

Report on the Testing of the

DexCom Inc.
Falcon Receiver (+8dB)

FCC ID: PH26403
IC: 9290A-26403
HVIN: MT26403-3

In accordance with:
FCC 47 CFR Part 15.247
FCC 47 CFR Part 15.107
ISED RSS-247 Issue 2, February 2017

Prepared for: DexCom Inc.
6340 Sequence Dr.
San Diego, CA 92121



America

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Document Number: NC72162700.4 | Issue: 1

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Franklin Rose	Sr. RF Wireless Engineer	Authorized Signatory	31 August 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
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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	31 August 2021

1.2 Introduction

Manufacturer	DexCom Inc.
Applicant's Email Address	Andrew.Burton@dexcom.com
Model Number(s)	MT26404-X
Serial Number(s)	RE F1 SN: PG049G07FA00001233
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15.247 FCC 47 CFR Part 15 Subpart B ISED RSS-247 Issue 2, February 2017
Order Number	72162700
Date of Receipt of EUT	15 June 2021
Start of Test	15 June 2021
Finish of Test	19 June 2021
Related Document(s)	N/A

Note: The report applies to all localized versions of the receiver whose model number is MT26404-X, where the X is a single- or double-digit alphanumerical identifier used to identify the localized / translated version of the user interface. All versions of the MT26404-X devices have identical hardware configuration and wireless radio performance.



1.3 Summary of Results

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

Table 1.3-1 – 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	15.247(b)(2)	RSS-247 (5.2a)	6dB / 99% Bandwidth	A2LA	ANSI C63.10:2013
2.3	15.247(b)(3)	RSS-247 (5.4d)	Peak Conducted Output Power	A2LA	ANSI C63.10:2013
2.4	15.247(e)	RSS-247 (5.2b)	Power Spectral Density	A2LA	ANSI C63.10:2013
2.5	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emissions	A2LA	ANSI C63.10:2013
2.6	15.247(d)	RSS-247 (5.5)	Conducted Band-Edge	A2LA	ANSI C63.10:2013
2.7	15.207	RSS-GEN	Conducted Emissions 15.207	A2LA	ANSI C63.10:2013
2.8	15.247(d)	RSS-GEN	Radiated Spurious Emissions	A2LA	ANSI C63.10:2013
2.9	15.205	RSS-GEN	Radiated Restricted Bands of Emissions	A2LA	ANSI C63.10:2013

Table 1.3-2 – Test Accreditation

Test Name	Name of Tester(s)	Results / Comments
Antenna Requirements	Sean Sellergren	Pass
6dB / 99% Bandwidth	Sean Sellergren	Pass
Peak Conducted Output Power	Sean Sellergren	Pass
Power Spectral Density	Sean Sellergren	Pass
Conducted Spurious Emissions	Sean Sellergren	Pass
Conducted Band-Edge	Sean Sellergren	Pass
Conducted Emissions 15.207	Sean Sellergren	Pass
Radiated Spurious Emissions	Sean Sellergren	Pass
Radiated Restricted Bands of Emissions	Sean Sellergren	Pass



1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT): Bluetooth Low Energy (BLE) used inside a DexCom Falcon Receiver used to monitor glucose levels.

Table 1.4-1 – Wireless Module Technical Information

Detail	Description
FCC ID#	PH26403
Transceiver Model #	MT26404-X
IC ID	9290A-26403
HVIN	MT26403-3
Transmit Frequency	2402MHz – 2480MHz
Receiver Frequency	2402MHz – 2480MHz
Antenna Type / Description:	Manufacture: Texas Instruments Model: AN043 Type: Planar Inverted F Gain: 2 dBi

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

**Table 1.4-2 – Cable Descriptions**

Cable/Port	Description
Micro-USB	Battery charging port

Table 1.4-3 – Support Equipment Descriptions

Make/Model	Description
N/A	N/A

1.4.2 Modes of Operation

The tested mode of operation was:

The EUT was modified by Dexcom Inc. with special firmware in order to properly modify the radio channels and transmission states for testing. The EUT was also set to a power level of 8dBm for all testing. For all antenna conducted testing the EUT was modified by Dexcom Inc. to include a short antenna connection to allow direct instrumental measurements.

1.5 Deviations from the Standard

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

1.6 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 1.6-1 – Modification Record

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

1.7 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

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

Phone: 651-631-2487
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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
Planar Inverted F	USB Dongle	2 dBi



2.2 6dB / 99% Bandwidth

2.2.1 Specification Reference

FCC 47 CFR Part 15.247(a)(2)
RSS-247 5.2(a)

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

16 June 2021

2.2.4 Test Method

The 6dB bandwidth was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz and the Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold using a peak detector. The marker-delta function of the spectrum analyzer was utilized to determine the 6dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth value. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The RBW to 1-5% of the occupied bandwidth and the VBW set to ≥ 3 times the RBW.

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 Test Results

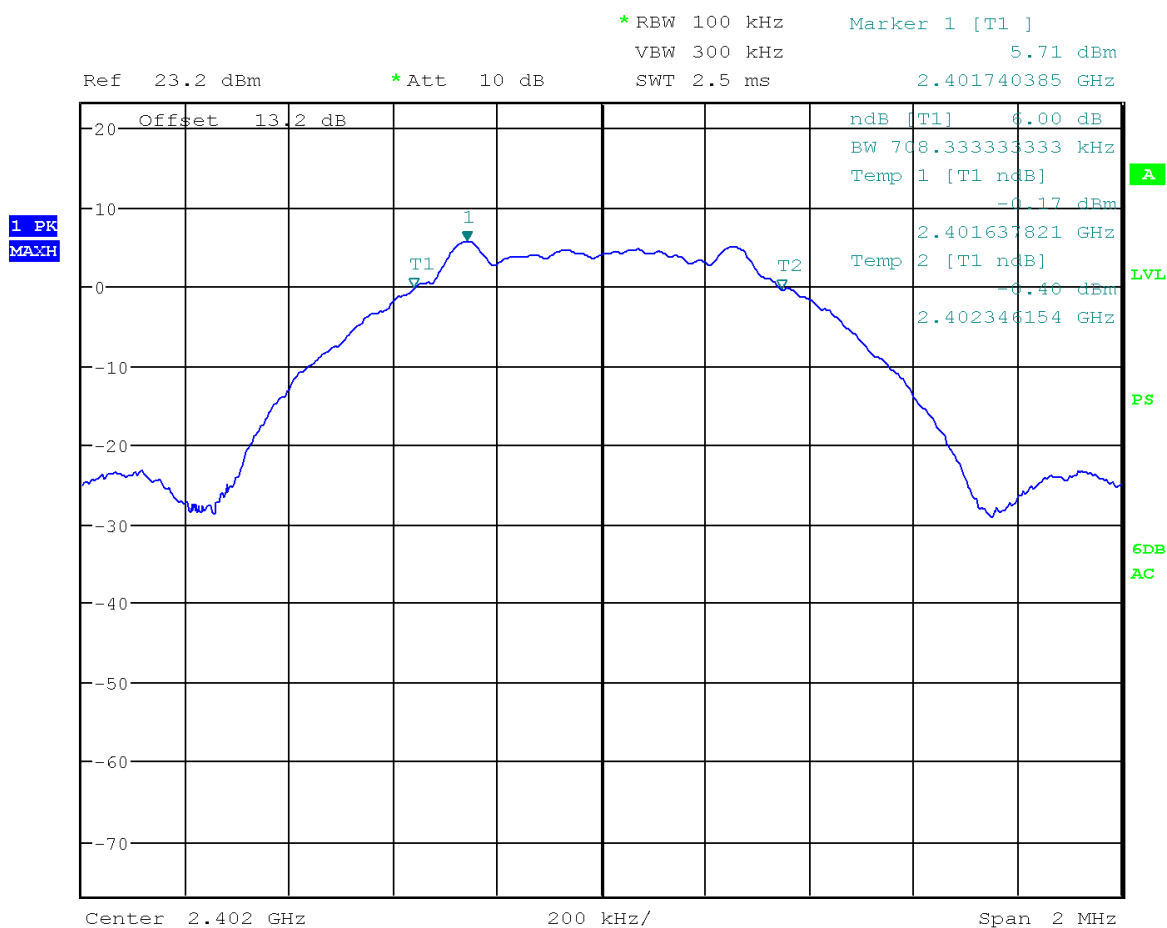
Table 2.2-1 – 6dB / 99% Bandwidth Results – F1 Unit

Frequency (MHz)	6dB Bandwidth (kHz)	99% Bandwidth (MHz)
2402	708.33	1.064
2440	727.56	1.064
2480	804.48	1.060

Test Summary: The EUT was set to 8dBm and modulation active during testing. The EUT operated as intended before, during, and after testing.

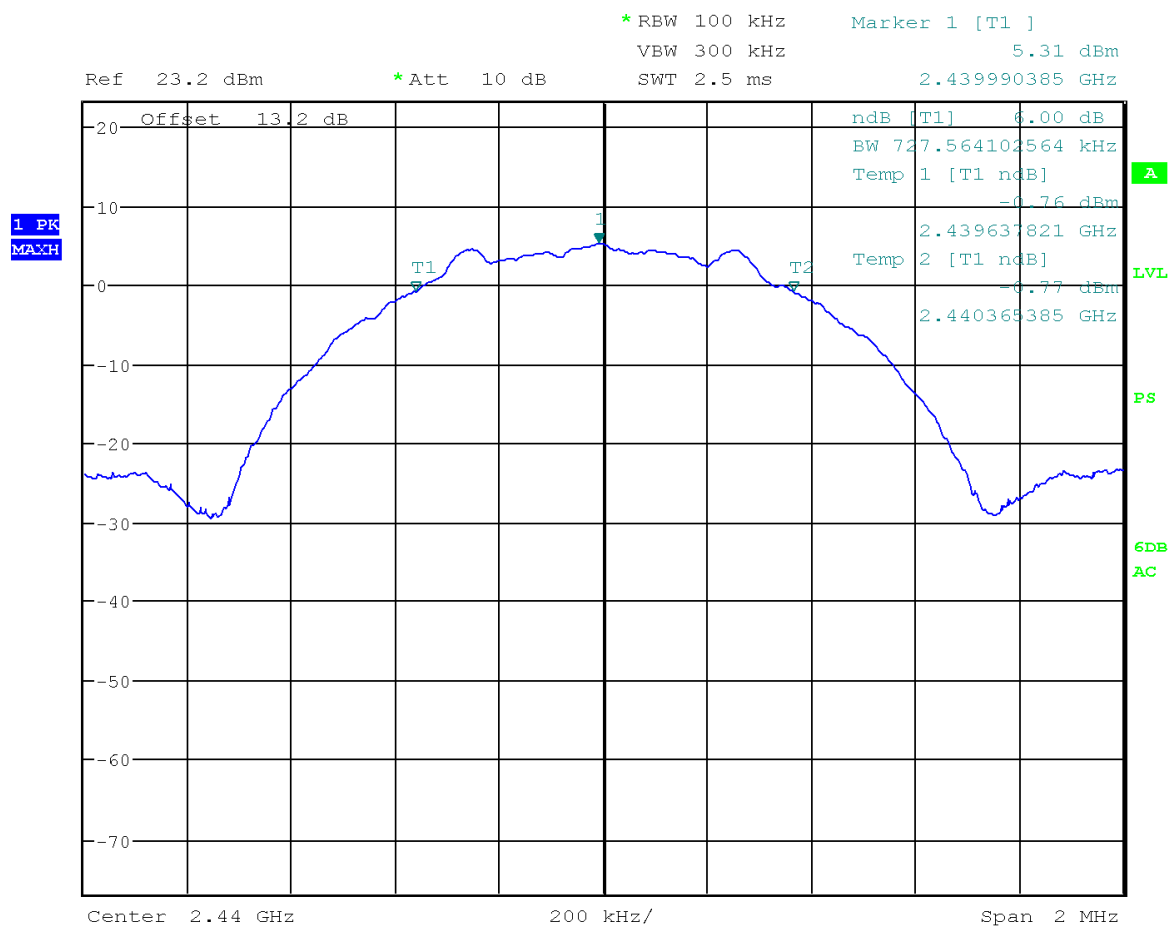
Test Result: Pass

See data below for detailed results.



