FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

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

FCC ID: PY7TM-0050

REPORT NUMBER: 14U17933-E7

ISSUE DATE: AUGUST 19, 2014

Prepared for
SONY MOBILE COMMUNICATIONS, INC.
NYA VATTENTORNET MOBILVAGEN 10
LUND 22188
SWEDEN

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
--	8/19/14	Initial Issue	P. Zhang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SONY MOBILE COMMUNICATIONS, INC.
EUT DESCRIPTION:	GSM/WCDMA/LTE Tablet + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ & NFC
SERIAL NUMBER:	CB5A20BJUL
DATE TESTED:	August 11-19, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 ISSUE 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:

PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.

Tested By:

ROLLY ALEGRE
CONSUMER TECHNOLOGY DIVISION
EMC ENGINEER
UL Verification Services Inc.

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

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

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

4.3. MEASUREMENT UNCERTAINTY

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

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

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

5.2. MAXIMUM OUTPUT POWER

The testing was performed at 1 meter. The transmitter maximum E-field at 30m distance is 14.61 dBuV/m which convert from the 1 meter data.

5.3. WORST-CASE CONFIGURATION AND MODE

The NFC function was tested at its' fundamental and only operational frequency of 13.56 MHz. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the Z-orientation was the worst-case orientation; therefore all final radiated testing was performed with the EUT in the Z-orientation while generating continuous emissions.

5.4. MODIFICATIONS

No modifications were made during testing.

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5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Radiated Emissions Above 30 MHz, AC Line Conducted Emissions and Frequency Stability:

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Sony	EP880	3514W01 S08489 SEM 060	DoC
Earphone	Sony	MH410c	14071EB60060A84	DoC
MHL cable	Sony	N/A	N/A	N/A

I/O CABLES

Radiated Emissions above 30 MHz, AC Line Conducted Emissions :

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
1	USB	1	Mini-USB	Shielded	2m	HDMI cable

TEST SETUP

The EUT is a stand-alone device configured and tested in a worst-case setup.

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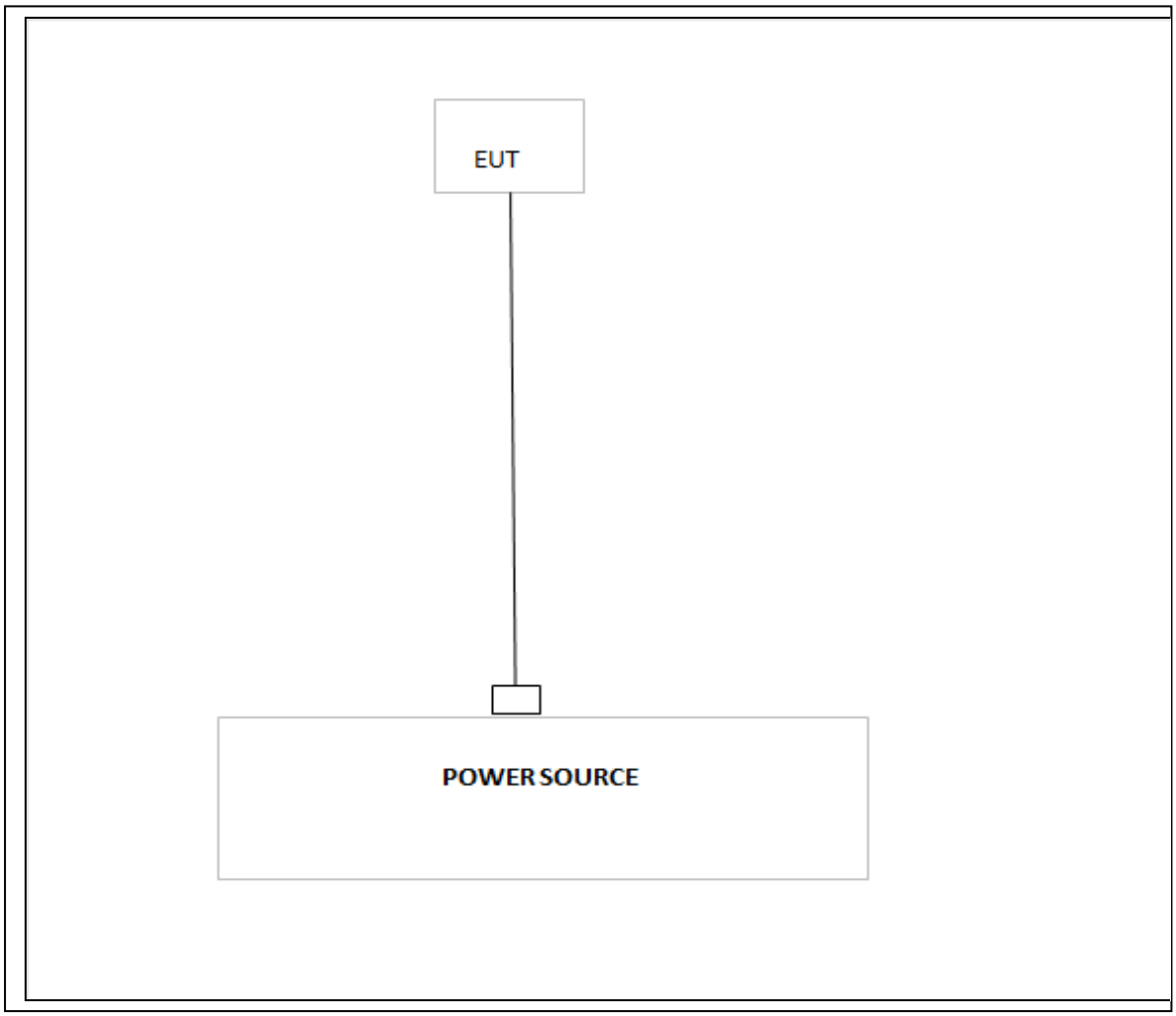
SETUP DIAGRAM FOR TESTS

