

### FCC CFR47 PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 7

**CERTIFICATION TEST REPORT** 

FOR

**BLUETOOTH STEREO HEADSET RECEIVER** 

MODEL NUMBER: PSP-N270U

FCC ID: CWTSAZY12 IC ID: 1788F-SAZY12

REPORT NUMBER: 09J12898-1, Revision A

**ISSUE DATE: NOVEMBER 16, 2009** 

Prepared for ALPS ELECTRIC CO., LTD. 1-7, YUKIGAYA-OTSUKA-CHO, OTA-KU, TOKYO, 145-8501, JAPAN

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NVLAP LAB CODE 200065-0

#### Revision History

Rev.	lssue Date	Revisions	Revised By
	11/05/09	Initial Issue	T. Chan
A	11/16/09	Updated Number Of Hopping Channels and Average Time Of Occupancy Plots	M. Mekuri

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## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME:	ALPS ELECTRIC CO., LTD.
	1-7, YUKIGAYA-OTSUKA-CHO,
	OTA-KU, TOKYO,
	145-8501, JAPAN

**EUT DESCRIPTION:** BLUETOOTH STEREO HEADSET RECEIVER

MODEL: PSP-N270U

**SERIAL NUMBER:** #1 (RADIATED UNIT), #2 (CONDUCTED UNIT)

DATE TESTED: NOVEMBER 2 -16, 2009

APPLICABLE STANDARDS					
STANDARD TEST RESULTS					
CFR 47 Part 15 Subpart C	Pass				
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass				
INDUSTRY CANADA RSS-GEN Issue 2	Pass				

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

THU CHAN EMC MANAGER COMPLIANCE CERTIFICATION SERVICES

Tested By:

own Char

DEVIN CHANG EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://www.ccsemc.com</u>.

# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Stereo Headset Receiver operated at 2402-2480MHz

The radio module is manufactured by ALPS Corporation.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	-0.58	0.87
2402 - 2480	Enhanced 8PSK	1.10	1.29

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Pattern antenna, with a maximum gain of 1.87dBi.

## 5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was RF Test Tool for Bluesuite, rev. 2.0.

## 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

The EUT is a portable device that has three orientations; therefore X, Y and Z orientations have been investigated. The worst case was found to be X orientation.

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## 5.6. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST						
Description	Manufacturer	Model	Serial Number			
Laptop	TOSHIBA	PSJ50N-0V4006	6017601H			
AC Adapter	TOSHIBA	PA3282U-2ACA	71C0002C10			

#### I/O CABLES

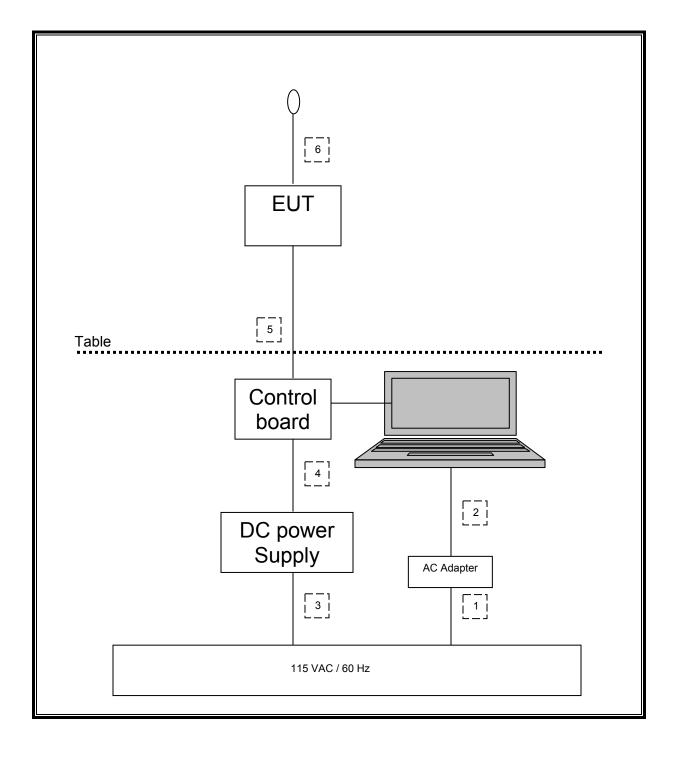
	I/O CABLE LIST								
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks			
1	AC	1	US 115V	Un-Shielded	2 m	N/A			
2	DC	1	DC	Un-Shielded	1.8m	N/A			
3	AC	1	US 115V	Un-Shielded	1.8m	N/A			
4	DC	1	DC	Un-Shielded	0.1m	N/A			
5	USB	1	USB	Un-Shielded	1m	N/A			
6	earphone	1	Jack	Un-Shielded	1m	N/A			

#### TEST SETUP

The EUT is a stand alone device. A laptop PC is connected via USB to exercise the device.

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#### **SETUP DIAGRAM FOR TESTS**



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# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST						
Description	Manufacturer	Model	Asset	Cal Due		
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/24/10		
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/16/09		
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	02/04/10		
Antenna, Horn, 18 GHz	EMCO	3115	C00945	01/29/10		
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	01/14/10		
Peak Power Meter	Boonton	4541	N/A	01/15/10		
Peak / Average Power Sensor	Boonton	57318	N/A	02/02/10		
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR		
Power Supply 20V@ 3 Amp	Agilent / HP	6284A	CNR	CNR		

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# 7. ANTENNA PORT TEST RESULTS

## 7.1. BASIC DATA RATE GFSK MODULATION

### 7.1.1. 20 dB AND 99% BANDWIDTH

#### <u>LIMIT</u>

None; for reporting purposes only.

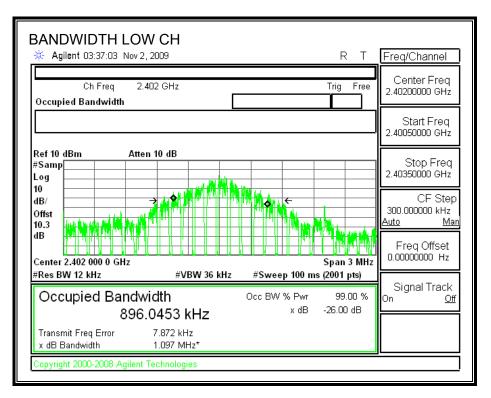
#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq$  1% of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

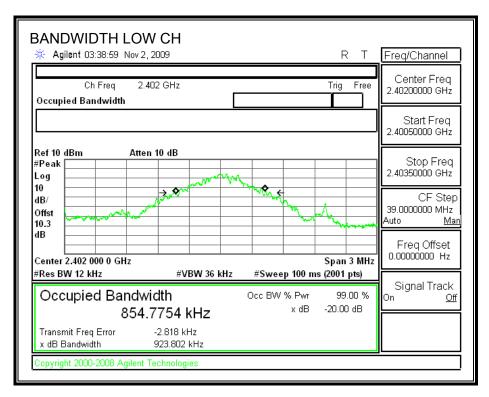
#### <u>RESULTS</u>

Channel Frequency		20 dB Bandwidth	99% Bandwidth	
(MHz)		(kHz)	(kHz)	
Low	2402	923.802	896.0453	
Middle	2441	922.888	877.8477	
High	2480	923.120	874.1921	

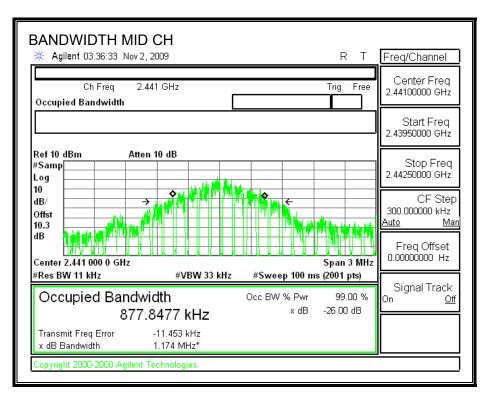
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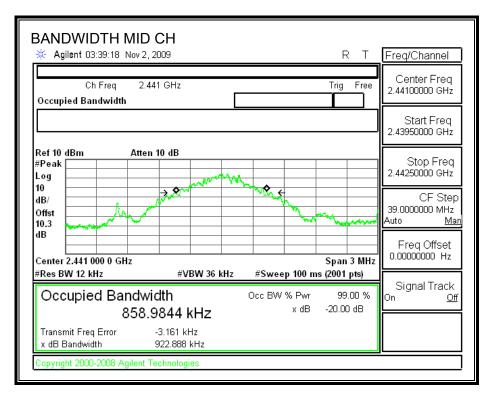
#### 20dB BANDWIDTH



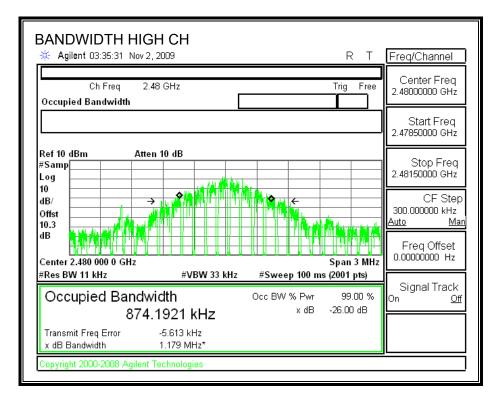
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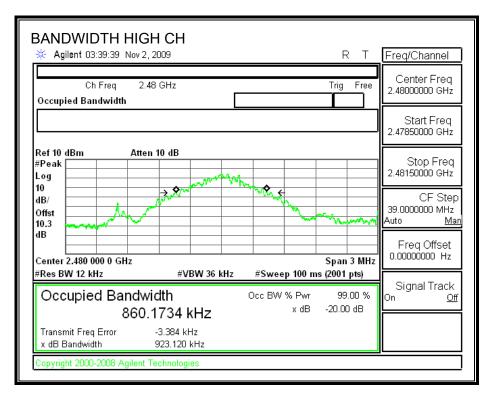
#### 20dB BANDWIDTH



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#### 20dB BANDWIDTH



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### 7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

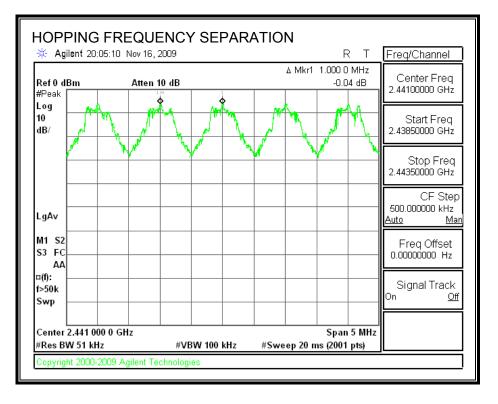
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

#### **RESULTS**

#### **HOPPING FREQUENCY SEPARATION**



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### 7.1.3. NUMBER OF HOPPING CHANNELS

#### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 nonoverlapping channels.

