

TEST REPORT**Report Number: 103916593MPK-001C****Project Number: G103916593****Original Report Issue Date: April 07, 2020****Revision Report Issue Date: June 11, 2020****Testing performed on the
Mullion Fusion IP Reader****Part Number: ER10****CPN: ER10, ER10-PCB****FCC ID: 2AEI3WLTC-ER10-MM17****IC: 20063-WLTDHMMER17****to****FCC Part 15 Subpart C (15.209)****FCC Part 15 Subpart C (15.225)****Industry Canada RSS-210 Issue 9****FCC Part 15, Subpart B****Industry Canada ICES-003****For****WaveLynx Technologies**

Test Performed by:

Intertek

1365 Adams Court

Menlo Park, CA 94025 USA

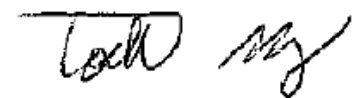
Test Authorized by:

WaveLynx Technologies

100 Technology Drive Suite B150

Broomfield, CO 80021 USA

Prepared by:



Todd Moy

Date: April 07, 2020

Reviewed by:



Krishna Vemuri

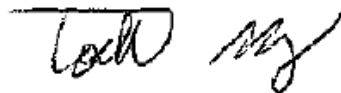
Date: April 07, 2020

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Report No. 103916593MPK-001C

Equipment Under Test:	Fusion Access Control Readers
Trade Name:	WaveLynx Technologies
Part Number:	ER10
CPN:	ER10, ER10-PCB
Serial Number:	1101201900000002
Applicant:	WaveLynx Technologies
Contact:	Daniel Field
Address:	100 Technology Drive Suite B150 Broomfield, CO 80021
Country	USA
Email	Danielfield@wavelynxtech.com
Applicable Regulation:	FCC Part 15 Subpart C (15.209) FCC Part 15 Subpart C (15.225) Industry Canada RSS-210 Issue 9 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 of Test:	November 19, 2019-March 23, 2020 & June 01, 2020

We attest to the accuracy of this report:



Todd Moy
Project Engineer



Krishna K Vemuri
EMC Manager

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1.0 Summary of Tests

TEST	REFERENCE FCC 15C	REFERENCE RSS-210	RESULTS
Radiated Emissions	15.209	RSS 210 (4.3)	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Occupied Bandwidth	15.215(c)	RSS-GEN	Complies
Radiated Emissions from Digital Parts	15.109	ICES-003	Complies
Conducted Emissions from Digital Parts	15.107	ICES-003	Complies
Antenna requirement	15.203	RSS-GEN	Complies ¹

¹ The EUT utilizes an internal Antenna.

TEST	REFERENCE FCC 15.225	REFERENCE RSS-210	RESULTS
Field Strength of Fundamental	15.225(a)	B.6	Complies
Radiated Emissions Outside the band	15.225(b), 15.225(c), 15.225(d), 15.209	B.6	Complies
Frequency Tolerance of the Carrier	15.225(e)	B.6	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Occupied Bandwidth	15.215	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies ¹

¹ The EUT utilizes an internal Antenna.

2.0 General Description

2.1 Product Description

WaveLynx Technologies supplied the following description of the EUT:

An IP based Mullion form factor secure access RFID reader and controller designed to read an end user's access badge and provide full door control.

The ER10, ER10-PCB are electrically identical, the only difference between the two devices is that the enclosures are different color and are made up of different materials.

Overview of the EUT

Applicant name & address	WaveLynx Technologies 100 Technology Drive Suite B150 Broomfield, CO 80021
Contact info / Email	Daniel Field / danielfield@wavelynxtech.com
Part Number	ER10
CPN	ER10, ER10-PCB
FCC Identifier	2AEI3WLTC-ER10-MM17
IC Identifier	20063-WLTDHMMER17
Operating Frequency	125 kHz, 13.56 MHz
Number of Channels	1 each frequency (RFID)
Type of Modulation	ASK Modulation (RFID)
Antenna Type	Wirewound coil (125kHz) PCB Trace Antenna (13.56 MHz)

EUT receive date: November 19, 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: November 19, 2019
Test completion date: March 26, 2020 & June 01, 2020

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4: 2014. Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013, ANSI C63.4-2014 & RSS-GEN Issue 5.

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).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	30 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

3.1 EUT Photo



ER10



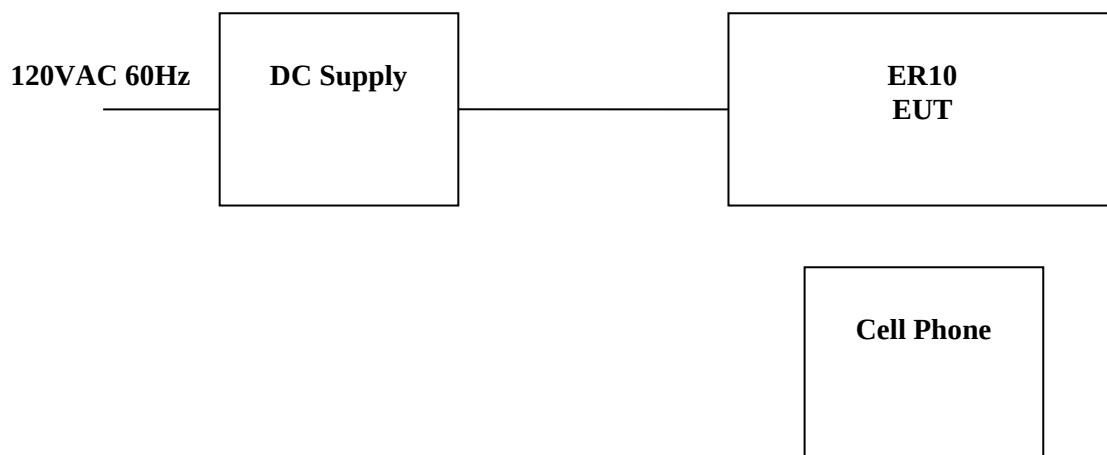
ER10-PCB

3.2 Block Diagram of Test Setup

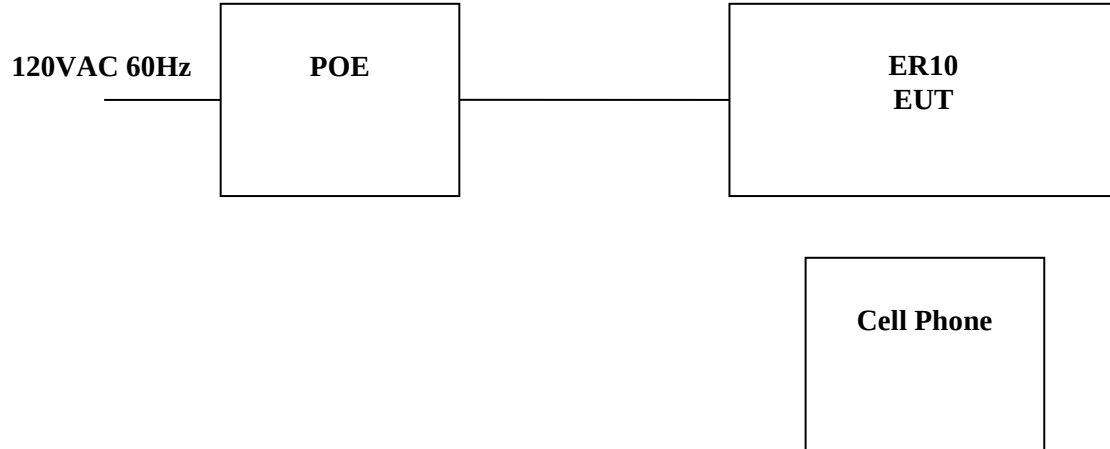
The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

Support Equipment		
Description	Manufacturer	Model No.
DC Power Supply	Extech	EP-3003
Cell Phone	Android	Galaxy S8
POE	Gigabit	POE-I100G

DC Supply Configuration



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

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit.

Evaluation for spurious emissions of pre-certified radio module installed inside Host equipment was performed. Radio module FCC ID: WAP2001. See Appendix A for test data and setup photos.

3.4 Software Exercise Program

None

3.5 Mode of Operation during test

The Fusion Access Control Readers was set up to continuously transmitting at 125kHz and 13.56MHz. In addition, during tests the EUT was paired and exercised with cell phone for BLE connection.

3.6 Modifications required for Compliance

No modifications were made by the manufacturer to bring the EUT 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 Field Strength of Fundamental and Radiated Emissions Outside the band

4.1.1 Requirements

FCC Rules 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 (84 dBuV) 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 band shall not exceed the general radiated emission limits in §15.209.

§15.209 Radiated emission limits; general requirements.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance back to 30 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring 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 ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.

Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz

9 kHz or greater for 150kHz to 30 MHz

120 kHz or greater for 30MHz to 1000 MHz

For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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 is as follows:

$$FS = RA + AF + CF - AG - DCF$$

Where FS = Field Strength in dB (μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB (μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB (1/m)

AG = Amplifier Gain in dB

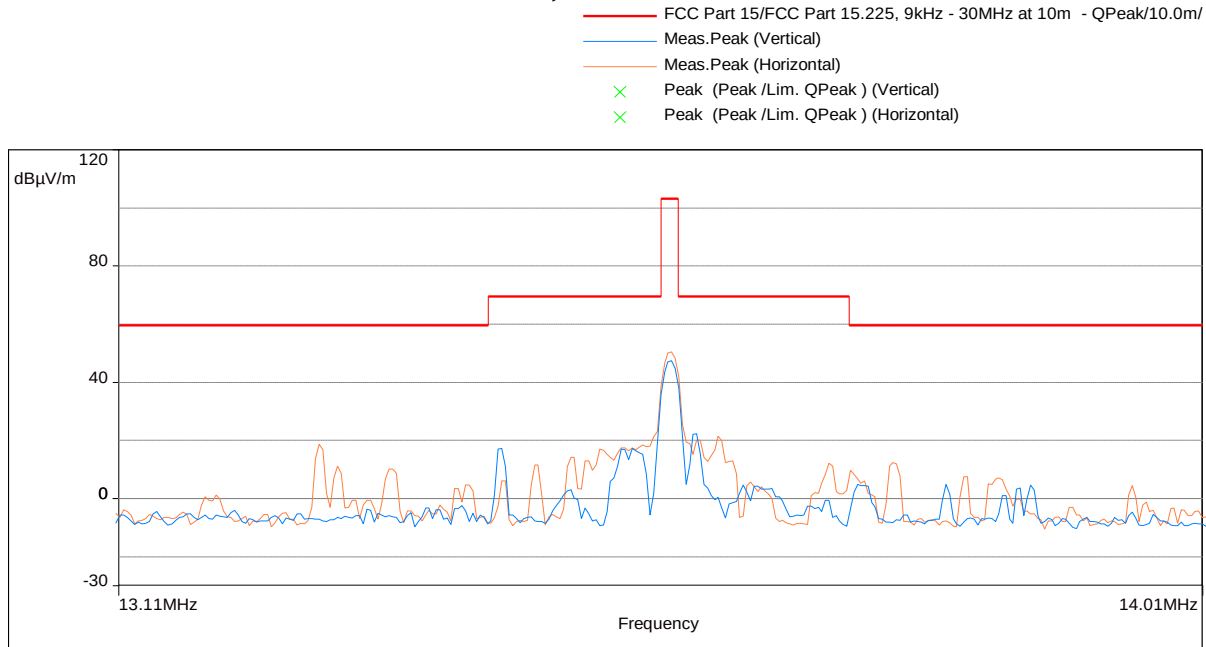
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz

4.1.3 Test Result 15.225 (a)(b)(c)

The data below shows the significant emission frequencies, the limit and the margin of compliance.
Note: Measurements were performed at parallel and perpendicular orientation of loop antenna, and vertical and horizontal orientations of EUT. The worst case data was presented below.

Fundamental, Black Case with POE



Model: ; Client: ; Comments: ; Test Date: 02/13/2020 14:01

Frequency	Peak FS@10m	Limit@10m	Margin	Polarity	RA@3m	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB		dB(uV)	dB
13.56	50.2	103.1	-53.0	parallel	68.0	-17.9
13.56	47.4	103.1	-55.7	perpendicular	65.3	-17.9

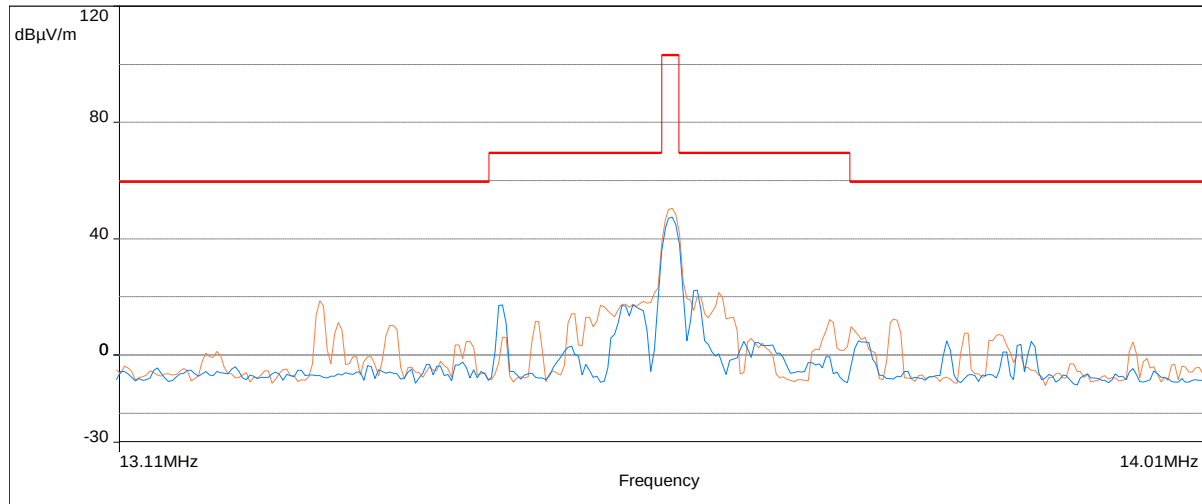
Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Fundamental, Black Case with DC

— FCC Part 15/FCC Part 15.225, 9kHz - 30MHz at 10m - QPeak/10.0m/
— Meas.Peak (Vertical)
— Meas.Peak (Horizontal)
× Peak (Peak /Lim. QPeak) (Vertical)
× Peak (Peak /Lim. QPeak) (Horizontal)



Model: ; Client: ; Comments: ; Test Date: 02/13/2020 14:01

Frequency	Peak FS@10m	Limit@10m	Margin	Polarity	RA@3m	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB		dB(uV)	dB
13.56	50.0	103.1	-53.5	parallel	67.9	-17.9
13.56	50.0	103.1	-53.5	perpendicular	67.9	-17.9

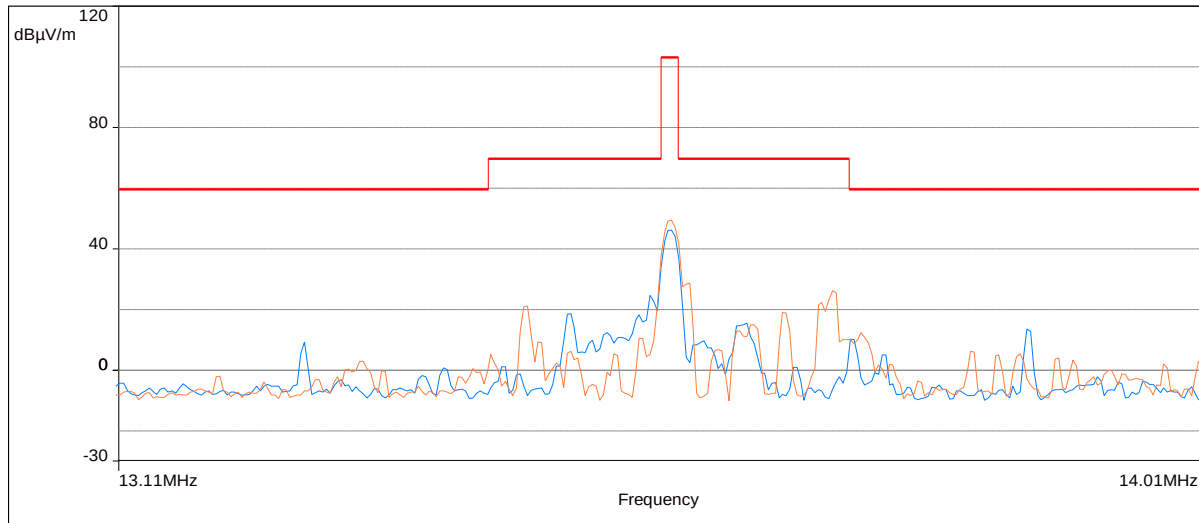
Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Fundamental, White Case with POE

— FCC Part 15/FCC Part 15.225, 9kHz - 30MHz at 10m - QPeak/10.0m/
— Meas.Peak (Horizontal)
— Meas.Peak (Vertical)
× Peak (Peak /Lim. QPeak) (Horizontal)
× Peak (Peak /Lim. QPeak) (Vertical)



Model: ; Client: ; Comments: ; Test Date: 02/13/2020 13:38

Frequency	Peak FS@10m	Limit@10m	Margin	Polarity	RA@3m	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB		dB(uV)	dB
13.56	49.1	103.1	-54.0	parallel	67.0	-17.9
13.56	46.2	103.1	-56.9	perpendicular	64.1	-17.9

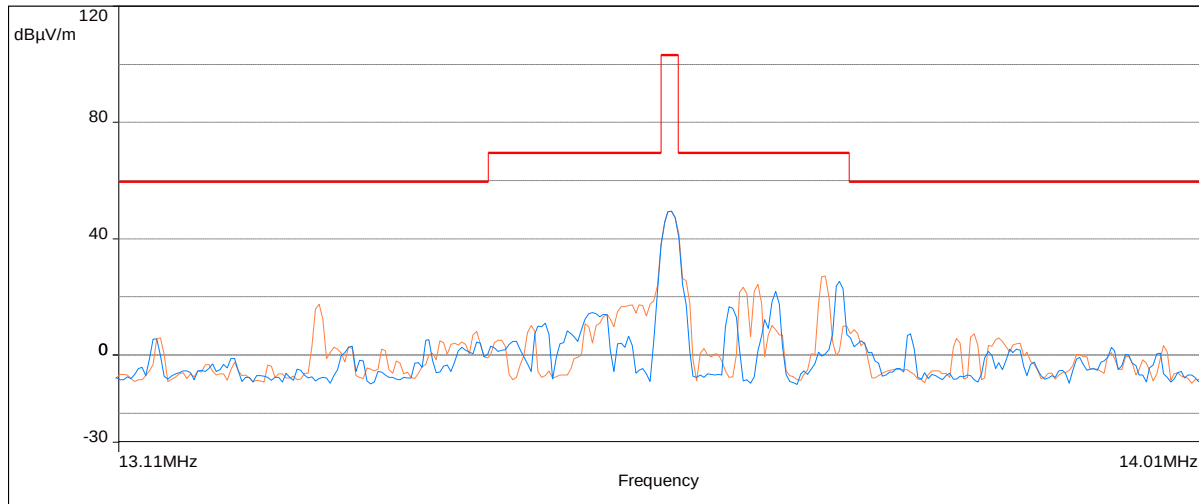
Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Fundamental, White Case with DC

— FCC Part 15/FCC Part 15.225, 9kHz - 30MHz at 10m - QPeak/10.0m/
— Meas.Peak (Vertical)
— Meas.Peak (Horizontal)
× Peak (Peak /Lim. QPeak) (Vertical)
× Peak (Peak /Lim. QPeak) (Horizontal)



Model: ; Client: ; Comments: ; Test Date: 02/13/2020 14:32

Frequency	Peak FS@10m	Limit@10m	Margin	Polarity	RA@3m	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB		dB(uV)	dB
13.56	49.6	103.1	-53.5	parallel	67.5	-17.9
13.56	49.6	103.1	-53.5	perpendicular	67.5	-17.9

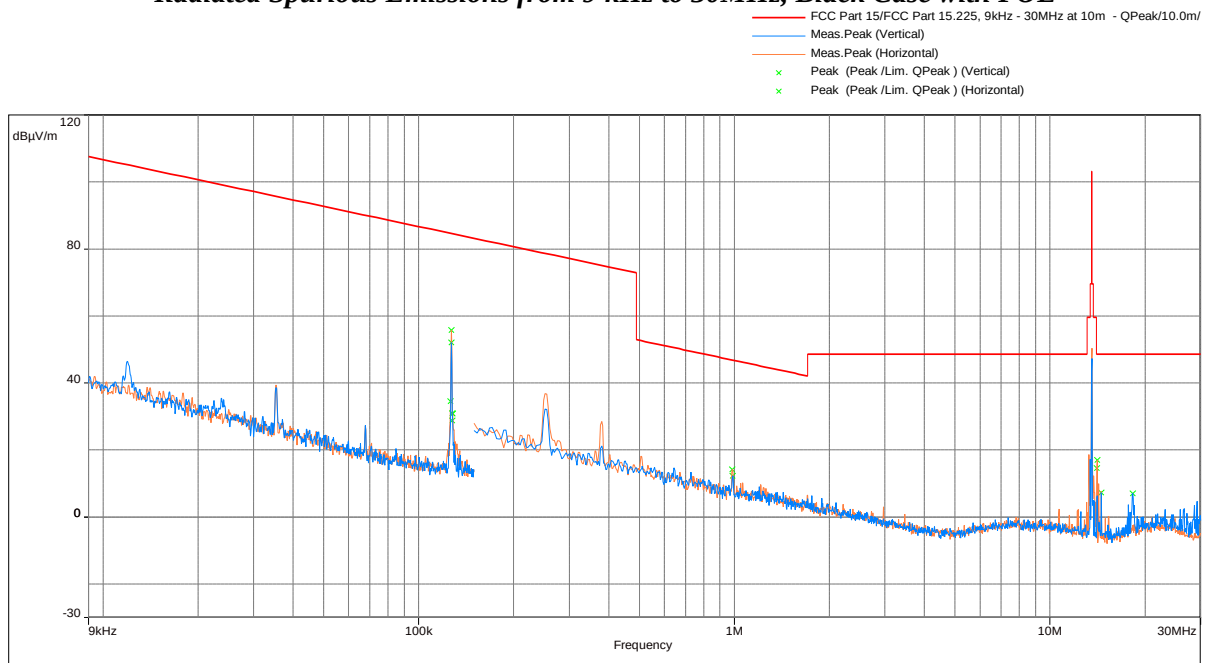
Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

4.1.4 Test Result 15.225 (d) and 15.209

Radiated Spurious Emissions from 9 kHz to 30MHz, Black Case with POE



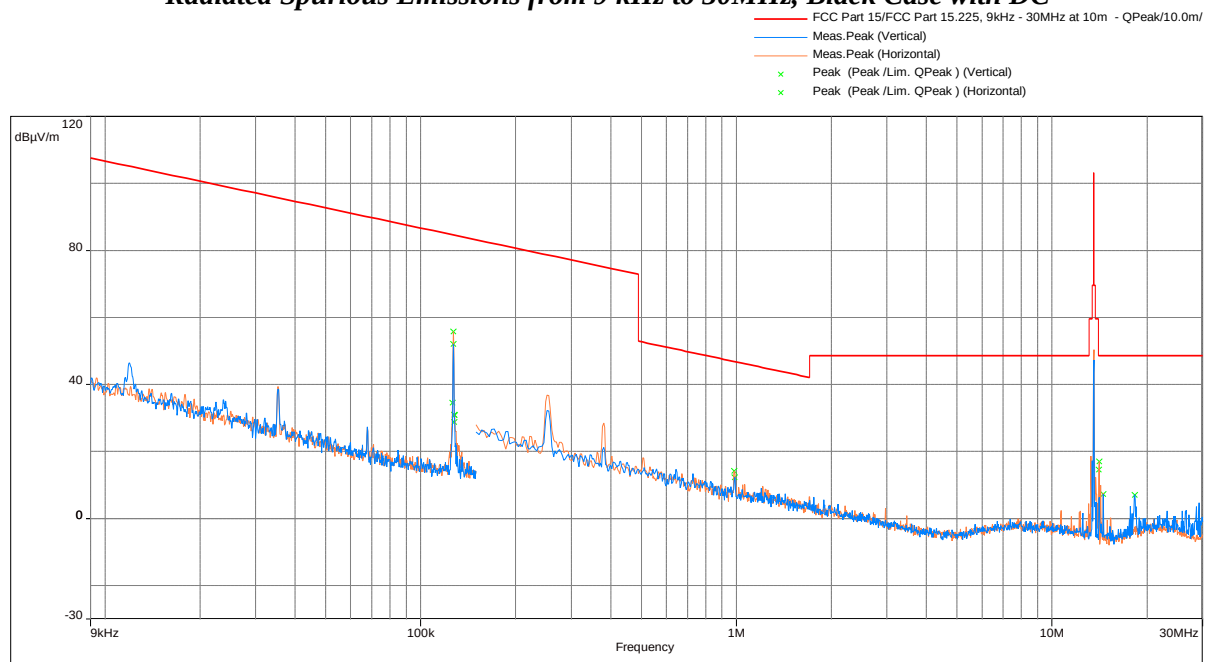
Frequency	Peak FS@10m	Limit@10m	Margin	Polarity	RA@3m	Correction
(MHz)	dB(uV/m)	dB(uV/m)	dB		dB(uV)	dB
0.127	52.1	84.6	-32.5	Parallel	41.1	11.0
0.127	55.7	84.6	-28.9	perpendicular	44.7	11.0

Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Radiated Spurious Emissions from 9 kHz to 30MHz, Black Case with DC



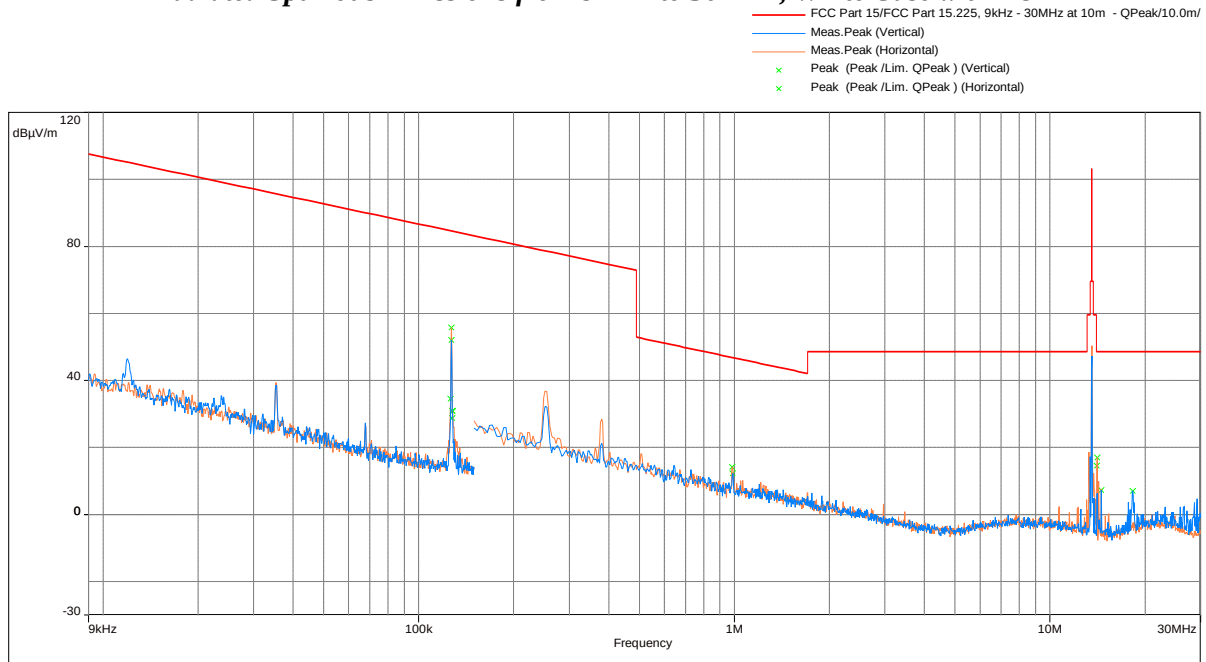
Frequency (MHz)	Peak FS@10m dB(uV/m)	Limit@10m dB(uV/m)	Margin dB	Polarity	RA@3m dB(uV)	Correction dB
0.127	55.7	84.6	-28.9		44.7	11.0
0.127	52.1	84.6	-32.5	perpendicular	41.1	11.0

Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Radiated Spurious Emissions from 9 kHz to 30MHz, White Case with POE



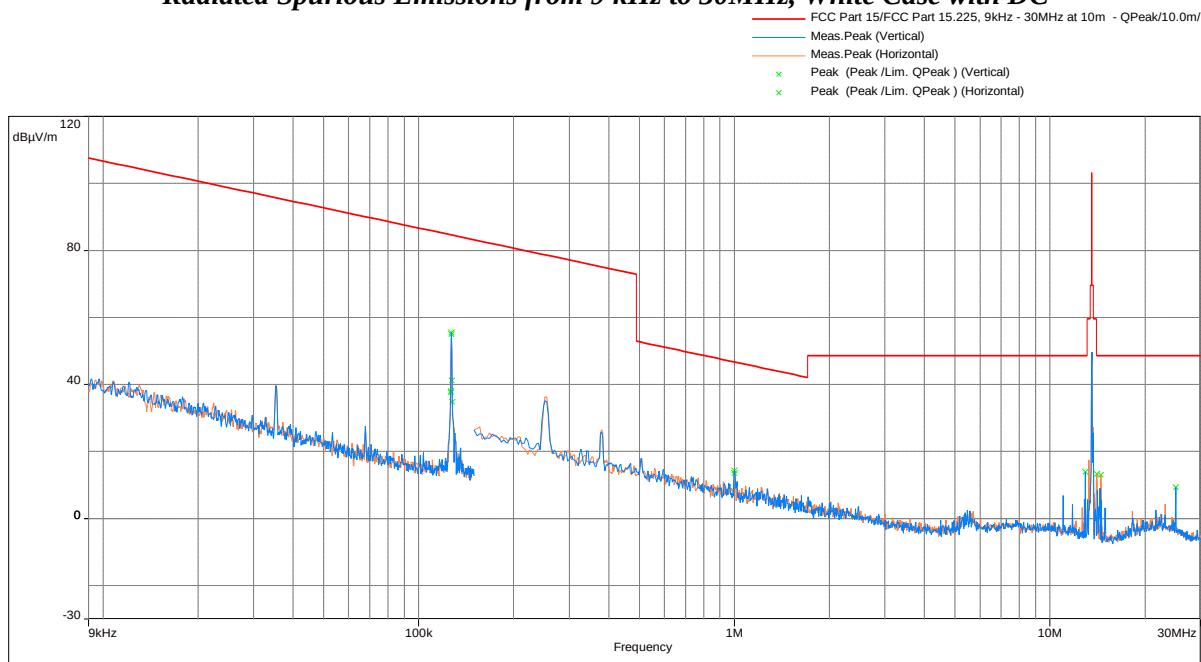
Frequency (MHz)	Peak FS@10m dB(uV/m)	Limit@10m dB(uV/m)	Margin dB	Polarity	RA@3m dB(uV)	Correction dB
0.127	52.1	84.6	-32.5	Parallel	41.1	11.0
0.127	55.7	84.6	-28.9	perpendicular	44.7	11.0

Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Radiated Spurious Emissions from 9 kHz to 30MHz, White Case with DC



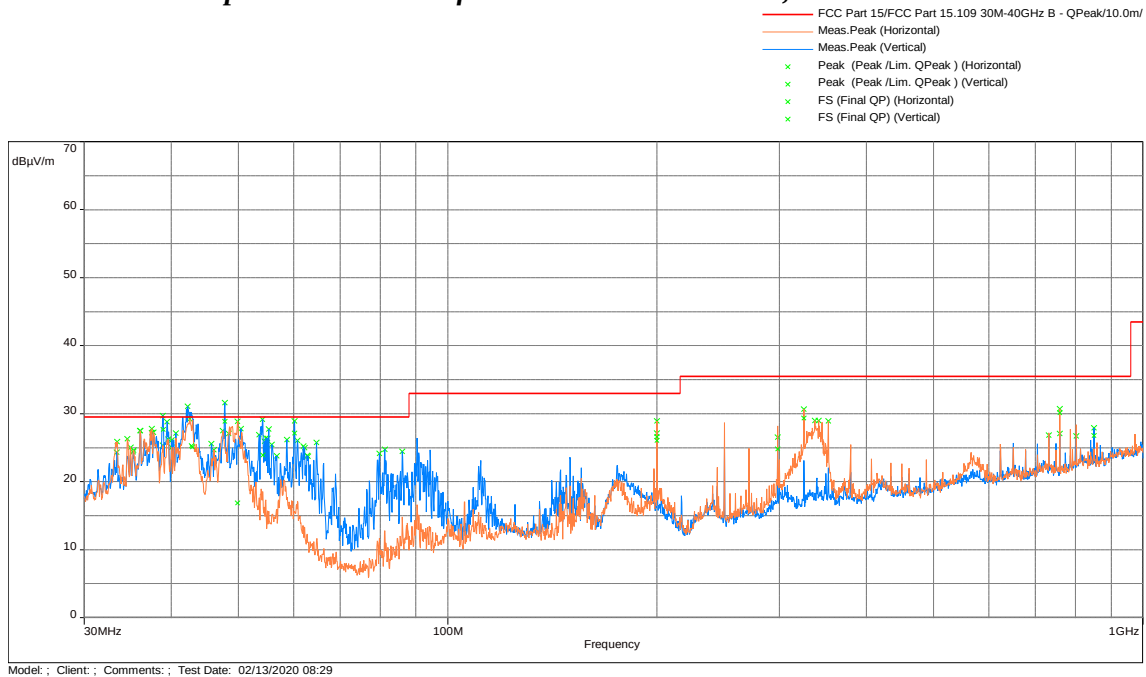
Frequency (MHz)	Peak FS@10m dB(uV/m)	Limit@10m dB(uV/m)	Margin dB	Polarity	RA@3m dB(uV)	Correction dB
0.127	55.5	84.6	-29.1	Parallel	44.5	11.0
0.127	55.0	84.6	-29.6	perpendicular	44.0	11.0

Note 1: All measurements were taken at 3m and extrapolated to 10m.

