



FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT
FOR
GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	3/18/2016	Initial issue	C. OOI
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC
SERIAL NUMBER: CB5129YWE4
DATE TESTED: March 7 - 18, 2016

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 FCC CFR 47 Part 2, FCC CFR 47 Part 15, and ANSI C63.10-2013.

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
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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:

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

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, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance, 1000 to 6000 MHz	3.86 dB
Radiated Disturbance, 6000 to 18000 MHz	4.23 dB
Radiated Disturbance, 18000 to 26000 MHz	5.30 dB
Radiated Disturbance, 26000 to 40000 MHz	5.23 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 with BT, DTS/UNII a/b/g/n/ac & NFC.

5.2. MAXIMUM OUTPUT POWER

The testing was performed at 1 meter. The transmitter maximum E-field at 30m distance is 23.61 dBuV/m which is converted 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.

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	UCH 20 1295-70821	N/A	N/A
Earphone	Sony	N/A	N/A	N/A

I/O CABLES

Radiated Emissions above 30 MHz, AC Line Conducted Emissions:

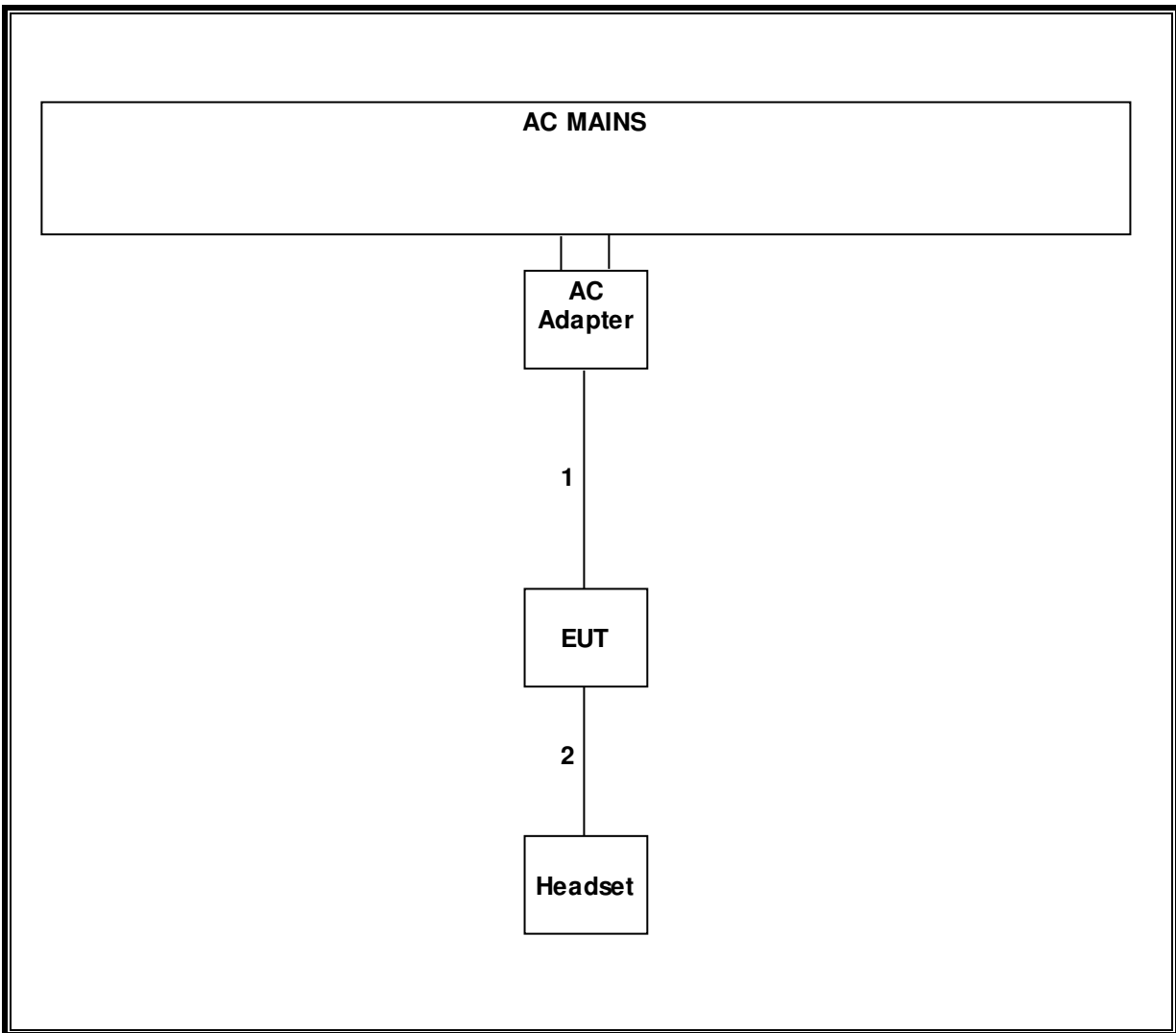
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Micro-USB	Shielded	1 m	None
2	Audio	1	Mini-Jack	Un-Shielded	1 m	None

