FCC CFR47 PART 15 SUBPART C

C2PC CERTIFICATION TEST REPORT

FOR

CDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

MODEL NUMBER: LGL62VL, L62VL, LG-L62VL

FCC ID: ZNFL62VL

REPORT NUMBER: 16I22653-E2V1

ISSUE DATE: 1/29/2016

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

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

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	1/29/2016	Initial issue	D. CORONIA

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 5

4.1. MEASURING INSTRUMENT CALIBRATION 5

4.2. SAMPLE CALCULATION 5

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. WORST-CASE CONFIGURATION AND MODE 7

5.5. DESCRIPTION OF TEST SETUP 8

6. TEST AND MEASUREMENT EQUIPMENT 10

7. SUMMARY TABLE 11

8. ANTENNA PORT TEST RESULTS 12

8.1. ON TIME, DUTY CYCLE 12

9. RADIATED EMISSION TEST 13

9.1. TRANSMITTER ABOVE 1 GHz 14

9.1.1. GFSK MODULATION 14

9.1.2. 8PSK MODULATION 24

9.2. WORST-CASE BELOW 1 GHz 34

10. SETUP PHOTOS 36

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC.

EUT DESCRIPTION: CDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

MODEL: LGL62VL, L62VL, LG-L62VL

SERIAL NUMBER: 601KPQJ000748

DATE TESTED: JANUARY 22-25, 2016

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 revision 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:

DAN CORONIA
WiSE PROJECT LEAD
CONSUMER TECHNOLOGY DIVISION
UL VERIFICATION SERVICES INC

Tested By:

JEFFREY WU
WiSE ENGINEER
CONSUMER TECHNOLOGY DIVISION
UL VERIFICATION SERVICES INC

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013 for FCC, 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 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.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Disturbance, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance,1000 to 6000 MHz	3.86 dB
Radiated Disturbance,6000 to 18000 MHz	4.23 dB
Radiated Disturbance,18000 to 26000 MHz	5.30 dB
Radiated Disturbance,26000 to 40000 MHz	5.23 dB

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a CDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

5.2. MAXIMUM OUTPUT POWER

See original report for details.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 0.24dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit on the channel with higher 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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	DC1507	EAD62377906	N/A

I/O CABLES

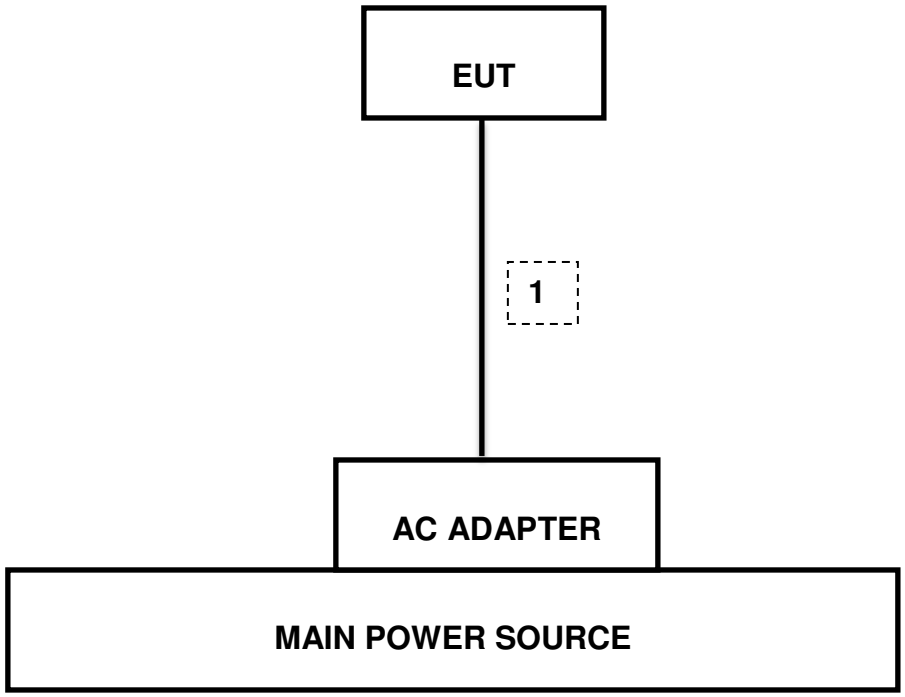
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A

TEST SETUP

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

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

SETUP DIAGRAM FOR TESTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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**	**T Number**	**Cal Due**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	130	09/01/16
Antenna, Horn, 18GHz	ETS Lindgren	3117	345	03/03/16
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/12/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
Amplifier, 10KHz to 1 GHz	Keysight	8447D	15	08/14/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	907	01/06/17
Bluetooth Tester	Rohde & Schwarz	CBT	438	04/24/16
Directional Coupler	Mini-Circuits	ZUDC10-183+	1140	CNR
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	417	05/04/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	893	04/25/16
High Pass Filter 3GHz	Micro-Tronics	HPS17543	898	04/25/16

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

7. SUMMARY TABLE

C2PC Reason: Please see LGL62VL FCC Class II change description for details.

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049	RSS-GEN 6.6	20 dB Occupied Bandwidth & (99%)	N/A	Conducted	See Original
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		See Original
15.247 (b)(1)	RSS-247 5.4.2	TX conducted output power	<21dBm		See Original
15.247 (a)(1)	RSS-247 5.1.2	Hopping frequency separation	> 25KHz		See Original
15.247 (a)(1)(iii)	RSS-247 5.1.4	Number of Hopping Channels	More than 15 non-overlapping channels		See Original
15.247 (a)(1)(iii)	RSS-247 5.1.4	Avg Time of Occupancy	< 0.4sec		See Original
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	See Original
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

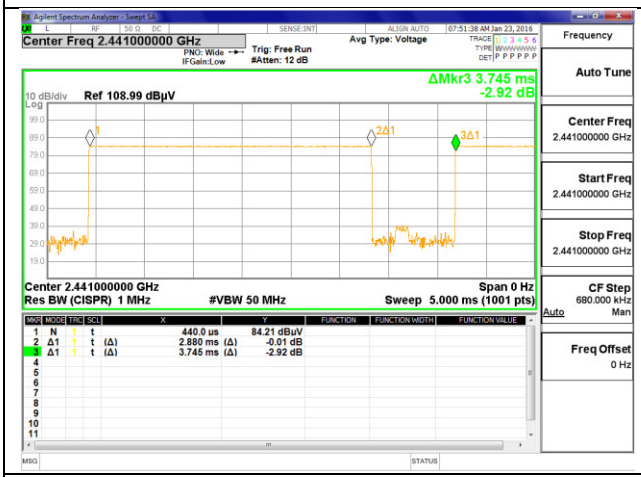
RESULTS

ON TIME AND DUTY CYCLE RESULTS

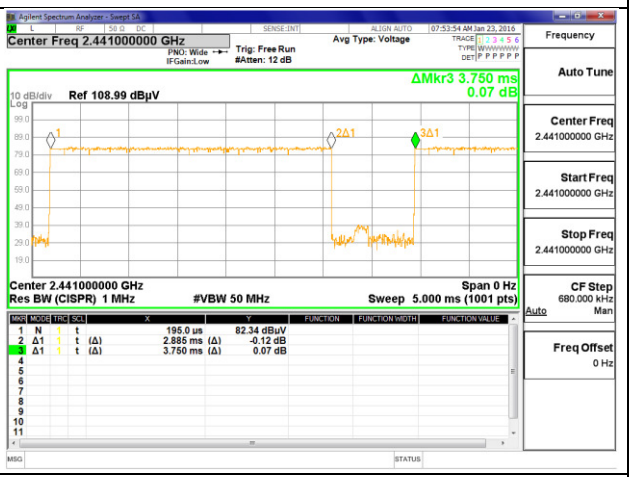
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
GFSK	2.880	3.745	0.769	76.90%	1.14	0.347
8PSK	2.885	3.75	0.769	76.93%	1.14	0.347

DUTY CYCLE PLOTS

GFSK



8PSK



NOTE: --

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9. RADIATED EMISSION TEST

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 for below 1GHz and 150cm for 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 band edge 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 1/T (on time) for average measurement.

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.

RESULTS

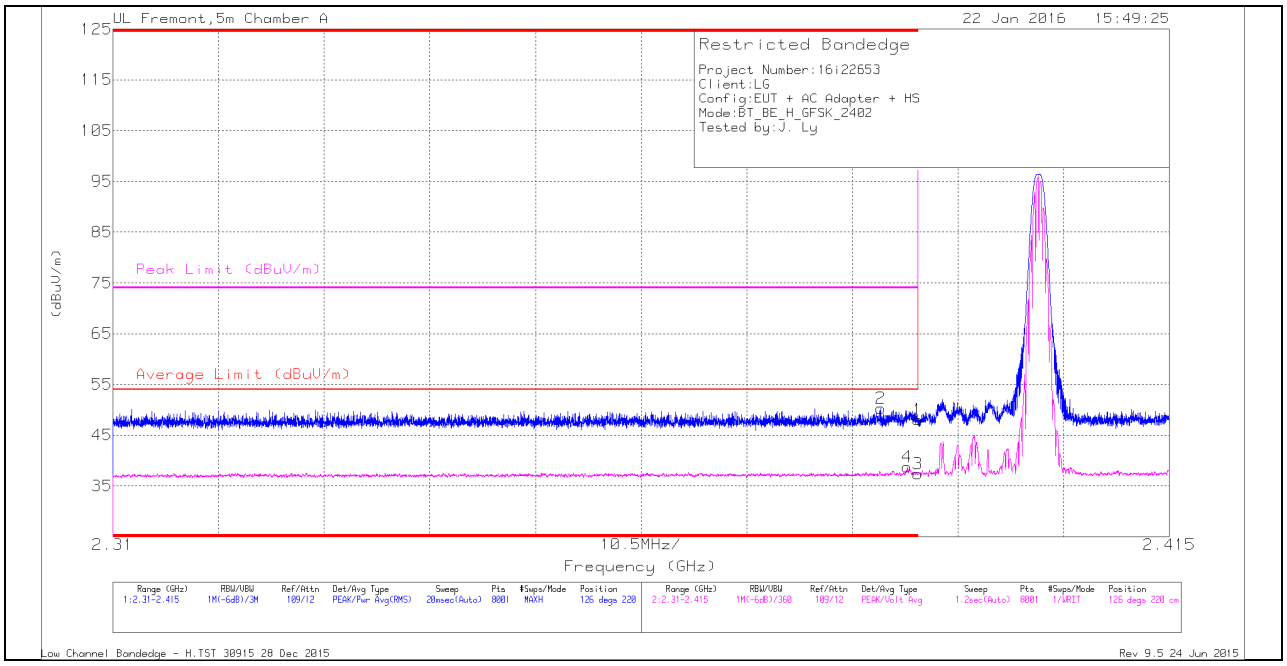
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
2	* 2.386	38.14	Pk	32	-19.9	50.24	-	-	74	-23.76	126	220	H
4	* 2.389	26.62	VA1T	32	-19.9	38.72	54	-15.28	-	-	126	220	H
1	* 2.39	35.97	Pk	32	-19.9	48.07	-	-	74	-25.93	126	220	H
3	* 2.39	25.23	VA1T	32	-19.9	37.33	54	-16.67	-	-	126	220	H

