TEST REPORT

Report Number: 104933346MPK-014
Project Numbers: G104933346
Report Issue Date: March 09, 2022
Revision Date: November 29, 2022

Testing performed on
Blood pressure monitor bracelet
Model Number: Bracelet G1

FCC ID: 2AUVE-AKTIIAG1

to

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

For

Aktiia SA

Test Performed by:	**Test Authorized by:**
Intertek	Aktiia SA
1365 Adams Court	Rue du Bassin 8a
Menlo Park, CA 94025 USA	2000 Neuchâtel
	Switzerland

Prepared by: _____ **Date:** March 09, 2022
Amar Kacel

Reviewed by: _____ **Date:** March 09, 2022
Krishna K Vemuri

Report No. 104933346MPK-014	
Equipment Under Test:	Blood pressure monitor bracelet
Model Number:	Bracelet G1
Applicant:	Aktiia SA
Contact:	Ritam Priya
Address:	Aktiia SA Rue du Bassin 8a 2000 Neuchâtel
Country:	Switzerland
Tel. Number:	(510)209-0189
Email:	ritam.priya@aktiia.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) ISED RSS-247 Issue 2
Date of Test:	February 03, 2022, to March 9, 2022

We attest to the accuracy of this report:
Report Revision 1.0:

Amar Kacel
Staff Engineer

Krishna K Vemuri
EMC Manager

Report Revision 2.0:

Amar Kacel
Staff Engineer

Anderson Soungpanya
EMC Team Leader

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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: February 03, 2022

EUT receive condition: The production version of the EUT was received in good condition with no apparent damage.

Test start date: February 03, 2022

Test completion date: March 9, 2022

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

2.0 General Information

2.1 Product Description

Aktiia SA supplied the following description of the EUT:

Aktiia Bracelet G1 is a non-invasive blood pressure (BP) monitor wearable bracelet intended to measure optical photoplethysmography (PPG) signals on the user's wrist and to calculate blood pressure values using a Pulse Wave Analysis (PWA) technique, following a calibration process using an oscillometric blood pressure monitor.

Aktiia Bracelet is the smart way to track user's blood pressure 24/7. Bluetooth connectivity allows the bracelet to be connected to the Aktiia mobile app.

For more information, refer to the manufacturer user manual.

The following product specification, declared by the manufacturer.

Information about the 2.4 GHz radio is presented below:

Applicant	Aktiia SA	
BLE Type	v4.2	v5.0
Model No.	Bracelet G1	
FCC Identifier	2AUVE-AKTIIAG1	
Type of transmission	Digital Transmission System (DTS)	
Rated RF Output	-0.98 dBm	-1.01 dBm
Antenna(s) & Gain	Internal Antenna, Gain: +1dBi	
Frequency Range	2402 – 2480 MHz	
Type of modulation/data rate	GFSK / 1Mbit/s	GFSK / 2Mbit/s
Number of Channel(s)	40	
Applicant Name & Address	Aktiia SA Rue du Bassin 8a 2000 Neuchâtel Switzerland	

*: Antenna gain was provided by Aktiia SA. Intertek takes no responsibility for the accuracy of the antenna gain.

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

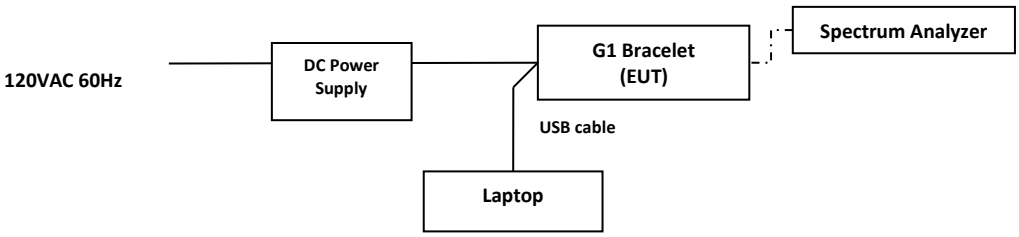
Equipment Under Test			
Description	**Manufacturer**	**Model**	**Serial Number**
Radiated Sample	Aktiia SA	Bracelet G1	8DBC5AE8A
Conducted Sample	Aktiia SA	Bracelet G1	Not provided

Support Equipment		
Description	**Manufacturer**	**Model**
DC Power Supply	Exetech	D30030012
Laptop	Lenovo	NA

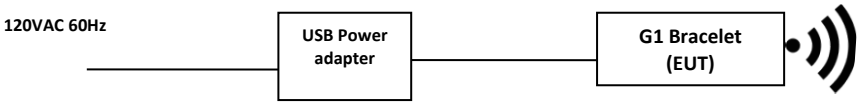
3.2 Block Diagram of Test Setup

Conducted Measurements SETUP

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

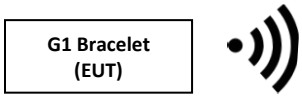


Charging Mode Radiated Measurements SETUP



Bluetooth

Battery Mode Radiated Measurements SETUP



Bluetooth

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

3.3 EUT Photo

Charging Mode:

Battery Mode:

3.4 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.

3.5 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Aktiia SA.

3.6 Mode of Operation during Test

Mode of operation during the tests was set up using a laptop which allows controlling the radio by test software. During the transmitter tests, the transmitter was set up to transmit maximum communication and RF power levels.

EUT was placed into transmit mode at the lowest (2402MHz) middle (2440MHz), and highest (2480MHz) channels.

Channels	Freq. MHz	GUI Setting
0 - 39	2402 to 2480	0

3.7 Modifications Required for Compliance

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

3.8 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) ≥ 3 x 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

BLE 4.2:

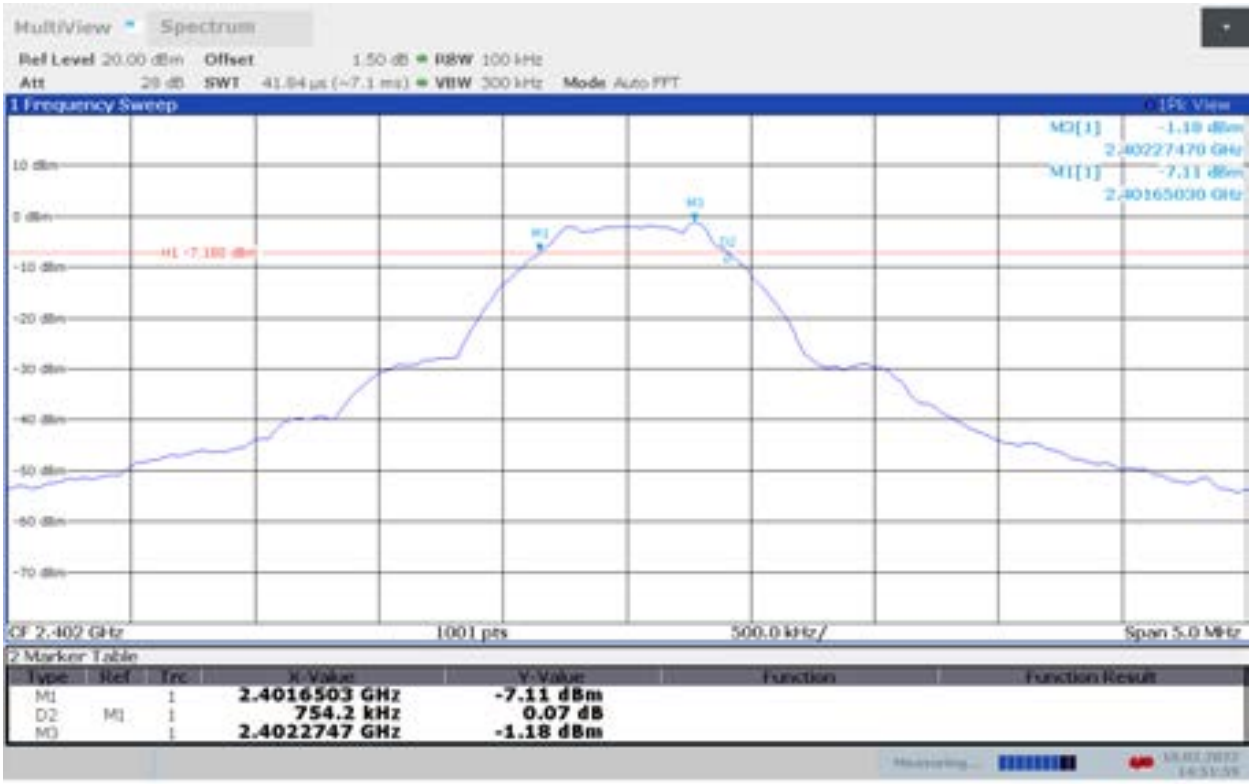
Frequency (MHz)	6-dB bandwidth FCC 15.247 & RSS-GEN, kHz	Occupied bandwidth, RSS-GEN, MHz	Plot
2402	754.2	--	1.1
	--	1.067	1.4
2440	739.3	--	1.2
	--	1.071	1.5
2480	754.2	--	1.3
	--	1.075	1.6

BLE 5.0:

Frequency (MHz)	6-dB bandwidth FCC 15.247 & RSS-GEN, kHz	Occupied bandwidth, RSS-GEN, MHz	Plot
2402	1409.0	--	1.7
	--	2.086	1.10
2440	1399.0	--	1.8
	--	2.102	1.11
2480	1319.0	--	1.9
	--	2.095	1.12

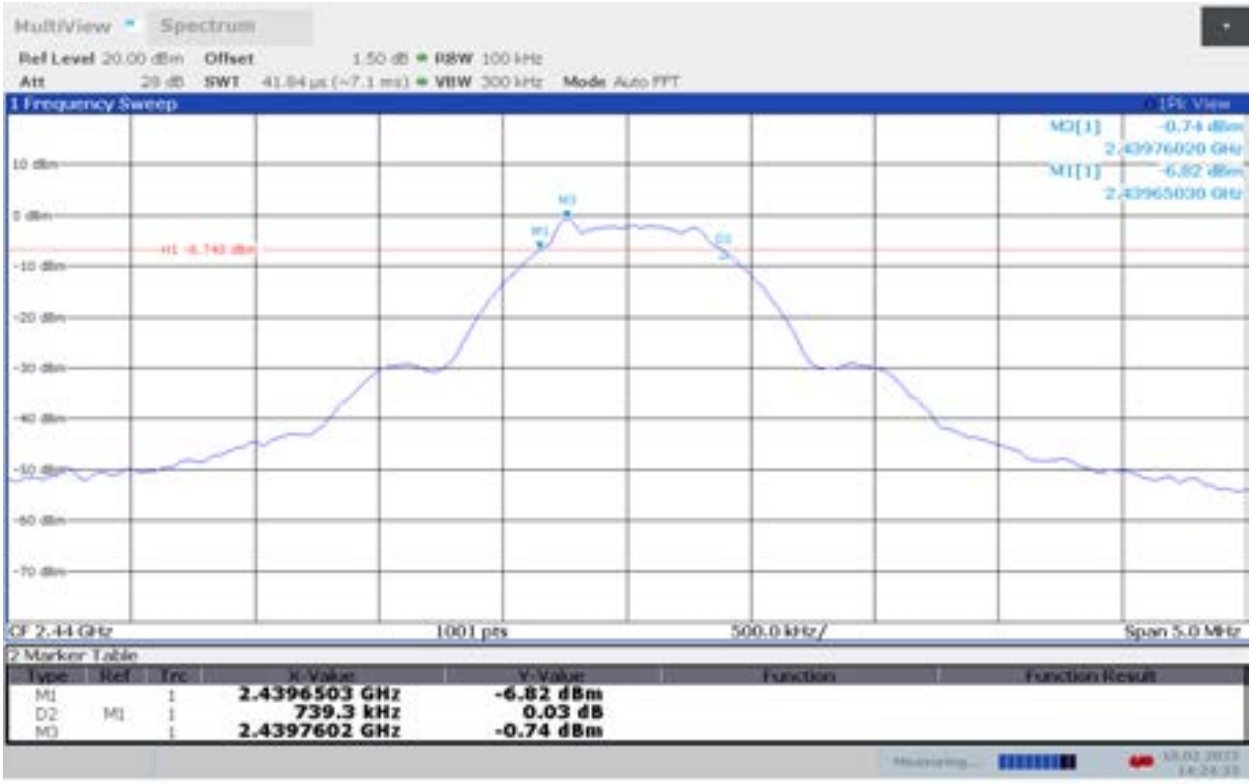
Tested By	Test Date	Results
Amar Kacel	February 09, 2022 to March 09, 2022	Complies

Plot 1. 1



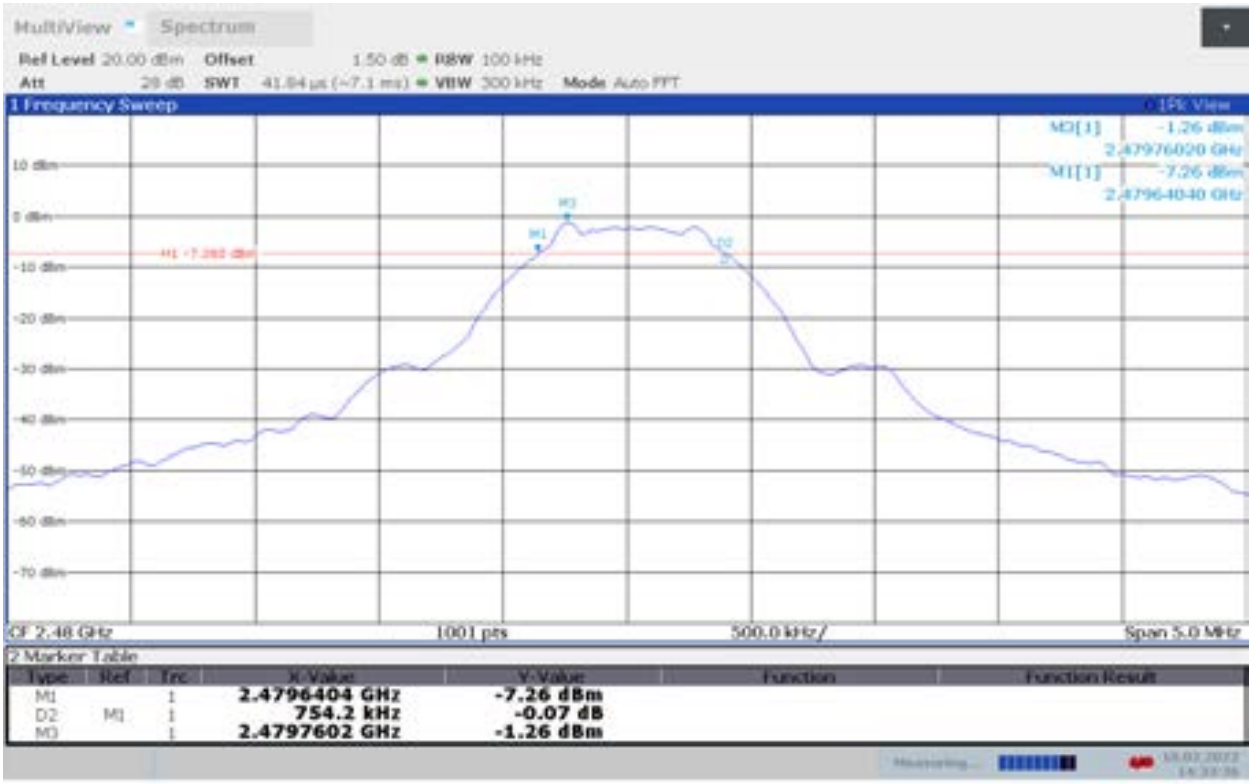
14:52:00 10.02.2022

Plot 1. 2



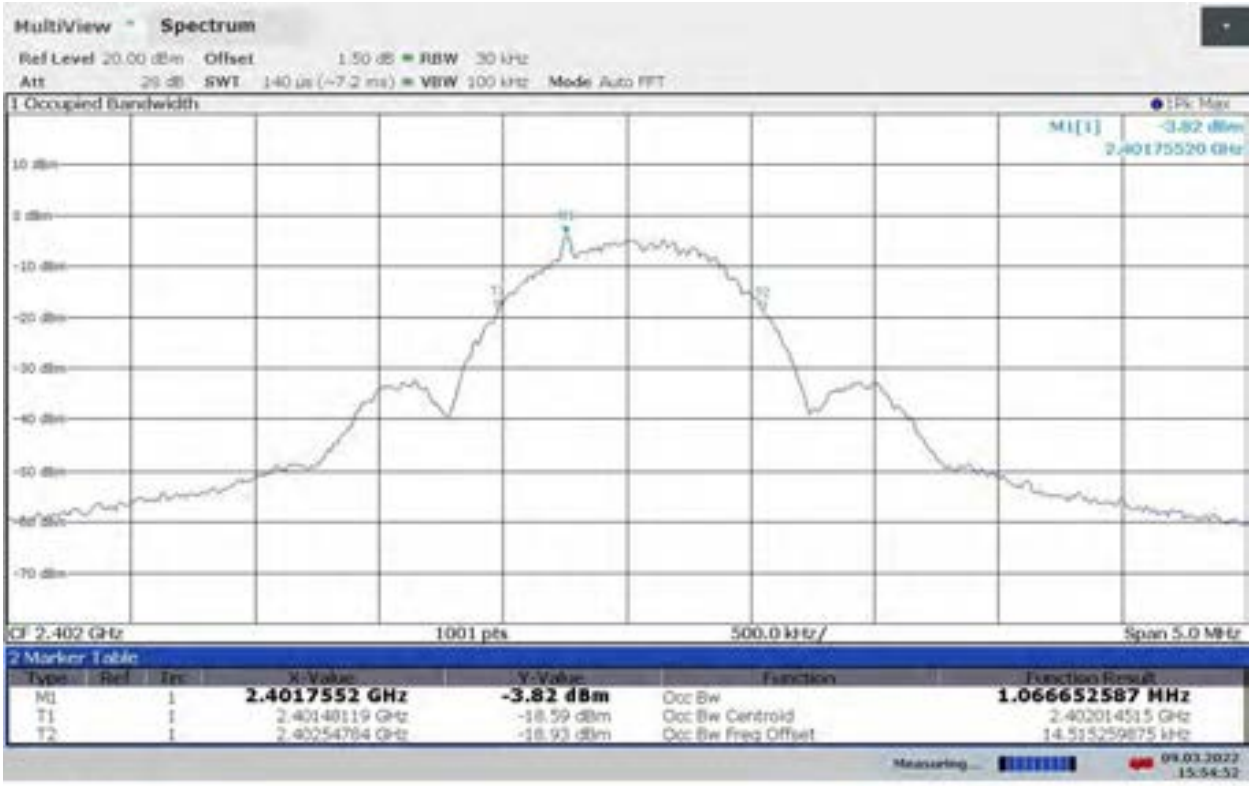
14:24:34 10.02.2022

Plot 1. 3



14:33:36 10.02.2022

Plot 1. 4



15:54:52 09.03.2022

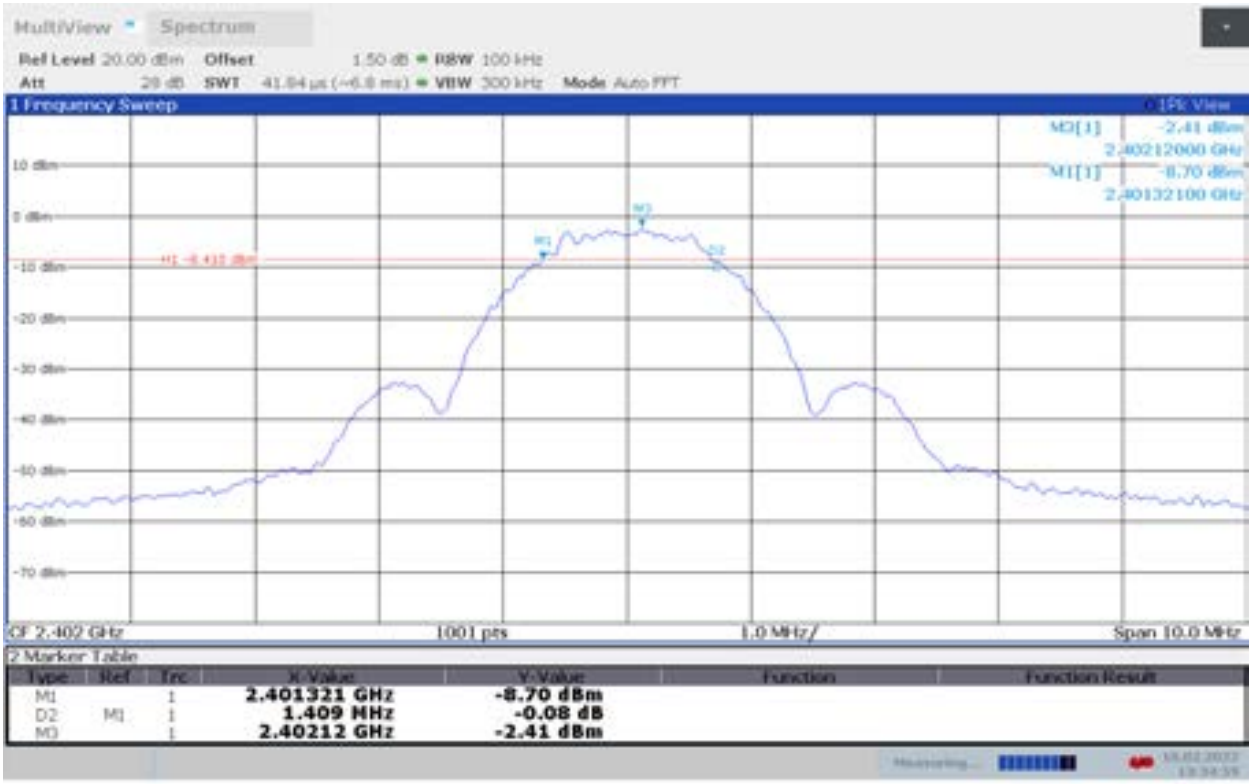
Plot 1.5

15:56:03 09.03.2022

Plot 1.6

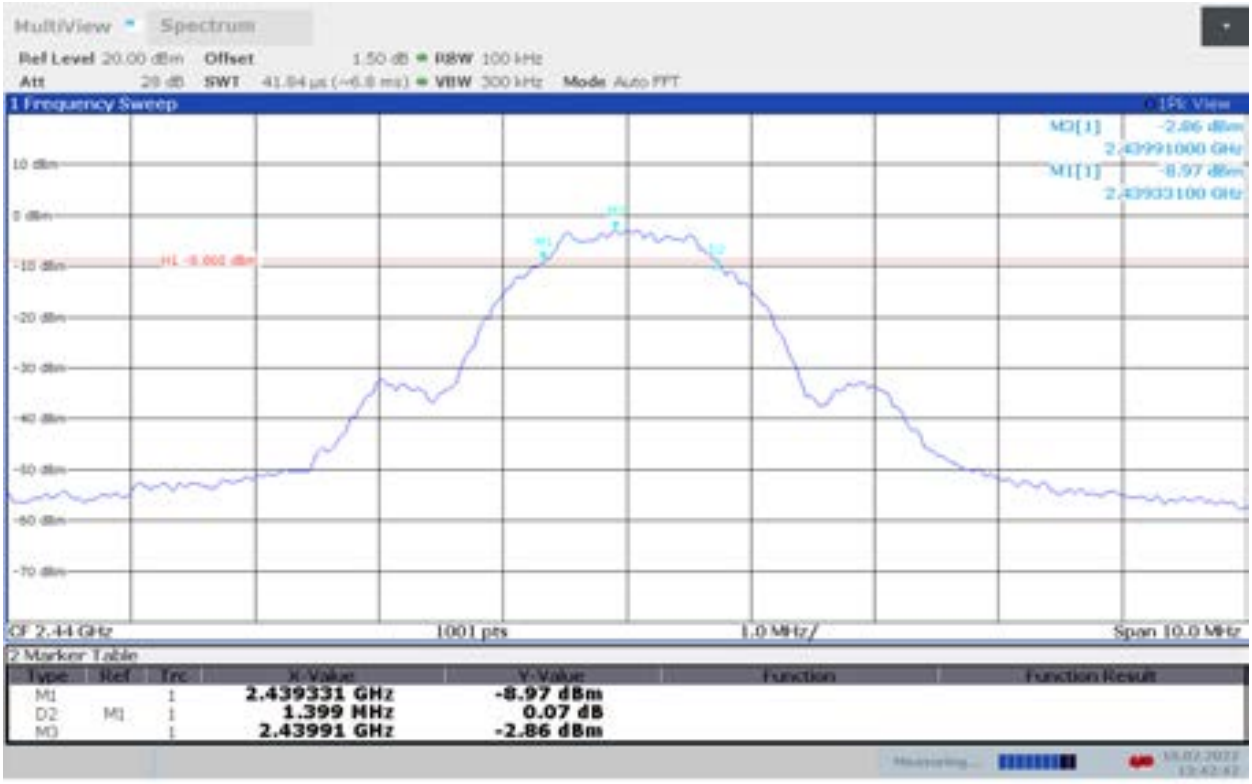
15:57:58 09.03.2022

Plot 1.7



13:34:59 10.02.2022

Plot 1.8

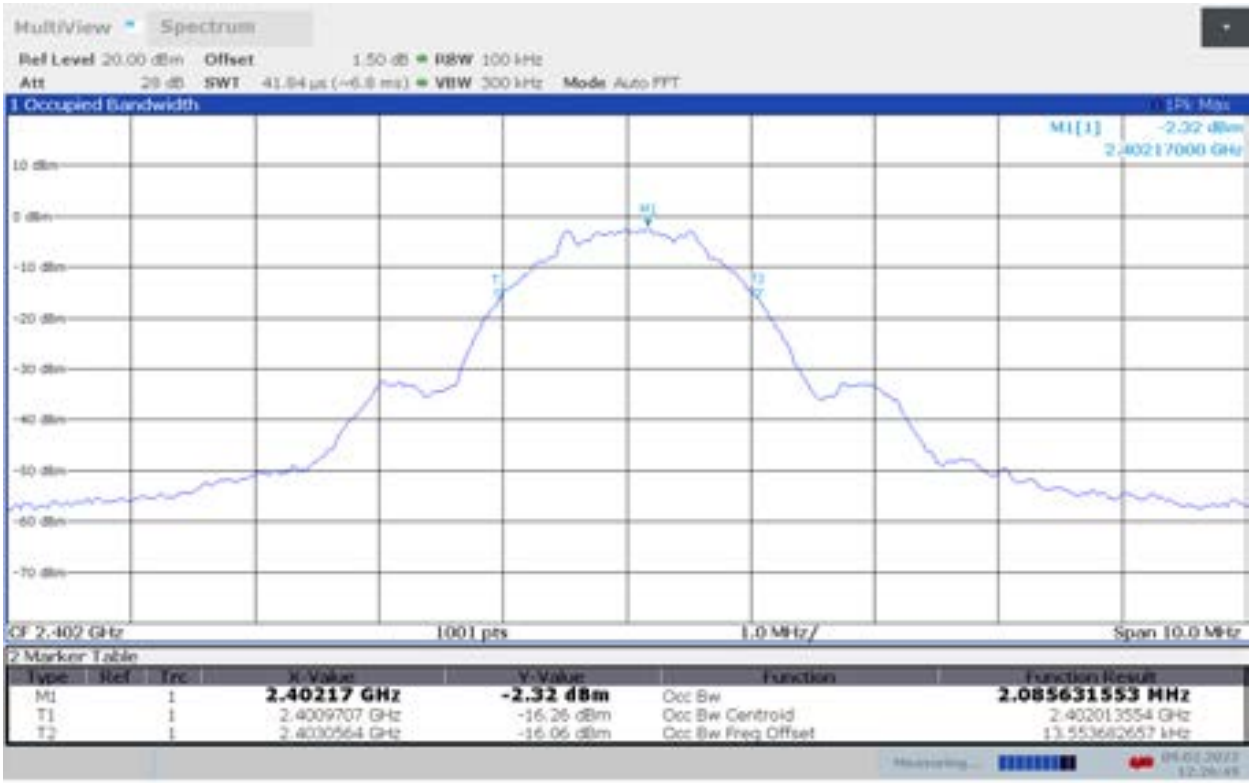


13:42:42 10.02.2022

Plot 1.9

13:54:00 10.02.2022

Plot 1.10

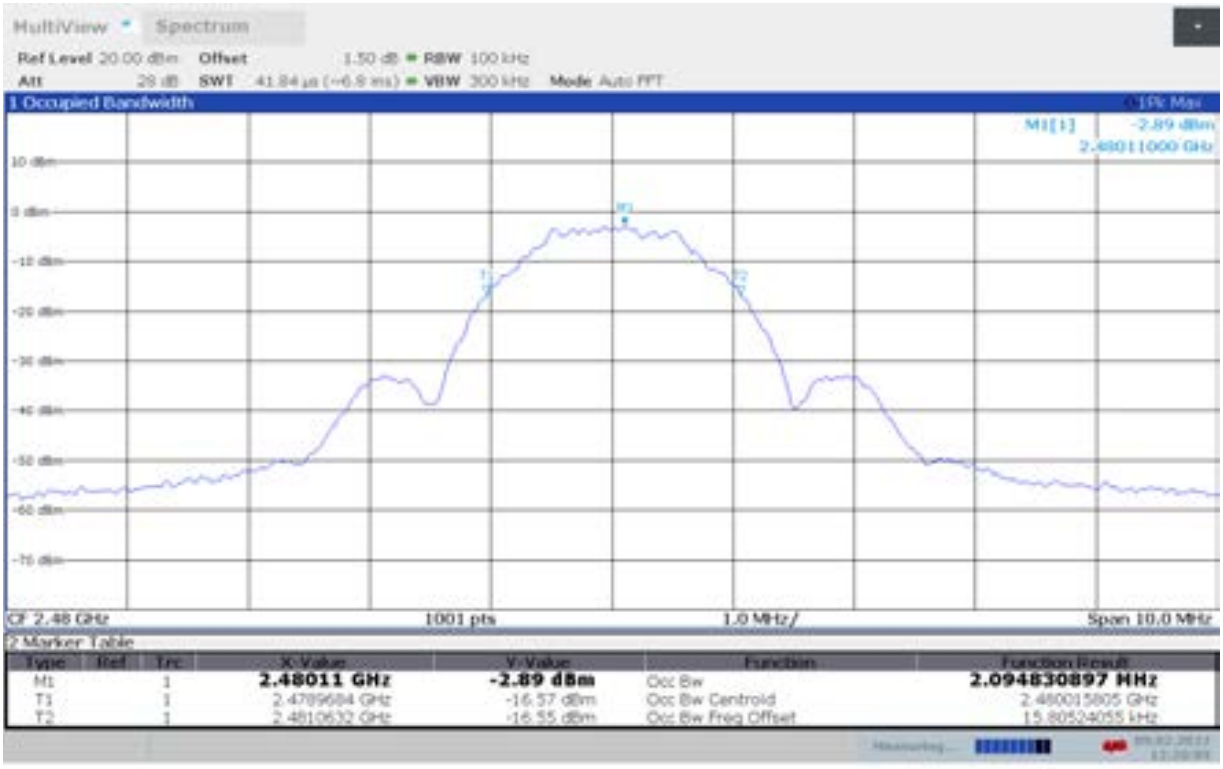


12:26:50 09.02.2022

Plot 1.11

12:22:59 09.02.2022

Plot 1.12



12:20:09 09.02.2022

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 ≥ DTS bandwidth in ANSI 63.10.

1. Set the RBW ≥ DTS Bandwidth
2. Set the VBW ≥ 3 x RBW
3. Set the span ≥ 3 x 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.

BLE 4.2

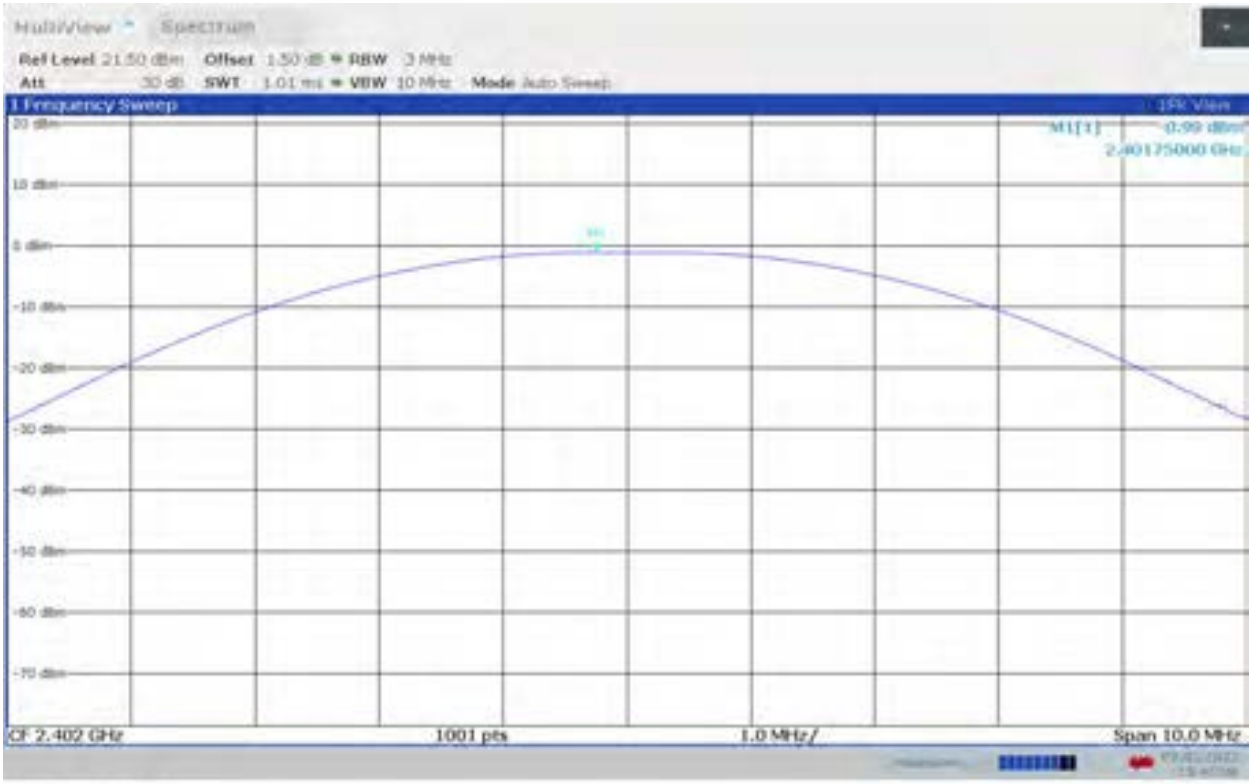
Frequency	Conducted Power (peak)		Plot
MHz	dBm	mW	
2402	-0.98	0.798	2.1
2442	-1.22	0.755	2.2
2480	-1.26	0.748	2.3

BLE 5.0

Frequency	Conducted Power (peak)		Plot
MHz	dBm	mW	
2402	-1.01	0.793	2.4
2442	-1.21	0.757	2.5
2480	-1.26	0.748	2.6

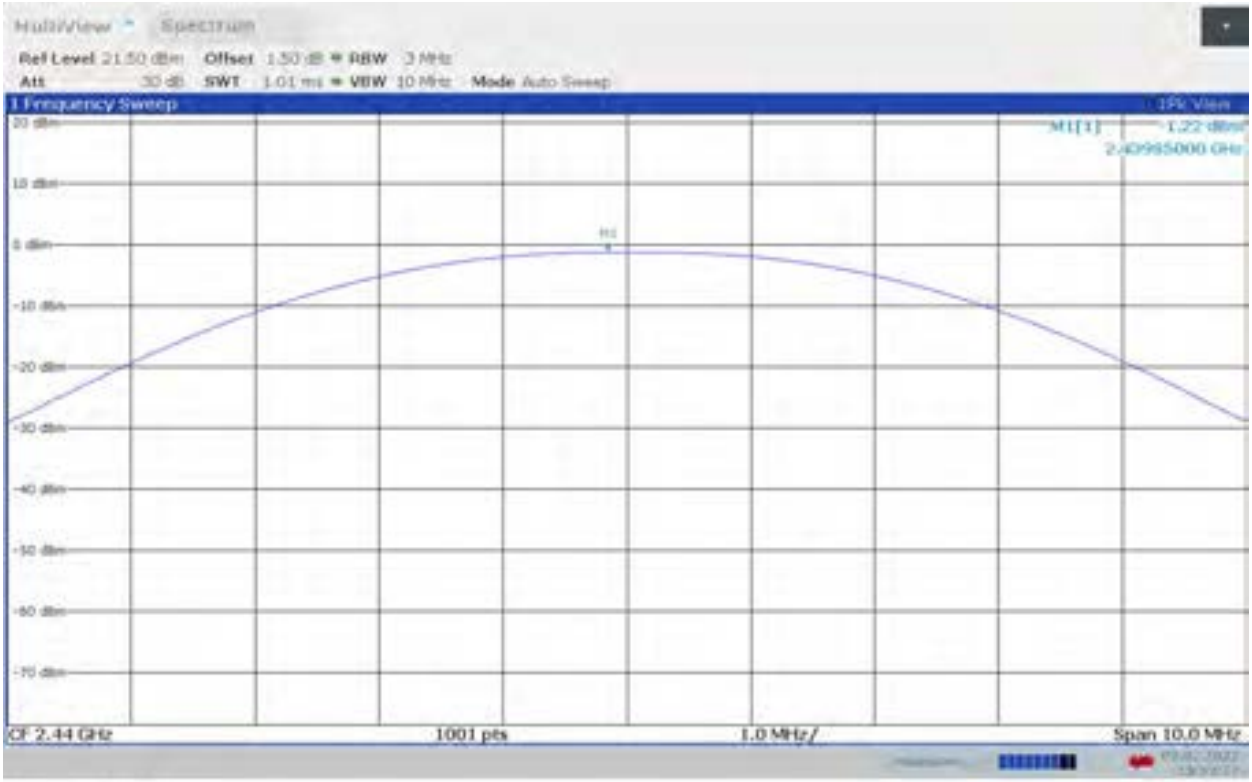
Tested By	Test Date	Results
Amar Kacel	February 07, 2022	Complies

Plot 2. 1



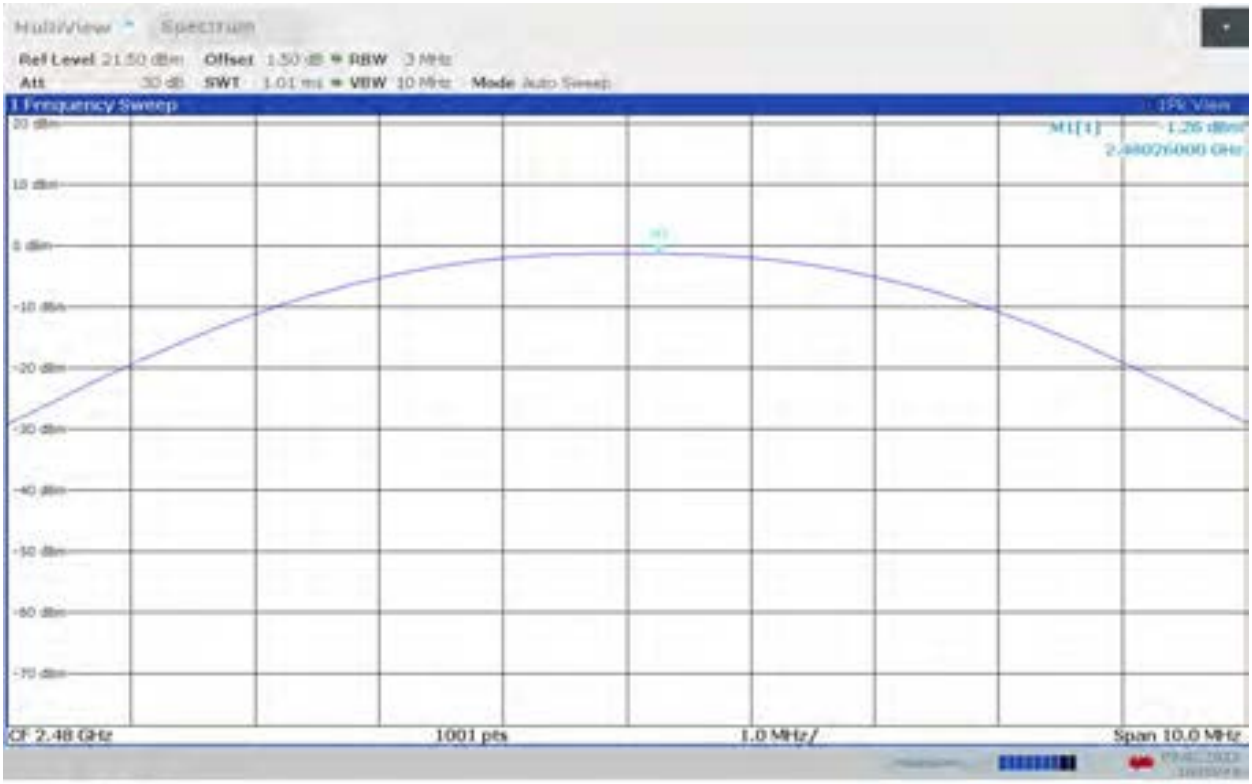
15:47:06 07.02.2022

Plot 2. 2



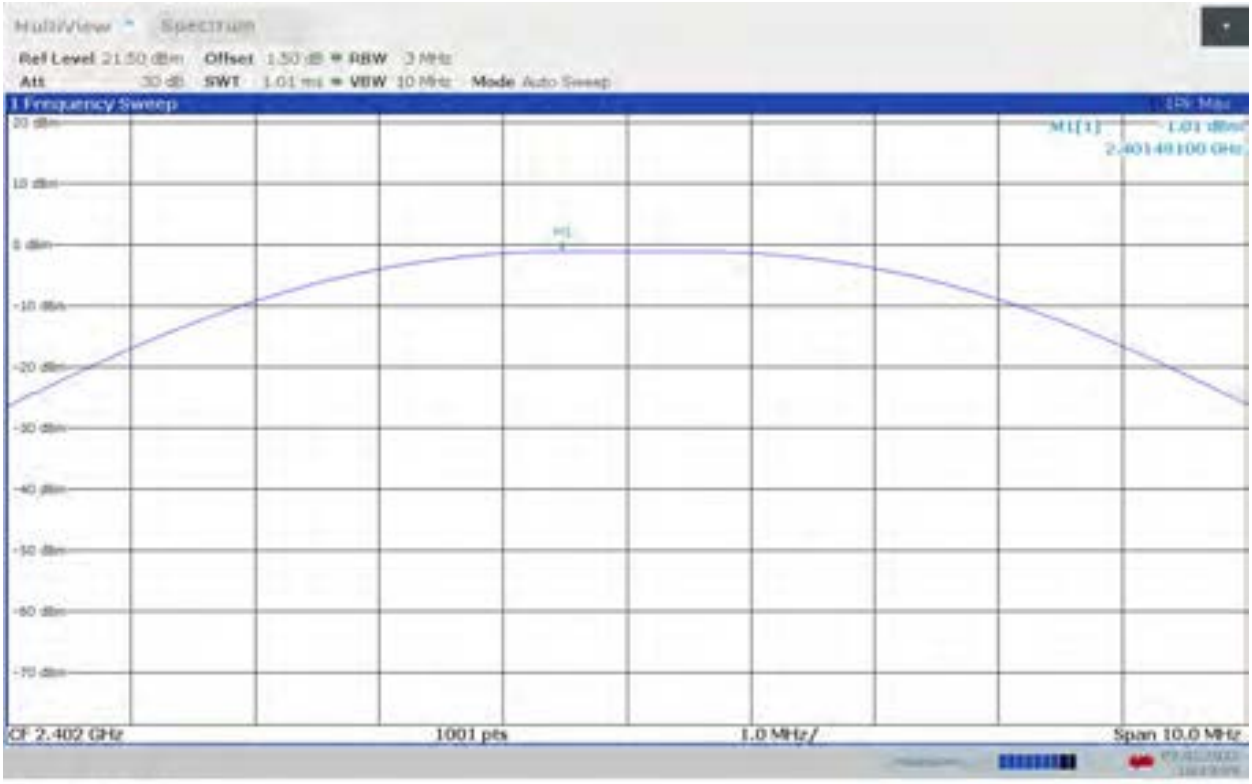
15:53:27 07.02.2022

Plot 2. 3



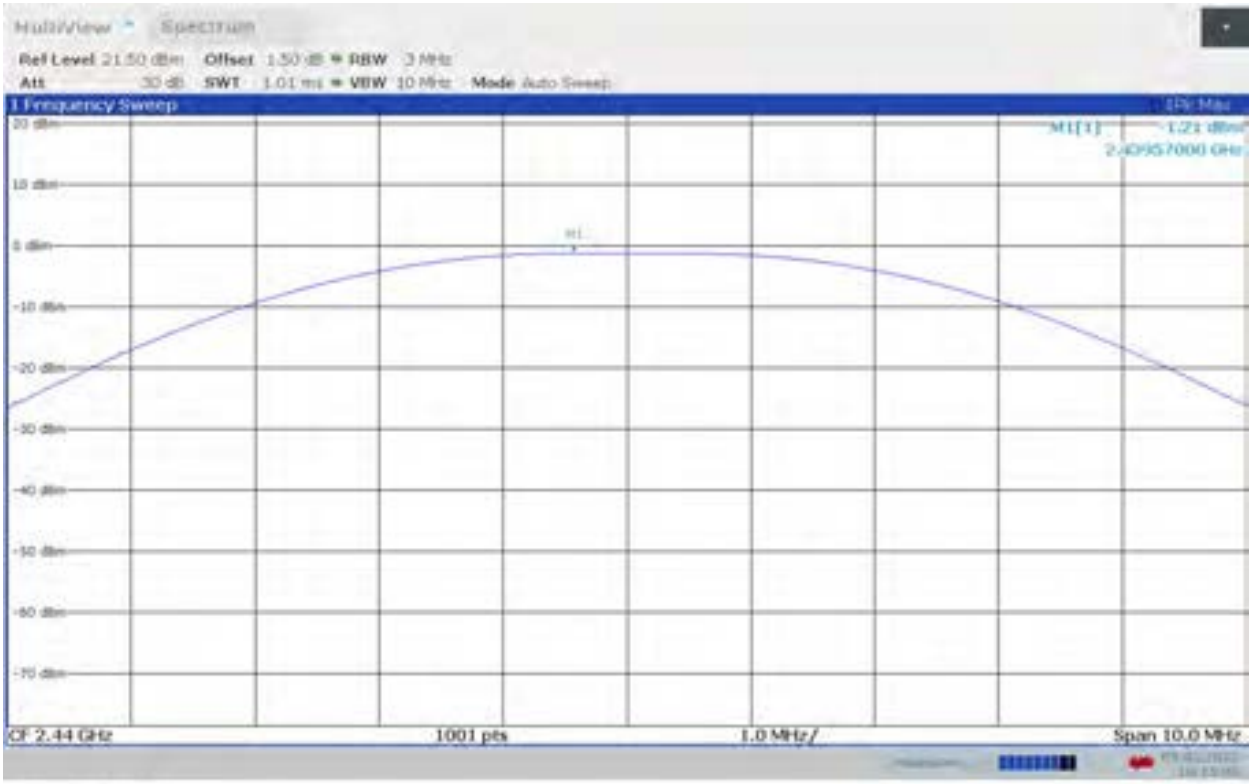
16:00:44 07.02.2022

Plot 2.4



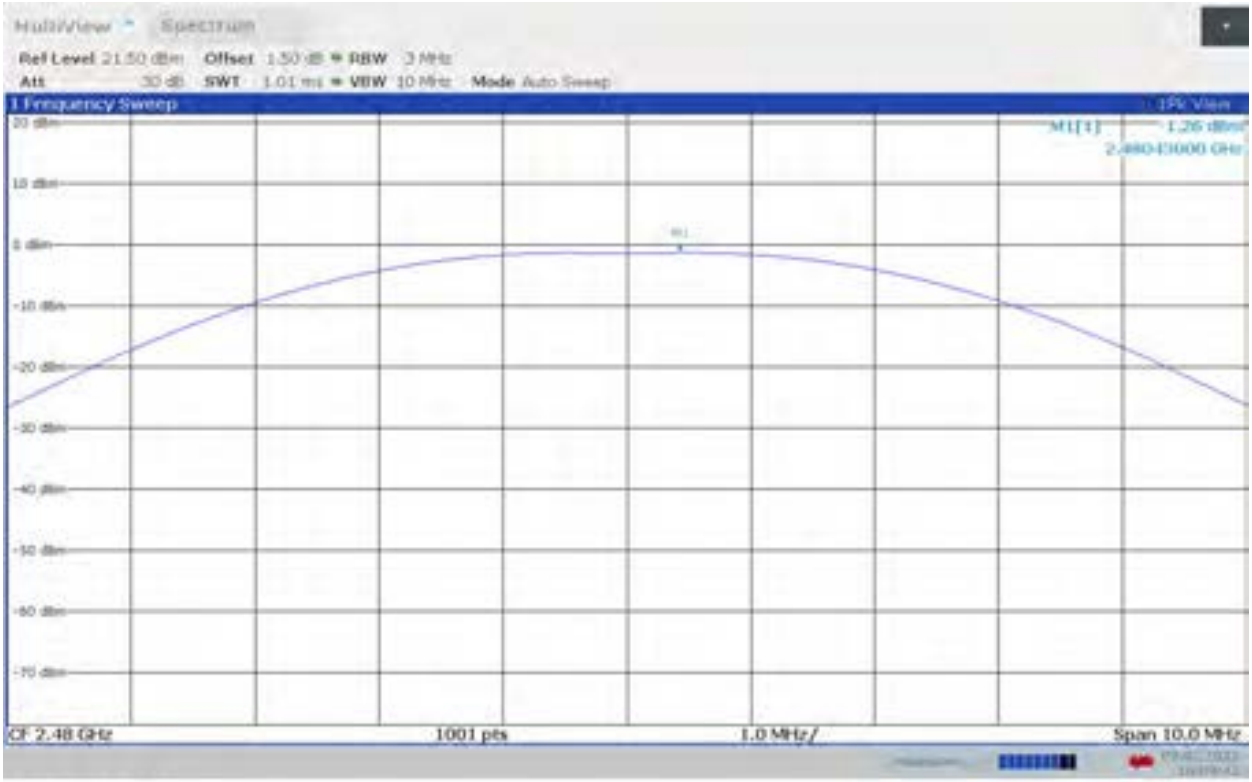
16:19:10 07.02.2022

Plot 2.5



16:15:02 07.02.2022

Plot 2.6



16:09:43 07.02.2022

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 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x 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

