FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1

BLUETOOTH LOW ENERGY CERTIFICATION TEST REPORT

FOR

CELLULAR PHONE WITH BLUETOOTH AND WLAN RADIOS

MODEL NUMBER: A1662

FCC ID: BCG-E2945A
IC: 579C-E2945A

REPORT NUMBER: 15U21634-E3V1

ISSUE DATE: JANUARY 22, 2016

Prepared for
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CUPERTINO, CA 95014, U.S.A.

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/22/2016	Initial Issue	M. Mekuria

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: CELLULAR PHONE WITH BLUETOOTH AND WLAN RADIOS

MODEL: A1662

SERIAL NUMBER: C39Q3008GR1X

DATE TESTED: AUGUST 25, 2015 to DECEMBER 09, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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.

Approved & Released For
UL Verification Services Inc. By:

MENGISTU MEKURIA
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Tested By:

ERIC YU
EMC ENGINEER
UL VERIFICATION SERVICES INC.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v03r04, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

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
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☒ Chamber G
	☒ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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:

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
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT, Model A1662 is a mobile phone with multimedia functions (music, application support, and video), cellular GSM/GPRS/EGPRS/CDMA/WCDMA/HSPA+/DC-HSDPA/LTE radio, IEEE 802.11a/b/g/n/ac radio, Bluetooth radio and NFC. The rechargeable battery is not user accessible.

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	11.84	15.28

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)
2.4	-0.90

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BlueTool 1.8.8.6

5.5. 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.

Worst-case data rates as provided by the client were:
Based on the baseline scan, the worst-case data rates were:

BLE: 1 Mbps.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

For simultaneous transmission of multiple channels from the same antenna in the 2.4GHz and 5GHz bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Latitude 3540	6LNG802	N/A
Laptop AC/DC adapter	Dell	FA90PE1-00	CN-0CM889-73245-95L-4954-A00	N/A
Earphone	Apple	NA	NA	N/A
EUT AC/DC adapter	Apple	A1385	D293062F3WVDHLHCF	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
None Used						

I/O CABLES (RADAITED BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	3	N/A

I/O CABLES (AC LINE CONDUCTED: AC/DC ADAPTER)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	AC	1	AC	Un-shielded	3	N/A

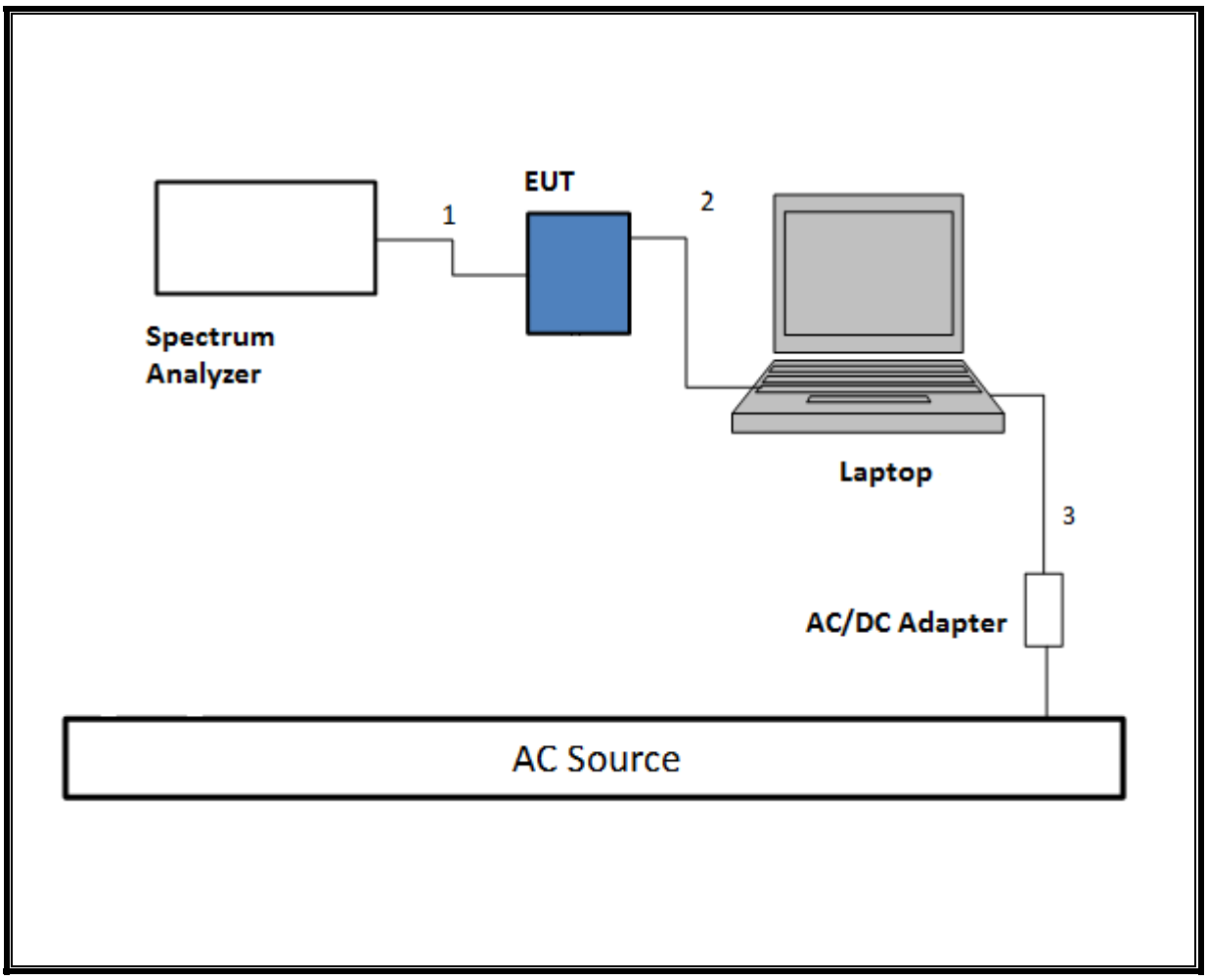
I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Headphones Jack	1	3.5mm Audio	Shielded	0.9	N/A
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	3	N/A

TEST SETUP - CONDUCTED TESTS

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

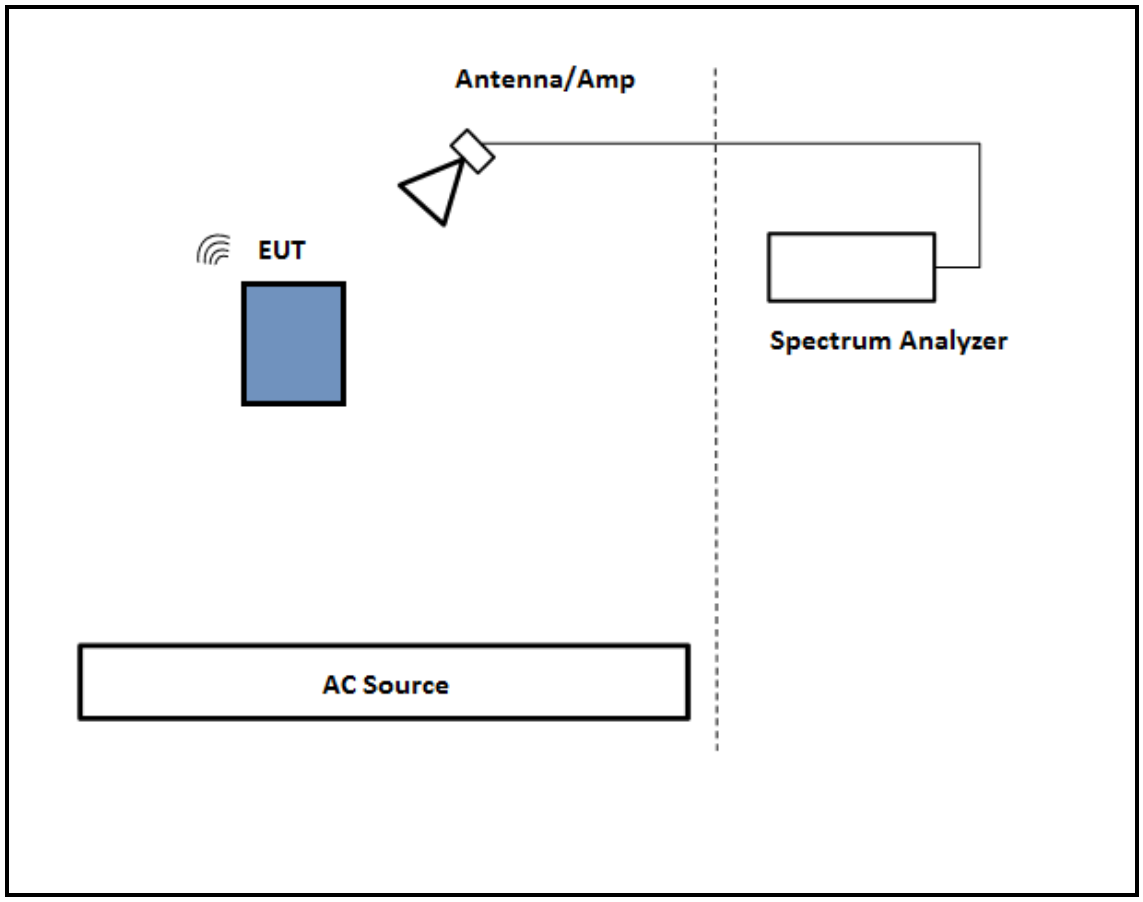
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was tested battery powered. Test software exercised the EUT.

