FCC CFR47 PART 15 SUBPART C

BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: LG870, LG-LG870, LGLG870

FCC ID: ZNFLG870

REPORT NUMBER: 13U14917-4

ISSUE DATE: APRIL 5, 2013

Prepared for

LG ELECTRONICS MOBILECOMM U.S.A., INC.
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
-	04/05/13	Original	T. LEE

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	LG ELECTRONICS MOBLILECOMM USA,INC. 1000 SYLVAN AVENUE ENGLEWOOD, NJ 07632, USA
EUT DESCRIPTION:	TRI-BAND PHONE WITH WLAN, BLUETOOTH, BLE, AND NFC
MODEL:	LG870, LG-LG870, LGLG87
SERIAL NUMBER:	99000250000211 (CONDUCTED) & 256691464000002149 (RADIATED)
DATE TESTED:	JANUARY 7 TO 25 & MARCH 14 TO 25, 2013

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:

TIM LEE
WiSE PROGRAM MANAGER
UL CCS

Tested By:

TONY WANG
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

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

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 http://www.ccsemc.com.

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

LTE Phone with Bluetooth and WLAN The EUT is a Dual Band phone that also supports BLUETOOTH, WLAN and NFC.

5.1. 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	BLE	8.44	6.98

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA (Planar Inverted F Antenna) with a maximum peak gain of -1.64dBi.

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was VS930_0311

The test utility software used during testing was FCC Test - LG.

The firmware used during testing was 3.0.8.00001_g114383

5.4. WORST-CASE CONFIGURATION AND MODE

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 Z orientation with AC adapter and earphone.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS-01WR	EAY62768913	N/A
Earphone	I-SOUND CO. LTD	HC-MYD-LG113	N/A	N/A

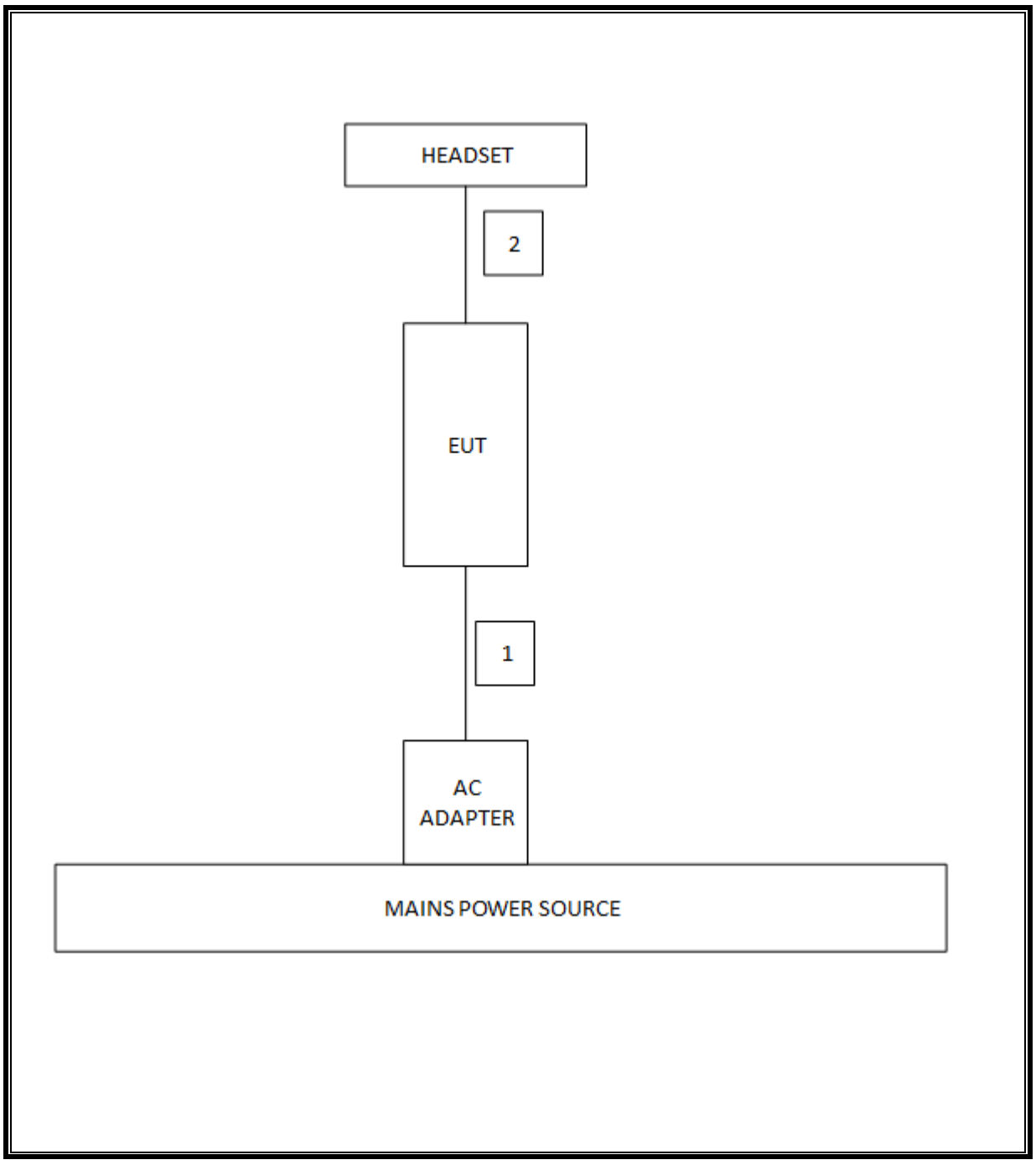
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

The EUT is a stand-alone device during the test..

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
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
Peak Power Meter	Agilent / HP	E4416A	C00963	5/13/2013
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	5/13/2013
LISN, 30 MHz	FCC	50/250-25-2	C00626	1/14/2014
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

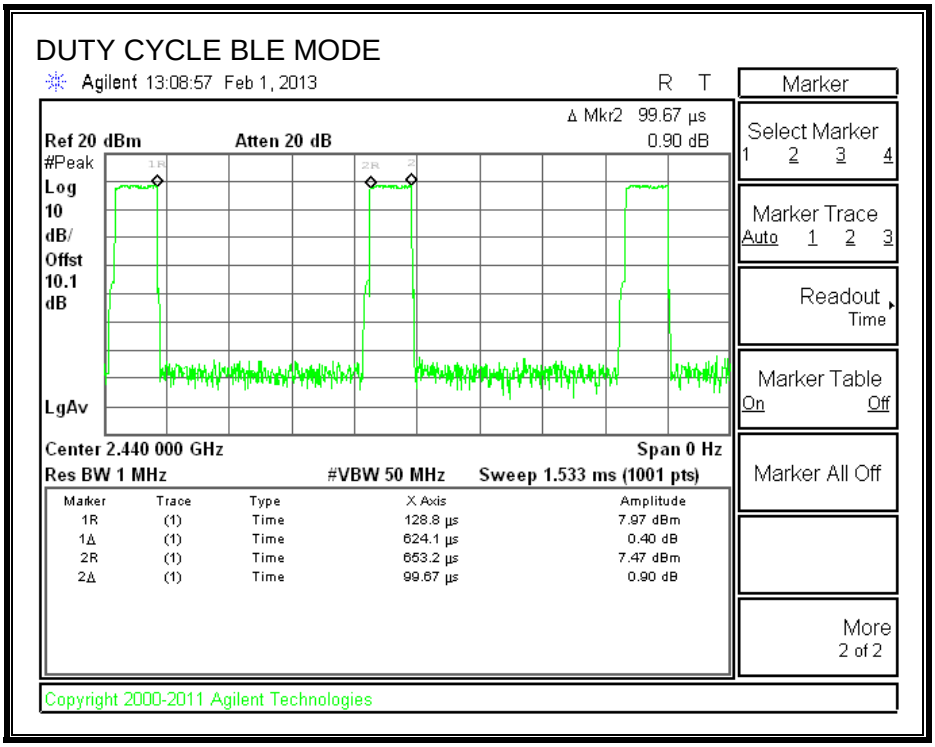
PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

7.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
BLE	0.10	1	0.160	16.0%	7.97	10.033

7.2. DUTY CYCLE PLOTS



8. MEASUREMENT METHOD

The Duty Cycle is less than 98% and consistent therefore KDB 789033 Method SA-2 is used for Power and PPSD

The Duty Cycle is less than 98% and consistent, KDB 789033 Method AD with Power RMS Averaging and duty cycle correction is used for average spurious emissions above 1 GHz

