FCC and ISED Canada Testing of the

Masimo Corporation
Sterling-LWB5

In accordance with FCC 47 CFR part 15.247 and ISED Canada's Radio Standards Specifications RSS-247

America

Add value.
Inspire trust.

Prepared for: Masimo Corporation
52 Discovery
Irvine, CA 92618

FCC ID: VKF-IRISA1
IC: 7362A-IRISA1

COMMERCIAL-IN-CONFIDENCE

Document Number: TP72157766.400 | Version Number: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Peter Walsh	2020 -October-07	
Testing	Thierry Jean-Charles	2020-October-07	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

FCC Accreditation Designation Number US1063 Tampa, FL Test Laboratory	Innovation, Science, and Economic Development Canada Accreditation Site Number 2087A-2 Tampa, FL Test Laboratory

EXECUTIVE SUMMARY
Samples of this product were tested and found to be in compliance with 15.247 and ISED Canada's RSS-247

A2LA Cert. No. 2955.15

TÜV SÜD America
5610 West Sligh Ave., Suite 100
Tampa, FL 33634

Phone: 813-284-2715
www.tuv-sud-america.com

Contents

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.

Issue	Description of Change	Date of Issue
1	First Issue	2020-October-07

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.

The evaluation is investigating continued compliance of the Masimo Corporation wireless module, model Sterling-LWB5 (FCC ID: VKF-IRISA1, IC: 7362A-IRISA1), when integrated within the Masimo Corporation model ISirona host product. The module utilizes a new antenna type under the new host condition, thus requiring a Class II Permissive Change. There are no additional changes to the product.

Applicant	Masimo Corporation
Manufacturer	Laird Connectivity
Applicant's Email Address	Phillip.warren@masimo.com
Model Number(s)	Sterling-LWB5
FCC ID	VKF-IRISA1
ISED Certification Number	7362A-IRISA1
Host Model Number	ISirona
Host Serial Number(s)	SY5A0762807
Host Hardware Version(s)	Revision D
Host Software Version(s)	1.0.0
Number of Samples Tested	1
Test Specification/Issue/Date	US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2019 Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017
Test Plan/Issue/Date	2020-January-27
Order Number	72157766
Date	2020-February-21
Date of Receipt of EUT	2020-May-27
Start of Test	2020-June-02
Finish of Test	2020-July-14
Name of Engineer(s)	Thierry Jean-Charles and Jean N. Rene
Related Document(s)	ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2019. Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN - General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1, March 2019.

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	No	Not Tested	15.247(a)(1)	RSS-247 5.1(b)	
Number of Hopping Channels	No	Not Tested	15.247(a)(1)(iii)	RSS-247 5.1(d)	
Channel Dwell Time	Yes	Pass	15.247(a)(1)(iii)	RSS-247 5.1(d)	12
20 dB Bandwidth	No	Not Tested	15.247(a)(1)(i)	RSS-247 5.1(a)	
99% Bandwidth	No	Not Tested	-------	RSS-GEN 6.6	
Peak Output Power	No	Not Tested	15.247(b)(3)	RSS-247 5.4(d)	
Band-Edge Compliance of RF Conducted Emissions	No	Not Tested	15.247(d)	RSS-247 5.5	
RF Conducted Spurious Emissions	No	Not Tested	15.247(d)	RSS-247 5.5	
Radiated Spurious Emissions into Restricted Frequency Bands	Yes	Pass	15.205, 15.209	RSS-GEN 8.9, 8.10	16
Power Line Conducted Emissions	No	Not Tested	15.207	RSS-GEN 8.8	

1.4 Product Information

1.4.1 Technical Description

The EUT is an integrated 802.11 a/b/g/n/ac WLAN, Bluetooth and BLE module. The EUT was evaluated when integrated within the Masimo ISirona host configuration with a new antenna type.

Technical Details
Mode of Operation: Frequency Hopping Spread Spectrum (FHSS)
Frequency Range: 2402 MHz - 2480 MHz
Number of Channels: 79
Channel Separation: 1 MHz
Data Rate: 1 Mbps (GFSK), 2 Mbps (EDR2), 3 Mbps (EDR3)
Modulations: GFSK, π/4 DQPSK (EDR2), 8 DPSK (EDR3)
Antenna Type/Gain: Molex Antenna Model 1461531100 / 3 dBi
Input Power: 5 VDC, Host power Supply

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

Table 1.4.1-1 – Cable Descriptions

Cable/Port	Description
Ethernet	Unshielded, EUT to remote laptop.
(6) Shuttle / USB	900-00001 with 1-meter serial cable and loop ack (3-meter cable for EFT test)
Power Cord	1.5 m, not shielded, power supply to EUT
Power Cord	1.8m, not shielded, power supply to AC Mains

Table 1.4.1-2 – Support Equipment Descriptions

Make/Model	Description
Masimo / ISirona	Host Device, SN: SY5A0762807
Masimo / HK-AD-050A500-D5	5VDC Power supply for ISirona
Dell / Latitude E7250	Laptop, SN: 8BCHF72
Dell / LA65NS2-01	19.5V AC Adapter, SN: CN-06TM1C-72438-54L-8611-A04

Note:

The Dell laptop and power supply were used as a support equipment for testing purposes and were outside of the test environment.

Declaration of Build Status

EQUIPMENT DESCRIPTION	
Model Name/Number	Sterling-LWB5 Module / (HVIN & PMN) Sterling-LWB5
Part Number	450-0162
Hardware Version	
Software Version	
FCC ID (if applicable)	VKF-IRISA1
ISED ID (if applicable)	7362A-IRISA1
Technical Description (Please provide a brief description of the intended use of the equipment)	802.11a/b/g/n/ac dual-band LWAN and Bluetooth Module

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	5850MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	32.768kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	☐	☐	
External DC	Nominal Voltage		Maximum Current
	3.7VDC		
Battery	Nominal Voltage		Battery Operating End Point Voltage
	N/A		N/A

EXTREME CONDITIONS					
Maximum temperature	+40	°C	Minimum temperature	+5	°C

Ancillaries
Please list all ancillaries which will be used with the device.

I hereby declare that the information supplied is correct and complete.

Name: Phillip Warren

Position held: Manager, Engineering Date: 26-June-2020

1.4.2 Modes of Operation

The EUT was evaluated while integrated within the ISirona host device for the Bluetooth radio.

1.4.3 Monitoring of Performance

The host device was set in the orientation of typical installation.

The EUT was evaluated for the Bluetooth Radio set to the low, middle and high channels corresponding to 2402, 2441, 2480 MHz, respectively.

The EUT was configured using the test power settings defined by the module manufacturer.

1.4.4 Performance Criteria

The EUT was evaluated for radiated band-edge and spurious emissions within the restricted bands to determine compliance for the new antenna/host configuration.

The dwell time in a 100 ms period was measured in order to determine the duty cycle correction factor for the average radiated emissions levels.

Table 1.4.4 -1: Performance Criteria

Parameter	Requirement
Antenna Requirement	FCC: Section 15.203. 15.204
Dwell Time	FCC; Section 15.247(a)(1)(iii); ISED Canada; RSS-247 5.1(d)
Radiated Spurious Emissions into Restricted Frequency Bands	FCC: Sections 15.205, 15.209; ISED Canada: RSS-GEN 8.9, 8.10

1.5 Deviations from the Standard

The EUT was evaluated without any deviation from the test standards.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme. 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

The equipment was tested as provided without any modifications.

