Report on the Testing of the

Deere & Company
SX00A

FCC ID: NTV-SX00A

In accordance with:
FCC 47 CFR Part 15.247
FCC 47 CFR Part 15.207
ISED RSS-247 Issue 2, February 2017
ISED RSS-GEN Issue 5, April 2018

America

Add value.
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Prepared for: Deere & Company
One John Deere Place
Moline, IL 61265

COMMERCIAL-IN-CONFIDENCE

Document Number: NC72167906.4 | Issue: 3

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Sean Sellergren	Sr EMC Engineer	**Authorized Signatory**	22 July 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

ACCREDITATION
Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

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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	22 July 2021
2	Incorrect table heading fixed. Added engineer note to Radiated band edge testing.	22 July 2021
3	Updated name of Applicant and Manufacture and address	2 August 2021

1.2 Introduction

Applicant	Deere & Company
Manufacturer	Deere & Company
Applicant's Email Address	BuchhopStevenJ@JohnDeere.com
Model Number(s)	SX00A
Serial Number(s)	PHYSX00A100179
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 ISED RSS-GEN Issue 5, April 2018
Order Number	72167906
Date of Receipt of EUT	17 MAY 2021
Start of Test	17 MAY 2021
Finish of Test	23 MAY 2021
Related Document(s)	KDB 558074 D01 ANSI C63.10 2013 TUV_SUD_PIF.pdf

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1.3 Scope of Testing

To perform certification testing to confirm that the wireless device(s) meet the requirements of the applicable standards and guidance documents (KDB 558074 D01).

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

Report Section	Specification Clause		Test Description	Accreditation	Base Standard
2.1	15.203	RSS-GEN	Antenna Requirements	A2LA	FCC Part 15.203
2.2	15.247(a)(1)(i)	RSS-247 (5.1a)	20dB / 99% Bandwidth	A2LA	ANSI C63.10:2013
2.3	15.247(a)(1)	RSS-247 (5.1b)	Hopping Channel Separation	A2LA	ANSI C63.10:2013
2.4	15.247(a)(1)(i)	RSS-247 (5.1c)	Number of Hopping Channels	A2LA	ANSI C63.10:2013
2.5	15.247(a)(1)(i)	RSS-247 (5.1d)	Average Occupancy Period	A2LA	ANSI C63.10:2013
2.6	15.247(b)(2)	RSS-247 (5.4d)	Peak Conducted Output Power	A2LA	ANSI C63.10:2013
2.7	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emissions	A2LA	ANSI C63.10:2013
2.8	15.247(d)	RSS-247 (5.5)	Conducted Band-Edge	A2LA	ANSI C63.10:2013
2.9	15.207	RSS-GEN	Conducted Emissions	A2LA	ANSI C63.4:2013
2.10	15.247(d)	RSS-GEN	Radiated Spurious Emissions	A2LA	ANSI C63.10:2013
2.11	15.205	RSS-GEN	Radiated Restricted Bands of Emissions	A2LA	ANSI C63.10:2013

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Table 1.4-2 – Test Accreditation

Test Name	Name of Tester(s)	Results / Comments
Antenna Requirements	Franklin Rose	Pass
20dB / 99% Bandwidth	Franklin Rose	Pass
Hopping Channel Separation	Franklin Rose	Pass
Number of Hopping Channels	Franklin Rose	Pass
Average Occupancy Period	Franklin Rose	Pass
Peak Conducted Output Power	Franklin Rose	Pass
Conducted Spurious Emissions	Franklin Rose	Pass
Conducted Band-Edge	Franklin Rose	Pass
Conducted Emissions	Franklin Rose	N/A
Radiated Spurious Emissions	Franklin Rose	Pass
Radiated Restricted Bands of Emissions	Franklin Rose	Pass

Note: Tests marked with N/A were not tested due to EUT not meeting the full requirements for test applicability and therefore are not required.

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1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT): Assembly is intended to be mounted on agricultural vehicle chassis to interrogate RFID tags attached to crop bundles. RFID reader assembly consists of an off-the-shelf integrated RFID engine, custom and off-the-shelf antenna options, and PCBA of supporting circuits.

Table 1.5-1 – Wireless Module Technical Information

Detail	Description
FCC ID	NTV-SX00A
Transceiver Model #	SX00A
Operating Frequency	902.75-927.25 MHz
Modulation Format	GFSK
Antenna Type / Gain:	Patch, 7 dBi

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

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Table 1.5-2 – Cable Descriptions

Cable/Port	Description
Custom wiring harness	A harness providing power and programming to the EUT

Table 1.5-3 – Support Equipment Descriptions

Make/Model	Description
Laptop PC	A PC used to program the EUT for testing

1.5.2 Modes of Operation

Table 1.5-4 – Test Frequencies & Modes of Operation

Channel	Frequency (MHz)	Mode(s)
Low End	902.75	Modulated; Unmodulated (CW)
Middle	915.25	Modulated; Unmodulated (CW)
High End	927.25	Modulated; Unmodulated (CW)

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 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
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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
Patch	SMA connector	7 dBi

Note: The antenna and antenna connector are fully contained within the EUT and are inaccessible to the end user.

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2.2 20dB / 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

17 MAY 2021

2.2.4 Test Method

The 20dB bandwidth was measured in accordance with the FCC KDB 558074 D01 15.247 Meas Guidance. 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 20dB 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.

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2.2.6 Test Results

Table 2.2-1 – 20dB / 99% Bandwidth Results

Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
902.75	0.033	0.065
915.25	0.034	0.069
927.25	0.034	0.070

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

Test Result: Pass

See data below for detailed results.

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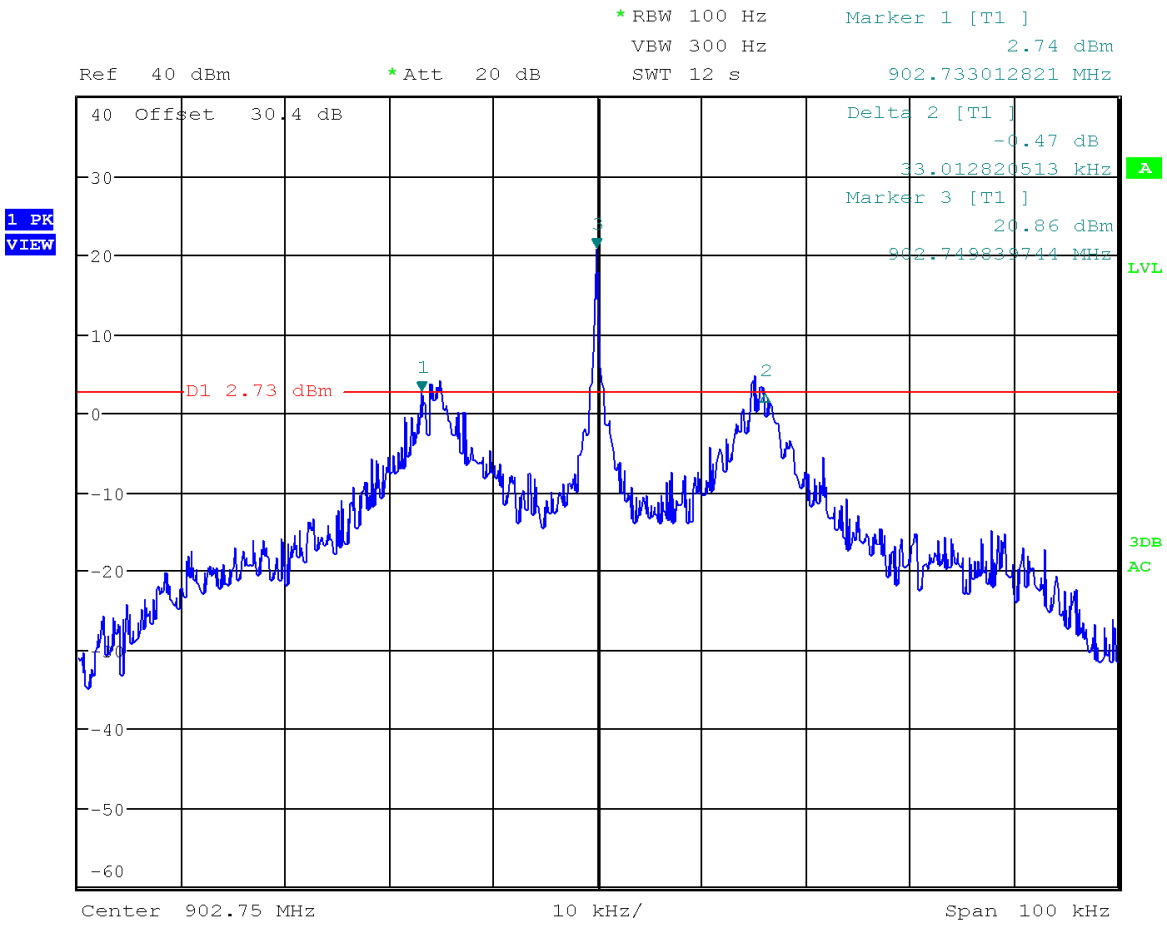

Figure 2-1 – 20dB Bandwidth – Low Channel

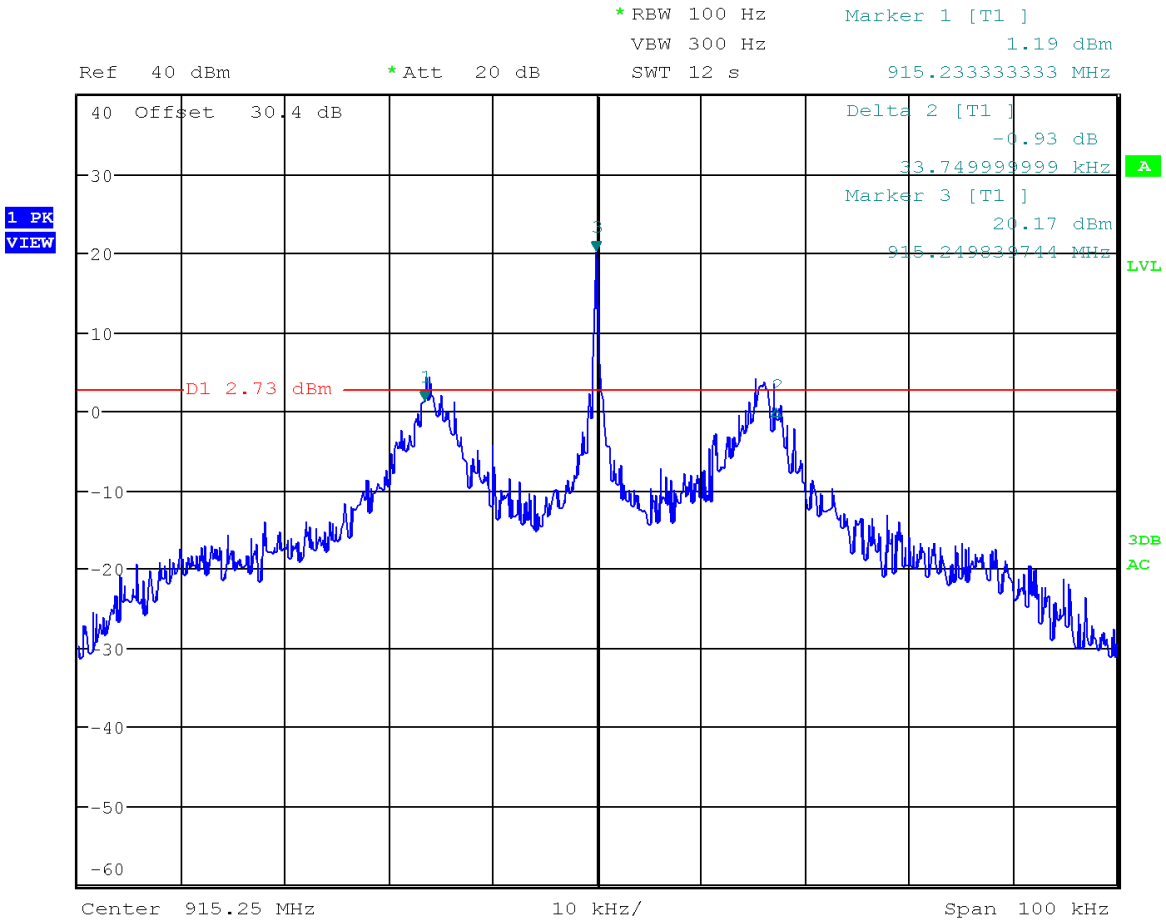

Figure 2-2 – 20dB Bandwidth – Middle Channel

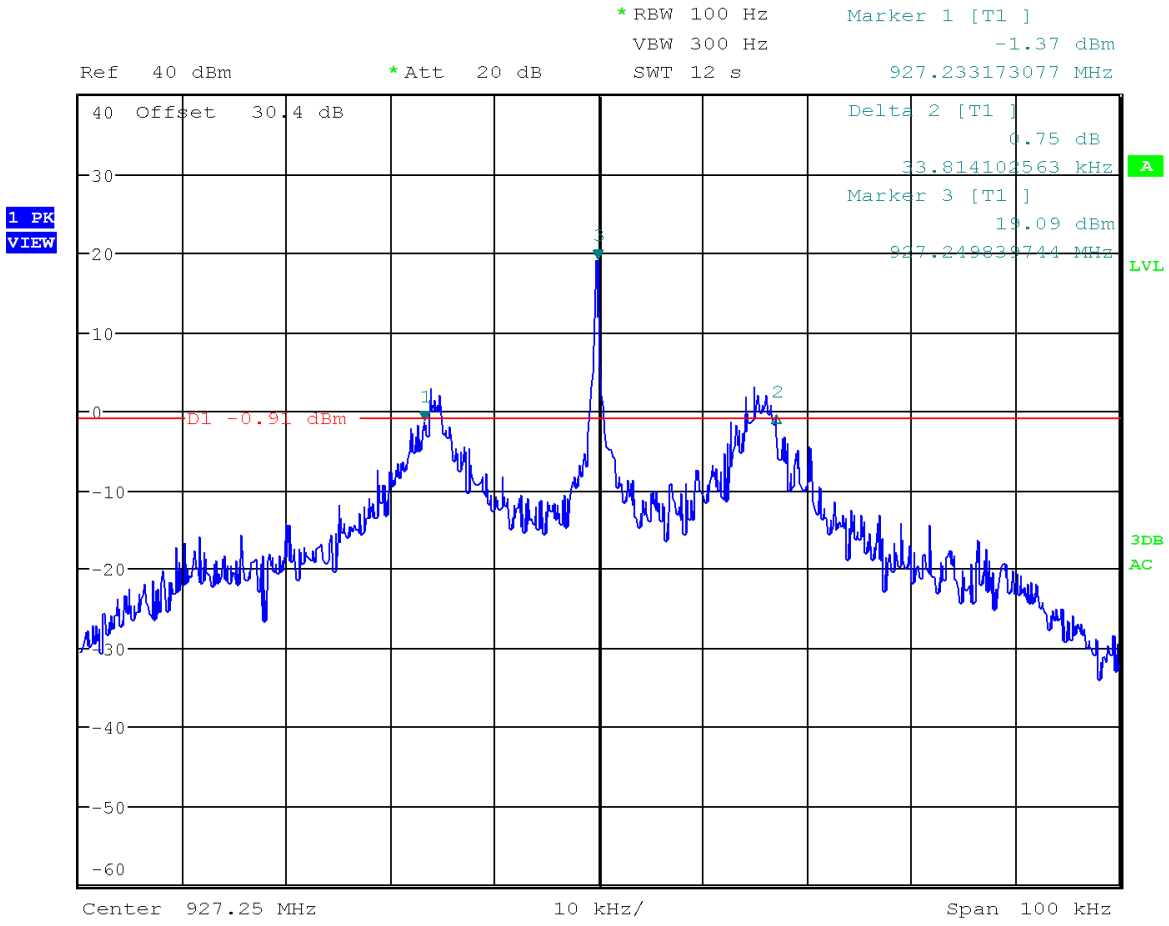

Figure 2-3 – 20dB Bandwidth – High Channel

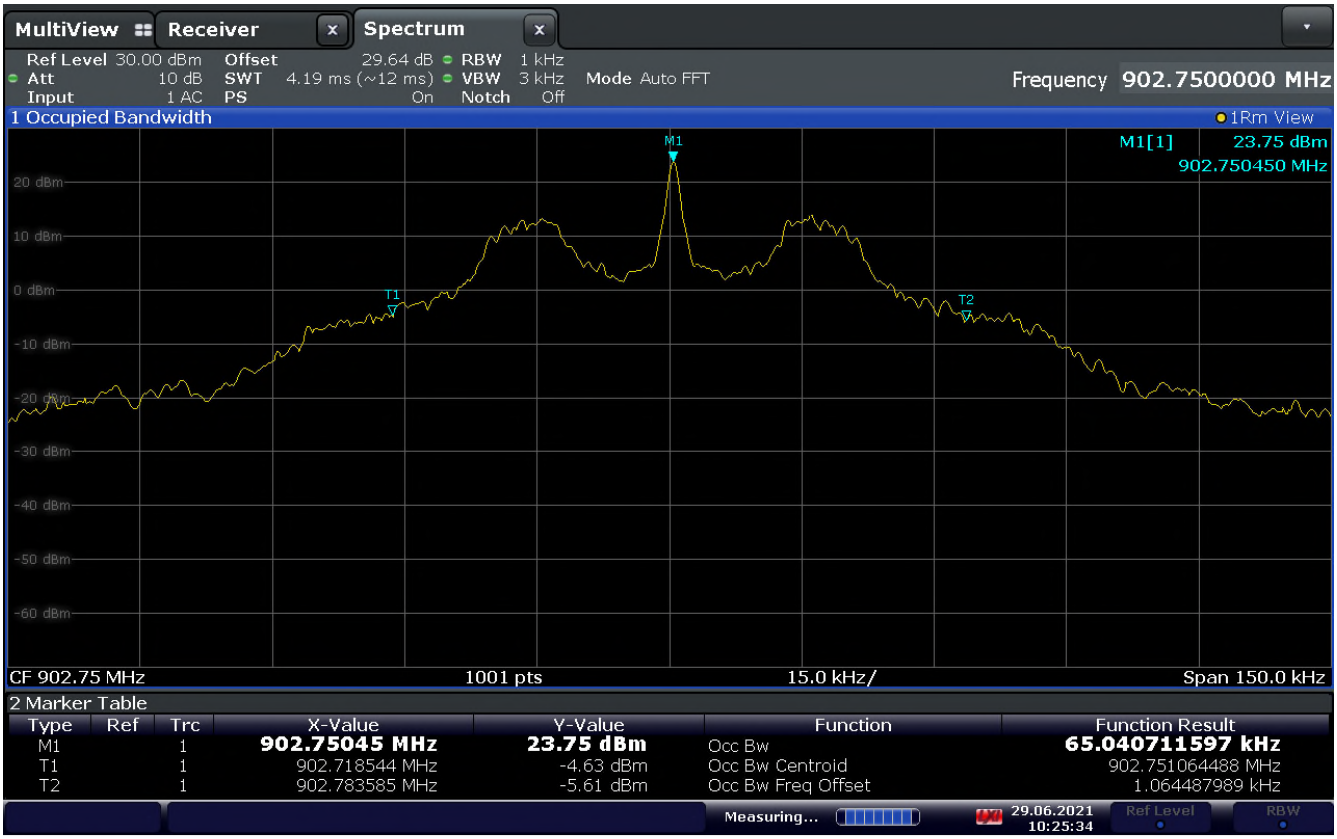

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Figure 2-4 – 99% Bandwidth – Low Channel