9. ANTENNA PORT TEST RESULTS

9.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

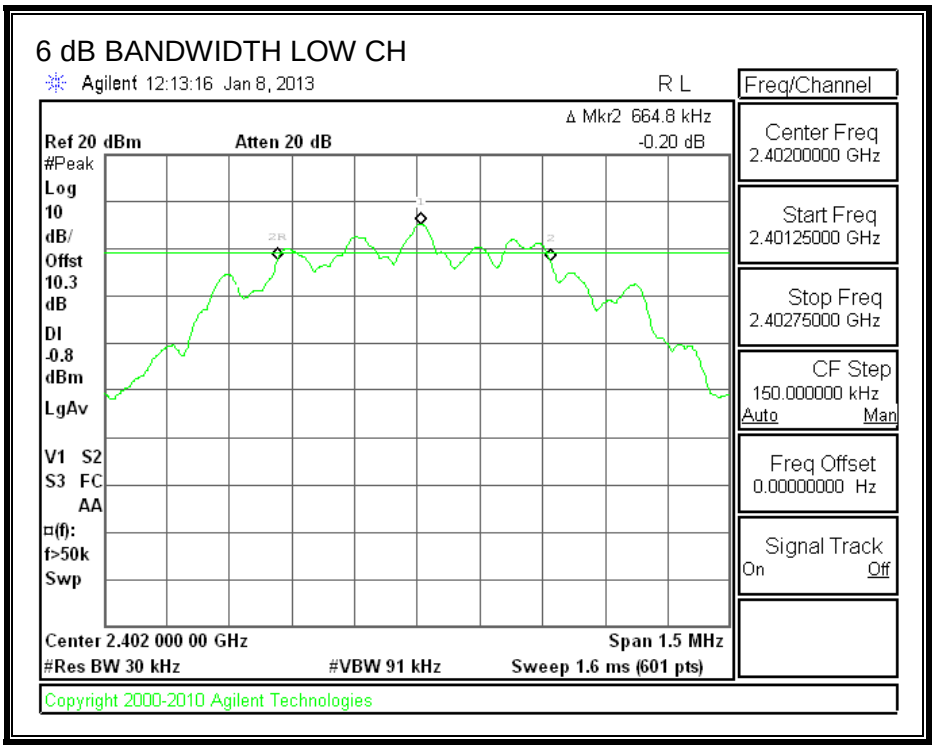
TEST PROCEDURE

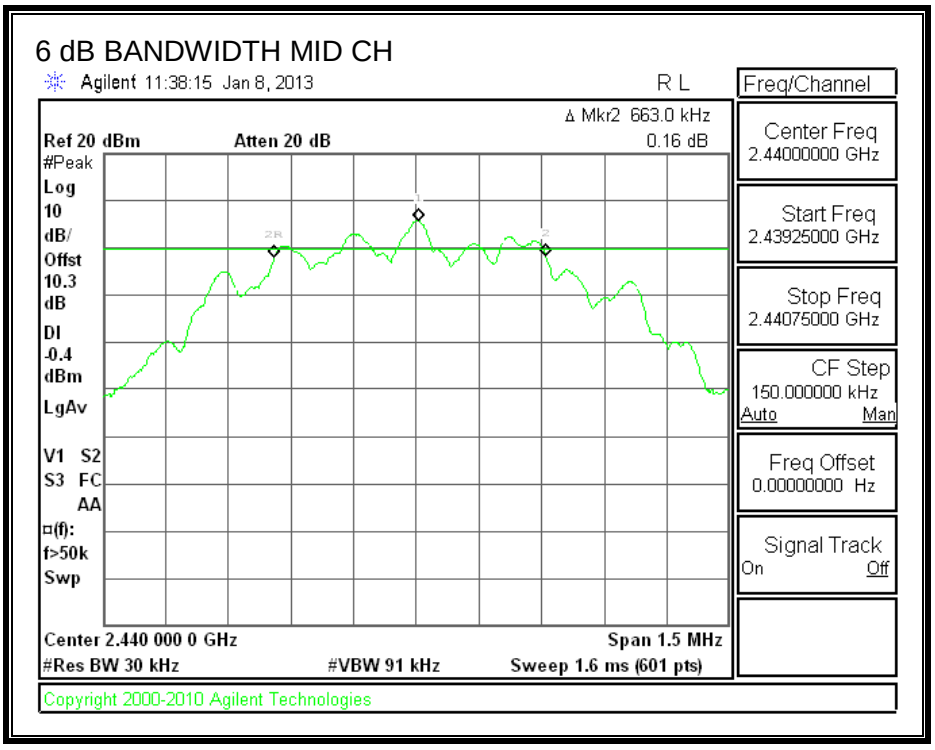
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW >= 3 x RBW, peak detector and max hold.

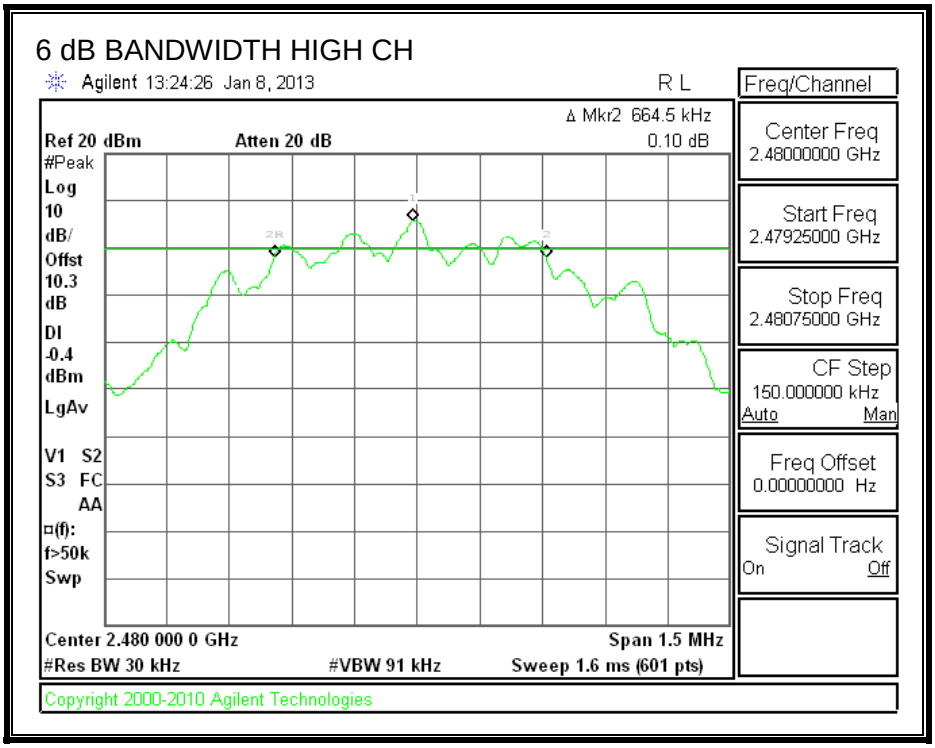
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6648	0.5
Middle	2440	0.6630	0.5
High	2480	0.6645	0.5

6 dB BANDWIDTH







9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

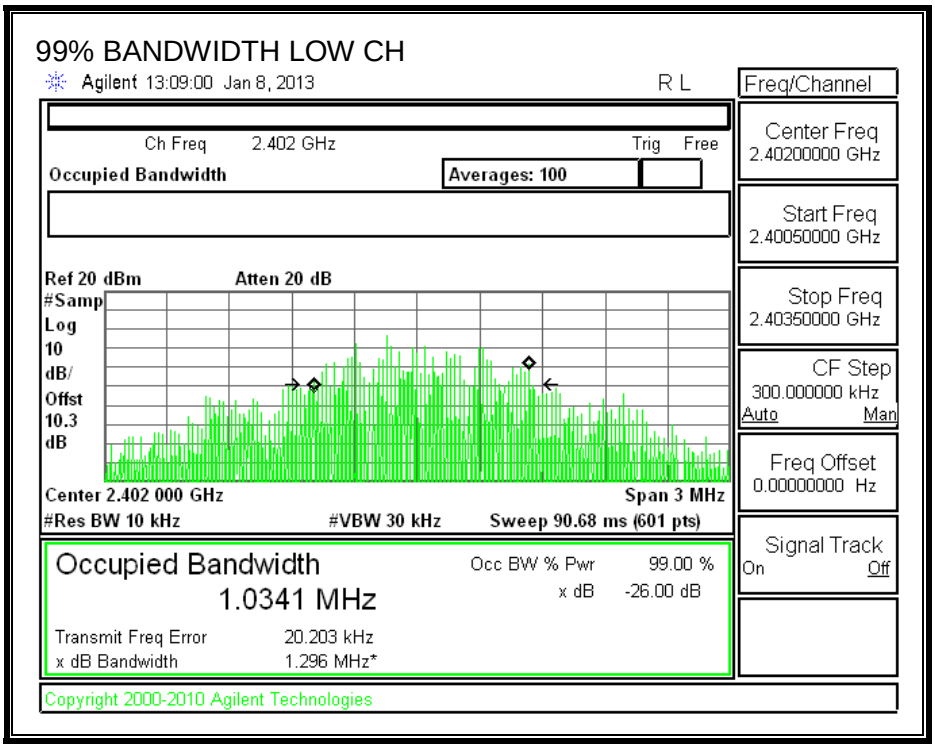
TEST PROCEDURE

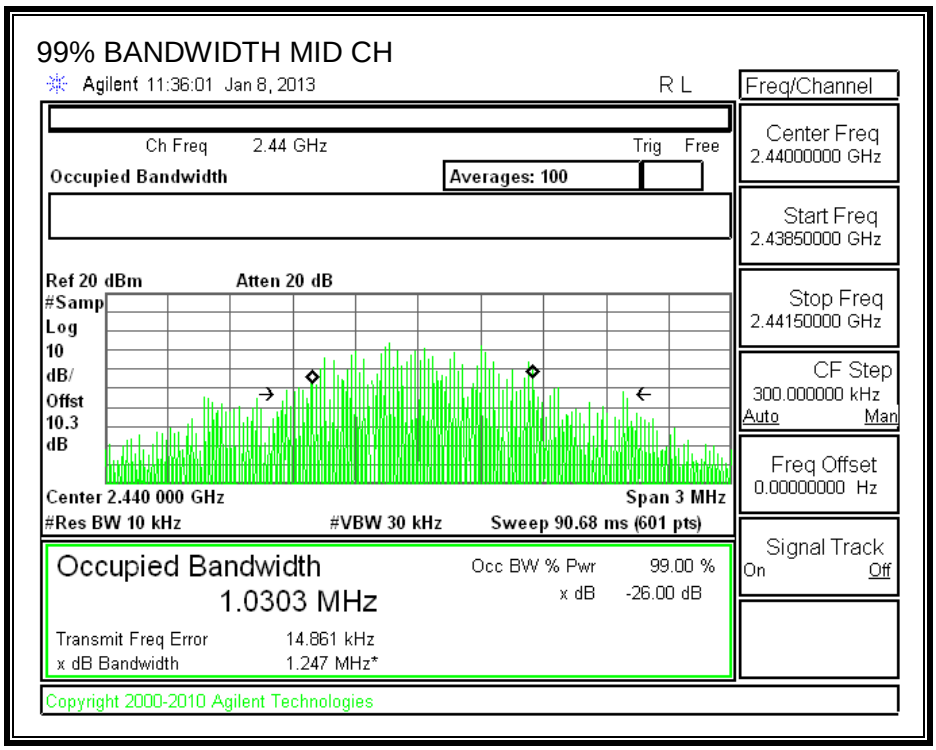
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

