FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

FCC ID: PY7-21831Z

REPORT NUMBER: 11589096A-E7V2

ISSUE DATE: 2017-02-24

Prepared for
SONY MOBILE COMMUNICATIONS, INC.
4-12-3 Higashi-Shinagawa, Shinagawa-ku,
Tokyo, 140-0002, Japan

Prepared by
UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400

NVLAP TESTING

NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2017-02-20	Initial Issue	Richard Jankovics
2	2017-02-24	Removed BLE reference from EUT description, revised Section 5.2 to Electric Field strength.	Jeff Moser

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.
4-12-3 Higashi-Shinagawa, Shinagawa-ku,
Tokyo, 140-0002, Japan

EUT DESCRIPTION: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

SERIAL NUMBER: 00440245-675939-2

DATE TESTED: 2017-01-05 – 2017-01-25

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. Government.

Approved & Released
For UL LLC By:

Jeff Moser
EMC Program Manager
UL – Consumer Technology Division

Prepared By:

Richard Jankovics
WiSE Engineer
UL – Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, 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 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
☐ Chamber NORTH
☒ Chamber SOUTH

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://www.nist.gov/nvlap/

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
Total RF power, conducted	± 0.45
RF power density, conducted	± 1.50
Spurious emissions, conducted	± 2.94
All emissions, radiated up to 26 GHz	± 5.36
Temperature	± 0.07
Humidity	± 2.26
DC and low frequency voltages	± 1.27
Conducted Emissions (0.150-30MHz)	± 3.65
Frequency Stability	± 141 Hz

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 FUNDAMENTAL ELECTRIC FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30 meter distance is 21.92 dBuV/m which is converted from the 3 meter data.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes loop antenna.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 1.30

5.5. 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.

For testing performed with the NFC Tag, the fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z, it was determined that X-Axis orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X-Axis orientation. Modulation and data rate were fixed by the tag.

For testing performed with the NFC Test App, the fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z, it was determined that Y-Axis orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y-Axis orientation. All modulations and data rates were investigated and it was determined that Type A, 106 Kbps was considered worst-case. Therefore, all testing was performed in Type A, 106 Kbps mode.

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Desktop	Lenovo	ThinkCentre	MG00ADEN	NA
Headphones	Sony	MH410x	1625A87E00005E2	NA
PowerSupply	Sony	1300-7138.1	4016W34204581	NA

I/O CABLES

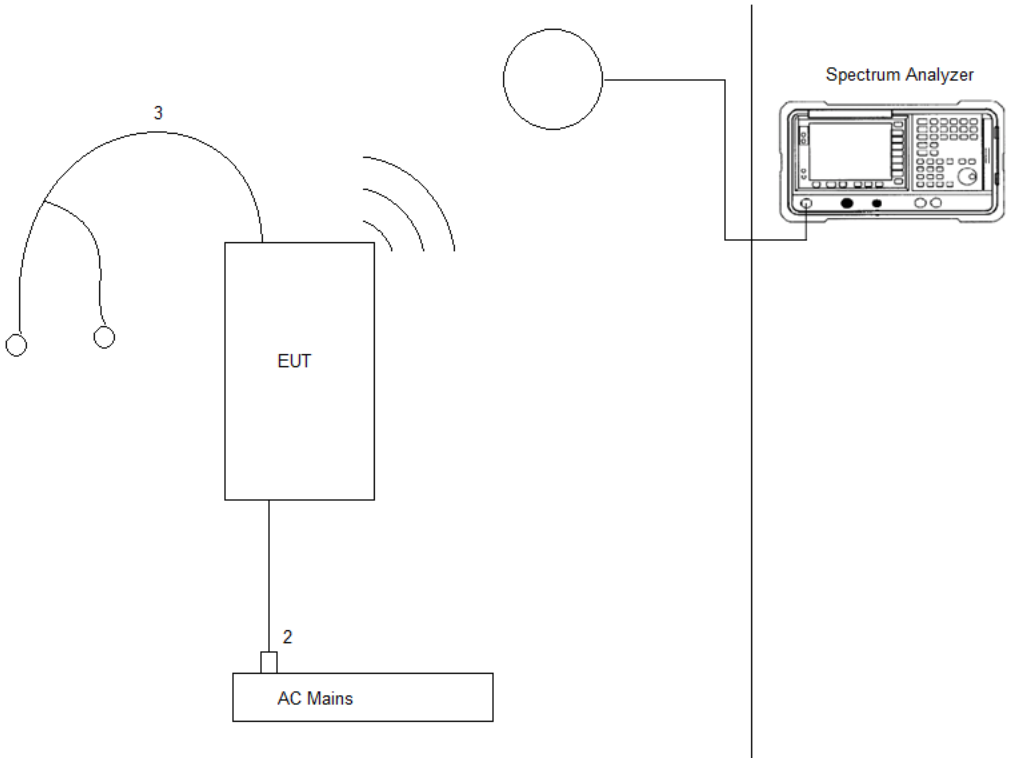
I/O Cable List					
Cable No	**Port**	**# of Identical ports**	**Connector Type**	**Cable Length (m)**	**Remarks**
2	DC Mains	1	AC	>1m	NA
3	Audio	1	3.5mm	>1m	Headphone

TEST SETUP

The EUT is setup as a standalone device. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS

Radiated



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2016-12-28	2017-12-31
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-07	2017-06-30
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2016-10-04	2017-10-04
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL077	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3476-240	2016-06-15	2017-06-30
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2016-08-24	2017-08-24
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2016-08-23	2017-08-23
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2016-06-09	2017-06-30
MM0167	Multi-meter	Fluke	83V	2016-10-07	2017-10-31
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2016-06-04	2017-06-30
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA

Test Equipment Used – Frequency Stability and Occupied Bandwidth Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2016-03-22	2017-03-31
1100502	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2016-06-06	2017-06-06
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
	Additional Equipment used				
SA0026	Spectrum Analyzer	Keysight Technologies	N9030A	2016-02-24	2017-02-28
7405	E and B – Field Probes	EMCO	7405	N/A	N/A

7. OCCUPIED BANDWIDTH

LIMITS

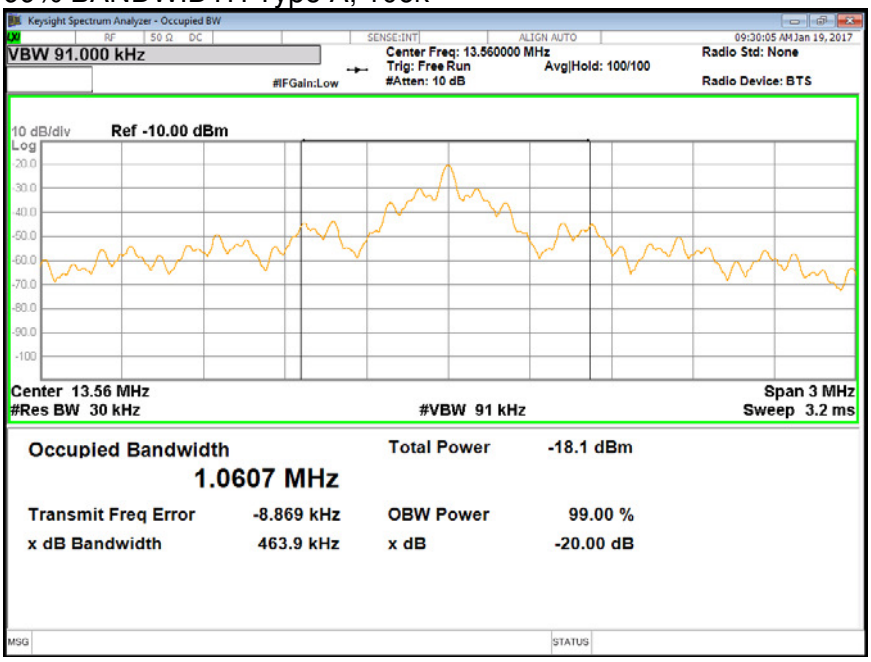
None; for reporting purposes only. Tested per ANSI C63.10 (6.9.2 and 6.9.3)

RESULTS

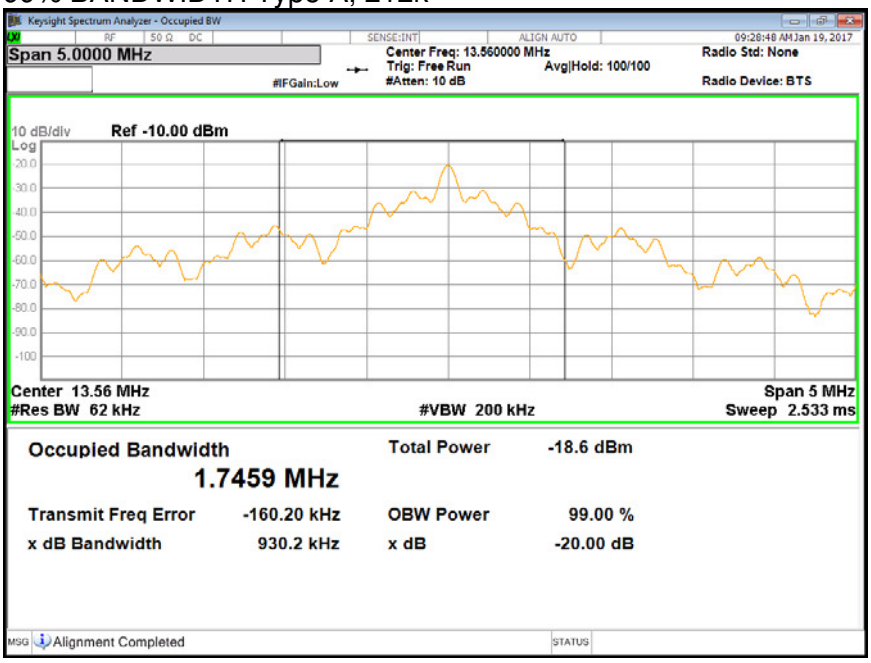
Frequency (MHz)	Modulation	Data Rate (kbps)	99% Bandwidth (MHz)	20 dB Bandwidth (MHz)
13.56	Type A	106	1.061	0.440
		212	1.746	0.864
		424	2.334	1.736
		848	2.122	1.770
	Type B	106	0.106	0.028
		212	0.203	0.028
		424	0.374	0.027
		848	0.683	0.026
	Type F	212	0.431	0.026
		424	0.883	0.026