#### TEST PROCEDURE

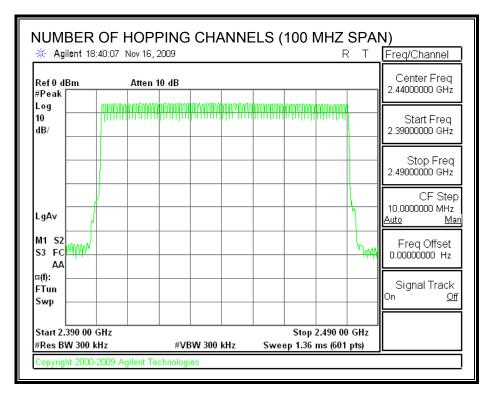
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

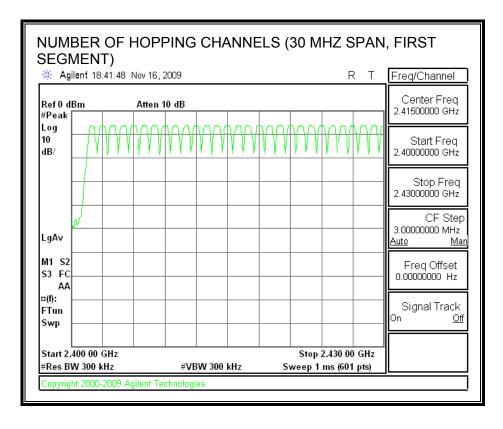
#### **RESULTS**

79 Channels observed.

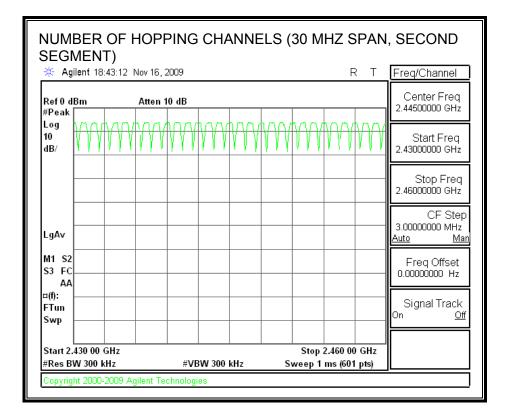
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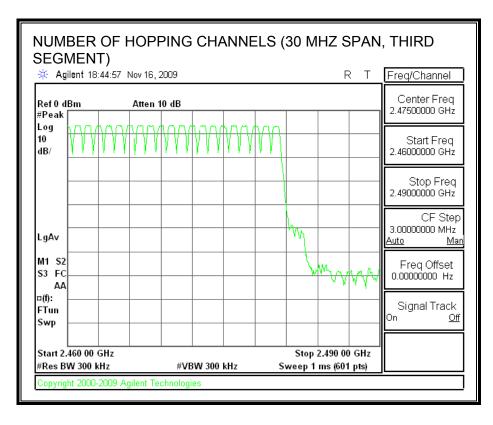
#### NUMBER OF HOPPING CHANNELS





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### 7.1.4. AVERAGE TIME OF OCCUPANCY

#### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 10 \* (# of pulses in 3.16 s) \* pulse width.

#### **RESULTS**

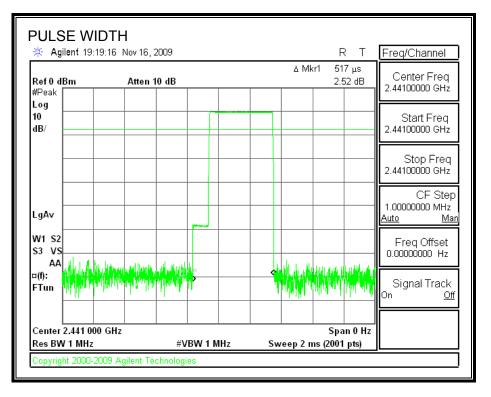
Time Of Occupancy = Pulse Width \* 10 \* Number of Pulses in 3.16 seconds

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.517	32	0.165	0.4	0.235
DH3	1.796	16	0.287	0.4	0.113
DH5	3.04	10	0.304	0.4	0.096

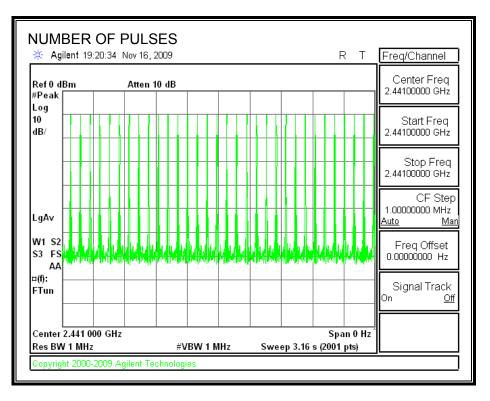
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#### <u>DH1</u>

#### **PULSE WIDTH**



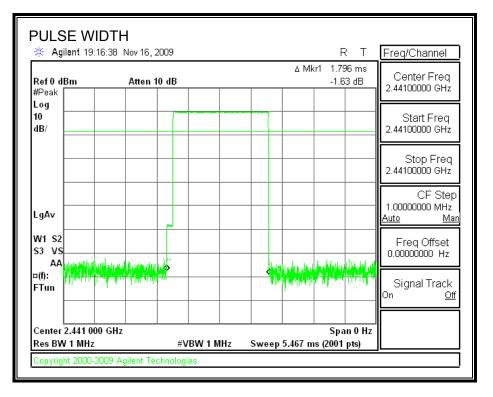
#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



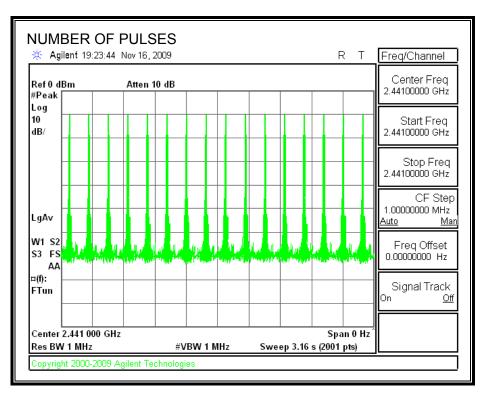
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#### <u>DH3</u>

#### PULSE WIDTH



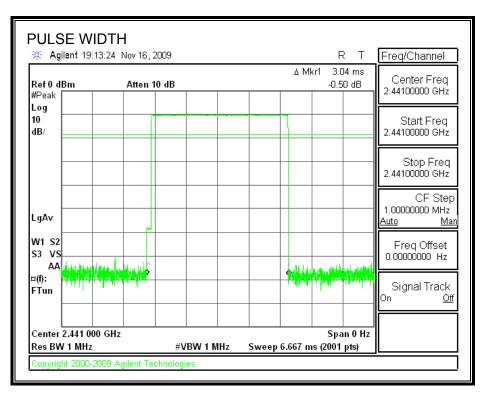
#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



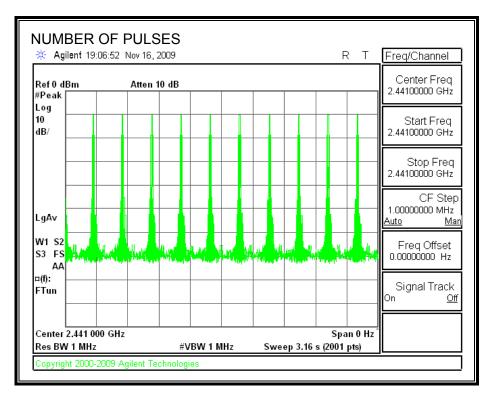
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#### <u>DH5</u>

#### PULSE WIDTH



#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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### 7.1.5. OUTPUT POWER

#### <u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

#### TEST PROCEDURE

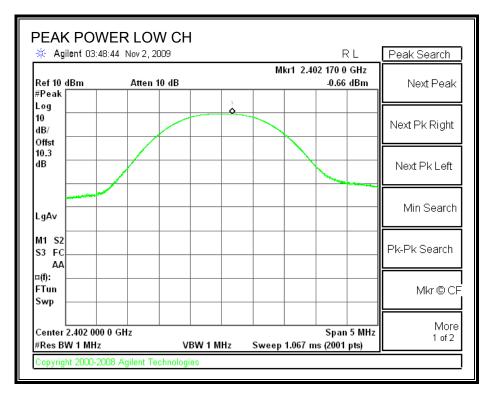
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

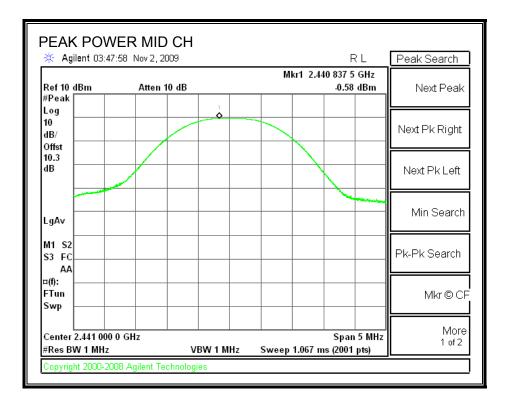
#### **RESULTS**

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	-0.66	30	-30.66
Middle	2441	-0.58	30	-30.58
High	2480	-0.75	30	-30.75

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#### **OUTPUT POWER**





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🔆 Agilent 03:47	:37 Nov 2, 2009				RL	$\neg \equiv$	eak Search
Ref 10 dBm #Peak	Atten 10 dB		M	kr1 2.47	9 810 0 GH; -0.75 dBn		Next Peak
Log 10							
dB/ Offst							ext Pk Right
10.3 dB						-∥ ,	Next Pk Left
LgAv							Min Search
M1 S2 S3 FC						Pi	-Pk Search
¤(f): FTun Swp							Mkr © CF
Center 2.480 000 #Res BW 1 MHz		/BW 1 MHz	Sweep	1.067 m	Span 5 M s (2001 pts)	Hz	More 1 of 2

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### 7.1.6. AVERAGE POWER

#### <u>LIMIT</u>

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 10.32 dB (including 10 dB pad and 0.32dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power	
	(MHz)	(dBm)	
Low	2402	-0.66	
Middle	2441	-0.58	
High	2480	-0.77	

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### 7.1.7. CONDUCTED SPURIOUS EMISSIONS

#### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

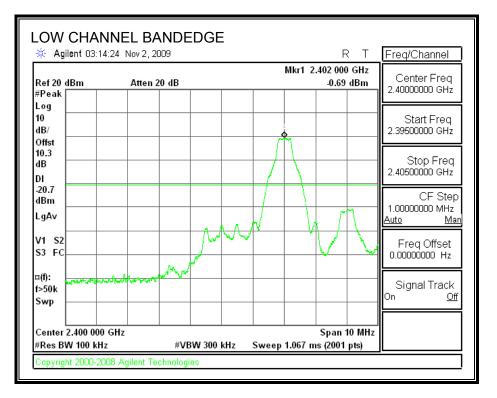
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

