

### FCC CFR47 PART 15 SUBPART C

### **CERTIFICATION TEST REPORT**

FOR

### TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC

MODEL NUMBER: LG870, LG-LG870, LGLG870

FCC ID: ZNFLG870

REPORT NUMBER: 13U14917-3

**ISSUE DATE: APRIL 5, 2013** 

Prepared for LG ELECTRONICS MOBILECOMM U.S.A., INC. 1000 SYLVAN AVENUE ENGLEWOOD CLIFFS, NEW JERSEY 07632

> 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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Page 2 of 80

# TABLE OF CONTENTS

1.	ATT	ESTATION OF TEST RESULTS	5
2.	TES	ST METHODOLOGY	6
3.	FAC	CILITIES AND ACCREDITATION	6
4.	CAI	LIBRATION AND UNCERTAINTY	6
	4.1.	MEASURING INSTRUMENT CALIBRATION	6
	4.2.	SAMPLE CALCULATION	6
	4.3.	MEASUREMENT UNCERTAINTY	6
5.	EQ	UIPMENT UNDER TEST	7
÷	5.1.	DESCRIPTION OF EUT	7
÷	5.2.	MAXIMUM OUTPUT POWER	7
	5.3.	DESCRIPTION OF AVAILABLE ANTENNAS	7
	5.4.	MODEL DIFFERNECE	7
	5.5.	SOFTWARE AND FIRMWARE	7
	5.6.	WORST-CASE CONFIGURATION AND MODE	8
	5.7.	DESCRIPTION OF TEST SETUP	
6.	TES	ST AND MEASUREMENT EQUIPMENT1	
7.	AN	TENNA PORT TEST RESULTS1	12
••	<b>AN</b> 7.1.	BASIC DATA RATE GFSK MODULATION	12
••	7 <i>.1.</i> 7.1.	BASIC DATA RATE GFSK MODULATION1 1. 20 dB AND 99% BANDWIDTH1	12 12
••	7. <i>1.</i> 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION	12 12 17
••	7 <i>.1.</i> 7.1.	BASIC DATA RATE GFSK MODULATION	12 12 17 19
••	7. <i>1.</i> 7.1. 7.1. 7.1. <mark>7.1.</mark> 7.1.	BASIC DATA RATE GFSK MODULATION	12 12 17 19 22 26
••	7. <i>1.</i> 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION	12 12 17 19 22 26 29
	7. <i>1.</i> 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION.       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3	12 12 17 19 22 26 29 30
	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         ENHANCED DATA RATE 8PSK MODULATION       3	12 12 17 19 22 26 29 30 35
	7. <i>1.</i> 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         ENHANCED DATA RATE 8PSK MODULATION       3         1. 20 dB AND 99% BANDWIDTH       3	12 12 17 19 22 20 30 35 35
	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         8. AVDUCTED SPURIOUS EMISSIONS       3         9. AND 99% BANDWIDTH       3         1. 20 dB AND 99% BANDWIDTH       3         2. HOPPING FREQUENCY SEPARATION       4         3. NUMBER OF HOPPING CHANNELS       4	12 17 19 22 29 30 35 35 40 42
	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.2. 7.2	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         8. AVERAGE DATA RATE 8PSK MODULATION       3         9. HOPPING FREQUENCY SEPARATION       4         4. AVERAGE TIME OF OCCUPANCY       3	12 12 17 19 22 29 30 35 35 40 42 45
	7. 1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.2. 7.2	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         8. AVD BAND 99% BANDWIDTH       3         9. OUTPUNG FREQUENCY SEPARATION       3         9. AVERAGE OF HOPPING CHANNELS       4         4. AVERAGE TIME OF OCCUPANCY       3         6. AVERAGE TIME OF OCCUPANCY       3         7. CONDUCTED SPURIOUS EMISSIONS       3         7. CONDUCTED SPURIOUS EMISSIONS       3         8. AVERAGE TOP OF OCCUPANCY       3         9. HOPPING FREQUENCY SEPARATION       4         4. AVERAGE TIME OF OCCUPANCY       4         5. OUTPUT POWER       4	12 12 17 19 226 29 30 35 35 40 42 45 49
	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.2. 7.2	BASIC DATA RATE GFSK MODULATION       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         8. AVERAGE DATA RATE 8PSK MODULATION       3         9. HOPPING FREQUENCY SEPARATION       3         9. HOPPING FREQUENCY SEPARATION       4         4. AVERAGE TIME OF OCCUPANCY       4         6. AVERAGE POWER       4	12 117 117 122 229 30 35 35 40 42 45 49 52
	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION.       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3 <i>ENHANCED DATA RATE 8PSK MODULATION</i> 3         1. 20 dB AND 99% BANDWIDTH       3         2. HOPPING FREQUENCY SEPARATION       4         3. NUMBER OF HOPPING CHANNELS       4         4. AVERAGE TIME OF OCCUPANCY       4         5. OUTPUT POWER       4         6. AVERAGE POWER       4         6. AVERAGE TIME OF OCCUPANCY       4         6. AVERAGE POWER       4	<i>12</i> 17 19 226 29 35 35 40 42 45 49 55
8.	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1.	BASIC DATA RATE GFSK MODULATION.       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         ENHANCED DATA RATE 8PSK MODULATION       3         1. 20 dB AND 99% BANDWIDTH       3         2. HOPPING FREQUENCY SEPARATION       4         3. NUMBER OF HOPPING CHANNELS       4         4. AVERAGE TIME OF OCCUPANCY       4         5. OUTPUT POWER       4         6. AVERAGE TIME OF OCCUPANCY       4         7. CONDUCTED SPURIOUS EMISSIONS       4         7. CONDUCTED SPURIOUS EMISSIONS       4         7. OUTPUNG FREQUENCY SEPARATION       4         7. OUTPUT POWER       4         6. AVERAGE TIME OF OCCUPANCY       4         7. OUTPUT POWER       4         6. AVERAGE POWER       5         7. CONDUCTED SPURIOUS EMISSIONS       5	<i>12</i> 17 19 229 35 35 40 425 49 523 <b>58</b>
8.	7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.1. 7.2. 7.2	BASIC DATA RATE GFSK MODULATION	<i>12</i> 117 117 117 117 117 119 122 117 119 122 129 130 135 140 145 145 153 158 158
8.	7. 1. 7. 1. 7. 1. 7. 1. 7. 1. 7. 1. 7. 1. 7. 1. 7. 2. 7. 2. 8. 1. 8. 1. 8. 2.	BASIC DATA RATE GFSK MODULATION.       1         1. 20 dB AND 99% BANDWIDTH       1         2. HOPPING FREQUENCY SEPARATION       1         3. NUMBER OF HOPPING CHANNELS       1         4. AVERAGE TIME OF OCCUPANCY       2         5. OUTPUT POWER       2         6. AVERAGE POWER       2         7. CONDUCTED SPURIOUS EMISSIONS       3         ENHANCED DATA RATE 8PSK MODULATION       3         1. 20 dB AND 99% BANDWIDTH       3         2. HOPPING FREQUENCY SEPARATION       4         AVERAGE TIME OF OCCUPANCY       4         5. OUTPUT POWER       3         6. AVERAGE POWER       4         7. CONDUCTED SPURIOUS EMISSIONS       4         6. AVERAGE TIME OF OCCUPANCY       4         7. OUTPUT POWER       4         6. AVERAGE TIME OF OCCUPANCY       4         6. AVERAGE POWER       4         7. CONDUCTED SPURIOUS EMISSIONS       5         DIATED TEST RESULTS       5         LIMITS AND PROCEDURE       5	<i>12</i> <i>12</i> <i>17</i> <i>19</i> <i>26</i> <i>35</i> <i>35</i> <i>42</i> <i>56</i> <i>58</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>58</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i> <i>59</i>

REPORT NO: 13U14917-3	DATE: APRIL 05, 2013
FCC ID: TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC	FCC ID: ZNFLG870
8.2.2. DATA RATE 8PSK MODULATION	64
8.3. WORST-CASE BELOW 1 GHz	69
9. AC POWER LINE CONDUCTED EMISSIONS	72
10. SETUP PHOTOS	76

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Page 4 of 80

## 1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	NY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC. 1000 SYLVAN AVENUE ENGLEWOOD CLIFFS, NEW JERSEY 07632				
<b>EUT DESCRIPTION:</b> TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND M					
MODEL: LG870, LG-LG870, LGLG870					
SERIAL NUMBER: 99000250000211(CONDUCTED) AND 256691464000002149 9RADIATED)					
DATE TESTED:	JANUARY 23-25 AND MARCH 14-25, 2013				
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 PROGRAM MANAGER UL CCS

Tested By:

Stone aguilan

STEVE AGUILAR EMC ENGINEER UL CCS

Page 5 of 80

# 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 Tri-band phone with WLAN, BT and NFC capability manufactured by LG Electronics.

## 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	12.14	16.37
2402 - 2480	Enhanced 8PSK	11.53	14.22

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an PIFA antenna, with a maximum gain of -1.64 dBi.

## 5.4. MODEL DIFFERNECE

All models, LG870, LG-870, and LGLG870, are identical except for model designation.

## 5.5. SOFTWARE AND FIRMWARE

The Baseband version was LGP769AT-00-V08k\_310-260-JUL 9-2012+0. The Kernel version was 3.0.21. The HW version was Rev. 1.0.

The firmware installed in the EUT during testing was Version 4.0.4.

The EUT software version installed during testing LGP769-V08k.

The test utility software used during testing was BT Test.

## 5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed 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 Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation with AC adapter and headset.

Page 8 of 80

### 5.7. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Support Equipment List						
Description Manufacturer Model Serial Number FCC ID						
AC Adapter	LG	MCS-01WR	EAY62768913	NA		
Headset	I-SOUND CO. LTD	HC-MYD-LG113	NA	NA		

#### I/O CABLES

	I/O Cable List						
Cable	Port	# of identical	Connector	Cable Type	<b>Cable Length</b>	Remarks	
No		ports	Туре		(m)		
1	USB	1	Mini-USB	Shielded	1.2m	N/A	
2	Headset	1	Mini-Jack	Unshielded	1m	N/A	

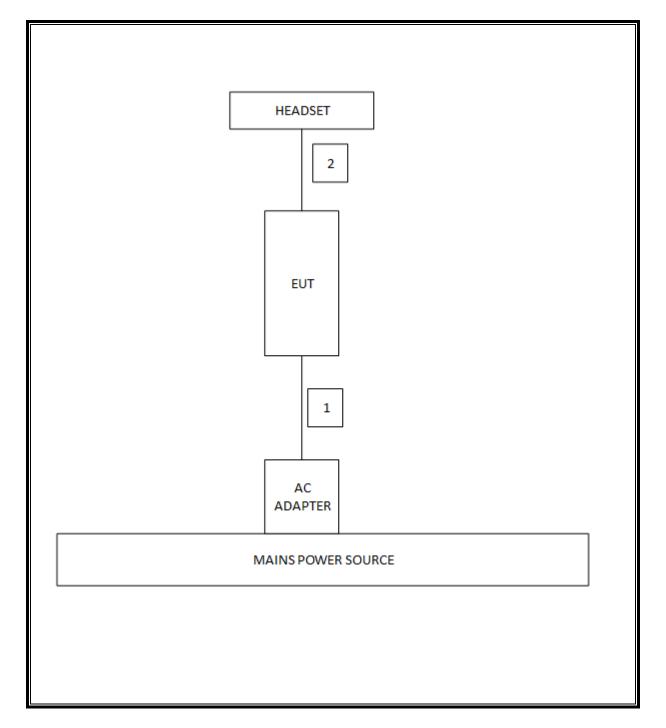
#### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests. EUT was set in the Hidden menu mode to enable BT communications.

