 MHz to comply with FCC Part 15.35. The channels modes were changed using a switch.

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 1.0 meter separation, using a standard gain Horn Antenna and pre-amplifier.

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

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz). From 4 GHz to 18 GHz, an HP E4446A Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the HP E4446A Spectrum Analyzer with a standard gain horn, and preamp were used.

Test Equipment List

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

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 and Canada RSS-210, Issue 7 (2007), Annex 8 for a DTS transmitter. 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) and RSS 210 A8.4 is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d) and RSS 210 A8.2(b), 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) for FCC and section 2.2,2.6 and 2.7 of RSS 210 for IC.

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. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

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 TEST DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.205 and 15.247(DTS)
RSS 210 A8, sections 2.2,2.6 and 2.7
Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	HAI						
Date(s) of Test:	June 16th,17th July 7th ,8th , 30th and August 4th , 11th and 26th 2009						
Test Engineer(s):	Aidi						
Voltage:	5.0 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: Bench DC supply			
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	Channel	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2351	H/S	11	1.10	349	46.7	54.0	7.3

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF fundamental (3m measurement distance).

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak Measurement (dBμV/m)	Average Measurement (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2405	H/S	1.12	352	107.0	105.2	125.2	20.0
2440	H/H	1.35	86	104.9	103.2	125.2	22.0
2475	H/S	1.08	349	105.9	103.7	125.2	21.5
2480	V/V	1.00	151	94.5	92.3	125.2	32.9

The following table depicts the level of significant radiated harmonic emissions seen on Channel 2405 MHz:

Antenna Polarization	Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (°)	EUT Orientation
Horizontal	4810	57.7	54.4	63.5	9.1	107.5	325	H
Horizontal	7215	48.5	37.8	94.7	56.9	103.1	244	H
Horizontal	9620	48.7	37.8	94.7	56.9	101.9	147	H
Vertical	12025	49.0	36.8	63.5	26.7	104.3	19	H
Vertical	14430	51.3	39.9	94.7	54.8	101.5	7	S
Horizontal	16835	51.9	40.4	94.7	54.3	104.3	4	H
	19240		Note 5					
	21645		Note 5					
	24050		Note 5					

The following table depicts the level of significant radiated harmonic emissions seen on Channel 2440 MHz:

Antenna Polarization	Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (°)	EUT Orientation
Horizontal	4880	54.3	51.0	63.5	12.5	111.2	322	H
Horizontal	7320	49.6	39.6	63.5	23.9	107.7	206	H
Horizontal	9760	49.0	38.0	92.7	54.7	104.2	146	H
Horizontal	12200	49.5	38.3	63.5	25.2	101.7	84	H
Vertical	14640	51.3	39.8	92.7	52.9	102.3	6	H
Horizontal	17080	54.5	43.1	92.7	49.6	102.4	11	S
	19520		Note 5					
	21960		Note 5					
	24400		Note 5					

Notes:

1) A Quasi-Peak Detector was used in measurements below 1 GHz, and an average detector as well as a peak detector with video averaging (RBW=1MHz, VBW=10Hz) was used in measurements above 1 GHz. The peak detector (RBW=1MHz, VBW=1MHz) was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meter of separation from the EUT.
3) H= Horizontal, V=Vertical, S= Side.
4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=3 MHz.
5) Emissions buried in system noise floor.

The following table depicts the level of significant radiated harmonic emissions seen on Channel 2475 MHz:

Antenna Polarization	Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (°)	EUT Orientation
Horizontal	4950	55.7	52.5	63.5	11.0	104.4	325	H
Horizontal	7425	51.0	41.0	63.5	22.5	106.7	203	H
Vertical	9900	50.4	40.0	93.2	53.2	103.0	267	H
Horizontal	12375	49.3	37.0	63.5	26.5	153.1	8	V
Horizontal	14850	50.0	38.6	93.2	54.6	174.3	3	V
Vertical	17325	55.7	44.0	93.2	49.2	104.1	28	H
	19800		Note 5					
	22275		Note 5					
	24750		Note 5					

The following table depicts the level of significant radiated harmonic emissions seen on Channel 2480 MHz:

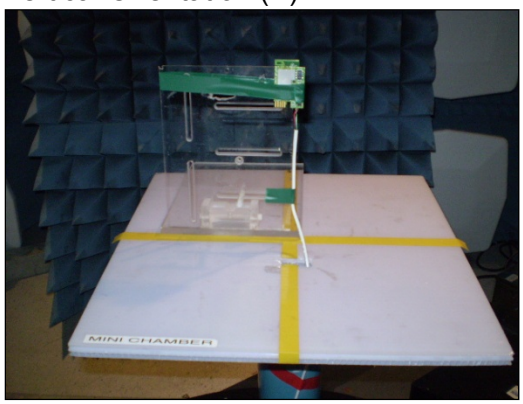
Polarization	(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)	Orientation
Vertical	4960	52.2	47.5	63.5	16.0	124.6	261	S
Horizontal	7440	49.4	39.1	63.5	24.4	106.4	214	H
Horizontal	9920	51.1	40.6	81.8	41.2	104.4	269	V
Horizontal	12400	50.4	38.4	63.5	25.1	171.2	6	S
Horizontal	14880	51.2	38.7	81.8	43.1	104.1	1	H
Horizontal	17360	56.4	44.1	81.8	37.7	122.5	3	H
	19840		Note 5					
	22320		Note 5					
	24800		Note 5					

Notes:

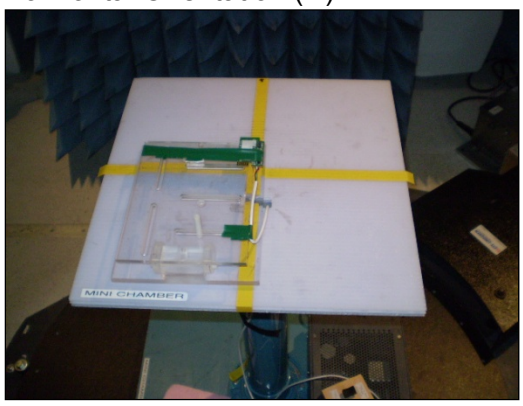
1) A Quasi-Peak Detector was used in measurements below 1 GHz, and an average detector as well as a peak detector with video averaging (RBW=1MHz, VBW=10Hz) was used in measurements above 1 GHz. The peak detector (RBW=1MHz, VBW=1MHz) was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meter of separation from the EUT.
3) H= Horizontal, V=Vertical, S= Side.
4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=3 MHz.
5) Emissions buried in system noise floor.

5.7 Test Setup Photo(s) – Radiated Emissions Test

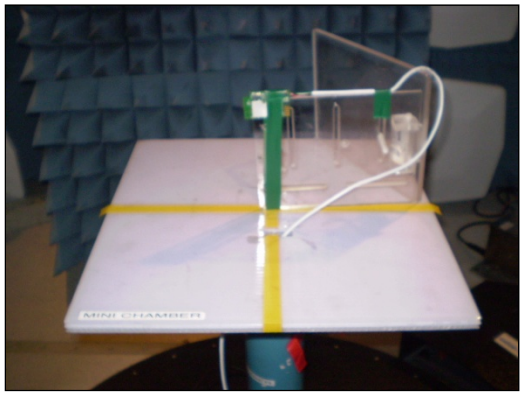
Vertical Orientation (V)



Horizontal Orientation (H)



Side Orientation

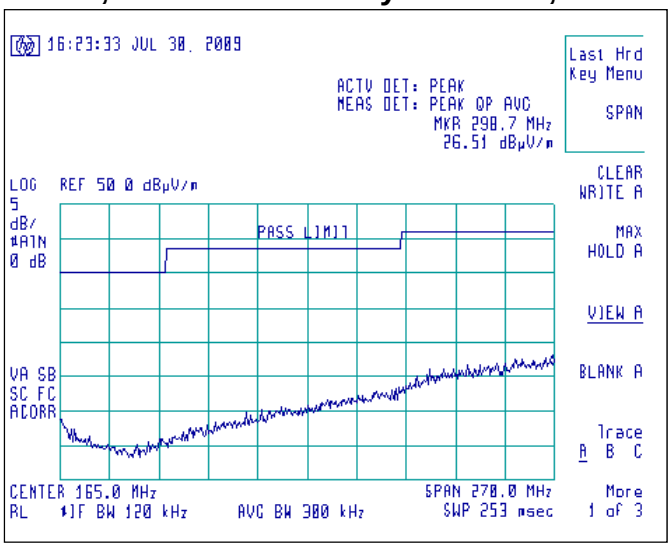


5.8 Screen Captures - Radiated Emissions Test

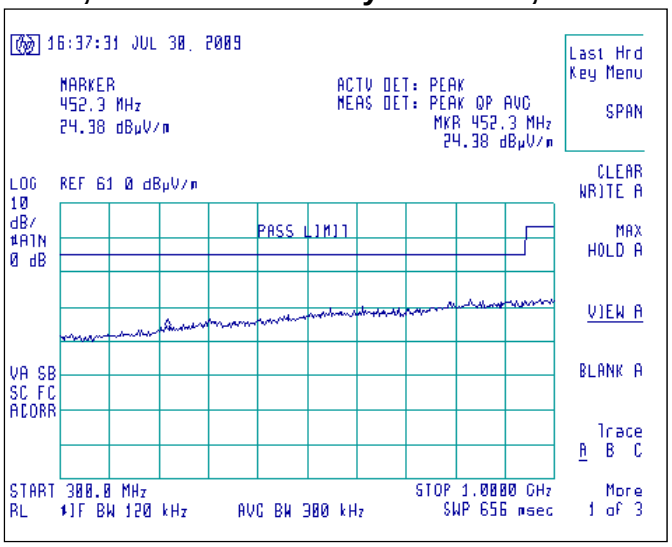
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 2405 MHz, 2440 MHz, 2475 MHz, or 2480 MHz, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Channel 2405MHz, Antenna Vertically Polarized, 30-300 MHz, at 3m