Note 2: Correction = AF+CF-AG- distance correction factor

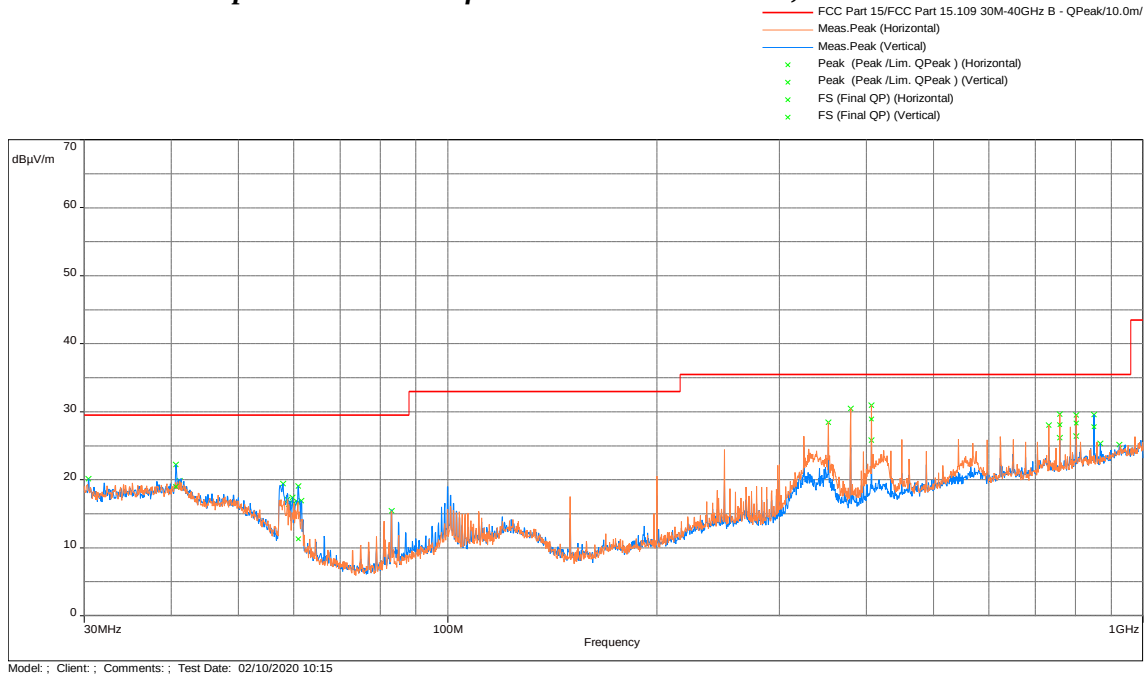
Distance correction factor= $40 \cdot \log_{10}(\text{limit distance}/\text{measured distance})$

Radiated Spurious Emissions from 30 MHz to 1000 MHz, Black Case with POE



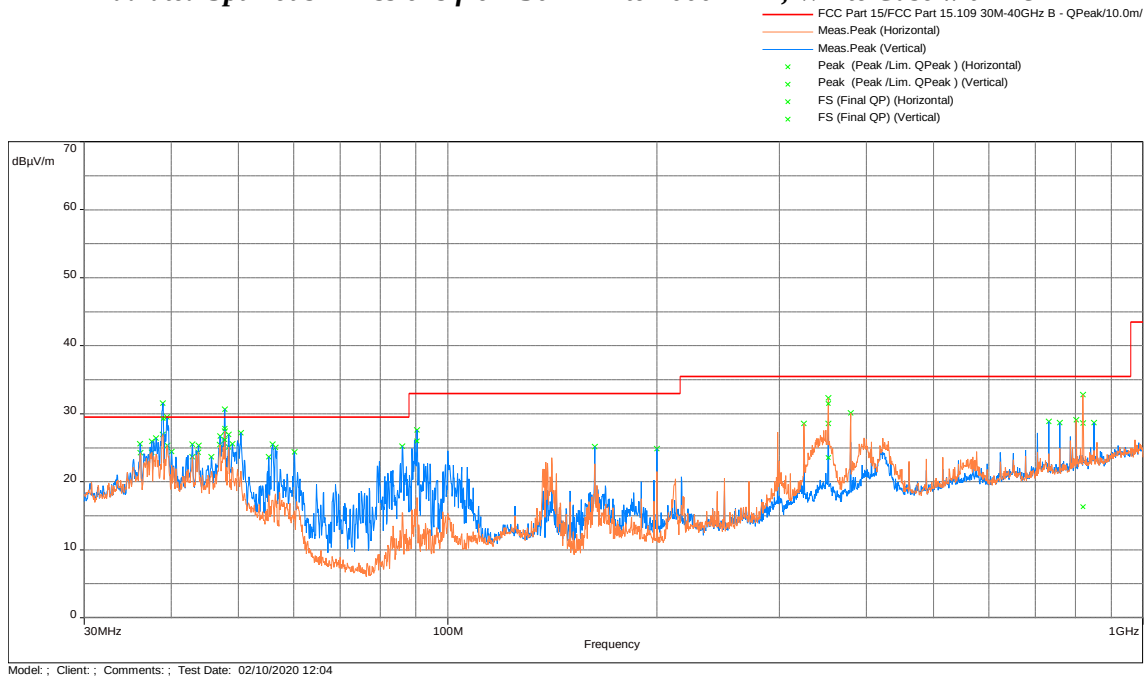
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
38.958	27.7	29.5	-1.8	301.5	4	Vertical	34.8	-7.1
42.810	25.3	29.5	-4.2	178.25	2.01	Vertical	32.3	-7.2
42.947	25.1	29.5	-4.4	247.25	1.97	Horizontal	32.2	-7.3
47.803	28.9	29.5	-0.6	310	4	Vertical	37.0	-8.2
49.829	16.9	29.5	-12.6	338	3.64	Horizontal	26.0	-9.1
54.173	23.9	29.5	-5.6	256.75	1	Vertical	36.3	-12.4
60.203	27.2	29.5	-2.4	338.25	2.97	Vertical	42.8	-15.7
199.985	26.6	33	-6.4	53.75	3.64	Horizontal	41.0	-14.4
199.984	26.0	33	-7.0	0	1	Vertical	40.5	-14.4
298.318	24.8	35.5	-10.7	3	1.08	Vertical	35.1	-10.3
325.438	29.4	35.5	-6.2	153.25	1.9	Horizontal	39.0	-9.6
759.372	30.1	35.5	-5.4	350	1.05	Horizontal	33.1	-3.0
849.919	26.8	35.5	-8.7	34	1.85	Vertical	28.4	-1.6

Radiated Spurious Emissions from 30 MHz to 1000 MHz, Black Case with DC



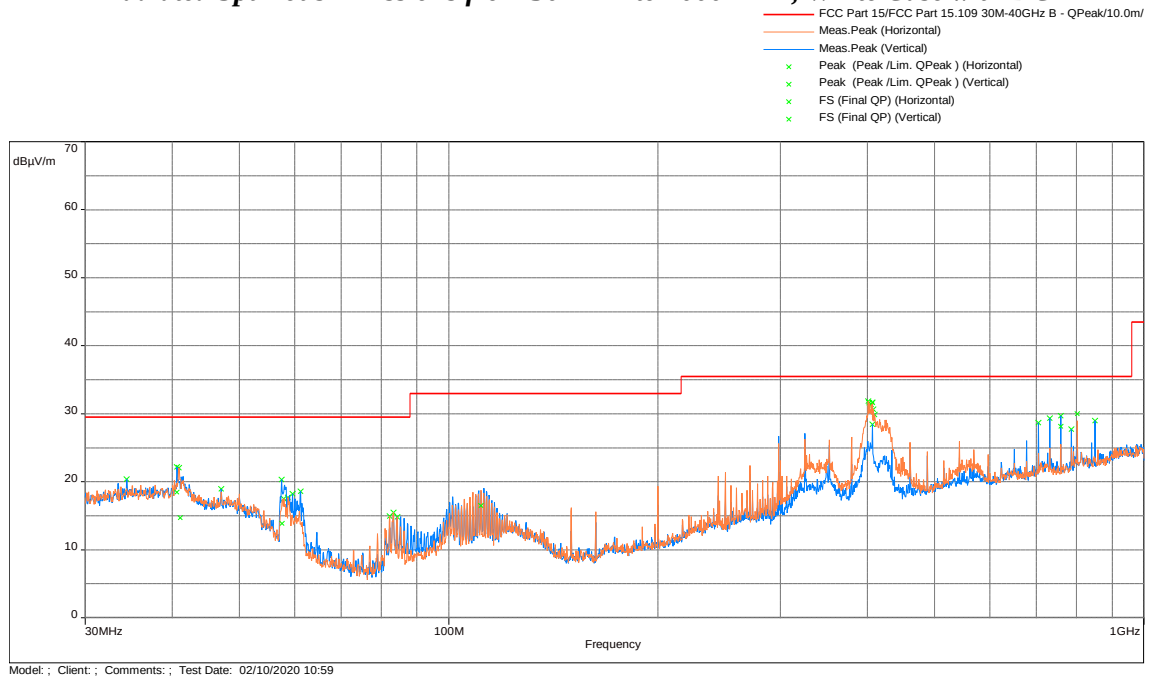
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
40.669	19.0	29.5	-10.5	107.25	1.2	Vertical	26.0	-7.0
60.972	11.3	29.5	-18.2	193	2.64	Vertical	27.3	-16.0
406.796	28.9	35.5	-6.6	65	1.73	Horizontal	36.3	-7.4
759.369	28.1	35.5	-7.4	359	1.08	Horizontal	31.1	-3.0
801.792	28.3	35.5	-7.2	199	1.3	Horizontal	30.2	-1.9
849.952	27.8	35.5	-7.8	45.5	1.88	Vertical	29.4	-1.6

Radiated Spurious Emissions from 30 MHz to 1000 MHz, White Case with POE



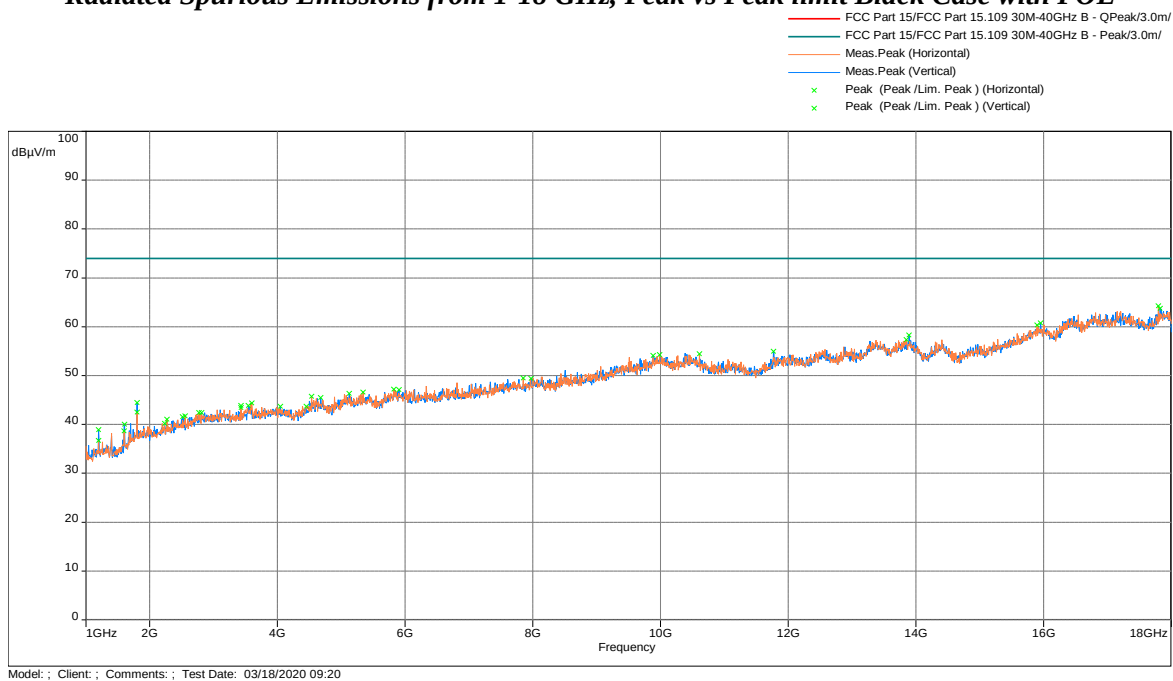
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBUV)	Correction (dB)
38.961	29.3	29.5	-0.2	181.25	3.96	Vertical	36.4	-7.1
47.803	27.9	29.5	-1.6	187	2.99	Vertical	36.0	-8.2
47.806	26.1	29.5	-3.4	72.25	2.22	Horizontal	34.3	-8.2
90.371	26.0	33	-7.0	344	1.46	Vertical	42.2	-16.2
352.565	23.6	35.5	-11.9	161	4	Vertical	32.7	-9.1
352.546	31.5	35.5	-4.0	139.25	2.39	Horizontal	40.6	-9.2

Radiated Spurious Emissions from 30 MHz to 1000 MHz, White Case with DC

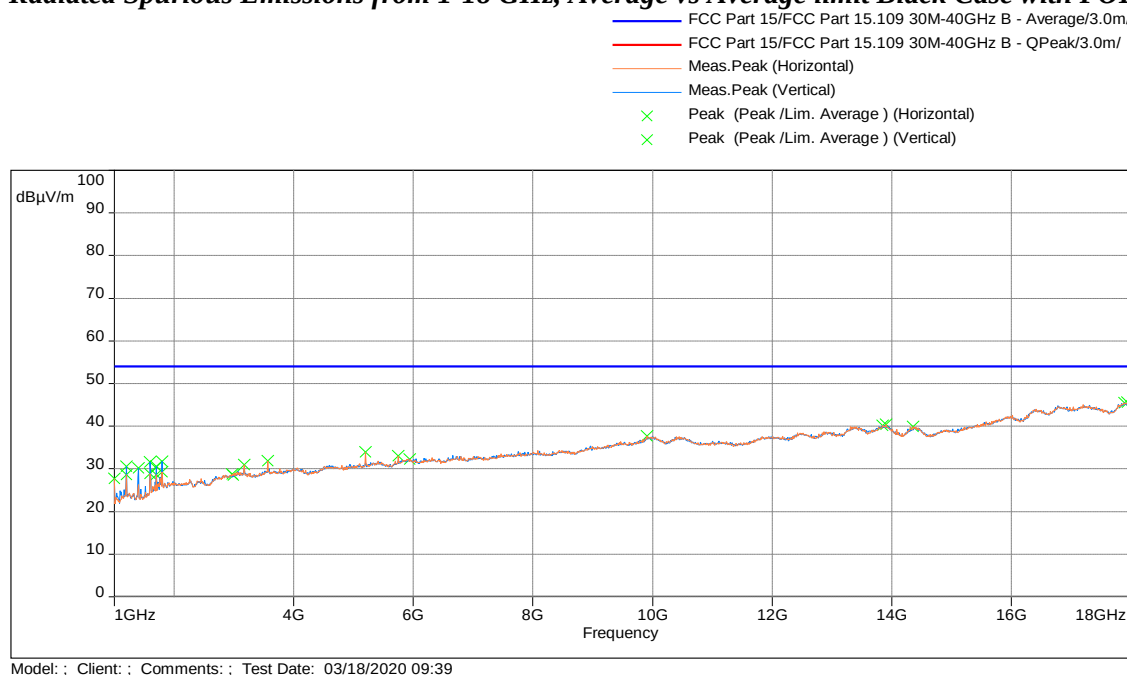


Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
40.660	18.5	29.5	-11.0	116.5	1.52	Vertical	25.5	-7.0
41.104	14.7	29.5	-14.8	204.75	1.56	Horizontal	21.7	-7.0
57.596	13.9	29.5	-15.6	193	2.9	Vertical	28.4	-14.6
111.255	16.5	33	-16.5	12	4	Horizontal	30.7	-14.2
406.804	31.7	35.5	-3.8	306.25	1.97	Horizontal	39.1	-7.4
759.354	28.1	35.5	-7.4	30.5	2.14	Vertical	31.1	-3.0
801.818	30.0	35.5	-5.5	291.75	1.41	Horizontal	31.9	-1.9

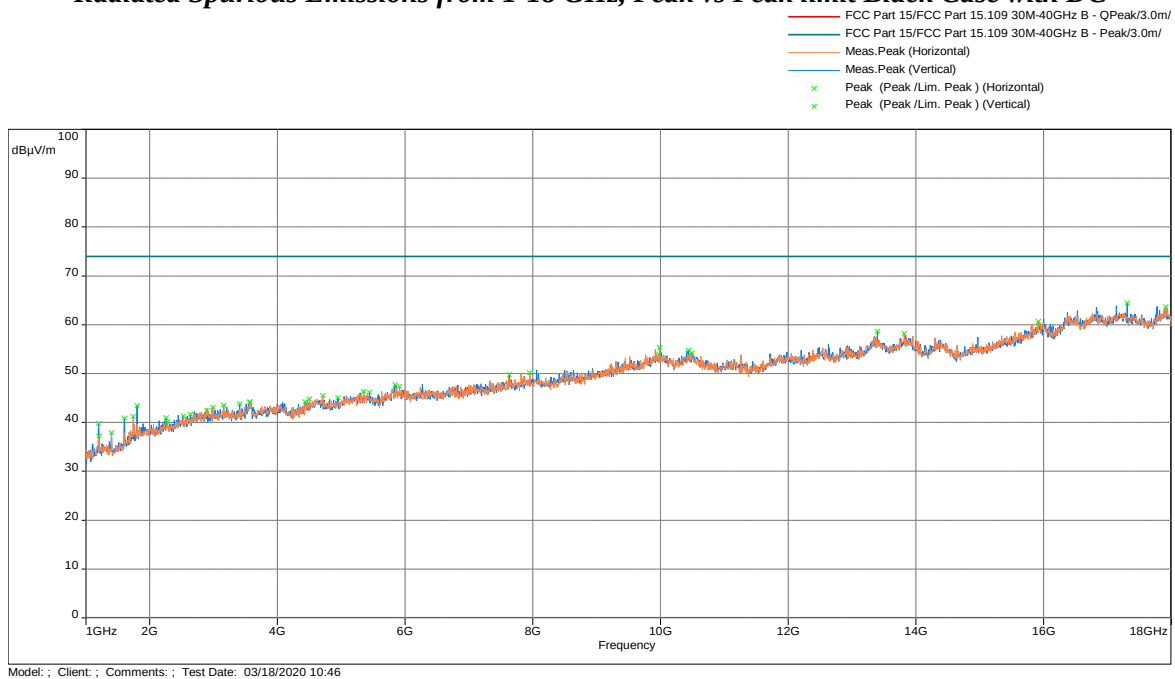
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit Black Case with POE



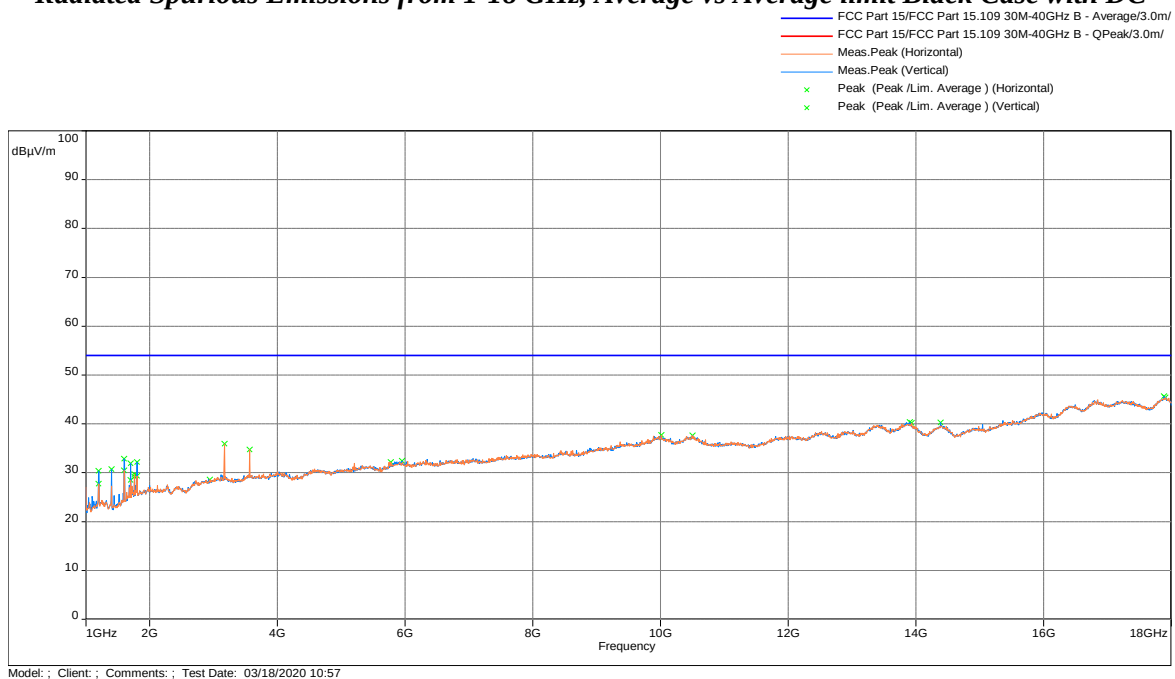
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit Black Case with POE



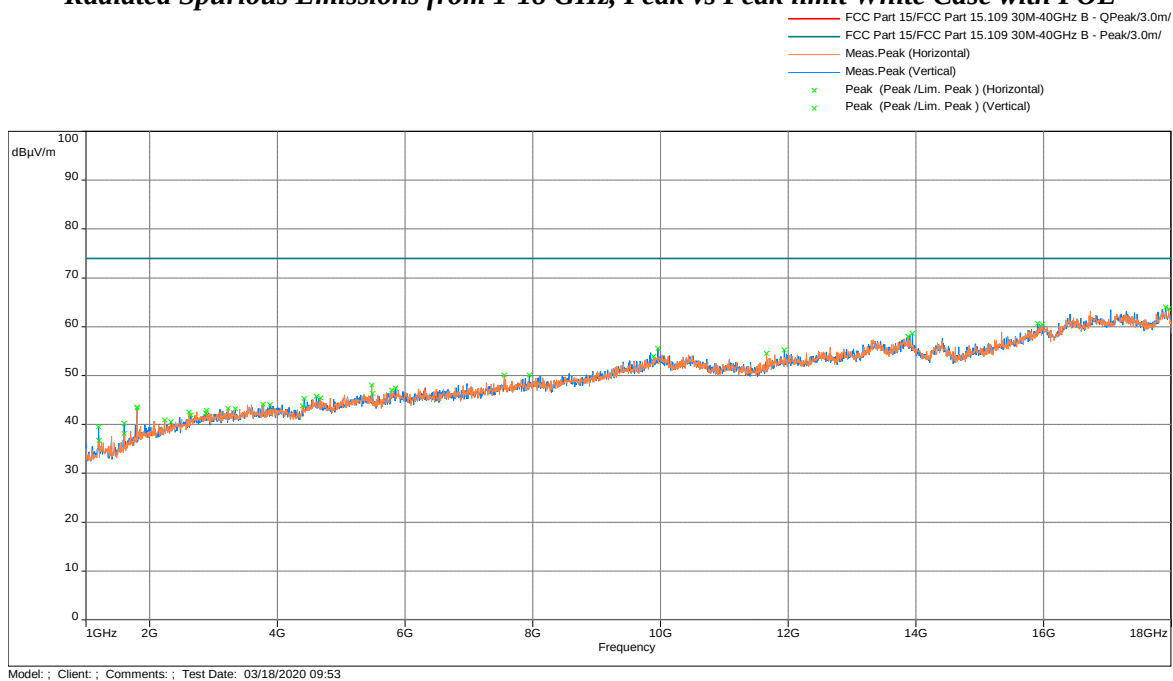
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit Black Case with DC



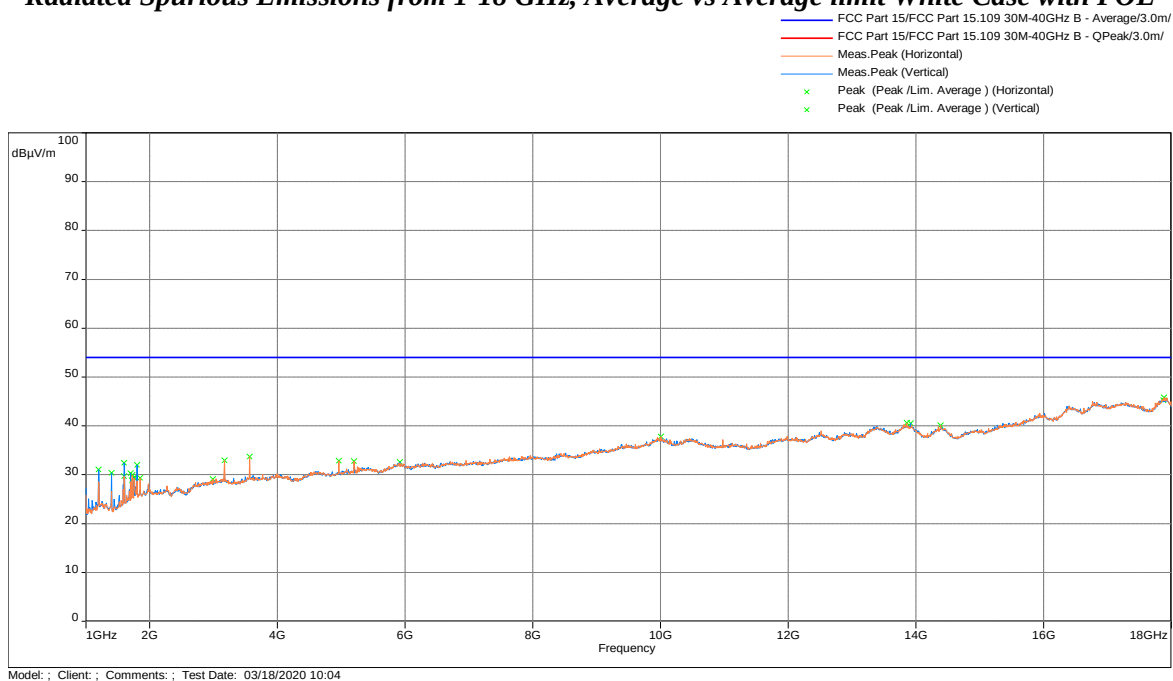
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit Black Case with DC



