



FCC 47 CFR PART 15 SUBPART B

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ and NFC

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Prepared for
SONY MOBILE COMMUNICATIONS, INC.
1-8-15 KONAN, MINATO-KU
TOKYO, 108-0075 JAPAN

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
--	03/18/15	Initial Issue	CHOON OOI

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.

EUT DESCRIPTION: GSM/WCDMA/LTE+ Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ and NFC

SERIAL NUMBER: CB5A23Q1W5

DATE TESTED: MARCH 7 – 17, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B	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:

Tested By:



CHOON OOI
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.



CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009.

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(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☐ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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 GSM/WCDMA/LTE + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ and NFC.

AC Adapter Power Requirements	100-300 VAC / 50-60 Hz
List of frequencies generated or used by the EUT	2 GHz (highest clock frequency)

5.2. PRELIMINARY TEST CONFIGURATIONS

The EUT was investigated in three orthogonal orientations X, Y, Z it was determined that X orientation with data transfer was worst-case; therefore, all final radiated testing was performed with the EUT in X orientation with data transfer.

5.3. MODE(S) OF OPERATION INVESTIGATED

Mode	Description
Idle	Receive mode
Data transfer	Copy files from EUT to PC
Data transfer	Copy files from EUT to 4K TV

5.4. MODIFICATIONS

No modifications were made during testing.

5.5. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	TP00001A	60Y5028	DoC
Earphone	Samsung	GH59	N/A	DoC
AC Adapter	Samsung	ETA0U10EBE	N/A	N/A
Mouse	Logitech	M-U0026	1304HS02AX68	N/A
Keyboard	Lenovo	KU-0225	54Y9400	N/A
Switch	Netgear	GS108T	29SA3C5T00E79	DoC
SD card	Kingstone	N/A	N/A	DoC
4K TV	Sony	XBR-49X850B	N/A	N/A

I/O CABLES

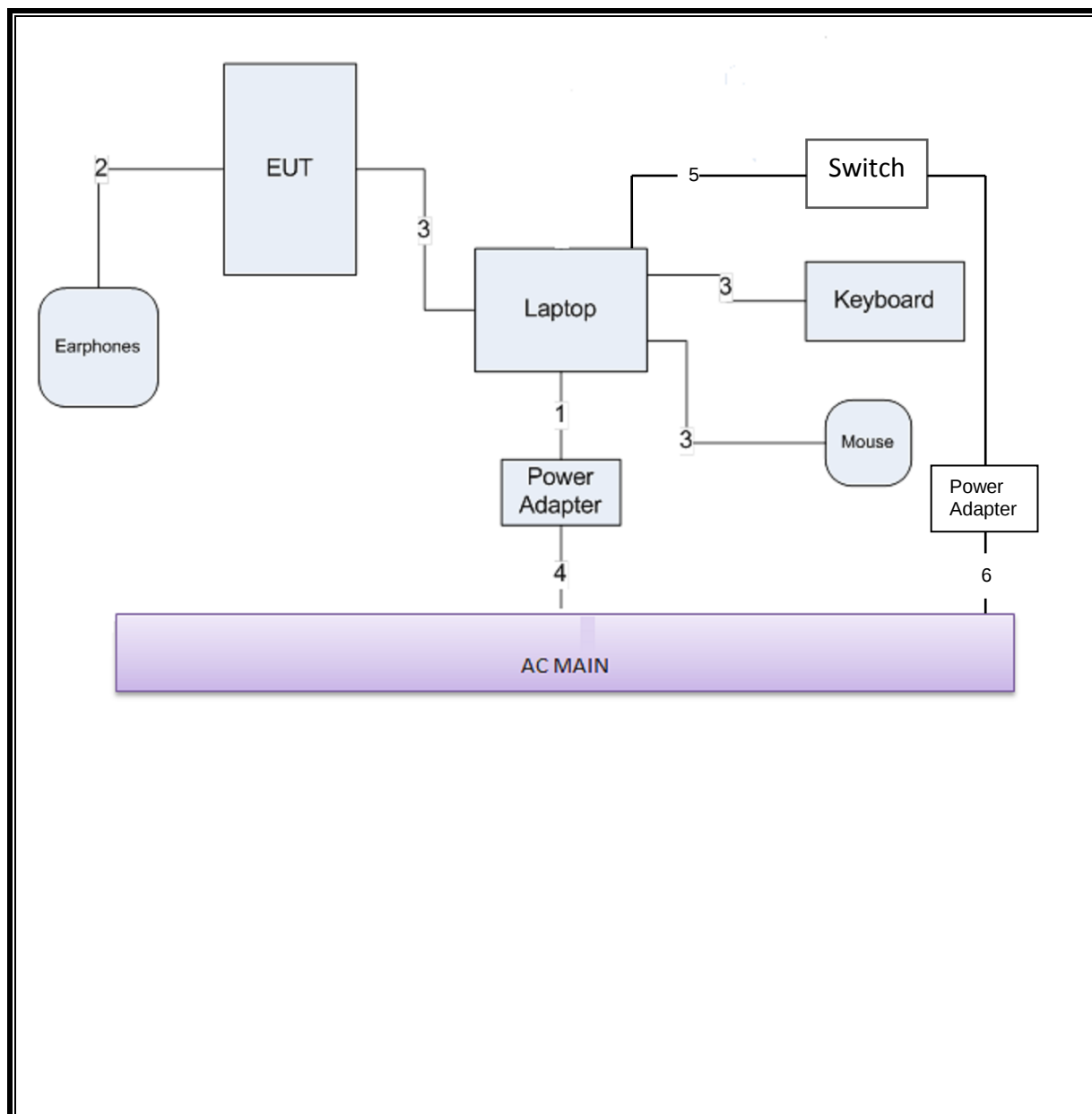
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Power	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A
3	USB	1	Mini-USB	Shielded	2m	N/A
4	AC Power	1	IEC	Unshielded	1m	N/A
5	Ethernet	1	RJ45	Unshielded	2m	N/A
6	MHL HDMI	1	MHL HDMI	Unshielded	3m	N/A

