



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

**BLUETOOTH LOW ENERGY
C2PC CERTIFICATION TEST REPORT**

FOR

**GSM/CDMA/WCDMA/LTE Phone + Bluetooth &
WLAN (2.4GHz & 5GHz) and NFC**

MODEL NUMBER: LG-D820, LGD820 and D820

FCC ID: ZNFD820

IC: 2703C-D820

REPORT NUMBER: 13U15778-3, Revision B

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	8/21/13	Initial Issue	P. Kim
A	9/12/13	Updated Section 5.4 Software and Firmware	AAumentado
B	9/17/13	Updated Section 7.2 investigate frequency range	P. Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC.
1000 SYLVAN AVENUE
ENGLEWOOD CLIFFS, NEW JERSEY 07632

EUT DESCRIPTION: GSM/CDMA/WCDMA + LTE Phone Bluetooth, WLAN
(2.4GHz & 5GHz) and NFC

MODEL: LG-D820, LGD820 and D820

SERIAL NUMBER: (01EEE7E020C97E30) RADIATED #1
(01EB815C20C97E15) RADIATED #2

DATE TESTED: July 29 – August 9, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	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:



PHILIP KIM
EMC SUPERVISOR
UL Verification Services Inc.

Tested By:



STEVEN TRAN
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a LTE Phone Bluetooth, WLAN(2.4GHz & 5GHz) and NFC

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	8.42	6.95

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.96 dBi.

5.4. SOFTWARE AND FIRMWARE

Android OS Version: 3.40-gbab8bca-00002-gd1a7716.
Kernel Version: M8974A-0.0.19.0.05.

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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	MCS.01WR	EAY62768913	N/A
Earphone	QuadBeat	LE 410	EAB62729001	N/A

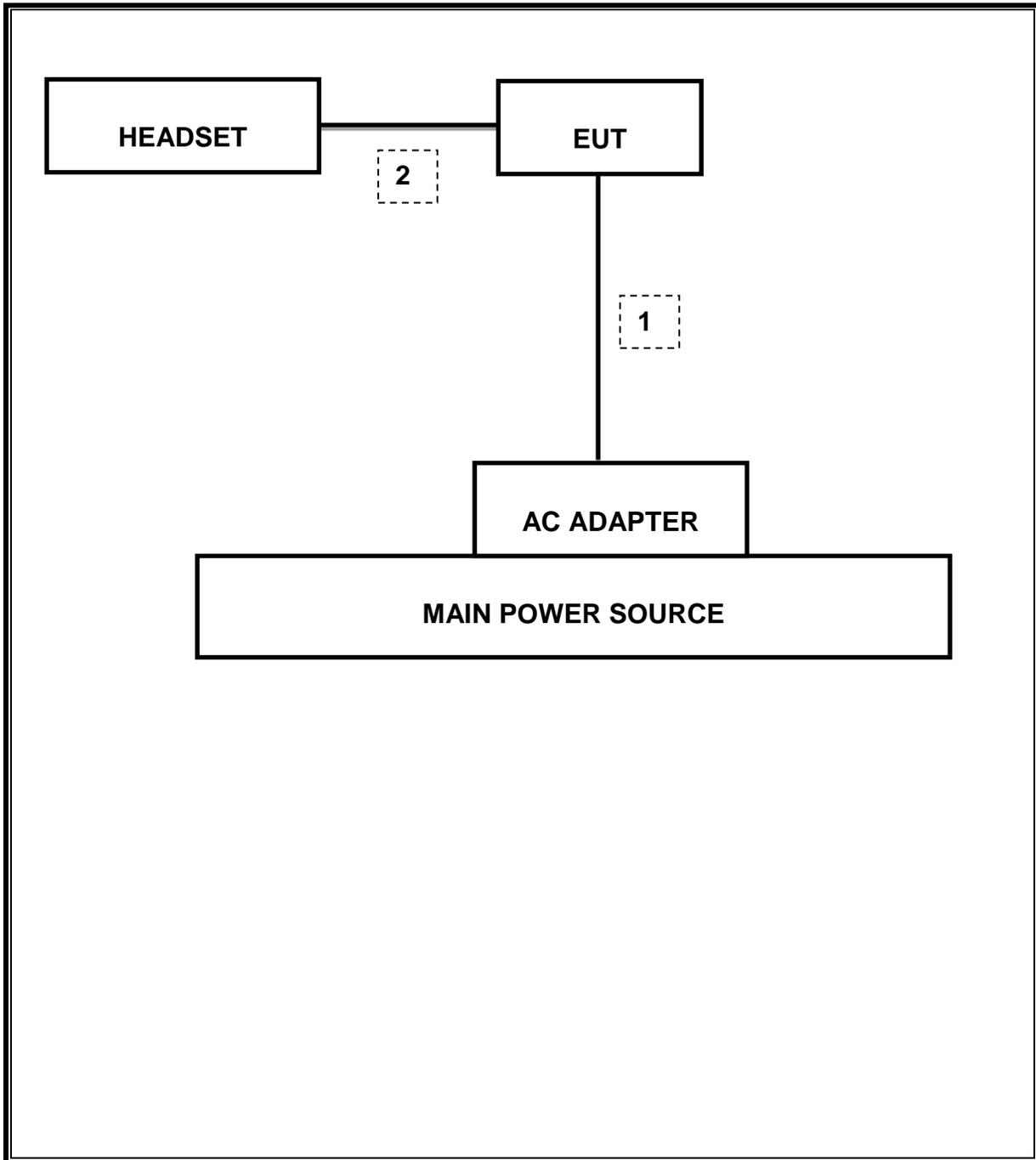
I/O CABLES

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. EUT was set in the Hidden menu mode to enable BLE communications.

