

Report on the Testing of the

Landis + Gyr Technology, Inc. Series 6 Gen 2 mSBR

In accordance with:
FCC 47 CFR part 15.247
ISED RSS-247 Issue 3, August 2023

Prepared for: Landis + Gyr Technology, Inc.
30000 Mill Creek Ave., Suite 100
Alpharetta, GA 30022



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NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Thierry Jean-Charles	Senior Engineer TUV SUD America Inc.	Authorized Signatory	05/21/2025

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FCC Accreditation Designation Number US1233
FCC Test Site Registration Number 967699
Innovation, Science, and Economic Development Canada Lab Code 23932

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above.



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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
0	First Issue	1/7/2025
1	Second Issue – Updated Model Name	5/21/2025

1.2 Introduction

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations Section 15.247 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

Applicant	Mr. Raghav Goteti
Manufacturer	Landis + Gyr Technology, Inc.
Applicant's Email Address	Raghav.Goteti@landisgyr.com
Model Name & Number(s)	S6G2 N651
Product Marketing Name(s)	Series 6 Gen 2 Network Node
Serial Number(s)	NA
FCC ID	R7PMGPM2B1
ISED Certification Number	5294A-MGPM2B1
Hardware Version(s)	M1502
Software Version(s)	RF Mesh: 20.20 RF Mesh IP/Wi-SUN: 30.03
Number of Samples Tested	2
Test Specification/Issue/Date	US Code of Federal Regulation (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2024 ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices, Issue 3, August 2023.
Order Number	721002294
Date of Receipt of EUT	8/1/2024
Start of Test	8/1/2024



Finish of Test

8/27/2024

Related Document(s)

ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device.

FCC OET KDB 558074 D01 15.247 Meas Guidance v05r02: Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules, April 2, 2019

US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2024.

ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1 (March 2019), Amendment 2 (February 2021)



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC Part 15.247 and ISED Canada's RSS-247 is shown below.

Table 1.3-1: Test Result Summary

Test Parameter	Test Plan (Yes/No)	Test Result	FCC 47 CFR Rule Part	ISED Canada's RSS	Test Report Page No
Antenna Requirement	Yes	Pass	15.203, 15.204	-----	11
Carrier Frequency Separation	Yes	Pass	15.247(a)(1)	RSS-247 5.1(b)	21
Number of Hopping Channels	Yes	Pass	15.247(a)(1)(i)	RSS-247 5.1(c)	23
Channel Dwell Time	No	Not Tested	15.247(a)(1)(i) 15.247(f)	RSS-247 5.1(c) RSS-247 5.3(a)	27
20 dB Bandwidth	Yes	Pass	15.247(a)(1)(i)	RSS-247 5.1(c)	28
99% Bandwidth	Yes	Pass	-----	RSS-GEN 6.7	28
Peak Output Power	Yes	Pass	15.247(b)(2)	RSS-247 5.4(a)	17
Average Output Power	Yes	Pass	15.247(b)(3)	RSS-247 5.4(a)	19
Band-Edge Compliance of RF Conducted Emissions	Yes	Pass	15.247(d)	RSS-247 5.5	38
RF Conducted Spurious Emissions	Yes	Pass	15.247(d)	RSS-247 5.5	43
Radiated Spurious Emissions into Restricted Frequency Bands	Yes	Pass	15.205, 15.209	RSS-GEN 8.9, 8.10	46
Power Spectral Density	Yes	Pass	15.247(e)	RSS-247 5.2(b)	36
Power Line Conducted Emissions	Yes	Pass	15.207	RSS-GEN 8.8	12
Duty Cycle	No	-----			-----

1.4 Product Information

1.4.1 Technical Description

The Series-6 RF Mesh platform supports half-duplex operation in both the Sub-GHz and 2.4-GHz bands. There are 2 types of RF Mesh Communication Stacks supported by the Series-6 platform: Mesh IP (SBS) and Wi-SUN (WSN).

Table 1.4-1 – Wireless Technical Information

Detail	Description
FCC ID	R7PMGPM2B1
ISED Certification Number	5294A-MGPM2B1
Model(s) / HVIN(s)	S6G2 N651
PMN(s)	Series 6 Gen 2 Network Node
Frequency Range	902.2 – 927.8 MHz
Modulation Format	FSK, OFDM
Antenna Type / Description:	Dipole Antenna / 5.7 dBi Gain Sector Antenna / 9.0 dBi Gain

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

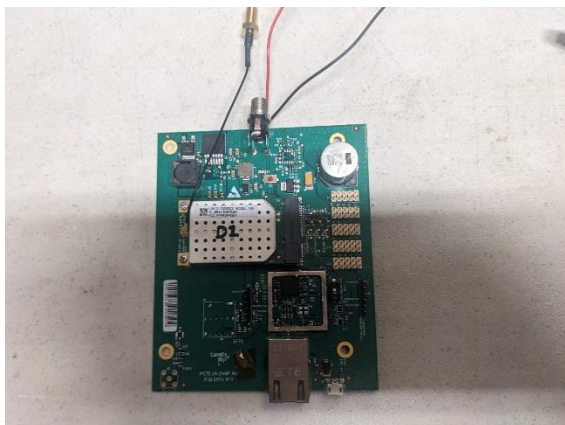


Figure 1.4.1-1 –Front view of the Conducted EUT module with evaluation board

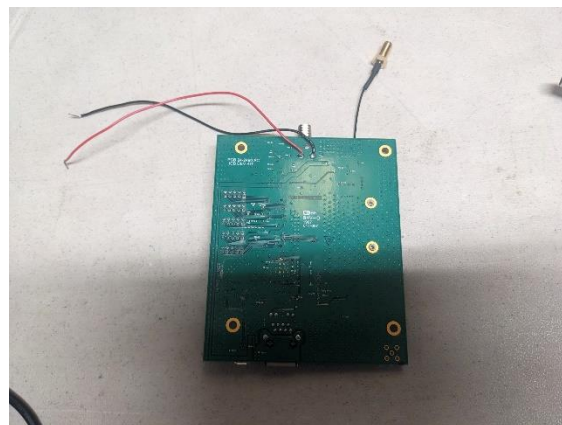


Figure 1.4.1-2 –Rear view of the Conducted EUT module with evaluation board

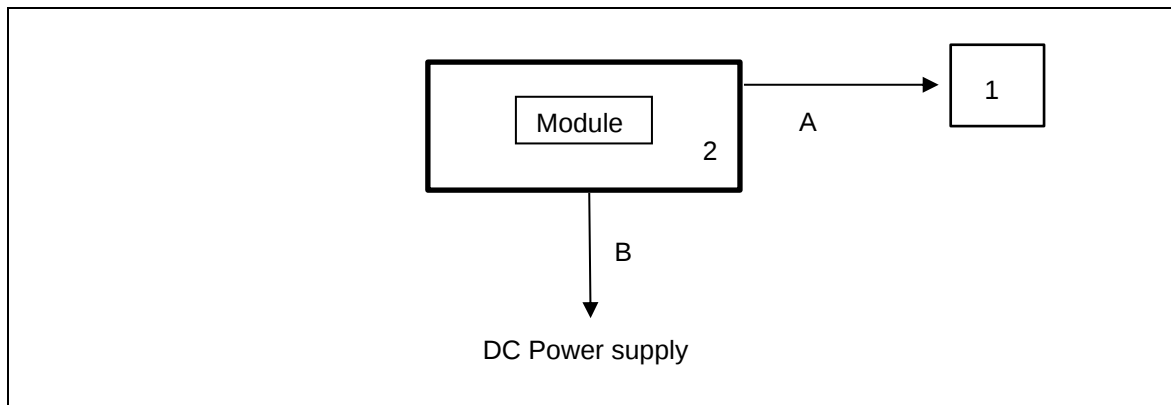


Figure 1.4.1-3 – Conducted Test Setup Block Diagram

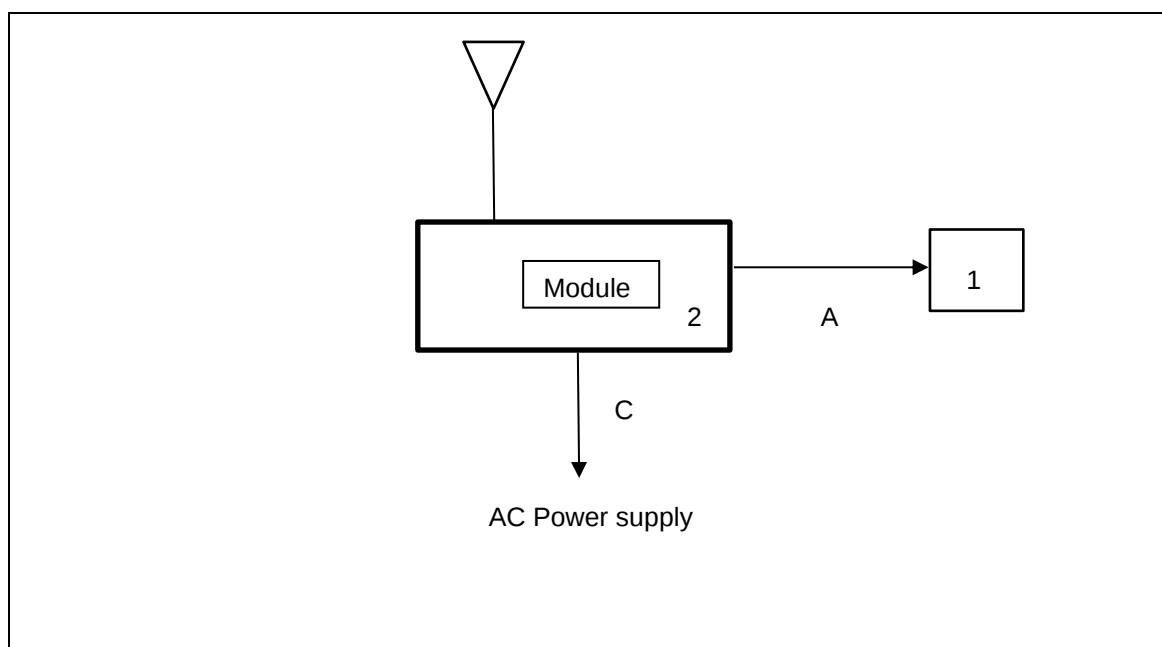


Figure 1.4.1-4 – AC Power Line Conducted Emissions Test Setup Block Diagram

Table 1.4.1-1 – Cable Descriptions

Item	Cable/Port	Description
A	USB Serial cable	Programming cable connected to laptop
B	DC Power Supply Cable	Power Supply DC power supply
C	AC Adapter Cable	AC Power Supply

Table 1.4.1-2 – Support Equipment Descriptions

Item	Make/Model	Description
1	Thinkpad	Laptop for configuration
2	Landis & Gyr	Evaluation Board



1.4.2 Modes of Operation

The Landis + Gyr Series 6 Gen 2 mSBR is an electricity metering module which includes a 900 MHz ISM transmitter.

This test report documents the compliance of the 900 MHz Frequency Hopping Spread Spectrum transceiver mode of operation. This model provides distinct proprietary modes of operation using both FHSS and hybrid classifications as outlined below.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Stack / Mode	Data Rates (kbps) / Coding Schemes	Classification
1	902.4 – 927.6	64	400	SBS (802.15.4 SUN FSK)	50, 150, 200 (PHY modes 1, 4, 5)	FHSS
2	902.2 – 927.8	129	200	WSN (802.15.4 SUN FSK)	50 (PHY mode 1)	FHSS
3	902.4 – 927.6	64	400	WSN (802.15.4 SUN FSK)	150, 200 (PHY modes 4, 5)	FHSS
4	902.4 – 927.6	64	400	SBS (802.15.4 SUN OFDM)	MCS3 – MCS6 (Option 3) (PHY modes 145 – 148)	Hybrid
5	902.4 – 927.6	64	400	WSN (802.15.4 SUN OFDM)	MCS2 – MCS3 (Option 3) (PHY modes 144, 145)	Hybrid
6	904.0 – 927.8	239	100	GSP (802.15.4 SUN FSK)	9.6, 19.2, 38.4	FHSS
7	902.3 – 927.8	86	300	GSP (802.15.4 SUN FSK)	9.6, 19.2, 38.4, 115.2	FHSS



1.4.3 Monitoring of Performance

For radiated emissions and AC Power Line conducted emissions, the EUT was evaluated with external dipole and sector antennas. For radiated emissions, the EUT was evaluated in three orthogonal orientations. The worst-case orientation was Y-position. See test setup photos for more information. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

For RF conducted measurements, the EUT was connected to the test equipment with a U.fl antenna connector to SMA connector.

The worst-case mode for all parameters measured is listed below:

Mode	Classification	20dB/99% Bandwidth	Number of Hopping Channels	Carrier Frequency Separation	Peak Output Power	Average Output Power	RF Conducted Spurious Emissions	Band-Edge RF Conducted Emissions	RSE into Restricted Frequency Bands	Power Spectral Density
		Data Rate (kbps)								
1	FHSS	*	*	*	*	NA	*	*	*	NA
2	FHSS	50	50	50	50	NA	50	50	50****	NA
3	FHSS	*	*	*	*	NA	*	*	*	NA
4	Hybrid	**	NA	**	NA	**	**	**	**	**
5	Hybrid	MCS2	NA	MCS2	NA	MCS2	MCS2	MCS2	MCS2****	MCS2
6	FHSS	9.6	9.6	9.6	9.6	NA	***	38.4	***	NA
7	FHSS	9.6, 19.2, 38.4, 115.2	9.6	9.6	9.6, 19.2, 38.4, 115.2	NA	9.6	115.2	9.6****	NA

* Addressed by mode 2

**Addressed by mode 5

***Addressed by mode 7

**** RSE testing was performed with both Dipole and sector antennas.

Power setting during test: Mode of operation 2: Power Setting - 290 for Dipole antenna & 255 for Sector antenna
 Mode of operation 5: Index: 42 dBm for Dipole & Sector antennas
 Mode of operation 6 & 7: Power Setting – 290 for Dipole antenna & 260 for sector antenna



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.

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

The equipment was tested as provided without any modifications.

1.7 Test Location

TÜV SÜD conducted the following tests at our Alpharetta, GA test laboratory.

Test Name	Name of Engineer(s)	Accreditation
Antenna Requirement	Bhagyashree Chaudhary	A2LA
Power Line Conducted Emissions	Bhagyashree Chaudhary	A2LA
Peak Output Power	Bhagyashree Chaudhary	A2LA
Average Output Power	Bhagyashree Chaudhary	A2LA
Carrier Frequency Separation	Bhagyashree Chaudhary	A2LA
Number of Hopping Channels	Bhagyashree Chaudhary	A2LA
20dB / 99% Bandwidth	Bhagyashree Chaudhary	A2LA
Band-Edge Compliance of RF Conducted Emissions	Bhagyashree Chaudhary	A2LA
RF Conducted Spurious Emissions	Bhagyashree Chaudhary	A2LA
Radiated Spurious Emissions into Restricted Frequency Bands	Bhagyashree Chaudhary	A2LA

Office address:
 TÜV SÜD America
 5945 Cabot Parkway, Suite 100
 Alpharetta, GA 30005, USA



2 Test Details

2.1 Antenna Requirement

2.1.1 Specification Reference

FCC Section: 15.203, 15.204

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 Date of Observation

8/1/2024

2.1.4 Test Method

N/A

2.1.5 Environmental Conditions

N/A

2.1.6 Observation

The EUT utilizes two external antennas, dipole antenna with peak gain 5.7 dBi and sector antenna with peak gain 9 dBi. Connection to the module is via U.fl to SMA adapter cable, therefore satisfying the requirements of Section 15.203.



2.2 Power Line Conducted Emissions

2.2.1 Specification Reference

FCC Section: 15.207
ISED Canada: RSS-Gen 8.8

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

8/27/2024

2.2.4 Test Method

ANSI C63.10 section 6 was the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Corrected Reading - Applicable Limit

2.2.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	23 °C
Relative Humidity	48 %
Atmospheric Pressure	972.2 mbar



2.2.6 Test Results

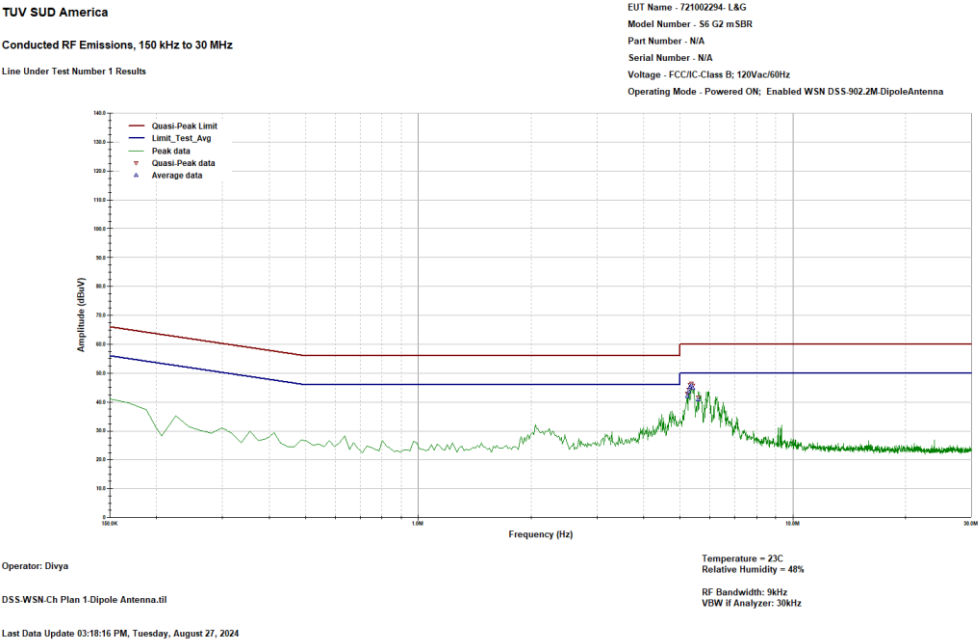


Figure 2.2.6-1: Conducted Emission Plot – Line 1 – Dipole Antenna

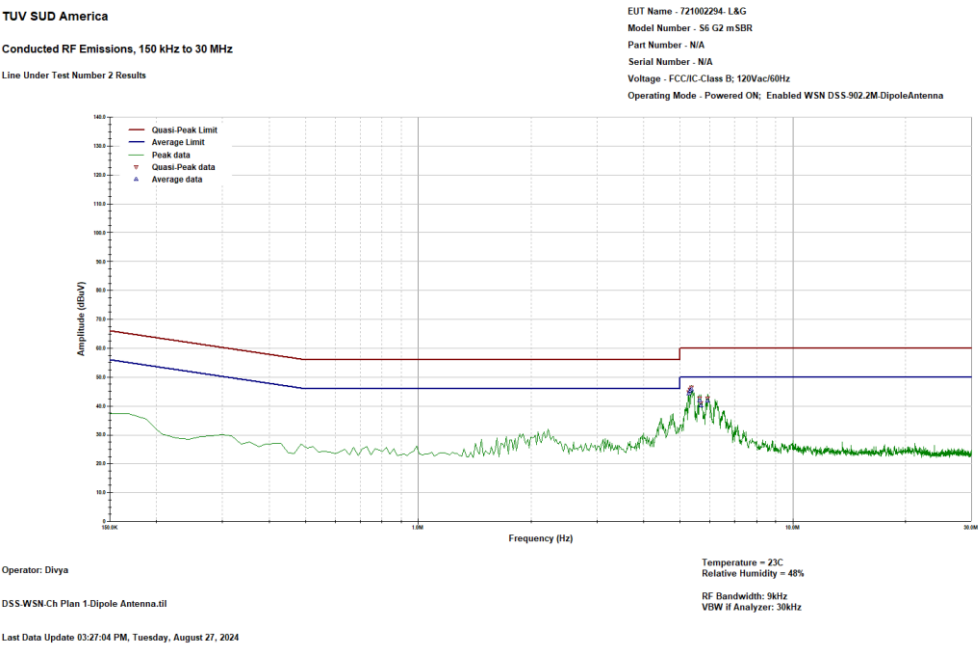


Figure 2.2.6-2: Conducted Emission Plot – Neutral -- Dipole Antenna

**Table 2.2.6-1: Conducted EMI Results-Avg – Line 1 – Dipole Antenna**

Frequency	Avg Limit	Avg Level Corr	Avg Level	CF	Avg Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.24	50	42	32.2	9.82	-8	PASS
5.28	50	43.5	33.7	9.82	-6.5	PASS
5.32	50	45.4	35.5	9.82	-4.6	PASS
5.36	50	45.6	35.8	9.82	-4.4	PASS
5.4	50	44.8	35	9.82	-5.2	PASS
5.6	50	40.8	31	9.818	-9.2	PASS

