CLASS II PERMISSIVE CHANGE
TEST REPORT

Report Number: 103920760MPK-002
Project Number: G103920760
Original Issue Date: May 17, 2019
Revision Issue Date: March 24, 2020

Testing performed on the
nLIGHT AIR
Model: RPP20
FCC ID: 2ADCB-RMODIT
IC: 6715C-RMODIT
to

FCC Part 15 Subpart C (15.247)
Industry Canada RSS-247 Issue 2
FCC Part 15, Subpart B
Industry Canada ICES-003

For

Acuity Brands Lighting Inc.

Test Performed by:	Test Authorized by:
Intertek	Acuity Brands Lighting Inc.
1365 Adams Court	One Lithonia Way
Menlo Park, CA 94025 USA	Conyers, GA 30012 USA

Prepared by: _____ **Date:** March 24, 2020
Aaron Chang

Reviewed by: _____ **Date:** March 24, 2020
Krishna Vemuri

Report No. 103920760MPK-002	
Equipment Under Test:	nLIGHT AIR
Trade Name:	Acuity Brands Lighting Inc.
Model Number:	RPP20
Serial Number:	001 (Radiated) 002 (Conducted)
Applicant:	Acuity Brands Lighting Inc.
Contact:	David Elliott
Address:	Acuity Brands Lighting Inc. One Lithonia Way Conyers, GA 30012
Country:	USA
Tel. Number:	(404) 502-3498
Email:	david.elliott2@acuity.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) Industry Canada RSS-247 Issue 2 FCC Part 15, Subpart B Industry Canada ICES-003 Issue 6
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date(s) of Test:	May 8-16, 2019 & March 23, 2020

We attest to the accuracy of this report:

Aaron Chang
EMC Project Engineer

Krishna K Vemuri
Engineering Team Lead

TABLE OF CONTENTS

1.0 Summary of Tests

TEST	REFERENCE FCC 15.247	REFERENCE RSS-247	RESULTS
RF Output Power	15.247(b)(3)	RSS-247, 5.4.4	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-247, 5.5	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies[1]
Radiated Emission from Digital Part and Receiver	15.109	ICES 003	Complies
AC Line Conducted Emission	15.107	ICES 003	Complies

[1] EUT utilizes permanently attached antenna.

2.0 General Description

2.1 Product Description

Acuity Brands Lighting Inc. supplied the following description of the EUT:

The nLight AIR rPP family of power packs are lighting control devices designed to offer flexible control for commercial and industrial lighting applications. The rPP consists of a relay, 0-10V dimming control, and a low voltage power supply output to power and wireless switches and sensors. The rPP is capable of switching loads up to 20 A via a latching relay designed with robust inrush protection from the harshswitching requirements of fluorescent and LED loads. Select power packs provide +24VDC low voltage output to power up to 4 nLight AIR mounted occupancy sensors and photocells. The nLight AIR rPP is designed for use as part of an nLight AIR group of devices or with nLight Eclypse.

For more information, refer to the following product specification, declared by the manufacturer.

Overview of the EUT	
Applicant name & address:	Acuity Brands Lighting Inc. One Lithonia Way Conyers, GA 30012 USA
Contact info / Email:	David Elliott / david.elliott2@acuitybrands.com
Model:	RPP20
FCC Identifier:	2ADCB-RMODIT
IC Identifier:	6715C-RMODIT
Operating Frequency:	904 – 926 MHz (SubGHz); 2402-2480 MHz (BLE)
Number of Channels:	12 (SubGHz); 40 (BLE)
Type of Modulation:	O-QPSK (SubGHz); GFSK (BLE)
Antenna Type:	Permanent attached antenna -0.6dBi (SubGHz); 3.1 (BLE)

EUT receive date: May 8, 2019
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: May 8, 2019
Test completion date: May 16, 2019 & March 23, 2020

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Antenna conducted measurements were performed according to the FCC documents “Guidance for Performing Compliance Measurement on Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System devices Operating under §15.247” (KDB 558074 D01 15.247 Meas Guidance v05r02), RSS-247 Issue 2, ANSI C63.10: 2013 and RSS-GEN Issue 5.

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10: 2013. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

3.0 System Test Configuration

3.1 Support Equipment and description

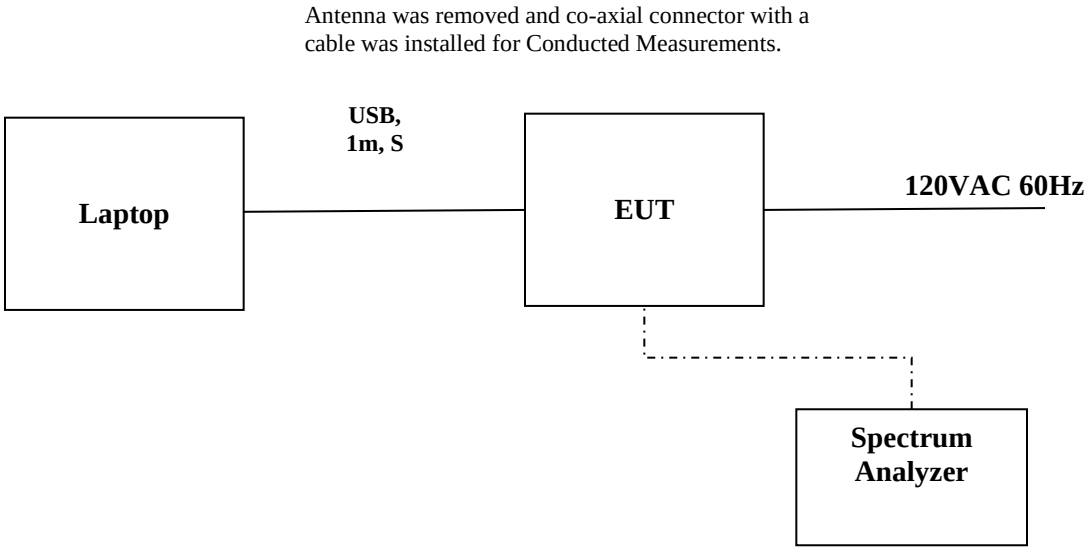
Support Equipment			
Type	**Model #**	**Quantity**	**S/N**
Laptop*	EliteBook 840	1	CNU4059P36

*Only used to configure channels on EUT.

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	**Manufacturer**	**Model Number**	**Serial Number**
nLIGHT AIR	Acuity Brands Lighting Inc.	RPP20	001 (Radiated) 002 (Conducted)

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table.

Class II permissive change testing was performed based on a new dual band antenna with a maximum peak gain of-06dBi at SubGHz and +3.1dBi gain at BLE.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Acuity Brands Lighting Inc.

3.5 Mode of Operation during test

During transmitter testing, the transmitter was setup to transmit at maximum RF power on low, middle and high frequencies/channels.

3.6 Modifications required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Maximum Peak Conducted Output Power at Antenna Terminals
FCC Rule: 15.247(b)(3); RSS-247 A8.4;

4.1.1 Requirements

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm.
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.1.2 Procedure

The procedure described in FCC Publication KDB 558074 D01 15.247 Meas Guidance v05r02 was used. Specifically, section 11.9.1.1 Method RBW ≥ DTS bandwidth in ANSI 63.10

1. Set the RBW ≥ DTS Bandwidth.
2. Set VBW ≥ [3 x RBW].
3. Set span ≥ [3 x RBW].
4. Sweep time = auto couple.
5. Detector = peak
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

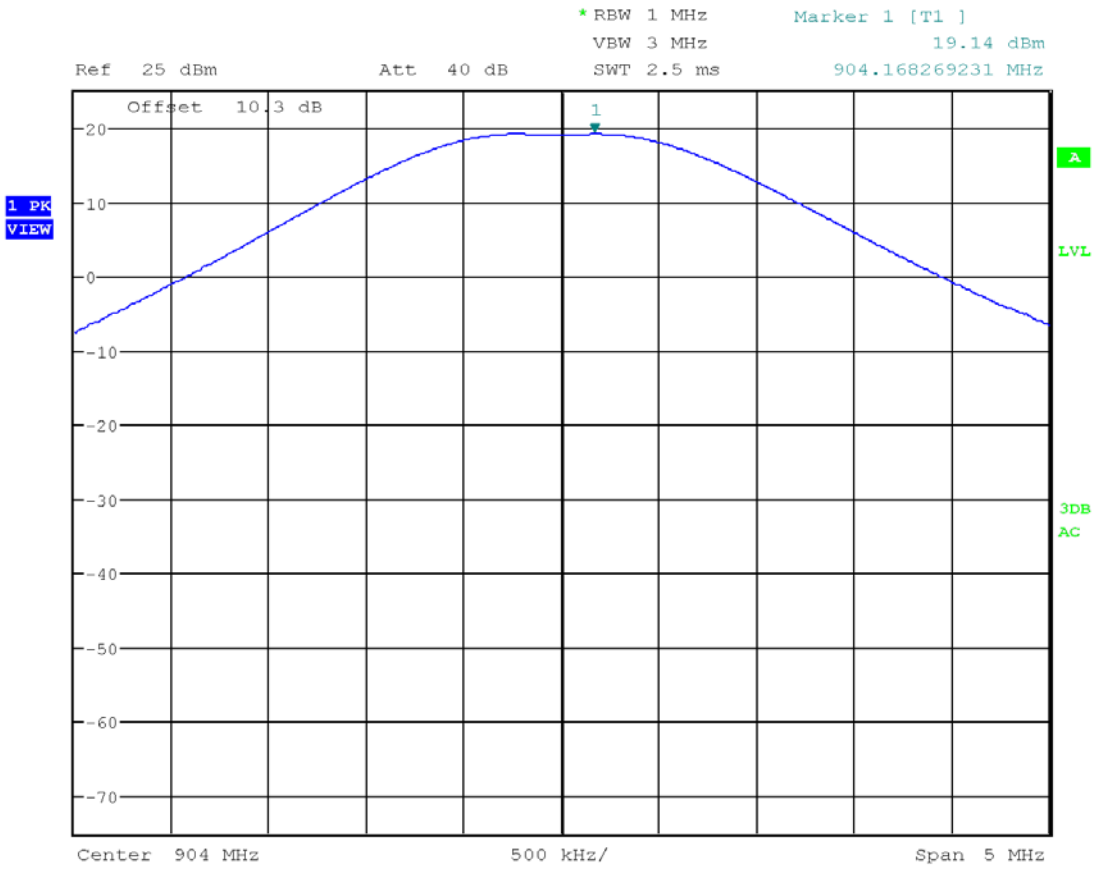
A spectrum analyzer was connected to the antenna port of the transmitter.

4.1.3 Test Results

Frequency, MHz	Conducted Power (peak), dBm	Conducted Power (peak), mW	Plot
904	19.14	82.04	2.1
914	19.01	79.61	2.2
926	18.92	77.98	2.3
2402	9.40	8.71	2.4
2440	9.17	8.26	2.5
2480	8.28	6.73	2.6

Results	Complies
Test date:	May 9, 2019

Plot 2.1



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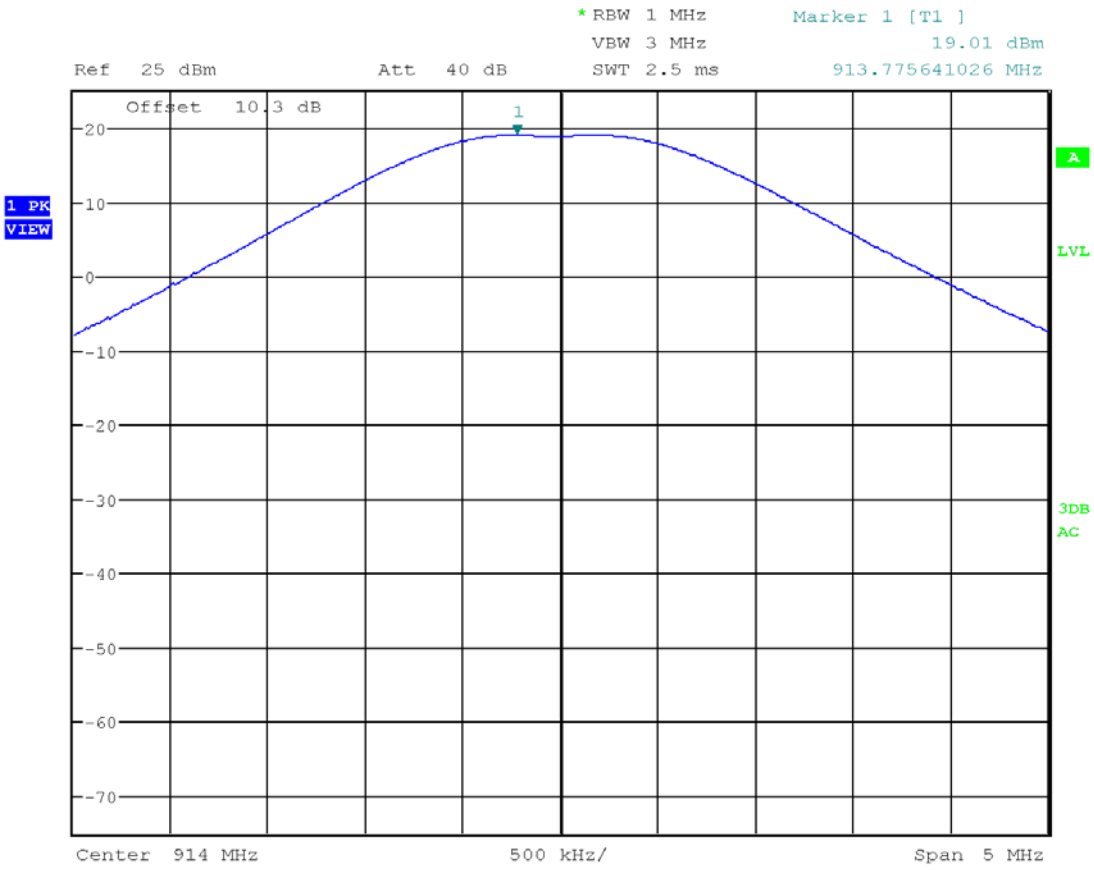
Plot 2.2



