

FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

CELLULAR/PCS CDMA AND LTE PHONE WITH BLUETOOTH AND WLAN

MODEL NUMBER: LS840, LG-LS840, LGLS840*

FCC ID: ZNFLS840

REPORT NUMBER: 11U14124-2

ISSUE DATE: NOVEMBER 21, 2011

Prepared for LG ELECTRONICS MOBILECOMM U.S.A., INC. 10101 OLD GROVE ROAD SAN DIEGO, CA 92131

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

*The models covered by this report are identical

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
	11/21/11	Initial Issue	

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CO	MPLIA	ANCE CERTIFICATION SERVICES (UL CCS)	FORM NO: CCSUP4701D

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	LG ELECTRONICS MOBILECOMM U.S.A., INC. 10101 OLD GROVE ROAD SAN DIEGO, CA 92131				
EUT DESCRIPTION:	Cellular/PCS CDMA and LTE Phone with Bluetooth and WLAN				
MODEL:	LS840, LG-LS840, LGLS840				
SERIAL NUMBER:	74000549, 74000556				
DATE TESTED:	OCTOBER 31, NOVEMBER 1-2, 2011				
APPLICABLE STANDARDS					
STANDARD TEST RESULTS					
CFR 47 Part 15 Subpart C Pass					

Compliance Certification Services (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:

Tested By:

DAVE WEAVER EMC SUPERVISOR UL CCS

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OLIVER SU 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 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.

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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a smart-phone that features Cellular/PCS CDMA and LTE with Bluetooth and WLAN.

The radio module is manufactured by Broadcom Co.

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	10.73	11.83
2402 - 2480	Enhanced 8PSK	9.72	9.38

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio uses a Direct Printed Antenna, with a maximum peak gain of -1.69 dBi.

5.4. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was V07D_June 23, 2011.

The test utility software used during testing was Bluetooth FCC.

5.5. WORST-CASE CONFIGURATION AND MODE

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

Radiated emissions below 1 GHz and power line conducted emissions were performed with the EUT set to the channel with highest output power.

For the fundamental investigation, since the EUT is a portable device that has three orientations; X, Y and Z orientations have been investigated, also with AC/DC adapter, and earphone, and the worst case was found to be at X orientation with AC/USB adapter and earphone.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Description Manufacturer Model Serial Number FCC ID							
AC Adapter	LG Electronics	MCS-02WS	SA14258000036	N/A			
Ear Phone	LG Electronics	N/A	N/A	N/A			

I/O CABLES

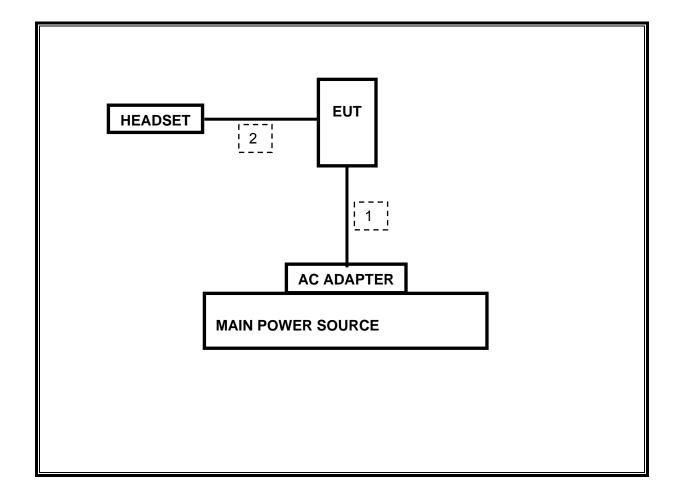
	I/O CABLE LIST								
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks			
1	DC	1	Mini Jack	Un-Shielded	1.0m	External ferrite added			
2	Audio	1	Mini Jack	Un-Shielded	1.0m	Volume control on cable			

TEST SETUP

The EUT is a stand-alone device and was tested with AC/USB adapter and earphone. Bluetooth Tester was used to control the EUT.

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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	C01176	08/15/12				
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/08/12				
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/12				
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/30/12				
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/16/12				
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR				
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	08/11/12				
P-Seies single channel Power	Agilent / HP	N1911A	N∕A	08/04/12				
Peak / Average Power Sensor	Agilent / HP	E9323A	N/A	08/04/12				
EMI Test Receiver, 9 kHz-7 GHz	R&S	ESCI 7	1000741	07/06/12				
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11				
Bluetooth Tester	R&S	1153.9000K35	N/A	04/22/12				

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7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB 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.

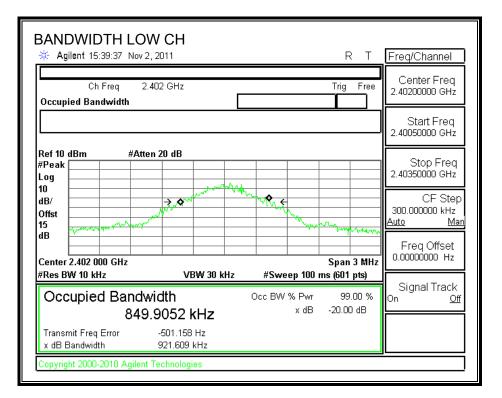
RESULTS

Channel	Frequency	20 dB Bandwidth
	(MHz)	(kHz)
Low	2402	921.609
Middle	2441	926.578
High	2480	952.475

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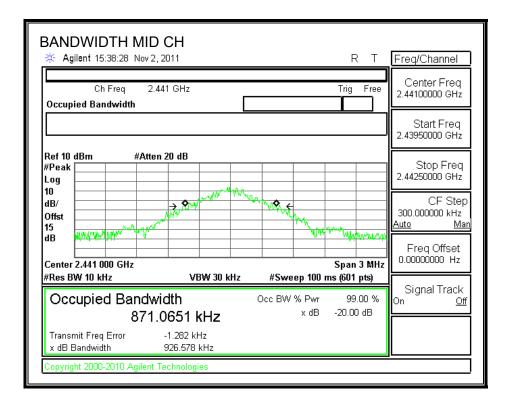
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20 dB BANDWIDTH



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Agilent 15:36:45 Nov 2, 20	011		RТ	Freq/Channel
Ch Freq 2.48 Occupied Bandwidth	GHz		Trig Free	Center Freq 2.48000000 GHz
	E			Start Freq 2.47850000 GHz
Ref 10 dBm #Atten 2 #Peak				Stop Freq 2.48150000 GHz
15	A MORE AND A MARKAN AND A	the work of the state of the st	W ^A shine a sure	CF Step 300.000000 kHz <u>Auto Mar</u>
dB	VBW 30 kHz	#Sweep 100	Span 3 MHz	Freq Offset 0.00000000 Hz
Occupied Bandwid		Occ BW % Pwr x dB	99.00 % -20.00 dB	Signal Track On <u>Off</u>
	4.067 kHz 952.475 kHz			

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7.1.2. HOPPING FREQUENCY SEPARATION

<u>LIMIT</u>

FCC §15.247 (a) (1)

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

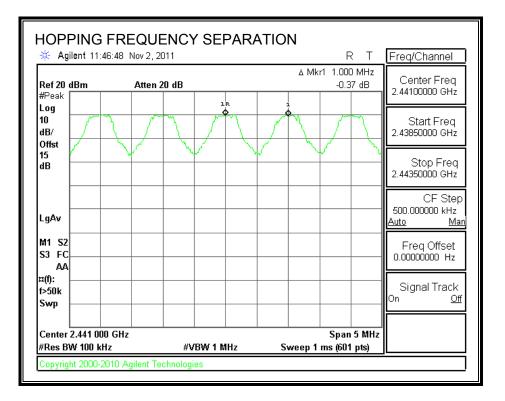
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 1 MHz. The sweep time is coupled.

<u>RESULTS</u>

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HOPPING FREQUENCY SEPARATION



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7.1.3. NUMBER OF HOPPING CHANNELS

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

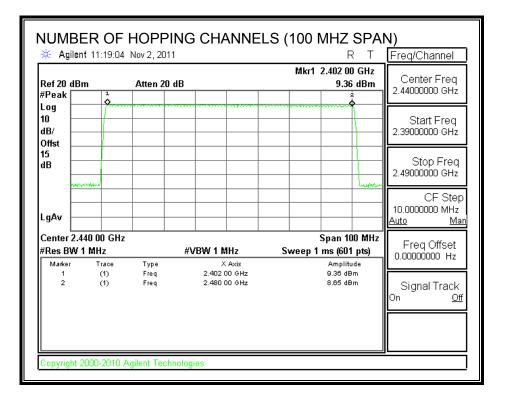
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

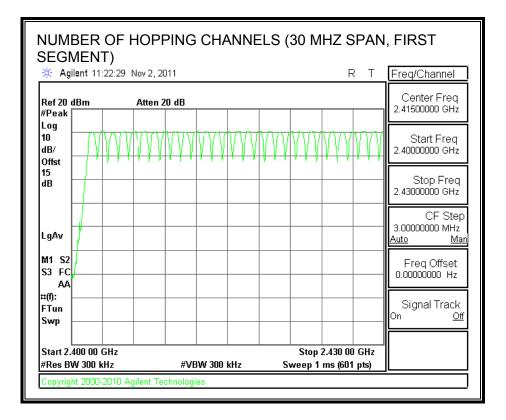
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NUMBER OF HOPPING CHANNELS