TEST SETUP

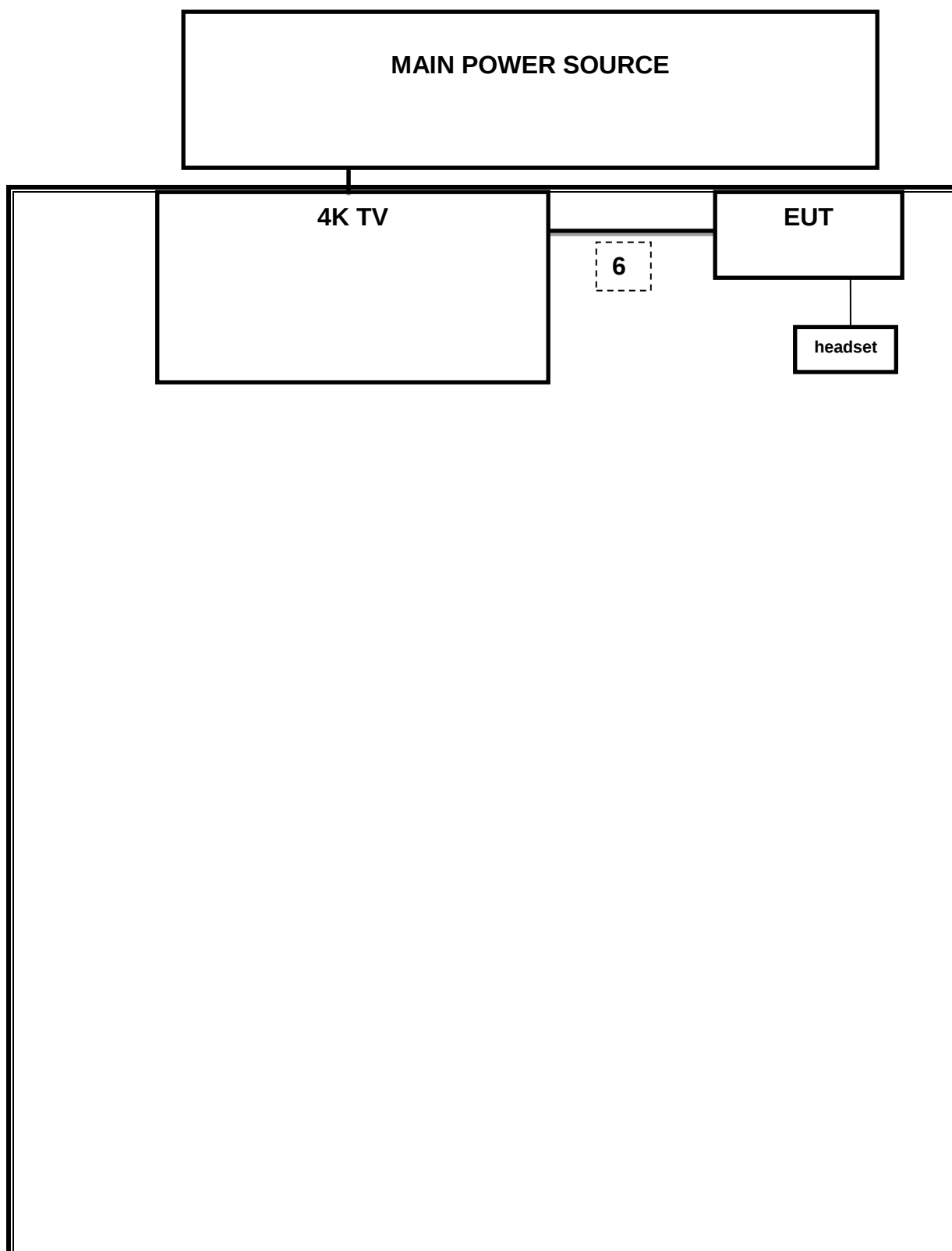
The EUT is installed in a typical configuration. Test software exercised the EUT.

TEST SETUP DIAGRAM

Configuration #1



Configuration #2



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	S/N	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
Pre-amplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
Antenna, Bilog, 30MHz-1GHz	Sunol Sciences	JB1	A0022704	08/14/15
Pre-amplifier, 26.5 GHz	Agilent/HP	8449B	3008A00931	10/22/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15
EMI Test Receiver, 30 MHz	R&S	ESHS 20	827129/006	08/08/15
LISN, 30 MHz	FCC	50/250-25-2	114	01/16/16
LISN, 10 kHz-30MHz	Solar	8012-50-R-24-BNC	837990	C.N.R

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2009

The highest clock frequency generated or used in the EUT is 1.0GHz therefore the frequency range was investigated from 30 MHz to 18 GHz.

