LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
TESTING CERT #1255.01
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TEST REPORT #: 311048
LSR Job #: C-1146

Compliance Testing of:

Meta Watch

Test Date(s):

June 2nd – July 20th, 2011

Prepared For:

Fossil
Attn: Dave Rosales
2280 N. Greenville Ave.
Richardson, TX 75082

In accordance with:
Federal Communications Commission (FCC) Part 15, Subpart C, Section 15.247
Industry Canada (IC) RSS 210 Annex 8
Frequency Hopping Spread Spectrum (FHSS)

This Test Report is issued under the Authority of:

Signature:  Date:

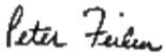
Test Report Reviewed by:	Tested by:
Peter Feilen, EMC Engineer	Shane Rismeyer, EMC Engineer
Signature:  Date: 7/25/11	Signature:  Date: 7/25/11

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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	Title
47 CFR, Parts 0-15 (FCC)	Code of Federal Regulations - Telecommunications
RSS 210 Annex 8	Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
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.
CISPR 16-1-1	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-705	Frequency Hopping Spread Spectrum Systems

1.3 - LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756

Industrie Canada Industry Canada

Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: IC 3088-A
On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: IC 3088

U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).
Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.
Date of Validation: November 20, 2002
Notified Body Identification Number: 1243

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 - Client Information

Manufacturer Name:	Fossil
Address:	2280 N. Greenville Ave.
Contact Name:	Dave Rosales

2.2 - Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	Meta Watch
Model Number:	WDS112
Serial Number:	N/A

2.3 - Associated Antenna Description

Johanson 2.4 GHz Chip antenna. See Appendix D for datasheet

2.4 - EUT'S Technical Specifications

EUT Frequency Range (in MHz)	2402-2479
Occupied Bandwidth (99% BW)	1.032 kHz
Type of Modulation	GFSK
Emission Designator	1K03G1D
EIRP (in mW) Max	2.95
EIRP (in mW) Min	2.14
Transmitter Spurious (worst case) at 3 meters	63.30 dBuV/m
Receiver Spurious (worst case) at 3 meters	37.78 dBuV/m
Receiver Bandwidth	1 MHz
Receiver Sensitivity	-91 dBm
Stepped (Y/N)	No
Step Value:	N/A
Frequency Tolerance %, Hz, ppm	Better than 100ppm
Microprocessor Model # (if applicable)	MSP430F5438A
Antenna Information	
Detachable/non-detachable	Non-detachable
Type	Chip
Gain (in dBi)	0.5 Peak
EUT will be operated under FCC Rule Part(s)	15.247
EUT will be operated under RSS Rule Part(s)	210
Modular Filing	☐ Yes ☒ No
Portable or Mobile?	Portable

RF Technical Information:

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

Procedure for Portable RF Exposure from KDB 447498:

$$Output\ Power\ \leq \frac{60}{f\ (GHz)}(mW)$$

$$2.95\ mW\ \leq 24.59\ mW$$

Note: Since the peak output power of 2.95 mW is below the low threshold of 24.59mW this device does not need SAR evaluation

2.5 - Product Description

Meta Watch™ is a wearable development system that enables rapid development of 'connected-watch' applications. The Meta Watch platforms utilize embedded *Bluetooth*® technology to connect to smartphones, tablets and other electronics devices. Optimized for low-power operation, watch platforms are based on the MSP430™ ultra-low-power microcontroller and CC2560 *Bluetooth* host controller interface solution from Texas Instruments Incorporated (TI).

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 - Climate Test Conditions

Temperature:	68 °F
Humidity:	38%
Pressure:	755 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	N/A
FCC : 15.247 (a)(1)(i) IC : RSS 210 A8.1 (a)	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 (a)(1)(i) IC: RSS 210 (b)	Carrier Frequency Separation	Yes
FCC:15.247 (a)(1)(i),(ii),(iii) IC: RSS 210 (c),(d),(e)	Number of Hopping Channels	Yes
FCC:15.247 (a)(1)(i),(ii),(iii) IC: RSS 210 (c),(d),(e)	Time of Occupancy (Dwell Time)	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

3.3 - Modifications Incorporated in the EUT for Compliance Purposes

☐ None ☒ Yes (explain below)

In order for the EUT to pass Radiated Spurious Emissions the power level for all channels was set to 14.

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 for a Frequency Hopping Spread Spectrum (FHSS) Transmitter.

Note: 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. 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 a continuously modulated transmit mode for testing using power as provided by a bench DC supply.

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 (2402), middle (2462) and high (2479) to comply with FCC Part 15.31m.

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 Bi-conical 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 and a Standard Gain Horn Antenna was used from 18 GHz to 25 GHz at a separation distance of 1m. 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. 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 IEC/ISO 17025 accredited calibration laboratory, traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the 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 EMI Receiver was operated with resolution bandwidths as prescribed in ANSI C63.4.

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 for a FHSS transmitter.

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 and RSS 210 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 A8.5, 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 of field strength (μV/m to dBμV/m):
dBμV/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

Reported data is the raw data corrected for all applicable factors such as antenna factors, cable loss, etc.

Sample reported data:

Raw Data + Antenna Factor + Cable Factor = Reported Data

58.85 dBμV/m + 28.52 dB + 4.93 dB = 92.3 dBμV/m

5.6 - Radiated Emissions Test Data Chart

Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	Fossil					
Date(s) of Test:	6/2/11-6/8/11					
Test Engineer(s):	Shane Rismeyer					
Voltage:	5VDC					
Operation Mode:	Continuous transmit, modulated mode					
Environmental Conditions in the Lab:	Temperature: 71˚F Relative Humidity: 32 %					
EUT Power:		Single Phase ___VAC		3 Phase ___VAC		
		Battery	**X**	Other: Bench DC Supply (5VDC)		
EUT Placement:	**X**	80cm non-conductive table		10cm Spacers		
EUT Test Location:	**X**	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS		
Measurements:		Pre-Compliance		Preliminary	**X**	Final
Detectors Used:	**X**	Peak	**X**	Quasi-Peak	**X**	Average

The following table depicts the level of significant spurious radiated RF emissions found (other than the fundamentals and its harmonics):

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (degrees)	Measured EFI (dBμV/m)	Limit (dBμV/m)	Margin (dB)
986.5	V/V	1.00	0	27.8	54.0	26.2
297.3	H/V	1.00	0	25.6	46.0	20.4

The following table depicts the level of radiated Fundamental emissions seen:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (degrees)	Measured EFI (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	H/V	1.17	0	92.3	125.2	32.9
2462	H/V	1.43	0	91.3	125.2	33.9
2479	H/V	1.15	19	90.6	125.2	34.6

RADIATED EMISSIONS DATA CHART (continued)

The following table depicts the level of significant radiated harmonic emissions seen on Channel 00:

Ant/EUT Polarity	Frequency (MHz)	Peak (dBµV/m)	Average EFI (dBµV/m)	Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dBµV/m)
H/Vertical	4804.0	63.71	62.72	111.7	307.9	63.5	0.78
V/Side	12010.0	59.23	57.29	104.6	54.9	63.5	6.21

The following table depicts the level of significant radiated harmonic emissions seen on Channel 30:

Ant/EUT Polarity	Frequency (MHz)	Peak (dBµV/m)	Average EFI (dBµV/m)	Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dBµV/m)
V/Flat	7385.9	65.28	63.30	109	36	63.5	0.20
V/Vertical	12310.0	59.58	57.53	104.4	64.4	63.5	5.97
H/Vertical	4924.0	57.71	55.72	106.7	329.6	63.5	7.78

The following table depicts the level of significant radiated harmonic emissions seen on Channel 78:

Ant/EUT Polarity	Frequency (MHz)	Peak (dBµV/m)	Average EFI (dBµV/m)	Height (cm)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dBµV/m)
V/Flat	7437.0	64.68	62.71	102.6	40.7	63.50	0.79
H/Vertical	4958.0	62.69	61.50	110.2	353.8	63.50	2.00
V/Vertical	12395.0	57.76	55.03	107.3	69.6	63.5	8.47

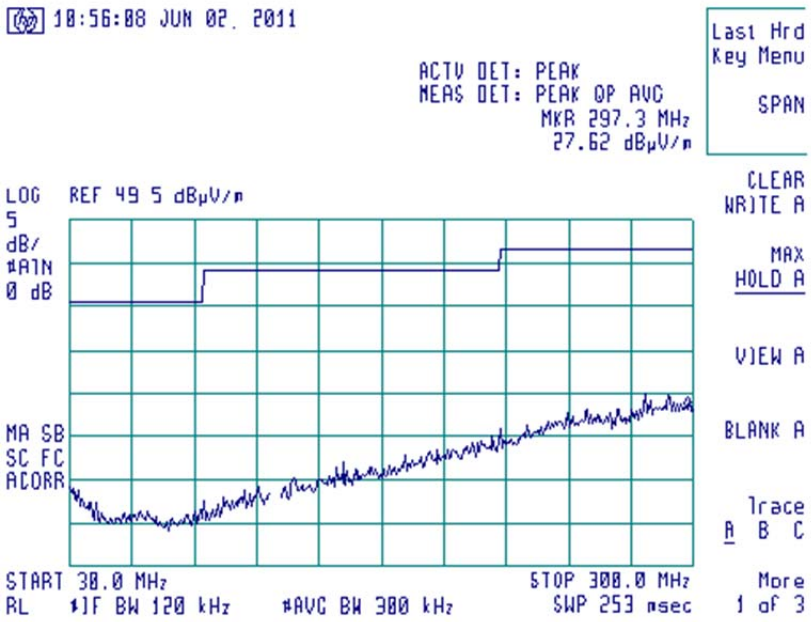
Notes:

1. A Quasi-Peak Detector was used in measurements below 1 GHz. To ensure the peak emissions did not exceed 20 dB above the limits a peak detector was used. A peak detector with video averaging was used for measurements above 1 GHz.
2. Measurements above 4 GHz were made at 1 m of separation from the EUT. Limits have been corrected to reflect the change in measurement distance.

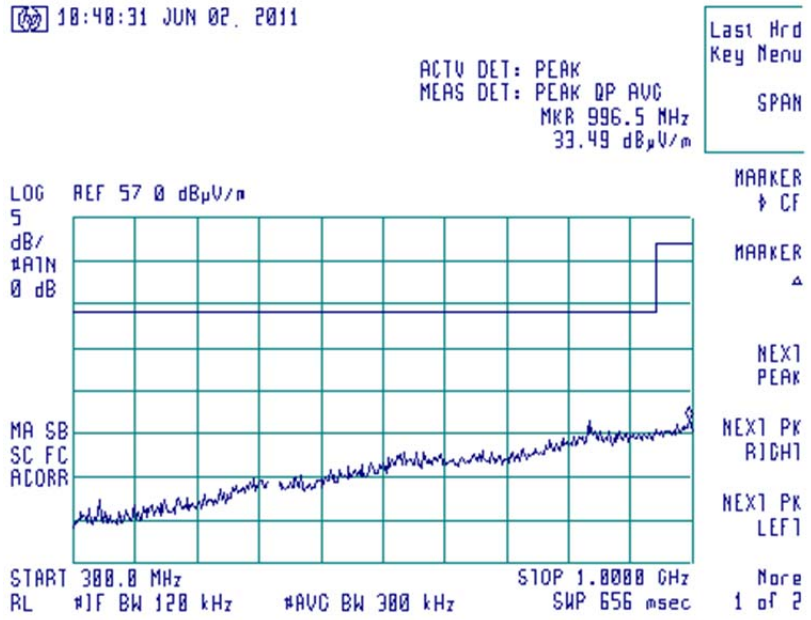
5.7 - Screen Captures - Radiated Emissions Test

Note: These screen captures represent Peak Emissions. For measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and a video averaged Peak detector function is utilized when measuring frequencies above 1 GHz.