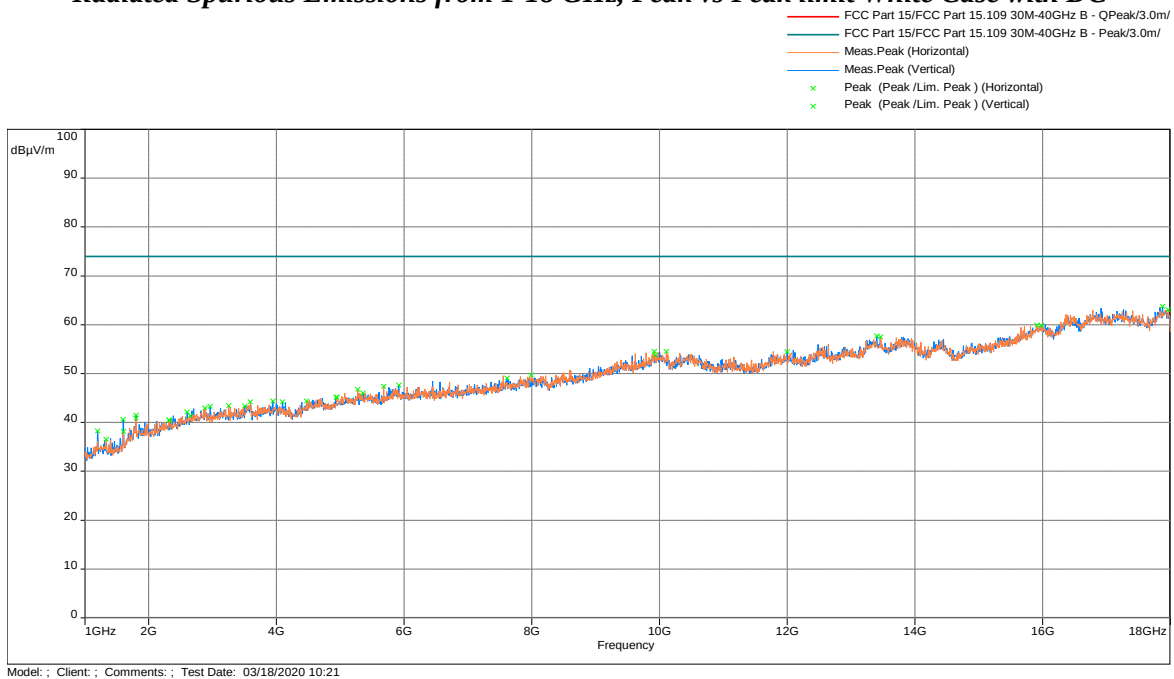
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit White Case with POE



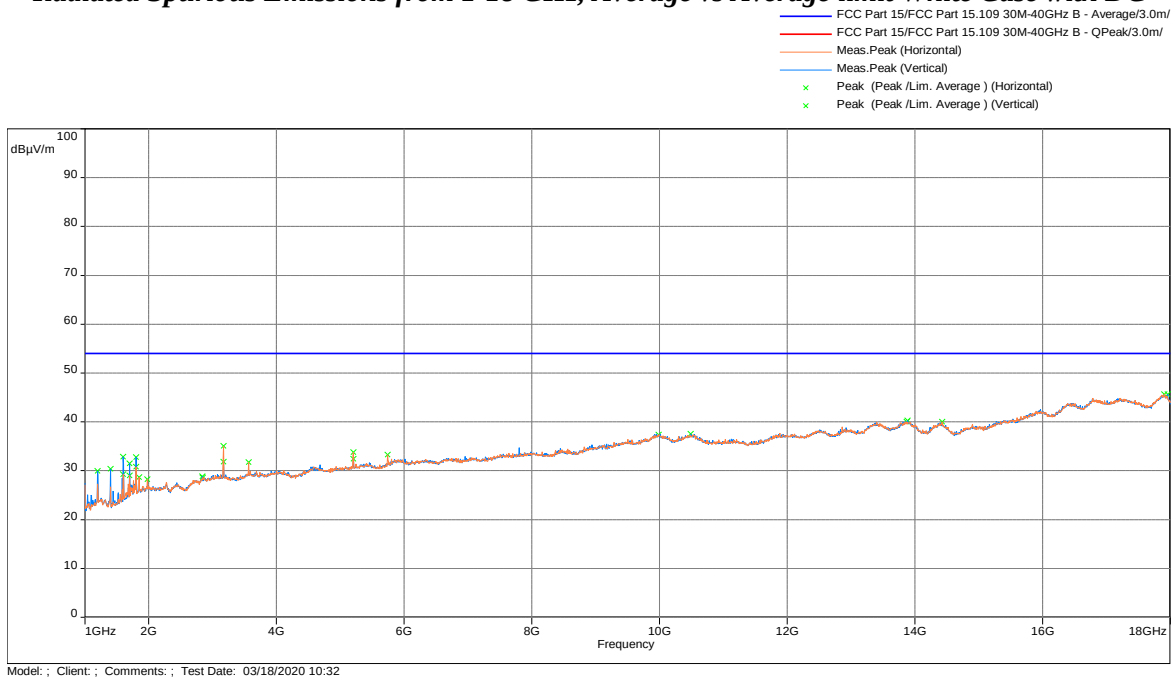
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with POE



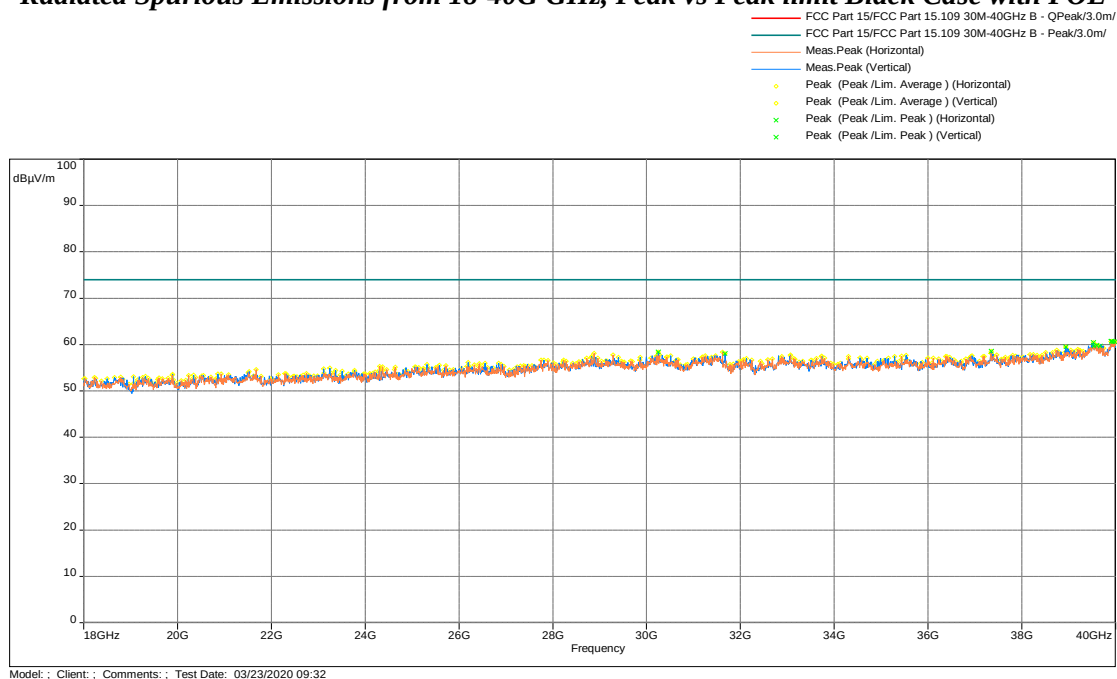
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit White Case with DC



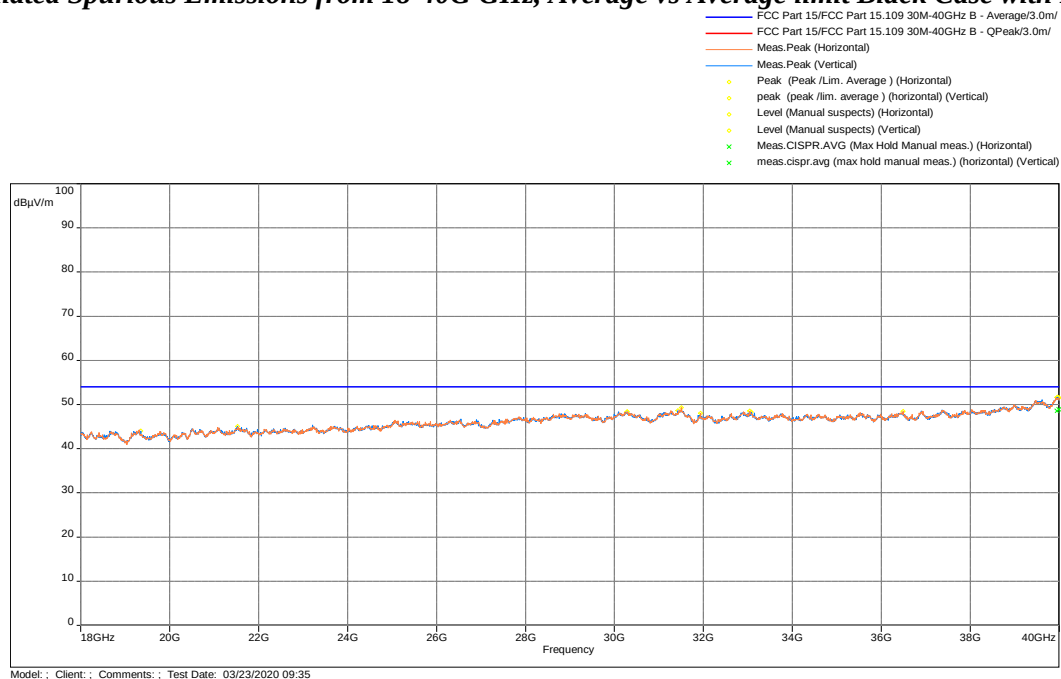
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with DC



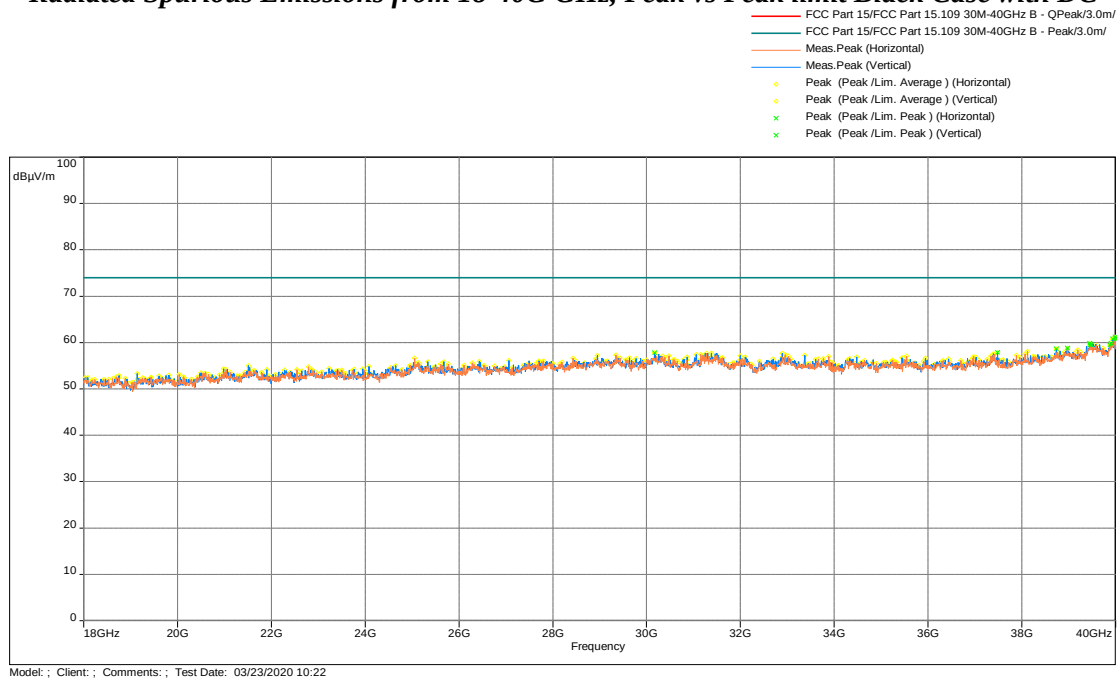
Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit Black Case with POE



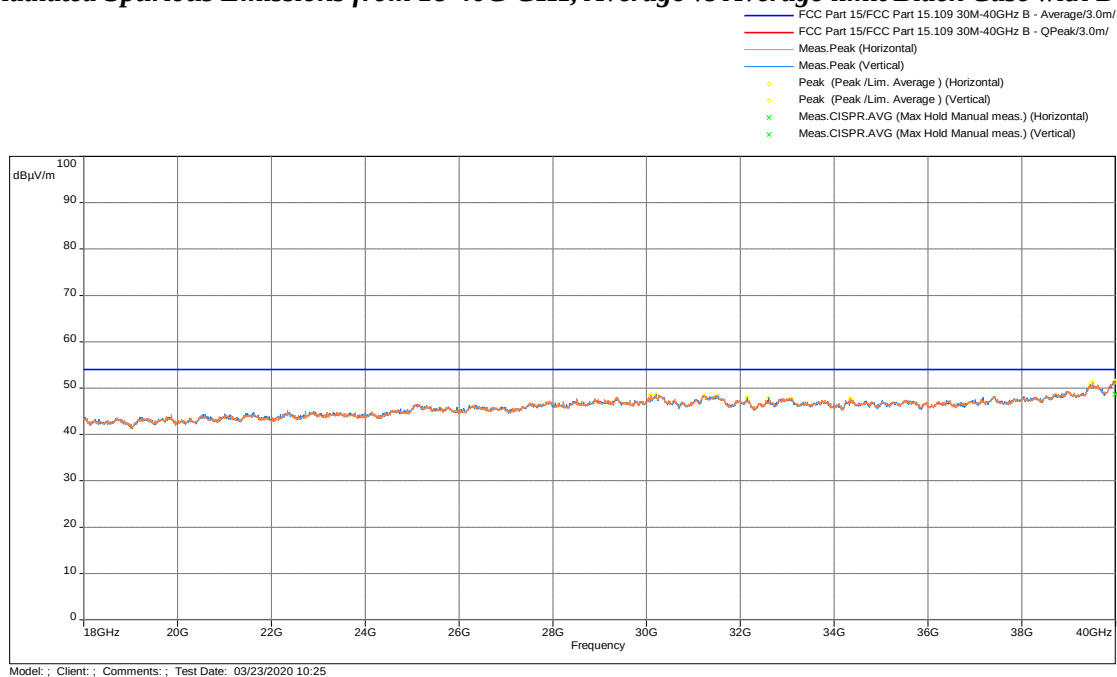
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit Black Case with POE



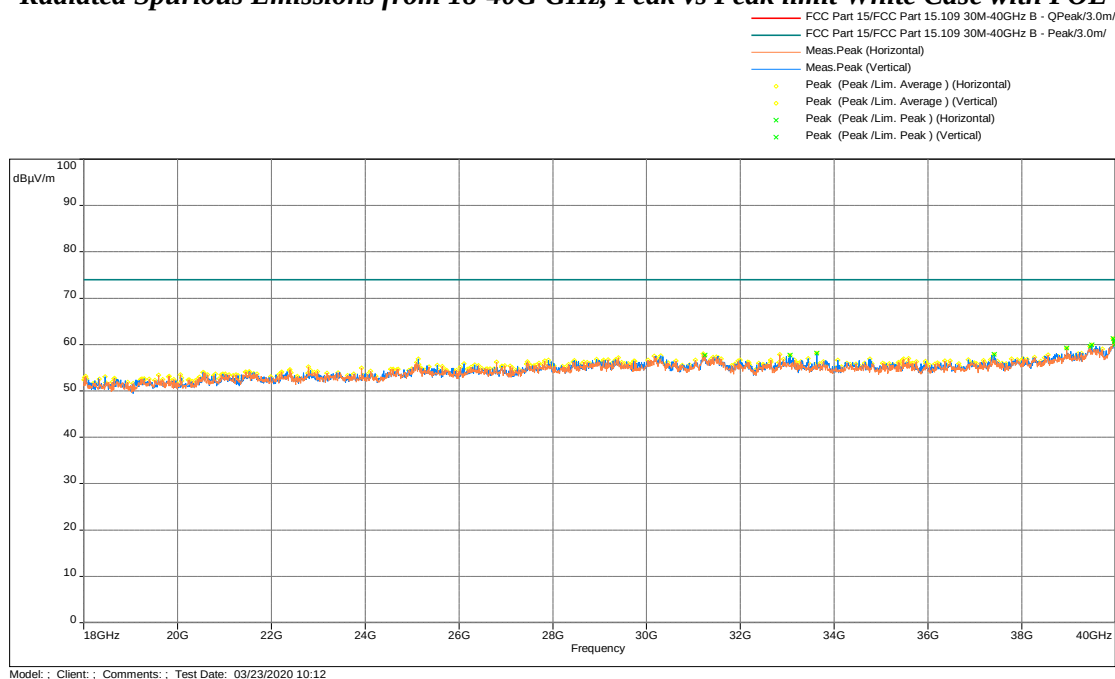
Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit Black Case with DC



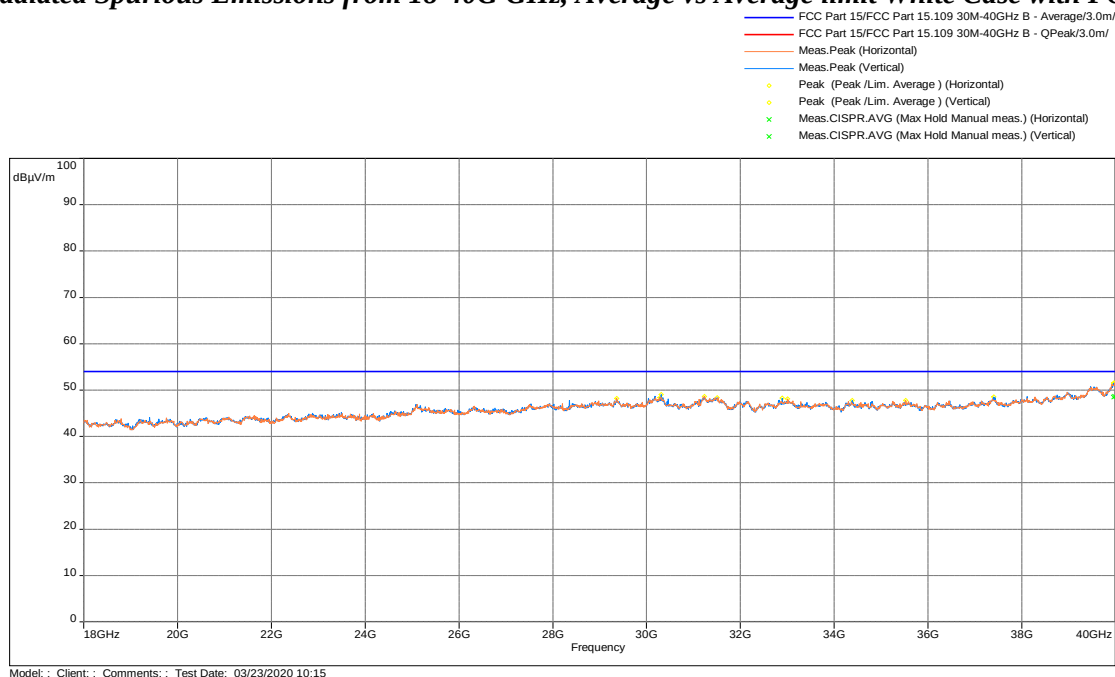
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit Black Case with DC



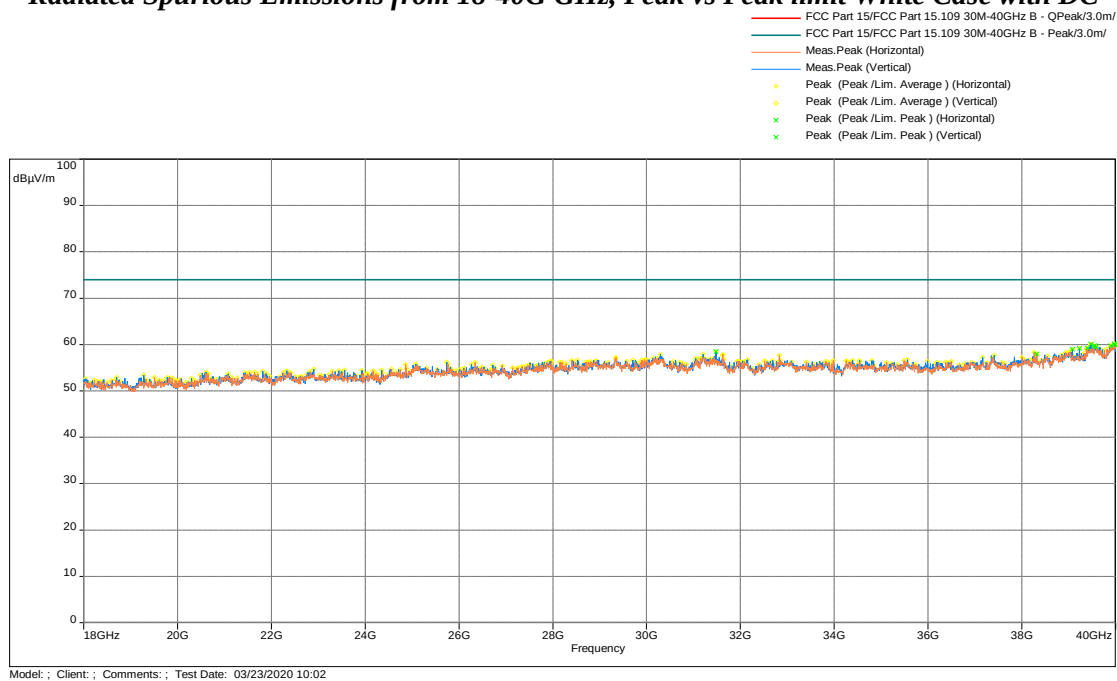
Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit White Case with POE



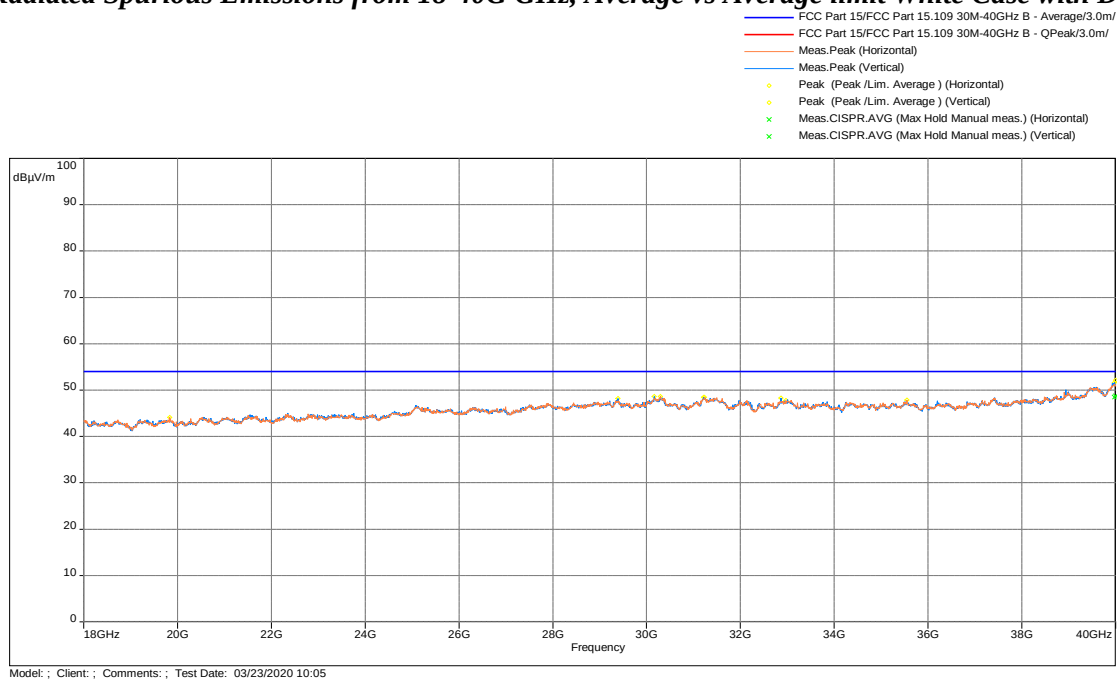
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit White Case with POE



Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit White Case with DC



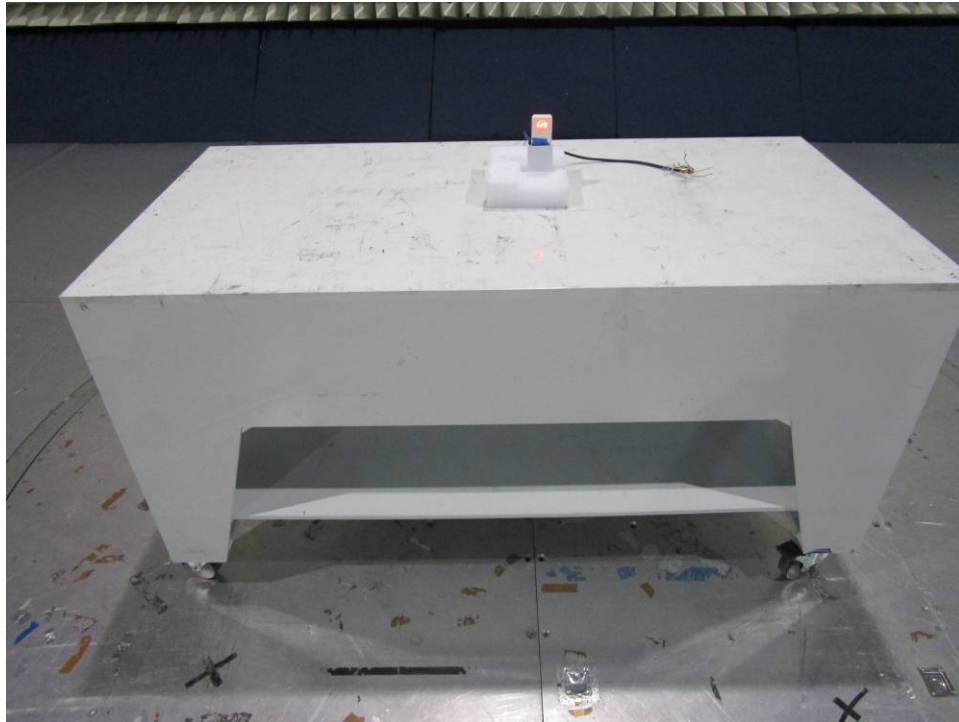
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit White Case with DC



Result	Complies by 0.2 dB
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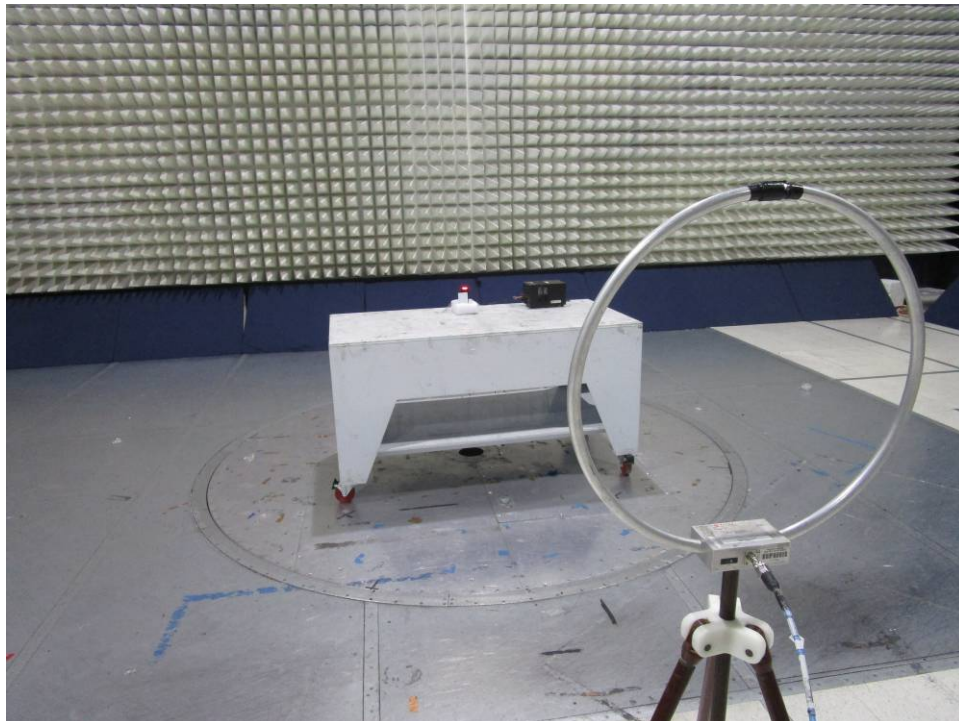
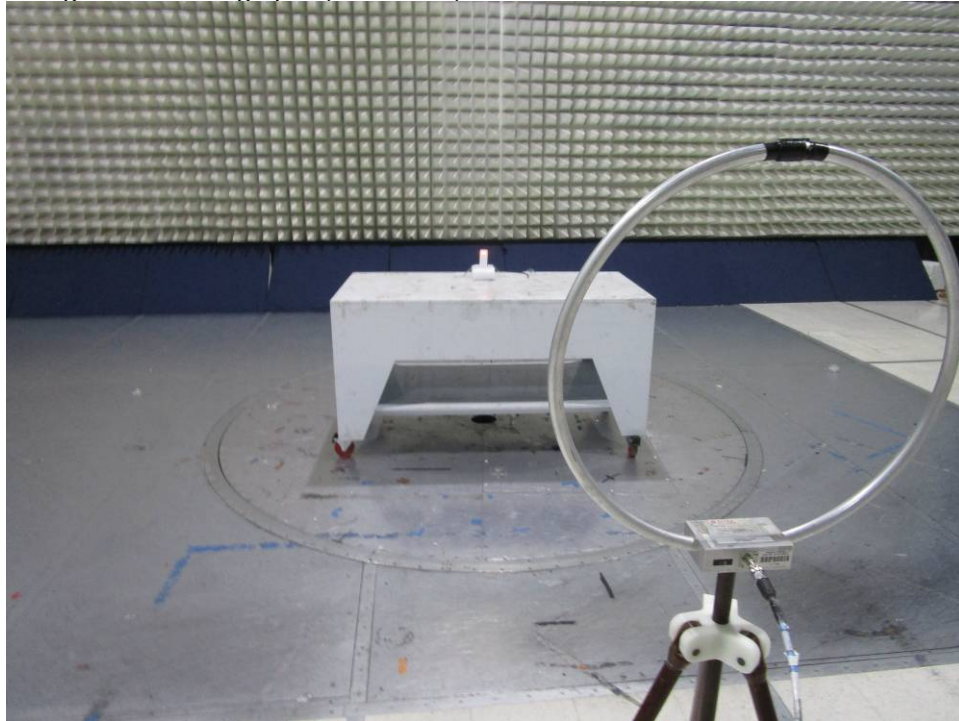
4.1.5 Test Configuration Photographs

The following photographs show the testing configurations used.