Table 2.2.6-2: Conducted EMI Results-QP – Line 1 – Dipole Antenna

Frequency	QP Limit	QP Level Corr	QP Level	CF	QP Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.24	60	42.8	33	9.82	-17.2	PASS
5.28	60	44.3	34.5	9.82	-15.7	PASS
5.32	60	46	36.2	9.82	-14	PASS
5.36	60	46.3	36.5	9.82	-13.7	PASS
5.4	60	45.8	35.9	9.82	-14.2	PASS
5.6	60	41.6	31.8	9.818	-18.4	PASS

Table 2.2.6-3: Conducted EMI Results-Avg – Neutral – Dipole Antenna

Frequency	Avg Limit	Avg Level Corr	Avg Level	CF	Avg Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.28	50	44.2	34.4	9.801	-5.8	PASS
5.32	50	45.1	35.3	9.803	-4.9	PASS
5.36	50	45.6	35.8	9.804	-4.4	PASS
5.64	50	42	32.2	9.813	-8	PASS
5.68	50	40.2	30.3	9.814	-9.8	PASS
5.92	50	41.9	32	9.818	-8.1	PASS

Table 2.2.6-4: Conducted EMI Results-QP – Neutral – Dipole Antenna

Frequency	QP Limit	QP Level Corr	QP Level	CF	QP Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.28	60	44.8	35	9.801	-15.2	PASS
5.32	60	45.7	35.9	9.803	-14.3	PASS
5.36	60	46.4	36.6	9.804	-13.6	PASS
5.64	60	42.8	32.9	9.813	-17.2	PASS
5.68	60	41	31.2	9.814	-19	PASS
5.92	60	42.6	32.8	9.818	-17.4	PASS

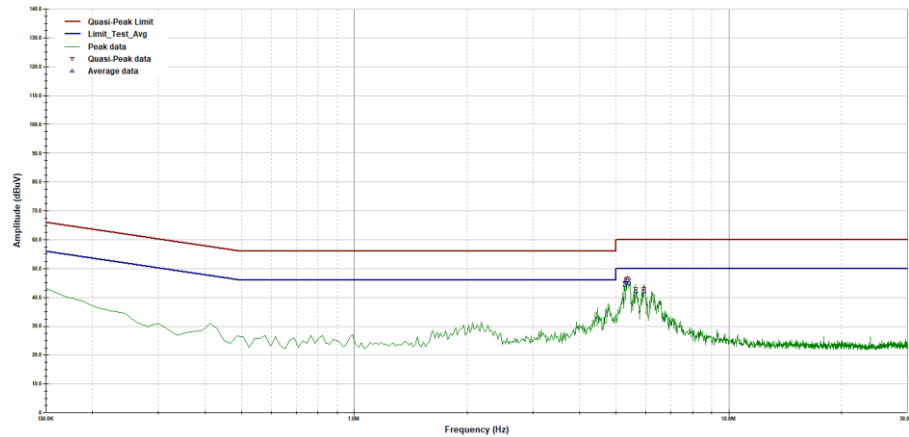


TUV SUD America

Conducted RF Emissions, 150 kHz to 30 MHz

Line Under Test Number 1 Results

EUT Name - 721002294.1&G
Model Number - S6 G2 mSBR
Part Number - N/A
Serial Number - N/A
Voltage - FCC/Class B: 120Vac/60Hz
Operating Mode - Powered ON; Enabled WSN DSS-902.2M Sector Antenna



Operator: Diviya

DSS-WSN-Ch Plan 1-Sector Antenna.tif

Last Data Update 02:56:34 PM, Tuesday, August 27, 2024

Temperature = 23C
Relative Humidity = 48%
RF Bandwidth: 9kHz
VDW # Analyzer: 30kHz

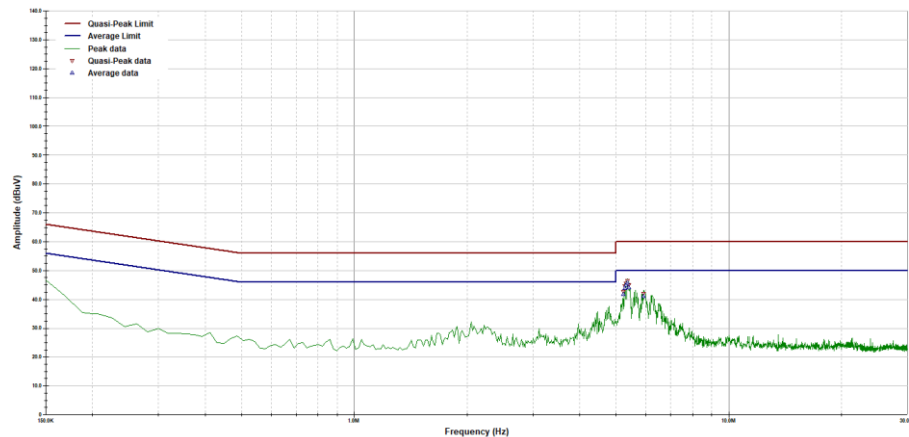
Figure 2.2.6-3: Conducted Emission Plot – Line 1 – Sector Antenna

TUV SUD America

Conducted RF Emissions, 150 kHz to 30 MHz

Line Under Test Number 2 Results

EUT Name - 721002294.1&G
Model Number - S6 G2 mSBR
Part Number - N/A
Serial Number - N/A
Voltage - FCC/Class B: 120Vac/60Hz
Operating Mode - Powered ON; Enabled WSN DSS-902.2M Sector Antenna



Operator: Diviya

DSS-WSN-Ch Plan 1-Sector Antenna.tif

Last Data Update 03:05:45 PM, Tuesday, August 27, 2024

Temperature = 23C
Relative Humidity = 48%
RF Bandwidth: 9kHz
VDW # Analyzer: 30kHz

Figure 2.2.6-4: Conducted Emission Plot – Neutral – Sector Antenna

**Table 2.2.6-5: Conducted EMI Results-Avg – Line 1 – Sector Antenna**

Frequency	Avg Limit	Avg Level Corr	Avg Level	CF	Avg Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.28	50	44.2	34.4	9.82	-5.8	PASS
5.32	50	45.6	35.8	9.82	-4.4	PASS
5.36	50	45.8	36	9.82	-4.2	PASS
5.4	50	45	35.2	9.82	-5	PASS
5.64	50	42.2	32.4	9.817	-7.8	PASS
5.92	50	42	32.2	9.812	-8	PASS

Table 2.2.6-6: Conducted EMI Results-QP – Line 1 – Sector Antenna

Frequency	QP Limit	QP Level Corr	QP Level	CF	QP Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.28	60	45	35.2	9.82	-15	PASS
5.32	60	46.2	36.4	9.82	-13.8	PASS
5.36	60	46.5	36.7	9.82	-13.5	PASS
5.4	60	45.9	36	9.82	-14.1	PASS
5.64	60	42.9	33.1	9.817	-17.1	PASS
5.92	60	42.8	33	9.812	-17.2	PASS

Table 2.2.6-7: Conducted EMI Results-Avg – Neutral – Sector Antenna

Frequency	Avg Limit	Avg Level Corr	Avg Level	CF	Avg Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.24	50	41.8	32	9.8	-8.2	PASS
5.28	50	43.9	34.1	9.801	-6.1	PASS
5.32	50	44.9	35.1	9.803	-5.1	PASS
5.36	50	45.7	35.9	9.804	-4.3	PASS
5.4	50	44.2	34.4	9.806	-5.8	PASS
5.92	50	41	31.2	9.818	-9	PASS

Table 2.2.6-8: Conducted EMI Results-QP – Neutral – Sector Antenna

Frequency	QP Limit	QP Level Corr	QP Level	CF	QP Margin	Result
MHz	dBuV	dBuV	dBuV	dB	dB	
5.24	60	42.7	32.9	9.8	-17.3	PASS
5.28	60	44.6	34.8	9.801	-15.4	PASS
5.32	60	45.6	35.8	9.803	-14.4	PASS
5.36	60	46.5	36.7	9.804	-13.5	PASS
5.4	60	45.1	35.3	9.806	-14.9	PASS
5.92	60	42	32.2	9.818	-18	PASS



2.3 Peak Output Power

2.3.1 Specification Reference

FCC Sections: 15.247(b)(2)
ISED Canada: RSS-247 5.4(a)

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

07/31/2024 to 08/01/2024

2.3.4 Test Method

The maximum conducted peak output power was measured in accordance with ANSI C63.10 Subclause 7.8.5 Method PKPM (Peak Power meter). The RF output port of the EUT was directly connected to the input of a peak power meter. The resulting peak value was recorded.

2.3.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.3.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.



Table 2.3.6-1: RF Output Power – (Dipole Antenna)

Frequency [MHz]	Peak Output Power (dBm)	E.I.R.P (dBm)	Data Rate (kbps)	Mode(s)
902.2	29.81	35.51	50	2
915	29.81	35.51	50	2
927.8	29.75	35.45	50	2
902.3	29.5	35.20	9.6	7
915.2	29.62	35.32	9.6	7
927.8	29.71	35.41	9.6	7
902.3	29.51	35.21	19.2	7
915.2	29.60	35.30	19.2	7
927.8	29.70	35.40	19.2	7
902.3	29.49	35.19	38.4	7
915.2	29.61	35.31	38.4	7
927.8	29.71	35.41	38.4	7
902.3	29.29	34.99	115.2	7
915.2	29.41	35.11	115.2	7
927.8	29.43	35.13	115.2	7

Table 2.3.6-2: RF Output Power – (Sector Antenna)

Frequency [MHz]	Peak Output Power (dBm)	E.I.R.P (dBm)	Data Rate (kbps)	Mode(s)
902.2	26.45	35.45	50	2
915	26.56	35.56	50	2
927.8	26.48	35.48	50	2
902.3	26.3	35.30	9.6	7
915.2	26.6	35.60	9.6	7
927.8	26.75	35.75	9.6	7
902.3	26.25	35.25	19.2	7
915.2	26.59	35.59	19.2	7
927.8	26.66	35.66	19.2	7
902.3	26.52	35.52	38.4	7
915.2	26.71	35.71	38.4	7
927.8	26.78	35.78	38.4	7
902.3	26.57	35.57	115.2	7
915.2	26.74	35.74	115.2	7
927.8	26.85	35.85	115.2	7



2.4 Average Output Power

2.4.1 Specification Reference

FCC Sections: 15.247(b)(3)
ISED Canada: RSS-247 5.4(a)

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

08/02/2024

2.4.4 Test Method

The Average conducted output power was measured in accordance with ANSI C63.10 Subclause 11.9.2.3.1 Method AVGPM (Average Power Meter). The RF output port of the EUT was directly connected to the input of an Average power meter. The resulting average value was recorded.

Note: This measurement method was evaluated for Hybrid Classification.

2.4.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.4.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.



Table 2.4.6-1: RF Output Power – Hybrid (Dipole Antenna)

Frequency [MHz]	Average Output Power (dBm)	E.I.R.P (dBm)	Coding Scheme	Mode(s)
902.4	26.79	32.49	MCS2	5
915.2	26.72	32.42	MCS2	5
927.6	26.62	32.32	MCS2	5

Table 2.4.6-2: RF Output Power – Hybrid (Sector Antenna)

Frequency [MHz]	Average Output Power (dBm)	E.I.R.P (dBm)	Coding Scheme	Mode(s)
902.4	26.79	35.79	MCS2	5
915.2	26.72	35.72	MCS2	5
927.6	26.62	35.62	MCS2	5



2.5 Carrier Frequency Separation

2.5.1 Specification Reference

FCC Sections: 15.247(a)(1)
ISED Canada: RSS-247 5.1(b)

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

07/31/2024 to 08/01/2024

2.5.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW started at approximately 30% of the channel spacing and adjusted as necessary to best identify the center of each individual channel. The VBW was set to $\geq$ RBW.

2.5.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

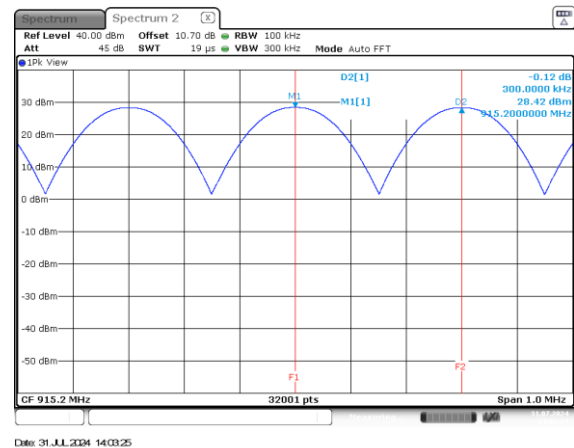
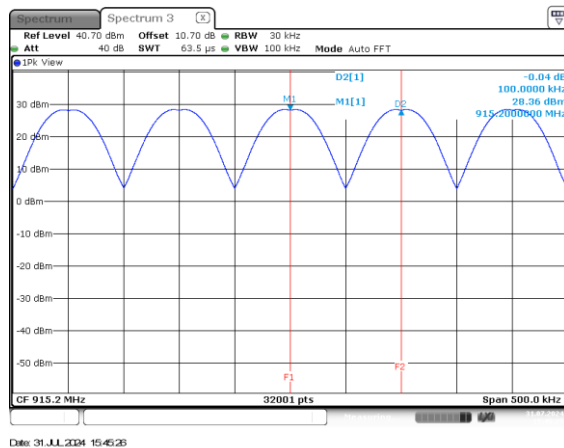
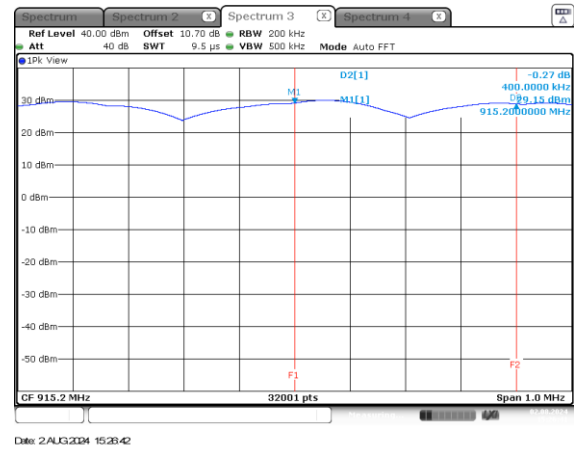
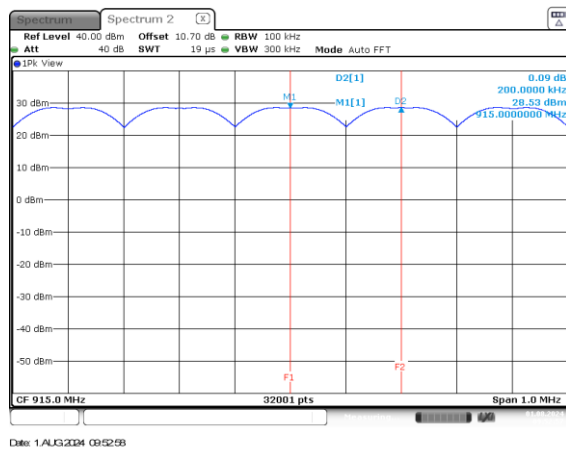
Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.5.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See below plots for detailed results.





2.6 Number of Hopping Channels

2.6.1 Specification Reference

FCC Sections: 15.247(a)(1)(i)
ISED Canada: RSS 247 5.1 (c)

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

07/31/2024 to 08/01/2024

2.6.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The span of the spectrum analyzer was set wide enough to capture the frequency band of operation. The RBW was set to less than 30% of the channel spacing or the 20dB bandwidth, whichever is smaller. The VBW was set to $\geq$ RBW.

2.6.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.6.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See below plots for detailed results.