BLE 4.2

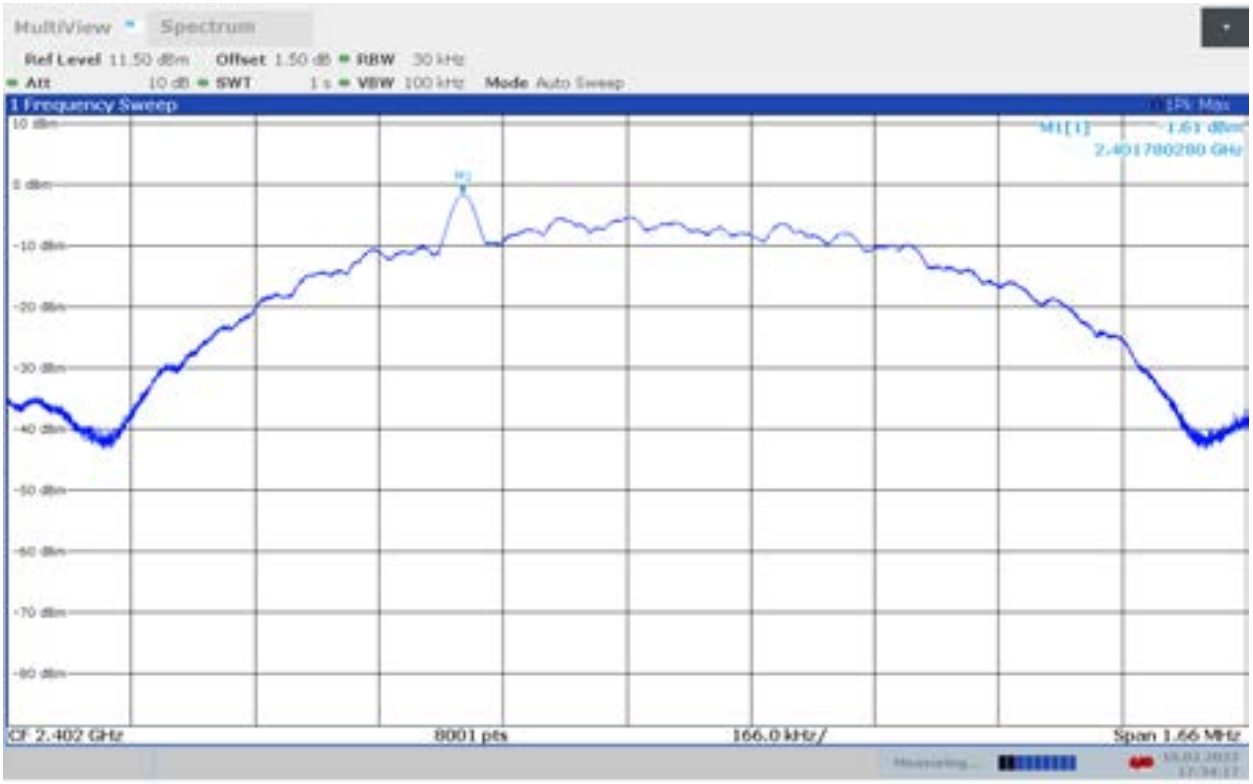
Frequency, MHz	Maximum Power Spectral Density, dBm	Maximum Power Spectral Density Limit, dBm	Margin, dB	Plot
2402	-1.61	8.0	-9.61	3.1
2440	-1.78	8.0	-9.78	3.2
2480	-1.78	8.0	-9.78	3.3

BLE 5.0

Frequency, MHz	Maximum Power Spectral Density, dBm	Maximum Power Spectral Density Limit, dBm	Margin, dB	Plot
2402	-3.85	8.0	-11.85	3.4
2440	-4.21	8.0	-12.21	3.5
2480	-4.27	8.0	-12.27	3.6

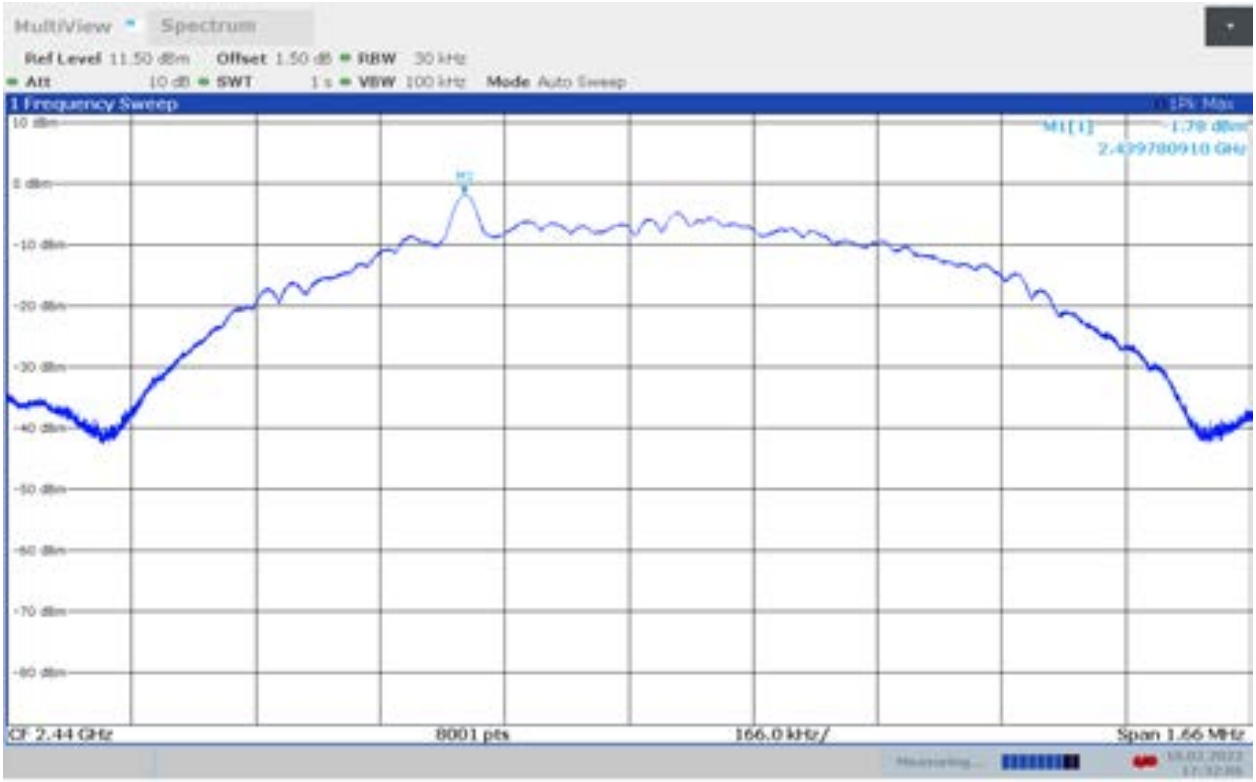
Tested By	Test Date	Results
Amar Kacel	February 10, 2022	Complies

Plot 3. 1



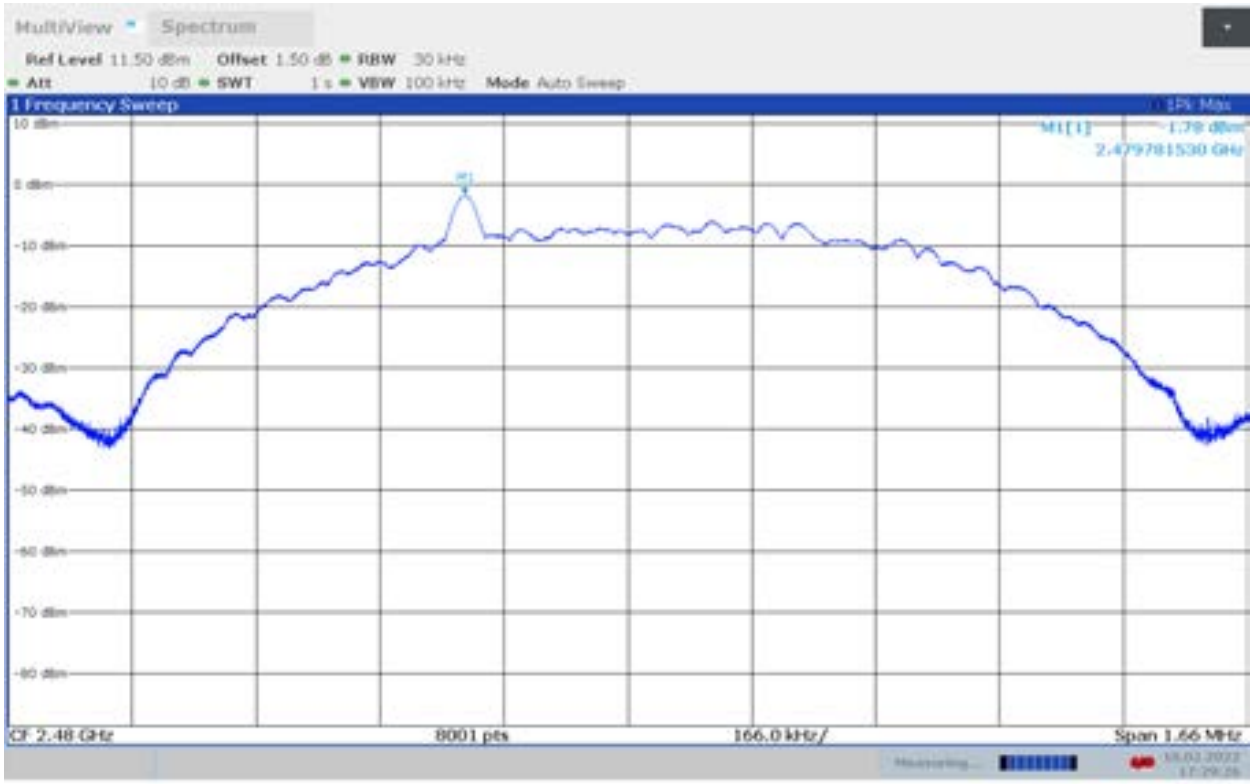
17:34:18 10.02.2022

Plot 3. 2



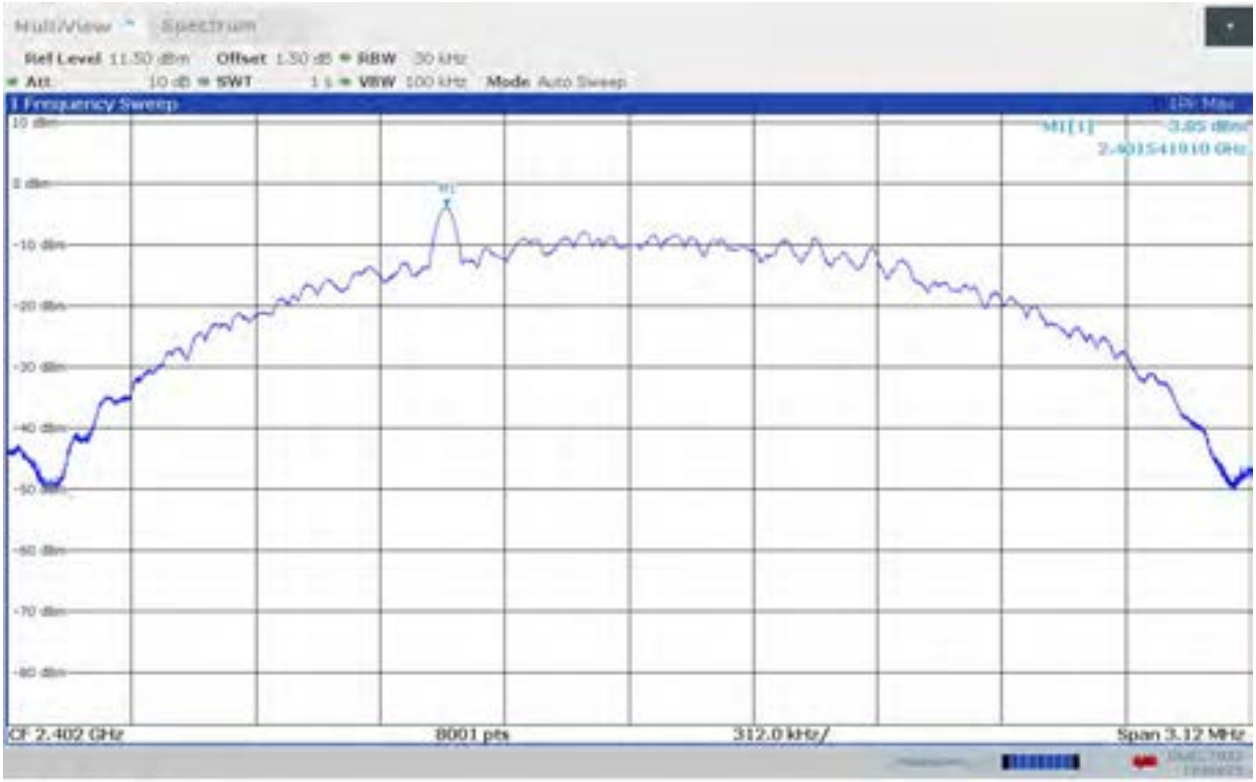
17:32:07 10.02.2022

Plot 3. 3



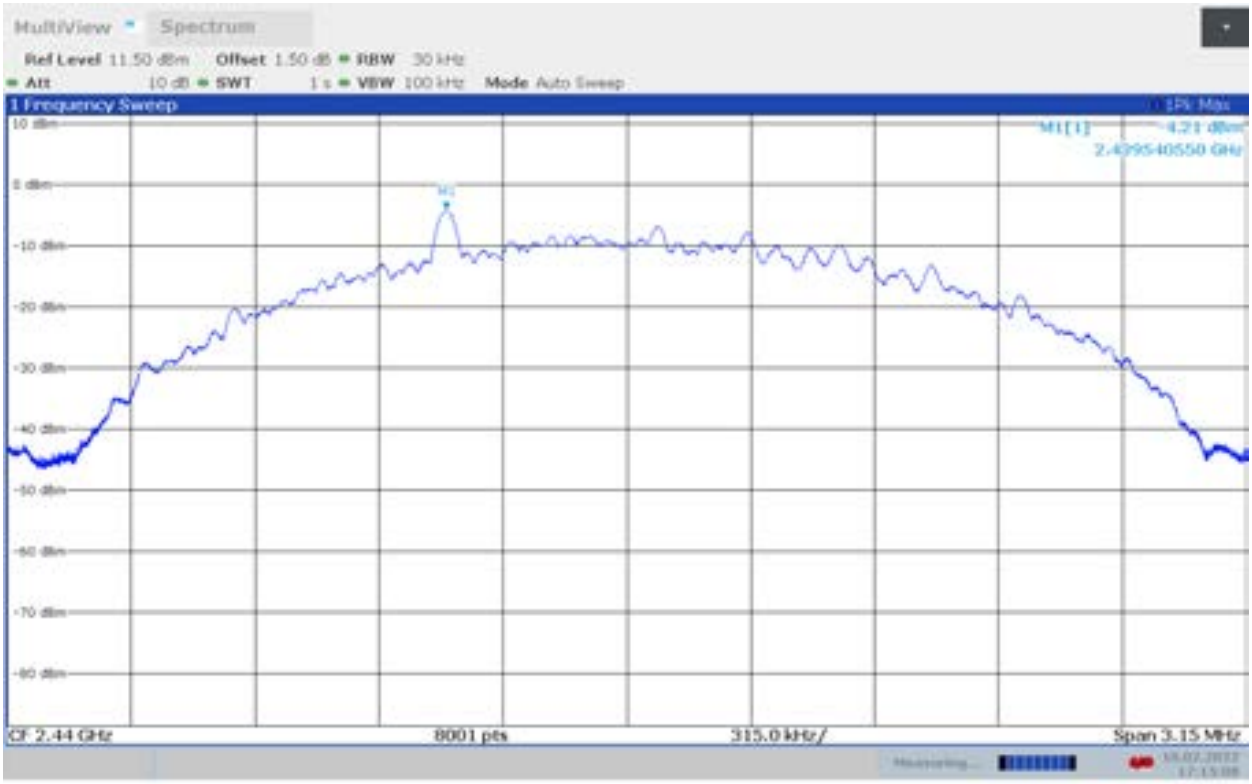
17:29:27 10.02.2022

Plot 3.4



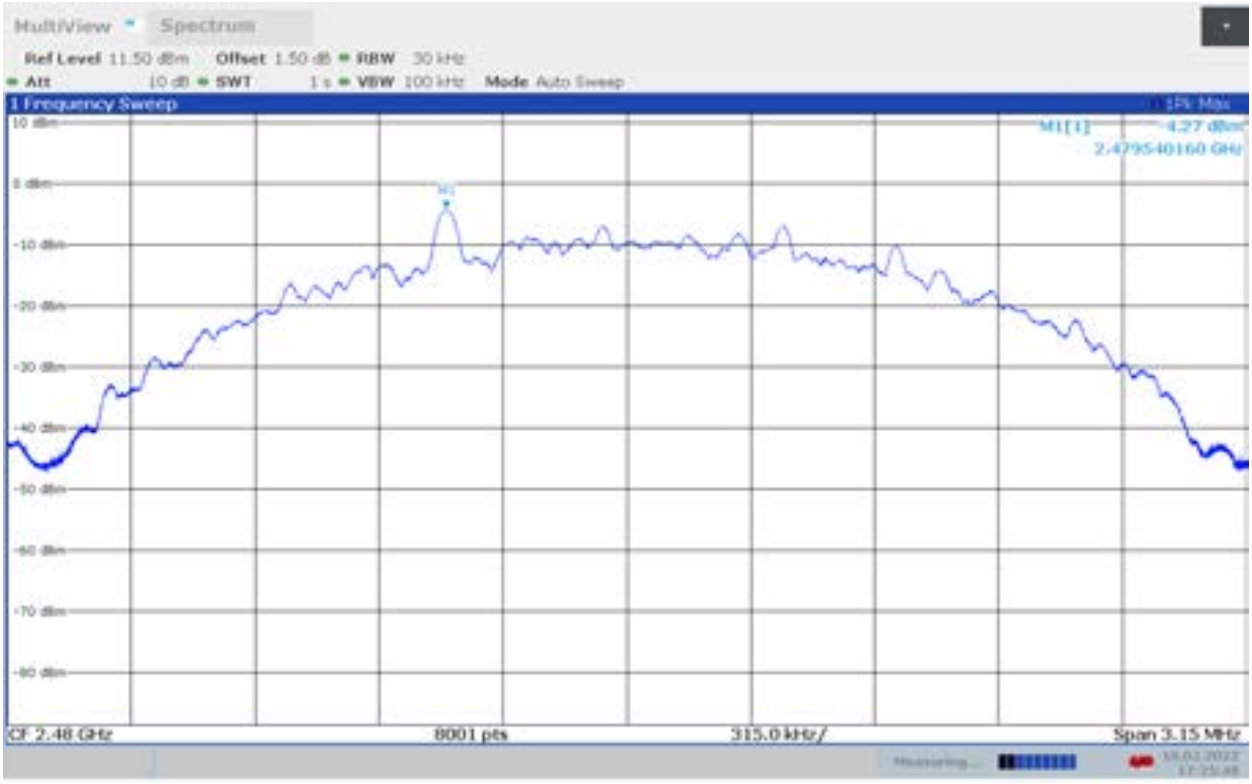
17:00:22 10.02.2022

Plot 3.5



17:15:09 10.02.2022

Plot 3.6



17:25:49 10.02.2022

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 ≥ 3 x 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.

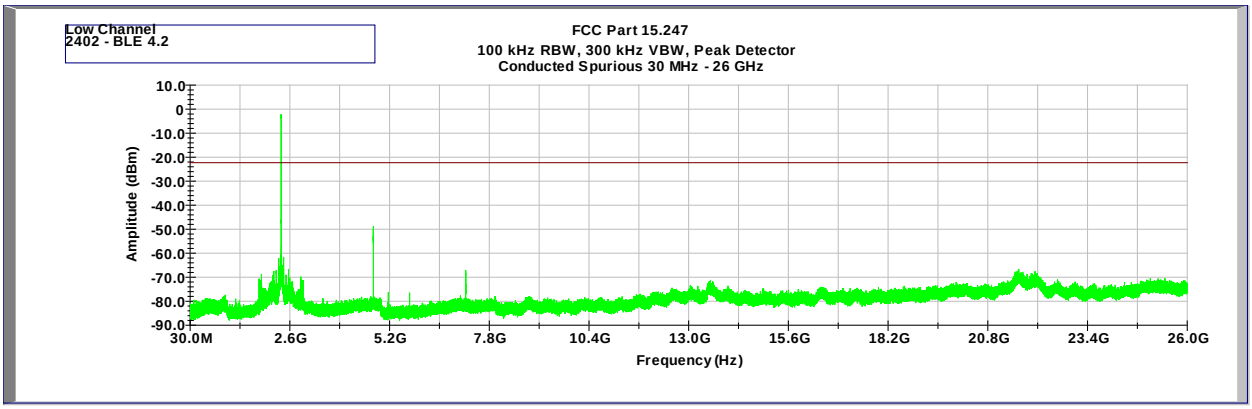
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

4.4.3 Test Result

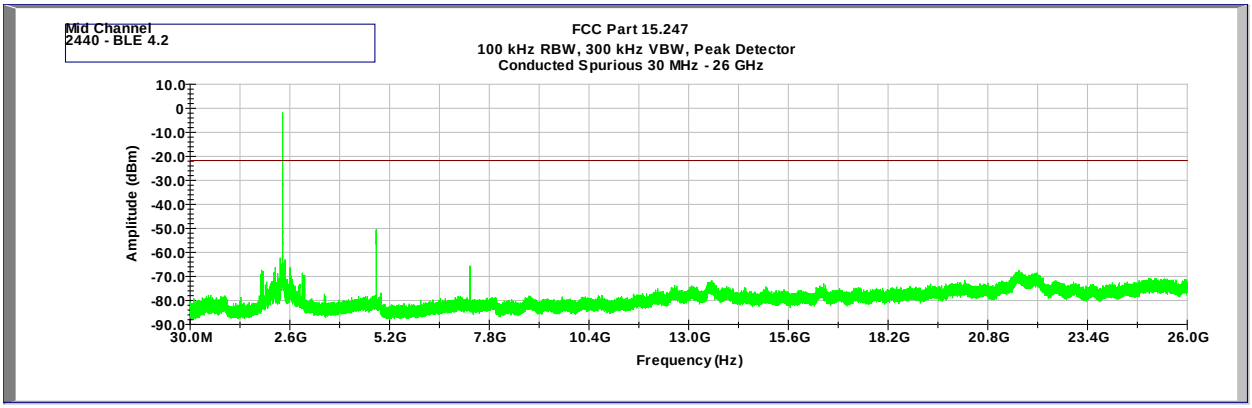
Refer to the following plots 4.3 – 4.5 and plots 4.2.3 – 4.2.5 for unwanted conducted emissions. The plot shows a -20dB attenuation limit line.

Tested By	Test Date	Results
Amar Kacel	February 10, 2022	Complies

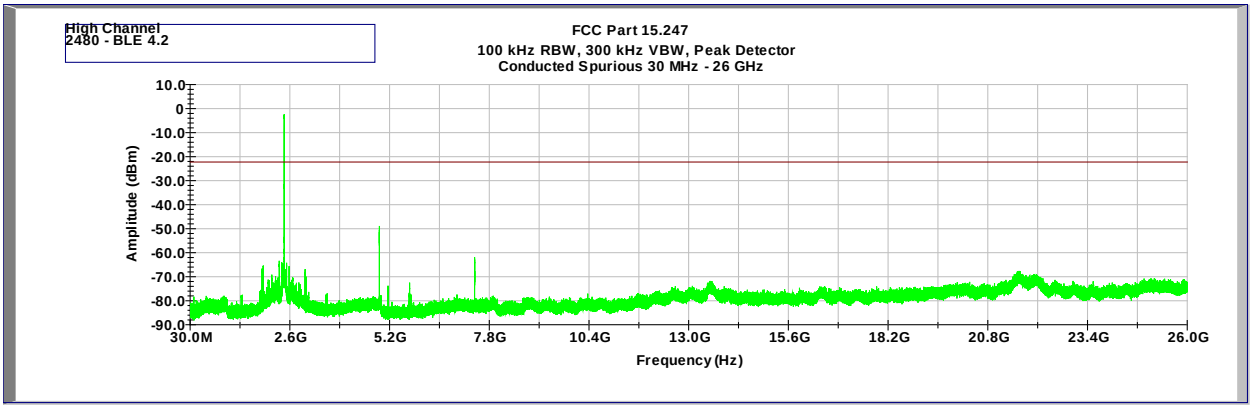
BLE 4.2 Tx @ Low Channel, 2402 MHz
30MHz -26GHz Conducted Spurious
Plot 4.3



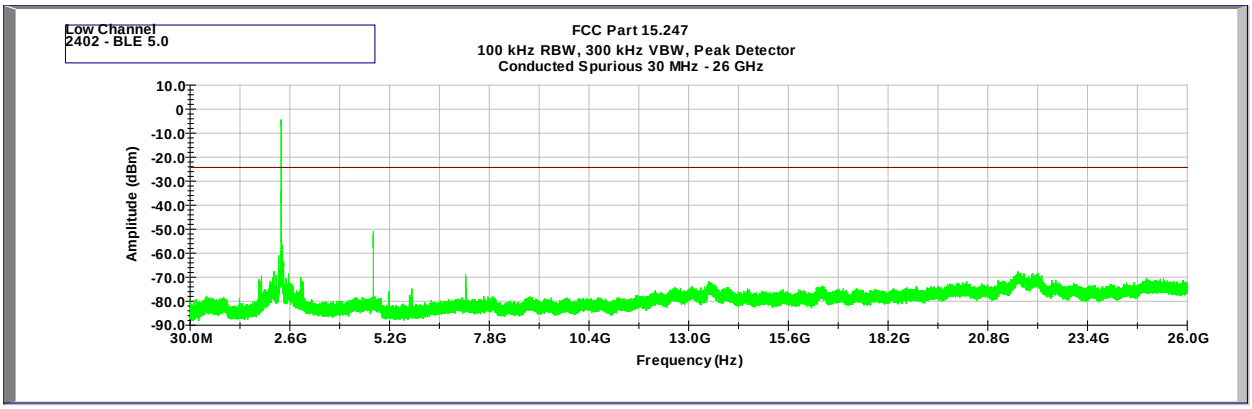
BLE 4.2 Tx @ Mid Channel, 2440 MHz
30MHz -26GHz Conducted Spurious
Plot 4.4



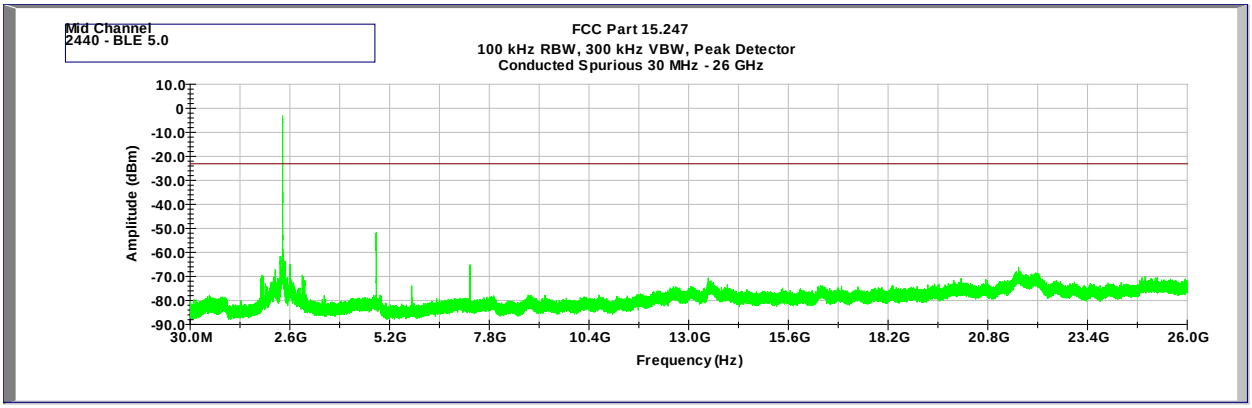
BLE 4.2 Tx @ High Channel, 2480 MHz
30MHz -26GHz Conducted Spurious
Plot 4.5



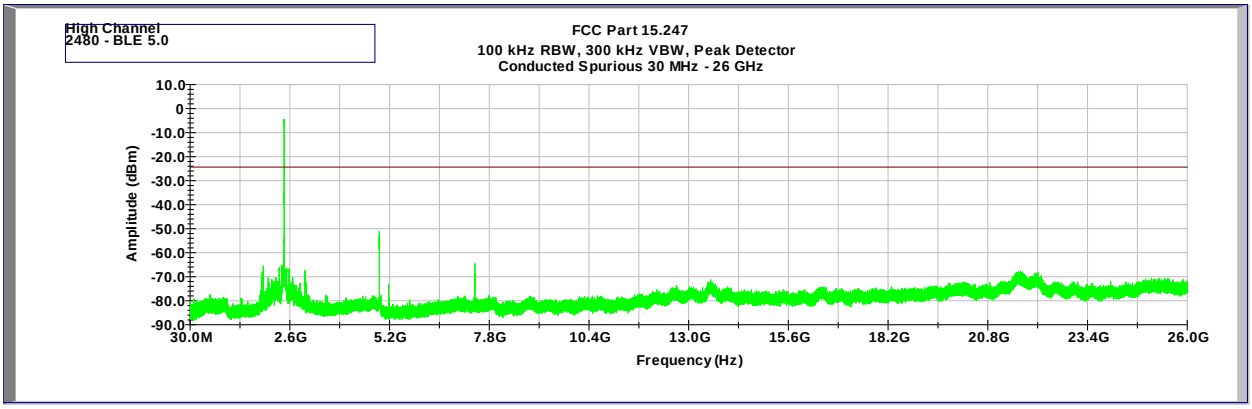
BLE 5.0 Tx @ Low Channel, 2402 MHz
30MHz -26GHz Conducted Spurious
Plot 4.2.3



BLE 5.0 Tx @ Mid Channel, 2440 MHz
30MHz -26GHz Conducted Spurious
Plot 4.2.4



BLE 5.0 Tx @ High Channel, 2480 MHz
30MHz -26GHz Conducted Spurious
Plot 4.2.5



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

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

4.5.4 Test Results

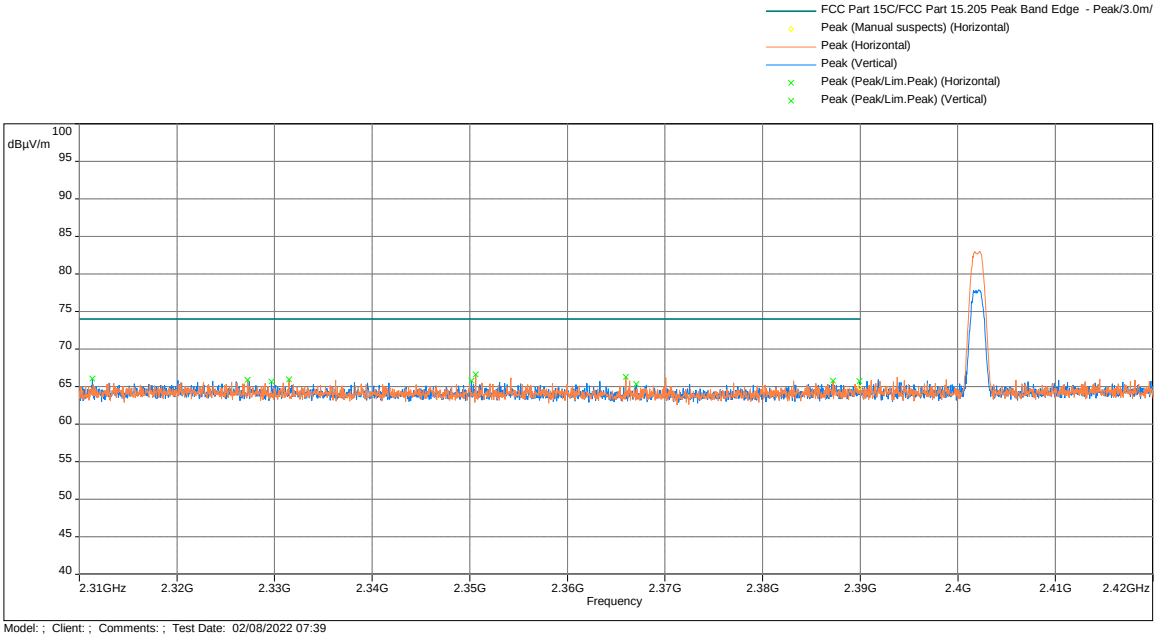
All testing in this section were performed by radiated measurements.

Tested By	Test Date	Results
Amar Kacel	February 08, 2022, to March 7, 2022	Complies

Test Results: 15.209/15.205 Radiated Restricted Band Emissions

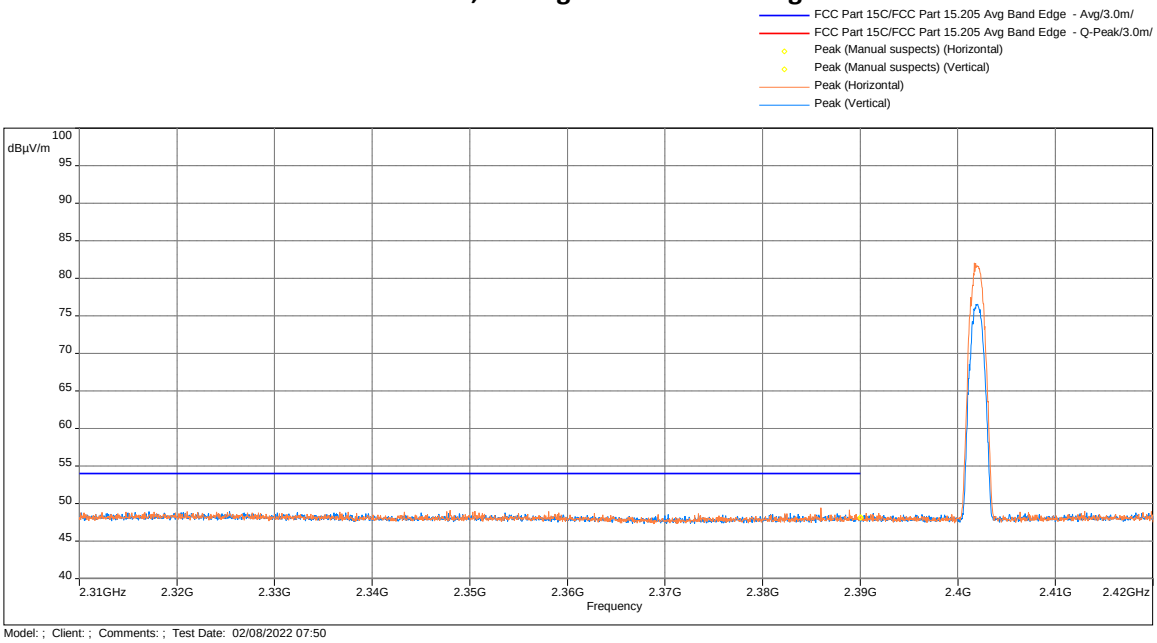
BLE 4.2 Charging Mode:

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 07:39

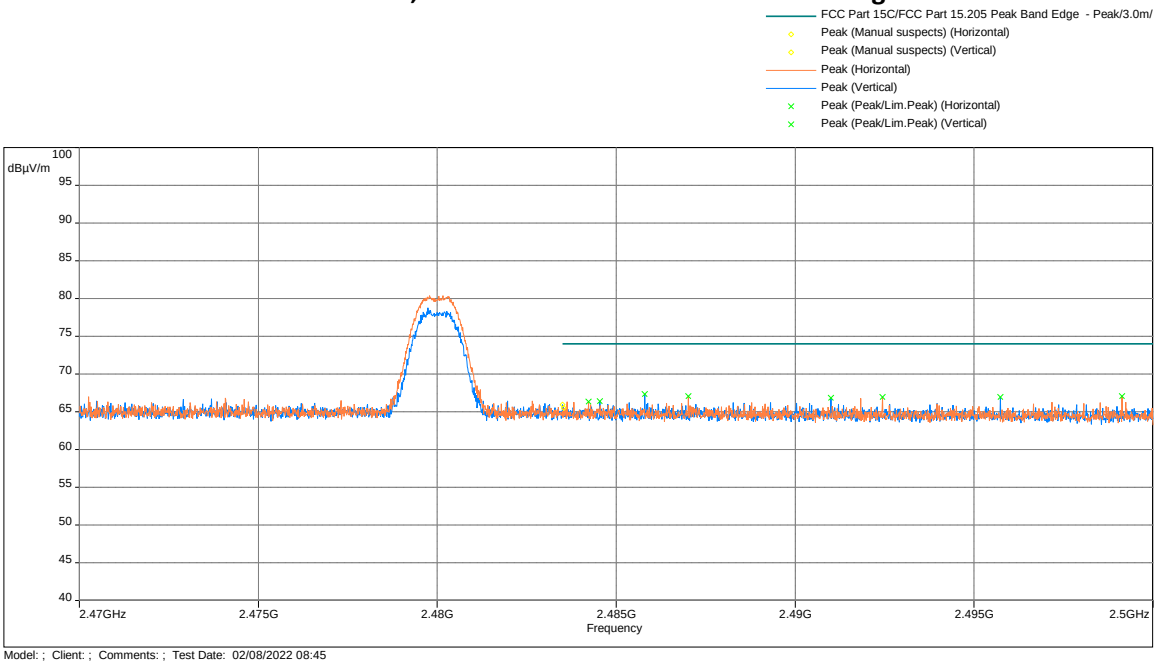
2310–2390 MHz, Average Scan with Average Limit



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 07:50

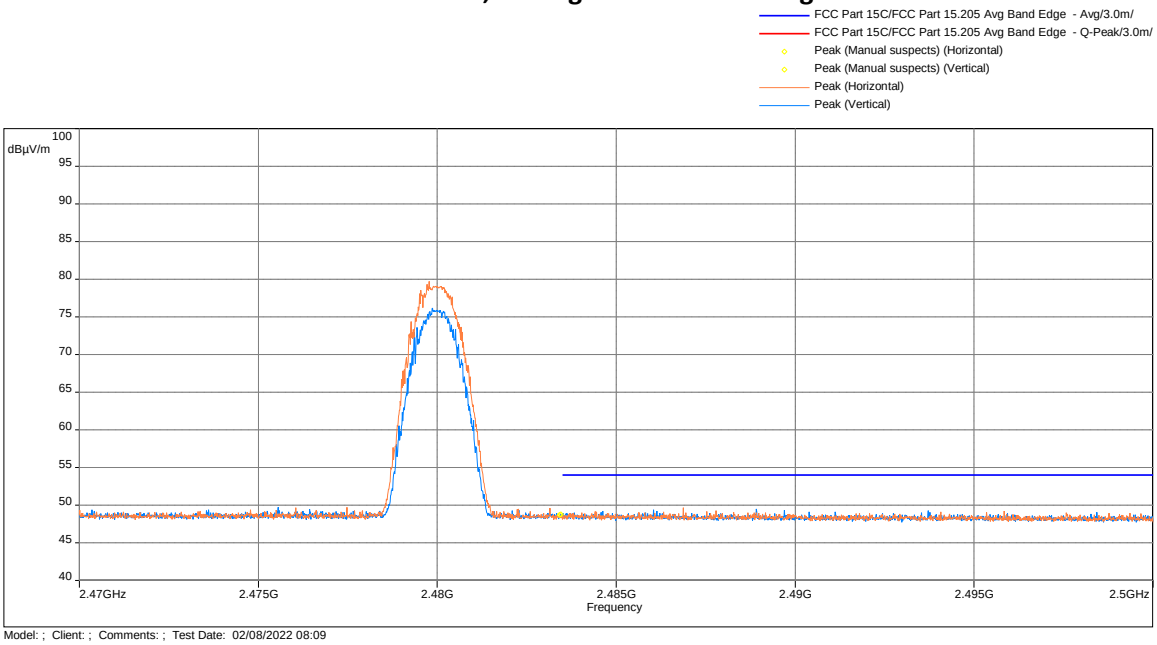
Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390.000	48.18	54	-5.82	2.49	350	Vertical	31

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 08:45

2483.5–2500 MHz, Average Scan with Average Limit



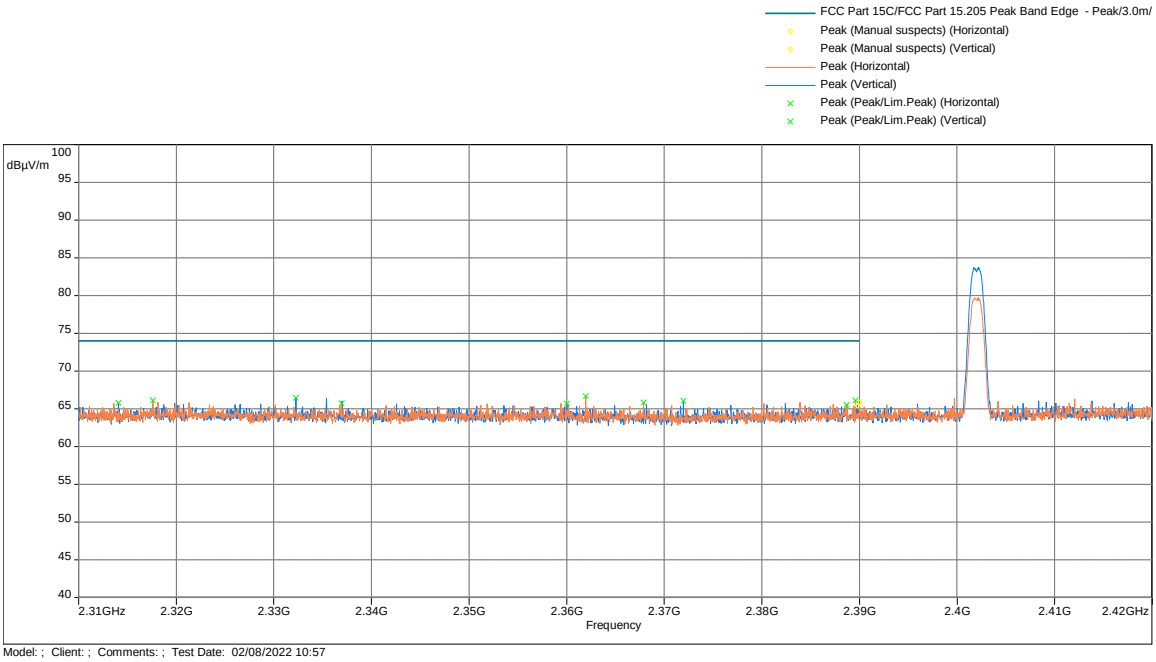
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 08:09

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.500	48.76	54	-5.24	1.51	4.50	Vertical	31.32

Results	Complies

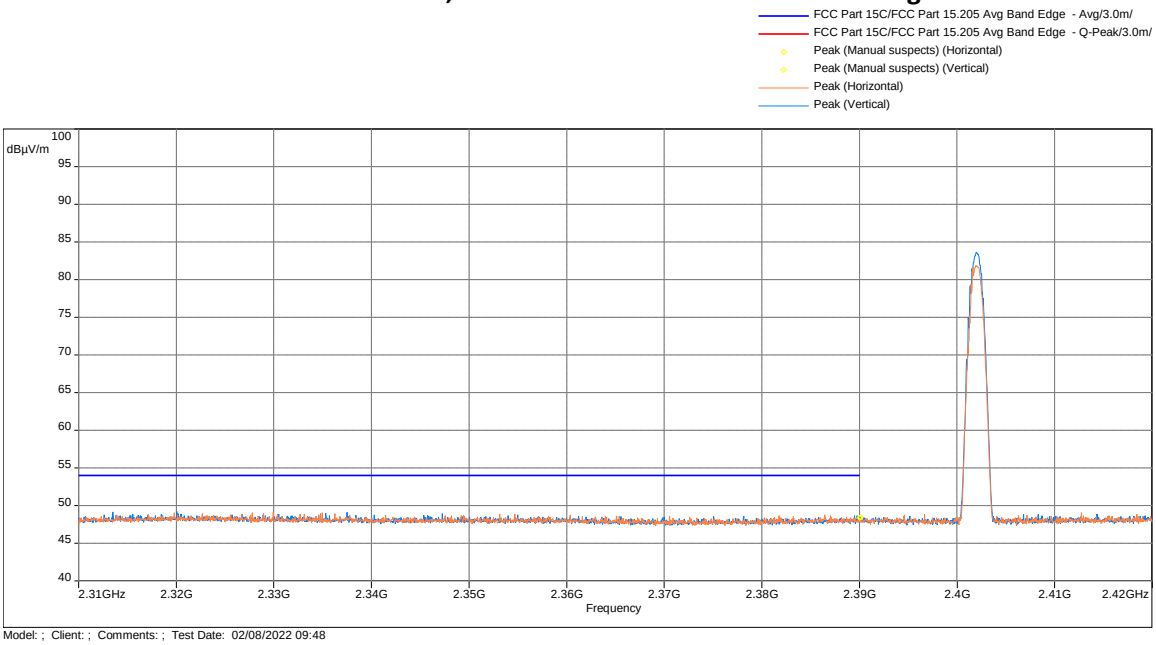
BLE 4.2 Battery Mode:

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 10:57

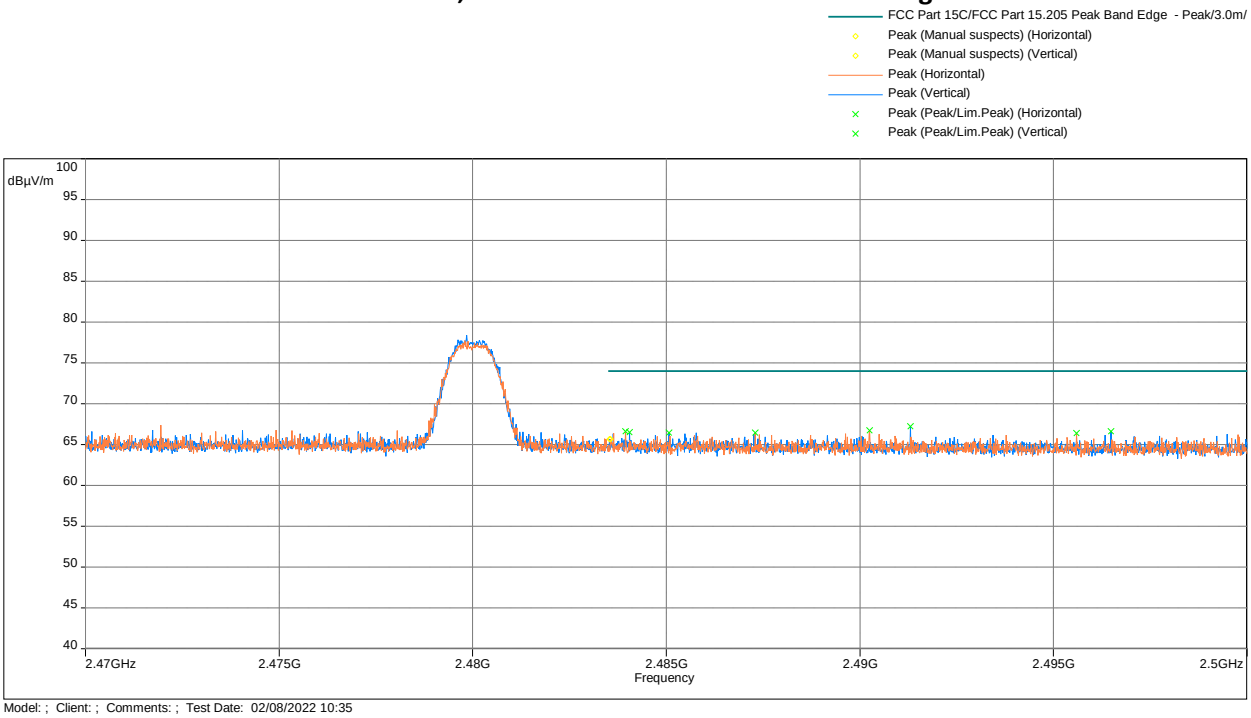
2310–2390 MHz, Peak Scan with Peak Limit and Average Limit



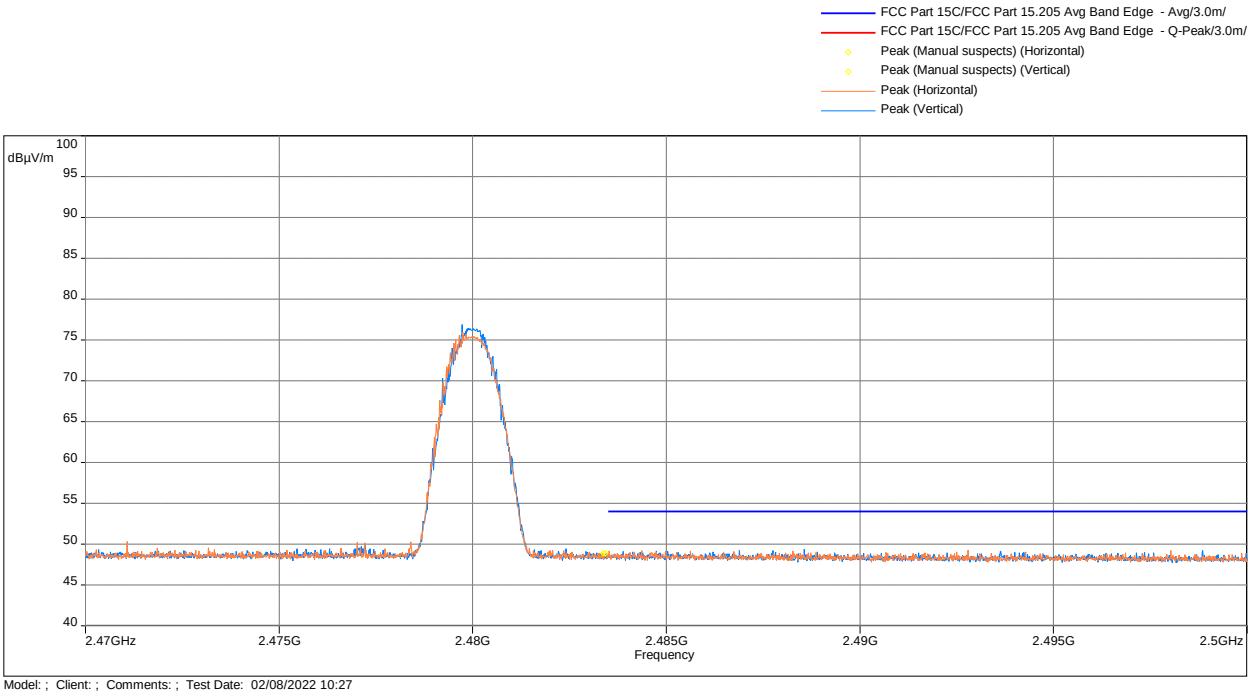
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 09:48

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390.000	48.70	54	-5.30	2.99	220.5	Horizontal	31

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 10:35



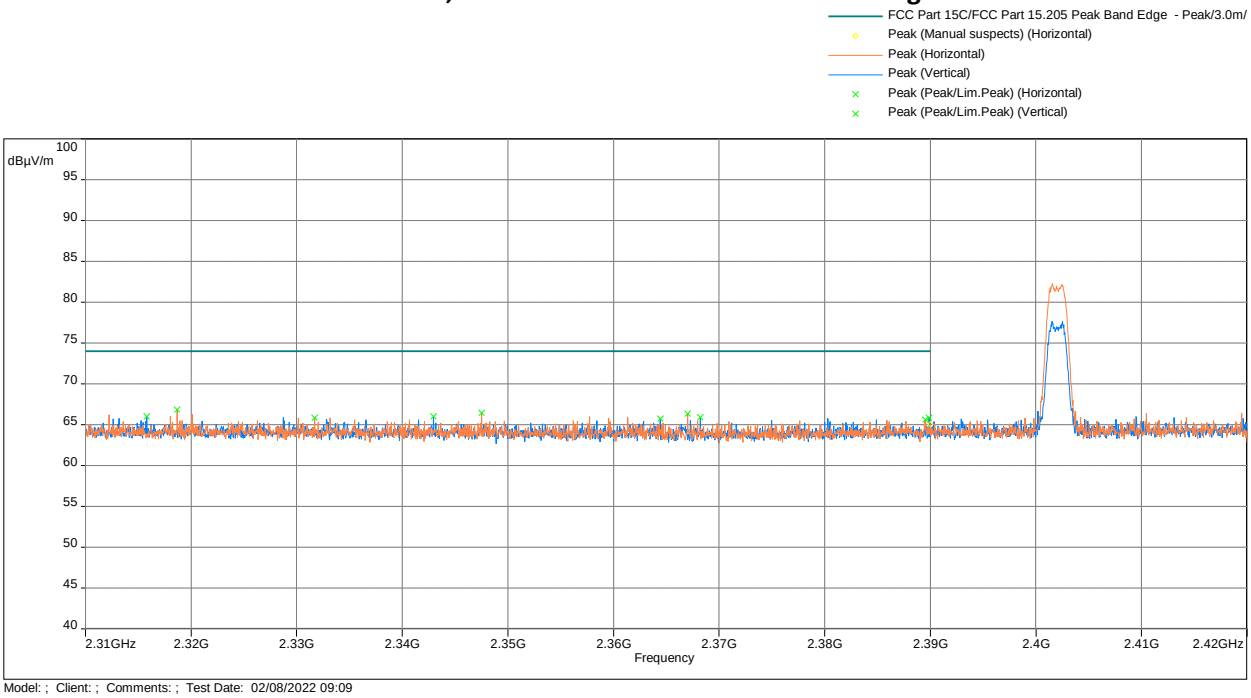
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 10:27

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.500	48.89	54	-5.11	2.99	0.00	Vertical	31.32

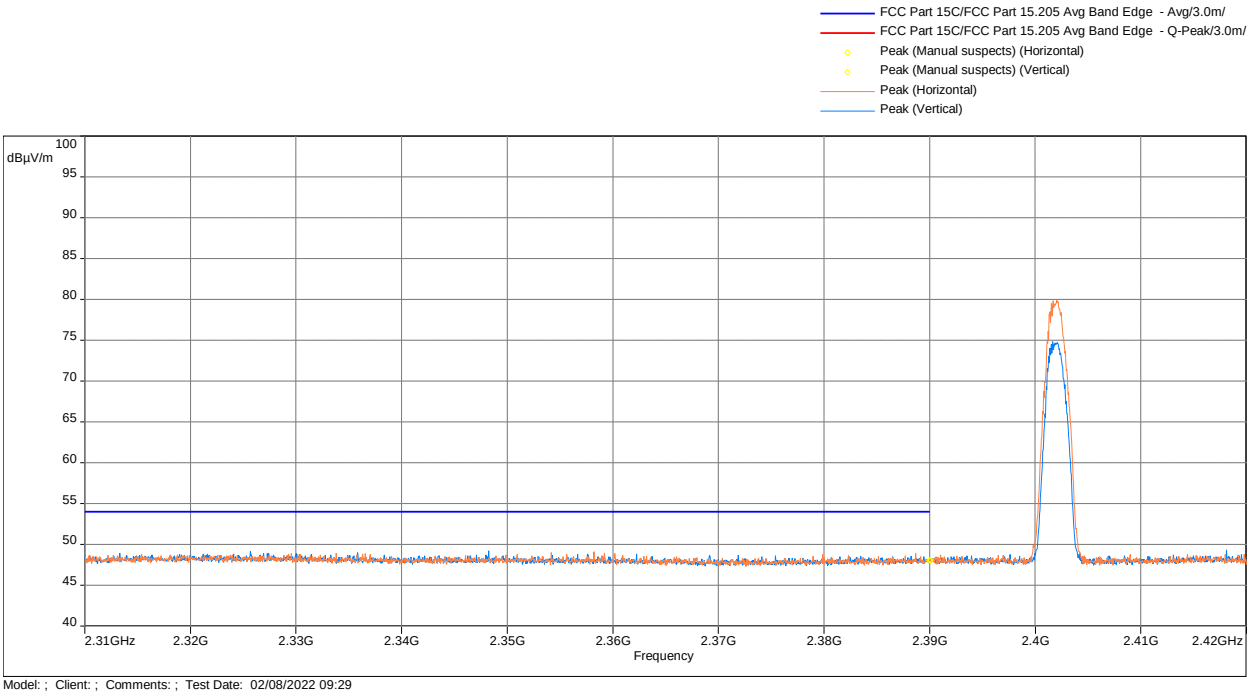
Results	Complies

BLE 5.0 Charging Mode:

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



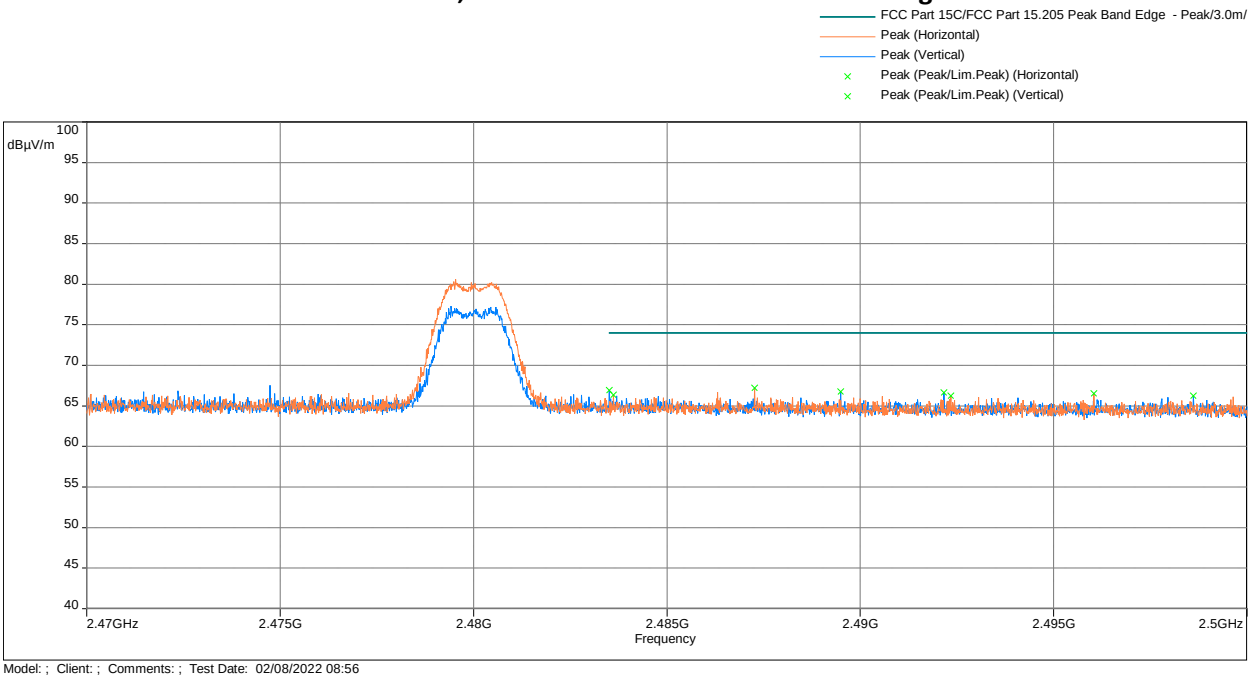
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 09:09



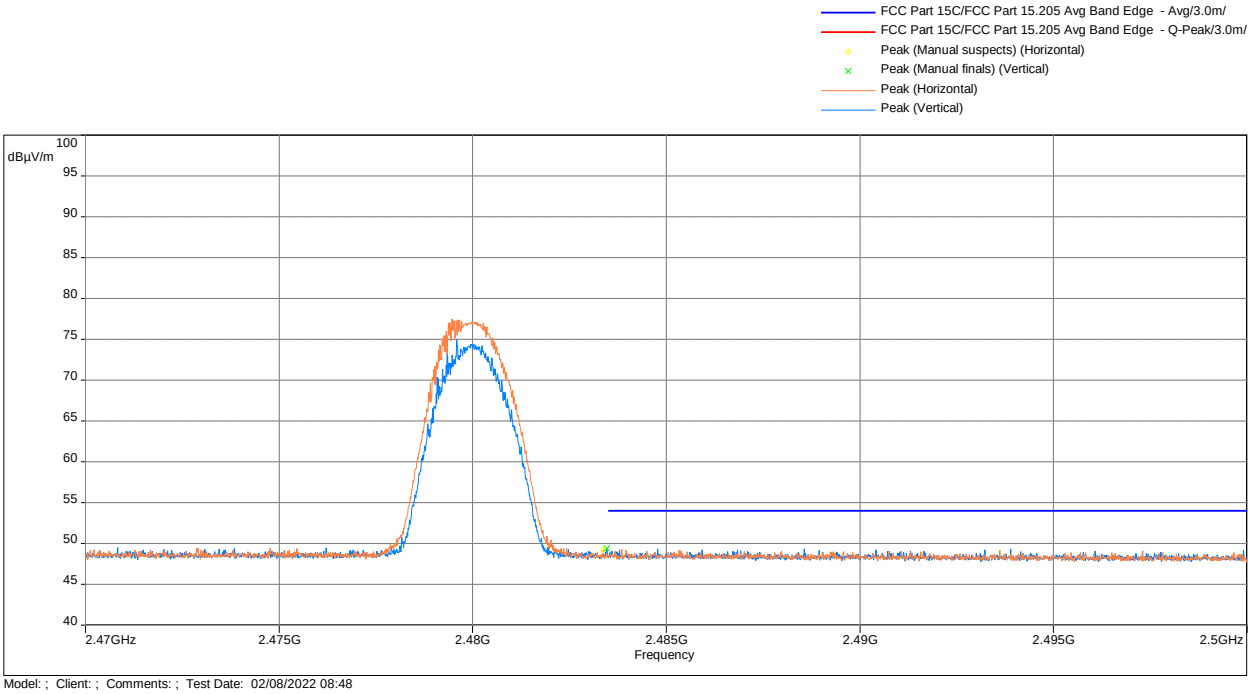
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 09:29

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390.000	48.08	54	-5.92	1.99	162.25	Horizontal	31

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 08:56



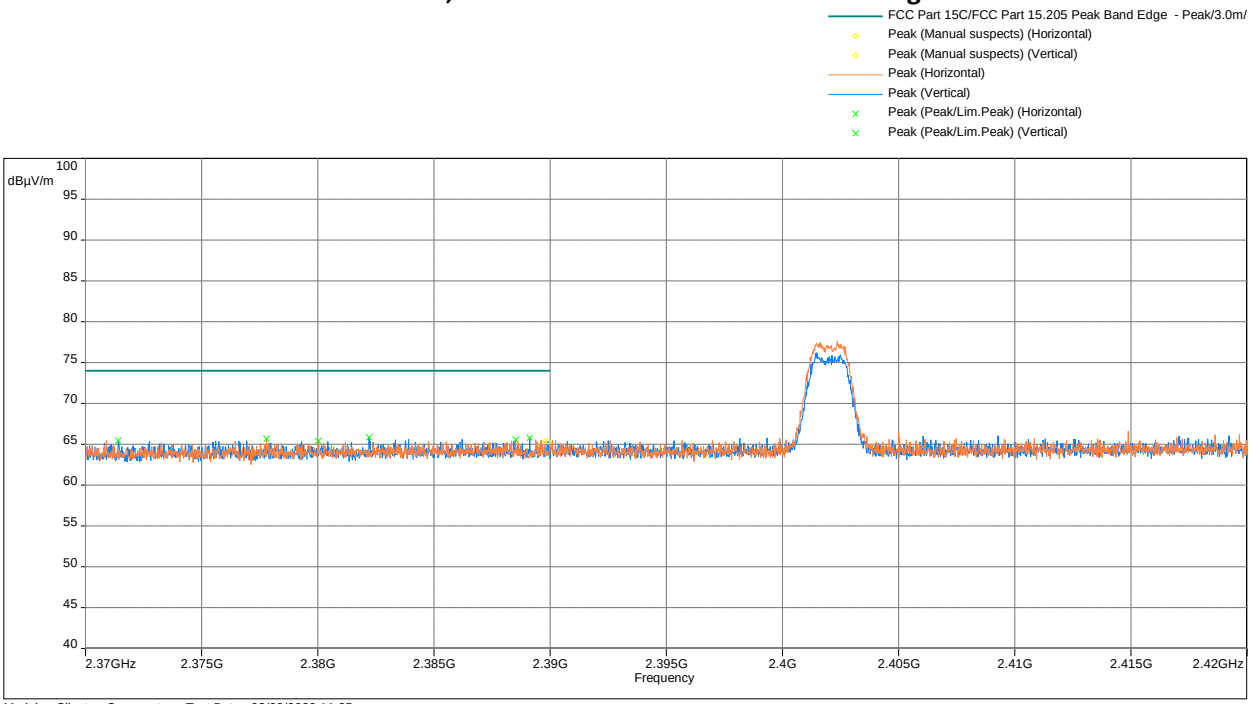
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 08:48

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.500	49.21	54	-4.79	2.49	311.25	Horizontal	31.32

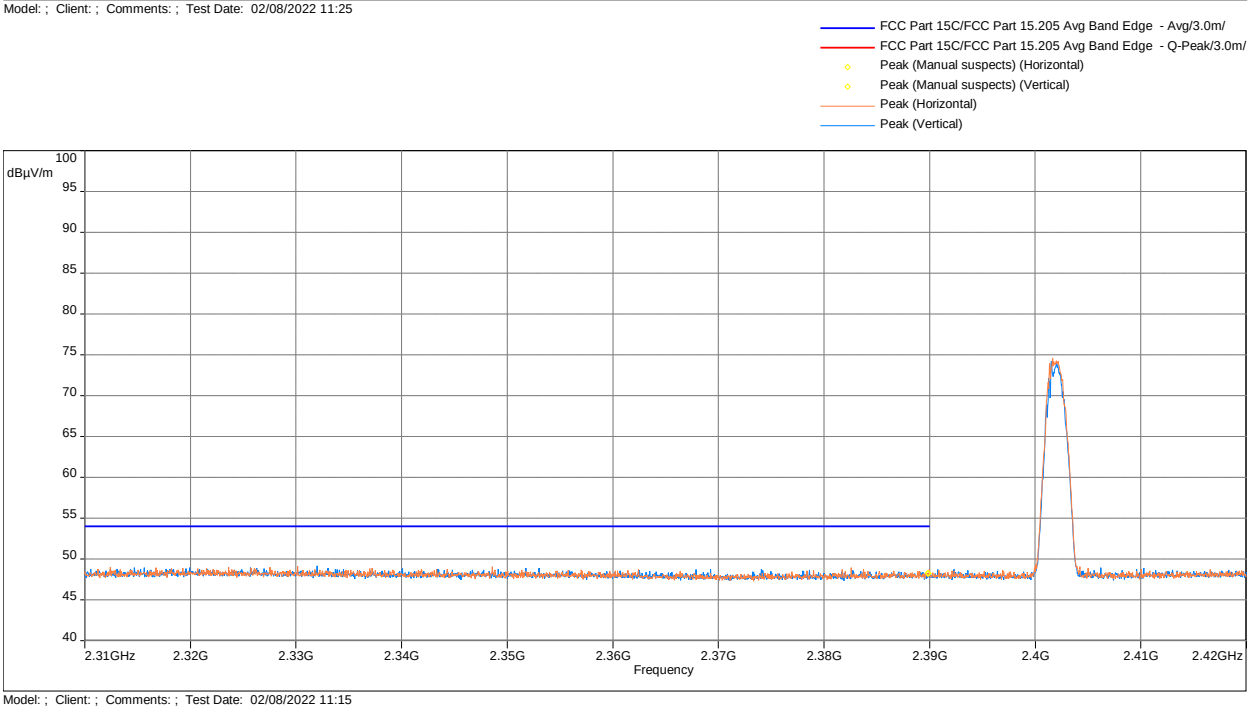
Results	Complies

BLE 5.0 Battery Mode:

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



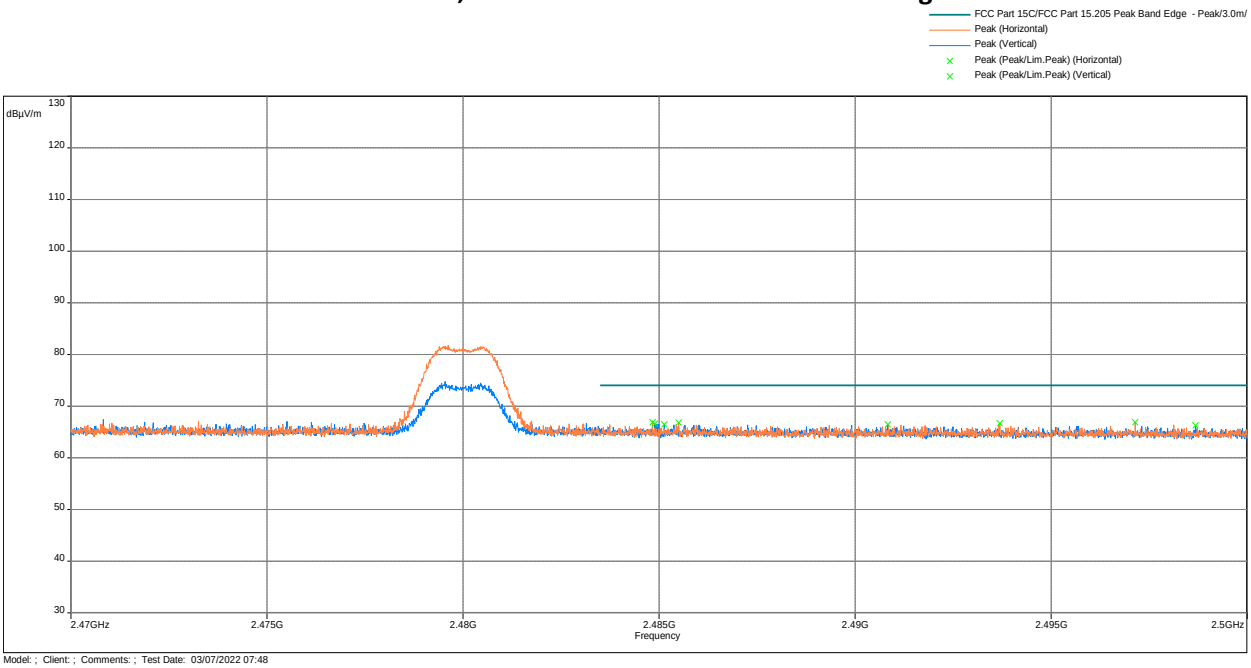
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 11:25



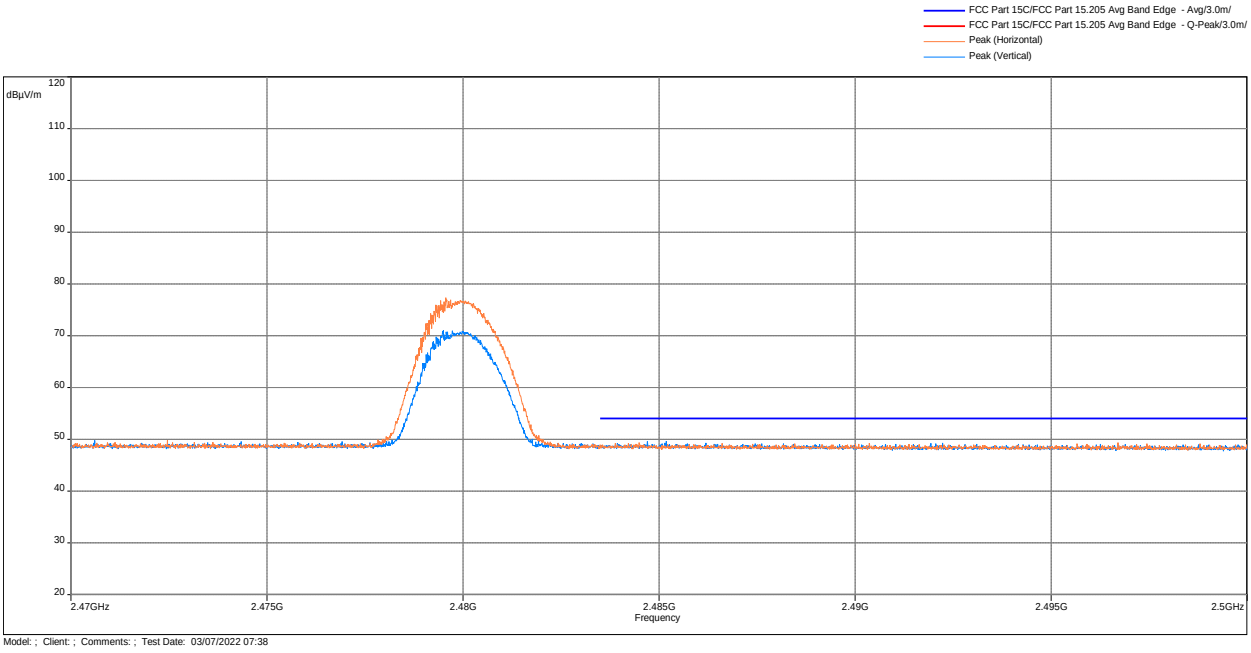
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 11:15

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390.000	48.26	54	-5.74	2.99	14.25	Horizontal	31

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



Model: ; Client: ; Comments: ; Test Date: 03/07/2022 07:48



Model: ; Client: ; Comments: ; Test Date: 03/07/2022 07:38

Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(µV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2483.500	49.19	54	-4.81	1.51	178.00	Vertical	31.32

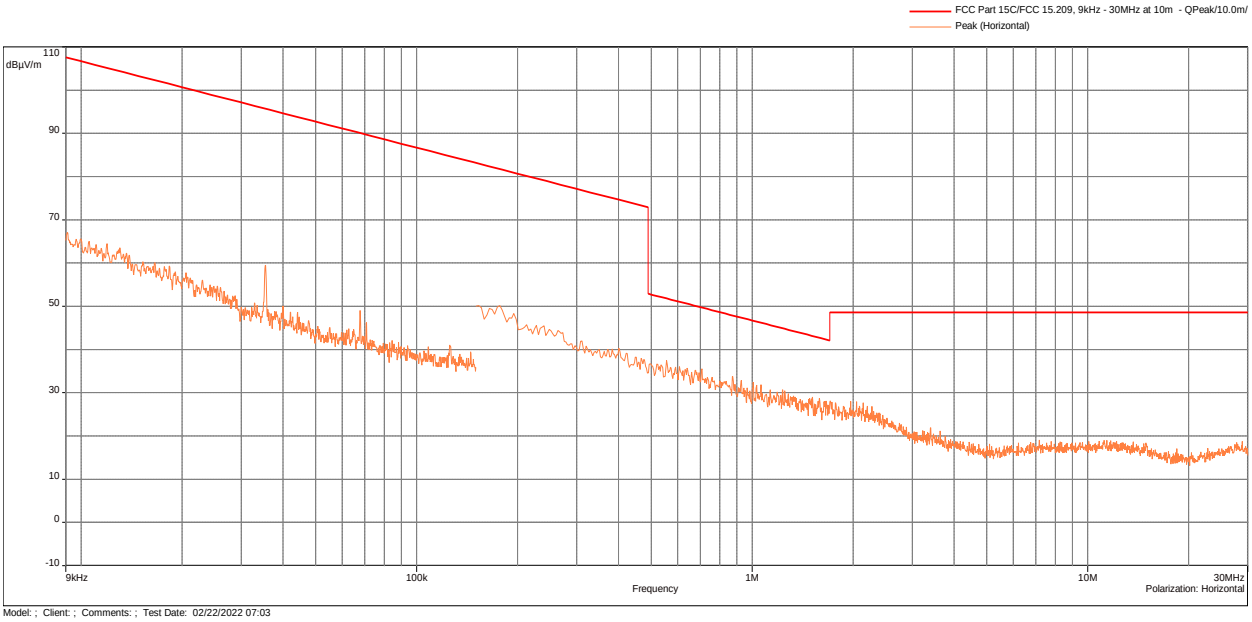
Results	Complies

BLE 4.2 Charging Mode:

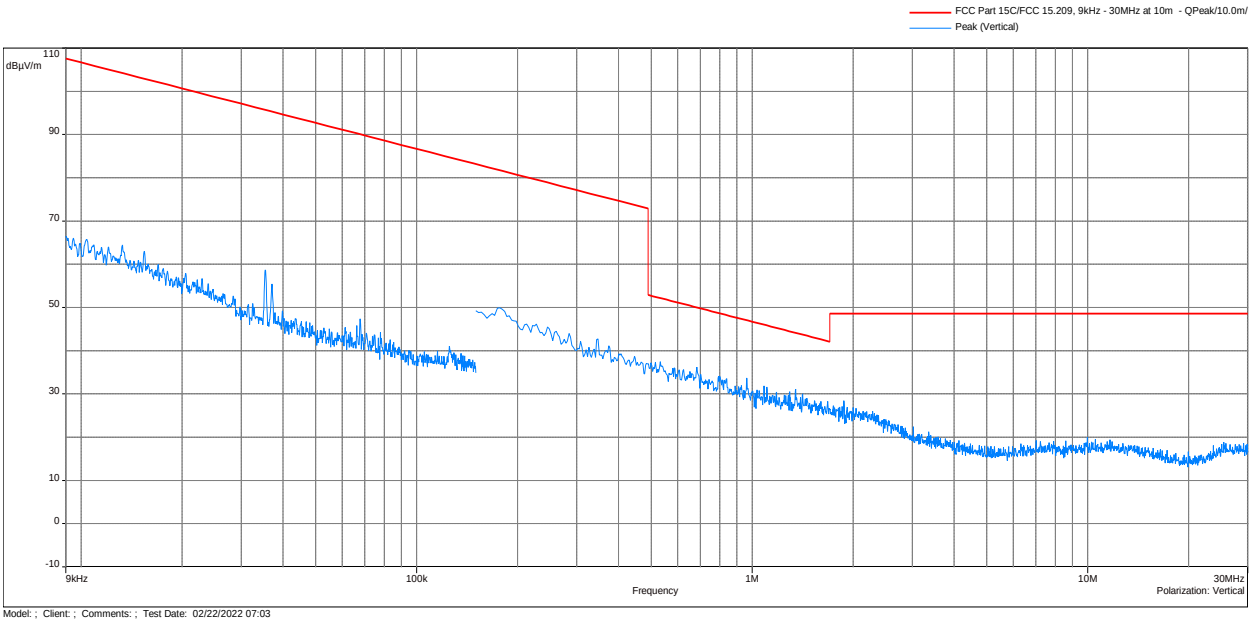
Out-of-Band Radiated Spurious Emissions

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

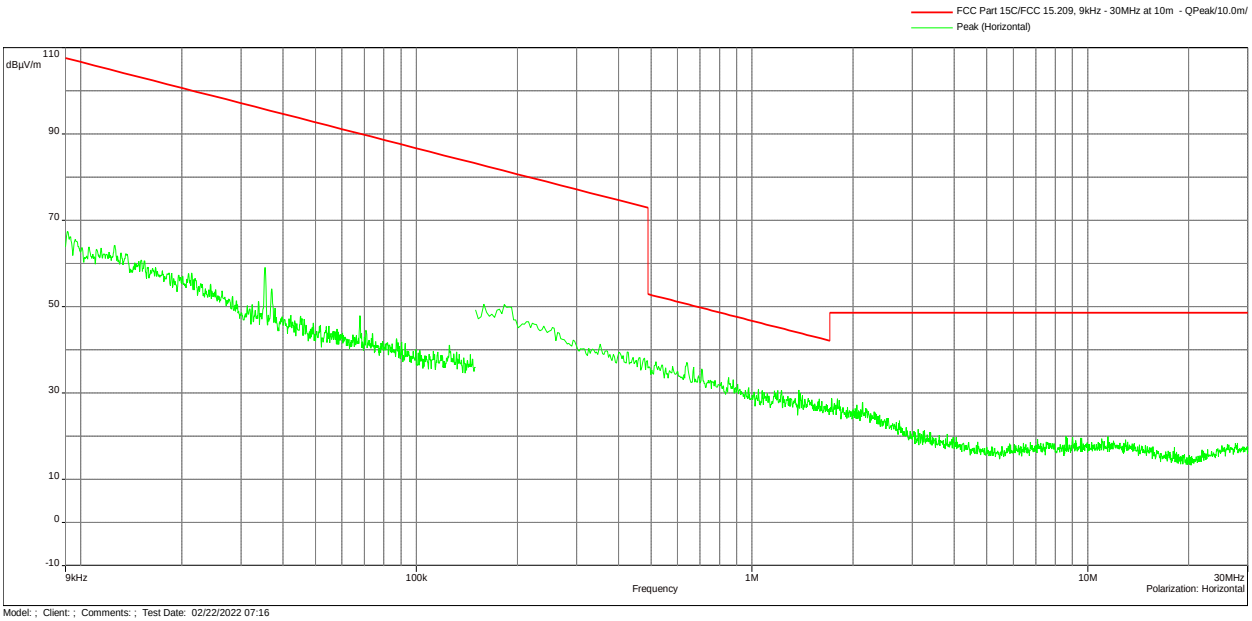
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

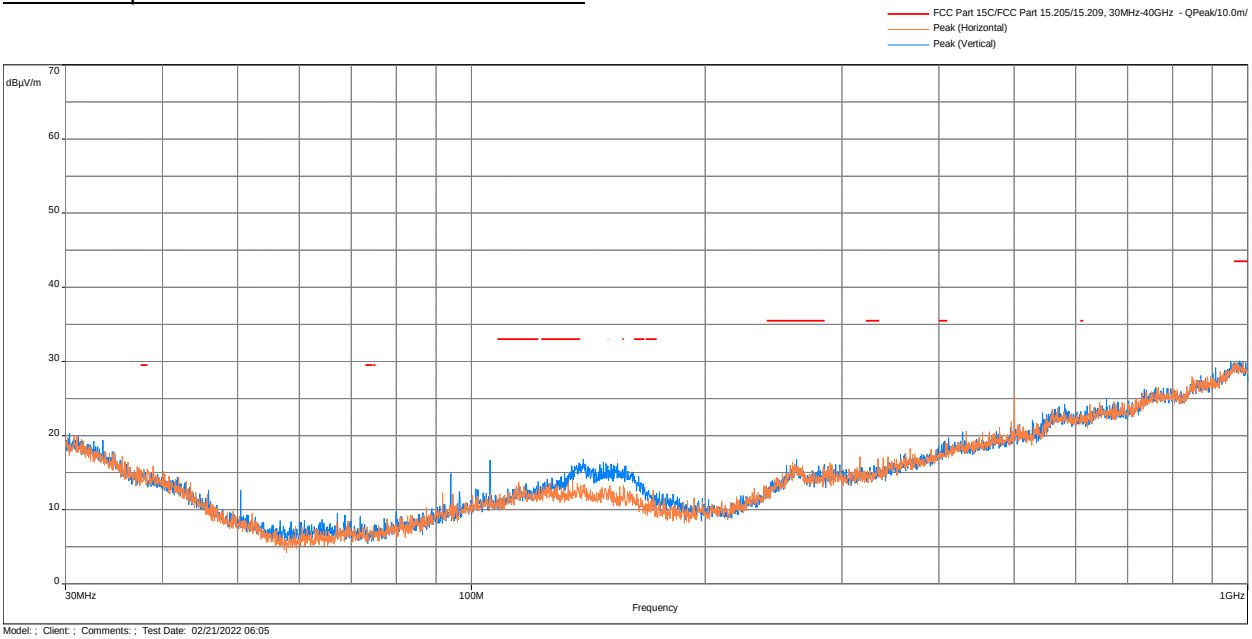


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



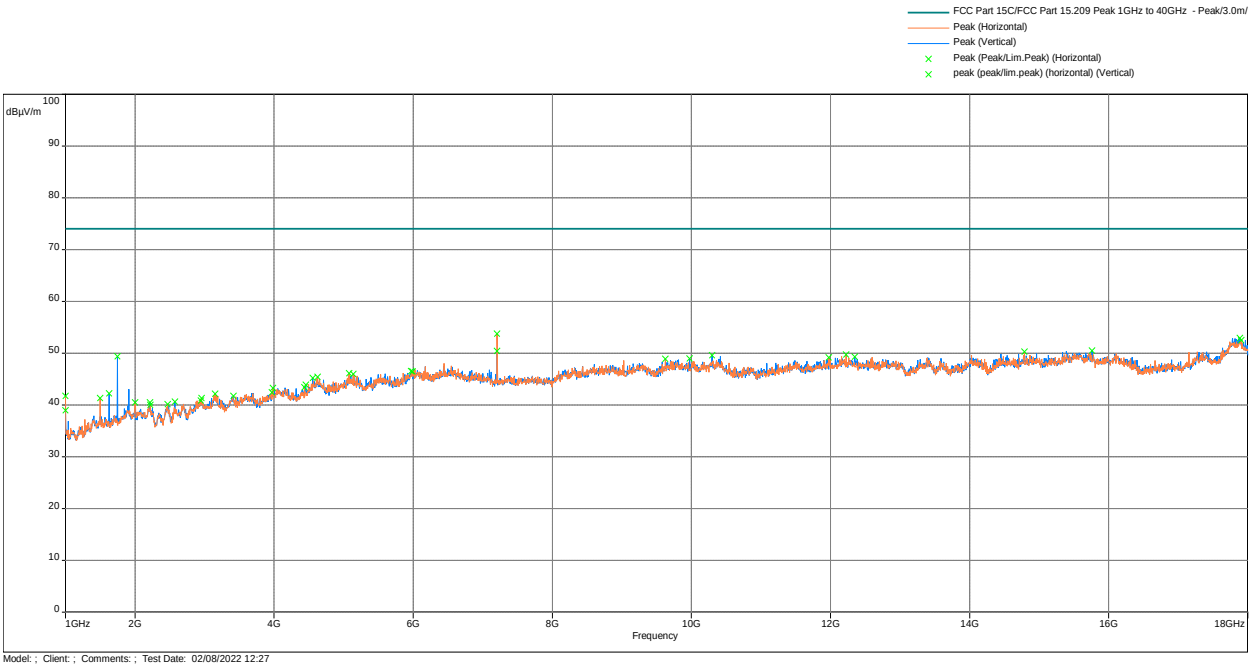
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 07:16

Radiated Spurious Emissions 30 MHz - 1000 MHz



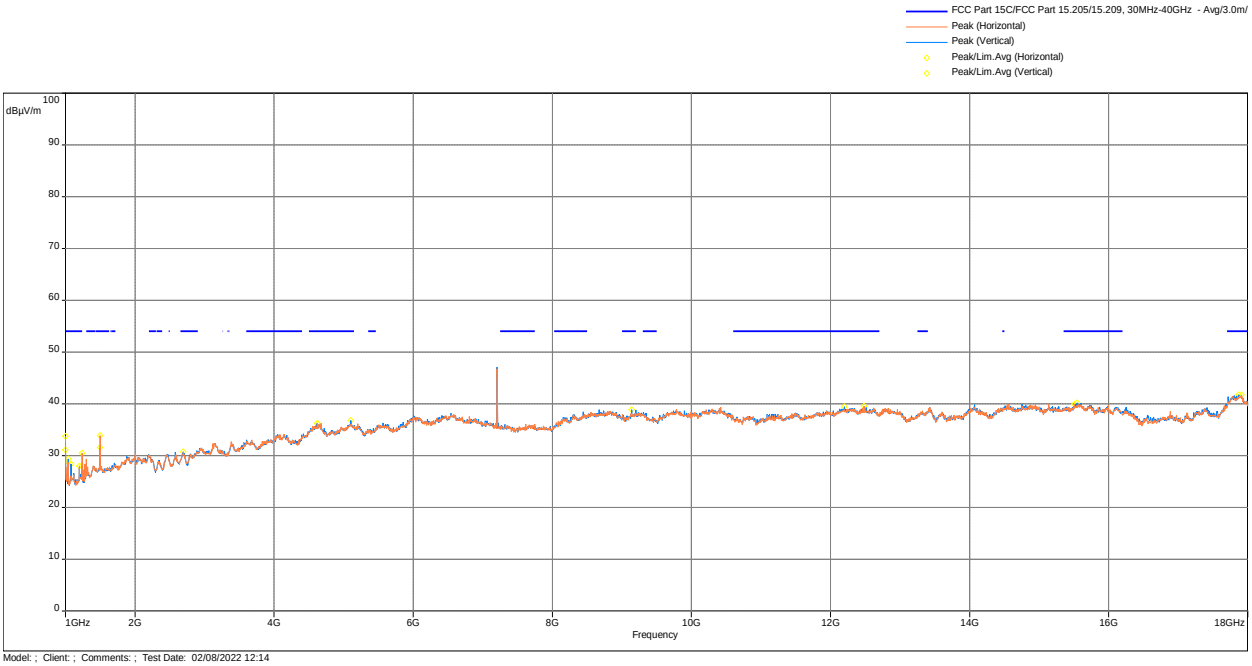
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 06:05

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



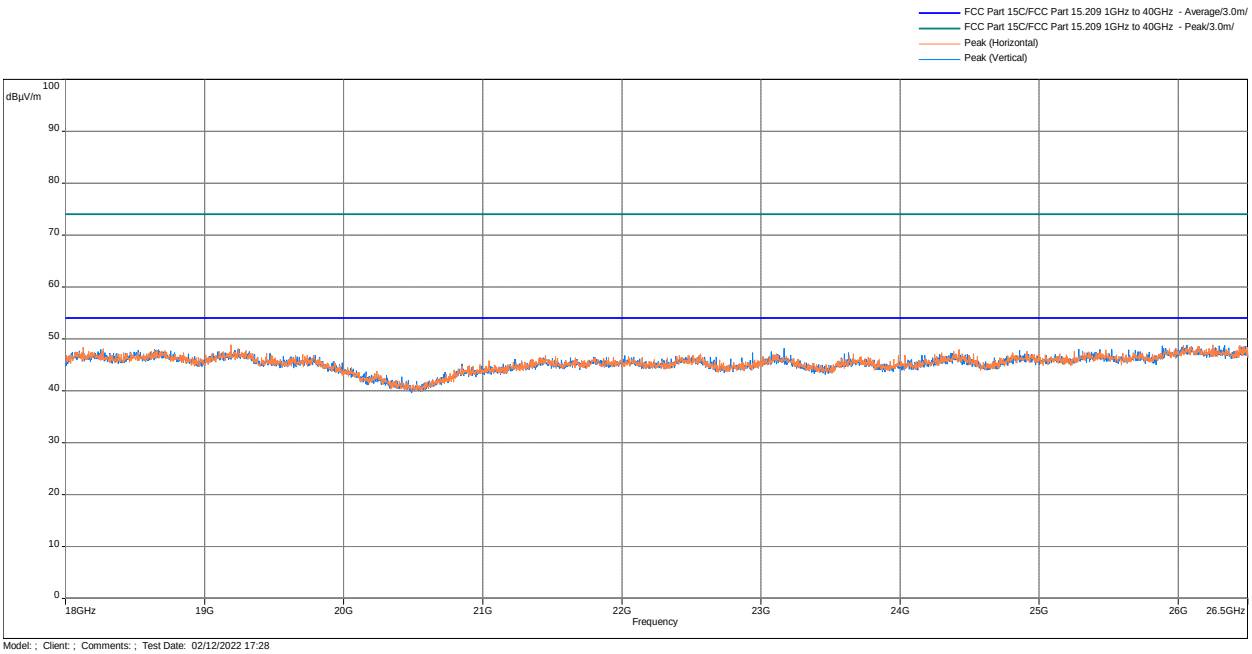
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 12:27

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 12:14

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
608.896	23.25	35.5	-12.25	1.01	248.75	Vertical	-3.67
609.446	23.23	35.5	-12.27	2	51	Vertical	-3.62
610.448	22.91	35.5	-12.59	3	319.5	Horizontal	-3.57
609.931	22.78	35.5	-12.72	3	31.75	Vertical	-3.57
612.938	22.69	35.5	-12.81	3	29	Horizontal	-3.68
976.170	30.12	43.5	-13.38	2	2	Vertical	3.77