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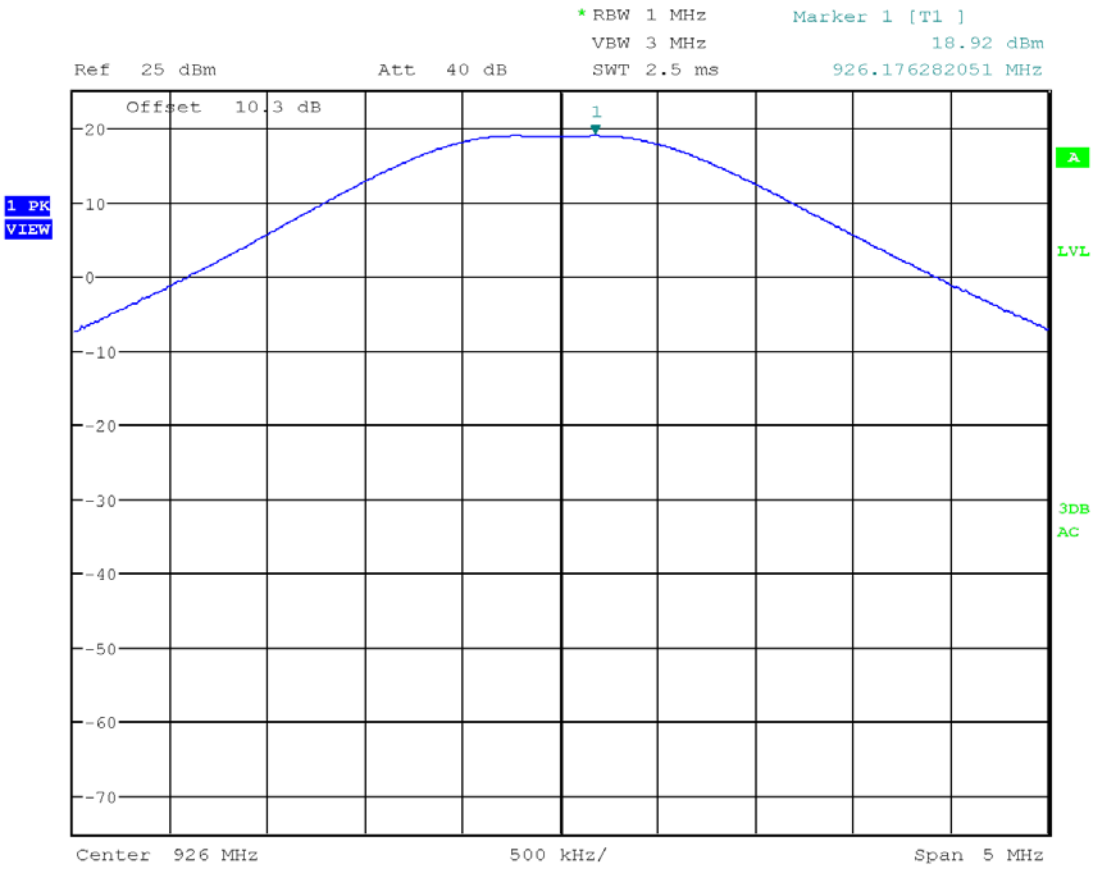
Plot 2.3



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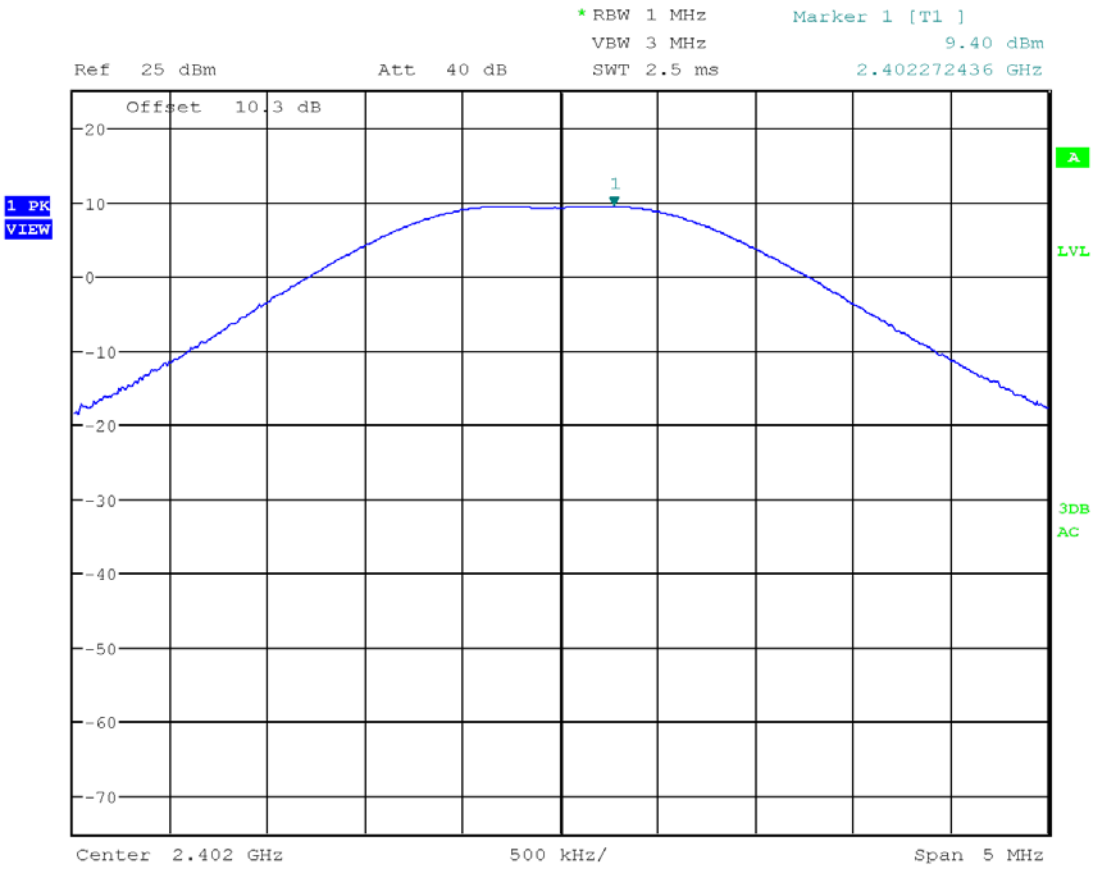
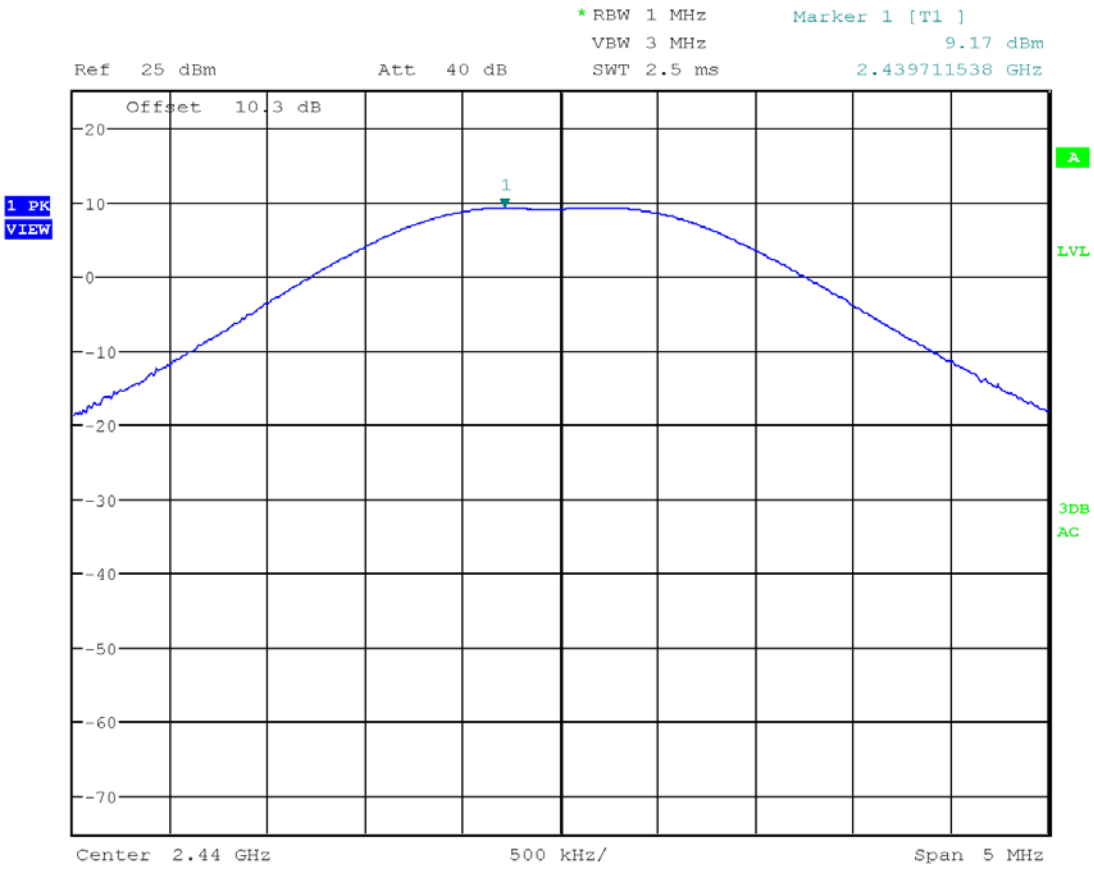
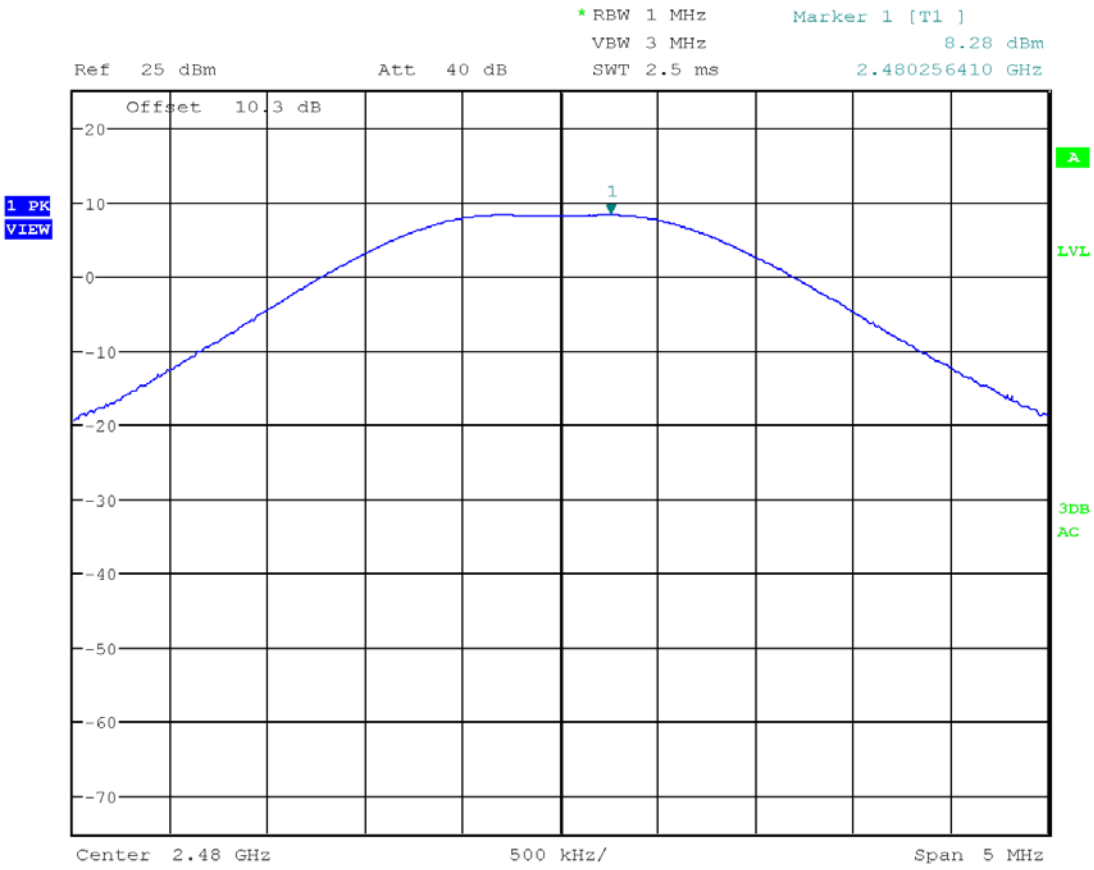

* RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
9.40 dBm
2.402272436 GHz
Ref 25 dBm
Att 40 dB
Offset 10.3 dB
1 PK
VIEW
A
LVL
3DB
AC
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.402 GHz
500 kHz/
Span 5 MHz
Date: 8.MAY.2019 23:56:01

Plot 2.5


* RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
9.17 dBm
2.439711538 GHz
Ref 25 dBm
Att 40 dB
Offset 10.3 dB
1 PK
VIEW
A
LVL
3DB
AC
Center 2.44 GHz
500 kHz/
Span 5 MHz
Date: 8.MAY.2019 23:56:41

Plot 2.6



Date: 8.MAY.2019 23:53:27

4.2 Transmitter Radiated Emissions
FCC Rules: 15.247(d), 15.209, 15.205; RSS-247;

4.2.1 Requirements

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.2.2 Procedure

Radiated emission measurements were performed from 30 MHz to 25 GHz according to the procedure described in ANSI C63.10: 2013. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz. Above 1000 MHz Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm in height for below 1000MHz and 1.5m in height for above 1GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 1 meter for frequencies 1 to 4 GHz, 3 meters for frequencies above 4 GHz and at 10 meters for frequencies below 1 GHz.