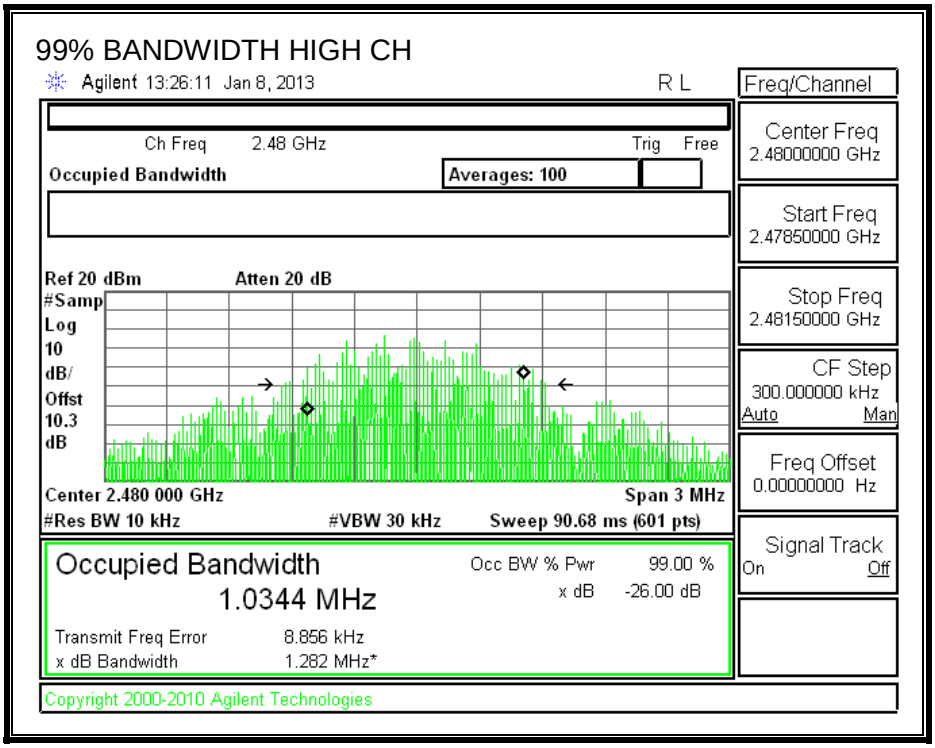
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0341
Middle	2440	1.0303
High	2480	1.0344

99% BANDWIDTH







9.3. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

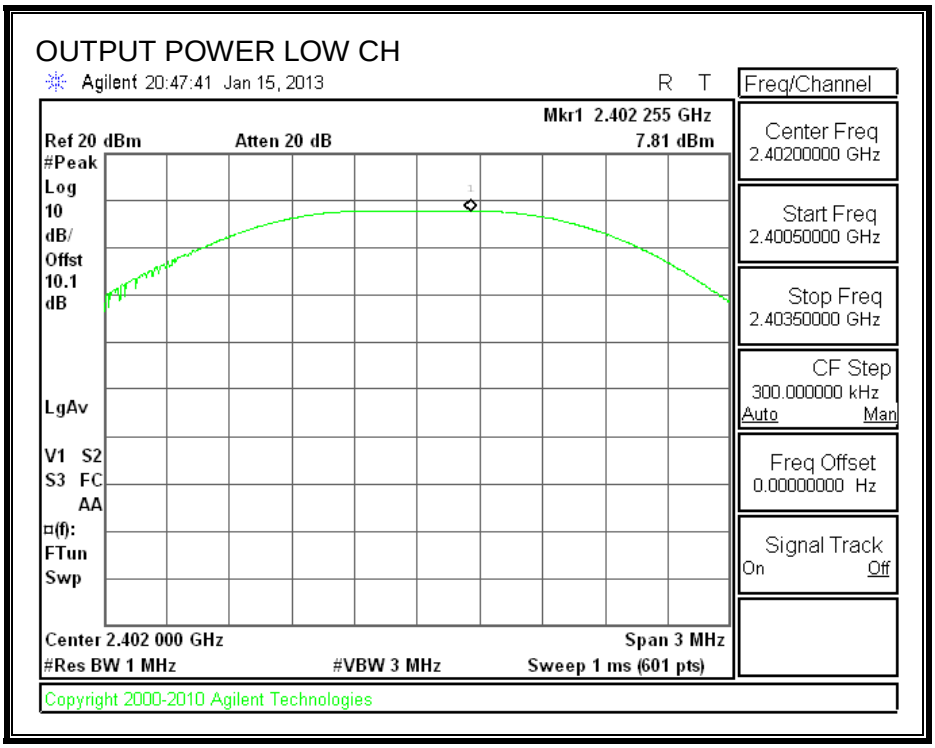
DIRECTIONAL ANTENNA GAIN

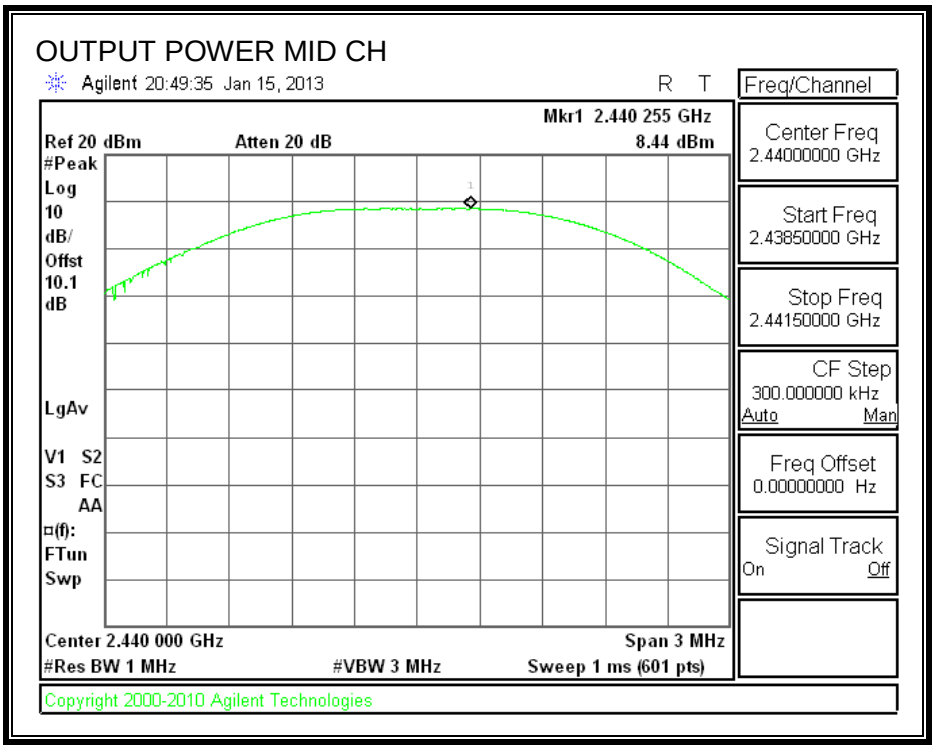
There is only one transmitter output therefore the directional gain is equal to the antenna gain.

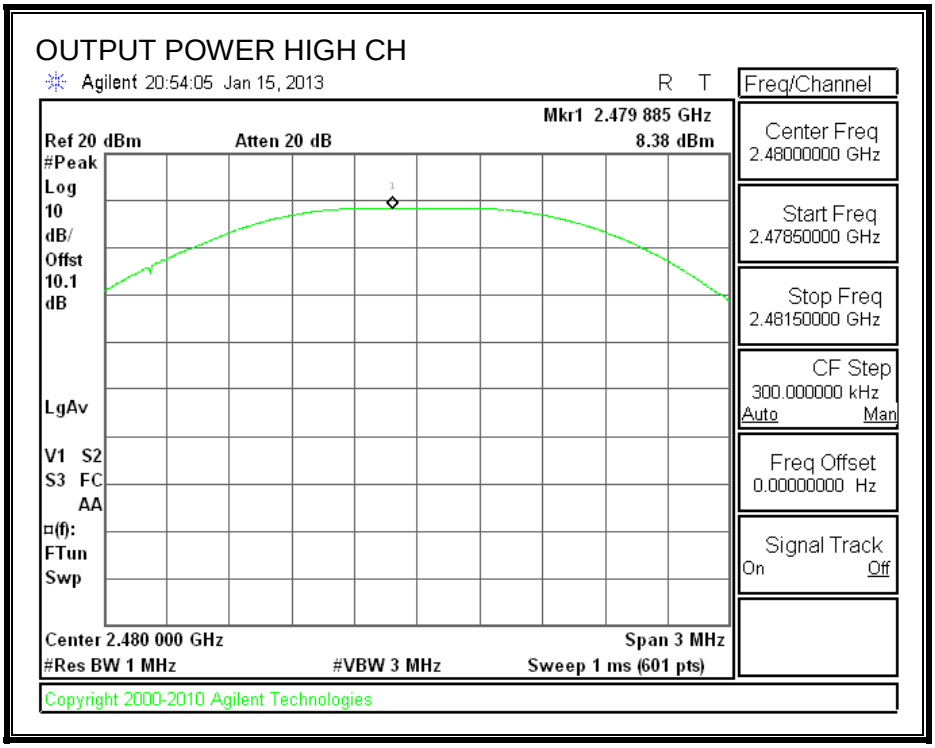
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.810	30	-22.190
Middle	2440	8.440	30	-21.560
High	2480	8.380	30	-21.620

OUTPUT POWER







9.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	8.39
Middle	2440	10.35
High	2480	10.37