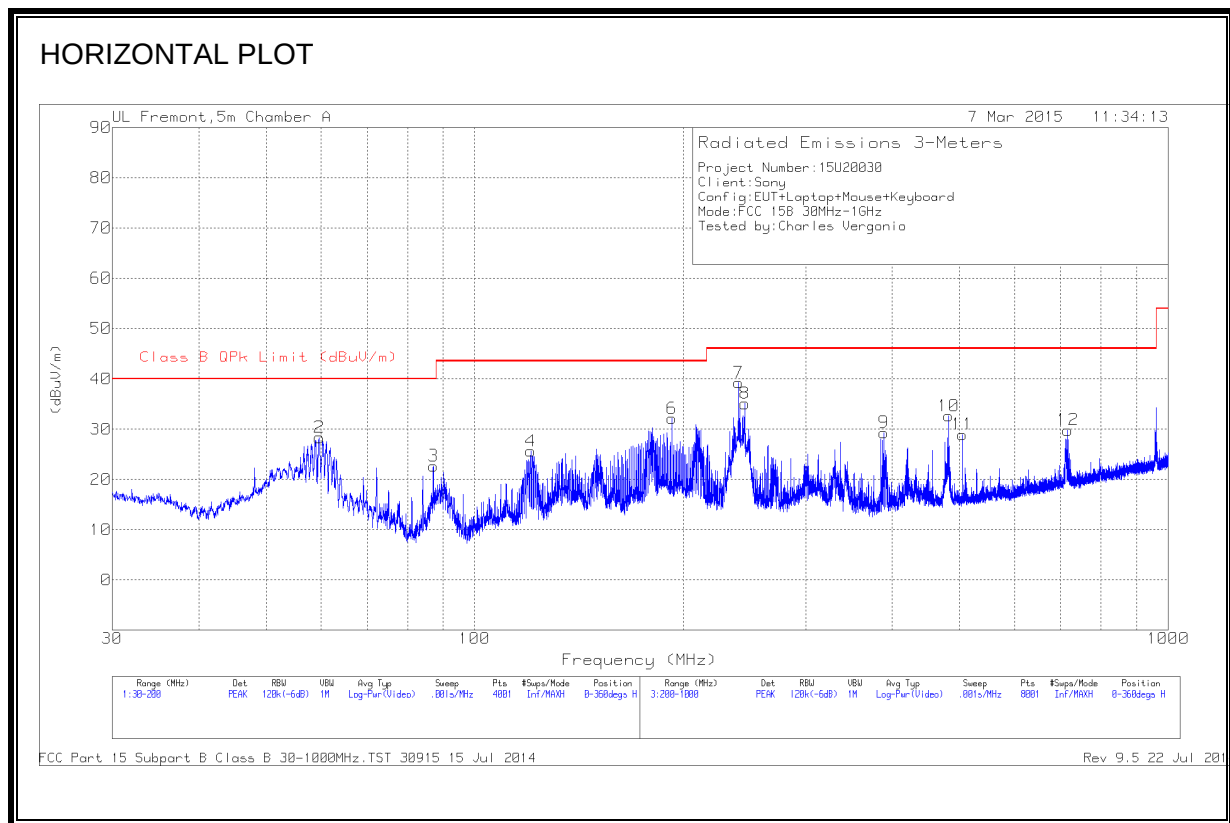
LIMIT

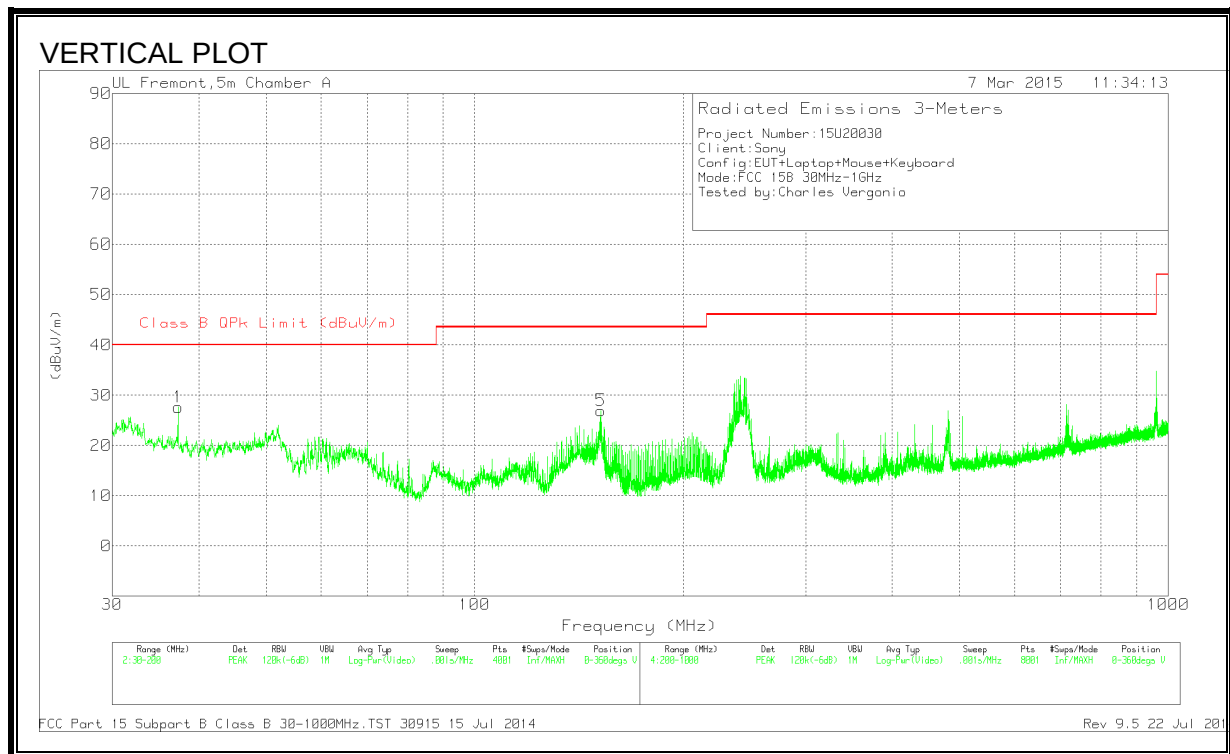
§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

RESULTS

RADIATED EMISSIONS 30 TO 1000 MHz (LAPTOP CONFIGURATION)



