

TEST REPORT

Report Number: 104685526MPK-003
Project Number: G104685526
Report Issue Date: December 29, 2021

Testing performed on
AgeLOC LumiSpa iO
Model Number: LS2R

FCC ID: 2AZ3A-LS2R
IC: 26225-LS2R

to

FCC Part 15 Subpart C (15.247)
ISED RSS-247 Issue 2

For

NSE Products, Inc.

Test Performed by:
Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:
NSE Products, Inc.
75 W Center St
Provo, UT 84601 USA

Prepared by: 
Aaron Chang

Date: December 29, 2021

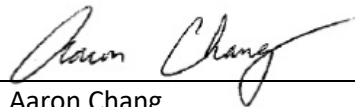
Reviewed by: 
Krishna K Vemuri

Date: December 29, 2021

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Report No. 104685526MPK-003	
Equipment Under Test:	AgeLOC LumiSpa iO
Model Number:	LS2R
Applicant:	NSE Products, Inc.
Contact:	Spencer Jarvis
Address:	NSE Products, Inc. 75 W Center St Provo, UT 84601
Country:	USA
Email:	sjarvis@nuskin.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) ISED RSS-247 Issue 2
Date of Test:	November 22, 2021 to December 1, 2021

We attest to the accuracy of this report:



Aaron Chang
Senior Project Engineer



Krishna K Vemuri
EMC Manager

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1.0 Summary of Tests

Test	Reference FCC	Reference Industry Canada	Result
RF Output Power	15.247(b)(3)	RSS-247, 5.4.d)	Complies
6 dB Bandwidth	15.247(a)(2)	RSS-247, 5.2.a)	Complies
Power Density	15.247(e)	RSS-247, 5.2.b)	Complies
Out of Band Antenna Conducted Emission	15.247(d)	RSS-247, 5.5	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-247, 5.5	Complies
AC Line Conducted Emission	15.207	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies (Internal Antenna)

EUT receive date: November 22, 2021

EUT receive condition: The pre-production version of 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 22, 2021

Test completion date: December 1, 2021

The test results in this report pertain only to the item tested.

2.0 General Information

2.1 Product Description

NSE Products, Inc. supplied the following description of the EUT:

NSE Products, inc. ageLOC LumiSpa iO is a facial cleaning device.

For more information, see user's manual provided by the manufacturer.

This test report covers only the 2.4GHz BLE radio.

Information about the 2.4 GHz radio is presented below:

Applicant	NSE Products, Inc.
Model No.	LS2R
FCC Identifier	2AZ3A-LS2R
IC Identifier	26225-LS2R
Type of transmission	Digital Transmission System (DTS)
Rated RF Output	0.8 dBm
Antenna(s) & Gain	Internal Antenna, Gain: 2.0 dBi
Frequency Range	2402 – 2480 MHz
Type of modulation/data rate	GFSK / 1Mbit/s
Number of Channel(s)	40
Applicant Name & Address	NSE Products, Inc. 75 W Center St Provo, UT 84601 USA

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

2.4 Test Methodology

Antenna conducted measurements were performed according to the FCC documents “Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247” (KDB 558074 D01 DTS Meas Guidance v05r02), and RSS-247 Issue 2, 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.

2.5 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 – 200 MHz	200 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	4.6	5.1 dB
AC mains conducted emissions	2.1 dB	-	-	-

3.0 System Test Configuration

3.1 Support Equipment

No support equipment was used.

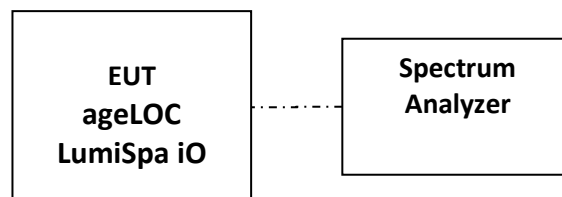
3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	Manufacturer	Model	Serial Number
Radiated Sample	NSE Products, Inc.	LS2R	12
Conducted Sample	NSE Products, Inc.	LS2R	26

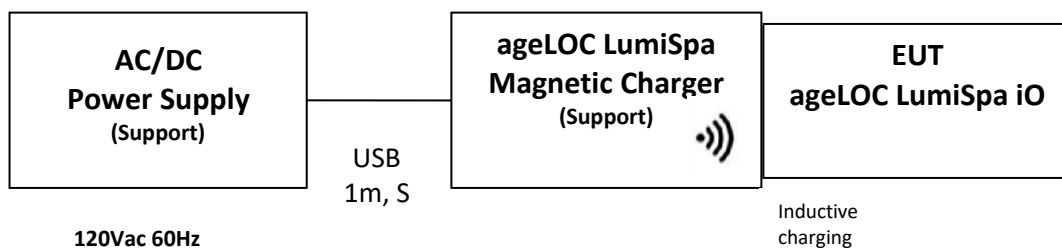
Support Equipment			
Description	Manufacturer	Model	Serial Number
AC/DC Adapter	Apple	ZC-F0504	1X91029Y459T
ageLOC LumiSpa Magnetic Charger	NSE Products, Inc. dba Nu Skin Enterprises	LS2MCF	Not labeled

Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.

Battery mode



Charging mode



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

EUT Photo



3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit. The highest clock frequency used in the EUT is 2.48 GHz.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by NSE Products, Inc.

3.5 Mode of Operation during Test

During the transmitter tests, the transmitter was setup to transmit maximum communication and RF power levels.

EUT was placed into transmit mode at the lowest (2402MHz) middle (2442MHz), and highest (2480MHz) channels.

3.6 Modifications Required for Compliance

No modifications were made by the manufacturer or Intertek to the EUT in order to bring the EUT into compliance.

3.7 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 6-dB Bandwidth and 99% Occupied Bandwidth FCC Rule: 15.247(a)(2); RSS-247, 5.2.a) and RSS-GEN;

4.1.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

4.1.2 Procedure

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

For FCC 6dB Channel Bandwidth the Procedure described in the FCC Publication KDB 558074 D01 Meas Guidance v05r02 was used to determine the DTS occupied bandwidth. Section 11.8.1 Option 1 of ANSI 63.10 was used.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

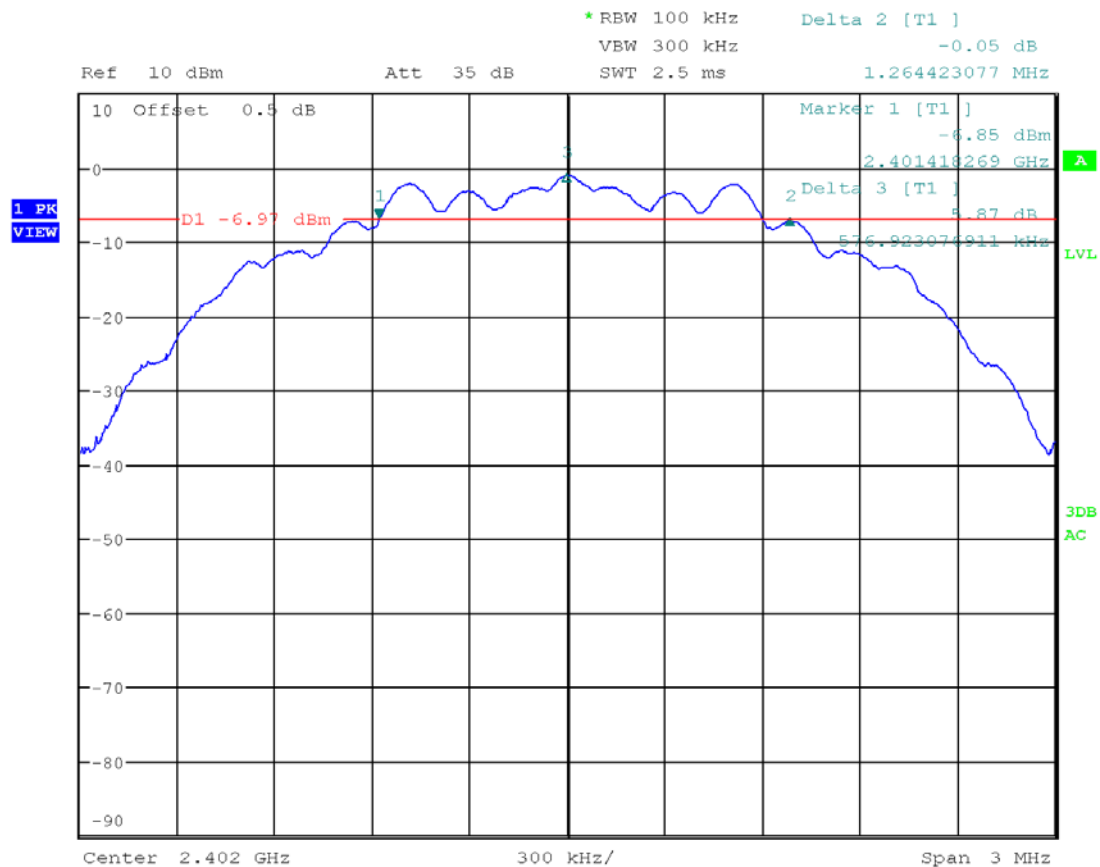
For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

4.1.3 Test Result

Frequency (MHz)	6-dB bandwidth FCC 15.247 MHz	Occupied bandwidth, RSS-GEN, MHz	Plot
2402	1.264	--	1.1
	--	2.058	1.4
2440	1.351	--	1.2
	--	2.067	1.5
2480	1.341	--	1.3
	--	2.067	1.6

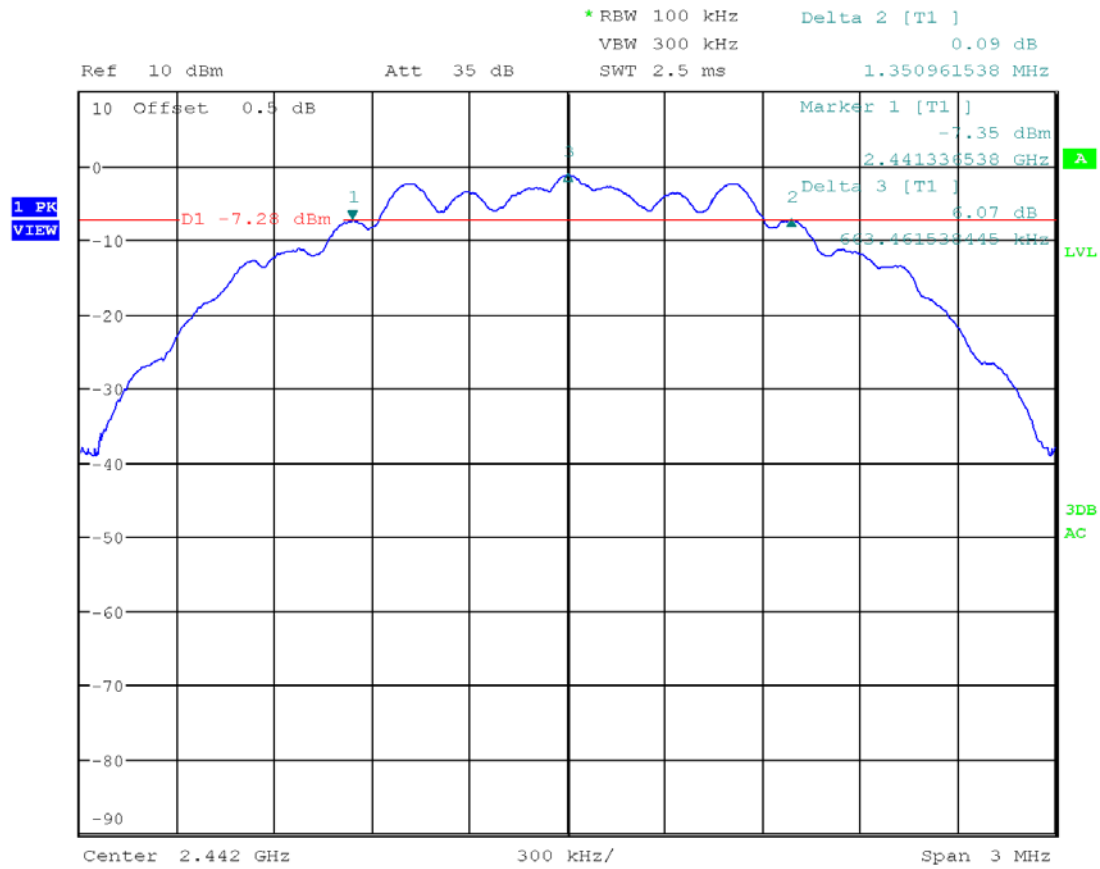
Tested By	Test Date	Results
Aaron Chang	November 23, 2021	Complies

Plot 1. 1



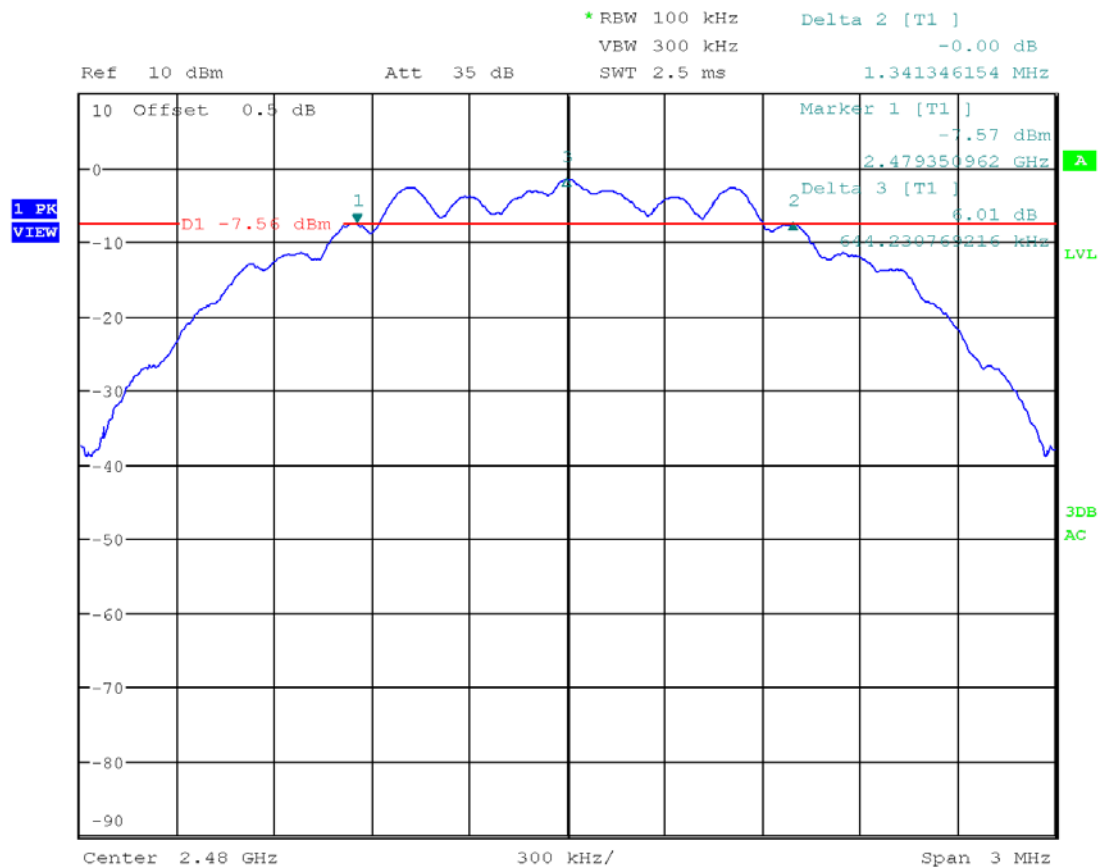
Date: 23.NOV.2021 22:11:02

Plot 1. 2



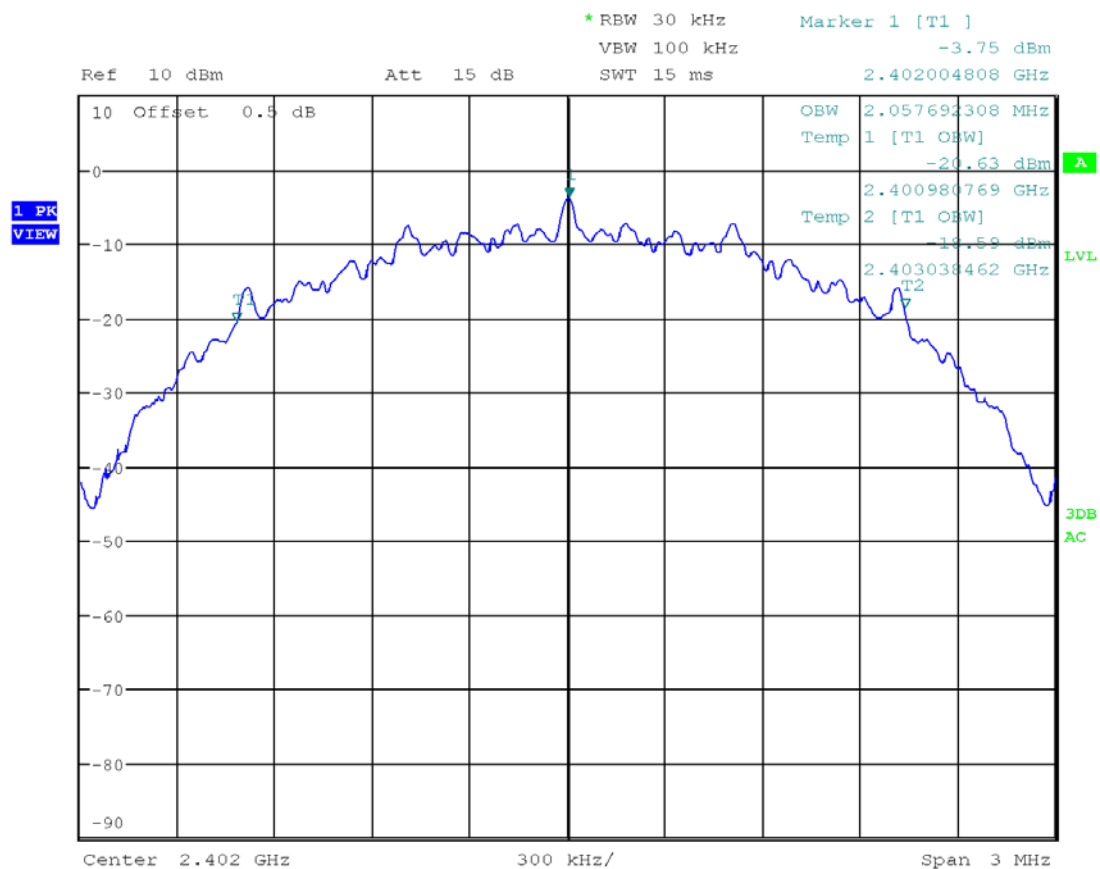
Date: 23.NOV.2021 22:06:48

Plot 1. 3



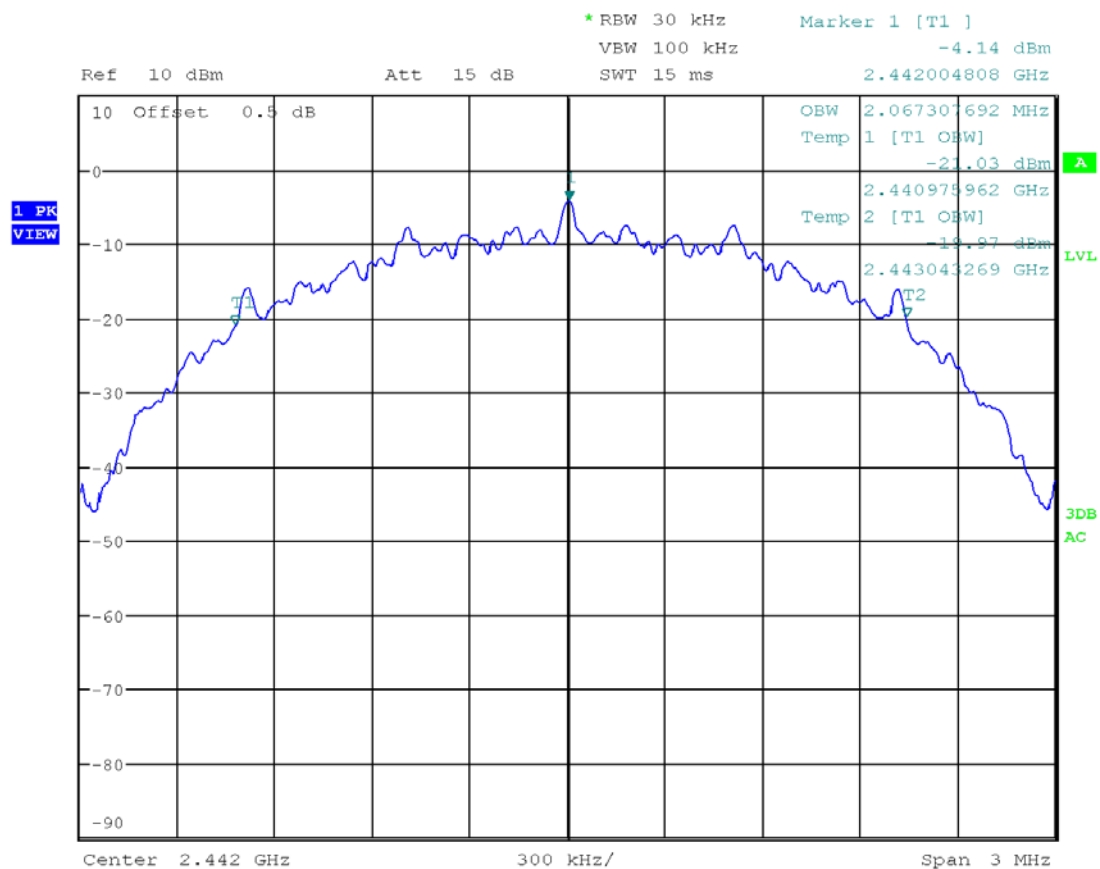
Date: 23.NOV.2021 22:08:06

Plot 1. 4



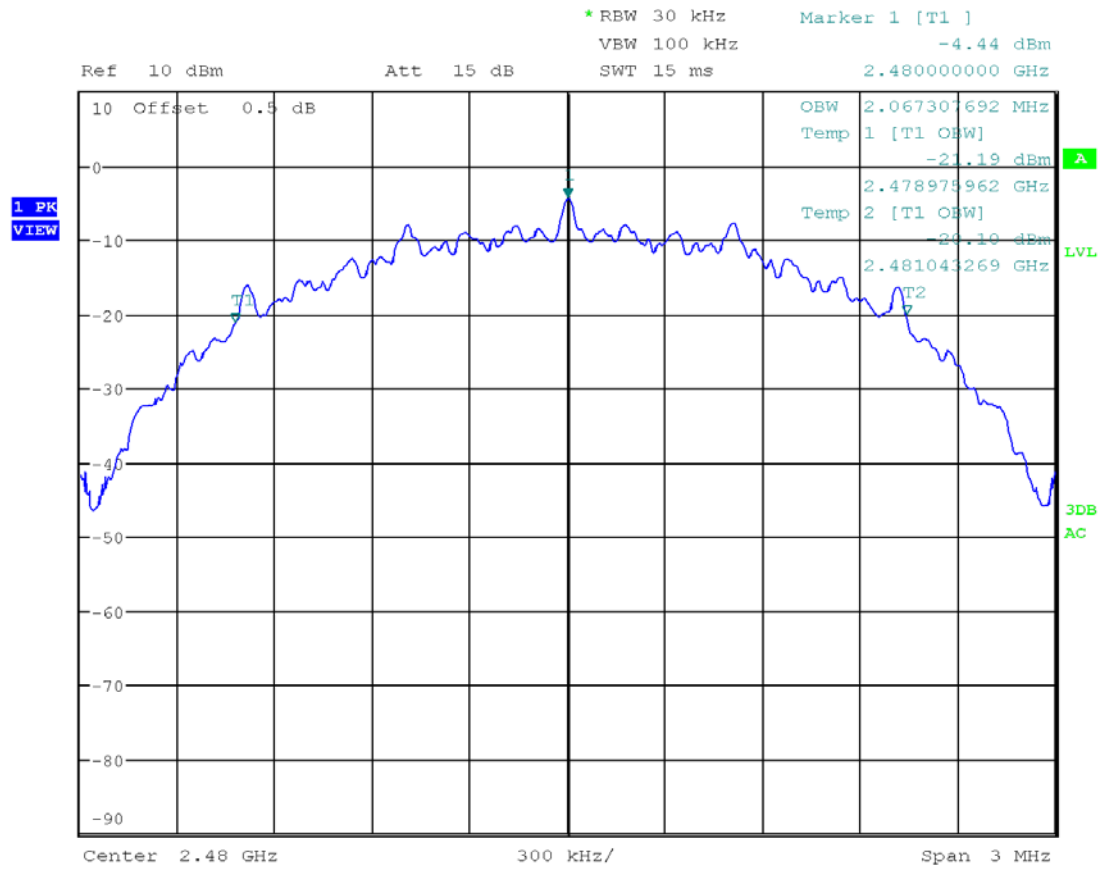
Date: 23.NOV.2021 22:12:17

Plot 1.5



Date: 23.NOV.2021 22:13:24

Plot 1.6



Date: 23.NOV.2021 22:14:07

Results

Complies

4.2 Maximum Peak Conducted Output Power at Antenna Terminals FCC Rule: 15.247(b)(3); RSS-247, 5.4.d);

4.2.1 Requirement

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.