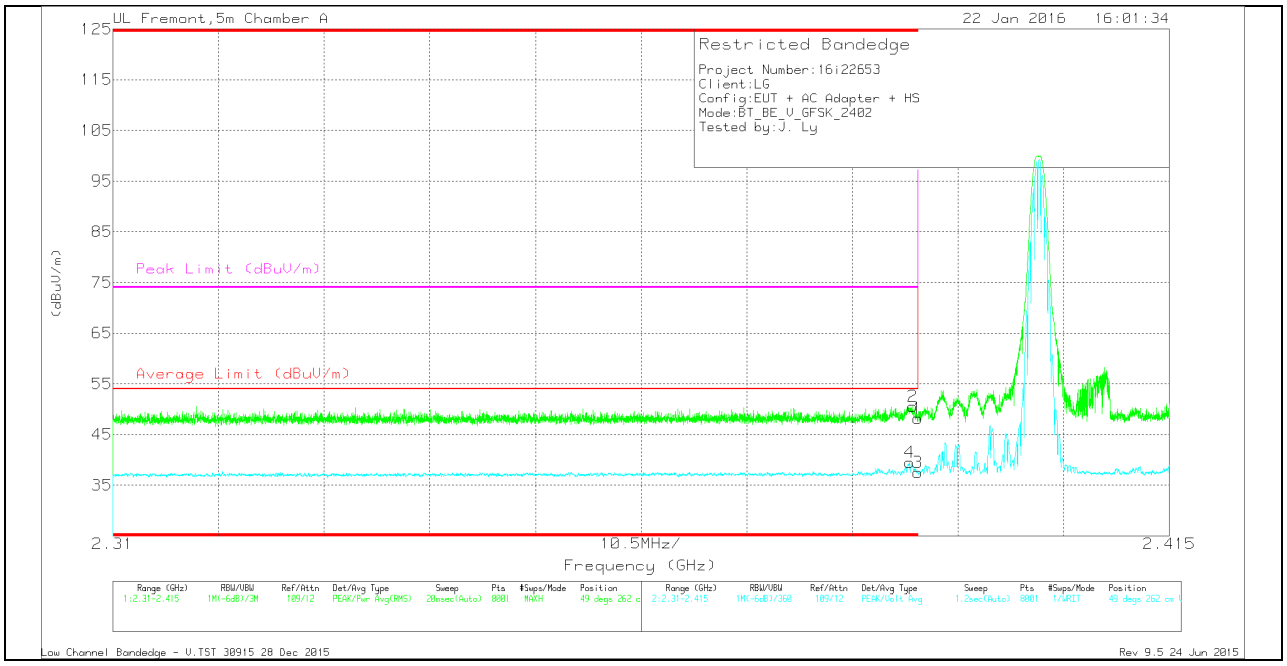
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
2	* 2.389	38.43	Pk	32	-19.9	50.53	-	-	74	-23.47	49	262	V
4	* 2.389	27.35	VA1T	32	-19.9	39.45	54	-14.55	-	-	49	262	V
1	* 2.39	36.06	Pk	32	-19.9	48.16	-	-	74	-25.84	49	262	V
3	* 2.39	25.36	VA1T	32	-19.9	37.46	54	-16.54	-	-	49	262	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

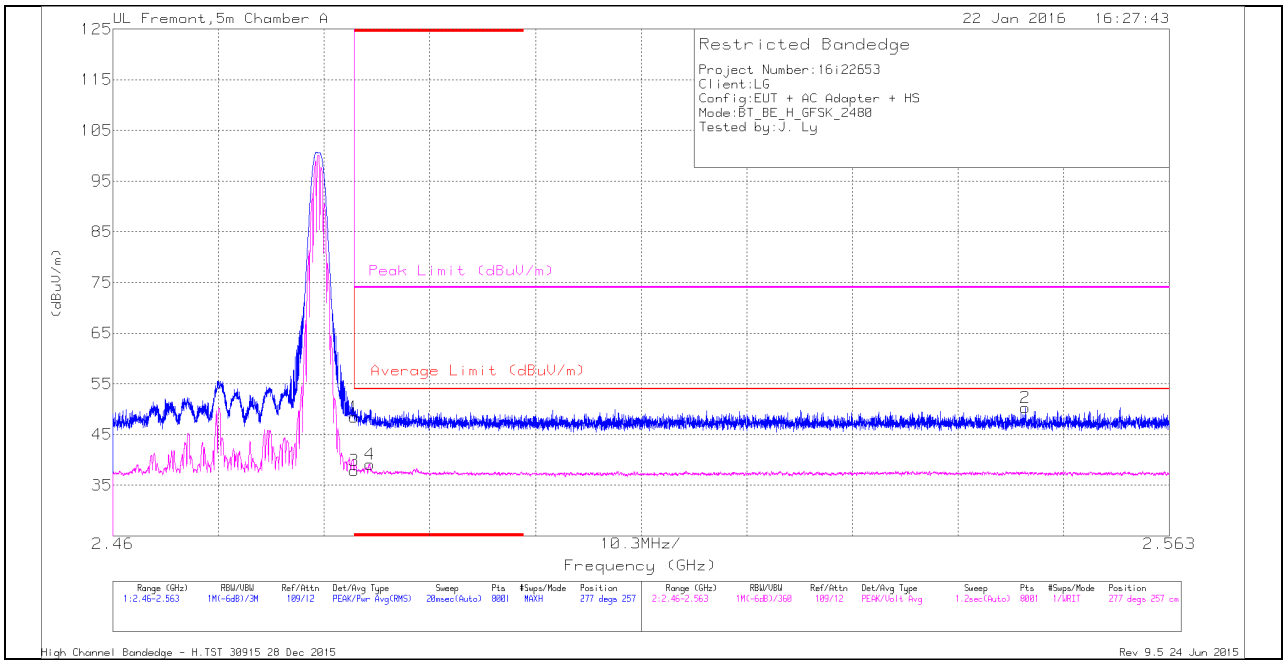
Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	36.32	Pk	32.1	-20	48.42	-	-	74	-25.58	277	257	H
3	* 2.484	25.76	VA1T	32.1	-20	37.86	54	-16.14	-	-	277	257	H
4	* 2.485	27.02	VA1T	32.1	-20	39.12	54	-14.88	-	-	277	257	H
2	2.549	38.27	Pk	32.2	-20.2	50.27	-	-	74	-23.73	277	257	H

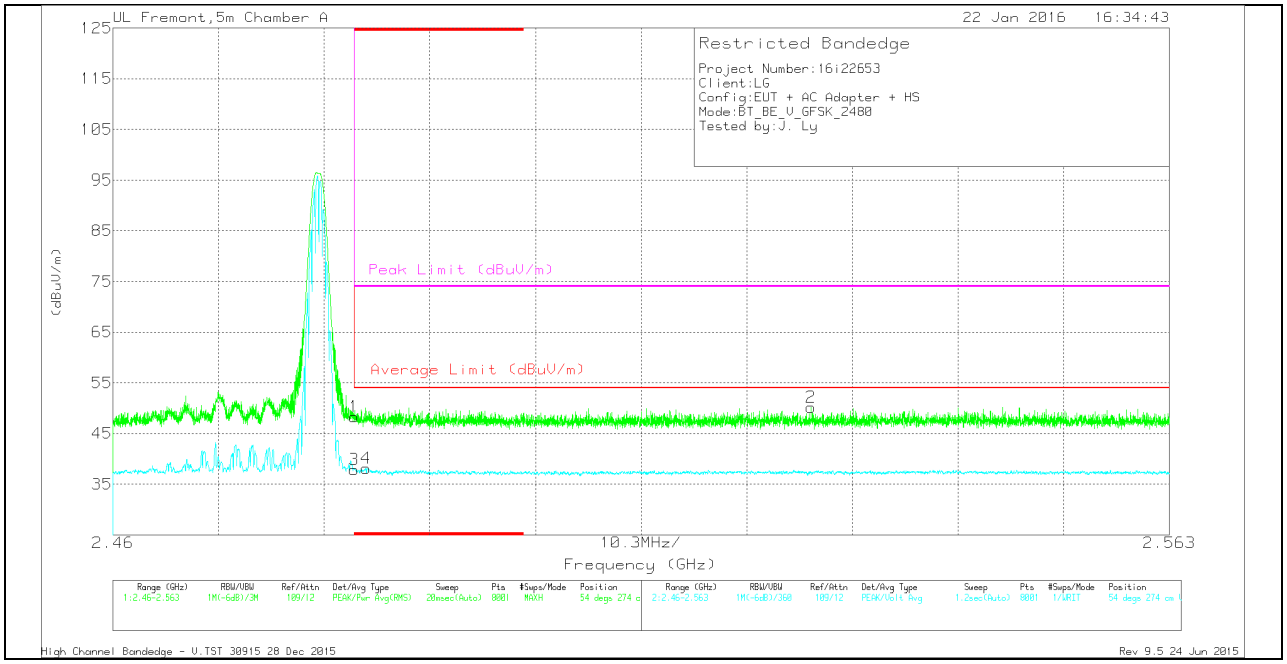
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	36.17	Pk	32.1	-20	48.27	-	-	74	-25.73	54	274	V
3	* 2.484	25.73	VA1T	32.1	-20	37.83	54	-16.17	-	-	54	274	V
4	* 2.485	26	VA1T	32.1	-20	38.1	54	-15.9	-	-	54	274	V
2	2.528	38.22	Pk	32.1	-20.1	50.22	-	-	74	-23.78	54	274	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