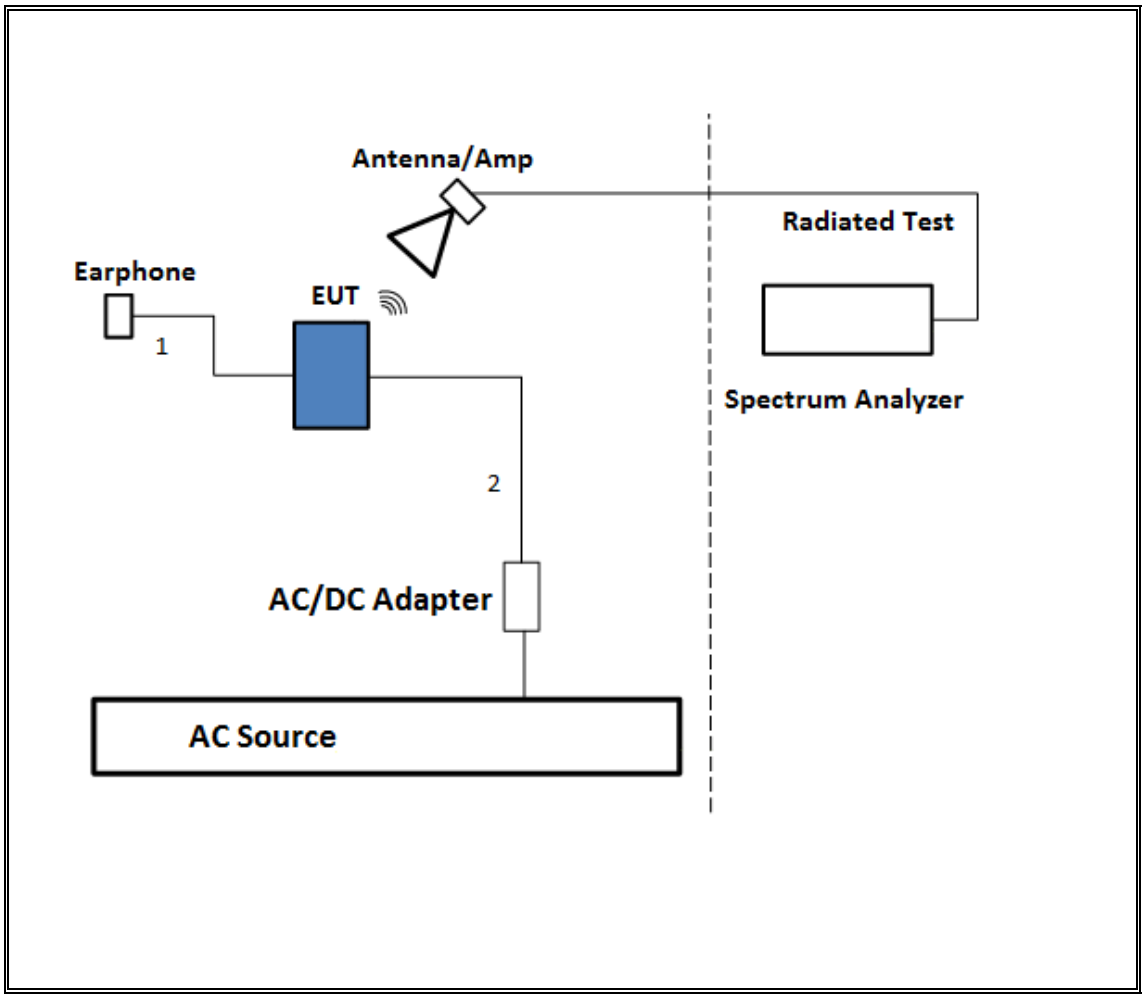
SETUP DIAGRAM



TEST SETUP- BELOW 1GHz

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

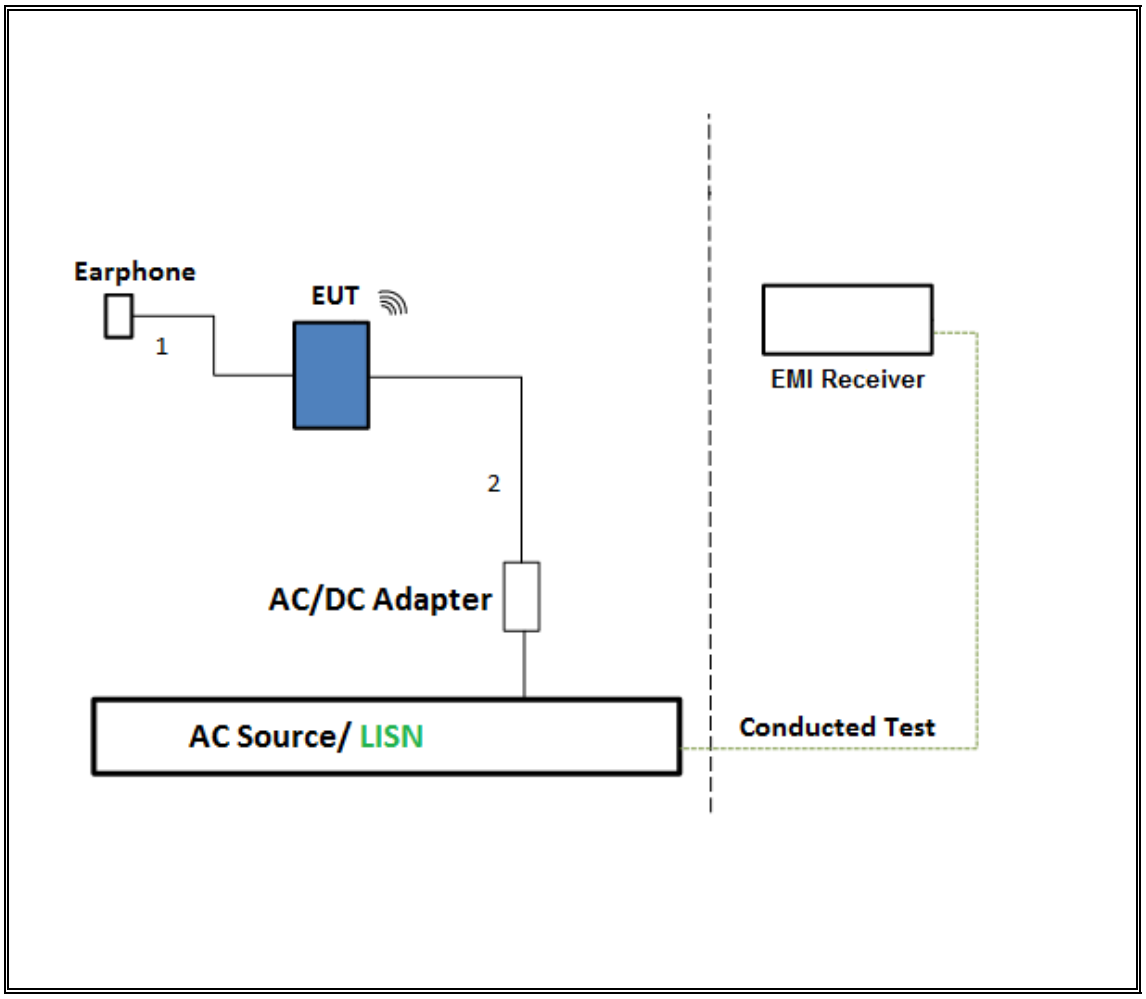
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

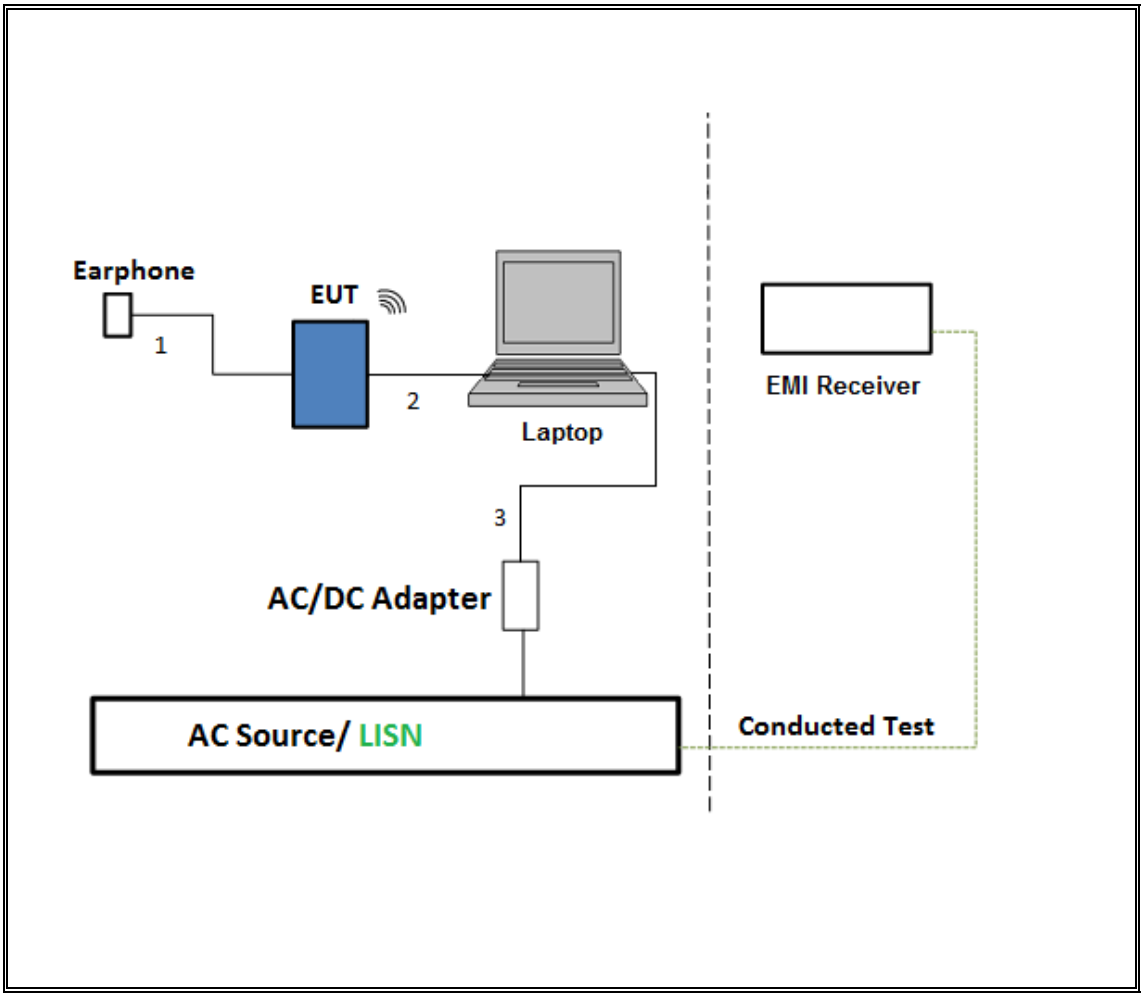
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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, Horn 1-18GHz	ETS Lindgren	3117	00143448	2/10/2016
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	1/14/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/26/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323561	6/8/2016
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	325117	6/9/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A-544	US51160264	12/23/2015
Power Meter, P-series single channel	Agilent	N1911A	GB45100212	9/25/2016
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/12/2016
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	1049	12/17/2015
Horn Antenna, 40GHz	ARA	MWH-2640/B	1029	7/15/2016
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/6/2016
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	3008A04710	6/29/2016
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/10/2016
LISN for Conducted Emissions CISPR-16	FCC	50/250-25-2	114	1/16/2016
Power Cable, Line Conducted Emissions ANSI 63.4	UL	PG1	N/A	7/28/2016
UL SOFTWARE				
*Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014	
*Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015	
*AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015	

Note: * indicates automation software version used in the compliance certification testing

7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r04, Section 8.1.

Output Power: KDB 558074 D01 v03r04, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r04, Section 12.1.

Band-edge: KDB 558074 D01 v03r04, Section 12.1.

7.2. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

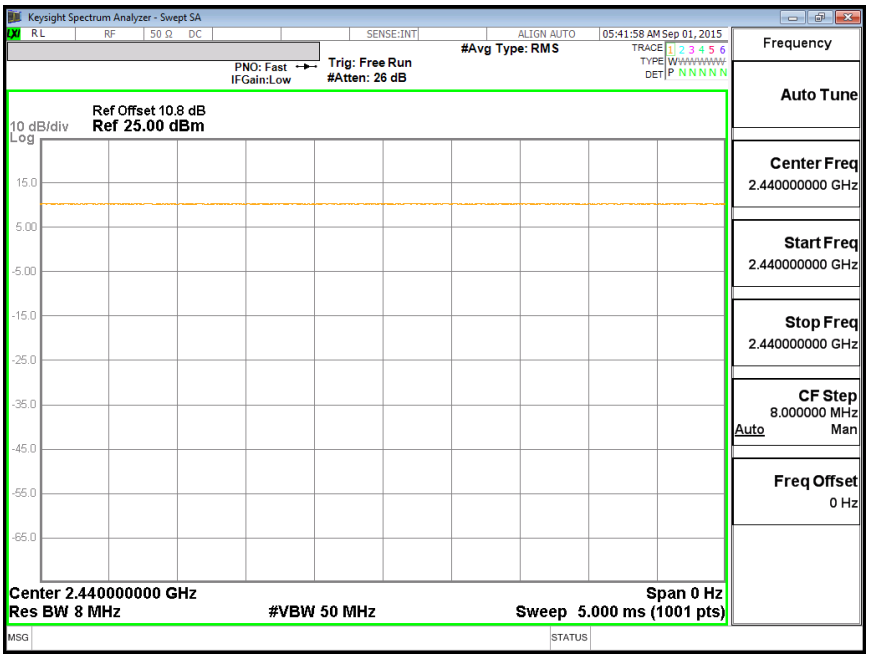
KDB 558074 Zero-Span Spectrum Analyzer Method.