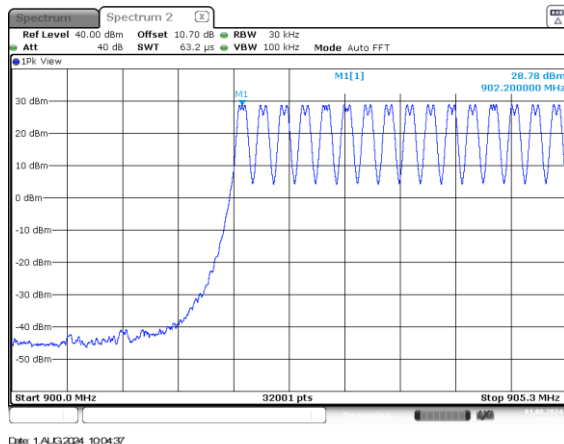


Figure 2.6.6-1: Mode 2 – 50 kbps (129 Channels)

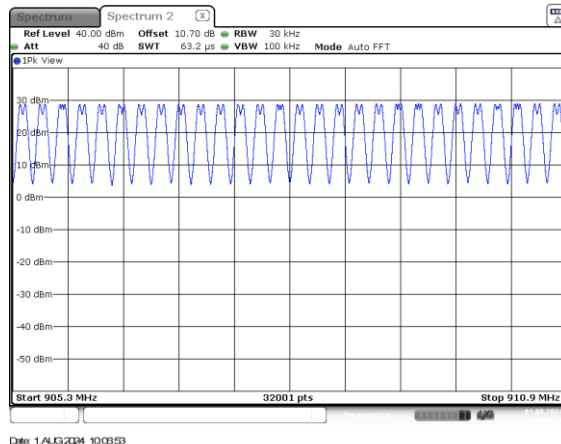


Figure 2.6.6-2: Mode 2 – 50 kbps (129 Channels)

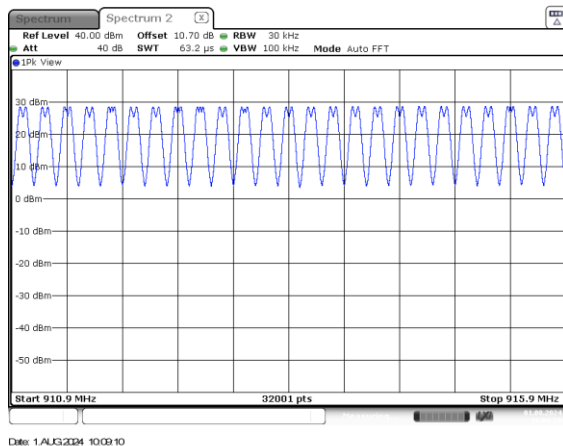


Figure 2.6.6-3: Mode 2 – 50 kbps (129 Channels)

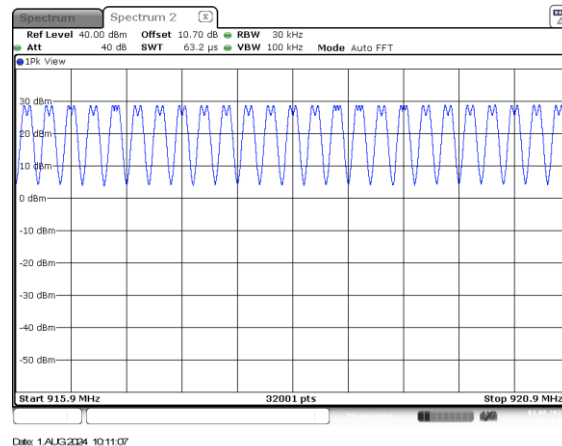


Figure 2.6.6-4: Mode 2 – 50 kbps (129 Channels)

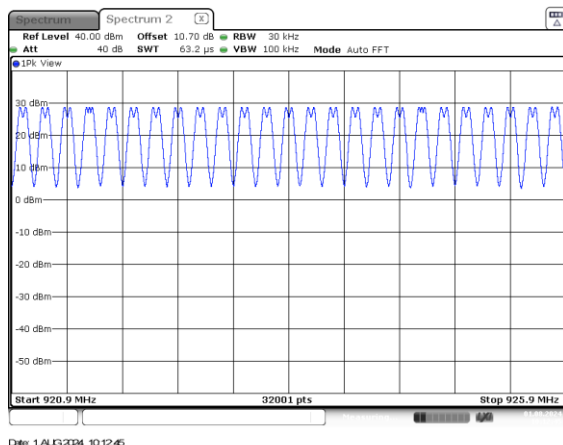


Figure 2.6.6-5: Mode 2 – 50 kbps (129 Channels)

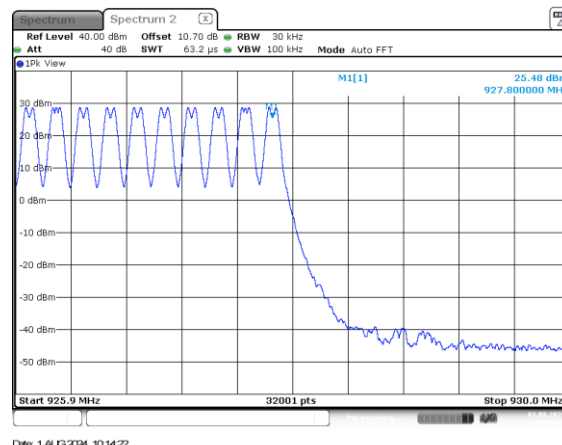
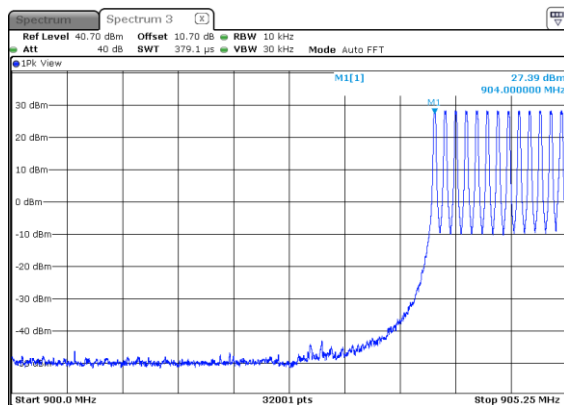
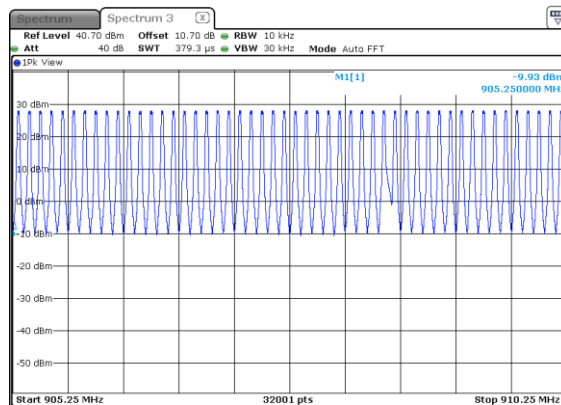


Figure 2.6.6-6: Mode 2 – 50 kbps (129 Channels)



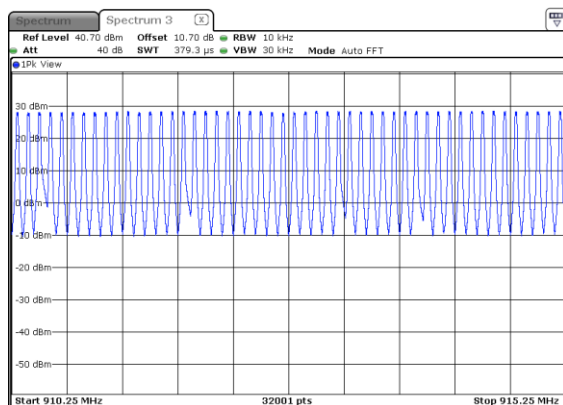
Date: 31.JUL.2024 16:04:04

Figure 2.6.6-7: Mode 6 – 9.6 kbps (239 Channels)



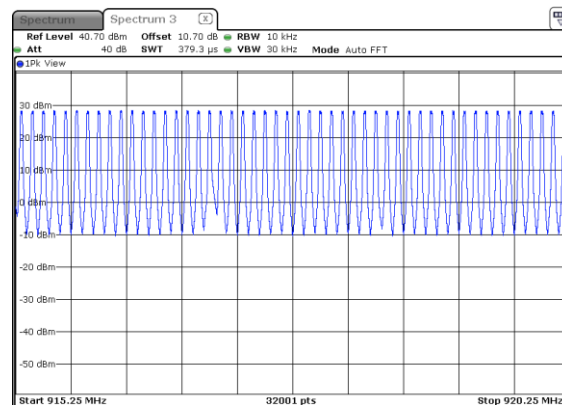
Date: 31.JUL.2024 16:03:21

Figure 2.6.6-8: Mode 6 – 9.6 kbps (239 Channels)



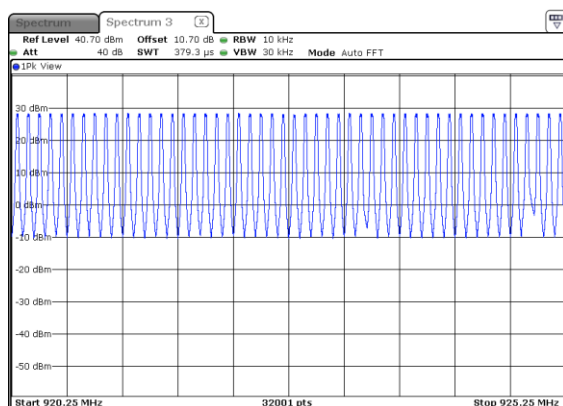
Date: 31.JUL.2024 16:03:37

Figure 2.6.6-9: Mode 6 – 9.6 kbps (239 Channels)



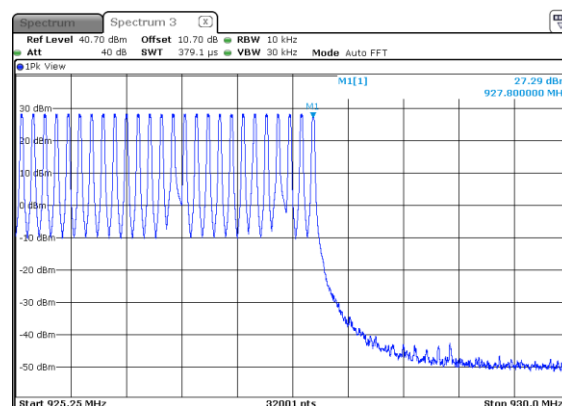
Date: 31.JUL.2024 16:11:13

Figure 2.6.6-10: Mode 6 – 9.6 kbps (239 Channels)



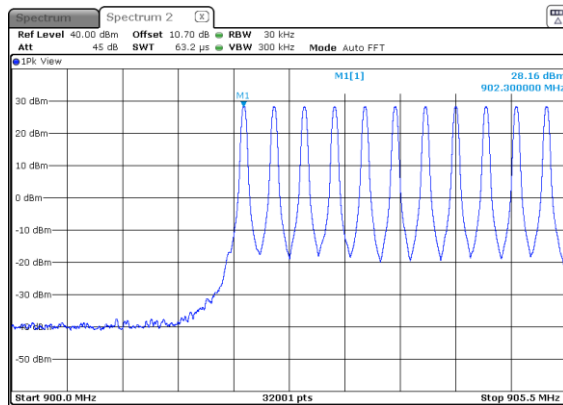
Date: 31.JUL.2024 16:13:10

Figure 2.6.6-11: Mode 6 – 9.6 kbps (239 Channels)



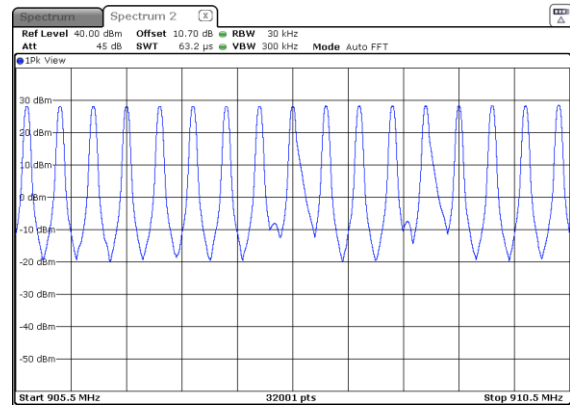
Date: 31.JUL.2024 16:14:32

Figure 2.6.6-12: Mode 6 – 9.6 kbps (239 Channels)



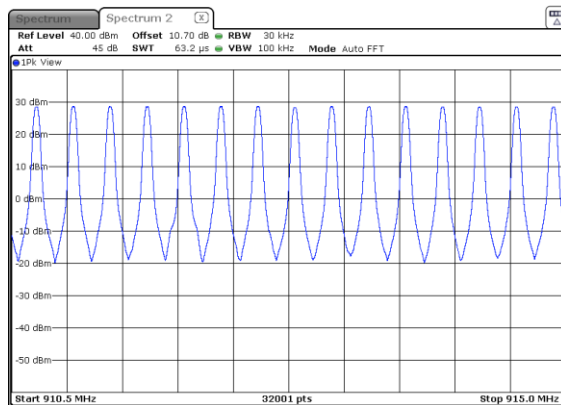
Date: 31.JUL.2024 14:03:38

Figure 2.6.6-13: Mode 7 – 9.6 kbps (86 Channels)



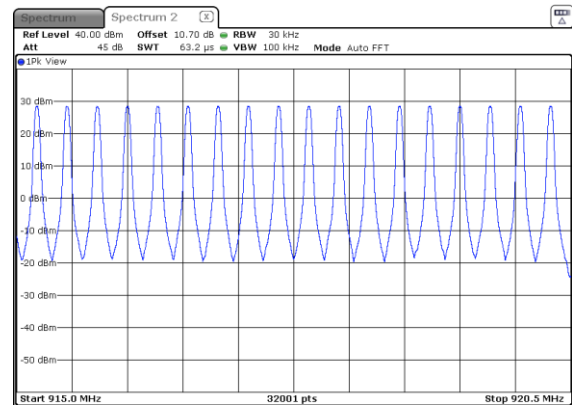
Date: 31.JUL.2024 14:03:59

Figure 2.6.6-14: Mode 7 – 9.6 kbps (86 Channels)



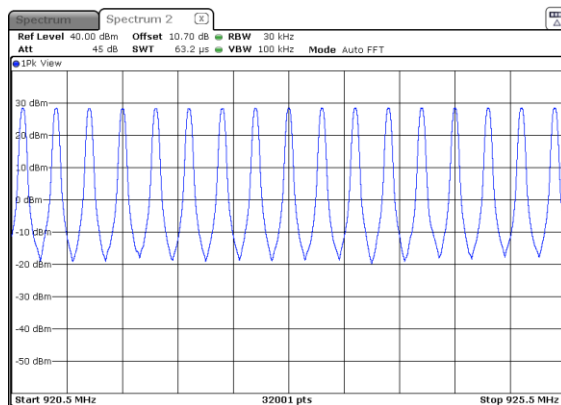
Date: 31.JUL.2024 14:11:13

Figure 2.6.6-15: Mode 7 – 9.6 kbps (86 Channels)



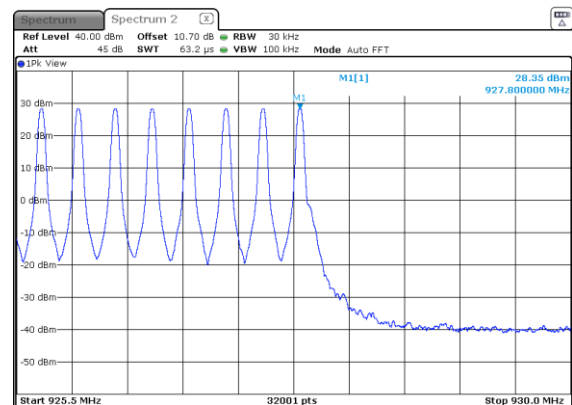
Date: 31.JUL.2024 14:13:47

Figure 2.6.6-16: Mode 7 – 9.6 kbps (86 Channels)



Date: 31.JUL.2024 14:15:44

Figure 2.6.6-17: Mode 7 – 9.6 kbps (86 Channels)



Date: 31.JUL.2024 14:17:04

Figure 2.6.6-18: Mode 7 – 9.6 kbps (86 Channels)



2.7 Channel Dwell Time

2.7.1 Specification Reference

FCC Sections: 15.247(a)(1)(i), 15.247 (f)
ISED: RSS-247 5.1(c), RSS-247 5.3(a)

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

Not Tested

2.7.4 Test Method

N/A

2.7.5 Environmental Conditions

N/A

2.7.6 Test Results

The EUT test mode does not generate a worst-case channel dwell time therefore a detailed engineering analysis is provided in the theory of operation for both FHSS and Hybrid modes of operation.



2.8 20dB / 99% Bandwidth

2.8.1 Specification Reference

FCC Sections: 15.247(a)(1)(i)
ISED Canada: RSS-247 5.1(c), RSS-GEN 6.7

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

07/31/2024 to 08/02/2024

2.8.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The Delta and ndB down functions of the analyzer were utilized to determine the 20 dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth. A peak detector was used.

2.8.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.8.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.

