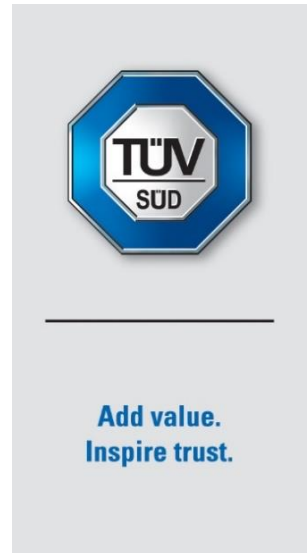


FCC and ISED Test Report

Jotron AS
Tron SA20 PLB

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 95, ISED RSS-287, ISED RSS-GEN and RTCM 11010.4
(121.5 MHz Homer Frequency)

Prepared for: Jotron AS
Ringdalskogen 8
3270 Larvik
Norway



FCC ID: VRVTRONSA20 IC: 2131A-TRONSA20

COMMERCIAL-IN-CONFIDENCE

Document 75956621-03 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Matthew Russell	Chief Engineer (RF)	Authorised Signatory	27 September 2023

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

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 2, FCC 47 CFR Part 95, ISED RSS-287, ISED RSS-GEN and RTCM 11010.4. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Neil Rousell	27 September 2023	
Testing	Paul Adams	27 September 2023	
Testing	Ahmad Javid	27 September 2023	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 2: 2021, FCC 47 CFR Part 95: 2021, ISED RSS-287: Issue 2 (03-2014) +A1 (06-2021), ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) + A2 (02-2021) and RTCM 11010.4: (06-2022) for the tests detailed in section 1.3.



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ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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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	27 September 2023

Table 1

1.2 Introduction

Applicant	Jotron AS
Manufacturer	Jotron AS
Model Number(s)	Tron SA20 PLB
Serial Number(s)	151 and 107
Hardware Version(s)	2137
Software Version(s)	1.3
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2021 FCC 47 CFR Part 95: 2021 ISED RSS-287: Issue 2 (03-2014) +A1 (06-2021) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) + A2 (2022-05). RTCM 11010.4: (06-2022)
Order Number	P55347
Date	16-September-2022
Date of Receipt of EUT	08-December-2022
Start of Test	12-January-2023
Finish of Test	20-June-2023
Name of Engineer(s)	Neil Rousell Paul Adams Ahmad Javid
Related Document(s)	ANSI C63.26: 2015



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 95, ISED RSS-287, ISED RSS-GEN and RTCM 11010.4 is shown below.

Section	Specification Clause					Test Description	Result	Comments/Base Standard
	Part 2	Part 95	RSS-287	RSS-GEN	RTCM 11010.4			
Configuration and Mode: Battery Powered - 121.5 MHz Homer								
2.1	2.1055	Subpart K	7.4.2	6.11	A.16.1	Transmitter Frequency and Output Power Stabilities	Pass	
2.2	2.1047	Subpart K	7.4.1	-	A.16.2	Modulation Characteristics	Pass	
2.3	-	Subpart K	7.4.5	-	A.16.2(e)	Spectrum Characteristics	Pass	
2.4	2.1046	Subpart K	7.4.3	6.12	A.16.3	Peak Equivalent Isotropic Radiated Power	Pass	
2.5	2.1051	Subpart K	7.4.4	6.13	4.2.4	Spurious Emissions at Antenna Terminals	Pass	
2.6	2.1049	-	-	6.7	-	Occupied Bandwidth	Pass	
2.7	21053	-	7.4.4	6.13	-	Radiated Spurious Emissions	Pass	

Table 2



1.4 Application Form

Equipment Description

Technical Description: <i>(Please provide a brief description of the intended use of the equipment including the technologies the product supports)</i>	RLS capable Personal Locator Beacon (PLB)	
Manufacturer:	Jotron AS	
Model:	Tron SA20 PLB	
Part Number:	103675	
Hardware Version:	2137	
Software Version:	1.3	
FCC ID of the product under test- see guidance here	VRVTRONSA20	
IC ID of the product under test- see guidance here	2131A-TRONSA20	