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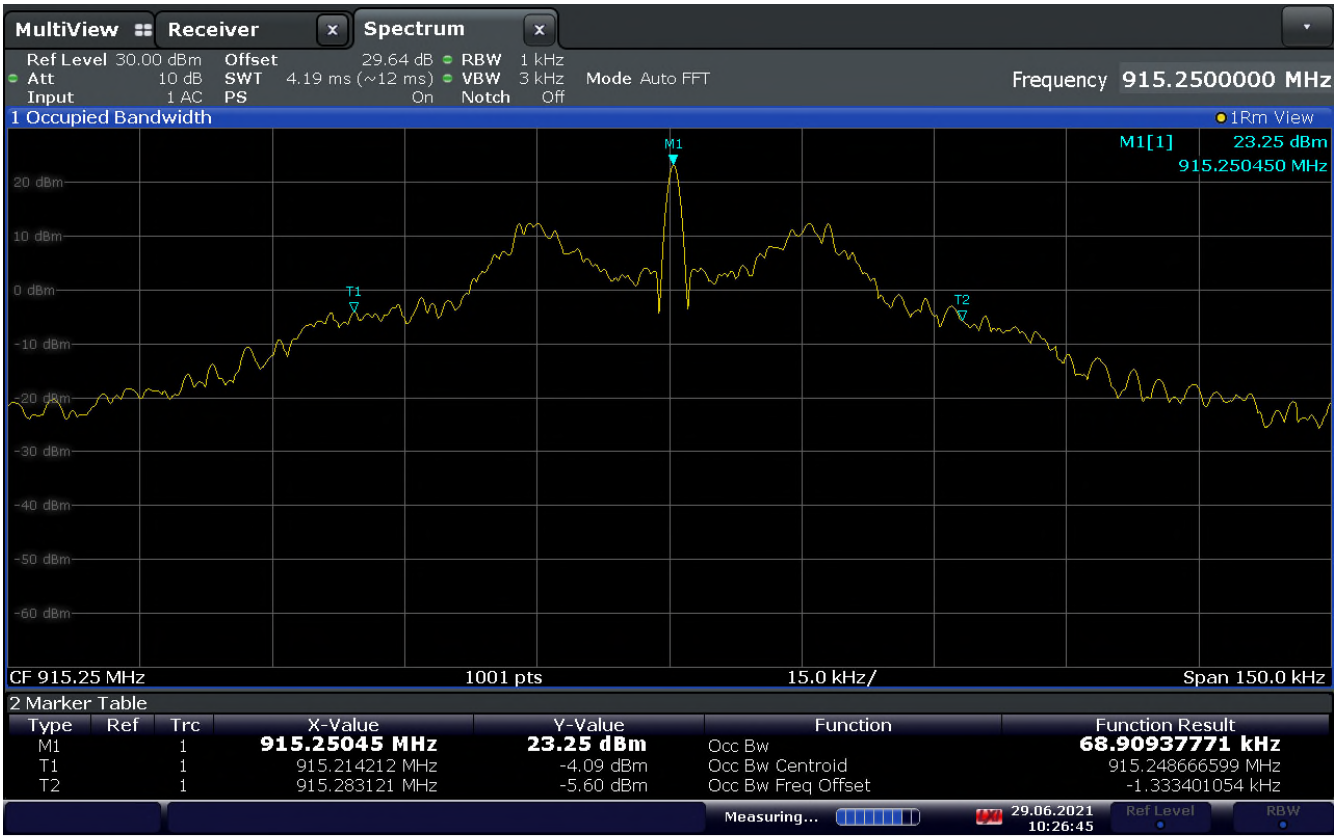

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Figure 2-5 – 99% Bandwidth – Middle Channel

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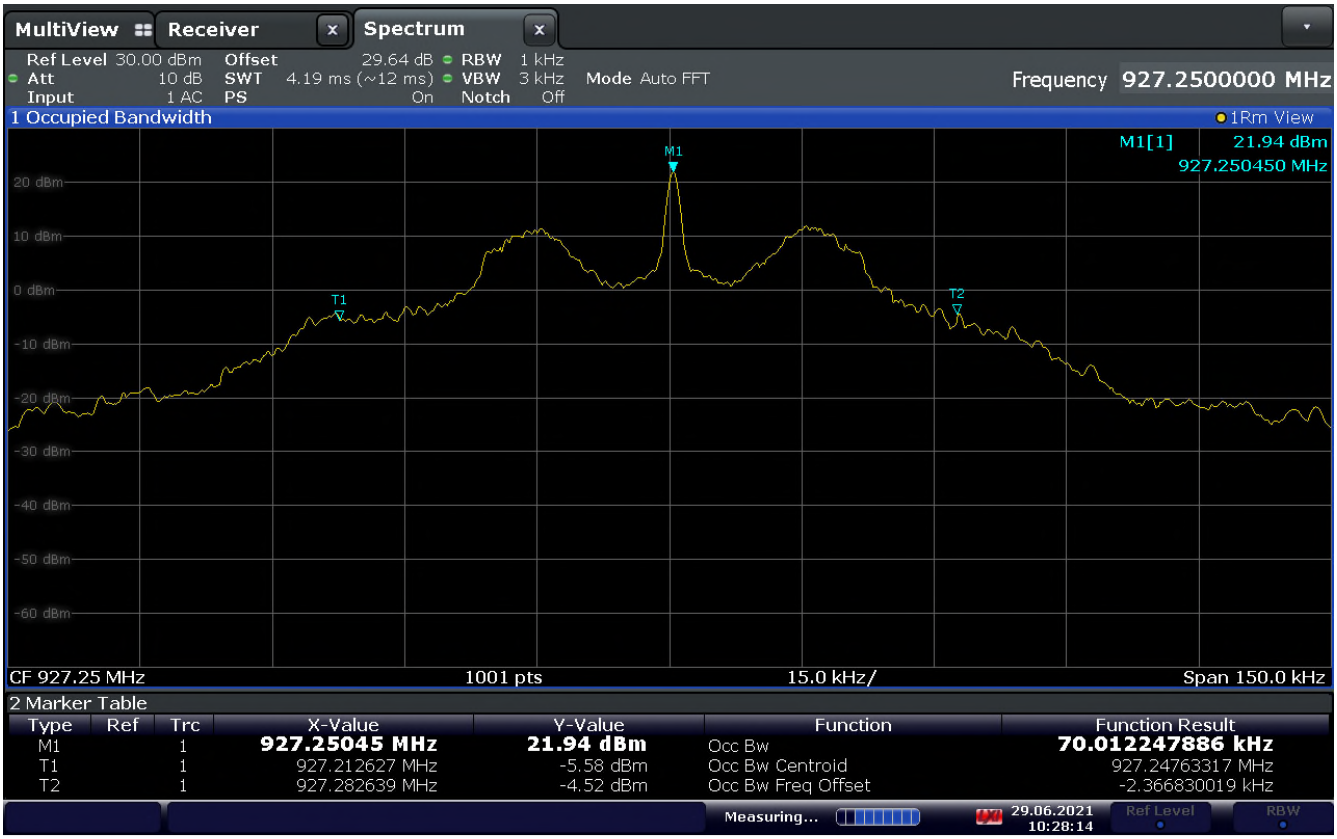

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Figure 2-6 – 99% Bandwidth – High Channel

2.2.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.2-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44	101537	G	12/31/2020	12/31/2021

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.

2.3 Hopping Channel Separation

2.3.1 Specification Reference

FCC 47 CFR Part 15.247(a)(1)
RSS-247 5.1(b)

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

17 MAY 2021

2.3.4 Test Method

The Hopping Channel Separation was measured in accordance with ANSI C63.10-2013 Section 7.8.2. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 30% of the channel spacing 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 channel separation of the adjacent channels.

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 – Hopping Channel Separation Results

Frequency 1 (MHz)	Frequency 2 (MHz)	Separation (MHz)	20dB Bandwidth (MHz)
915.25	915.75	0.500	0.034

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

Test Result: Pass Fail

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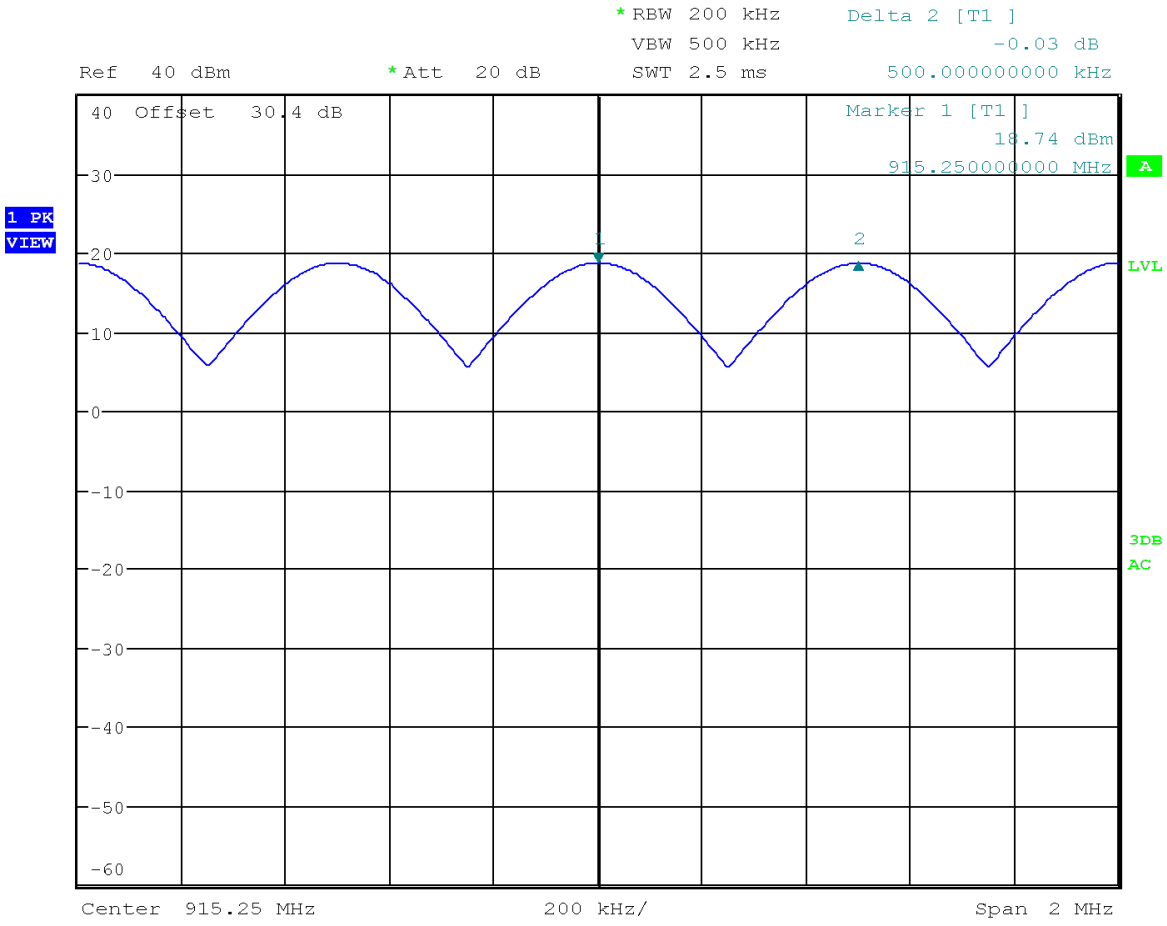

Figure 2-7 – Hopping Channel Separation

2.3.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.3-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021

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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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2.4 Number of Hopping Channels

2.4.1 Specification Reference

FCC 47 CFR Part 15.247(a)(1)(i)
RSS-247 5.1(c)

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

17 MAY 2021

2.4.4 Test Method

The Number of Hopping Channels was measured in accordance with ANSI C63.10-2013 Section 7.8.3. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to ≤ 30% of the channel spacing or the 20dB Bandwidth, and the Video Bandwidth (VBW) was set to ≥ 3 times the RBW. The trace was set to max hold using a peak detector. The spectrum analyzer automatic peak list function was utilized to determine the number of channels.

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 – Number of Hopping Channel Results

Number of Hopping Channels
50

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

Test Result: Pass

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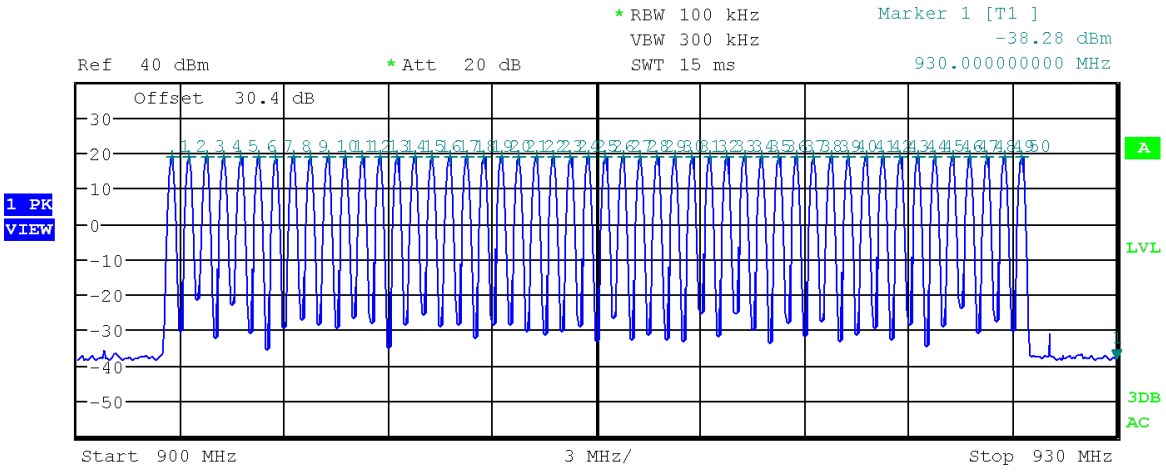

#	Frequency	Level	#	Frequency	Level
1	902.740385 MHz	18.58 dBm	13	908.750000 MHz	18.66 dBm
2	903.221154 MHz	18.61 dBm	14	909.230769 MHz	18.67 dBm
3	903.750000 MHz	18.60 dBm	15	909.759615 MHz	18.71 dBm
4	904.230769 MHz	18.55 dBm	16	910.240385 MHz	18.71 dBm
5	904.711538 MHz	18.57 dBm	17	910.769231 MHz	18.70 dBm
6	905.240385 MHz	18.62 dBm	18	911.250000 MHz	18.71 dBm
7	905.721154 MHz	18.55 dBm	19	911.730769 MHz	18.80 dBm
8	906.250000 MHz	18.62 dBm	20	912.259615 MHz	18.69 dBm
9	906.730769 MHz	18.70 dBm	21	912.740385 MHz	18.72 dBm
10	907.259615 MHz	18.63 dBm	22	913.269231 MHz	18.71 dBm
11	907.740385 MHz	18.67 dBm	23	913.750000 MHz	18.70 dBm
12	908.221154 MHz	18.67 dBm	24	914.230769 MHz	18.74 dBm

Date: 17.MAY.2021 07:06:53

Figure 2-8 – Number of Hopping Channels

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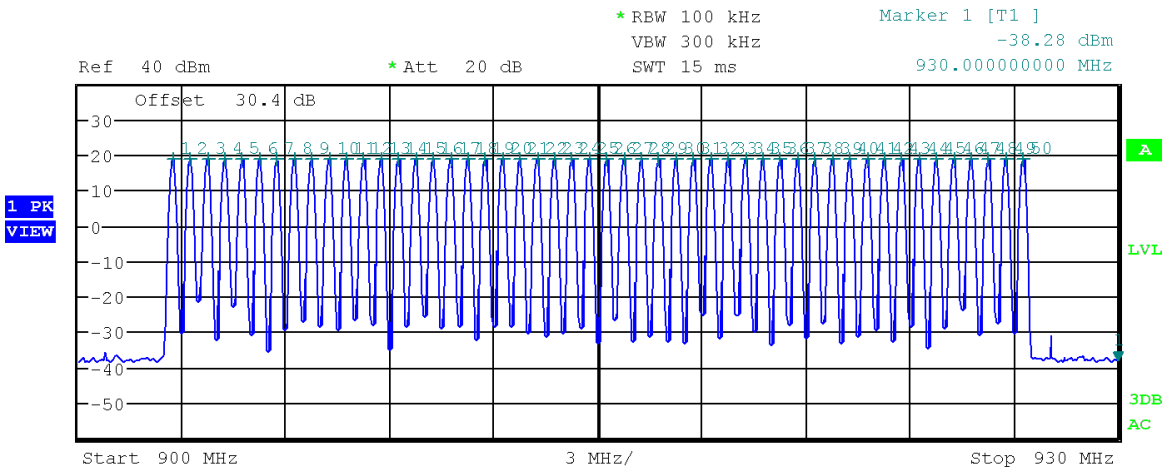

#	Frequency	Level	#	Frequency	Level
25	914.759615 MHz	18.77 dBm	37	920.769231 MHz	18.73 dBm
26	915.240385 MHz	18.79 dBm	38	921.250000 MHz	18.69 dBm
27	915.769231 MHz	18.70 dBm	39	921.778846 MHz	18.65 dBm
28	916.250000 MHz	18.75 dBm	40	922.259615 MHz	18.68 dBm
29	916.730769 MHz	18.72 dBm	41	922.788462 MHz	18.70 dBm
30	917.259615 MHz	18.75 dBm	42	923.269231 MHz	18.69 dBm
31	917.740385 MHz	18.75 dBm	43	923.750000 MHz	18.69 dBm
32	918.269231 MHz	18.72 dBm	44	924.278846 MHz	18.68 dBm
33	918.750000 MHz	18.78 dBm	45	924.759615 MHz	18.71 dBm
34	919.278846 MHz	18.68 dBm	46	925.288462 MHz	18.72 dBm
35	919.759615 MHz	18.69 dBm	47	925.769231 MHz	18.60 dBm
36	920.240385 MHz	18.78 dBm	48	926.250000 MHz	18.63 dBm

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Figure 2-9 – Number of Hopping Channels

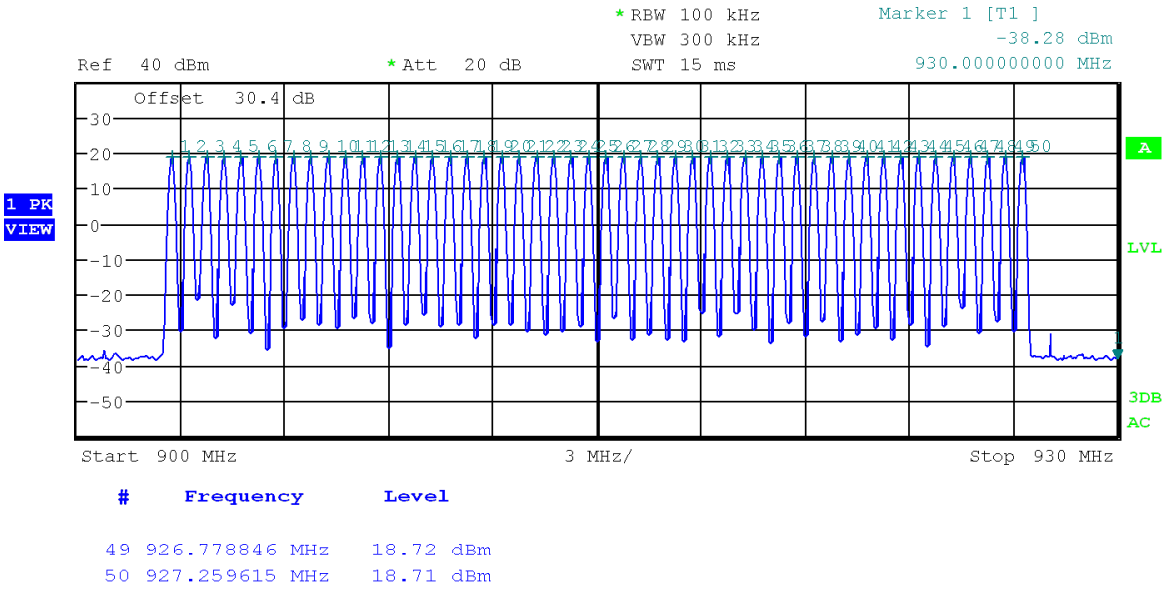

Figure 2-10 – Number of Hopping Channels

2.4.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.4-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021

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.