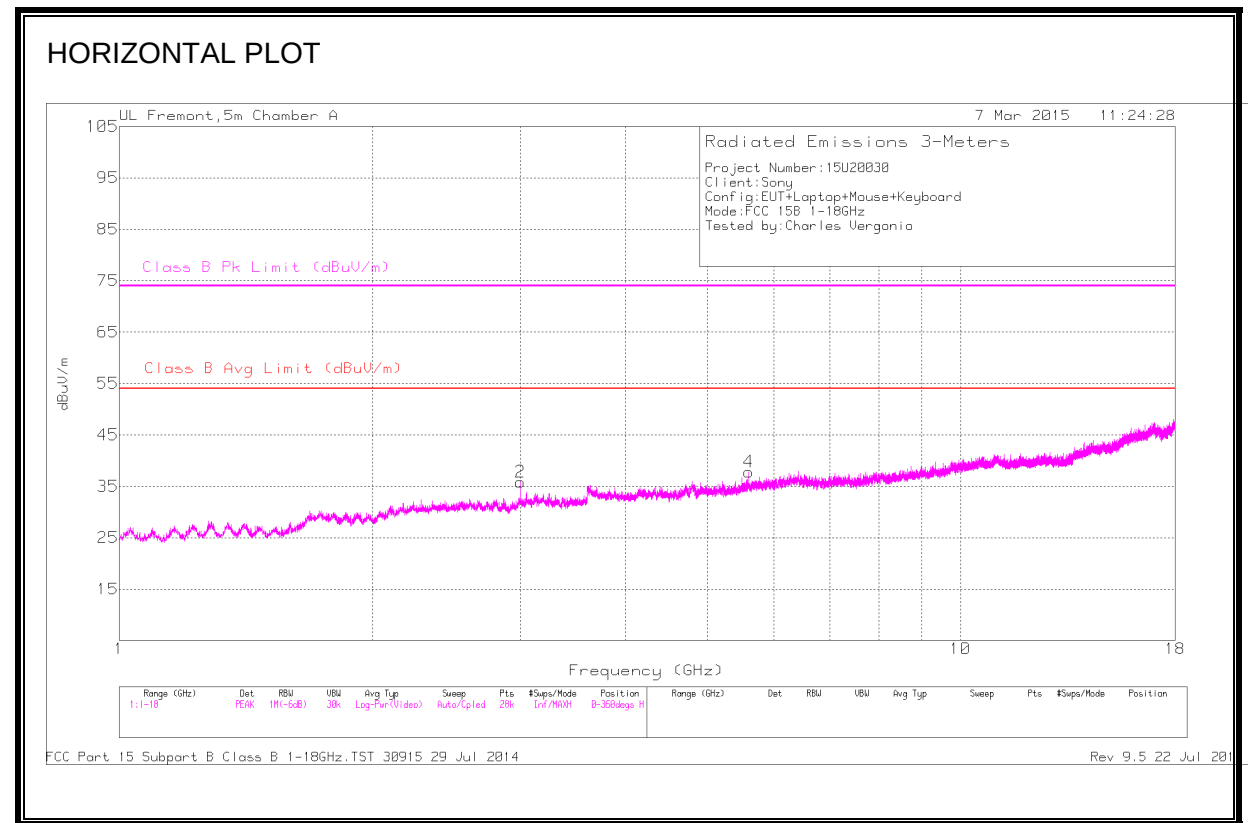


HORIZONTAL AND VERTICAL DATA

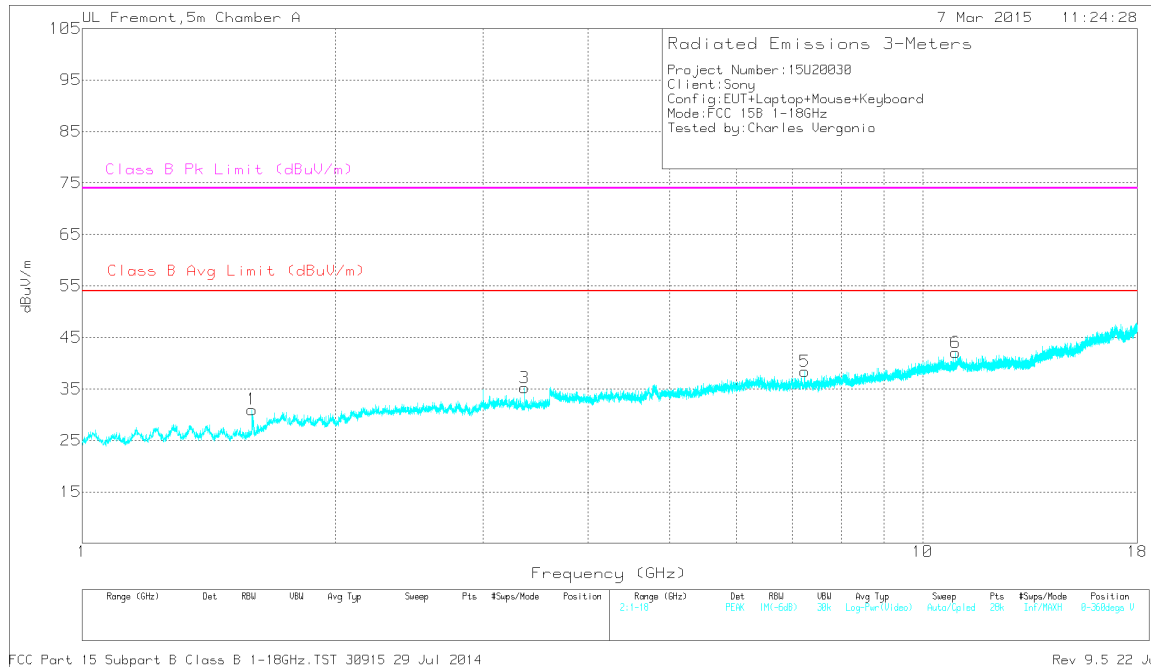
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	37.3525	42.61	PK	16.1	-31.1	27.61	40	-12.39	0-360	101	V
2	59.7075	51.64	PK	7.6	-30.9	28.34	40	-11.66	0-360	300	H
3	87.1625	45.97	PK	7.4	-30.7	22.67	40	-17.33	0-360	200	H
4	120.44	42.12	PK	13.9	-30.4	25.62	43.52	-17.9	0-360	300	H
5	152.1025	44.63	PK	12.5	-30.2	26.93	43.52	-16.59	0-360	101	V
6	192.4775	50.31	PK	11.8	-30	32.11	43.52	-11.41	0-360	101	H
7	240.1	57.43	PK	11.5	-29.7	39.23	46.02	-6.79	0-360	101	H
8	245.3	53.3	PK	11.5	-29.7	35.1	46.02	-10.92	0-360	101	H
9	389.3	43.51	PK	14.9	-29.1	29.31	46.02	-16.71	0-360	300	H
10	482.5	43.64	PK	17.7	-28.7	32.64	46.02	-13.38	0-360	200	H
11	505.3	39.96	PK	17.6	-28.6	28.96	46.02	-17.06	0-360	200	H
12	716.5	37.93	PK	20.2	-28.3	29.83	46.02	-16.19	0-360	101	H

PK - Peak detector

RADIATED EMISSIONS 1GHz to 18GHz (WORST-CASE CONFIGURATION)



