

TEST REPORT

Report Number: 105220135MPK-003

Project Number: G105220135

Report Issue Date: January 30, 2023

**Testing performed on
Vector Sensor
Model Number: HSV.1A**

**FCC ID: TBD_FCC
IC: TBD_ID**

to

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

For

Nexxiot AG


Test Performed by:

Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:

NEXXIOT AG
Hardstrasse 201,
8005 Zürich,
Switzerland

Prepared by: _____


Bryce Toma

Date: January 30, 2023

Reviewed by: _____


Minh Ly

Date: January 30, 2023

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program. This report must not be used to claim product endorsement by A2LA, NIST nor any other agency of the U.S. Government.

Report No. 105220135MPK-003	
Equipment Under Test:	Vector Sensor
Model Number:	HSV.1A
Applicant:	Nexxiot AG
Contact:	Florencia Roshardt
Address:	Nexxiot AG Hardstrasse 201, 8005 Zürich
Country:	Switzerland
Email:	florencia.roshardt@nexxiot.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) ISED RSS-247 Issue 2
Date of Test:	December 7, 2022 to January 20, 2023

We attest to the accuracy of this report, original Issued:



Bryce Toma
Engineer



Minh Ly
EMC Team Lead

TABLE OF CONTENTS

1.0	Summary of Tests	4
2.0	General Information	5
2.1	Product Description	5
2.2	Related Submittal(s) Grants.....	6
2.3	Test Facility	6
2.4	Test Methodology.....	6
2.5	Measurement Uncertainty	6
3.0	System Test Configuration.....	7
3.1	Support Equipment.....	7
3.2	Block Diagram of Test Setup	7
3.3	Justification	9
3.4	Software Exercise Program.....	9
3.5	Mode of Operation during Test	9
3.6	Modifications Required for Compliance	9
3.7	Additions, Deviations and Exclusions from Standards.....	9
4.0	Measurement Results	10
4.1	6-dB Bandwidth and 99% Occupied Bandwidth	10
4.2	Maximum Peak Conducted Output Power at Antenna Terminals	18
4.3	Maximum Power Spectral Density.....	22
4.4	Out of Band Antenna Conducted Emission.....	26
4.5	Transmitter Radiated Emissions	31
5.0	List of Test Equipment.....	58
6.0	Document History.....	59

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	Not Applicable ¹
Antenna Requirement	15.203	RSS-GEN	Complies (Internal Antenna)

¹ EUT is battery powered.

EUT receive date: December 7, 2022

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: December 7, 2022

Test completion date: January 20, 2023

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

2.0 General Information

2.1 Product Description

Nexxiot AG supplied the following description of the EUT:

The Vector Sensor is a remote monitoring equipment that measures acceleration and magnet fields. These measurements are then communicated and transferred to a gateway. Vector Sensors are typically used in railway environments.

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

This test report covers only the 2.4GHz OQPSK radio.

Information about the 2.4 GHz radio is presented below:

Applicant	Nexxiot AG
Model No.	HSV.1A
FCC Identifier	TBD_FCC
IC Identifier	TBD_ID
Type of transmission	Digital Transmission System (DTS)
Rated RF Output	+5.46 dBm
Antenna(s) & Gain	Internal Antenna, Gain: 3.0 dBi
Frequency Range	2405 – 2480 MHz
Type of modulation/data rate	GFSK / 2 Mbps
Number of Channel(s)	16
Applicant Name & Address	Nexxiot AG Hardstrasse 201, 8005 Zürich, Switzerland

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

The EUT does not have any support equipment.

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	Manufacturer	Model	Serial Number
Vector Sensor	Nexxiot AG	HSV.1A	PVEC-0027

Support Equipment			
Description	Manufacturer	Model	Serial Number
Not applicable. The EUT does not have any support equipment			



EUT Photos

External Top



External Bottom



3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT was configured to continuously transmit. Different orientation of the EUT were tested and only the worse-case emissions were reported.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Nexxiot AG

3.5 Mode of Operation during Test

Mode of operation during the tests was setup using a laptop which allows controlling the radio by test software. 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 (2405MHz) middle (2440MHz), and highest (2480MHz) channels for OQPSK mode.

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.

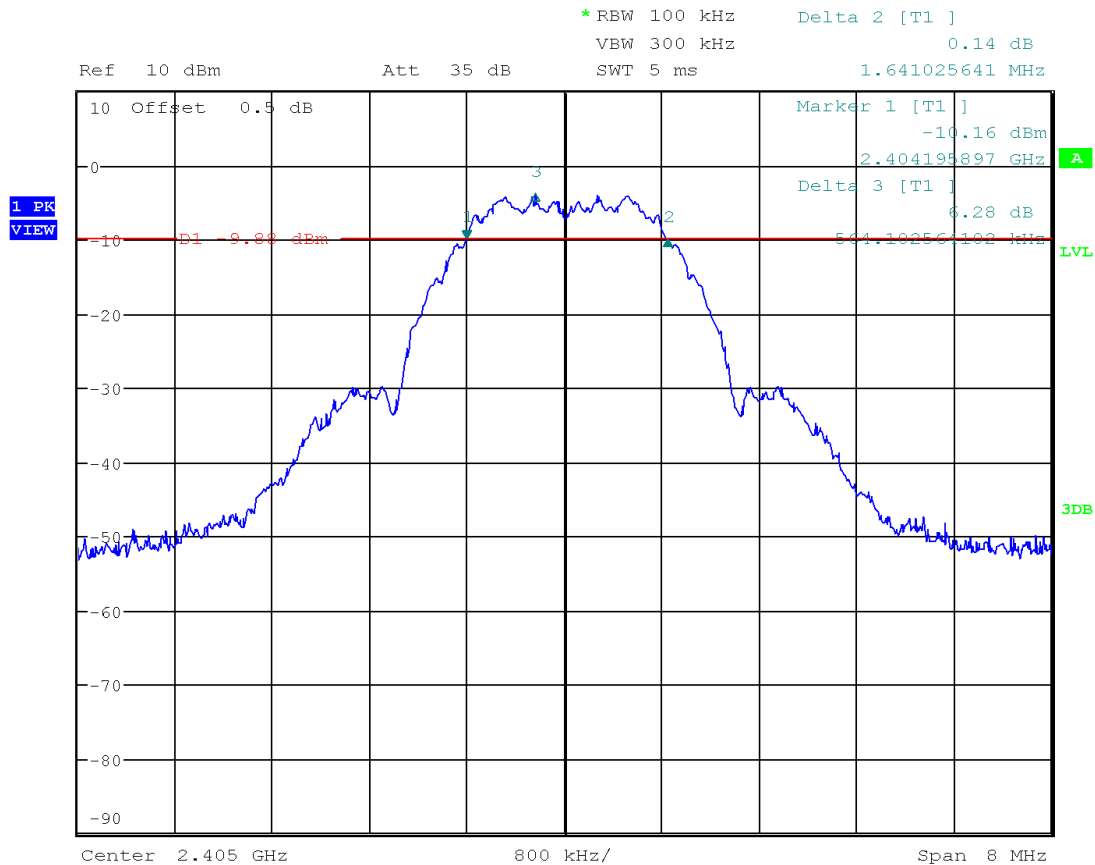
For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

4.1.3 Test Result

Mode	Frequency (MHz)	6-dB bandwidth FCC 15.247 kHz	Occupied bandwidth, RSS-GEN, MHz	Plot
OQPSK (802.15.4)	2405	1.641	--	1.1
		--	2.243	1.4
	2440	1.641	--	1.2
		--	2.248	1.5
	2480	1.641	--	1.3
		--	2.254	1.6

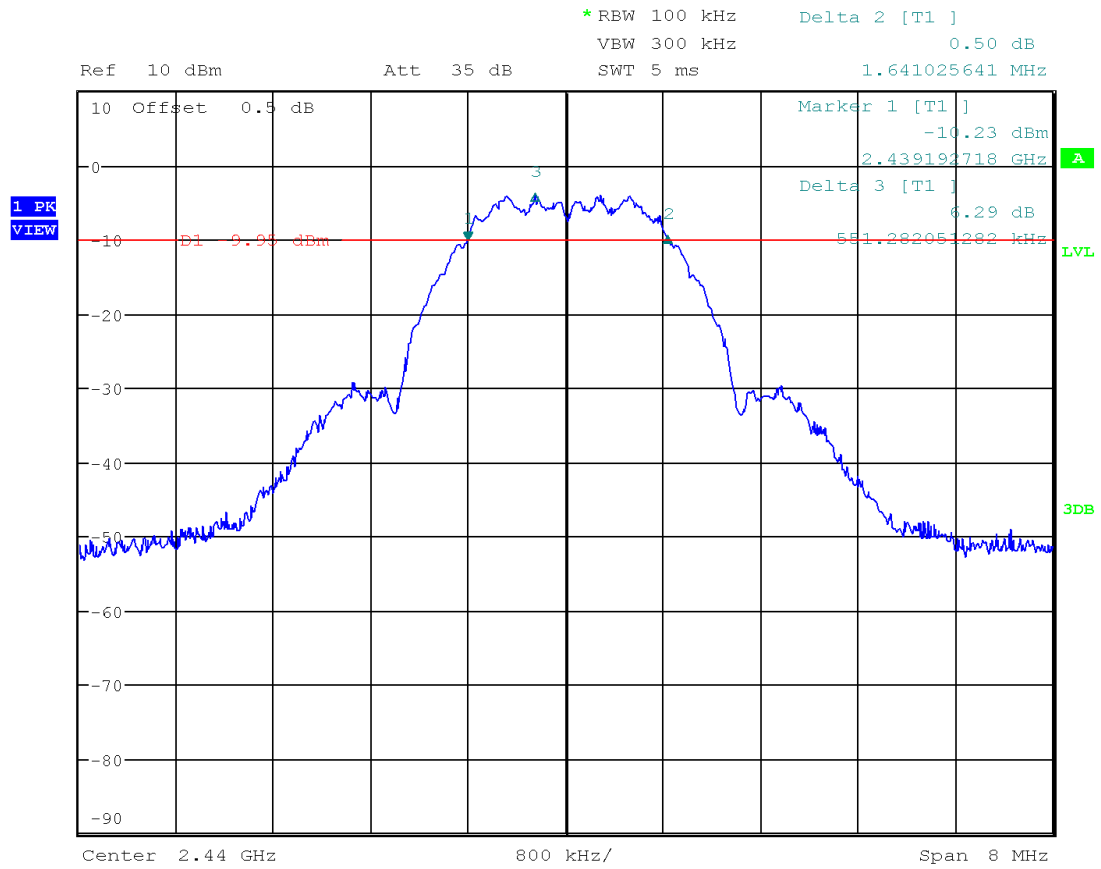
Tested By	Test Date	Results
Bryce Toma	December 21, 2022	Complies