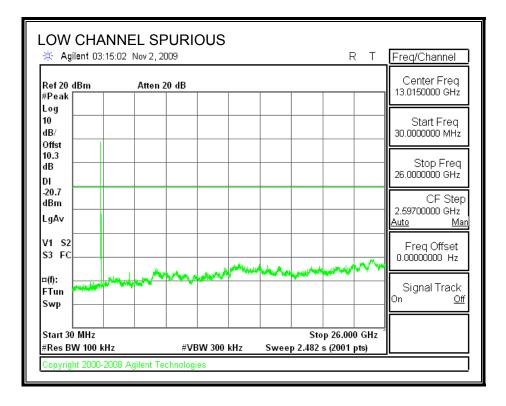
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

#### **RESULTS**

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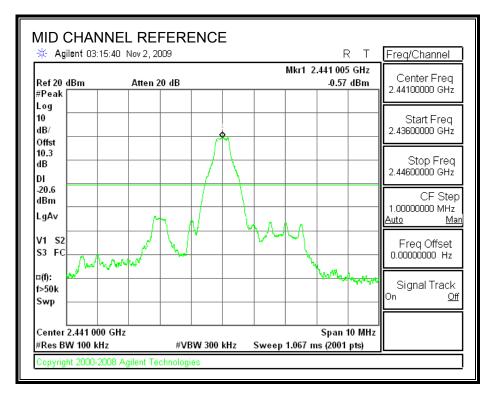
#### SPURIOUS EMISSIONS, LOW CHANNEL

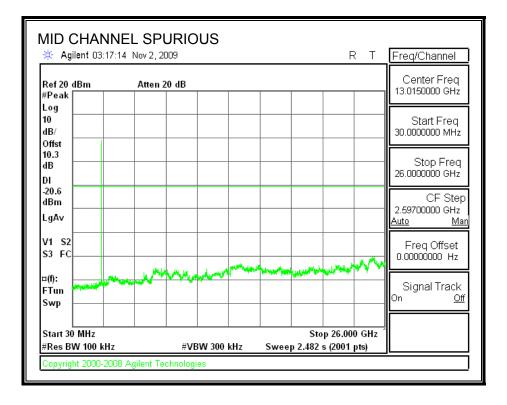




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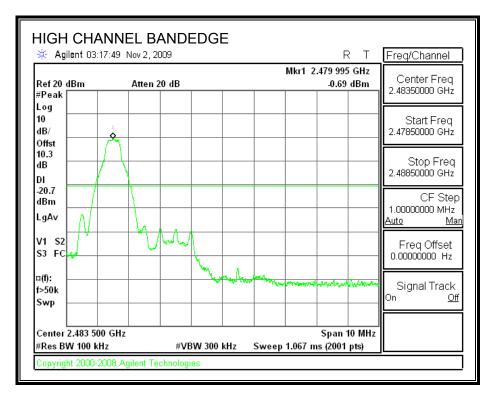
#### SPURIOUS EMISSIONS, MID CHANNEL

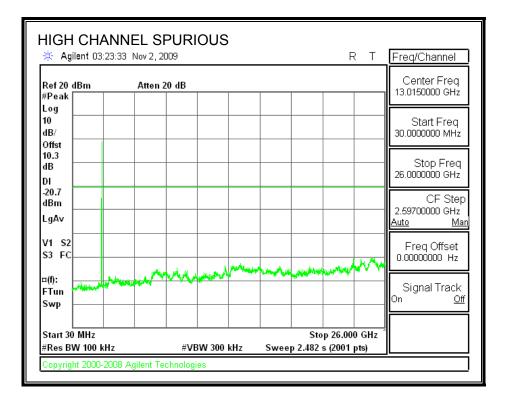




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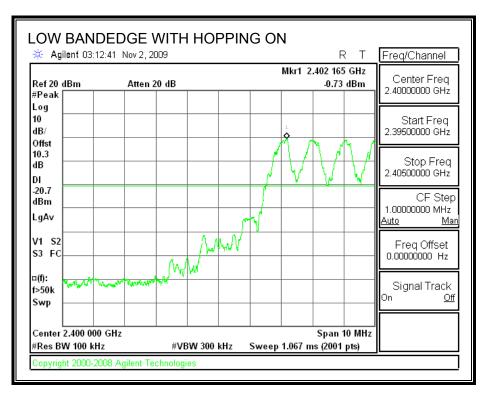
#### SPURIOUS EMISSIONS, HIGH CHANNEL

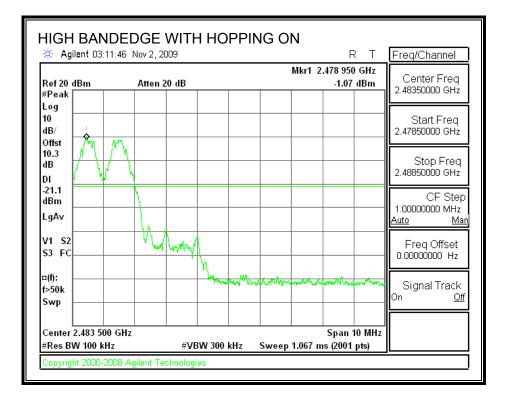




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#### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





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## 7.2. ENHANCED DATA RATE 8PSK MODULATION

### 7.2.1. 20 dB AND 99% BANDWIDTH

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

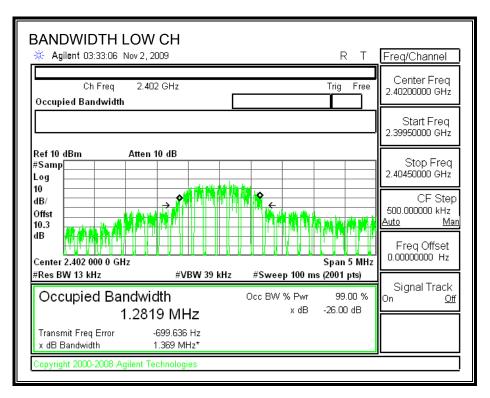
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq$  1% of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### **RESULTS**

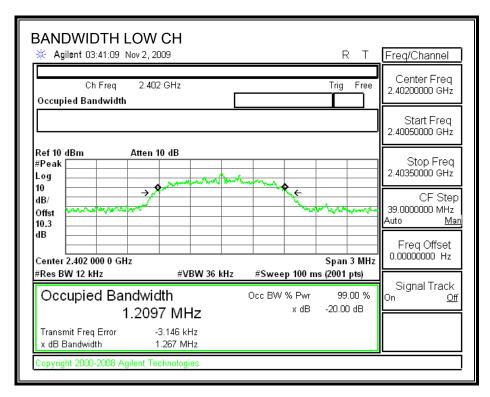
Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	2402	1.267	1.2819
Middle	2441	1.268	1.2696
High	2480	1.264	1.2633

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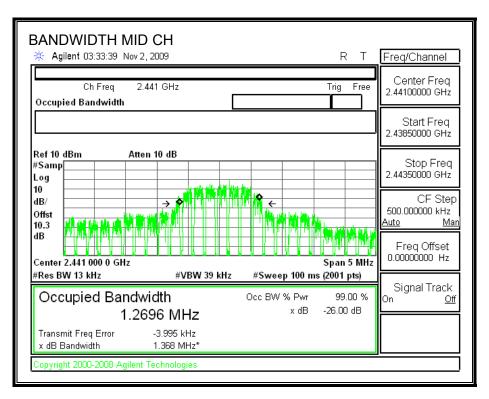
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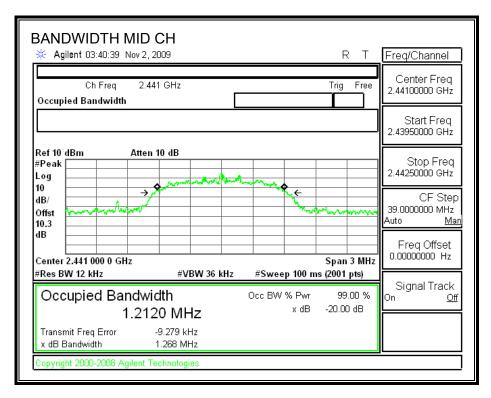
#### 20dB BANDWIDTH



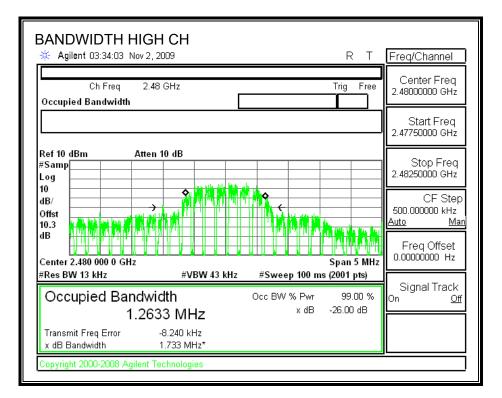
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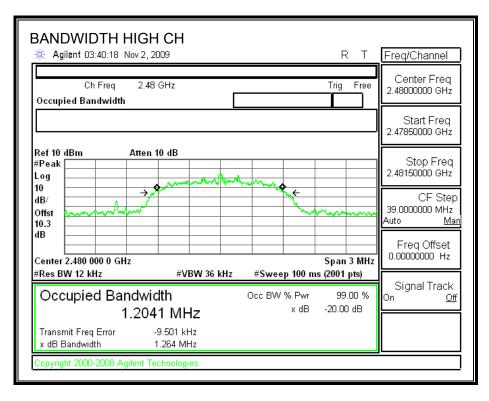
#### 20dB BANDWIDTH



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#### 20dB BANDWIDTH



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### 7.2.2. HOPPING FREQUENCY SEPARATION

#### <u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

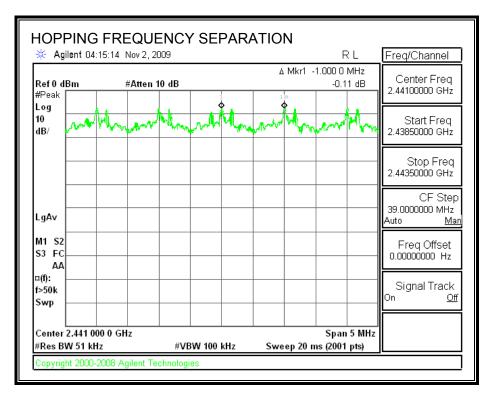
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

#### **RESULTS**

#### HOPPING FREQUENCY SEPARATION



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## 7.2.3. NUMBER OF HOPPING CHANNELS

### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 nonoverlapping channels.