99% BANDWIDTH

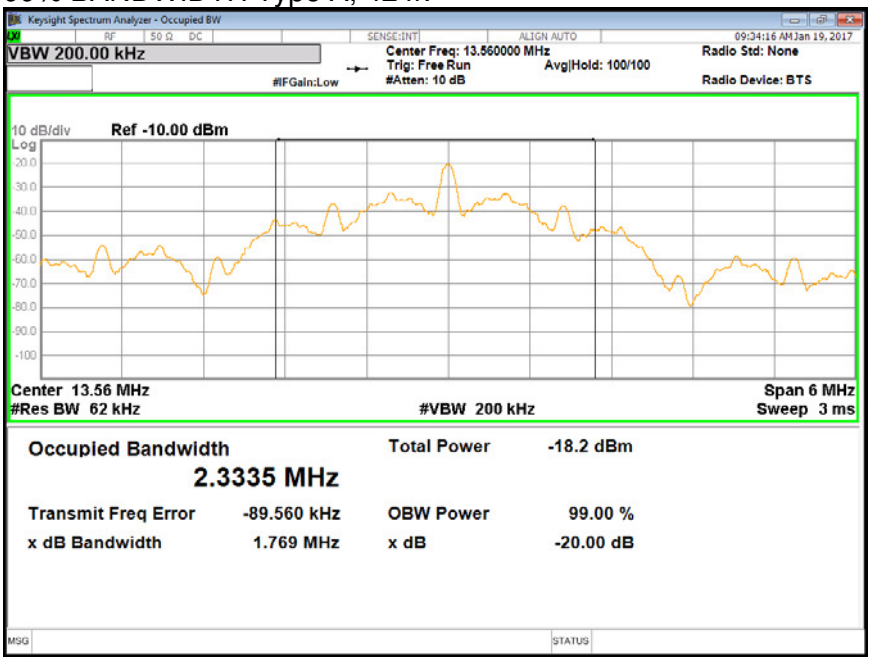
99% BANDWIDTH Type A, 106k



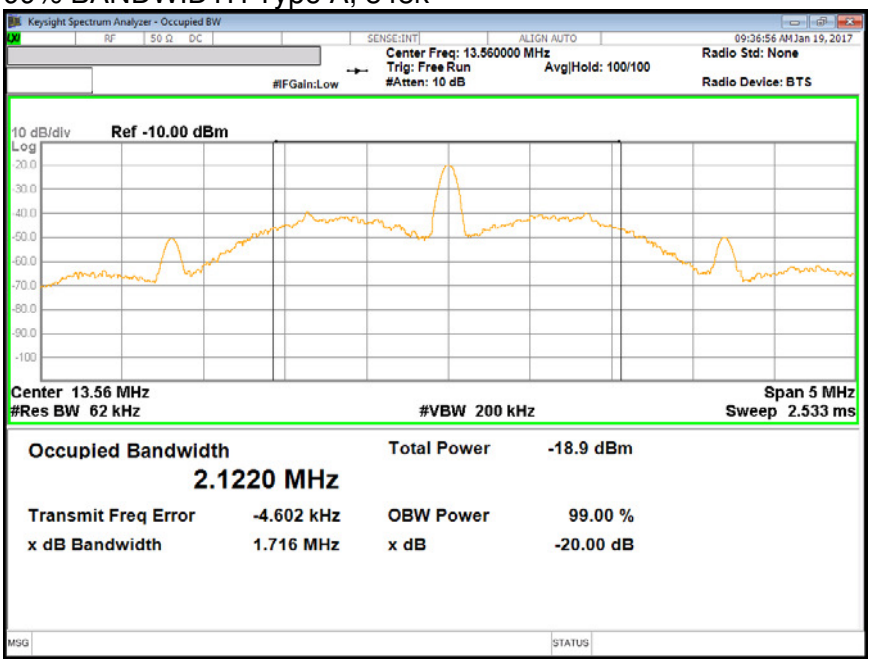
99% BANDWIDTH Type A, 212k



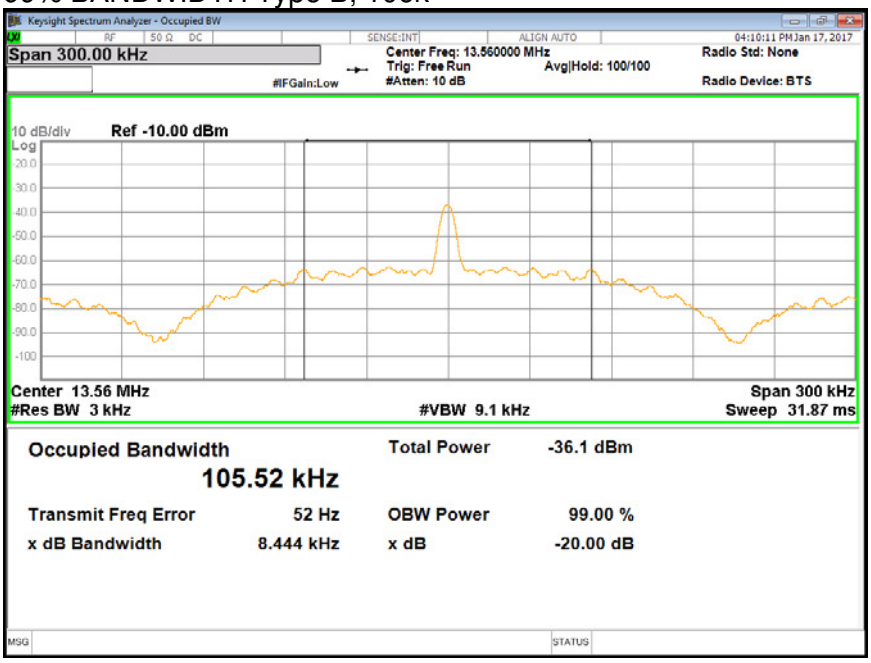
99% BANDWIDTH Type A, 424k



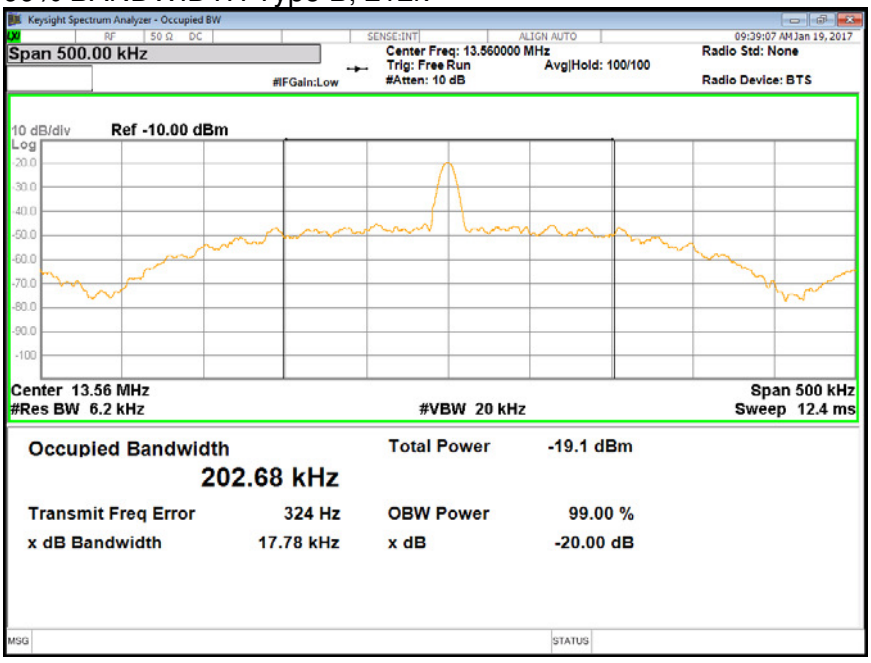
99% BANDWIDTH Type A, 848k



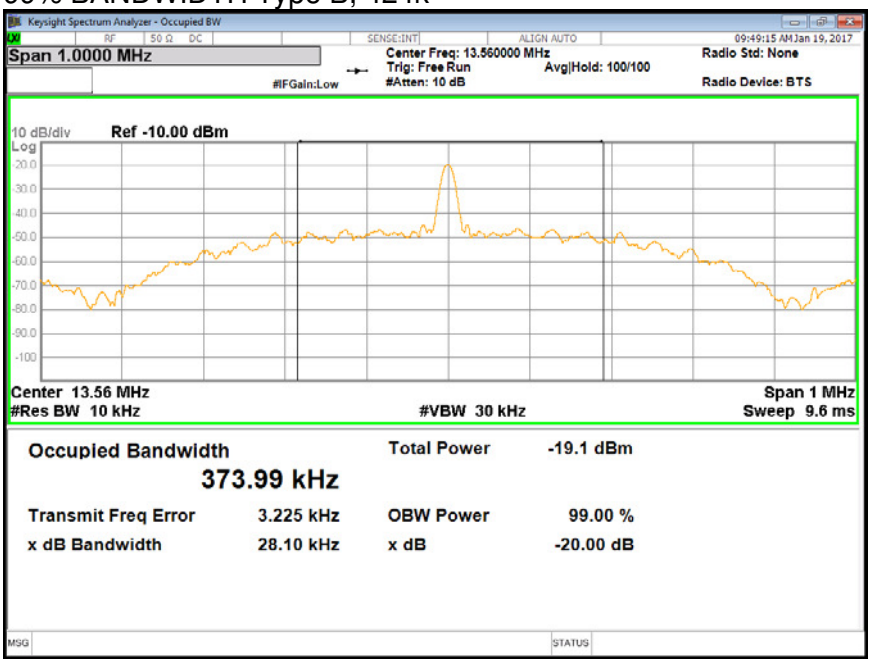
99% BANDWIDTH Type B, 106k



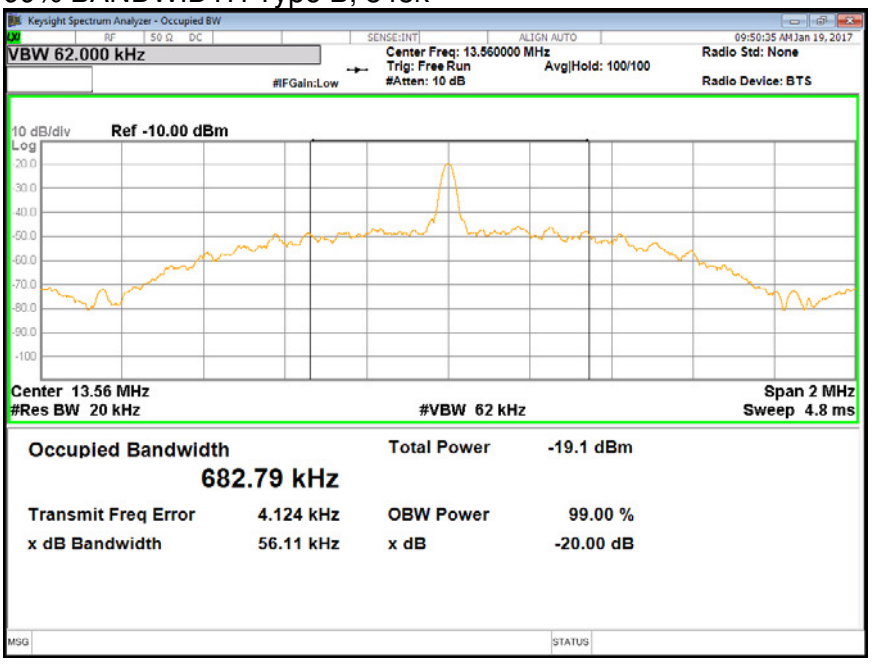
99% BANDWIDTH Type B, 212k



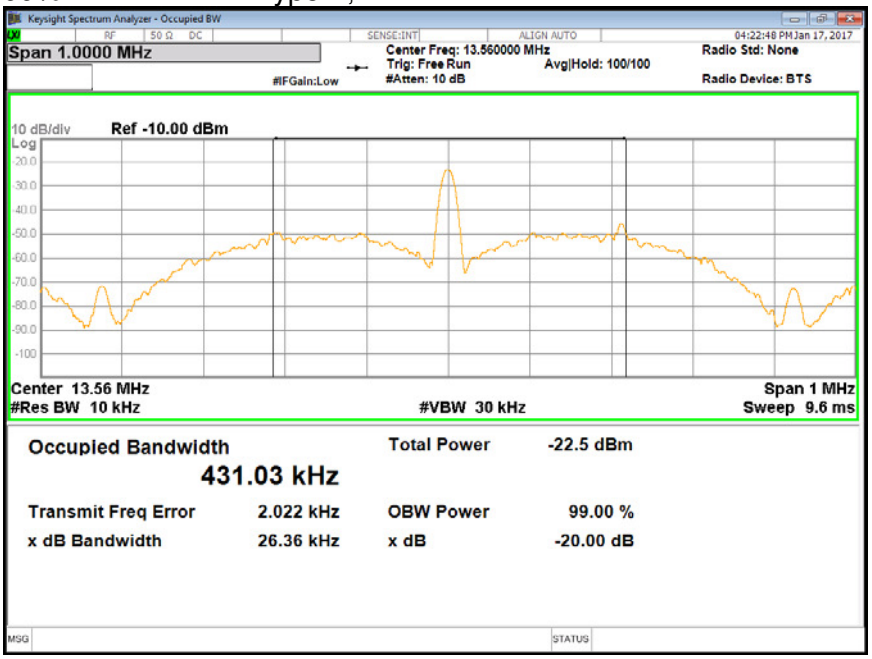
99% BANDWIDTH Type B, 424k



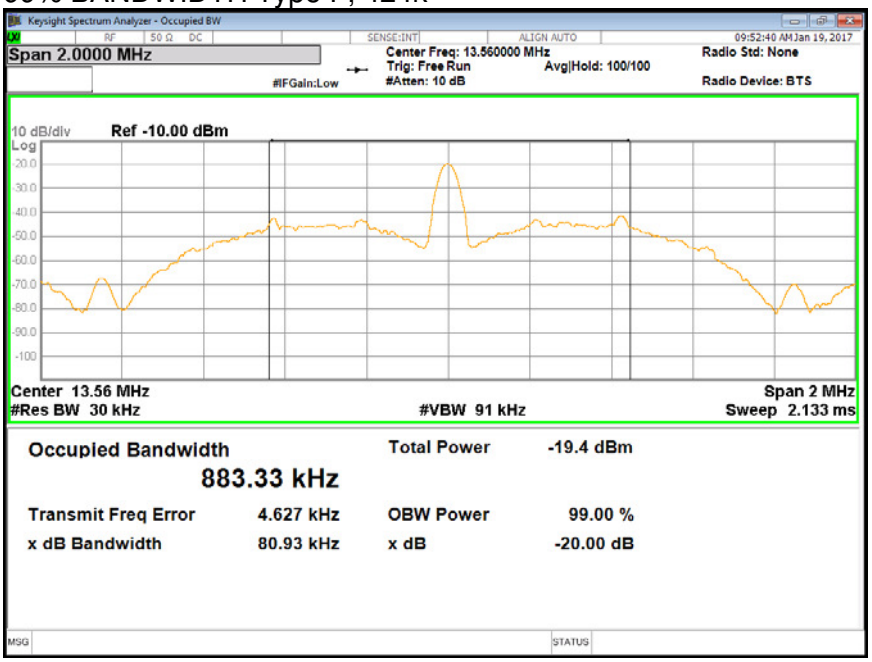
99% BANDWIDTH Type B, 848k



99% BANDWIDTH Type F, 212k

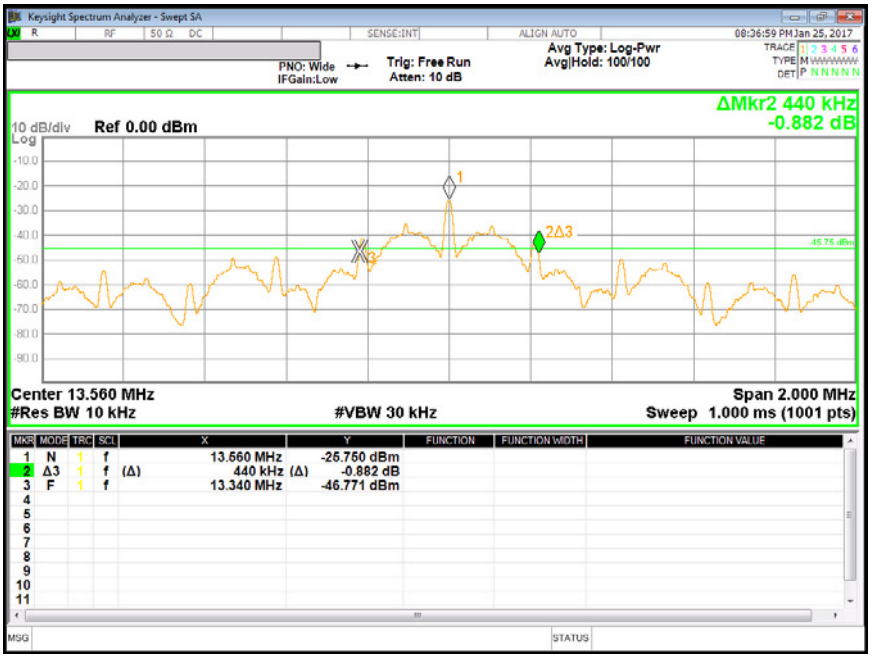


99% BANDWIDTH Type F, 424k



20dB BANDWIDTH

20dB BANDWIDTH Type A, 106k



20dB BANDWIDTH Type A, 212k

20dB BANDWIDTH Type A, 424k

20dB BANDWIDTH Type A, 848k

20dB BANDWIDTH Type B, 106k

20dB BANDWIDTH Type B, 212k

20dB BANDWIDTH Type B, 424k

20dB BANDWIDTH Type B, 848k

20dB BANDWIDTH Type F, 212k

20dB BANDWIDTH Type F, 424k

8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225, 15.209