TEST SETUP

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

SETUP DIAGRAM FOR TESTS

Radiated Emissions Below 30 MHz:



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
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	T123	10/22/16
Antenna, Loop, 30 MHz	EMCO	6502	T35	05/15/16
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	09/25/16
Preamplifier, 1300 MHz	Keysight	8447D	T64	08/14/16
EMI Test Receiver, 9 KHz to	Rohde & Schwa	ECSI7	T284	09/10/16
Peak Power Meter	Agilent / HP	N1914A	T254	06/08/16
Peak / Average Power Sens	Keysight	E9327A	T388	04/16/16
LISN, 30 MHz	Solar	8012-50-R-24-	T28	07/28/16
Temperature Chamber	CSZ	2PHS-8-3	T754	03/21/16

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015

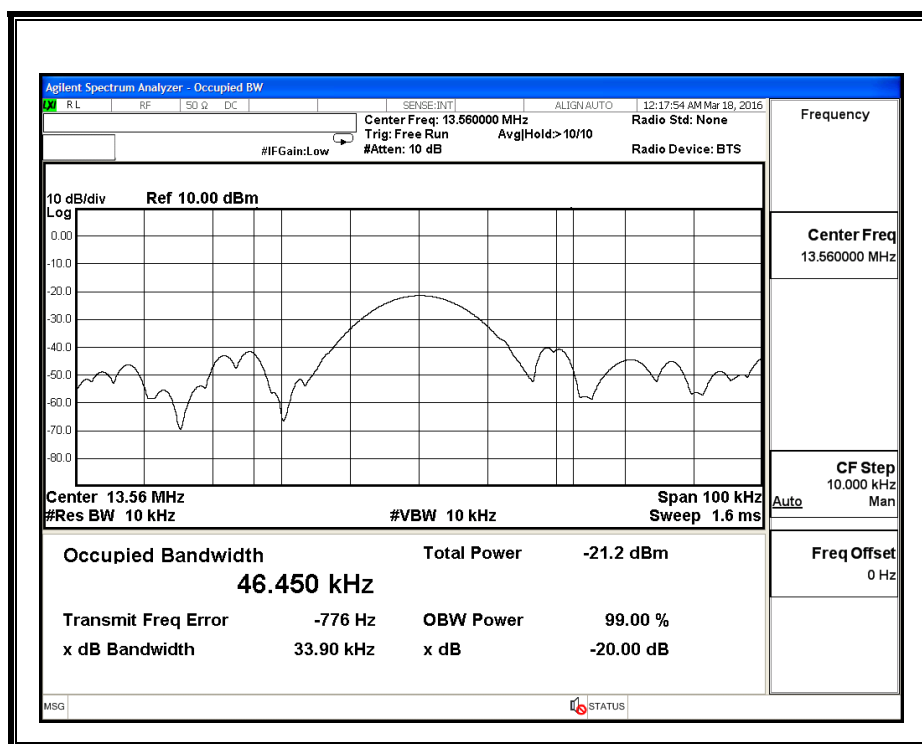
7. OCCUPIED BANDWIDTH

LIMITS

For reporting purposes only

RESULTS

Channel	Frequency (KHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
Low	13.56	46.45	33.90



