



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

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE + BLUETOOTH + DTS/UNII a/b/g/n/ac + ANT+ & NFC

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IC ID: 4170B-TM0061

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**Prepared for
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1-8-15 KONAN, MINATO-KU
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	3/10/15	Initial Issue	Ooi, Choon
A	4/17/15	Revised 7.2.2 and 7.2.3	Ooi, Choon

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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: CB5A23Q9M5 (Conducted), CB5A23Q1WM (Radiated)
DATE TESTED: FEBRUARY 20-MARCH 5, 2015

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 4	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:



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CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.

Tested By:



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, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-210 Issue 8; RSS-GEN Issue 4.

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:

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

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 26000 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

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)
2402 - 2480	ANT +	90.22	89.99	3.00

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.6 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	SONY	EP880	3514W 01 S08328	N/A
Earphone	Sony	N/A	N/A	N/A

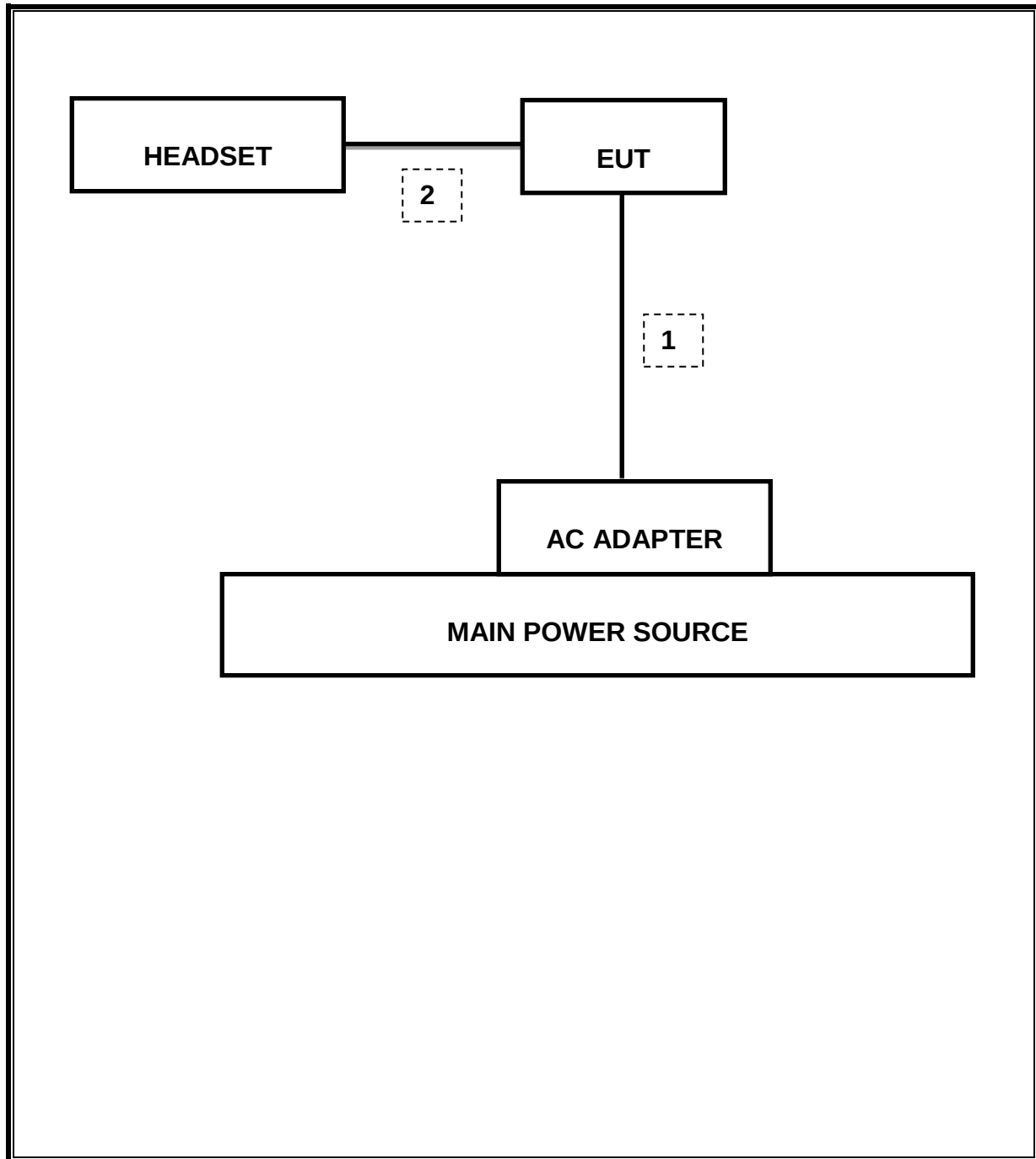
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	80cm	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:

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	12/08/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/15
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
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/16

