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ENGINEERING TEST REPORT # 308248-5000 TX
LSR Job #:C-380

Compliance Testing of:
THX9321R5000

Test Date(s):
September 8th to 18th 2008

Prepared For:
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247 FHSS TX
Frequency Hopping Spread Spectrum Operating in the
Frequency Band 902MHz –928MHz

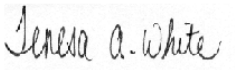
Test Report Reviewed by: Teresa A. White, Quality Manager Signature:  Date: September 30, 2008	**Tested by:** Khairul Aidi Zainal, Senior EMC Engineer Signature:  Date: September 30, 2008

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.247
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Digital Modulation Transmitters operating in the Frequency Band of 902 MHz – 928 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	• Commercial, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2007	Code of Federal Regulations - Telecommunications
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006 A2: 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.

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:	**Honeywell**
Address:	**1985 Douglas Drive North Golden Valley, MN 55422**
Contact Person:	**Robert Juntunen**
Contact Phone:	**N/A**
Contact Email:	**Robert.d.juntunen@honeywell.com**

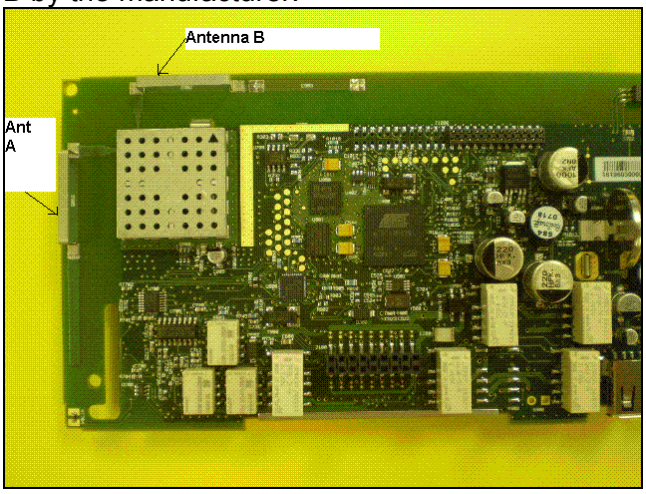
2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Color Alpha
Model Number:	THX9321R5000
Serial Number:	16196030000261 (Test mode) 16196030000246 (Hop mode)

2.3 ASSOCIATED ANTENNA DESCRIPTION

There are two - PCB trace with bar element. The antennas are designated as antenna A and B by the manufacturer.



2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	903MHz to 926.4MHz
Radiated RF Power (in Watts)	Antenna A: 0.0194 Watts (at 926.4MHz) Antenna B: 0.0267 Watts (at 903 MHz)
Maximum Conducted RF/Output Power (in dBm)	Antenna A: 10.7dBm (at 903MHz) Antenna B: 10.9 dBm (at 903MHz)
Maximum Conducted RF/Output Power (Watts)	Antenna A: 0.0117 Watts (at 903MHz) Antenna B: 0.0123 Watts (at 903MHz)
Operating Voltage	115VAC
Field Strength (at 3 meters) (in dBuV/m)	Antenna A: 108.1 dBuV/m (at 926.4 MHz) Antenna B: 109.5 dBuV/m (at 903 MHz)
Maximum Occupied Bandwidth (99% BW) (in kHz)	83.0 kHz
Type of Modulation	FSK
Maximum EIRP (in mW)	Antenna A: 19.4 mW (at 926.4 MHz) Antenna B: 26.7 mW (at 903 MHz)
Emission Designator	83K0F1D
Transmitter Spurious (worst case)	Antenna A: 48.2 dBuV/m at 1m (6321.0 MHz) Antenna B: 47.8 dBuV/m at 1m (6484.8 MHz)
Frequency Tolerance %, Hz, ppm	100 ppm
Microprocessor Model # (if applicable)	MSP430F2370
Antenna Information	
Detachable/non-detachable	Non-detachable
Type	PCB trace with bar element.
Gain (in dBi) (Note: Measured over conducting Ground Plane.) Note: Gain calculated using data from channel with highest field strength.	Antenna A: 2.87 dBi Antenna B: 3.37 dBi
EUT will be operated under FCC and IC Rule Part(s)	47 CFR 15.247 and 15.207 IC: RSS-GEN, 2007 and RSS-210, Issue 7, 2007
Portable/Mobile	☐ Portable ☒ Mobile
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: OET Bulletin 65, IC Safety Code 6
- Measurement Distance: 20 cm
- Antenna A RF Value: 0.0385 ☐ V/m ☐ A/m ☒ W/m^2
  ☐ Measured ☐ Computed ☒ Calculated

- Antenna B RF Value: 0.0532 ☐ V/m ☐ A/m ☒ W/m^2
  ☐ Measured ☐ Computed ☒ Calculated

2.5 PRODUCT DESCRIPTION

The device is a line powered thermostat with an integrated graphic color user interface; it provides temperature and humidity information in addition to output relay logic to control HVAC equipment for residential and light commercial applications.

PHOTO (Optional)

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTING

3.1 CLIMATE TEST CONDITIONS

Temperature:	72º Fahrenheit
Humidity:	56%
Pressure:	741mmHg

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)(1)	Bandwidth of an FHSS 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(d)	RF Spurious Emissions	Yes
15.247(b), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
The transmitter circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B and the associated Radio Receiver and Digital Circuitry 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)**

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ **None** ☐ **Yes (explain below)**

3.5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2007	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15-Radio Frequency Device
ANSI C63.4	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 7	2007	Low Power License-Exempt Radio Communication Devices (All Frequency Bands)
IC RSS-212 Issue 1		Test Methods for Radio Equipment
RSS-GEN	2007	General Requirements and Information for the Certification of Radio Communication Equipment

The test procedures used are in accordance with ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

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 8.1) for a Frequency Hopping Spread Spectrum (FHSS) Transmitter.

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

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

EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in continuous transmit mode for final testing using power as provided by the Honeywell transformer which is connected to the Mains network. The unit has the capability to operate on 3 channels and two non-detachable EUT antennas. The switching of the antenna and channels of the THX9321R5000 are done at the module screen:

1. Under 'Menu', select 'Self Test' mode and then select 'RF XTR'. Under 'RF XTR', select 'TX mode (manual)'.
2. 'TX mode (manual)' will allow for selections of channels (1:903MHz, 2:914.6MHz or 3:926.4MHz), antennas (Antenna A or Antenna B) and mode (Transmit or Receive).

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 (3) standard channels: low (903.0MHz), middle (914.6MHz) and high (926.4MHz) to comply with FCC Part 15.35 and both internal non-detachable antennas. The EUT was only tested in one orientation (Vertical) as this is its normal operation orientation (Wall Mounted).

5.2 Test Setup Photo(s) – Radiated Emissions Test

Vertical Orientation

5.3 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 10000 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.

5.4 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. From 4 GHz to 10 GHz, an HP E4407B Spectrum Analyzer and an EMCO Horn Antenna were used.

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
Spectrum Analyzer	HP	E4407B	US39160256
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 (5-18 GHz)	Adv. Microwave	WLA612	0123101
Pre-Amp (18-15 GHz)	Adv. Microwave	WLA622-4	0123001
Horn Antenna – Std. Gain	EMCO	3160.09	9809-1120

5.5 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for an FHSS transmitter [Canada RSS-210, Issue 7 (2007), Annex 8 (section 8.1). The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

5.6 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 902-928 MHz band, as specified in Title 47 CFR 15.247 (b)(1), 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

5.7 DATA CHART – RADIATED EMISSIONS TEST

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.205 and 15.247(FHSS)
Frequency Range Inspected: 30 MHz to 10000 MHz

Manufacturer:	Honeywell International						
Date(s) of Test:	September 8th to 11th 2008						
Test Engineer(s):	Khairul Aidi Zainal						
Voltage:	115 VAC						
Operation Mode:	continuous transmit						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:	√	Single Phase 115 VAC		3 Phase ___VAC			
		Battery		Other:			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:		Peak	√	Quasi-Peak	√	Average	

The following table depicts the level of significant spurious (not including signal harmonics) radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	EUT Antenna	EUT Channel	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	Spurious Limit (dBμV/m)	Margin (dB)
80.6	V/V	B	Note 2	1.00	119	21.0	40.0	19.0
81.3	V/V	A	Note 2	1.00	70	21.4	40.0	18.6

Note: 1.Spurious Limit is a combination of 15.247 and 15.205 limits.
2. Present on all channels.

Radiated Fundamental.

A. Antenna A

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
903.0	V/V	1.00	153	**106.7**	125.2	**18.5**
914.6	V/V	1.00	148	**107.1**	125.2	**18.1**
926.4	V/V	1.00	148	**108.1**	125.2	**17.1**

B. Antenna B

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
903.0	H/V	1.30	205	**109.5**	125.2	**15.7**
914.6	H/V	1.29	156	**109.3**	125.2	**15.9**
926.4	H/V	1.28	158	**109.3**	125.2	**15.9**

DATA CHART-RADIATED EMISSIONS TEST *(continued)*

A. Antenna A

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Low Channel : 903MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBμV/m)	Average (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
1806	H/V	1.00	158	43.4	34.0	86.7	52.7
2709				Note 3			
3612				Note 3			
4515	V/V	1.00	160	45.9	33.9	63.5	29.6
5418	V/V	1.41	0	47.8	40.2	63.5	23.3
6321	H/V	1.26	141	52.2	48.2	96.2	48.0
7224	V/V	1.17	29	51.4	41.5	96.2	54.7
8127				Note 3			
9030	V/V	1.10	166	53.3	45.5	63.5	18.0

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Middle Channel : 914.6MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBμV/m)	Average (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
1829.2	H/V	1.00	164	43.2	33.6	87.1	53.5
2743.8				Note 3			
3658.4				Note 3			
4573.0	V/V	1.00	158	47.6	36.2	63.5	27.3
5487.6	V/V	1.40	156	49.9	42.7	96.6	53.9
6402.2	H/V	1.19	141	51.7	46.7	96.6	49.9
7316.8	V/V	1.16	7	51.0	43.4	63.5	20.1
8231.4				Note 3		63.5	63.5
9146.0	V/V	1.00	171	53.4	45.7	63.5	17.8

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on High Channel: 926.4MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBμV/m)	Average (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
1852.8	H/V	1.00	168	43.3	33.6	88.1	54.5
2779.2				Note 3			
3705.6				Note 3			
4632.0	V/V	1.00	157	45.4	33.7	63.5	29.8
5558.4	V/V	1.00	157	51.7	47.5	97.6	50.1
6484.8	H/V	1.11	139	51.2	46.7	97.6	50.9
7411.2	V/V	1.20	0	50.7	43.0	63.5	20.5
8337.6				Note 3		63.5	63.5
9264.0	V/V	1	173	52.8	44.4	97.6	53.2

Notes:

1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4GHz were made at 1 meters of separation from the EUT
3) Measurement at receiver system noise floor.

DATA CHART-RADIATED EMISSIONS TEST *(continued)*

B. Antenna B.

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Low Channel : 903MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBµV/m)	Average (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
1806	V/V	1.18	109	42.5	31.6	89.5	57.9
2709				Note3			
3612				Note3			
4515	V/V	1.00	160	45.2	34.1	63.5	29.4
5418	V/V	1.04	162	50.9	46.1	63.5	17.4
6321	H/V	1.28	140	51.0	46.8	99.0	52.2
7224	V/V	1.18	80	53.4	46.5	99.0	52.5
8127				Note3			
9030	V/V	1.14	184	52.4	44.1	63.5	19.4

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Middle Channel : 914.6MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBµV/m)	Average (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
1829.2	V/V	1.13	151	43.0	33.4	89.3	55.9
2743.8				Note3			
3658.4				Note3			
4573.0	V/V	1.00	161	45.3	35.6	63.5	27.9
5487.6	V/V	1.03	152	51.3	46.3	98.8	52.5
6402.2	H/V	1.22	141	51.0	46.8	98.8	52.0
7316.8	V/V	1.18	30	51.4	45.9	63.5	17.6
8231.4				Note3			
9146.0	V/V	1.13	186	52.0	45.1	63.5	18.4

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on High Channel: 926.4MHz

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Peak (dBµV/m)	Average (dBµV/m)	15.247 Limit (dBµV/m)	Margin (dB)
1852.8	V/V	1.12	149	44.7	39.1	89.3	50.2
2779.2				Note3			
3705.6				Note3			
4632.0	V/V	1.00	160	42.7	33.6	63.5	29.9
5558.4	V/V	1.00	150	50.4	47.3	98.8	51.5
6484.8	H/V	1.20	142	50.5	47.8	98.8	51.0
7411.2	V/V	1.14	0	50.3	43.6	63.5	19.9
8337.6				Note3			
9264.0	V/V	1.03	170	51.5	45.6	98.8	53.2

Notes:

1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meters of separation from the EUT
3) Measurement at receiver system noise floor.

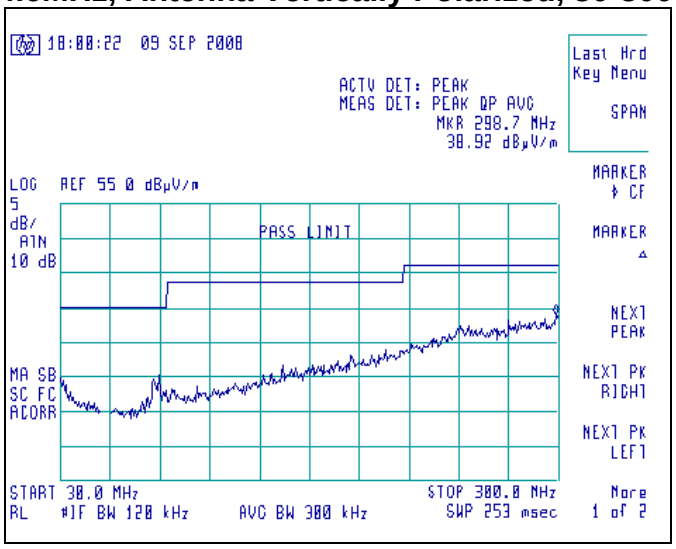
5.8 Screen Captures - Radiated Emissions Testing

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.