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2.5 Average Occupancy Period

2.5.1 Specification Reference

FCC 47 CFR Part 15.247(a)(1)(i)
RSS-247 5.1(d)

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

29 JUN 2021

2.5.4 Test Method

The Average Occupancy Period (Dwell Time) was measured in accordance with ANSI C63.10-2013 Section 7.8.4. The spectrum analyzer was put into a 0 Hz Span (time domain) measurement mode, and the Resolution Bandwidth (RBW) of the spectrum analyzer was set less than or equal to the channel spacing and where possible was set > 1/T, where T is the dwell time. The sweep time was set high enough to encompass the entire time on the channel. Triggering was set to video trigger at a level high enough to negate interference from adjacent channels. The trace was set to max hold using a peak detector. The marker-delta function of the spectrum analyzer was utilized to determine the occupancy time on the channel. The test was then repeated (if necessary) to measure the period until returning to the channel.

The Average Occupancy Period is calculated with the following formula:

*(Number of Hops within the Requirement Period) = (Number of Observed Hops) * (Requirement Period / Analyzer Sweep Time)*

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

Table 2.5-1 – Average Occupancy Period Results

Frequency (MHz)	Number of Hops Observed	Requirement Time Period (s)	Dwell Time per Hop (ms)	Average Occupancy Period (ms)	Occupancy Limit (ms)	Margin (ms)
915.25	2	20	198.2	0.3964	0.4	-0.0036

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

Test Result: Pass

See data below for detailed results.

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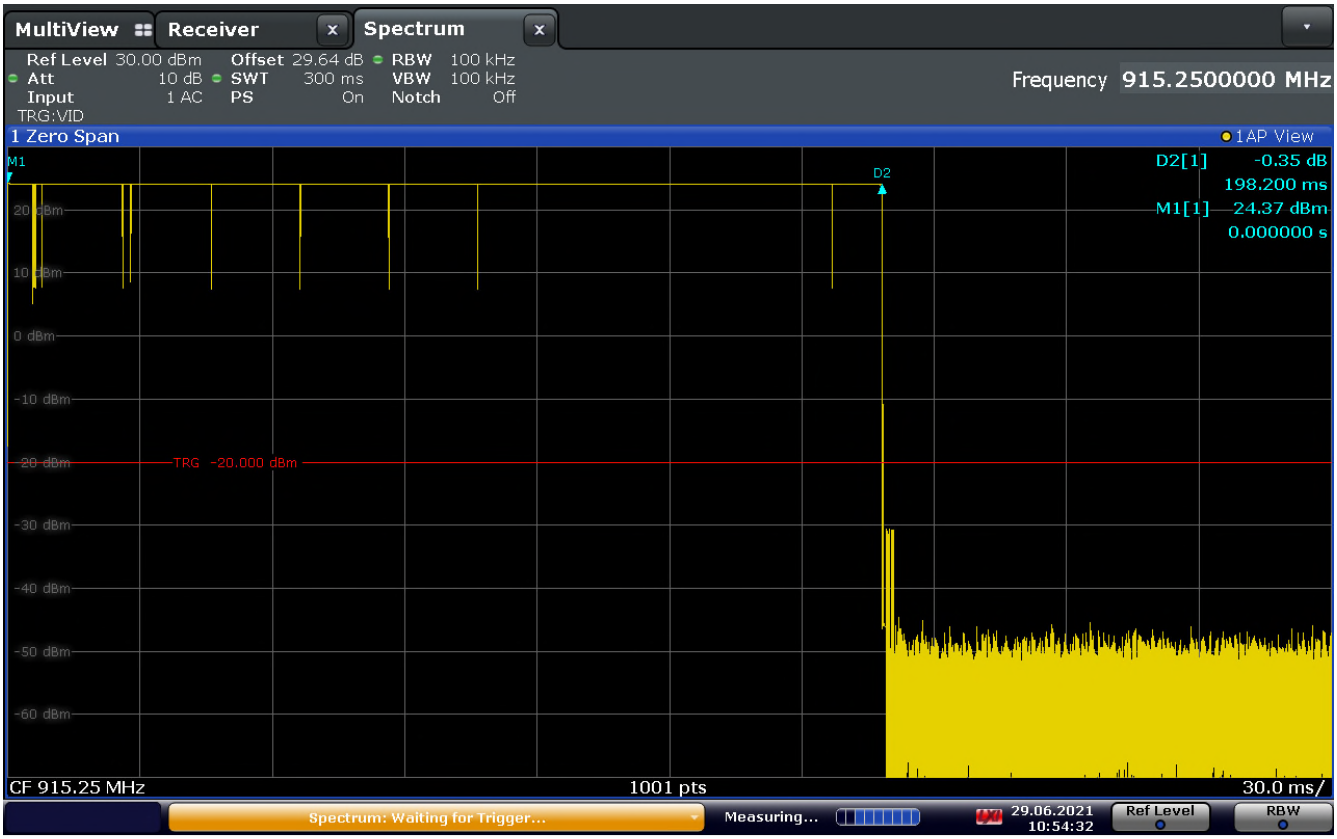

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Figure 2-11 – Dwell Time of Hop

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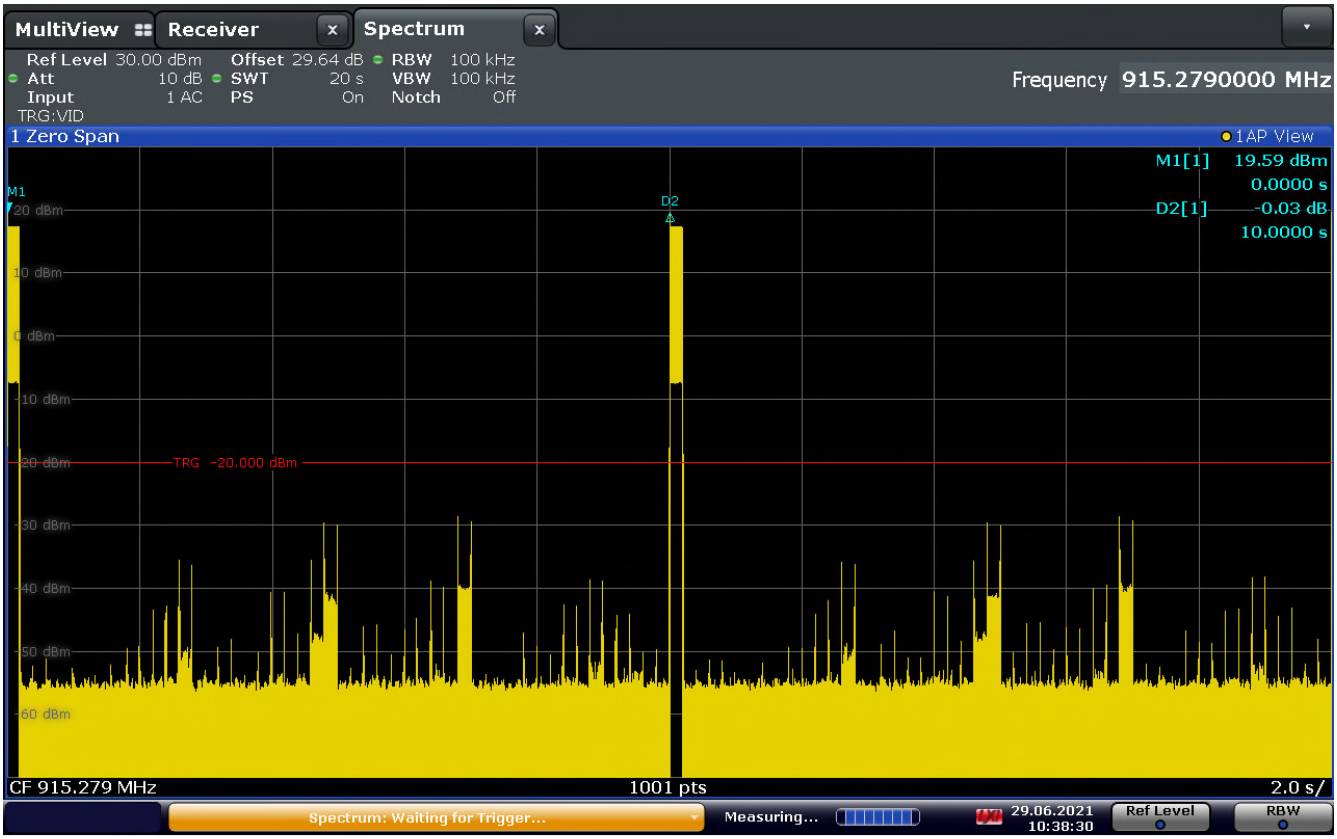

10:38:31 29.06.2021

Figure 2-12 – Number of Hops in 20 s

2.5.7 Test Location and Test Equipment Used

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

Table 2.5-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44	101537	G	12/31/2020	12/31/2021

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.

2.6 Peak Conducted Output Power

2.6.1 Specification Reference

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

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

17 MAY 2021

2.6.4 Test Method

The maximum peak conducted output power was measured in accordance with ANSI C63.10-2013 Section 7.8.5. The RF output of the EUT was directly connected to the input of the spectrum analyzer along with a suitable external attenuator. The Resolution Bandwidth (RBW) was > 20dB of the emission and the VBW was set to ≥ 3 times the RBW. The trace was set to max hold using a peak detector. The marker-to-peak function of the spectrum analyzer was utilized to determine the peak level of the emission.

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

Table 2.6-1 – Peak Conducted Output Power Results

Frequency (MHz)	Measured Output Power (dBm)	Output Power Limit (dBm)	Margin (dB)
902.75	24.91	29.00	4.09
915.25	24.24	29.00	4.76
927.25	23.03	29.00	5.97

Note: The output power limit clause found in 15.247(b)(4) states that antenna array gains greater than 6 dBi are subject to decreased power output limits (more stringent) by the amount in which they exceed 6 dBi.

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

Test Result: Pass

See data below for detailed results.

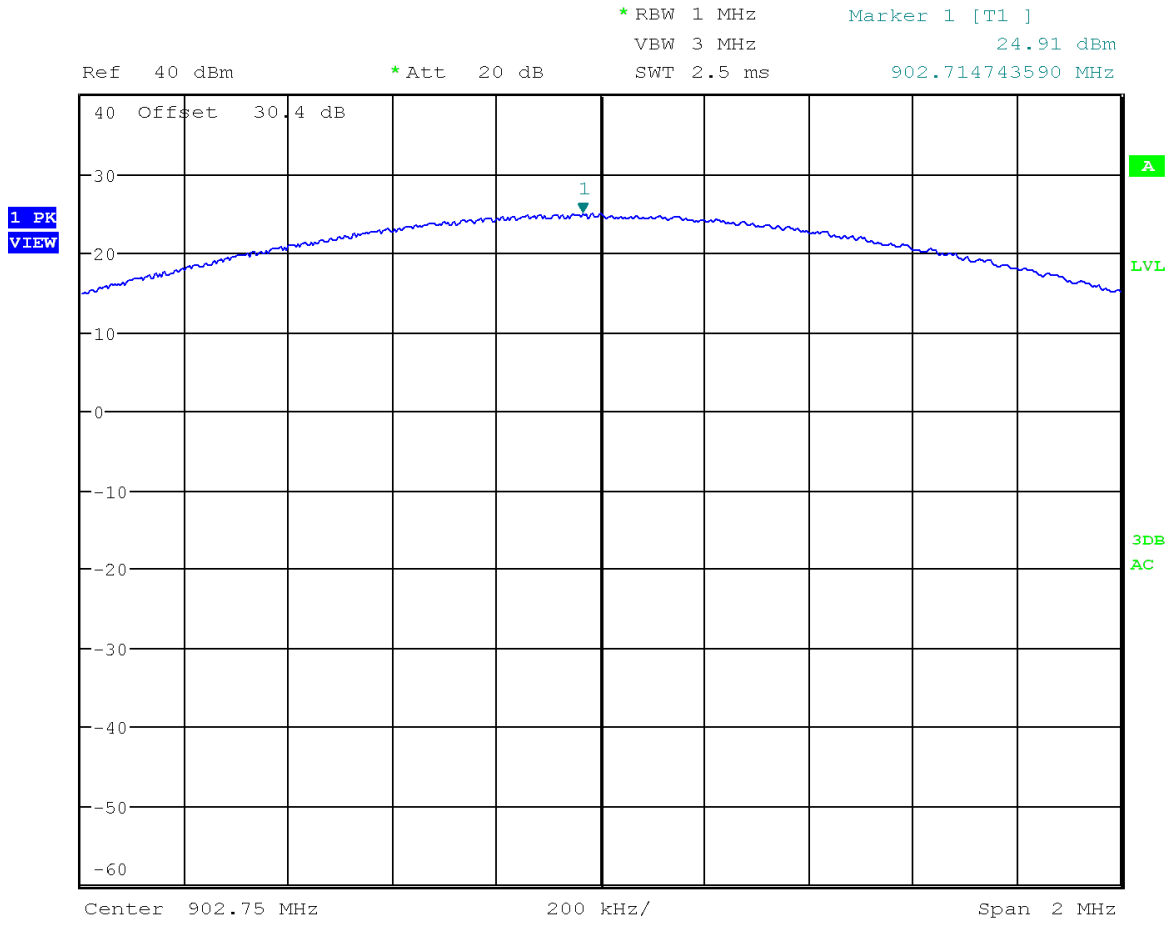

Figure 2-13 – Peak Conducted Output Power – Low Channel

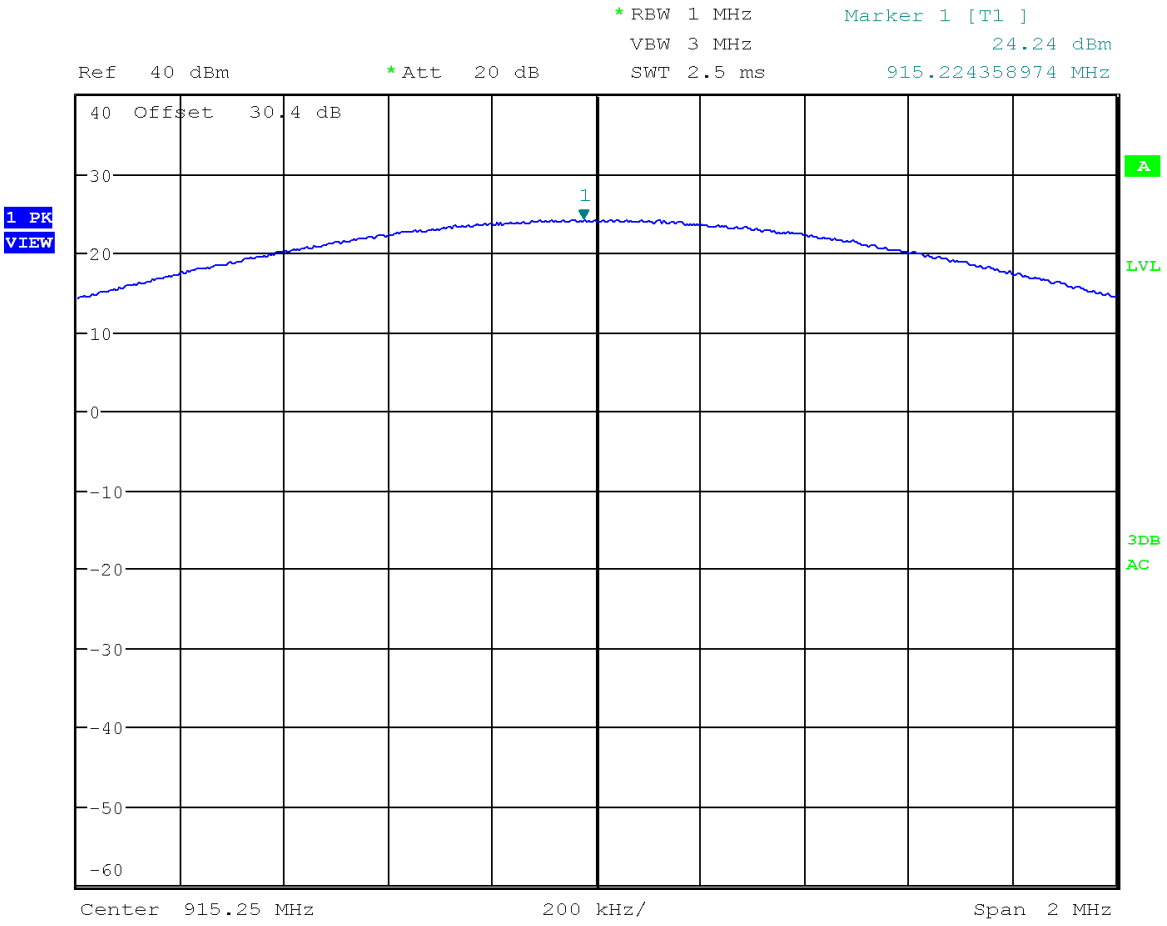

Figure 2-14 – Peak Conducted Output Power – Middle Channel

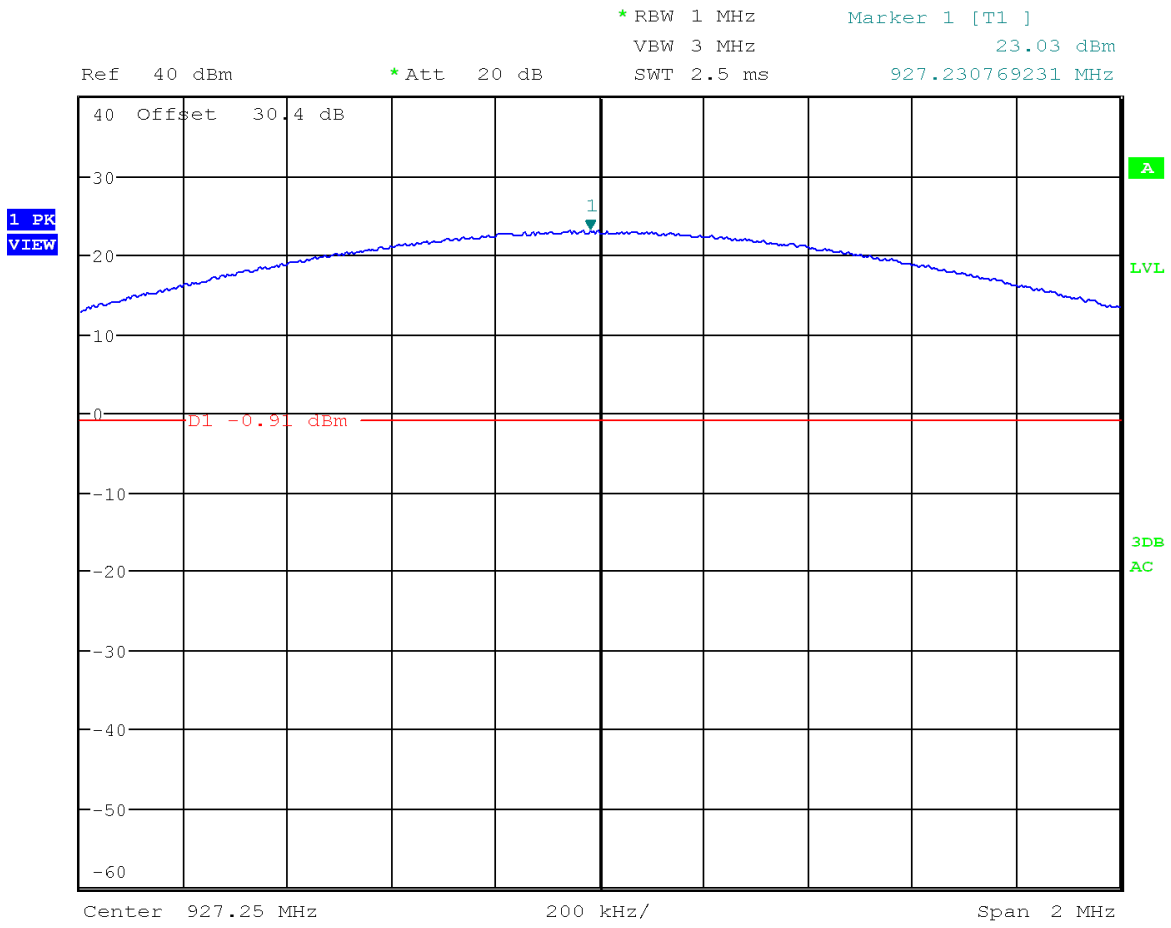

Figure 2-15 – Peak Conducted Output Power – High Channel

2.6.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.6-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021

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.

