

FCC CFR47 PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

GLASS

MODEL NUMBER: XEB

FCC ID: A4R-X1

REPORT NUMBER: 12U14656-3

ISSUE DATE: NOVEMBER 28, 2012

Prepared for GOOGLE INC. 1600 AMPHITHEATRE PARKWAY MOUNTAIN VIEW CA, 94043, U.S.A

Prepared by UL CCS 47173 BENICIA STREET FREMONT, CA 94538, U.S.A. TEL: (510) 771-1000 FAX: (510) 661-0888

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
	11/28/12	Initial Issue	T. LEE

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	GOOGLE INC. 1600 AMPHITHEATRE PARKWAY MOUNTAIN VIEW, CA, 94043, U.S.A	
EUT DESCRIPTION:	GLASS	
MODEL:	XEB	
SERIAL NUMBER:	015498FC0A011010	
DATE TESTED:	NOVEMBER 21-28, 2012	
	APPLICABLE STANDARDS	
ST	ANDARD	TEST RESULTS
CFR 47 P	art 15 Subpart C	Pass

UL 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 UL 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL 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 UL CCS By:

TIM LEE WISE PROJECT MANAGER UL CCS

Tested By:

Maubonquym

THANH NGUYEN EMC ENGINEER UL CCS

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

UL 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%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a glass providing a heads-up video display. The device incorporates an 802.11 b/g 2.4 GHz WLAN and BT, BT-LE radio. This report covers the Bluetooth radio.

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
2402 - 2480	Basic GFSK	11.66	14.66
2402 - 2480	Enhanced 8PSK	11.65	14.62

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a coaxial monopole antenna, with a maximum gain is 3.32 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware/software installed in the EUT during testing was 20121114095638.

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5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed video playing with audio sound and with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation(The right side up) was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation operated by AC adapter.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List							
Description Manufacturer Model Serial Number FCC ID							
AC Charger	GOOGLE	10AG212020	N/A	N/A			

I/O CABLES

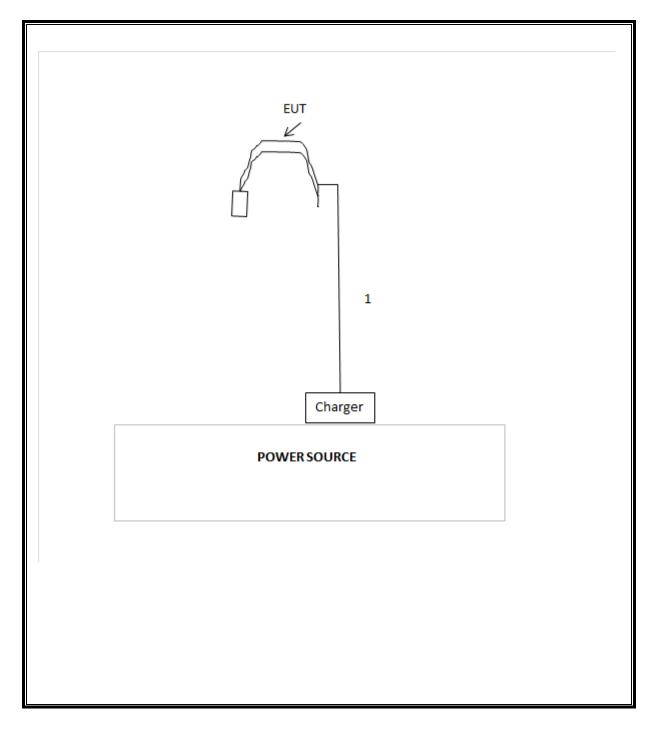
	I/O Cable List							
Cable No		# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks		
1	DC	1	USB	Shielded	1.2	No		

TEST SETUP

The EUT was at the worst position and connected to the charger played the video script and transmit the worst case BT mode.

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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 Date	Cal Due	
Antenna, Horn, 18 GHz	EMCO	3115	C00872	09/20/12	09/20/13	
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/21/12	21/10/13	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	10/21/12	10/21/13	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	02/21/12	02/21/13	
Bilog 30-2000MHz	Sunol	JB1	C01071	01/26/12	01/26/13	
Power meter	HP	437B	T226	06/25/12	06/25/13	
Power Sensor	НР	8481A	T233	06/26/12	06/26/13	
LISN, 30 MHz	FCC	LISN-50/250-25-	N02625	12/13/11	12/13/12	
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BN	N02481	03/07/12	03/07/13	
EMI Test Receiver	R&S	ESC20	N02396	08/18/12	08/18/13	

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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

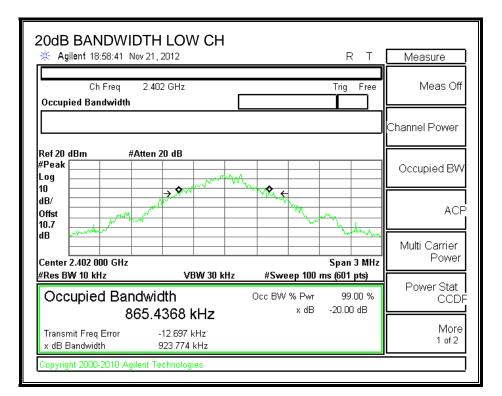
The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

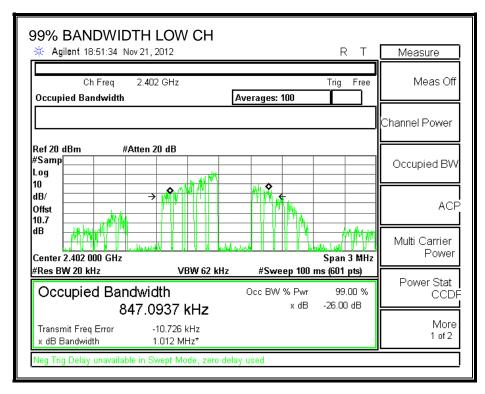
RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(kHz)	(kHz)
Low	2402	923.77	847.0937
Middle	2441	885.89	834.8419
High	2480	924.18	844.9554

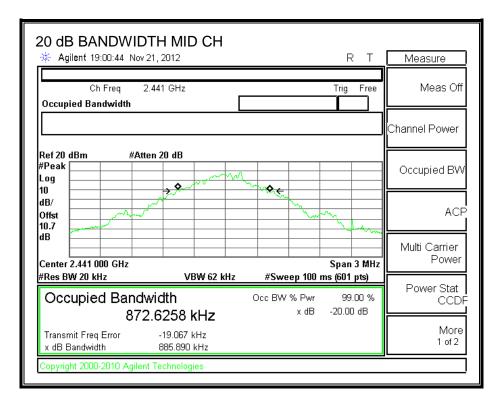
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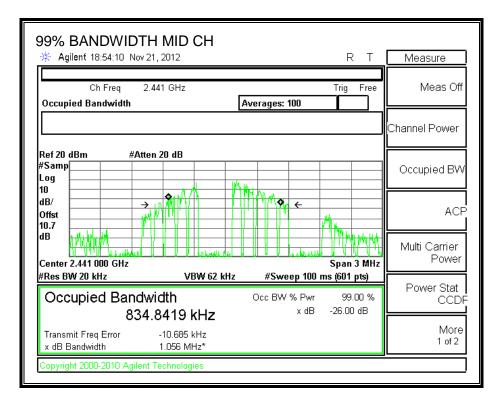
20 dB AND 99% BANDWIDTH



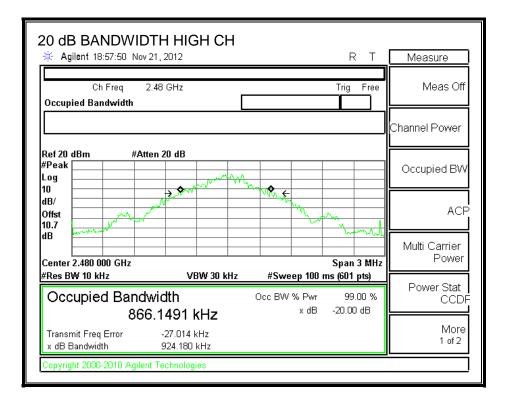


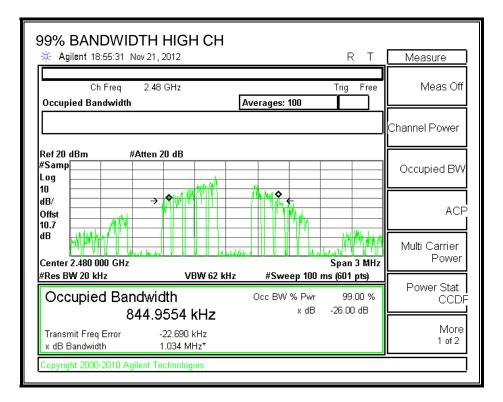
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7.1.2. HOPPING FREQUENCY SEPARATION

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.