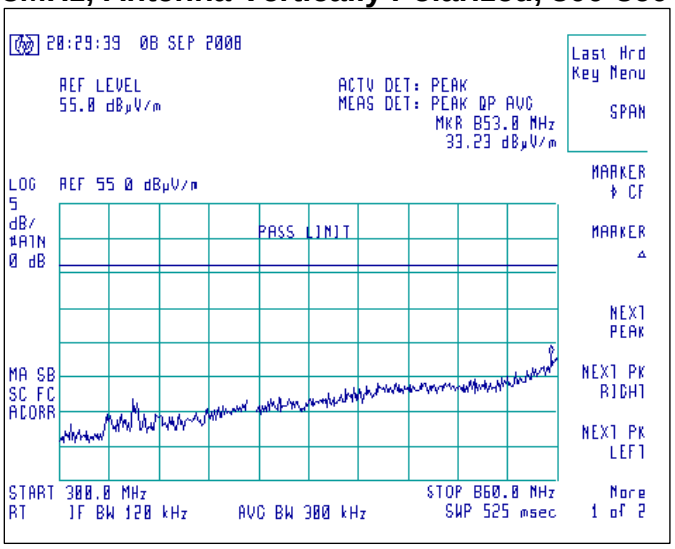
The signature scans shown here are from worst-case emissions, as measured on channels 903MHz, 914.6MHz, or 926.4MHz and the two types of EUT antenna (A or B), with the sense antenna both in vertical and horizontal polarity.

Antenna A

Channel 914.6MHz, Antenna Vertically Polarized, 30-300 MHz, at 3m

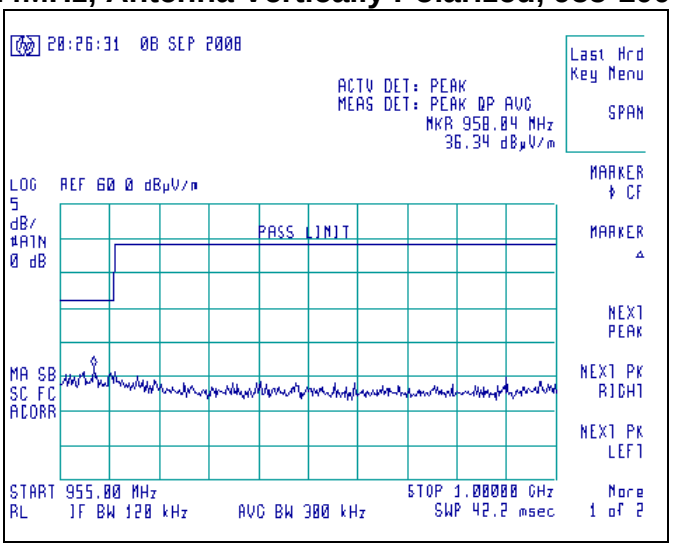


Channel 903MHz, Antenna Vertically Polarized, 300-860 MHz, at 3m

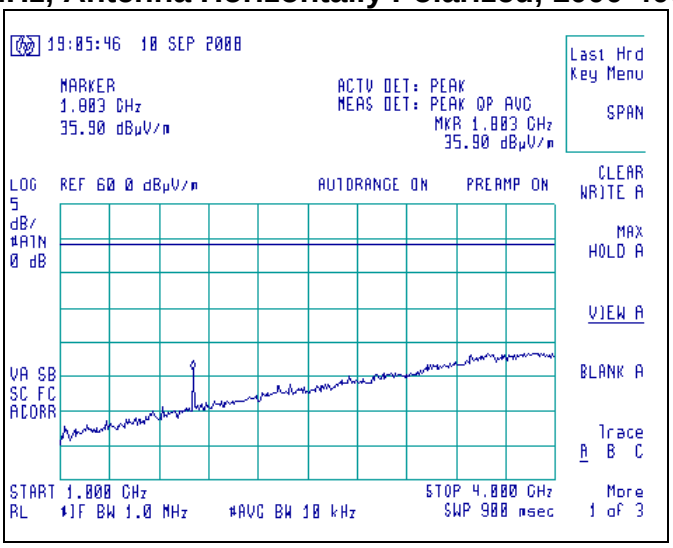


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 926.4MHz, Antenna Vertically Polarized, 955-1000 MHz, at 3m

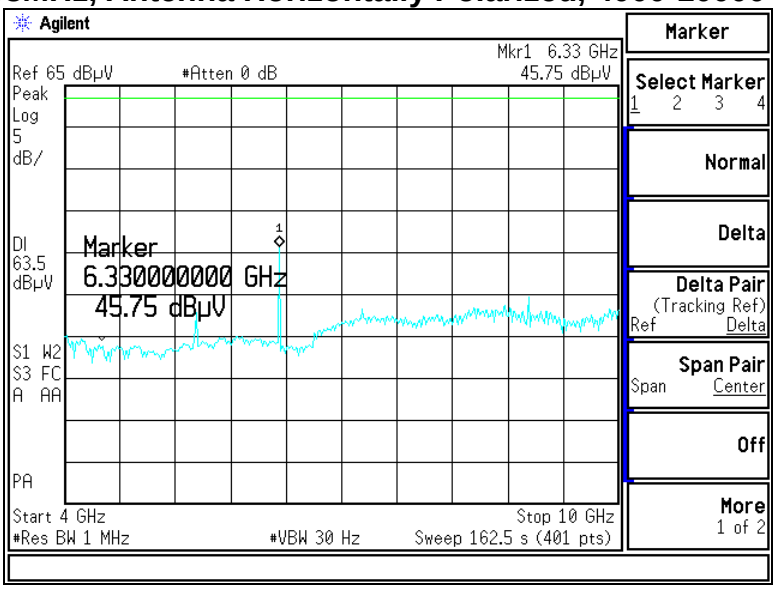


Channel 903MHz, Antenna Horizontally Polarized, 1000-4000 MHz, at 3m



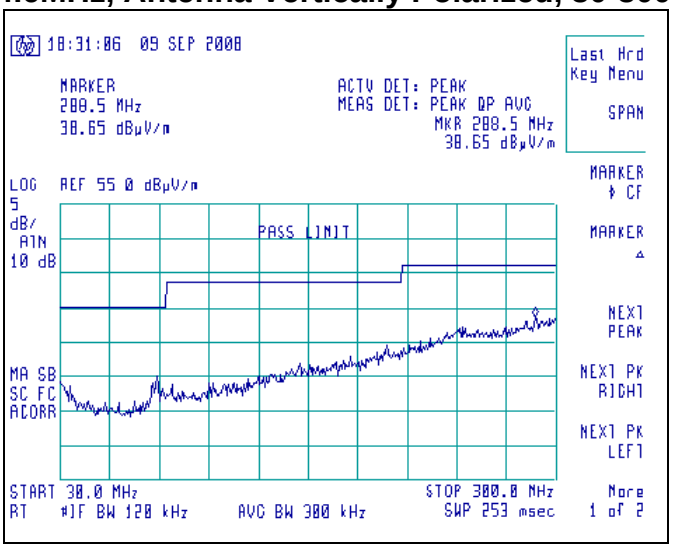
Screen Captures - Radiated Emissions Testing *(continued)*

Channel 903MHz, Antenna Horizontally Polarized, 4000-10000 MHz, at 1m

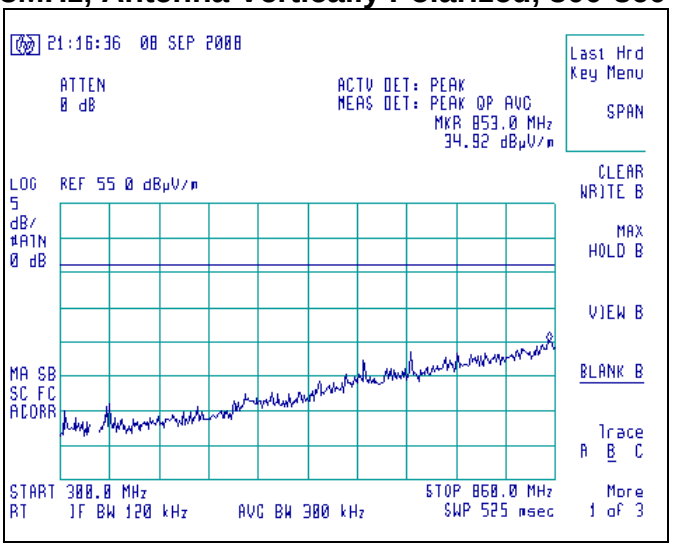


Antenna B

Channel 914.6MHz, Antenna Vertically Polarized, 30-300 MHz, at 3m

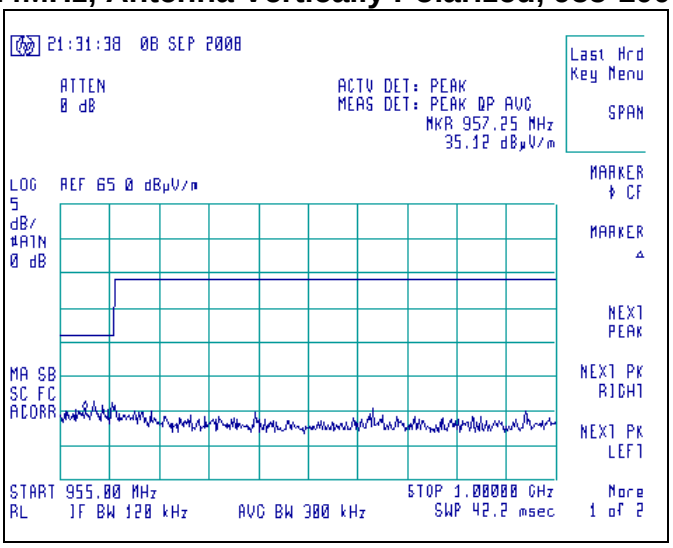


Channel 903MHz, Antenna Vertically Polarized, 300-860 MHz, at 3m

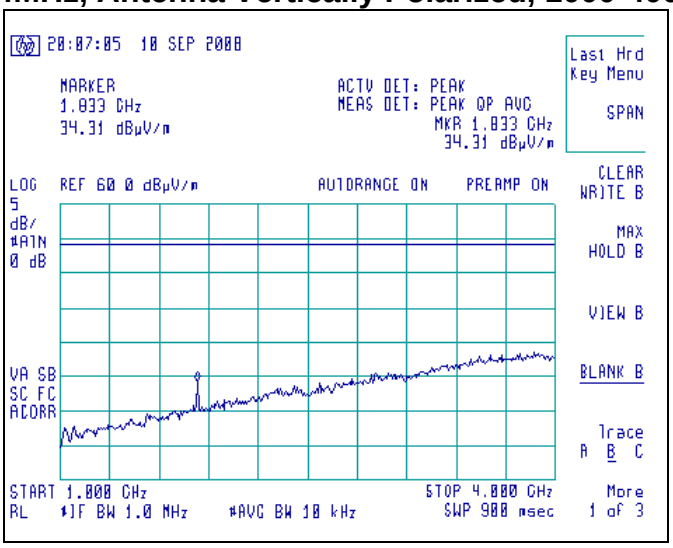


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 926.4MHz, Antenna Vertically Polarized, 955-1000 MHz, at 3m



