

Report on the Testing of the

Quidel Corporation
Savanna (m/n: 1360318)

FCC ID: 2AX9RB20382SAV

In accordance with:
FCC 47 CFR Part 15.247
FCC 47 CFR Part 15.207
ISED RSS-247 Issue 2, February 2017

Prepared for: Quidel Corporation
10165 McKellar Ct
Raleigh, NC 27606 USA

COMMERCIAL-IN-CONFIDENCE

Document Number: NC72166077.3 | Issue: 1



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NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Franklin Rose	Sr. Wireless RF Test Engineer	Authorized Signatory	13 MAY 2021

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

FCC Accreditation
Designation Number US1148 New Brighton, MN Test
Laboratory

Innovation, Science, and Economic Development Canada
Accreditation
Site Number 4512A New Brighton, MN Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above and the tests shown in Table 1.3.1 of this report.



A2LA Cert. No. 2955.11

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Table 1.1-1 – Modification Record

Issue	Description of Change	Date of Issue
1	First Issue	13 MAY 2021

1.2 Introduction

Applicant	Quidel Corporation
Manufacturer	Quidel Corporation
Applicant's Email Address	MMorovich@quidel.com
Model Number(s)	Savanna (m/n: 1360318)
Serial Number(s)	A0000030 A0000047
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15.247 FCC 47 CFR Part 15.207 ISED RSS-247 Issue 2, February 2017
Order Number	72166077
Date of Receipt of EUT	15 March 2021
Start of Test	15 March 2021
Finish of Test	03 May 2021
Related Document(s)	KDB 558074 D01 ANSI C63.10 2013



1.3 Scope of Testing

To perform testing to confirm that the wireless device(s) meet the requirements of the applicable standards and guidance documents (KDB 558074 D01). To perform testing for an FCC Class II Permissive Change to accommodate an antenna change and a new FCC ID number.

1.4 Summary of Results

A summary of the tests carried out in accordance with the specifications shown below.

Table 1.4-1 – Summary of Results

Section	Specification Clause		Test Description	Accreditation	Base Standard
2.1	15.203	RSS-GEN	Antenna Requirements	A2LA	FCC Sub Part C 15.203
2.2	15.207	RSS-GEN	Conducted Emissions 15.207	A2LA	ANSI C63.10:2013
2.3	15.247(d)	RSS-GEN	Radiated Spurious Emissions	A2LA	ANSI C63.10:2013
2.4	15.205	RSS-GEN	Radiated Restricted Bands of Emissions	A2LA	ANSI C63.10:2013



Table 1.4-2 – Test Accreditation

Test Name	Name of Tester(s)	Results / Comments
Antenna Requirements	Sean Sellergren	Pass
Conducted Emissions 15.207	Sean Sellergren	Pass
Radiated Spurious Emissions	Sean Sellergren	Pass
Radiated Restricted Bands of Emissions	Sean Sellergren	Pass



1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT) was a sample-to-results molecular diagnostics (MDx) system that can perform both qualitative and quantitative nucleic acid amplification tests.

Table 1.5-1 – Wireless Module Technical Information

Detail	Description
FCC ID	2AX9RB20382SAV
Transceiver Model #	1360318
Operating Frequency	802.11b/g: 2412 – 2462 MHz 802.11n HT20: 2412 – 2462 MHz 802.11n HT40: 2422 – 2452 MHz
Antenna Type / Gain:	Flex Dipole / 2.5 dBi & 2.4 GHz

A full description and detailed product specification details are available from the manufacturer.

**Table 1.5-2 – Cable Descriptions**

Cable/Port	Description
Ethernet	Ethernet
Input Power	Power port for AC to DC power supply

Table 1.5-3 – Support Equipment Descriptions

Make/Model	Description
Hewlett Packard / 9470M	ELITEBOOK FOLIO PC used for channel programming prior to testing

1.5.2 Modes of Operation

The tested mode of operation was:

Low Channel / Mode	802.11b/g/n (20MHz) = 2412 MHz, 80211.n (40MHz) = 2422MHz
Mid Channel / Mode	802.11b/g/n (20 & 40MHz) = 2437 MHz
High Channel / Mode	802.11b/g/n (20MHz) = 2462 MHz, 80211.n (40MHz) = 2452MHz

Using provided test software the channels were selected according and power was set to 14 dB for 802.11b/g/n (20) and 9 dB 802.11n (40).

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Table 1.7-1 – Modification Record

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State		

1.8 Test Location

TÜV SÜD conducted the following tests at our New Brighton, MN Test Laboratory.
Office address:

TÜV SÜD America
141 14th Street NW
New Brighton, MN 55112 USA



2 Test Details

2.1 Antenna Requirements

2.1.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.203
RSS-GEN Issue 5

2.1.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.1.3 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Note: Above statement is taken from FCC Part 15 Subpart C §15.203

Table 2.1-1 – Antenna Used In EUT

Antenna Type	Connection Type	Antenna Gain
Flex Dipole	U.FL	2.5 dBi



2.2 Conducted Emissions 15.207

2.2.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.207
RSS-GEN Issue 5

2.2.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.2.3 Date of Test

03 May 2021

2.2.4 Test Method

The EUT was placed on a non-conductive table 0.8 m above a reference ground plane and 0.4 m away from a vertical coupling plane.

All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted emissions measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.

The EUT was tested with each transmitter operating in the worst-case channel and mode as determined in the original FCC report. Transmitters were tested individually.

The EUT was assessed against the limits of FCC 15.207.

2.2.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.2.6 Additional Observations

Measurements were performed using BAT-EMC (v3.18) automated software. The reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.



2.2.7 Sample Computation (Conducted Emission)

Measuring equipment raw measurement (dB μ V) @ 150 kHz			30.0
Correction Factor (dB)	TEMC00002 - LISN	0.03	10.53
	Cable 1	10.50	
Reported Quasi-peak Final Measurement (dB μ V) @ 150 kHz			40.53

2.2.8 Test Results

Test Summary: Measurements were taken at the low, mid & high channels in the worst mode of operation as determined by previous radiated spurious emission testing. EUT operated as intended before, during, and after testing.

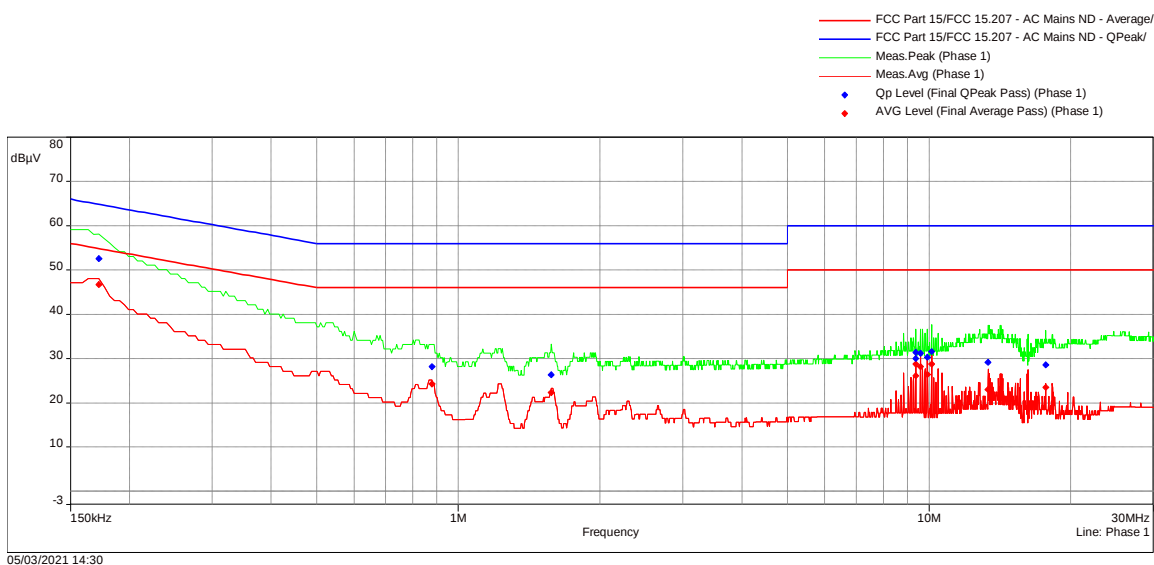
Test Result: Pass

See data below for detailed results.



802.11n HT20 - L1 Low Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L1	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L1

Test Results:
Pass

Test Notes: 802.11n HT20 Low Channel 2412MHz

Figure 2-1 – Graphical Results – AC Mains L1 Plot – Low Channel

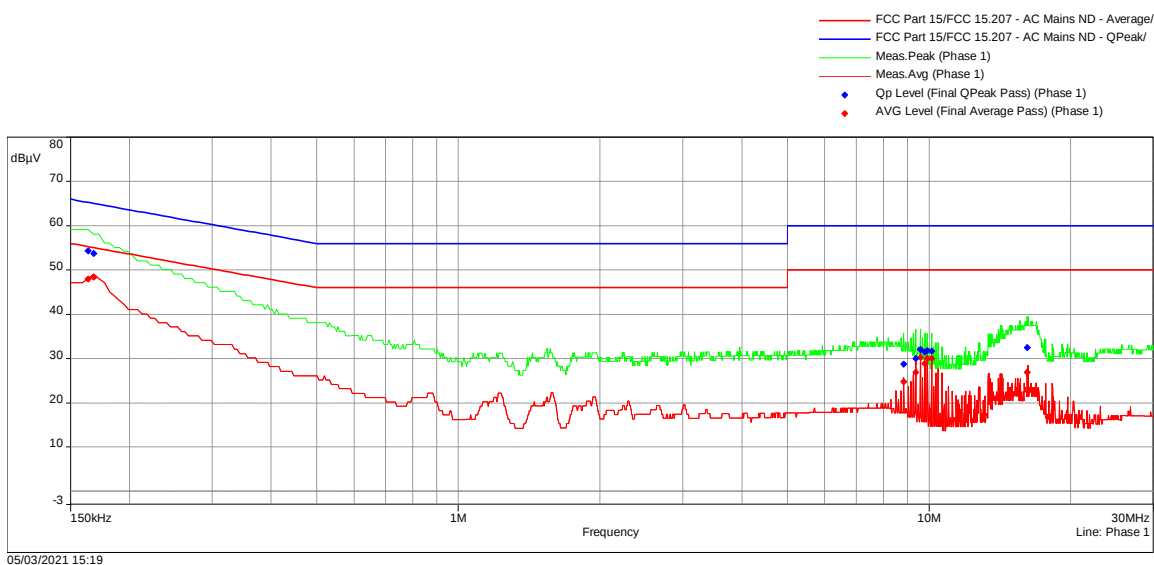
**Table 2.2-1 – Conducted Emissions Results on the AC Power Port (L1) – Low Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
172.5kHz	46.70	54.84	-8.14	52.57	64.84	-12.27	Pass
879kHz	24.26	46.00	-21.74	28.19	56.00	-27.81	Pass
1.5765MHz	22.29	46.00	-23.71	26.28	56.00	-29.72	Pass
9.366MHz	26.12	50.00	-23.88	29.97	60.00	-30.03	Pass
9.3705MHz	28.70	50.00	-21.30	31.39	60.00	-28.61	Pass
9.582MHz	28.12	50.00	-21.88	31.18	60.00	-28.82	Pass
9.906MHz	26.41	50.00	-23.59	30.32	60.00	-29.68	Pass
10.122MHz	28.76	50.00	-21.24	31.58	60.00	-28.42	Pass
13.353MHz	23.03	50.00	-26.97	29.09	60.00	-30.91	Pass
17.691MHz	23.48	50.00	-26.52	28.55	60.00	-31.45	Pass



802.11n HT20 - L2 Low Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L1	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L2

Test Results:
Pass

Test Notes: 802.11n HT20 Low Channel 2412MHz

Figure 2-2 – Graphical Results – AC Mains L2 Plot – Low Channel

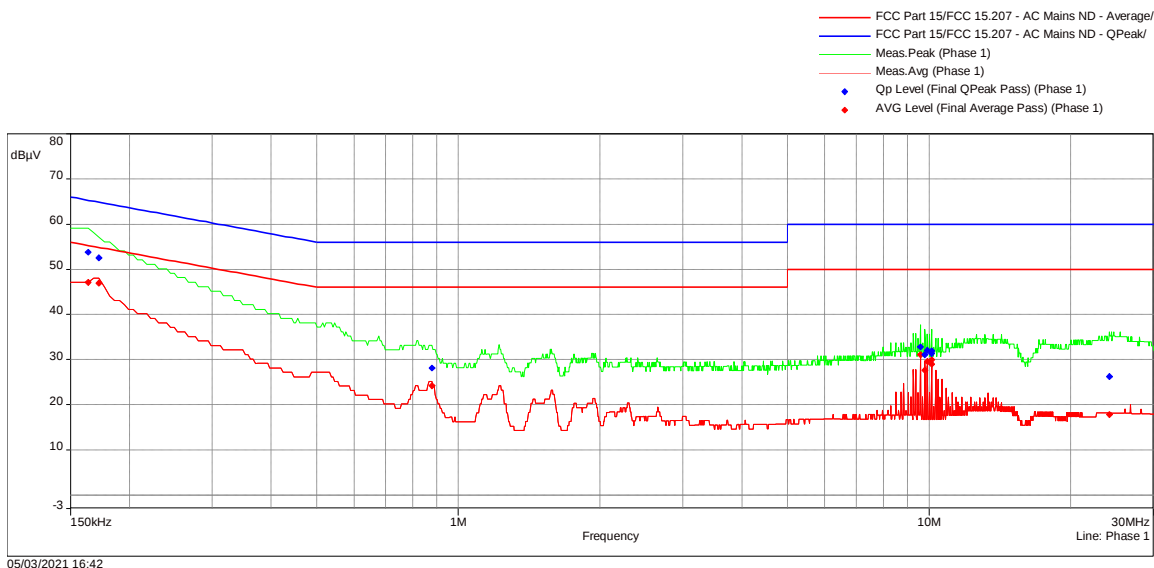
**Table 2.2-2 – Conducted Emissions Results on the AC Power Port (L2) – Low Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
163.5kHz	47.95	55.28	-7.33	54.35	65.28	-10.93	Pass
168kHz	48.41	55.06	-6.65	53.72	65.06	-11.34	Pass
8.8305MHz	24.74	50.00	-25.26	28.71	60.00	-31.29	Pass
9.366MHz	26.91	50.00	-23.09	29.99	60.00	-30.01	Pass
9.582MHz	30.17	50.00	-19.83	32.10	60.00	-27.90	Pass
9.798MHz	28.83	50.00	-21.17	31.52	60.00	-28.48	Pass
9.906MHz	29.98	50.00	-20.02	31.76	60.00	-28.24	Pass
10.122MHz	30.05	50.00	-19.95	31.72	60.00	-28.28	Pass
16.1655MHz	26.87	50.00	-23.13	32.48	60.00	-27.52	Pass



