



**FCC CFR47 PART 15 SUBPART C**

**BLUETOOTH LOW ENERGY  
CERTIFICATION TEST REPORT**

**FOR**

**CDMA/LTE PHABLET + BLUETOOTH, & DTS/UNII a/b/g/n**

**MODEL NUMBER: LG-LS770, LS770, LGLS770**

**FCC ID: ZNFLS770**

**REPORT NUMBER: 15119834-E3 REVISION A**

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*Prepared for*

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**NVLAP LAB CODE 200065-0**

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--	02/11/15	Initial Issue	D. Corona
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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** LG ELECTRONICS MOBILECOMM U.S.A., INC  
**EUT DESCRIPTION:** CDMA/LTE PHABLET + BLUETOOTH, & DTS/UNII a/b/g/n  
**MODEL:** LG-LS770, LS770, LGLS770  
**SERIAL NUMBER:** 804AA215 (RADIATED), 00431 (CONDUCTED)  
**DATE TESTED:** JANUARY 21-22, 29 & FEBRUARY 11, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.

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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, and FCC CFR 47 Part 15C.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
<input type="checkbox"/> Chamber A(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 2324B-4)
<input checked="" type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 2324B-5)
<input checked="" type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 2324B-6)
	<input type="checkbox"/> Chamber G(IC: 2324B-7)
	<input type="checkbox"/> Chamber H(IC: 2324B-8)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable} \\ &\text{Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 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 18000 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 CDMA/LTE PHABLET + BLUETOOTH, & DTS/UNII a/b/g/n

### 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	BLE	0.22	1.05

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -3.84dBi.

#### **5.4. 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS-02WR	RA4Y1031433	N/A
Earphone	LG	N/A	N/A	N/A

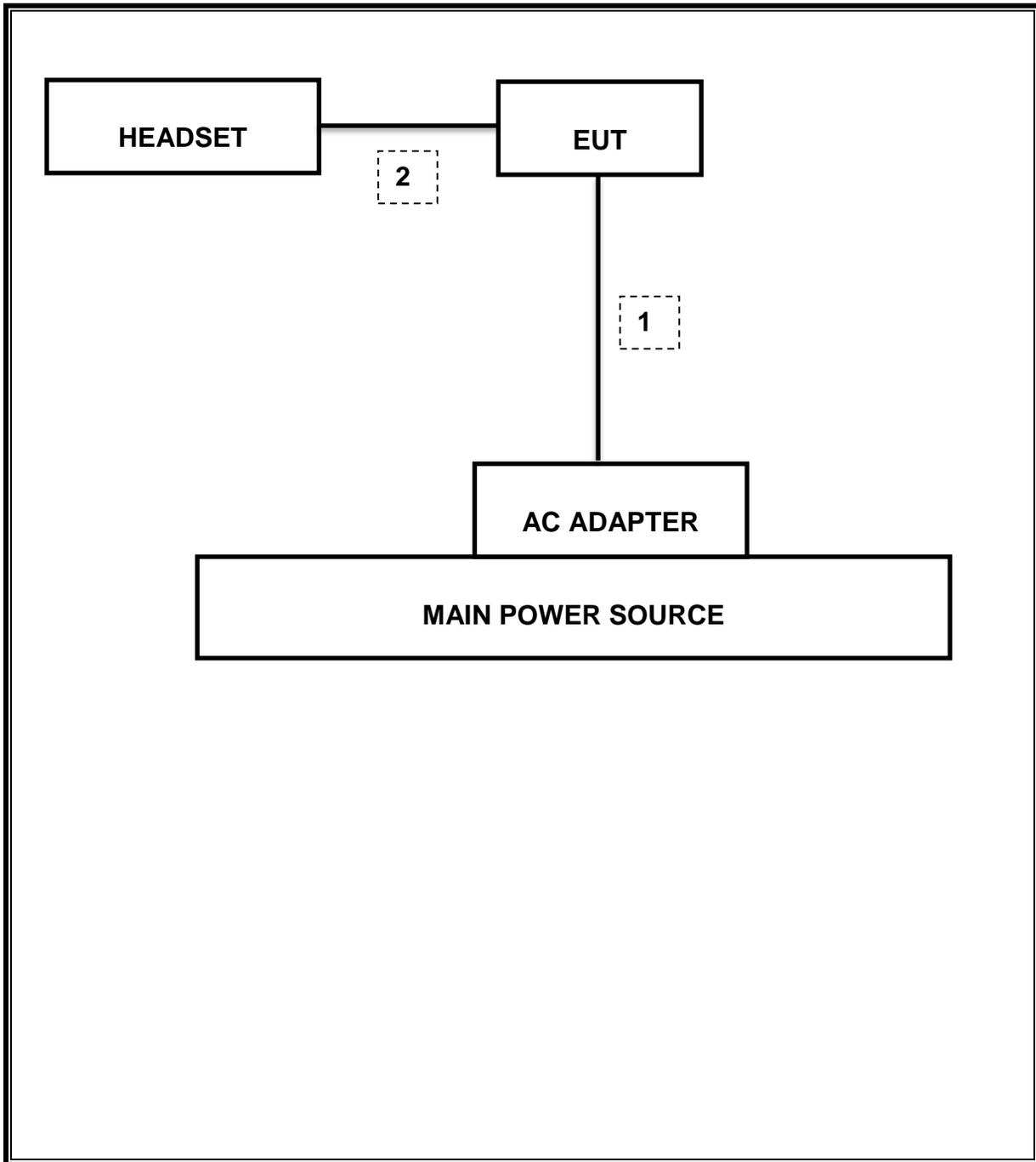
### I/O CABLES

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 continuously communicating to the Bluetooth tester during the tests.

**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
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/15
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/15
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
CLT Software	UL	UL RF	Version 1.0, 02/02/15
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

## 7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-210 A8.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	.664MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-50.66dBm
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	0.22dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-14.98dBm
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass	49.4 dBuV(AV)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	42.75dBuV/m

## 8. ANTENNA PORT TEST RESULTS

### 8.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

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

#### TEST PROCEDURE

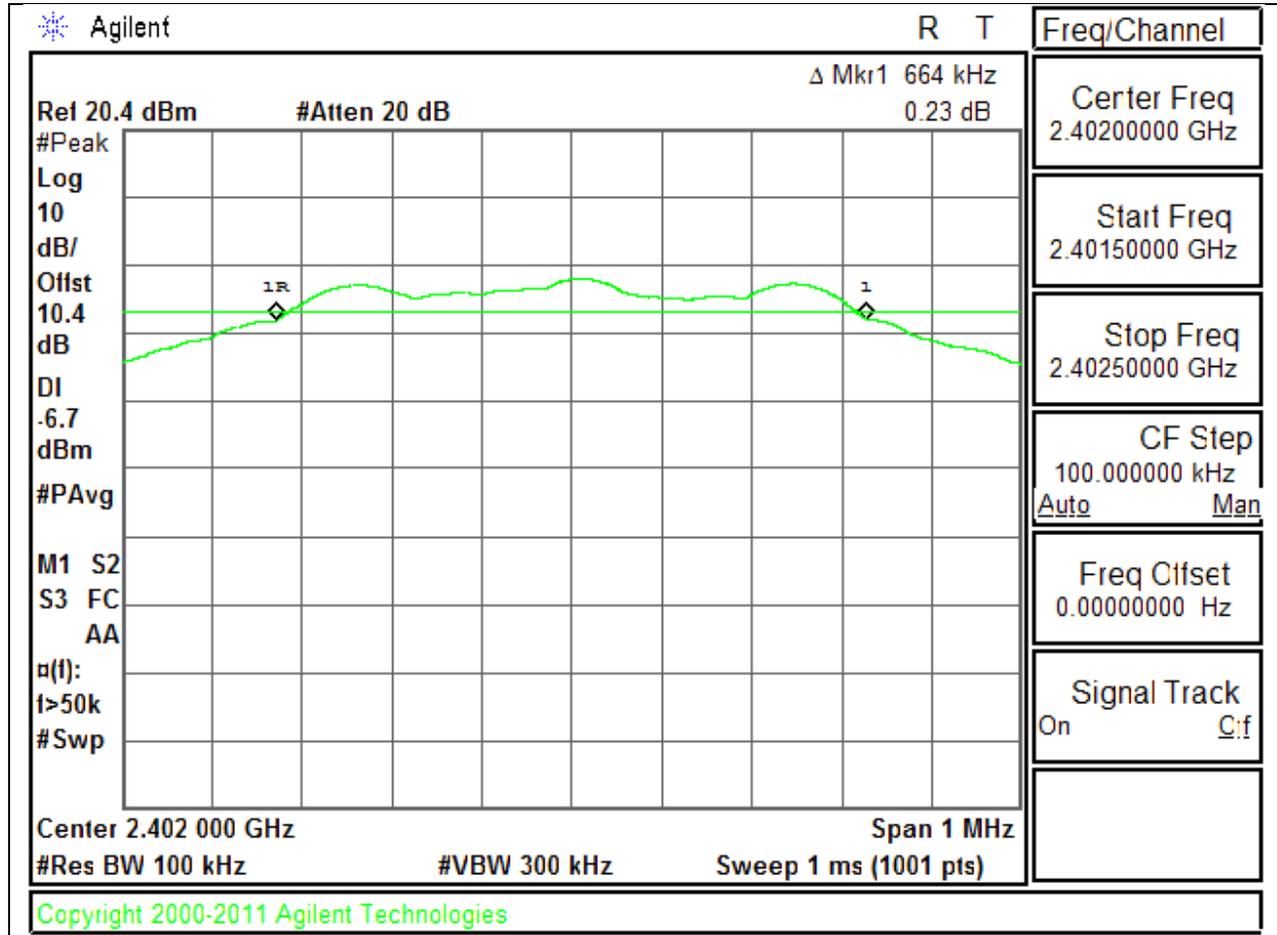
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

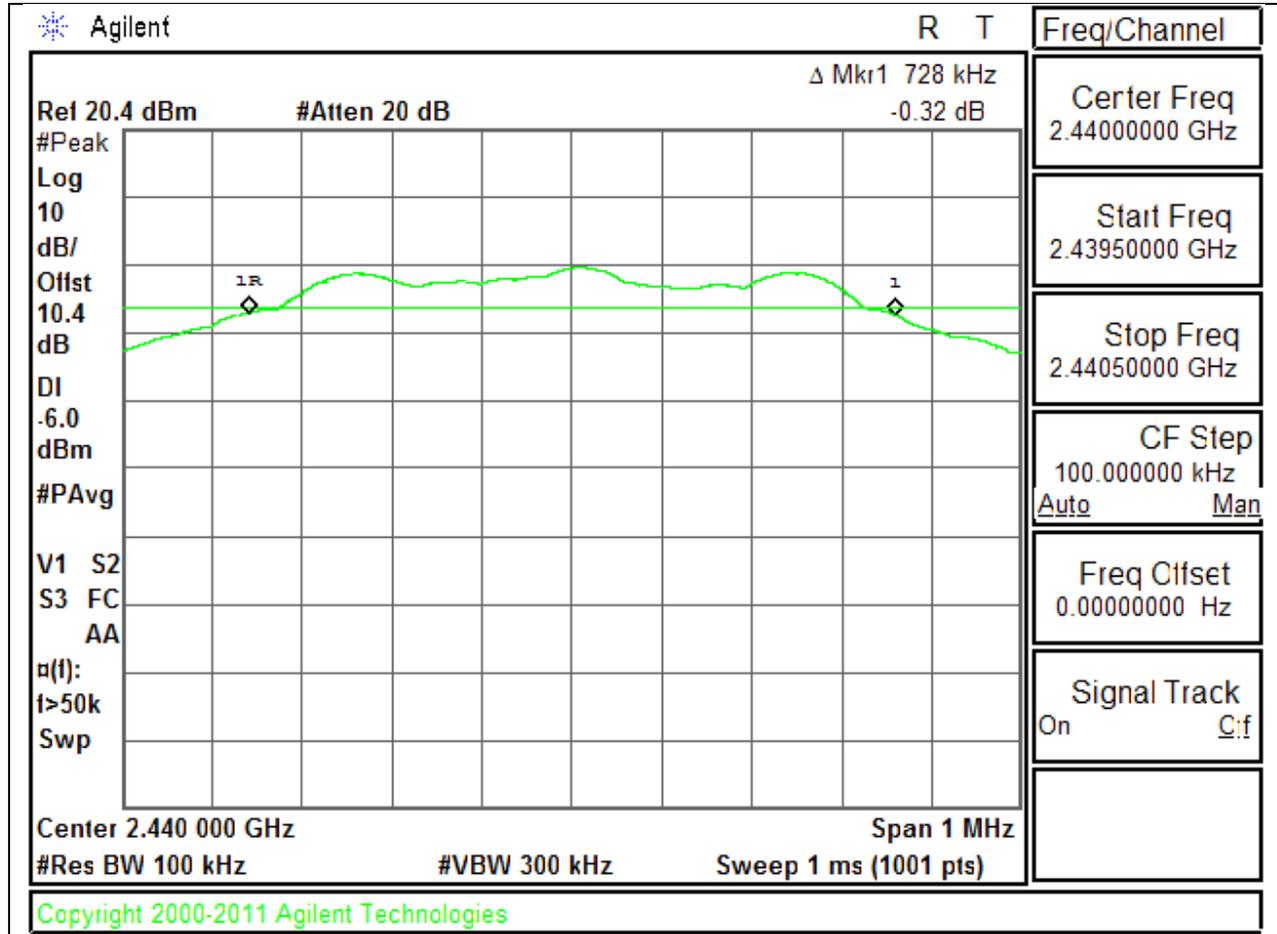
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.664	0.5
Middle	2440	0.728	0.5
High	2480	0.721	0.5