VERTICAL PLOT



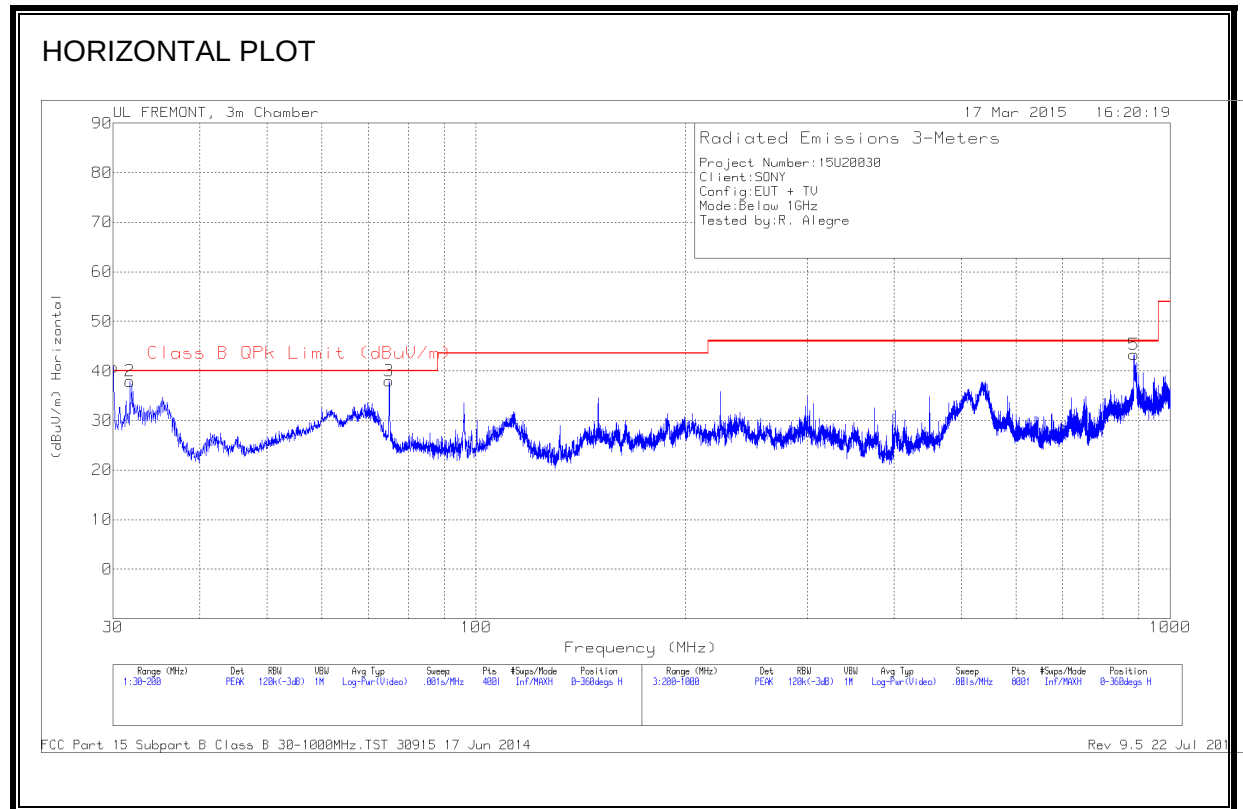
HORIZONTAL AND VERTICAL DATA

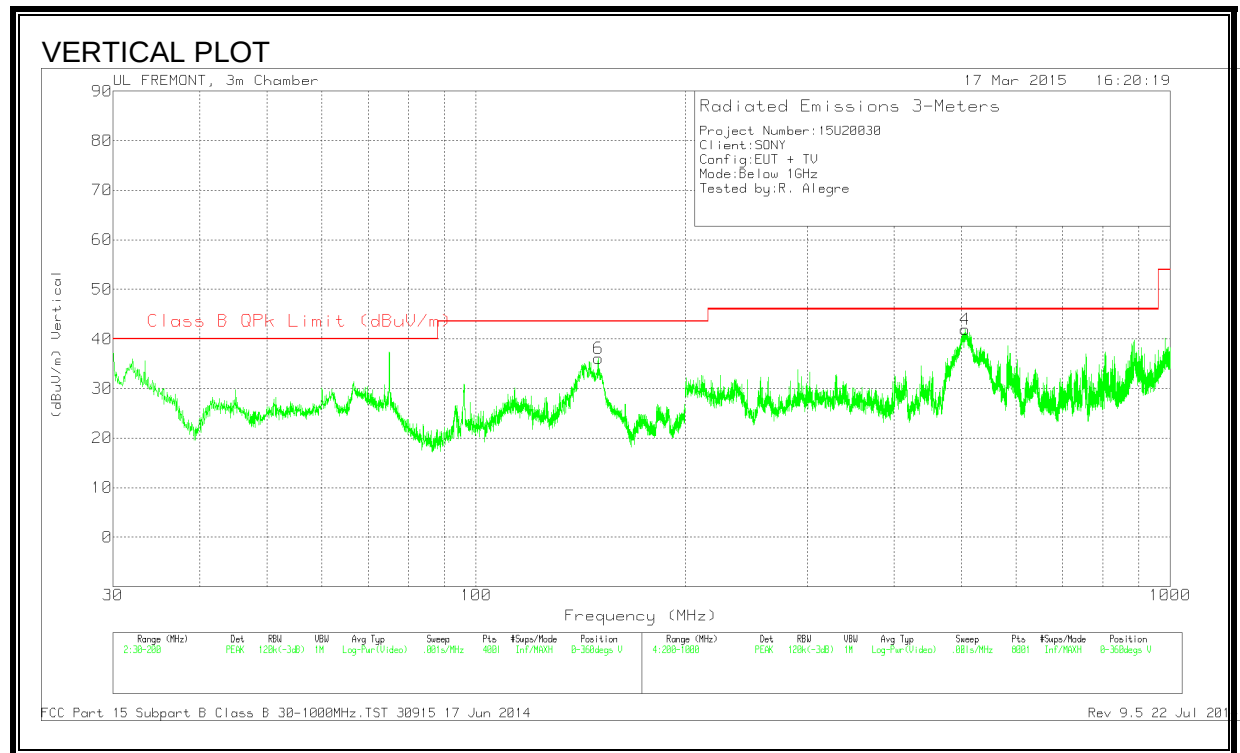
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR) Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.593	36.8	PK	27.7	-33.5	31	-	-	74	-43	0-360	201	V
2	3	34.24	PK	32.7	-31.1	35.84	-	-	74	-38.16	0-360	100	H
3	3.36	33.31	PK	32.7	-30.8	35.21	-	-	74	-38.79	0-360	100	V
4	5.6	31.81	PK	34.9	-28.9	37.81	-	-	74	-36.19	0-360	100	H
5	7.237	29.29	PK	35.6	-26.5	38.39	-	-	74	-35.61	0-360	201	V
6	10.949	26.14	PK	38.3	-22.4	42.04	-	-	74	-31.96	0-360	201	V