Radiated Emissions Below 30 MHz:



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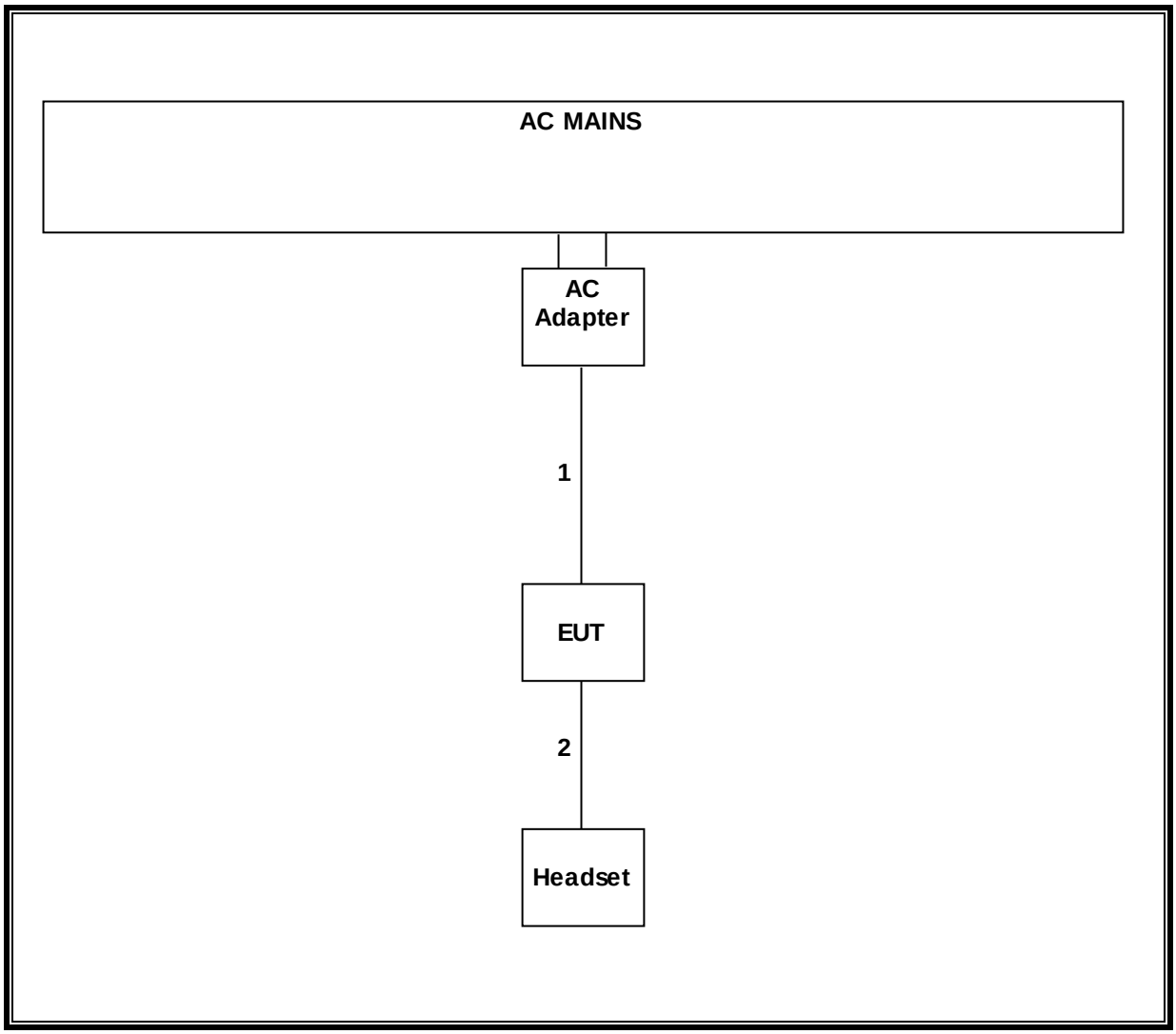
Radiated Emissions Above 30 MHz, AC Line Conducted Emissions :