7. LIMITS AND RESULTS

7.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

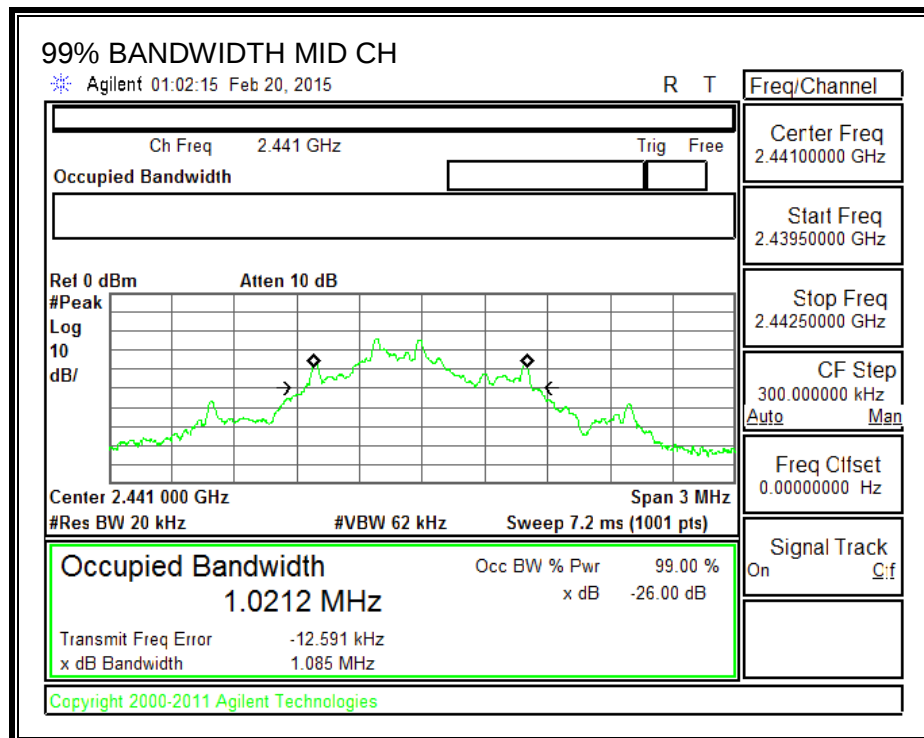
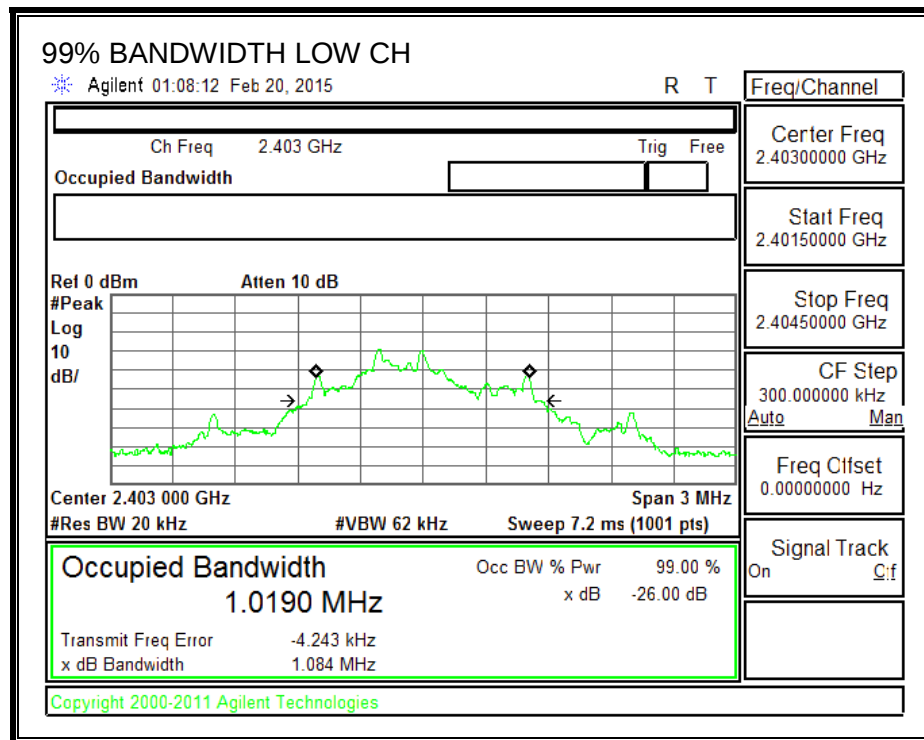
TEST PROCEDURE

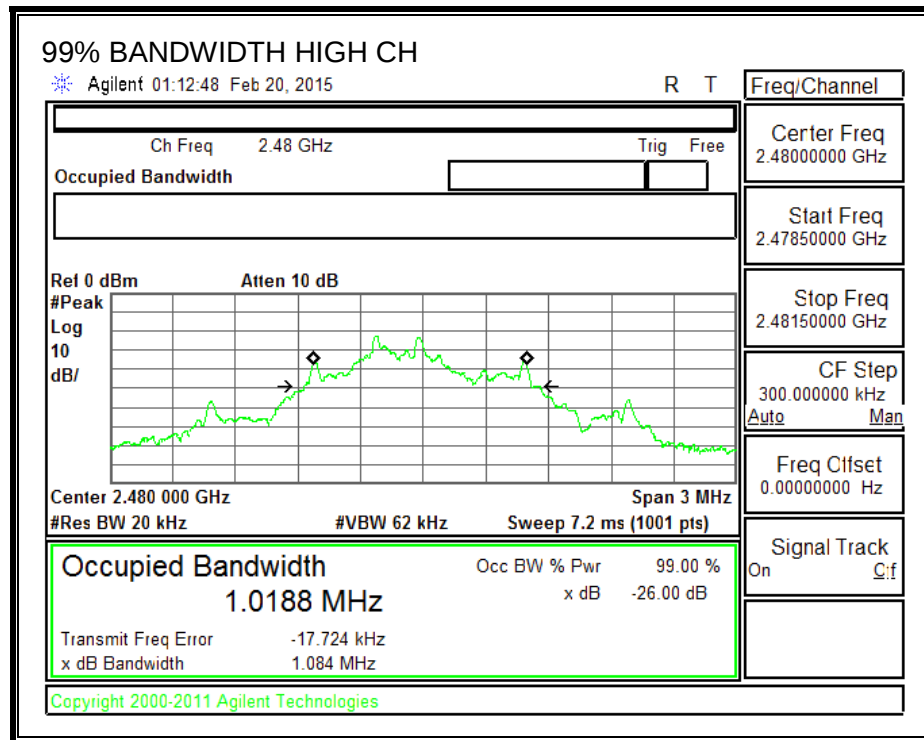
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2403	1.019
Middle	2441	1.021
High	2480	1.018

99% BANDWIDTH





7.2. TRANSMITTER RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4: 2009

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.