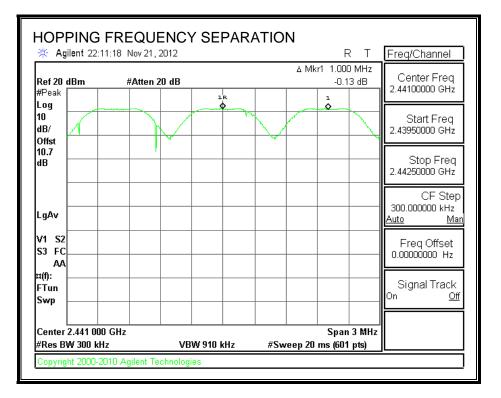
TEST PROCEDURE

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

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HOPPING FREQUENCY SEPARATION



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7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

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 non-overlapping channels.

TEST PROCEDURE

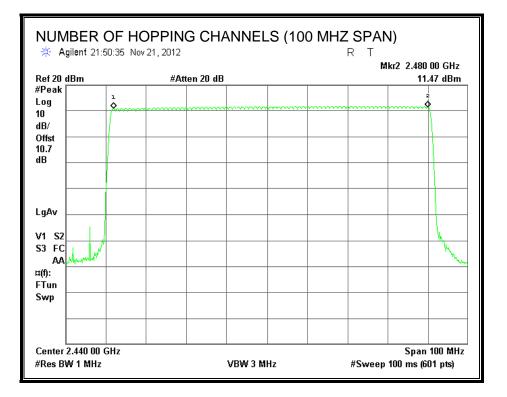
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed.

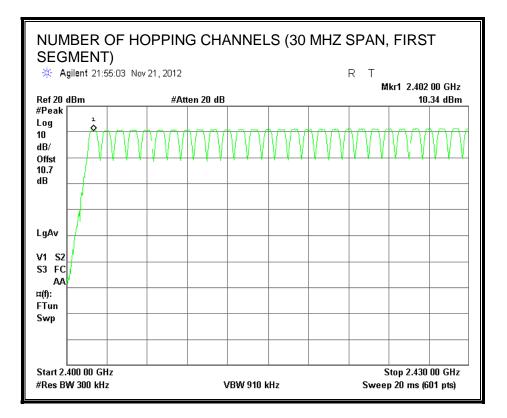
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NUMBER OF HOPPING CHANNELS

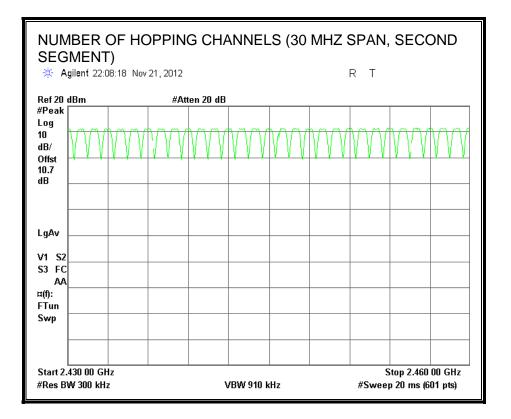


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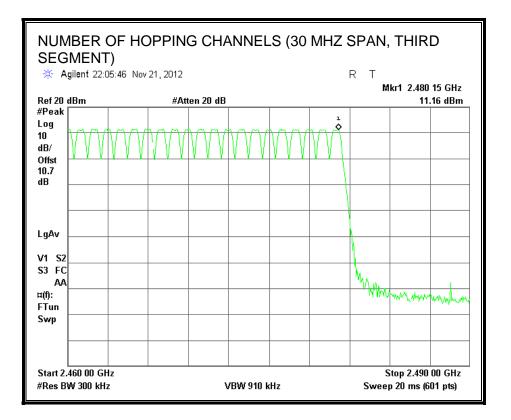
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7.1.4. AVERAGE TIME OF OCCUPANCY

<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.

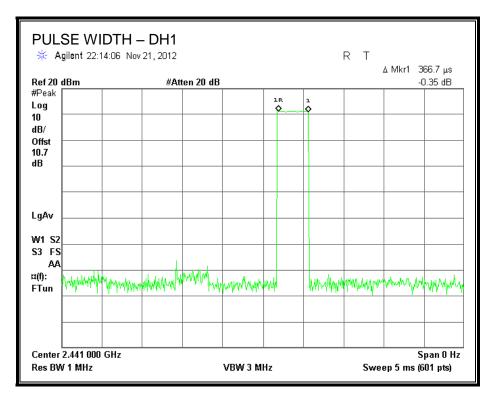
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

DH Packet	Pulse	Number of	Average Time	Limit	Margin		
	Width (msec)	Pulses in 3.16 seconds	of Occupancy (sec)	(sec)	(sec)		
GFSK Norma	GFSK Normal Mode						
DH1	0.3667	25	0.092	0.4	-0.308		
DH3	1.642	18	0.296	0.4	-0.104		
DH5	2.882	13	0.375	0.4	-0.025		

RESULTS

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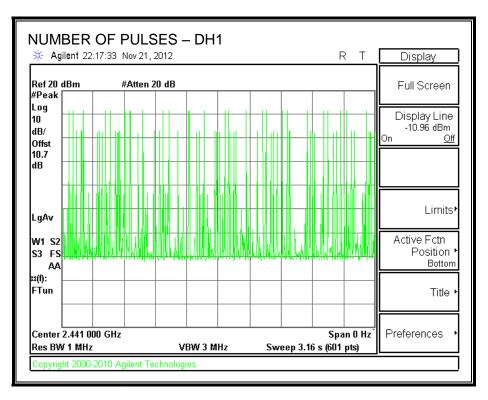
PULSE WIDTH - DH1



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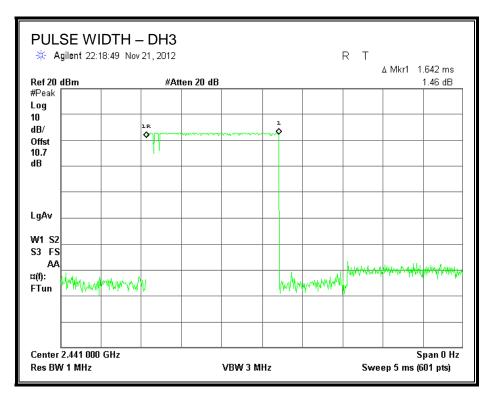
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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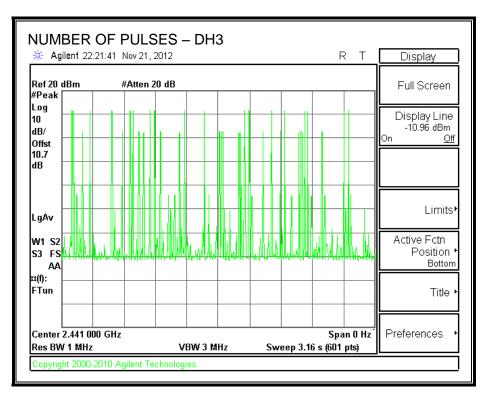
PULSE WIDTH - DH3



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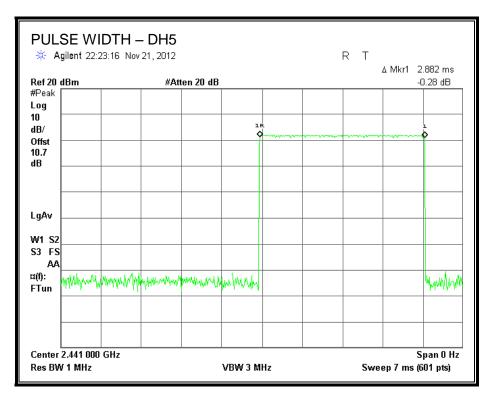
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



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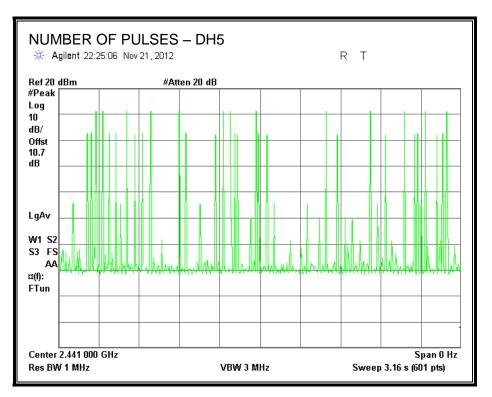
PULSE WIDTH - DH5



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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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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

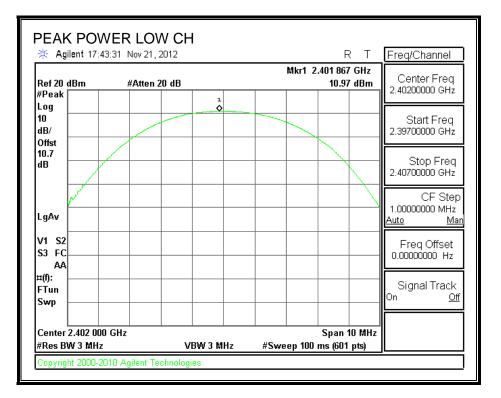
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	10.97	30	-19.03
Middle	2441	11.66	30	-18.34
High	2480	11.59	30	-18.41