Table 2.8.6-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Data Rate	Mode(s)
902.2	112.8	115.300	50	2
915	113.8	114.400	50	2
927.8	113.7	114.600	50	2
902.4	342.6	432.800	MCS2	5
915.2	347.4	391.800	MCS2	5
927.6	329.8	391.000	MCS2	5
902.3	21.390	20.491	9.6	7
915.2	21.469	20.555	9.6	7
927.8	21.427	20.660	9.6	7
902.3	42.333	41.636	19.2	7
915.2	41.414	42.236	19.2	7
927.8	42.095	41.608	19.2	7
902.3	86.441	85.959	38.4	7
915.2	87.491	85.647	38.4	7
927.8	88.072	85.053	38.4	7
902.3	235.355	220.693	115.2	7
915.2	235.355	221.568	115.2	7
927.8	235.355	221.068	115.2	7

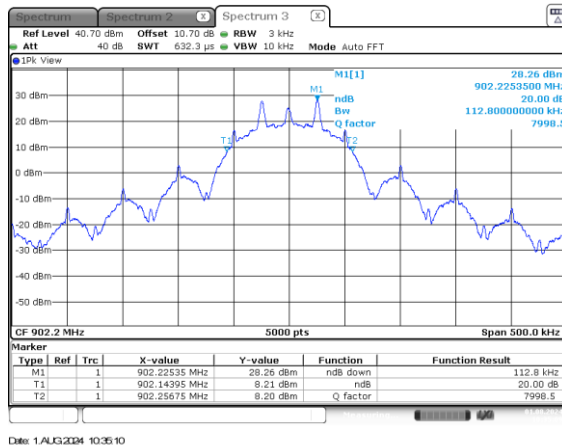


Figure 2.8.6-1: Mode 2 – 20 dB BW – LCH – 50 kbps

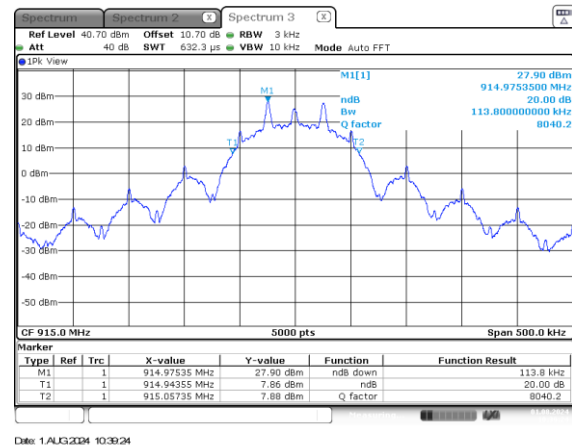


Figure 2.8.6-2: Mode 2 – 20 dB BW – MCH – 50 kbps

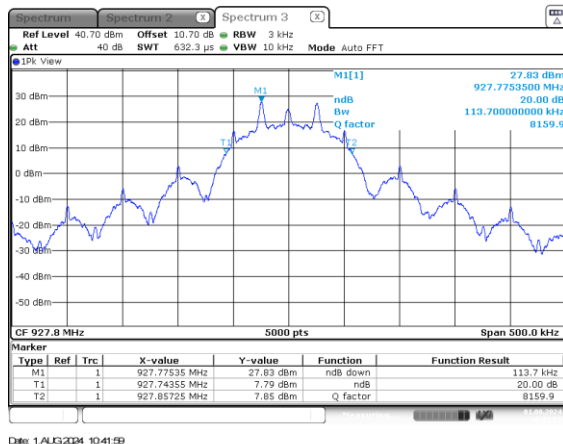


Figure 2.8.6-3: Mode 1 – 20 dB BW – HCH – 50 kbps

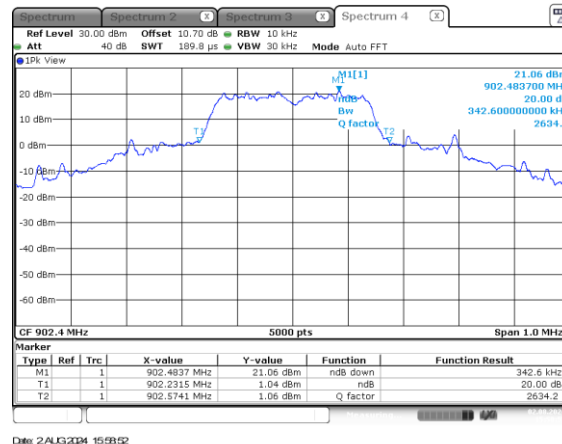


Figure 2.8.6-4: Mode 5 – 20 dB BW – LCH – MCS2

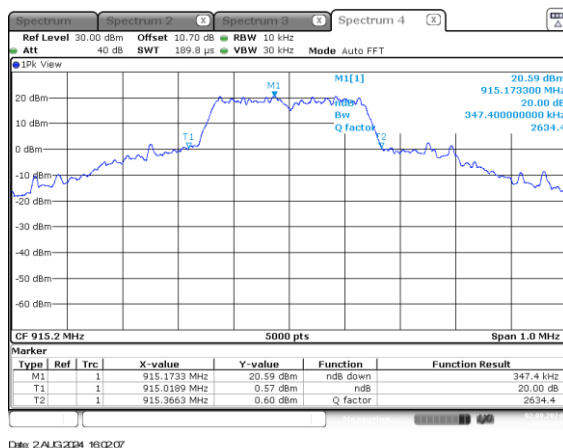


Figure 2.8.6-5: Mode 5 – 20 dB BW – MCH – MCS2

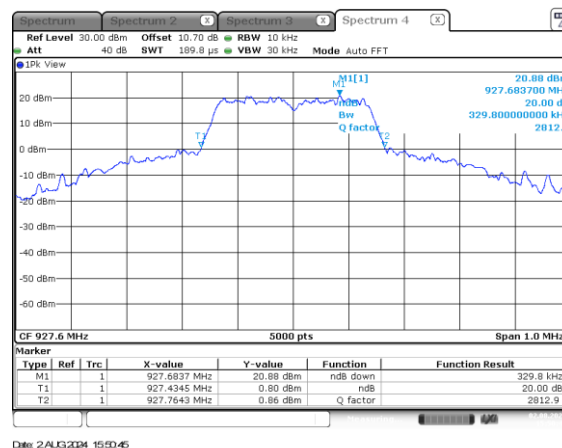


Figure 2.8.6-6: Mode 5 – 20 dB BW – HCH – MCS2

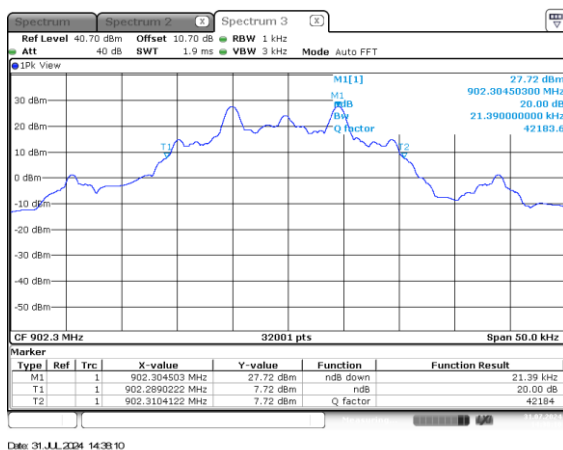


Figure 2.8.6-7: Mode 7 – 20 dB BW – LCH – 9.6 kbps

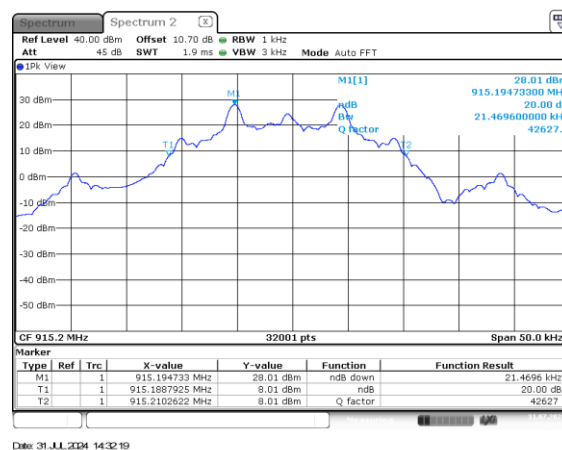
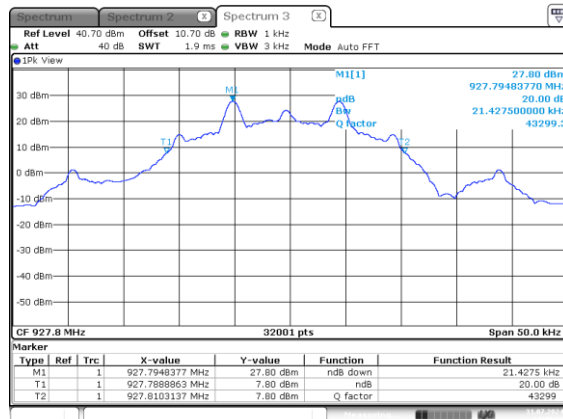
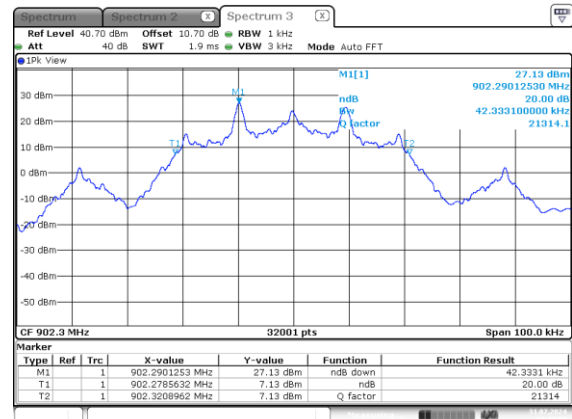