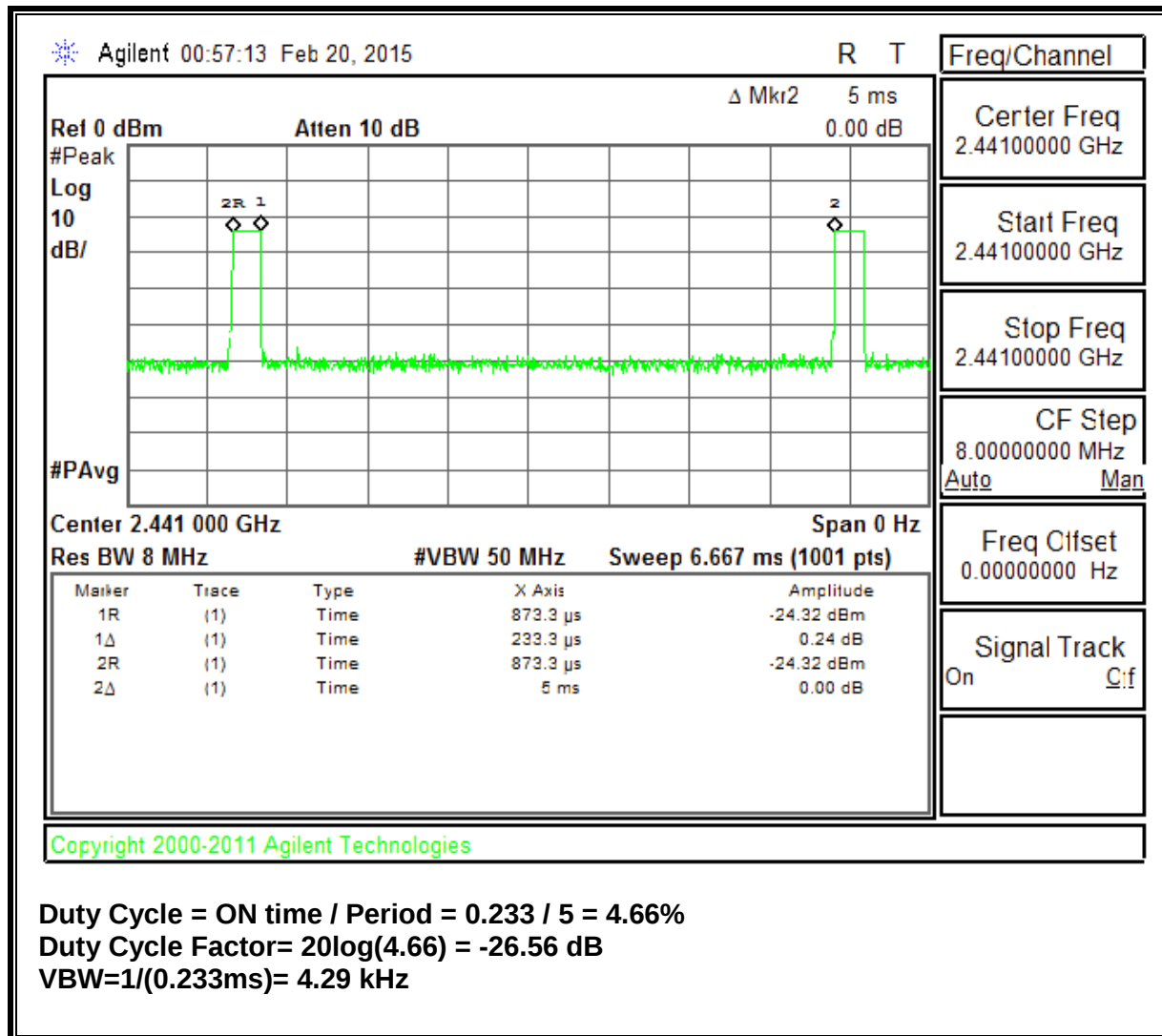
(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under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

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (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

7.2.1. DUTY CYCLE



7.2.2. FUNDAMENTAL FREQUENCY RADIATED EMISSION



FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP
47173 BENICIA STREET, FREMONT, CA 94538, USA

Project #: 15U20030
Report #: 15U20030
Date & Time: 02/20/15
Test Engr: R. Alegre

Company: Sony
EUT Description: GSM/WCDMA/LTE TABLET + BLUETOOTH + DTS/UNII a/b/g/n/ac + ANT+ & NFC
Test Configuration: X POSITION
Type of Test: FCC
Mode of Operation: Transmitting : ANT+ mode

