FCC and ISED Canada Radio Testing of the

Sensus Metering Systems Inc.
FLXI2102

In accordance with FCC 47 CFR Part 24 Subpart D, Part 101 Subpart C and ISED Canada's Radio Standards Specifications RSS-119, RSS-134

America

Add value.
Inspire trust.

Prepared for: Sensus Metering Systems Inc.
639 Davis Drive
Morrisville, NC 27560

FCC ID: SDBFLXI2102
IC: 2220A-FLXI2102

COMMERCIAL-IN-CONFIDENCE

Document Number: RD72162913.102 | Version Number: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Thierry Jean-Charles	2020 -October-16	
Testing	Chris Gormley	2020-October-16	

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 US1245 Durham, NC Test Laboratory	Innovation, Science, and Economic Development Canada Accreditation Site Number 20446 Durham NC Test Laboratory

EXECUTIVE SUMMARY
Samples of this product were tested and found to be in compliance with FCC Part 24 Subpart D, Part 101 Subpart C and ISED Canada's RSS-119, RSS-134.

A2LA Cert. No. 2955.18

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TÜV SÜD America
2320 Presidential Drive, Suite 101
Durham, NC 27703

Phone: 919-381-4235
www.tuv-sud-america.com

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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.

Issue	Description of Change	Date of Issue
1	First Issue	2020-October-16

1.2 Introduction

The purpose of this report is to demonstrate compliance of a depopulated Zigbee radio variant of the FXZIG210 with the FCC's Code of Federal Regulations Part 24 Subpart D, Part 101 Subpart C and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-119, RSS-134 for the tests documented herein.

The worst-case modulations from the original filing of the FXZIG210 (RD72127191.100) and the Class 2 Permissive Change (RD72144961.100) were assessed and documented in this report.

The test data in original test reports are verified and are representative to the new depopulated equipment version.

Applicant	Sensus Metering Systems Inc.
Manufacturer	Sensus Metering Systems Inc.
Applicant's Email Address	Pam.Sequeira@xylem.com
Model Number(s)	FLXI2102
Serial Number(s)	7300514 (Radiated Emissions) 7300515 (RF Conducted Measurements)
Hardware Version(s)	REV K
Software Version(s)	v35520066
Number of Samples Tested	2
Test Specification/Issue/Date	US Code of Federal Regulations (CFR): Title 47, Part 24, Subpart D: Personal Communications Services – 2021 US Code of Federal Regulations (CFR): Title 47, Part 101, Subpart C: Fixed Microwave Services -2012 Industry Canada Radio Standards Specification: RSS-119 - Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz, Issue 12, May 2015 Industry Canada Radio Standards Specification: RSS-134 - 900 MHz Narrowband Personal Communication Service, Issue 2, February 2016
Test Plan/Issue/Date	2020-February-28
Order Number	72162913
Date	2020-September-14
Date of Receipt of EUT	2020-September-18
Start of Test	2020-September-25
Finish of Test	2020-October-15
Name of Engineer(s)	Chris Gormley
Related Document(s)	US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2021 Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN - General Requirements for Compliance of Radio Apparatus, Issue 5, Amendment 1, March 2019 ANSI C63.26: 2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with 24 Subpart D, Part 101 Subpart C and ISED Canada's RSS-119, RSS-134 is shown below.

Table 1.3-1: Test Result Summary

Test Parameter	Test Plan (Yes/No)	Test Results	FCC 47 CFR Rule Part	ISED Canada's RSS	Test Report Page No.
RF Power Output	No	--------	2.1046; 24.132; 101.113(a)	RSS-Gen 6.12; RSS-119 5.4; RSS-134 4.3(a), (b)	
Out of Band Unwanted Emissions	No	--------	2.1053; 24.133 a(1), a(2); 101.111 a(5), 101.111 a(6)	RSS-Gen 6.13; RSS-119 5.8.3, RSS-119 5.8.6; RSS-134 4.4	
Occupied Bandwidth	Yes	Pass	2.1049; 101.109	RSS-Gen 6.7	12
Spurious Emissions at Antenna Terminals	Yes	Pass	2.1053; 24.133 a(1), a(2); 101.111 a(5), 101.111 a(6)	RSS-Gen 6.13; RSS-119 5.8.3, RSS-119 5.8.6; RSS-134 4.4	18
Field Strength of Spurious Radiation	Yes	Pass	2.1053; 24.133 a(1), a(2); 101.111 a(5), 101.111a(6)	RSS-Gen 6.13; RSS-119 5.8.3, RSS-119 5.8.6; RSS-134 4.4	28
Frequency Stability	No	--------	2.1055; 24.135; 101.107	RSS-Gen 6.11; RSS-119 5.3; RSS-134 4.5	

1.4 Product Information

1.4.1 Technical Description

The equipment under test was the FLXI2102 transceiver module that incorporates a Sensus FLEXNET 900MHz transceiver.

The FLXI2102 is meant as an endpoint state-of-the-art supporting communications WAN and HAN communication. The electronics package is designed to be installed in the Aclara I210+c meter. The Aclara I210+c meter is Aclara's flagship residential meter product supporting Demand, TOU, LP as well as a service switch

Technical Details per the Manufacturer

Mode of Operation: FLEXNET 900 MHz
Frequency Range: 901 MHz - 960 MHz
Antenna Type/Gain: ¼ wave printed monopole, 2.77 dBi
Input Power: 4 VDC

The FLXI2102 transmitters produce 14 distinct modulation formats. The emissions designators for the modulation types used by the FLXI2102 transmitters are as follows:

EMISSIONS DESIGNATORS:

Mode	Emission Designator	Modulation
Normal	9K60F2D	7-FSK
Double Density	9K60F2D	13-FSK
C & I (Half Baud)	4K80F2D	7-FSK
Priority	4K80F2D	13-FSK
MPass (5 kbps)	5K90F1D	2-GFSK
MPass (10 kbps)	11K8F1D	2-GFSK
2SFSK (Half Baud)	5K00F1D	2-SFSK
4SFSK (Half Baud)	5K60F1D	4-SFSK
8SFSK (Half Baud)	5K90F1D	8-SFSK
2SFSK	10K0F1D	2-SFSK
4SFSK	11K3F1D	4-SFSK
8SFSK	11K9F1D	8-SFSK
m4Pass (10k)	4K70F1D	4-GFSK
m4Pass (20k)	9K30F1D	4-GFSK

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

Table 1.4.1-1 – Cable Descriptions

Cable/Port	Description
Power Cable	2m, Not Shielded, EUT to DC Power Supply

Note: The EUT is a standalone module. The DC power supply and cables were used for testing purposes only.

Table 1.4.1-2 – Support Equipment Descriptions

Make/Model	Description
Sorensen / QRD20-4	DC Power Supply, S/N 2716

Note: The EUT is a standalone module. The DC power supply and cables were used for testing purposes only.

Declaration of Build Status

EQUIPMENT DESCRIPTION	
Model Name/Number	FLXI2102
Part Number	70033-112-70001
Hardware Version	REV K
Software Version	v35520066
FCC ID (if applicable)	SDBFLXI2102
ISED ID (if applicable)	2220A-FLXI2102
Technical Description (Please provide a brief description of the intended use of the equipment)	The radio module for the Aclara meter contains a licensed 900MHz fully digital transceiver that is supplied to Aclara fully tested and calibrated. It is installed by Aclara at their manufacturing facility.

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	960.000MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	901.000 MHz
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
	4.0V (+/- 5%)		1A
Battery	Nominal Voltage		Battery Operating End Point Voltage

EXTREME CONDITIONS					
Maximum temperature	+ 85	°C	Minimum temperature	- 40	°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: Pamela Sequeira

Position held: Sr. HW Regulatory Engineer Date:

1.4.2 Modes of Operation

The tested mode of operation was for the EUT in constant TX mode for the 900 MHz Flexnet transmitter. The EUT was operating at the maximum TX output power per the manufacturer. TX output power was not configurable via the programming Flexnet Utility user interface.

1.4.3 Monitoring of Performance

The following performance attributes were monitored: .

The FLEXNET 900MHz transmitter was evaluated for radiated and RF conducted measurements for worst-case modulation types from the original filing. Where applicable, data is provided for the unit and modulation having the worst-case emissions.

For radiated emissions, the EUT was evaluated in all 3 orthogonal orientations X, Y, and Z-planes. The results presented in this document represented the worse-case orientation, which was the Y-plane (upright).

The RF Conducted measurements were performed on a sample configured with an RF connector at the antenna port to allow direct coupling to the spectrum analyzer / power meter.

The EUT is designed to operate in multiple bands under the requirements of CFR 47 Parts 24 and 101. The following is a list of the frequency bands of operation sorted based on the FCC rule parts in which the band is associated.

CFR Title 47 Rule Part	Frequency Band of Operation (MHz)
24D	901.0 - 902.0
24D	930.0 - 931.0
24D	940.0 - 941.0
101	928.85 - 929.0
101	932.0 - 932.5
101	941.0 - 941.5
101	952.0 – 953.0
101	959.85 - 960.0

Based on the requirements set forth in accordance 47 CFR 2.1046-2.1057 as stated above, the methodology in selecting the places to test in the available bands of operation is outlined in the following table.

CFR Title 47 Rule Part	Frequency Band of Operation (MHz)	Location in the Range of Operation	Approx. Test Freq.
24D	901.0 - 902.0	Middle	901.5000
101	928.85 - 929.0	Middle	928.9250
24D	930.0 - 931.0	Middle	930.5000
101	932.0 - 932.5	Middle	932.2500
24D	940.0 - 941.0	1 near top and 1 near bottom	940.0125
101	941.0 - 941.5		941.4875
101	952.0 – 953.0	Middle	952.5000
101	959.85 – 960.0	Middle	959.9250

1.4.4 Performance Criteria

The parameters evaluated are summarized below.

