

Report on the Testing of the Mueller MS-H-Radio-LN

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

Prepared for: Mueller Systems
1200 Abernathy Rd
Atlanta, GA 30328



America

**Add value.
Inspire trust.**

COMMERCIAL-IN-CONFIDENCE

Document Number: AT72185599.1C0

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Kirby Munroe	Wireless / EMC Technical and Certification Manager, North America TUV SUD America Inc.	Authorized Signatory	2/24/2023

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 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.



A2LA Cert. No. 2955.09

DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD America with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD America. No part of this document may be reproduced without the prior written approval of TÜV SÜD America.
© TÜV SÜD.

ACCREDITATION

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

TÜV SÜD America
5945 Cabot Parkway, Suite 100
Alpharetta, GA 3005

Phone: 678-341-5900
www.tuv-sud-america.com

TÜV SÜD

TÜV®



Contents

1	Report Summary	3
1.1	Report Modification Record.....	3
1.2	Introduction.....	3
1.3	Brief Summary of Results	5
1.4	Product Information	6
1.5	Deviations from the Standard.....	8
1.6	EUT Modification Record	8
1.7	Test Location	9
2	Test Details	10
2.1	Antenna Requirement	10
2.2	Power Line Conducted Emissions	11
2.3	Peak Output Power	14
2.4	RF Conducted Spurious Emissions	16
2.5	Radiated Spurious Emissions into Restricted Frequency Bands.....	19
2.6	Test Equipment Used.....	23
3	Diagram of Test Set-ups.....	24
4	Accreditation, Disclaimers and Copyright.....	26



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	2/24/2023

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 to support a permissive change to add the new host MS-H-Radio-LN to limited modular approved FCC ID: SM6-RMXR / IC: 9235A-RMXR.

The limited module does not contain its own power regulation and relies on the host to supply the proper regulated voltages; therefore, an evaluation of the combination host / module is required.

Applicant	Ran Zhou
Manufacturer	Mueller Systems
Applicant's Email Address	rzhou@muellerwp.com
Host Model Name/Number(s)	MS-H-Radio-LN
Serial Number(s)	41010275
Module FCC ID	SM6-RMXR
Module ISED Certification Number	9235A-RMXR
Hardware Version(s)	N/A
Software Version(s)	N/A
Number of Samples Tested	1 (Unit #2)
Test Specification/Issue/Date	US Code of Federal Regulation (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2022 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 2, February 2017.
Order Number	72185599
Date of Receipt of EUT	12/13/2022



Start of Test	1/4/2023
Finish of Test	1/6/2023
Related Document(s)	<p>ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device.</p> <p>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</p> <p>US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2022.</p> <p>ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1 (March 2019), Amendment 2 (February 2021)</p>



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	-----	10
Carrier Frequency Separation	No	Not Tested	15.247(a)(1)	RSS-247 5.1(b)	-----
Number of Hopping Channels	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(c)	-----
Channel Dwell Time (FHSS / Hybrid)	No	Not Tested	15.247(a)(1)(i) 15.247(f)	RSS-247 5.1(c) RSS-247 5.3(a)	-----
20 dB Bandwidth	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(c)	-----
99% Bandwidth	No	Not Tested	-----	RSS-GEN 6.7	-----
Peak Output Power	Yes	Pass	15.247(b)(2)	RSS-247 5.4(a)	14
Band-Edge Compliance of RF Conducted Emissions	No	Not Tested	15.247(d)	RSS-247 5.5	-----
RF Conducted Spurious Emissions	Yes	Pass	15.247(d)	RSS-247 5.5	16
Radiated Spurious Emissions into Restricted Frequency Bands	Yes	Pass	15.205, 15.209	RSS-GEN 8.9, 8.10	19
Power Line Conducted Emissions	Yes	Pass	15.207	RSS-GEN 8.8	11
Duty Cycle	No	-----			-----

NOTE: Based on the module limitations, only those tests impacted by the combination of host and module were evaluated.



1.4 Product Information

1.4.1 Technical Description

The MS-H-Radio-LN is intended to serve as a portable, battery powered gateway between a MiTech device and Mi.Net devices. The MS-H-Radio-LN provides direct RF access for configuration, control and test of Mi.Net RF enabled products from a MiTech device.

The connection between the MiTech device and Installation tool is made via a Bluetooth connection. The connection between the Installation tool and the Mi.Net devices shall be made via a 900 MHz radio link.

MS-H-Radio-LN consist of the Repeater Radio Module which operates on 902.5 – 927.35 MHz FHSS technology; LMA FCC ID: SM6-RMXR / IC: 9235A-RMXR. The system uses 2 modes of operation data modes which uses 50 channels form 902.5 to 927MHz. The system also has a hailing mode consist of 50 hailing channels from 902.65 to 927.35 MHz MS-H-Radio-LN also consist of Bluetooth module, which contains a Bluetooth 4.0 + EDR compatible module (FCC ID: A8TBM78ABCDEF GH / IC: 12246A-BM78SPPS5M2) enabling the use to communicate data through a Wireless interface.

Only 900 MHz data is represented in this report. Simultaneous transmission between the Bluetooth pre-approved module and Mueller 900 MHz limited module (LMA) is addressed in a separate report.