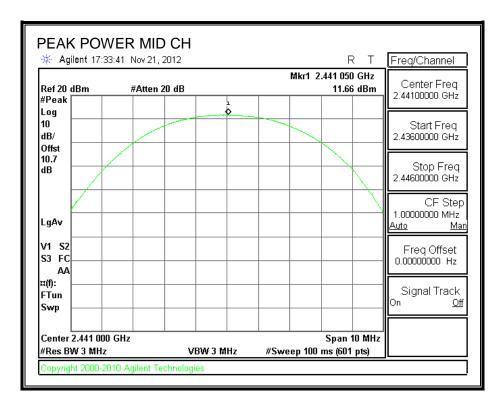
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OUTPUT POWER

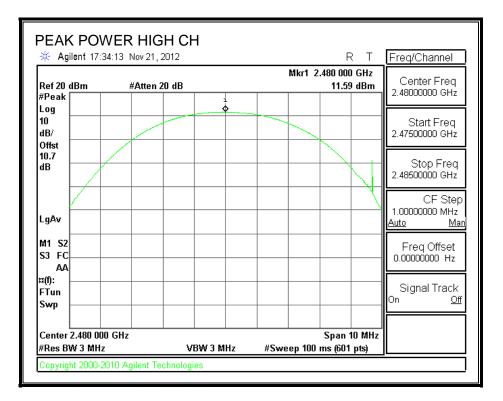


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7.1.6. AVERAGE POWER

<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 10.7 dB (including 10 dB pad and .7 dB 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	7.10
Middle	2441	7.65
High	2480	7.62

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7.1.1. 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.

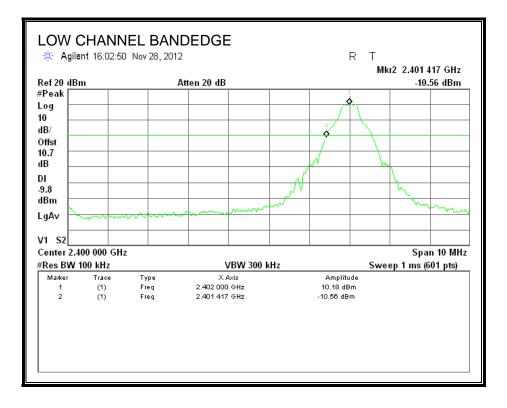
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

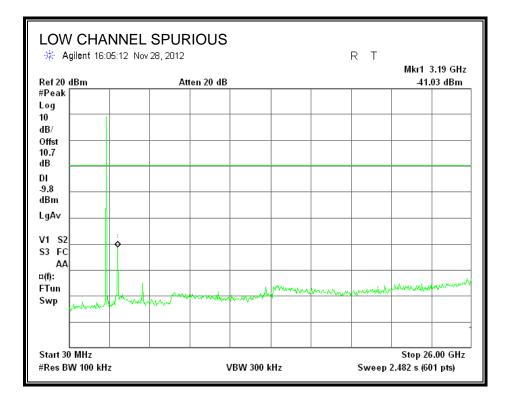
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

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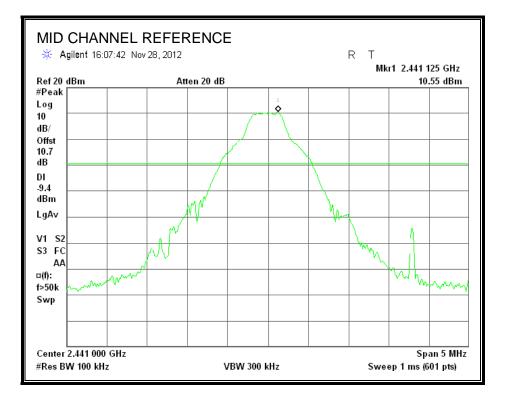
SPURIOUS EMISSIONS, LOW CHANNEL

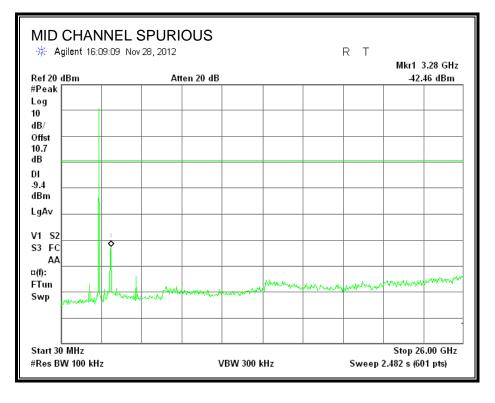




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SPURIOUS EMISSIONS, MID CHANNEL

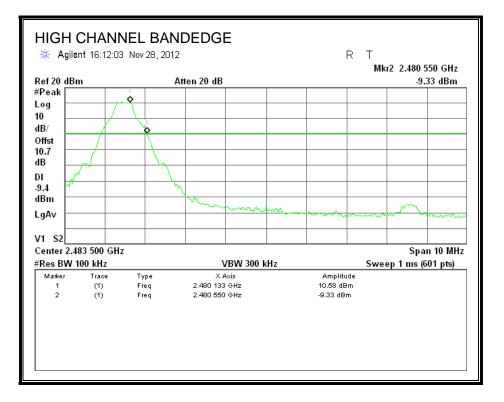


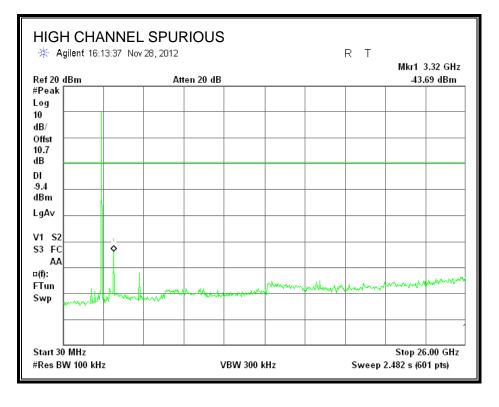


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SPURIOUS EMISSIONS, HIGH CHANNEL

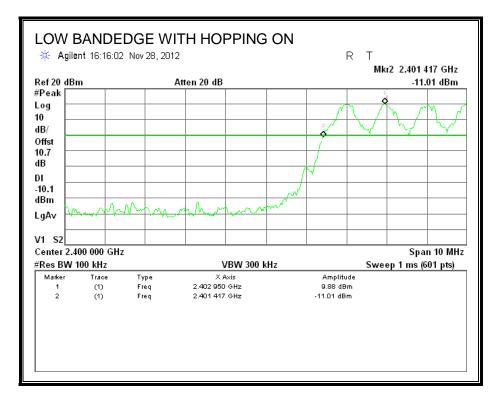


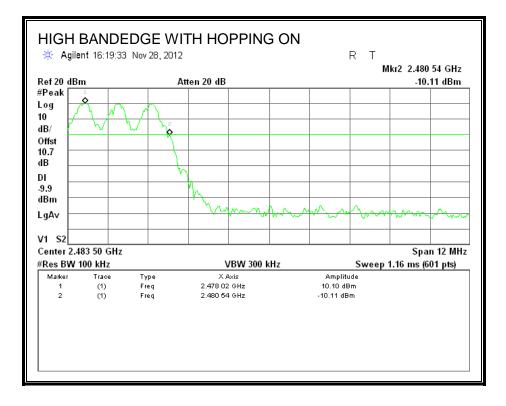


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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





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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.

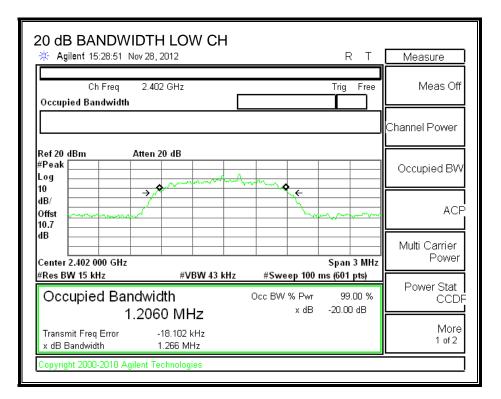
RESULTS

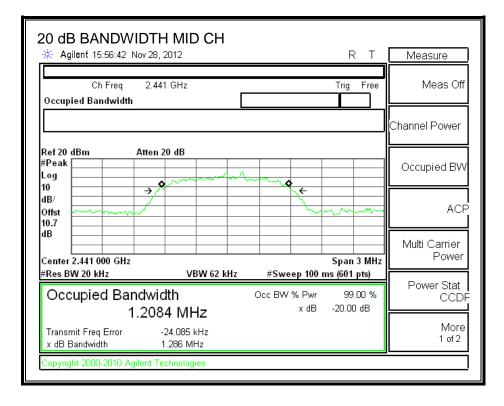
Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	2402	1.266	1.2134
Middle	2441	1.286	1.2584
High	2480	1.288	1.1951