M% = ((t1+t2+t3+...)/T) * 66.83% = 4.70%

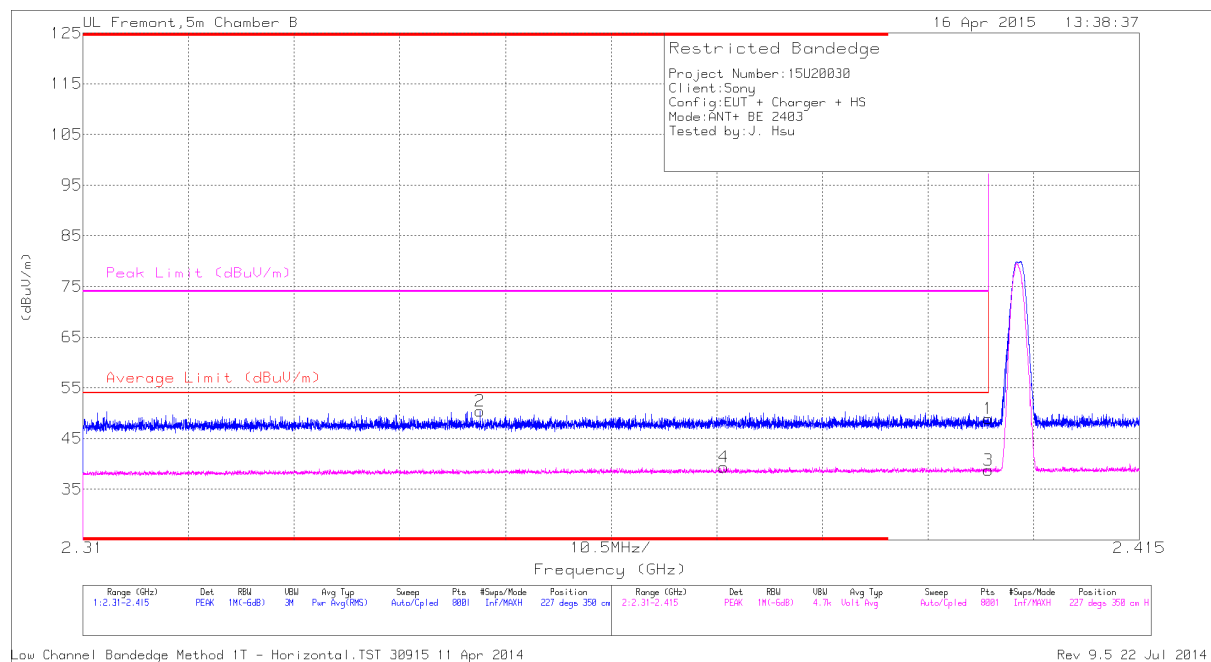
Av Reading = Pk Reading + 20*log(M%)
20 * log (M%) = -26.56

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	85.25	85.11	32.10	-33.00	0.00	84.35	84.21	114.00	94.00	-29.65	-9.79	3mV	0.00	1.00
2403.00	80.53	80.12	32.10	-33.00	0.00	79.63	79.22	114.00	94.00	-34.37	-14.78	3mH	0.00	2.00
Mid channel														
2441.00	90.11	89.12	32.10	-33.00	0.00	89.21	88.22	114.00	94.00	-24.79	-5.78	3mV	0.00	1.00
2441.00	80.53	80.05	32.10	-33.00	0.00	79.63	79.15	114.00	94.00	-34.37	-14.85	3mH	0.00	2.00
High channel														
2480.00	91.12	90.89	32.10	-33.00	0.00	90.22	89.99	114.00	94.00	-23.78	-4.01	3mV	0.00	1.00
2480.00	82.12	81.78	32.10	-33.00	0.00	81.22	80.88	114.00	94.00	-32.78	-13.12	3mH	0.00	2.00

AVG VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

7.2.3. TRANSMITTER RESTRICTED BAND EDGES

BANDEDGE (LOW CHANNEL, HORIZONTAL)

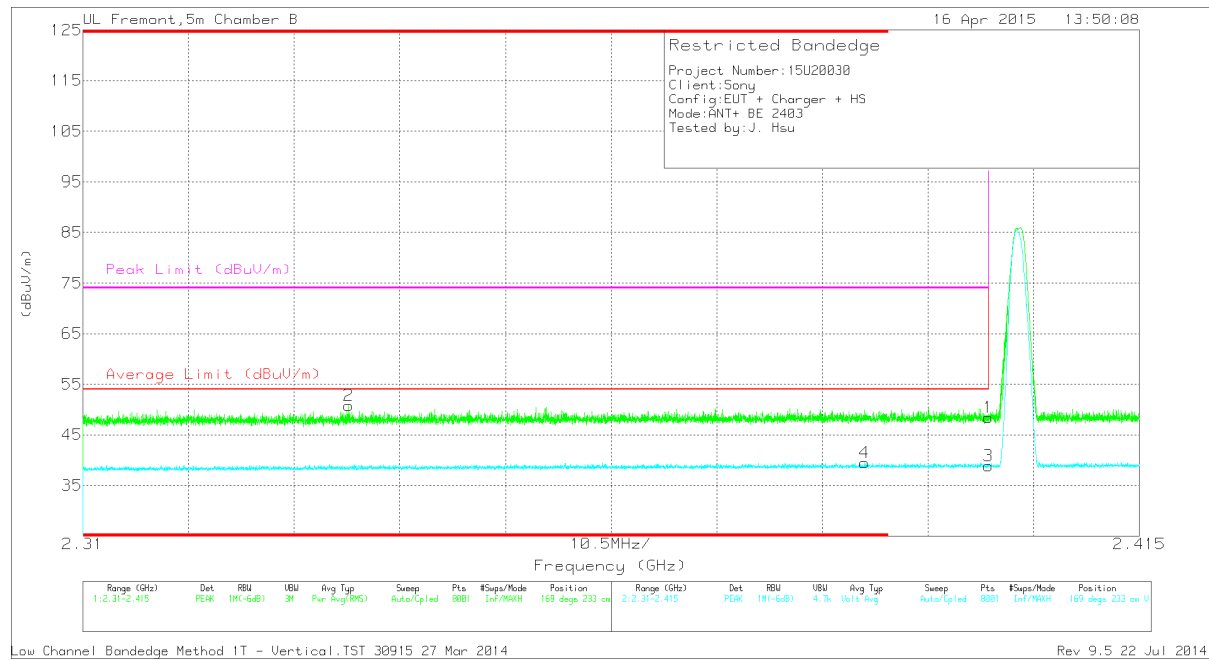


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.349	41.2	PK	31.8	-22.6	50.4	-	-	74	-23.6	227	350	H
4	* 2.374	30.09	VB1T	31.9	-22.6	39.39	54	-14.61	-	-	227	350	H
1	2.4	39.41	PK	32.1	-22.6	48.91	-	-	74	-25.09	227	350	H
3	2.4	29.19	VB1T	32.1	-22.6	38.69	54	-15.31	-	-	227	350	H

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

BANDEDGE (LOW CHANNEL, VERTICAL)