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Page 9 of 80

#### SETUP DIAGRAM FOR TESTS



# 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, 44 GHz	Agilent / HP	E4446A	C00986	3/22/2013	
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	12/13/2013	
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/2013	
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/8/2013	
CBT Bluetooth Tester	R & S	СВТ	N/A	5/15/2013	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	1/28/2014	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/2013	
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	5/23/2013	
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/2013	
Antenna, Horn, 18 GHz	EMCO	3115	C00945	12/11/2013	
Power Meter	Agilent / HP	N1911A	MY451002	7/27/2013	
Peak / Average Power Sensor	Agilent / HP	E9323A	US404115	7/26/2013	
LISN, 30 MHz	FCC	50/250-25-2	C00626	1/14/2014	
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR	
Directional Coupler	N\A	1850		N/A	

Page 11 of 80

# 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.

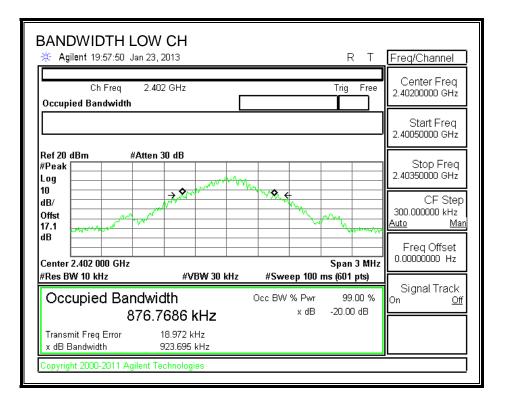
#### **RESULTS**

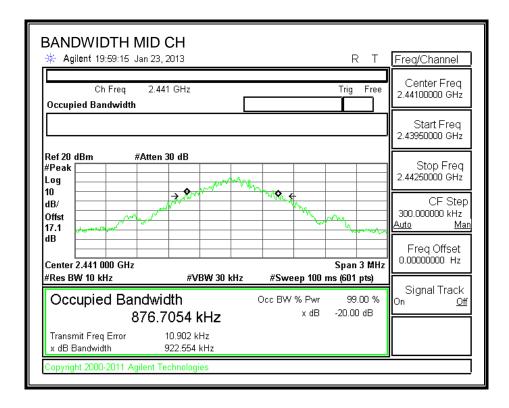
Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(kHz)	(kHz)
Low	2402	923.695	873.3631
Middle	2441	922.554	873.8665
High	2480	922.773	888.7791

Page 12 of 80

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#### 20 dB BANDWIDTH



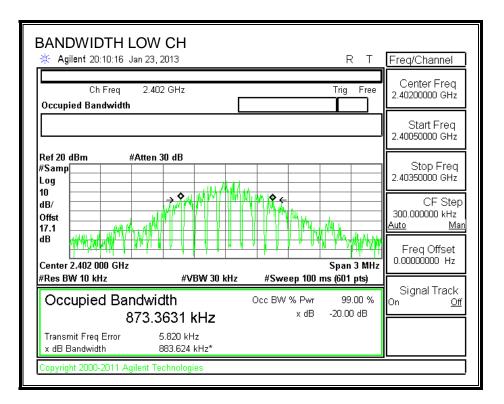


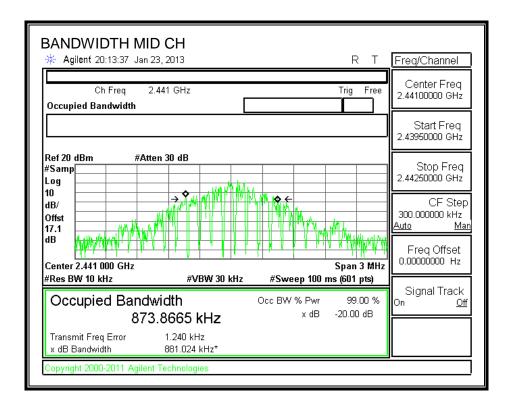
Page 13 of 80

BANDWIDTH HIGH ( # Agilent 20:01:51 Jan 23, 201			RT	Freq/Channel
Ch Freq 2.48 GH Occupied Bandwidth	1z		Trig Free	Center Freq 2.48000000 GHz
				Start Freq 2.47850000 GHz
Ref 20 dBm #Atten 30 d #Peak Log	dB	Vin VIRie		Stop Freq 2.48150000 GHz
dB/ Offst 17.1			Ny ward	CF Step 300.000000 kHz <u>Auto Man</u>
Center 2.480 000 GHz #Res BW 10 kHz	#VBW 30 kHz	#Sweep 100 r	Span 3 MHz	Freq Offset 0.00000000 Hz
Occupied Bandwidth 873.24	<u>ווויייייייי</u>	Occ BW % Pwr x dB	99.00 %	Signal Track On <u>Off</u>
	49 kHz 1.773 kHz			
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Page 14 of 80

#### 99%dB BANDWIDTH





Page 15 of 80

BANDWIDTH HIG	-		RТ	Freq/Channel
Ch Freq 2.4 Occupied Bandwidth	18 GHz		Trig Free	Center Freq 2.48000000 GHz
				Start Freq 2.47850000 GHz
#Samp Log 10 dB/ Offst 17.1 dB Center 2.480 000 GHz	n 30 dB		Span 3 MHz	Stop Freq           2.48150000 GHz           CF Step           300.000000 kHz <u>Auto</u> Freq Offset           0.0000000 Hz
#Res BW 10 kHz Occupied Bandw 888	#VBW 30 kHz idth 7791 kHz	#Sweep 100 r Occ BW % Pwr x dB	<u>, , ,</u>	Signal Track <sup>On <u>Off</u></sup>
Transmit Freq Error x dB Bandwidth	22.879 kHz 859.405 kHz*			
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Page 16 of 80

### 7.1.2. HOPPING FREQUENCY SEPARATION

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

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

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

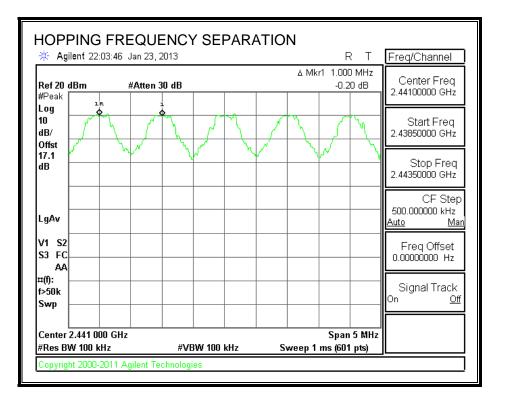
#### TEST PROCEDURE

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

#### **RESULTS**

Page 17 of 80

#### HOPPING FREQUENCY SEPARATION



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Page 18 of 80

### 7.1.3. NUMBER OF HOPPING CHANNELS

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

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

#### TEST PROCEDURE

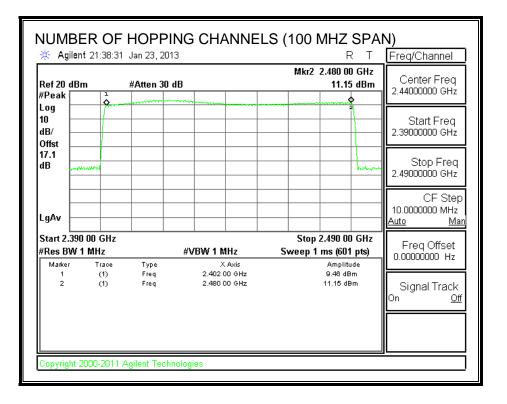
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

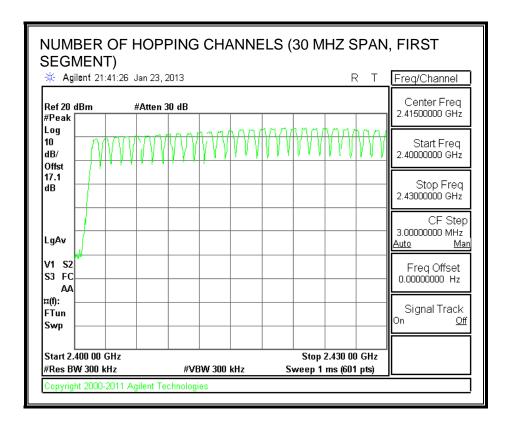
#### **RESULTS**

Normal Mode: 79 Channels observed.

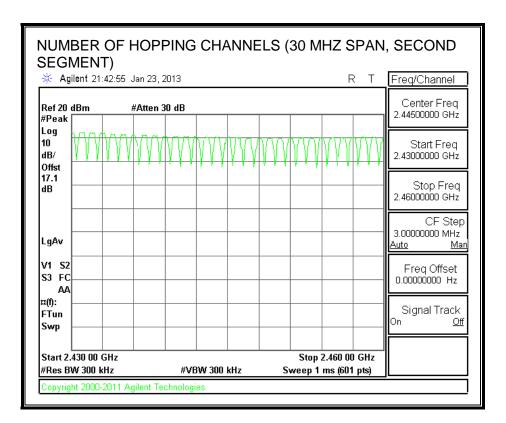
Page 19 of 80

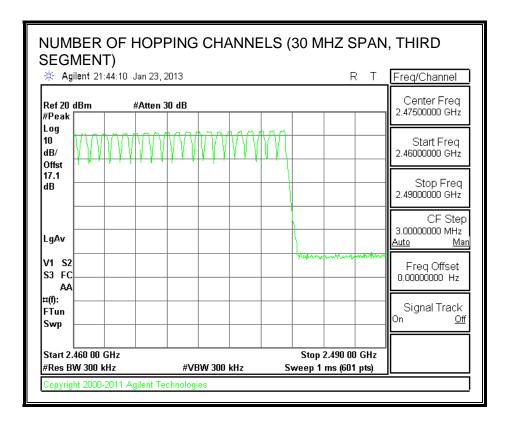
#### NUMBER OF HOPPING CHANNELS





Page 20 of 80





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Page 21 of 80

#### <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.

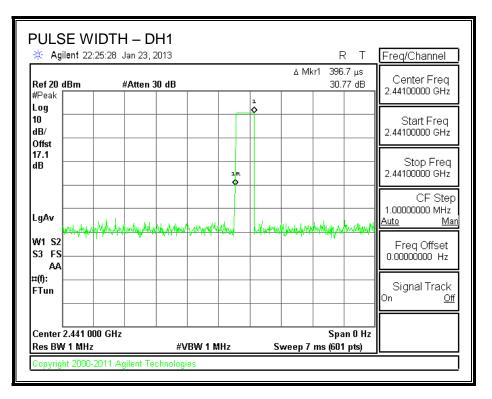
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 10 \* (# of pulses in 3.16 s) \* pulse width.