9.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247

IC RSS-210 A8.2

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

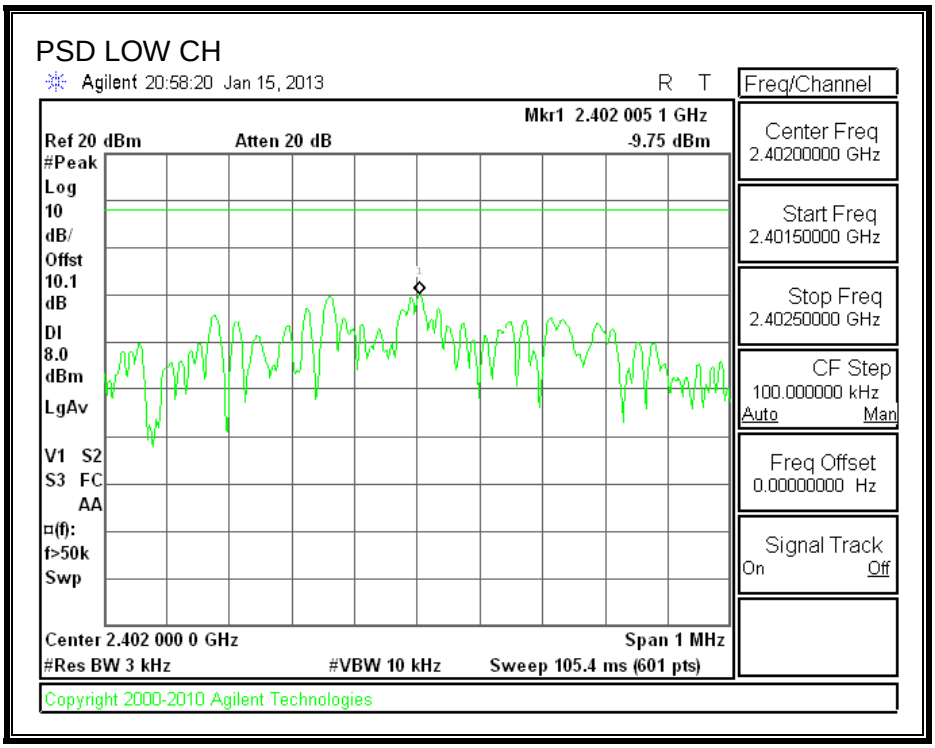
TEST PROCEDURE

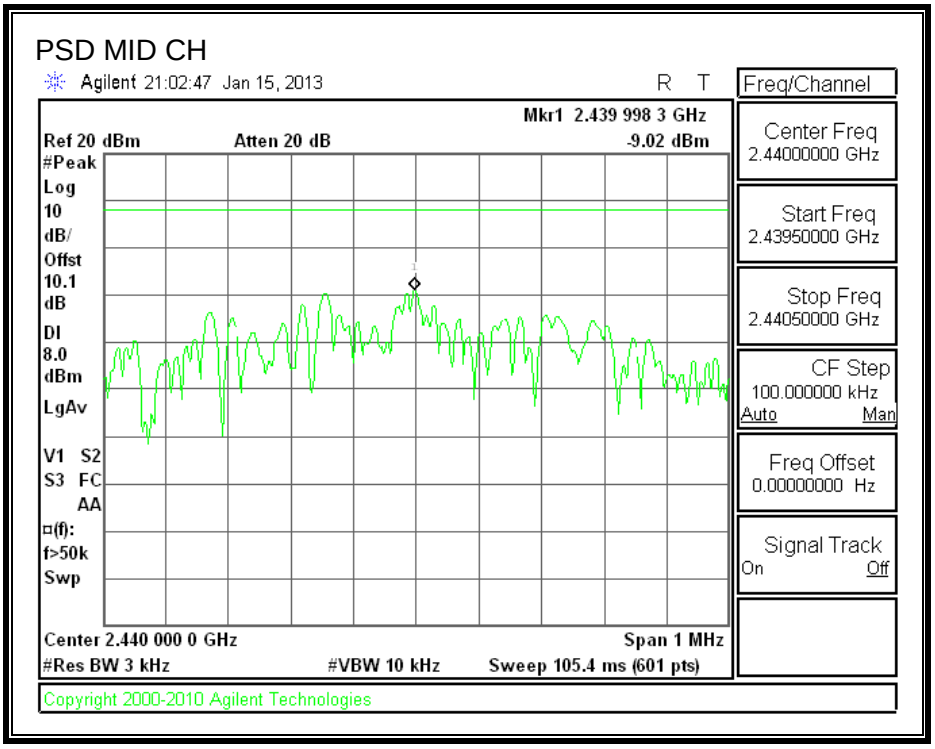
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

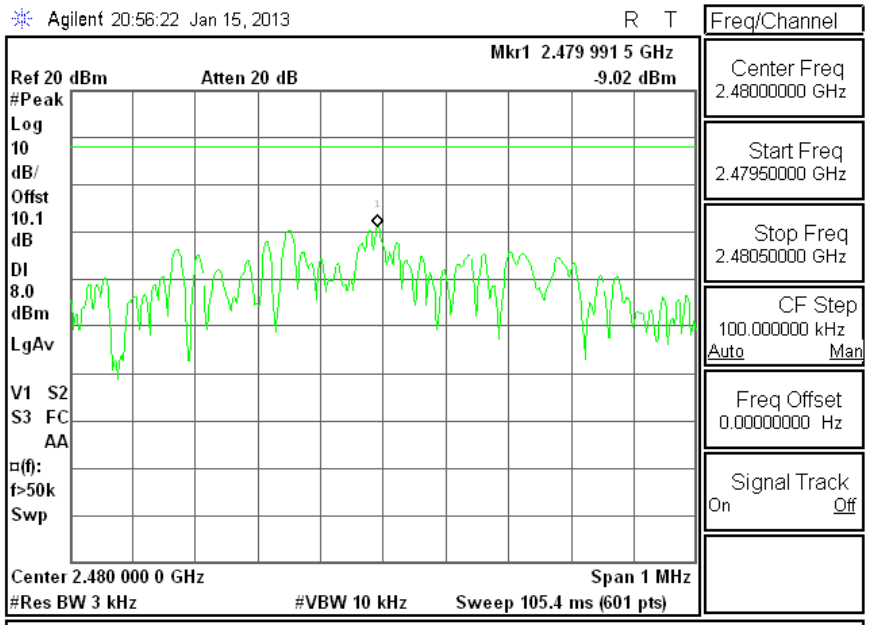
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-9.75	8	-17.75
Middle	2440	-9.02	8	-17.02
High	2480	-9.02	8	-17.02

POWER SPECTRAL DENSITY





PSD HIGH CH



9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

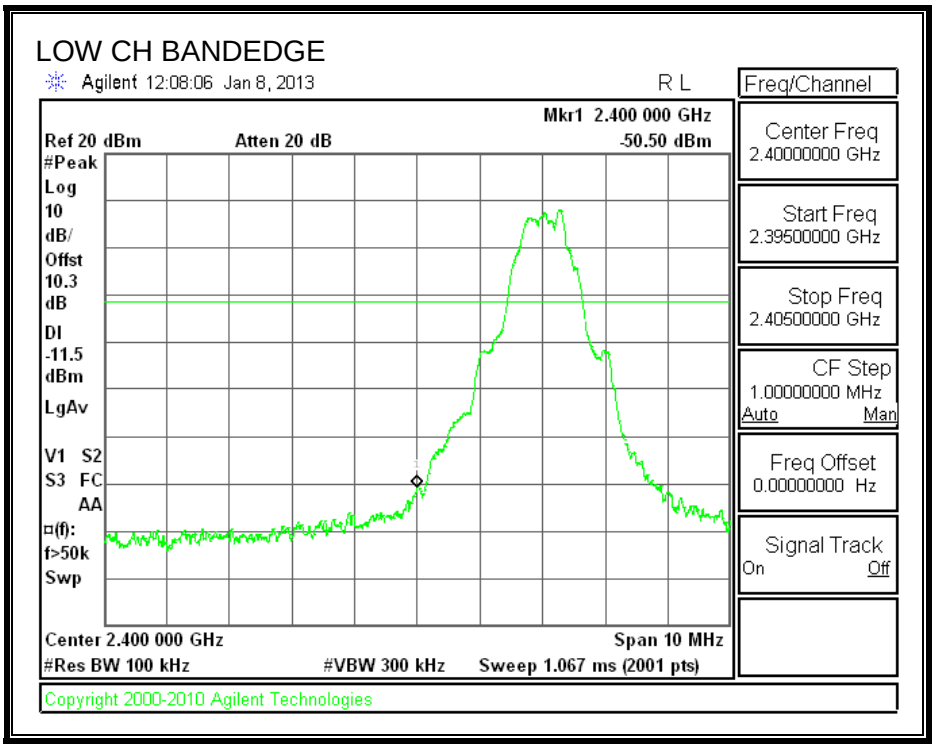
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

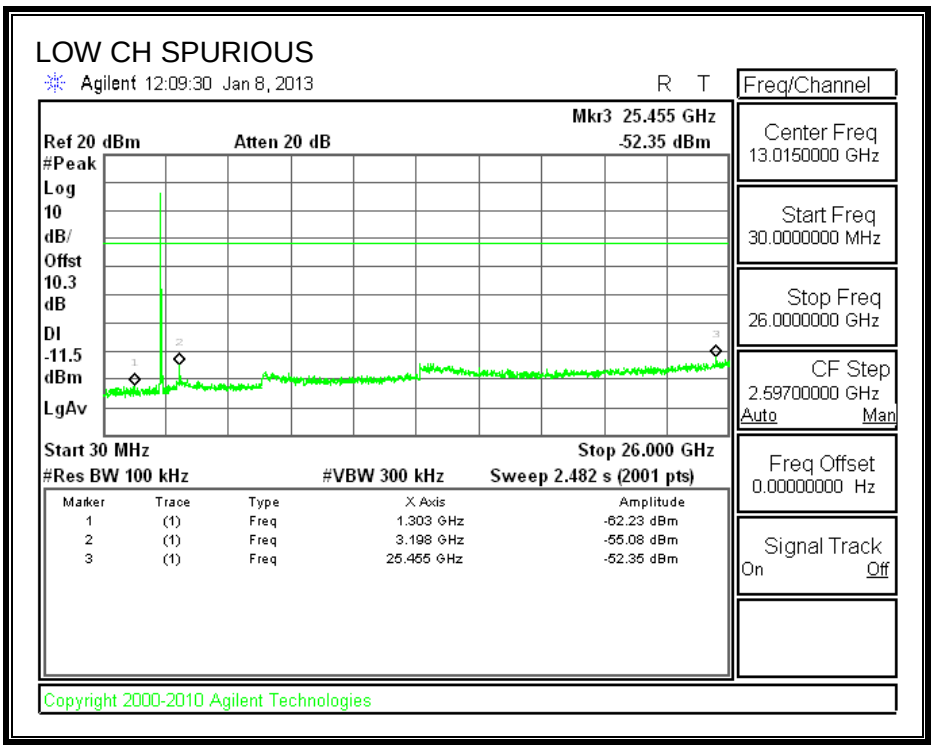
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