Table 1.4.4-1: Performance Criteria

Parameter	Requirement
Occupied Bandwidth	ISED Canada RSS-GEN 6.7
Unwanted Emissions at the Antenna Terminal	FCC 47 CFR Parts: 2.1053; 24.133 a(1), a(2); 101.111 a(6) ISED Canada RSS-119 5.8.6; RSS-134 4.4
Radiated Spurious Emissions	FCC 47 CFR Parts: 2.1053; 24.133 a(1), a(2); 101.111 a(6) ISED Canada RSS-119 5.8.6; RSS-134 4.4

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 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

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Durham NC Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
DC Powered Operating		
Occupied Bandwidth	Chris Gormley	A2LA
Spurious Emissions at Antenna Terminals	Chris Gormley	A2LA
Field Strength of Spurious Radiation	Chris Gormley	A2LA

Office Address

TÜV SÜD America Inc.
2320 Presidential Drive, Suite 101
Durham, NC 27703

2 Test Details

2.1 Occupied Bandwidth

2.1.1 Specification Reference

FCC Section 2.1049; ISED Canada RSS-GEN 6.7

2.1.2 Equipment Under Test and Modification State

Model: FLXI2102, Serial Number: 7300515

2.1.3 Date of Test

2020-September-25

2.1.4 Test Method

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through 20.05dB of passive attenuation. The internal correction factors of the spectrum analyzer were employed to correct for any cable and attenuator losses.

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts. The nominal IF filter 3 dB bandwidth (RBW) is in the range of 1% to 5% of the OBW, and the VBW was set ≥ 3 × RBW. The reference level was set to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. The measurements were made using the spectrum analyzer's 99% BW function.

2.1.5 Environmental Conditions

Ambient Temperature	23.8 °C
Relative Humidity	45.1 %
Atmospheric Pressure	1000.6 mbar

2.1.6 Test Results

<u>DC Powered Operating</u>

Table 2.1.6-1: 99% Bandwidth Test Results

Frequency (MHz)	ISED Canada Rule Part	Mode of Operation	99% Bandwidth (kHz)
901.5000	RSS-134	Normal	11.891
930.5000	RSS-134	MPass 5k	5.807
940.0125	RSS-134	MPass 5k	5.784
928.9250	RSS-119	Normal	12.028
932.2500	RSS-119	Normal	12.05
941.4875	RSS-119	MPass 5k	5.795
952.5000	RSS-119	MPass 5k	5.791
959.9250	RSS-119	MPass 5k	5.779

