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

CERTIFICATION TEST REPORT

FOR

GLASS

MODEL NUMBER: XEB

FCC ID: A4R-X1

REPORT NUMBER: 13U14955-1, REVISION A

ISSUE DATE: APRIL 12, 2013

Prepared for
GOOGLE INC.
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW CA, 94043, U.S.A

Prepared by
UL CCS
47173 BENICIA STREET
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/01/13	Initial Issue	T. LEE
A	04/12/13	Correction to model on cover page, updated bandedge data, and updated antenna gains	G. Persons

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOOGLE INC.
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW, CA, 94043, U.S.A

EUT DESCRIPTION: GLASS

MODEL: XEB

SERIAL NUMBER: ECABB131105243

DATE TESTED: MARCH 30 – APRIL 12, 2013

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

UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

TIM LEE
WiSE PROJECT MANAGER
UL CCS

Tested By:

MONA HUA
EMC ENGINEER
UL CCS

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 CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a glass providing a heads-up video display. The device incorporates an 802.11 b/g 2.4 GHz WLAN and BT radio. This report covers the Bluetooth radio.

5.2. MAXIMUM OUTPUT POWER

The measured average power values were within ± 0.5 dB of the original values. Refer to original report number “12U14656-3A” for exact output power values and for all antenna port results.

5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The change filed under this application has the following changes:

- The antenna length was increased by 2.5mm.
- The antenna gain was increased to 5.64 dBi.
- The Wifi antenna battery pod grounding was changed.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a coaxial monopole antenna with a maximum gain of 5.64 dBi.

5.5. SOFTWARE AND FIRMWARE

The firmware/software installed in the EUT during testing was 201303251100.

5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed video playing with audio sound and 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, and Z. It was determined that Z-orientation was the worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z-orientation operated by AC adapter.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Charger	GOOGLE	10AGE212020	N/A	N/A

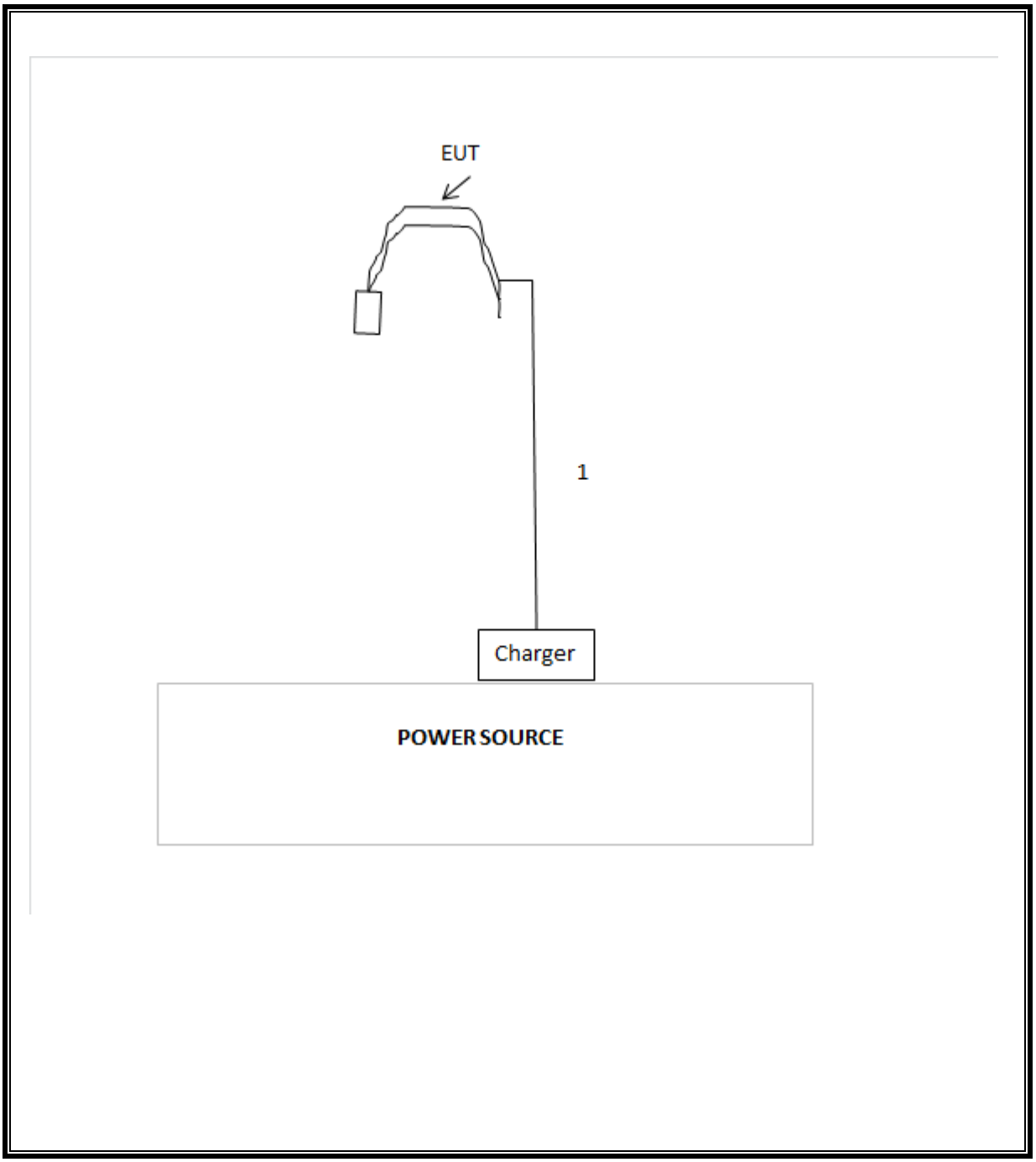
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	USB	Shielded	1.2	No

TEST SETUP

The EUT was at the worst position and connected to the charger played the video script and transmit the worst case BT mode.

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, Horn, 18 GHz	EMCO	3115	C00872	09/20/12	09/20/13
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	08/22/12	08/22/13
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	04/23/12	04/23/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	11/11/12	11/11/13
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/12	08/08/13
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14

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

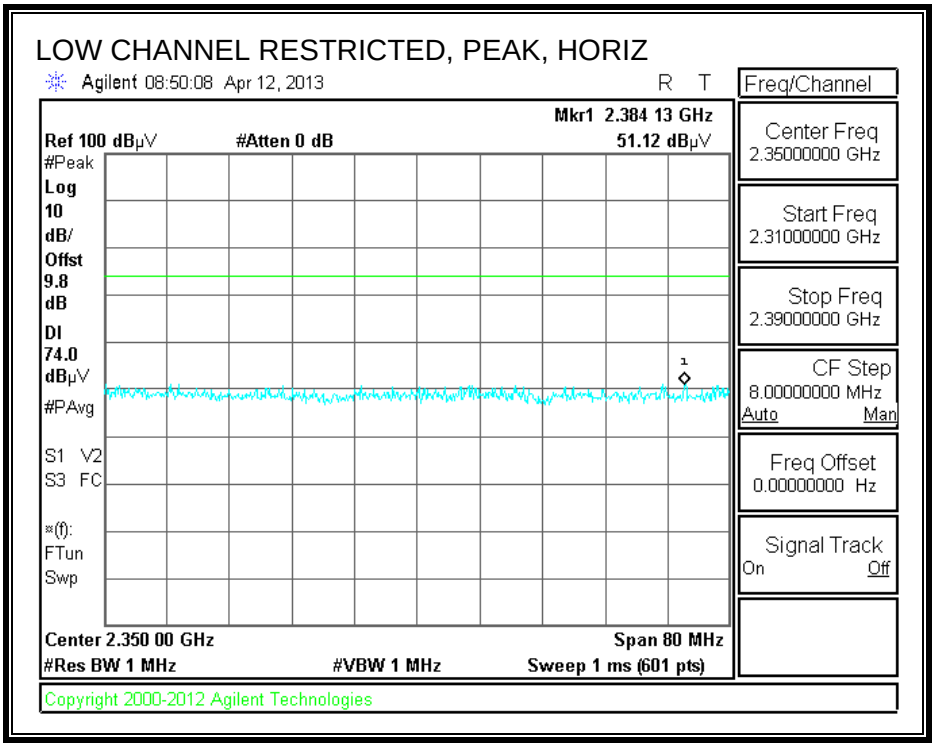
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