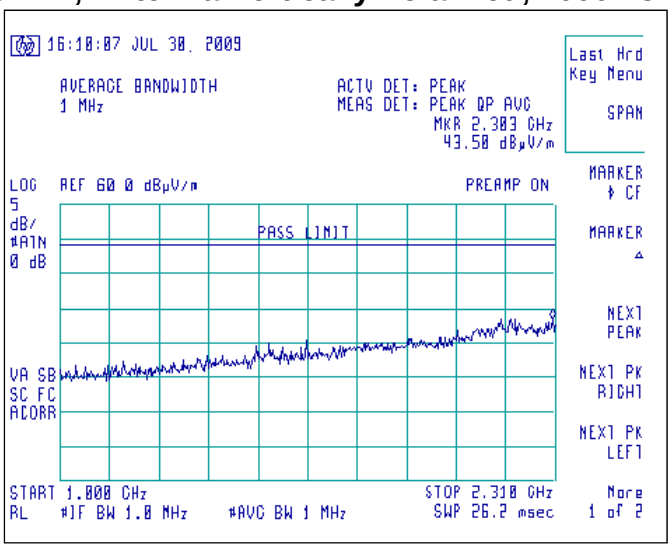


Channel 2405MHz, Antenna Vertically Polarized, 300-1000 MHz, at 3m

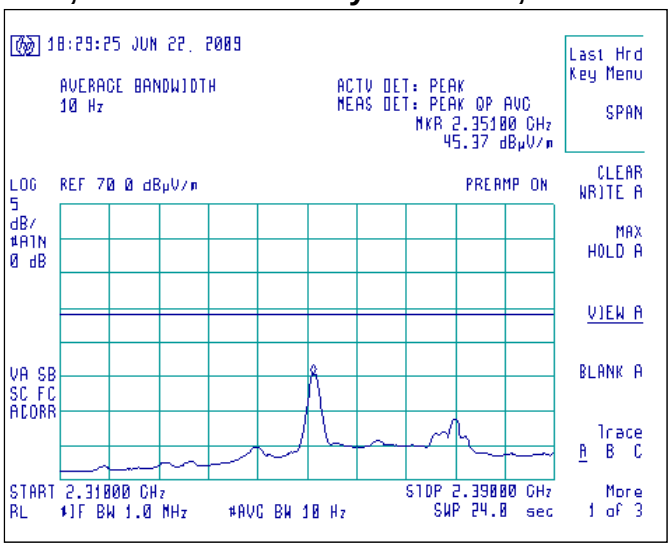


Screen Captures - Radiated Emissions Testing *(continued)*

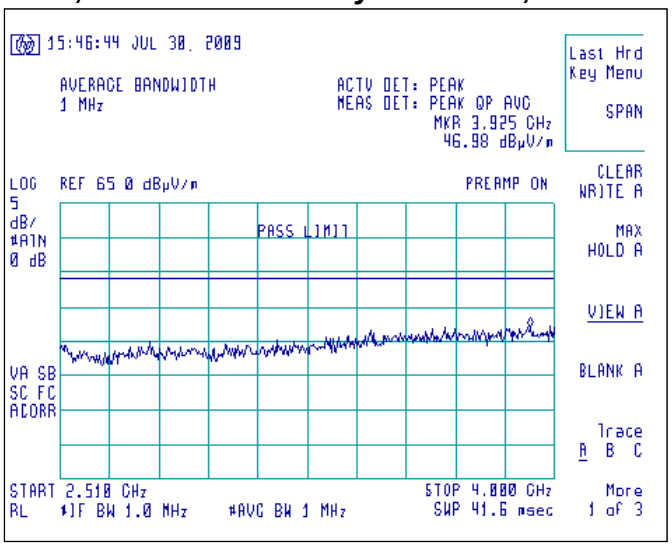
Channel 2440MHz, Antenna Vertically Polarized, 1000-2310 MHz, at 3m



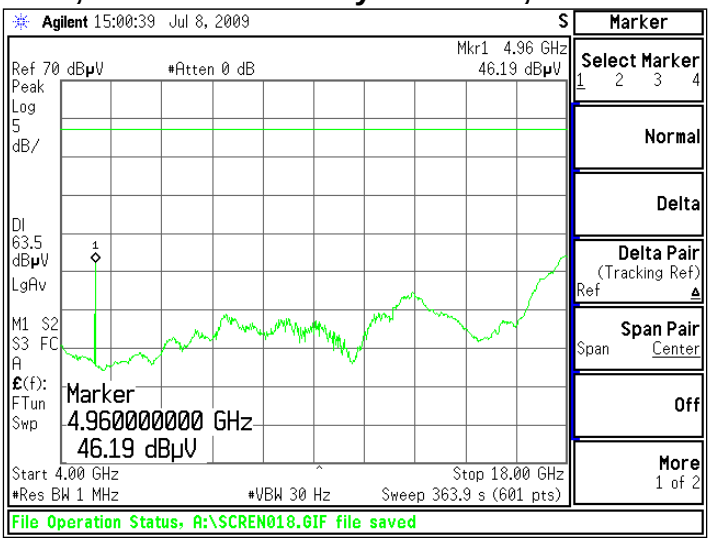
Channel 2405MHz, Antenna Vertically Polarized, 2310- 2390 MHz, at 3m



Channel 2440MHz, Antenna Vertically Polarized, 2510-4000 MHz, at 3m

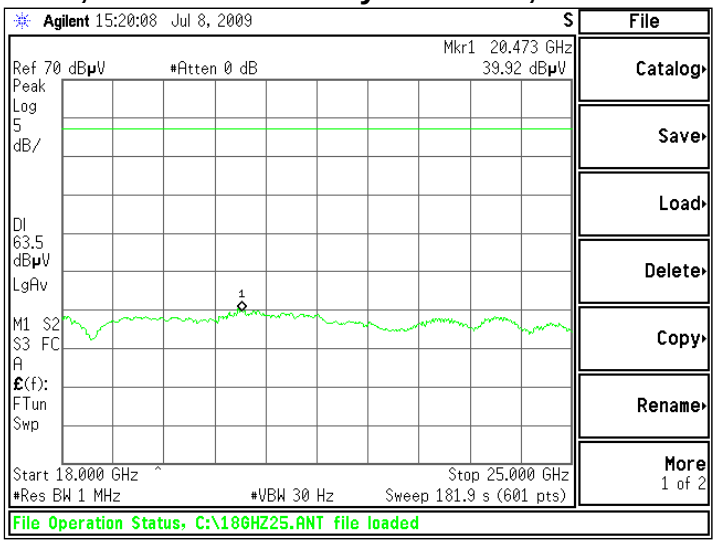


Channel 2480MHz, Antenna Vertically Polarized, 4000 - 18000 MHz, at 1m



Screen Captures - Radiated Emissions Testing *(continued)*

Channel 2480MHz, Antenna Vertically Polarized, 18000-25000 MHz, at 1m



5.9 Receive Mode Testing

Per the requirements of RSS-210, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen (2007) Section 4.10.

The test setup, procedure, and equipment utilized were identical to that described in sections 5.1, 5.2, and 5.3 of this document.

Measurement data and screen captures from the receive tests are presented below:

Frequency (MHz)	Height (m)	Azimuth (degree)	Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
339	2.74	0	36.2	46.0	9.8	Vertical	Vertical
4880	1.00	195	44.7	63.5	18.8	Horizontal	Vertical

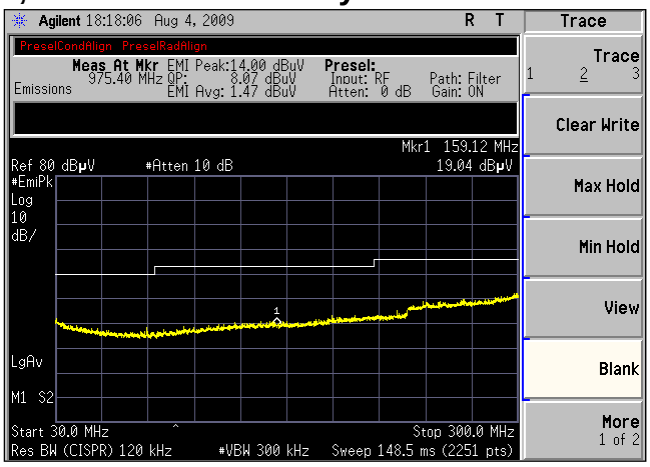
Note:
1. Spurious emissions were independent of channel.
2. Measurements above 1GHz were performed at a separation distance of 1m.

Screen Captures - Radiated Emissions Testing – Receive Mode

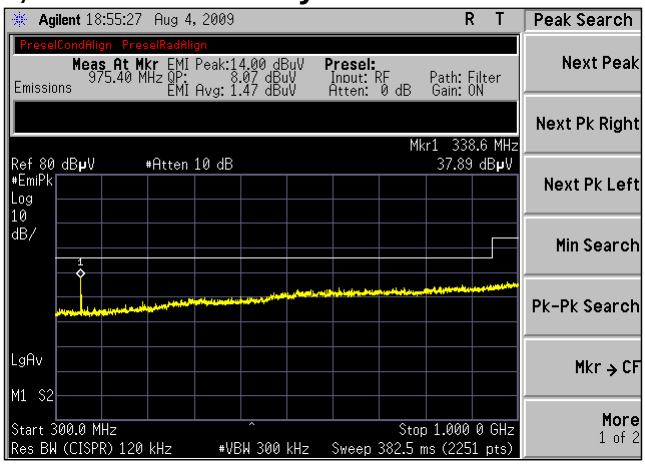
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 11(2405MHz), 18(2440MHz), 25(2475MHz) and 26(2480MHz), with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Channel 18, Antenna Horizontally Polarized 30 MHz to 300 MHz