A preamp was used from 30 MHz to 1 GHz and 4-25 GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average limits for 1GHz – 18GHz.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

4.2.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

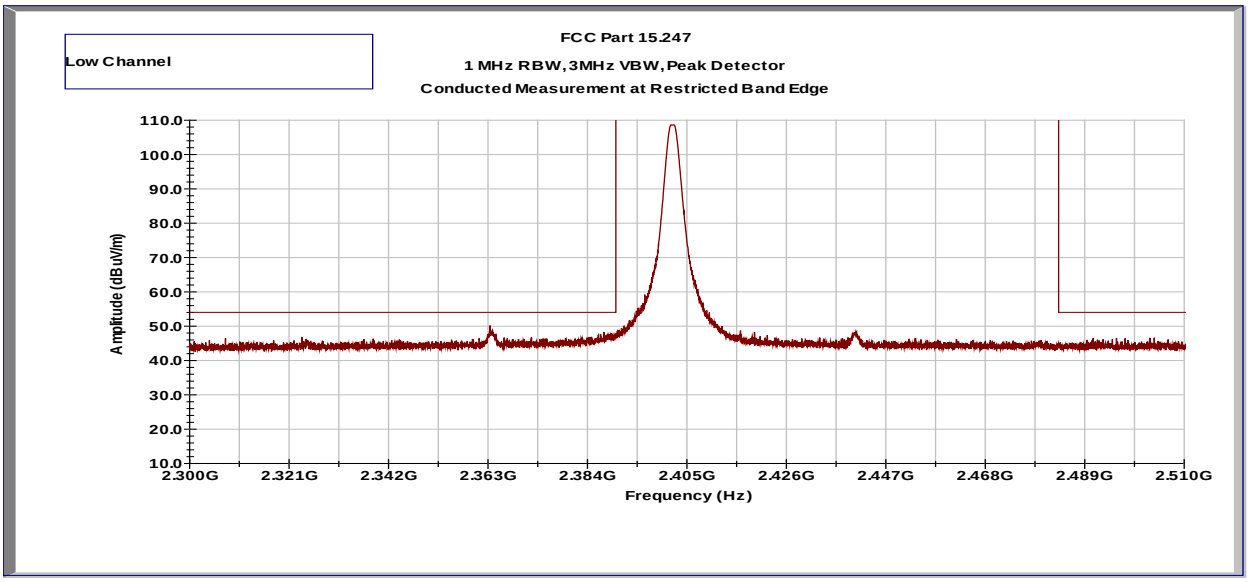
Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV); AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m).
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m.

4.2.4 Test Result

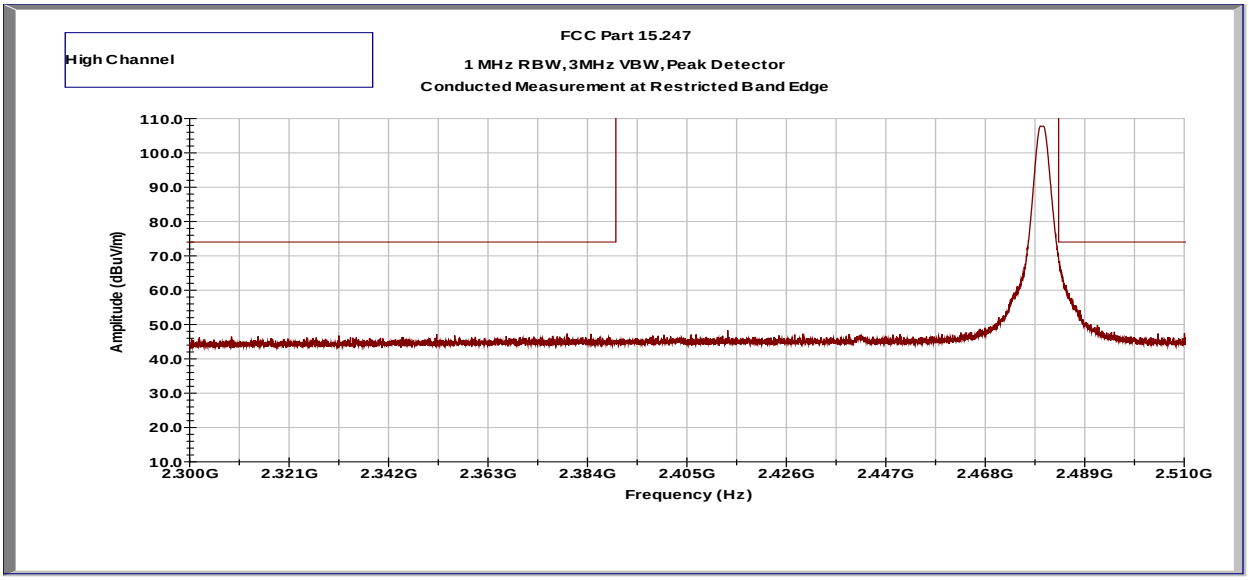
The data below shows the significant emission frequencies, the limit and the margin of compliance.
Note: Measurements were performed at vertical and horizontal orientations of EUT.

Antenna Port Band Edge, 2402 MHz Tx Low Band Edge, Peak Detector vs Avg limits



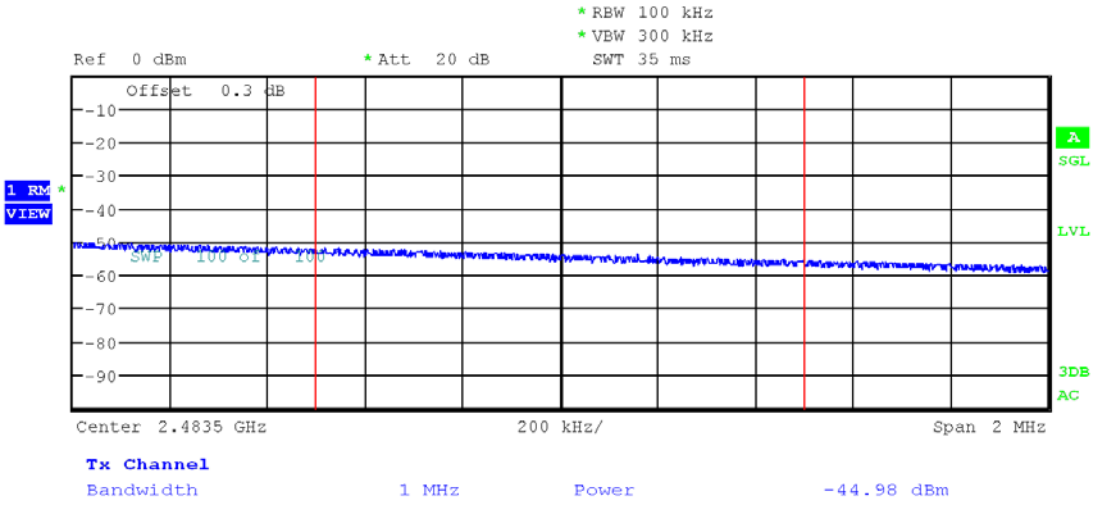
Frequency (MHz)	Peak dB(µV/m)	Avg Limit dB(µV/m)	Margin (dB)
2390	47.9	54	-6.1

Antenna Port Band Edge, 2480 MHz Tx High Band Edge, Peak Detector vs Peak limits



Frequency (MHz)	Peak dB(µV/m)	Peak Limit dB(µV/m)	Margin (dB)
2483.5	69.8	74	-4.2

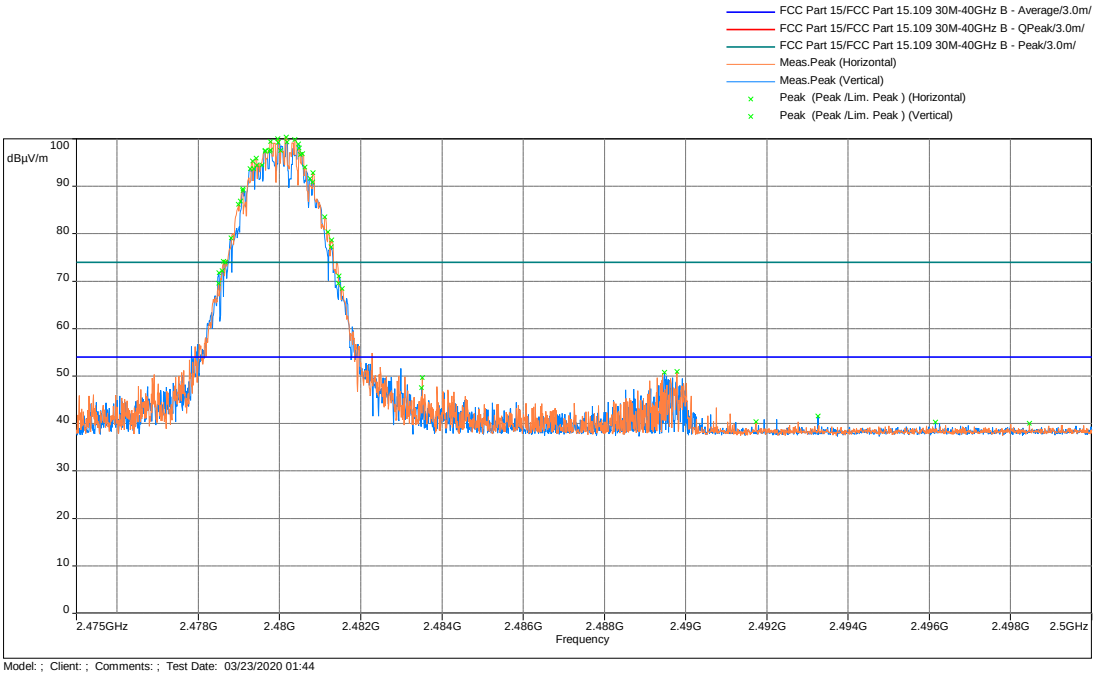
Antenna Port Band Edge, 2480 MHz Tx High Band Edge, Avg Detector vs Avg Limits



E = EIRP - 20logD + 104.8
E = -44.98 + 3.1 - 20log (3) + 104.8
E = 53.4 dBuV

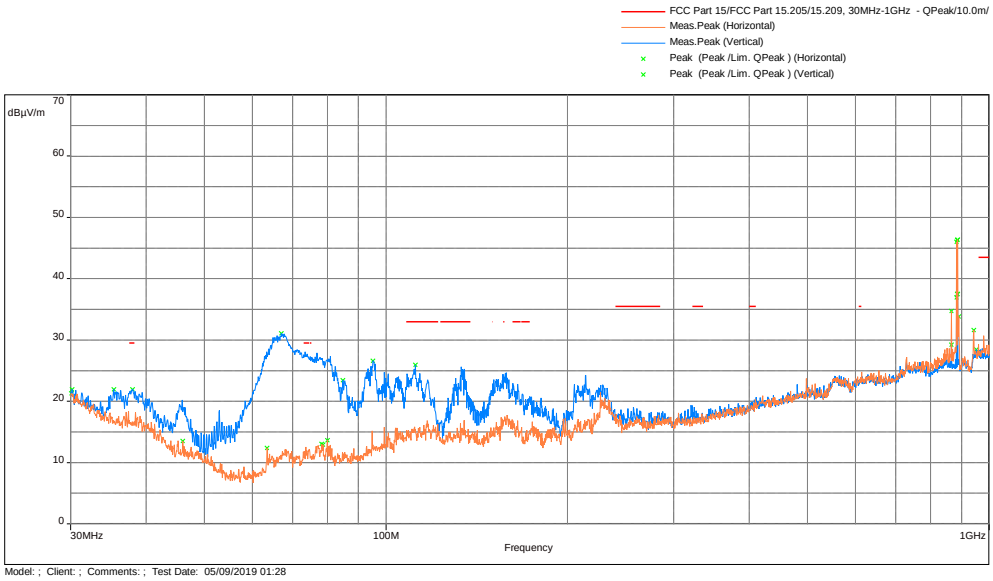
Frequency (MHz)	Avg dB(µV/m)	Avg Limit dB(µV/m)	Margin (dB)
2483.5	53.4	54	-0.6

Radiated Band Edge (Cabinet)
2480 MHz Tx High Band Edge, Peak Detector vs Avg Limits



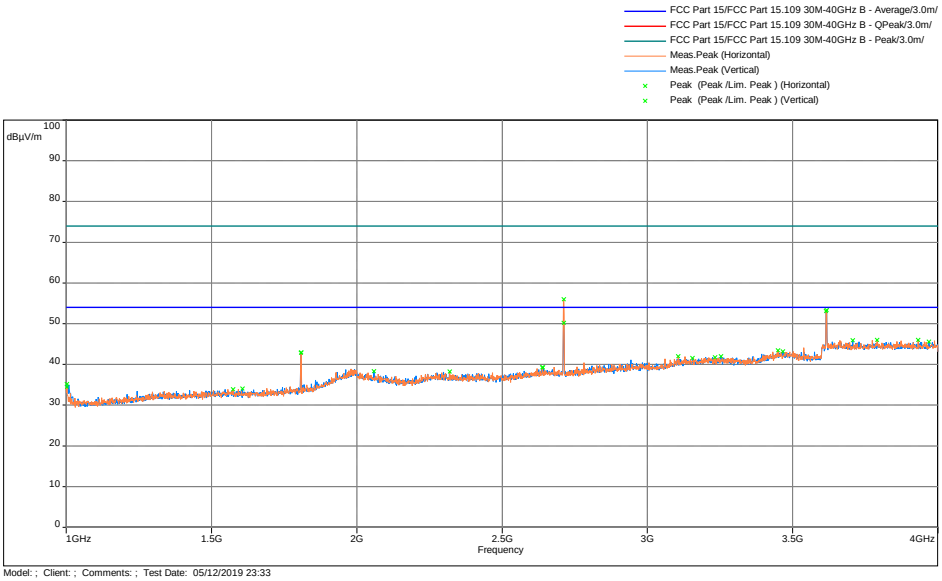
Frequency (MHz)	Peak@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
2483.513	49.65	54	-4.35	1.98	324.5	Horizontal	5.2
2489.785	50.98	54	-3.02	1.98	336.75	Horizontal	5.2
2483.5	47.51	54	-6.49	0.99	185.75	Vertical	5.2
2489.485	50.77	54	-3.23	1.99	47.25	Vertical	5.2