Table 1.4.1-1 – Wireless Technical Information – 900 MHz

Detail	Description
Module FCC ID	SM6-RMXR
Module ISED Canada Certification Number	9235A-RMXR
HVIN	MS-H-RADIO
PMN	MS-H-RADIO-LN
Frequency Range	902.5 – 927.35 MHz
Modulation Format	FSK
Antenna Type / Description:	PCB Trace antenna / 4.8dBi

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



Figure 1.4.1-1 –Front view of the Host EUT



Figure 1.4.1-2 – Back view of the Host EUT

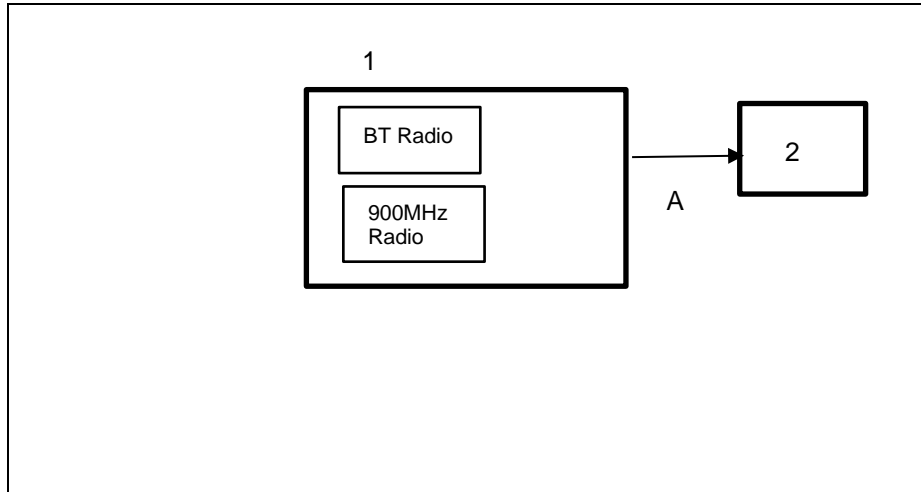


Figure 1.4.1-3 – Test Setup Block Diagram

Table 1.4.1-2 – Cable Descriptions

Item	Cable/Port	Description
A	USB Cable	Programming Cable

Table 1.4.1-3 – Support Equipment Descriptions

Item	Make/Model	Description
1	MS-H-Radio-LN	MiTech Field Radio
2	Lenovo	Laptop used for configuring wireless module



1.4.2 Modes of Operation

This test report documents the compliance Repeater Radio Module which operates on 902.5 – 927.35 MHz FHSS technology in the host device MS-H-Radio-LN.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Stack / Mode	Data Rates Supported (kbps)
1	902.5 – 927	50	250	FHSS	9600bps
2	902.65 – 927.35 (Hailing Frequency)	50	150	FHSS	9600bps

1.4.3 Monitoring of Performance

For radiated emissions, the EUT was evaluated in an orientation of typical use. See test setup photos for more information. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

For RF Conducted peak power & Spurious Emissions measurements, the EUT was connected to the test equipment with an MMCX to SMA connector. The EUT was programmed to generate a continuously modulated signal.

Radiated and conducted testing were evaluated on EUT with battery mode.

Following test cases were evaluated as per the client requested.

Test case	Modulation / Data rate	Tested Frequency (MHz)
Peak output power	FSK / 9600bps	902.5 – 915 – 927.35
Conducted Spurious Emissions	FSK / 9600bps	902.5 – 915 – 927.35
Radiated spurious emissions	FSK / 9600bps	902.5 – 915 – 927.35

Power setting during test: 9

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
AC Power Line Conducted Emissions	Divya Adusumilli	A2LA
Peak Output Power	Divya Adusumilli	A2LA
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

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 Test

1/6/2023

2.1.4 Test Method

N/A

2.1.5 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

2.1.6 Test Results

The 900 MHz module utilizes a PCB trace antenna with 4.8dBi gain and Bluetooth radio utilizes integrated chip antenna with 1.65 dBi gain. 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

1/6/2023

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	24 °C
Relative Humidity	43 %
Atmospheric Pressure	982.1 mbar



2.2.6 Test Results

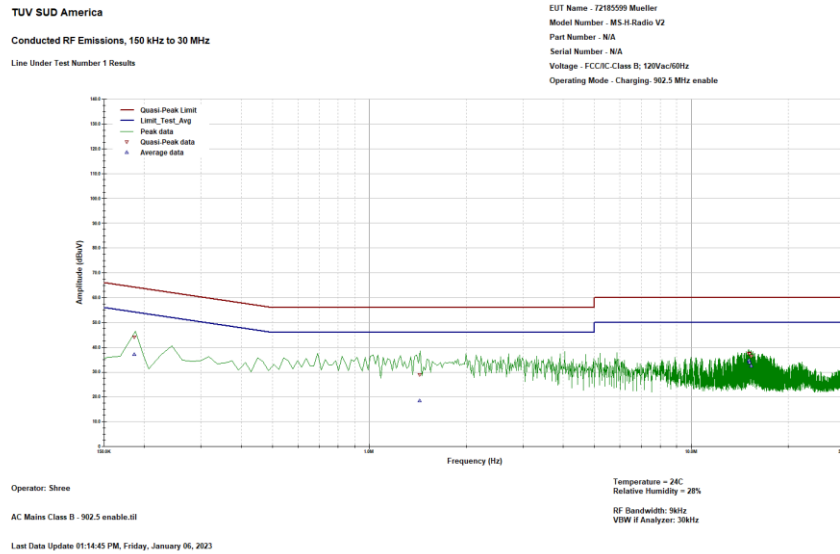


Figure 2.2.6-1 – Graphical Results – AC Mains L1 Plot

Table 2.2.6-1 – Conducted Emissions Results on the AC Power Port (L1)