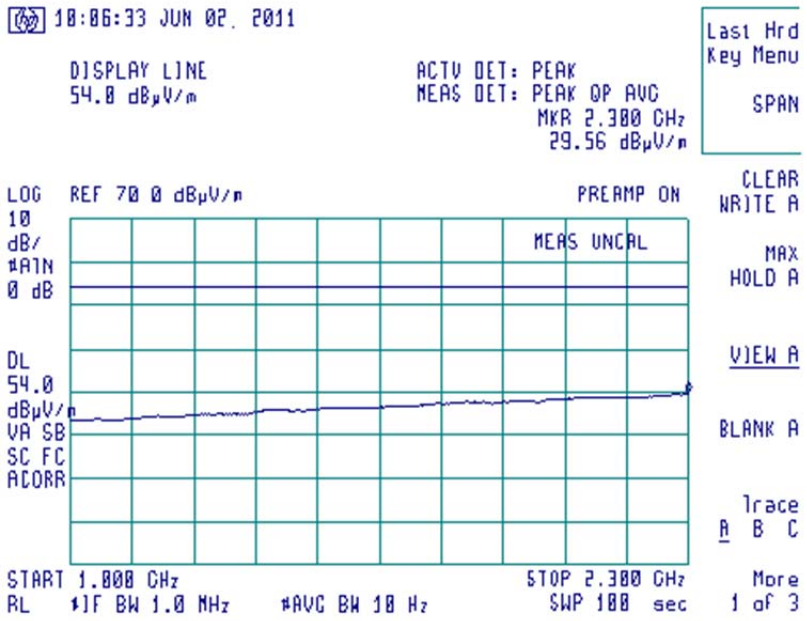
Channel 2462 MHz, Antenna Vertically Polarized, 30-300 MHz, at 3m



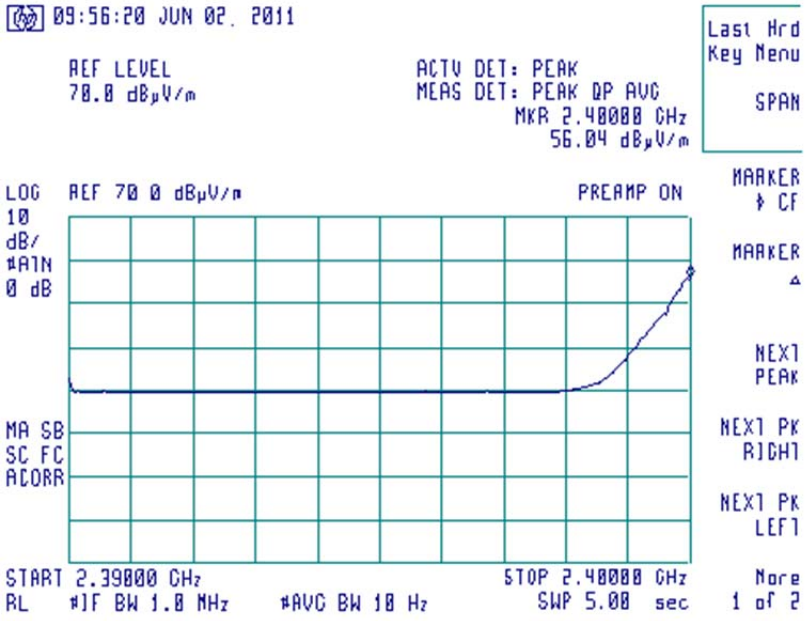
Channel 2462 MHz, Antenna Vertically Polarized, 300-1000 MHz, at 3m



Channel 2462 MHz, Antenna Vertically Polarized, 1000-2300 MHz, at 3m

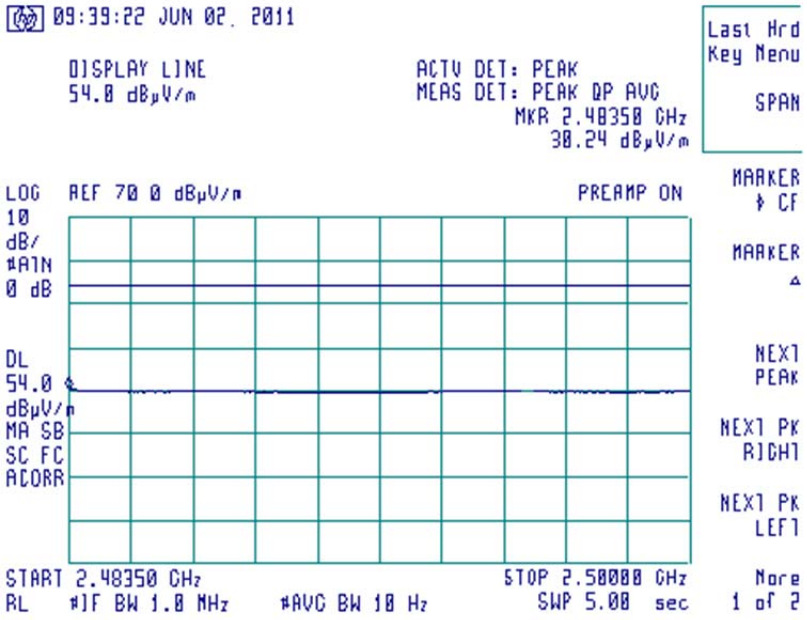


Channel 2402 MHz, Antenna Vertically Polarized, 2300-2400 MHz, at 3m

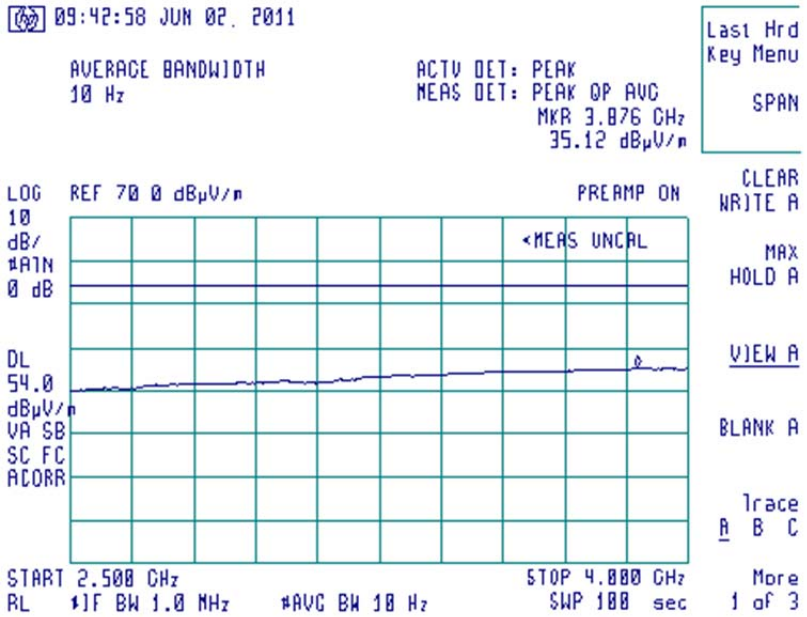


Screen Captures - Radiated Emissions Testing *(continued)*

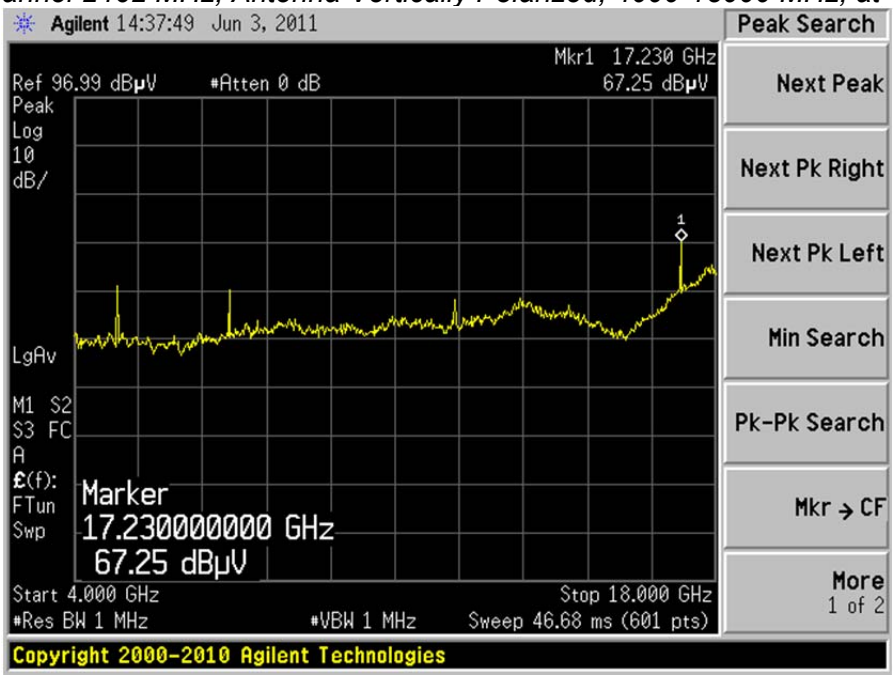
Channel 2479 MHz, Antenna Vertically Polarized, 2483.5-2500 MHz (UBE), at 3m



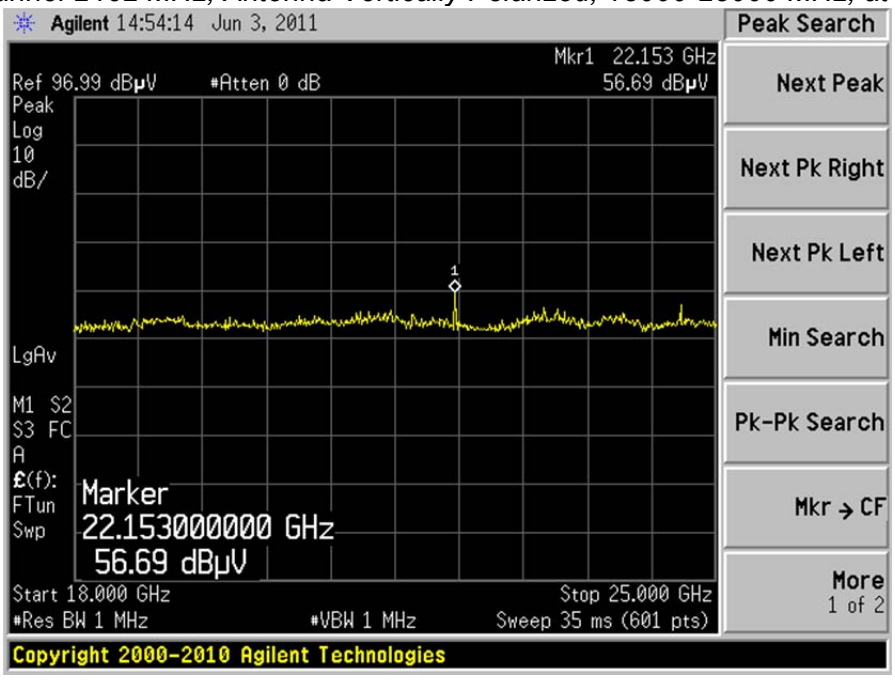
Channel 2462 MHz, Antenna Vertically Polarized, 2500-4000 MHz, at 3m



Channel 2462 MHz, Antenna Vertically Polarized, 4000-18000 MHz, at 1m



Channel 2462 MHz, Antenna Vertically Polarized, 18000-25000 MHz, at 1m



5.8 - Receive Mode Testing

Per the requirements of RSS-210 and CFR 47 part 15, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen Section 4.10 and CFR 47 15.109.