802.11n HT20 - L1 Mid Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L1	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L1

Test Results:
Pass

Test Notes: 802.11n HT20 Mid Channel 2437MHz

Figure 2-3 – Graphical Results – AC Mains L1 Plot – Mid Channel

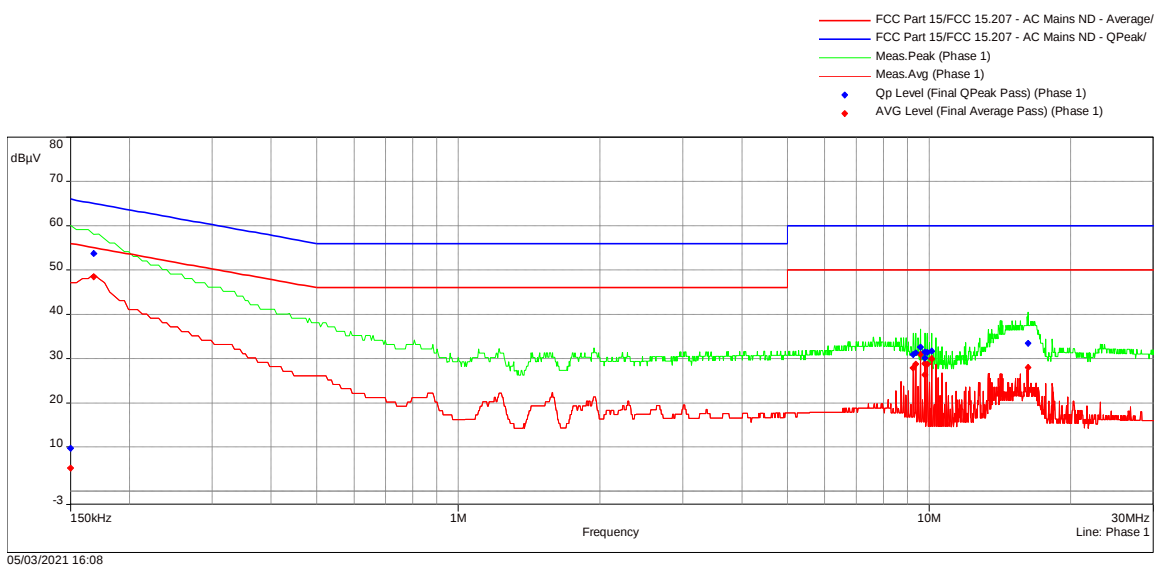
**Table 2.2-3 – Conducted Emissions Results on the AC Power Port (L1) – Mid Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
163.5kHz	47.07	55.28	-8.21	53.81	65.28	-11.47	Pass
172.5kHz	46.89	54.84	-7.95	52.58	64.84	-12.26	Pass
879kHz	24.19	46.00	-21.81	28.10	56.00	-27.90	Pass
9.582MHz	31.03	50.00	-18.97	32.78	60.00	-27.22	Pass
9.798MHz	27.62	50.00	-22.38	31.02	60.00	-28.98	Pass
9.906MHz	29.56	50.00	-20.44	32.01	60.00	-27.99	Pass
10.1175MHz	29.00	50.00	-21.00	31.40	60.00	-28.60	Pass
10.122MHz	29.96	50.00	-20.04	31.97	60.00	-28.03	Pass
24.162MHz	17.83	50.00	-32.17	26.23	60.00	-33.77	Pass



802.11n HT20 - L2 Mid Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L2	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L2

Test Results:
Pass

Test Notes: 802.11n HT20 Mid Channel 2437MHz

Figure 2-4 – Graphical Results – AC Mains L2 Plot – Mid Channel

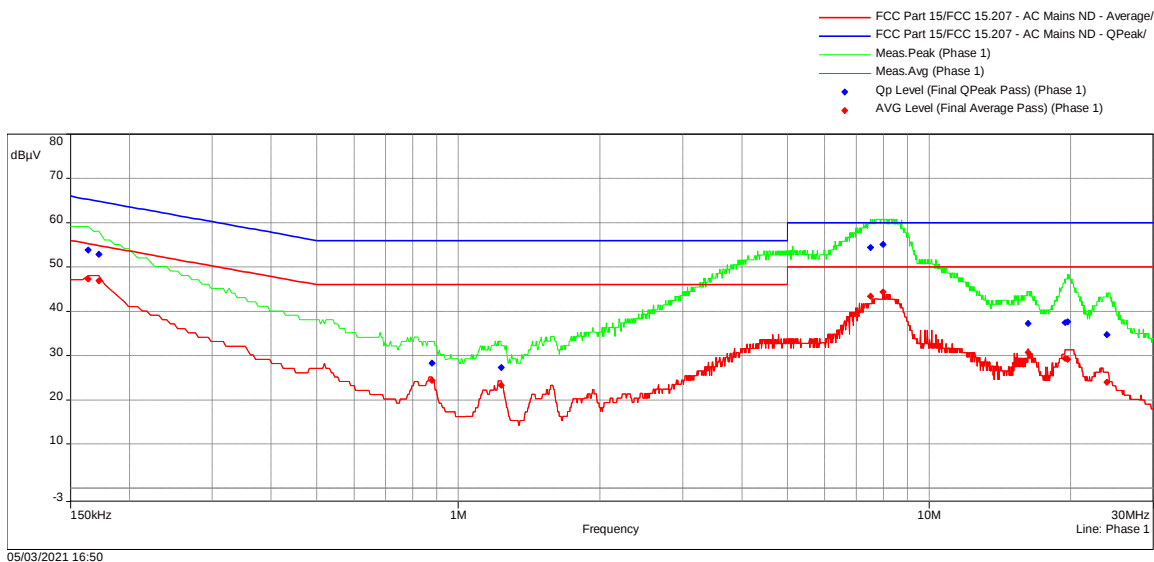
**Table 2.2-4 – Conducted Emissions Results on the AC Power Port (L2) – Mid Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
150kHz	5.18	56.00	-50.82	9.71	66.00	-56.29	Pass
168kHz	48.43	55.06	-6.63	53.75	65.06	-11.31	Pass
9.258MHz	27.86	50.00	-22.14	30.92	60.00	-29.08	Pass
9.366MHz	28.69	50.00	-21.31	31.24	60.00	-28.76	Pass
9.582MHz	31.04	50.00	-18.96	32.52	60.00	-27.48	Pass
9.7935MHz	26.33	50.00	-23.67	30.08	60.00	-29.92	Pass
9.798MHz	28.83	50.00	-21.17	31.45	60.00	-28.55	Pass
9.906MHz	28.77	50.00	-21.23	31.42	60.00	-28.58	Pass
10.122MHz	29.95	50.00	-20.05	31.69	60.00	-28.31	Pass
16.2285MHz	27.99	50.00	-22.01	33.44	60.00	-26.56	Pass



802.11n HT20 - L1 High Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L1	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L1

Test Results:
Pass

Test Notes: 802.11n HT20 High Channel 2462MHz

Figure 2-5 – Graphical Results – AC Mains L1 Plot – High Channel

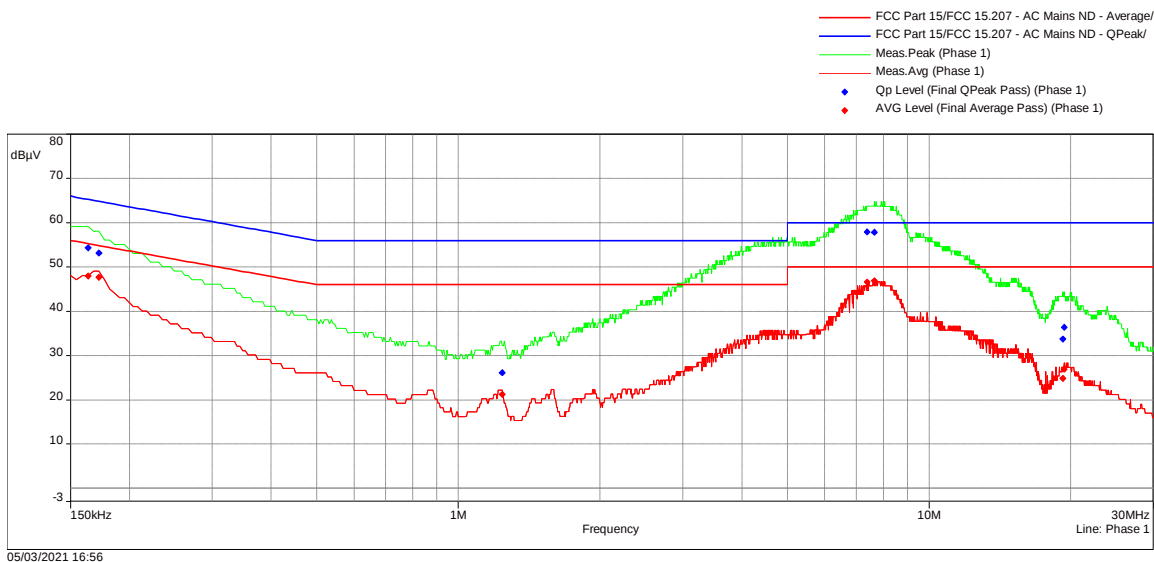
**Table 2.2-5 – Conducted Emissions Results on the AC Power Port (L1) – High Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
163.5kHz	47.25	55.28	-8.03	53.87	65.28	-11.41	Pass
172.5kHz	46.91	54.84	-7.93	52.82	64.84	-12.02	Pass
879kHz	24.33	46.00	-21.67	28.21	56.00	-27.79	Pass
1.2345MHz	23.30	46.00	-22.70	27.30	56.00	-28.70	Pass
7.512MHz	43.43	50.00	-6.57	54.44	60.00	-5.56	Pass
7.9845MHz	44.38	50.00	-5.62	55.08	60.00	-4.92	Pass
16.2285MHz	30.67	50.00	-19.33	37.19	60.00	-22.81	Pass
19.437MHz	29.32	50.00	-20.68	37.41	60.00	-22.59	Pass
19.689MHz	29.11	50.00	-20.89	37.58	60.00	-22.42	Pass
23.838MHz	24.00	50.00	-26.00	34.66	60.00	-25.34	Pass



802.11n HT20 - L2 High Channel

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150kHz- 30MHz	L2	9kHz	4.5kHz	5000 ms/MHz



Limit:
FCC 15.207 - AC Mains

Line Tested:
L2

Test Results:
Pass

Test Notes: 802.11n HT20 High Channel 2462MHz

Figure 2-6 – Graphical Results – AC Mains L2 Plot – High Channel

**Table 2.2-6 – Conducted Emissions Results on the AC Power Port (L2) – High Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
163.5kHz	47.98	55.28	-7.30	54.32	65.28	-10.96	Pass
172.5kHz	47.73	54.84	-7.11	53.14	64.84	-11.70	Pass
1.239MHz	21.21	46.00	-24.79	26.15	56.00	-29.85	Pass
7.386MHz	46.63	50.00	-3.37	57.94	60.00	-2.06	Pass
7.656MHz	46.90	50.00	-3.10	57.88	60.00	-2.12	Pass
19.2525MHz	24.82	50.00	-25.18	33.70	60.00	-26.30	Pass
19.3785MHz	26.85	50.00	-23.15	36.39	60.00	-23.61	Pass



2.2.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.

Test Area: GRP2

Table 2.2-7 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10696	Fischer Custom Comm.	TLISN, CISPR 22	F-071115-1057-1-09	91832	G	07/11/2019	07/11/2021
WRLE11121	Aeroflex Weinschel	Attenuator, 20dB	34-20-33	CE0613	B	09/29/2020	09/29/2021
NBLE11720	PMM	EMI Receiver	9010F	030WW80601	G	05/08/2020	05/08/2022

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



2.3 Radiated Spurious Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.247
RSS-GEN Issue 5

2.3.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state "0", as noted in §1.6.

2.3.3 Date of Test

03 March – 30 April 2021

2.3.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8 m above a reference ground plane for 30-1000 MHz and 1.5m above the ground plane for above 1 GHz.

For 30-1000 MHz a pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 3m distance.

For above 1 GHz a pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using peak and average detectors; measurements were taken at a 3m distance.

For all frequency ranges the final readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification. For below 1 GHz final measurements were taken with a quasi-peak detector and above 1 GHz final measurements were re-measured with peak and average detectors.

The EUT was assessed against the limits specified in FCC 47 CFR Part 15C §15.209.

2.3.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



2.3.6 Additional Observations

The highest frequency to which the DUT was measured in accordance with §15.33(a)(1).

Automated measurements used BAT-EMC (v3.18) software. Measurements were done at a 3m distance. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.3.7 Sample Computation (Radiated Emissions)

Measuring equipment raw measurement (dBμV) @ 30 MHz			20.0
Correction Factor (dB)	Cable 2	0.24	18.94
	TEMC00011 (antenna)	18.70	
Reported Quasi-peak Final Measurement (dBμV/m) @ 30 MHz			38.94

2.3.8 Test Results

Test Summary: All modes were pre-screened at low, mid & high channels. Only worst-case measurement scans as determined by the pre-screens are shown in this report. Measurements between 1-18 GHz were taken with a 2.4 GHz notch filter in front of the pre-amp to prevent overloading. EUT operated as intended before, during, and after testing.

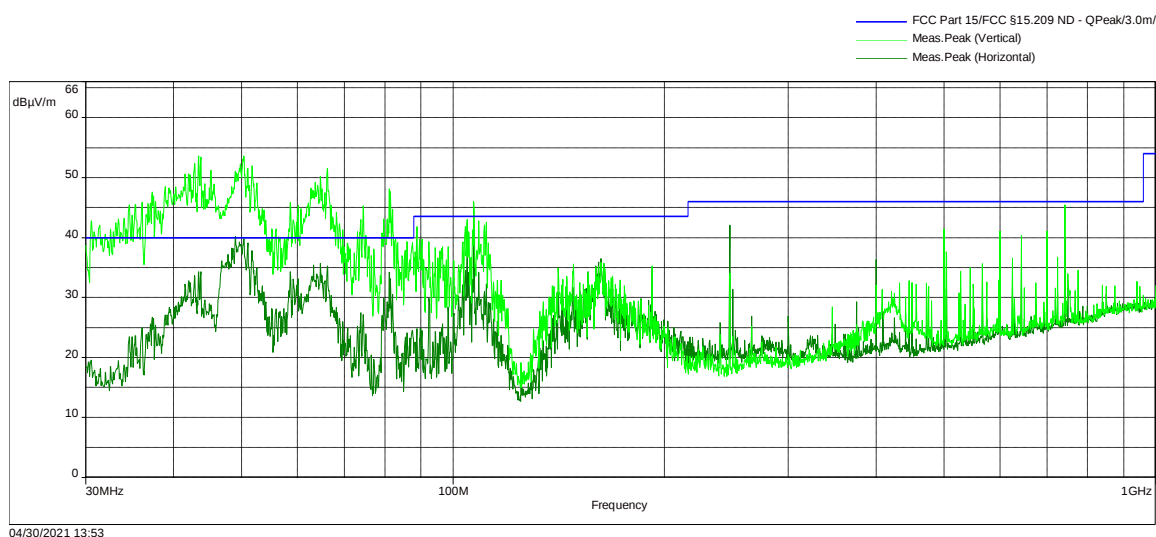
Test Result: Pass

See data below for detailed results.