Channel 916.4MHz, Antenna Vertically Polarized, 1000-4000 MHz, at 3m



Screen Captures - Radiated Emissions Testing *(continued)*

Channel 903MHz, Antenna Vertically Polarized, 4000-10000 MHz, at 1m

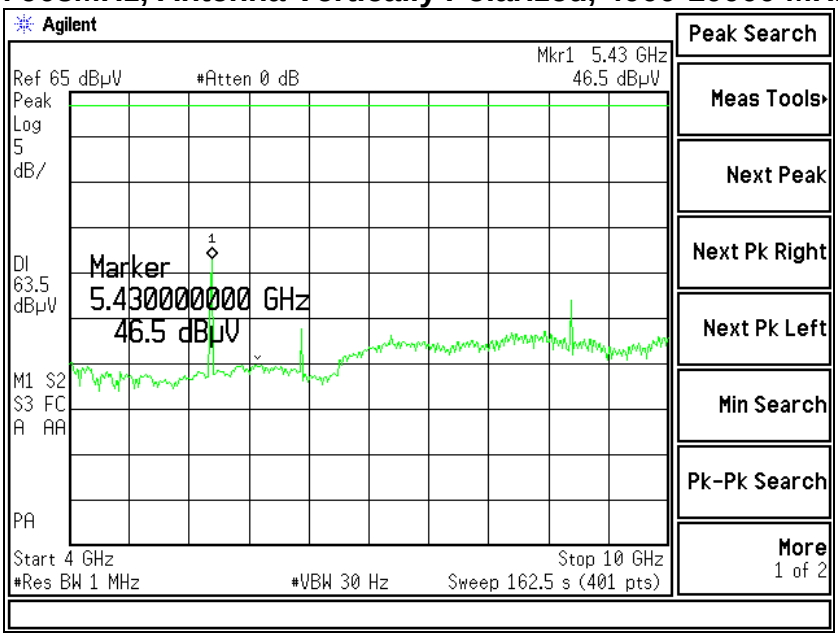


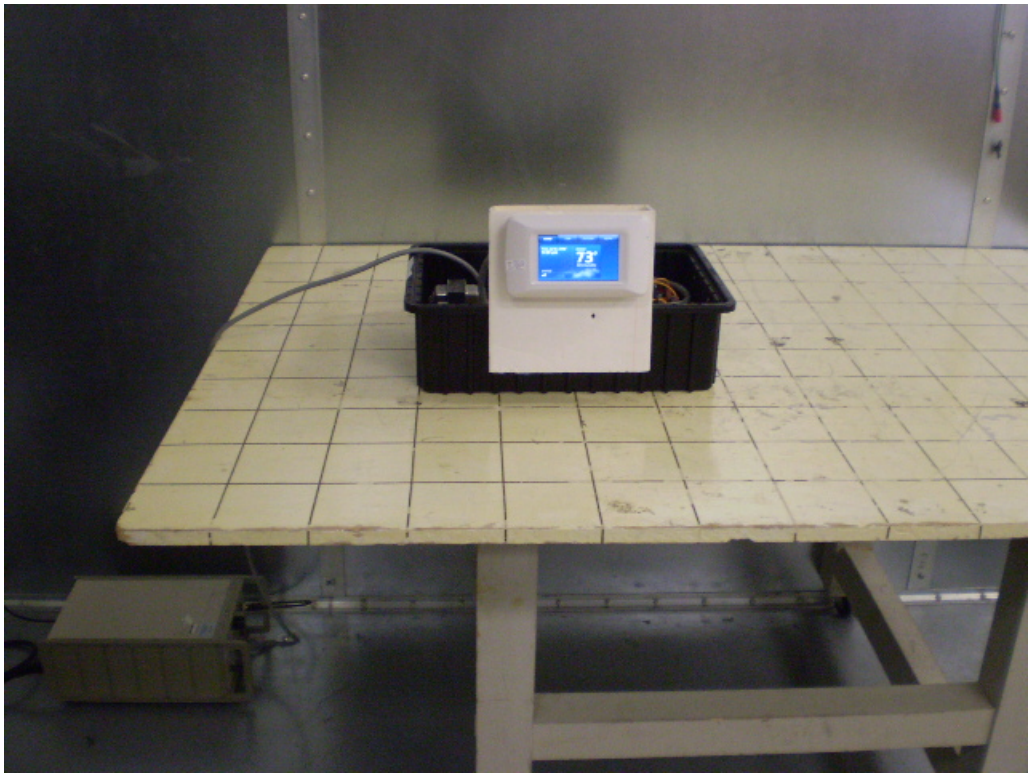
EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

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-GEN, 2007 (section 7.2.2). 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. 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).

Supply voltage to the THX9321R5000 was provided by a transformer (provided by Honeywell) which was connected to the Mains network.

6.2 Test Setup Photo(s) – Conducted Emissions Test



6.3 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 30 MHz.

6.4 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 used as measurements.

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

6.5 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.

6.6 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.			

6.7 DATA CHART-CONDUCTED RF EMISSIONS TEST

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

Manufacturer:	Honeywell International					
Date(s) of Test:	September 18th 2008					
Test Engineer:	Khairul Aidi Zainal					
Voltage:	115 VAC					
Operation Mode:	continuous transmit					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	Conducted RF Emissions 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

A. Antenna A.

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Measured (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Measured (dBµV)	Average Limit (dBµV)	Average Margin (dB)
0.152	1	17.9	65.9	48.0	5.7	55.9	50.2
0.618	1	18.0	56.0	38.0	13.9	46.0	32.1
0.618	2	17.4	56.0	38.6	14.6	46.0	31.4

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.

B. Antenna B.

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Measured (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Measured (dBµV)	Average Limit (dBµV)	Average Margin (dB)
0.158	1	16.7	65.6	48.9	3.4	55.6	52.2
0.619	1	18.3	56.0	37.7	14.5	46.0	31.5
0.151	2	17.1	66.0	48.9	5.0	56.0	51.0

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.

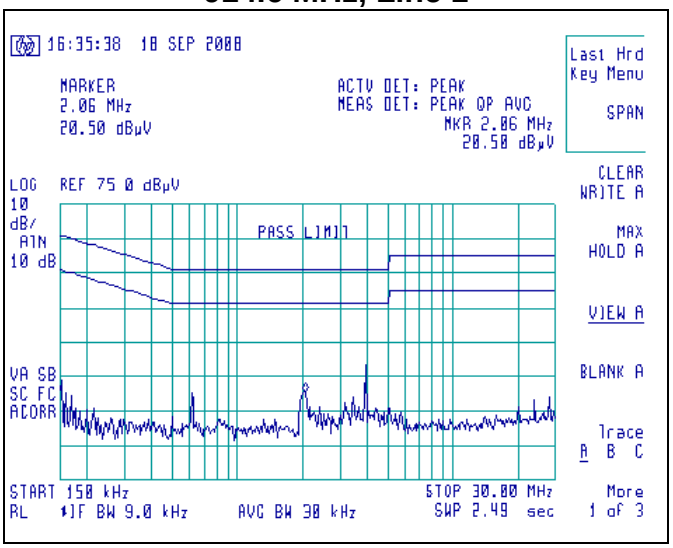
6.8 Screen Captures – Conducted Emissions Test

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

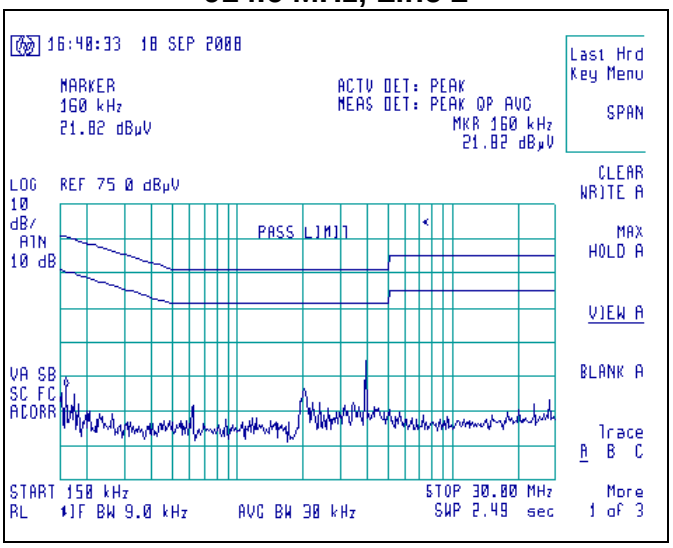
The signature scans shown here are from the middle channel, chosen as being a good representative of channels.

A. Antenna A

914.6 MHz, Line 1

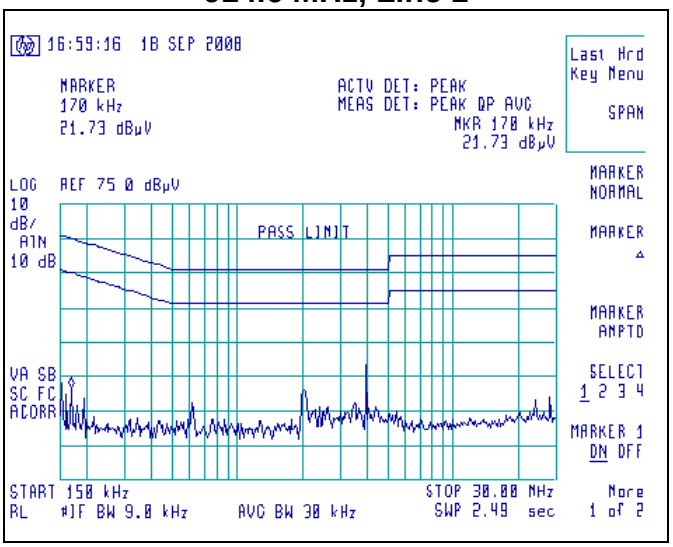


914.6 MHz, Line 2



B. Antenna B

914.6 MHz, Line 1



914.6 MHz, Line 2

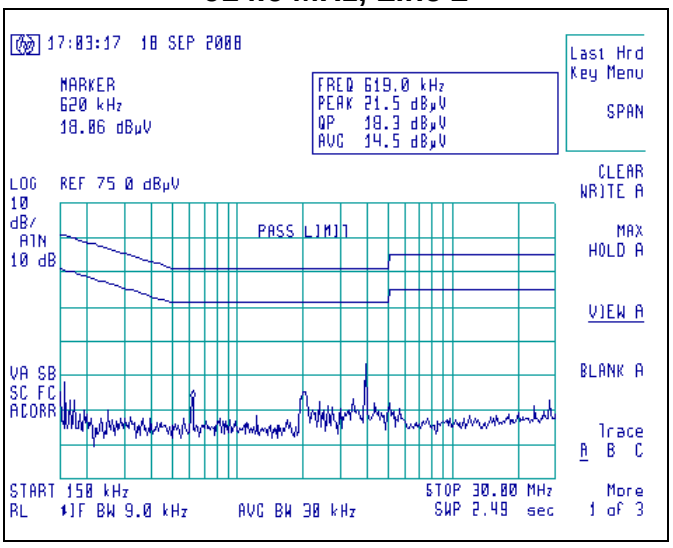


EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(1)

7.1 Limits

For a Frequency Hopping Spread Spectrum, the -20 dB bandwidth shall be less than 250 kHz. The maximum allowed 20dB bandwidth is 500 kHz.

7.2 Method of Measurements

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

The bandwidth requirement found in FCC Part 15.247(a)(1) requires a -20dB occupied bandwidth of less than 250 kHz since the EUT has 50 channels. 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 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, thereby allowing direct measurements without the need for any further corrections. The spectrum analyzer used had the resolution bandwidth set to 10 kHz for this portion of the tests to satisfy the requirement that the measuring equipment RBW be at greater than or equal to 5% of the occupied bandwidth. The EUT was configured to run in a continuous transmit mode. 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 83.0 kHz, which is below the maximum of 250 kHz.

7.3 Test Equipment List

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

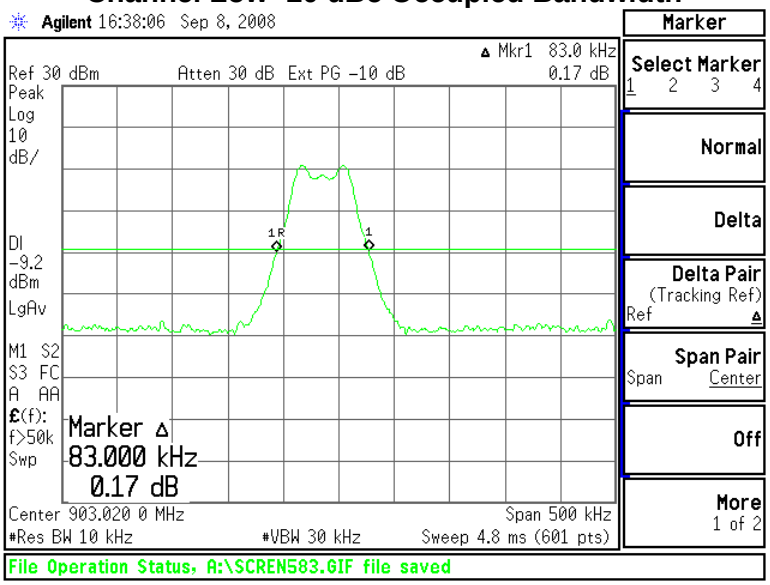
7.4 Test Data

Channel	Center Frequency (MHz)	Antenna A Measured -20 dBc Occ. BW (kHz)	Antenna B Measured -20 dBc Occ. BW (kHz)	Maximum -20 dBc Occ. BW Limit (kHz)
Low	903.0	83.0	81.5	250
Middle	914.6	81.9	81.6	250
High	926.4	82.9	81.1	250

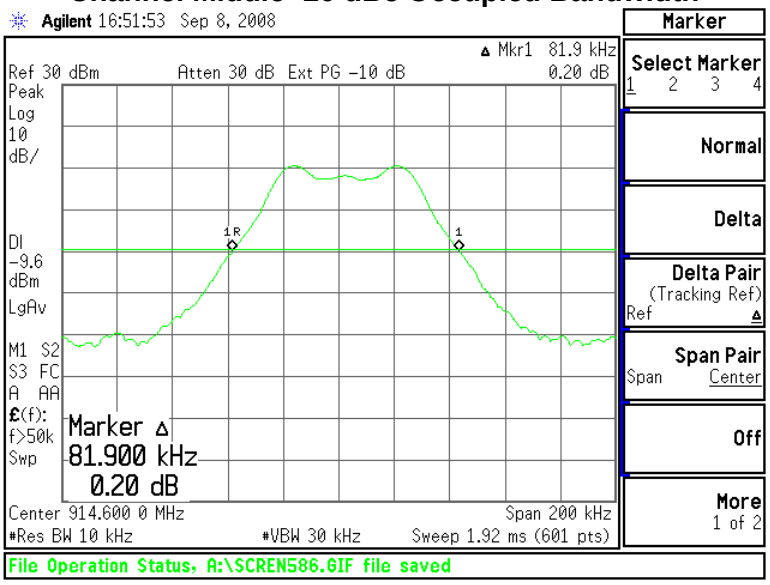
7.5 Screen Captures - OCCUPIED BANDWIDTH

Antenna A:

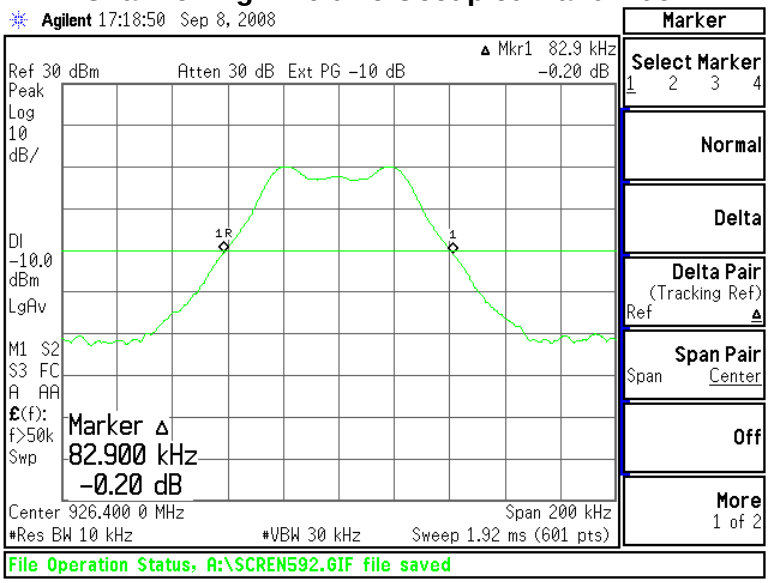
Channel Low -20 dBc Occupied Bandwidth



Channel Middle -20 dBc Occupied Bandwidth

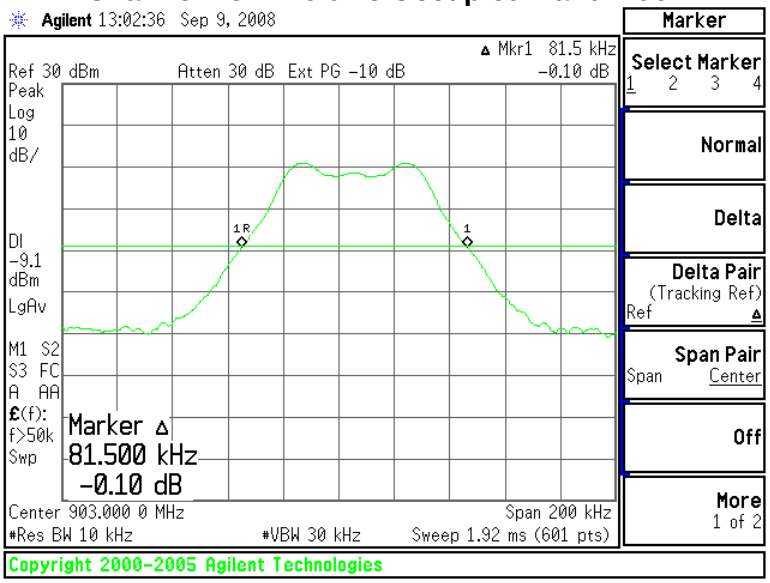


Channel High -20 dBc Occupied Bandwidth

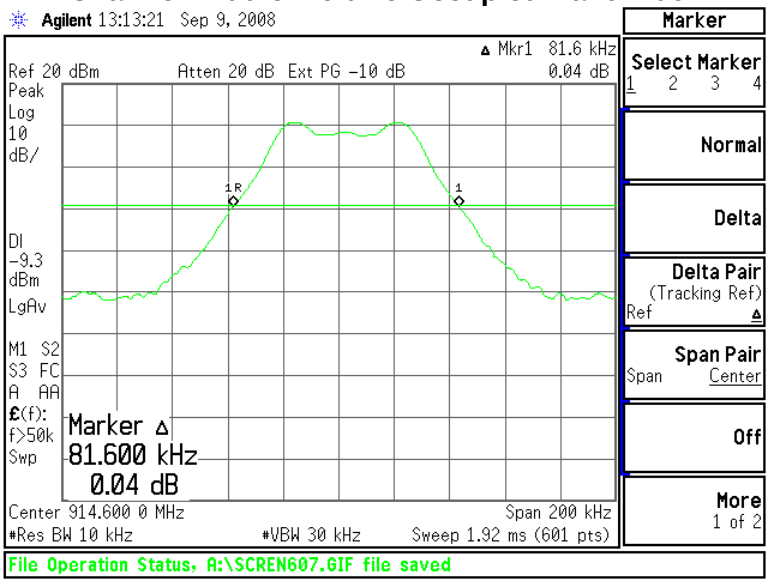


Antenna B:

Channel Low -20 dBc Occupied Bandwidth



Channel Middle -20 dBc Occupied Bandwidth



Channel High -20 dBc Occupied Bandwidth

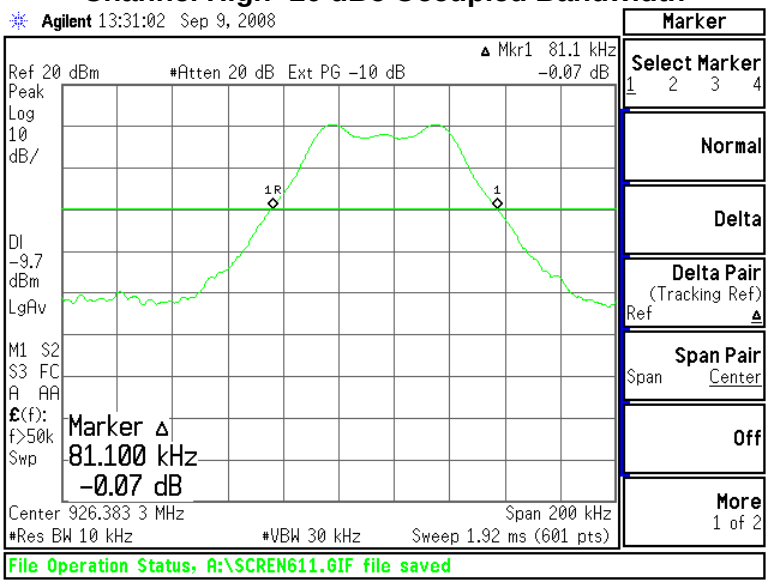


EXHIBIT 8. BAND-EDGE MEASUREMENTS

8.1 Method of Measurements

FCC 15.247(d) requires 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 902-928 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, antenna A, would be 86.7dBuV/m.

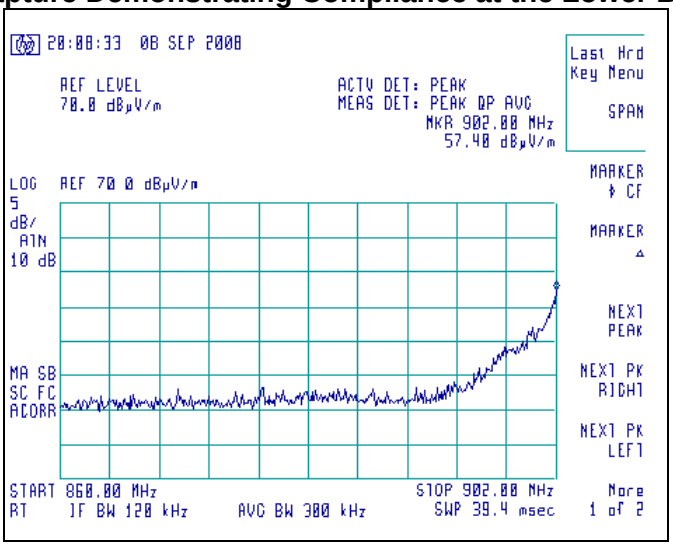
The Lower Band-Edge limit, antenna B, would be 89.5dBuV/m.

The Upper Band-Edge limit, antenna A, would be 88.1dBuV/m.

The Upper Band-Edge limit, antenna B, would be 89.3dBuV/m.

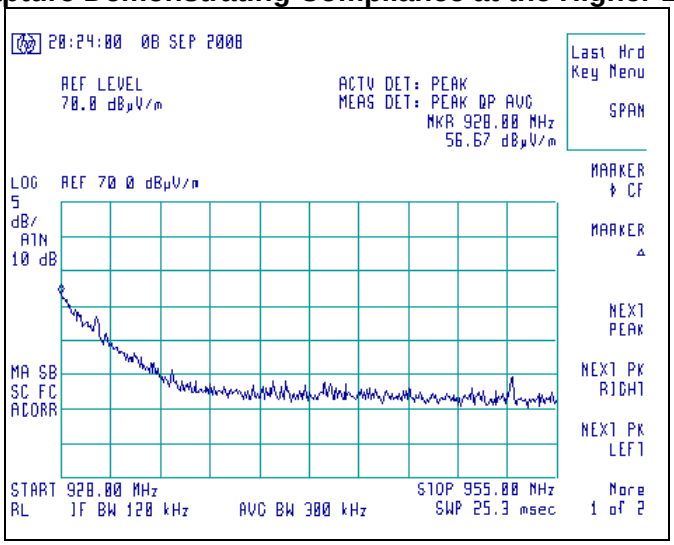
A. Antenna A.

Screen Capture Demonstrating Compliance at the Lower Band-Edge



The Lower Band-Edge limit, antenna A, would be 86.7dBuV/m.

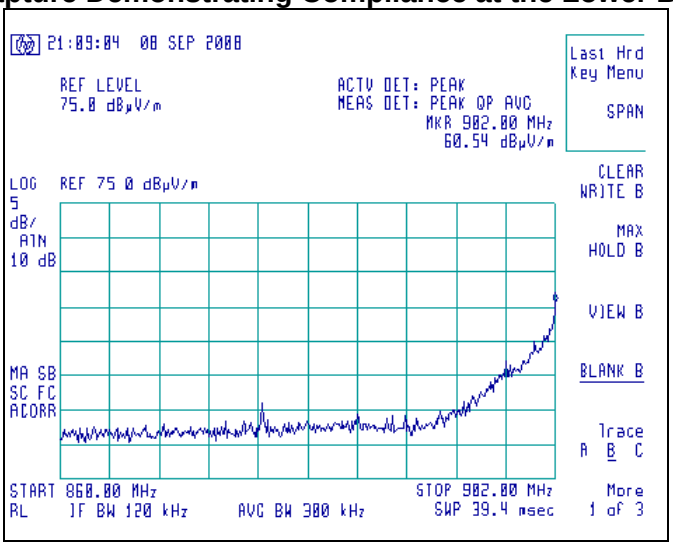
Screen Capture Demonstrating Compliance at the Higher Band-Edge



The Upper Band-Edge limit, antenna A, would be 88.1dBuV/m.

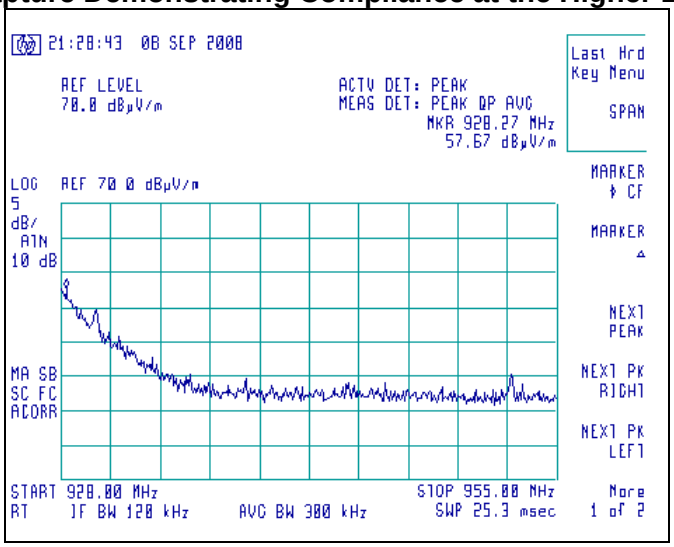
B. Antenna B

Screen Capture Demonstrating Compliance at the Lower Band-Edge



The Lower Band-Edge limit, antenna B, would be 89.5dBuV/m.

Screen Capture Demonstrating Compliance at the Higher Band-Edge



The Upper Band-Edge limit, antenna B, would be 89.3dBuV/m.

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

9.1 Method of Measurements

Signals to the antennas of the THX9321R5000 are routed through an RF switch. The conducted RF output power of the EUT was measured at the input of this RF switch, which switches between the trace antennas, 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. The spectrum analyzer was used with resolution bandwidth set to 100kHz, and a span of 500kHz, with measurements from a peak detector presented in the chart below.