### TEST PROCEDURE

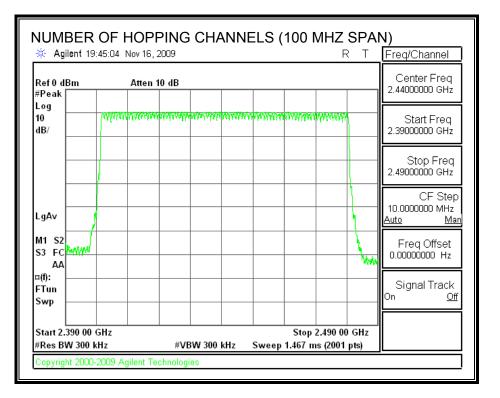
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

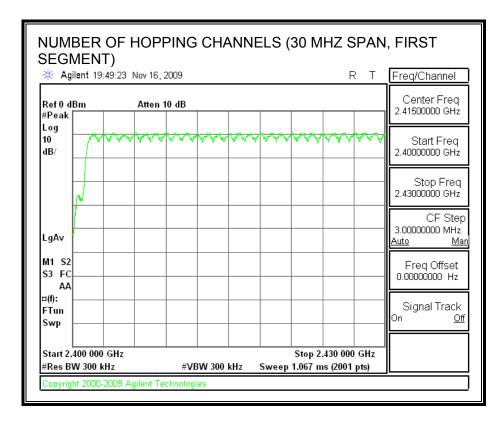
### **RESULTS**

79 Channels observed.

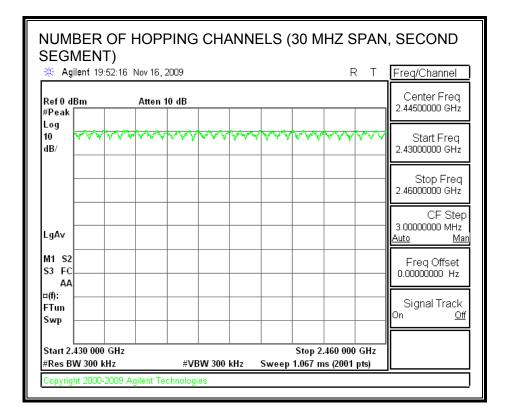
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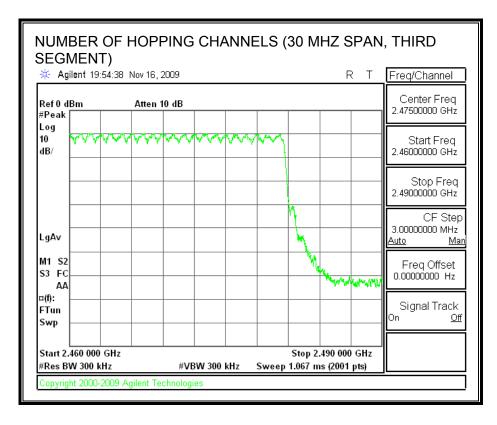
### NUMBER OF HOPPING CHANNELS





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## 7.2.4. AVERAGE TIME OF OCCUPANCY

### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 10 \* (# of pulses in 3.16 s) \* pulse width.

### **RESULTS**

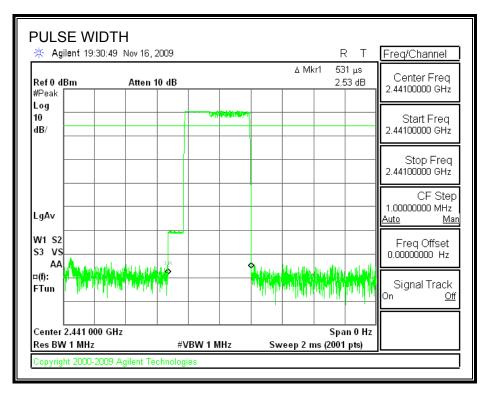
Time Of Occupancy = Pulse Width \* 10 \* Number of Pulses in 3.16 seconds

8PSK Mode

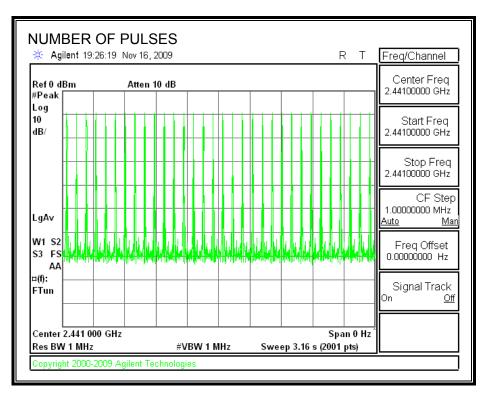
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupan cy (sec)	Limit (sec)	Margin (sec)
DH1	0.53	32	0.170	0.4	0.230
DH3	1.791	16	0.287	0.4	0.113
DH5	3.04	11	0.334	0.4	0.066

### <u>DH1</u>

### PULSE WIDTH



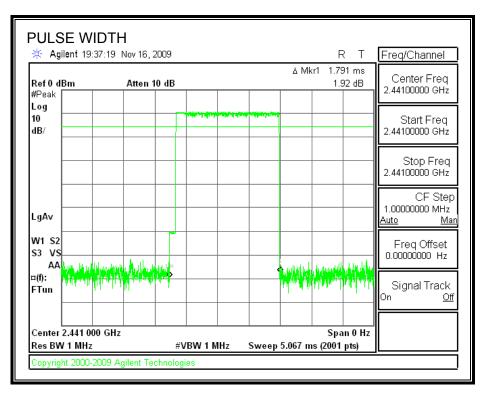
## NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



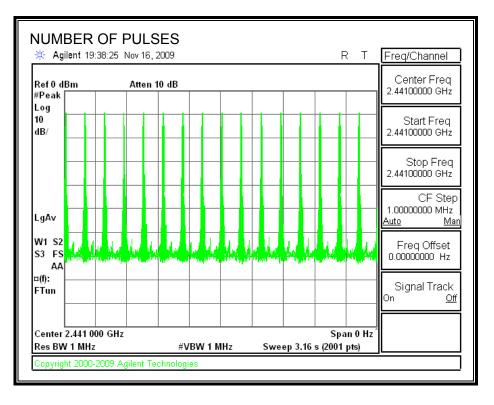
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### <u>DH3</u>

### PULSE WIDTH



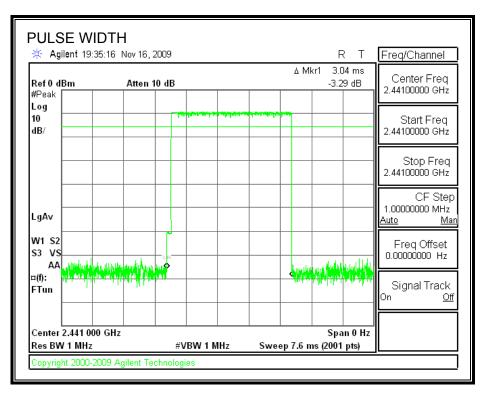
### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



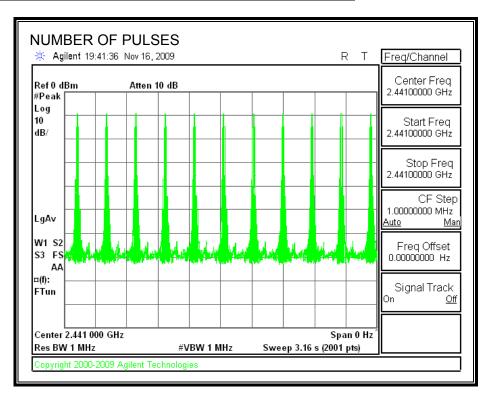
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### <u>DH5</u>

### PULSE WIDTH



### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



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## 7.2.5. OUTPUT POWER

## <u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### TEST PROCEDURE

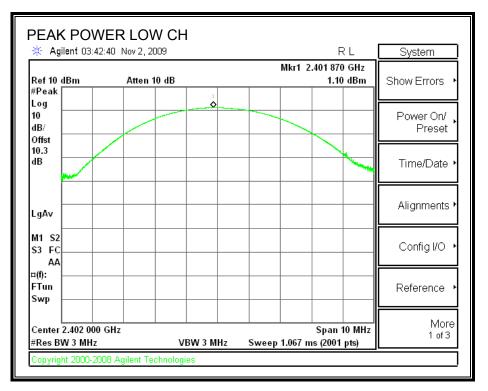
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

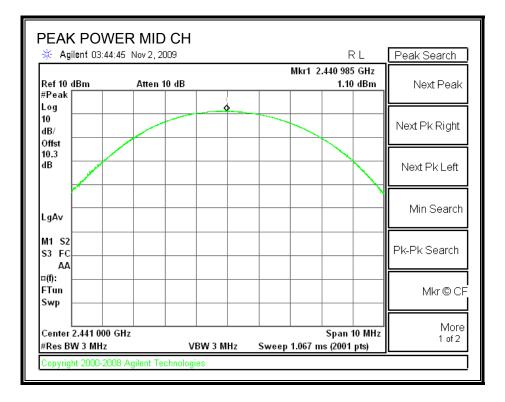
### **RESULTS**

Channel	Frequency	SA Output	Limit	Margin
	(MHz)	Power	(dBm)	(dB)
Low	2402	1.10	21	-18.44
Middle	2441	1.10	21	-18.59
High	2480	0.73	21	-19.23

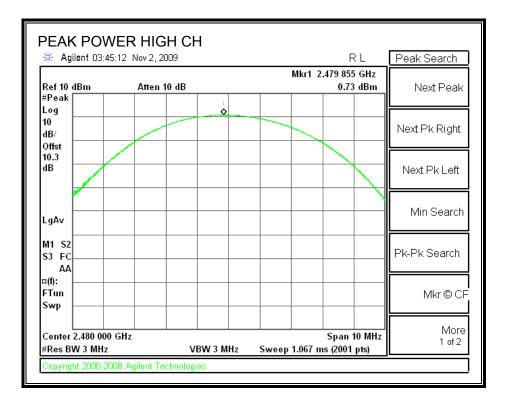
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## OUTPUT POWER





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COMPLIANCE CERTIFICATION SERVICES FORM NO: CCSUP4701C 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of CCS.