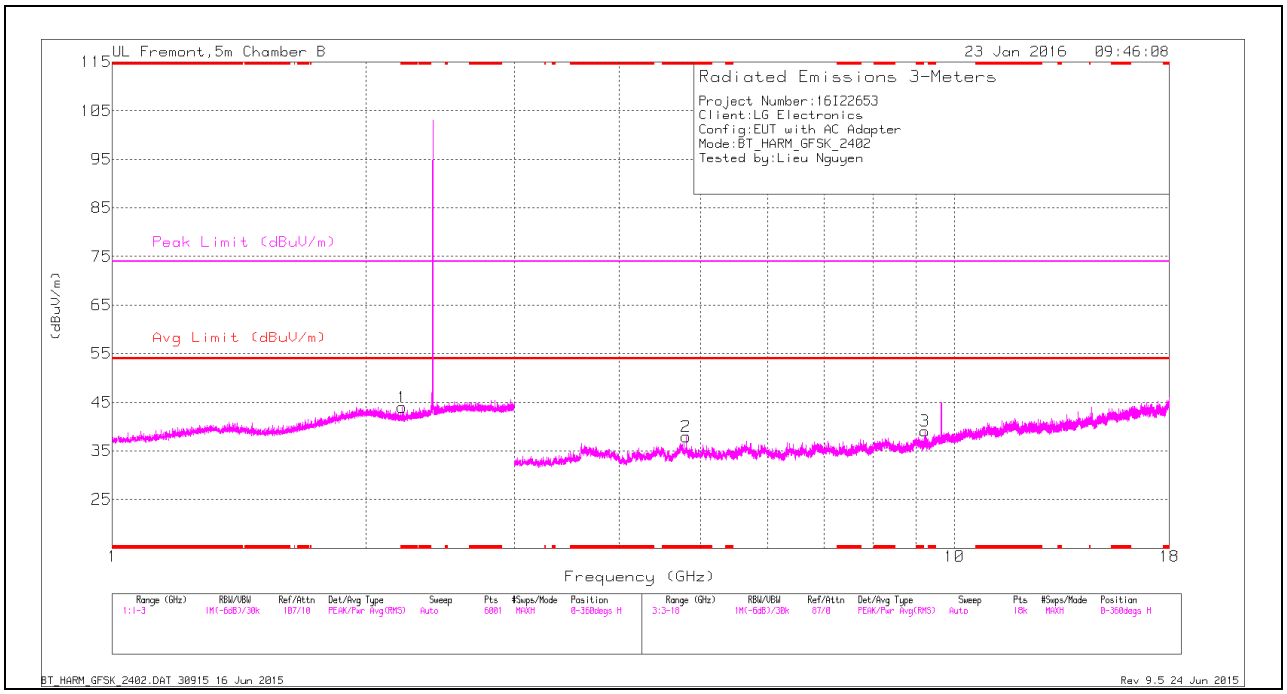
Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

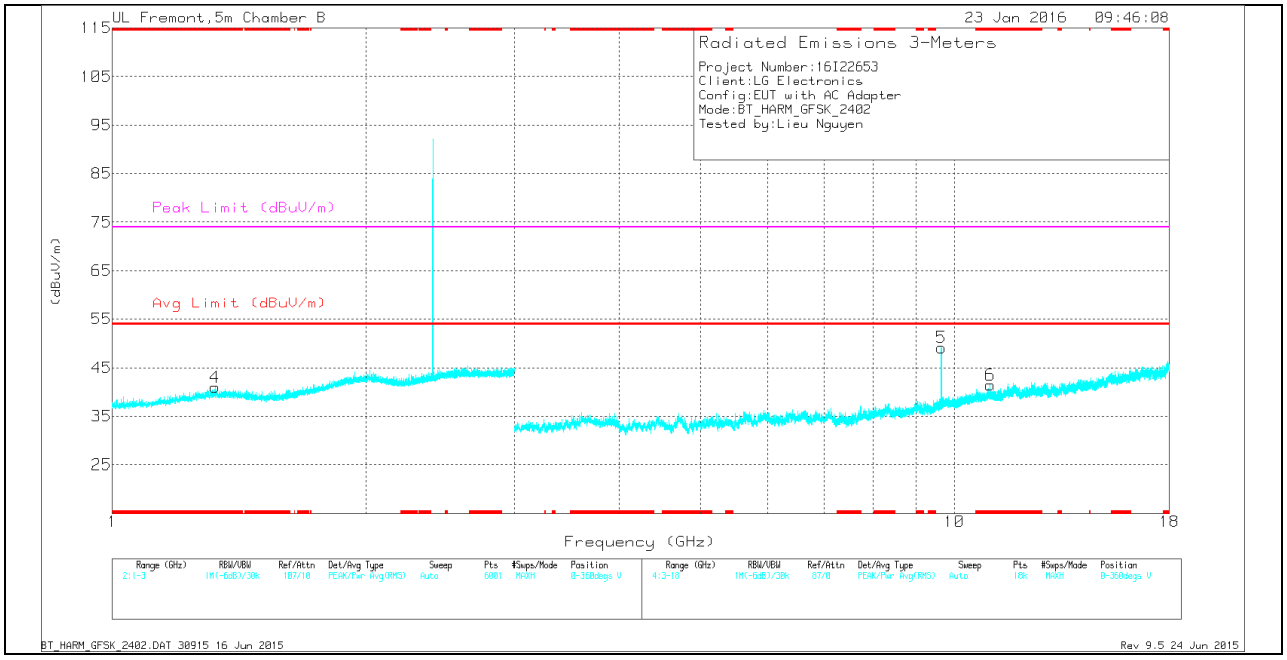
HARMONICS AND SPURIOUS EMISSIONS

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	* 2.209	37.18	Pk	31.1	-24.3	43.98	-	-	74	-30.02	0-360	199	H
4	* 1.324	36.87	Pk	29.4	-25.3	40.97	-	-	74	-33.03	0-360	199	V
2	* 4.804	34.63	Pk	34.3	-31	37.93	-	-	74	-36.07	0-360	101	H
6	* 11.025	28.78	Pk	37.7	-25	41.48	-	-	74	-32.52	0-360	199	V
3	9.22	29.37	Pk	36.2	-26.5	39.07	-	-	74	-34.93	0-360	101	H
5	9.648	38.92	Pk	36.7	-26.5	49.12	-	-	74	-24.88	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 2.208	44.06	PK2	31.1	-24.2	50.96	-	-	74	-23.04	79	278	H
* 2.207	30.41	VA1T	31.1	-24.2	37.31	54	-16.69	-	-	79	278	H
* 1.326	44.68	PK2	29.4	-25.4	48.68	-	-	74	-25.32	37	297	V
* 1.325	31.08	VA1T	29.4	-25.3	35.18	54	-18.82	-	-	37	297	V
* 4.804	41.23	PK2	34.3	-31	44.53	-	-	74	-29.47	144	105	H
* 4.804	30.37	VA1T	34.3	-31	33.67	54	-20.33	-	-	144	105	H
* 11.023	35.11	PK2	37.7	-25	47.81	-	-	74	-26.19	41	182	V
* 11.024	22.01	VA1T	37.7	-25	34.71	54	-19.29	-	-	41	182	V
9.22	36.15	PK2	36.2	-26.5	45.85	-	-	74	-28.15	162	400	H
9.222	36.8	PK2	36.2	-26.6	46.4	-	-	74	-27.6	205	101	H
9.648	41.35	PK2	36.7	-26.5	51.55	-	-	74	-22.45	274	132	V
9.648	42.72	PK2	36.7	-26.5	52.92	-	-	74	-21.08	271	108	V

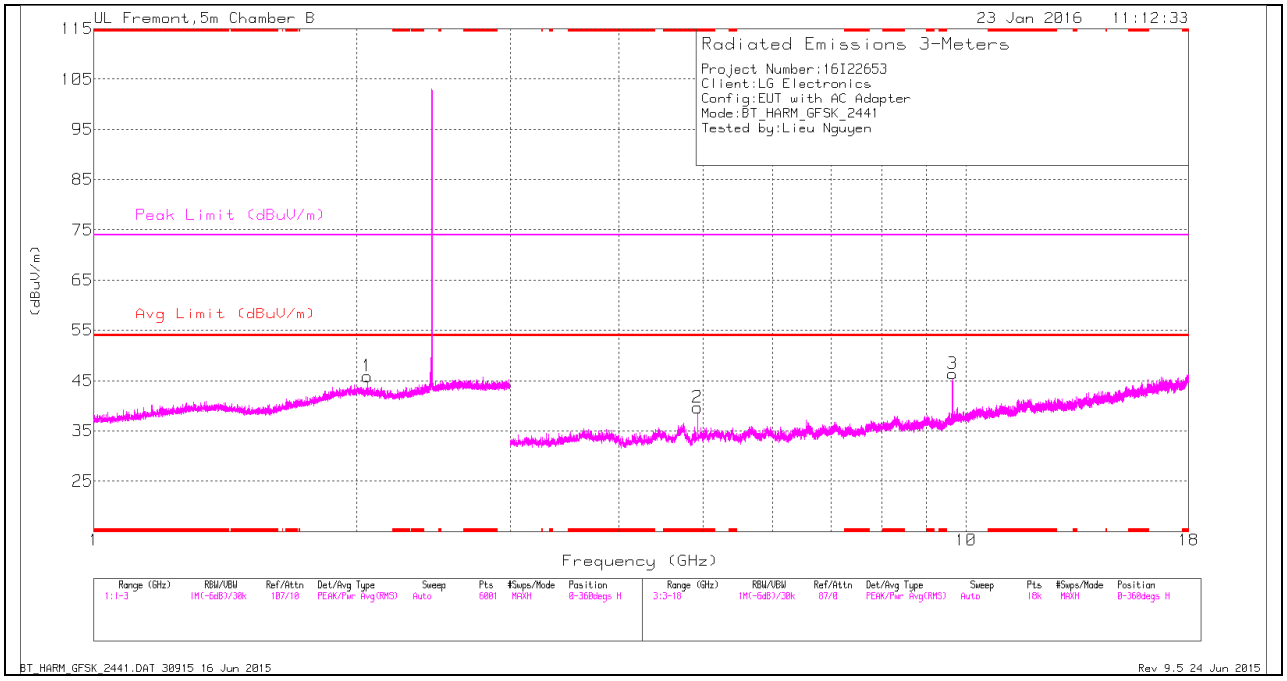
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