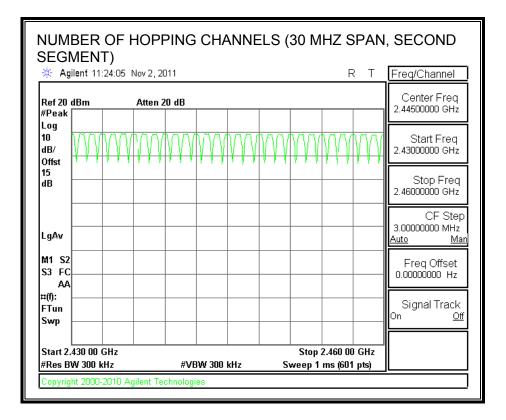


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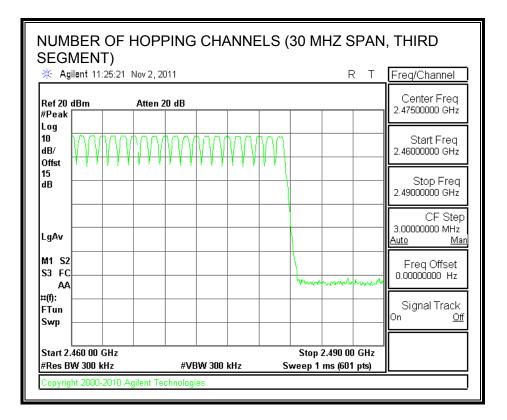


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7.1.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

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.

<u>RESULTS</u>

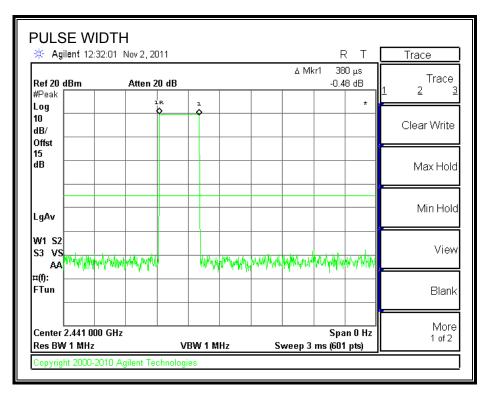
Time of Occupancy = 10 * xx pulses * yy msec = zz msec

DH Packet	Pulse	Number of	Average	Limit	Margin
	Width	Pulses in	Time of		
	(msec)	3.16	(sec)	(sec)	(sec)
		seconds			
DH1	0.38	31	0.118	0.4	-0.282
DH3	1.635	16	0.262	0.4	-0.138
DH5	2.891	10	0.289	0.4	-0.111

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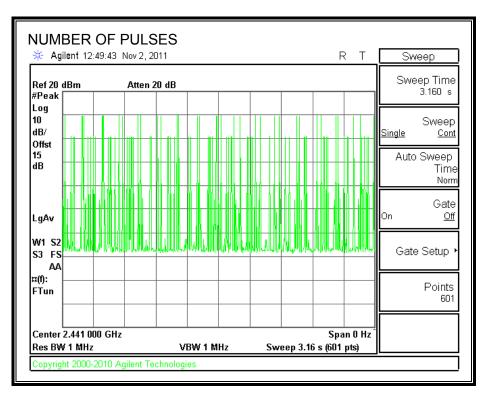
DH1

PULSE WIDTH



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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

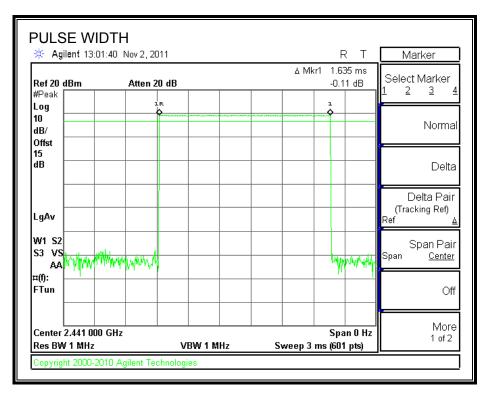


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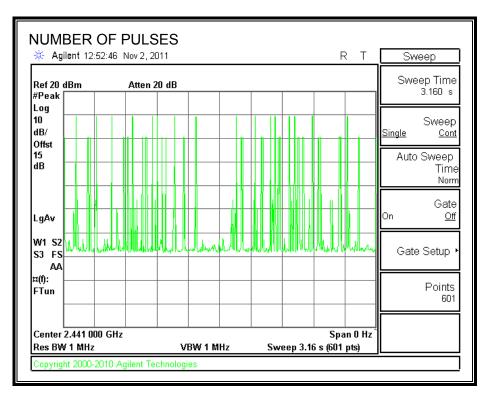
<u>DH3</u>

PULSE WIDTH



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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

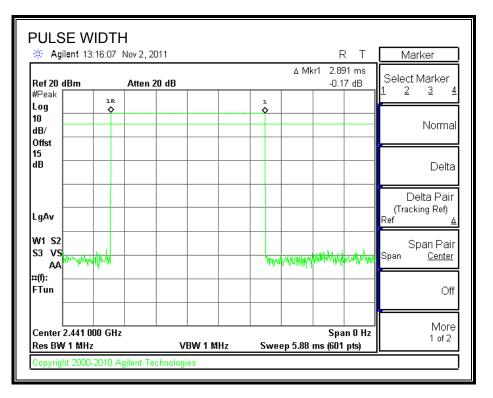


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<u>DH5</u>

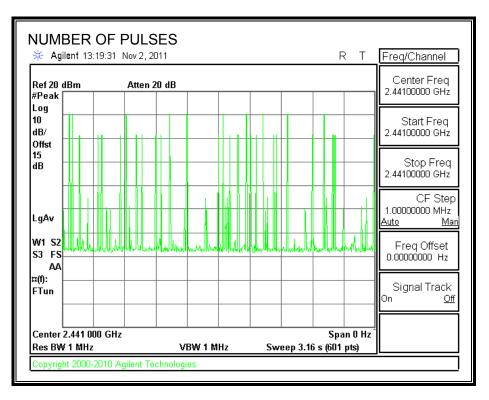
PULSE WIDTH



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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)

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

TEST PROCEDURE

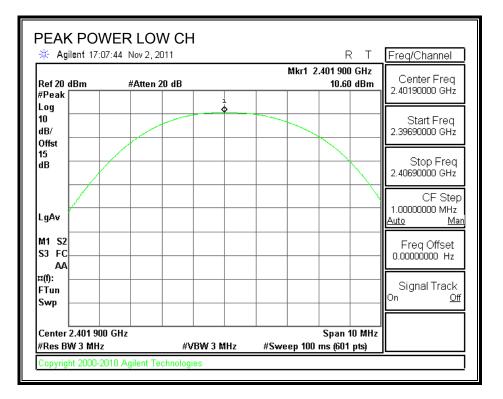
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

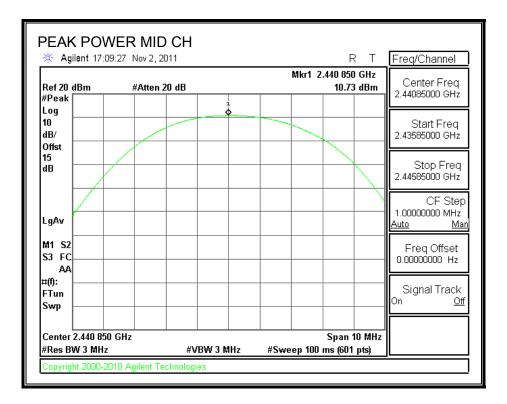
Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	10.60	30	-19.40
Middle	2441	10.73	30	-19.27
High	2480	10.18	30	-19.82

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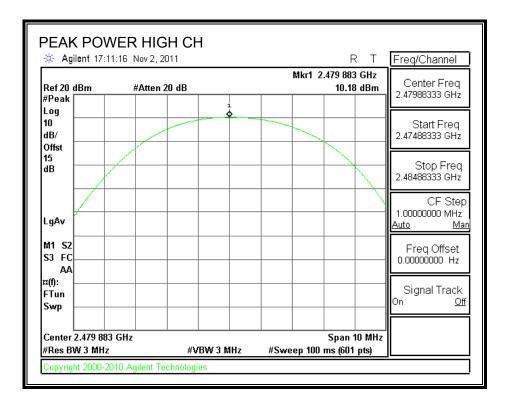
OUTPUT POWER



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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 10.4 dB (including 10 dB pad and 0.4 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	9.20	
Middle	2441	9.20	
High	2480	9.20	

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7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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.