**6 dB BANDWIDTH PLOTS**

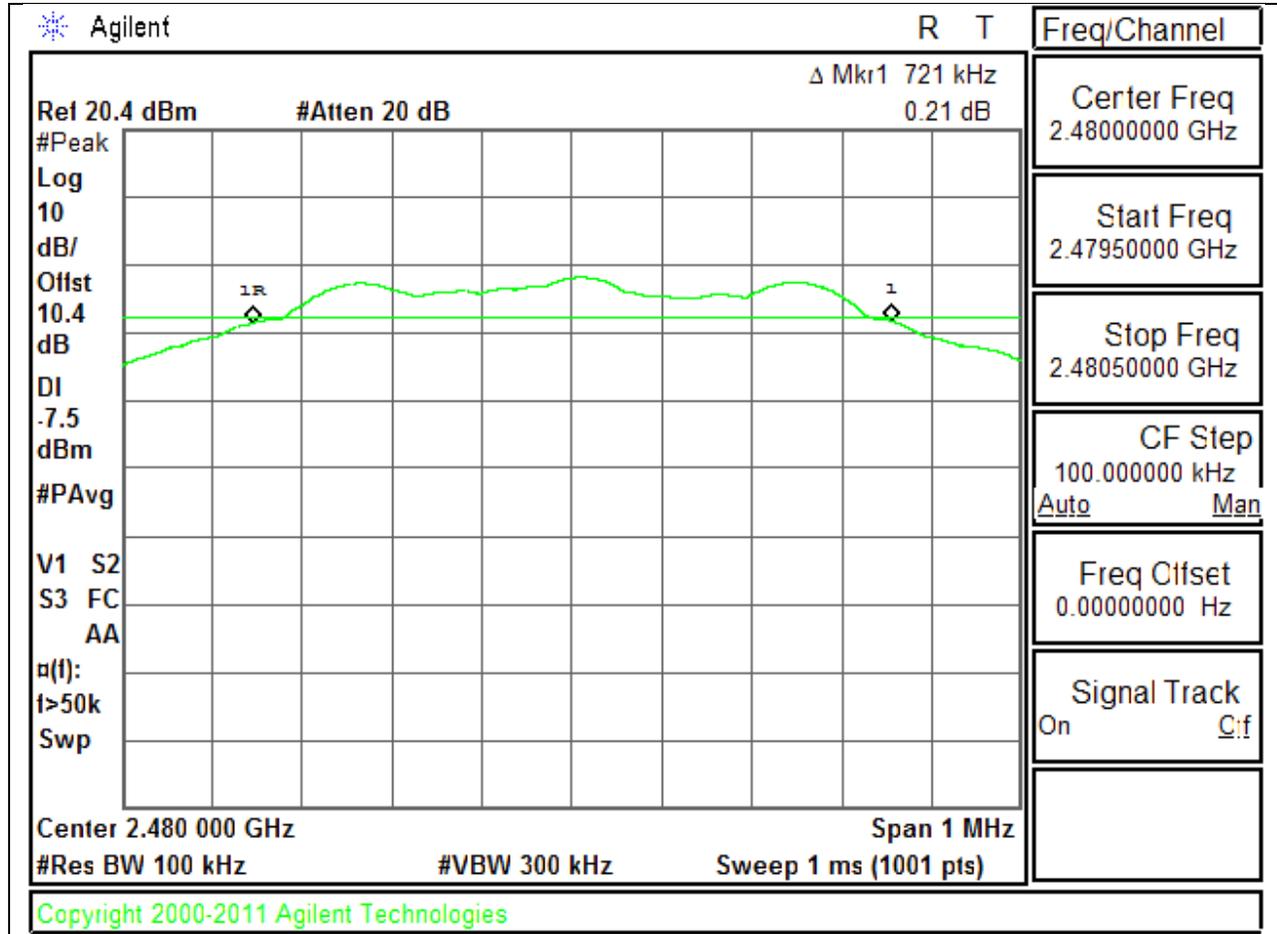
**LOW CHANNEL**



MID CHANNEL



### HIGH CHANNEL



## 8.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

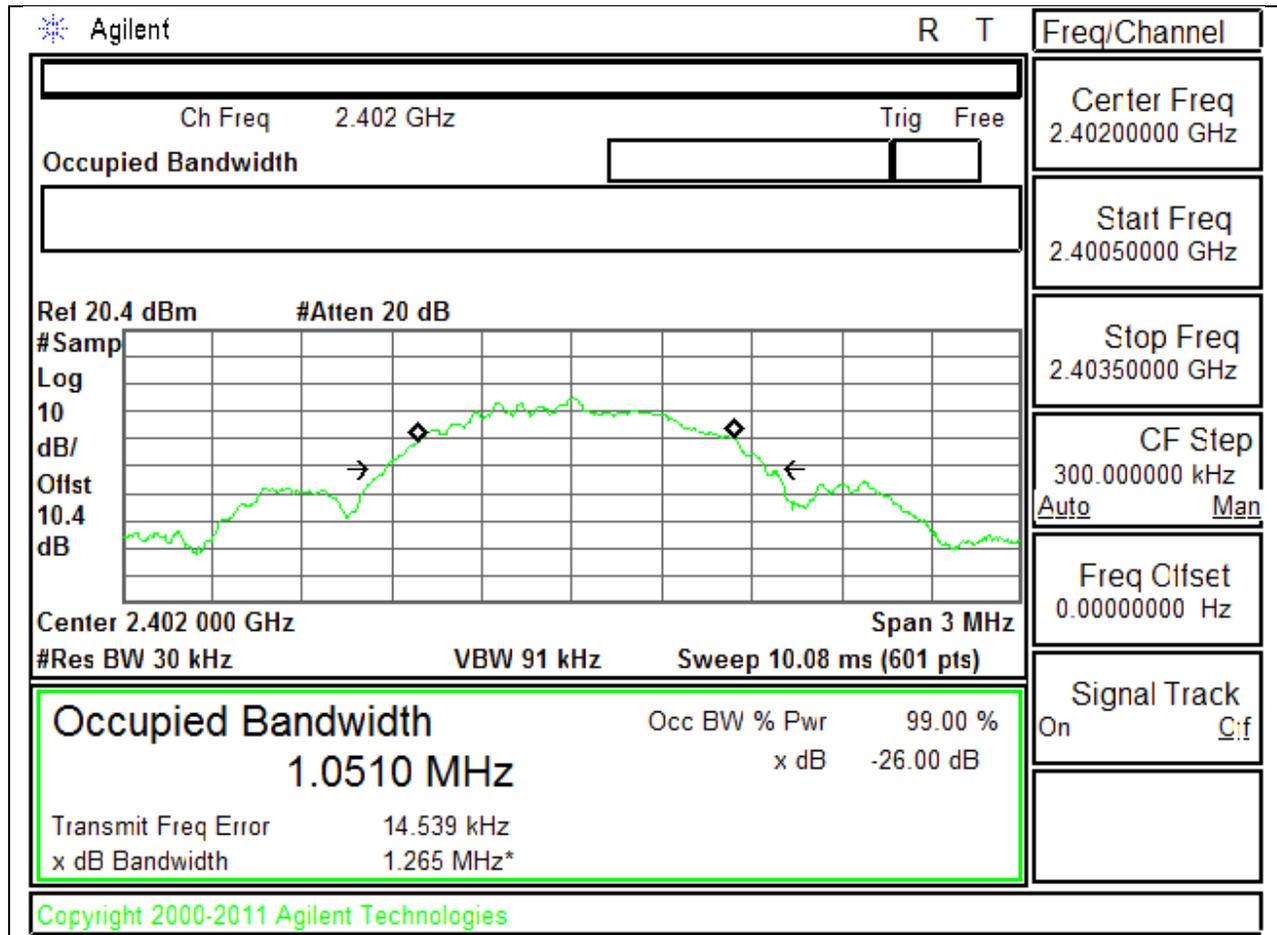
Reference to KDB558074 D01 DTS Meas Guidance v03r01: The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

### RESULTS

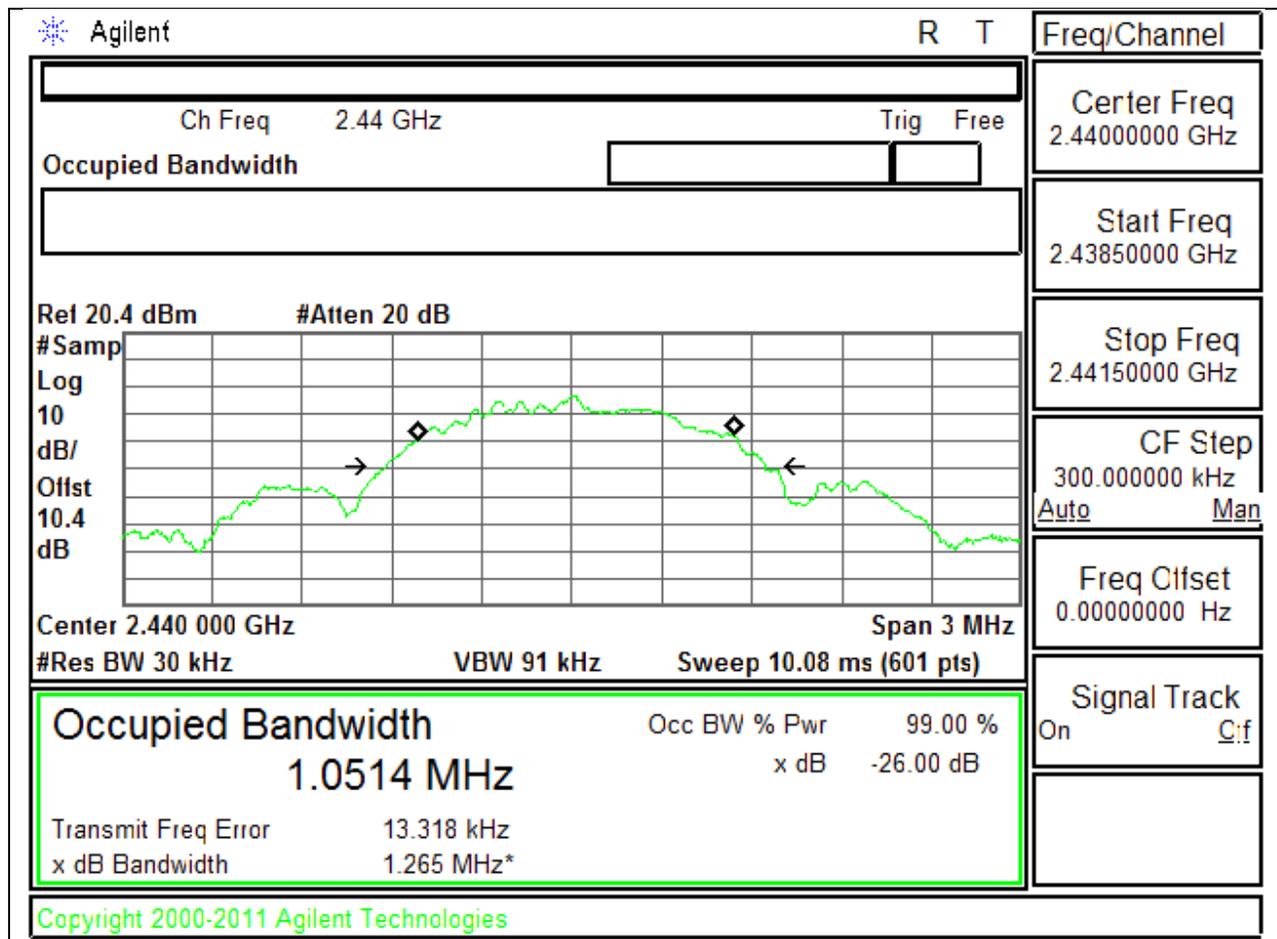
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.051
Middle	2440	1.051
High	2480	1.052

**99% BANDWIDTH PLOTS**

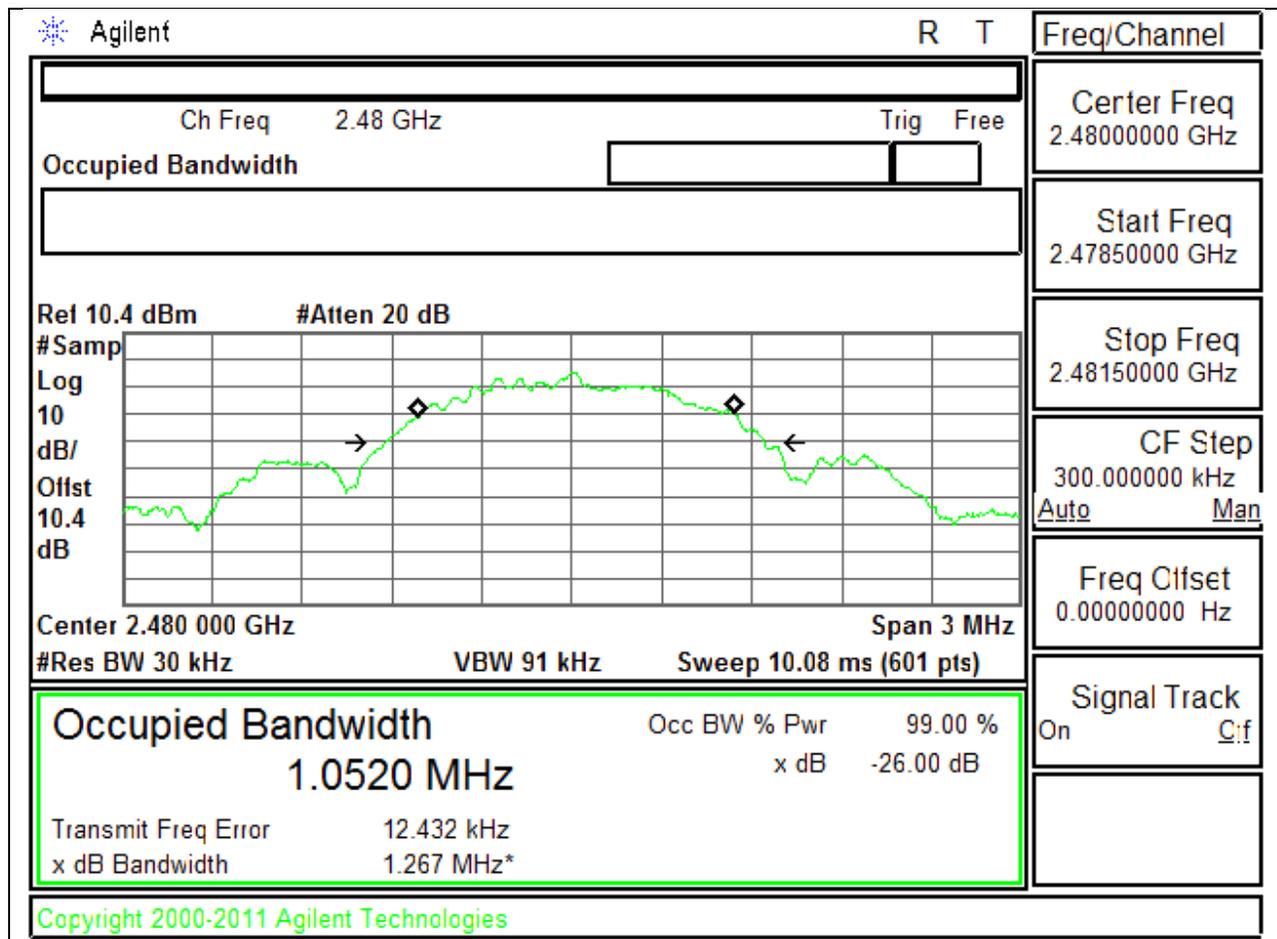
**LOW CHANNEL**



**MID CHANNEL**



### HIGH CHANNEL



### 8.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

#### TEST PROCEDURE

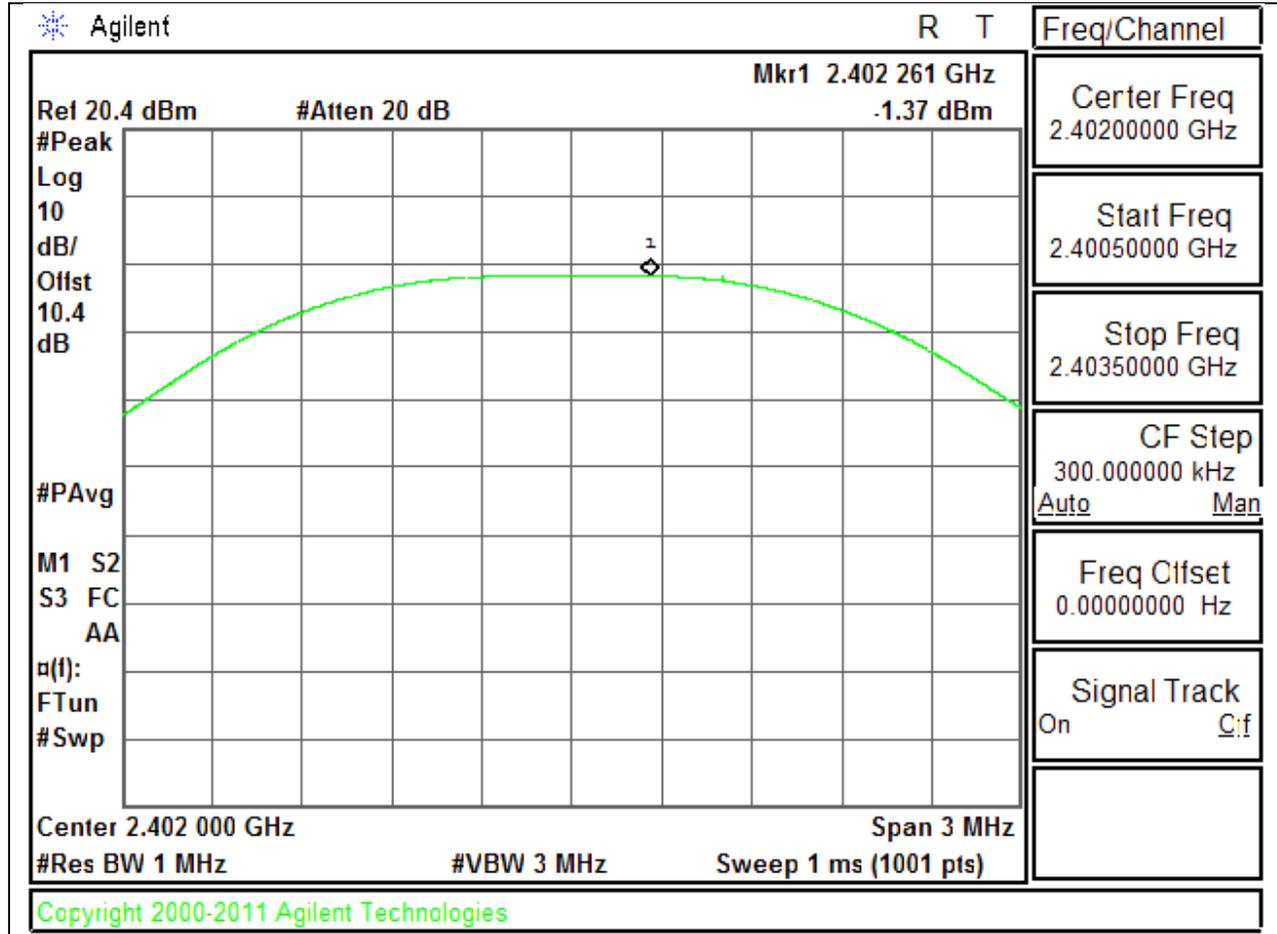
Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r01 April 9, 2013 under section 9.1.1 utilizing spectrum analyzer.