Spurious Emissions 30M-1GHz 802.11n HT20 Low Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
30MHz- 1GHz	Vertical	3m	100kHz	18001Pts	Auto
30MHz- 1GHz	Horizontal	3m	100kHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

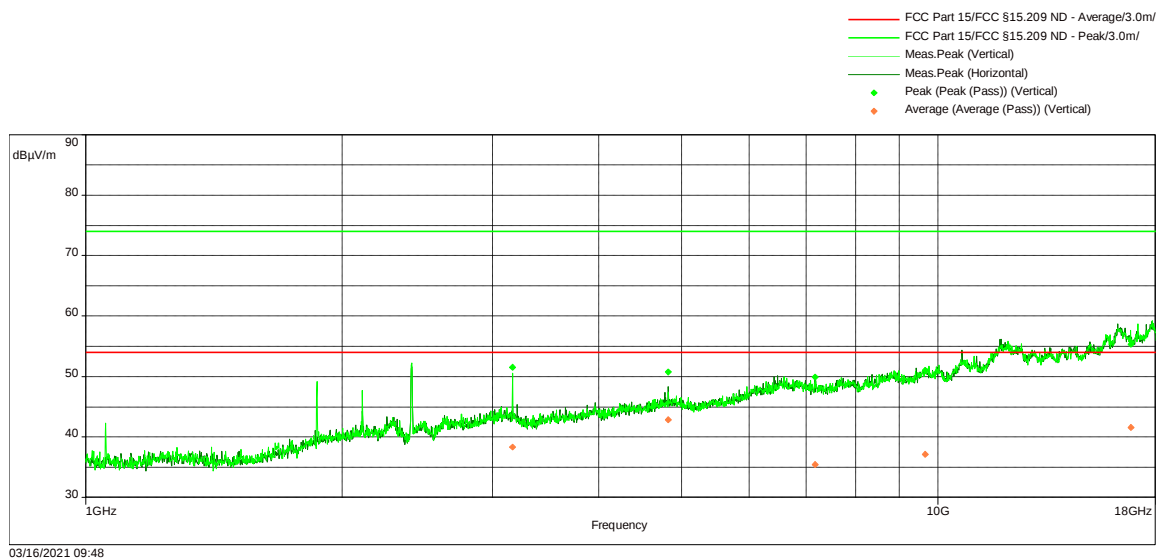
Test Notes: 802.11n HT20 Low Ch 2412MHz. All emissions above the limit were determined to not be related to the transmitter via investigation testing. No spurious emissions were measured in this frequency range.

Figure 2-7 – RE Spurious Emissions 30-1000 MHz – Low Channel



Spurious Emissions 1 - 18GHz 802.11n HT20 Low Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
1GHz- 18GHz	Vertical	3m	1MHz	18001Pts	Auto
1GHz- 18GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 - Low Channel 2412MHz

Figure 2-8 – RE Spurious Emissions 1-18 GHz – Low Channel

**Table 2.3-1 – RE Spurious Emissions 1-18 GHz – Low Channel**

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
3.1675GHz	51.55	74.00	-22.45	38.31	54.00	-15.69	108.00	2.56	Vertical	Pass	Pass
4.8240556GHz	50.75	74.00	-23.25	42.82	54.00	-11.18	123.00	1.09	Vertical	Pass	Pass
7.1766667GHz	49.89	74.00	-24.11	35.42	54.00	-18.58	94.00	2.46	Vertical	Pass	Pass
9.653GHz	51.03	74.00	-22.97	37.12	54.00	-16.88	226.00	1.59	Vertical	Pass	Pass
16.846833GHz	55.38	74.00	-18.62	41.61	54.00	-12.39	296.00	2.92	Vertical	Pass	Pass



Spurious Emissions 18 - 26GHz 802.11n HT20 Low Ch

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
18GHz- 26GHz	Vertical	3m	1MHz	18001Pts	Auto
18GHz- 26GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 Low Ch 2412MHz

Figure 2-9 – RE Spurious Emissions 18-26 GHz – Low Channel

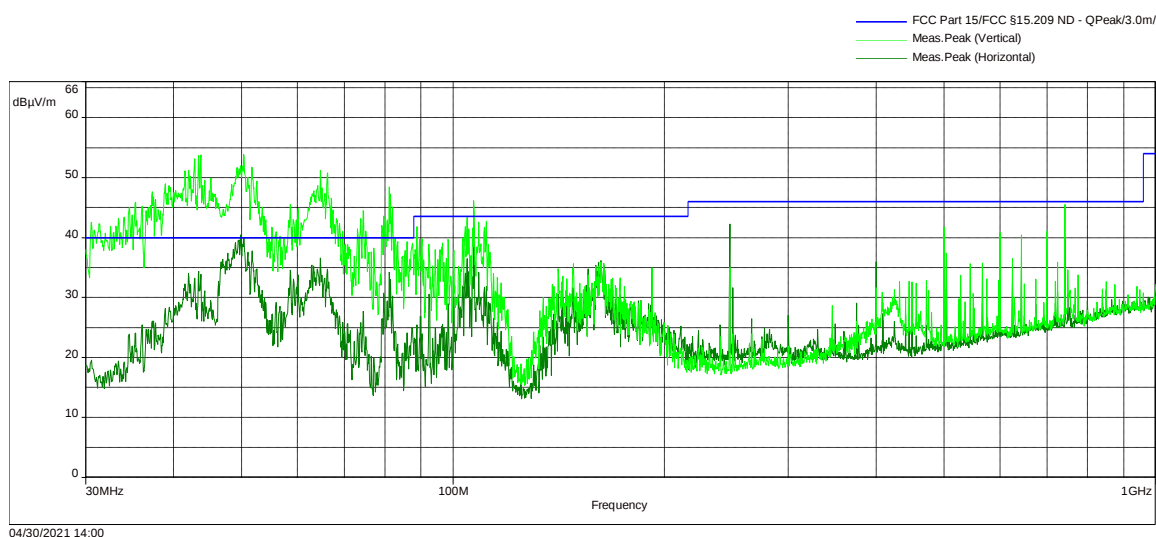
**Table 2.3-2 – RE Spurious Emissions 18-26 GHz – Low Channel**

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
20.990667GHz	47.03	74.00	-26.97	33.64	54.00	-20.36	216.00	3.12	Vertical	Pass	Pass
22.913778GHz	48.21	74.00	-25.79	34.37	54.00	-19.63	33.00	2.16	Horizontal	Pass	Pass
23.66GHz	47.82	74.00	-26.18	34.04	54.00	-19.96	342.00	3.83	Vertical	Pass	Pass
25.332889GHz	49.76	74.00	-24.24	35.64	54.00	-18.36	283.00	2.76	Horizontal	Pass	Pass



Spurious Emissions 30M-1GHz 802.11n HT20 Mid Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
30MHz- 1GHz	Vertical	3m	100kHz	18001Pts	Auto
30MHz- 1GHz	Horizontal	3m	100kHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

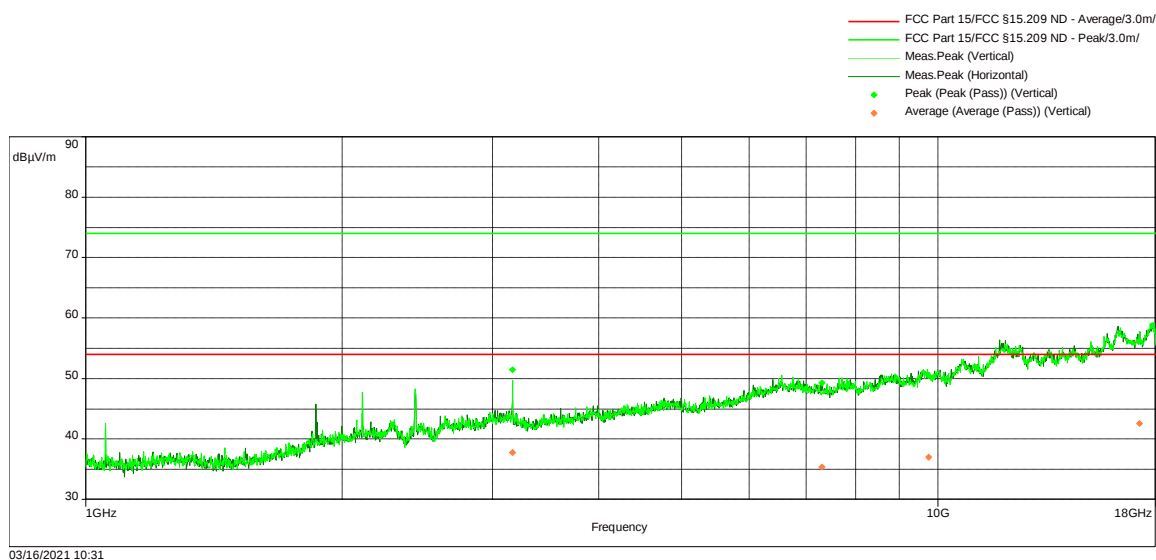
Test Notes: 802.11n HT20 Mid Ch 2437MHz. All emissions above the limit were determined to not be related to the transmitter via investigation testing. No spurious emissions were measured in this frequency range.

Figure 2-10 – RE Spurious Emissions 30-1000 MHz – Mid Channel



Spurious Emissions 1 - 18GHz 802.11n HT20 Mid Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
1GHz- 18GHz	Vertical	3m	1MHz	18001Pts	Auto
1GHz- 18GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 - Mid Channel 2437MHz

Figure 2-11 – RE Spurious Emissions 1-18 GHz – Mid Channel

**Table 2.3-3 – RE Spurious Emissions 1-18 GHz – Mid Channel**

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
3.1675GHz	51.47	74.00	-22.53	37.76	54.00	-16.24	123.00	2.56	Vertical	Pass	Pass
7.3107778GHz	49.28	74.00	-24.72	35.39	54.00	-18.61	182.00	2.21	Vertical	Pass	Pass
9.7483889GHz	50.47	74.00	-23.53	37.00	54.00	-17.00	2.00	3.07	Vertical	Pass	Pass
17.234056GHz	56.23	74.00	-17.77	42.55	54.00	-11.45	64.00	1.34	Vertical	Pass	Pass

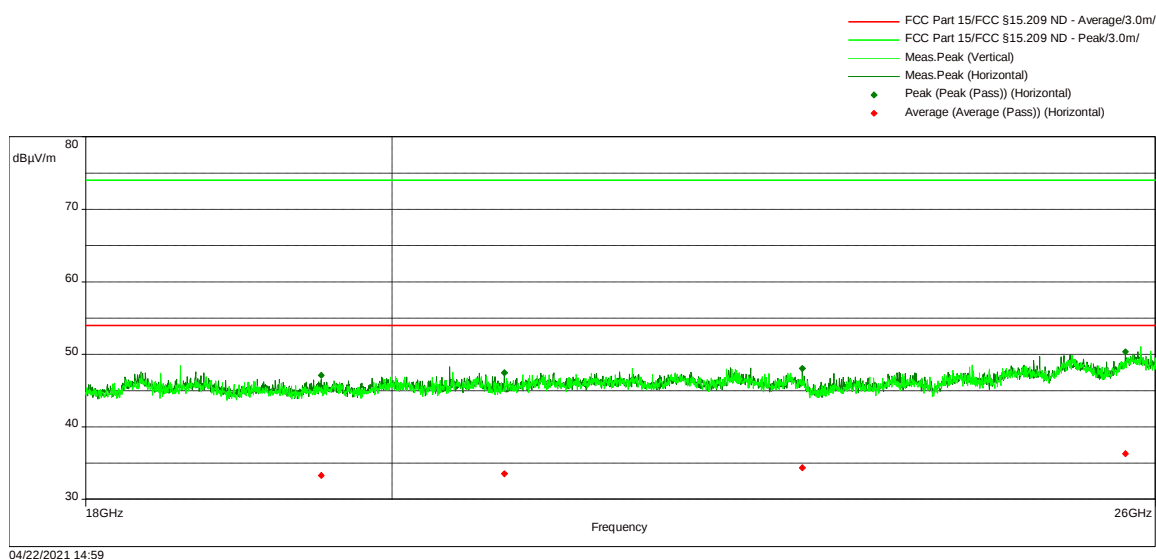
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Spurious Emissions 18 - 26GHz 802.11n HT20 Mid Ch

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
18GHz- 26GHz	Vertical	3m	1MHz	18001Pts	Auto
18GHz- 26GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 Low Ch 2437MHz

Figure 2-12 – RE Spurious Emissions 18-26 GHz – Mid Channel

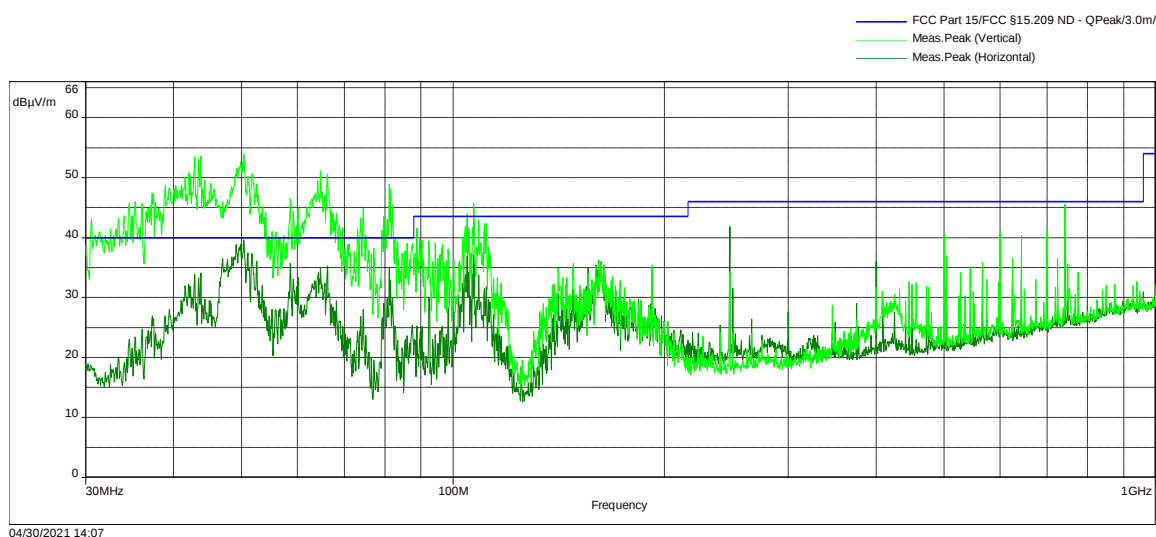
**Table 2.3-4 – RE Spurious Emissions 18-26 GHz – Mid Channel**

