FCC CFR47 PART 15 SUBPART C

ANT+
CERTIFICATION TEST REPORT

FOR

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

FCC ID: PY7PM-0813

REPORT NUMBER: 14U17919-6 REVISION C

ISSUE DATE: APRIL 09, 2015

Prepared for
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NVLAP LAB CODE 100255-0

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/18/14	Initial Issue	D. Coronia
A	8/6/14	Updated statement	P. Zhang
B	4/6/15	Updated Fundamental Result	CHOON OOI
C	4/9/15	Updated Section 5.2	CHOON OOI

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.

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

SERIAL NUMBER: 1906287

DATE TESTED: JULY 3 – JULY 11, 2014

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 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.

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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, 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.

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.

The test sites and measurement facilities used to collect data are located at 1285 Walt Whitman Rd. Melville, NY 11747, USA.

UL Melville is accredited by NVLAP, Laboratory Code 100255-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/1002550.htm.

All antenna port conducted tests and AC line conducted emissions were performed at the UL-Fremont locations. All radiated testing was performed at the UL-Melville facility.

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 18000 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 Phone + Bluetooth, DTS/UNII a/b/g/n/ac, ANT+ & NFC.

5.2. MAXIMUM OUTPUT FUNDAMENTAL FIELD STRENGTH

The ANT+ mode has maximum output fundamental field strength as follows:

Frequency Range (MHz)	Mode	Peak E-field Strength (dBuV/m)	Avg E-field Strength (dBuV/m)	Distance (m)
2403 - 2480	ANT +	93.76	93.56	3.00

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.4 dBi.

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

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

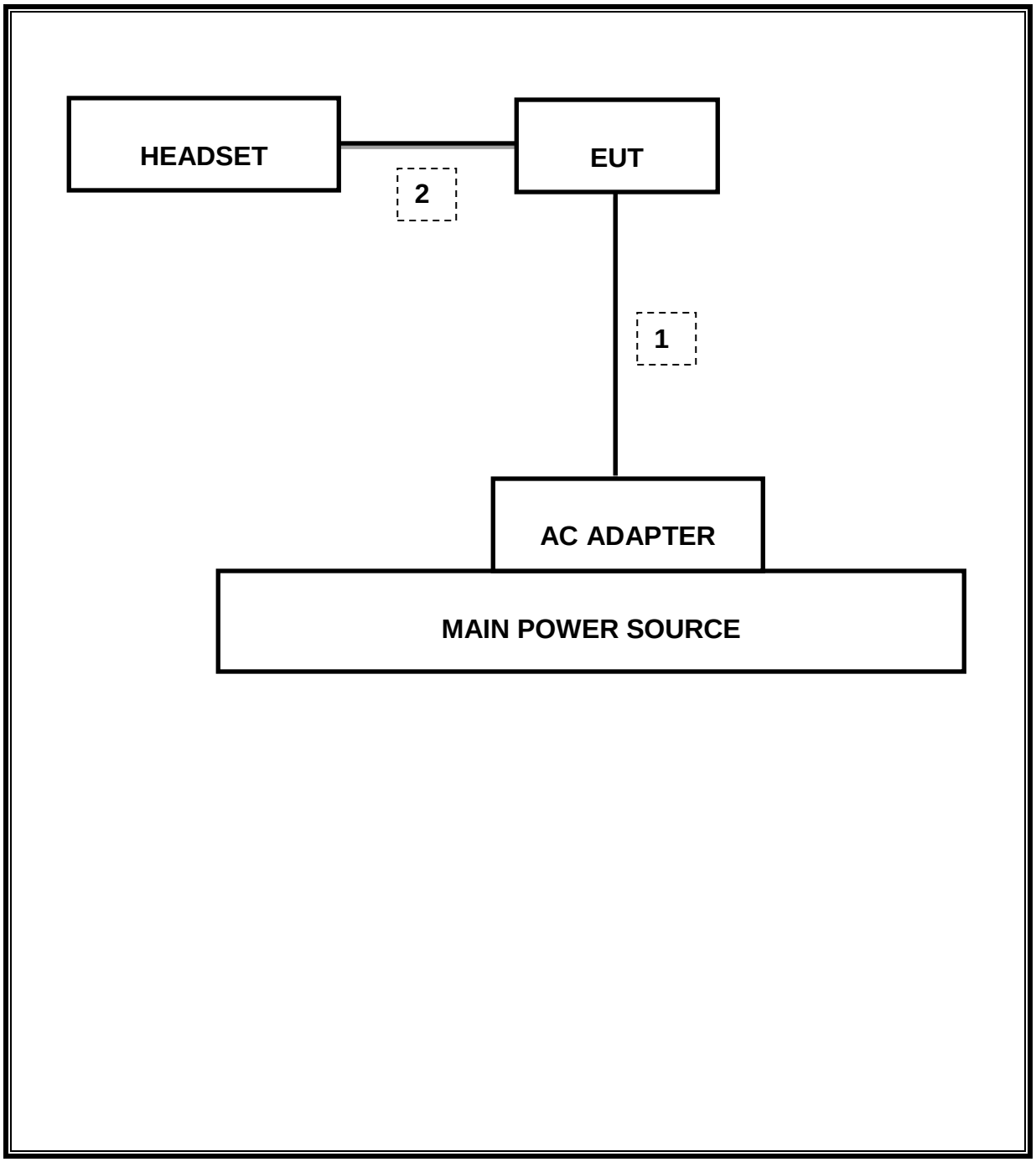
I/O CABLES

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 set to continuously transmit in ANT + test 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:

UL – Melville Equipment

Radiated Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESCI7	75141	2014-01-29	2015-01-31
Hybrid Antenna	Sunol	JB-1	84106	2014-02-19	2015-02-19
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Multimeter	Fluke	87V	44547	2014-01-29	2015-01-31
Above 1GHz (Band Optimized System)					
Spectrum Analyzer	Agilent	E4446A	72823	2014-06-12	2015-06-12
Horn Antenna (2-4 GHz)	ETS	3161-02 (22°)**	48107	2007-09-27	See * below
Horn Antenna (4-8 GHz)	ETS	3161-03 (22°)**	48106	2007-09-27	See * below
Horn Antenna (8-12 GHz)	ETS	3160-07 (26°)**	8933	2008-11-24	See * below
Horn Antenna (12-18 GHz)	ETS	3160-08 (26°)**	8932	2007-09-27	See * below
Horn Antenna (18-26.5 GHz)	ETS	3160-09 (27°)**	8947	2007-09-26	See * below
Horn Antenna	EMCO	3115	ME5A-766		
Signal Path Controller	HP	11713A	50250	N/A	N/A
Gain Controller	HP	11713A	50251	N/A	N/A
RF Switch / Preamp Fixture	UL	BOMS1	50249	N/A	N/A
System Controller	UL	BOMS2	50252	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2012-12-22	2014-12-22
Multimeter	Fluke	87V	44547	2014-01-29	2015-01-31

* - Note: As allowed by the calibration standard ANSI C63.4 Section 4.4.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.

Gain standard horn antennas (sometimes called standard gain horn antennas) need not be calibrated beyond that which is provided by the manufacturer unless they are damaged or deterioration is suspected, or they are used at a distance closer than $2D^2/\lambda$. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.

** - Number in parentheses denotes antenna beam width.

UL – Fremont Equipment

Test Equipment List				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/14
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/15
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/14
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/14
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/15

7. SUMMARY TABLE

The model FCC ID: PY7PM-0813 shares the same enclosure and circuit board as mode FCC ID: PY7PM-0810. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units.

After confirming through preliminary radiated emissions that the performance of the PY7PM-0813 ANT+ remains representative of this model (FCC ID: PY7PM-0810) test data for FCC ID: PY7PM-0810 is being submitted for this application.

Radiated emissions were fully re-evaluated against FCC Part 15B requirements for digital devices and results indicated no significant differences between the two versions. Other differences between the two FCC IDs are in the WWAN. WWAN, SAR and EMC have been fully retested for FCC ID: PY7PM-0813.