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
ESA-E Spectrum Analyzer, 9kHz-26.5 GHz	Agilent / HP	E4407B	C01098	04/04/15
Antenna, Loop, 30 MHz	EMCO	6502	C00593	02/20/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/15
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/21/15
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
DMM	Fluke	77-11	N02303	10/31/14
Digital Thermometer	Tektronix	DTM920	None	10/21/14
Temperature Chamber	CSZ	2PHS-8-3	T267	03/04/15

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7. OCCUPIED BANDWIDTH

RULE PART(S)

IC RSS 210 Issue 8

LIMITS

For reporting purposes only

RESULTS

Channel	Frequency (KHz)	99% Bandwidth (KHz)
Low	13.56	21.541

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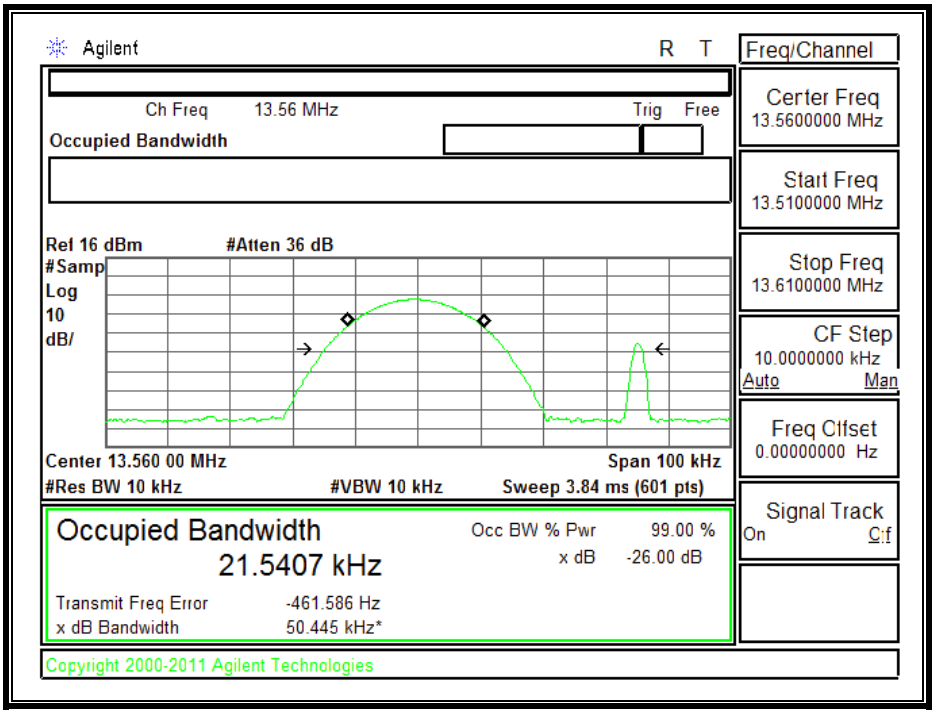