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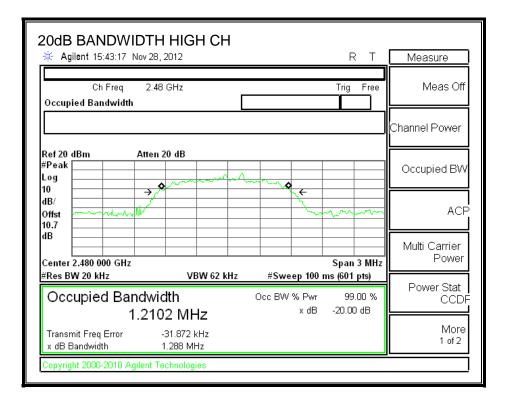
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20 dB BANDWIDTH



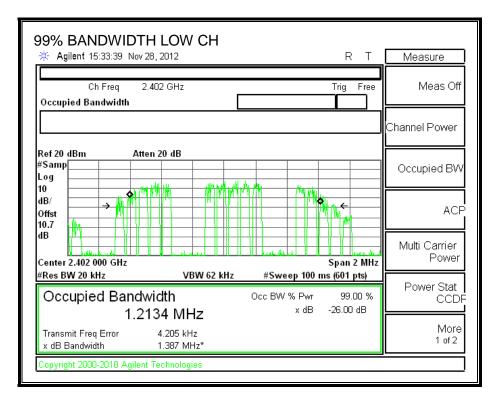


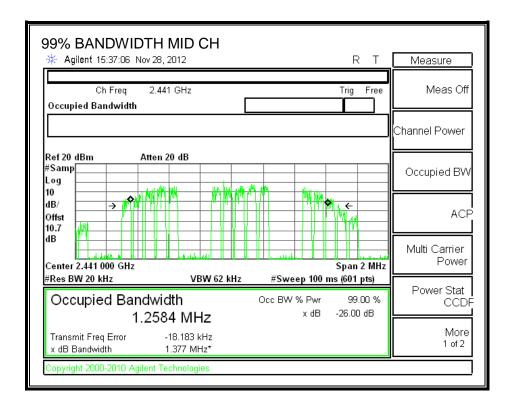
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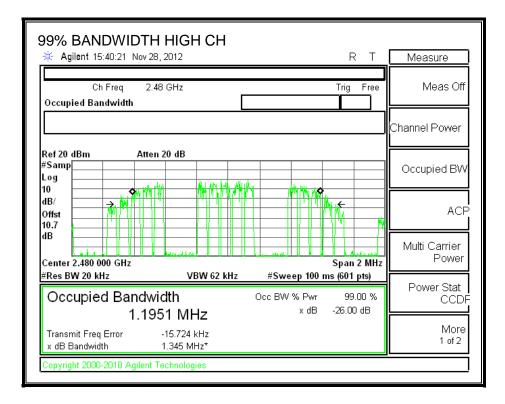
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99% BANDWIDTH





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7.2.2. 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.

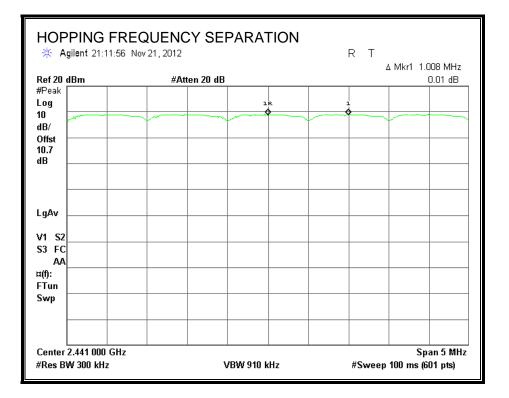
TEST PROCEDURE

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

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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

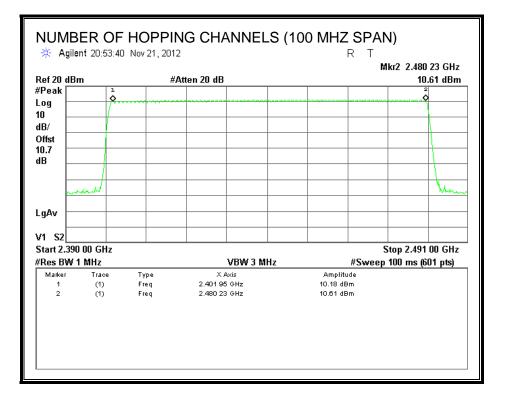
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

<u>RESULTS</u>

79 Channels observed.

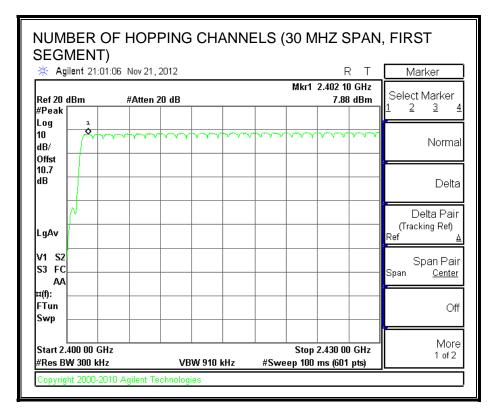
Page 47 of 88

NUMBER OF HOPPING CHANNELS



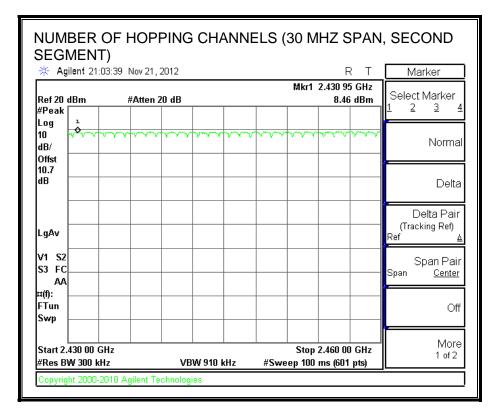
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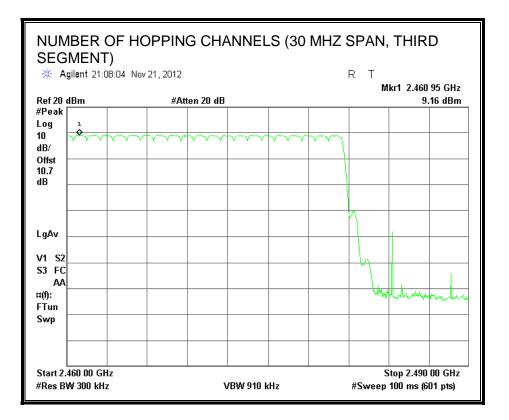
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7.2.4. AVERAGE TIME OF OCCUPANCY

<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 = 10 * xx pulses * yy msec = zz msec

8PSK (EDR) Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3833	seconds 22	0.084	0.4	-0.316
DH3	1.633	15	0.245	0.4	-0.155
DH5	2.867	11	0.315	0.4	-0.085

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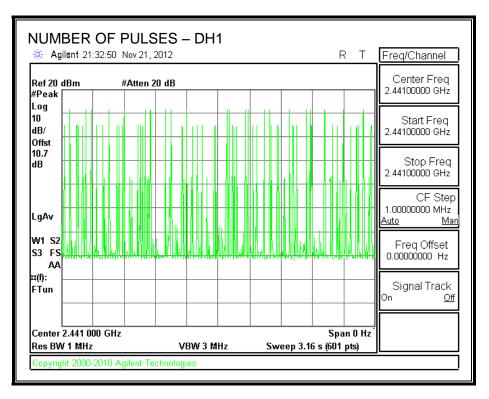
PULSE WIDTH - DH1

	IDTH – DH1			RТ	
Ref 20 dBm	30:12 Nov 21, 2012		ΔMI		Freq/Channel Center Freq
#Peak Log 10					2.44100000 GHz
dB/ Offst	LR WW				Start Freq 2.44100000 GHz
10.7 dB					Stop Freq 2.44100000 GHz
LgAv					CF Step 1.00000000 MHz <u>Auto Man</u>
W1 S2 S3 FS AA	hunhamman Harladhula	Warnet Market Warne	MUKA JA JANA MANA	Memoria	Freq Offset 0.00000000 Hz
¤(f):					Signal Track On <u>Off</u>
Center 2.441 00 Res BW 1 MHz		VBW 3 MHz	Sweep 5	Span 0 Hz ms (601 pts)	
Copyright 2000-2	2010 Agilent Technolo	ogies			

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



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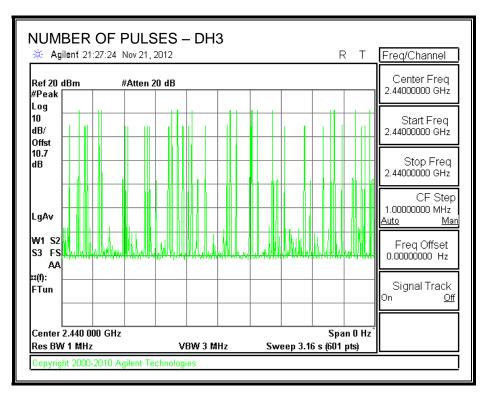
PULSE WIDTH – DH3