8. RADIATED EMISSION TEST RESULTS

LIMIT

§15.225

(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)

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 C63.10-2013

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 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater (1000MHz)

RESULTS

No non-compliance noted:

KDB 937606 OATS and Chamber Correlation Justification

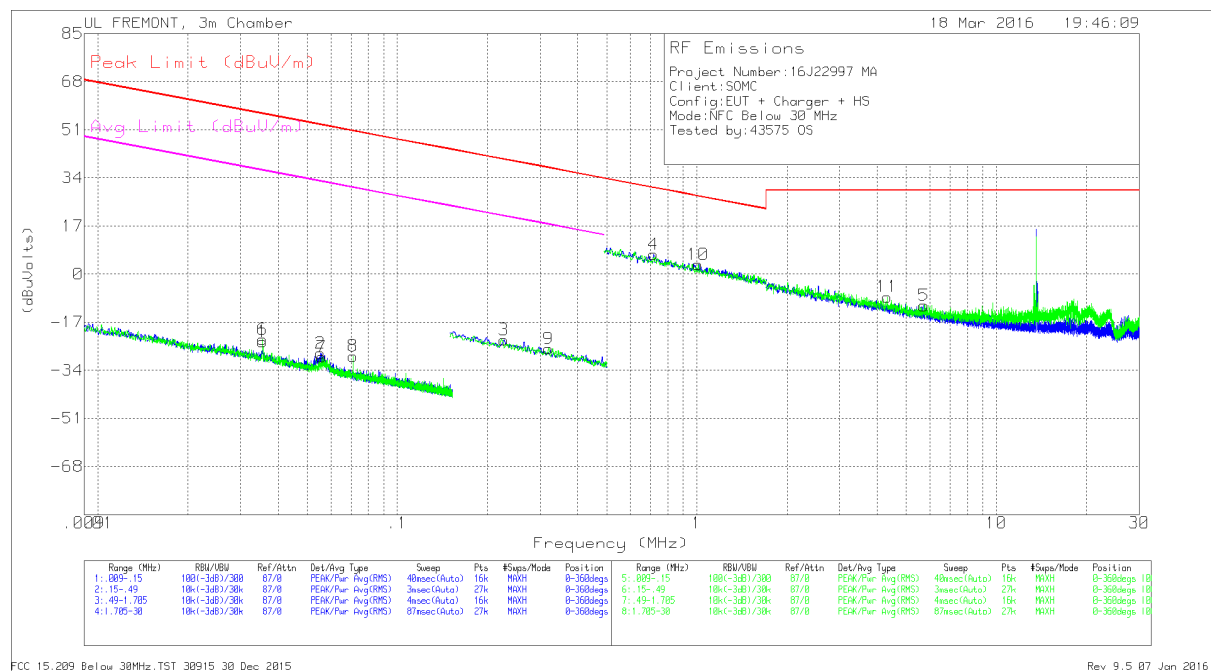
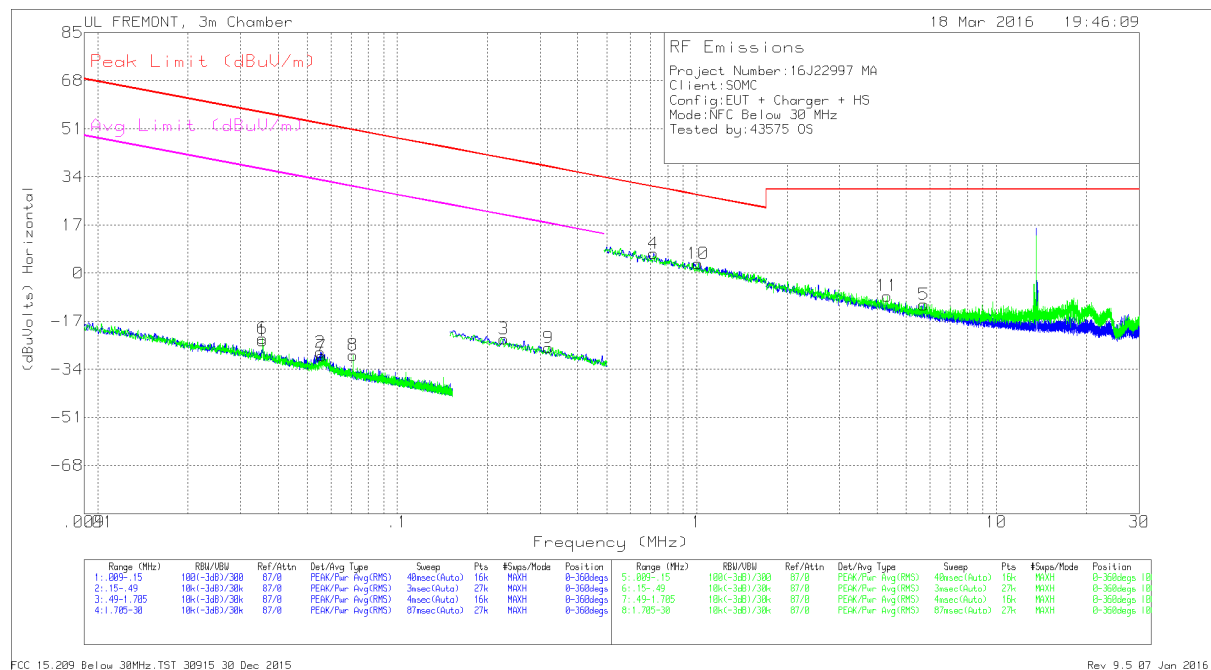
- Device is a Smart Phone.
- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