#### RESULTS

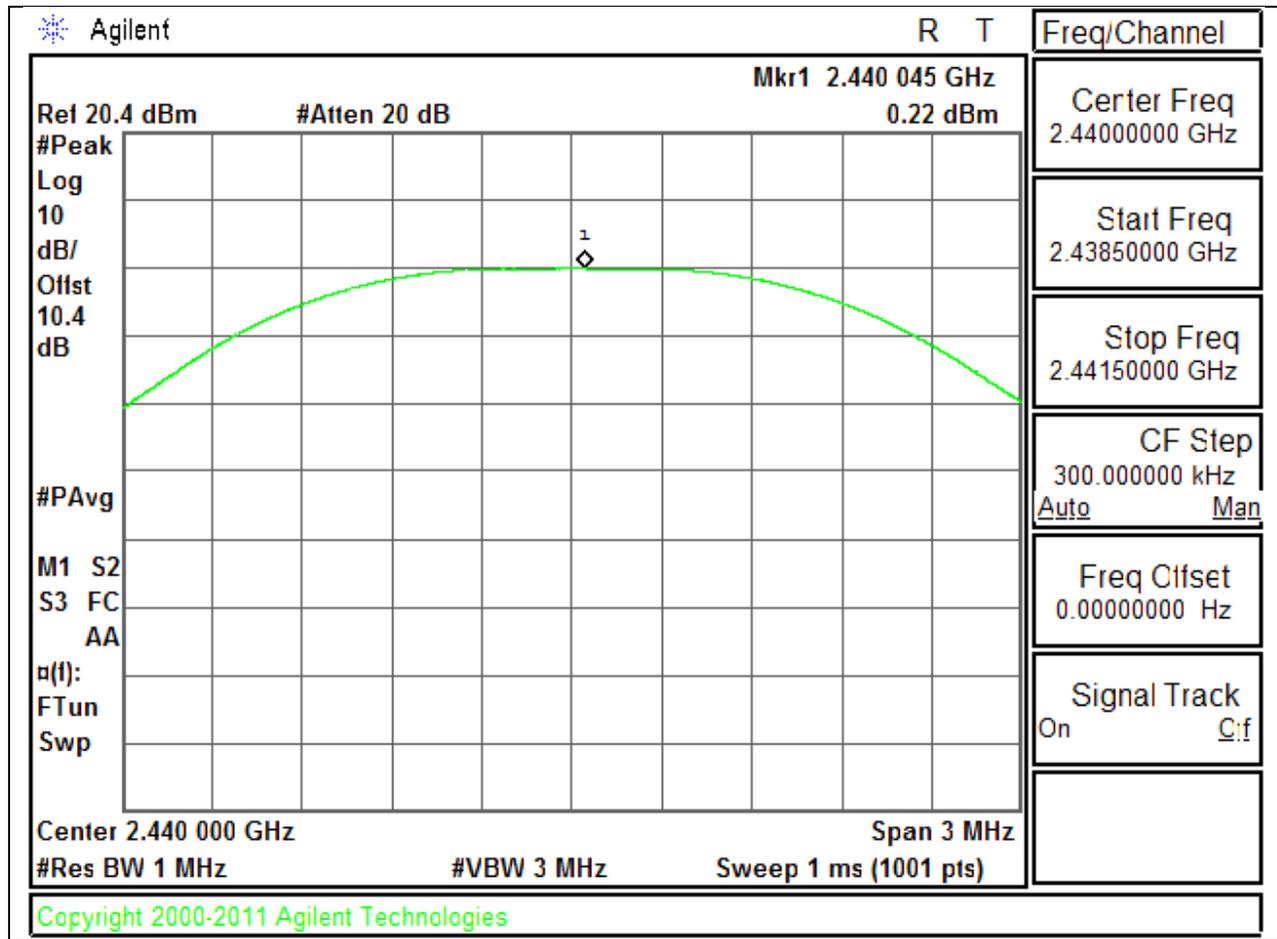
Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-1.370	30	-31.370
Middle	2440	0.220	30	-29.780
High	2480	-1.220	30	-31.220

**OUTPUT POWER PLOTS**

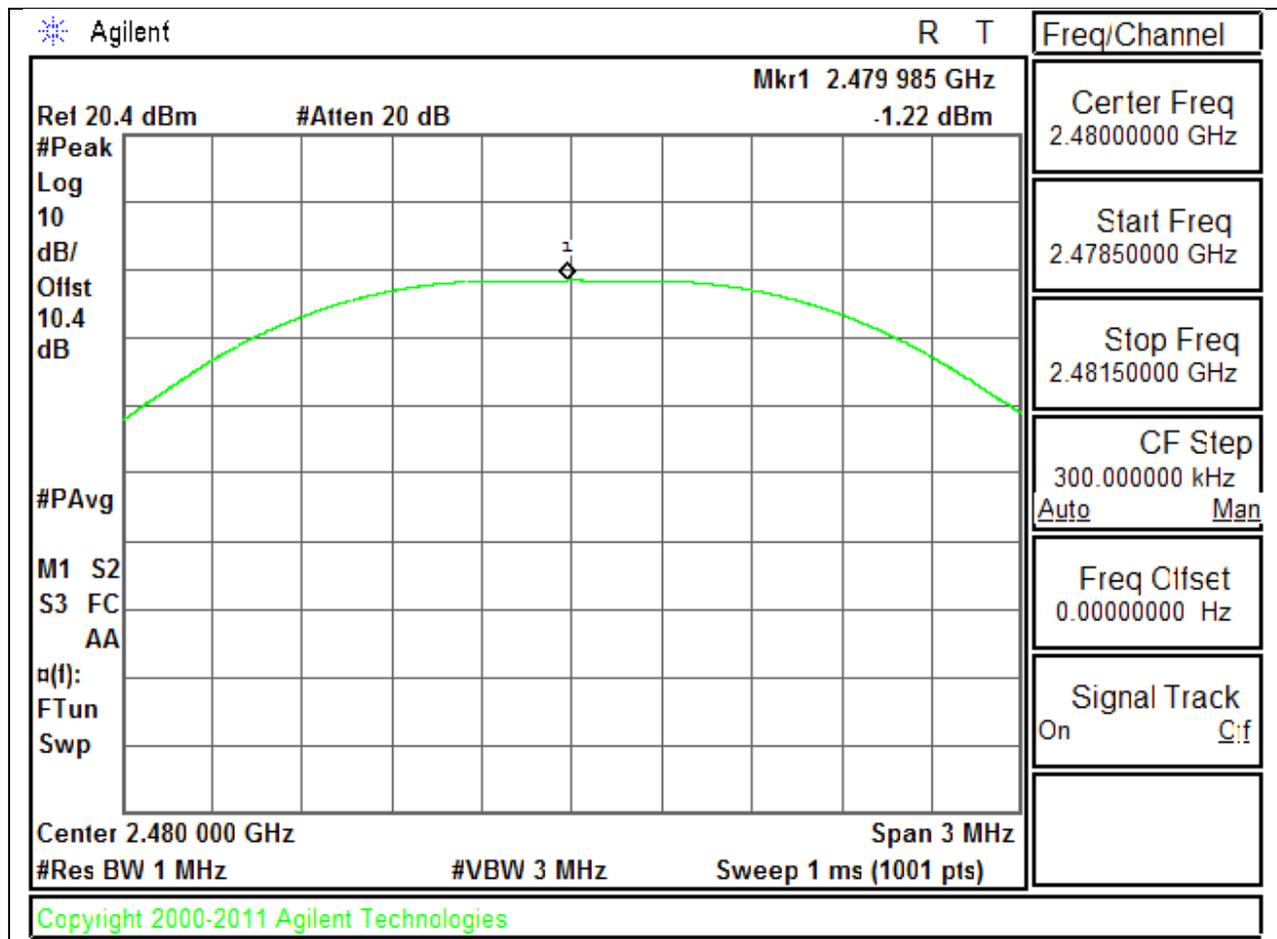
**LOW CHANNEL**



### MID CHANNEL



### HIGH CHANNEL



## 8.4. 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	-1.5
Middle	2440	-0.2
High	2480	-1.4

## 8.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

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

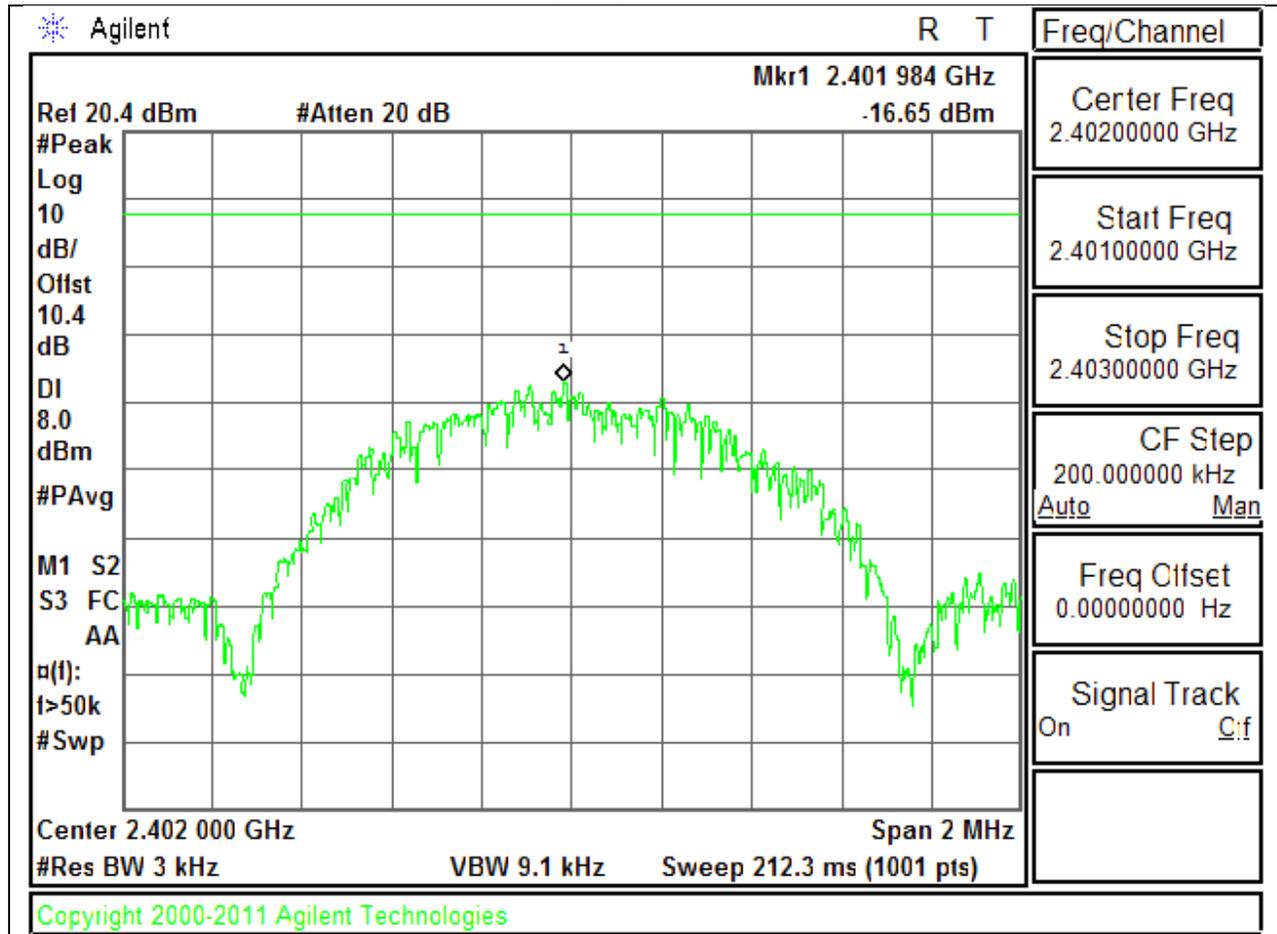
Power Spectral Density was performed utilizing the “Method PKPSD (Peak PSD)” under KDB558074 D01 DTS Meas Guidance v03r01, April 9, 2013

### RESULTS

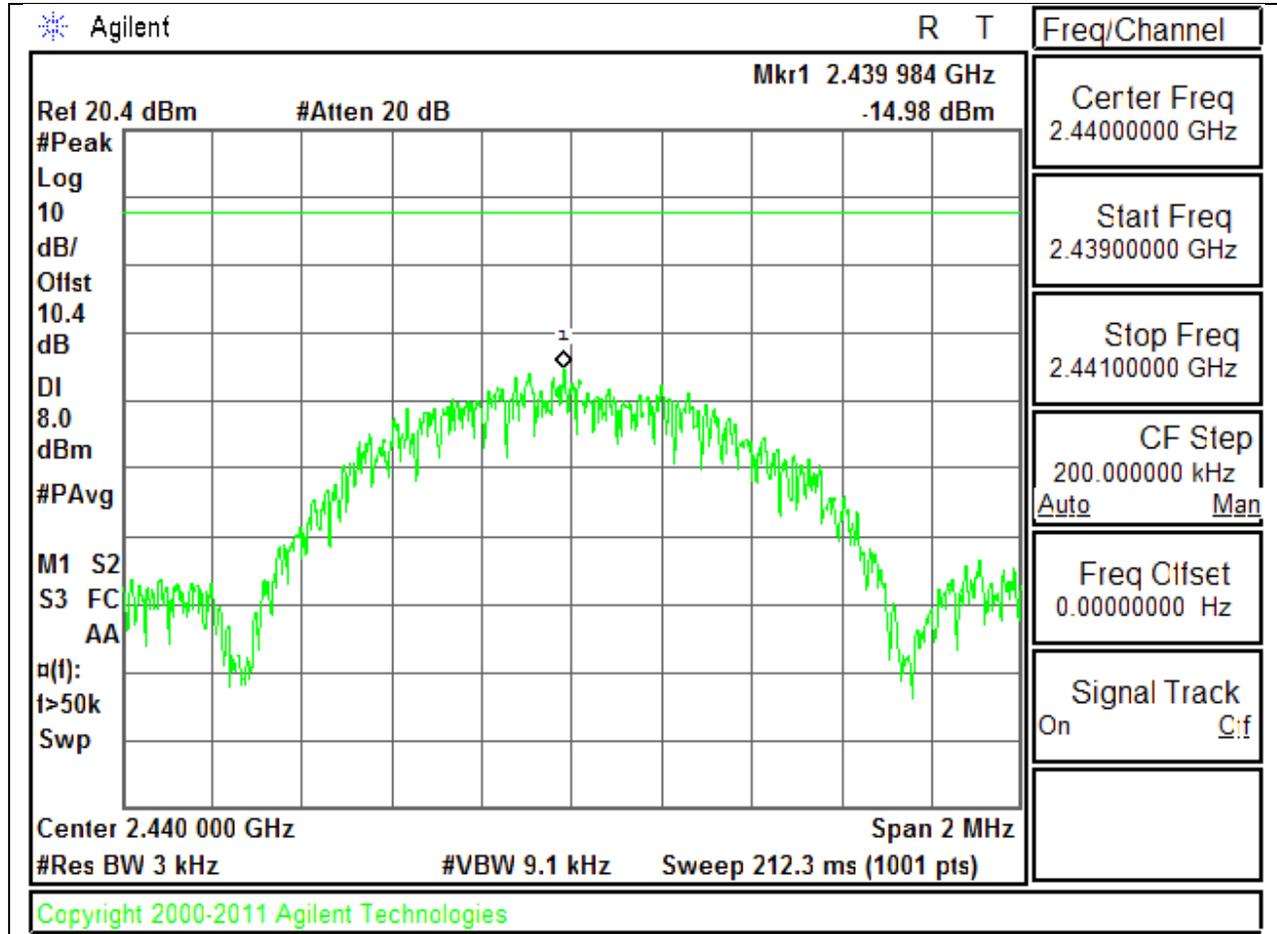
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-16.65	8	-24.65
Middle	2440	-14.98	8	-22.98
High	2480	-16.36	8	-24.36