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	5.000	5.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS

DUTY CYCLE



7.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

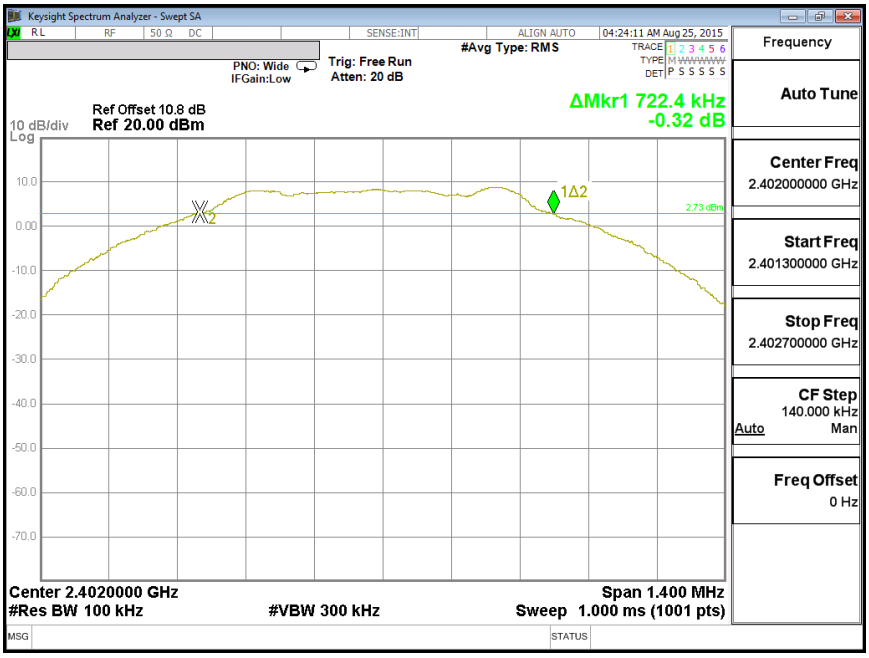
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

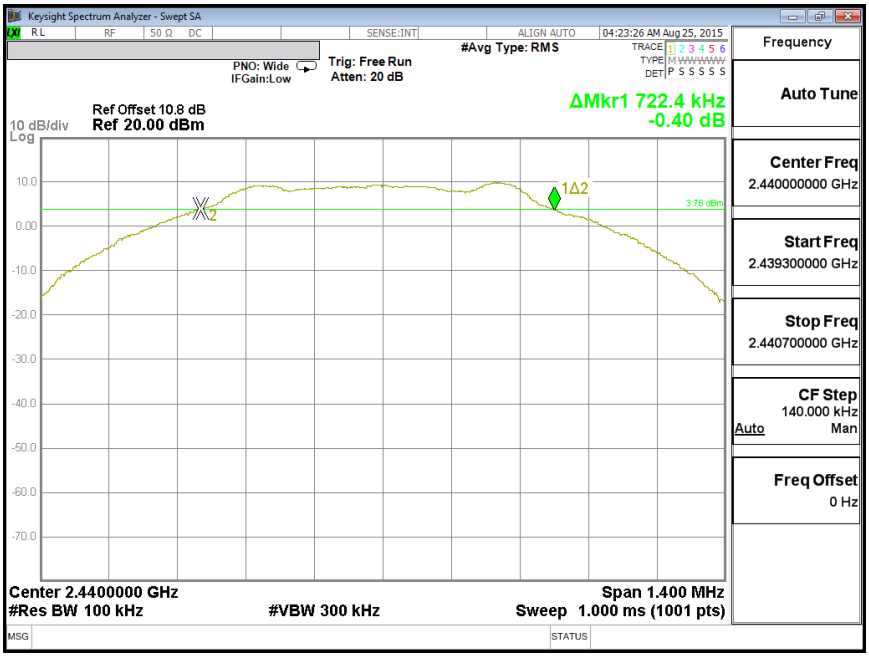
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.722	0.5
Middle	2440	0.722	0.5
High	2480	0.728	0.5

6 dB BANDWIDTH

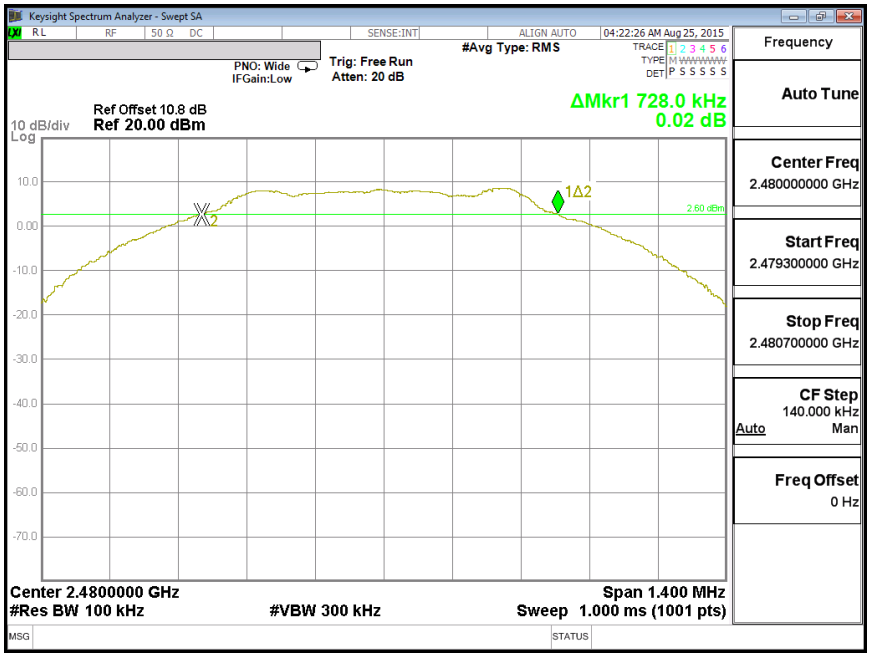
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.4. 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.

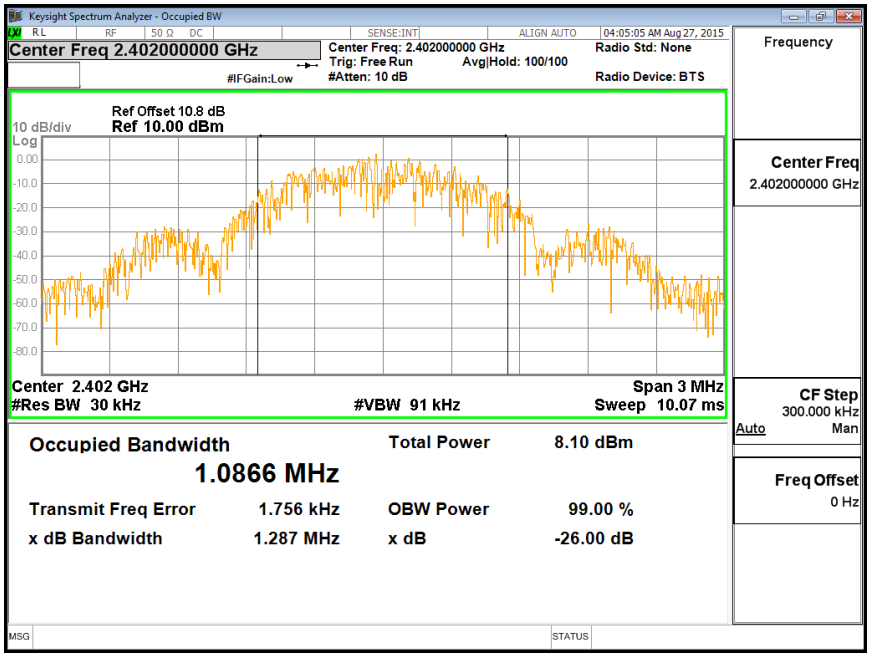
RESULTS

IPA

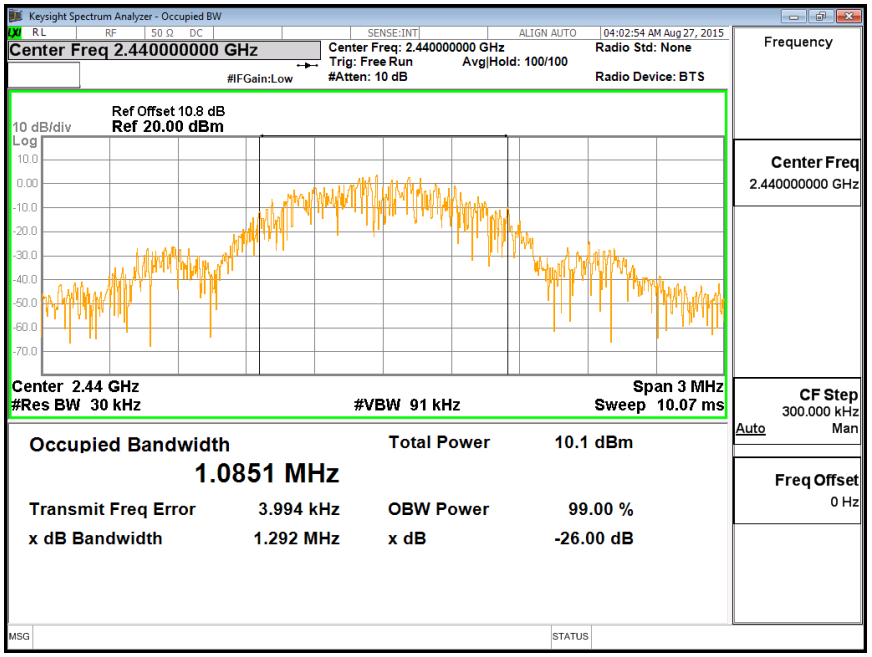
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.087
Middle	2440	1.085
High	2480	1.070

99% BANDWIDTH

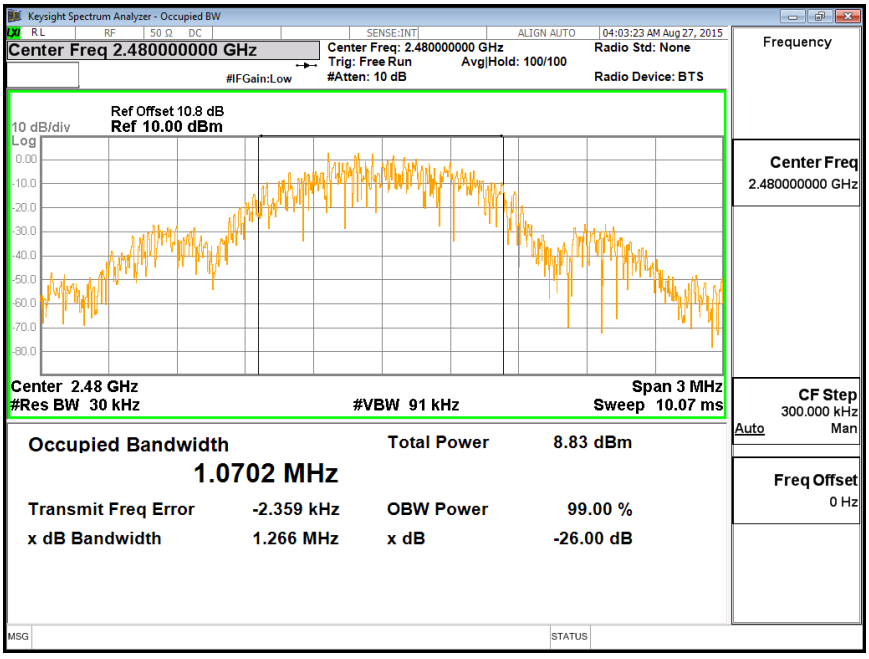
99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

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	11.07
Middle	2440	11.50
High	2480	10.67

7.6. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

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

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.38	30	-18.620
Middle	2440	11.84	30	-18.160
High	2480	10.97	30	-19.030

7.7. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 (5.2) (2)

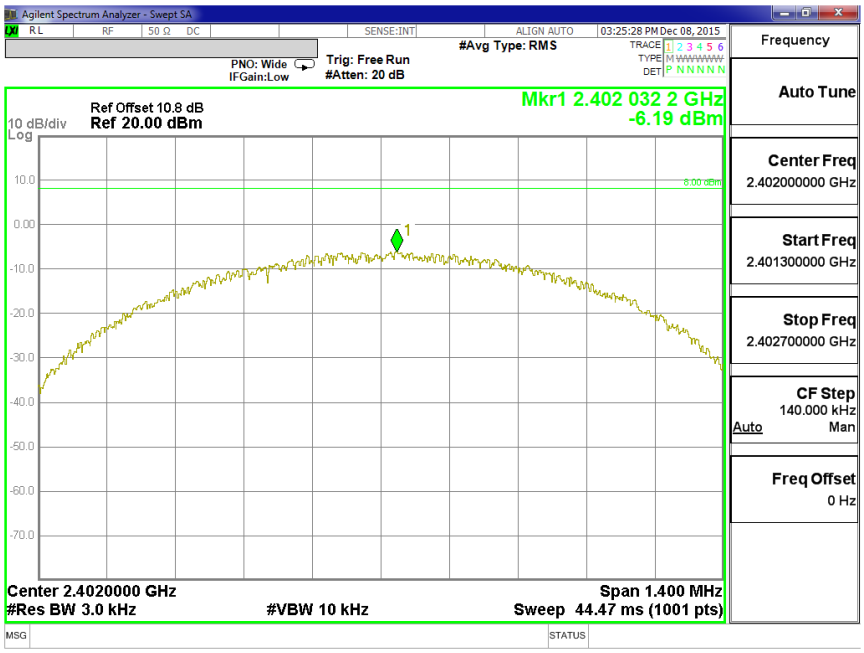
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