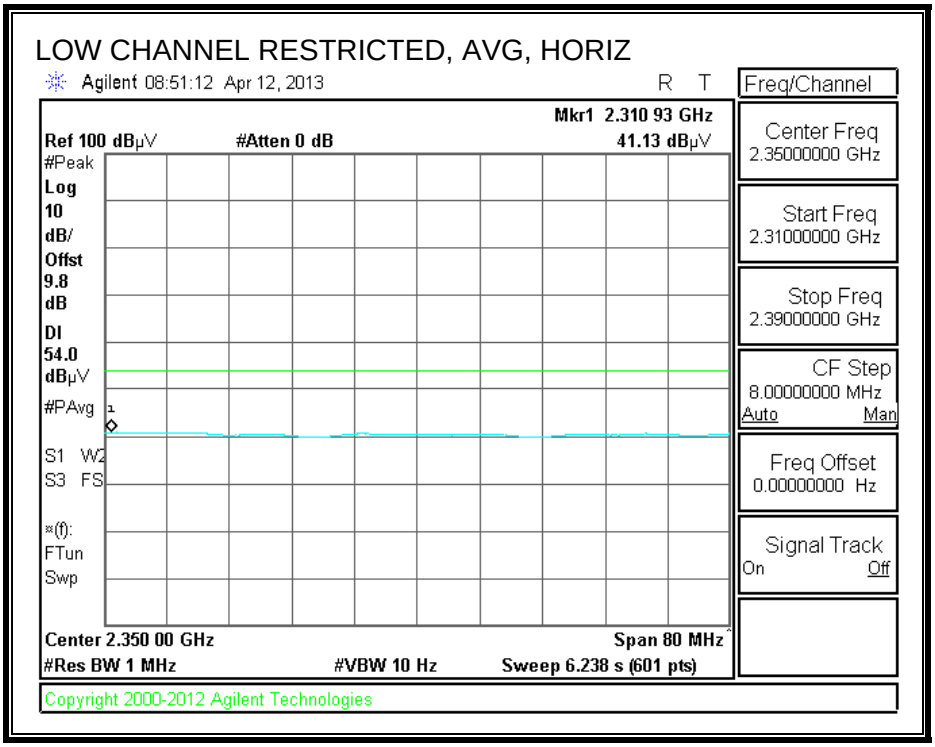
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.2. TRANSMITTER ABOVE 1 GHz

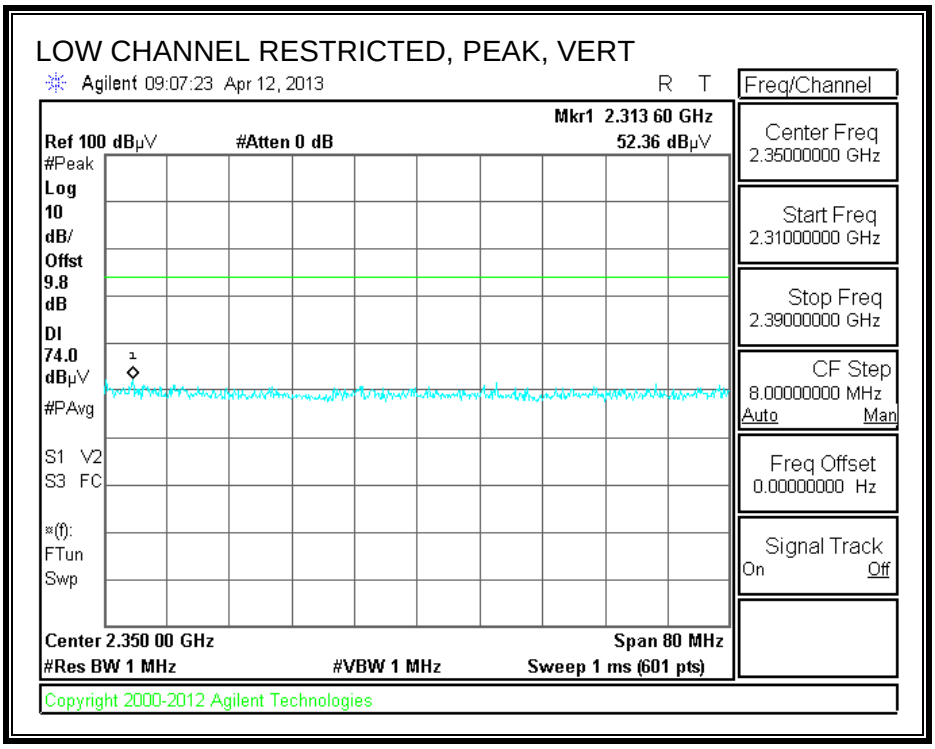
7.2.1. BASIC DATA RATE GFSK MODULATION

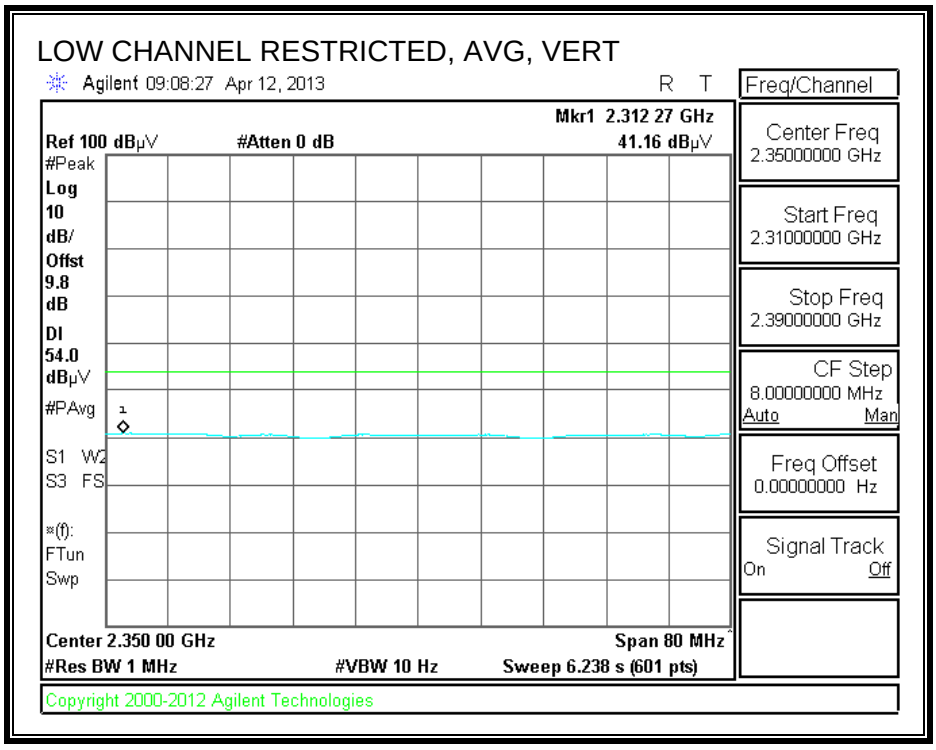
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