ISED Canada RSS-GEN 6.6, ISED Canada RSS-134

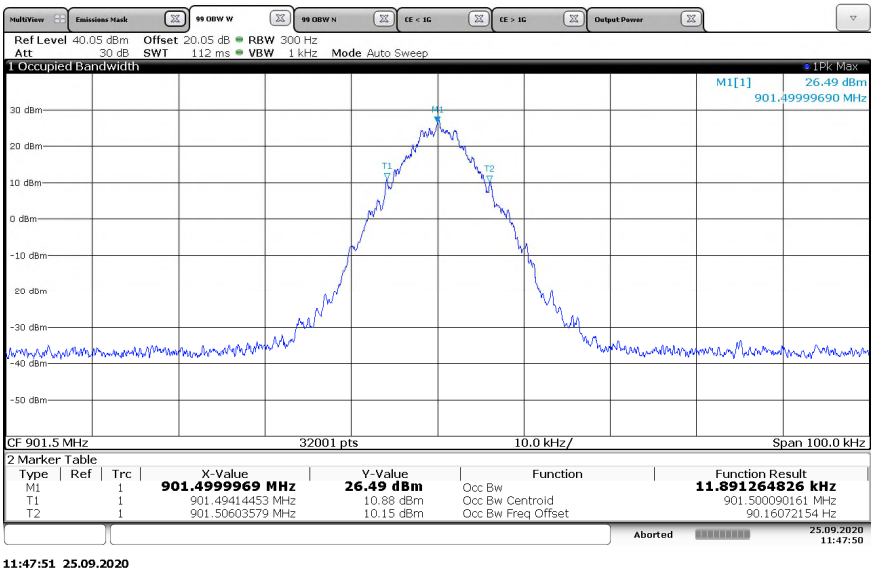

Figure 2.1.6-1: 901.5 MHz – Normal Mode

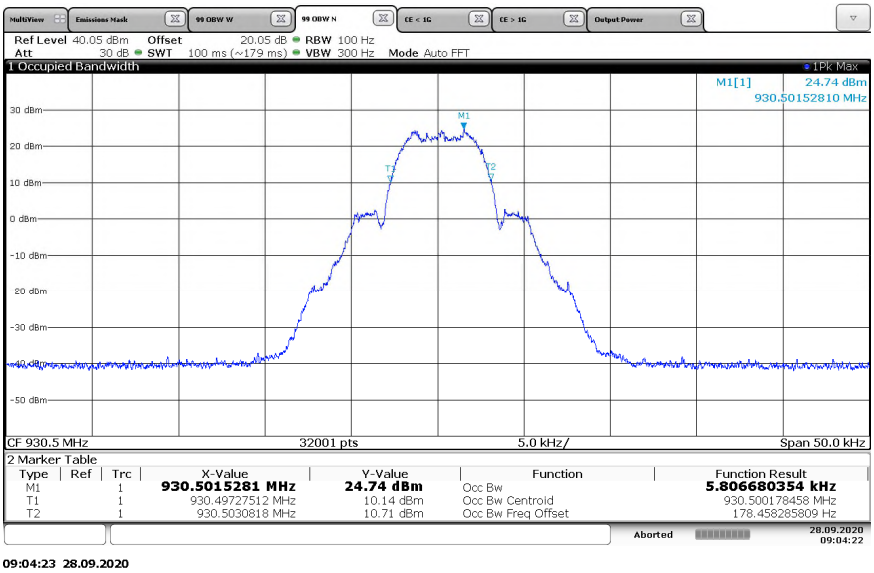

Figure 2.1.6-2: 930.5 MHz – MPass 5k Mode

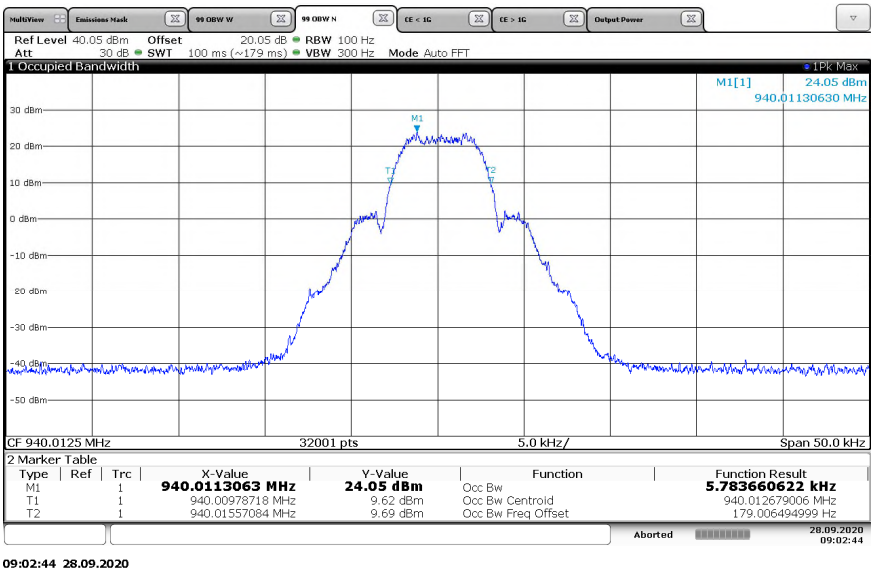

Figure 2.1.6-3: 940.0125 MHz – MPass 5k Mode

ISED Canada RSS-GEN 6.6, ISED Canada RSS-119

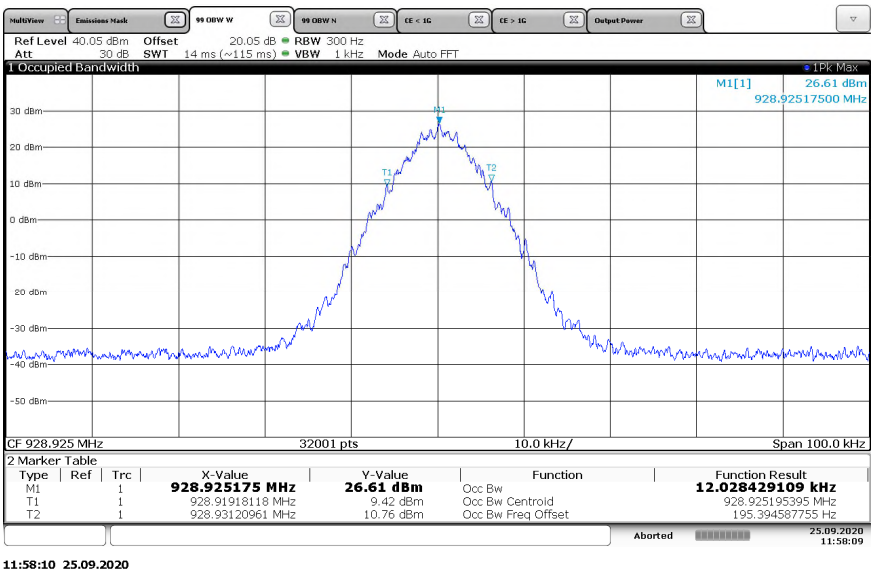

Figure 2.1.6-4: 928.925 MHz – Normal Mode

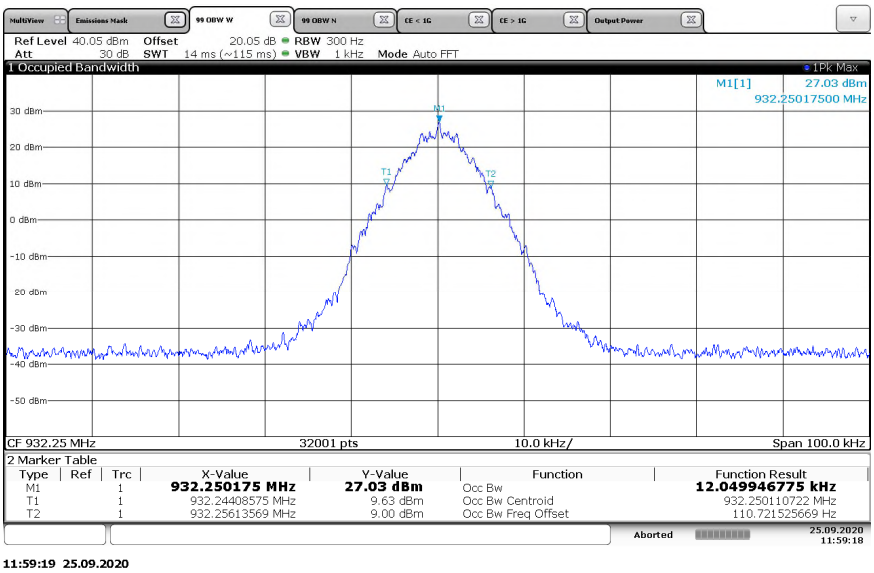

Figure 2.1.6-5: 932.25 MHz – Normal Mode

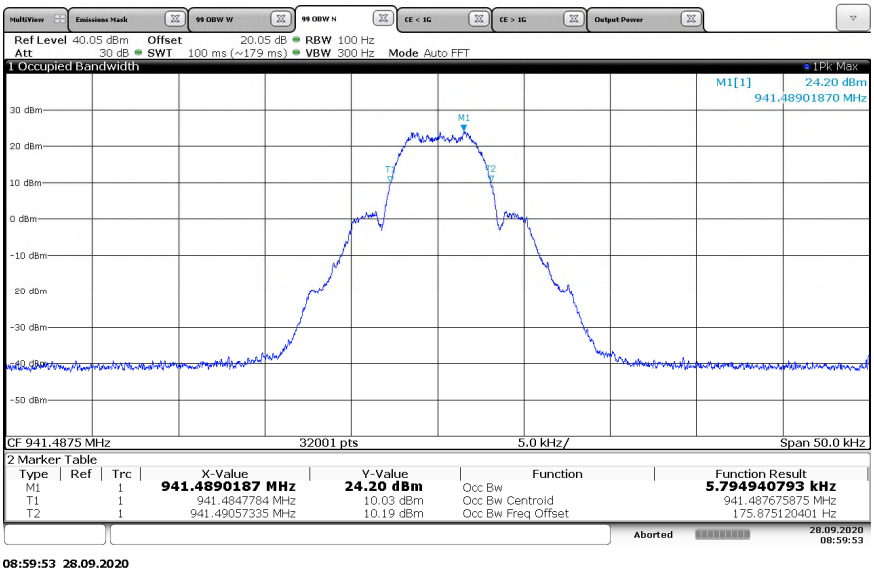

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Figure 2.1.6-6: 941.4875 MHz – MPass 5k Mode

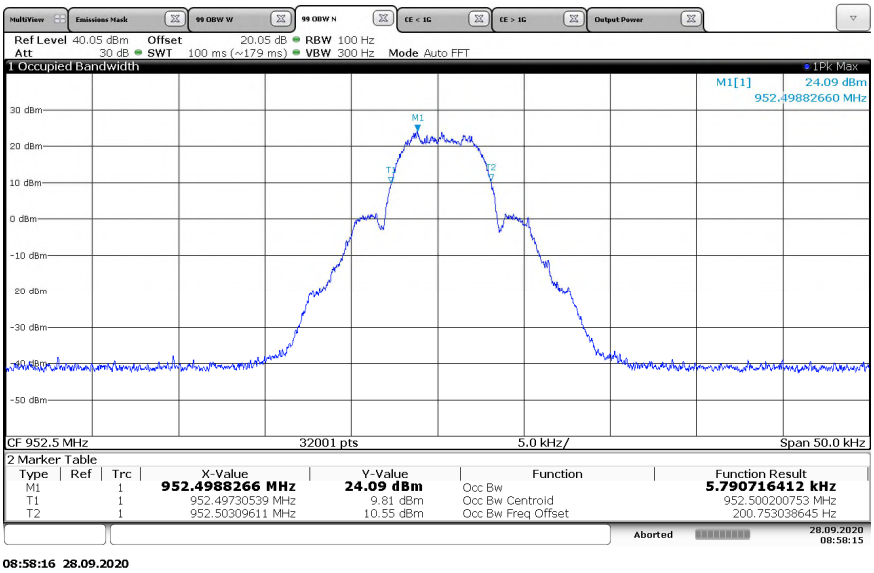

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Figure 2.1.6-7: 952.5 MHz – MPass 5k Mode

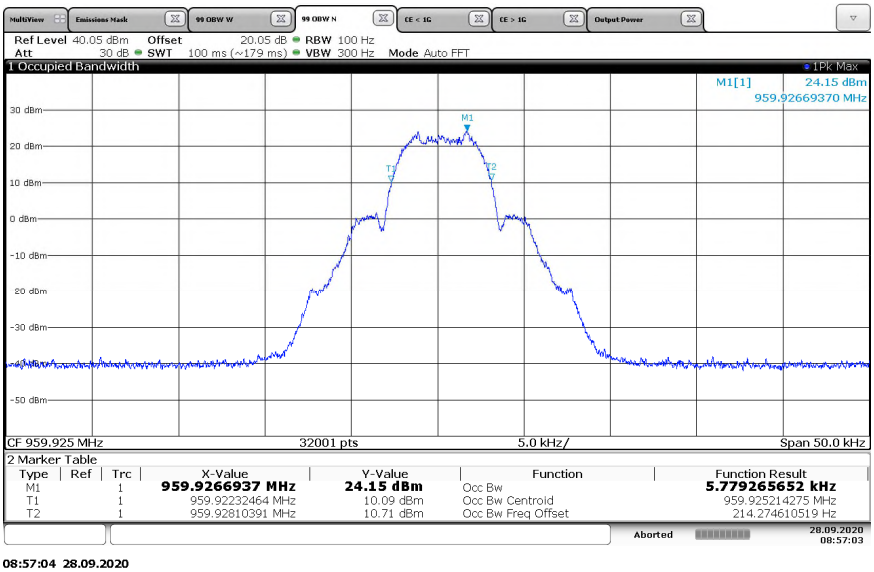

Figure 2.1.6-8: 959.925 MHz – MPass 5k Mode

2.1.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., Presidential Drive, Suite 101, Durham, NC 27703, USA.

Instrument	Manufacturer	Type No	TE No	Firmware / Software Revision	Calibration Period (months)	Calibration Due
Atten 20dB 2.9mm-M/F, DC-26.5GH, 2W	Aeroflex Inmet	26AH-20	DEMC3049	N/A	12	23-Jan-2021
Signal & Spectrum Analyzer	Rohde & Schwarz	FSW43	DEMC3085	2.90 SP1	24	07-Dec-2022

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

2.2 Spurious Emissions at Antenna Terminals

2.2.1 Specification Reference

FCC 47 CFR Parts: 2.1053; 24.133 a(1), a(2); 101.111 a(5), 101.111 a(6)
ISED Canada RSS-119 5.8.3, RSS-119 5.8.6; RSS-134 4.4

2.2.2 Equipment Under Test and Modification State

Model: FLXI2102, Serial Number: 7300515

2.2.3 Date of Test

2020-September-25

2.2.4 Test Method

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through 20.05dB of passive attenuation. The spectrum analyzer resolution bandwidth was set to 100 kHz below 1000 MHz and 1 MHz above 1000 MHz. The internal correction factors of the spectrum analyzer were employed to correct for any cable, attenuator or filter losses. The spectrum was investigated in accordance to CFR 47 Part 2.1057. There were no significant emissions from 9 kHz or lowest frequency generated to 30 MHz. Results are shown below.

2.2.5 Environmental Conditions

Ambient Temperature	23.8 °C
Relative Humidity	45.1 %
Atmospheric Pressure	1000.6 mbar

2.2.6 Test Results

<u>DC Powered Operating</u>

Part 24.133 a(1), a(2), ISED Canada RSS-134 4.4.1 (a), (b), 4.4.2 (a), (b)