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 Date	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	03/23/12	02/13/14
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/12	10/25/13
Antenna, Horn, 25.5 GHz	ARA	MWH-1826/B	C00980	11/14/12	11/14/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/13	01/28/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/12	12/20/13
CBT Bluetooth Tester	R & S	CBT	None	07/12/13	07/12/14
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/12	12/13/13
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/12	12/13/13
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR	CNR

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For restricted band edge measurements, when doing peak, above 1 GHz, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3MHz.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
BLE	0.39	0.63	0.622	62.2%	2.07

For restricted band edge measurements, when doing average, above 1GHz, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz and add duty cycle factor off set for average measurements. Duty cycle factor = $10 \log(1/\text{Duty Cycle})$. For this sample: $\text{DCF} = 10 \log(1/0.622) = 2.07\text{dB}$. Please see above table. In addition the detector is set to RMS and trace average is set 100.

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.

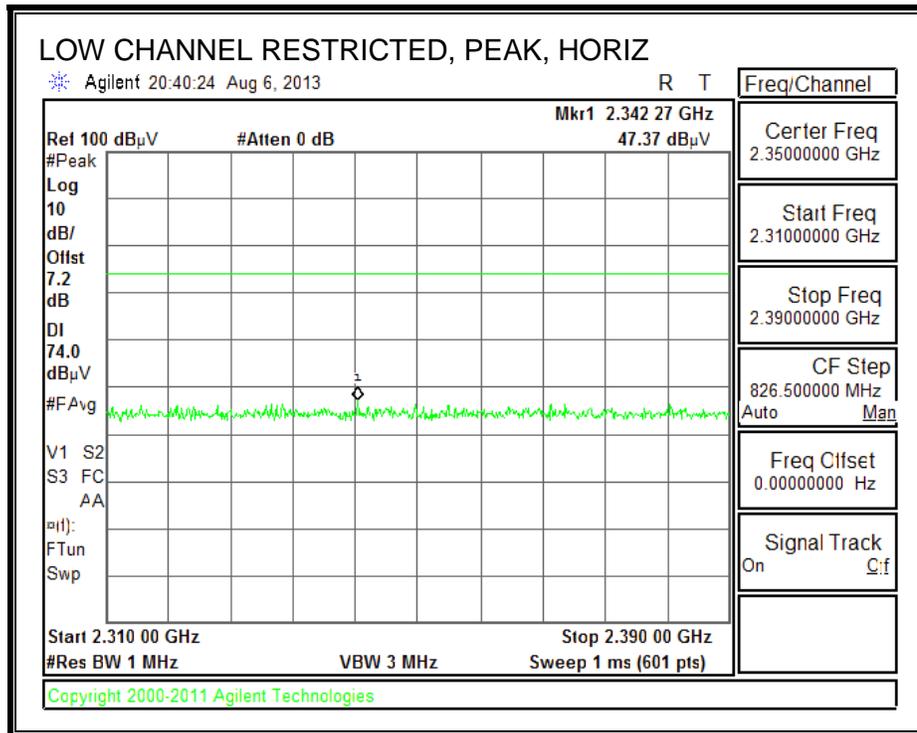
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

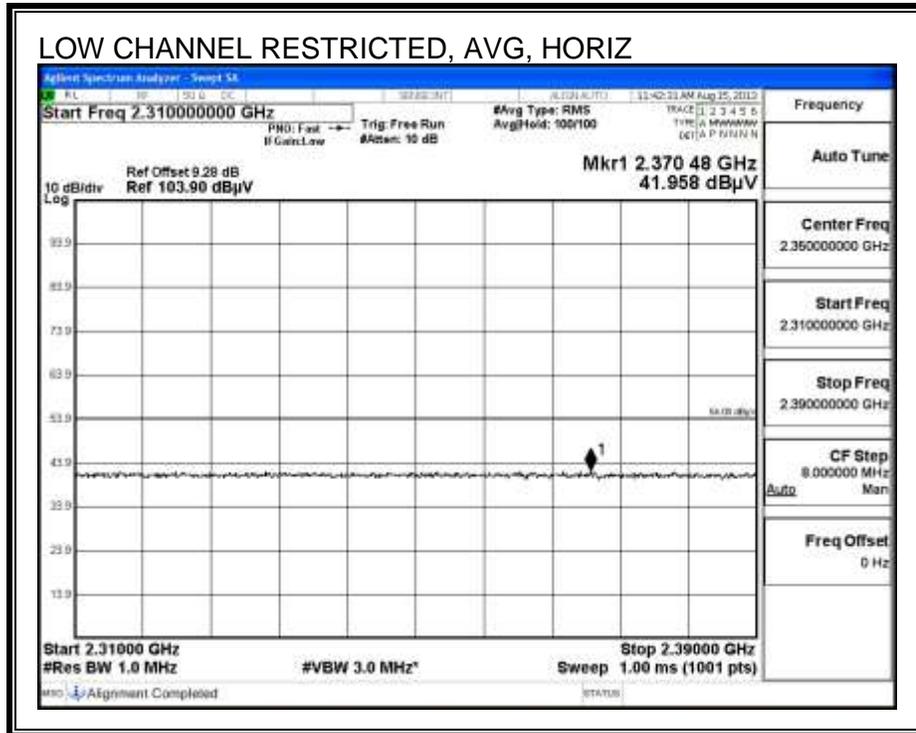
Please note that Peak and Average plots were taken in 2 different chambers. Due to that the reference offset values are not the same.