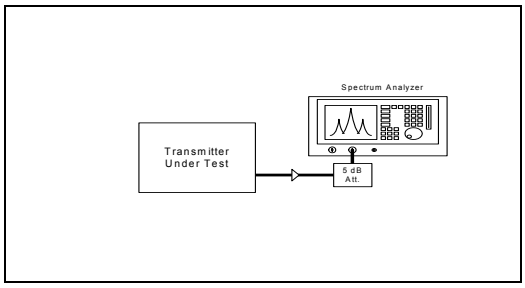
9.2 Test Data

Antenna A:

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	903.0	+30.0	10.7	19.3
Middle	914.6	+30.0	10.4	19.6
High	926.4	+30.0	10.0	20.0

Antenna B:

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	903.0	+30.0	10.9	19.1
Middle	914.6	+30.0	10.7	19.3
High	926.4	+30.0	10.3	19.7



Measured Conducted RF Power Output (in Watts): 0.011 Watts

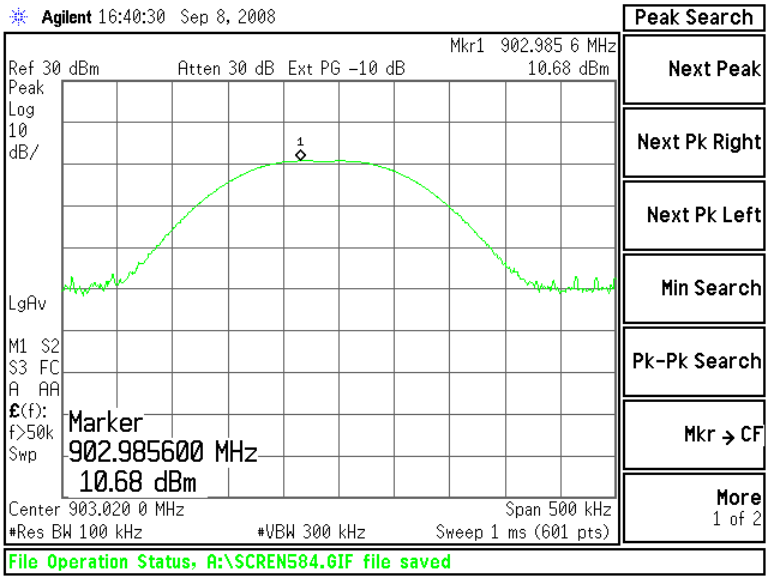
9.3 Test Equipment List

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

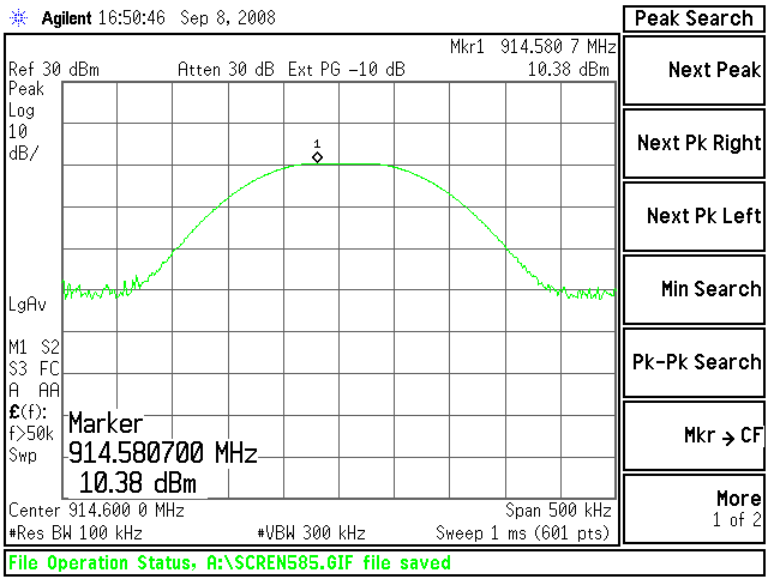
9.4 Screen Captures – Power Output (Conducted)

Antenna A

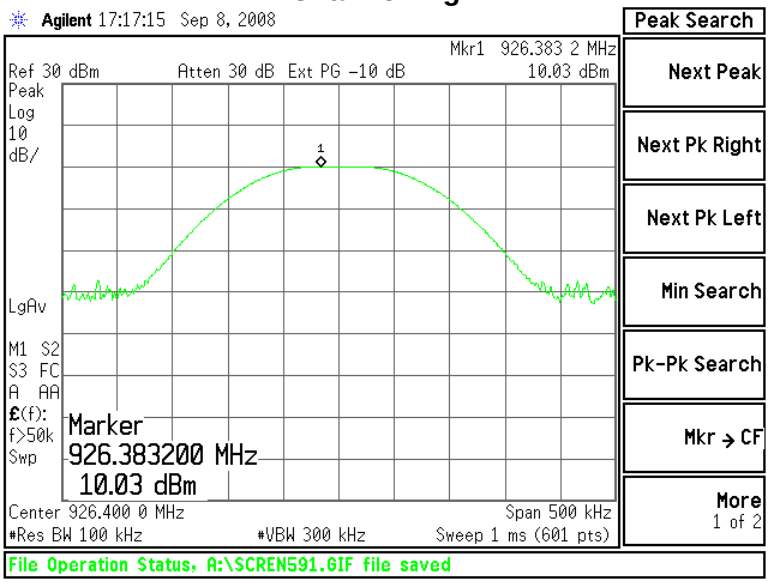
Channel Low



Channel Middle

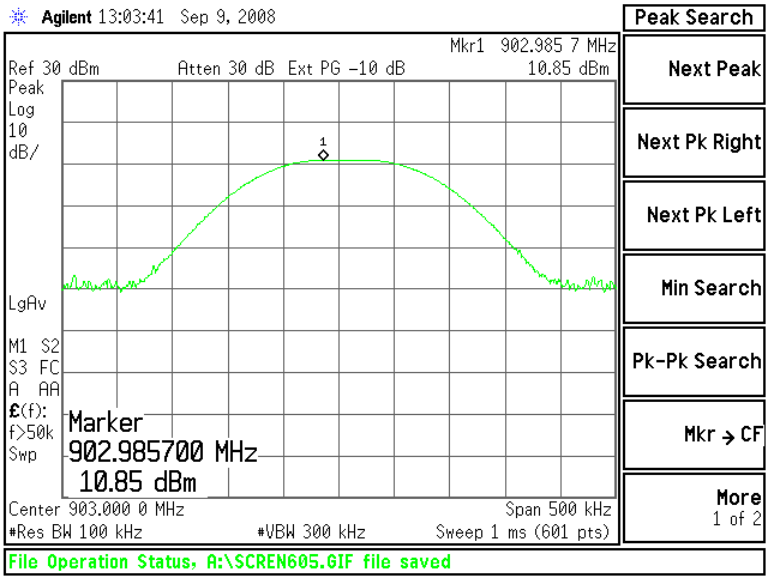


Channel High

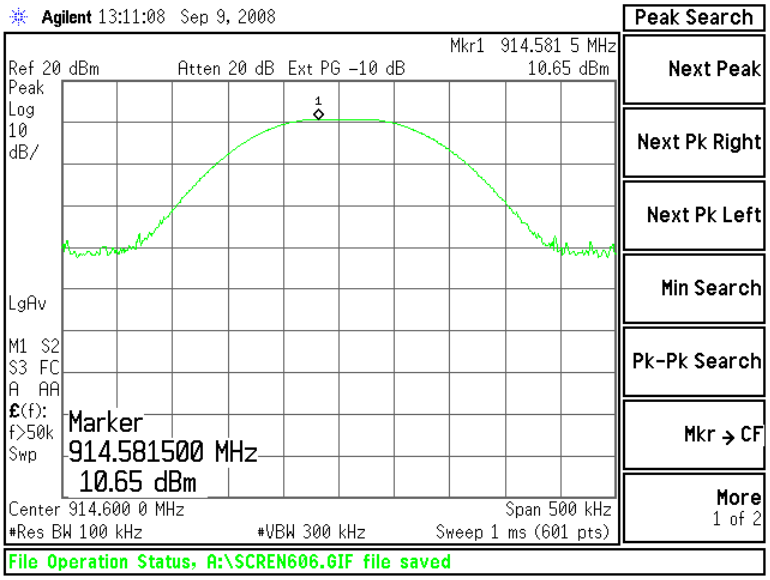


Antenna B

Channel Low



Channel Middle



Channel High

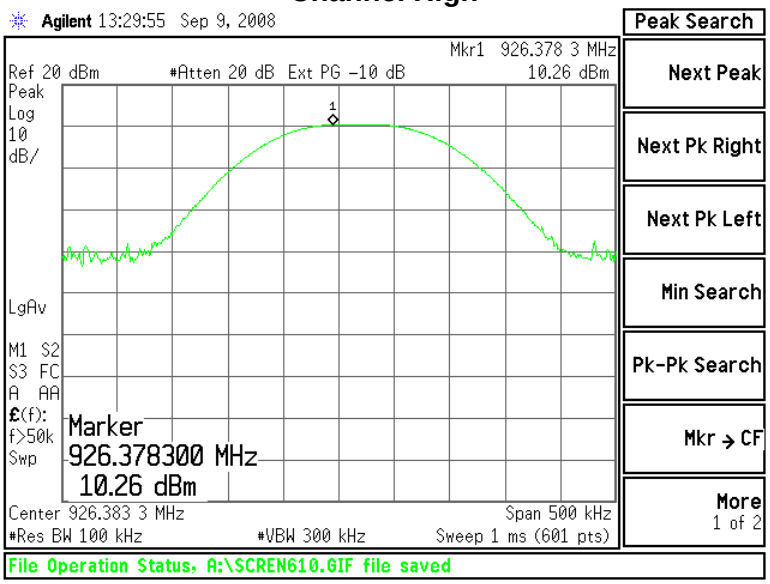


EXHIBIT 10. CHANNEL OCCUPANCY

10.1 Test Setup & Procedure

Part 15.247(a)(1)(i) requires a measurement of channel occupancy, for this device, of no more than 400 milliseconds in a 10 second period if utilizing between 25 and 50 channels, or in a 20 second period if utilizing 50 or more channels. The channel occupancy for this EUT was measured using an HP E4407B spectrum analyzer, set to zero-span at the frequency of interest. With the analyzer in single sweep video trigger mode, the transmission lengths can be measured by adjusting the sweep rate of the analyzer. A suitable sweep rate was used to measure the channel occupancy at the low, mid and high channels. Measurement was performed radiated.

The longest time any transmission will occur on a single channel is 177.0 milliseconds. In the worst case scenario, transition time to the next hop channel is 15 seconds (typical 1 minute) which leads to a same channel repeat time of 750 seconds for the THX9321R5000. Therefore, in a 20 second period, average channel occupancy would be no greater than 177.0 milliseconds.

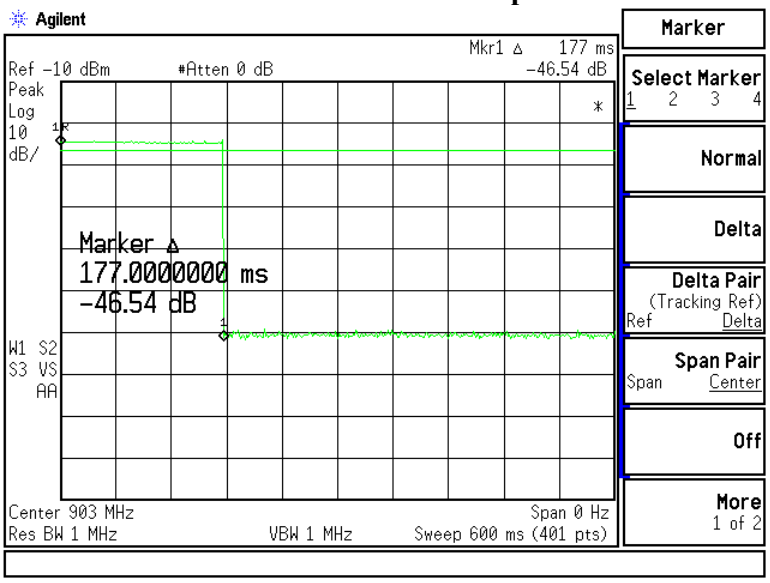
Note: For the sole purpose of expediting testing, the manufacturer re-programmed the hopping duration. Instead of a channel repeat time of 750 seconds, during testing it was reduced to 33.5 seconds.

10.2 Test Data

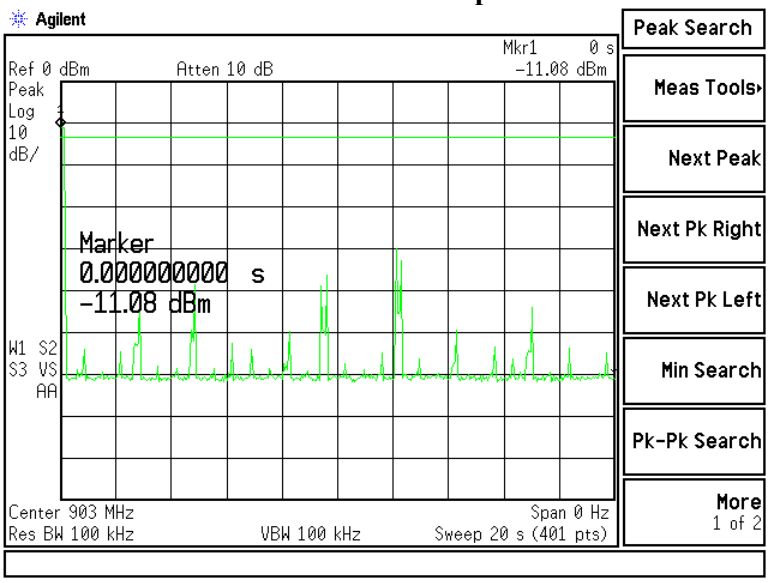
Channel	Frequency (MHz)	Occupancy Per transmission (ms)	Occupancy in 20 second window (ms)
Low	903.0	177.0	177.0
Middle	914.6	177.0	177.0
High	926.4	177.0	177.0