Table 3

Intentional Radiators

Technology	Homer 121	PLB 406
Frequency Range (MHz to MHz)	121.5 MHz	406.031 MHz
Conducted Declared Output Power(dBm)	20.6	36.6
Antenna Gain (dBi)	-	-
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	25 kHz	25 kHz
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	AM	Phase modulation
ITU Emission Designator (see guidance here)	3K20A3X	16K0G1D
(not mandatory for Part 15 devices)		
Bottom Frequency (MHz)	-	-
Middle Frequency (MHz)	121.5 MHz	406.031 MHz
Top Frequency (MHz)	-	-

Table 4



Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	
Lowest frequency generated or used in the device or on which the device operates or tunes	
Class A Digital Device (Use in commercial, industrial or business environment) IZI Class B Digital Device (Use in residential environment only) <input type="checkbox"/>	

Table 5

AC Power Source

AC supply frequency:		Hz
Voltage		V
Max current:		A
Single Phase D	Three Phase <input type="checkbox"/>	

Table 6

DC Power Source

Nominal voltage:		V
Extreme upper voltage:		V
Extreme lower voltage:		V
Max current:		A

Table 7

Battery Power Source

Voltage:	6.0	V
End-point voltage:	<i>equivalent to discharge of 24 hours of use</i>	<i>V (Point at which the battery will terminate)</i>
Alkaline <input type="checkbox"/> Leclanche <input type="checkbox"/> Lithium <input checked="" type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Lead Acid <input type="checkbox"/> *(Vehicle regulated)		
Other <input type="checkbox"/> Please detail:		

Table 8

Charging

Can the EUT transmit whilst being charged	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
---	--

Table 9



Temperature

Minimum temperature:	-20	°C
Maximum temperature:	+55	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)	-	dB
--	---	----

Table 11

Antenna Characteristics

Antenna connector <input type="checkbox"/>		State impedance		Ohm
Temporary antenna connector <input type="checkbox"/>		State impedance	50	Ohm
Integral antenna <input checked="" type="checkbox"/>	Type:	Gain	-5	dBi
External antenna <input type="checkbox"/>	Type:	Gain		dBi
<p>For external antenna only: Standard Antenna Jack <input type="checkbox"/> If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed <input type="checkbox"/> Non-standard Antenna Jack D All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement. Where the gain of the antenna is inherently accounted for as a result of the measurement, such as field strength measurements on a part 15.249 or 15.231 device, so the gain does not necessarily need to be verified. However, enough information regarding the construction of the antenna shall be provided. Such information maybe photographs, length of wire antenna etc.</p>				

Table 12

Ancillaries (If applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 13

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

Name: Frank Løke
 Position held: Certification Manager
 Date: 11 April 2023



1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a Jotron AS Tron SA20 PLB.

The primary function of the EUT (Personal Location Beacon (PLB)) is transmitting 406 MHz and additionally, the EUT has functionality for GNSS Rx (GPS/Galileo/GLONASS), 121.5 MHz Homer and RLS.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test 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
Model: Tron SA20 PLB, Serial Number: 151			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: Tron SA20 PLB, Serial Number: 107			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 14



1.8 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Battery Powered - 121.5 MHz Homer		
Transmitter Frequency and Output Power Stabilities	Neil Rousell	UKAS
Modulation Characteristics	Neil Rousell	UKAS
Spectrum Characteristics	Neil Rousell	UKAS
Peak Equivalent Isotropic Radiated Power	Paul Adams	UKAS
Spurious Emissions at Antenna Terminals	Neil Rousell	UKAS
Occupied Bandwidth	Neil Rousell	UKAS
Radiated Spurious Emissions	Ahmad Javid	UKAS

Table 15

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Transmitter Frequency and Output Power Stabilities

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 95, Subpart K
ISED RSS-287, Clause 7.4.2
ISED RSS-GEN, Clause 6.11
RTCM 11010.4, Clause A.16.1

2.1.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 151 - Modification State 0

2.1.3 Date of Test

09-February-2023 to 10-February-2023

2.1.4 Test Method

This test was performed in accordance with ANSI C63.26 clause 5.6 and RSS-287 clause 6.1.