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Tampa FL Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
AC Powered Operating		
Antenna Requirement	Thierry Jean-Charles	A2LA
Dwell Time	Thierry Jean-Charles	A2LA
Radiated Spurious Emissions into Restricted Frequency Bands	Thierry Jean-Charles and Jean N. Rene	A2LA

Office Address:

TÜV SÜD America, Inc.
5610 W. Sligh Ave, Suite 100
Tampa, FL 33634
USA

2 Test Details

2.1 Antenna Requirements

2.1.1 Specification Reference

FCC: Section 15.203, 15.204

2.1.2 Equipment Under Test and Modification State

SN: SY5A0762807

2.1.3 Date of Test

7/1/2020

2.1.4 Test Method

N/A

2.1.5 Environmental Conditions

Ambient Temperature	N/A
Relative Humidity	N/A
Atmospheric Pressure	N/A

2.1.6 Test Results

Limit Clause FCC Sections: 15.203, 15,204

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The EUT in the ISirona host configuration uses a Molex Antenna Model 1461531100 / 3 dBi with an I-PEX MHF4 connector. The EUT meets the requirements of FCC Section 15.203.

2.1.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

As this was a visual inspection, no test equipment was used.

2.2 Channel Dwell Time

2.2.1 Specification Reference

FCC: Section 15.247(a)(1)(iii)
ISED Canada: RSS-247 5.1(d)

2.2.2 Equipment Under Test and Modification State

SN: SY5A0762718

2.2.3 Date of Test

6/29/2020

2.2.4 Test Method

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer was set 0 Hz centered on a hopping channel. The RBW was set to ≤ the channel spacing, and the sweep time adjusted to capture the entire dwell time per channel with peak detector max hold function.

2.2.5 Environmental Conditions

Ambient Temperature	24.5°C
Relative Humidity	48 %
Atmospheric Pressure	1013.6 mbar

2.2.6 Test Results

AC Powered Operating

Limit Clause FCC Part 15.247(a)(1)(iii); ISED RSS-247 5.1 (d)

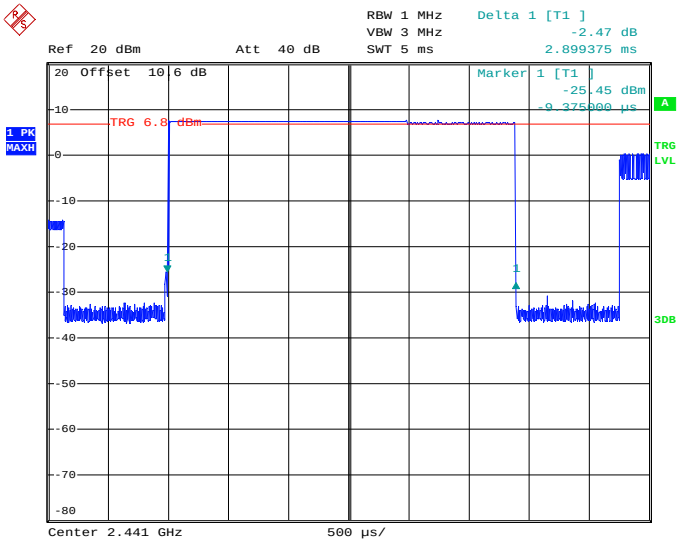

Figure 2.2.6-1: Dwell Time – GFSK – DH5

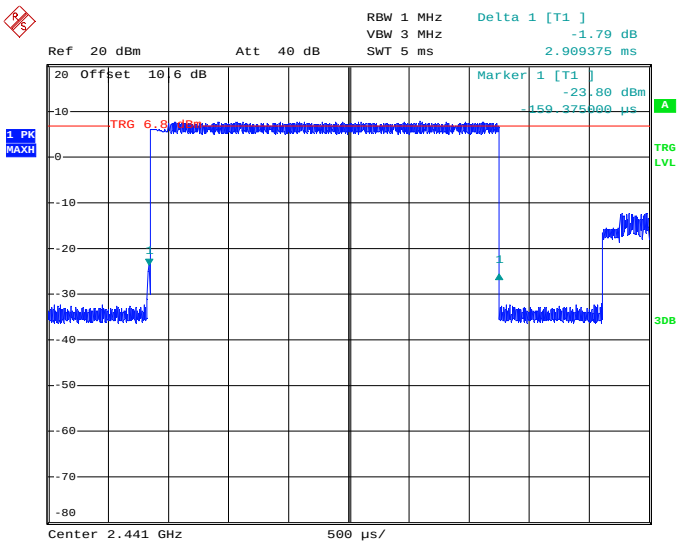

Figure 2.2.6-2: Dwell Time – EDR2 – 2-DH5

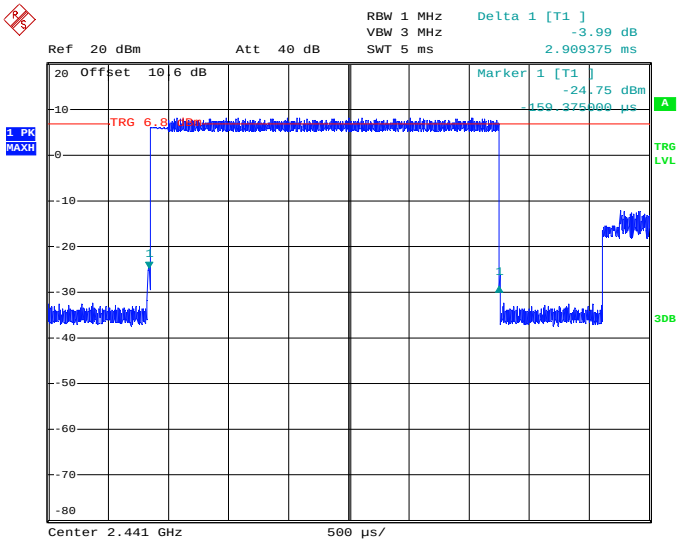

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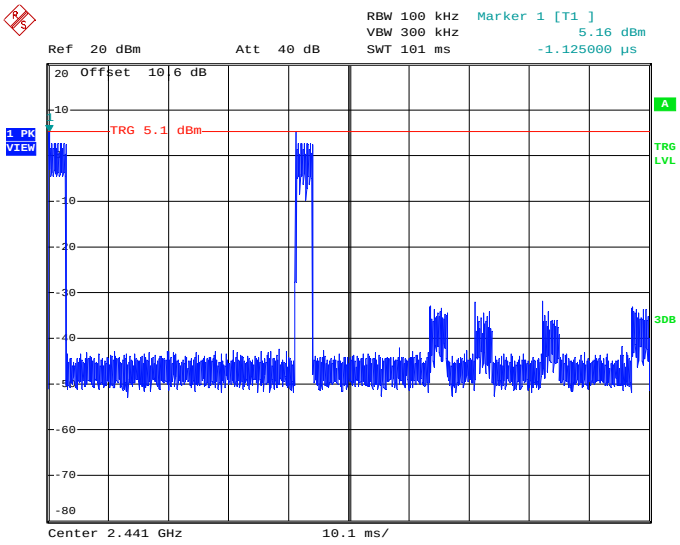
Figure 2.2.6-3: Dwell Time – EDR3 – 3-DH5



Date: 29.JUN.2020 21:01:53

Figure 2.2.6-4: Worst Case Number of Occurrences over 100ms

2.2.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSP40	BEMC00283	4.50 SP5	24	04-Oct-2021
Attenuator 10dB, 2.9 mm-M/F, DC-40GHz 2 W	Aeroflex Inmet	40AH2W-10	BEMC02110	N/A	12	27-Jul-2020
Duratest High Frequency Cable, 26.5GHz	Teledyne Storm Products	921-0101-036	BEMC02112	N/A	12	12-Oct-2020

TU - Traceability Unscheduled
O/P MON - Traceability Unscheduled
N/A - Not Applicable

2.3 Radiated Spurious Emissions into Restricted Frequency Bands

2.3.1 Specification Reference

FCC Sections: 15.205, 15.209;
ISED Canada: RSS-GEN 8.9, 8.10

2.3.2 Equipment Under Test and Modification State

SN: SY5A0762807

2.3.3 Date of Test

6/23/2020 to 7/14/2020

2.3.4 Test Method

Radiated emissions tests were made over the frequency range of 9 kHz to 26 GHz, 10 times the highest fundamental frequency. 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.