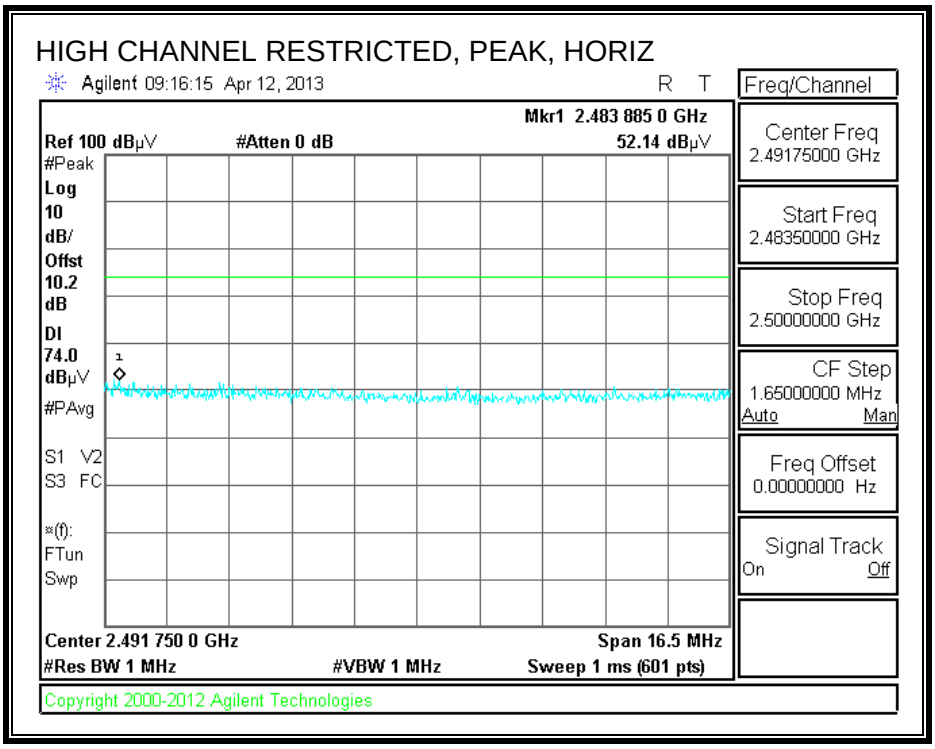


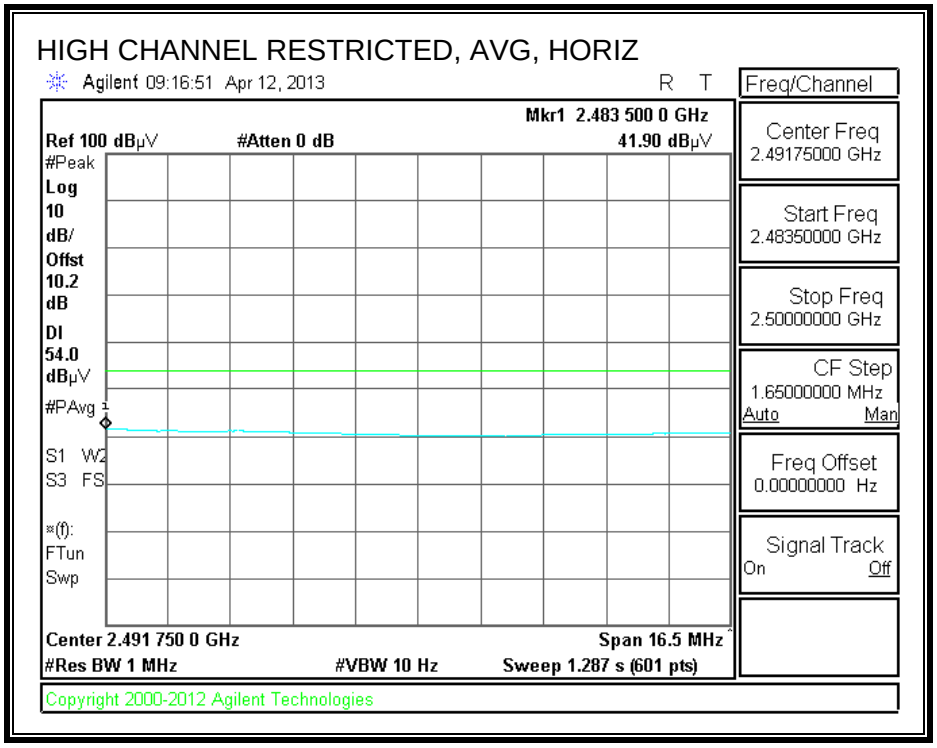
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



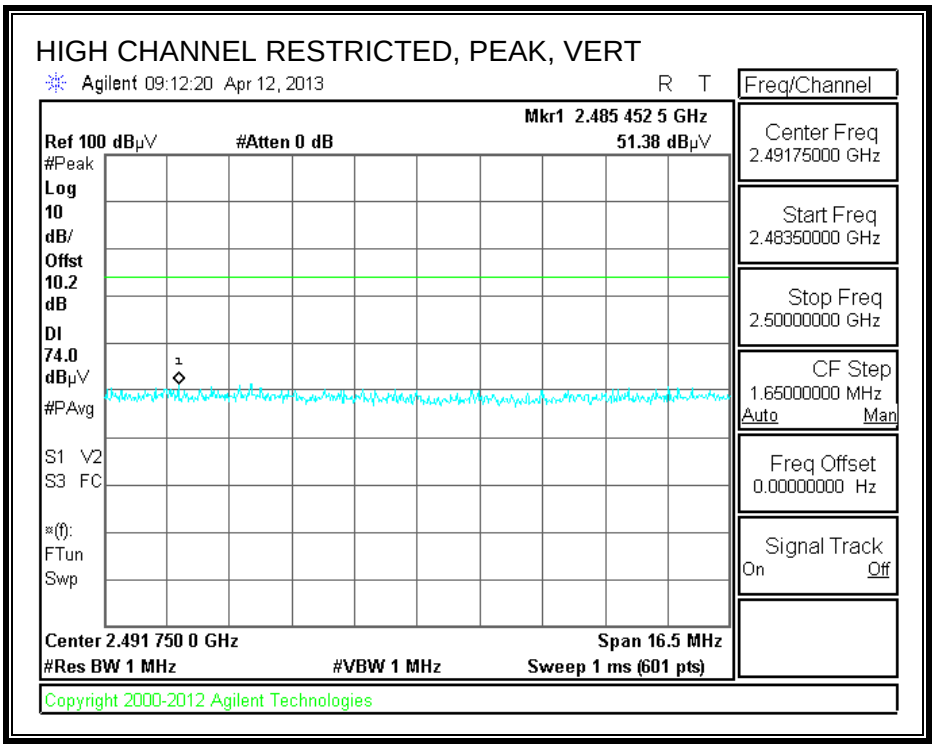


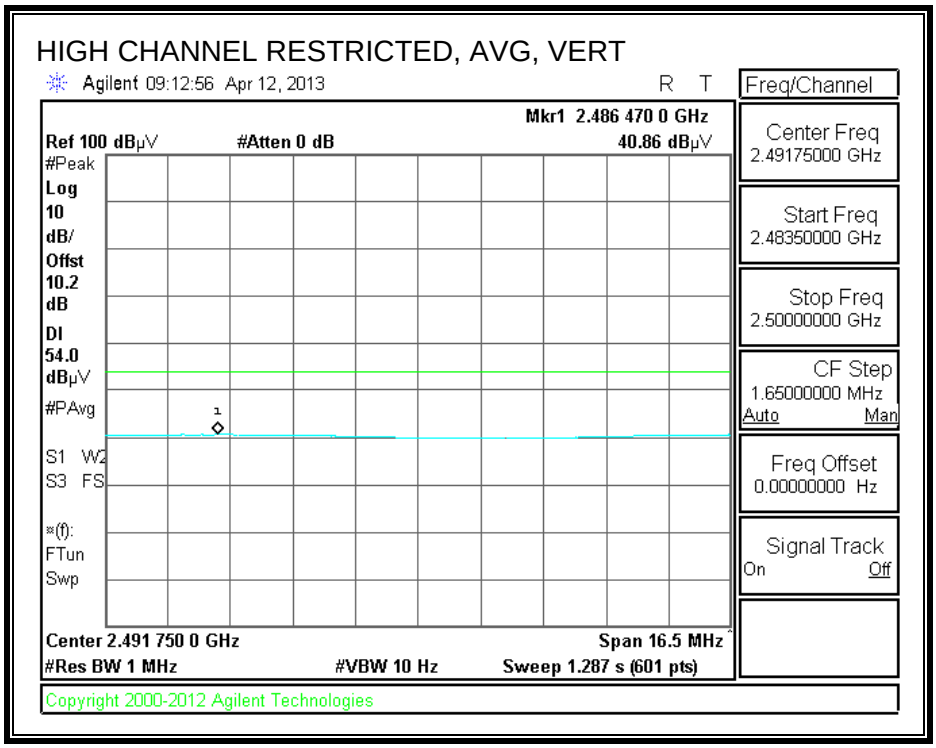
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Mona Hua
Date: 03/30/13
Project #: 13U14955
Company: Google
Test Target: EUT with AC Adapter
Mode Oper: Tx, BT, GFSK