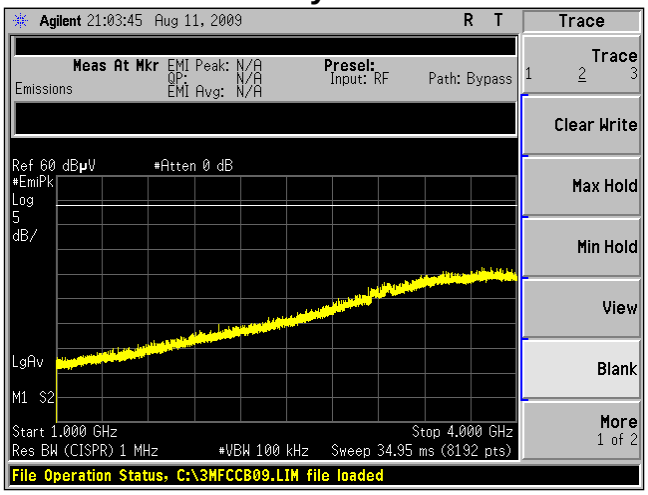


Channel 18, Antenna Vertically Polarized 300 MHz to 1000 MHz

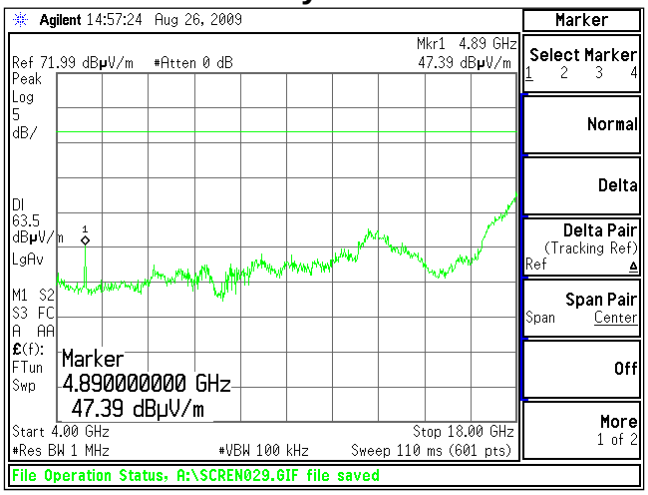


Screen Captures - Radiated Emissions Testing – Receive Mode **(continued)**

Channel 18, Antenna Horizontally Polarized 1000 MHz to 4000 MHz



Channel 18, Antenna Horizontally Polarized 4000 MHz to 18000 MHz



Screen Captures - Radiated Emissions Testing – Receive Mode *(continued)*

Channel 18, Antenna Horizontally Polarized 18000 MHz to 25000 MHz

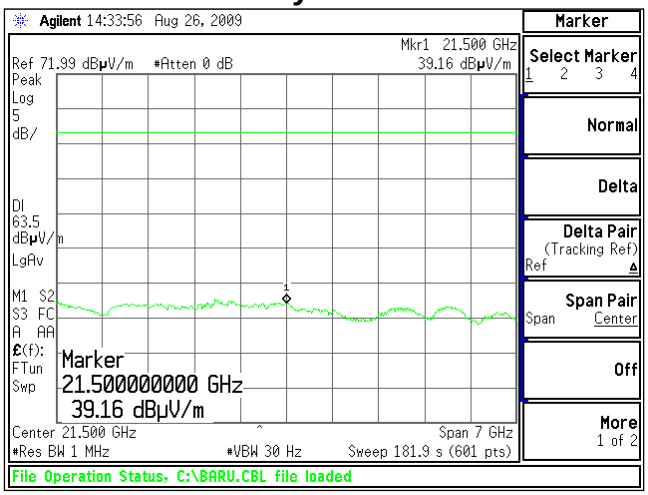


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE

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 and RSS GEN. 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 and also **continuous receive** mode for this portion of the testing. The EUT was powered using a readily available DC adapter. 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, Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the Agilent E4445A spectrum analyzer, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	Agillent	E4445A	MY48250225
LISN	EMCO	3816/2NM	9701-1057
Transient Limiter	HP	119474A	3107A01708

6.4 Test Results

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

6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

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

6.6 CONDUCTED EMISSIONS TEST DATA CHART

Frequency Range inspected: 150 KHz to 30 MHz
Test Standard: FCC 15.207 Class B
IC RSS GEN 7.2.2

6.6.1 Transmit mode.

Manufacturer:	Home Automation Inc.					
Date(s) of Test:	August 11th 2009					
Test Engineer:	Aidi Zainal					
Voltage:	120 VAC					
Operation Mode:	continuous transmit					
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)
0.179	L1	20.6	64.5	43.9	7.9	54.5	46.6
0.619	L1	15.9	56.0	40.1	12.3	46.0	33.7
22.430	L1	3.0	60.0	57.0	1.4	50.0	48.6
5.980	L1	3.4	60.0	56.6	0.9	50.0	49.1
0.204	L2	11.3	63.4	52.1	6.6	53.4	46.9
0.621	L2	13.3	56.0	42.7	6.6	46.0	39.4
3.550	L2	6.8	56.0	49.2	3.8	46.0	42.2
8.020	L2	7.1	60.0	52.9	4.5	50.0	45.5
23.130	L2	7.0	60.0	53.0	4.3	50.0	45.7

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 across the Low, Middle and High channels tested.

6.6.2 Receive mode.

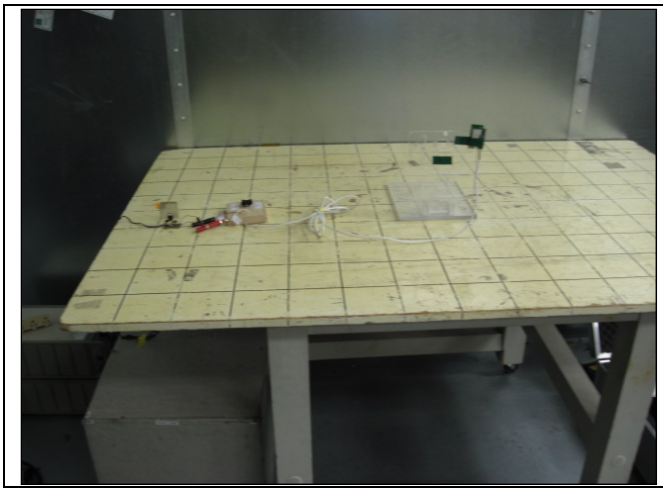
Manufacturer:	Home Automation Inc.					
Date(s) of Test:	August 11th 2009					
Test Engineer:	Aidi Zainal					
Voltage:	120 VAC					
Operation Mode:	continuous receive					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	AC Mains test bench				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

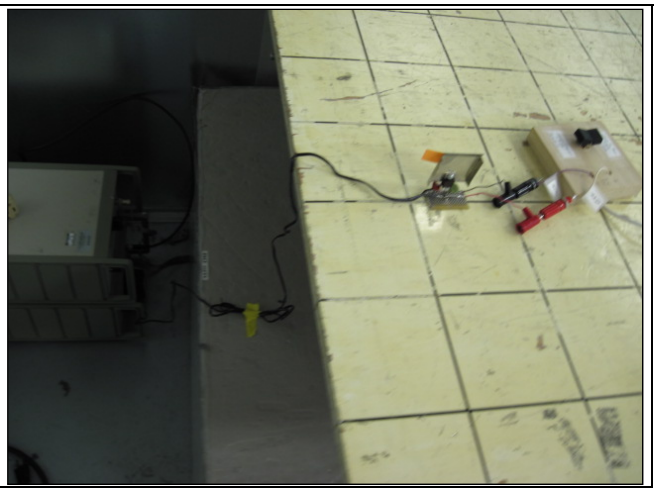
		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
0.156	L1	21.1	65.7	44.6	9.2	55.7	46.5
0.197	L1	18.0	63.7	45.7	7.1	53.7	46.6
0.716	L1	7.4	56.0	48.6	3.5	46.0	42.5
5.420	L1	3.8	60.0	56.2	1.0	50.0	49.0
24.490	L1	3.1	60.0	56.9	1.8	50.0	48.2
0.176	L2	12.5	64.7	52.2	7.2	54.7	47.5
0.275	L2	10.7	61.0	50.3	5.5	51.0	45.4
0.734	L2	7.2	56.0	48.8	3.5	46.0	42.5
2.630	L2	4.6	56.0	51.5	2.1	46.0	43.9
22.990	L2	3.4	60.0	56.6	1.5	50.0	48.5

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 across the Low, Middle and High channels tested.

6.7 Test Setup Photo(s) – Conducted Emissions Test





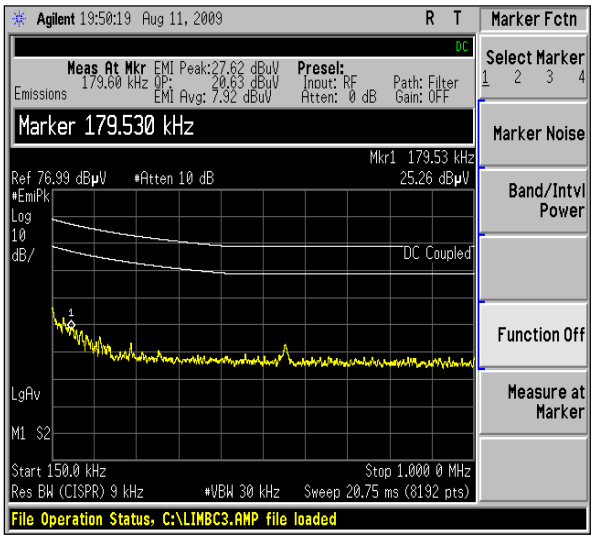
6.8 Screen Captures – Conducted Emissions Test

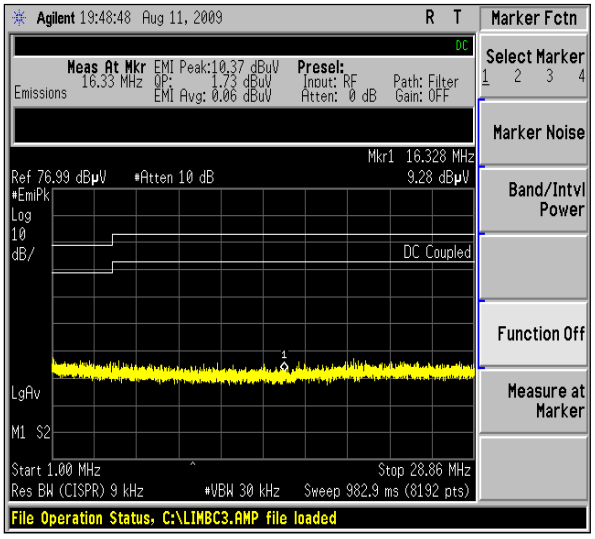
These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2 (Table 2).