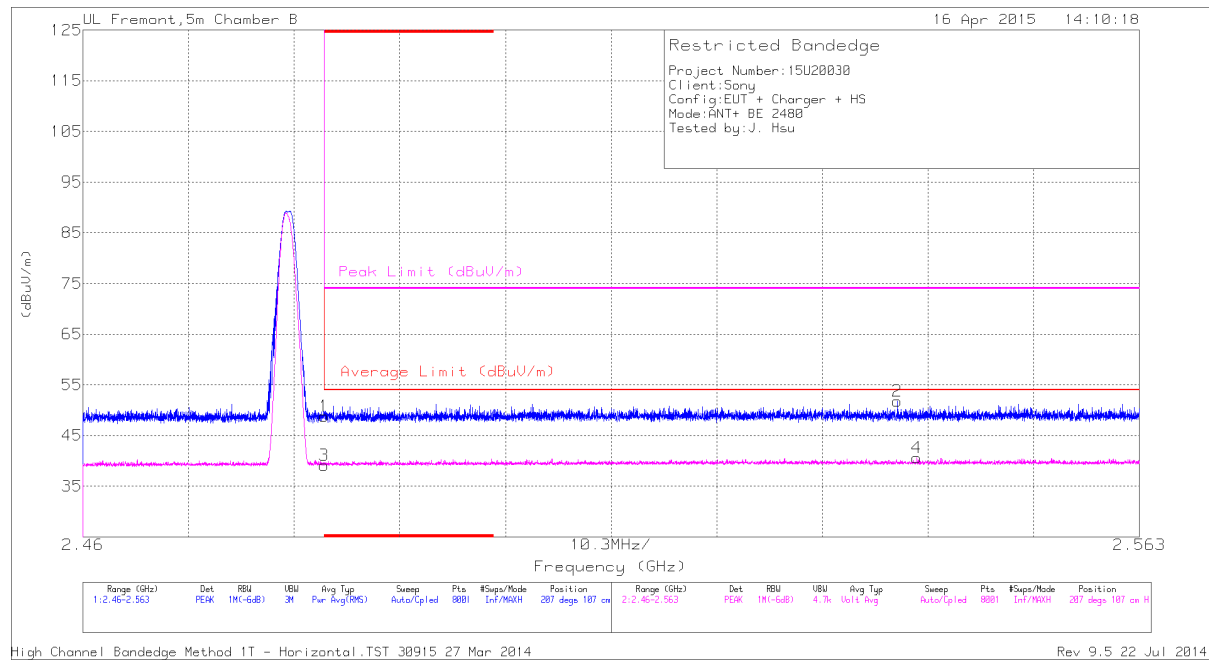


Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.336	41.8	PK	31.7	-22.7	50.8	-	-	74	-23.2	169	233	V
4	* 2.388	30.12	VB1T	32	-22.6	39.52	54	-14.48	-	-	169	233	V
1	2.4	38.91	PK	32.1	-22.6	48.41	-	-	74	-25.59	169	233	V
3	2.4	29.32	VB1T	32.1	-22.6	38.82	54	-15.18	-	-	169	233	V

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

BANDEDGE (HIGH CHANNEL, VERTICAL)



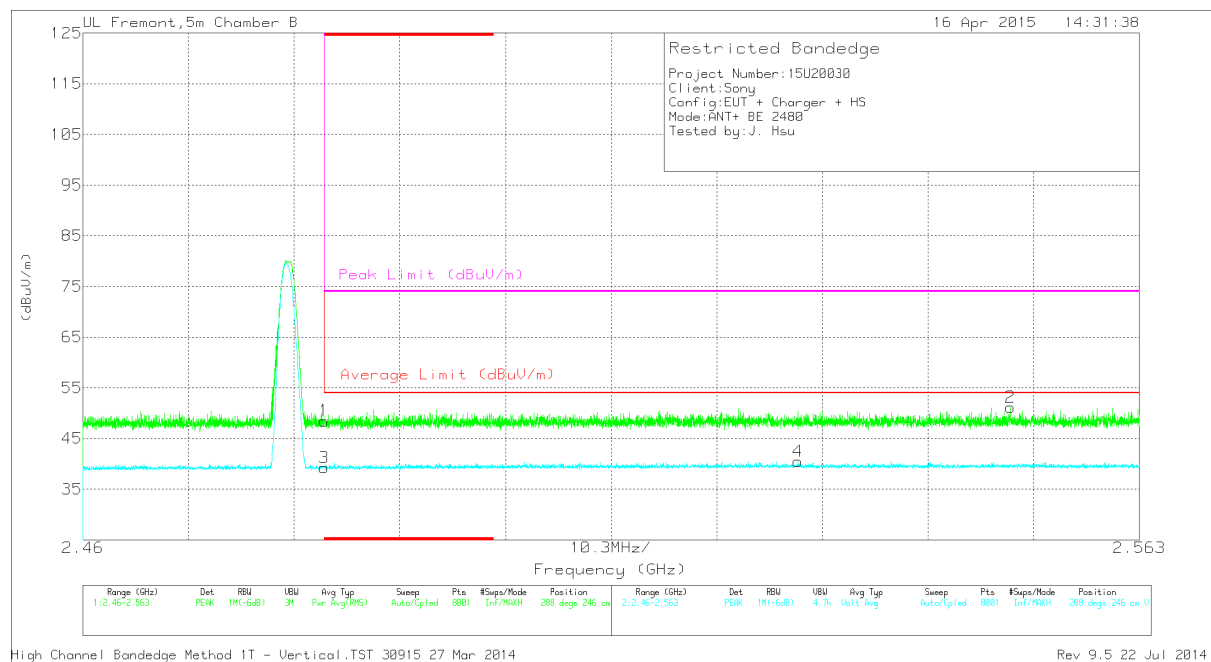
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/ Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.65	PK	32.5	-22.4	48.75	-	-	74	-25.25	207	107	H
3	* 2.484	29.07	VB1T	32.5	-22.4	39.17	54	-14.83	-	-	207	107	H
2	2.539	41.62	PK	32.6	-22.4	51.82	-	-	74	-22.18	207	107	H
4	2.541	30.38	VB1T	32.6	-22.4	40.58	54	-13.42	-	-	207	107	H