Testing was performed after the battery was discharged for a minimum of 24 hours of 'normal operation' which is the operating lifetime of the EUT as declared by the manufacturer.

2.1.5 Environmental Conditions

Ambient Temperature	19.6 - 20.5 °C
Relative Humidity	37.1 - 38.0 %



2.1.6 Test Results

Battery Powered - 121.5 MHz Homer

Temperature	Measured Frequency (MHz)	Frequency Error (ppm)	Carrier Power (dBm)
+55.0 °C	121.500522	4.30	20.655
+50.0 °C	121.500272	2.24	20.721
+40.0 °C	121.500900	7.41	20.682
+30.0 °C	121.500482	3.97	20.737
+20.0 °C	121.500284	2.34	20.720
+10.0 °C	121.500450	3.70	20.694
0 °C	121.500305	2.51	20.709
-10.0 °C	121.500412	3.39	20.672
-20.0 °C	121.500438	3.60	20.683

Table 16 - Frequency Stability Under Temperature Variations

RTCM 11010.4, Limit Clause A.16.1

The carrier frequency, measured at the minimum and maximum operating temperatures, shall be 121.5 MHz \pm 50 parts/million.

ISED RSS-287, Limit Clause 7.4.2

The carrier frequency shall not depart by more than 0.005% (\pm 50 ppm) from that measured at 20°C and the rated supply voltage.



2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	24-Feb-2023
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	14-Sep-2023
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Feb-2023
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	13-Jul-2023
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	25-Apr-2023
Attenuator 5W 30dB DC-18GHz	Aaren	AT40A-4041-D18-30	5502	12	21-Apr-2023

Table 17

O/P Mon – Output Monitored using calibrated equipment



2.2 Modulation Characteristics

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047
FCC 47 CFR Part 95, Subpart K
ISED RSS-287, Clause 7.4.1
RTCM 11010.4, Clause A.16.2

2.2.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 151 - Modification State 0

2.2.3 Date of Test

12-January-2023 to 17-January-2023

2.2.4 Test Method

This test was performed in accordance with RTCM 11010.4, Clause A.16.2 and RSS-287 Clause 6.4.

2.2.5 Environmental Conditions

Ambient Temperature	21.2 - 21.7 °C
Relative Humidity	29.6 - 49.1 %



2.2.6 Test Results

Battery Powered - 121.5 MHz Homer

Requirement	Result			Unit
	-20 °C	+21.7°	+55 °C	
The carrier is not interrupted (except for two seconds encompassing the transmission of the 406 MHz pulse plus the additional time required for the Morse "P" transmission).	True	True	True	-
Lower Audio Frequency	381	381	381	Hz
Upper Audio Frequency	1165	1165	1165	Hz
Audio Frequency Direction	High to Low	High to Low	High to Low	-
Range of Audio Frequency	784	784	784	Hz
Sweep Repetition Rate	2.7	2.7	2.7	Hz
Modulation Duty Cycle (near start)	36.8	36.8	36.8	%
Modulation Duty Cycle (near midpoint)	34.9	34.9	34.9	%
Modulation Duty Cycle (near end)	35.5	35.5	35.5	%
Modulation Factor	0.87	0.87	0.87	%
Morse Code P - Dot Length	113.9	113.9	113.9	ms
Morse Code P - Dash Length	345.4	345.4	345.4	ms
Morse Code P - Gap Length	115.4	115.4	115.4	ms
Morse Code P - Modulating Frequency	983	983	983	Hz

Table 18 - Modulation Characteristics

Remark:

Morse P length was 1951ms due to 3 x additional 115ms units.
 Voice was not supported.