10.3 Plots of Channel Occupancy

Occupancy on 903MHz
600 milliseconds sweep

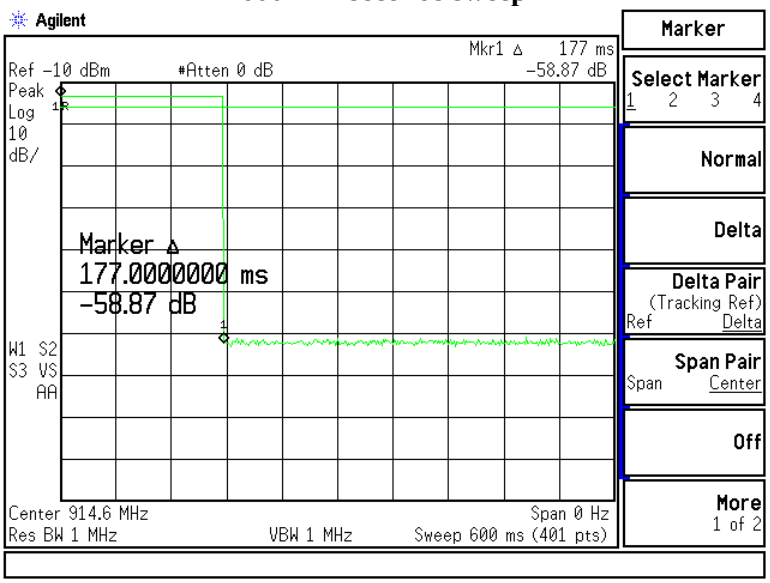


20 seconds sweep

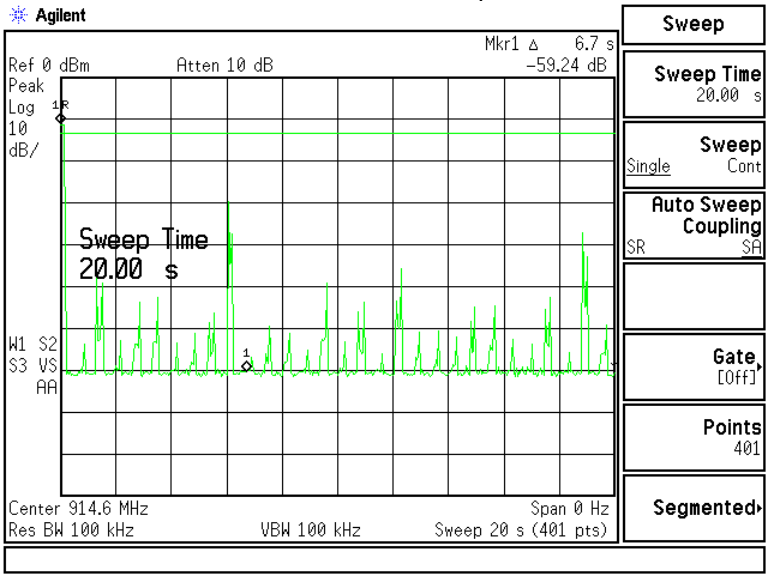


Plots of Channel Occupancy *(continued)*

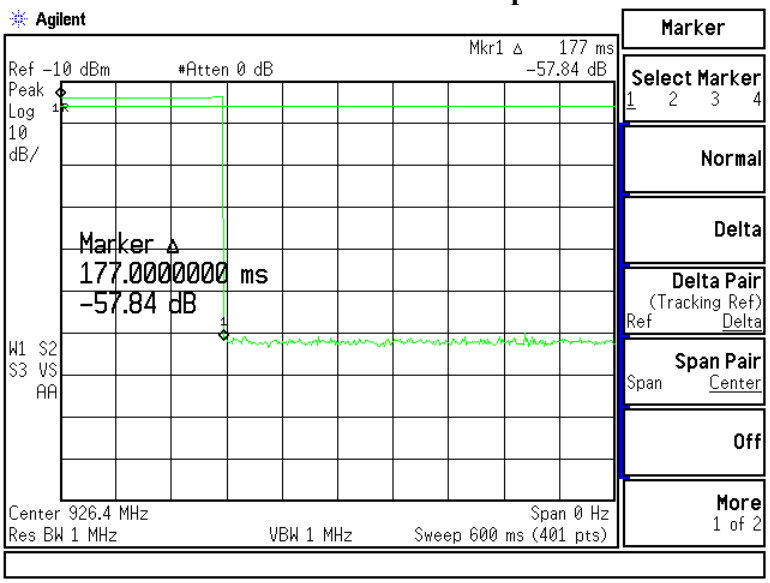
Occupancy in 914.6MHz
600 milliseconds sweep



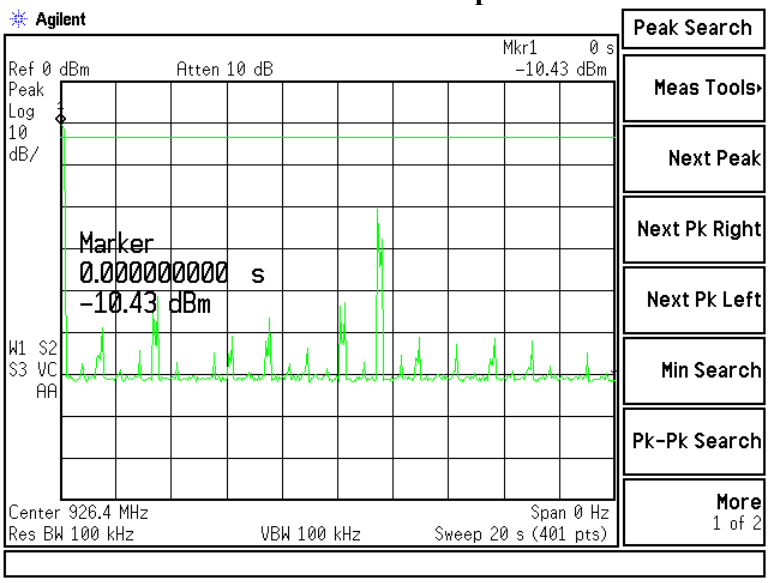
20 seconds sweep



Occupancy on 926.4MHz
600 milliseconds sweep



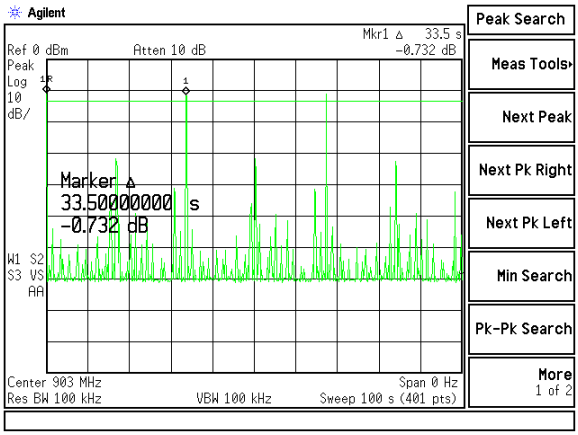
20 seconds sweep



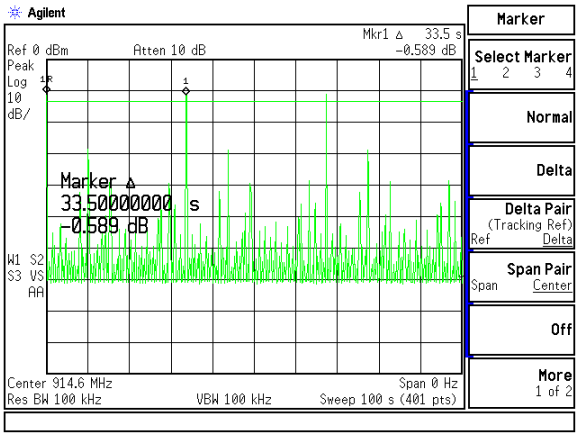
Duration Between consecutive hops.

Note: Plots show modified hop duration. Actual hop duration is longer than 33.5 seconds.

903MHz



914.6MHz



926.4MHz

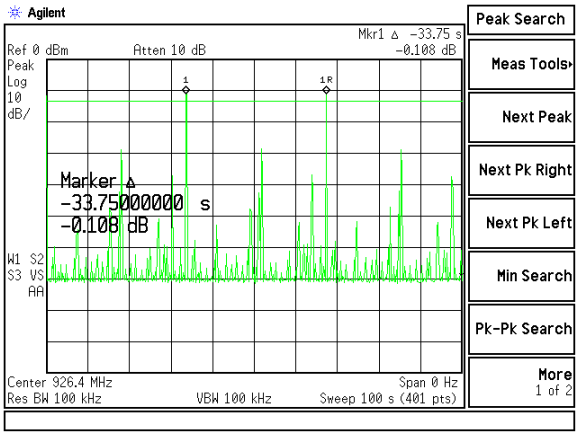


EXHIBIT 11. SPURIOUS EMISSIONS: 15.247(d)

11.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at lease 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

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) 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. 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 other than the harmonics could be noted within -70 dBc of the fundamental level for this product.

11.2 Test Equipment List

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

11.3 Test Data

Antenna A:

	Channel Low	Channel Middle	Channel High
Fundamental	10.7(dBm)	10.4(dBm)	10.0(dBm)
2nd Harmonic	-39.2(dBm)	-37.3(dBm)	-40.7(dBm)
3rd Harmonic	-64.2(dBm)	-63.3(dBm)	-66.0(dBm)
4th Harmonic	-76.1(dBm)	-76.8(dBm)	-77.2(dBm)
5th Harmonic	-76.1(dBm)	-76.2(dBm)	-77.3(dBm)
6th Harmonic	-71.0(dBm)	-68.4(dBm)	-66.3(dBm)
7th Harmonic	-65.5(dBm)	-62.9(dBm)	-60.6(dBm)
8th Harmonic	-63.0(dBm)	-65.6(dBm)	-65.8(dBm)
9th Harmonic	Note1	Note1	Note1
10th Harmonic	-75.7(dBm)	-75.6(dBm)	-75.6(dBm)

Notes:
(1) Measurement at system noise floor.

Antenna B:

	Channel Low	Channel Middle	Channel High
Fundamental	10.9(dBm)	10.7(dBm)	10.3(dBm)
2nd Harmonic	-38.7(dBm)	-38.9(dBm)	-40.6(dBm)
3rd Harmonic	-66.1(dBm)	-67.0(dBm)	-67.8(dBm)
4th Harmonic	-76.1(dBm)	-76.1(dBm)	-74.8(dBm)
5th Harmonic	-77.8(dBm)	-77.5(dBm)	-76.4(dBm)
6th Harmonic	-71.8(dBm)	-72.1(dBm)	-71.7(dBm)
7th Harmonic	-69.6(dBm)	-68.4(dBm)	-67.6(dBm)
8th Harmonic	-55.1(dBm)	-56.9(dBm)	-58.0(dBm)
9th Harmonic	Note 1	Note 1	Note 1
10th Harmonic	-72.7(dBm)	-71.4(dBm)	-71.5(dBm)

Notes:
(1) Measurement at system noise floor.

Spurious Emissions other than harmonics.

Antenna A:

Freq(MHz)	Chan	level(dBm)
169.2	MID	-50.8
602.8	MID	-58.8
614.4	HI	-59.0
643.4	LOW	-59.2
746.3	MID	-54.1
757.9	HI	-56.9
940.7	MID	-53.3
952.3	HI	-54.0

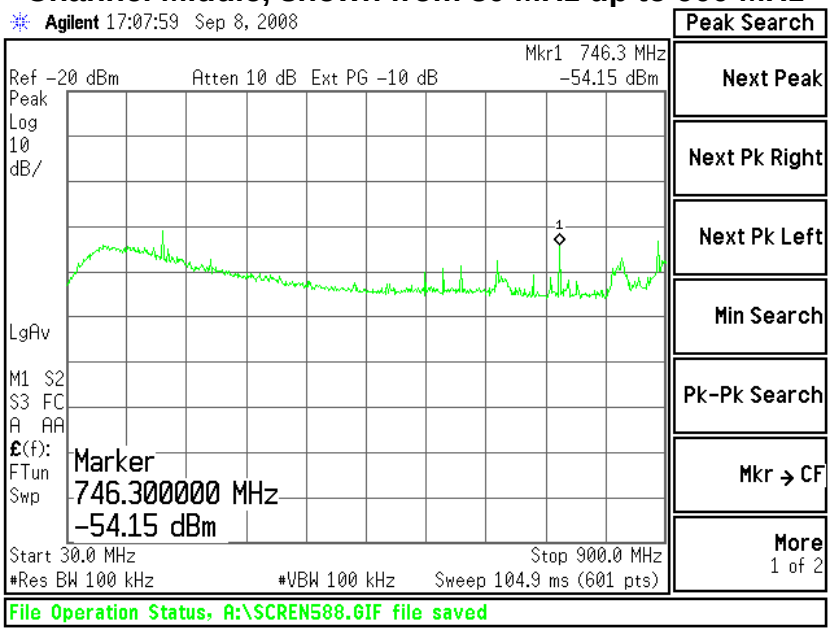
Antenna B:

Freq(MHz)	Chan	level(dBm)
169.2	MID	-51.7
602.8	MID	-59.0
614.4	HI	-58.8
643.4	LOW	-59.6
746.3	MID	-53.9
757.9	HI	-56.9
940.7	MID	-54.0
952.3	HI	-54.8

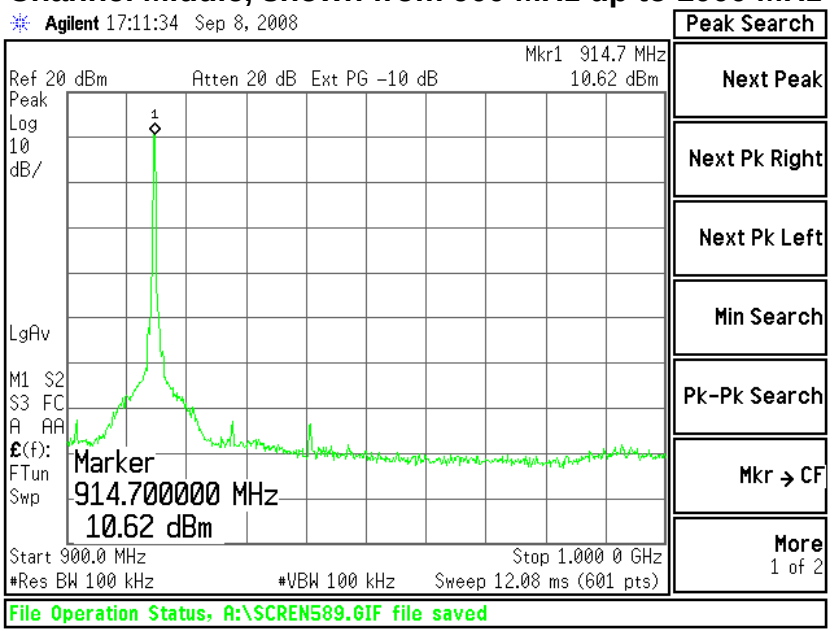
11.4 Screen Captures – Spurious Emissions