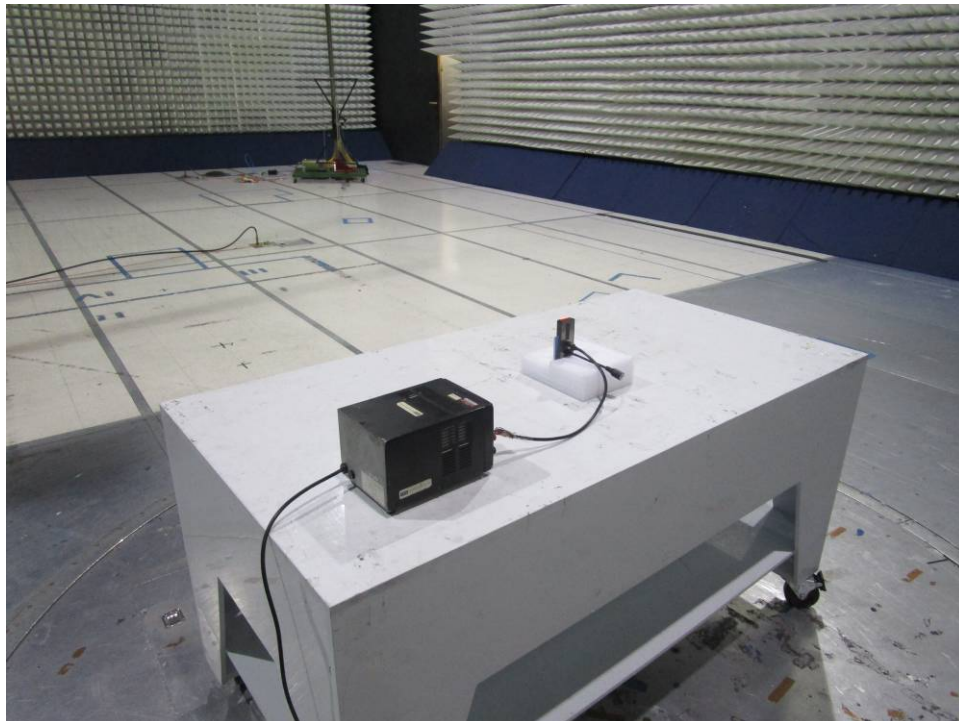


Electromagnetic Radiated Disturbance Setup Photograph

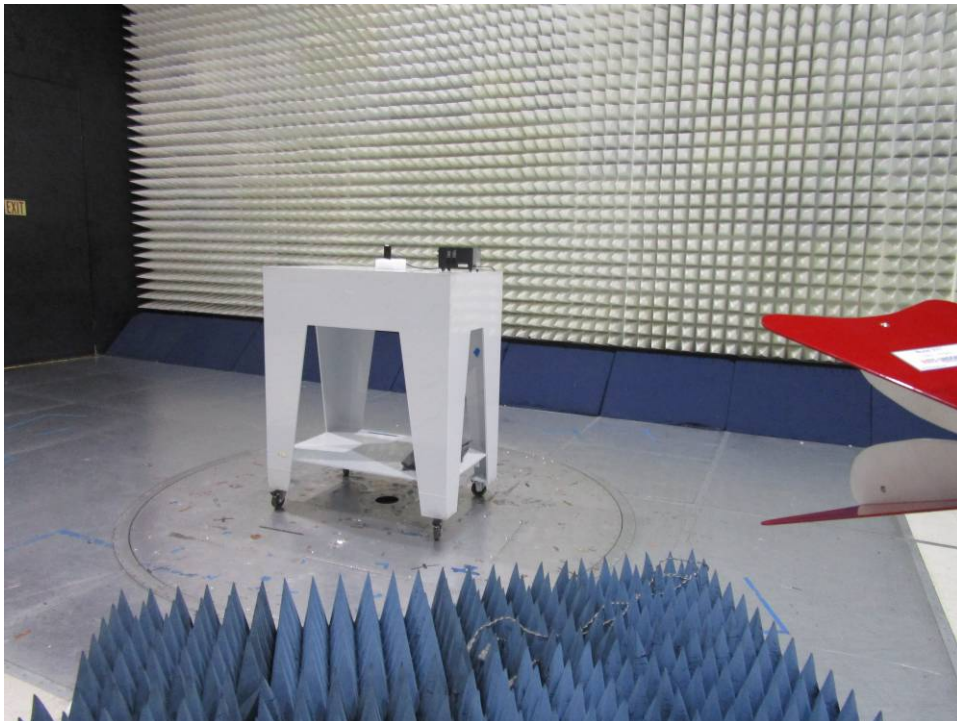
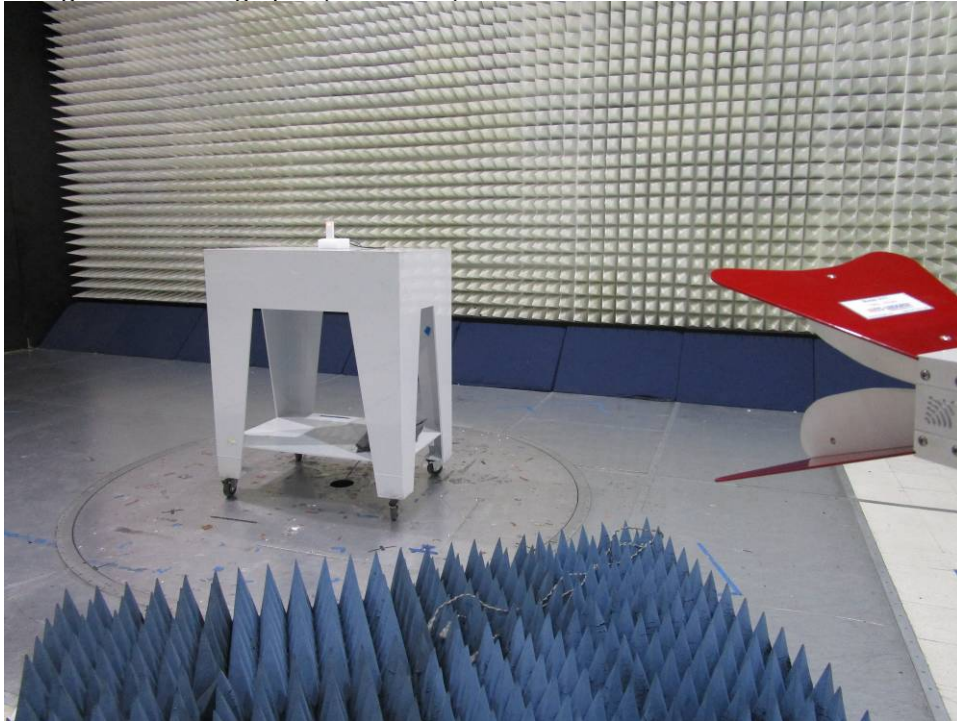
4.1.5 Test Configuration Photographs (Continued)



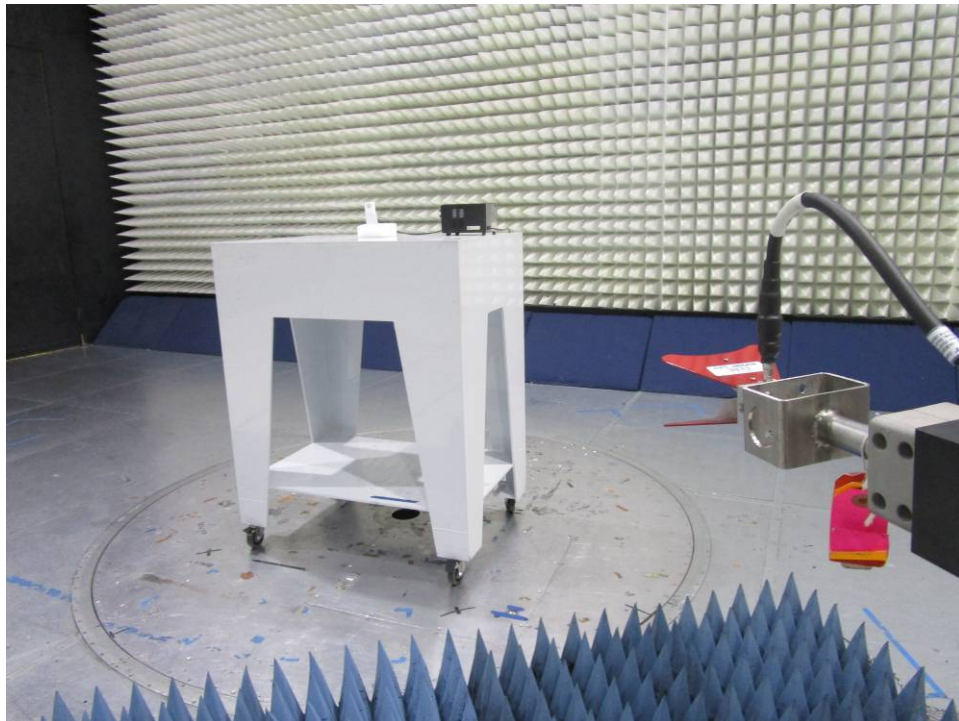
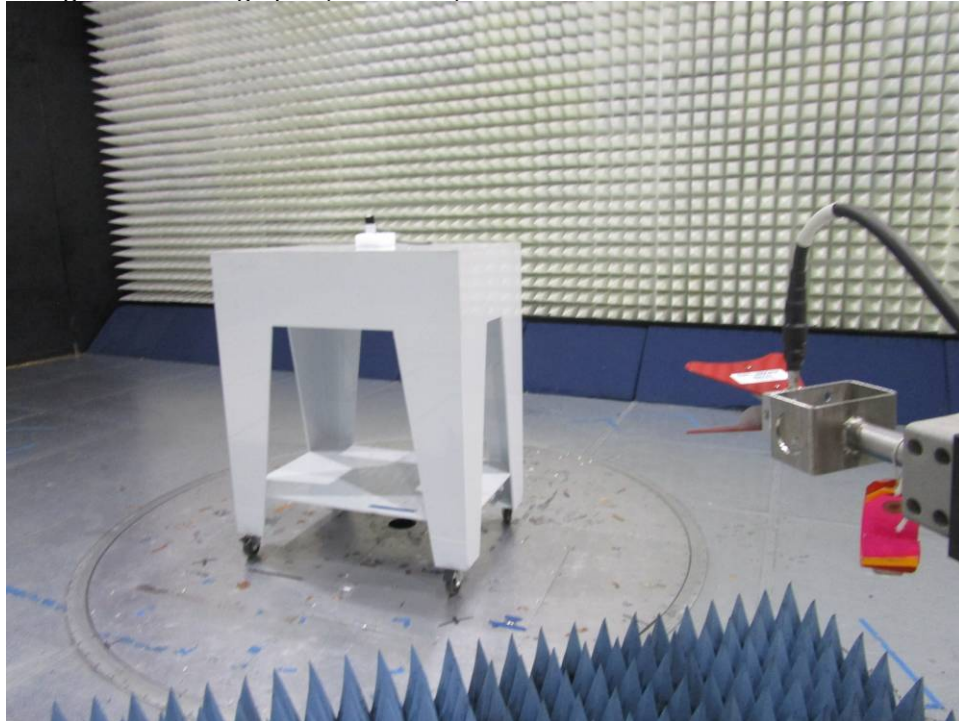
4.1.5 Test Configuration Photographs (Continued)



4.1.5 Test Configuration Photographs (Continued)



4.1.5 Test Configuration Photographs (Continued)



4.2 Frequency Tolerance

4.2.1 Requirement FCC 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.

4.2.2 Procedure

The EUT was placed in the temperature chamber. The frequency counter was connected to the transmitter output. For each temperature, the carrier frequency was recorded. In addition, the carrier frequency was recorded when the power was set to 13.8 V DC (115% of 12V DC) and to 10.2 V DC (85% of 12V DC).

4.2.3 Test Results 15.225 (e)

Nominal Frequency: 13560000 Hz

Voltage (DC)	Temperature (C)	Measured Frequency (Hz)	Deviation from Reference (Hz)	Deviation (%)
12	-20	13560160	80	0.00059
12	-10	13560112	32	0.000236
12	0	13560096	16	0.000118
12	10	13560096	16	0.000118
12	20	13560080	0	0
12	30	13560048	-32	0.000236
12	40	13560032	-48	0.000354
12	50	13560016	-64	0.000472
10.2	20	13560064	-16	0.000118
13.8	20	13560032	-48	0.000354

4.3 Occupied Bandwidth FCC 15.215

4.3.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.3.2 Procedure

The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

Frequency (MHz)	-20 dB Channel Bandwidth (kHz)	99% Channel Bandwidth (kHz)
0.126	10.577	39.744

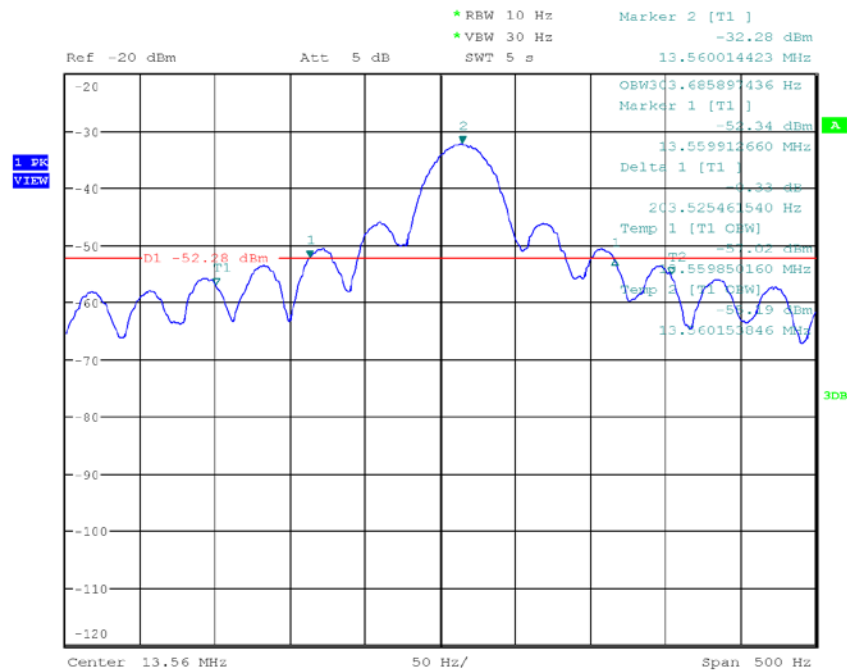
[illegible]

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4.3.3 Test Results (Continued)

Frequency (MHz)	-20 dB Channel Bandwidth (Hz)	99% Channel Bandwidth (Hz)
13.56	203.525	303.686

-20dB & 99% Channel Bandwidth Plot



Date: 19.NOV.2019 15:43:47

4.4 AC Line Conducted Emission FCC Rule 15.207, FCC 15.107

4.4.1 Requirement

Frequency Band MHz	Class B Limit dB(μ V)		Class A Limit dB(μ V)	
	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.

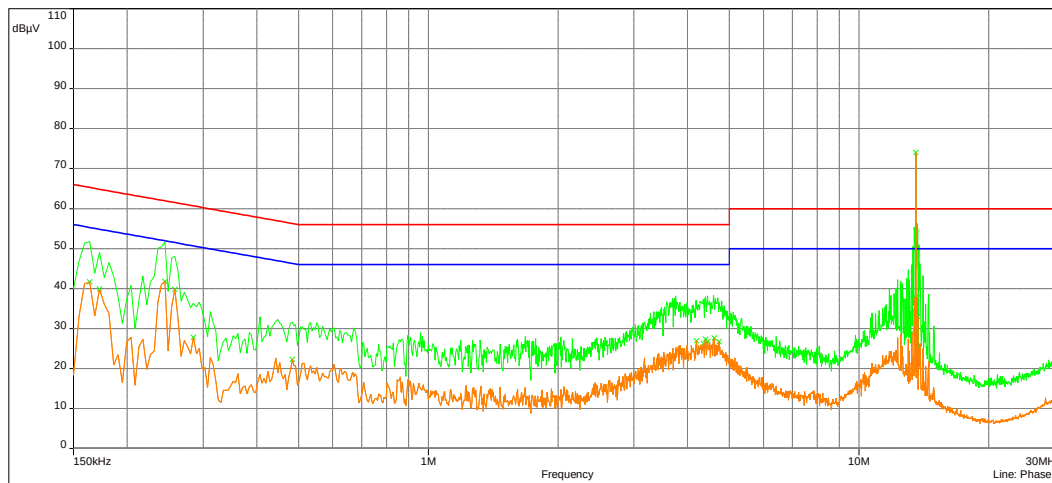
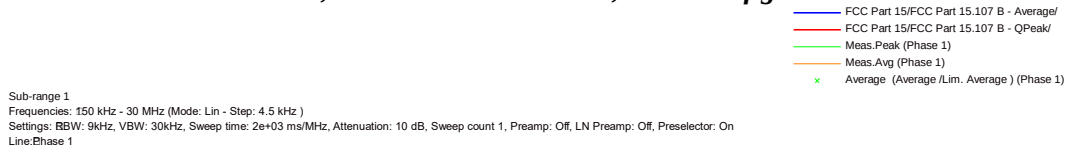
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 & 15.107 to ensure the device complies with 15.207 & 15.107.

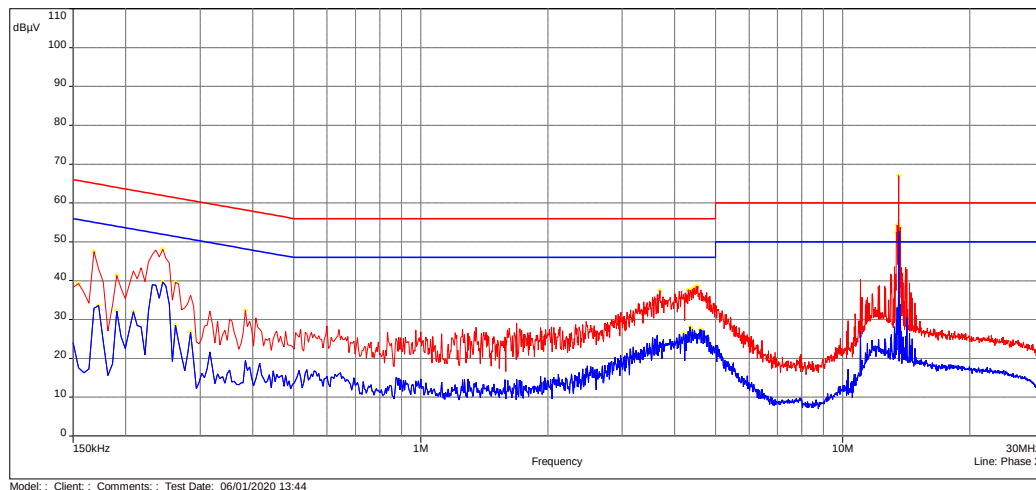
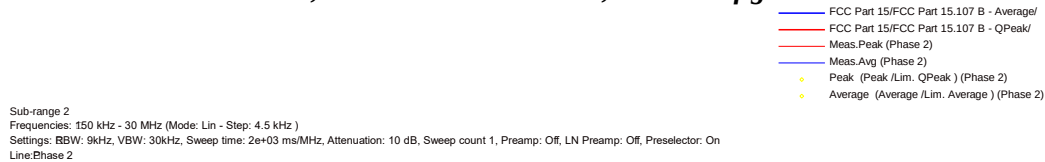
4.4.3 Test Result

15.107 & 15.207

AC Line Conducted Emission, 120VAC 60Hz Phase 1, POE Configuration without termination



AC Line Conducted Emission, 120VAC 60Hz Phase 2, POE Configuration without termination

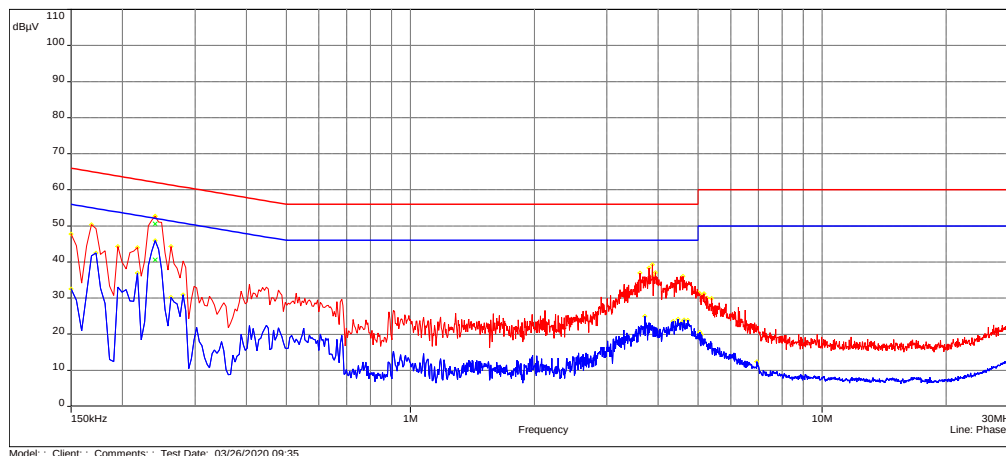


Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.155	39.2	65.8	-26.5	Phase 2	11.2
0.164	51.7	65.3	-13.6	Phase 1	11.1
0.168	47.5	65.1	-17.6	Phase 2	11.1
0.173	49.0	64.8	-15.8	Phase 1	11.1
0.191	41.3	64.0	-22.7	Phase 2	11.0
0.204	40.8	63.5	-22.7	Phase 1	10.9
0.218	43.1	62.9	-19.8	Phase 1	10.9
0.245	51.6	61.9	-10.3	Phase 1	10.8
0.245	48.1	61.9	-13.8	Phase 2	10.8
0.258	48.0	61.5	-13.5	Phase 1	10.8
0.263	39.5	61.4	-21.8	Phase 2	10.8
0.384	32.4	58.2	-25.8	Phase 2	10.7
3.687	37.4	56	-18.6	Phase 2	10.7
3.732	37.6	56	-18.4	Phase 1	10.7
3.755	38.2	56	-17.8	Phase 1	10.7
4.299	37.7	56	-18.3	Phase 2	10.8
4.349	37.6	56	-18.4	Phase 2	10.8
4.443	38.1	56	-17.9	Phase 2	10.8
4.448	38.1	56	-17.9	Phase 1	10.8
4.497	38.6	56	-17.5	Phase 2	10.8
4.533	38.6	56	-17.4	Phase 2	10.8
4.592	38.3	56	-17.7	Phase 1	10.8
4.646	37.5	56	-18.5	Phase 1	10.8
4.700	37.7	56	-18.3	Phase 1	10.8
13.421	52.5	60	-7.5	Phase 2	11.0
13.434	55.4	60	-4.6	Phase 1	11.0
13.475	54.3	60	-5.7	Phase 2	11.0
13.484	55.4	60	-4.6	Phase 1	11.0
13.628	51.0	60	-9.0	Phase 2	11.0
13.641	52.0	60	-8.0	Phase 2	11.0
13.646	56.3	60	-3.7	Phase 1	11.0
13.686	53.8	60	-6.2	Phase 2	11.0
13.691	54.8	60	-5.2	Phase 1	11.0
13.767	51.0	60	-9.0	Phase 1	11.0

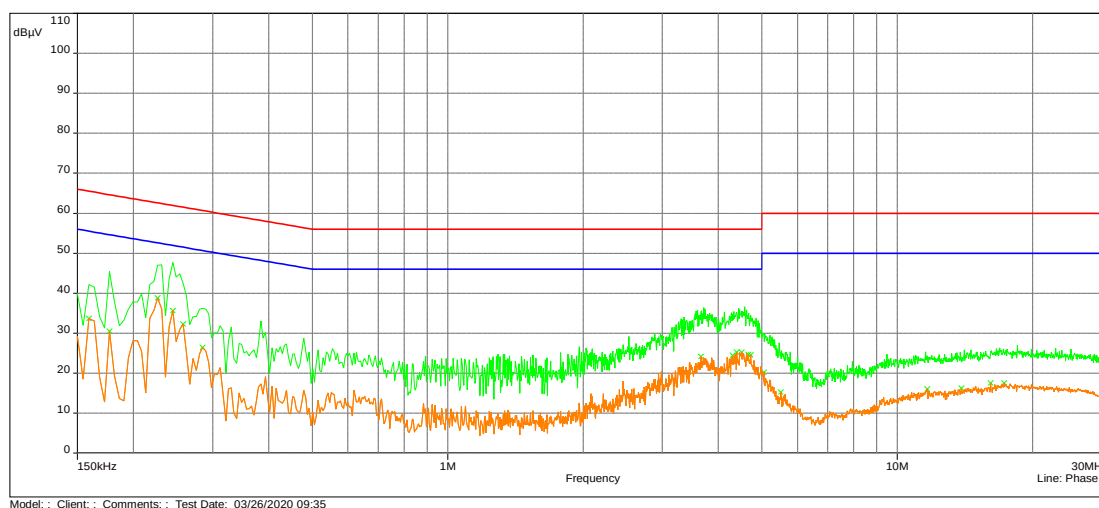
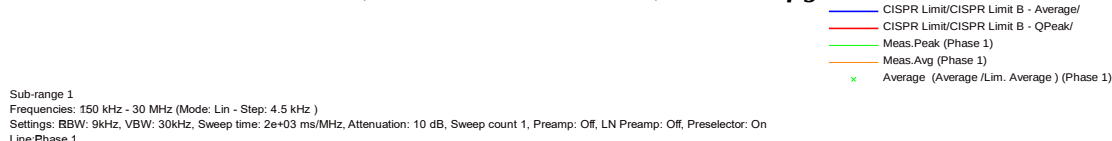
Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.164	41.6	55.3	-13.7	Phase 1	11.1
0.173	39.9	54.8	-14.9	Phase 1	11.1
0.173	33.6	54.8	-21.3	Phase 2	11.1
0.191	32.2	54.0	-21.8	Phase 2	11.0
0.209	32.0	53.3	-21.3	Phase 2	10.9
0.245	41.7	51.9	-10.2	Phase 1	10.8
0.245	39.6	51.9	-12.3	Phase 2	10.8
0.258	39.7	51.5	-11.8	Phase 1	10.8
0.263	28.6	51.4	-22.8	Phase 2	10.8
0.285	27.8	50.7	-22.9	Phase 1	10.8
0.285	26.7	50.7	-24.0	Phase 2	10.8
0.483	22.3	46.3	-24.0	Phase 1	10.7
4.196	27.0	46	-19.1	Phase 1	10.8
4.200	26.5	46	-19.5	Phase 2	10.8
4.250	26.3	46	-19.7	Phase 2	10.8
4.349	28.1	46	-17.9	Phase 2	10.8
4.362	26.2	46	-19.8	Phase 1	10.8
4.403	27.4	46	-18.6	Phase 2	10.8
4.407	27.3	46	-18.7	Phase 1	10.8
4.448	26.7	46	-19.3	Phase 1	10.8
4.596	27.5	46	-18.6	Phase 2	10.8
4.610	27.6	46	-18.4	Phase 1	10.8
4.637	27.3	46	-18.7	Phase 2	10.8
4.736	26.7	46	-19.3	Phase 1	10.8
13.272	29.0	50	-21.0	Phase 1	11.0
13.416	29.8	50	-20.2	Phase 2	11.0
13.434	34.7	50	-15.3	Phase 1	11.0
13.475	33.1	50	-16.9	Phase 2	11.0
13.484	37.8	50	-12.2	Phase 1	11.0
13.628	33.1	50	-16.9	Phase 2	11.0
13.646	37.6	50	-12.4	Phase 1	11.0
13.686	34.0	50	-16.1	Phase 2	11.0
13.691	32.9	50	-17.1	Phase 1	11.0
14.199	30.5	50	-19.5	Phase 2	11.0

15.107 & 15.207

AC Line Conducted Emission, 120VAC 60Hz Phase 1, POE Configuration with termination



AC Line Conducted Emission, 120VAC 60Hz Phase 2, POE Configuration with termination

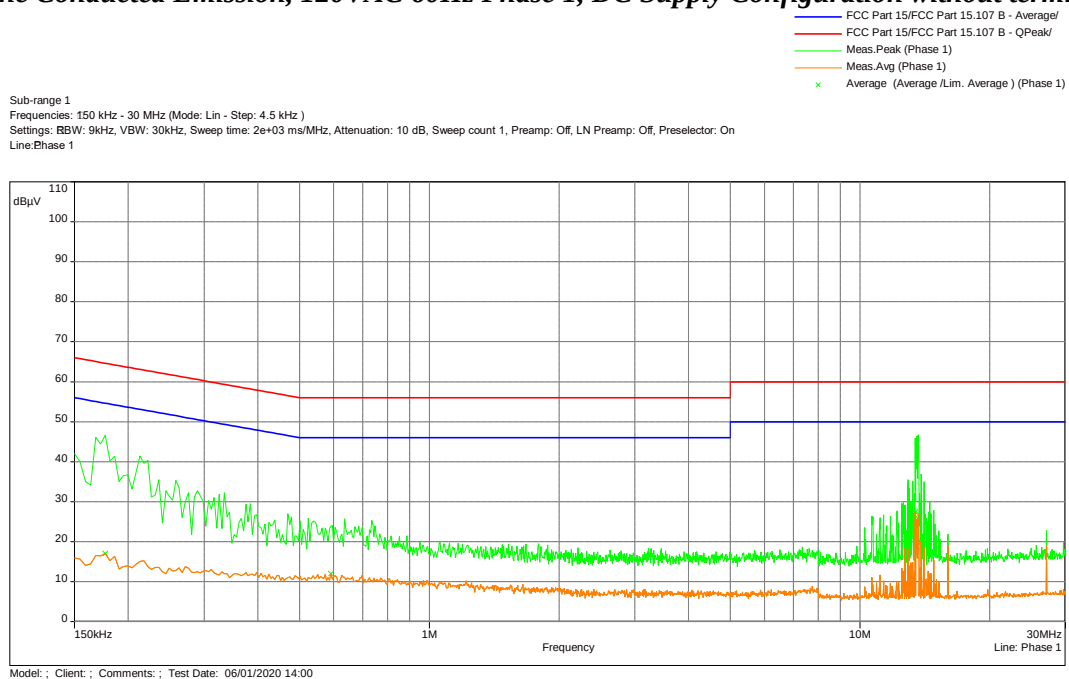


Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.150	47.8	66	-18.2	Phase 2	10.7
0.159	42.2	65.5	-23.4	Phase 1	10.7
0.168	50.3	65.1	-14.7	Phase 2	10.7
0.177	45.4	64.6	-19.2	Phase 1	10.7
0.195	44.4	63.8	-19.5	Phase 2	10.7
0.209	39.9	63.3	-23.3	Phase 1	10.7
0.218	44.0	62.9	-18.9	Phase 2	10.6
0.231	47.1	62.4	-15.4	Phase 1	10.6
0.240	52.7	62.1	-9.4	Phase 2	10.6
0.245	47.6	61.9	-14.3	Phase 1	10.6
0.263	44.4	61.4	-17.0	Phase 2	10.6
0.384	33.1	58.2	-25.1	Phase 1	10.6
3.602	35.7	56	-20.3	Phase 1	10.8
3.615	37.0	56	-19.0	Phase 2	10.8
3.710	36.4	56	-19.6	Phase 1	10.8
3.737	36.1	56	-20.0	Phase 1	10.8
3.804	38.4	56	-17.6	Phase 2	10.8
3.872	39.3	56	-16.7	Phase 2	10.8
3.903	36.0	56	-20.0	Phase 2	10.8
3.939	37.1	56	-19.0	Phase 2	10.8
4.443	36.3	56	-19.8	Phase 1	10.8
4.574	36.6	56	-19.4	Phase 1	10.9
4.592	36.0	56	-20.0	Phase 2	10.9
4.619	35.8	56	-20.2	Phase 1	10.9
5.010	31.6	60	-28.4	Phase 2	10.9
5.037	29.9	60	-30.1	Phase 1	10.9
5.051	31.2	60	-28.8	Phase 2	10.9
5.154	31.1	60	-28.9	Phase 2	10.9
5.168	31.2	60	-28.8	Phase 2	10.9
5.213	29.5	60	-30.5	Phase 1	10.9
5.262	30.0	60	-30.0	Phase 2	10.9
5.267	29.1	60	-31.0	Phase 1	10.9
5.339	28.5	60	-31.6	Phase 1	10.9
5.375	27.0	60	-33.0	Phase 1	10.9
5.388	29.9	60	-30.1	Phase 2	10.9
5.465	27.6	60	-32.4	Phase 1	10.9