4.2.2 Procedure

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

1. Set the $RBW \geq DTS$ Bandwidth
2. Set the $VBW \geq 3 \times RBW$
3. Set the span $\geq 3 \times RBW$
4. Detector = Peak
5. Sweep time = Auto couple
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.

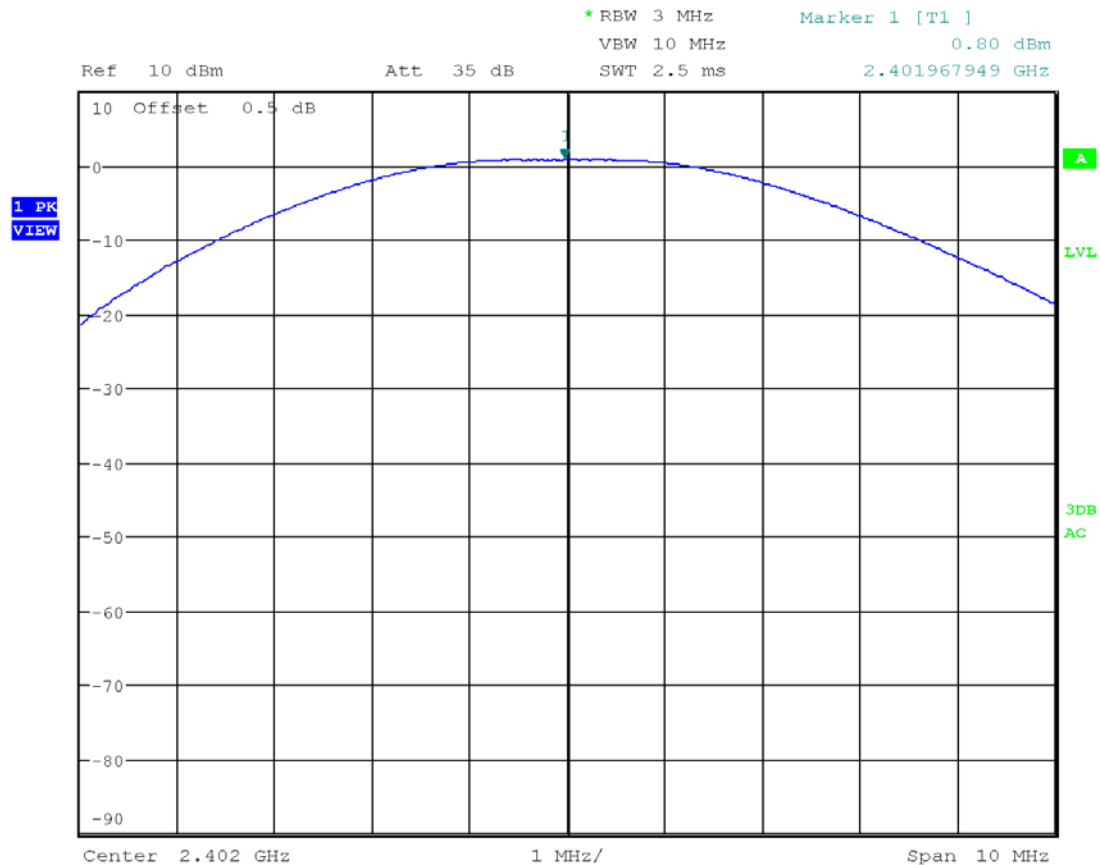
4.2.3 Test Result

Refer to the following plots 2.1 – 2.3 for the test details.

Frequency	Conducted Power (peak)		Plot
	dBm	mW	
2402	0.80	1.20	2.1
2442	0.48	1.12	2.2
2480	0.26	1.06	2.3

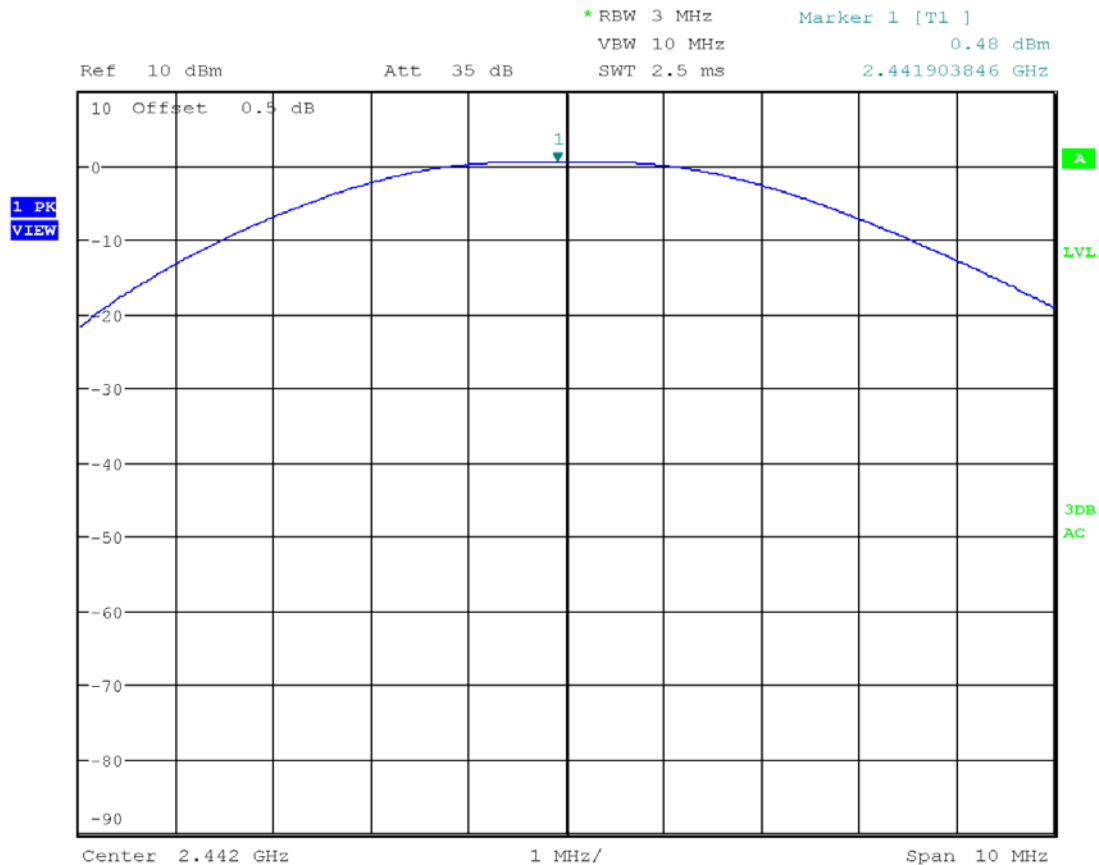
Tested By	Test Date	Results
Aaron Chang	November 23, 2021	Complies

Plot 2.1



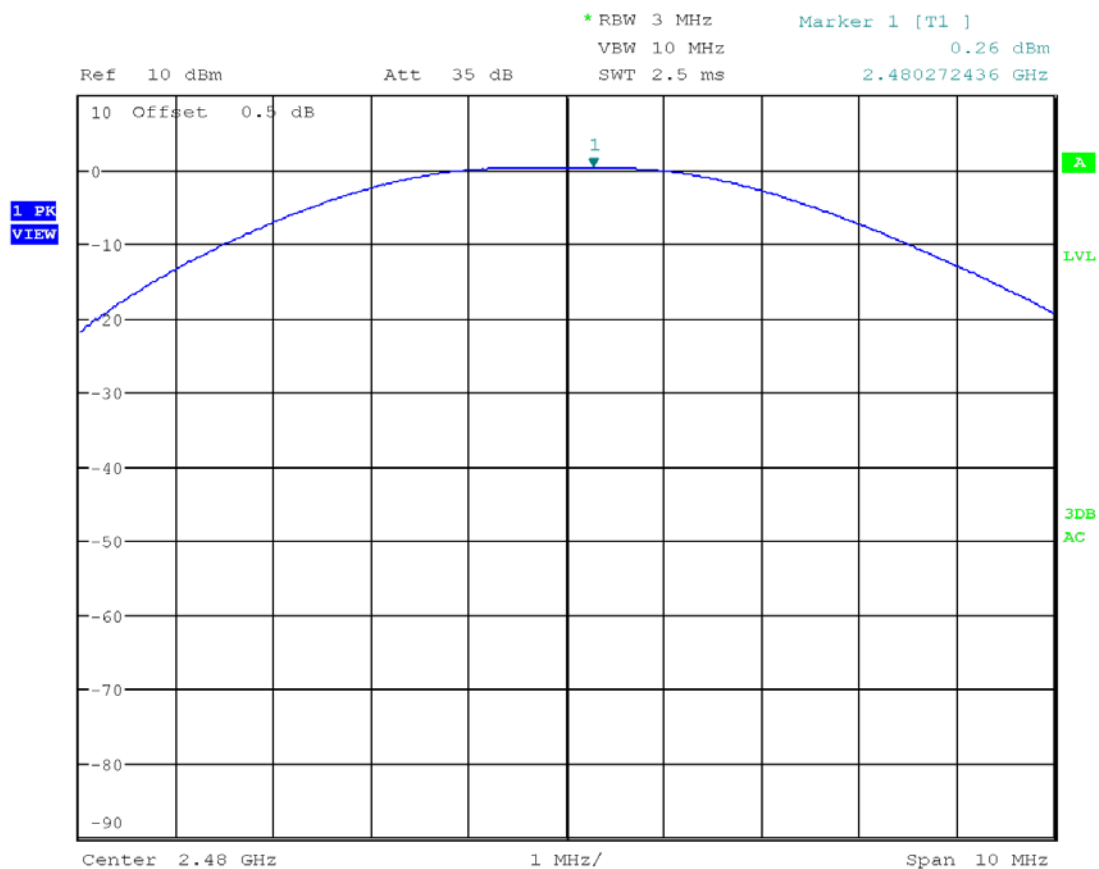
Date: 23.NOV.2021 22:01:02

Plot 2. 2



Date: 23.NOV.2021 22:01:49

Plot 2. 3



Date: 23.NOV.2021 22:02:16

Results

Complies

4.3 Maximum Power Spectral Density FCC: 15.247 (e); RSS-247, 5.2.b);

4.3.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Procedure

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

The procedure described in FCC Publication KDB 558074 D01 Meas Guidance v05r02, specifically section 11.10.2 Method PKPSD (peak PSD) of ANSI 63.10.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the *DTS bandwidth*.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

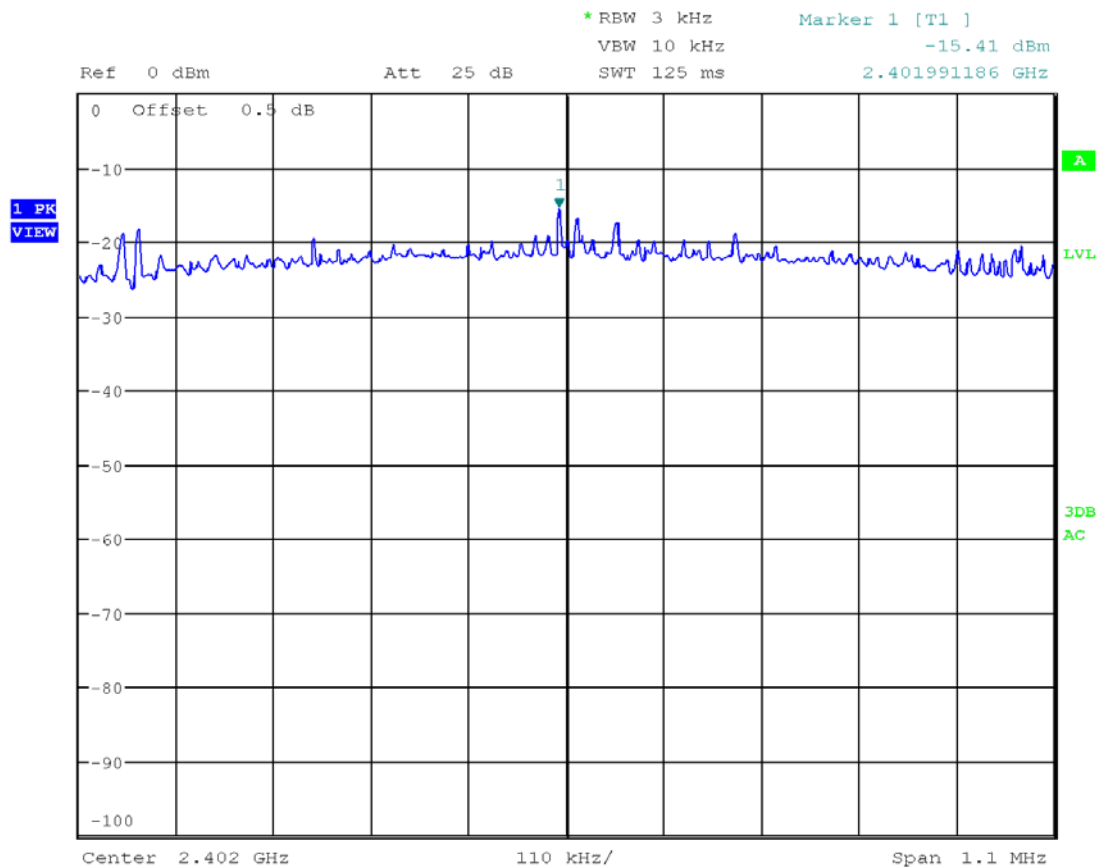
4.3.3 Test Result

Refer to the following plots for the test result

Frequency, MHz	Maximum Power Spectral Density, dBm	Maximum Power Spectral Density Limit, dBm	Margin, dB	Plot
2402	-15.41	8.0	-23.41	3.1
2440	-16.87	8.0	-24.87	3.2
2480	-16.36	8.0	-24.36	3.3

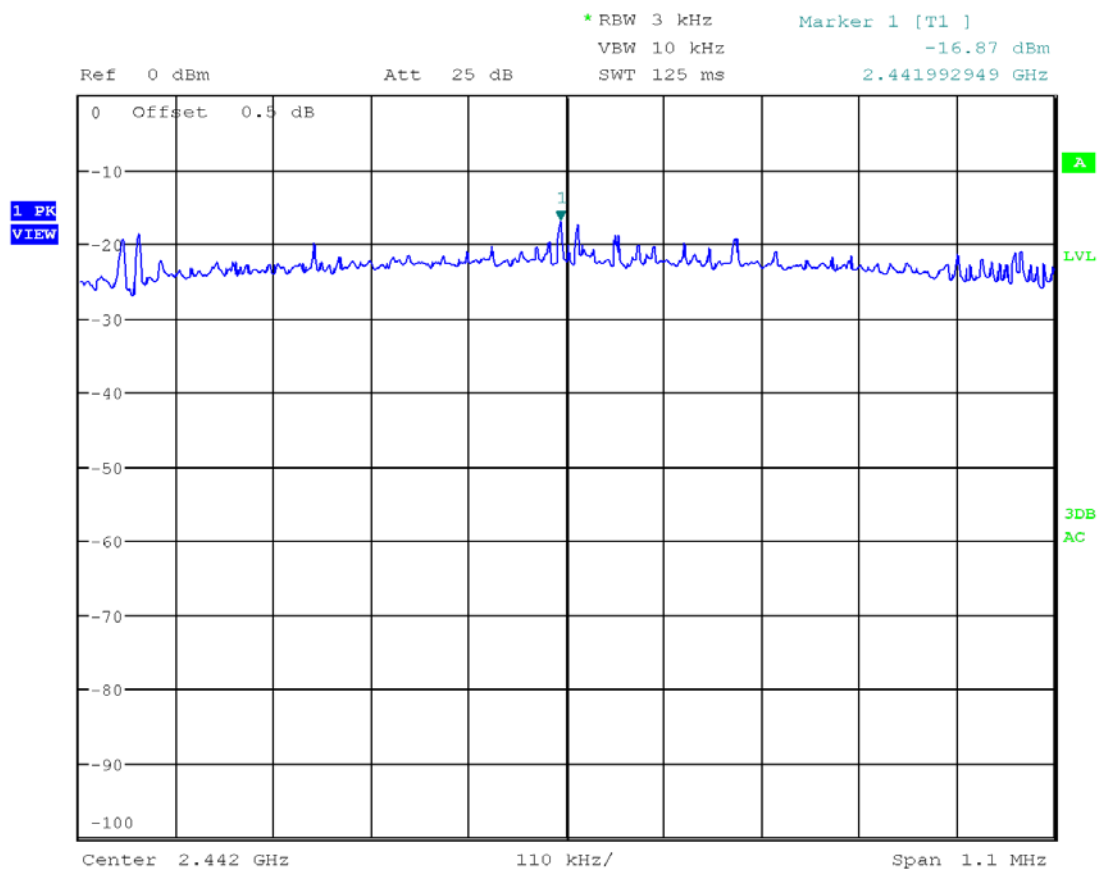
Tested By	Test Date	Results
Aaron Chang	November 23, 2021	Complies

Plot 3.1



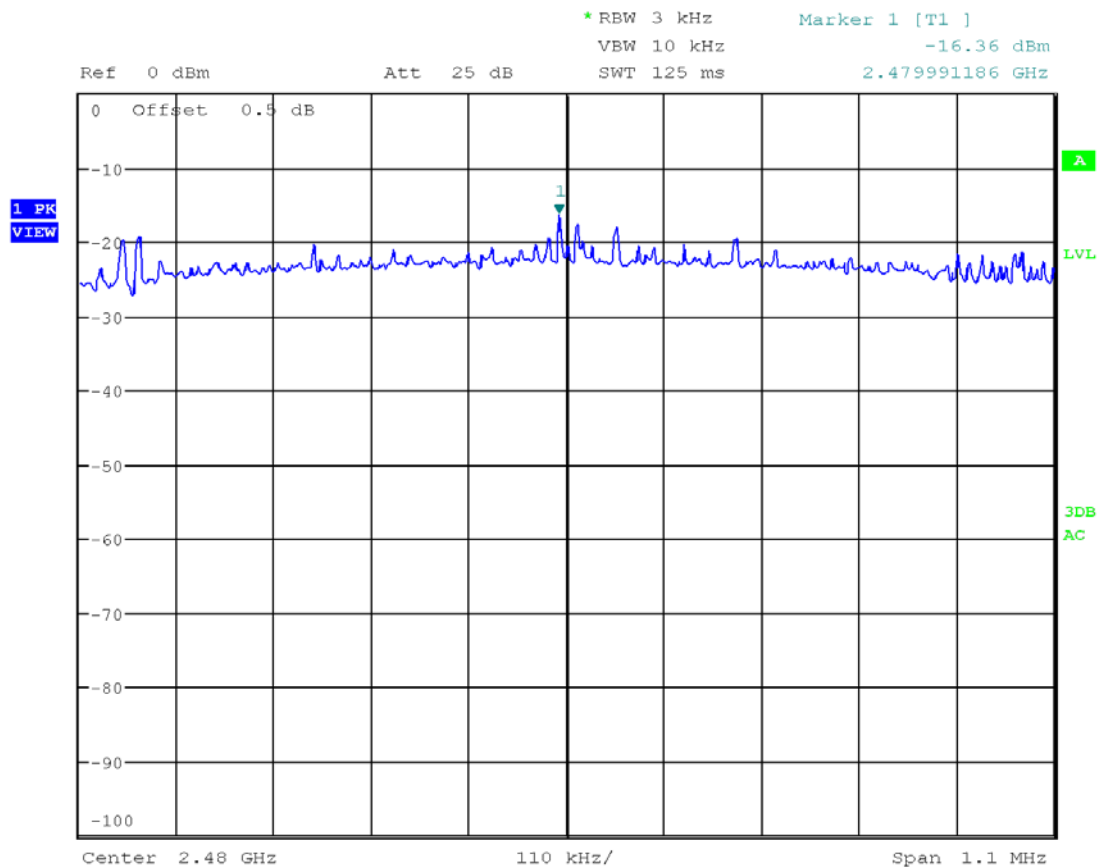
Date: 23.NOV.2021 22:04:18

Plot 3.2



Date: 23.NOV.2021 22:04:47

Plot 3.3



Date: 23.NOV.2021 22:03:37

Results

Complies

4.4 Out of Band Antenna Conducted Emission FCC: 15.247(d); RSS-247, 5.5;

4.4.1 Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

In addition, 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)

4.4.2 Procedure

The procedure described in FCC Publication KDB 558074 D01 Meas Guidance v05r02, specifically section 11.11 DTS Emissions in non-restricted frequency bands of ANSI 63.10.