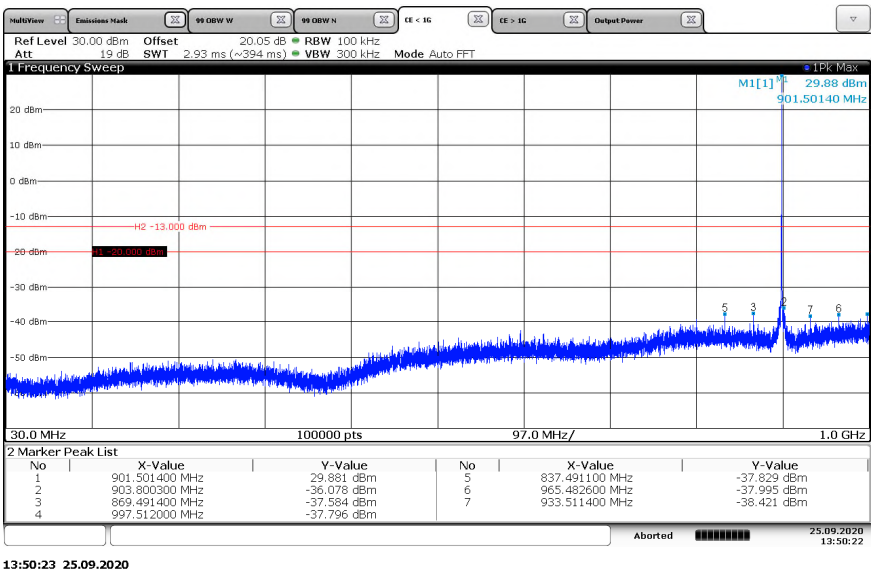

Figure 2.2.6-1: 901.5 MHz – 30MHz to 1GHz – Normal mode

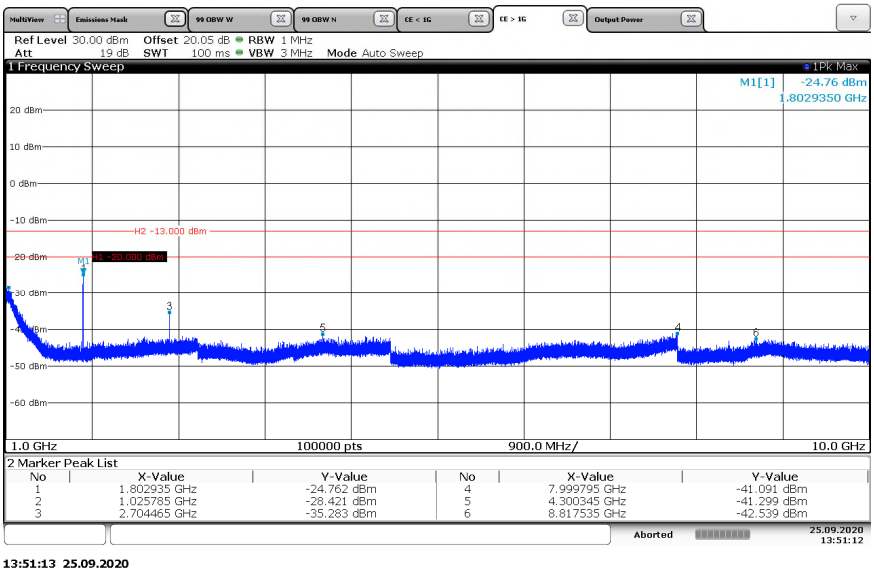

Figure 2.2.6-2: 901.5 MHz – 1GHz to 10GHz – Normal mode

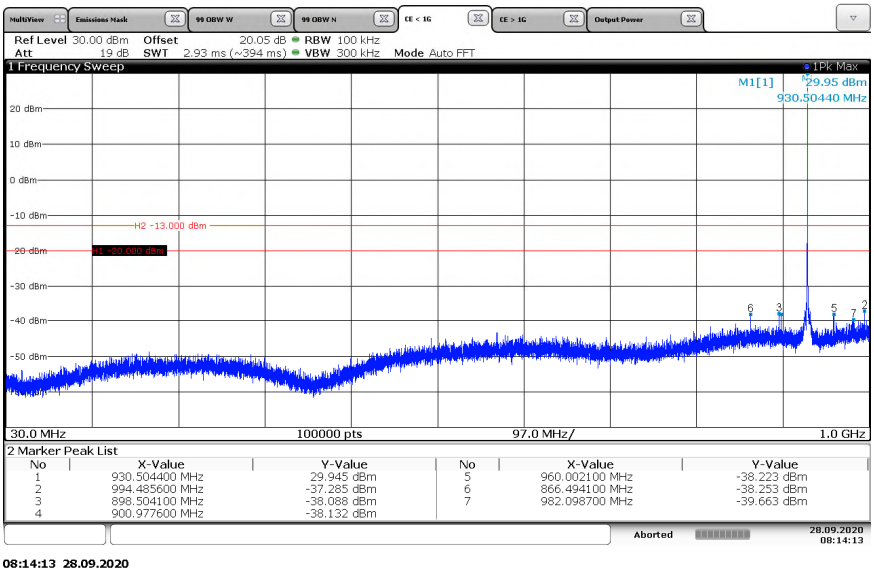

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Figure 2.2.6-3: 930.5 MHz – 30MHz to 1GHz – Mpass5k mode

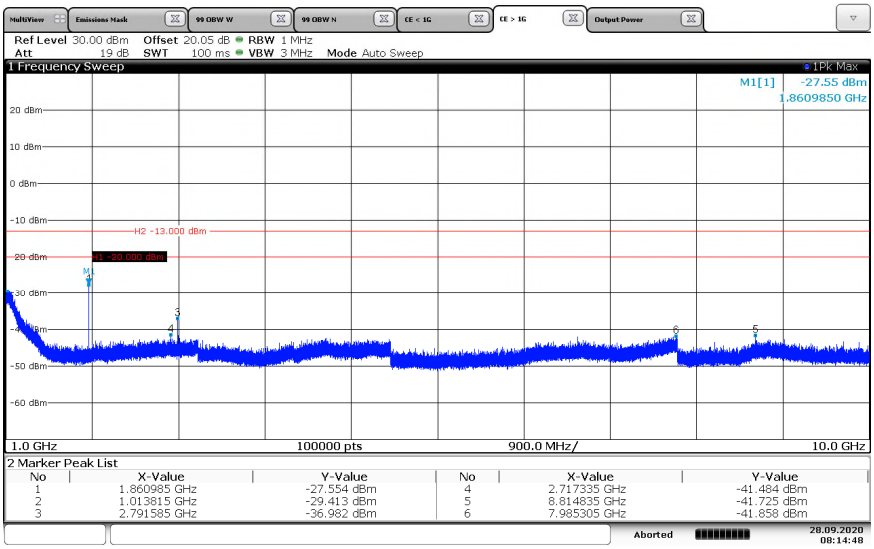

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Figure 2.2.6-4: 930.5 MHz – 1GHz to 10GHz – Mpass 5k mode

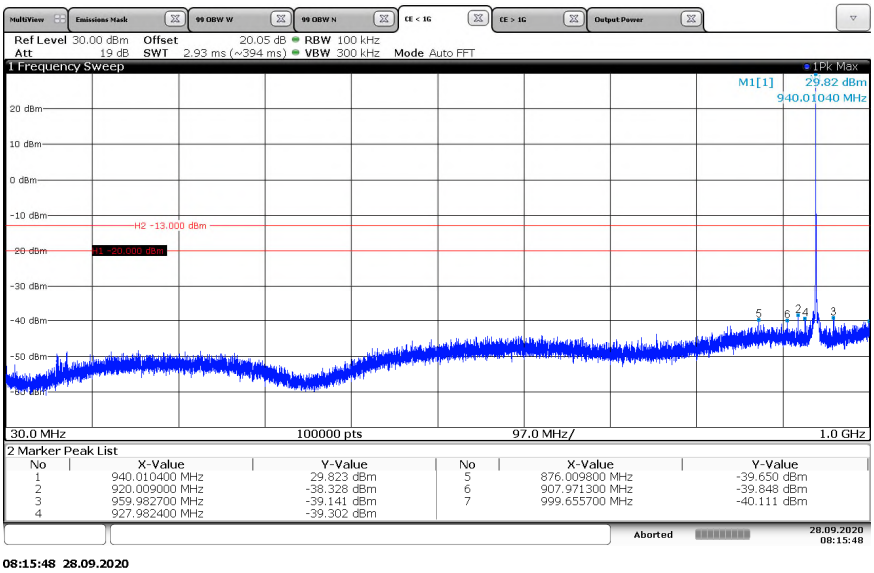

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Figure 2.2.6-5: 940.0125 MHz – 30MHz to 1GHz – Mpass5k mode

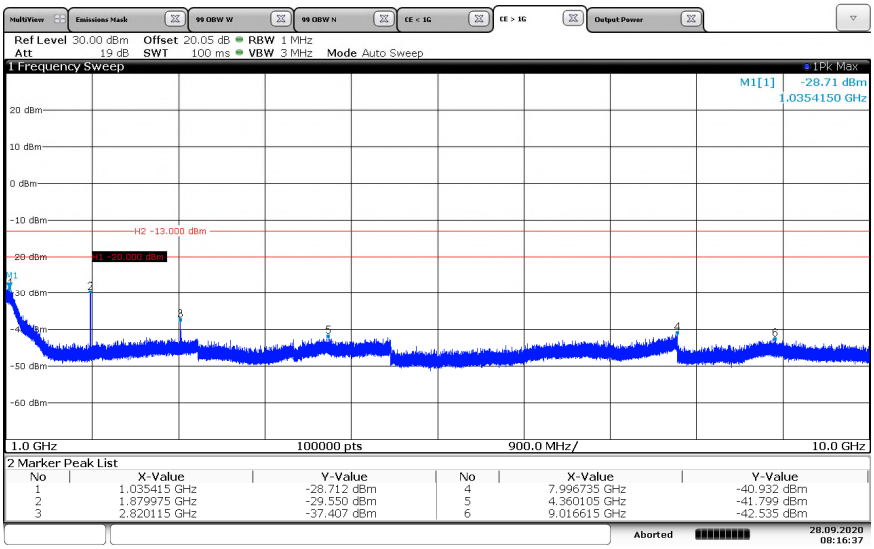

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Figure 2.2.6-6: 940.0125 MHz – 1GHz to 10GHz – Mpass5k mode