The signature scans shown here are from channel 2480, chosen as being a good representative of channels.

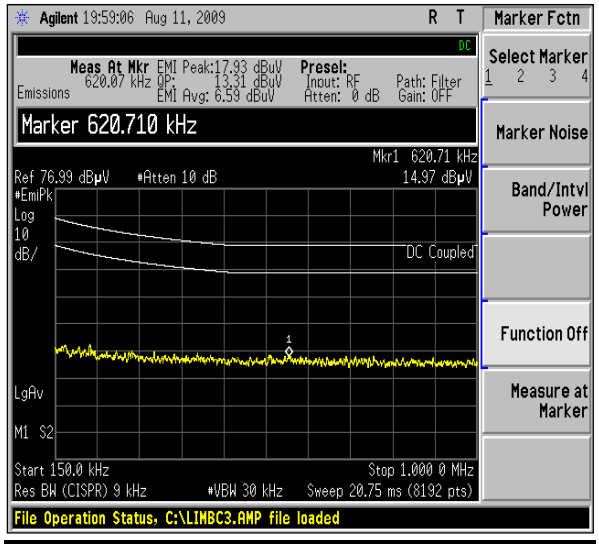
6.8.1 Transmit mode.

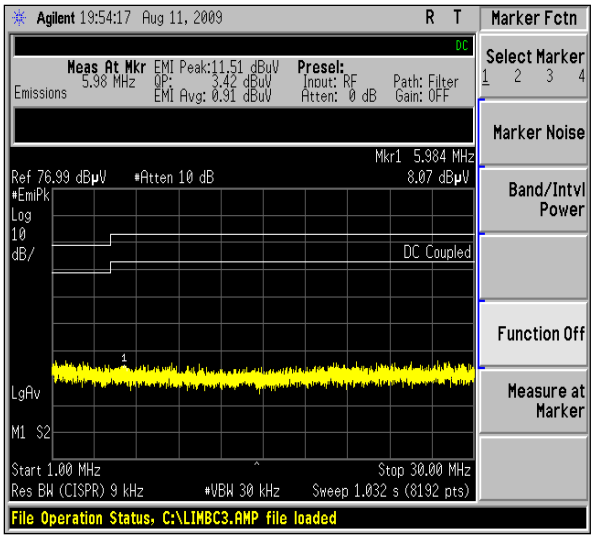
Line 1





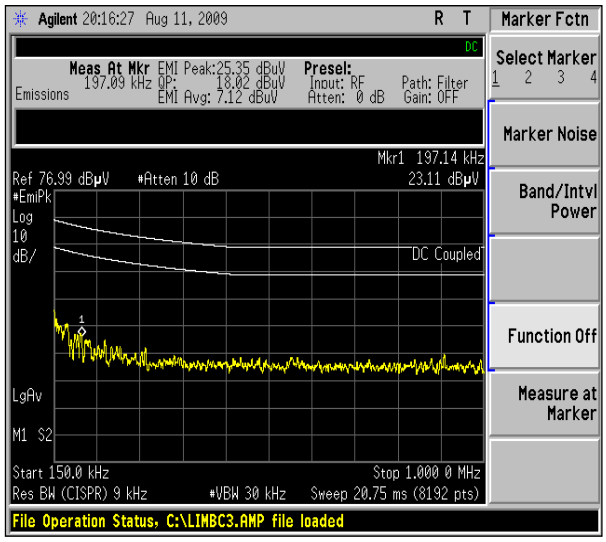
Line 2

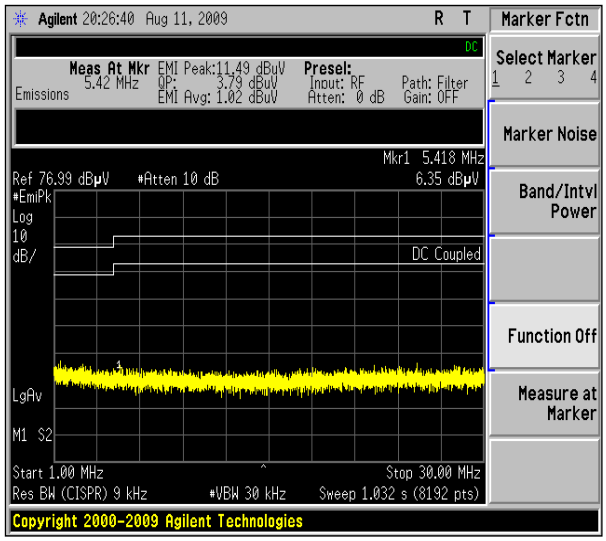




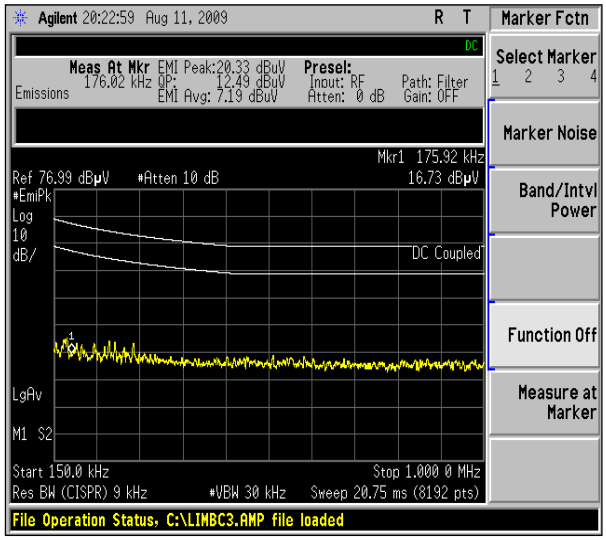
6.8.1 Receive mode.

Line 1


Agilent 20:16:27 Aug 11, 2009
R T
Marker Fctn
Meas At Mkr 197.09 kHz
EMI Peak:25.35 dBuV
QP: 18.02 dBuV
EMI Avg: 7.12 dBuV
Presel:
Input: RF
Atten: 0 dB
Path: Filter
Gain: OFF
Emissions
Select Marker
1 2 3 4
Marker Noise
Mkr1 197.14 kHz
Ref 76.99 dBµV
#Atten 10 dB
23.11 dBµV
#EmiPk
Log
10
dB/
DC Coupled
Band/Intvl Power
Function Off
Measure at Marker
LgAv
M1 S2
Start 150.0 kHz
Stop 1.000 0 MHz
Res BW (CISPR) 9 kHz
#VBW 30 kHz
Sweep 20.75 ms (8192 pts)
File Operation Status, C:\LIMBC3.AMP file loaded


Agilent 20:26:40 Aug 11, 2009
R T
Marker Fctn
Meas At Mkr 5.42 MHz
EMI Peak:11.49 dBuV
QP: 3.79 dBuV
EMI Avg: 1.02 dBuV
Presel:
Input: RF
Atten: 0 dB
Path: Filter
Gain: OFF
Emissions
Select Marker
1 2 3 4
Marker Noise
Mkr1 5.418 MHz
Ref 76.99 dBµV
#Atten 10 dB
6.35 dBµV
#EmiPk
Log
10
dB/
DC Coupled
Band/Intvl Power
Function Off
Measure at Marker
LgAv
M1 S2
Start 1.00 MHz
Stop 30.00 MHz
Res BW (CISPR) 9 kHz
#VBW 30 kHz
Sweep 1.032 s (8192 pts)
Copyright 2000-2009 Agilent Technologies

Line 2


Agilent 20:22:59 Aug 11, 2009
R T
Marker Fctn
Meas At Mkr EMI Peak:20.33 dBuV
176.02 kHz QP: 12.49 dBuV
EMI Avg: 7.19 dBuV
Presel:
Inout: RF
Atten: 0 dB
Path: Filter
Gain: OFF
Emissions
Select Marker
1 2 3 4
Marker Noise
Mkr1 175.92 kHz
Ref 76.99 dBµV
#Atten 10 dB
16.73 dBµV
Band/Intvl Power
#EmiPk
Log
10
dB/
DC Coupled
Function Off
LgAv
Measure at Marker
M1 S2
Start 150.0 kHz
Stop 1.000 0 MHz
Res BW (CISPR) 9 kHz
#VBW 30 kHz
Sweep 20.75 ms (8192 pts)
File Operation Status, C:\LIMBC3.AMP file loaded

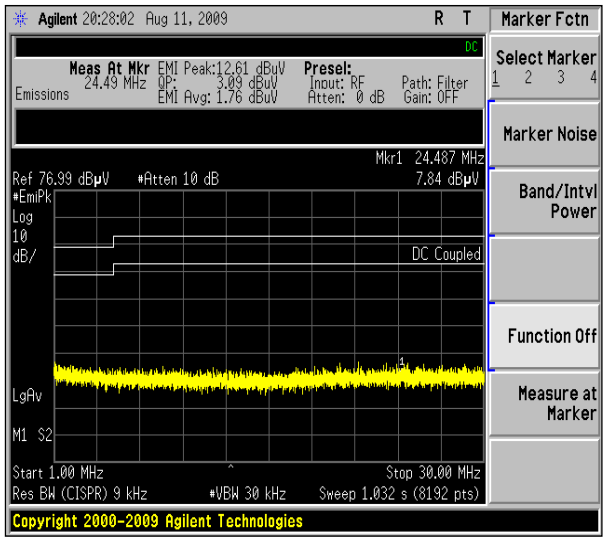

Agilent 20:28:02 Aug 11, 2009
R T
Marker Fctn
Meas At Mkr EMI Peak:12.61 dBuV
24.49 MHz QP: 3.09 dBuV
EMI Avg: 1.76 dBuV
Presel:
Inout: RF
Atten: 0 dB
Path: Filter
Gain: OFF
Emissions
Select Marker
1 2 3 4
Marker Noise
Mkr1 24.487 MHz
Ref 76.99 dBµV
#Atten 10 dB
7.84 dBµV
Band/Intvl Power
#EmiPk
Log
10
dB/
DC Coupled
Function Off
LgAv
Measure at Marker
M1 S2
Start 1.00 MHz
Stop 30.00 MHz
Res BW (CISPR) 9 kHz
#VBW 30 kHz
Sweep 1.032 s (8192 pts)
Copyright 2000-2009 Agilent Technologies

EXHIBIT 7. OCCUPIED BANDWIDTH:

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

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

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) and RSS 210 A8.2(a) requires a minimum -6dBc occupied bandwidth of 500 kHz. In addition, Industry Canada (IC RSS GEN 4.6.1) requires the measurement of the -20dBc occupied bandwidth. 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 E4446A spectrum analyzer. An Agilent model E4446A spectrum analyzer was used with the resolution bandwidth set to 30 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 (6 dB bandwidth) when compared to the specified limit, is 1670 kHz, which is above the minimum of 500 kHz.