**POWER SPECTRAL DENSITY PLOTS**

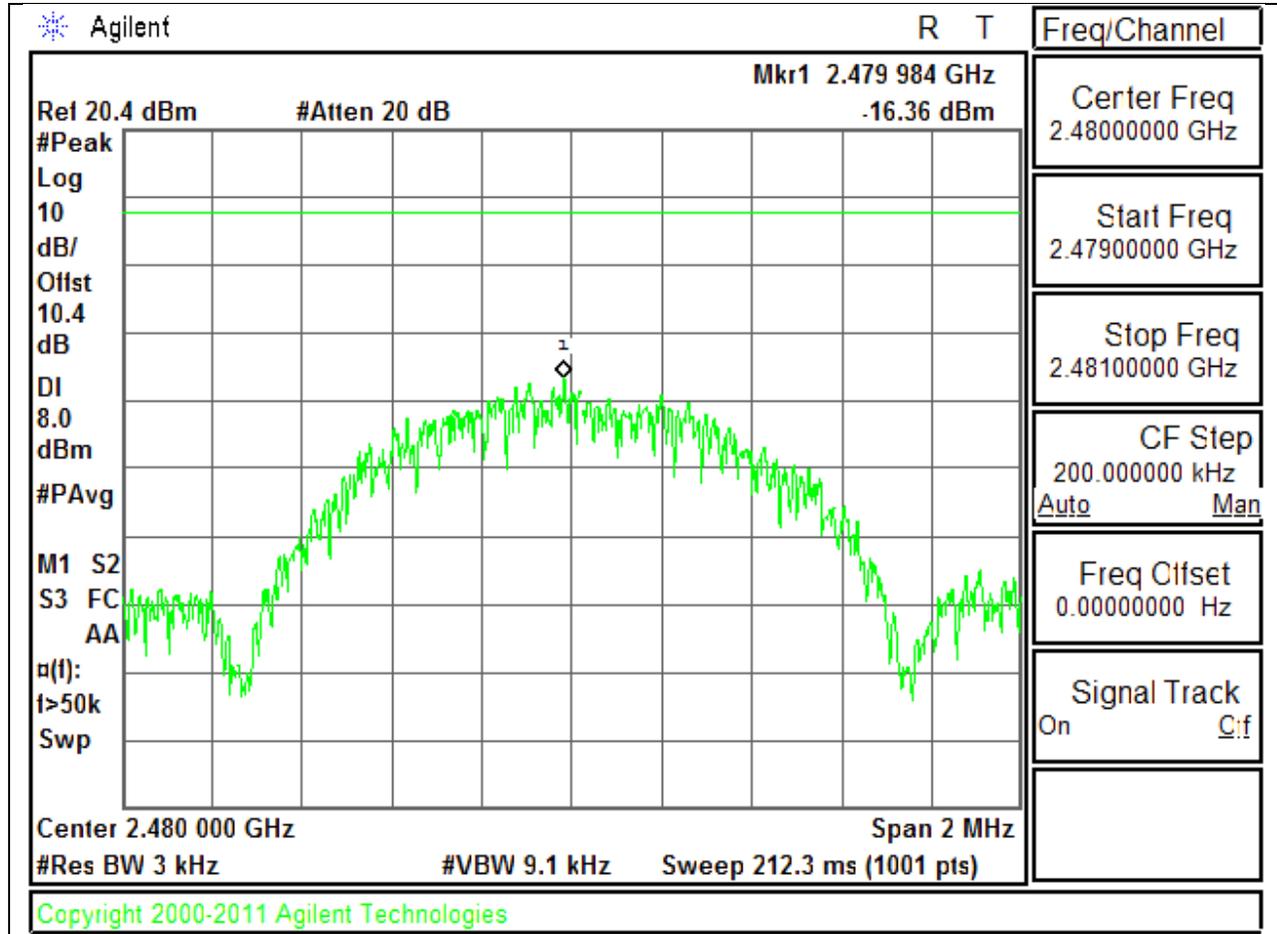
**LOW CHANNEL**



### MID CHANNEL



### HIGH CHANNEL



## **8.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **TEST PROCEDURE**

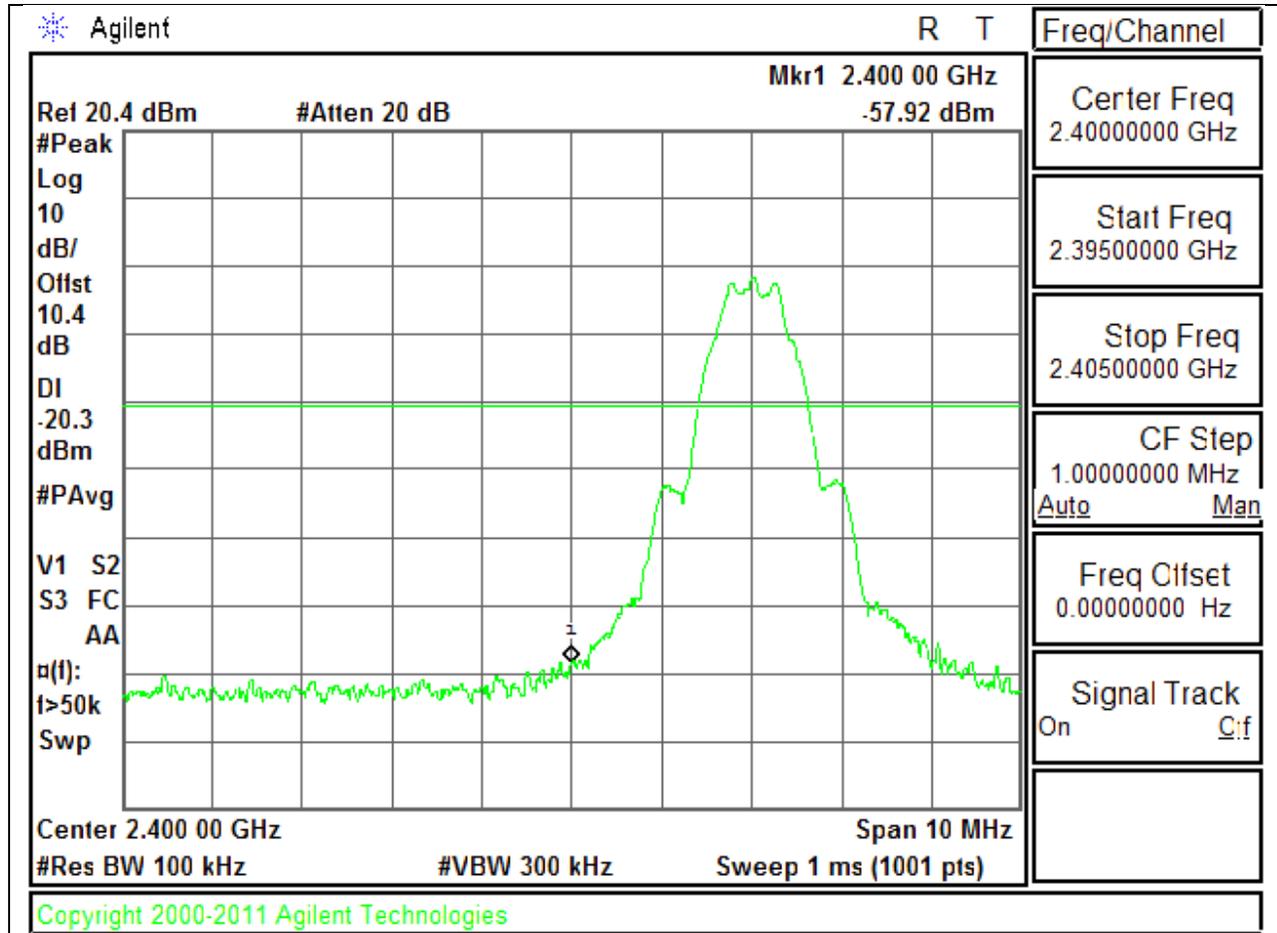
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

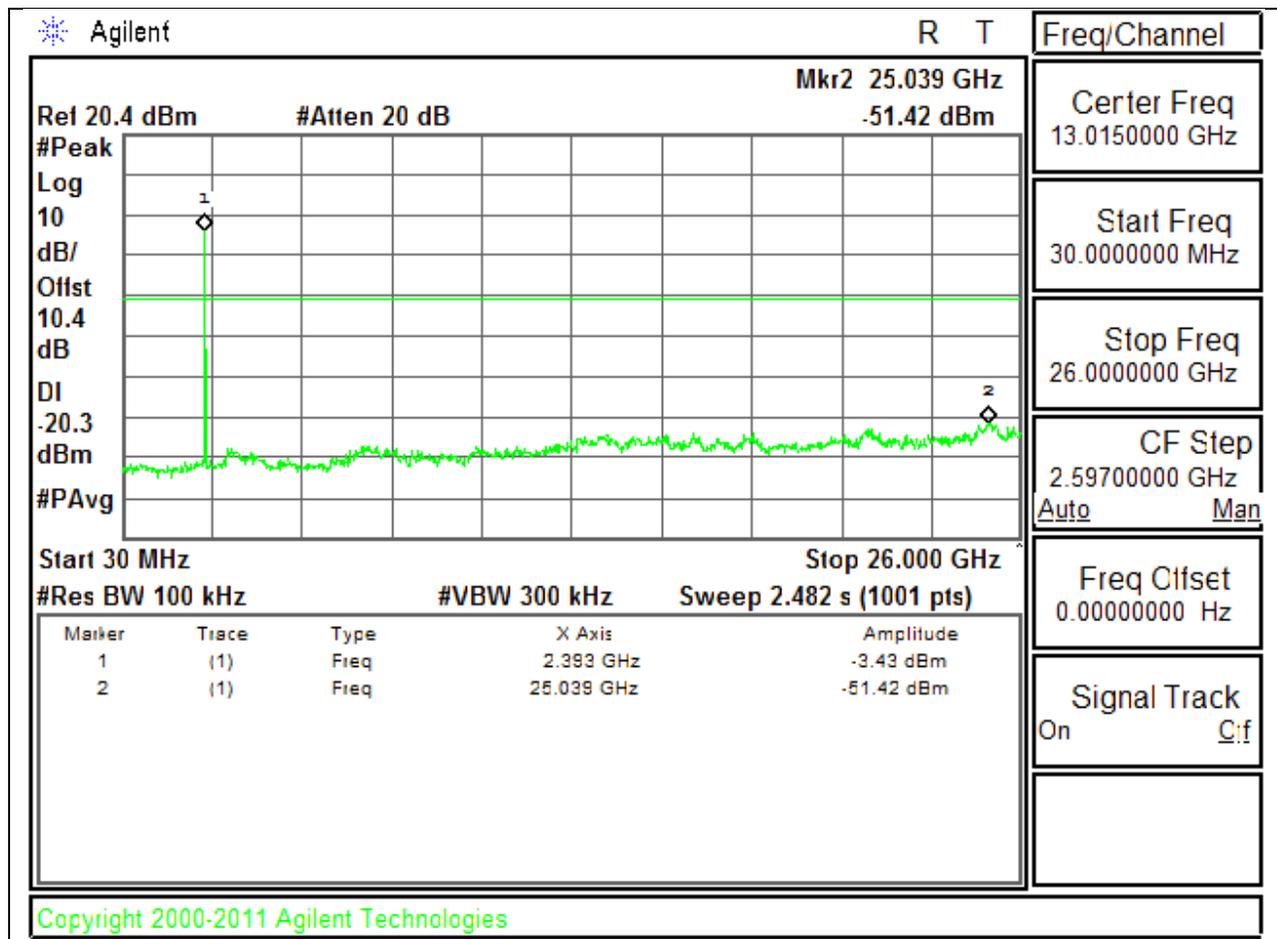
**RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**