7.2. TRANSMITTER ABOVE 1 GHz

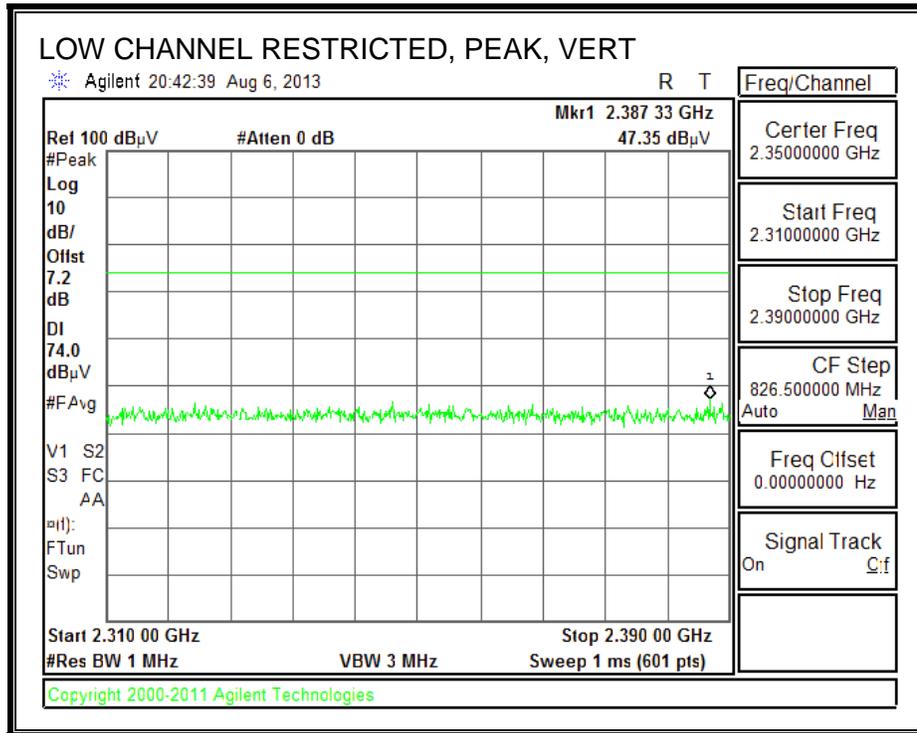
7.3. TX ABOVE 1 GHz FOR BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND

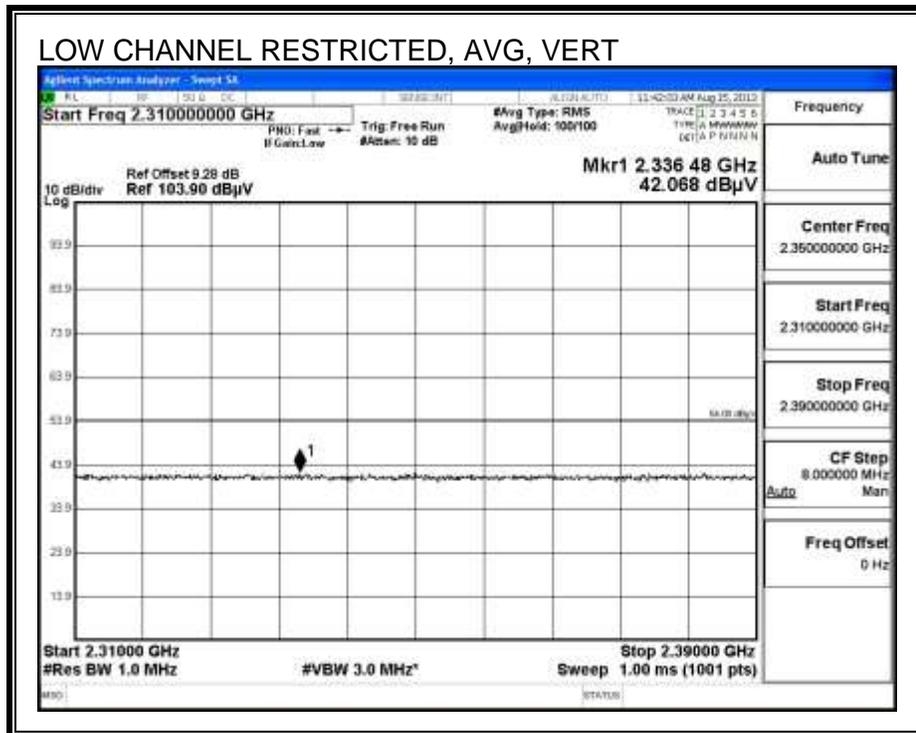
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