PK - Peak detector

RADIATED EMISSIONS 30 TO 1000 MHz (4K TV CONFIGURATION)





HORIZONTAL AND VERTICAL DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.0425	46.5	PK	21.8	-27.5	40.8	40	.8	0-360	100	H
2	31.7	44.83	PK	20.6	-27.5	37.93	40	-2.07	0-360	100	H
3	75.0075	56.64	PK	8.4	-27	38.04	40	-1.96	0-360	300	H
6	149.9775	50.26	PK	12.1	-26.3	36.06	43.52	-7.46	0-360	100	V
4	506.1	49.88	PK	17.8	-25.8	41.88	46.02	-4.14	0-360	100	V
5	886.7	45.31	PK	22	-24	43.31	46.02	-2.71	0-360	100	H

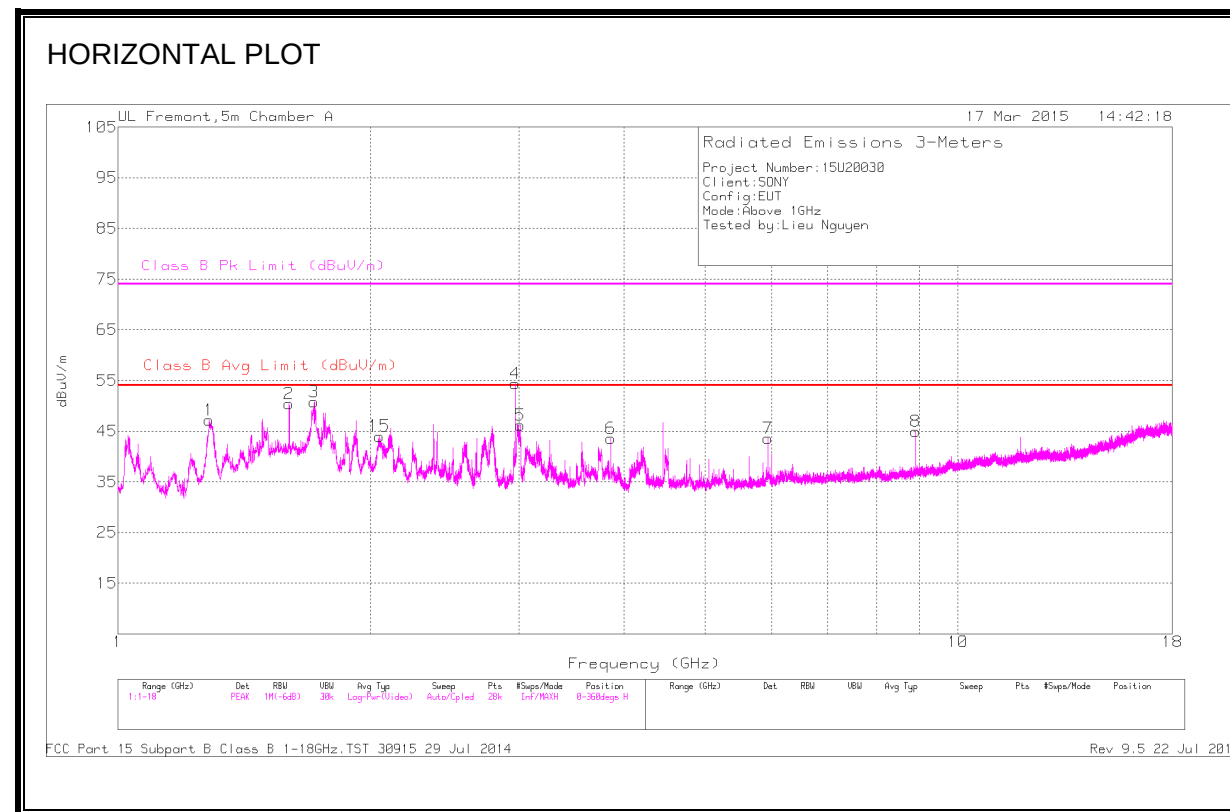
PK - Peak detector

Radiated Emissions

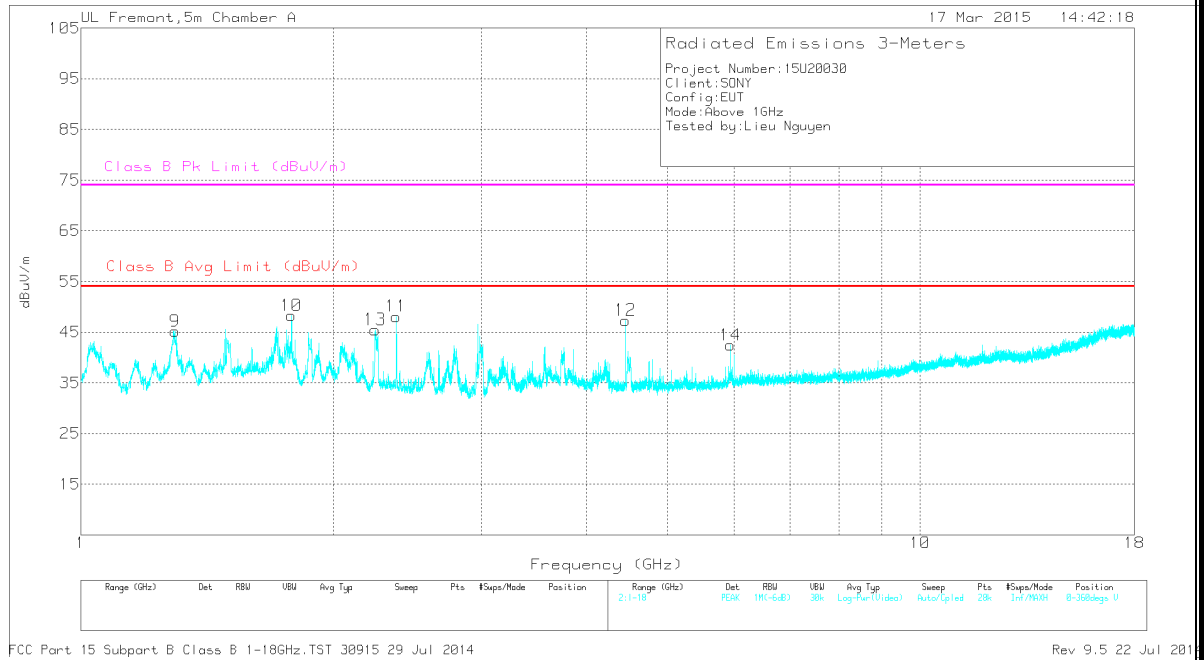
Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
30.0052	36.53	QP	21.8	-27.5	30.83	40	-9.17	76	253	H
886.6329	40.76	QP	22	-24	38.76	46.02	-7.26	146	100	H