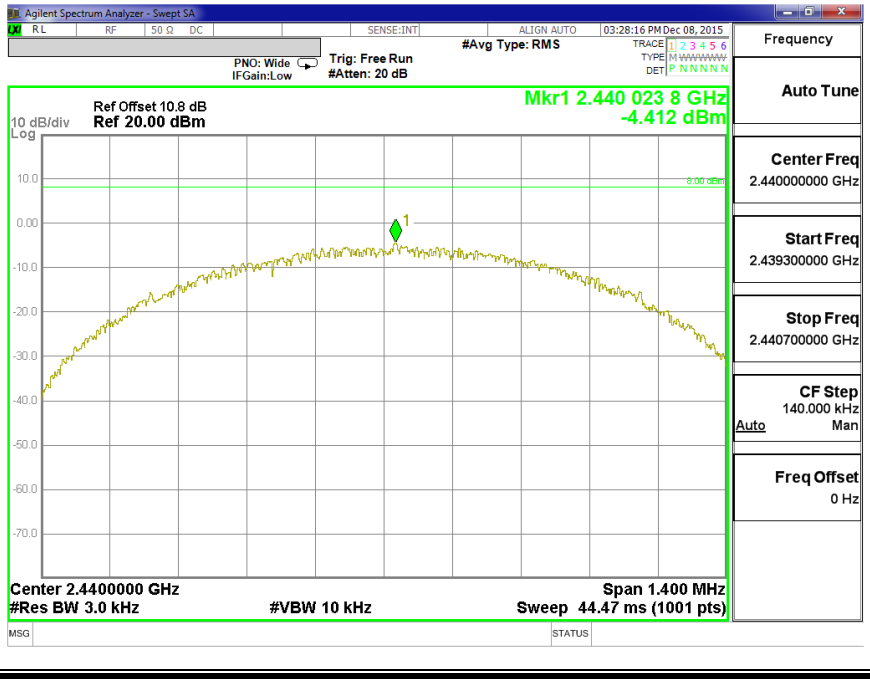
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-6.19	8	-14.19
Middle	2440	-4.41	8	-12.41
High	2480	-6.58	8	-14.58

POWER SPECTRAL DENSITY

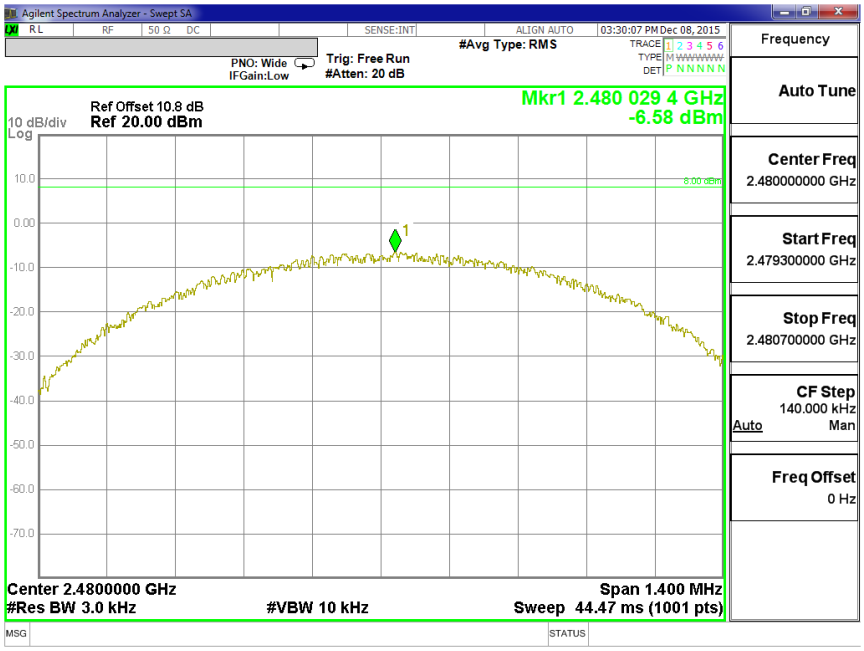
PSD LOW CH



PSD MID CH



PSD HIGH CH



7.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

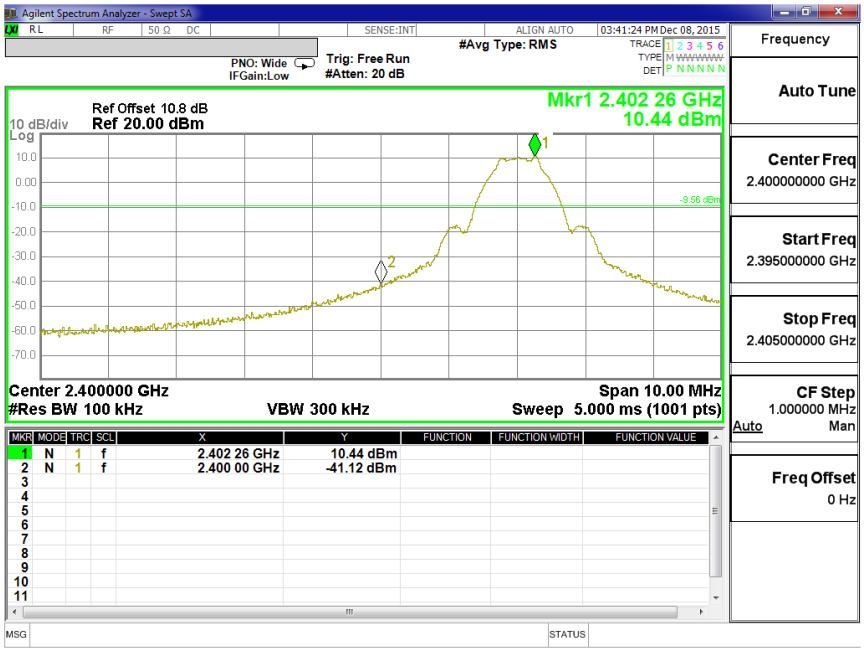
IC RSS-247 (5.5)

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

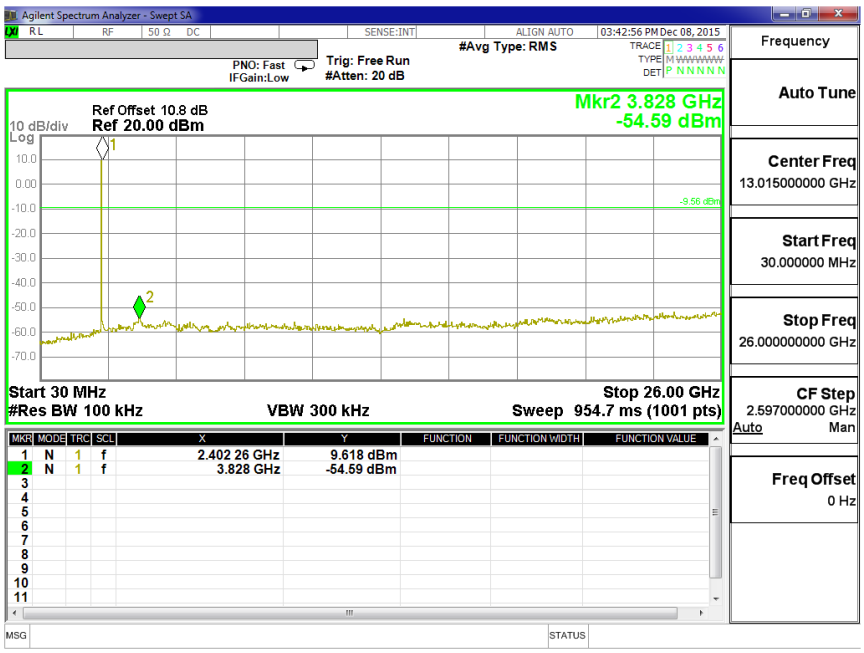
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE

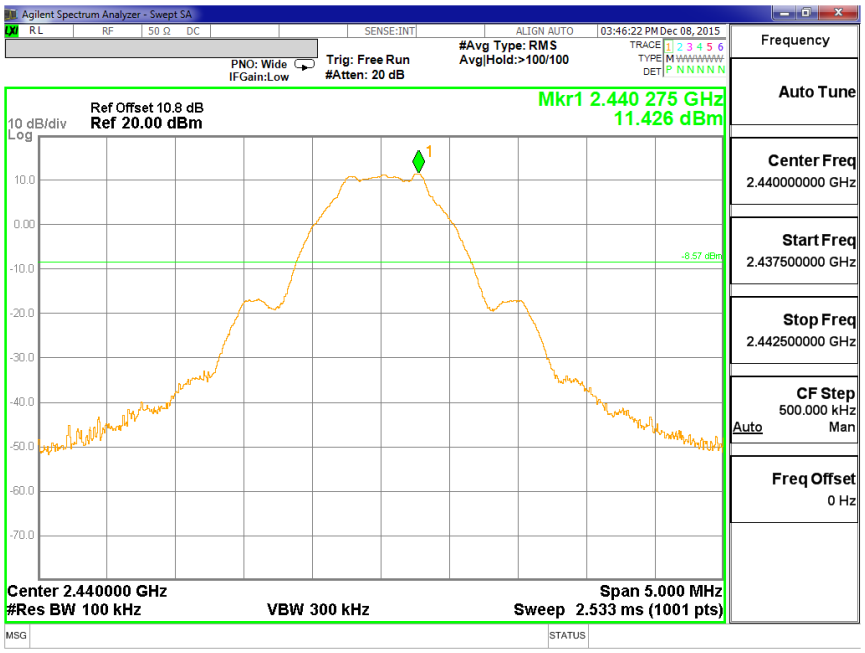


LOW CH SPURIOUS

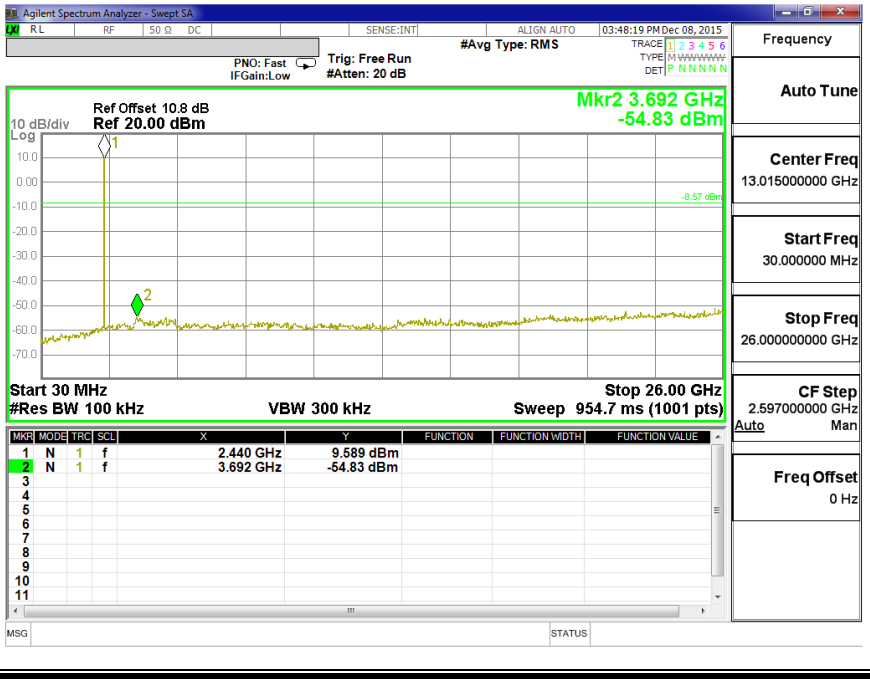


SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE

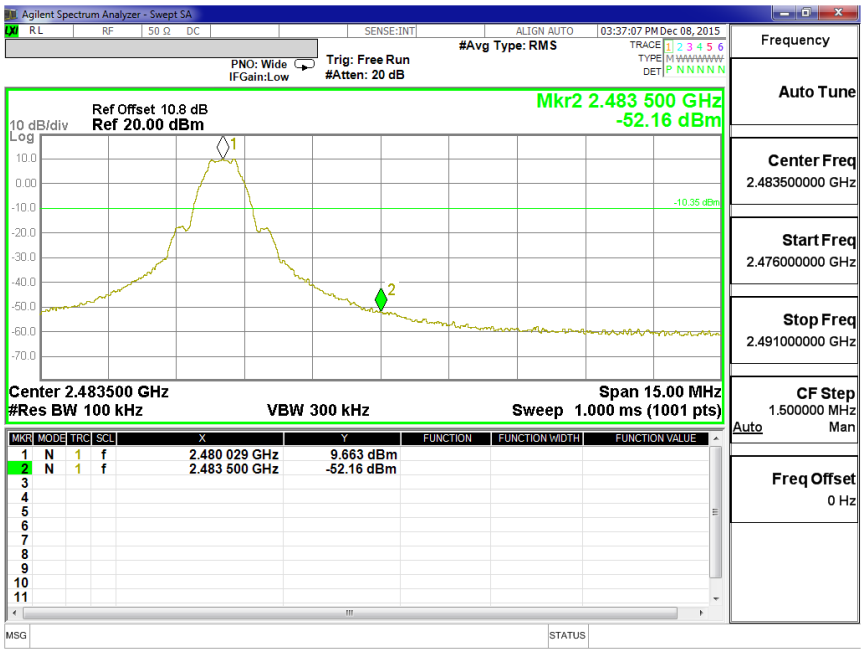


MID CH SPURIOUS

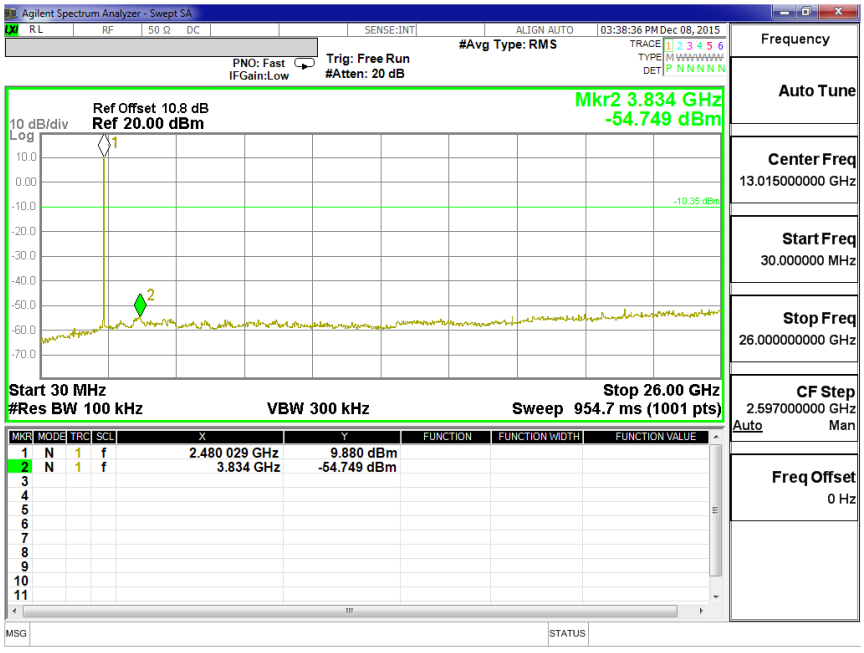


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CH BANDEDGE



HIGH CH SPURIOUS



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

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 for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. 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 3 MHz for peak measurements and 1 MHz resolution bandwidth with 3MHz video bandwidth with average detector for average measurements.

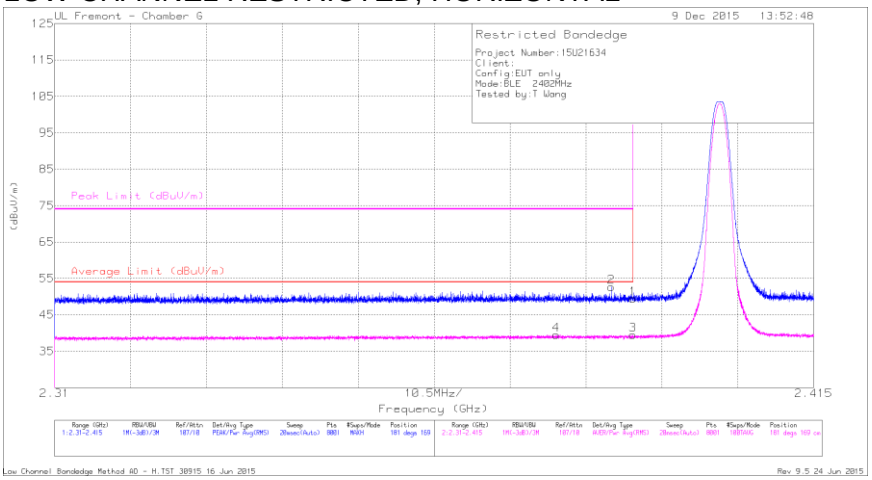
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. RESTRICTED BANDEDGE

LOW CHANNEL RESTRICTED, HORIZONTAL



DATA

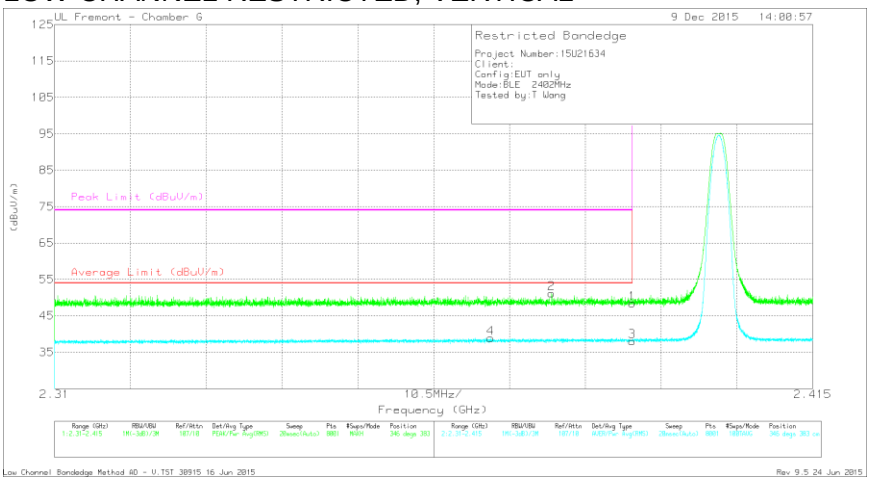
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.97	Pk	31.9	-24.5	49.37	-	-	74	-24.63	181	169	H
2	* 2.387	45.32	Pk	31.8	-24.5	52.62	-	-	74	-21.38	181	169	H
3	* 2.39	32.05	RMS	31.9	-24.5	39.45	54	-14.55	-	-	181	169	H
4	* 2.379	32.22	RMS	31.8	-24.5	39.52	54	-14.48	-	-	181	169	H

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

Pk - Peak detector

RMS - RMS detection

LOW CHANNEL RESTRICTED, VERTICAL



DATA

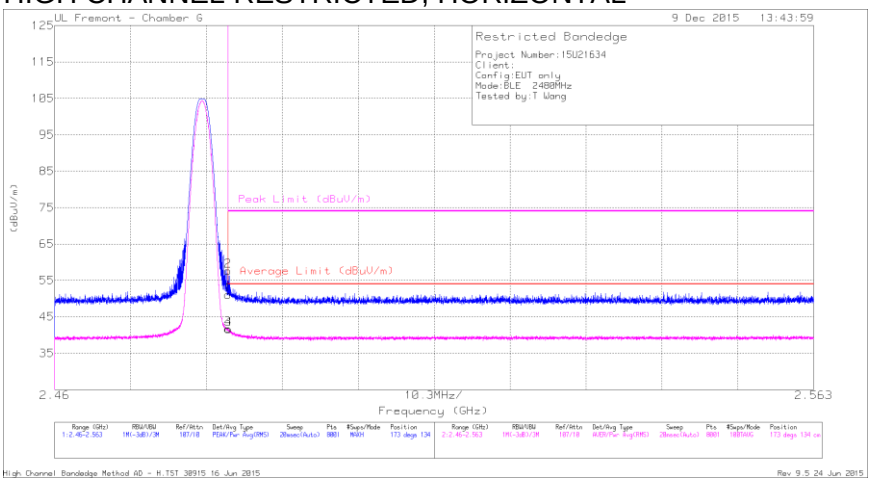
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41	Pk	31.9	-24.5	48.4	-	-	74	-25.6	346	383	V
2	* 2.379	43.84	Pk	31.8	-24.5	51.14	-	-	74	-22.86	346	383	V
3	* 2.39	30.56	RMS	31.9	-24.5	37.96	54	-16.04	-	-	346	383	V
4	* 2.37	31.59	RMS	31.8	-24.5	38.89	54	-15.11	-	-	346	383	V

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

Pk - Peak detector

RMS - RMS detection

HIGH CHANNEL RESTRICTED, HORIZONTAL



DATA

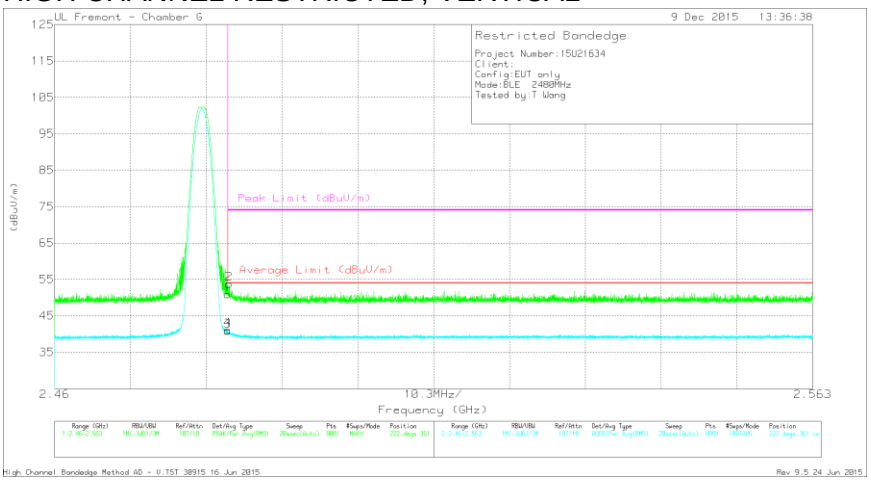
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	43.27	Pk	32.3	-24.5	51.07	-	-	74	-22.93	173	134	H
2	* 2.484	49.8	Pk	32.3	-24.5	57.6	-	-	74	-16.4	173	134	H
3	* 2.484	33.93	RMS	32.3	-24.5	41.73	54	-12.27	-	-	173	134	H
4	* 2.484	33.76	RMS	32.3	-24.5	41.56	54	-12.44	-	-	173	134	H

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

Pk - Peak detector

RMS - RMS detection

HIGH CHANNEL RESTRICTED, VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/ Fltr/Pad (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	43.13	Pk	32.3	-24.5	50.93	-	-	74	-23.07	222	361	V
2	* 2.484	45.99	Pk	32.3	-24.5	53.79	-	-	74	-20.21	222	361	V
3	* 2.484	33.11	RMS	32.3	-24.5	40.91	54	-13.09	-	-	222	361	V
4	* 2.484	33.3	RMS	32.3	-24.5	41.1	54	-12.9	-	-	222	361	V

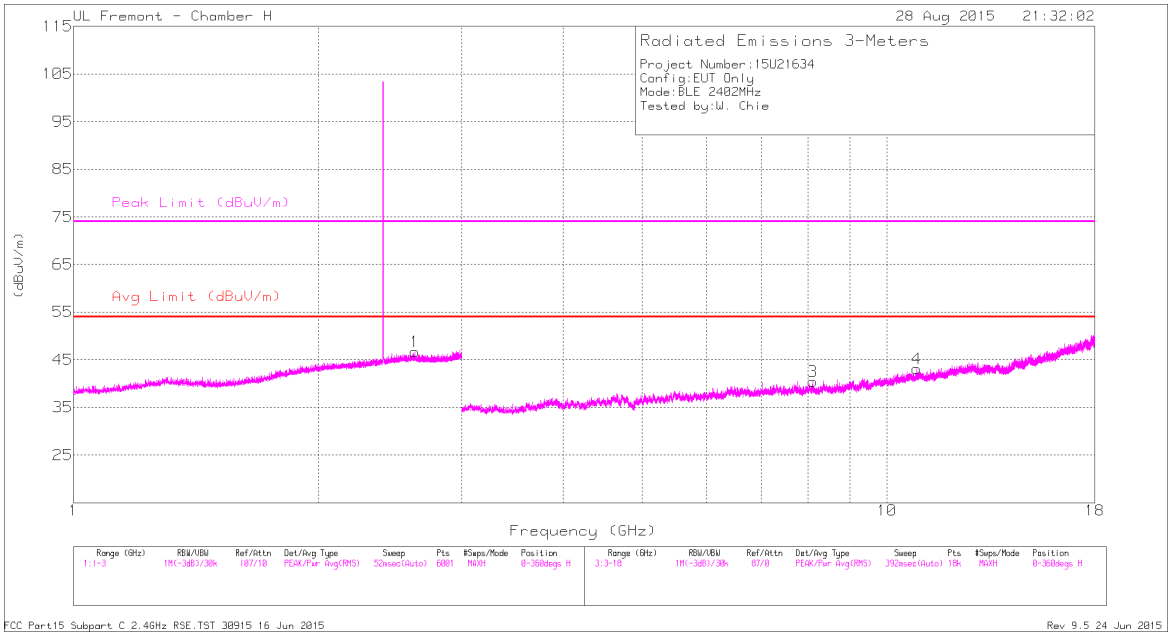
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