7.3 Test Equipment List

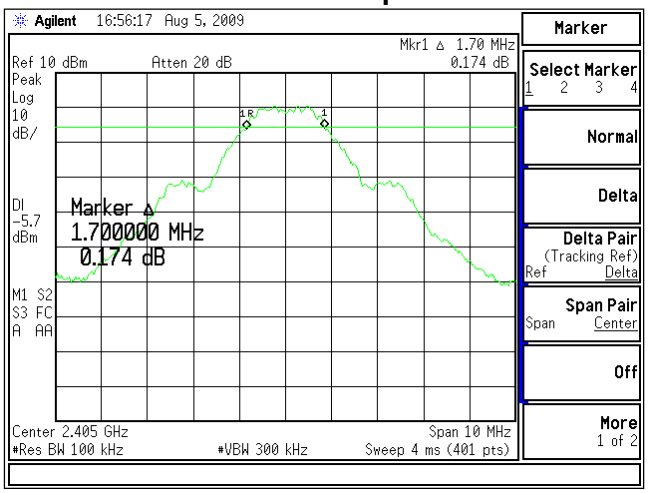
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

7.4 Test Data

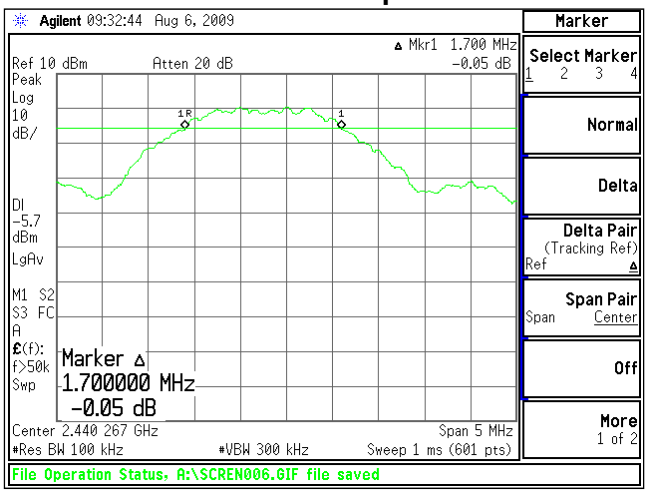
Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc Occ.Bw (kHz)
11	2405	1700	500	2450
18	2440	1700	500	2370
25	2475	1700	500	2330
26	2480	1670	500	2550

7.5 Screen Captures - OCCUPIED BANDWIDTH

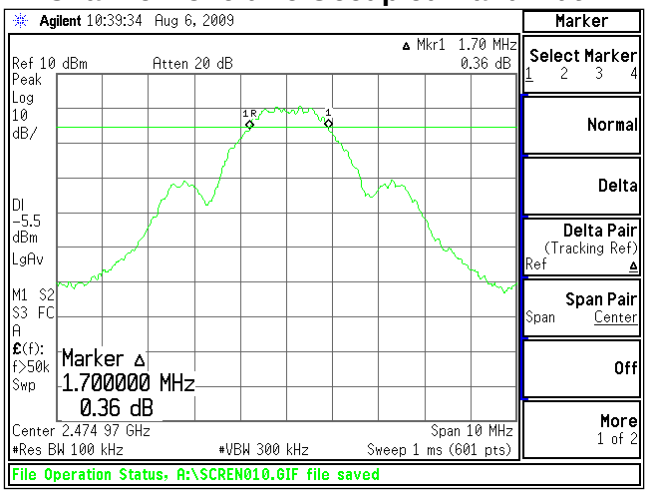
Channel 11 -6 dBc Occupied Bandwidth



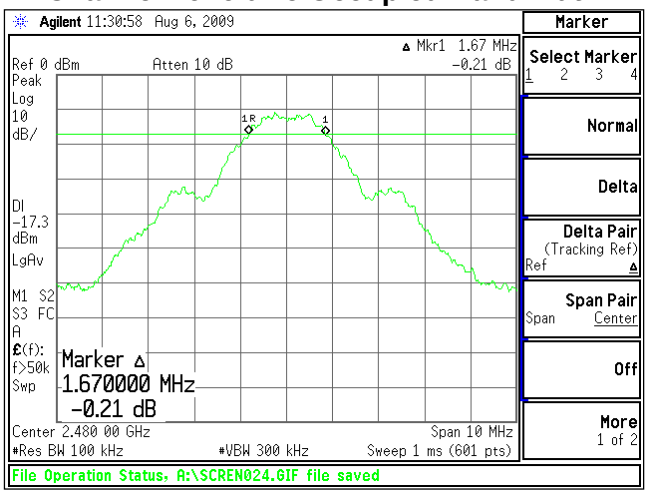
Channel 18 -6 dBc Occupied Bandwidth



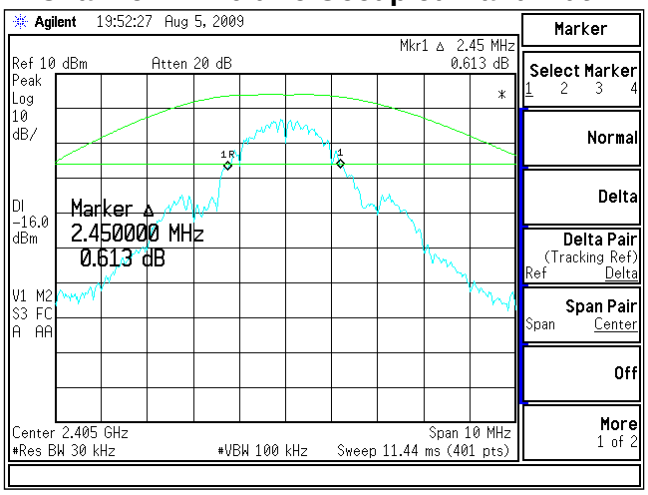
Channel 25 -6 dBc Occupied Bandwidth



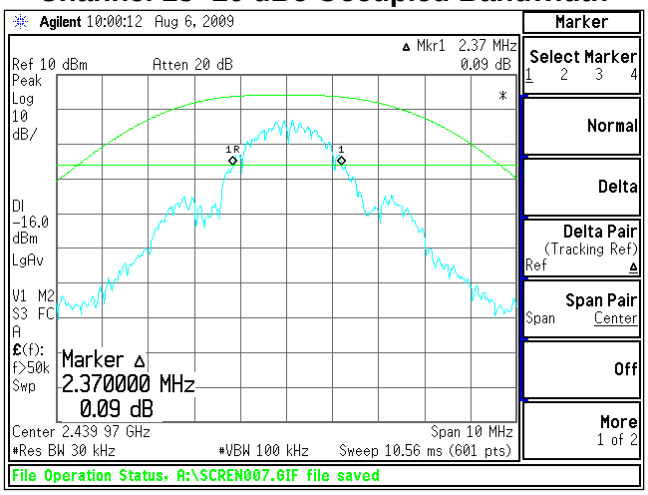
Channel 26 -6 dBc Occupied Bandwidth



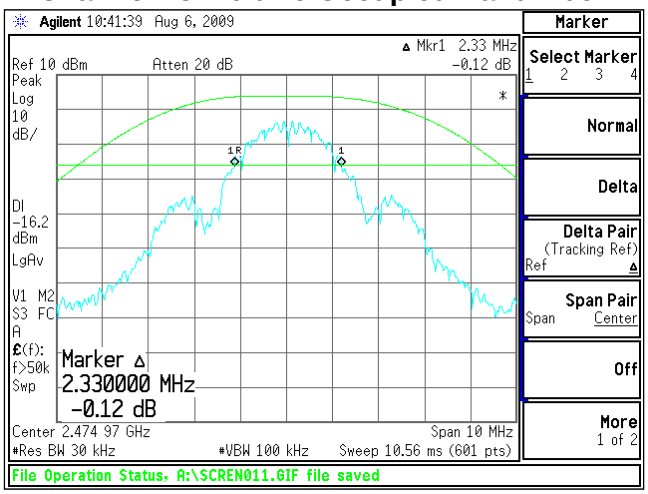
Channel 11 -20 dBc Occupied Bandwidth



Channel 18 -20 dBc Occupied Bandwidth



Channel 25 -20 dBc Occupied Bandwidth



Channel 26 -20 dBc Occupied Bandwidth

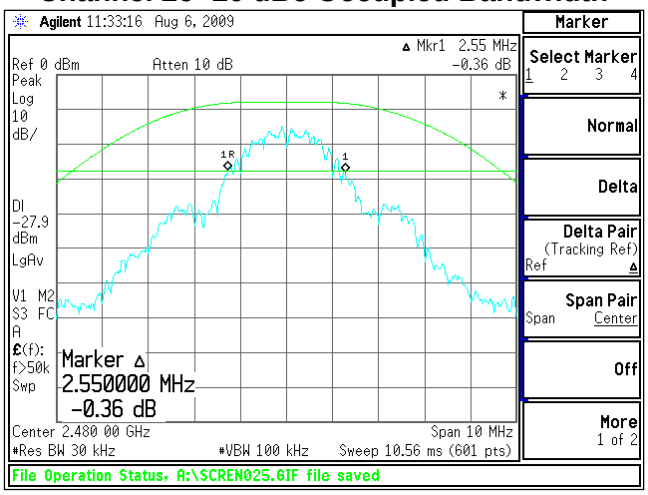
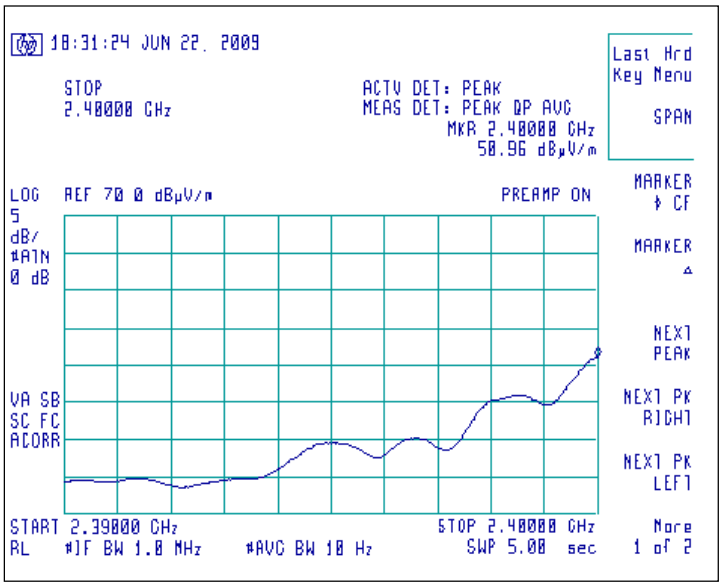