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)	Ant./EUT Polarity	Height (m)	Azimuth (degrees)	Measured EMI (dBμV/m)	Limit (dBμV/m)	Margin (dB)
289.2	V/Vertical	1.00	0	25.4	46.0	20.6
996.5	V/Vertical	1.00	0	30.5	54.0	23.5
2467.3	V/Vertical	1.00	0	37.8	54.0	16.2

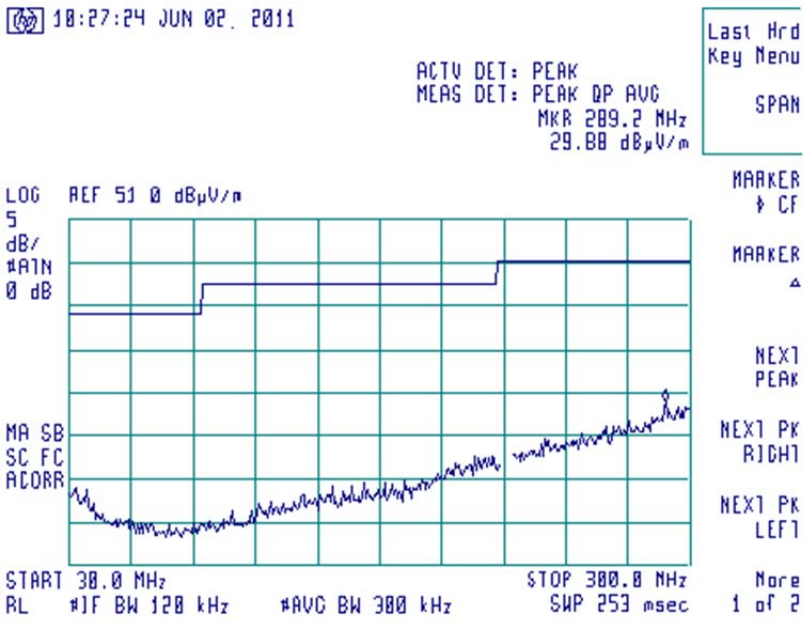
Notes:

1. A Quasi-Peak Detector was used in measurements below 1 GHz. To ensure the peak emissions did not exceed 20 dB above the limits a peak detector was used above 1 GHz. A peak detector with video averaging was used for measurements above 1 GHz.
2. Measurements above 4 GHz were made at 1 meters of separation from the EUT.
3. H: Horizontal, V: Vertical

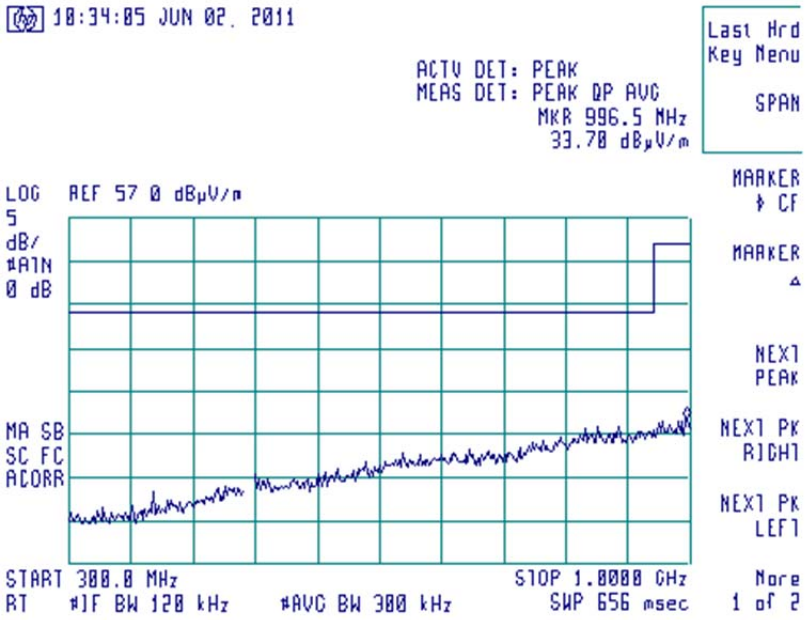
5.9 - Screen Captures - Radiated Emissions Testing – Receive Mode

Note: These screen captures represent Peak Emissions. For measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and a video averaged Peak detector function is utilized when measuring frequencies above 1 GHz.

Antenna Vertically Polarized, 30 MHz to 300 MHz

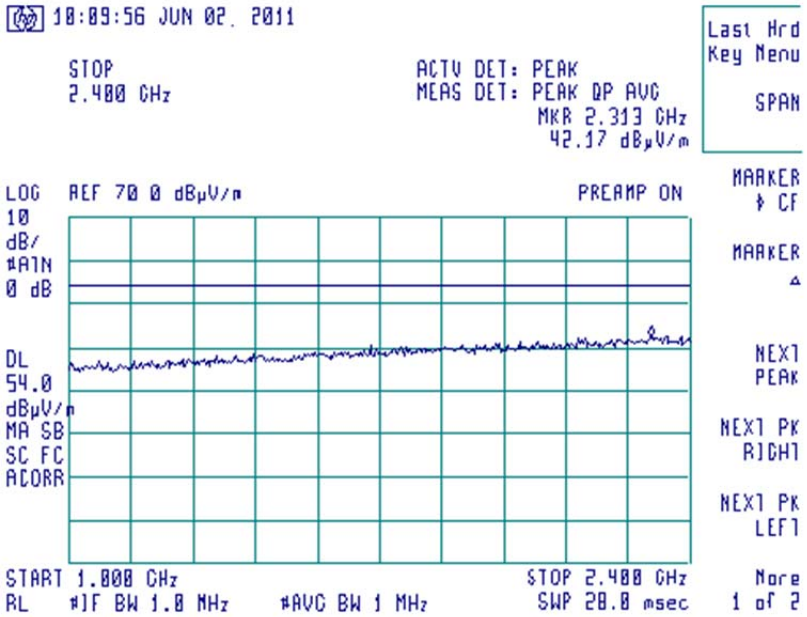


Antenna Vertically Polarized, 300 MHz to 1000 MHz

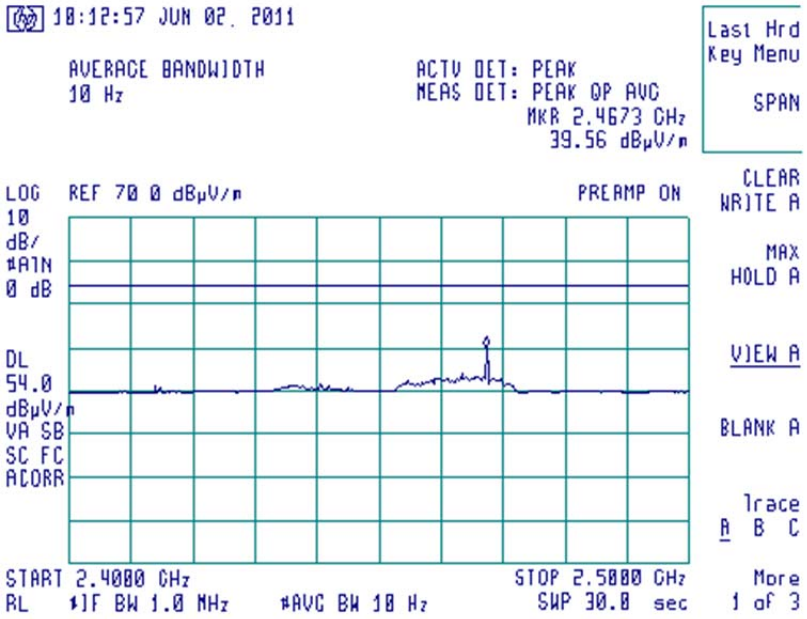


Screen Captures - Radiated Emissions Testing – Receive Mode (continued)

Antenna Vertically Polarized, 1000 MHz to 2400 MHz

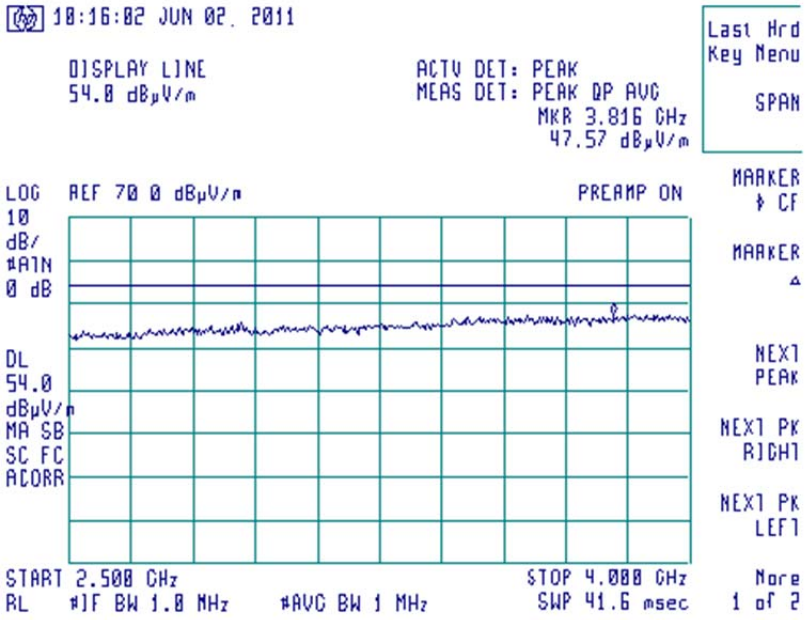


Antenna Vertically Polarized, 2400 MHz to 2500MHz

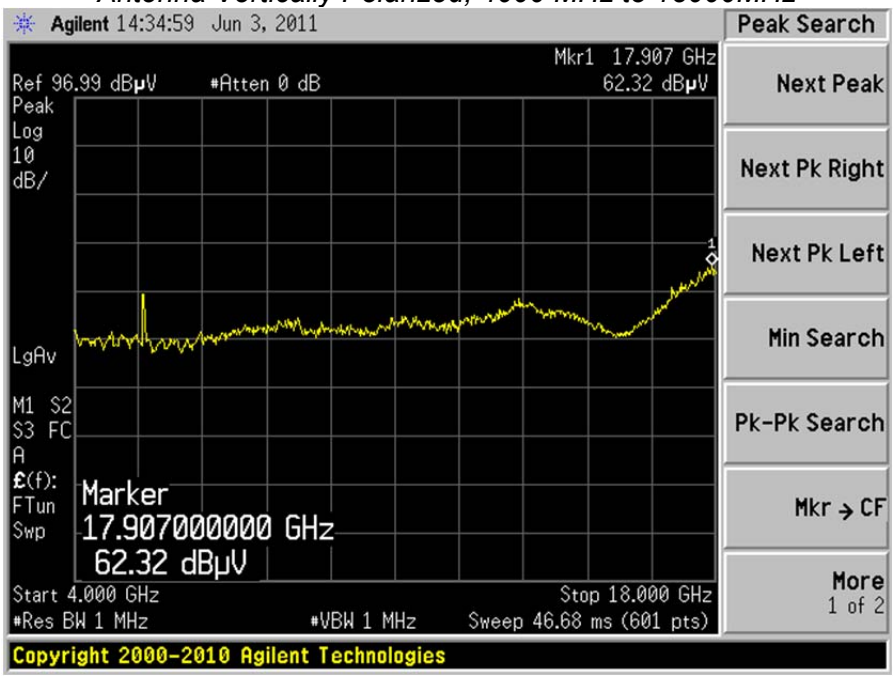


Screen Captures - Radiated Emissions Testing – Receive Mode *(continued)*

Antenna Vertically Polarized, 2500 MHz to 4000MHz



Antenna Vertically Polarized, 4000 MHz to 18000MHz



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

Antenna Vertically Polarized, 18000 MHz to 25000MHz

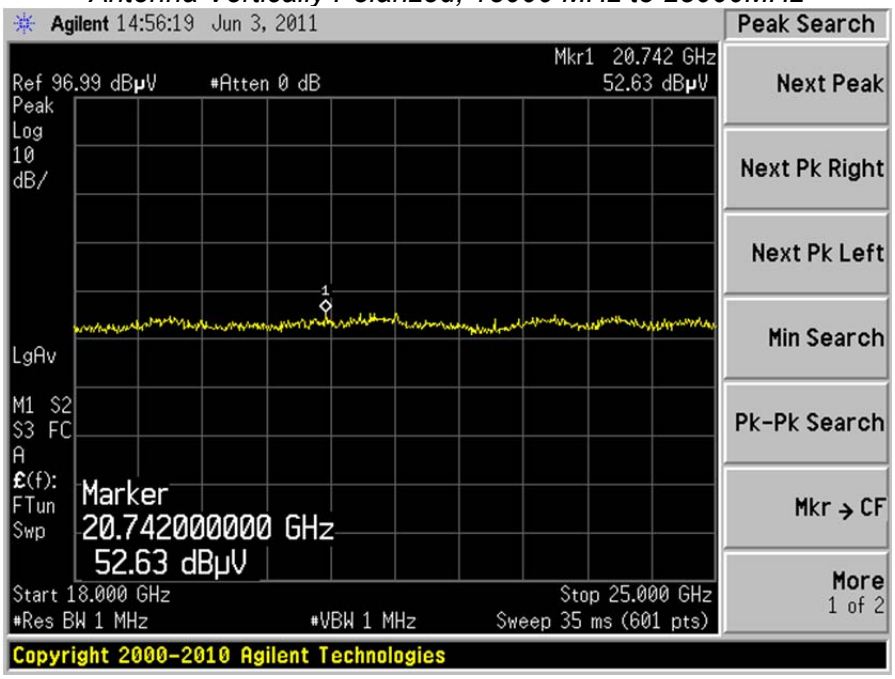


EXHIBIT 7. OCCUPIED BANDWIDTH

7.1 - Limits

For a frequency Hopping system in the 2400 to 2500 MHz band, the 20 dB bandwidth shall not exceed 500 kHz for FCC CFR 47 15.247 (a)(1)(i) and IC RSS 210 A8.1. (c).