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8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225
IC RSS-210, Annex 2, Section A2.6 (Transmitter)
IC RSS-GEN, Section 6 (Receiver)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:
§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.
§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

TEST PROCEDURE

ANSI C63.4-2009

The EUT is an intentional radiator that incorporates a digital device. The highest fundamental frequency generated or used in the device is 13.56 MHz. The frequency range was investigated from 0.15 MHz to the 10^{th} harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

RESULTS

No non-compliance noted:

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8.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

FCC Part 15, Subpart B & C **1 Meter Distance Measurement At Open Field**

Company: SONY
Project #: 14U17933
Model #: NFC
Tester: R. Alegre/Jude S.
Date: 8/15/14

Frequency (MHz)	PK (dBu/V)	QP (dBu/V)	AV (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
Loop Antenna Face on: Z position worst												
13.56	63.14		N/A	10.56	-59.08	14.61	N/A	84.00	N/A	-69.4	N/A	Fundamental @ 1m Dist
13.55	50.15		N/A	10.56	-59.08	1.62	N/A	50.48	N/A	-48.9	N/A	13.41MHz-13.553MHz
13.57	50.84		N/A	10.56	-59.08	2.31	N/A	50.48	N/A	-48.2	N/A	13.567MHz-13.71MHz
13.24	42.97		N/A	10.52	-59.08	-5.59	N/A	40.51	N/A	-46.1	N/A	13.110-13.410MHz
13.90	42.65		N/A	10.52	-59.08	-5.59	N/A	40.51	N/A	-46.1	N/A	13.71-14.01MHz
1.69	47.73		N/A	10.27	-59.08	-1.09	N/A	29.54	N/A	-30.6	N/A	9k-13.11MHz
21.89	44.06		N/A	9.922	-59.08	-5.10	N/A	29.54	N/A	-34.6	N/A	14.01MHz-30MHz
Loop Antenna Face off: z position												
13.56	53.55		N/A	10.56	-59.08	5.02	N/A	84.00	N/A	-79.0	N/A	Fundamental @ 1m Dist
13.55	48.53		N/A	10.56	-59.08	0.00	N/A	50.48	N/A	-50.5	N/A	13.41MHz-13.553MHz
13.57	46.55		N/A	10.56	-59.08	-1.98	N/A	50.48	N/A	-52.5	N/A	13.567MHz-13.71MHz
13.24	42.04		N/A	10.52	-59.08	-6.52	N/A	40.51	N/A	-47.0	N/A	13.110-13.410MHz
13.90	42.33		N/A	10.59	-59.08	-6.16	N/A	40.51	N/A	-46.7	N/A	13.71-14.01MHz
1.69	44.51		N/A	10.27	-59.08	-4.31	N/A	29.54	N/A	-33.8	N/A	9k-13.11MHz
21.89	42.71		N/A	9.922	-59.08	-6.45	N/A	29.54	N/A	-36.0	N/A	14.01MHz-30MHz