#### **RESULTS**

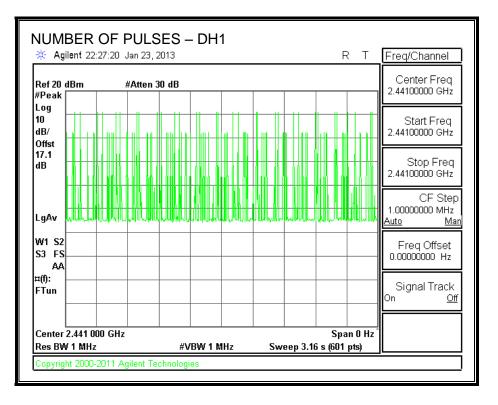
DH Packet	Pulse Width	Number of Pulses in	Average Time of Occupancy	Limit	Margin	
	(msec)	3.16 seconds	(sec)	(sec)	(sec)	
GFSK Normal Mode						
DH1	0.3962	32	0.127	0.4	-0.273	
DH3	1.645	17	0.280	0.4	-0.120	
DH5	2.917	11	0.321	0.4	-0.079	

Page 22 of 80

#### PULSE WIDTH - DH1

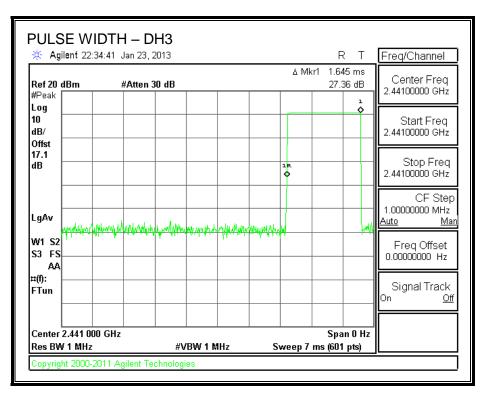


#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1

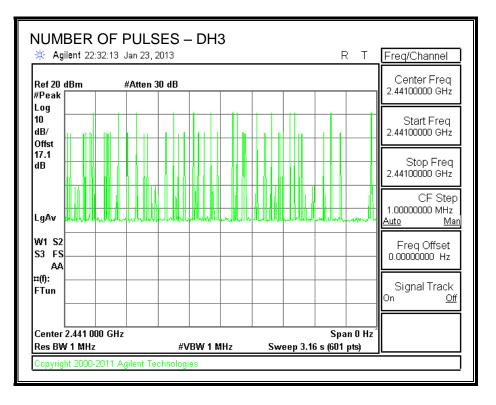


Page 23 of 80

#### PULSE WIDTH – DH3

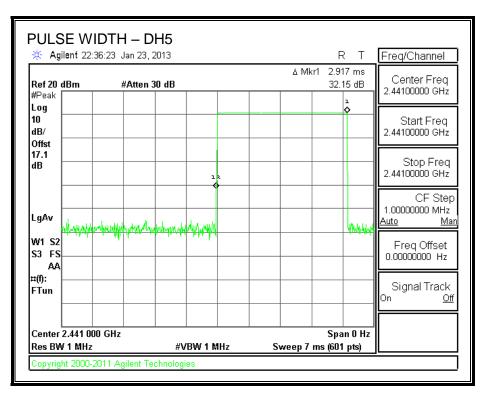


#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3

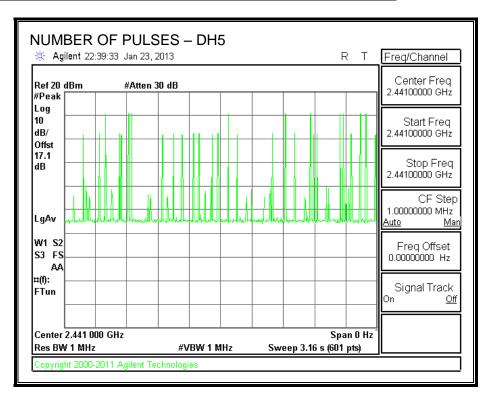


Page 24 of 80

#### PULSE WIDTH - DH5



#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



Page 25 of 80

### 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

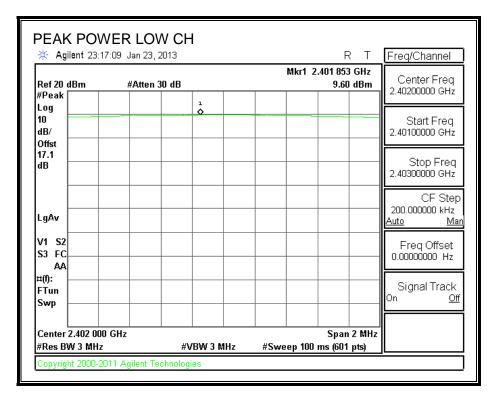
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

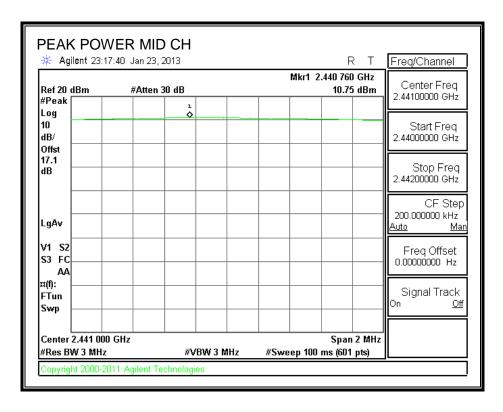
#### **RESULTS**

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	9.60	30	-20.40
Middle	2441	10.75	30	-19.25
High	2480	12.14	30	-17.86

Page 26 of 80

#### **OUTPUT POWER**





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Page 27 of 80

🔆 Agilent 23:18	3:07 Jan 23, 2013			RT	Freq/Channel
Ref 20 dBm #Peak	#Atten 30 dB		Mkr1 2.47	'9 923 GHz 12.14 dBm	Center Freq 2.4800000 GHz
HPeak Log					
10 dB/					Start Freq 2.47900000 GHz
Offst 17.1 dB					Stop Freq 2.48100000 GHz
					CF Step 200.000000 kHz
LgAv					<u>Auto Mar</u>
M1 S2 S3 FC AA					Freq Offset 0.00000000 Hz
¤(f): FTun Swp					Signal Track On <u>Off</u>
Center 2.480 000 #Res BW 3 MHz		VBW 3 MHz	#Sweep 100 ms	Span 2 MHz s (601 nts)	

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Page 28 of 80

### 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 17.1 dB (including 16.4dB directional 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	9.26	
Middle	2441	10.30	
High	2480	11.58	

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Page 29 of 80

### 7.1.7. CONDUCTED SPURIOUS EMISSIONS

#### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

#### TEST PROCEDURE

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

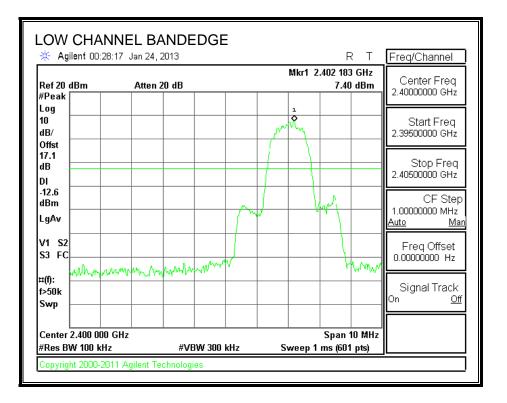
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

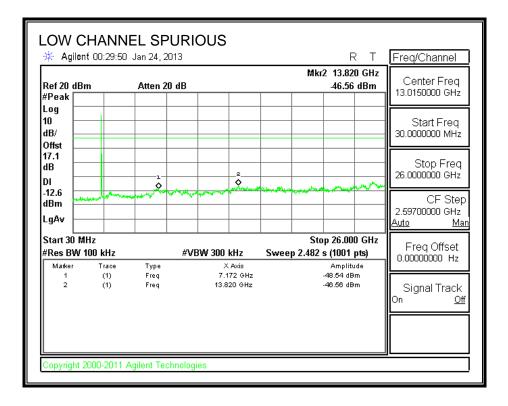
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