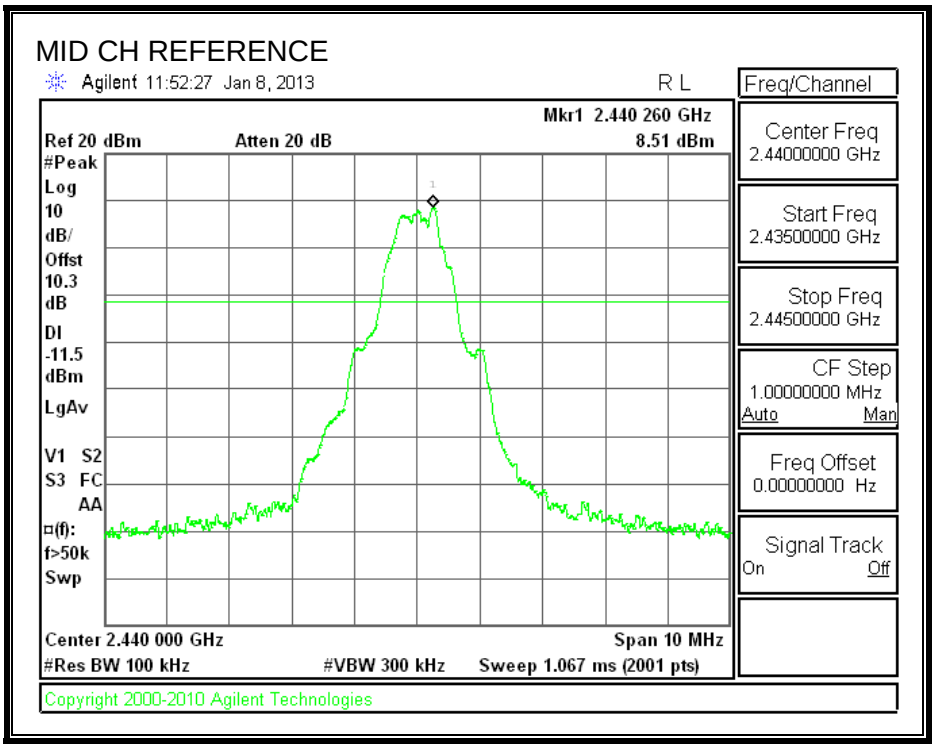
RESULTS

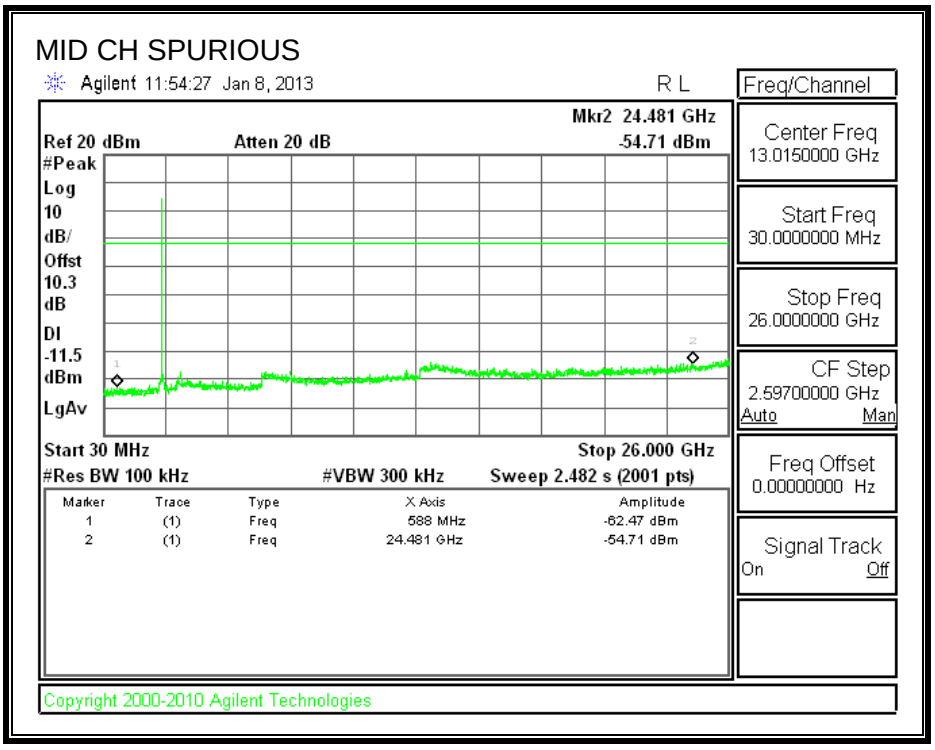
SPURIOUS EMISSIONS, LOW CHANNEL



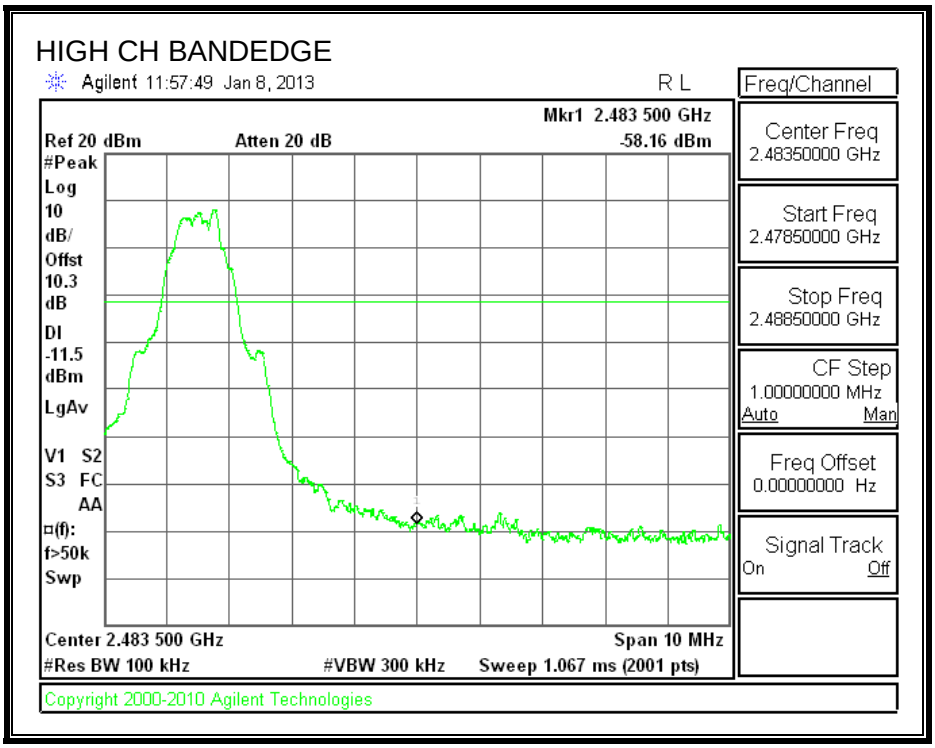


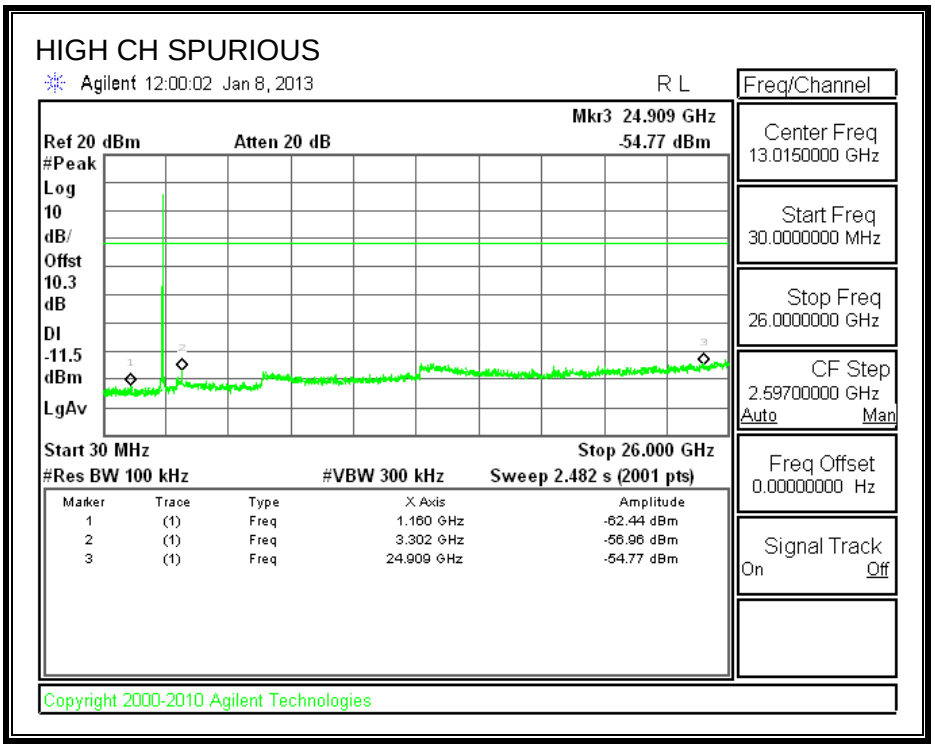
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





10. RADIATED TEST RESULTS

10.1. 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.

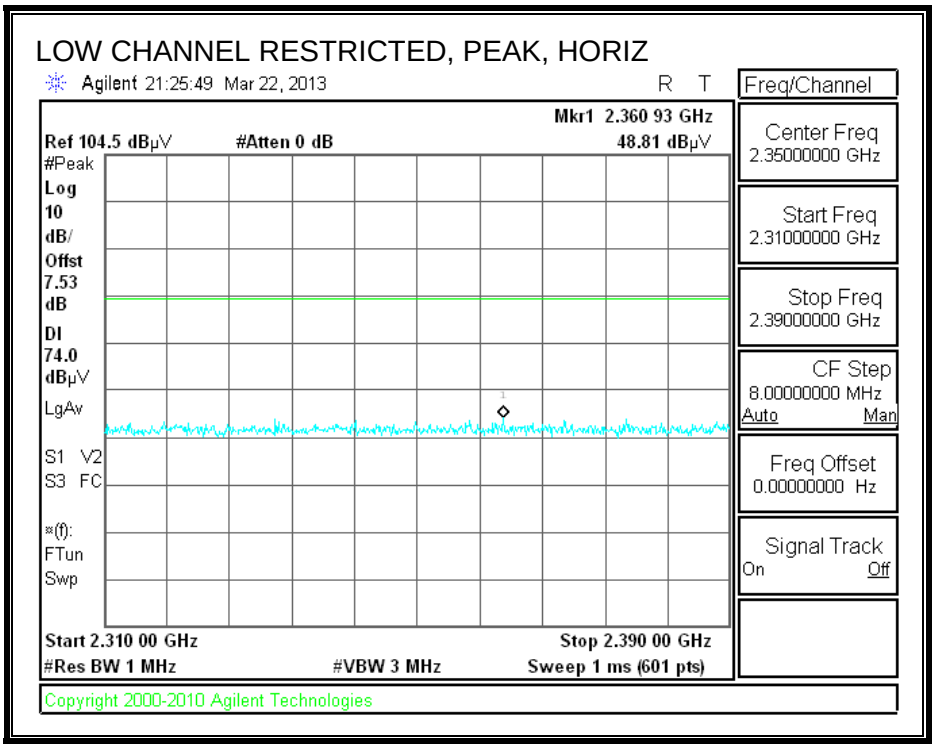
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