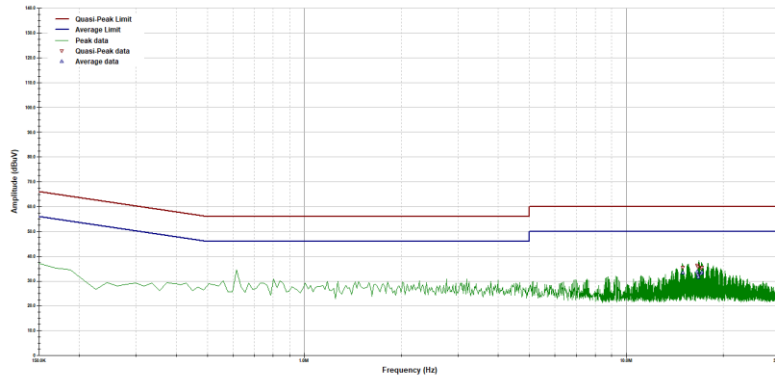
Frequency (MHz)	Avg Limit	Avg Level Corr	Avg Level	Corr Fact.	Avg Margin	Result
0.19	55	37.2	27.5	9.677	-17.8	PASS
1.43	46	18.4	8.7	9.706	-27.6	PASS
15.07	50	34.6	24.6	9.971	-15.4	PASS
15.08	50	34.7	24.7	9.971	-15.3	PASS
15.14	50	33.9	23.9	9.971	-16.1	PASS
15.32	50	32.5	22.5	9.973	-17.5	PASS

Frequency (MHz)	QP Limit	QP Level Corr	QP Level	Corr Fact.	QP Margin	Result
0.19	65	44.1	34.5	9.677	-20.8	PASS
1.43	56	28.9	19.2	9.706	-27.1	PASS
15.07	60	37.5	27.5	9.971	-22.5	PASS
15.08	60	37.5	27.6	9.971	-22.5	PASS
15.14	60	37.4	27.5	9.971	-22.6	PASS
15.32	60	36.3	26.4	9.973	-23.7	PASS



TUV SUD America
 Conducted RF Emissions, 150 kHz to 30 MHz
 Line Under Test Number 2 Results

EUT Name - 72185599 Mueller
 Model Number - MS-H-Radio V2
 Part Number - N/A
 Serial Number - N/A
 Voltage - FCC/IC Class B, 120Vac/60Hz
 Operating Mode - Charging 902.5 MHz enable



Operator: Shree
 AC Mains Class B - 902.5 enable.tif
 Last Data Update 01:41:13 PM, Friday, January 06, 2023

Temperature - 24C
 Relative Humidity - 28%
 RF Bandwidth: 9kHz
 VSWR Analyzer: 20kHz

Figure 2.2.6-2 – Graphical Results – AC Mains N Plot

Table 2.2.6-2 – Conducted Emissions Results on the AC Power Port (N)

Frequency (MHz)	Avg Limit	Avg Level Corr	Avg Level	Corr Fact.	Avg Margin	Result
14.97	50	33.4	23.4	10.009	-16.6	PASS
16.63	50	33.9	23.9	10.033	-16.1	PASS
16.68	50	32.4	22.4	10.034	-17.6	PASS
16.74	50	31.4	21.3	10.035	-18.6	PASS
17.11	50	33.2	23.1	10.046	-16.8	PASS
17.18	50	33.5	23.5	10.049	-16.5	PASS

Frequency (MHz)	QP Limit	QP Level Corr	QP Level	Corr Fact.	QP Margin	Result
14.97	60	35.5	25.5	10.009	-24.5	PASS
16.63	60	36.3	26.3	10.033	-23.7	PASS
16.68	60	35.7	25.7	10.034	-24.3	PASS
16.74	60	32.3	22.2	10.035	-27.7	PASS
17.11	60	35.3	25.2	10.046	-24.7	PASS
17.18	60	35.5	25.4	10.049	-24.5	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

1/6/2023

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 section 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.



Table 2.3.6-1: RF Output Power

Frequency [MHz]	Peak Output Power (dBm)	Data Rate (bps)
902.5	26.57	9600
915.00	27.10	9600
927.35	27.60	9600



2.4 RF Conducted Spurious Emissions

2.4.1 Specification Reference

FCC Section 15.247(d)
ISED Canada RSS – 247 5.5

2.4.2 Equipment Under Test and Modification State

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

2.4.3 Date of Test

1/6/2023

2.4.4 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). Conducted spurious emissions attenuated by 20 dBc.