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## 7.2.6. AVERAGE POWER

### <u>LIMIT</u>

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

### RESULTS

The cable assembly insertion loss of 10.32 dB (including 10 dB pad and 0.32dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	1.08
Middle	2441	1.08
High	2480	0.71

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## 7.2.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

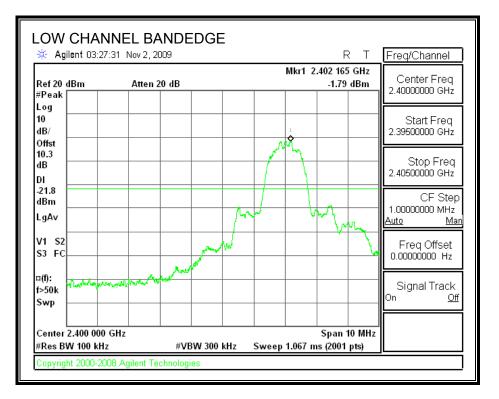
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

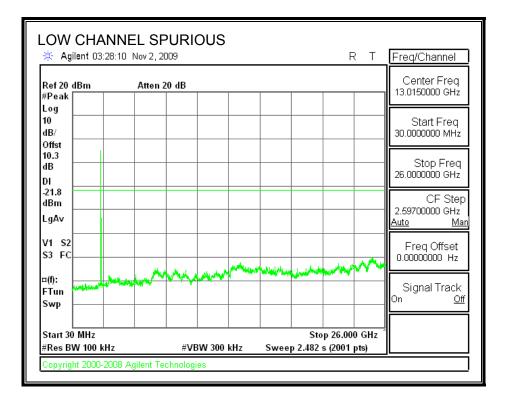
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

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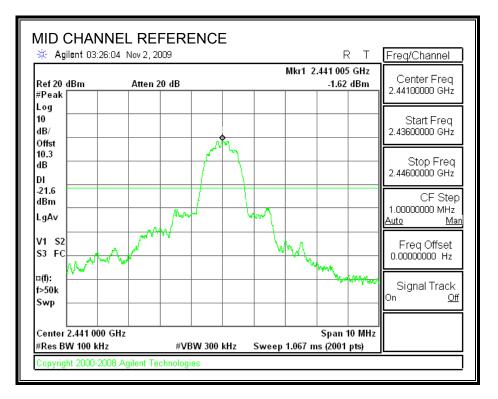
### SPURIOUS EMISSIONS, LOW CHANNEL

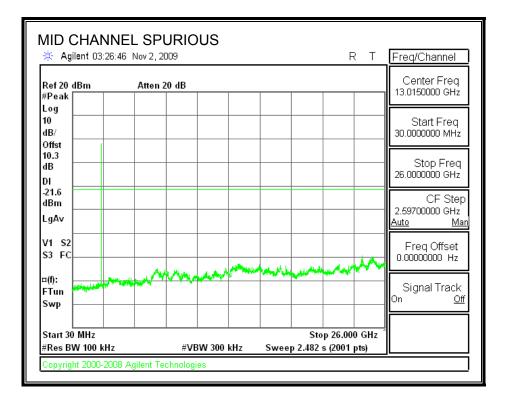




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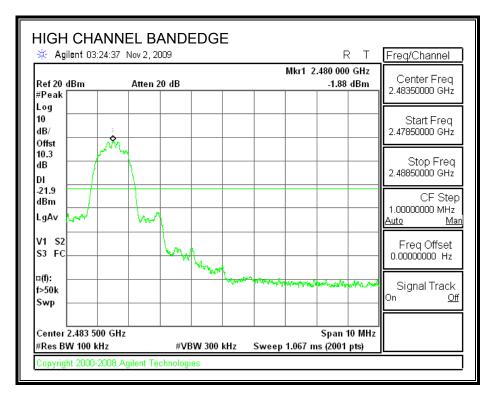
#### SPURIOUS EMISSIONS, MID CHANNEL

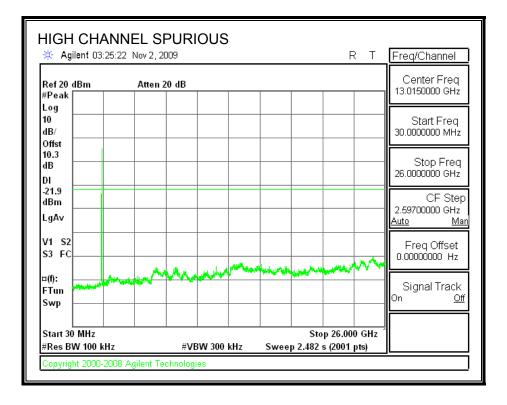




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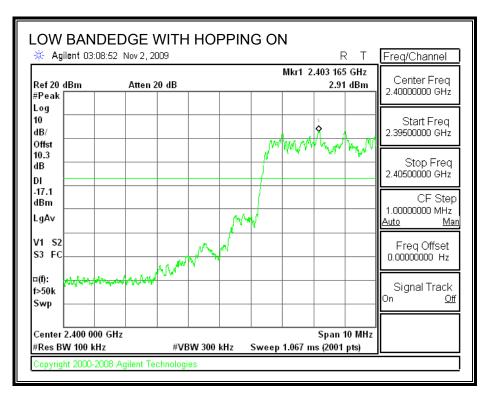
#### SPURIOUS EMISSIONS, HIGH CHANNEL

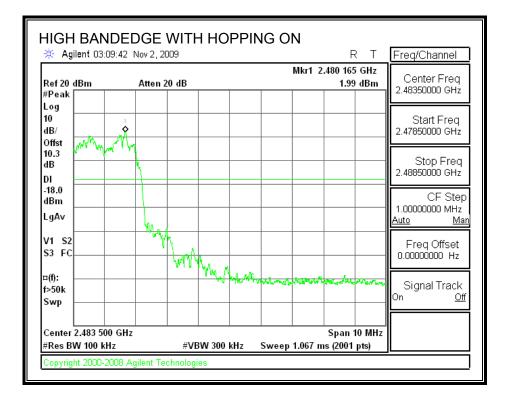




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### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





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# 8. RADIATED TEST RESULTS

## 8.1. LIMITS AND PROCEDURE

## <u>LIMITS</u>

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

## TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

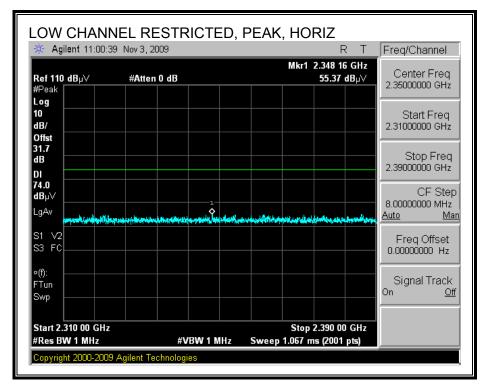
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

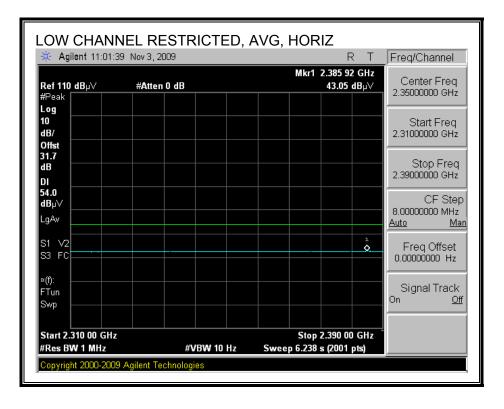
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 8.2. TRANSMITTER ABOVE 1 GHz

## 8.2.1. BASIC DATA RATE GFSK MODULATION

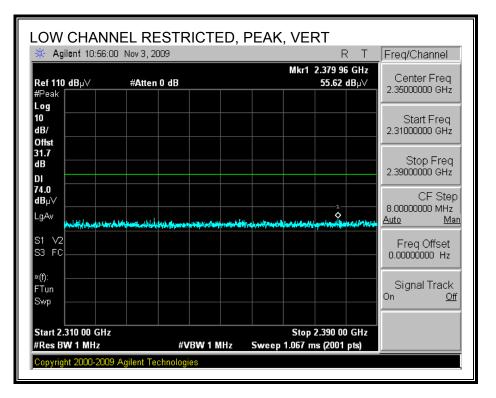
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

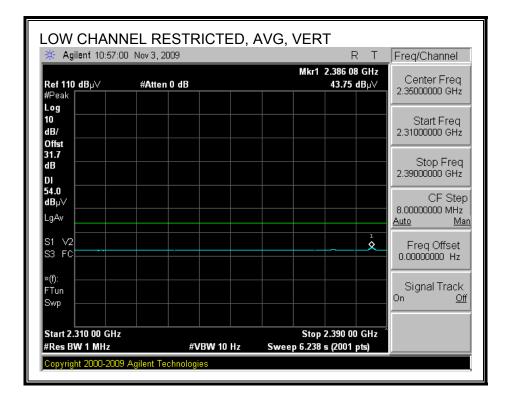




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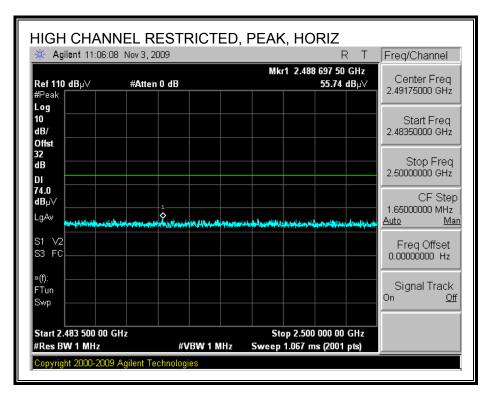
### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

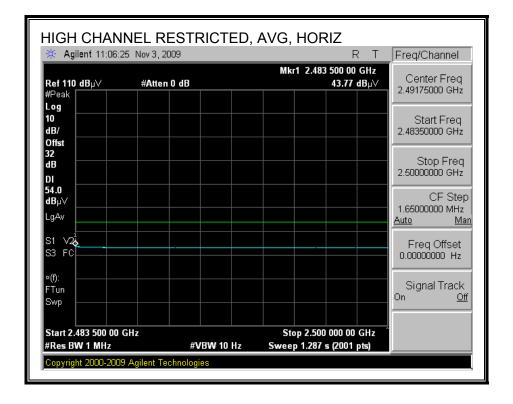




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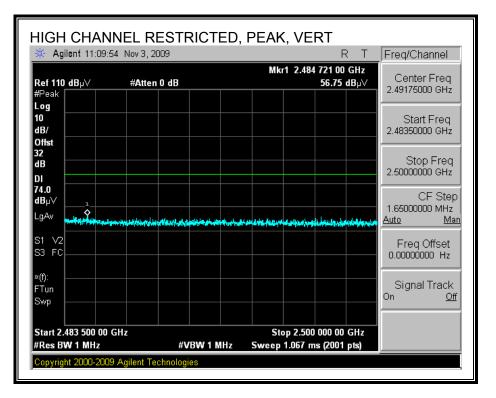
### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

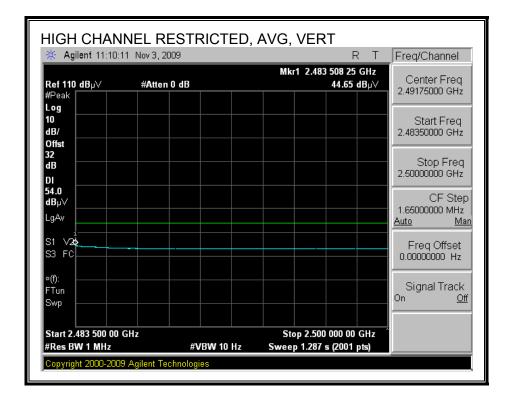




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### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