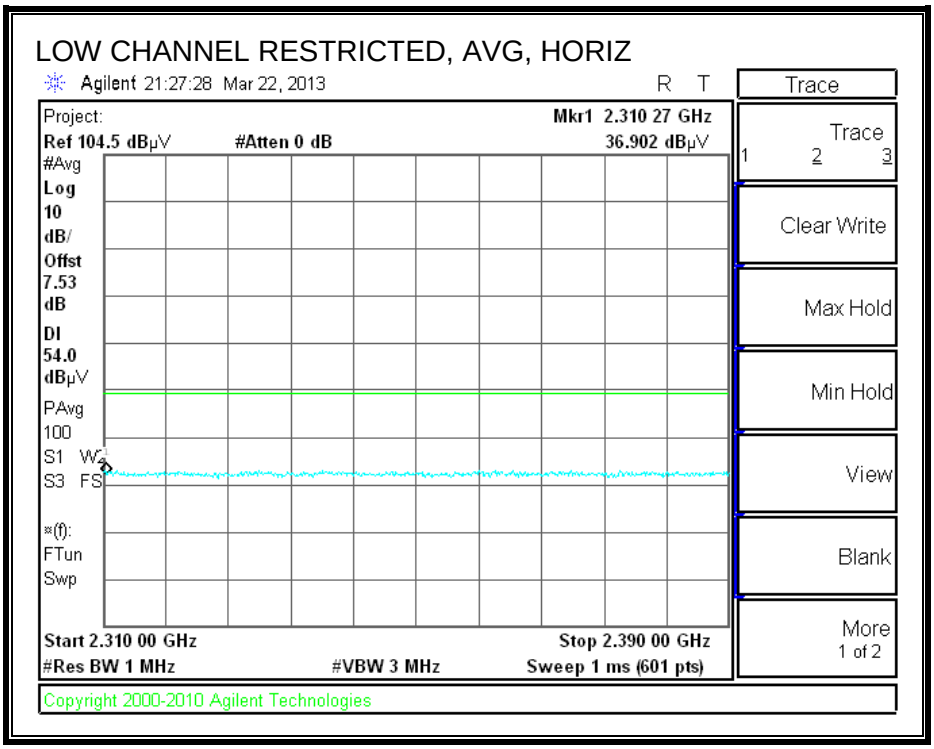
For 2.4 GHz band, the spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

10.2. TRANSMITTER ABOVE 1 GHz

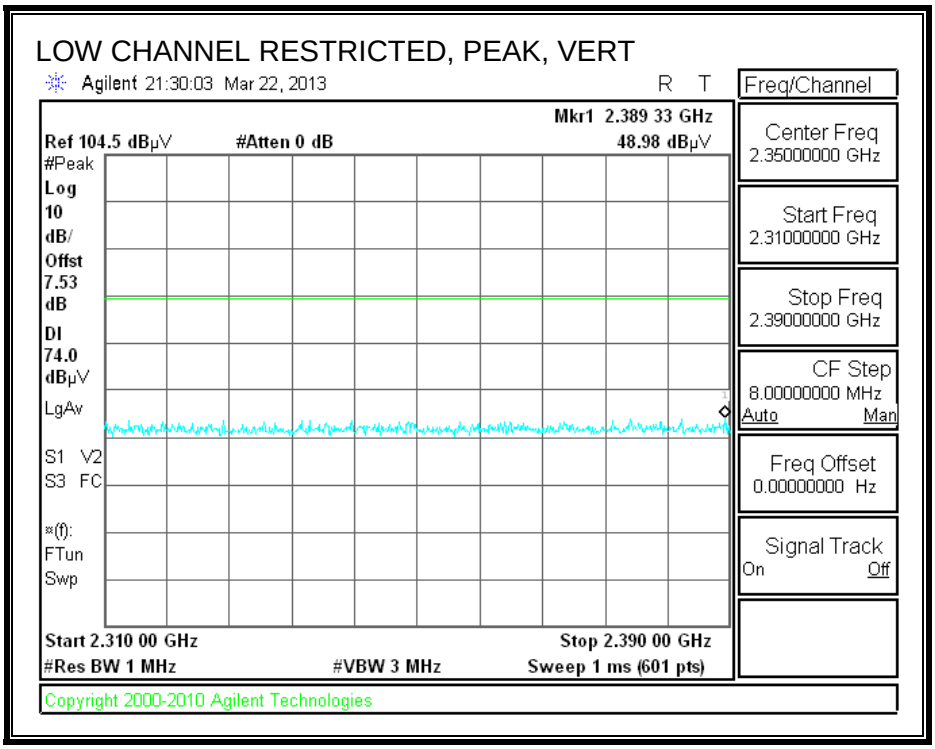
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

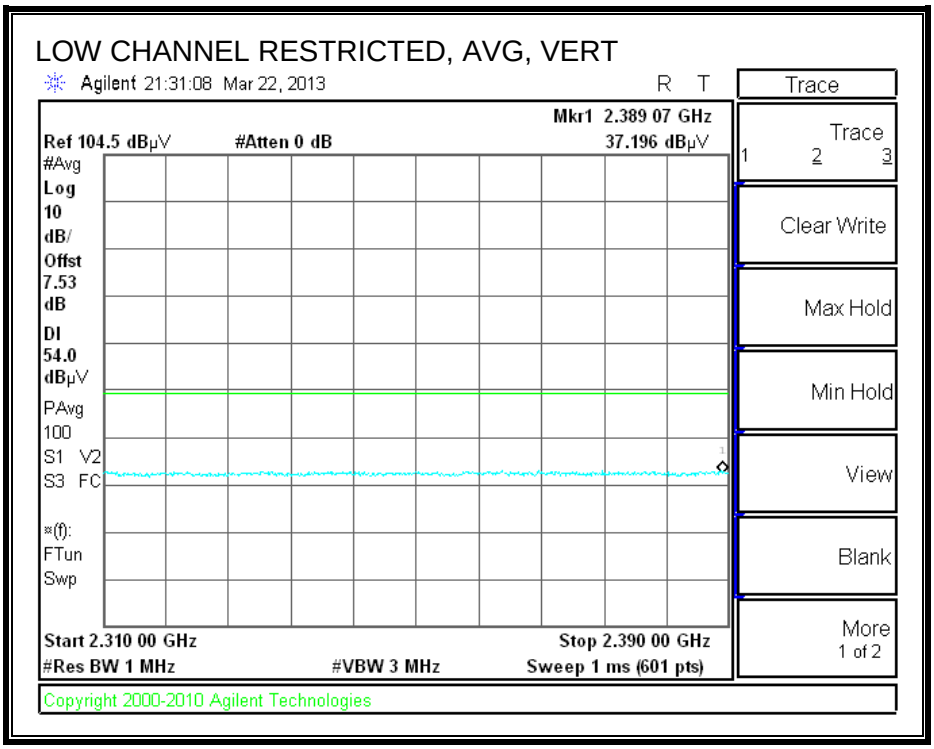




Actual Average = Measured Average + Correction Factor
= 36.902 dBuV + 7.97
= 44.872 dBuV

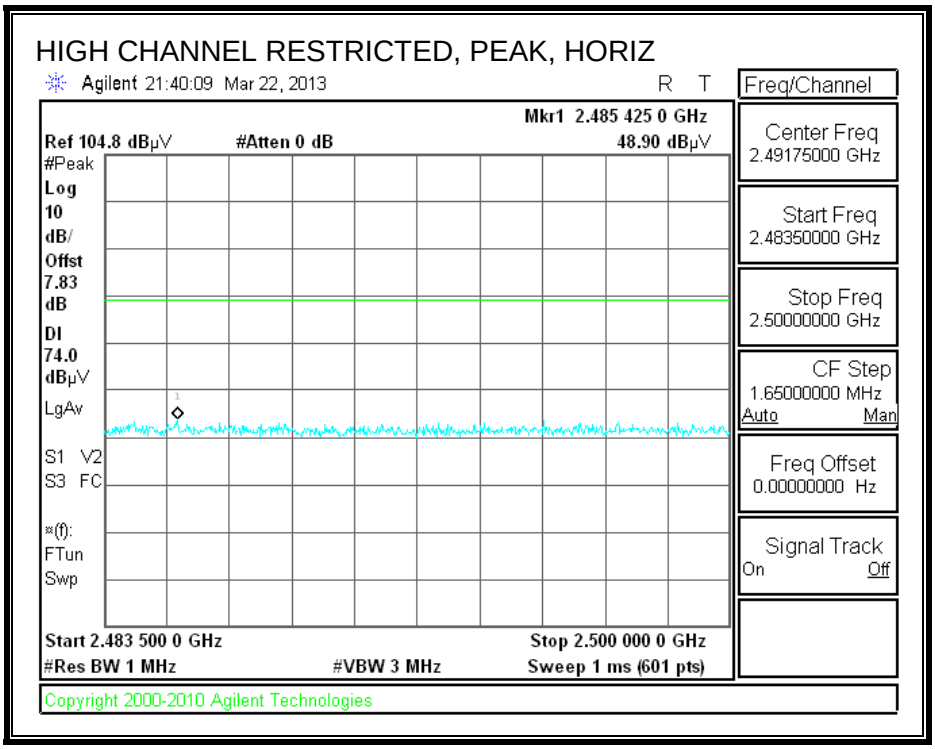
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

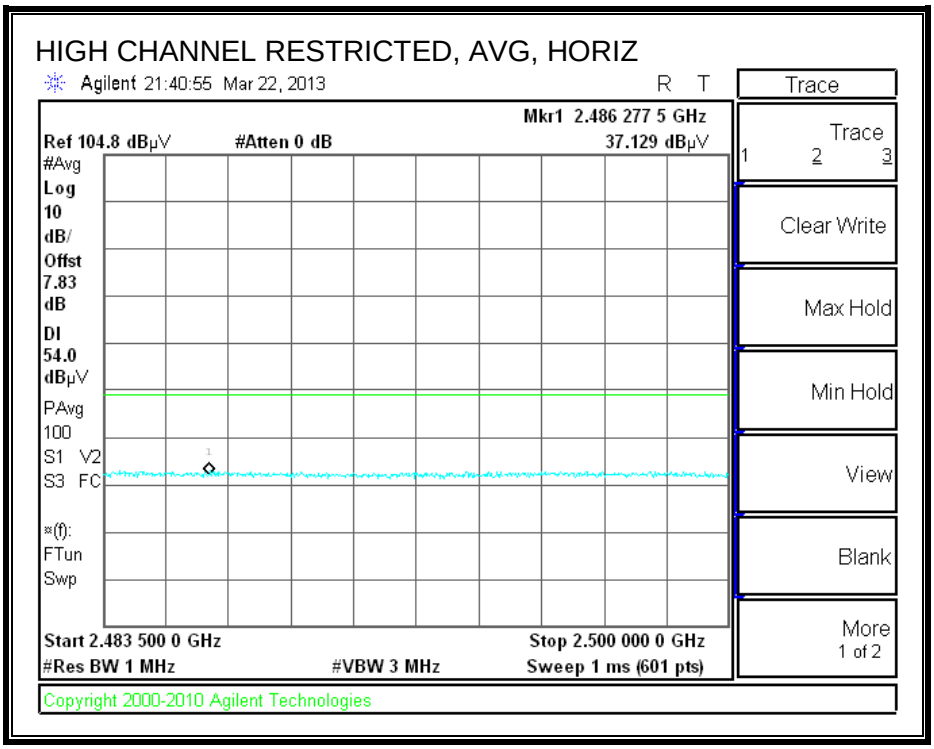




Actual Average = Measured Average + Correction Factor
= 37.196 dBuV + 7.97
= 45.166 dBuV