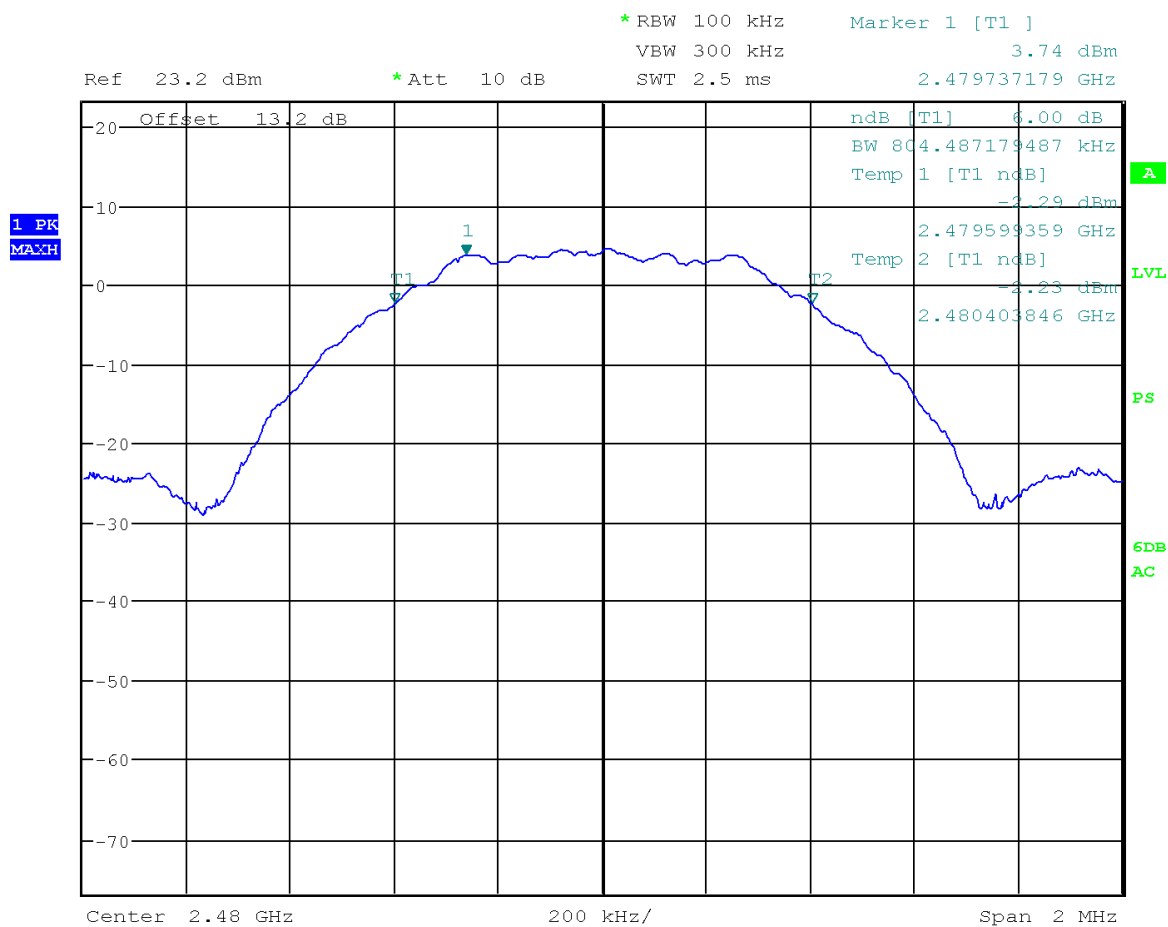
Date: 16.JUN.2021 14:03:50

Figure 2.2-1 – 6dB Bandwidth – Low Channel



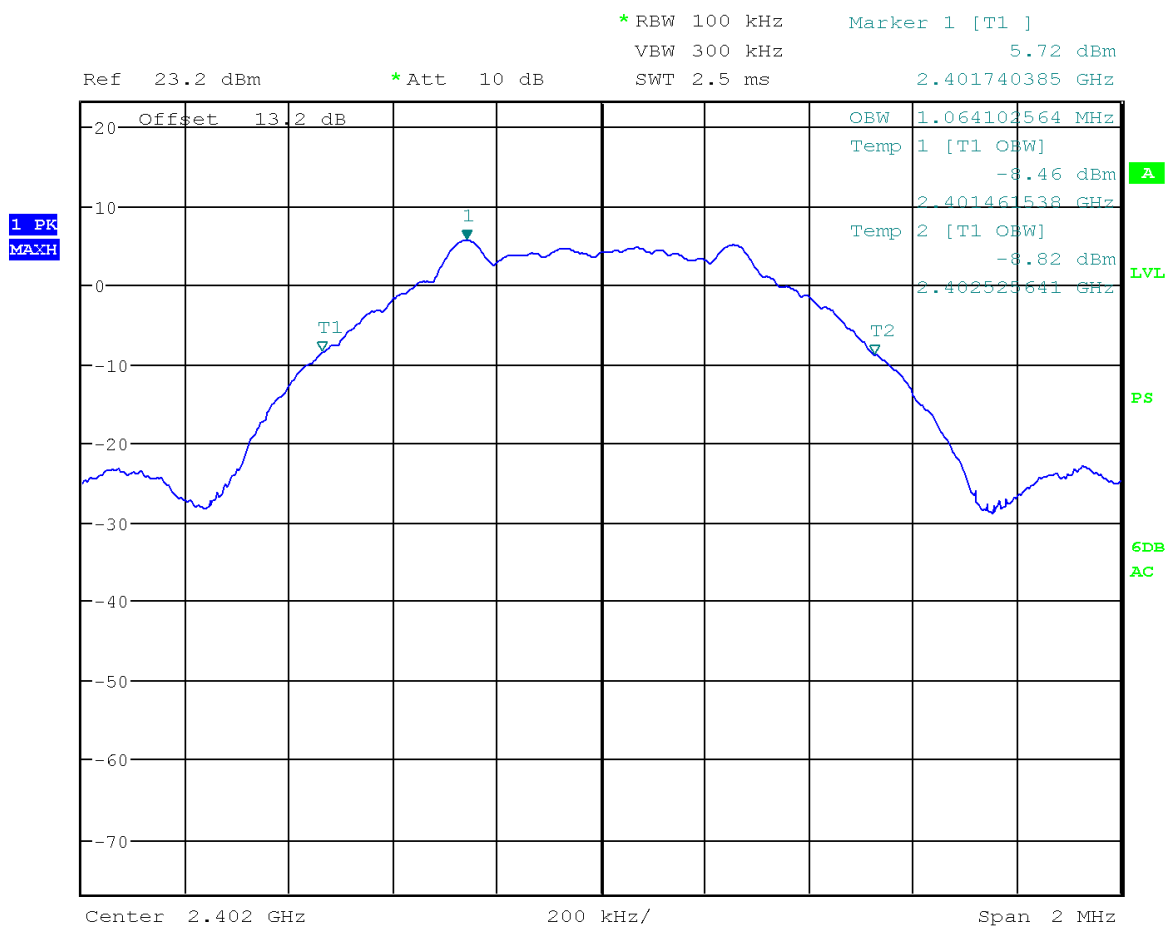
Date: 16.JUN.2021 14:02:45

Figure 2.2-2 – 6dB Bandwidth – Middle Channel



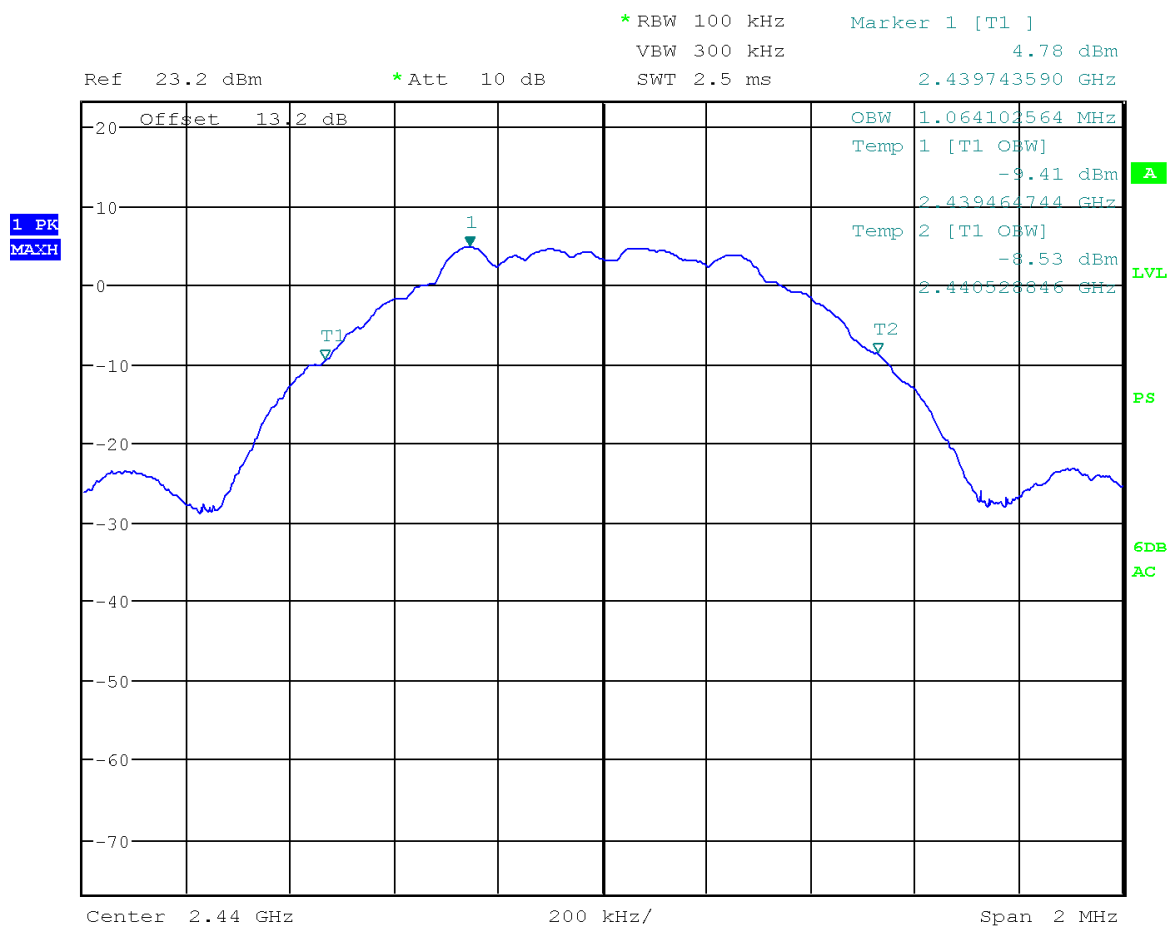
Date: 16.JUN.2021 14:01:33

Figure 2.2-3 – 6dB Bandwidth – High Channel



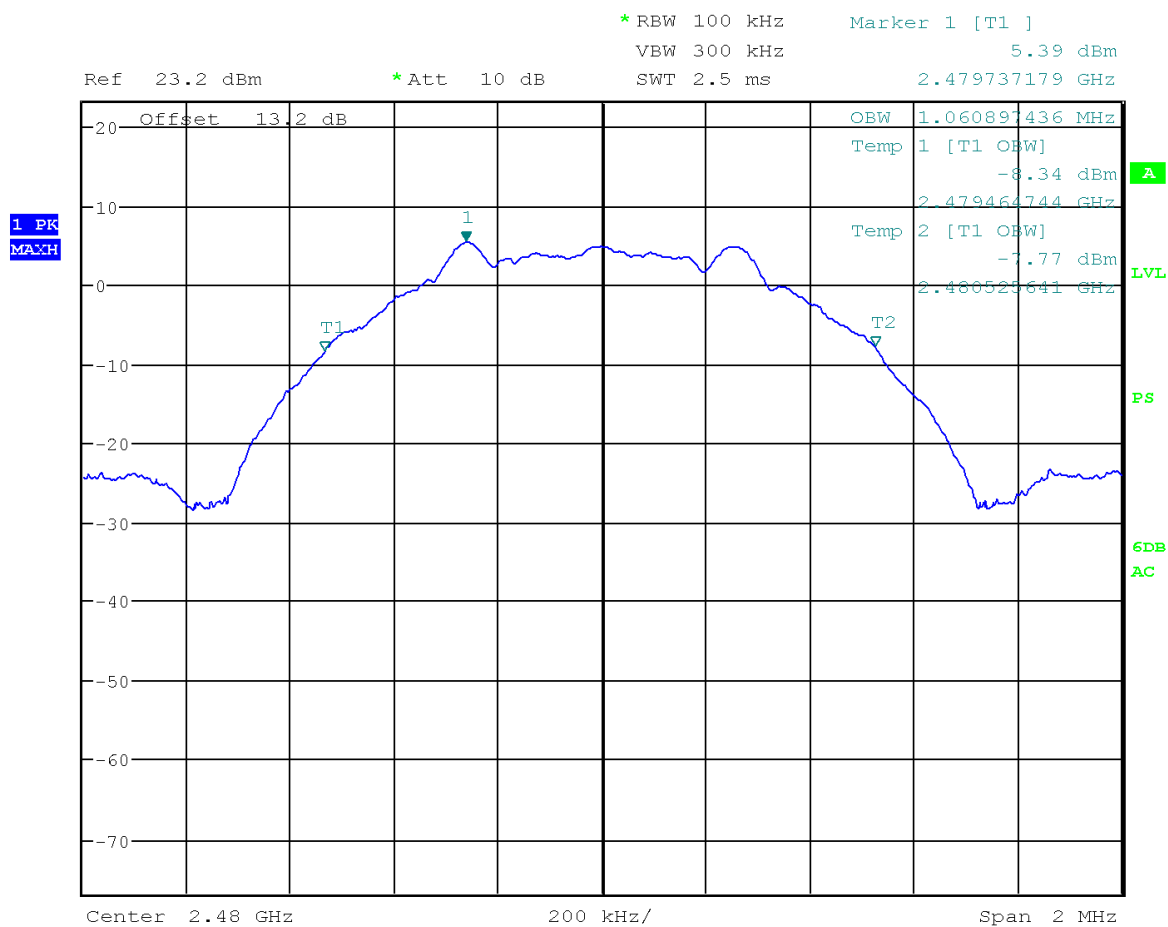
Date: 16.JUN.2021 14:12:04

Figure 2.2-4 – 99% Bandwidth – Low Channel



Date: 16.JUN.2021 14:13:48

Figure 2.2-5 – 99% Bandwidth – Middle Channel



Date: 16.JUN.2021 14:15:02

Figure 2.2-6 – 99% Bandwidth – High Channel



2.2.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: CSAC1

Table 2.2-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
DEMC3002	Rohde & Schwarz	Receiver, 20 Hz-40 GHz	ESU40	100346	G	05/14/2021	05/14/2022

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 Peak Conducted Output Power

2.3.1 Specification Reference

FCC 47 CFR Part 15.247(b)(3)
RSS-247 5.2(d)

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

16 June 2021

2.3.4 Test Method

The maximum peak conducted output power was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02 utilizing the $RBW \geq DTS$ Bandwidth method. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator.

Maximum conducted output limit is equal to 1 Watt (30dBm).

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 Test Results

Table 2.3-1 – Peak Conducted Output Power Results

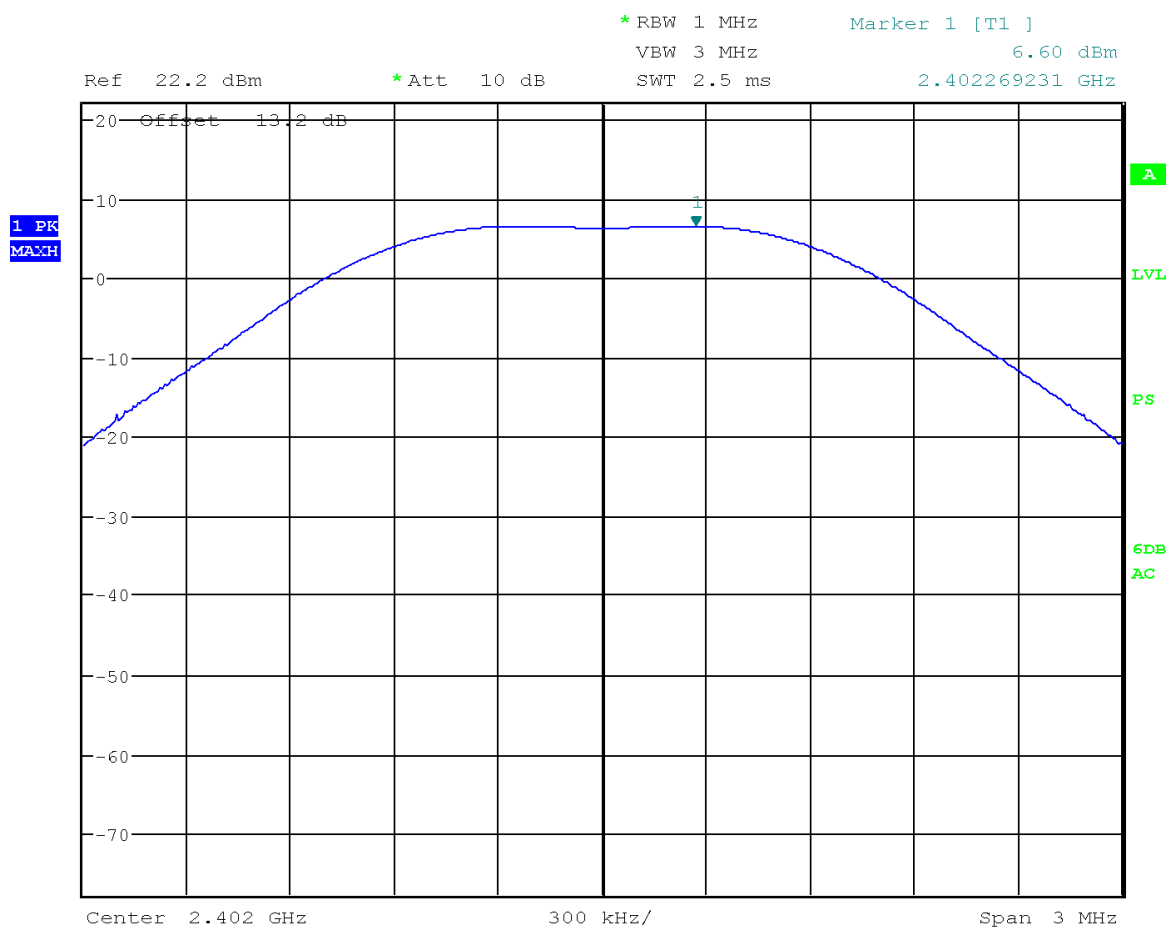
Frequency (MHz)	Measured Output Power (dBm)
2402	6.60
2440	6.51
2480	6.32

Note: Measured Output Power includes correction offset for external attenuator and cable.