(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

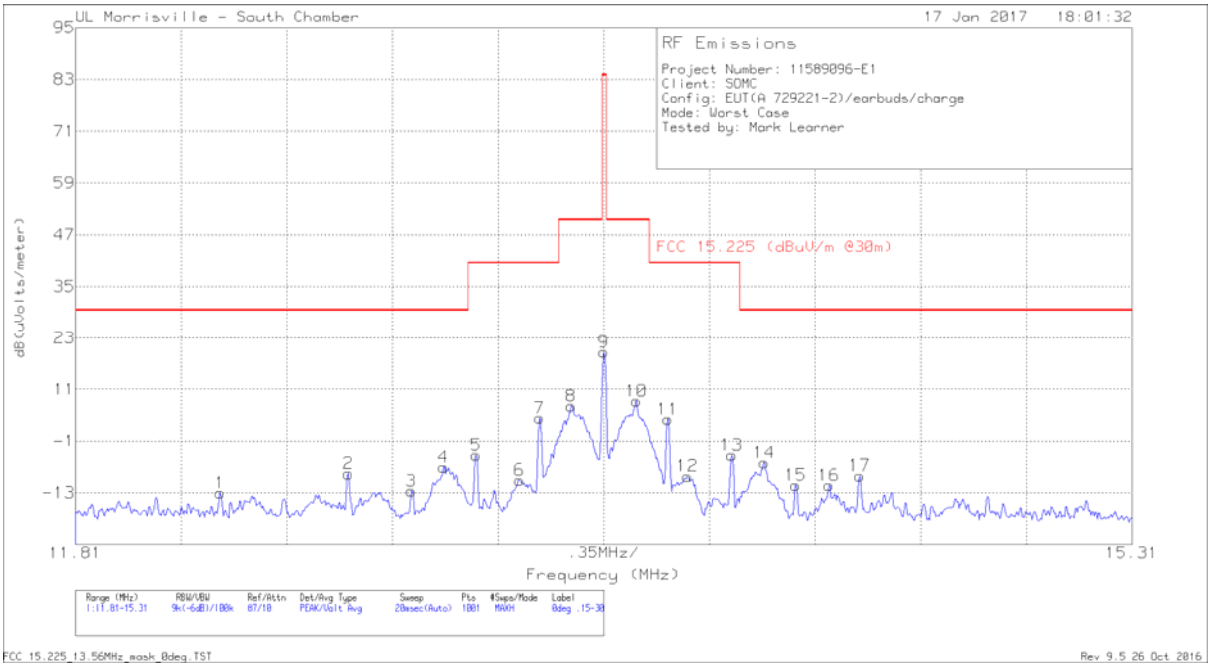
Device is a Smart Phone.

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 Type A, 106k, 0 deg (Test App)

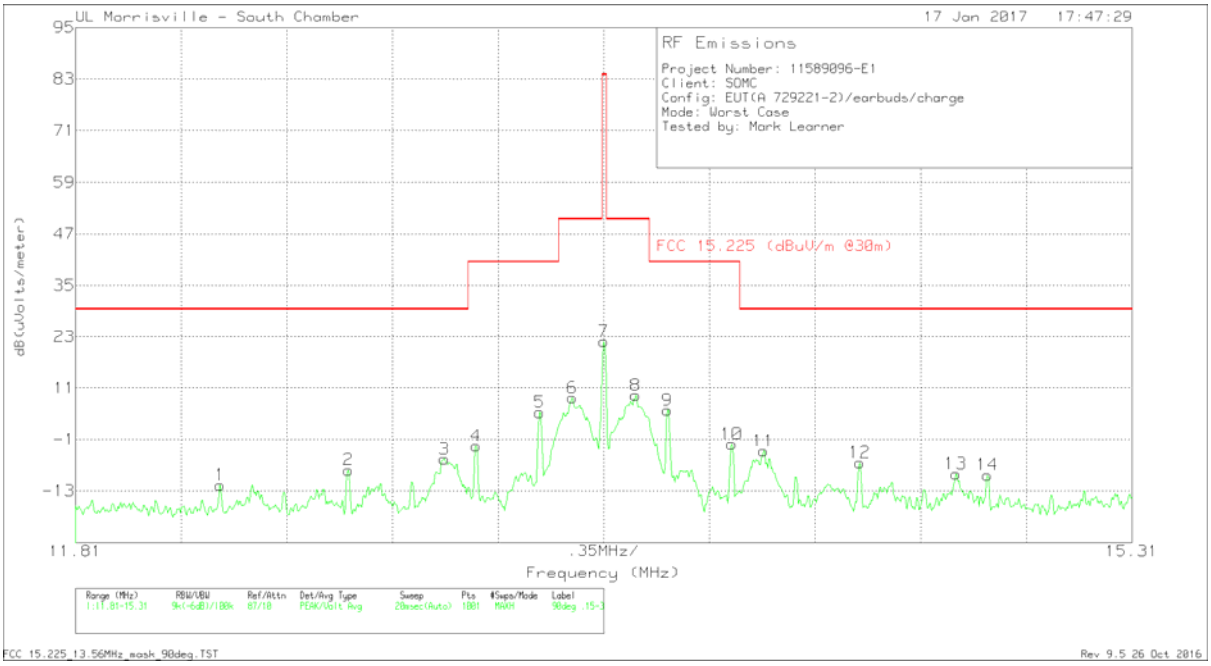


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 (dBuV/m @30m)	Margin (dB)	Azimuth (Degs)
1	12.2895	15.83	Pk	10.5	.6	-40	-13.07	29.5	-42.57	72
2	12.713	20.44	Pk	10.4	.6	-40	-8.56	29.5	-38.06	72
3	12.923	16.38	Pk	10.4	.6	-40	-12.62	29.5	-42.12	72
4	13.028	21.99	Pk	10.4	.6	-40	-7.01	29.5	-36.51	72
5	13.1365	24.73	Pk	10.4	.6	-40	-4.27	40.5	-44.77	72
6	13.28	18.94	Pk	10.4	.6	-40	-10.06	40.5	-50.56	72
7	13.3465	33.29	Pk	10.4	.6	-40	4.29	40.5	-36.21	72
8	13.4515	36.07	Pk	10.4	.6	-40	7.07	50.5	-43.43	72
9	13.56	48.66	Pk	10.4	.6	-40	19.66	84	-64.34	72
10	13.6685	37.29	Pk	10.4	.6	-40	8.29	50.5	-42.21	72
11	13.77175	33.03	Pk	10.4	.6	-40	4.03	40.5	-36.47	72
12	13.8365	19.84	Pk	10.4	.6	-40	-9.16	40.5	-49.66	72
13	13.9835	24.73	Pk	10.4	.6	-40	-4.27	40.5	-44.77	72
14	14.09025	22.96	Pk	10.4	.6	-40	-6.04	29.5	-35.54	72