#### **RESULTS**

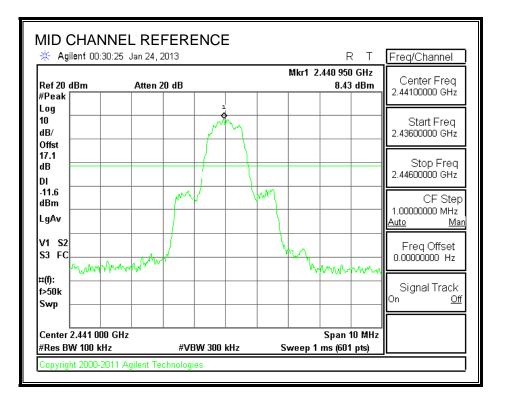
Page 30 of 80

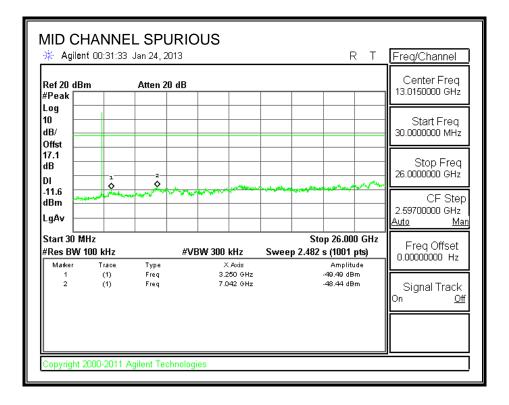
#### SPURIOUS EMISSIONS, LOW CHANNEL



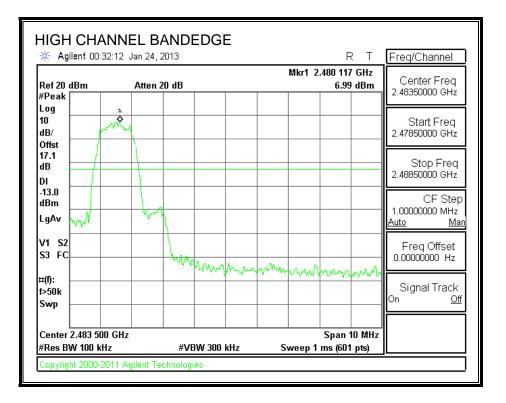


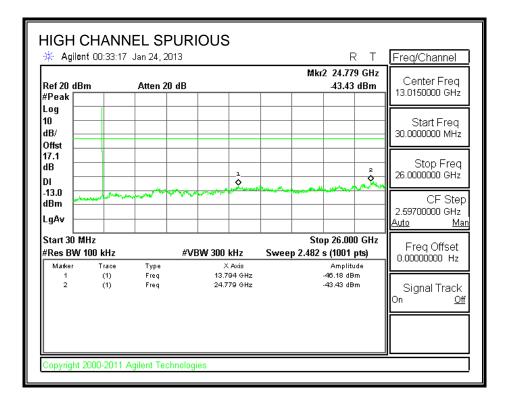
#### SPURIOUS EMISSIONS, MID CHANNEL



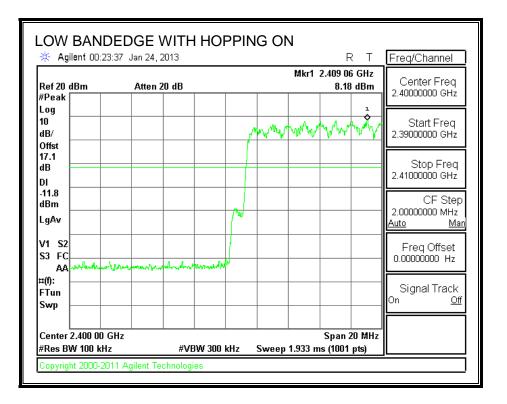


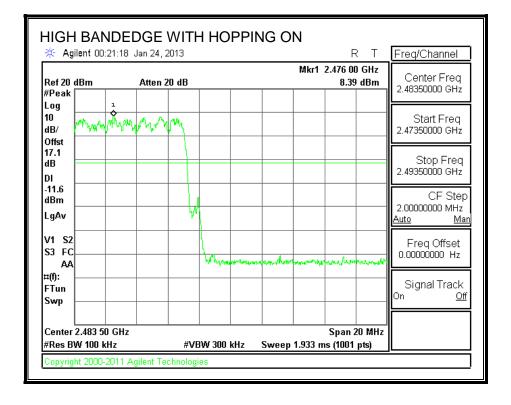
#### SPURIOUS EMISSIONS, HIGH CHANNEL





#### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





Page 34 of 80

### 7.2. ENHANCED DATA RATE 8PSK MODULATION

### 7.2.1. 20 dB AND 99% BANDWIDTH

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

None; for reporting purposes only.

#### TEST PROCEDURE

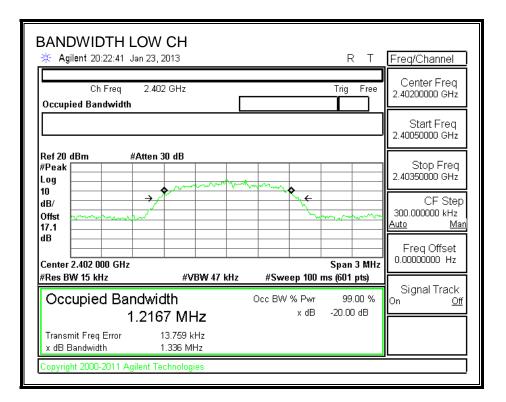
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq$  1% of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

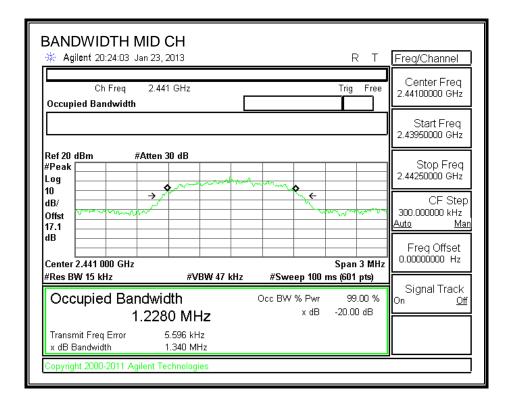
#### RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth	
	(MHz)	(kHz)	(kHz)	
Low	2402	1336	1224	
Middle	2441	1340	1215.7	
High	2480	1336	1212.9	

Page 35 of 80

#### 20 dB AND 99% BANDWIDTH



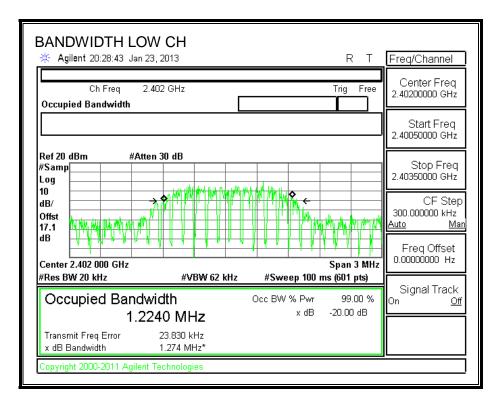


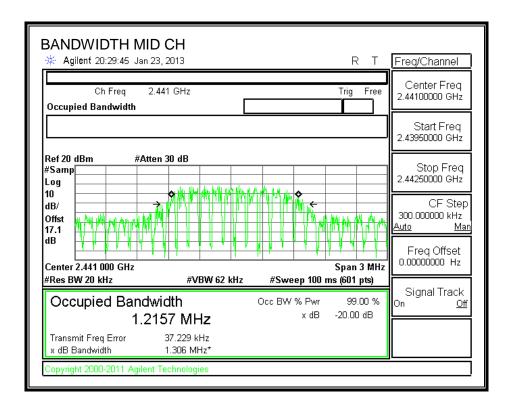
Page 36 of 80

BANDWIDTH H			RТ	Freq/Channel						
Ch Freq Occupied Bandwidth	2.48 GHz		Trig Free	Center Freq 2.48000000 GHz						
				Start Freq 2.47850000 GHz						
Ref 20 dBm #A #Peak Log 10	tten 30 dB	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Stop Freq 2.48150000 GHz						
dB/ Offst 17.1 dB	→ /		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	CF Step 300.000000 kHz <u>Auto Man</u>						
Center 2.480 000 GHz #Res BW 15 kHz	#VBW 47 kHz	#Sween 100	Span 3 MHz ms (601 nts)	Freq Offset 0.00000000 Hz						
Occupied Band	Res BW 15 kHz         #VBW 47 kHz         #Sweep 100 ms (601 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %           1.2077 MHz         × dB         -20.00 dB									
Transmit Freq Error x dB Bandwidth	2.559 kHz 1.336 MHz									
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Page 37 of 80

#### 99% BANDWIDTH





Page 38 of 80

Ch Freq 2.48 GHz Trig Free Occupied Bandwidth	Freq/Channel
WS amp         WS amp           Log         10           dB/         Image: Conter 2.480 000 GHz           KRes BW 20 kHz         #VBW 62 kHz           WS Weep 100 ms (601 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %	Center Freq 2.48000000 GHz
WS amp         WS amp           Log         10           dB/         Image: Conter 2.480 000 GHz           KRes BW 20 kHz         #VBW 62 kHz           WS Weep 100 ms (601 pts)           Occupied Bandwidth         Occ BW % Pwr         99.00 %	Start Freq 2.47850000 GHz
Occupied Bandwidth Occ BW % Pwr 99.00 %	Stop Freq 2.48150000 GHz CF Step 300.000000 kHz <u>Auto Man</u> Freq Offset 0.00000000 Hz
	Signal Track On <u>Off</u>
Transmit Freq Error 21.538 kHz x dB Bandwidth 1.326 MHz*	

Page 39 of 80

# 7.2.2. HOPPING FREQUENCY SEPARATION

### <u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

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

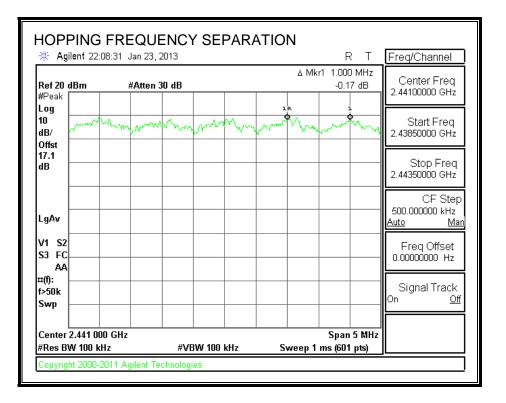
#### TEST PROCEDURE

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

#### **RESULTS**

Page 40 of 80

#### HOPPING FREQUENCY SEPARATION



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Page 41 of 80

# 7.2.3. NUMBER OF HOPPING CHANNELS

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

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

#### TEST PROCEDURE

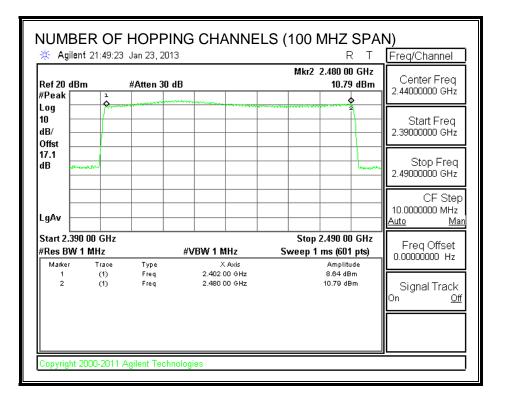
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

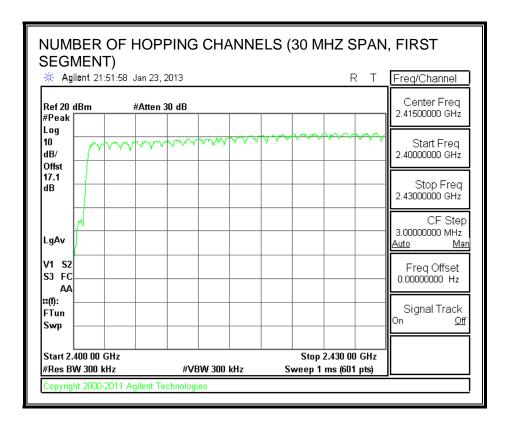
#### **RESULTS**

Normal Mode: 79 Channels observed.