For measurements below 30 MHz, the receive antenna height was set to 1 m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

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 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 measurements are made with RBW of 1 MHz and VBW of 3 MHz.

2.3.5 Duty Cycle Correction

The EUT was configured to transmit at 100% duty cycle during the evaluation. A Duty Cycle Correction of 5.819% corresponding to 20*log(5.819/100) = -24.7 dB was applied to the peak measurements for the corrected average results.

The duty cycle correction factor was determined from the worst-case dwell time over 100 ms period.

Duty cycle = Dwell Time * Number of Occurrences / 100 ms
= 2.909375 ms *2 / 100 ms
= 5.819 ms / 100ms
= 5.819 %

2.3.6 Environmental Conditions

Ambient Temperature	25 °C
Relative Humidity	33 %
Atmospheric Pressure	1016.5 mbar

2.3.7 Test Results

AC Powered Operating

Limit Clause FCC Sections 15.205, 15.209, ISED Canada: RSS-GEN 8.9, 8.10

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.4090-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Table 2.3.7-1: Radiated Emissions Test Results – Other Emissions within the Restricted Bands

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
1000.01	52.76	49.34	H	-9.39	43.37	39.95	74.0	54.0	30.6	14.1
1000.01	50.05	45.23	V	-9.39	40.66	35.84	74.0	54.0	33.3	18.2
1200	56.14	53.94	H	-9.12	47.02	44.82	74.0	54.0	27.0	9.2
1200	53.72	51.05	V	-9.12	44.60	41.93	74.0	54.0	29.4	12.1
1400	61.89	60.88	H	-8.85	53.04	52.03	74.0	54.0	21.0	2.0
1400	56.24	54.25	V	-8.85	47.39	45.40	74.0	54.0	26.6	8.6
1600	53.33	50.15	H	-7.83	45.50	42.32	74.0	54.0	28.5	11.7
1600	55.60	53.25	V	-7.83	47.77	45.42	74.0	54.0	26.2	8.6
2200	50.76	44.86	H	-5.54	45.22	39.32	74.0	54.0	28.8	14.7
2200	48.10	42.53	V	-5.54	42.56	36.99	74.0	54.0	31.4	17.0

Notes:

- The emissions reported above are generated by the digital device. They are independent of the modes of operation of the transmitter. They are reported for informational purposes only.

Table 2.3.7-2: Radiated Emissions Test Results – GFSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	55.34	55.34	H	-5.22	50.12	25.42	74.0	54.0	23.9	28.6
4804	49.24	49.24	H	-0.22	49.02	24.32	74.0	54.0	25.0	29.7
4804	45.82	45.82	V	-0.22	45.60	20.90	74.0	54.0	28.4	33.1
12010	43.18	43.18	H	11.49	54.67	29.96	74.0	54.0	19.3	24.0
12010	41.32	41.32	V	11.49	52.81	28.10	74.0	54.0	21.2	25.9
Middle Channel										
4882	49.44	49.44	H	-0.08	49.36	24.65	74.0	54.0	24.6	29.3
4882	45.64	45.64	V	-0.08	45.56	20.85	74.0	54.0	28.4	33.1
7323	55.73	55.73	H	3.72	59.45	34.74	74.0	54.0	14.6	19.3
7323	51.13	51.13	V	3.72	54.85	30.14	74.0	54.0	19.2	23.9
12205	42.07	42.07	H	11.06	53.13	28.42	74.0	54.0	20.9	25.6
12205	40.70	40.70	V	11.06	51.76	27.05	74.0	54.0	22.2	26.9
High Channel										
2483.5	60.31	60.31	H	-5.05	55.26	30.55	74.0	54.0	18.7	23.4
2483.5	58.12	58.12	V	-5.05	53.07	28.36	74.0	54.0	20.9	25.6
4960	51.21	51.21	H	0.05	51.26	26.56	74.0	54.0	22.7	27.4
4960	46.46	46.46	V	0.05	46.51	21.81	74.0	54.0	27.5	32.2
7440	46.28	46.28	H	3.81	50.09	25.38	74.0	54.0	23.9	28.6
7440	44.98	44.98	V	3.81	48.79	24.08	74.0	54.0	25.2	29.9
12400	39.33	39.33	H	10.63	49.96	25.25	74.0	54.0	24.0	28.7

Notes:

- All the emissions above 12.4 GHz were attenuated below the limits and the noise floor of the measurement equipment.
- A duty cycle correction factor corresponding to 20*log(2*2.909375/100) = -24.703 dB was used for the corrected average levels.

Table 2.3.7-3: Radiated Emissions Test Results – EDR2

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	54.47	54.47	H	-5.22	49.25	24.55	74.0	54.0	24.7	29.4
4804	49.28	49.28	H	-0.22	49.06	24.36	74.0	54.0	24.9	29.6
4804	45.95	45.95	V	-0.22	45.73	21.03	74.0	54.0	28.3	33.0
12010	40.84	40.84	H	11.49	52.33	27.62	74.0	54.0	21.7	26.4
12010	39.42	39.42	V	11.49	50.91	26.20	74.0	54.0	23.1	27.8
Middle Channel										
4882	48.34	48.34	H	-0.08	48.26	23.55	74.0	54.0	25.7	30.4
4882	45.23	45.23	V	-0.08	45.15	20.44	74.0	54.0	28.9	33.6
7323	53.45	53.45	H	3.72	57.17	32.46	74.0	54.0	16.8	21.5
7323	51.10	51.10	V	3.72	54.82	30.11	74.0	54.0	19.2	23.9
12205	37.84	37.84	H	11.06	48.90	24.19	74.0	54.0	25.1	29.8
12205	37.71	37.71	V	11.06	48.77	24.06	74.0	54.0	25.2	29.9
High Channel										
2483.5	60.51	60.51	H	-5.05	55.46	30.75	74.0	54.0	18.5	23.2
2483.5	56.75	56.75	V	-5.05	51.70	26.99	74.0	54.0	22.3	27.0
4960	50.04	50.04	H	0.05	50.09	25.39	74.0	54.0	23.9	28.6
4960	45.84	45.84	V	0.05	45.89	21.19	74.0	54.0	28.1	32.8
7440	44.07	44.07	H	3.81	47.88	23.17	74.0	54.0	26.1	30.8
7440	44.63	44.63	V	3.81	48.44	23.73	74.0	54.0	25.6	30.3

Notes:

- All the emissions above 12.21 GHz were attenuated below the limits and the noise floor of the measurement equipment.
- A duty cycle correction factor corresponding to 20*log(2*2.909375/100) = -24.703 dB was used for the corrected average levels.