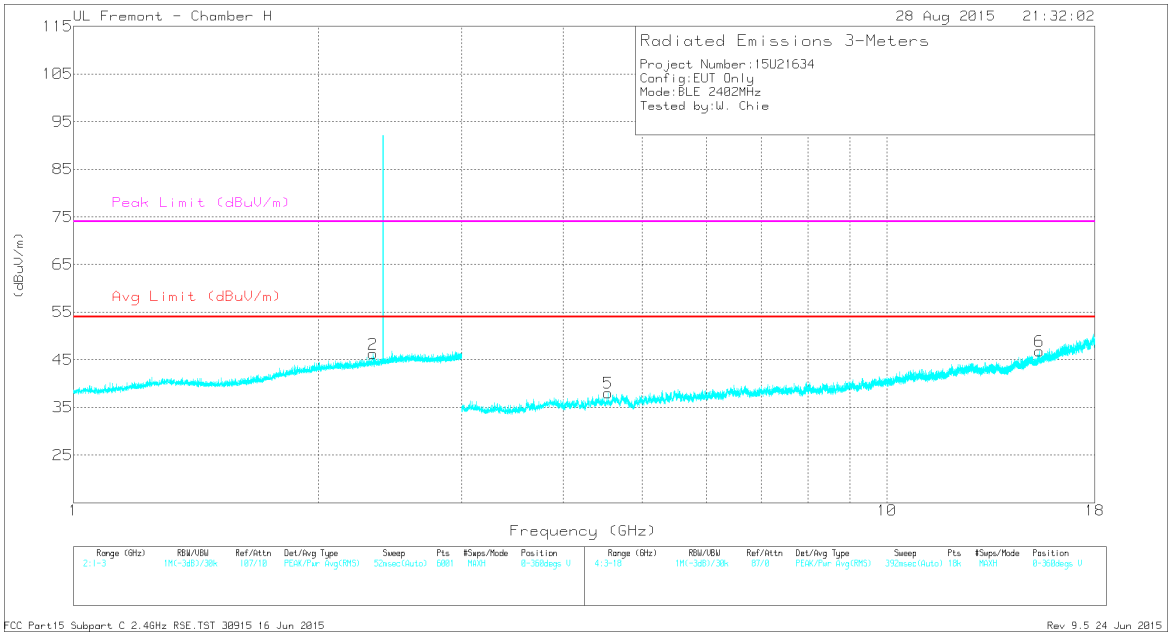
RMS - RMS detection

8.2.2. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



DATA

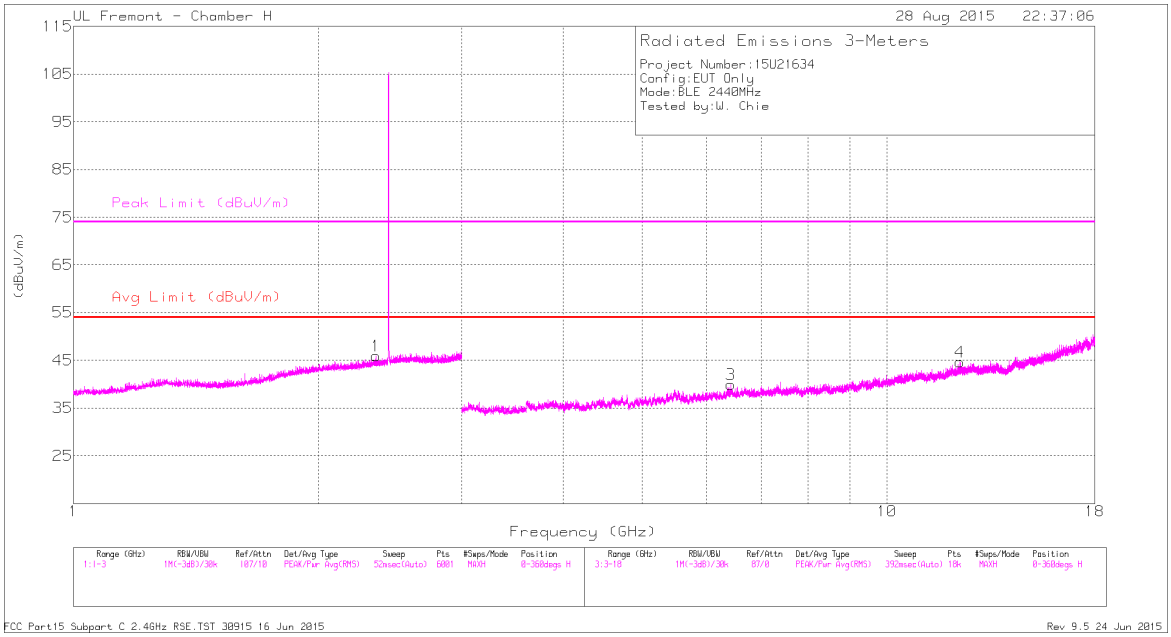
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.336	43.28	PK2	31.9	-23.5	51.68	-	-	74	-22.32	268	253	V
	* 2.337	31.41	MAv1	31.9	-23.5	39.81	54	-14.19	-	-	268	253	V
3	* 8.104	39.14	PK2	35.9	-28	47.04	-	-	74	-26.96	102	157	H
	* 8.103	26.97	MAv1	35.9	-28	34.87	54	-19.13	-	-	102	157	H
4	* 10.875	36.08	PK2	37.8	-24.6	49.28	-	-	74	-24.72	124	110	H
	* 10.874	24.47	MAv1	37.8	-24.6	37.67	54	-16.33	-	-	124	110	H
5	* 4.543	42.47	PK2	33.9	-31.8	44.57	-	-	74	-29.43	245	204	V
	* 4.542	30.43	MAv1	33.9	-31.8	32.53	54	-21.47	-	-	245	204	V
6	* 15.384	37.19	PK2	40.7	-24.3	53.59	-	-	74	-20.41	97	395	V
	* 15.385	24.81	MAv1	40.7	-24.3	41.21	54	-12.79	-	-	97	395	V
1	2.628	43.48	PK2	32.5	-23.2	52.78	-	-	-	-	344	192	H

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

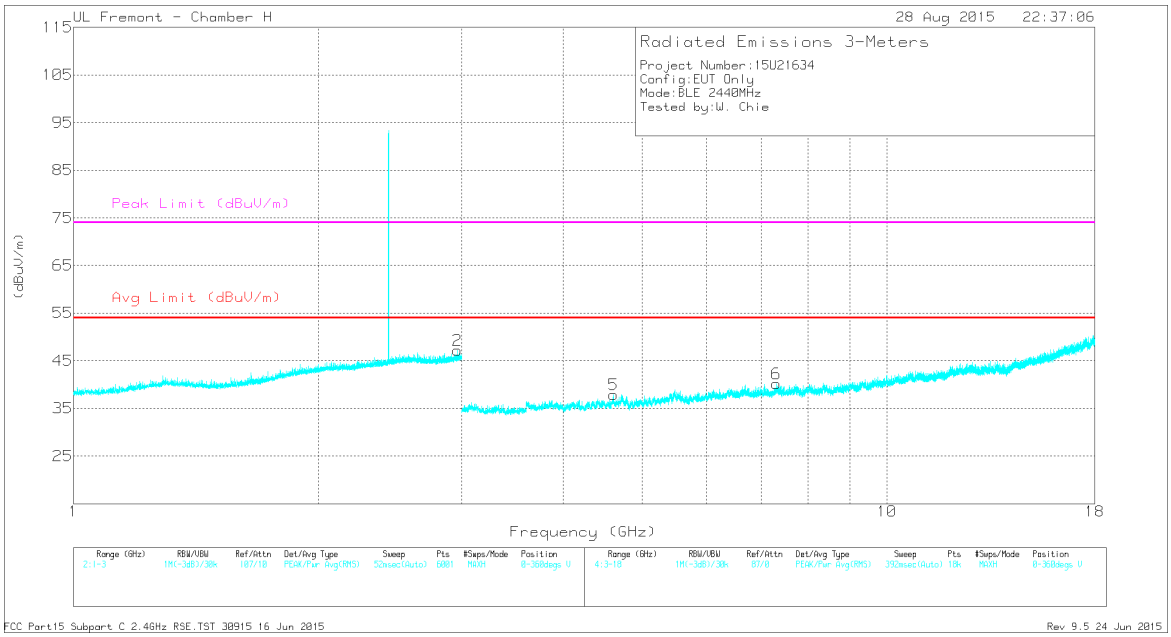
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



DATA

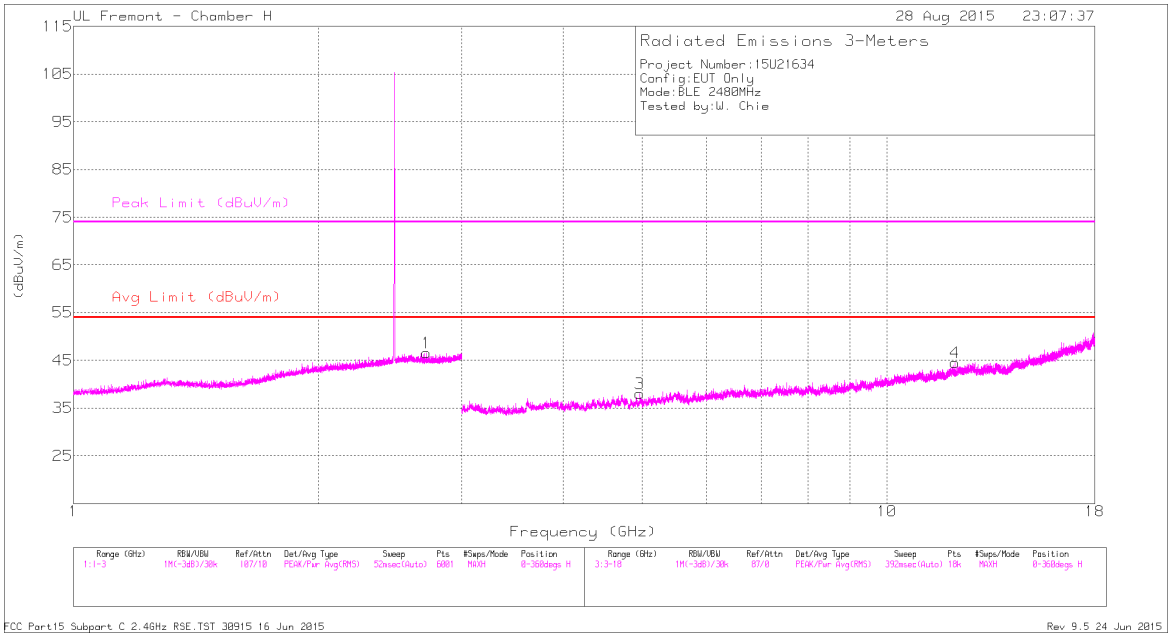
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.356	44.38	PK2	31.9	-23.5	52.78	-	-	74	-21.22	200	272	H
	* 2.353	31.46	MAv1	31.9	-23.5	39.86	54	-14.14	-	-	200	272	H
4	* 12.29	36.19	PK2	39.1	-24.3	50.99	-	-	74	-23.01	17	130	H
	* 12.29	24.52	MAv1	39.1	-24.3	39.32	54	-14.68	-	-	17	130	H
5	* 4.612	41.95	PK2	34	-31.2	44.75	-	-	74	-29.25	325	220	V
	* 4.61	30.24	MAv1	34	-31.2	33.04	54	-20.96	-	-	325	220	V
6	* 7.315	39.45	PK2	35.9	-28.3	47.05	-	-	74	-26.95	157	106	V
	* 7.316	27.49	MAv1	36	-28.3	35.19	54	-18.81	-	-	157	106	V
2	2.961	43.36	PK2	32.6	-22.9	53.06	-	-	-	-	360	115	V
3	6.429	40.13	PK2	35.7	-29.2	46.63	-	-	-	-	319	400	H