15	14.19525	17.77	Pk	10.4	.6	-40	-11.23	29.5	-40.73	72
16	14.3055	17.73	Pk	10.4	.6	-40	-11.27	29.5	-40.77	72
17	14.407	19.98	Pk	10.4	.6	-40	-9.02	29.5	-38.52	72

Pk - Peak detector

FUNDAMENTAL Type A, 106k, 90 deg (Test App)

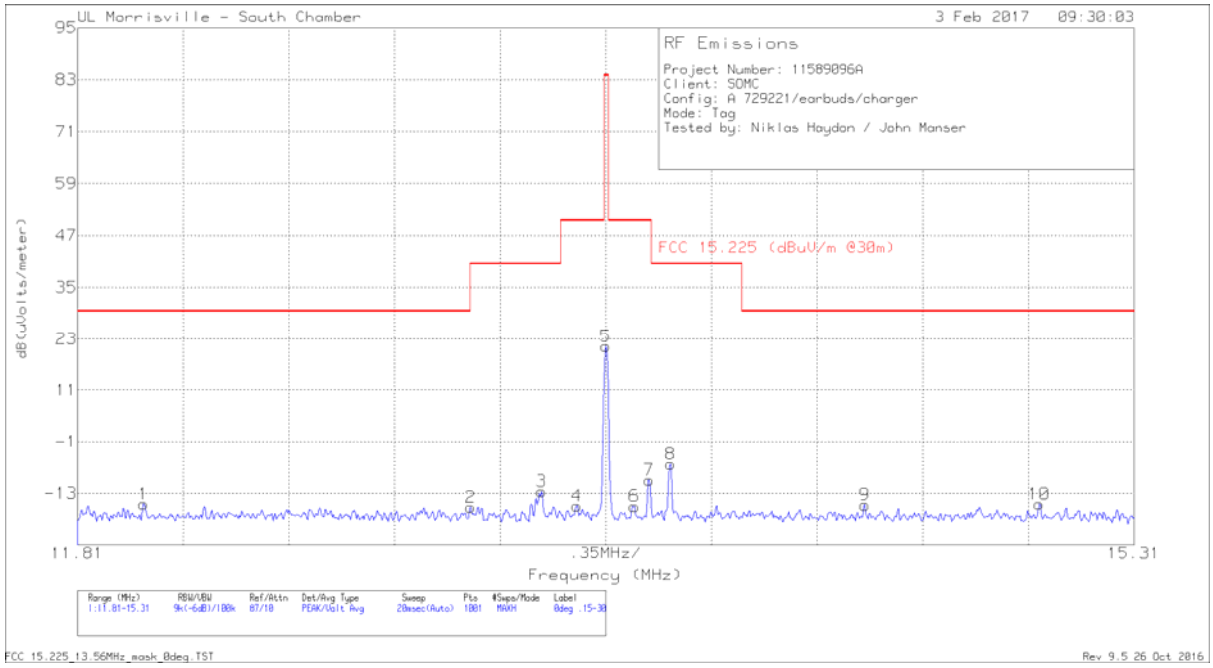


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 (dBuV/m @30m)	Margin (dB)	Azimuth (Degs)
1	12.2895	17.24	Pk	10.5	.6	-40	-11.66	29.5	-41.16	174
2	12.713	20.87	Pk	10.4	.6	-40	-8.13	29.5	-37.63	174
3	13.0315	23.38	Pk	10.4	.6	-40	-5.62	29.5	-35.12	174
4	13.1365	26.5	Pk	10.4	.6	-40	-2.5	40.5	-43	174
5	13.3465	34.3	Pk	10.4	.6	-40	5.3	40.5	-35.2	174
6	13.455	37.75	Pk	10.4	.6	-40	8.75	50.5	-41.75	174
7	13.56	50.92	Pk	10.4	.6	-40	21.92	84	-62.08	174
8	13.665	38.31	Pk	10.4	.6	-40	9.31	50.5	-41.19	174
9	13.77	34.77	Pk	10.4	.6	-40	5.77	40.5	-34.73	174
10	13.9835	26.87	Pk	10.4	.6	-40	-2.13	40.5	-42.63	174
11	14.0885	25.28	Pk	10.4	.6	-40	-3.72	29.5	-33.22	174
12	14.407	22.6	Pk	10.4	.6	-40	-6.4	29.5	-35.9	174
13	14.7255	20.08	Pk	10.3	.6	-40	-9.02	29.5	-38.52	174
14	14.8305	19.8	Pk	10.3	.6	-40	-9.3	29.5	-38.8	174