**LOW CHANNEL BANDEDGE**

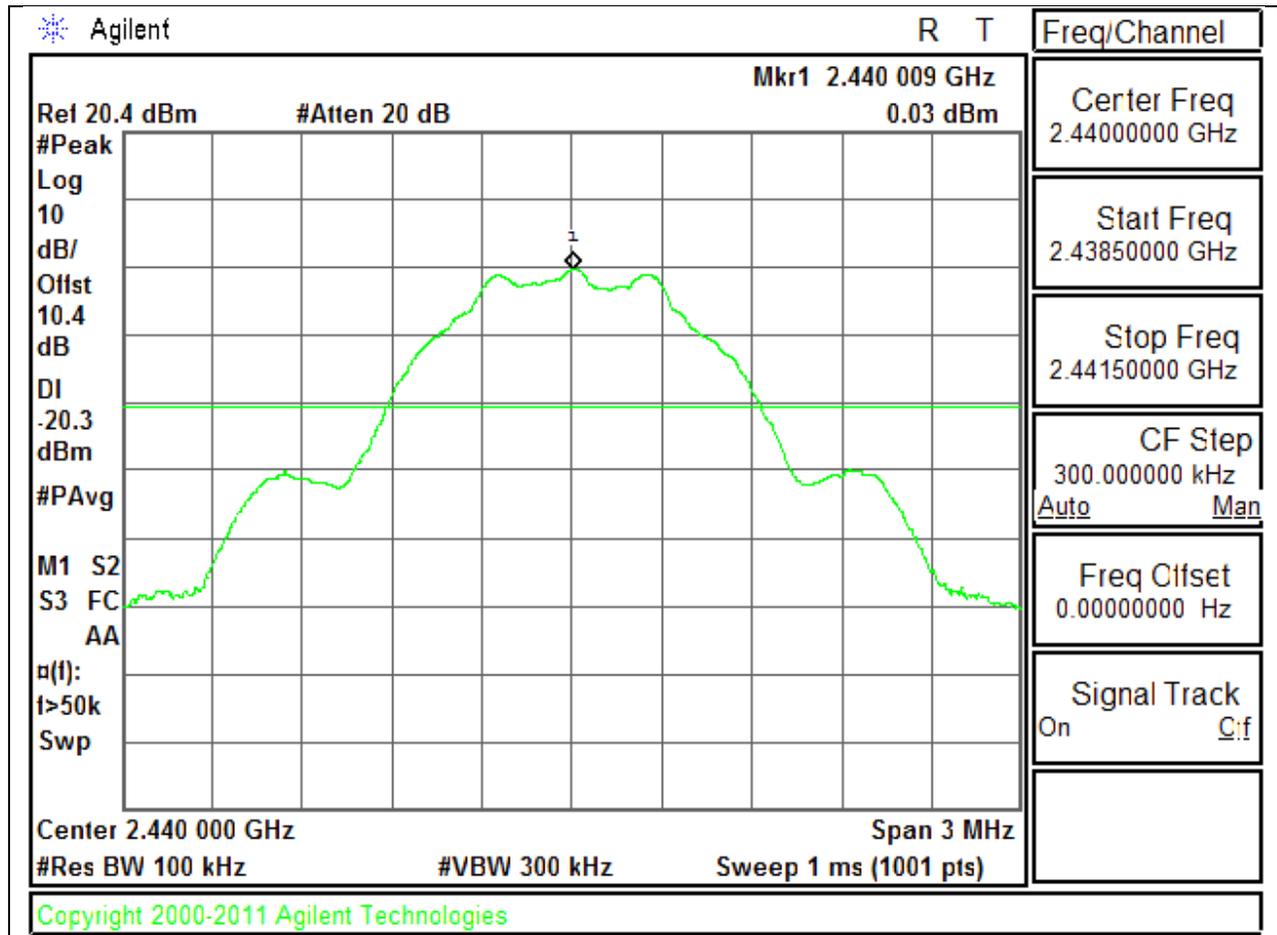


### LOW CHANNEL SPURIOUS

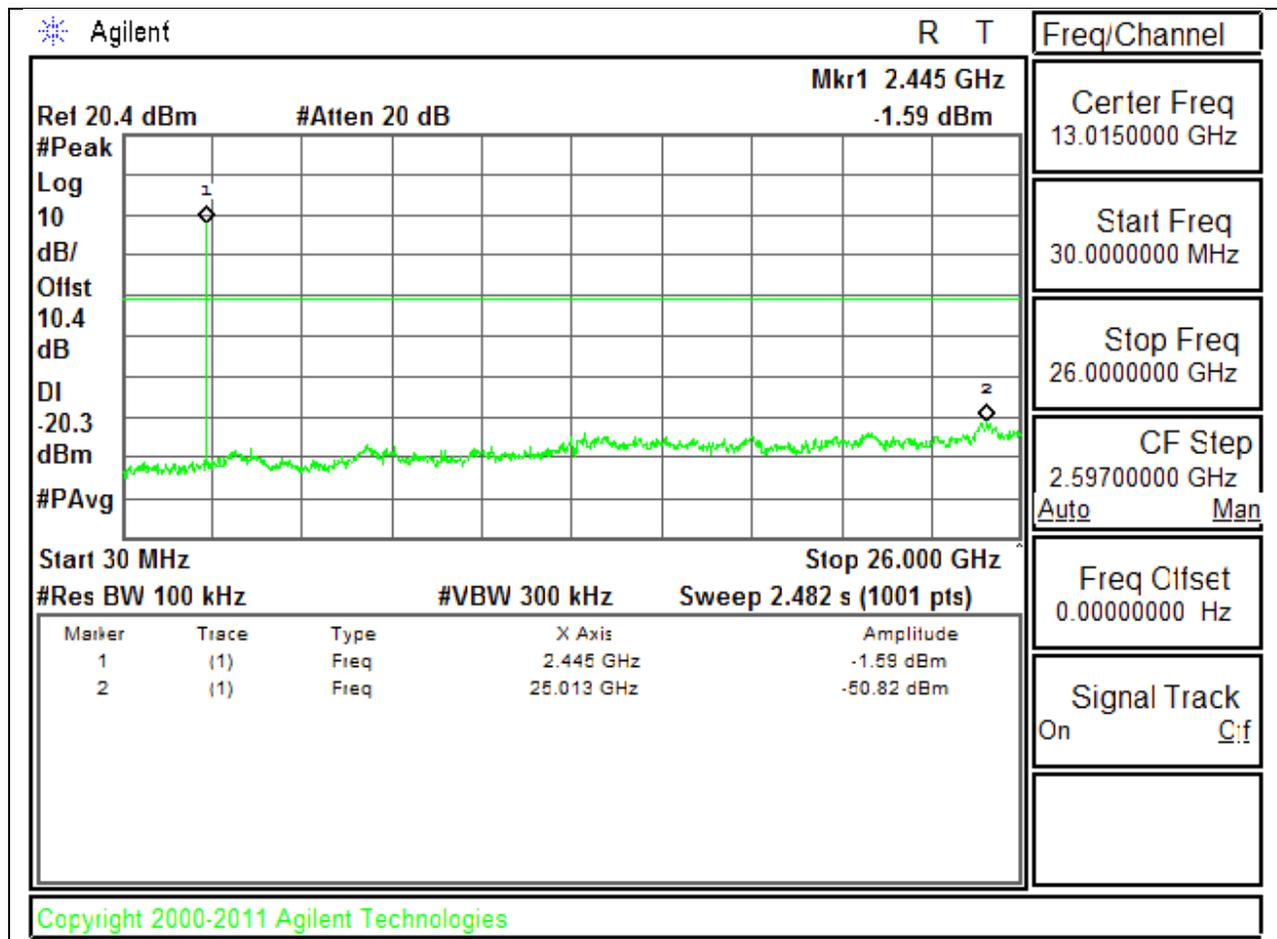


**SPURIOUS EMISSIONS, MID CHANNEL**

**MID CHANNEL REFERENCE**

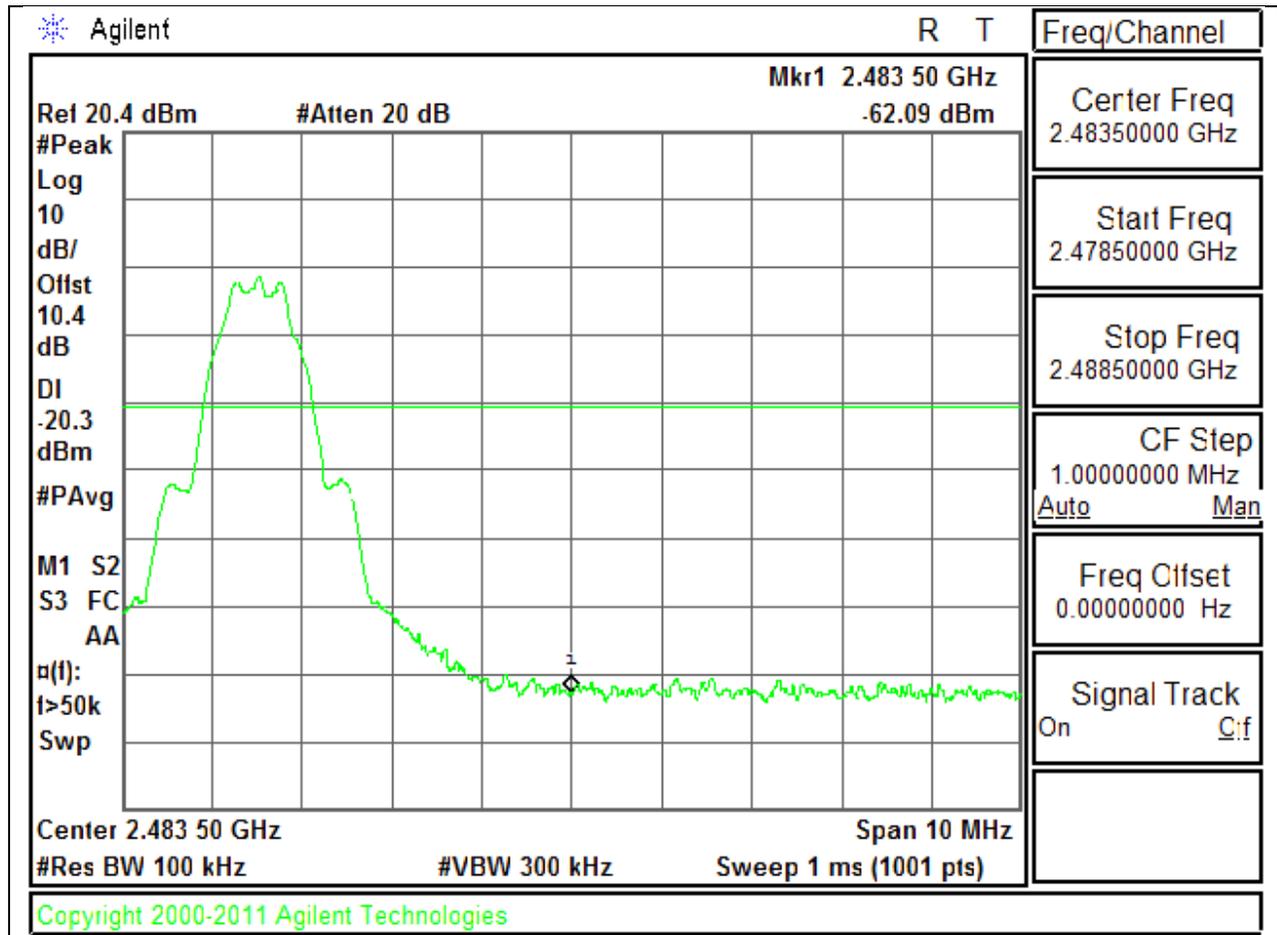


### MID CHANNEL SPURIOUS

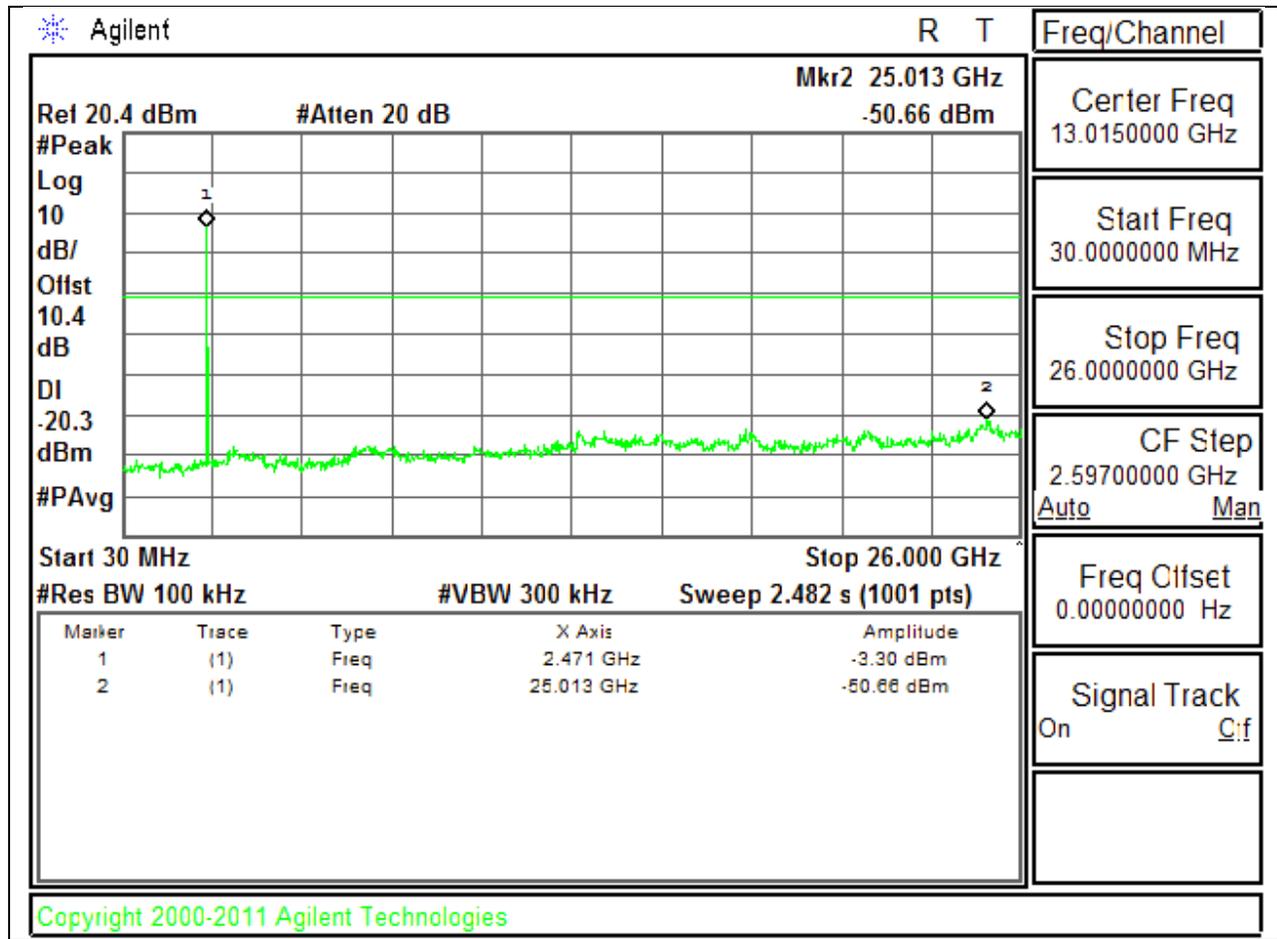


**SPURIOUS EMISSIONS, HIGH CHANNEL**

**HIGH CHANNEL BANDEDGE**



### HIGH CHANNEL SPURIOUS



## 9. RADIATED TEST RESULTS

### 9.1. 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 - 2009. 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 add duty cycle factor for average measurements. Duty cycle factor =  $10 \log (1/x)$ . For this sample: DCF =  $10 \log (1/0.623) = 2.05 \text{ dB}$  (Spectrum Analyzer round it up to 2.1 dB)

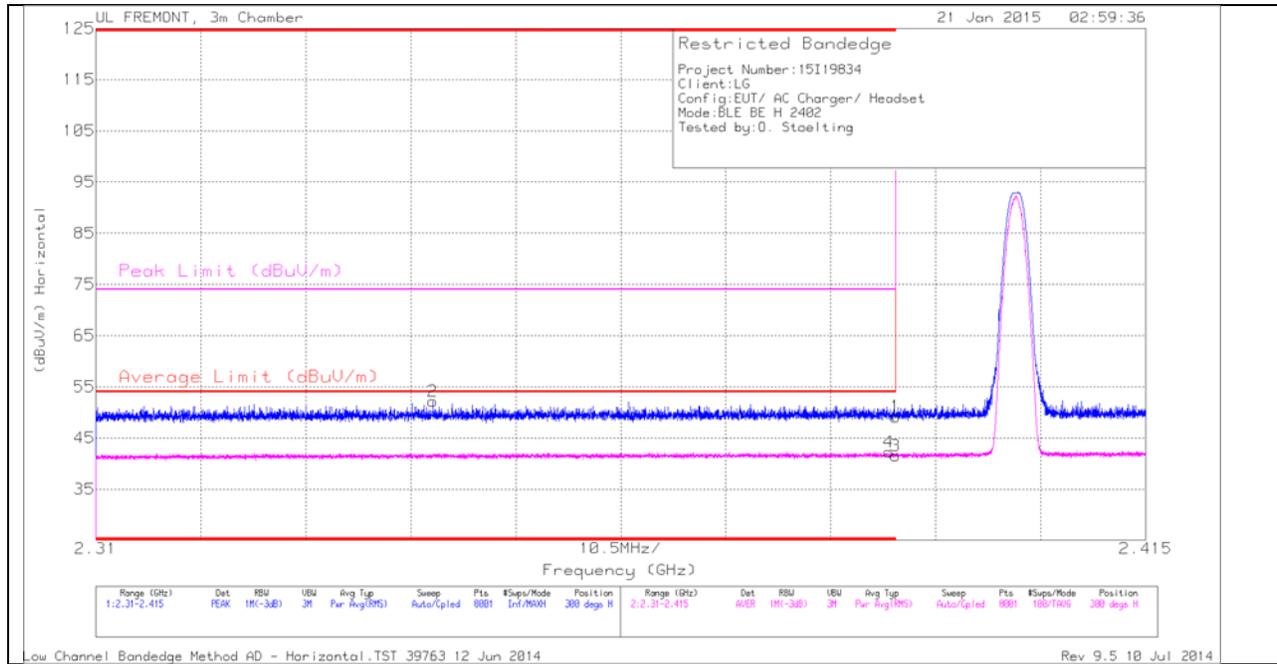
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable 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.

## 9.2. TRANSMITTER ABOVE 1 GHz RESTRICTED BANDEDGE (LOW CHANNEL)

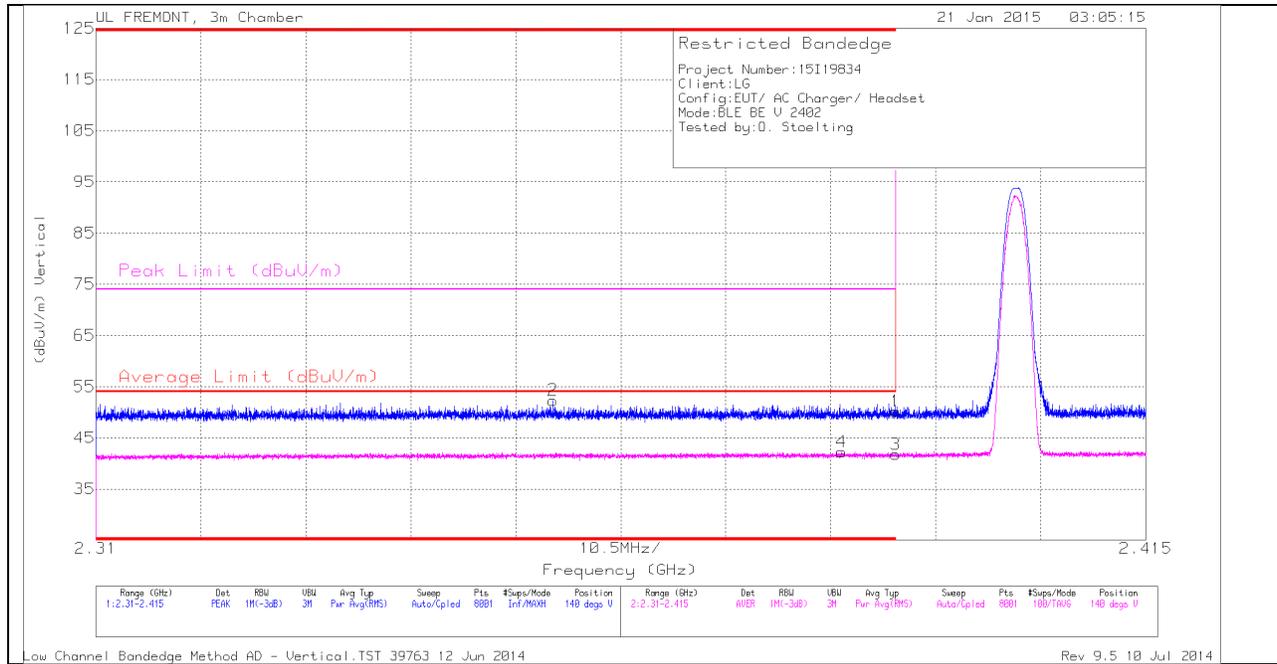
### HORIZONTAL PEAK AND AVERAGE PLOT



### HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Fitter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.344	43.24	PK	32	-23.1	0	52.14	-	-	74	-21.86	300	376	H
4	* 2.389	31.19	RMS	32.1	-23.1	2.05	42.24	54	-11.76	-	-	300	376	H
1	* 2.39	40.15	PK	32.1	-23.1	0	49.15	-	-	74	-24.85	300	376	H
3	* 2.39	30.45	RMS	32.1	-23.1	2.05	41.5	54	-12.5	-	-	300	376	H