QP - Quasi-Peak detector

RADIATED EMISSIONS 1GHz to 18GHz (4K TV CONFIGURATION)



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR) Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.284	52.52	PK	28.7	-34	47.22	-	-	74	-26.78	0-360	100	H
9	1.295	50.29	PK	28.8	-33.9	45.19	-	-	74	-28.81	0-360	201	V
2	1.599	55.9	PK	27.9	-33.4	50.4	-	-	74	-23.6	0-360	100	H
3	1.711	55.23	PK	28.8	-33.2	50.83	-	-	74	-23.17	0-360	100	H
10	1.782	51.55	PK	29.7	-33	48.25	-	-	74	-25.75	0-360	201	V
15	2.047	45.41	PK	31.3	-32.7	44.01	-	-	74	-29.99	0-360	100	H
13	2.241	46.4	PK	31.5	-32.4	45.5	-	-	74	-28.5	0-360	201	V
11	2.376	48.31	PK	31.9	-32.1	48.11	-	-	74	-25.89	0-360	100	V
4	2.97	53.07	PK	32.8	-31.5	54.37	-	-	74	-19.63	0-360	201	H
5	3.011	44.23	PK	32.9	-31	46.13	-	-	74	-27.87	0-360	100	H
6	3.861	40.19	PK	33.4	-30	43.59	-	-	74	-30.41	0-360	201	H
12	4.454	43.36	PK	33.8	-29.8	47.36	-	-	74	-26.64	0-360	100	V
7	5.94	36.21	PK	35.3	-27.9	43.61	-	-	74	-30.39	0-360	100	H
14	5.94	35.06	PK	35.3	-27.9	42.46	-	-	74	-31.54	0-360	100	V
8	8.91	33.98	PK	36.1	-25.1	44.98	-	-	74	-29.02	0-360	100	H

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CISPR) Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.97	47.01	Av	32.8	-31.5	48.31	54	-5.69	74	-25.69	332	202	H

QP - Quasi-Peak detector

Av - average detection

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2009

LIMIT

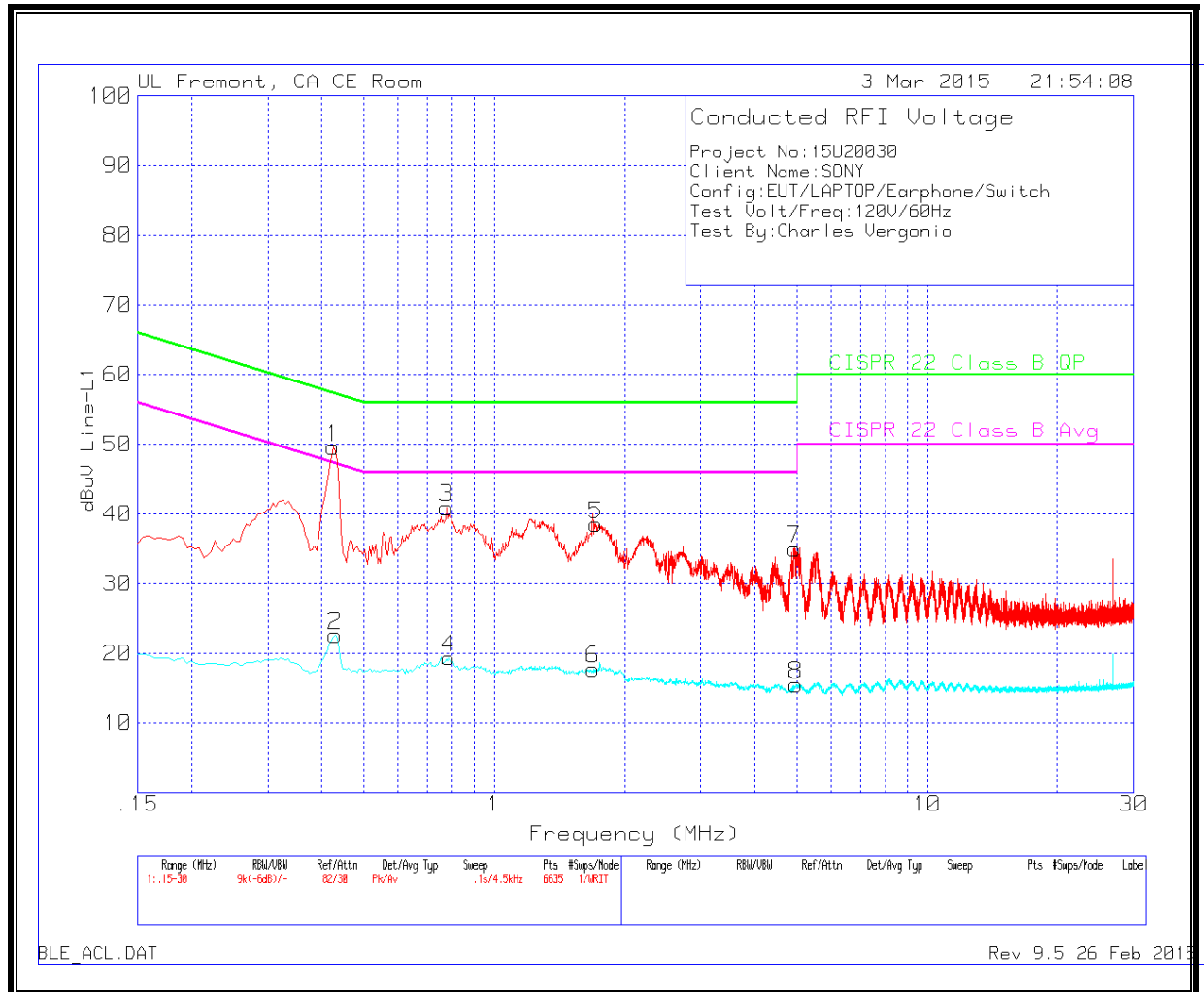
§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