Figure 2.8.6-8: Mode 7 – 20 dB BW – MCH – 9.6 kbps



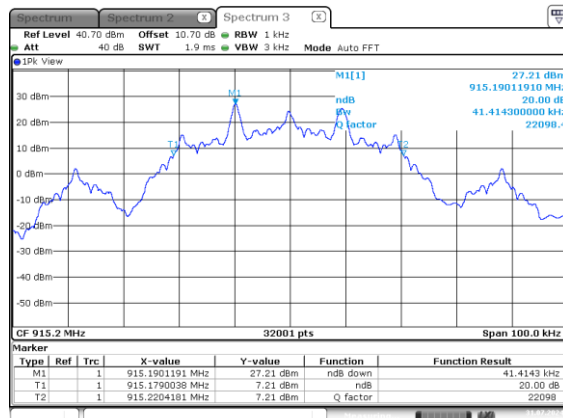
Date: 31.JUL.2024 14:40:31

Figure 2.8.6-9: Mode 7 – 20 dB BW – HCH – 9.6 kbps



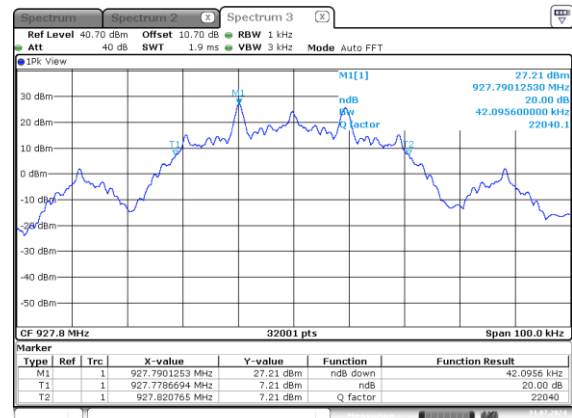
Date: 31.JUL.2024 14:44:59

Figure 2.8.6-10: Mode 7 – 20 dB BW – LCH – 19.2 kbps



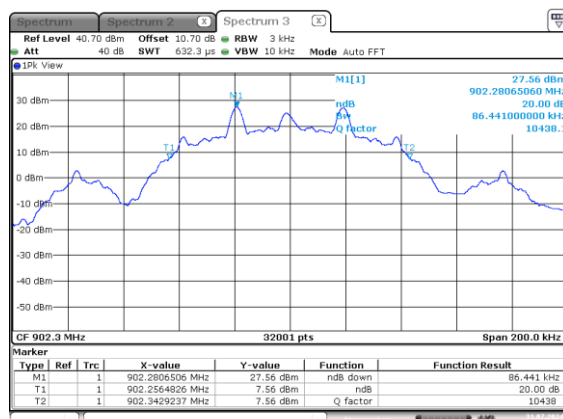
Date: 31.JUL.2024 14:48:53

Figure 2.8.6-11: Mode 7 – 20 dB BW – MCH – 19.2 kbps



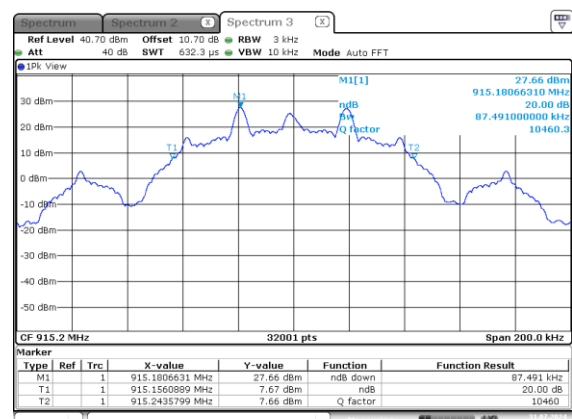
Date: 31.JUL.2024 14:52:08

Figure 2.8.6-12: Mode 7 – 20 dB BW – HCH – 19.2 kbps



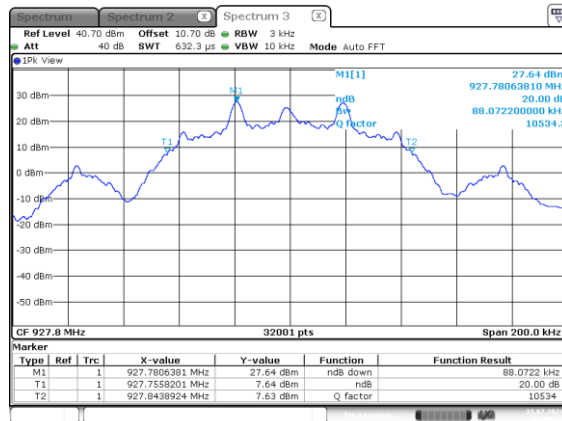
Date: 31.JUL.2024 14:59:17

Figure 2.8.6-13: Mode 7 – 20 dB BW – LCH – 38.4 kbps



Date: 31.JUL.2024 15:01:14

Figure 2.8.6-14: Mode 7 – 20 dB BW – MCH – 38.4 kbps



Date: 31.JUL.2024 15:08:43

Figure 2.8.6-15: Mode 7 – 20 dB BW – HCH – 38.4 kbps



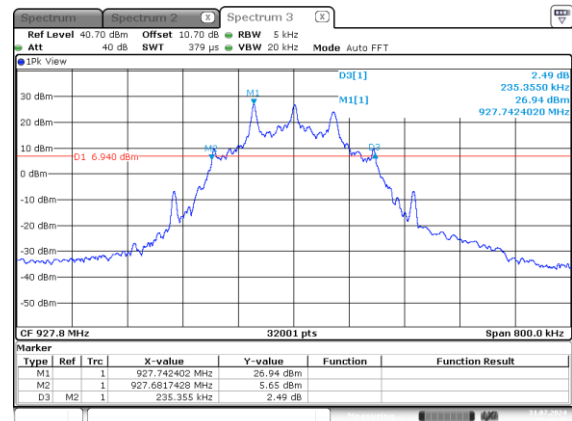
Date: 31.JUL.2024 15:14:14

Figure 2.8.6-16: Mode 7 – 20 dB BW – LCH – 115.2 kbps



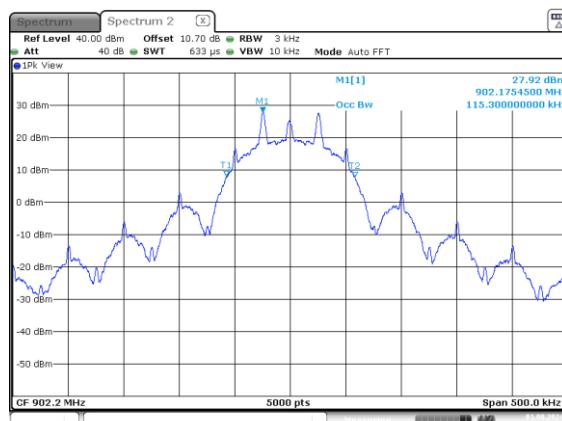
Date: 31.JUL.2024 15:28:52

Figure 2.8.6-17: Mode 7 – 20 dB BW – MCH – 115.2 kbps



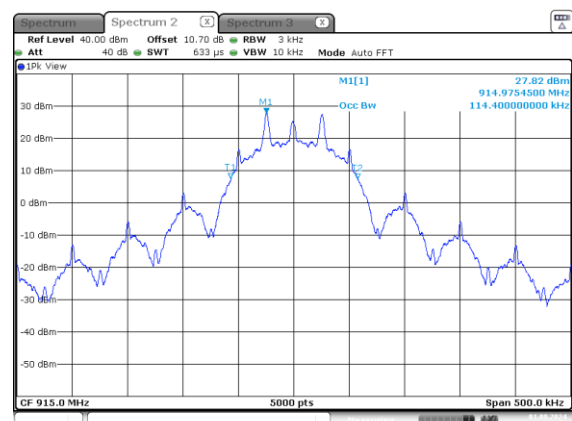
Date: 31.JUL.2024 15:32:26

Figure 2.8.6-18: Mode 7 – 20 dB BW – HCH – 115.2 kbps



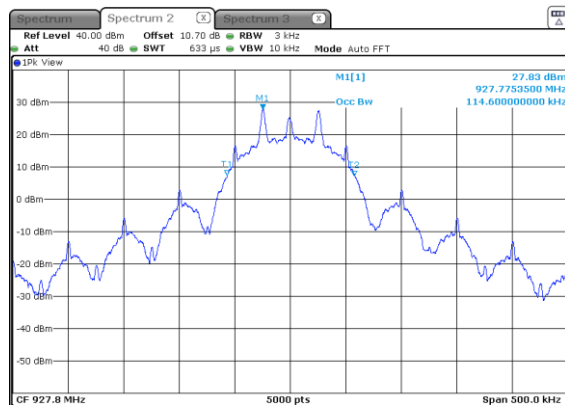
Date: 1.AUG.2024 10:32:53

Figure 2.8.6-19: Mode 2 – 99% OBW – LCH – 50 kbps



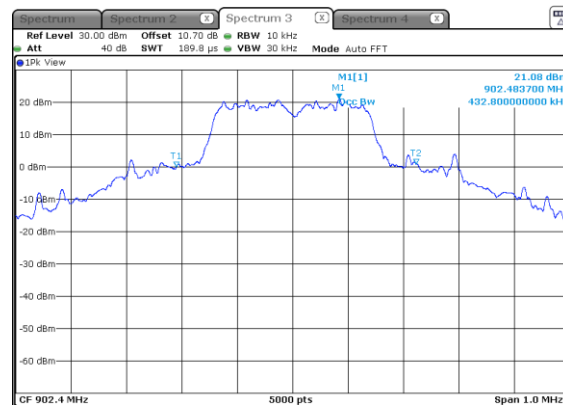
Date: 1.AUG.2024 10:38:29

Figure 2.8.6-20: Mode 2 – 99% OBW – MCH – 50 kbps



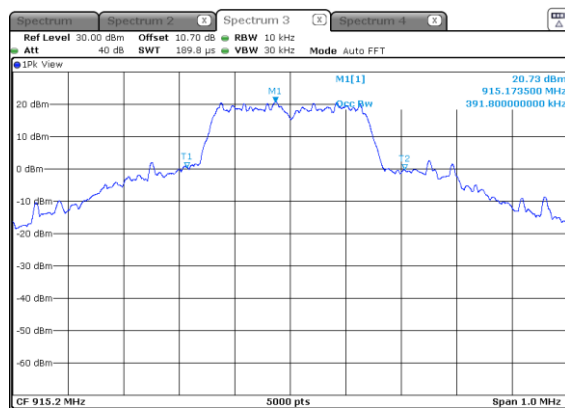
Date: 1 AUG 2024 10:41:05

Figure 2.8.6-21: Mode 2 – 99% OBW – HCH – 50 kbps



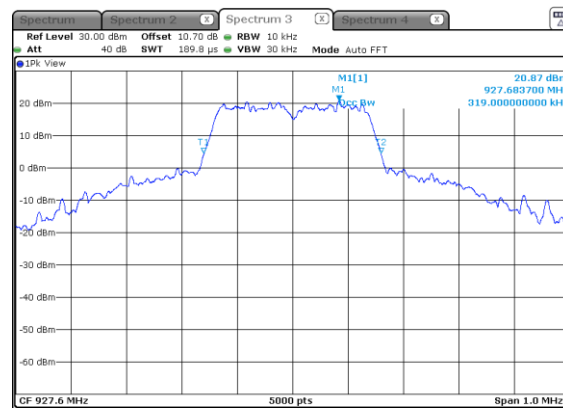
Date: 2 AUG 2024 15:55:57

Figure 2.8.6-22: Mode 5 – 99% OBW – LCH – MCS2



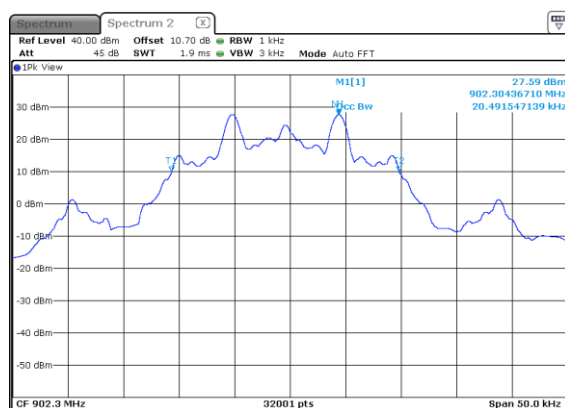
Date: 2 AUG 2024 10:04:24

Figure 2.8.6-23: Mode 5 – 99% OBW – MCH – MCS2



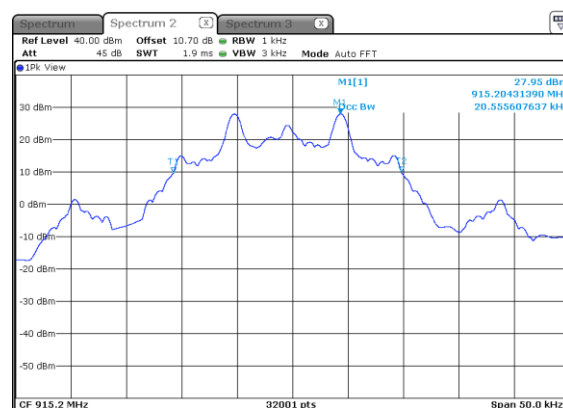
Date: 2 AUG 2024 15:47:49

Figure 2.8.6-24: Mode 5 – 99% OBW – HCH – MCS2



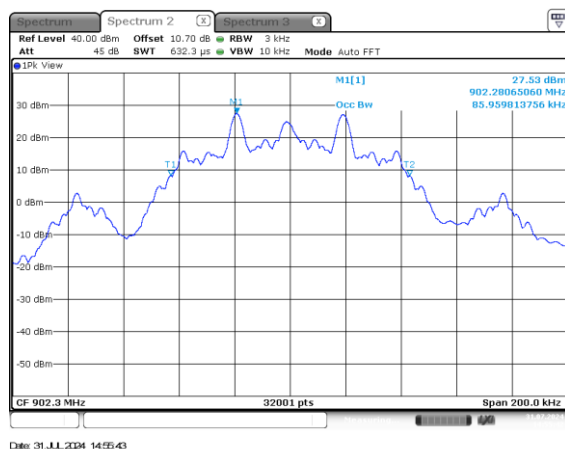
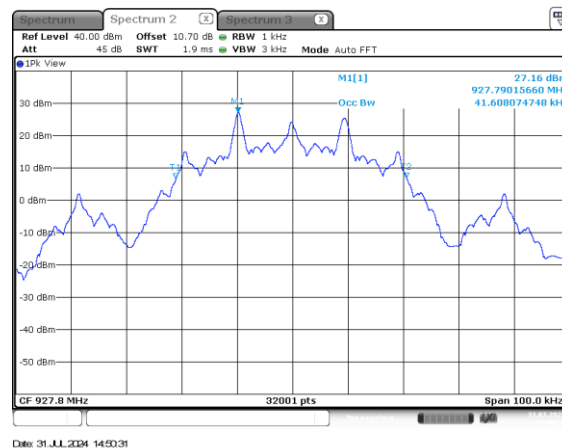
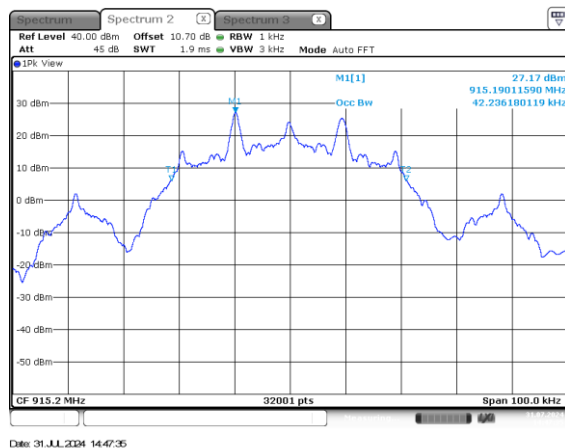
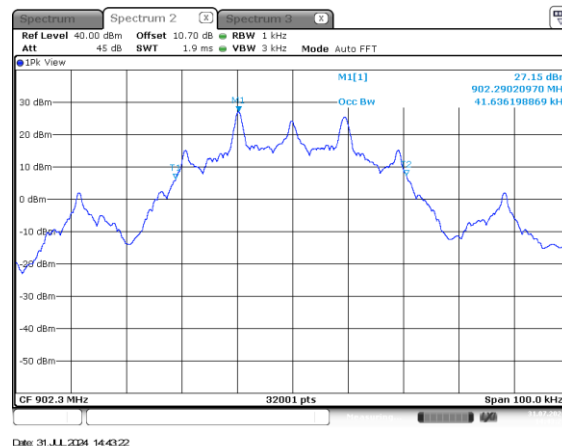
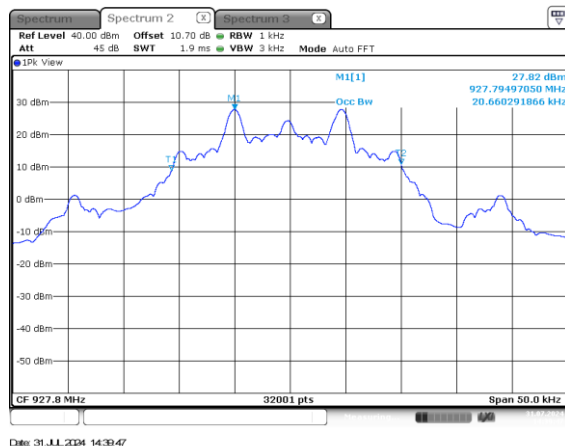
Date: 31 JUL 2024 14:28:29

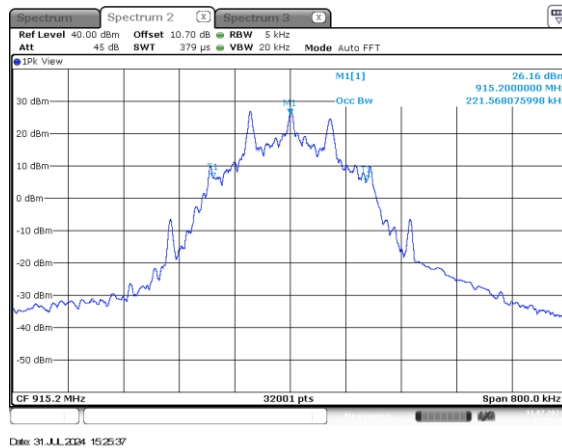
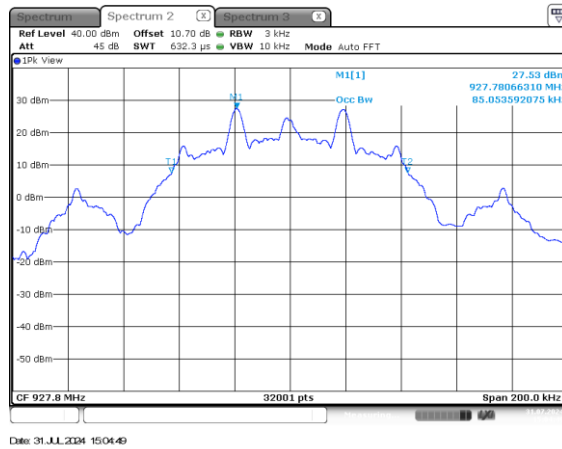
Figure 2.8.6-25: Mode 7 – 99% OBW – LCH – 9.6 kbps



Date: 31 JUL 2024 14:38:32

Figure 2.8.6-26: Mode 7 – 99% OBW – MCH – 9.6 kbps







2.9 Maximum Power Spectral Density in the Fundamental Emission

2.9.1 Specification Reference

FCC Sections: 15.247(e)
ISED Canada: RSS-247 5.2(b)

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

08/02/2024

2.9.4 Test Method

The power spectral density was measured in accordance with the ANSI 63.10 Subclause 11.10.3 Method AVGPSD (AVGPSD). The RF output of the equipment under test was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 3 kHz. The Video Bandwidth (VBW) was set to 10 kHz. Span was set to 1.5 times the OBW. The RMS average detector is used, with the trace set to average hold. The marker is placed on the highest peak of the resulting trace.

Note: This test requirement is evaluated for only Hybrid Classification.

2.9.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.9.6 Test Results

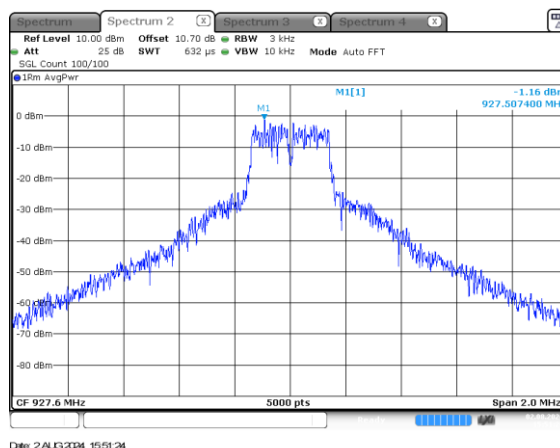
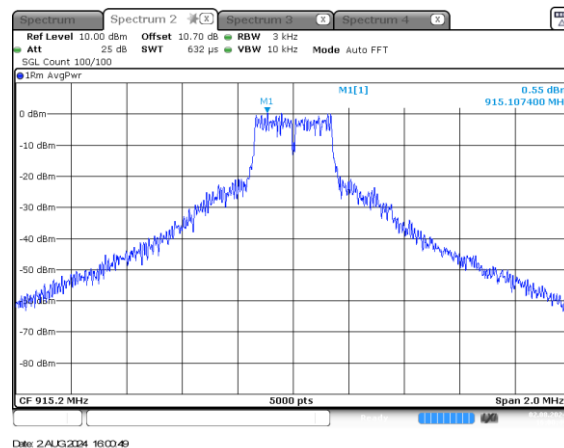
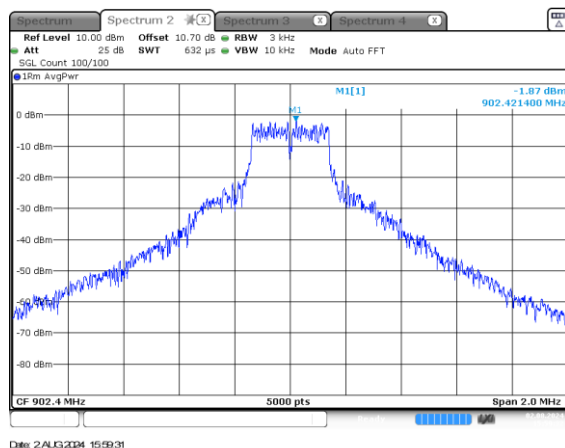
Test Summary: EUT was set to transmit mode.

Test Results: Pass

See data below for detailed results.

Table 2.9.6-1: RF Power Spectral Density- Hybrid

Frequency [MHz]	Average PSD (dBm)	Coding Scheme	Mode(s)
902.4	-1.87	MCS2	5
915.2	0.55	MCS2	5
927.6	-1.16	MCS2	5





2.10 Band-Edge Compliance of RF Conducted Emissions

2.10.1 Specification Reference

FCC Sections: 15.247(d)
ISED Canada: RSS-247 5.5

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

07/31/2024 to 08/19/2024

2.10.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer with suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement, the spectrum analyzer's RBW was set to 100kHz and the VBW was set to 300kHz.

If the maximum peak conducted output power procedure was used to determine compliance, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc) Mode 2, 6 and 7 band edge frequency attenuated by 20 dBc

If maximum conducted (average) output power was used to determine compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc). Mode 5 band edge frequency attenuated by 30 dBc.

2.10.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.10.6 Test Results

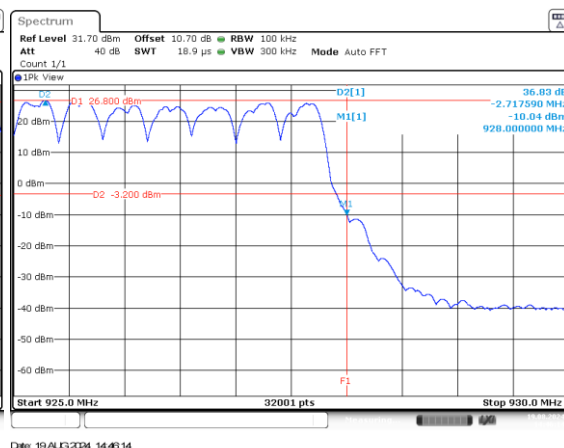
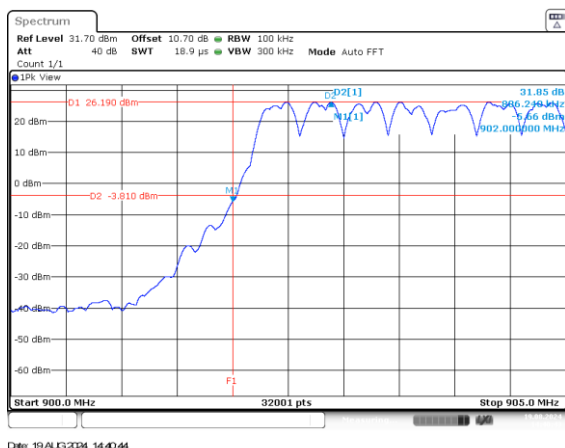
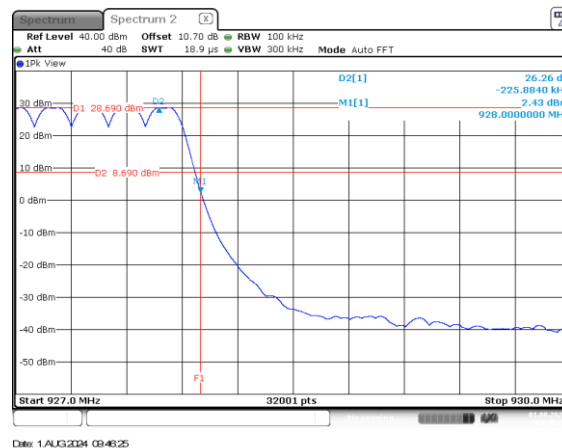
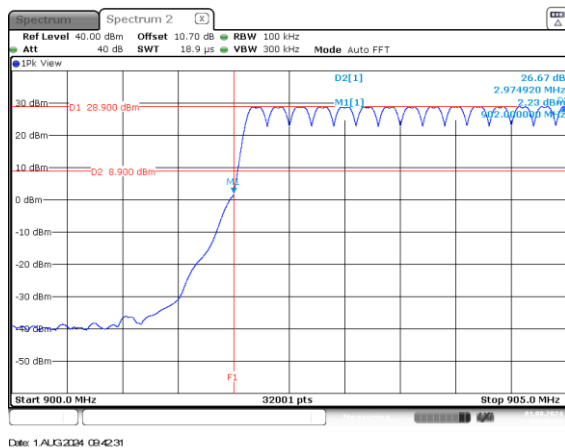
Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.