Part 101.111 a(6), RSS-119 5.8.6

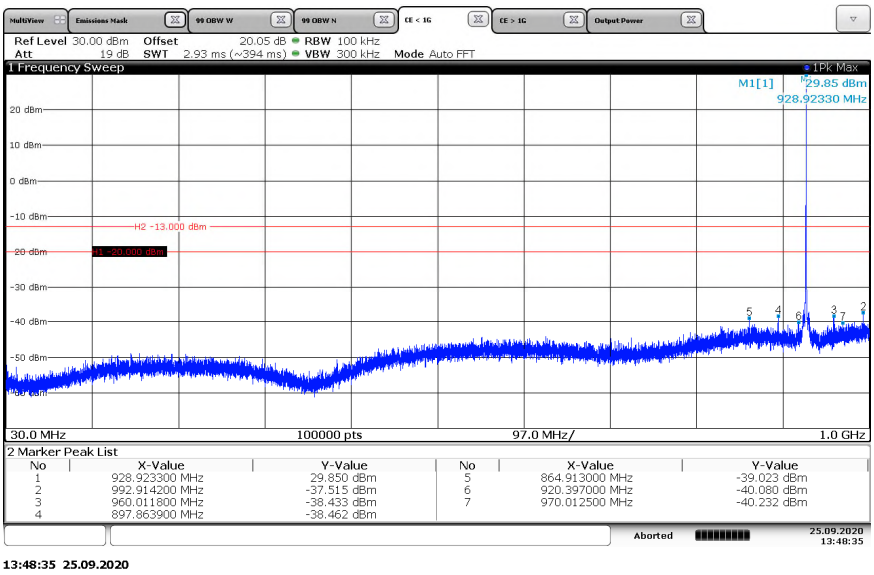


Figure 2.2.6-7: 928.925 MHz – 30MHz to 1GHz – Normal mode

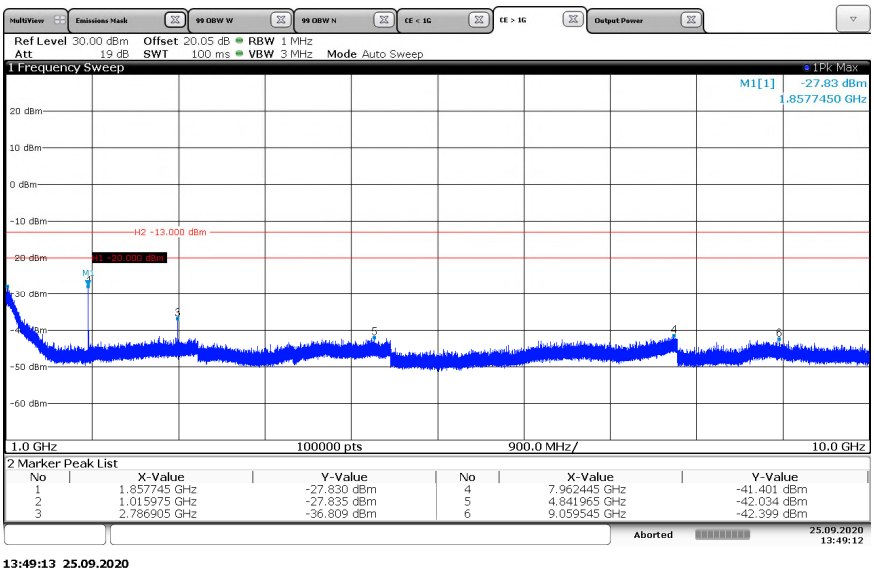


Figure 2.2.6-8: 928.925 MHz – 1GHz to 10GHz – Normal mode

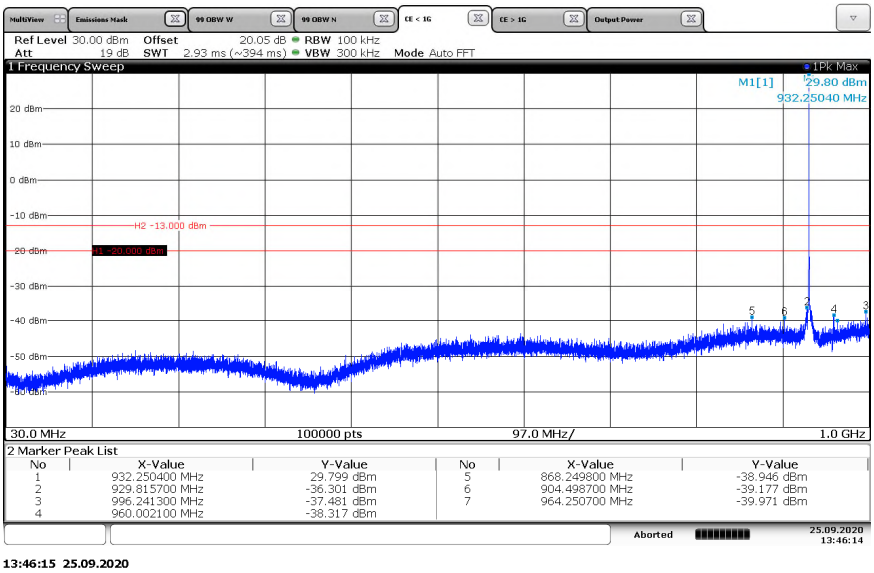


Figure 2.2.6-9: 932.25 MHz – 30MHz to 1GHz – Normal mode

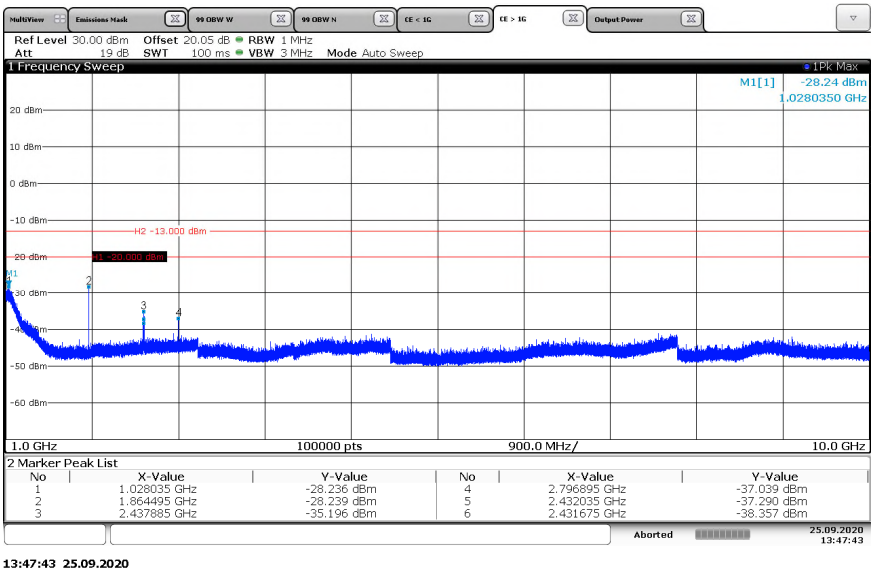
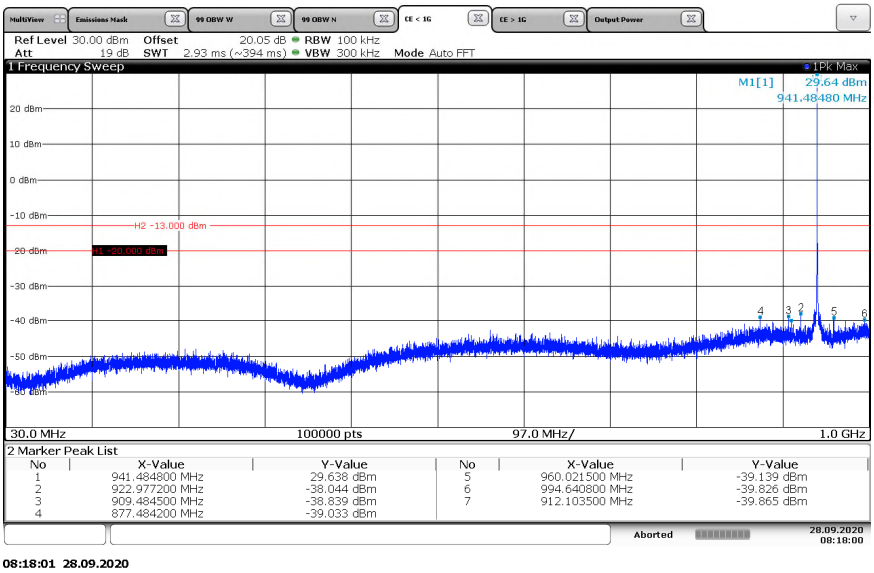
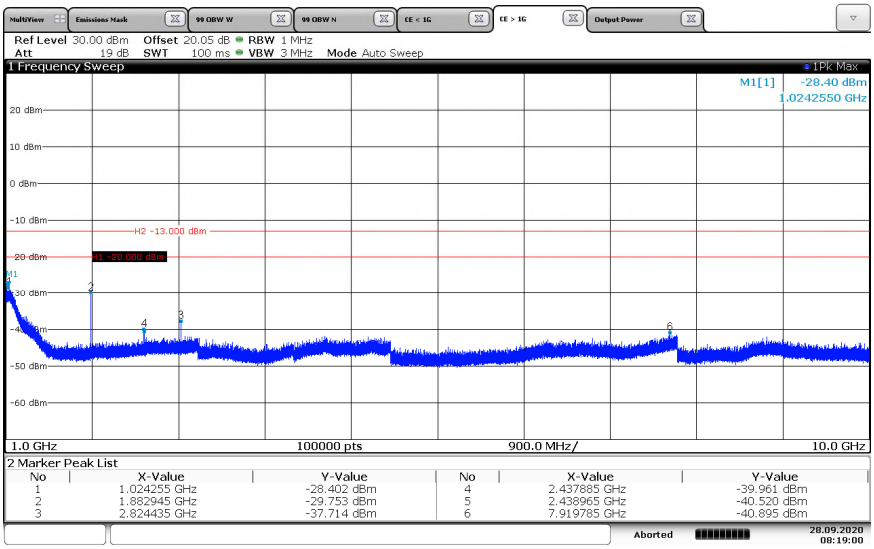