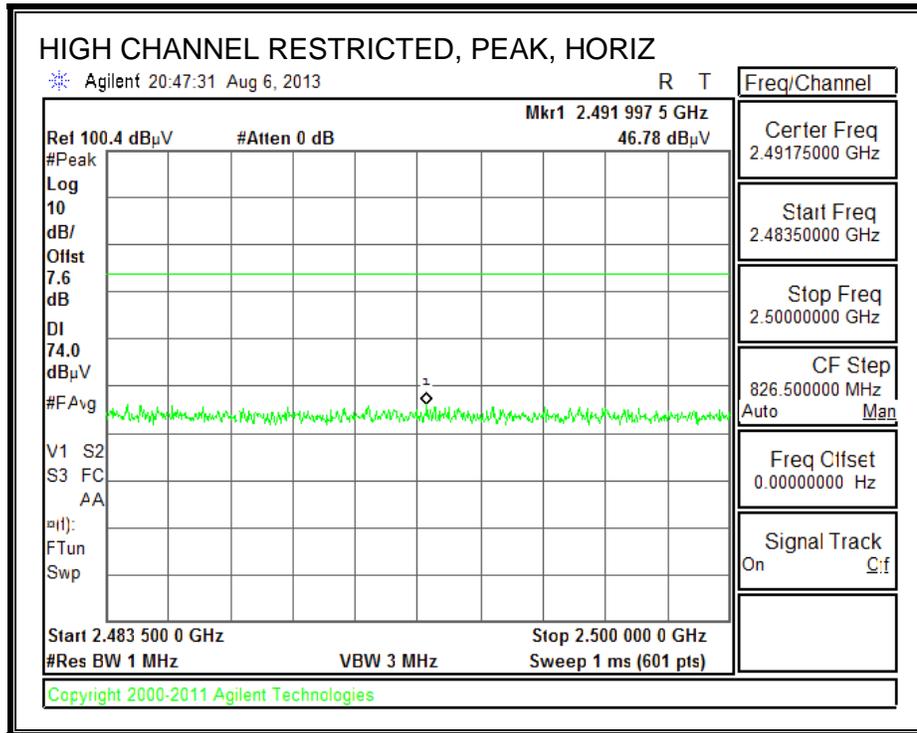


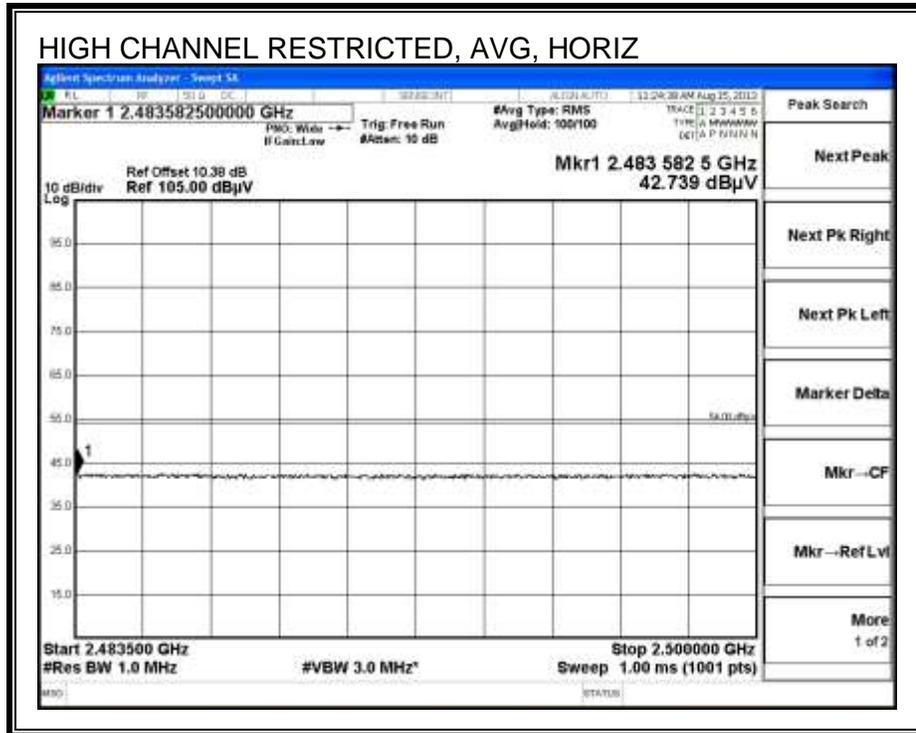
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