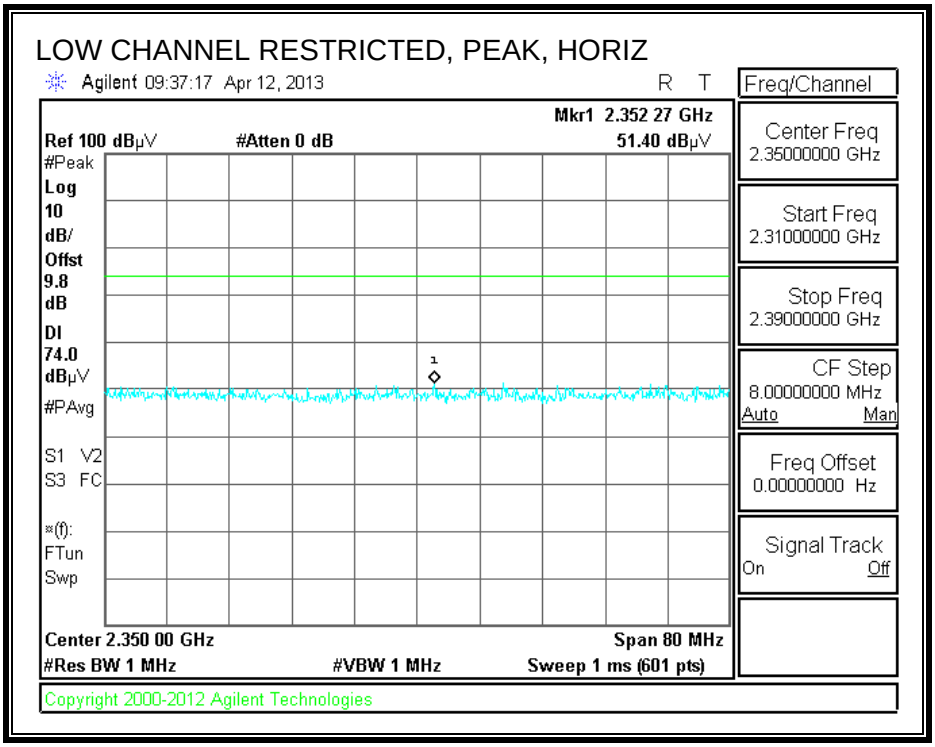
f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

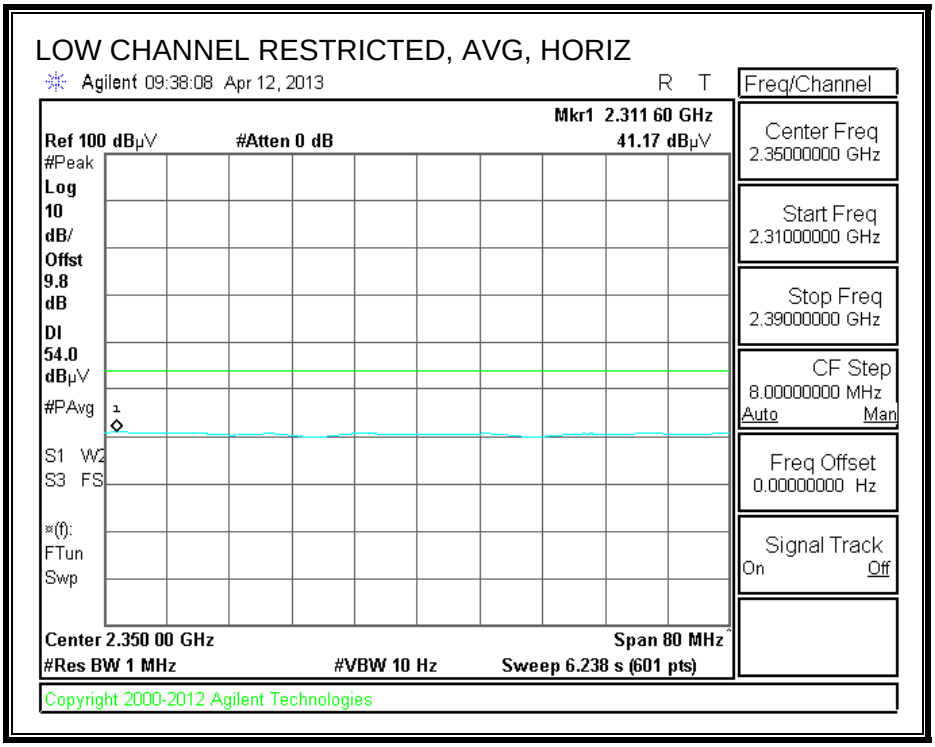
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Ch, 2402 MHz															
4.804	3.0	38.1	33.1	6.3	-34.8	0.0	0.0	42.6	74.0	-31.4	V	P	102.5	70.8	
4.804	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	102.5	70.8	
4.804	3.0	37.7	33.1	6.3	-34.8	0.0	0.0	42.3	74.0	-31.7	H	P	166.5	5.2	
4.804	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	166.5	5.2	
Mid Ch, 2441 MHz															
4.882	3.0	37.9	33.1	6.3	-34.8	0.0	0.0	42.5	74.0	-31.5	V	P	118.9	324.9	
4.882	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	V	A	118.9	324.9	
7.323	3.0	36.7	35.8	8.5	-34.9	0.0	0.0	46.2	74.0	-27.8	V	P	100.5	277.4	
7.323	3.0	23.3	35.8	8.5	-34.9	0.0	0.0	32.7	54.0	-21.3	V	A	100.5	277.4	
4.882	3.0	37.8	33.1	6.3	-34.8	0.0	0.0	42.5	74.0	-31.5	H	P	113.7	246.3	
4.882	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	H	A	113.7	246.3	
7.323	3.0	36.5	35.8	8.5	-34.9	0.0	0.0	45.9	74.0	-28.1	H	P	178.7	0.0	
7.323	3.0	23.2	35.8	8.5	-34.9	0.0	0.0	32.7	54.0	-21.3	H	A	178.7	0.0	
High Ch, 2480 MHz															
4.960	3.0	37.1	33.2	6.4	-34.8	0.0	0.0	41.9	74.0	-32.1	V	P	101.6	262.8	
4.960	3.0	24.1	33.2	6.4	-34.8	0.0	0.0	28.9	54.0	-25.1	V	A	101.6	262.8	
7.440	3.0	36.7	36.0	8.5	-34.9	0.0	0.0	46.3	74.0	-27.7	V	P	200.0	149.6	
7.440	3.0	23.5	36.0	8.5	-34.9	0.0	0.0	33.1	54.0	-20.9	V	A	200.0	149.6	
4.960	3.0	36.5	33.2	6.4	-34.8	0.0	0.0	41.3	74.0	-32.7	H	P	149.3	315.5	
4.960	3.0	24.1	33.2	6.4	-34.8	0.0	0.0	28.8	54.0	-25.2	H	A	149.3	315.5	
7.440	3.0	37.1	36.0	8.5	-34.9	0.0	0.0	46.8	74.0	-27.2	H	P	129.4	295.5	
7.440	3.0	23.5	36.0	8.5	-34.9	0.0	0.0	33.1	54.0	-20.9	H	A	129.4	295.5	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