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2.7 Conducted Spurious Emissions

2.7.1 Specification Reference

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

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

17 MAY 2021

2.7.4 Test Method

The maximum peak conducted output power was measured in accordance with ANSI C63.10-2013 Section 7.8.8. 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 5 times the highest intentional radiator and the trace was set to max hold using the peak detector.

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 Test Results

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

Test Result: Pass

See data below for detailed results.

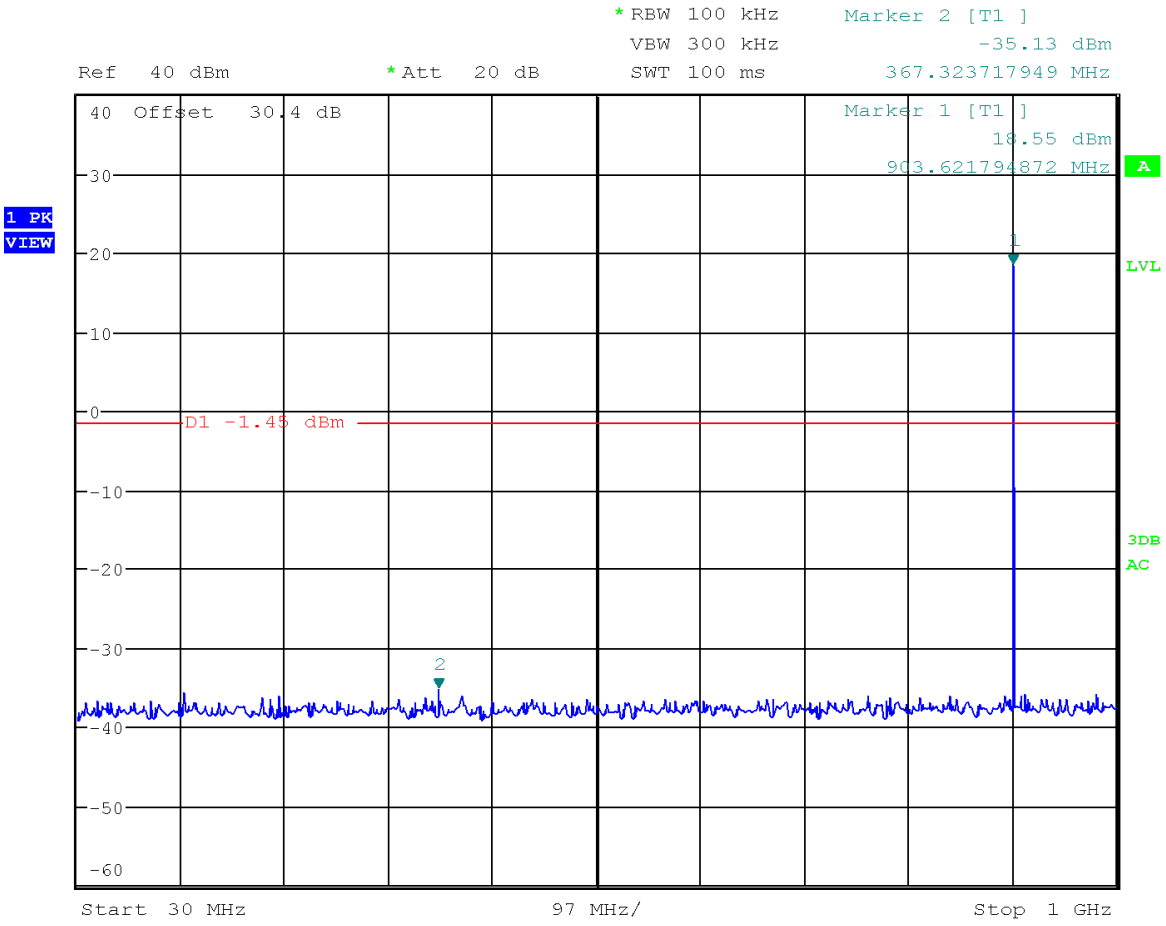

Figure 2-16 – Conducted Spurious Emissions 30 MHz – 1GHz – Low Channel

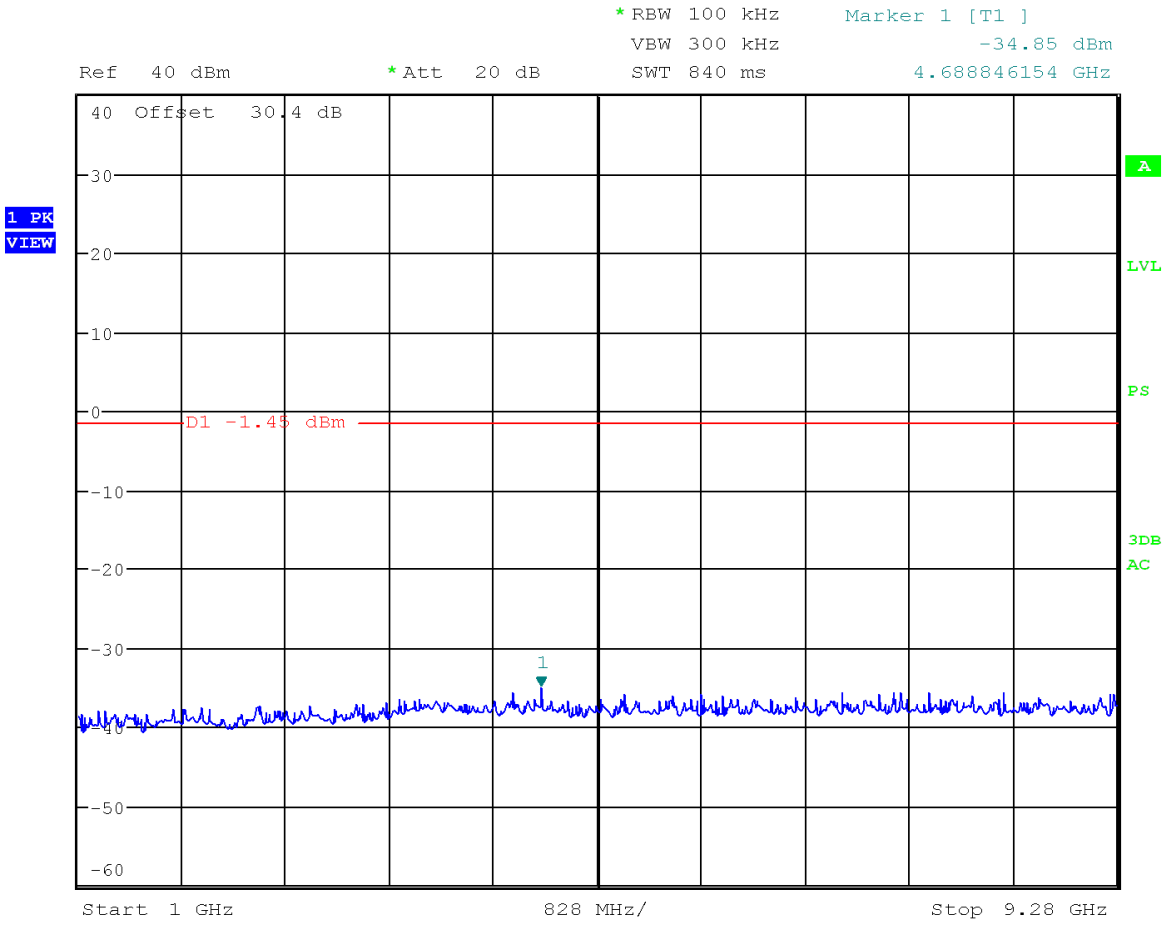

Figure 2-17 – Conducted Spurious Emissions Above 1GHz – Low Channel

Table 2.7-1 – Conducted Spurious Emissions Results – Low Channel

Marker/Plot	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
Marker 2, Plot 1	367.32	-35.13	-1.45	-33.68
Marker 1, Plot 2	4688.85	-34.85	-1.45	-33.40

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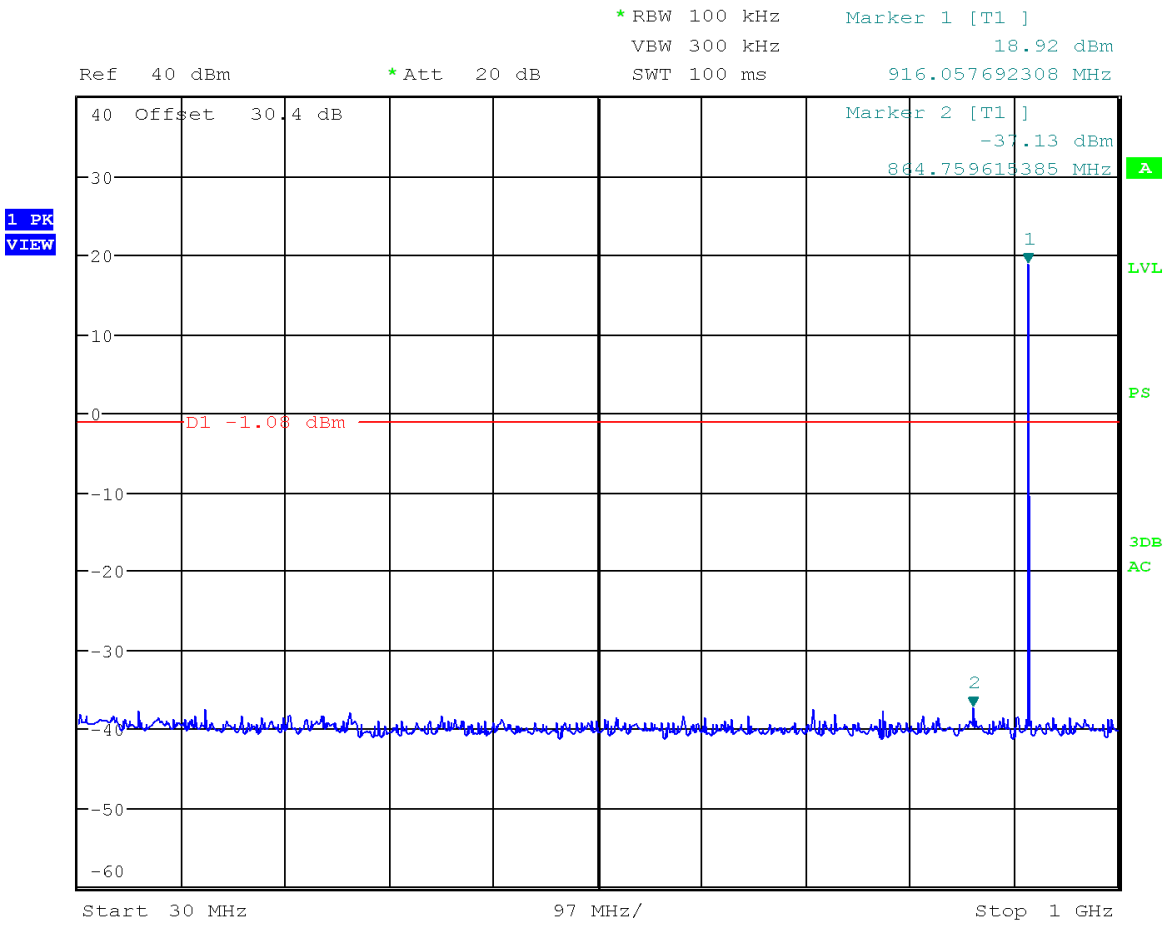

Figure 2-18 – Conducted Spurious Emissions 30 MHz – 1GHz – Middle Channel

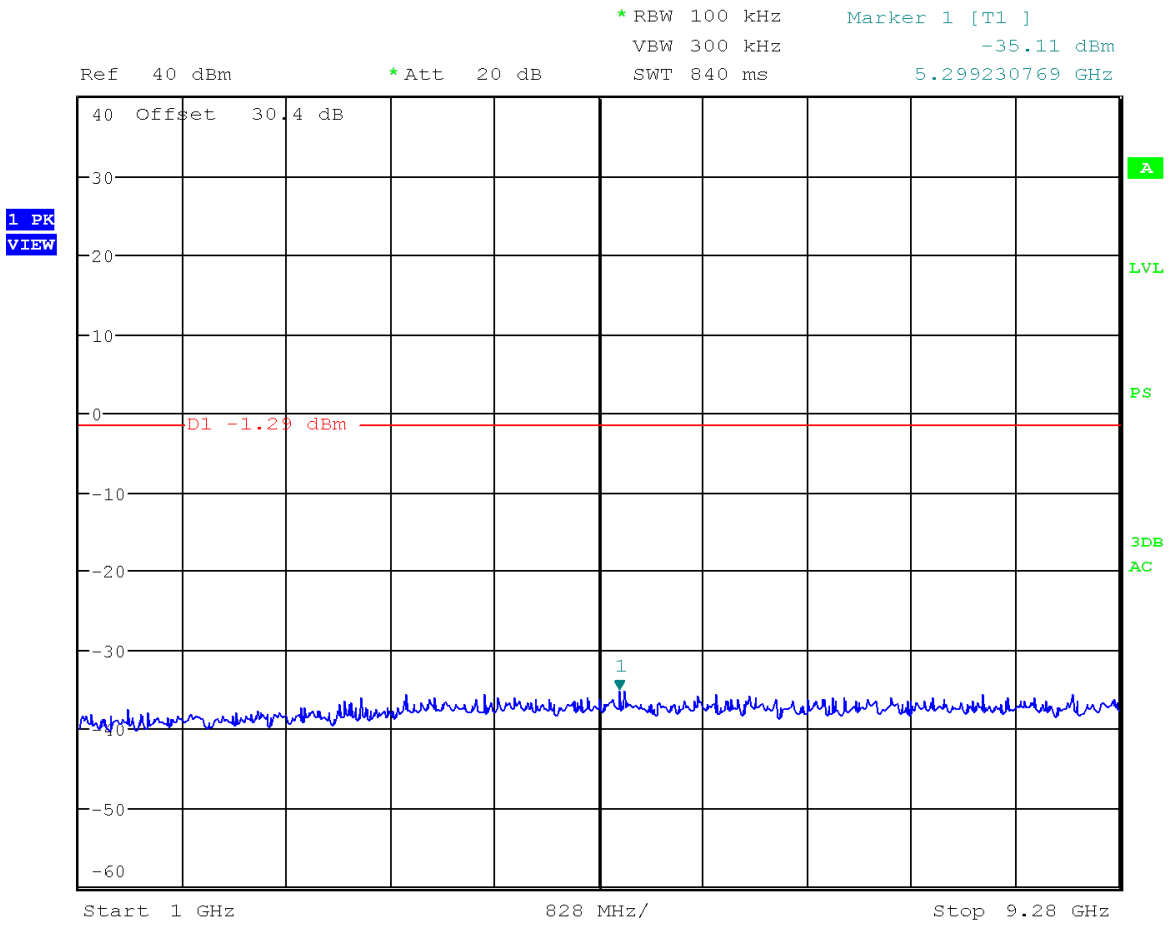

Figure 2-19 – Conducted Spurious Emissions Above 1GHz – Middle Channel

Table 2.7-2 – Conducted Spurious Emissions Results – Middle Channel

Marker/Plot	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
Marker 2, Plot 1	864.76	-37.13	-1.45	-35.68
Marker 1, Plot 2	5299.23	-35.11	-1.45	-33.66

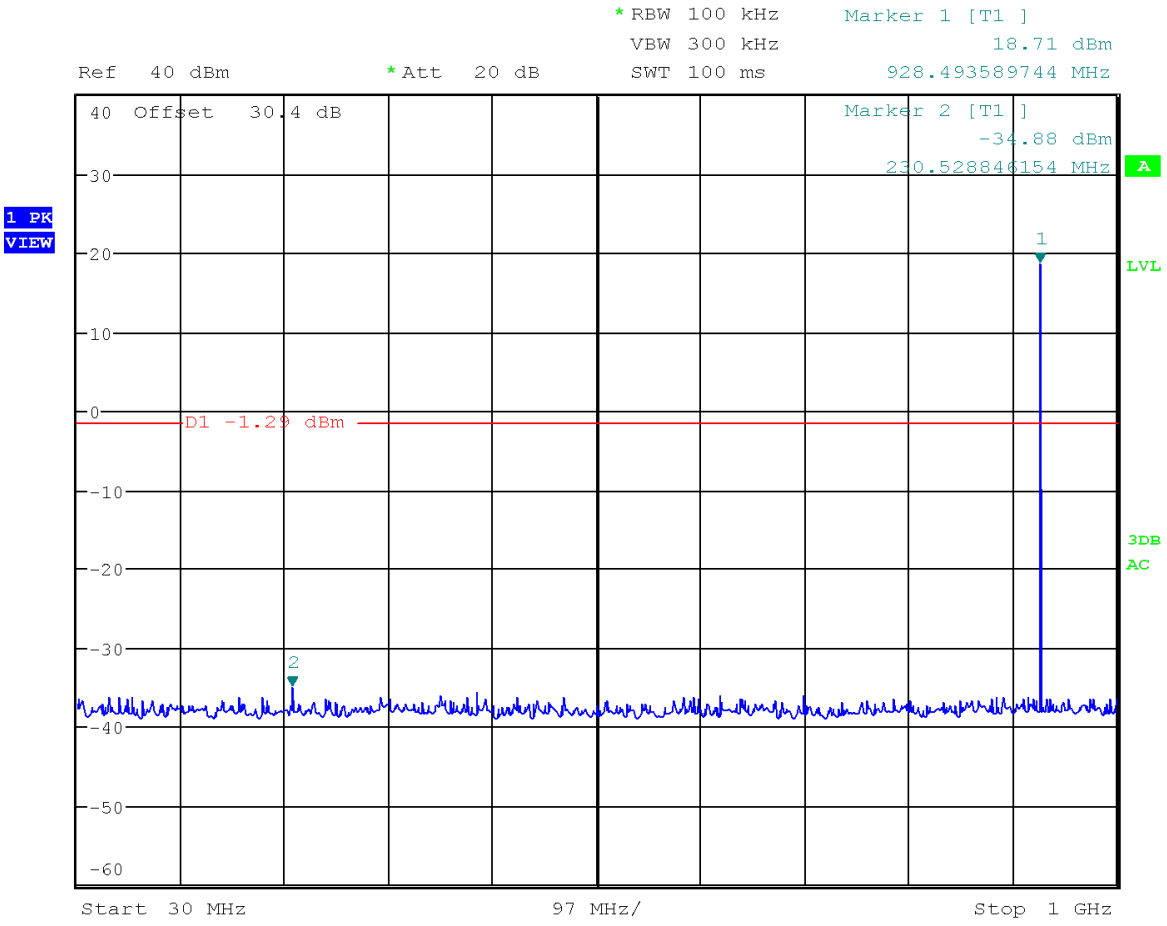

Figure 2-20 – Conducted Spurious Emissions 30 MHz – 1GHz – High Channel

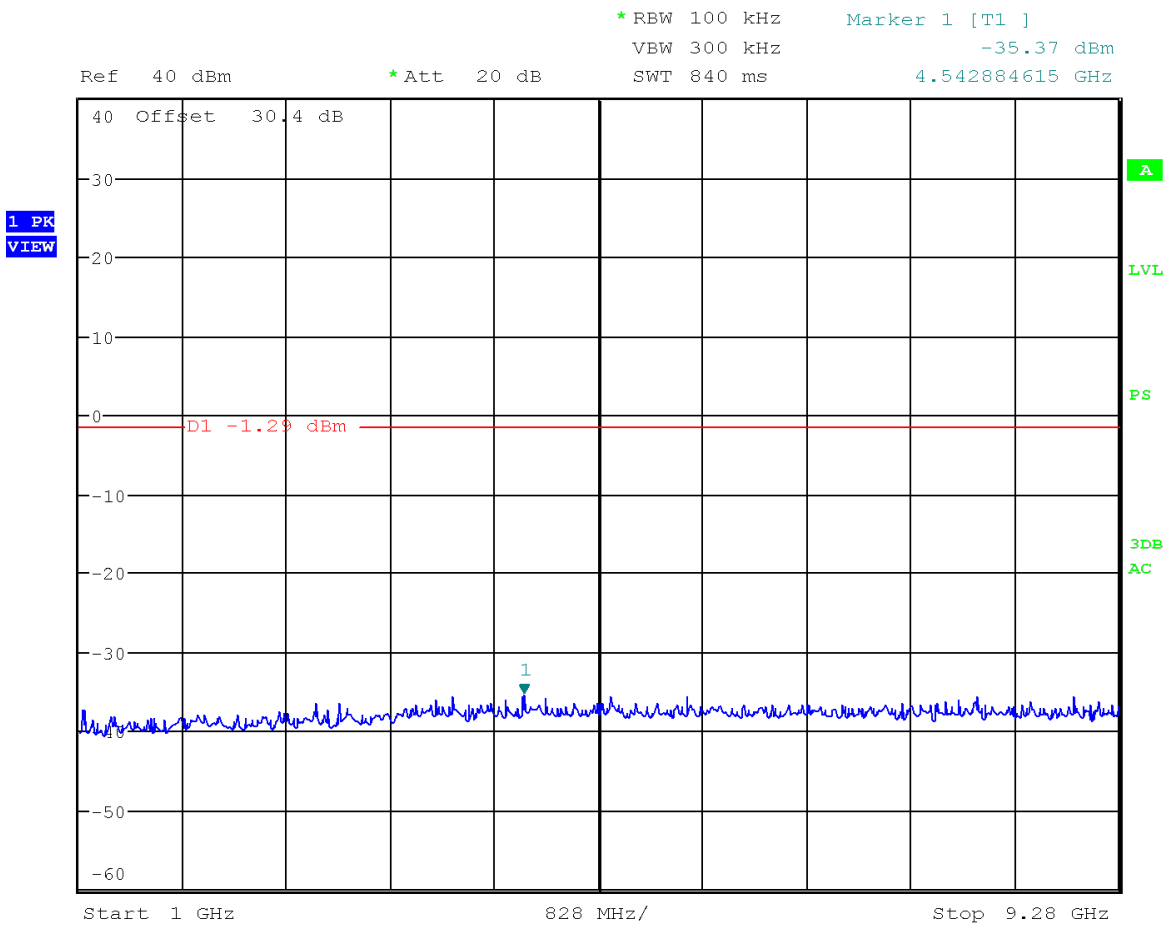

Figure 2-21 – Conducted Spurious Emissions Above 1GHz – High Channel

Table 2.7-3 – Conducted Spurious Emissions Results – High Channel

Marker/Plot	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
Marker 2, Plot 1	230.53	-34.88	-1.45	-33.43
Marker 1, Plot 2	4542.89	-35.37	-1.45	-33.92