15.209 Radiated Spurious Emissions Low Channel, Tx at 904 MHz



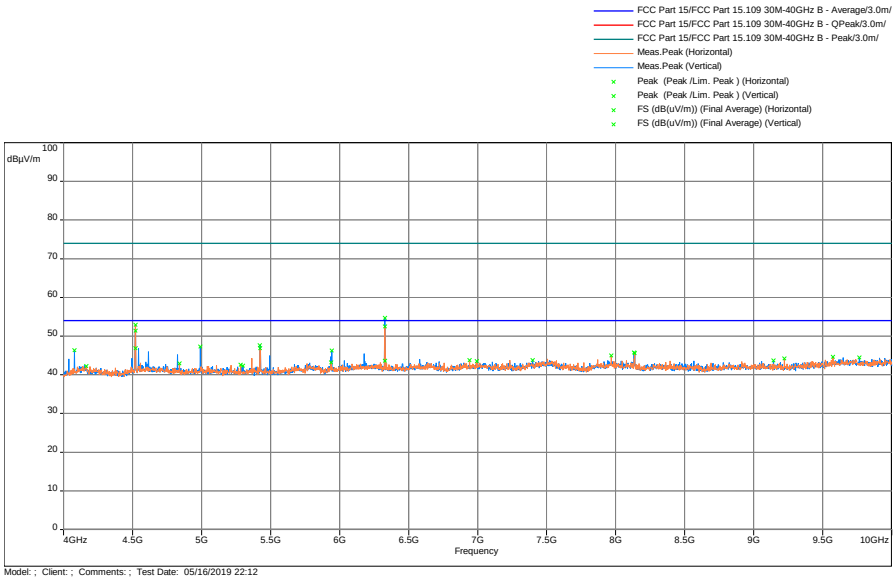
Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
865.7197	34.72	35.5	-0.78	287.75	1.00	Horizontal	-1.67
890.4223	33.8	35.5	-1.7	296.5	1.00	Horizontal	-1.23

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



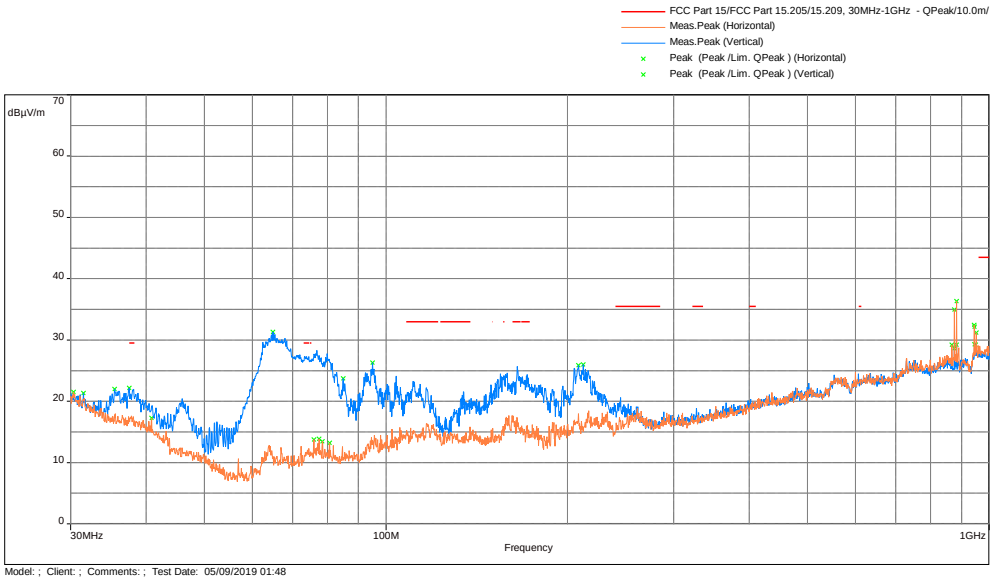
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
2712.5	53.09	54	-0.91	1.02	228.75	Horizontal	13.11
3616.9	47.31	54	-6.69	1.02	16	Horizontal	15.86

Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Avg Limit



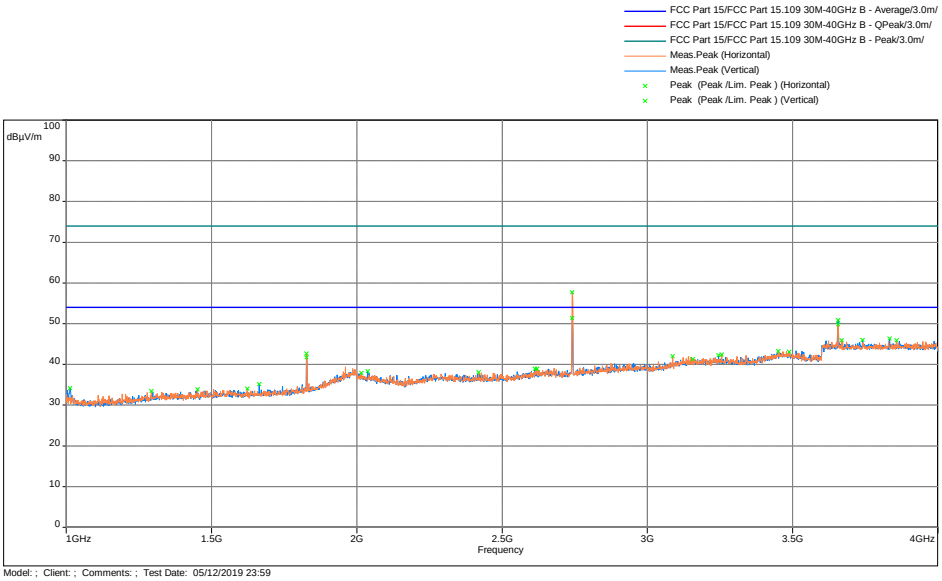
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
4521.031	46.88	54	-7.12	1.55	247.75	Horizontal	-9.49
6329.429	43.62	54	-10.38	1.52	111.75	Vertical	-5.96

15.209 Radiated Spurious Emissions Mid Channel, Tx at 914 MHz



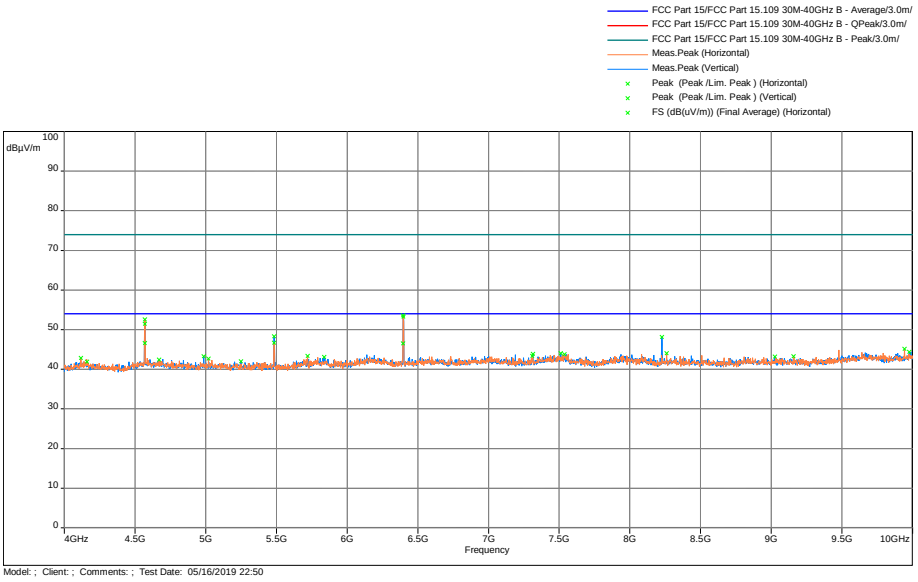
Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
875.5167	34.94	35.5	-0.56	285	1.00	Horizontal	-1.65
944.419	32.41	35.5	-3.09	285	1.00	Horizontal	0.41

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



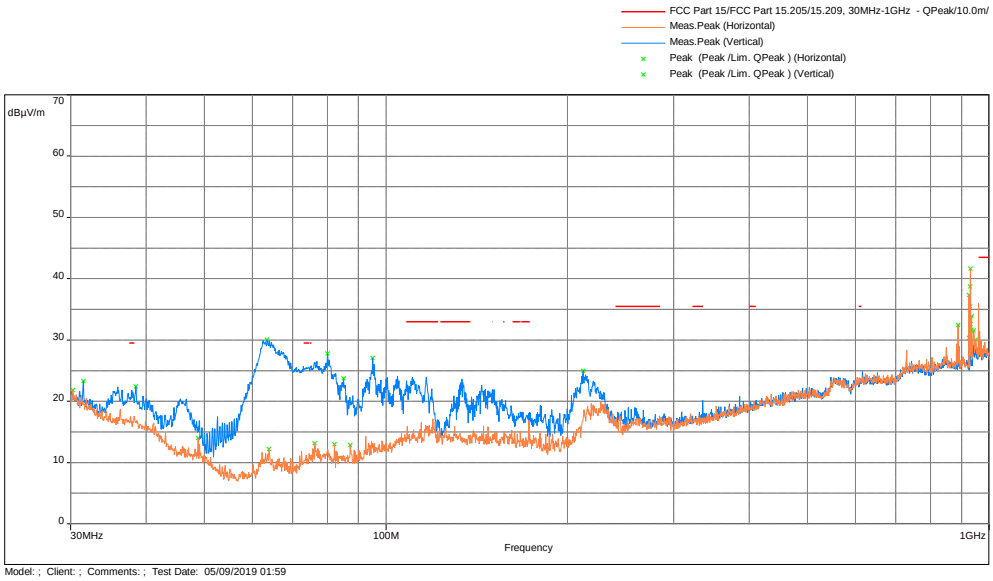
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
2741.4	53.68	54	-0.32	1.02	236.25	Horizontal	13.21
3655.1	44.51	54	-9.49	1.51	97	Vertical	15.98

Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Avg Limit



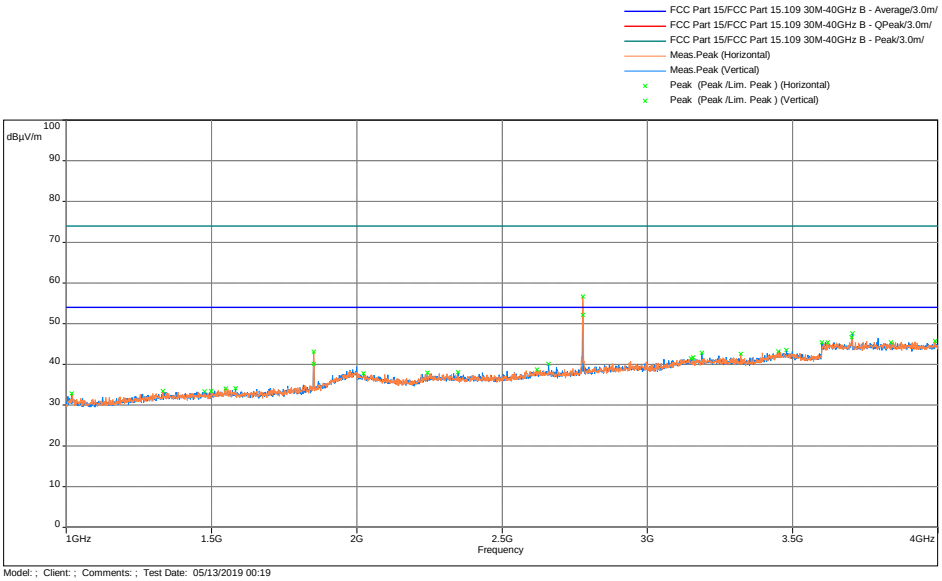
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
4568.976	46.57	54	-7.43	1.36	243.75	Horizontal	-9.14
6396.574	46.51	54	-7.49	1.36	323.5	Horizontal	-6.18

15.209 Radiated Spurious Emissions High Channel, Tx at 926 MHz



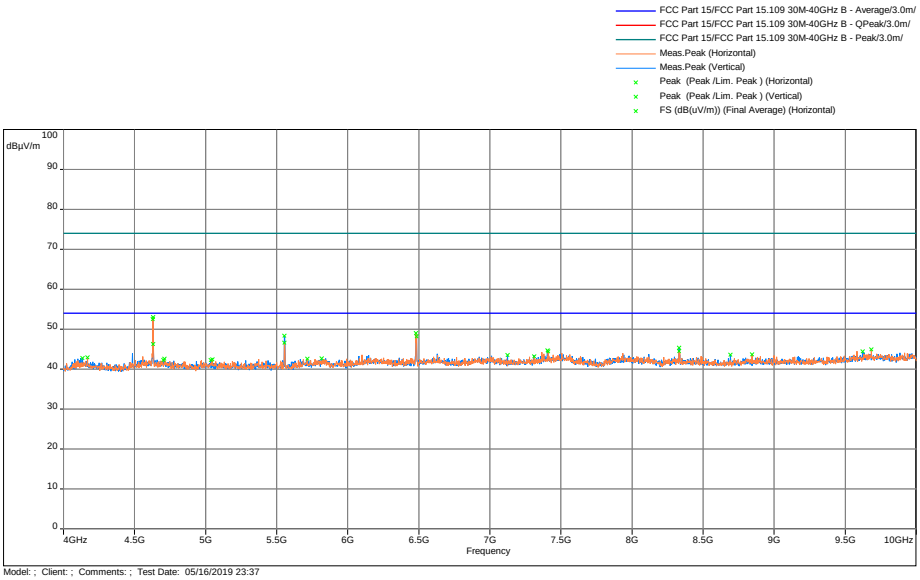
Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
935.4303	33.88	35.5	-1.62	288.25	1.00	Horizontal	0.31
80.01967	27.75	29.5	-1.75	167.5	2.5	Vertical	-21.52

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



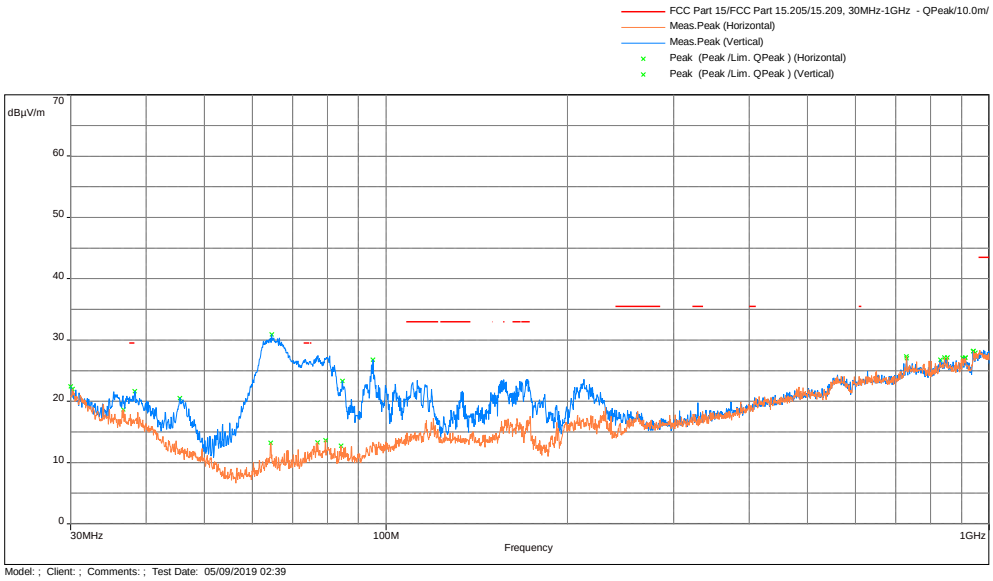
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
2777.5	53.22	54	-0.78	1.02	230	Horizontal	13.31
3704.7	40.2	54	-13.8	1.51	167	Vertical	16.12

Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Avg Limit



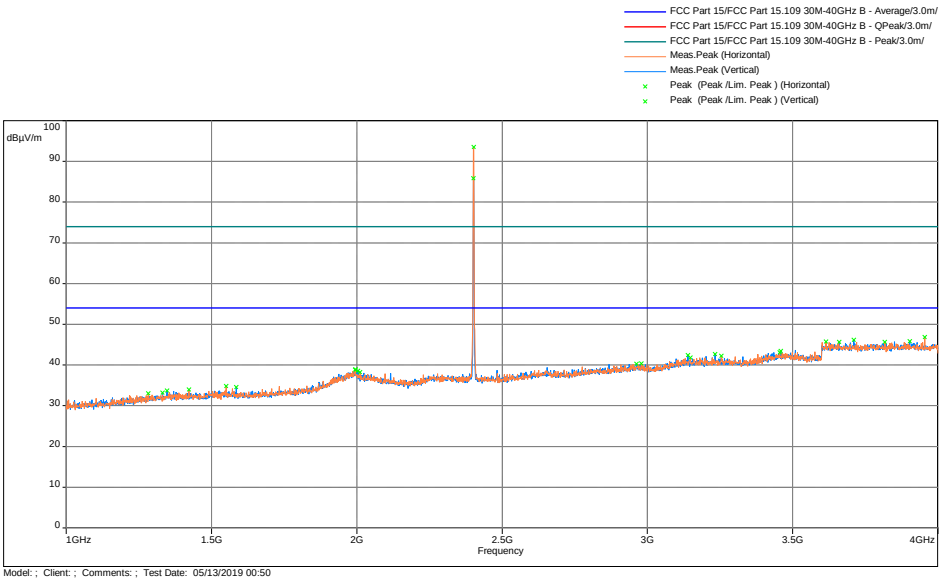
Frequency (MHz)	Avg@3m dB(µV/m)	Lim. Avg dB(µV/m)	Margin (dB)	Height (m)	Angle (°)	Antenna Polarization	Correction (dB)
4631.029	46.23	54	-7.77	1.3	350	Horizontal	-9.06

15.209 Radiated Spurious Emissions Low Channel, Tx at 2402 MHz

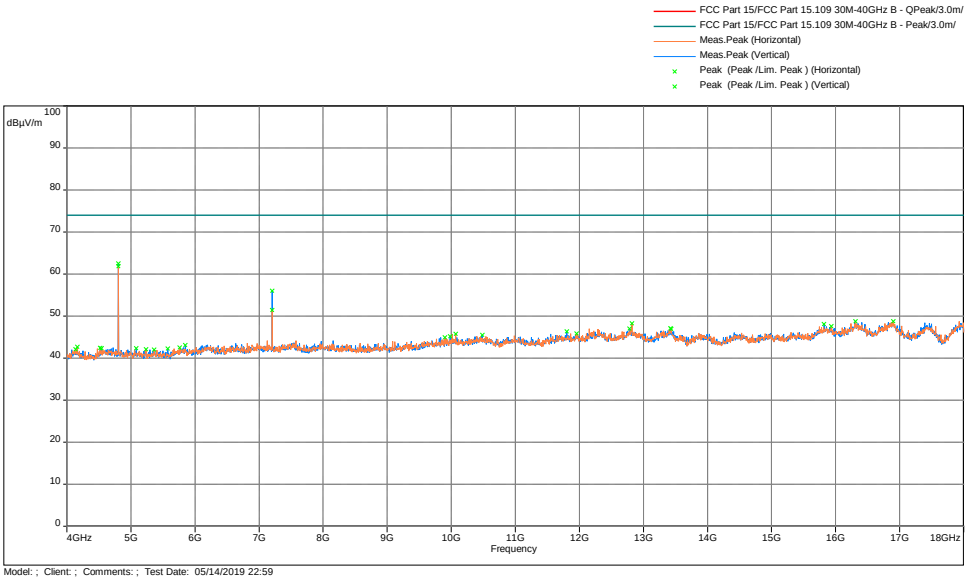


Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
84.643	23.28	29.5	-6.22	39.75	1.00	Vertical	-20.83
95.184	26.74	33	-6.26	349.75	1.00	Vertical	-19.29

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Peak/Avg Limit



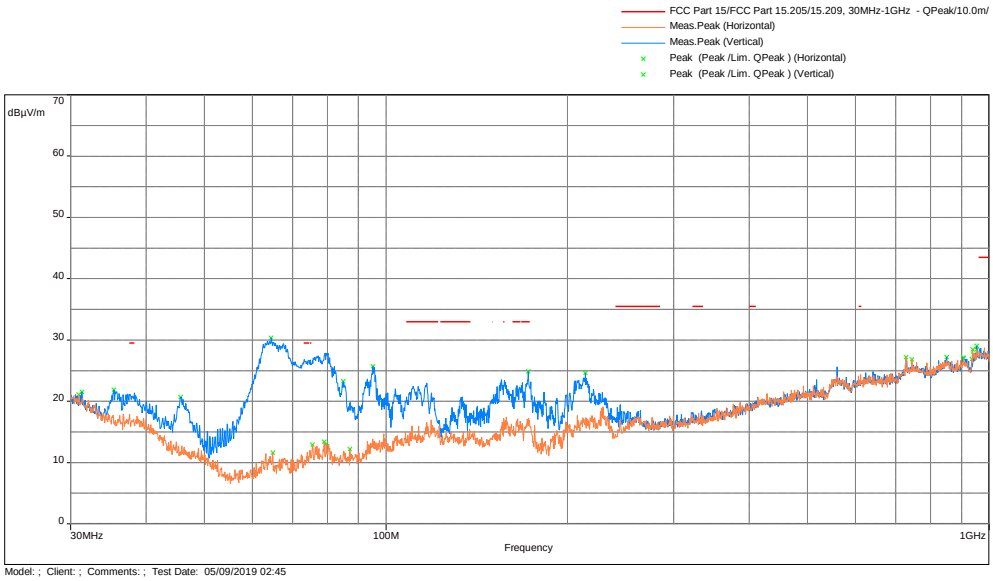
Frequency (MHz)	Peak@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4804.533	62.49	74	-11.51	153	1.50	Vertical	-9.29
7205.067	56.03	74	-17.97	144.75	2.00	Vertical	-5.8

Frequency (MHz)	Ave@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4804.533	42.49	54	-11.51	153	1.50	Vertical	-9.29
7205.067	36.03	54	-17.97	144.75	2.00	Vertical	-5.8

Note: Average measurement was derived from applying a duty cycle correction to the Peak measurement. See Annex A.

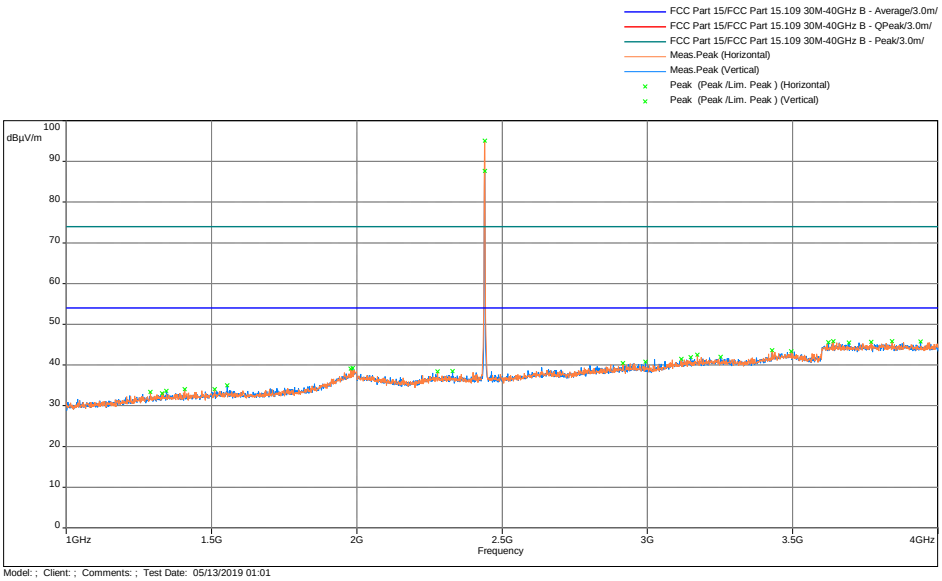
Note: No significant frequencies were found above 18 GHz.

15.209 Radiated Spurious Emissions Low Channel, Tx at 2440 MHz

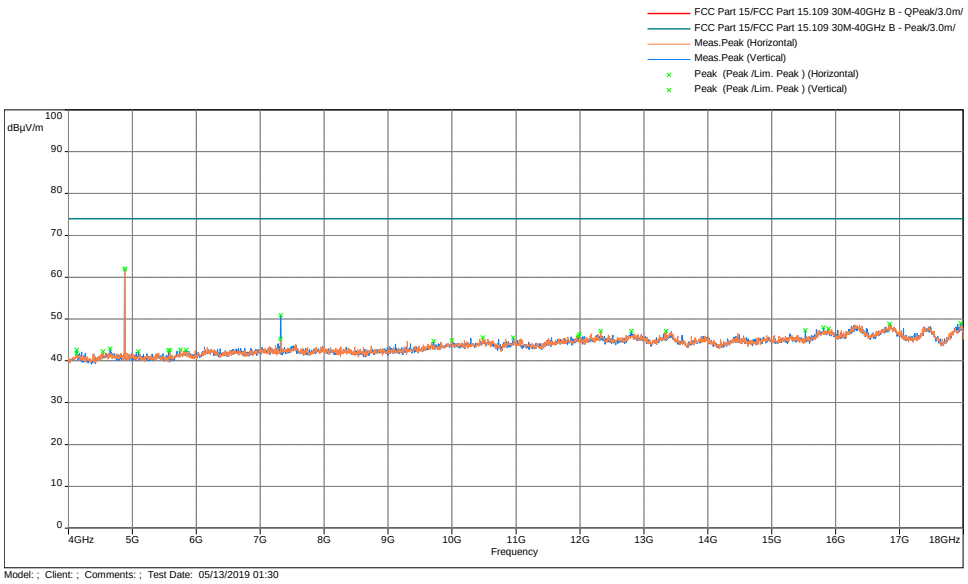


Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
84.966	23.26	29.5	-6.24	0	1.00	Vertical	-20.76
954.183	29.02	35.5	-6.48	78.75	4.00	Vertical	0.56

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Peak/Avg Limit



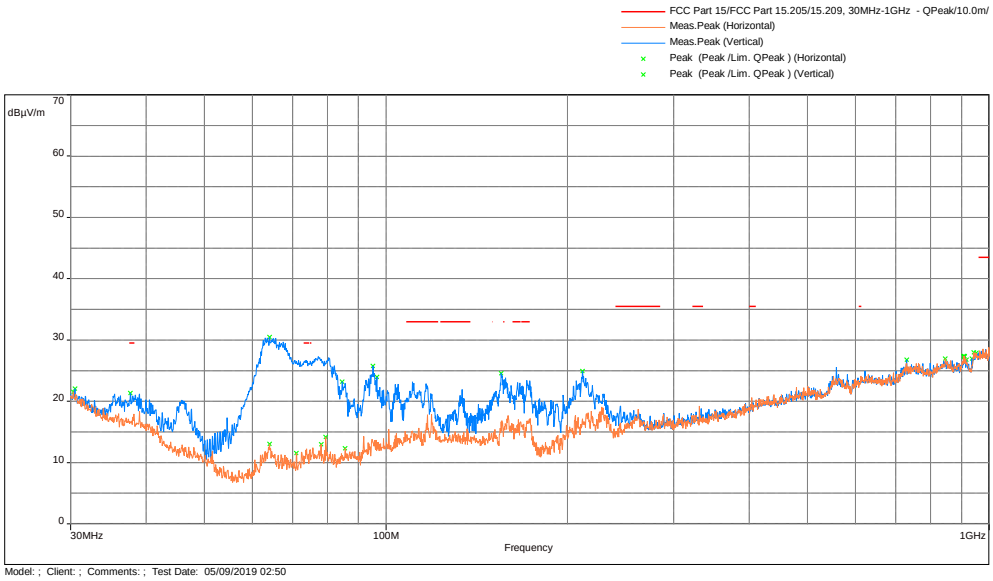
Frequency (MHz)	Peak@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4880.133	62.07	74	-11.93	324.5	1.00	Vertical	-9.6
7320.8	50.9	74	-23.1	155.25	2.00	Vertical	-5.9

Frequency (MHz)	Ave@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4880.133	42.07	54	-11.93	324.5	1.00	Vertical	-9.6
7320.8	30.9	54	-23.1	155.25	2.00	Vertical	-5.9

Note: Average measurement was derived from applying a duty cycle correction to the Peak measurement. See Annex A.