HOPPING MODE:



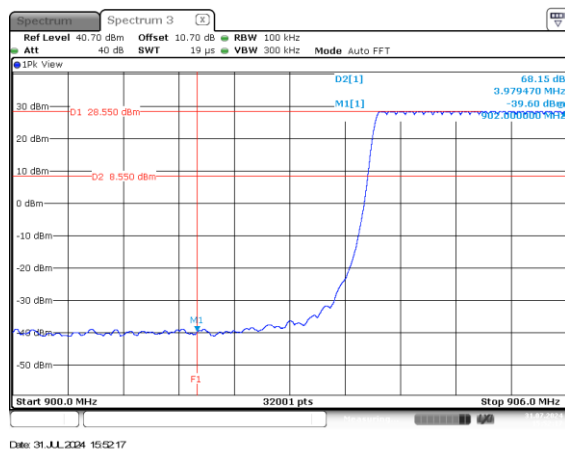


Figure 2.10.6-5: Lower Band edge – Mode 6 – 38.4 kbps

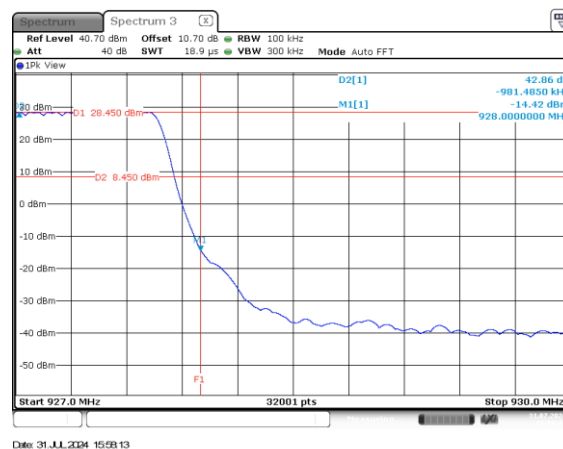


Figure 2.10.6-6: Upper Band edge – Mode 6 – 38.4 kbps

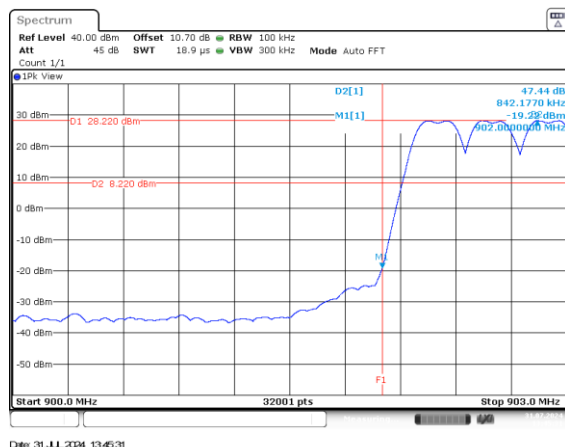


Figure 2.10.6-7: Lower Band edge – Mode 7 – 115.2 kbps

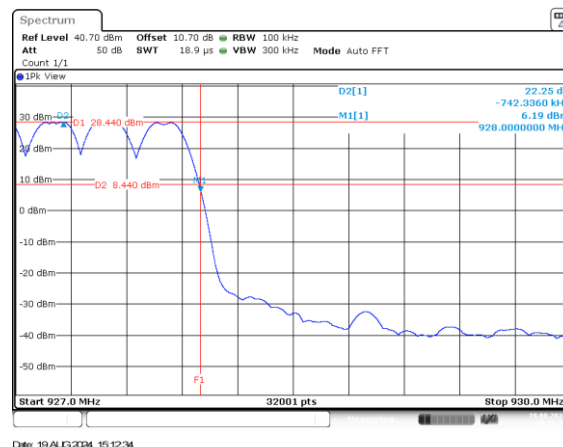


Figure 2.10.6-8: Upper Band edge – Mode 7 – 115.2 kbps

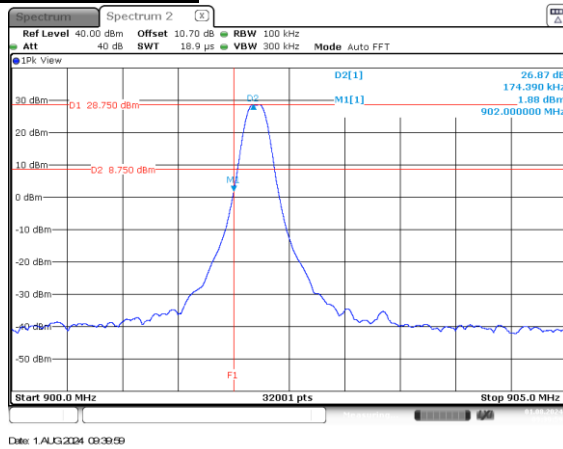
NON-HOPPING MODE:

Figure 2.10.6-9: Lower Band edge – Mode 2– 50kbps

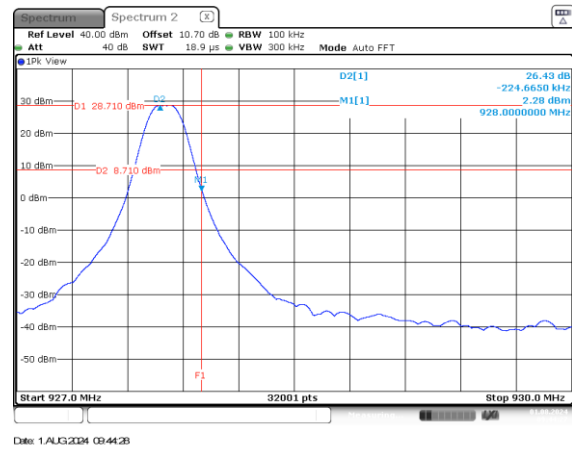


Figure 2.10.6-10: Upper Band edge – Mode 2 – 50kbps

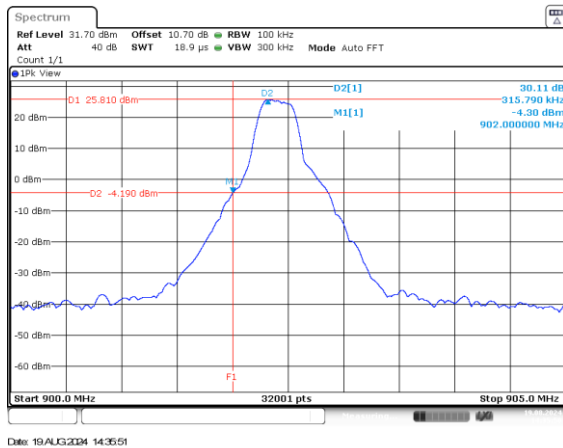


Figure 2.10.6-11: Lower Band edge – Mode 5 – MCS2

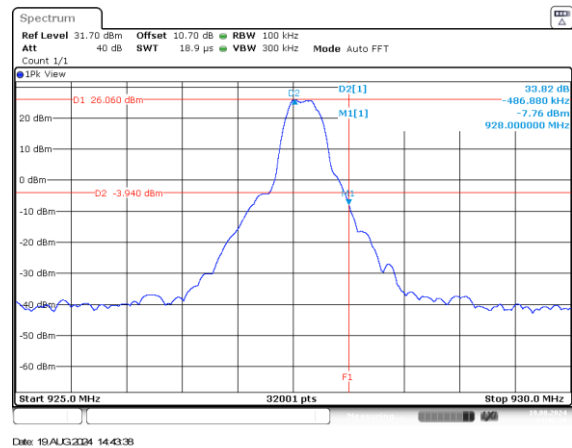
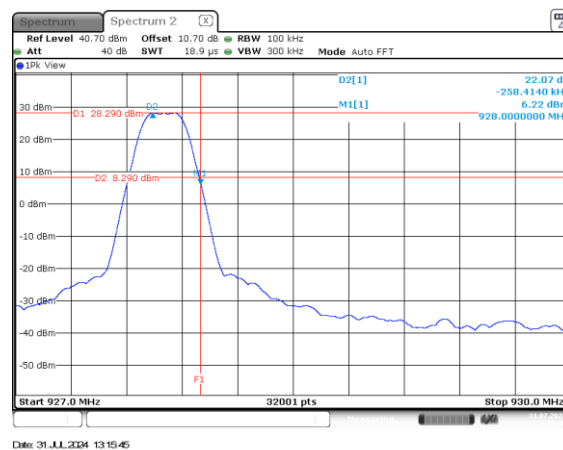
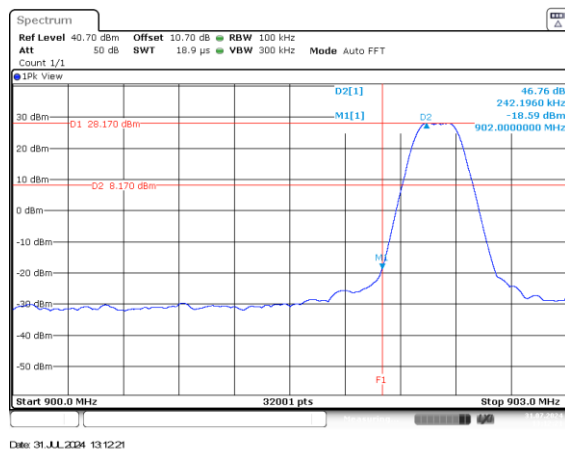
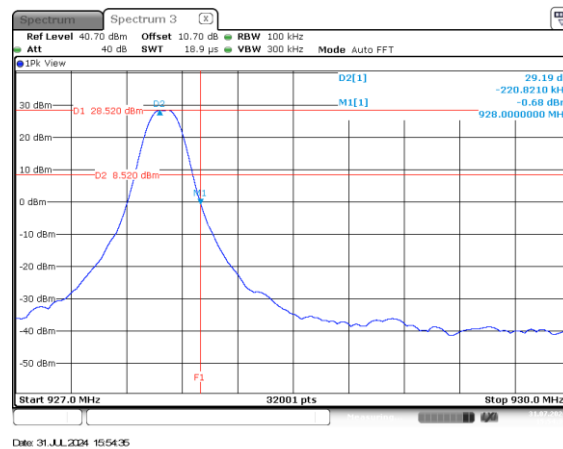
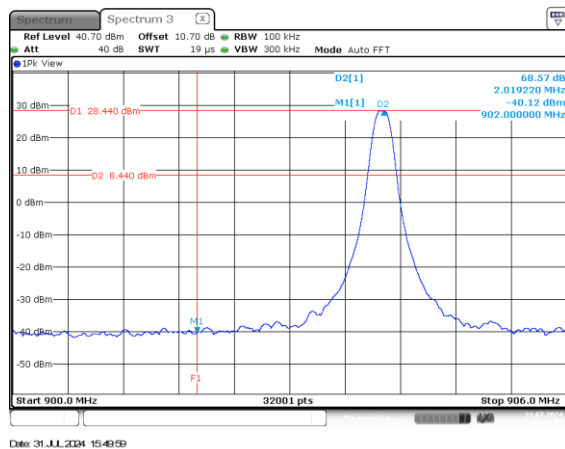


Figure 2.10.6-12: Upper Band edge – Mode 5 – MCS2





2.11 RF Conducted Spurious Emissions

2.11.1 Specification Reference

FCC Sections: 15.247(d)
ISED Canada: RSS-247 5.5

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

07/31/2024 to 08/02/2024

2.11.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center, and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100kHz. A peak detector function was used with the trace set to max hold.

If the maximum peak conducted output power procedure was used to determine compliance, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc). Mode 1 conducted spurious emissions attenuated by 20 dBc.

If maximum conducted (average) output power was used to determine compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc). Mode 5 band edge frequency attenuated by 30 dBc.

2.11.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

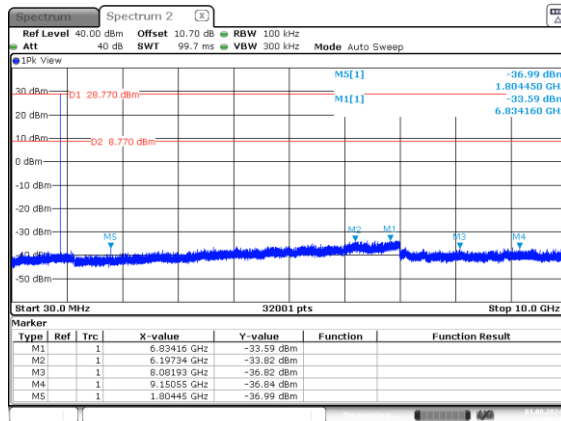
Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.11.6 Test Results

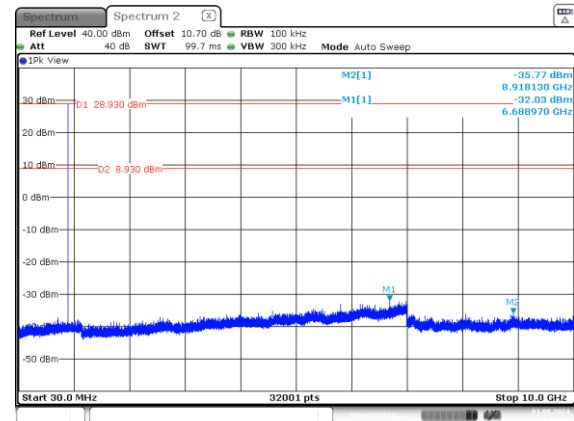
Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.

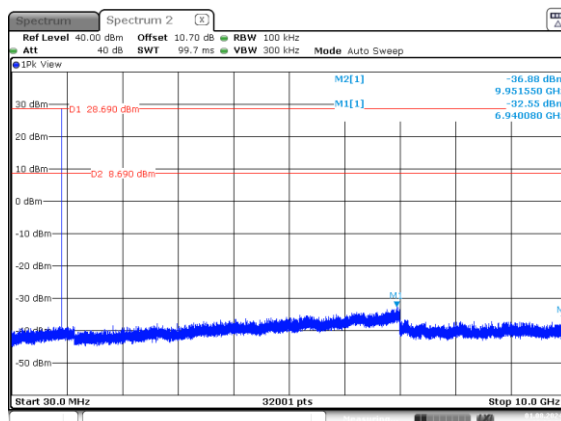


Date: 1 AUG 2024 09:55:32

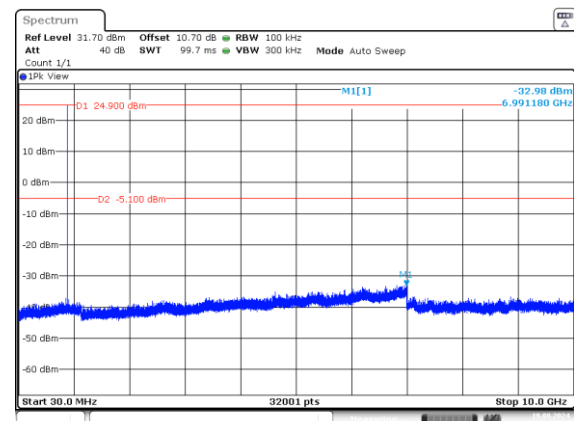


Date: 1 AUG 2024 10:00:04

Figure 2.11.6-1:30MHz – 10GHz – LCH – Mode 2 – 50kbps Figure 2.11.6-2:30MHz – 10GHz – MCH – Mode 2 – 50kbps

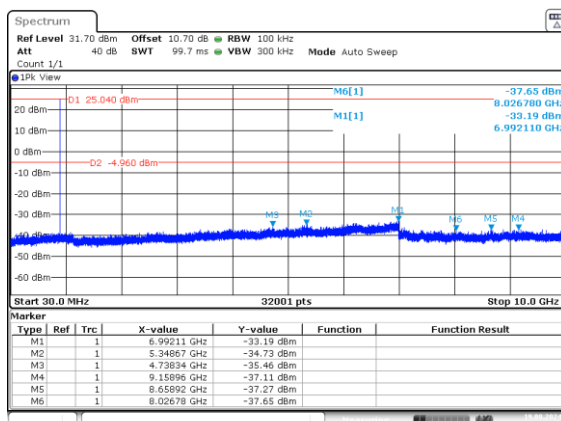


Date: 1 AUG 2024 10:02:01

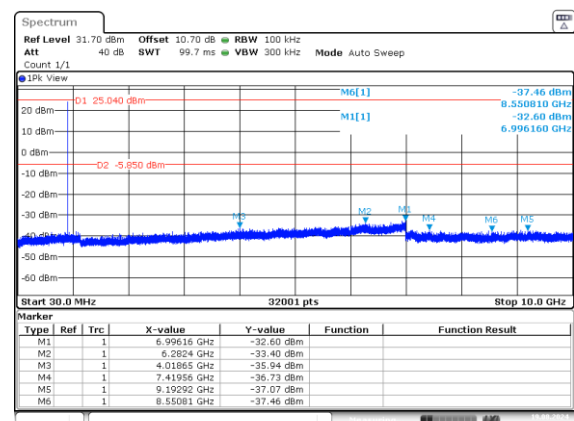


Date: 19 AUG 2024 14:50:28

Figure 2.11.6-3:30MHz – 10GHz – HCH – Mode 2 – 50kbps Figure 2.11.6-4:30MHz – 10GHz – LCH – Mode 5 – MCS2



Date: 19 AUG 2024 14:54:04



Date: 19 AUG 2024 14:57:37

Figure 2.11.6-5:30MHz – 10GHz – MCH – Mode 5 – MCS2 Figure 2.11.6-6:30MHz – 10GHz – HCH – Mode 5 – MCS2

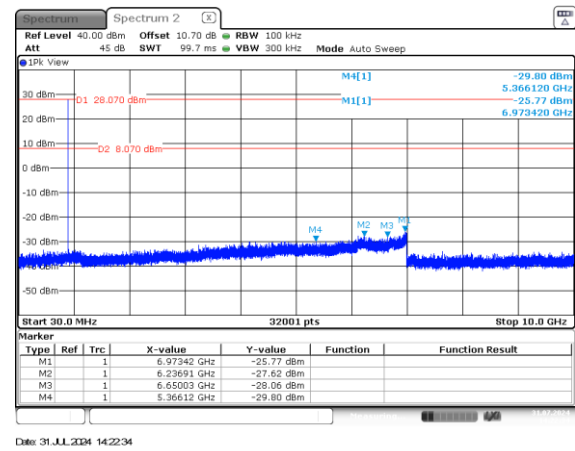
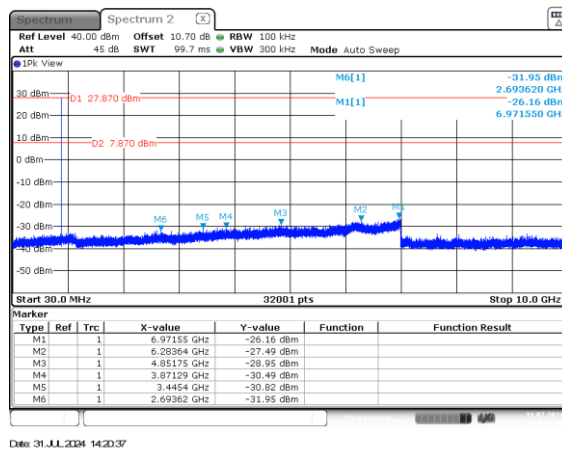


Figure 2.11.6-7:30MHz – 10GHz – LCH – Mode 7 – 9.6kbps Figure 2.11.6-8:30MHz – 10GHz – MCH – Mode 7 – 9.6kbps

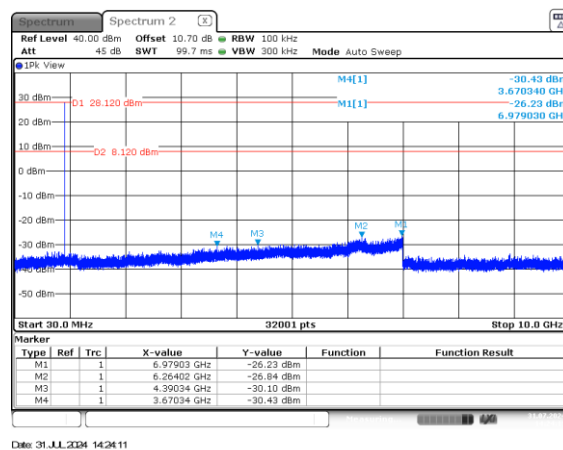


Figure 2.11.6-9:30MHz – 10GHz – HCH – Mode 7 – 9.6kbps



2.12 Radiated Spurious Emissions into Restricted Frequency Bands

2.12.1 Specification Reference

FCC Sections: 15.205, 15.209.
ISED Canada: RSS – Gen 8.9/8.10

2.12.2 Equipment Under Test and Modification State

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

2.12.3 Date of Test

08/01/2024 to 08/12/2024

2.12.4 Test Method

Radiated emissions tests were made over the frequency range of 9 kHz to 10 GHz, 10 times the highest fundamental frequency of 900 MHz. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in Section 15.209.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 150 kHz, quasi-peak measurements were made using a resolution bandwidth RBW of 200 Hz and a video bandwidth VBW of 1 kHz and frequencies between 150 kHz and 30MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 9 kHz and a video bandwidth VBW of 30 kHz. For frequencies between 30 MHz and 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements were made with RBW of 1 MHz and VBW of 3 MHz.