2.7.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.7-4 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021

Cal Code G = Calibration performed by an accredited outside source.
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2.8 Conducted Band-Edge

2.8.1 Specification Reference

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

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

17 MAY 2021

2.8.4 Test Method

The maximum peak conducted output power was measured in accordance with ANSI C63.10-2013 Section 7.8.8. 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 5 times the highest intentional radiator and the trace was set to max hold using the peak detector, and was repeated using an average detector.

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 Test Results

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

Test Result: Pass

See data below for detailed results.

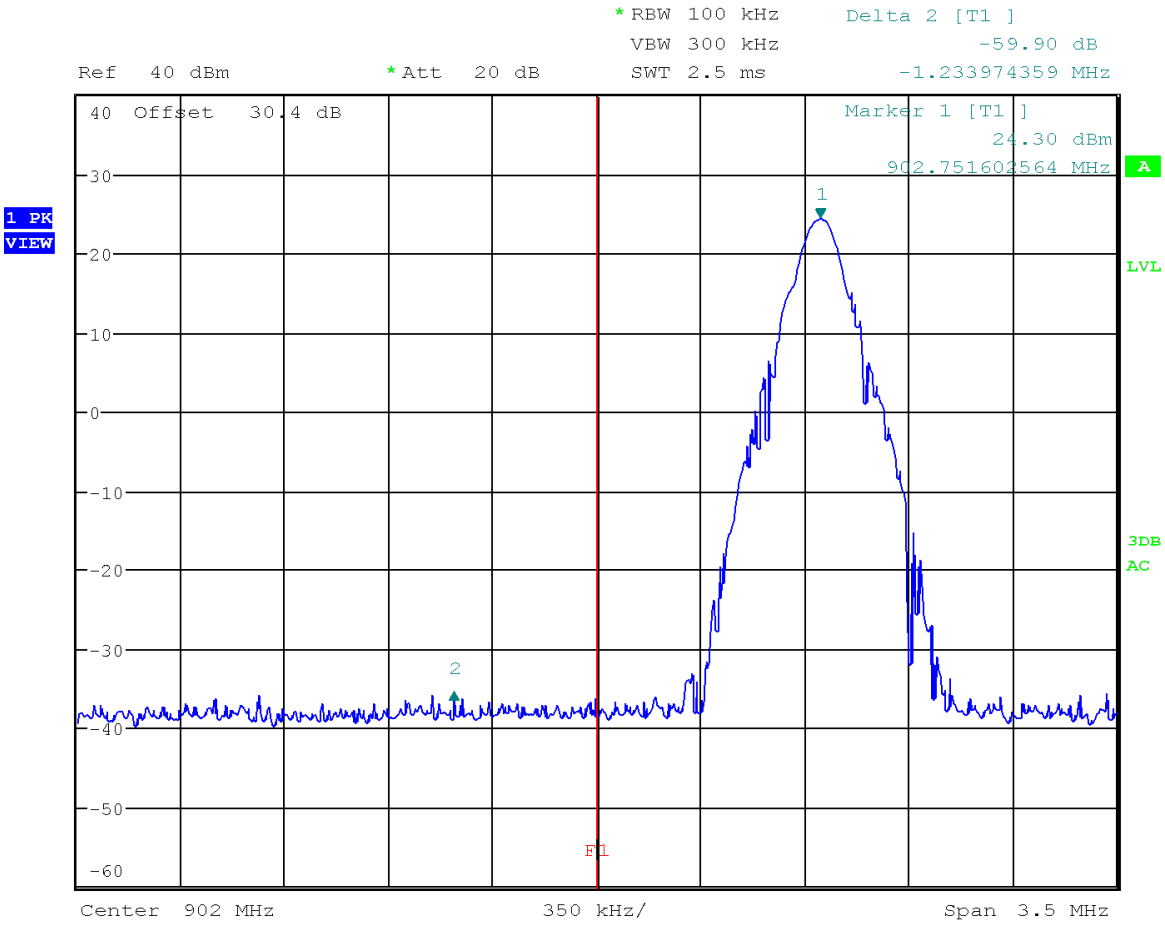

Figure 2-22 – Conducted Band-Edge – Low Channel, Stopped

Table 2.8-1 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
901.52	-35.60	4.91	-40.51

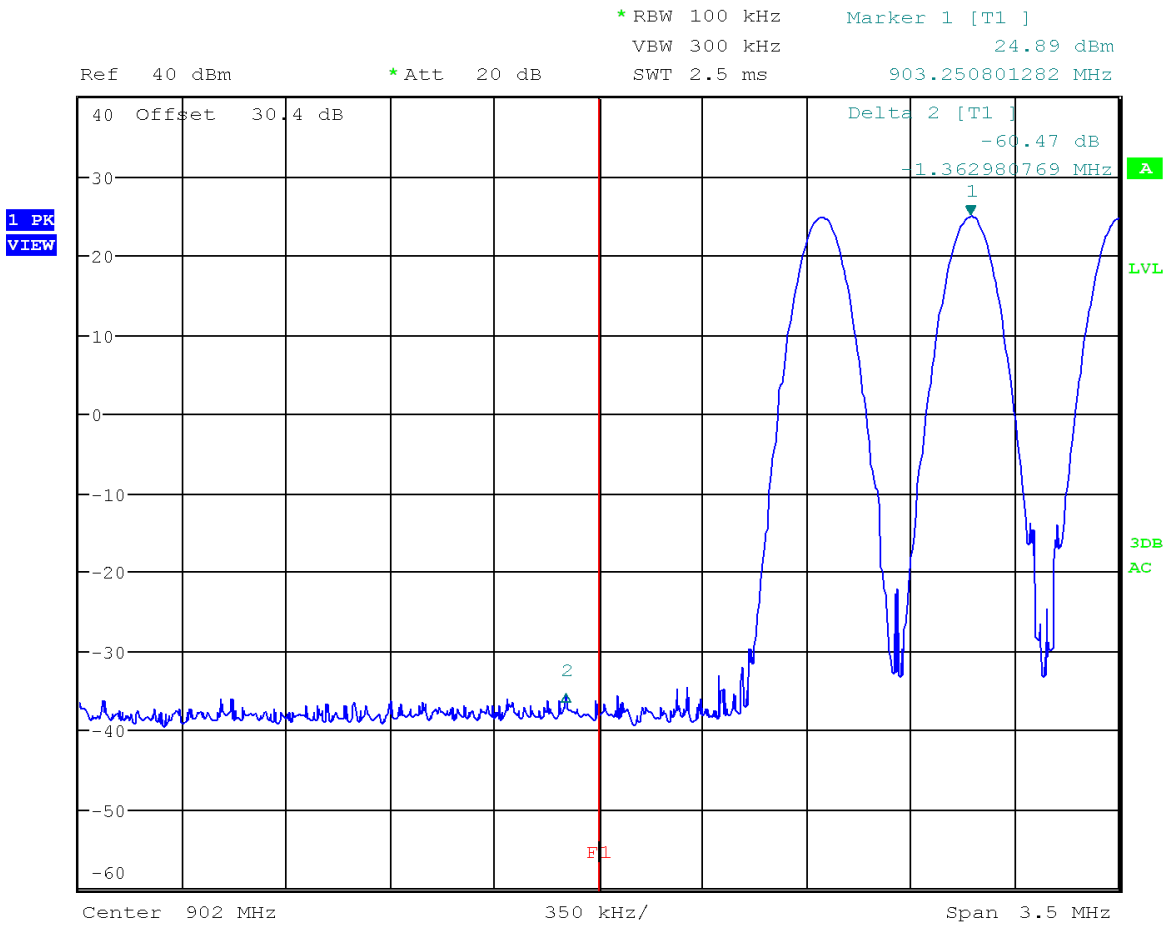

Figure 2-23 – Conducted Band-Edge – Low Channel, Hopping

Table 2.8-2 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
901.89	-35.58	4.91	-40.49

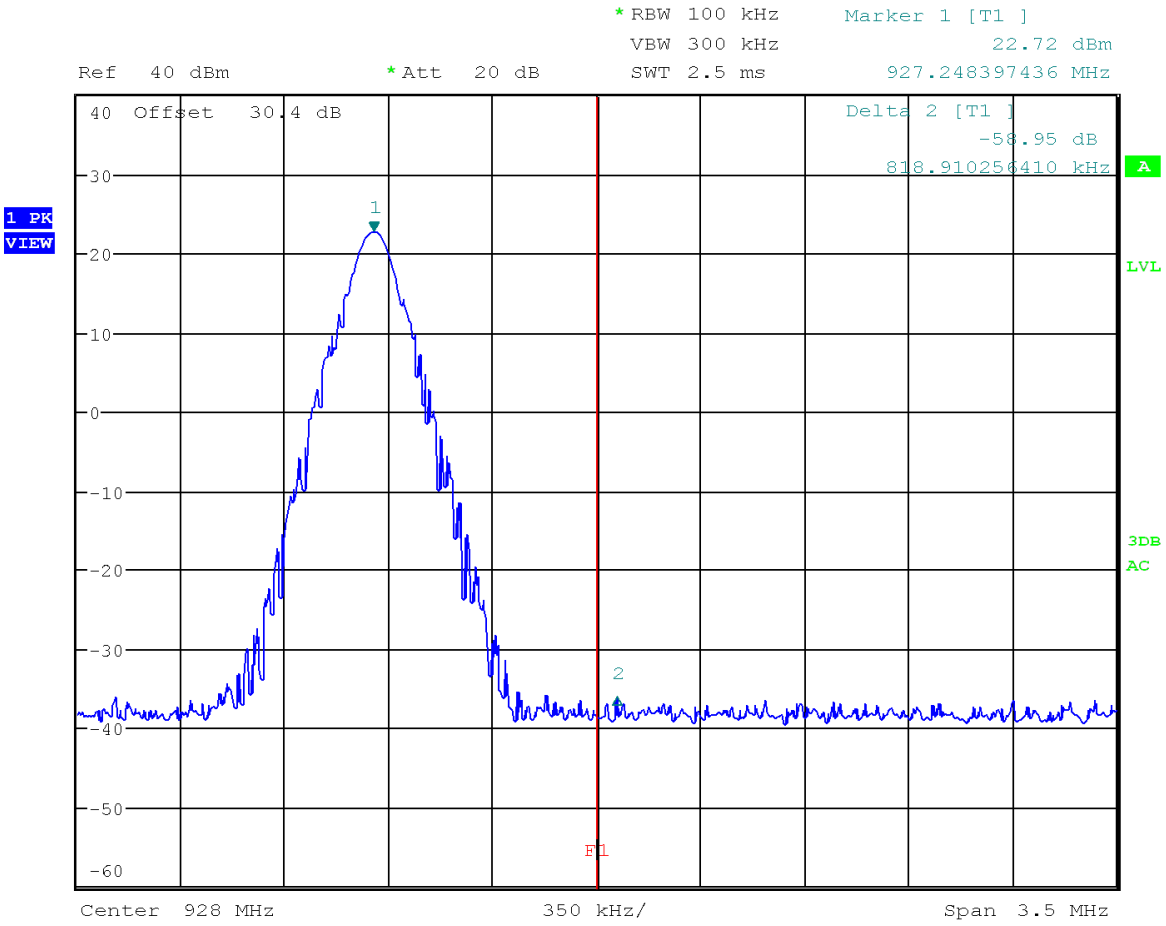

Figure 2-24 – Conducted Band-Edge – High Channel, Stopped

Table 2.8-3 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
928.07	-36.23	4.91	-41.14

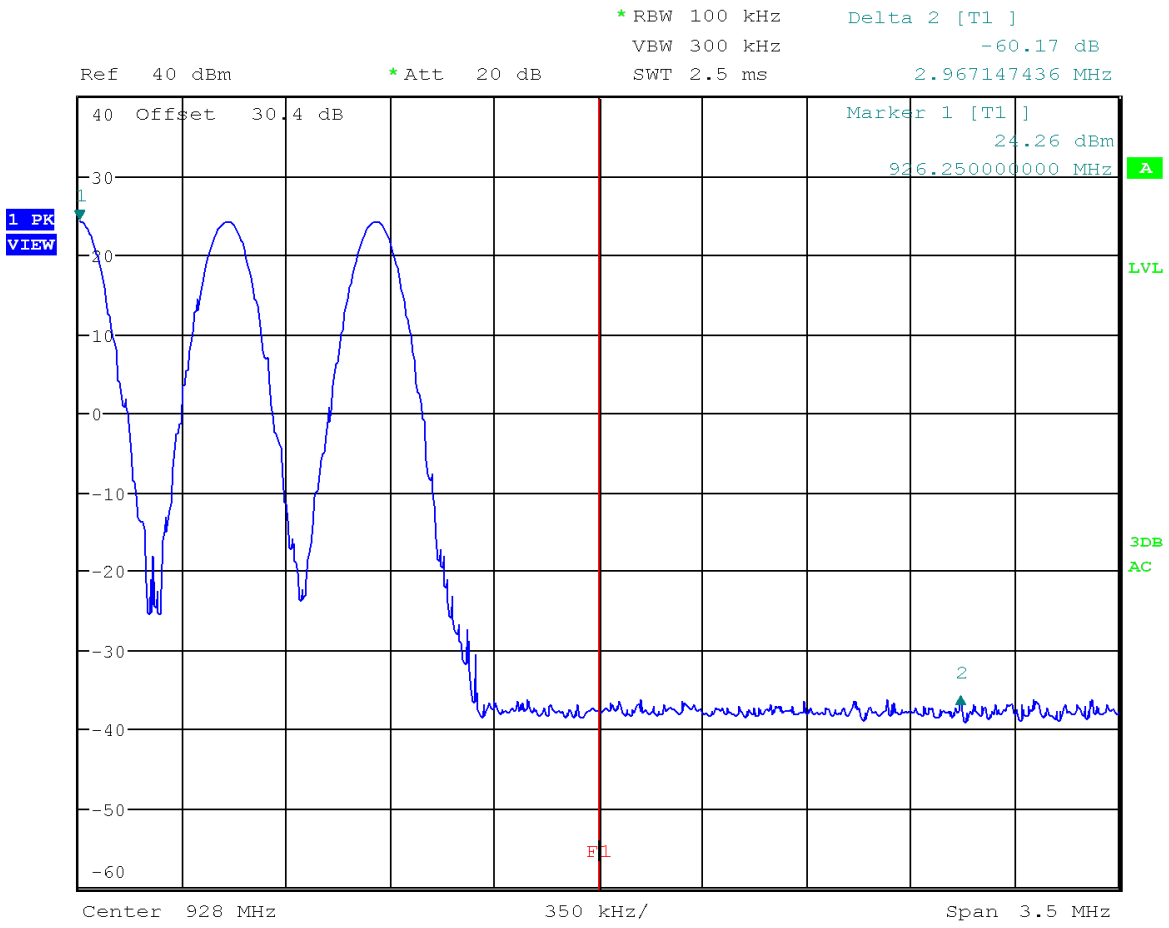

Figure 2-25 – Conducted Band-Edge – High Channel, Hopping

Table 2.8-4 – Conducted Band-Edge Results

Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
929.22	-35.91	4.91	-40.82

2.8.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.8-5 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	11/20/2021
WRLE11119	RF Precision Cables	Attenuator, 30dB	ATX3396-30	none	B	11/02/2020	11/02/2021

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.

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2.9 Conducted Emissions 15.207

2.9.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.207
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

17 MAY 2021

2.9.4 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.

2.9.5 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 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.

2.9.7 Sample Computation (Conducted Emission)

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

2.9.8 Test Results

Test Result: N/A

EUT does not provide a way to connect to AC Mains.

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2.10 Radiated Spurious Emissions

2.10.1 Specification Reference

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

2.10.2 Equipment Under Test and Modification State

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

2.10.3 Date of Test

17 MAY 2021 - 23 JUN 2021

2.10.4 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 final measurements below 1 GHz a quasi-peak detector was used 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.

2.10.5 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.

2.10.6 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.

2.10.7 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

2.10.8 Test Results

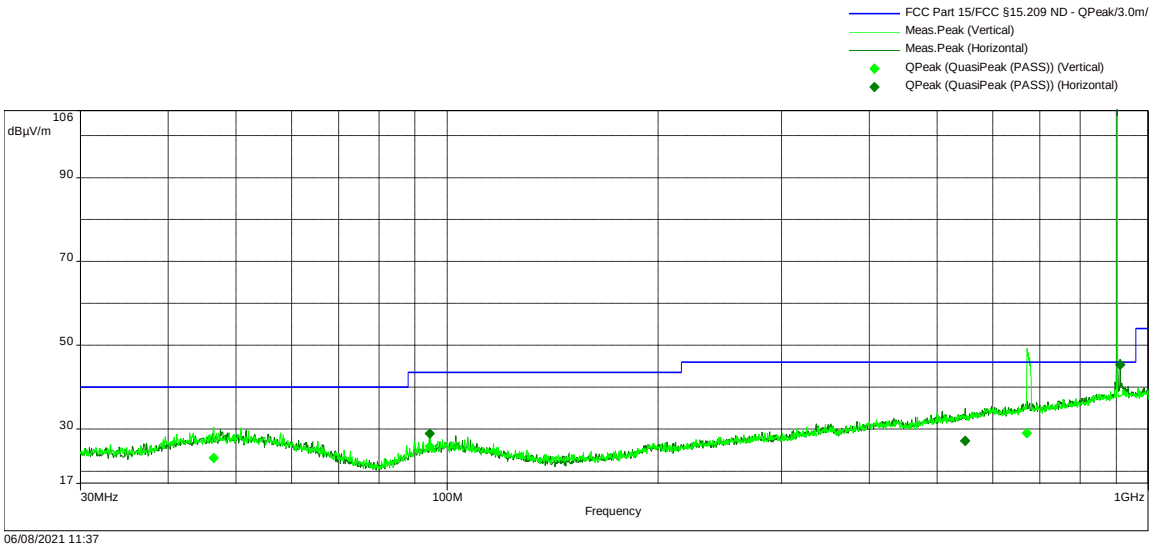
Test Summary: Measurements between 1-18 GHz were taken with a 2.4 GHz notch filter in front of the pre-amp to prevent overloading. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

Spurious Emissions 30M-1GHz - FCC Low CH 902.75MHz

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

Note: The emission measured at 902 MHz is the transmit fundemental frequency and is not subject to this limit.