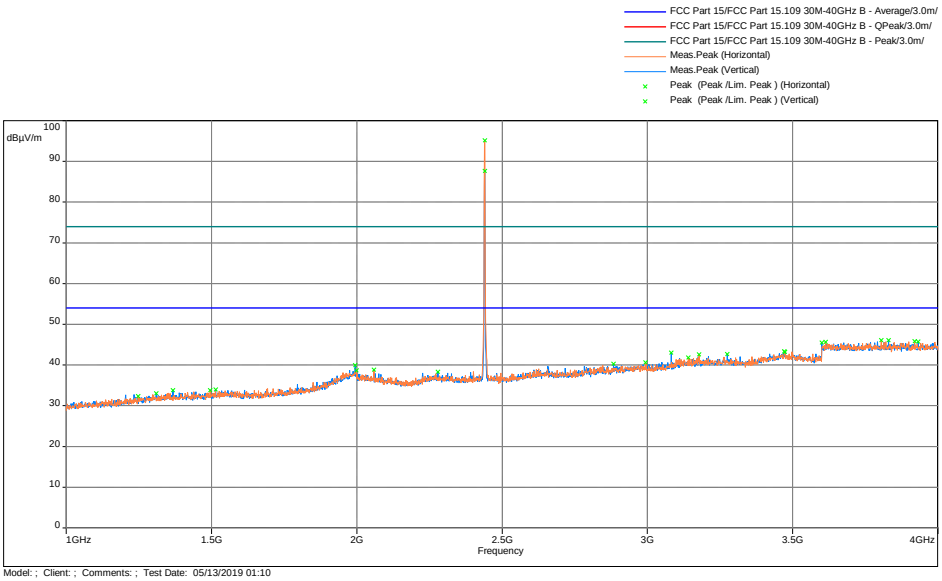
Note: No significant frequencies were found above 18 GHz.

15.209 Radiated Spurious Emissions Low Channel, Tx at 2480 MHz

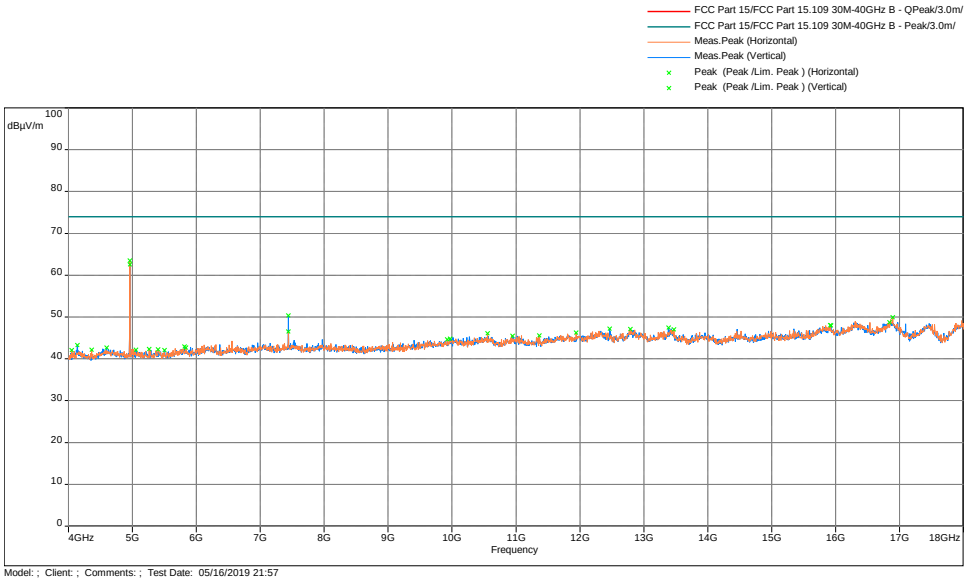


Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
84.611	23.18	29.5	-6.32	1.25	1.00	Vertical polarization	-20.84
95.184	25.74	33	-7.26	226.5	1.00	Vertical polarization	-19.29

Radiated Spurious Emissions 1000 - 4000 MHz, Peak Scan vs Avg Limit



Radiated Spurious Emissions 4000 - 18000 MHz, Peak Scan vs Peak/Avg Limit



Frequency (MHz)	Peak@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4960.4	63.51	74	-10.49	227	1.50	Horizontal	-9.45
7440.733	50.37	74	-23.63	260.5	1.50	Vertical	-5.45

Frequency (MHz)	Ave@3m dB(µV/m)	Lim. Peak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
4960.4	43.51	54	-10.49	227	1.50	Horizontal	-9.45
7440.733	30.37	54	-23.63	260.5	1.50	Vertical	-5.45

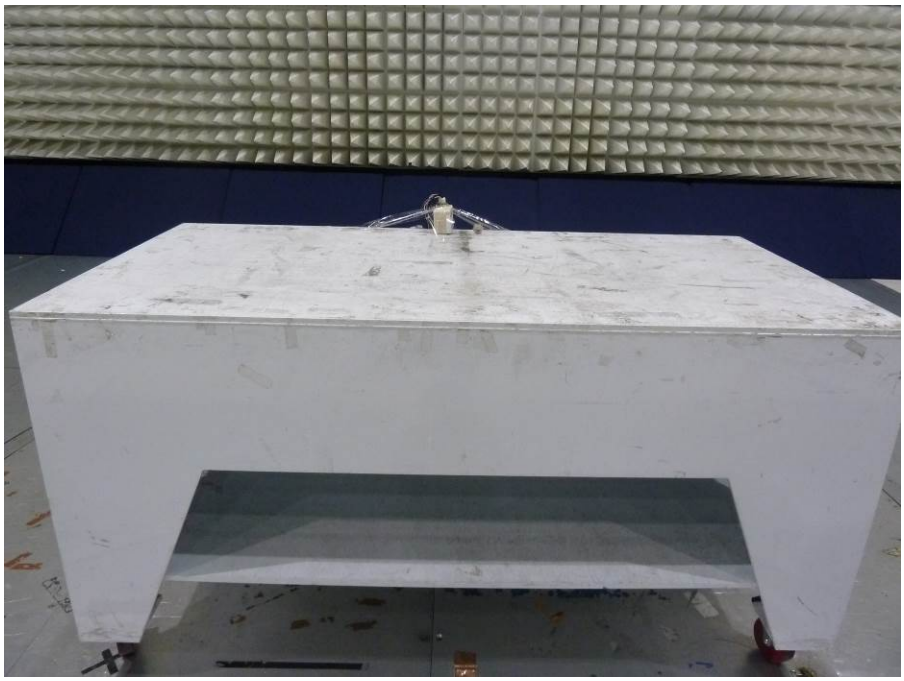
Note: Average measurement was derived from applying a duty cycle correction to the Peak measurement. See Annex A.

Note: No significant frequencies were found above 18 GHz.

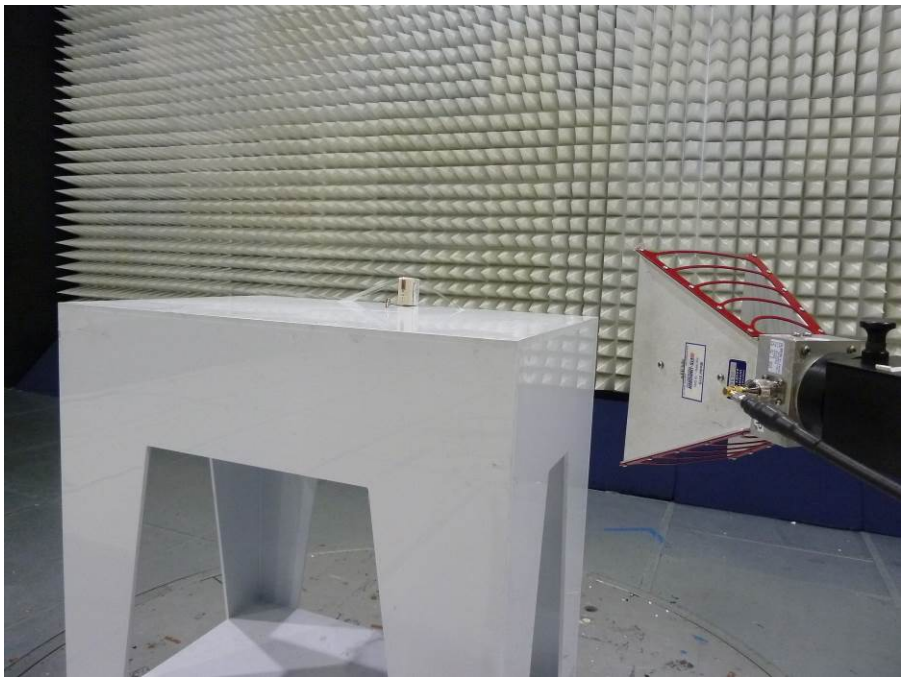
Results	Complies
Test date:	May 12 & 16, 2019

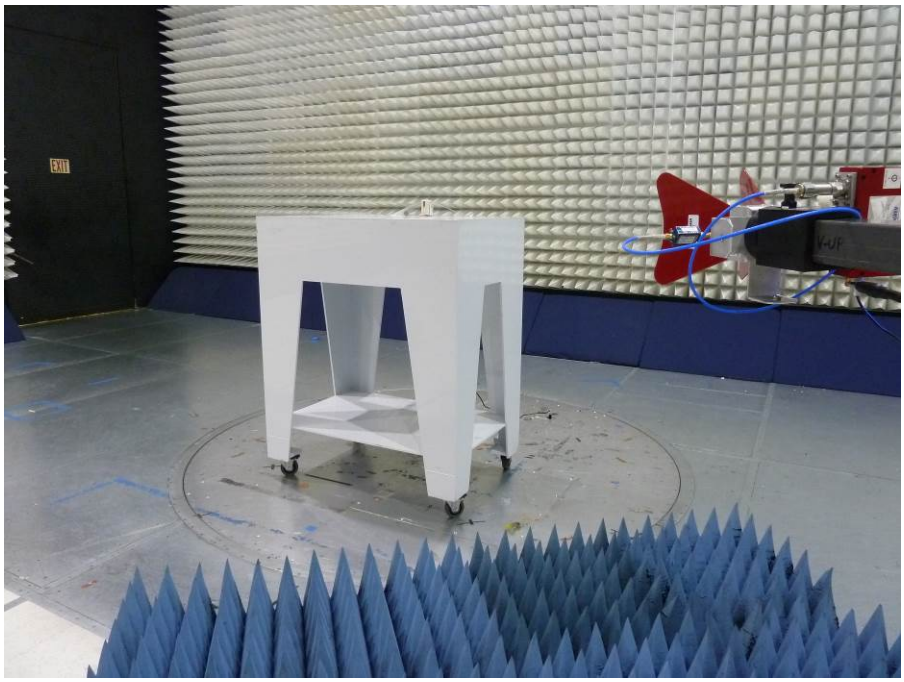
4.1.5 Test Configuration Photographs

The following photographs show the testing configurations used.



4.1.5 Test Configuration Photographs (Continued)





4.3 Digital Parts Radiated Emissions
FCC Ref: 15.109, ICES 003

4.3.1 Requirements

Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003*, RSS GEN

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

4.3.2 Procedure

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

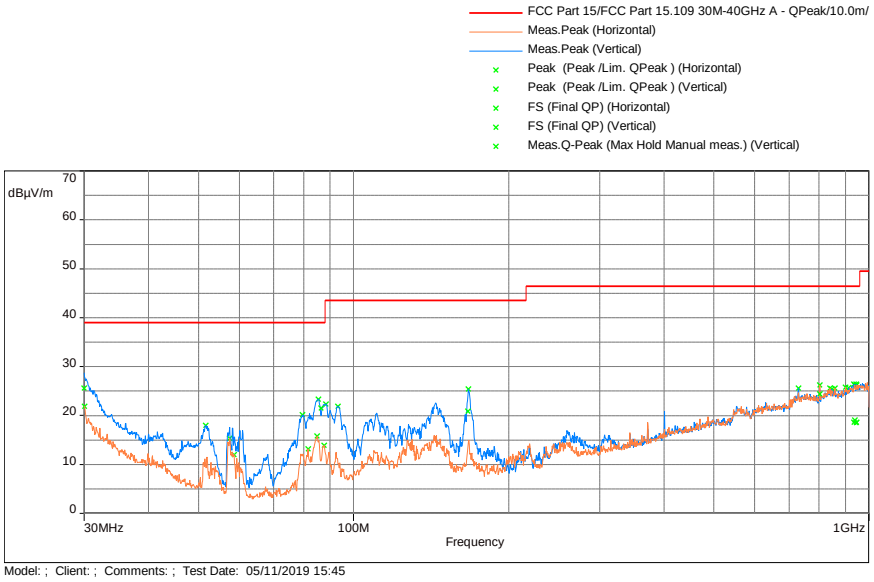
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4-2014.

4.3.4 Test Result

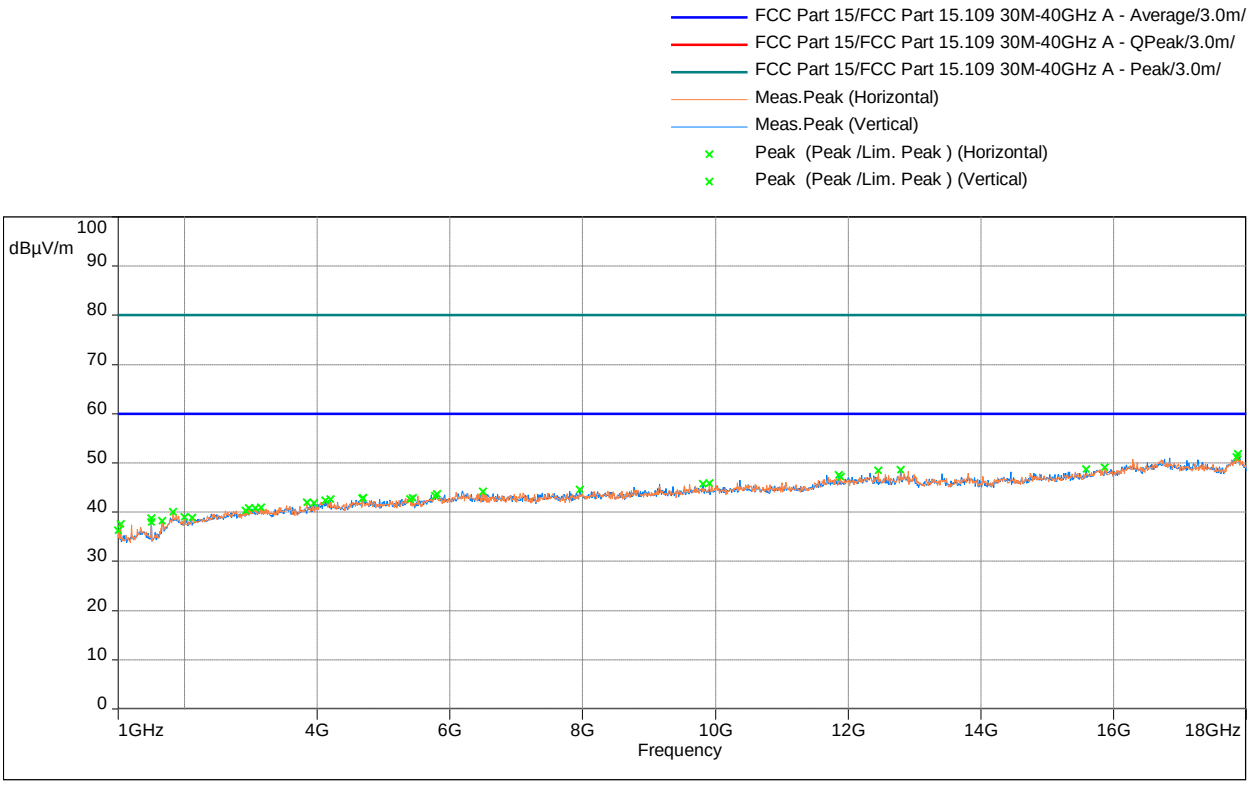
The EUT met the radiated disturbance requirements of FCC & ICES 003 for a Class A device.