2.12.5 Environmental Conditions

The EUT was evaluated within the temperature, humidity and pressure range of the EUT as specified by the standard. The laboratory shall have an ambient temperature range of 15°C to 35°C, relative humidity range of 30% to 60% and atmospheric pressure range of 86 kPa to 106 kPa.

Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar



2.12.6 Test Results

Test Summary: EUT was set to transmit mode as per sections 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.

Table 2.12.6-1: Radiated Spurious Emissions Tabulated Data – Mode 2 – 50 kbps – Dipole Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dBμV/m	dBμV/m	dBμV/m	dBμV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.2 MHz									
271.991	----	18.403	----	46	----	-27.6	V	PASS	PASS
1075.775	38.839	23.868	74	54	-35.16	-30.13	H	PASS	PASS
1012.475	40.523	25.192	74	54	-33.48	-28.81	V	PASS	PASS
2706.725	44.891	30.225	74	54	-29.11	-23.77	H	PASS	PASS
3608.95	47.746	32.66	74	54	-26.25	-21.34	H	PASS	PASS
4511	48.282	34.215	74	54	-25.72	-19.78	H	PASS	PASS
2706.525	44.671	30.29	74	54	-29.33	-23.71	V	PASS	PASS
3609.025	47.315	32.652	74	54	-26.68	-21.35	V	PASS	PASS
4511.175	49.057	34.218	74	54	-24.94	-19.78	V	PASS	PASS
MCH – 915.0 MHz									
1011.075	39.136	26.231	74	54	-34.86	-27.77	V	PASS	PASS
2745.225	44.836	30.589	74	54	-29.16	-23.41	H	PASS	PASS
3660.1	47.678	32.846	74	54	-26.32	-21.15	H	PASS	PASS
4574.9	49.363	33.424	74	54	-24.64	-20.58	H	PASS	PASS
2745.025	45.414	30.596	74	54	-28.59	-23.4	V	PASS	PASS
3659.975	47.108	32.938	74	54	-26.89	-21.06	V	PASS	PASS
4574.85	47.82	33.324	74	54	-26.18	-20.68	V	PASS	PASS
HCH – 927.8 MHz									
271.99	----	19.171	----	46	----	-26.83	V	PASS	PASS
1003.725	39.493	25.108	74	54	-34.51	-28.89	H	PASS	PASS
1022.55	39.567	24.877	74	54	-34.43	-29.12	H	PASS	PASS
1023.675	40.349	24.965	74	54	-33.65	-29.03	V	PASS	PASS
1071.6	38.673	24.855	74	54	-35.33	-29.14	V	PASS	PASS
2783.6	45.669	30.145	74	54	-28.33	-23.86	H	PASS	PASS
3711	47.993	32.983	74	54	-26.01	-21.02	H	PASS	PASS
4639.05	47.891	33.294	74	54	-26.11	-20.71	H	PASS	PASS
2783.375	45.065	30.101	74	54	-28.94	-23.9	V	PASS	PASS
3711.4	47.286	33.012	74	54	-26.71	-20.99	V	PASS	PASS
4639	48.022	33.375	74	54	-25.98	-20.63	V	PASS	PASS



Table 2.12.6-2: Radiated Spurious Emissions Tabulated Data – Mode 2 – 50 kbps – Sector Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dBμV/m	dBμV/m	dBμV/m	dBμV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.2 MHz									
1046.325	38.184	24.693	74	54	-35.82	-29.31	H	PASS	PASS
2706.775	45.075	30.266	74	54	-28.93	-23.73	H	PASS	PASS
3608.9	47.186	32.678	74	54	-26.81	-21.32	H	PASS	PASS
2706.35	45.178	30.378	74	54	-28.82	-23.62	V	PASS	PASS
3608.825	47.374	32.626	74	54	-26.63	-21.37	V	PASS	PASS
MCH – 915.0 MHz									
1059.225	42.747	24.805	74	54	-31.25	-29.2	H	PASS	PASS
2744.925	44.741	30.507	74	54	-29.26	-23.49	H	PASS	PASS
3659.875	47.319	32.713	74	54	-26.68	-21.29	H	PASS	PASS
2744.75	44.717	30.527	74	54	-29.28	-23.47	V	PASS	PASS
3660.2	48.113	32.734	74	54	-25.89	-21.27	V	PASS	PASS
HCH – 927.8 MHz									
975.92	-----	22.687	-----	54	-----	-31.31	H	PASS	PASS
1059.825	42.462	28.435	74	54	-31.54	-25.57	H	PASS	PASS
2783.625	45.452	30.225	74	54	-28.55	-23.77	H	PASS	PASS
3711.2	48.324	33.056	74	54	-25.68	-20.94	H	PASS	PASS
2783.6	44.843	30.33	74	54	-29.16	-23.67	V	PASS	PASS
3711.3	48.652	34.051	74	54	-25.35	-19.95	V	PASS	PASS



Table 2.12.6-3: Radiated Spurious Emissions Tabulated Data – Mode 5 – MCS2 – Dipole Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dBµV/m	dBµV/m	dBµV/m	dBµV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.4 MHz									
113.859	-----	31.017	-----	43.5	-----	-12.48	H	PASS	PASS
137.648	-----	25.542	-----	43.5	-----	-17.96	H	PASS	PASS
113.617	-----	25.716	-----	43.5	-----	-17.78	V	PASS	PASS
271.991	-----	20.151	-----	46	-----	-25.85	V	PASS	PASS
1001.775	40.321	26.431	74	54	-33.68	-27.57	H	PASS	PASS
1011.425	39.771	26.099	74	54	-34.23	-27.9	H	PASS	PASS
1019.2	40.448	25.499	74	54	-33.55	-28.5	H	PASS	PASS
1014.925	38.758	27.901	74	54	-35.24	-26.1	V	PASS	PASS
1028.675	56.133	27.534	74	54	-17.87	-26.47	V	PASS	PASS
2707.45	45.08	30.281	74	54	-28.92	-23.72	H	PASS	PASS
3609.65	46.738	32.793	74	54	-27.26	-21.21	H	PASS	PASS
4511.9	50.122	34.382	74	54	-23.88	-19.62	H	PASS	PASS
2707.375	45.099	30.31	74	54	-28.9	-23.69	V	PASS	PASS
3609.35	48.166	32.849	74	54	-25.83	-21.15	V	PASS	PASS
4512.2	49.326	34.583	74	54	-24.67	-19.42	V	PASS	PASS
MCH – 915.2 MHz									
111.962	-----	29.453	-----	43.5	-----	-14.05	H	PASS	PASS
166.379	-----	8.801	-----	43.5	-----	-34.7	H	PASS	PASS
116.036	-----	23.377	-----	43.5	-----	-20.12	V	PASS	PASS
271.965	-----	18.89	-----	46	-----	-27.11	V	PASS	PASS
1002.9	39.248	26.82	74	54	-34.75	-27.18	H	PASS	PASS
1011.875	39.752	26.338	74	54	-34.25	-27.66	H	PASS	PASS
1020.3	48.486	25.589	74	54	-25.51	-28.41	H	PASS	PASS
1011.175	39.161	25.29	74	54	-34.84	-28.71	V	PASS	PASS
1021.825	39.576	25.722	74	54	-34.42	-28.28	V	PASS	PASS
2745.35	45.68	30.605	74	54	-28.32	-23.39	H	PASS	PASS
3661	47.5	32.859	74	54	-26.5	-21.14	H	PASS	PASS
4576.05	48.078	33.369	74	54	-25.92	-20.63	H	PASS	PASS
2745.775	45.406	30.643	74	54	-28.59	-23.36	V	PASS	PASS
3661.05	47.739	32.873	74	54	-26.26	-21.13	V	PASS	PASS
4575.95	50.649	33.48	74	54	-23.35	-20.52	V	PASS	PASS
HCH – 927.6 MHz									
114.294	-----	30.585	-----	43.5	-----	-12.91	H	PASS	PASS
113.567	-----	21.562	-----	43.5	-----	-21.94	V	PASS	PASS
272.025	-----	14.886	-----	46	-----	-31.11	V	PASS	PASS
1006.125	38.533	24.971	74	54	-35.47	-29.03	H	PASS	PASS



1013.325	40.079	25.255	74	54	-33.92	-28.75	H	PASS	PASS
1018.775	37.787	25.065	74	54	-36.21	-28.93	V	PASS	PASS
1023.425	58.483	29.057	74	54	-15.52	-24.94	V	PASS	PASS
2782.9	44.42	30.049	74	54	-29.58	-23.95	H	PASS	PASS
3710.65	47.742	33.005	74	54	-26.26	-20.99	H	PASS	PASS
4637.775	47.761	33.303	74	54	-26.24	-20.7	H	PASS	PASS
2782.725	44.518	30.057	74	54	-29.48	-23.94	V	PASS	PASS
3710.625	48.012	33.109	74	54	-25.99	-20.89	V	PASS	PASS
4637.9	48.194	33.432	74	54	-25.81	-20.57	V	PASS	PASS

Table 2.12.6-4: Radiated Spurious Emissions Tabulated Data – Mode 5 – MCS2 – Sector Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dBμV/m	dBμV/m	dBμV/m	dBμV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.4 MHz									
272	-----	20.023	-----	46	-----	-25.98	V	PASS	PASS
1011.05	57.878	39.461	74	54	-16.12	-14.54	H	PASS	PASS
1026.1	54.367	37.216	74	54	-19.63	-16.78	H	PASS	PASS
1059.475	49.982	33.428	74	54	-24.02	-20.57	H	PASS	PASS
1000.65	60.589	36.179	74	54	-13.41	-17.82	V	PASS	PASS
1027.55	56.016	31.341	74	54	-17.98	-22.66	V	PASS	PASS
2707.05	45.017	30.312	74	54	-28.98	-23.69	H	PASS	PASS
3609.825	48.04	32.914	74	54	-25.96	-21.09	H	PASS	PASS
4512.25	52.307	36.389	74	54	-21.69	-17.61	H	PASS	PASS
2707.425	44.847	30.62	74	54	-29.15	-23.38	V	PASS	PASS
3609.625	47.644	33.254	74	54	-26.36	-20.75	V	PASS	PASS
4511.975	52.346	36.639	74	54	-21.65	-17.36	V	PASS	PASS
MCH – 915.2 MHz									
271.99	-----	20.525	-----	46	-----	-25.48	V	PASS	PASS
1002.15	54.831	25.915	74	54	-19.17	-28.08	H	PASS	PASS
1023.35	52.798	25.303	74	54	-21.2	-28.7	H	PASS	PASS
1030.5	54.257	25.537	74	54	-19.74	-28.46	H	PASS	PASS
1003.425	57.762	26.091	74	54	-16.24	-27.91	V	PASS	PASS
1020.725	54.637	25.511	74	54	-19.36	-28.49	V	PASS	PASS
1032.2	55.832	25.791	74	54	-18.17	-28.21	V	PASS	PASS
2745.8	45.311	30.897	74	54	-28.69	-23.1	H	PASS	PASS
3661.05	47.803	33.092	74	54	-26.2	-20.91	H	PASS	PASS
4575.75	50.647	35.455	74	54	-23.35	-18.54	H	PASS	PASS
2745.85	45.961	31.078	74	54	-28.04	-22.92	V	PASS	PASS



3660.85	48.601	33.938	74	54	-25.4	-20.06	V	PASS	PASS
4576.05	51.365	36.016	74	54	-22.64	-17.98	V	PASS	PASS
HCH – 927.6 MHz									
133.33	-----	14.759	-----	43.5	-----	-28.74	V	PASS	PASS
271.99	-----	20.802	-----	46	-----	-25.2	V	PASS	PASS
1001.7	57.975	41.05	74	54	-16.02	-12.95	H	PASS	PASS
1028.95	55.613	38.049	74	54	-18.39	-15.95	H	PASS	PASS
1052.925	55.343	37.568	74	54	-18.66	-16.43	H	PASS	PASS
1000.525	59.775	36.683	74	54	-14.23	-17.32	V	PASS	PASS
1028.3	56.22	32.461	74	54	-17.78	-21.54	V	PASS	PASS
1068.05	49.08	27.521	74	54	-24.92	-26.48	V	PASS	PASS
2783.025	46.05	30.227	74	54	-27.95	-23.77	H	PASS	PASS
3710.425	47.916	33.095	74	54	-26.08	-20.91	H	PASS	PASS
2782.875	44.629	30.191	74	54	-29.37	-23.81	V	PASS	PASS
3710.525	47.536	33.57	74	54	-26.46	-20.43	V	PASS	PASS
4637.825	51	35.499	74	54	-23	-18.5	V	PASS	PASS



Table 2.12.6-5: Radiated Spurious Emissions Tabulated Data – Mode 7 – 9.6 kbps – Dipole Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB μ V/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.3 MHz									
2707.05	45.06	30.505	74	54	-28.94	-23.5	H	PASS	PASS
3609.425	47.813	33.391	74	54	-26.19	-20.61	H	PASS	PASS
2706.725	46.72	30.509	74	54	-27.28	-23.49	V	PASS	PASS
3609.5	49.682	36.258	74	54	-24.32	-17.74	V	PASS	PASS
4337.85	49.065	34.542	74	54	-24.94	-19.46	V	PASS	PASS
MCH – 915.2 MHz									
2745.725	45.454	31.006	74	54	-28.55	-22.99	H	PASS	PASS
3660.55	48.414	33.156	74	54	-25.59	-20.84	H	PASS	PASS
3660.725	48.858	35.436	74	54	-25.14	-18.56	V	PASS	PASS
HCH – 927.8 MHz									
2783.4	44.933	30.665	74	54	-29.07	-23.33	H	PASS	PASS
3711.2	47.302	35.17	74	54	-26.7	-18.83	H	PASS	PASS
2783.375	45.133	32.867	74	54	-28.87	-21.13	V	PASS	PASS
3711.3	49.188	36.466	74	54	-24.81	-17.53	V	PASS	PASS



Table 2.12.6-6: Radiated Spurious Emissions Tabulated Data – Mode 7 – 9.6 kbps – Sector Antenna

Frequency	Peak Value	QP/Avg Value	Peak Limit	QP/Avg Limit	Peak Margin	QP/Avg Margin	Polarity	Peak Limit Results	QP/Avg Limit Results
MHz	dBμV/m	dBμV/m	dBμV/m	dBμV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH - 902.3 MHz									
2706.875	45.393	30.828	74	54	-28.61	-23.17	H	PASS	PASS
3609.3	47.094	33.065	74	54	-26.91	-20.94	H	PASS	PASS
2706.925	45.004	30.595	74	54	-29	-23.41	V	PASS	PASS
3609.45	48.125	33.053	74	54	-25.87	-20.95	V	PASS	PASS
MCH – 915.2 MHz									
2745.725	45.356	30.799	74	54	-28.64	-23.2	H	PASS	PASS
3660.8	47.458	33.879	74	54	-26.54	-20.12	H	PASS	PASS
4576.125	47.928	33.516	74	54	-26.07	-20.48	H	PASS	PASS
2745.55	45.221	30.874	74	54	-28.78	-23.13	V	PASS	PASS
3661.025	47.066	33.34	74	54	-26.93	-20.66	V	PASS	PASS
4576.175	48.228	33.56	74	54	-25.77	-20.44	V	PASS	PASS
HCH – 927.8 MHz									
2783.45	45.029	30.608	74	54	-28.97	-23.39	H	PASS	PASS
3711.225	48.289	33.487	74	54	-25.71	-20.51	H	PASS	PASS
2783.6	45.594	30.78	74	54	-28.41	-23.22	V	PASS	PASS
3711.1	49.192	34.342	74	54	-24.81	-19.66	V	PASS	PASS



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Radiated Emissions, Under 1GHz

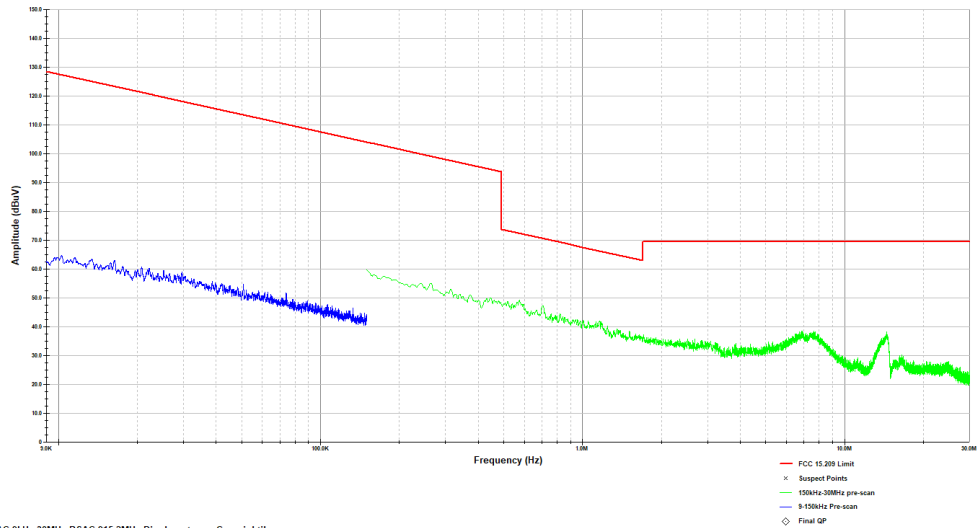
HV Graph

Company - L+G

Model - S6G2-mSBR

Config - 915.2MHz GSP mode dipole antenna

Operator - Shree



FCC 15.209 BSAC 9kHz-30MHz BSAC 915.2MHz Dipole antenna Co-axial.ttl

Last Data Update 12:32:52 PM, Monday, August 12, 2024

Figure 1: Reference plot for Radiated Spurious Emissions – 9 kHz – 30 MHz – Mode 7 – MCH – Dipole Antenna