Test Summary: The EUT was set to 8dBm and modulation active during testing. The EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

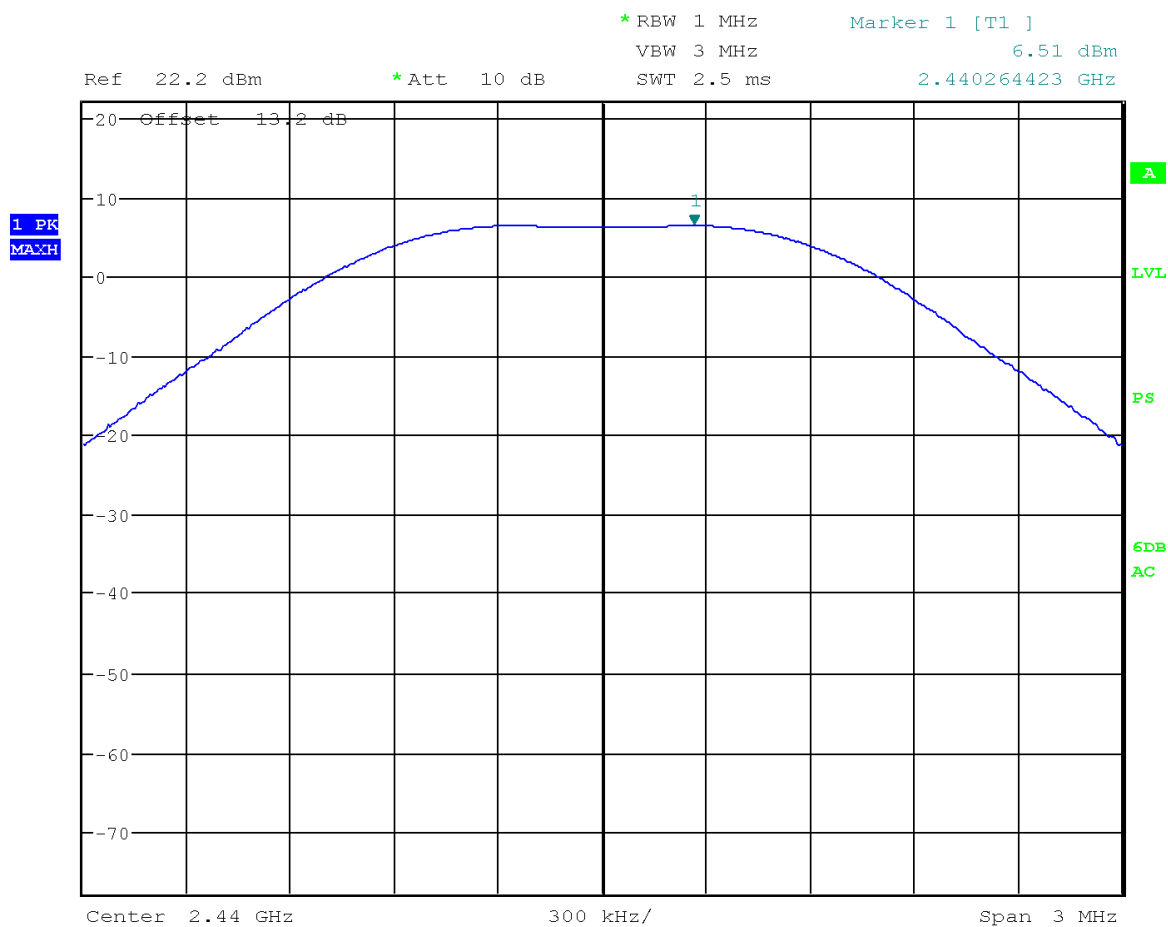


Date: 16.JUN.2021 14:46:06

Figure 2.3-1 – Peak Conducted Output Power – Low Channel

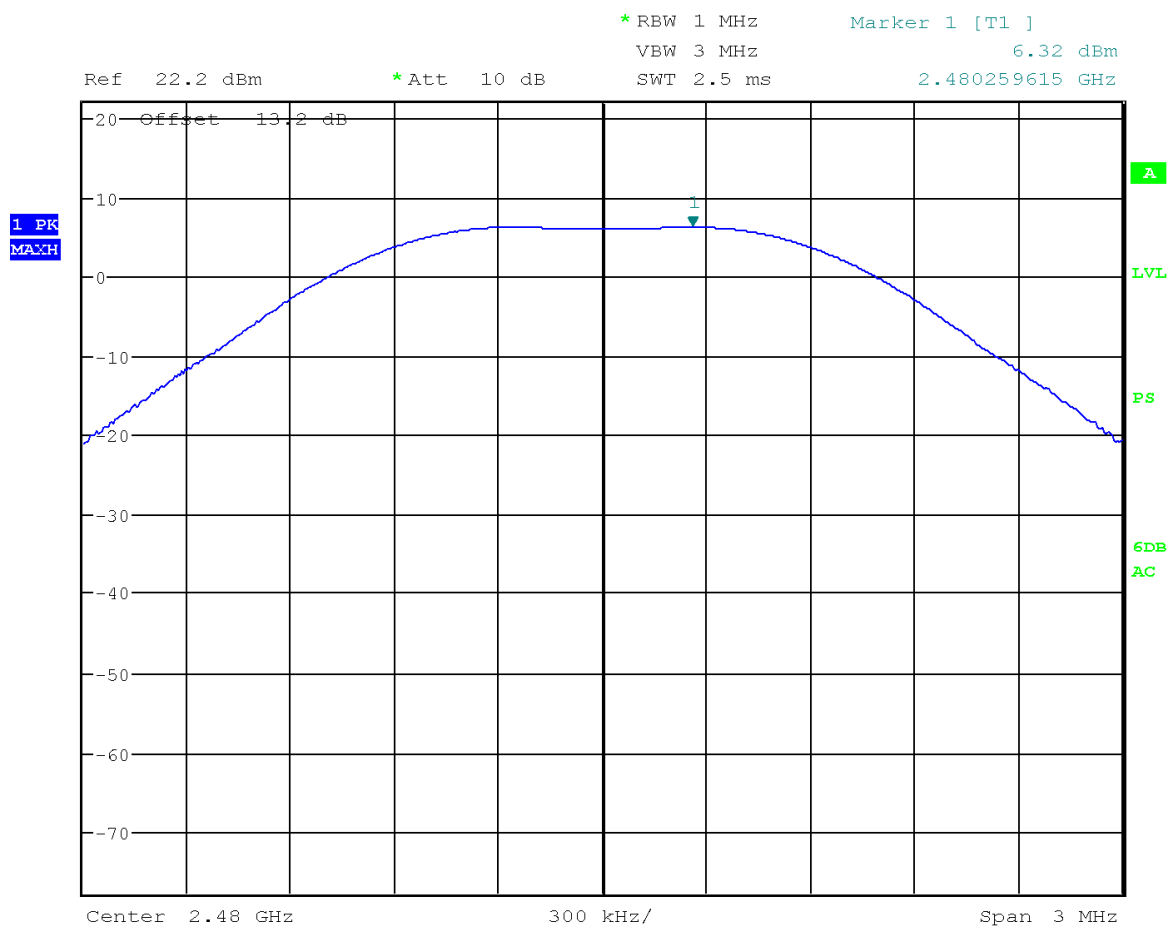
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Date: 16.JUN.2021 14:44:40

Figure 2.3-2 – Peak Conducted Output Power – Middle Channel



Date: 16.JUN.2021 14:43:35

Figure 2.3-3 – Peak Conducted Output Power – High Channel



2.3.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: CSAC1

Table 2.3-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
DEMC3002	Rohde & Schwarz	Receiver, 20 Hz-40 GHz	ESU40	100346	G	05/14/2021	05/14/2022

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.



2.4 Power Spectral Density

2.4.1 Specification Reference

FCC 47 CFR Part 15.247(e)
RSS-247 5.2(b)

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

16 June 2021

2.4.4 Test Method

The maximum peak conducted output power was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02 utilizing the PKPSD (peak PSD) method. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The RBW of the spectrum analyzer was set to 50kHz and the VBW was set to ≥ 3 times the RBW. The spectrum analyzer was set to max hold using the peak detector.

Power Spectral Density limit is equal to 8dBm.

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

Table 2.4-1 – Peak Conducted Output Power Results

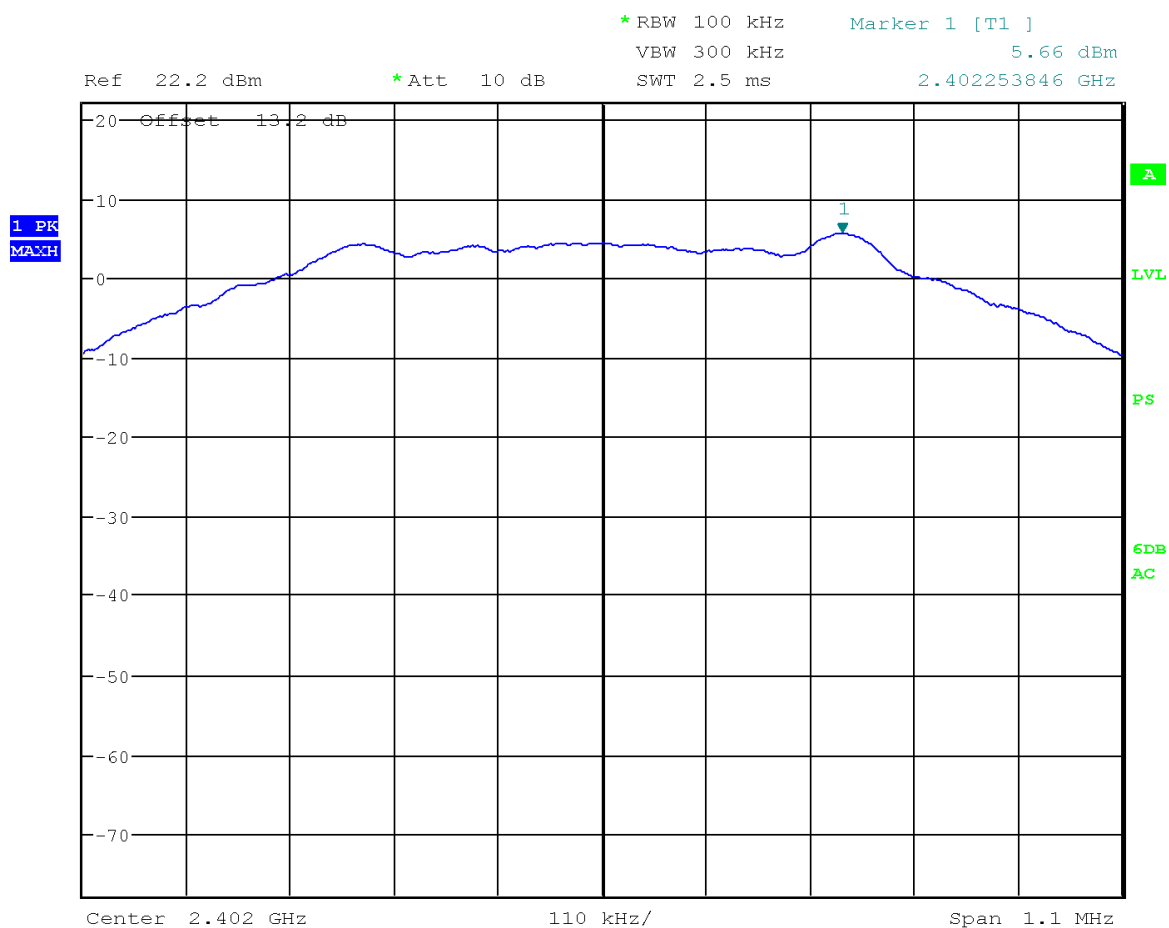
Frequency (MHz)	Measured PSD Level (dBm)
2402	5.66
2440	5.18
2480	5.20

Note: Measured PSD Level includes correction offset for external attenuator and cable.

Test Summary: The EUT was set to 8dBm and modulation active during testing. The EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

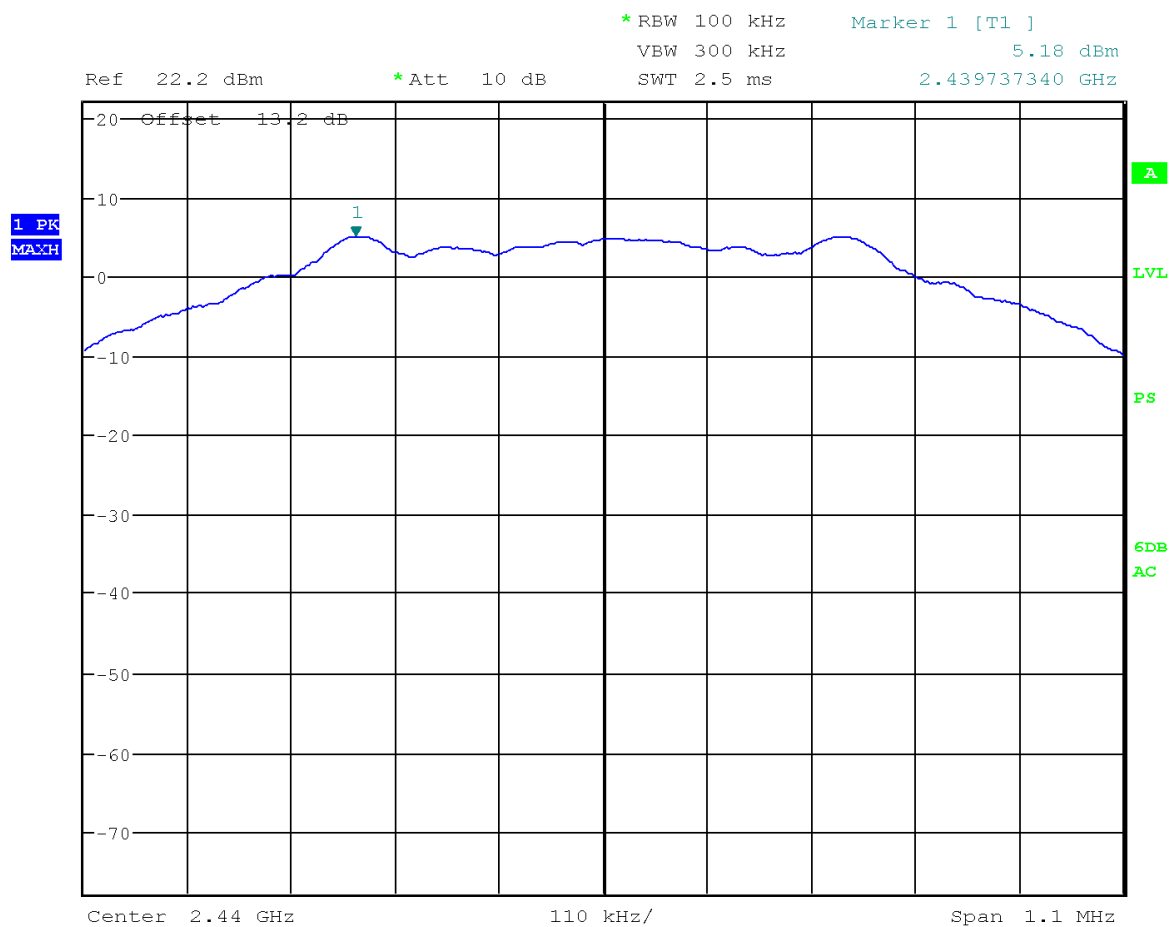


Date: 16.JUN.2021 14:56:03

Figure 2.4-1 – Peak Conducted Output Power – Low Channel

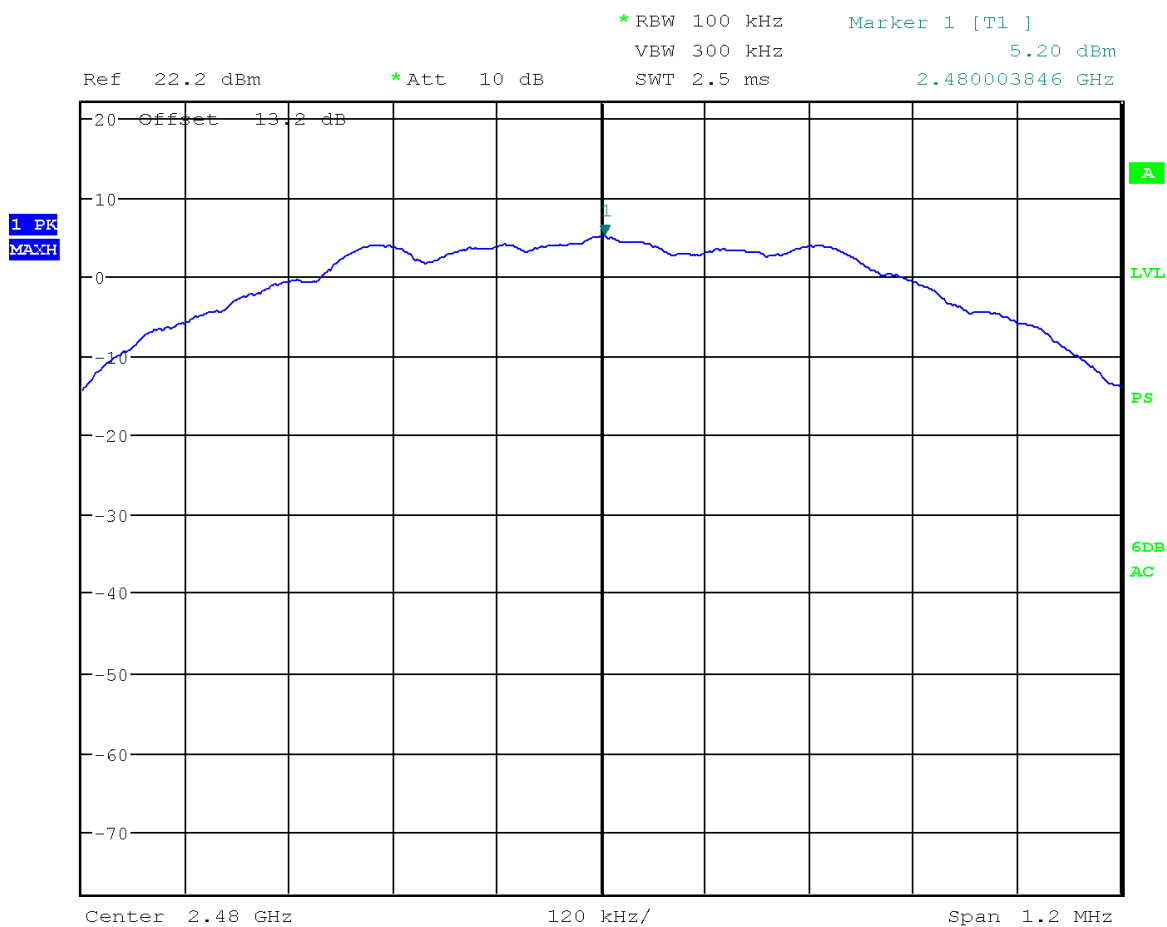
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Date: 16.JUN.2021 14:57:03

Figure 2.4-2 – Peak Conducted Output Power – Middle Channel



Date: 16.JUN.2021 14:58:28

Figure 2.4-3 – Peak Conducted Output Power – High Channel



2.4.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: CSAC1

Table 2.4-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
DEMC3002	Rohde & Schwarz	Receiver, 20 Hz-40 GHz	ESU40	100346	G	05/14/2021	05/14/2022

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.