Plot 1.1



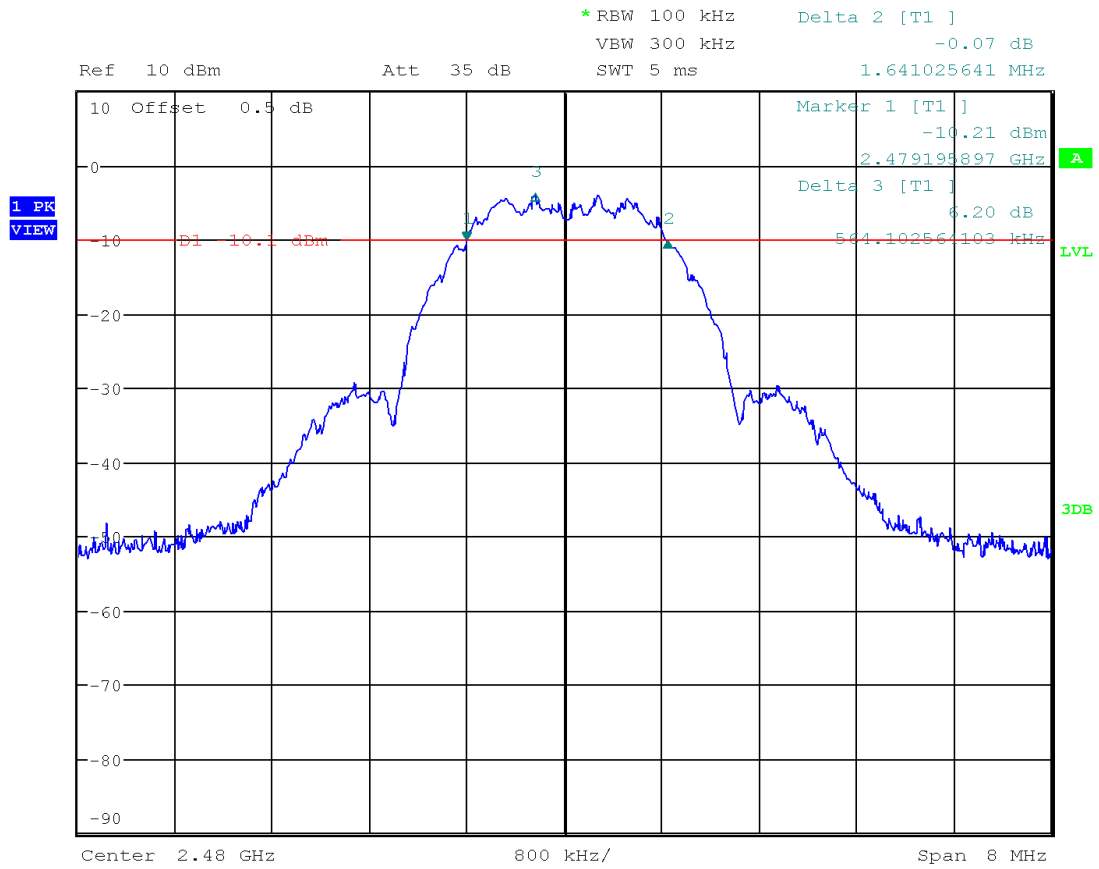
Date: 21.DEC.2022 04:14:20

Plot 1.2



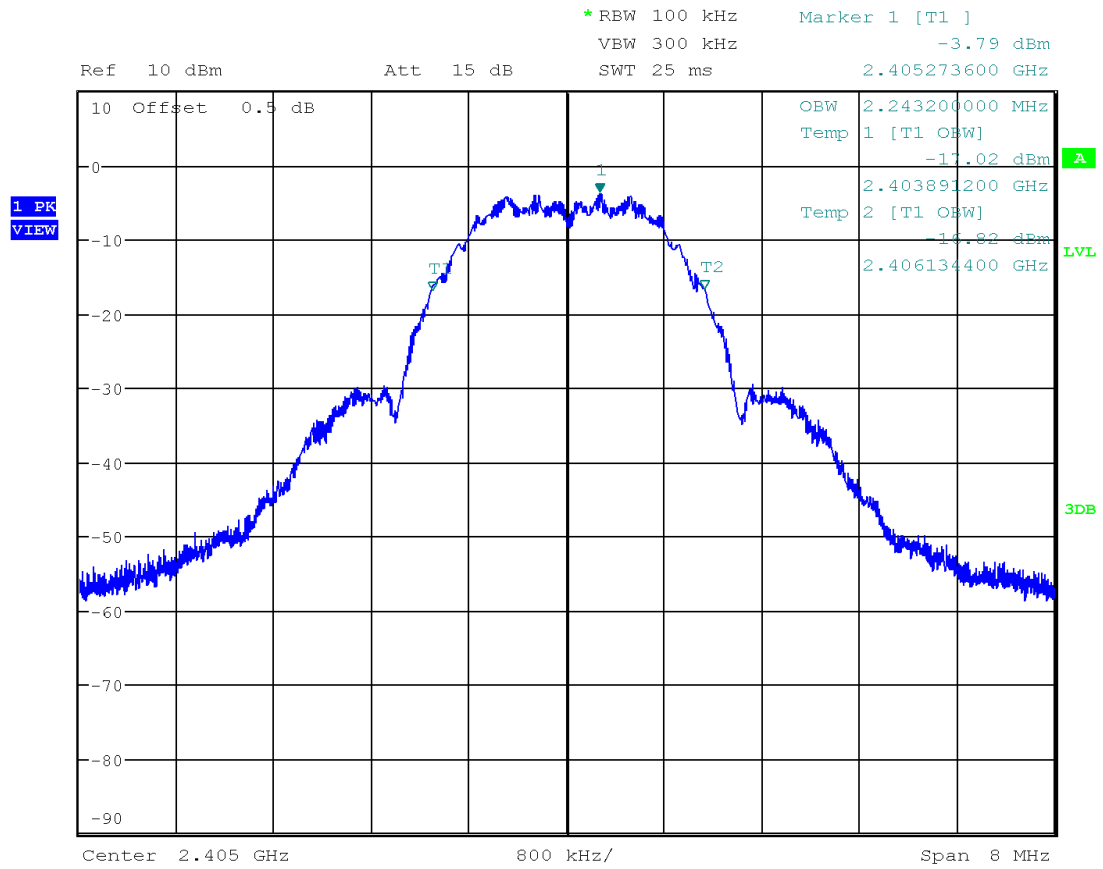
Date: 21.DEC.2022 04:12:40

Plot 1.3



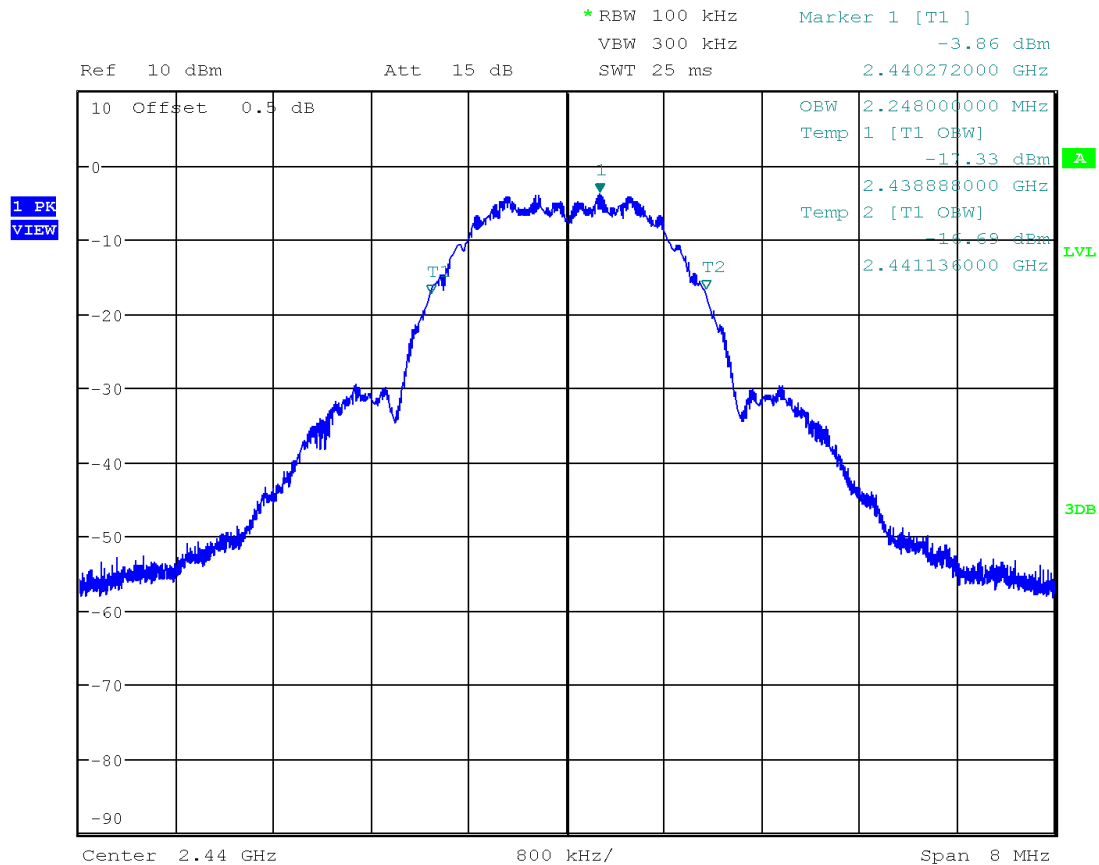
Date: 21.DEC.2022 04:10:56

Plot 1.4



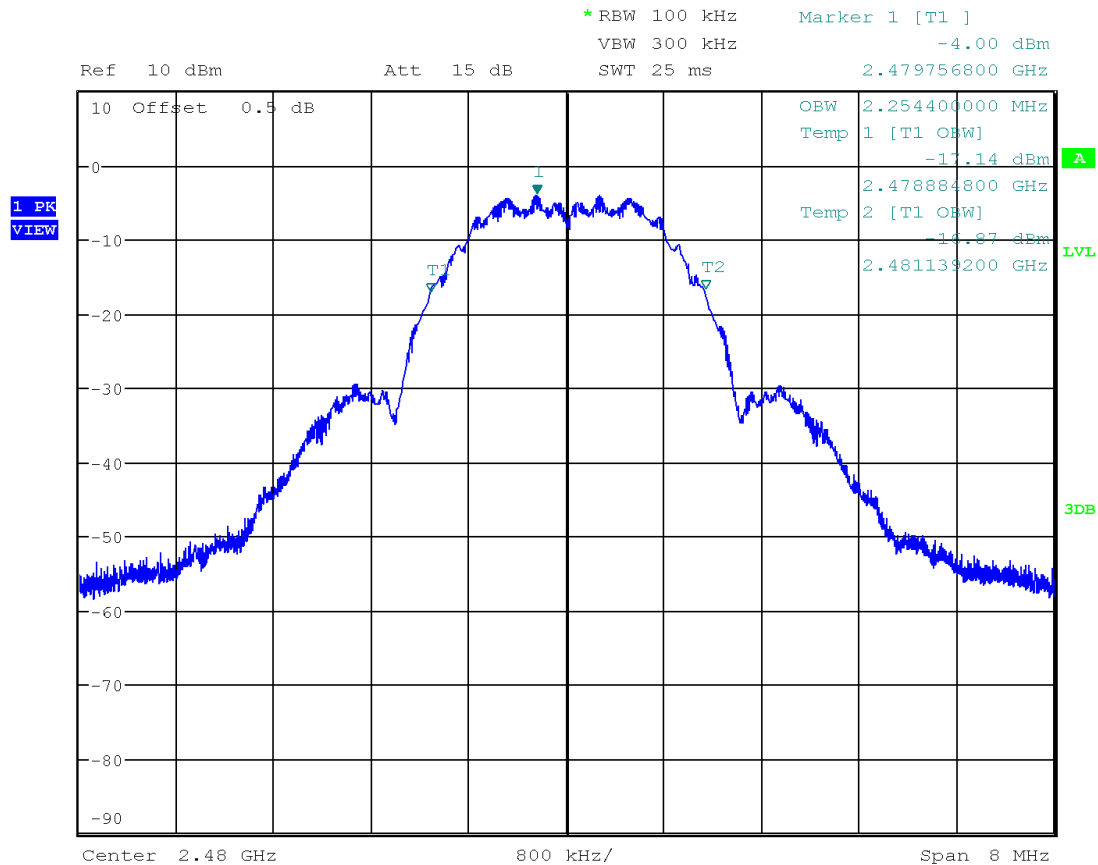
Date: 21.DEC.2022 04:06:26

Plot 1.5



Date: 21.DEC.2022 04:07:39

Plot 1.6



Date: 21.DEC.2022 04:08:56

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.

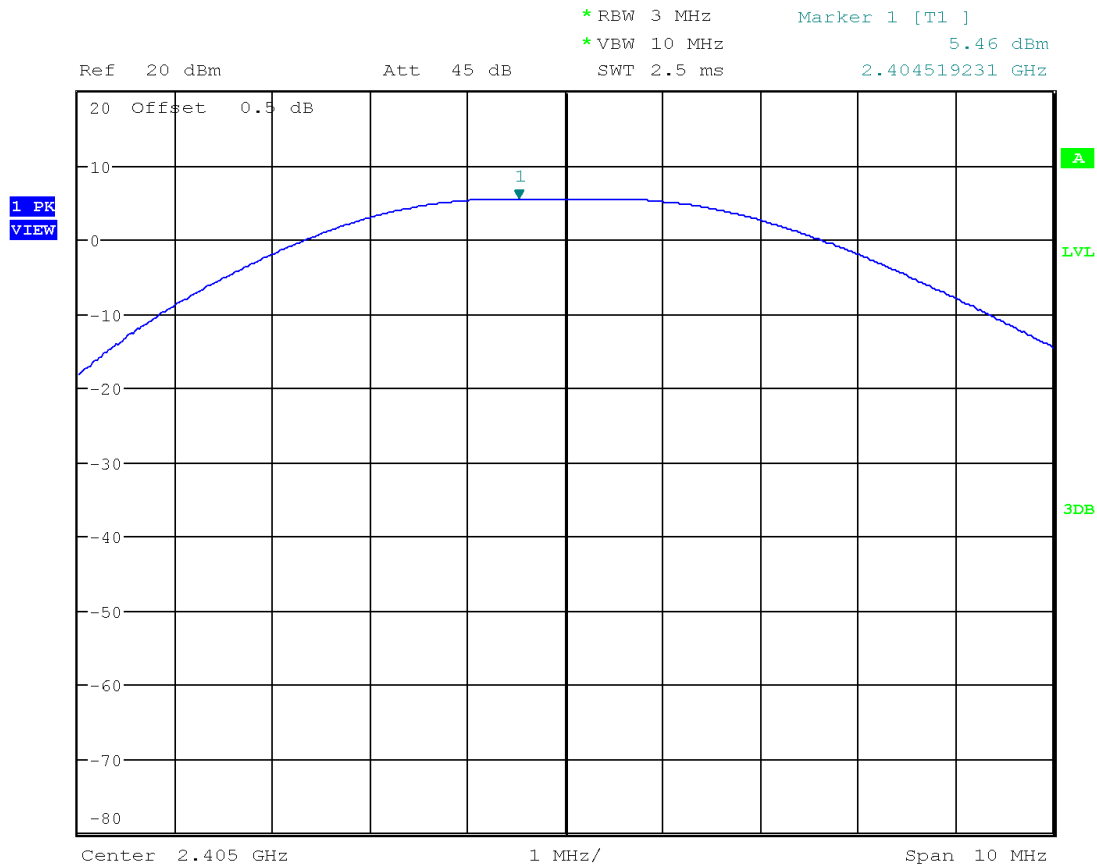
4.2.3 Test Result

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

Mode	Frequency	Conducted Power (peak)		Plot
	MHz	dBm	mW	
OQPSK (802.15.4)	2405	5.46	3.52	2.1
	2440	5.35	3.43	2.2
	2480	5.12	3.25	2.3

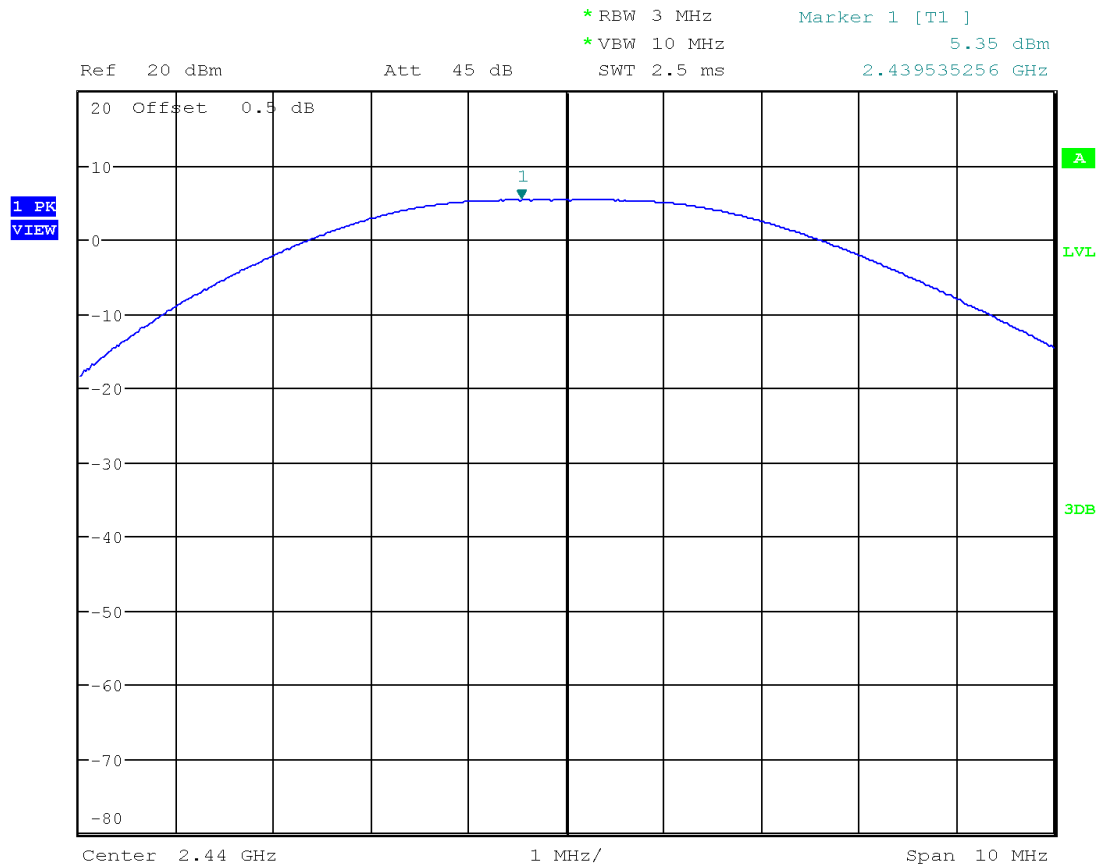
Tested By	Test Date	Results
Bryce Toma	January 13, 2023	Complies

Plot 2.1



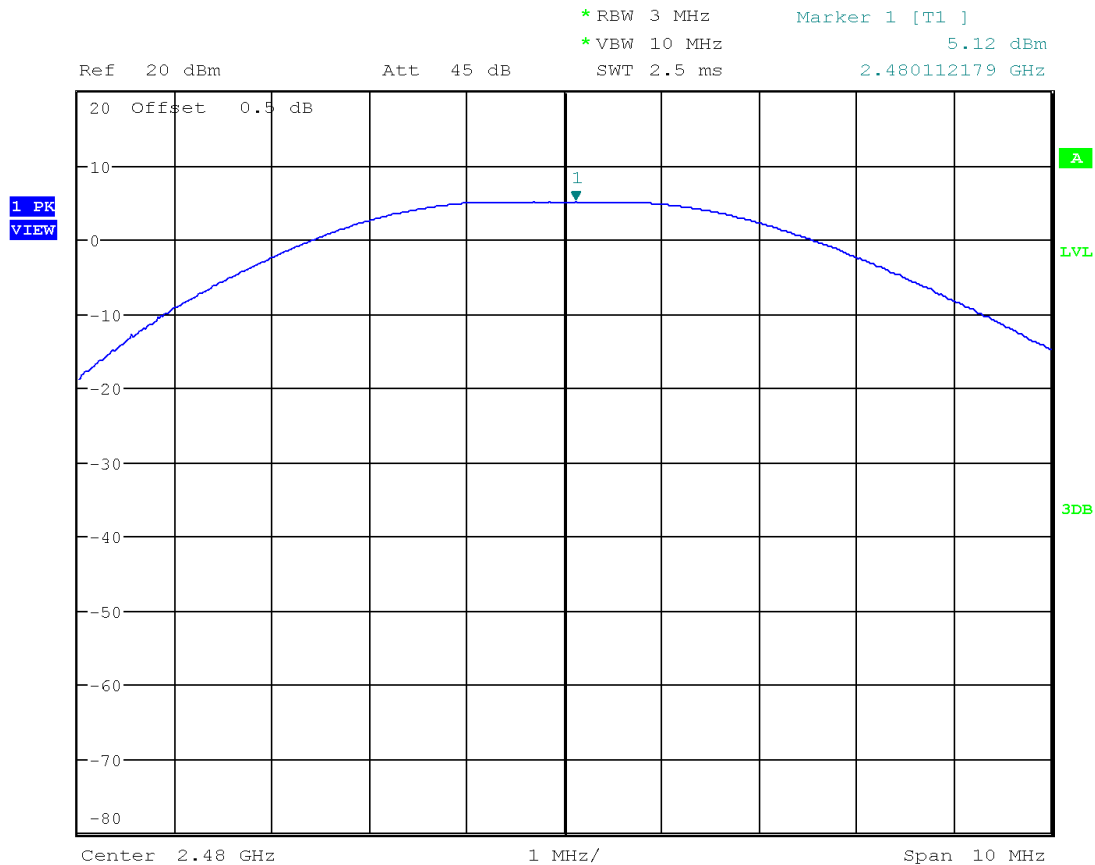
Date: 13.JAN.2023 00:41:20

Plot 2.2



Date: 13.JAN.2023 00:43:03

Plot 2.3



Date: 13.JAN.2023 00:44:15

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.