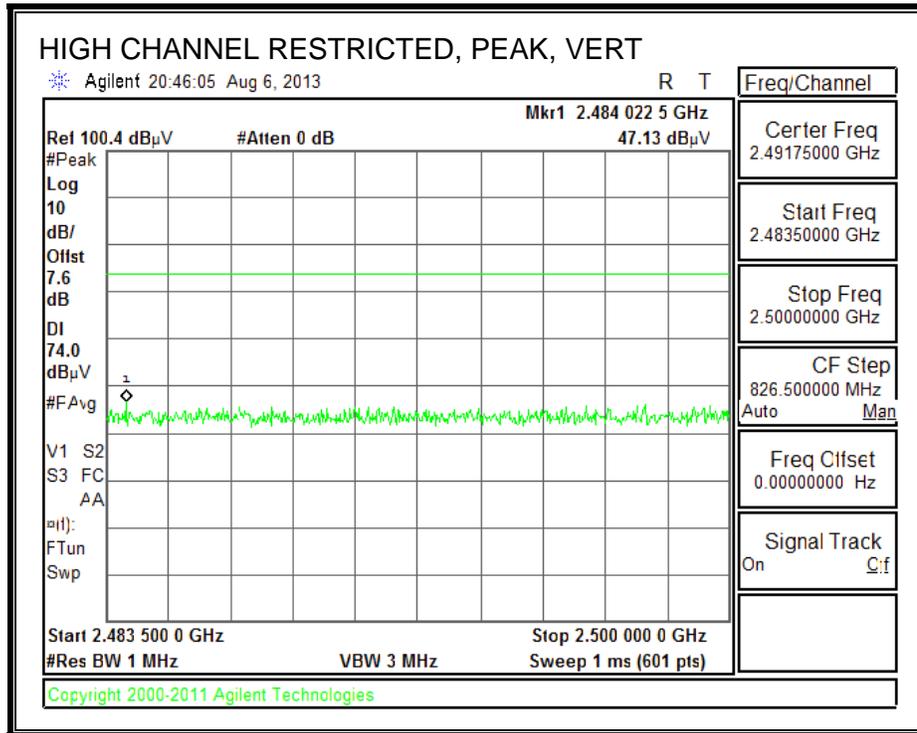


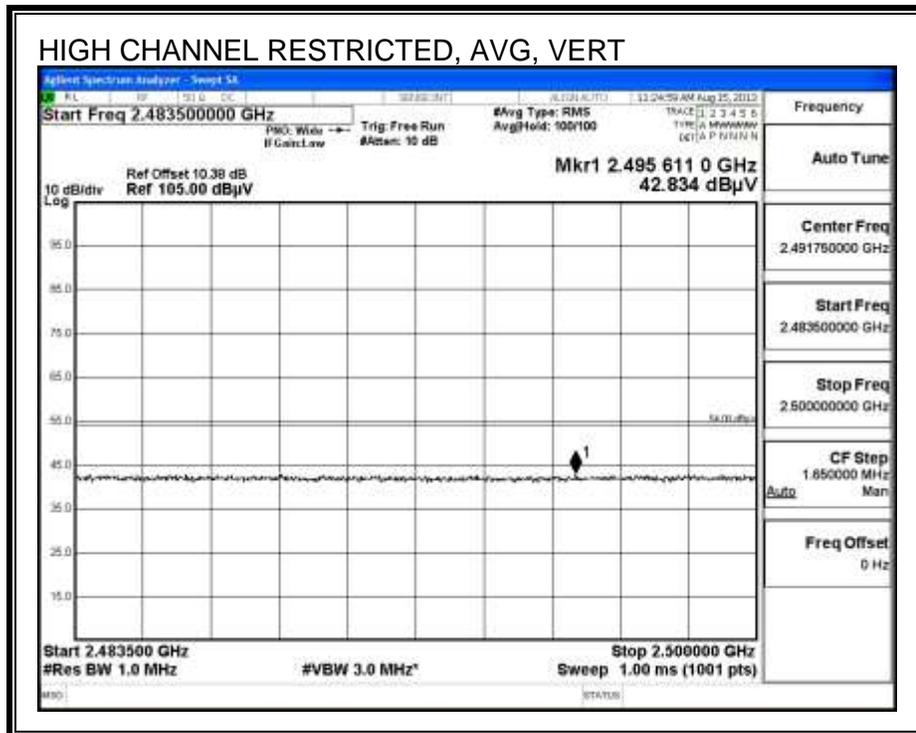
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





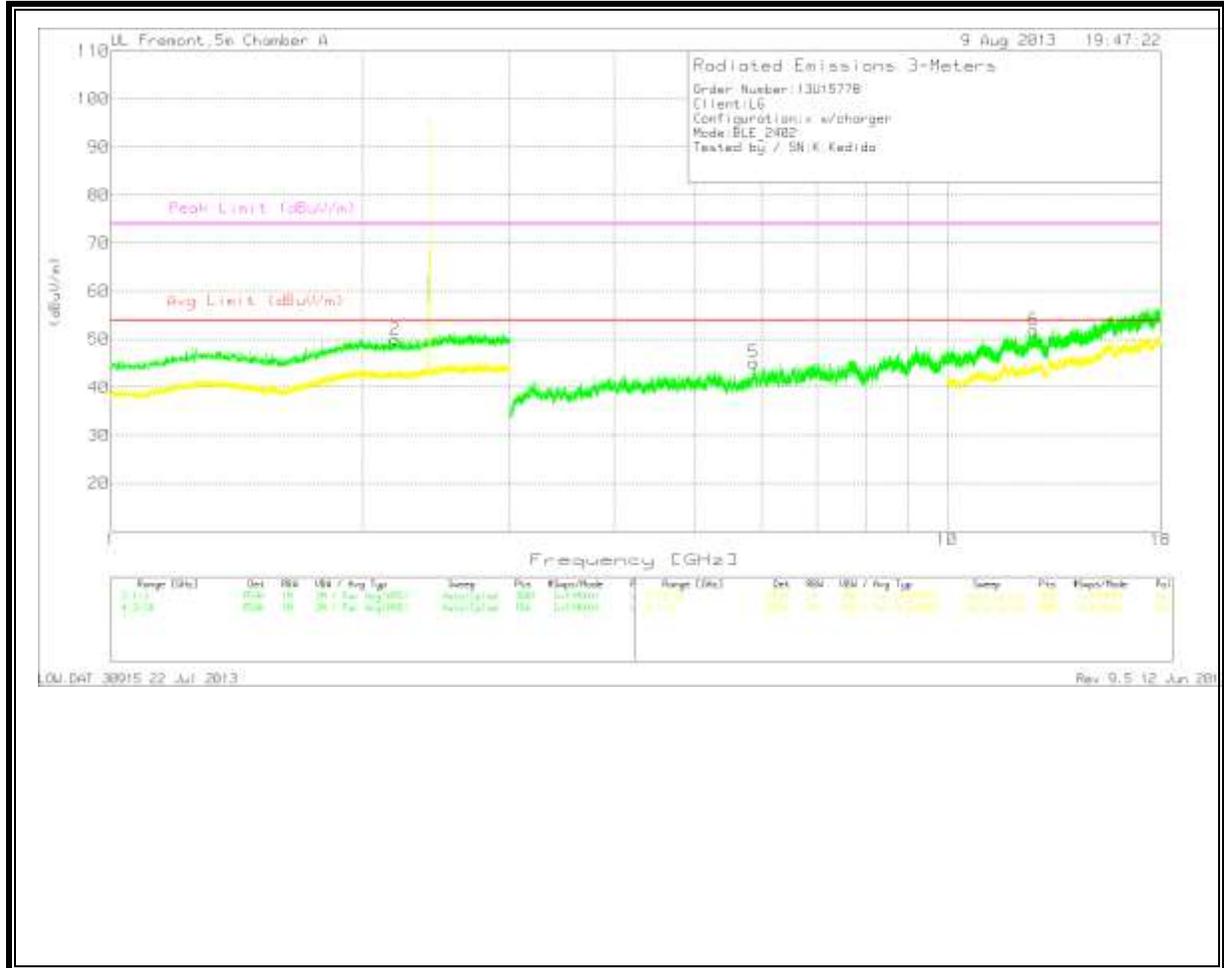
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