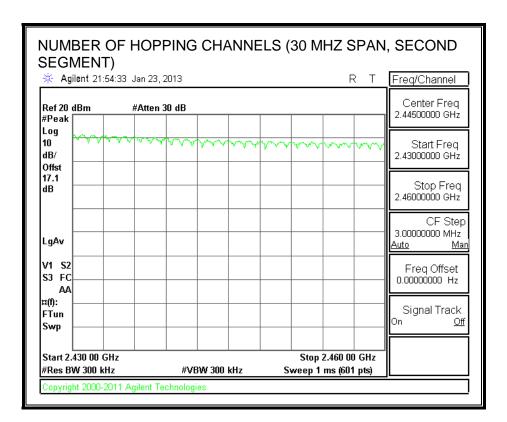
Page 42 of 80

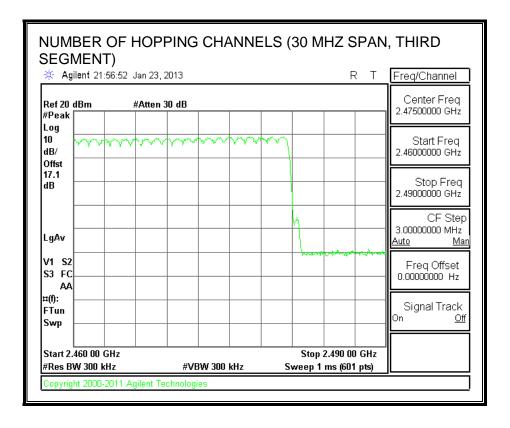
#### NUMBER OF HOPPING CHANNELS





Page 43 of 80





Page 44 of 80

# 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

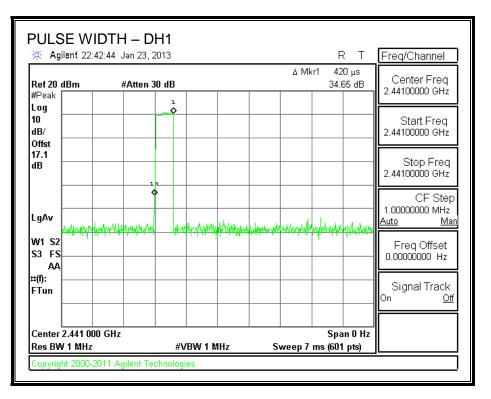
Time Of Occupancy = 10 \* xx pulses \* yy msec = zz msec

#### 8PSK (EDR) Mode

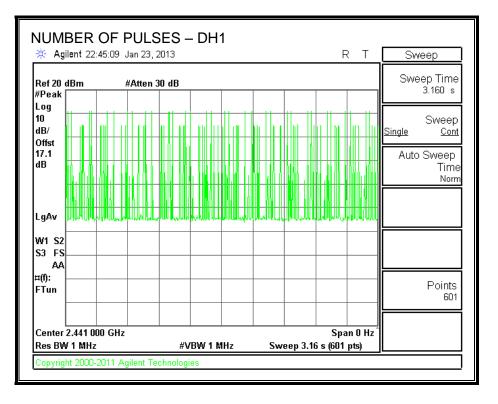
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.42	32	0.134	0.4	-0.266
DH3	DH3 1.68		0.319	0.4	-0.081
DH5	2.905	12	0.349	0.4	-0.051

Page 45 of 80

#### PULSE WIDTH - DH1

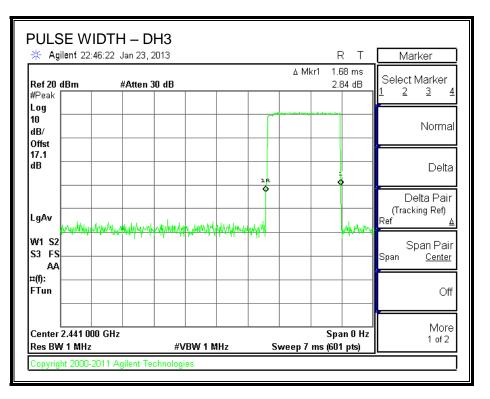


#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1

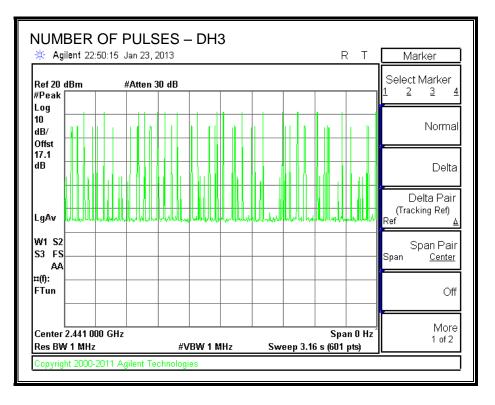


Page 46 of 80

#### PULSE WIDTH – DH3

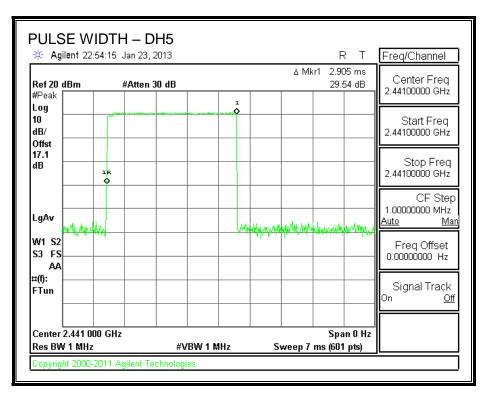


#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3

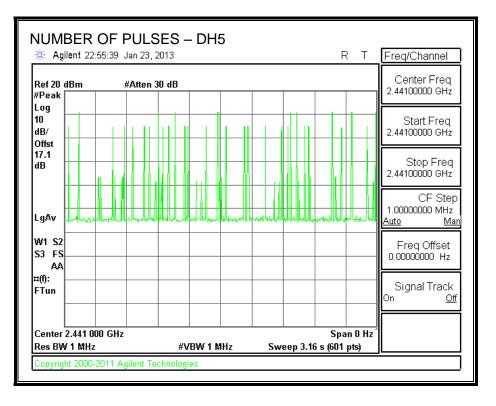


Page 47 of 80

#### PULSE WIDTH - DH5



#### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



Page 48 of 80

# 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

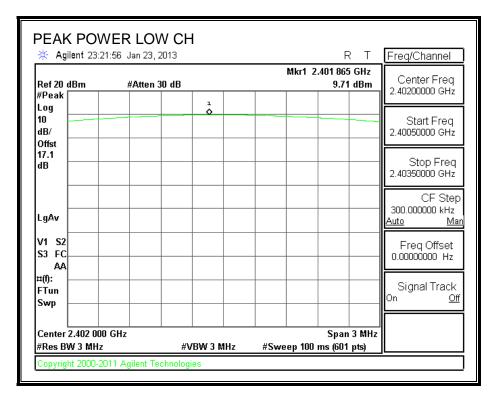
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

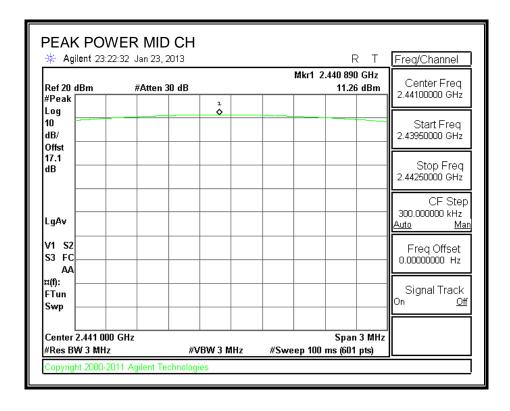
#### **RESULTS**

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	9.71	30	-20.29
Middle	2441	11.26	30	-18.74
High	2480	11.53	30	-18.47

Page 49 of 80

#### **OUTPUT POWER**





Page 50 of 80

👾 Agilent 23:2	4:09 Jan 23, 2010	j		RT	Freq/Channel
Ref 20 dBm	#Atten 30 d	B	Mkr1 2.479	810 GHz 1.53 dBm	Center Freq 2.48000000 GHz
#Peak Log					
10 dB/				_	Start Freq 2.47850000 GHz
Offst 17.1 dB					Stop Freq 2.48150000 GHz
LgAv					CF Step 300.000000 kHz <u>Auto Mar</u>
V1 S2 S3 FC AA					Freq Offset 0.00000000 Hz
¤(f): FTun Swp					Signal Track On <u>Off</u>
Center 2.480 000 #Res BW 3 MHz		#VBW 3 MHz	Sweep 100 ms	ipan 3 MHz (601 nts)	

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Page 51 of 80

### 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 17.1 dB (including 16.4dB directional 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	6.98
Middle	2441	8.78
High	2480	8.42

Page 52 of 80

## 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.

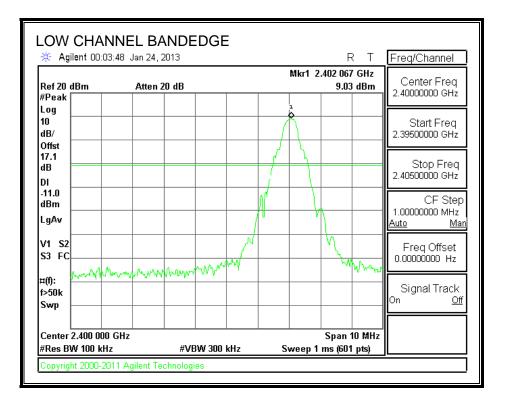
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

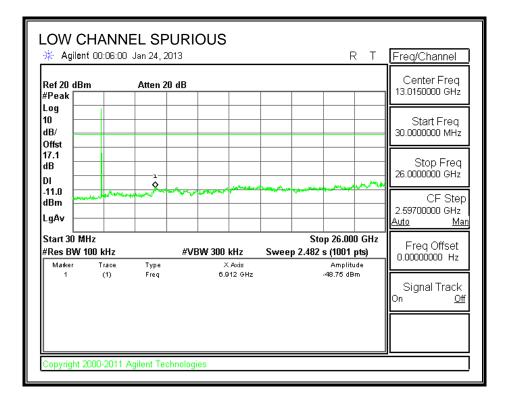
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