Figure 2.2.6-10: 932.25 MHz – 1GHz to 10GHz – Normal mode



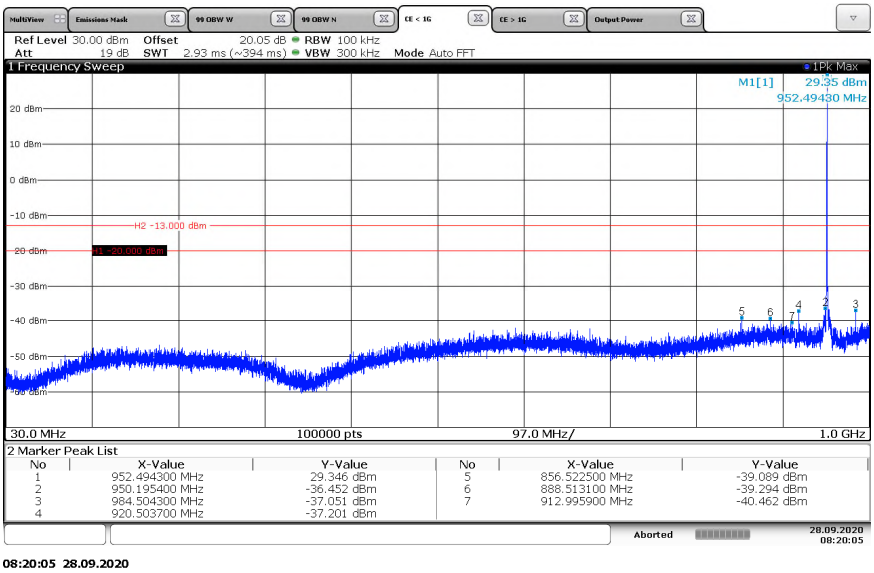
08:18:01 28.09.2020

Figure 2.2.6-11: 941.4875 MHz – 30MHz to 1GHz – Mpass5k mode



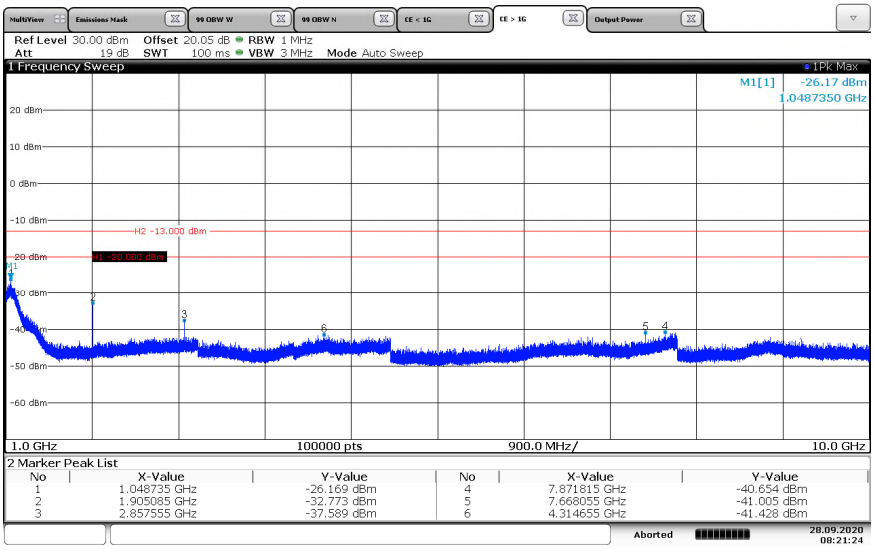
08:19:00 28.09.2020

Figure 2.2.6-12: 941.4875 MHz – 1GHz to 10GHz – Mpass5k mode



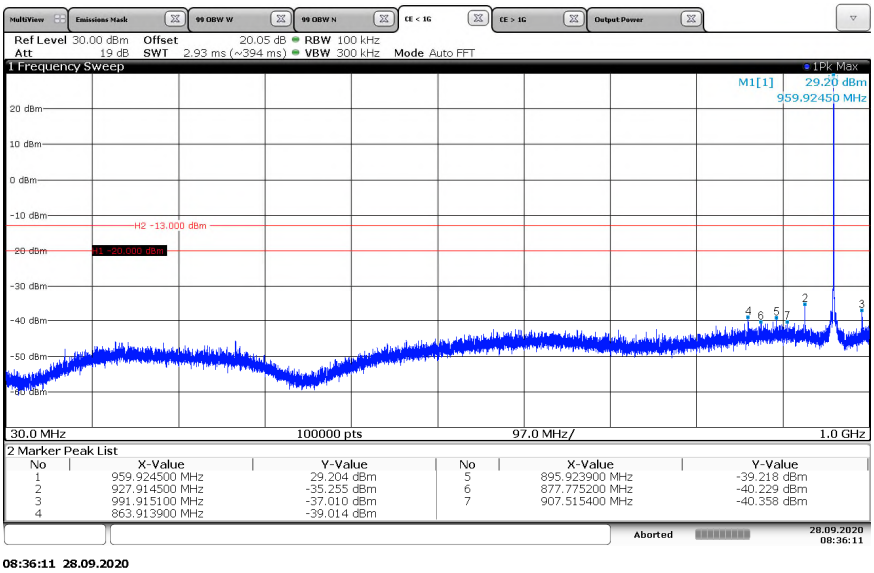
08:20:05 28.09.2020

Figure 2.2.6-13: 952.5 MHz – 30MHz to 1GHz – Mpass5k mode



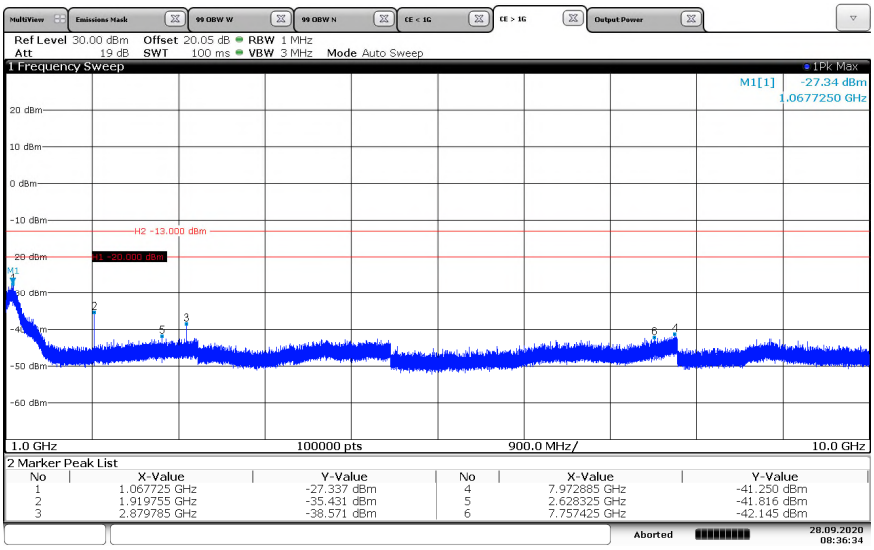
08:21:25 28.09.2020

Figure 2.2.6-14: 952.5 MHz – 1GHz to 10GHz – Mpass5k mode



08:36:11 28.09.2020

Figure 2.2.6-15: 959.925 MHz – 30MHz to 1GHz – Mpass5k mode



08:36:35 28.09.2020

Figure 2.2.6-16: 959.925 MHz – 1GHz to 10GHz – Mpass5k mode

2.2.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., Presidential Drive, Suite 101, Durham, NC 27703, USA.

Instrument	Manufacturer	Type No	TE No	Firmware / Software Revision	Calibration Period (months)	Calibration Due
Atten 20dB 2.9mm-M/F, DC-26.5GH, 2W	Aeroflex Inmet	26AH-20	DEMC3049	N/A	12	23-Jan-2021
Signal & Spectrum Analyzer	Rohde & Schwarz	FSW43	DEMC3085	2.90 SP1	24	07-Dec-2022

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

2.3 Field Strength of Spurious Radiation

2.3.1 Specification Reference

FCC 47 CFR Parts: 2.1053; 24.133 a(1), a(2); 101.111 a(6)
ISED Canada RSS-119 5.8.6; RSS-134 4.4

2.3.2 Equipment Under Test and Modification State

Model: FLXI2102, Serial Number: 7300514

2.3.3 Date of Test

2020-September-28 to 2020-October-01

2.3.4 Test Method

The EUT was evaluated in accordance to ANSI C63.26:2015 Section 5.5.3 Measurement of Spurious Emissions using Substitution Method.

Radiated emissions tests were made over the frequency range of 30 MHz to 10 times the highest fundamental frequency. The equipment under test is placed in the Semi-Anechoic Chamber on a RF transparent table at the turntable center. For each spurious emission, the antenna mast is raised and lowered from one (1) to four (4) meters and the turntable is rotated 360º and the maximum reading on the spectrum analyzer is recorded. This was repeated for both horizontal and vertical polarizations of the receive antenna.

The equipment under test is then replaced with a substitution antenna fed by a signal generator. The signal generator's frequency is set to that of the spurious emission recorded from the equipment under test. The antenna mast is raised and lowered from one (1) to four (4) meters to obtain a maximum reading on the spectrum analyzer. The output of the signal generator is then adjusted until the reading on the spectrum analyzer matches that obtained from the equipment under test. The signal generator level is recorded. The power in dBm of each spurious emission is calculated by correcting the signal generator level for the cable loss and gain of the substitution antenna referenced to a dipole. The spectrum was investigated in accordance to FCC CFR 47 Part 2.1057.

The magnitude of all spurious emissions not reported were attenuated below the noise floor of the measurement system and therefore not specified in this report. Results are shown below.

2.3.5 Environmental Conditions

Ambient Temperature	23.8 °C
Relative Humidity	45.1 %
Atmospheric Pressure	1000.6 mbar

2.3.6 Test Results

DC Powered Operating

Part 24.133 a(1), a(2), RSS-134 4.4.1 (a), (b), 4.4.2 (a), (b)4.4.2 (a),

Table 2.3.6-1: Field Strength of Spurious Emissions – 901.5 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
965.87	33.6	H	-39.45	-13.00	26.45
1141.92	63.7	H	-39.81	-13.00	26.81
1141.92	57.7	V	-46.91	-13.00	33.91
1803	80.6	H	-21.24	-13.00	8.24
1803	76.4	V	-25.34	-13.00	12.34
2704.5	60.3	H	-39.13	-13.00	26.13
2704.5	63.1	V	-36.33	-13.00	23.33

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-2: Field Strength of Spurious Emissions – 930.5 MHz – mPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
994.55	36.8	H	-36.44	-13.00	23.44
1148.24	67.5	H	-35.89	-13.00	22.89
1148.24	62	V	-42.29	-13.00	29.29
1861	70.9	H	-31.78	-13.00	18.78
1861	67.9	V	-34.08	-13.00	21.08
2791.5	44.5	H	-59.37	-13.00	46.37
2791.5	51.3	V	-49.67	-13.00	36.67

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-3: Field Strength of Spurious Emissions – 940.0125 MHz – mPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1145.03	66.3	H	-37.10	-13.00	24.10
1145.03	61.2	V	-43.10	-13.00	30.10
1880.025	66.8	H	-35.69	-13.00	22.69
1880.025	63.3	V	-38.79	-13.00	25.79
2820.0375	45.5	H	-57.58	-13.00	44.58
2820.0375	49.2	V	-52.18	-13.00	39.18

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Part 101.111a(5) & a(6), RSS-119 5.8.3 & 5.8.6

Table 2.3.6-4: Field Strength of Spurious Emissions – 928.925 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1143.43	68.3	H	-35.11	-20.00	15.11
1143.43	61.9	V	-42.41	-20.00	22.41
1857.85	72.5	H	-29.78	-20.00	9.78
1857.85	71	V	-30.68	-20.00	10.68
2786.775	51.1	H	-49.87	-20.00	29.87
2786.775	53.5	V	-45.67	-20.00	25.67

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-5: Field Strength of Spurious Emissions – 932.25 MHz – Normal Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1141.83	68.3	H	-35.11	-20.00	15.11
1141.83	62.5	V	-41.81	-20.00	21.81
1864.5	69.9	H	-32.48	-20.00	12.48
1864.5	67	V	-34.58	-20.00	14.58
2796.75	46.9	H	-55.17	-20.00	35.17
2796.75	52.4	V	-48.57	-20.00	28.57

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-6: Field Strength of Spurious Emissions – 941.4875 MHz – mPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1144.23	69.8	H	-33.60	-20.00	13.60
1144.23	64.4	V	-39.70	-20.00	19.70
1882.975	66.9	H	-35.39	-20.00	15.39
1882.975	63.5	V	-38.39	-20.00	18.39
2824.4625	48.5	H	-52.89	-20.00	32.89
2824.4625	50.6	V	-50.39	-20.00	30.39

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-7: Field Strength of Spurious Emissions – 952.5 MHz – mPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1146.63	71.1	H	-32.19	-20.00	12.19
1146.63	59.6	V	-44.79	-20.00	24.79
1905	60.7	H	-41.41	-20.00	21.41
1905	58	V	-43.91	-20.00	23.91
2857.5	45.6	H	-57.10	-20.00	37.10
2857.5	48.8	V	-53.20	-20.00	33.20

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 2.3.6-8: Field Strength of Spurious Emissions – 959.925 MHz – mPass 5k Mode