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

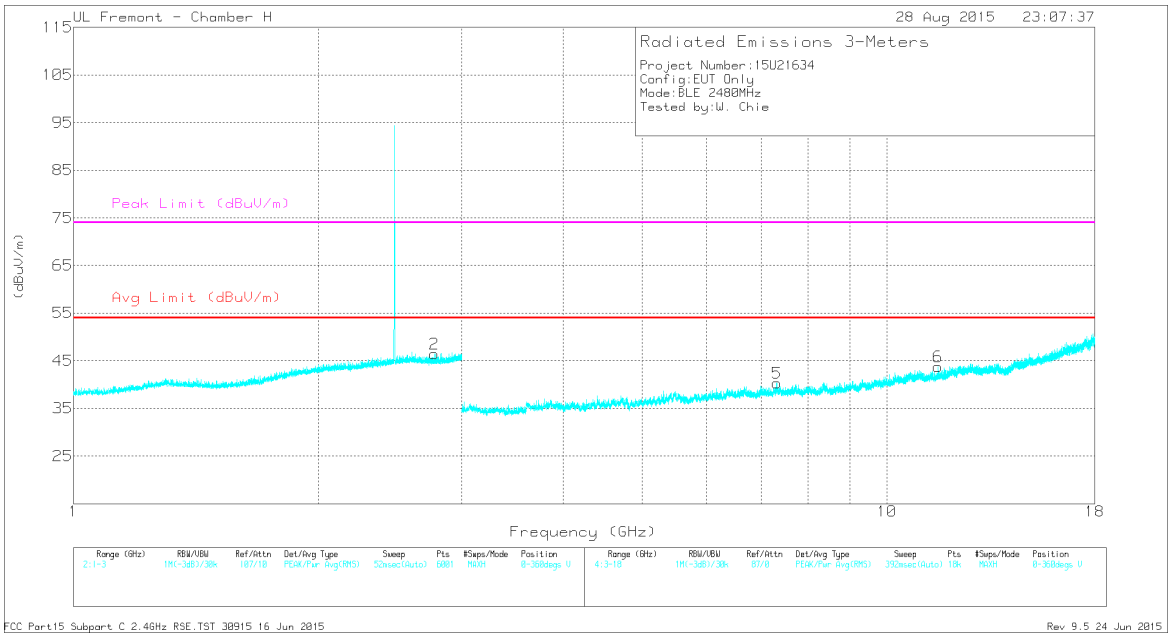
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.715	43.6	PK2	32.3	-23.2	52.7	-	-	74	-21.3	281	253	H
	* 2.718	31.44	MAv1	32.3	-23.2	40.54	54	-13.46	-	-	281	253	H
2	* 2.778	43.69	PK2	32.4	-23.3	52.79	-	-	74	-21.21	282	364	V
	* 2.781	31.45	MAv1	32.4	-23.3	40.55	54	-13.45	-	-	282	364	V
3	* 4.962	42.34	PK2	34.2	-30.9	45.64	-	-	74	-28.36	263	111	H
	* 4.964	29.04	MAv1	34.2	-30.8	32.44	54	-21.56	-	-	263	111	H
4	* 12.117	35.76	PK2	38.9	-24.9	49.76	-	-	74	-24.24	267	165	H
	* 12.118	24.4	MAv1	38.9	-24.9	38.4	54	-15.6	-	-	267	165	H
5	* 7.317	39.61	PK2	36	-28.3	47.31	-	-	74	-26.69	231	131	V
	* 7.317	27.54	MAv1	36	-28.3	35.24	54	-18.76	-	-	231	131	V
6	* 11.556	36.26	PK2	38	-24.2	50.06	-	-	74	-23.94	238	196	V
	* 11.56	24.38	MAv1	38	-24.2	38.18	54	-15.82	-	-	238	196	V

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

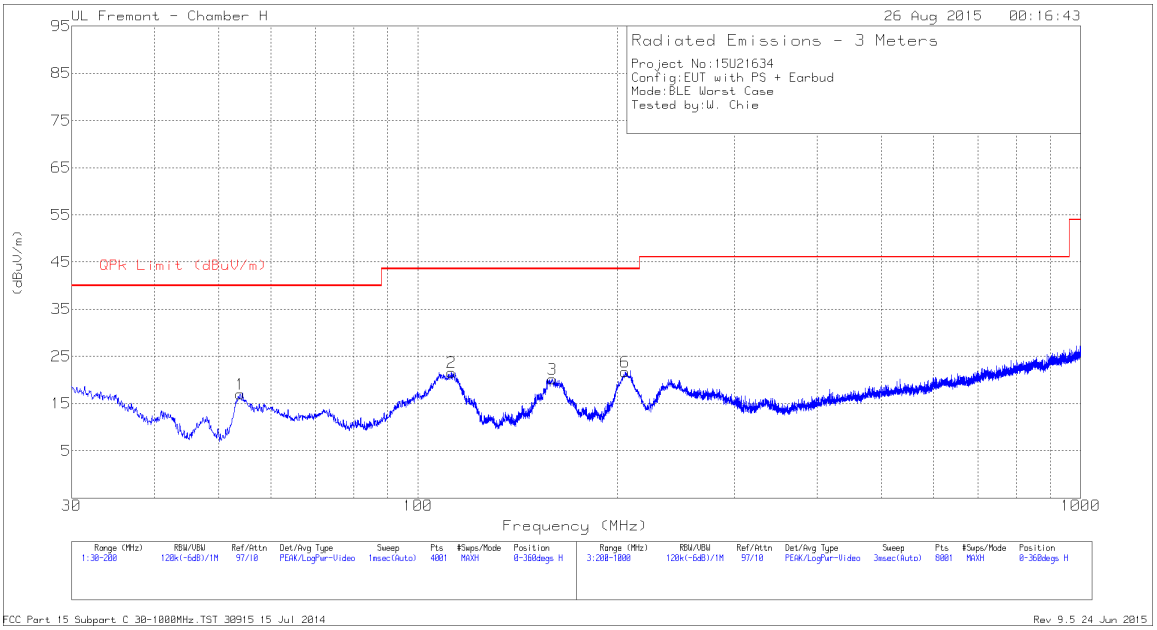
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

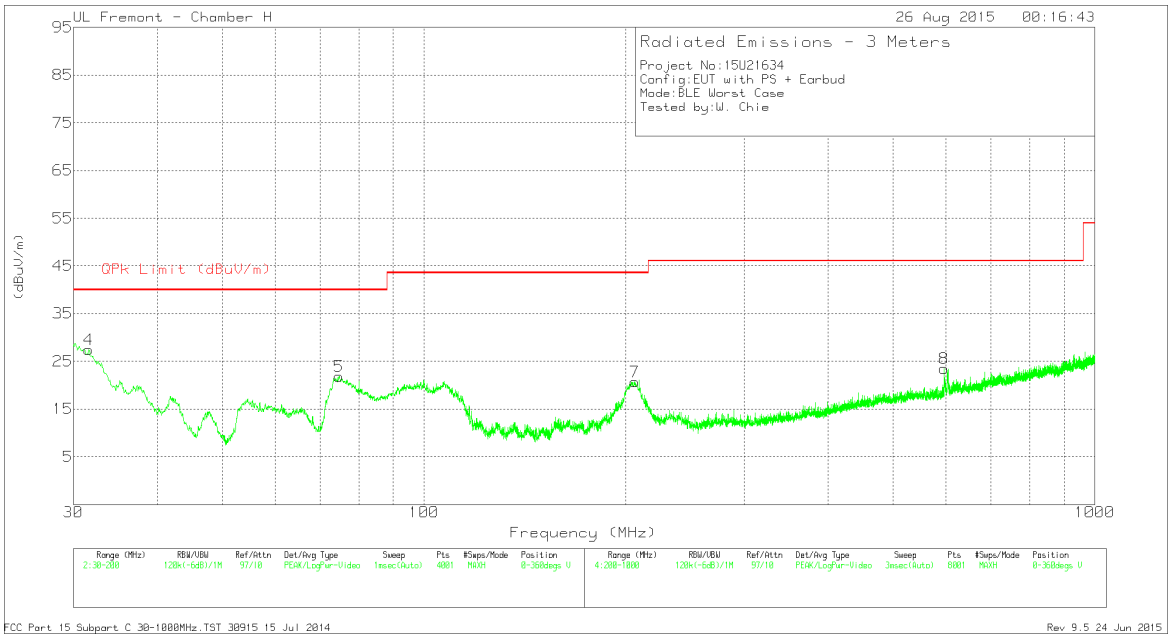
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL: PLOT



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 112.28	39.05	Pk	12.9	-30.4	21.55	43.52	-21.97	0-360	301	H
4	31.6575	37.94	Pk	20.8	-31.3	27.44	40	-12.56	0-360	100	V
1	53.885	40.77	Pk	7.2	-30.9	17.07	40	-22.93	0-360	401	H
5	74.71	44.32	Pk	8.3	-30.7	21.92	40	-18.08	0-360	100	V
3	159.37	38.16	Pk	12	-30	20.16	43.52	-23.36	0-360	201	H
6	205.3	40.52	Pk	10.9	-29.7	21.72	43.52	-21.8	0-360	100	H
7	206.3	39.75	Pk	10.7	-29.7	20.75	43.52	-22.77	0-360	100	V
8	596.3	33.02	Pk	18.6	-28.1	23.52	46.02	-22.5	0-360	100	V

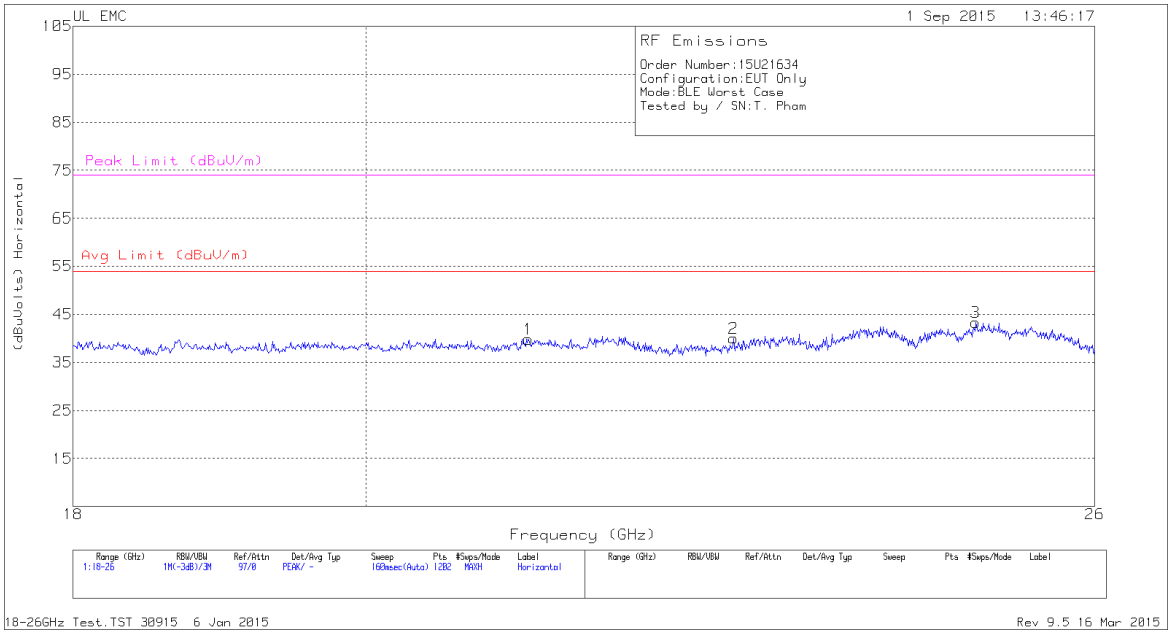
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

8.4. WORST-CASE 18 to 26 GHz

SPURIOUS EMISSIONS 18 to 26 GHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT

DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	21.204	40.93	Pk	33.10	-24.7	-9.5	39.83	54	-14.16	74	-34.16
2	22.829	41.40	Pk	33.30	-25.2	-9.5	40.00	54	-14.00	74	-34.00
3	24.908	43.13	Pk	34.00	-24.3	-9.5	43.33	54	-10.66	74	-30.66
4	19.459	41.10	Pk	32.50	-24.6	-9.5	39.50	54	-14.50	74	-34.50
5	22.556	40.43	Pk	33.30	-24.9	-9.5	39.33	54	-14.66	74	-34.66
6	25.061	43.83	Pk	34.00	-25.0	-9.5	43.33	54	-10.66	74	-30.66

Pk - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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

C63.10.