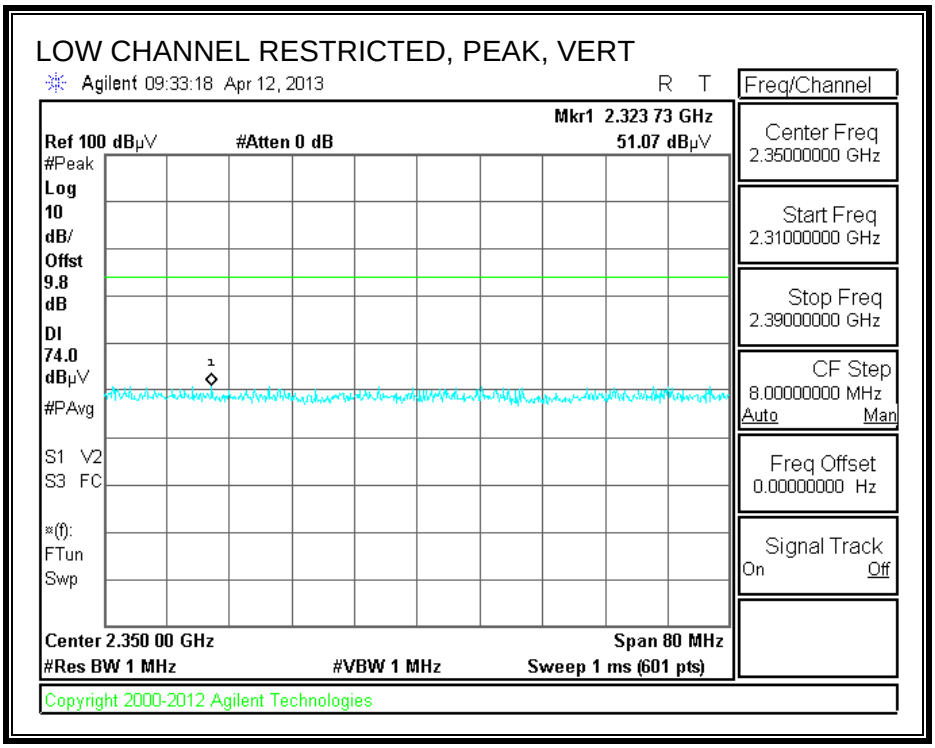
7.2.2. ENHANCED DATA RATE 8PSK MODULATION

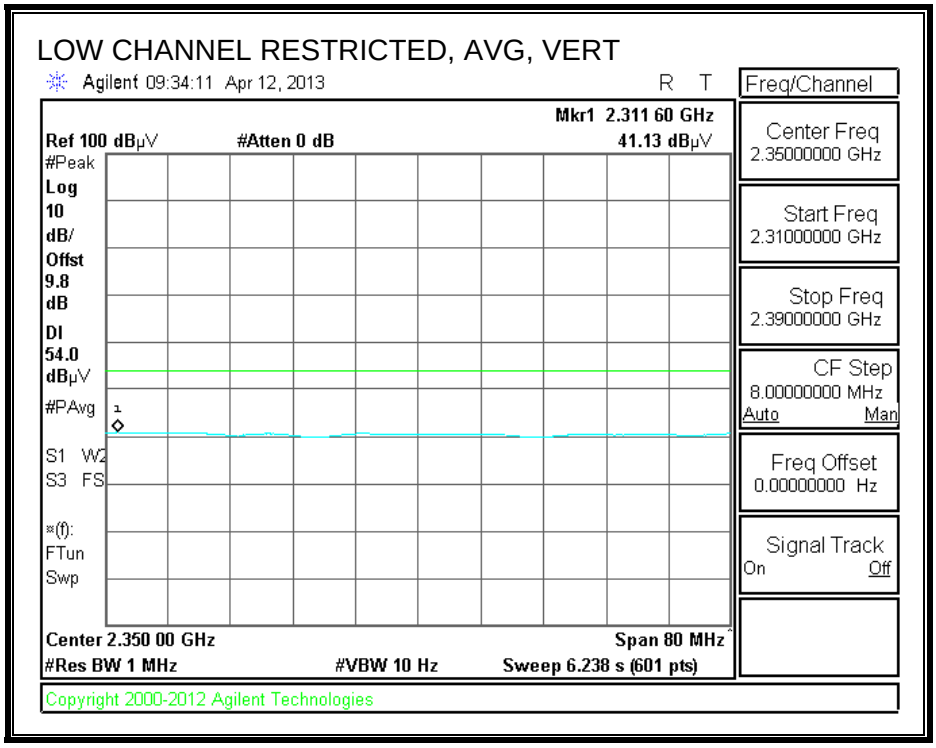
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