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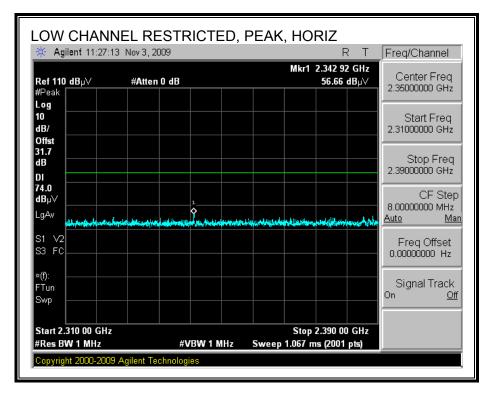
### HARMONICS AND SPURIOUS EMISSIONS

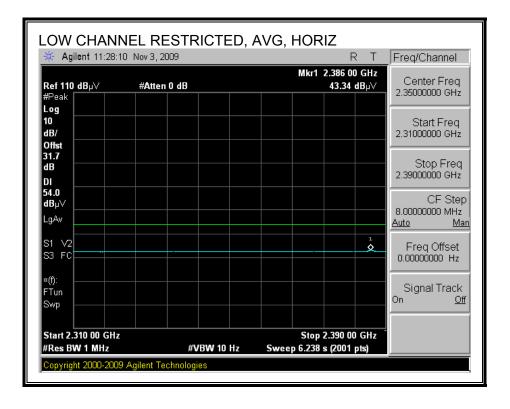
Compliand	ce Cer	tification	Service	s, Fre	mont 5r	n Chamb	er						
Test Engr:		Devin C	hang										
Date:		11/03/09											
Project #:		09U1289	8										
Company:		ALPS											
EUT Descri	iption:	EUT only	v										
Mode Ope	-	Tx GFS											
-	f	Measurer		wency	Amp	Preamp	Gain			Average	Field Stren	eth Limit	
	- Dist	Distance		• •	-	Distance		et to 3 me	ters	-	ld Strength	-	
	Read	Analyzer			Avg			trength @			vs. Average		
	AF	Antenna	-		Peak	-		rengtn (g Field Stre		_	vs. Peak Lis		
	CL	Cable Lo			HPF	High Pas			<u></u>	-margini \	O. I Can Lil		
	CL.	Cable LO			1111	rugu ras	s rine	•					
f	Dist	Read	AF	CL	Amp	D Corr	Flte	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV			dB	dB	dB		dBuV/m	-	V/H	P/A/OP	10000
2402MHz													
4.804	3.0	46.1	32.8	5.8	-34.8	0.0	0.0	49.8	74.0	-24.2	V	Р	
4.804	3.0	36.4	32.8	5.8	-34.8	0.0	0.0	40.1	54.0	-13.9	V	A	
4.804	3.0	47.3	32.8	5.8	-34.8	0.0	0.0	51.0	74.0	-23.0	H	P	
4.804	3.0	37.2	32.8	5.8	-34.8	0.0	0.0	40.9	54.0	-13.1	H	A	
2441MHz											•		
4.882	3.0	49.1	32.8	5.8	-34.9	0.0	0.0	52.9	74.0	-21.1	V	P	
4.882	3.0	38.9	32.8	5.8	-34.9	0.0	0.0	42.7	54.0	-11.3	V	A	
7.323	3.0	37.2	35.2	7.3	-34.7	0.0	0.0	45.0	74.0	-29.0	V	P	
7.323	3.0	24.6	35.2	7.3	-34.7	0.0	0.0	32.4	54.0	- <b>21.6</b>	V	A	
4.882	3.0	44.9	32.8	5.8	-34.9	0.0	0.0	48.7	74.0	-25.3	H	P	
4.882	3.0	34.6	32.8	5.8	-34.9	0.0	0.0	38.4	54.0	-15.6	H	A	
7.323	3.0	37.6	35.2	7.3	-34.7	0.0	0.0	45.5	74.0	-28.5	H	P	
7.323	3.0	24.6	35.2	7.3	-34.7	0.0	0.0	32.4	54.0	-21.6	H	A	
2480MHz		ļ		ļ	ļ								
4.960	3.0	43.4	32.9	5.9	-34.9	0.0	0.0	47.3	74.0	-26.7	V	P	
4.960	3.0	32.8	32.9	5.9	-34.9	0.0	0.0	36.7	54.0	-17.3	V	A	
7.440	3.0	37.1	35.4	7.3	-34.6	0.0	0.0	45.2	74.0	-28.8	V V	Р	
7.440	3.0	24.7	35.4	7.3	-34.6	0.0	0.0	32.8	54.0	-21.2	\$	A	
4.960	3.0	41.1	32.9	5.9	-34.9	0.0	0.0	45.1	74.0	-28.9	H	P	
4.960	3.0	30.4	32.9	5.9	-34.9	0.0	0.0	34.4	54.0	-19.6	H	A	
	3.0	37.3 24.7	35.4 35.4	7.3 7.3	-34.6	0.0	0.0	45.3	74.0	-28.7	H	P	
7.440 7.440	3.0				-34.6	0.0	0.0	32.8	54.0	-21.2	H	A	

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## 8.2.2. ENHANCED DATA RATE 8PSK MODULATION

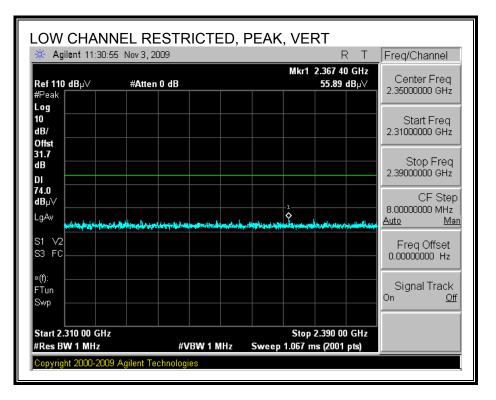
### **RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

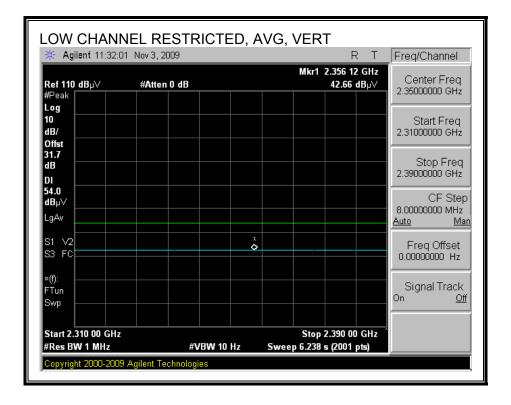




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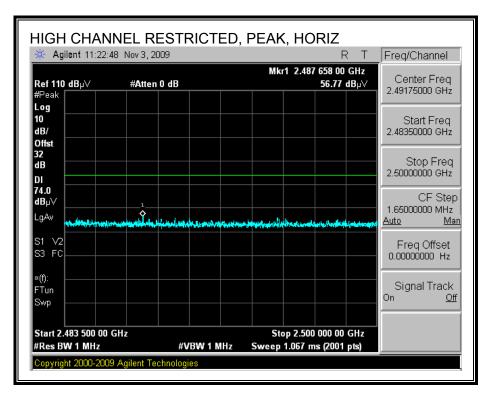
### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

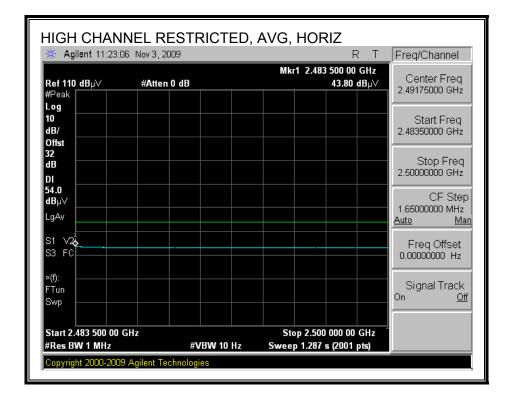




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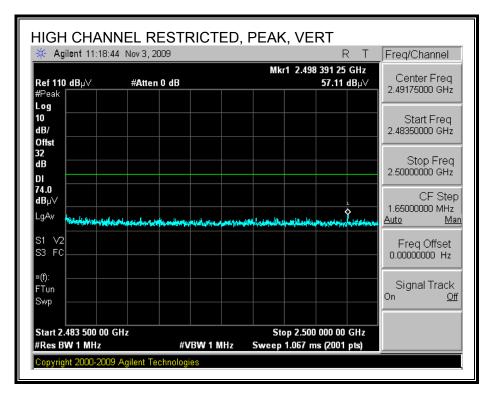
### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

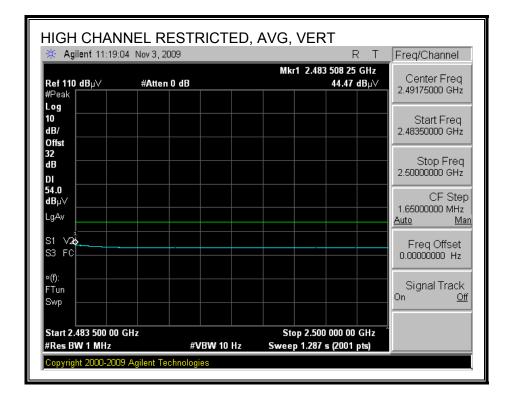




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### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





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### HARMONICS AND SPURIOUS EMISSIONS