EXHIBIT 8. BAND-EDGE MEASUREMENTS

8.1 Method of Measurements

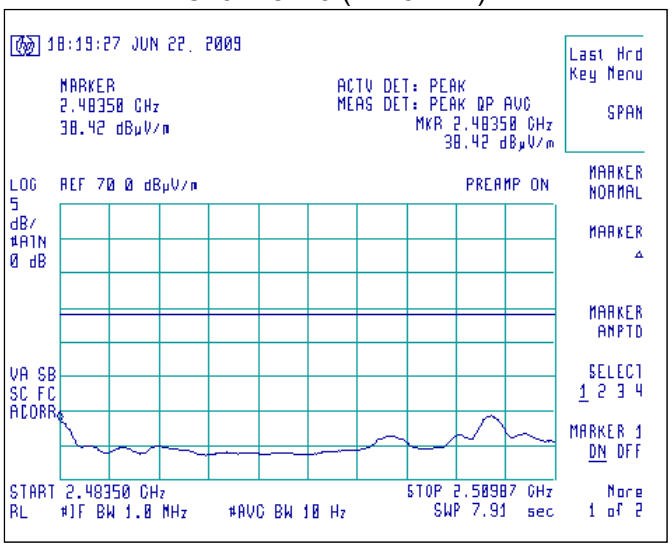
FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. 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.

Screen Capture Demonstrating Compliance at the Lower Band-Edge



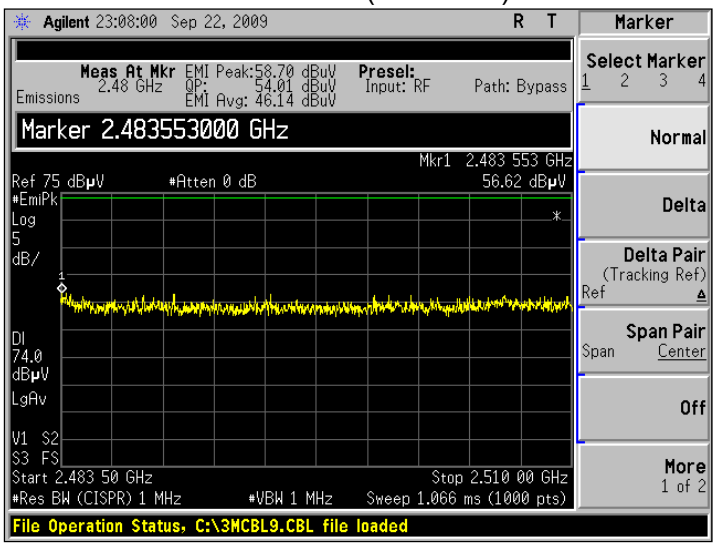
The Lower Band-Edge limit, in this case, would be + 85.2 dBµV/m at 3m.

Screen Capture Demonstrating Compliance at the Higher Band-Edge
Channel 25 (2475MHz)



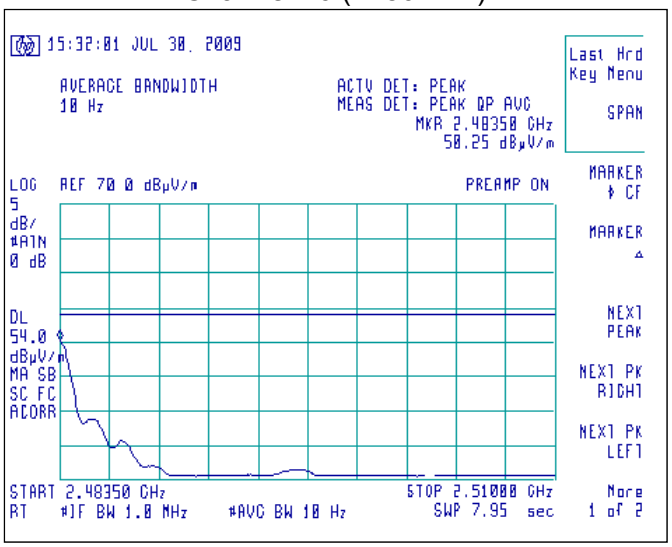
The Upper Band-Edge limit, in this case, would be + 54.0 dBµV/m at 3m.

Screen Capture Demonstrating Peak limit compliance at the Higher Band-Edge
Channel 25 (2475MHz)



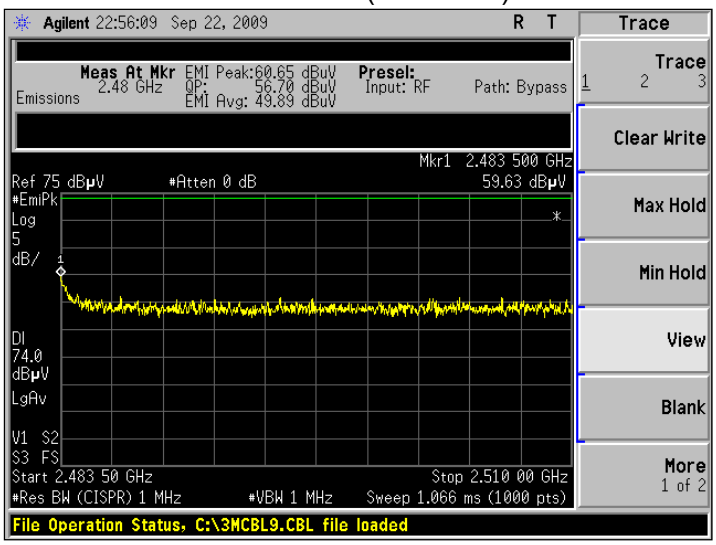
The Peak limit, in this case, would be + 74.0 dBµV/m at 3m.

Channel 26 (2480MHz)



The Upper Band-Edge limit, in this case, would be + 54.0 dBµV/m at 3m.

Screen Capture Demonstrating Peak limit compliance at the Higher Band-Edge
Channel 26 (2480MHz)



The Peak limit, in this case, would be + 74.0 dBµV/m at 3m.

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

9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable. The loss from the cable was added as a correction factor on the analyzer, thereby 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, with measurements from a peak detector presented in the chart below.

9.2 Test Equipment List

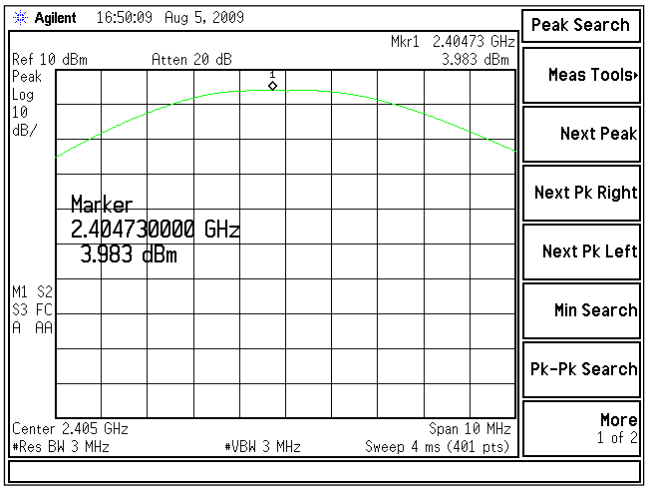
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

9.3 Test Data

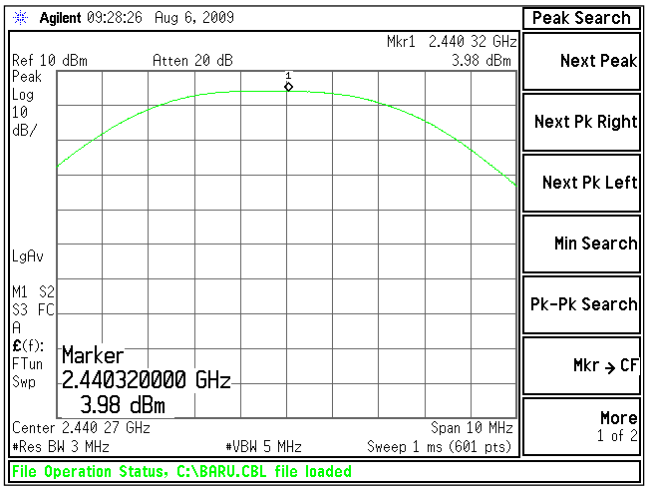
CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
11	2405	+30 dBm	3.98	26.0
18	2440	+30 dBm	3.98	26.0
25	2475	+30 dBm	3.98	26.0
26	2480	+30 dBm	-7.92	37.9