2.5 Conducted Spurious Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15.247(d)
RSS-247 5.2(5.5)

2.5.2 Equipment Under Test and Modification State

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

2.5.3 Date of Test

16 June 2021

2.5.4 Test Method

The maximum peak conducted output power was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The RBW of the spectrum analyzer was set to 100kHz and the VBW was set to ≥ 3 times the RBW. The spectrum analyzer span was set to cover the entire frequency range of 30MHz to 25GHz (5 times the highest intentional radiator) and the trace was set to max hold using the peak detector.

The limit used for the entire frequency range is 20 dBc (20 dB lower than the maximum in-band peak PSD level, which was determined in Section 2.4 of this report).

2.5.5 Environmental Conditions

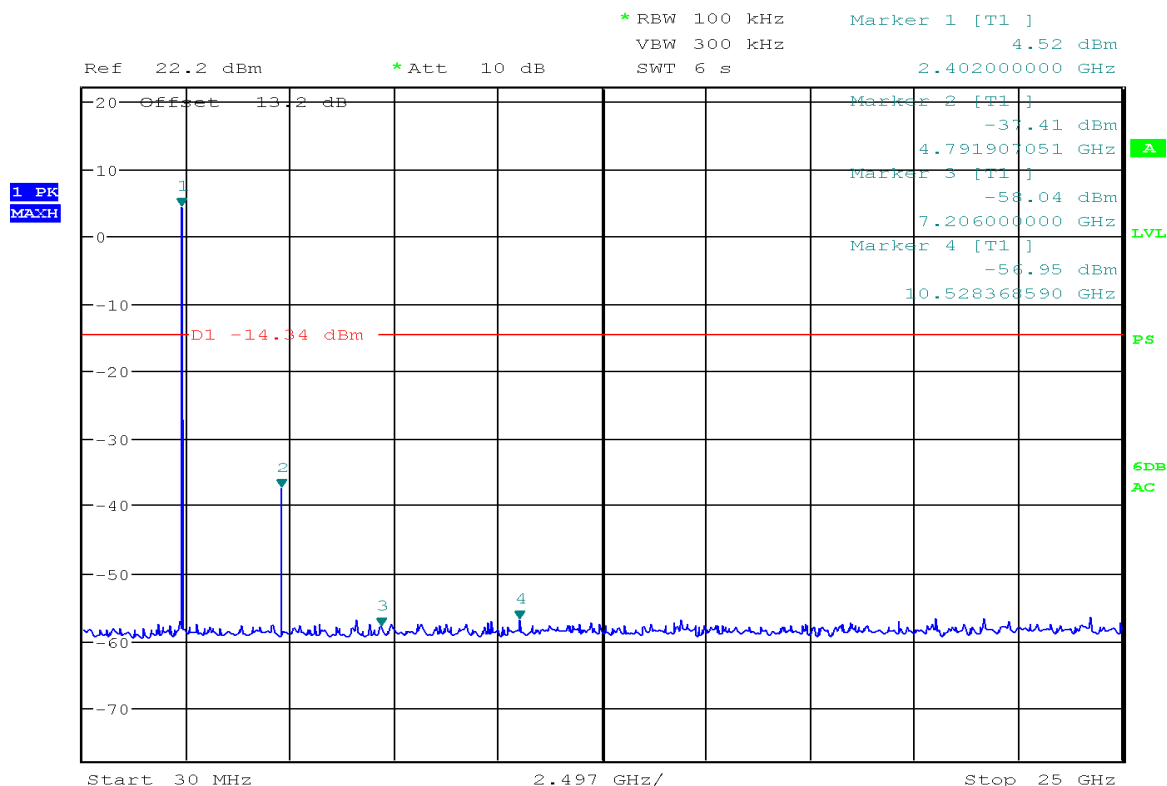
The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.5.6 Test Results

Test Summary: The EUT was set to 8dBm and modulation active during testing. The EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

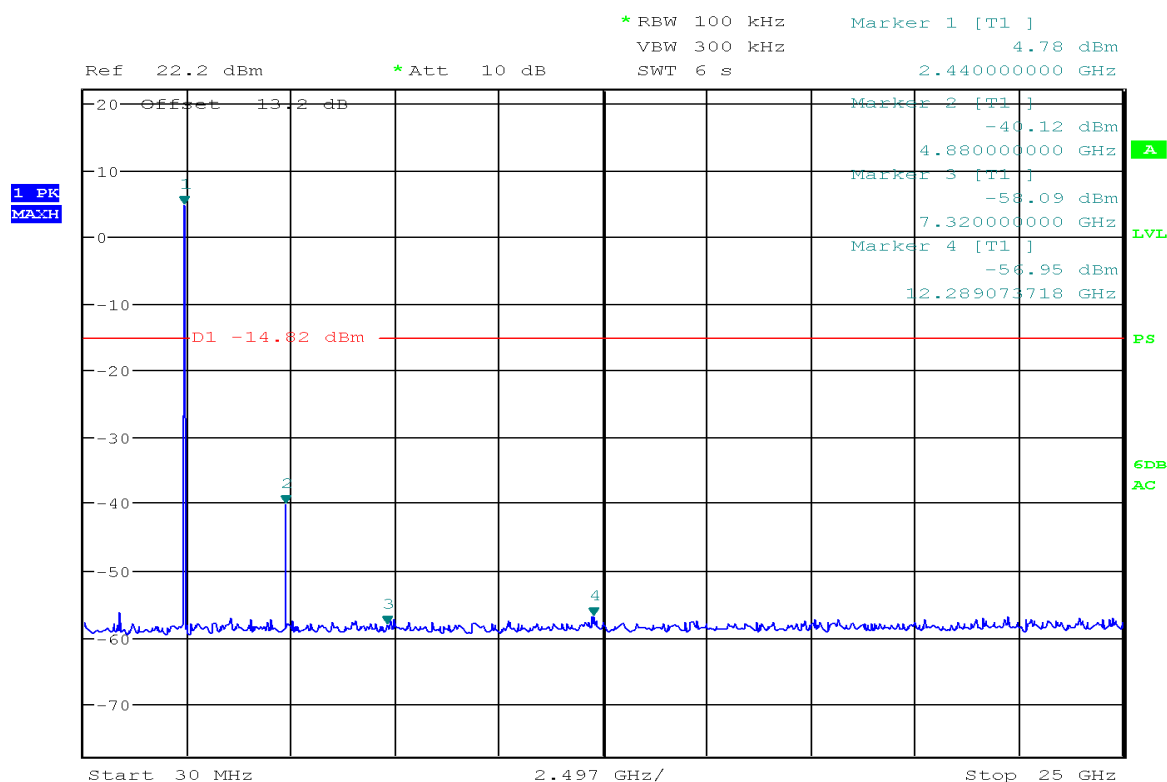


Date: 16.JUN.2021 15:15:42

Figure 2.5-1 – Conducted Spurious Emissions 30 MHz – 25GHz – Low Channel**Table 2.5-1 – Conducted Spurious Emissions 30 MHz – 25GHz Results**

Frequency (MHz)	Measured Level (dBm)	20 dBc Limit (dBm)	Margin (dBm)
4791.90	-37.41	-14.34	-23.07
7206.00	-58.04	-14.34	-43.7
10528.63	-56.95	-14.34	-42.61

Note: 20dBc limit is based on PSD value measured in Section 2.4 of this report.

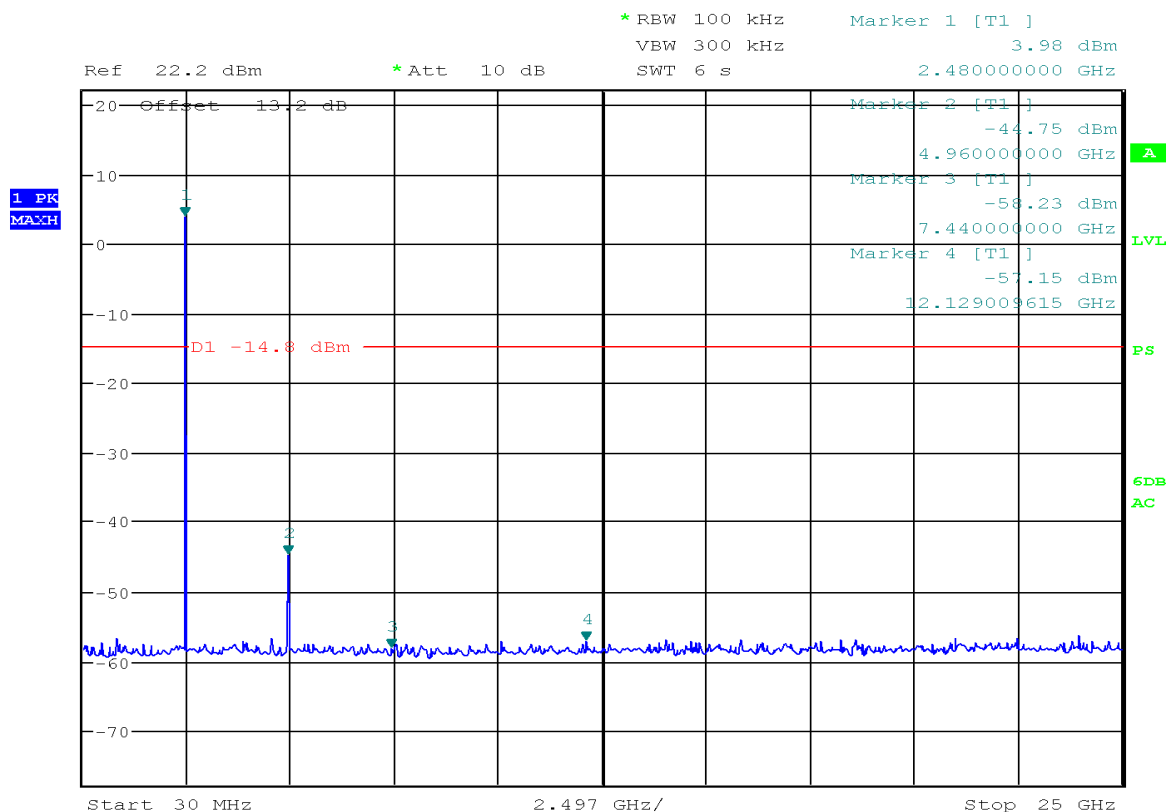


Date: 16.JUN.2021 15:18:29

Figure 2.5-2 – Conducted Spurious Emissions 30 MHz – 25GHz – Middle Channel**Table 2.5-2 – Conducted Spurious Emissions 30 MHz – 25GHz Results**

Frequency (MHz)	Measured Level (dBm)	20 dBc Limit (dBm)	Margin (dBm)
4880.00	-40.12	-14.82	-25.30
7320.00	-58.09	-14.82	-43.27
12289.07	-56.95	-14.82	-42.13

Note: 20dBc limit is based on PSD value measured in Section 2.4 of this report.



Date: 16.JUN.2021 15:22:18

Figure 2.5-3 – Conducted Spurious Emissions 30 MHz – 25GHz – High Channel**Table 2.5-3 – Conducted Spurious Emissions 30 MHz – 25GHz Results**

Frequency (MHz)	Measured Level (dBm)	20 dBc Limit (dBm)	Margin (dBm)
4960.00	-44.75	-14.8	-26.95
7440.00	-58.23	-14.8	-43.43
12129.00	-57.15	-14.8	-42.35

Note: 20dBc limit is based on PSD value measured in Section 2.4 of this report.



2.5.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.

Test Area: CSAC1

Table 2.5-4 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
DEMC3002	Rohde & Schwarz	Receiver, 20 Hz-40 GHz	ESU40	100346	G	05/14/2021	05/14/2022

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.



2.6 Conducted Band-Edge

2.6.1 Specification Reference

FCC 47 CFR Part 15.247(d)
RSS-247 5.2(5.5)

2.6.2 Equipment Under Test and Modification State

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

2.6.3 Date of Test

16 June 2021

2.6.4 Test Method

The maximum peak conducted output power was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance v05r02. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The RBW of the spectrum analyzer was set to 100kHz and the VBW was set to ≥ 3 times the RBW. The spectrum analyzer to max hold using the peak detector and then again using an average detector.

The limit used for the 2400 – 2483.5 MHz band-edges is 20 dBc (20 dB lower than the maximum in-band peak PSD level, which was determined in Section 2.4 of this report).

2.6.5 Environmental Conditions

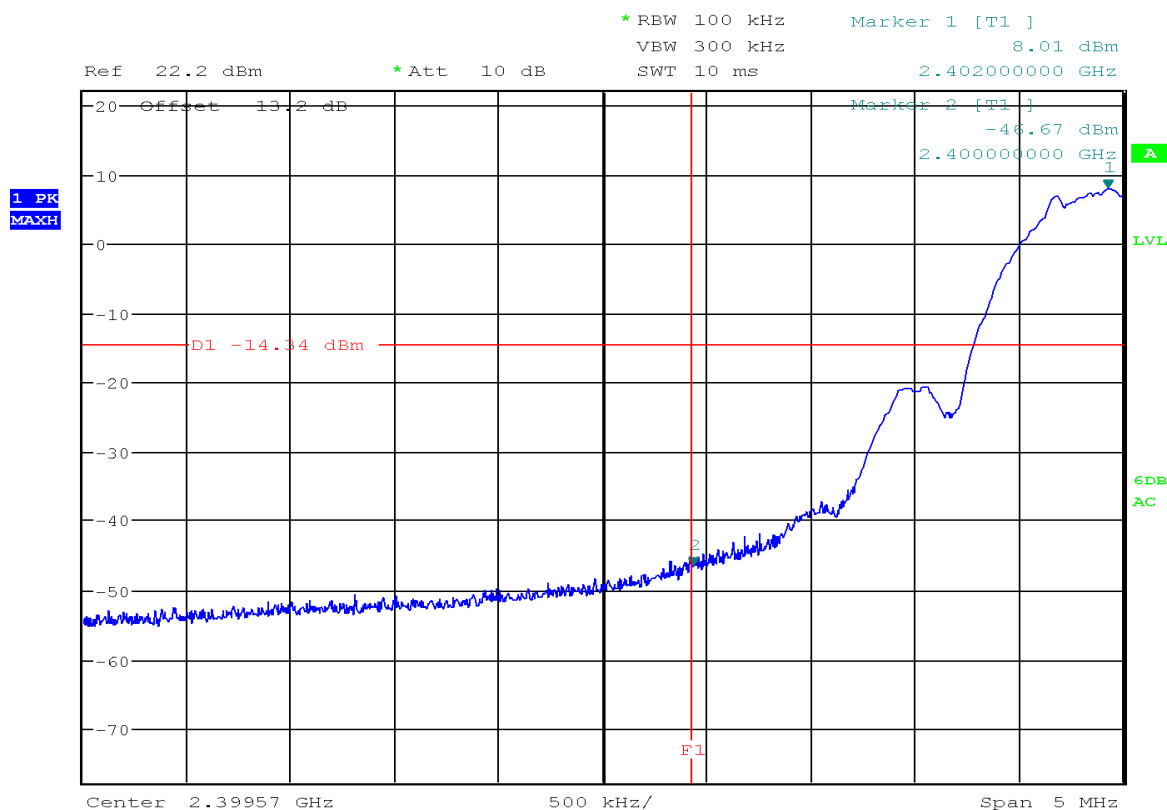
The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.6.6 Test Results

Test Summary: The EUT was set to 8dBm and modulation active during testing. The EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.