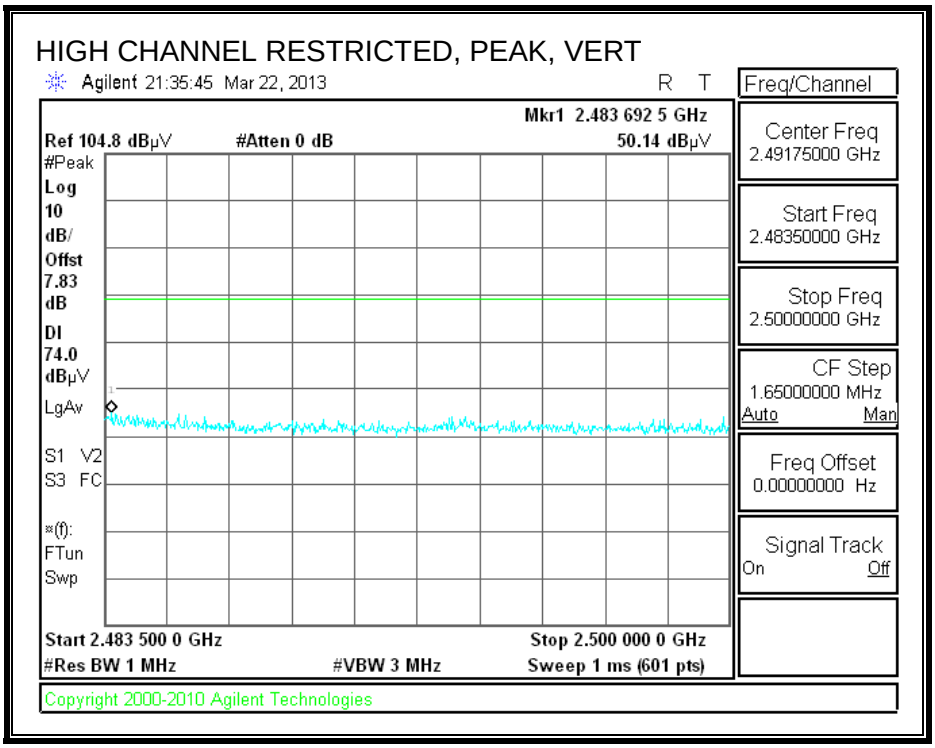
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

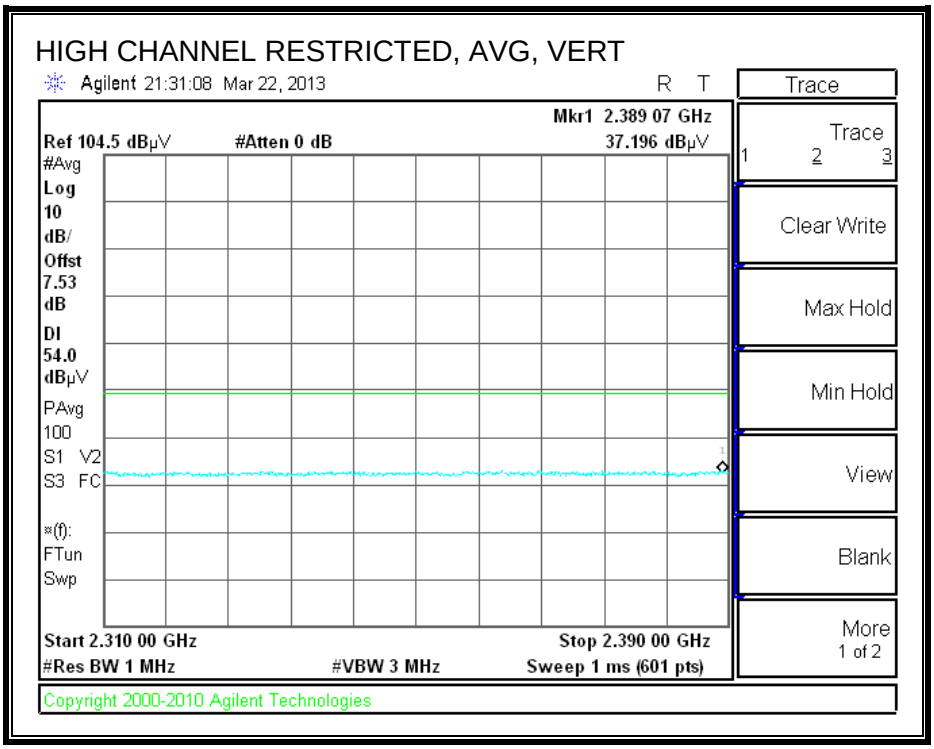




Actual Average = Measured Average + Correction Factor
= 37.129 dBuV + 7.97
= 45.099 dBuV

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





Actual Average = Measured Average + Correction Factor
= 37.196 dBuV + 7.97
= 45.166 dBuV

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber-B

Company:	LG
Project #:	13u14917
Date:	3/22/2013
Test Engineer:	Tony Wang
Configuration:	LG870 with Headset and Ac Adapter
Mode:	Tx BLE Har

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A005(	T88 Miteq 26-40GHz	T125; ARA 18-26GHz; S/N:1007	FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001

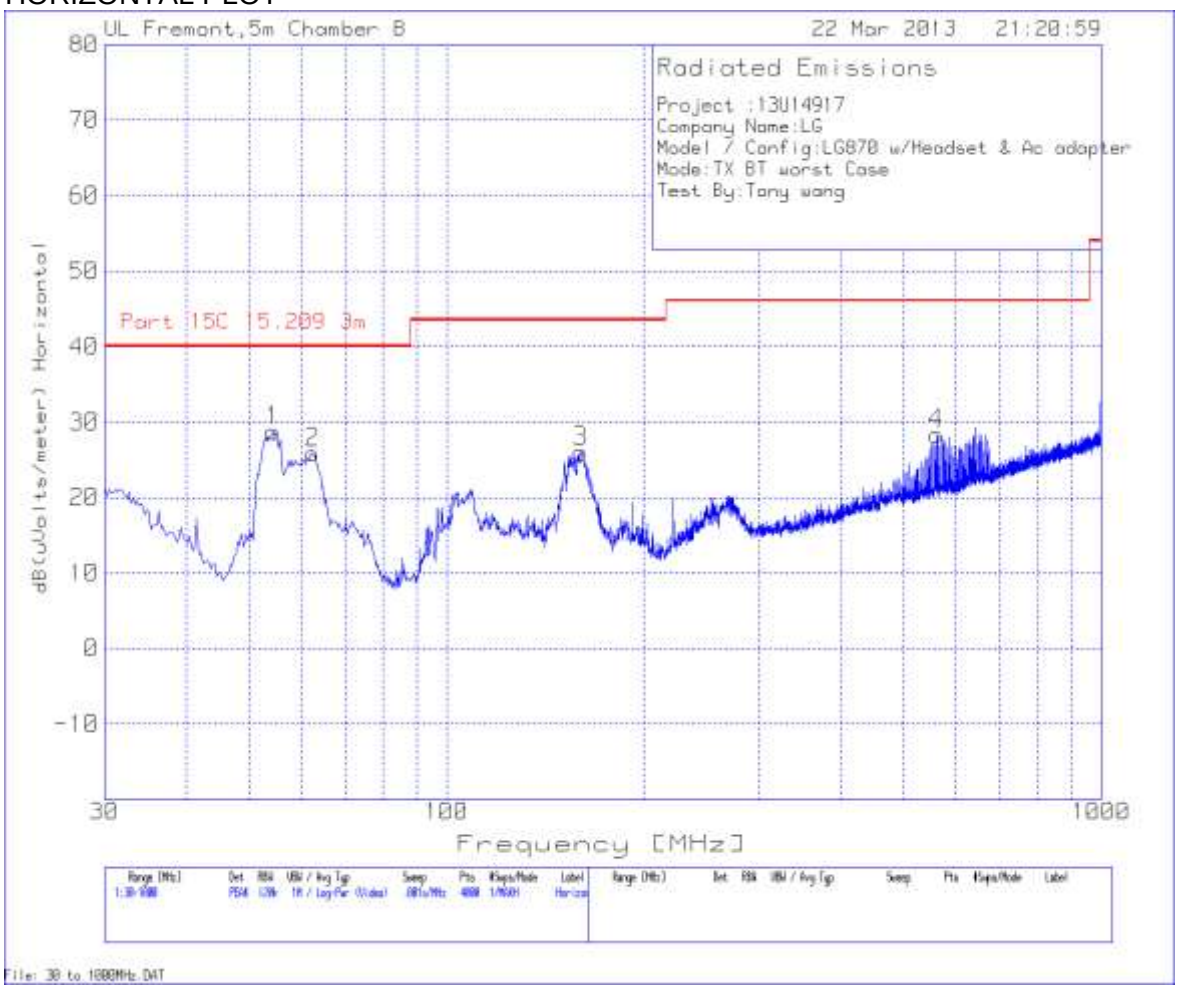
Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low ch, 2402MHz															
4.804	3.0	37.5	27.5	33.1	7.0	-34.9	0.0	0.0	42.7	32.7	74	54	-31.3	-21.3	H
4.804	3.0	38.5	27.7	33.1	7.0	-34.9	0.0	0.0	43.7	32.9	74	54	-30.3	-21.1	V
Mid ch, 2440MHz															
4.880	3.0	41.3	27.8	33.2	7.1	-34.9	0.0	0.0	46.7	33.2	74	54	-27.3	-20.8	H
7.320	3.0	37.9	26.8	35.8	8.9	-35.1	0.0	0.0	47.5	36.4	74	54	-26.5	-17.6	H
4.880	3.0	39.3	27.7	33.2	7.1	-34.9	0.0	0.0	44.7	33.1	74	54	-29.3	-20.9	V
7.320	3.0	37.4	26.8	35.8	8.9	-35.1	0.0	0.0	47.0	36.4	74	54	-27.0	-17.6	V
High ch, 2480MHz															
4.960	3.0	38.2	27.2	33.2	7.1	-34.9	0.0	0.0	43.7	32.7	74	54	-30.3	-21.3	H
7.440	3.0	37.3	26.7	36.0	8.9	-35.1	0.0	0.0	47.1	36.5	74	54	-26.9	-17.5	H
4.960	3.0	37.4	27.3	33.2	7.1	-34.9	0.0	0.0	42.9	32.8	74	54	-31.1	-21.2	V
7.440	3.0	37.2	26.7	36.0	8.9	-35.1	0.0	0.0	47.0	36.5	74	54	-27.0	-17.5	V