**VERTICAL PEAK AND AVERAGE PLOT**

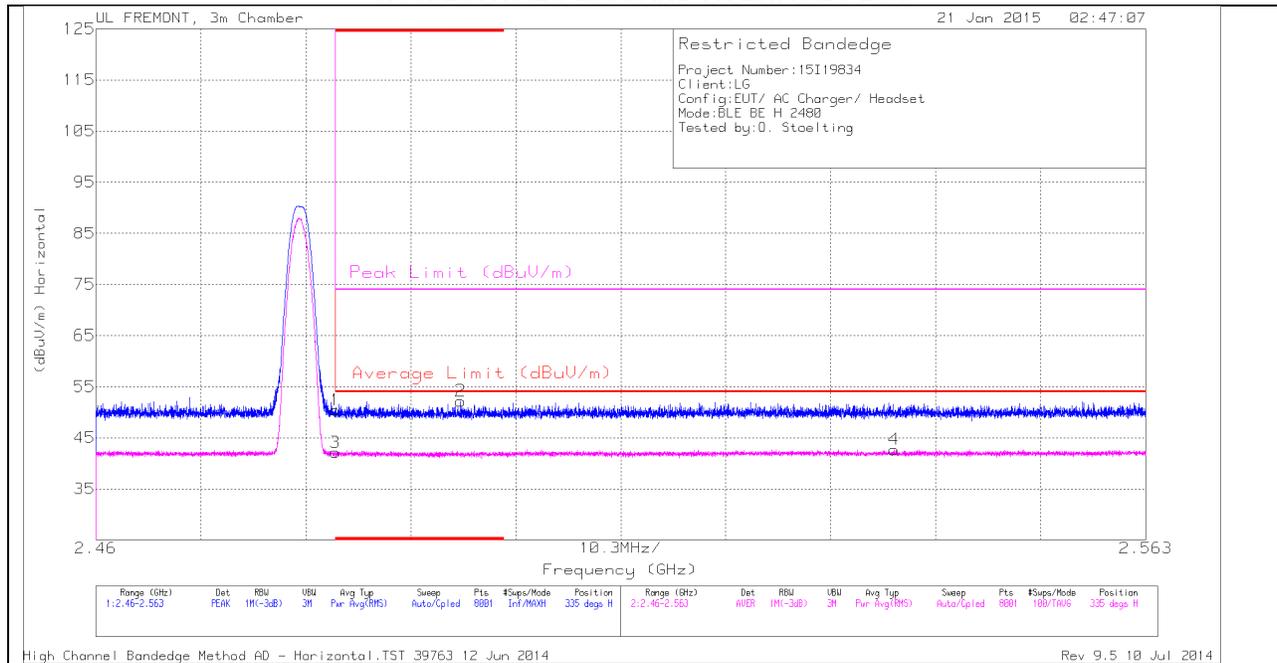


**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.21	PK	32.1	-23.1	0	50.21	-	-	74	-23.79	140	384	V
2	* 2.356	43.41	PK	32	-23.1	0	52.31	-	-	74	-21.69	140	384	V
3	* 2.39	30.71	RMS	32.1	-23.1	2.05	41.76	54	-12.24	-	-	140	384	V
4	* 2.385	31.19	RMS	32.1	-23.1	2.05	42.24	54	-11.76	-	-	140	384	V

### AUTHORIZED BANDEDGE (HIGH CHANNEL)

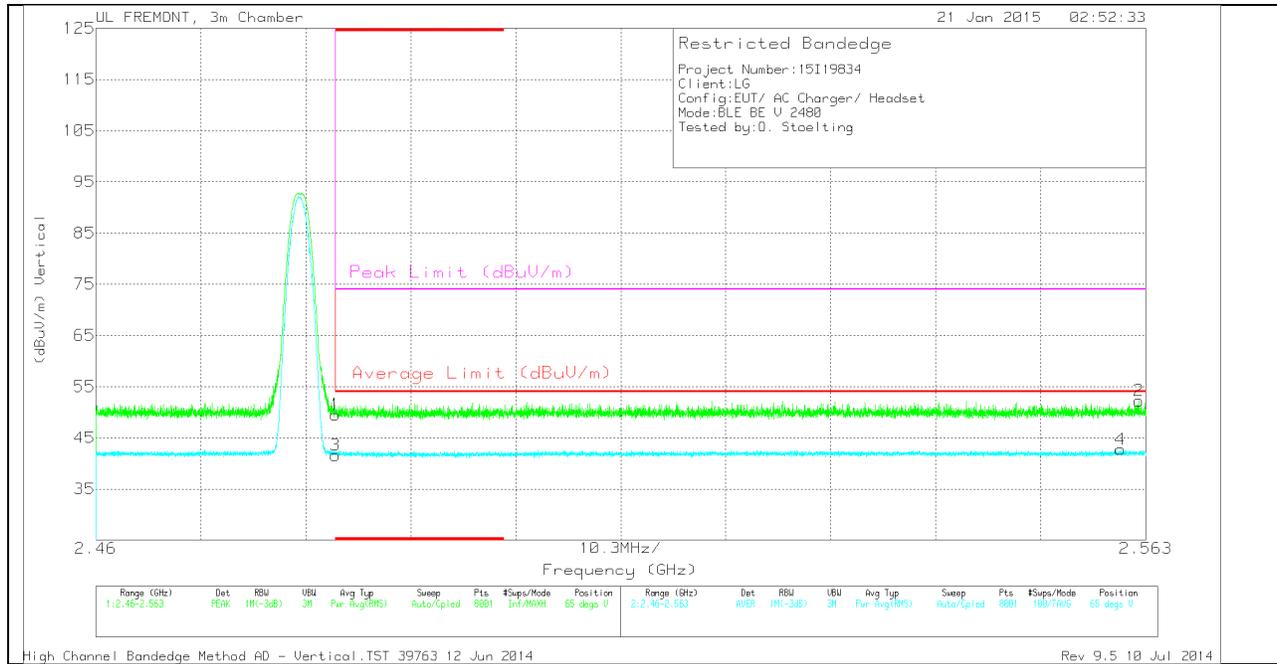
#### HORIZONTAL PEAK AND AVERAGE PLOT



#### HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fit r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.13	PK	32.1	-22.8	0	50.43	-	-	74	-23.57	335	376	H
2	* 2.496	42.88	PK	32.1	-22.8	0	52.18	-	-	74	-21.82	335	376	H
3	* 2.484	30.78	RMS	32.1	-22.8	2.05	42.13	54	-11.87	-	-	335	376	H
4	2.538	31.14	RMS	32.2	-22.7	2.05	42.69	54	-11.31	-	-	335	376	H

**VERTICAL PEAK AND AVERAGE PLOT**

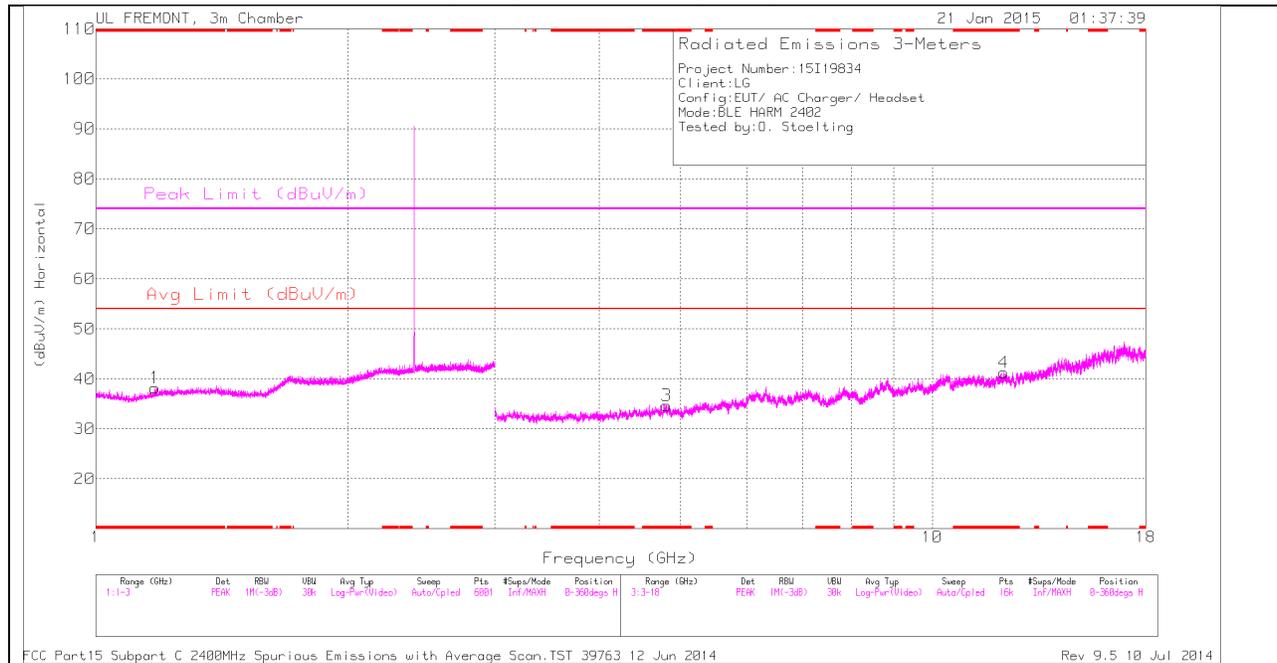


**VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Filter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.22	PK	32.1	-22.8	0	49.52	-	-	74	-24.48	65	367	V
3	* 2.484	30.26	RMS	32.1	-22.8	2.05	41.61	54	-12.39	-	-	65	367	V
4	2.561	31.2	RMS	32.2	-22.7	2.05	42.75	54	-11.25	-	-	65	367	V
2	2.562	42.73	PK	32.2	-22.7	0	52.23	-	-	74	-21.77	65	367	V

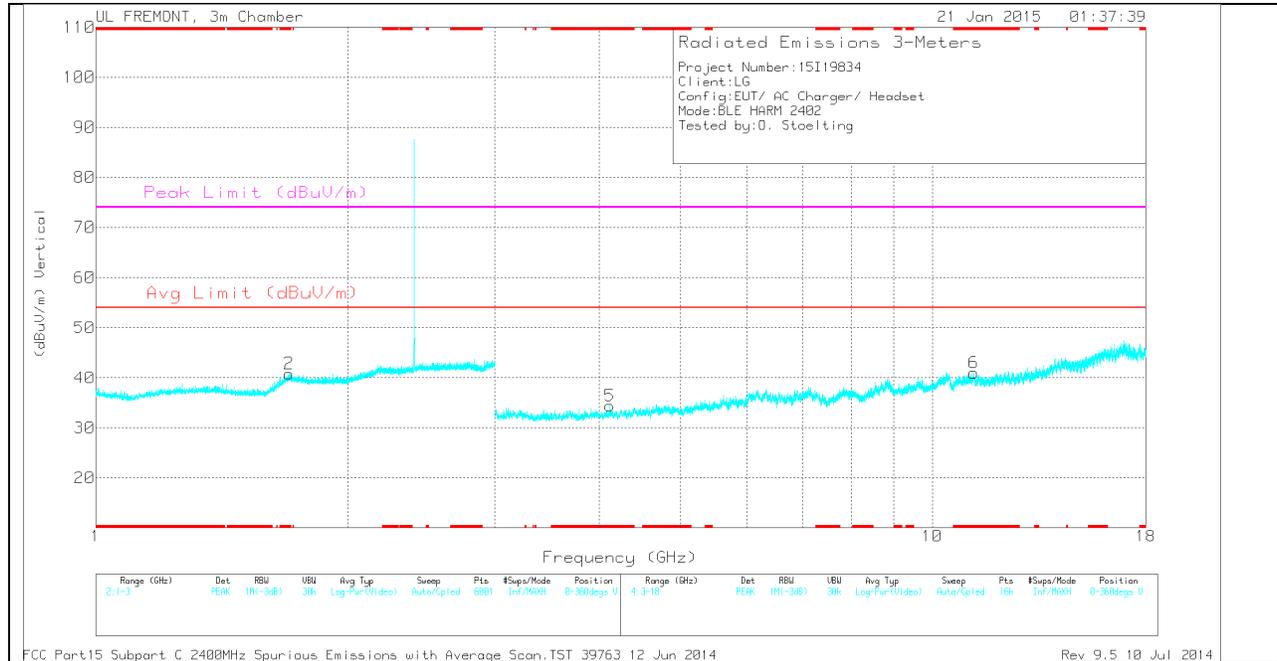
**HARMONICS AND SPURIOUS EMISSIONS**

**LOW CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## LOW CHANNEL DATA

### TRACE MARKERS

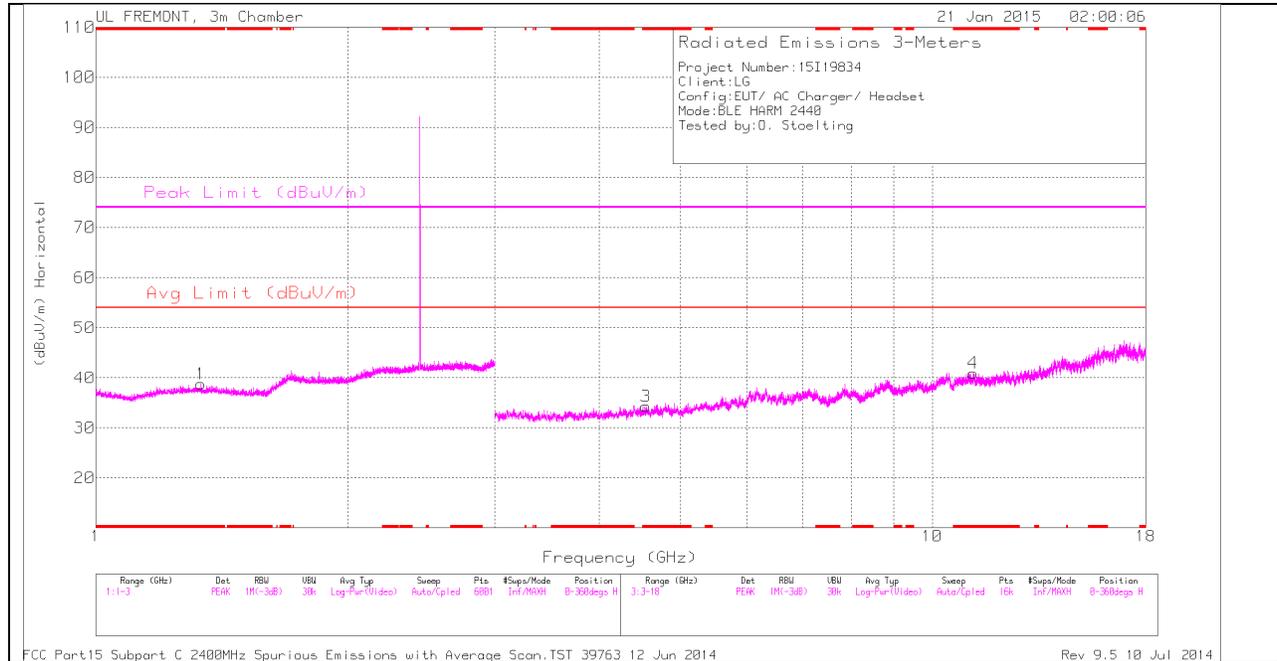
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fitr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.177	34.29	PK	27.7	-23.8	0	38.19	-	-	74	-35.81	0-360	200	H
2	* 1.702	33.52	PK	30.7	-23.4	0	40.82	-	-	74	-33.18	0-360	100	V
3	* 4.811	31.08	PK	34	-30.4	0	34.68	-	-	74	-39.32	0-360	100	H
4	* 12.17	29.14	PK	38.6	-26.5	0	41.24	-	-	74	-32.76	0-360	100	H
5	* 4.115	32.2	PK	33.2	-31	0	34.4	-	-	74	-39.6	0-360	200	V
6	* 11.204	27.68	PK	38.3	-25	0	40.98	-	-	74	-33.02	0-360	200	V