* No more emissions were found up to 30MHz

Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

P.K. = Peak
Q.P. = Quasi Peak Reading
A.F. = Antenna factor

Rev. 10.23.09

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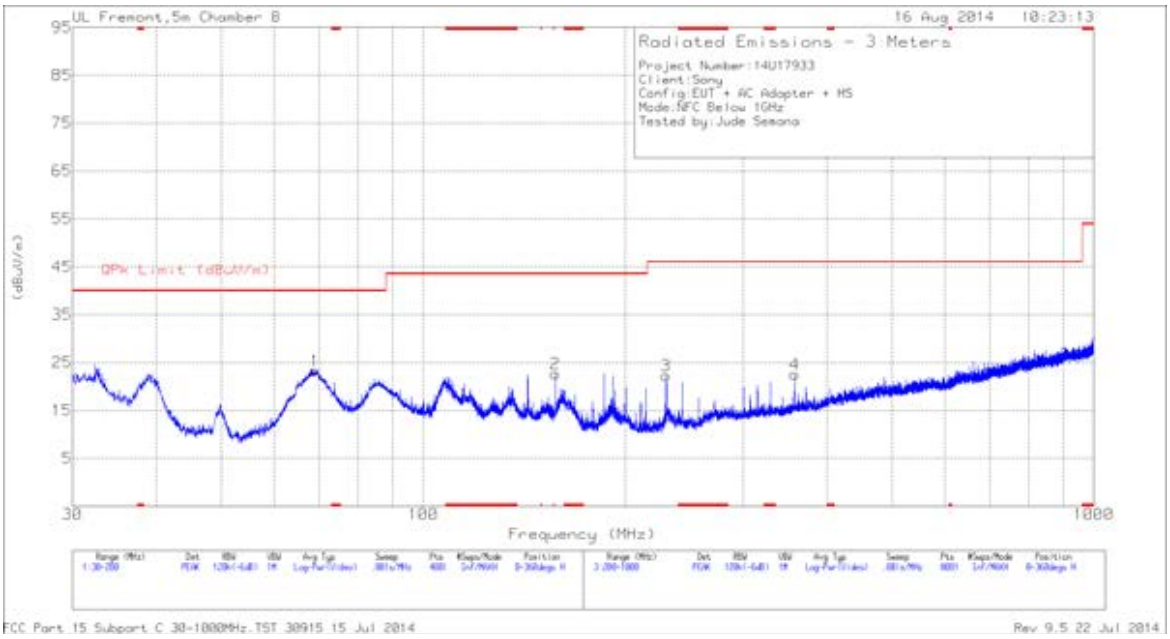
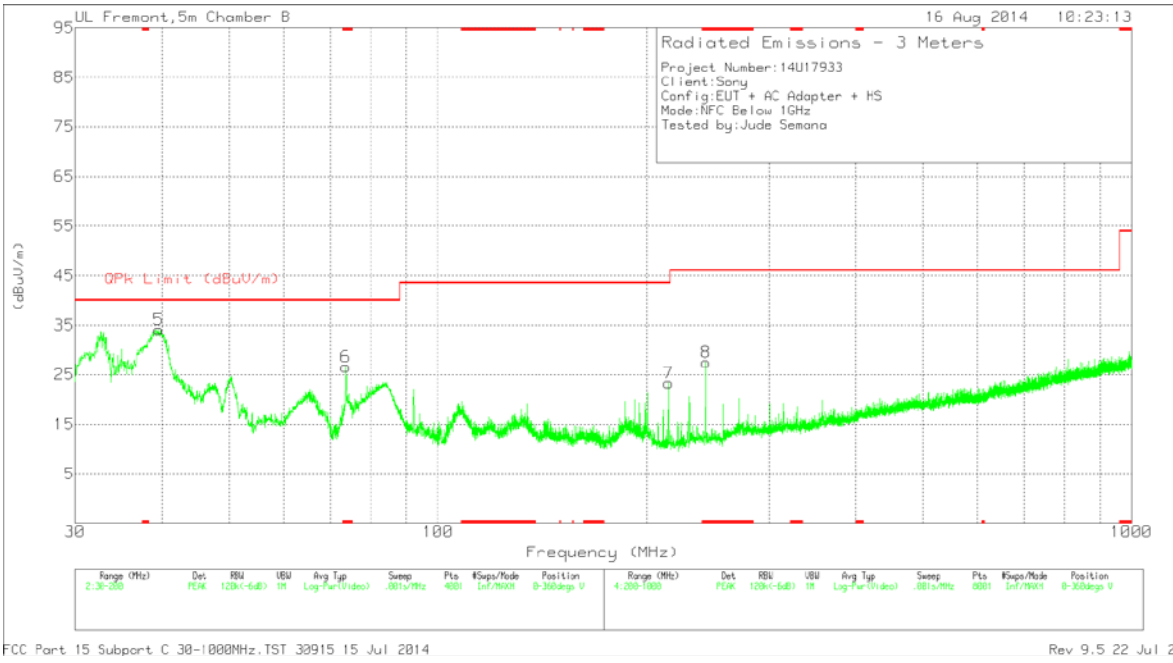
8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz

EMI PLOT





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Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 73.7325	46.81	PK	8.1	-28.3	26.61	40	-13.39	0-360	101	V
8	* 243.4	42.24	PK	11.7	-26.4	27.54	46.02	-18.48	0-360	200	V
5	39.5625	48.5	PK	14.3	-28.7	34.1	40	-5.9	0-360	101	V
1	68.93	43.46	PK	8.1	-28.3	23.26	40	-16.74	0-360	200	H
2	157.5	37.89	PK	12.2	-27.4	22.69	43.52	-20.83	0-360	101	H
7	214.8	39.53	PK	10.6	-26.8	23.33	43.52	-20.19	0-360	200	V
3	230.4	37.79	PK	11.1	-26.6	22.29	46.02	-23.73	0-360	101	H
4	358	33.77	PK	14.6	-25.8	22.57	46.02	-23.45	0-360	200	H

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

PK - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014

Rev 9.5 22 Jul 2014

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9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207
IC RSS-GEN, Section 7.2.2

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 50µH/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 (dBµV)	
	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.		

TEST PROCEDURE

ANSI C63.4-2009

RESULTS

No non-compliance noted:

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6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.15	36.39	PK	1.4	0	37.79	66	-28.21	-	-
2	.15	18.43	Av	1.4	0	19.83	-	-	56	-36.17
3	.159	35.94	PK	1.3	0	37.24	65.5	-28.26	-	-
4	.159	14.29	Av	1.3	0	15.59	-	-	55.5	-39.91
5	.4785	32.04	PK	.4	0	32.44	56.4	-23.96	-	-
6	.4785	24.05	Av	.4	0	24.45	-	-	46.4	-21.95
7	.6135	42.74	PK	.3	0	43.04	56	-12.96	-	-
8	.6135	26.22	Av	.3	0	26.52	-	-	46	-19.48
9	13.56	48.42	PK	.2	.2	48.82	60	-11.18	-	-
10	13.56	19.16	Av	.2	.2	19.56	-	-	50	-30.44
11	16.8765	35.61	PK	.3	.2	36.11	60	-23.89	-	-
12	16.8765	22.73	Av	.3	.2	23.23	-	-	50	-26.77

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Line-L2 .15 - 30MHz

Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
21	.15	35.75	PK	1.5	0	37.25	66	-28.75	-	-
22	.15	18.09	Av	1.5	0	19.59	-	-	56	-36.41
23	.159	35.33	PK	1.4	0	36.73	65.5	-28.77	-	-
24	.159	13.08	Av	1.4	0	14.48	-	-	55.5	-41.02
19	.4785	29.99	PK	.4	0	30.39	56.4	-26.01	-	-
20	.4785	23.1	Av	.4	0	23.5	-	-	46.4	-22.9
17	.933	30.2	PK	.3	0	30.5	56	-25.5	-	-
18	.933	19.65	Av	.3	0	19.95	-	-	46	-26.05
15	13.5645	52.24	PK	.3	.2	52.74	60	-7.26	-	-
16	13.5645	27.39	Av	.3	.2	27.89	-	-	50	-22.11
13	25.3725	36.24	PK	.3	.3	36.84	60	-23.16	-	-
14	25.3725	13.98	Av	.3	.3	14.58	-	-	50	-35.42

PK - Peak detector

Av - average detection

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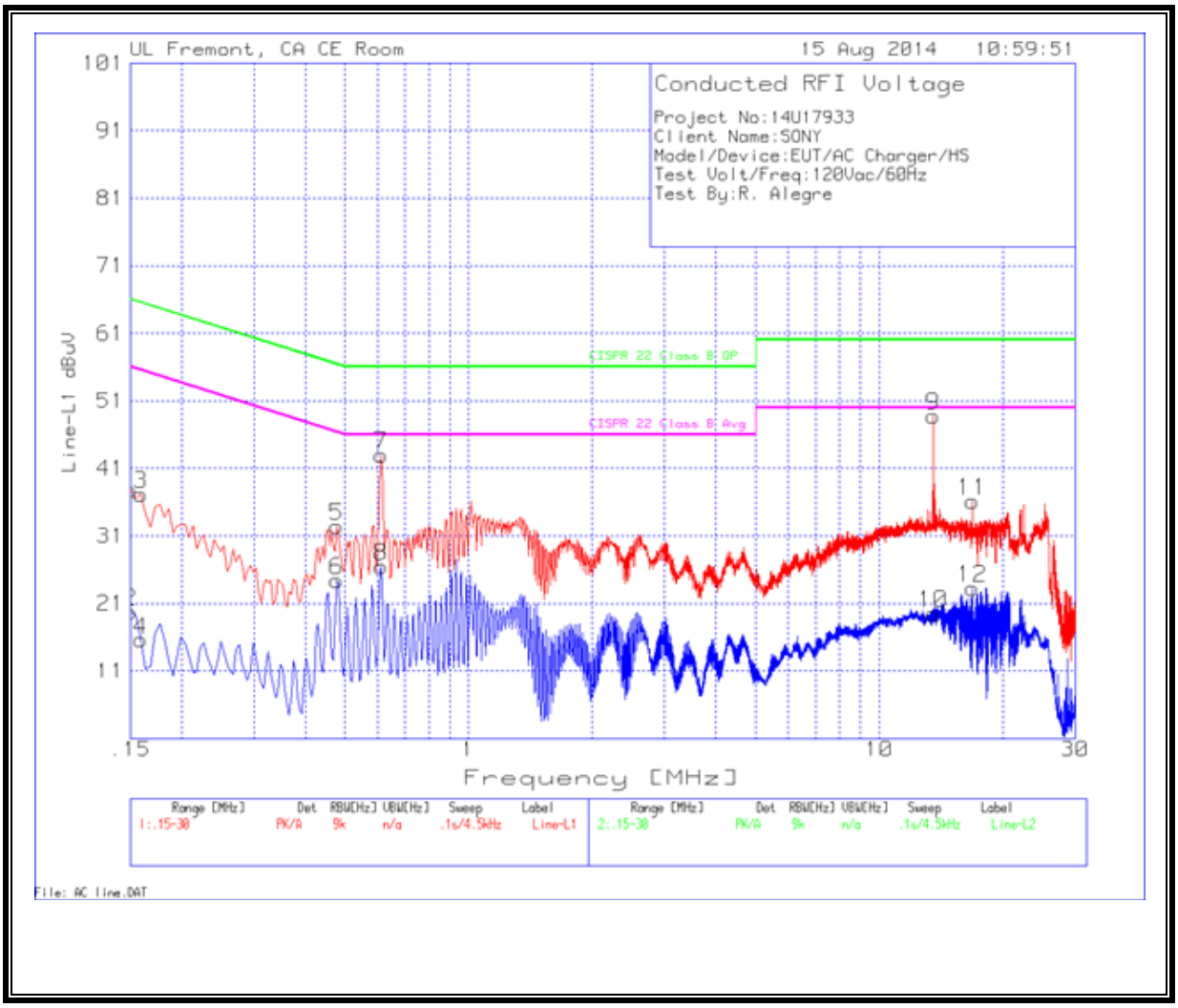
LINE 1 RESULTS



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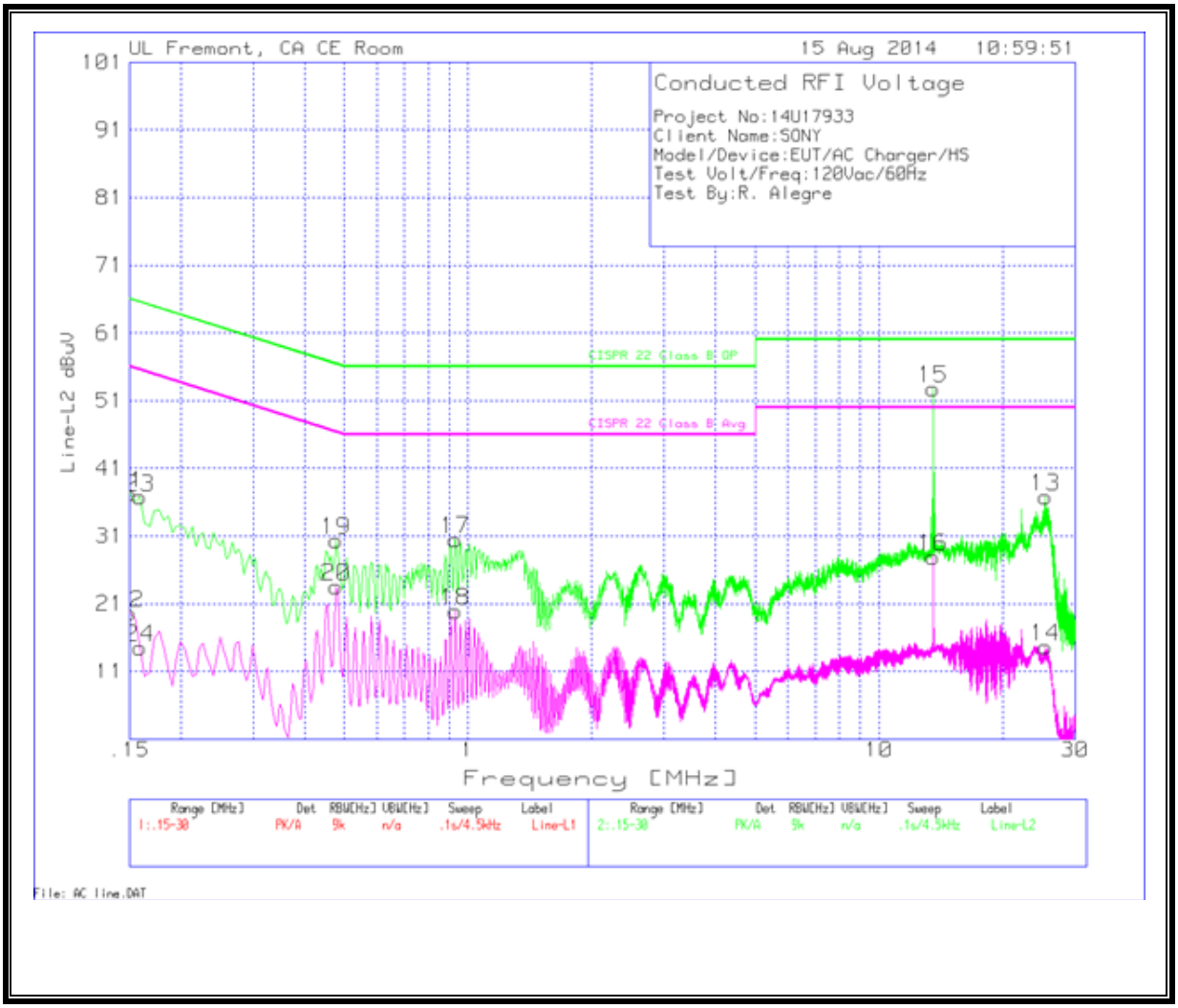
LINE 2 RESULTS



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10. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

ANSI C63.4 Section 13

RESULTS

Reference Frequency: EUT Channel 13.560000 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5597500	32.079	± 100
3.80	40	13.5596500	39.454	± 100
3.80	30	13.5601250	4.425	± 100
3.80	***20***	***13.5601850***	***0.000***	***± 100***
3.80	10	13.5602300	-3.319	± 100
3.80	0	13.5603100	-9.218	± 100
3.80	-10	13.5603700	-13.643	± 100
3.80	-20	13.5604300	-18.068	± 100
3.80	-30	13.5606600	-35.029	± 100
3.42	20	13.5602620	-5.678	± 100
4.18	20	13.5604110	-16.666	± 100

No non-compliance noted.

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