Figure 2-26 – RE Spurious Emissions 30-1000 MHz – Low Channel

Table 2.10-1 – RE Spurious Emissions 30-1000 MHz – Low Channel

Spurious Emissions 30M-1GHz - FCC Low CH 902.75MHz

Frequency	Quasi-Peak Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Quasi-Peak Margin (dB)	Azimuth (º)	Height (m)	Polarity	Quasi-Peak Result
46.50403809MHz	23.14	40.00	-16.86	360.00	3.02	Vertical	PASS
94.49975098 MHz	25.86	43.50	-17.64	76.00	3.88	Vertical	PASS
671.696683 MHz	29.01	46.00	-16.99	318.00	3.17	Vertical	PASS
94.49493424 MHz	28.88	43.50	-14.62	343.00	3.78	Horizontal	PASS
548.3035741 MHz	27.14	46.00	-18.86	186.00	2.15	Horizontal	PASS
912.0004166 MHz	45.39	46.00	-0.61	3.00	1.85	Horizontal	PASS

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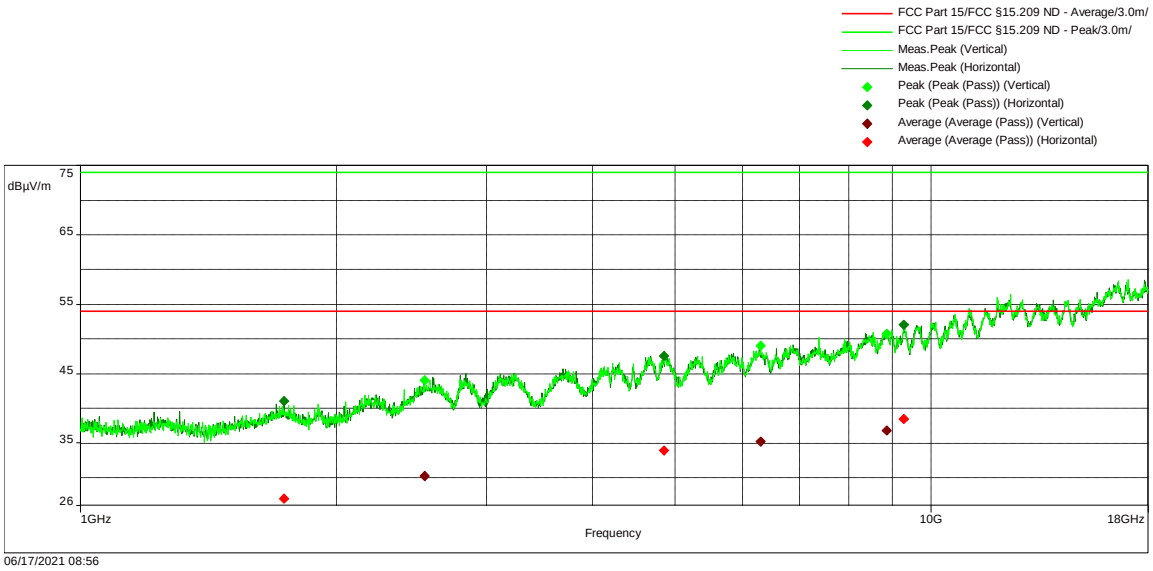
Spurious Emissions 1 - 18GHz, FCC Low CH 902.75 MHz

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

Figure 2-27 – RE Spurious Emissions 1-18 GHz – Low Channel

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Table 2.10-2 – RE Spurious Emissions 1-18 GHz – Low Channel

Spurious Emissions 1 - 18GHz, FCC Low CH 902.75 MHz

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
1.7357222GHz	41.04	74.00	-32.96	26.98	54.00	-27.02	358.00	1.12	Horizontal	PASS	PASS
2.5394444GHz	44.04	74.00	-29.96	30.27	54.00	-23.73	50.00	3.78	Vertical	PASS	PASS
4.8505GHz	47.54	74.00	-26.46	33.94	54.00	-20.06	274.00	3.98	Horizontal	PASS	PASS
6.3058889GHz	49.02	74.00	-24.98	35.23	54.00	-18.77	358.00	1.01	Vertical	PASS	PASS
8.8643889GHz	50.74	74.00	-23.26	36.81	54.00	-17.19	156.00	2.92	Vertical	PASS	PASS
9.2922222GHz	52.04	74.00	-21.96	38.47	54.00	-15.53	163.00	3.73	Horizontal	PASS	PASS

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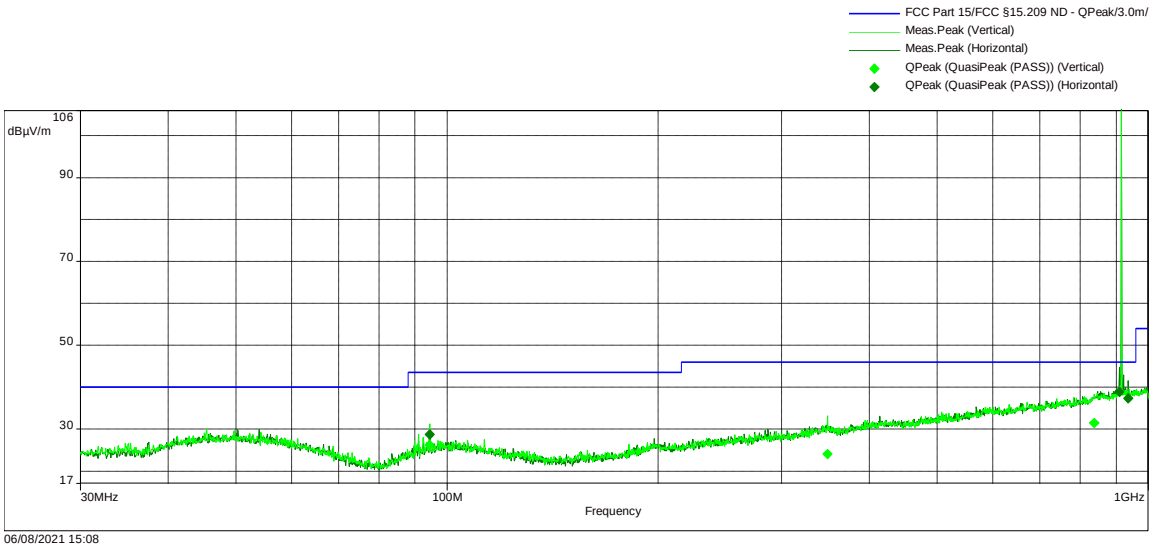
Spurious Emissions 30M-1GHz - FCC Mid CH 915.25MHz

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

Note: The emission measured at 915 MHz is the transmit fundemental frequency and is not subject to this limit.

Figure 2-28 – RE Spurious Emissions 30-1000 MHz – Mid Channel

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Table 2.10-3 – RE Spurious Emissions 30-1000 MHz – Mid Channel

Spurious Emissions 30M-1GHz - FCC Mid CH 915.25MHz

Frequency	Quasi-Peak Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Quasi-Peak Margin (dB)	Azimuth (°)	Height (m)	Polarity	Quasi-Peak Result
94.51415527	26.11	43.50	-17.39	13.00	1.95	Vertical	PASS
348.6584277	23.99	46.00	-22.01	159.00	3.73	Vertical	PASS
836.8897395	31.45	46.00	-14.55	182.00	1.54	Vertical	PASS
94.49962891	28.71	43.50	-14.79	171.00	3.88	Horizontal	PASS
908.7502409	38.87	46.00	-7.13	20.00	1.90	Horizontal	PASS
936.0003207	37.38	46.00	-8.62	343.00	1.74	Horizontal	PASS

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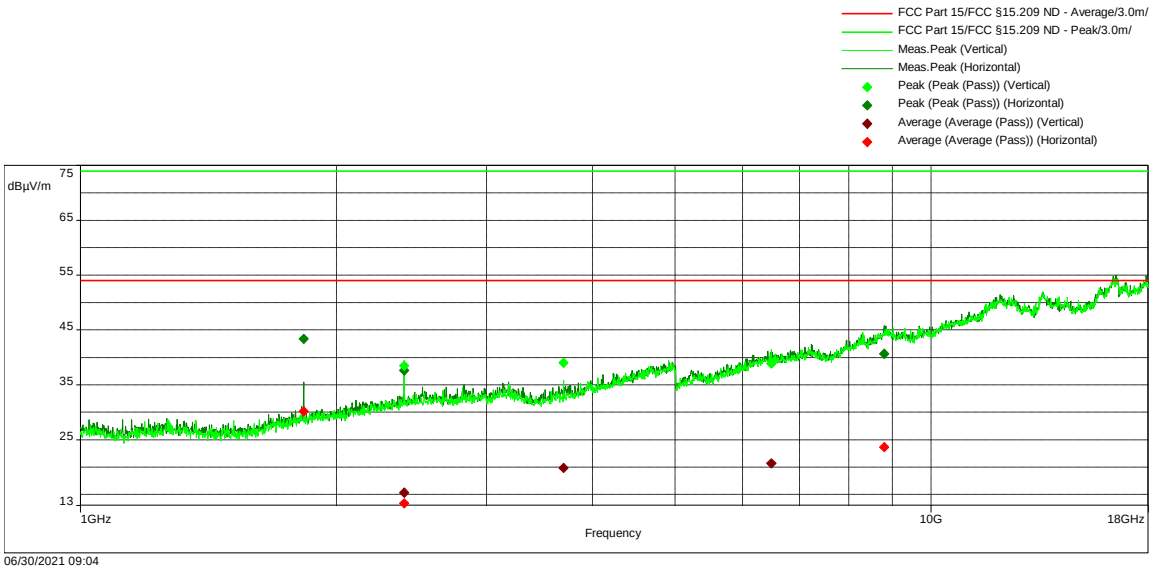
Spurious Emissions 1 - 18GHz, FCC Mid CH 915.25 MHz

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

Figure 2-29 – RE Spurious Emissions 1-18 GHz – Mid Channel

Table 2.10-4 – RE Spurious Emissions 1-18 GHz – Mid Channel

Spurious Emissions 1 - 18GHz, FCC Mid CH 915.25 MHz

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (º)	Height (m)	Polarity	Peak Result	Average Result
1.8301667GHz	43.35	74.00	-30.65	30.19	54.00	-23.81	360.00	1.39	Horizontal	PASS	PASS
2.4015556GHz	38.48	74.00	-35.52	15.37	54.00	-38.63	248.00	2.76	Vertical	PASS	PASS
3.6954444GHz	39.02	74.00	-34.98	19.84	54.00	-34.16	178.00	2.15	Vertical	PASS	PASS
6.4891111GHz	38.85	74.00	-35.15	20.72	54.00	-33.28	211.00	1.00	Vertical	PASS	PASS
8.8124444GHz	40.68	74.00	-33.32	23.66	54.00	-30.34	354.00	3.02	Horizontal	PASS	PASS

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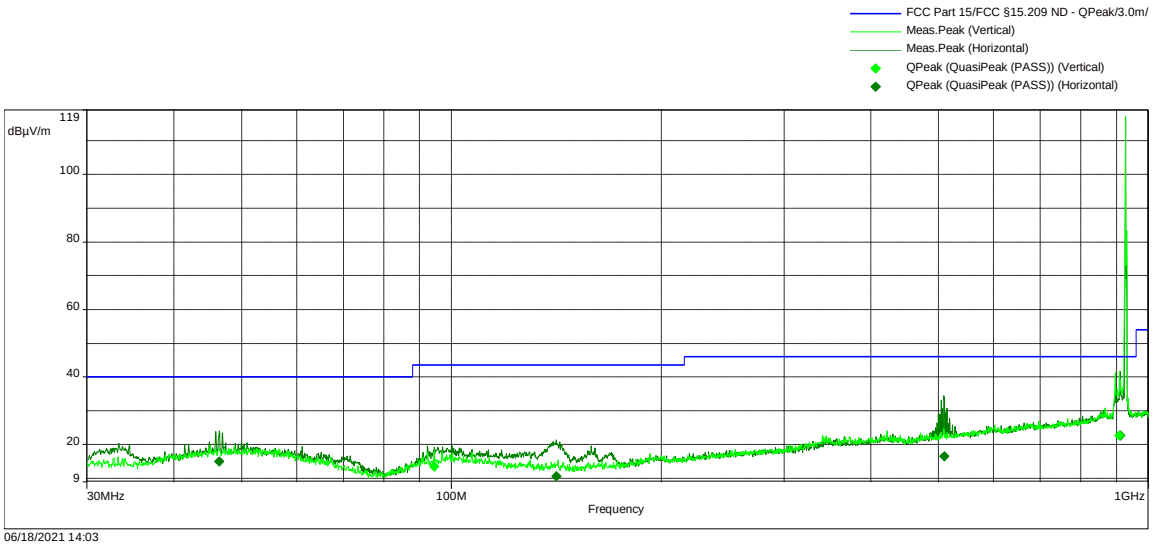
Spurious Emissions 30M-1GHz - FCC High CH 927.25MHz

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

Note: The emission measured at 927 MHz is the transmit fundemental frequency and is not subject to this limit.

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

Table 2.10-5 – RE Spurious Emissions 30-1000 MHz – High Channel

Spurious Emissions 30M-1GHz - FCC High CH 927.25MHz

Frequency	Quasi-Peak Level (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Quasi-Peak Margin (dB)	Azimuth (º)	Height (m)	Polarity	Quasi-Peak Result
94.50054948	13.56	43.50	-29.94	64.00	3.93	Vertical	PASS
909.6948502	22.70	46.00	-23.30	123.00	2.87	Vertical	PASS
46.42329362	15.01	40.00	-24.99	196.00	1.60	Horizontal	PASS
141.4617512	10.61	43.50	-32.89	259.00	1.09	Horizontal	PASS
509.4380405	16.58	46.00	-29.42	186.00	1.54	Horizontal	PASS
912.0294693	22.68	46.00	-23.32	10.00	2.61	Horizontal	PASS

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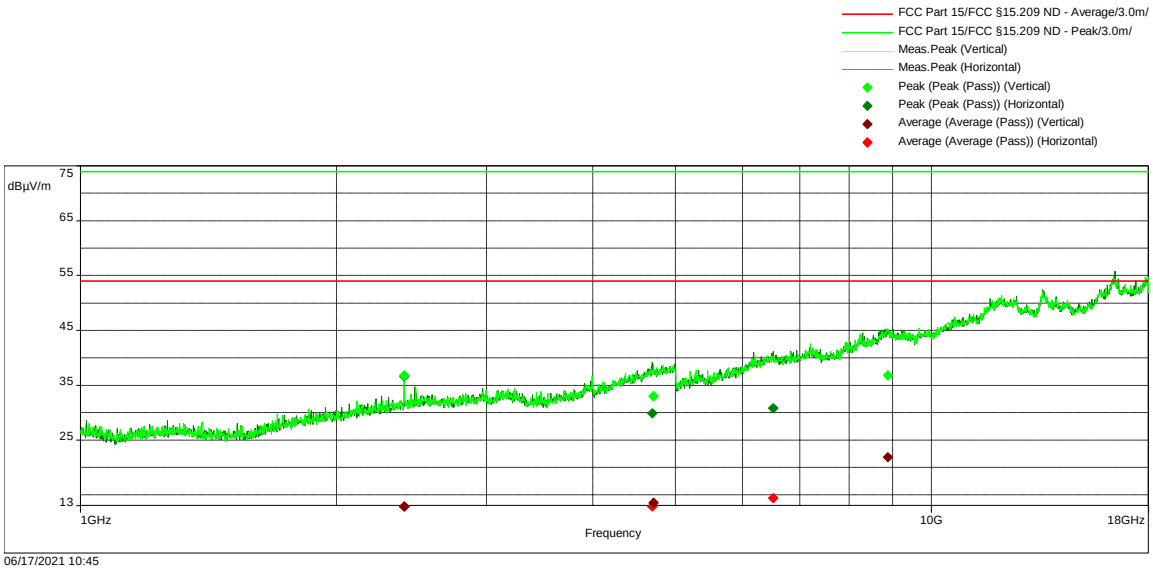
Spurious Emissions 1 - 18GHz - FCC High CH 927.25MHz

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

Figure 2-31 – RE Spurious Emissions 1-18 GHz – High Channel

Table 2.10-6 – RE Spurious Emissions 1-18 GHz – High Channel

Spurious Emissions 1 - 18GHz - FCC High CH 927.25MHz

Frequency	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (º)	Height (m)	Polarity	Peak Result	Average Result
2.4015556GHz	36.76	74.00	-37.24	9.00	54.00	-45.00	72.00	2.71	Vertical	PASS	PASS
4.6984444GHz	29.83	74.00	-44.17	11.81	54.00	-42.19	332.00	3.73	Horizontal	PASS	PASS
4.7145GHz	32.96	74.00	-41.04	13.56	54.00	-40.44	79.00	1.44	Vertical	PASS	PASS
6.5202778GHz	30.77	74.00	-43.23	14.42	54.00	-39.58	105.00	3.48	Horizontal	PASS	PASS
8.8898889GHz	36.80	74.00	-37.20	21.86	54.00	-32.14	35.00	3.32	Vertical	PASS	PASS

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2.10.9 Test Location and Test Equipment Used

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

Table 2.10-7 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE10985	Agilent Technologies	Pre Amplifier, 0.1-1300 MHz	8447D	2443A04180	B	04/07/2021	04/07/2022
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
NBLE11578	ETS-Lindgren	Antenna, BiConiLog	3142C	00079889	G	09/14/2020	09/14/2022
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/04/2020	09/04/2022
NBLE11699	Mini-Circuits Lab	Filter, 900-950 MHz Notch	N03915M1	138901	B	03/31/2021	03/31/2022

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.

2.11 Radiated Band-Edge

2.11.1 Specification Reference

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

2.11.2 Equipment Under Test and Modification State

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

2.11.3 Date of Test

23 JUL 2021

2.11.4 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.