9.4 Screen Captures – Power Output (Conducted)

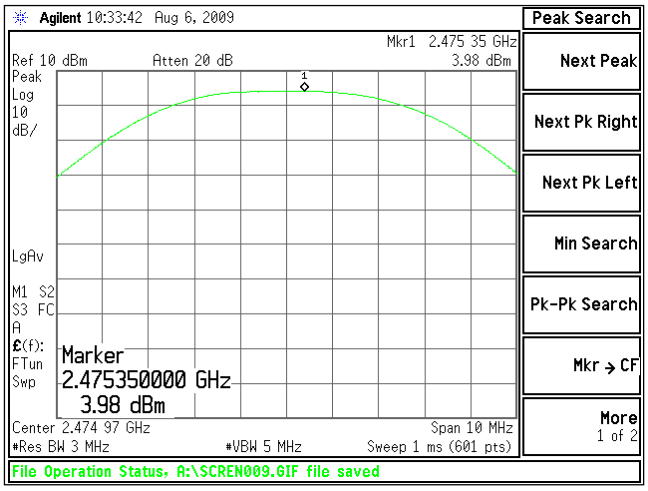
Channel 11



Channel 18



Channel 25



Channel 26

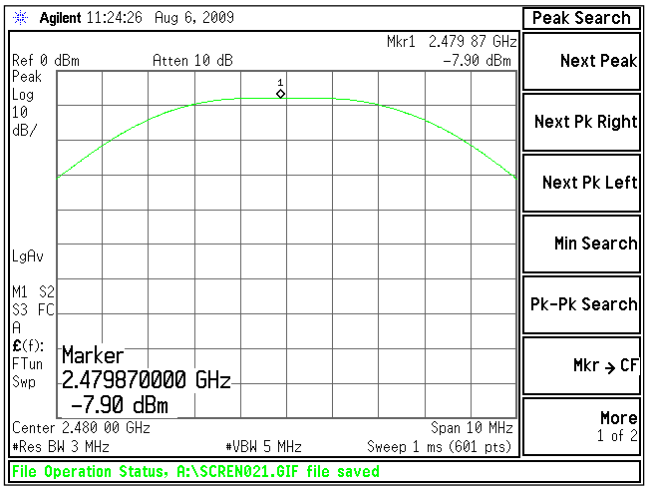


EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

10.1 Limits

For digitally modulated 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) and RSS 210 A8.2(b), 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 using the utility built into the HP Analyzer. The resultant density was then corrected to a 3 kHz bandwidth. The highest density was found to be no greater than -21.8 dBm, which is under the allowable limit by 29.8 dB.

10.2 Test Equipment List

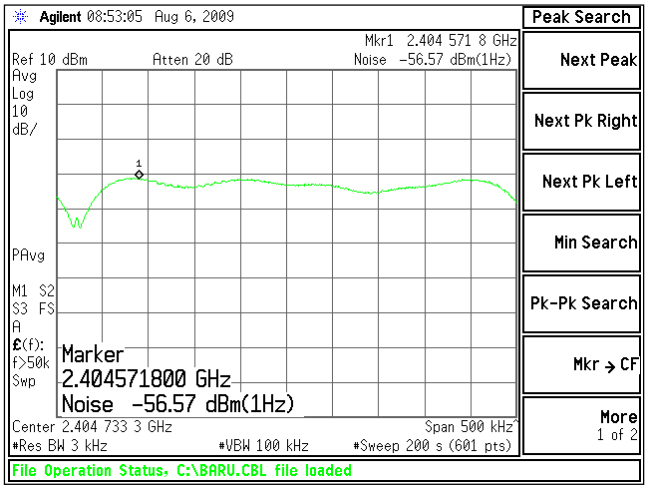
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

10.3 Test Data

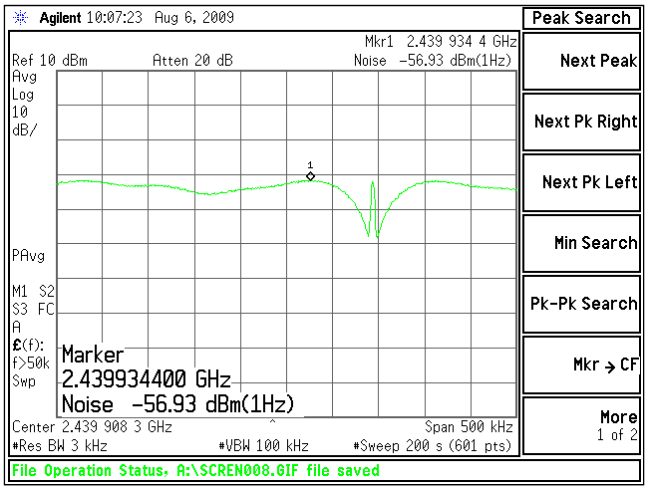
Channel	Center Frequency (MHz)	Measured Channel Power (dBm/__kHz)	Corrected Power Measurement (dBm/3kHz)	Limit (dBm)	Margin (dB)
11	2405	-56.6	-21.8	+8.0	29.8
18	2440	-56.9	-22.1	+8.0	30.1
25	2475	-56.7	-21.9	+8.0	29.9
26	2480	-68.5	-33.7	+8.0	41.7

10.4 Screen Captures – Power Spectral Density

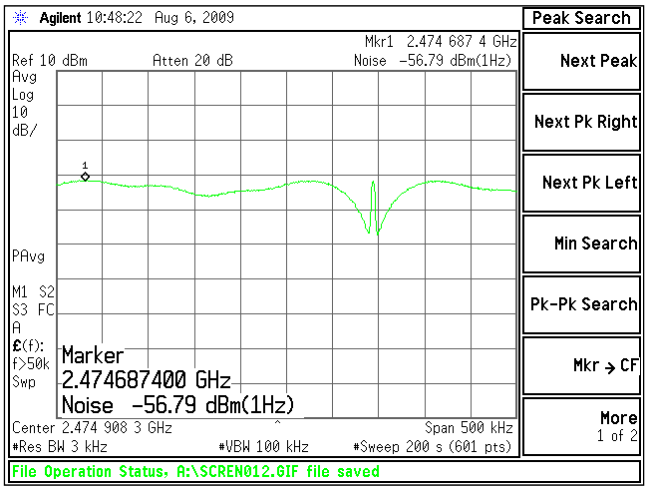
Channel 11



Channel 18



Channel 25



Channel 26

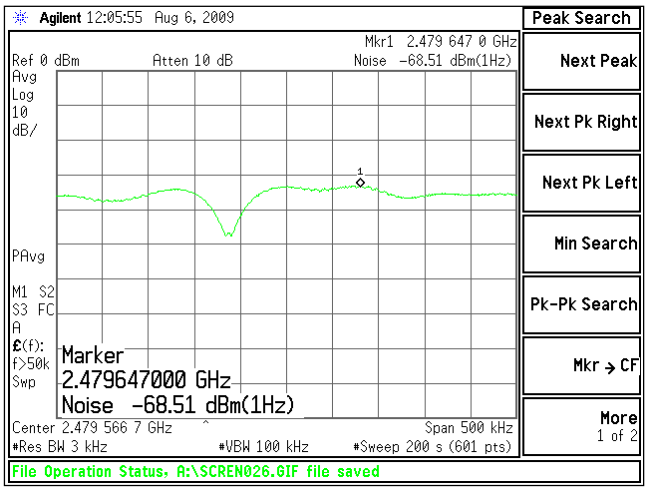


EXHIBIT 11. SPURIOUS RADIATED EMISSIONS: 15.247(d)

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 least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

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)

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

FCC 47 CFR 15.205(a) – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 – 0.110	162.0125 – 167.17	2310 – 2390	9.3 – 9.5
0.49 – 0.51	167.72 – 173.2	2483.5 – 2500	10.6 – 12.7
2.1735 – 2.1905	240 – 285	2655 – 2900	13.25 – 13.4
8.362 – 8.366	322 – 335.4	3260 – 3267	14.47 – 14.5
13.36 – 13.41	399.9 – 410	3332 – 3339	14.35 – 16.2
25.5 – 25.67	608 – 614	3345.8 – 3358	17.7 – 21.4
37.5 – 38.25	960 – 1240	3600 – 4400	22.01 – 23.12
73 – 75.4	1300 – 1427	4500 – 5250	23.6 – 24.0
108 – 121.94	1435 – 1626.5	5350 – 5460	31.2 – 31.8
123 – 138	1660 – 1710	7250 – 7750	36.43 – 36.5
149.9 – 150.05	1718.8 – 1722.2	8025 – 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 – 9200	

FCC 47 CFR 15.209(a) Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 – 0.490	2,400 / F (kHz)	300
0.490 – 1.705	24,000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Calculation of Radiated Emission Measurements

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	-
960-25,000	500	54.0	63.5

FCC Part 15.247(d) and IC RSS 210 A8.5 require 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. The loss from the cable was added on the analyzer as a correction factor, hence allowing direct readings of the measurements made without the need for any further corrections. An Agilent model E444A 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.

11.2 Test Equipment List

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

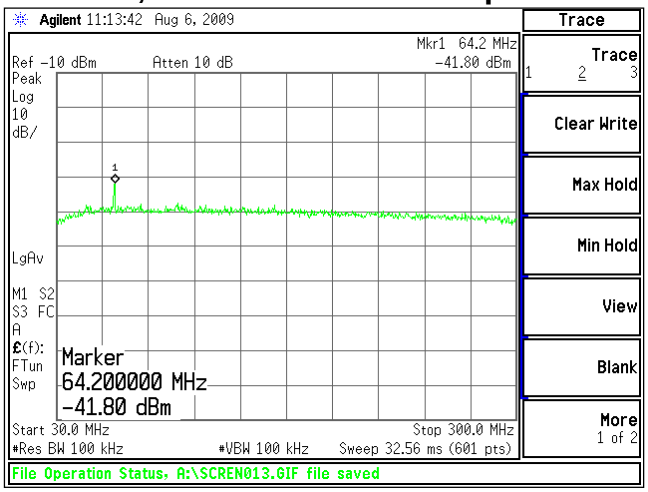
11.3 Test Data

	Channel 11	Channel 18	Channel 25	Channel 26
Fundamental	0.4	0.4	0.5	-12.0
2nd Harmonic	-64.5	-68.3	-68.9	-68.5
3rd Harmonic	-57.8	-58.5	-63.0	Note 1
4th Harmonic	-60.0	-61.1	-62.5	-82.9
5th Harmonic	-57.4	-57.7	-60.2	Note 1
6th Harmonic	-73.7	-73.6	-75.9	-81.4
7th Harmonic	-75.8	-81.4	-83.1	Note 1
8th Harmonic	-82.9	-81.5	Note 1	Note 1
9th Harmonic	Note 1	Note 1	Note 1	Note 1
10th Harmonic	Note 1	Note 1	Note 1	Note 1

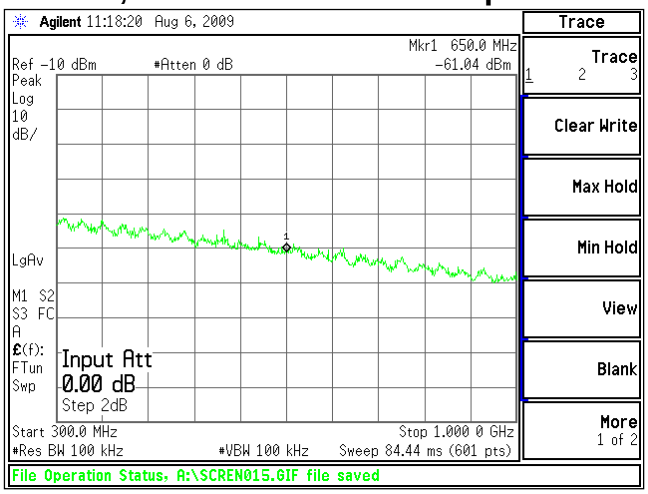
Notes:
(1) Measurement at system noise floor.
(2) Measurement unit is dBm.