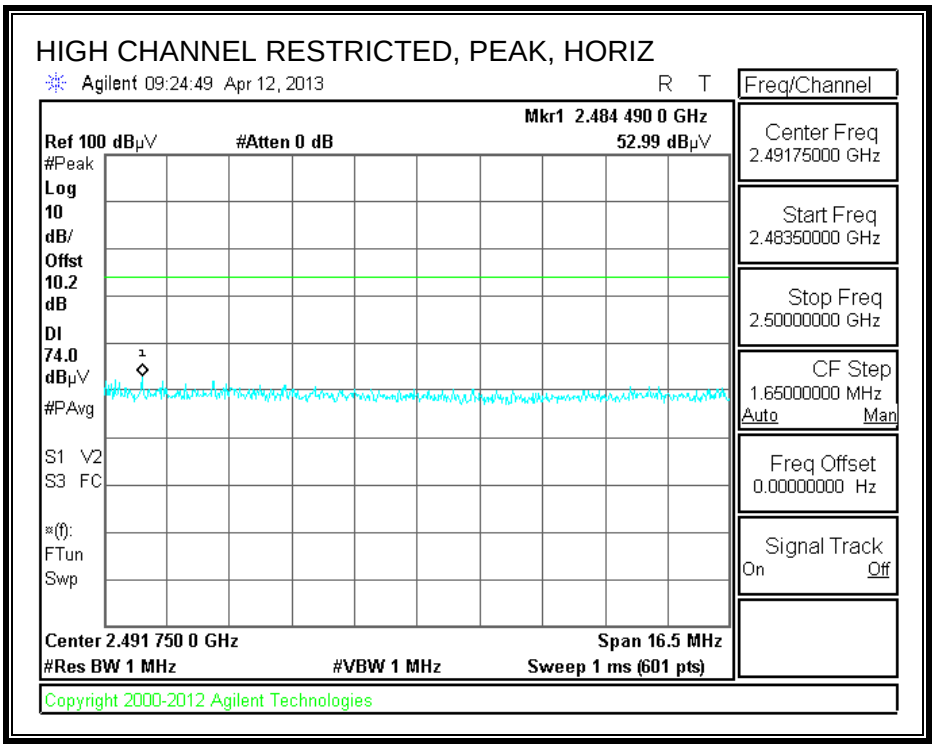


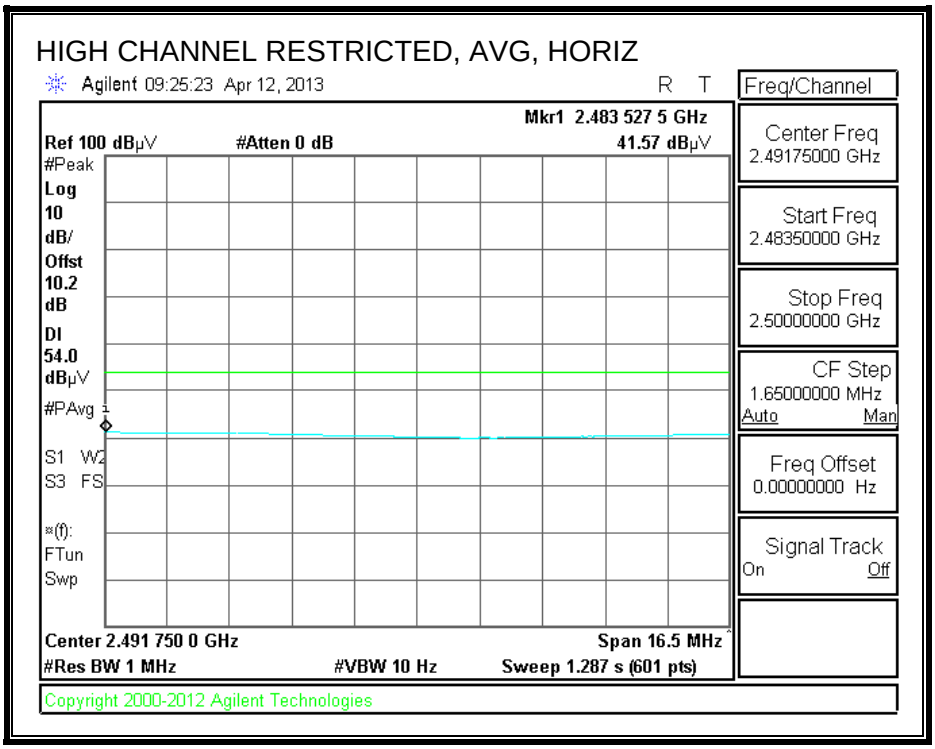
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



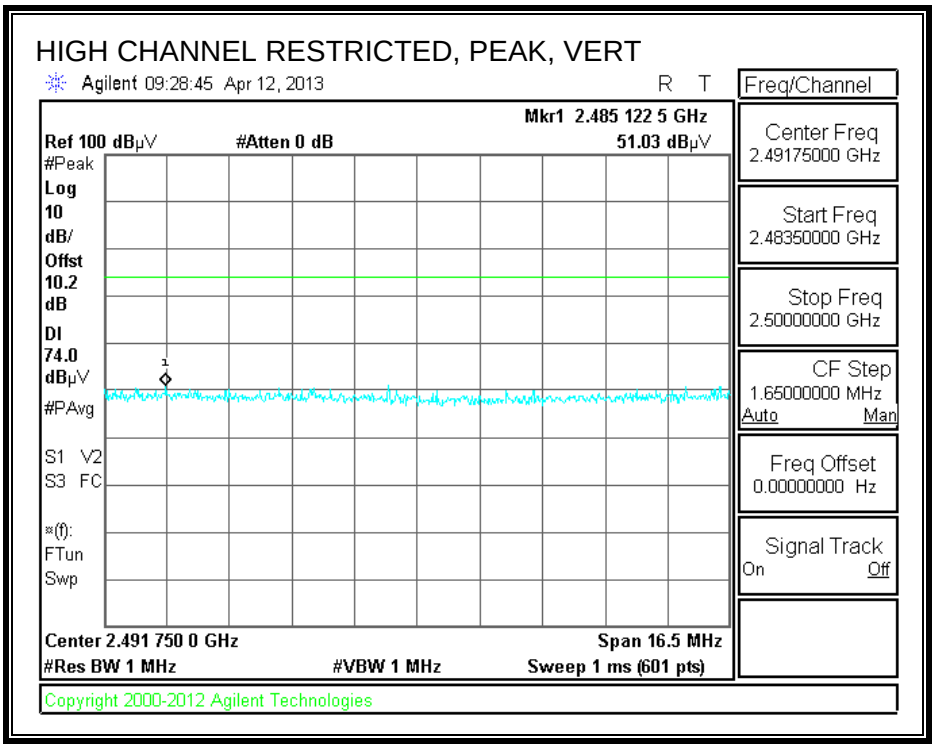


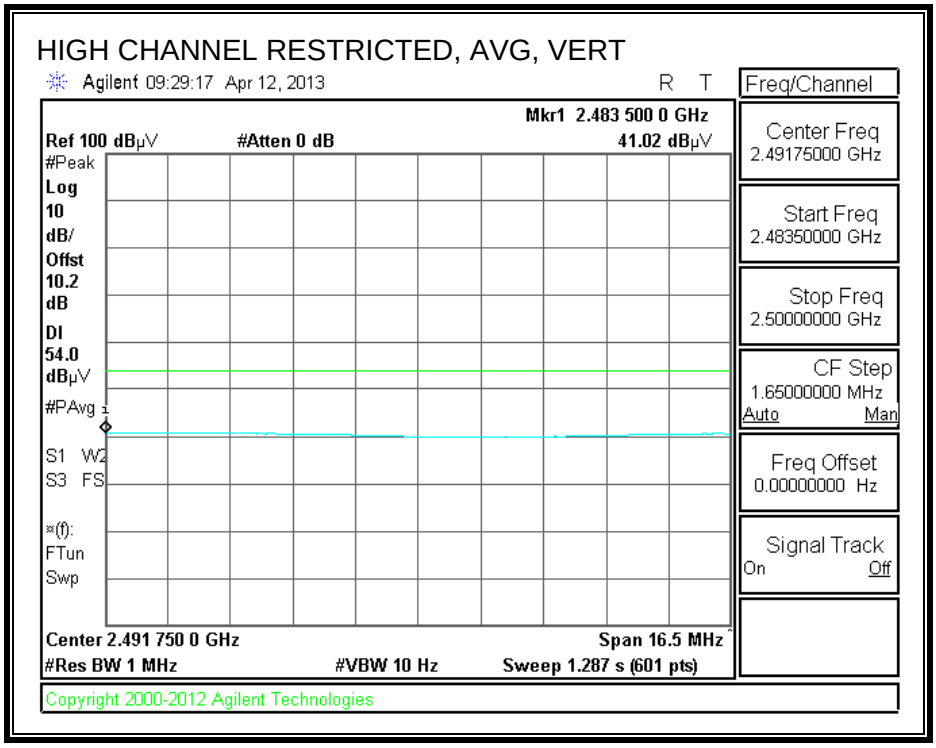
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Mona Hua
Date: 03/30/13
Project #: 13U14955
Company: Google
Test Target: EUT with AC Adapter
Mode Oper: Tx, BT, 8PSK

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m
AF	Antenna Factor	Peak	Calculated Peak Field Strength
CL	Cable Loss	HPF	High Pass Filter