High Freq Complian				s, Frei	mont 5n	n Chamb	er						
Test Engr:		Devin C	hang										
Date:		11/03/09	_										
Project #:		09U1289	8										
Company:		ALPS											
EUT Descr		EUT only	v										
Mode Ope	r	Tx 8PSE	c										
-	f	Measuren	nent Fred	wency	Amp	Preamp (	Gain			Average	Field Stren	gth Limit	
Dist Distance to Antenna Read Analyzer Reading		• •	-	Distance		ct to 3 me	eters	_	ld Strength	-			
			Avg	Average	Field S	trength @	0.3 m		s. Average				
	AF	Antenna	-		Peak	-		Field Stre	-	_	s. Peak Li		
	CL	Cable Los	55		HPF	High Pas			-	2			
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.		Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
2402MHz													
4.804	3.0	50.6	32.8	5.8	-34.8	0.0	0.0	54.2	74.0	- <b>19.8</b>	V	P	
4.804	3.0	40.0	32.8	5.8	-34.8	0.0	0.0	43.7	54.0	-10.3	V	A	
4.804	3.0	46.4	32.8	5.8	-34.8	0.0	0.0	50.1	74.0	-23.9	H	P	
4.804	3.0	36.3	32.8	5.8	-34.8	0.0	0.0	40.0	54.0	-14.0	H	A	
2441MHz				<u>.</u>									
4.882	3.0	48.4	32.8	5.8	-34.9	0.0	0.0	52.2	74.0	-21.8	v v	P	
4.882	3.0	37.8	32.8	5.8	-34.9	0.0	0.0	41.6	54.0	-12.4		A	
7.323 7.323	3.0 3.0	37.6 24.6	35.2 35.2	7.3 7.3	-34.7 -34.7	0.0	0.0	45.4 32.4	74.0 54.0	-28.6 -21.6	V V	P A	
4.882	3.0	44.0	32.8	7.5 5.8	-34.7	0.0	0.0	48.0	54.0 74.0	-21.0	и Н	P	
4.882	3.0	33.9	32.8	5.8	-34.9	0.0	0.0	37.7	54.0	-16.3	H	A	
7.323	3.0	37.8	35.2	7.3	-34.7	0.0	0.0	45.7	74.0	-28.3	H	P	
7.323	3.0	24.6	35.2	7.3	-34.7	0.0	0.0	32.4	54.0	-21.6	H	Ā	
2480MHz						1				1		1	
4.960	3.0	44.1	32.9	5.9	-34.9	0.0	0.0	48.0	74.0	- <b>26.0</b>	V	P	
4.960	3.0	33.3	32.9	5.9	-34.9	0.0	0.0	37.2	54.0	- <b>16.8</b>	V	Α	
7.440	3.0	37.5	35.4	7.3	-34.6	0.0	0.0	45.6	74.0	- <b>28.4</b>	V	P	
7.440	3.0	24.7	35.4	7.3	-34.6	0.0	0.0	32.8	54.0	-21.2	V	Α	
4.960	3.0	40.3	32.9	5.9	-34.9	0.0	0.0	44.2	74.0	- <b>29.8</b>	H	P	
4.960	3.0	29.2	32.9	5.9	-34.9	0.0	0.0	33.1	54.0	-20.9	H	A	
7.440	3.0	38.3	35.4	7.3	-34.6	0.0	0.0	46.3	74.0	-27.7	H	P	
	3.0	24.7	35.4	7.3	-34.6	0.0	0.0	32.8	54.0	-21.2	H	A	
7.440													

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# 8.3. RECEIVER ABOVE 1 GHz

Test Engr:		Devin C	<b>.</b>										
Date:		11/03/09	-										
		09U1289											
Project #:			8										
Company		ALPS											
EUT Descr													
Mode Ope		Rx mode				-							
	f	Measuren				Preamp (				_	Field Stren	-	
	Dist	Distance				Distance					ld Strength		
	Read	Analyzer	-		Avg	_		trength @		_	s. Average		
	AF	Antenna			Peak			Field Stre	ength	Margin v	rs. Peak Lis	mit	
	CL	Cable Los	35		HPF	High Pas	s Filter						
f	Dist	Read	AF	CL	A	D Corr	Fltr	Corr.	Limit	Marrie	Ant D-1	Det.	Notes
f GHz	Dist (m)	Kead dBuV	AF dB/m		Amp dB	D Corr dB	fltr dB		Limit dBuV/m		Ant. Pol. V/H	Det. P/A/QP	Notes
2402MHz	~ ~												
1.602	3.0	49.7	26.2	3.1	-35.7	0.0	0.0	43.2	74.0	-30.8	V	P	
1.602	3.0	46.2	26.2	3.1	-35.7	0.0	0.0	39.7	54.0	-14.3	v	A	
2.403	3.0	47.1	28.2	3.8	-35.1	0.0	0.0	44.1	74.0	-29.9	v	P	
2.403	3.0	43.0	28.2	3.8	-35.1	0.0	0.0	39.9	54.0	-14.1	v	Ā	
1.602	3.0	52.4	26.2	3.1	-35.7	0.0	0.0	45.9	74.0	-28.1	H	P	
1.602	3.0	50.2	26.2	3.1	-35.7	0.0	0.0	43.7	54.0	-10.3	H	A	
2.403	3.0	44.6	28.2	3.8	-35.1	0.0	0.0	41.6	74.0	-32.4	H	P	
2.403	3.0	38.3	28.2	3.8	-35.1	0.0	0.0	35.3	54.0	- <b>18.7</b>	H	A	
2441MHz	\$												
1.628	3.0	50.9	26.3	3.1	-35.7	0.0	0.0	44.5	74.0	-29.5	V	P	
1.628	3.0	47.5	26.3	3.1	-35.7	0.0	0.0	41.1	54.0	-12.9	V	A	
2.442	3.0	46.8	28.3	3.9	-35.1	0.0	0.0	43.9	74.0	- <b>30.1</b>	V	P	
2.442	3.0	41.7	28.3	3.9	-35.1	0.0	0.0	38.9	54.0	-15.1	V	A	
1.628	3.0	51.0	26.3	3.1	-35.7	0.0	0.0	44.7	74.0	-29.3	H	P	
1.628	3.0	47.5	26.3	3.1	-35.7	0.0	0.0	41.1	54.0	-12.9	H	A	
2.442	3.0	45.8	28.3	3.9	-35.1	0.0	0.0	43.0	74.0	-31.0	H	P	
2.442 2480MHz	3.0	38.8	28.3	3.9	-35.1	0.0	0.0	35.9	54.0	- <b>18.1</b>	H	A	
1.654	3.0	45.1	26.4	3.1	-35.7	0.0	0.0	38.9	74.0	-35.1	v	P	
1.654	3.0	45.1	26.4	3.1	-35.7	0.0	0.0	29.9	74.0 54.0	-35.1	v	A	
2.482	3.0	45.7	28.5	3.9	-35.1	0.0	0.0	43.0	74.0	-31.0	v	P	
2.482	3.0	38.6	28.5	3.9	-35.1	0.0	0.0	35.8	54.0	-18.2	v	Ā	
1.654	3.0	49.7	26.4	3.1	-35.7	0.0	0.0	43.5	74.0	-30.5	H	P	
1.654	3.0	46.1	26.4	3.1	-35.7	0.0	0.0	39.9	54.0	-14.1	H	Ā	
2.482	3.0	44.1	28.5	3.9	-35.1	0.0	0.0	41.4	74.0	-32.6	H	P	
2.482	3.0	35.7	28.5	3.9	-35.1	0.0	0.0	32.9	54.0	-21.1	H	A	
	•		•					•					

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## 8.4. WORST-CASE BELOW 1 GHz

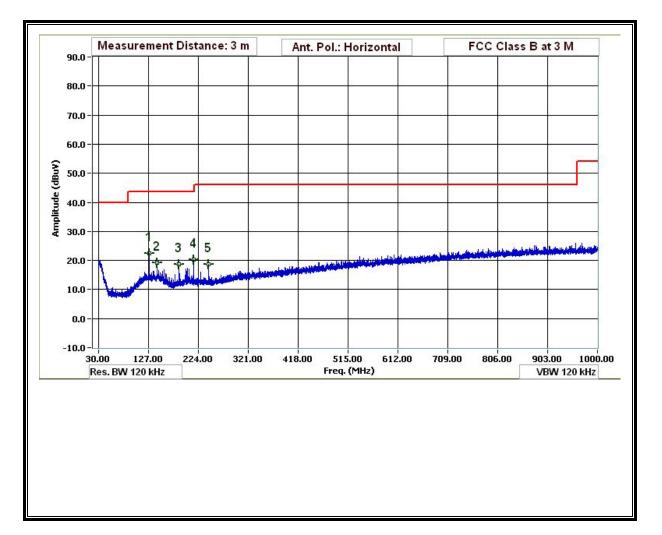
### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION))