Note: Correction = AF + CF - Preamp

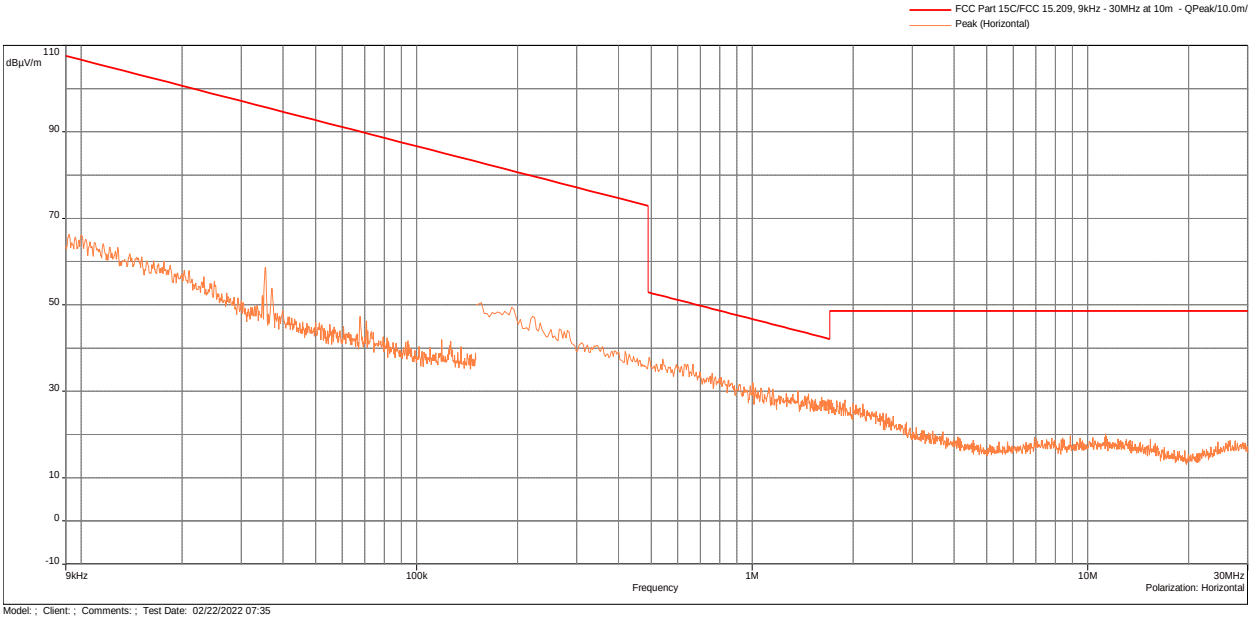
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
17909.90	41.75	54	-12.25	3.01	304.5	Horizontal	7.94
17865.13	41.73	54	-12.27	2.99	121.25	Vertical	8.22
15543.50	40.24	54	-13.76	1.01	14.75	Vertical	3.66
15506.10	39.92	54	-14.08	3.01	131.25	Horizontal	3.39
12481.80	39.59	54	-14.41	3.01	196.25	Horizontal	1.46
12197.90	39.46	54	-14.54	1.99	0	Vertical	1.4

Note: Correction = AF + CF - Preamp

Results	Complies

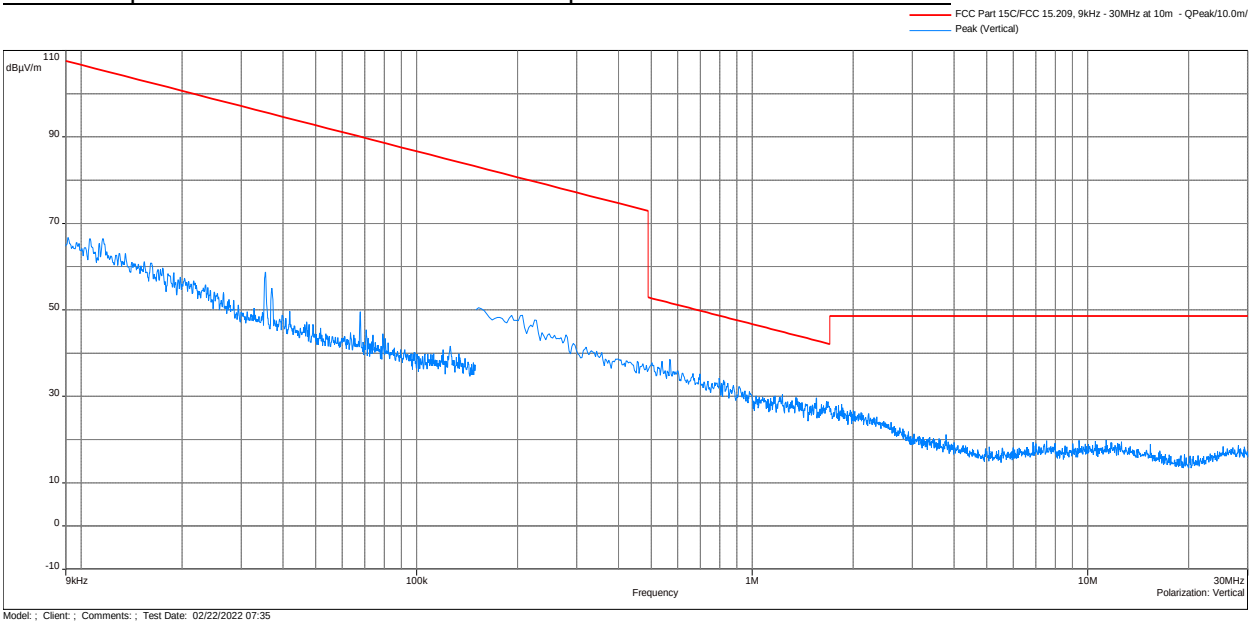
Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



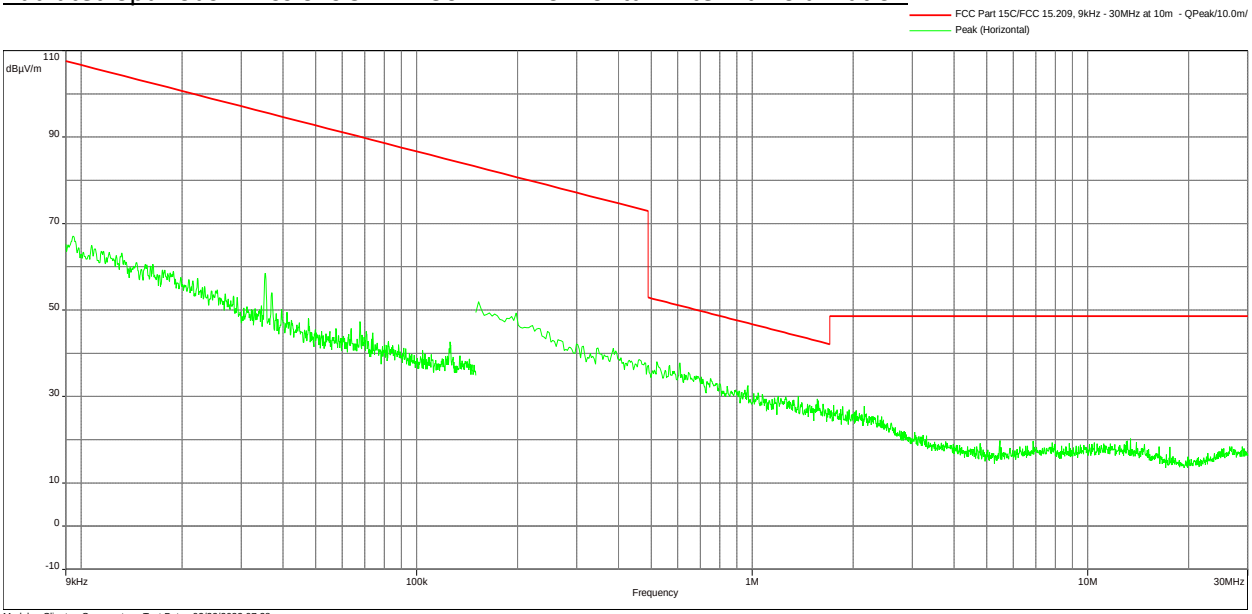
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 07:35

Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization



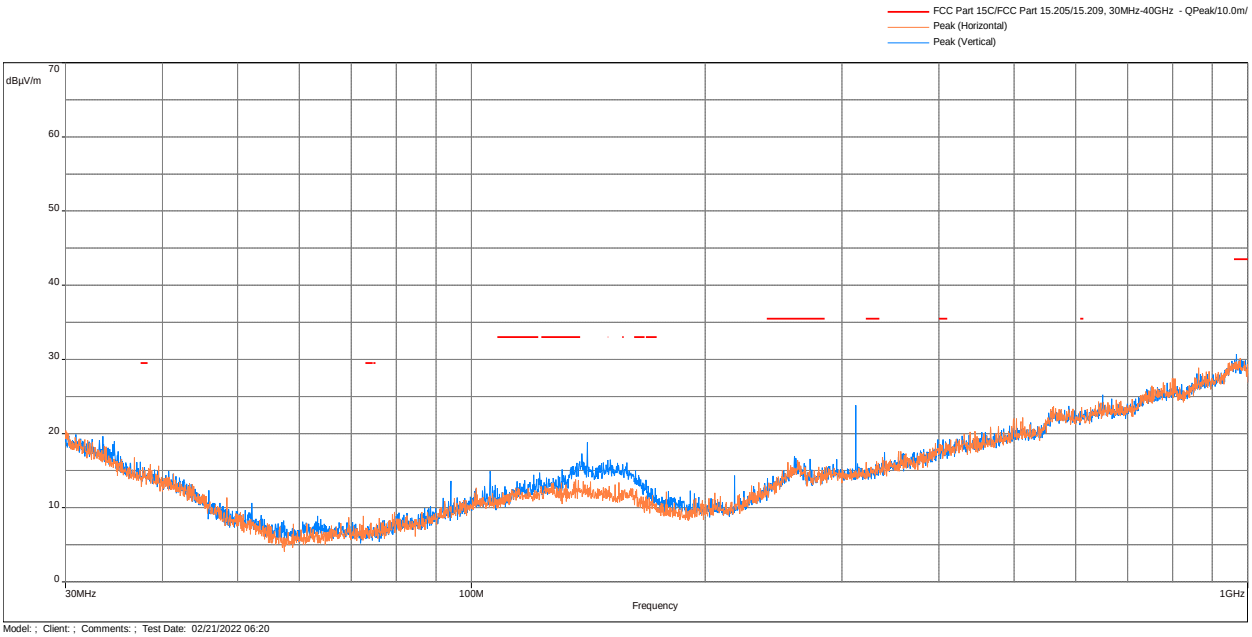
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 07:35

Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



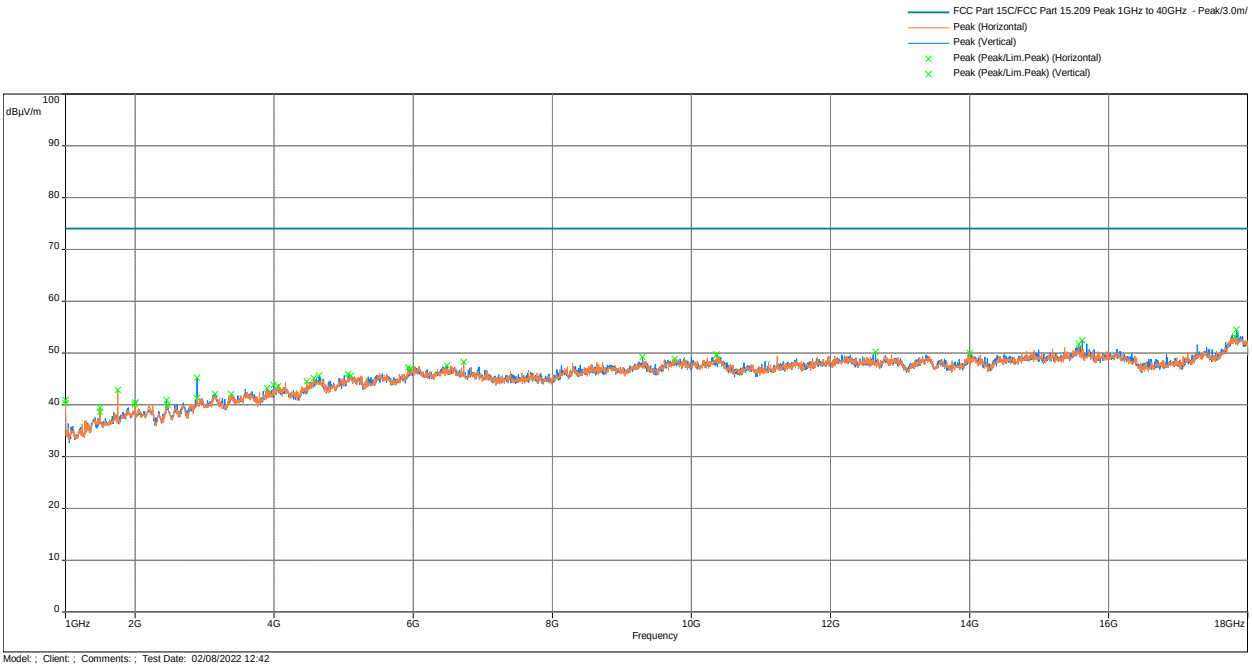
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 07:28

Radiated Spurious Emissions 30 MHz - 1000 MHz



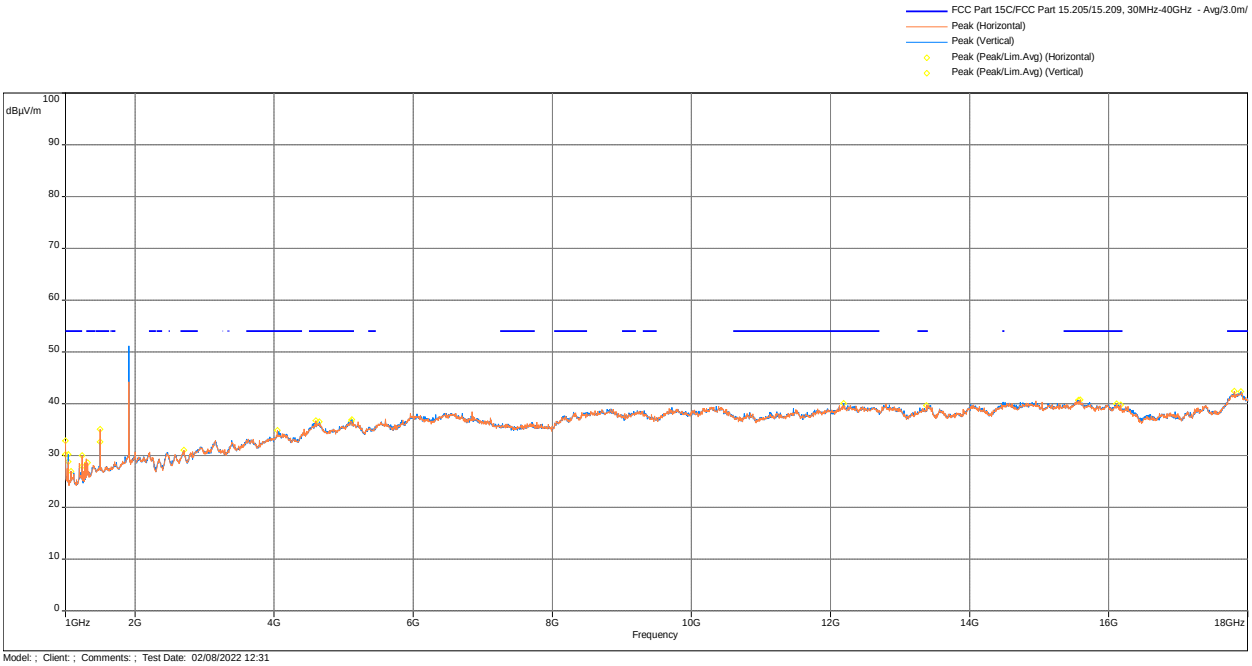
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 06:20

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



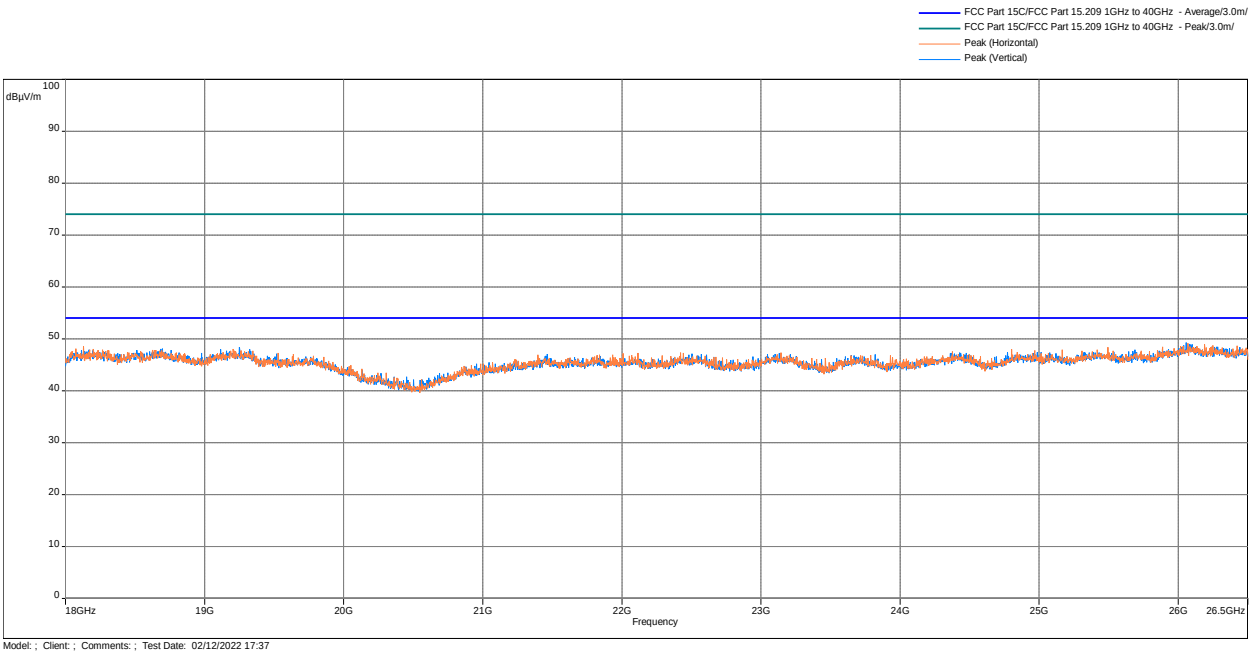
Model: ; Client: ; Comments: ; Test Date: 02/08/2022 12:42

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



Model: ; Client: ; Comments: ; Test Date: 02/08/2022 12:31

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



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
610.9977	23.6	35.5	-11.9	2	45.75	Horizontal	-3.57
611.0947	23.07	35.5	-12.43	2.99	341.75	Vertical	-3.58
609.1223	23.03	35.5	-12.47	2.01	301.75	Vertical	-3.65
966.5673	30.71	43.5	-12.79	4	173.75	Vertical	4.04
613.1317	22.52	35.5	-12.98	4	359.75	Horizontal	-3.68
611.709	22.51	35.5	-12.99	4	186.5	Horizontal	-3.64

Note: Correction = AF + CF – Preamp

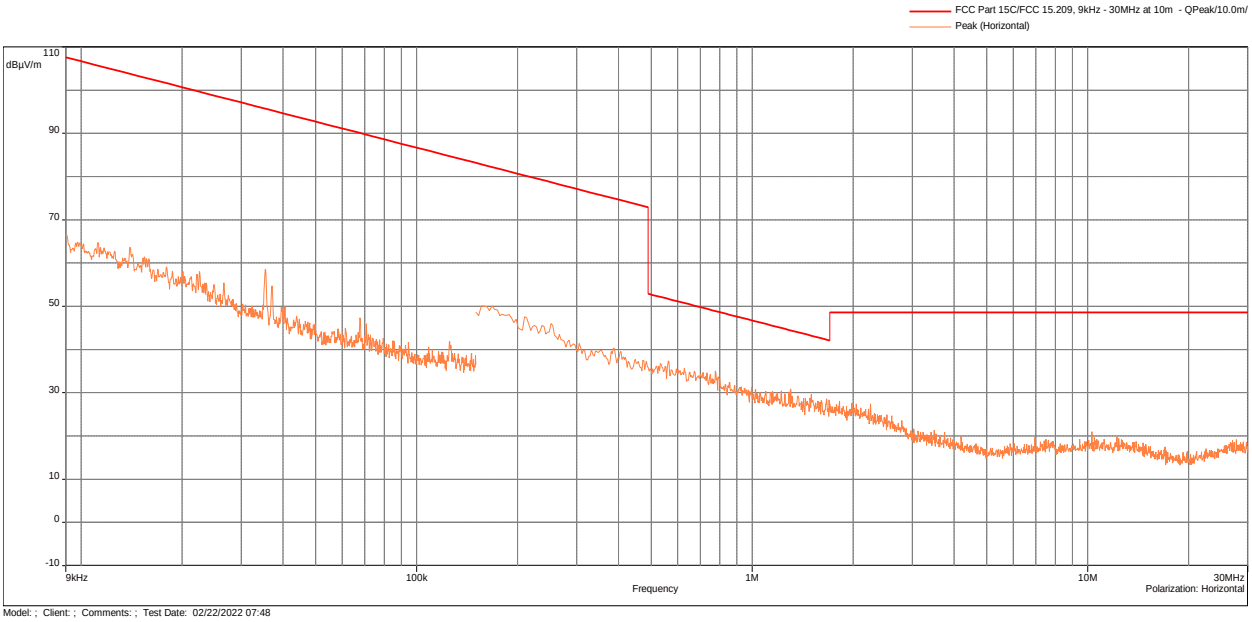
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
17806.77	42.47	54	-11.53	3.99	143.5	Horizontal	9.34
17901.40	42.36	54	-11.64	2.99	0	Vertical	8.8
15588.83	40.76	54	-13.24	3.99	122	Horizontal	4.62
15566.17	40.72	54	-13.28	1.01	57.5	Vertical	4.51
12188.27	40.04	54	-13.96	2.99	163.75	Vertical	1.96
16111.87	39.99	54	-14.01	3.99	99.75	Horizontal	4.36

Note: Correction = AF + CF - Preamp

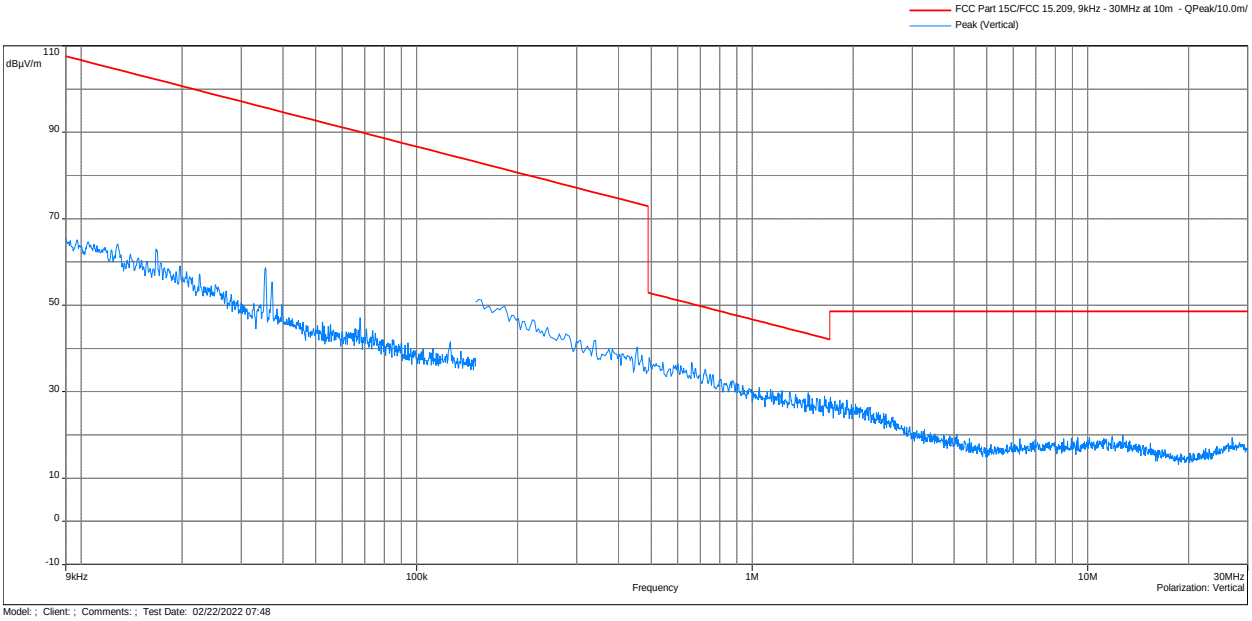
Results	Complies

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

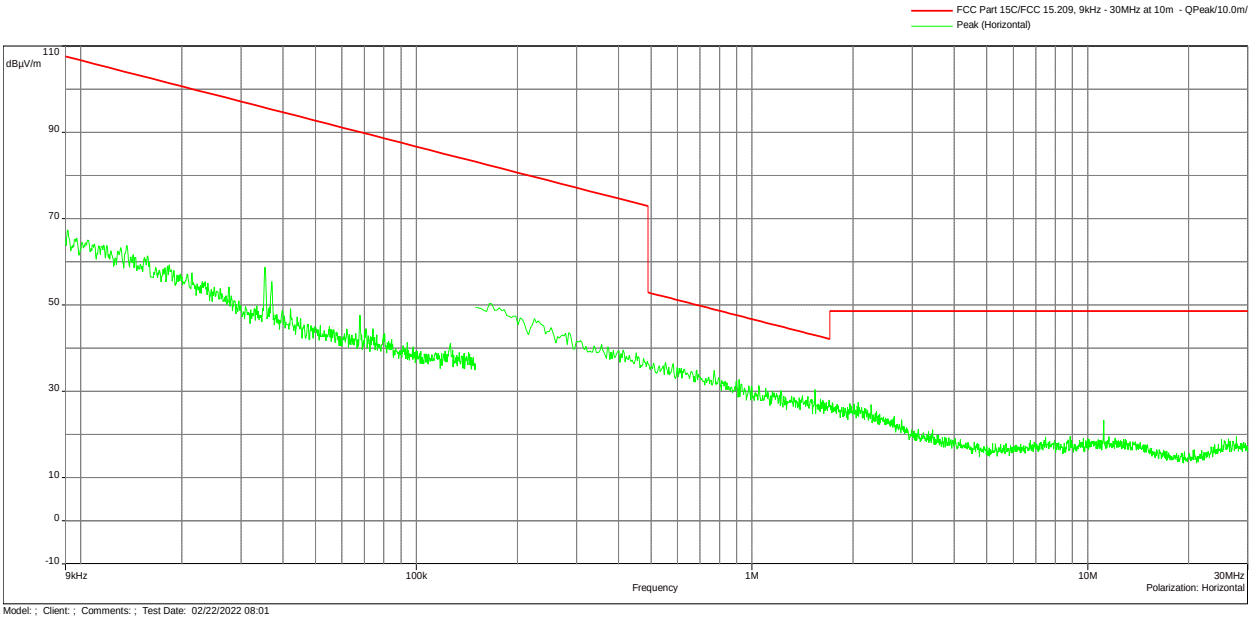
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

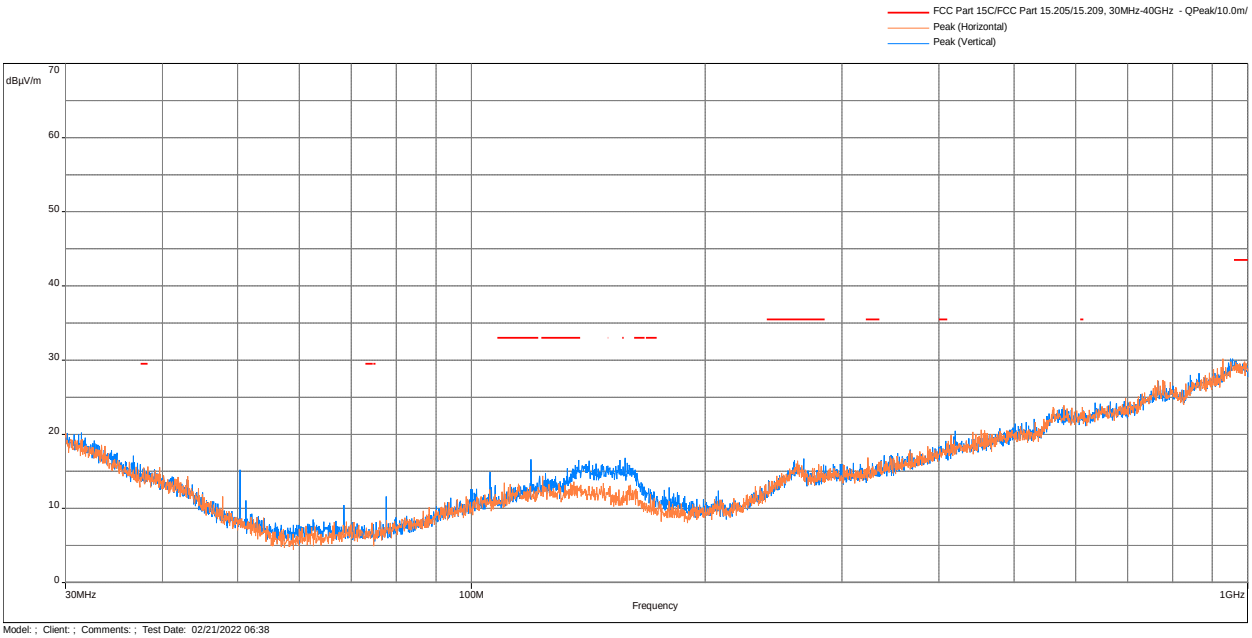


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



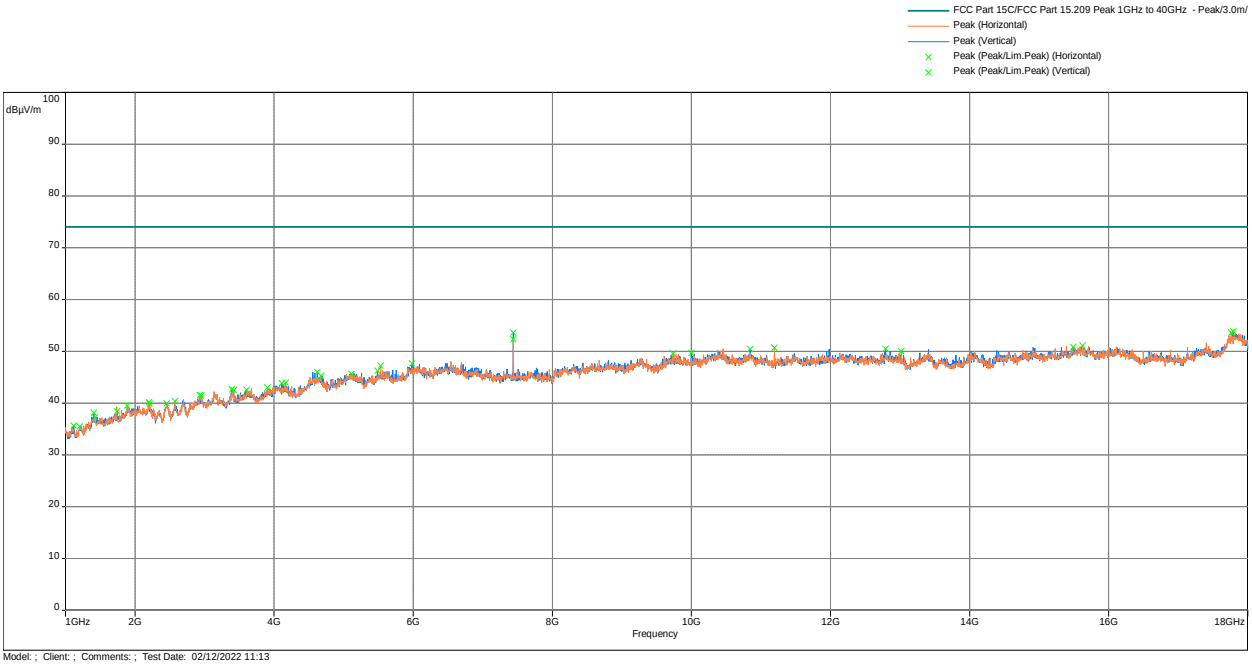
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:01

Radiated Spurious Emissions 30 MHz - 1000 MHz



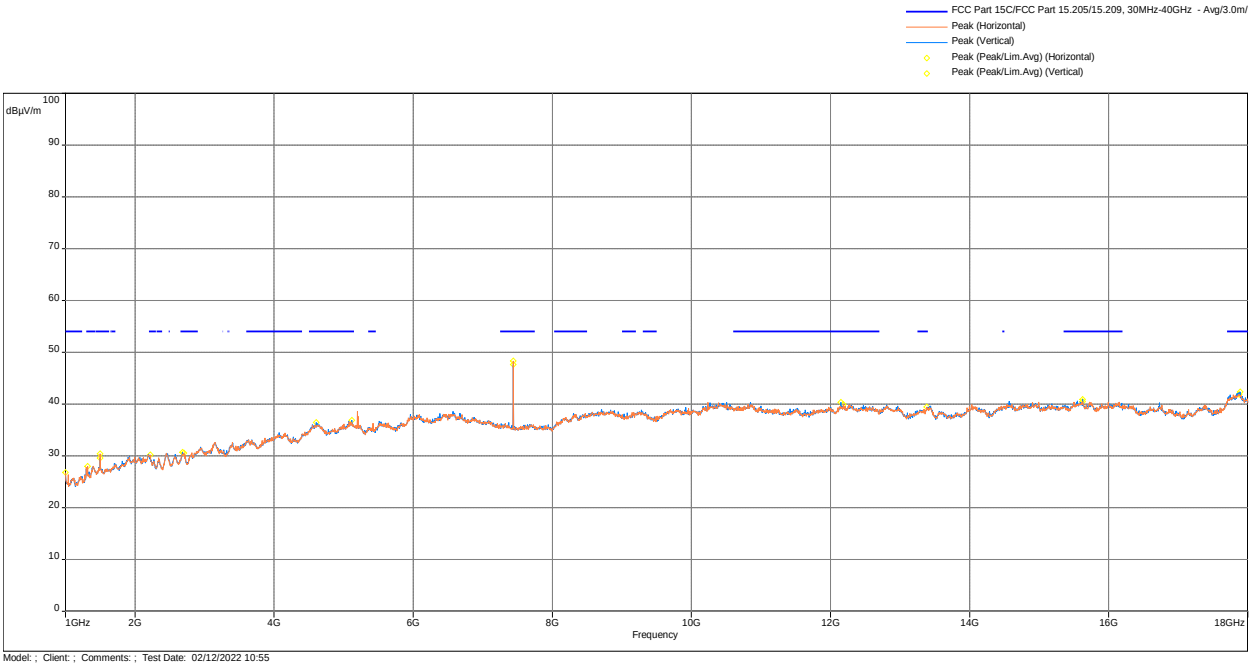
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 06:38

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



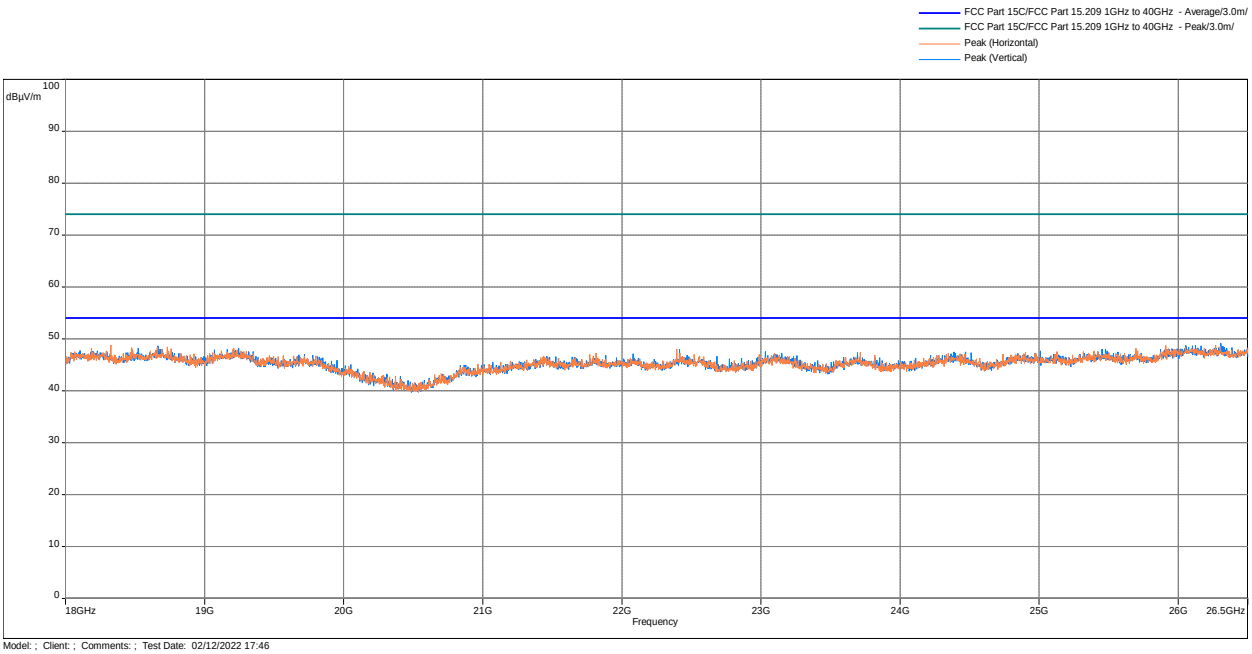
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 11:13

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 10:55

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
612.162	23.67	35.5	-11.83	2	1.25	Horizontal	-3.67
612.485	23.1	35.5	-12.4	2	332.5	Horizontal	-3.68
613.584	23.05	35.5	-12.45	2	133.5	Horizontal	-3.68
609.413	22.93	35.5	-12.57	2	76.75	Horizontal	-3.63
610.836	22.56	35.5	-12.94	2.96	323.25	Horizontal	-3.57
963.205	29.92	43.5	-13.58	4	318	Vertical	3.97

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7439.60	48.35	54	-5.65	3.01	88	Horizontal	-2.33
7440.73	47.63	54	-6.37	1.99	326.25	Vertical	-2.33
17892.33	42.39	54	-11.61	3.99	283.25	Vertical	8.85
17877.60	41.92	54	-12.08	2.01	187.25	Horizontal	8.92
15623.97	40.89	54	-13.11	1.01	338.5	Vertical	4.66
15626.23	40.47	54	-13.53	3.99	78.25	Horizontal	4.66

Note: Correction = AF + CF - Preamp

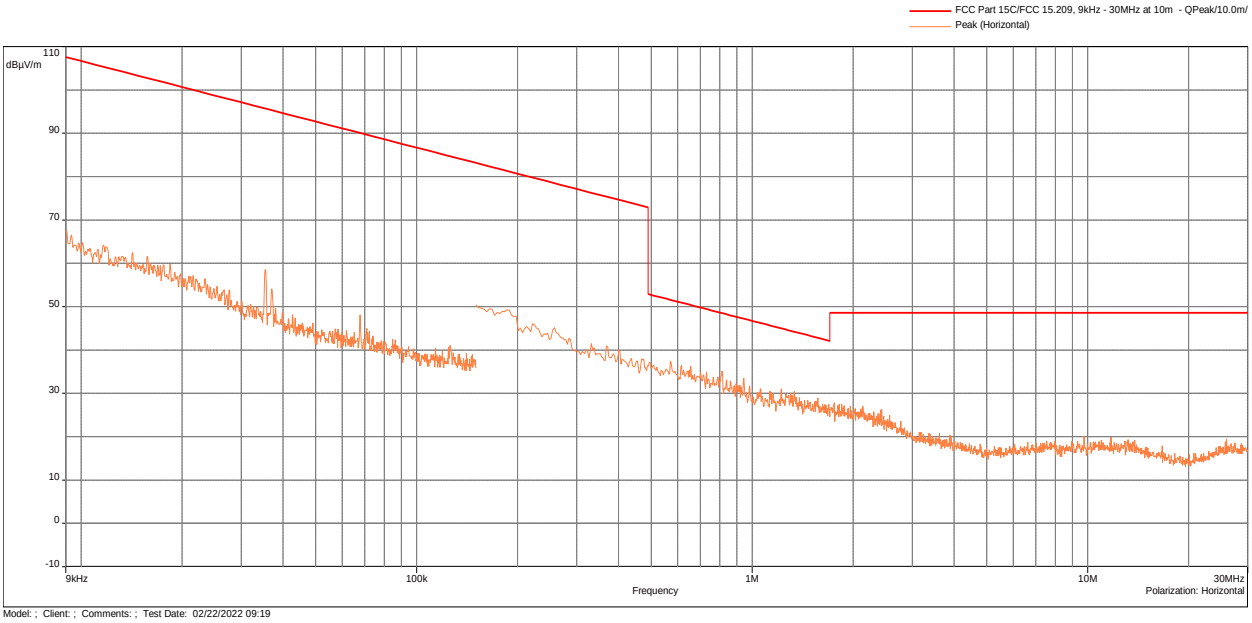
Results	Complies

BLE 4.2 Battery Mode:

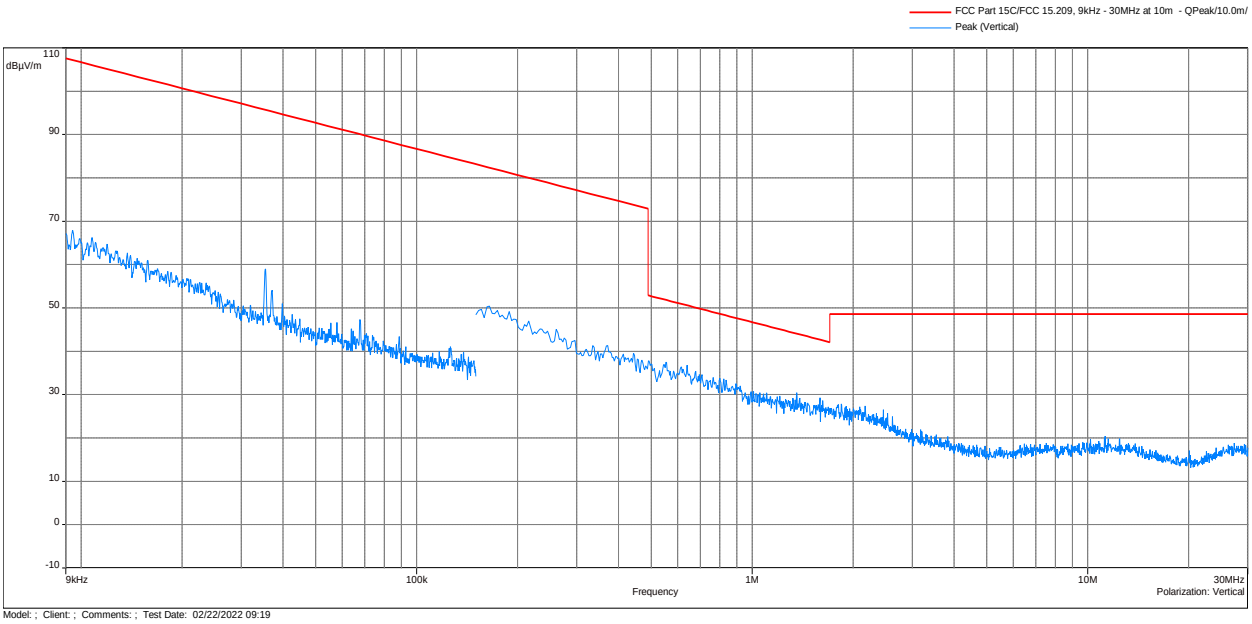
Out-of-Band Radiated Spurious Emissions

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

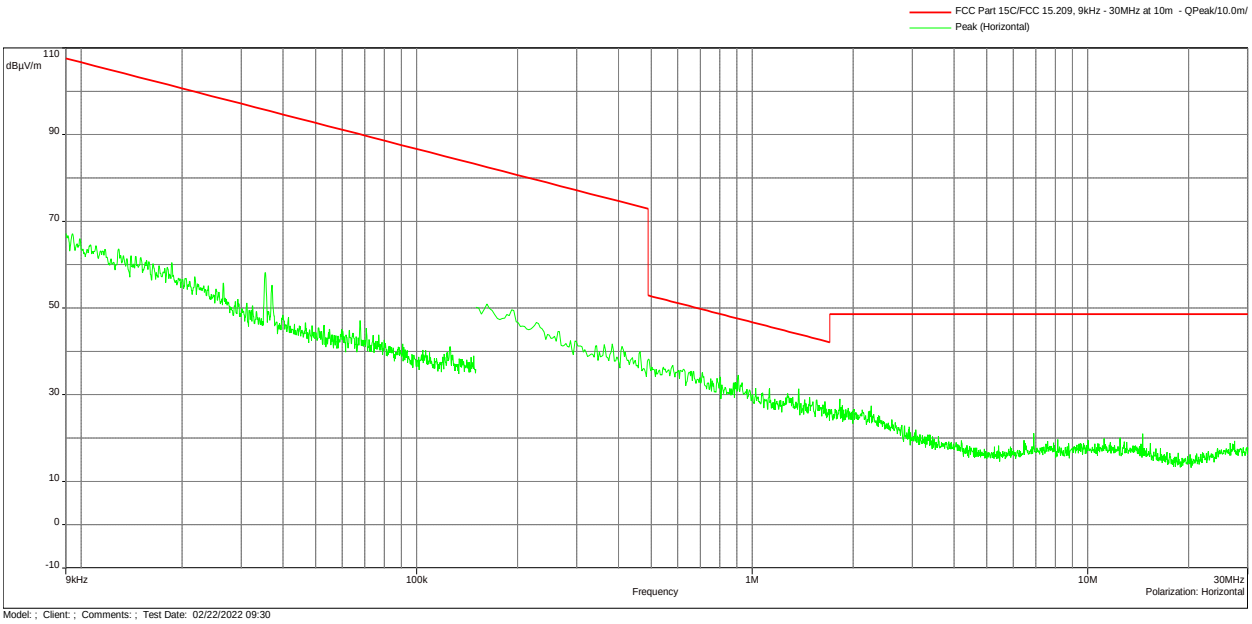
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