Antenna A

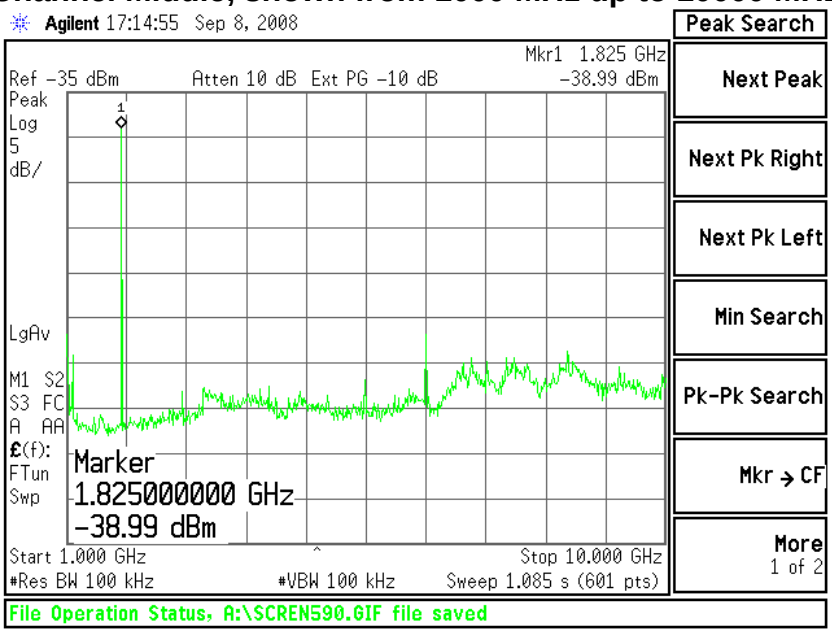
Channel Middle, shown from 30 MHz up to 900 MHz



Channel Middle, shown from 900 MHz up to 1000 MHz

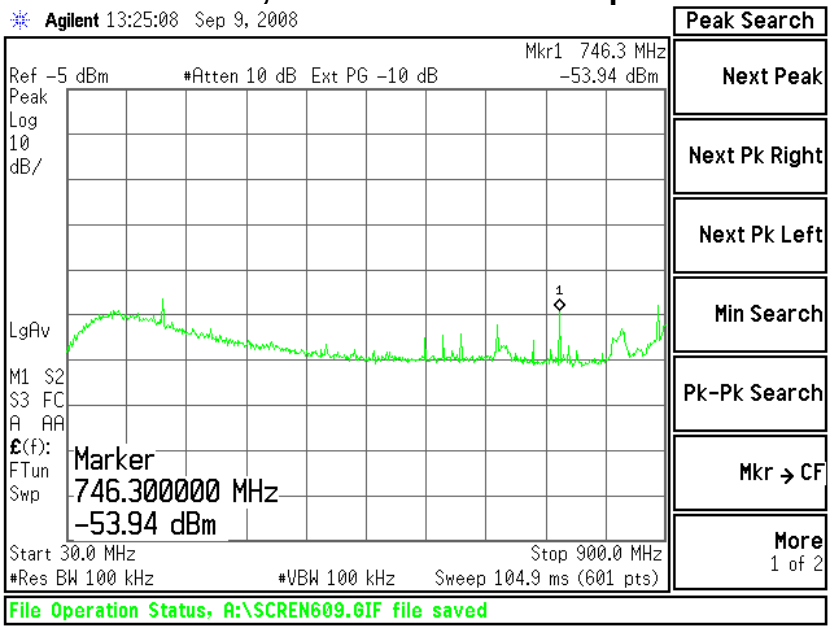


Channel Middle, shown from 1000 MHz up to 10000 MHz

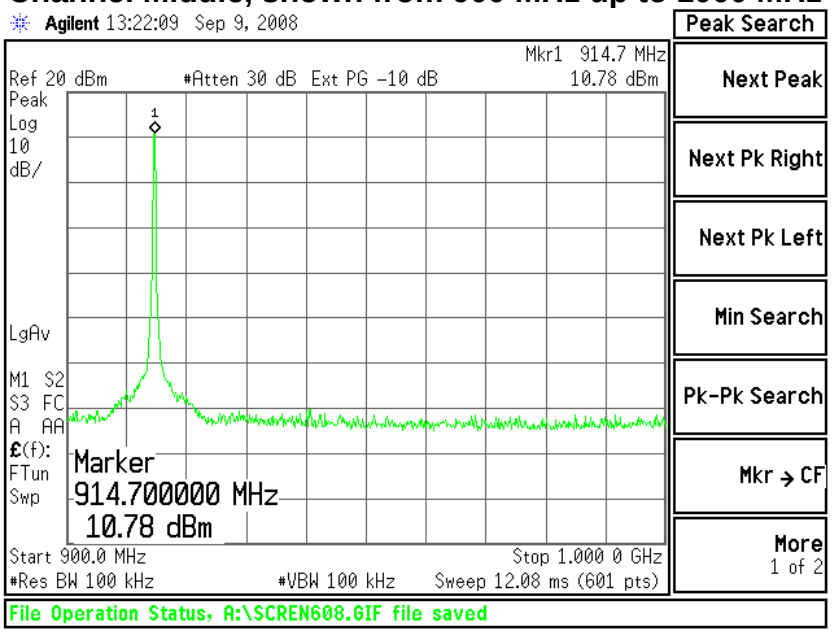


Antenna B

Channel Middle, shown from 30 MHz up to 900 MHz



Channel Middle, shown from 900 MHz up to 1000 MHz



Channel Middle, shown from 1000 MHz up to 10000 MHz

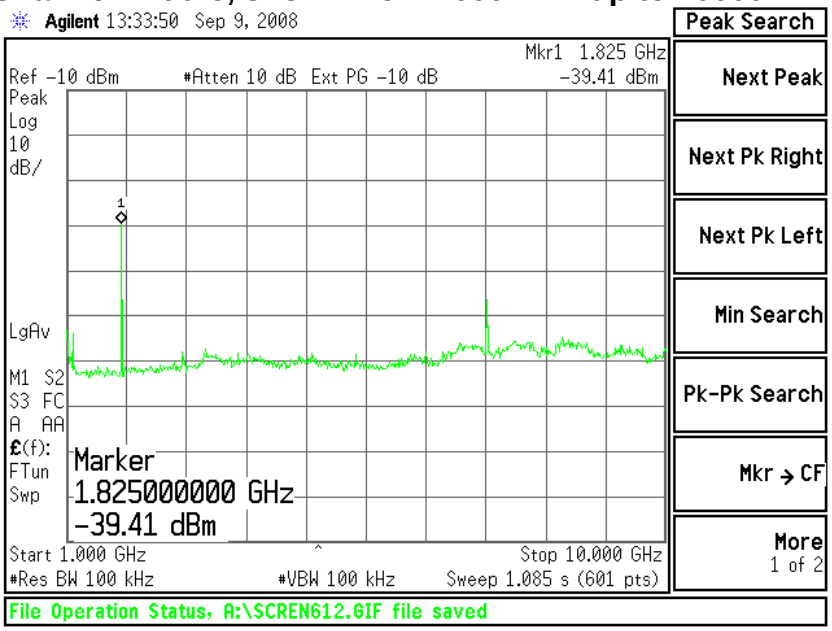


EXHIBIT 12. CHANNEL PLAN AND SEPARATION

An HP E4407B spectrum analyzer was used with a resolution bandwidth of 30 kHz to measure the channel separation of the EUT.

The minimum and maximum channel-separations measured for this device are 375 kHz and 400 kHz respectively. The maximum occupied bandwidth of the device, as reported in the previous section is 83.0 kHz. The following plots describe this spacing, and also establish the channel separation and plan.

12.1 Test Data

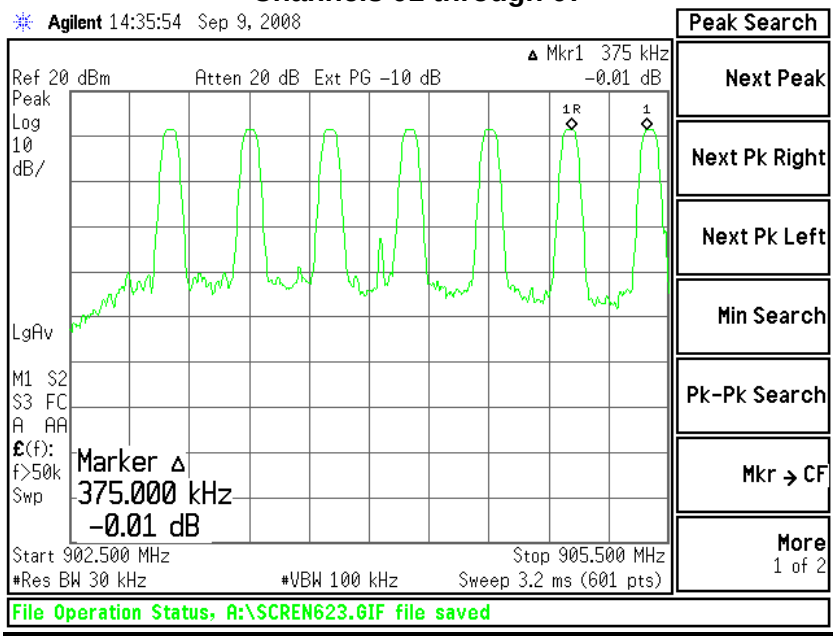
Antenna A

Frequency Span (MHz)	Number of Channels	Minimum Separation (kHz)
902.5 to 905.5	7	375
905.5 to 908.5	7	380
908.5 to 911.5	4	370
911.5 to 914.5	7	375
914.5 to 917.5	6	400
917.5 to 920.5	8	395
920.5 to 923.5	4	400
923.5 to 926.5	7	400
926.5 to 928.5	0	NA
	Total channels=50	

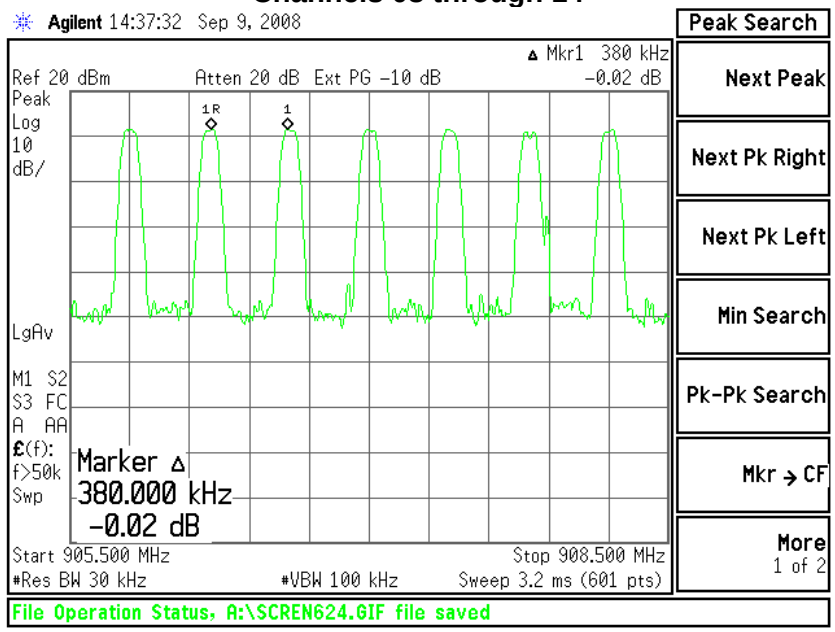
The system **MEETS** the minimum requirement of utilizing **50** channels, as well as maintaining a minimum channel separation of **375kHz**, which is greater than the -20 dBc OCCBW of **83.0kHz**.