RTCM 11010.4, Limit Clause A.16.2 and ISED RSS-287, Limit Clause 7.4.1

Requirement	Limit
The carrier is not interrupted (except for two seconds encompassing the transmission of the 406 MHz pulse plus the additional time required for the Morse "P" transmission).	True
Lower Audio Frequency	> 300 Hz
Upper Audio Frequency	< 1600 Hz
Audio Frequency Range	> 700 Hz
Sweep Repetition Rate	Between 2 Hz and 4 Hz
Modulation Duty Cycle	Between 33% and 55%
Modulation Factor	Between 85% and 100%
Morse Letter P:	
Dot Length	115 ms ± 5%
Dash Length	345 ms ± 5%
Gap Length	115 ms ± 5%
Modulating Frequency	1000 Hz ± 50 Hz

Table 19 - Modulation Characteristic Limits

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Thermocouple Thermometer	Fluke	51	3172	12	27-Jan-2023
Oscilloscope	Agilent Technologies	DSO9104A	4142	12	06-Oct-2023
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	13-Jul-2023
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	23-Oct-2023
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	08-Mar-2023
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	25-Apr-2023
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5498	12	16-May-2023
Digital Timer	Radio Spares	RS Pro	5603	12	25-Aug-2023

Table 20

O/P Mon – Output Monitored using calibrated equipment



2.3 Spectrum Characteristics

2.3.1 Specification Reference

FCC 47 CFR Part 95: Subpart K
ISED RSS-287, Clause 7.4.5
RTCM 11010.4, Clause A.16.2(e)

2.3.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 151 - Modification State 0

2.3.3 Date of Test

10-February-2023

2.3.4 Test Method

This test was performed in accordance with RSS-287, Clause 6.5.

2.3.5 Environmental Conditions

Ambient Temperature	20.6 °C
Relative Humidity	36.7 %



2.3.6 Test Results

Battery Powered - 121.5 MHz Homer

Parameter	Result
Total (Wideband) Power (dBm)	15.845
Power within the resolution bandwidth (dBm)	11.355
Difference (dB)	4.5

Table 21 - Spectrum Characteristics

RTCM 1010.4, Limit Clause A.16.2(e)

Measurements must be made to show that at least 30% of the total power emitted during any transmission cycle with or without modulation shall be contained within ± 30 Hz of the carrier frequency. Additionally, if the emission is interrupted by the transmission of the 406 MHz burst, the carrier frequency must not shift more than ± 30 Hz.

ISED RSS-287 Limit Clause 7.4.5

The total power in the resolution bandwidth shall not drop by more than 5 dB below the transmitter mean output power that is measured by a wideband meter, indicating that at least 30% of the power resides within the band $f_c \pm 30$ Hz (at 121.5 MHz) and within the band $f_c \pm 60$ Hz (at 243 MHz).

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	24-Feb-2023
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Feb-2023
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	13-Jul-2023
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	25-Apr-2023
Attenuator 5W 30dB DC-18GHz	Aaren	AT40A-4041-D18-30	5502	12	21-Apr-2023

Table 22



2.4 Peak Equivalent Isotropic Radiated Power

2.4.1 Specification Reference

RTCM 11010.4, Clause A.16.3
 RTCM 11010.4, Clause A.16.4

2.4.2 Equipment Under Test and Modification State

Tron SA20, S/N: 157 - Modification State 0

2.4.3 Date of Test

20 June 2023

2.4.4 Test Method

This test was performed in accordance with RTCM 11010.4, Clause A.16.3 and A.16.4.

2.4.5 Environmental Conditions

Ambient Temperature 26.2 °C
 Relative Humidity 38.1 %

2.4.6 Test Results

Battery Powered - 121.5 MHz Homer

Azimuth (°)	Elevation resulting in maximum EIRP (20°)
	PEIRP (mW)
0	44.75
30	40.81
60	42.74
90	43.73
120	46.86
150	49.07
180	50.21
210	52.58
240	55.06
270	51.38
300	49.07
330	49.07
Maximum Recorded Value	55.06
Mean Value	49.07

Table 23 – On Ground Plane (A16.3)



Azimuth (°)	Elevation resulting in maximum EIRP (5°)
	PEIRP (mW)
0	2.42
90	2.54
180	2.39
270	2.48
Maximum Recorded Value	2.54
Mean Value	2.45

Table 24 – Off Ground Plane (A16.4)

RTCM 11010.4 Limit Clause A.16.3

The median value of PEIRP shall be between 25 and 100 mW. The ratio of the maximum to minimum of the 11 highest values of PEIRP shall not exceed 4 to 1 (6 dB)

RTCM 11010.4 Limit Clause A16.4

The minimum value of PEIRP measured at each of the 4 azimuth angle increments shall be at least 2 mW.