2.11.5 Environmental Conditions

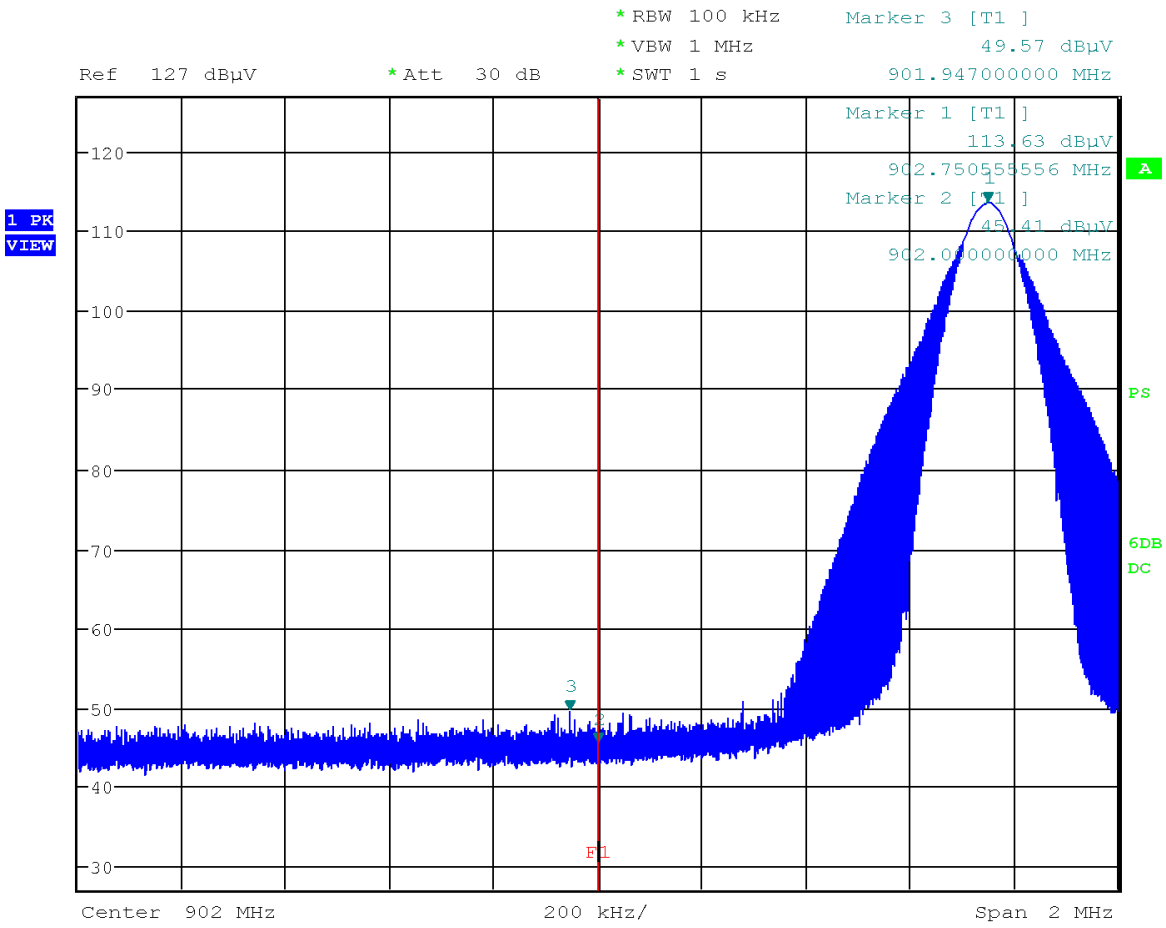
The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.11.6 Test Results

Test Summary: EUT operated as intended before, during, and after testing. Both stopped and hopping operation were evaluated, and the worst-case was chosen for final evaluation of radiated band-edge emissions.

Test Result: Pass

See data below for detailed results.



Date: 23.JUL.2021 13:21:49

Figure 2-32 – Radiated Band-Edge, Low Channel – Peak, Stopped

Table 2.11-1 – Radiated Band Edge – Low Channel – Peak, Stopped

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
901.95	39.82	74.00	-34.18	-9.75	Pass

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

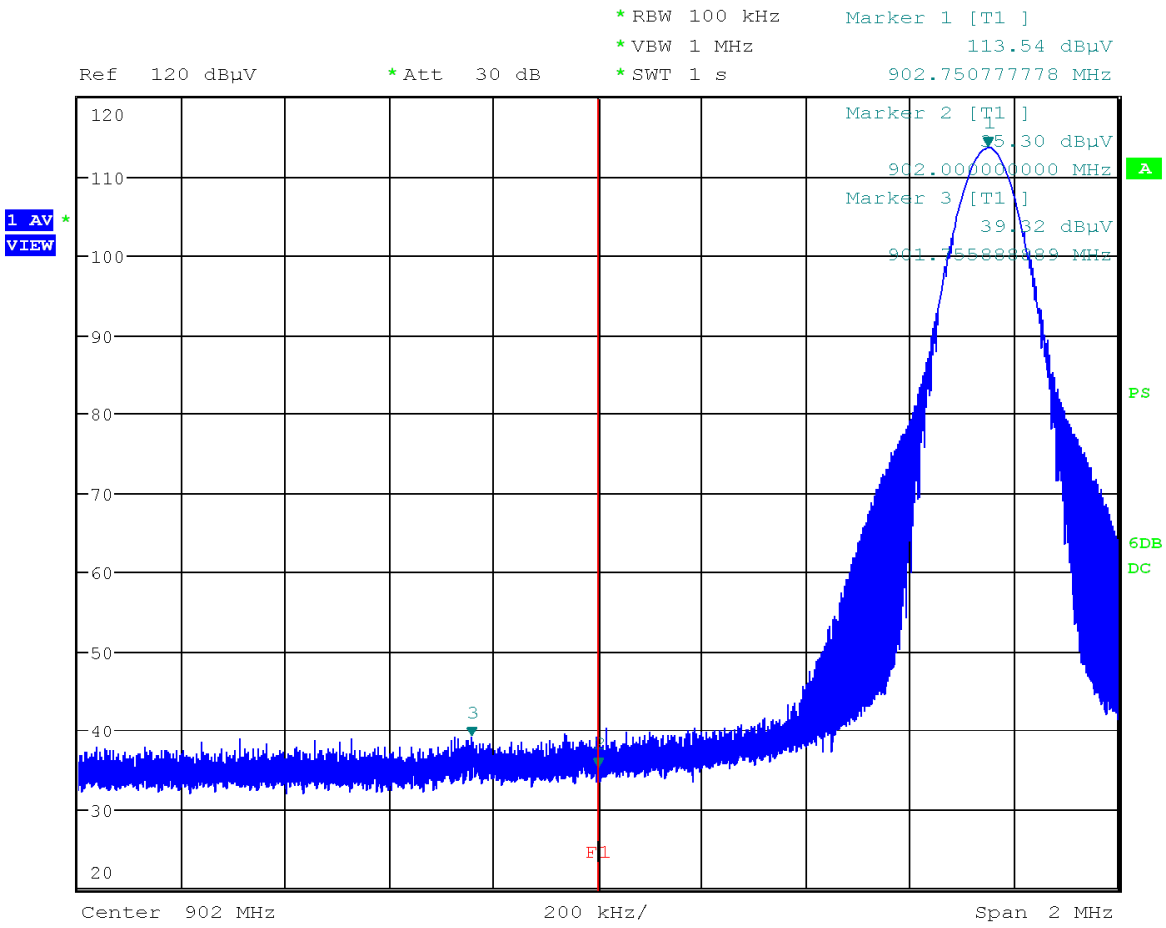
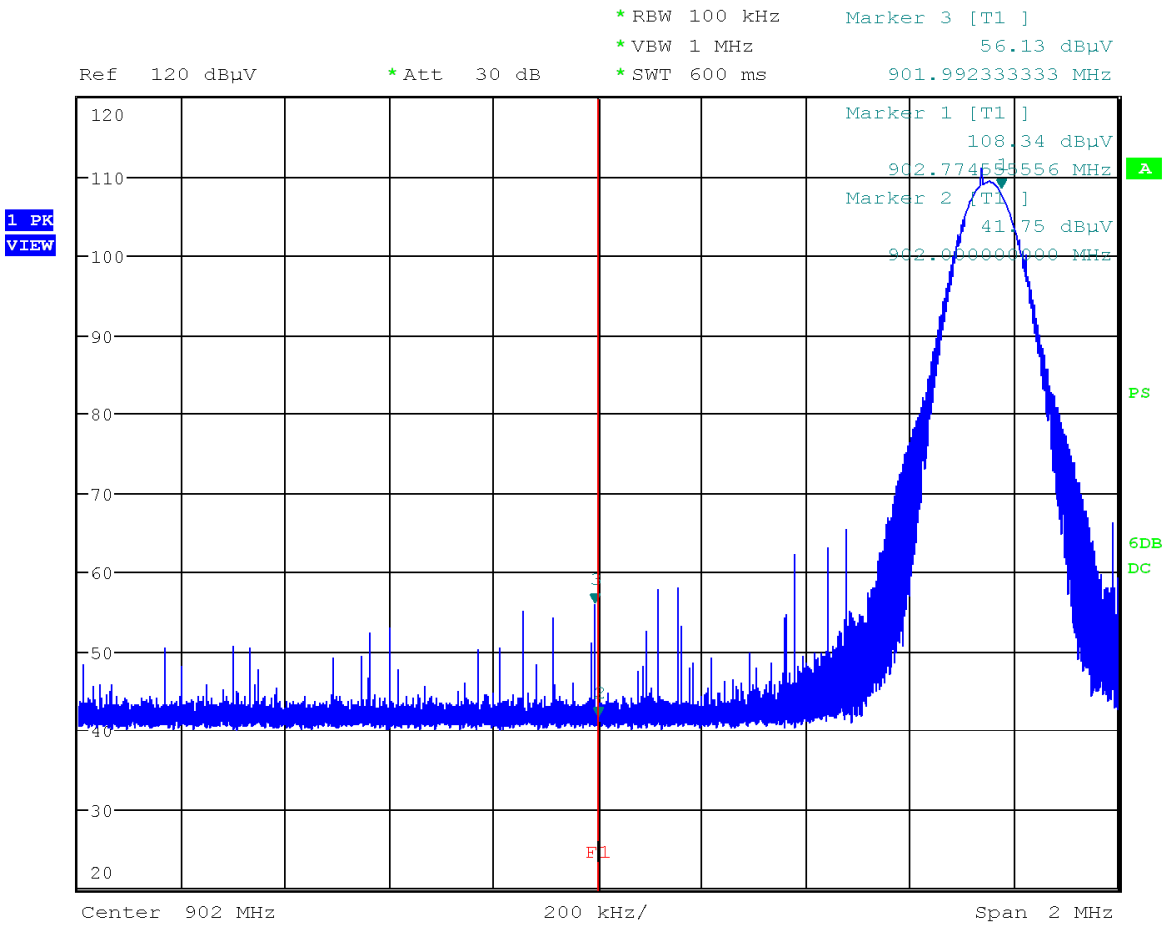


Figure 2-33 – Radiated Band-Edge, Low Channel – Average, Stopped

Table 2.11-2 – Radiated Band Edge – Low Channel – Average, Stopped

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
901.76	29.57	54.00	-24.43	-9.75	Pass

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



Date: 23.JUL.2021 13:34:38

Figure 2-34 – Radiated Band-Edge, Low Channel – Peak, Hopping

Table 2.11-3 – Radiated Band Edge – Low Channel – Peak, Hopping

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
901.99	46.38	74.00	-27.62	-9.75	Pass

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

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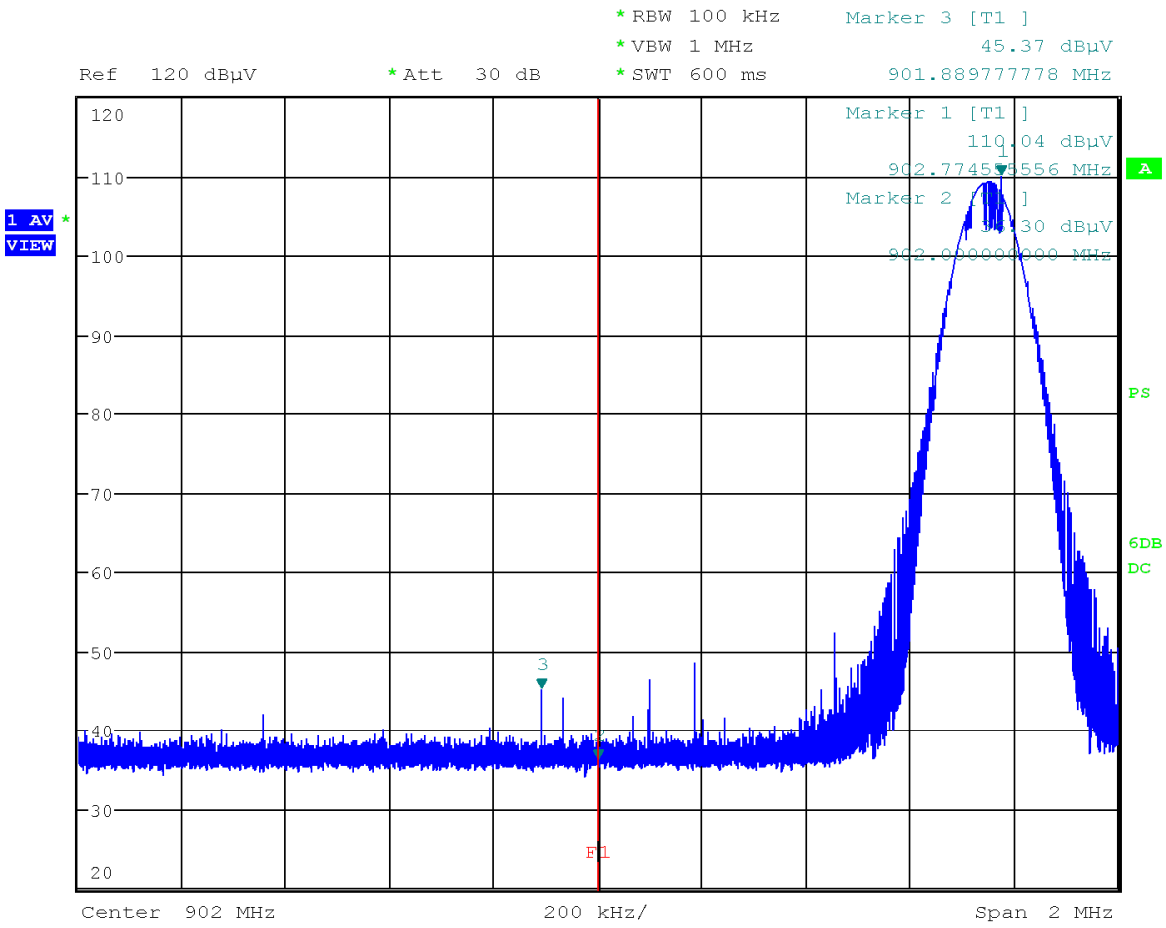

Figure 2-35 – Radiated Band-Edge, Low Channel – Average, Hopping

Table 2.11-4 – Radiated Band Edge – Low Channel – Average, Hopping

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
901.89	35.62	54.00	-18.38	-9.75	Pass

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

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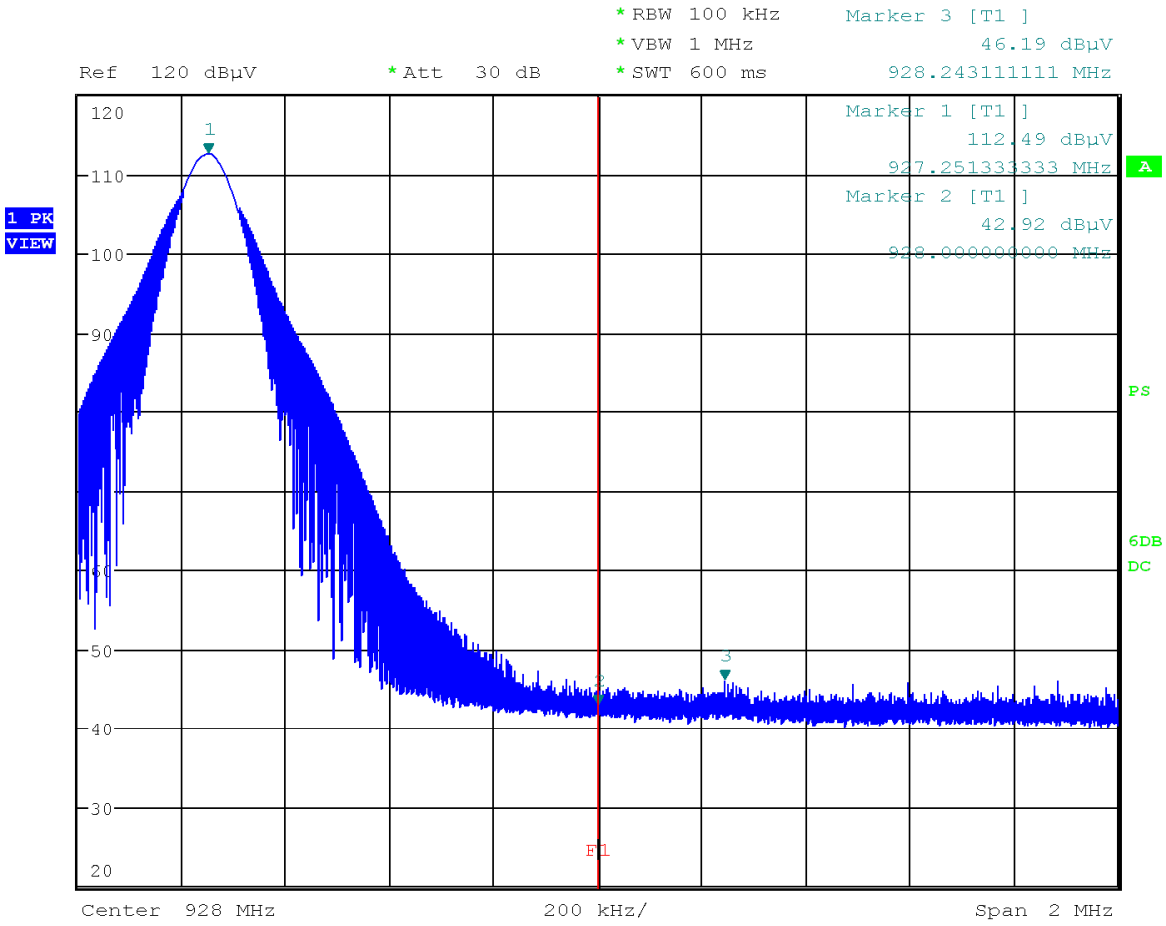

Figure 2-36 – Radiated Band-Edge, High Channel – Peak, Stopped

Table 2.11-5 – Radiated Band Edge – High Channel – Peak, Stopped

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
928.24	36.48	74.00	-37.52	-9.71	Pass

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

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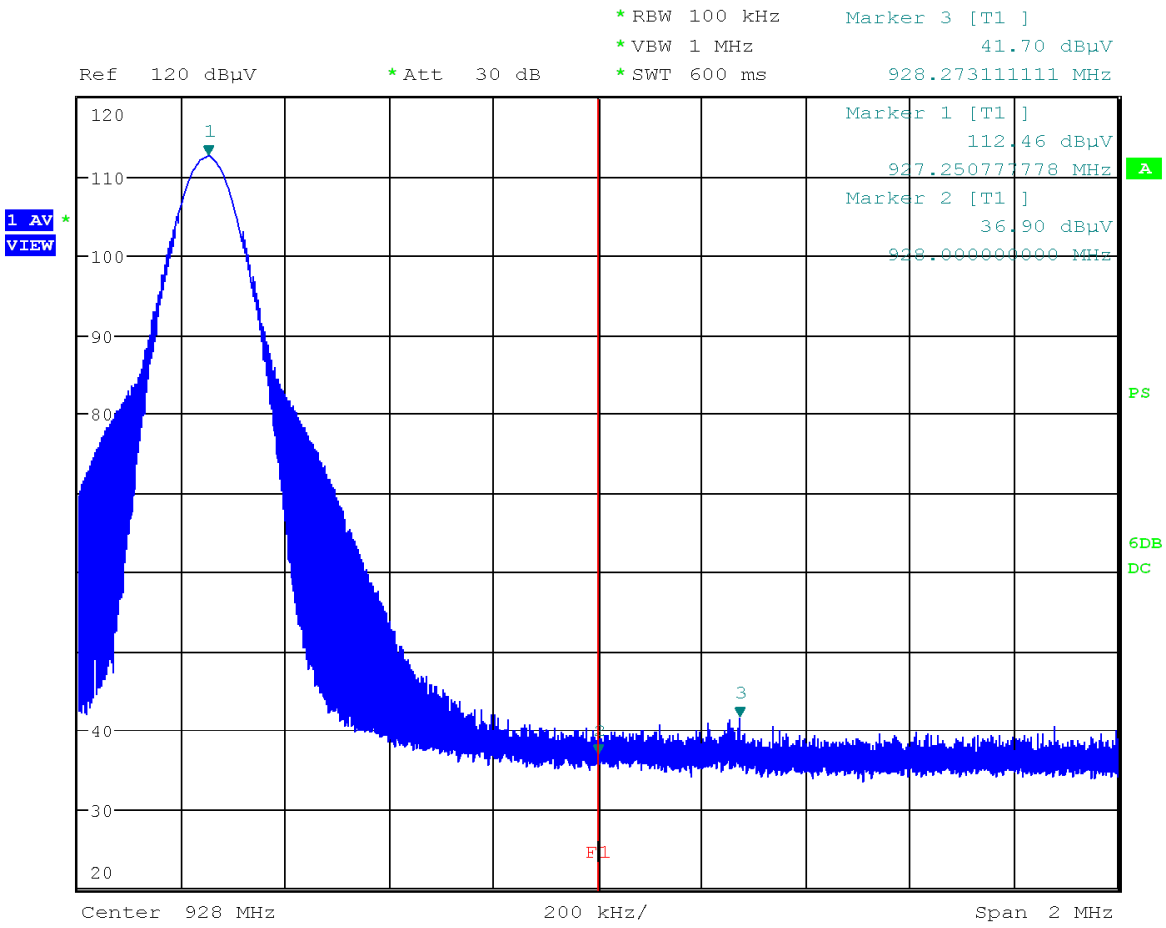