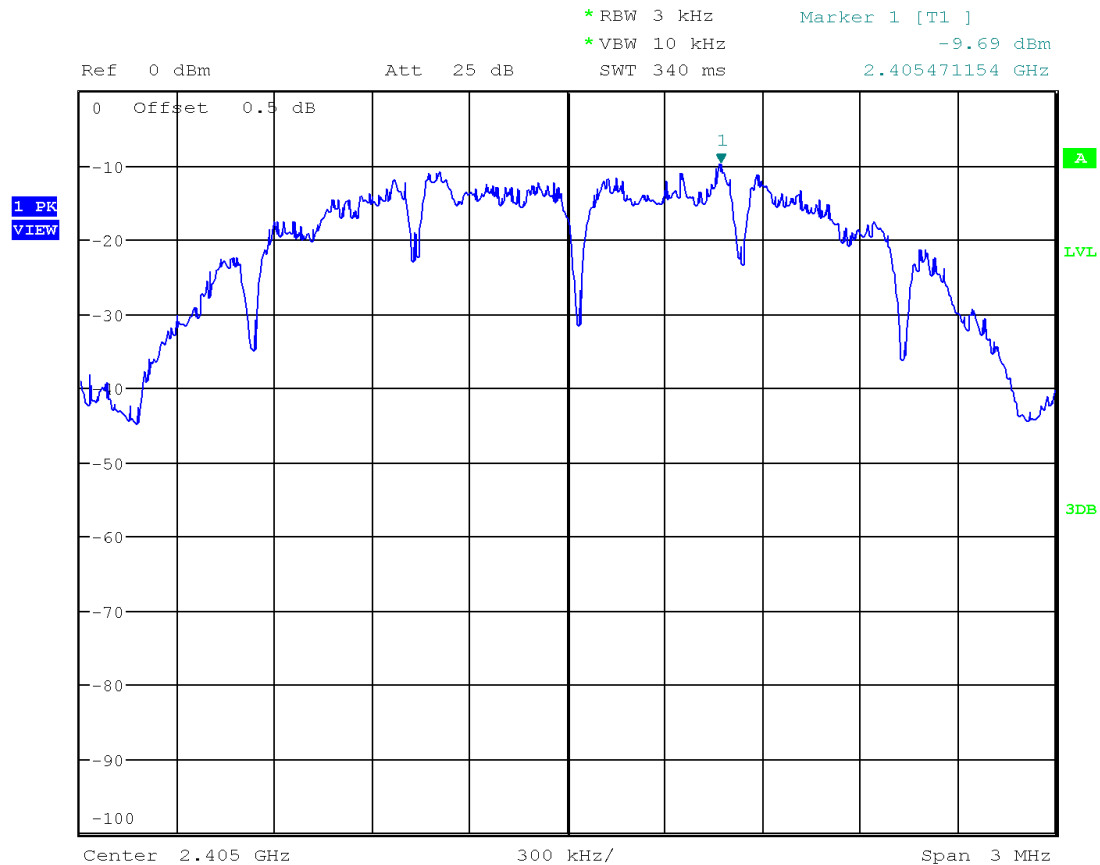
4.3.3 Test Result

Refer to the following plots for the test result

Mode	Frequency, MHz	Maximum Power Spectral Density, dBm	Maximum Power Spectral Density Limit, dBm	Margin, dB	Plot
OQPSK	2405	-9.69	8.0	-17.69	3.1
	2440	-9.92	8.0	-17.92	3.2
	2480	-10.10	8.0	-18.10	3.3

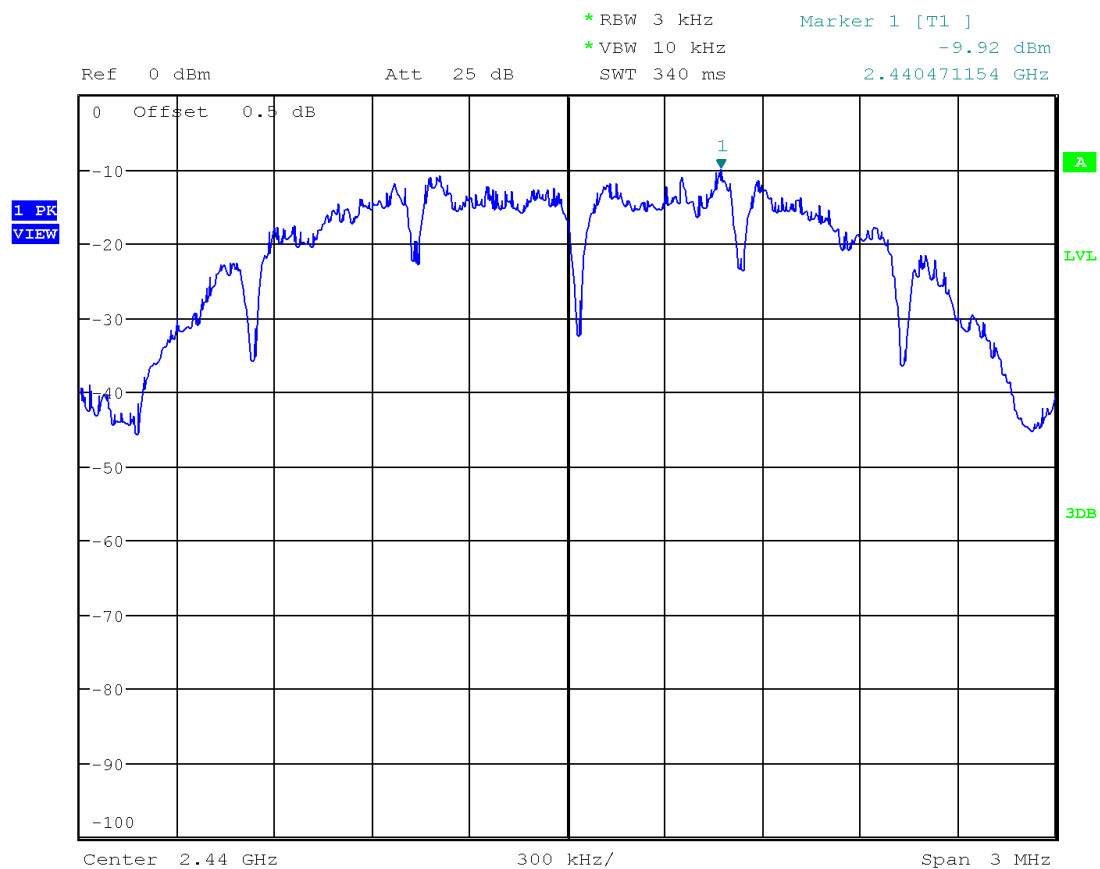
Tested By	Test Date	Results
Bryce Toma	January 13, 2023	Complies

Plot 3.1



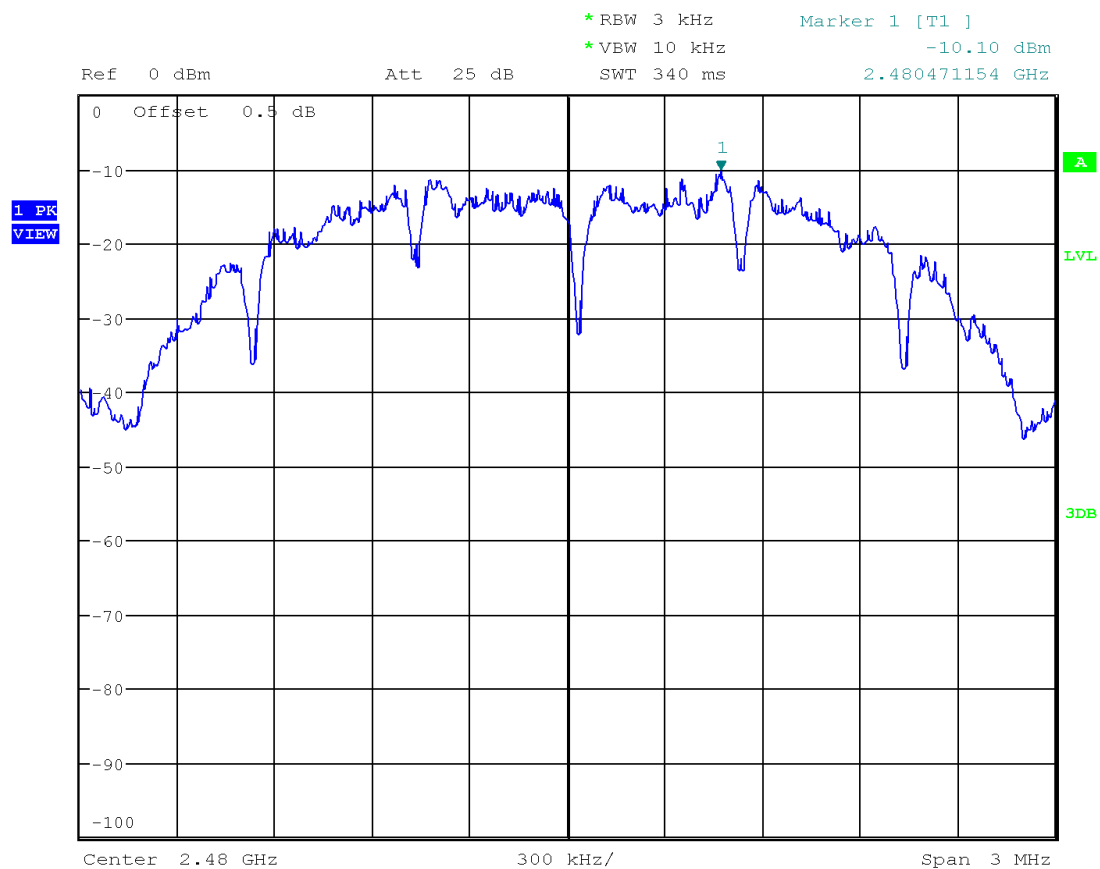
Date: 13.JAN.2023 01:03:10

Plot 3.2



Date: 13.JAN.2023 00:57:43

Plot 3.3



Date: 13.JAN.2023 01:00:11

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.

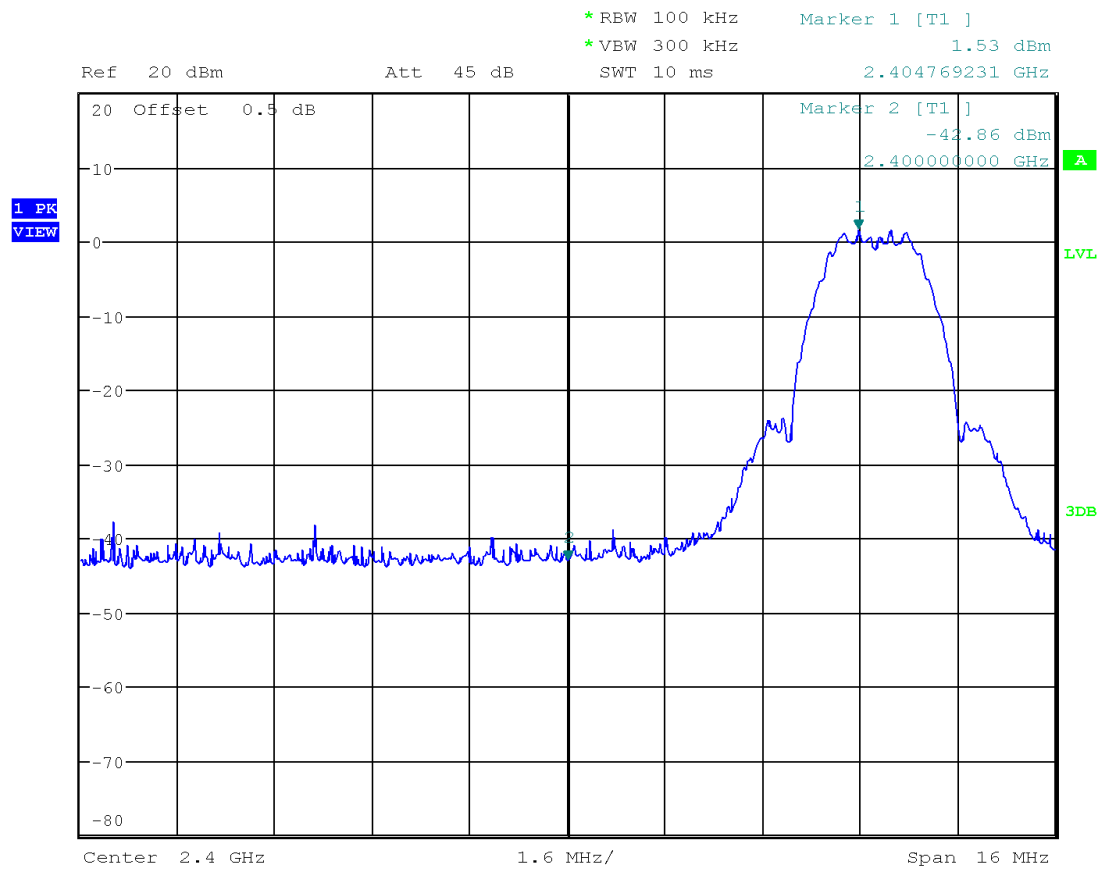
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

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.

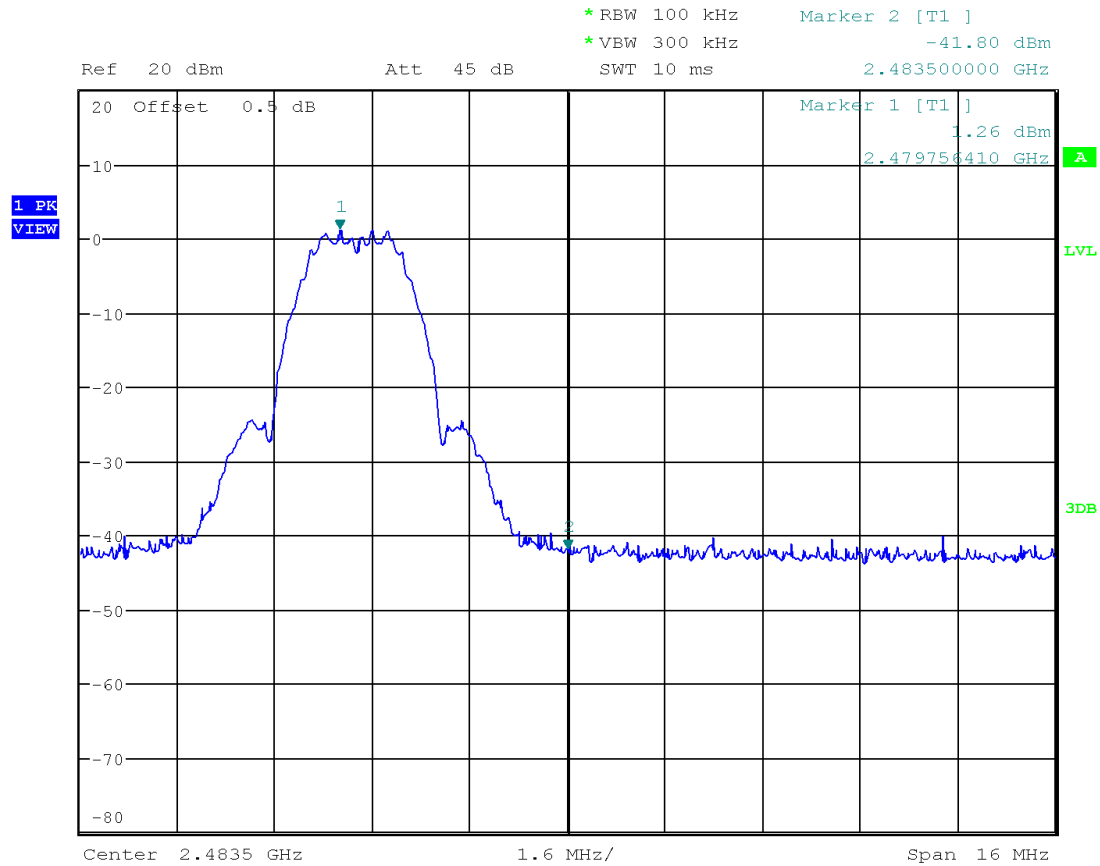
Tested By	Test Date	Results
Bryce Toma	January 13, 2023	Complies

OQPSK Mode
Tx @ Low Channel, 2405 MHz Band Edge
Plot 4.1



Date: 13.JAN.2023 01:11:56

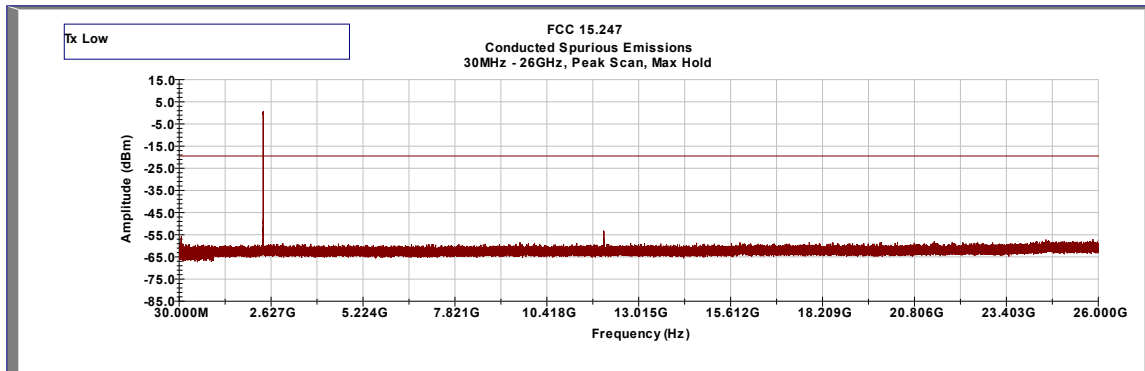
OQPSK Mode
Tx @ High Channel, 2480 MHz Band Edge
Plot 4.2



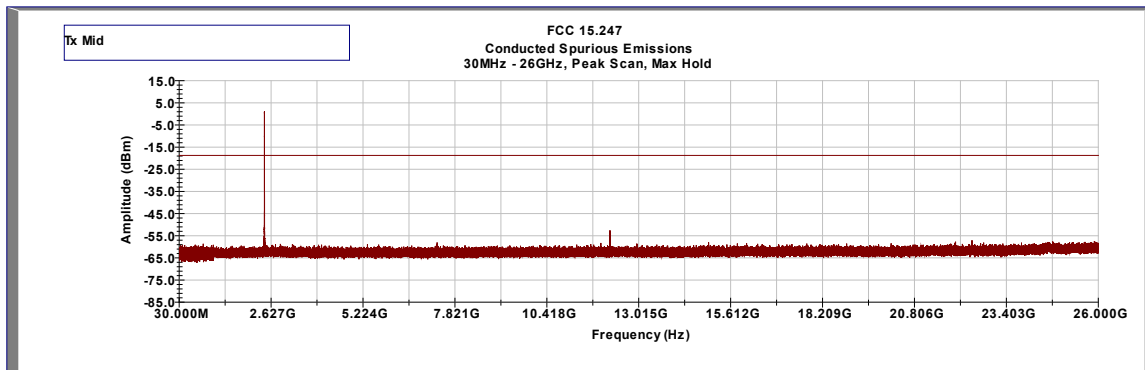
Date: 13.JAN.2023 01:14:03

Results **Complies**

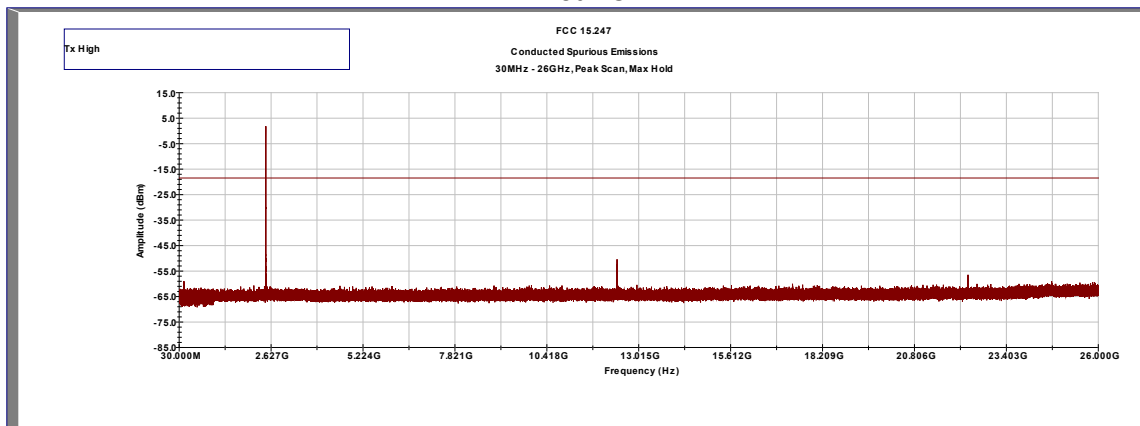
OQPSK Mode
Tx @ Low Channel, 2405 MHz
30MHz -26GHz Conducted Spurious
Plot 4.3



OQPSK Mode
Tx @ Mid Channel, 2440 MHz
30MHz -26GHz Conducted Spurious
Plot 4.4



OQPSK Mode
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 $[(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$.

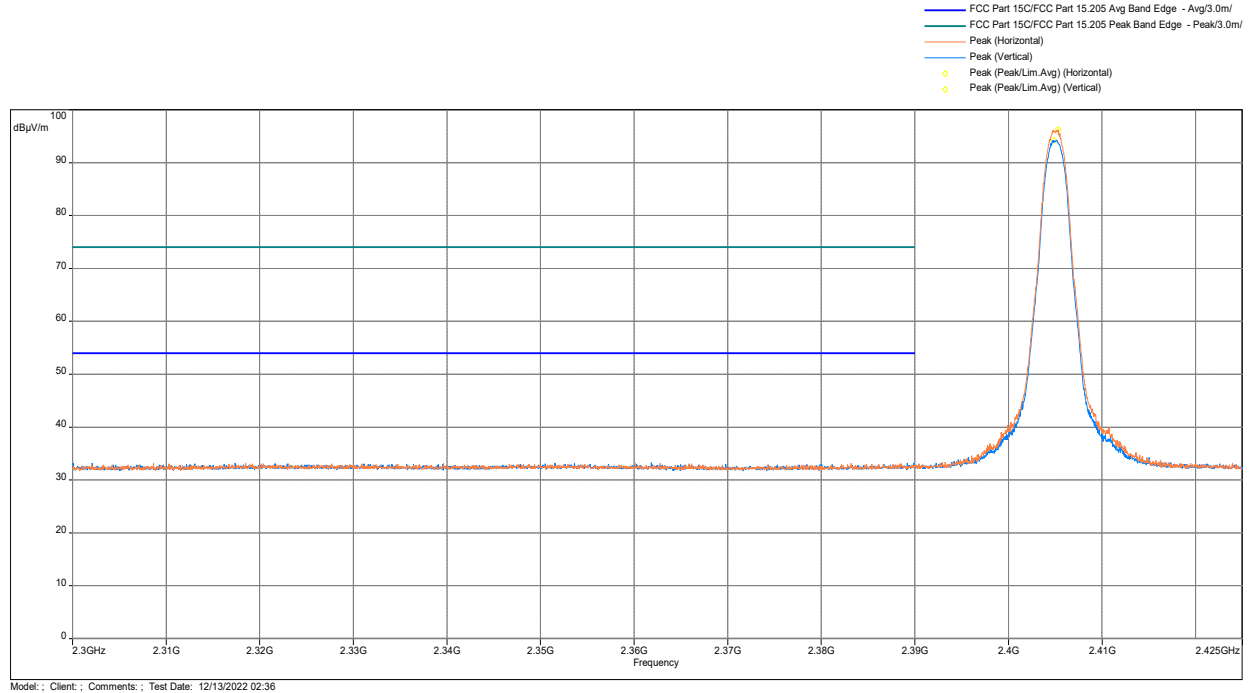
4.5.4 Test Results

All testing in this section were performed by radiated measurements.

Tested By	Test Date	Results
Bryce Toma	December 13, 2022 – January 20, 2023	Complies

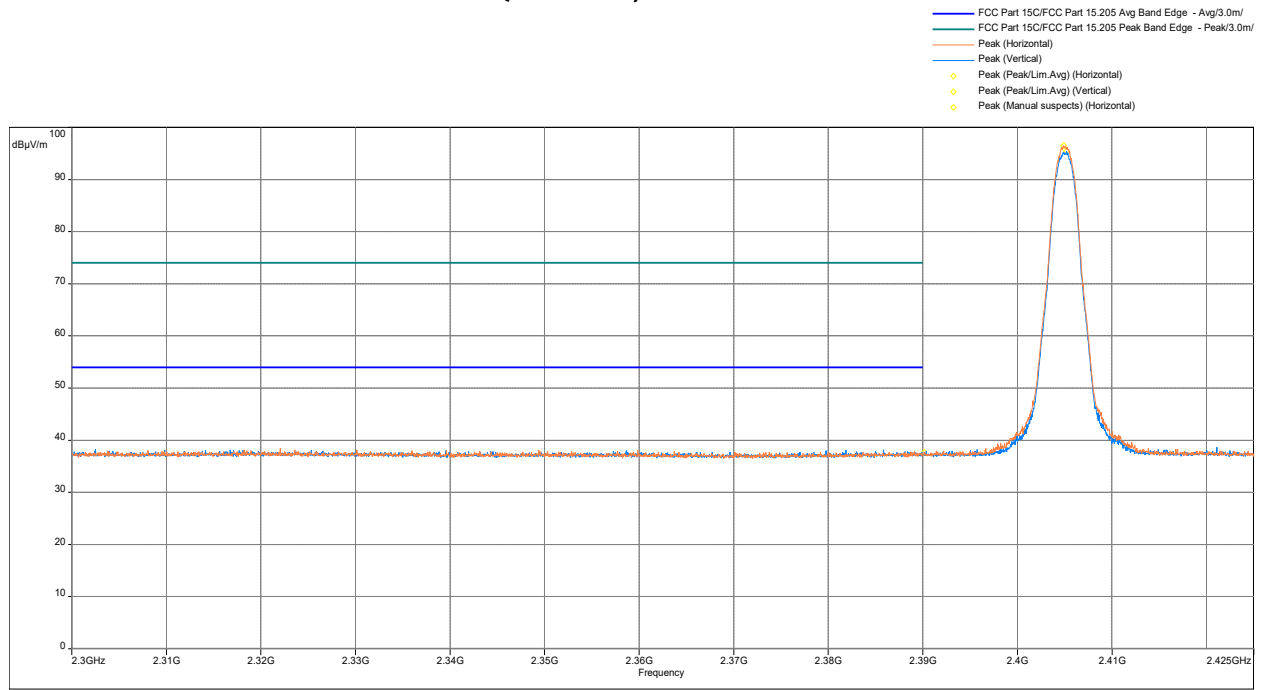
Test Results: 15.209/15.205 Radiated Restricted Band Emissions

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



Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390	33.07	54	-20.93	3.99	0	Horizontal	21.85

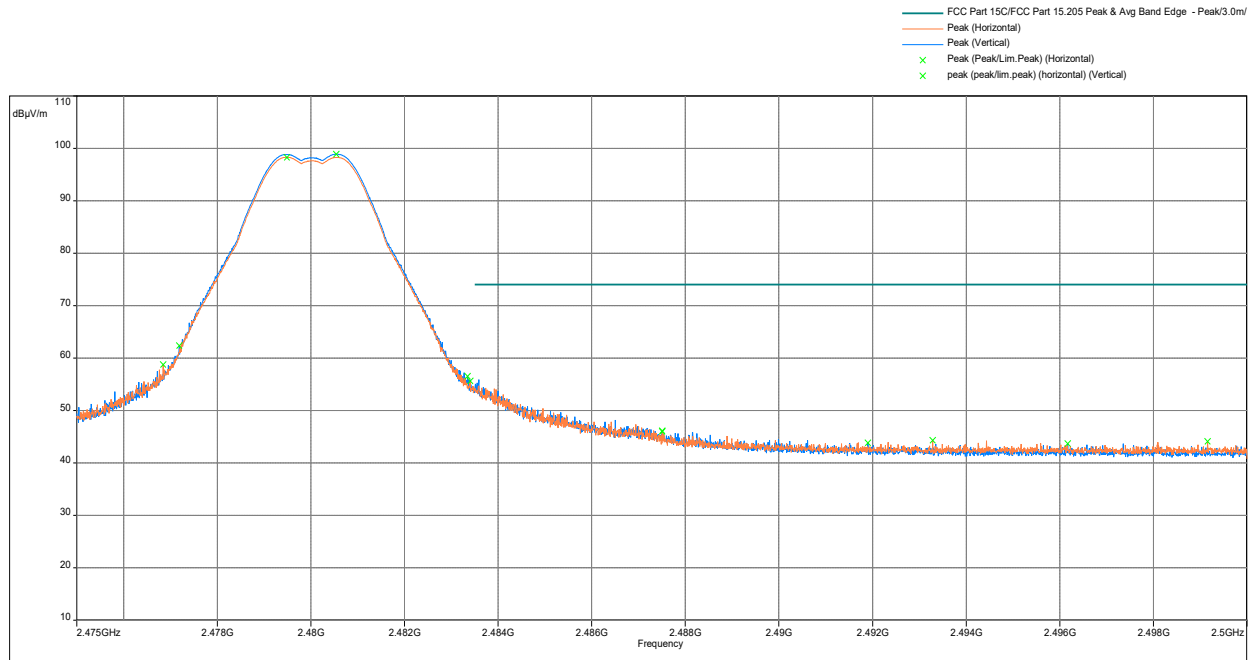
Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2310–2390 MHz, Peak Scan with Peak Limit and Average Limit
OQPSK Mode; EUT Vertical



Freq. MHz	Peak@3m dB(uV/m)	Avg Limit dB(uV/m)	Avg Margin dB	Height m	Azimuth deg	Polarity	Correction dB
2390	37.66	54	-16.34	2.01	180.5	Horizontal	21.85

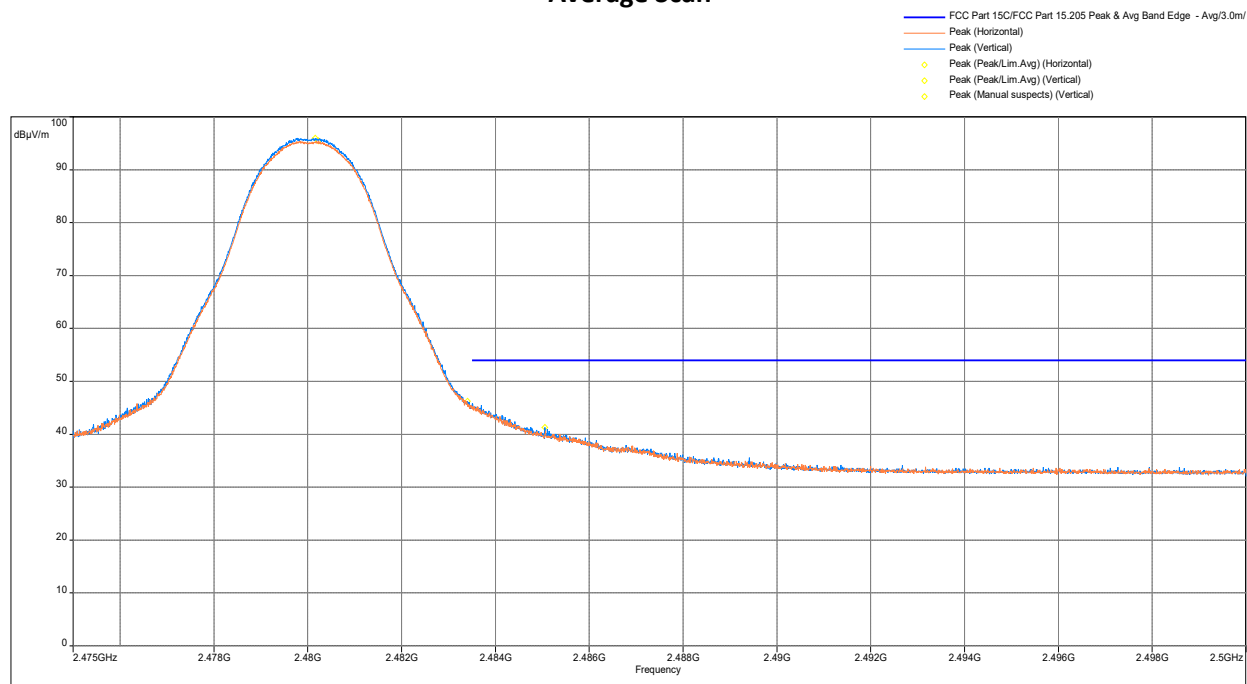
Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2483.5–2500 MHz, Peak Scan with Peak Limit
OQPSK Mode; EUT Horizontal

Peak Scan



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.5	54.28	74	-19.72	1.01	188	Horizontal	22.15

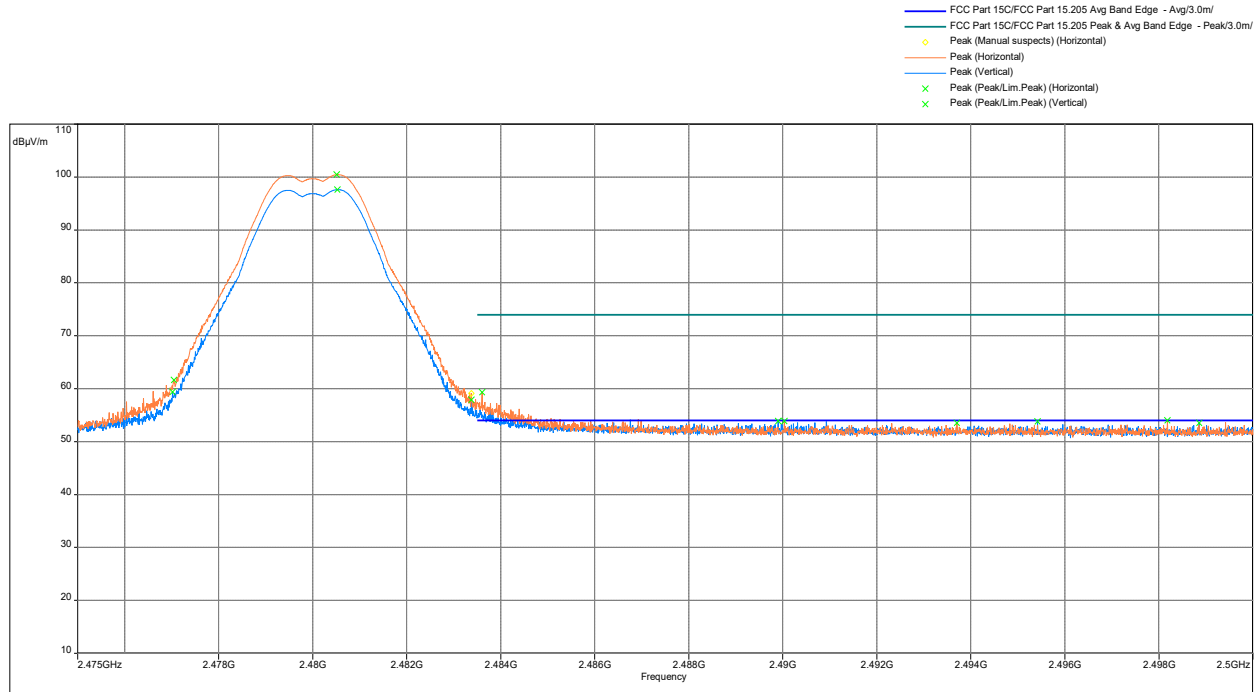
Average Scan



Frequency (MHz)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.5	46.23	54	-7.77	1.01	250.5	Vertical	22.15

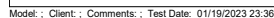
Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2483.5–2500 MHz, Peak Scan with Peak Limit and Average Limit
OQPSK Mode; EUT Vertical

Peak Scan



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.5	59.12	74	-14.78	1.01	121.25	Horizontal	22.15

Average Scan

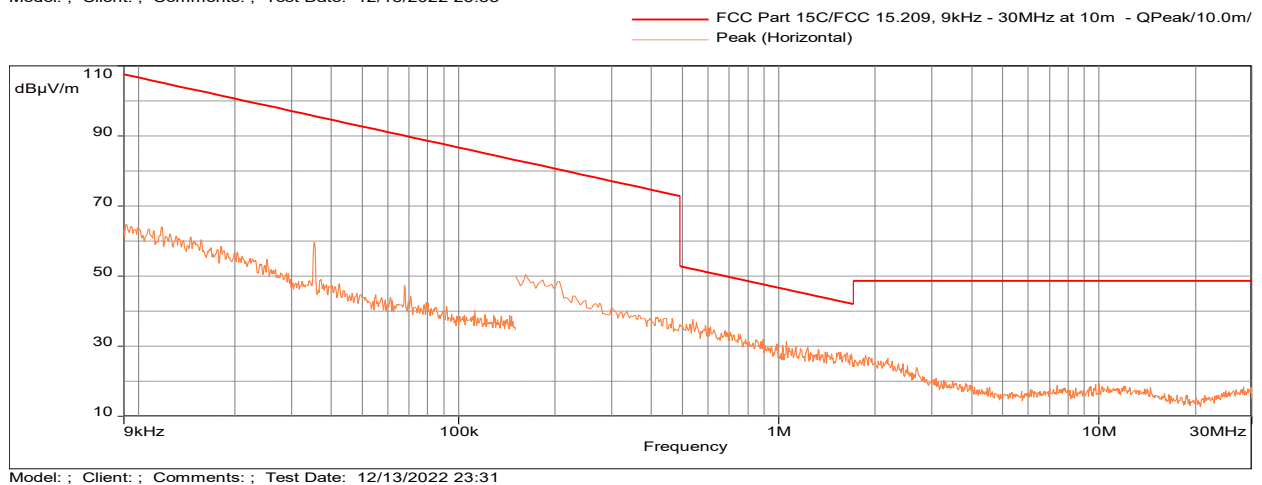
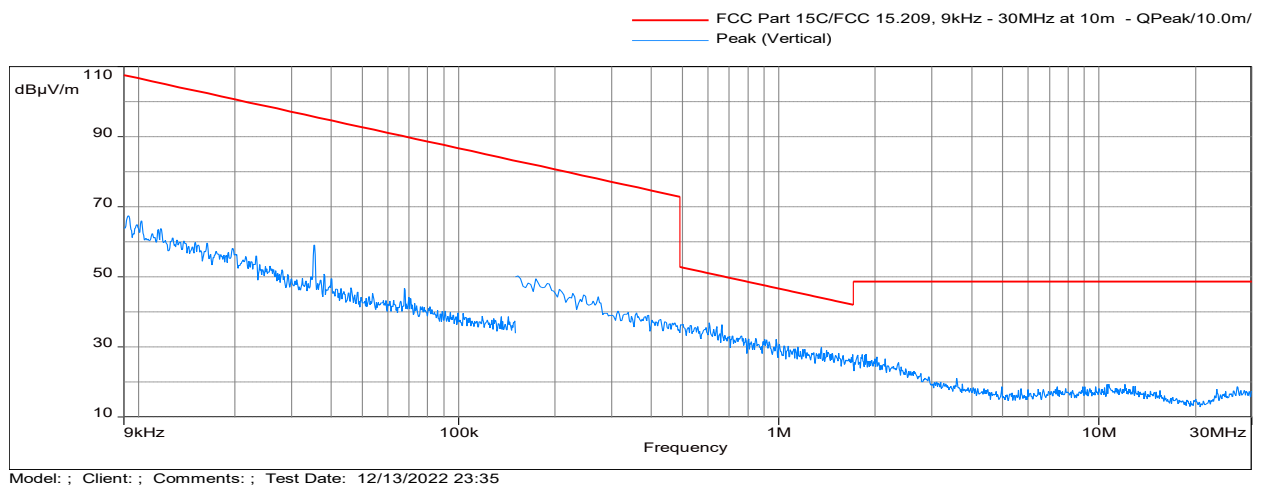
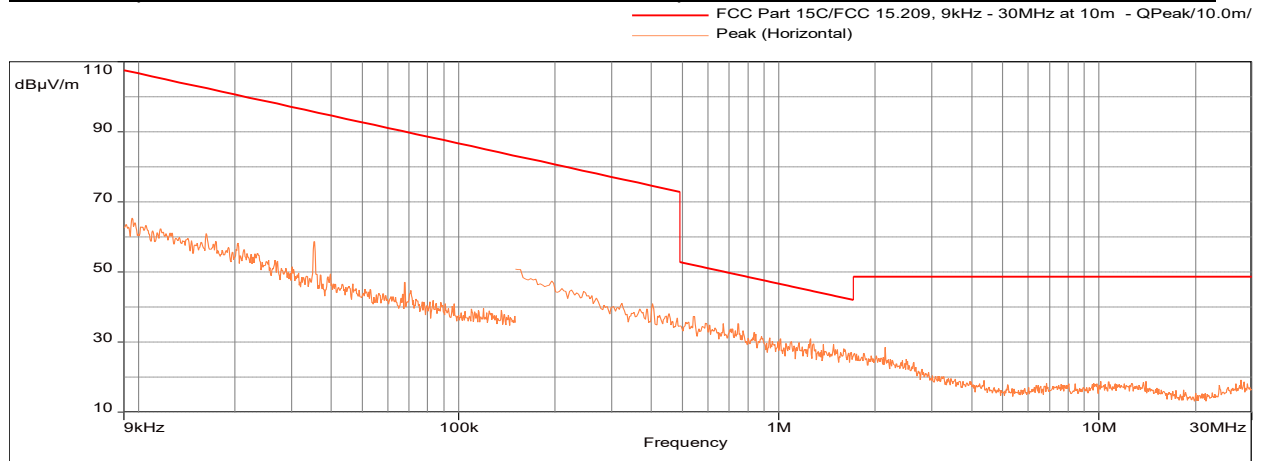


Frequency (MHz)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.5	47.94	54	-6.06	1.01	143.5	Horizontal	22.15

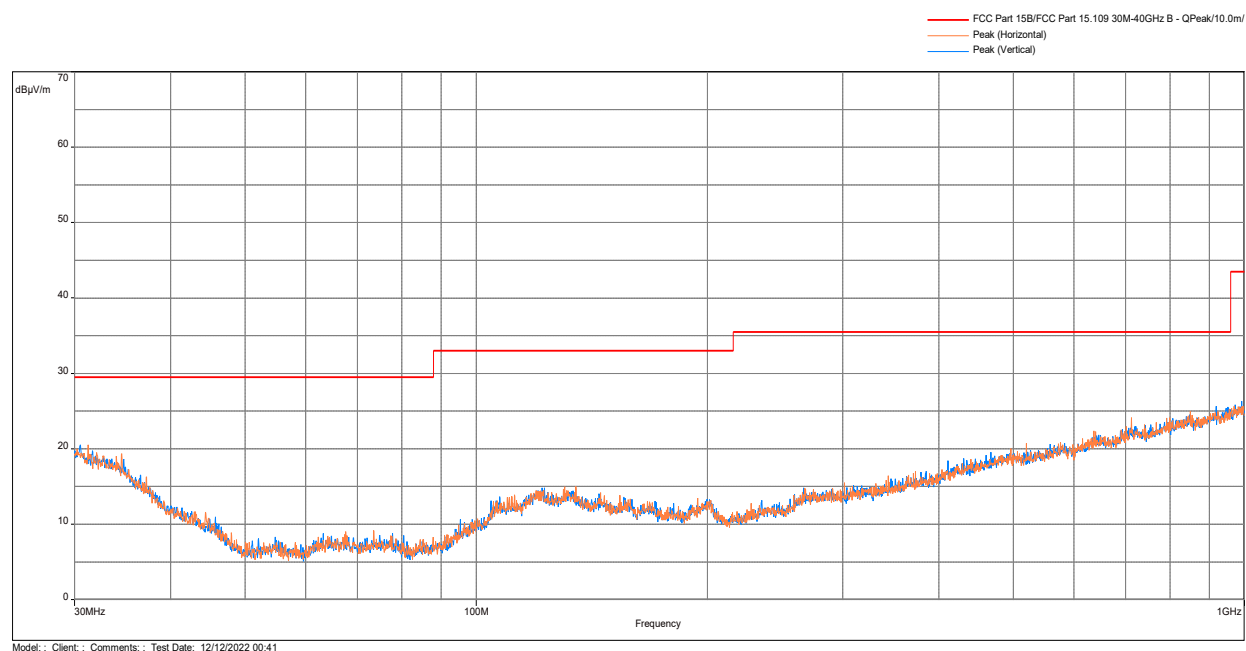
Out-of-Band Radiated Spurious Emissions

Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2405MHz
OQPSK Mode

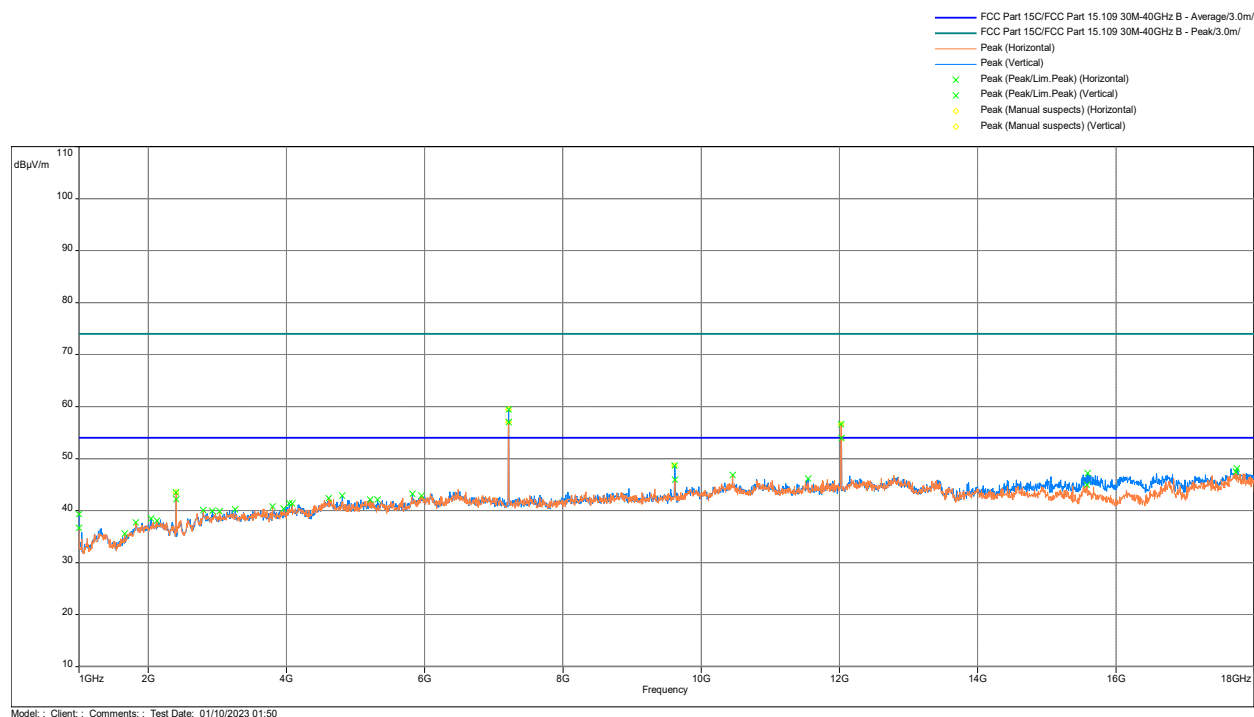
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



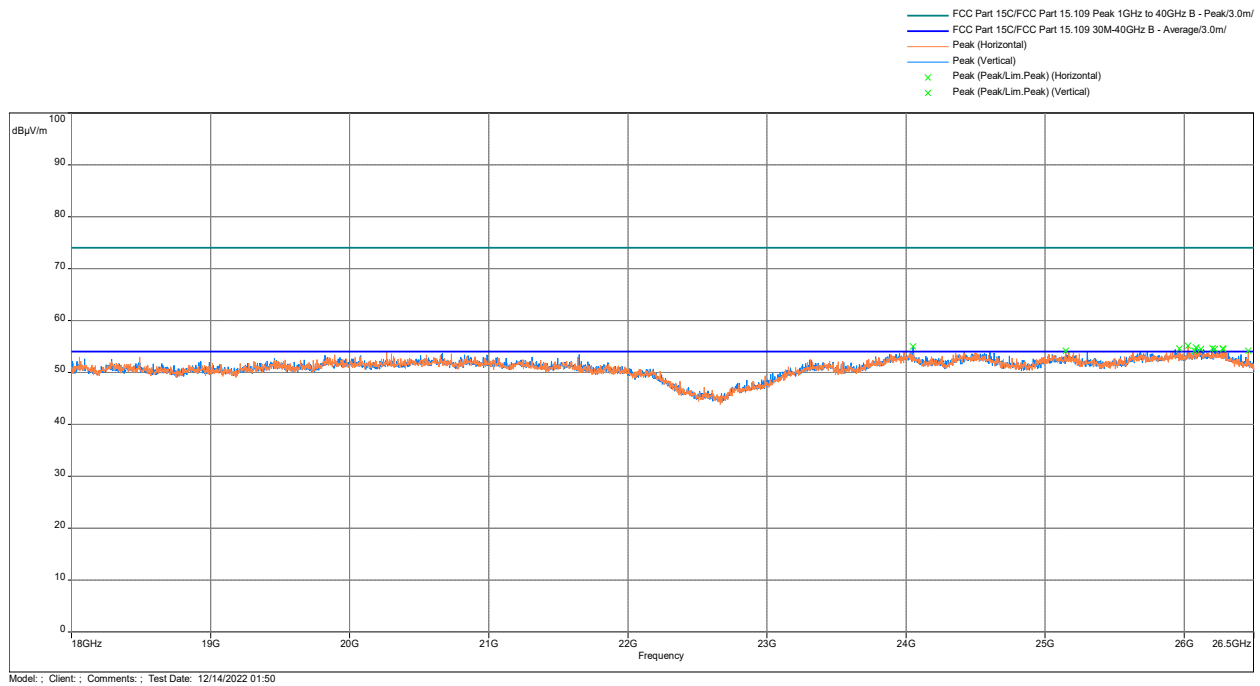
Radiated Spurious Emissions 30 MHz - 1000 MHz



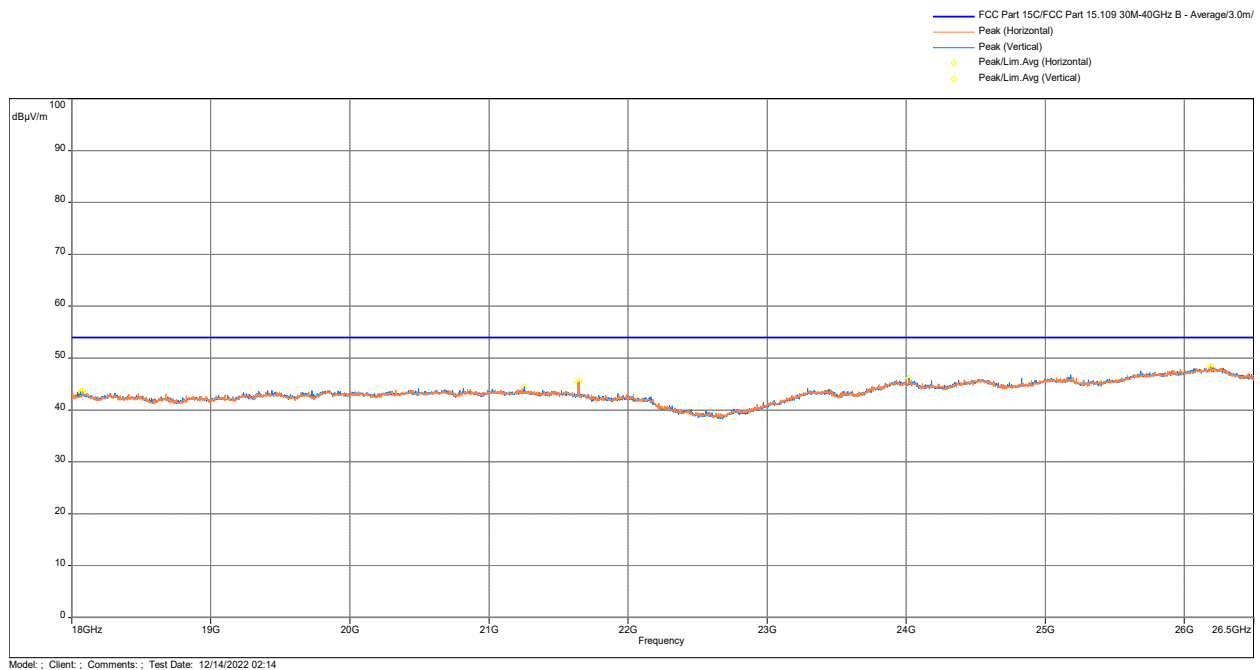
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan



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



Radiated Spurious Emissions 18 – 26.5 GHz, Avg Scan vs Avg Limit



Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2405MHz
OQPSK Mode

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
31.229	20.51	29.50	-8.99	2.00	137.00	Horizontal	-7.63
34.559	19.38	29.50	-10.12	3.00	224.25	Horizontal	-9.57
67.636	9.04	29.50	-20.46	3.00	261.50	Horizontal	-18.97
73.521	9.17	29.50	-20.33	0.98	339.25	Horizontal	-18.93
99.614	10.48	33.00	-22.52	2.00	215.50	Horizontal	-16.54
712.718	24.11	35.50	-11.39	3.00	156.25	Horizontal	-3.76