#### **RESULTS**

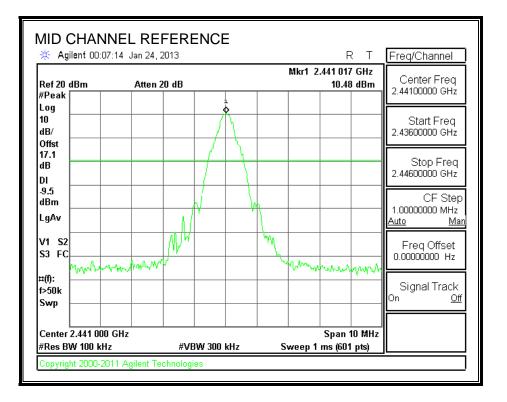
Page 53 of 80

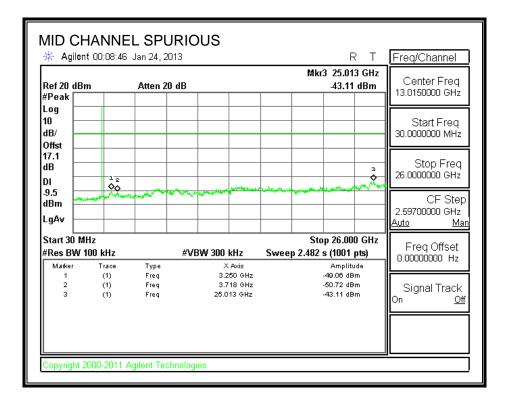
#### SPURIOUS EMISSIONS, LOW CHANNEL





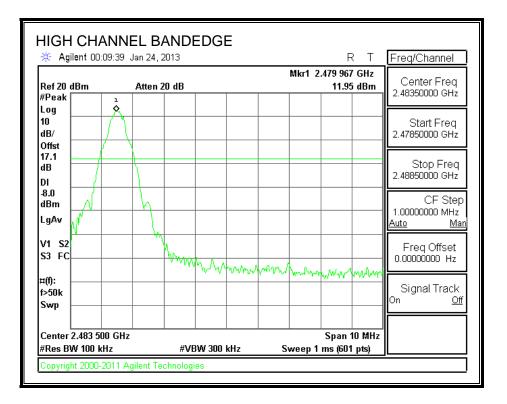
#### SPURIOUS EMISSIONS, MID CHANNEL

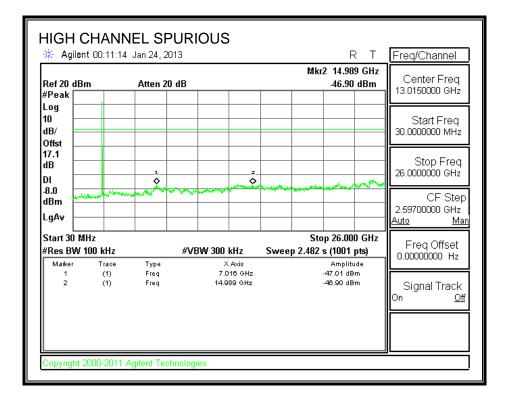




Page 55 of 80

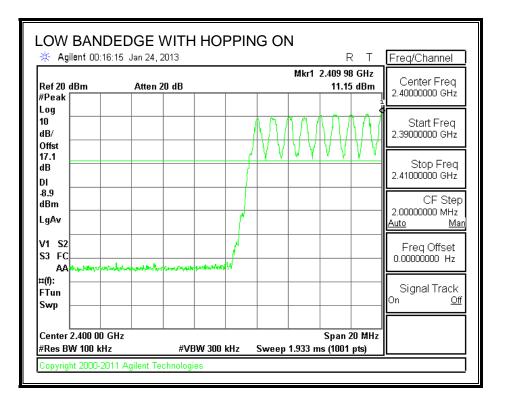
#### SPURIOUS EMISSIONS, HIGH CHANNEL

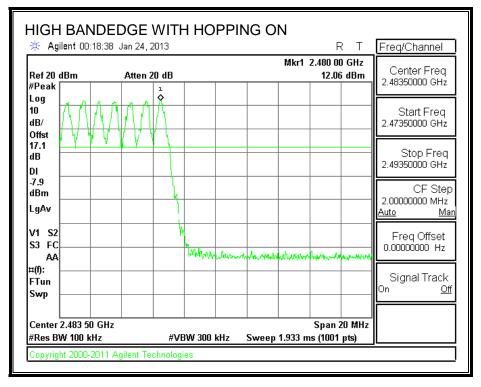




Page 56 of 80

#### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





#### Page 57 of 80

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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.

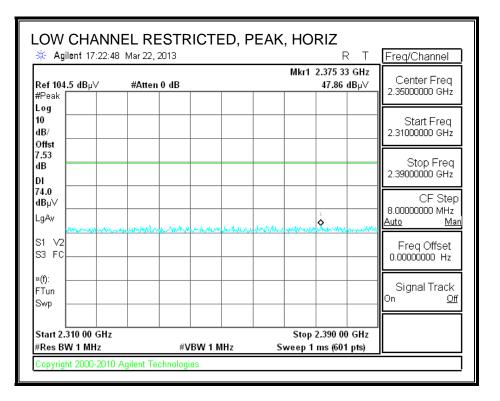
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

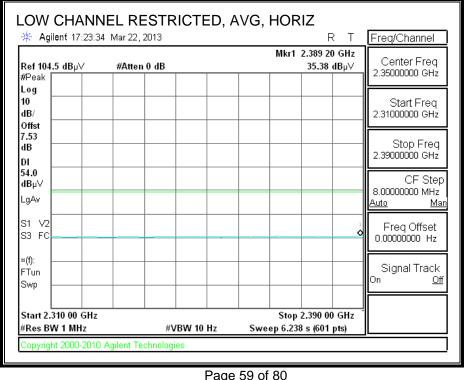
Page 58 of 80

#### 8.2. **TRANSMITTER ABOVE 1 GHz**

## 8.2.1. BASIC DATA RATE GFSK MODULATION

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



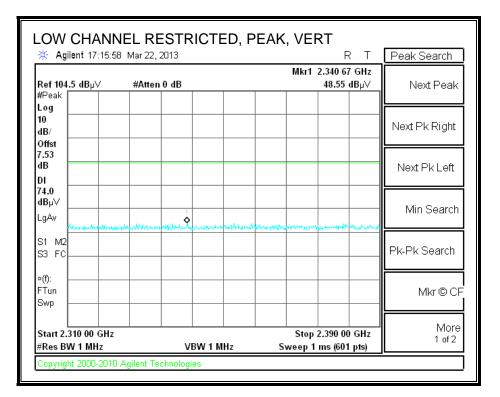


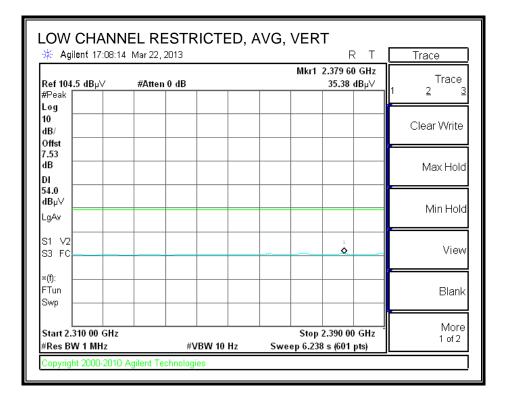
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Page 59 of 80

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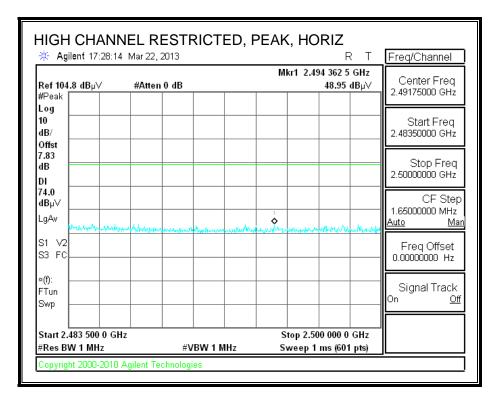
### **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

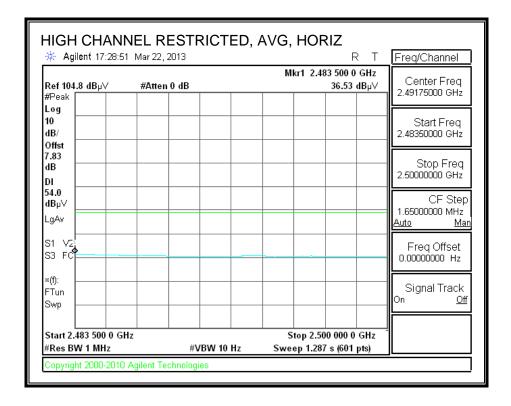




Page 60 of 80

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

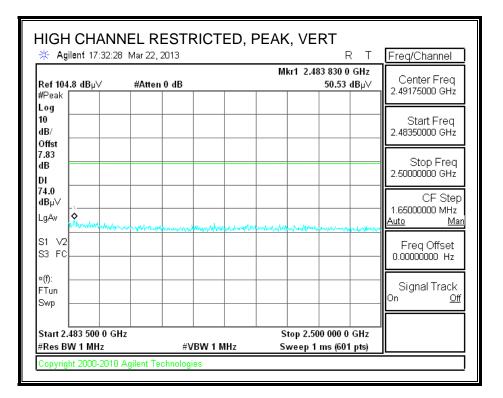


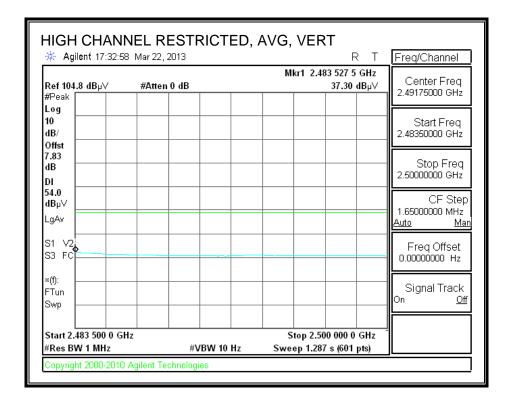


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Page 61 of 80

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





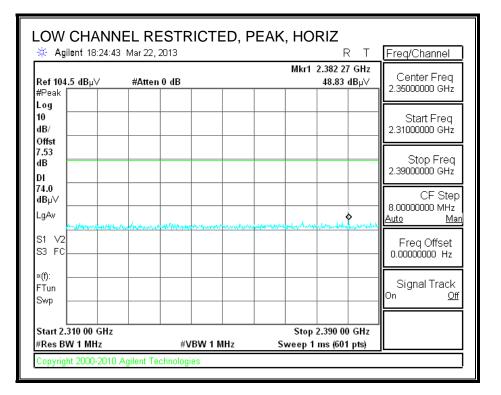
Page 62 of 80

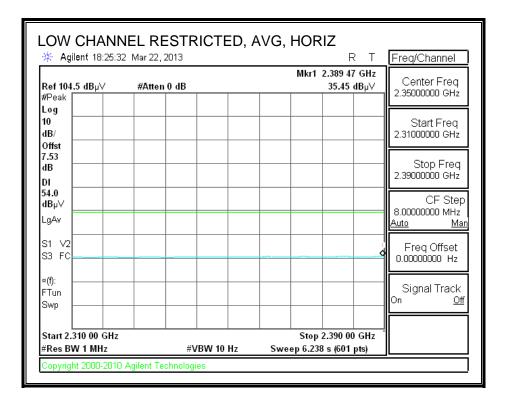
#### HARMONICS AND SPURIOUS EMISSIONS

	High	Frequency	Measuren	ent											
Complia	ince Ce	ertification	Services, Fr	emont	5m Ch	amber-	В								
Compan	IV:		LG												
Project			13u14917												
Date:			3/22/2013												
Test En	gineer:		Tony Wang												
Configu	ration:		LG870 with H	eadset an	d Ac A	dapter									
Mode:			Ts BT GFSK												
Test Eq	uipmen	d:													
Horn 1-18GHz Pre-amplifer 1-26GHz						GHz	Pre-am	plifer	26-40GH	Iz	H	orn > 180	iHz		Limit
T59; 5	T59; S/N: 3245 @3m 🔹 T145 Agilent 3008A0056 🗸				05E 🗸	T88 Mib	T88 Miteq 26-40GHz + T125; ARA 18-26GHz; S/N:1007 + FCC 1						FCC 15.205 .		
1	cable 2 able 22	2 <b>2807700</b> 807700		able 2	-	• 00	20' cal	96191	2 <b>807500</b> 07500 -		HPF	_	ject Filte 001	RBV Averag	Measurements V=VBW=1MHz te Measurements MHz : VBW=10Hz
1	Dist	Paul Ph	Read Avg.	AF	CL	Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Anglin	Pl. Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB		dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
Lon ch, 2	402MHz			-											- Addred
4.804	3.0	36.5	29.0	33.1	7.0	-34.9	0.0	0.0	41.7	34.2	74	54	-32.3	-19.8	Ĥ
4.004	3.0	37.2	29.5	33.1	7.0	-34.9	0.0	0.0	42.4	34.7	74	54	-31.6	-19.3	v
	LIME-				-	-	-		-						
4.804		38.5	29.3	33.1	7.0	34.9	0.0	0.0	43.8	34.6	74	54	-30.2	-19.4	Н
4.804 Mid ch. 3 4.822	3.0	36.7	29.6	33.1	7.0	-34.9	0.0	0.0	42.0	34.9	74	54	-32.0	-19.1	v
4.804 Mid ch. 3	3.0 3.0	3957			-		-	-	-		-	-			
4.804 Mid ch. 3 4.822 4.822	3.0			1											
4.804 Mid ch. 3 4.822	3.0		29.5	33.2	7.1	34.9	0.0	0.0	44.1	35.0	74	54	-29.9	-19.0	H