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.

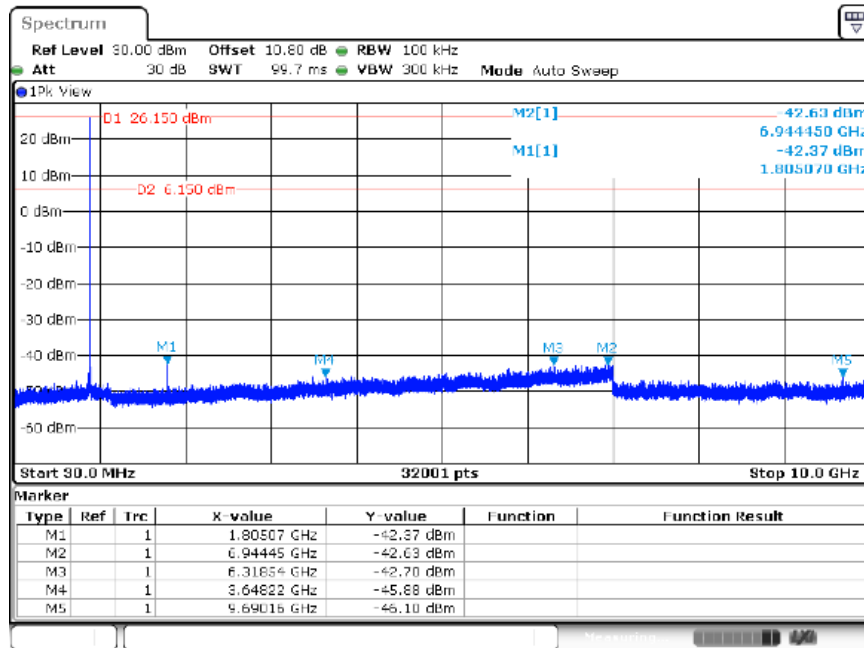
Ambient Temperature	22.3 °C
Relative Humidity	53.8 %
Atmospheric Pressure	972.2 mbar

2.4.6 Test Results

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

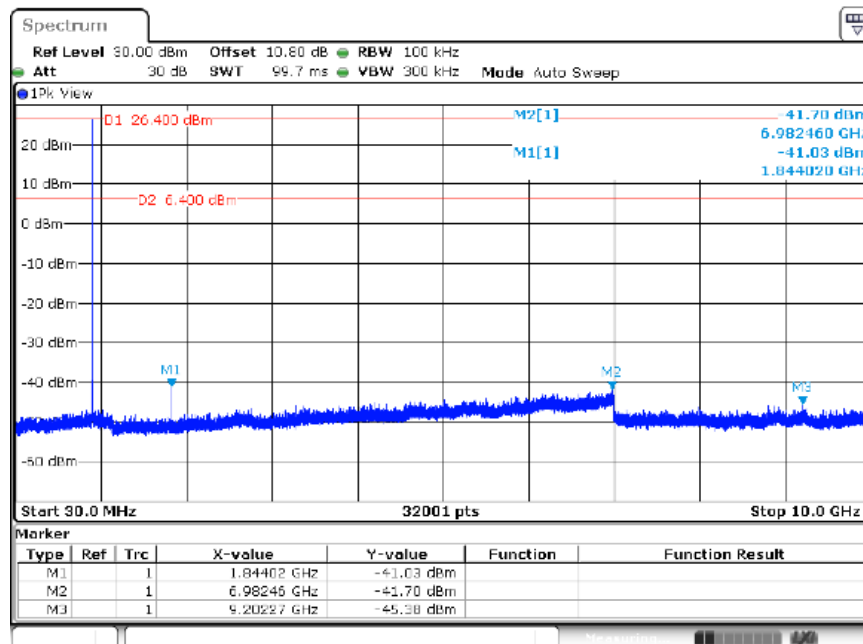
Test Results: Pass

See data below for detailed results.