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7213.5	59.42	74	-14.58	1.99	330.5	Vertical	-4.81
7216.9	57	74	-17	2.01	333.25	Horizontal	-4.8
12022.8	56.58	74	-17.42	2.01	125.25	Horizontal	-0.24
12027.9	53.97	74	-20.03	2.99	334.75	Vertical	-0.23

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7213.5	52.25	54	-1.75	1.99	348.5	Vertical	-4.81
7216.9	51.69	54	-2.31	2.01	292.25	Horizontal	-4.81
12022.8	46.25	54	-7.75	2.01	56.25	Horizontal	-0.24
12027.9	44.26	54	-9.74	2.99	0	Vertical	-0.23

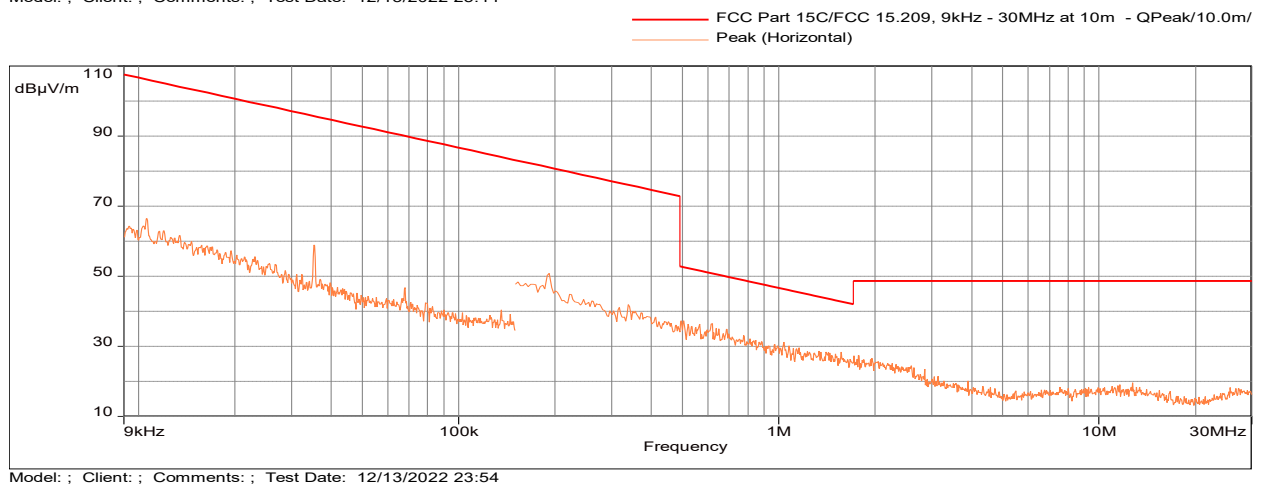
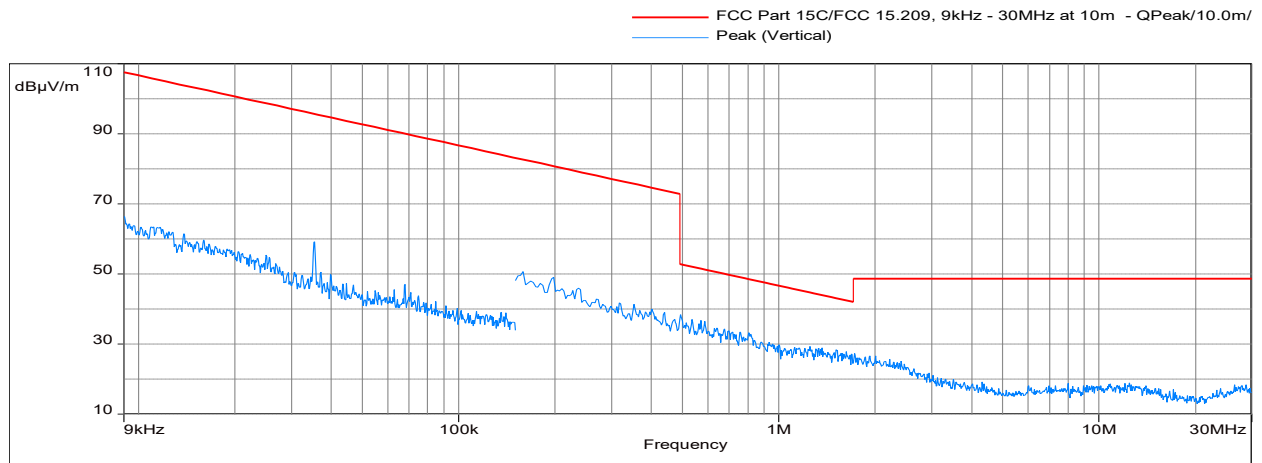
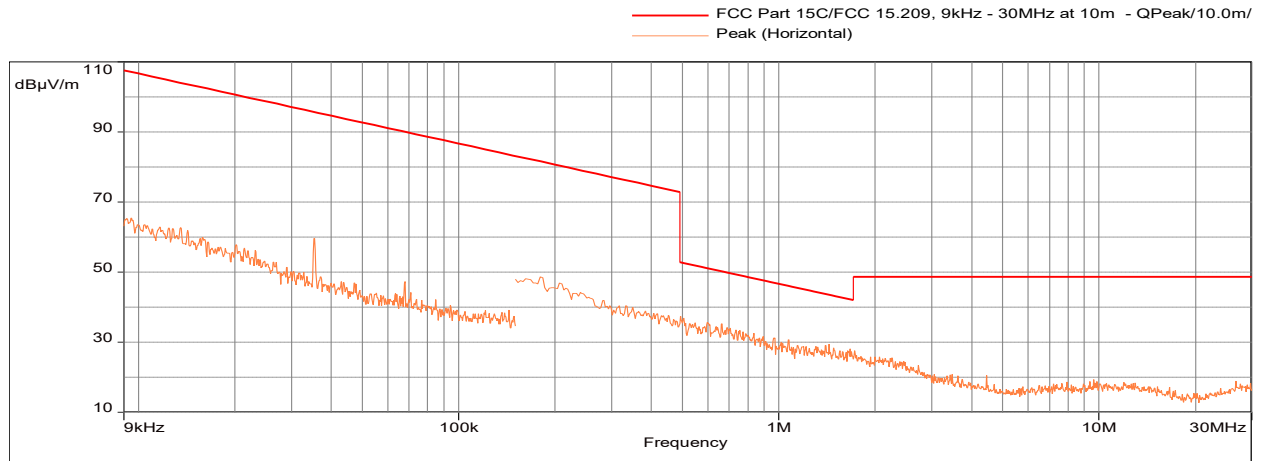
Note: Correction = AF + CF - Preamp

Note: The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at confidence level of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

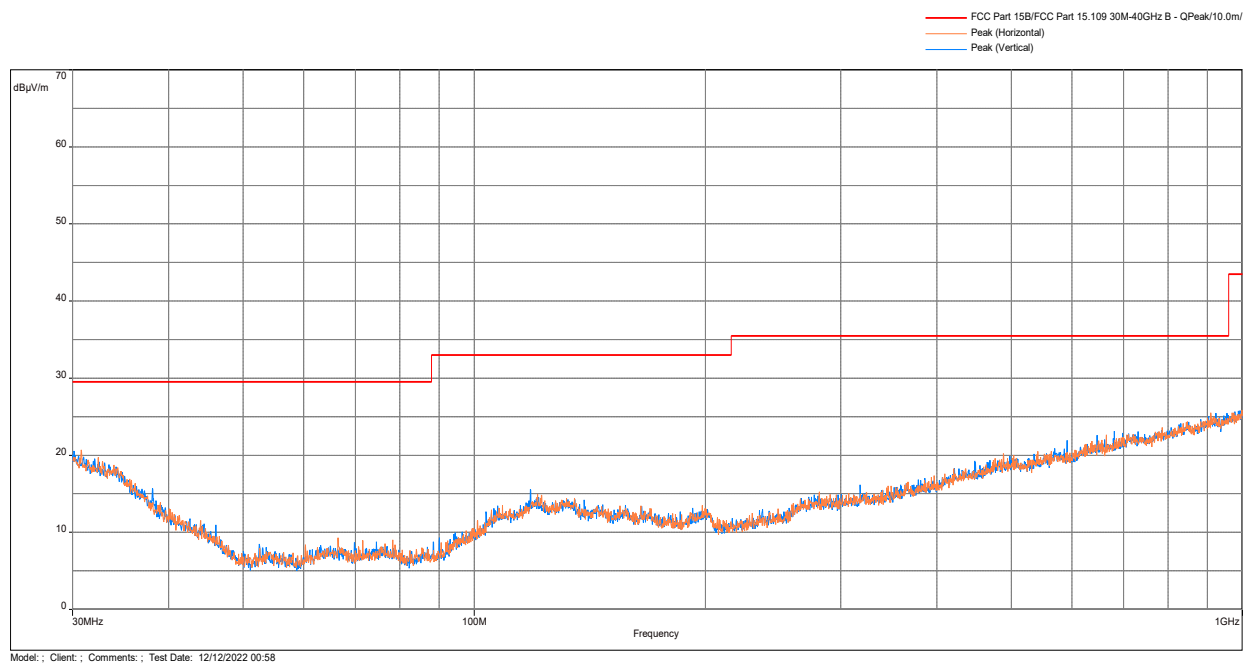
Results	Complies
----------------	-----------------

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

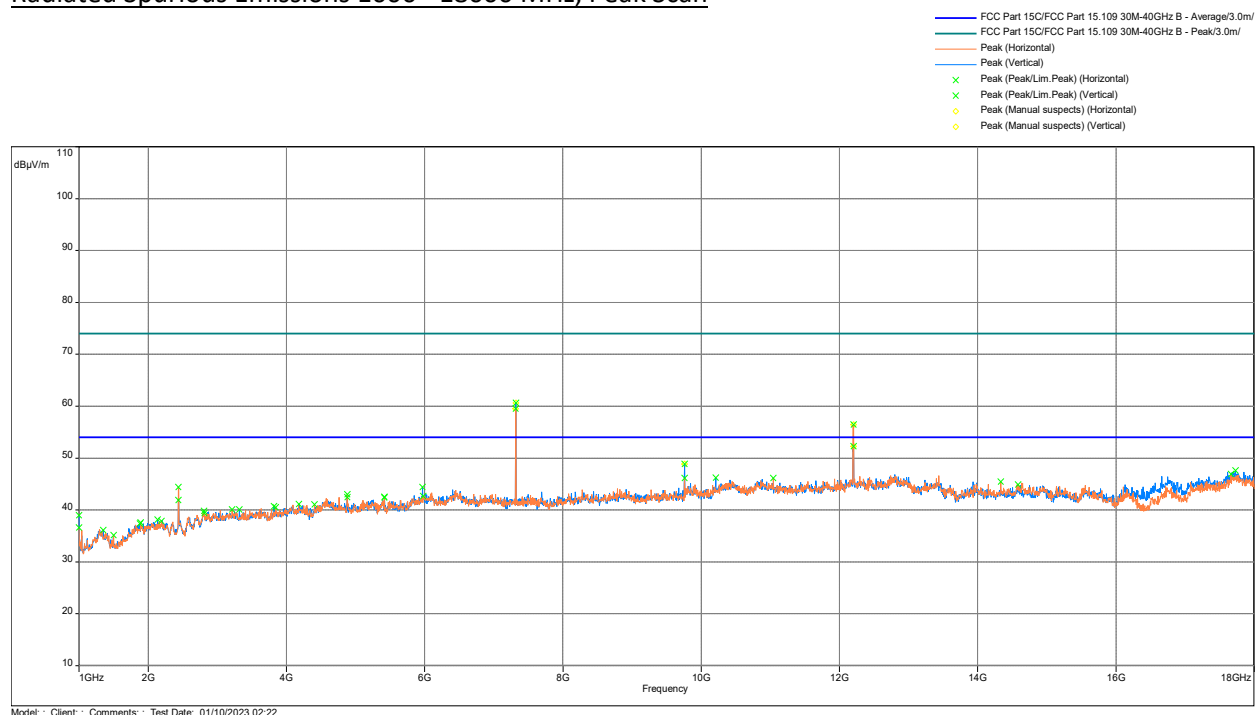
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



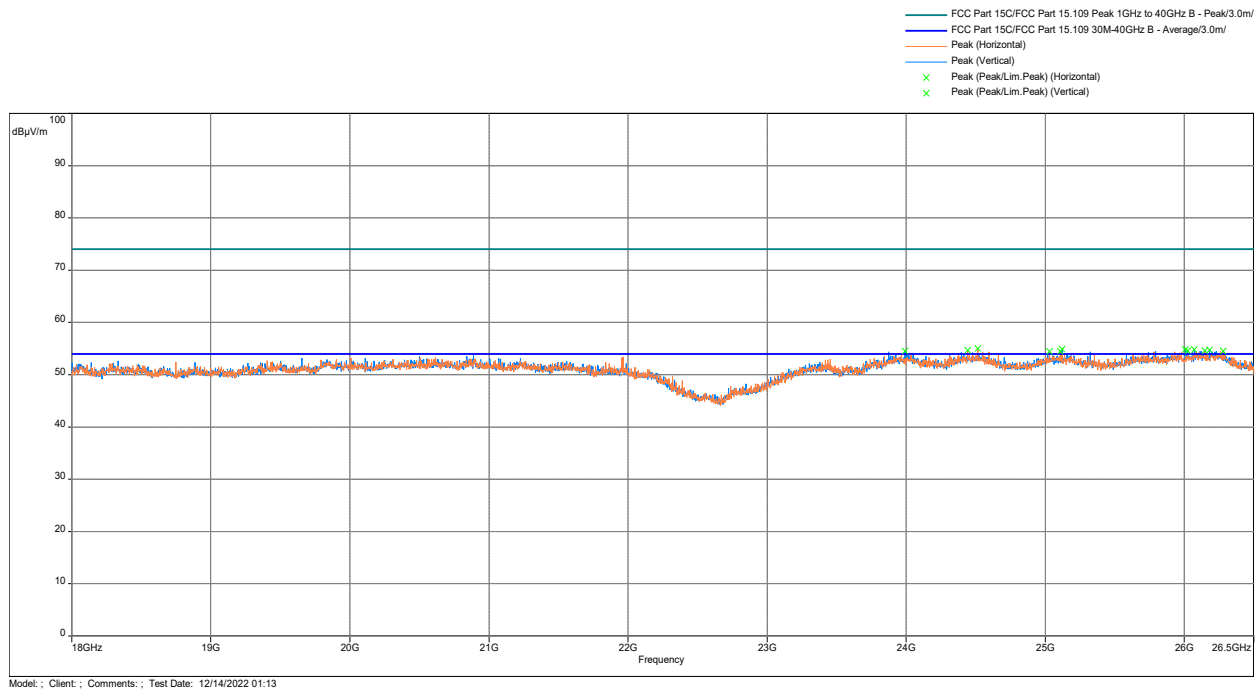
Radiated Spurious Emissions 30 MHz - 1000 MHz



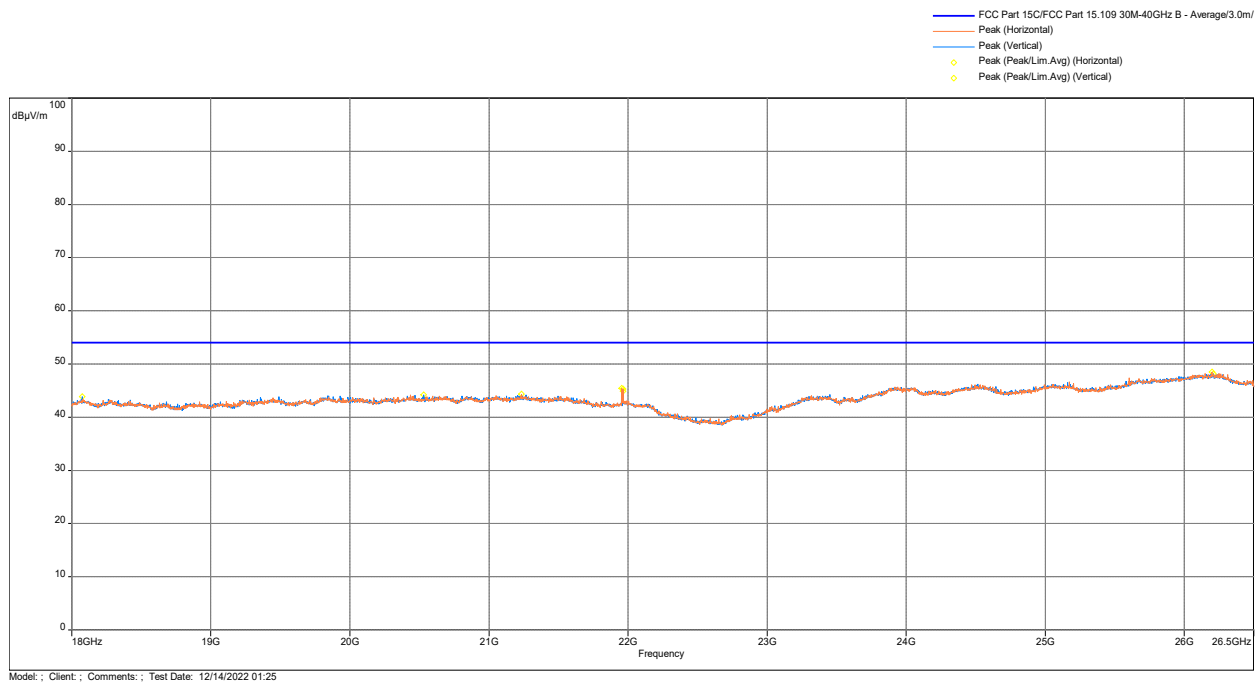
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan



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



Radiated Spurious Emissions 18 – 26.5 GHz, Avg Scan vs Avg Limit



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

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
30.776	20.69	29.50	-8.81	3.00	230.50	Horizontal	-7.17
66.504	9.32	29.50	-20.18	2.00	98.25	Horizontal	-19.03
78.338	9.00	29.50	-20.50	2.00	34.75	Horizontal	-19.22
99.678	10.56	33.00	-22.44	0.99	103.50	Horizontal	-16.52
664.962	22.68	35.5	-12.82	0.99	322.50	Horizontal	-4.74
710.746	22.74	35.5	-12.76	0.99	94.50	Horizontal	-3.73

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7318.333	59.52	74	-14.48	2.01	334.75	Horizontal	-4.52
12203	56.47	74	-17.53	2.01	143	Horizontal	-0.12
7321.733	60.64	74	-13.36	1.99	318.75	Vertical	-4.51
12203	52.26	74	-21.74	1.99	1	Vertical	-0.12

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7321.167	48.73	54	-5.27	2.18	250.75	Vertical	-4.52
7318.333	52.88	54	-1.12	3.01	314.5	Horizontal	-4.51
12203	47.14	54	-6.86	3.99	317	Vertical	-0.12
12203	47.64	54	-6.36	2.01	283.75	Horizontal	-0.12

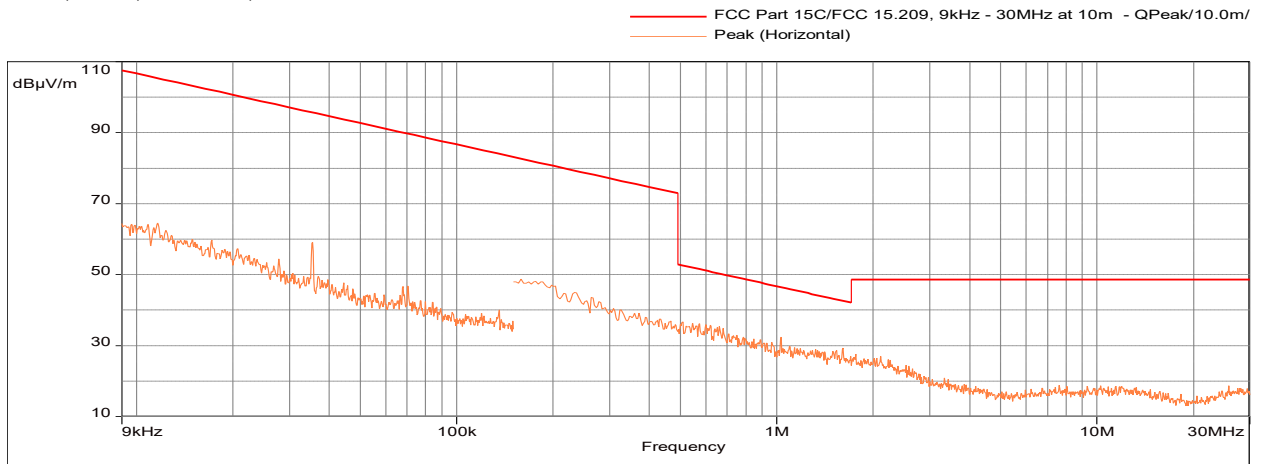
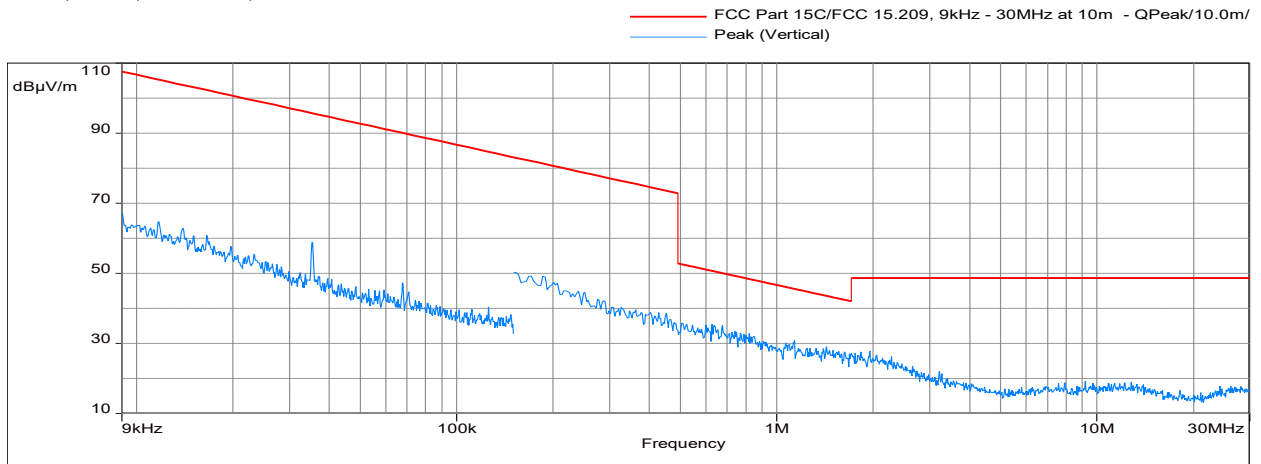
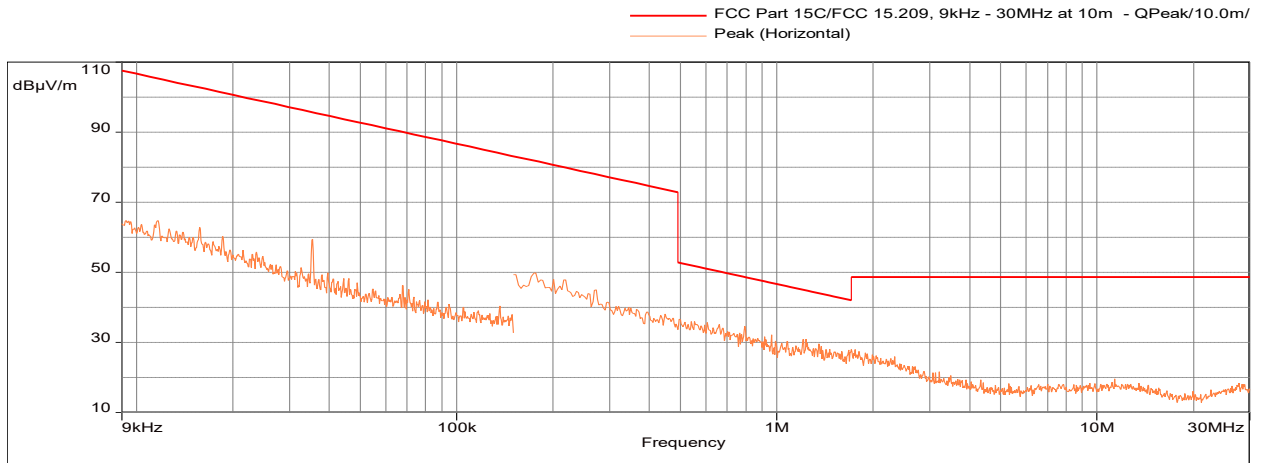
Note: Correction = AF + CF - Preamp

Note: The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at confidence level of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

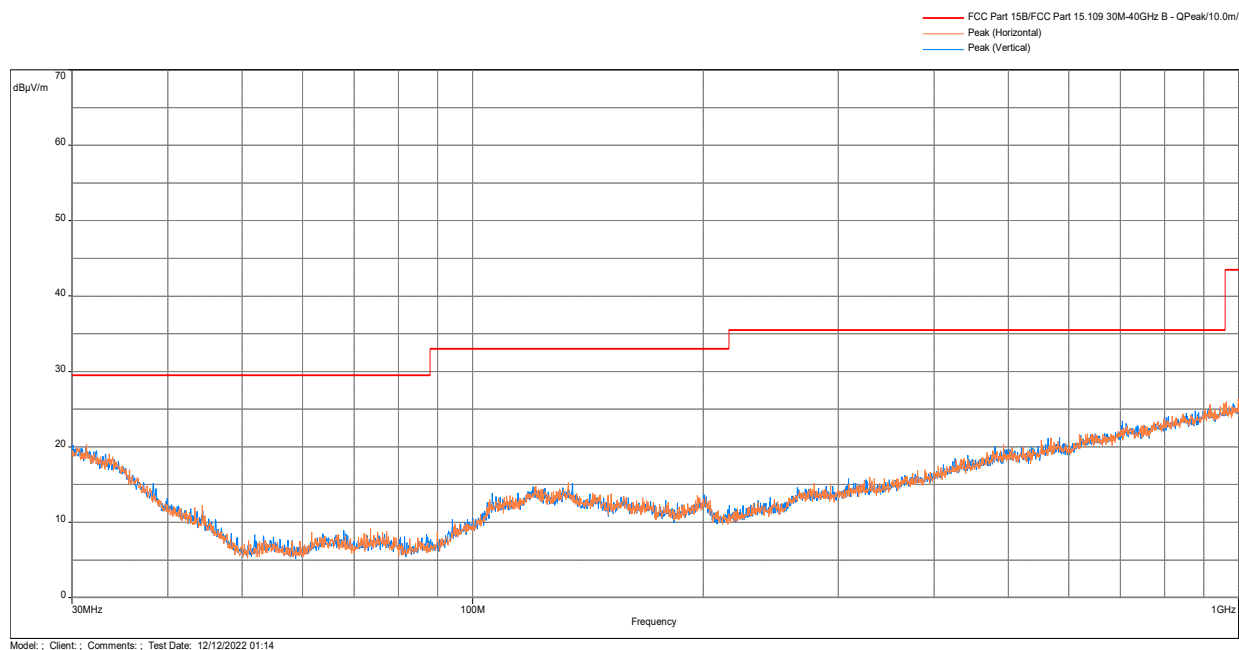
Results	Complies
----------------	-----------------

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

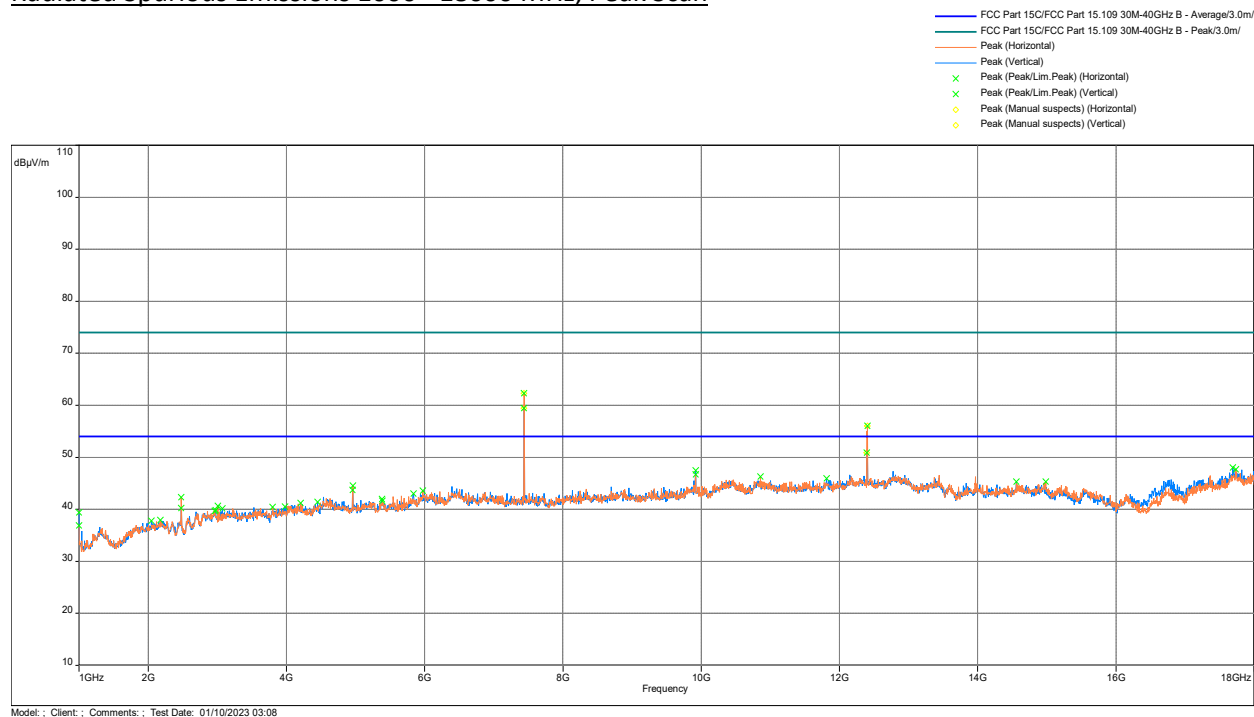
Radiated Spurious Emissions 9kHz - 30 MHz Parallel, Perpendicular & Horizontal Antenna Polarization



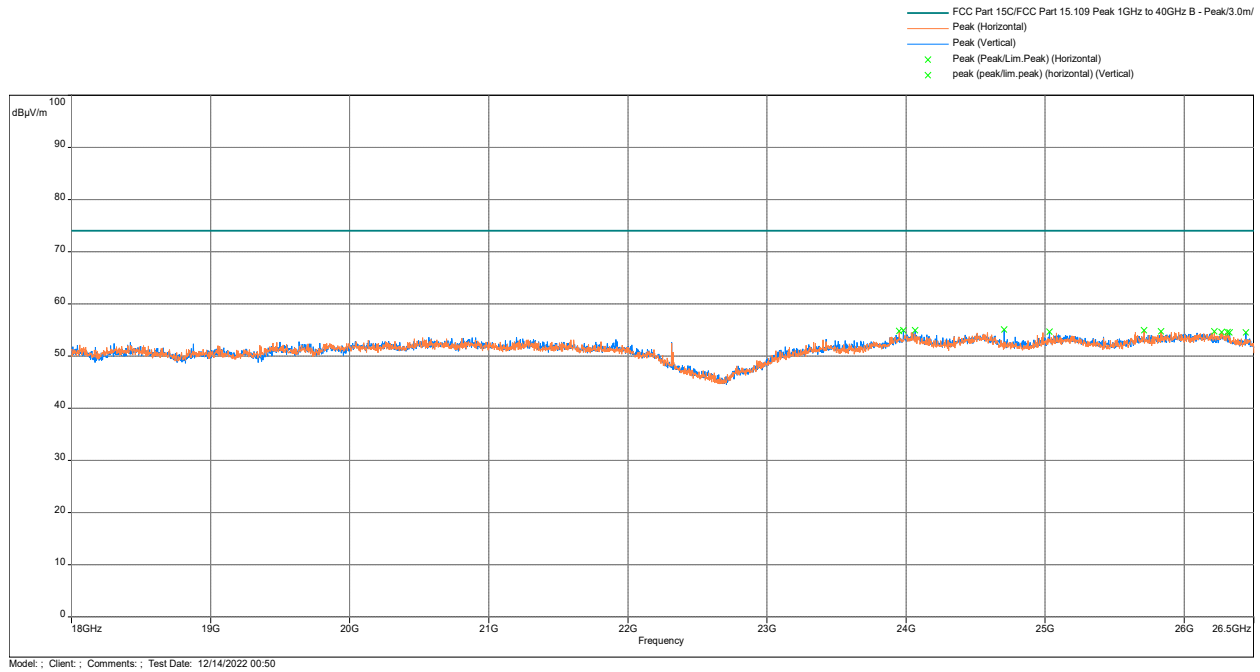
Radiated Spurious Emissions 30 MHz - 1000 MHz



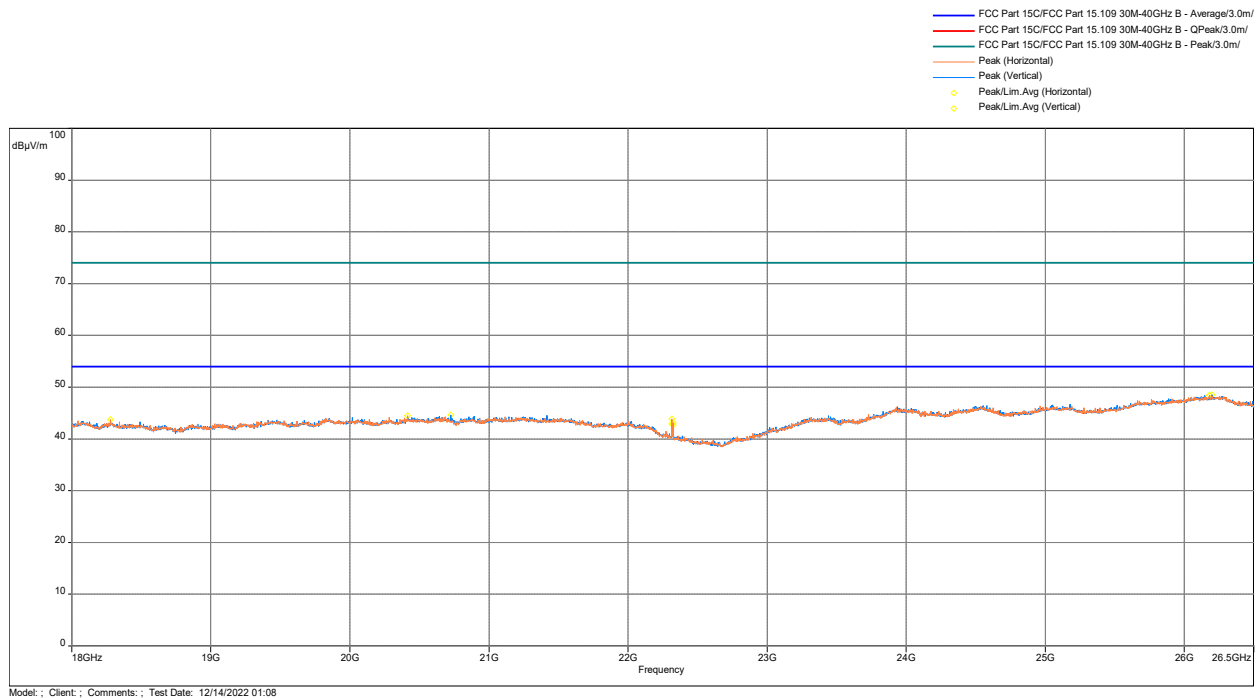
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan



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



Radiated Spurious Emissions 18 - 26 GHz, Avg Scan vs Avg Limit



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

Frequency (MHz)	QPeak@ 10m (dBμV/m)	Lim. QPeak @10m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
31.326	20.34	29.50	-9.16	2.00	162.50	Horizontal	-7.70
44.388	12.25	29.50	-17.25	3.00	319.00	Horizontal	-16.73
73.585	9.16	29.50	-20.34	3.59	292.25	Horizontal	-18.93
94.893	9.81	33.00	-23.19	0.99	136.50	Horizontal	-17.89
818.901	24.07	35.50	-11.43	2.00	278.00	Horizontal	-1.92
846.546	24.38	35.50	-11.12	2.00	120.25	Horizontal	-1.52

Note: Correction = AF + CF – Preamp

Frequency (MHz)	Peak @3m (dBμV/m)	Lim. Peak @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7438.467	62.32	74	-11.68	2.01	335.25	Horizontal	-4.06
12403.03	56.02	74	-17.98	2.01	127	Horizontal	0.03
7438.467	59.45	74	-14.55	1.99	327	Vertical	-4.06
12397.37	50.89	74	-23.11	1.99	334	Vertical	0.02

Note: Correction = AF + CF - Preamp

Frequency (MHz)	Ave @3m (dBμV/m)	Lim. Ave @3m (dBμV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
7438.467	53.89	54	-0.11	2.99	283.75	Horizontal	-4.06
7438.467	45.57	54	-8.43	1.88	270.5	Vertical	-4.06
12397.37	44.72	54	-9.28	2.01	24.25	Vertical	0.02
12403.03	47.59	54	-6.41	1.99	292.75	Horizontal	0.03

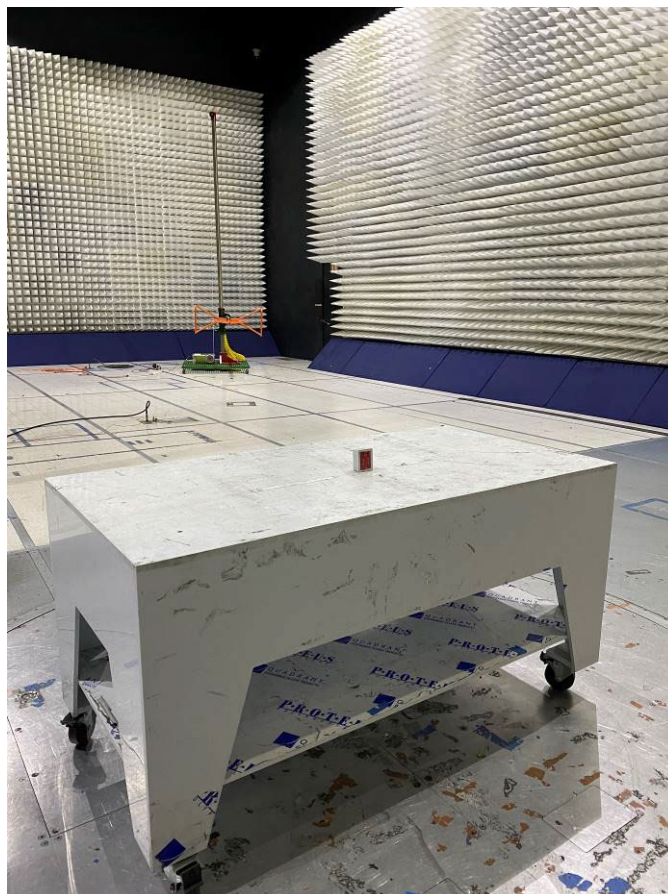
Note: Correction = AF + CF - Preamp

Note: The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at confidence level of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

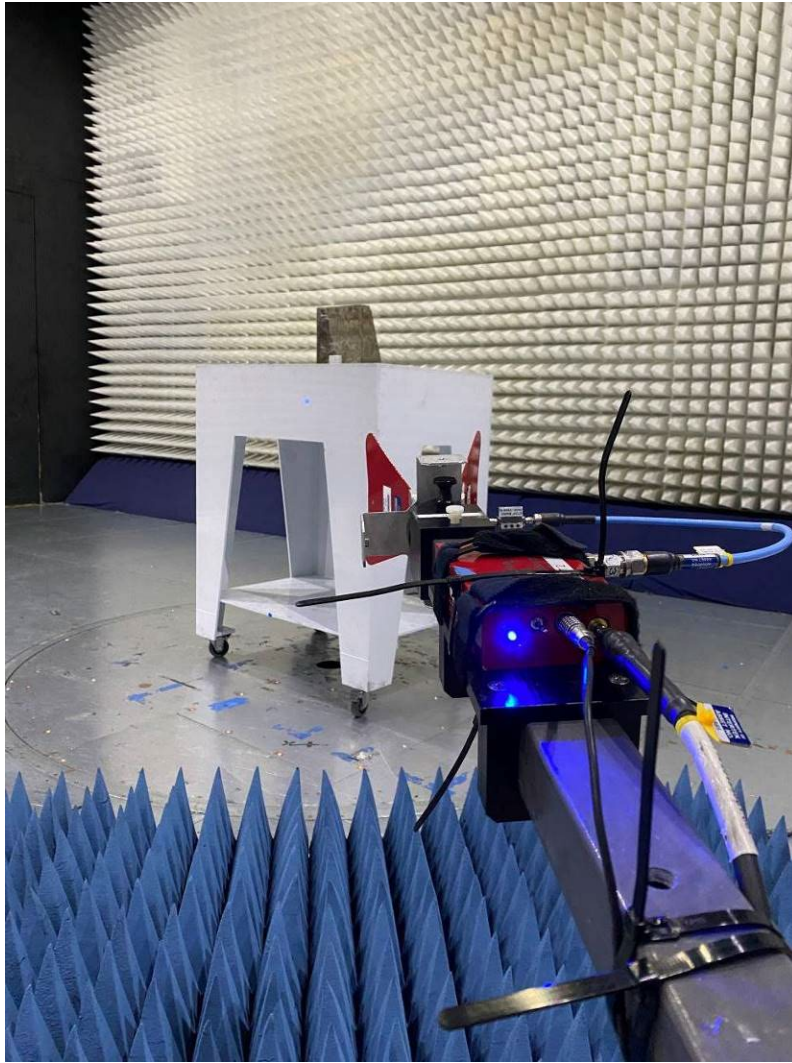
Results	Complies
----------------	-----------------

4.5.5 Test Setup Configuration

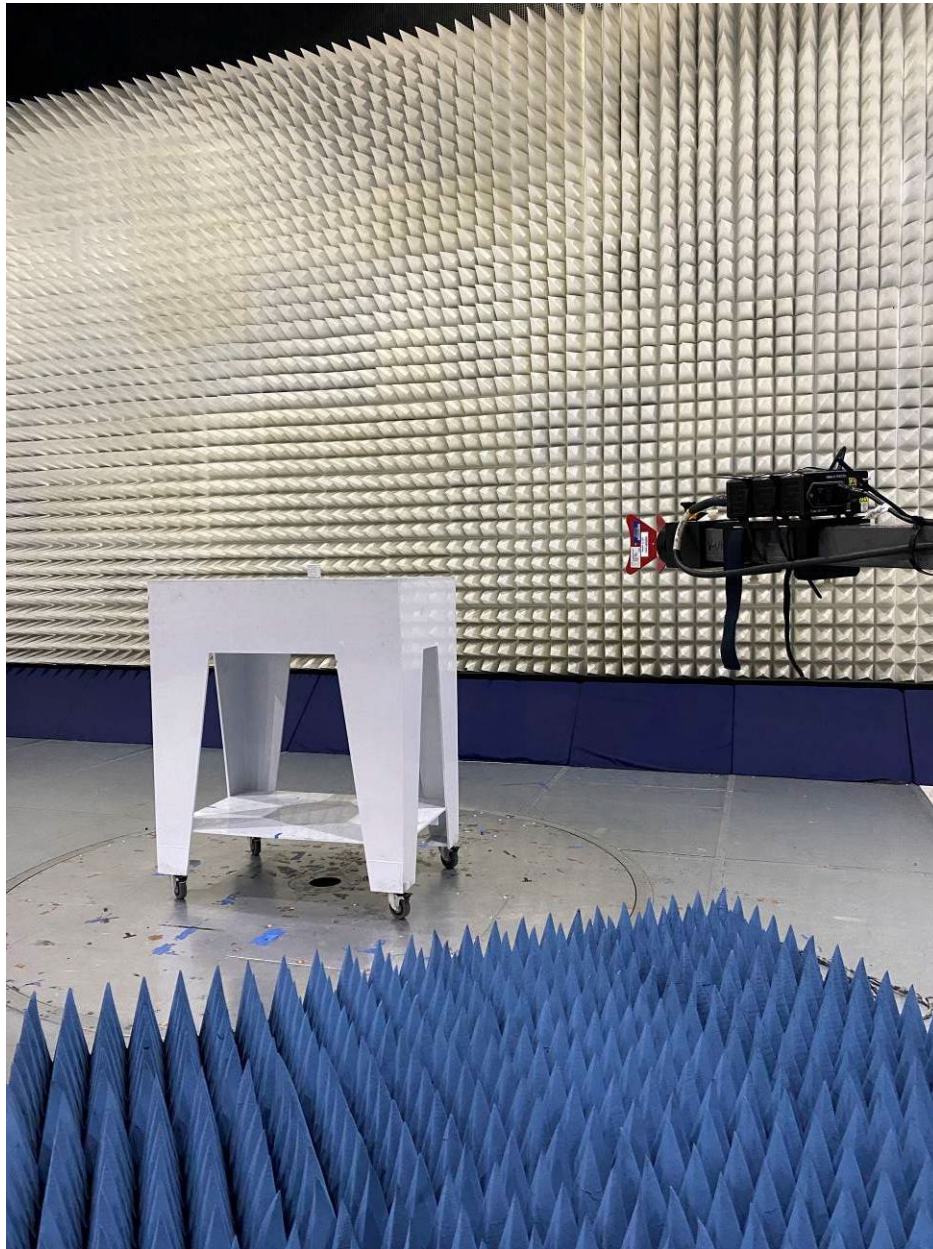
The following photographs show the testing configurations used.



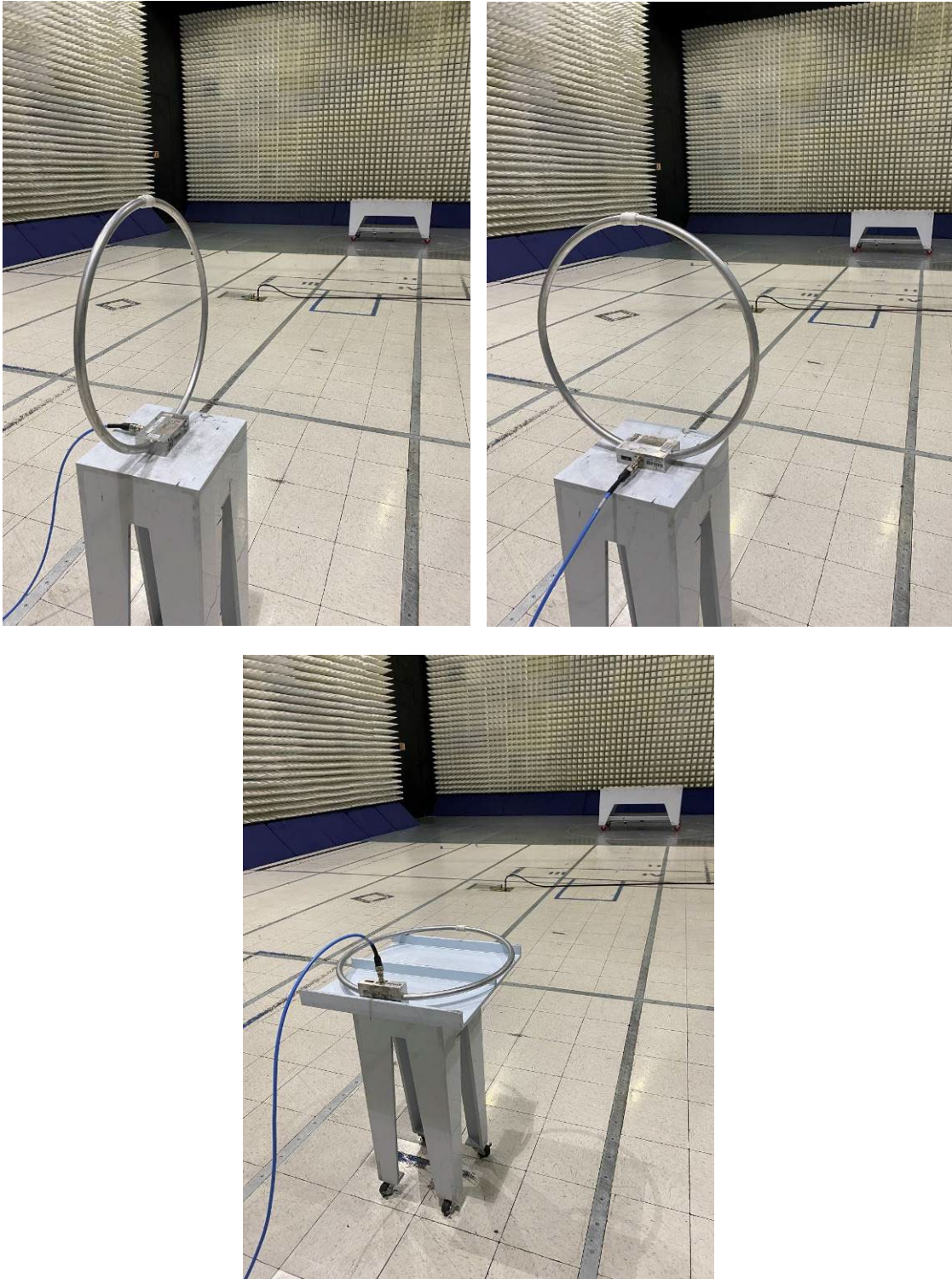
4.5.5 Test Setup Configuration (Continued)



4.5.5 Test Setup Configuration (Continued)



4.5.5 Test Setup Configuration (Continued)



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	03/10/23
Loop Antenna	EMCO	6512	ITS 001598	12	07/23/23
10m Semi-anechoic chamber	Panashield	10m Chamber	ITS 00984	36	07/29/23
Spectrum Analyzer 20hz-26.5ghz	Rohde & Schwarz	FSU	ITS 00913	12	05/17/2023
2Hz-43.5GHz Signal and Spectrum Analyzer	Rohde & Schwarz	FSW43	ITS 01818	12	07/19/2023
150kHz to 30MHz LISN	COM-POWER	LIN-115A	ITS 01289	12	07/18/2023
EMI Test Receiver	Rohde & Schwarz	ESR7	ITS 01607	12	11/17/2023
1-40GHz Passive Horn Antenna	ETS Lindgren	3116C	ITS 01776	12	11/01/2023
18-40GHz Preamp	uComp Nordic	MCNS-50-18004000335P	ITS 01799	12	03/24/2023
30MHz-2GHz Bi-Log Antenna	SunAR RF Motion	JB1	ITS 01577	12	02/10/2023
9kHz-1GHz Pre-amplifier	Sonoma Instrument	310N	ITS 01713	12	02/17/2023
10kHz-1GHz 2 meter RF Cable	TRU Corp.	TRU Core 300	ITS 01340	12	07/21/2023
1-18GHz Small Horn Antenna with Preamp	ETS Lindgren	3117-PA	ITS 01365	12	05/04/2023
Double-Ridged Waveguide Horn 1-18GHz (small horn)	ETS Lindgren	3115	ITS 00982	12	05/11/2023
1-40GHz RF Cable SMA to SMA SN# 1GVT420154801001	MEGA PHASE	EMC1-K1K1-236	ITS 01885	12	04/25/2023
1-18GHz 2 meter RF Cable SMA to N-Type	TRU Corp.	TRU Core 300	ITS 01320	12	09/20/2023

No Calibration required

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.23	Nexxiot.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 / G105220135	BT	ML	January 30, 2023	Original Release.

END OF REPORT