**LOW CHANNEL
 VERTICAL**



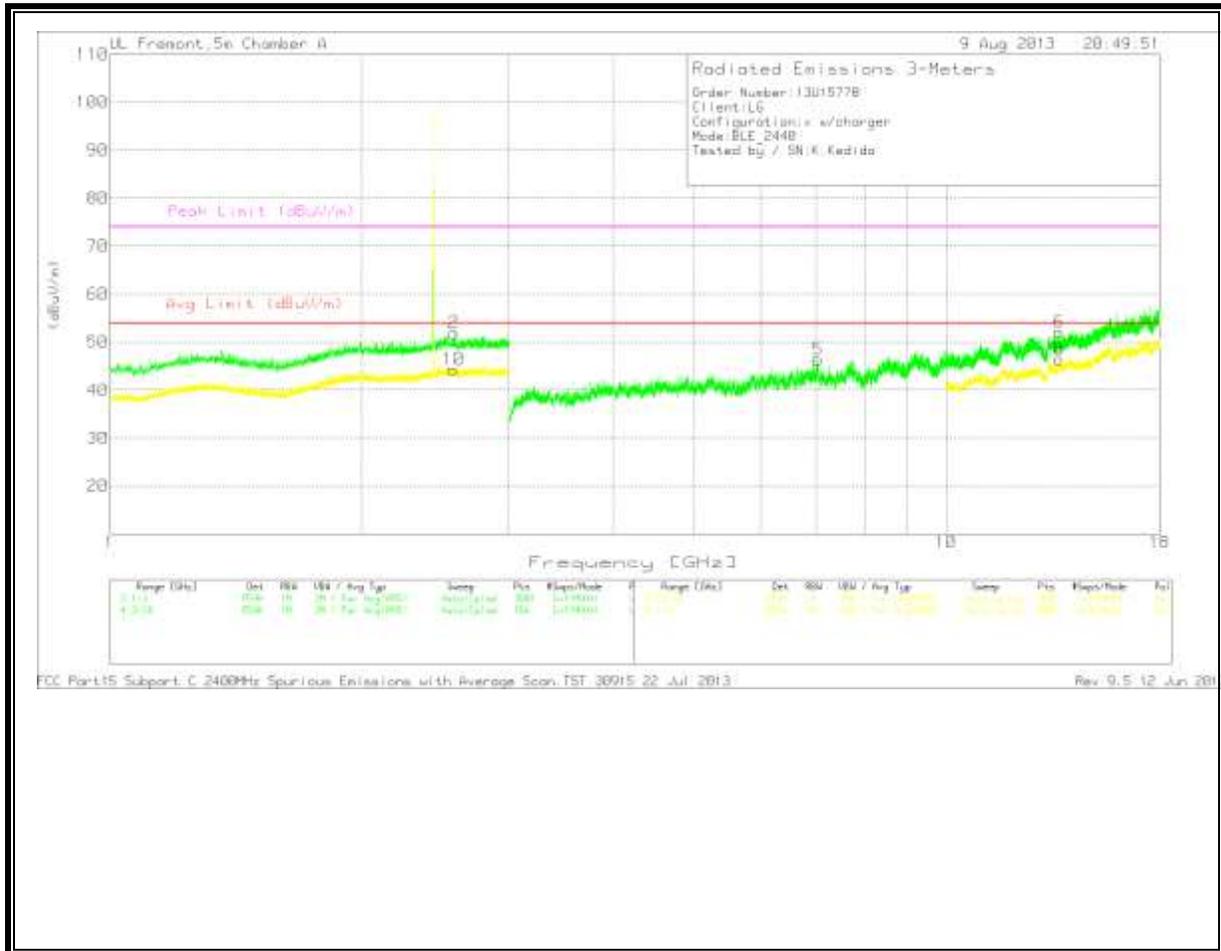
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.189	41.54	PK	31.5	-23.1	49.94	53.97	-4.03	74	-24.06	0-360	200	V
5.878	36.67	PK	35	-26.5	45.17	53.97	-8.8	74	-28.83	0-360	200	V
12.695	35.04	PK	39.2	-22.4	51.84	53.97	-2.13	74	-22.16	0-360	200	V