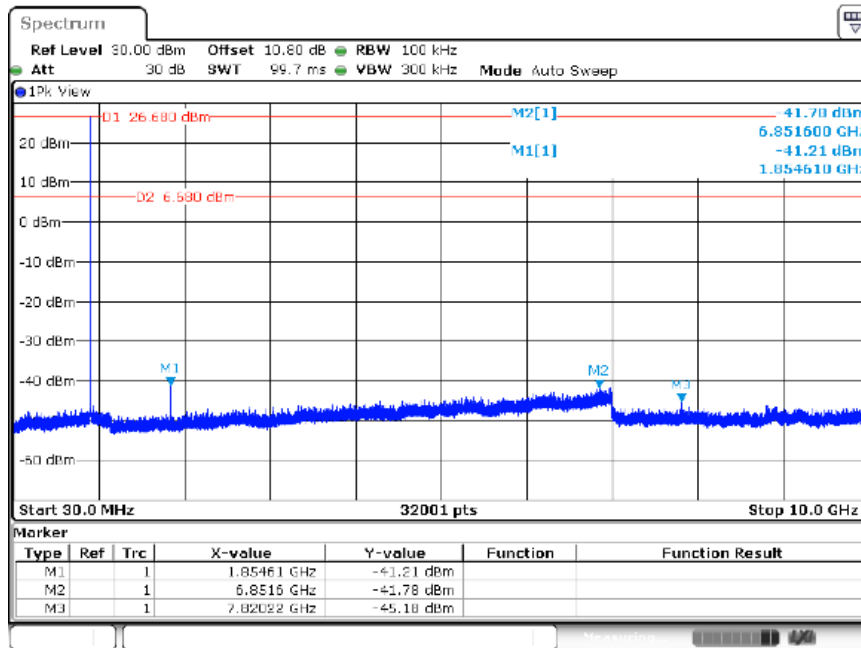
Date: 6 JUN 2023 14:04:04

Figure 2.4.6-1: 30MHz-10 GHz- LCH



Date: 6 JUN 2023 14:10:14

Figure 2.4.6-2: 30MHz-10 GHz- MCH



Date: 6.JAN.2023 14:13:43

Figure 2.4.6-3: 30MHz-10 GHz- HCH



2.5 Radiated Spurious Emissions into Restricted Frequency Bands

2.5.1 Specification Reference

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

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

01/04/2023 to 01/06/2023

2.5.4 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 300 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 10 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 100 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.

2.5.5 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 1.4.2 / 1.4.3.

Test Results: Pass

See data below for detailed results.

Table 2.5.6-1: Radiated Spurious Emissions Tabulated Data

Frequency	Peak Value	Avg Value	Peak Limit	Avg Limit	Peak Margin	Avg Margin	Antenna Polarity	Peak Limit Results	Avg Limit Results
MHz	dBµV/m	dBµV/m	dBµV/m	dBµV/m	dB	dB	H/V	Pass/Fail	Pass/Fail
LCH									
2707.525	54.756	50.35	74	54	-19.24	-3.65	H	PASS	PASS
3609.975	50.198	41.325	74	54	-23.8	-12.67	H	PASS	PASS
4512.475	51.071	39.728	74	54	-22.93	-14.27	H	PASS	PASS
2707.475	54.786	50.182	74	54	-19.21	-3.82	V	PASS	PASS
3609.95	49.456	38.299	74	54	-24.54	-15.7	V	PASS	PASS
4512.475	50.749	41.531	74	54	-23.25	-12.47	V	PASS	PASS
MCH									
2744.975	52.837	48.333	74	54	-21.16	-5.67	H	PASS	PASS
3660.025	49.003	37.382	74	54	-25	-16.62	H	PASS	PASS
4575.05	50.628	39.564	74	54	-23.37	-14.44	H	PASS	PASS
2745.025	53.357	49.243	74	54	-20.64	-4.76	V	PASS	PASS
3659.975	49.609	39.499	74	54	-24.39	-14.5	V	PASS	PASS
4575.025	50.759	38.608	74	54	-23.24	-15.39	V	PASS	PASS
HCH									
2782.025	52.229	47.433	74	54	-21.77	-6.57	H	PASS	PASS
4636.725	49.284	38.356	74	54	-24.72	-15.64	H	PASS	PASS
2782.025	50.983	45.188	74	54	-23.02	-8.81	V	PASS	PASS
3709.4	48.498	36.453	74	54	-25.5	-17.55	V	PASS	PASS
4636.725	50.67	41.671	74	54	-23.33	-12.33	V	PASS	PASS