8. LIMITS AND RESULTS

8.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

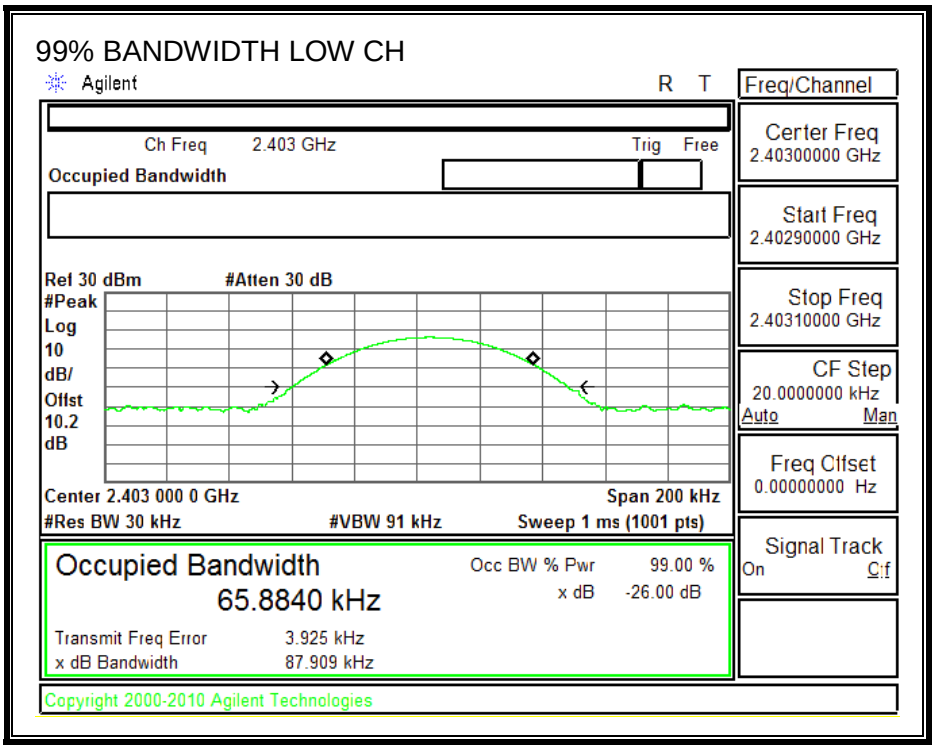
TEST PROCEDURE

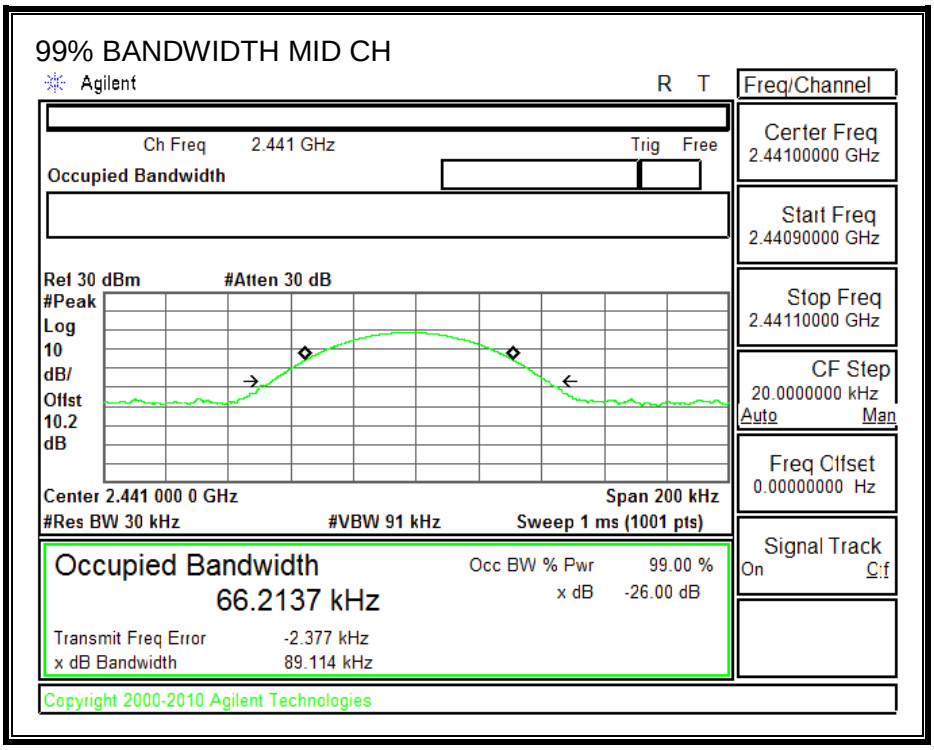
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

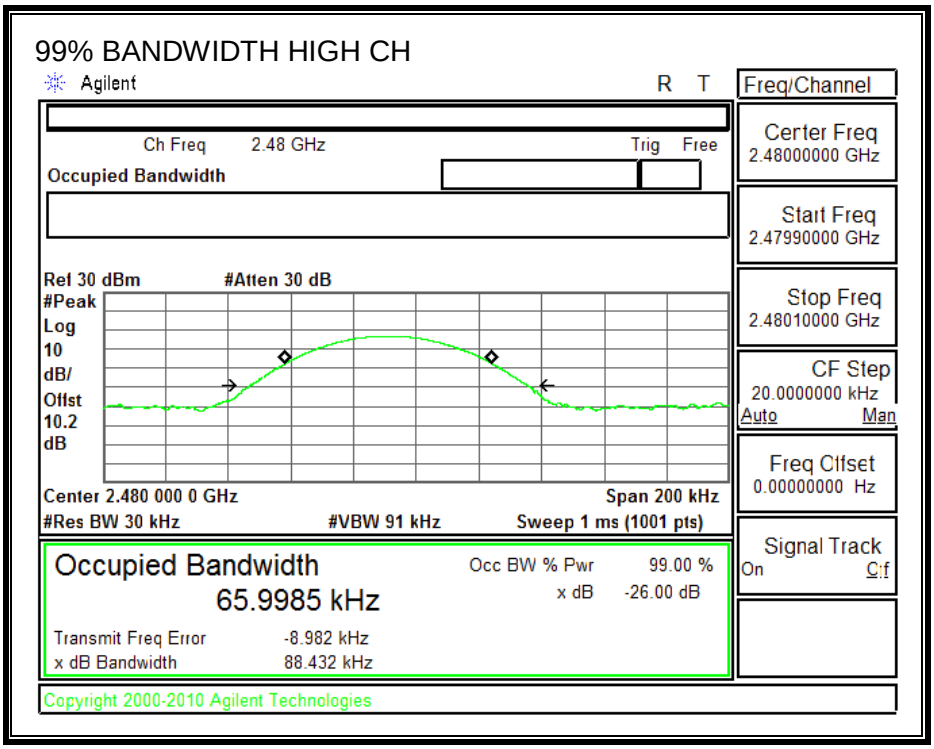
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2403	0.0658840
Middle	2442	0.0662137
High	2480	0.0659985