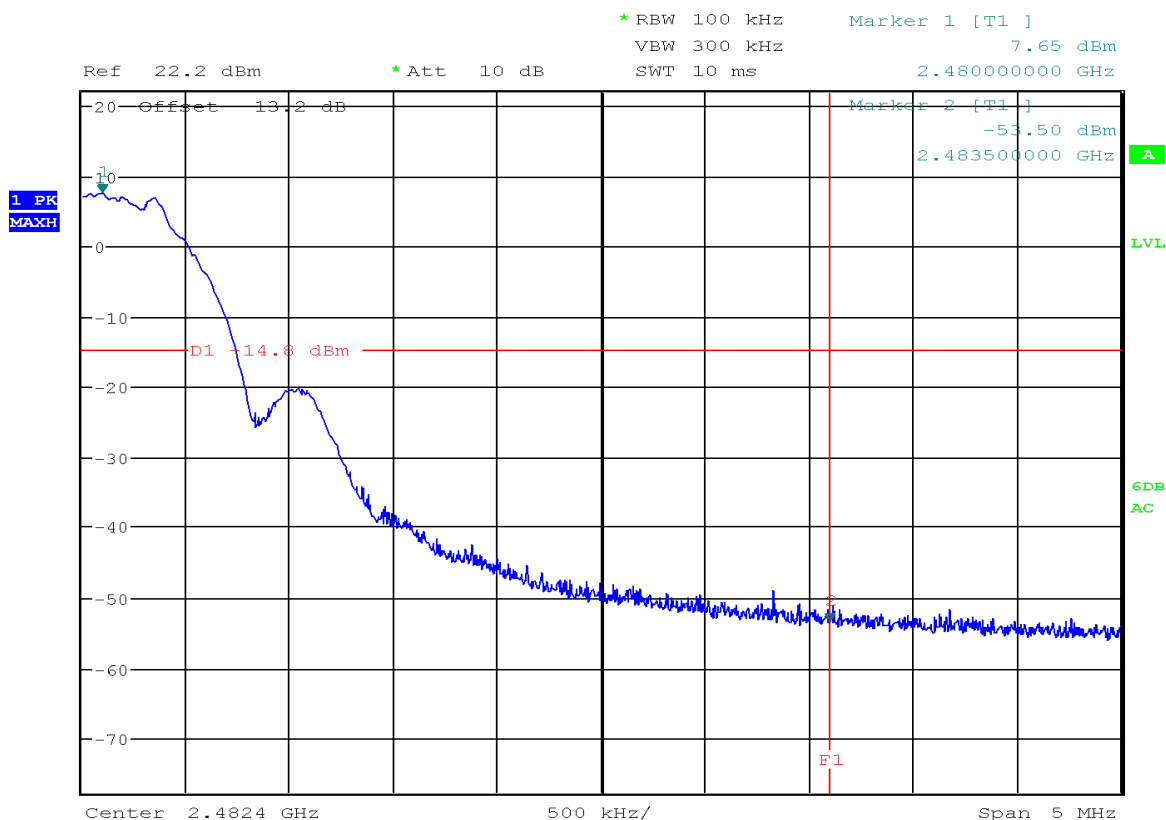
Date: 16.JUN.2021 16:41:04

Figure 2.6-1 – Conducted Band-Edge – Low Channel

Table 2.6-1 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	20 dBc Limit (dBm)	Margin (dBm)
2400	-46.67	-14.34	-32.23

Note: 20dBc limit is based on PSD value measured in Section 2.4 of this report.



Date: 16.JUN.2021 16:47:31

Figure 2.6-2 – Conducted Band-Edge – High Channel

Table 2.6-2 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	20 dBc Limit (dBm)	Margin (dBm)
2483.5	-53.50	-14.8	-38.7

Note: 20dBc limit is based on PSD value measured in Section 2.4 of this report.



2.6.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.

Test Area: CSAC1

Table 2.6-3 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
DEMC3002	Rohde & Schwarz	Receiver, 20 Hz-40 GHz	ESU40	100346	G	05/14/2021	05/14/2022

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.



2.7 Conducted Emissions

2.7.1 Specification Reference

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

2.7.2 Equipment Under Test and Modification State

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

2.7.3 Date of Test

18 June 2021

2.7.4 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.

2.7.5 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.

2.7.6 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.



2.7.7 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

2.7.8 Test Results

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

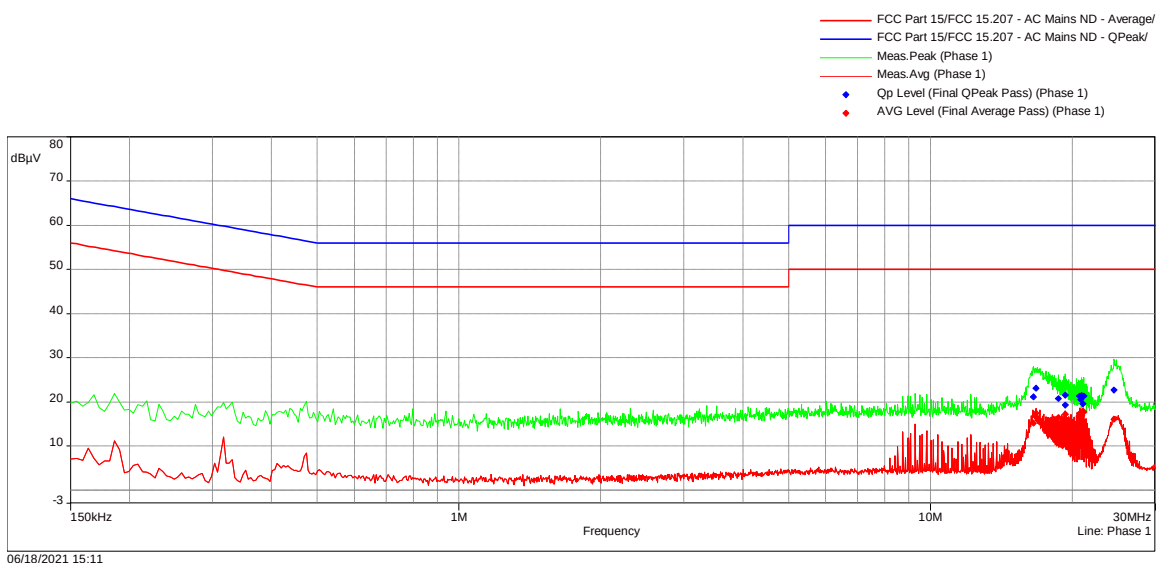
Test Result: Pass

See data below for detailed results.



BLE Low Ch 2402MHz - L1

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: BLE Low CH 2402MHz

Figure 2.7-1 – Graphical Results – AC Mains L1 Plot – Low Channel



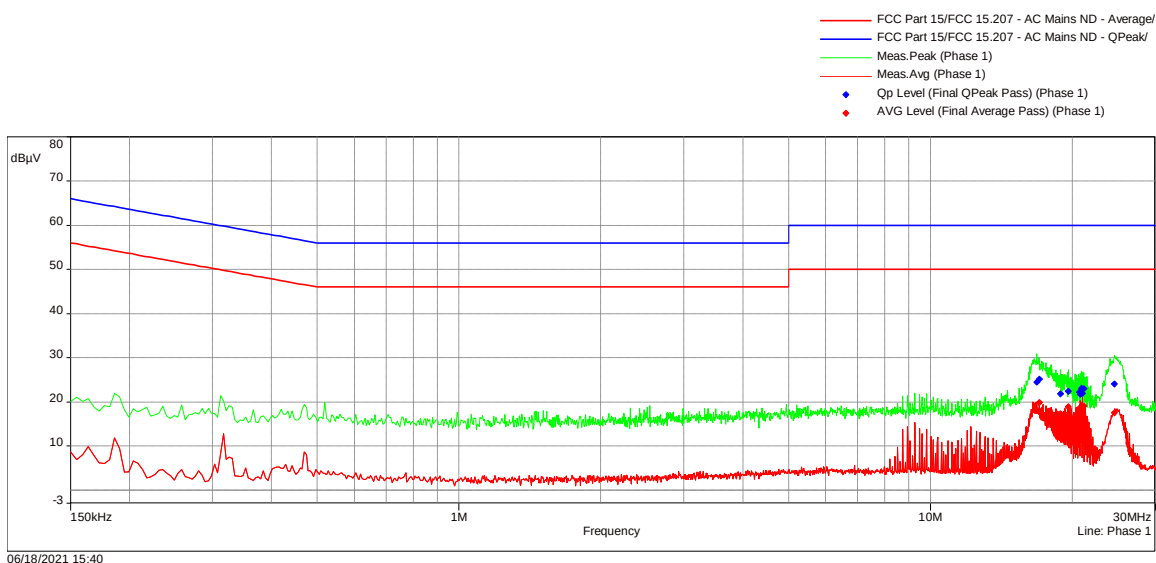
Table 2.7-1 – AC Mains L1 Plot – Low Channel

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
16.5255MHz	15.14	50.00	-34.86	21.08	60.00	-38.92	Pass
16.7325MHz	17.40	50.00	-32.60	23.07	60.00	-36.93	Pass
18.672MHz	16.40	50.00	-33.60	20.76	60.00	-39.24	Pass
19.32MHz	17.23	50.00	-32.77	21.48	60.00	-38.52	Pass
19.3245MHz	14.01	50.00	-35.99	19.29	60.00	-40.71	Pass
20.724MHz	17.33	50.00	-32.67	21.29	60.00	-38.71	Pass
20.832MHz	16.56	50.00	-33.44	20.58	60.00	-39.42	Pass
20.94MHz	16.97	50.00	-33.03	21.43	60.00	-38.57	Pass
21.048MHz	14.74	50.00	-35.26	19.55	60.00	-40.45	Pass
21.1515MHz	17.68	50.00	-32.32	21.29	60.00	-38.71	Pass
24.5265MHz	16.08	50.00	-33.92	22.71	60.00	-37.29	Pass



BLE Low Channel 2402MHz - L2

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: BLE Low CH 2402MHz

Figure 2.7-2 – Graphical Results – AC Mains L2 Plot – Low Channel



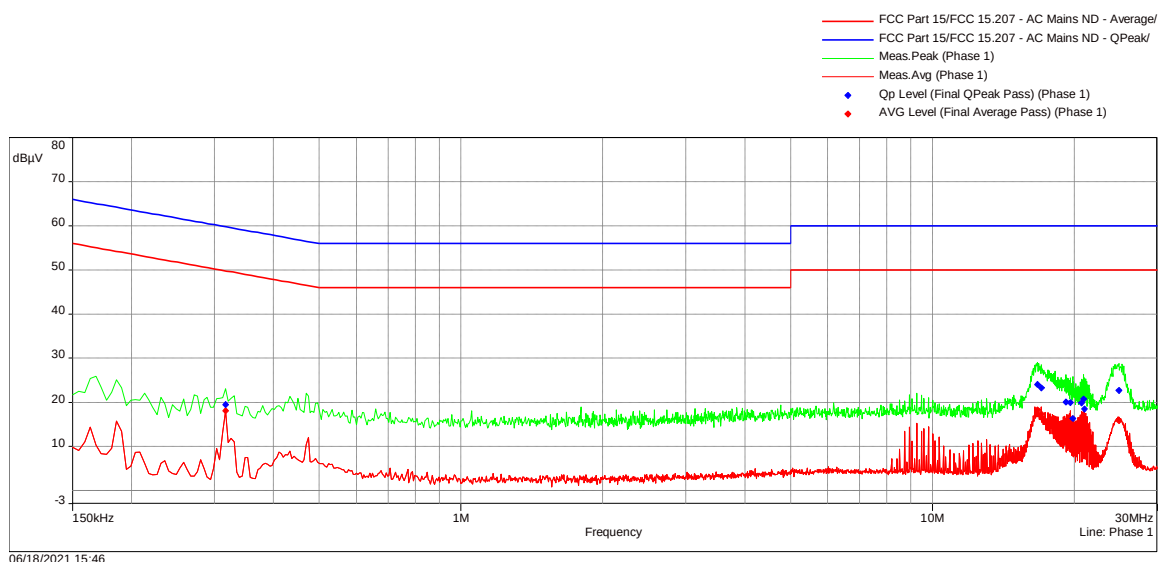
Table 2.7-2 – AC Mains L2 Plot – Low Channel

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
16.818MHz	18.14	50.00	-31.86	24.41	60.00	-35.59	Pass
17.0385MHz	19.83	50.00	-30.17	25.12	60.00	-34.88	Pass
18.87MHz	17.30	50.00	-32.70	21.78	60.00	-38.22	Pass
19.626MHz	18.87	50.00	-31.13	22.42	60.00	-37.58	Pass
20.706MHz	18.54	50.00	-31.46	22.18	60.00	-37.82	Pass
20.814MHz	17.83	50.00	-32.17	21.70	60.00	-38.30	Pass
20.922MHz	18.65	50.00	-31.35	23.03	60.00	-36.97	Pass
21.03MHz	17.84	50.00	-32.16	21.94	60.00	-38.06	Pass
21.138MHz	19.04	50.00	-30.96	22.97	60.00	-37.03	Pass
24.54MHz	17.51	50.00	-32.49	24.05	60.00	-35.95	Pass



BLE Mid Ch 2440MHz - L1

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: BLE Mid CH 2440MHz

Figure 2.7-3 – Graphical Results – AC Mains L1 Plot – Mid Channel



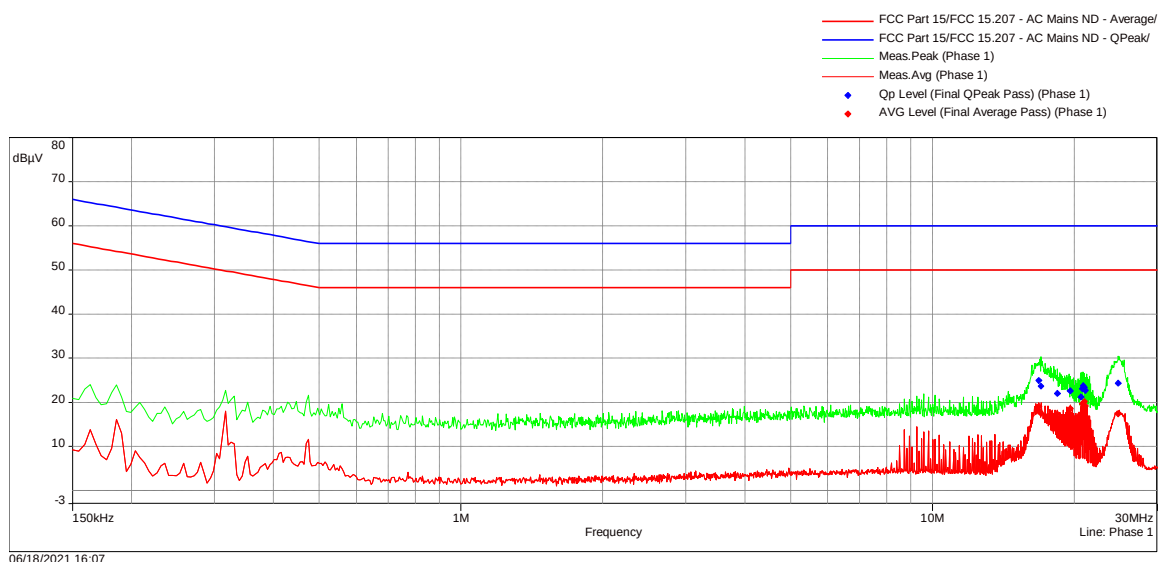
Table 2.7-3 – AC Mains L1 Plot – Mid Channel

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
316.5kHz	18.12	49.80	-31.68	19.49	59.80	-40.30	Pass
16.71MHz	18.26	50.00	-31.74	24.08	60.00	-35.92	Pass
17.034MHz	17.29	50.00	-32.71	23.30	60.00	-36.70	Pass
19.1895MHz	15.19	50.00	-34.81	20.03	60.00	-39.97	Pass
19.6215MHz	15.01	50.00	-34.99	20.00	60.00	-40.00	Pass
19.842MHz	10.64	50.00	-39.36	16.30	60.00	-43.70	Pass
20.7015MHz	14.79	50.00	-35.21	19.82	60.00	-40.18	Pass
20.9175MHz	15.82	50.00	-34.18	20.76	60.00	-39.24	Pass
21.0255MHz	13.43	50.00	-36.57	18.50	60.00	-41.50	Pass
24.864MHz	15.90	50.00	-34.10	22.67	60.00	-37.33	Pass