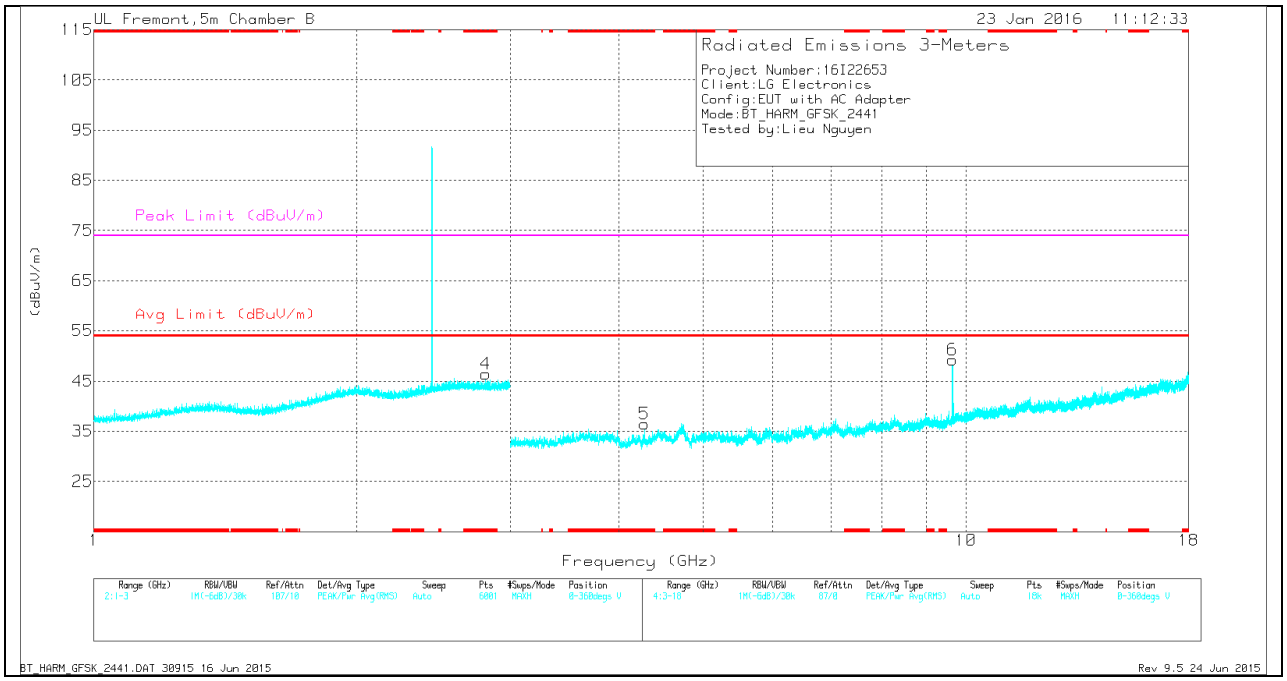
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
4	* 2.812	36.4	Pk	32.6	-23.7	45.3	-	-	74	-28.7	0-360	200	V
2	* 4.924	36.91	Pk	34.1	-32.5	38.51	-	-	74	-35.49	0-360	101	H
5	* 4.279	34.51	Pk	33.6	-32.8	35.31	-	-	74	-38.69	0-360	199	V
1	2.058	37.21	Pk	32	-24.5	44.71	-	-	74	-29.29	0-360	101	H
6	9.647	37.88	Pk	36.7	-26.5	48.08	-	-	74	-25.92	0-360	101	V
3	9.648	35.02	Pk	36.7	-26.5	45.22	-	-	74	-28.78	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 2.813	43.62	PK2	32.6	-23.7	52.52	-	-	74	-21.48	137	389	V
* 2.812	30.35	VA1T	32.6	-23.7	39.25	54	-14.75	-	-	137	389	V
* 4.924	41.66	PK2	34.1	-32.5	43.26	-	-	74	-30.74	13	373	H
* 4.922	28.74	VA1T	34.1	-32.5	30.34	54	-23.66	-	-	13	373	H
* 4.279	41.99	PK2	33.6	-32.8	42.79	-	-	74	-31.21	195	338	V
* 4.279	28.97	VA1T	33.6	-32.8	29.77	54	-24.23	-	-	195	338	V
2.058	43.96	PK2	32	-24.5	51.46	-	-	74	-22.54	305	238	H
9.648	40.48	PK2	36.7	-26.5	50.68	-	-	74	-23.32	92	377	H
9.648	42.72	PK2	36.7	-26.5	52.92	-	-	74	-21.08	271	108	V

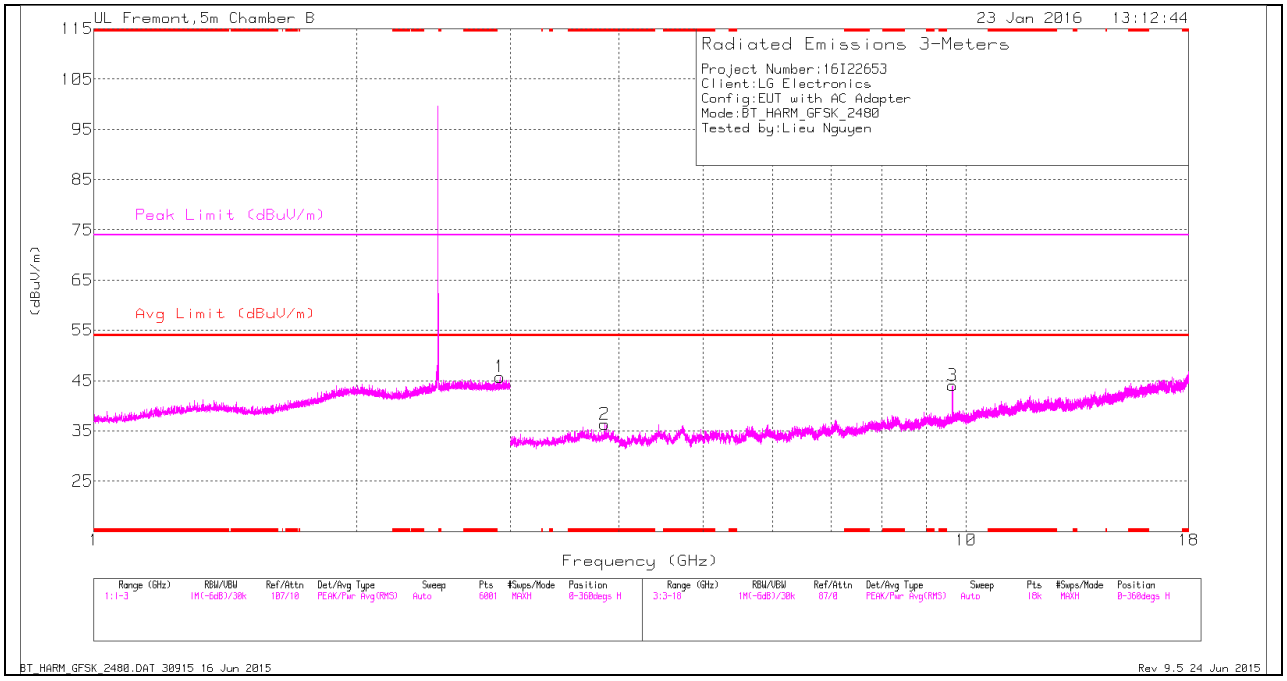
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

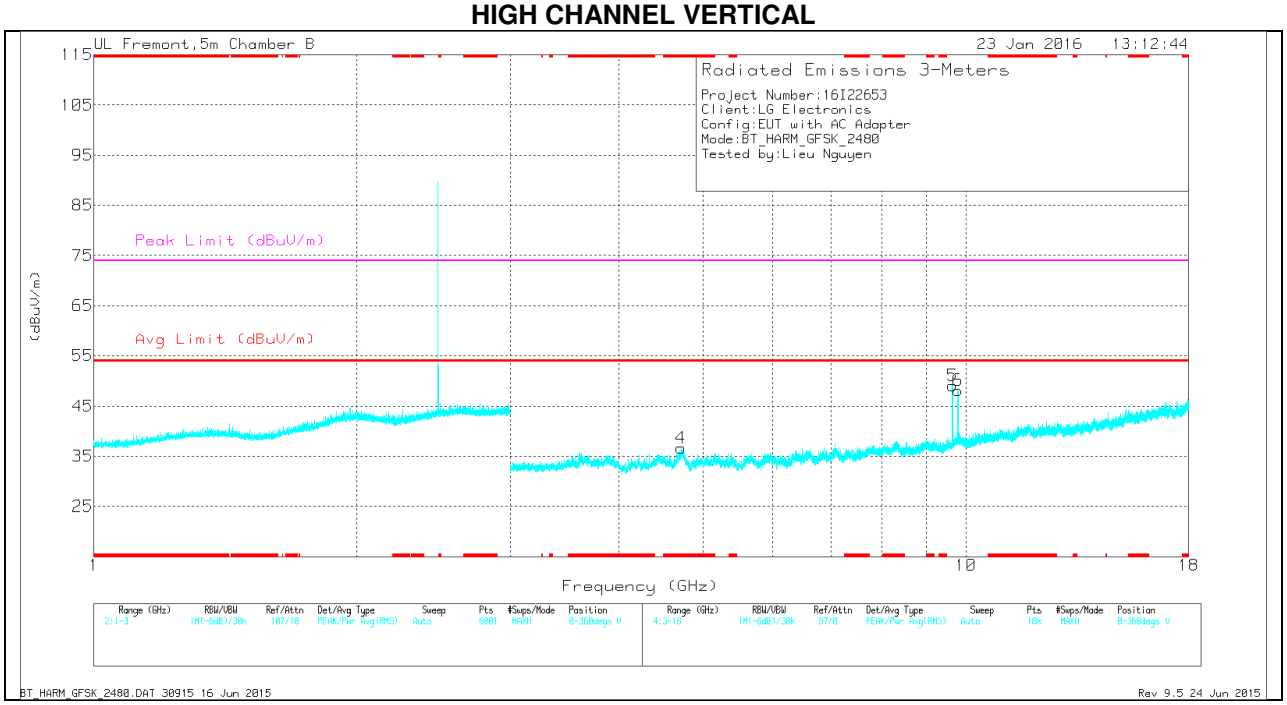
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	* 3.852	34.95	Pk	33.4	-32	36.35	-	-	74	-37.65	0-360	199	H
4	* 4.712	33.63	Pk	34.2	-31.2	36.63	-	-	74	-37.37	0-360	199	V
1	2.921	36.71	Pk	32.6	-23.6	45.71	-	-	74	-28.29	0-360	199	H
5	9.647	38.88	Pk	36.7	-26.5	49.08	-	-	74	-24.92	0-360	101	V
3	9.648	33.82	Pk	36.7	-26.5	44.02	-	-	74	-29.98	0-360	101	H
6	9.788	37.11	Pk	37	-26	48.11	-	-	74	-25.89	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 3.852	41.63	PK2	33.4	-32	43.03	-	-	74	-30.97	164	396	H
* 3.854	29.08	VA1T	33.4	-32	30.48	54	-23.52	-	-	164	396	H
* 4.712	41.56	PK2	34.2	-31.2	44.56	-	-	74	-29.44	300	369	V
* 4.711	28.7	VA1T	34.2	-31.2	31.7	54	-22.3	-	-	300	369	V
2.921	43.22	PK2	32.6	-23.6	52.22	-	-	74	-21.78	300	209	H
9.648	40.24	PK2	36.7	-26.5	50.44	-	-	74	-23.56	91	366	H
9.648	42.72	PK2	36.7	-26.5	52.92	-	-	74	-21.08	271	108	V
9.788	34.72	PK2	37	-26	45.72	-	-	74	-28.28	149	351	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