99% BANDWIDTH







8.2. TRANSMITTER RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

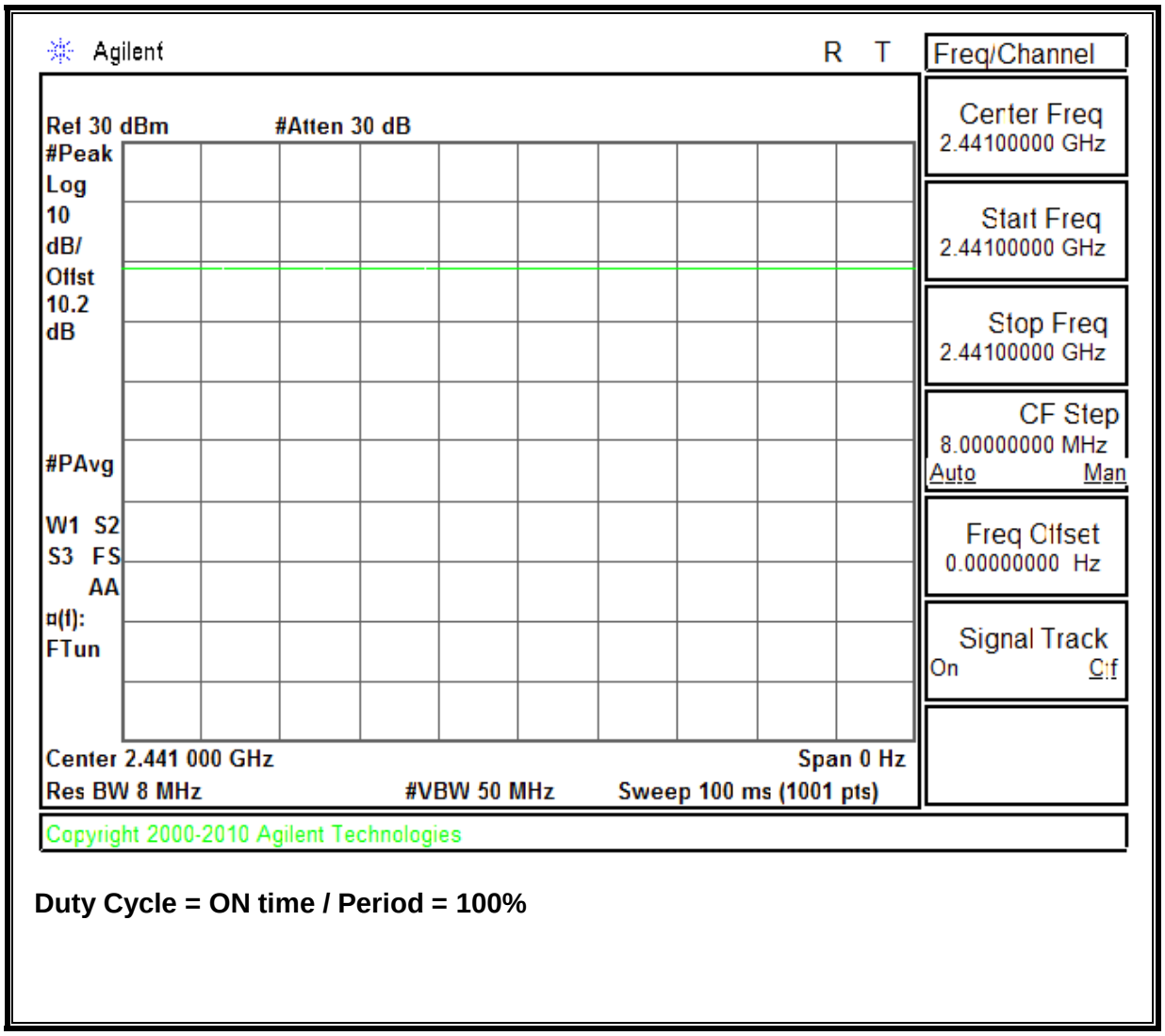
(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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.

RESULTS

8.2.1. DUTY CYCLE



Duty Cycle = ON time / Period = 100%

8.2.2. FUNDAMENTAL FREQUENCY RADIATED EMISSION

FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

47173 BENICIA STREET, FREMONT, CA 94538, USA

Project #:	14U17929
Report #:	14U17929
Date& Time:	07/08/14
Test Engr:	N. Sheridan
Company:	Sony
EUT Description:	GSM/WCDMA/LTE + BLUETOOTH & WLAN (2.4 & 5GHZ) BAR PHONE
Test Configuration :	X POSITION
Type of Test:	FCC
Mode of Operation:	Transmitting : ANT+ mode

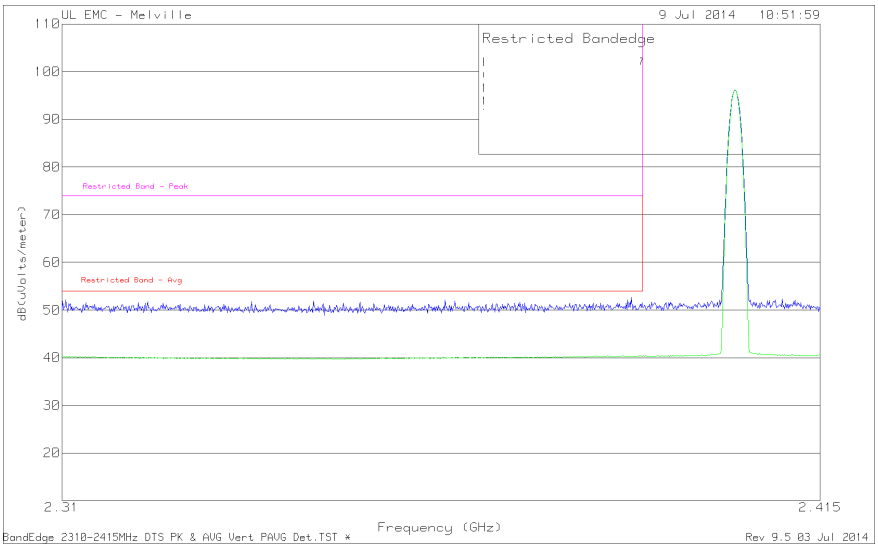
Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC_B	Av Limit FCC_B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)
Low channel														
2403.00	84.75	84.60	32.10	-32.10	0.00	84.75	84.60	114.00	94.00	-29.25	-9.40	3mV	297.00	3.44
2403.00	93.42	93.22	32.10	-32.10	0.00	93.42	93.22	114.00	94.00	-20.58	-0.78	3mH	90.00	2.79
Mid channel														
2441.00	84.92	84.84	32.10	-32.10	0.00	84.92	84.84	114.00	94.00	-29.08	-9.16	3mV	316.00	3.67
2441.00	93.75	93.56	32.10	-32.10	0.00	93.75	93.56	114.00	94.00	-20.25	-0.44	3mH	110.00	2.24
High channel														
2480.00	84.56	84.42	32.10	-32.10	0.00	84.56	84.42	114.00	94.00	-29.44	-9.58	3mV	280.00	3.49
2480.00	93.76	93.34	32.10	-32.10	0.00	93.76	93.34	114.00	94.00	-20.24	-0.66	3mH	38.00	2.25