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEGE (HIGH CHANNEL, VERTICAL)



Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.39	PK	32.5	-22.4	48.49	-	-	74	-25.51	288	246	V
3	* 2.484	29.16	VB1T	32.5	-22.4	39.26	54	-14.74	-	-	288	246	V
4	2.53	30.15	VB1T	32.6	-22.3	40.45	54	-13.55	-	-	288	246	V
2	2.55	40.77	PK	32.7	-22.3	51.17	-	-	74	-22.83	288	246	V

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

HARMONICS



FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP
47173 BENICIA STREET, FREMONT, CA 94538, USA

Project #: 15U20030
Report #: 15U20030
Date & Time: 02/20/15
Test Engr: R. Alegre

Company: Sony

EUT Description: GSM/WCDMA/LTE TABLET + BLUETOOTH + DTS/UNII a/b/g/n/ac + ANT+ & NFC

Test Configuration: X POSITION

Type of Test: FCC

Mode of Operation: Transmitting : ANT+ mode

M% = ((t1+t2+t3+...)/T) * 66.83% = 4.70%

Av Reading = Pk Reading + 20*log(M%)

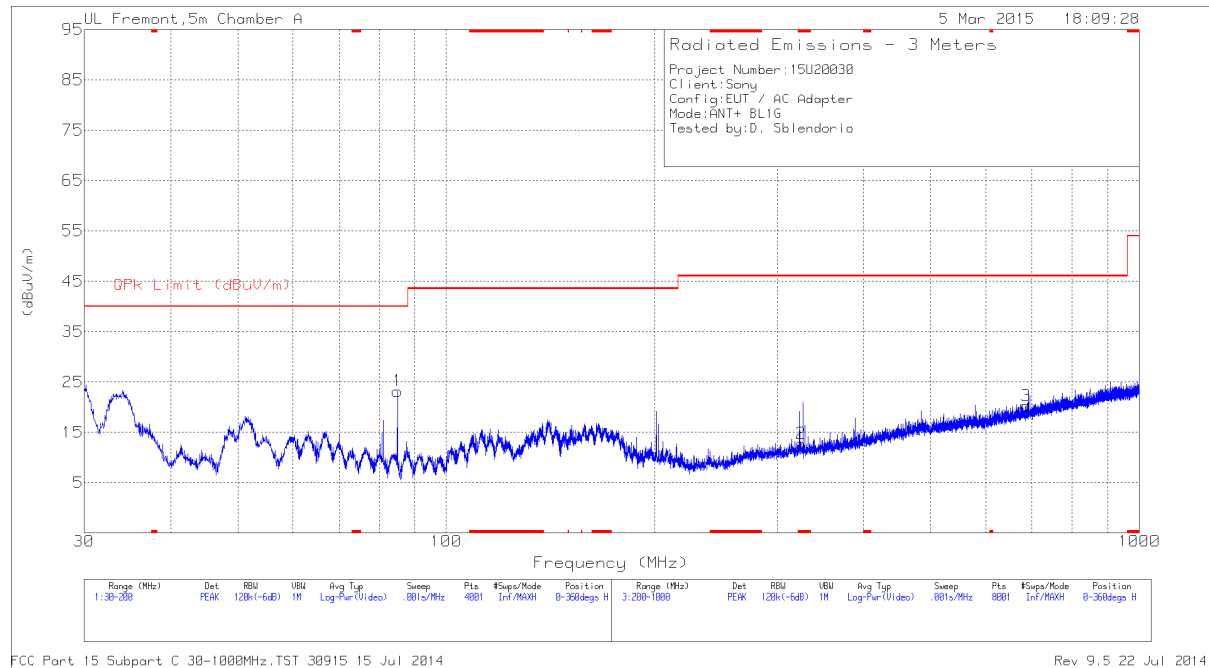
20 * log (M%) = -26.56

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														
4806.00	40.98	33.66	34.00	-31.00	0.00	43.98	36.66	74.00	54.00	-30.02	-17.34	3mV	0.00	1.00
4806.00	41.02	34.27	34.00	-31.00	0.00	44.02	37.27	74.00	54.00	-29.98	-16.73	3mH	0.00	2.00
Mid channel														
4882.00	41.19	33.17	34.00	-31.00	0.00	44.19	36.17	74.00	54.00	-29.81	-17.83	3mV	0.00	1.00
4882.00	41.77	35.65	34.00	-31.00	0.00	44.77	38.65	74.00	54.00	-29.23	-15.35	3mH	0.00	2.00
High channel														
4960.00	40.39	33.58	34.00	-31.00	0.00	43.39	36.58	74.00	54.00	-30.61	-17.42	3mV	0.00	1.00
4960.00	41.20	34.46	34.00	-31.00	0.00	44.20	37.46	74.00	54.00	-29.80	-16.54	3mH	0.00	2.00