7.2 - Method of Measurements

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 470 Hz RBW and VBW=4.7 kHz.

For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to a 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, allowing direct measurements, without the need for any further corrections. A spectrum analyzer was used with the resolution bandwidth set to 470 Hz 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.

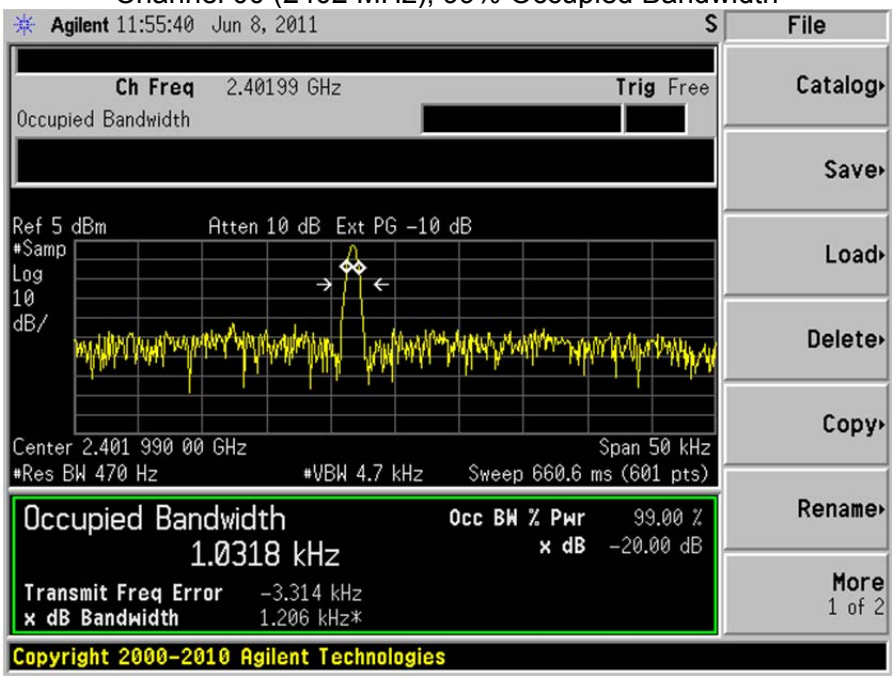
From this data, the closest measurement (20 dB bandwidth) when compared to the specified limit, is 1.032 kHz, which is below the maximum of 500 kHz.

7.3 - Test Data

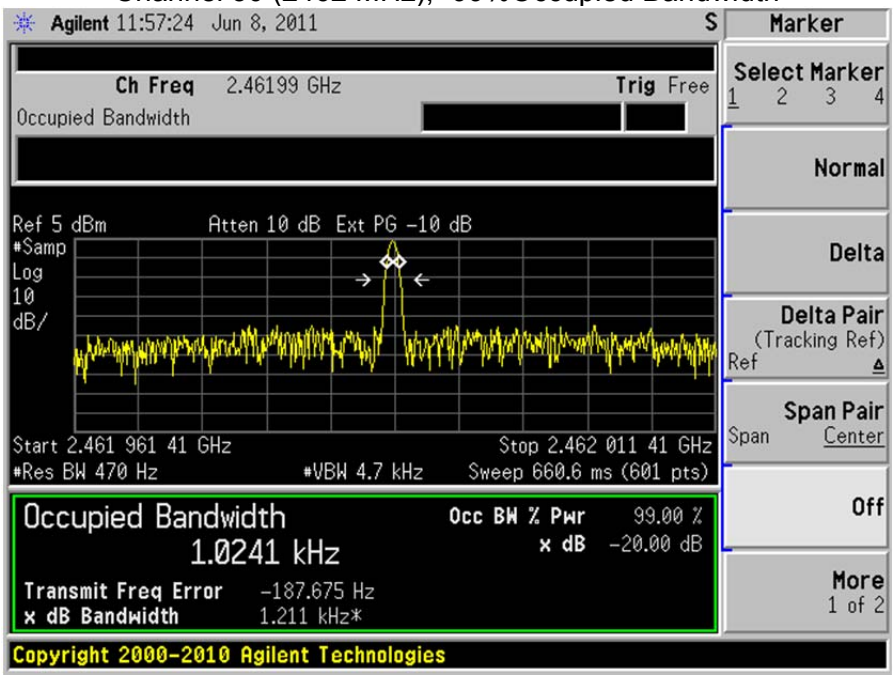
Channel	Center Frequency (MHz)	Measured -20 dBc Occ. BW (kHz)	Maximum -20 dBc Limit (kHz)	Margin (kHz)
00	2402	1.21	500	498.79
30	2462	1.21	500	498.79
78	2479	1.21	500	498.79

7.4 - Screen Captures - Occupied Bandwidth

Channel 00 (2402 MHz), 99% Occupied Bandwidth



Channel 30 (2462 MHz), -99%Occupied Bandwidth



Channel 78 (2479 MHz), 99% Occupied Bandwidth

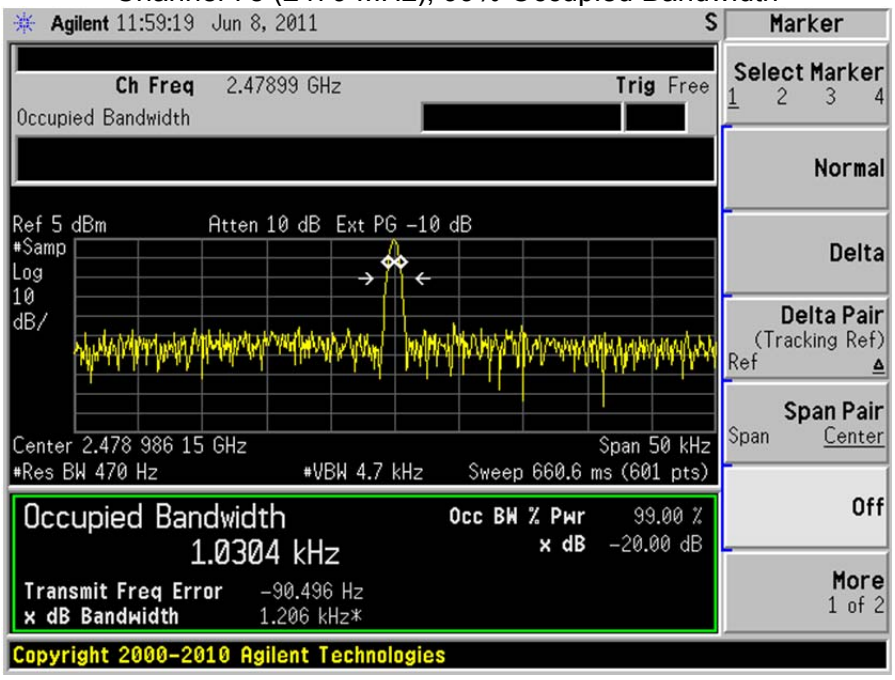


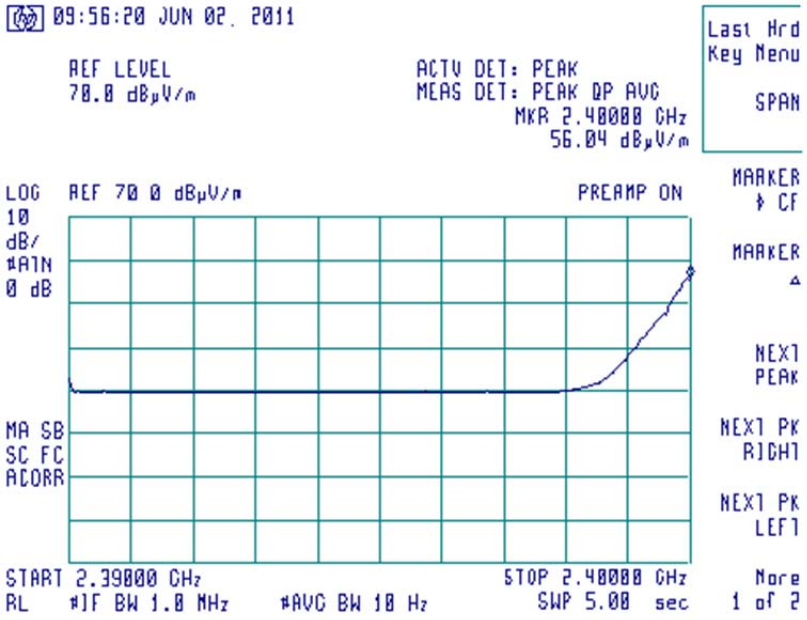
EXHIBIT 8. BAND EDGE MEASUREMENTS

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 72.3 dBuV/m at 3m.



Screen Capture Demonstrating Compliance at the Higher Band-Edge

The Upper Band-Edge limit, would be 54 dBuV/m at 3m.

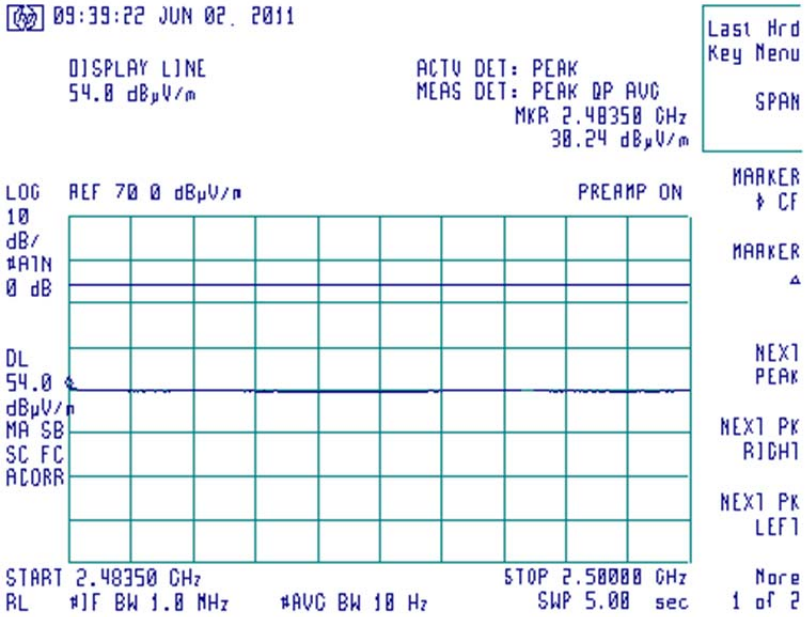


EXHIBIT 9. POWER OUTPUT (CONDUCTED)

9.1 - Method of Measurements

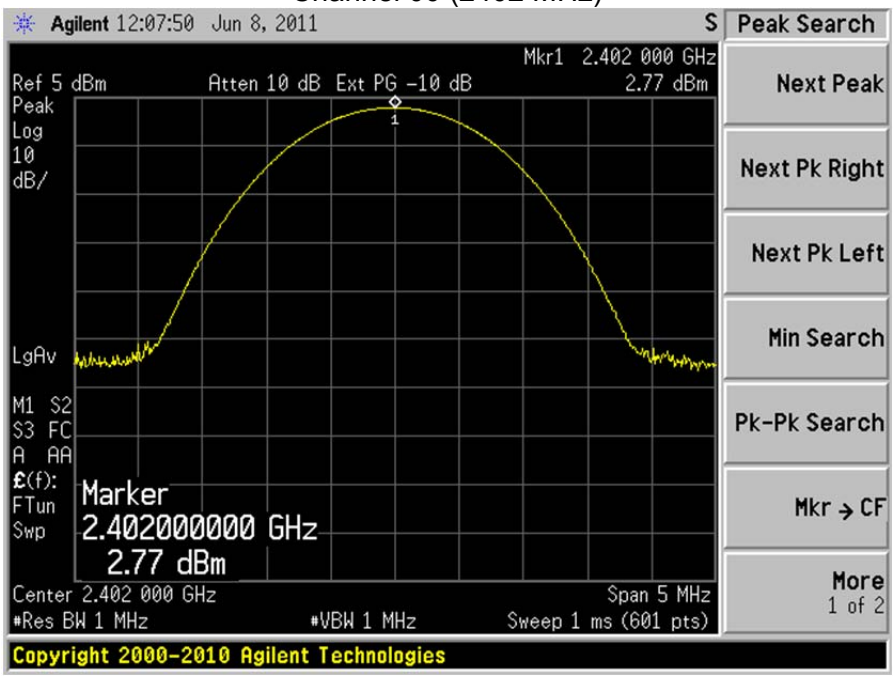
The conducted RF output power of the EUT was measured at the antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, allowing direct measurements without the need 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 bandwidths set to 1 MHz and a span of 5 MHz, Bluetooth, and 3 MHz and a span of 10 MHz, wireless, with measurements from a peak detector presented in the chart below.