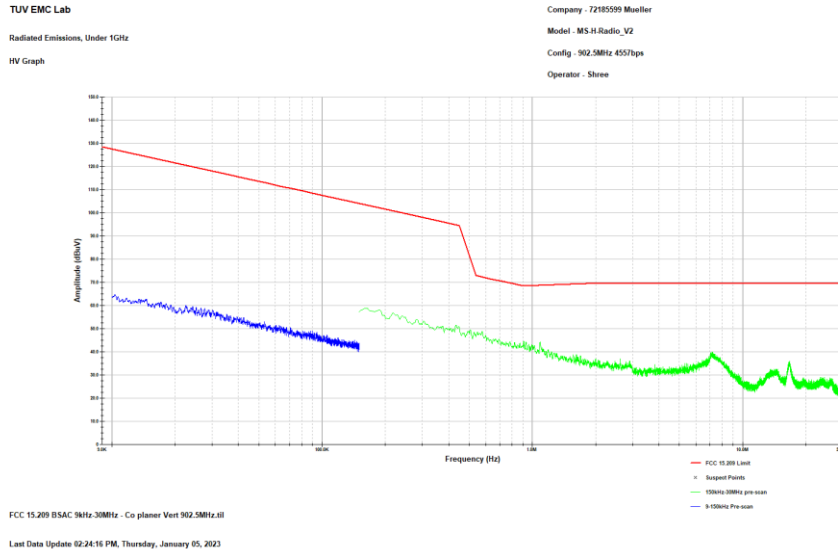


Figure 1: Reference plot for Radiated Spurious Emissions – 9 kHz – 30 MHz -LCH

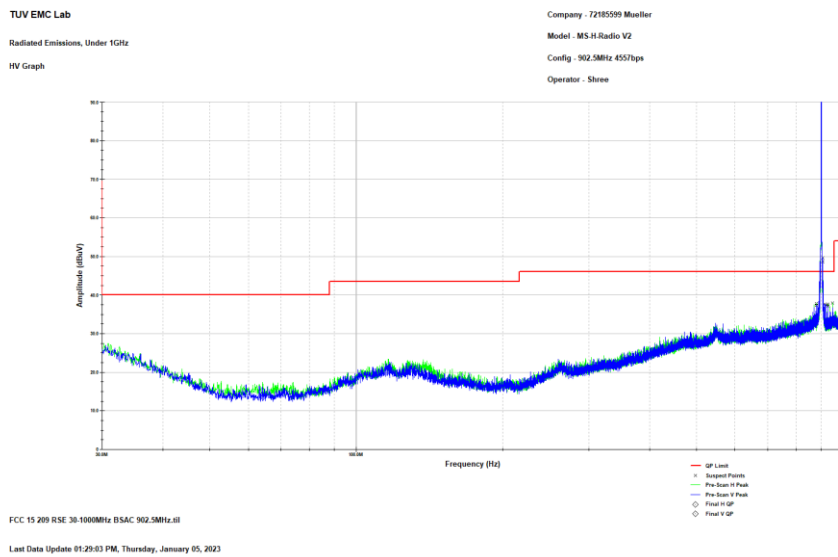


Figure 2: Reference Plot for Radiated Spurious Emissions – 30 MHz – 1 GHz -LCH

Note: Peak above the limit line is fundamental frequency.

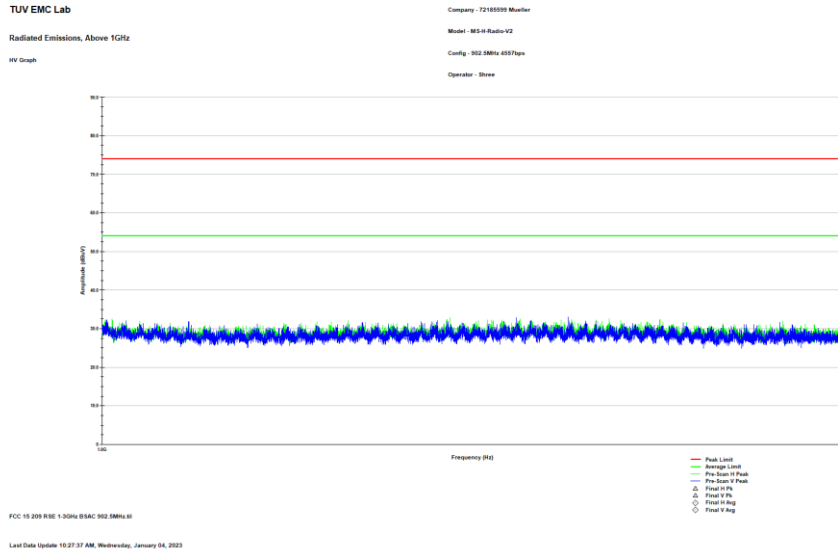


Figure 3: Reference plot for Radiated Spurious Emissions – 1 GHz – 1.5 GHz – LCH

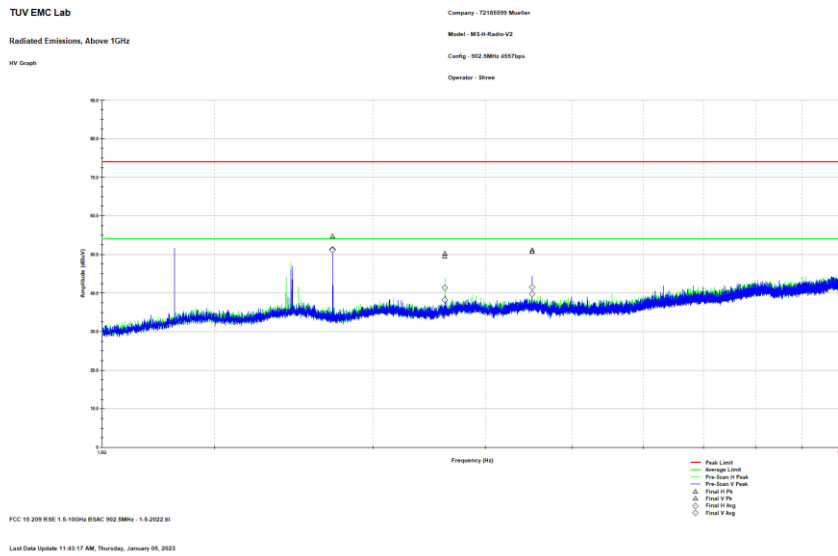


Figure 4: Reference plot for Radiated Spurious Emissions – 1.5 GHz – 10 GHz – LCH

Note: Radiated spurious with in restricted bands only were evaluated.