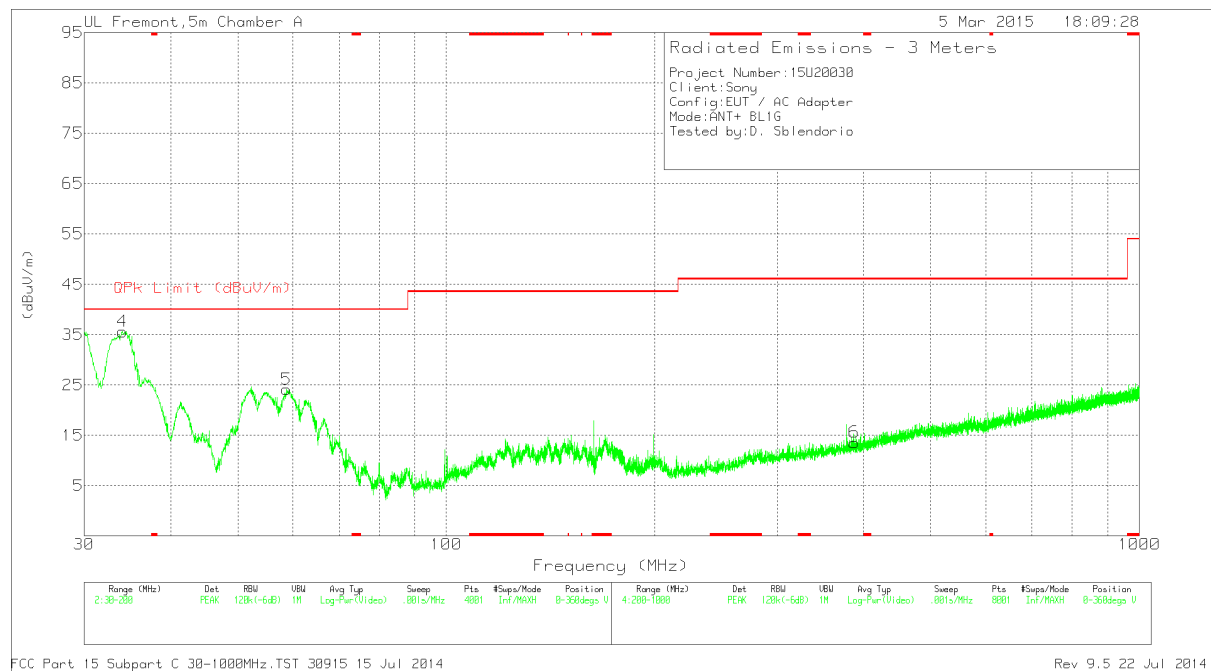
AVG VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

7.2.4. SPURIOUS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 324.9	27.97	PK	14	-29.2	12.77	46.02	-33.25	0-360	101	H
4	34.08	48.4	PK	18.4	-31.2	35.6	40	-4.4	0-360	101	V
5	58.815	47.55	PK	7.5	-30.9	24.15	40	-15.85	0-360	101	V
1	84.995	46.62	PK	7.3	-30.7	23.22	40	-16.78	0-360	300	H
6	387.9	27.79	PK	14.9	-29.1	13.59	46.02	-32.43	0-360	300	V
3	687.1	28.59	PK	19.9	-28.2	20.29	46.02	-25.73	0-360	300	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.9

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

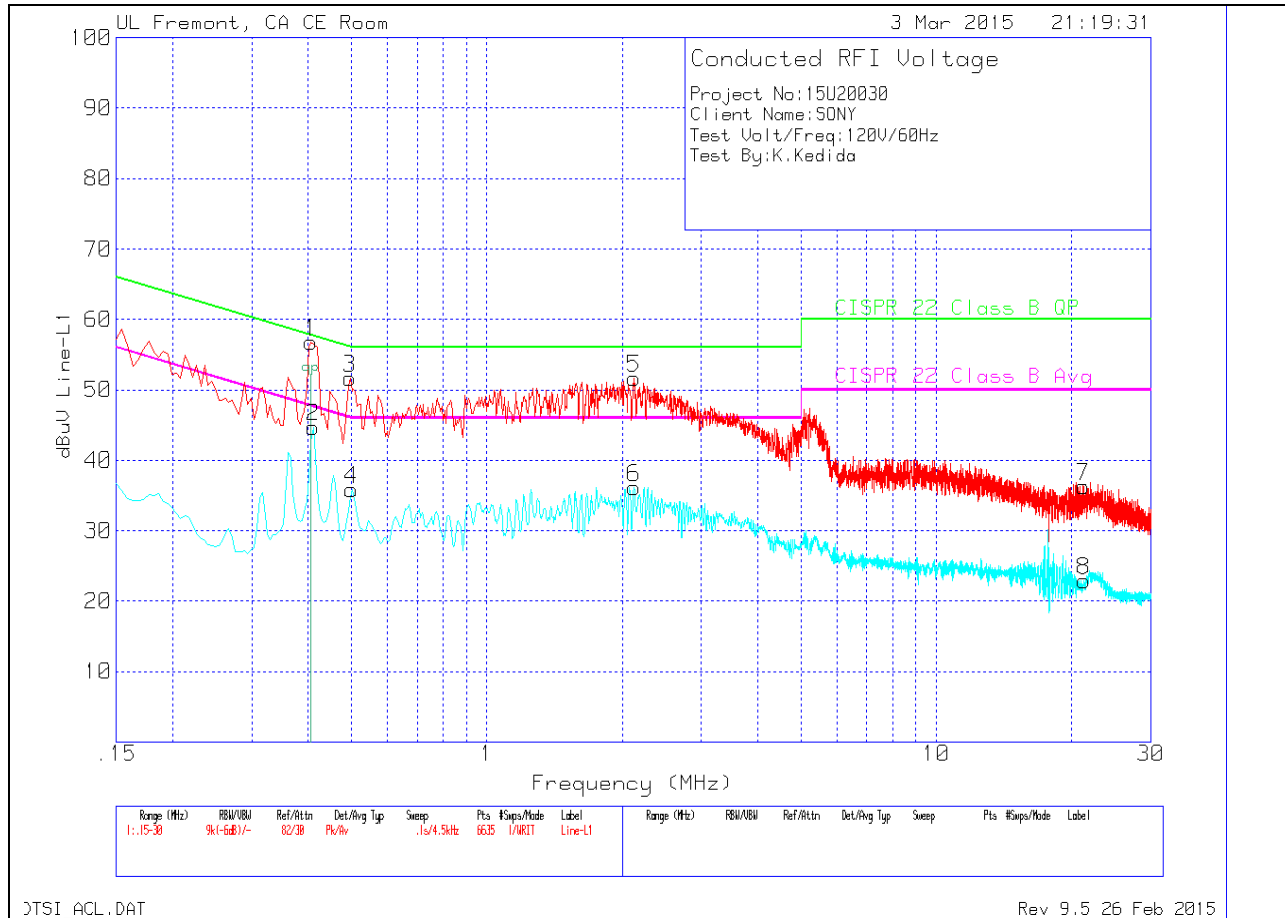
* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4 - 2009