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
19.518667GHz	47.15	74.00	-26.85	33.31	54.00	-20.69	315.00	3.58	Horizontal	Pass	Pass
20.784889GHz	47.49	74.00	-26.51	33.53	54.00	-20.47	360.00	1.19	Horizontal	Pass	Pass
23.024889GHz	48.07	74.00	-25.93	34.34	54.00	-19.66	231.00	2.05	Horizontal	Pass	Pass
25.731556GHz	50.38	74.00	-23.62	36.29	54.00	-17.71	110.00	3.83	Horizontal	Pass	Pass



Spurious Emissions 30M-1GHz 802.11n HT20 High Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
30MHz- 1GHz	Vertical	3m	100kHz	18001Pts	Auto
30MHz- 1GHz	Horizontal	3m	100kHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

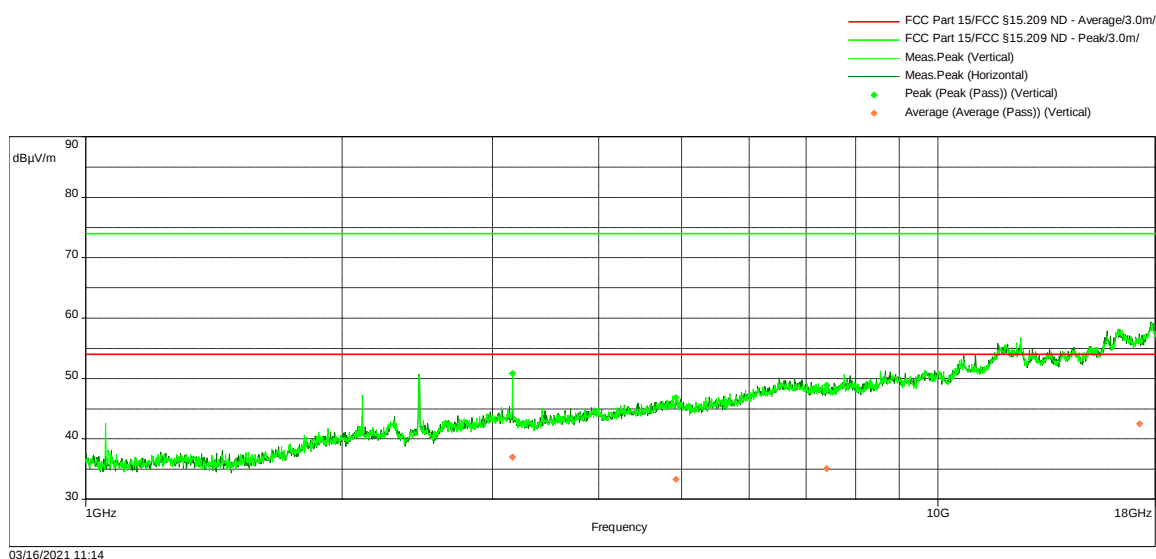
Test Notes: 802.11n HT20 High Ch 2462MHz. All emissions above the limit were determined to not be related to the transmitter via investigation testing. No spurious emissions were measured in this frequency range

Figure 2-13 – RE Spurious Emissions 30-1000 MHz – High Channel



Spurious Emissions 1 - 18GHz 802.11n HT20 High Channel

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
1GHz- 18GHz	Vertical	3m	1MHz	18001Pts	Auto
1GHz- 18GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 - High Channel 2462MHz

Figure 2-14 – RE Spurious Emissions 1-18 GHz – High Channel



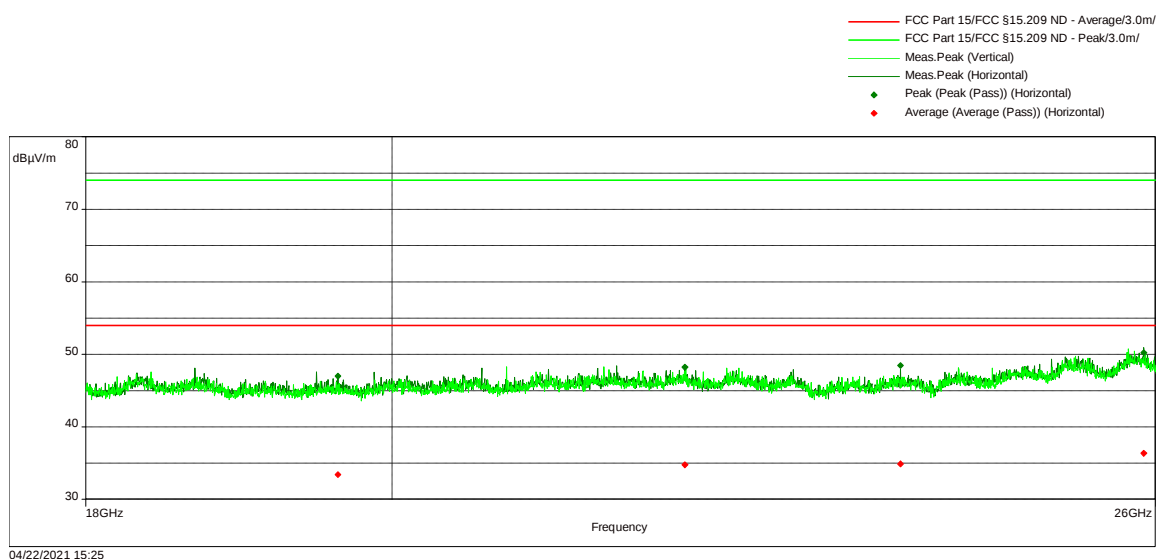
Table 2.3-5 – RE Spurious Emissions 1-18 GHz – High Channel

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
3.1675GHz	50.80	74.00	-23.20	36.96	54.00	-17.04	94.00	1.54	Vertical	Pass	Pass
4.9279444GHz	46.87	74.00	-27.13	33.31	54.00	-20.69	79.00	2.41	Vertical	Pass	Pass
7.4042778GHz	48.89	74.00	-25.11	35.11	54.00	-18.89	174.00	1.00	Vertical	Pass	Pass
17.234056GHz	56.28	74.00	-17.72	42.53	54.00	-11.47	277.00	3.88	Vertical	Pass	Pass



Spurious Emissions 18 - 26GHz 802.11n HT20 High Ch

Frequency Range	Polarity	Antenna Distance	RBW	Step Size	Sweep Time
18GHz- 26GHz	Vertical	3m	1MHz	18001Pts	Auto
18GHz- 26GHz	Horizontal	3m	1MHz	18001Pts	Auto



Limit:
FCC §15.209

Test Results:
Pass

Test Notes: 802.11n HT20 Low Ch 2462MHz

Figure 2-15 – RE Spurious Emissions 18-26 GHz – High Channel

**Table 2.3-6 – RE Spurious Emissions 18-26 GHz – High Channel**

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Peak Result	Average Result
19.631111GHz	47.01	74.00	-26.99	33.43	54.00	-20.57	151.00	1.24	Horizontal	Pass	Pass
22.117778GHz	48.23	74.00	-25.77	34.79	54.00	-19.21	349.00	1.09	Horizontal	Pass	Pass
23.817778GHz	48.49	74.00	-25.51	34.88	54.00	-19.12	66.00	2.76	Horizontal	Pass	Pass
25.894667GHz	50.24	74.00	-23.76	36.36	54.00	-17.64	184.00	1.70	Horizontal	Pass	Pass



2.3.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: 3mSAC

Table 2.3-7 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11141	Hewlett-Packard	Preamplifier, 100 kHz-1300 MHz	8447D	2944A08773	B	01/08/2021	01/08/2022
WRLE11519	Com-Power Corp.	Preamp, 500 MHz-18 GHz	PAM-118A	18040002	B	01/08/2021	01/08/2022
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44	101537	G	12/31/2020	12/31/2021
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	B	09/04/2020	09/04/2022
NBLE11645	SCHWARZBECK MESS-ELEKTRONIK	Antenna, Trilog Broadband, 30-7000 MHz	VULB 9162	0254	G	04/09/2021	04/09/2023
NBLE11689	ATM	Antenna, DRG 18-40 GHz	180-442-KF	102040	G	05/13/2019	05/13/2021
NBLE11688	Rohde & Schwarz	Preamp, 18-40 GHz	TRS-PR1840	10006	G	05/02/2019	05/02/2021

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



2.4 Radiated Band-Edge

2.4.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.247
RSS-GEN Issue 5

2.4.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.4.3 Date of Test

03 March – 30 April 2021

2.4.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 1.5 m above a reference ground plane. Measurements were taken at a 3m distance. The fundamental signal was maximized while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using a peak detector. Band-edge measurements were made with the device in its maximized position using a peak and average detector as described in ANSI C63.10.

The EUT was assessed against the limits specified in FCC 47 CFR Part 15C §15.209.

2.4.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

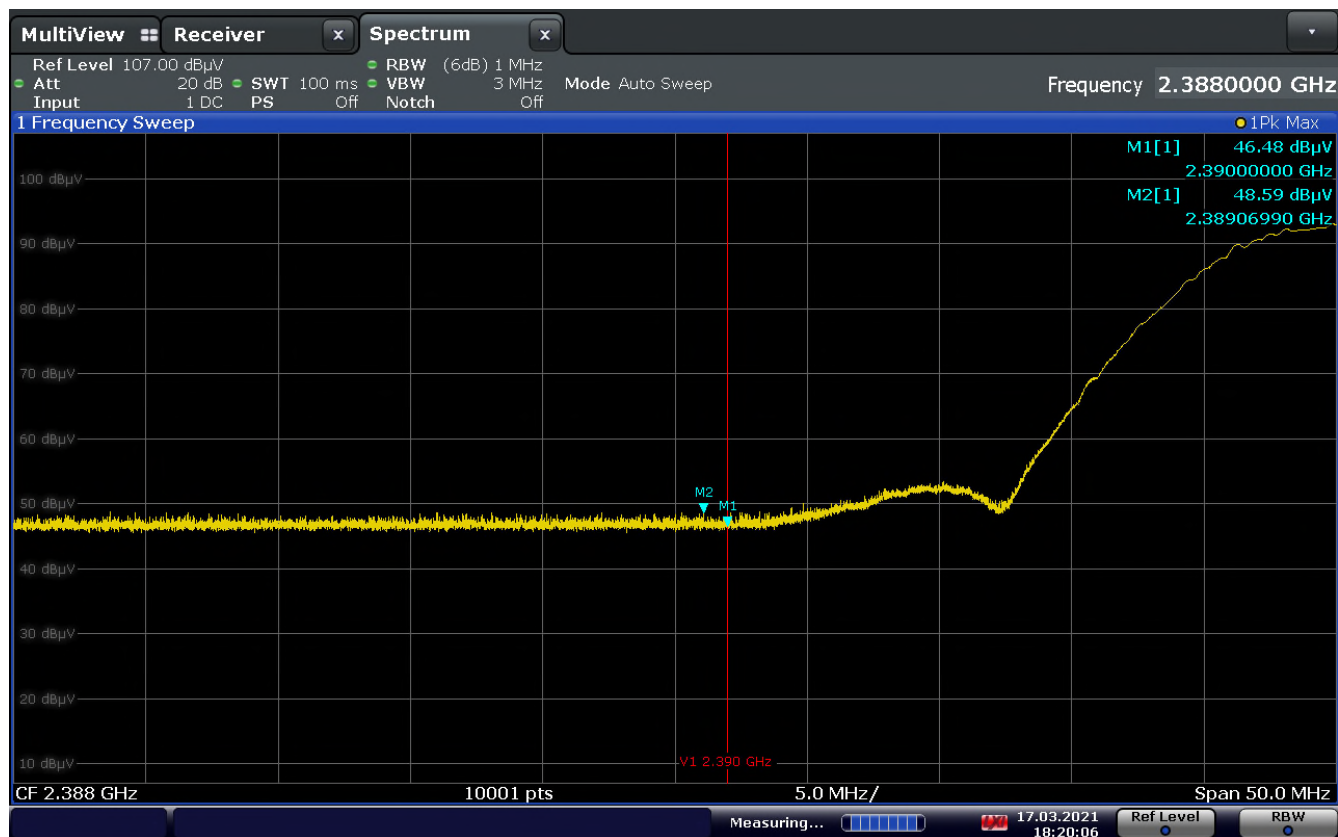
2.4.6 Test Results

Test Summary: EUT operated as intended before, during, and after testing.

.