8.2.3. TRANSMITTER RESTRICTED BAND EDGES

RESTRICTED BANDEDGE (LOW CHANNEL)

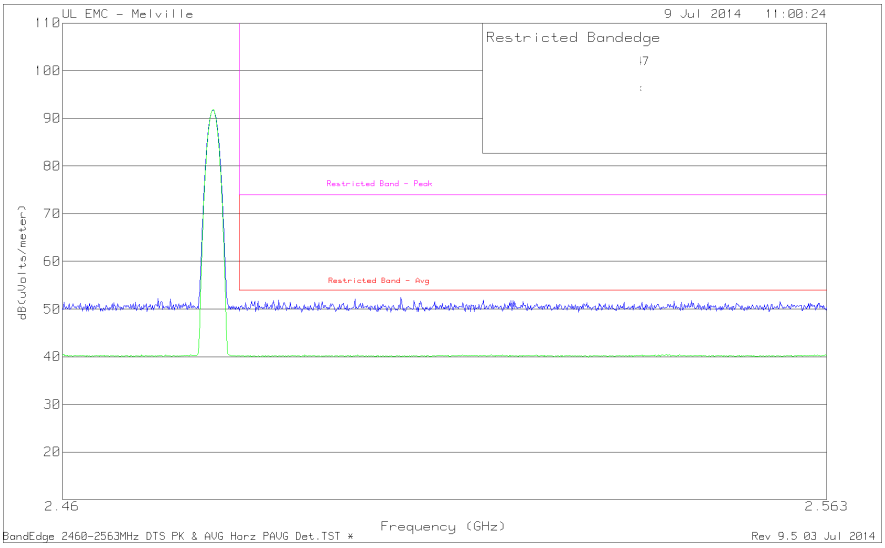
LOW CH RESTRICTED, PEAK & AVG HORIZONTAL

LOW CH RESTRICTED, PEAK & AVG, VERICAL

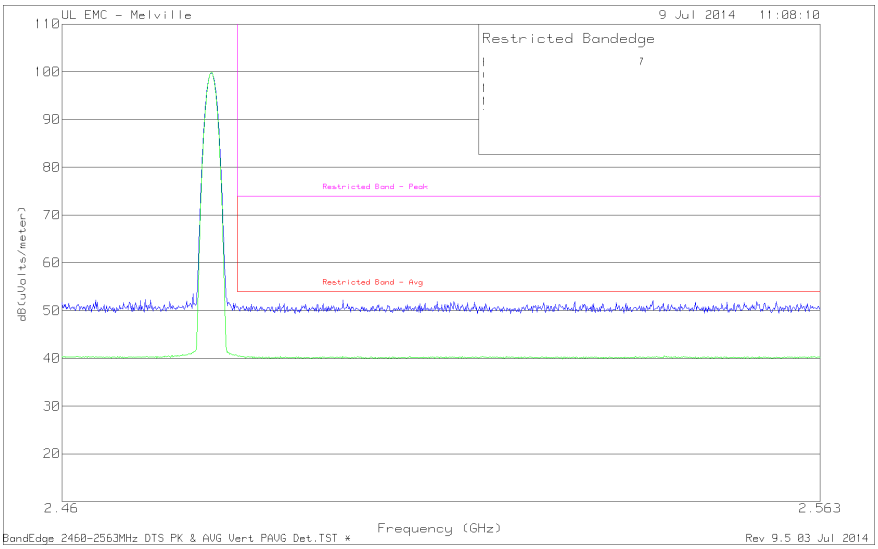


RESTRICTED BANDEDGE (HIGH CHANNEL)