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1148.24	71.7	H	-31.59	-20.00	11.59
1148.24	66.9	V	-37.09	-20.00	17.09
1919.85	58.4	H	-44.52	-20.00	24.52
1919.85	55.7	V	-46.62	-20.00	26.62
2879.775	44	H	-59.91	-20.00	39.91
2879.775	47.8	V	-54.41	-20.00	34.41

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

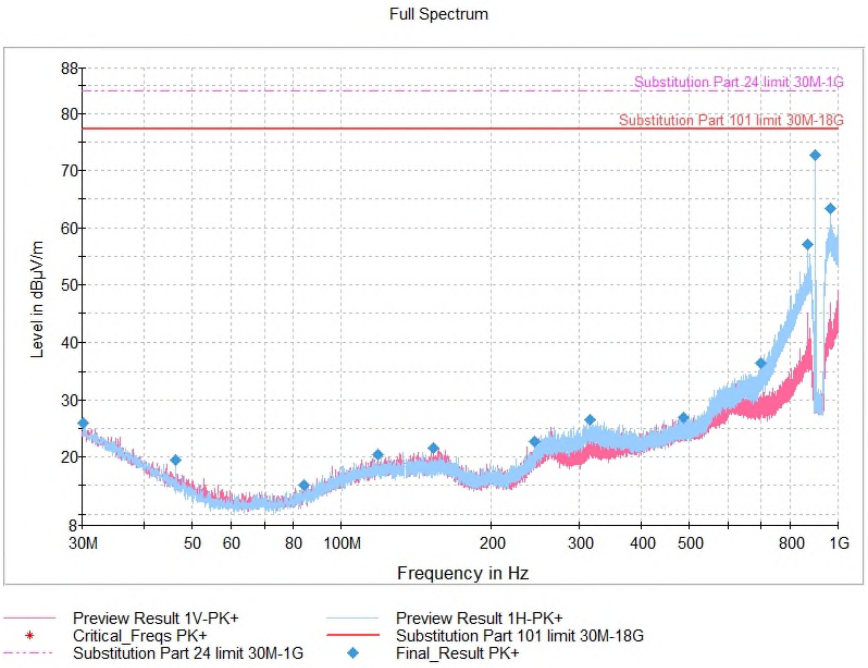


Figure 2.3.6-1: Field Strength of Spurious Emissions Representative Pre-Scan – 30 MHz – 1 GHz

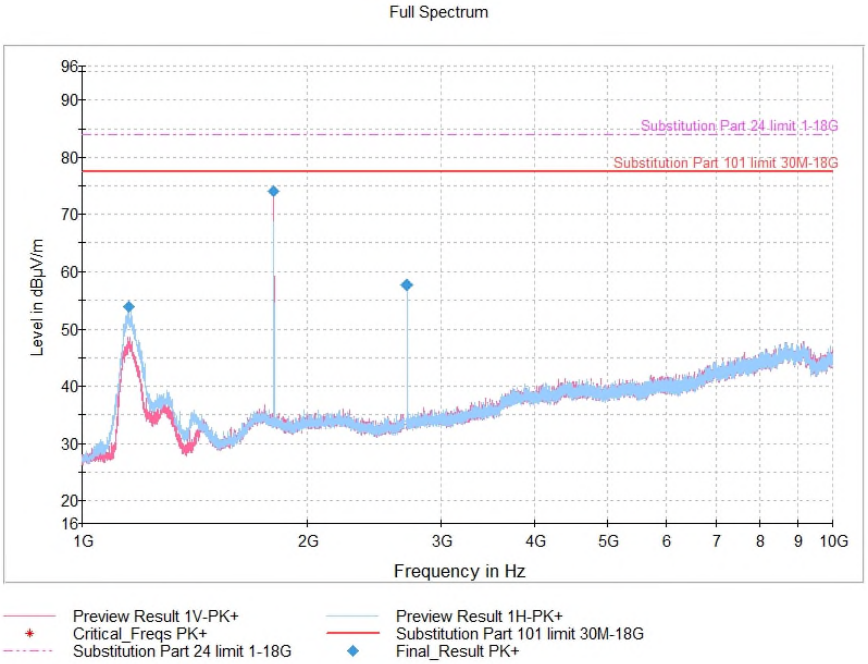


Figure 2.3.6-2: Field Strength of Spurious Emissions Representative Pre-Scan – 1 GHz – 10 GHz

2.3.7 Test Location and Test Equipment Used

This test was carried out in TÜV SÜD America, Inc., Presidential Drive, Suite 101, Durham, NC 27703, USA.

Instrument	Manufacturer	Type No	TE No	Firmware / Software Revision	Calibration Period (months)	Calibration Due
Receiver	Rohde & Schwarz	ESU40	DEMC3002	4.73 SP4	12	22-Jan-2021
Pre-Amplifier 1GHz to 18GHz	Rohde & Schwarz	TS-PR18	DEMC3006	N/A	12	23-Jan-2021
Software	Rohde & Schwarz	EMC32-EB	DEMC3012	10.50.00	N/A	NCR
Double-Ridged Waveguide Horn Antenna	EMCO	3115	DEMC3014	N/A	24	12-Apr-2021
Double ridged waveguide Antenna	Fei Teng Wireless Technology	HA-07M18G-NF	DEMC3016	N/A	12	08-Apr-2021
20GHz Signal Generator	Rohde & Schwarz	SMB100A	DEMC3020	2.20.382.113	12	22-Jan-2021
Highpass Filter	Micro-Tronics	HPM50108	DEMC3029	N/A	12	29-Jan-2021
High Frequency Cable 26 GHz	Hasco, Inc.	HLL142-S1-S1-192/WA	DEMC3032	N/A	12	23-Jan-2021
High Frequency Cable 26GHz	Hasco, Inc.	HLL142-S1-S1-36	DEMC3033	N/A	12	23-Jan-2021
RF Cable Set with Asset # 3039	Florida RF Labs	NMSE-290AW-60.0-NMSE	DEMC3038	N/A	12	29-Jan-2021
RF Cable. Part of two part set with Asset # 3038	Florida RF Labs	NMSE-290AW-396.0-NMSE	DEMC3039	N/A	12	29-Jan-2021
Cable for Asset 3005	Rohde & Schwarz	Rohde & Schwarz 3005	DEMC3055	N/A	12	23-Jan-2021
BiLog Antenna	Ametek CTS Germany GmbH	CBL 6112D	DEMC3161	N/A	12	18-Feb-2021
Band Reject Filter	Micro-Tronics	BRC50722	DEMC3178	N/A	12	06-Mar-2021
Log Periodic Antenna	EMCO	3146	DEMC499	N/A	24	20-Jun-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

Table 3-1: Test Equipment Used – Durham, NC

Instrument	Manufacturer	Type No	TE No	Firmware / Software Revision	Calibration Period (months)	Calibration Due
Receiver	Rohde & Schwarz	ESU40	DEMC3002	4.73 SP4	12	22-Jan-2021
Pre-Amplifier 1GHz to 18GHz	Rohde & Schwarz	TS-PR18	DEMC3006	N/A	12	23-Jan-2021
Power Meter	Rohde & Schwarz	NRP2	DEMC3008	N/A	12	11-Feb-2021
Wideband Sensor	Rohde & Schwarz	NRP-Z81	DEMC3009	N/A	12	11-Feb-2021
Software	Rohde & Schwarz	EMC32-EB	DEMC3012	10.50.00	N/A	NCR
Double-Ridged Waveguide Horn Antenna	EMCO	3115	DEMC3014	N/A	24	12-Apr-2021
Double ridged waveguide Antenna	Fei Teng Wireless Technology	HA-07M18G-NF	DEMC3016	N/A	12	08-Apr-2021
20GHz Signal Generator	Rohde & Schwarz	SMB100A	DEMC3020	2.20.382.113	12	22-Jan-2021
Highpass Filter	Micro-Tronics	HPM50108	DEMC3029	N/A	12	29-Jan-2021
High Frequency Cable 26 GHz	Hasco, Inc.	HLL142-S1-S1-192/WA	DEMC3032	N/A	12	23-Jan-2021
High Frequency Cable 26GHz	Hasco, Inc.	HLL142-S1-S1-36	DEMC3033	N/A	12	23-Jan-2021
RF Cable Set with Asset # 3039	Florida RF Labs	NMSE-290AW-60.0-NMSE	DEMC3038	N/A	12	29-Jan-2021
RF Cable. Part of two part set with Asset # 3038	Florida RF Labs	NMSE-290AW-396.0-NMSE	DEMC3039	N/A	12	29-Jan-2021
Atten 20dB 2.9mm-M/F, DC-26.5GH, 2W	Aeroflex Inmet	26AH-20	DEMC3049	N/A	12	23-Jan-2021
Cable for Asset 3005	Rohde & Schwarz	Rohde & Schwarz 3005	DEMC3055	N/A	12	23-Jan-2021
BiLog Antenna	Ametek CTS Germany GmbH	CBL 6112D	DEMC3161	N/A	12	18-Feb-2021
Band Reject Filter	Micro-Tronics	BRC50722	DEMC3178	N/A	12	06-Mar-2021
Log Periodic Antenna	EMCO	3146	DEMC499	N/A	24	20-Jun-2021
Atten 20dB 2.9mm-M/F, DC-26.5GH, 2W	Aeroflex Inmet	26AH-20	DEMC3049	N/A	12	23-Jan-2021
Signal & Spectrum Analyzer	Rohde & Schwarz	FSW43	DEMC3085	2.90 SP1	24	07-Dec-2022