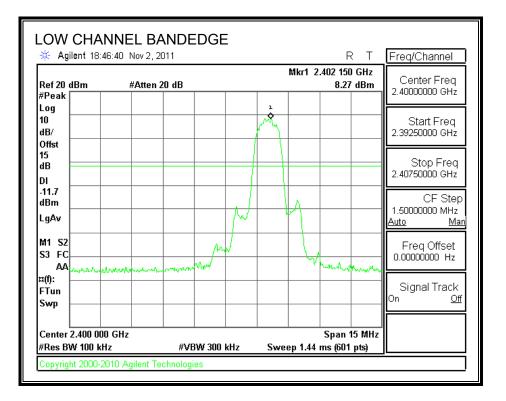
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

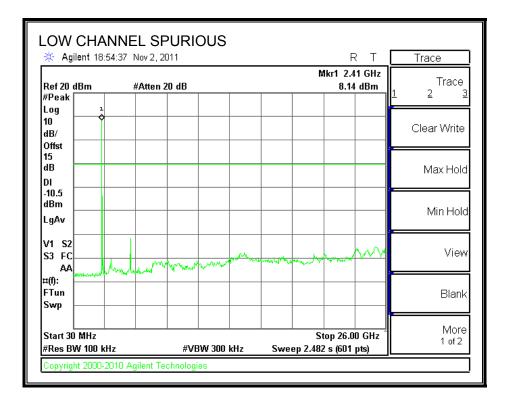
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SPURIOUS EMISSIONS, LOW CHANNEL



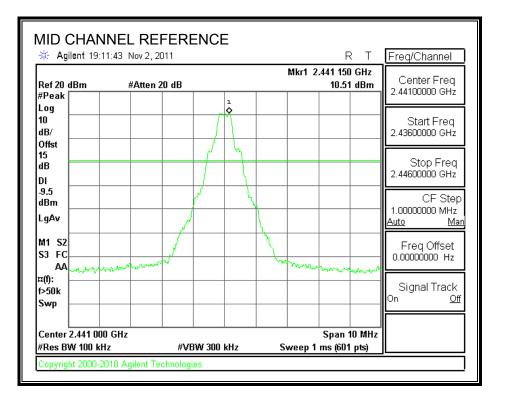
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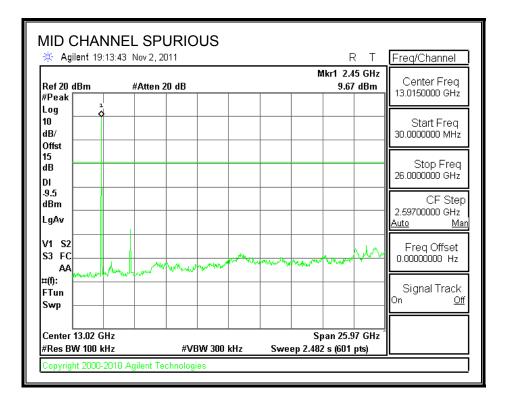
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SPURIOUS EMISSIONS, MID CHANNEL



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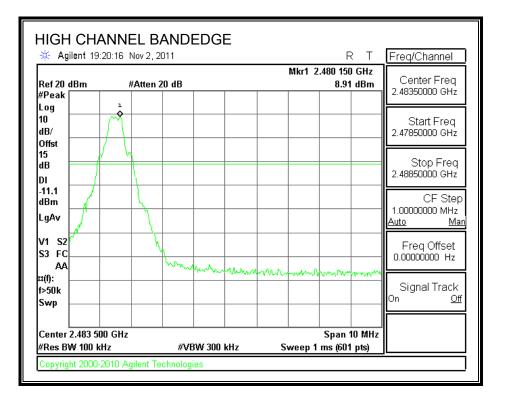
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SPURIOUS EMISSIONS, HIGH CHANNEL



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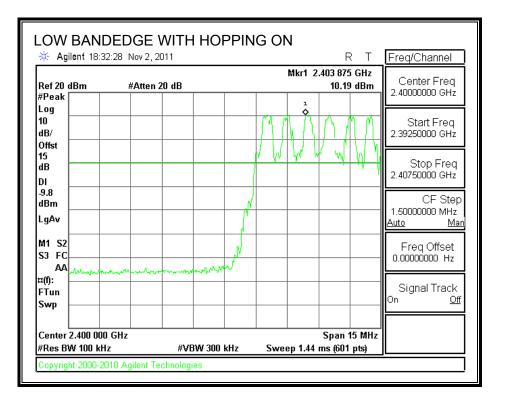
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🔆 Agilent 19:25	51 Nov 2, 2011		R T Freq/Channe)
Ref 20 dBm #Peak	#Atten 20 dB	Mkr1 2. 8.5	.50 GHz i2 dBm Center Fre 13.0150000 GH	
Log 1 10 dB/			Start Fre 30.0000000 M	
Offst 15 dB DI			Stop Fre	
-11.1 dBm			CF S 2.59700000 Gi	Ηz
V1 S2	man mar an and	atter the and the second of th		<u>Mai</u> et Iz
¤(f): FTun Swp	and the second s		Signal Tra	ck <u>Off</u>
Start 30 MHz #Res BW 100 kHz	#VBW 300	Stop 26. kHz Sweep 2.482 s (601		

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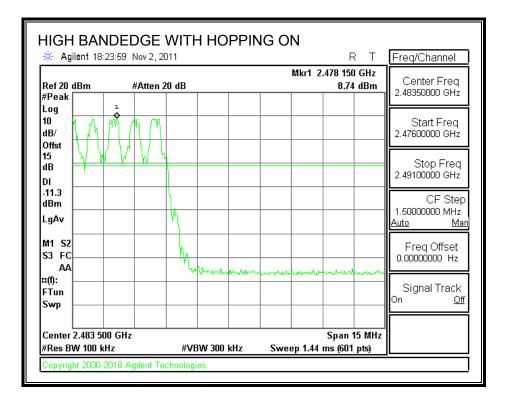
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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB 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.

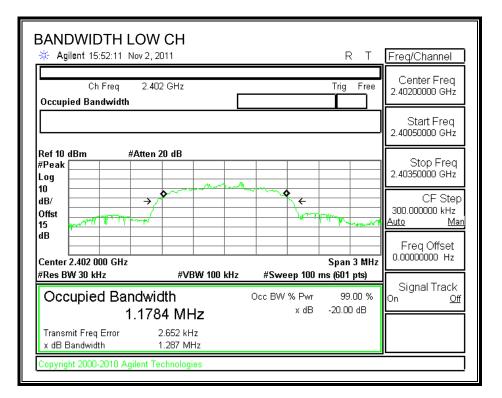
RESULTS

Channel	Frequency	20 dB Bandwidth
	(MHz)	(MHz)
Low	2402	1.287
Middle	2441	1.29
High	2480	1.301

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20 dB BANDWIDTH

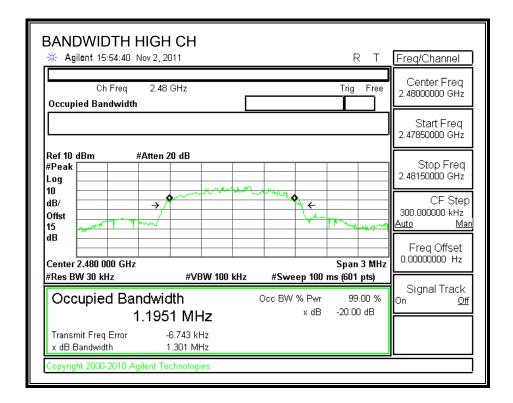


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BANDWIDTH MID C			RТ	Freq/Channel
Ch Freq 2.441 Occupied Bandwidth	GHz		Trig Free	Center Freq 2.44100000 GHz
				Start Freq 2.43950000 GHz
dB/ Offst 15 dB Center 2.441 000 GHz			Span 3 MHz	Stop Freq 2.44250000 GHz CF Step 300.000000 kHz <u>Auto Man</u> Freq Offset 0.00000000 Hz
#Res BW 30 kHz Occupied Bandwidt	#VBW 100 kHz	#Sweep 100 r		Signal Track On Off
1.1758 Transmit Freq Error 4.0		x dB		
Copyright 2000-2010 Agilent Tecl	nnologies			

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7.2.2. HOPPING FREQUENCY SEPARATION

<u>LIMIT</u>

FCC §15.247 (a) (1)

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.

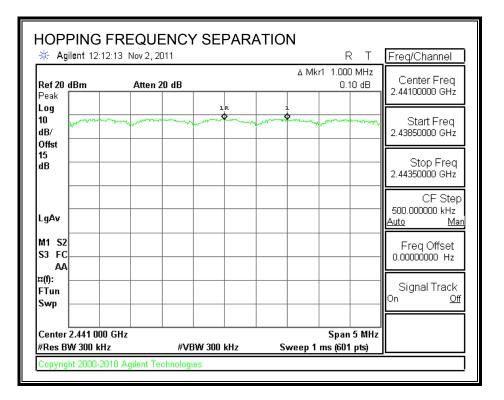
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

<u>RESULTS</u>

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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)

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

TEST PROCEDURE

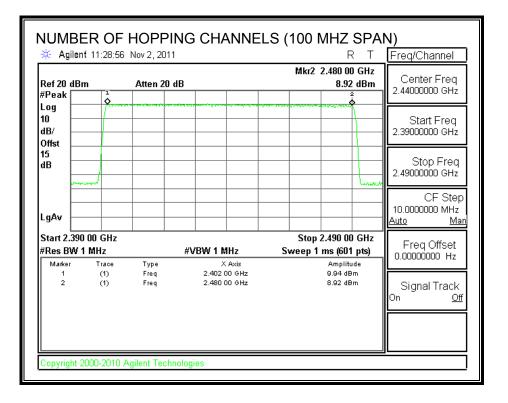
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