2.4.7 Test Location and Test Equipment Used

This test was carried out in Open Area Facility.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Spectrum Analyser	Hewlett Packard	8542E	18	-	TU
Antenna, (Tuned Dipole Set)	Roberts Antenna	A-100	568	24	24-May-2025
Power Meter	Rohde & Schwarz	NRP	3491	12	13-Jan-2024
Wideband Power Sensor, 50 MHz-18 GHz	Rohde & Schwarz	NRP-Z81	3492	12	13-Jan-2024
Inclinometer, Digital	Radio Spares	01-900-020003 (RS 667-3916)	4125	12	14-Mar-2024
Analyser (Spectrum)	Rohde & Schwarz	FPL1003	5349	12	02-Jan-2024
Dreloscop Strobe	Unknown	3009	5387	-	TU
Humidity & Temperature meter	Rotronic	HP31 HygroPalm	6247	12	21-Sep-2023

Table 25

TU – Traceability Unscheduled



2.5 Spurious Emissions at Antenna Terminals

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 95, Subpart K
ISED RSS-287, Clause 7.4.4
ISED RSS-GEN, Clause 6.13
RTCM 11010.4, Clause 4.2.4

2.5.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 151 - Modification State 0

2.5.3 Date of Test

17-January-2023 to 18-January-2023

2.5.4 Test Method

This test was performed in accordance with ANSI C63.26, Clause 5.7.

2.5.5 Environmental Conditions

Ambient Temperature	21.2 - 21.4 °C
Relative Humidity	29.6 - 32.3 %



2.5.6 Test Results

Battery Powered - 121.5 MHz Homer

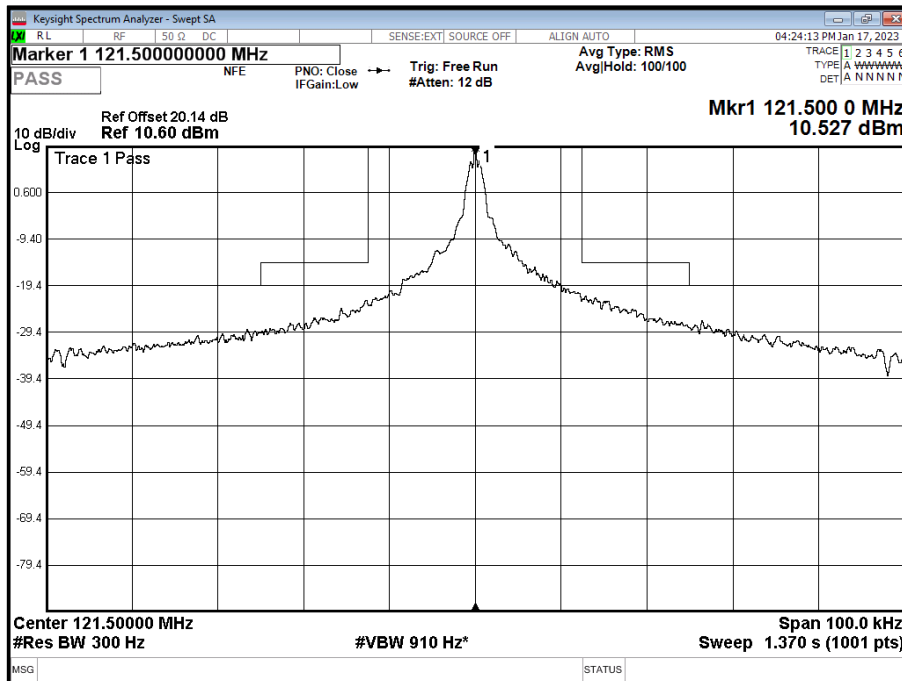


Figure 1 - Transmitter Mask (RSS-287 Clause 7.4.4)