Pk - Peak detector

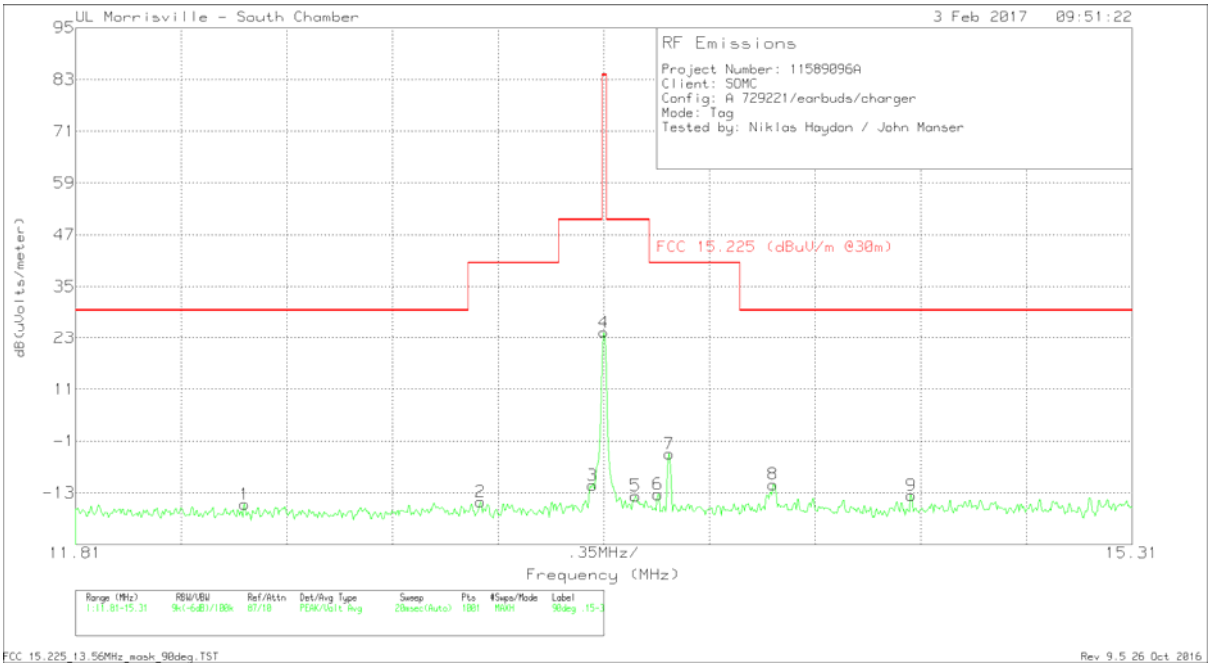
FUNDAMENTAL 0 deg (With Tag)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uV/m)	FCC 15.225 (dBuV/m @30m)	Margin (dB)	Azimuth (Degs)
1	12.02875	13.43	Pk	10.5	.6	-40	-15.47	29.5	-44.97	69
2	13.112	12.77	Pk	10.4	.6	-40	-16.23	40.5	-56.73	69
3	13.3465	16.47	Pk	10.4	.6	-40	-12.53	40.5	-53.03	69
4	13.46375	13.09	Pk	10.4	.6	-40	-15.91	50.5	-66.41	69
5	13.56	50.28	Pk	10.4	.6	-40	21.28	84	-62.72	69
6	13.6545	12.99	Pk	10.4	.6	-40	-16.01	50.5	-66.51	69
7	13.7035	19.08	Pk	10.4	.6	-40	-9.92	50.5	-60.42	69
8	13.7735	22.83	Pk	10.4	.6	-40	-6.17	40.5	-46.67	69
9	14.4175	13.29	Pk	10.4	.6	-40	-15.71	29.5	-45.21	69
10	14.995	13.57	Pk	10.3	.6	-40	-15.53	29.5	-45.03	69

Pk - Peak detector
FCC 15.225_13.56MHz_mask_0deg.TST
Rev 9.5 26 Oct 2016

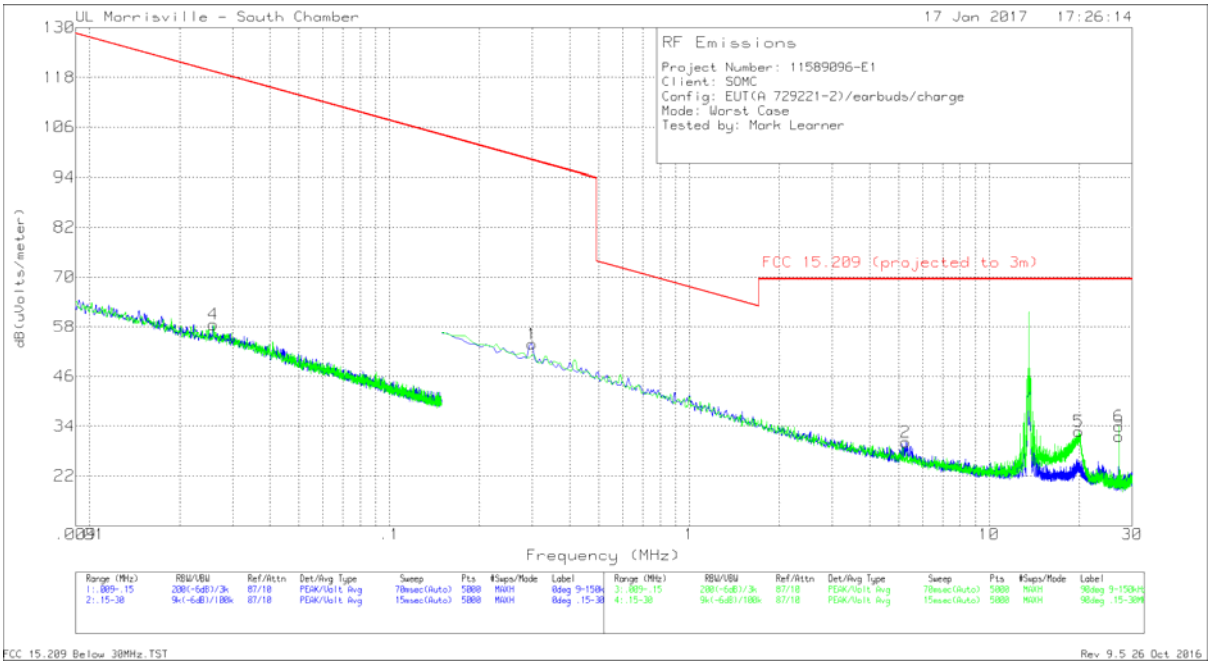
FUNDAMENTAL 90 deg (With Tag)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 (dBuV/m @30m)	Margin (dB)	Azimuth (Degs)
1	12.37	13.24	Pk	10.5	.6	-40	-15.66	29.5	-45.16	164
2	13.1505	13.96	Pk	10.4	.6	-40	-15.04	40.5	-55.54	164
3	13.5215	17.68	Pk	10.4	.6	-40	-11.32	50.5	-61.82	164
4	13.56	53.3	Pk	10.4	.6	-40	24.3	84	-59.7	164
5	13.665	15.3	Pk	10.4	.6	-40	-13.7	50.5	-64.2	164
6	13.7385	15.63	Pk	10.4	.6	-40	-13.37	40.5	-53.87	164
7	13.777	25.04	Pk	10.4	.6	-40	-3.96	40.5	-44.46	164
8	14.12	17.95	Pk	10.4	.6	-40	-11.05	29.5	-40.55	164
9	14.5785	15.52	Pk	10.3	.6	-40	-13.58	29.5	-43.08	164

Pk - Peak detector
FCC 15.225_13.56MHz_mask_90deg.TST
Rev 9.5 26 Oct 2016

SPURIOUS EMISSION (0.009-30 MHz) Type A, 106k (Test App)