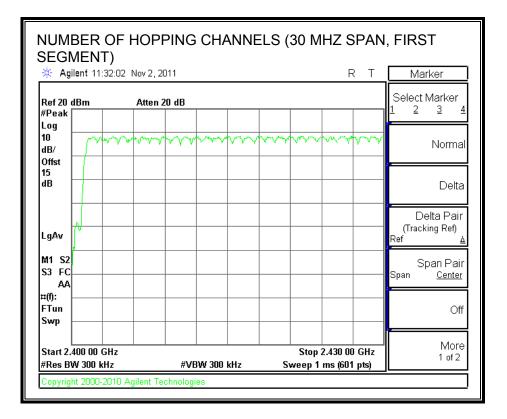
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NUMBER OF HOPPING CHANNELS

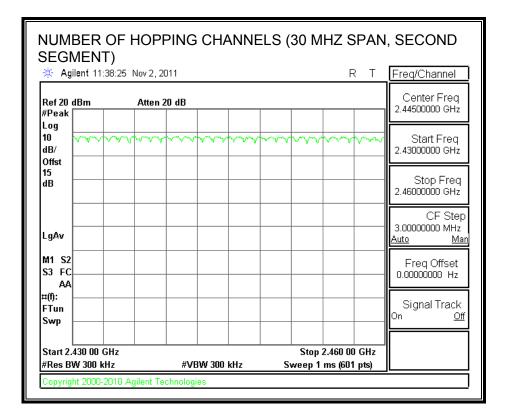


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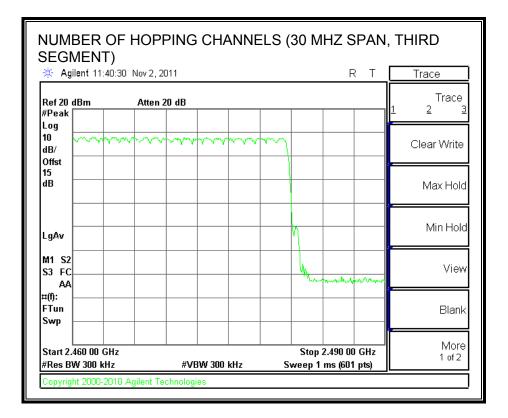
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7.2.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

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.

<u>RESULTS</u>

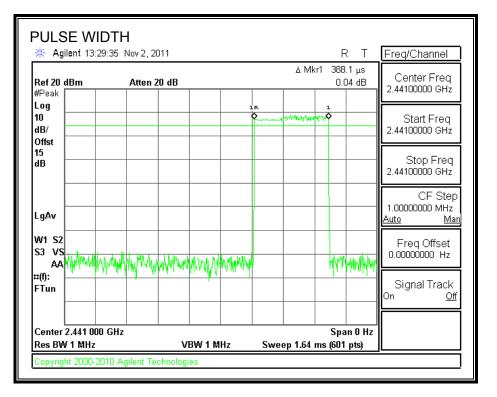
Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

DH Packet	Pulse	Number of	Average	Limit	Margin
	Width	Pulses in	Time of		
	(msec)	3.16	(sec)	(sec)	(sec)
		seconds			
DH1	0.3881	31	0.120	0.4	-0.280
DH3	1.635	17	0.278	0.4	-0.122
DH5	2.9	10	0.290	0.4	-0.110

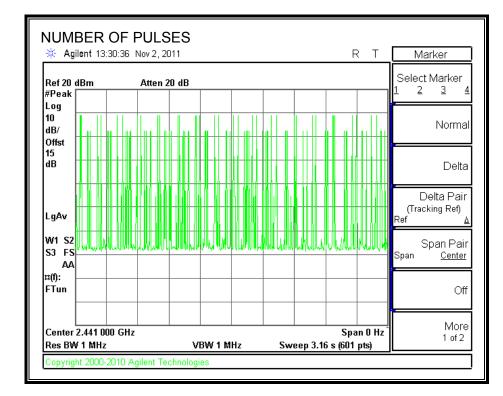
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<u>DH1</u>

PULSE WIDTH



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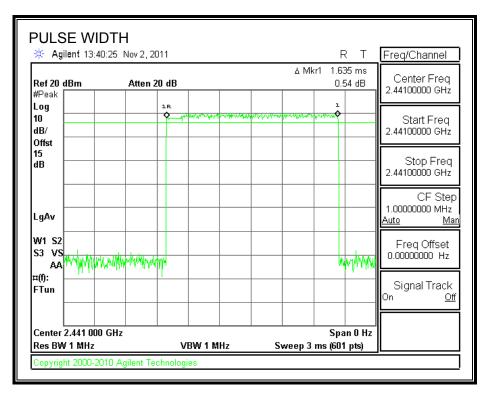
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

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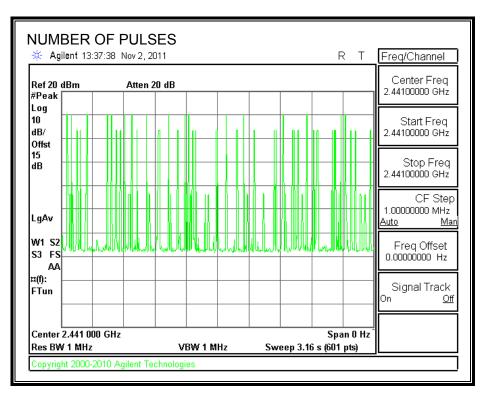
DH3

PULSE WIDTH



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NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

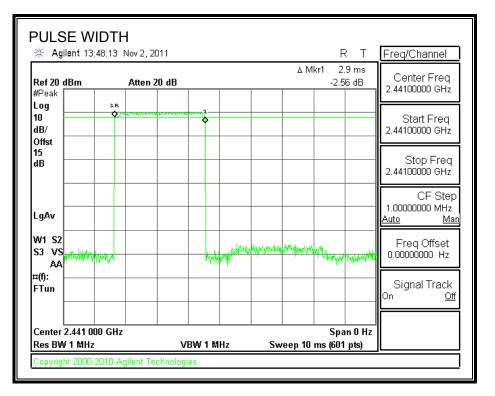


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<u>DH5</u>

PULSE WIDTH



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1 of 2

NUMBER OF PULSES 🔆 Agilent 13:49:40 Nov 2, 2011 R T Marker Select Marker Ref 20 dBm Atten 20 dB 2 3 #Peak 4 Log 10 Normal dB/ Offst 15 dB Delta Delta Pair (Tracking Ref) LgAv Ref W1 S2 Span Pair S3 VS Span Center AA ¤(f): FTun Off More Center 2.441 000 GHz Span 0 Hz

VBW 1 MHz

Sweep 3.16 s (601 pts)

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

Res BW 1 MHz

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7.2.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

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

TEST PROCEDURE

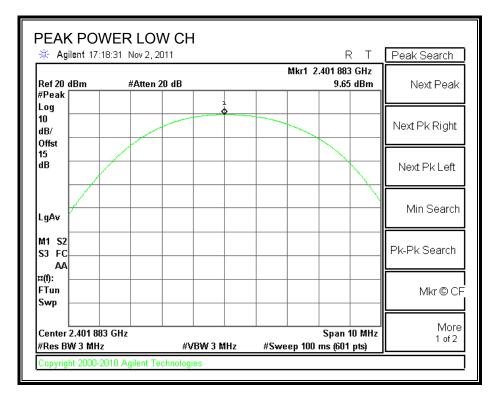
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

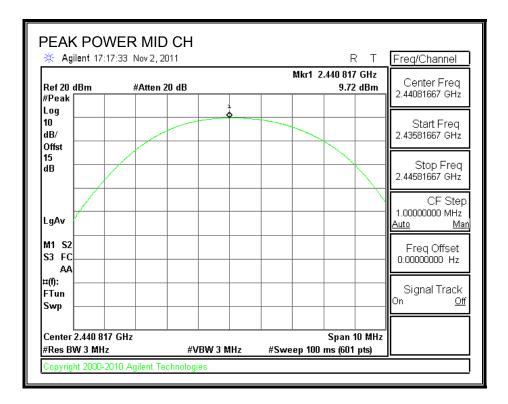
Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	9.65	30	-20.35
Middle	2441	9.72	30	-20.28
High	2480	9.08	30	-20.92

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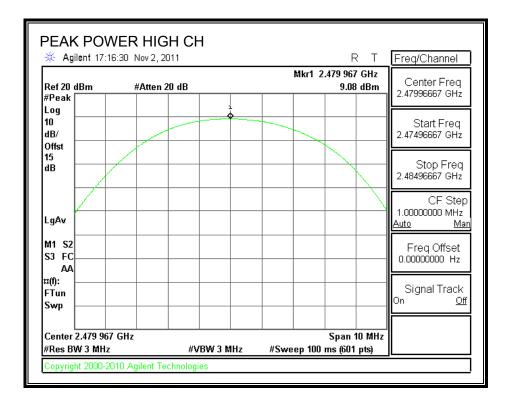
OUTPUT POWER



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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 10.4 dB (including 10 dB pad and 0.4 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	6.80
Middle	2441	6.90
High	2480	6.90

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7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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.

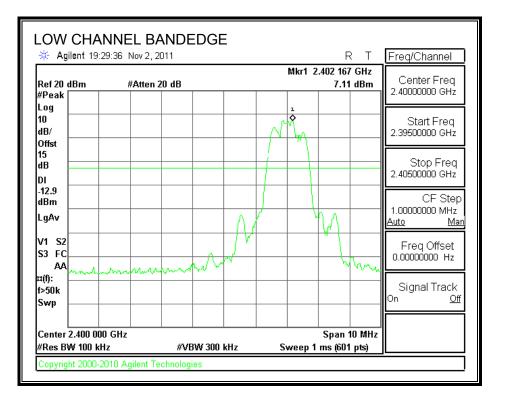
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

RESULTS

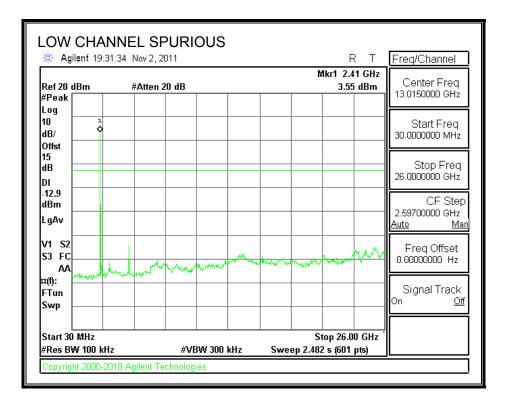
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SPURIOUS EMISSIONS, LOW CHANNEL



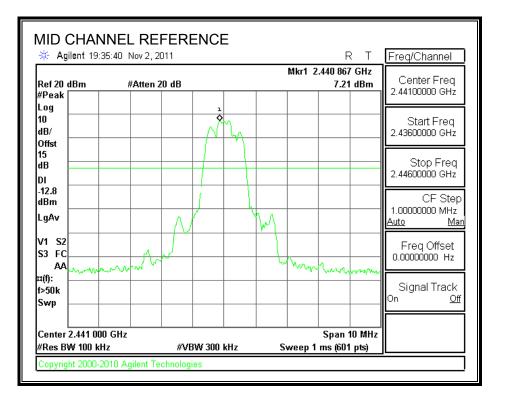
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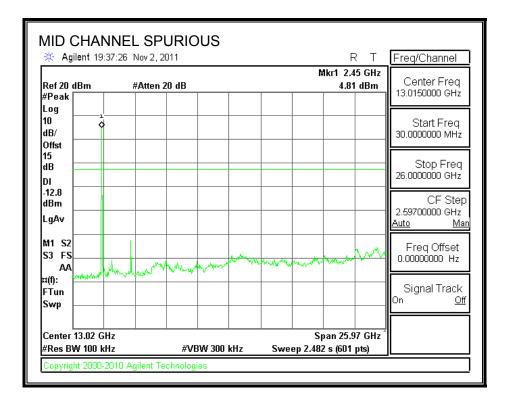
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SPURIOUS EMISSIONS, MID CHANNEL



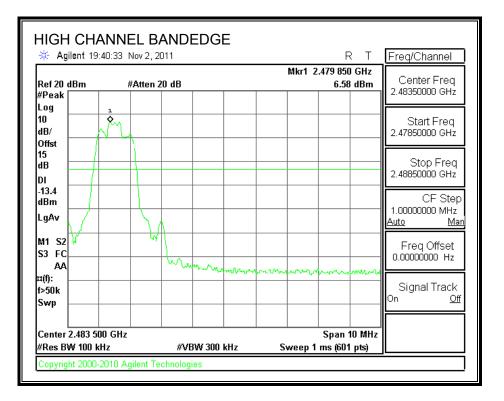
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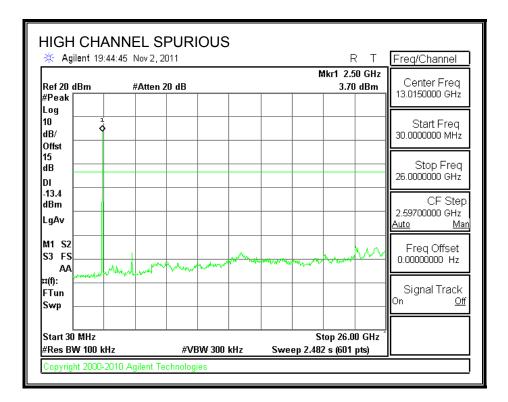


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SPURIOUS EMISSIONS, HIGH CHANNEL

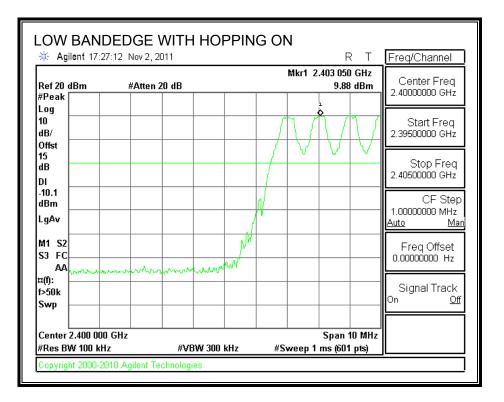


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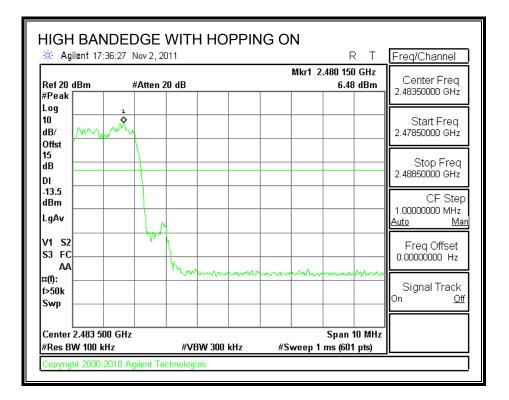


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SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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 17:40:0	00101,2011			R T	Freq/Channel
f 110 dBµ∨ eak	#Atten 0 dB		Mkr1 2.332 6 56.28	o/GHz IdBµ∨	Center Fred 2.3500000 GH
g					Start Fred 2.31000000 GH
fst					Stop Fre 2.39000000 GH
.0 µ∨ ^A w	r And a second s	anna ann ann ann ann ann ann ann ann an	Month Month Marine	and make the second	CF Sto 8.00000000 MH <u>Auto N</u>
V2 FC					Freq Offse 0.00000000 H:
): un /p					Signal Trac On !
art 2.310 00 GHz es BW 1 MHz		W 1 MHz	Stop 2.390 C Sweep 1 ms (60		

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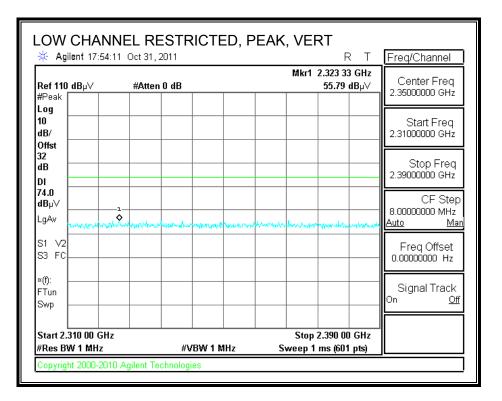
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#Atten 0 dB	Mkr1 2.33	160 GHz	
	43.	10 dBµ∨	Center Freq 2.35000000 GHz
			Start Freq 2.31000000 GHz
			Stop Freq
			2.3900000 GHz
			CF Step 8.0000000 MHz
			Auto Mar
			Freq Offset 0.00000000 Hz
			Signal Track On <u>Off</u>
	Stop 2.390	1 00 GHz	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



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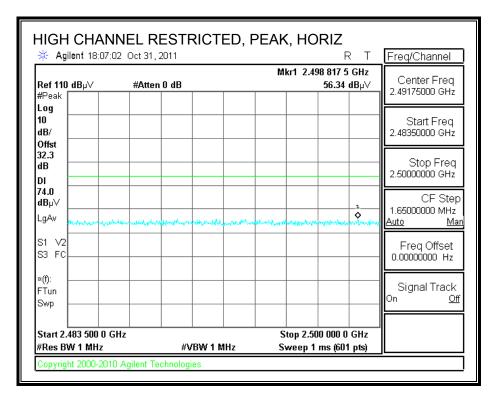
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🔆 Agilent 17:55:2	21 Oct 31, 2011			RT	Freq/Channel
Ref 110 dB µ∨ #Peak	#Atten 0 dB		Mkr1	2.330 80 GHz 43.11 dBµ∨	Center Freq 2.35000000 GHz
Log 10 dB/					Start Freq
Offst 32 dB					Stop Freq
DI					2.39000000 GHz CF Step
dBµ∨ LgAv					8.00000000 MHz <u>Auto Mar</u>
S1 V2 S3 FC					Freq Offset 0.00000000 Hz
»(f): FTun					Signal Track
Swp Start 2.310 00 GHz			E	2 200 00 CU	
#Res BW 1 MHz		#VBW 10 Hz	Sweep 6.23	2.390 00 GHz 8 s (601 nts)	

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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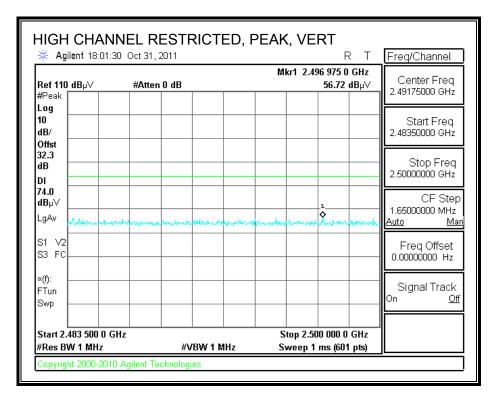
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🔆 Agilent 18:07	:45 Oct 31, 2011			RT	Freq/Channel
Ref 110 dB µ∨ #Peak □	#Atten 0 dB		Mkr1 2.49	5 655 0 GHz 43.72 dBµ∀	Center Freq 2.49175000 GHz
#Peak Log					
10 dB/					Start Freq 2.48350000 GHz
Offst 32.3 dB					Stop Freq
DI					2.5000000 GHz
54.0 dBµ∨					CF Step 1.6500000 MHz
LgAv					Auto Man
S1 V2			1 (Freq Offset
*(f):					
FTun Swp					Signal Track On <u>Off</u>
Start 2.483 500 0 #Res BW 1 MHz		VBW 10 Hz	Stop 2.500 Sweep 1.287) 000 0 GHz	

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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	:27 Oct 31, 2011	R	i regranamen
Ref 110 dB µ∨ #Peak □	#Atten 0 dB	Mkr1 2.496 975 0 (43.75 d	Contor Frod
Log			
10 dB/			Start Freq 2.48350000 GHz
Offst 32.3 dB			Stop Freq
DI			2.5000000 GHz
54.0 dBµ∨			CF Step
LgAv			Auto Mar
S1 V2 S3 FC		 1 Ø	Freq Offset 0.00000000 Hz
×(f):			
FTun Swp			Signal Track On <u>Off</u>
Start 2.483 500 0	CH-2	Stop 2.500 000 0 (SH2

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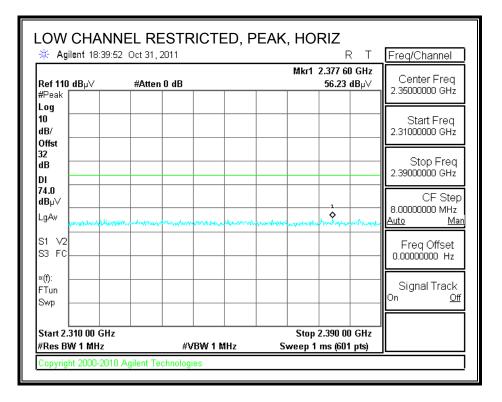
HARMONICS AND SPURIOUS EMISSIONS

Test Engr	:	Oliver S	u										
Date:		11/01/11											
Project #:	oject #: 11U14124												
Company: LG													
Test Targ		FCC 15.	209										
Mode Op		EUT +AC		apter	+ Earph	one: BT.	GFSK	Mode					
				•		, ,							
	f	Measuren			•	Preamp				-	Field Stren	-	
	Dist	Distance						et to 3 me			ld Strength		
	Read	Analyzer	-		Avg	-		trength @		0	/s. Average		
	AF	Antenna			Peak			Field Stro	ength	Margin v	/s. Peak Lii	mit	
	CL	Cable Los	88		HPF	High Pas	s Filter						
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	-	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB	aBu V/m	dBuV/m	dB	V/H	P/A/QP	
Low Ch, 2			22.1	50	24.0	0.0	0.0	41.4	74.0	22.6	п	P	
4.804 4.804	3.0	37.3	33.1 33.1	5.8 5.8	-34.8 -34.8	0.0	0.0	41.4 29.1	74.0 54.0	-32.6	H H	P A	
4.804 12.010	3.0	33.8	39.4	5.8 9.7	-34.8	0.0	0.0	50.5	<u> </u>	-24.9	H H	A P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-23.3	H	A	
4.804	3.0	39.4	33.1	5.8	-34.8	0.0	0.0	43.4	74.0	-30.6	V	P	
4.804	3.0	28.5	33.1	5.8	-34.8	0.0	0.0	32.5	54.0	-21.5	v	A	
12.010	3.0	33.5	39.4	9.7	-32.5	0.0	0.0	50.1	74.0	-23.9	V	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	V	A	
Mid Ch, 2	441MH	z											
4.882	3.0	36.2	33.2	5.8	-34.8	0.0	0.0	40.4	74.0	-33.6	Н	Р	
4.882	3.0	23.9	33.2	5.8	-34.8	0.0	0.0	28.1	54.0	-25.9	H	A	
7.323	3.0	35.3	36.3	7.3	-34.1	0.0	0.0	44.8	74.0	-29.2	H	Р	
7.323	3.0	22.9	36.3	7.3	-34.1	0.0	0.0	32.4	54.0	-21.6	H	A	
12.205	3.0	33.2	39.4	9.8	-32.5	0.0	0.0	49.9	74.0	-24.1	H	P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.8	54.0	-16.2	H	A	
4.882	3.0	37.4	33.2	5.8	-34.8	0.0	0.0	41.6	74.0	-32.4	V	P	
4.882	3.0	24.0 35.2	33.2 36.3	5.8 7.3	-34.8	0.0	0.0	28.2	54.0 74.0	-25.8 -29.3	V V	A P	
7.323 7.323	3.0	23.0	36.3	7.3	-34.1	0.0	0.0	32.5	74.0 54.0	-29.3	V V	A P	
12.205	3.0	33.8	39.4	9.8	-34.1	0.0	0.0	50.5	74.0	-21.5	V	A P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.9	54.0	-23.3	V	A	
High Ch,			2217	2.10					- 110				
4.960	3.0	36.4	33.2	5.9	-34.8	0.0	0.0	40.7	74.0	-33.3	Н	Р	
4.960	3.0	23.9	33.2	5.9	-34.8	0.0	0.0	28.2	54.0	-25.8	Н	A	
7.440	3.0	34.9	36.5	7.3	-34.1	0.0	0.0	44.6	74.0	-29.4	Н	Р	
7.440	3.0	22.9	36.5	7.3	-34.1	0.0	0.0	32.7	54.0	-21.3	Н	A	
12.400	3.0	32.8	39.4	9.9	-32.5	0.0	0.0	49.7	74.0	-24.3	H	Р	
12.400	3.0	20.7	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	H	A	
4.960	3.0	36.2	33.2	5.9	-34.8	0.0	0.0	40.5	74.0	-33.5	V	Р	
4.960	3.0	23.8	33.2	5.9	-34.8	0.0	0.0	28.1	54.0	-25.9	V	A	
7.440	3.0	35.6	36.5	7.3	-34.1	0.0	0.0	45.3	74.0	-28.7	V	P	
7.440	3.0	22.8	36.5	7.3	-34.1	0.0	0.0	32.6	54.0	-21.4	V	A	
12.400	3.0	32.8	39.4	9.9 9.9	-32.5	0.0	0.0	49.7	74.0	-24.3	V V	P A	
12.400		20.8	39.4	7.9	-32.5	0.0	0.0	37.6	54.0	-16.4	v	A	

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8.2.1. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



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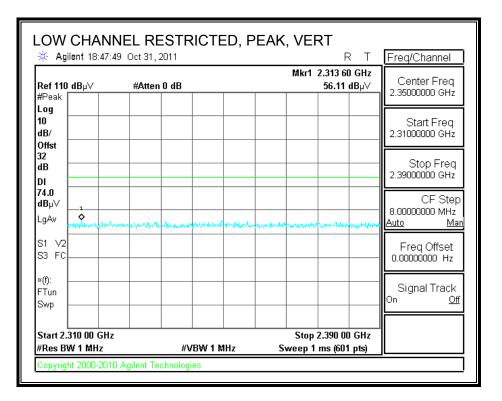
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🔆 Agilent 18:40:4	47 OCL31, ZUTT	R T	Freq/Channel
Ref 110 dB µ∨ #Peak	#Atten 0 dB	Mkr1 2.331 73 GHz 43.12 dBµ∀	Center Freq 2.35000000 GHz
Log			
10 dB/			Start Freq 2.31000000 GHz
Offst 32			Stop Freq
dB DI			2.39000000 GHz
54.0 dBµ∀			CF Step
LgAv			8.00000000 MHz <u>Auto Man</u>
S1 V2 S3 FC	1 (Freq Offset 0.00000000 Hz
×(f):			
FTun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz		Stop 2.390 00 GHz	_
#Res BW 1 MHz	#VBW 10 I	•	

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RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



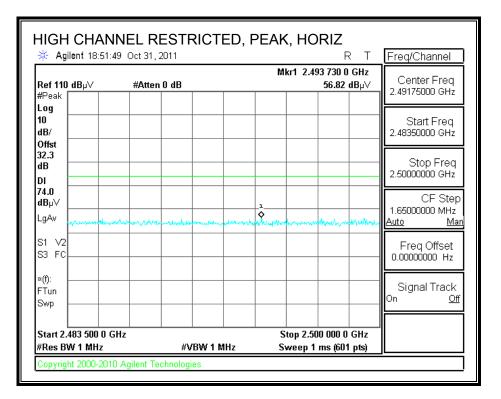
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🔆 Agilent 18:48:3	37 Oct 31, 2011	R T	Freq/Channel
Ref 110 dBµ∨ #Peak	#Atten 0 dB	Mkr1 2.340 93 GHz 43.14 dBµ∀	Center Freq 2.35000000 GHz
Log			
10 dB/			Start Freq 2.31000000 GHz
Offst 32 dB			Stop Freq
DI			2.39000000 GHz
54.0 dBµ∨			CF Step
LgAv			8.00000000 MHz <u>Auto Man</u>
S1 V2			Freq Offset
S3 FC			0.00000000 Hz
×(f):			
FTun Swp			Signal Track On <u>Off</u>
Start 2.310 00 GHz		Stop 2.390 00 GHz	7
#Res BW 1 MHz	#VBW 10 Hz	: Sweep 6.238 s (601 pts)	