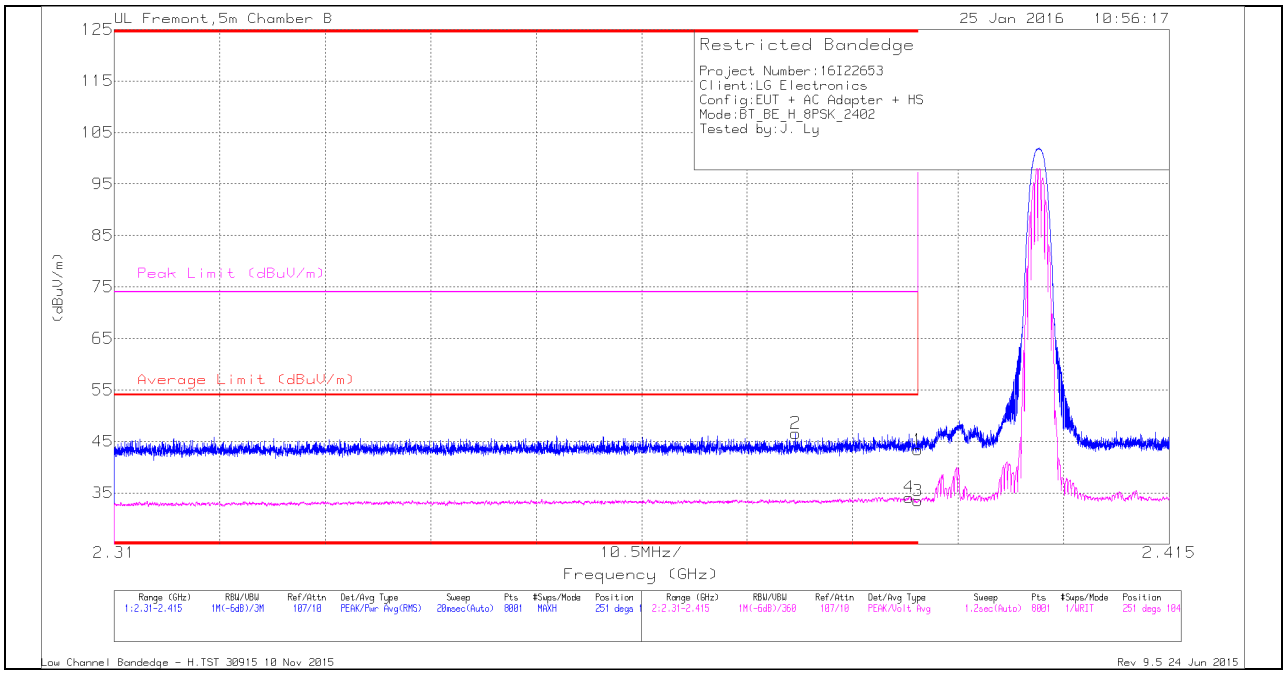
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.1.2. 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
2	* 2.378	36.59	Pk	31.9	-21.9	46.59	-	-	74	-27.41	251	104	H
4	* 2.389	24.04	VA1T	32	-21.9	34.14	54	-19.86	-	-	251	104	H
1	* 2.39	33.23	Pk	32	-21.9	43.33	-	-	74	-30.67	251	104	H
3	* 2.39	23.34	VA1T	32	-21.9	33.44	54	-20.56	-	-	251	104	H

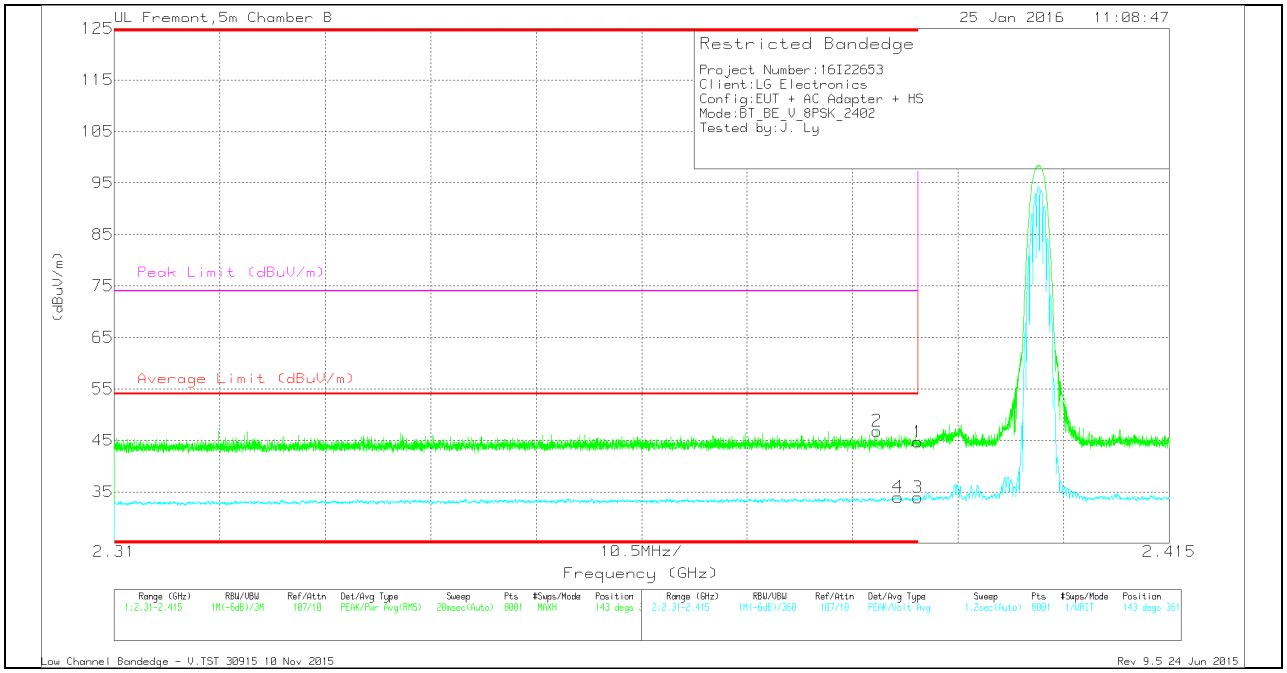
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
2	* 2.386	36.72	Pk	32	-21.9	46.82	-	-	74	-27.18	143	361	V
4	* 2.388	23.9	VA1T	32	-21.9	34	54	-20	-	-	143	361	V
1	* 2.39	34.61	Pk	32	-21.9	44.71	-	-	74	-29.29	143	361	V
3	* 2.39	23.82	VA1T	32	-21.9	33.92	54	-20.08	-	-	143	361	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

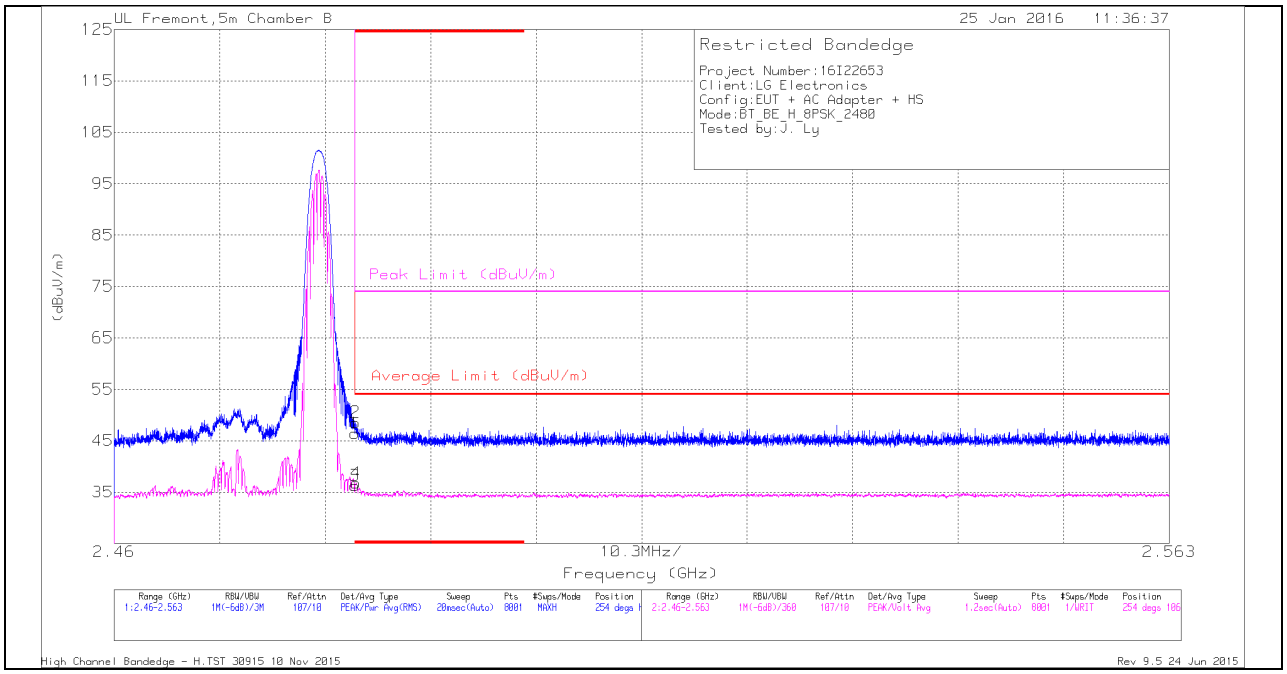
Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	35.71	Pk	32.5	-21.8	46.41	-	-	74	-27.59	254	106	H
2	* 2.484	37.83	Pk	32.5	-21.8	48.53	-	-	74	-25.47	254	106	H
3	* 2.484	25.57	VA1T	32.5	-21.8	36.27	54	-17.73	-	-	254	106	H
4	* 2.484	26.06	VA1T	32.5	-21.8	36.76	54	-17.24	-	-	254	106	H