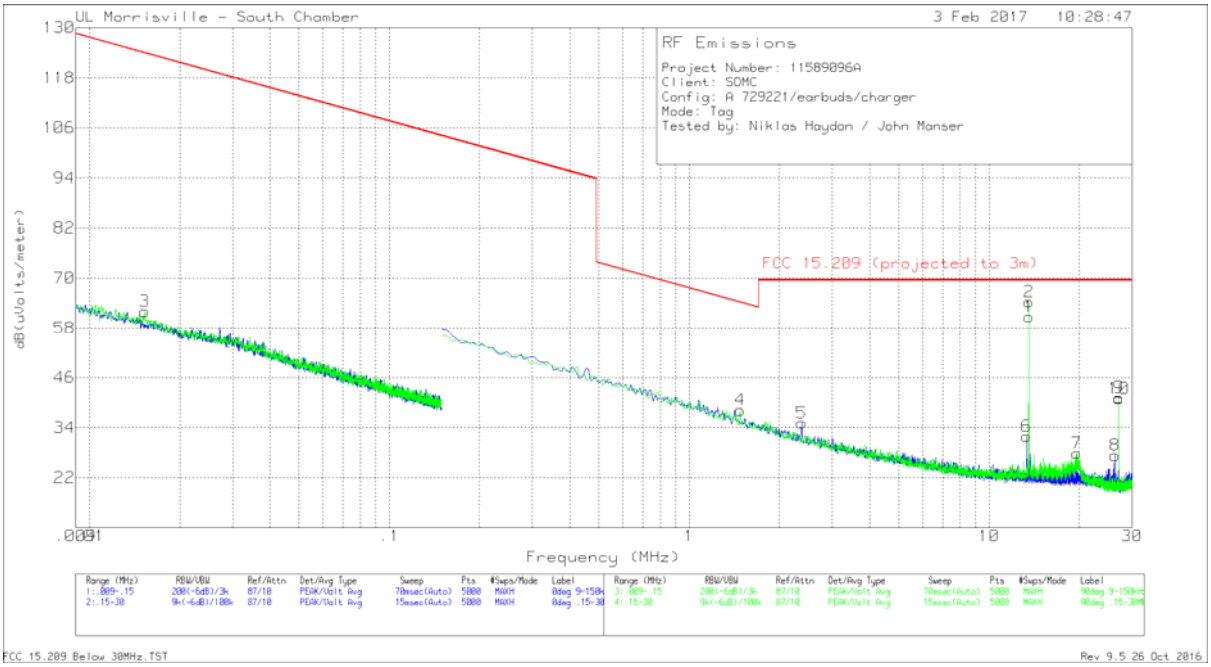


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)	Loop Antenna Face
1	.29928	43.06	Pk	10.6	.1	53.76	98.08	-44.32	0-360	On EUT
2	5.26715	18.73	Pk	11	.4	30.13	69.54	-39.41	0-360	On EUT
3	27.12101	22.01	Pk	8.6	.9	31.51	69.54	-38.03	0-360	On EUT
4	.02591	44.76	Pk	13.7	.1	58.56	119.33	-60.77	0-360	Off EUT
5	19.91998	22.09	Pk	9.9	.7	32.69	69.54	-36.85	0-360	Off EUT
6	27.12101	24.38	Pk	8.6	.9	33.88	69.54	-35.66	0-360	Off EUT

Pk - Peak detector

SPURIOUS EMISSION (0.009-30 MHz) (With Tag)

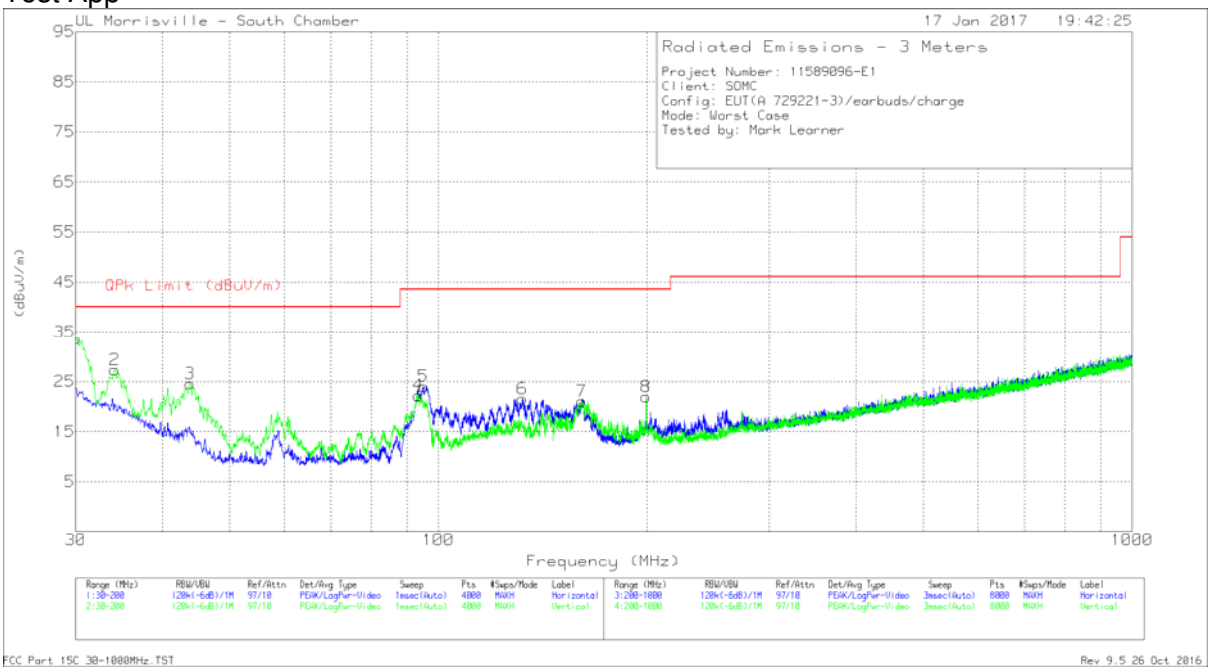


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)	Polarity
3	.0153	45.92	Pk	16	.1	62.02	123.91	-61.89	0-360	Face Off
4	1.48153	26.99	Pk	11	.2	38.19	64.19	-26	0-360	Face Off
5	2.37121	23.88	Pk	11	.2	35.08	69.54	-34.46	0-360	Face On
6	13.3489	20.95	Pk	10.4	.6	31.95	69.54	-37.59	0-360	Face On
7	19.60352	17.21	Pk	9.9	.7	27.81	69.54	-41.73	0-360	Face Off
8	26.29104	17.74	Pk	8.7	.9	27.34	69.54	-42.2	0-360	Face On
9	27.12101	31.66	Pk	8.6	.9	41.16	69.54	-28.38	0-360	Face On
10	27.12101	31.43	Pk	8.6	.9	40.93	69.54	-28.61	0-360	Face Off

Pk - Peak detector
FCC 15.209 Below 30MHz.TST
Rev 9.5 26 Oct 2016

8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz

Test App

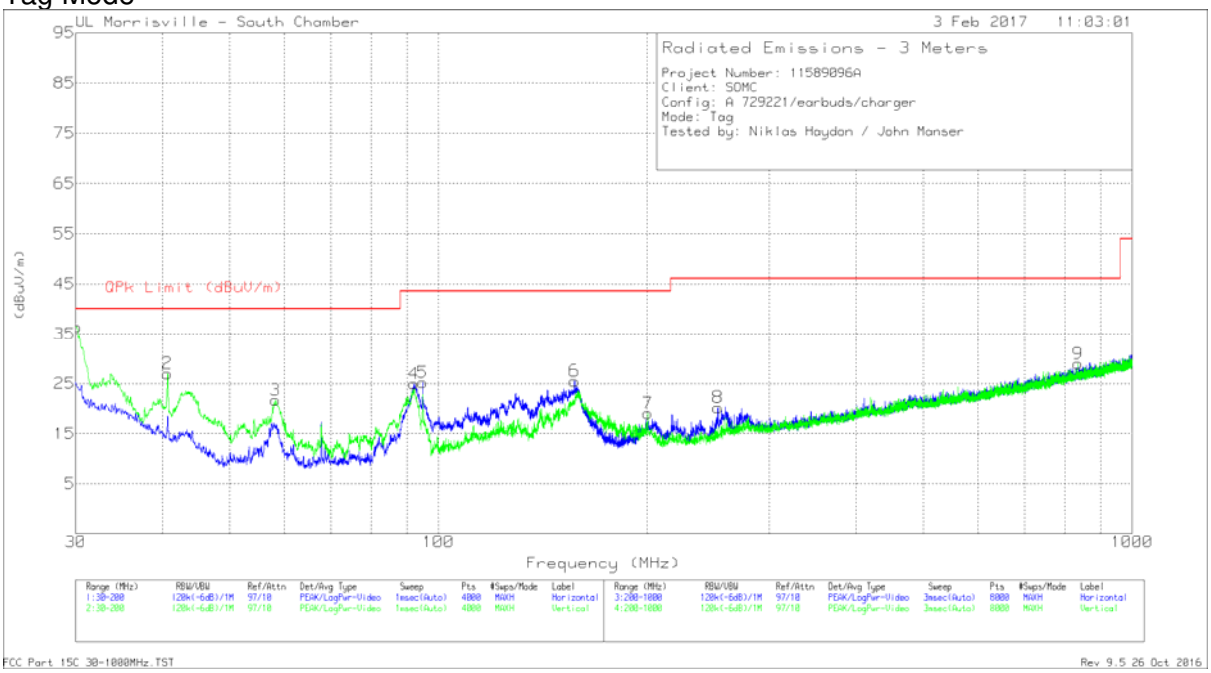


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 132.1539	34.26	Pk	18	-30.7	21.56	43.52	-21.96	0-360	198	H
1	30.0425	39.44	Pk	26	-31.8	33.64	40	-6.36	0-360	101	V
2	34.1661	36.27	Pk	22.9	-31.8	27.37	40	-12.63	0-360	101	V
3	43.8373	40.61	Pk	15.6	-31.6	24.61	40	-15.39	0-360	101	V
4	93.5114	40.95	Pk	12.4	-31.1	22.25	43.52	-21.27	0-360	101	V
5	95.1269	42.13	Pk	12.8	-30.9	24.03	43.52	-19.49	0-360	198	H
7	161.0189	34.77	Pk	16.8	-30.5	21.07	43.52	-22.45	0-360	101	V
8	199.2788	34.71	Pk	17.4	-30.2	21.91	43.52	-21.61	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