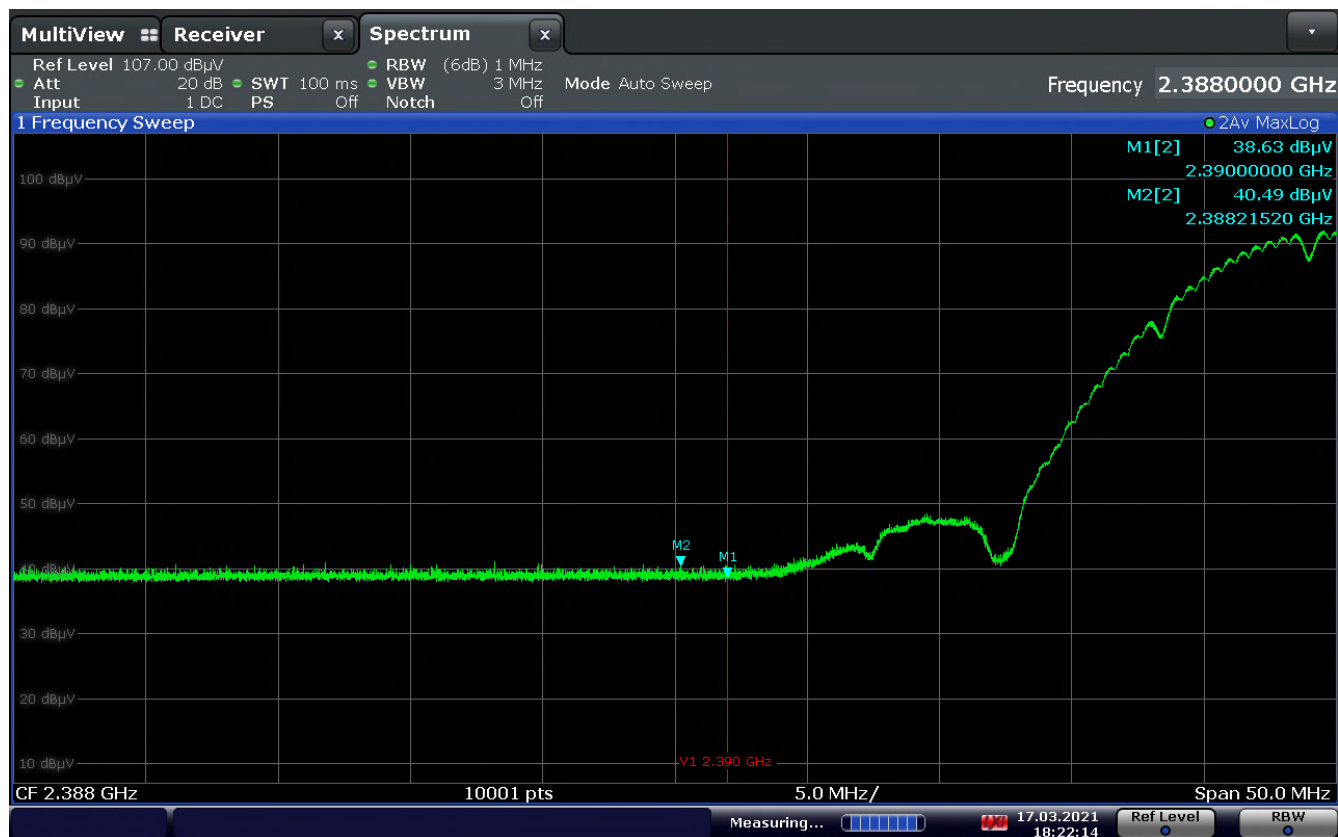
Test Result: Pass

See data below for detailed results.



18:20:07 17.03.2021

Figure 2-16 – Band-Edge, 802.11b Low Channel – Peak



18:22:15 17.03.2021

Figure 2-17 – Band-Edge, 802.11b Low Channel – Average

**Table 2.4-1 – Restricted Band Edge – 802.11b Low Channel – Peak**

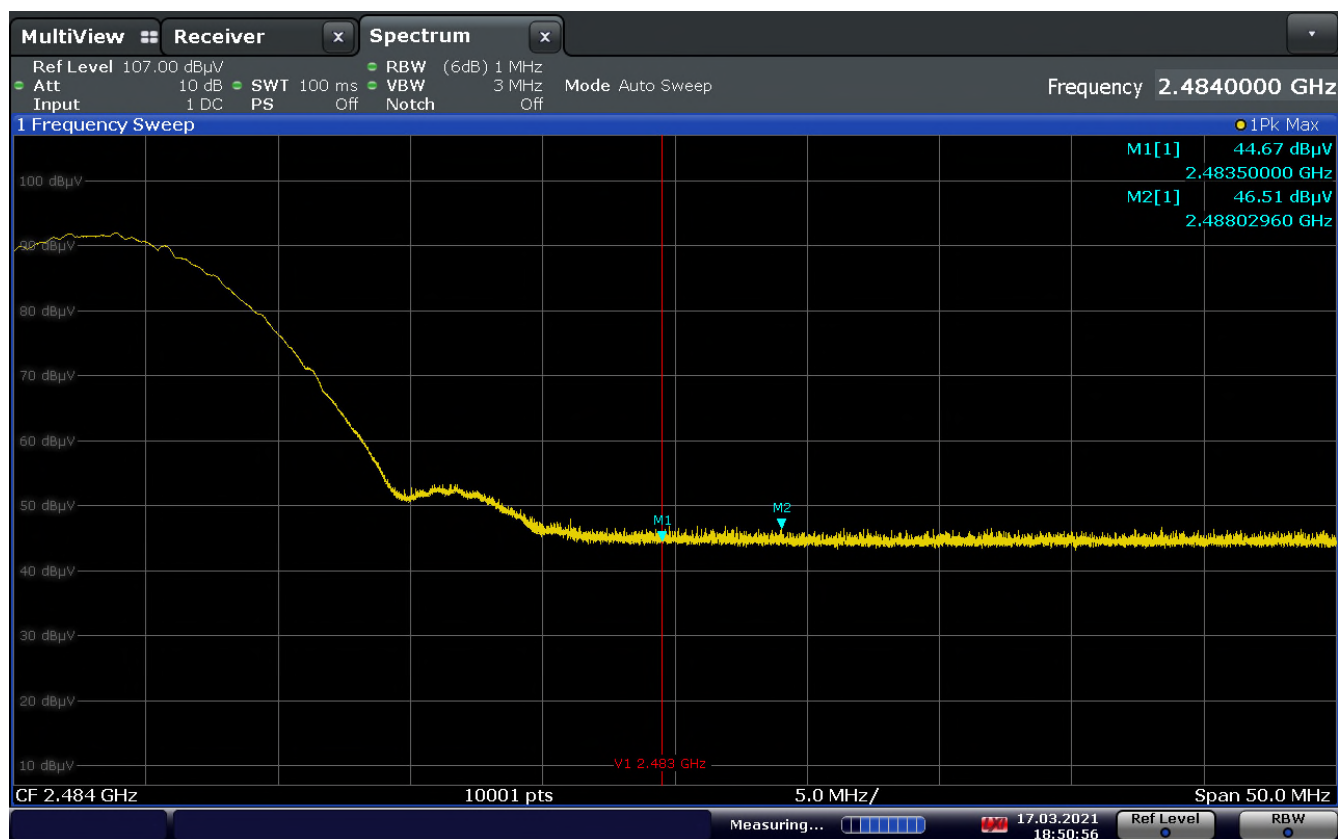
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2390	52.97	74.00	-21.03	6.49	Pass
2389.06	55.08	74.00	-18.92	6.49	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-2 – Restricted Band Edge – 802.11b Low Channel – Average

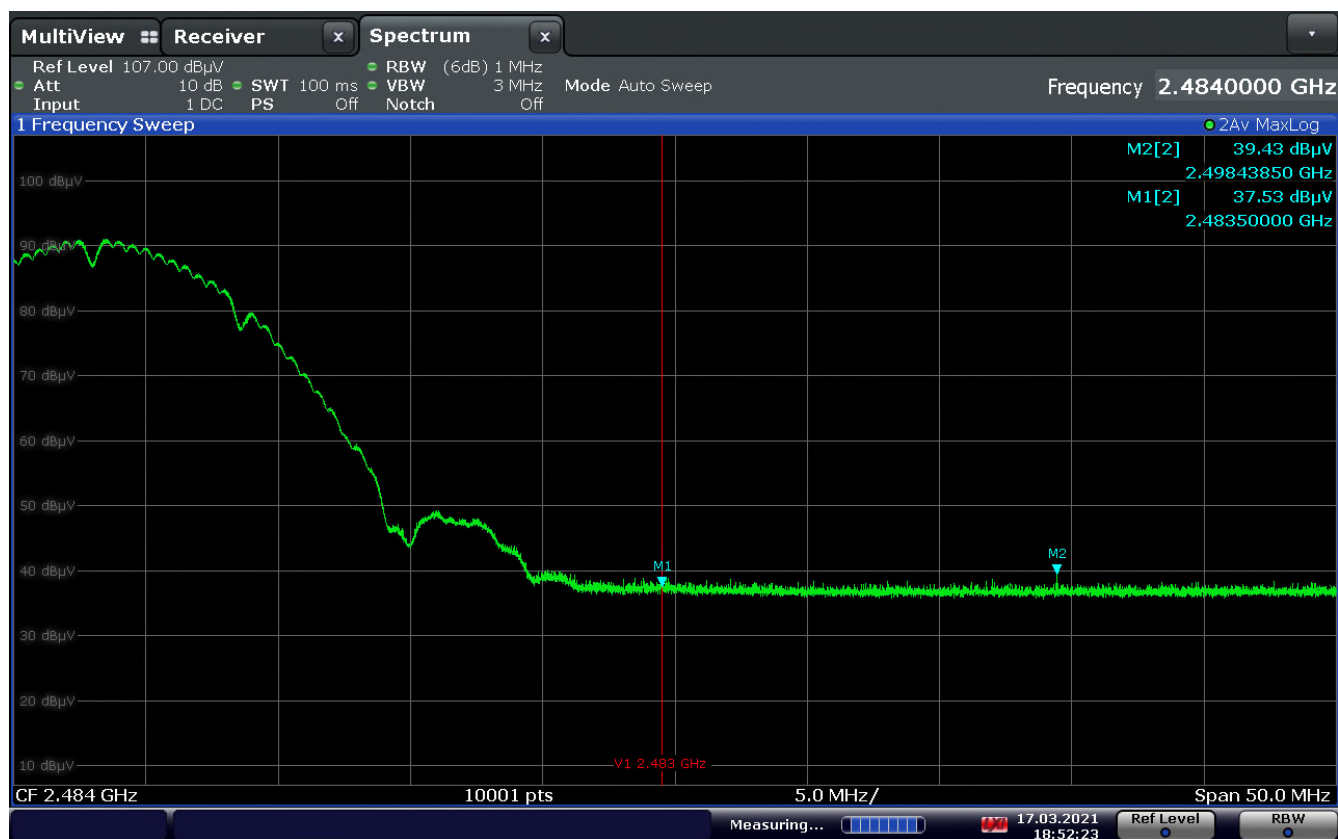
Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2390	45.53	54.00	-8.47	6.49	Pass
2388.21	46.98	54.00	-7.02	6.49	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



18:50:57 17.03.2021

Figure 2-18 – Band-edge, 802.11b High Channel – Peak



18:52:23 17.03.2021

Figure 2-19 – Band-edge, 802.11b High Channel – Average

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**Table 2.4-3 – Restricted Band Edge – 802.11b High Channel – Peak**

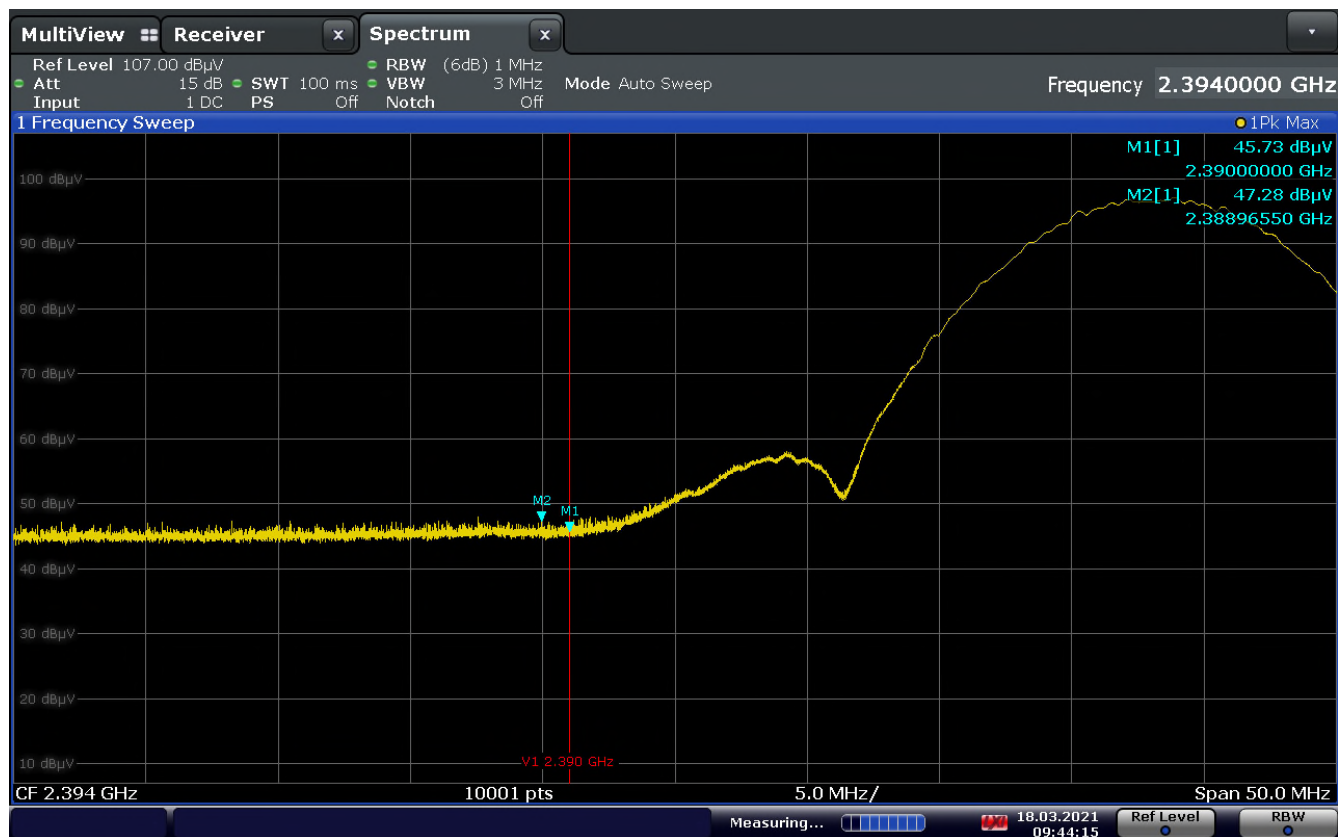
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2483.5	51.13	74.00	-22.87	6.46	Pass
2488.02	52.97	74.00	-21.03	6.46	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-4 – Restricted Band Edge – 802.11b High Channel – Average

Frequency	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2483.5	43.99	54.00	-10.01	6.46	Pass
2498.43	45.89	54.00	-8.11	6.46	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.