HIGH CH RESTRICTED, PEAK & AVG, Horizontal

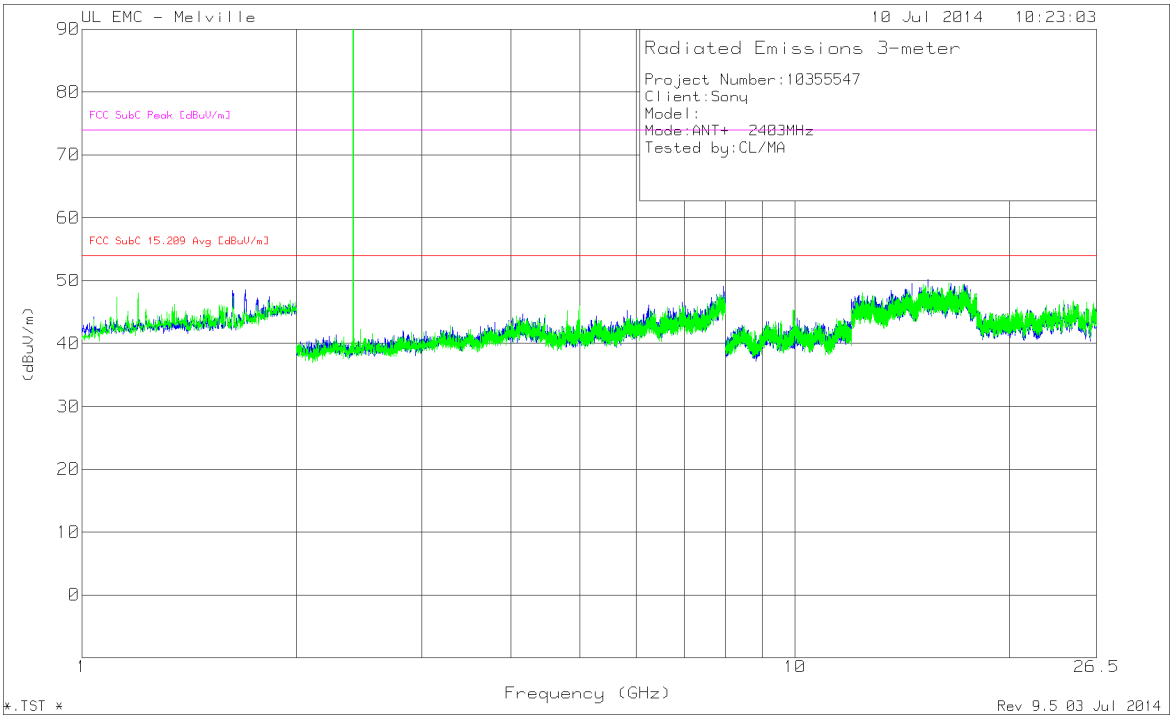


HIGH CH RESTRICTED, PEAK & AVG, Vertical



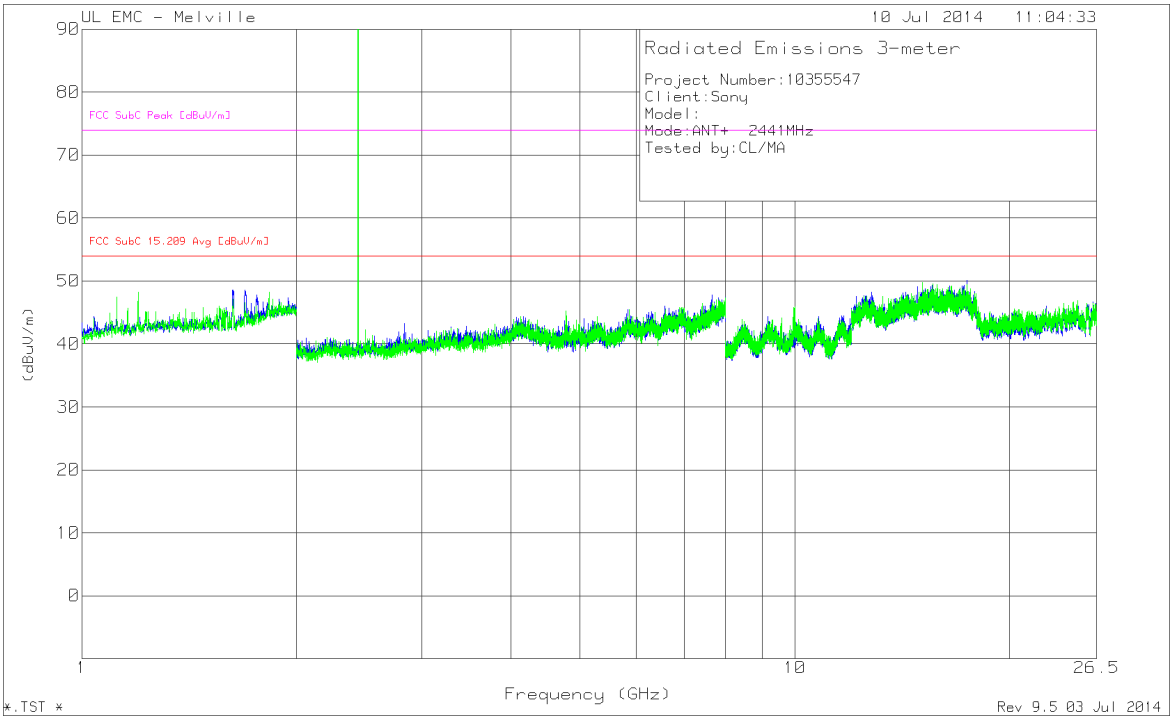
HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

HARMONICS – LOW CHANNEL



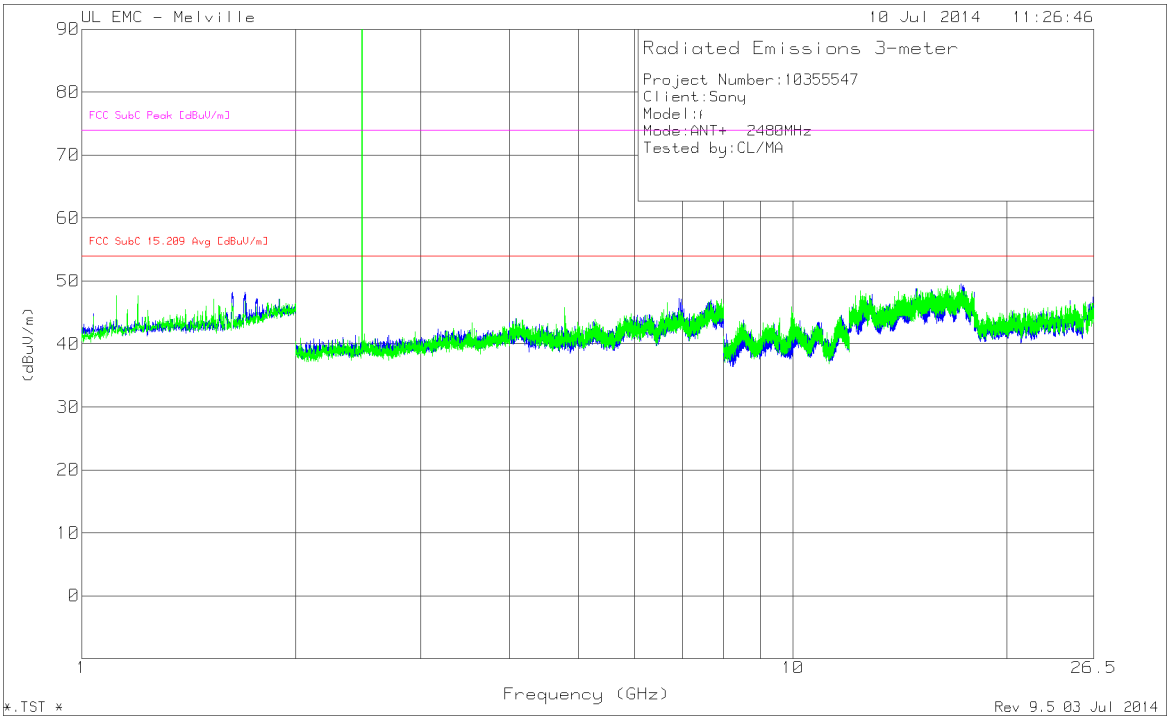
No emissions detected above the system noise floor