BLE Mid Ch 2440MHz - L2

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: BLE Mid CH 2440MHz

Figure 2.7-4 – Graphical Results – AC Mains L2 Plot – Mid Channel



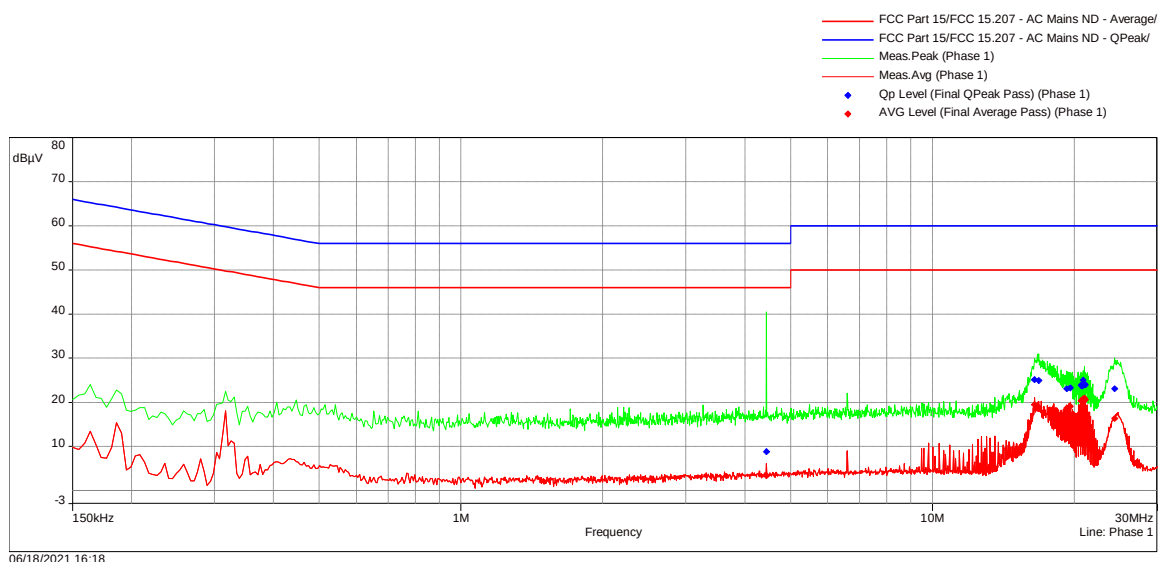
Table 2.7-4 – AC Mains L2 Plot – Mid Channel

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
16.8045MHz	19.06	50.00	-30.94	24.94	60.00	-35.06	Pass
16.9845MHz	17.47	50.00	-32.53	23.70	60.00	-36.30	Pass
18.4245MHz	17.32	50.00	-32.68	22.05	60.00	-37.95	Pass
19.608MHz	18.57	50.00	-31.43	22.54	60.00	-37.46	Pass
20.688MHz	16.61	50.00	-33.39	21.24	60.00	-38.76	Pass
20.7915MHz	19.69	50.00	-30.31	23.08	60.00	-36.92	Pass
20.8995MHz	19.00	50.00	-31.00	23.72	60.00	-36.28	Pass
21.0075MHz	20.17	50.00	-29.83	23.40	60.00	-36.60	Pass
21.1155MHz	19.17	50.00	-30.83	22.64	60.00	-37.36	Pass
24.792MHz	17.38	50.00	-32.62	24.32	60.00	-35.68	Pass



BLE High Ch 2480MHz - L1

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: BLE High CH 2480MHz

Figure 2.7-5 – Graphical Results – AC Mains L1 Plot – High Channel



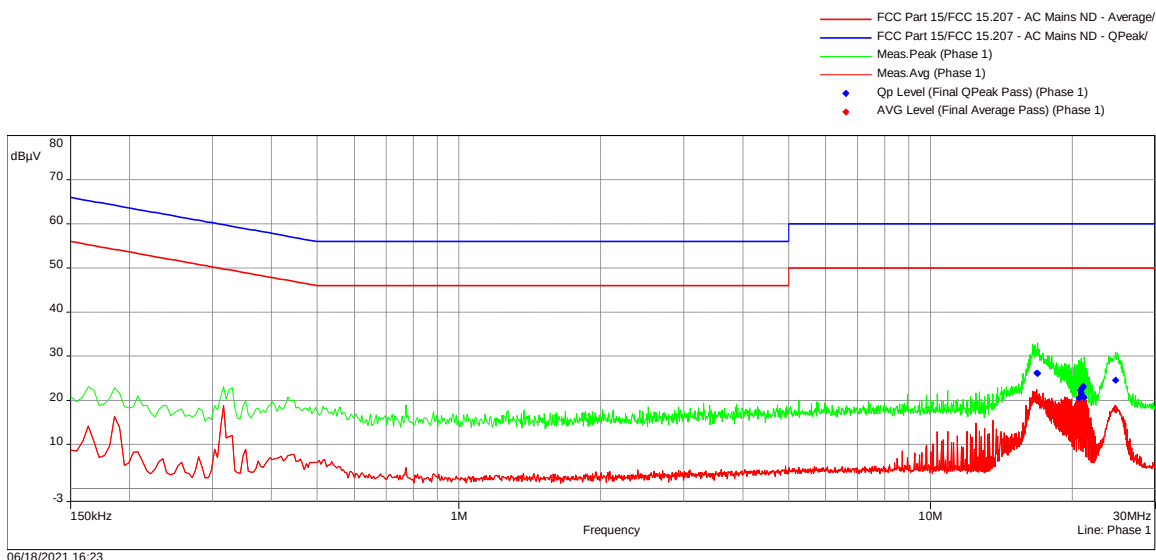
Table 2.7-5 – AC Mains L1 Plot – High Channel

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
4.443MHz	3.33	46.00	-42.67	8.83	56.00	-47.17	Pass
16.4805MHz	19.49	50.00	-30.51	25.12	60.00	-34.88	Pass
16.8045MHz	18.92	50.00	-31.08	24.92	60.00	-35.08	Pass
19.2795MHz	18.64	50.00	-31.36	23.10	60.00	-36.90	Pass
19.6035MHz	19.09	50.00	-30.91	23.27	60.00	-36.73	Pass
20.679MHz	20.36	50.00	-29.64	23.88	60.00	-36.12	Pass
20.787MHz	20.37	50.00	-29.63	23.71	60.00	-36.29	Pass
20.895MHz	20.87	50.00	-29.13	25.02	60.00	-34.98	Pass
21.003MHz	20.98	50.00	-29.02	24.20	60.00	-35.80	Pass
21.111MHz	20.63	50.00	-29.37	23.99	60.00	-36.01	Pass
24.342MHz	16.38	50.00	-33.62	23.05	60.00	-36.95	Pass



BLE High Ch 2480MHz - L2

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: BLE High CH 2480MHz

Figure 2.7-6 – Graphical Results – AC Mains L2 Plot – High Channel

**Table 2.7-6 – AC Mains L2 Plot – High Channel**

Frequency	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
16.8MHz	19.98	50.00	-30.02	26.19	60.00	-33.81	Pass
16.8765MHz	20.17	50.00	-29.83	26.08	60.00	-33.92	Pass
20.679MHz	15.29	50.00	-34.71	20.53	60.00	-39.47	Pass
20.787MHz	17.20	50.00	-32.80	22.27	60.00	-37.73	Pass
20.895MHz	16.67	50.00	-33.33	21.70	60.00	-38.30	Pass
21.003MHz	18.08	50.00	-31.92	22.79	60.00	-37.21	Pass
21.111MHz	18.68	50.00	-31.32	23.14	60.00	-36.86	Pass
21.219MHz	15.66	50.00	-34.34	20.69	60.00	-39.31	Pass
24.72MHz	17.77	50.00	-32.23	24.55	60.00	-35.45	Pass



2.7.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: GRP2

Table 2.7-7 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE10459	Weinschel	Attenuator, 20dB	34-20-34	BP1557	B	11/15/2020	11/15/2021
WRLE10945	Fischer Custom Comm.	LISN	FCC-LISN-50-25-2-10	120309	G	08/08/2019	08/08/2021
WRLE10946	Fischer Custom Comm.	LISN	FCC-LISN-50-25-2-10	120310	G	10/21/2020	10/21/2022
NBLE11592	Rohde & Schwarz	EMI Test Receiver	ESR7	101771	G	02/22/2021	02/22/2022

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.



2.8 Radiated Spurious Emissions

2.8.1 Specification Reference

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

2.8.2 Equipment Under Test and Modification State

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

2.8.3 Date of Test

18 June 2021

2.8.4 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.

2.8.5 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.



2.8.6 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 from 30-1000 MHz were done at a 3m distance. Measurements above 1 GHz 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.

2.8.7 Sample Computation (Radiated Emissions)

Measuring equipment raw measurement (dBμV) @ 30 MHz			20.0
Correction Factor (dB)	Cable 2	0.24	18.94
	TEMPC00011 (antenna)	18.70	
Reported Quasi-peak Final Measurement (dBμV/m) @ 30 MHz			38.94

2.8.8 Test Results

Test Summary: The EUT was pre-screened at 3 orthogonal axis to determine worst-case orientation. Final measurements as shown in this report were performed on only the identified worst-case configuration. Measurements between 1-18 GHz were taken with a 2.4 GHz notch filter in front of the pre-amp to prevent overloading.

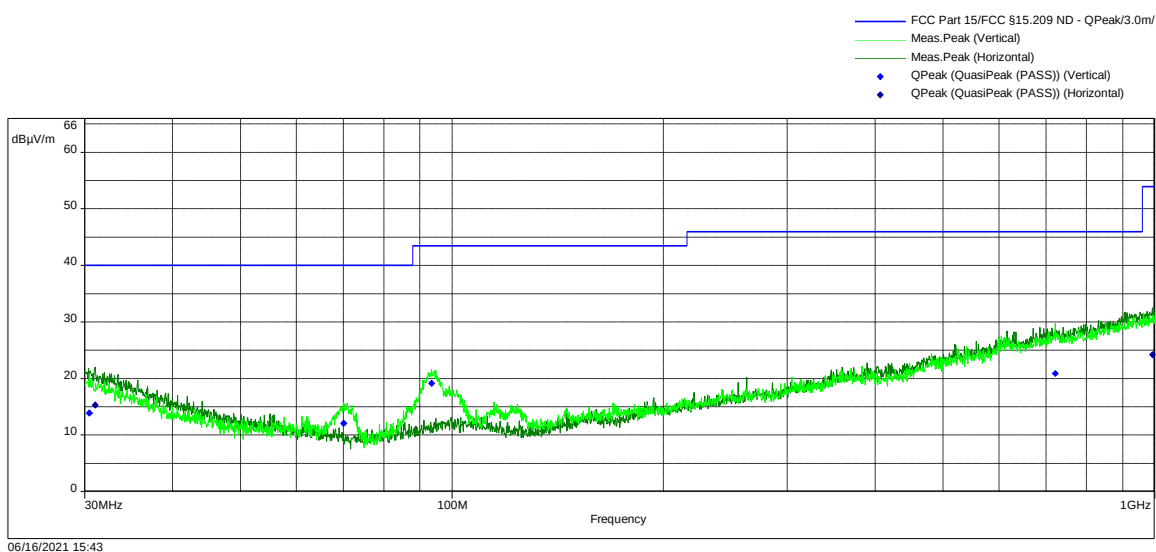
Test Result: Pass

See data below for detailed results.



Spurious Emissions 30M-1GHz - low Ch - Y axis

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: Y-axis Low Channel 2402MHz

Figure 2.8-1 – RE Spurious Emissions 30-1000 MHz – Low Channel

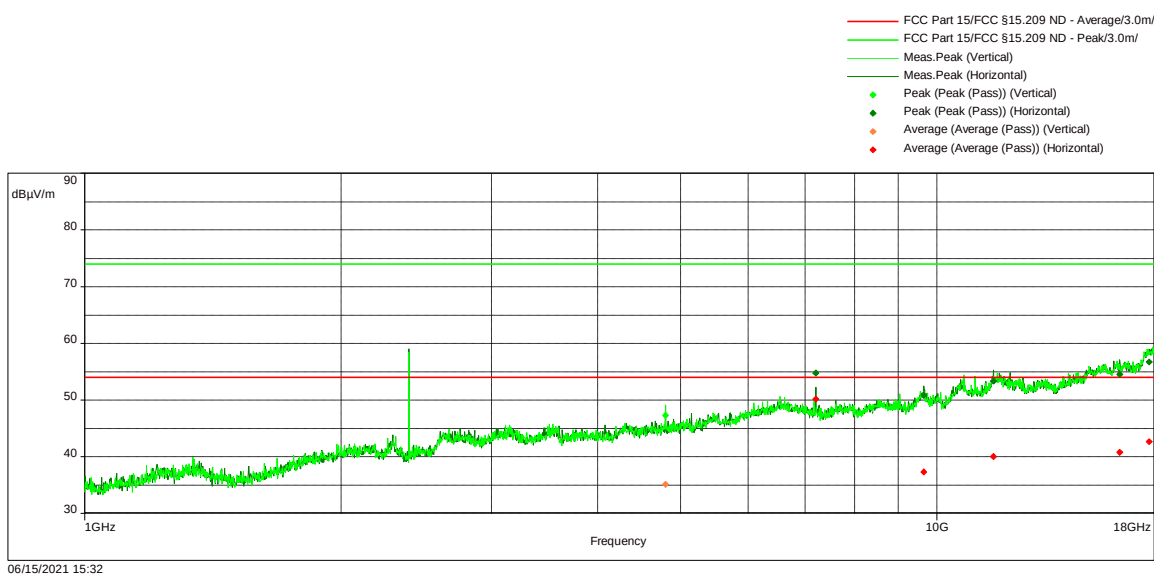
**Table 2.8-1 – RE Spurious Emissions 30-1000 MHz – Low Channel**

Frequency	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
30.483237MHz	13.83	40.00	-26.17	131.00	3.93	Vertical	Pass
31.058227MHz	15.32	40.00	-24.68	229.00	3.65	Horizontal	Pass
70.129434MHz	12.09	40.00	-27.91	214.00	1.24	Vertical	Pass
93.581677MHz	19.15	43.50	-24.35	198.00	1.09	Vertical	Pass
721.56861MHz	20.87	46.00	-25.13	208.00	1.22	Vertical	Pass
993.55517MHz	24.20	53.97	-29.77	198.00	2.34	Horizontal	Pass



Spurious Emissions 1 - 18GHz - Low Ch - Y axis

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: Y-axis Low Channel 2402MHz

Figure 2.8-2 – RE Spurious Emissions 1-18 GHz – Low Channel



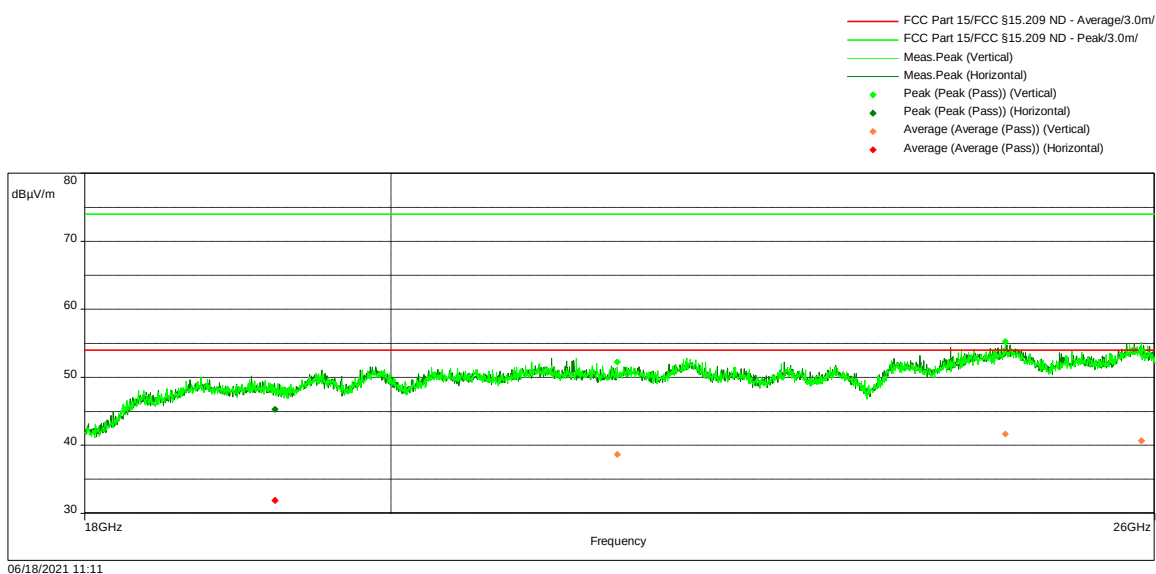
Table 2.8-2 – RE Spurious Emissions 1-18 GHz – Low Channel