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RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



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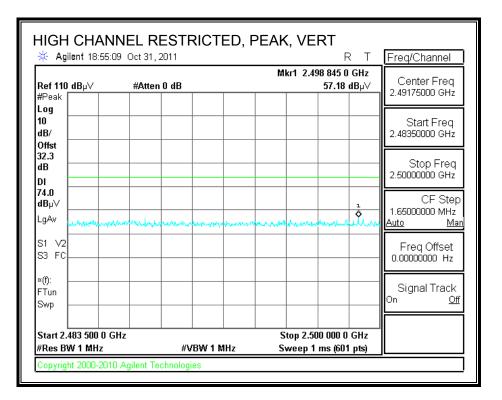
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🔆 Agilent 18:52:	20 00031,2011			R T	Freq/Channel
Ref 110 dB µ∨ #Peak	#Atten 0 dB		Mkr1 2.	487 625 0 GHz 43.72 dBµ∨	Center Freq 2.49175000 GHz
Log					
10 dB/					Start Freq 2.48350000 GHz
Offst 32.3 dB					Stop Freq
DI					2.5000000 GHz
54.0 dBµ∨					CF Step
LgAv					Auto Mar
S1 V2	1 •				Freq Offset
					0.00000000 112
×(f): FTun Swp					Signal Track
owb					
Start 2.483 500 0 (GHz		Stop 2.5	500 000 0 GHz	Ļ
Start 2.483 500 0 (#Res BW 1 MHz		VBW 10 Hz	•	500 000 0 GHz 87 s (601 pts)	^

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RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



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🔆 Agilent 18:55:	50 OCL31,2011			RT	Freq/Channel
Ref 110 dB µ∨ #Peak □	#Atten 0 dB		Mkr1 2.492 5	547 5 GHz 3.72 dBµ∨	Center Freq 2.49175000 GHz
Log					
10 dB/					Start Freq 2.48350000 GHz
Offst 32.3 dB					Stop Freq
DI					2.5000000 GHz
54.0 dBµ∀					CF Step 1.6500000 MHz
LgAv					Auto Mar
S1 V2					Freq Offset
S3 FC					0.00000000 Hz
»(f):					
FTun Swp					Signal Track On <u>Off</u>
Start 2.483 500 0 G	GHz		Stop 2.500 ()00 0 GHz	
#Res BW 1 MHz		#VBW 10 Hz	Sweep 1.287 s	(601 pts)	

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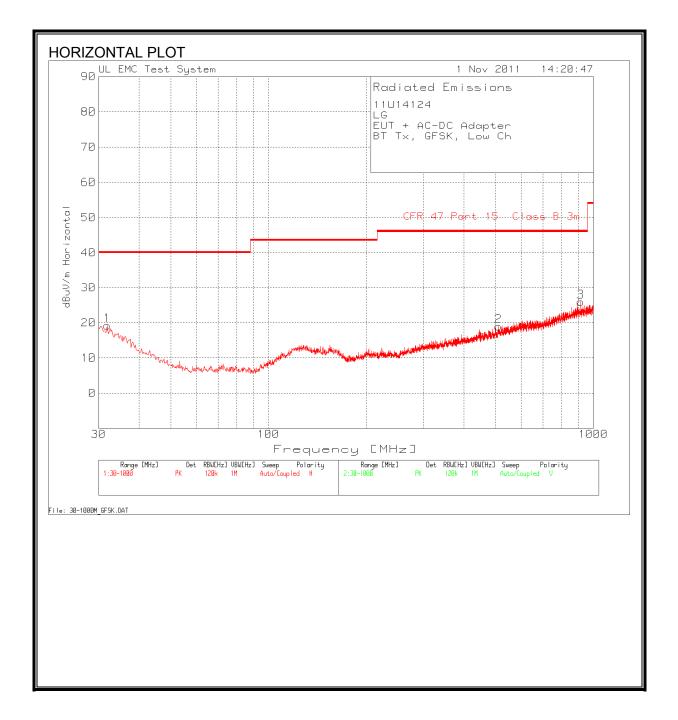
HARMONICS AND SPURIOUS EMISSIONS

Compliar				., .									
Test Engr	:		Oliver Su										
Date:		10/31/11											
Project #: Company		11U1412 LG	4										
Test Targ		FCC 15.2	209										
Mode Op		EUT +AC		anter	+ Farnh	one• BT	8PSK	Mode					
nioue o p		Lei me	De nu	upter	, mi bu	one, <i>D</i> 1,	01.011	induc					
	f	Measurem			•	Preamp 0					Field Stren	0	
	Dist	Distance		na	D Corr	Distance					ld Strength		
	Read	Analyzer			Avg			trength @		-	/s. Average		
	AF	Antenna			Peak			Field Stre	ength	Margin	s. Peak Li	mit	
	CL	Cable Los	ss		HPF	High Pas	s Filter						
f	Dist	Read	AF	CL	Amp	D Corr	Fltr	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
GHz	(m)	dBuV	dB/m	dB	dB	dB	dB		dBuV/m	dB	V/H	P/A/QP	
Low Ch, 2	2402MH	Z											
4.804	3.0	37.6	33.1	5.8	-34.8	0.0	0.0	41.7	74.0	-32.3	V	Р	
4.804	3.0	25.4	33.1	5.8	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	
12.010	3.0	33.4	39.4	9.7	-32.5	0.0	0.0	50.0	74.0	-24.0	V	P	
12.010 4.804	3.0	20.9 36.9	39.4 33.1	9.7 5.8	-32.5 -34.8	0.0	0.0	37.5 41.0	54.0 74.0	-16.5 -33.0	V H	A P	
4.804	3.0	24.3	33.1	5.8	-34.8	0.0	0.0	28.4	54.0	-35.0	н Н	A A	
12.010	3.0	33.0	39.4	9.7	-32.5	0.0	0.0	49.6	74.0	-24.4	H	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	Н	A	
Mid Ch, 2													
4.882	3.0	36.6	33.2	5.8	-34.8	0.0	0.0	40.8	74.0	-33.2	H	P	
4.882	3.0	24.3	33.2	5.8	-34.8	0.0	0.0	28.4	54.0	-25.6	H	A P	
7.323 7.323	3.0	35.0 23.0	36.3 36.3	7.3	-34.1 -34.1	0.0	0.0	44.5 32.5	74.0 54.0	-29.5 -21.5	H H	P A	
12.205	3.0	33.4	39.4	9.8	-32.5	0.0	0.0	50.2	74.0	-21.3	H	P A	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.9	54.0	-16.1	Н	A	··· ·· ·· ·· ·· ·· ·· ··
4.882	3.0	36.9	33.2	5.8	-34.8	0.0	0.0	41.1	74.0	-32.9	V	Р	
4.882	3.0	24.2	33.2	5.8	-34.8	0.0	0.0	28.4	54.0	-25.6	V	A	
7.323	3.0	35.9	36.3	7.3	-34.1	0.0	0.0	45.4	74.0	-28.6	V	P	
7.323	3.0	22.9 33.6	36.3 39.4	7.3 9.8	-34.1 -32.5	0.0	0.0	32.4 50.3	54.0 74.0	-21.6 -23.7	V V	A P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	30.3	54.0	-16.1	V	A	
High Ch,													
4.960	3.0	35.7	33.2	5.9	-34.8	0.0	0.0	40.0	74.0	-34.0	Н	Р	
4.960	3.0	23.8	33.2	5.9	-34.8	0.0	0.0	28.1	54.0	-25.9	H	A	
7.440	3.0	35.4	36.5	7.3	-34.1	0.0	0.0	45.2	74.0	-28.8	H	P	
7.440	3.0	22.9	36.5 39.4	7.3 9.9	-34.1 -32.5	0.0	0.0	32.6 49.7	54.0	-21.4	H H	A P	
12.400 12.400	3.0	32.9 20.7	<u>39.4</u> 39.4	9.9 9.9	-32.5	0.0	0.0	<u>49.7</u> 37.6	74.0 54.0	-24.3 -16.4	H H	P A	
4.960	3.0	35.8	33.2	5.9	-34.8	0.0	0.0	40.1	74.0	-33.9	V	P A	
4.960	3.0	24.1	33.2	5.9	-34.8	0.0	0.0	28.5	54.0	-25.5	V	A	
7.440	3.0	35.7	36.5	7.3	-34.1	0.0	0.0	45.5	74.0	-28.5	V	Р	
7.440	3.0	22.9	36.5	7.3	-34.1	0.0	0.0	32.6	54.0	-21.4	V	A	
12.400	3.0	32.7	39.4	9.9	-32.5	0.0	0.0	49.6	74.0	-24.4	V	P	
12.400	3.0	20.7	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	V	A	