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

Fundamental

FCC Part 15, Subpart B & C 3 Meter Distance Measurement At Emissions Chamber													
Company: SOMC Project #: 16J22997 FCC ID #: PY7-PM0941 Tester: Jude semana Date: 3/11/2016													
Frequency (MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	AF (dB/m)	Distance (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													
Fundamental Field Strength & Within Bands:													
13.56	73.467		--	10.56	1	-59.08	24.94	--	84.00	--	-59.1	--	Fundamental @ 30m Dist
13.41	51.52		--	10.54	1	-59.08	2.98	--	50.48	--	-47.5	--	13.41-13.553MHz Spurious @ 30m
13.553	67.83		--	10.56	1	-59.08	19.30	--	50.48	--	-31.2	--	13.41-13.553MHz Spurious @ 30m
13.567	68.214		--	10.56	1	-59.08	19.69	--	50.48	--	-30.8	--	13.567-13.710MHz Spurious @ 30m
13.664	52.651		--	10.57	1	-59.08	4.13	--	40.51	--	-36.4	--	13.567-13.710MHz Spurious @ 30m
13.349	52.761		--	10.53	1	-59.08	4.21	--	40.51	--	-36.3	--	13.110-13.410MHz Spurious @ 30m
13.772	50.967		--	10.58	1	-59.08	2.46	--	29.54	--	-27.1	--	13.710-14.010MHz Spurious @ 30m
Loop Antenna Face Off: Z-Position													
Fundamental Field Strength & Within Bands:													
13.56	69.37		--	10.56	1	-59.08	20.84	--	84.00	--	-63.2	--	Fundamental @ 30m Dist
13.454	51.03		--	10.55	1	-59.08	2.49	--	50.48	--	-48.0	--	13.41-13.553MHz Spurious @ 30m
13.553	62.88		--	10.56	1	-59.08	14.35	--	50.48	--	-36.1	--	13.41-13.553MHz Spurious @ 30m
13.567	60.21		--	10.56	1	-59.08	11.68	--	50.48	--	-38.8	--	13.567-13.710MHz Spurious @ 30m
13.66	50.43		--	10.57	1	-59.08	1.91	--	40.51	--	-38.6	--	13.567-13.710MHz Spurious @ 30m
13.35	49.66		--	10.54	1	-59.08	1.11	--	40.51	--	-39.4	--	13.110-13.410MHz Spurious @ 30m
13.773	50.88		--	10.58	1	-59.08	2.37	--	29.54	--	-27.2	--	13.710-14.010MHz Spurious @ 30m
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 Readings A.F. = Antenna factor													

Spurious Emissions (0.15 – 30 MHz)