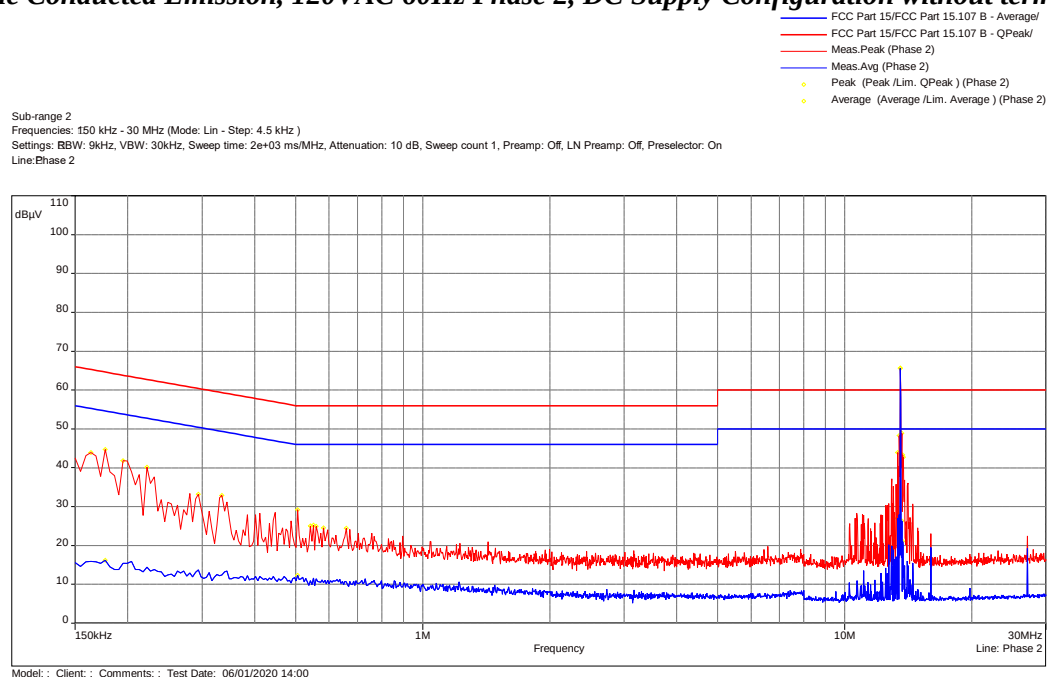
Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.150	32.6	56	-23.4	Phase 2	10.7
0.159	33.6	55.5	-21.9	Phase 1	10.7
0.173	42.5	54.8	-12.4	Phase 2	10.7
0.177	30.4	54.6	-24.2	Phase 1	10.7
0.218	36.9	52.9	-16.0	Phase 2	10.6
0.227	38.7	52.6	-13.8	Phase 1	10.6
0.240	45.9	52.1	-6.2	Phase 2	10.6
0.245	35.6	51.9	-16.3	Phase 1	10.6
0.258	32.2	51.5	-19.3	Phase 1	10.6
0.263	30.3	51.4	-21.1	Phase 2	10.6
0.281	31.0	50.8	-19.8	Phase 2	10.6
0.285	26.4	50.7	-24.3	Phase 1	10.6
3.660	24.1	46	-21.9	Phase 1	10.8
3.714	25.0	46	-21.0	Phase 2	10.8
4.304	24.5	46	-21.5	Phase 1	10.8
4.353	23.6	46	-22.5	Phase 2	10.8
4.394	25.3	46	-20.7	Phase 1	10.8
4.475	24.2	46	-21.8	Phase 2	10.8
4.511	25.2	46	-20.8	Phase 1	10.8
4.565	23.3	46	-22.7	Phase 2	10.9
4.619	24.0	46	-22.0	Phase 2	10.9
4.664	24.7	46	-21.3	Phase 1	10.9
4.722	24.5	46	-21.5	Phase 1	10.9
4.727	23.9	46	-22.2	Phase 2	10.9
5.051	20.2	50	-29.9	Phase 1	10.9
5.051	20.5	50	-29.5	Phase 2	10.9
5.096	19.9	50	-30.1	Phase 2	10.9
5.510	15.3	50	-34.8	Phase 1	10.9
6.950	12.4	50	-37.6	Phase 2	10.9
11.670	16.0	50	-34.0	Phase 1	11.1
13.889	16.2	50	-33.8	Phase 1	11.2
16.134	17.5	50	-32.5	Phase 1	11.3
17.304	17.5	50	-32.5	Phase 1	11.3
28.446	13.3	50	-36.7	Phase 2	11.6

15.107 & 15.207

AC Line Conducted Emission, 120VAC 60Hz Phase 1, DC Supply Configuration without termination



AC Line Conducted Emission, 120VAC 60Hz Phase 2, DC Supply Configuration without termination

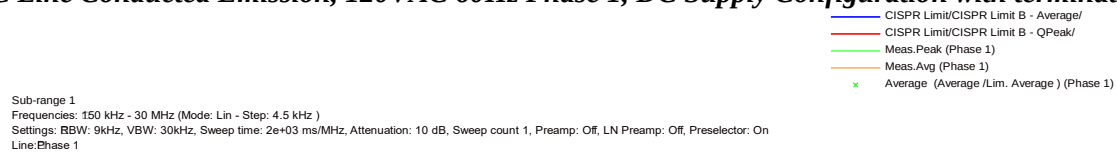


Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.150	42.0	66.0	-24.0	Phase 1	11.2
0.164	43.9	65.3	-21.4	Phase 2	11.1
0.177	46.6	64.6	-18.1	Phase 1	11.0
0.177	44.7	64.6	-19.9	Phase 2	11.0
0.195	41.8	63.8	-22.0	Phase 2	11.0
0.213	41.4	63.1	-21.7	Phase 1	10.9
0.222	40.1	62.7	-22.6	Phase 2	10.9
0.236	35.5	62.3	-26.8	Phase 1	10.9
0.258	35.3	61.5	-26.2	Phase 1	10.8
0.294	33.2	60.4	-27.2	Phase 2	10.8
0.335	32.2	59.3	-27.1	Phase 1	10.7
0.335	32.9	59.3	-26.4	Phase 2	10.7
0.501	25.3	56	-30.7	Phase 1	10.7
0.506	29.2	56	-26.8	Phase 2	10.7
0.524	25.9	56	-30.1	Phase 1	10.7
0.537	25.2	56	-30.8	Phase 1	10.7
0.542	25.1	56	-30.9	Phase 2	10.7
0.551	25.3	56	-30.7	Phase 2	10.6
0.560	24.9	56	-31.1	Phase 2	10.6
0.582	24.6	56	-31.4	Phase 2	10.6
0.636	25.7	56	-30.3	Phase 1	10.6
0.659	24.4	56	-31.6	Phase 2	10.6
0.735	25.4	56	-30.6	Phase 1	10.6
0.888	21.5	56	-34.5	Phase 1	10.6
13.344	43.9	60	-16.1	Phase 2	11.0
13.439	46.0	60	-14.1	Phase 1	11.0
13.461	48.3	60	-11.7	Phase 2	11.0
13.484	45.5	60	-14.5	Phase 1	11.0
13.547	46.4	60	-13.6	Phase 1	11.0
13.583	41.3	60	-18.7	Phase 1	11.0
13.646	46.7	60	-13.3	Phase 1	11.0
13.668	48.9	60	-11.1	Phase 2	11.0
13.695	45.1	60	-14.9	Phase 1	11.0
13.713	43.3	60	-16.7	Phase 2	11.0
13.767	42.7	60	-17.3	Phase 2	11.0

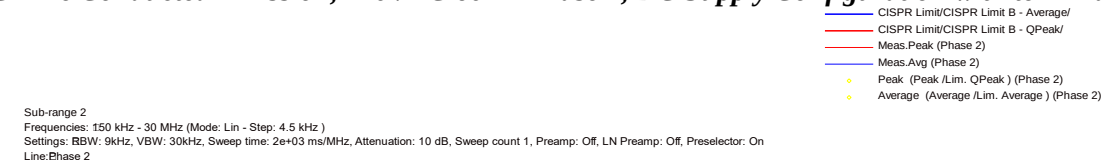
Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.177	17.1	54.6	-37.6	Phase 1	11.0
0.177	16.2	54.6	-38.5	Phase 2	11.0
0.506	12.4	46	-33.6	Phase 2	10.7
0.591	12.0	46	-34.1	Phase 1	10.6
13.344	27.0	50	-23.0	Phase 2	11.0
13.439	27.4	50	-22.6	Phase 1	11.0
13.457	27.9	50	-22.1	Phase 2	11.0
13.484	25.5	50	-24.5	Phase 1	11.0
13.506	20.5	50	-29.5	Phase 2	11.0
13.542	18.9	50	-31.1	Phase 1	11.0
13.646	25.9	50	-24.2	Phase 1	11.0
13.668	26.4	50	-23.7	Phase 2	11.0
13.695	26.8	50	-23.2	Phase 1	11.0
13.713	21.1	50	-28.9	Phase 2	11.0
13.857	19.9	50	-30.1	Phase 1	11.0

15.107 & 15.207

AC Line Conducted Emission, 120VAC 60Hz Phase 1, DC Supply Configuration with termination



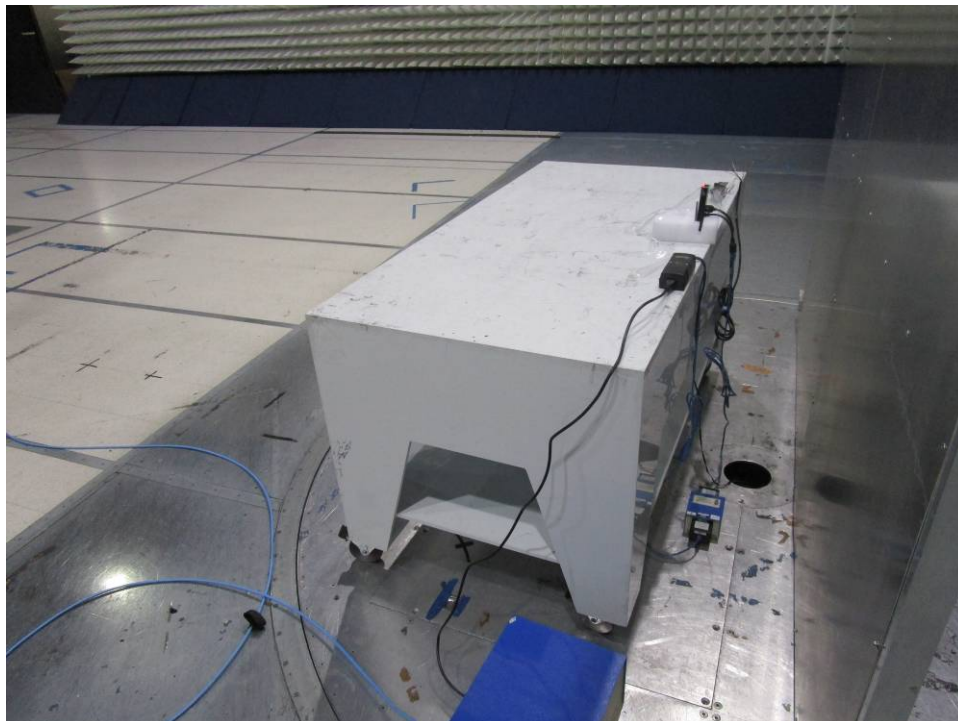
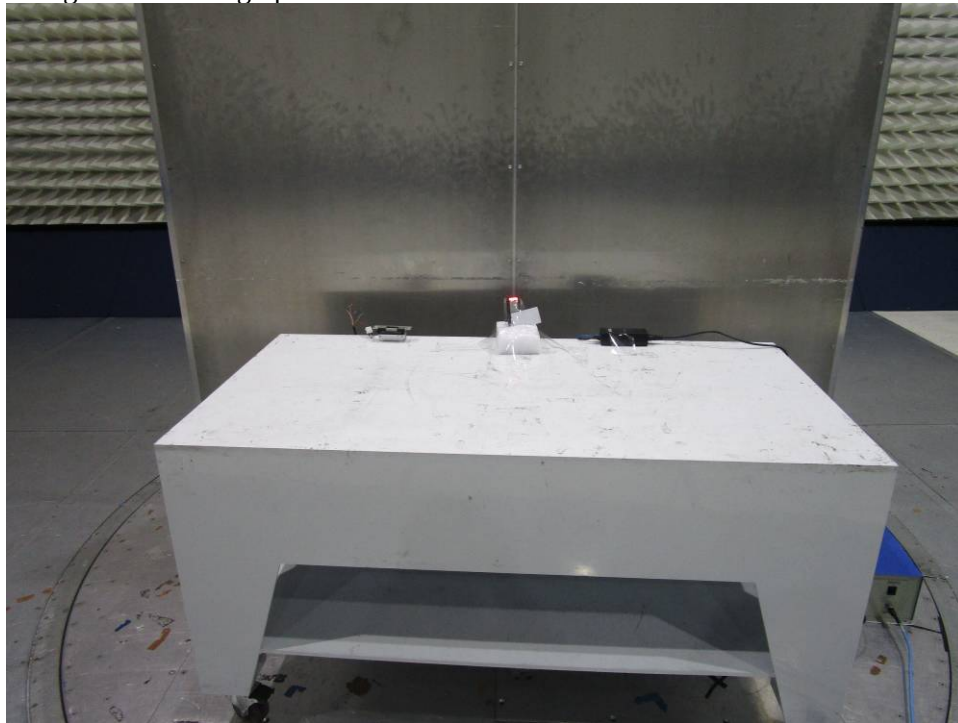
AC Line Conducted Emission, 120VAC 60Hz Phase 2, DC Supply Configuration with termination



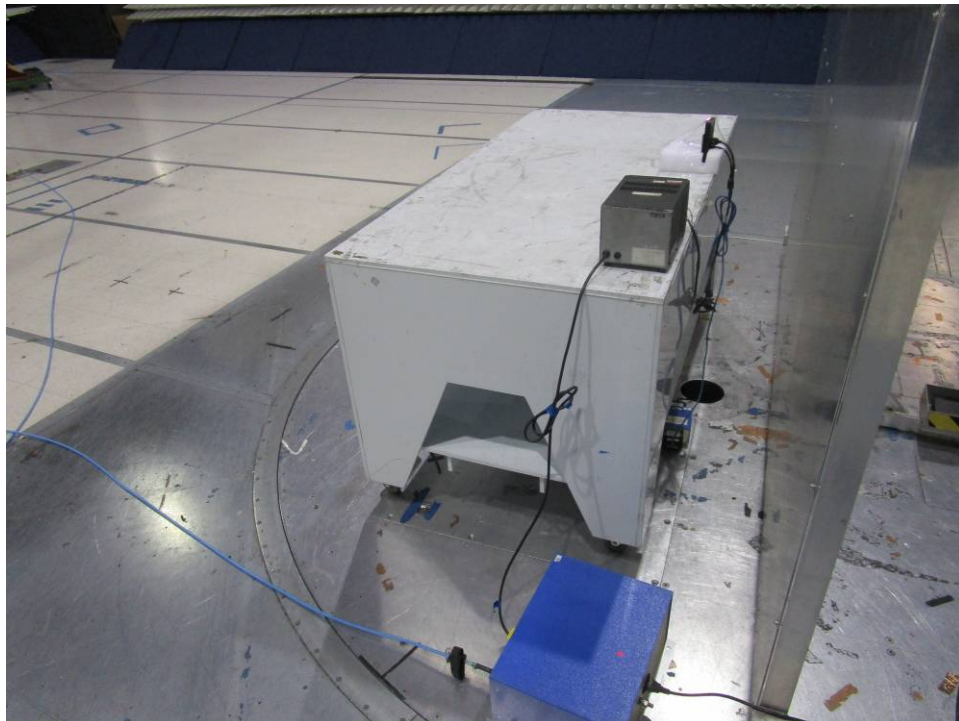
Frequency (MHz)	QPeak (dBμV)	Lim. QPeak (dBμV)	Margin (dB)	Comment	Correction (dB)
0.150	43.3	66	-22.7	Phase 2	10.7
0.159	44.2	65.5	-21.3	Phase 1	10.7
0.168	43.8	65.1	-21.3	Phase 1	10.7
0.168	43.9	65.1	-21.2	Phase 2	10.7
0.191	40.7	64.0	-23.3	Phase 1	10.6
0.222	36.8	62.7	-26.0	Phase 1	10.5
0.231	33.9	62.4	-28.5	Phase 2	10.5
0.254	37.2	61.6	-24.4	Phase 1	10.5
0.254	34.0	61.6	-27.7	Phase 2	10.5
0.263	33.7	61.4	-27.7	Phase 2	10.5
0.339	30.0	59.2	-29.2	Phase 1	10.4
0.353	28.1	58.9	-30.8	Phase 2	10.4
0.501	24.8	56	-31.2	Phase 1	10.3
0.506	24.8	56	-31.2	Phase 2	10.3
0.515	25.7	56	-30.4	Phase 1	10.3
0.519	25.0	56	-31.0	Phase 2	10.4
0.537	26.5	56	-29.5	Phase 1	10.3
0.546	25.8	56	-30.2	Phase 1	10.4
0.564	21.6	56	-34.4	Phase 2	10.3
0.596	22.5	56	-33.5	Phase 2	10.3
0.605	24.7	56	-31.3	Phase 1	10.3
0.699	21.3	56	-34.7	Phase 2	10.3
0.744	21.6	56	-34.4	Phase 2	10.3
0.753	23.8	56	-32.2	Phase 1	10.3
13.560	30.9	60	-29.1	Phase 2	10.7
15.999	26.5	60	-33.5	Phase 1	10.7
15.999	27.0	60	-33.0	Phase 2	10.7
27.119	32.6	60	-27.5	Phase 2	10.6
27.128	24.3	60	-35.8	Phase 1	10.6
28.739	20.1	60	-39.9	Phase 2	10.6
28.851	19.5	60	-40.6	Phase 2	10.6
28.887	19.3	60	-40.7	Phase 1	10.6
29.076	20.5	60	-39.5	Phase 2	10.6
29.301	19.9	60	-40.1	Phase 1	10.6
29.319	19.5	60	-40.6	Phase 1	10.6
29.531	20.1	60	-39.9	Phase 1	10.6

Frequency (MHz)	Avg (dBμV)	Lim. Avg (dBμV)	Margin (dB)	Comment	Correction (dB)
0.150	13.5	56	-42.5	Phase 2	10.7
0.159	12.2	55.5	-43.3	Phase 1	10.7
4.380	6.5	46	-39.6	Phase 1	10.5
4.416	6.6	46	-39.4	Phase 2	10.5
12.800	9.1	50	-41.0	Phase 1	10.7
13.560	29.7	50	-20.3	Phase 2	10.7
15.999	25.4	50	-24.6	Phase 2	10.7
15.999	24.9	50	-25.1	Phase 1	10.7
27.119	31.6	50	-18.5	Phase 2	10.6
27.128	13.5	50	-36.5	Phase 1	10.6

4.3.4 Test Configuration Photographs



4.3.4 Test Configuration Photographs (continued):



4.5 Radiated Emissions on Digital Parts FCC Ref: 15.109, ICES 003, RSS Gen

4.5.1 Test Limit

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

4.5.2 Procedures

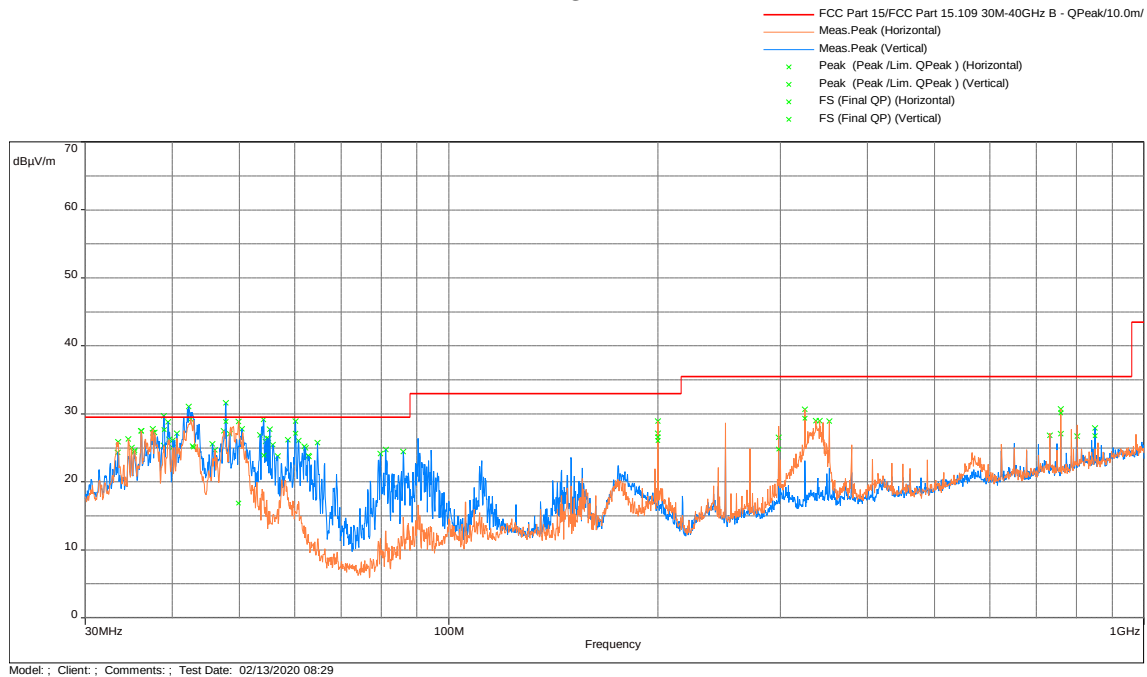
Radiated measurements were taken. 120 kHz resolution bandwidth was used from 30 MHz - 1 GHz. 1 MHz resolution bandwidth was used for measurements done above 1 GHz. All plots are corrected for cable loss, antenna factor, and preamp.

Radiated emission measurements were performed from 30 MHz to 18000 MHz. The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Measurements recorded in this section were made with the Transmitter in Tx mode.

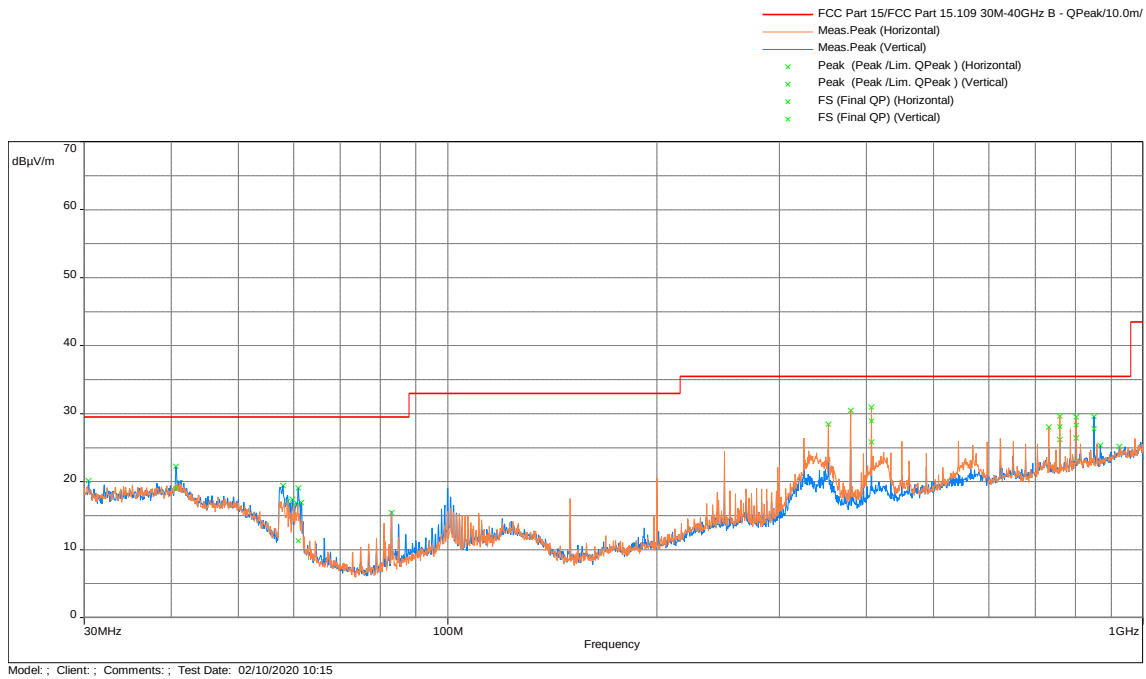
4.5.3 Test Results

FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz, Black Case with POE



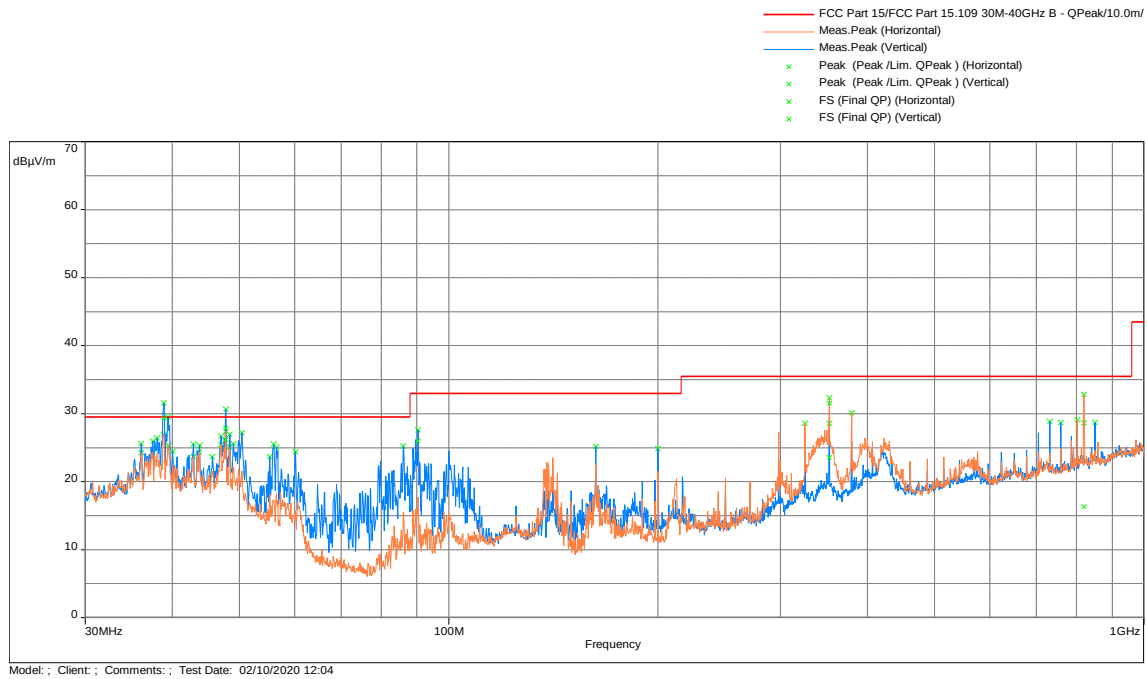
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
38.958	27.7	29.5	-1.8	301.5	4	Vertical	34.8	-7.1
42.810	25.3	29.5	-4.2	178.25	2.01	Vertical	32.3	-7.2
42.947	25.1	29.5	-4.4	247.25	1.97	Horizontal	32.2	-7.3
47.803	28.9	29.5	-0.6	310	4	Vertical	37.0	-8.2
49.829	16.9	29.5	-12.6	338	3.64	Horizontal	26.0	-9.1
54.173	23.9	29.5	-5.6	256.75	1	Vertical	36.3	-12.4
60.203	27.2	29.5	-2.4	338.25	2.97	Vertical	42.8	-15.7
199.985	26.6	33	-6.4	53.75	3.64	Horizontal	41.0	-14.4
199.984	26.0	33	-7.0	0	1	Vertical	40.5	-14.4
298.318	24.8	35.5	-10.7	3	1.08	Vertical	35.1	-10.3
325.438	29.4	35.5	-6.2	153.25	1.9	Horizontal	39.0	-9.6
759.372	30.1	35.5	-5.4	350	1.05	Horizontal	33.1	-3.0
849.919	26.8	35.5	-8.7	34	1.85	Vertical	28.4	-1.6

FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz, Black Case with DC



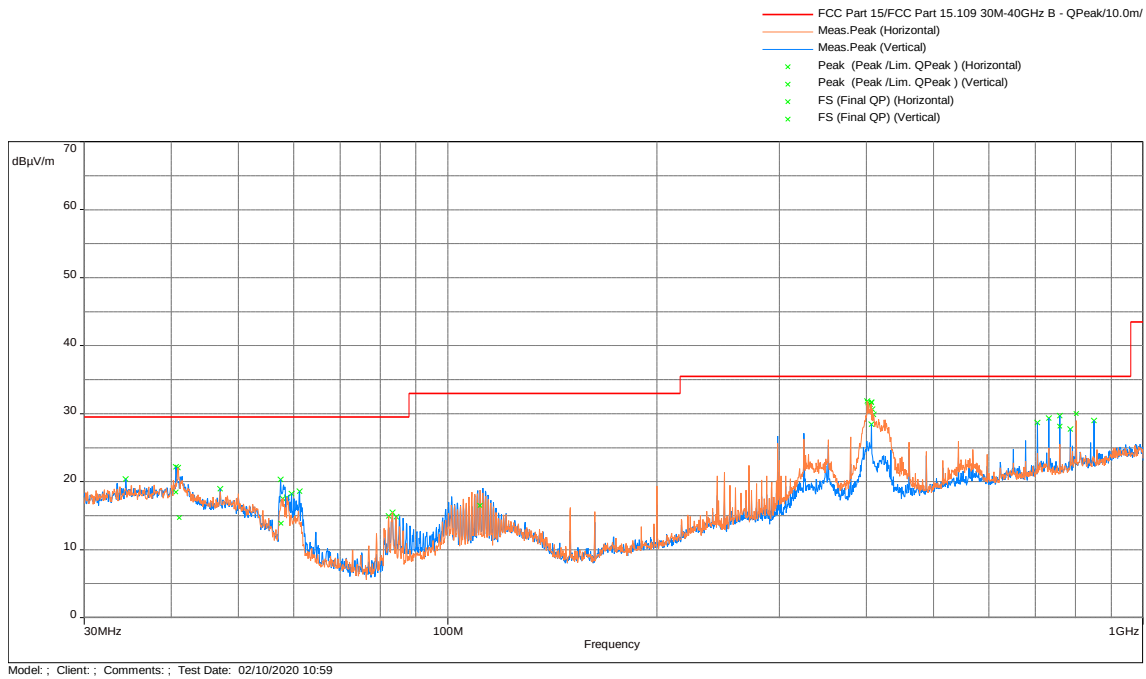
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
40.669	19.0	29.5	-10.5	107.25	1.2	Vertical	26.0	-7.0
60.972	11.3	29.5	-18.2	193	2.64	Vertical	27.3	-16.0
406.796	28.9	35.5	-6.6	65	1.73	Horizontal	36.3	-7.4
759.369	28.1	35.5	-7.4	359	1.08	Horizontal	31.1	-3.0
801.792	28.3	35.5	-7.2	199	1.3	Horizontal	30.2	-1.9
849.952	27.8	35.5	-7.8	45.5	1.88	Vertical	29.4	-1.6

FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz, White Case with POE



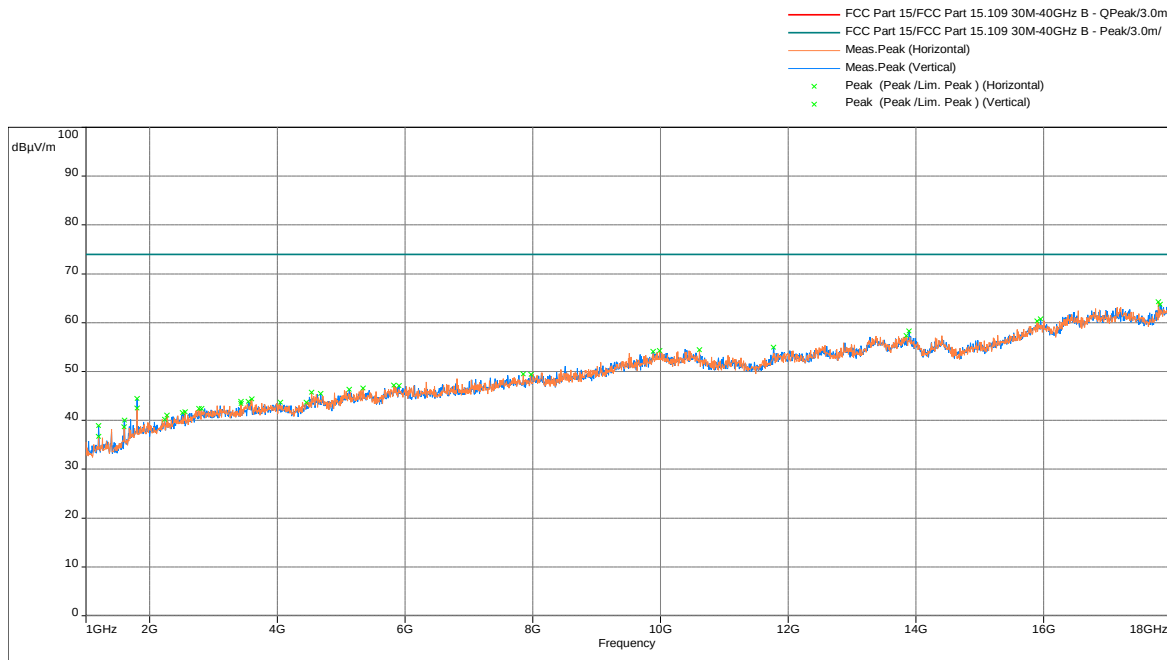
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
38.961	29.3	29.5	-0.2	181.25	3.96	Vertical	36.4	-7.1
47.803	27.9	29.5	-1.6	187	2.99	Vertical	36.0	-8.2
47.806	26.1	29.5	-3.4	72.25	2.22	Horizontal	34.3	-8.2
90.371	26.0	33	-7.0	344	1.46	Vertical	42.2	-16.2
352.565	23.6	35.5	-11.9	161	4	Vertical	32.7	-9.1
352.546	31.5	35.5	-4.0	139.25	2.39	Horizontal	40.6	-9.2

FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 30 MHz to 1000 MHz, White Case with DC



Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
40.660	18.5	29.5	-11.0	116.5	1.52	Vertical	25.5	-7.0
41.104	14.7	29.5	-14.8	204.75	1.56	Horizontal	21.7	-7.0
57.596	13.9	29.5	-15.6	193	2.9	Vertical	28.4	-14.6
111.255	16.5	33	-16.5	12	4	Horizontal	30.7	-14.2
406.804	31.7	35.5	-3.8	306.25	1.97	Horizontal	39.1	-7.4
759.354	28.1	35.5	-7.4	30.5	2.14	Vertical	31.1	-3.0
801.818	30.0	35.5	-5.5	291.75	1.41	Horizontal	31.9	-1.9

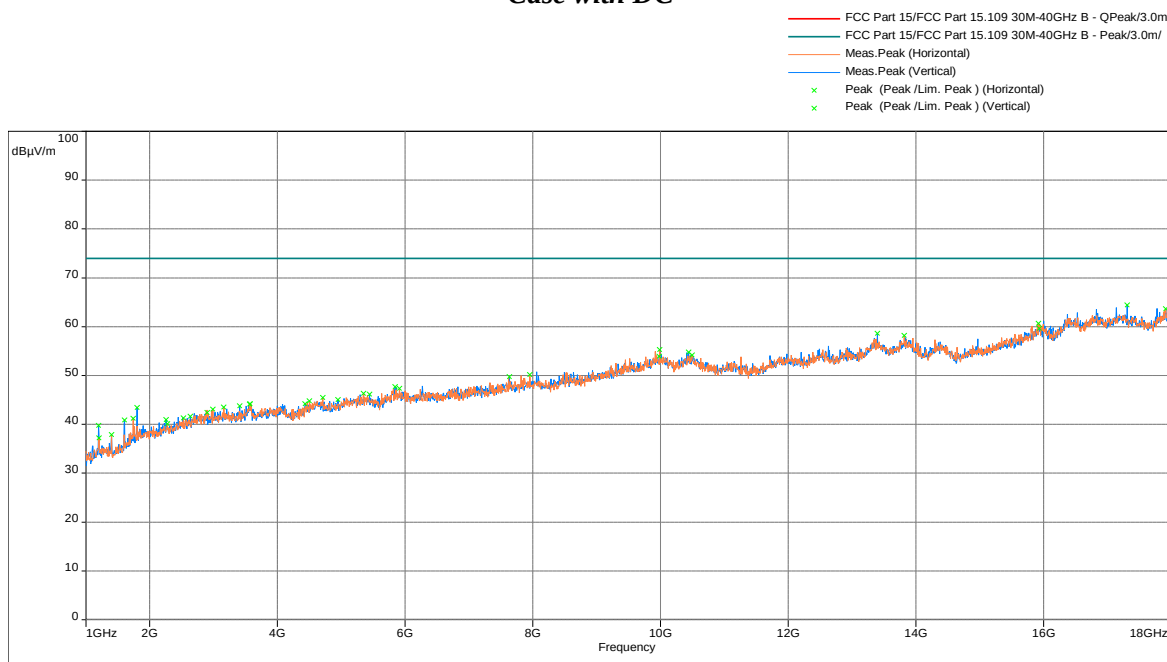
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 1-18 GHz, Peak vs Peak limit Black Case with POE



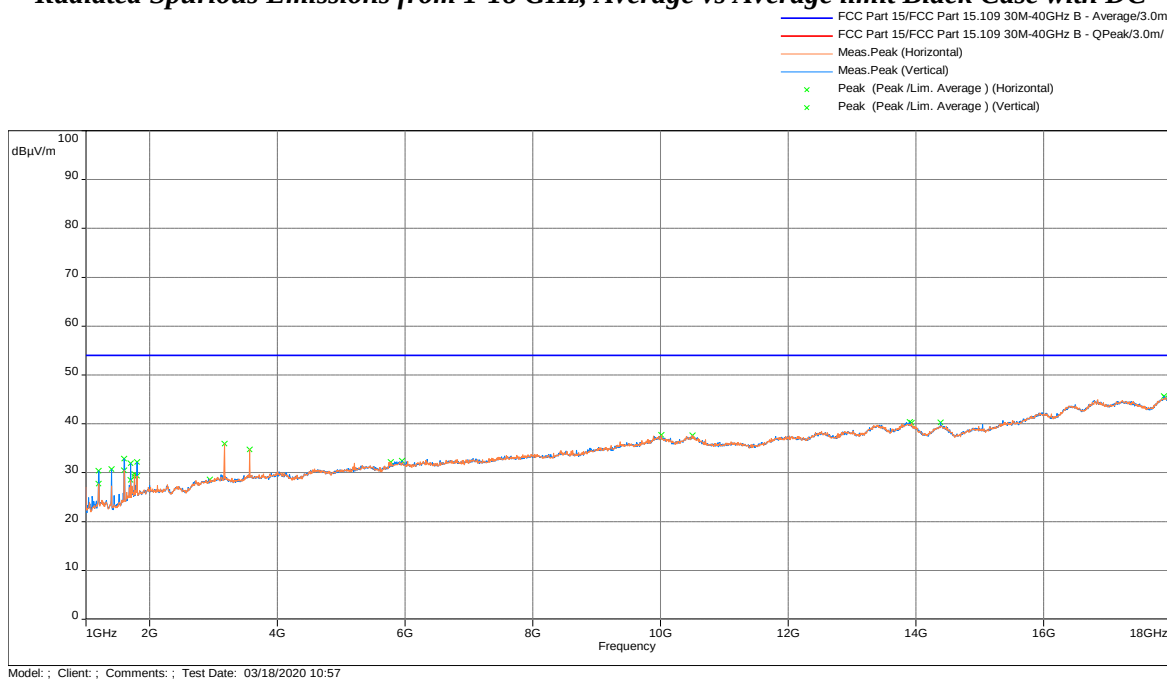
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 1-18 GHz, Average vs Average limit Black Case with POE



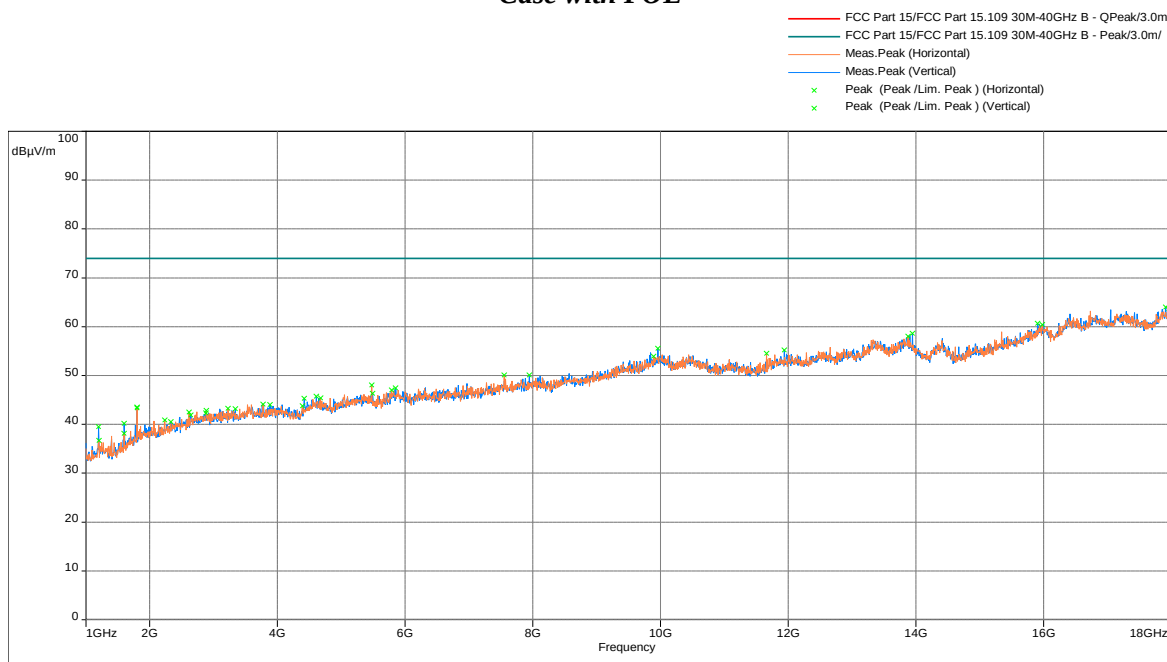
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 1-18 GHz, Peak vs Peak limit Black Case with DC



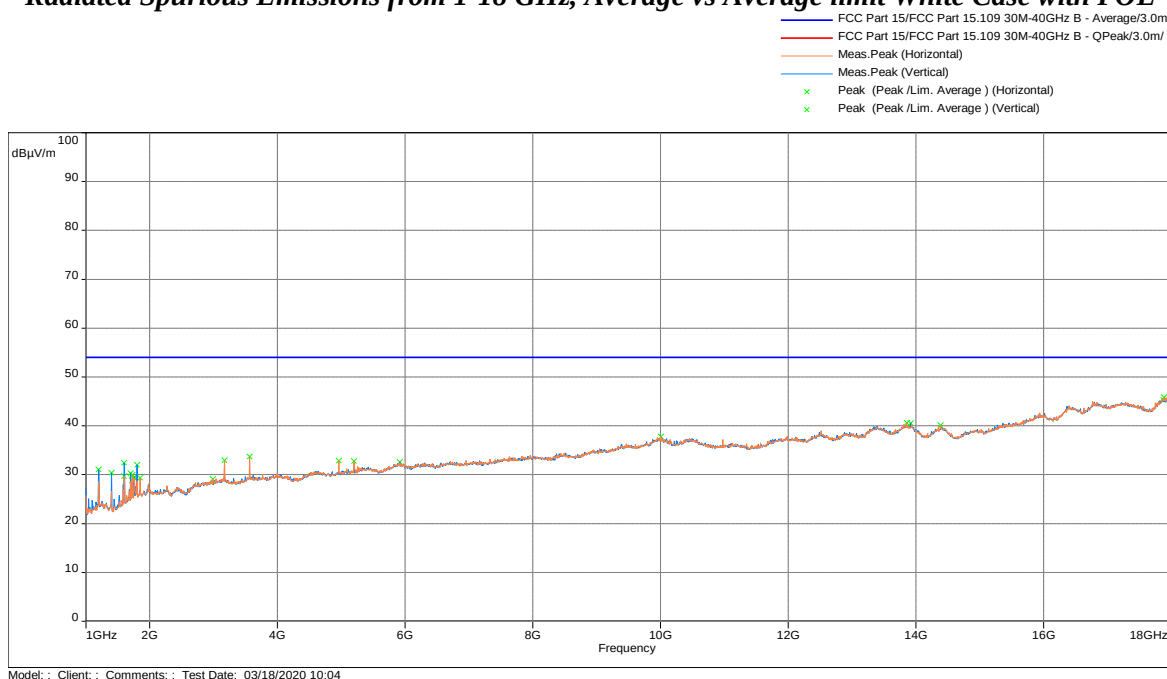
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit Black Case with DC



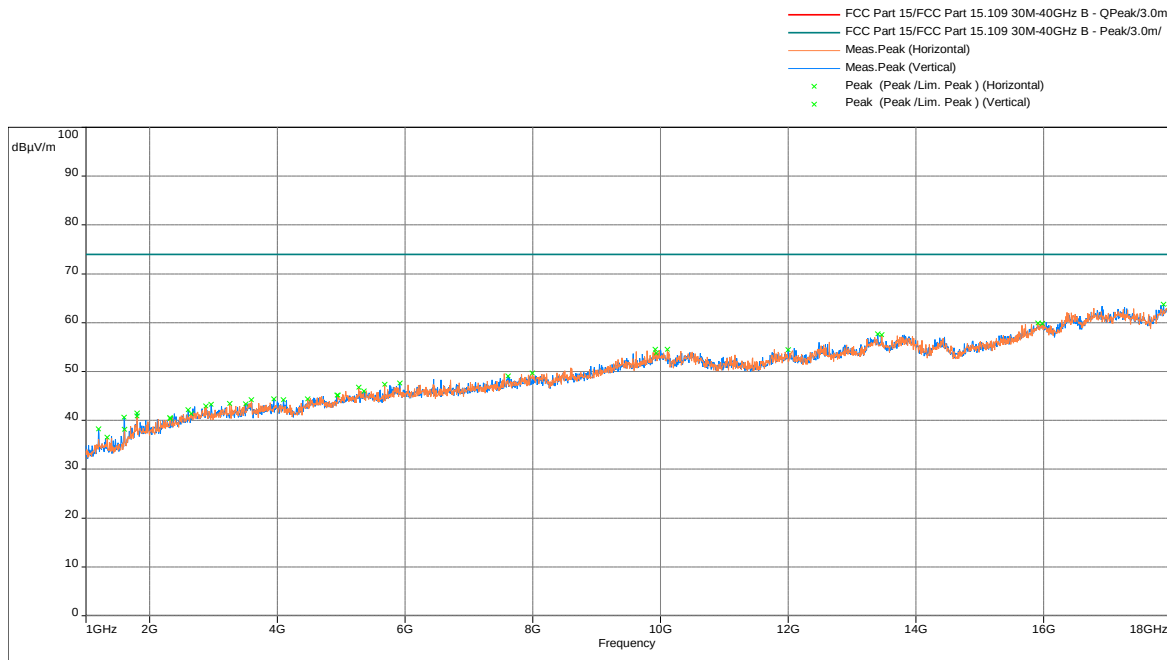
FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 1-18 GHz, Peak vs Peak limit White Case with POE



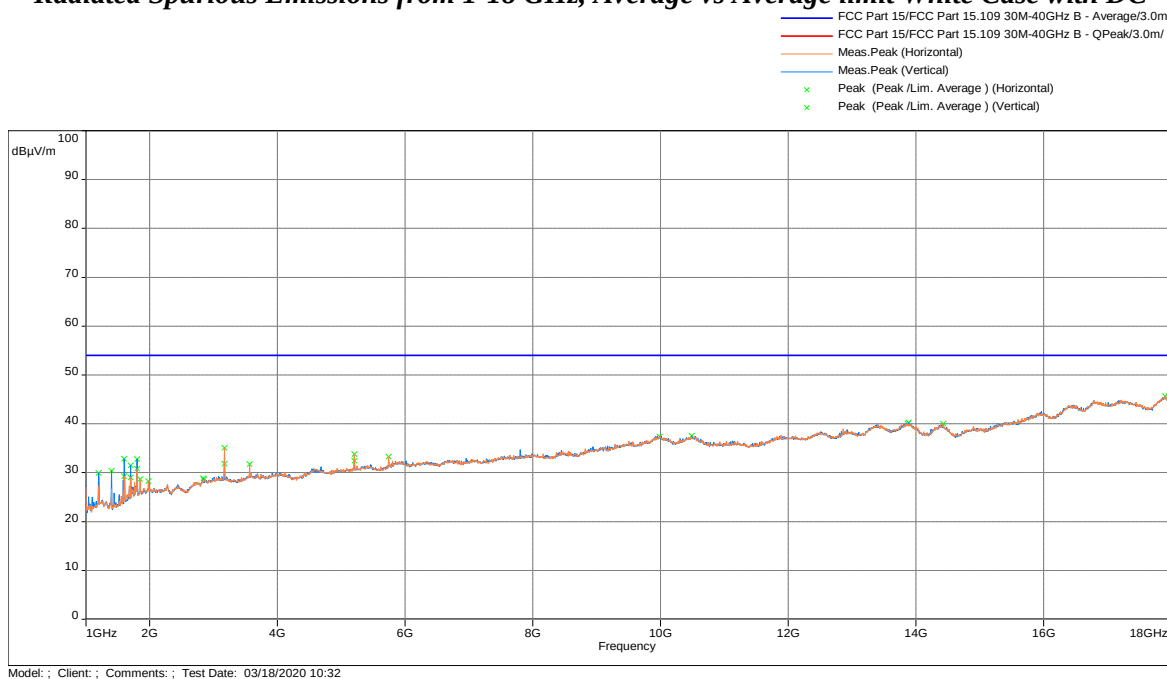
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with POE



FCC Part 15 Subpart B and ICES-003, Radiated Disturbance, 1-18 GHz, Peak vs Peak limit White Case with DC

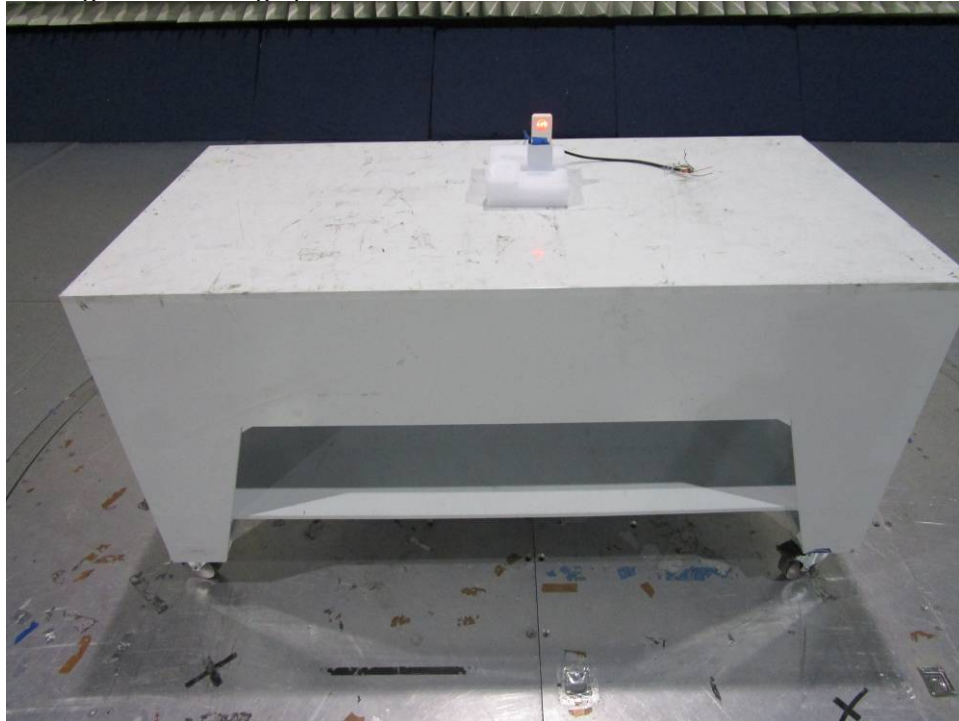


Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with DC



Results ☒ **Complies** by 0.2 dB for FCC Part 15 Subpart B and ICES-003

4.5.4 Test Configuration Photographs



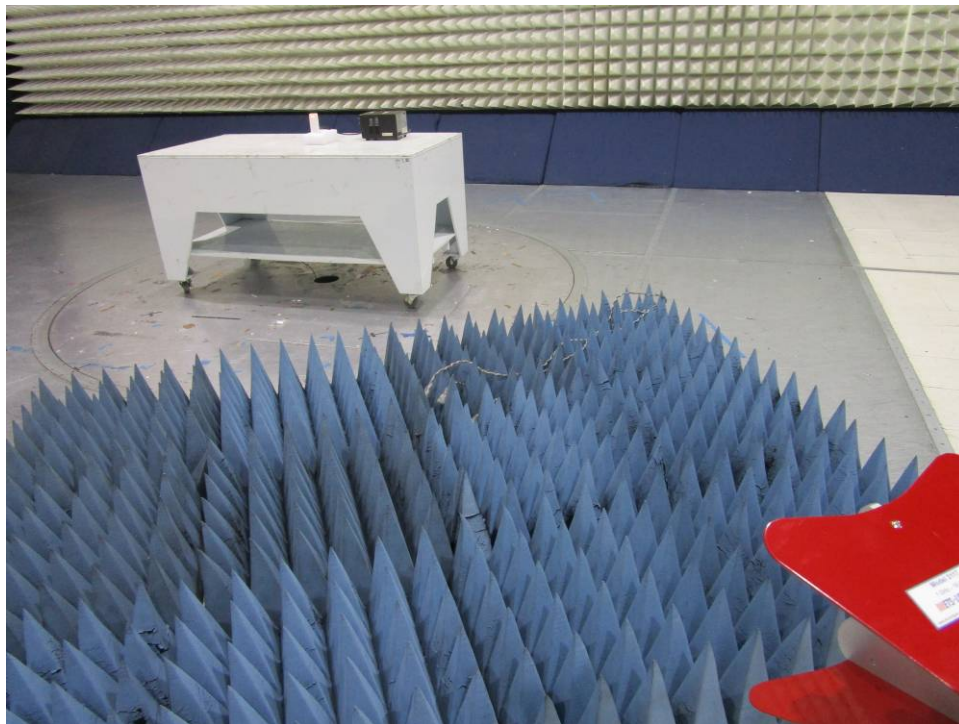
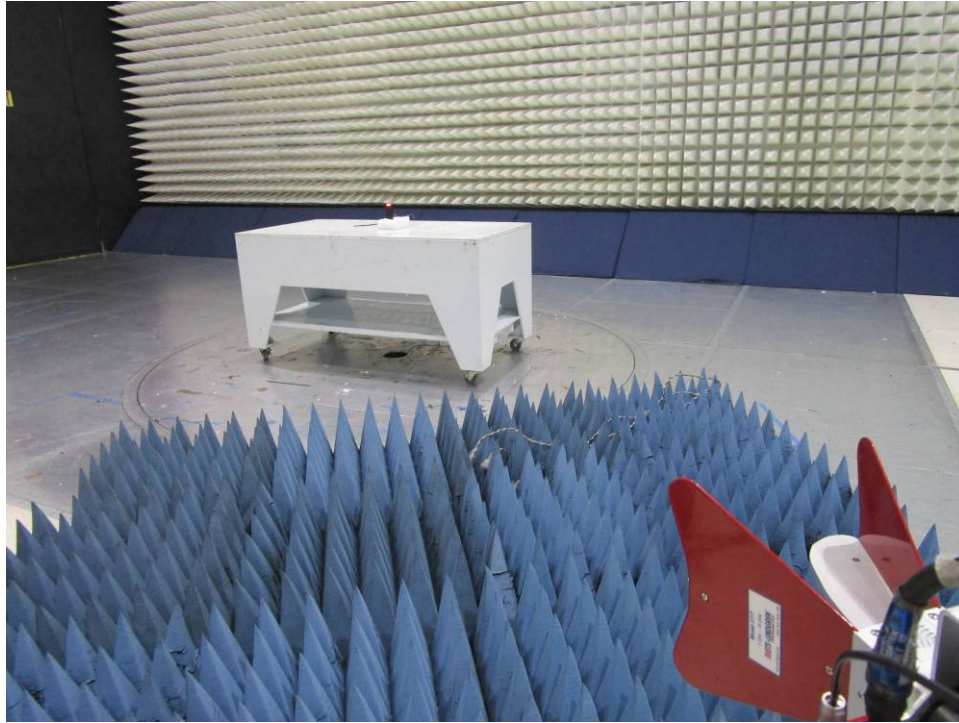
Electromagnetic Radiated Disturbance Setup Photograph

4.5.4 Test Configuration Photographs (continued)



Electromagnetic Radiated Disturbance Setup Photograph

4.5.4 Test Configuration Photographs (Continued)



Electromagnetic Radiated Disturbance Setup Photograph

5.0 List of test equipment

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

Equipment	Manufacturer	Model/Type	Asset No.	Calibration	Cal Due
EMI Receiver	Rohde and Schwarz	ESR	ITS 01607	12	10/23/20
Passive Loop Antenna	EMCO	6512	ITS 001598	12	10/22/20
Pre-Amplifier	Sonoma	310	ITS 00942	12	03/15/21
BI-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	04/24/20
Horn Antenna	ETS-Lindgren	3117-PA	ITS 01636	12	01/17/21
Horn Antenna	ETS Lindgren	3116C	ITS 01376	12	04/15/20
Pre-Amplifier	Miteq	TTA1840-35-S-M	ITS 01393	12	02/08/21
Notch Filter	Micro-Tronics	BRM50702	ITS 01166	12	05/14/20
Loop Sensor	Solar Electronics	7334-1	ITS 01608	12	10/09/20
RF Cable	Megaphase	EMC1-K1K1-236	ITS 01537	12	02/20/21
RF Cable	TRU Corporation	TRU CORE 300	ITS 01330	12	05/09/20
RF Cable	TRU Corporation	TRU CORE 300	ITS 00465	12	08/16/20
RF Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	08/16/20
LISN	Com-Power	LIN-115A	ITS 01285	12	07/26/20
Transient Limiter	COM-POWER	LIT-153A	ITS 01452	12	08/30/20

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.17.0.10	Wavelynx, ML_11-19-2019.bpp

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103916593	TM	KV	April 07, 2020	Original document
2.0 / G103916593	TM	KV	June 03, 2020	Updated Model Number from F10 to ER10 per client's request.
3.0 / G103916593	TM	KV	June 11, 2020	Updated report with new FCC ID, IC ID and CPNs per client's request.

7. Appendix A: Evaluation for spurious emissions of pre-certified radio module installed inside the host equipment per KDB 996369 D04.

A1.0 Radiated Emissions (ANSI C63.10)

A1.1 Method

Tests are performed in accordance with ANSI C63.10, FCC 47CFR PT 15.247.

TEST SITE: 10m ALSE

10m ALSE: The test facility is located at 1365 Adams Court, Menlo Park, California. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of ANSI C63.10:2013. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. Above 1 GHz an antenna mast with boresight capabilities is used.

The A2LA certificate number for this site is 1755-01

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U _{CISPR}
Radiated Emissions, 10m	30-200 MHz	4.7 dB	6.3 dB
Radiated Emissions, 10m	200-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	1-18 GHz	5.1 dB	5.2 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 32.