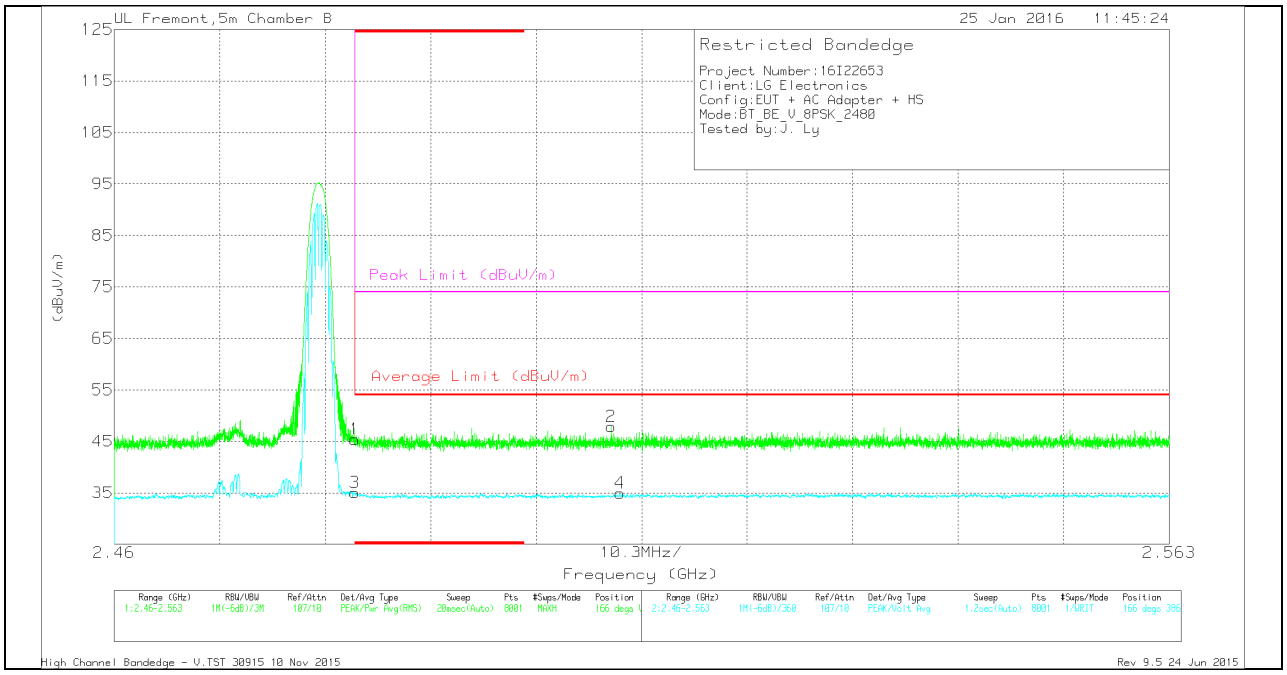
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	34.7	Pk	32.5	-21.8	45.4	-	-	74	-28.6	166	386	V
3	* 2.484	24.34	VA1T	32.5	-21.8	35.04	54	-18.96	-	-	166	386	V
2	2.509	37.06	Pk	32.6	-21.8	47.86	-	-	74	-26.14	166	386	V
4	2.509	24.15	VA1T	32.6	-21.8	34.95	54	-19.05	-	-	166	386	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

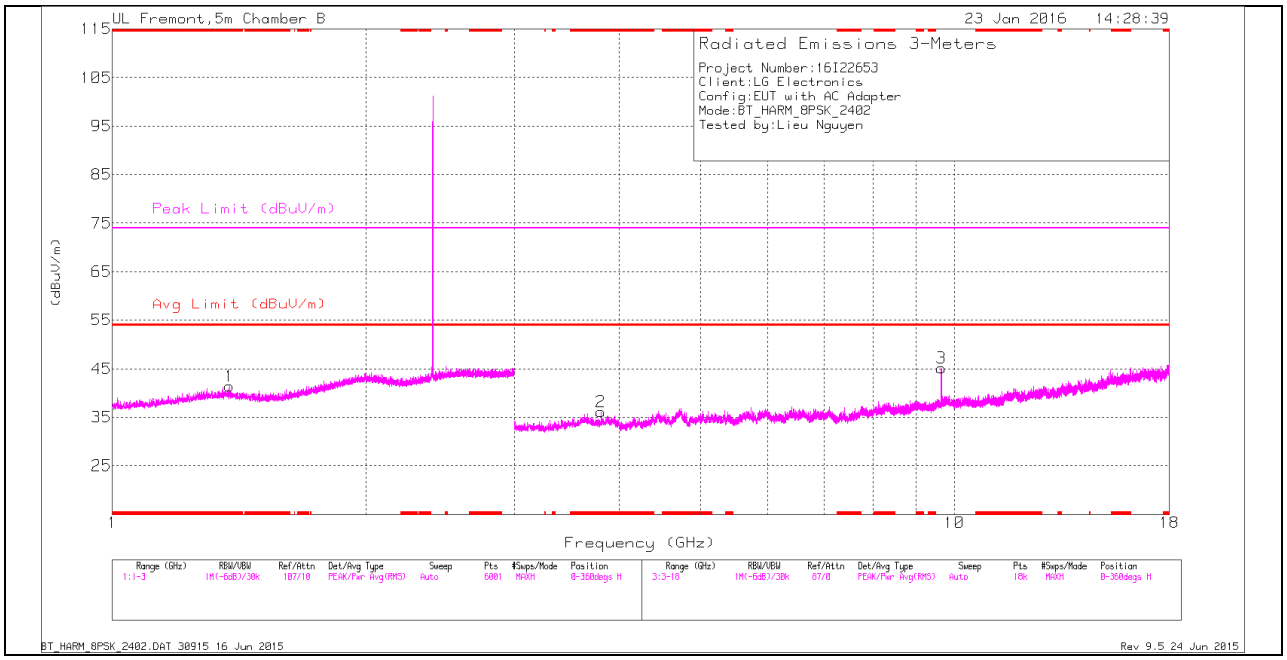
Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

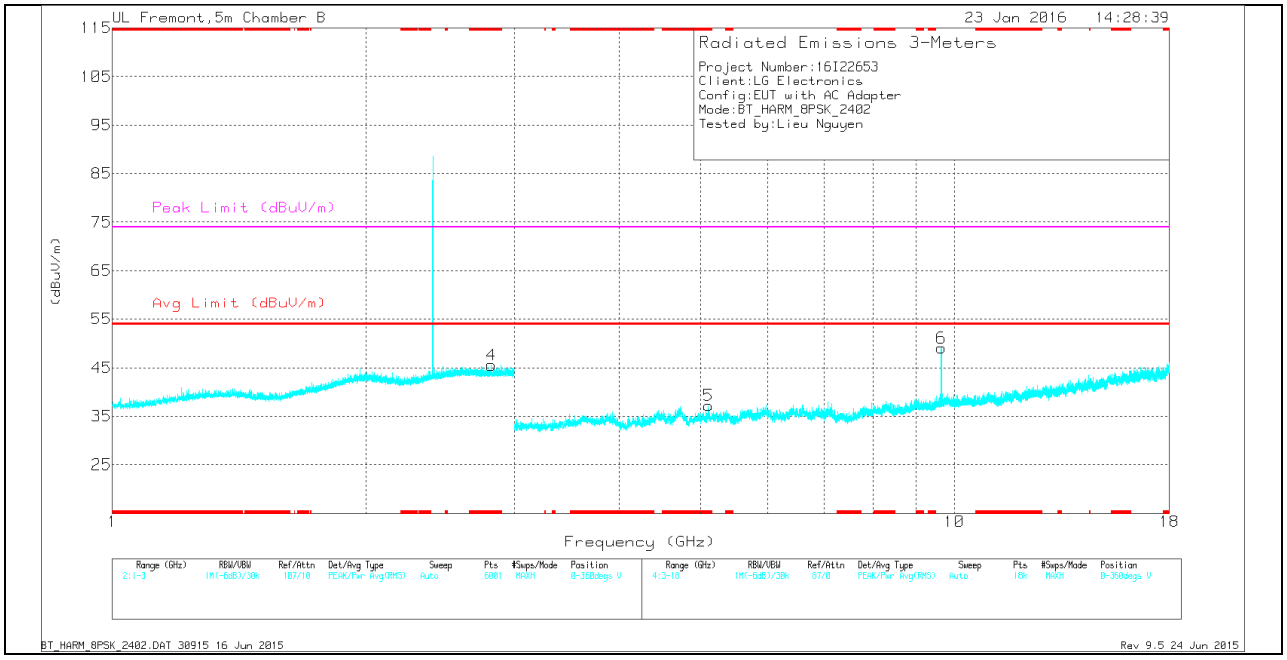
HARMONICS AND SPURIOUS EMISSIONS

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	* 1.378	37.33	Pk	29.4	-25.3	41.43	-	-	74	-32.57	0-360	102	H
4	* 2.819	36.64	Pk	32.6	-23.7	45.54	-	-	74	-28.46	0-360	200	V
2	* 3.804	35.31	Pk	33.3	-32.5	36.11	-	-	74	-37.89	0-360	199	H
5	* 5.104	34.28	Pk	34	-31.1	37.18	-	-	74	-36.82	0-360	199	V
3	9.648	34.95	Pk	36.7	-26.5	45.15	-	-	74	-28.85	0-360	101	H
6	9.648	38.87	Pk	36.7	-26.5	49.07	-	-	74	-24.93	0-360	102	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 1.379	44.57	PK2	29.4	-25.3	48.67	-	-	74	-25.33	5	354	H
* 1.377	31.03	VA1T	29.4	-25.3	35.13	54	-18.87	-	-	5	354	H
* 2.818	44.03	PK2	32.6	-23.7	52.93	-	-	74	-21.07	233	366	V
* 2.818	30.33	VA1T	32.6	-23.7	39.23	54	-14.77	-	-	233	366	V
* 3.804	42.17	PK2	33.3	-32.5	42.97	-	-	74	-31.03	344	304	H
* 3.806	29.22	VA1T	33.3	-32.5	30.02	54	-23.98	-	-	344	304	H
* 5.106	41.07	PK2	34	-31.1	43.97	-	-	74	-30.03	158	372	V
* 5.106	27.84	VA1T	34	-31.1	30.74	54	-23.26	-	-	158	372	V
9.648	40.73	PK2	36.7	-26.5	50.93	-	-	74	-23.07	95	375	H
9.648	42.78	PK2	36.7	-26.5	52.98	-	-	74	-21.02	274	130	V

