

Tekniam, LLC

TEST REPORT

SCOPE OF WORK

EMISSIONS TESTING – RUCS Distribution Module, Model: RDM21

REPORT NUMBER

104856862MPK-001

ISSUE DATE

February 25, 2022

[REVISED DATE]

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Class II Permissive Change TEST REPORT

Report Number: 104856862MPK-001

Project Number: G104856862

February 25, 2022

Testing performed on the
RUCS Distribution Module
Model: RDM21

FCC ID: 2A2SC-RDM21

to

FCC Part 15 Subpart C (15.247)

For

Tekniam, LLC

Test Performed by:

Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:

Tekniam, LLC
15501 W. 100th Terr
Lenexa, KS 66219 USA

Prepared by: _____

Minh Ly

Date: February 25, 2022

Reviewed by: _____


Krishna K Vemuri

Date: February 25, 2022

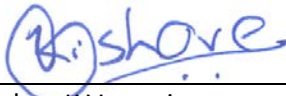
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Report No. 104856862MPK-001	
Equipment Under Test:	RUCS Distribution Module
Model Number:	RDM21
Applicant:	Tekniam, LLC
Contact:	Jamie Gilbert
Address:	Tekniam, LLC 15501 W. 100th Terr Lenexa, KS 66219
Country:	USA
Tel. Number:	(563) 449-2998
Email:	Jgilbert@gbasi.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247)
Date of Test:	December 28, 2021 – Feb 04, 2022

We attest to the accuracy of this report:



Minh Ly
Senior Project Engineer



Krishna K Vemuri
EMC Manager

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1.0 Summary of Tests

Test	Reference FCC	Result
RF Output Power	15.247(b)(3)	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	Complies
AC Line Conducted Emission	15.207	Complies
Antenna Requirement	15.203	Complies. The EUT is for professional installation only.

EUT receive date: December 15, 2021

EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

Test start date: December 28, 2021

Test completion date: February 04, 2022

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

2.0 General Information

2.1 Product Description

Tekniam, LLC supplied the following description of the EUT:

The RUCS Distribution Module (DM) is a high-power, ruggedized, outdoor meshing access point designed for the connection to and extension of existing IP networks and internet services. DMs are connected to the internet through an existing router, or via a RUCS Portable Communications Link (PCL), and then mounted outside in a high location for maximum range.

For 2.4GHz radio module, only 802.11n is enable. All legacy mode and others are disabled by software. For 5GHz radio module, only 802.11ac is enable. All legacy mode and others are disabled by software.

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

The EUT supports a wide range of data rates in the 2.4GHz band:

IEEE 802.11n 20MHz

IEEE 802.11n 40MHz

This test report covers only the 2.4GHz WiFi radio. Information about the WiFi radio is presented below:

Radio Information	
Applicant	Tekniam, LLC
Model Number	RDM21
FCC Identifier	2A2SC-RDM21
Modulation Technique	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Rated RF Output	802.11n 20MHz: 27.41 dBm 802.11n 40MHz: 21.61 dBm
Frequency Range	2412 – 2462 MHz, 802.11n
Type of modulation	BPSK, QPSK, 16QAM, 64QAM
Number of Channel(s)	11 for 802.11n HT20
Antenna(s) & Gain	Omni Antenna, Gain: +7.0 dBi
Applicant Name & Address	Tekniam, LLC 15501 W. 100th Terr Lenexa, KS 66219 USA

The EUT supports the following configurations:

Channels in 2.4 GHz band			
Channel no.	Frequency (MHz)	IEEE 802.11n HT 20 mode	
1	2412	√	X
2	2417	√	
3	2422	√	
4	2427	√	
5	2432	√	
6	2437	√	X
7	2442	√	
8	2447	√	
9	2452	√	
10	2457	√	
11	2462	√	X

√ = available

X = to be tested

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).

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

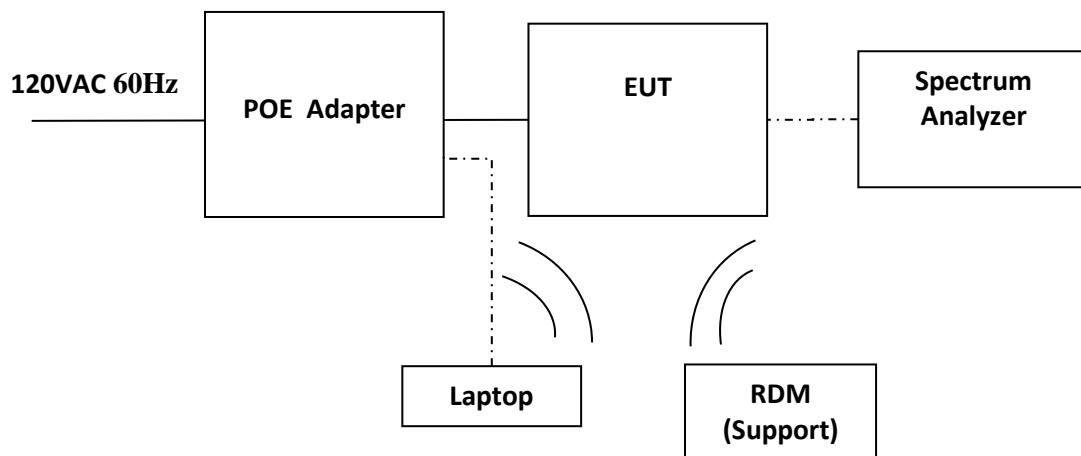
3.1 Support Equipment and description

Support Equipment		
Description	Manufacturer	Model No./ Serial No.
Laptop	Lenovo	IdeaPad 3
RUCS Distribution Module (2 nd unit)	Tekniam, LLC	RDM21/ 70F503

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
RUCS Distribution Module (RDM)	Tekniam, LLC	RDM21	27F786
POE Adapter	Alfa Network	APOE48v-1G	2003-0000451

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



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

EUT Photos



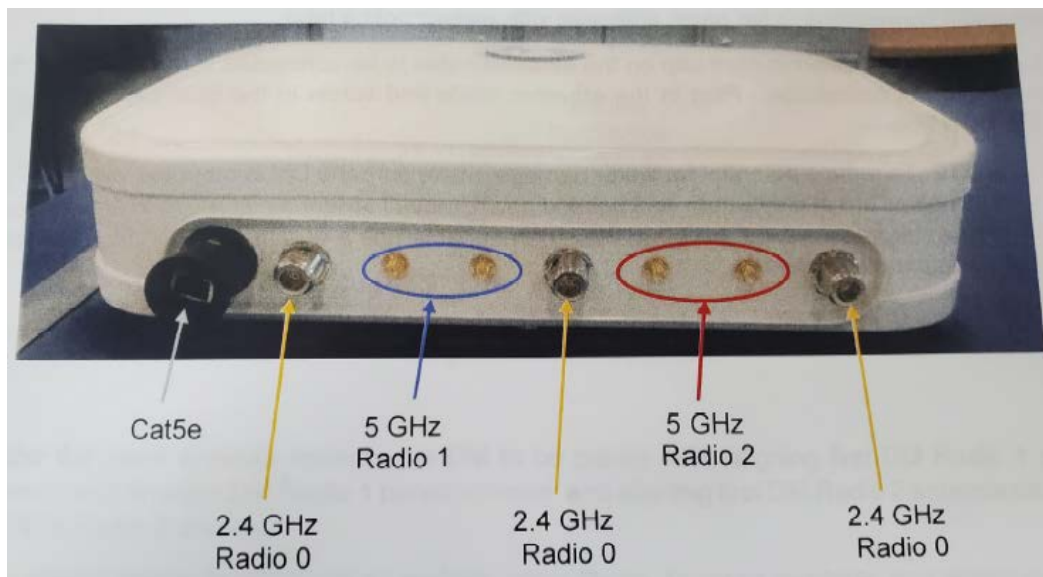
3.3 Justification

Preliminary testing was performed for all modulation/data rate modes. The worse-case data rate with highest power and widest spectrum were selected for final measurements:

OFDM MCS0 – for 802.11n

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

Class II permissive change testing was performed based on Radio Module, Model: DR900VX (FCC ID: 2AG7VDR900VX). Three modules, model: DR900VX, were installed inside the RDM21 with radio 0 operates as a 3x3 MIMO at 2.4GHz, radio 1 operates as a 2x2 MIMO at 5GHz (U-NII 1) and radio 2 operates as a 2x2 MIMO at 5GHz (U-NII 3). The 2.4GHz radio has the Omni antenna with antenna gain of 7dBi and the 5GHz radio has the panel antenna with antenna gain of 12dBi.



3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Tekniam, LLC

3.5 Mode of Operation During Test

During transmitter testing, the transmitter was setup to transmit continuously using the maximum RF power setting provided by the manufacturers via test scripts. The corresponding output power in dBm can be found in section 4.2 of this report.

The table below reflects the RF power setting needed to be compliant with radiated restricted band edge requirements of 15.205 & 15.209.

Channels	802.11n HT20	802.11n HT40
1 - 11	19	14

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 Maximum Conducted Output Power at Antenna Terminals FCC Rule: 15.247(b)(3)

4.1.1 Requirement

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

4.1.2 Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer to measure the Maximum Conducted Transmitter Output Power. The offset programmed on the analyzer is corrected to include cable loss, attenuator.

The procedure described in FCC Publication KDB 558074 D01 Meas Guidance v05r02 was used. Specifically, section 8.3.1.3 PKPM1 Peak-reading power meter method

Tested By	Test Date
Minh Ly	January 29, 2022

4.1.3 Test Result

Refer to the following plots for the test result:

Mode	Channel	Frequency	Output Power Ant 1	Output Power Ant 2	Output Power Ant 3	Antenna Gain	Output Power Sum	Output Power Limit
		MHz	dBm	dBm	dBm	dB	dBm	dBm
802.11n HT20	Low	2412	22.72	22.81	22.39	7	27.41	29
	Mid	2437	20.74	22.27	22.41	7	26.64	29
	High	2462	21.21	21.22	21.43	7	26.05	29
802.11n HT40	Low (1)	2422	16.79	16.61	17.10	7	21.61	29
	Mid (4)	2437	16.46	16.76	17.07	7	21.54	29
	High (11)	2452	16.34	16.80	17.02	7	21.50	29

Note: the output power limit is reduced by 1dBm due to the directional gain of the antenna exceeded 6dBi.

4.2 Transmitter Radiated Emissions FCC Rules: 15.247(d), 15.209, 15.205

4.2.1 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.

4.2.2 Procedure – Radiated Emissions

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.

For average measurement in the lower restricted band, the procedure described in ANSI C63.10: 2013 Section 11.12.2.5.3 was used. For average measurement in the higher restricted band (2483.5MHz – 2500MHz), the integration method of ANSI C63.4, Section 11.13.3.5 was used.

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 30MHz to 26GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average limits for 1GHz – 26GHz.

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.

ANSI C63.10-2013; 5.6.2.2

Determining worst-case mode for Spurious emissions:

Measure the mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum).

The highest output power were found in 802.11ac 20MHz, therefore Spurious emissions were measured using 802.11ac 20MHz bandwidth.