# 8.2.2. DATA RATE 8PSK MODULATION

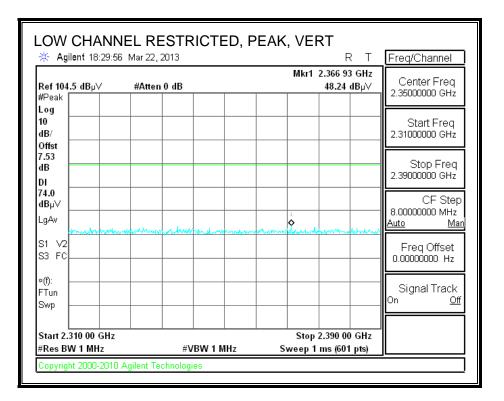
#### **RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

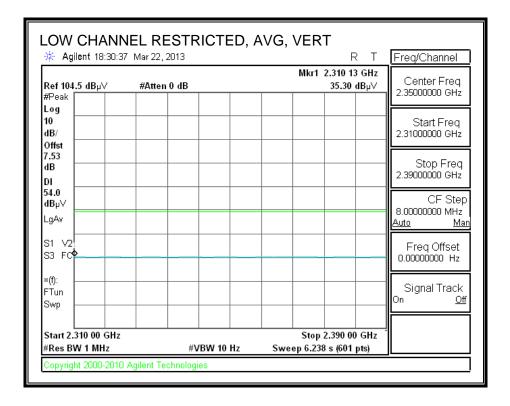




Page 64 of 80

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

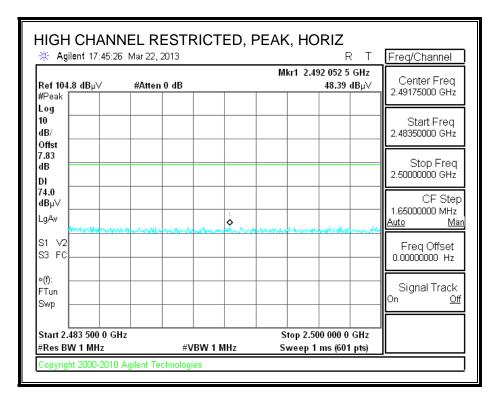


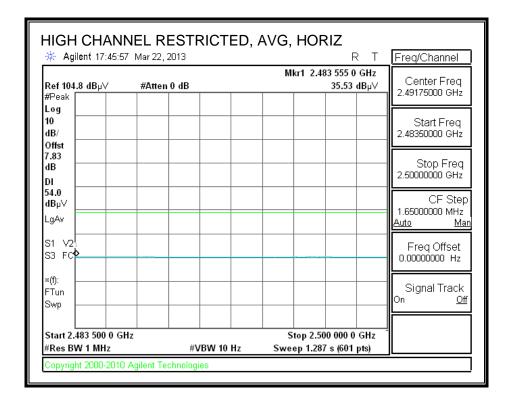


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Page 65 of 80

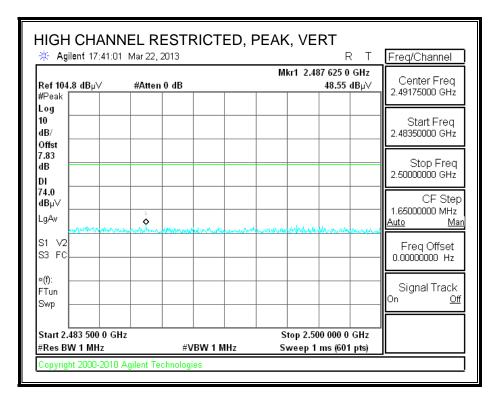
#### **RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

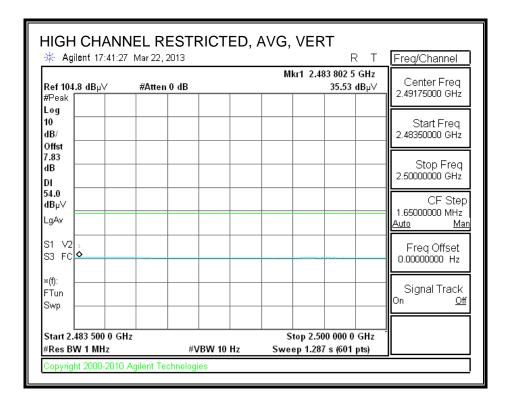




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#### **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





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Page 67 of 80

#### HARMONICS AND SPURIOUS EMISSIONS

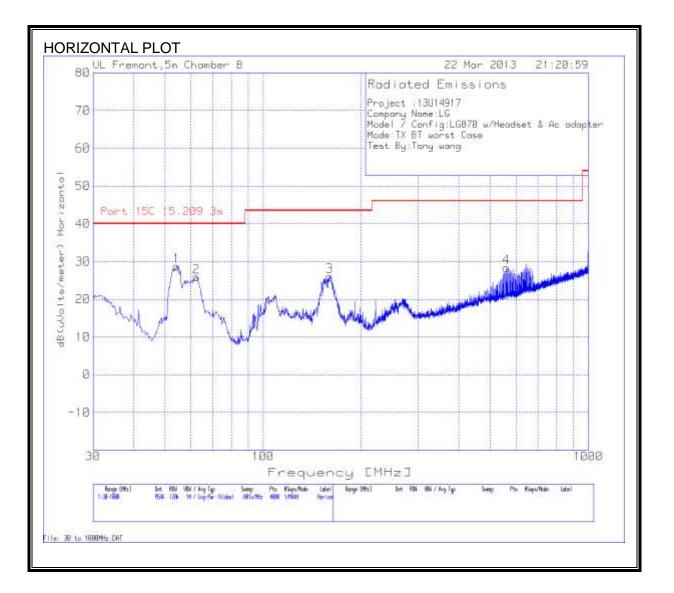
	High	Frequency	Measurem	ient											
Complia	ance Co	rtification	Services, Fr	emont:	5m Ch	amber-	В								
Compan	157		LG												
Project	#:		13u14917												
Date:			3/22/2013												
Test En			Tony Wang												
Configu	ration:		LG870 with He	radoret ara	d Ac Ad	lapter									
Mode:			Tx BT IPSK												
lest Eq	nipmen	ut:													
Horn 1-18GHz Pre-amplifer 1-26GHz					Hz	Pre-am	plifer	26-40GH	z	н	orn > 18G	Hz		Limit	
T59; 5	T59; S/N: 3245 @3m 🖌 T145 Agilent 3008A0056 🗸				056 🗸	T88 Mit	eq 26-	40GHz	• T12	5; ARA 18-26	GHz; S/N:1	007		FCC 15.205	
3"	cable 2	22807700	12' 0	able 2	28076	00	20' cal	ble 22	807500		HPF	Re	ject Filte		Measurements
	cable 2 able 22	*****	_	able 2		00	20' cal	See 1	energener H		HPF		004	RBV Averag	Measurements W=VBW=1MHz ge Measurements 1MHz ; VBW=10Hz
		807700	_	able 228			100000	See 1	energener H	Avg	HPF Pk Lim	• R_	001	RBV Averag	W=VBW=1MHz ge Measurements
f GHz	able 22 Dist (m)	Read Pk dBuV	• 12' ci	able 228	07600		20° cab	le 228	07500 -	143 B	WOILE:	• R_	001	• Averag RBW=1	W=VBW=1MHz ge Measurements 1MHz ; VBW=10Hz
3' c f GHz Low ch, 2	able 220 Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	• Amp dB	20' cab D Corr dB	le 228 Fitr dB	Peak dBuV/m	dBuV/m	Pk Lim dBuV/m	• R Avg Lim dBuV/m	001 Pk Mar dB	RBV Averag RBW=1 Avg Mar dB	W=VBW=1MHz ge Measurements IMHz ; VBW=10Hz Notes (V/H)
f GHz Low ch, 2 4,804	able 220 Dist (m) 402MHz 3.0	Read Pk dBuV 38.2	Read Avg. dBuV 27.6	AF dB/m 33.1	07600 CL dB 7.0	• Amp dB 34.9	20° cab D Corr dB 0.0	le 228 Fltr dB 0,0	Peak dBuV/m 43.4	dBaV/m 32.8	Pk Lim dBuV/m 74	• R_ Avg Lim dBuV/m	001 Pk Mar dB -30.6	RBW Averag RBW=1 Avg Mar dB	W=VBW=1MHz ge Measurements IMHz ; VBW=10Hz Notes (V/H) H
f GHz Low ch, 2 4,804	able 220 Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	• Amp dB	20' cab D Corr dB	le 228 Fitr dB	Peak dBuV/m	dBuV/m	Pk Lim dBuV/m	• R Avg Lim dBuV/m	001 Pk Mar dB	RBV Averag RBW=1 Avg Mar dB	W=VBW=1MHz ge Measurements IMHz ; VBW=10Hz Notes (V/H)
3' c f GHz Lon ch, 2 4.804 4.804 Mid ch, 2	able 220 Dist (m) 402MHz 3.0 3.0	807700 Read Pk dBuV 38.2 38.1	• 12' cr Read Avg. dBuV 27.6 27.6	AF dB/m 33.1	CL dB 7.0 7.0	• Amp dB 34.9 34.9	20" cab D Corr dB 0.0 0.0	le 228 Fltr dB 0.0 0.0	Peak dBuV/m 43.4 43.3	dBuV/m 32.8 32.8	Pk Lim dBaV/m 74 74	Avg Lim dBuV/m 54 54	001 Pk Mar dB -30.6 -30.7	RBW Averag RBW=1 Avg Mar dB -21.2 -21.2	W=VBW=1MHz ge Measurements IMHz ; VBW=10Hz Notes (V/H) H
f GHz Law ch, 2 1.804 1.804 Mid ch, 2 1.822	able 220 Dist (m) 402MHz 3.0 3.0 441MHz 3.0	807700 Read Pk dBuV 38.2 38.1 38.1	<ul> <li>12' cr</li> <li>Read Avg. dBaV</li> <li>27.6</li> <li>27.6</li> <li>27.8</li> </ul>	AF dB/m 33.1 33.1 33.1	CL dB 7.0 7.0 7.0	• Amp dB 34.9 34.9 34.9	20' cab D Corr dB 0.0 0.0	e 228	Peak dBuV/m 43.4 43.4	dBuV/m 32.8 32.8 33.1	Pk Lim dBaV/m 74 74 74	Avg Lim dBuV/m 54 54 54	001 Pk Mar dB -30.6 -30.7 -30.7	RBW Averag RBW=1 Avg Mar dB -21.2 -21.2 -21.2 -20.9	W=VBW=1MH2 ge Measurements (MH2 ; VBW=10H2 Notes (V/H) H V
3' c	able 220 Dist (m) 402MHz 3.0 3.0	807700 Read Pk dBuV 38.2 38.1	• 12' cr Read Avg. dBuV 27.6 27.6	AF dB/m 33.1	CL dB 7.0 7.0	• Amp dB 34.9 34.9	20" cab D Corr dB 0.0 0.0	le 228 Fltr dB 0.0 0.0	Peak dBuV/m 43.4 43.3	dBuV/m 32.8 32.8	Pk Lim dBaV/m 74 74	Avg Lim dBuV/m 54 54	001 Pk Mar dB -30.6 -30.7	RBW Averag RBW=1 Avg Mar dB -21.2 -21.2	W=VBW=1MHz ge Measurements IMHz ; VBW=10Hz Notes (V/H) H V
f GHz Low ch, 2 4.804 4.804 Mid ch, 2 4.822	able 220 Dist (m) 402MHz 3.0 3.0 441MHz 3.0 3.0	Read Pk dBuV 38.2 38.1 38.1 37.4	<ul> <li>Read Avg. dBaV</li> <li>27.6</li> <li>27.6</li> <li>27.8</li> <li>27.7</li> </ul>	AF dB/m 33.1 33.1 33.1	CL dB 7.0 7.0 7.0 7.0 7.0	Amp dB 34.9 34.9 34.9 34.9	20° cab D Corr dB 0.0 0.0 0.0	le 228 Fltr dB 0.0 0.0 0.0	Peak dBuV/m 43.4 43.3 43.4 42.7	dBuV/m 32.8 32.8 33.1 33.0	Pk Lim dBuV/m 74 74 74 74 74	Avg Lim dBuV/m 54 54 54	001 Pk Mar dB -30.6 -30.7 -30.6 -31.3	RBW=1 Avg Mar dB 21.2 21.2 20.9 -21.0	W=VBW=1MH2 ge Measurements (MH2 ; VBW=10H2 Notes (V/H) H V
f GHz Low ch, 2 4.804 4.894 Mid ch, 2 4.822 4.822	able 220 Dist (m) 402MHz 3.0 3.0 441MHz 3.0 3.0	807700 Read Pk dBuV 38.2 38.1 38.1 37.4	<ul> <li>12' cr</li> <li>Read Avg. dBaV</li> <li>27.6</li> <li>27.6</li> <li>27.8</li> </ul>	AF dB/m 33.1 33.1 33.1	CL dB 7.0 7.0 7.0	• Amp dB 34.9 34.9 34.9	20' cab D Corr dB 0.0 0.0	e 228	Peak dBuV/m 43.4 43.4	dBuV/m 32.8 32.8 33.1	Pk Lim dBaV/m 74 74 74	Avg Lim dBuV/m 54 54 54	001 Pk Mar dB -30.6 -30.7 -30.7	RBW Averag RBW=1 Avg Mar dB -21.2 -21.2 -21.2 -20.9	W=VBW=1MH2 ge Measurements (MH2 ; VBW=10H2 Notes (V/H) H V