TUV EMC Lab

Radiated Emissions, Under 1GHz

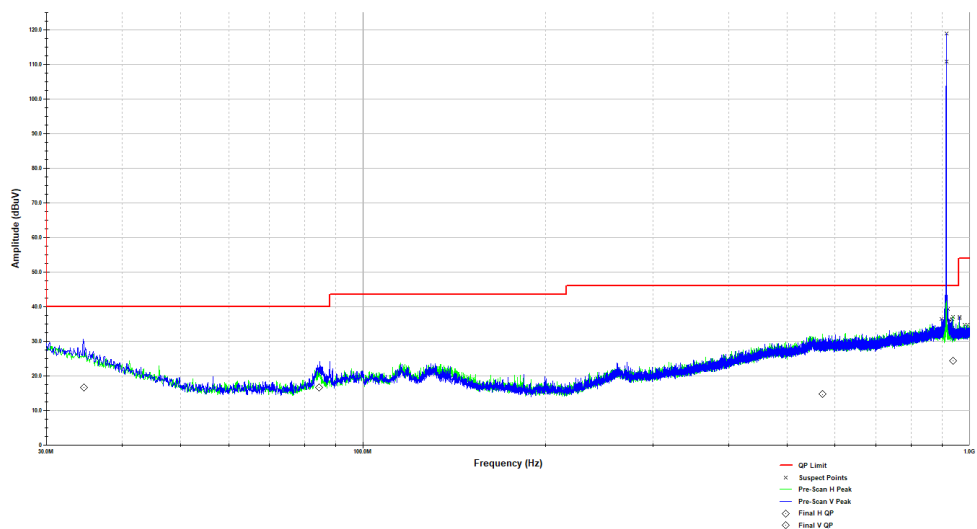
HV Graph

Company - L+G

Model - S6G2-mSBR

Config - 915MHz WSN mode FHSS - Dipole antenna

Operator - Shree



FCC 15.209 RSE 30-1000MHz BSAC 915 MHz Dipole antenna.ttl

Last Data Update 09:47:45 AM, Monday, August 05, 2024

Figure 2: Reference plot for Radiated Spurious Emissions – 30 MHz – 1 GHz – Mode 2 – MCH - Dipole Antenna

Note: Emissions within restricted bands were evaluated.



TUV EMC Lab

Company - L+G

Radiated Emissions, Above 1GHz

Model - 56G2 mSBR

HV Graph

Config - 915MHz WSN Mode FHSS Dipole antenna

Operator - Diviya

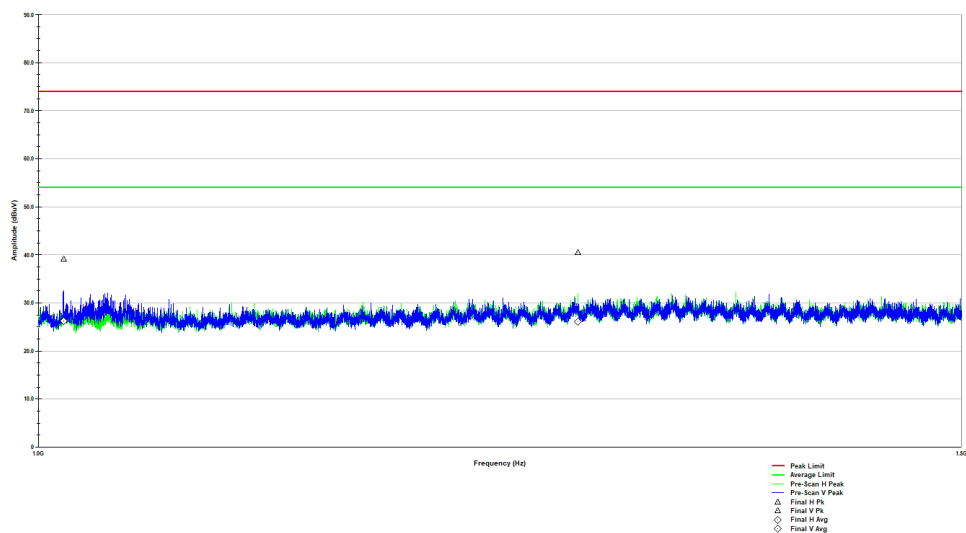


Figure 3: Reference plot for Radiated Spurious Emissions – 1 GHz – 1.5 GHz – Mode 1 – MCH – Dipole Antenna

TUV EMC Lab

Company - L+G

Radiated Emissions, Above 1GHz

Model - 56G2 mSBR

HV Graph

Config - 915 MHz WSN mode FHSS Dipole antenna

Operator - Diviya

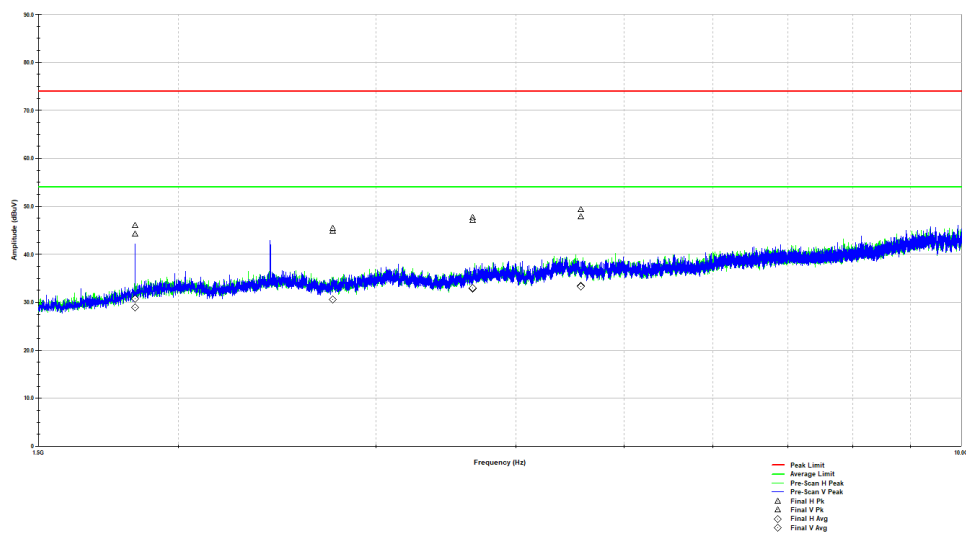


Figure 4: Reference plot for Radiated Spurious Emissions – 1.5 GHz – 10 GHz – Mode 1 – MCH – Dipole Antenna

Note: Emissions within restricted bands were evaluated.



2.13 Test Equipment Used

Table 2.13-1 –Equipment List

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
628	EMCO	6502	Active Loop Antenna 10kHz-30MHz	9407-2877	06/20/2023	06/20/2025
853	Teseq	CBL6112D	BiLog Antenna	51616	7/26/2023	7/26/2025
884	ETS Lindgren (EMCO)	3117	DOUBLE-RIDGED GUIDE ANTENNA	240106	5/16/2023	5/16/2025
889	Com Power	PAM 103	Pre-amplifier	18020215	10/02/2023	10/02/2024
338	Hewlett Packard	8449B	High Frequency Pre-Amp	3008A01111	6/18/2024	6/18/2026
882	Rohde & Schwarz	ESW44	ESW44 EMI TEST RECEIVER	101961	6/18/2024	6/18/2025
22	Teledyne Storm Microwave	90-195-456	BSAC Cable	N/A	07/15/2024	07/15/2025
20	Teledyne Storm Microwave	R-90-195-036	BSAC Cable	N/A	07/15/2024	07/15/2025
21	Teledyne Storm Microwave	R-90-195-072	BSAC Cable	N/A	07/15/2024	07/15/2025
337	Microwave Circuits	H1G513G1	Microwave filter	282706	06/03/2024	06/03/2025
827	Rohde & Schwarz	RF Cable set	TS8997 Rack cable set	N/A	01/02/2024	01/02/2025
622	Rohde & Schwarz	FSV40 (v3.40)	FSV Signal Analyzer 10Hz to 40GHz	101338	12/06/2023	12/06/2024
267	Hewlett Packard	N1911A	Power Meter	MY45100129	06/22/2023	06/22/2025
268	Hewlett Packard	N1921A	Power Sensor	MY45240184	08/22/2023	08/22/2025
346	Aero flex /Weinschel	54A-10	10dB Attenuator	T1362	06/20/2024	06/20/2025
872	HP	E7402A	EMI Receiver	US40240258	6/20/2024	6/20/2025
871	ACS	n/a	Conducted EMI Cable	871	03/22/2024	03/22/2025
3010	Rohde & Schwarz	ENV216	Two-Line V-Network	3010	6/18/2024	6/18/2025

N/A – Not Applicable

3 Diagram of Test Set-ups

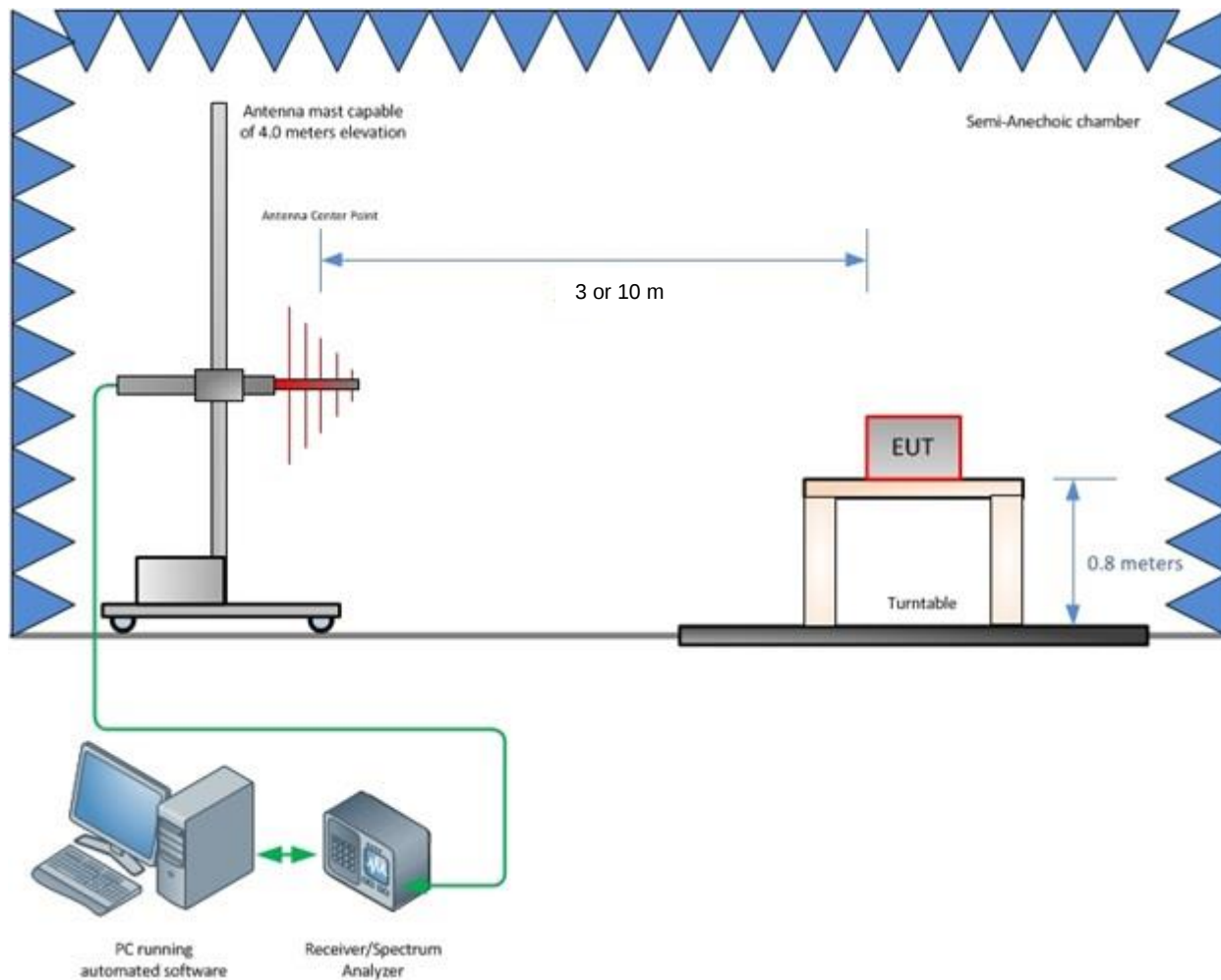


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

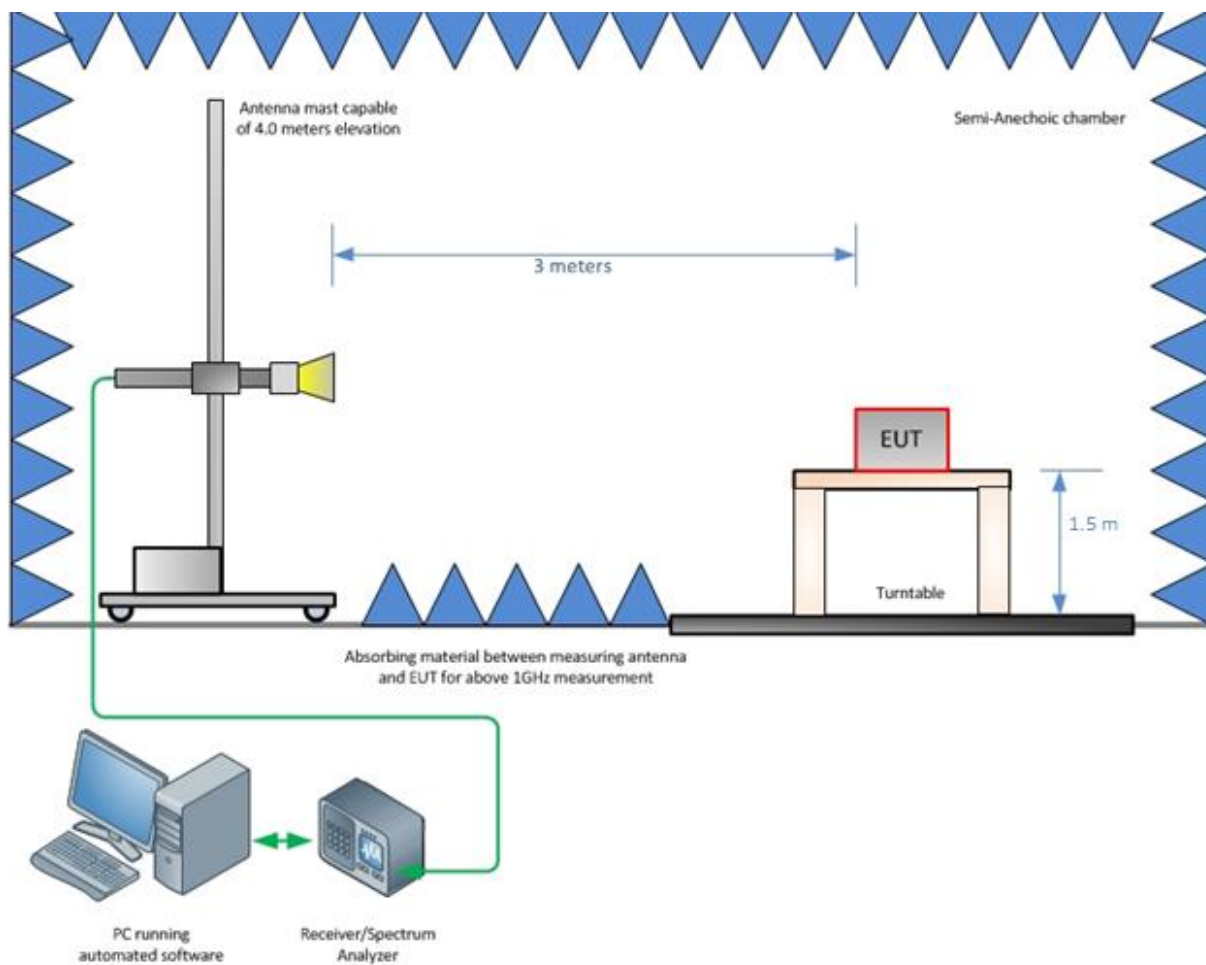


Figure 3-2 – Radiated Emissions Test Setup above 1 GHz

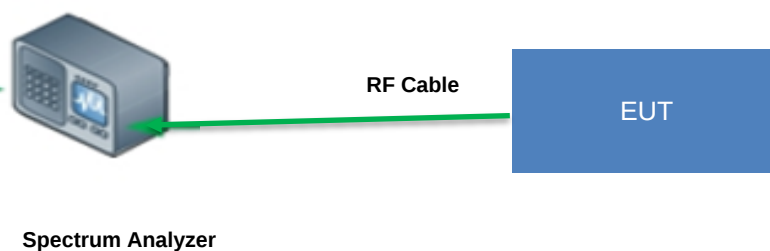


Figure 3-3 – Conducted Test Setup: Antenna Port measurement



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STATEMENT OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) $k = 1.96$ which provide confidence levels of 95%.

Table 4-1: Estimation of Measurement Uncertainty

Parameter	U_{lab}
Occupied Channel Bandwidth	$\pm 0.009 \%$
RF Conducted Output Power	$\pm 0.349 \text{ dB}$
Power Spectral Density	$\pm 0.372 \text{ dB}$
Antenna Port Conducted Emissions	$\pm 1.264 \text{ dB}$
Radiated Emissions $\leq 1 \text{ GHz}$	$\pm 5.814 \text{ dB}$
Radiated Emissions $> 1 \text{ GHz}$	$\pm 4.318 \text{ dB}$
Temperature	$\pm 0.860 \text{ }^{\circ}\text{C}$
Radio Frequency	$\pm 2.832 \times 10^{-8}$
AC Power Line Conducted Emissions	$\pm 3.360 \text{ dB}$

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.