Sample 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:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dB μ V/m

To convert from dB μ V to μ V or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μ V
NF = Net Reading in dB μ V

Example:

$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$
 $UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$

A1.2 Test Equipment Used:

See Section 5.0 for specific equipment used for this test

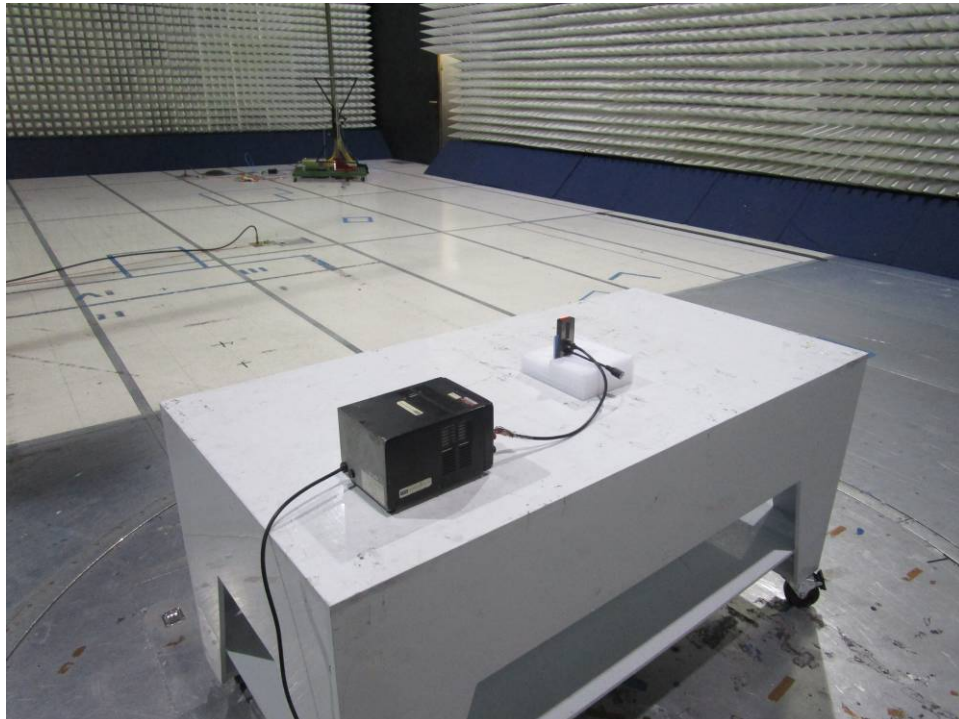
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	3.17.0.10

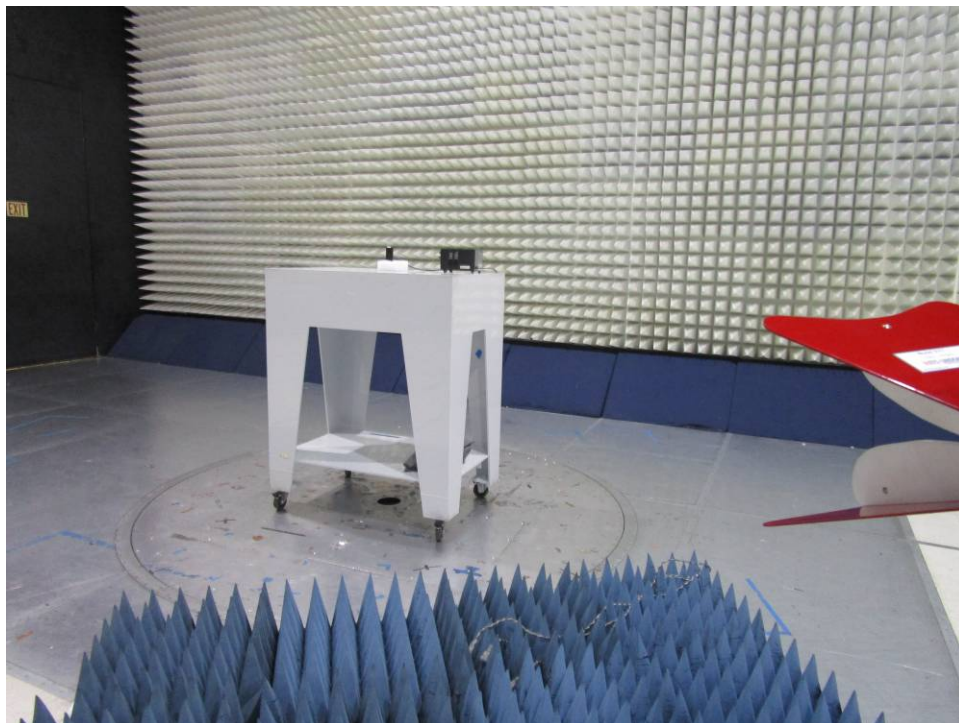
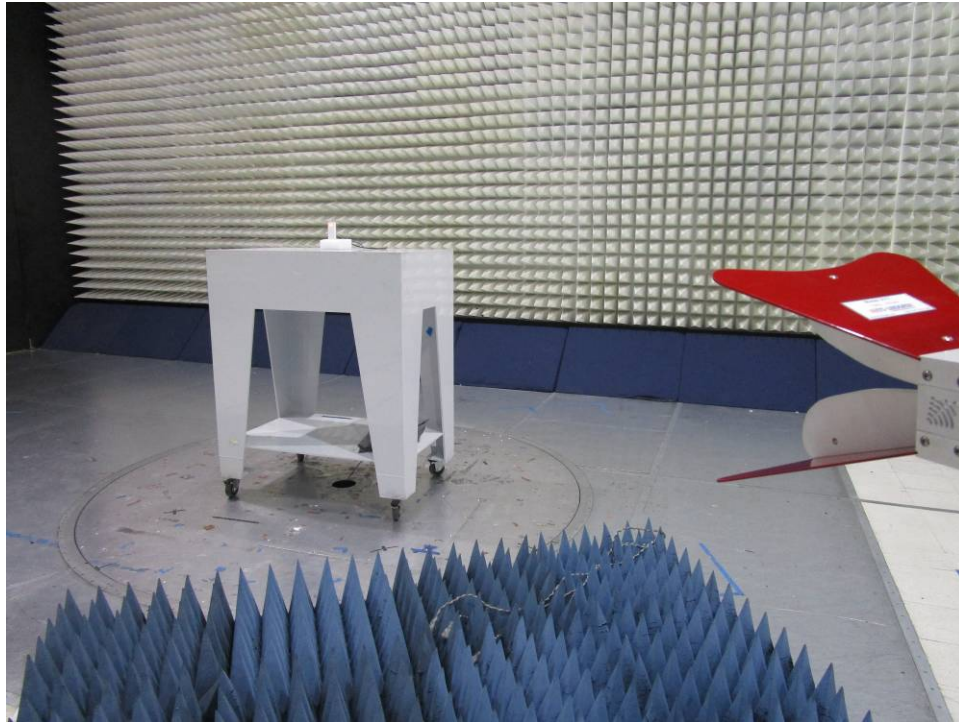
A1.3 Result:

The sample tested was found to comply.

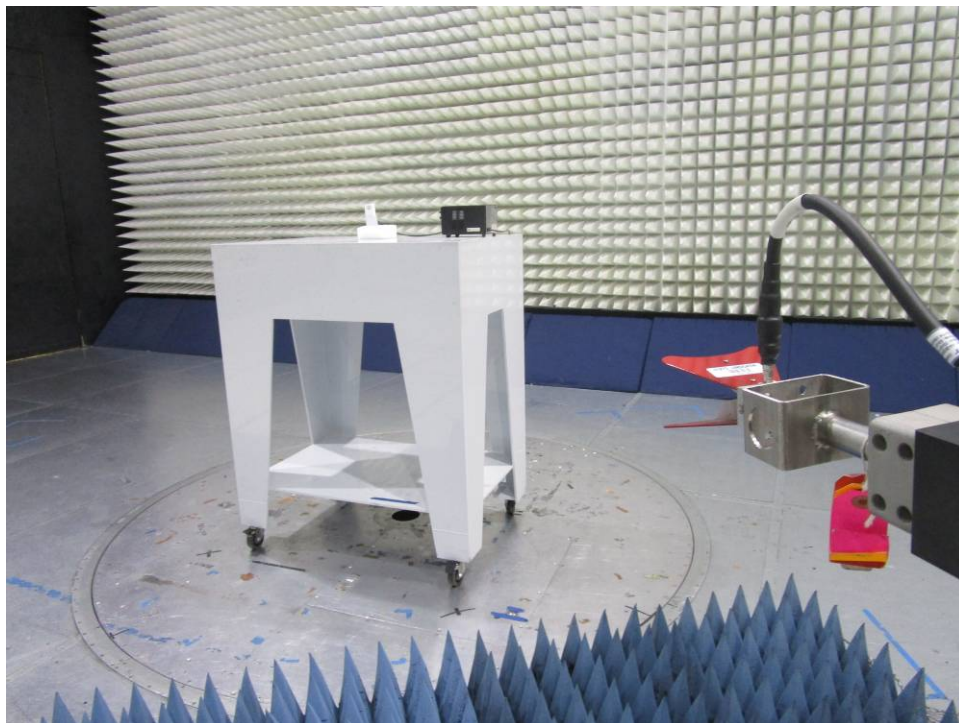
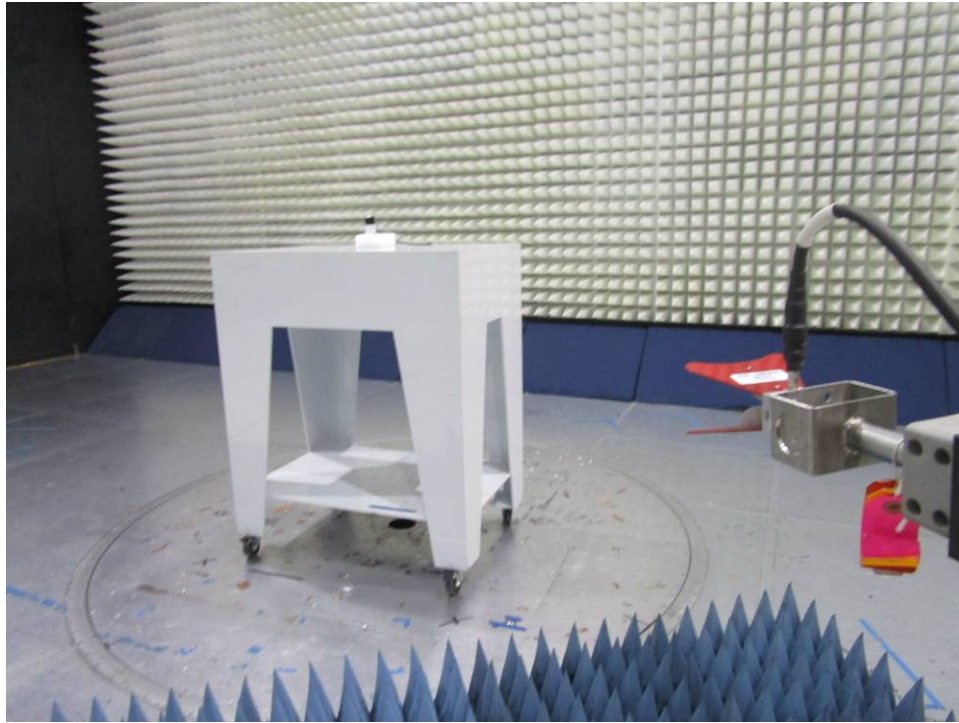
A1.4 Photographs:



A1.4 Photographs (continued):

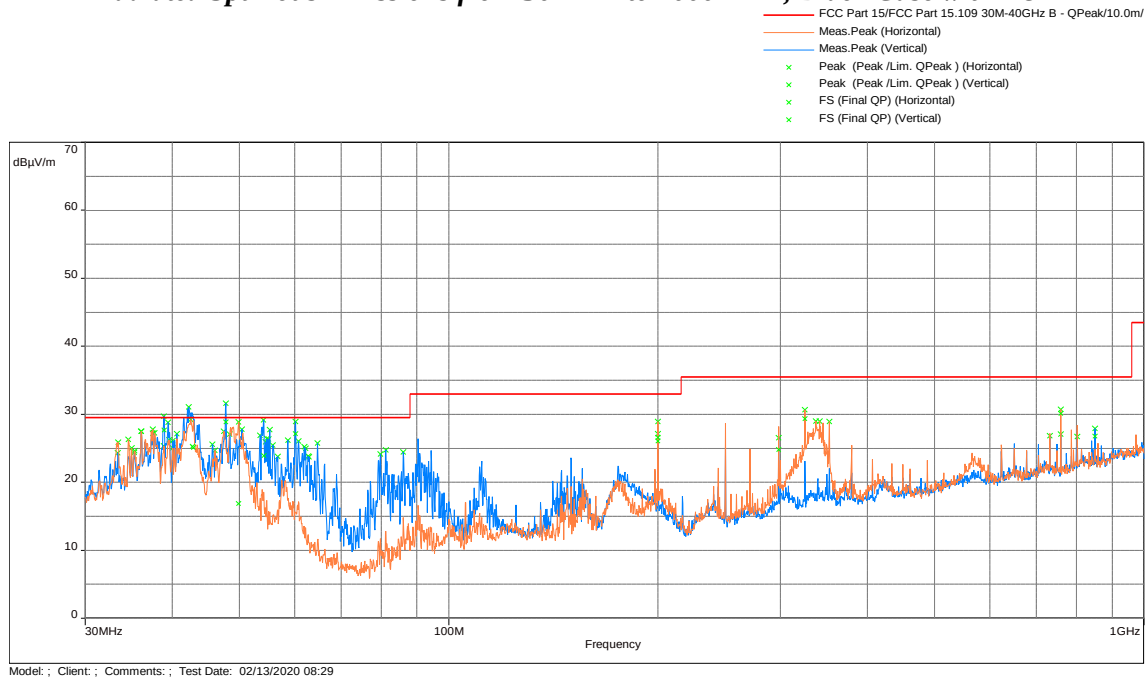


A1.4 Photographs (continued):



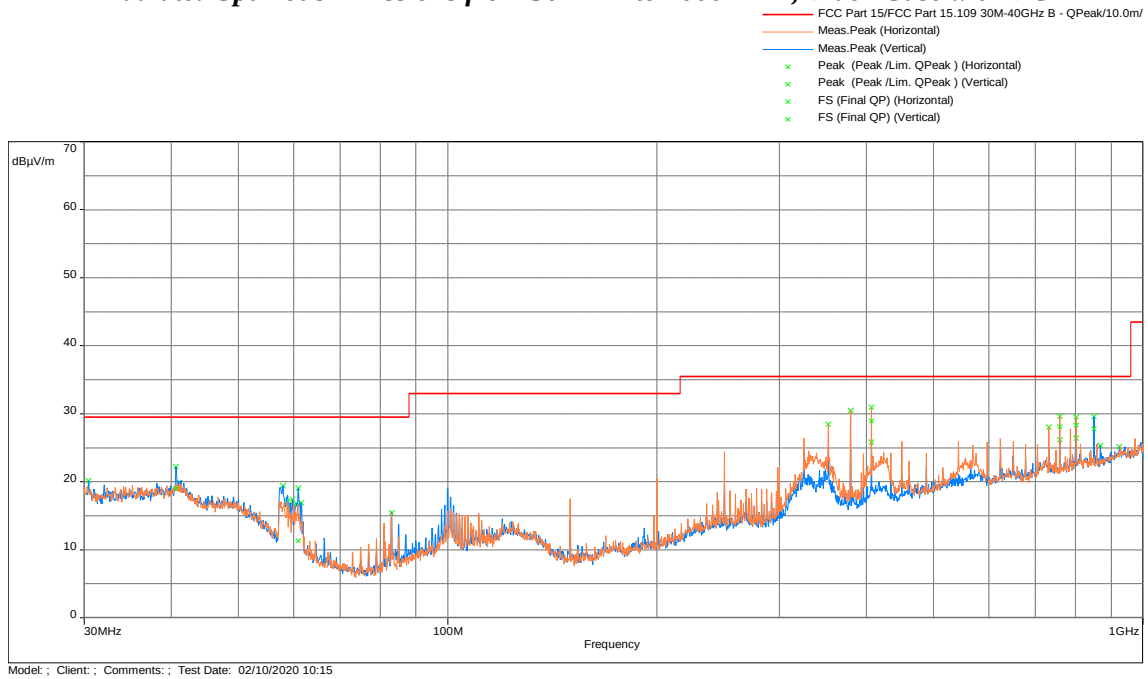
A1.5 Test Data

Radiated Spurious Emissions from 30 MHz to 1000 MHz, Black Case with POE



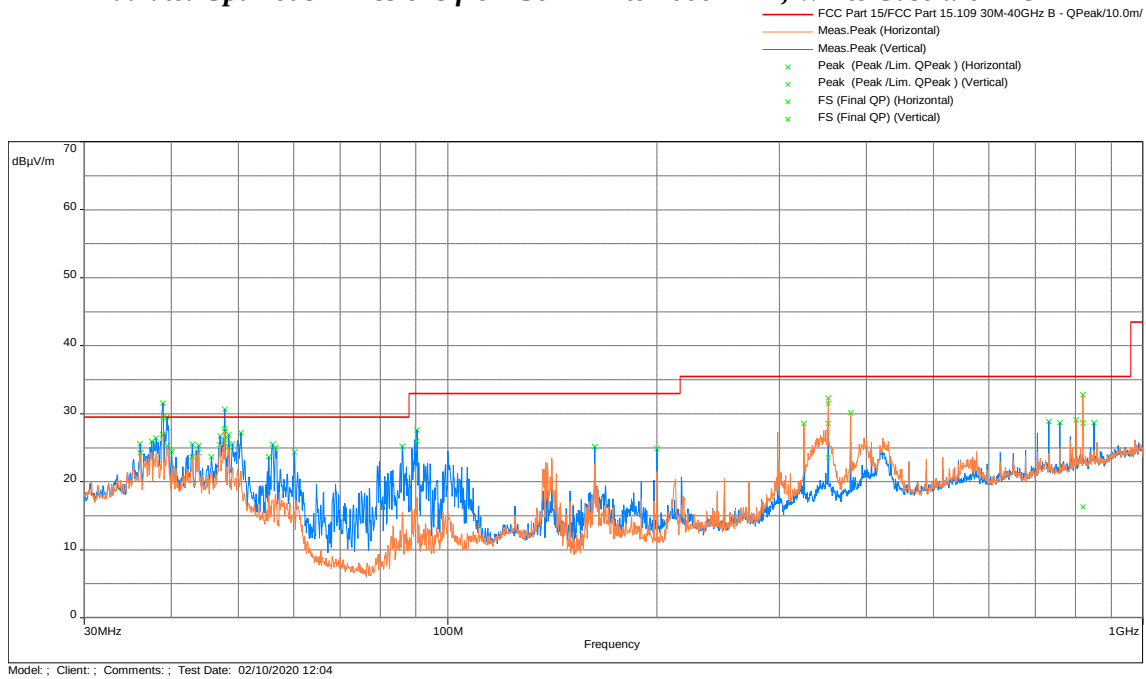
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
38.958	27.7	29.5	-1.8	301.5	4	Vertical	34.8	-7.1
42.810	25.3	29.5	-4.2	178.25	2.01	Vertical	32.3	-7.2
42.947	25.1	29.5	-4.4	247.25	1.97	Horizontal	32.2	-7.3
47.803	28.9	29.5	-0.6	310	4	Vertical	37.0	-8.2
49.829	16.9	29.5	-12.6	338	3.64	Horizontal	26.0	-9.1
54.173	23.9	29.5	-5.6	256.75	1	Vertical	36.3	-12.4
60.203	27.2	29.5	-2.4	338.25	2.97	Vertical	42.8	-15.7
199.985	26.6	33	-6.4	53.75	3.64	Horizontal	41.0	-14.4
199.984	26.0	33	-7.0	0	1	Vertical	40.5	-14.4
298.318	24.8	35.5	-10.7	3	1.08	Vertical	35.1	-10.3
325.438	29.4	35.5	-6.2	153.25	1.9	Horizontal	39.0	-9.6
759.372	30.1	35.5	-5.4	350	1.05	Horizontal	33.1	-3.0
849.919	26.8	35.5	-8.7	34	1.85	Vertical	28.4	-1.6

Radiated Spurious Emissions from 30 MHz to 1000 MHz, Black Case with DC



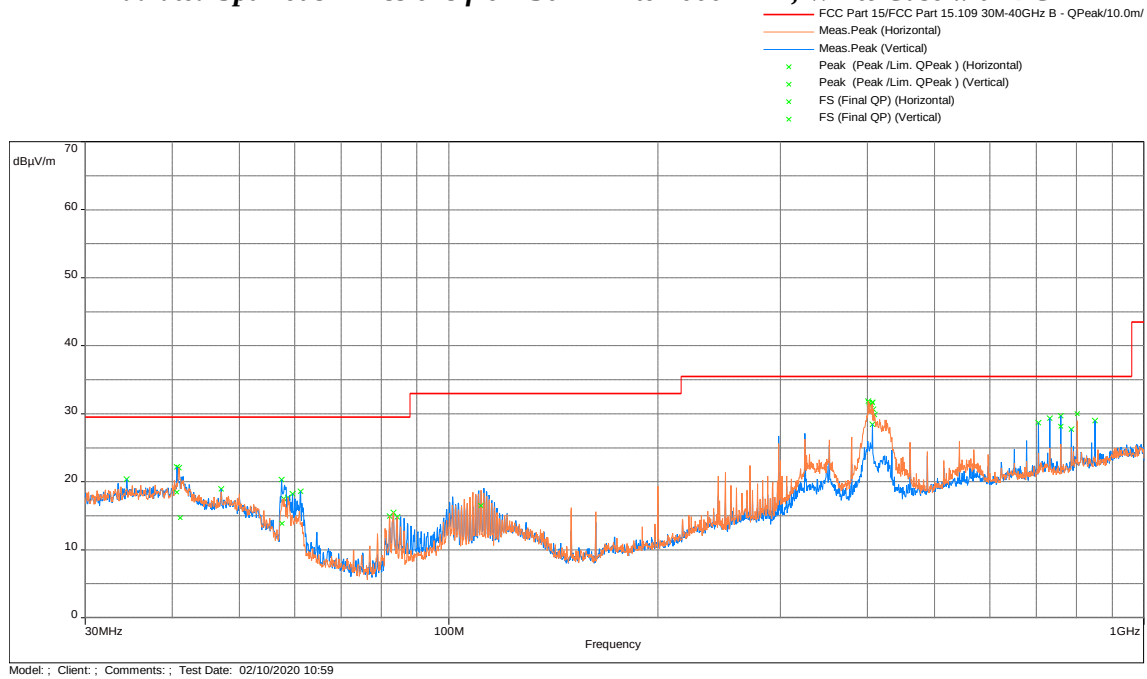
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
40.669	19.0	29.5	-10.5	107.25	1.2	Vertical	26.0	-7.0
60.972	11.3	29.5	-18.2	193	2.64	Vertical	27.3	-16.0
406.796	28.9	35.5	-6.6	65	1.73	Horizontal	36.3	-7.4
759.369	28.1	35.5	-7.4	359	1.08	Horizontal	31.1	-3.0
801.792	28.3	35.5	-7.2	199	1.3	Horizontal	30.2	-1.9
849.952	27.8	35.5	-7.8	45.5	1.88	Vertical	29.4	-1.6

Radiated Spurious Emissions from 30 MHz to 1000 MHz, White Case with POE



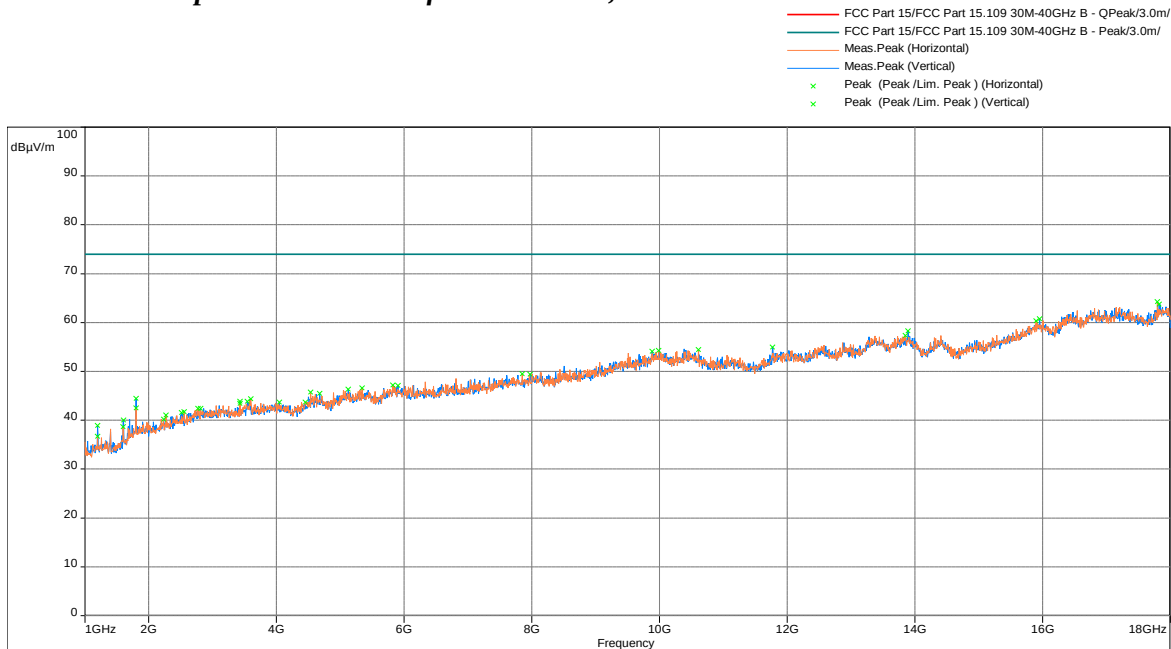
Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
38.961	29.3	29.5	-0.2	181.25	3.96	Vertical	36.4	-7.1
47.803	27.9	29.5	-1.6	187	2.99	Vertical	36.0	-8.2
47.806	26.1	29.5	-3.4	72.25	2.22	Horizontal	34.3	-8.2
90.371	26.0	33	-7.0	344	1.46	Vertical	42.2	-16.2
352.565	23.6	35.5	-11.9	161	4	Vertical	32.7	-9.1
352.546	31.5	35.5	-4.0	139.25	2.39	Horizontal	40.6	-9.2

Radiated Spurious Emissions from 30 MHz to 1000 MHz, White Case with DC

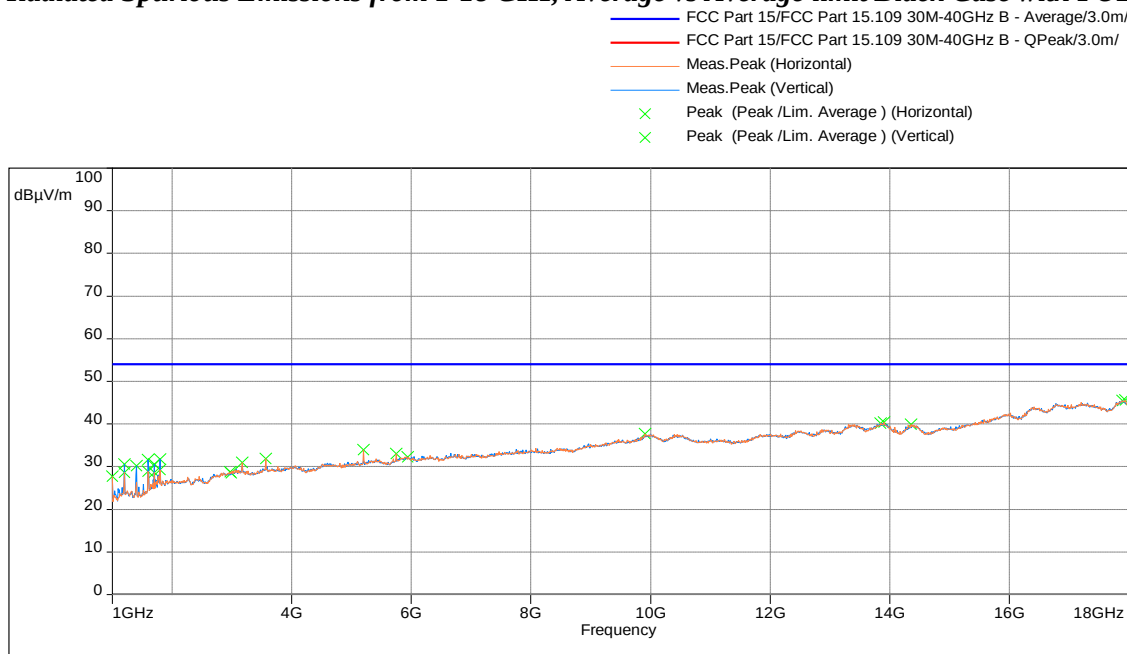


Freq (MHz)	FS @10m dB(uV/m)	Limit dB(uV/m)	Margin (dB)	Azimuth (Deg)	Height (m)	Polarity	RA@10m (dBuV)	Correction (dB)
40.660	18.5	29.5	-11.0	116.5	1.52	Vertical	25.5	-7.0
41.104	14.7	29.5	-14.8	204.75	1.56	Horizontal	21.7	-7.0
57.596	13.9	29.5	-15.6	193	2.9	Vertical	28.4	-14.6
111.255	16.5	33	-16.5	12	4	Horizontal	30.7	-14.2
406.804	31.7	35.5	-3.8	306.25	1.97	Horizontal	39.1	-7.4
759.354	28.1	35.5	-7.4	30.5	2.14	Vertical	31.1	-3.0
801.818	30.0	35.5	-5.5	291.75	1.41	Horizontal	31.9	-1.9

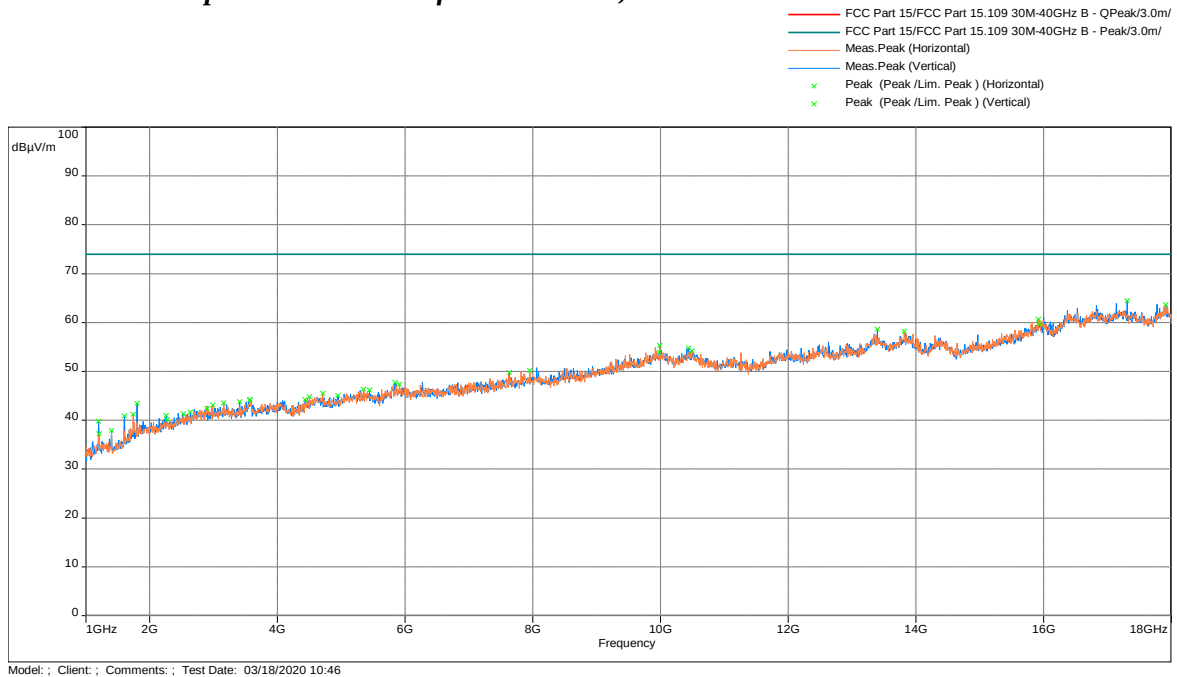
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit Black Case with POE