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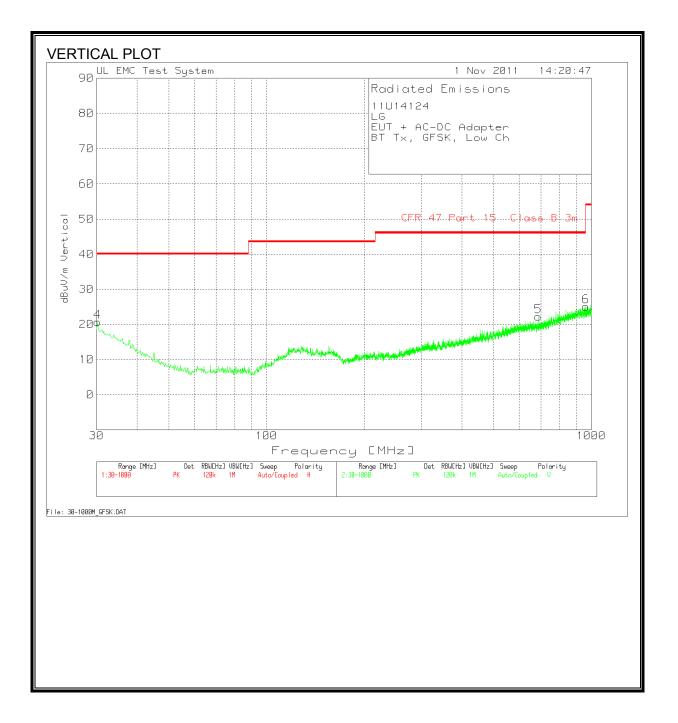
8.3. WORST-CASE BELOW 1 GHz

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



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



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HORIZONTAL AND VERTICAL DATA

11U14124										
LG										
EUT + AC-DO	C Adapter									
BT Tx, GFSK										
	,									
Horizontal										
30 -										
1000MHz										
				3m T15	3m Bilog					
			3m below	PreAmp	T185		CFR 47			
			1GHz	below.	below		Part 15			
Test	Meter		Cable.TXT	1GHz.TXT	1GHz.TXT		Class B		Height	
Frequency	Reading	Detector	[dB]	[dB]	[dB]	dBuV/m	3m	Margin	[cm]	Polarity
31.9384	27.93	РК	0.6	-28.3	19	19.23	40	-20.77	176	Horz
510.1539	28.22	РК	2.3	-28.5	17	19.02	46	-26.98	251	Horz
914.3205	28.15	РК	3.2	-27.6	22.2	25.95	46	-20.05	99	Horz
V + : 20										
Vertical 30										
1000MHz				2	2					
			2	3m T15	3m Bilog		CED 47			
			3m below	PreAmp	T185		CFR 47			
Test			1GHz	below	below		Part 15		11-1-1-1-4	
Test -	Meter	.	Cable.TXT	1GHz.TXT			Class B		Height	
Frequency	Reading	Detector	[dB]	[dB]	[dB]	dBuV/m	3m	Margin	[cm]	Polarity
30.1938	28.49	PK	0.6	-28.3	19.9	20.69	40	-19.31	176	Vert
687.1343	28.94	PK	2.7	-28.4	18.9	22.14	46	-23.86	101	Vert
962.0064	26.85	РК	3.2	-27.5	22.5	25.05	54	-28.95	176	Vert
PK - Peak de	etector									
QP - Quasi-F	Peak deteo	tor								
LnAv - Linea	ir Average	detector								
LgAv - Log A	verage de	tector								
Av - Averag	e detector	•								
CAV - CISPR	Average of	detector								
RMS - RMS c	detection									
CRMS - CISP	R RMS det	ection								
Text File: 30	-1000M_1	1U14124LG	.TXT							
File: 30-1000										

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted I	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.

<u>RESULTS</u>

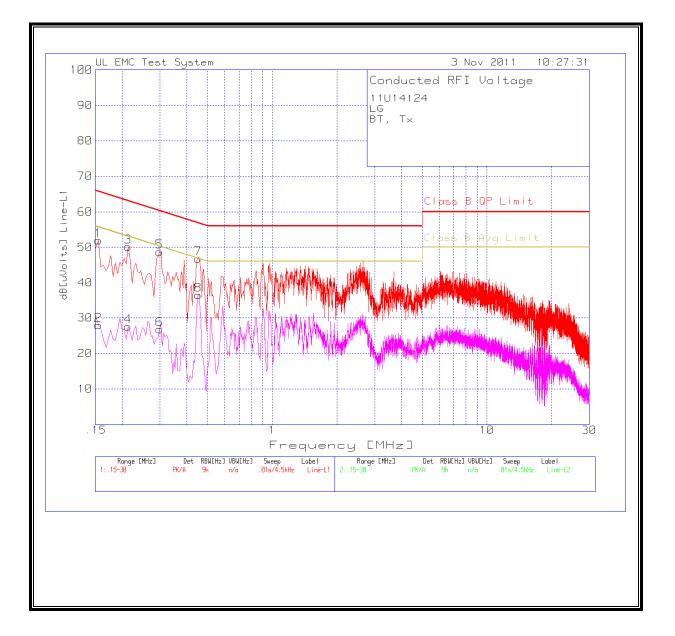
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<u>6 WORST EMISSIONS</u>

11U14124									
LG									
BT, Tx									
Line-L1 .15									
30MHz									
				Conducted					
Test	Meter			Emission		Class B		Class B	
Frequency	Reading	Detector	LISN [dB]	Cable [dB]	dB[uVolts]	QP Limit	Margin	Avg Limit	Margin
0.1545	51.94	PK	0	0	51.94	65.8	-13.86	55.8	-
0.1545	27.92	Av	0	0	27.92	65.8	-37.88	55.8	-27.88
0.213	50.13	PK	0	0	50.13	63.1	-12.97	53.1	-
0.213	27.59	Av	0	0	27.59	63.1	-35.51	53.1	-25.51
0.2985	48.7	PK	0	0	48.7	60.3	-11.6	50.3	-
0.2985	26.8	Av	0	0	26.8	60.3	-33.5	50.3	-23.5
0.4515	46.85	PK	0	0	46.85	56.8	-9.95	46.8	-
0.4515	36.45	Av	0	0	36.45	56.8	-20.35	46.8	-10.35
Line-L2 .15									
30MHz									
0.1545	47.66	PK	0	0	47.66	65.8	-18.14	55.8	-
0.1545	28.22	Av	0	0	28.22	65.8	-37.58	55.8	-27.58
0.177	46.3	PK	0	0	46.3	64.6	-18.3	54.6	-
0.177	25.03	Av	0	0	25.03	64.6	-39.57	54.6	-29.57
0.4515	45.12	PK	0	0	45.12	56.8	-11.68	46.8	-
0.4515	32.06	Av	0	0	32.06	56.8	-24.74	46.8	-14.74
PK - Peak d									
QP - Quasi-									
LnAv - Linea	-								
LgAv - Log A	-	ector							
Av - Average									
CAV - CISPR Average detector									
RMS - RMS									
CRMS - CIS									
Text File: LC	Line-L1.T	хт							

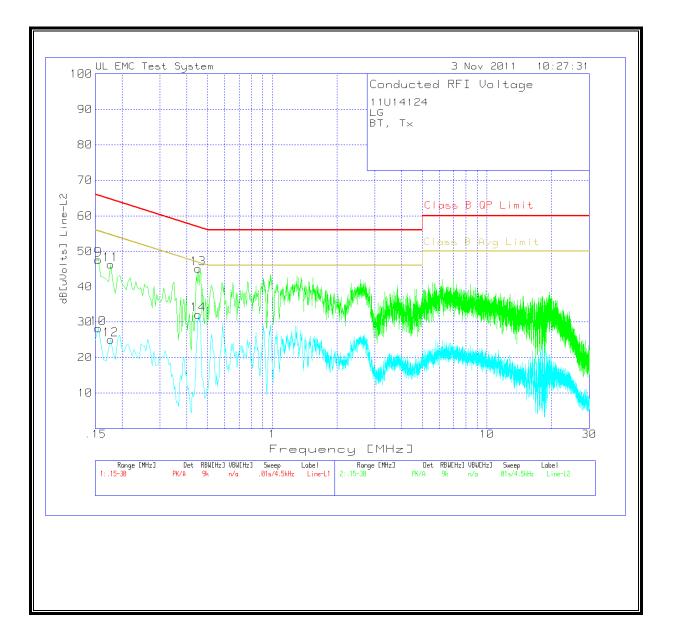
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LINE 1 RESULTS



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LINE 2 RESULTS



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10. 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 Magnetic field strength strength (V/m) (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 1500–100,000	27.5	0.073	0.2 f/1500 1.0	30 30 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.

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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 ²)	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> ^{0.5}	0.0042f ^{0.5}	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 ^{1.2}
150 000–300 000	0.158f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616 000 /f ^{1.2}

* 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^2 is equivalent to 1 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/m² EIRP = Equivalent Isotropic Radiated Power in W D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m EIRP = Equivalent Isotropic Radiated Power in W S = Power density in W/m²

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x Gx = Numeric gain of antenna x

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/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

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RESULTS

(MPE distance equals 20 cm)

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	10.73	-1.69	0.02	0.002

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