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULTS

Line-L1 .15 - 30MHz

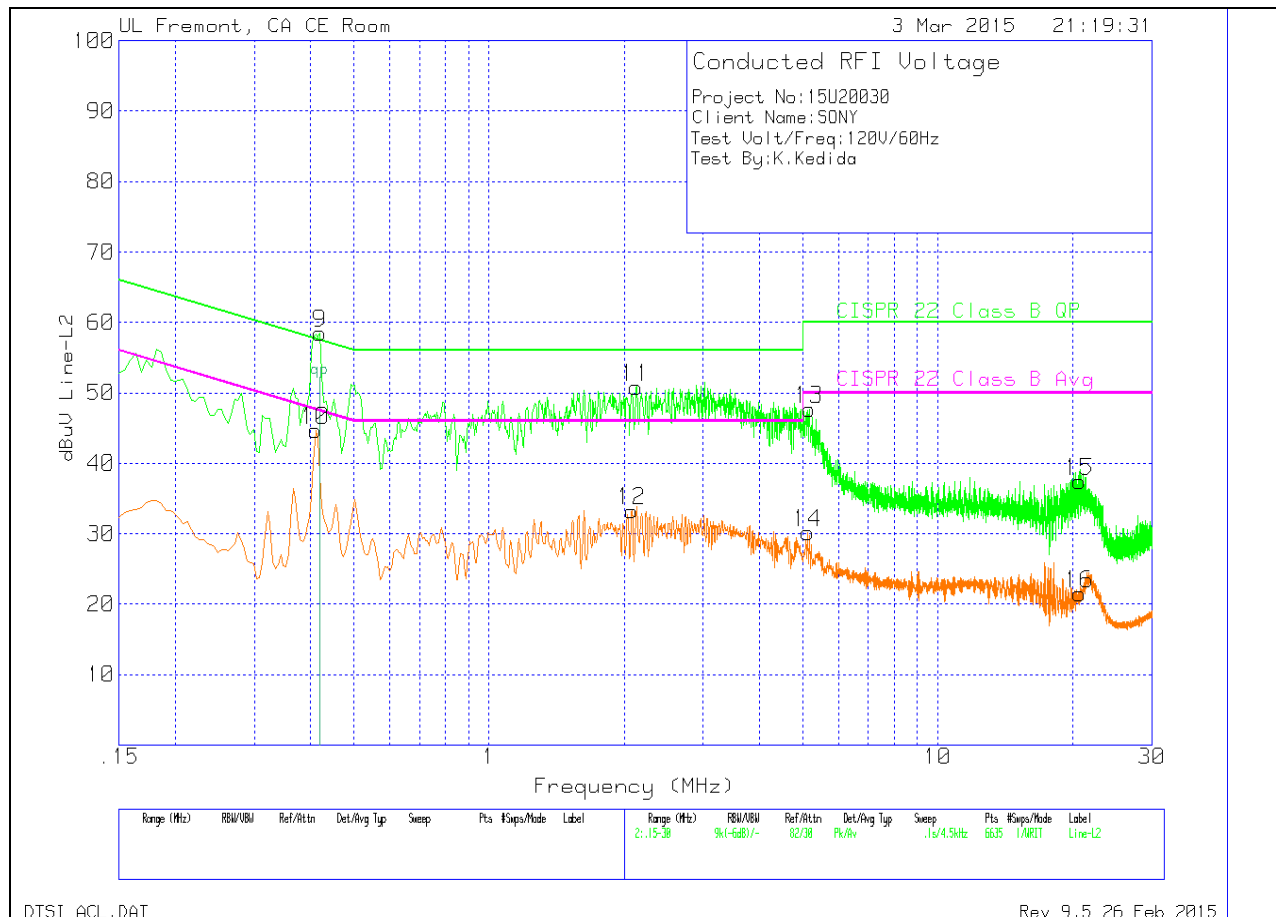
Range 1: Line-L1 .15 - 30MHz

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	.4065	56.34	Pk	.4	0	56.74	-	-	-	-
2	.411	44.34	Av	.4	0	44.74	-	-	47.63	-2.89
3	.4965	51.36	Pk	.3	0	51.66	-	-	-	-
4	.501	35.52	Av	.3	0	35.82	-	-	46	-10.18
5	2.1255	51.37	Pk	.2	.1	51.67	-	-	-	-
6	2.1255	35.88	Av	.2	.1	36.18	-	-	46	-9.82
7	21.246	35.75	Pk	.3	.2	36.25	-	-	-	-
8	21.282	22.44	Av	.3	.2	22.94	-	-	50	-27.06

Pk - Peak detector

Av - Average detection

LINE 2 PLOT



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	.42	58.04	Pk	.4	0	58.44	-	-	-	-
10	.411	44.26	Av	.4	0	44.66	-	-	47.63	-2.97
11	2.1255	50.51	Pk	.2	.1	50.81	-	-	-	-
12	2.0805	32.94	Av	.2	.1	33.24	-	-	46	-12.76
13	5.172	47.41	Pk	.2	.1	47.71	-	-	-	-
14	5.127	29.88	Av	.2	.1	30.18	-	-	50	-19.82
15	20.67	36.97	Pk	.3	.2	37.47	-	-	-	-
16	20.67	21.02	Av	.3	.2	21.52	-	-	50	-28.48

Pk - Peak detector

Av - Average detection