Tag Mode



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
8	* 252.9069	33.92	Pk	16.2	-29.9	20.22	46.02	-25.8	0-360	102	H
1	30.0211	39.44	Qp	26	-31.8	33.64	40	-6.36	301	100	V
2	40.6703	40.72	Pk	17.9	-31.6	27.02	40	-12.98	0-360	101	V
3	58.2698	41.25	Pk	11.8	-31.4	21.65	40	-18.35	0-360	101	V
4	92.2361	44.08	Pk	12	-31.1	24.98	43.52	-18.54	0-360	198	H
5	94.9143	43.52	Pk	12.7	-31	25.22	43.52	-18.3	0-360	198	H
6	157.1079	39.21	Pk	16.8	-30.5	25.51	43.52	-18.01	0-360	299	H
7	200.3	31.81	Pk	17.4	-30.2	19.01	43.52	-24.51	0-360	102	V
9	835.8827	30.09	Pk	26.5	-27.6	28.99	46.02	-17.03	0-360	298	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted 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 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

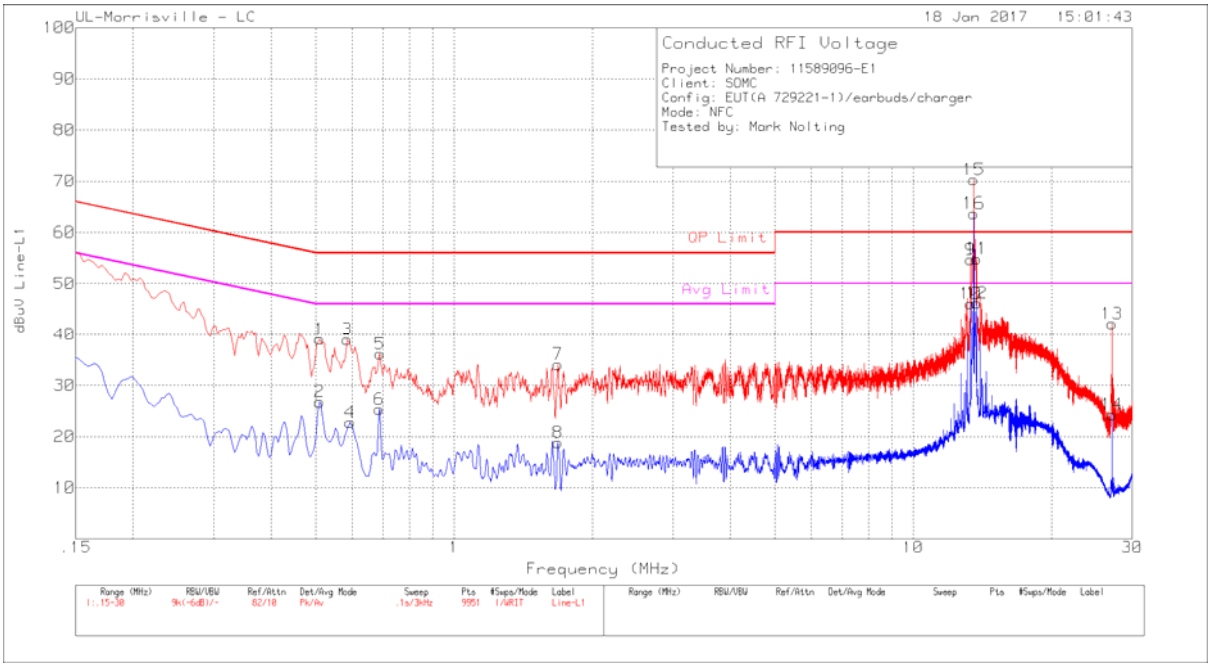
ANSI C63.10

RESULTS

No non-compliance noted:

LINE 1 RESULTS

With Antenna

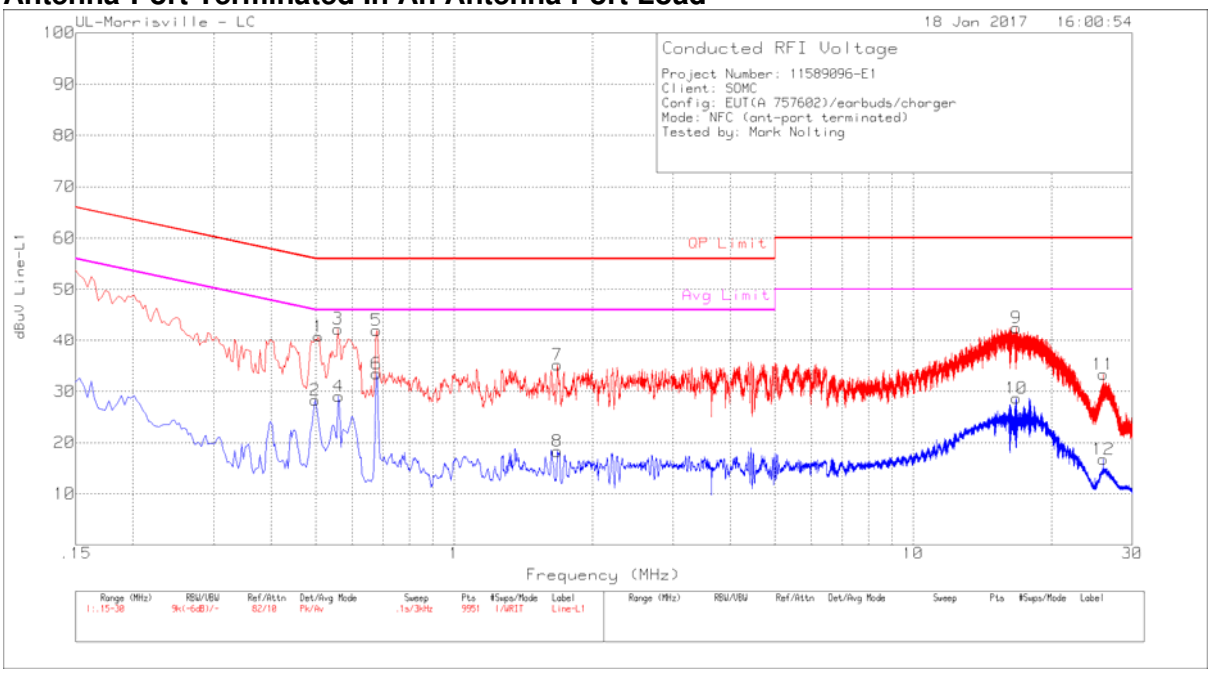


Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.51	29.08	Pk	0	10	39.08	56	-16.92	-	-
2	.51	16.77	Av	0	10	26.77	-	-	46	-19.23
3	.585	29.05	Pk	0	10	39.05	56	-16.95	-	-
4	.594	12.73	Av	0	10	22.73	-	-	46	-23.27
5	.69	26.13	Pk	0	10	36.13	56	-19.87	-	-
6	.687	15.36	Av	0	10	25.36	-	-	46	-20.64
7	1.686	24.11	Pk	0	10	34.11	56	-21.89	-	-
8	1.683	8.81	Av	0	10	18.81	-	-	46	-27.19
9	13.35	44.24	Pk	.1	10.4	54.74	**	**	**	**
10	13.347	35.64	Av	.1	10.4	46.14	**	**	**	**
11	13.773	44.39	Pk	.1	10.4	54.89	**	**	**	**
12	13.773	35.73	Av	.1	10.4	46.23	**	**	**	**
13	27.12	31.14	Pk	.3	10.7	42.14	**	**	**	**
14	27.12	13.29	Av	.3	10.7	24.29	**	**	**	**
15	13.56	59.84	Pk	.1	10.4	70.34	**	**	**	**
16	13.56	53.23	Av	.1	10.4	63.73	**	**	**	**

Pk - Peak detector
Av - Average detection

** - Indicates these emissions are over-the-air emissions picked up by the power cord and not a power-line conducted issue. (See the following plot with the antenna terminated in a dummy load showing line-conducted emissions well below the applicable limits.)

Antenna-Port Terminated In An Antenna Port Load

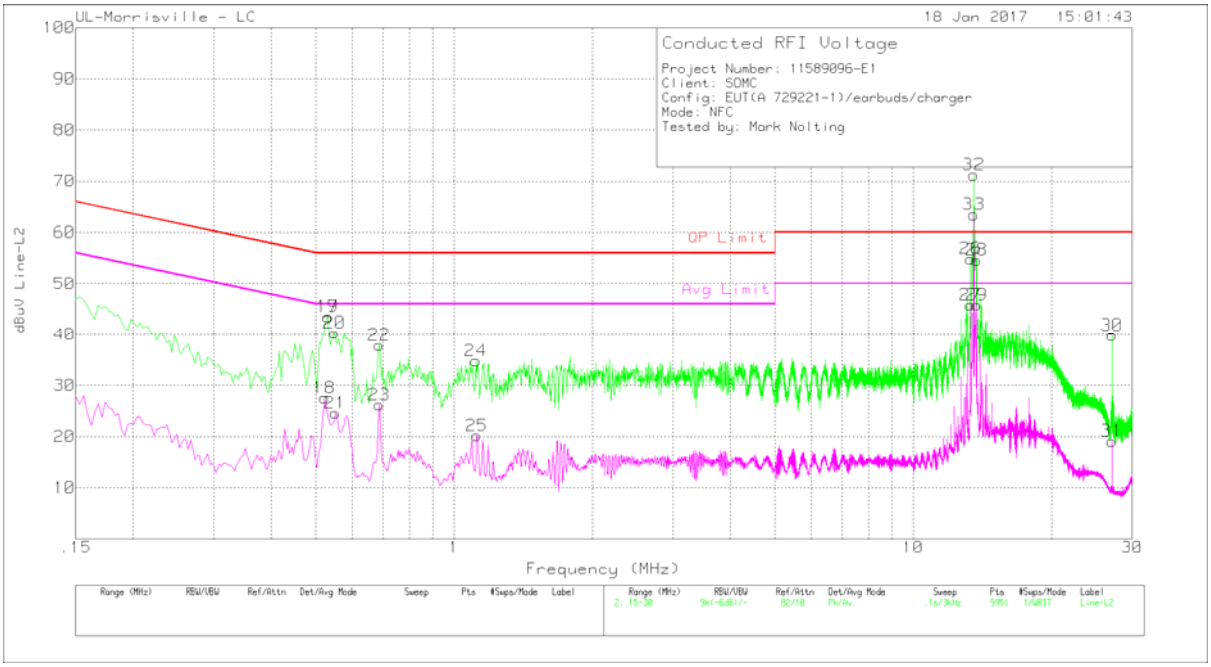


Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.507	30.86	Pk	0	10	40.86	56	-15.14	-	-
2	.498	18.28	Av	0	10	28.28	-	-	46.03	-17.75
3	.558	32.36	Pk	0	10	42.36	56	-13.64	-	-
4	.561	18.99	Av	0	10	28.99	-	-	46	-17.01
5	.678	32.07	Pk	0	10	42.07	56	-13.93	-	-
6	.678	23.44	Av	0	10	33.44	-	-	46	-12.56
7	1.68	25.18	Pk	0	10	35.18	56	-20.82	-	-
8	1.68	8.29	Av	0	10	18.29	-	-	46	-27.71
9	16.806	31.83	Pk	.2	10.5	42.53	60	-17.47	-	-
10	16.77	17.92	Av	.2	10.5	28.62	-	-	50	-21.38
11	25.962	22.32	Pk	.3	10.7	33.32	60	-26.68	-	-
12	25.965	5.75	Av	.3	10.7	16.75	-	-	50	-33.25

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS

With Antenna

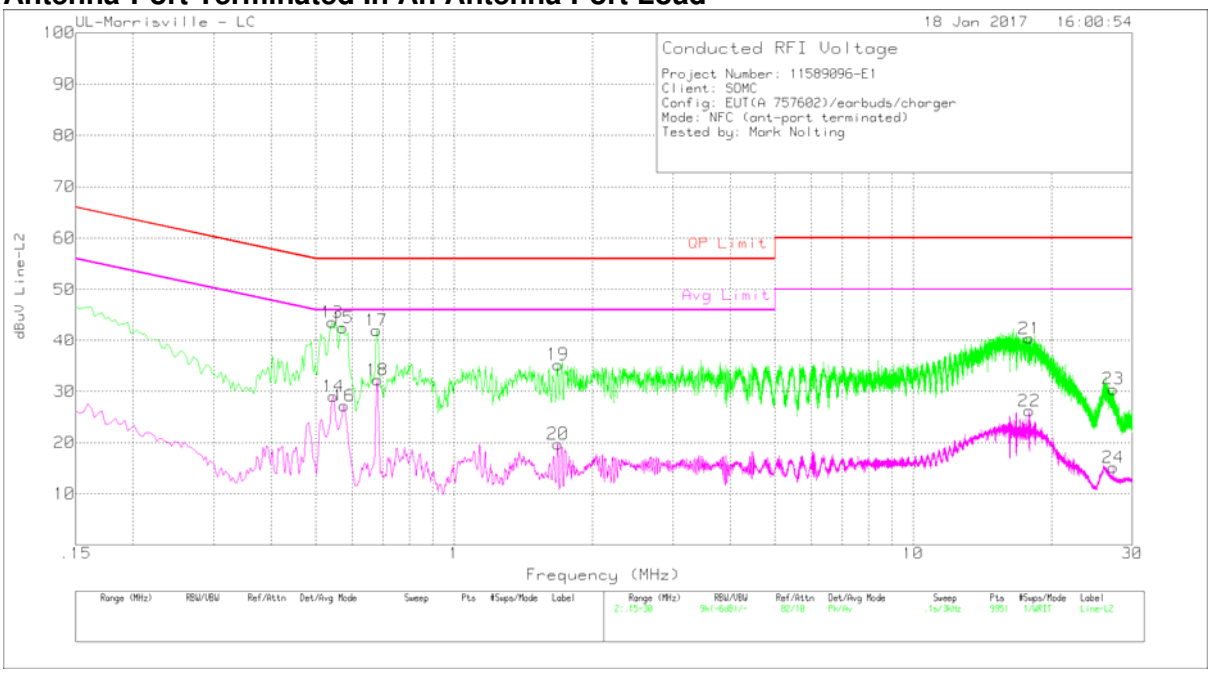


Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
17	.531	33.59	Pk	0	10	43.59	56	-12.41	-	-
18	.522	17.56	Av	0	10	27.56	-	-	46	-18.44
19	.531	33.59	Pk	0	10	43.59	56	-12.41	-	-
20	.549	30.38	Pk	0	10	40.38	56	-15.62	-	-
21	.552	14.6	Av	0	10	24.6	-	-	46	-21.4
22	.687	27.92	Pk	0	10	37.92	56	-18.08	-	-
23	.687	16.23	Av	0	10	26.23	-	-	46	-19.77
24	1.116	24.82	Pk	0	10	34.82	56	-21.18	-	-
25	1.122	10.15	Av	0	10	20.15	-	-	46	-25.85
26	13.347	44.4	Pk	.1	10.4	54.9	**	**	**	**
27	13.347	35.35	Av	.1	10.4	45.85	**	**	**	**
28	13.77	44.14	Pk	.1	10.4	54.64	**	**	**	**
29	13.773	35.34	Av	.1	10.4	45.84	**	**	**	**
30	27.12	28.88	Pk	.3	10.7	39.88	**	**	**	**
31	27.12	8.12	Av	.3	10.7	19.12	**	**	**	**
32	13.56	60.76	Pk	.1	10.4	71.26	**	**	**	**
33	13.56	53.02	Av	.1	10.4	63.52	**	**	**	**

Pk - Peak detector
Av - Average detection

** - Indicates these emissions are over-the-air emissions picked up by the power cord and not a power-line conducted issue. (See the following plot with the antenna terminated in a dummy load showing line-conducted emissions well below the applicable limits.)

Antenna-Port Terminated In An Antenna Port Load



Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.543	33.66	Pk	0	10	43.66	56	-12.34	-	-
14	.546	19.03	Av	0	10	29.03	-	-	46	-16.97
15	.573	32.58	Pk	0	10	42.58	56	-13.42	-	-
16	.576	17.15	Av	0	10	27.15	-	-	46	-18.85
17	.678	32.02	Pk	0	10	42.02	56	-13.98	-	-
18	.681	22.22	Av	0	10	32.22	-	-	46	-13.78
19	1.683	25.23	Pk	0	10	35.23	56	-20.77	-	-
20	1.683	9.72	Av	0	10	19.72	-	-	46	-26.28
21	17.91	29.85	Pk	.1	10.5	40.45	60	-19.55	-	-
22	17.904	15.58	Av	.1	10.5	26.18	-	-	50	-23.82
23	27.291	19.44	Pk	.3	10.7	30.44	60	-29.56	-	-
24	27.291	4.13	Av	.3	10.7	15.13	-	-	50	-34.87

Pk - Peak detector
Av - Average detection

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 C63.10-2013

RESULTS

No non-compliance noted.

Startup

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5596840	5.116	± 100
5.00	40	13.5596916	4.554	± 100
5.00	30	13.5597185	2.572	± 100
5.00	***20***	***13.5597534***	***0.000***	***± 100***
5.00	10	13.5597838	-2.240	± 100
5.00	0	13.5598143	-4.489	± 100
5.00	-10	13.5598250	-5.282	± 100
5.00	-20	13.5598038	-3.715	± 100
4.25	20	13.5597555	-0.157	± 100
5.75	20	13.5597568	-0.249	± 100

2 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5596876	6.379	± 100
5.00	40	13.5597066	4.978	± 100
5.00	30	13.5597383	2.646	± 100
5.00	***20***	***13.5597741***	***0.000***	***± 100***
5.00	10	13.5598015	-2.019	± 100
5.00	0	13.5598221	-3.540	± 100
5.00	-10	13.5598229	-3.595	± 100
5.00	-20	13.5597926	-1.364	± 100
4.25	20	13.5597766	-0.184	± 100
5.75	20	13.5597761	-0.147	± 100

5 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5596879	6.407	± 100
5.00	40	13.5597075	4.960	± 100
5.00	30	13.5597404	2.535	± 100
5.00	***20***	***13.5597748***	***0.000***	***± 100***
5.00	10	13.5598034	-2.111	± 100
5.00	0	13.5598226	-3.531	± 100
5.00	-10	13.5598228	-3.540	± 100
5.00	-20	13.5597901	-1.134	± 100
4.25	20	13.5597779	-0.230	± 100
5.75	20	13.5597769	-0.157	± 100

10 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5596873	6.499	± 100
5.00	40	13.5597074	5.015	± 100
5.00	30	13.5597400	2.609	± 100
5.00	***20***	***13.5597754***	***0.000***	***± 100***
5.00	10	13.5598039	-2.102	± 100
5.00	0	13.5598229	-3.503	± 100
5.00	-10	13.5598228	-3.494	± 100
5.00	-20	13.5597890	-1.005	± 100
4.25	20	13.5597779	-0.184	± 100
5.75	20	13.5597763	-0.065	± 100

TEST INFORMATION

Date 1/5/17
Project No: 11589096
Tester: John Manser