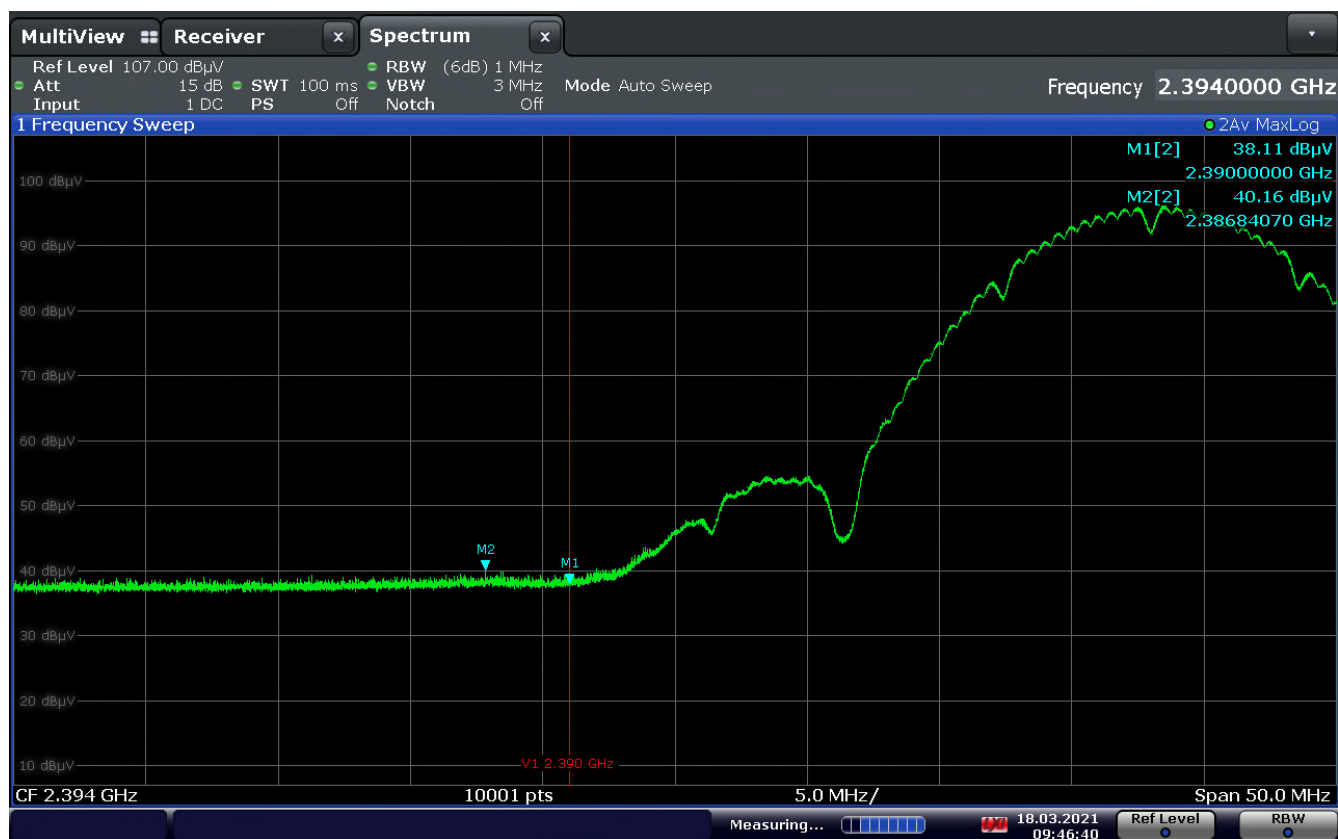


09:44:16 18.03.2021

Figure 2-20 – Band-Edge, 802.11g Low Channel – Peak

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09:46:41 18.03.2021

Figure 2-21 – Band-Edge, 802.11g Low Channel – Average

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**Table 2.4-5 – Restricted Band Edge – 802.11g Low Channel – Peak**

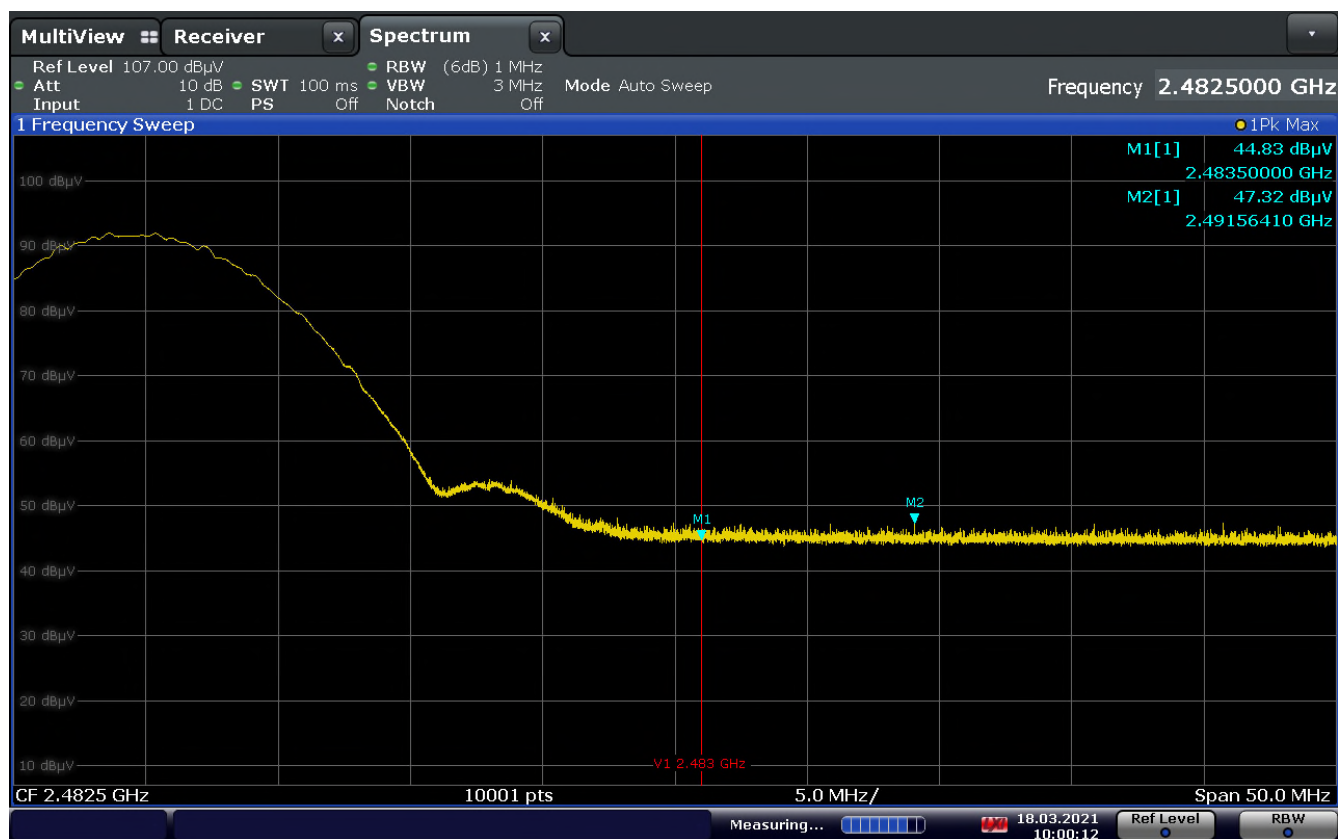
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2390	52.22	74.00	-21.78	6.49	Pass
2388.96	53.77	74.00	-20.23	6.49	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-6 – Restricted Band Edge – 802.11g Low Channel – Average

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2390	44.6	54.00	-9.4	6.49	Pass
2386.84	46.65	54.00	-7.35	6.49	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



10:00:12 18.03.2021

Figure 2-22 – Band-edge, 802.11g High Channel – Peak

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10:02:06 18.03.2021

Figure 2-23 – Band-edge, 802.11g High Channel – Average

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**Table 2.4-7 – Restricted Band Edge – 802.11g High Channel – Peak**

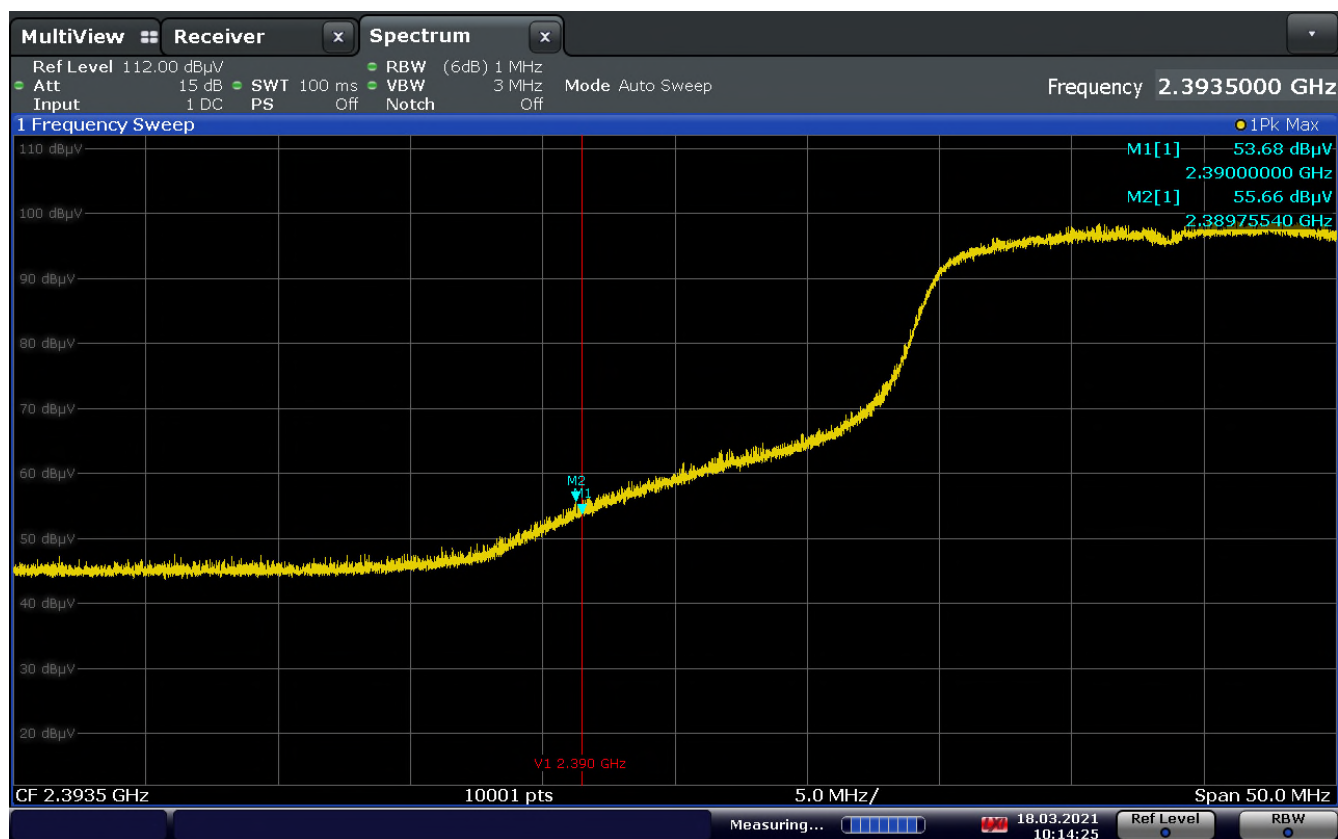
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2483.5	51.29	74.00	-22.71	6.46	Pass
2491.56	53.78	74.00	-20.22	6.46	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-8 – Restricted Band Edge – 802.11g High Channel – Average

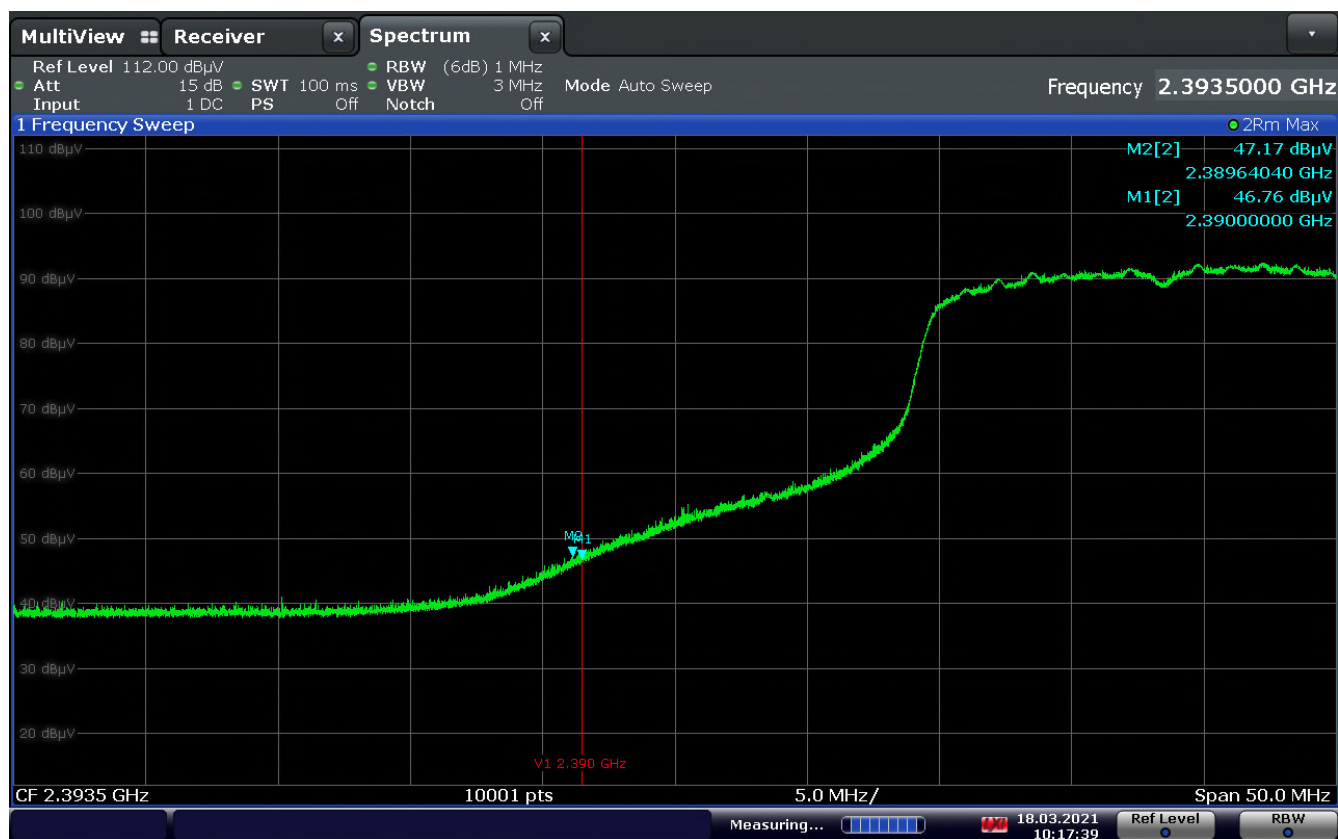
Frequency	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2483.5	44.82	54.00	-9.18	6.46	Pass
2483.85	45.54	54.00	-8.46	6.46	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