RESULTS

9.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

Line-L1 .15 - 30MHz

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.168	45.08	Pk	1.2	0	46.28	65.06	-18.78	-	-
2	.168	23.66	Av	1.2	0	24.86	-	-	55.06	-30.2
3	.807	43.66	Pk	.3	0	43.96	56	-12.04	-	-
4	.807	26.81	Av	.3	0	27.11	-	-	46	-18.89
5	2.3055	27.96	Pk	.2	.1	28.26	56	-27.74	-	-
6	2.2965	18.06	Av	.2	.1	18.36	-	-	46	-27.64
7	6.936	28.71	Pk	.2	.1	29.01	60	-30.99	-	-
8	6.8955	19.35	Av	.2	.1	19.65	-	-	50	-30.35
9	26.1375	22.35	Pk	.3	.3	22.95	60	-37.05	-	-
10	26.142	10.35	Av	.3	.3	10.95	-	-	50	-39.05

Line-L2 .15 - 30MHz

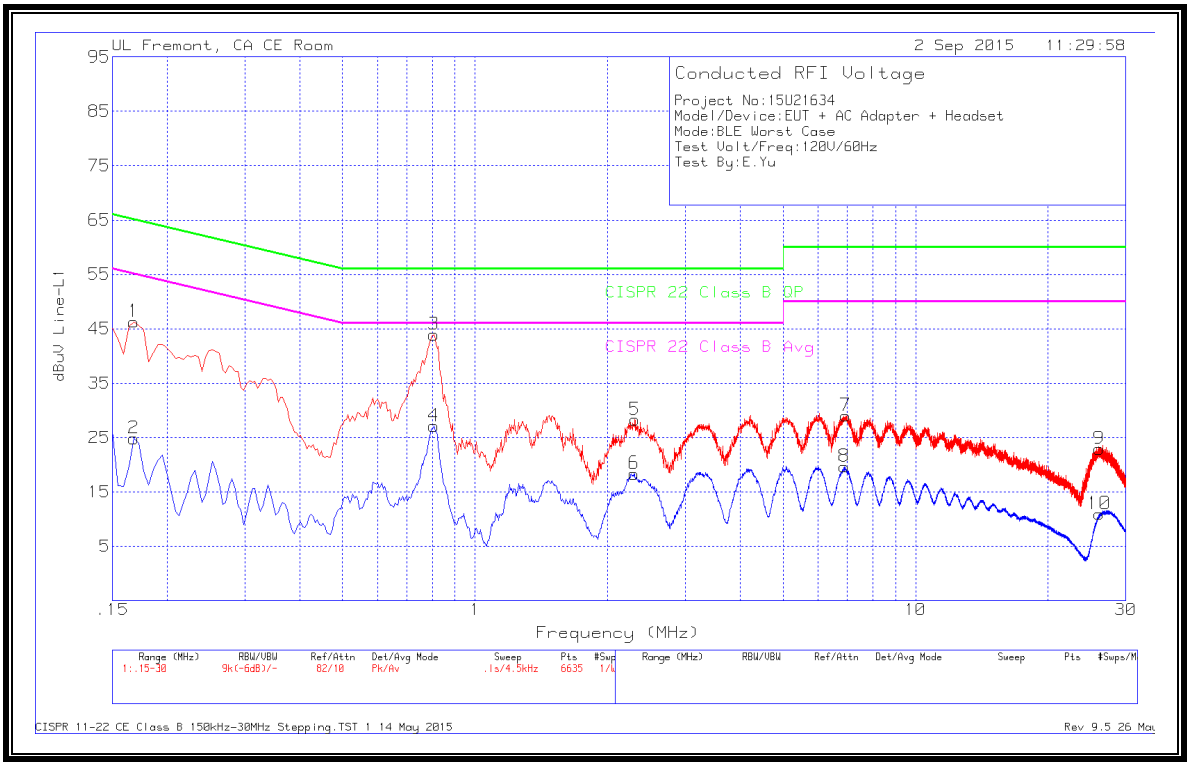
Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
11	.168	44.34	Pk	1.3	0	45.64	65.06	-19.42	-	-
12	.168	24.05	Av	1.3	0	25.35	-	-	55.06	-29.71
13	.8115	42.28	Pk	.3	0	42.58	56	-13.42	-	-
14	.8025	29.5	Av	.3	0	29.8	-	-	46	-16.2
15	2.283	27.61	Pk	.2	.1	27.91	56	-28.09	-	-
16	2.292	18.93	Av	.2	.1	19.23	-	-	46	-26.77
17	6.027	27.24	Pk	.2	.1	27.54	60	-32.46	-	-
18	6.009	18.19	Av	.2	.1	18.49	-	-	50	-31.51
19	26.016	18.3	Pk	.3	.3	18.9	60	-41.1	-	-
20	26.025	8.07	Av	.3	.3	8.67	-	-	50	-41.33

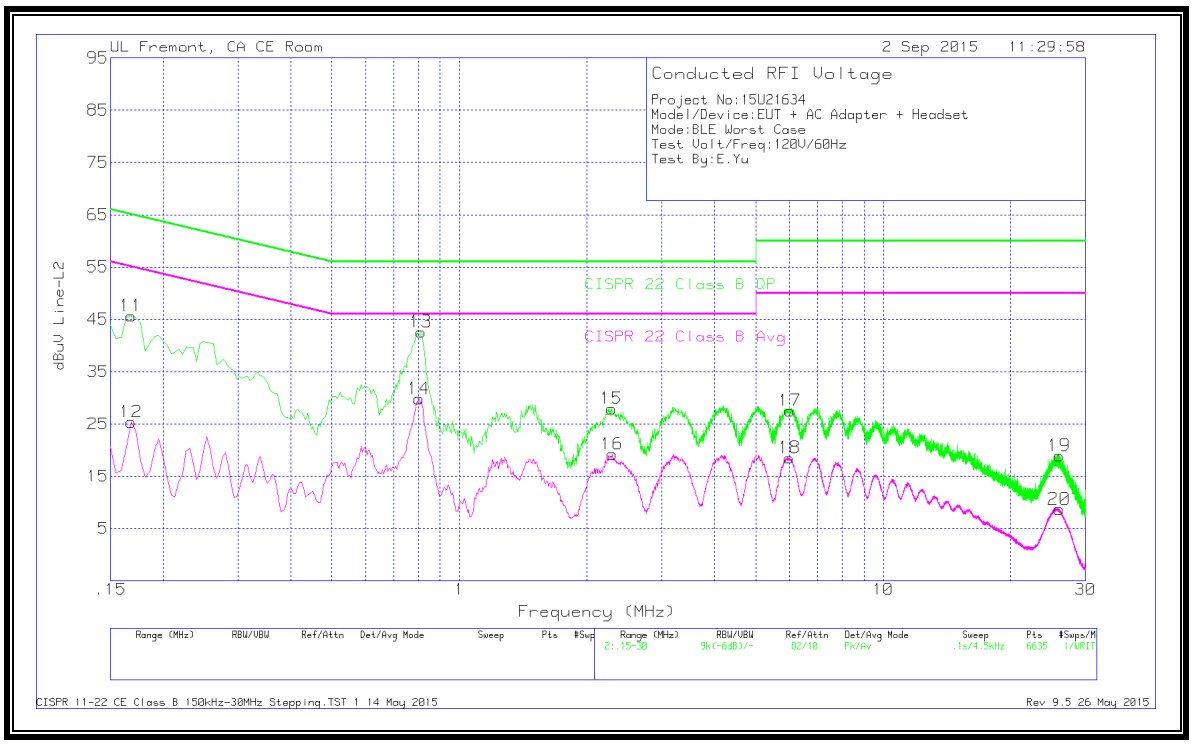
Pk - Peak detector

Av - Average detection

LINE 1 RESULTS



LINE 2 RESULTS



9.2. EUT POWERED BY HOST PC VIA USB CABLE

Line-L1 .15 - 30MHz

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.168	53.07	Pk	1.2	0	54.27	65.06	-10.79	-	-
2	.168	36.87	Av	1.2	0	38.07	-	-	55.06	-16.99
3	.4155	30.66	Pk	.4	0	31.06	57.54	-26.48	-	-
4	.42	25.58	Av	.4	0	25.98	-	-	47.45	-21.47
5	5.559	24.89	Pk	.2	.1	25.19	60	-34.81	-	-
6	5.559	9.54	Av	.2	.1	9.84	-	-	50	-40.16
7	13.614	31.3	Pk	.2	.2	31.7	60	-28.3	-	-
8	13.578	18.45	Av	.2	.2	18.85	-	-	50	-31.15
9	18.0915	24.35	Pk	.3	.2	24.85	60	-35.15	-	-
10	18.096	11.92	Av	.3	.2	12.42	-	-	50	-37.58

Line-L2 .15 - 30MHz

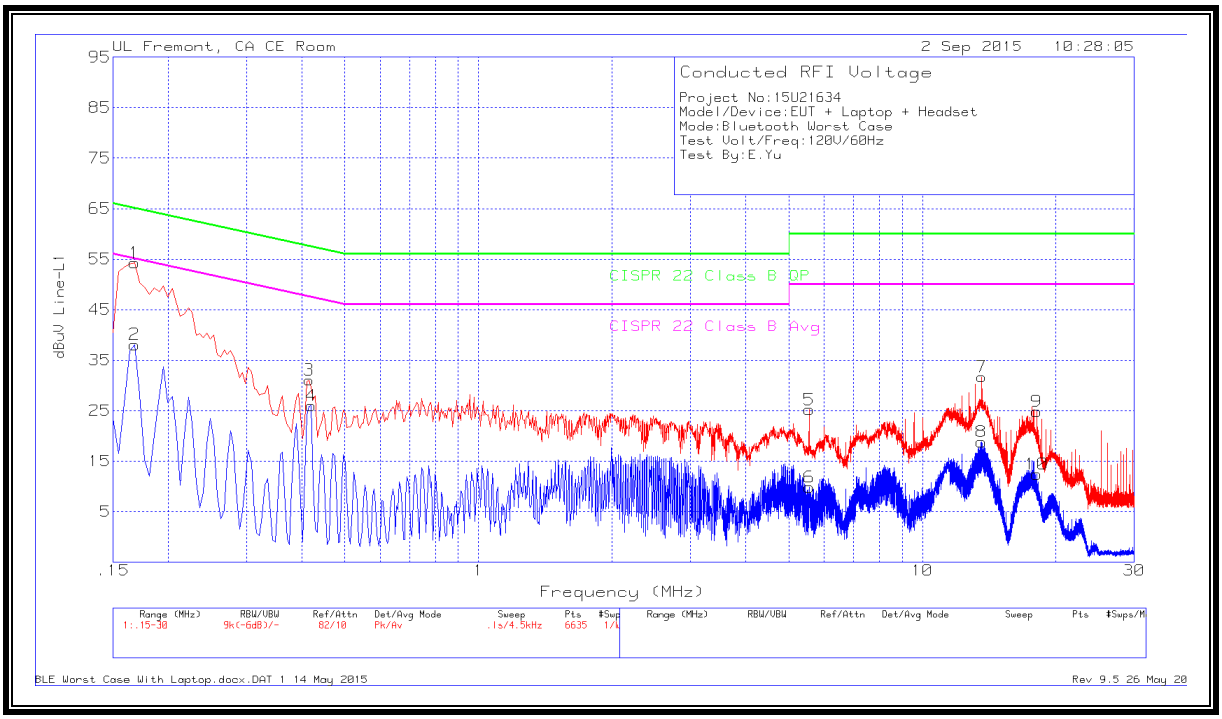
Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
11	.168	52.18	Pk	1.3	0	53.48	65.06	-11.58	-	-
12	.1635	31.62	Av	1.3	0	32.92	-	-	55.28	-22.36
13	.411	34	Pk	.4	0	34.4	57.63	-23.23	-	-
14	.411	26.98	Av	.4	0	27.38	-	-	47.63	-20.25
15	4.596	27.5	Pk	.2	.1	27.8	56	-28.2	-	-
16	4.5915	11.42	Av	.2	.1	11.72	-	-	46	-34.28
17	13.9875	36.01	Pk	.2	.2	36.41	60	-23.59	-	-
18	13.974	21.09	Av	.2	.2	21.49	-	-	50	-28.51
19	17.124	36.07	Pk	.3	.2	36.57	60	-23.43	-	-
20	17.124	12.44	Av	.3	.2	12.94	-	-	50	-37.06

Pk - Peak detector

Av - Average detection

LINE 1 RESULTS



LINE 2 RESULTS