11.4 Screen Captures – Spurious Radiated Emissions

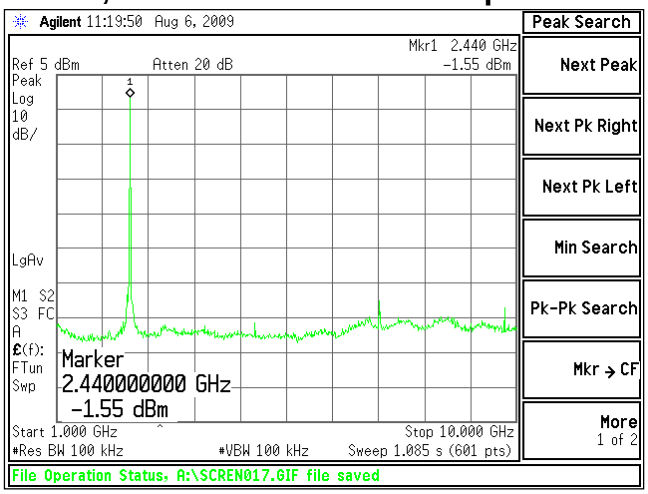
Channel 18, shown from 30 MHz up to 300 MHz



Channel 18, shown from 300 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

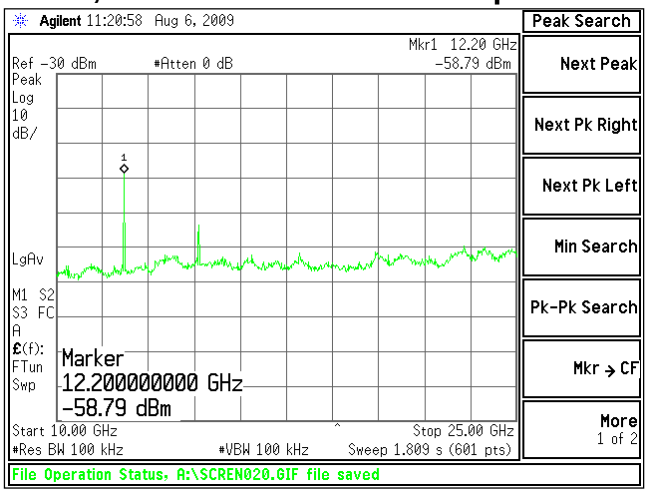


EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

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

	DC Voltage Source		
	4.25 VDC	5.0 VDC	5.75 VDC
Channel 11	2405003400(Hz)	2405003400(Hz)	2405003400(Hz)
Channel 18	2440002660(Hz)	2440002660(Hz)	2440002660(Hz)
Channel 25	2475002619(Hz)	2475002636(Hz)	2475002611(Hz)
Channel 26	2480003197(Hz)	2480003114(Hz)	2480003180(Hz)

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

	DC Voltage Source		
	4.25 VDC	5.0 VDC	5.75 VDC
Channel 11	3.98(dBm)	3.98(dBm)	4.08(dBm)
Channel 18	3.87(dBm)	3.98(dBm)	3.96(dBm)
Channel 25	3.97(dBm)	3.98(dBm)	3.96(dBm)
Channel 26	-7.83(dBm)	-7.92(dBm)	-7.84(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.

EXHIBIT 13. MPE CALCULATIONS

The following MPE calculations are based on an inverted-F printed circuit board trace antenna with a measured ERP of 105.2dBµV/m (at 3 meters) and conducted RF power of +3.98 dBm as presented to the antenna. The calculated gain of this antenna, based on the ERP measurements performed over a conducting ground plane is 5.99 dB.

Prediction of MPE limit at a given distance

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

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

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

Maximum peak output power at antenna input terminal:	3.98	(dBm)
Maximum peak output power at antenna input terminal:	2.500	(mW)
Antenna gain(typical):	5.99	(dBi)
Maximum antenna gain:	3.972	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2405	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.001976	(mW/cm^2)
Maximum allowable antenna gain:	33.0	(dBi)
Margin of Compliance at 20 cm =	27.0	dB

APPENDIX A

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Spurious Emissions Job # : C-647

Prepared By: aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/26/2008	9/26/2009	Active Calibration
2	aa 960144	Phaseflex	Gore	EkD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration
3	aa 960081	Double Ridge Horn Antenna	EMCO	3115	6907	9/26/2008	9/26/2009	Active Calibration
4	ee 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro	WLA622-4	123001	6/30/2009	6/30/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Power Spectral Density Job # : C-647

Prepared By: Aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/26/2008	9/26/2009	Active Calibration
2	aa 960144	Phaseflex	Gore	EkD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Conducted Measurements Job # : C-647

Prepared By: Aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/26/2008	9/26/2009	Active Calibration
2	aa 960144	Phaseflex	Gore	EkD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Zainal

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Conducted Emissions Job # : C-647

Prepared By: Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	aa 960008	LISN	EMCO	3816/2NM	9701-1057	12/29/2008	12/29/2009	Active Calibration
2	aa 960031	Transient Limiter	HP	11947A	3107A01708	9/23/2008	9/23/2009	Active Calibration
3	ee 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration
4	ee 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/10/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Radiated Emissions (109) Job # : C-647

Prepared By: aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	9/23/2008	9/23/2009	Active Calibration
2	ee 960014	EMI Receiver-filter section	HP	85460A	3448A00296	9/23/2008	9/23/2009	Active Calibration
3	aa 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/20/2008	10/20/2009	Active Calibration
4	aa 960077	Bicon Antenna	EMCO	93110B	9702-2918	11/24/2008	11/24/2009	Active Calibration
5	aa 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	12/23/2008	12/23/2009	Active Calibration
6	ee 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/26/2008	9/26/2009	Active Calibration
7	aa 960144	Phaseflex	Gore	EkD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration
8	aa 960081	Double Ridge Horn Antenna	EMCO	3115	6907	9/26/2008	9/26/2009	Active Calibration
9	ee 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro	WLA622-4	123001	6/30/2009	6/30/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Band-Edge Job # : C-647

Prepared By: aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	9/23/2008	9/23/2009	Active Calibration
2	ee 960014	EMI Receiver-filter section	HP	85460A	3448A00296	9/23/2008	9/23/2009	Active Calibration
3	aa 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	12/23/2008	12/23/2009	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 6-Aug-2009 Type Test : Radiated Emissions Job # : C-647

Prepared By: aidi Customer : Home Automation Inc. (LSR) Quote #: 309187

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	9/23/2008	9/23/2009	Active Calibration
2	ee 960014	EMI Receiver-filter section	HP	85460A	3448A00296	9/23/2008	9/23/2009	Active Calibration
3	aa 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/20/2008	10/20/2009	Active Calibration
4	aa 960077	Bicon Antenna	EMCO	93110B	9702-2918	11/24/2008	11/24/2009	Active Calibration
5	aa 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	12/23/2008	12/23/2009	Active Calibration
6	ee 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/26/2008	9/26/2009	Active Calibration
7	aa 960144	Phaseflex	Gore	EkD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration
8	aa 960081	Double Ridge Horn Antenna	EMCO	3115	6907	9/26/2008	9/26/2009	Active Calibration
9	ee 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro	WLA622-4	123001	6/30/2009	6/30/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

APPENDIX B

TEST STANDARDS – CURRENT PUBLICATION DATES RADIO

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2003		
CISPR 11	2009-05		
CISPR 12	2007-05		
CISPR 14-1	2005-11	2008-11	
CISPR 14-2	2001-11	2001-11	2008-05
CISPR 16-1-1 Note 1	2006-03	2006-09	2007-07
CISPR 16-1-2 Note 1	2003	2004-04	2006-07
CISPR 22	2008-09		
CISPR 24	1997-09	2001-07	2002-10
EN 55011	2007-05		
EN 55014-1	2006		
EN 55014-2	1997		
EN 55022	2006	2007	
EN 60601-1-2	2007-03		
EN 61000-3-2	2006-05		
EN 61000-3-3	2008-12		
EN 61000-4-2	2009-03		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2007-08		
EN 61000-4-8	1994	2001	
EN 61000-4-11	2004-10		
EN 61000-6-1	2007-02		
EN 61000-6-2	2005-12		
EN 61000-6-3	2007-02		
EN 61000-6-4	2007-02		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2008		
FCC Public Notice DA 00-1407	2000		
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2007-02		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
IEC 61000-4-3	2008-04	incl in 2006	
IEC 61000-4-4	2004-07		
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-06		
IEC 61000-4-8	2001-03		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14082	1998-07		
MIL Std. 461E	1999-08		
RSS GEN	2007-06		
RSS 119	2007-06		
RSS 123	1999-11		
RSS 125	2000-03		
RSS 131	2003-07		
RSS 136	2002-10		
RSS 137	2009-02		
RSS 210	2007-06		
RSS 213	2005-12		
RSS 243	2005-11		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation.

Updated on 8-14-09

APPENDIX C
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