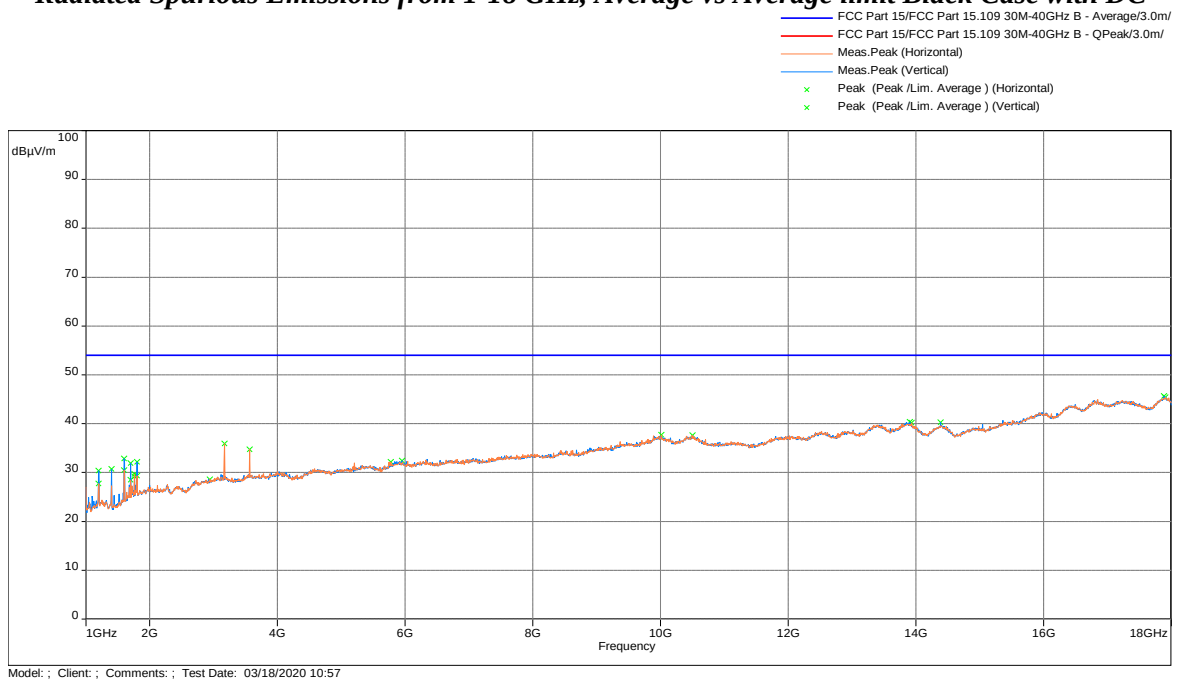
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit Black Case with POE



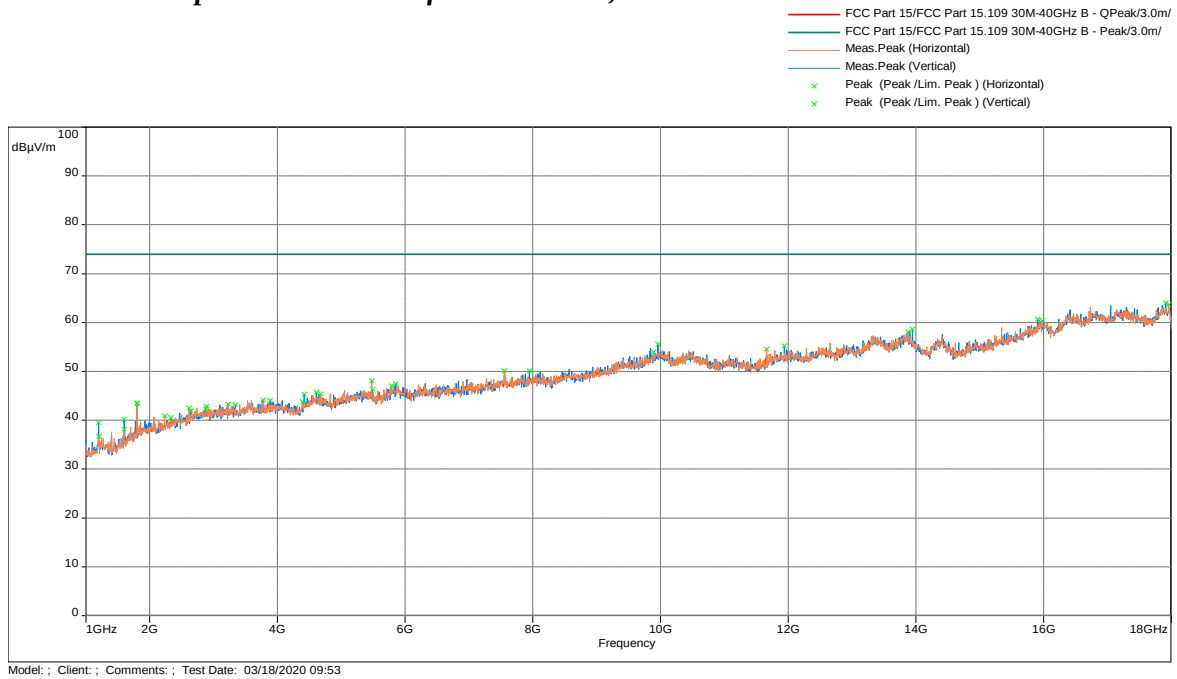
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit Black Case with DC



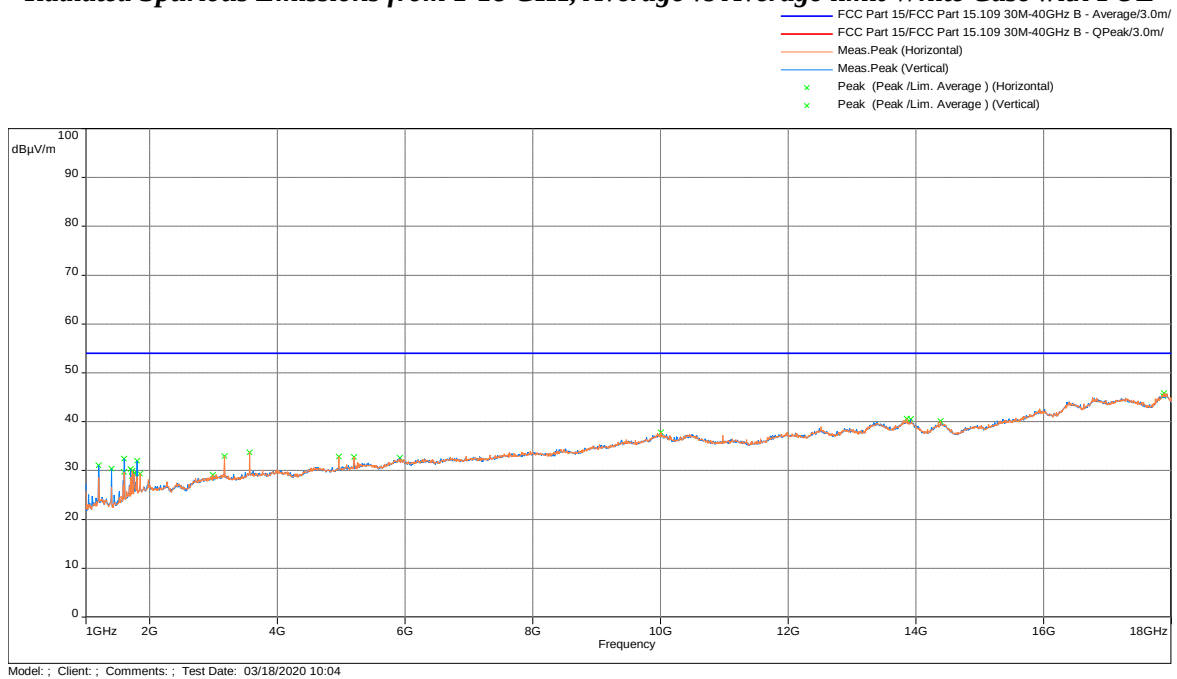
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit Black Case with DC



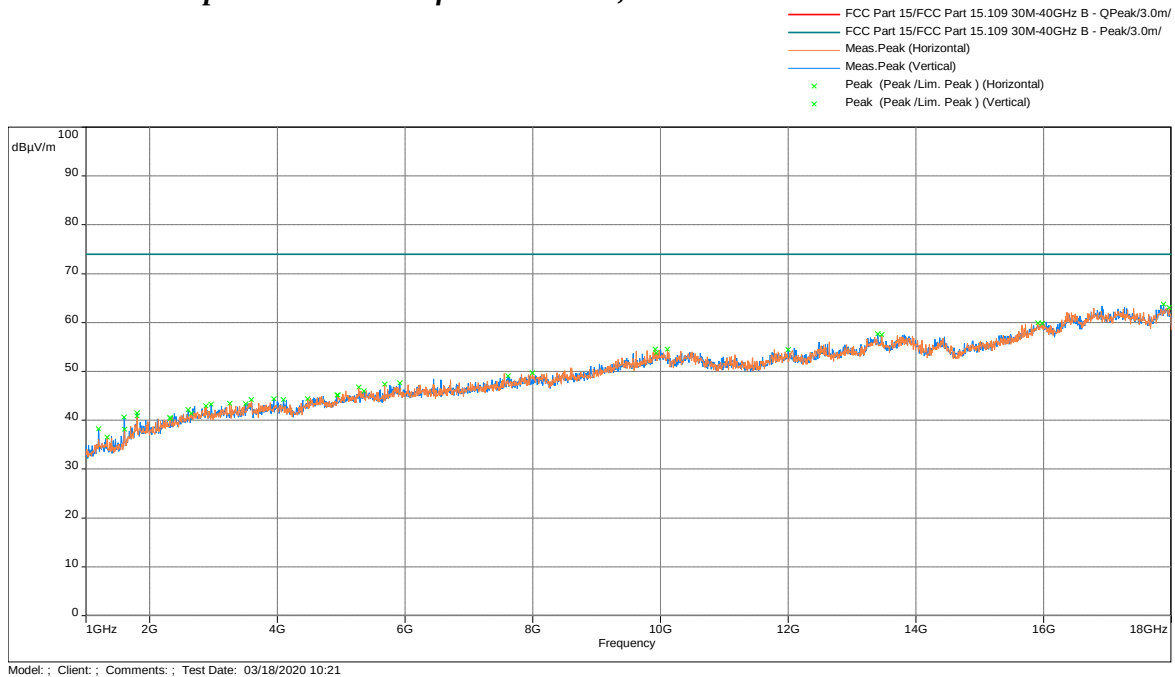
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit White Case with POE



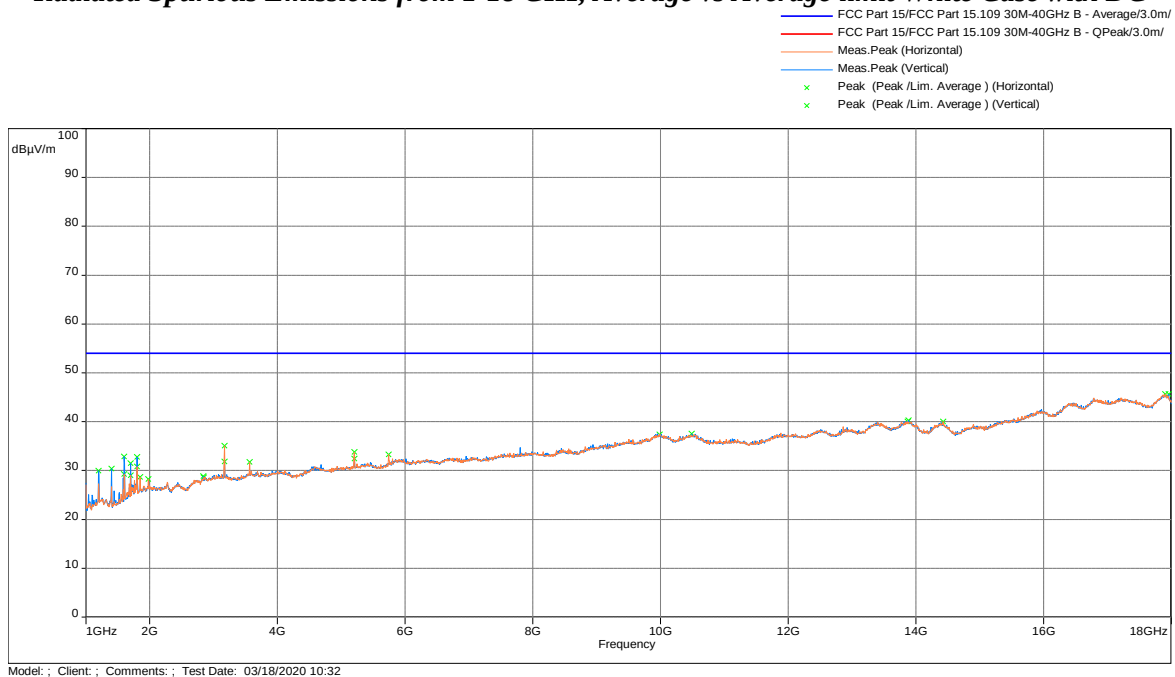
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with POE



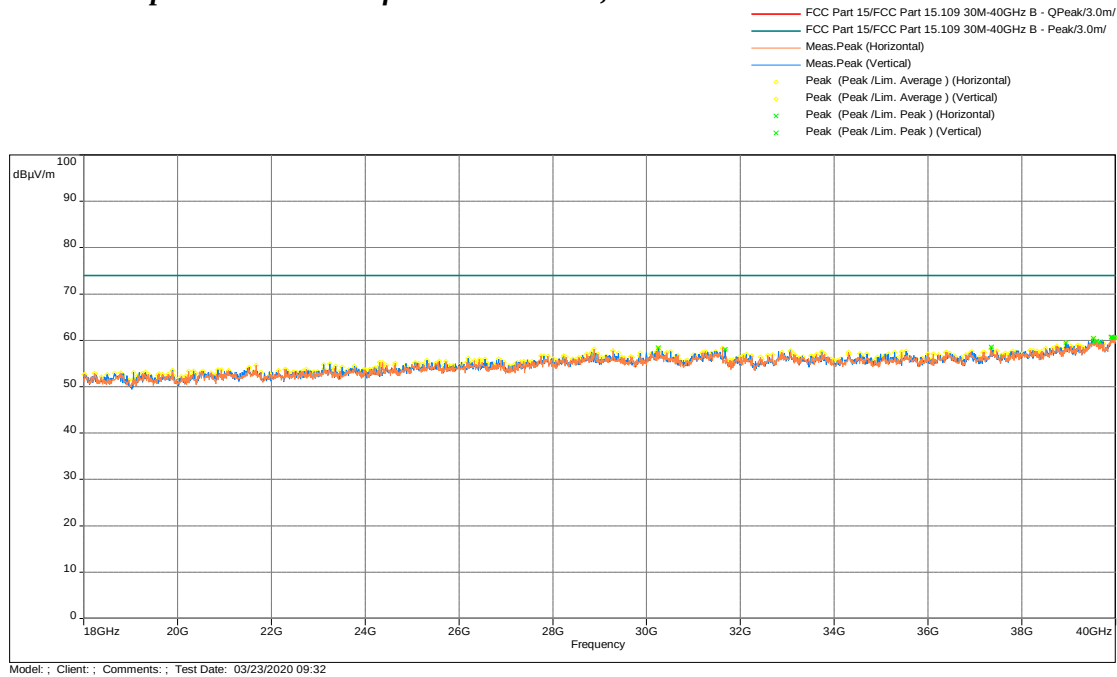
Radiated Spurious Emissions from 1-18 GHz, Peak vs Peak limit White Case with DC



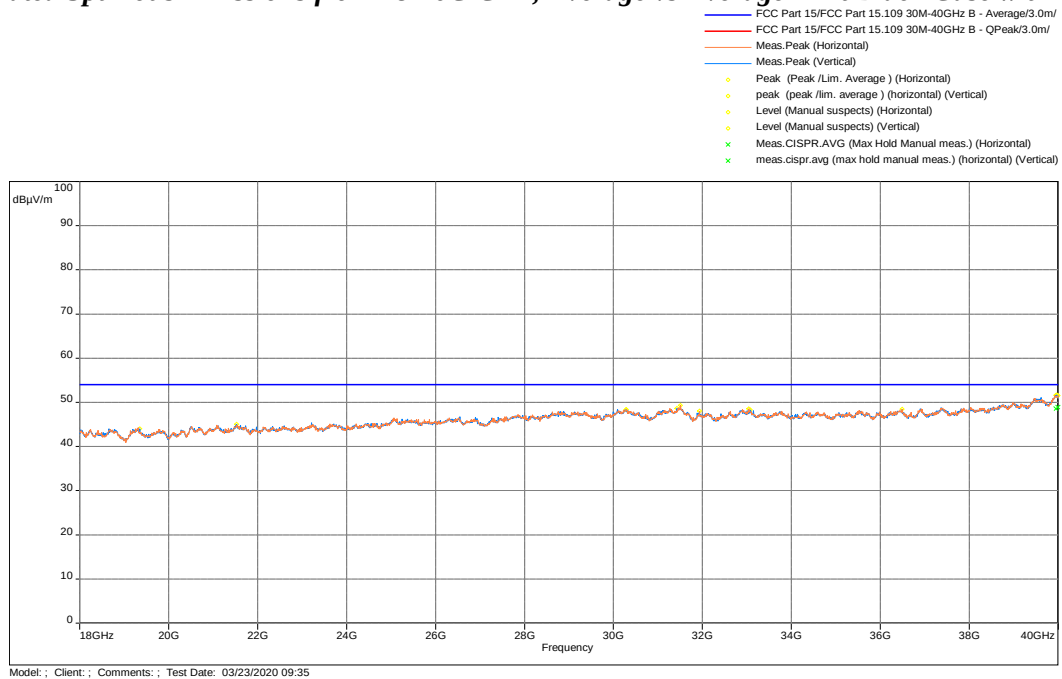
Radiated Spurious Emissions from 1-18 GHz, Average vs Average limit White Case with DC



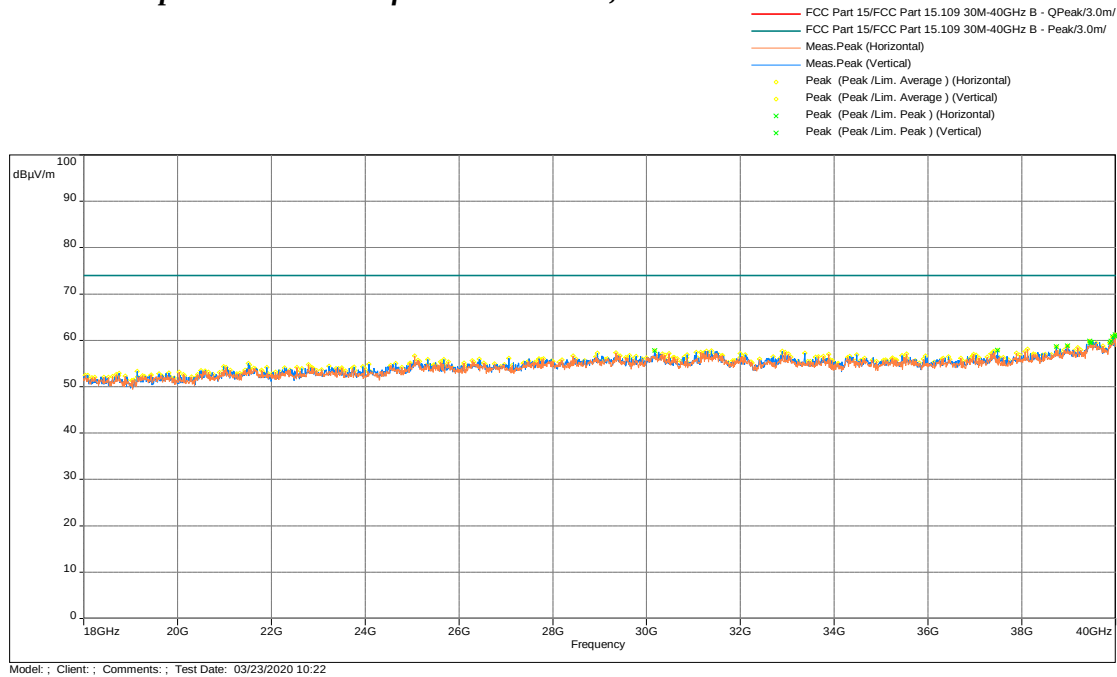
Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit Black Case with POE



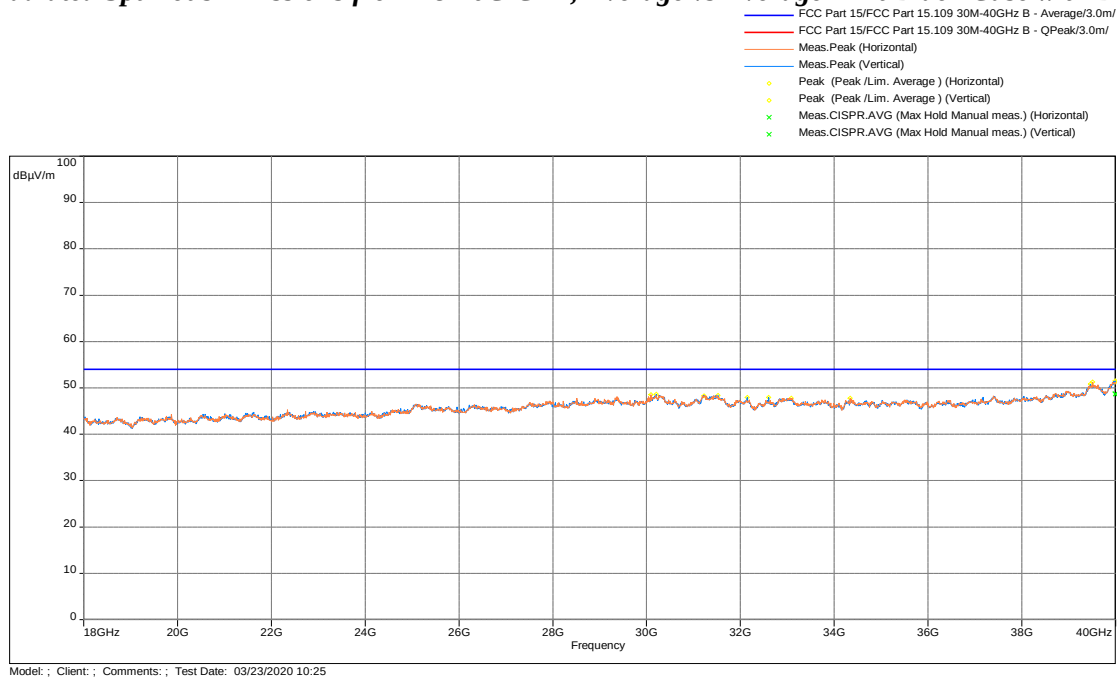
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit Black Case with POE



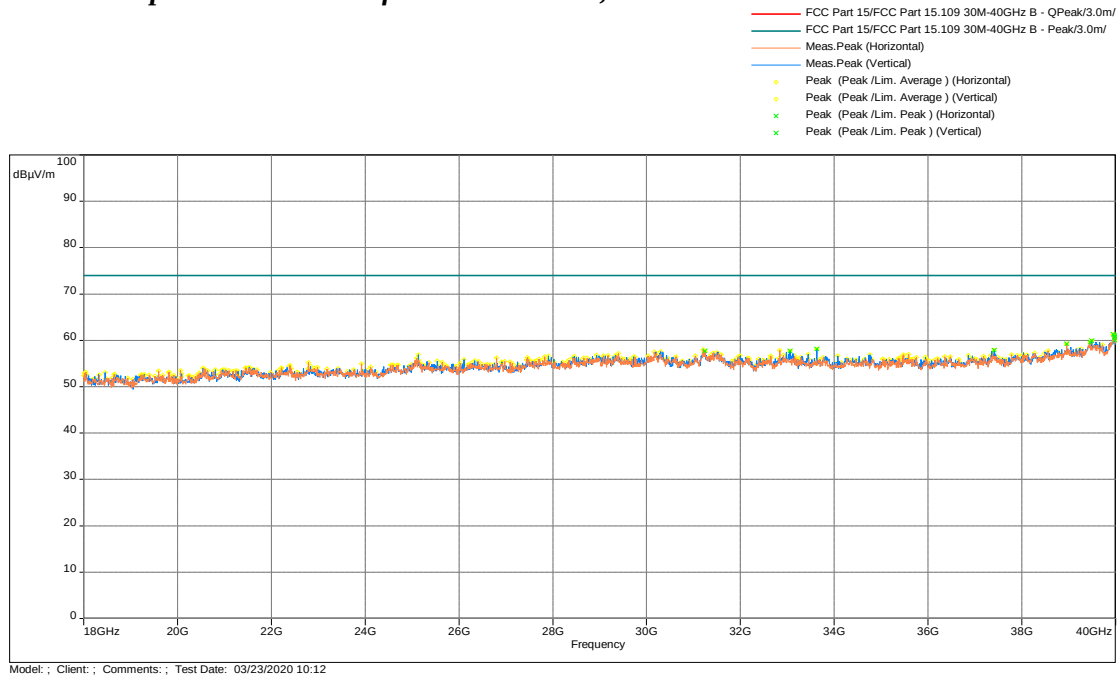
Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit Black Case with DC



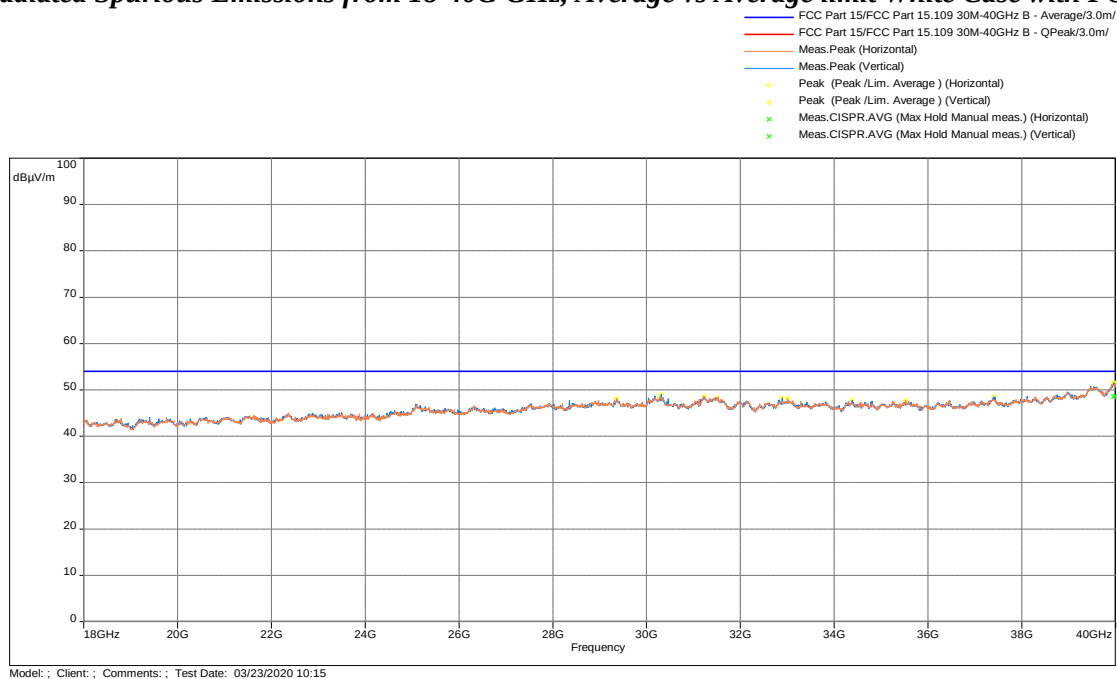
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit Black Case with DC



Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit White Case with POE



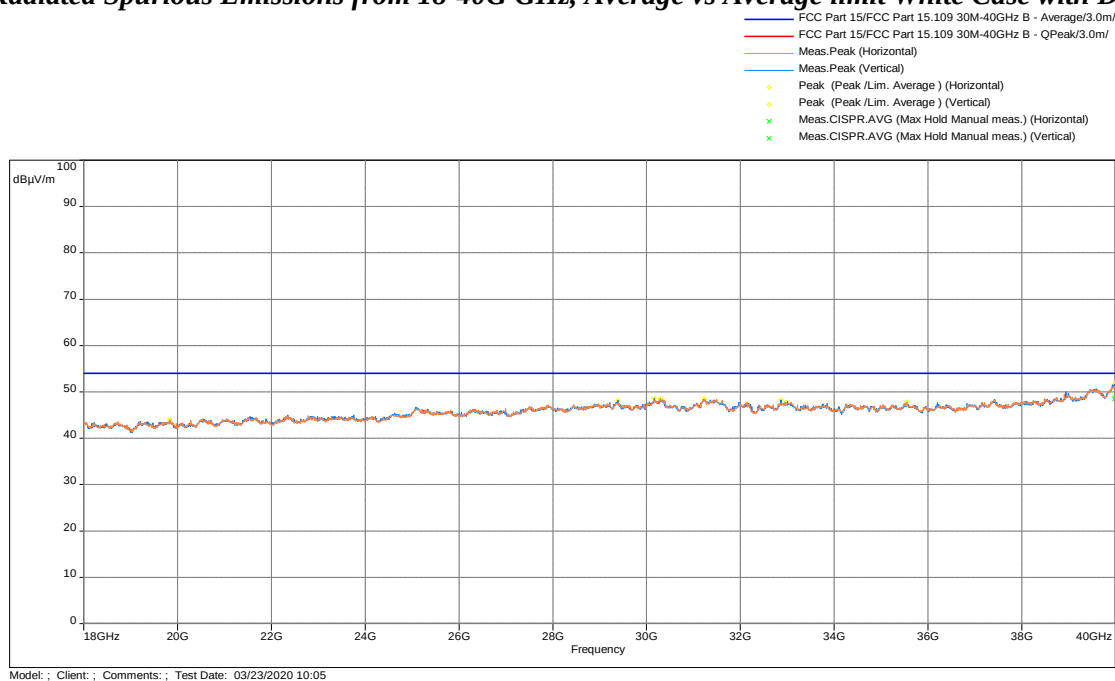
Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit White Case with POE



Radiated Spurious Emissions from 18-40G GHz, Peak vs Peak limit White Case with DC



Radiated Spurious Emissions from 18-40G GHz, Average vs Average limit White Case with DC



Result Complies by 0.2 dB

END OF REPORT