10:14:25 18.03.2021

Figure 2-24 – Band-Edge, 802.11n HT20 Low Channel – Peak



10:17:39 18.03.2021

Figure 2-25 – Band-Edge, 802.11n HT20 Low Channel – Average

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**Table 2.4-9 – Restricted Band Edge – 802.11n HT20 Low Channel – Peak**

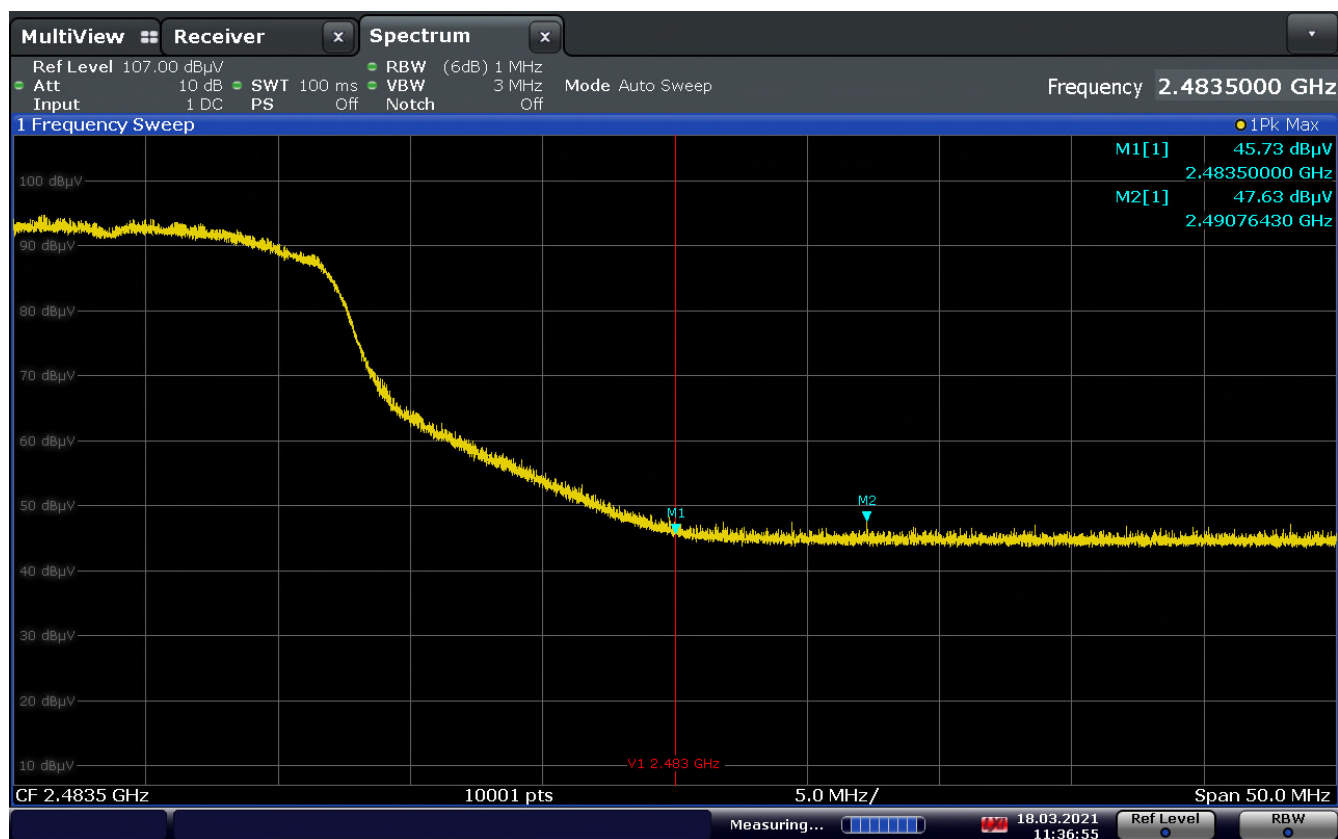
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2390	60.14	74.00	-13.86	6.49	Pass
2389.75	62.12	74.00	-11.88	6.49	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-10 – Restricted Band Edge – 802.11n HT20 Low Channel – Average

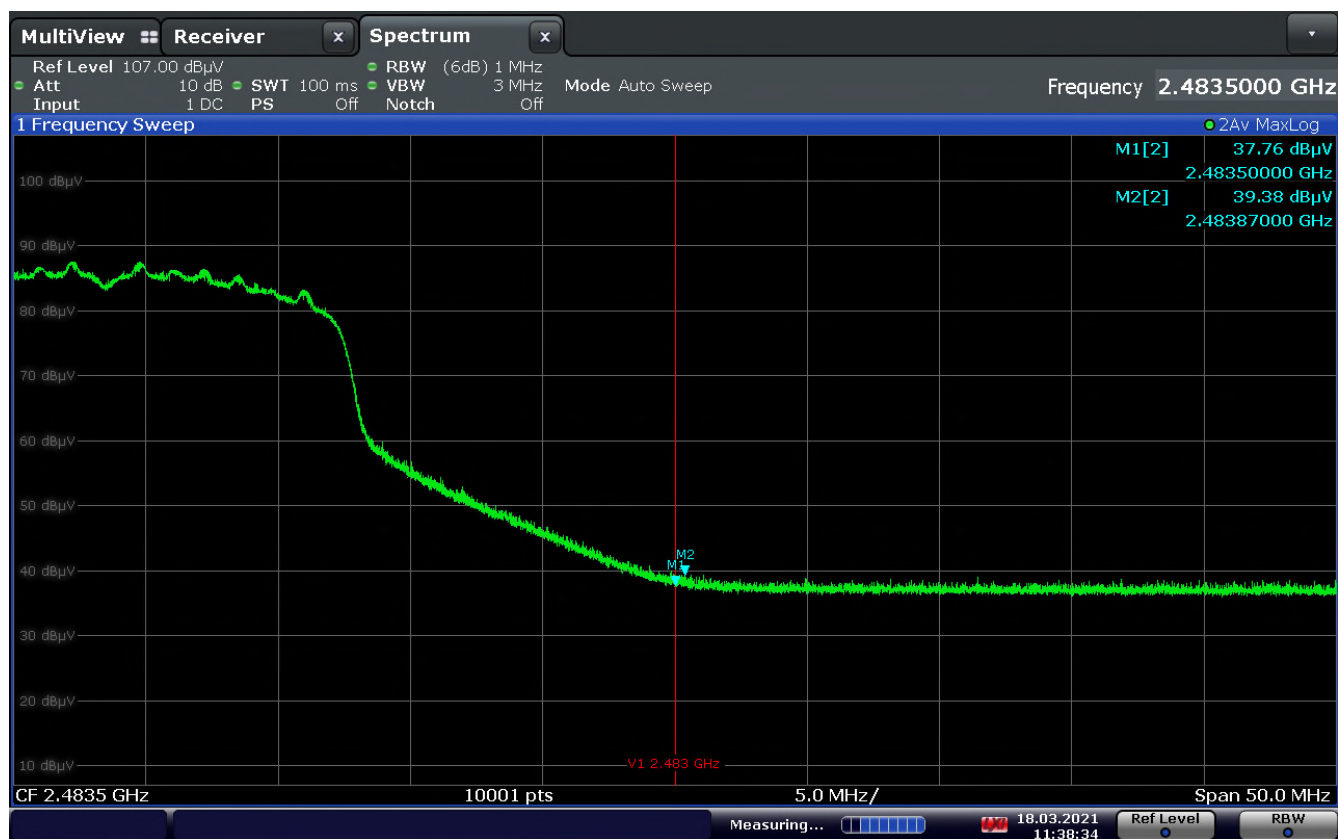
Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2390	53.22	54.00	-0.78	6.49	Pass
2389.64	53.63	54.00	-0.37	6.49	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



11:36:55 18.03.2021

Figure 2-26 – Band-edge, 802.11n HT20 High Channel – Peak



11:38:35 18.03.2021

Figure 2-27 – Band-edge, 802.11n HT20 High Channel – Average

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**Table 2.4-11 – Restricted Band Edge – 802.11n HT20 High Channel – Peak**

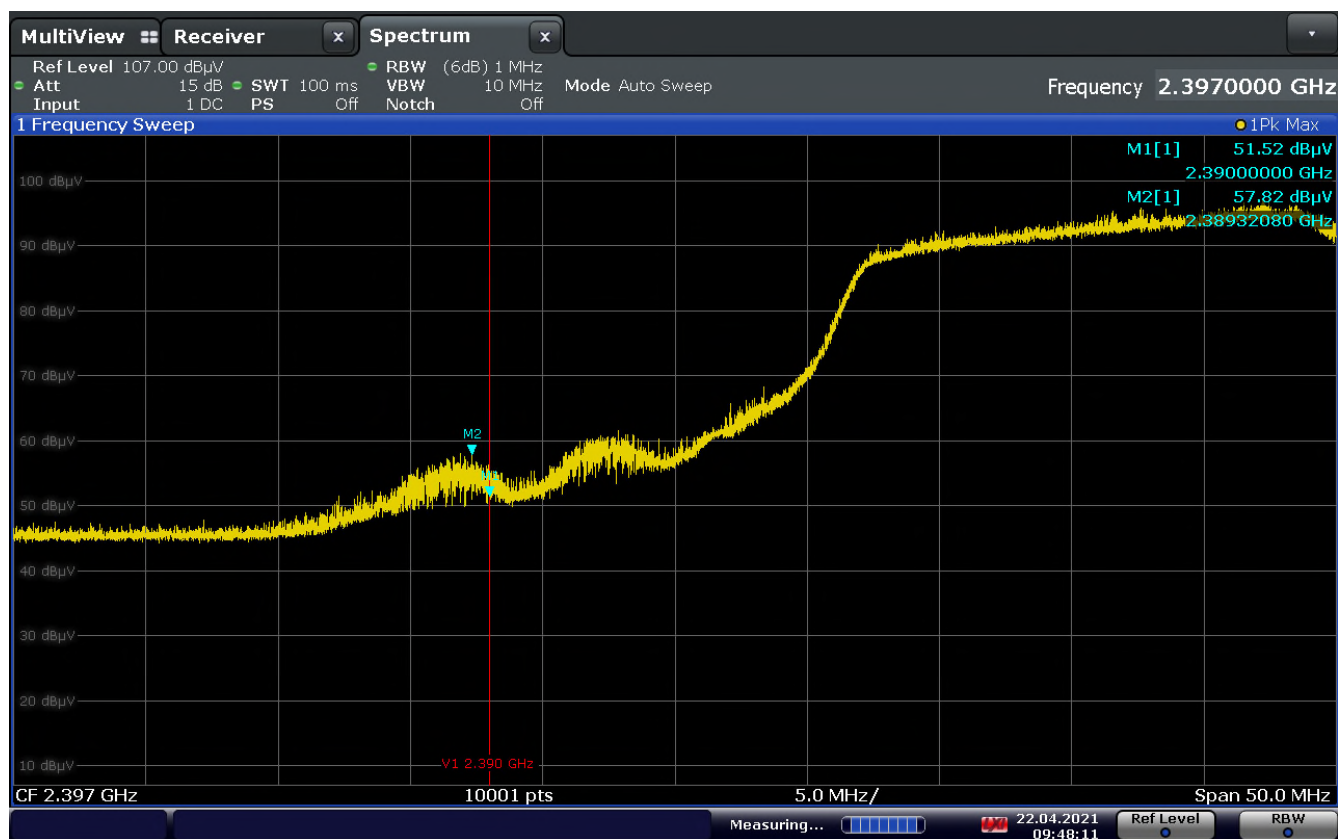
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2483.5	52.19	74.00	-21.81	6.46	Pass
2490.76	54.09	74.00	-19.91	6.46	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-12 – Restricted Band Edge – 802.11n HT20 High Channel – Average

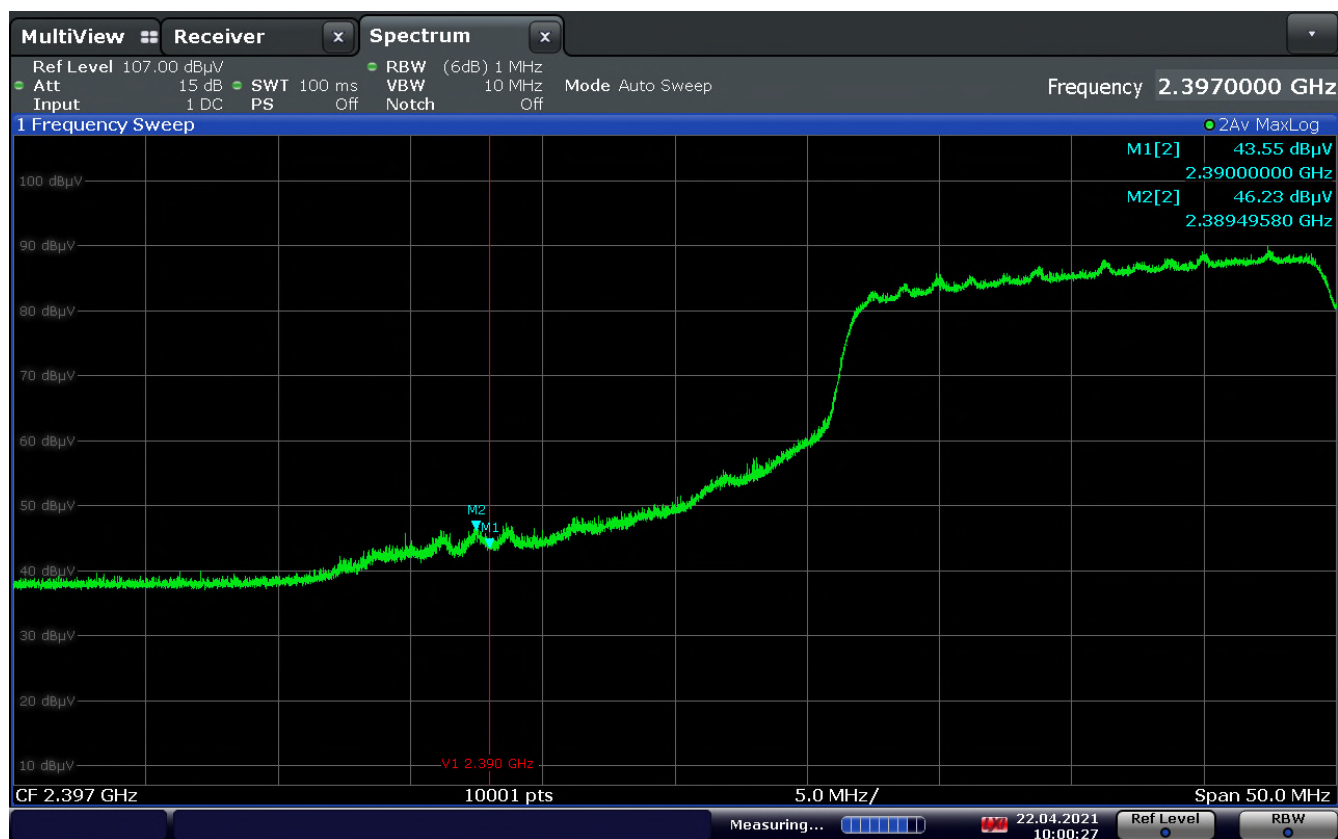
Frequency	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2483.5	44.22	54.00	-9.78	6.46	Pass
2483.87	45.84	54.00	-8.16	6.46	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