PK - Peak detector

### RADIATED EMISSIONS

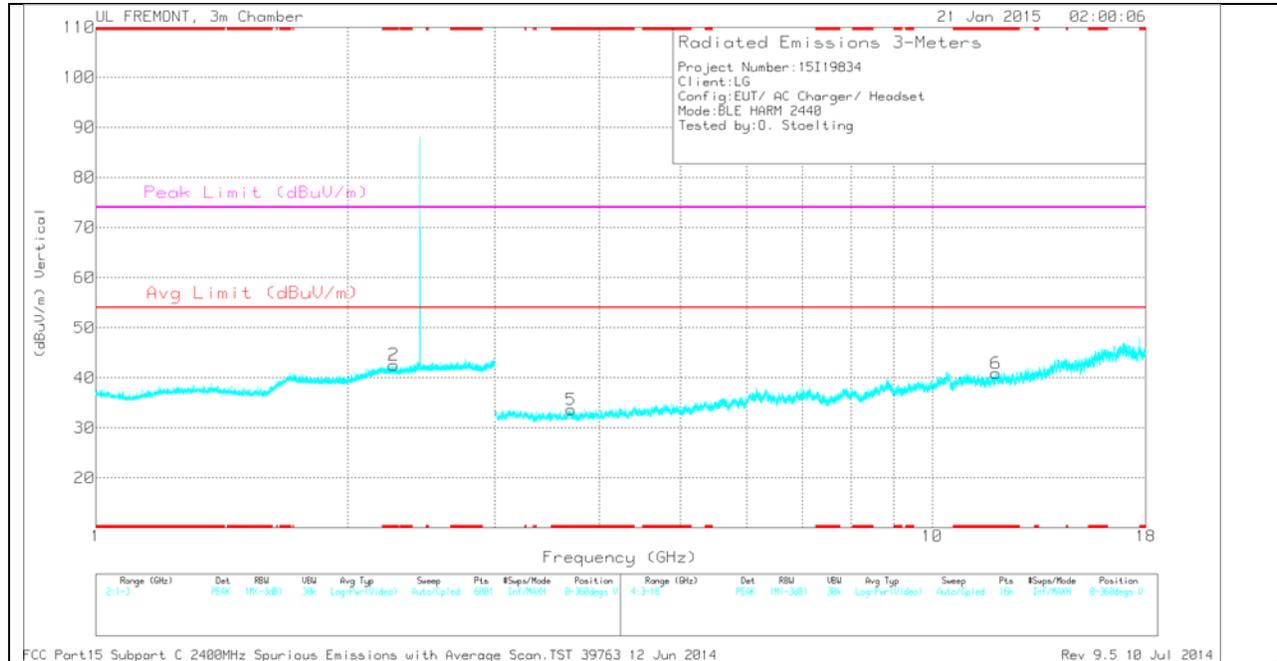
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fitr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.17	37.64	PK2	38.6	-26.5	0	49.74	-	-	74	-24.26	119	188	H
* 12.172	25.97	MAV1	38.6	-26.5	2.05	40.12	54	-13.88	-	-	119	188	H
* 11.204	37.04	PK2	38.3	-25	0	50.34	-	-	74	-23.66	202	181	V
* 11.206	25.09	MAV1	38.3	-25	2.05	40.44	54	-13.56	-	-	202	181	V

### MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### MID CHANNEL DATA

#### TRACE MARKERS

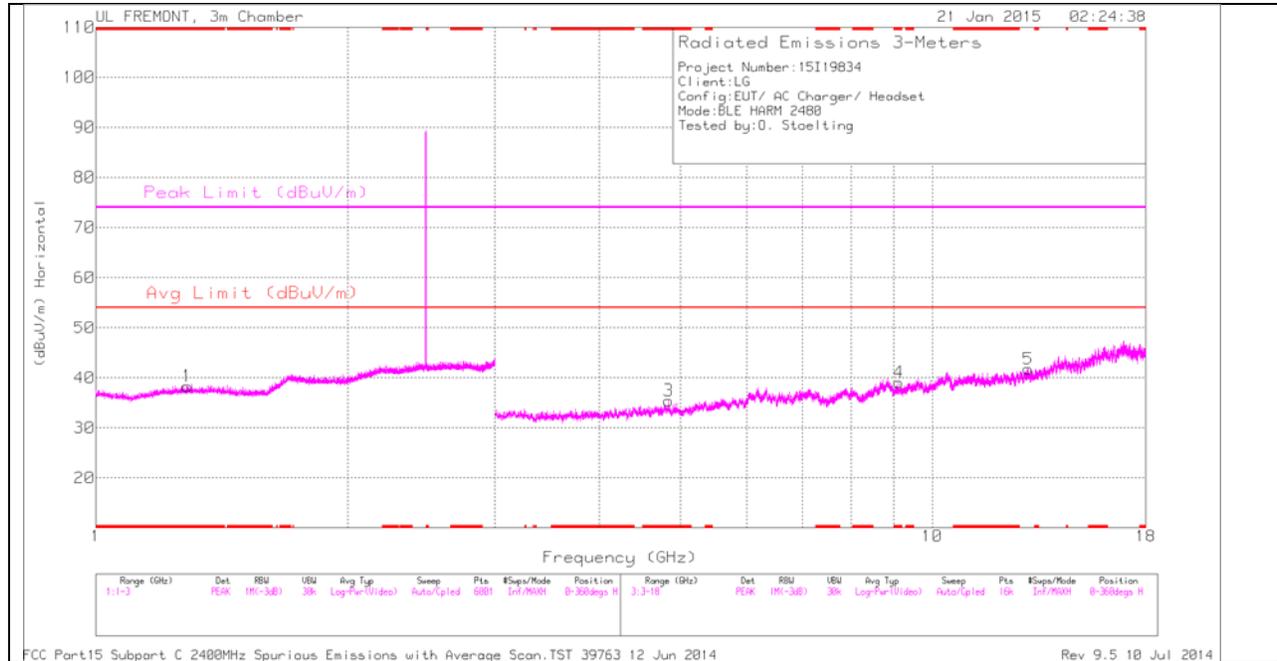
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.336	34.08	PK	28.4	-23.7	0	38.78	-	-	74	-35.22	0-360	200	H
2	* 2.271	33.67	PK	31.9	-23	0	42.57	-	-	74	-31.43	0-360	200	V
3	* 4.546	31.97	PK	33.5	-31.2	0	34.27	-	-	74	-39.73	0-360	100	H
4	* 11.196	27.74	PK	38.3	-25.1	0	40.94	-	-	74	-33.06	0-360	200	H
5	* 3.701	31.54	PK	32.9	-30.8	0	33.64	-	-	74	-40.36	0-360	200	V
6	* 11.919	28.77	PK	38.4	-26.3	0	40.87	-	-	74	-33.13	0-360	100	V

PK - Peak detector

#### RADIATED EMISSIONS

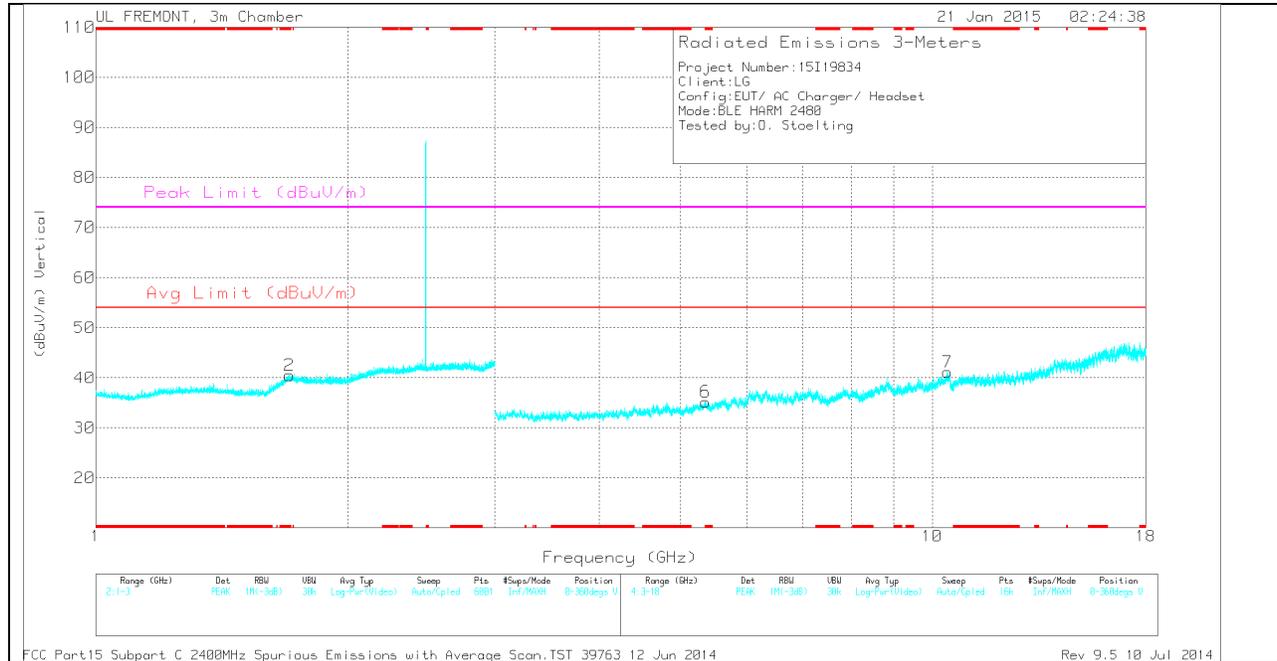
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.271	43.34	PK2	31.9	-23	0	52.24	-	-	74	-21.76	276	223	V
* 2.271	30.61	MAV1	31.9	-23	2.05	41.56	54	-12.44	-	-	276	223	V
* 11.197	36.58	PK2	38.3	-25.1	0	49.78	-	-	74	-24.22	73	119	H
* 11.198	24.88	MAV1	38.3	-25.1	2.05	40.13	54	-13.87	-	-	73	119	H
* 11.921	38.37	PK2	38.4	-26.3	0	50.47	-	-	74	-23.53	135	182	V
* 11.919	26.12	MAV1	38.4	-26.3	2.05	40.27	54	-13.73	-	-	135	182	V

### HIGH CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

### HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## HIGH CHANNEL DATA

### TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.287	33.71	PK	28.3	-23.7	0	38.31	-	-	74	-35.69	0-360	100	H
2	* 1.704	33.19	PK	30.7	-23.4	0	40.49	-	-	74	-33.51	0-360	200	V
3	* 4.839	31.43	PK	33.9	-29.9	0	35.43	-	-	74	-38.57	0-360	200	H
4	* 9.121	28.56	PK	36.7	-26.2	0	39.06	-	-	74	-34.94	0-360	200	H
6	* 5.355	30.89	PK	34.3	-30	0	35.19	-	-	74	-38.81	0-360	100	V
7	10.434	28.35	PK	38.1	-25.3	0	41.15	-	-	-	-	0-360	100	V
5	13.022	30.16	PK	38.8	-27.2	0	41.76	-	-	-	-	0-360	100	H

PK - Peak detector

### RADIATED EMISSIONS

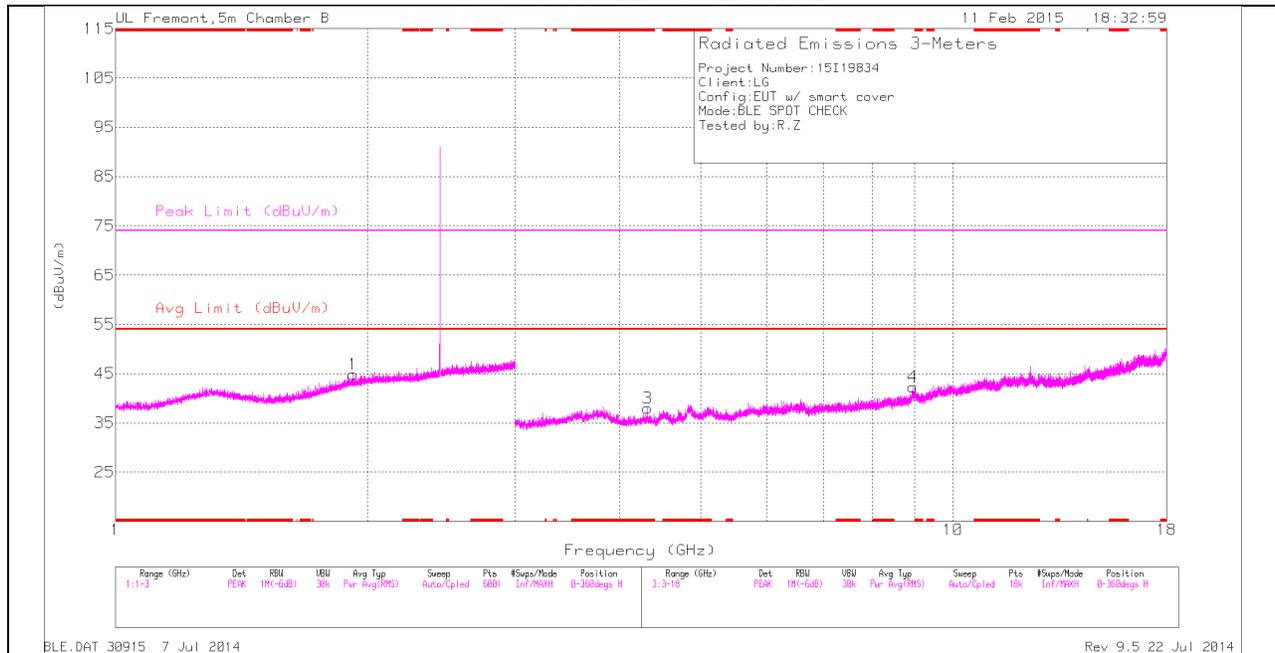
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.703	42.62	PK2	30.7	-23.4	0	49.92	-	-	74	-24.08	63	175	V
* 1.705	30.7	MAV1	30.7	-23.4	2.05	40.05	54	-13.95	-	-	63	175	V
* 9.121	38.57	PK2	36.7	-26.2	0	49.07	-	-	74	-24.93	359	377	H
* 9.12	25.95	MAV1	36.7	-26.2	2.05	38.5	54	-15.5	-	-	359	377	H

### 9.3. ADDITIONAL TESTS (Phone with Smart Case and Stylus Pen)

#### 9.3.1. BLE MID CHANNEL (Worst case)

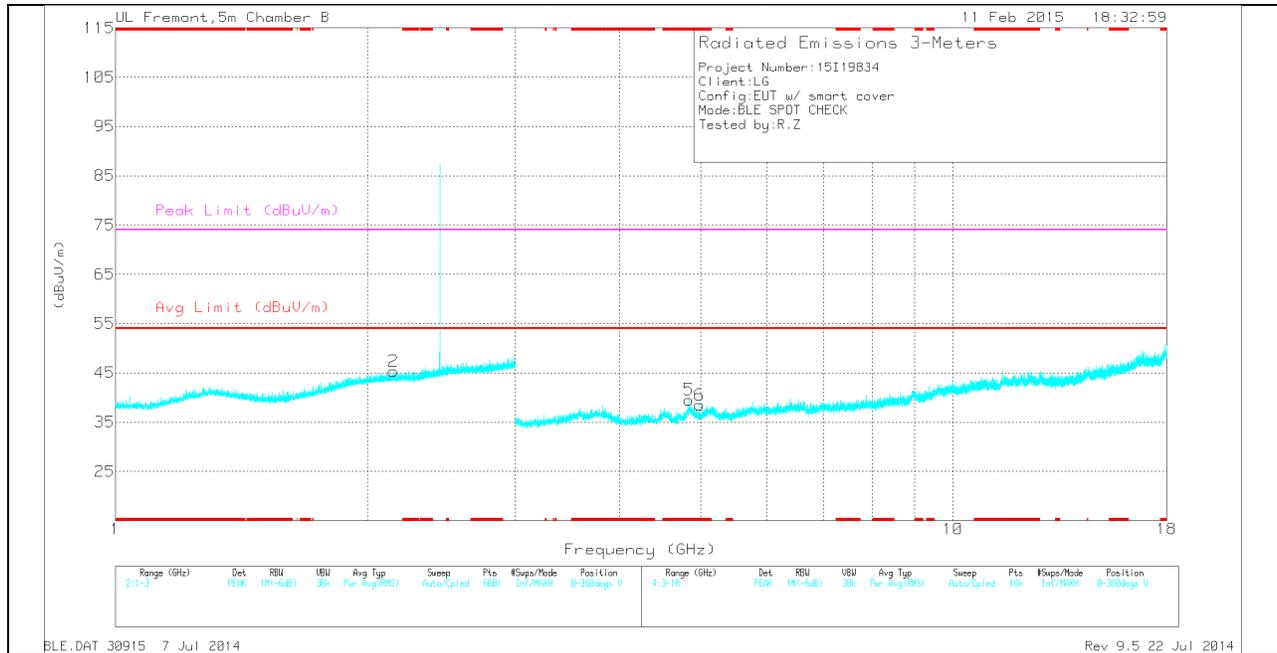
#### HARMONICS AND SPURIOUS EMISSIONS

##### MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL VERTICAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