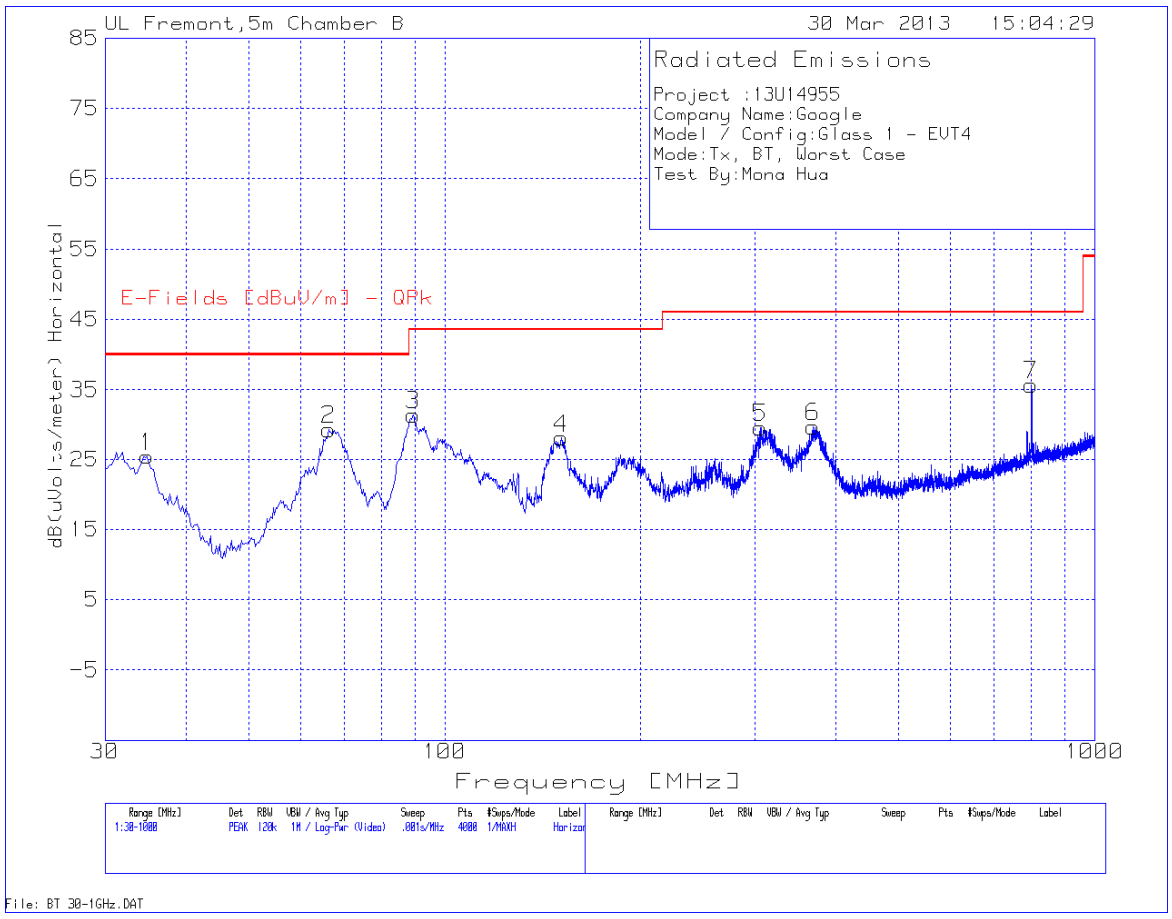
Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
Low Ch, 2402 MHz															
4.804	3.0	38.3	33.1	6.3	-34.8	0.0	0.0	42.8	74.0	-31.2	V	P	180.4	268.2	
4.804	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	180.4	268.2	
4.804	3.0	37.8	33.1	6.3	-34.8	0.0	0.0	42.4	74.0	-31.6	H	P	199.3	24.4	
4.804	3.0	24.9	33.1	6.3	-34.8	0.0	0.0	29.4	54.0	-24.6	H	A	199.3	24.4	
Mid Ch, 2441 MHz															
4.882	3.0	37.2	33.1	6.3	-34.8	0.0	0.0	41.9	74.0	-32.1	V	P	195.9	292.6	
4.882	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	V	A	195.9	292.6	
7.323	3.0	36.7	35.8	8.5	-34.9	0.0	0.0	46.1	74.0	-27.9	V	P	196.6	176.0	
7.323	3.0	23.2	35.8	8.5	-34.9	0.0	0.0	32.7	54.0	-21.3	V	A	196.6	176.0	
4.882	3.0	37.4	33.1	6.3	-34.8	0.0	0.0	42.1	74.0	-31.9	H	P	168.3	262.3	
4.882	3.0	24.5	33.1	6.3	-34.8	0.0	0.0	29.1	54.0	-24.9	H	A	168.3	262.3	
7.323	3.0	36.1	35.8	8.5	-34.9	0.0	0.0	45.5	74.0	-28.5	H	P	197.4	321.0	
7.323	3.0	23.2	35.8	8.5	-34.9	0.0	0.0	32.7	54.0	-21.3	H	A	197.4	321.0	
High Ch, 2480 MHz															
4.960	3.0	38.1	33.2	6.4	-34.8	0.0	0.0	42.8	74.0	-31.2	V	P	163.2	287.4	
4.960	3.0	24.2	33.2	6.4	-34.8	0.0	0.0	29.0	54.0	-25.0	V	A	163.2	287.4	
7.440	3.0	36.7	36.0	8.5	-34.9	0.0	0.0	46.4	74.0	-27.6	V	P	100.0	145.7	
7.440	3.0	23.7	36.0	8.5	-34.9	0.0	0.0	33.3	54.0	-20.7	V	A	100.0	145.7	
4.960	3.0	37.5	33.2	6.4	-34.8	0.0	0.0	42.3	74.0	-31.7	H	P	115.1	32.0	
4.960	3.0	24.2	33.2	6.4	-34.8	0.0	0.0	29.0	54.0	-25.0	H	A	115.1	32.0	
7.440	3.0	36.7	36.0	8.5	-34.9	0.0	0.0	46.4	74.0	-27.6	H	P	192.3	39.6	
7.440	3.0	23.7	36.0	8.5	-34.9	0.0	0.0	33.3	54.0	-20.7	H	A	192.3	39.6	

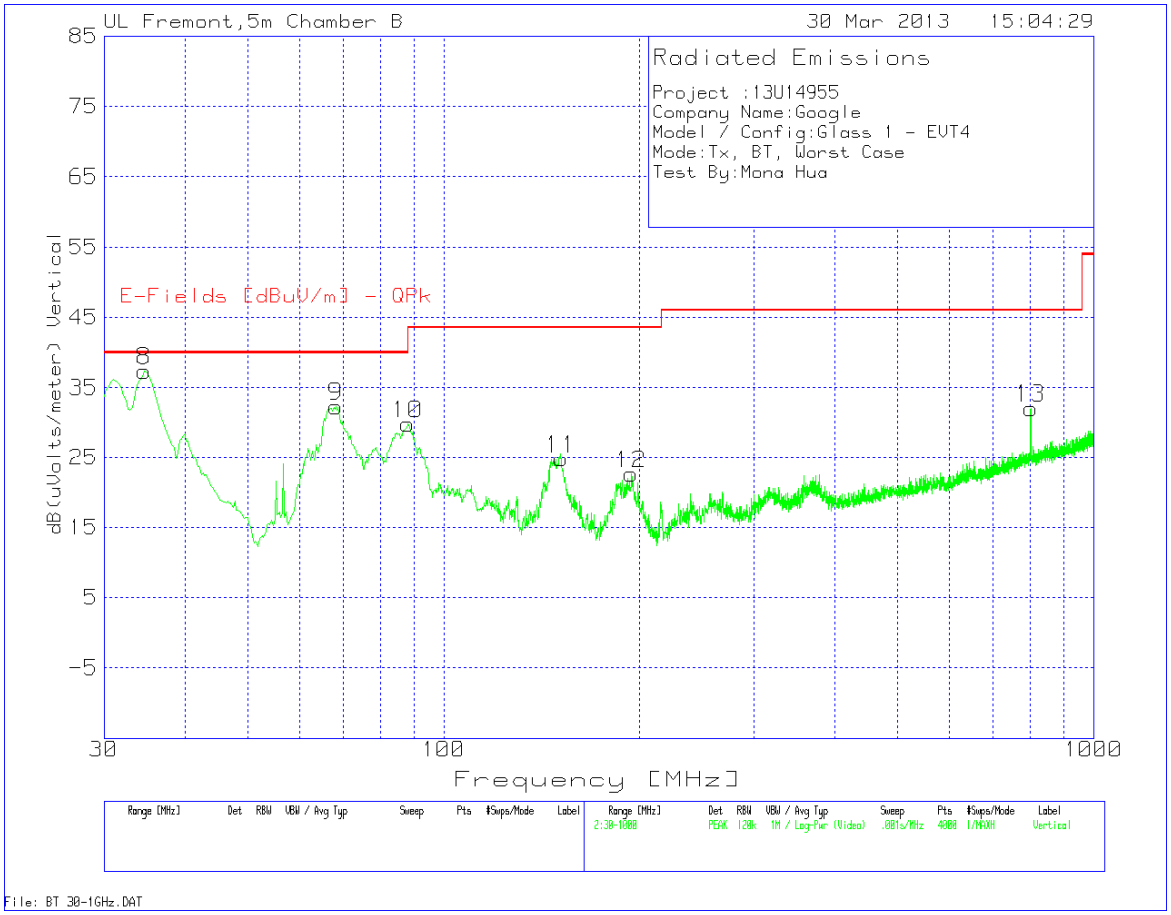
Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

7.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz



Horizontal 30 - 1000MHz										
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	T243	Preamp/Cable loss [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - QPk	Margin (dB)	Height [cm]	Polarity
1	34.8464	37.15	PK	17.3	-29	25.45	40	-14.55	400	Horz
2	66.3477	50.4	PK	7.6	-28.7	29.3	40	-10.7	200	Horz
3	89.368	52.43	PK	7.5	-28.5	31.43	43.52	-12.09	400	Horz
4	151.4014	43.51	PK	12.3	-27.7	28.11	43.52	-15.41	200	Horz
5	306.0005	42.55	PK	13.5	-26.4	29.65	46.02	-16.37	100	Horz
6	368.7609	41	PK	15	-26.3	29.7	46.02	-16.32	100	Horz
7	800.0874	39.3	PK	21.2	-24.8	35.7	46.02	-10.32	100	Horz



Vertical 30 - 1000MHz										
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	T243	Preamp/Cable loss [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - QPk	Margin (dB)	Height [cm]	Polarity
8	34.604	48.74	PK	17.6	-29	37.34	40	-2.66	200	Vert
9	68.2863	53.19	PK	7.8	-28.7	32.29	40	-7.71	200	Vert
10	88.1564	51	PK	7.3	-28.5	29.8	43.52	-13.72	200	Vert
11	151.6438	40.21	PK	12.3	-27.7	24.81	43.52	-18.71	200	Vert
12	194.5341	38.29	PK	11.6	-27.3	22.59	43.52	-20.93	200	Vert
13	800.3298	35.62	PK	21.2	-24.8	32.02	46.02	-14	200	Vert

Vertical 30 - 1000MHz										
Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Preamp/Cable loss [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - QPk	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
34.7615	49.12	QP	17.4	-29	37.52	40	-2.48	248	101	Vert

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

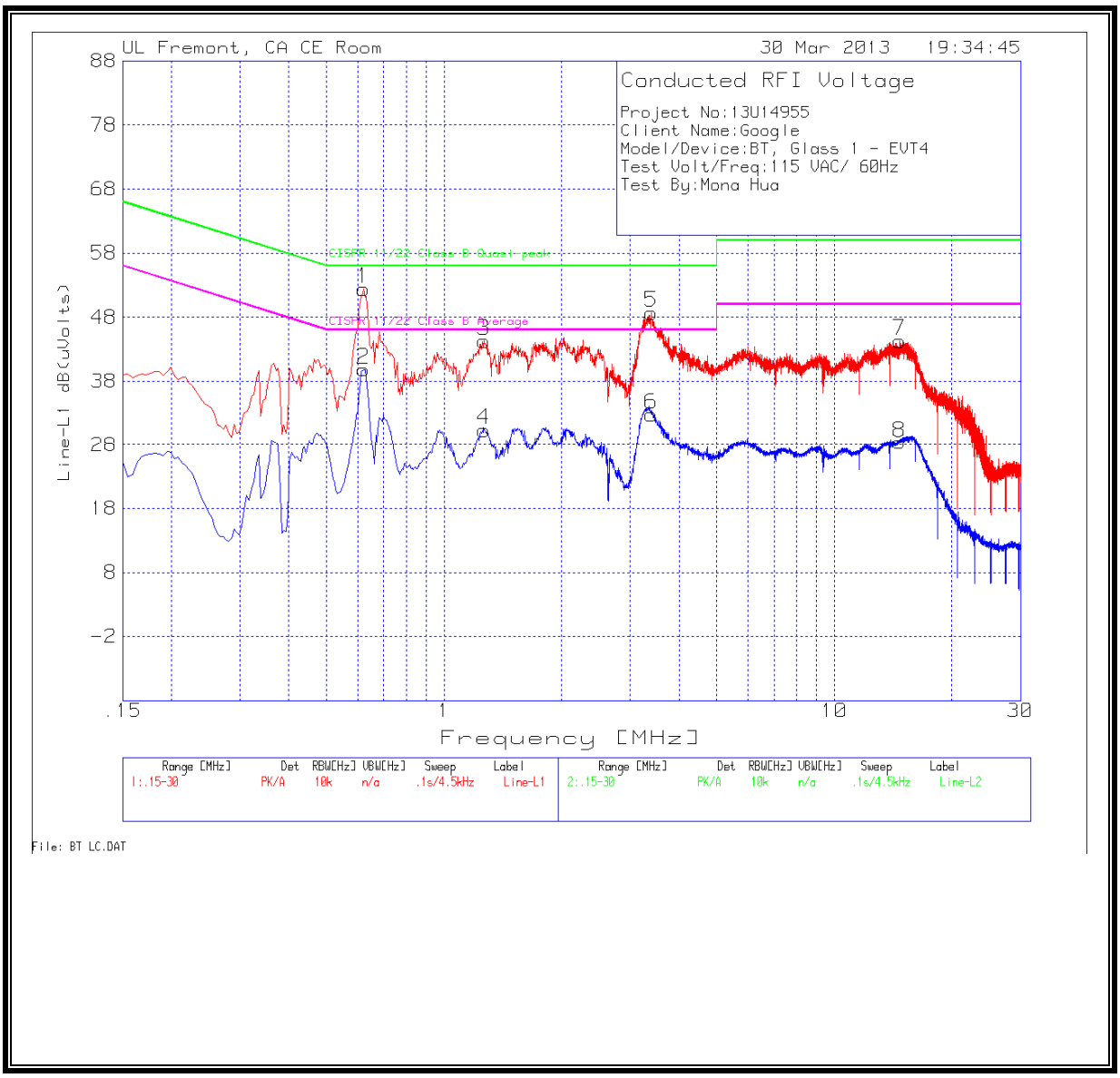
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

Project No:13U14955									
Client Name:Google									
Model/Device:BT, Glass 1 - EVT4									
Test Volt/Freq:115 VAC/ 60Hz									
Test By:Mona Hua									
Line-L1 .15 - 30MHz									
Test Frequency (MHz)	**Meter Reading (dBuV)**	**Detector**	**T24 IL L1.TXT (dB)**	**LC Cables 1&3 (dB)**	**dB(uVolts)**	**CISPR 11/22 Class B Quasi-peak**	**Margin**	**CISPR 11/22 Class B Average**	**Margin**
0.6225	52.3	PK	0.1	0	52.4	56	-3.6	-	-
0.6225	39.74	Av	0.1	0	39.84	-	-	46	-6.16
1.266	44.1	PK	0.1	0.1	44.3	56	-11.7	-	-
1.266	30.14	Av	0.1	0.1	30.34	-	-	46	-15.66
3.4035	48.53	PK	0.1	0.1	48.73	56	-7.27	-	-
3.4035	32.56	Av	0.1	0.1	32.76	-	-	46	-13.24
14.703	43.84	PK	0.2	0.2	44.24	60	-15.76	-	-
14.703	27.97	Av	0.2	0.2	28.37	-	-	50	-21.63
Line-L2 .15 - 30MHz									
Test Frequency (MHz)	**Meter Reading (dBuV)**	**Detector**	**T24 IL L1.TXT (dB)**	**LC Cables 1&3 (dB)**	**dB(uVolts)**	**CISPR 11/22 Class B Quasi-peak**	**Margin**	**CISPR 11/22 Class B Average**	**Margin**
0.6045	43.19	PK	0.1	0	43.29	56	-12.71	-	-
0.6045	18.81	Av	0.1	0	18.91	-	-	46	-27.09
1.23	34.47	PK	0.1	0.1	34.67	56	-21.33	-	-
1.23	10.67	Av	0.1	0.1	10.87	-	-	46	-35.13
7.0665	39.7	PK	0.1	0.1	39.9	60	-20.1	-	-
7.0665	23.96	Av	0.1	0.1	24.16	-	-	50	-25.84
14.1225	42.01	PK	0.2	0.2	42.41	60	-17.59	-	-
14.1225	25.02	Av	0.2	0.2	25.42	-	-	50	-24.58

LINE 1 RESULTS



LINE 2 RESULTS