AF CL MHz (0 28.884 3 43.369 3 28.884 3 43.365 3 28.884 3 43.165 3 14.808 3	11 09 AI 000000000000000000000000000000000	evin Cha /04/09 /U12898 LPS TT only nk Mode easurement stance to nalyzer R nalyzer R nalyzer R nalyzer R attenna Fa ble Loss Read dBuV 32.9 35.0 35.4 33.3 34.4 33.8 35.4 33.8	e nt Freque Antenn eading actor		Amp D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.2 28.3 28.2 28.2	Preamp ( Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	-	Limit	_	Margin vs. Ant. Pol. V/H V V V H	Limit Det. P/A/QP P P P P P	Notes
ate: roject #: company: UT Description lode Oper: f Dis Res AF CL f DI MIHZ (0 28.884 2 02.687 2 43.369 2 28.884 3 386.126 2 386.126 2 43.369 2 28.884 3 28.884 3 28.884 3 28.884 3 28.884 3 28.884 3 28.884 3 28.884 3 29.884 3 20.687 3 29.884 3 20.687 3 20.697 3 20.	11 09 AI 000000000000000000000000000000000	/04/09 /012898 LPS JT only nk Mode easuremet stance to halyzer R htenna Fa ble Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 33.4 33.4	e nt Freque Antenn. eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
roject #: 'ompany: UT Description fode Oper: f Diss Res AF CL f MHz () 28.884 3 02.687 3 43.369 3 86.126 3 86.126 3 14.808 3 43.369 3 ev. 1.27.09	09 Al Li M M ist Di ead Ar F Ar L Ca Dist (m) 0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	U12898 LPS JT only nk Mode easuremee stance to alyzer R alyzer R alyzer R alyzer R alyzer R alyzer R alyzer R alyzer A alyzer A a	e nt Freque Antenn. eading actor 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
tompany: UT Description Iode Oper: f Dis Res: AF CL f D.687 2 43.369 3 86.126 3 86.126 3 14.808 2 43.369 3 9 86.126 3 14.808 3 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	AI on: EU Li M ist Di ead Ar F Ar L Ca Dist (m) 0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.	LPS JT only nk Mode easurements stance to halyzer R ttenna Fa ble Loss Read dBuV 32.9 35.0 34.5 33.3 34.4 33.3 34.4 33.8	e nt Freque Antenn. eading actor 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
UT Description lode Oper: f Dis Res AF CL f DMHz (0 28.884 3 02.687 3 43.369 3 86.126 3 86.126 3 43.369 3 86.126 3 43.369 3 86.126 3 9 43.369 3	on: EL Li Mist Di ead Ar F Ar L Ca Dist (m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	T only nk Mode easurements stance to halyzer R htenna Fa ible Loss Read dBuV 32.9 35.0 34.5 33.3 34.4 35.4 33.8	nt Freque Antenn eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
UT Description lode Oper: f Dis Res AF CL f DMHz (0 28.884 3 02.687 3 43.369 3 86.126 3 86.126 3 43.369 3 86.126 3 43.369 3 86.126 3 9 43.369 3	Li M ist Di ead Ar F Ar L Ca Dist (m) (0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.	nk Mode easureme stance to nalyzer R ntenna Fa bble Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	nt Freque Antenn eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
Iode Oper: f Dis Res AF CL f DHZ (0) 28.884 3 02.687 3 43.369 3 86.126 3 86.126 3 43.369 3 96.126 3 14.808 3 96.126 3 97.126 3 9	Li M ist Di ead Ar F Ar L Ca Dist (m) (0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.	nk Mode easureme stance to nalyzer R ntenna Fa bble Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	nt Freque Antenn eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
f Dis Re: AF CL f DHZ (0 28.884 2 20.687 3 43.369 2 43.369 2 43.369 2 43.369 2 43.369 2 43.369 2 43.369 2 43.369 2	M ist Di ead Ar F Ar L Ca Dist (m) 0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.	easureme stance to halyzer R ttenna Fa bble Loss Read dBuV 32.9 35.0 34.5 33.3 36.1 33.3 34.4 35.4 33.8	nt Freque Antenn eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
Dis Rez AF CL 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ist Di ead Ar F Ar L Ca Dist (m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	stance to halyzer R htenna Fa ble Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	Artenn. eading actor AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.1 1.2 1.3	D Corr Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Distance Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Correct ert Loss d Field S ength Lir Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	Margin dB -24.2 -23.4 -26.5	Ant. Pol. V/H V V V	Det. P/A/QP P P P	Notes
Rez AF CL MHz () 28.884 2 02.687 3 28.884 2 02.687 3 28.884 2 43.369 3 28.884 2 43.165 3 86.126 3 86.126 3 43.369 3 2 43.369 3 2 43.369 3 2 43.369 3 2 43.369 3 2 43.369 3 3	ead Ar F Ar L Ca Dist (m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	nalyzer R. htenna Fa ble Loss <b>Read</b> <b>dBuV</b> 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	CL dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	Filter Corr. Limit 28.3 28.2 28.2 28.3 28.3 28.3 28.3 28.3	Filter Ins Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ert Loss d Field S ength Lin Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	trength nit Corr. dBuV/m 19.3 20.1 19.5 22.5	Limit dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
AF CL MHz () 88.884 3 12.687 2 38.884 3 13.369 3 38.884 3 33.165 3 36.126 3 36.126 3 36.126 3 33.369 3 3.369 3	F Ar L Ca Dist (m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Attenna Fable Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 33.3 35.4 33.8	AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	Corr. Limit Amp dB 28.3 28.2 28.2 28.2 28.3 28.3 28.3 28.3	Calculate Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	d Field S ength Lin Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	nit Corr. dBuV/m 19.3 20.1 19.5 22.5	dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
CL f D MHz (r) 28.884 3 02.687 3 43.369 3 86.126 3 86.126 3 14.808 3 43.369 3 ev. 1.27.09	L Ca Dist (m) (1) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	ble Loss Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 33.4 35.4 33.8	AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	Limit Amp dB 28.3 28.2 28.2 28.2 28.3 28.3 28.3 28.2 28.2	Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	rigth Lin Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	nit Corr. dBuV/m 19.3 20.1 19.5 22.5	dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
f         D           MHz         (i)           28.884         3           02.687         3           43.369         3           88.884         3           43.165         3           86.126         3           43.369         3           ev. 1.27.09         4	Dist (m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Read dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	AF dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	Amp dB 28.3 28.2 28.2 28.3 28.3 28.3 28.2 28.2	D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Filter dB 0.0 0.0 0.0 0.0 0.0 0.0	Corr. dBuV/m 19.3 20.1 19.5 22.5	dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
MHz         (r)           18.884         3           12.687         3           13.369         3           18.884         3           13.165         3           16.126         3           13.369         2           14.808         3           13.369         2           ev. 1.27.09         1.27.09	(m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	dB 28.3 28.2 28.2 28.3 28.3 28.3 28.2 28.2	dB 0.0 0.0 0.0 0.0 0.0 0.0	dB 0.0 0.0 0.0 0.0 0.0	dBuV/m 19.3 20.1 19.5 22.5	dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
MHz         (r)           28.884         2           02.687         2           28.884         2           28.884         2           28.884         2           86.126         2           14.808         2           ev. 1.27.09	(m) ( 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	dBuV 32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	dB/m 13.6 12.0 11.8 13.6 13.1 11.3 11.9	dB 1.1 1.3 1.3 1.1 1.1 1.2 1.3	dB 28.3 28.2 28.2 28.3 28.3 28.3 28.2 28.2	dB 0.0 0.0 0.0 0.0 0.0 0.0	dB 0.0 0.0 0.0 0.0 0.0	dBuV/m 19.3 20.1 19.5 22.5	dBuV/m 43.5 43.5 46.0 43.5	dB -24.2 -23.4 -26.5	V/H V V V	P/A/QP P P P	Notes
88.884         3           12.687         3           13.369         2           18.884         3           13.165         3           36.126         2           14.808         2           13.369         3           ev. 1.27.09         2	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	32.9 35.0 34.5 36.1 33.3 34.4 35.4 33.8	13.6 12.0 11.8 13.6 13.1 11.3 11.9	1.1 1.3 1.3 1.1 1.1 1.2 1.3	28.3 28.2 28.2 28.3 28.3 28.3 28.2 28.2	0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	19.3 20.1 19.5 22.5	43.5 43.5 46.0 43.5	-24.2 -23.4 -26.5	V V V	P P P	
12.687         2           13.369         3           18.884         3           13.165         3           36.126         2           13.369         3           14.808         3           13.369         3           ev. 1.27.09	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	35.0 34.5 36.1 33.3 34.4 35.4 33.8	12.0 11.8 13.6 13.1 11.3 11.9	1.3 1.3 1.1 1.1 1.2 1.3	28.2 28.2 28.3 28.3 28.2 28.2 28.2	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	20.1 19.5 22.5	43.5 46.0 43.5	-23.4 -26.5	V V	P P	
43.369         3           28.884         3           43.165         3           36.126         3           14.808         3           43.369         3           ev. 1.27.09	3.0 3.0 3.0 3.0 3.0 3.0 3.0	34.5 36.1 33.3 34.4 35.4 33.8	11.8 13.6 13.1 11.3 11.9	1.3 1.1 1.1 1.2 1.3	28.2 28.3 28.3 28.2 28.2 28.2	0.0 0.0 0.0 0.0	0.0 0.0 0.0	19.5 22.5	46.0 43.5	-26.5	V	Р	
28.884 3 43.165 3 86.126 3 14.808 3 43.369 3 ev. 1.27.09	3.0 3.0 3.0 3.0 3.0 3.0	36.1 33.3 34.4 35.4 33.8	13.6 13.1 11.3 11.9	1.1 1.1 1.2 1.3	28.3 28.3 28.2 28.2	0.0 0.0 0.0	0.0 0.0	22.5	43.5				
33.165         3           36.126         3           44.808         3           33.369         3           ev. 1.27.09	3.0 3.0 3.0 3.0	33.3 34.4 35.4 33.8	13.1 11.3 11.9	1.1 1.2 1.3	28.3 28.2 28.2	0.0 0.0	0.0			-21.0	· H	Р	
86.126 3 14.808 3 13.369 3 ev. 1.27.09	3.0 3.0 3.0	34.4 35.4 33.8	11.3 11.9	1.2 1.3	28.2 28.2	0.0		19.1				P	
14.808 3 13.369 3 ev. 1.27.09	3.0 3.0	35.4 33.8	11.9	1.3	28.2			18.6	43.5	-24.4	H H	P	
43.369 3 ev. 1.27.09	3.0	33.8				. 0.0	0.0 0.0	18.6	43.5	-24.9 -23.1	н Н	P	
ev. 1.27.09			11.0	1.0	÷ 20.2	0.0	0.0	20.4 18.8	45.5		н Н	P	
	er emissi				1	0.0	0.0	10.0	40.0	-27.2		<b>F</b>	

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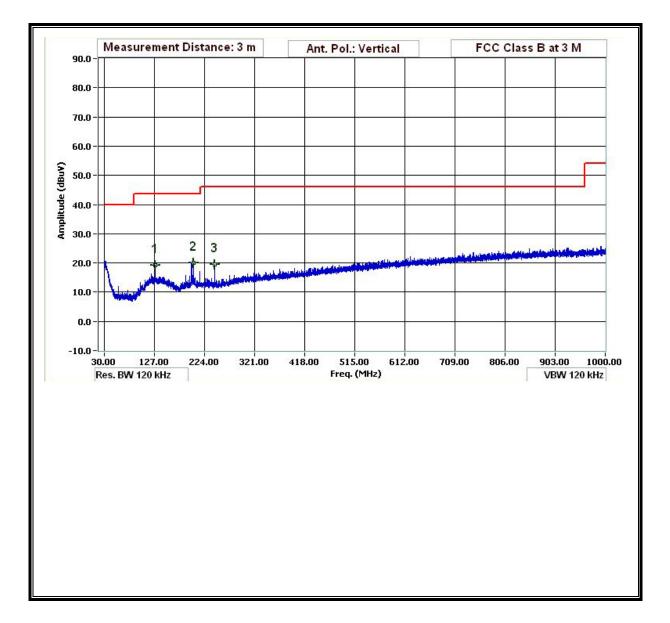
### HORIZONTAL PLOT



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### VERTICAL PLOT



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# 9. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	l/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/F 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	on/Uncontrolled Exp	oosure	
0.3–1.34 1.34–30	614 824/f	1.63 2.19/f	*(100) *(180/f²)	30 30

#### TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

#### TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30–300 300–1500	27.5	0.073	0.2 f/1500	30 30
1500-100,000			1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-tions where a transient through a location where occu-

pational/controlled limits apply provided he or she is made aware of the potential for exposure. NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

## Table 5

Exposure Limits for Persons Not Classed As RF and Microwave Ex-
posed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	2.19/ <i>f</i>		6
10–30	28	2.19/f		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> <sup>0.5</sup>	0.0042f <sup>0.5</sup>	f/150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 /f <sup>1.2</sup>
150 000–300 000	0.158f <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> f <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> f	616 000 /f <sup>1.2</sup>

\* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.

- 2. A power density of 10 W/m<sup>2</sup> is equivalent to  $1 \text{ mW/cm}^2$ .
- A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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## EQUATIONS

Power density is given by:

S = EIRP / (4 \* Pi \* D^2)

where

S = Power density in W/m<sup>2</sup> EIRP = Equivalent Isotropic Radiated Power in W D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mWc/m<sup>2</sup> by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

## LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm<sup>2</sup>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

## <u>RESULTS</u>

Band	Mode	Separation	Output	Antenna	IC Power	FCC Power
		Distance	Power	Gain	Density	Density
		(m)	(dBm)	(dBi)	(W/m^2)	(mW/cm^2)
2.4 GHz	Bluetooth	0.20	1.10	1.87	0.0039	0.00039

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