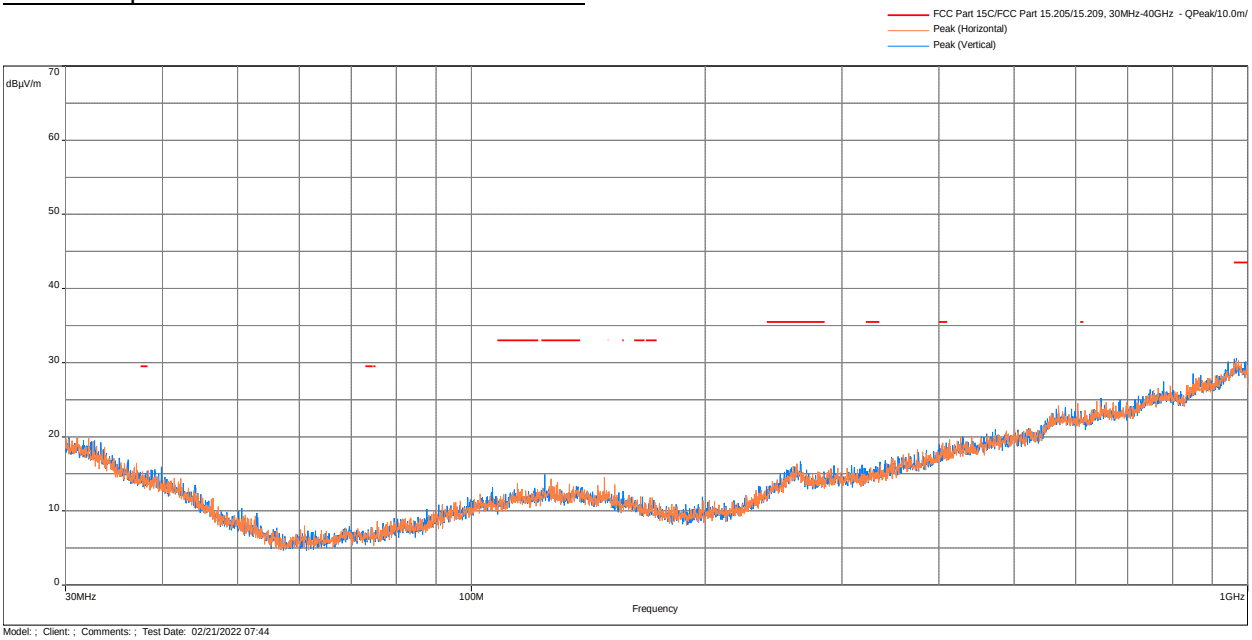


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



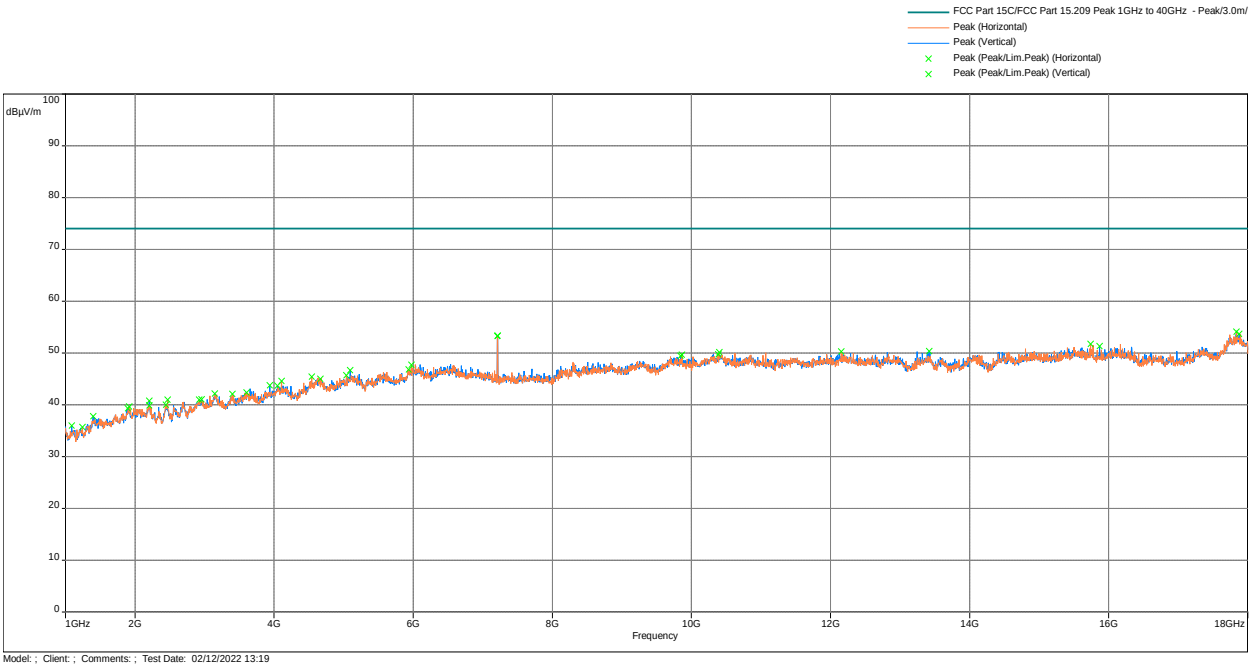
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 09:30

Radiated Spurious Emissions 30 MHz - 1000 MHz



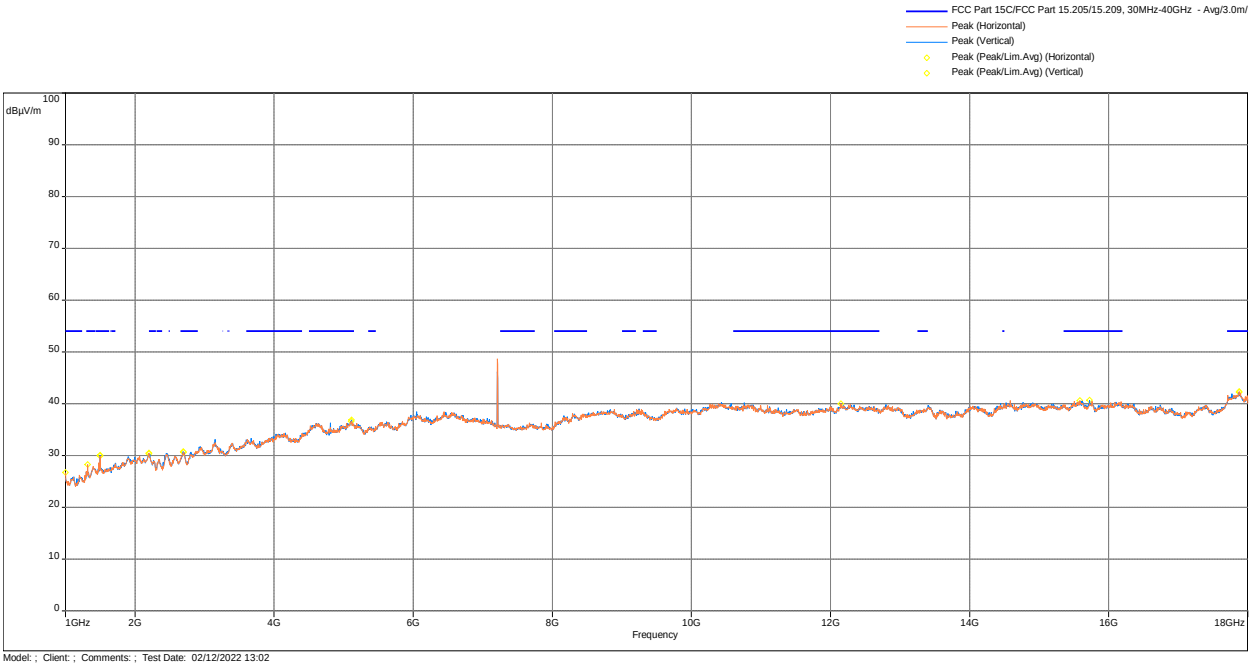
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 07:44

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



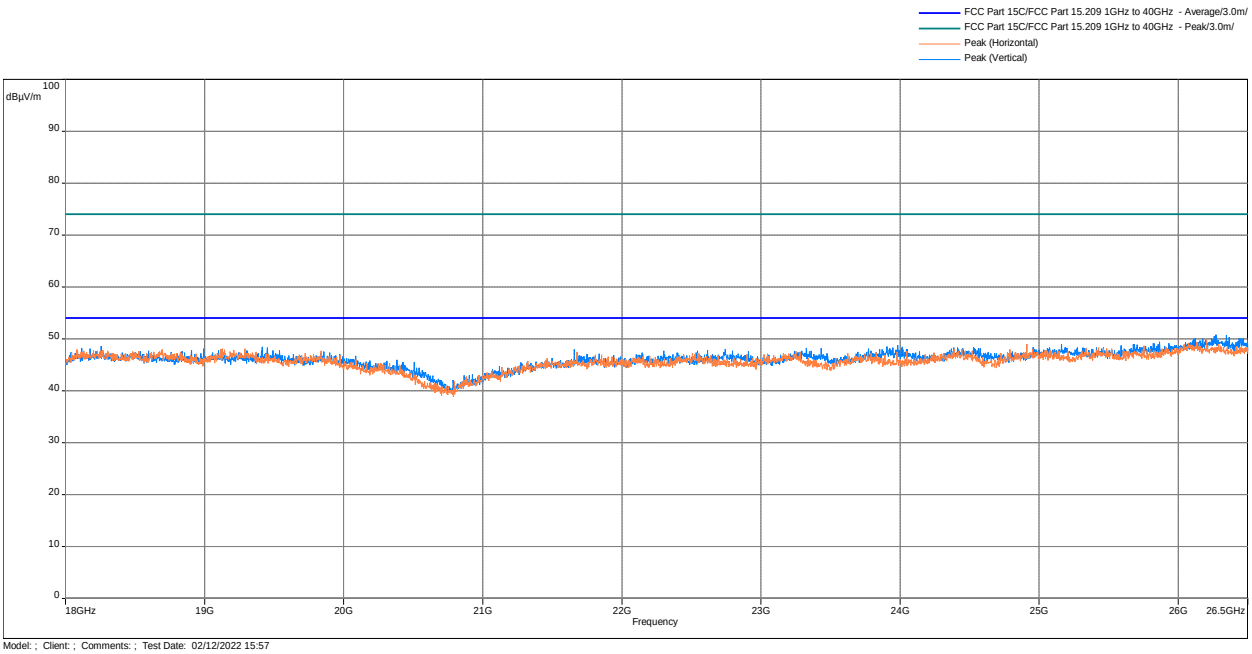
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 13:19

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 13:02

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
609.478	23.5	35.5	-12	3	20.5	Vertical	-3.62
609.090	23.16	35.5	-12.34	4	42.5	Horizontal	-3.66
966.212	30.58	43.5	-12.92	2	266.75	Vertical	4.03
960.456	30.53	43.5	-12.97	4	359.75	Vertical	3.94
611.353	22.48	35.5	-13.02	1.96	244.5	Horizontal	-3.61
612.129	22.43	35.5	-13.07	4	323.25	Vertical	-3.67

Note: Correction = AF + CF - Preamp.

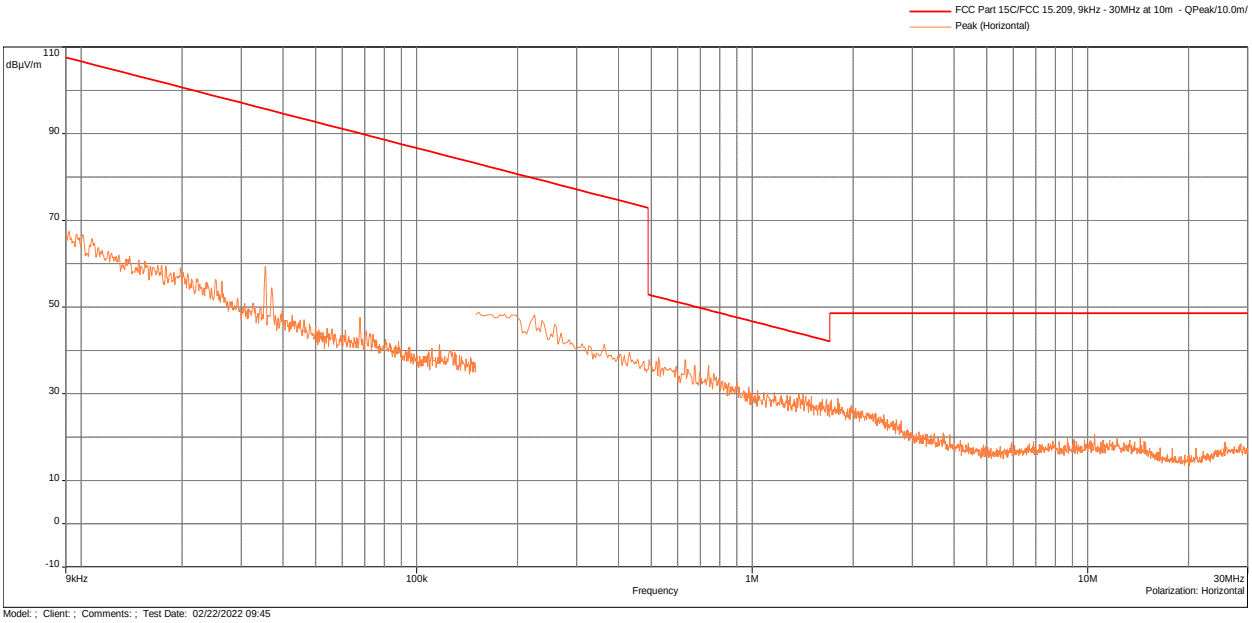
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
17877.60	42.35	54	-11.65	2.01	229.25	Horizontal	8.92
17877.60	42.23	54	-11.77	3.99	0	Vertical	8.92
15726.53	40.73	54	-13.27	2.99	187.75	Vertical	4.49
15584.30	40.62	54	-13.38	1.01	22.5	Horizontal	4.6
12146.90	40.03	54	-13.97	3.99	14.5	Horizontal	1.82
5114.00	36.89	54	-17.11	1.99	0	Vertical	-3.53

Note: Correction = AF + CF - Preamp

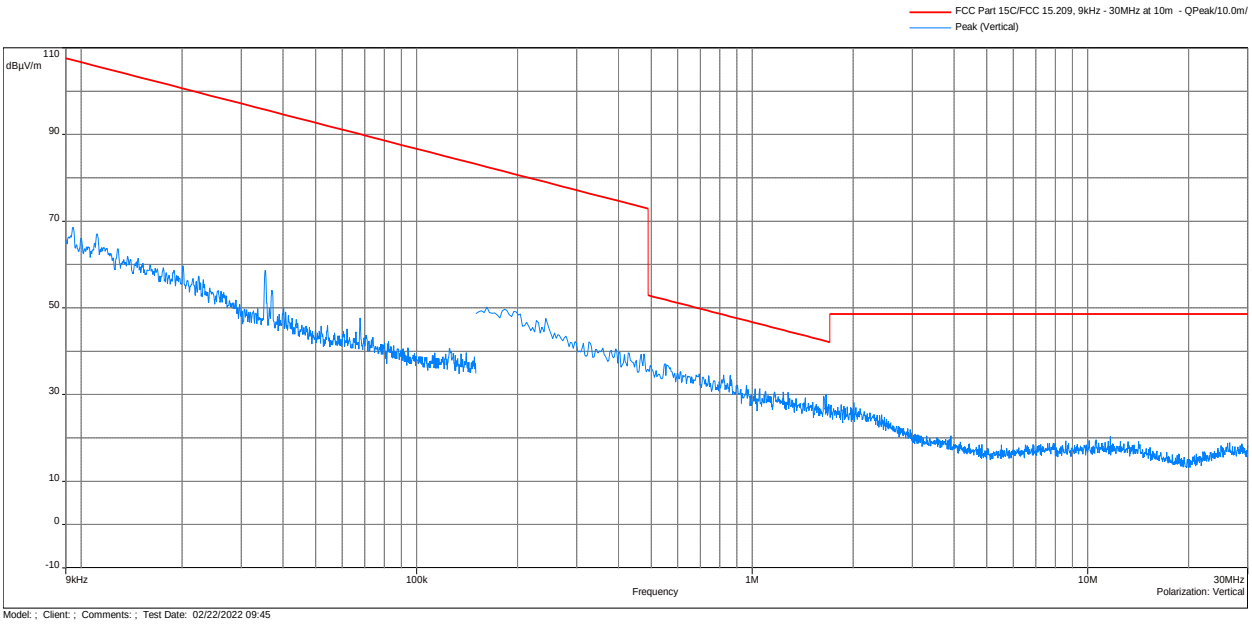
Results	Complies

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

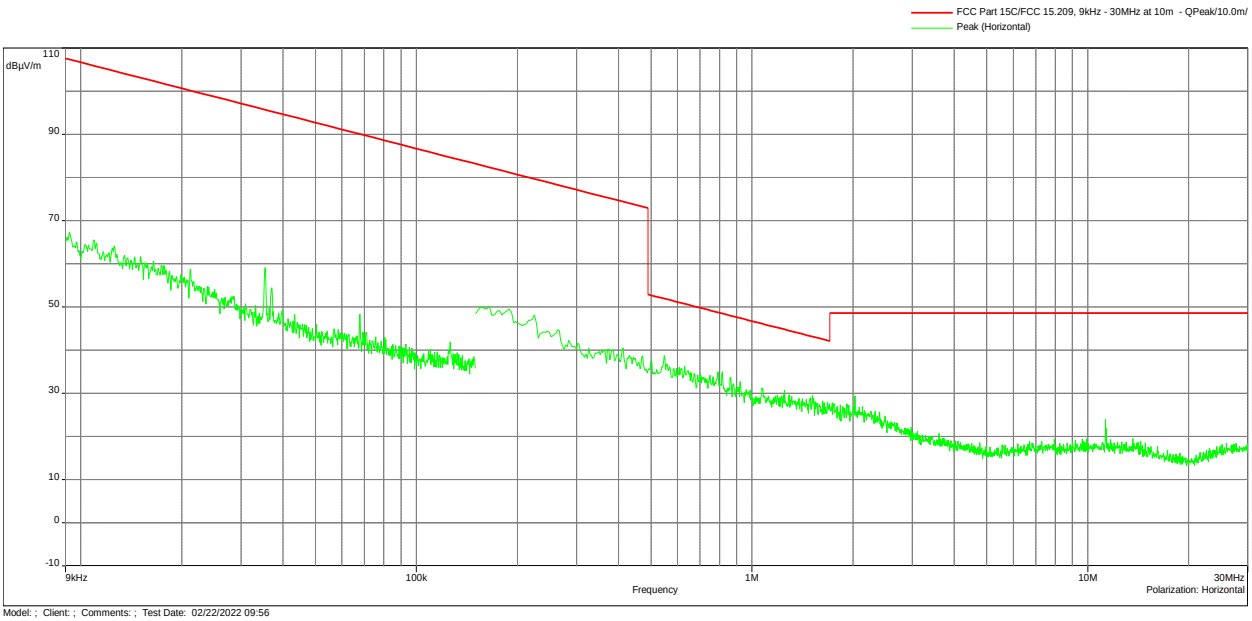
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

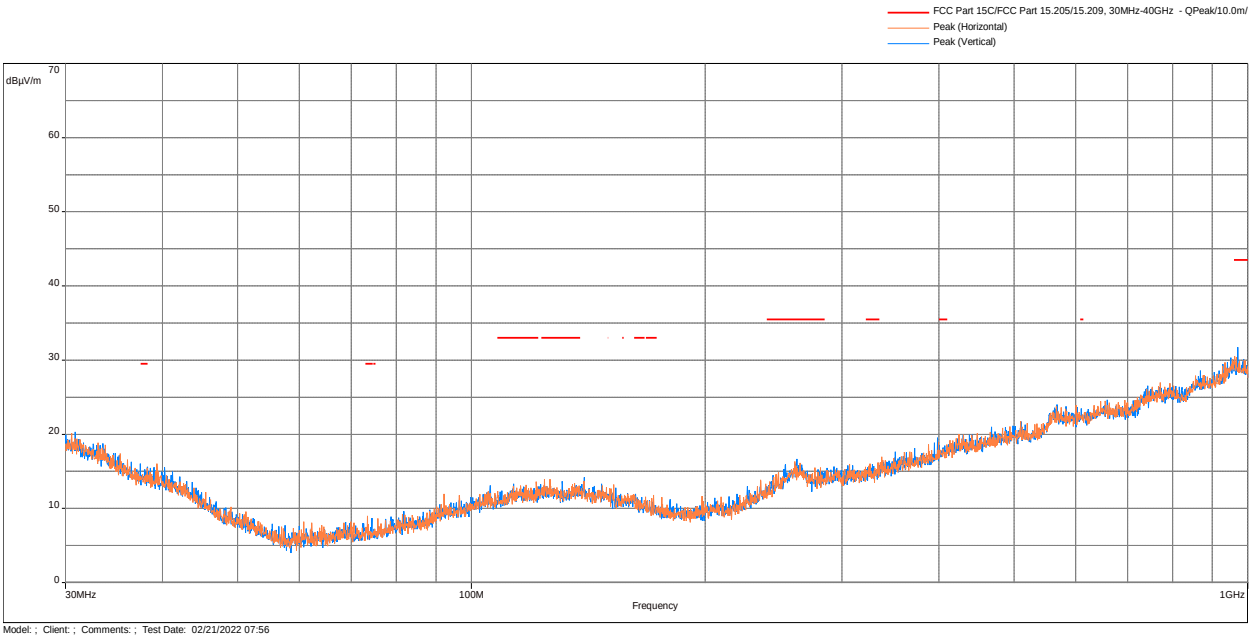


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



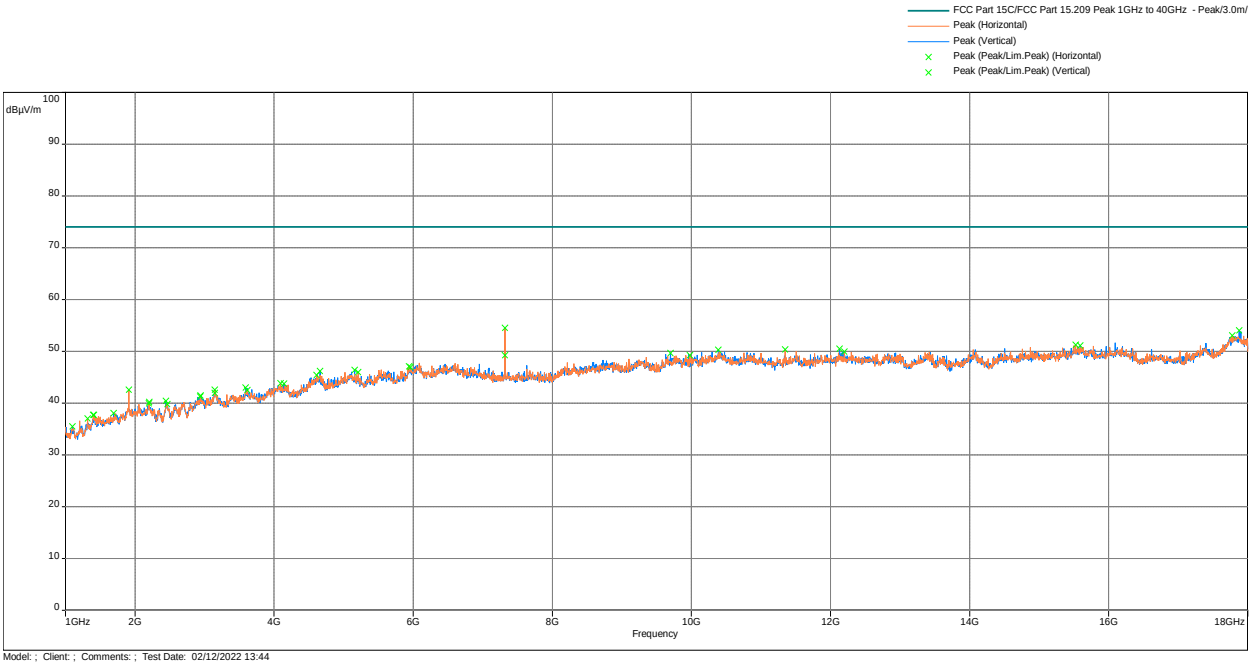
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 09:56

Radiated Spurious Emissions 30 MHz - 1000 MHz



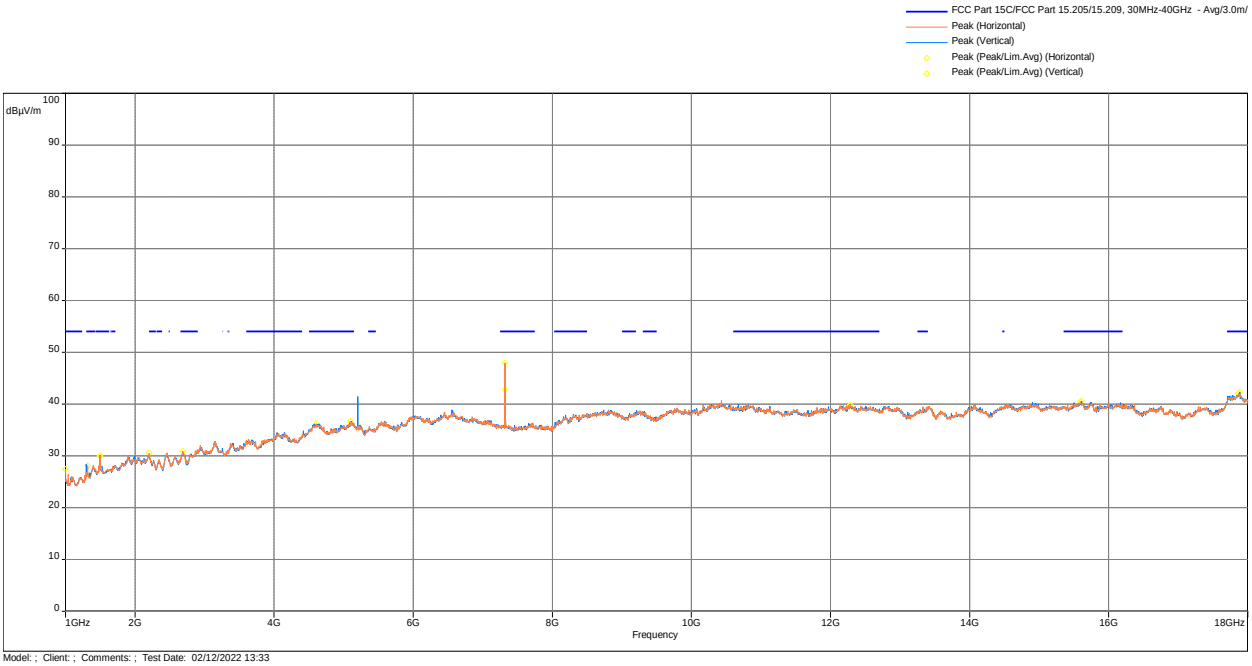
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 07:56

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



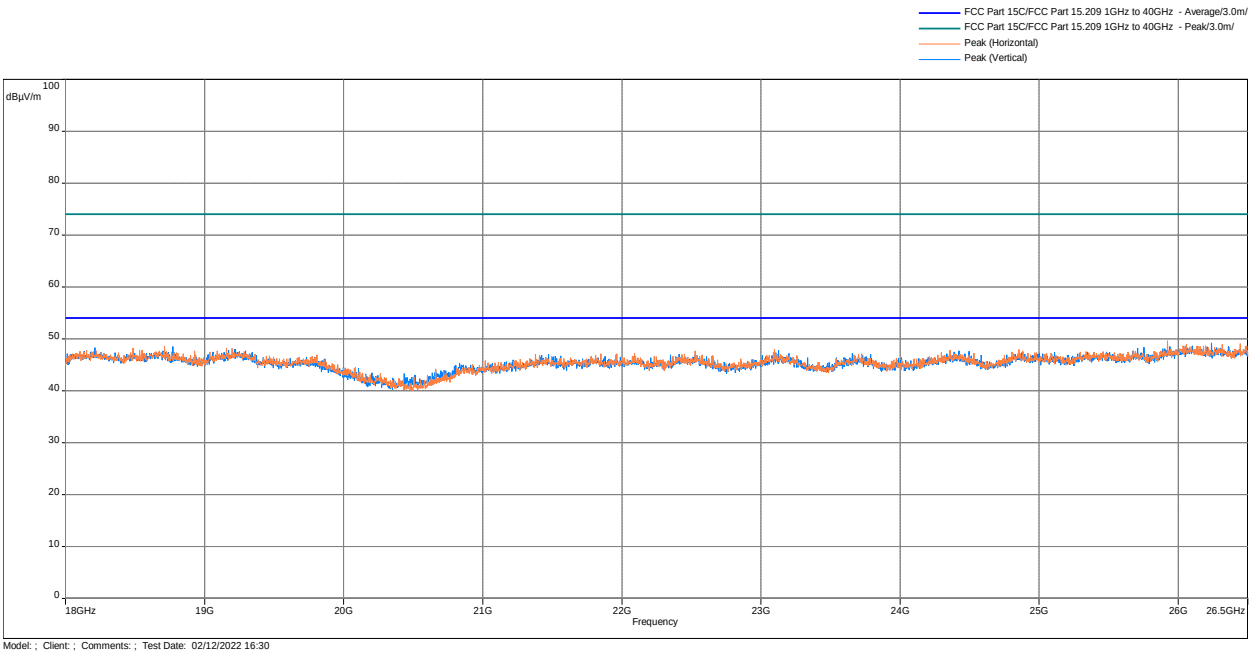
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 13:44

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 13:33

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



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
970.253	31.77	43.5	-11.73	3	169	Vertical	3.91
609.995	23.49	35.5	-12.01	3	359.75	Vertical	-3.57
612.032	22.66	35.5	-12.84	4	47	Horizontal	-3.67
612.841	22.61	35.5	-12.89	2	199.75	Vertical	-3.68
608.928	22.53	35.5	-12.97	4	204	Vertical	-3.67
961.814	30.51	43.5	-12.99	2.01	337.25	Horizontal	4.03

Note: Correction = AF + CF – Preamp

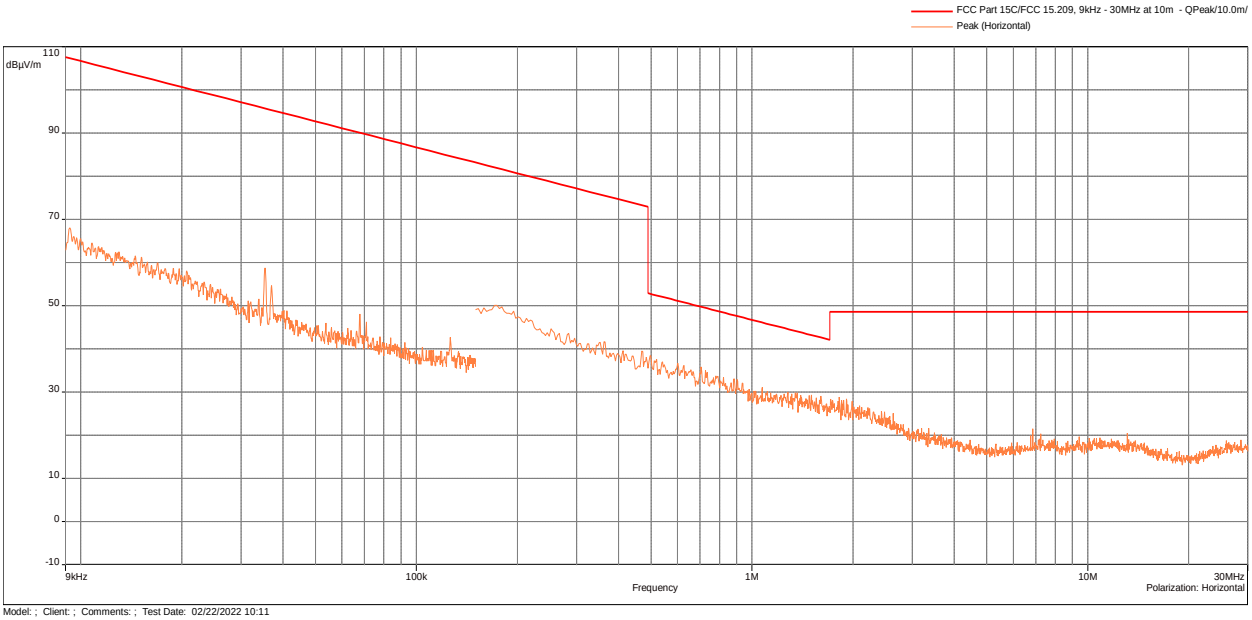
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7319.47	48.01	54	-5.99	1.99	217.5	Horizontal	-2.53
7320.60	42.8	54	-11.2	3.99	0	Vertical	-2.53
17887.23	42.29	54	-11.71	3.01	0	Vertical	8.87
17865.13	42.08	54	-11.92	3.99	175.5	Horizontal	8.96
15609.80	40.53	54	-13.47	1.01	0	Vertical	4.67
15588.27	40.41	54	-13.59	1.99	174.5	Horizontal	4.62

Note: Correction = AF + CF - Preamp

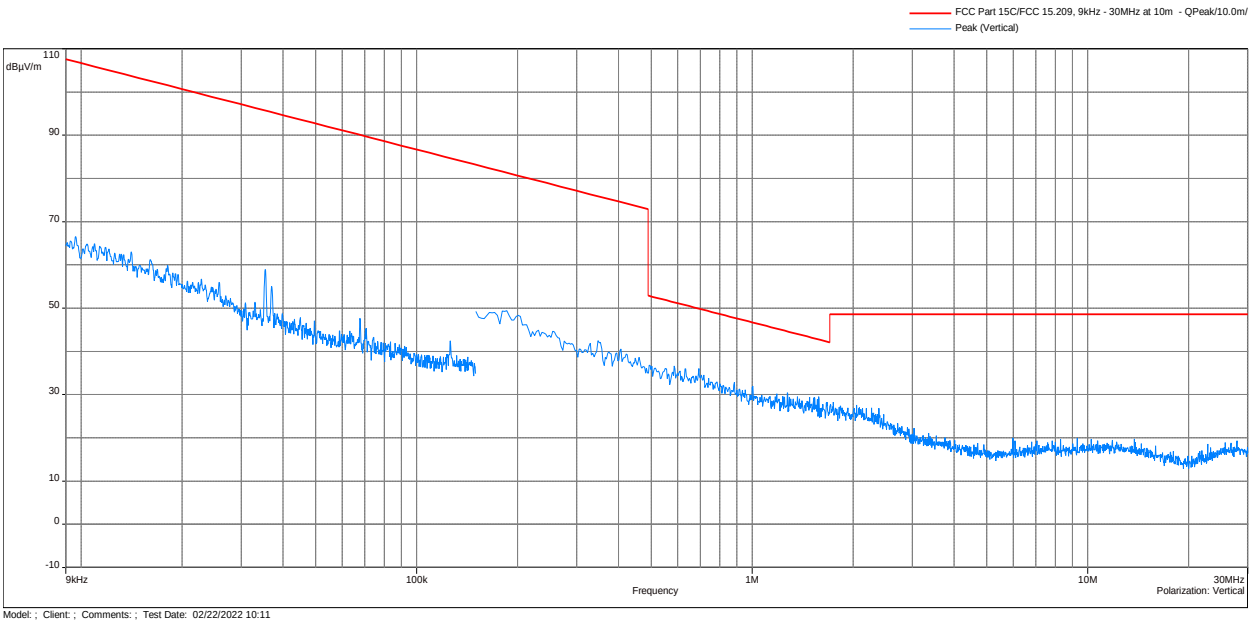
Results	Complies

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

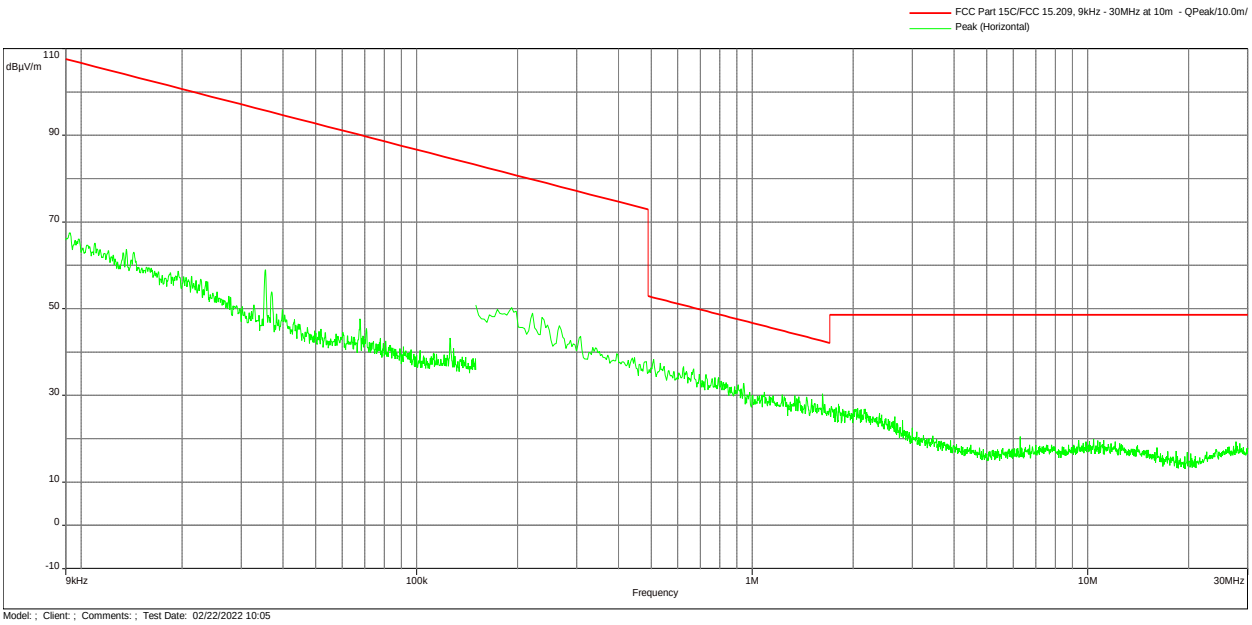
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

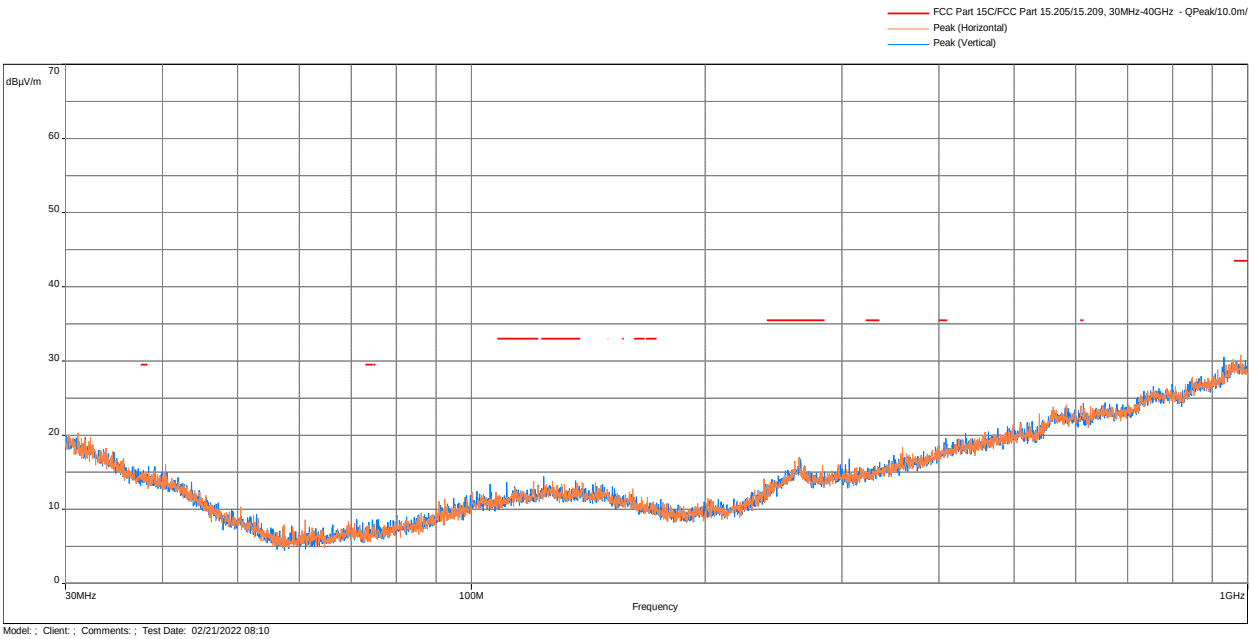


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



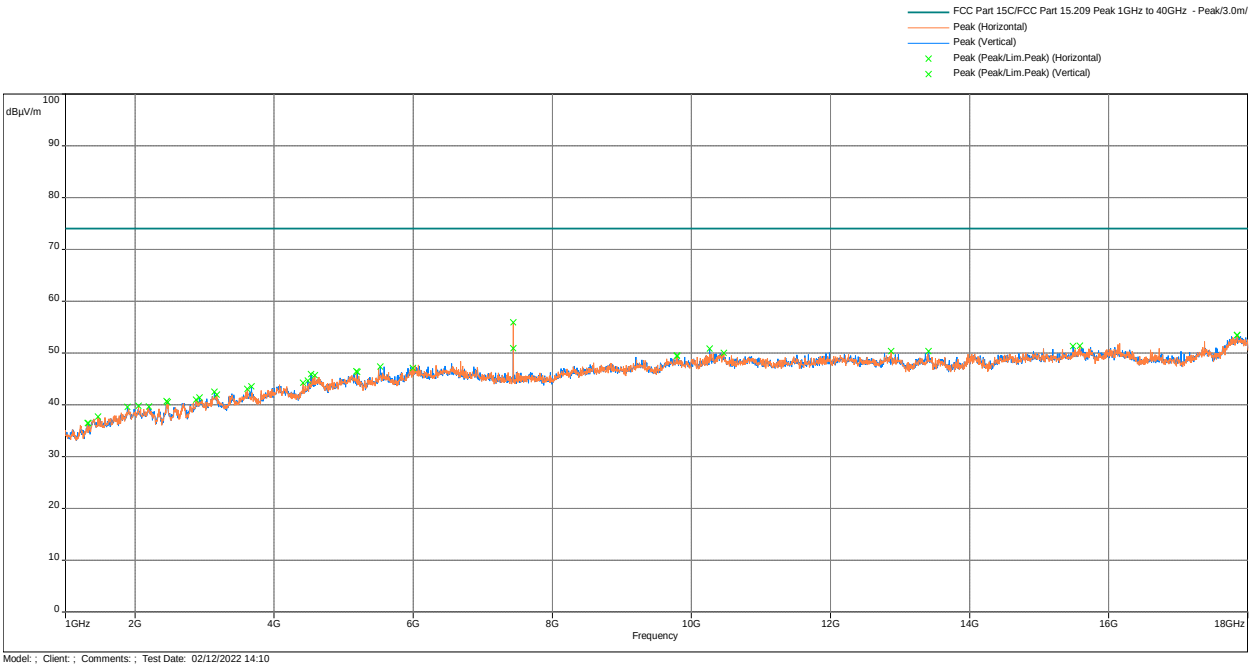
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 10:05

Radiated Spurious Emissions 30 MHz - 1000 MHz



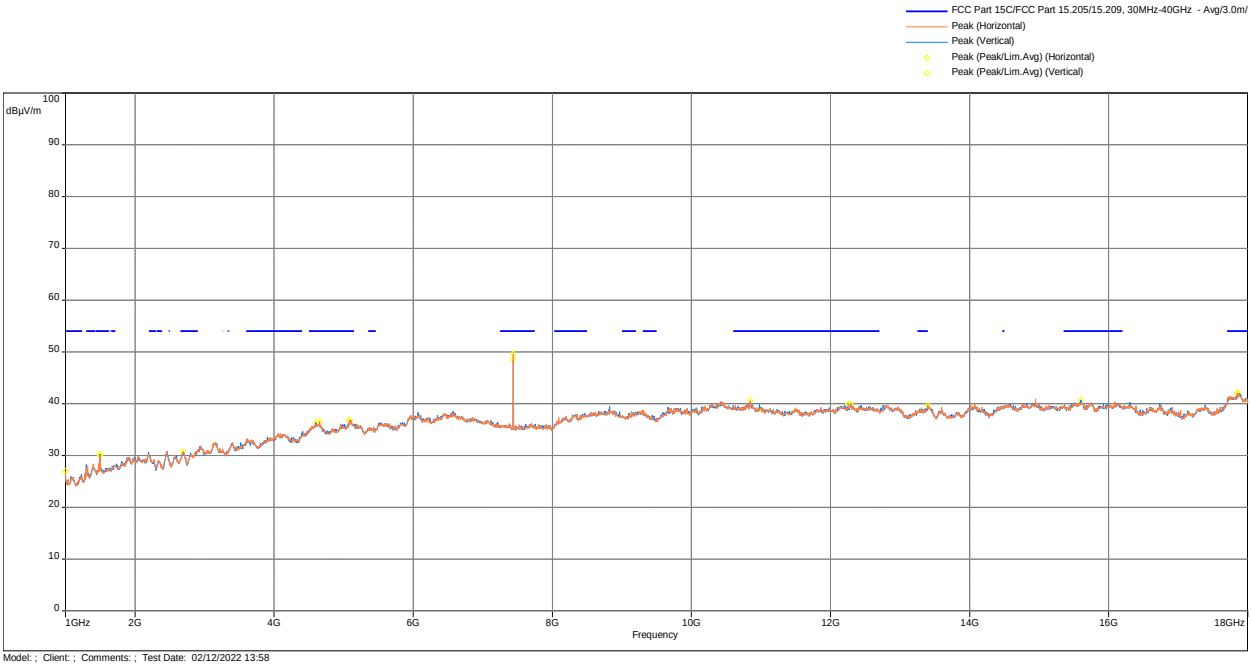
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 08:10

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



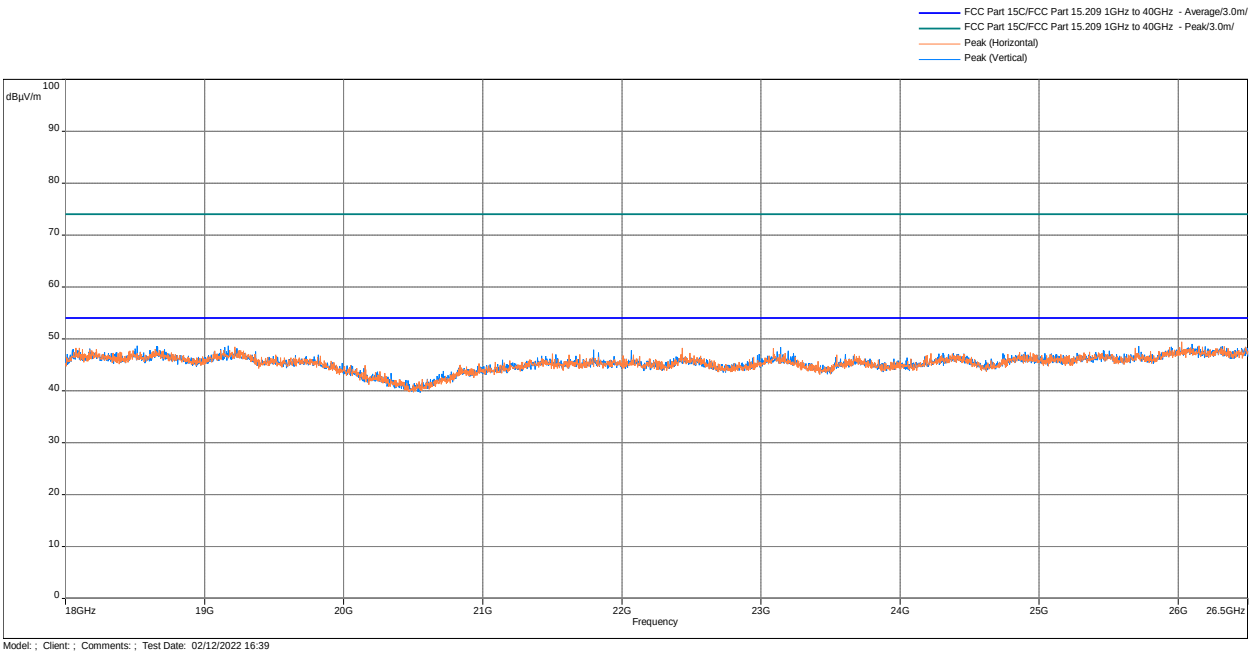
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 14:10

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 13:58

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
613.875	24.32	35.5	-11.18	0.99	297.5	Vertical	-3.68
609.284	23.96	35.5	-11.54	2.97	156	Horizontal	-3.64
612.938	22.88	35.5	-12.62	2	151.75	Vertical	-3.68
979.210	30.84	43.5	-12.66	1	336.5	Horizontal	3.74
612.291	22.61	35.5	-12.89	1.99	164.5	Horizontal	-3.68
608.637	22.55	35.5	-12.95	2	106.5	Vertical	-3.67

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7440.73	49.67	54	-4.33	1.01	209	Horizontal	-2.33
7439.03	48.52	54	-5.48	1.01	109.75	Vertical	-2.33
17852.10	42.1	54	-11.9	1.01	58	Horizontal	9.01
17865.13	42	54	-12	1.01	44.25	Vertical	8.96
15597.90	40.8	54	-13.2	3.01	88	Vertical	4.66
10846.97	40.61	54	-13.39	3.99	152	Horizontal	1.23

Note: Correction = AF + CF - Preamp

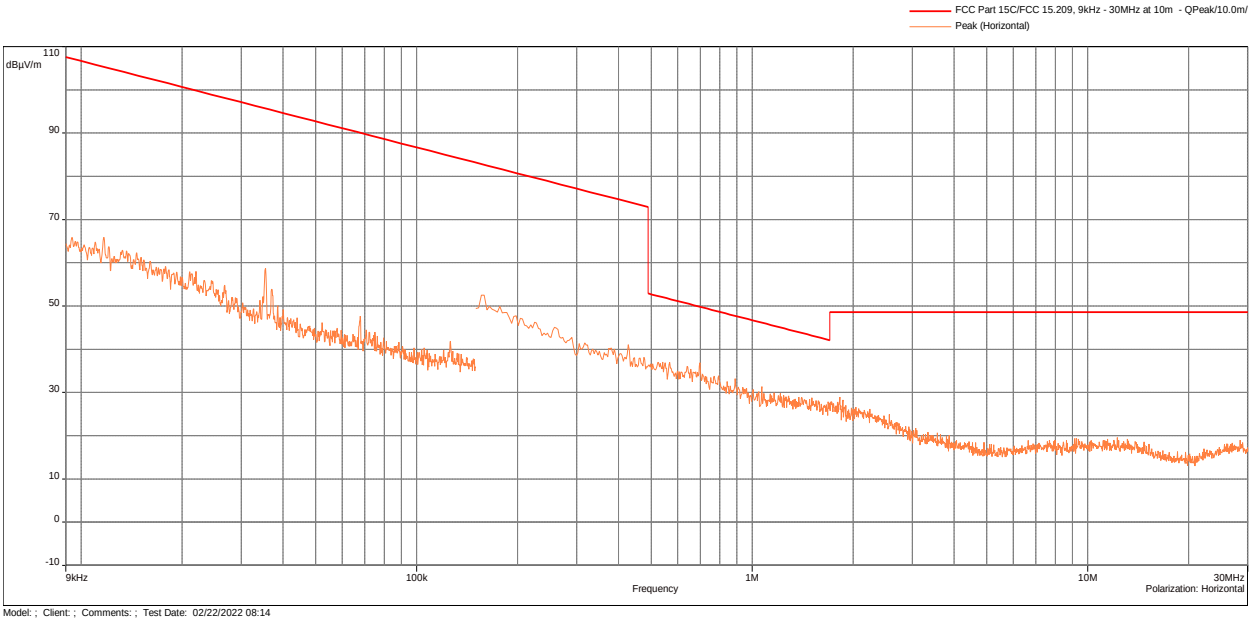
Results	Complies

BLE 5.0 Charging Mode:

Out-of-Band Radiated Spurious Emissions

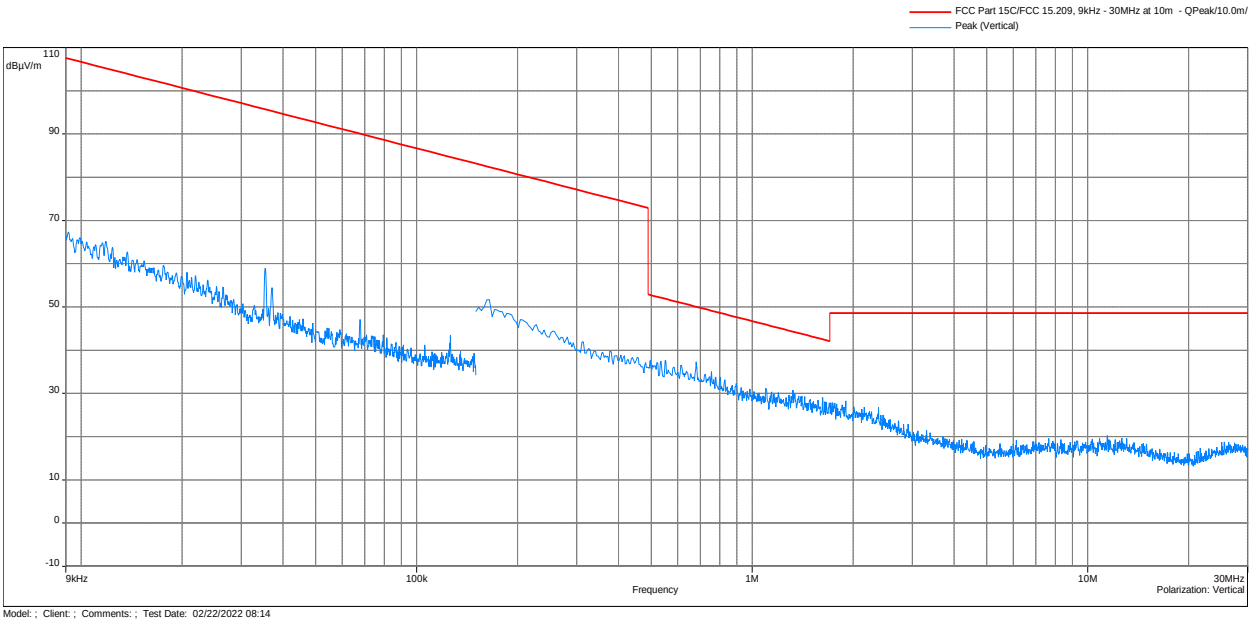
Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz

Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



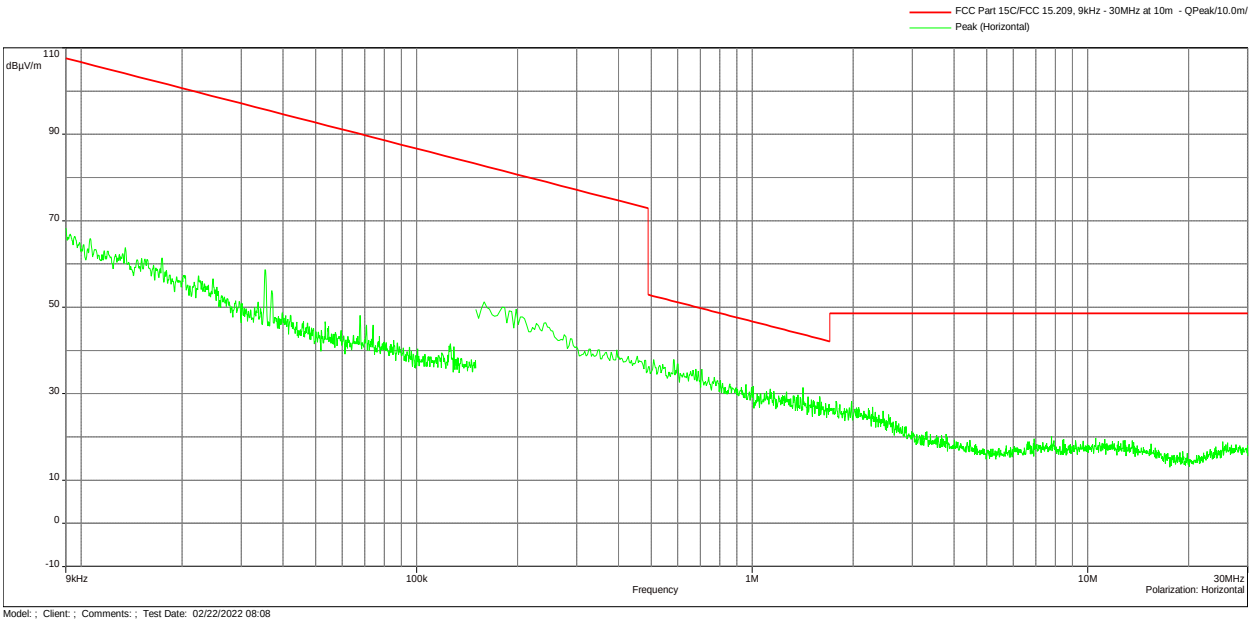
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:14

Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization



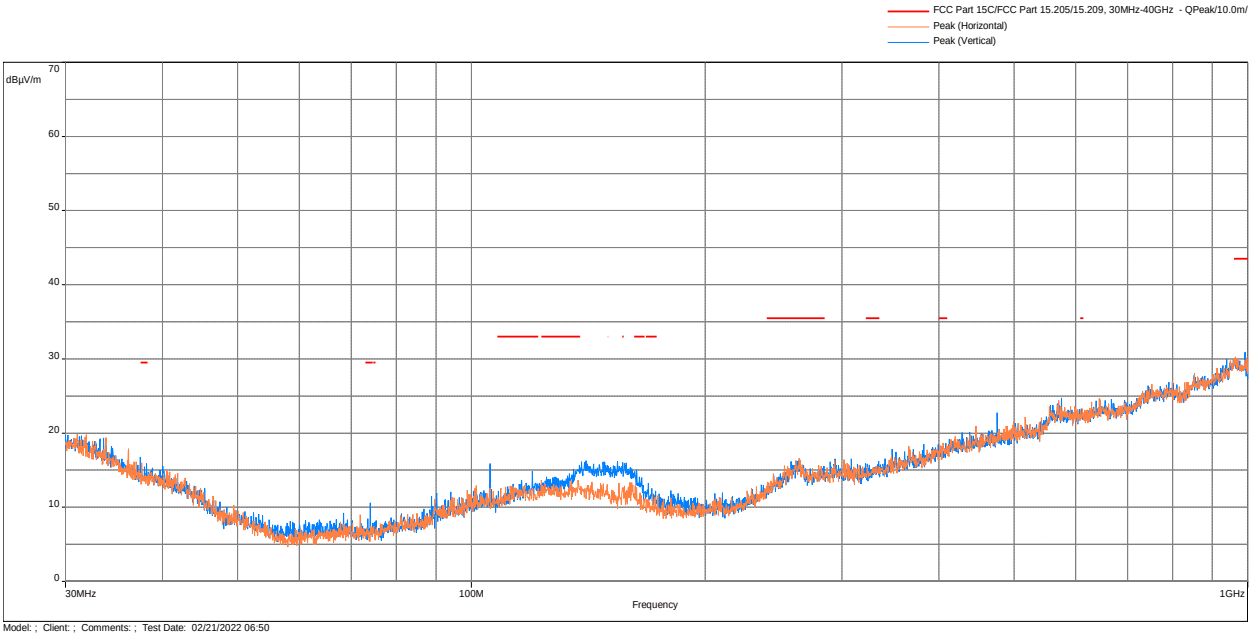
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:14

Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



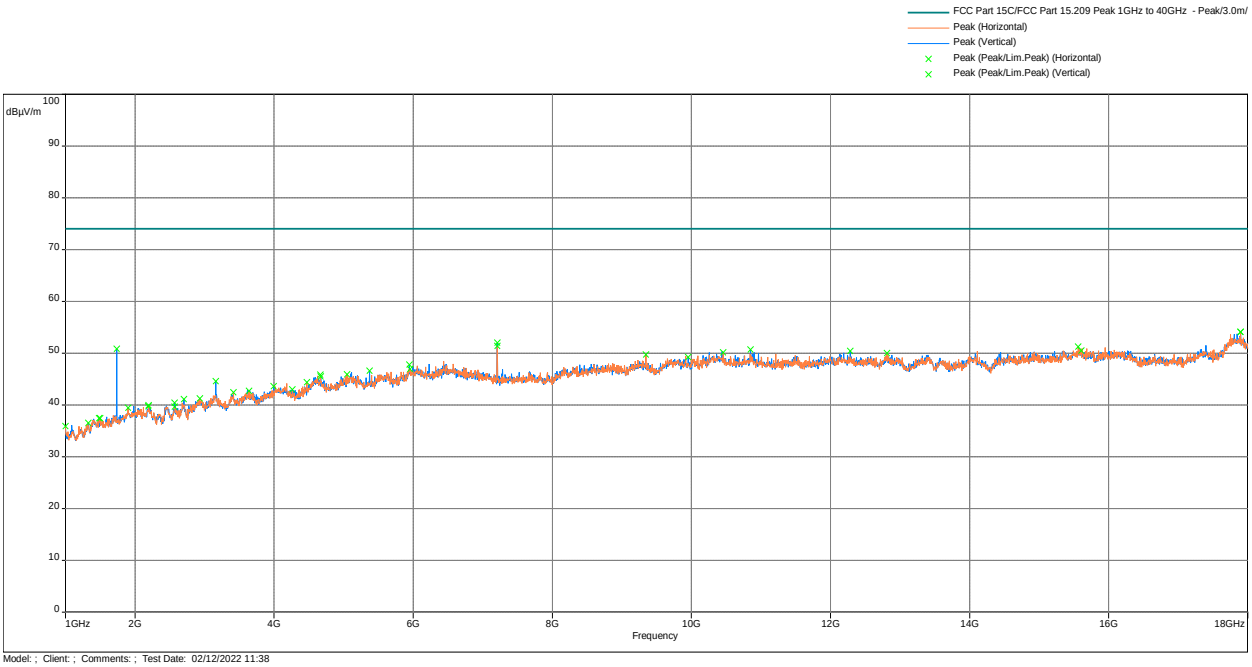
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:08

Radiated Spurious Emissions 30 MHz - 1000 MHz



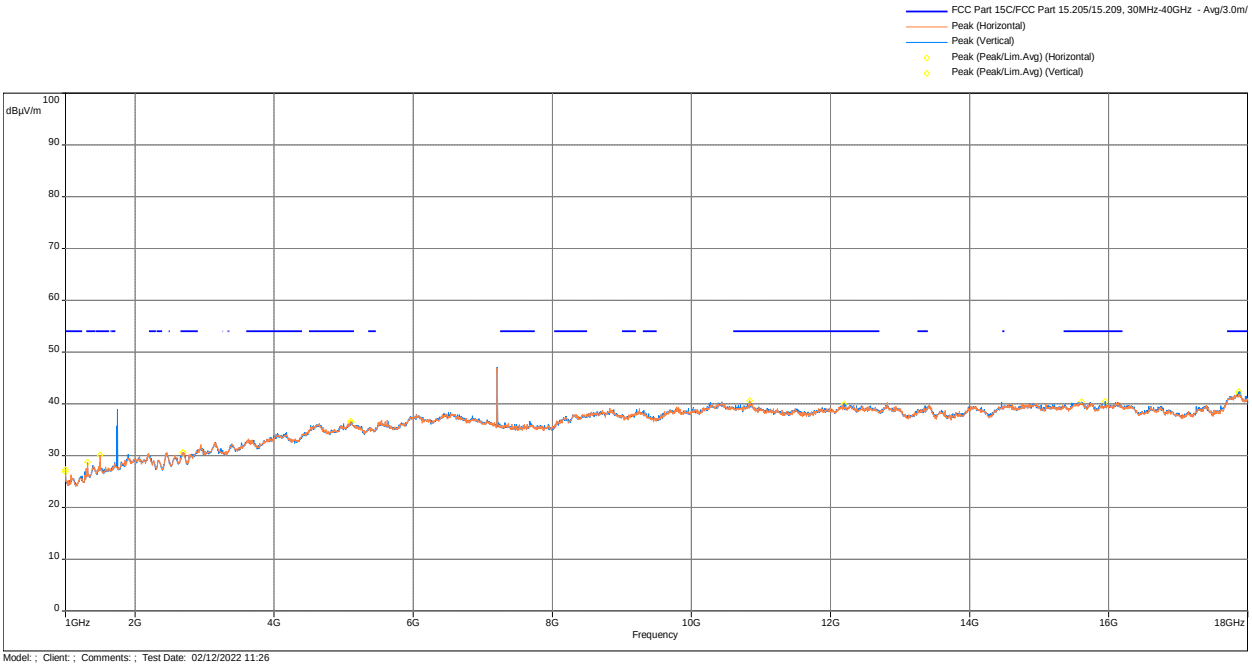
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 06:50

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



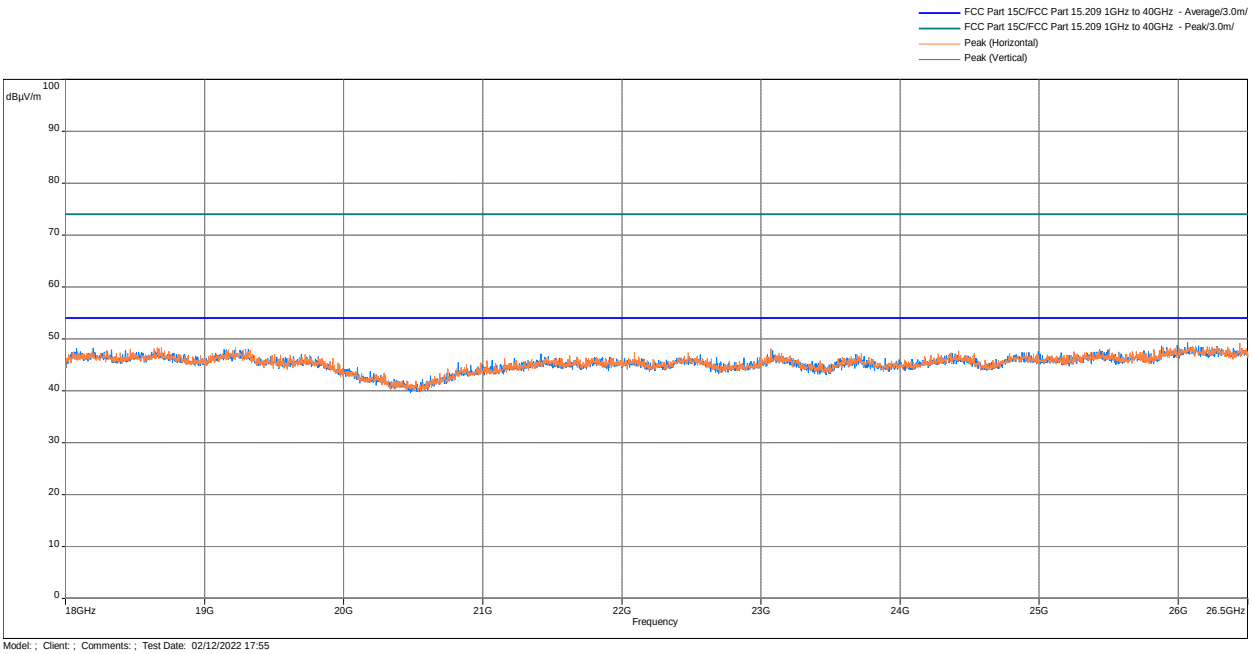
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 11:38

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 11:26

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
612.194	23.3	35.5	-12.2	1.98	323.75	Horizontal	-3.67
610.319	23.28	35.5	-12.22	4	115.75	Vertical	-3.57
608.928	23.08	35.5	-12.42	4	0	Horizontal	-3.67
991.884	30.9	43.5	-12.6	3	0	Vertical	3.69
613.455	22.82	35.5	-12.68	1.98	68	Horizontal	-3.68
612.776	22.41	35.5	-13.09	1	6.25	Vertical	-3.68

Note: Correction = AF + CF - Preamp

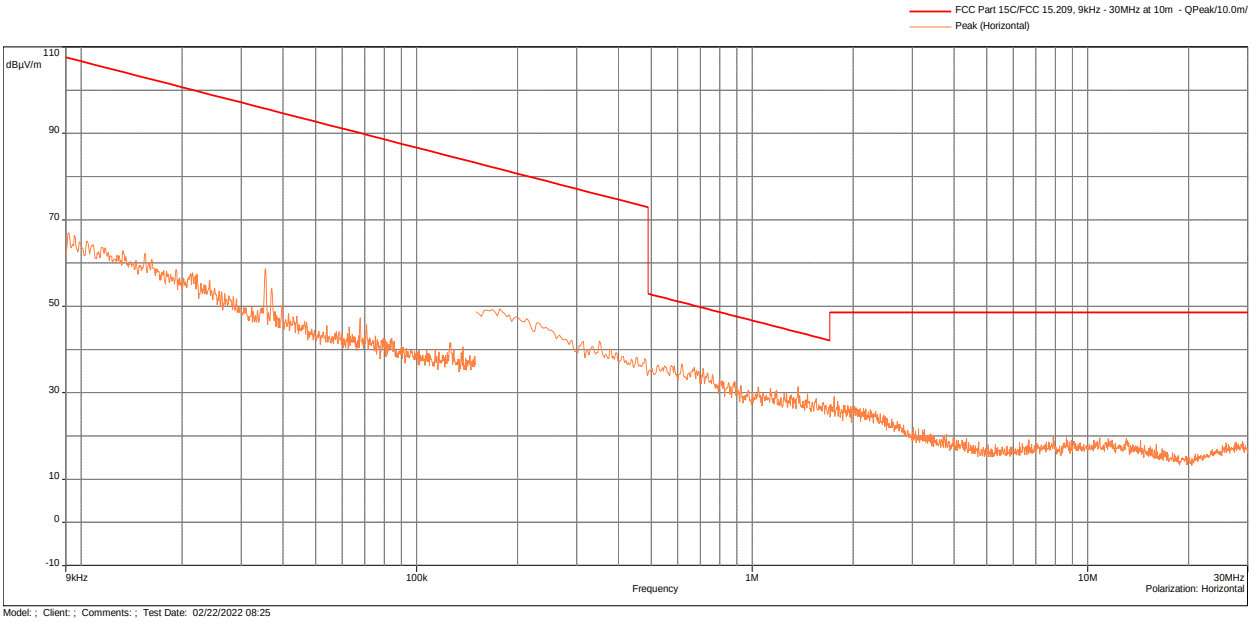
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
17869.10	42.38	54	-11.62	3.99	338.25	Vertical	8.95
17874.20	41.98	54	-12.02	1.01	338.5	Horizontal	8.93
10841.30	40.62	54	-13.38	2.99	77.75	Horizontal	1.25
15946.97	40.51	54	-13.49	3.99	164.25	Vertical	4.07
15610.37	40.42	54	-13.58	3.99	175.25	Horizontal	4.66
12193.37	39.92	54	-14.08	2.01	164.25	Vertical	1.98

Note: Correction = AF + CF - Preamp

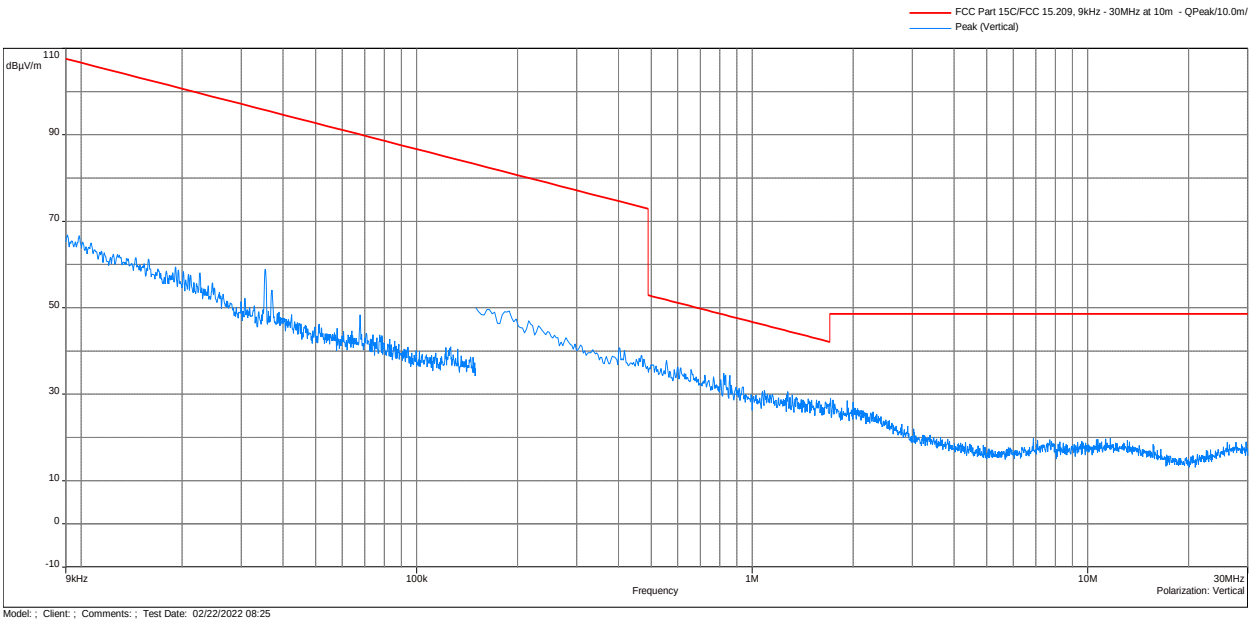
Results	Complies

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

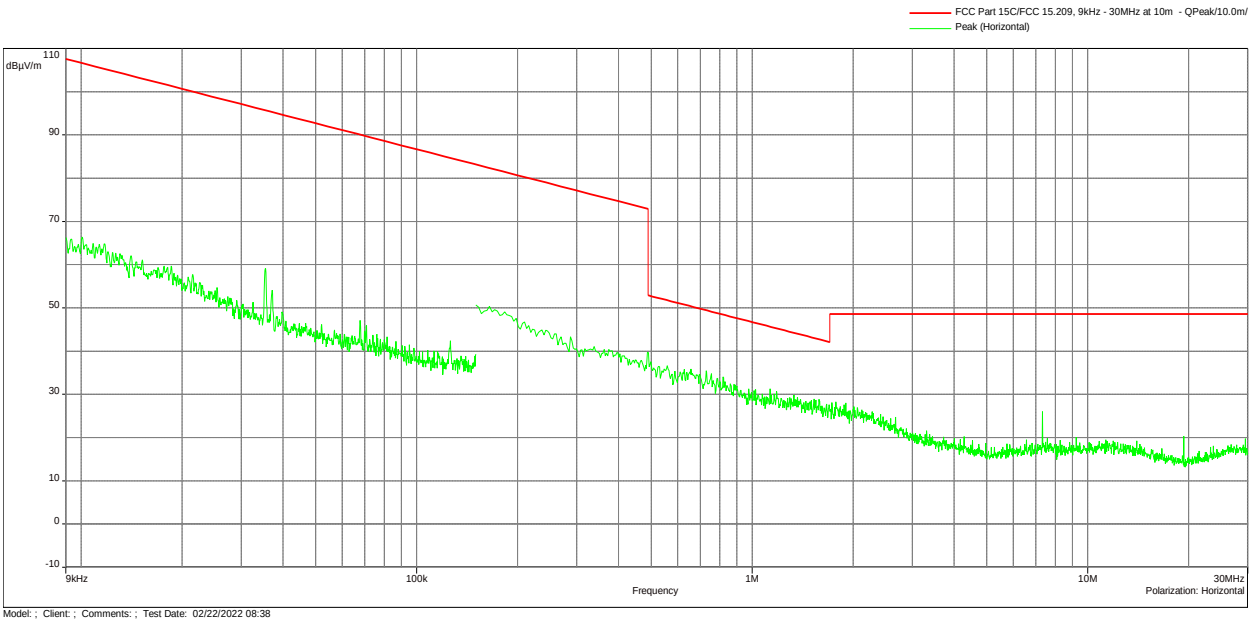
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

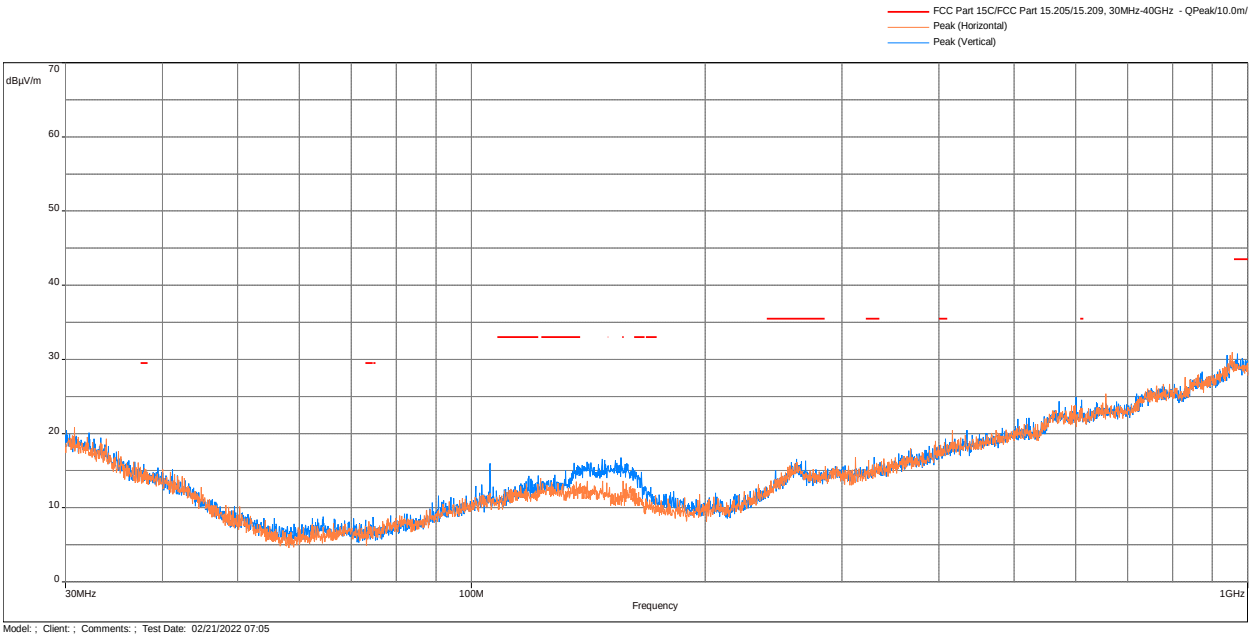


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



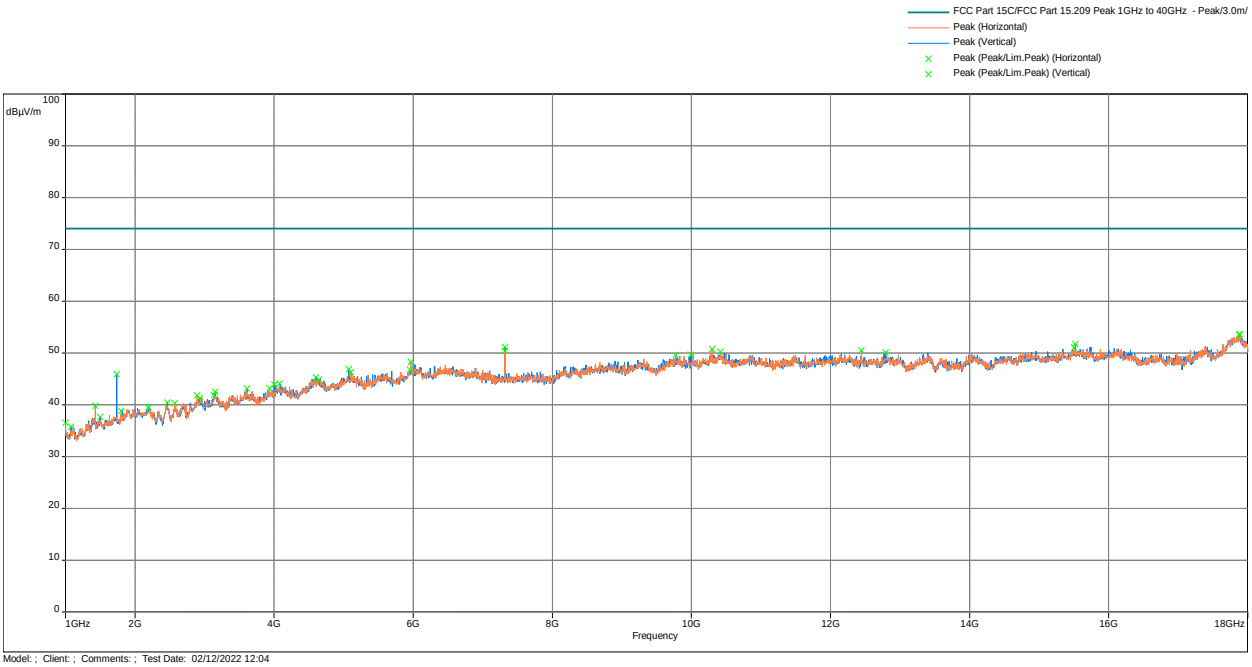
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:38

Radiated Spurious Emissions 30 MHz - 1000 MHz



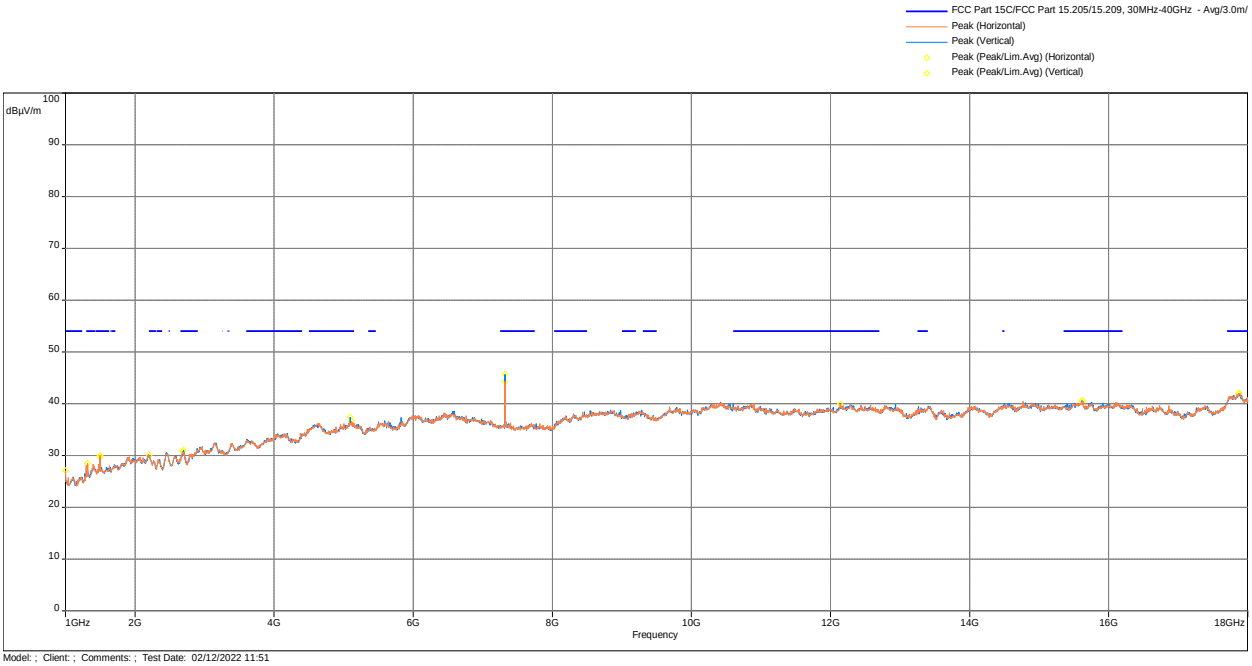
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 07:05

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



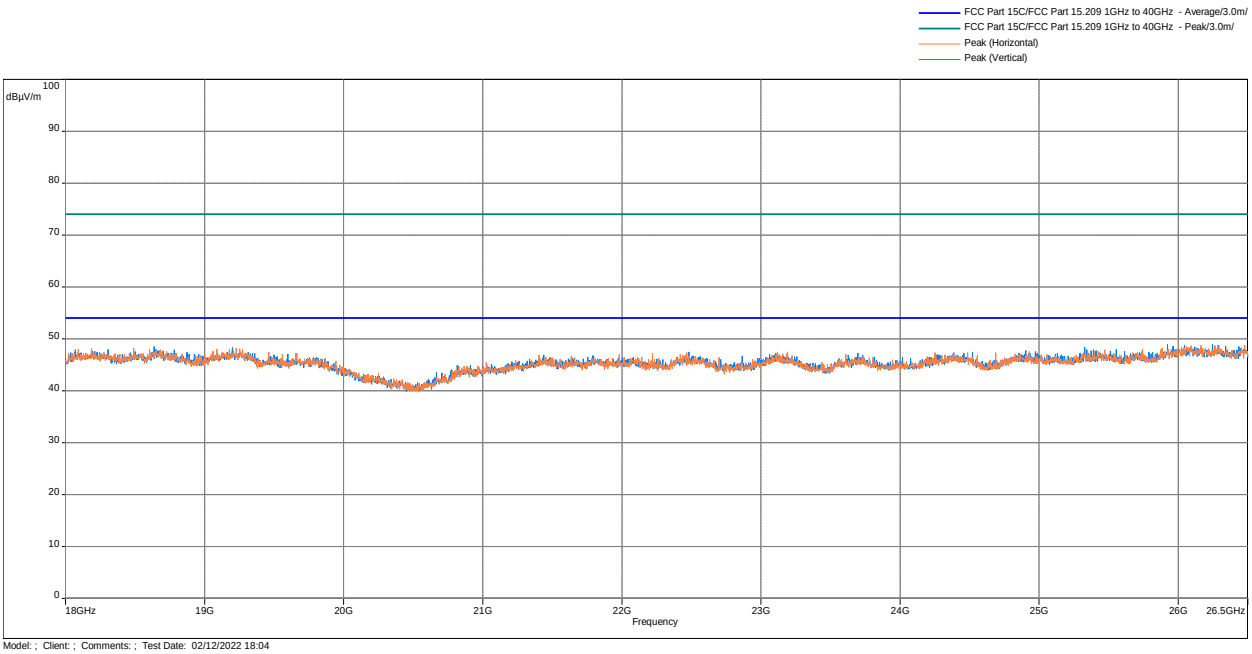
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 12:04

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 11:51

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



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
610.674	24.57	35.5	-10.93	3	217.25	Vertical	-3.57
608.993	23.65	35.5	-11.85	3	0	Vertical	-3.67
608.864	23.47	35.5	-12.03	2	5.25	Horizontal	-3.67
611.483	23.44	35.5	-12.06	0.98	337	Horizontal	-3.62
610.674	22.87	35.5	-12.63	4	183.5	Horizontal	-3.57
613.132	22.77	35.5	-12.73	3	239.5	Vertical	-3.68

Note: Correction = AF + CF – Preamp

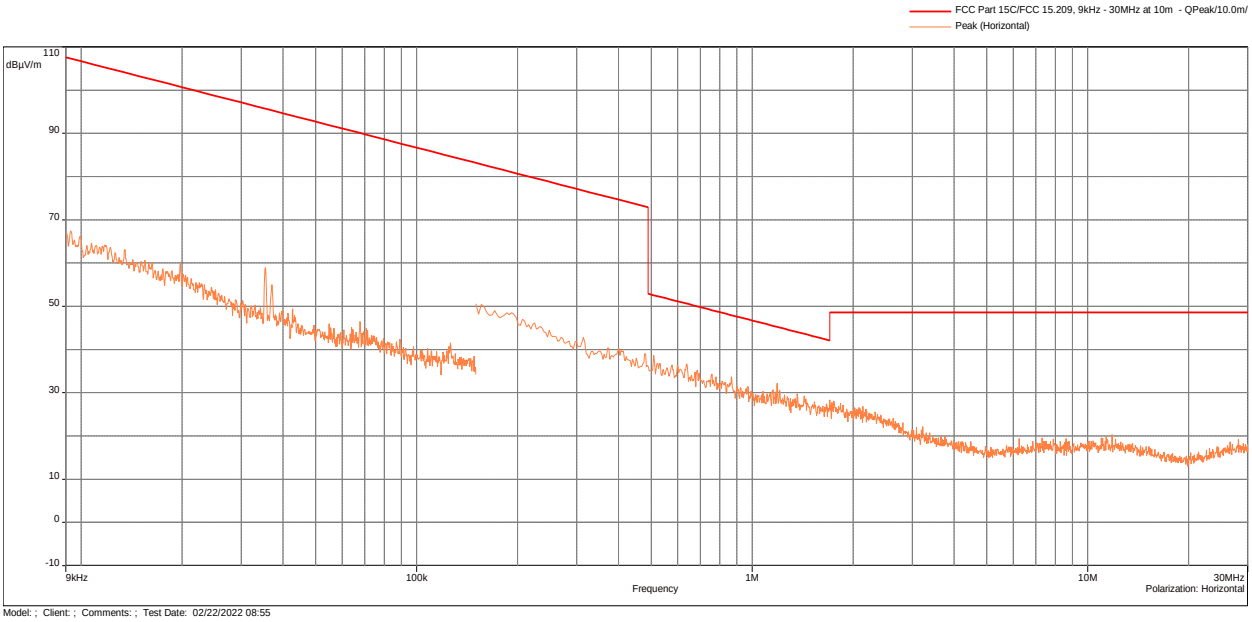
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7318.90	45.69	54	-8.31	3.01	109.25	Vertical	-2.53
7321.17	44.33	54	-9.67	1.99	109.25	Horizontal	-2.53
17873.07	42.12	54	-11.88	1.99	195.5	Horizontal	8.94
17870.23	42.01	54	-11.99	3.01	195.75	Vertical	8.95
15614.90	40.64	54	-13.36	1.01	0	Vertical	4.66
15632.47	40.53	54	-13.47	3.99	326	Horizontal	4.65

Note: Correction = AF + CF - Preamp

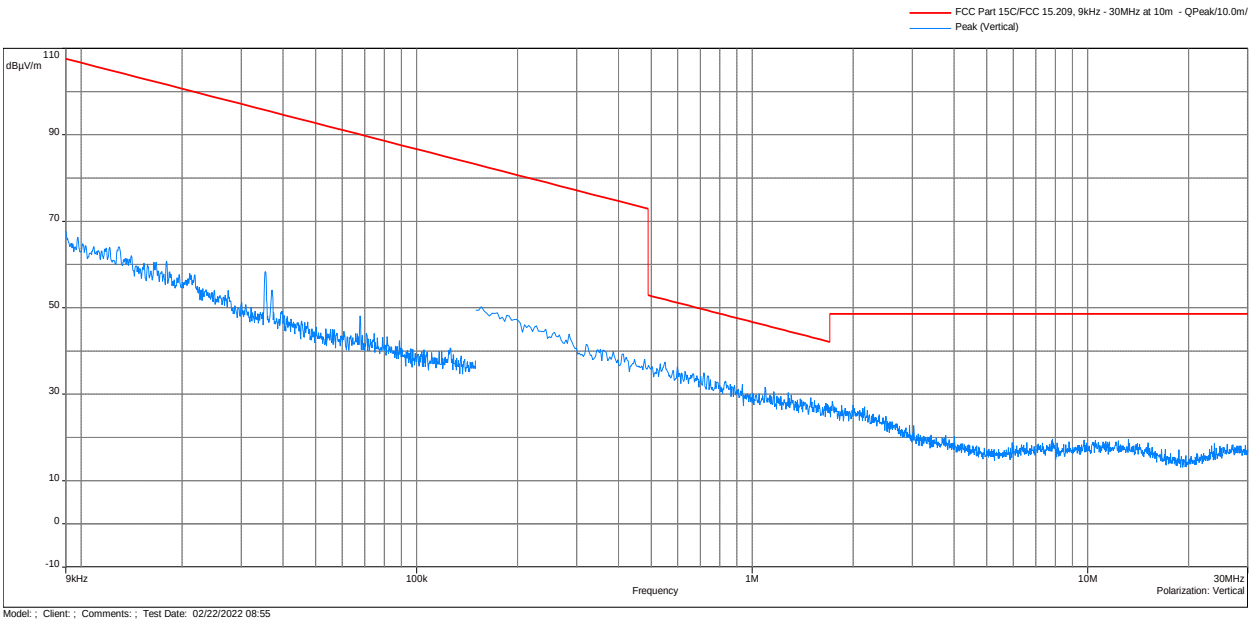
Results	Complies

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

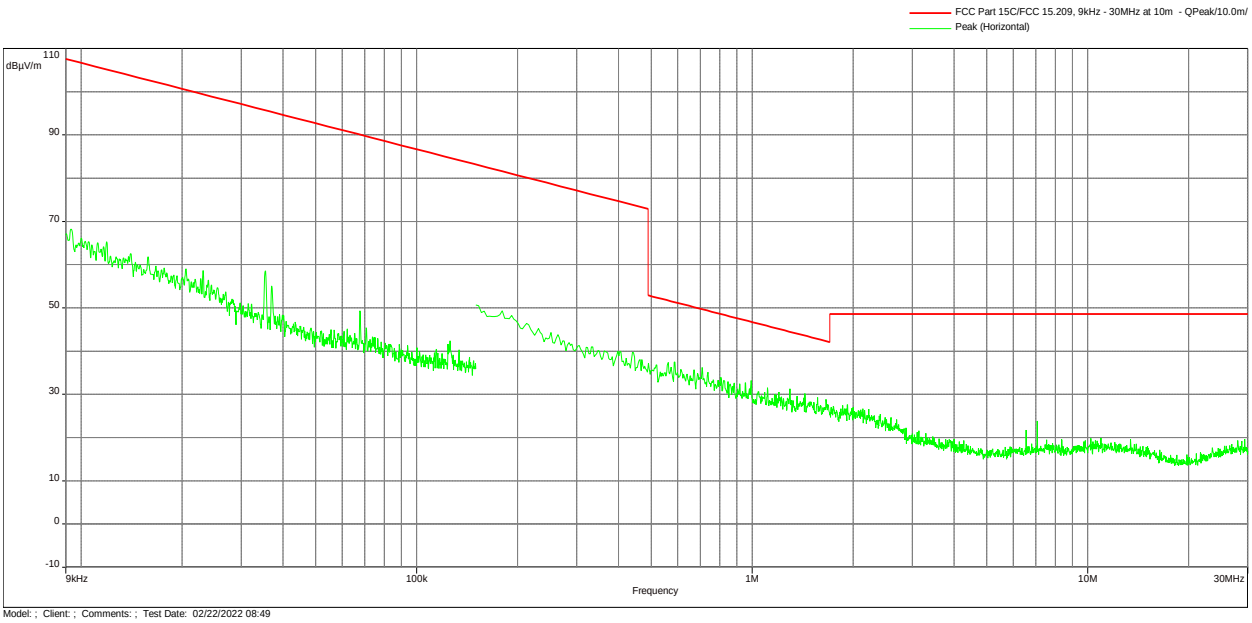
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

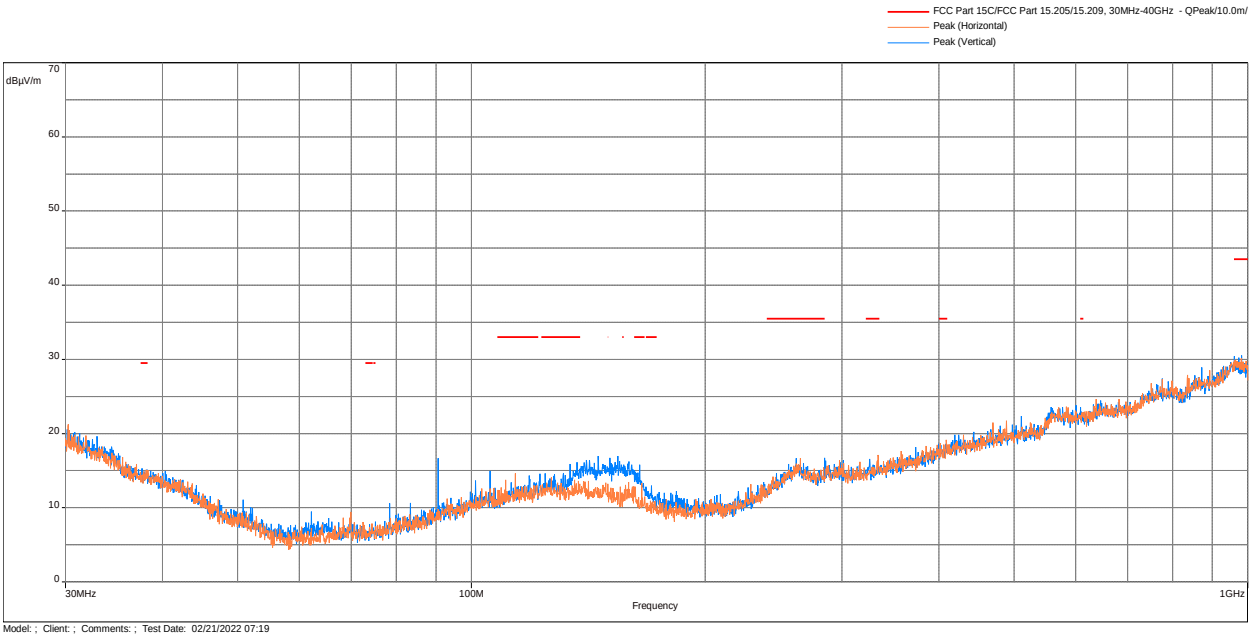


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



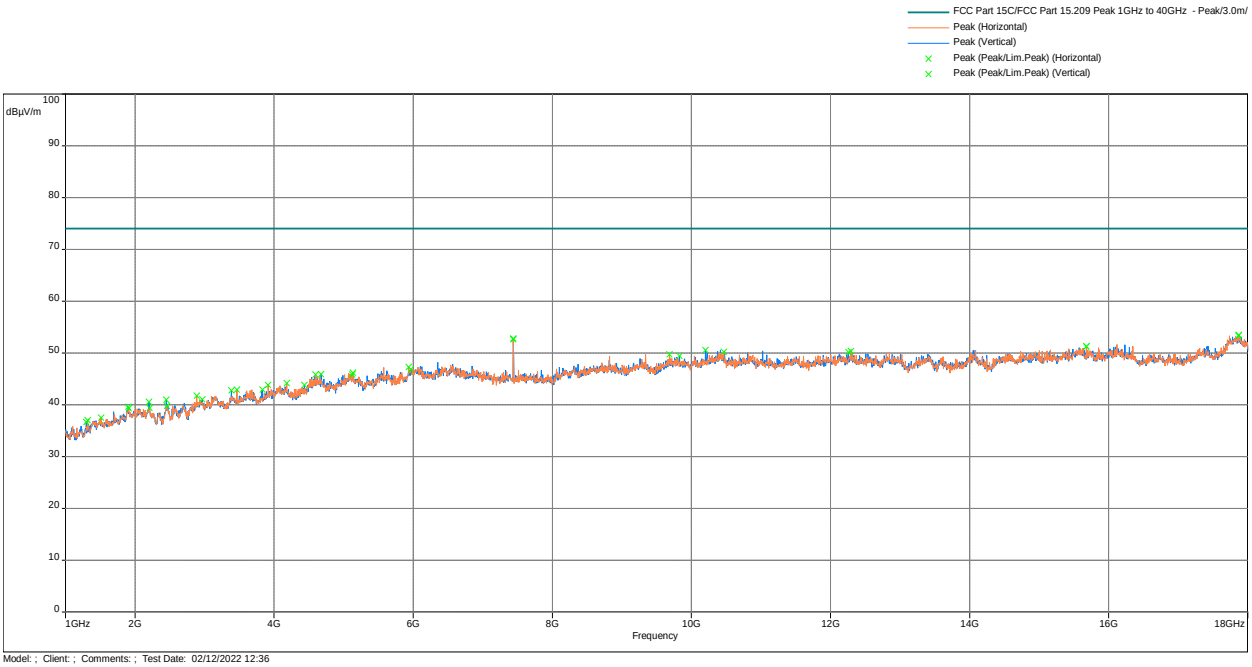
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 08:49

Radiated Spurious Emissions 30 MHz - 1000 MHz



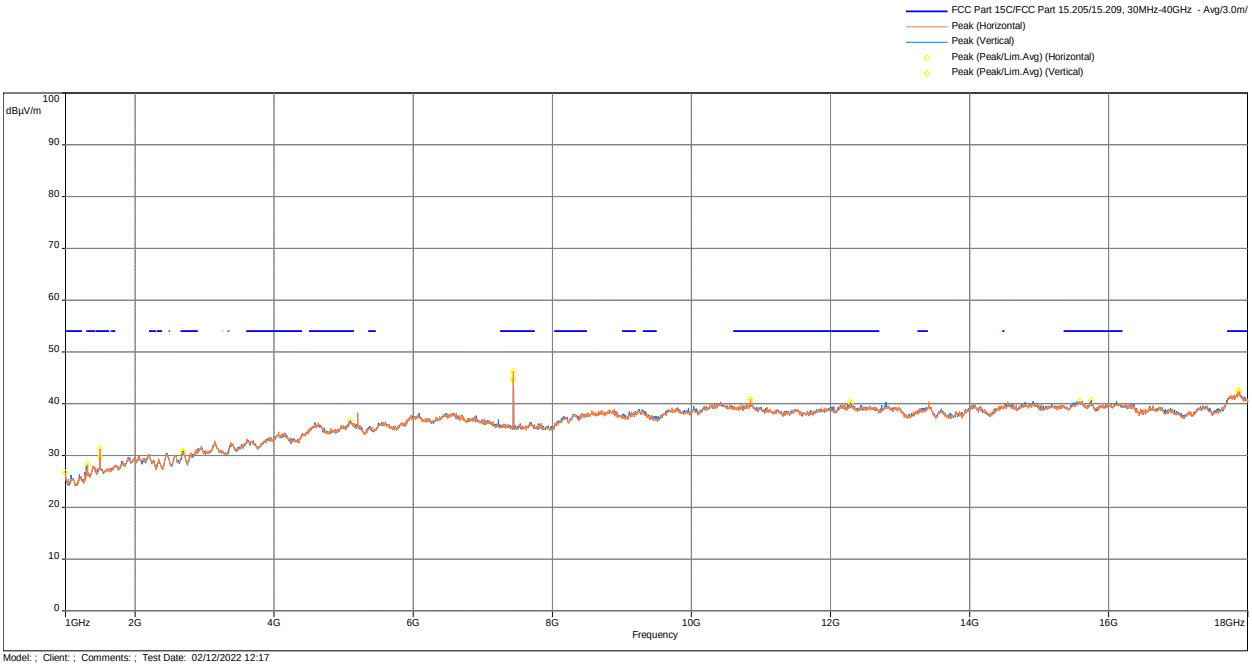
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 07:19

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



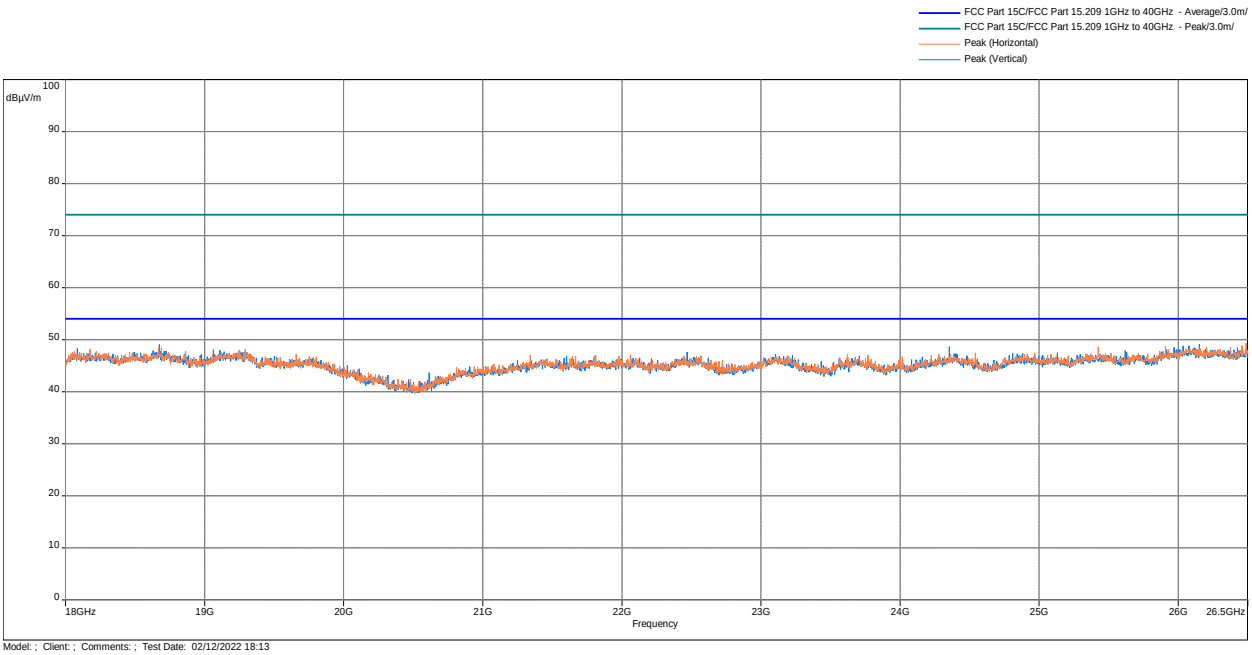
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 12:36

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 12:17

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
609.155	23.54	35.5	-11.96	3	350	Vertical	-3.65
610.157	22.95	35.5	-12.55	3	107	Vertical	-3.57
613.552	22.83	35.5	-12.67	3.01	0	Horizontal	-3.68
611.418	22.8	35.5	-12.7	2.01	358.25	Horizontal	-3.61
611.095	22.66	35.5	-12.84	4	76.5	Vertical	-3.58
982.055	30.55	43.5	-12.95	2	204	Vertical	3.76

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7439.03	46.27	54	-7.73	2.99	57.75	Horizontal	-2.33
7439.03	44.92	54	-9.08	2.01	294.75	Vertical	-2.33
7441.30	44.49	54	-9.51	2.01	294.75	Vertical	-2.32
17869.67	42.49	54	-11.51	2.99	0	Horizontal	8.95
17869.10	42.27	54	-11.73	2.01	78.5	Vertical	8.95
10847.53	40.81	54	-13.19	3.99	304.25	Horizontal	1.23

Note: Correction = AF + CF - Preamp

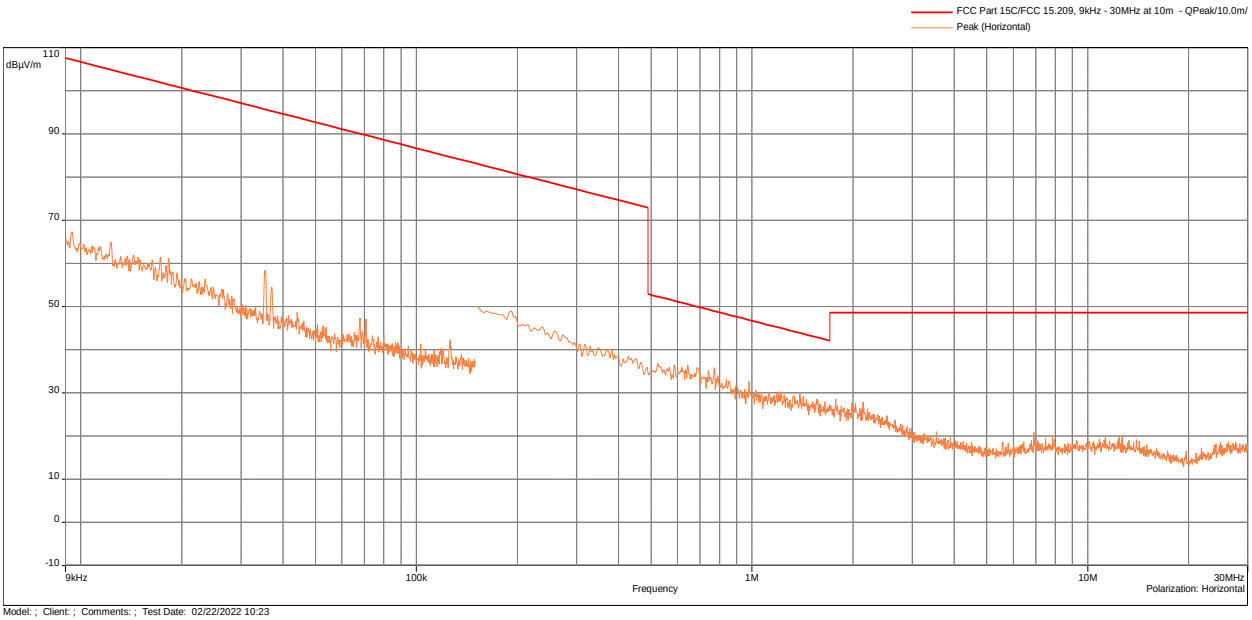
Results	Complies

BLE 5.0 Battery Mode:

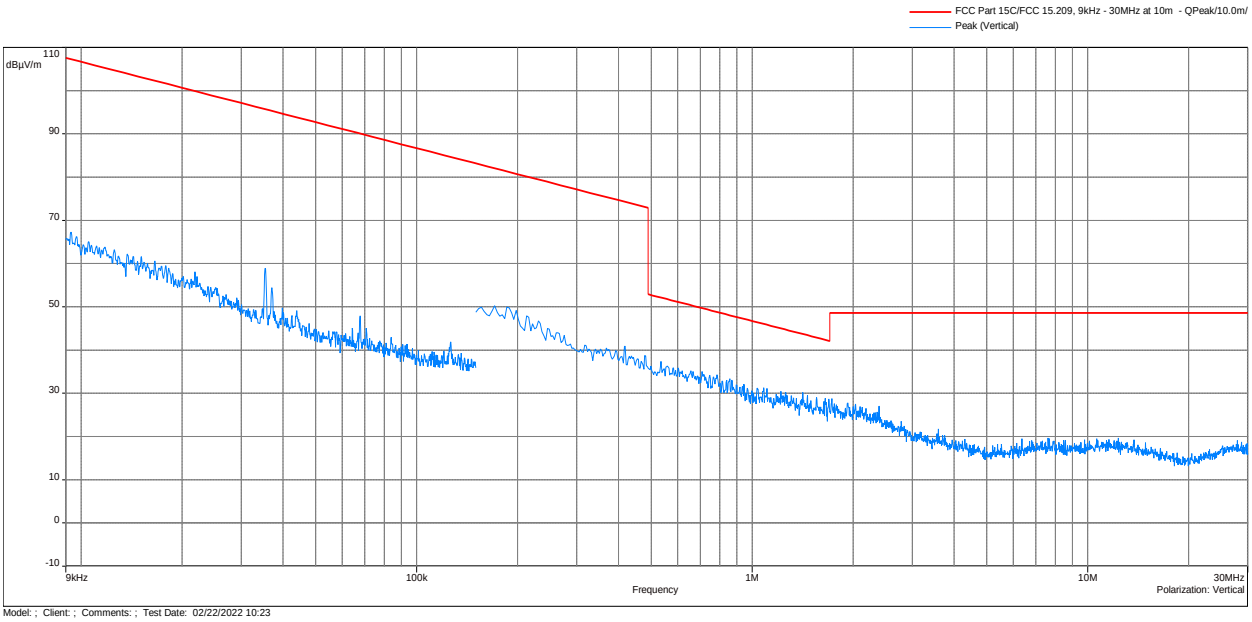
Out-of-Band Radiated Spurious Emissions

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

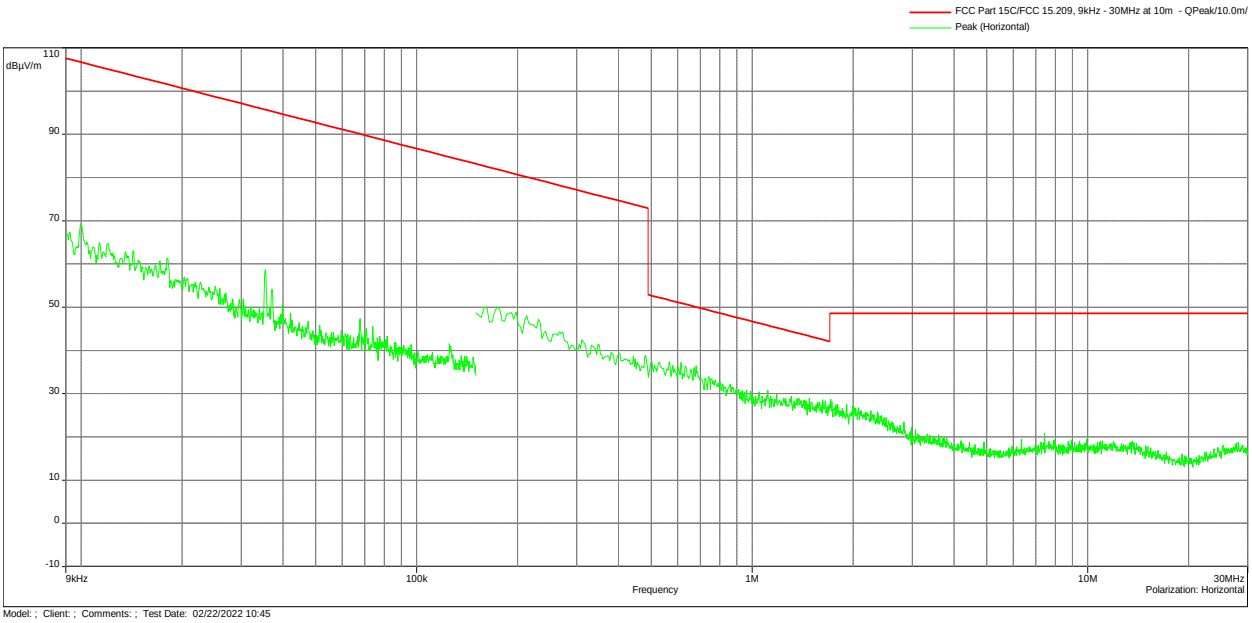
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

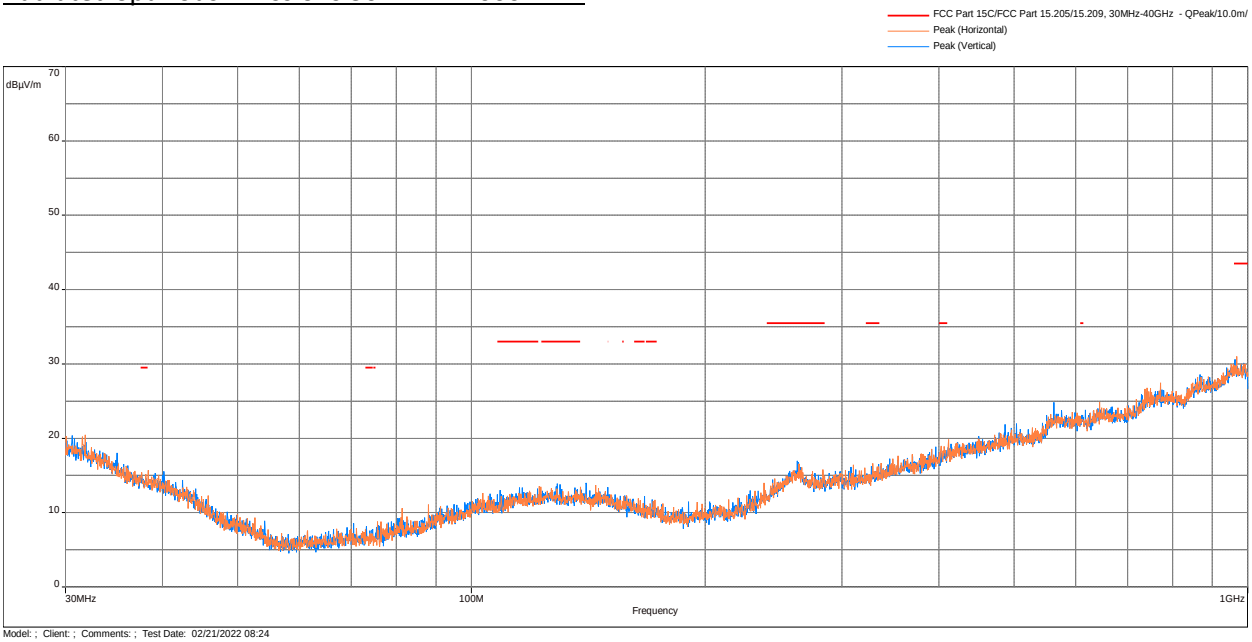


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



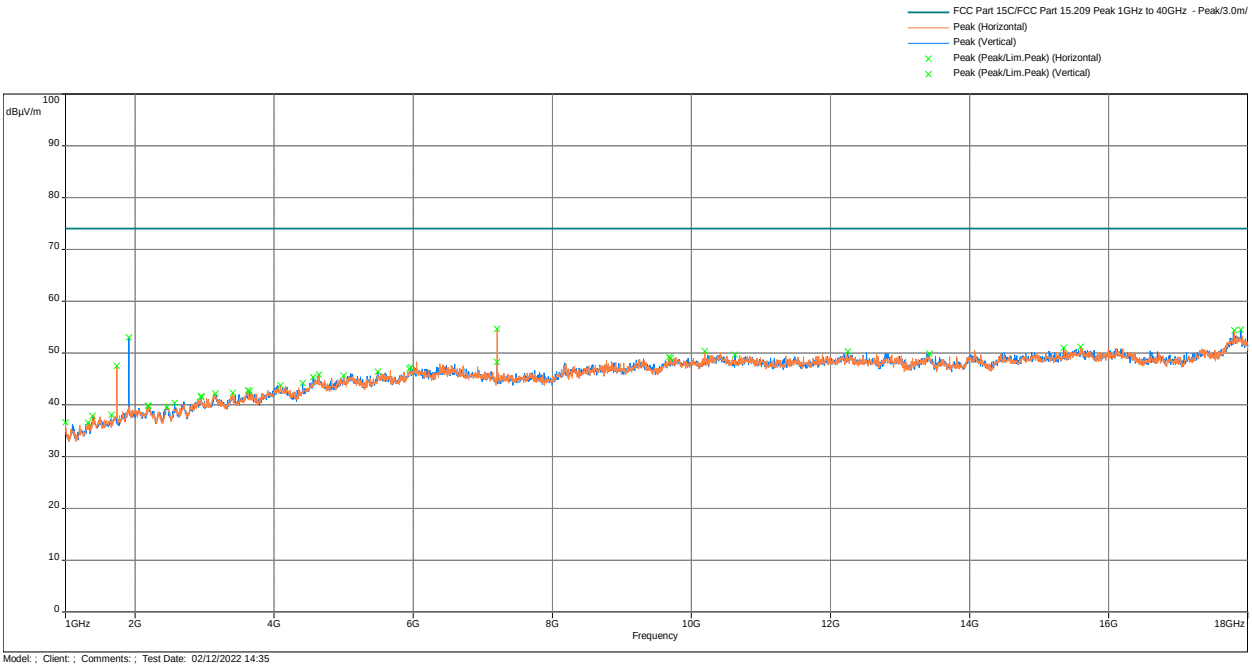
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 10:45

Radiated Spurious Emissions 30 MHz - 1000 MHz



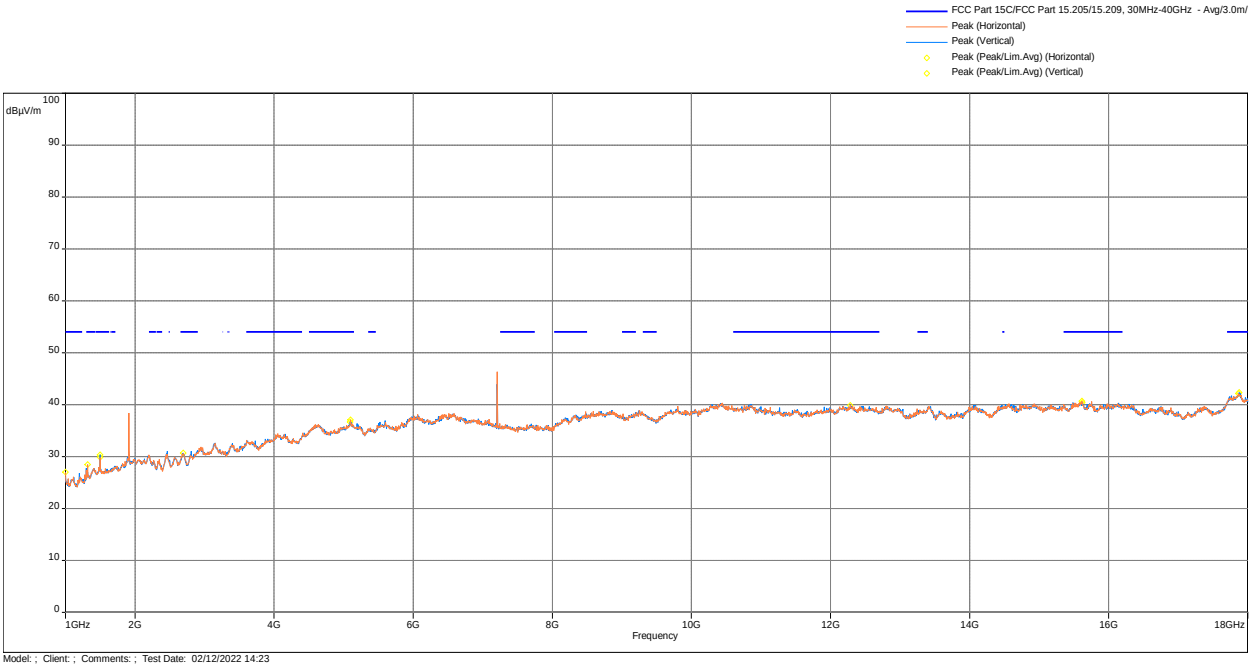
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 08:24

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



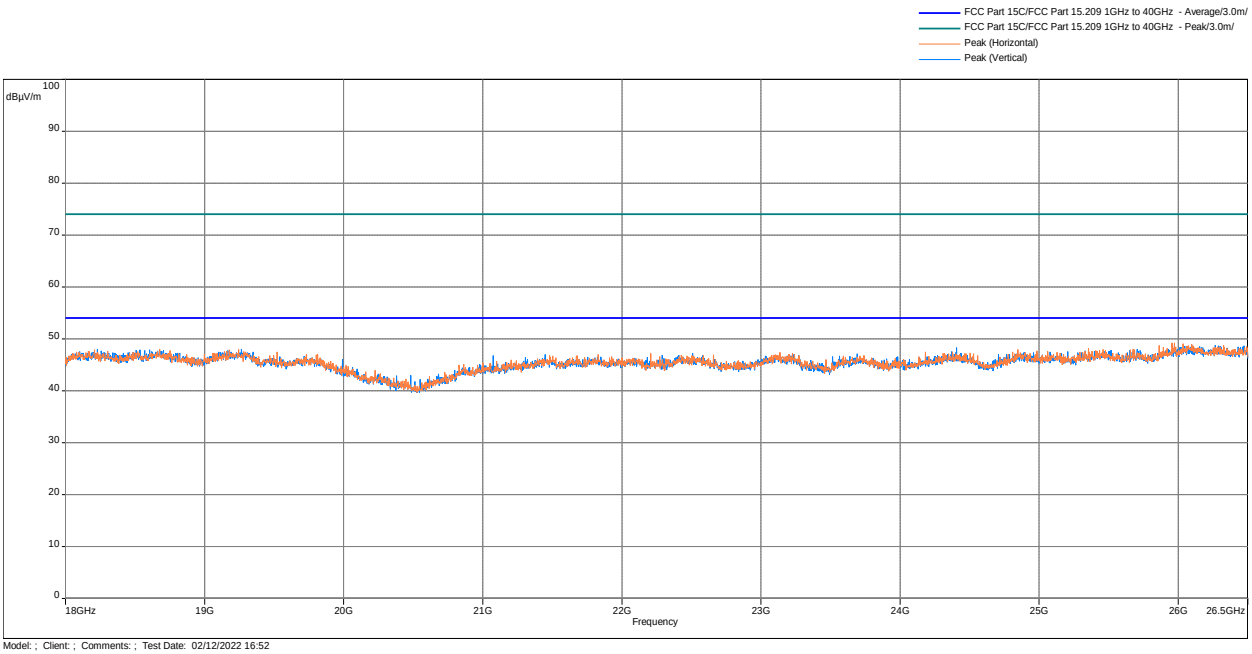
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 14:35

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 14:23

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
611.644	23.15	35.5	-12.35	4	41.25	Vertical	-3.64
612.905	23.11	35.5	-12.39	1	98.75	Vertical	-3.68
967.343	31.03	43.5	-12.47	3.01	41.25	Horizontal	4.01
610.513	22.95	35.5	-12.55	1	270.5	Vertical	-3.57
608.346	22.93	35.5	-12.57	1.01	276	Horizontal	-3.67
613.811	22.86	35.5	-12.64	4	204	Vertical	-3.68

Note: Correction = AF + CF - Preamp

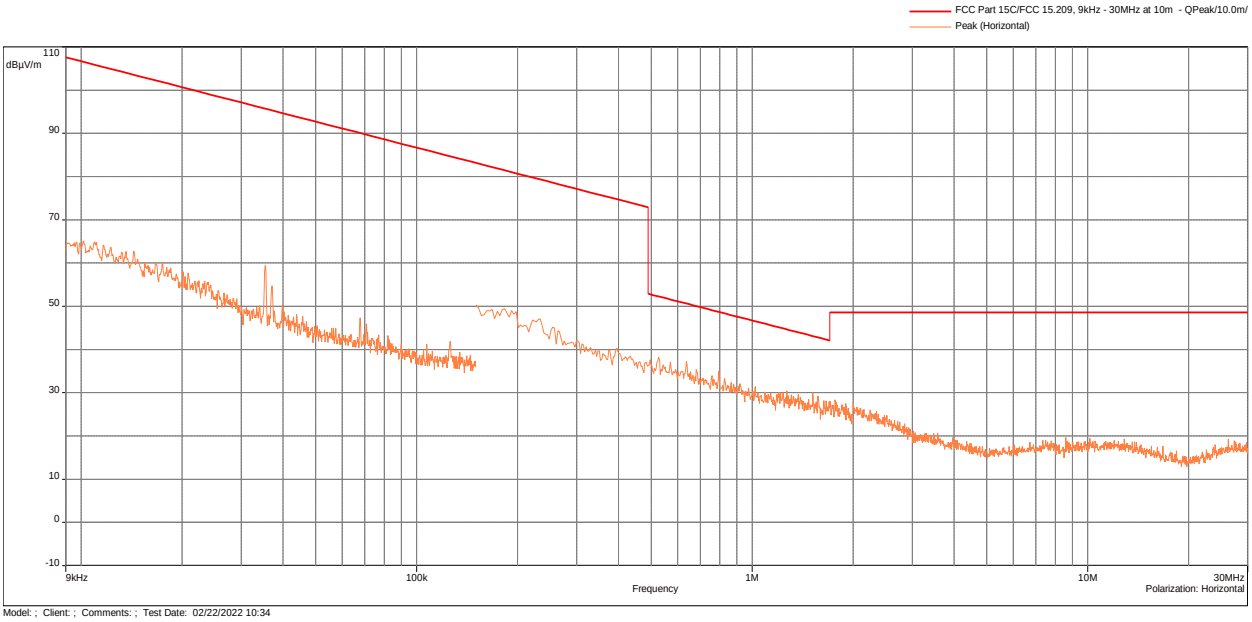
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
17877.03	42.37	54	-11.63	3.99	338.75	Vertical	8.92
17864.57	42.15	54	-11.85	1.99	130.75	Horizontal	8.97
15614.90	40.71	54	-13.29	3.99	22.25	Horizontal	4.66
15620.00	40.42	54	-13.58	3.01	44.25	Vertical	4.66
12281.77	39.87	54	-14.13	1.01	208.75	Horizontal	2.02
5097.00	37.08	54	-16.92	1.99	304.75	Horizontal	-3.52

Note: Correction = AF + CF - Preamp

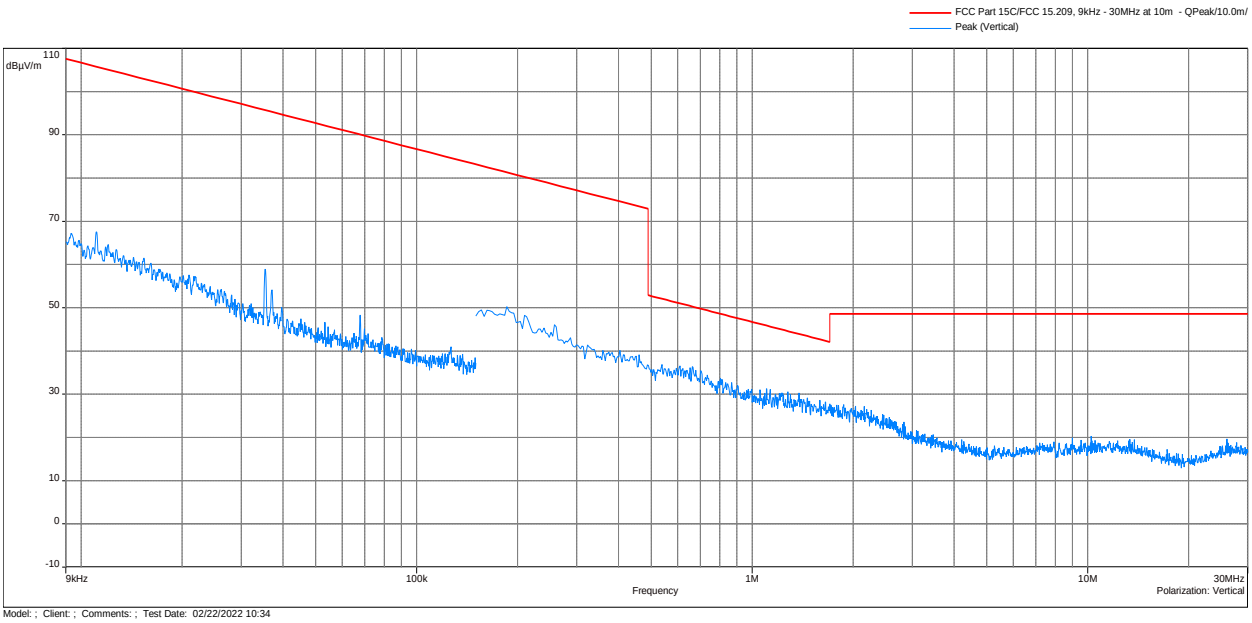
Results	Complies

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

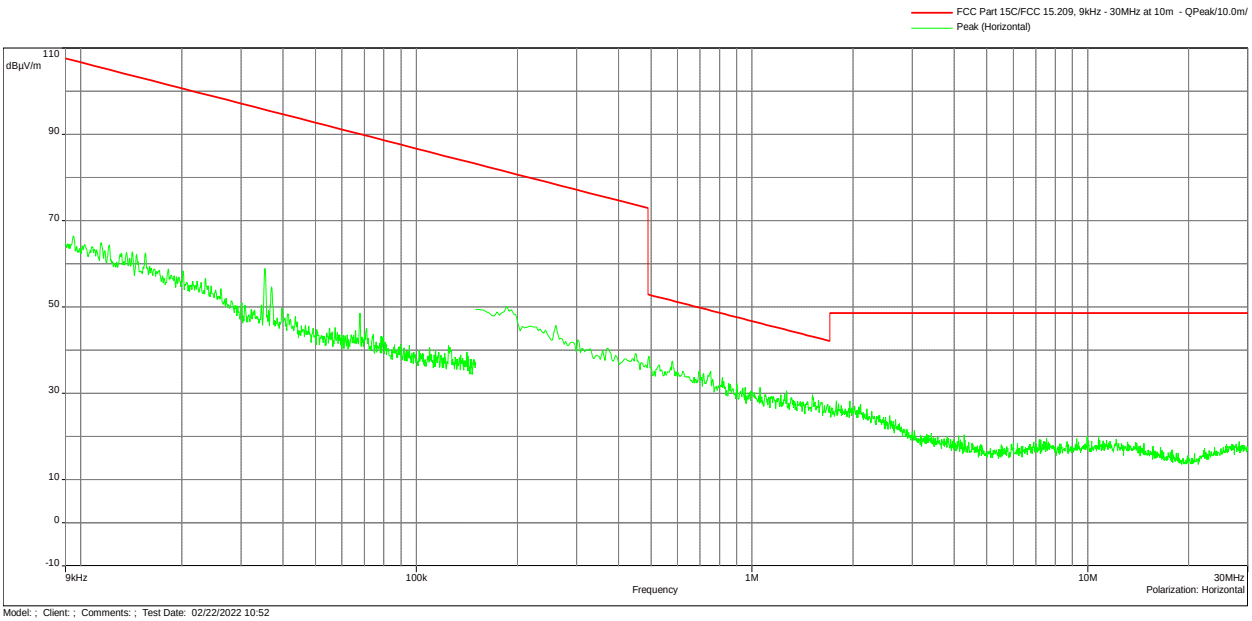
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

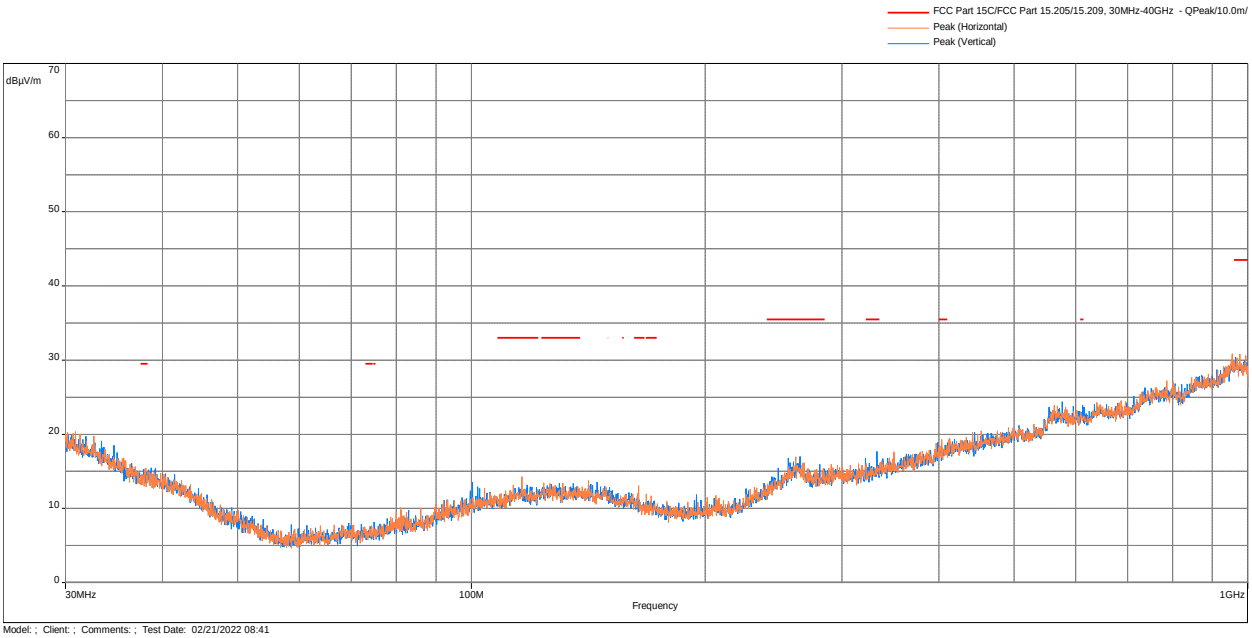


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



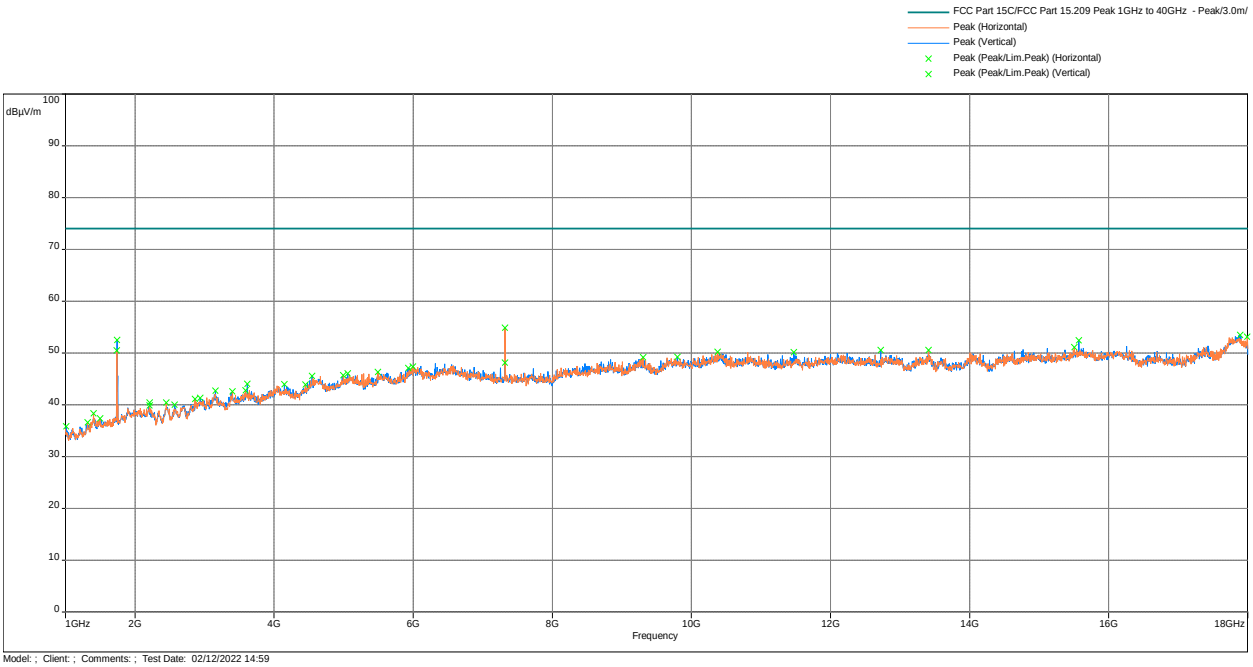
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 10:52

Radiated Spurious Emissions 30 MHz - 1000 MHz



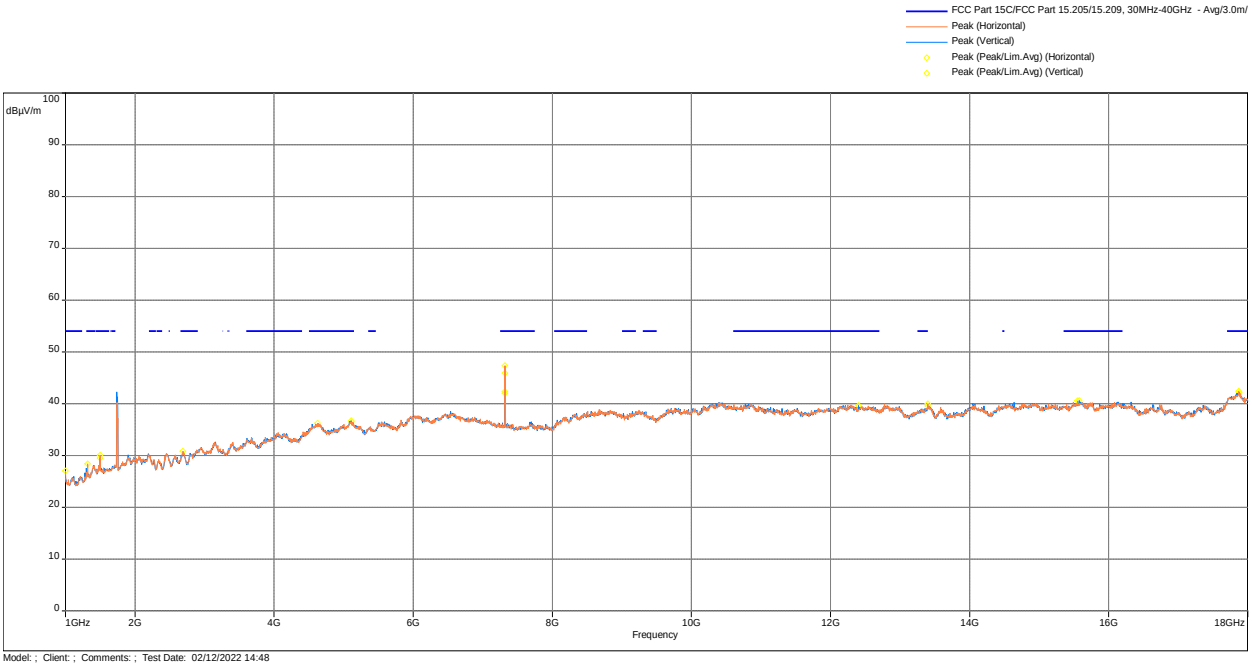
Model: ; Client: ; Comments: ; Test Date: 02/21/2022 08:41

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



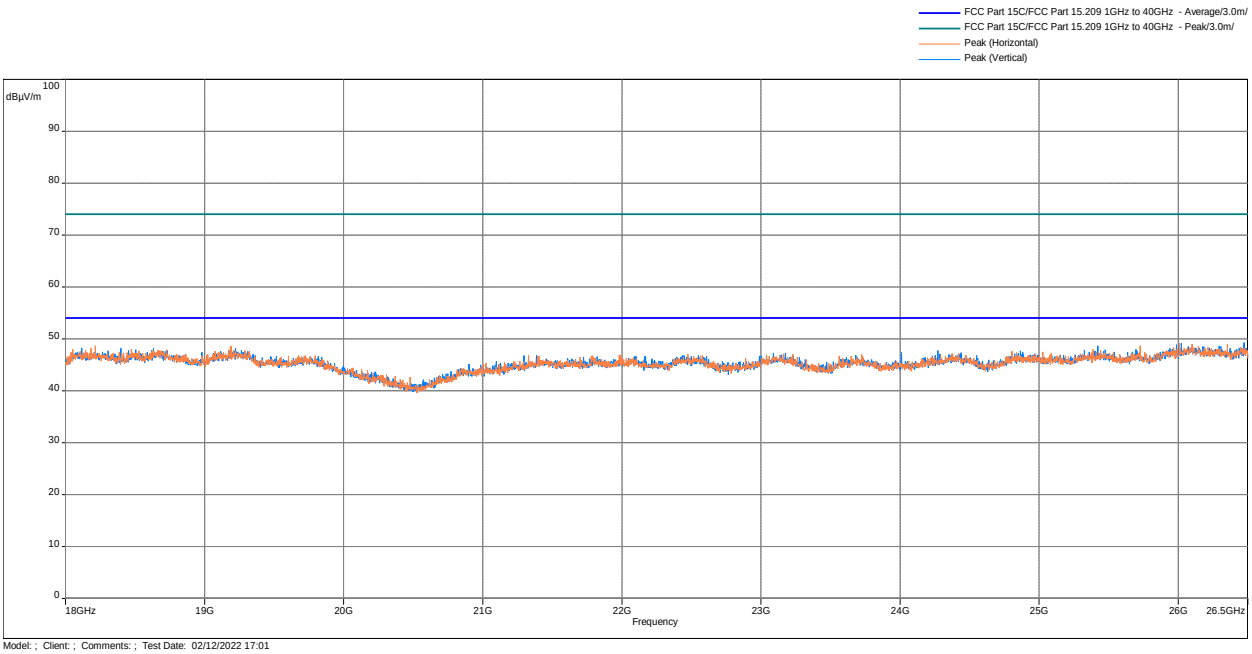
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 14:59

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 14:48

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



Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440 MHz

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
612.711	23.92	35.5	-11.58	4	40.75	Vertical	-3.68
609.252	23.06	35.5	-12.44	2.99	301.75	Horizontal	-3.64
611.644	22.99	35.5	-12.51	2	217.75	Vertical	-3.64
976.849	30.83	43.5	-12.67	2.99	41.25	Horizontal	3.71
610.771	22.76	35.5	-12.74	4	165.25	Vertical	-3.57
608.152	22.72	35.5	-12.78	1	138.25	Vertical	-3.67

Note: Correction = AF + CF – Preamp

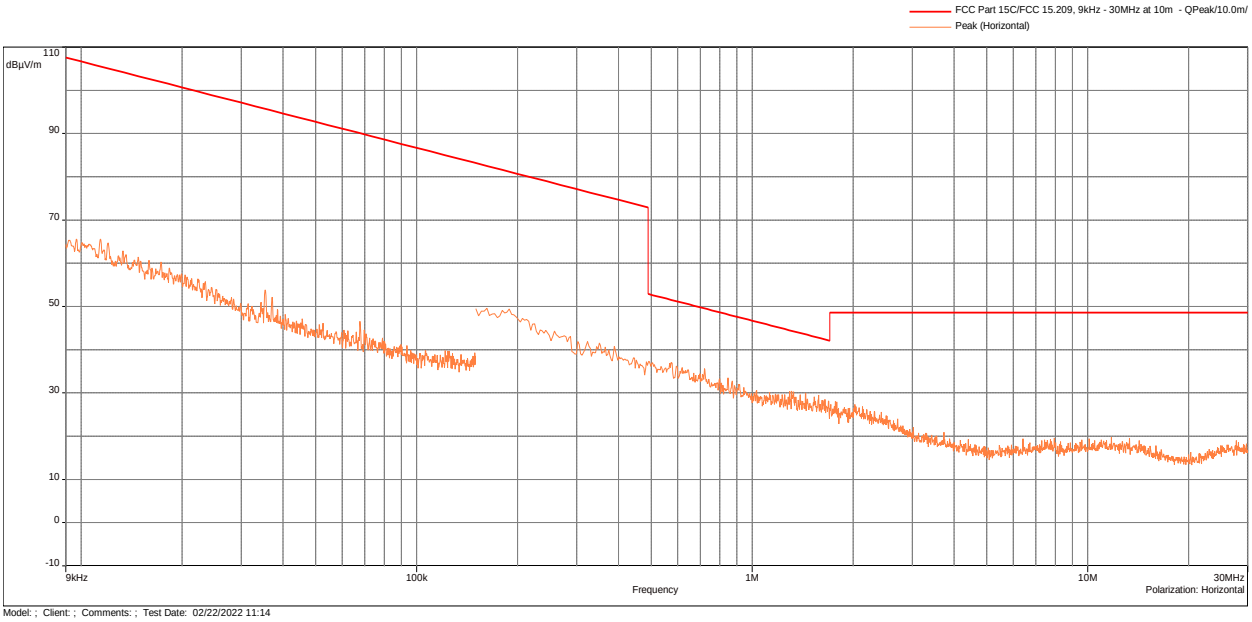
Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7321.17	47.36	54	-6.64	1.99	217	Horizontal	-2.53
7318.33	45.94	54	-8.06	1.99	217	Horizontal	-2.53
17870.23	42.46	54	-11.54	3.99	65.25	Horizontal	8.95
7318.90	42.38	54	-11.62	3.99	0	Vertical	-2.53
17873.07	42.14	54	-11.86	2.01	208.75	Vertical	8.94
7321.17	42	54	-12	3.99	0	Vertical	-2.53

Note: Correction = AF + CF - Preamp

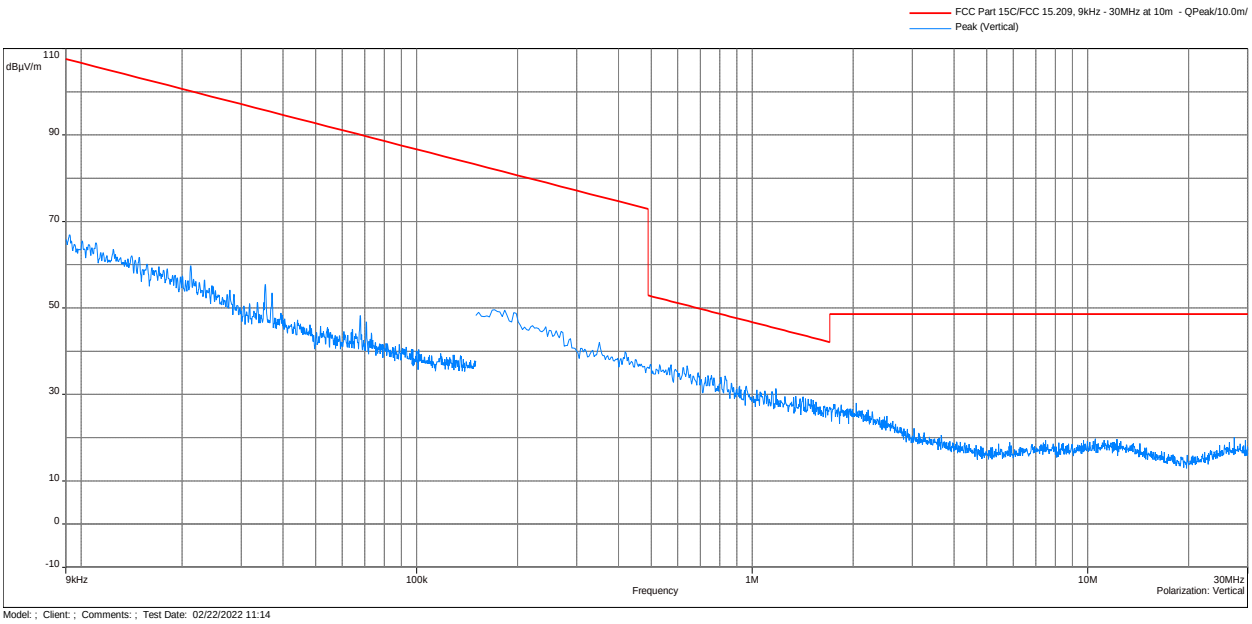
Results	Complies

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

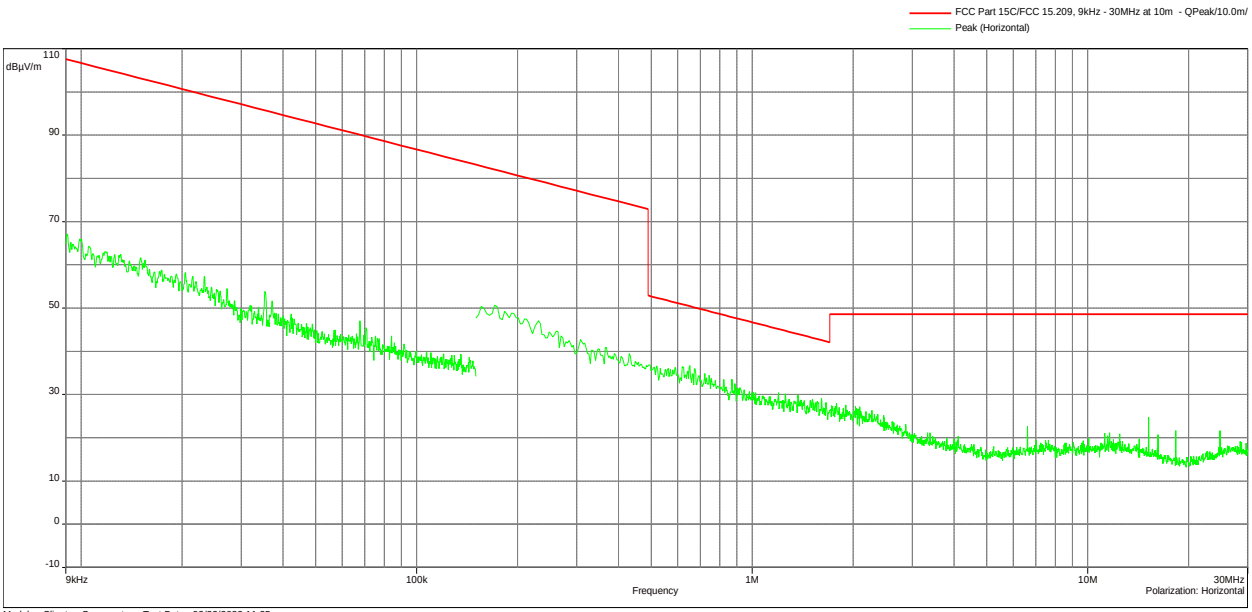
Radiated Spurious Emissions 9kHz - 30 MHz Parallel Antenna Polarization



Radiated Spurious Emissions 9kHz - 30 MHz Perpendicular Antenna Polarization

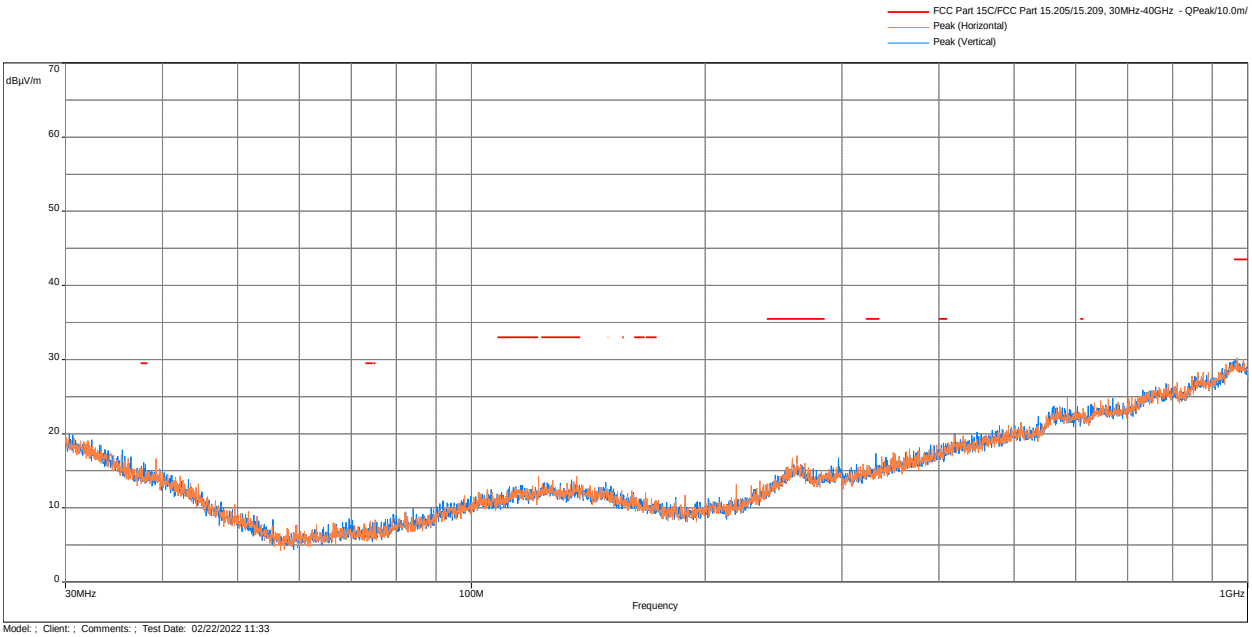


Radiated Spurious Emissions 9kHz - 30 MHz Horizontal Antenna Polarization



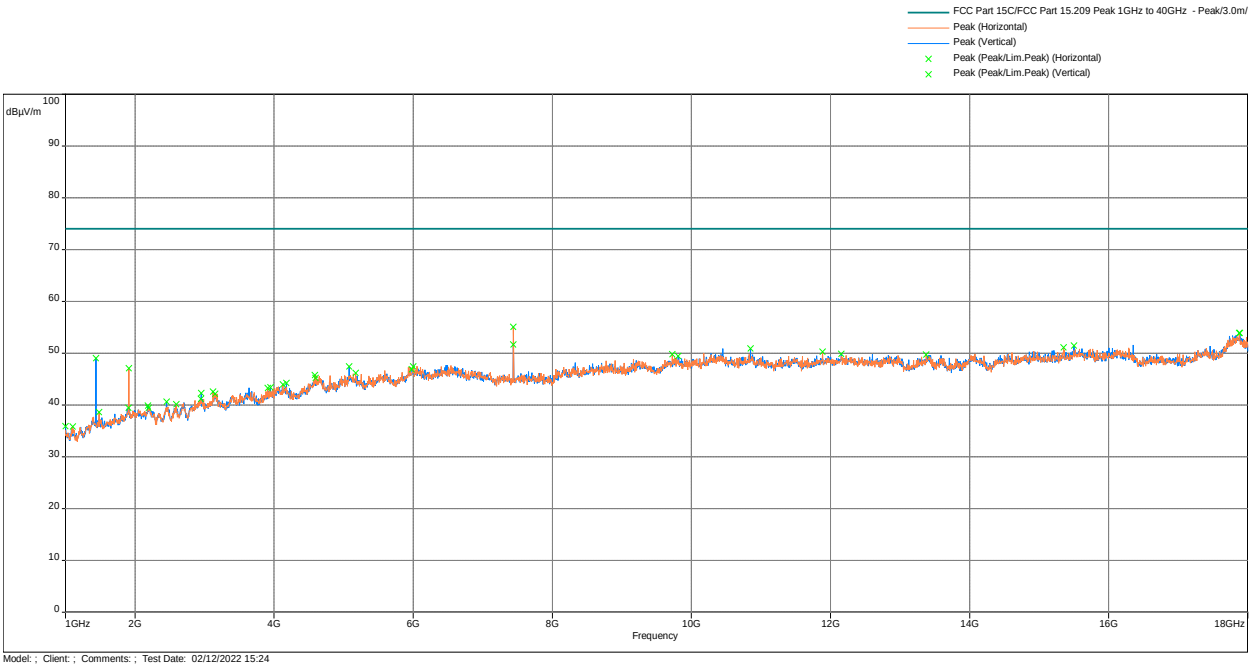
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 11:25

Radiated Spurious Emissions 30 MHz - 1000 MHz



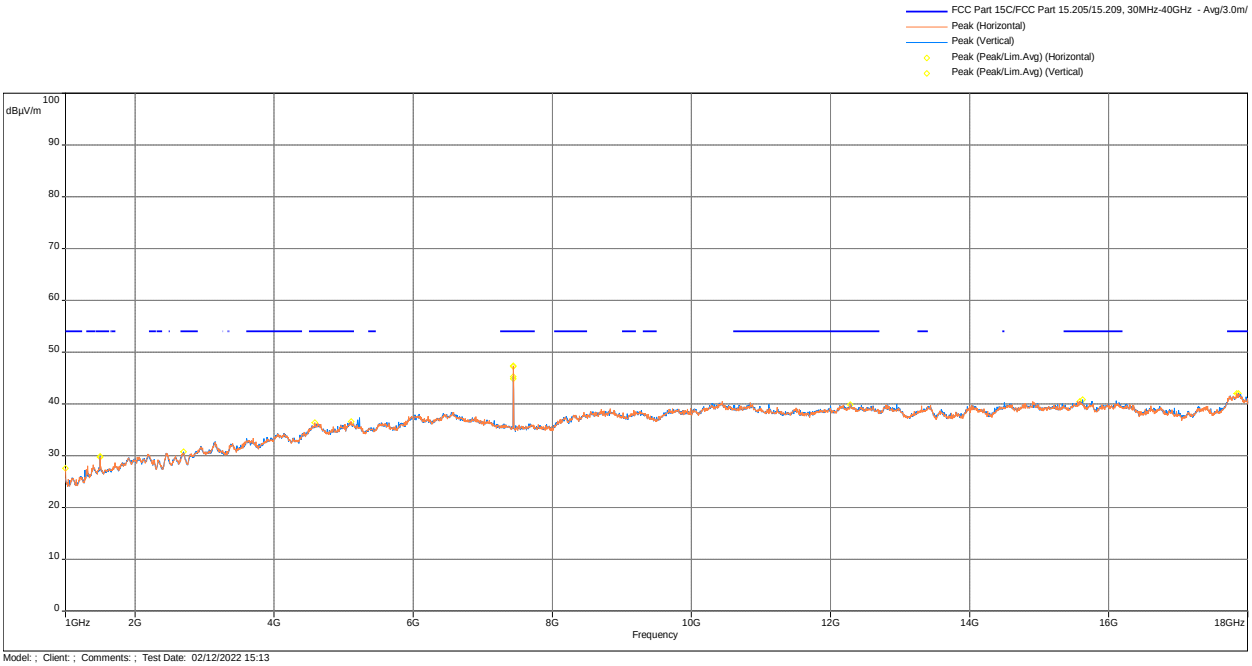
Model: ; Client: ; Comments: ; Test Date: 02/22/2022 11:33

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



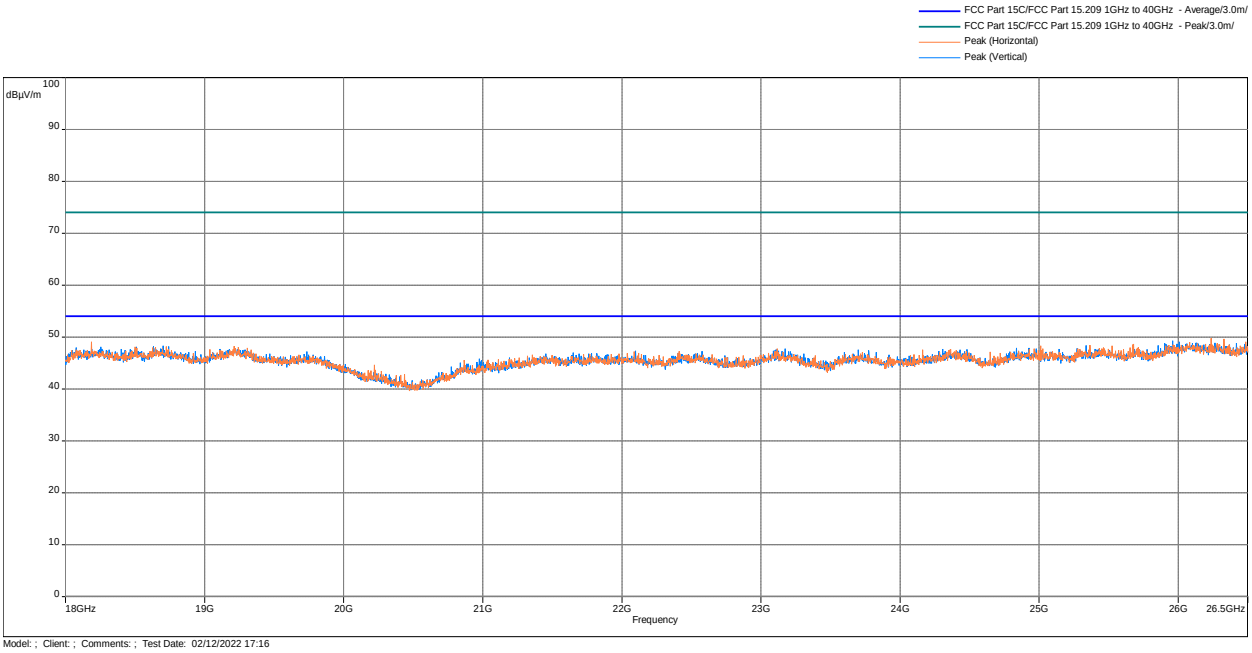
Model: ; Client: ; Comments: ; Test Date: 02/12/2022 15:24

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



Model: ; Client: ; Comments: ; Test Date: 02/12/2022 15:13

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



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

Frequency (MHz)	QPeak@ 10m (dBµV/m)	Lim. QPeak @10m (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
613.487	23.43	35.5	-12.07	3.01	288.5	Horizontal	-3.68
608.055	22.78	35.5	-12.72	4	151.75	Horizontal	-3.67
612.129	22.78	35.5	-12.72	4	38	Horizontal	-3.67
612.905	22.58	35.5	-12.92	4	23.5	Vertical	-3.68
609.316	22.52	35.5	-12.98	3.01	221.75	Horizontal	-3.63
968.249	30.23	43.5	-13.27	4	345.75	Horizontal	3.95

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Ave @3m (dBµV/m)	Lim. Ave @3m (dBµV/m)	Margin dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7441.30	47.36	54	-6.64	1.01	207.75	Horizontal	-2.32
7438.47	47.22	54	-6.78	2.99	208	Horizontal	-2.33
7438.47	45.31	54	-8.69	1.01	108.75	Vertical	-2.33
7441.30	44.84	54	-9.16	3.99	0	Vertical	-2.32
17864.57	42.03	54	-11.97	3.01	87.5	Vertical	8.97
17839.07	42.02	54	-11.98	3.99	109.25	Horizontal	9.11

Note: Correction = AF + CF – Preamp

Results	Complies

4.5.5 Test Setup Configuration

The following photographs show the testing configurations used.

Battery mode Z axis

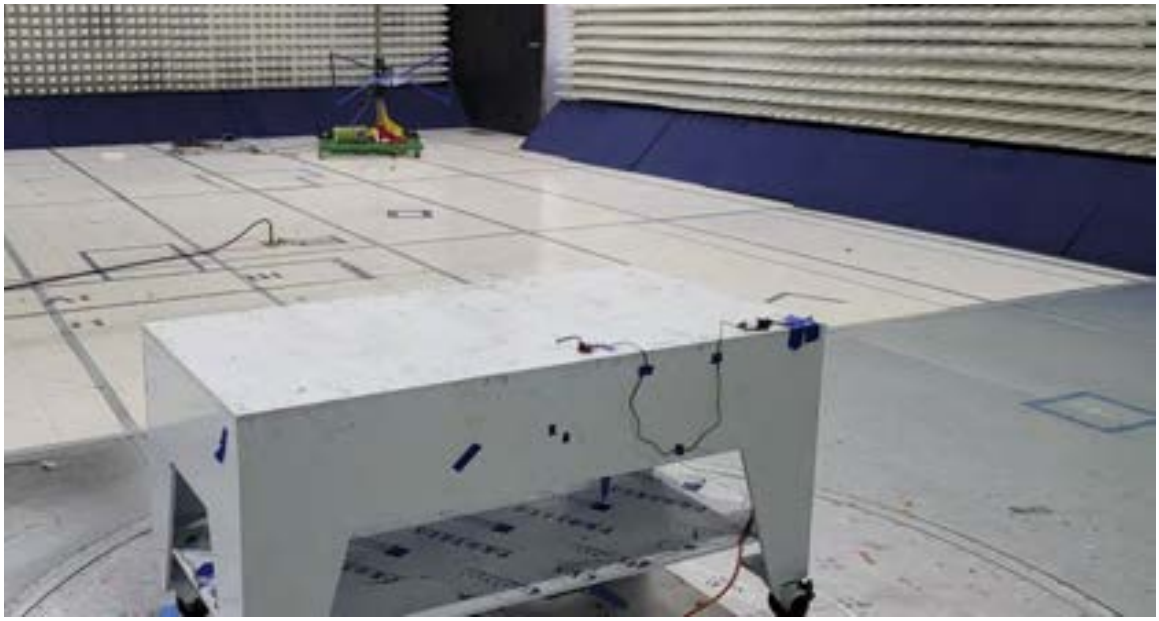
Battery mode X axis

Battery mode Y axis

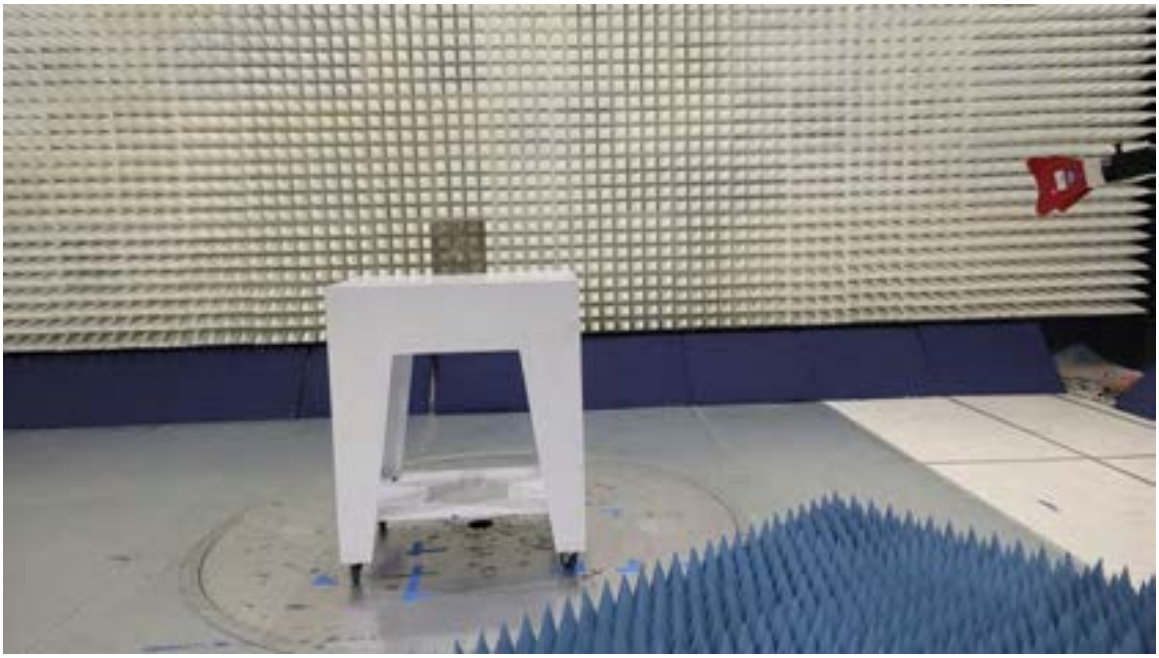
Charging mode

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.

AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10: 2013. EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207.

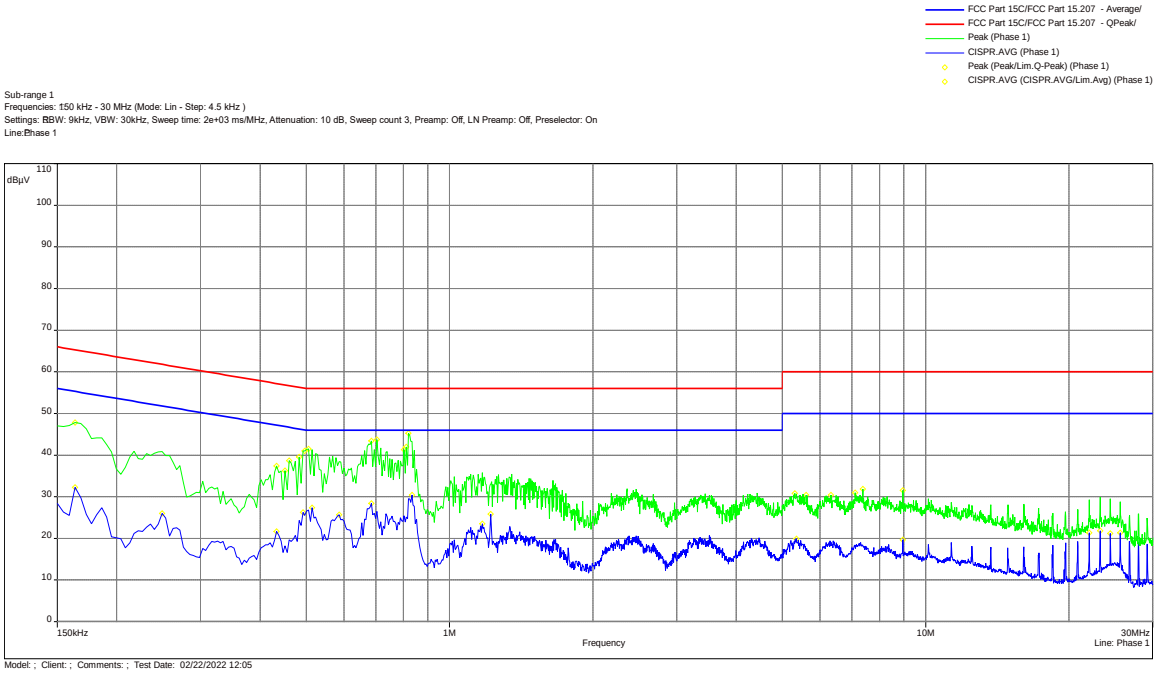
Tested By	Test Date	Results
Amar Kacel	February 22, 2022	Complies

4.6.3 Test Result

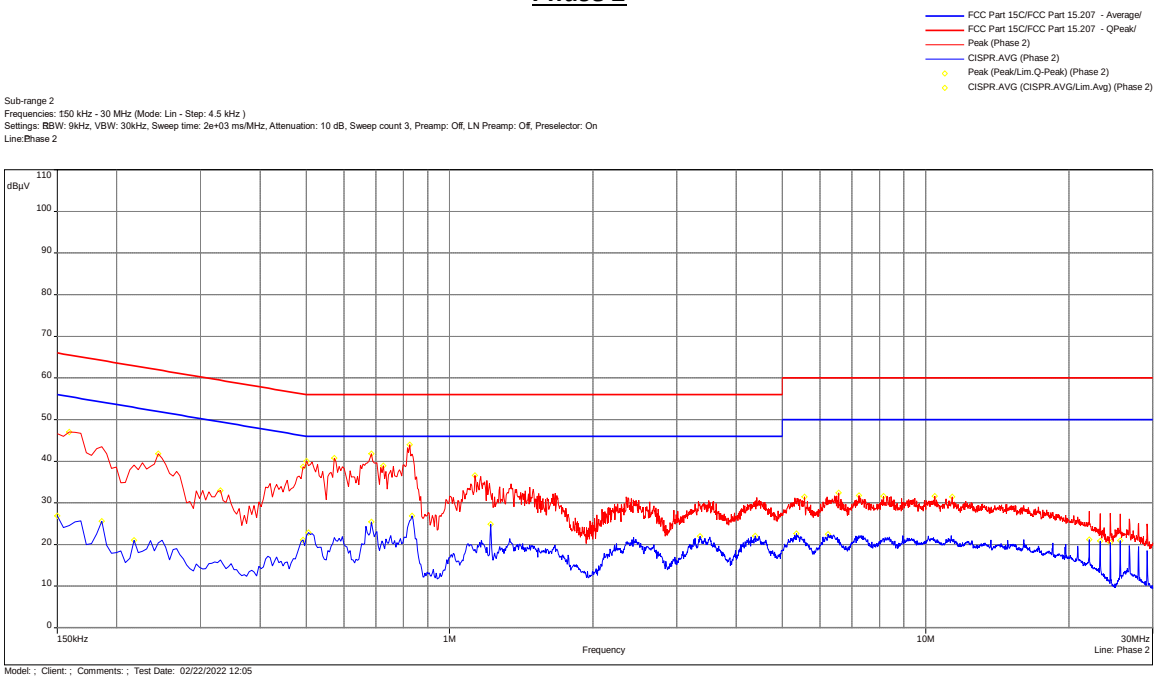
BLE 4.2:

15.207: Conducted Emissions 120VAC 60Hz

Phase 1



Phase 2



4.6.3 Test Results (Continued)

Q-Peak

Frequency (MHz)	Q-Peak (dBµV)	Limit Q-Peak (dBµV)	Margin Q-Peak (dB)	Line	Correction (dB)
0.8205	45.22	56	-10.78	Phase 1	10.54
0.8250	43.99	56	-12.01	Phase 2	10.54
0.7035	43.71	56	-12.29	Phase 1	10.57
0.6855	43.44	56	-12.56	Phase 1	10.58
0.8115	41.99	56	-14.01	Phase 1	10.55
0.6855	41.8	56	-14.2	Phase 2	10.58
0.5055	41.49	56	-14.51	Phase 1	10.54
0.8025	41.32	56	-14.68	Phase 1	10.55
0.4965	41.02	56.06	-15.03	Phase 1	10.55
0.5730	40.78	56	-15.22	Phase 2	10.55
0.5010	40.06	56	-15.94	Phase 2	10.54
0.4830	39.55	56.29	-16.73	Phase 1	10.56
0.7260	38.9	56	-17.1	Phase 2	10.55

Average

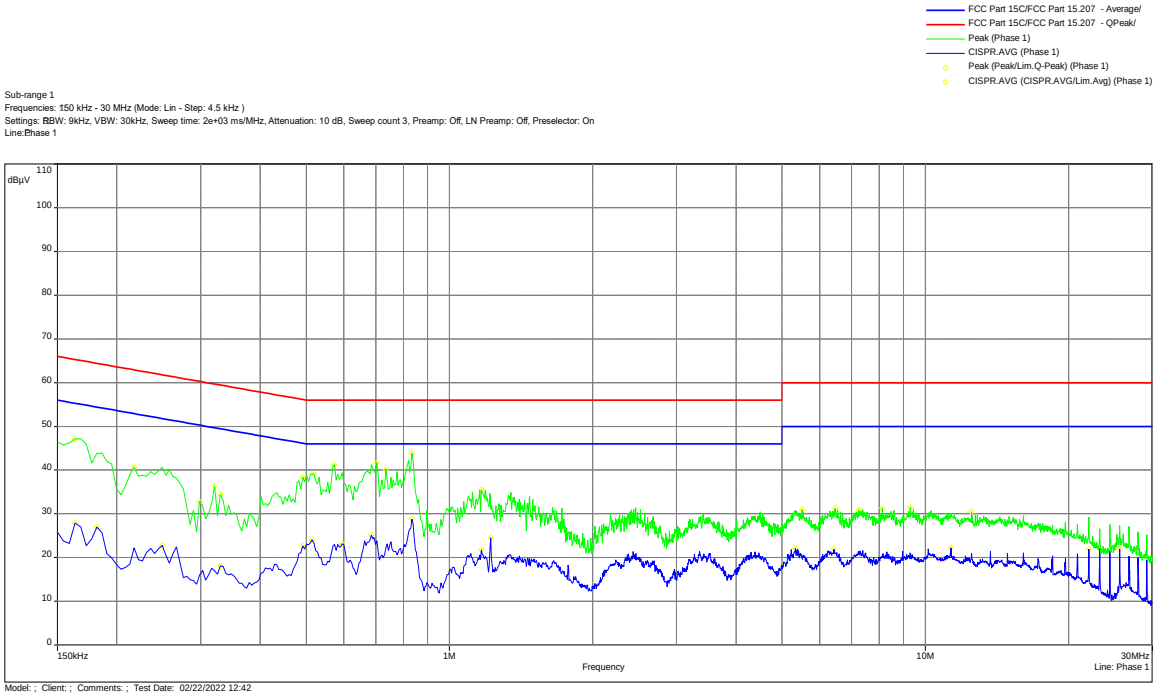
Frequency (MHz)	CISPR AVG (dBµV)	Limit Avg (dBµV)	Margin Avg (dB)	Line	Correction (dB)
0.8340	30.39	46	-15.61	Phase 1	10.55
0.6855	28.42	46	-17.58	Phase 1	10.58
0.5145	27.4	46	-18.6	Phase 1	10.55
0.8340	26.91	46	-19.09	Phase 2	10.55
0.4920	26.28	46.13	-19.86	Phase 1	10.55
1.2210	25.86	46	-20.14	Phase 1	10.58
0.5865	25.68	46	-20.32	Phase 1	10.56
0.6855	25.42	46	-20.58	Phase 2	10.58
1.2210	24.85	46	-21.15	Phase 2	10.58
1.1715	23.52	46	-22.48	Phase 1	10.56
0.1635	32.22	55.28	-23.06	Phase 1	10.56
0.5055	22.9	46	-23.1	Phase 2	10.54
4.3845	22.04	46	-23.96	Phase 2	10.7
3.3585	21.95	46	-24.05	Phase 2	10.67

Results	Complies

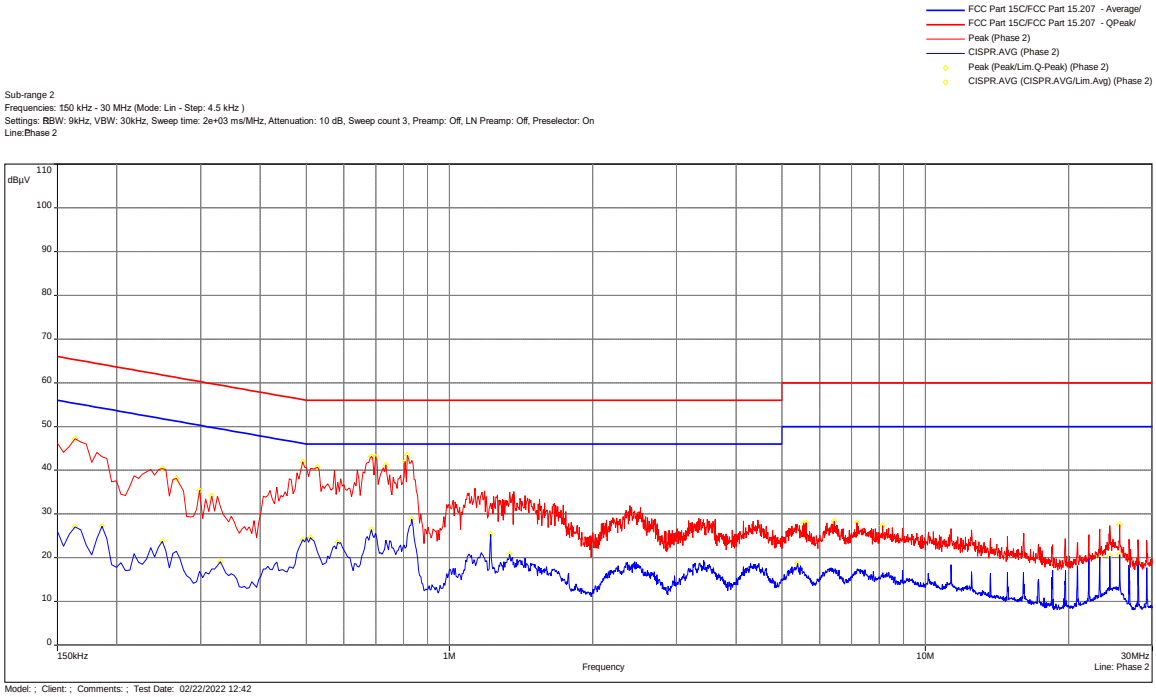
BLE 5.0:

15.207: Conducted Emissions 120VAC 60Hz

Phase 1



Phase 2



4.6.3 Test Results (Continued)

Q-Peak

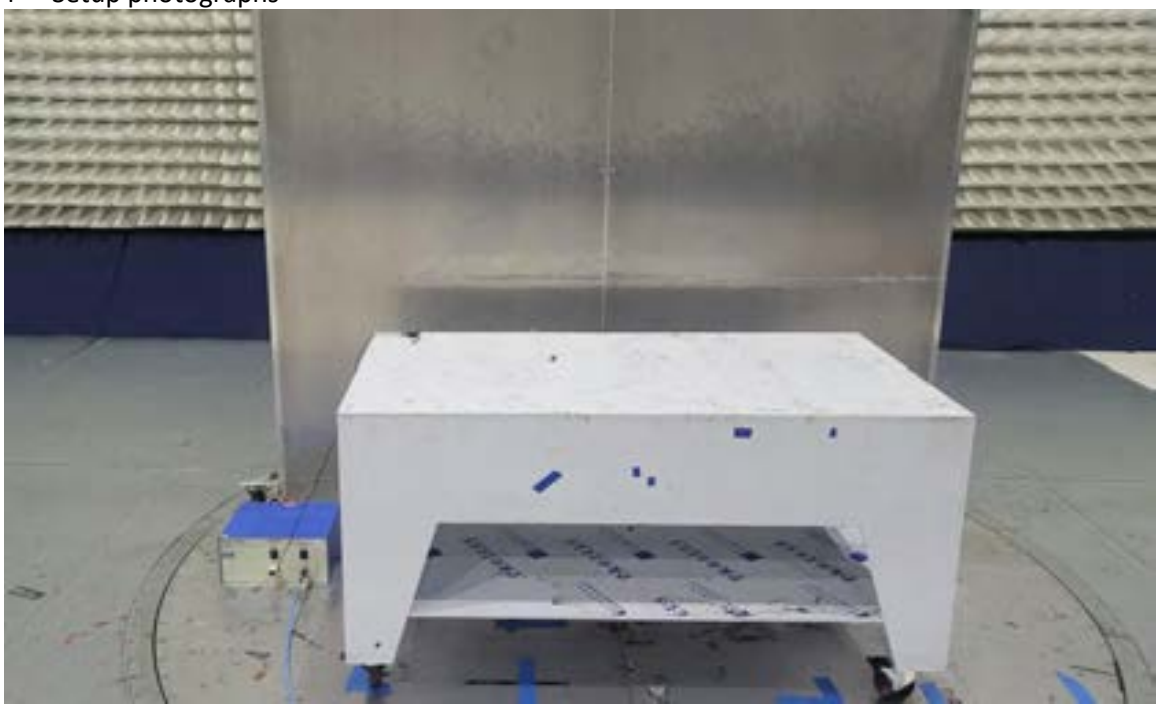
Frequency (MHz)	Q-Peak (dBµV)	Limit Q-Peak (dBµV)	Margin Q-Peak (dB)	Line	Correction (dB)
0.8340	43.84	56	-12.16	Phase 1	10.55
0.8160	43.49	56	-12.51	Phase 2	10.54
0.6855	43.18	56	-12.82	Phase 2	10.58
0.6990	43.02	56	-12.98	Phase 2	10.57
0.8070	42.05	56	-13.95	Phase 2	10.55
0.4920	41.91	56.13	-14.23	Phase 2	10.55
0.7035	41.66	56	-14.34	Phase 1	10.57
0.5730	41.26	56	-14.74	Phase 1	10.55
0.7350	41.24	56	-14.76	Phase 2	10.54
0.5280	40.74	56	-15.26	Phase 2	10.56
0.7350	40.08	56	-15.92	Phase 1	10.54
0.5190	39.12	56	-16.88	Phase 1	10.55
0.4920	38.41	56.13	-17.72	Phase 1	10.55

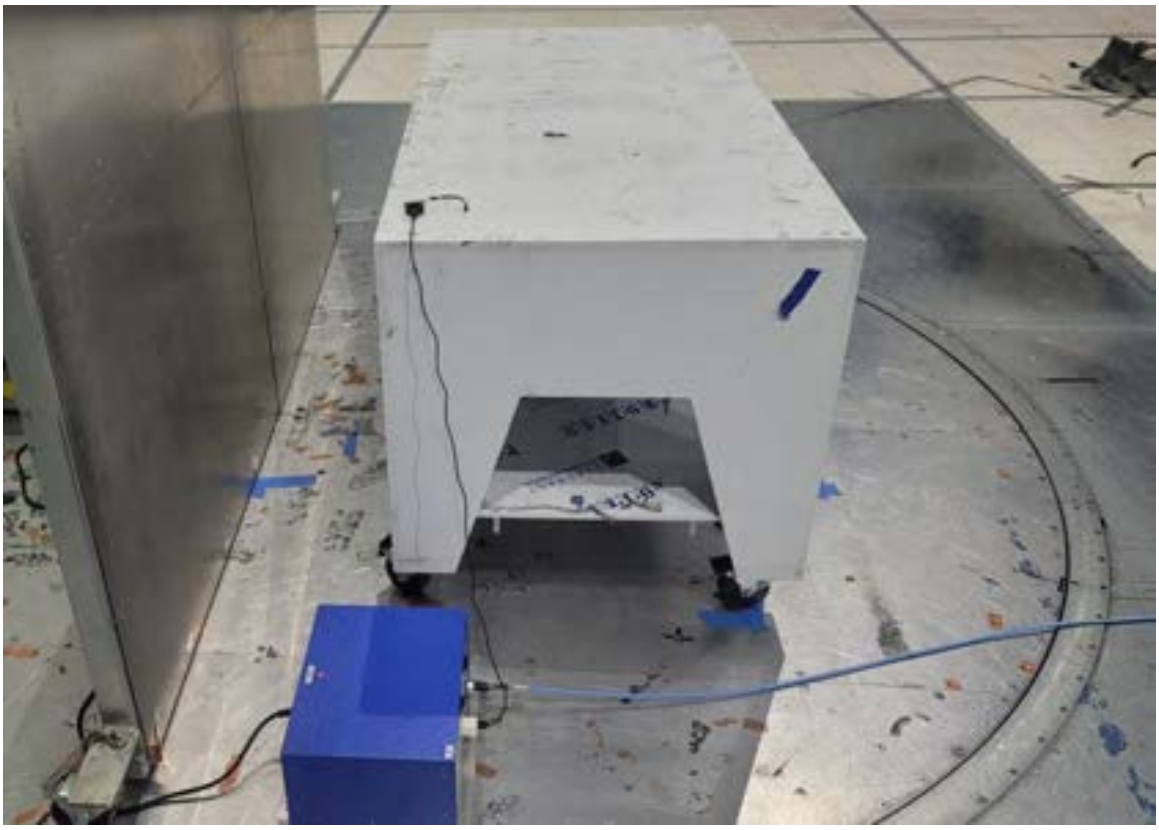
Average

Frequency (MHz)	CISPR AVG (dBµV)	Limit Avg (dBµV)	Margin Avg (dB)	Line	Correction (dB)
0.8340	28.83	46	-17.17	Phase 1	10.55
0.8340	28.83	46	-17.17	Phase 2	10.55
0.6855	26.43	46	-19.57	Phase 2	10.58
1.2210	25.4	46	-20.6	Phase 2	10.58
0.6855	25.12	46	-20.88	Phase 1	10.58
0.5100	24.62	46	-21.38	Phase 2	10.55
1.2210	24.5	46	-21.5	Phase 1	10.58
0.5145	24.08	46	-21.92	Phase 1	10.55
0.4920	24.17	46.13	-21.96	Phase 2	10.55
0.5820	23.55	46	-22.45	Phase 2	10.56
0.5955	23.14	46	-22.86	Phase 1	10.55
0.4920	22.69	46.13	-23.45	Phase 1	10.55
1.1670	21.76	46	-24.24	Phase 1	10.57
1.3380	20.79	46	-25.21	Phase 2	10.59

Results	Complies

4.6.4 Setup photographs





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 Test Receiver 40GHz	Rohde & Schwarz	ESU40	ITS 00961	12	03/09/2022
9kHz-1GHzPre-Amplifier	Sonoma Instruments	310N	ITS 00415	12	04/28/2022
30-1000MHz Bilog Antenna	Teseq	CBL 6111D	ITS 01774	12	04/21/2022
18 - 26.5GHz Horn Antenna	EMCO	3160-09	ITS 00571	#	#
18-40GHz Preamp	uComp Nordic	MCNS-50-18004000335P	ITS 01799	12	03/19/2022
1-18GHz Small Horn Antenna with Preamp	ETS Lindgren	3117-PA	ITS 01365	12	04/20/2022
NOTCH FILTER	MICRO-TRONICS	BRC50702	ITS 01166	12	06/29/2022
1-18GHz 2 meter RF Cable SMA to N-Type	TRU Corp.	TRU Core 300	ITS 01330	12	06/29/2022
1-40GHz RF Cable (Type SMA)	MEGA PHASE	EMC1-K1K1-236	ITS 01849	12	10/25/2022
9kHz-30MHz Loop Antenna (Passive)	ETS Lindgren	6512	ITS 01573	12	11/09/2022
10kHz-1GHz 6 meter RF Cable	TRU Corp.	TRU Core 300	ITS 01333	12	04/28/2022
10kHz-1GHz 11 meter RF Cable	TRU Corp.	TRU Core 300	ITS 01335	12	09/14/2022
10kHz-1GHz 2 meter RF Cable	TRU Corp.	TRU Core 300	ITS 01339	12	09/14/2022
150kHz to 30MHz LISN	COM-POWER	LIN-115A	ITS 01290	12	07/09/2022
2Hz-43.5GHz Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	ITS 01818	12	07/16/2022
10m Semi-Anechoic Chamber	Panashield	10m Chamber	ITS 00984	36	07/29/2023

No Calibration required

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.23	10m Template
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 / G104933346	AK	KV	March 09, 2022	Original document
2.0 / G104933346	AK	AS	November 29, 2022	Updated antenna gain information from “-1.5dBi” to “+1dBi” as provided by the manufacturer

END OF REPORT