MID CHANNEL

VERTICAL



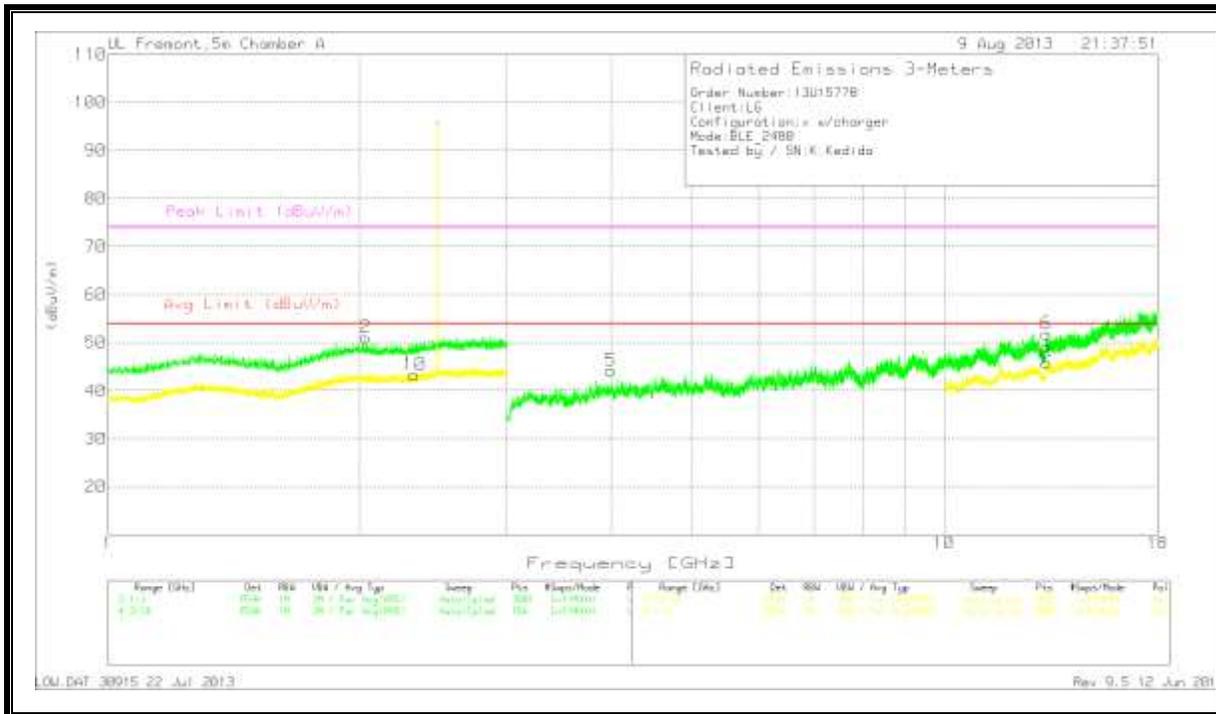
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7.023	35.87	PK	35.4	-24.9	46.37	53.97	-7.6	74	-27.63	0-360	200	V
13.646	28.49	PK	38.8	-20.9	46.39	53.97	-7.58	74	-27.61	0-360	200	V
2.576	34.25	PK	32.7	-22.7	44.25	53.97	-9.72	74	-29.75	0-360	100	V

HIGH CHANNEL

VERTICAL



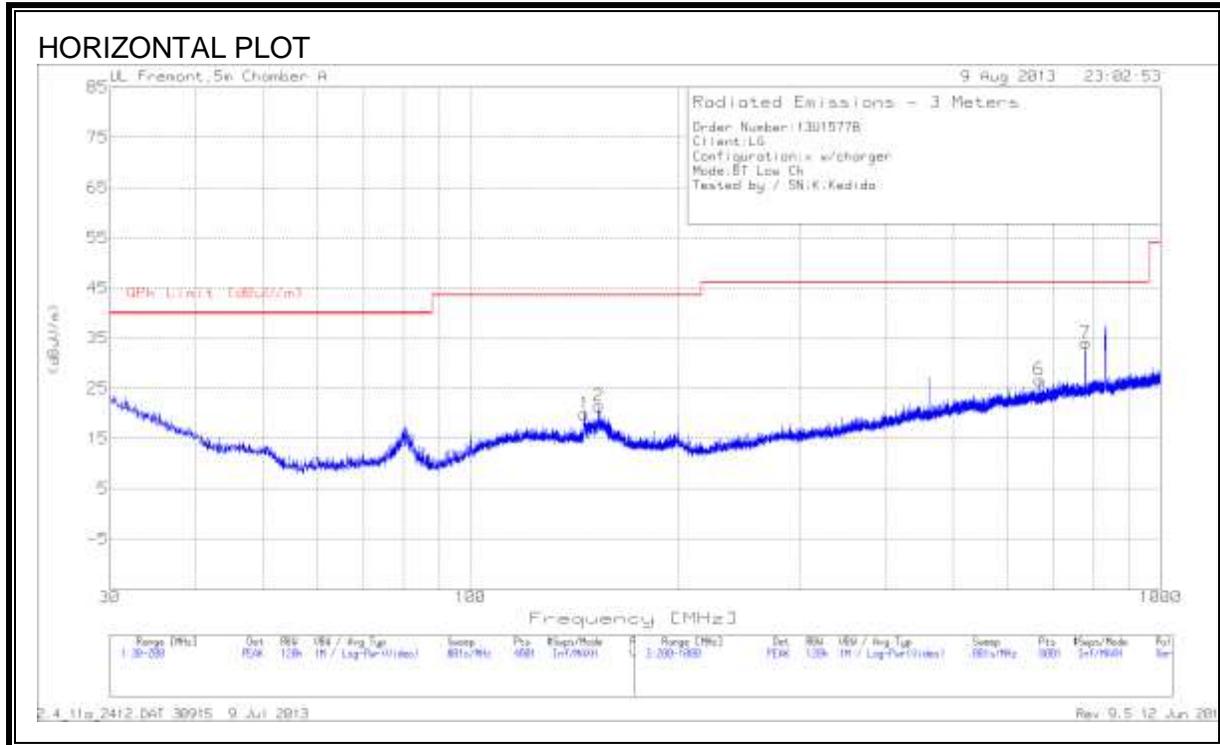
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