HARMONICS – MID CHANNEL



No emissions detected above the system noise floor

HARMONICS – HIGH CHANNEL

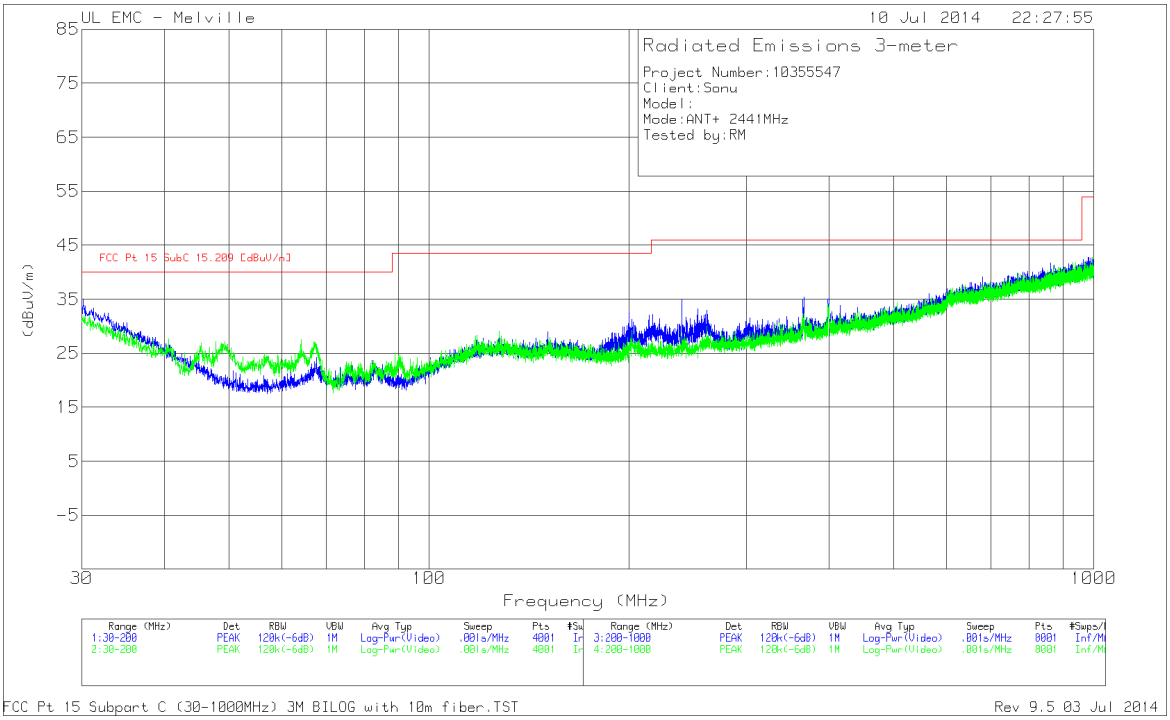


No emissions detected above the system noise floor

8.2.1. SPURIOUS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORSE-CASE)

HORIZONTAL & VERTICAL PLOT



Frequency (MHz)	Meter Reading (dBuV)	Det	AF-84106 [dB/m]	GL [dB]	Corrected Reading (dBuV/m)	FCC Pt 15 SubC 15.209 [dBuV/m]	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
67.6975	14.81	PK	8.3	1.1	24.21	40	-15.79	0-360	250	H
45.385	16.6	PK	9.3	1	26.9	40	-13.1	0-360	100	V
49.3375	18.64	PK	7.5	1	27.14	40	-12.86	0-360	100	V
67.1025	17.82	PK	8.2	1.1	27.12	40	-12.88	0-360	100	V
* 240	20.49	PK	12.1	2.3	34.89	46	-11.11	0-360	99	H
366.5	16.98	PK	15.5	2.9	35.38	46	-10.62	0-360	99	H
398.2	15.3	PK	15.8	3	34.1	46	-11.9	0-360	99	V

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

PK - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

ANSI C63.4 - 2009

RESULTS

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	36.38	PK	1.4	0	37.78	66	-28.22	-	-
2	.15	16.86	Av	1.4	0	18.26	-	-	56	-37.74
3	.375	34.63	PK	.4	0	35.03	58.4	-23.37	-	-
4	.375	24.29	Av	.4	0	24.69	-	-	48.4	-23.71
5	1.122	38.84	PK	.2	0	39.04	56	-16.96	-	-
6	1.122	21.48	Av	.2	0	21.68	-	-	46	-24.32
7	1.455	39.37	PK	.2	.1	39.67	56	-16.33	-	-
8	1.455	21.09	Av	.2	.1	21.39	-	-	46	-24.61
9	5.811	32.42	PK	.2	.1	32.72	60	-27.28	-	-
10	5.811	14.1	Av	.2	.1	14.4	-	-	50	-35.6
11	17.8665	32.94	PK	.3	.2	33.44	60	-26.56	-	-
12	17.8665	19.15	Av	.3	.2	19.65	-	-	50	-30.35