	(IDTH – DH3 36:00 Nov 21, 2012			RТ	Marker
Ref 20 dBm #Peak	#Atten 20 dl		۸ MI		Select Marker
Log 10 dB/	1 11-11-11-11-11-11-11-11-11-11-11-11-11				Normal
10.7 dB					Delta
LgAv					Delta Pair (Tracking Ref) Ref <u>∆</u>
W1 S2 S3 FS AA		man the second second	Manufand	AND TAMPANYANYA	Span Pair Span <u>Center</u>
¤(f): FTun		(0)9 10	California al filo.		Off
Center 2.441 00 Res BW 1 MHz		VBW 3 MHz	Sweep 7	Span 0 Hz ms (601 pts)	More 1 of 2
Copyright 2000-	2010 Agilent Techno	logies	•	•••]

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



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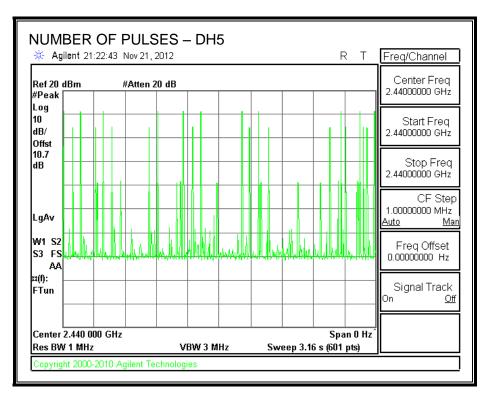
PULSE WIDTH – DH5

PULSE WIDTH – I	DH5		
🔆 Agilent 21:16:52 Nov 21	, 2012	RT	Freq/Channel
Ref 20 dBm #Atten #Peak	20 dB	∆ Mkr1 2.867 ms 1.80 dB	Center Freq 2.44100000 GHz
Log 10 dB/ Offst	18, 19, 19, 19, 19, 19, 19, 19, 19, 19, 19	1 *	Start Freq 2.44100000 GHz
10.7 dB			Stop Freq 2.44100000 GHz
LgAv			CF Step 1.00000000 MHz <u>Auto Man</u>
W1 S2 S3 FS	4,44	Langelangersennestlandetaggerensterage	Freq Offset 0.00000000 Hz
¤(f): FTun			Signal Track On <u>Off</u>
Center 2.441 000 GHz Res BW 1 MHz	VBW 3 MHz	Span 0 Hz Sweep 10 ms (601 pts)	
Copyright 2000-2010 Agilent T	echnologies		

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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



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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.

TEST PROCEDURE

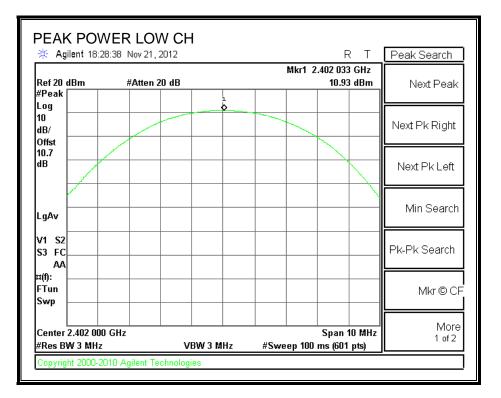
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	10.93	30	-19.07
Middle	2441	11.59	30	-18.41
High	2480	11.65	30	-18.35

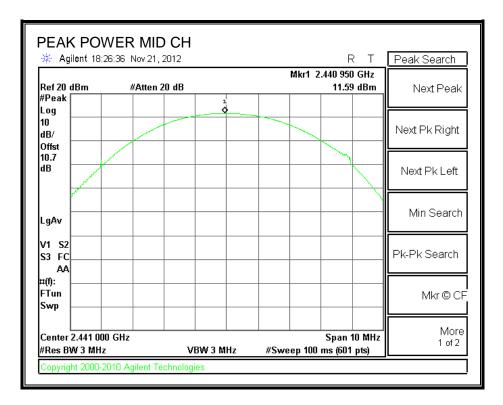
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OUTPUT POWER

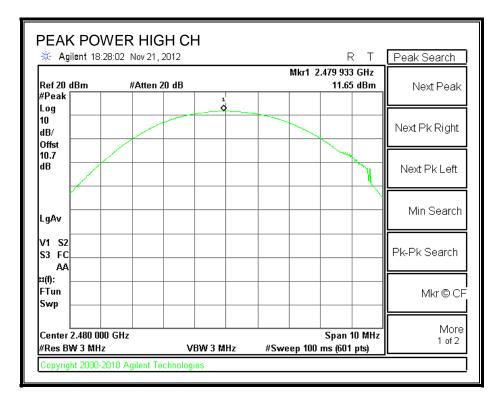


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7.2.6. AVERAGE POWER

<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 10.7 dB (including 10 dB pad and .7 dB 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	5.01
Middle	2441	5.74
High	2480	5.71

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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.

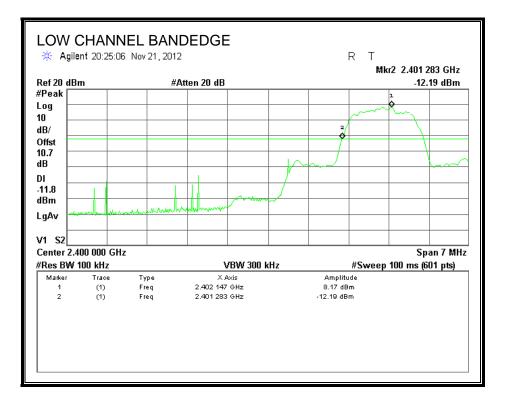
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

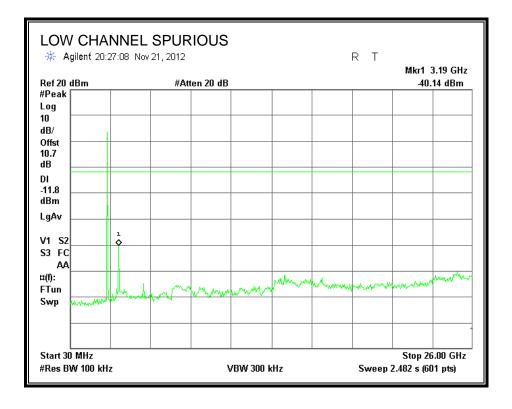
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

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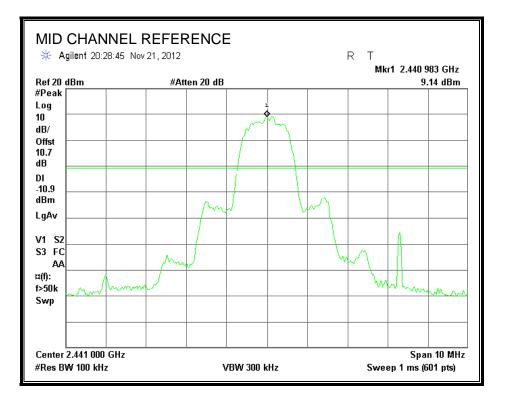
SPURIOUS EMISSIONS, LOW CHANNEL

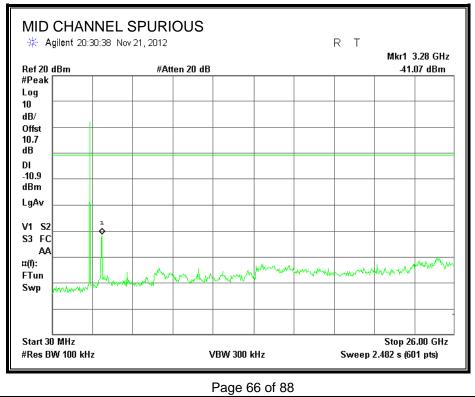




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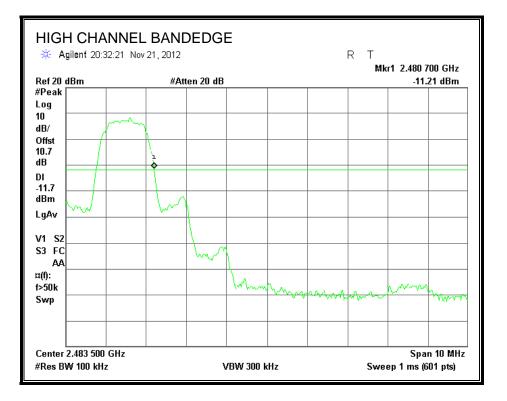
SPURIOUS EMISSIONS, MID CHANNEL

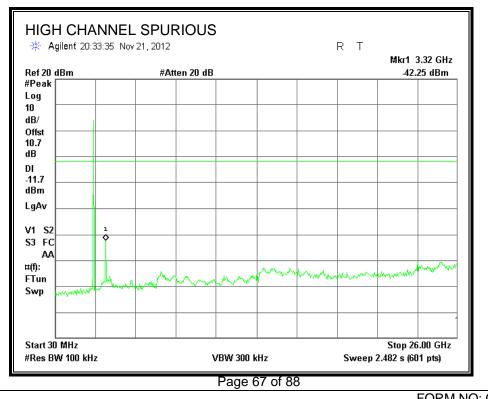




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SPURIOUS EMISSIONS, HIGH CHANNEL

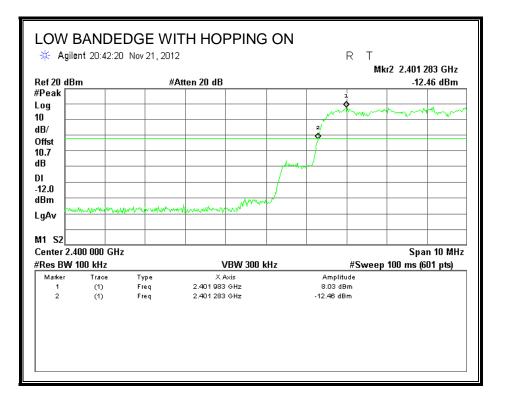




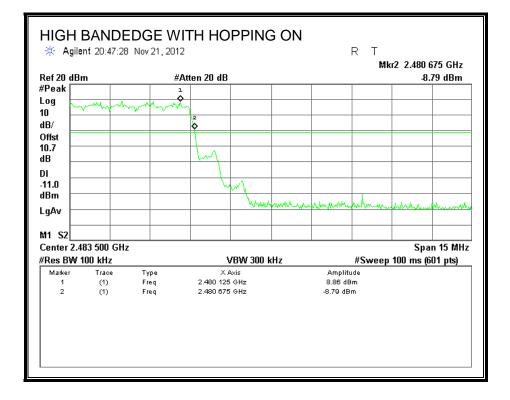
UL CCS

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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.

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8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

Agilent 23:23:18	Nov 21, 2012		R T	Freq/Channel
ef 104.3 dBµ∀ Peak	#Atten 0 dB	Mk	r1 2.318 27 GHz 49.31 dBµ∨	Center Freq 2.35000000 GHz
og D B/				Start Freq 2.3100000 GHz
28 B				Stop Freq 2.39000000 GHz
4.0 Bµ∨ gAv	madentermenterpresente	kontra and a second second		CF Ste 8.00000000 MHz <u>Auto M</u>
1 M2 3 FC				Freq Offset 0.00000000 Hz
(f): Tun wp				Signal Track On <u>O</u>
tart 2.310 00 GHz Res BW 1 MHz	VBW 1 N		op 2.390 00 GHz o 1 ms (601 pts)	

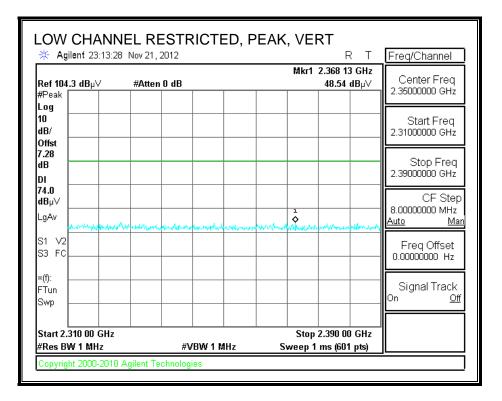
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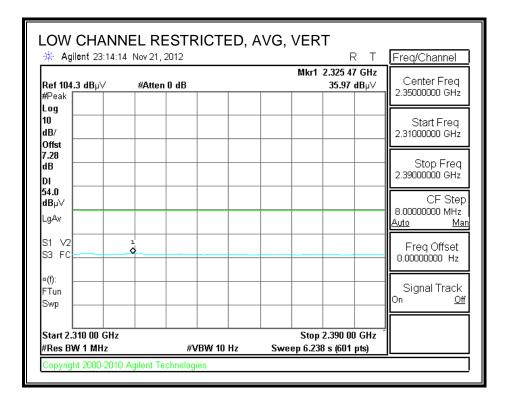
* Agilent 23:24:11 Nov 21,		AVG, HORIZ	Freq/Channel
Ref 104.3 dBµ∨ #Atter #Peak	n 0 dB	Mkr1 2.388 27 GHz 36.26 dBµ∀	Center Freq 2.35000000 GHz
Log 10 dB/ Offst			Start Freq 2.31000000 GHz
7.28 dB DI			Stop Freq 2.39000000 GHz
54.0 dBµ√ LgAv			CF Step 8.0000000 MHz <u>Auto Man</u>
S1 V2 S3 FC			Freq Offset 0.00000000 Hz
*(f): FTun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz #Res BW 1 MHz	#VBW 10 Hz	Stop 2.390 00 GHz Sweep 6.238 s (601 pts)	

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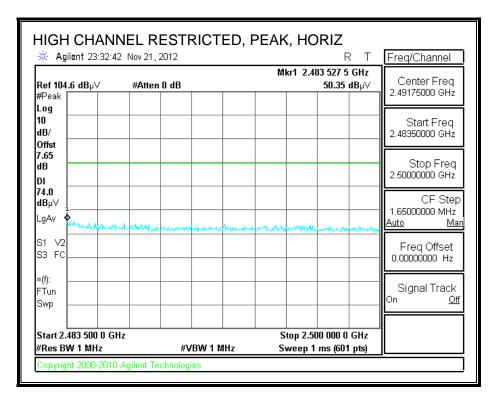
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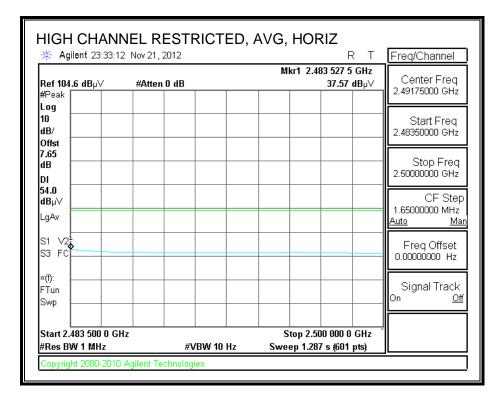
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





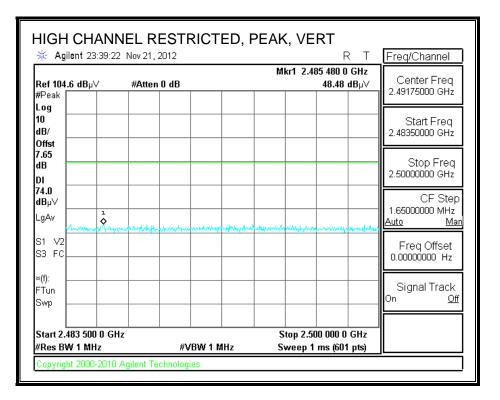
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Agilent 23:39:		Mkr1 2,483 500 0	T Freq/Channel
Ref 104.6 dBµ∨ #Peak	#Atten 0 dB	35.91	
Log 10 dB/ Offst			Start Freq 2.48350000 GHz
7.65 dB DI			Stop Freq 2.5000000 GHz
54.0 dBµ∨ LgAv			CF Step 1.65000000 MHz <u>Auto Ma</u> i
S1 V2 S3 FC			Freq Offset 0.00000000 Hz
×(f): FTun Swp			Signal Track OnOff
Start 2.483 500 0 0 #Res BW 1 MHz	GHz #VBW 10	Stop 2.500 000 0 Hz Sweep 1.287 s (601	

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HARMONICS AND SPURIOUS EMISSIONS

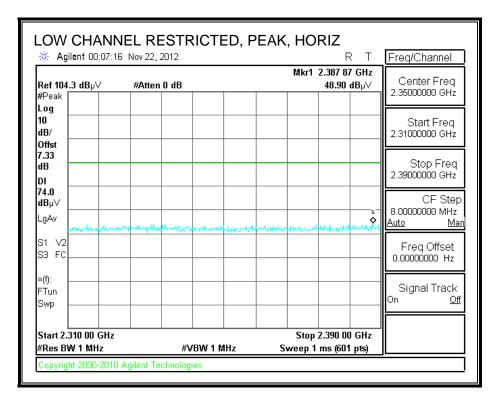
e Certification	Services, Fre			_											
		mont 31	n Cha	mber											
	GOOGLE														
	12U14656														
	11/22/2012														
eer: on:	Thanh Nguyen EUT at worst po														
on .		SILION													
ment:															
Horn 1-18GHz Pre-amplifer 1-26GHz					Pre-am	plifer	26-40GH	z	Ho	orn > 18G	Hz		Limit		
2238 @3m	▼ T34 HP	8449B		-				-				-	FCC 15.209		
cy Cables															
le 22807700	12' ca	able 22	28076	00	20' cal	ble 22	807500		HPF Reject Filter				<u>x Measurements</u> W=VBW=1MHz		
e 22807700	▼ 12' cal	ole 2280	7600	•	20' cab	le 2280	07500			• R_	001		ge Measurements 1MHz ; VBW=10Hz		
Dist Read Pk	Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes		
m) dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	-	dBuV/m	dBuV/m	dB	dB	(V/H)		
													v		
													H		
3.0 39.20	26.40	36.2	9.1	-33.2	0.0	0.0	51.3	38.5	74	54	-22.7	-15.5	H		
													H H		
3.0 38.26	25.36	33.2	6.8	-34.0	0.0	0.0	44.2	31.3	74	54	- 29.8	-22.7	V		
3.0 40.37	26.37	36.3	9.1	-33.1	0.0	0.0	52.7	38.7	74	54	-21.3	-15.3	v		
	25.25	33.2	69	-34.0	0.0	0.0	44.4	3] 3	74	54	-29.6	-22.7	v		
3.0 39.33 3.0 39.33	26.43	36.5	9.1	-33.0	0.0	0.0	51.9	39.0	74	54 54	-29.0	-15.0	v		
3.0 38.53	25.36	33.2	6.9	-34.0	0.0	0.0	44.6	31.4	74	54	-29.4	-22.6	H		
3.0 39.54	26.35	36.5	9.1	-33.0	0.0	0.0	52.1	38.9	74	54	-21.9	-15.1	H		
					[]		.								
					-		at to 2 mot			-	rg Lim Average Field Strength Limit				
											<u> </u>				
-	-			-											
L Cable Los				HPF	High Pas					- IC 14100		. I CUL DIIII			
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8.2.1. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



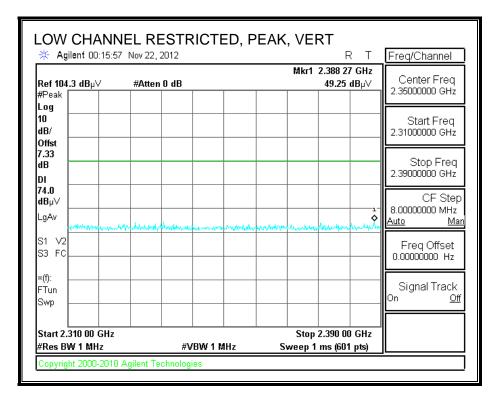
UL CCS FORM NO: CCSUP4701G 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL CCS.

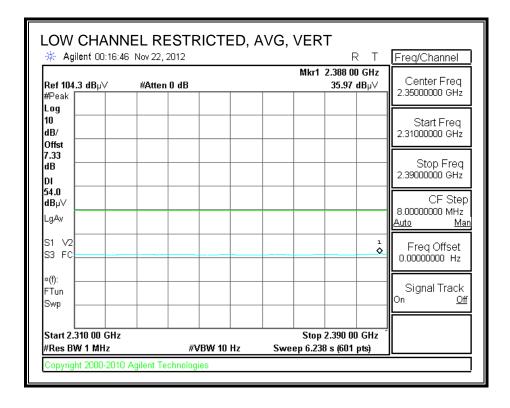
* Agilent 00:08:4		ED, AVG, HORIZ	T Freq/Channel
Ref 104.3 dBµ∨ #Peak	#Atten 0 dB	Mkr1 2.388 27 (36.43 dE	Contor From I
.og 10 1B/ Dffst			Start Freq 2.31000000 GHz
/.33 IB			Stop Freq 2.39000000 GHz
i4.0 IBµ∨ .gAv			CF Step 8.00000000 MHz <u>Auto Man</u>
31 V2 33 FC			Freq Offset
(f): Tun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz Res BW 1 MHz	#VBW 10	Stop 2.390 00 (Hz Sweep 6.238 s (601 pt	

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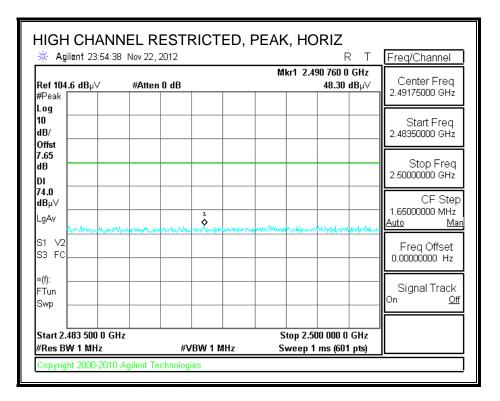
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





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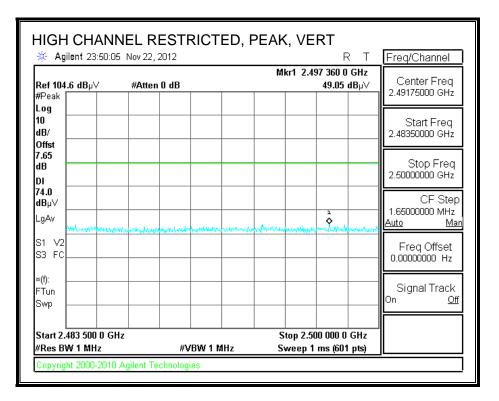
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

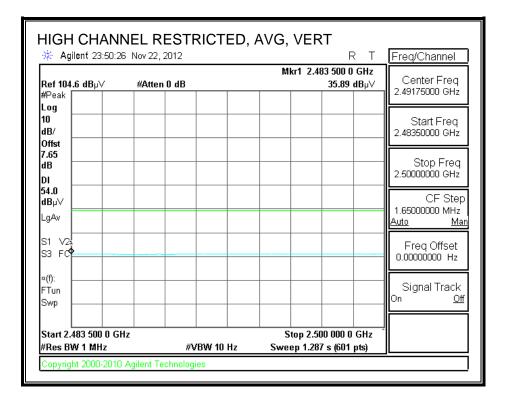


🔆 Agilent 23:55	13 1409 22, 2012	R T	Freq/Channel
Ref 104.6 dBµ∀ #Peak	#Atten 0 dB	Mkr1 2.483 500 0 GHz 35.85 dBµ∨	Center Freq 2.49175000 GHz
Log 10			
dB/			Start Freq 2.48350000 GHz
7.65			Stop Freq
dB DI			2.5000000 GHz
54.0 dBµ∨			CF Step
LgAv			1.65000000 MHz Auto Ma
S1 V2			Freq Offset
S3 FC			0.00000000 Hz
×(f):			Signal Track
FTun Swp			On <u>Off</u>
			_
Start 2.483 500 0 #Res BW 1 MHz	GHz #VBW 10 F	Stop 2.500 000 0 GHz Iz Sweep 1.287 s (601 pts)	

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





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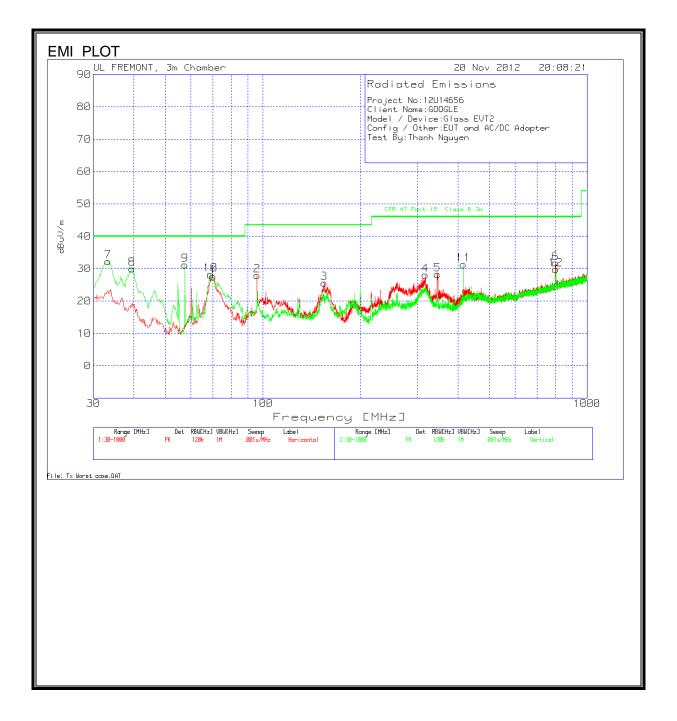
HARMONICS AND SPURIOUS EMISSIONS