**MID CHANNEL DATA**

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.32	33.25	PK	33.7	-29	37.95	-	-	74	-36.05	0-360	101	H
5	* 4.836	33.17	PK	34.1	-27.7	39.57	-	-	74	-34.43	0-360	201	V
6	* 4.983	33.13	PK	34.2	-28.8	38.53	-	-	74	-35.47	0-360	201	V
1	1.921	34.81	PK	31.5	-21.5	44.81	-	-	-	-	0-360	101	H
2	2.147	34.62	PK	31.8	-21.1	45.32	-	-	-	-	0-360	201	V
4	8.959	28.37	PK	36.1	-22.2	42.27	-	-	-	-	0-360	101	H

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Filtr/Pad (db)	DCCF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.322	39.21	PK2	33.7	-29	-	43.91	-	-	74	-30.09	360	100	H
* 4.319	28.64	MAV1	33.7	-29	2.05	35.39	54	-18.61	-	-	360	100	H
* 4.835	39.45	PK2	34.1	-27.7	-	45.85	-	-	74	-28.15	360	202	V
* 4.835	28.66	MAV1	34.1	-27.7	2.05	37.11	54	-16.89	-	-	360	202	V

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

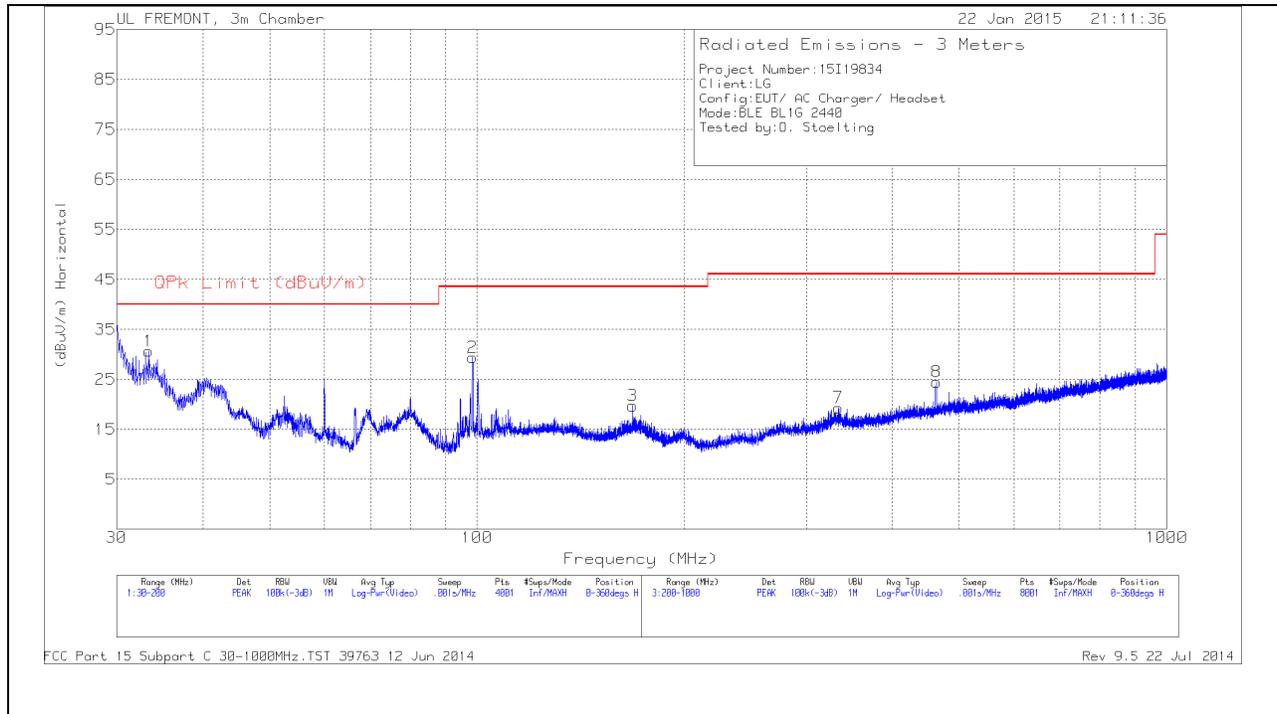
PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

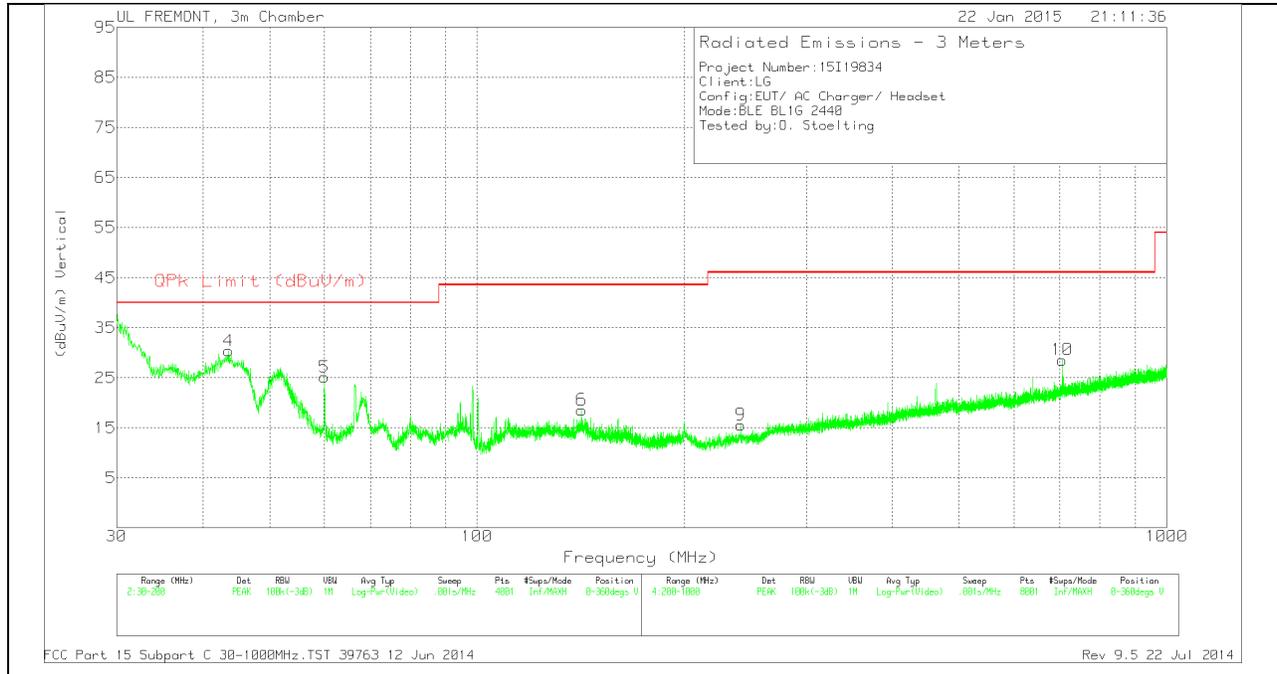
### 9.4. WORST-CASE BELOW 1 GHz

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

#### HORIZONTAL PLOT



### VERTICAL PLOT



### BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.4	39.62	PK	18.5	-27.5	30.62	40	-9.38	0-360	300	H
4	43.6425	46.78	PK	11	-27.4	30.38	40	-9.62	0-360	100	V
5	60.005	45.14	PK	7.1	-27.1	25.14	40	-14.86	0-360	100	V
2	98.4675	46.67	PK	9.5	-26.8	29.37	43.52	-14.15	0-360	300	H
6	141.7325	32.17	PK	12.8	-26.4	18.57	43.52	-24.95	0-360	100	V
3	167.9975	34.24	PK	11.6	-26.1	19.74	43.52	-23.78	0-360	200	H
9	241.1	29.28	PK	11.7	-25.4	15.58	46.02	-30.44	0-360	100	V
7	334.3	30.52	PK	14	-25.2	19.32	46.02	-26.7	0-360	100	H
8	463.7	33.17	PK	17.1	-25.8	24.47	46.02	-21.55	0-360	200	H
10	705.3	33.49	PK	20.3	-25.2	28.59	46.02	-17.43	0-360	100	V

PK - Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

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.

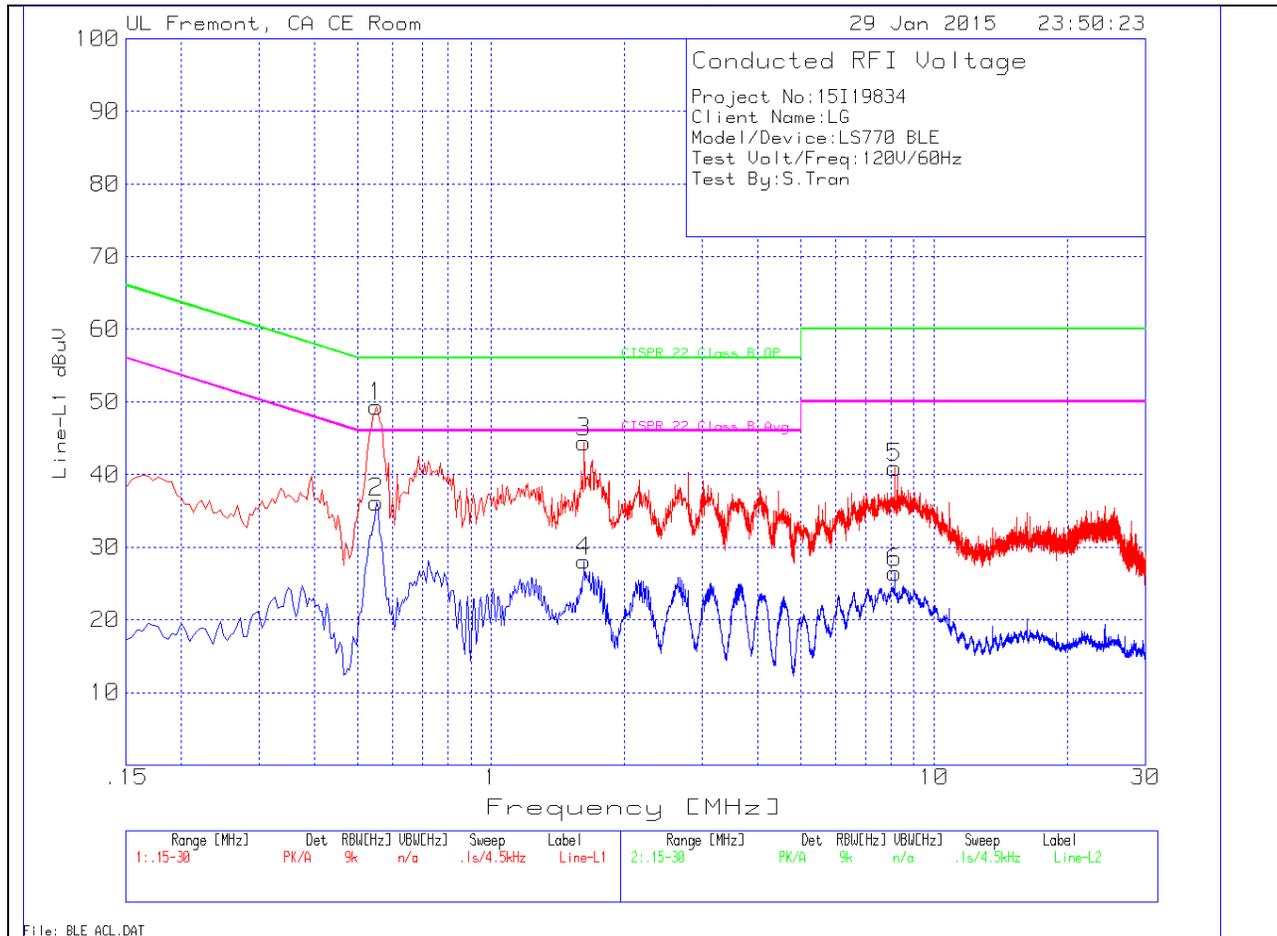
### TEST PROCEDURE

ANSI C63.4 - 2009

### RESULTS

**6 WORST EMISSIONS**

**LINE 1 PLOT**



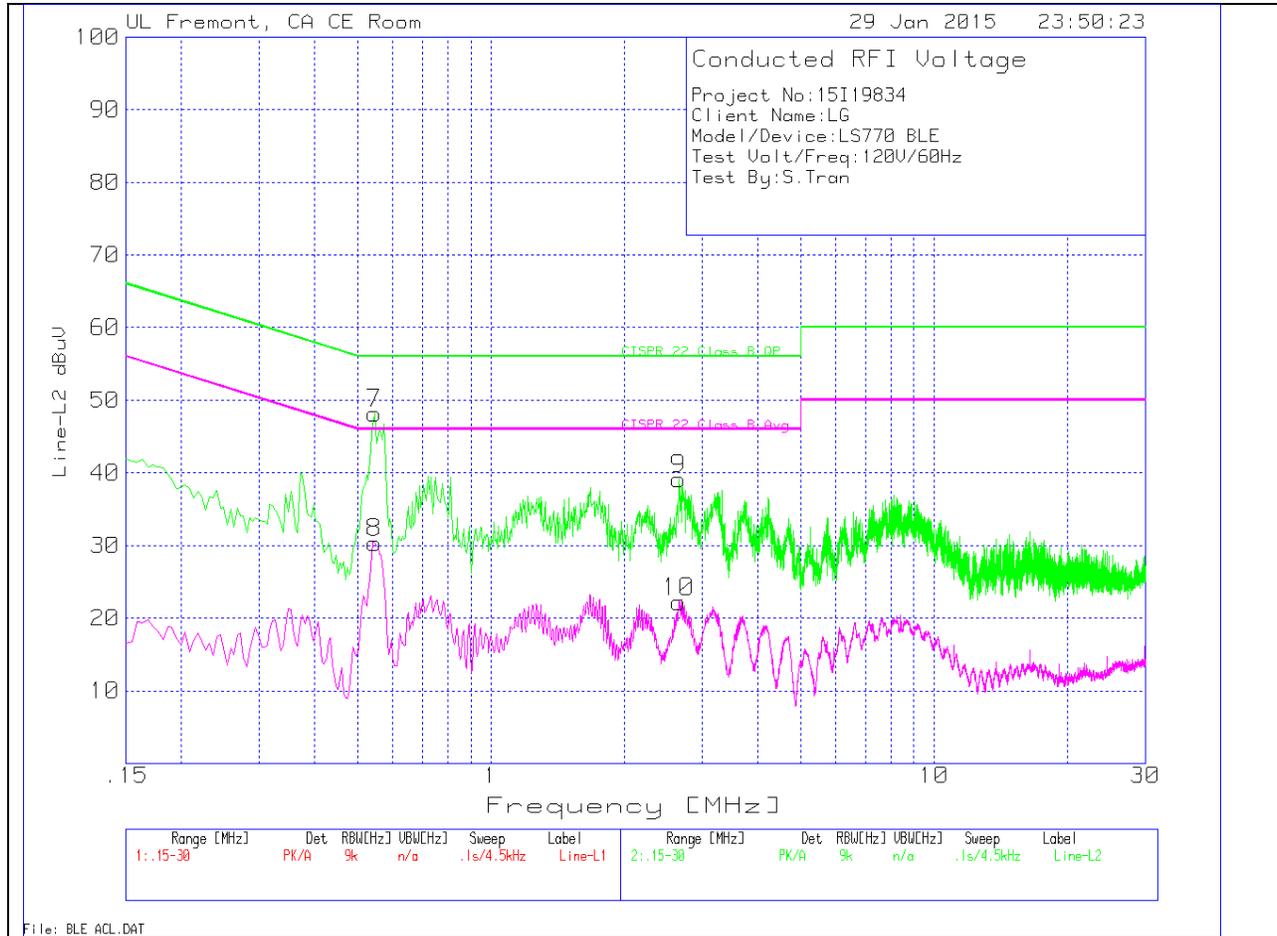
**LINE 1 RESULTS**

**Line-L1 .15 - 30MHz**

**Trace Markers**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.5505	49.07	PK	.3	0	49.37	56	-6.63	-	-
2	.5505	35.92	Av	.3	0	36.22	-	-	46	-9.78
3	1.6215	44.13	PK	.2	.1	44.43	56	-11.57	-	-
4	1.6215	27.79	Av	.2	.1	28.09	-	-	46	-17.91
5	8.142	40.6	PK	.2	.1	40.9	60	-19.1	-	-
6	8.142	26.14	Av	.2	.1	26.44	-	-	50	-23.56

### LINE 2 PLOT



### LINE 2 RESULTS

#### Line-L2 .15 - 30MHz

##### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
7	.546	47.87	PK	.3	0	48.17	56	-7.83	-	-
8	.546	30.03	Av	.3	0	30.33	-	-	46	-15.67
9	2.6565	38.84	PK	.2	.1	39.14	56	-16.86	-	-
10	2.6565	21.91	Av	.2	.1	22.21	-	-	46	-23.79

PK - Peak detector  
 Av - average detection