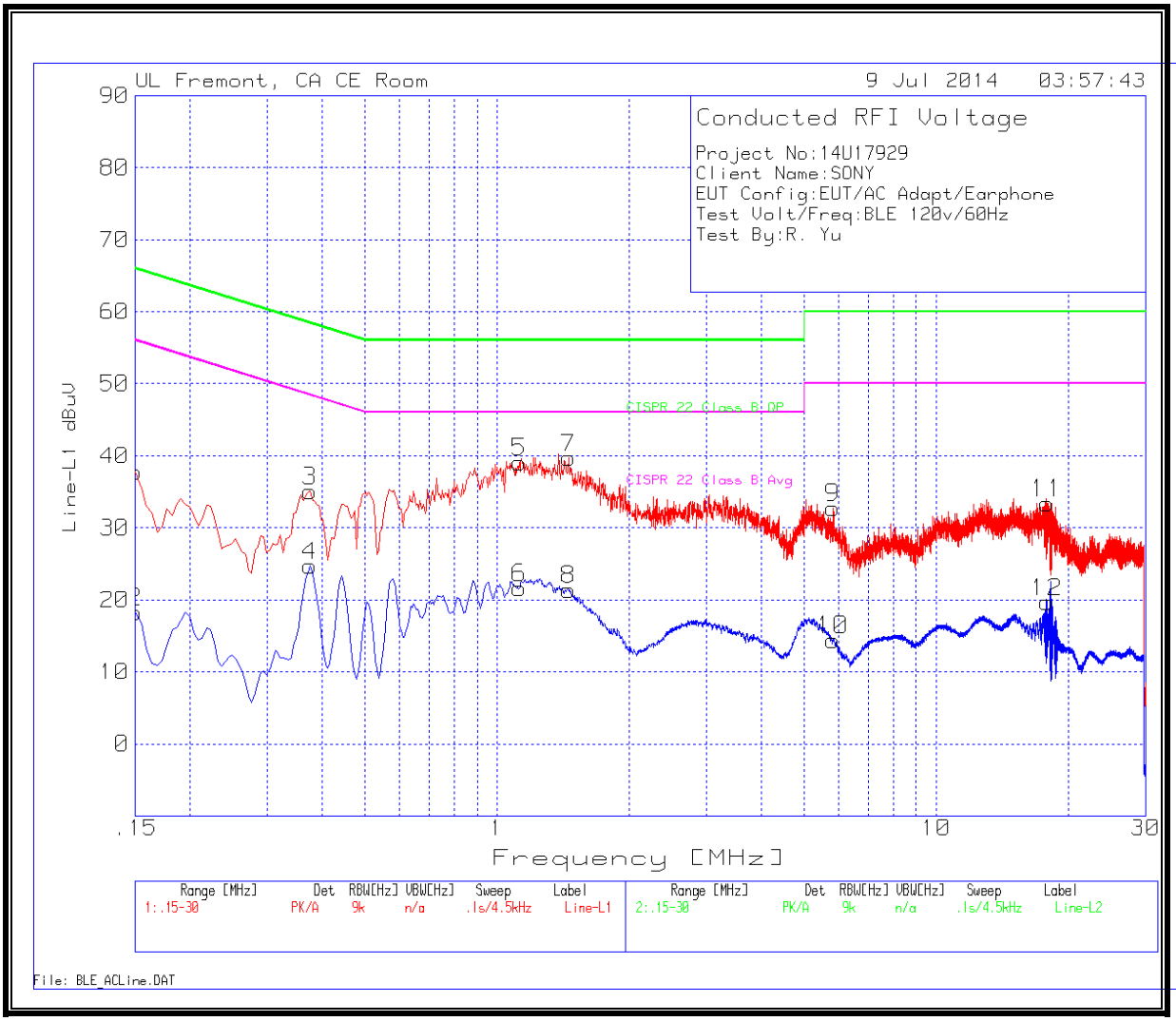
Line-L2 .15 - 30MHz

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)
13	.186	34.32	PK	1.1	0	35.42	64.2	-28.78	-	-
14	.186	14.03	Av	1.1	0	15.13	-	-	54.2	-39.07
15	.33675	31.42	PK	.5	0	31.92	59.3	-27.38	-	-
16	.33675	10.81	Av	.5	0	11.31	-	-	49.3	-37.99
17	1.1625	36.58	PK	.3	0	36.88	56	-19.12	-	-
18	1.1625	20.77	Av	.3	0	21.07	-	-	46	-24.93
19	1.455	36.68	PK	.2	.1	36.98	56	-19.02	-	-
20	1.455	20.38	Av	.2	.1	20.68	-	-	46	-25.32
21	11.3955	26.96	PK	.2	.2	27.36	60	-32.64	-	-
22	11.3955	11.05	Av	.2	.2	11.45	-	-	50	-38.55
23	18.249	29.78	PK	.3	.2	30.28	60	-29.72	-	-
24	18.249	17.62	Av	.3	.2	18.12	-	-	50	-31.88

PK - Peak detector
Av - average detection

LINE 1 RESULTS



LINE 2 RESULTS