12.2 Screen Captures – Channel Separation

Channels 01 through 07

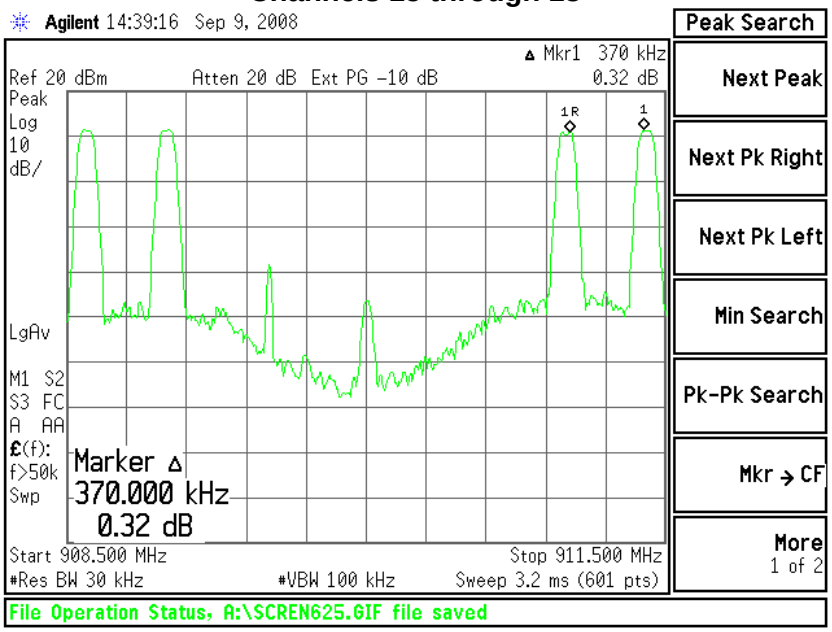


Channels 08 through 14

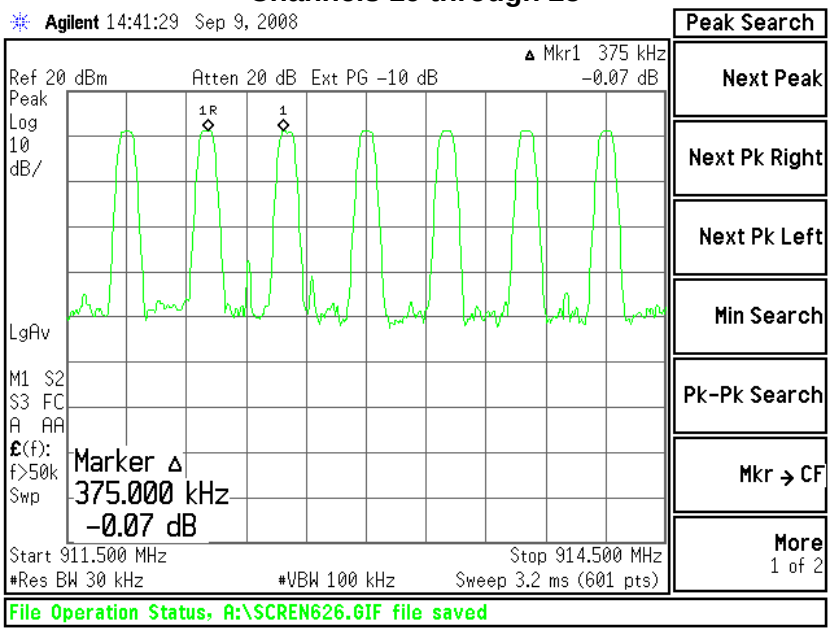


Screen Captures – Channel Separation *(continued)*

Channels 15 through 18

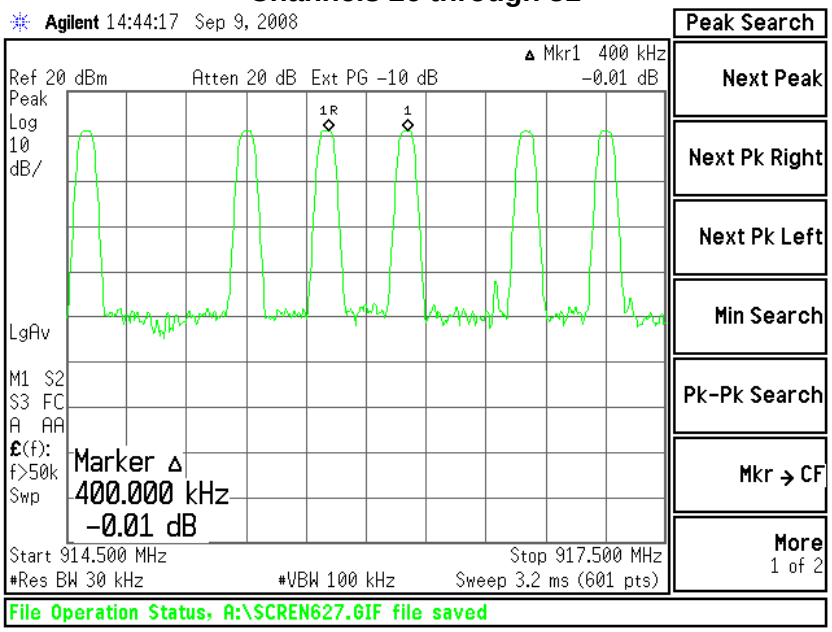


Channels 19 through 25

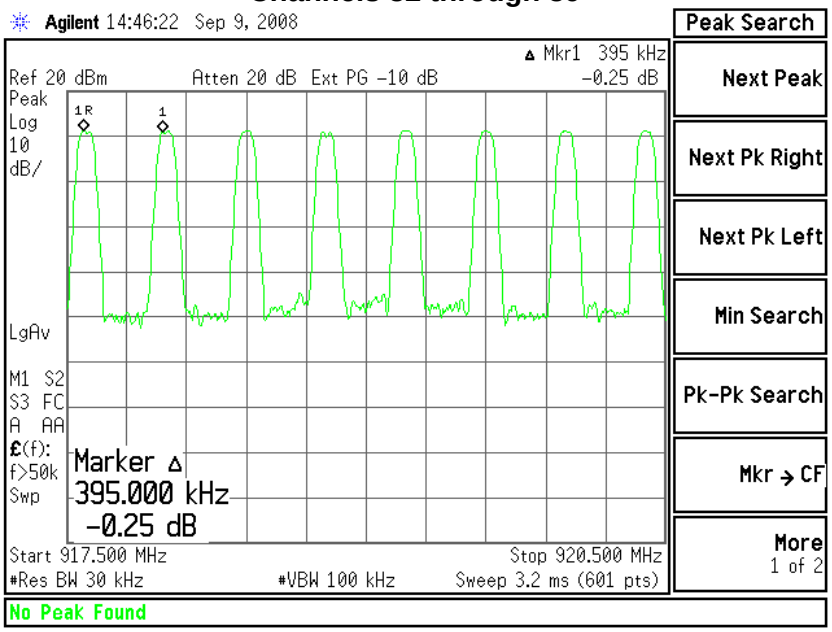


Screen Captures – Channel Separation *(continued)*

Channels 26 through 31

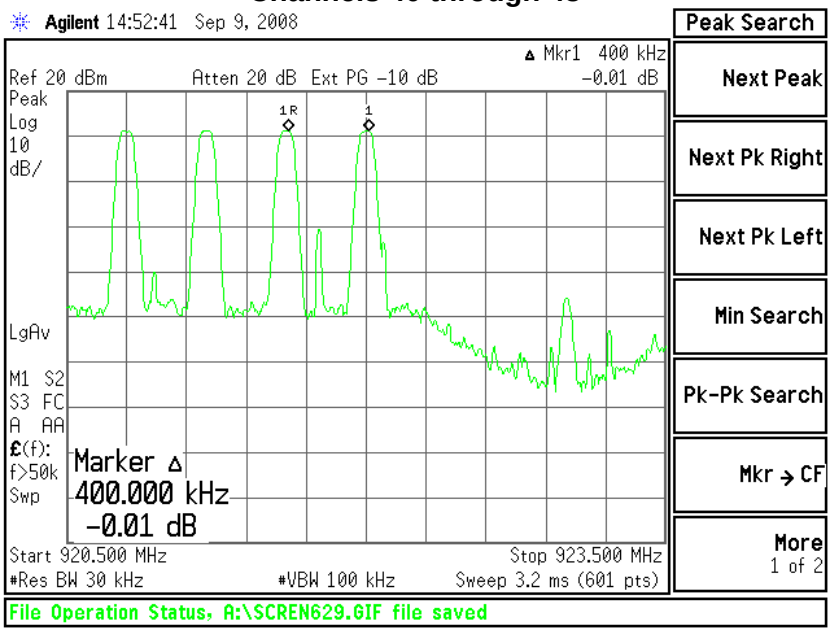


Channels 32 through 39

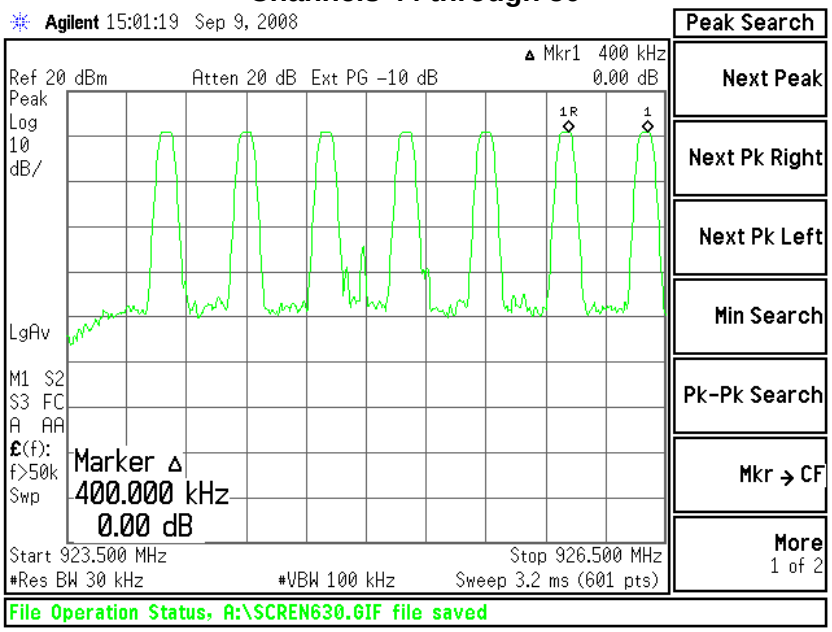


Screen Captures – Channel Separation *(continued)*

Channels 40 through 43



Channels 44 through 50



Screen Captures – Channel Separation *(continued)*

Scan of 926.5MHz to 928.0MHz

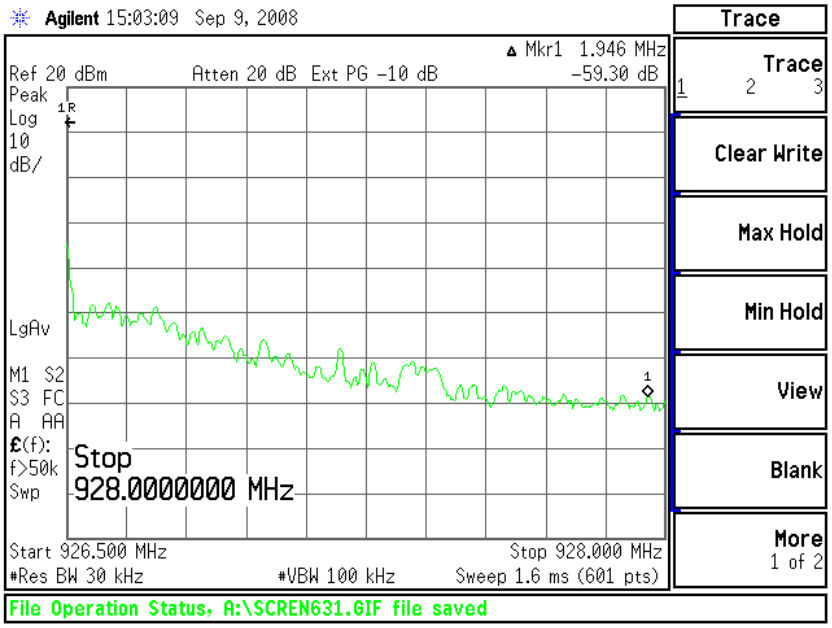


EXHIBIT 13. EQUAL CHANNEL USAGE

Due to the nature of the transmission, testing to the standard was not possible. Below is a sample declared by the manufacturer.

Table 2 (typical hop sequence)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Transmission #
6	31	33	8	48	23	26	1	17	42	38	13	19	44	35	10	Channel used
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Transmission #
9	34	37	12	0	25	3	28	16	41	24	49	18	43	45	20	Channel used
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	Transmission #
21	46	30	5	7	32	47	22	29	4	40	15	14	39	27	2	Channel used
48	49	50														Transmission #
11	36	repeat														Channel used

This sample hop sequence shows equal usage of all channels

EXHIBIT 14. PSEUDORANDOM HOPPING PATTERN

Below is a sample declared by the manufacturer.

Table 2 (typical hop sequence)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Transmission #
6	31	33	8	48	23	26	1	17	42	38	13	19	44	35	10	Channel used
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Transmission #
9	34	37	12	0	25	3	28	16	41	24	49	18	43	45	20	Channel used
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	Transmission #
21	46	30	5	7	32	47	22	29	4	40	15	14	39	27	2	Channel used
48	49	50														Transmission #
11	36	repeat														Channel used

This sample hop sequence shows usage of all channels and randomness of channel selections.

EXHIBIT 15 POWER STABILITY OVER VOLTAGE

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 output power at the appropriate frequency markers. For this test, the EUT was placed in CW modulated continuous transmit mode. Power was supplied by an external bench-type variable AC power supply, and the output power was monitored using the spectrum analyzer. Measurements were made for both antenna A and antenna B of the EUT.

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

Antenna A

	DC/AC Voltage Source		
	97.8 VAC	115 VAC	133 VAC
903 MHz	10.9 dBm	10.8 dBm	10.8 dBm
914.6 MHz	10.6 dBm	10.5 dBm	10.5 dBm
926.4 MHz	10.2 dBm	10.1 dBm	10.1 dBm

Antenna B

	DC/AC Voltage Source		
	97.8 VAC	115 VAC	133 VAC
903 MHz	10.9 dBm	10.8 dBm	10.9 dBm
914.6 MHz	10.8 dBm	10.6 dBm	10.7 dBm
926.4 MHz	10.3 dBm	10.1 dBm	10.2 dBm

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

No anomalies were noted in the measured transmit power, varying less than 1 dB, during the voltage variation tests. There was no instance that the output power exceeded any limit during the test.

EXHIBIT 16. MPE CALCULATIONS

A. Antenna A.

The following MPE calculations are based on the printed circuit board antenna with a measured field strength of 108.1 dBµV/m, at 3 meters, and conducted RF power of +10.0 dBm as presented to the antenna. The calculated gain (measured over conducting ground plane) of this antenna, based on the measurement is 2.87dBi.

B. Antenna B.

The following MPE calculations are based on the printed circuit board antenna with a measured field strength of 109.5 dBµV/m, at 3 meters, and conducted RF power of +10.9 dBm as presented to the antenna. The calculated gain (measured over conducting ground plane) of this antenna, based on the measurement is 3.37dBi.

APPENDIX A

Test Equipment List

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

Note 1 - Equipment calibrated within a traceable system.

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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

Firmware and Setup Instructions

The switching of the antenna and channels of the THX9321R5000 are done at the module screen (touch screen):

1. Under 'Menu', select 'Self Test' mode and then select 'RF XTR'. Under 'RF XTR', select 'TX mode (manual)'.
2. 'TX mode (manual)' will allow for selections of channels (1:903MHz, 2:914.6MHz or 3:926.4MHz), antennas (Antenna A or Antenna B) and mode (Transmit or Receive).