9.2 - Test Data

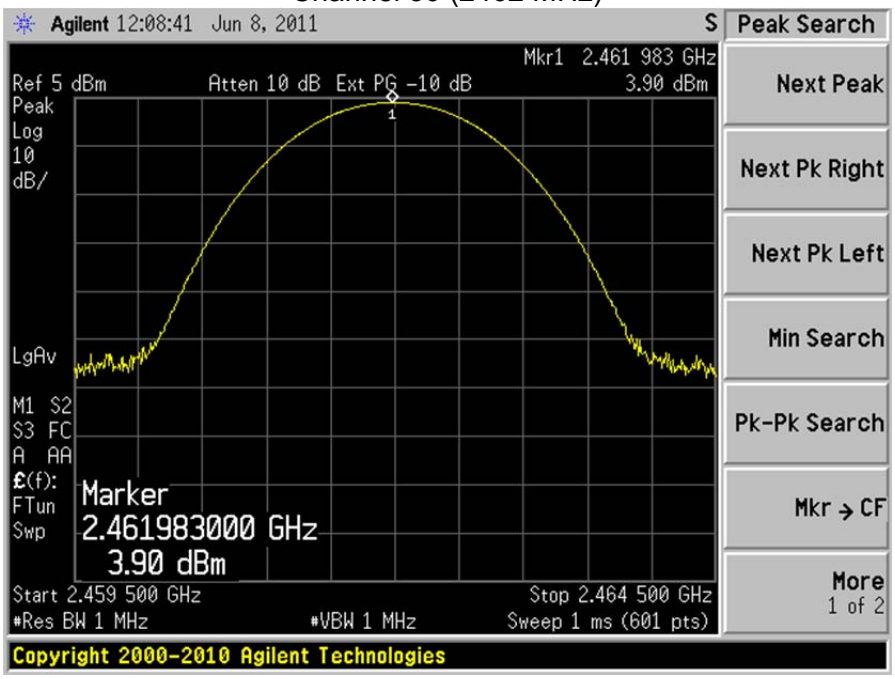
Channel	Center Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.8	30.0	27.2
Middle	2462	3.9	30.0	26.1
High	2479	4.2	30.0	25.8

9.3 - Screen Captures – Power Output (Conducted)

Channel 00 (2402 MHz)



Channel 30 (2462 MHz)



Channel 78 (2479 MHz)

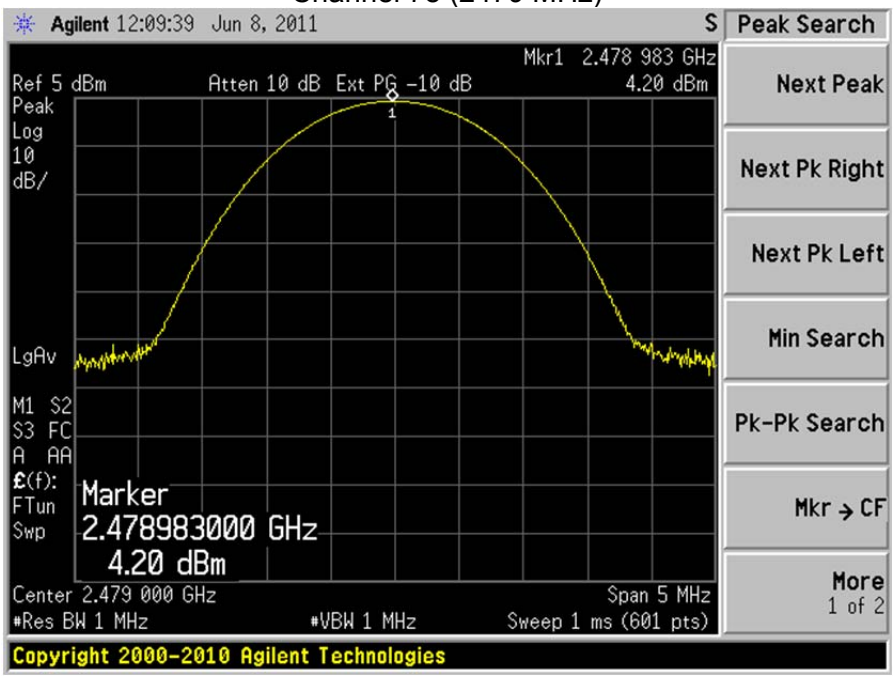


EXHIBIT 10. CONDUCTED SPURIOUS EMISSIONS: 15.247(d)

10.1 - 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.

10.2 - Conducted Harmonic And Spurious RF Measurements

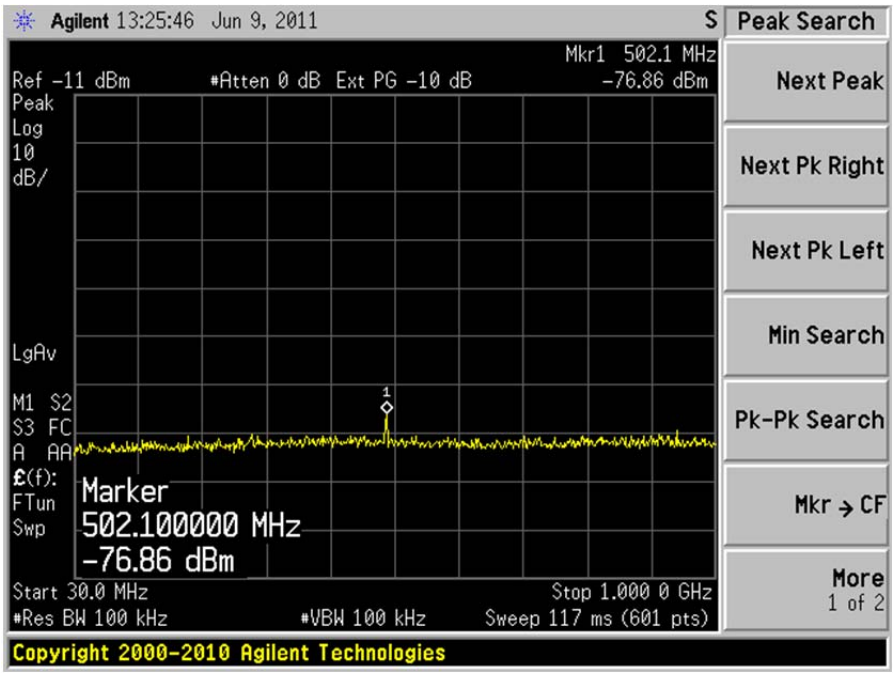
FCC Part 15.247(d) and IC RSS 210 A8.5 both require a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable 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, thereby allowing direct readings of the measurements made without the need for any further corrections. A 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.

Transmitter Harmonic Emissions

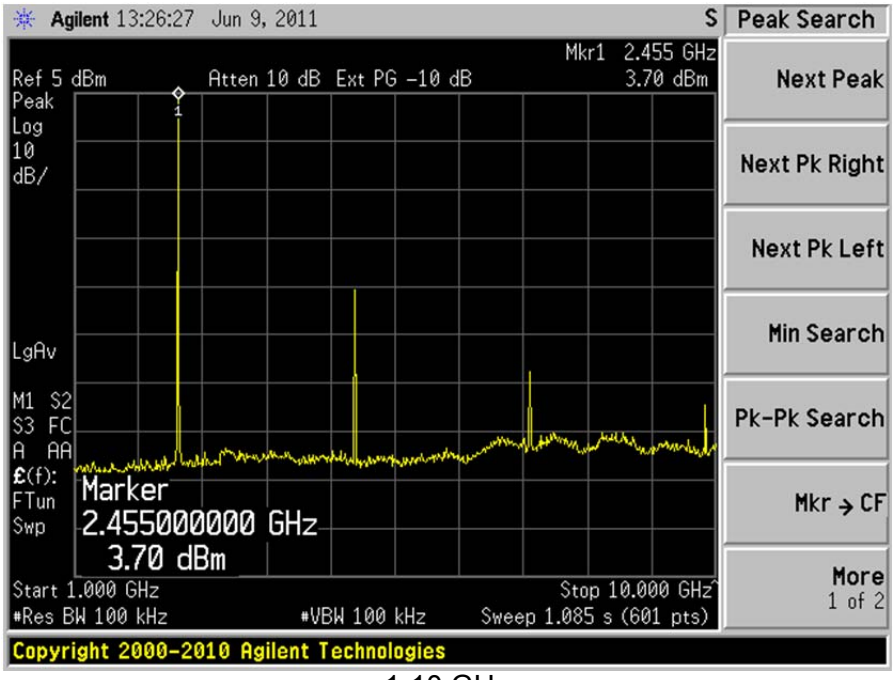
Frequency	Channel 00 (2402 MHz)	Channel 30 (2462 MHz)	Channel 78 (2479 MHz)
Fundamental	2.23	3.66	3.80
2nd Harmonic	-38.47	-36.12	-34.39
3rd Harmonic	-50.18	-51.32	-52.29
4th Harmonic	-58.42	-59.06	-56.77
5th Harmonic	-56.91	-59.16	-57.56
6th Harmonic	-48.78	-42.79	-41.40
7th Harmonic	-43.62	-44.42	-45.88
8th Harmonic	-71.12	-61.23	-61.23
9th Harmonic	-60.22	-58.68	-59.42
10th Harmonic	Note (1)	Note (1)	Note (1)

Note 1): Measurement at system noise floor and >50dB from limit.

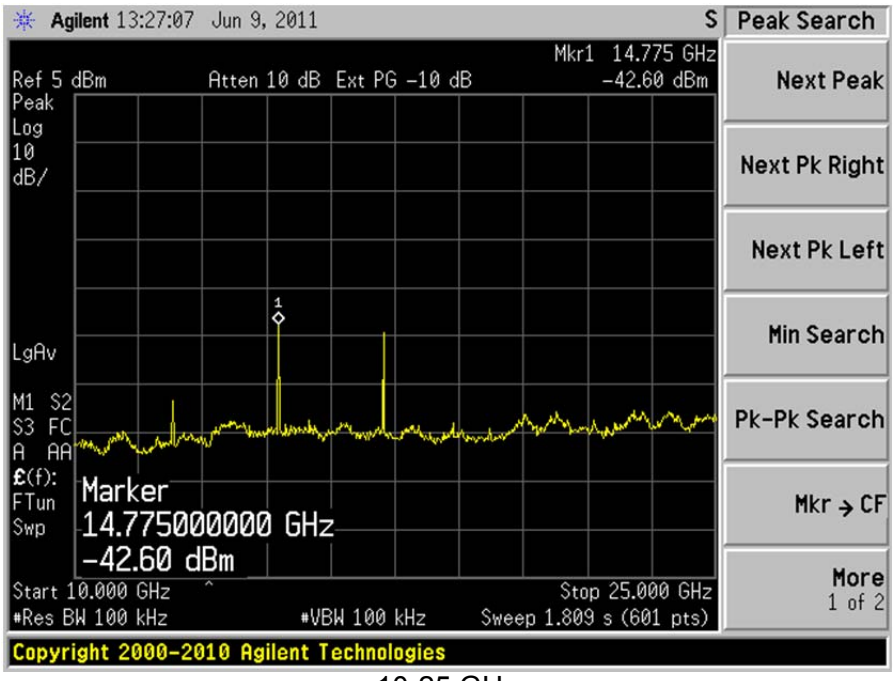
10.3- Screen Captures – Spurious Radiated Emissions



30-1000 MHz



1-10 GHz


Agilent 13:27:07 Jun 9, 2011
S
Peak Search
Mkr1 14.775 GHz
Ref 5 dBm
Atten 10 dB Ext PG -10 dB
-42.60 dBm
Next Peak
Peak
Log
10
dB/
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
A AA
Pk-Pk Search
£(f):
FTun
Swp
Marker
14.775000000 GHz
-42.60 dBm
Mkr → CF
More
1 of 2
Start 10.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 1.809 s (601 pts)
Copyright 2000-2010 Agilent Technologies

10-25 GHz

EXHIBIT 11. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

For measurements of the frequency and power stability, the transmitter was powered by an external bench-type variable power supply. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers and also the output power at the antenna port.