Table 2.3.7-4: Radiated Emissions Test Results – EDR3

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	54.95	54.95	H	-5.22	49.73	25.03	74.0	54.0	24.3	29.0
4804	48.98	48.98	H	-0.22	48.76	24.06	74.0	54.0	25.2	29.9
4804	46.23	46.23	V	-0.22	46.01	21.31	74.0	54.0	28.0	32.7
12010	40.52	40.52	H	11.49	52.01	27.30	74.0	54.0	22.0	26.7
12010	39.98	39.98	V	11.49	51.47	26.76	74.0	54.0	22.5	27.2
Middle Channel										
4882	49.80	49.80	H	-0.08	49.72	25.01	74.0	54.0	24.3	29.0
4882	45.43	45.43	V	-0.08	45.35	20.64	74.0	54.0	28.7	33.4
7323	52.29	52.29	H	3.72	56.01	31.30	74.0	54.0	18.0	22.7
7323	51.88	51.88	V	3.72	55.60	30.89	74.0	54.0	18.4	23.1
12205	38.70	38.70	H	11.06	49.76	25.05	74.0	54.0	24.2	28.9
12205	38.06	38.06	V	11.06	49.12	24.41	74.0	54.0	24.9	29.6
High Channel										
2483.5	60.10	60.10	H	-5.05	55.05	30.34	74.0	54.0	19.0	23.7
2483.5	57.48	57.48	V	-5.05	52.43	27.72	74.0	54.0	21.6	26.3
4960	50.05	50.05	H	0.05	50.10	25.40	74.0	54.0	23.9	28.6
4960	45.11	45.11	V	0.05	45.16	20.46	74.0	54.0	28.8	33.5
7440	43.73	43.73	H	3.81	47.54	22.83	74.0	54.0	26.5	31.2
7440	44.24	44.24	V	3.81	48.05	23.34	74.0	54.0	26.0	30.7

Notes:

- All the emissions above 12.21 GHz were attenuated below the limits and the noise floor of the measurement equipment.
- A duty cycle correction factor corresponding to 20*log(2*2.909375/100) = -24.703 dB was used for the corrected average levels.

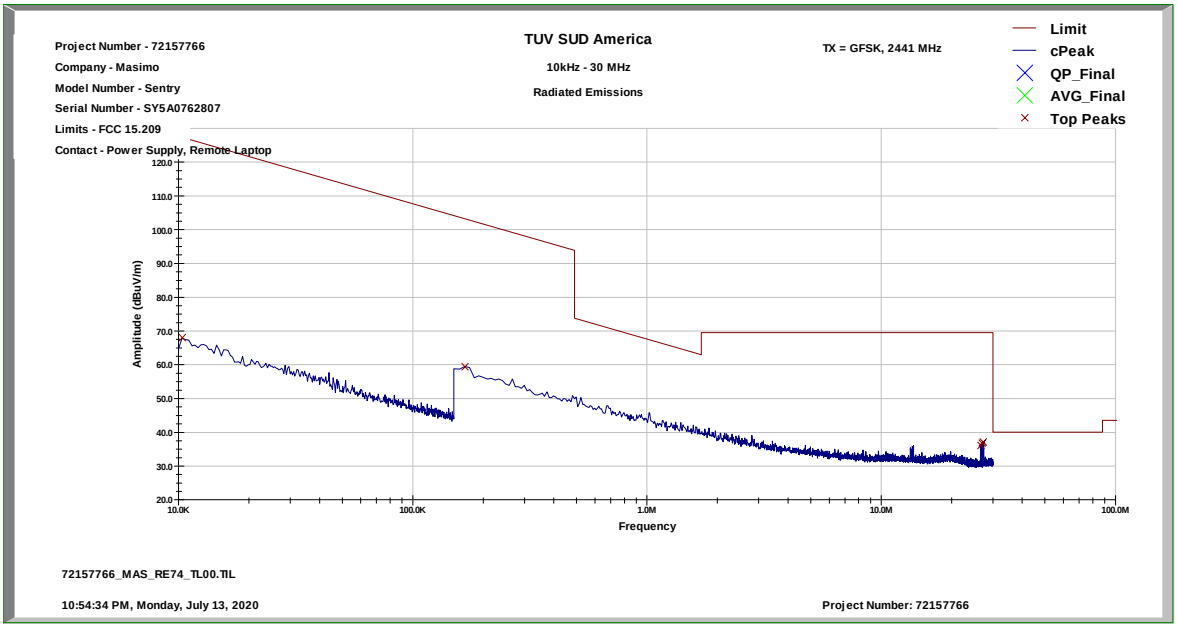


Figure 2.3.7-1: Radiated Emissions Representative Scan below 30 MHz

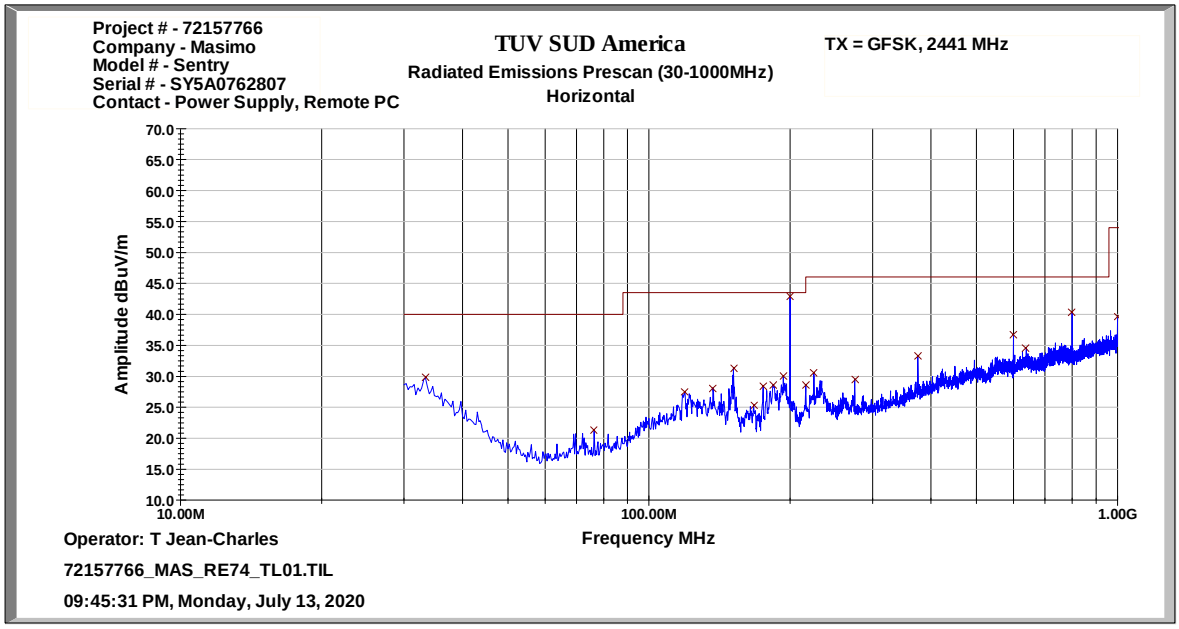


Figure 2.3.7-2: Radiated Emissions Representative Scan – 30 MHz – 1 GHz – Horizontal Polarization