Trace Markers

Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	.03552	43	Pk	12.5	1.4	-80	-23.1	56.59	-79.69	36.59	-59.69	0-360
1	.03553	42.18	Pk	12.5	1.4	-80	-23.92	56.59	-80.51	36.59	-60.51	0-360
2	.0554	39.35	Pk	11.2	1.4	-80	-28.05	52.73	-80.78	32.73	-60.78	0-360
7	.05603	38.04	Pk	11.2	1.4	-80	-29.36	52.64	-82	32.64	-62	0-360
8	.07125	38.6	Pk	11	1.4	-80	-29	50.55	-79.55	30.55	-59.55	0-360
3	.22723	44.43	Pk	10.8	1.5	-80	-23.27	40.48	-63.75	20.48	-43.75	0-360
9	.31949	41.36	Pk	10.7	1.5	-80	-26.44	37.52	-63.96	17.52	-43.96	0-360

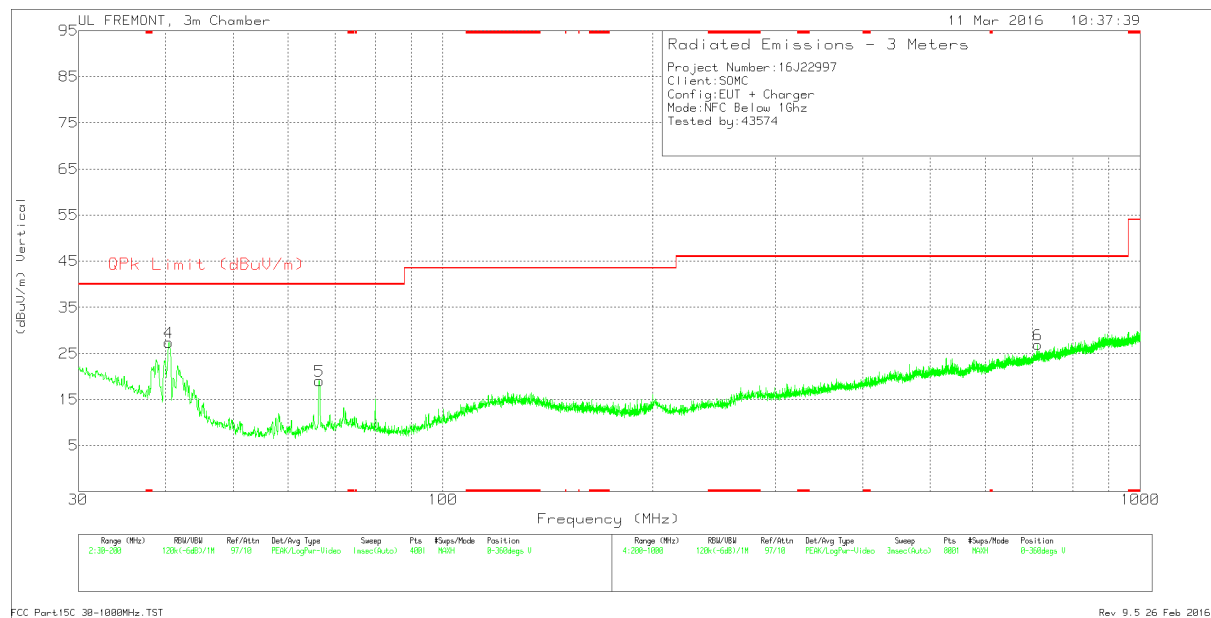
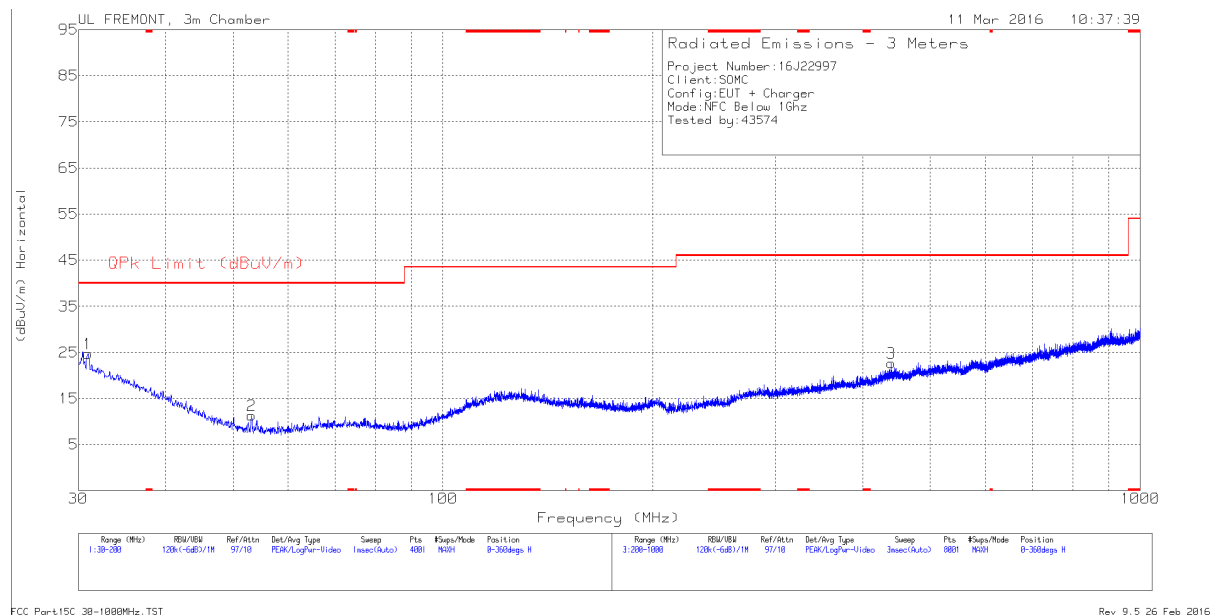
Pk - Peak detector

Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.71728	34.8	Pk	10.6	1.5	-40	6.9	30.49	-23.59	-	-	0-360
10	1.01056	31.15	Pk	10.7	1.5	-40	3.35	27.51	-24.16	-	-	0-360
11	4.31976	19.53	Pk	10.9	1.5	-40	-8.07	29.54	-37.61	-	-	0-360
5	5.73089	16.45	Pk	10.9	1.5	-40	-11.15	29.54	-40.69	-	-	0-360

Pk - Peak detector

FCC 15.209 Below 30MHz.TST 30915 30 Dec 2015
Rev 9.5 07 Jan 2016

8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.9775	31.04	Pk	20.9	-27.2	24.74	40	-15.26	0-360	200	H
4	40.455	40.5	Pk	13.9	-27	27.4	40	-12.6	0-360	100	V
2	53.1625	30.84	Pk	7.4	-26.9	11.34	40	-28.66	0-360	300	H
5	66.5075	37.64	Pk	8.1	-26.7	19.04	40	-20.96	0-360	100	V
3	439.6	30.66	Pk	16.9	-24.9	22.66	46.02	-23.36	0-360	100	H
6	712.7	30.68	Pk	20.3	-24.1	26.88	46.02	-19.14	0-360	400	V

* - indicates frequency in 47 CFR §15.205/IC RSS-Gen §8.10Restricted Band

Pk - Peak detector

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(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 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.		

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 C63.10.