2.6 Test Equipment Used

Table 2.6-1 –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	06/08/2021	06/08/2023
853	Teseq	CBL6112D	BiLog Antenna	51616	7/15/2021	7/15/2023
884	ETS Lindgren (EMCO)	3117	DOUBLE-RIDGED GUIDE ANTENNA	240106	5/6/2021	5/6/2023
889	Com Power	PAM 103	Pre-amplifier	18020215	9/27/2022	9/27/2023
338	Hewlett Packard	8449B	High Frequency Pre-Amp	3008A01111	6/22/2021	6/22/2023
882	Rohde & Schwarz	ESW44	ESW44 EMI TEST RECEIVER	101961	7/14/2022	7/14/2023
22	Teledyne Storm Microwave	90-195-456	BSAC Cable	N/A	10/7/2022	10/7/2023
20	Teledyne Storm Microwave	R-90-195-036	BSAC Cable	N/A	7/12/2022	7/12/2023
21	Teledyne Storm Microwave	R-90-195-072	BSAC Cable	N/A	7/12/2022	7/12/2023
267	Hewlett Packard	N1911A	Power Meter	MY45100129	07/27/2021	07/27/2023
331	Microwave Circuits	H1G513G1	High pass Filter	31417	5/31/2022	5/31/2023
827	Rohde & Schwarz	RF Cable set	TS8997 Rack cable set	N/A	12/21/2022	12/21/2023
622	Rohde & Schwarz	FSV40 (v3.40)	FSV Signal Analyzer 10Hz to 40GHz	101338	10/05/2022	10/05/2023
872	HP	E7402A	EMI Receiver	US40240258	6/21/2022	6/21/2023
871	ACS	n/a	Conducted EMI Cable	871	4/1/2022	4/1/2023
3010	Rohde & Schwarz	ENV216	Two-Line V-Network	3010	6/22/2022	6/22/2023