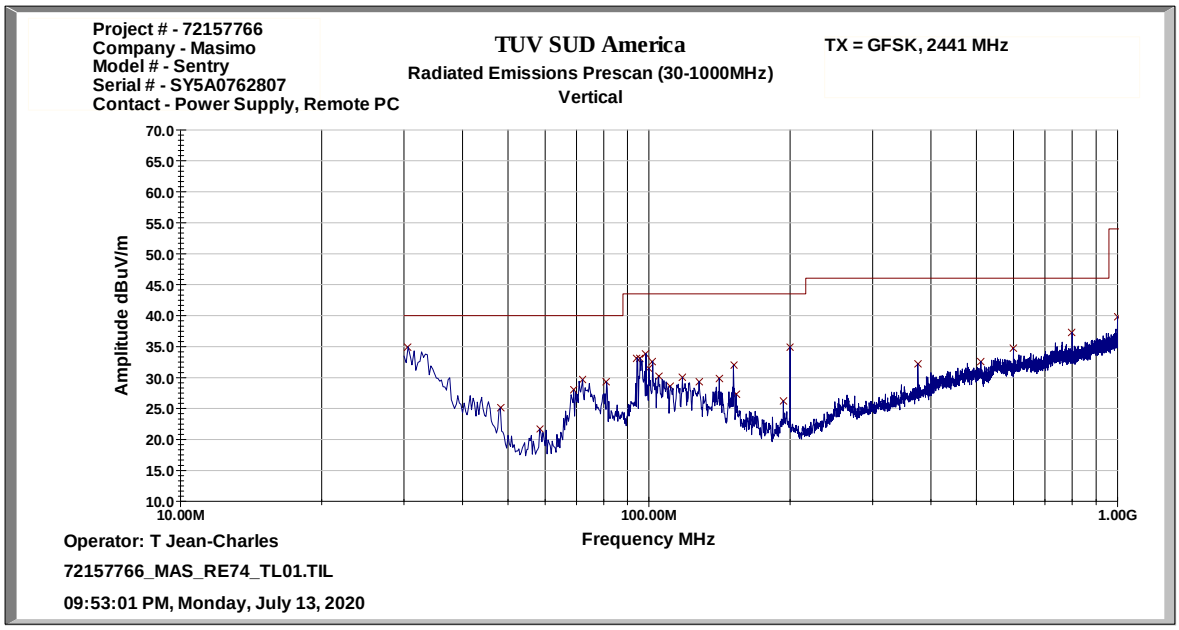


Figure 2.3.7-3: Radiated Emissions Representative Scan – 30 MHz – 1 GHz – Vertical Polarization

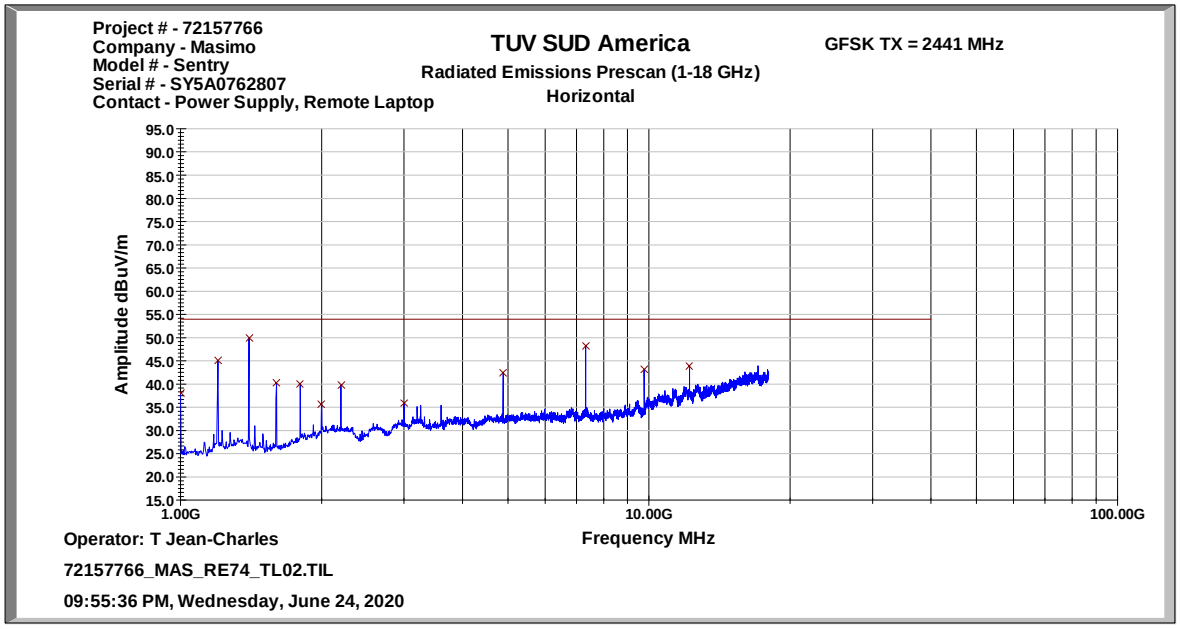


Figure 2.3.7-4: Radiated Emissions Representative Scan – 1 GHz – 18 GHz – Horizontal Polarization

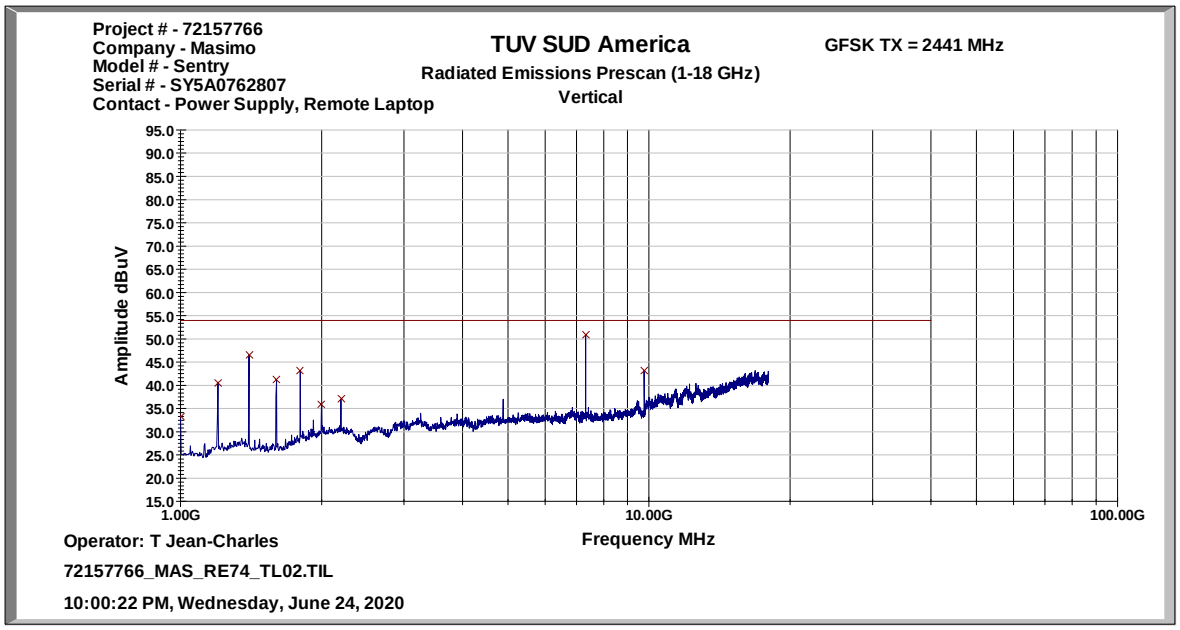


Figure 2.3.7-5: Radiated Emissions Representative Scan – 1 GHz – 18 GHz – Vertical Polarization