4.25 VDC		5 VDC		Channel
Power (dBm)	Frequency (Hz)	Power (dBm)	Frequency (Hz)	
2.83	2401986439	2.88	2401986539	Low
3.56	2461986245	3.63	2461986129	Mid
3.83	2478986135	3.88	2478986085	High

Frequency Drift

Channel	Maximum (Hz)	Minimum (Hz)	Difference (Hz)
Low	2401986539	2401986439	100
Mid	2461986245	2461986129	116
High	2478986135	2478986085	50

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.

The maximum shift in frequency is 116 Hz which is better than 100 ppm in the 2400 MHz to 2483.5 MHz band.

EXHIBIT 12. CHANNEL PLAN AND SEPARATION

A 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 1013 Hz and 1033 Hz respectively.

The minimum channel separation limit as stated in FCC CFR 47 15.247 and IC RSS210 is 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

The minimum number of channels limit as stated in FCC CFR 47 15.247 and IC RSS210 is 50 channels for channel bandwidth less than 250 kHz and 25 channels for channel bandwidth greater than 250 kHz.

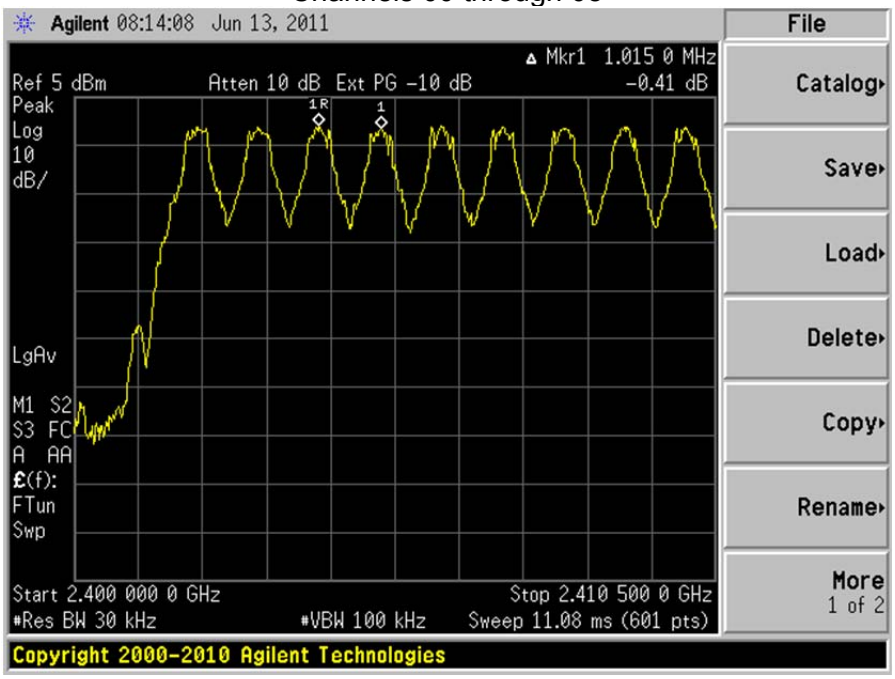
The following plots describe this spacing, and also establish the channel separation and plan.

Range (MHz)	Number of Channels Per Capture	Max separation (Hz)
2400 - 2410.5	9.0	1015
2410.5 - 2420	9.5	1013
2420 - 2430	10.0	1033
2430 - 2440	10.0	1017
2440-2450	10.0	1017
2450-2460	10.0	1033
2460-2470	10.0	1017
2470-2483.5	10.5	1012.5

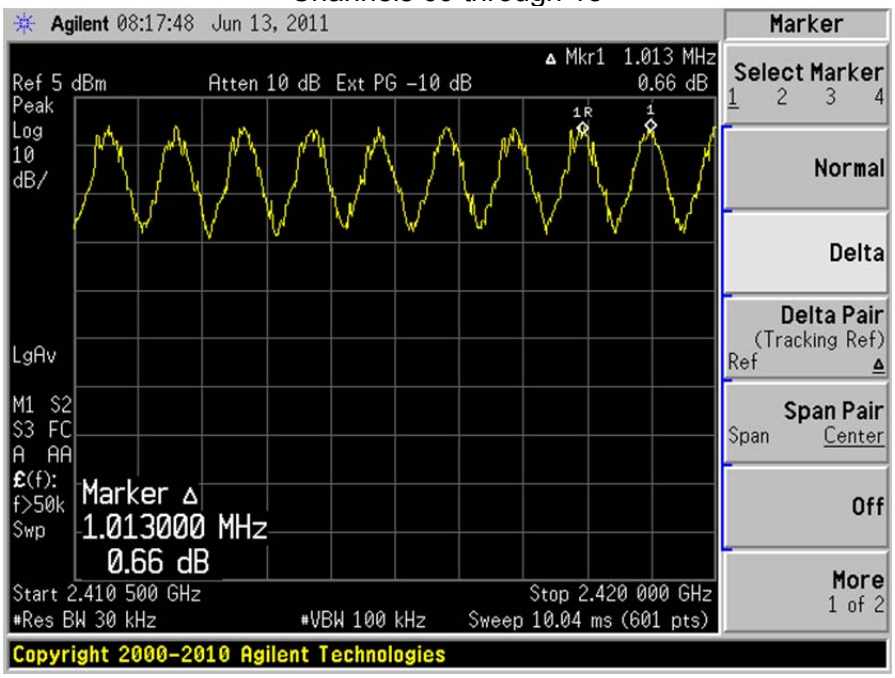
Total Channels	79
Largest Max separation	1033
Smallest Max Separation	1013