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

4 Diagram of Test Set-ups

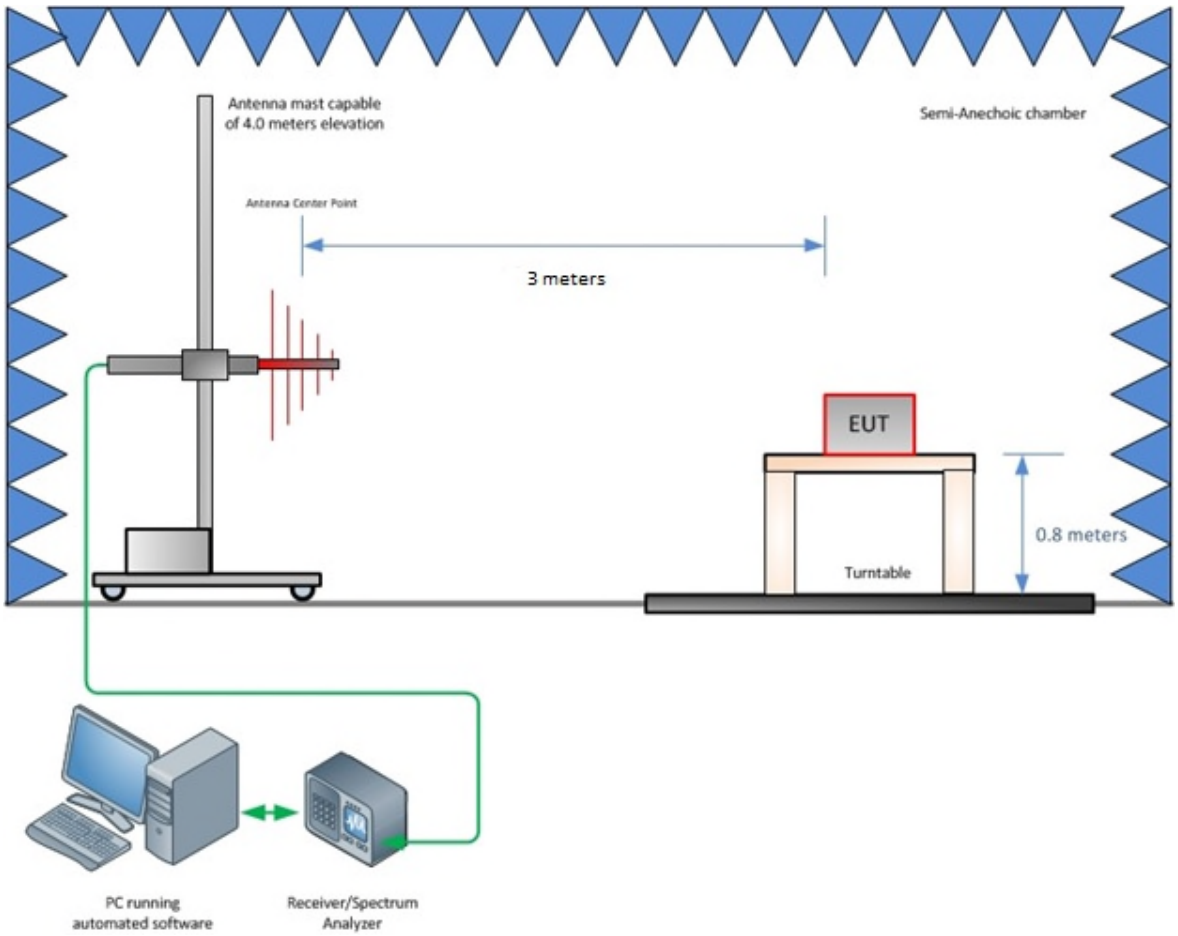


Figure 4-1 - Radiated Emissions Test Setup up to 1 GHz

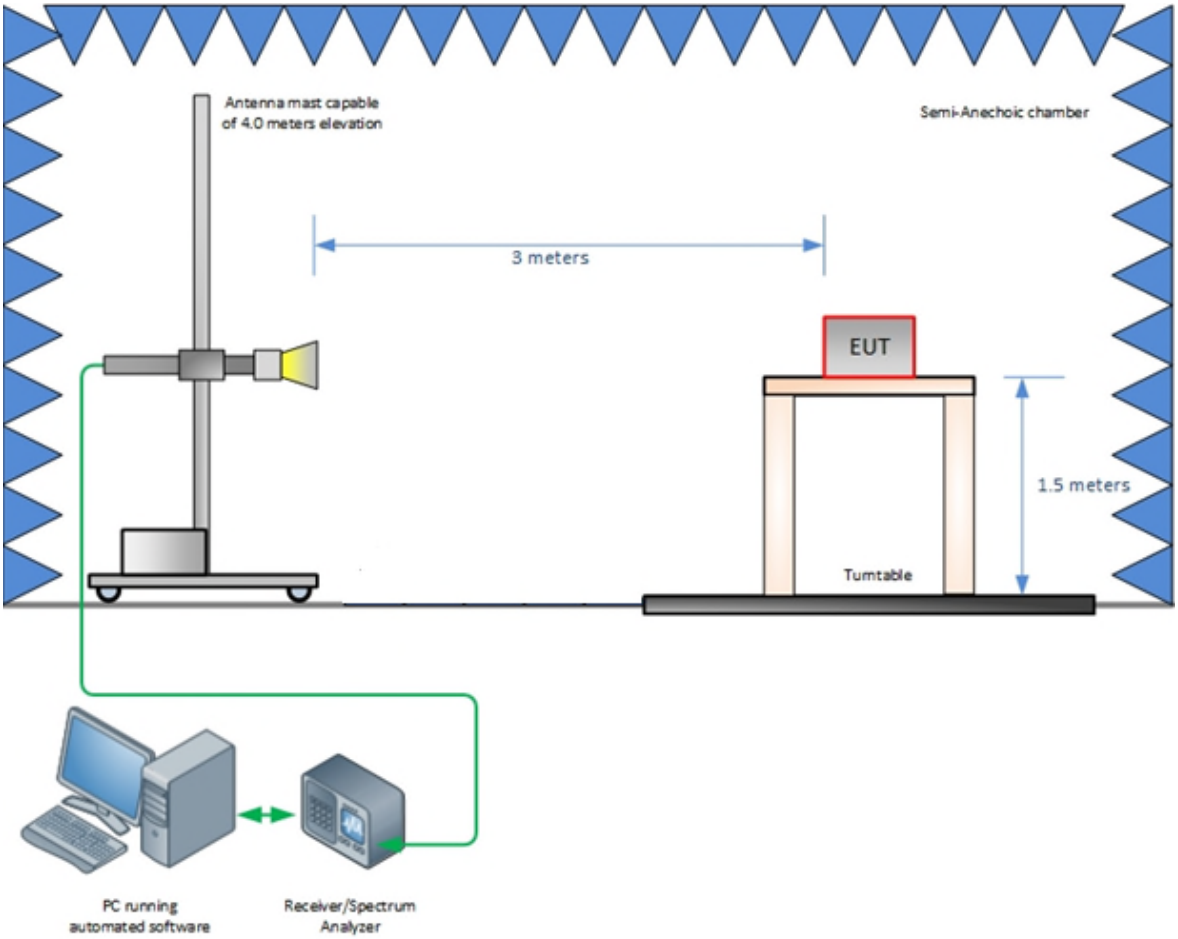


Figure 4-2 - Radiated Emissions Test Setup above 1 GHz

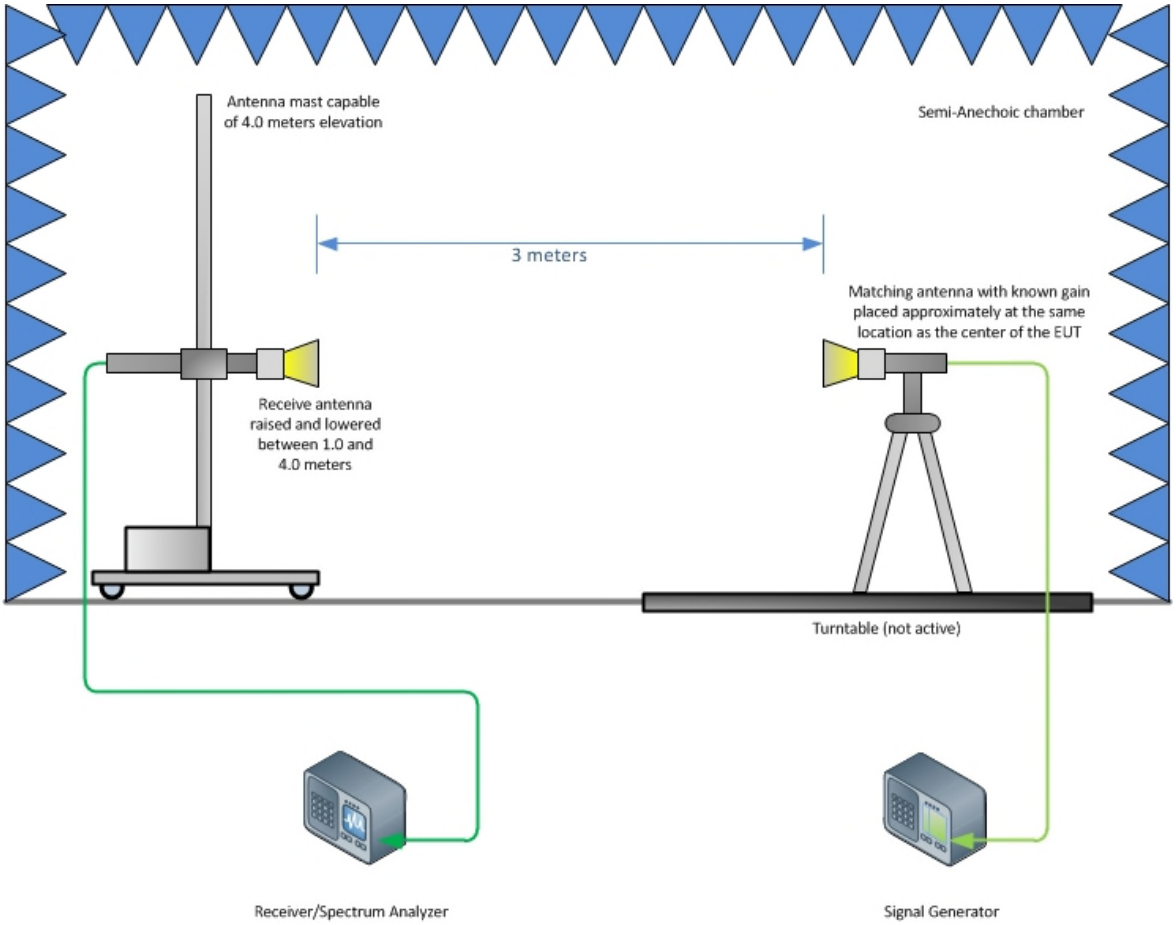


Figure 4-3 - Substitution Test Setup above 1 GHz

5 Measurement Uncertainty

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

Table 5-1 – Measurement Uncertainties , Durham, NC

Test Discipline	MU		Unit
Transmitter Unwanted Emissions in the Spurious Domain	Conducted	2.717	dB
	Radiated	5..877	dB
Temperature		0.689	°C
RF Output Power		1.13	dB
Occupied Channel Bandwidth		0.004	%

6 Accreditation, Disclaimers and Copyright

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