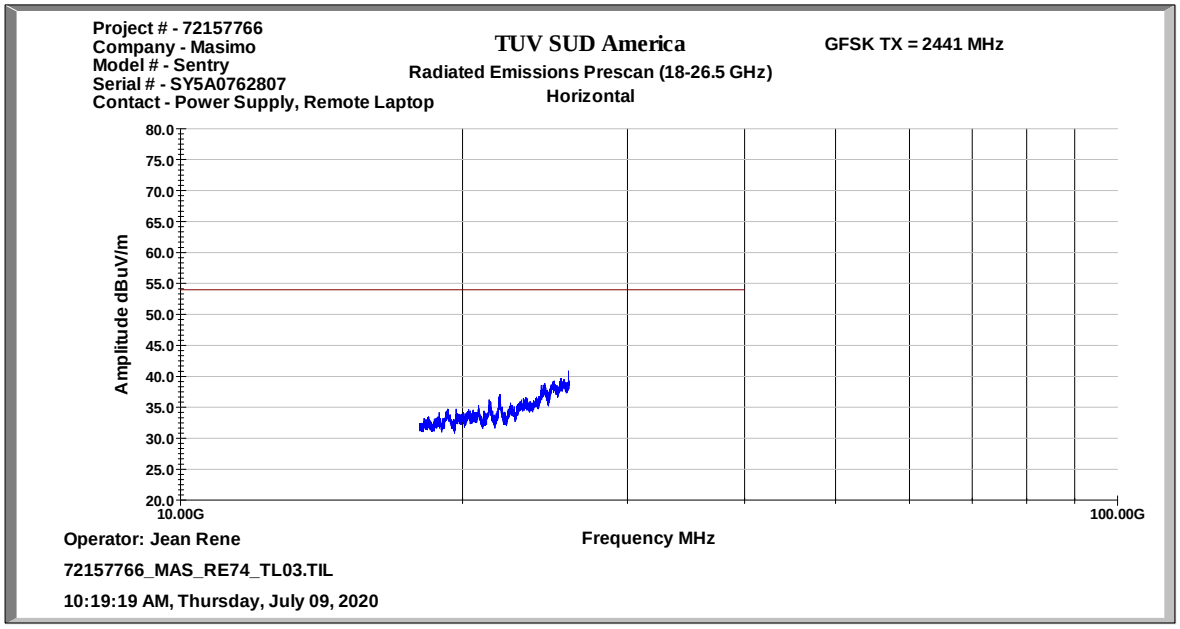


Figure 2.3.7-6: Radiated Emissions Representative Scan – 18 GHz – 26 GHz – Horizontal Polarization

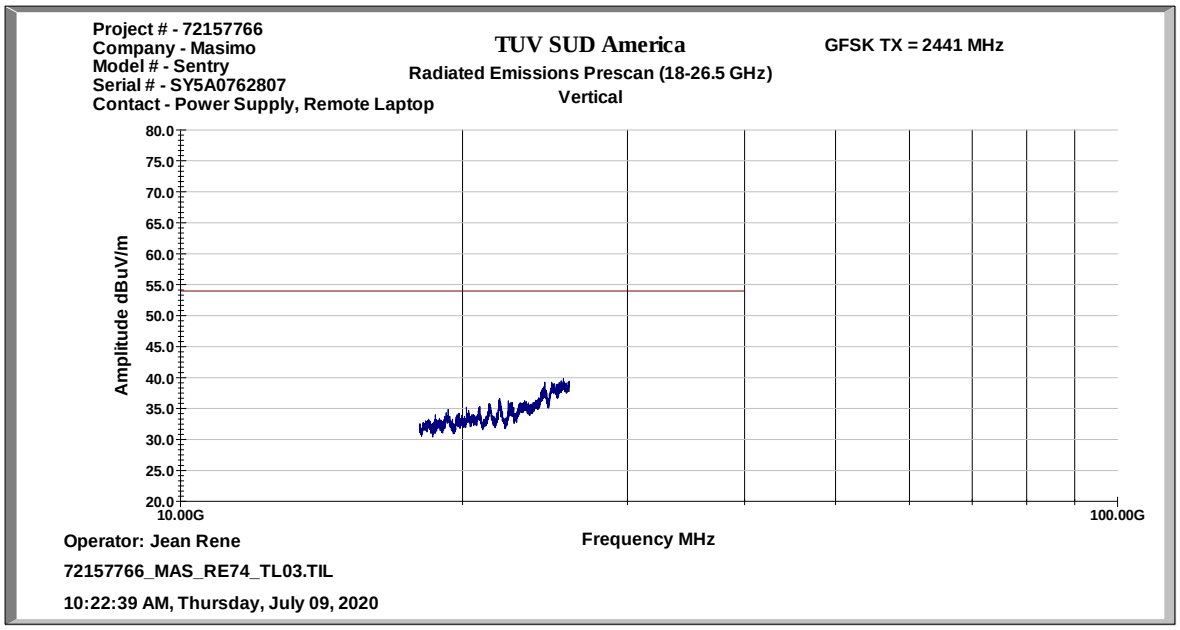


Figure 2.3.7-7: Radiated Emissions Representative Scan – 18 GHz – 26 GHz – Vertical Polarization

2.3.8 Sample Calculations

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 55.34 + (-5.22) = 50.12 dBµV/m
Margin: 74 dBµV/m – 50.12 dBµV/m = 23.88 dB

Example Calculation: Average
Corrected Level: 55.34 + (-5.22) -24.7 = 25.42 dBµV/m
Margin: 54 dBµV/m – 25.42 dBµV/m = 28.58 dB

2.3.9 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., 5610 W. Sligh Ave, Suite 100, Tampa, FL 33634, USA.

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
9kHz-26.5GHz EMC analyzer/HYZ	Agilent	E7405A	BEMC00523	A.14.06	24	27-Nov-2020
10dB Attenuator	Merrimac	FAN-6-10K	BEMC02086	N/A	12	12-Oct-2020
Tile Automation Software	ETS Lindgren	TILE4! - Version 4.2.A	BEMC02095	4.2A	N/A	NCR
BI LOG PERIODIC, ANTENNA	Schaffner	CBL6112B	TEMC00005	N/A	24	31-Oct-2021
Loop Antenna	Com Power	AL-130	TEMC00025	N/A	24	26-Sep-2021
Horn Antenna	Schwarzbeck	BBHA-9170	TEMC00029	N/A	60	23-Aug-2021
EMC Chamber	Panashield	N/A	TEMC00031	N/A	36	28-Jan-2021
Double Ridge Guide Horn	ETS Lindgren	3117	TEMC00061	N/A	24	07-Feb-2022
18 GHz-40 GHz Microwave Preamplifier	COM-power	PAM-840A	TEMC00147	N/A	12	16-Mar-2021
PAM-118A	Com-Power Corporation	PAM-118A	TEMC00160	N/A	12	16-Mar-2021
2.4 GHz Notch Filter	Micro-Tronics	BRM50702-01	TEMC00176	N/A	12	12-Mar-2021
A81-0303 18 GHz Cable Set	Teledyne Storm Products	A81-0303-360/96	TEMC00201	N/A	12	22-Apr-2021
1571AN 40 GHz Cable	IW Microwave	KPS-1571AN	TEMC00218	N/A	12	06-Jul-2021

TU - Traceability Unscheduled
O/P MON - Traceability Unscheduled
N/A - Not Applicable
NCR – No Calibration Required