10.3. WORST-CASE BELOW 1 GHz

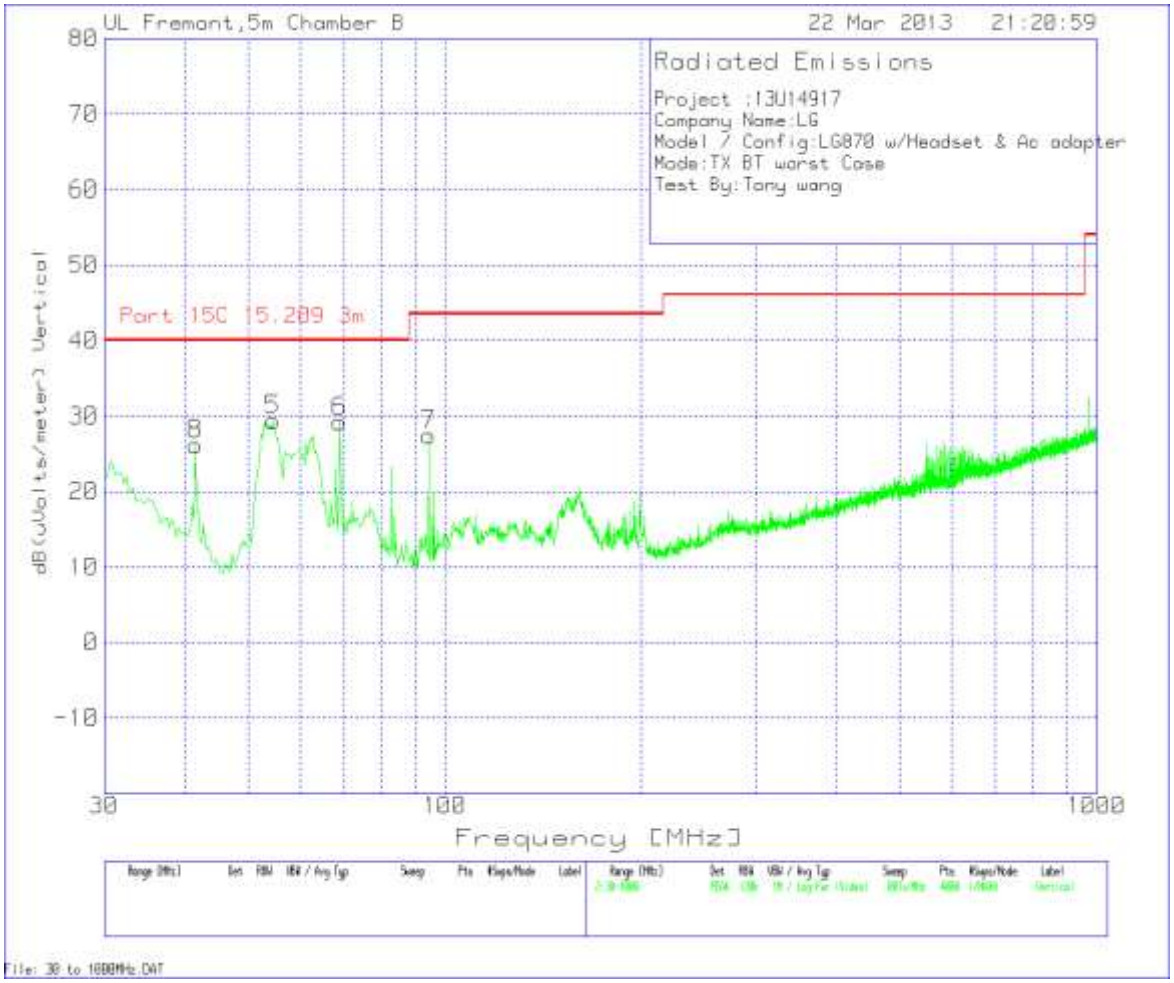
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project :13U14917
Company Name:LG
Model / Config:LG870 w/Headset & Ac adapter
Mode:TX BLE worst Case
Test By:Tony wang

Horizontal 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T243 Hybrid	T10 preamp/ Cable loss loop	dB(uVolts/meter)	Part 15C 15.209 3m	Margin	Height [cm]	Polarity
1	54.2318	50.73	PK	6.9	-28.9	28.73	40	-11.27	400	Horz
2	62.4706	47.38	PK	7.3	-28.8	25.88	40	-14.12	400	Horz
3	160.1249	41.58	PK	12.1	-27.6	26.08	43.5	-17.42	200	Horz
4	560.1924	36.17	PK	18.4	-26.2	28.37	46	-17.63	200	Horz

Vertical 30 - 1000MHz

Marker No.	Test Frequency	Meter Reading	Detector	T243 Hybrid	T10 preamp/ Cable loss loop	dB(uVolts/meter)	Part 15C 15.209 3m	Margin	Height [cm]	Polarity
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	PK	6.9	-28.9	29.43	40	-10.57	300	Vert
6	69.0132	50.1	PK	7.8	-28.7	29.2	40	-10.8	200	Vert
7	94.4567	47.37	PK	8.5	-28.4	27.47	43.5	-16.03	200	Vert
8	41.389	42.74	PK	12.4	-29	26.14	40	-13.86	200	Vert

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

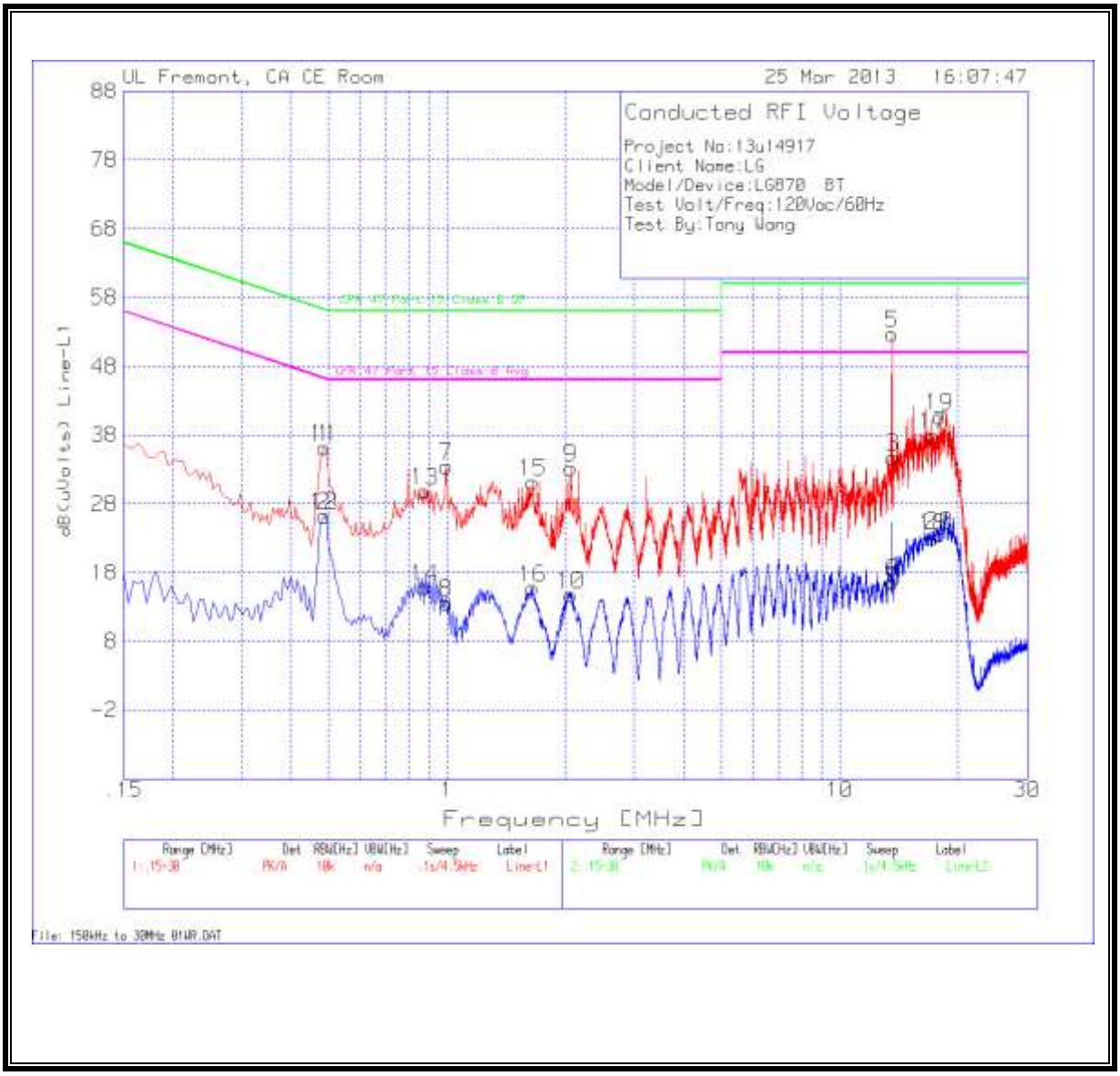
ANSI C63.4

RESULTS

6 WORST EMISSIONS

Project No:13u14917									
Client Name:LG									
Model/Device:LG870 BLE									
Test Volt/Freq:120Vac/60Hz									
Test By:Tony Wang									
Line-L1 .15 - 30MHz									
Test Frequency	**Meter Reading**	**Detector**	**T24 IL L1.TXT (dB)**	**LC Cables 1&3.TXT (dB)**	**dB(uVolts)**	**CFR 47 Part 15 Class B QP**	**Margin**	**CFR 47 Part 15 Class B Avg**	**Margin**
0.4875	36.09	PK	0.1	0	36.19	56.2	-20.01	-	-
0.4875	26.14	Av	0.1	0	26.24	-	-	46.2	-19.96
13.65	34.38	PK	0.2	0.2	34.78	60	-25.22	-	-
13.65	16.44	Av	0.2	0.2	16.84	-	-	50	-33.16
2.067	32.99	PK	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 Frequency	**Meter Reading**	**Detector**	**T24 IL L1.TXT (dB)**	**LC Cables 1&3.TXT (dB)**	**dB(uVolts)**	**CFR 47 Part 15 Class B QP**	**Margin**	**CFR 47 Part 15 Class B Avg**	**Margin**
0.4875	36.09	PK	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	PK	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	PK	0.2	0.2	40.69	60	-19.31	-	-
17.9475	23.07	Av	0.2	0.2	23.47	-	-	50	-26.53

LINE 1 RESULTS



LINE 2 RESULTS