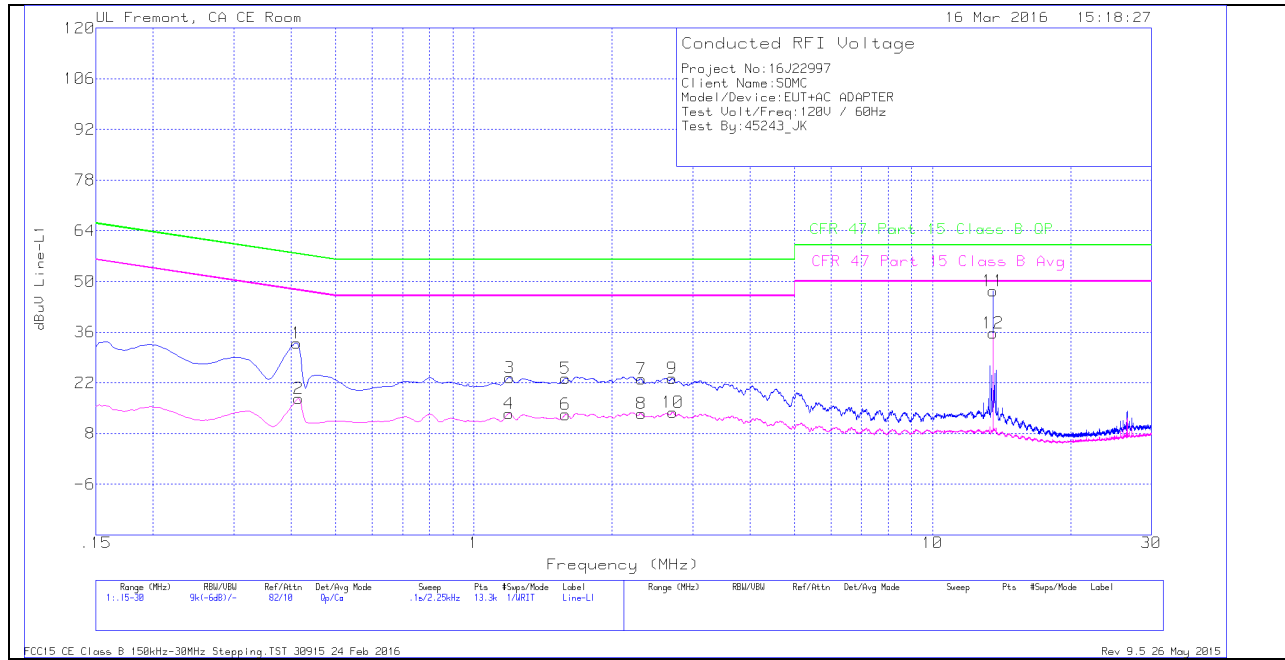
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

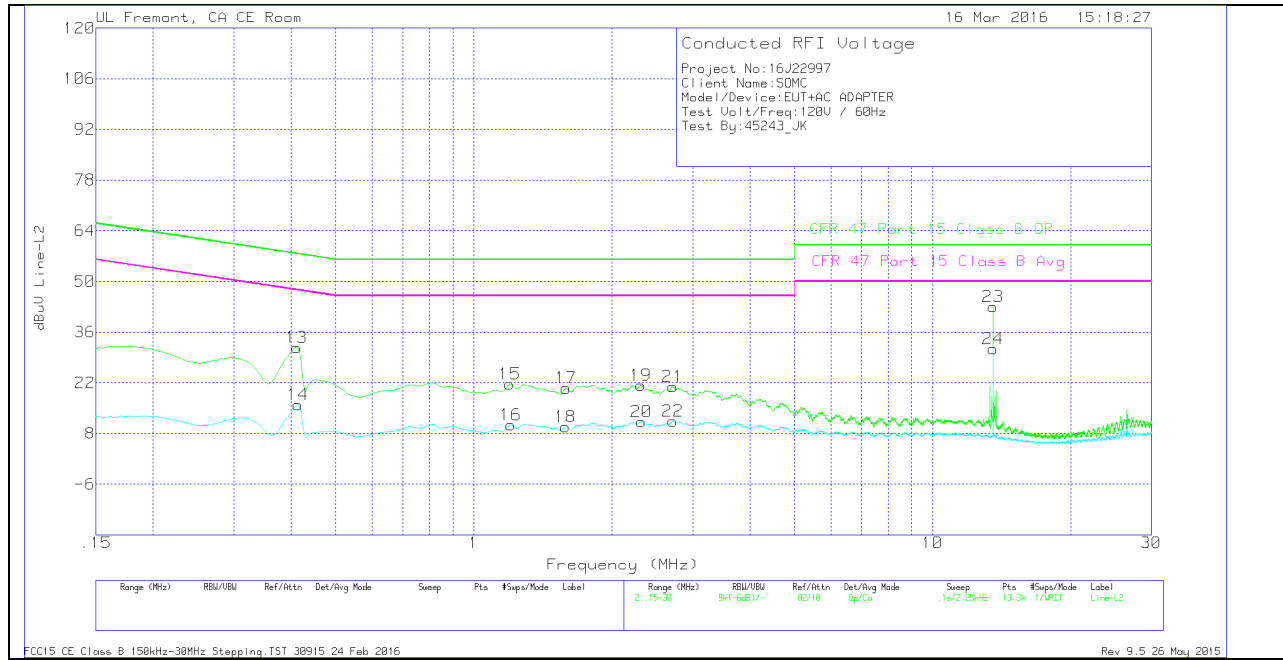
RESULTS

No non-compliance noted:

LINE 1 PLOT



LINE 2 PLOT



LINE 1 & LINE 2 RESULTS

Trace Markers

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.411	22.54	Qp	.4	0	10.1	33.04	57.63	-24.59	-	-
2	.4155	7.13	Ca	.4	0	10.1	17.63	-	-	47.54	-29.91
3	1.19625	12.96	Qp	.3	.1	10.1	23.46	56	-32.54	-	-
4	1.194	3.04	Ca	.3	.1	10.1	13.54	-	-	46	-32.46
5	1.5855	12.9	Qp	.2	.1	10.1	23.3	56	-32.7	-	-
6	1.5855	2.84	Ca	.2	.1	10.1	13.24	-	-	46	-32.76
7	2.31675	12.63	Qp	.2	.1	10.1	23.03	56	-32.97	-	-
8	2.31675	3.07	Ca	.2	.1	10.1	13.47	-	-	46	-32.53
9	2.70488	12.89	Qp	.2	.1	10.1	23.29	56	-32.71	-	-
10	2.71163	3.47	Ca	.2	.1	10.1	13.87	-	-	46	-32.13
11	13.56	36.84	Qp	.2	.2	10.2	47.44	60	-12.56	-	-
12	13.56	25.21	Ca	.2	.2	10.2	35.81	-	-	50	-14.19

Qp - Quasi-Peak detector

Ca - CISPR average detection

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.411	21.28	Qp	.4	0	10.1	31.78	57.63	-25.85	-	-
14	.41325	5.43	Ca	.4	0	10.1	15.93	-	-	47.58	-31.65
15	1.1985	11.2	Qp	.2	.1	10.1	21.6	56	-34.4	-	-
16	1.203	-0.05	Ca	.2	.1	10.1	10.35	-	-	46	-35.65
17	1.59	10.14	Qp	.2	.1	10.1	20.54	56	-35.46	-	-
18	1.5855	-6	Ca	.2	.1	10.1	9.8	-	-	46	-36.2
19	2.31	10.89	Qp	.2	.1	10.1	21.29	56	-34.71	-	-
20	2.319	.84	Ca	.2	.1	10.1	11.24	-	-	46	-34.76
21	2.7195	10.5	Qp	.2	.1	10.1	20.9	56	-35.1	-	-
22	2.715	1.01	Ca	.2	.1	10.1	11.41	-	-	46	-34.59
23	13.56	32.51	Qp	.2	.2	10.2	43.11	60	-16.89	-	-
24	13.56	20.83	Ca	.2	.2	10.2	31.43	-	-	50	-18.57

Qp - Quasi-Peak detector

Ca - CISPR average detection

10. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.

While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.

TEST PROCEDURE

ANSI C63.10-2013

RESULTS

No non-compliance noted.

Frequency stability versus temperature & apply voltage

Reference Frequency: EUT Channel 13.560000 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
5.00	50	13.5598988	-4.143	± 100
5.00	40	13.5598654	-1.680	± 100
5.00	30	13.5598627	-1.477	± 100
5.00	20	13.5598427	0.000	± 100
5.00	10	13.5598425	0.009	± 100
5.00	0	13.5598976	-4.055	± 100
5.00	-10	13.5598877	-3.319	± 100
5.00	-20	13.5599756	-9.801	± 100
5.00	-30	13.5599765	-9.870	± 100
4.25	20	13.5598723	-2.183	± 100
5.75	20	13.5598652	-1.663	± 100

Note: Frequency stability versus time interval measurements were taken and worst case results are reported in the above table.