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Software / Firmware Revision	Calibration Period (months)	Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSP40	BEMC00283	4.50 SP5	24	04-Oct-2021
9kHz-26.5GHz EMC analyzer/HYZ	Agilent	E7405A	BEMC00523	A.14.06	24	27-Nov-2020
10dB Attenuator	Merrimac	FAN-6-10K	BEMC02086	N/A	12	12-Oct-2020
Tile Automation Software	ETS Lindgren	TILE4! - Version 4.2.A	BEMC02095	4.2A	N/A	NCR
Attenuator 10dB, 2.9 mm-M/F, DC-40GHz 2 W	Aeroflex Inmet	40AH2W-10	BEMC02110	N/A	12	27-Jul-2020
Duratest High Frequency Cable, 26.5GHz	Teledyne Storm Products	921-0101-036	BEMC02112	N/A	12	12-Oct-2020
BI LOG PERIODIC, ANTENNA	Schaffner	CBL6112B	TEMC00005	N/A	24	31-Oct-2021
Loop Antenna	Com Power	AL-130	TEMC00025	N/A	24	26-Sep-2021
Horn Antenna	Schwarzbeck	BBHA-9170	TEMC00029	N/A	60	23-Aug-2021
EMC Chamber	Panashield	N/A	TEMC00031	N/A	36	28-Jan-2021
Double Ridge Guide Horn	ETS Lindgren	3117	TEMC00061	N/A	24	07-Feb-2022
18 GHz-40 GHz Microwave Preamplifier	COM-power	PAM-840A	TEMC00147	N/A	12	16-Mar-2021
PAM-118A	Com-Power Corporation	PAM-118A	TEMC00160	N/A	12	16-Mar-2021
2.4 GHz Notch Filter	Micro-Tronics	BRM50702-01	TEMC00176	N/A	12	12-Mar-2021
A81-0303 18 GHz Cable Set	Teledyne Storm Products	A81-0303-360/96	TEMC00201	N/A	12	22-Apr-2021
1571AN 40 GHz Cable	IW Microwave	KPS-1571AN	TEMC00218	N/A	12	06-Jul-2021

TU - Traceability Unscheduled
O/P MON - Traceability Unscheduled
N/A - Not Applicable
NCR – No Calibration Required

4 Diagram of Test Set-ups

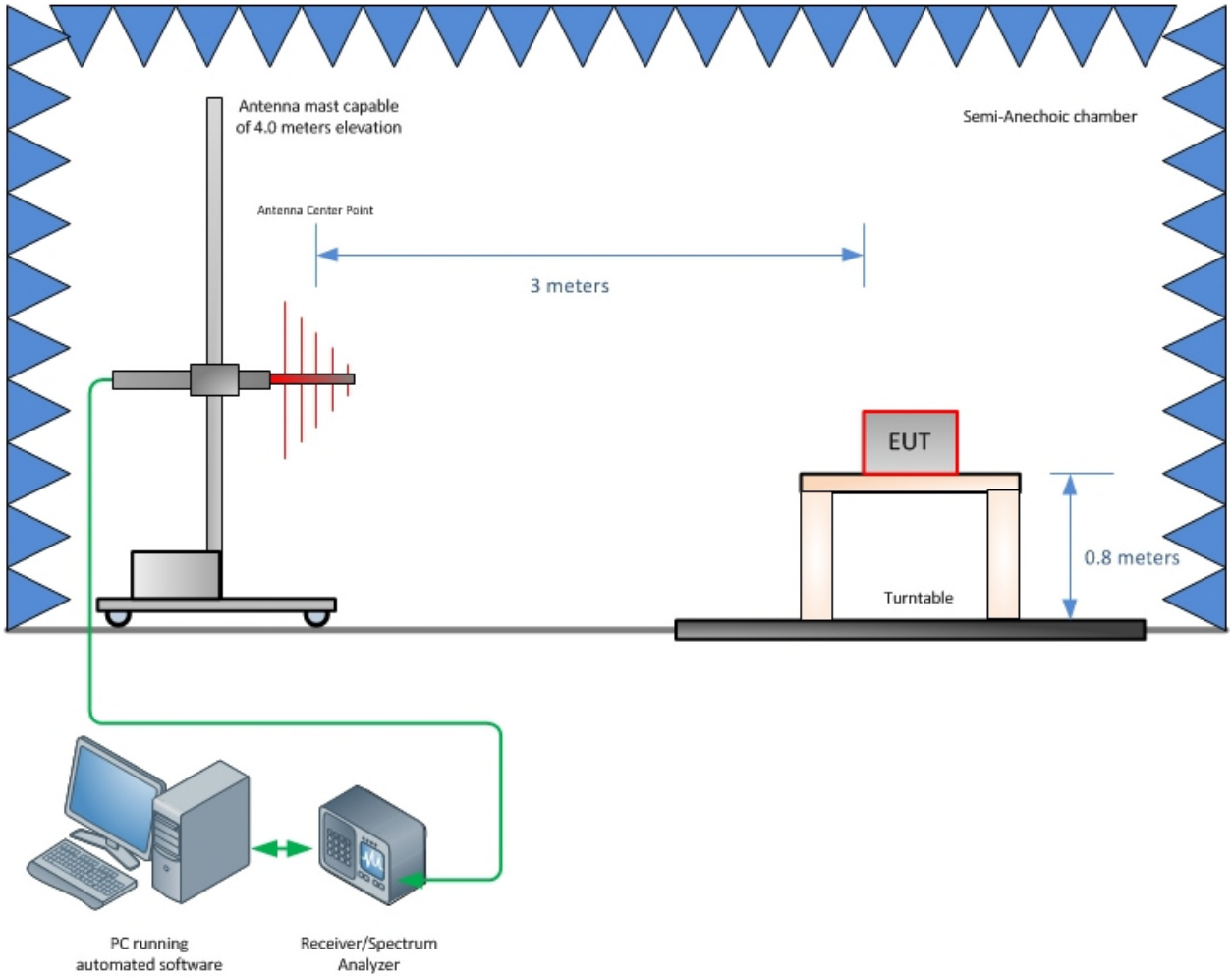


Figure 4-1 - Radiated Emissions Test Setup up to 1 GHz

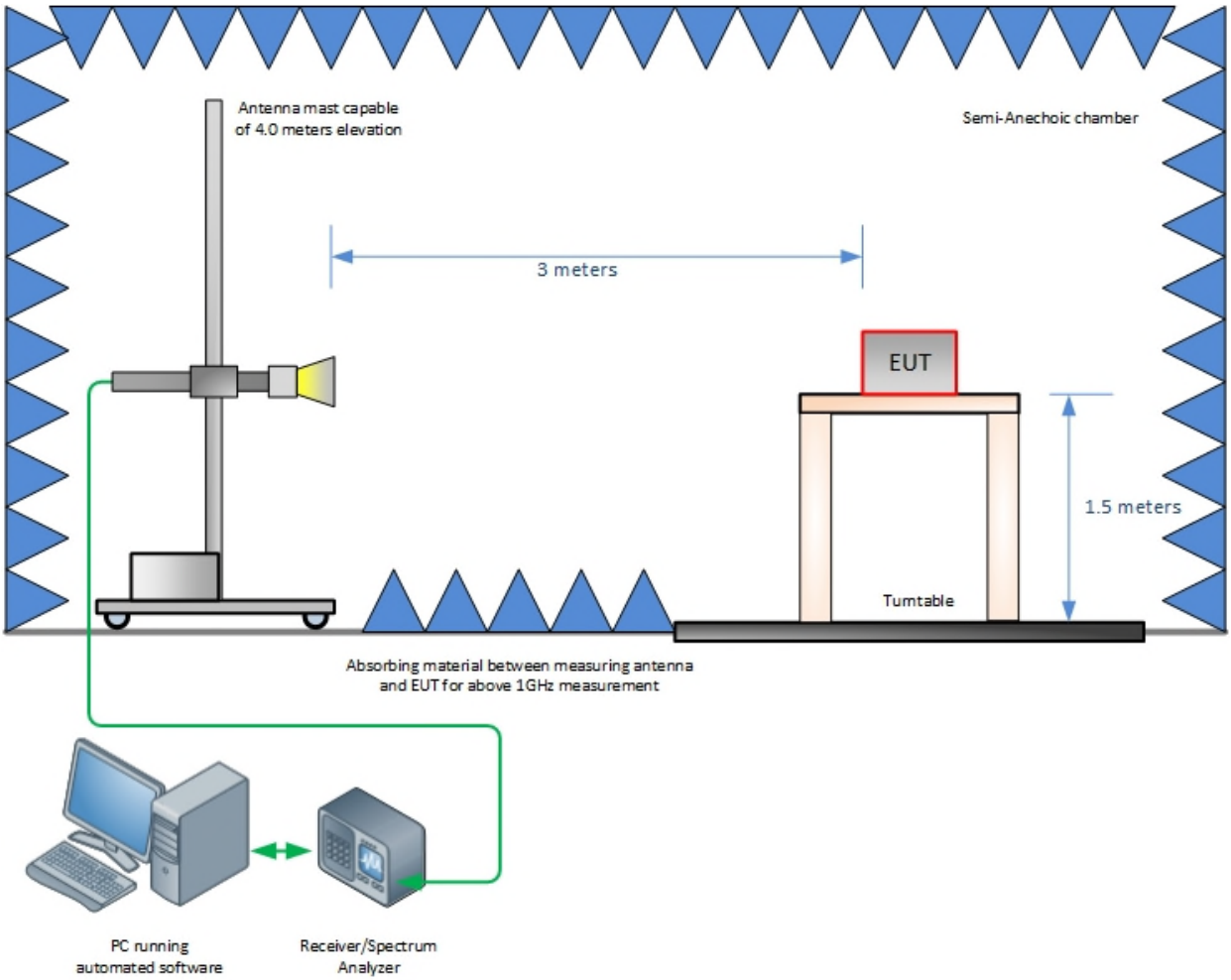


Figure 4-2 - Radiated Emissions Test Setup above 1 GHz

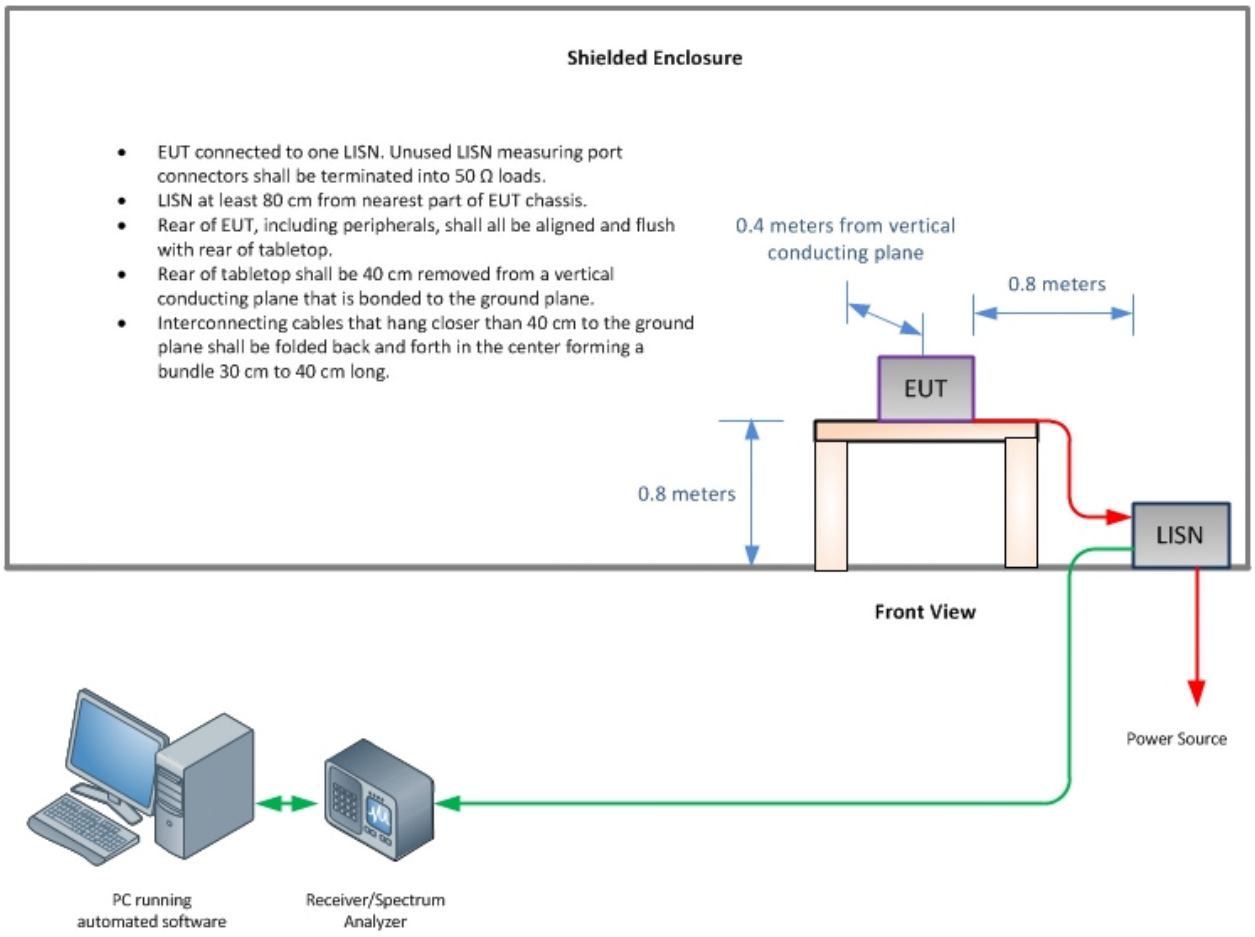


Figure 4-3 – Conducted Emissions Test Setup

5 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Table 5-1 - Values of U_{cispr} and U_{Lab}

Measurement	U_{cispr}	U_{Lab}
Conducted disturbance (mains port) (9 kHz – 150 kHz) (150 kHz – 30 MHz)	 3.8 dB 3.4 dB	 3.71 dB 3.31 dB
Conducted disturbance (telecom port) (150 kHz – 30 MHz 55 dB LCL) (150 kHz – 30 MHz 65 dB LCL) (150 kHz – 30 MHz 75 dB LCL)	 5.0 dB 5.0 dB 5.0 dB	 4.11 dB 4.50 dB 4.94 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1 000 MHz) (1 – 6 GHz) (6-18 GHz)	 6.3 dB 5.2 dB 5.5 dB	 5.85 dB 4.48 dB 4.48 dB

Notes:

U_{cispr} resembles a value of measurement uncertainty for a specific test, which was determined by considering uncertainties associated with the quantities listed in CISPR 16-4-2:2011.

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