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

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq 3 \times$ RBW.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

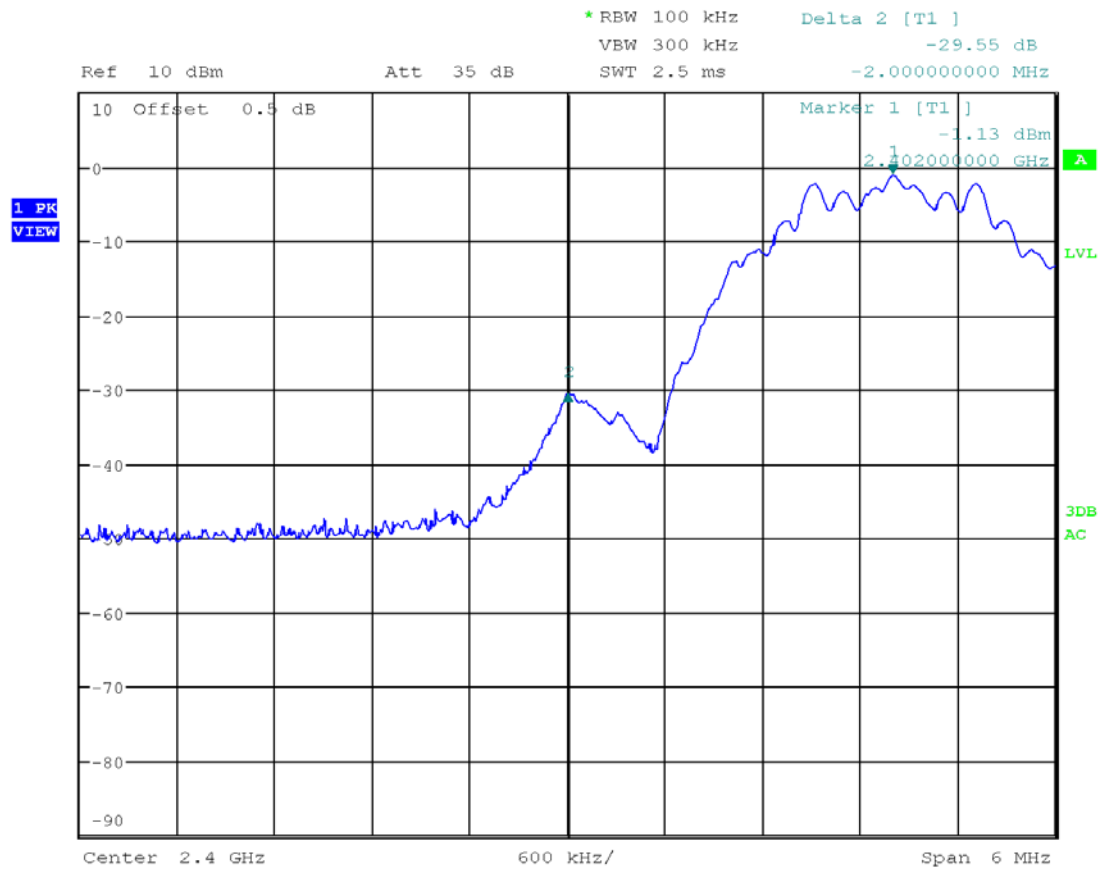
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

4.4.3 Test Result

Refer to the following plots 4.1 – 4.5 for unwanted conducted emissions. The plot shows -20dB attenuation limit line.

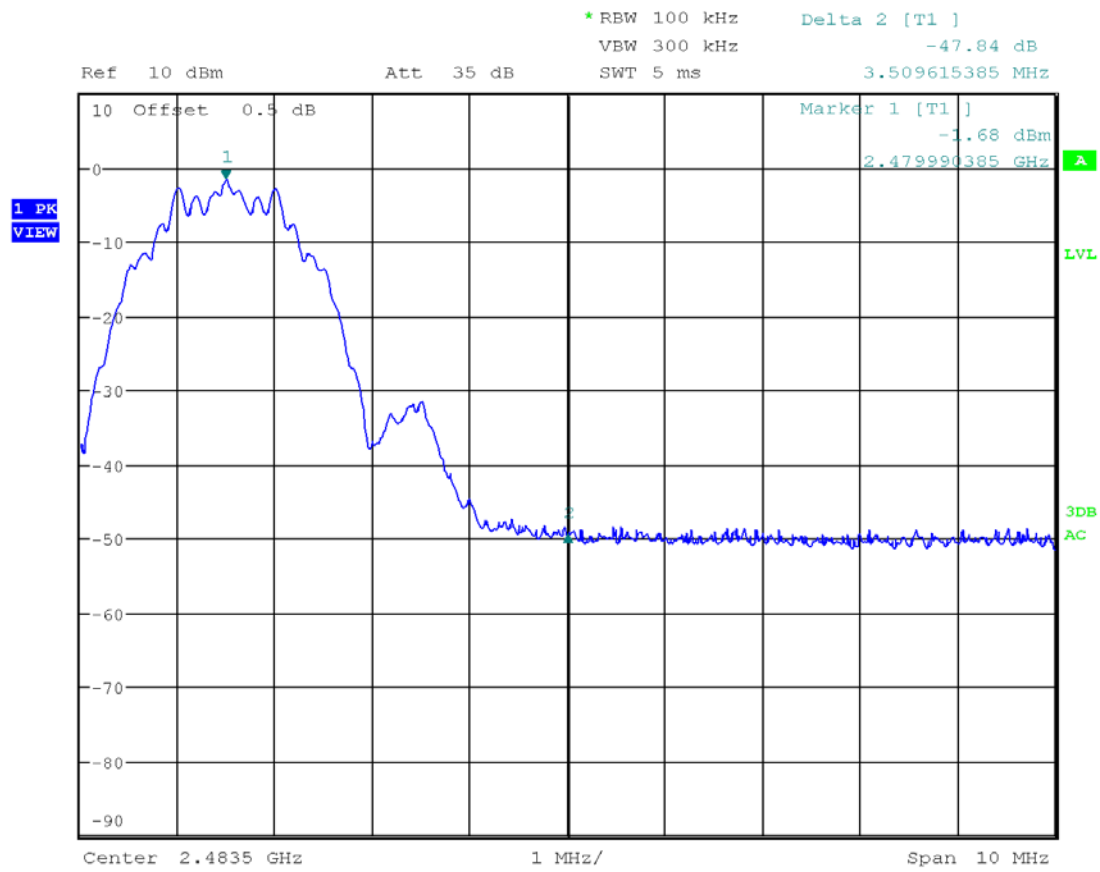
Tested By	Test Date	Results
Aaron Chang	November 23, 2021	Complies

Tx @ Low Channel, 2402 MHz Band Edge
Plot 4.1



Date: 23.NOV.2021 22:17:58

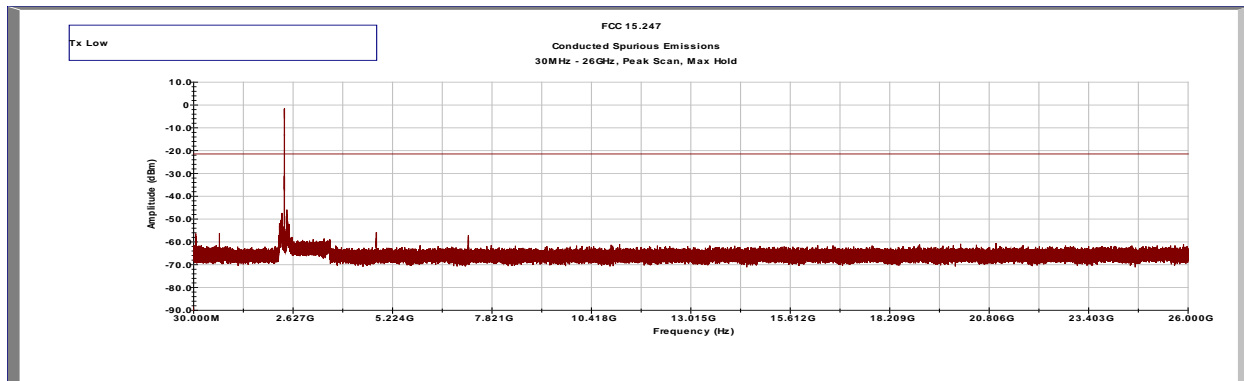
Tx @ High Channel, 2480 MHz Band Edge
Plot 4.2



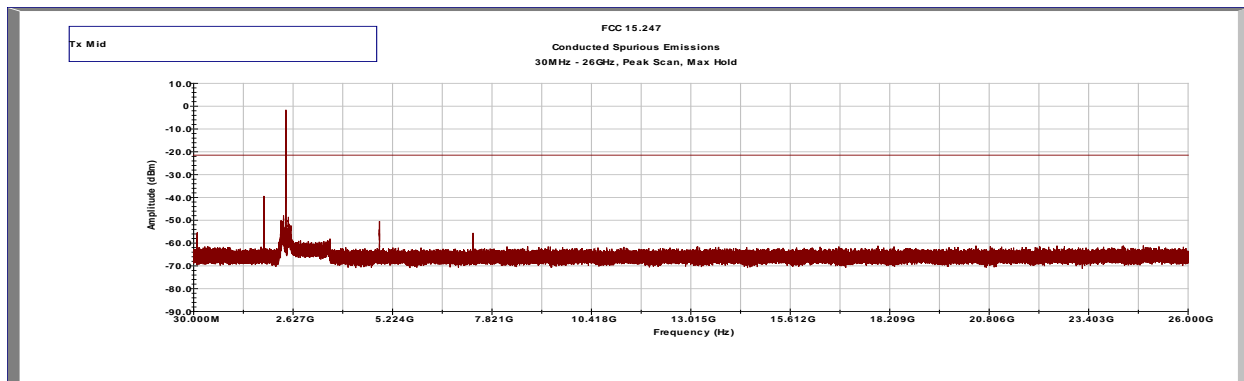
Date: 23.NOV.2021 22:15:41

Results	Complies
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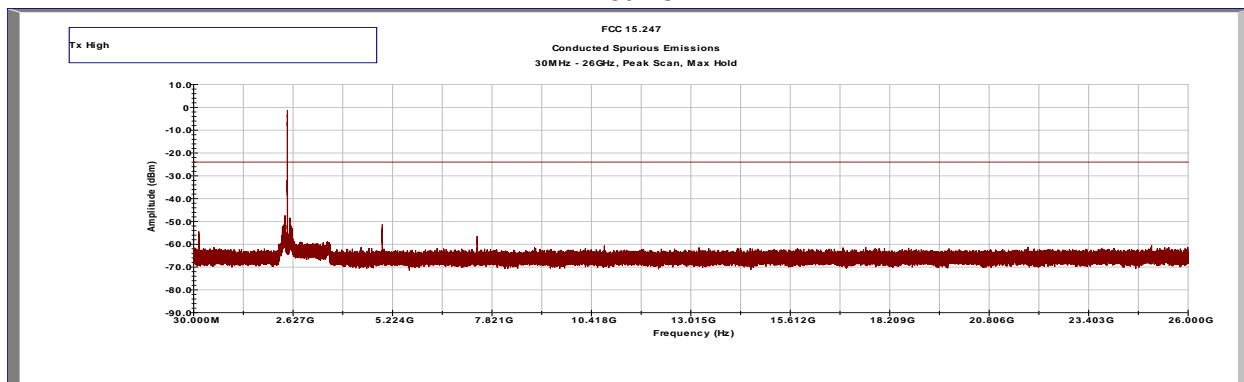
Tx @ Low Channel, 2402 MHz
30MHz -26GHz Conducted Spurious
Plot 4.3



Tx @ Mid Channel, 2442 MHz
30MHz -26GHz Conducted Spurious
Plot 4.4



Tx @ High Channel, 2480 MHz
30MHz -26GHz Conducted Spurious
Plot 4.5



Results

Complies

4.5 Transmitter Radiated Emissions FCC Rules: 15.247(d), 15.209, 15.205; RSS-247, 5.5;

4.5.1 Requirement

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.

4.5.2 Procedure

Radiated emission measurements were performed from 9 kHz to 26.5 GHz according to the procedure described in ANSI C63.10: 2013. Spectrum Analyzer Resolution Bandwidth is 200Hz or greater for frequencies 9kHz to 30MHz, 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 3 meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz.

Measurements made from 1 GHz to 18GHz had a 2.4-2.5GHz notch filter in place. A preamp was used from 9kHz to 26.5GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average limits for 1GHz – 26.5GHz.

Correlation measurements were performed below 30MHz between 10m ALSE and Open Field site according to FCC KDB 414788 D01 Radiated Test Site v01r01 section 2. All readings were within the acceptable tolerance.

Radiated measurements were performed on the X, Y and Z orientation of the EUT. Data is presented with the worst-case configuration (the configuration which resulted in the highest emission levels).

4.5.3 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(μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB(μ V); 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(μ V) 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(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(1/m)

CF = 1.6 dB

AG = 29.0 dB

$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32 \text{ dB}(\mu\text{V/m})$.

Level in μ V/m = Common Antilogarithm $[(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$.

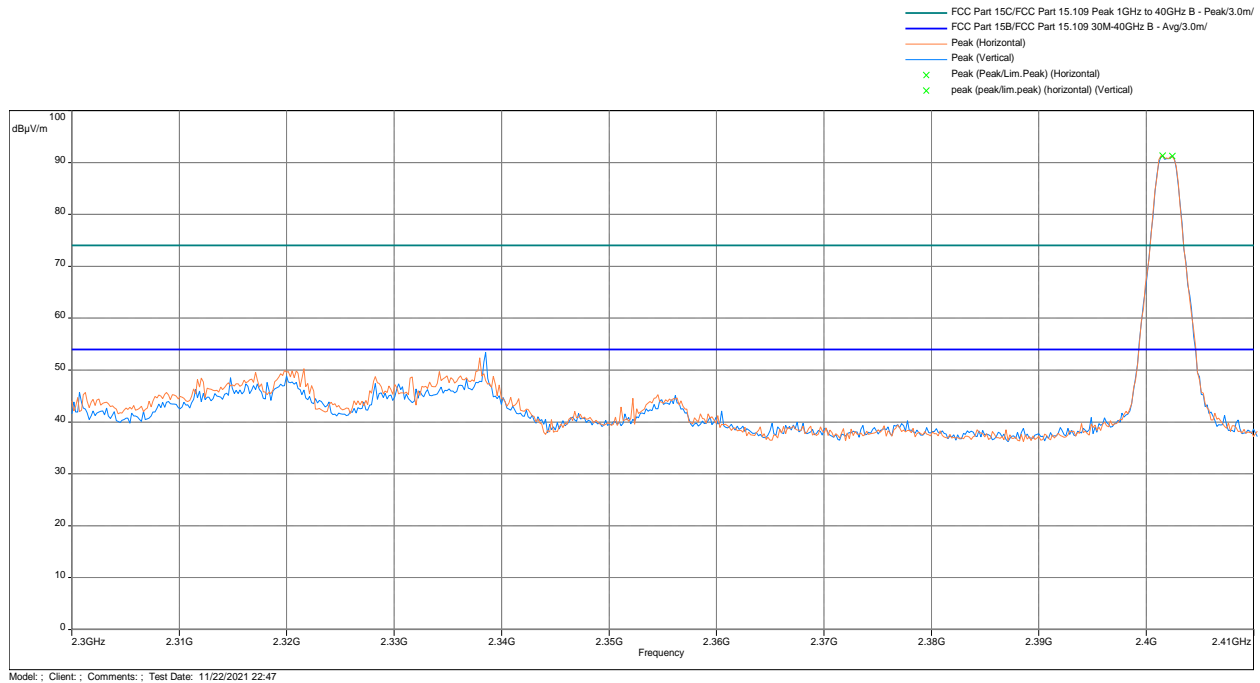
4.5.4 Test Results

All testing in this section were performed by radiated measurements.

Tested By	Test Date	Results
Aaron Chang	November 22 – December 1, 2021	Complies

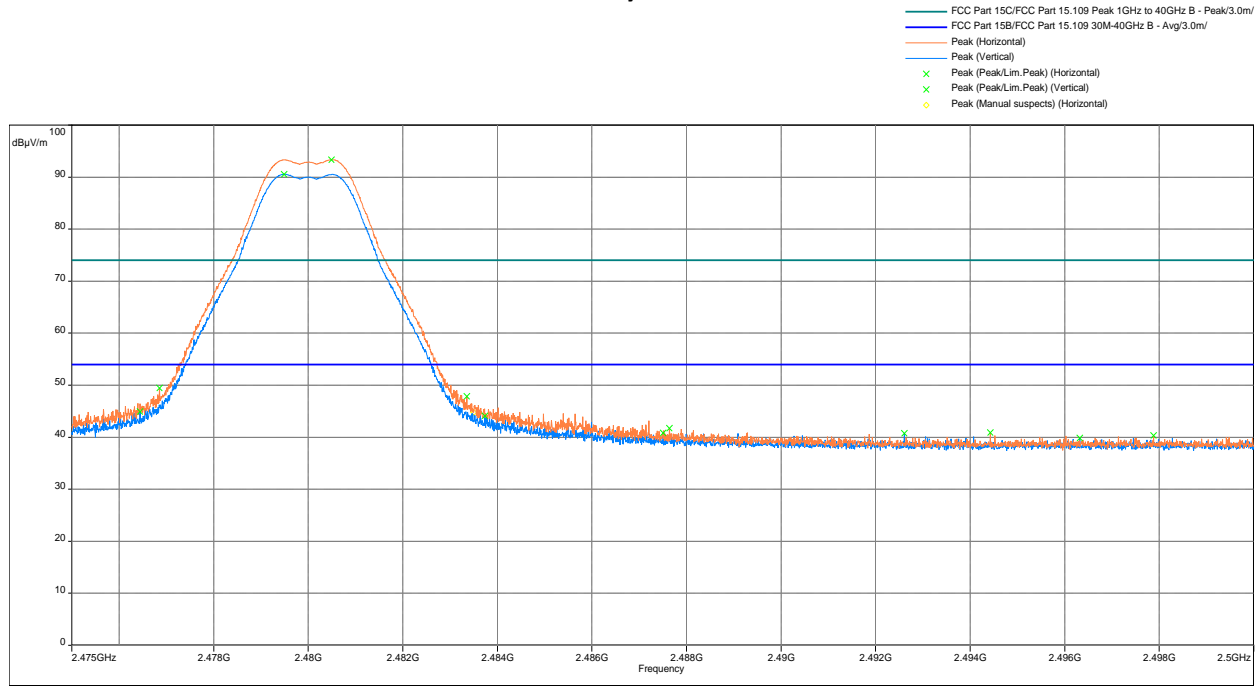
Test Results: 15.209/15.205 Radiated Restricted Band Emissions

**Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2310–2390 MHz, Peak Scan with Peak Limit and Average Limit
Battery Mode**



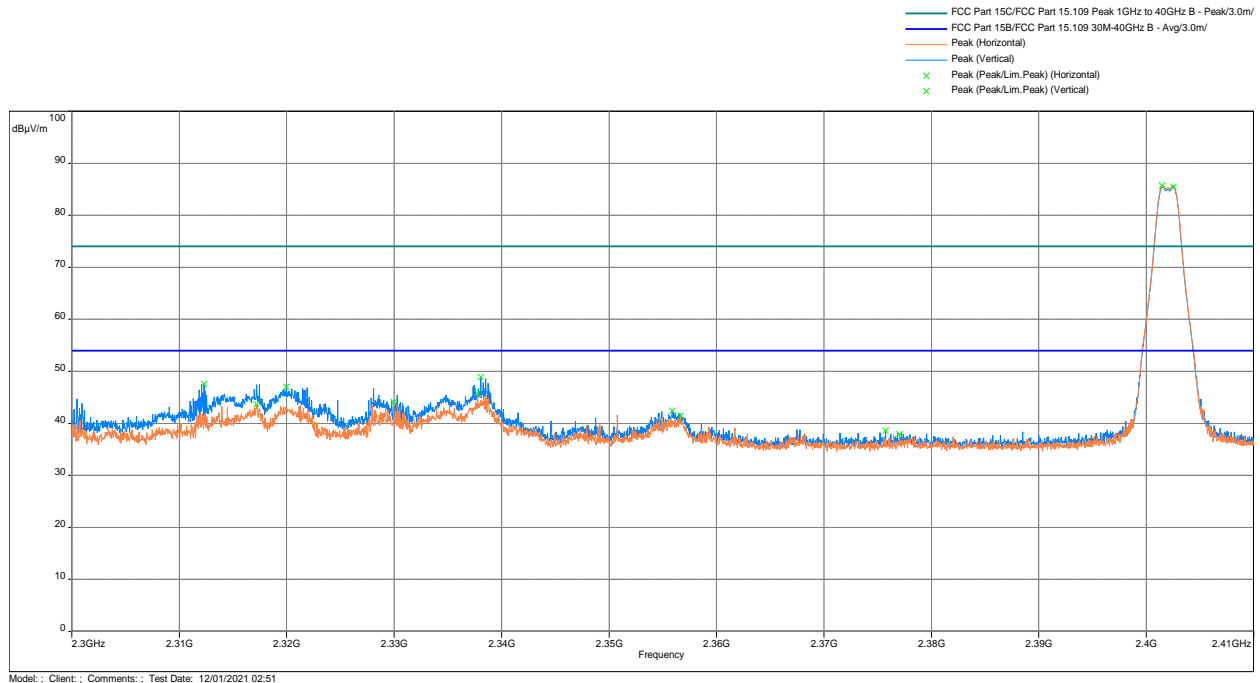
Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2321.600	49.25	54	-4.75	1.01	0	Horizontal	-12.55
2337.980	51.4	54	-2.6	1.01	7.25	Horizontal	-12.44
2390.000	36.29	54	-17.71	1.01	276.75	Horizontal	-11.93
2319.980	47.88	54	-6.12	1.49	328.75	Vertical	-12.56
2338.520	53.39	54	-0.61	2.49	340	Vertical	-12.44
2390.000	36.78	54	-17.22	1.01	258.5	Vertical	-11.93

**Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2483.5–2500 MHz, Peak Scan with Peak Limit and Average Limit
Battery Mode**



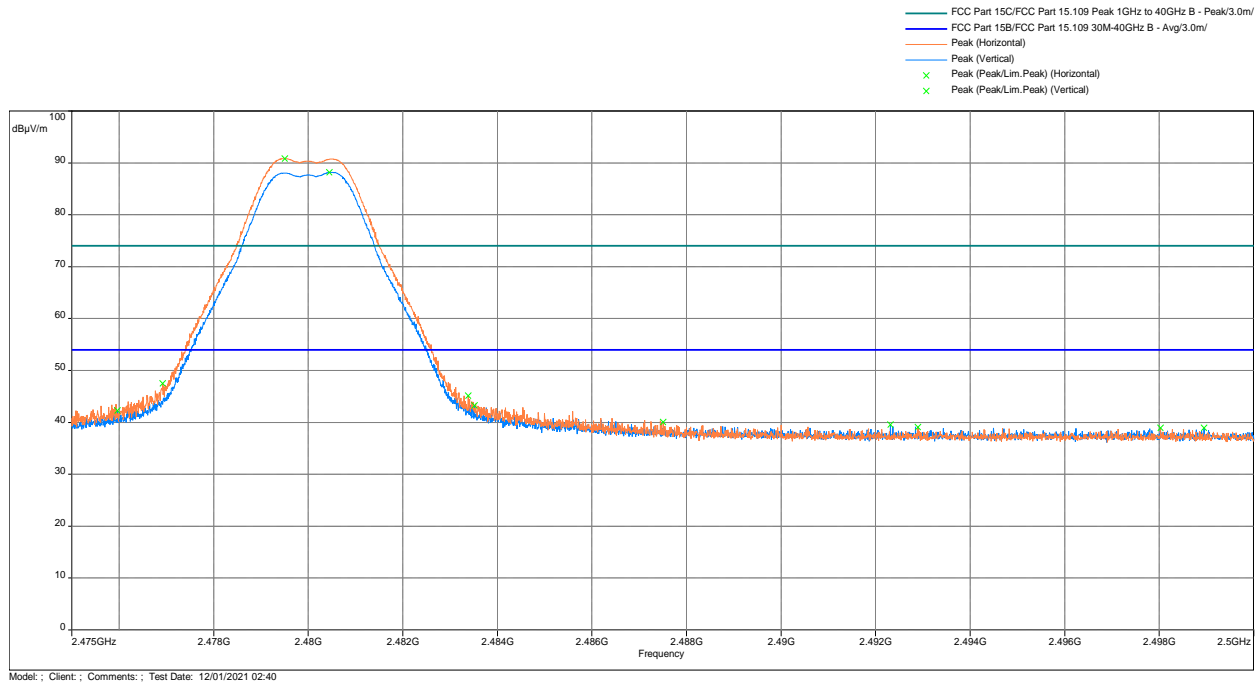
Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.5	44.76	54	-9.24	1.49	294.75	Horizontal	-10.86

**Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2310–2390 MHz, Peak Scan with Peak Limit and Average Limit
Charging Mode**



Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2338.06	48.9	54	-5.1	1.49	322	Vertical	-12.44
2390.002	36.94	54	-17.06	1.49	0	Vertical	-11.93

**Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2483.5–2500 MHz, Peak Scan with Peak Limit and Average Limit
Charging Mode**



Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.5	42.41	54	-11.59	1.01	295.75	Horizontal	-10.86

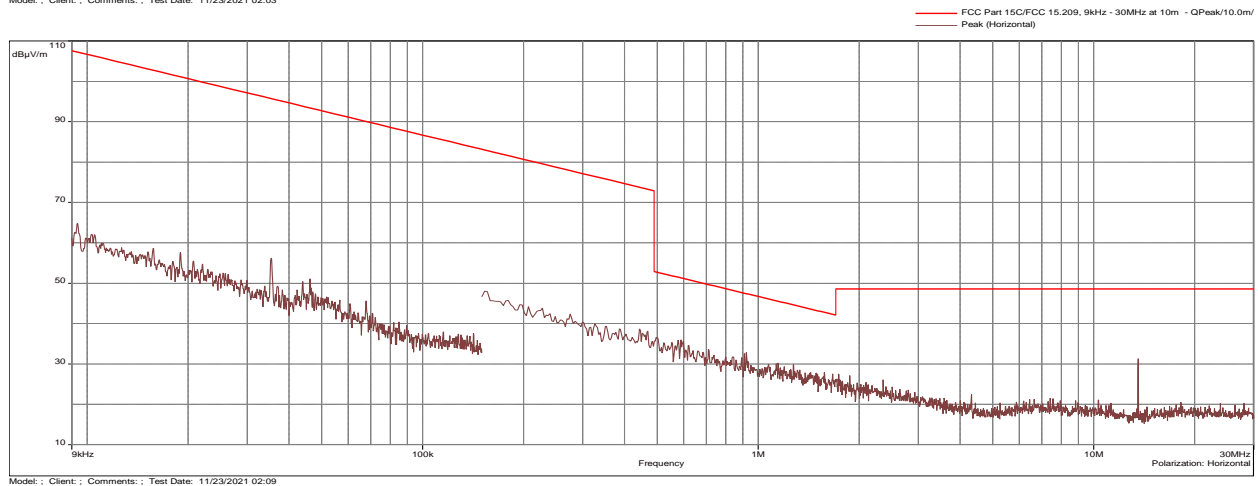
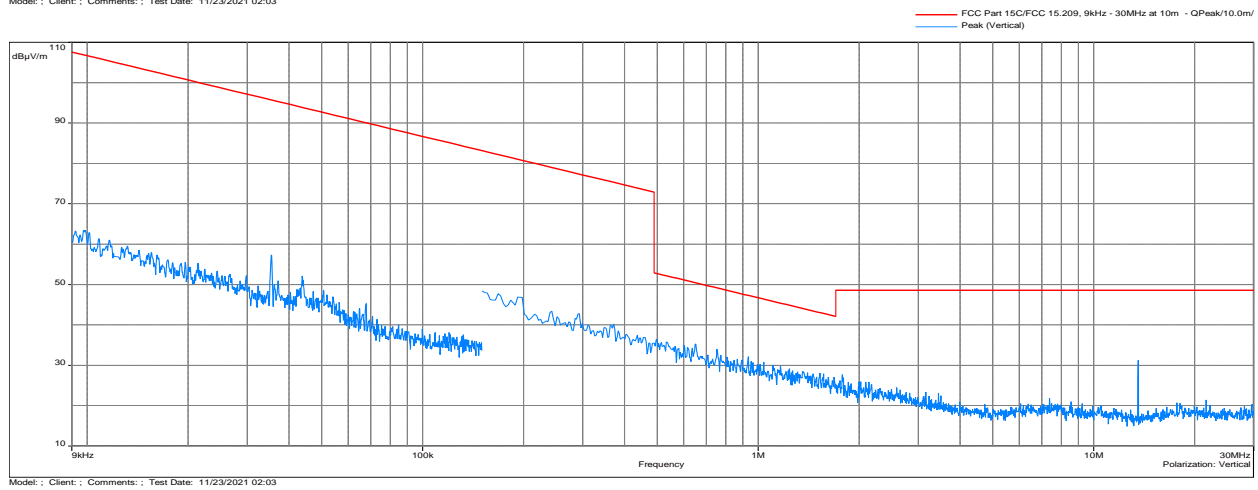
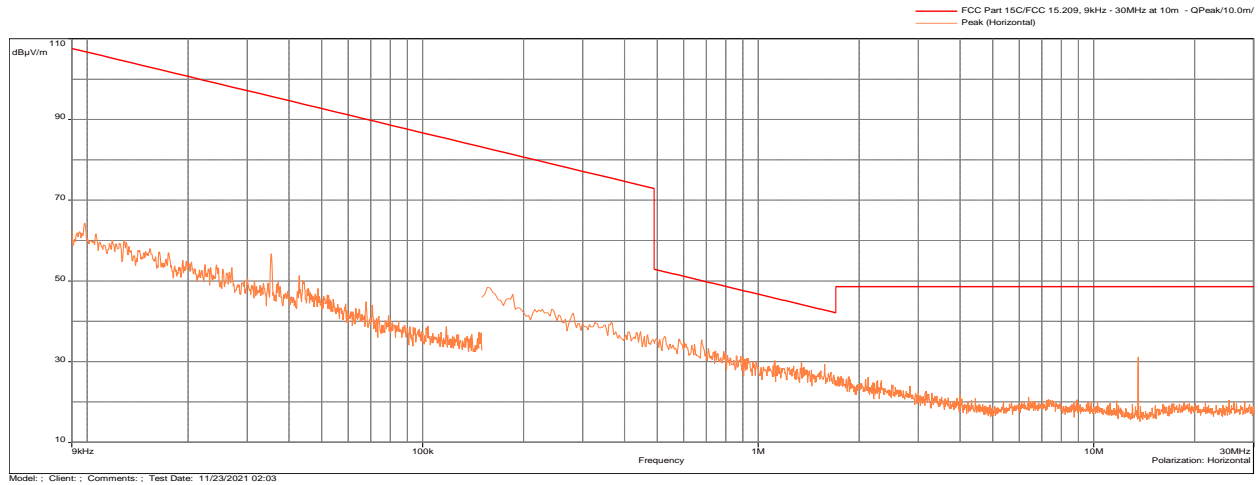
Results

Complies

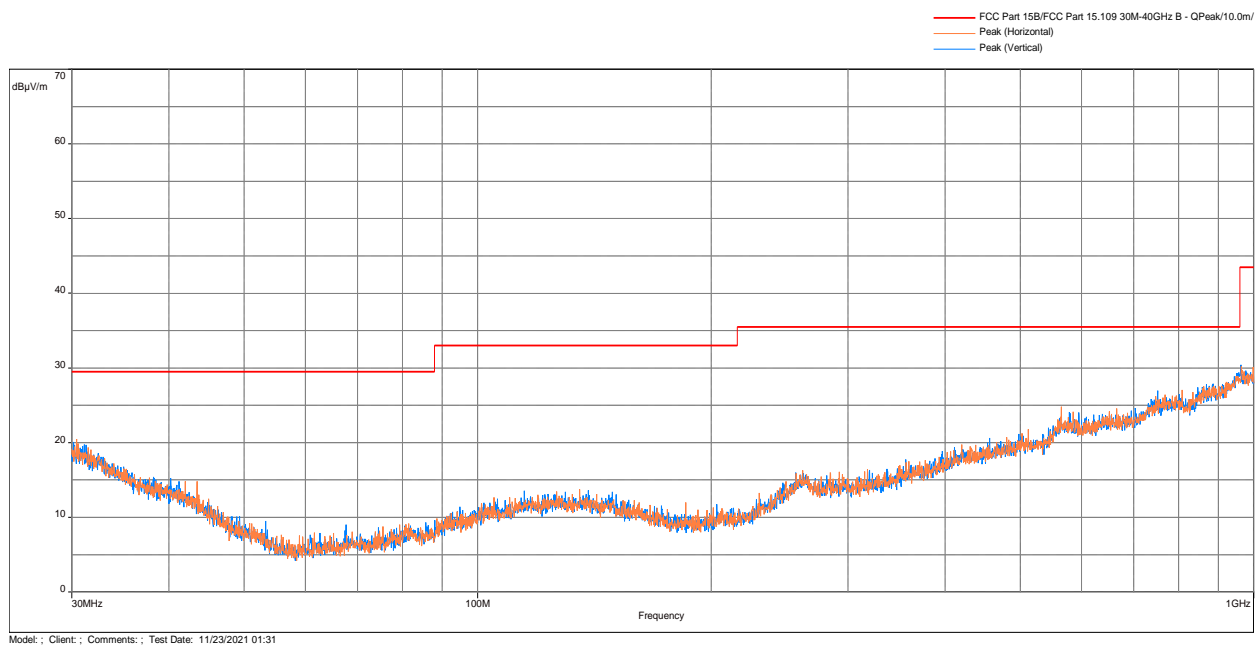
Out-of-Band Radiated Spurious Emissions

Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz
Battery Mode

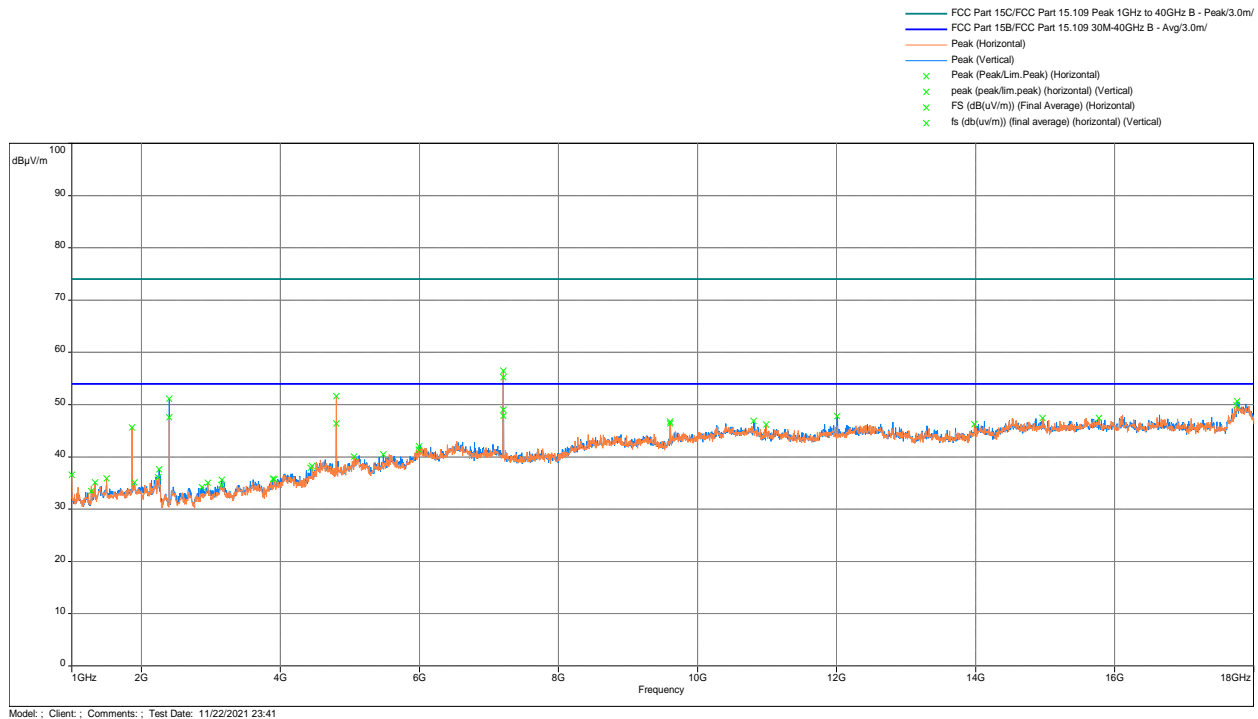
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



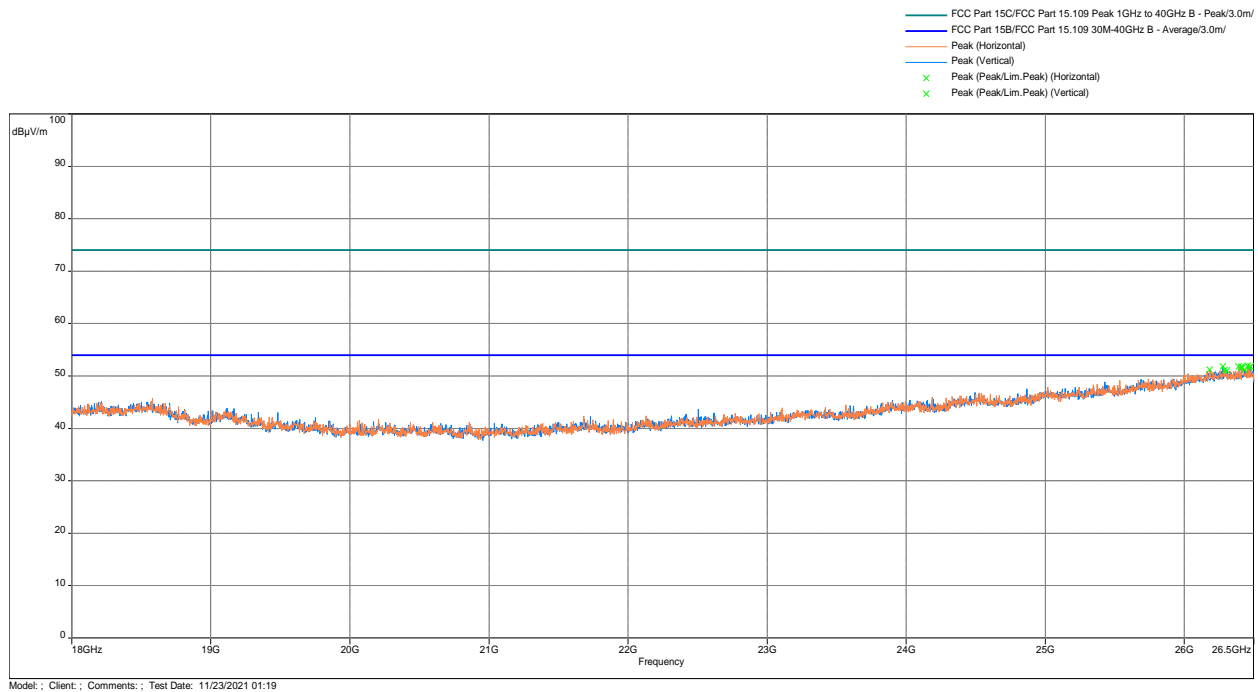
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 – 26.5 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz
Battery Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
956.932	29.41	35.5	-6.09	4	346	Vertical	3.77
952.276	29.32	35.5	-6.18	2	182	Vertical	3.47
950.821	29.28	35.5	-6.22	1	180.25	Vertical	3.33
955.994	29.2	35.5	-6.3	3	325	Vertical	3.67
958.872	29.08	35.5	-6.42	4	317.75	Vertical	3.79
948.525	28.92	35.5	-6.58	0.99	144.75	Horizontal	3.27

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin dB	Height (m)	Angle (°)	Comment	Correction (dB)
4804.600	46.41	74	-27.59	1.49	42.25	Vertical	-5.6
4804.600	51.6	74	-22.4	2.49	30	Horizontal	-5.6
7207.833	56.49	74	-17.51	2.49	289.25	Horizontal	-3.12
7207.833	55.24	74	-18.76	1.99	333	Vertical	-3.12

Note: Correction = AF + CF - Preamp

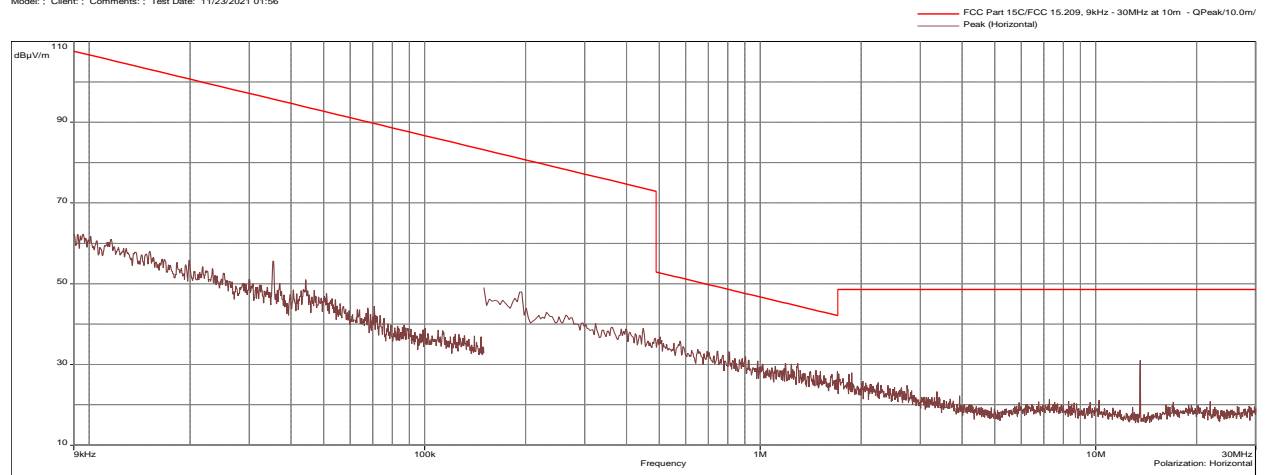
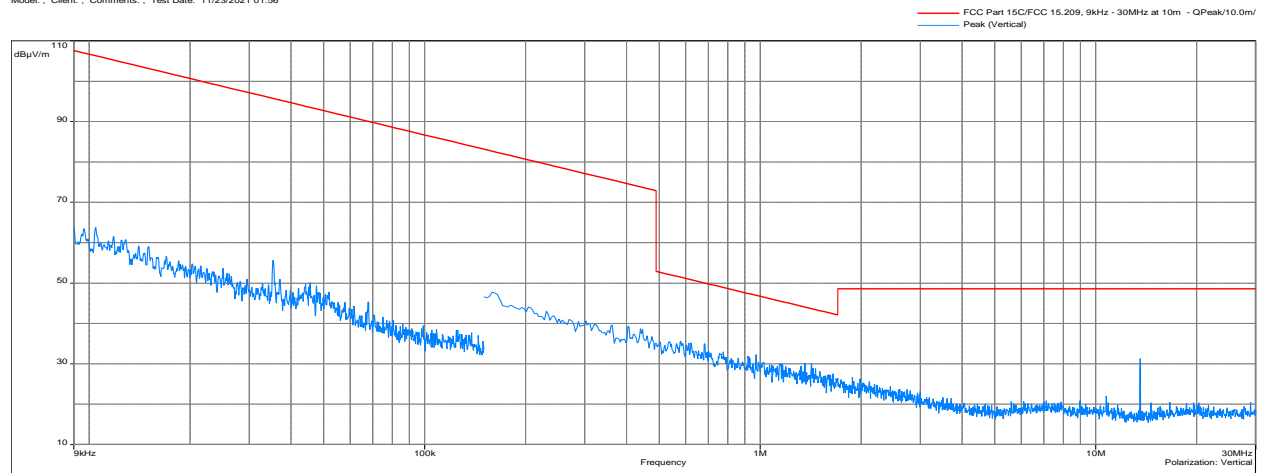
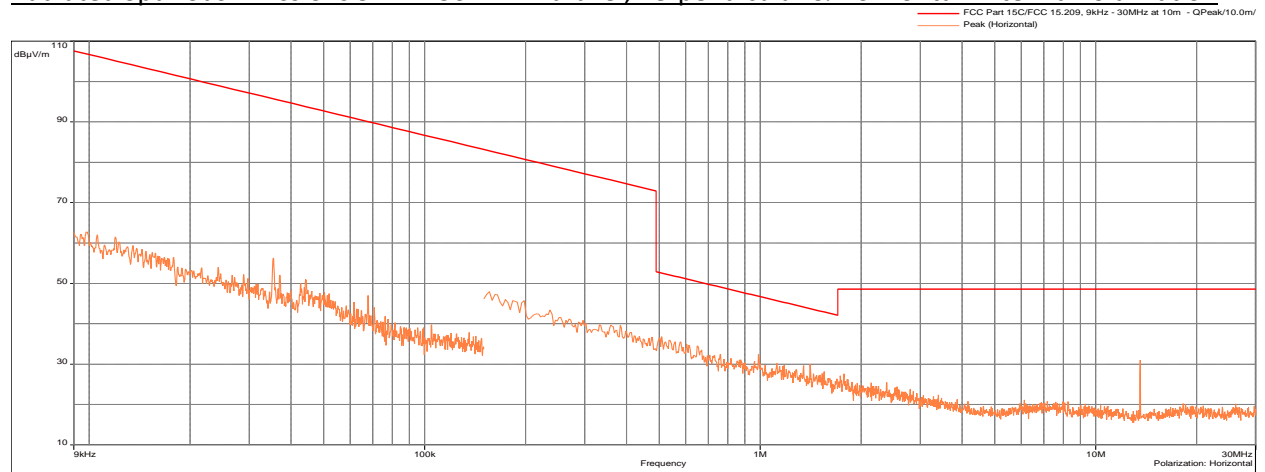
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin dB	Height (m)	Angle (°)	Comment	Correction (dB)
4804.600	46.41	54	-7.59	1.49	42.25	Vertical	-5.6
4804.600	51.6	54	-2.4	2.49	30	Horizontal	-5.6
7207.013	49.01	54	-4.99	1.84	20.75	Vertical	-3.12
7207.013	47.81	54	-6.19	1.72	189.75	Horizontal	-3.12

Note: Correction = AF + CF - Preamp

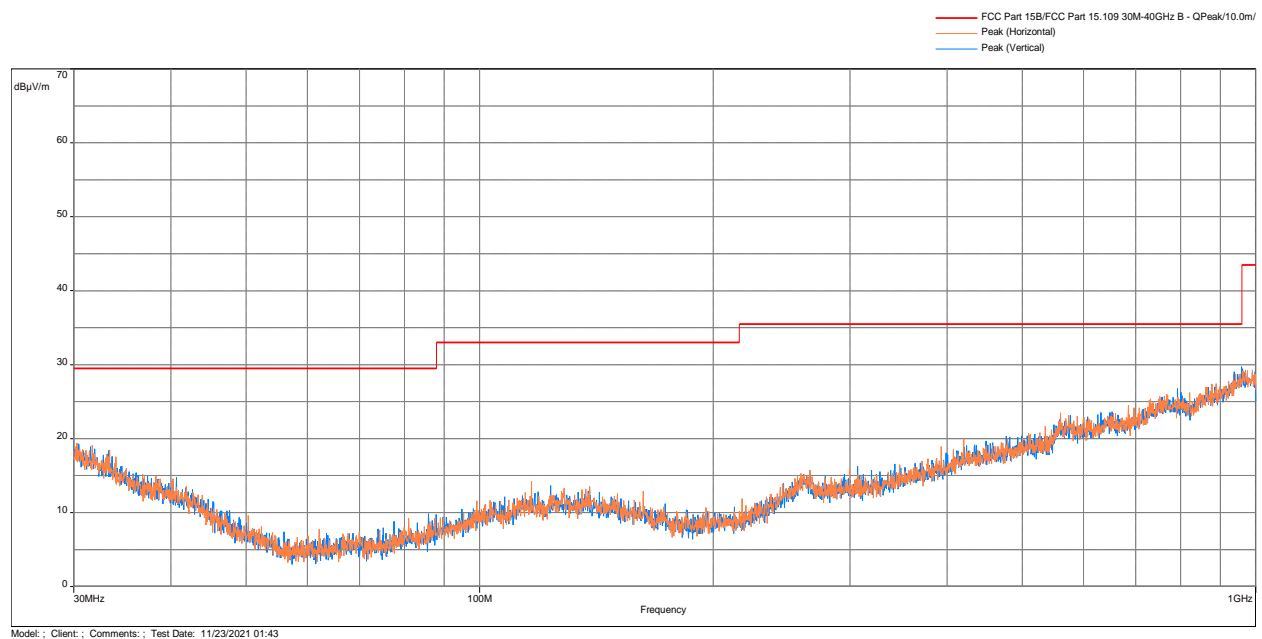
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2442 MHz
Battery Mode

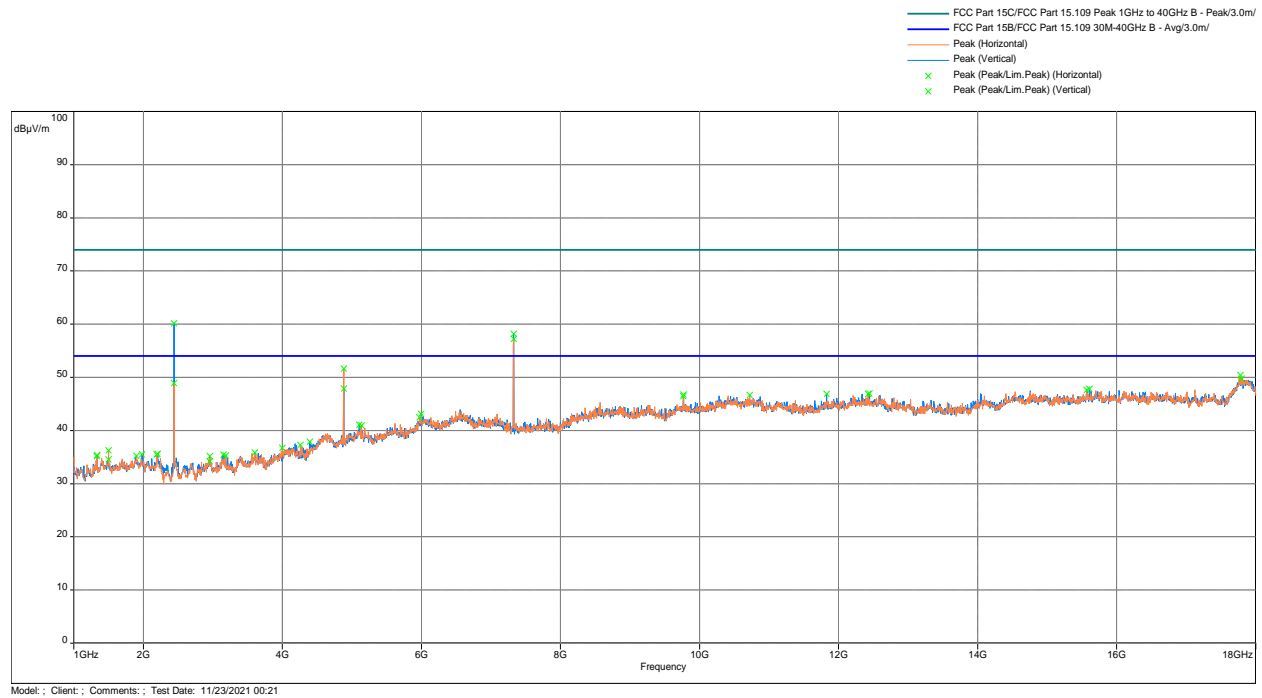
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



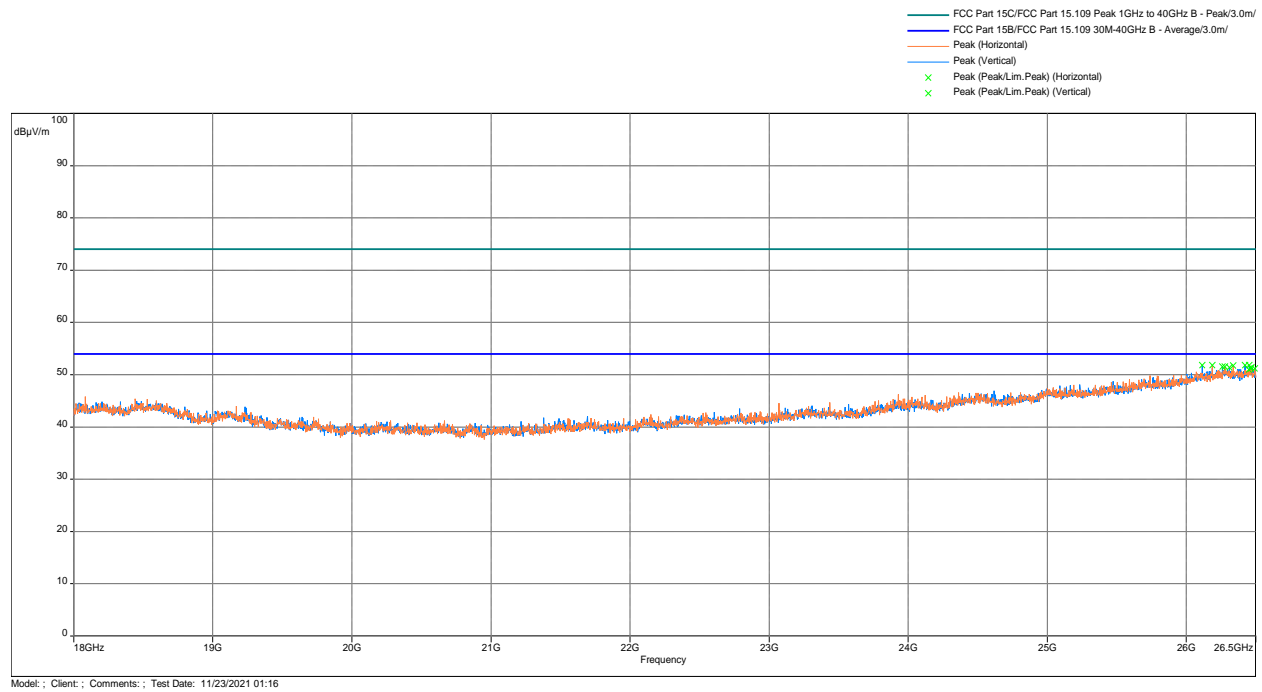
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 – 26.5 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2442 MHz
Battery Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
959.098	29.73	35.5	-5.77	0.99	334.75	Vertical	3.8
938.373	29.06	35.5	-6.44	0.99	197.5	Vertical	2.7
954.830	28.78	35.5	-6.72	0.99	299.25	Horizontal	3.64
941.412	28.77	35.5	-6.73	0.99	26.75	Horizontal	2.88
947.491	28.72	35.5	-6.78	0.99	235	Vertical	3.17
936.982	28.66	35.5	-6.84	0.99	344.25	Vertical	2.68

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
4884.500	51.65	74	-22.35	2.49	38.25	Horizontal	-5.31
4884.500	47.89	74	-26.11	2.01	327.5	Vertical	-5.31
7327.400	58.19	74	-15.81	2.01	2.25	Vertical	-3
7327.400	57.22	74	-16.78	1.99	7.25	Horizontal	-3

Note: Correction = AF + CF - Preamp

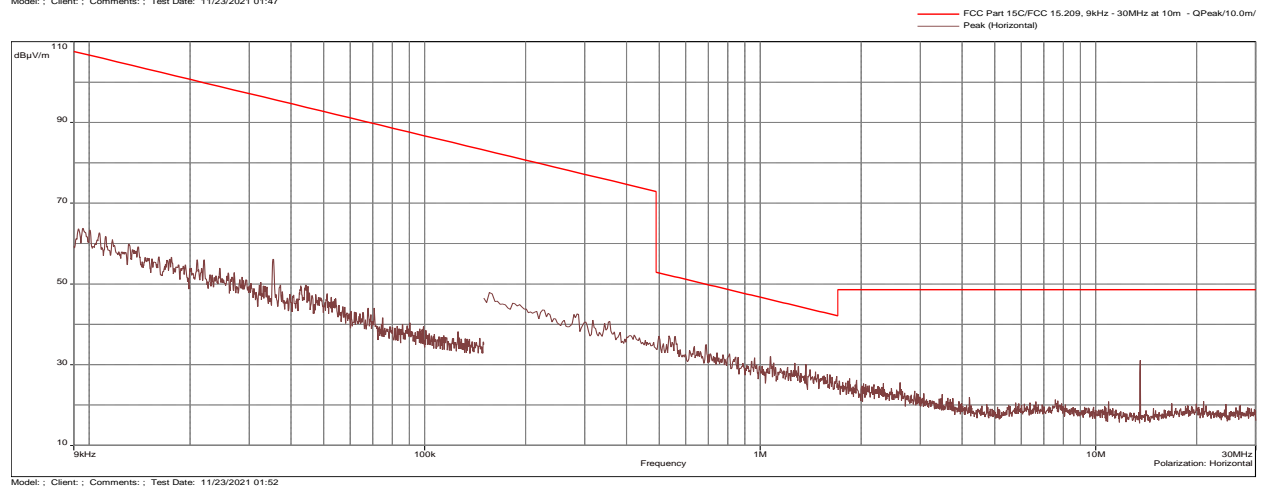
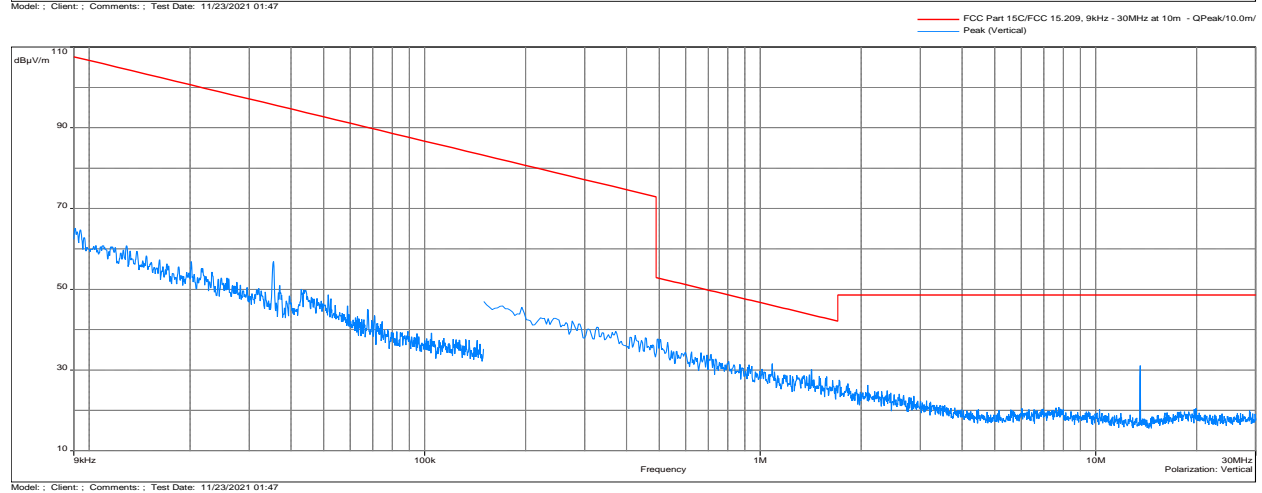
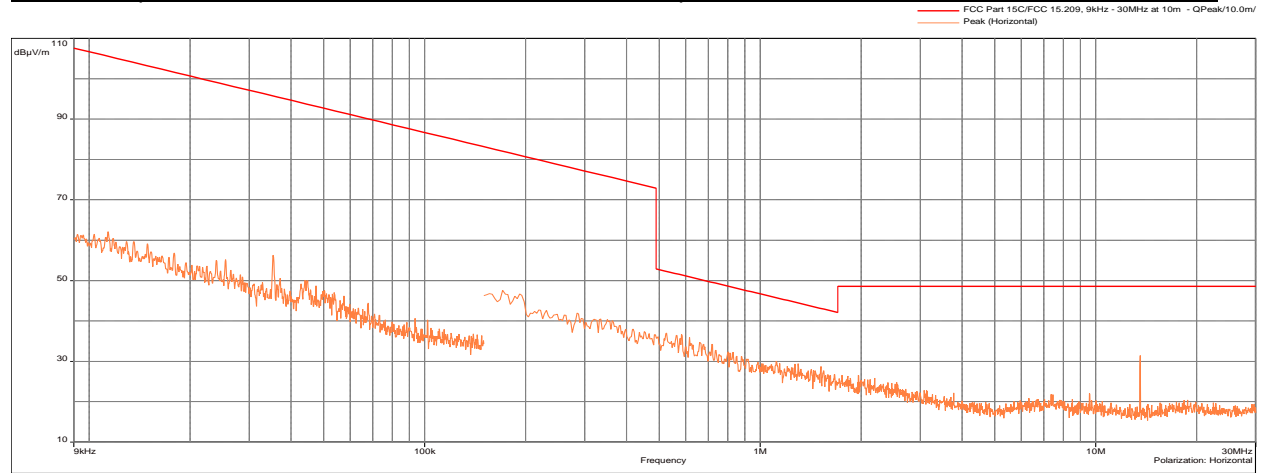
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
4884.500	44.59	54	-9.41	2.01	251.5	Horizontal	-5.31
4884.500	39.75	54	-14.25	1.99	325.75	Vertical	-5.31
7327.400	52.47	54	-1.53	2.01	294.25	Horizontal	-3
7327.400	51.4	54	-2.6	1.99	347.5	Vertical	-3

Note: Correction = AF + CF - Preamp

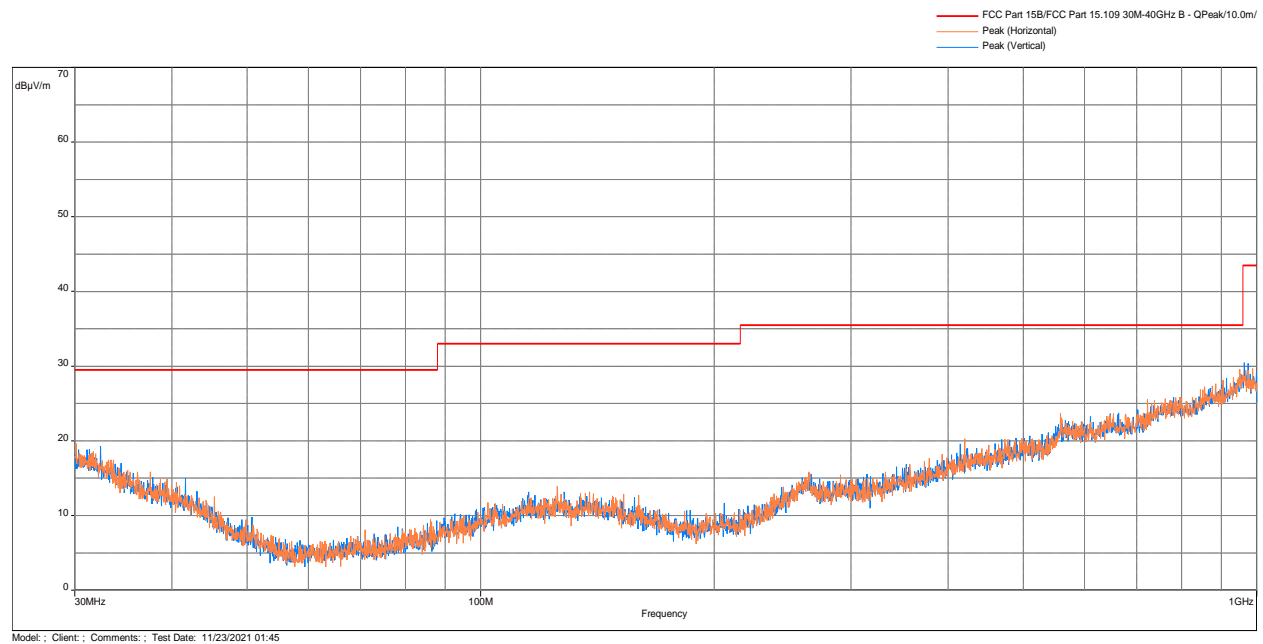
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz
Battery Mode

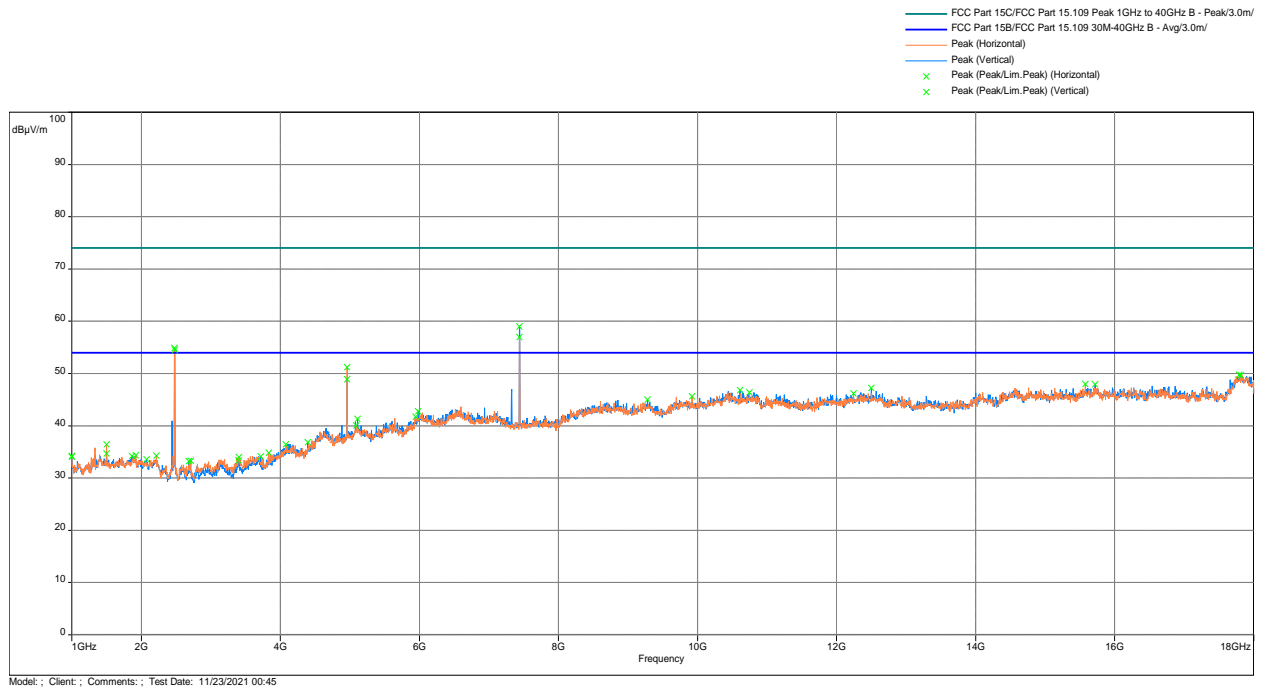
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