N/A – Not Applicable

3 Diagram of Test Set-ups

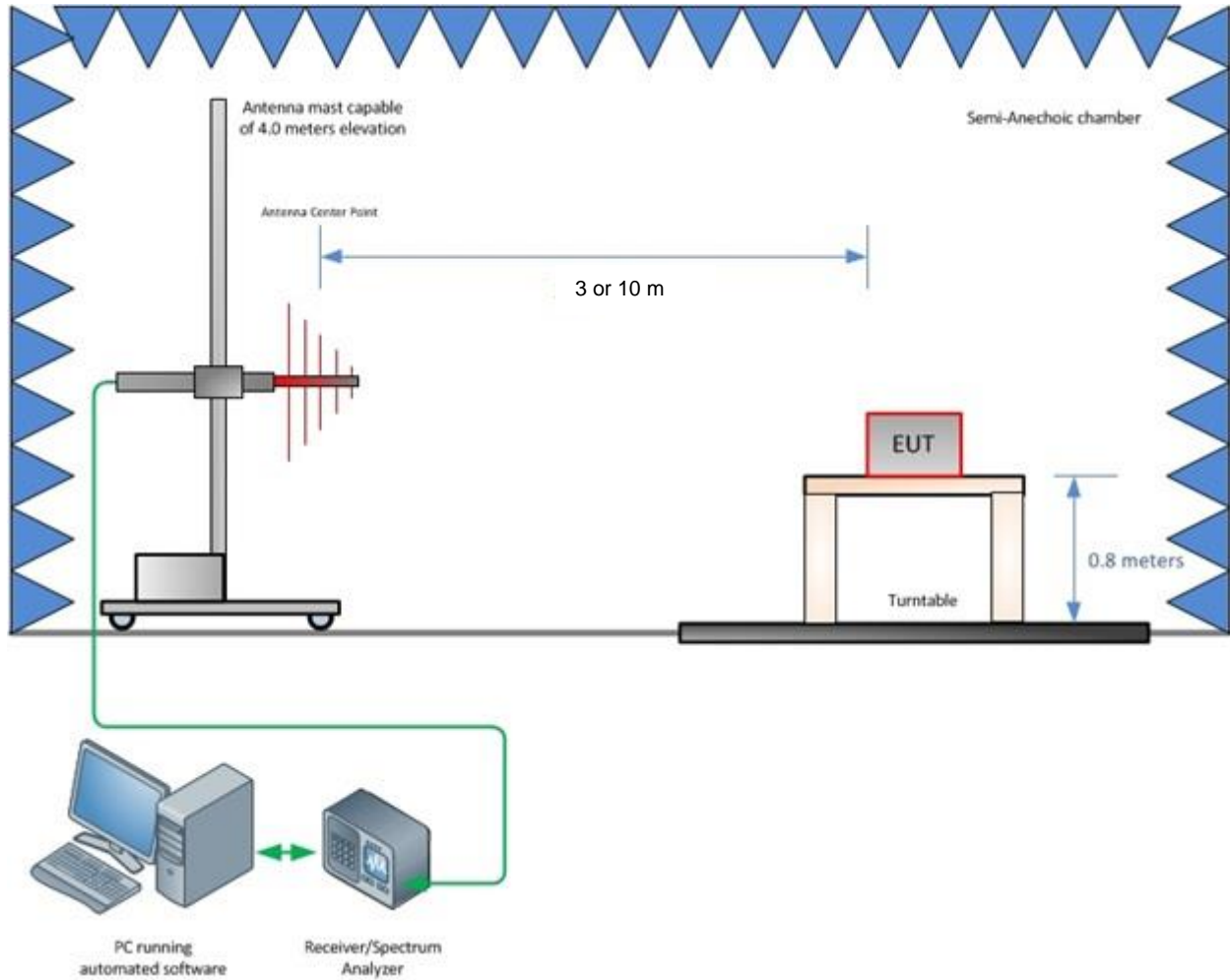


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

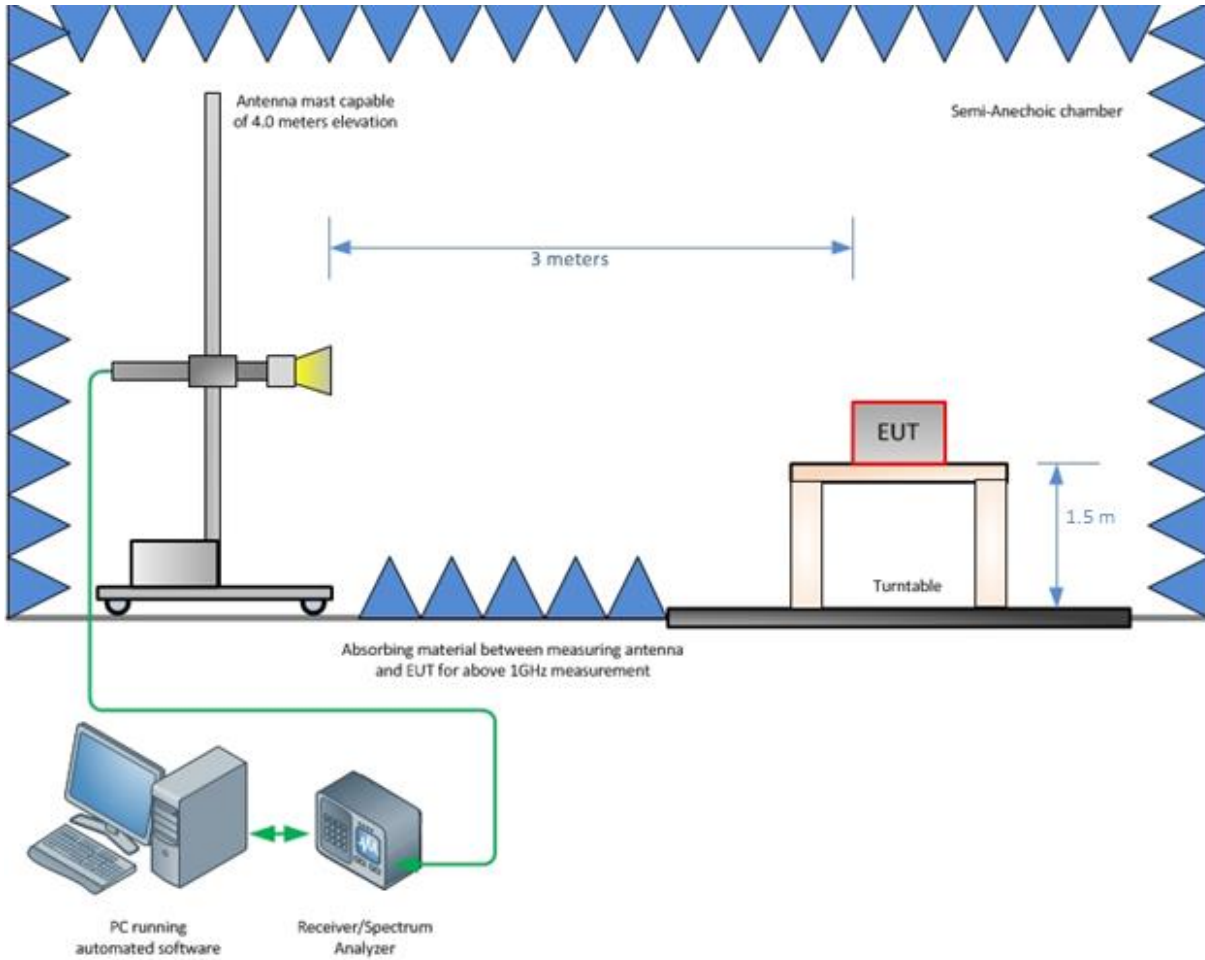


Figure 3-2 – Radiated Emissions Test Setup above 1 GHz

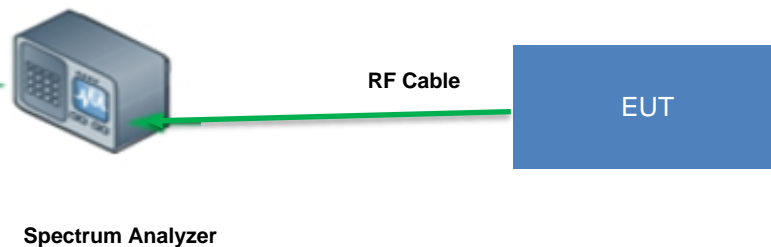


Figure 3-3 – Conducted Test Setup: Antenna Port measurement



4 Accreditation, Disclaimers and Copyright

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

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}
RF Conducted Output Power	± 0.349 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	$\pm 2.832 \times 10^{-8}$
AC Power Line Conducted Emissions	± 3.360 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.