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
4.8032778GHz	47.29	74.00	-26.71	35.14	54.00	-18.86	19.00	1.00	Vertical	Pass	Pass
7.2059444GHz	54.72	74.00	-19.28	50.14	54.00	-3.86	129.00	1.17	Horizontal	Pass	Pass
9.6454444GHz	50.84	74.00	-23.16	37.30	54.00	-16.70	136.00	3.67	Horizontal	Pass	Pass
11.644833GHz	53.28	74.00	-20.72	40.04	54.00	-13.96	246.00	3.35	Horizontal	Pass	Pass
16.384056GHz	54.53	74.00	-19.47	40.74	54.00	-13.26	203.00	2.42	Horizontal	Pass	Pass
17.728944GHz	56.71	74.00	-17.29	42.64	54.00	11.36	17.00	2.03	Horizontal	Pass	Pass



Spurious Emissions 18 - 26GHz - Low CH - Y axis

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: Y-axis Low Channel 2402MHz

Figure 2.8-3 – RE Spurious Emissions 18-26 GHz – Low Channel

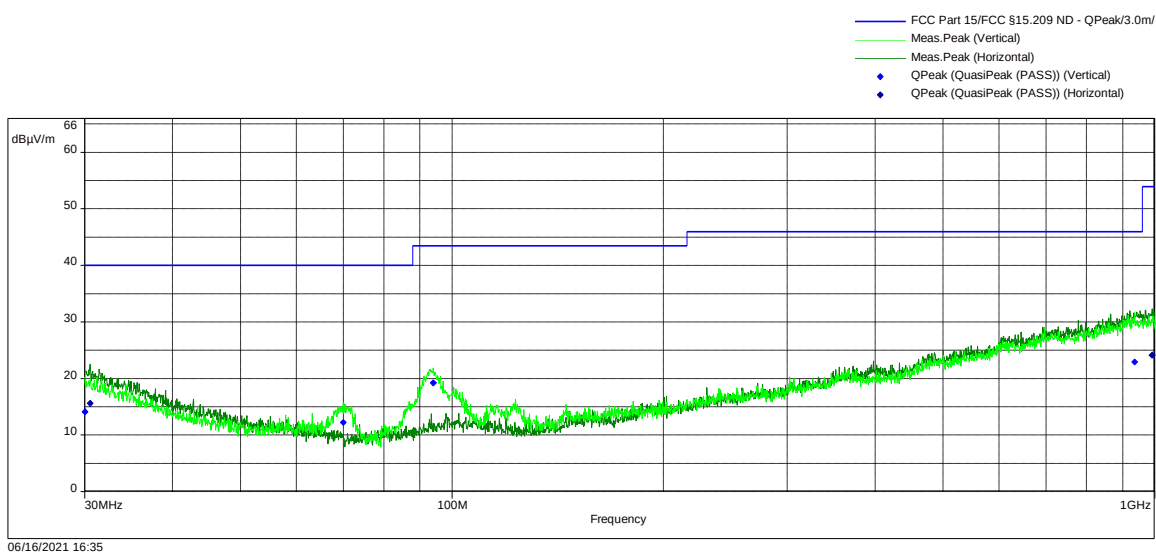
**Table 2.8-3 – RE Spurious Emissions 18-26 GHz – Low Channel**

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
19.216GHz	45.28	74.00	-28.72	31.88	54.00	-22.12	164.00	3.17	Horizontal	Pass	Pass
21.614667GHz	52.27	74.00	-21.73	38.65	54.00	-15.35	328.00	1.24	Vertical	Pass	Pass
24.7GHz	55.24	74.00	-18.76	41.66	54.00	-12.34	0.00	3.58	Vertical	Pass	Pass
25.882667GHz	54.00	74.00	-20.00	40.63	54.00	-13.37	240.00	3.17	Vertical	Pass	Pass



Spurious Emissions 30M-1GHz - Mid Ch - Y axis

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: Y-axis Mid Channel 2440MHz

Figure 2.8-4 – RE Spurious Emissions 30-1000 MHz – Mid Channel

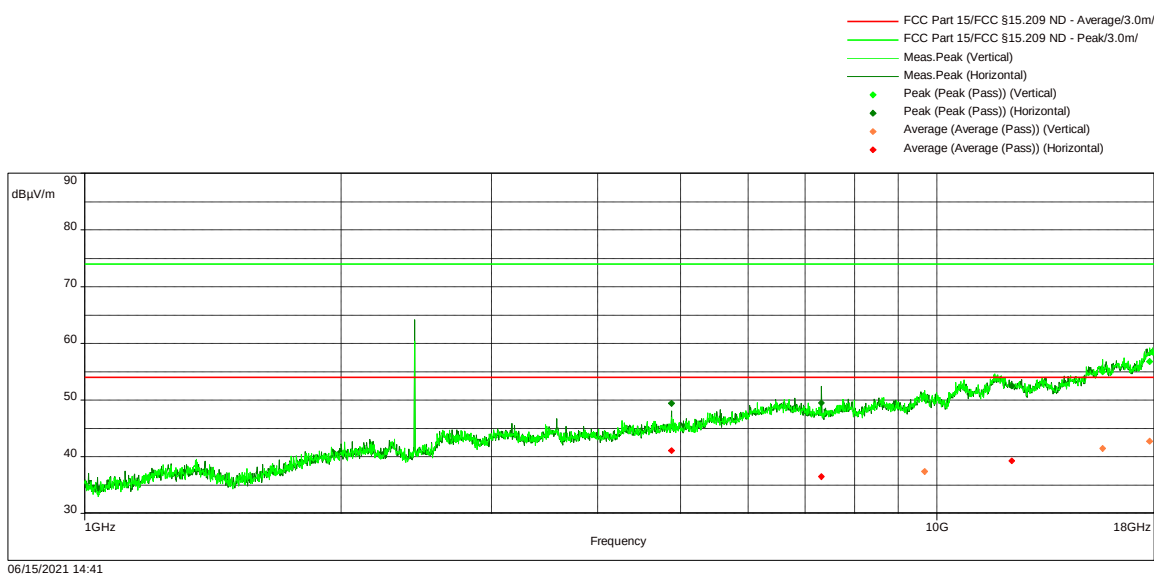
**Table 2.8-4 – RE Spurious Emissions 30-1000 MHz – Mid Channel**

Frequency	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
30.058333MHz	14.11	40.00	-25.89	203.00	3.62	Vertical	Pass
30.547863MHz	15.61	40.00	-24.39	353.00	1.83	Horizontal	Pass
69.999338MHz	12.24	40.00	-27.76	198.00	1.13	Vertical	Pass
94.133066MHz	19.20	43.50	-24.30	199.00	1.00	Vertical	Pass
935.9911MHz	22.90	46.00	-23.10	271.00	3.47	Vertical	Pass
991.44257MHz	24.09	53.97	-29.88	33.00	2.07	Horizontal	Pass



Spurious Emissions 1 - 18GHz - Mid Ch - Y axis

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: Y-axis Mid Channel 2440MHz

Figure 2.8-5 – RE Spurious Emissions 1-18 GHz – Mid Channel

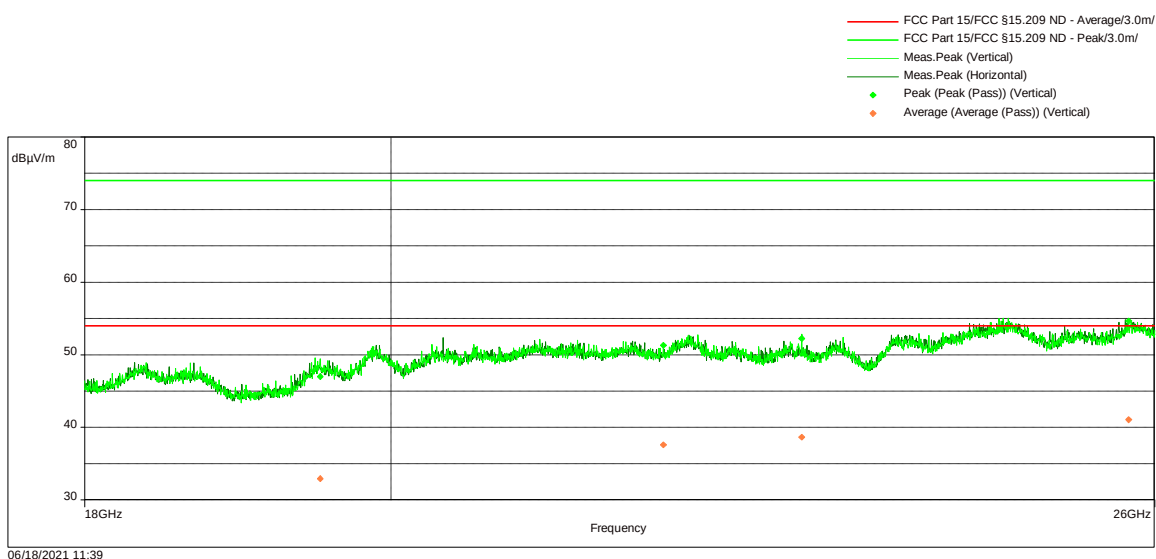
**Table 2.8-5 – RE Spurious Emissions 1-18 GHz – Mid Channel**

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
4.8797778GHz	49.43	74.00	-24.57	41.08	54.00	-12.92	217.00	1.48	Horizontal	Pass	Pass
7.3192778GHz	49.50	74.00	-24.50	36.46	54.00	-17.54	114.00	3.33	Horizontal	Pass	Pass
9.6652778GHz	50.62	74.00	-23.38	37.36	54.00	-16.64	330.00	2.02	Vertical	Pass	Pass
12.232278GHz	52.52	74.00	-21.48	39.25	54.00	-14.75	212.00	3.31	Horizontal	Pass	Pass
15.634167GHz	54.93	74.00	-19.07	41.45	54.00	-12.55	44.00	1.83	Vertical	Pass	Pass
17.756333GHz	56.75	74.00	-17.25	42.68	54.00	-11.32	309.00	1.20	Vertical	Pass	Pass



Spurious Emissions 18 - 26GHz - Mid CH - Y axis

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: Y-axis Mid Channel 2440MHz

Figure 2.8-6 – RE Spurious Emissions 18-26 GHz – Mid Channel

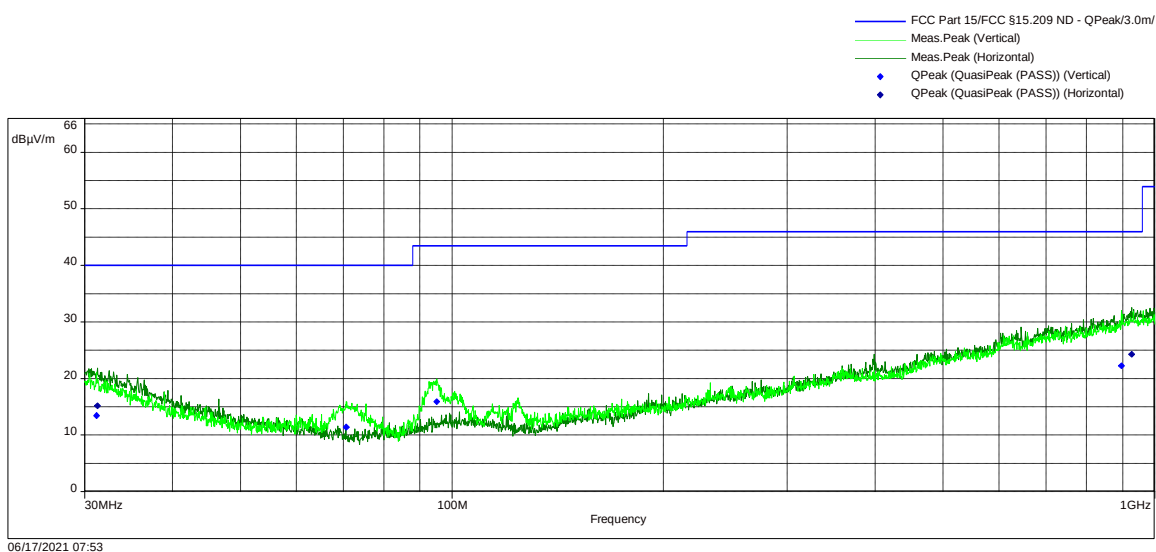
**Table 2.8-6 – RE Spurious Emissions 18-26 GHz – Mid Channel**

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
19.516889GHz	46.98	74.00	-27.02	32.96	54.00	-21.04	204.00	3.27	Vertical	Pass	Pass
21.960889GHz	51.28	74.00	-22.72	37.61	54.00	-16.39	24.00	3.02	Vertical	Pass	Pass
23.028889GHz	52.22	74.00	-21.78	38.63	54.00	-15.37	306.00	1.95	Vertical	Pass	Pass
25.767556GHz	54.67	74.00	-19.33	41.04	54.00	-12.96	90.00	2.41	Vertical	Pass	Pass



Spurious Emissions 30M-1GHz - High Ch - Y axis

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: Y-axis High Channel 2480MHz

Figure 2.8-7 – RE Spurious Emissions 30-1000 MHz – High Channel

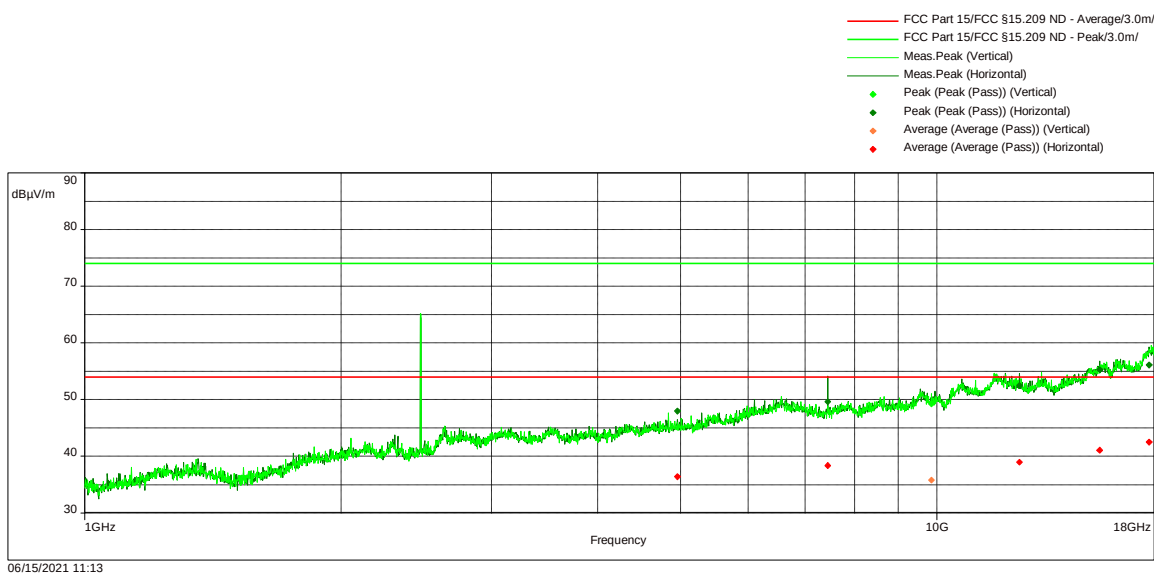
**Table 2.8-7 – RE Spurious Emissions 30-1000 MHz – High Channel**

Frequency	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
31.199659MHz	13.43	40.00	-26.57	95.00	1.05	Vertical	Pass
31.279711MHz	15.18	40.00	-24.82	261.00	1.72	Horizontal	Pass
70.735513MHz	11.39	40.00	-28.61	240.00	1.29	Vertical	Pass
95.08015MHz	15.93	43.50	-27.57	210.00	1.09	Vertical	Pass
896.45636MHz	22.23	46.00	-23.77	58.00	2.36	Vertical	Pass
927.60751MHz	24.28	46.00	-21.72	251.00	1.13	Horizontal	Pass



Spurious Emissions 1 - 18GHz - High Ch - Y axis

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: Y-axis High Channel 2480MHz

Figure 2.8-8 – RE Spurious Emissions 1-18 GHz – High Channel

**Table 2.8-8 – 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
4.9600556GHz	47.97	74.00	-26.03	36.41	54.00	-17.59	19.00	3.35	Horizontal	Pass	Pass
7.4392222GHz	49.61	74.00	-24.39	38.32	54.00	-15.68	123.00	1.63	Horizontal	Pass	Pass
9.8485GHz	49.23	74.00	-24.77	35.81	54.00	-18.19	5.00	2.69	Vertical	Pass	Pass
12.493889GHz	52.46	74.00	-21.54	38.97	54.00	-15.03	316.00	1.17	Horizontal	Pass	Pass
15.515167GHz	55.25	74.00	-18.75	41.04	54.00	-12.96	217.00	1.94	Horizontal	Pass	Pass
17.740278GHz	56.08	74.00	-17.92	42.46	54.00	-11.54	334.00	1.40	Horizontal	Pass	Pass



Spurious Emissions 18 - 26GHz - High CH - Y axis

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: Y-axis High Channel 2480MHz

Figure 2.8-9 – RE Spurious Emissions 18-26 GHz – High Channel

**Table 2.8-9 – 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
19.837778GHz	52.19	74.00	-21.81	38.80	54.00	-15.20	200.00	1.70	Horizontal	Pass	Pass
19.837778GHz	52.58	74.00	-24.42	38.42	54.00	-15.58	218.00	1.49	Vertical	Pass	Pass
22.244444GHz	52.99	74.00	-21.01	39.17	54.00	-14.83	97.00	2.61	Horizontal	Pass	Pass
24.785333GHz	55.15	74.00	-18.85	41.57	54.00	-12.43	204.00	2.15	Horizontal	Pass	Pass



2.8.9 Test Location and Test Equipment Used

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

Table 2.8-10 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11460	ETS-Lindgren	Antenna, Horn 1-18 GHz	3117	155005	G	02/17/2021	02/17/2023
WRLE02668	Hewlett-Packard	Preamplifier, 0.1-1300 MHz	8447D	1937A02209	B	11/10/2020	11/10/2021
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
NBLE11578	ETS-Lindgren	Antenna, BiConiLog	3142C	00079889	G	09/14/2020	09/14/2022
NBLE11689	ATM	Antenna, DRG 18-40 GHz	180-442-KF	102040	G	06/02/2021	06/02/2023
NBLE11688	Rohde & Schwarz	Preamp, 18-40 GHz	TRS-PR1840	10006	G	06/10/2021	06/10/2023
NBLE11699	Microwave Circuits	Notch Filter, 2.4-2.4837 GHz	N0324415	502922 DC1947	B	01/19/2021	01/19/2022

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.



2.9 Radiated Band-Edge

2.9.1 Specification Reference

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

2.9.2 Equipment Under Test and Modification State

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

2.9.3 Date of Test

15 June 2021

2.9.4 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.

2.9.5 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.

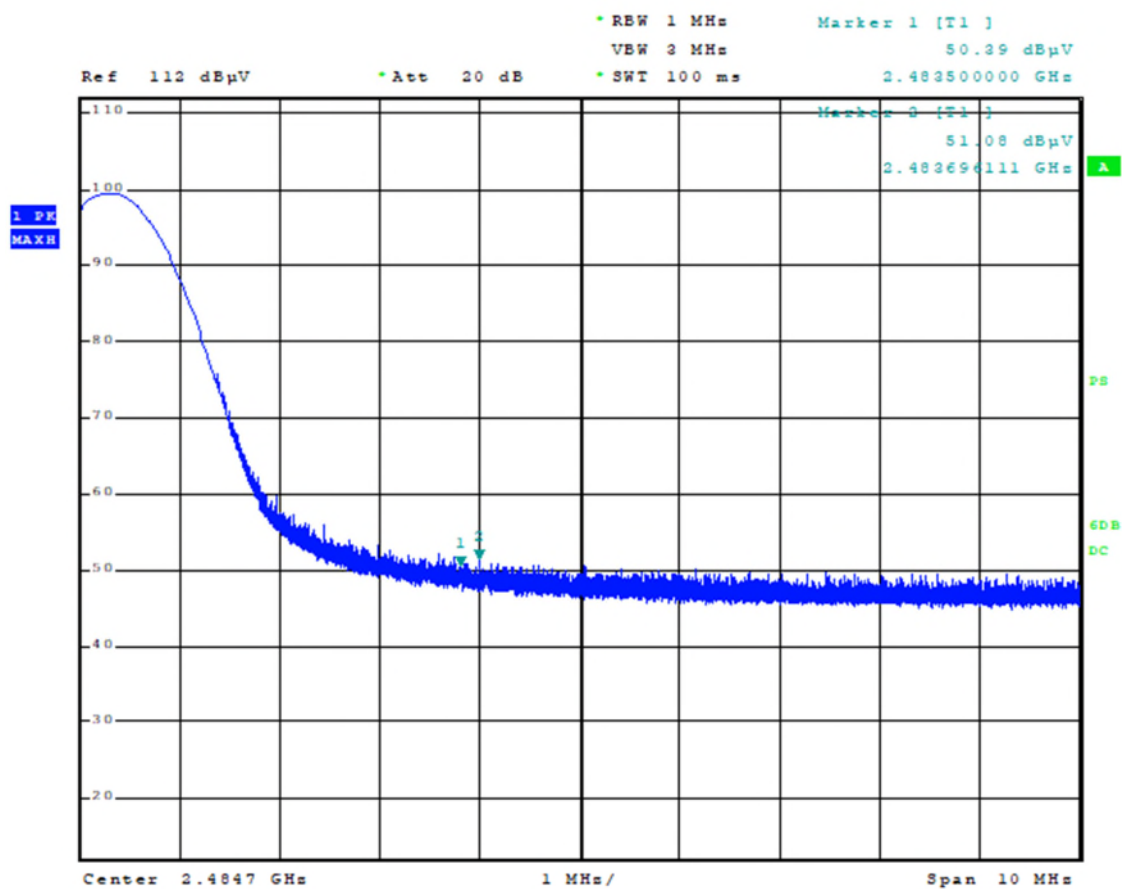
2.9.6 Test Results

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

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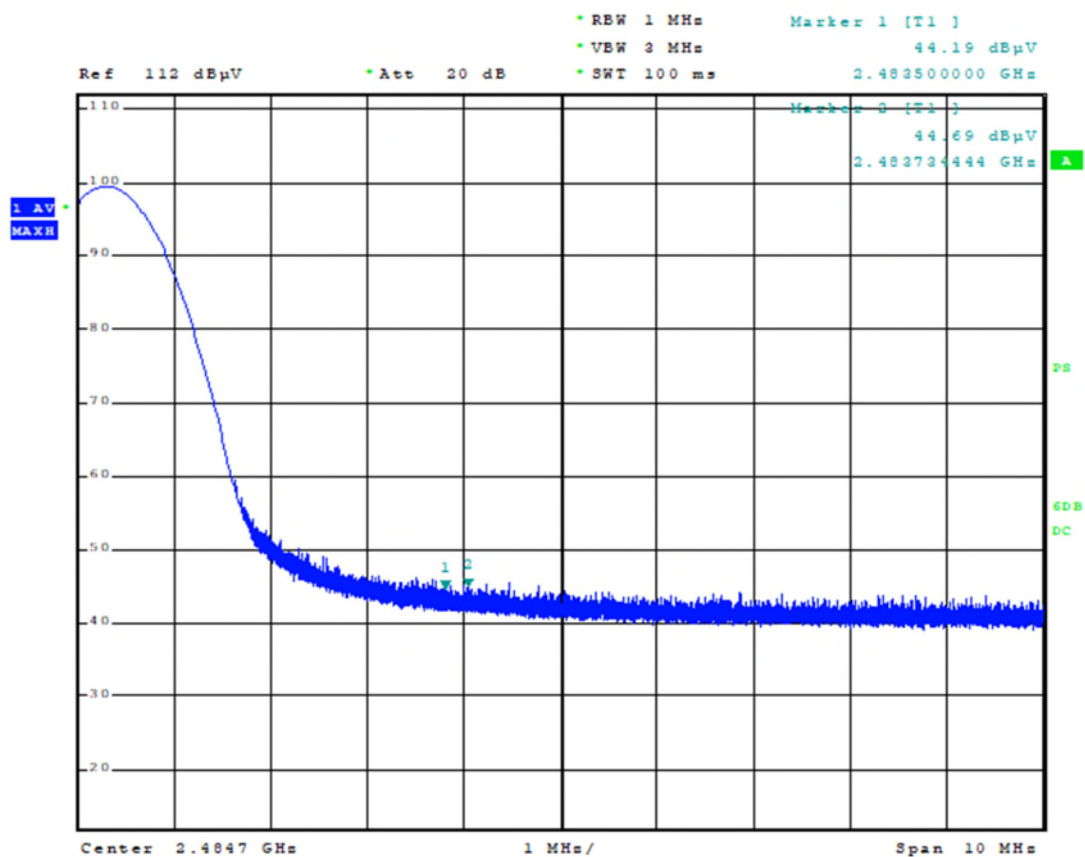
Test Result: Pass

See data below for detailed results.



Date: 15.JUN.2021 14:55:18

Figure 2.9-1 – Band-Edge, High Channel – Peak



Date: 15.JUN.2021 14:57:16

Figure 2.9-2 – Band-Edge, High Channel – Average

**Table 2.9-1 – Restricted Band Edge – High Channel – Peak**

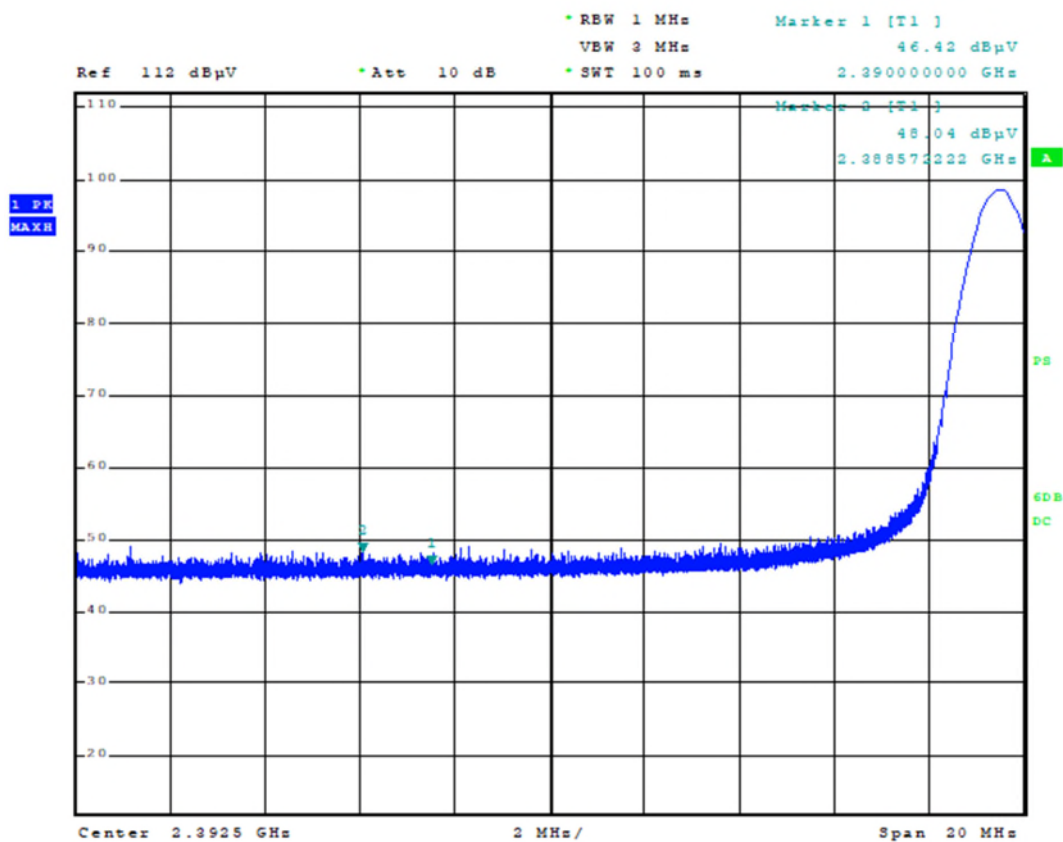
Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2483.5	55.86	74.00	-18.14	5.47	Pass
2484.69	56.58	74.00	-17.42	5.50	Pass

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

Table 2.9-2 – Restricted Band Edge – High Channel – Average

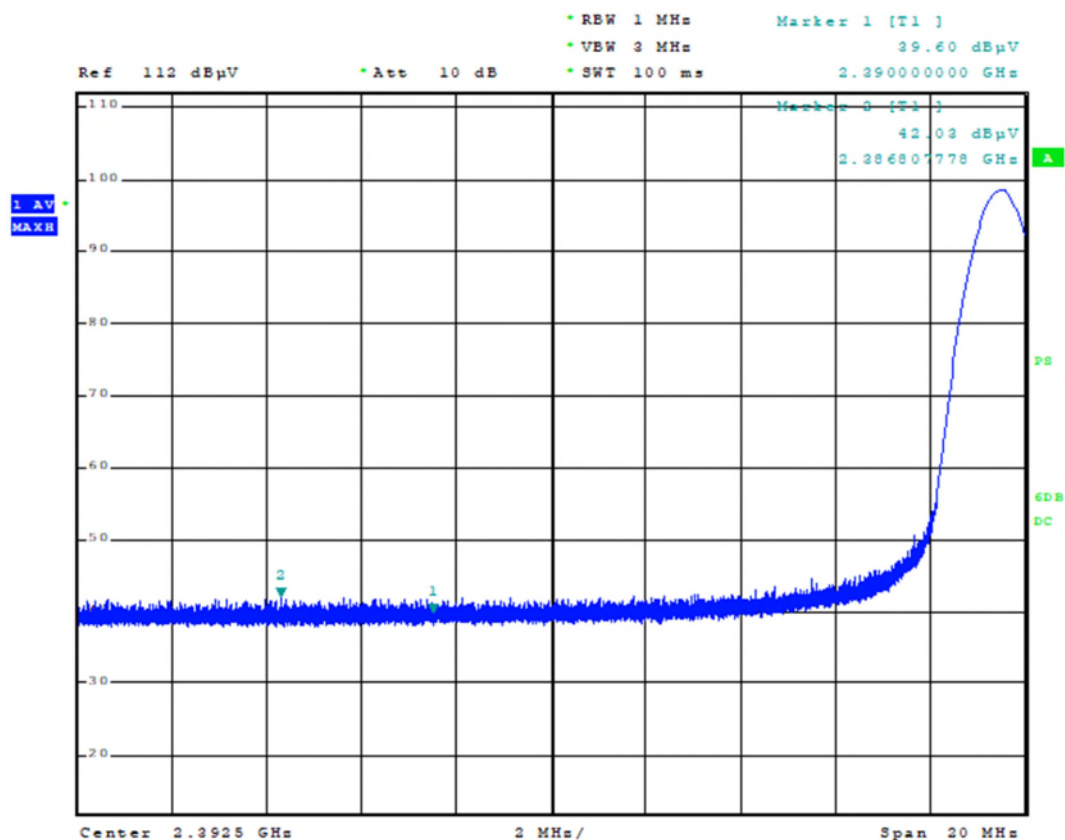
Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2483.5	49.66	54.00	-4.34	5.47	Pass
2487.34	50.19	54.00	-3.81	5.50	Pass

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



Date: 15.JUN.2021 14:39:05

Figure 2.9-3 – Band-edge, Low Channel – Peak



Date: 15.JUN.2021 14:43:45

Figure 2.9-4 – Band-edge, Low Channel – Average

**Table 2.9-3 – Restricted Band Edge – Low Channel – Peak**

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
2390	51.88	74.00	-22.12	5.46	Pass
2388.57	53.51	74.00	-20.49	5.47	Pass

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

Table 2.9-4 – Restricted Band Edge – Low Channel – Average

Frequency	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
2390 MHz	45.06	54.00	-8.94	5.46	Pass
2386.80	47.50	54.00	-6.50	5.48	Pass

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



2.9.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.

Test Area: STS

Table 2.9-5 – Restricted Band Edge Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/08/2021	01/08/2022
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
NBLE02001	Pasternack	Attenuator, 10 dB	18N20W-10dB	2001	G	11/06/2020	11/06/2021
NBLE11460	ETS-Lindgren	Antenna, Horn 1-18 GHz	3117	155005	G	02/17/2021	02/17/2023

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.



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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