09:48:11 22.04.2021

Figure 2-28 – Band-Edge, 802.11n HT40 Low Channel – Peak



10:00:27 22.04.2021

Figure 2-29 – Band-Edge, 802.11n HT40 Low Channel – Average

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**Table 2.4-13 – Restricted Band Edge – 802.11n HT40 Low Channel – Peak**

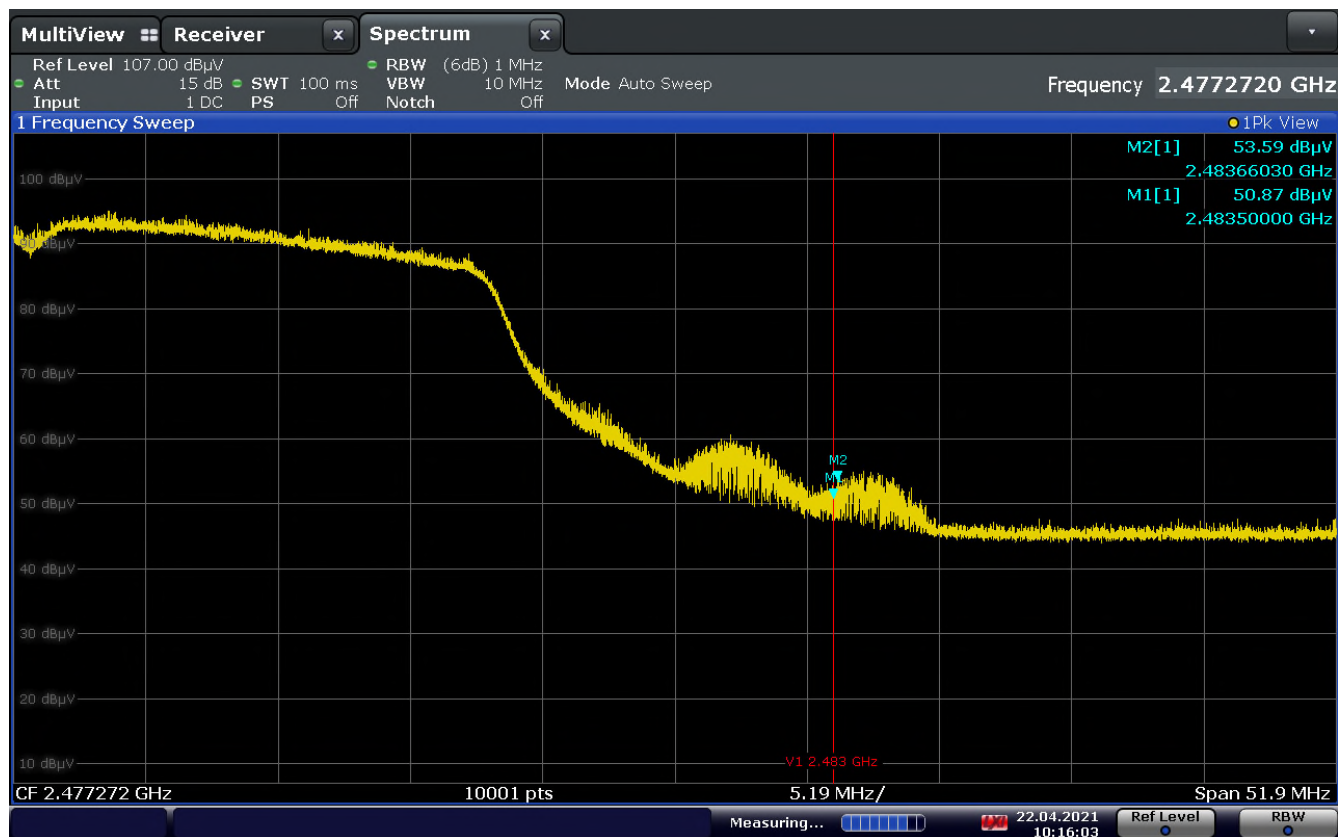
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2390	58.01	74.00	-15.99	6.49	Pass
2389.32	64.31	74.00	-9.69	6.49	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-14 – Restricted Band Edge – 802.11n HT40 Low Channel – Average

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2390	50.04	54.00	-3.96	6.49	Pass
2389.49	52.72	54.00	-1.28	6.49	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



10:16:04 22.04.2021

Figure 2-30 – Band-edge, 802.11n HT40 High Channel – Peak



10:18:46 22.04.2021

Figure 2-31 – Band-edge, 802.11n HT40 High Channel – Average

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**Table 2.4-15 – Restricted Band Edge – 802.11n HT40 High Channel – Peak**

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2483.5	57.33	74.00	-16.67	6.46	Pass
2483.66	60.05	74.00	-13.95	6.46	Pass

Note: Peak level calculation: Final Peak level = analyzer level + correction factor.
 Margin Calculation: Peak Margin = Peak Level – Peak Limit.

Table 2.4-16 – Restricted Band Edge – 802.11n HT40 High Channel – Average

Frequency	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2483.5	46.94	54.00	-7.06	6.46	Pass
2485.03	48.01	54.00	-5.99	6.46	Pass

Note: Peak level calculation: Final Average level = analyzer level + correction factor.
 Margin Calculation: Average Margin = Average Level – Average Limit.



2.4.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: 3mSAC

Table 2.4-17 – Restricted Band Edge Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE11519	Com-Power Corp.	Preamp, 500 MHz-18 GHz	PAM-118A	18040002	B	01/08/2021	01/08/2022
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44	101537	G	12/31/2020	12/31/2021
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	B	09/04/2020	09/04/2022
NBLE11594	Pasternack	Attenuator, 10dB	PE7019-10	X23	B	02/15/2021	02/15/2022

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

3 Diagram of Test Setups

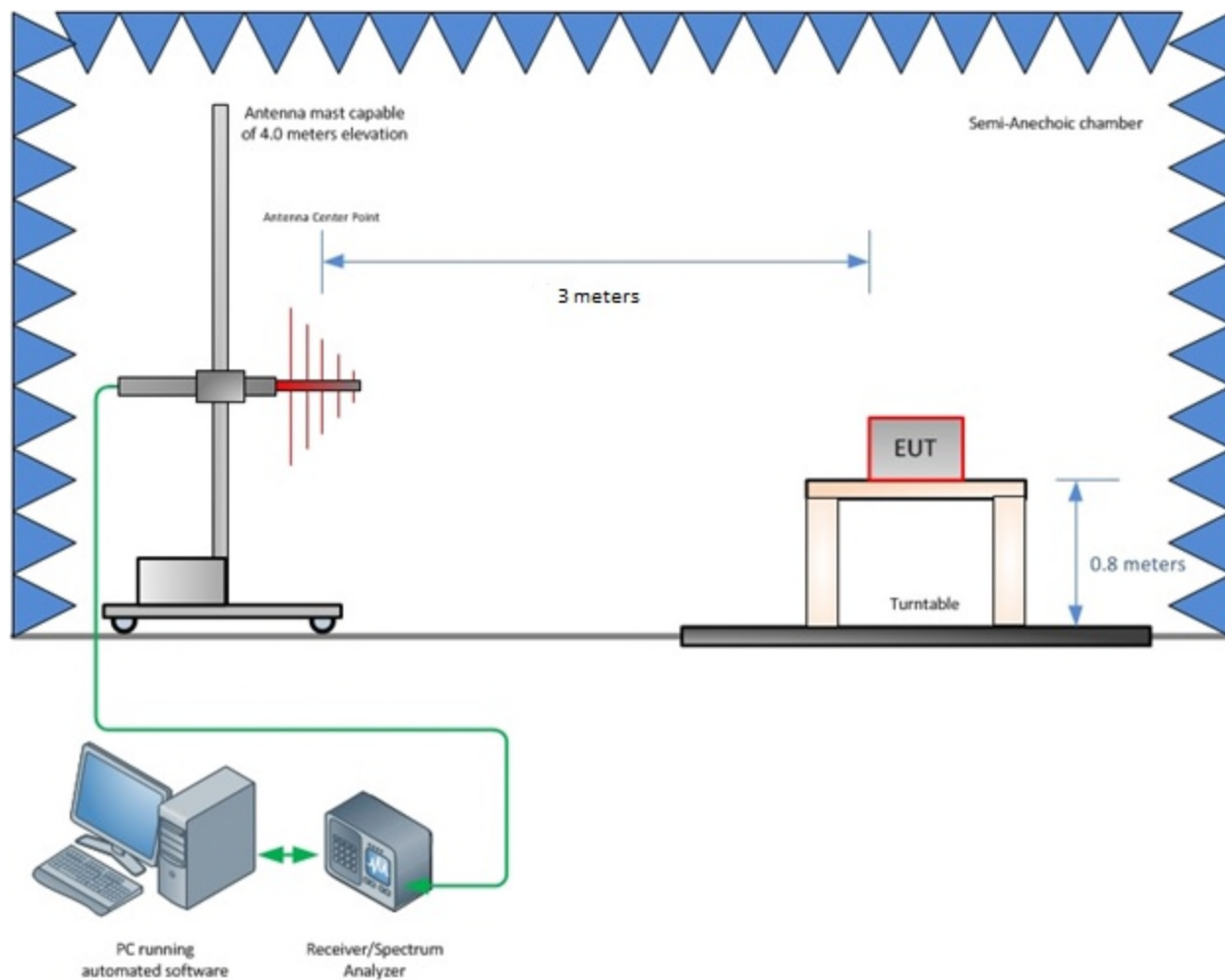


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

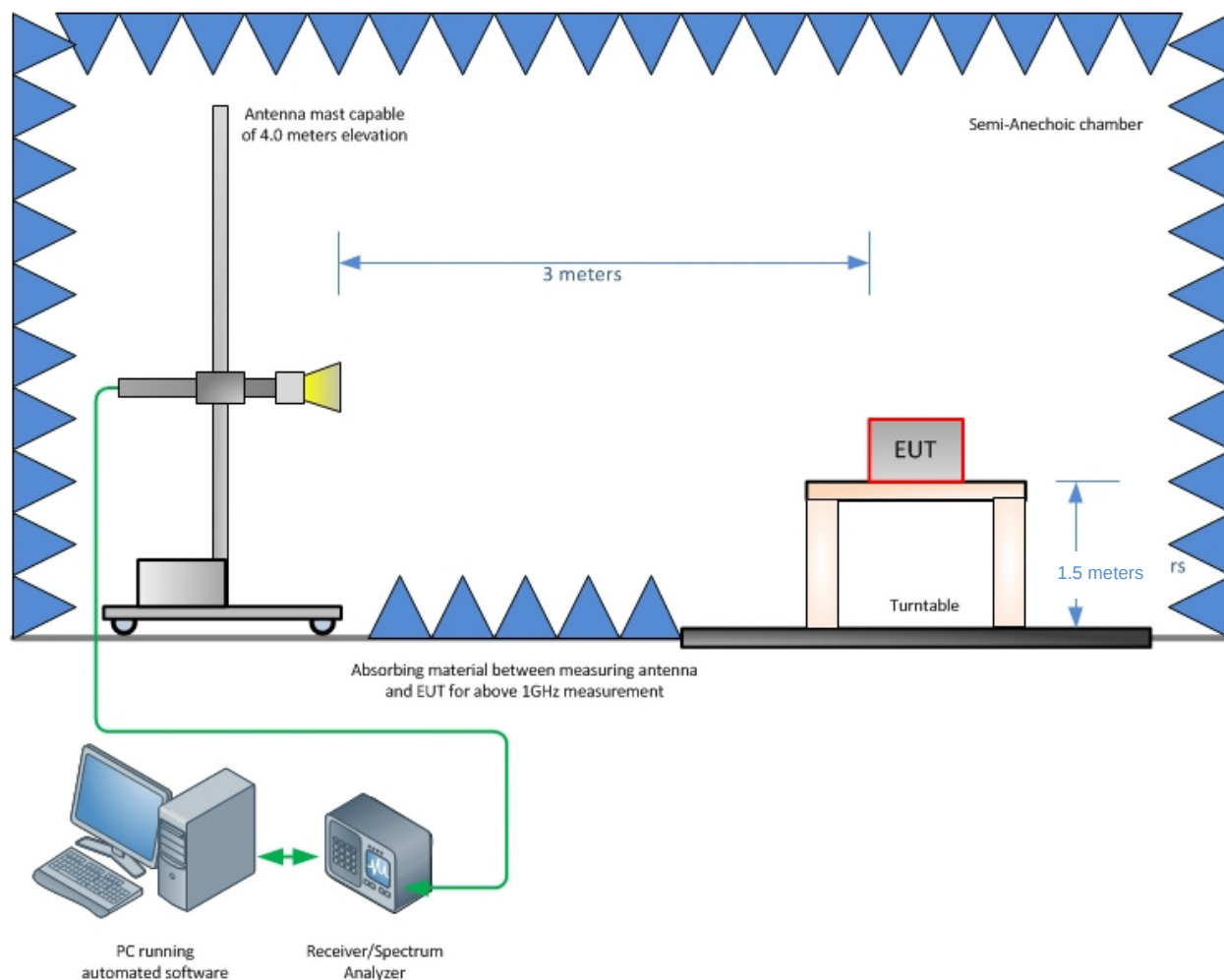


Figure 3-2 – Radiated Emissions Test Setup above 1 GHz



4 Accreditation, Disclaimers and Copyright

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STATEMENT OF MEASUREMENT UNCERTAINTY – Emissions

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. This test system has a measurement uncertainty of ± 3.30 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. This test system for 30 MHz-1000 MHz has a measurement uncertainty of ± 5.88 dB and above 1 GHz a measurement uncertainty of ± 4.47 dB. The measurement uncertainty values for conducted and radiated emissions meet the requirements as expressed in CISPR 16-4-2. The equipment comprising the test systems is calibrated on an annual basis.

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications