



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

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Prepared for
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NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2017-02-07	Initial Issue	Richard Jankovics
2	2017-03-02	Removed BLE reference from EUT description, revised Section 5.2 to Electric Field strength and corrected OBW data on page 12 (Type B, 424 kbps).	Jeff Moser
3	2017-03-08	Included a test deviation note for the Occupied Bandwidth (20 dB BW) plots	Jeff Moser

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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:

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

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: QV7000KQ0F; QV7000CM0F; QV7000F40F

DATE TESTED: 2017-01-31 – 2017-02-03

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:

Prepared By:



Jeff Moser
EMC Program Manager
UL – Consumer Technology Division



Richard Jankovics
WiSE Engineer
UL – Consumer Technology Division

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 ELECTRIC FIELD STRENGTH

The testing was performed at 3 meter. The transmitter maximum E-field at 30 meter distance is 16.42 dBuV/m in app mode and 20.57 dBuV/m in tag mode 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 0.38.

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

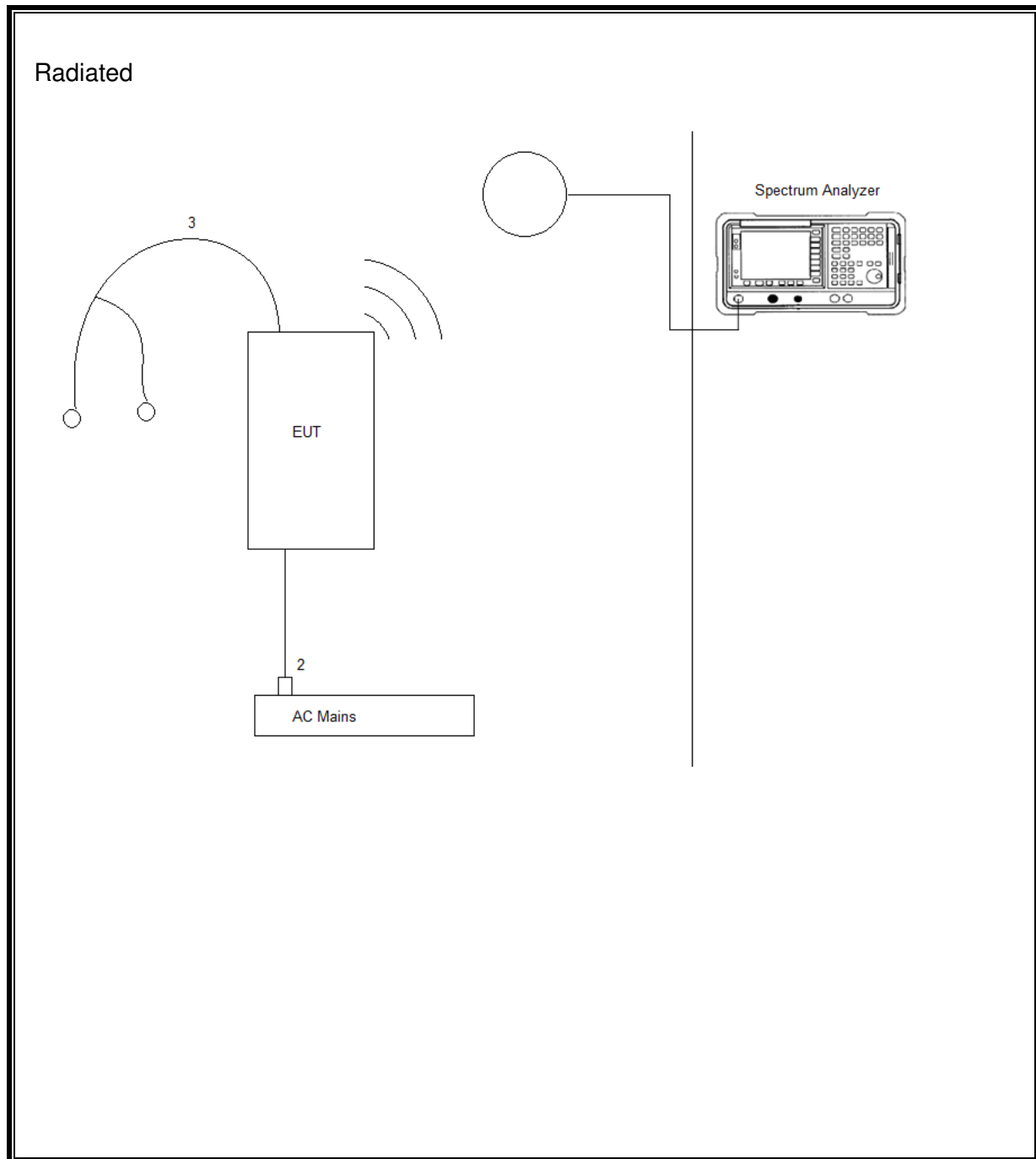
I/O CABLES

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



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

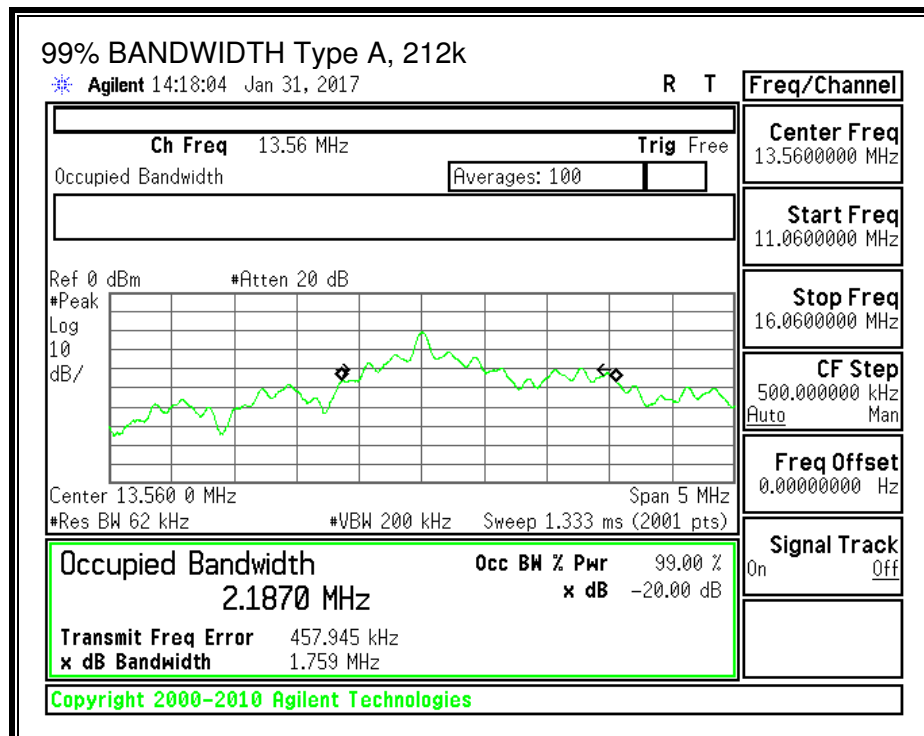
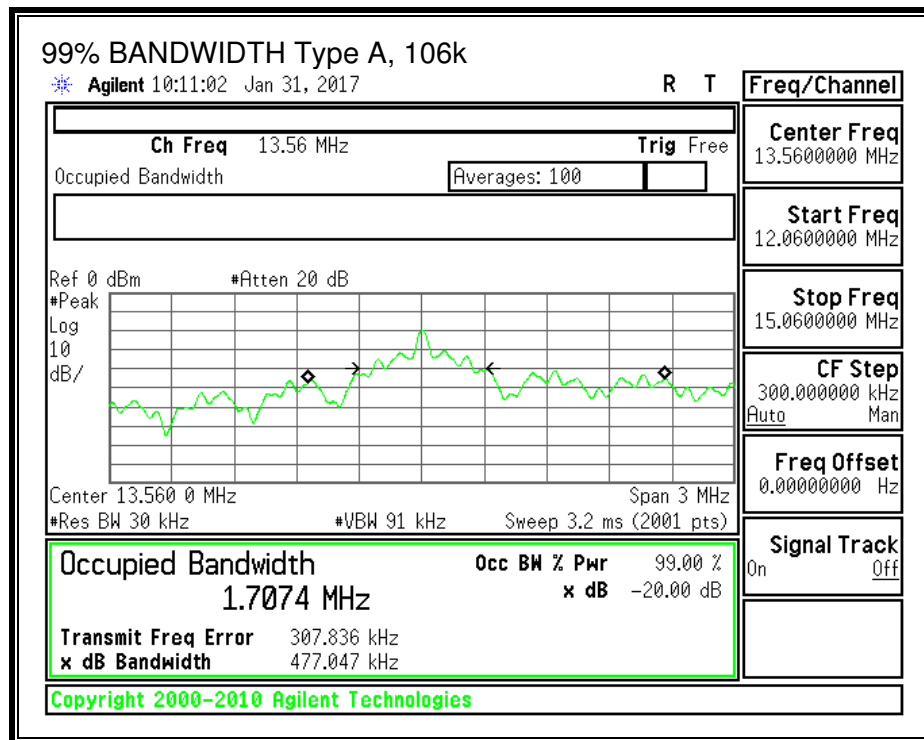
None; for reporting purposes only. Tested per ANSI C63.10 (6.9.2 and 6.9.3)

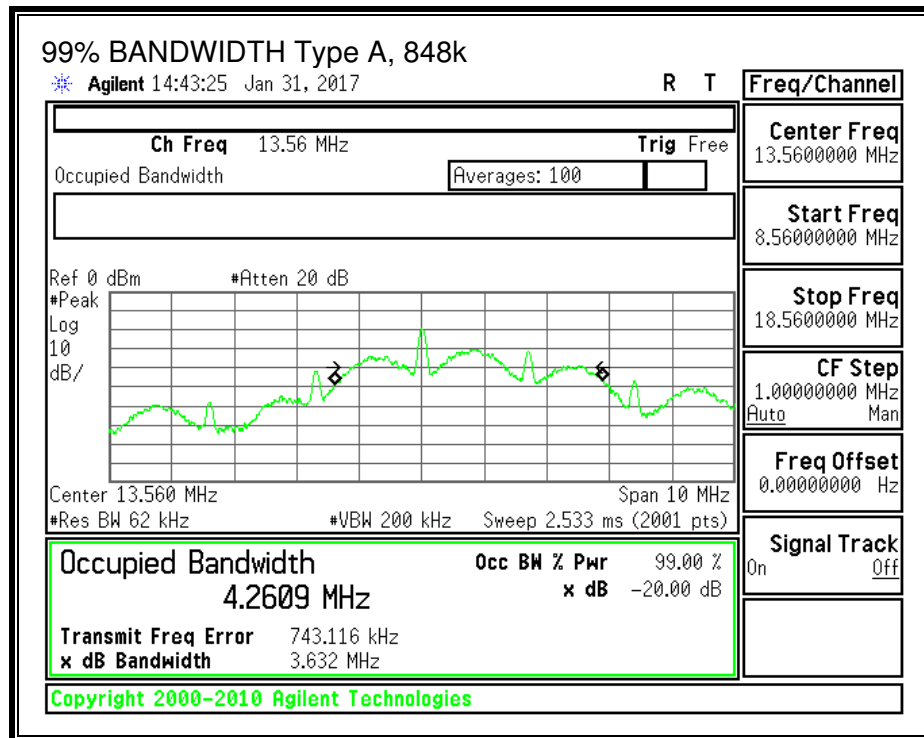
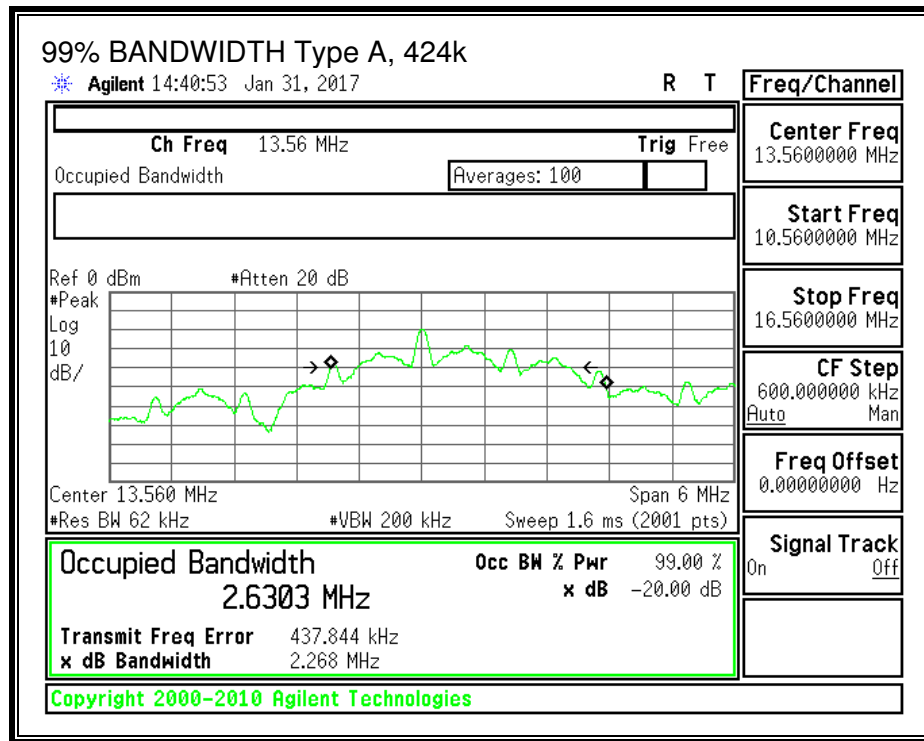
Test Deviation: 20 dB BW measurements for Types B and F – A test deviation was required from ANSI C63.10: 2013. Due to the nature of the signal, it was not possible to set the resolution bandwidth to 1-5% of the 20 dB bandwidth. Doing so would eliminate the measurable signal and make it not visible on the spectrum analyzer. Therefore, the resolution bandwidth was set as low as possible, while still maintaining a measurable fundamental. The video bandwidth was set to 3x RBW as required in C63.10:2013.

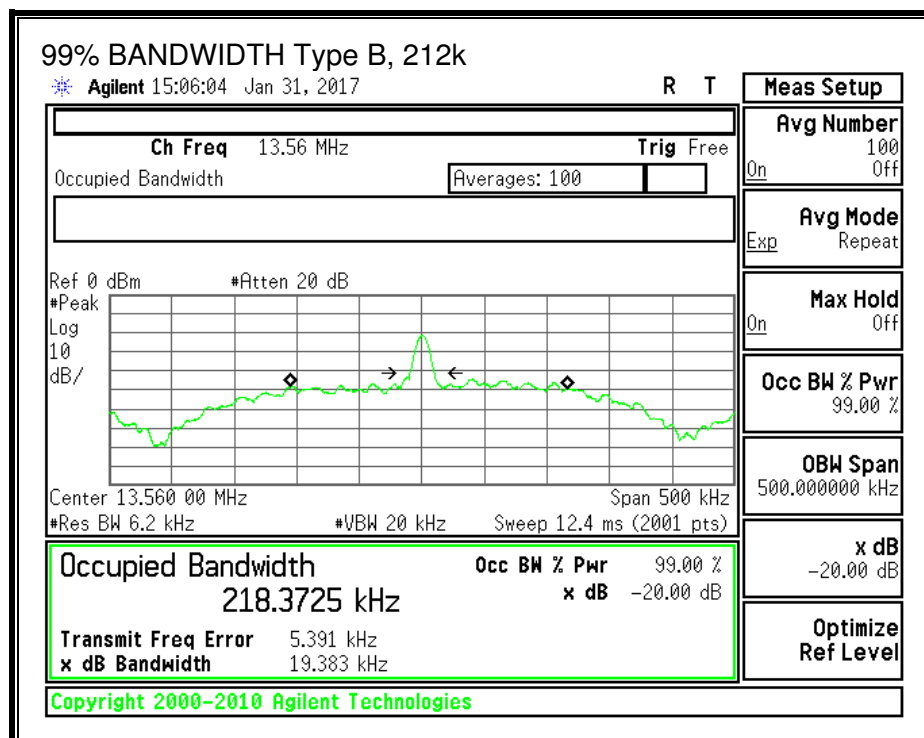
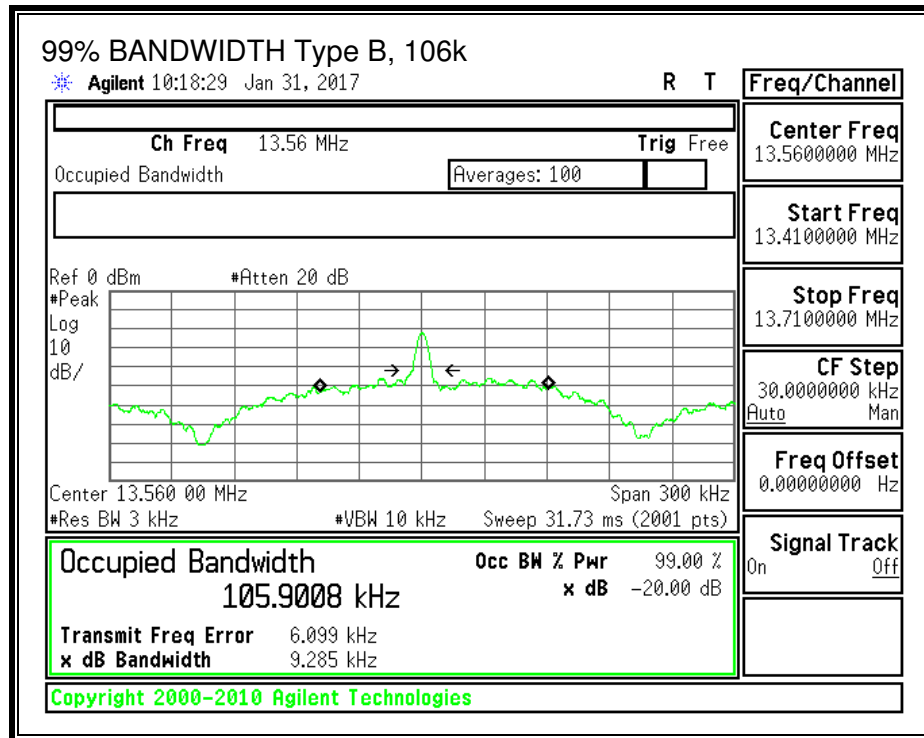
RESULTS

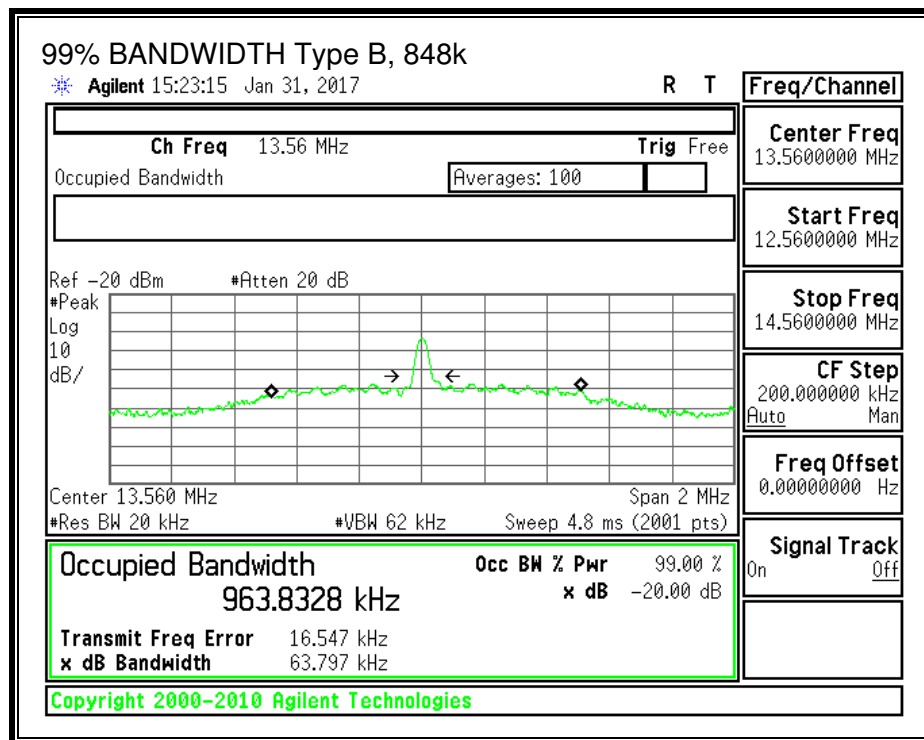
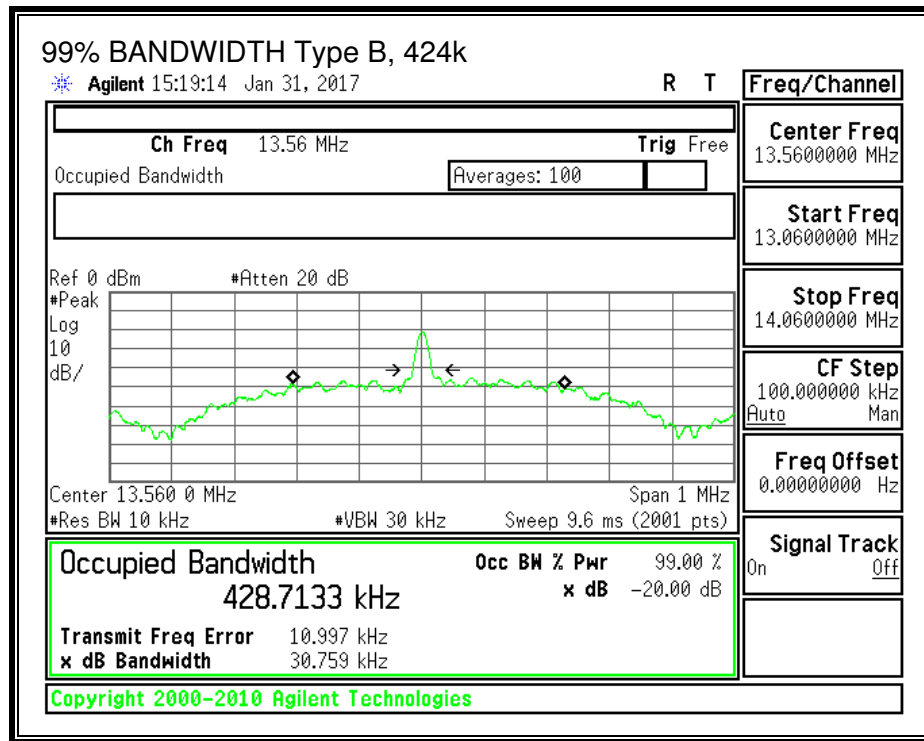
Frequency (MHz)	Modulation	Data Rate (kbps)	99% Bandwidth (MHz)	20 dB Bandwidth (MHz)
13.56	Type A	106	1.707	0.438
		212	2.187	0.860
		424	2.630	1.724
		848	4.261	2.595
	Type B	106	0.106	0.028
		212	0.218	0.028
		424	0.429	0.028
		848	0.964	0.028
	Type F	212	0.458	0.028
		424	0.916	0.028
		848	1.846	0.028

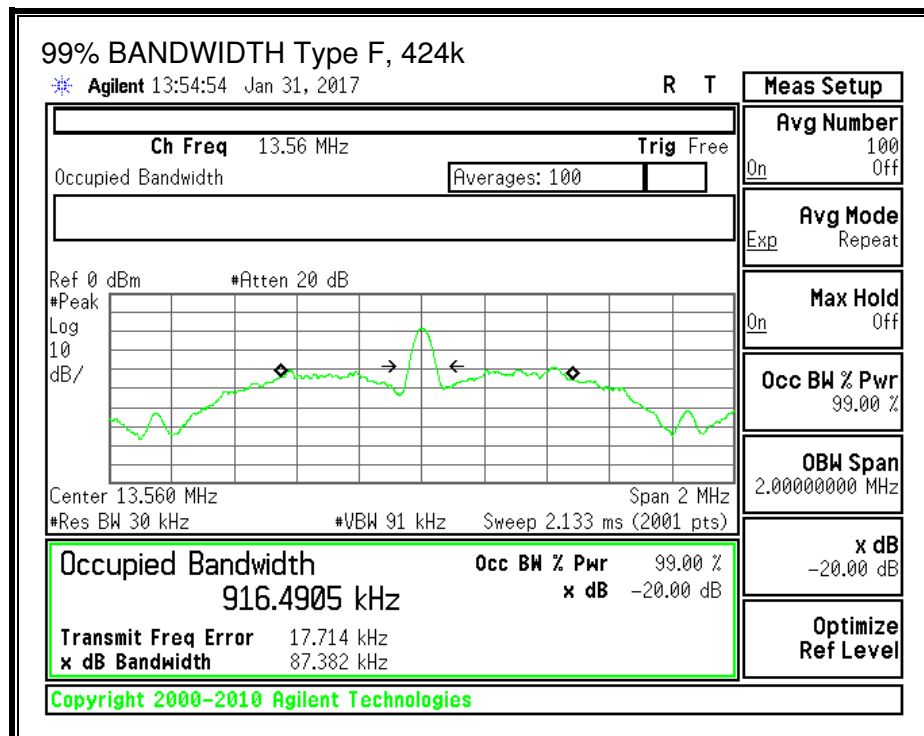
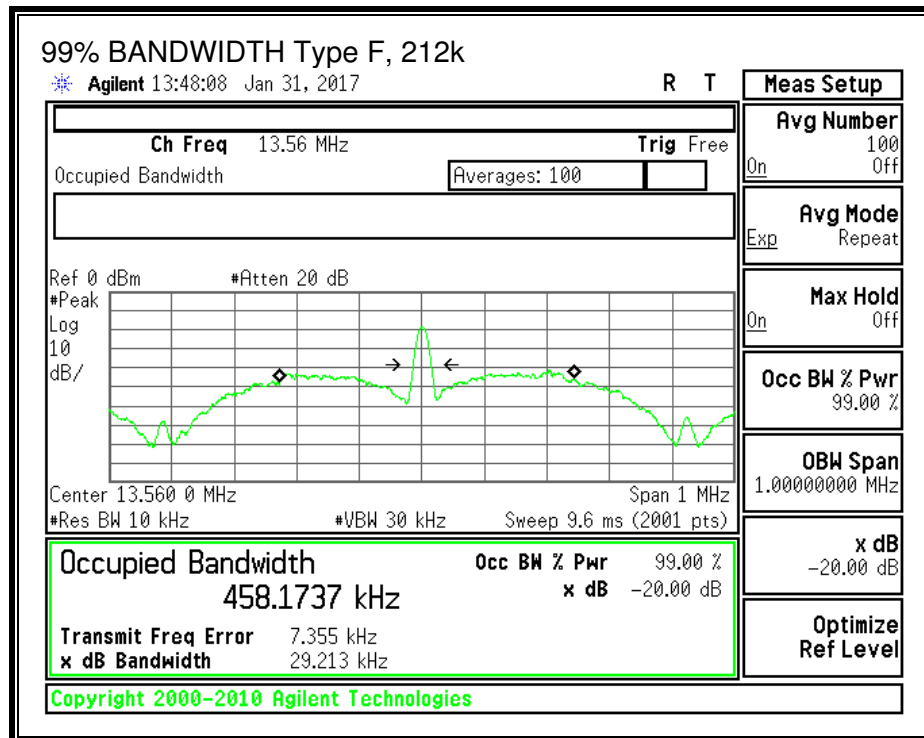
99% BANDWIDTH

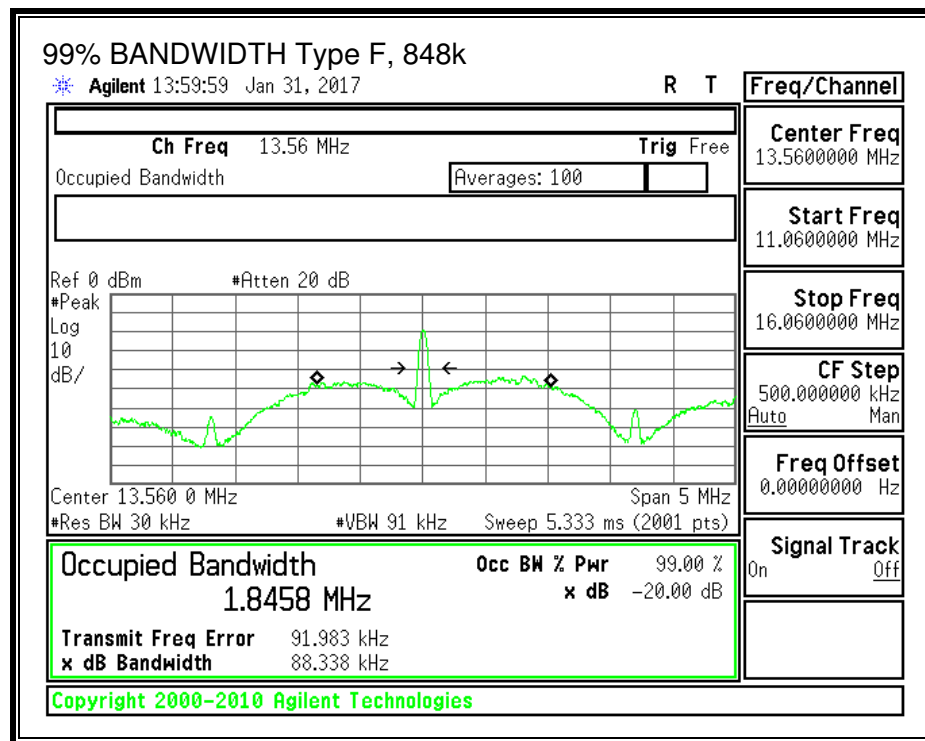




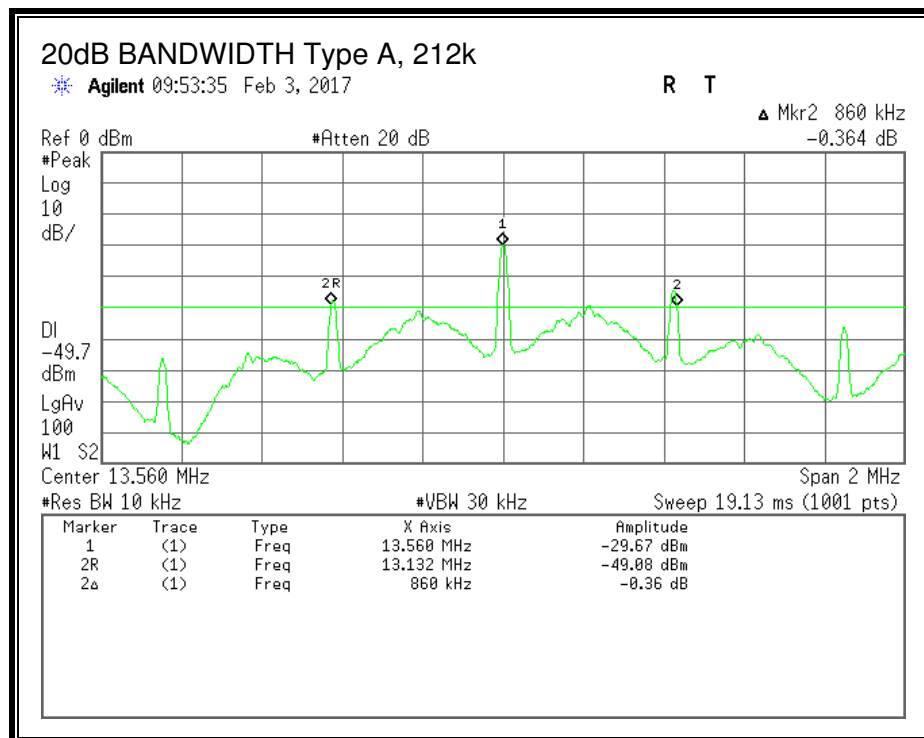
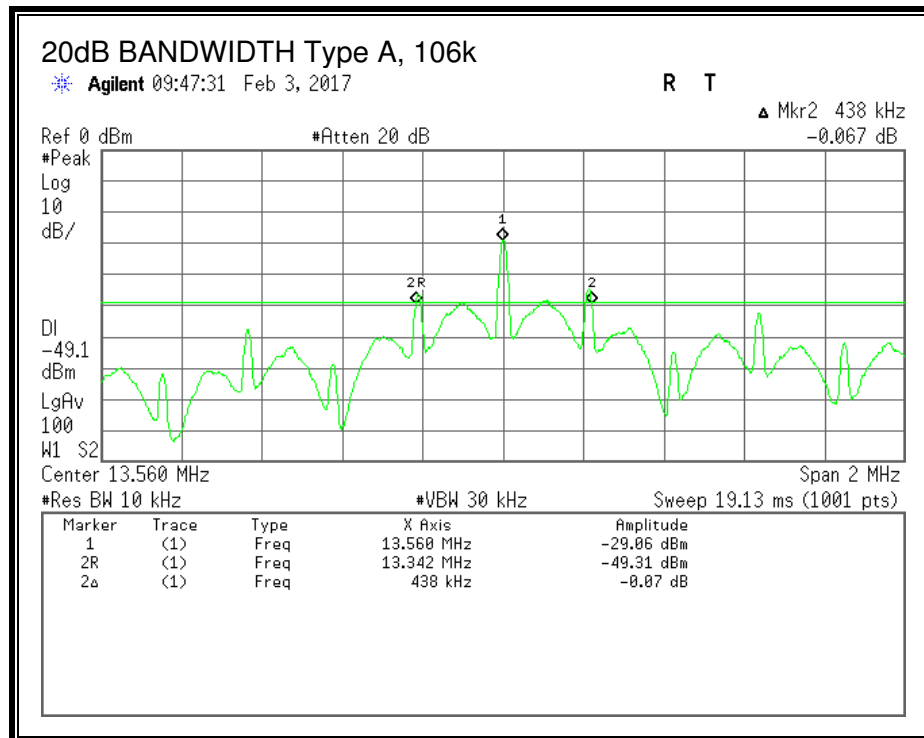


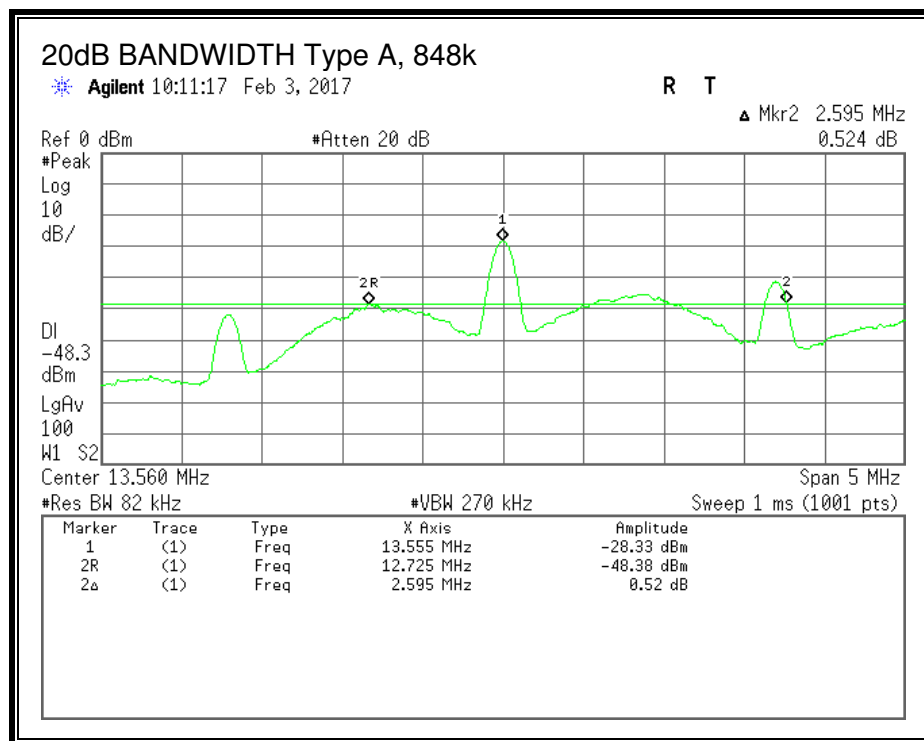
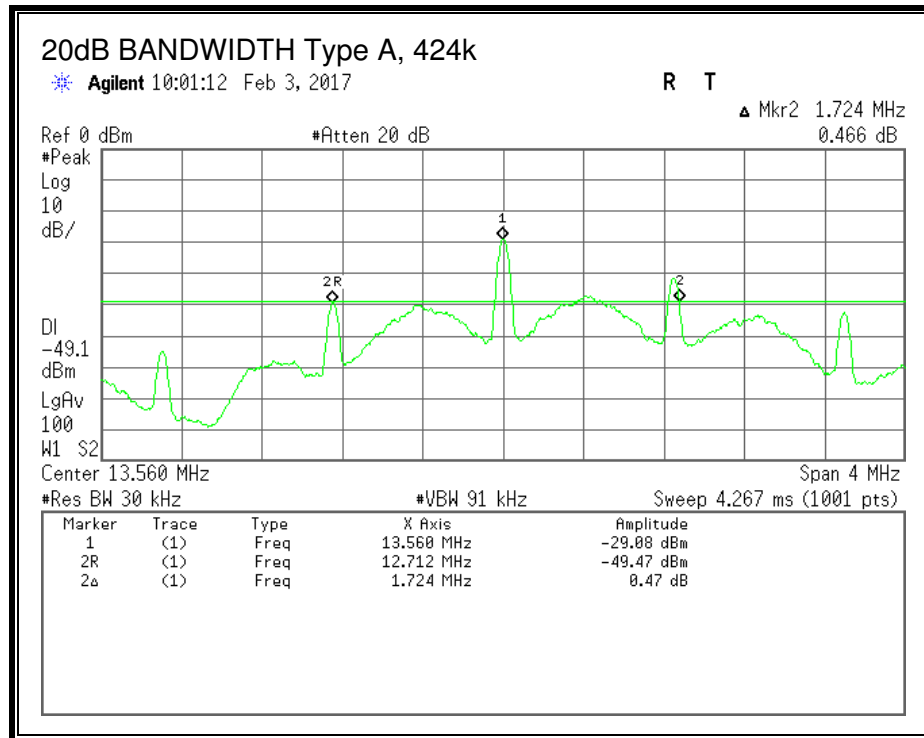


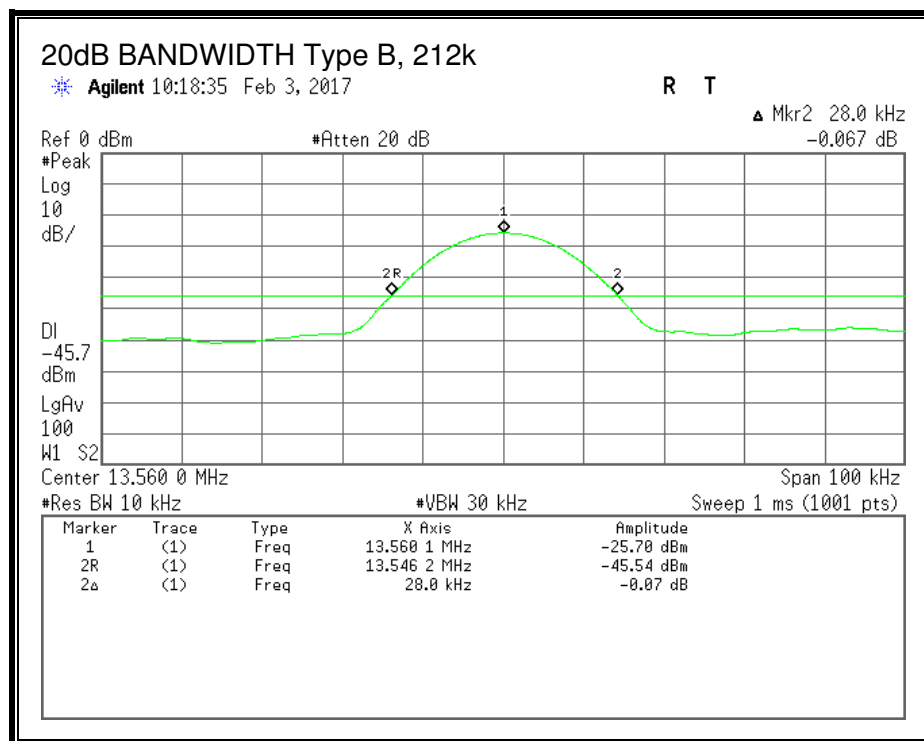
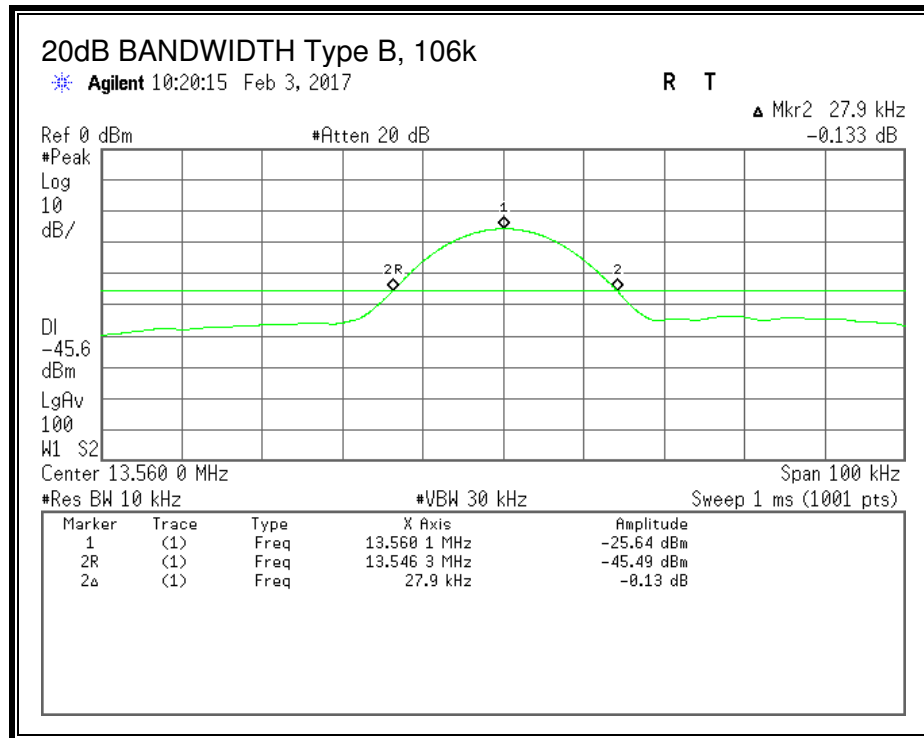


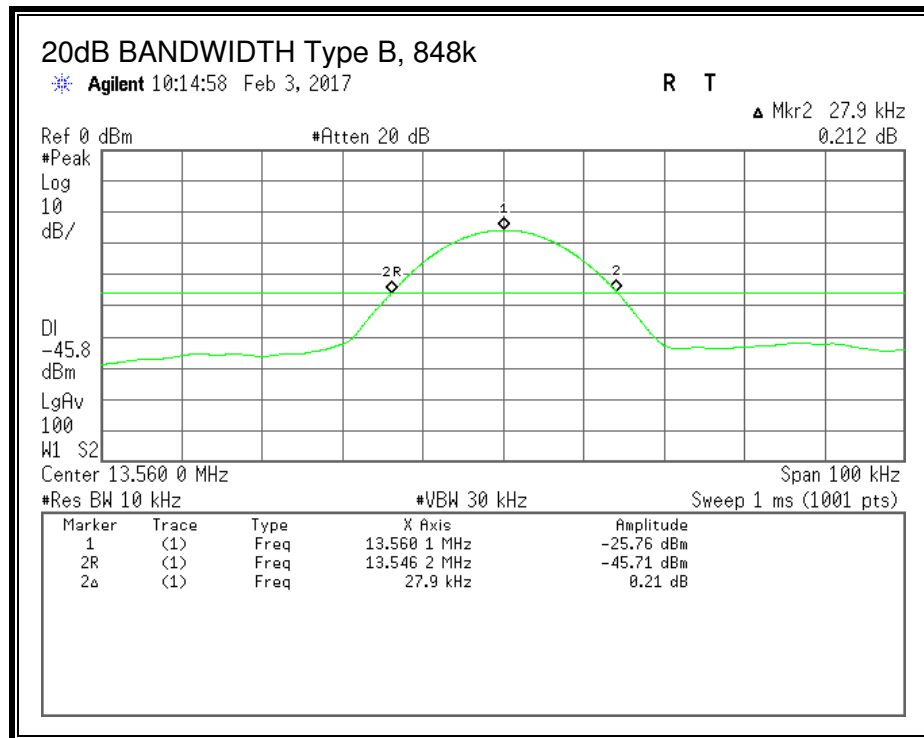
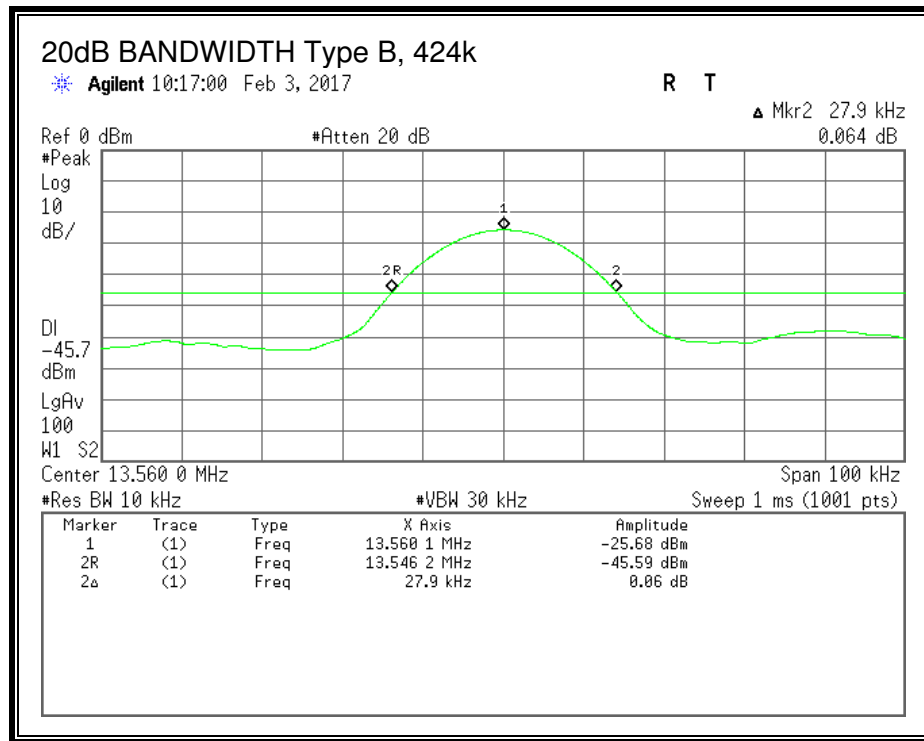


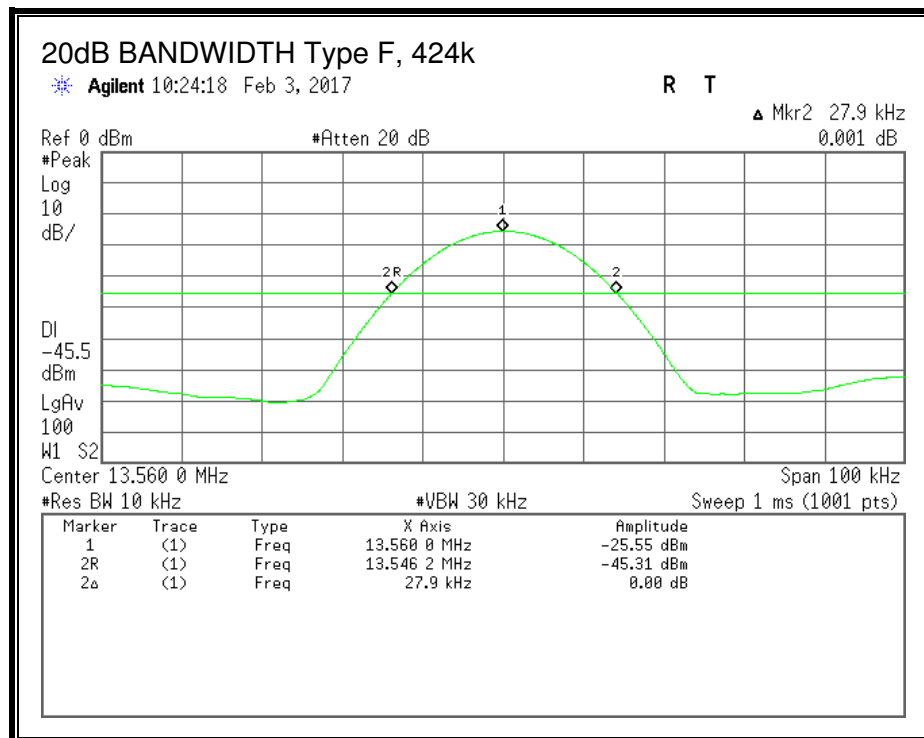
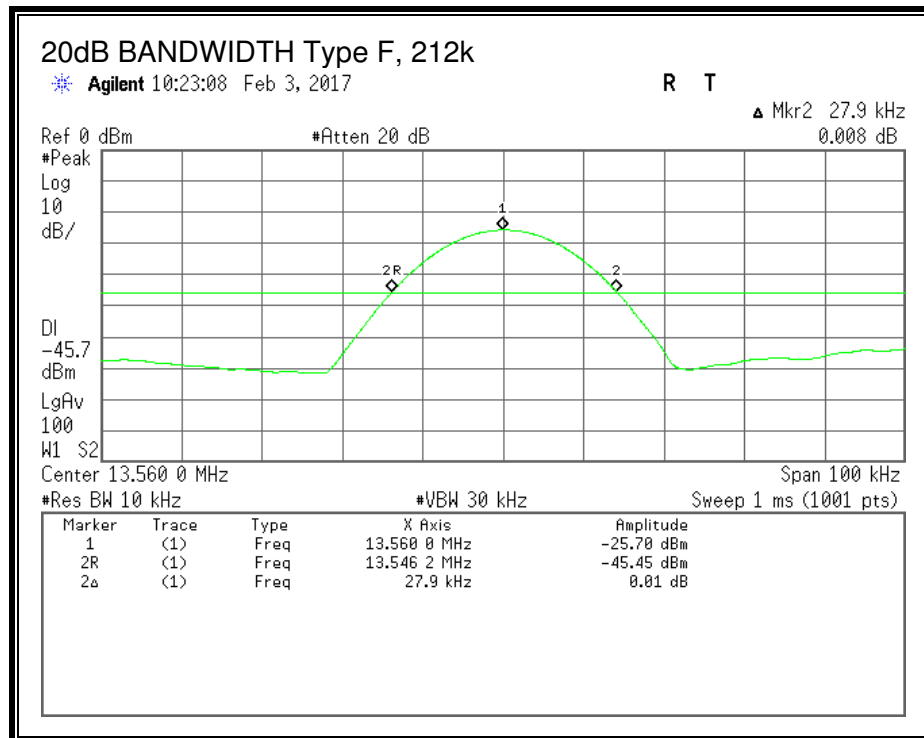
20dB BANDWIDTH

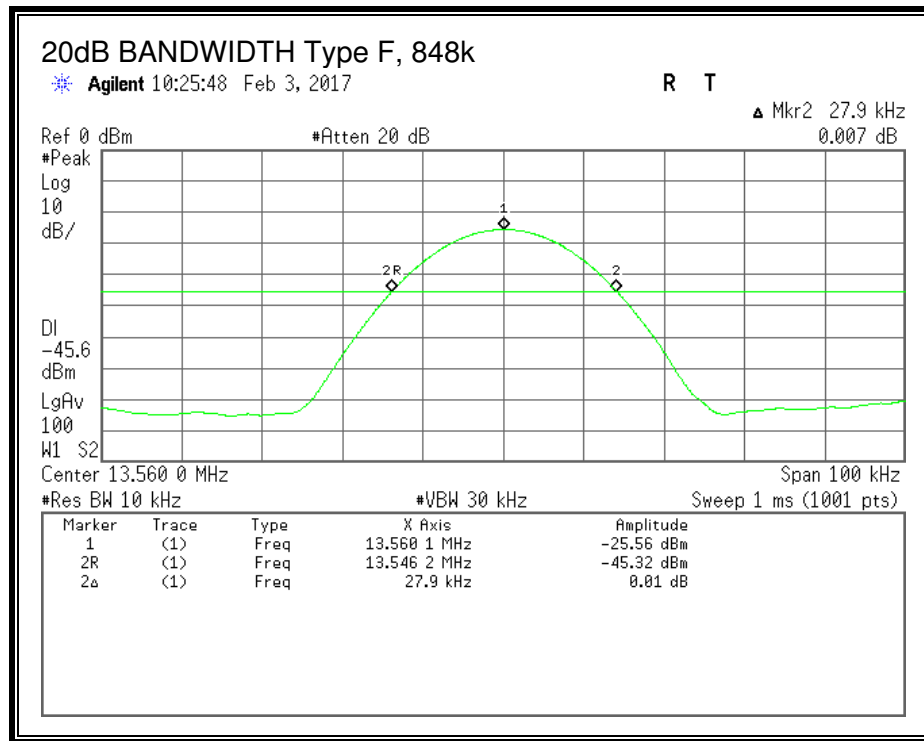












8. RADIATED EMISSION TEST RESULTS

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 field strength from µV/m to dBµV/m is:

Limit (dBµV/m) = 20 log limit (µV/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

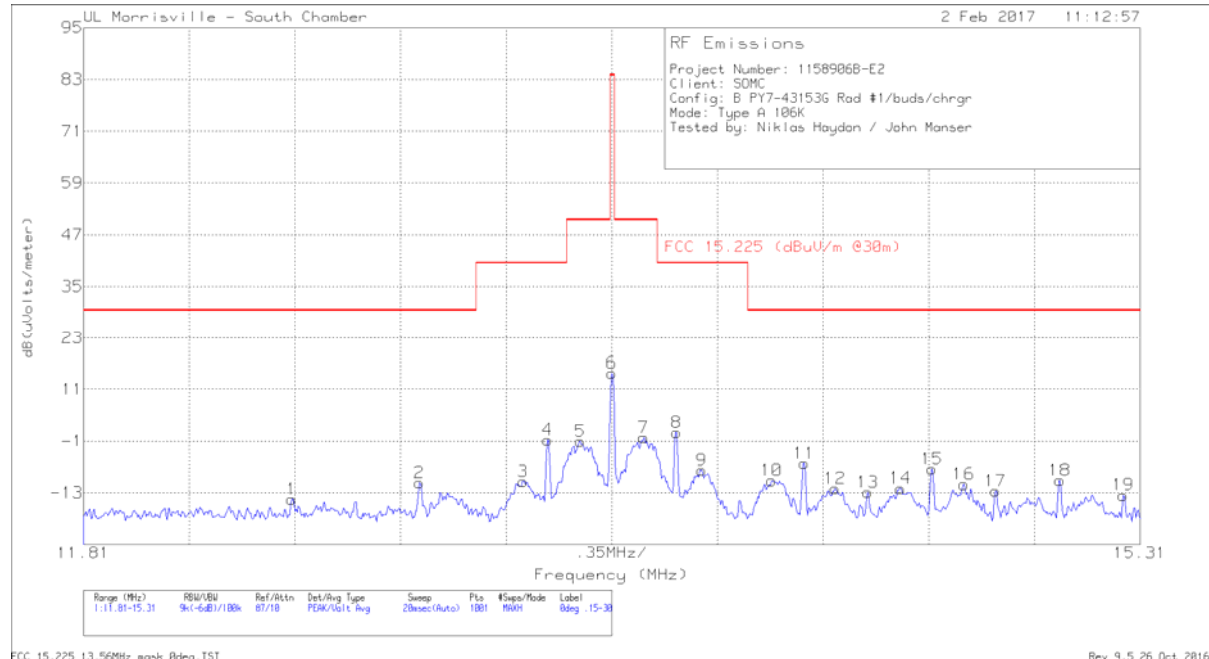
Device is a Smart Phone.

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)

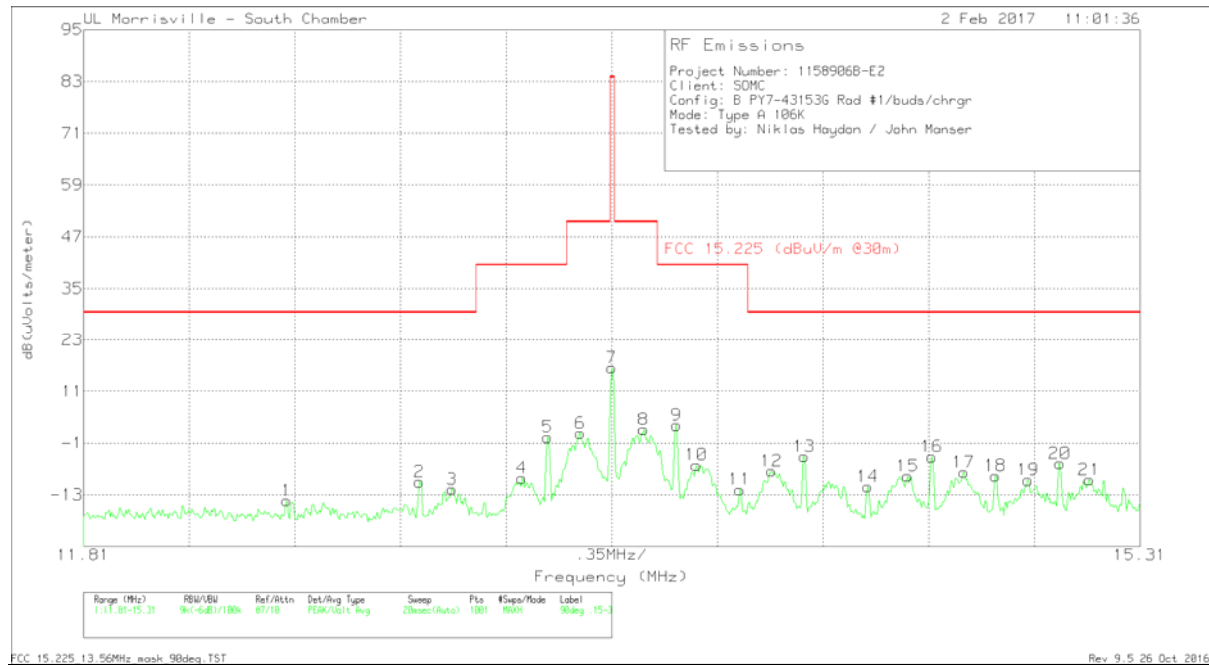
FUNDAMENTAL Type A, 106k, 0 deg (Test App)



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	12.4995	14.45	Pk	10.5	.6	-40	-14.45	29.5	-43.95	71
2	12.923	18.27	Pk	10.4	.6	-40	-10.73	29.5	-40.23	71
3	13.266	18.59	Pk	10.4	.6	-40	-10.41	40.5	-50.91	71
4	13.3465	28.27	Pk	10.4	.6	-40	-.73	40.5	-41.23	71
5	13.455	27.93	Pk	10.4	.6	-40	-1.07	50.5	-51.57	71
6	13.56	43.76	Pk	10.4	.6	-40	14.76	84	-69.24	71
7	13.665	28.82	Pk	10.4	.6	-40	-.18	50.5	-50.68	71
8	13.7735	29.98	Pk	10.4	.6	-40	.98	40.5	-39.52	71
9	13.8575	21.25	Pk	10.4	.6	-40	-7.75	40.5	-48.25	71
10	14.0885	18.83	Pk	10.4	.6	-40	-10.17	29.5	-39.67	71
11	14.197	22.86	Pk	10.4	.6	-40	-6.14	29.5	-35.64	71
12	14.2985	16.98	Pk	10.4	.6	-40	-12.02	29.5	-41.52	71
13	14.407	16.12	Pk	10.4	.6	-40	-12.88	29.5	-42.38	71
14	14.5155	17.16	Pk	10.3	.6	-40	-11.94	29.5	-41.44	71
15	14.6205	21.58	Pk	10.3	.6	-40	-7.52	29.5	-37.02	71
16	14.7255	18.06	Pk	10.3	.6	-40	-11.04	29.5	-40.54	71
17	14.8305	16.52	Pk	10.3	.6	-40	-12.58	29.5	-42.08	71
18	15.044	19.01	Pk	10.3	.6	-40	-10.09	29.5	-39.59	71
19	15.254	15.57	Pk	10.3	.6	-40	-13.53	29.5	-43.03	71

Pk - Peak detector

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



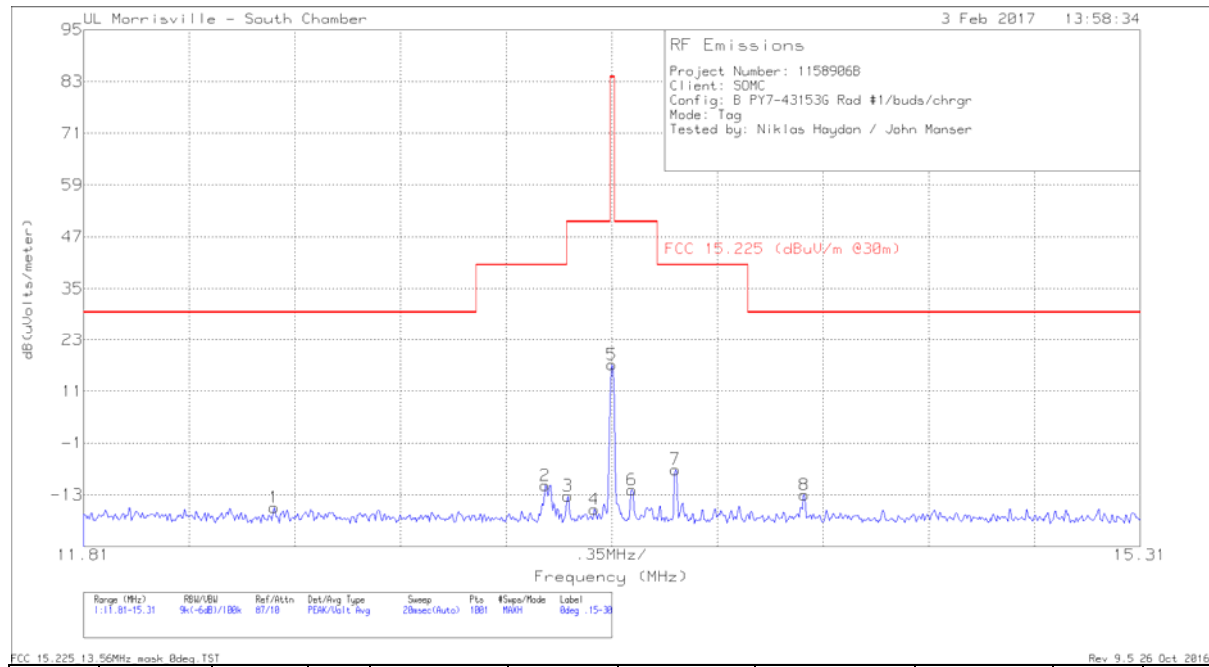
FCC 15.225 13.56MHz mask 90deg TST

Rev 9.5.26 Oct 2016

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	12.482	14.59	Pk	10.5	.6	-40	-14.31	29.5	-43.81	191
2	12.923	18.98	Pk	10.4	.6	-40	-10.02	29.5	-39.52	191
3	13.02975	17.25	Pk	10.4	.6	-40	-11.75	29.5	-41.25	191
4	13.2625	19.86	Pk	10.4	.6	-40	-9.14	40.5	-49.64	191
5	13.3465	29.34	Pk	10.4	.6	-40	.34	40.5	-40.16	191
6	13.455	30.31	Pk	10.4	.6	-40	1.31	50.5	-49.19	191
7	13.56	45.42	Pk	10.4	.6	-40	16.42	84	-67.58	191
8	13.665	31.11	Pk	10.4	.6	-40	2.11	50.5	-48.39	191
9	13.7735	32.12	Pk	10.4	.6	-40	3.12	40.5	-37.38	191
10	13.84	22.91	Pk	10.4	.6	-40	-6.09	40.5	-46.59	191
11	13.9835	17.22	Pk	10.4	.6	-40	-11.78	40.5	-52.28	191
12	14.0885	21.52	Pk	10.4	.6	-40	-7.48	29.5	-36.98	191
13	14.197	24.83	Pk	10.4	.6	-40	-4.17	29.5	-33.67	191
14	14.407	17.91	Pk	10.4	.6	-40	-11.09	29.5	-40.59	191
15	14.54	20.48	Pk	10.3	.6	-40	-8.62	29.5	-38.12	191
16	14.6205	24.91	Pk	10.3	.6	-40	-4.19	29.5	-33.69	191
17	14.7255	21.28	Pk	10.3	.6	-40	-7.82	29.5	-37.32	191
18	14.8305	20.51	Pk	10.3	.6	-40	-8.59	29.5	-38.09	191
19	14.939	19.52	Pk	10.3	.6	-40	-9.58	29.5	-39.08	191
20	15.044	23.38	Pk	10.3	.6	-40	-5.72	29.5	-35.22	191
21	15.142	19.55	Pk	10.3	.6	-40	-9.55	29.5	-39.05	191

Pk - Peak detector

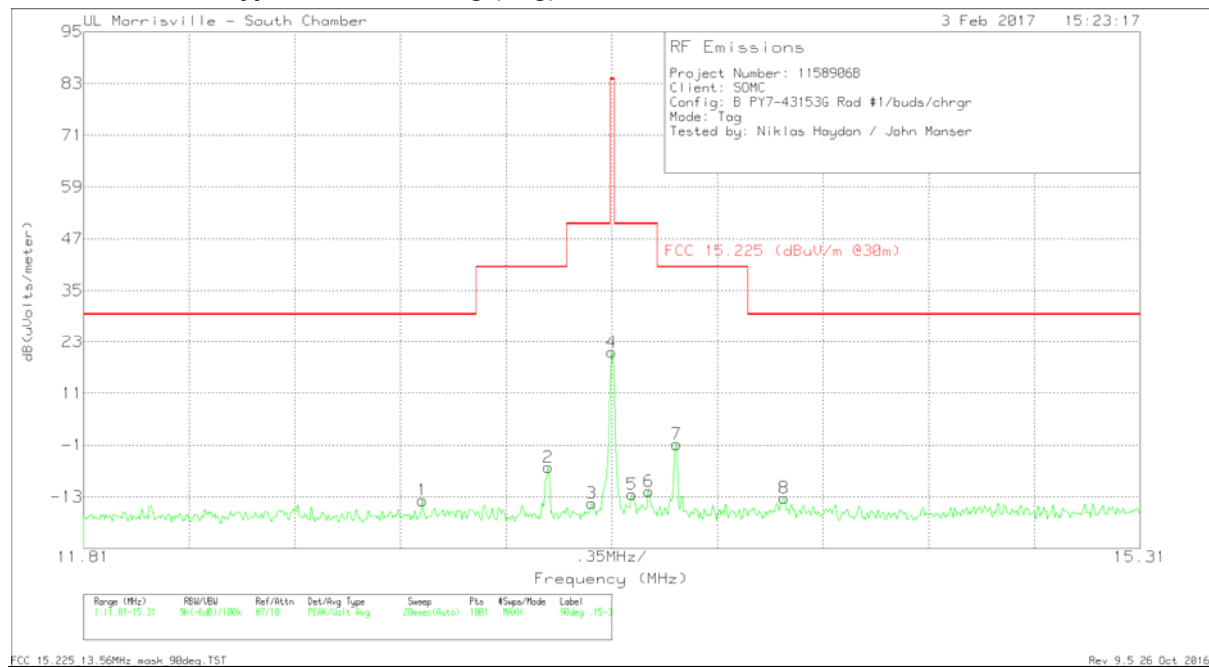
FUNDAMENTAL Type A, 106k, 0 deg (Tag)



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	12.44	12.94	Pk	10.5	.6	-40	-15.96	29.5	-45.46	250
2	13.3395	18.13	Pk	10.4	.6	-40	-10.87	40.5	-51.37	250
3	13.413	15.74	Pk	10.4	.6	-40	-13.26	50.5	-63.76	250
4	13.5005	12.6	Pk	10.4	.6	-40	-16.4	50.5	-66.9	250
5	13.56	46.17	Pk	10.4	.6	-40	17.17	84	-66.83	250
6	13.6265	17.17	Pk	10.4	.6	-40	-11.83	50.5	-62.33	250
7	13.77	21.85	Pk	10.4	.6	-40	-7.15	40.5	-47.65	250
8	14.197	15.94	Pk	10.4	.6	-40	-13.06	29.5	-42.56	250

Pk - Peak detector

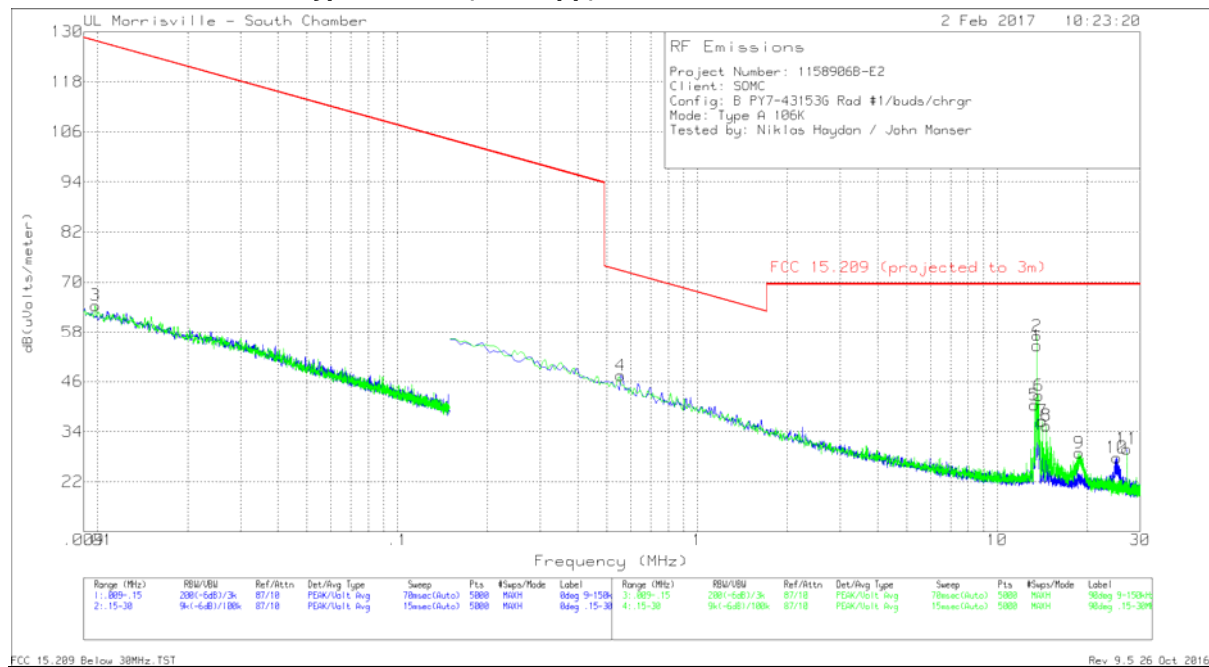
FUNDAMENTAL Type A, 106k, 90 deg (Tag)



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	12.93175	15.19	Pk	10.4	.6	-40	-13.81	29.5	-43.31	156
2	13.35	22.8	Pk	10.4	.6	-40	-6.2	40.5	-46.7	156
3	13.4935	14.52	Pk	10.4	.6	-40	-14.48	50.5	-64.98	156
4	13.56	49.57	Pk	10.4	.6	-40	20.57	84	-63.43	156
5	13.6265	16.54	Pk	10.4	.6	-40	-12.46	50.5	-62.96	156
6	13.6825	17.31	Pk	10.4	.6	-40	-11.69	50.5	-62.19	156
7	13.7735	28.18	Pk	10.4	.6	-40	-.82	40.5	-41.32	156
8	14.1305	15.73	Pk	10.4	.6	-40	-13.27	29.5	-42.77	156

Pk - Peak detector

SPURIOUS EMISSION Type A, 106k (Test App)

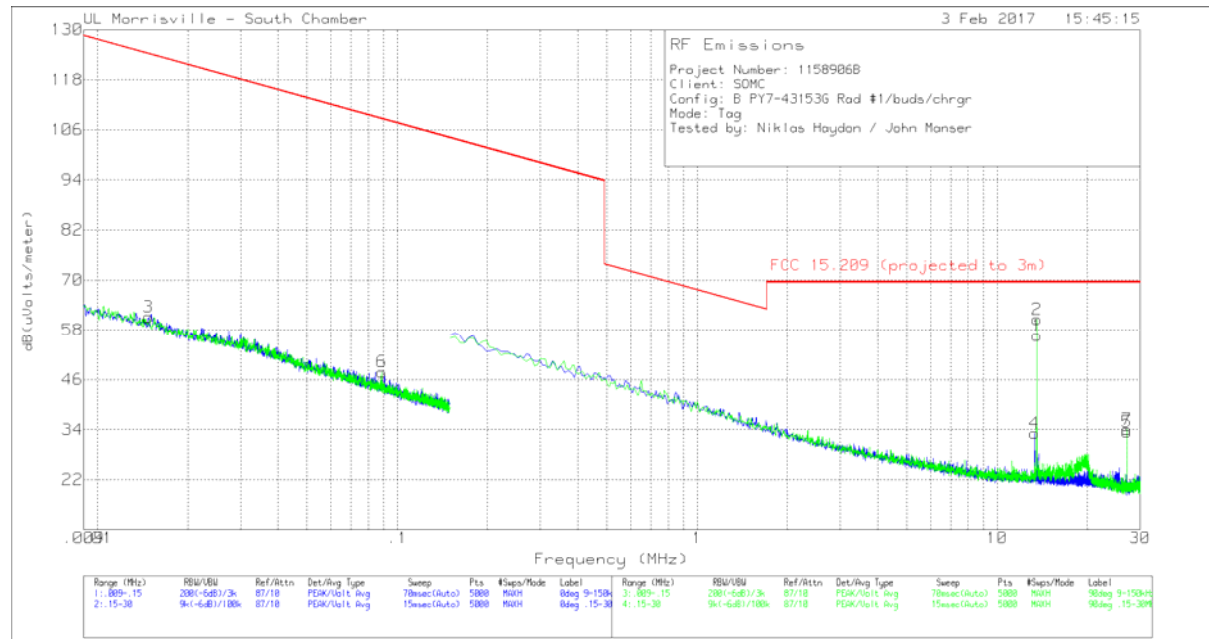


FCC 15.209 Below 30MHz TST Rev 9.5.26 Oct 2016

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)
3	.00984	45.82	Pk	18.5	.1	64.42	127.74	-63.32	0-360
4	.55603	36.58	Pk	10.8	.1	47.48	72.7	-25.22	0-360
5	13.3489	29.38	Pk	10.4	.6	40.38	69.54	-29.16	0-360
6	13.76985	31.64	Pk	10.4	.6	42.64	69.54	-26.9	0-360
7	14.19379	25.53	Pk	10.4	.6	36.53	69.54	-33.01	0-360
8	14.61773	24.55	Pk	10.3	.6	35.45	69.54	-34.09	0-360
9	18.73772	18.17	Pk	10	.7	28.87	69.54	-40.67	0-360
10	25.07295	17.85	Pk	9.1	.8	27.75	69.54	-41.79	0-360
11	27.12101	20.36	Pk	8.6	.9	29.86	69.54	-39.68	0-360

Pk - Peak detector

SPURIOUS EMISSION Type A, 106k (Tag)



FCC 15.209 Below 30MHz, TST

Rev 9.5 26 Oct. 2016

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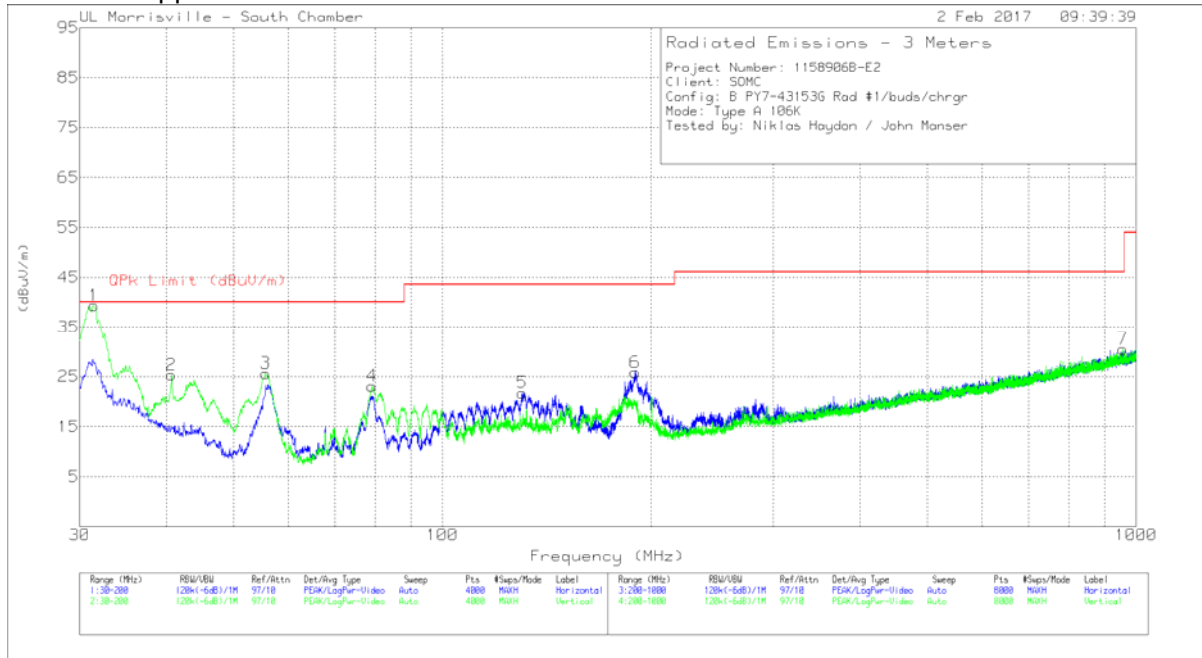
ce Markers

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)	Polarity
3	.0148	44.81	Pk	16.2	.1	61.11	124.2	-63.09	0-360	Face On
4	13.34591	22.16	Pk	10.4	.6	33.16	69.54	-36.38	0-360	Face On
5	27.12101	23.9	Pk	8.6	.9	33.4	69.54	-36.14	0-360	Face On
6	.08852	36.53	Pk	11.2	.1	47.83	108.66	-60.83	0-360	Face Off
7	27.12101	24.56	Pk	8.6	.9	34.06	69.54	-35.48	0-360	Face Off

Pk - Peak detector

8.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz

With Test App



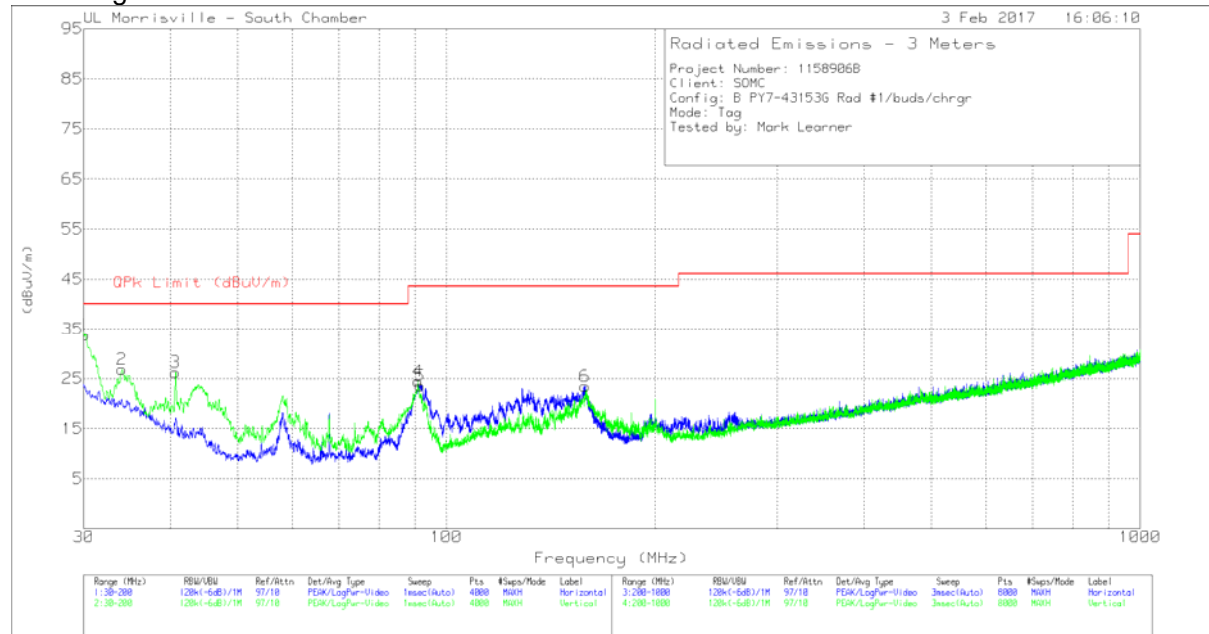
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 130.326	34.35	Pk	18.1	-30.7	21.75	43.52	-21.77	0-360	198	H
1	31.2251	37.01	Qp	25	-31.8	30.21	40	-9.79	284	109	V
2	40.6703	39.06	Pk	17.9	-31.6	25.36	40	-14.64	0-360	101	V
3	55.6341	45.24	Pk	11.7	-31.3	25.64	40	-14.36	0-360	101	V
4	79.1852	42.21	Pk	12.1	-31.2	23.11	40	-16.89	0-360	101	V
6	189.5863	40.34	Pk	15.8	-30.3	25.84	43.52	-17.68	0-360	198	H
7	957.3984	29.44	Pk	27.5	-26.4	30.54	46.02	-15.48	0-360	299	V

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

Pk - Peak detector

Qp - Quasi-Peak detector

With Tag



FCC Part 15C 30-1000MHz.TST

Rev 9.5 26 Oct 2016

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ce 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
1	30.1275	39.67	Pk	25.9	-31.8	33.77	40	-6.23	0-360	101	V
2	34.0811	35.63	Pk	22.9	-31.7	26.83	40	-13.17	0-360	101	V
3	40.6703	39.95	Pk	17.9	-31.6	26.25	40	-13.75	0-360	101	V
4	91.0033	43.74	Pk	11.8	-31.1	24.44	43.52	-19.08	0-360	101	V
5	91.5984	42.77	Pk	11.9	-31.1	23.57	43.52	-19.95	0-360	199	H
6	158.4257	37.14	Pk	16.8	-30.5	23.44	43.52	-20.08	0-360	102	H

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

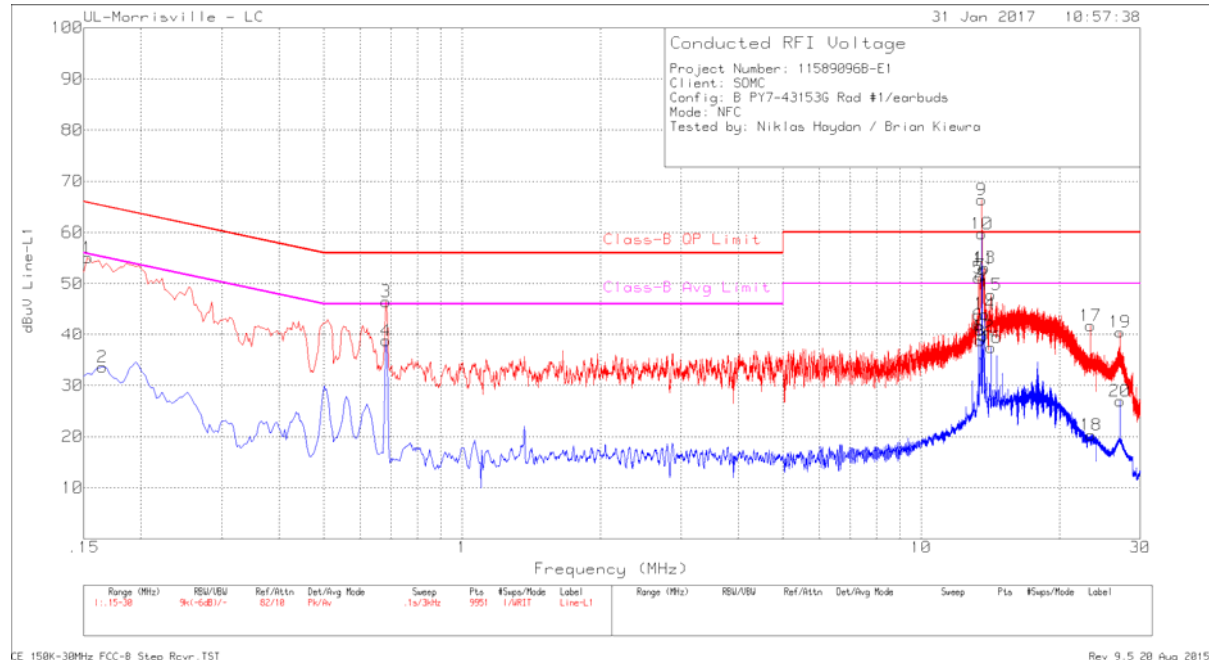
ANSI C63.10

RESULTS

No non-compliance noted:

LINE 1 RESULTS

With Antenna



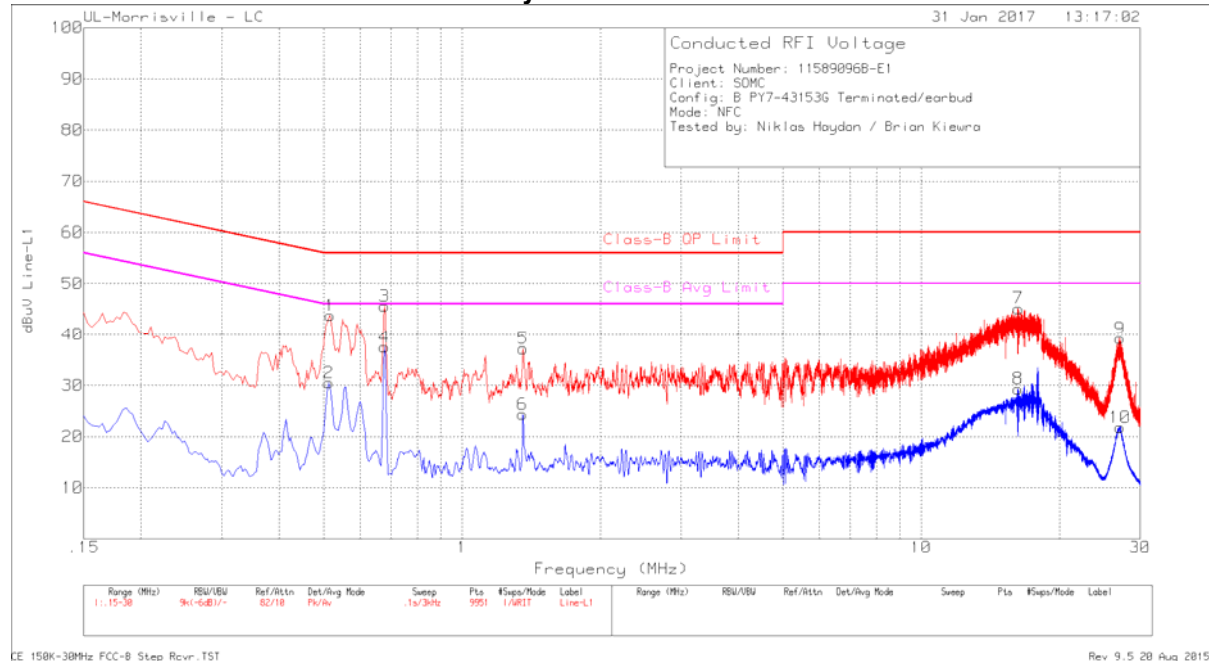
Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.153	44.87	Pk	.2	10	55.07	65.84	-10.77	-	-
2	.165	23.4	Av	.2	10	33.6	-	-	55.21	-21.61
3	.684	36.52	Pk	0	10	46.52	56	-9.48	-	-
4	.684	28.79	Av	0	10	38.79	-	-	46	-7.21
5	13.347	40.64	Pk	.1	10.4	51.14	60	-8.86	-	-
6	13.347	31.41	Av	.1	10.4	41.91	-	-	50	-8.09
7	13.461	41.12	Pk	.1	10.4	51.62	60	-8.38	-	-
8	13.455	28.24	Av	.1	10.4	38.74	-	-	50	-11.26
9	13.56	55.9	Pk	.1	10.4	66.4	60	6.4	-	-
10	13.56	49.28	Av	.1	10.4	59.78	-	-	50	9.78
11	13.665	42.3	Pk	.1	10.4	52.8	60	-7.2	-	-
12	13.665	29.19	Av	.1	10.4	39.69	-	-	50	-10.31
13	13.773	42.62	Pk	.1	10.4	53.12	60	-6.88	-	-
14	13.773	33.58	Av	.1	10.4	44.08	-	-	50	-5.92
15	14.196	37.31	Pk	.1	10.4	47.81	60	-12.19	-	-
16	14.196	26.94	Av	.1	10.4	37.44	-	-	50	-12.56
17	23.403	30.94	Pk	.3	10.6	41.84	60	-18.16	-	-
18	23.463	9.42	Av	.3	10.6	20.32	-	-	50	-29.68
19	27.12	29.52	Pk	.3	10.7	40.52	60	-19.48	-	-
20	27.12	15.9	Av	.3	10.7	26.9	-	-	50	-23.1

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 a Dummy Load

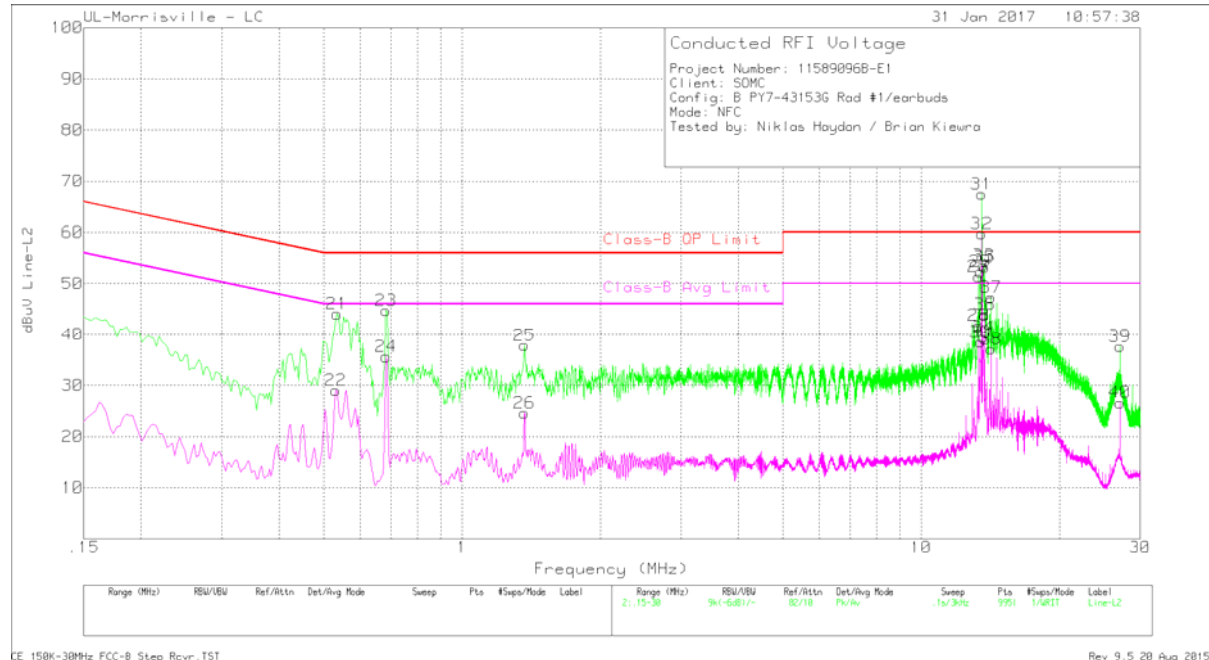


Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
1	.516	33.8	Pk	0	10	43.8	56	-12.2	-	-
2	.513	20.52	Av	0	10	30.52	-	-	46	-15.48
3	.678	35.6	Pk	0	10	45.6	56	-10.4	-	-
4	.678	27.53	Av	0	10	37.53	-	-	46	-8.47
5	1.359	27.21	Pk	0	10	37.21	56	-18.79	-	-
6	1.356	14.32	Av	0	10	24.32	-	-	46	-21.68
7	16.287	34.49	Pk	.2	10.5	45.19	60	-14.81	-	-
8	16.284	18.63	Av	.2	10.5	29.33	-	-	50	-20.67
9	27.117	28.25	Pk	.3	10.7	39.25	60	-20.75	-	-
10	27.093	10.77	Av	.3	10.7	21.77	-	-	50	-28.23

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS

With Antenna



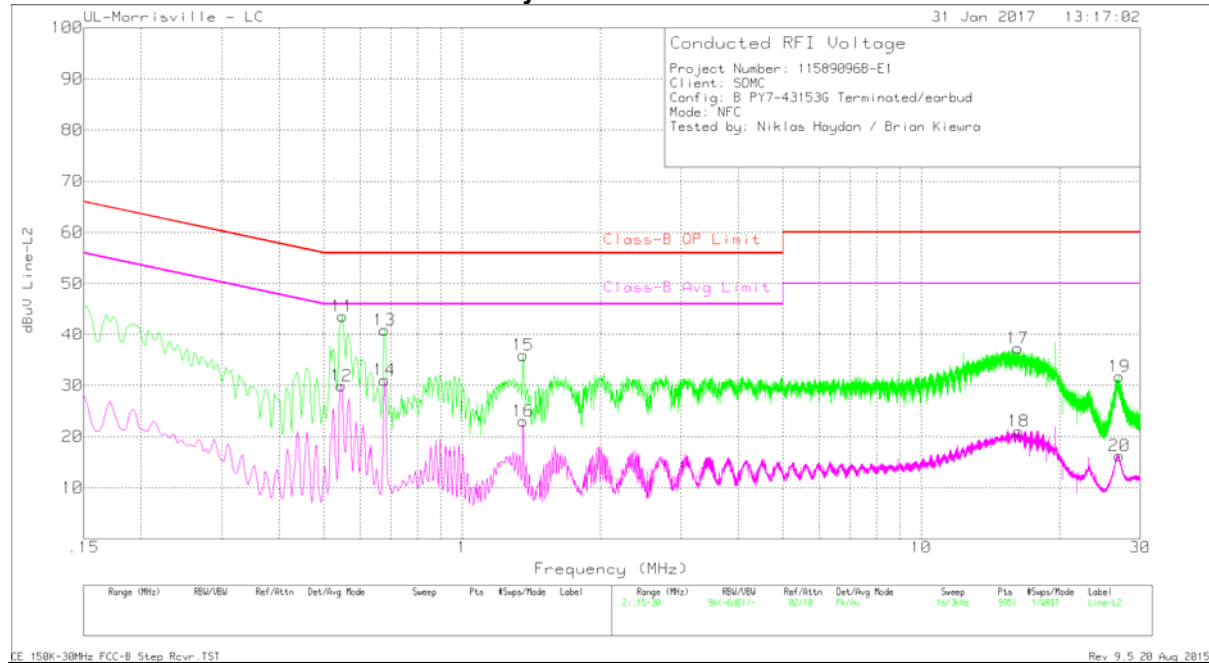
Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
21	.534	34.1	Pk	0	10	44.1	56	-11.9	-	-
22	.531	19.01	Av	0	10	29.01	-	-	46	-16.99
23	.684	34.75	Pk	0	10	44.75	56	-11.25	-	-
24	.684	25.62	Av	0	10	35.62	-	-	46	-10.38
25	1.368	27.87	Pk	0	10	37.87	56	-18.13	-	-
26	1.368	14.63	Av	0	10	24.63	-	-	46	-21.37
27	13.347	40.89	Pk	.1	10.4	51.39	60	-8.61	-	-
28	13.347	31.31	Av	.1	10.4	41.81	-	-	50	-8.19
29	13.455	41.83	Pk	.1	10.4	52.33	60	-7.67	-	-
30	13.455	27.97	Av	.1	10.4	38.47	-	-	50	-11.53
31	13.56	57.02	Pk	.1	10.4	67.52	60	7.52	-	-
32	13.56	49.25	Av	.1	10.4	59.75	-	-	50	9.75
33	13.665	43.14	Pk	.1	10.4	53.64	60	-6.36	-	-
34	13.665	28.95	Av	.1	10.4	39.45	-	-	50	-10.55
35	13.773	42.75	Pk	.1	10.4	53.25	60	-6.75	-	-
36	13.773	33.53	Av	.1	10.4	44.03	-	-	50	-5.97
37	14.196	36.83	Pk	.1	10.4	47.33	60	-12.67	-	-
38	14.196	26.62	Av	.1	10.4	37.12	-	-	50	-12.88
39	27.12	26.67	Pk	.3	10.7	37.67	60	-22.33	-	-
40	27.12	15.63	Av	.3	10.7	26.63	-	-	50	-23.37

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 a Dummy Load



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	Class-B QP Limit	Margin (dB)	Class-B Avg Limit	Margin (dB)
11	.549	33.68	Pk	0	10	43.68	56	-12.32	-	-
12	.546	19.87	Av	0	10	29.87	-	-	46	-16.13
13	.678	30.9	Pk	0	10	40.9	56	-15.1	-	-
14	.678	21.03	Av	0	10	31.03	-	-	46	-14.97
15	1.359	25.87	Pk	0	10	35.87	56	-20.13	-	-
16	1.359	13.02	Av	0	10	23.02	-	-	46	-22.98
17	16.242	26.72	Pk	.1	10.5	37.32	60	-22.68	-	-
18	16.305	10.43	Av	.1	10.5	21.03	-	-	50	-28.97
19	27.036	20.76	Pk	.3	10.7	31.76	60	-28.24	-	-
20	27.039	5.27	Av	.3	10.7	16.27	-	-	50	-33.73

Pk - Peak detector

Av - 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.

TEST PROCEDURE

ANSI C63.10-2013

RESULTS

No non-compliance noted.

Startup

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5599190	3.982	± 100
5.00	40	13.5599290	3.245	± 100
5.00	30	13.5599490	1.770	± 100
5.00	20	13.5599730	0.000	± 100
5.00	10	13.5600100	-2.729	± 100
5.00	0	13.5600380	-4.794	± 100
5.00	-10	13.5601040	-9.661	± 100
5.00	-20	13.5601650	-14.159	± 100
4.25	20	13.5599790	-0.442	± 100
5.75	20	13.5599850	-0.885	± 100

2 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5599200	5.678	± 100
5.00	40	13.5599400	4.204	± 100
5.00	30	13.5599710	1.917	± 100
5.00	20	13.5599970	0.000	± 100
5.00	10	13.5600310	-2.507	± 100
5.00	0	13.5600470	-3.687	± 100
5.00	-10	13.5600430	-3.392	± 100
5.00	-20	13.5600180	-1.549	± 100
4.25	20	13.5600090	-0.885	± 100
5.75	20	13.5600030	-0.442	± 100

5 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5599230	5.900	± 100
5.00	40	13.5599440	4.351	± 100
5.00	30	13.5599750	2.065	± 100
5.00	20	13.5600030	0.000	± 100
5.00	10	13.5600340	-2.286	± 100
5.00	0	13.5600480	-3.319	± 100
5.00	-10	13.5600670	-4.720	± 100
5.00	-20	13.5600090	-0.442	± 100
4.25	20	13.5600210	-1.327	± 100
5.75	20	13.5600070	-0.295	± 100

10 minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
			Delta (ppm)	Limit (ppm)
5.00	50	13.5599220	6.416	± 100
5.00	40	13.5599440	4.794	± 100
5.00	30	13.5599750	2.507	± 100
5.00	20	13.5600090	0.000	± 100
5.00	10	13.5600340	-1.844	± 100
5.00	0	13.5600480	-2.876	± 100
5.00	-10	13.5600790	-5.162	± 100
5.00	-20	13.5600040	0.369	± 100
4.25	20	13.5600270	-1.327	± 100
5.75	20	13.5600080	0.074	± 100

TEST INFORMATION

Date 2/1/17

Project No: 11589096

Tester: John Manser