4.2.3 Field Strength Calculation

Field Strength Calculation

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

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

Where FS = Field Strength in dB(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 = Com

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

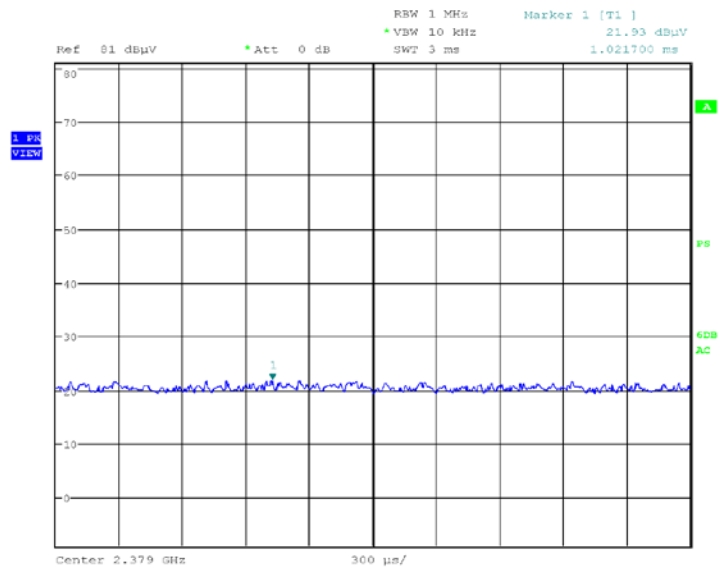
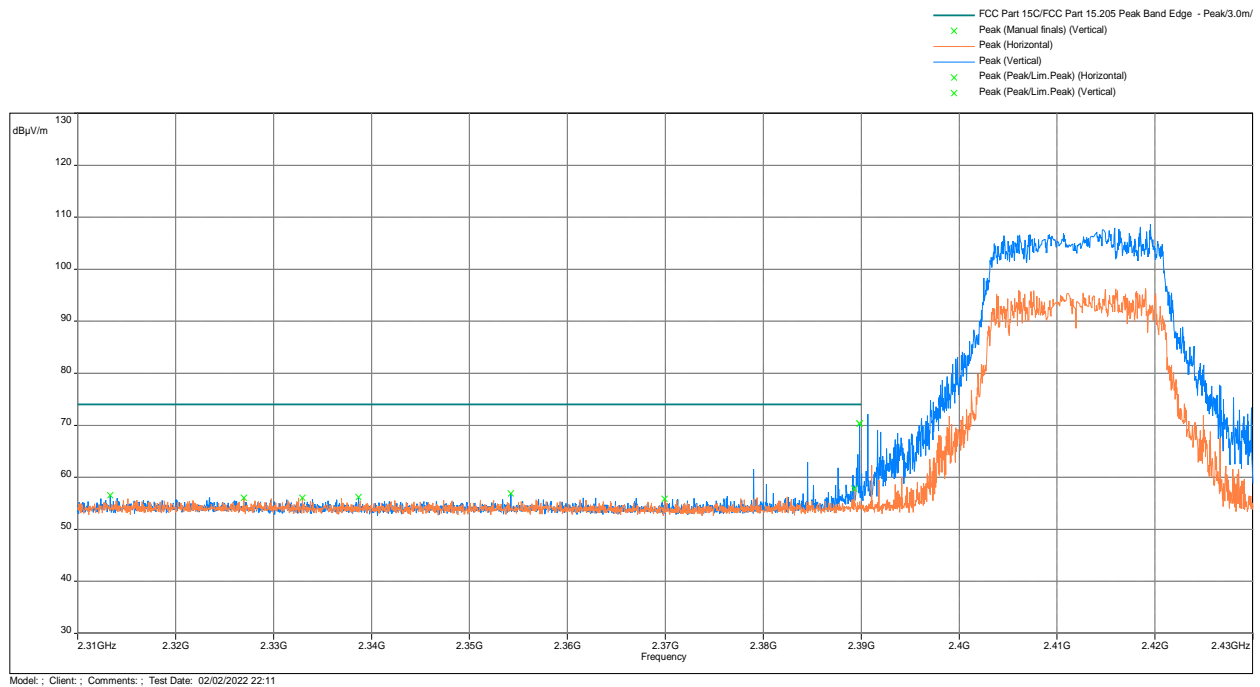
4.2.4 Test Results

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

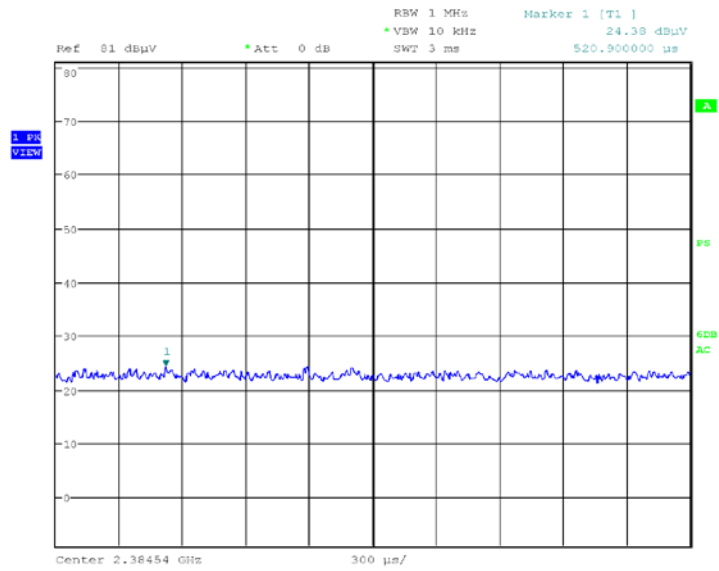
Tested By	Test Date
Minh Ly	January 29 – February 04, 2022

Test Results: 15.209/15.205 Radiated Restricted Band Emissions

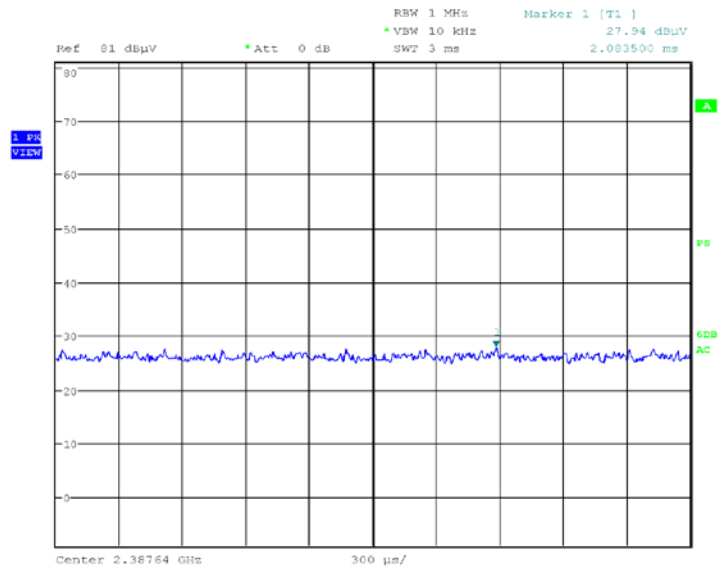
**Out-of-Band Spurious Emissions at the Band Edge @1m distance
802.11n HT20, 2412 MHz, Peak**



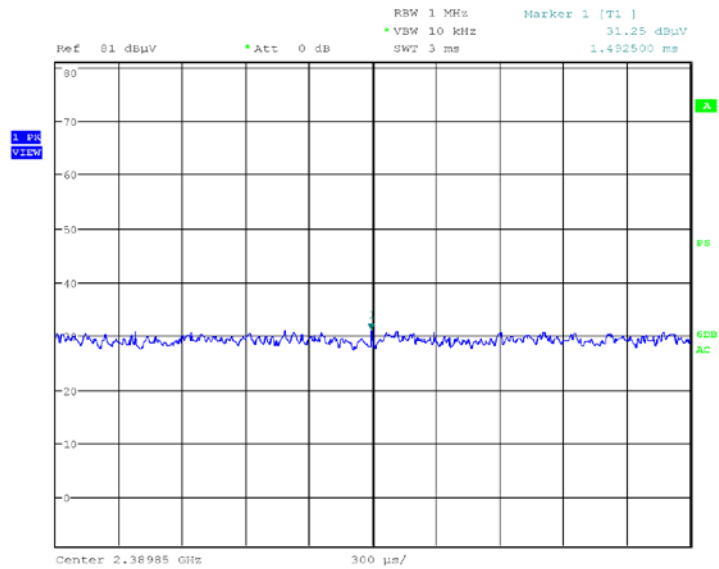
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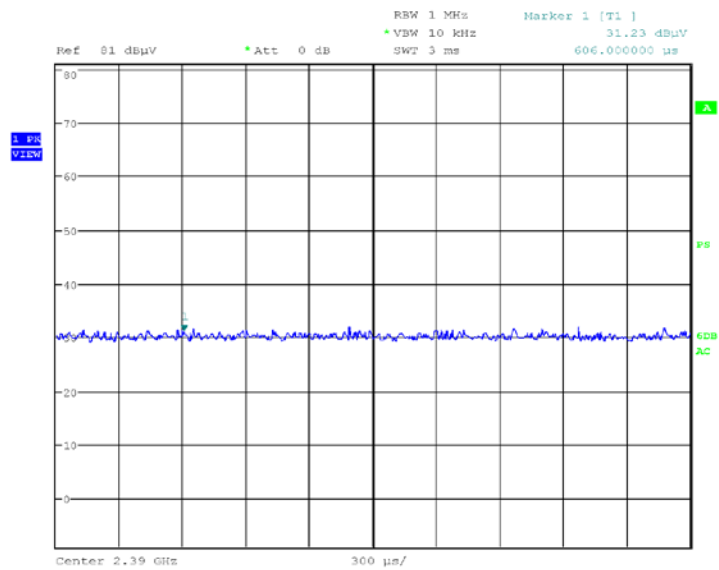
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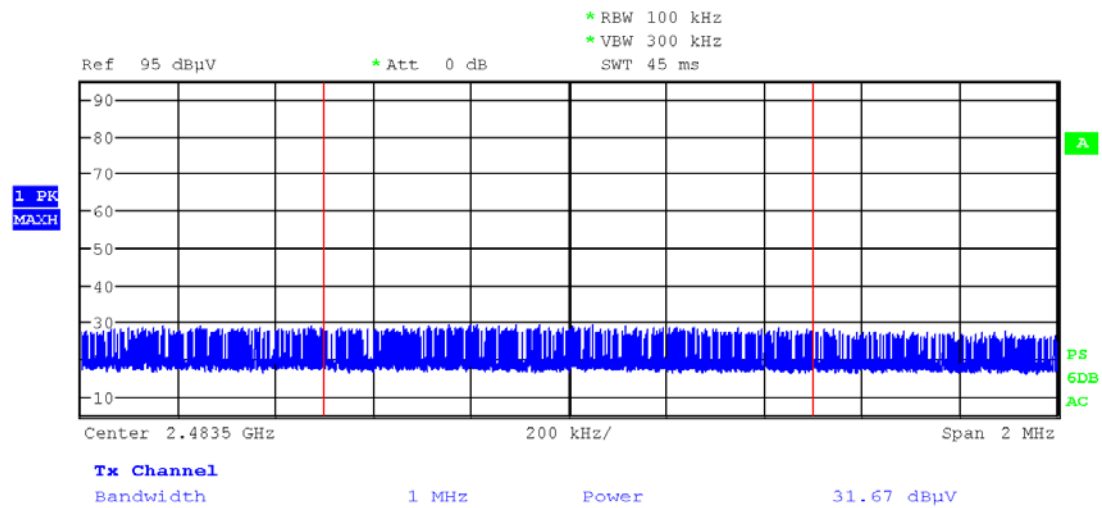
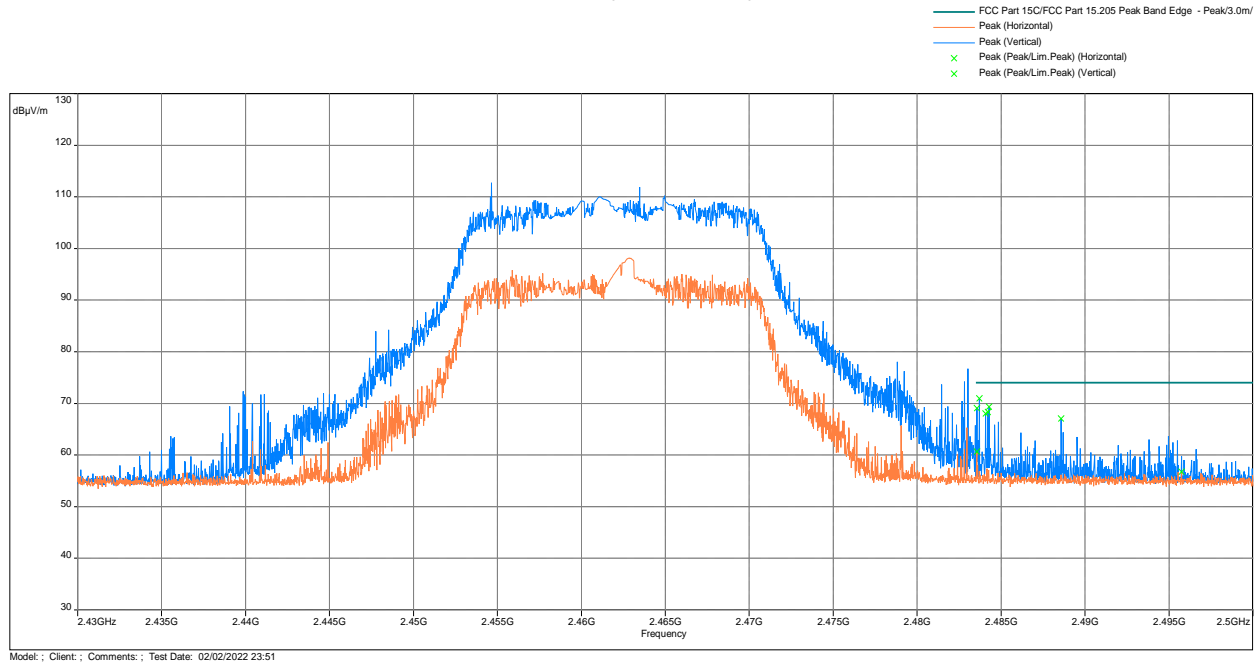


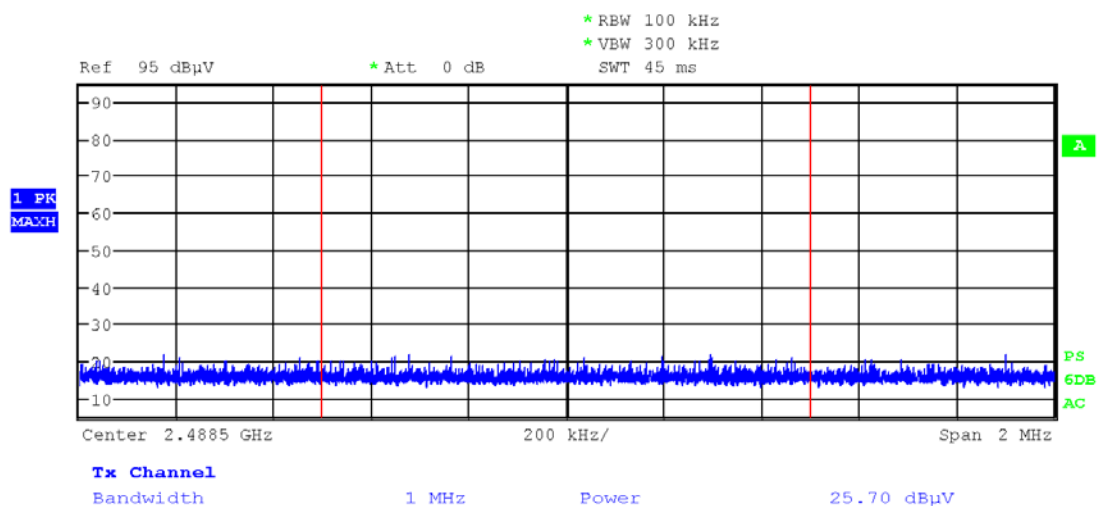
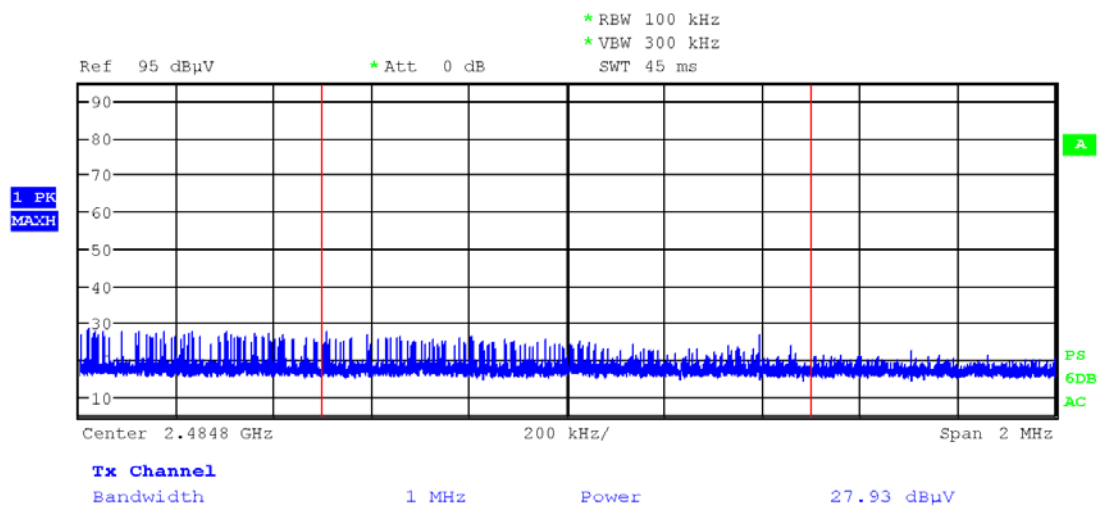
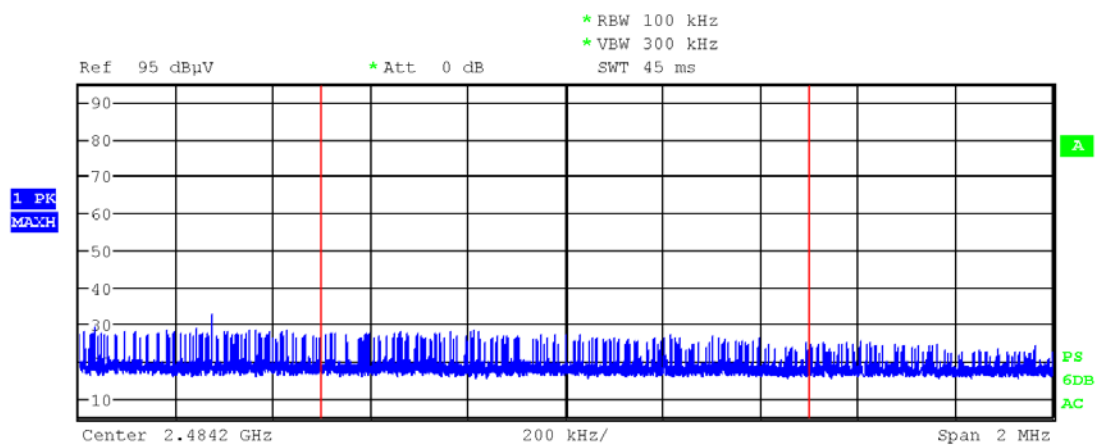
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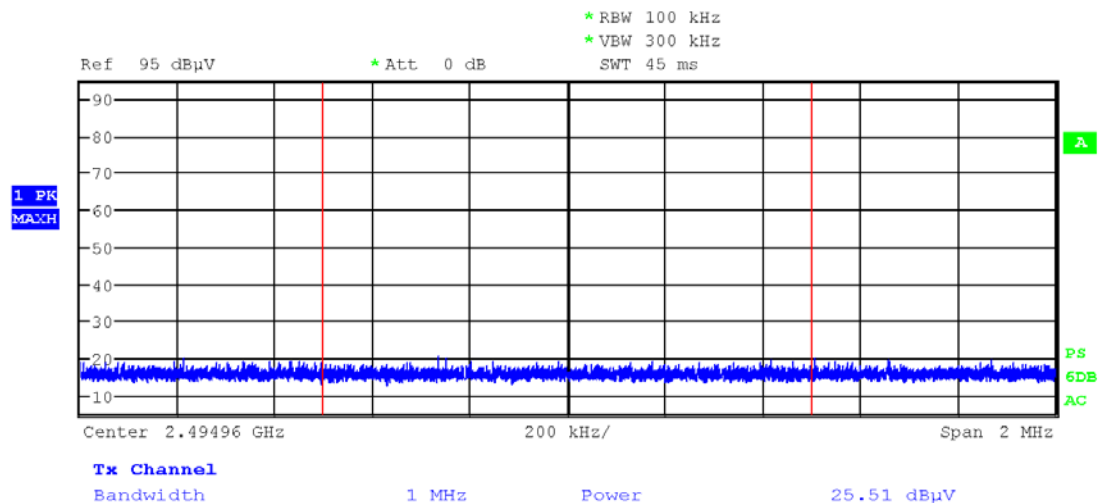
Freq. MHz	Ave@3m dB(μV/m)	Ave Limit dB(μV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB	Raw
2379.0	43.3	54.0	-10.7	2.0	326	Vertical	21.4	21.9
2384.5	45.8	54.0	-8.2	1.8	286	Vertical	21.4	24.4
2387.6	49.3	54.0	-4.7	2.1	286	Vertical	21.4	27.9
2390.0	52.7	54.0	-1.3	1.9	0	Vertical	21.5	31.2

Note: All other emissions investigated are only noise-floor and they were 10dB below the average limits.

Out-of-Band Spurious Emissions at the Band Edge @1m distance 802.11n HT20, 2462 MHz, Peak



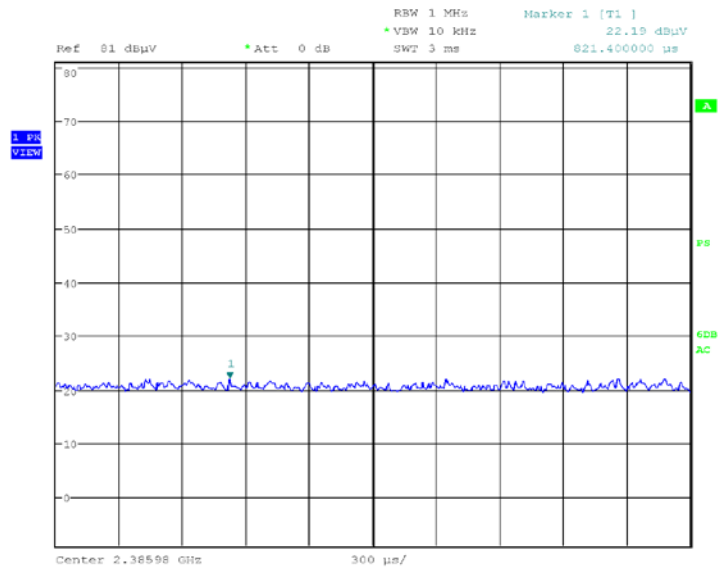
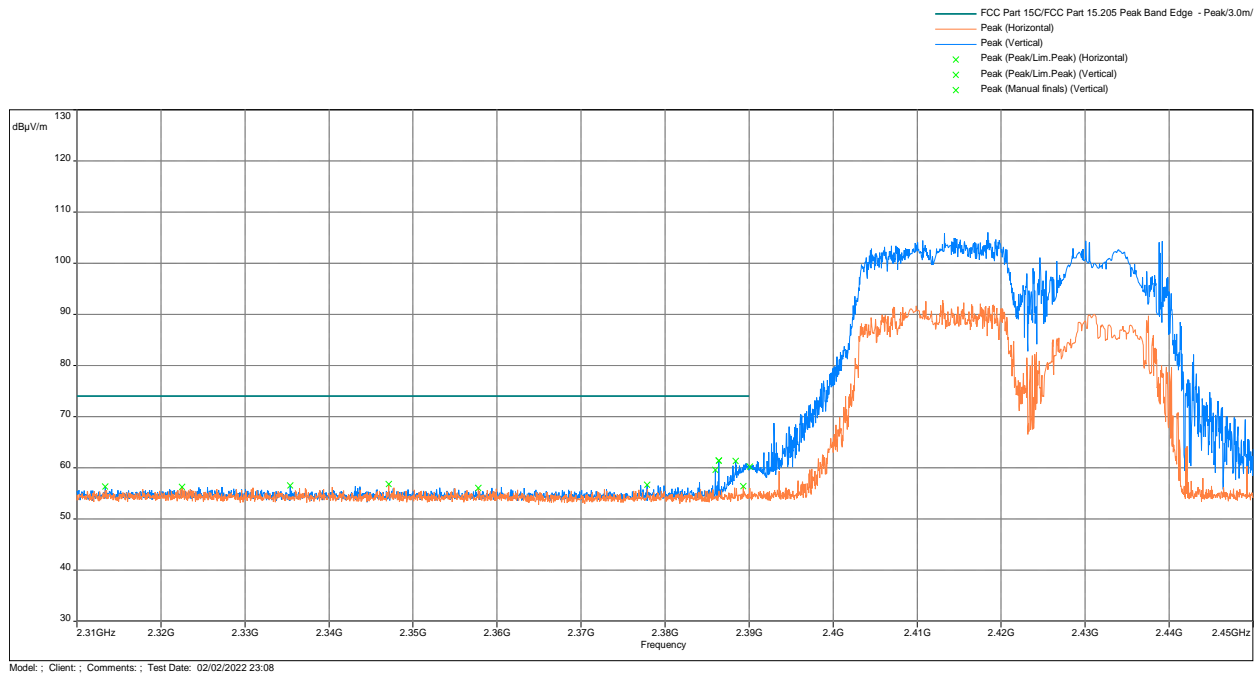




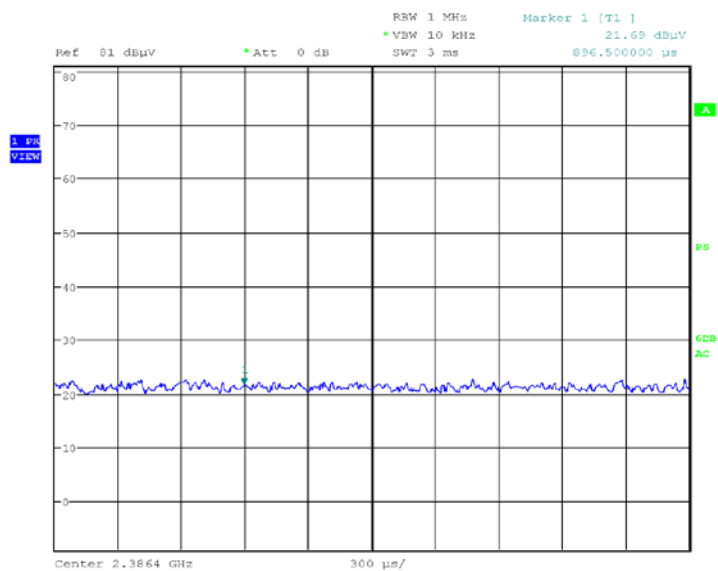
Freq. MHz	Ave@3m dB(μV/m)	Ave Limit dB(μV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB	Raw
2483.5	53.5	54.0	-0.5	1.5	302	Vertical	21.8	31.7
2484.2	50.9	54.0	-3.1	1.6	302	Vertical	21.8	29.1
2484.8	49.7	54.0	-4.3	1.6	0	Vertical	21.8	27.9
2488.5	47.4	54.0	-6.6	2.0	327	Vertical	21.7	25.7
2495.0	47.1	54.0	-6.9	1.9	294	Vertical	21.6	25.5

Note: All other emissions investigated are only noise-floor and they were 10dB below the average limits.

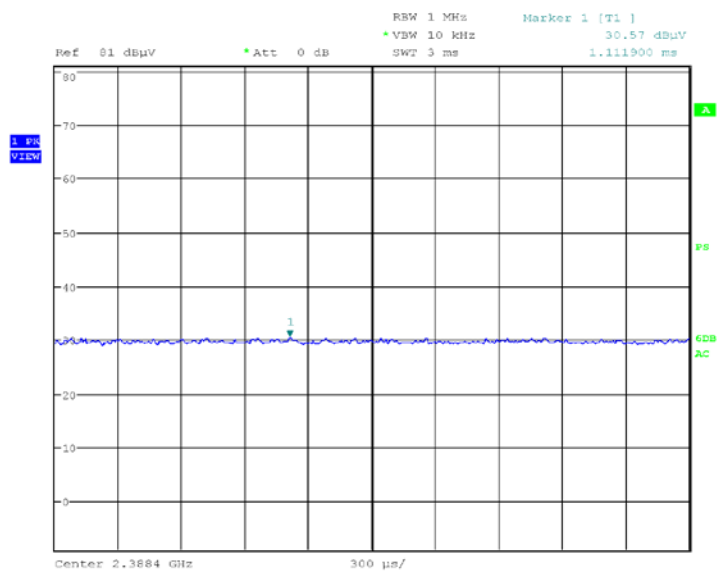
Out-of-Band Spurious Emissions at the Band Edge @1m distance 802.11n HT40, 2422 MHz, Peak



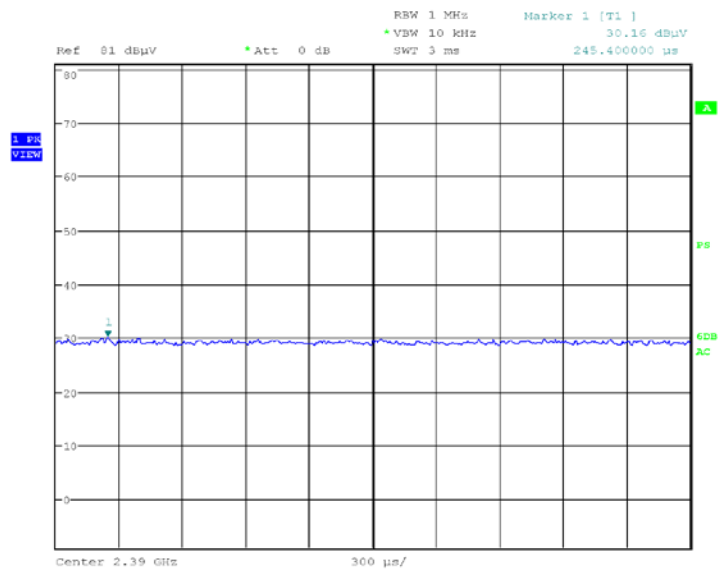
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Date: 3.FEB.2022 23:06:09



Date: 3.FEB.2022 23:03:45

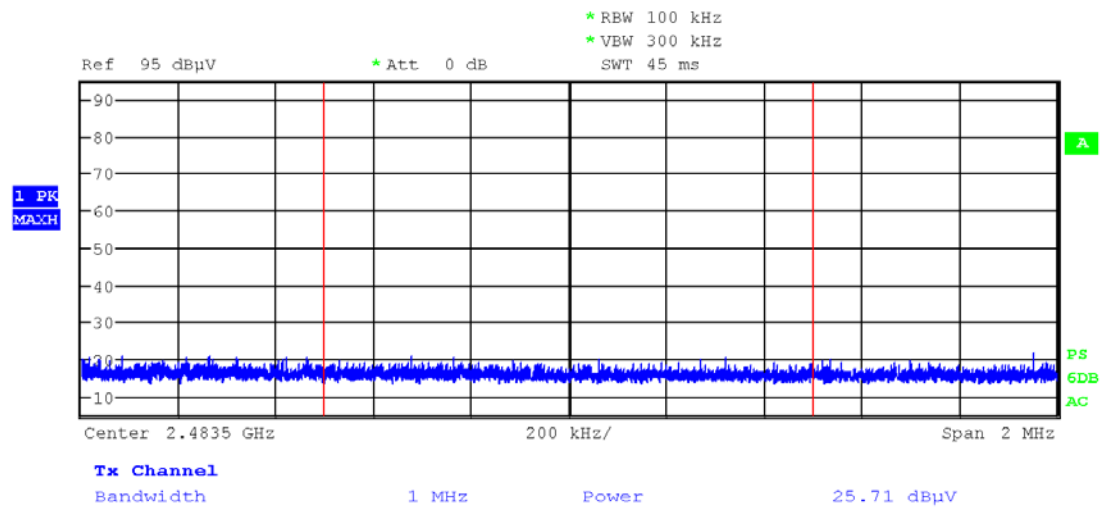
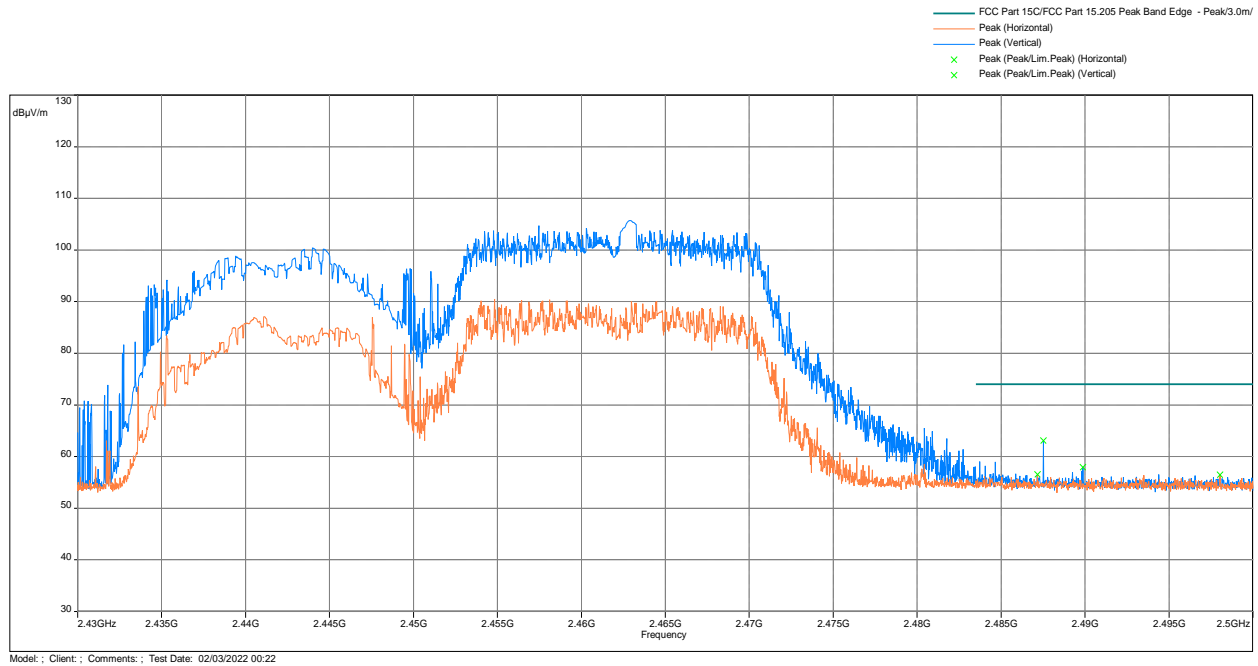


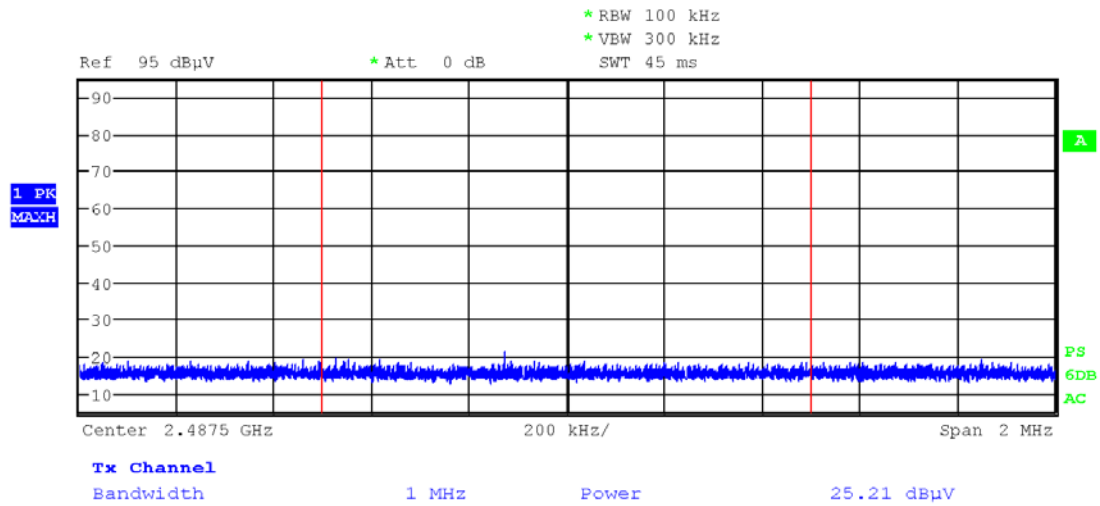
Date: 3.FEB.2022 23:02:23

Freq. MHz	Ave@3m dB(μV/m)	Ave Limit dB(μV/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB	Raw
2386.0	43.6	54.0	-10.4	2.0	49	Vertical	21.4	22.2
2386.4	43.1	54.0	-10.9	2.0	316	Vertical	21.4	21.7
2388.4	52.1	54.0	-2.0	2.0	283	Vertical	21.5	30.6
2390.0	51.7	54.0	-2.3	2.0	26	Vertical	21.5	30.2

Note: All other emissions investigated are only noise-floor and they were 10dB below the average limits.

Out-of-Band Spurious Emissions at the Band Edge @1m distance 802.11n HT40, 2452 MHz, Peak





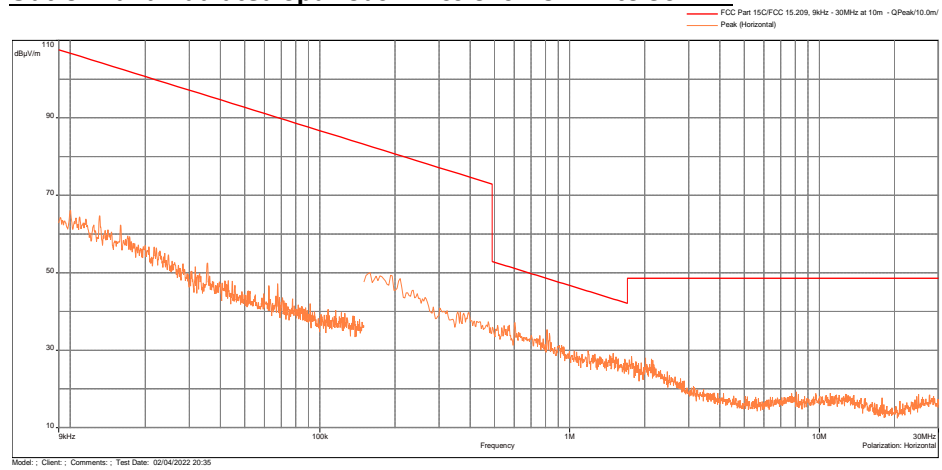
Freq. MHz	Ave@3m dB(μ V/m)	Ave Limit dB(μ V/m)	Margin dB	Height m	Azimuth deg	Polarity	Correction dB	Raw
2483.5	47.5	54.0	-6.5	2.0	281	Vertical	21.8	25.7
2487.5	46.9	54.0	-7.1	2.0	300	Vertical	21.7	25.2

Note: All other emissions investigated are only noise-floor and they were 10dB below the average limits.

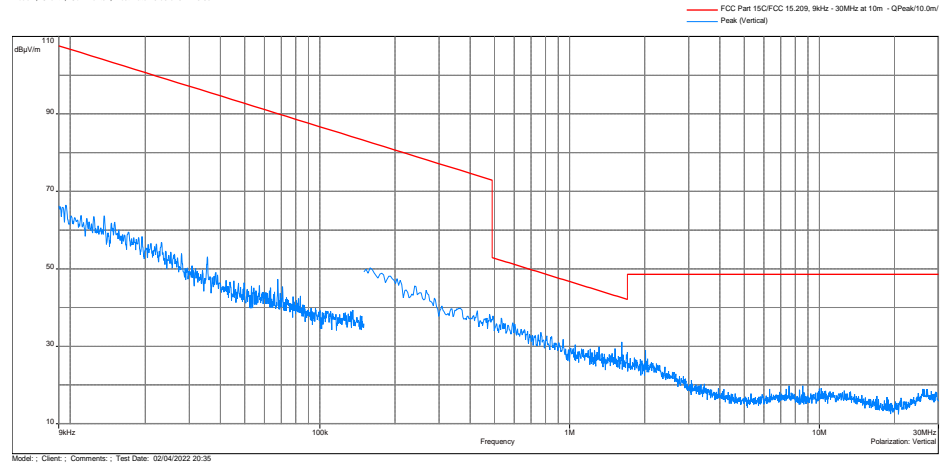
Results	Complies
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Out-of-Band Radiated Spurious Emissions – 9 kHz to 30MHz

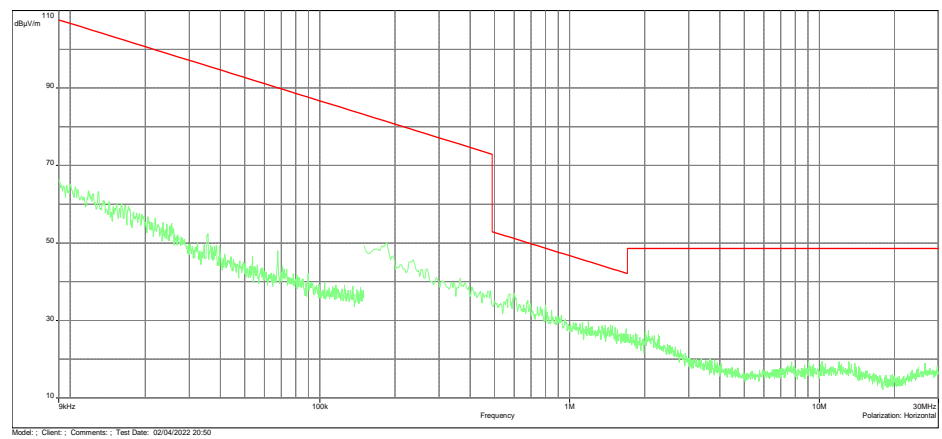
Antenna Position -
Coaxial



Antenna Position -
Coplanar

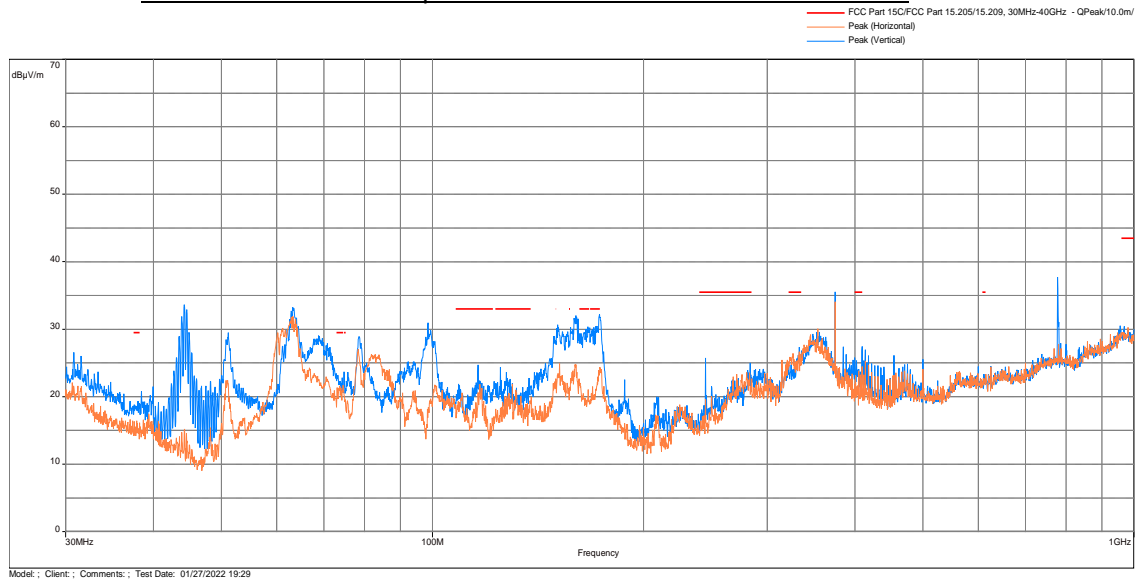


Antenna Position -
Horizontal

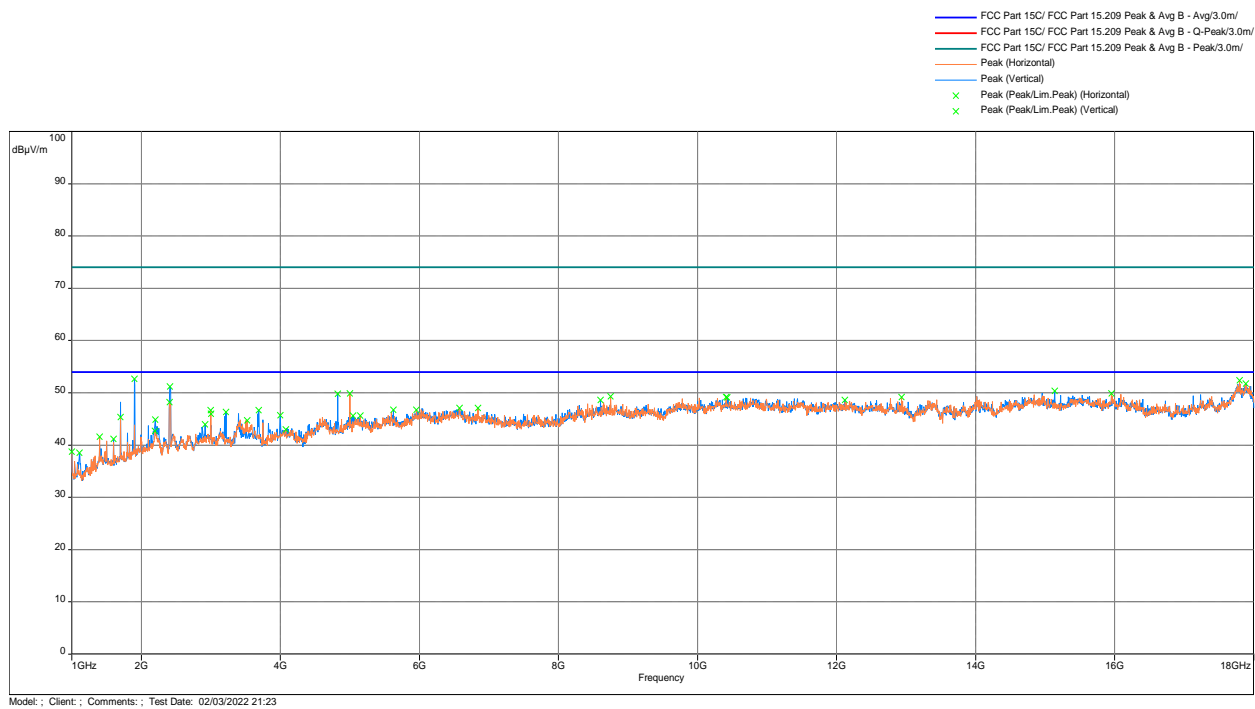


Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11n 20MHz, 2412MHz

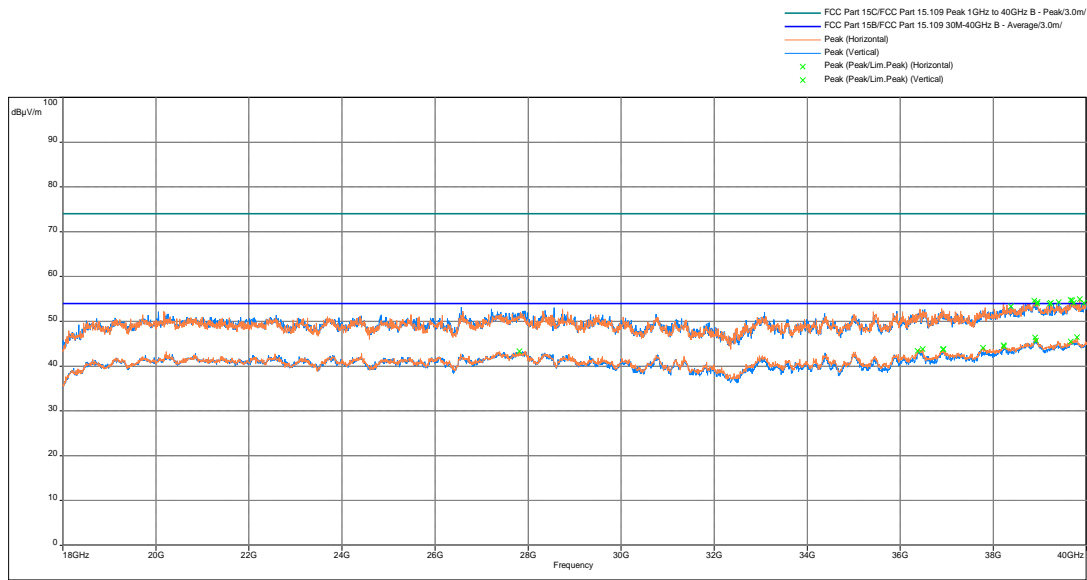
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



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



Radiated Spurious Emissions 18000 - 40000 MHz, Peak Scan vs Peak & Avg Limit



Frequency	FS@10m	Limit@10m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
74.8	23.7	29.5	-5.8	2.3	298.0	Vertical	-19.5
165.5	30.0	33.0	-3.0	1.0	169.8	Vertical	-15.6
166.6	30.4	33.0	-2.6	1.0	155.8	Vertical	-15.7
169.2	30.0	33.0	-3.0	1.2	155.8	Vertical	-15.9
170.9	30.4	33.0	-2.6	1.3	164.8	Vertical	-16.1
173.0	32.2	33.0	-0.8	1.5	160.5	Vertical	-16.2

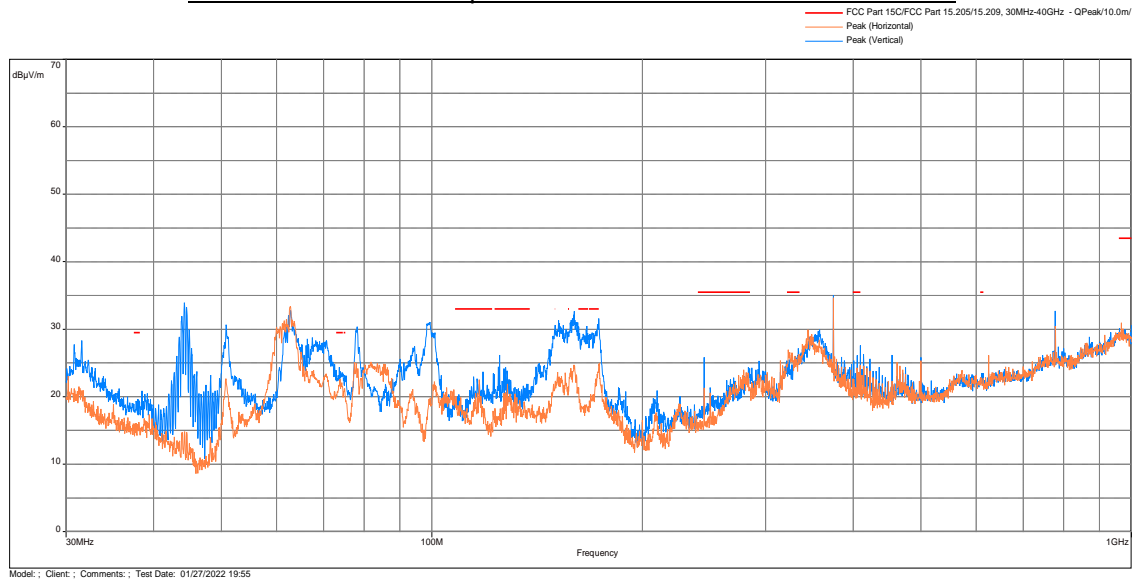
Frequency	FS@10m	Limit@10m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
1901.0	52.6	54.0	-1.4	1.5	300.8	Vertical	-12.0
4823.9	49.8	54.0	-4.2	1.7	359.8	Vertical	-5.0
4999.5	49.9	54.0	-4.2	2.3	325.8	Horizontal	-4.2
17795.4	52.3	54.0	-1.7	2.5	339.8	Horizontal	10.0

Note: Correction = AF + CF - Preamp

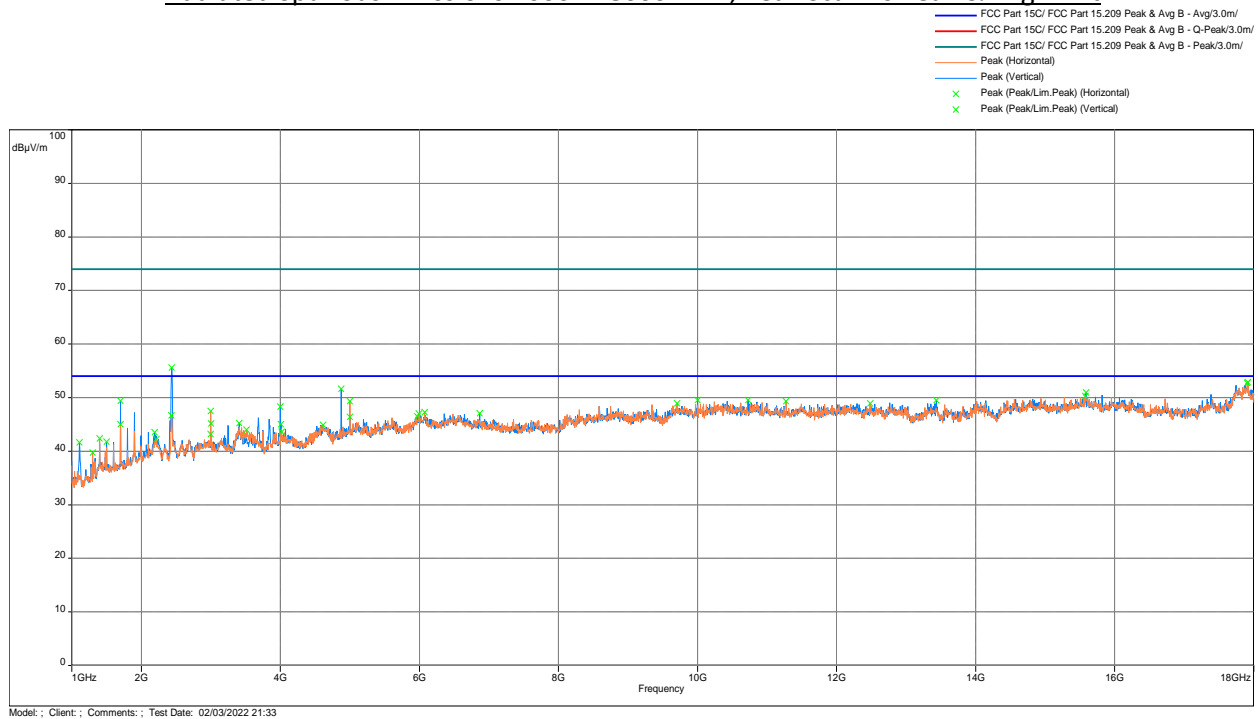
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11n 20MHz, 2437MHz

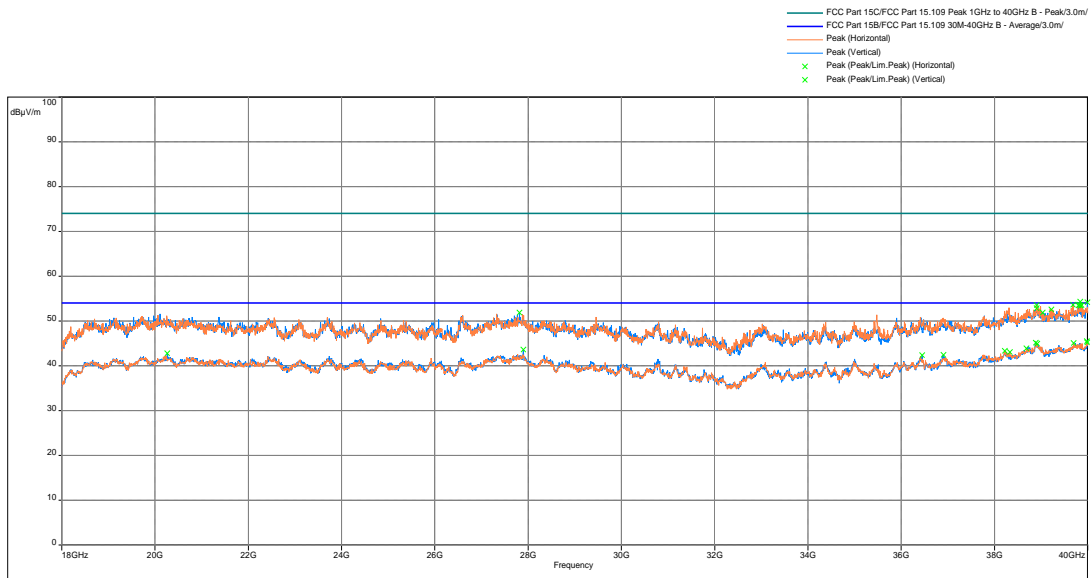
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



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



Radiated Spurious Emissions 18000 - 40000 MHz, Peak Scan vs Peak & Avg Limit



Frequency	FS@10m	Limit@10m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
73.9	22.6	29.5	-6.9	3.2	311.8	Horizontal	-19.6
150.0	30.6	33.0	-2.4	1.1	118.5	Vertical	-14.7
162.2	30.4	33.0	-2.6	1.0	159.8	Vertical	-15.4
166.6	30.5	33.0	-2.5	1.0	188.8	Vertical	-15.7
169.5	29.5	33.0	-3.5	1.3	150.8	Vertical	-16.0
170.4	29.4	33.0	-3.6	1.4	173.5	Vertical	-16.1

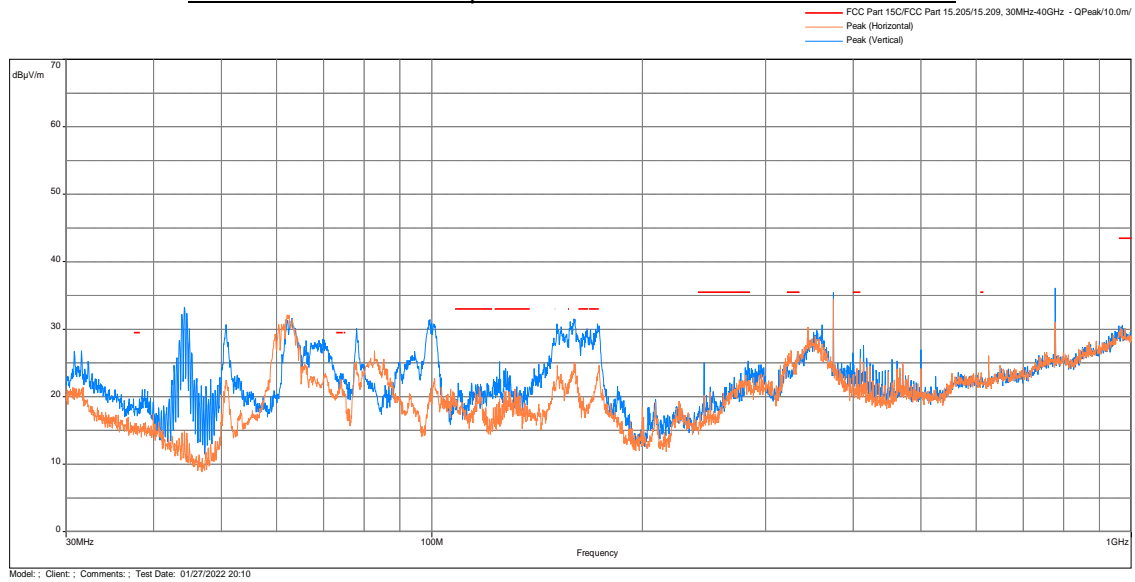
Frequency	FS@10m	Limit@10m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
1699.8	49.4	54.0	-4.6	1.5	322.3	Vertical	-13.7
4873.7	51.7	54.0	-2.3	1.6	249.5	Vertical	-4.7
5000.1	49.3	54.0	-4.7	1.4	91.0	Horizontal	-4.2
17913.3	52.8	54.0	-1.2	1.8	84.5	Vertical	9.7

Note: Correction = AF + CF - Preamp

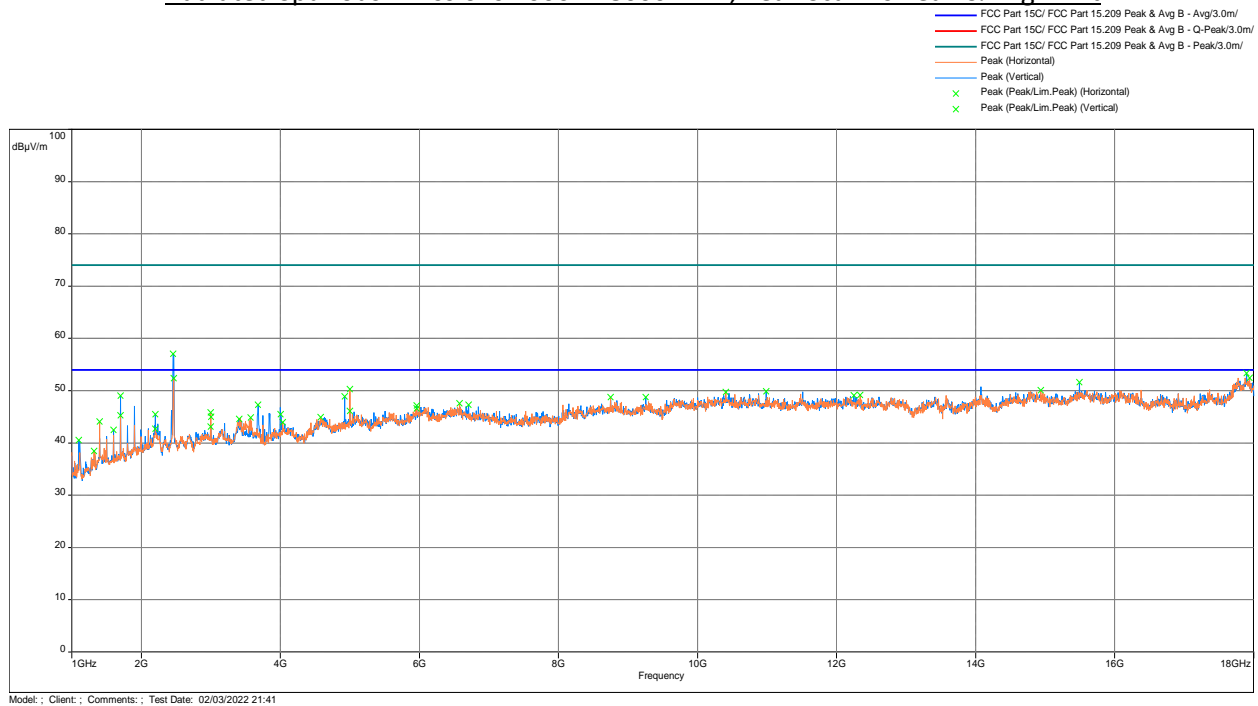
Results	Complies
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Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11n 20MHz, 2462MHz

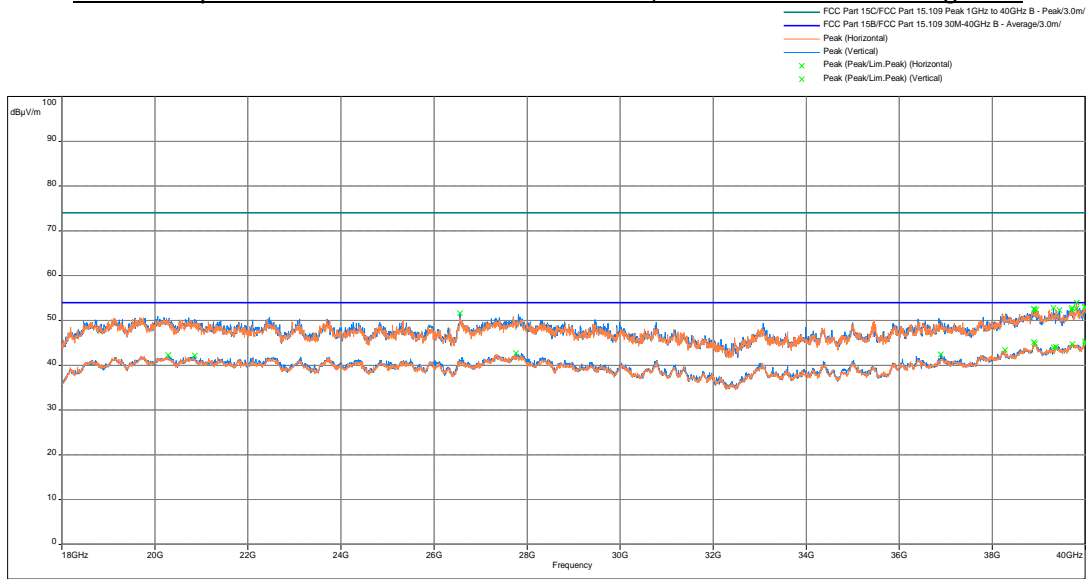
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



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



Radiated Spurious Emissions 18000 - 40000 MHz, Peak Scan vs Peak & Avg Limit



Frequency	FS@10m	Limit@10m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
74.0	23.5	29.5	-6.1	2.0	280.8	Vertical	-19.6
164.2	29.5	33.0	-3.5	1.1	150.8	Vertical	-15.5
166.8	30.1	33.0	-2.9	1.4	164.0	Vertical	-15.7
168.6	30.0	33.0	-3.0	1.7	141.3	Vertical	-15.9
170.9	29.4	33.0	-3.6	1.5	169.0	Vertical	-16.1
172.6	30.8	33.0	-2.2	1.7	155.5	Vertical	-16.2

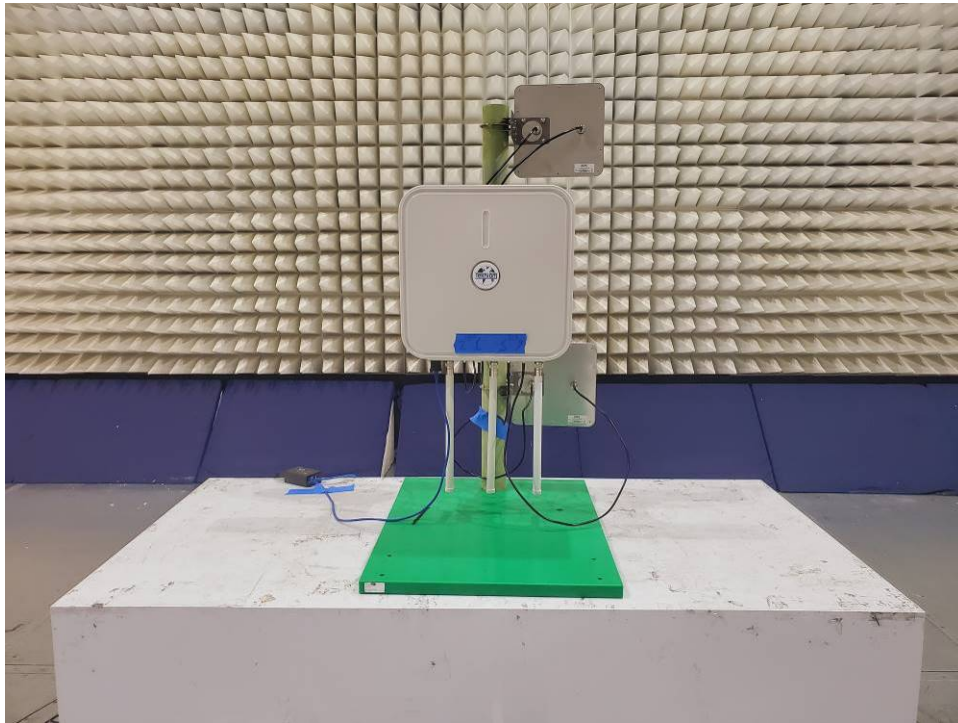
Frequency	Peak FS@3m	Avg Limit@3m	Margin	Height	Azimuth	Polarity	Correction
MHz	dBuV/m	dBuV/m	(dB)	(m)	(deg)		dB
1699.8	49.0	54.0	-5.0	1.5	337.0	Vertical	-13.7
4923.6	48.9	54.0	-5.1	1.6	231.0	Vertical	-4.5
5000.1	50.3	54.0	-3.7	1.5	59.0	Horizontal	-4.2
17894.0	53.0	54.0	-1.0	3.3	217.0	Vertical	9.9

Note: Correction = AF + CF - Preamp

Results	Complies
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4.2.5 Test Setup Photographs

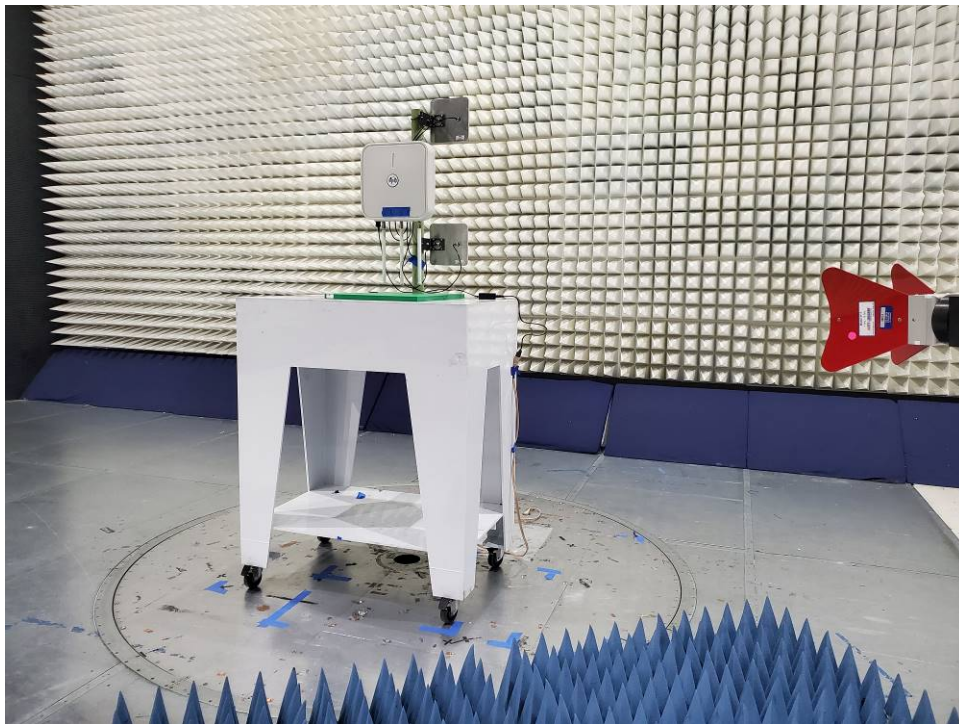
The following photographs show the testing configurations used.



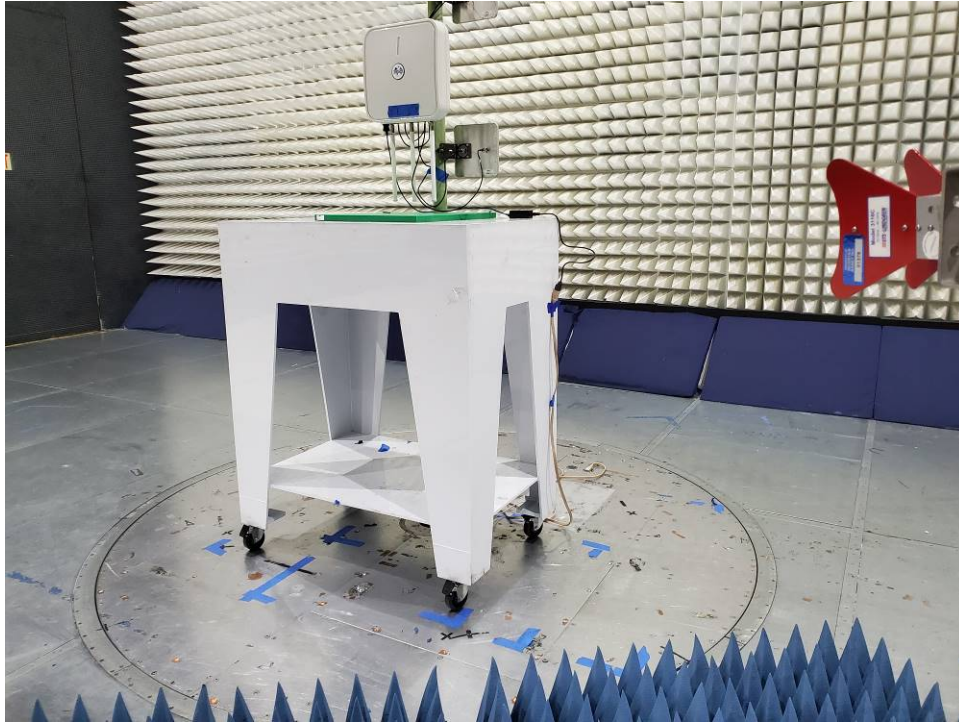
4.2.5 Test Setup Configuration (Continued)



4.2.5 Test Setup Configuration (Continued)



4.2.5 Test Setup Photographs (continued)



4.3 AC Line Conducted Emission FCC: 15.207

4.3.1 Requirement

Frequency Band MHz	FCC Part 15.207 Limits	
	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *
0.50-5.00	56	46
5.00-30.00	60	50

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

4.3.2 Procedure

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

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

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

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

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

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

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

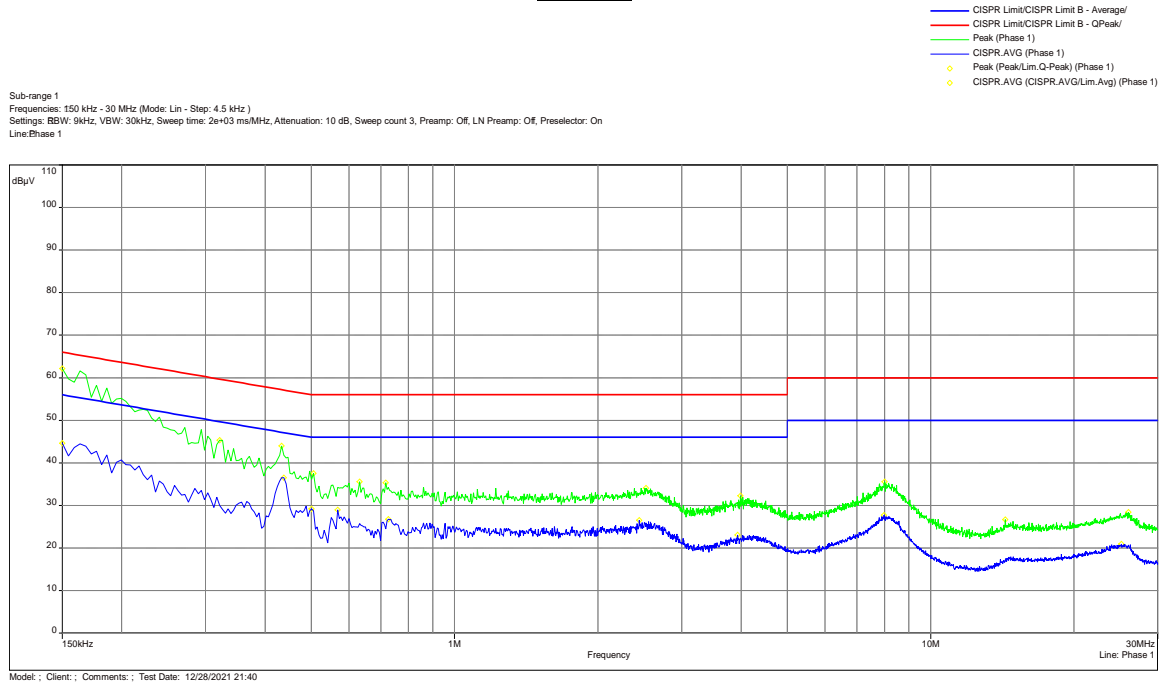
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10: 2013.

Tested By	Test Date
Minh Ly	December 28, 2021

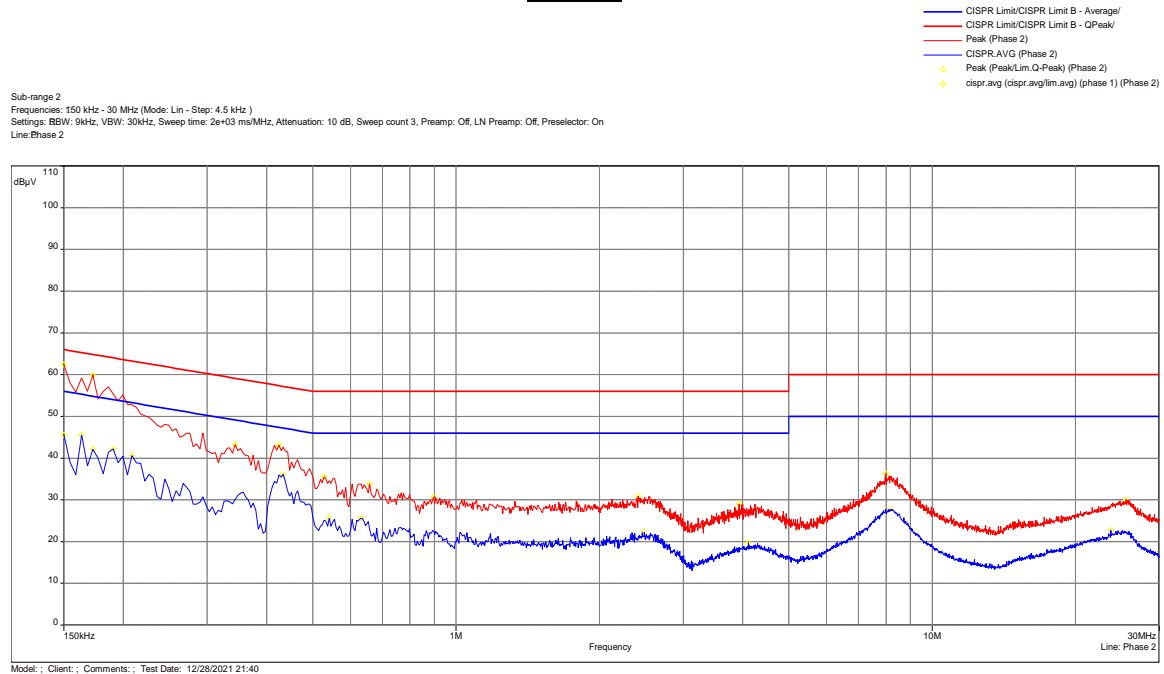
4.3.3 Test Results

15.207: Conducted Emissions 120VAC 60Hz

Phase 1



Phase 2



4.3.3 Test Results (Continued)

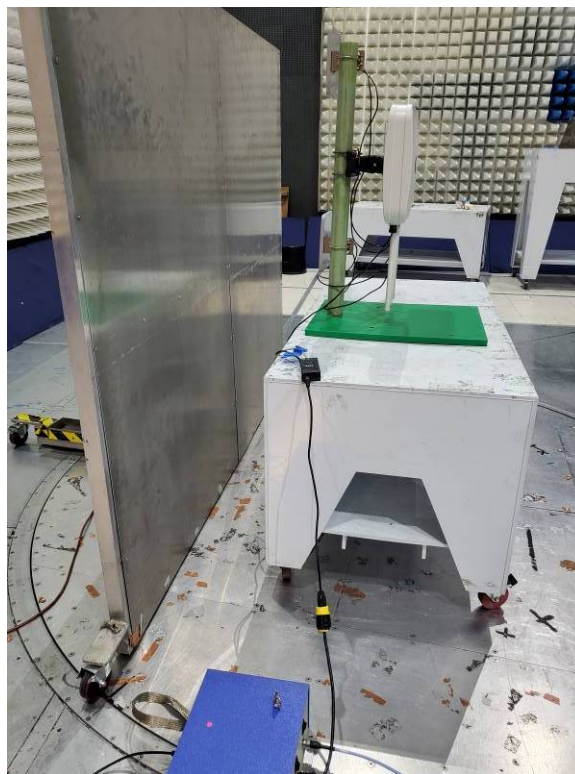
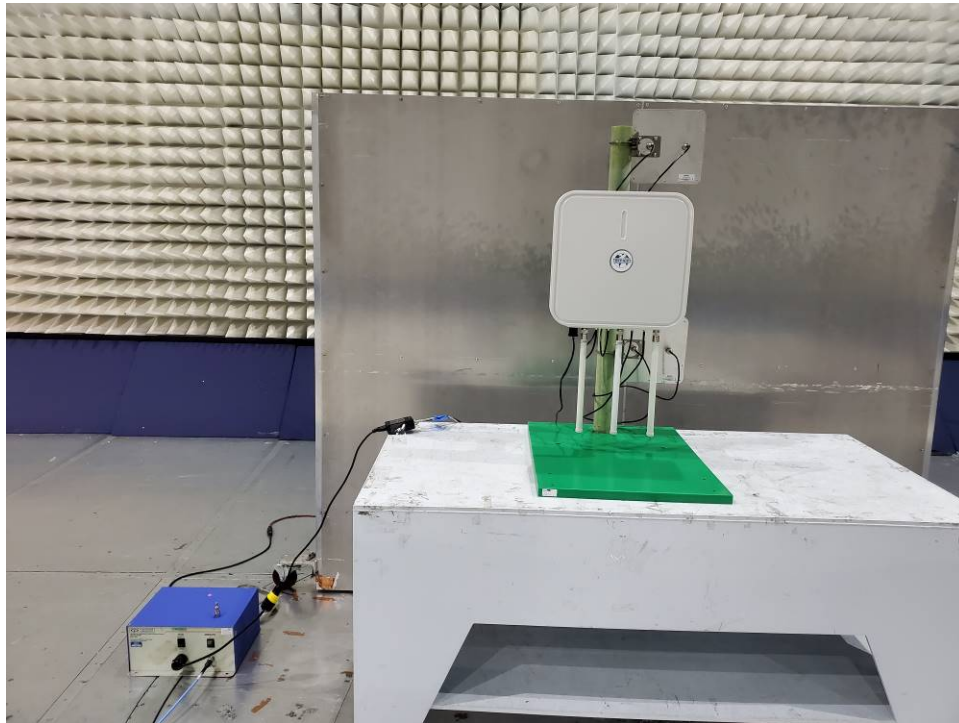
Frequency (MHz)	Q-Peak (dBμV)	Limit Q-Peak (dBμV)	Margin Q-Peak (dB)	Line	Correction (dB)
0.150	62.4	66.0	-3.6	Phase 2	11.0
0.150	62.1	66.0	-3.9	Phase 1	11.0
0.173	59.8	64.8	-5.0	Phase 2	11.0
0.321	45.3	59.7	-14.4	Phase 1	11.0
0.344	43.3	59.1	-15.9	Phase 2	11.1
0.425	43.1	57.4	-14.3	Phase 2	11.1
0.434	44.0	57.2	-13.2	Phase 1	11.1
0.506	37.5	56.0	-18.5	Phase 1	11.1
0.632	35.6	56.0	-20.4	Phase 1	11.1

Frequency (MHz)	CISPR AVG (dBμV)	Limit Avg (dBμV)	Margin Avg (dB)	Line	Correction (dB)
0.150	45.6	56.0	-10.4	Phase 2	11.0
0.150	44.7	56.0	-11.4	Phase 1	11.0
0.164	45.6	55.3	-9.7	Phase 2	11.0
0.173	42.2	54.8	-12.7	Phase 2	11.0
0.191	42.2	54.0	-11.8	Phase 2	11.0
0.209	40.6	53.3	-12.7	Phase 2	11.0
0.434	36.1	47.2	-11.1	Phase 2	11.1
0.438	36.6	47.1	-10.6	Phase 1	11.1
0.501	29.2	46.0	-16.8	Phase 1	11.1

Results: Complies by 3.6 dB

4.3.4 Test Setup Photographs

The following photographs show the testing configurations used.



5.0 List of Test Equipment

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

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	03/09/22
EMI Receiver	Rohde and Schwarz	FSW	ITS 01818	12	07/16/22
Loop Antenna	ETS	6512	ITS 01573	12	11/09/22
Active Horn Antenna	ETS-Lindgren	3117-PA	ITS 01365	12	04/20/22
Horn Antenna	ETS-Lindgren	3115	ITS 00982	12	05/13/22
Horn Antenna	ETS-Lindgren	3116c	ITS 01376	12	05/13/22
BI-Log Antenna	Teseq	CBL611D	ITS 01774	12	04/21/22
Pre-Amplifier	Sonoma Instrument	310N	ITS 00942	12	04/19/22
18-40GHz Preamp	uComp Nordic	MCNS-50-18004000335P	ITS 01799	12	03/19/22
Wideband Power Meter	Keysight Technologies	U2021XA	ITS 01576	12	03/30/22
LISN	FCC	LIN-120A	ITS 01400	12	12/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01462	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01465	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	09/14/22
RF Cable	TRU Corporation	TRU CORE 300	ITS 01342	12	09/14/22
RF Cable	Mega Phase	EMC1-K1K1-236	ITS 01781	12	02/19/22
RF Cable	Mega Phase	TM40-K1K1-19	ITS 01155	12	04/28/22
Band Reject Filter	MICRO-TRONICS	BRM50716	ITS 01798	12	02/26/22
10m Semi-anechoic chamber	Panashield	10m Chamber	ITS 00984	36	07/29/23

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.23	Tekniam_ML.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 / G104856862	ML	KV	February 25, 2022	Original document

END OF REPORT