		18GHz	Pre-am		-26G	Hz	Pre-am	plifer	26-40GH	z	Но	orn > 180	Hz		Limit FCC 15.209
Hi Fre	quency Cab	_		ble 22	8076	•	20' cat	ole 22	807500		HPF	Re	eject Filte		<u>Measurements</u> W=VBW=1MHz
3' c	able 228	07700	, 12' cab	le 2280	7600	•	20' cabl	e 2280)7500 -			• R_	001	Avera	ge Measurements 1MHz ; VBW=10H:
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
w Ch	2.0	20.50	25.20	22.1	4 9	241		0.0	45.0	41.1	74	54	29.7	22.0	
04 06	3.0 3.0	39.50 41.27	25.30 28.52	33.1 36.2	6.8 9.1	-34.1 -33.2	0.0 0.0	0.0	45.3 53.3	31.1 40.6	74 74	54 54	-28.7 -20.7	-22.9 -13.4	V V
04	3.0	40.02	27.30	33.1	6.8	-34.1	0.0	0.0	45.8	33.1	74	54	-28.2	-20.9	Н
06	3.0	41.43	28.55	36.2	9.1	-33.2	0.0	0.0	53.5	40.6	74	54	-20.5	-13.4	H
l ch															
21	3.0	40.75	27.39	33.2	6.8	-34.0	0.0	0.0	46.8	33.4	74	54	-27.2	-20.6	H
01 21	3.0 3.0	41.14 40.62	28.19 28.56	36.4 33.2	9.1 6.8	-33.1 -34.0	0.0 0.0	0.0	53.6 46.6	40.6 34.6	74 74	54 54	-20.4 -27.4	-13.4 -19.4	H
01	3.0	40.62	28.50	36.4	0.8 9.1	-34.0	0.0	0.0	40.0 54.4	34.0 40.6	74	54 54	-27.4	-19.4 -13.4	v
	2480MH2		-0.10		~								-2710		•
60	3.0	40.40	26.85	33.2	6.9	-34.0	0.0	0.0	46.5	32.9	74	54	-27.5	-21.1	V
40	3.0	42.45	28.29	36.5	9.1	-33.0	0.0	0.0	55.0	40.8	74	54	-19.0	-13.2	V
60	3.0	40.49	26.92	33.2	6.9	-34.0	0.0	0.0	46.6	33.0	74	54	-27.4	-21.0	H
40	3.0	41.16	28.28	36.5	9.1	-33.0	0.0	0.0	53.7	40.8	74	54	-20.3	-13.2	H
v. 11.1	f Dist	Measureme Distance to Analyzer Re Antenna Fa Cable Loss	eading ctor			Amp D Corr Avg Peak HPF	Average	Correc Field S d Peal	ct to 3 mete Strength @ c Field Stre	3 m		Pk Lim Avg Mar	Peak Field Margin vs	Field Strengtl d Strength Li . Average Li . Peak Limit	mit mit

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8.1. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz



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EMISSIC	ONS DAT	A								
Project No	:12U14656									
Client Nan	ne:GOOGLE									
	evice:Glass									
Config / O	ther: EUT ar	nd AC/DC A	dapter, pl	ay video ai	nd Tx wors	t case				
Test By:Th	anh Nguyer	1								
Horizontal	30 - 1000M	Hz								
Marker	Test	Meter	Detector	25MHz-	Antenna	dBuV/m	CFR 47	Margin	Height	Polarity
No.	Frequency	Reading		1GHz Chambr	T185 (dB)		Part 15 Class B		[cm]	
				3m Amplifie d (dB)			3m			
1	70.1259	46.49	РК	-27.1	8.2	27.59	40	-12.41	301	Horz
2	95.9073	46.05	PK	-26.9	8.8	27.95	43.5	-15.55	400	Horz
3	154.6423	39.64	PK	-26.3	12.2	25.54	43.5	-17.96	201	Horz
4	316.8905	39.51	PK	-25.2	13.7	28.01	46	-17.99	100	Horz
5	345.5795	39.46	PK	-25.3	14.1	28.26	46	-17.74	100	Horz
6	798.4013	35.29	PK	-24.6	21.1	31.79	46	-14.21	100	Horz
) - 1000MHz									
	Test Frequency	Meter Reading	Detector	25MHz- 1GHz	Antenna T185 (dB)	dBuV/m	CFR 47 Part 15	Margin	Height [cm]	Polarity
				Chambr			Class B			
				3m Amplifie			3m			
				d (dB)						
7	33.2954	40.98	РК	-27.5	18.8	32.28	40	-7.72	101	Vert
8	39.4984	43.2		-27.4	14.2	30	40	-10	101	Vert
9	57.526	51.39	РК	-27.2	7	31.19			101	Vert
10	68.9628	47.18	PK	-27.1	8.1	28.18	40	-11.82		Vert
11	415.3637	40.86	РК	-25.7	16.1	31.26	46			Vert
12	800.7274	33.33	РК	-24.6	21.1	29.83	46	-16.17	101	Vert

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)					
	Quasi-peak	Average				
0.15-0.5	66 to 56 *	56 to 46 *				
0.5-5	56	46				
5-30	60	50				

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

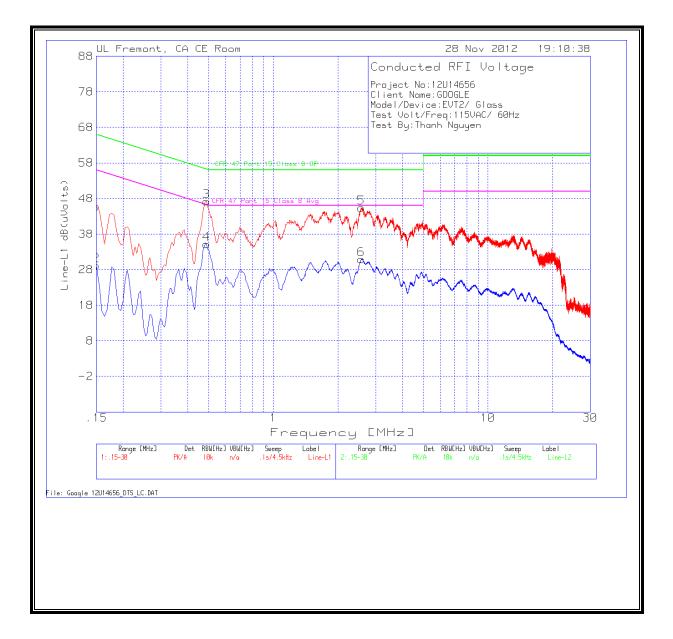
RESULTS

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<u>6 WORST EMISSIONS</u>

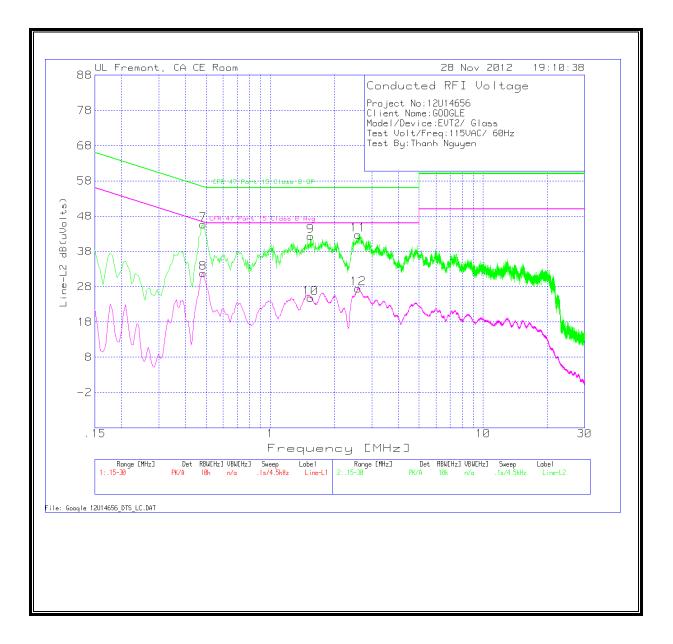
	vice:EVT2/								
Test Volt/F	•								
Test By:Tha	anh Nguye	n							
Line-L1.15	201417								
Test	Meter	Detector	T24 IL	IC Cables	dB(uVolts)	CER 47	Margin	CFR 47	Margin
Frequency		Detettor	L1.TXT	1&3.TXT	ublarousi	Part 15	Margin	Part 15	Margin
requency	neaung		(dB)	(dB)		Class B		Class B	
			(ub)	(ub)		QP		Avg	
0.15	45.72	DK	0.1	0	45.82		-20.18		-
0.15			0.1	0	29.11		-	56	-26.8
0.4875			0.1	0	47.21	56.2	-8.99		-
0.4875			0.1	0	35.2		-	46.2	-1
2.571			0.1	0.1	45.45		-10.55		-
2.571			0.1	0.1	30.9	-	-	46	-15.
Line-L2.15	- 30MHz								
Test	Meter	Detector	T24 IL	LC Cables	dB(uVolts)	CFR 47	Margin	CFR 47	Margin
Frequency	Reading		L1.TXT	1&3.TXT		Part 15		Part 15	
			(dB)	(dB)		Class B		Class B	
						QP		Avg	
0.483	45.52	РК	0.1	0	45.62	56.3	-10.68	-	-
0.483	31.78	Av	0.1	0	31.88	-	-	46.3	-14.4
1.545	42.09	РК	0.1	0.1	42.29	56	-13.71	-	-
1.545	24.64	Av	0.1	0.1	24.84	-	-	46	-21.1
2.589	42.54	РК	0.1	0.1	42.74	56	-13.26	-	-
2.589	27.28	Av	0.1	0.1	27.48	-	-	46	-18.5

LINE 1 RESULTS



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LINE 2 RESULTS



END OF REPORT

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