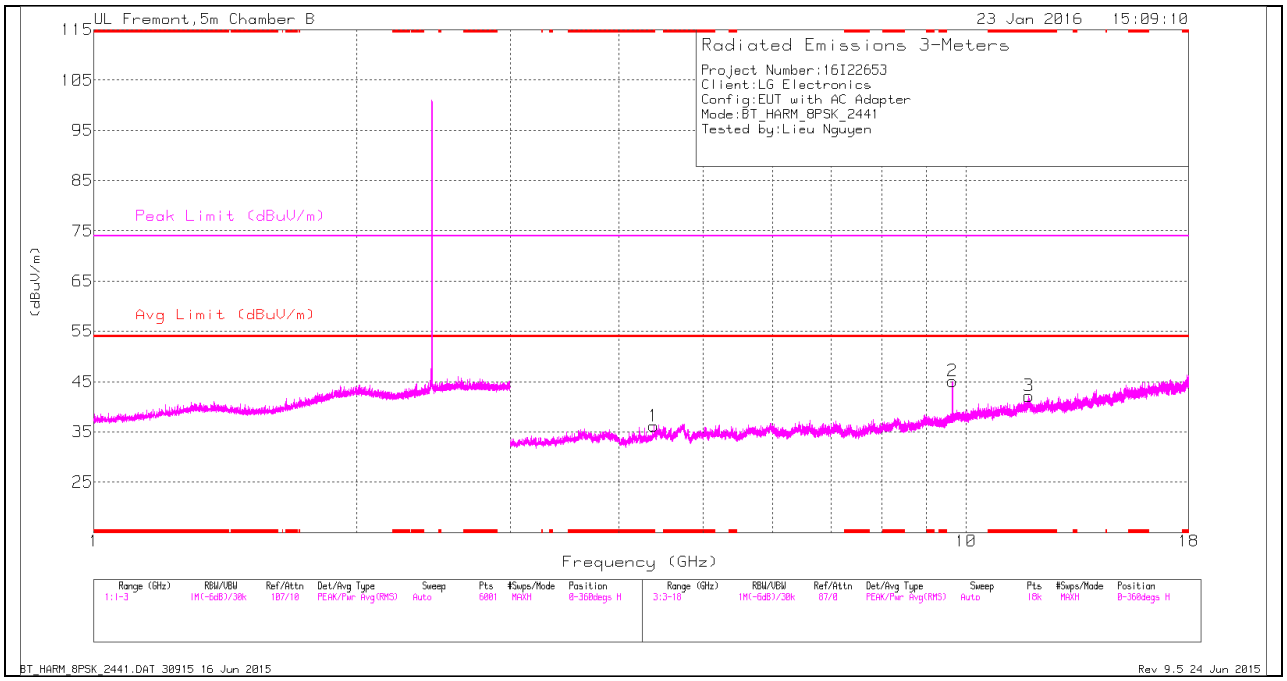
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

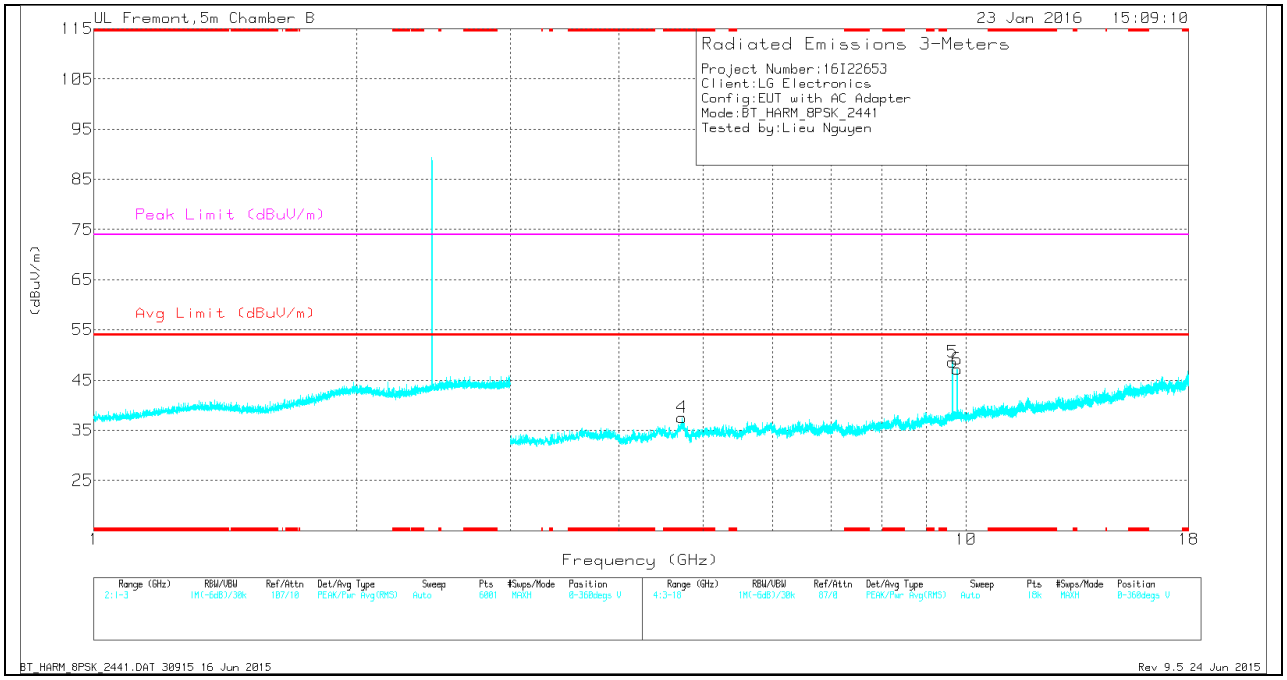
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	* 4.383	34.25	Pk	33.8	-31.9	36.15	-	-	74	-37.85	0-360	200	H
3	* 11.804	27.73	Pk	38.6	-24.2	42.13	-	-	74	-31.87	0-360	200	H
4	* 4.725	34.01	Pk	34.3	-30.8	37.51	-	-	74	-36.49	0-360	200	V
2	9.648	34.89	Pk	36.7	-26.5	45.09	-	-	74	-28.91	0-360	101	H
5	9.648	38.43	Pk	36.7	-26.5	48.63	-	-	74	-25.37	0-360	101	V
6	9.768	36.23	Pk	36.9	-26	47.13	-	-	74	-26.87	0-360	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 4.382	42.27	PK2	33.8	-31.9	44.17	-	-	74	-29.83	315	333	H
* 4.383	28.88	VA1T	33.8	-31.9	30.78	54	-23.22	-	-	315	333	H
* 11.804	34.46	PK2	38.6	-24.1	48.96	-	-	74	-25.04	329	225	H
* 11.803	21.69	VA1T	38.6	-24.2	36.09	54	-17.91	-	-	329	225	H
* 4.725	40.65	PK2	34.3	-30.8	44.15	-	-	74	-29.85	107	379	V
* 4.727	28.13	VA1T	34.3	-30.8	31.63	54	-22.37	-	-	107	379	V
9.648	40.02	PK2	36.7	-26.5	50.22	-	-	74	-23.78	95	377	H
9.648	42.49	PK2	36.7	-26.5	52.69	-	-	74	-21.31	273	107	V

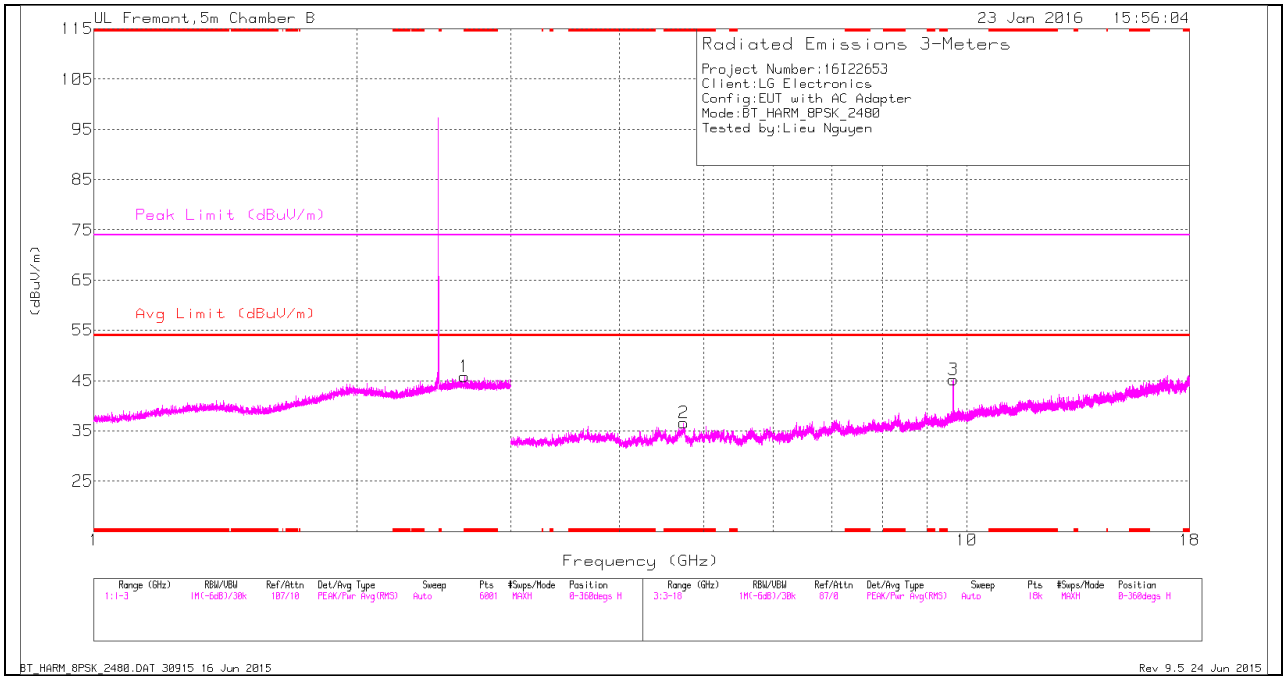
* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