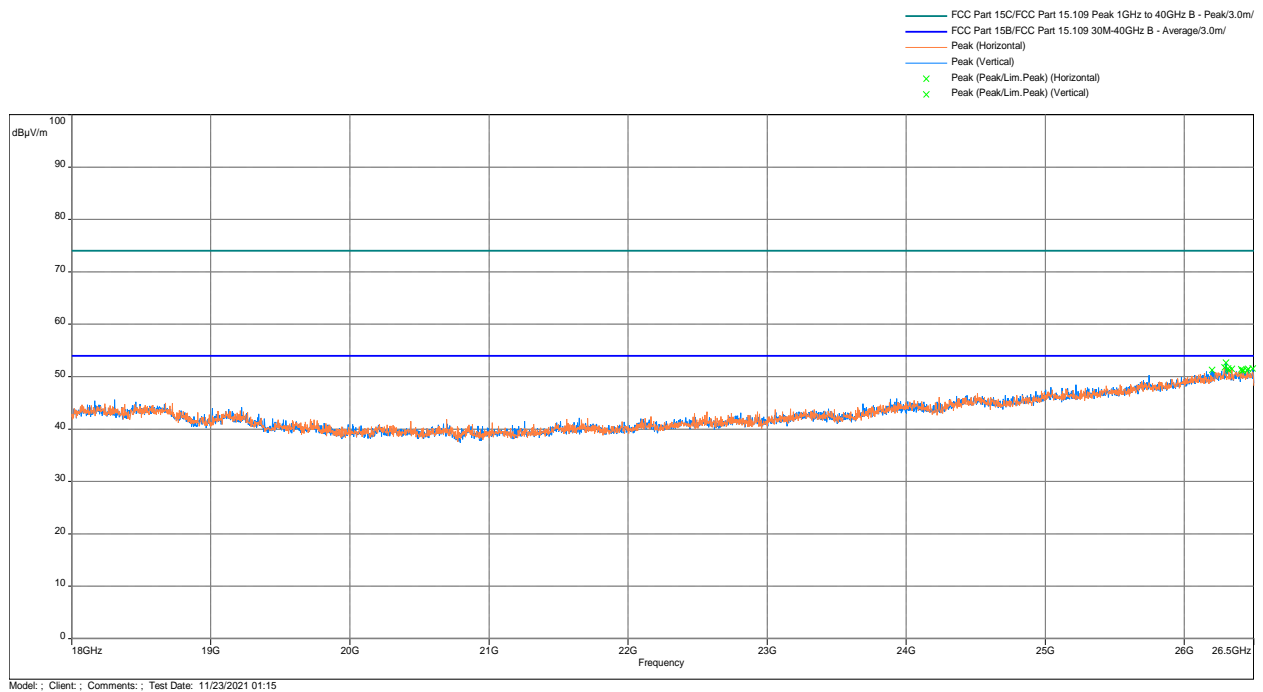
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 - 26 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz
Battery Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
950.918	29.57	35.5	-5.93	0.99	0	Horizontal	3.33
953.828	28.97	35.5	-6.53	0.99	358.75	Horizontal	3.56
953.181	28.89	35.5	-6.61	0.99	308	Vertical	3.55
956.706	28.83	35.5	-6.67	0.99	217	Vertical	3.75
959.907	28.72	35.5	-6.78	0.99	171	Horizontal	3.81
932.973	28.5	35.5	-7	0.99	335.5	Horizontal	2.44

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
4961.000	51.21	74	-22.79	2.49	28	Horizontal	-4.95
4961.000	48.87	74	-25.13	1.49	325	Vertical	-4.96
7441.300	58.97	74	-15.03	1.99	0	Vertical	-2.72
7441.300	56.98	74	-17.02	2.01	310.25	Horizontal	-2.72

Note: Correction = AF + CF - Preamp

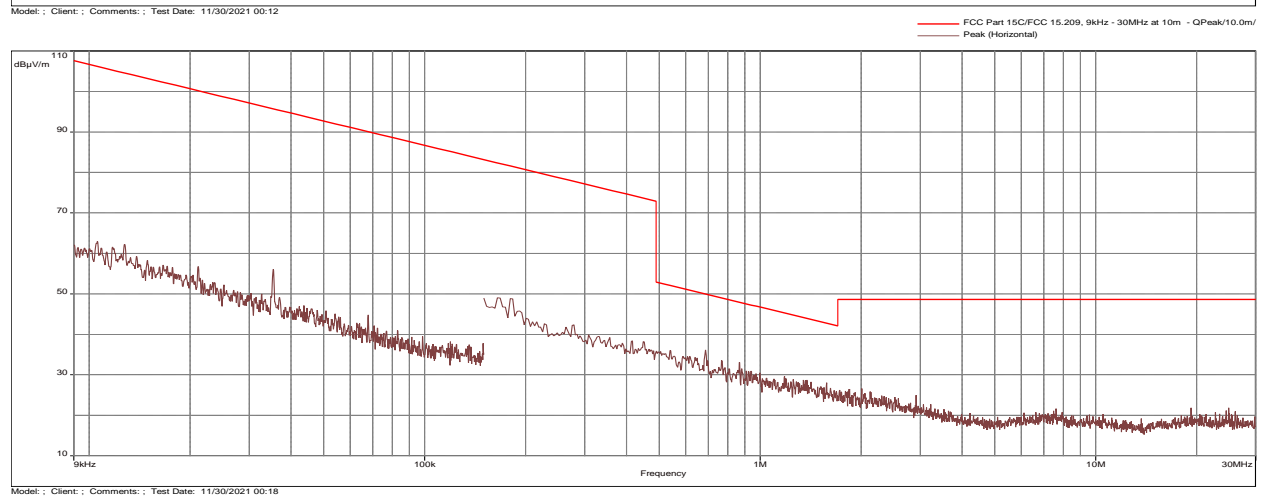
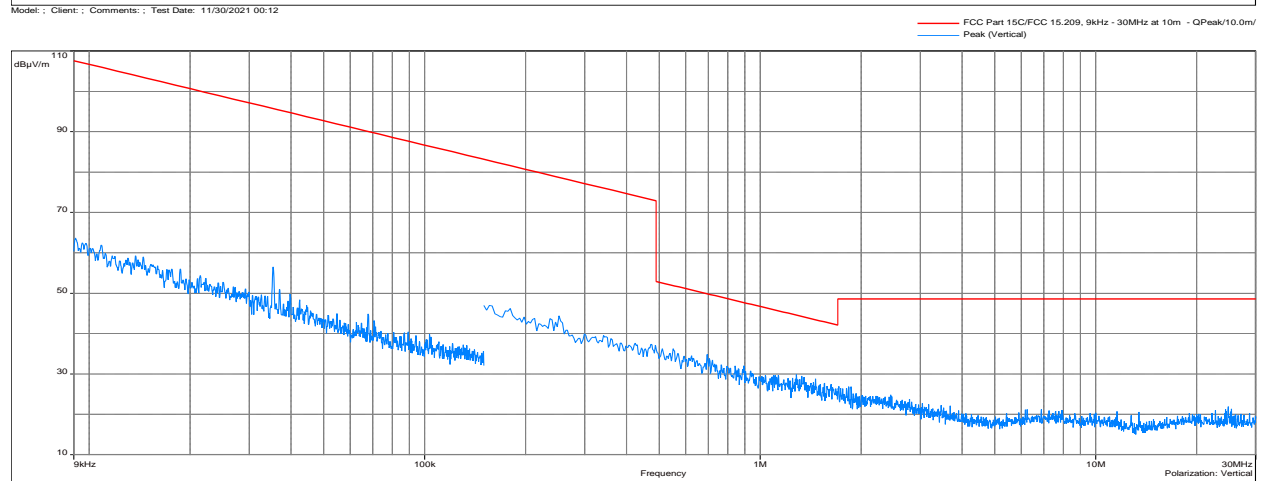
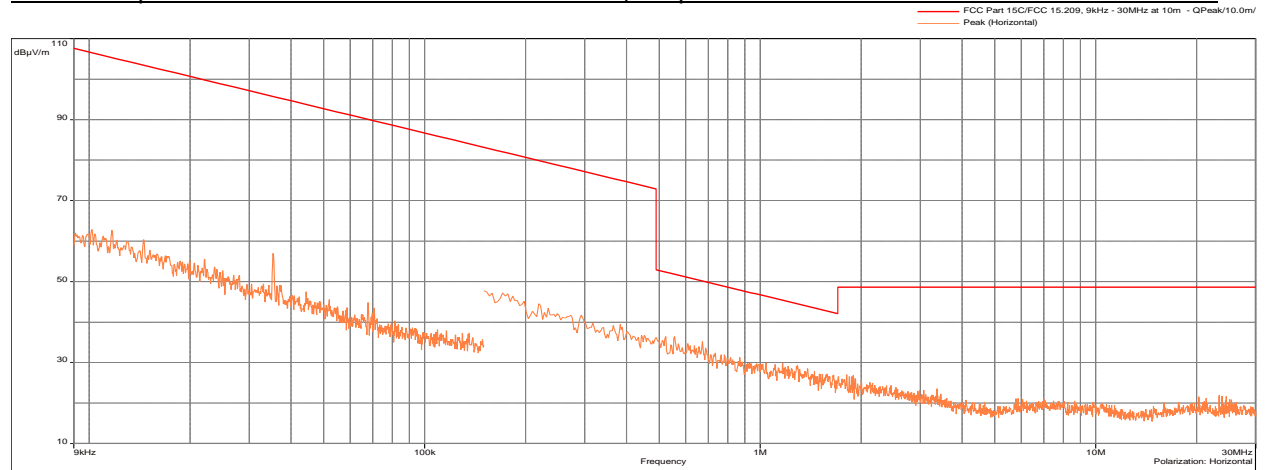
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
4961.000	46.16	54	-7.84	3.01	44.5	Horizontal	-4.95
4961.000	39.92	54	-14.08	1.01	317.25	Vertical	-4.95
7441.300	52.67	54	-1.33	1.99	23	Vertical	-2.72
7441.300	52.11	54	-1.89	3.01	304.25	Horizontal	-2.72

Note: Correction = AF + CF - Preamp

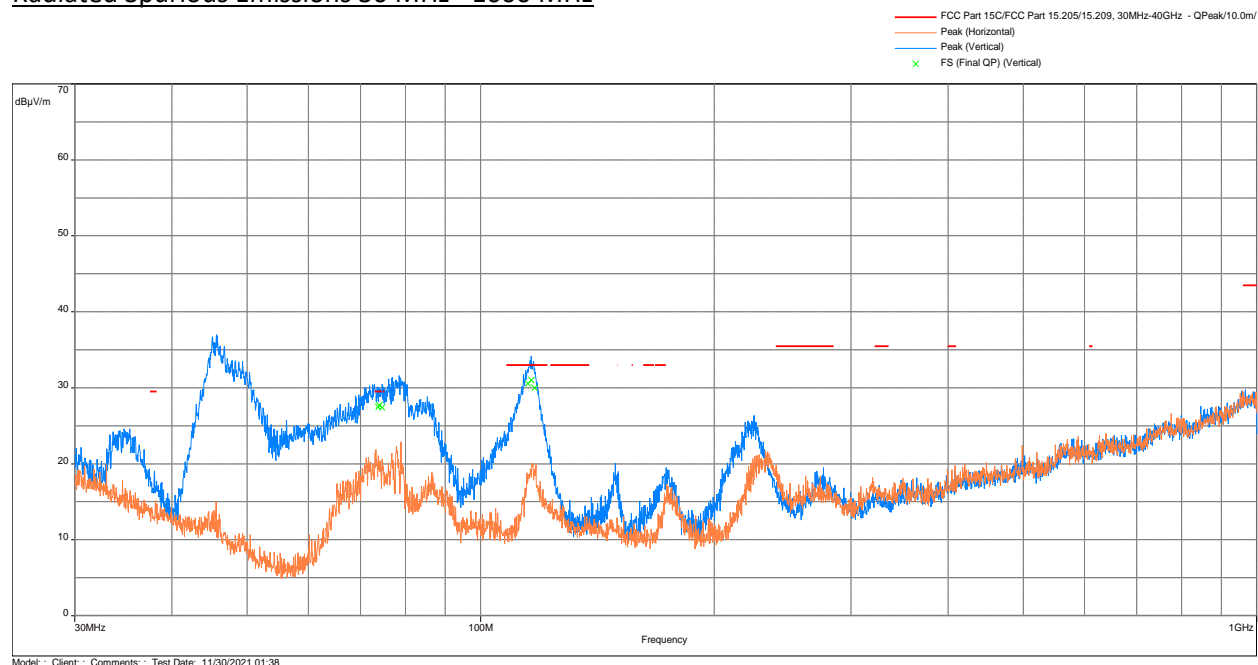
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz
Charging Mode

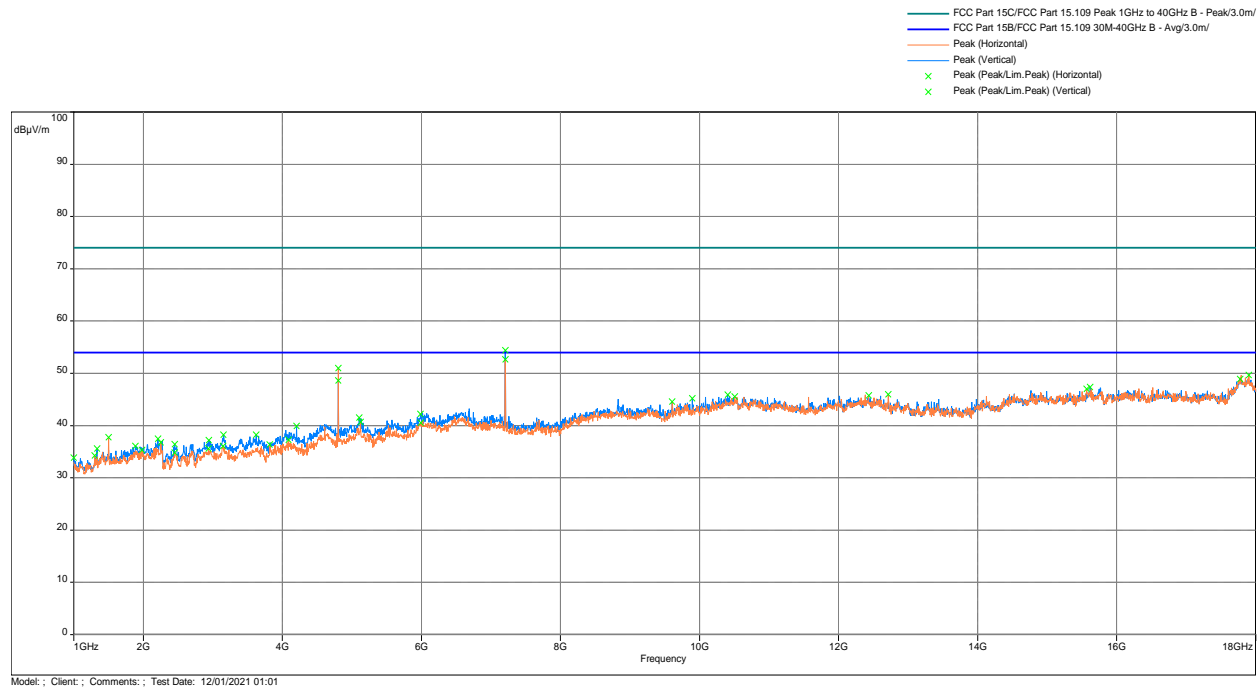
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



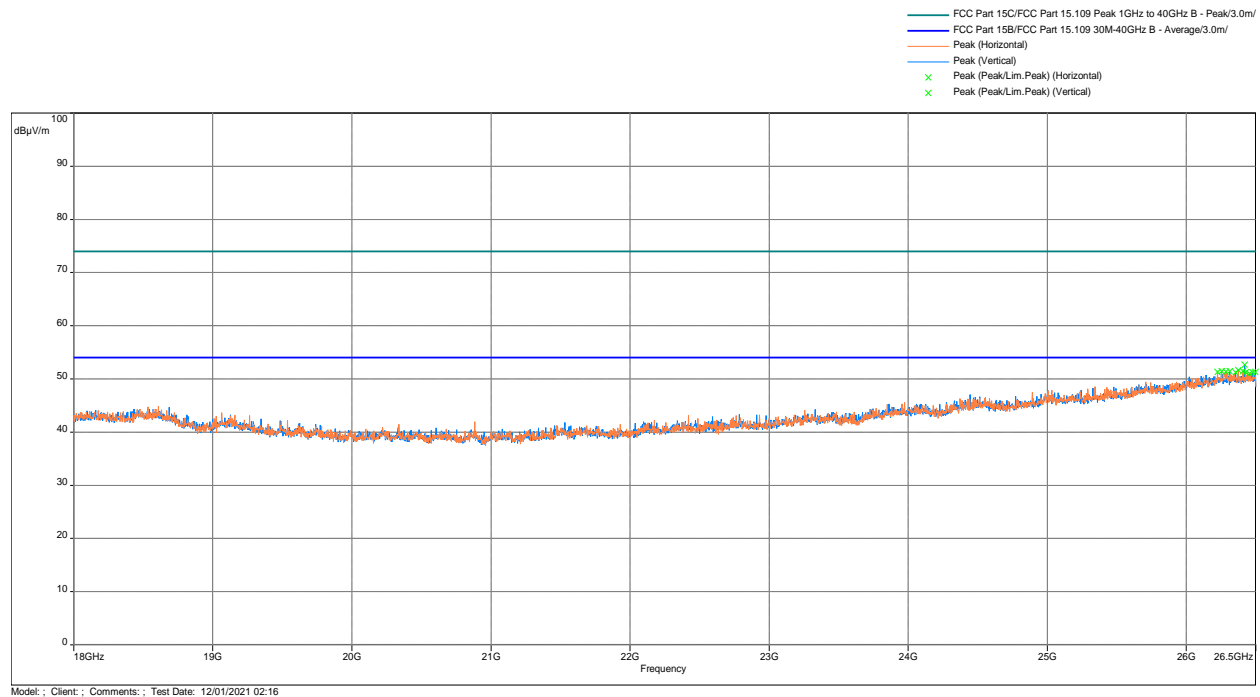
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 – 26.5 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz
Charging Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
73.852	27.47	29.5	-2.03	2.14	47.25	Vertical	-19.65
74.077	27.73	29.5	-1.77	2.2	207.25	Vertical	-19.62
74.648	27.45	29.5	-2.05	1.95	52.25	Vertical	-19.56
115.124	30.55	33	-2.45	1	285.25	Vertical	-14.74
116.287	31.01	33	-1.99	1	131.25	Vertical	-14.61
117.328	29.98	33	-3.02	1	283.75	Vertical	-14.53

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin dB	Height (m)	Angle (°)	Comment	Correction (dB)
4804.600	50.95	74	-23.05	2.01	252.75	Horizontal	-5.6
4804.600	48.62	74	-25.38	1.49	247.5	Vertical	-5.6
7207.267	54.41	74	-19.59	1.49	333.5	Vertical	-3.12
7207.267	52.65	74	-21.35	1.51	189	Horizontal	-3.12

Note: Correction = AF + CF - Preamp

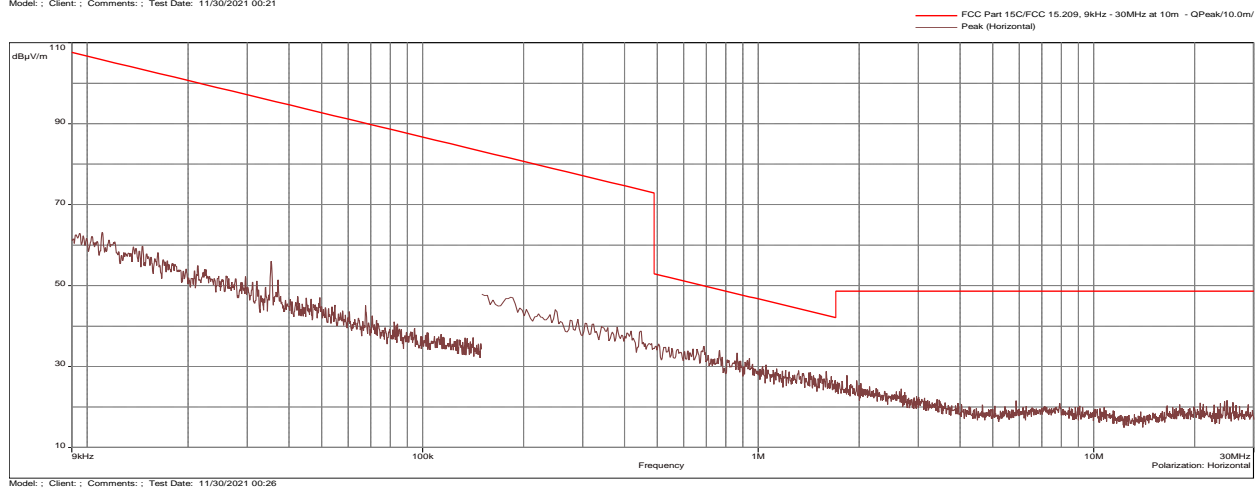
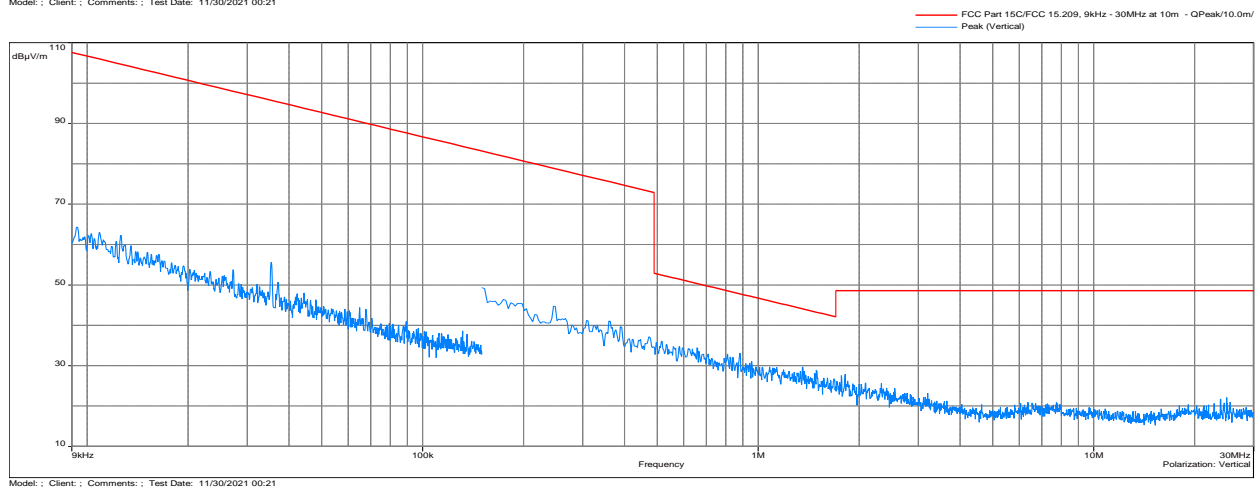
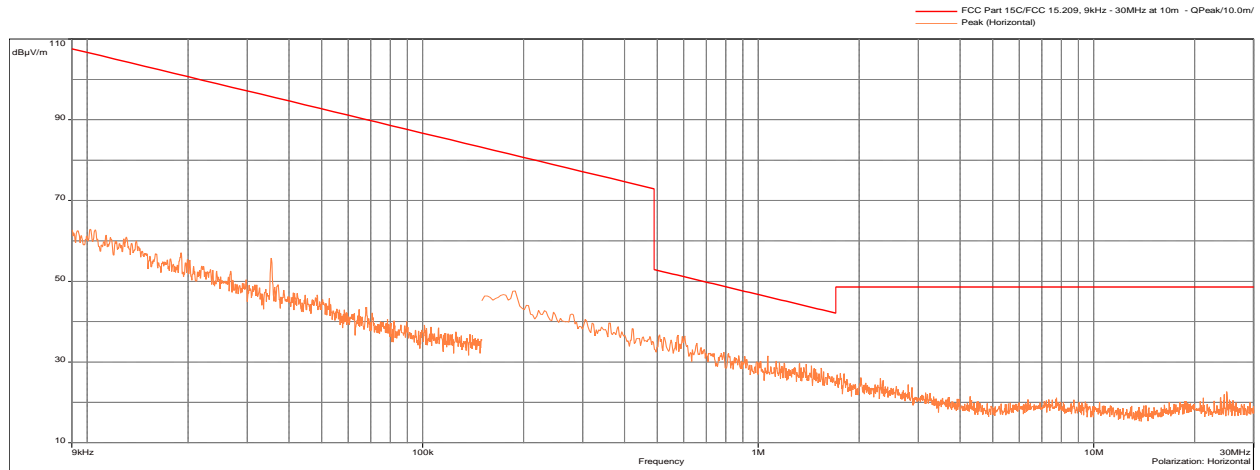
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin dB	Height (m)	Angle (°)	Comment	Correction (dB)
4802.900	47.16	54	-6.84	2.01	260.75	Horizontal	-5.61
4804.600	39.58	54	-14.42	1.01	0.25	Vertical	-5.6
7207.267	47.71	54	-6.29	2.01	304	Horizontal	-3.12
7207.267	46.94	54	-7.06	1.01	109.75	Vertical	-3.12