Figure 2-37 – Radiated Band-Edge, High Channel – Average, Stopped

Table 2.11-6 – Radiated Band Edge – High Channel – Average, Stopped

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
901.76	31.99	54.00	-22.01	-9.71	Pass

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

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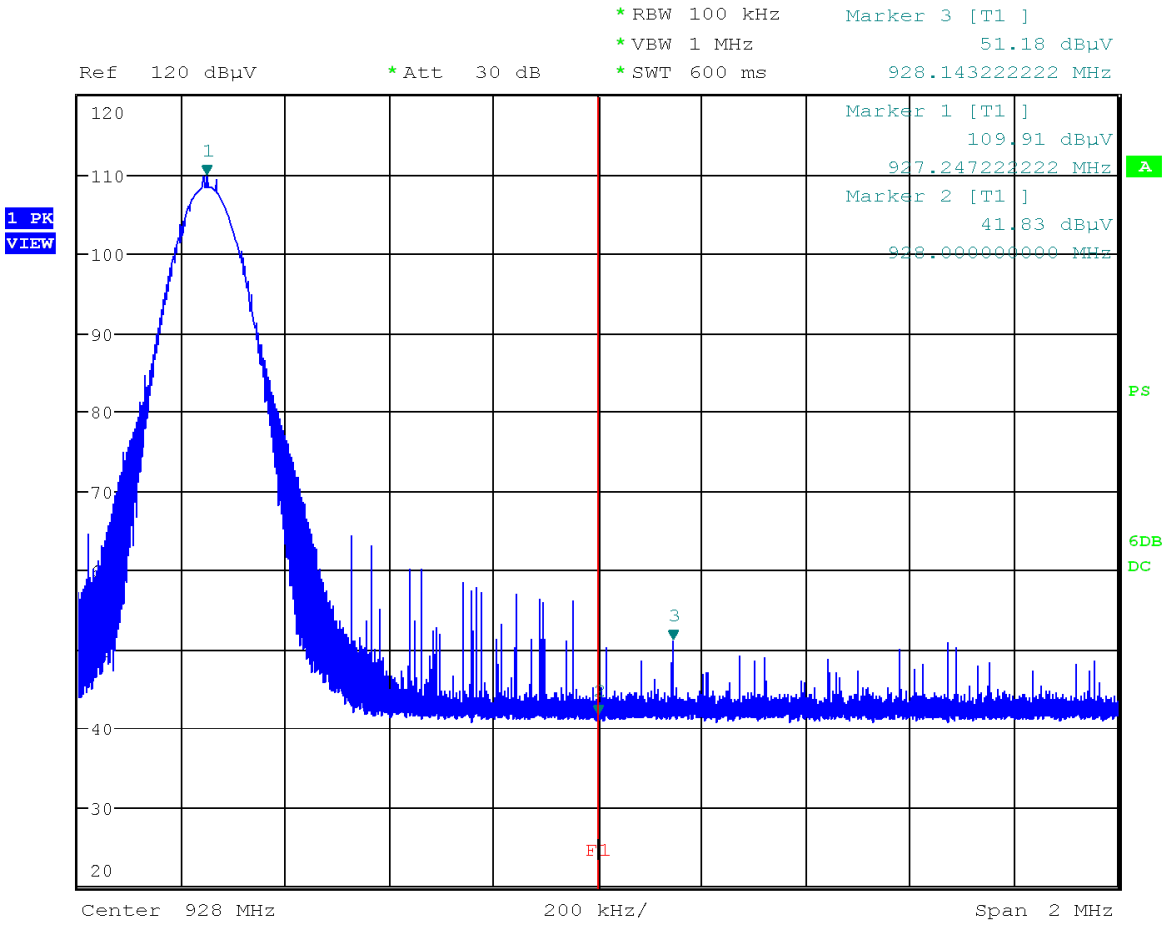

Figure 2-38 – Radiated Band-Edge, High Channel – Peak, Hopping

Table 2.11-7 – Radiated Band Edge – High Channel – Peak, Hopping

Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Correction Factor (dB)	Peak Result
901.99	41.47	74.00	-32.53	-9.71	Pass

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

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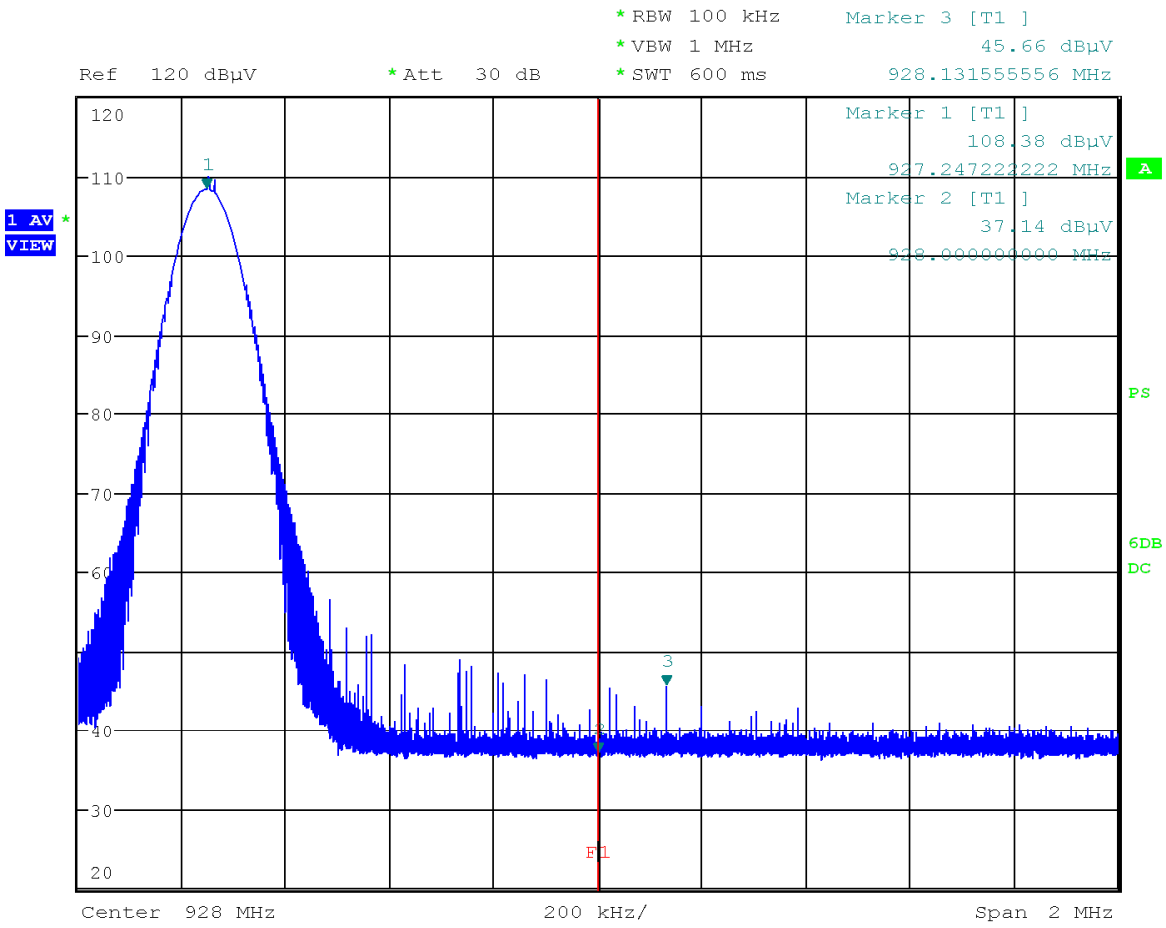

Figure 2-39 – Radiated Band-Edge, High Channel – Average, Hopping

Table 2.11-8 – Radiated Band Edge – High Channel – Average, Hopping

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Correction Factor (dB)	Average Result
901.89	35.95	54.00	-18.05	-9.71	Pass

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

2.11.7 Test Location and Test Equipment Used

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

Table 2.11-9 – Restricted Band Edge Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE10985	Agilent Technologies	Pre Amplifier, 0.1-1300 MHz	8447D	2443A04180	B	04/07/2021	04/07/2022
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
NBLE11578	ETS-Lindgren	Antenna, BiConiLog	3142C	00079889	G	09/14/2020	09/14/2022
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/04/2020	09/04/2022
NBLE11699	Mini-Circuits Lab	Filter, 900-950 MHz Notch	N03915M1	138901	B	03/31/2021	03/31/2022

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.

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3 Diagram of Test Setups

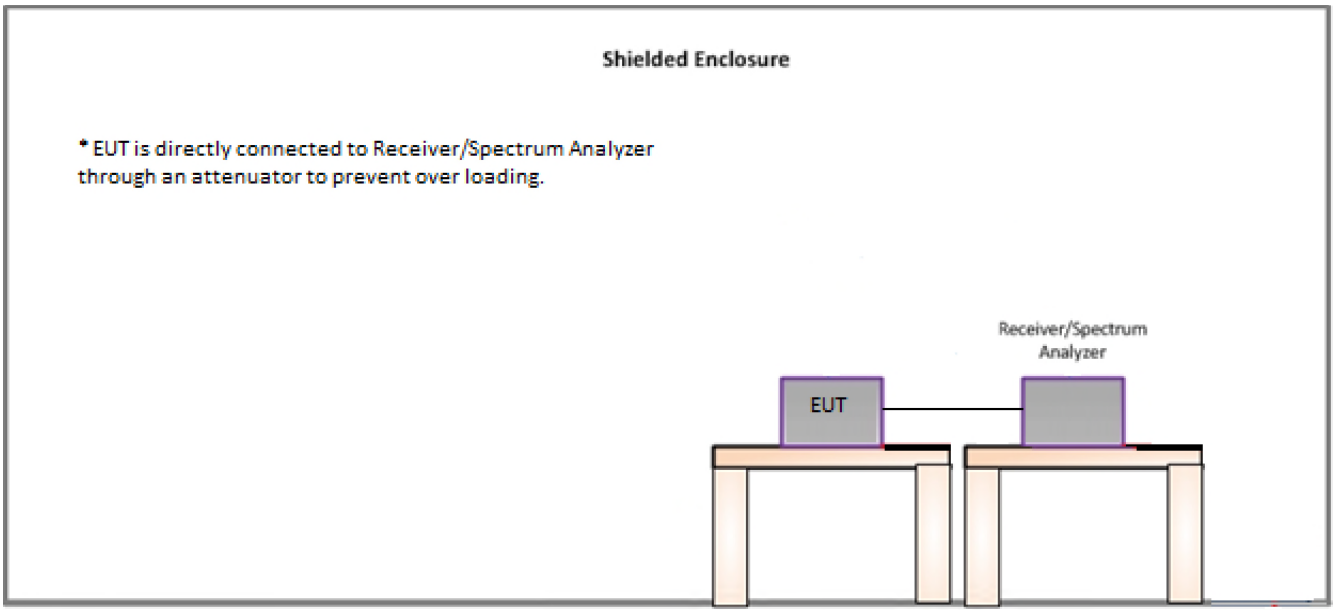

Figure 3-1 – Conducted Test Setup

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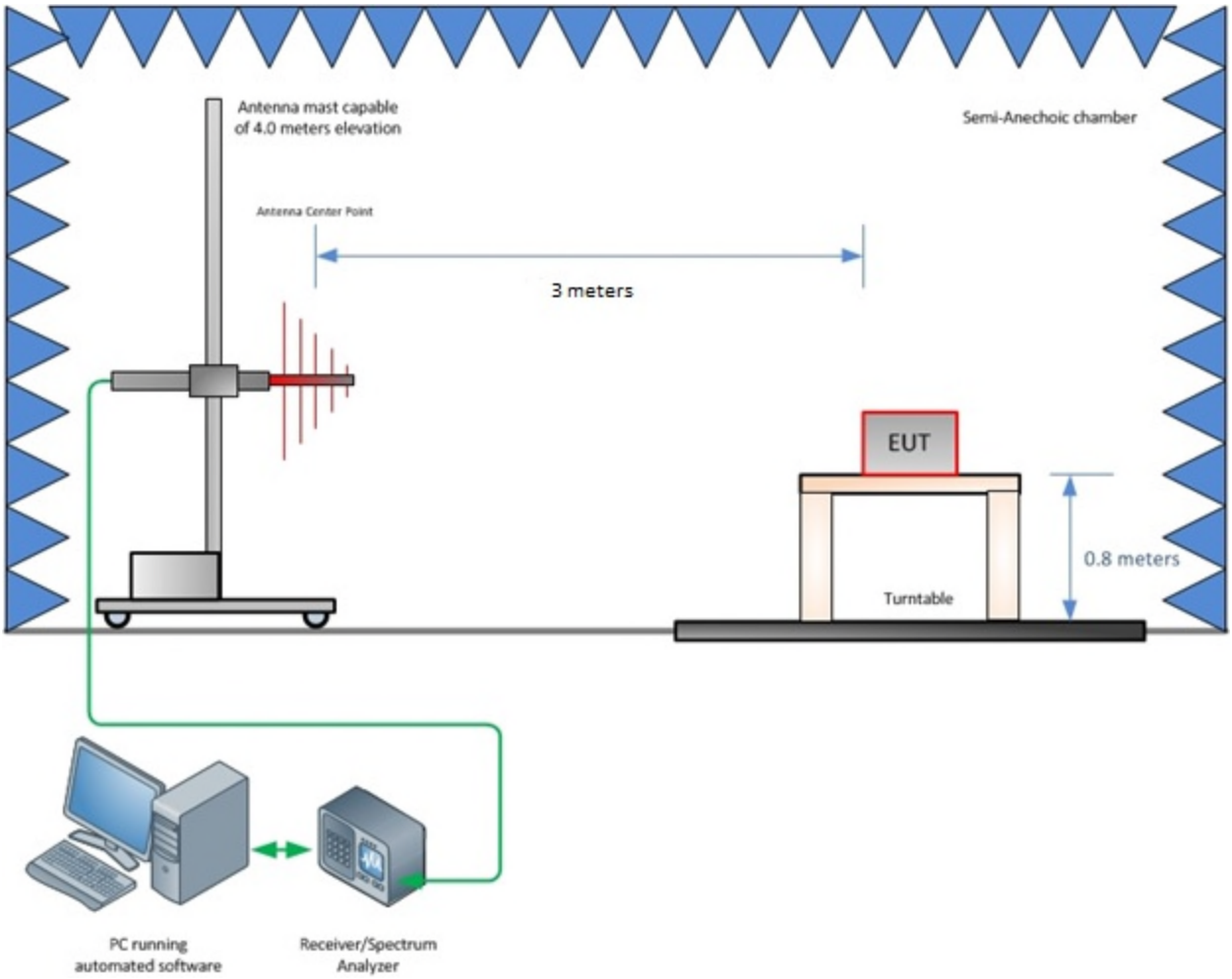

Figure 3-2 – Radiated Emissions Test Setup up to 1 GHz

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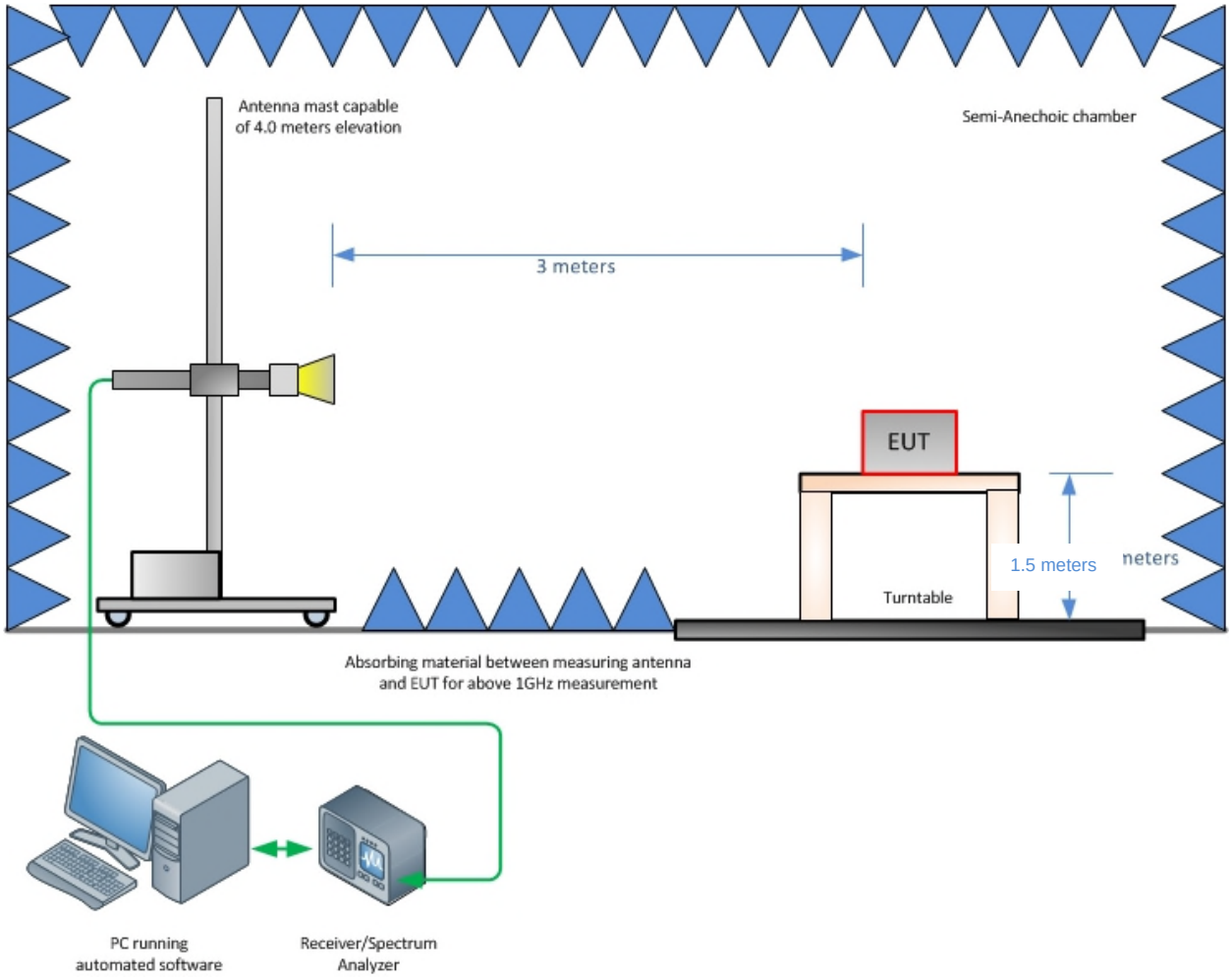

Figure 3-3 – Radiated Emissions Test Setup above 1 GHz

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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

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