15.109 Radiated Emissions 30 MHz – 1 GHz, Class A



Frequency (MHz)	QPeak@10m dB(µV/m)	Lim. QPeak dB(µV/m)	Margin (dB)	Angle (°)	Height (m)	Antenna Polarization	Correction (dB)
801.8241	24.4	46.4	-22	264.75	1	Horizontal	27.34
938.482	19	46.4	-27.4	259.5	1.36	Horizontal	18.7
946.3658	18.62	46.4	-27.78	131.25	2.53	Horizontal	18.2
30	25.54	39	-13.46	179.75	1.01	Vertical	36.25
86.43697	21.52	39	-17.48	76.25	1.41	Vertical	42.21
166.7654	20.84	43.5	-22.66	198.75	1.97	Vertical	39.09

Radiated Emissions 1000 - 18000 MHz, Peak Scan vs Avg Limit

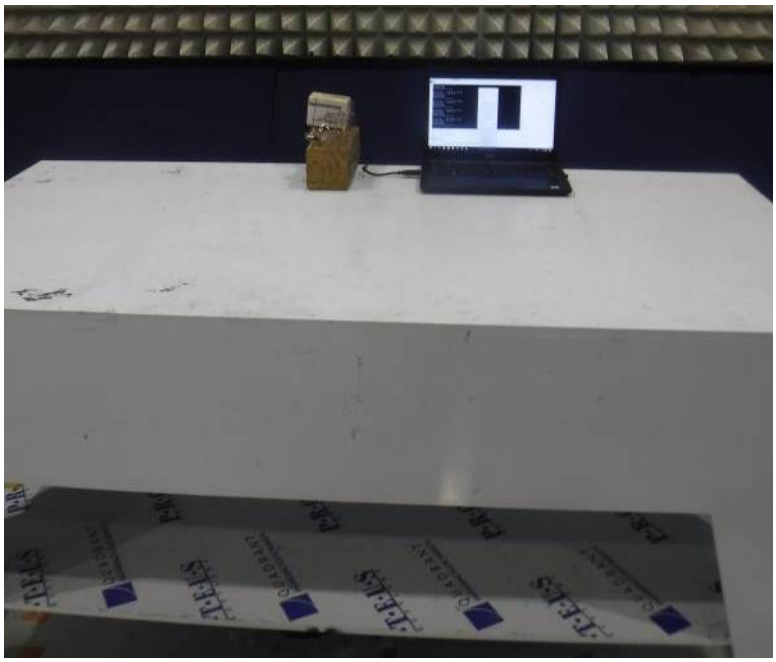


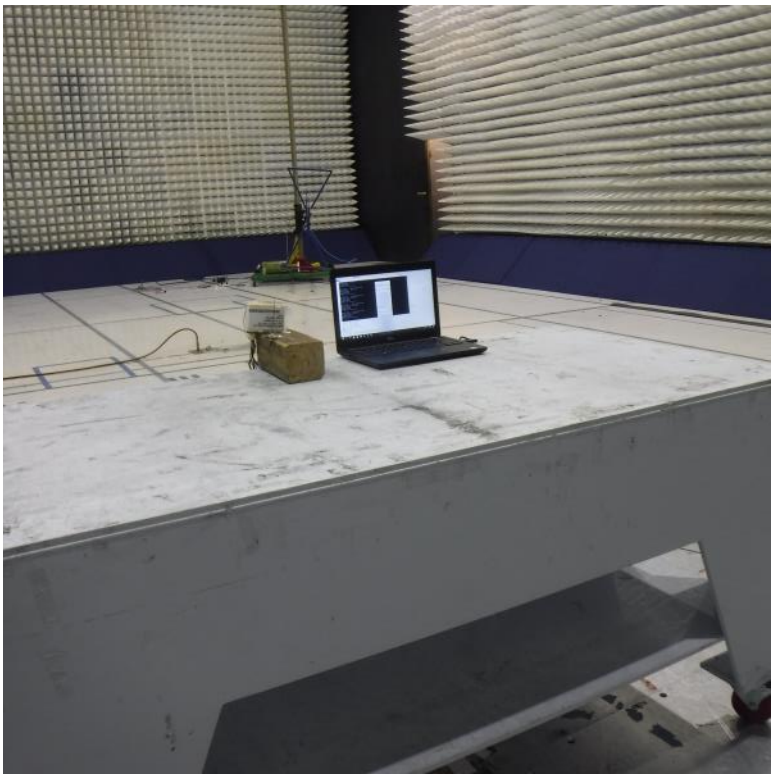
Model: ; Client: ; Comments: ; Test Date: 05/10/2019 22:35

Results	Complies
Test date:	May 11, 2019

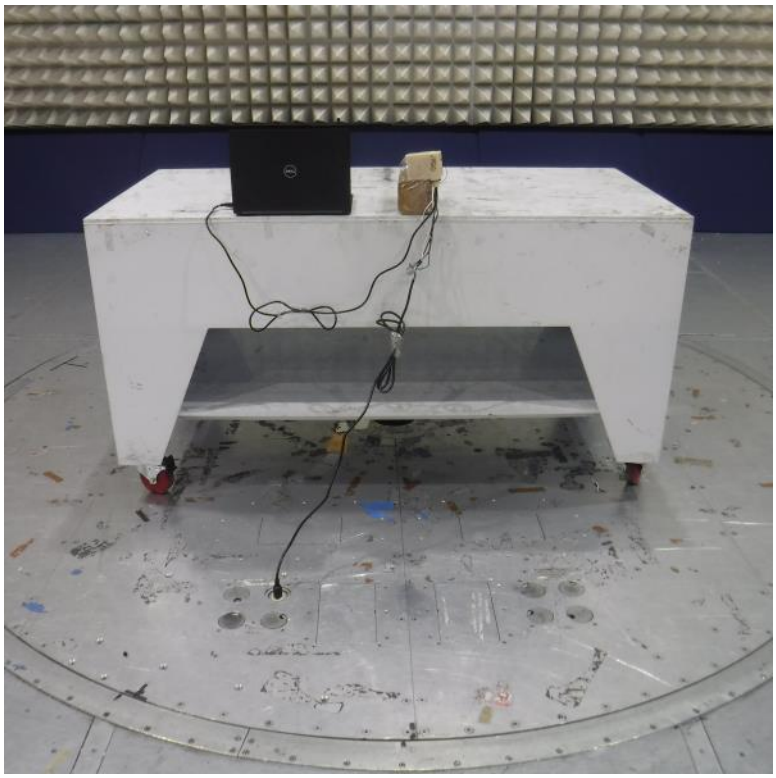
4.3.5 Test Configuration Photographs

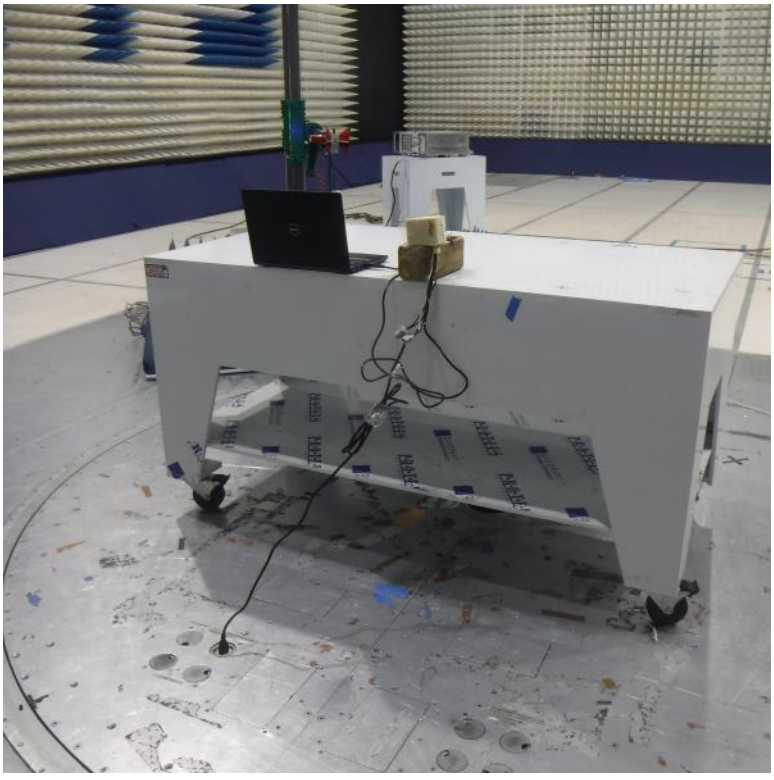
The following photographs show the testing configurations used.





4.3.5 Test Configuration Photographs (Continued)





4.4 AC Line Conducted Emission
FCC Rule 15.107/15.207

4.4.1 Requirement

Frequency Band MHz	Class B Limit dB(µV)		Class A Limit dB(µV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.4.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m but may be extended for larger EUT.

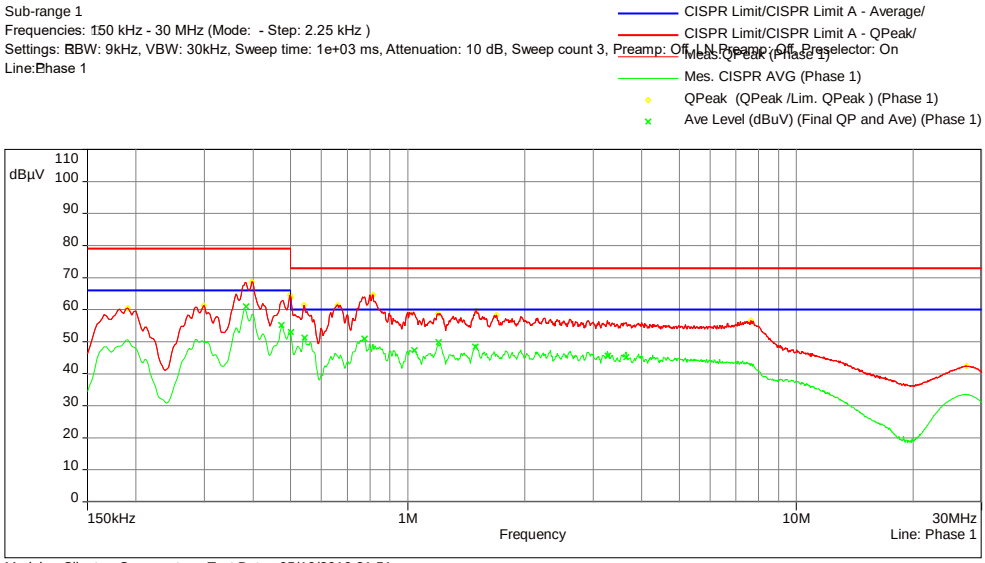
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 and 15.107.

4.4.3 Test Result

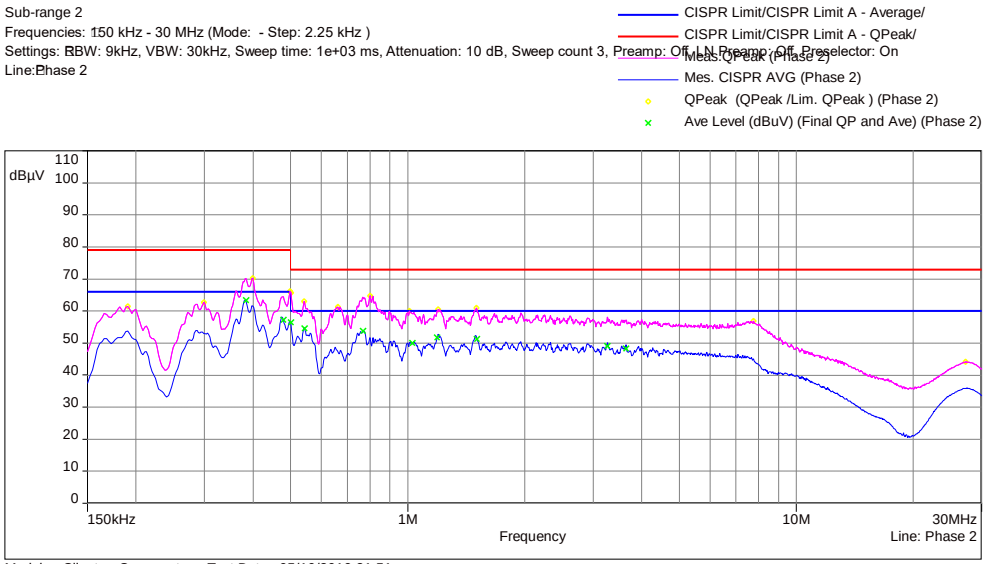
15.107 AC Line Conducted Emission from 150kMHz to 30 MHz

Phase 1



Model: ; Client: ; Comments: ; Test Date: 05/10/2019 21:51

Neutral



Model: ; Client: ; Comments: ; Test Date: 05/10/2019 21:51

Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	Margin (dB)	Line	Correction (dB)
0.501	65.75	73	-7.25	Phase 2	11.97
0.800	64.8	73	-8.2	Phase 2	12
0.814	64.65	73	-8.35	Phase 1	12
0.400	70.21	79	-8.79	Phase 2	11.96
0.501	63.88	73	-9.12	Phase 1	11.97
0.542	63.07	73	-9.93	Phase 2	11.97
0.398	68.7	79	-10.3	Phase 1	11.96
0.542	61.5	73	-11.5	Phase 1	11.97
0.661	61.43	73	-11.57	Phase 1	11.99
0.661	61.25	73	-11.75	Phase 2	11.99