Note: Correction = AF + CF - Preamp

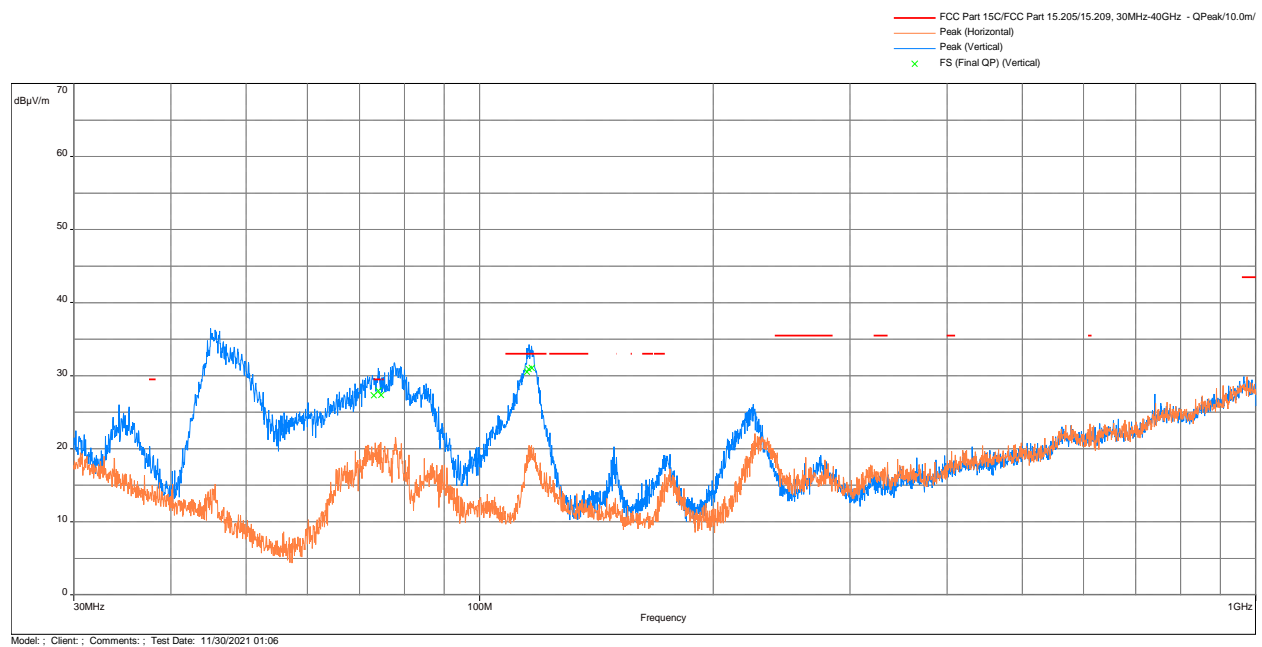
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2442 MHz
Charging Mode

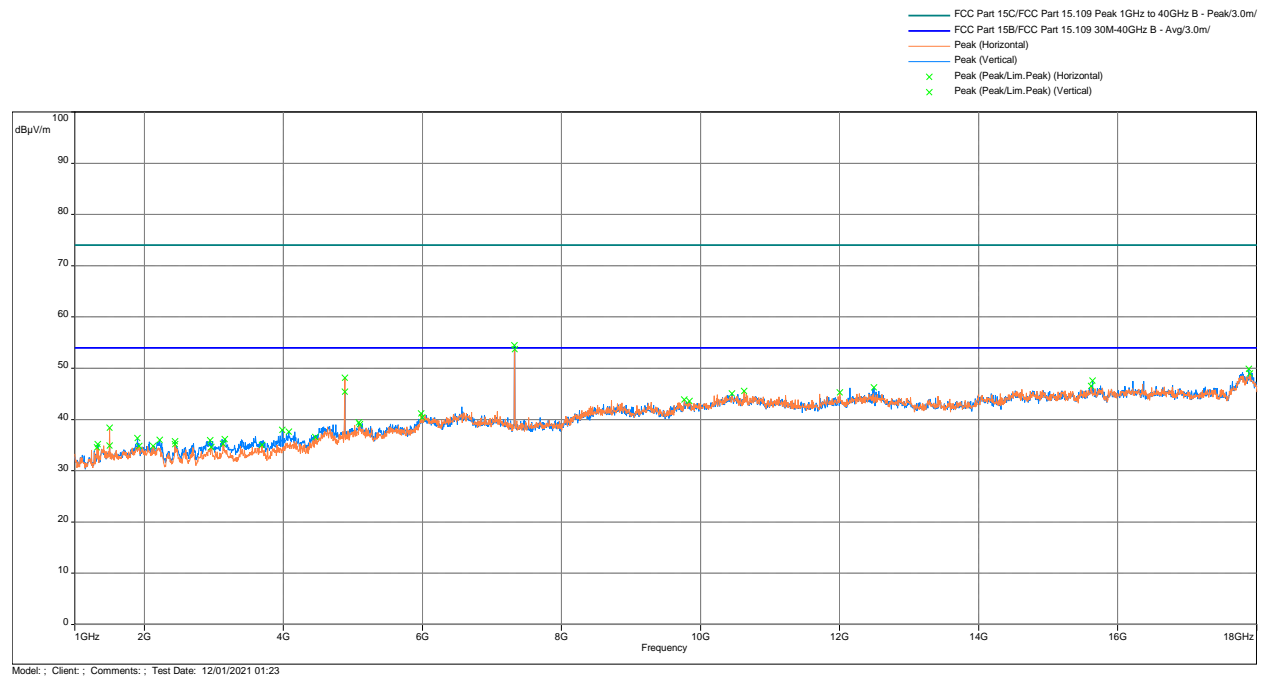
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



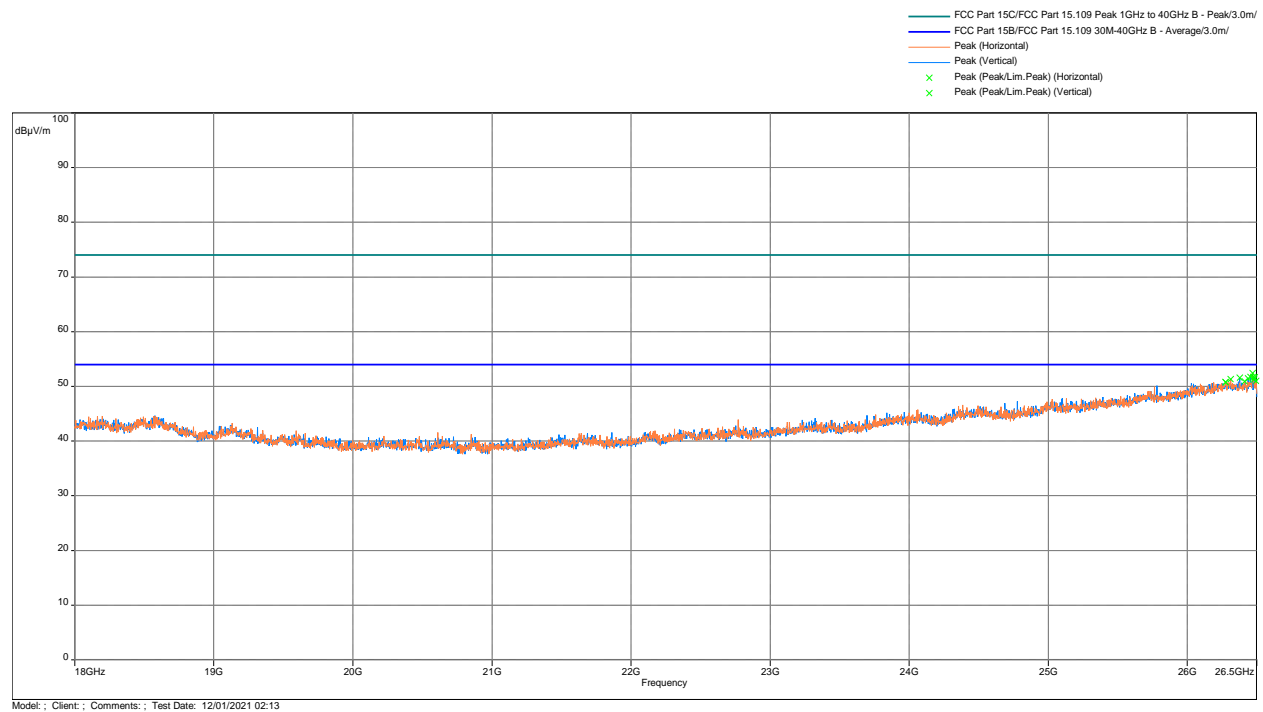
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 – 26.5 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2442 MHz
Charging Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
73.040	27.31	29.5	-2.19	2.35	77.5	Vertical	-19.74
74.074	27.95	29.5	-1.55	1.96	197.5	Vertical	-19.62
74.649	27.35	29.5	-2.15	1.98	79.5	Vertical	-19.56
115.113	30.53	33	-2.47	1	291.25	Vertical	-14.74
115.703	30.9	33	-2.1	1	301.75	Vertical	-14.67
116.726	31.06	33	-1.94	1	135	Vertical	-14.56

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7324.567	54.47	74	-19.53	1.49	324.75	Vertical	-3.01
7327.400	53.71	74	-20.29	1.51	187.25	Horizontal	-3
4885.067	48.11	74	-25.89	2.01	253.25	Horizontal	-5.31
4885.067	45.41	74	-28.59	1.49	324.75	Vertical	-5.31

Note: Correction = AF + CF - Preamp

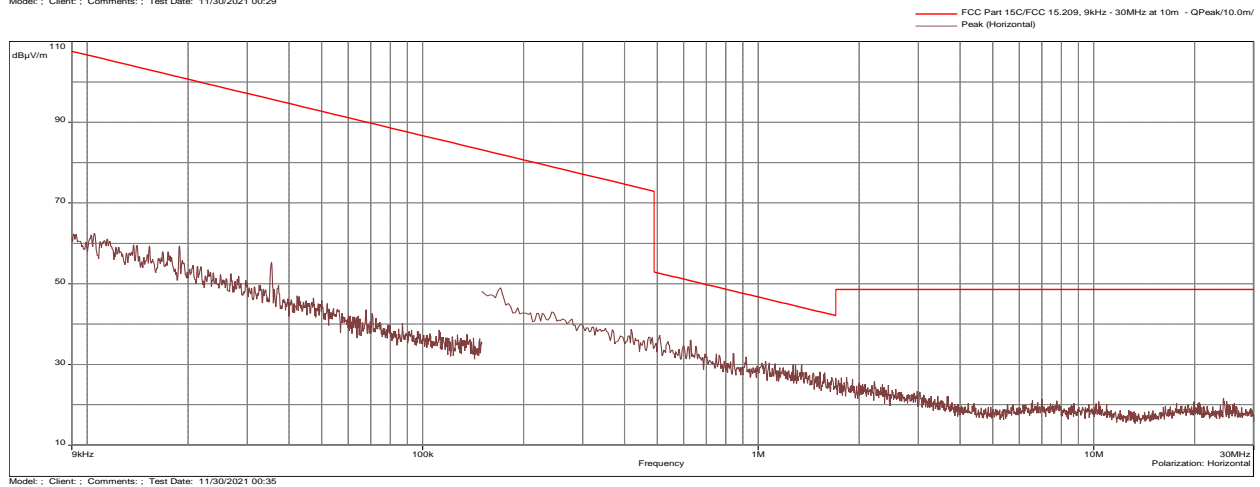
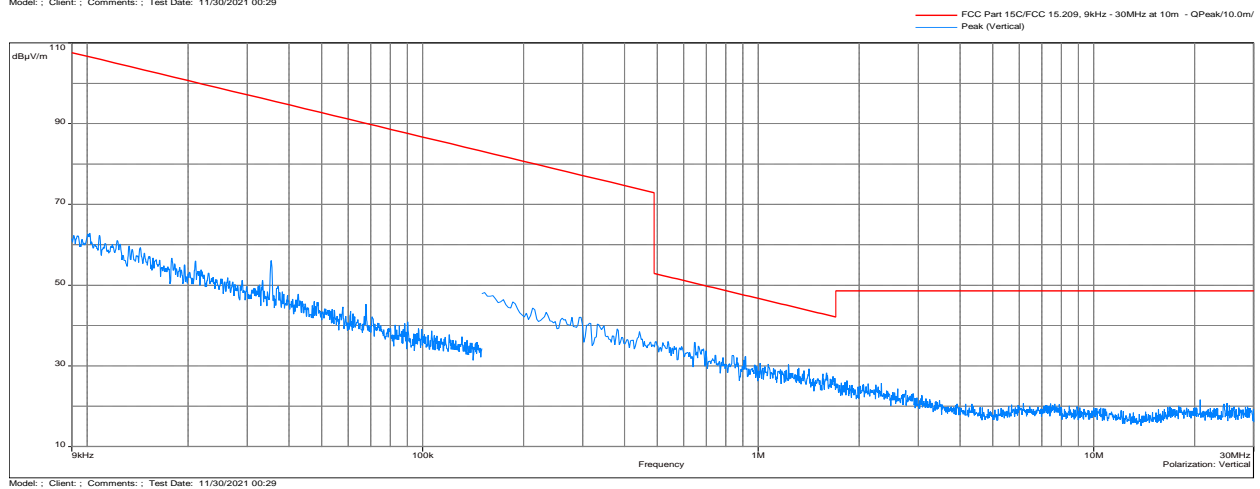
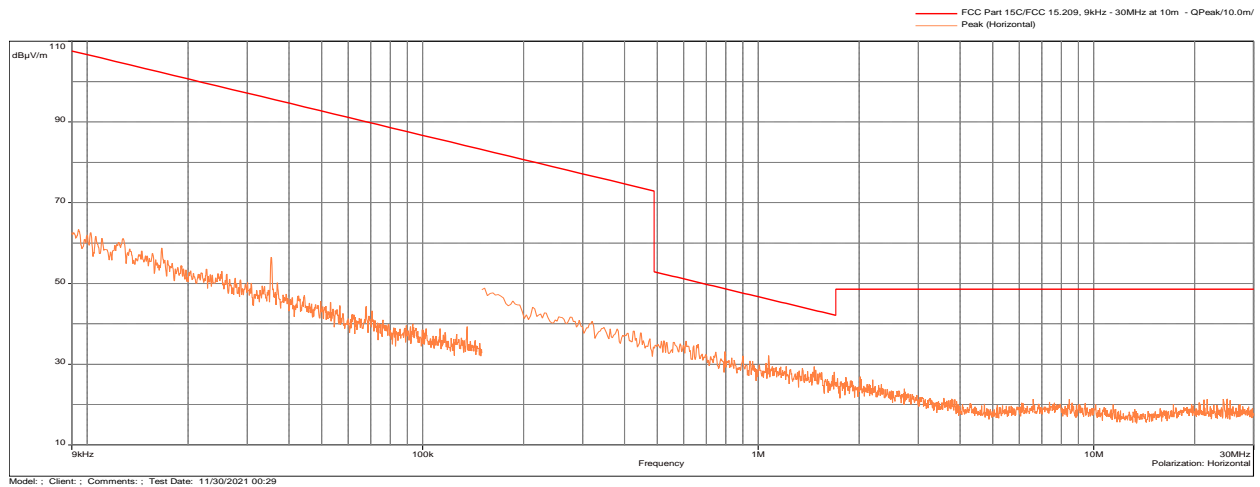
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7327.400	46.93	54	-7.07	1.01	153.25	Vertical	-3
7326.833	46.6	54	-7.4	1.01	164.5	Horizontal	-3
4885.067	43.03	54	-10.97	2.01	261.5	Horizontal	-5.31
4885.067	36.8	54	-17.2	1.01	304	Vertical	-5.31

Note: Correction = AF + CF - Preamp

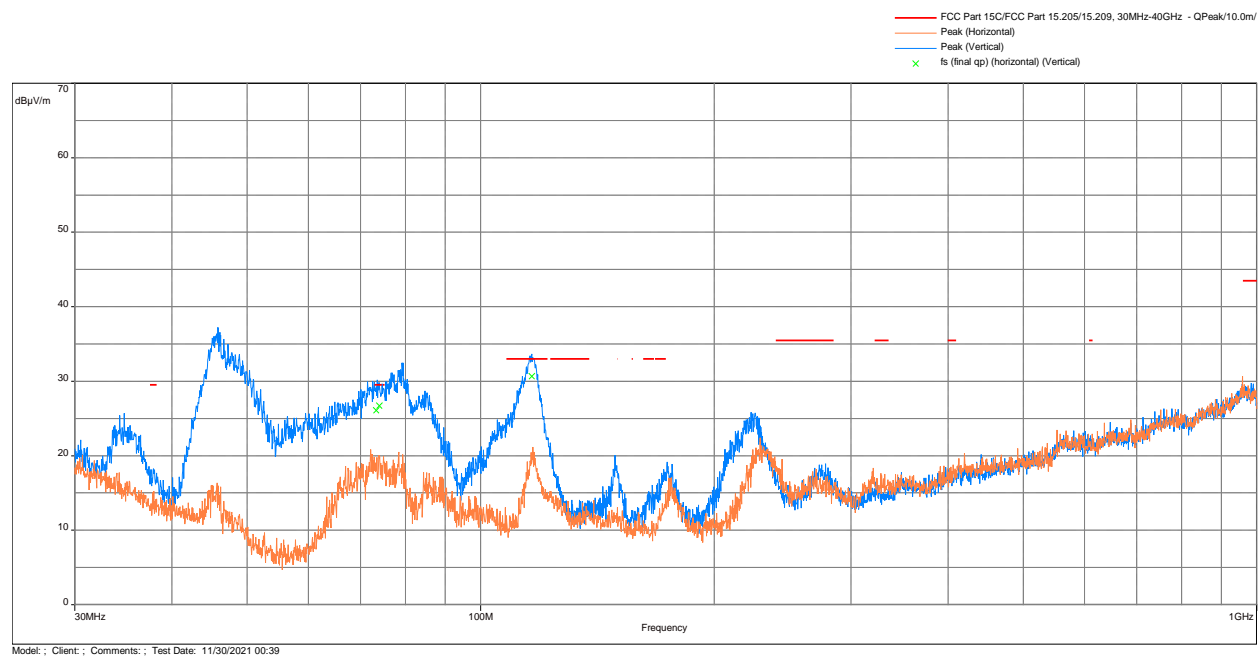
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz
Charging Mode

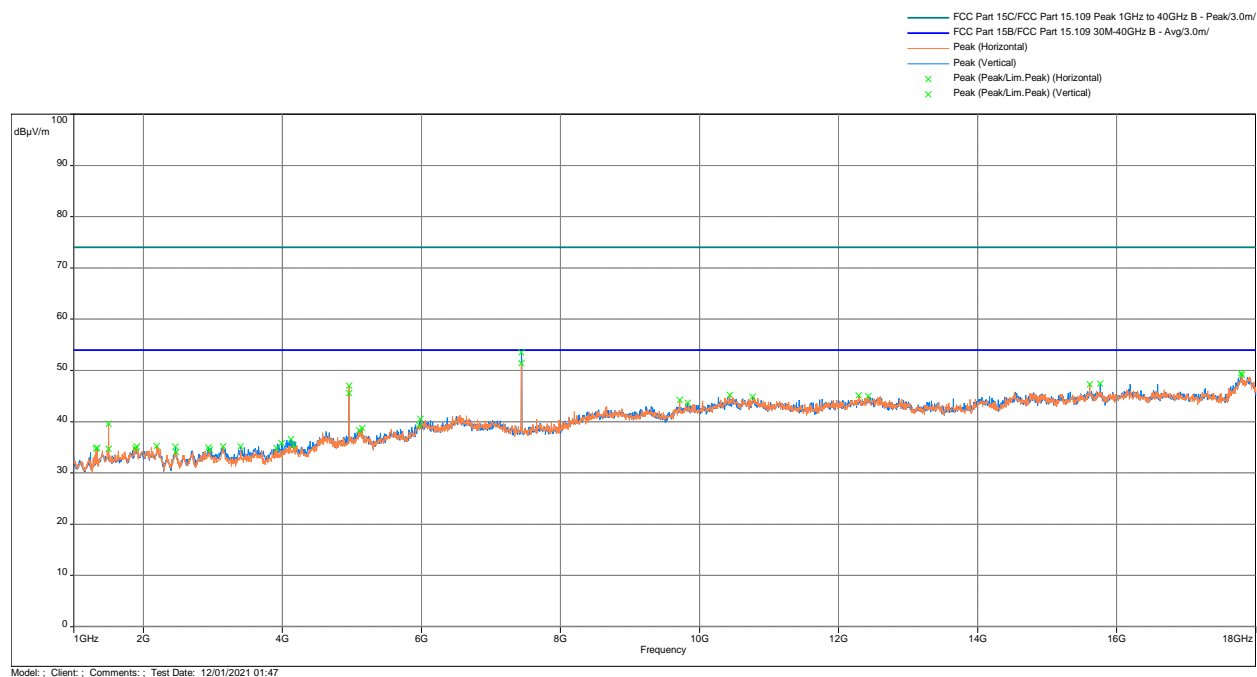
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