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Page 68 of 80

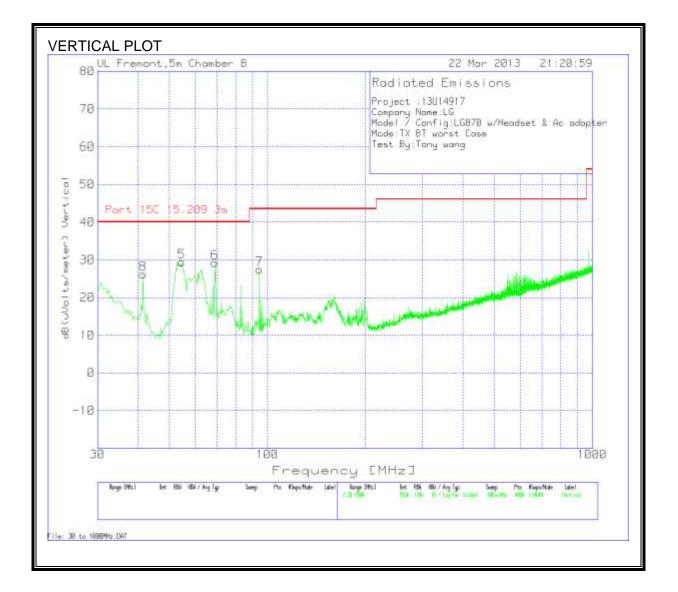
# 8.3. WORST-CASE BELOW 1 GHz

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



Page 69 of 80

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



Page 70 of 80

#### REPORT NO: 13U14917-3 FCC ID: TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC

Project :1	3U14917									
Company	Name:LG									
Model / C	onfig:LG870	w/Headse	et & Ac ada	pter						
Mode:TX	BT worst Ca	se								
Test By:Tony wang										
Horizonta	l 30 - 1000M	Hz								
Marker	Test	Meter	Detector	T243	T10	dB(uVolt	Part 15C	Margin	Height	Polarity
No.	Frequency	Reading		Hybrid	preamp/ Cable loss loop	s/meter)		Ū	[cm]	
1	54.2318	50.73	РК	6.9	-28.9	28.73	40	-11.27	400	Horz
2	62.4706	47.38	РК	7.3	-28.8	25.88	40	-14.12	400	Horz
3	160.1249	41.58	РК	12.1	-27.6	26.08	43.5	-17.42	200	Horz
4	560.1924	36.17	РК	18.4	-26.2	28.37	46	-17.63	200	Horz
Vertical 3	) 0 - 1000MHz									
Marker	Test	Meter	Detector	T243	T10	dB(uVolt	Part 15C	Margin	Height	Polarity
No.	Frequency	Reading		Hybrid	preamp/ Cable loss loop	s/meter)	15.209 3m		[cm]	
Marker No	Test Freque	Meter Rea	Detector	T243 Hybr	T10 pream	dB(uVolts	Part 15C 1	Margin	Height [cn	Polarity
5	54.4741	51.43	РК	6.9	-28.9	29.43	40	-10.57	300	Vert
6	69.0132	50.1	РК	7.8	-28.7	29.2	40	-10.8	200	Vert
7	94.4567	47.37	РК	8.5	-28.4	27.47	43.5	-16.03	200	Vert
	41.389	42.74	PK	12.4	-29	26.14	40	-13.86	200	Vert

Page 71 of 80

# 9. AC POWER LINE CONDUCTED EMISSIONS

### <u>LIMITS</u>

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.

<u>RESULTS</u>

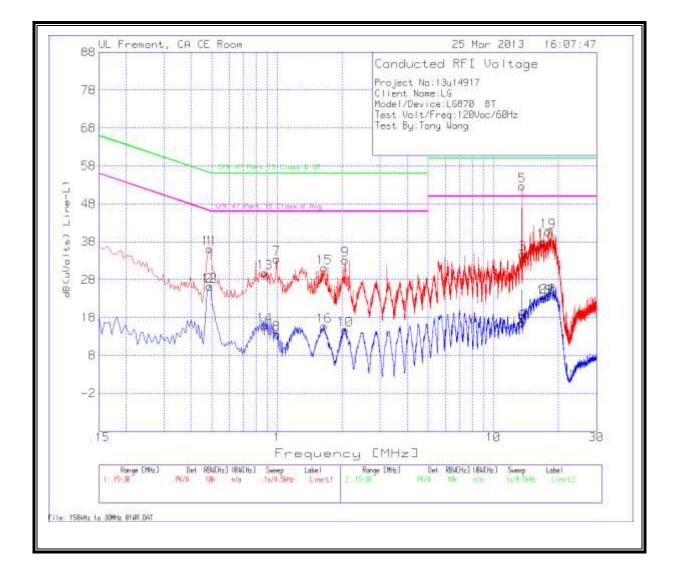
Page 72 of 80

#### **<u>6 WORST EMISSIONS</u>**

Project No:1	3u14917								
<b>Client Name</b>	:LG								
Model/Devic	:e:LG870 B	т							
Test Volt/Fre	eq:120Vac/	60Hz							
Test By:Tony	Wang								
Line-L1 .15 -	30MHz								
Test	Meter	Detector	T24 IL	LC Cables	dB(uVolt	CFR 47	Margin	CFR 47	Margin
Frequency	Reading		L1.TXT	1&3.TXT	s)	Part 15		Part 15	
			(dB)	(dB)		Class B		Class B	
						QP		Avg	
0.4875	36.09	РК	0.1	0	36.19	56.2	-20.01	-	-
0.4875	26.14	Av	0.1	0	26.24	-	-	46.2	-19.96
0.996	33.41	РК	0.1	0	33.51	56	-22.49	-	-
0.996	13.56	Av	0.1	0	13.66	-	-	46	-32.34
2.067	32.99	РК	0.1	0.1	33.19	56	-22.81	-	-
2.067	14.58	Av	0.1	0.1	14.78	-	-	46	-31.22
Line-L2 .15 -	30MHz								
Test	Meter	Detector	T24 IL	LC Cables	dB(uVolt	CFR 47	Margin	CFR 47	Margin
Frequency	Reading		L1.TXT	1&3.TXT	s)	Part 15		Part 15	
			(dB)	(dB)		Class B		Class B	
						QP		Avg	
0.4875	36.09	РК	0.1	0	36.19	56.2	-20.01	-	-
0.4875	26.14	Av	0.1	0	26.24	-	-	46.2	-19.96
17.241	37.56	РК	0.2	0.2	37.96	60	-22.04	-	-
17.241	22.7	Av	0.2	0.2	23.1	-	-	50	-26.9
17.9475	40.29	РК	0.2	0.2	40.69	60	-19.31	-	-
17.9475	23.07	Av	0.2	0.2	23.47	-	-	50	-26.53

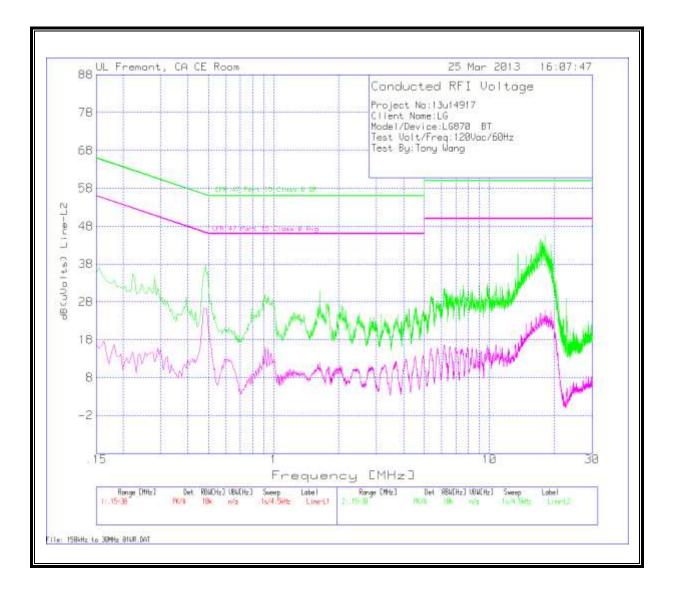
Page 73 of 80

#### LINE 1 RESULTS



Page 74 of 80

#### LINE 2 RESULTS



Page 75 of 80