12.1 - Screen Captures – Channel Separation

Channels 00 through 08

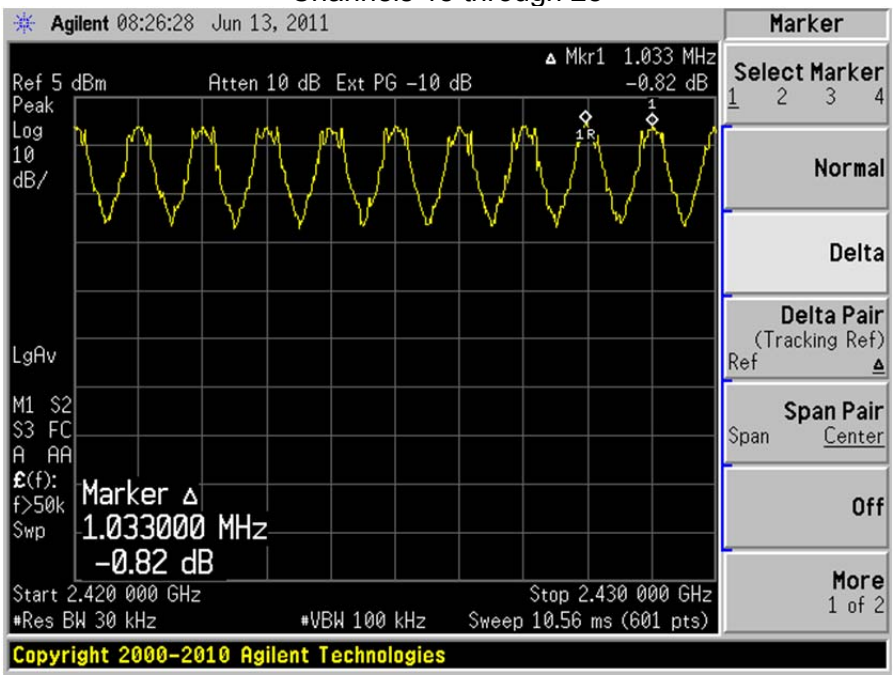


Channels 09 through 18

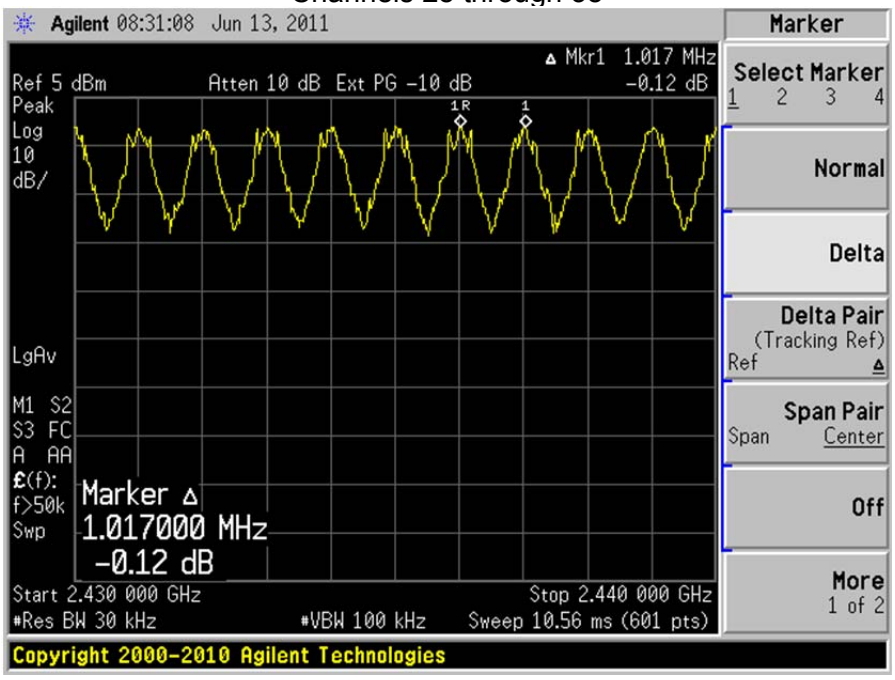


Screen Captures – Channel Separation *(continued)*

Channels 18 through 28

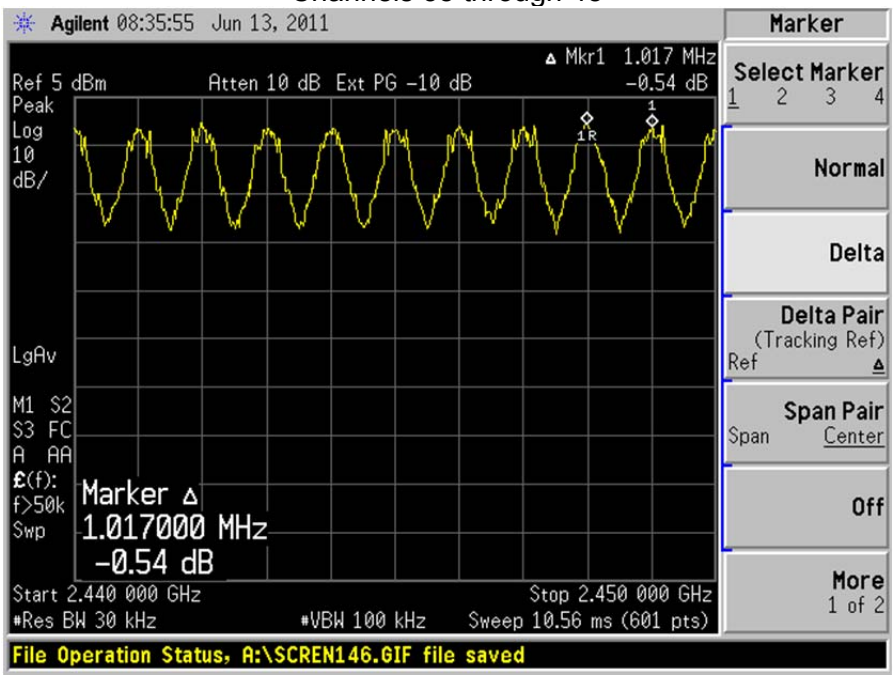


Channels 28 through 38

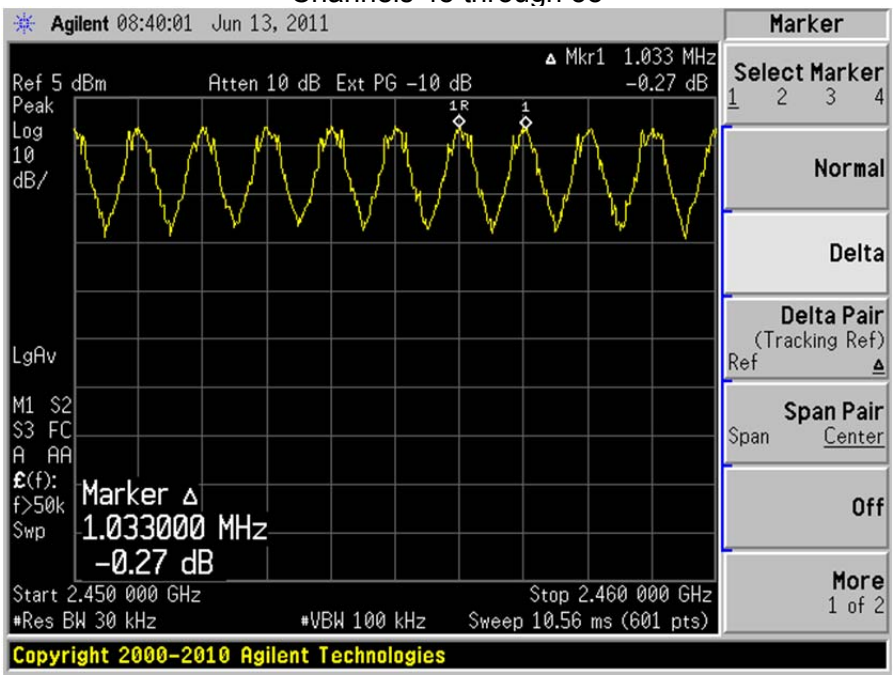


Screen Captures – Channel Separation *(continued)*

Channels 38 through 48

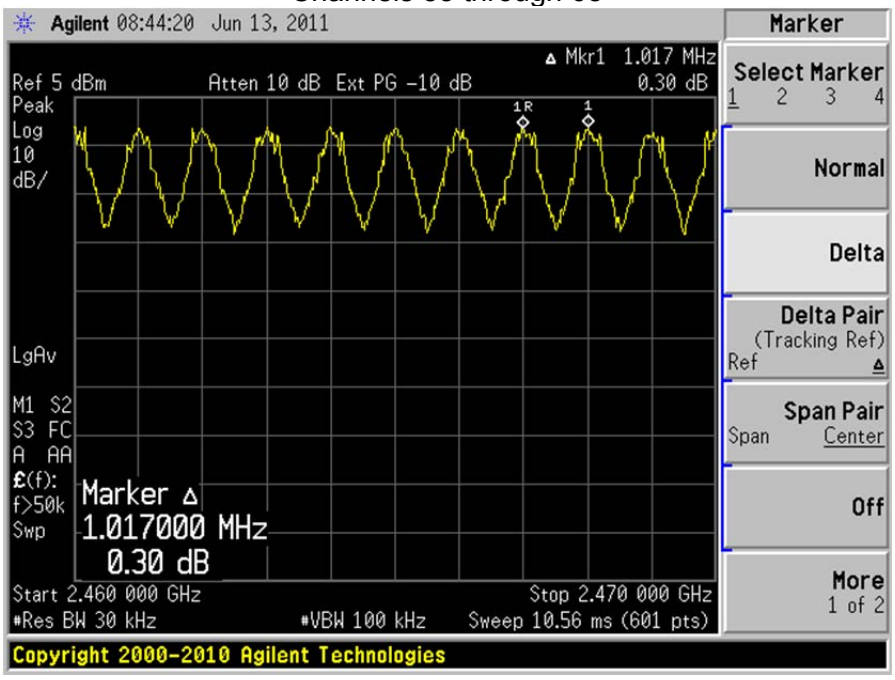


Channels 48 through 58



Screen Captures – Channel Separation *(continued)*

Channels 58 through 68



Channels 68 through 78

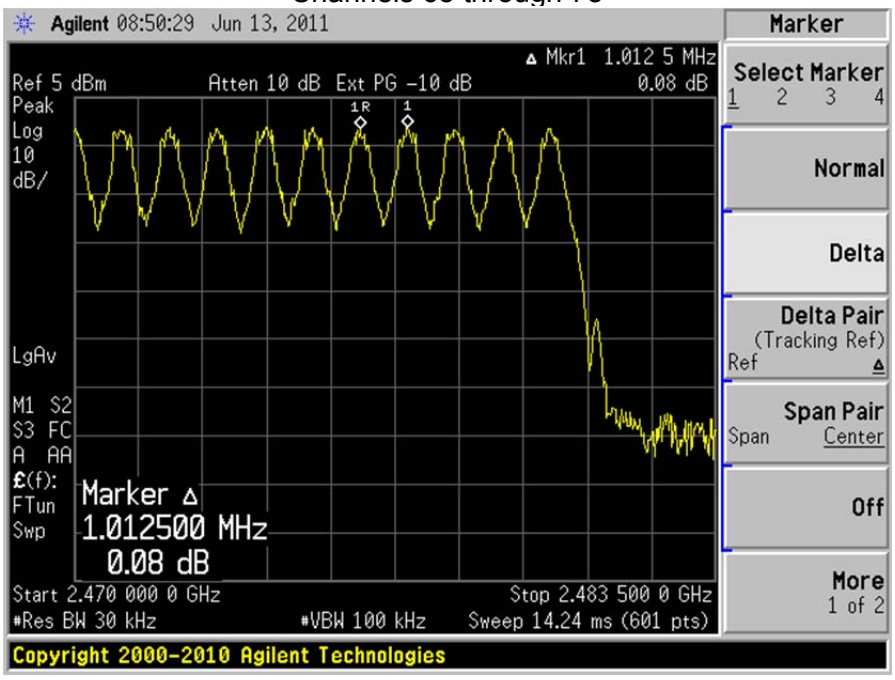
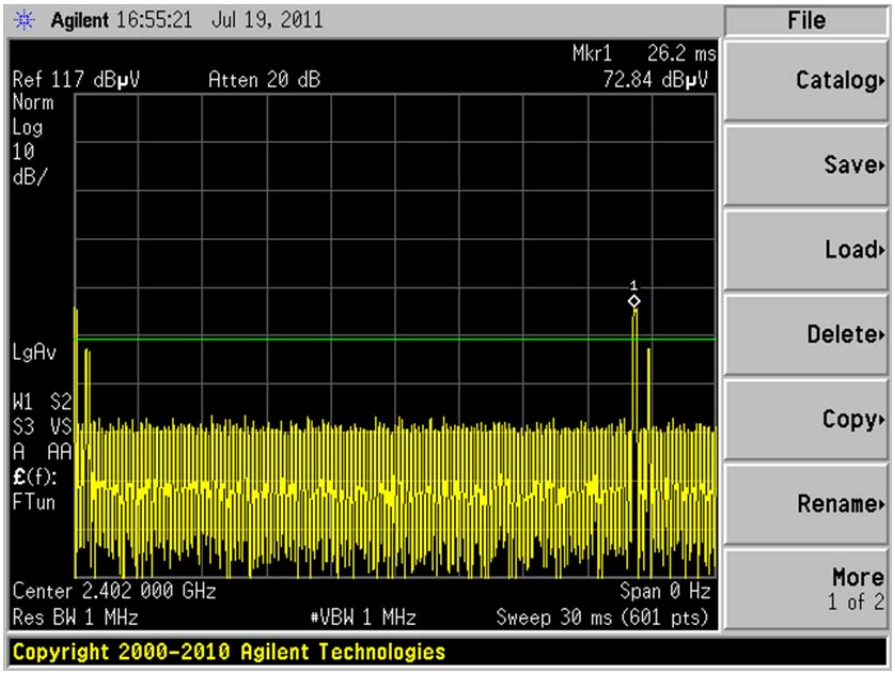


EXHIBIT 13. CHANNEL OCCUPANCY

Part 15.247(a)(1) requires a channel occupancy, for this device, of no more than 400 milliseconds in a 31.6 second window (given 79 EUT has 79 channels). The channel occupancy for this EUT was measured using a spectrum analyzer, set to zero-span at the frequency of interest. With the analyzer in peak-hold mode, the transmission lengths can be measured by adjusting the sweep rate of the analyzer.

The longest time any transmission will occur on a single channel is 156.67 microseconds. In a 30ms window, each channel has 1 transmission cycle. The maximum occupancy in a 31.6 second window is calculated by dividing 1 transmission cycle in a 30ms window. Then, multiplying by the 313.33 microsecond transmission duration per cycle, to arrive at 330.0 milliseconds total occupancy.

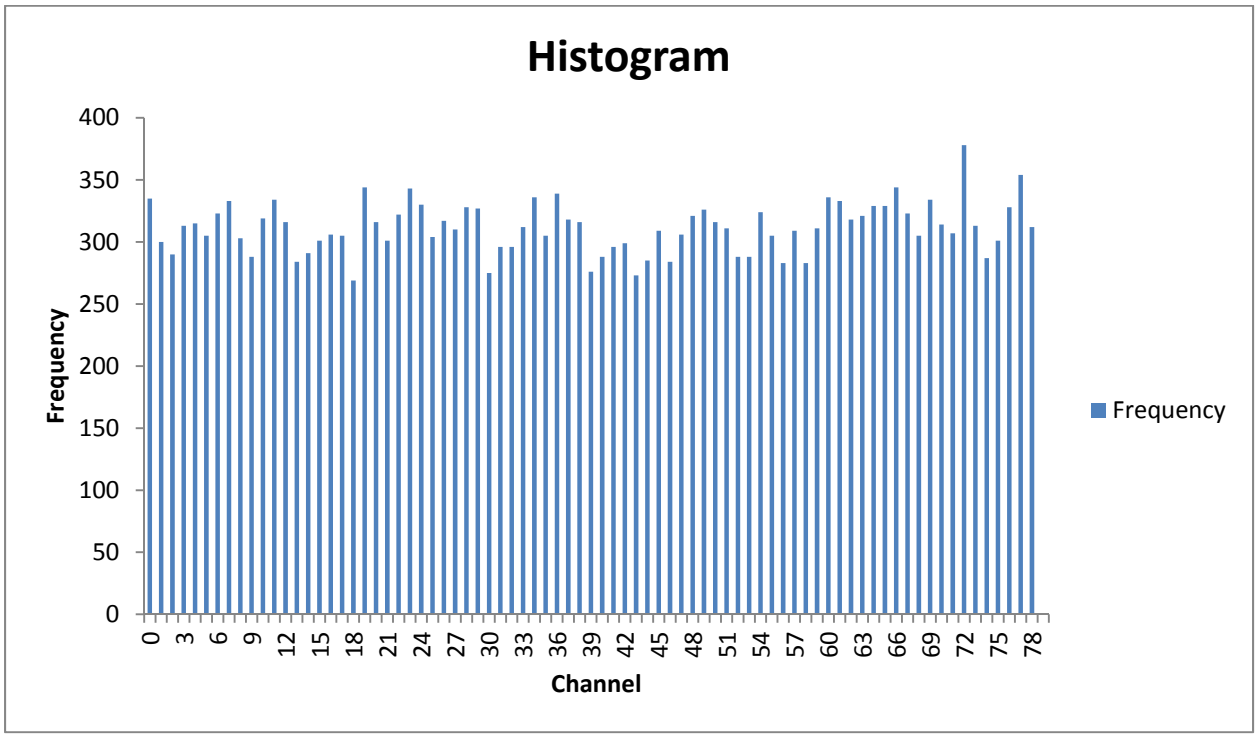


Capture showing 1 transmission cycle of 30ms with two packets of 156.667 µs duration each.

EXHIBIT 14. EQUAL CHANNEL USAGE AND PSEUDORANDOM HOPPING SEQUENCE.

In total, six types of hopping sequence are defined − *five for the basic hop sys*tem and one for an adapted set of hop locations used by adaptive frequency hopping (AFH). These sequences are:

•A page hopping sequence with 32 wake-up frequencies distributed equally over the 79 MHz, with a period length of 32;
•A page response hopping sequence covering 32 response frequencies that are in a one-to-one correspondence to the current page hopping sequence. The master and slave use different rules to obtain the same sequence;
•An inquiry hopping sequence with 32 wake-up frequencies distributed equally over the 79 MHz, with a period length of 32;
•An inquiry response hopping sequen*ce covering 32 response frequen*cies that are in a one-to-one correspondence to the current inquiry hopping sequence.
•A basic channel hopping sequence which has a very long period length, which does not show repetitive patterns over a short time interval, and which distributes the hop frequencies equally over the 79 MHz during a short time interval.
•An adapted channel hopping sequence derived from the basic channel hopping sequence which uses the same channel mechanism and may use fewer than 79 frequencies. The adapted channel hopping sequence is only *used in place of* the basic channel hopping sequence. All other hopping sequences are not affected by hop sequence adaptation.



Note: The information in this section is provided by the manufacturer.

EXHIBIT 15. RECEIVER SYNCHRONIZATION AND RECEIVER INPUT BANDWIDTH.

The hop table is determined by the master's Bluetooth address and the master's Bluetooth clock. The hop sequence generation is described in the Bluetooth Baseband Specification section 2.6. The slave creates an offset from its own clock to create a clock synchronized to the master. The clock is a 28 bit counter with a period of 312.5 us (one half of a time slot). Using the master's Bluetooth address and its synchronized version of the master clock the slave generates the hop sequence of the piconet.

Master transmissions start on even number slots and slave transmissions start in odd slots. Each packet starts with an access code which provides synchronization information and packet information. During an active conversation the slave is constantly synchronizing its clock with the master clock. When the slave goes into sniff mode (low power mode) it must listen for packets to obtain synchronization information before transmitting. Before a connection is made the slave connects to the master using a special hop sequence in a mode called Paging. This is described in section 2.4.3 of the Bluetooth Baseband Specification.

The receiver input bandwidth is 1 MHz.

Note: The information in this section is provided by the manufacturer.

APPENDIX A - Test Equipment List

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Channel Occupancy Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	9/22/2011	9/22/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fieber

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Channel Plan & Separation Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	9/22/2011	9/22/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fieber

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Spurious Emissions Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	9/22/2011	9/22/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fieber

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Conducted Power Output Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	9/22/2011	9/22/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fieber

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Occupied Bandwidth (20dB) Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	9/22/2011	9/22/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fiden

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 6-Apr-2011 Type Test: Radiated Emissions Job #: C-1146

Prepared By: Shane Rismeyer Customer: Fossil Quote #: 311048

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	10/29/2010	10/29/2011	Active Calibration
2	EE 960014	EMI Receiver-filter section	HP	85460A	3448A00296	10/29/2010	10/29/2011	Active Calibration
3	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/19/2010	10/19/2011	Active Calibration
4	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	10/19/2010	10/19/2011	Active Calibration
5	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	4/27/2011	4/27/2012	Active Calibration
6	EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	1/4/2011	1/4/2012	Active Calibration
7	EE 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro	WLA622-4	123001	10/13/2010	10/13/2011	Active Calibration

Project Engineer: Quality Assurance: Peter Fiden

APPENDIX B - Test Standards: Current Publication Dates Radio

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2009		
ANSI C63.10	2009		
CISPR 11	2009-05	2009-12 P	
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	2010-01		
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	2009		
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	2009-05		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2009-05		
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,	2009		
FCC Public Notice DA 00-1407	2000		
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2009-08		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	2009-02
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
IEC 61000-4-3	2008-04	incl in 2008-	2009-12

STANDARD #	DATE	Am. 1	Am. 2
IEC 61000-4-4	2004-07	2010-10	
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-10		
IEC 61000-4-8	2009-09		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14982	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	2010-02		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation.

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

APPENDIX D - Antenna Specification(s)

2450 MHz Antenna — **P/N 2450AT18B100**

Detail Specification: 08/10/09 — Page 1 of 3

General Specifications

Part Number	2450AT18B100
Frequency Range	2400 - 2500 Mhz
Peak Gain	0.5 dBi typ. (XZ-V)
Average Gain	-0.5 dBi typ. (XZ-V)
Return Loss	9.5 dB min.

Input Power	3W max.
Impedance	50 Ω
Operating Temperature	-40 to +85°C
Reel Quanity	3,000

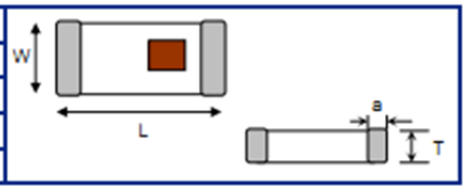
P/N Suffix	**Packaging Style**	Bulk	Suffix = S	Eg. 2450AT18B100S
		T & R	Suffix = E	Eg. 2450AT18B100E
	Termination Style	100% Tin	Suffix = None	Eg. 2450AT18B100(E or S)
		Tin / Lead	Please consult Factory	

Terminal Configuration

No.	Function
1	Feeding Point
2	NC

Mechanical Dimensions

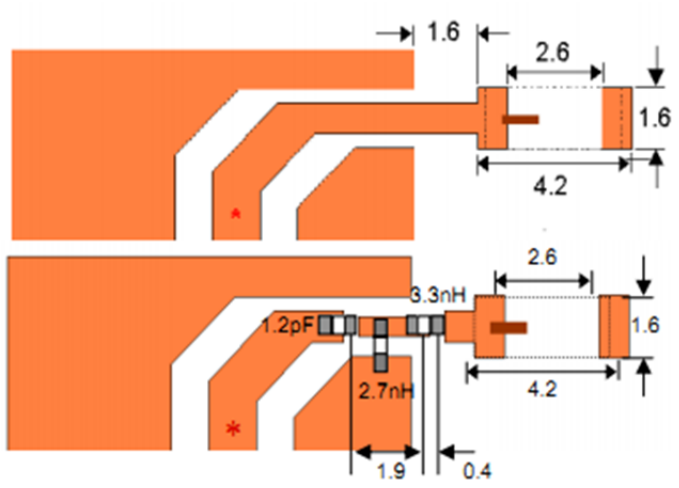
	In	mm
L	0.126 ± 0.008	3.20 ± 0.20
W	0.063 ± 0.008	1.60 ± 0.20
T	0.051 +.004/-.008	1.30 +0.1/-0.2
a	0.020 ± 0.012	0.50 ± 0.30



Mounting Considerations

Mount these devices with brown mark facing up. Units: mm

Line width should be designed to provide 50 Ω impedance matching characteristics.



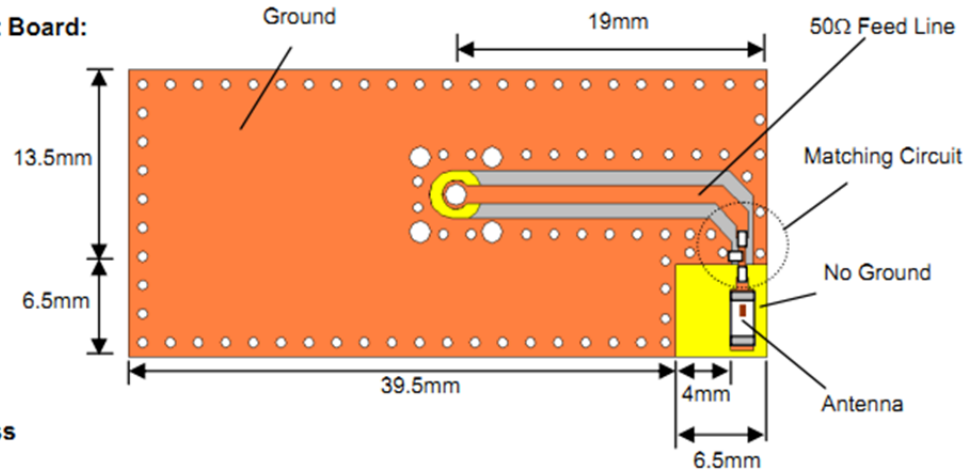
a) Without Matching Circuits

b) With Matching Circuits

JTI P/N for Matching Circuit:
Cap (1.2pF): 500R07S1R2BV4T
Inductor (2.7nH): L-07C2N7SV6T
Inductor (3.3nH): L-07C3N3SV6T

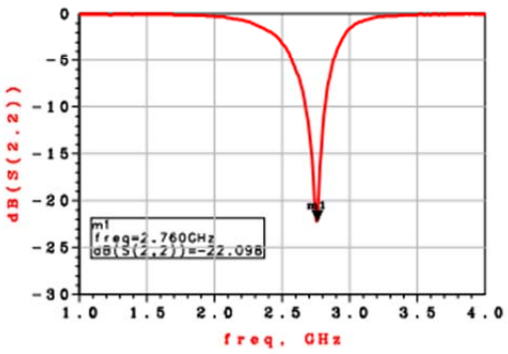
Typical Electrical Characteristics (T=25°C)

Test Board:

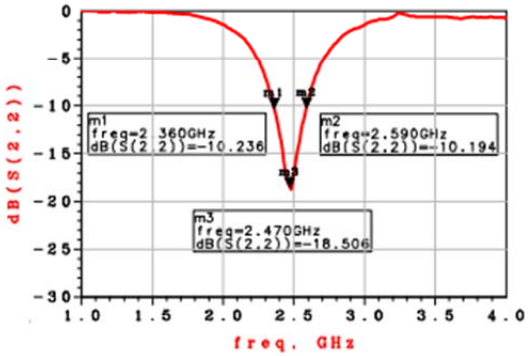


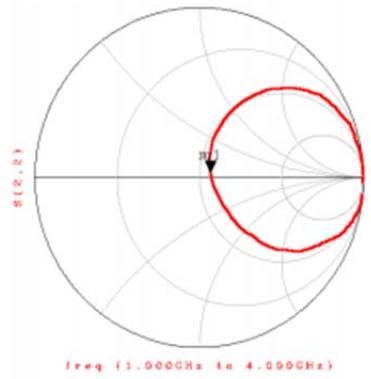
Return Loss

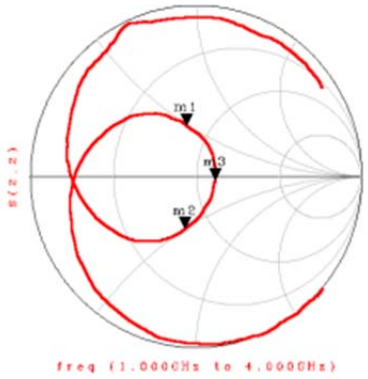
a) Without Matching Circuit



b) With Matching Circuit

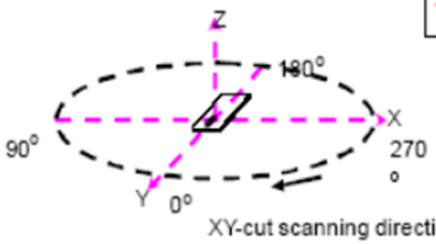




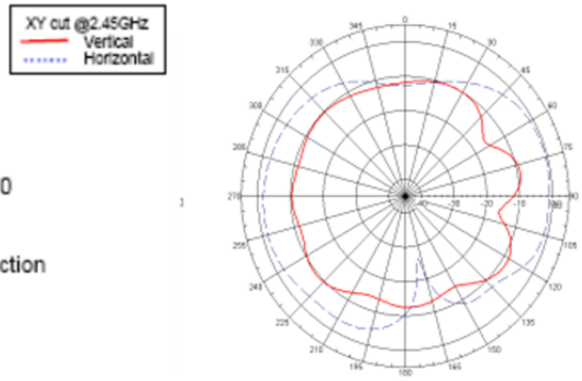


Typical Radiation Patterns

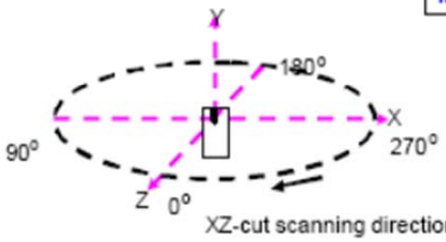
XY-V/XY-H



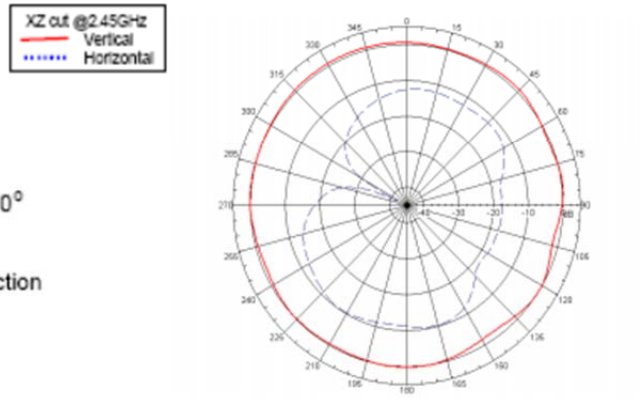
XY-cut scanning direction



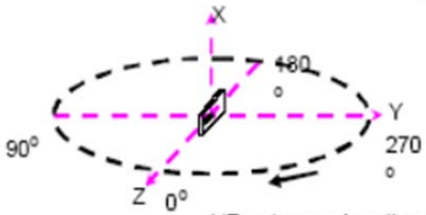
XZ-V/XZ-H



XZ-cut scanning direction



YZ-V/YZ-H



YZ-cut scanning direction