RESULTS

6 WORST EMISSIONS

Line-L1 .15 - 30MHz



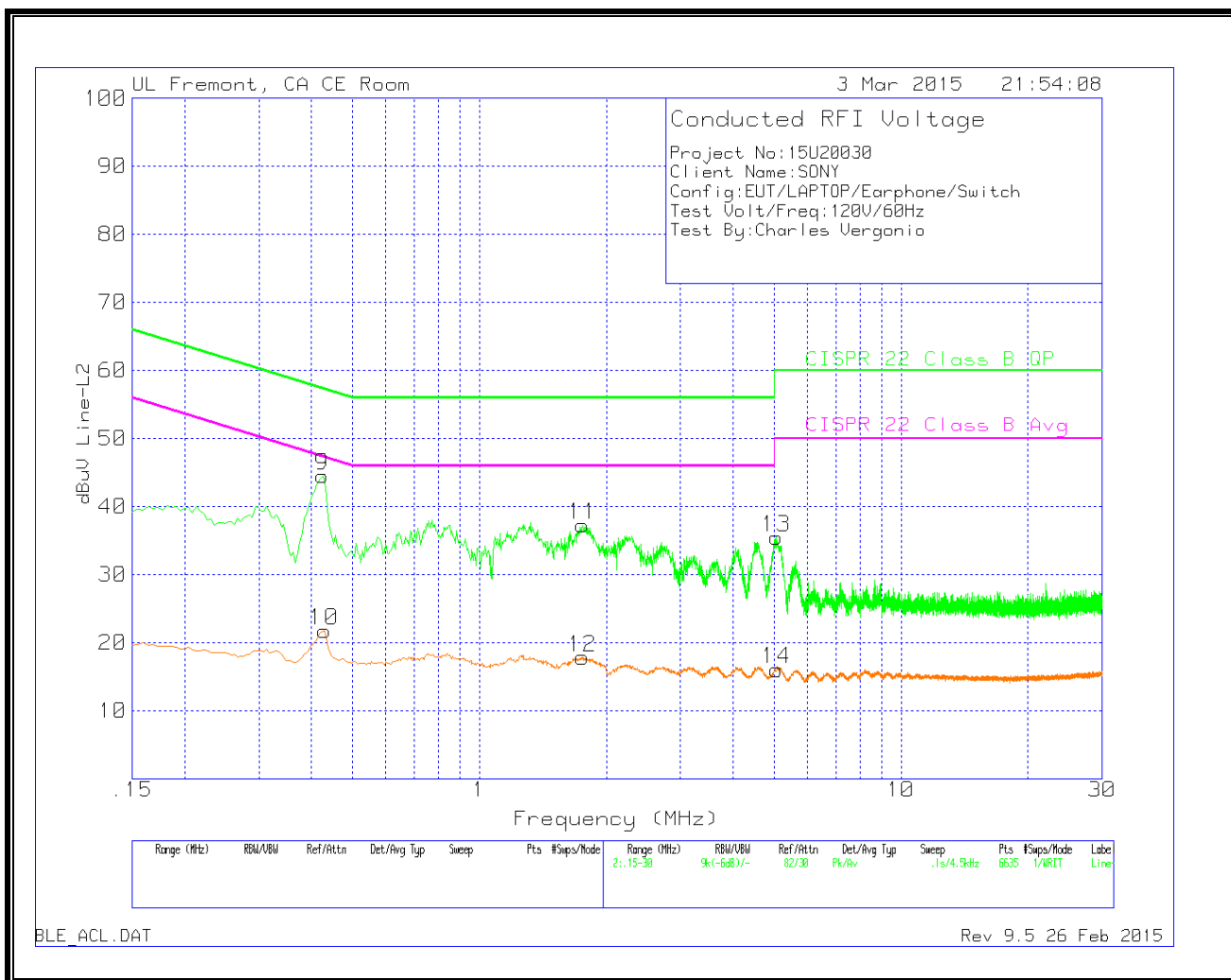
LINE 1 RESULTS

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	QP Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.4245	49.2	Pk	.4	0	49.6	-	-	-	-
2	.429	22.21	Av	.4	0	22.61	-	-	47.27	-24.66
3	.7755	40.63	Pk	.3	0	40.93	-	-	-	-
4	.7845	19.06	Av	.3	0	19.36	-	-	46	-26.64
5	1.716	38.24	Pk	.2	.1	38.54	-	-	-	-
6	1.6935	17.46	Av	.2	.1	17.76	-	-	46	-28.24
7	4.947	34.71	Pk	.2	.1	35.01	-	-	-	-
8	4.9785	15.21	Av	.2	.1	15.51	-	-	46	-30.49

Line-L2 .15 - 30MHz



LINE 2 RESULTS

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	QP Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
9	.4245	44.12	Pk	.4	0	44.52	-	-	-	-
10	.429	21.35	Av	.4	0	21.75	-	-	47.27	-25.52
11	1.7565	37	Pk	.2	.1	37.3	-	-	-	-
12	1.7565	17.55	Av	.2	.1	17.85	-	-	46	-28.15
13	5.0595	35.18	Pk	.2	.1	35.48	-	-	-	-
14	5.0685	15.76	Av	.2	.1	16.06	-	-	50	-33.94