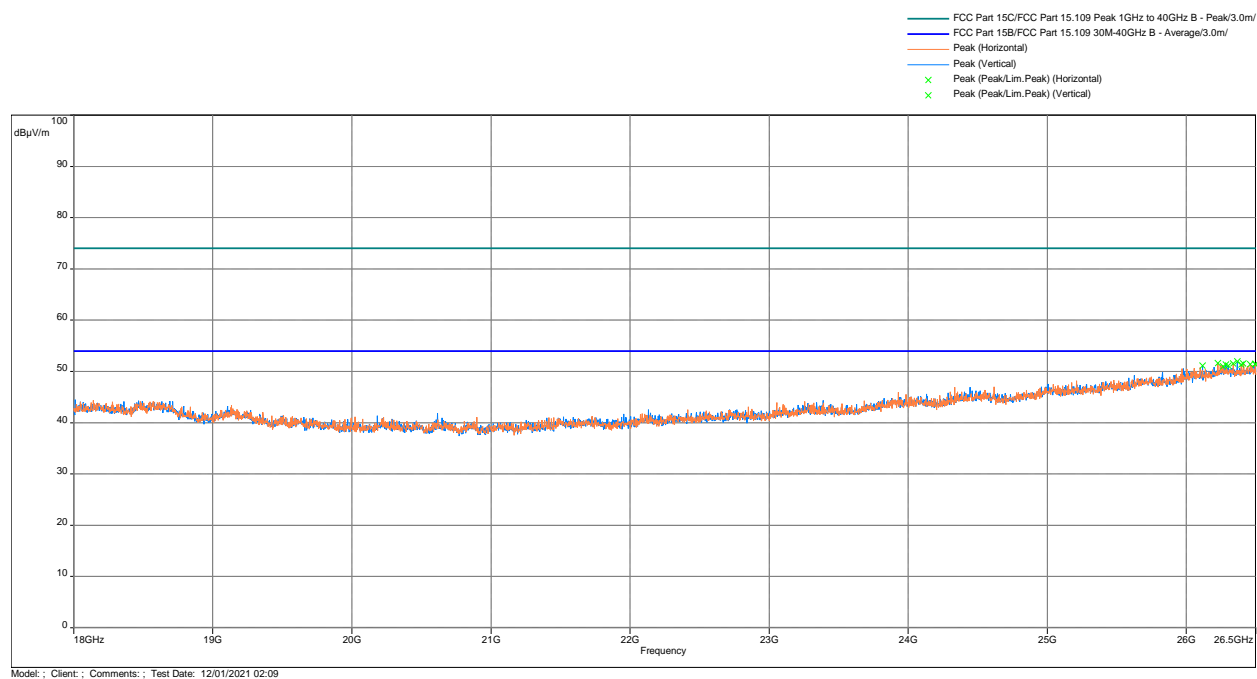
Radiated Spurious Emissions 30 MHz - 1000 MHz



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



Radiated Spurious Emissions 18 - 26 GHz, Peak Scan vs Peak & Average Limit



Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz
Charging Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
61.784	26.51	29.5	-2.99	1	186.75	Vertical	-20.86
73.387	26.08	29.5	-3.42	2.14	80.25	Vertical	-19.7
74.077	26.7	29.5	-2.8	1.89	169	Vertical	-19.62
114.616	31.97	33	-1.03	1	111.5	Vertical	-14.75
116.398	30.69	33	-2.31	1.04	144.75	Vertical	-14.6

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7441.300	53.45	74	-20.55	1.49	335.25	Vertical	-2.72
7441.300	51.4	74	-22.6	1.51	187.25	Horizontal	-2.72
4961.000	46.98	74	-27.02	2.01	251.5	Horizontal	-4.96
4961.000	45.56	74	-28.44	1.01	0	Vertical	-4.96

Note: Correction = AF + CF - Preamp

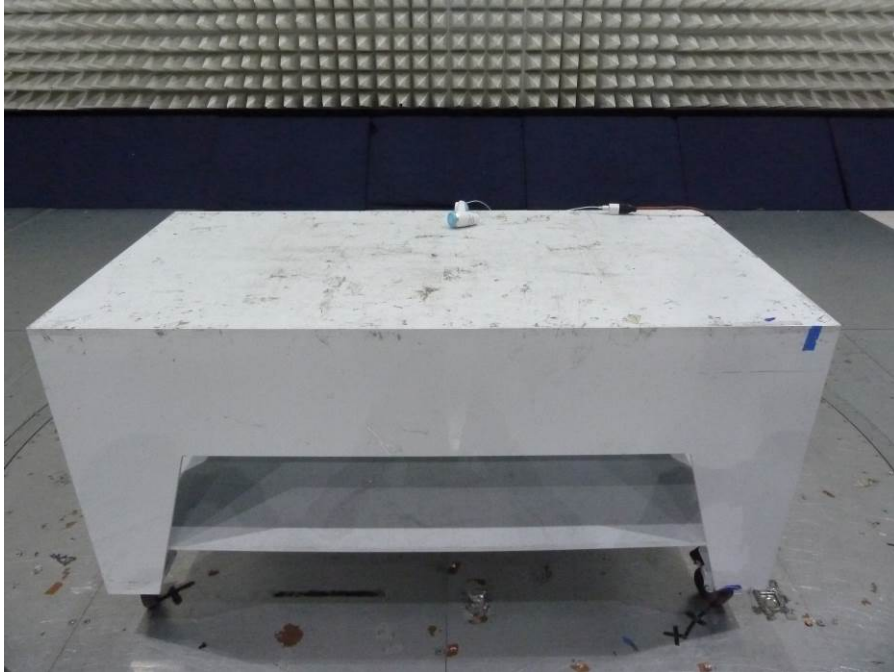
Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7441.300	46.61	54	-7.39	1.01	153.25	Vertical	-2.72
7441.300	45.01	54	-8.99	2.01	303.75	Horizontal	-2.72
4961.000	40.77	54	-13.23	1.01	1.25	Vertical	-4.95
4961.000	40.36	54	-13.64	2.01	260.75	Horizontal	-4.95

Note: Correction = AF + CF - Preamp

Results	Complies
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4.5.5 Test Setup Configuration

The following photographs show the testing configurations used.



4.5.5 Test Setup Configuration (Continued)



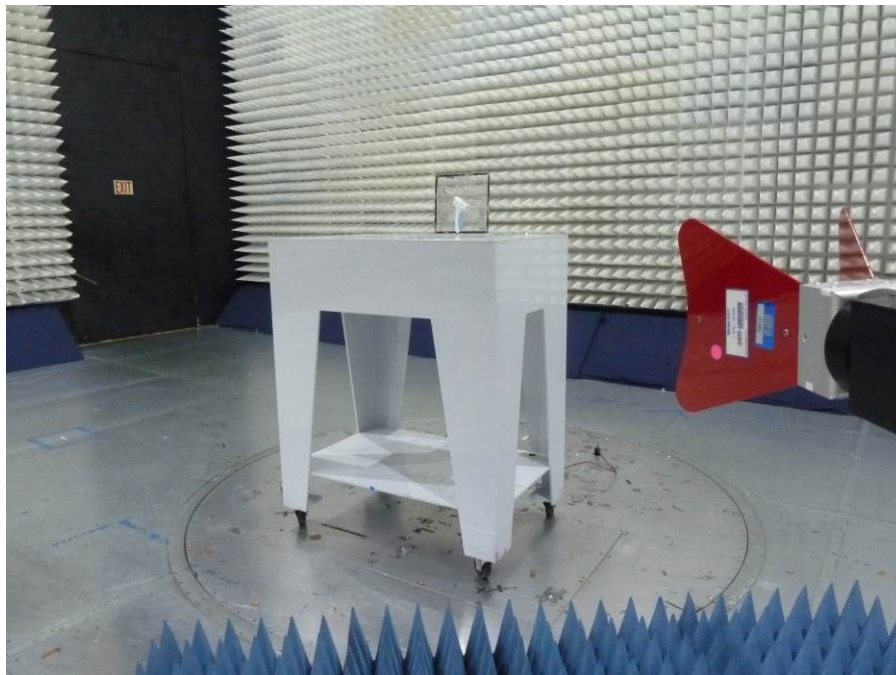
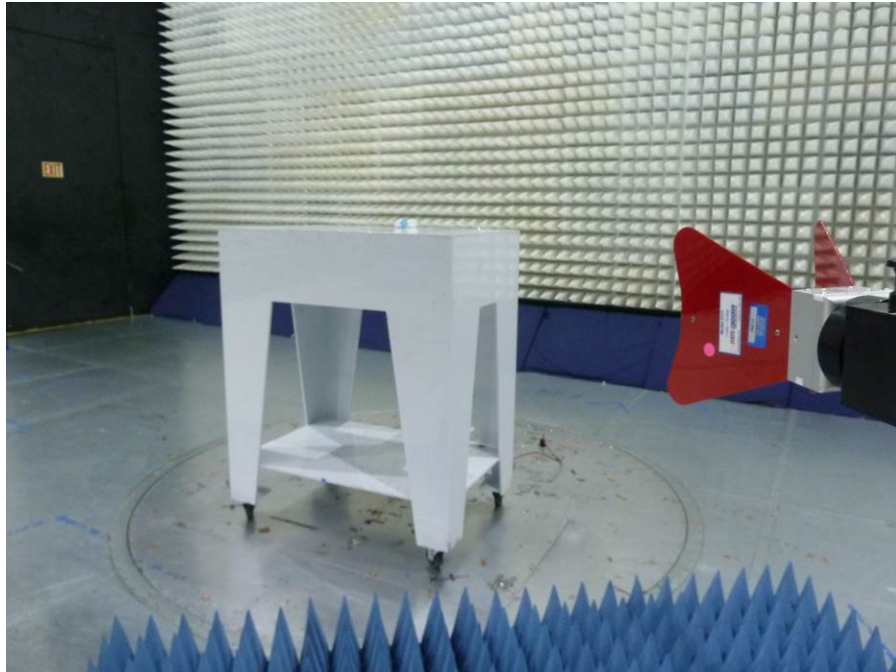
4.5.5 Test Setup Configuration (Continued)



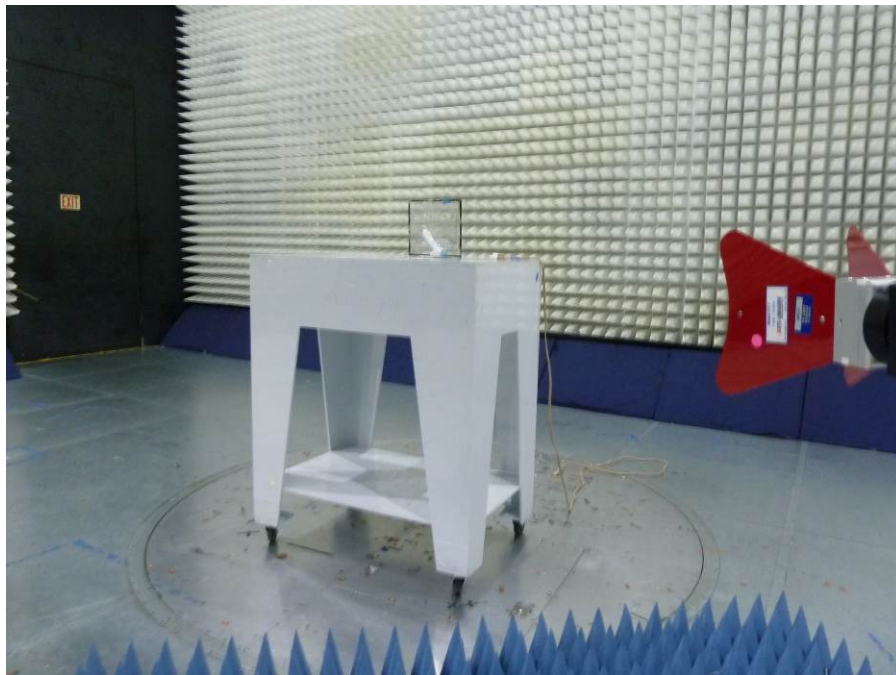
4.5.5 Test Setup Configuration (Continued)



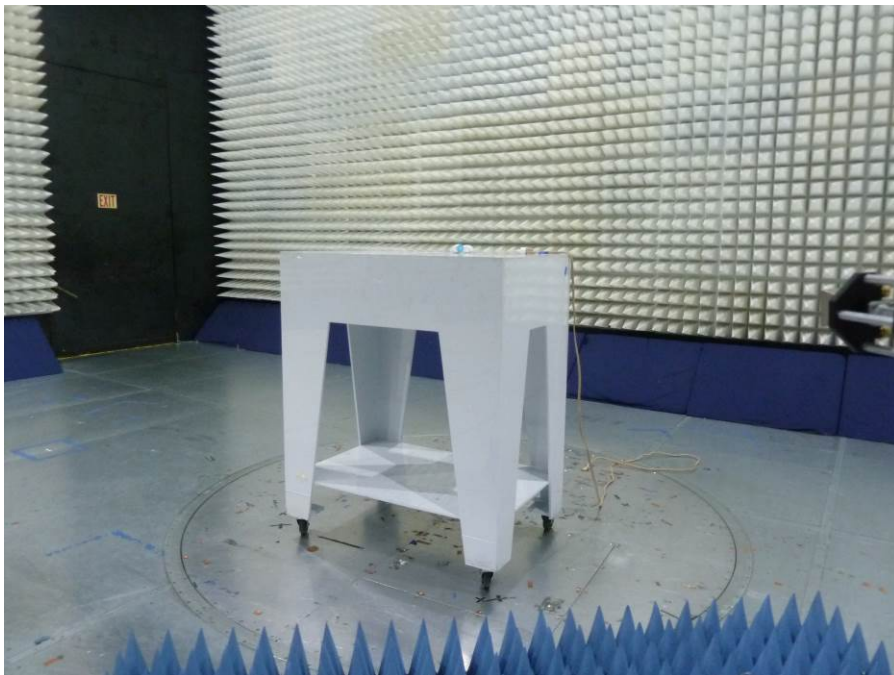
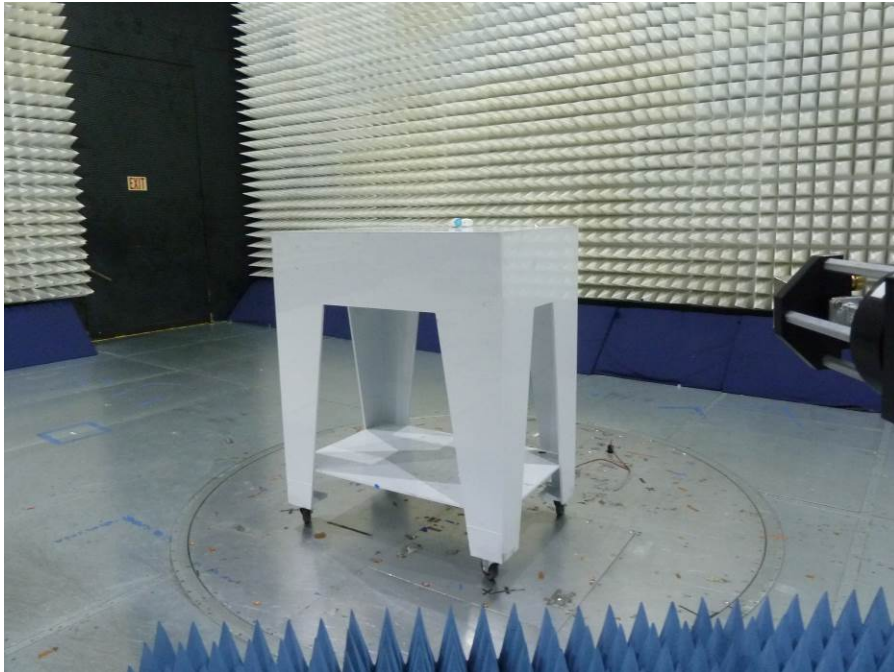
4.5.5 Test Setup Configuration (Continued)



4.5.5 Test Setup Configuration (Continued)



4.5.5 Test Setup Configuration (Continued)



4.6 AC Line Conducted Emission FCC: 15.207; RSS-GEN;

4.6.1 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.*

4.6.2 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.

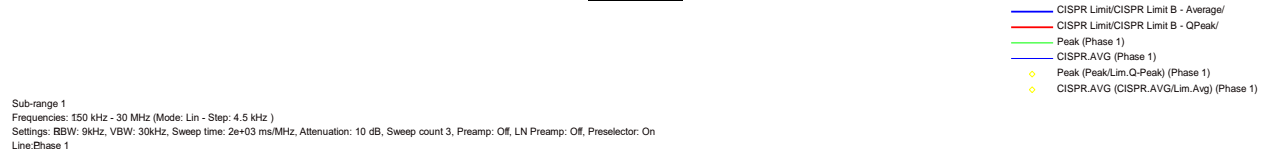
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10-2013.

Tested By	Test Date
Aaron Chang	December 1, 2021

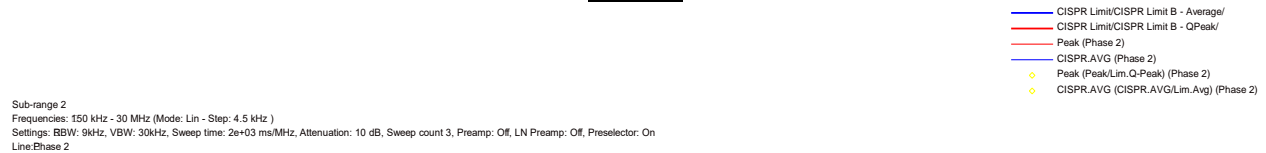
4.6.3 Test Result

15.207: Conducted Emissions 120VAC 60Hz

Phase 1



Phase 2



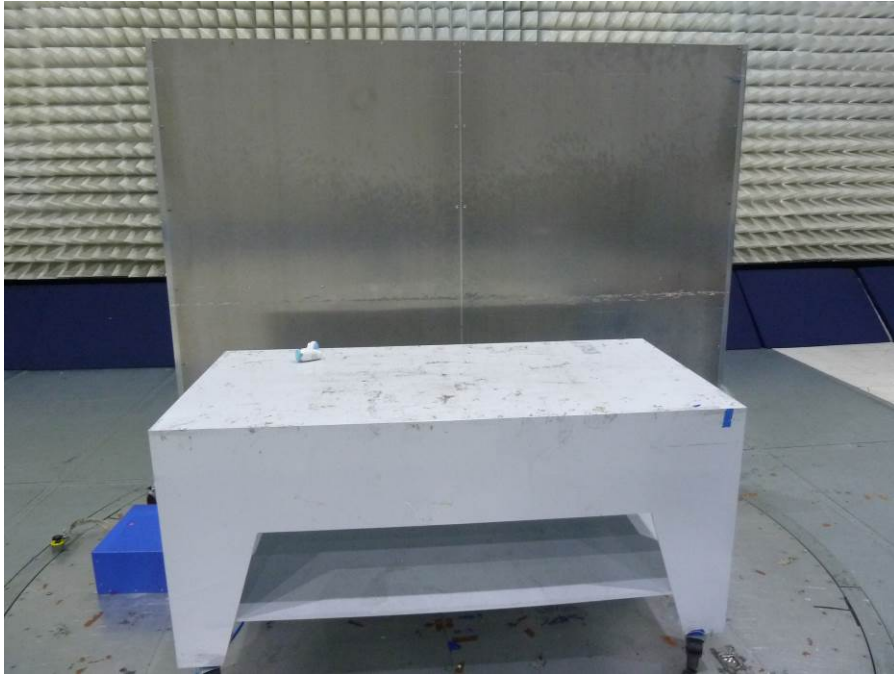
4.6.3 Test Results (Continued)

Frequency (MHz)	CISPR AVG (dBμV)	Q-Peak (dBμV)	Limit Avg (dBμV)	Limit Q-Peak (dBμV)	Margin Avg (dB)	Margin Q-Peak (dB)	Line	Correction (dB)
0.348	36.17	41.32	49.01	59.01	-12.84	-17.69	Phase 1	20.55
1.392	37.1	41.15	46	56	-8.9	-14.85	Phase 1	20.63
3.827	37.3	40.38	46	56	-8.7	-15.62	Phase 1	20.71
4.871	37.08	40.56	46	56	-8.92	-15.44	Phase 1	20.72
5.798	37.27	40.53	50	60	-12.73	-19.47	Phase 1	20.72
6.261	37.44	40.43	50	60	-12.56	-19.57	Phase 1	20.74
6.725	37.18	40.39	50	60	-12.82	-19.61	Phase 1	20.77
7.188	37.53	40.44	50	60	-12.47	-19.56	Phase 1	20.76
0.155	39.09	47.76	55.75	65.75	-16.66	-17.99	Phase 2	20.54
0.641	24.93	40.78	46	56	-21.07	-15.22	Phase 2	20.58
17.849	21.76	31.11	50	60	-28.24	-28.89	Phase 2	20.94

Results: Complies

4.6.4 Test Setup Photographs

The following photographs show the testing configurations used.



5.0 List of Test Equipment

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

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	03/09/22
LISN	Com-Power	LIN-115A	ITS 01284	12	07/09/22
Horn Antenna	ETS Lindgren	3117PA	ITS 01365	12	04/20/22
18-40GHz Preamp	uComp Nordic	MCNS-50-18004000335P	ITS 01799	12	03/19/22
Pyramidal Horn Antenna	EMCO	3160-09	ITS 00571	#	#
Loop Antenna	EMCO	6512	ITS 001598	12	06/21/22
BI-Log Antenna	Teseq	CBL 6111D	ITS 01505	12	03/22/22
Pre-Amplifier	Sonoma Instrument	310N	ITS 00942	12	04/19/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01341	12	04/28/22
Notch Filter	MICRO-TRONICS	BRM50702	ITS 01166	12	06/29/22
RF Cable	Mega Phase	EMC1-K1K1-236	ITS 01484	12	06/29/22
10m Semi-anechoic chamber	Panashield	10m Chamber	ITS 00984	36	07/29/23

No Calibration required

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.19.1.19	Nu Skin.bpp
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0 / G104685526	AC	KV	December 29, 2021	Original document

END OF REPORT