Frequency (MHz)	CISPR AVG (dBµV)	Lim. Average (dBµV)	Margin (dB)	Line	Correction (dB)
0.38175	63.4	66	-2.6	Phase 2	11.96
0.501	55.91	60	-4.09	Phase 2	11.97
0.5415	54.87	60	-5.13	Phase 2	11.97
0.38175	60.09	66	-5.91	Phase 1	11.96
0.77325	53.65	60	-6.35	Phase 2	12
1.1985	52.75	60	-7.25	Phase 2	12.01
0.501	52.48	60	-7.52	Phase 1	11.97
1.49775	52.38	60	-7.62	Phase 2	12.05
0.474	58.14	66	-7.86	Phase 2	11.99
0.5415	51.42	60	-8.58	Phase 1	11.97
0.77325	51.05	60	-8.95	Phase 1	12
1.0365	50.51	60	-9.49	Phase 2	12.02
3.2685	50.09	60	-9.91	Phase 2	12.1
3.64425	49.52	60	-10.48	Phase 2	12.14
1.1985	49.27	60	-10.73	Phase 1	12.01
1.4955	49.1	60	-10.9	Phase 1	12.05
0.474	54.81	66	-11.19	Phase 1	11.99
0.65175	48.72	60	-11.28	Phase 2	11.99
0.285	53.97	66	-12.03	Phase 2	11.94
0.1905	53.72	66	-12.28	Phase 2	11.94
1.0365	47.6	60	-12.4	Phase 1	12.02
27.2715	33.56	60	-26.44	Phase 1	12.61

15.207 AC Line Conducted Emission from 150kMHz to 30 MHz

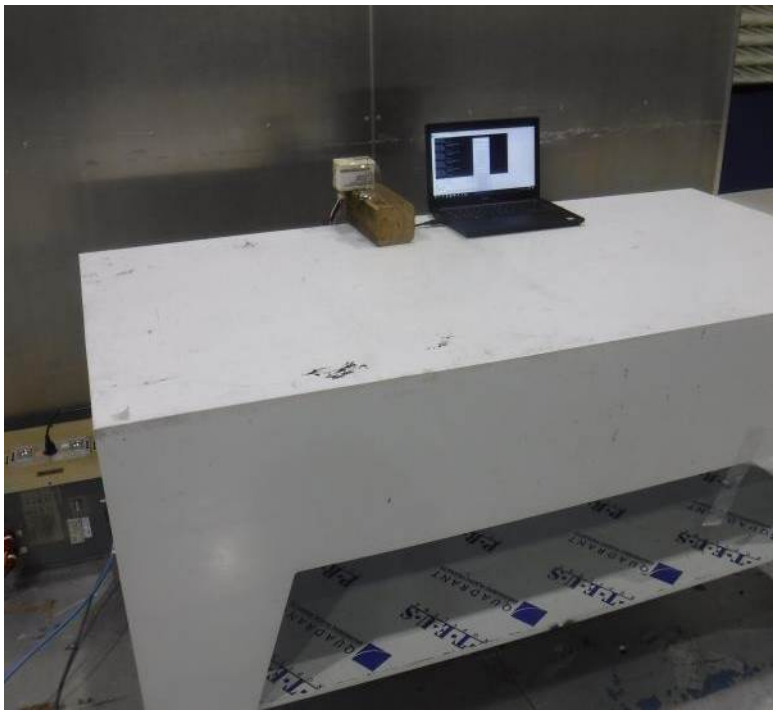
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	Margin (dB)	Line	Correction (dB)
0.190	61.49	64.01	-2.52	Phase 2	11.94
7.752	56.86	60	-3.14	Phase 2	12.25
7.653	56.6	60	-3.4	Phase 1	12.24
0.190	60.49	64.01	-3.52	Phase 1	11.94
27.280	44.13	60	-15.87	Phase 2	12.61
27.471	42.42	60	-17.58	Phase 1	12.61

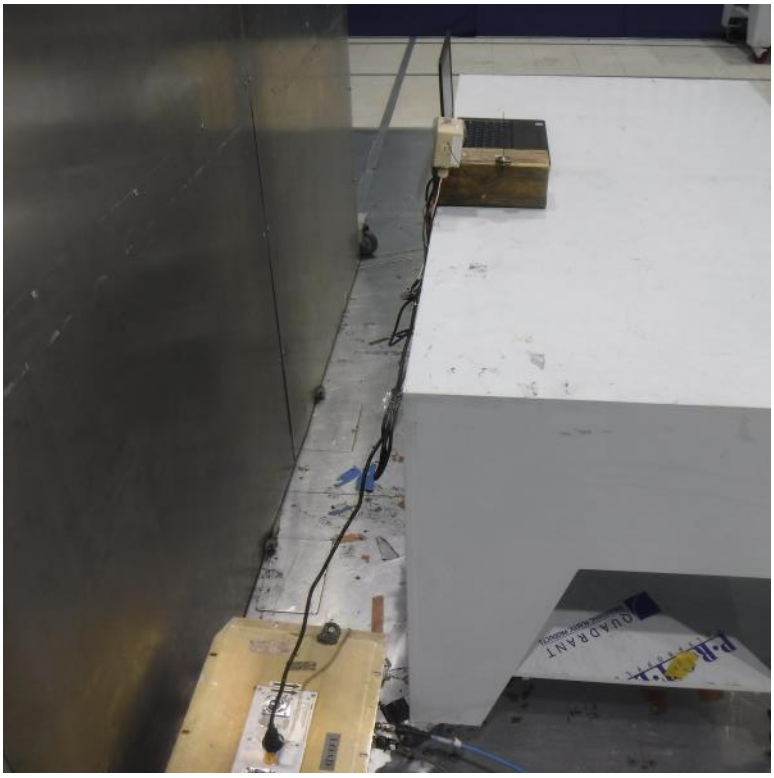
Frequency (MHz)	CISPR AVG (dBµV)	Lim. Average (dBµV)	Margin (dB)	Line	Correction (dB)
0.190	53.72	54.01	-0.29	Phase 2	11.94
5.014	47.57	50	-2.43	Phase 2	12.2
0.190	50.63	54.01	-3.38	Phase 1	11.94
5.183	44.93	50	-5.07	Phase 1	12.19
27.622	35.94	50	-14.06	Phase 2	12.61
27.271	33.56	50	-16.44	Phase 1	12.61

Results	Complies
Test date:	May 10 & 13, 2019

4.4.4 Test Configuration Photographs

The following photographs show the testing configurations used.





5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Test dates: May 8-16, 2019

Equipment	Manufacturer	Model/Type	Serial No.	Calibration Interval	Cal Due
EMI Receiver	Rohde and Schwarz	ESR	ITS 01607	12	10/24/19
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	10/26/19
BI-Log Antenna	Teseq	CBL 6111D	ITS 01058	12	09/20/19
Pre-Amplifier	Com-Power	PAM-103	ITS 01645	12	03/06/20
Active Horn Antenna	ETS Lindgren	3117-PA	ITS 01636	12	01/17/20
Horn Antenna	ETS Lindgren	3116c	ITS 01376	12	04/25/19
Pre-Amplifier	Miteq	TTA1840-35-S-M	ITS 01393	12	02/08/20
Pyramidal Horn Antenna	EMCO	3160-09	ITS 00571	#	#
Pre-Amplifier (18-40GHz)	Miteq	TTA1840-35-S-M	ITS 01393	12	02/08/20
LISN	FCC	FCC-LISN-50-50-M-H	ITS 00552	12	12/07/19
RF Cable	MEGA PHASE	EMC1-K1K1-236	ITS 01543	12	11/11/20
High Pass Filter	Reactel	7HS-4-18 S11	ITS 01171	12	02/15/20

* Calibration performed by ITS prior to the test. # Calibration not required

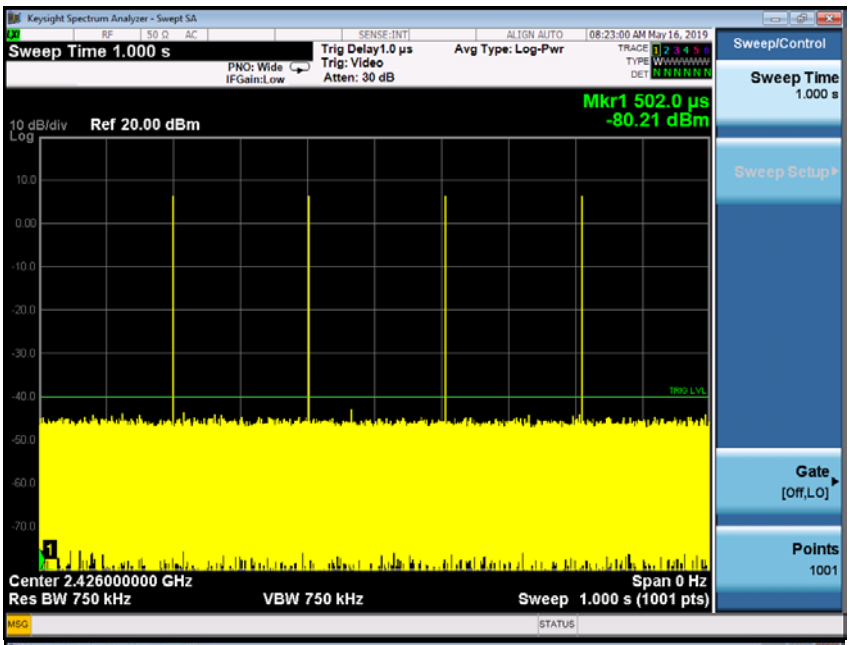
Test date: March 23, 2020

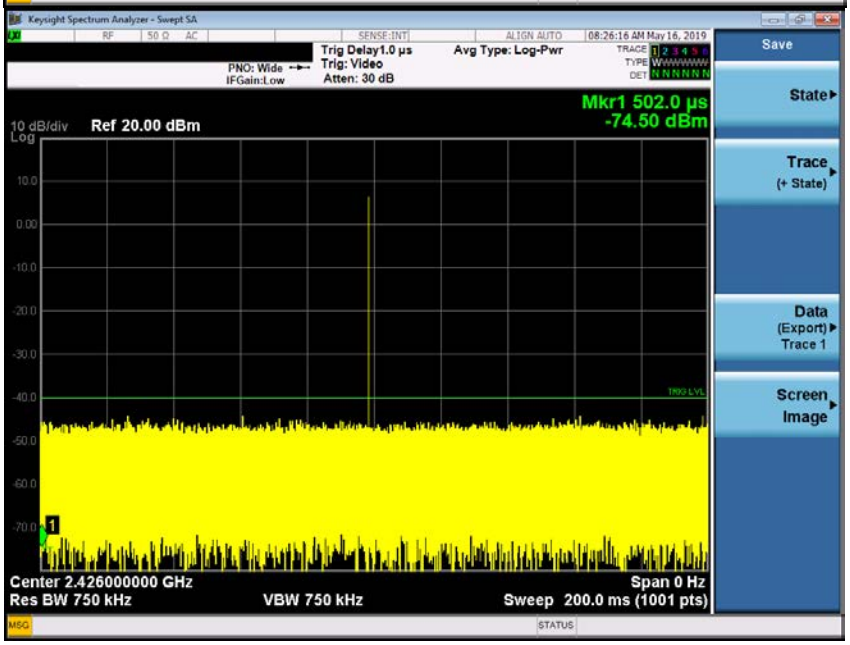
Equipment	Manufacturer	Model/Type	Serial No.	Calibration Interval	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	10/26/19
Active Horn Antenna	ETS Lindgren	3117-PA	ITS 01636	12	01/17/20
RF Cable	MEGA PHASE	EMC1-K1K1-236	ITS 01543	12	11/11/20

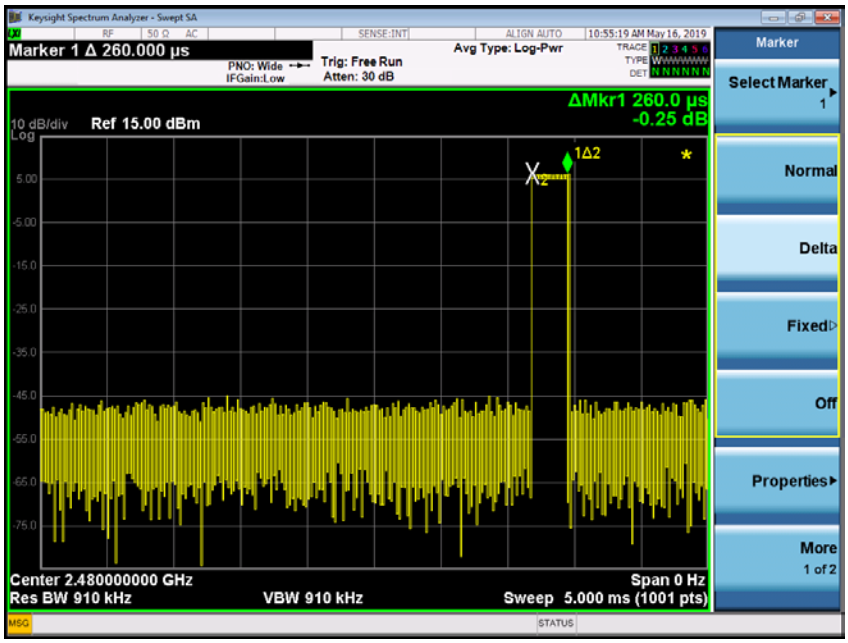
Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.16.0.64	Acuity_5-8-2019

ANNEX A: Duty Correction Factor







Duty Cycle:
DC = [0.260 ms/100 ms]*100= 0.26%

DCF = 20 Log (DC) = -51.7 dB
Max DCF = -20 dB was used.

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103920760	AC	KV	May 17, 2019	Original document
2.0 / G103920760	AC	KV	March 23, 2020	Added Radiated Band Edge (Cabinet) on page 21.

END OF REPORT