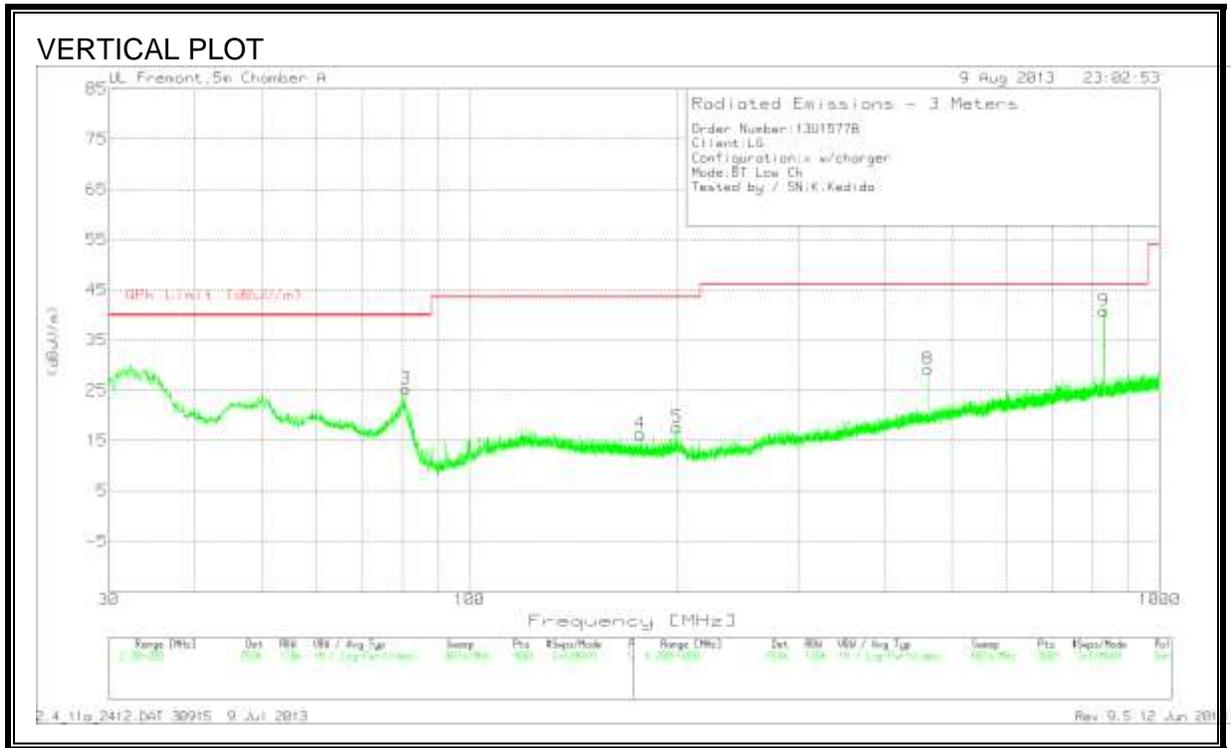
HIGH CHANNEL DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3.997	39.47	PK	33.8	-29.1	44.17	53.97	-9.8	74	-29.83	0-360	200	V
13.259	28.71	PK	39.2	-22.1	45.81	53.97	-8.16	74	-28.19	0-360	100	V
2.328	34.27	PK	31.7	-22.7	43.27	53.97	-10.7	74	-30.73	0-360	100	V

7.4. WORST-CASE BELOW 1 GHz

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





DATA

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
146.3225	34.09	PK	12.4	-26.6	19.89	43.52	-23.63	0-360	200	H
153.4625	35.67	PK	12.3	-26.5	21.47	43.52	-22.05	0-360	200	H
80.915	44.79	PK	7.6	-27.1	25.29	40	-14.71	0-360	100	V
176.9225	31.15	PK	11.5	-26.3	16.35	43.52	-27.17	0-360	100	V
199.9575	31.42	PK	12.3	-26.1	17.62	43.52	-25.9	0-360	100	V
668	30.27	PK	19.2	-22.8	26.67	46.02	-19.35	0-360	100	H
779.1	36.15	PK	20.5	-22.6	34.05	46.02	-11.97	0-360	400	H
461.6	37.25	PK	16.7	-24.7	29.25	46.02	-16.77	0-360	200	V
830.8	42.02	PK	21.2	-22.4	40.82	46.02	-5.2	0-360	400	V