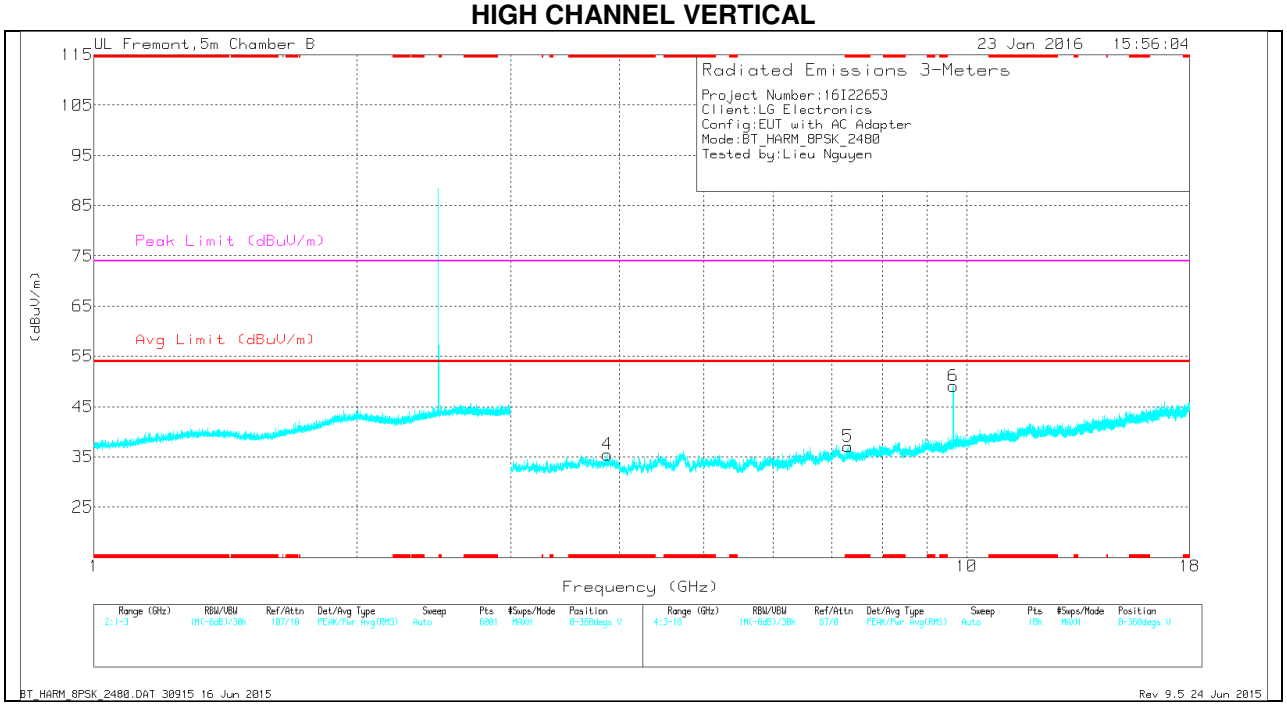
UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	* 2.657	36.93	Pk	32.7	-23.8	45.83	-	-	74	-28.17	0-360	199	H
2	* 4.737	32.99	Pk	34.3	-30.7	36.59	-	-	74	-37.41	0-360	101	H
4	* 3.873	33.57	Pk	33.5	-31.6	35.47	-	-	74	-38.53	0-360	199	V
5	* 7.313	31.96	Pk	35.3	-30.2	37.06	-	-	74	-36.94	0-360	199	V
3	9.648	34.99	Pk	36.7	-26.5	45.19	-	-	74	-28.81	0-360	101	H
6	9.648	38.91	Pk	36.7	-26.5	49.11	-	-	74	-24.89	0-360	101	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 2.656	43.6	PK2	32.7	-23.8	52.5	-	-	74	-21.5	177	126	H
* 2.657	30.22	VA1T	32.7	-23.8	39.12	54	-14.88	-	-	177	126	H
* 4.736	41.93	PK2	34.3	-30.7	45.53	-	-	74	-28.47	13	319	H
* 4.735	28.61	VA1T	34.3	-30.7	32.21	54	-21.79	-	-	13	319	H
* 3.873	42.07	PK2	33.5	-31.6	43.97	-	-	74	-30.03	255	273	V
* 3.873	28.66	VA1T	33.5	-31.6	30.56	54	-23.44	-	-	255	273	V
* 7.315	39.69	PK2	35.3	-30.1	44.89	-	-	74	-29.11	138	170	V
* 7.315	26.25	VA1T	35.3	-30.1	31.45	54	-22.55	-	-	138	170	V
9.648	40.08	PK2	36.7	-26.5	50.28	-	-	74	-23.72	96	102	H
9.648	43.1	PK2	36.7	-26.5	53.3	-	-	74	-20.7	276	107	V
9.768	35.14	PK2	36.9	-26	46.04	-	-	74	-27.96	221	322	V

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10Restricted Band

PK2 - KDB558074 Method: Maximum Peak

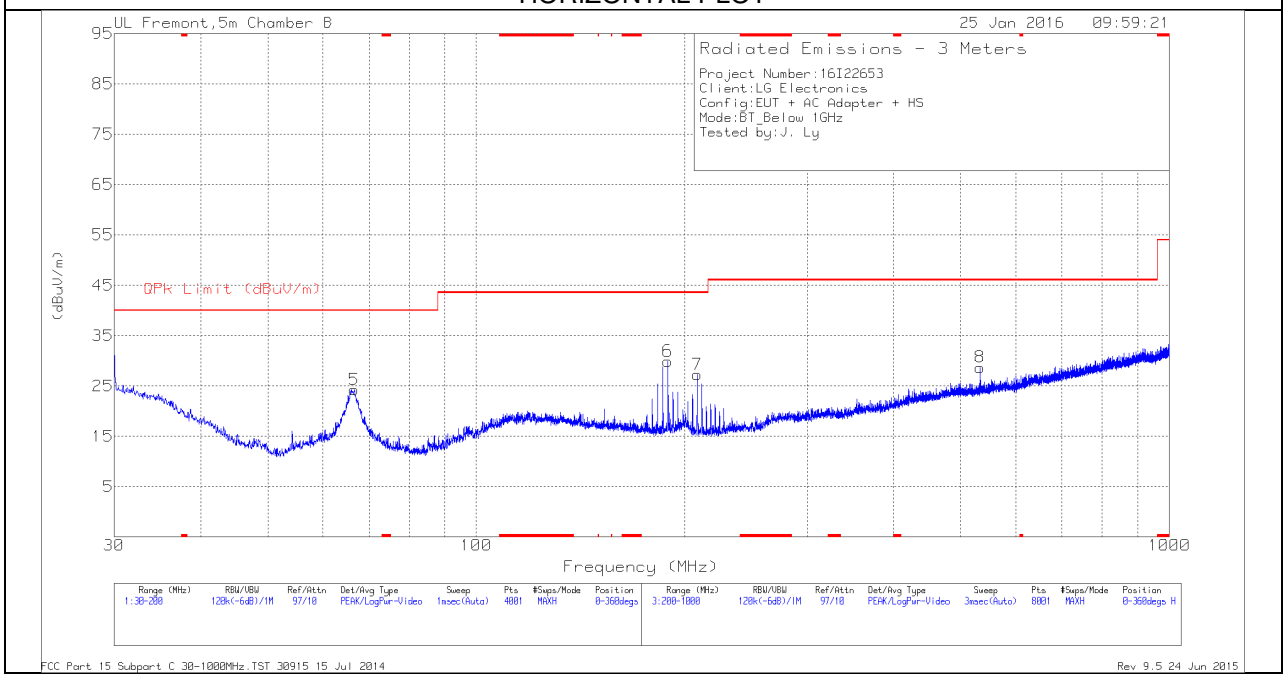
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

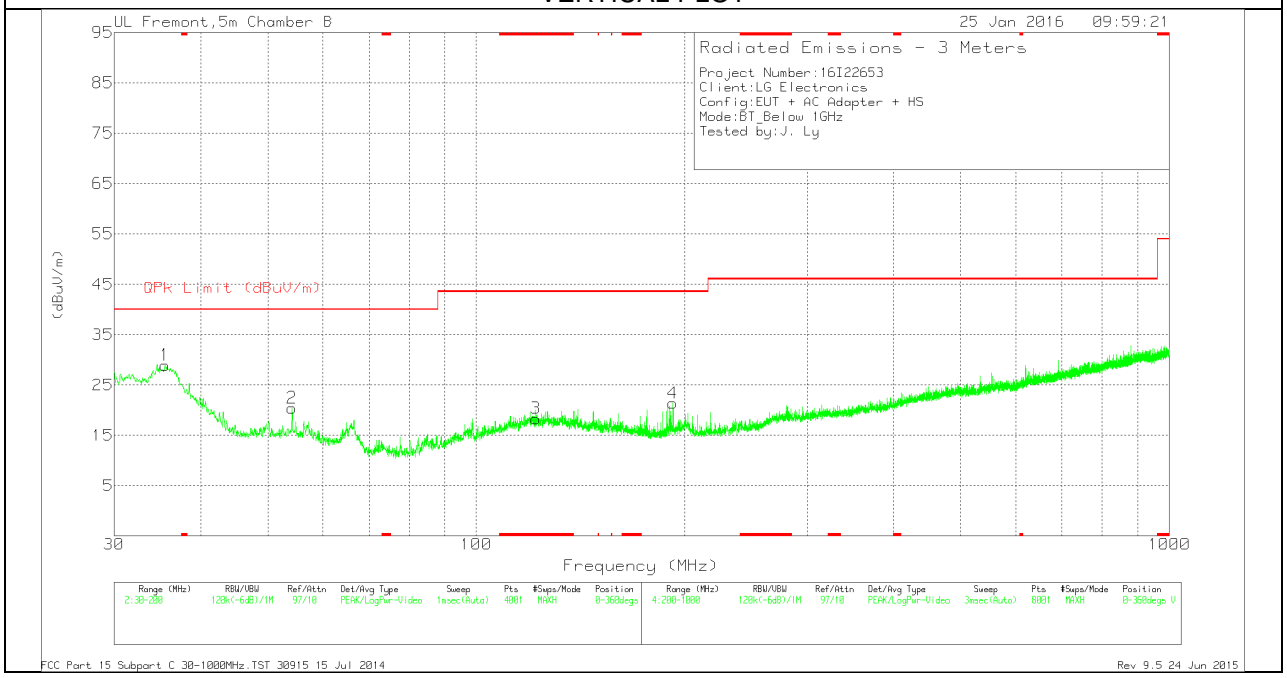
9.2. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

BELOW 1 GHz TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 121.885	28.34	Pk	17.8	-27.8	18.34	43.52	-25.18	0-360	101	V
1	35.525	36.55	Pk	21.3	-28.9	28.95	40	-11.05	0-360	101	V
2	54.1825	37.92	Pk	11	-28.5	20.42	40	-19.58	0-360	101	V
5	66.635	40.75	Pk	12	-28.5	24.25	40	-15.75	0-360	299	H
6	188.9925	41.83	Pk	15.2	-27.1	29.93	43.52	-13.59	0-360	199	H
4	192.18	33.1	Pk	15.4	-27.1	21.4	43.52	-22.12	0-360	101	V
7	208.3	39.88	Pk	14.4	-27	27.28	43.52	-16.24	0-360	101	H
8	533.6	32.91	Pk	22	-26.2	28.71	46.02	-17.31	0-360	101	H

* - indicates frequency in 47 CFR §15.205/IC RSS-GEN §8.10 Restricted Band

Pk - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.