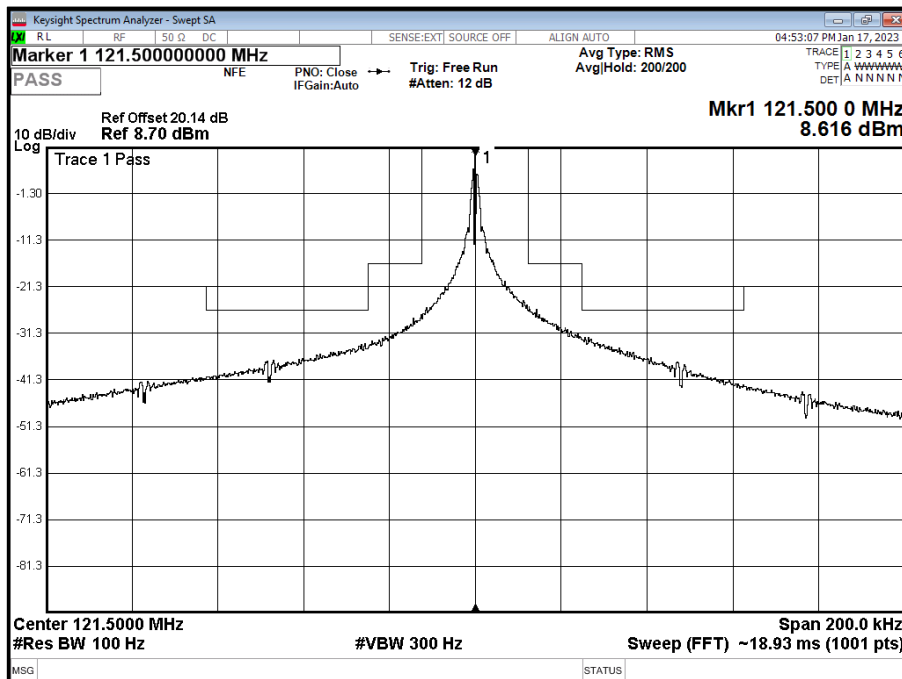


Figure 2 - Transmitter Mask (RTCM 1010.2 Clause 4.2.3)

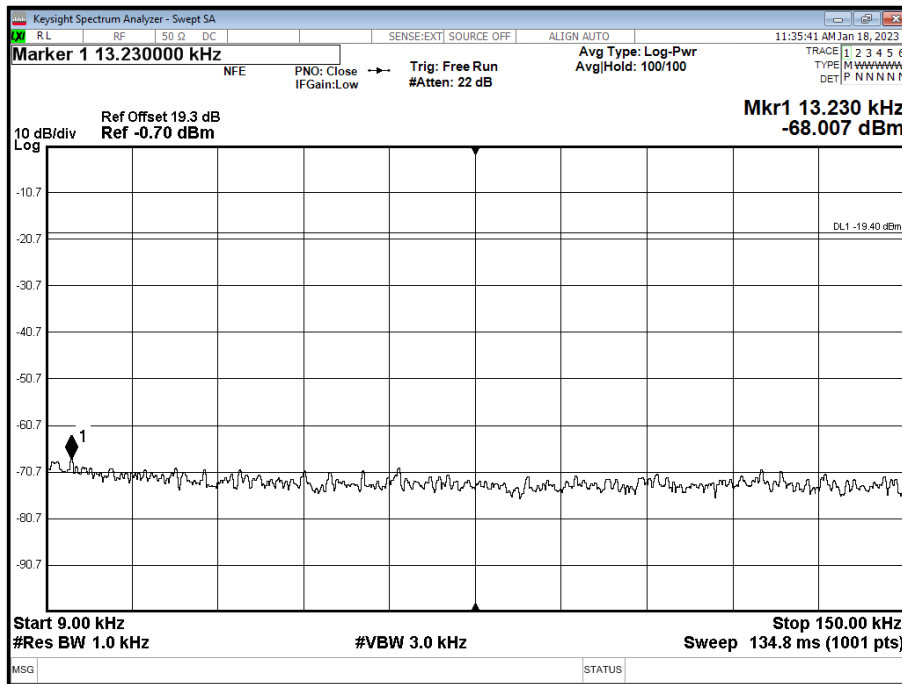


Figure 3 - 9 kHz to 150 kHz

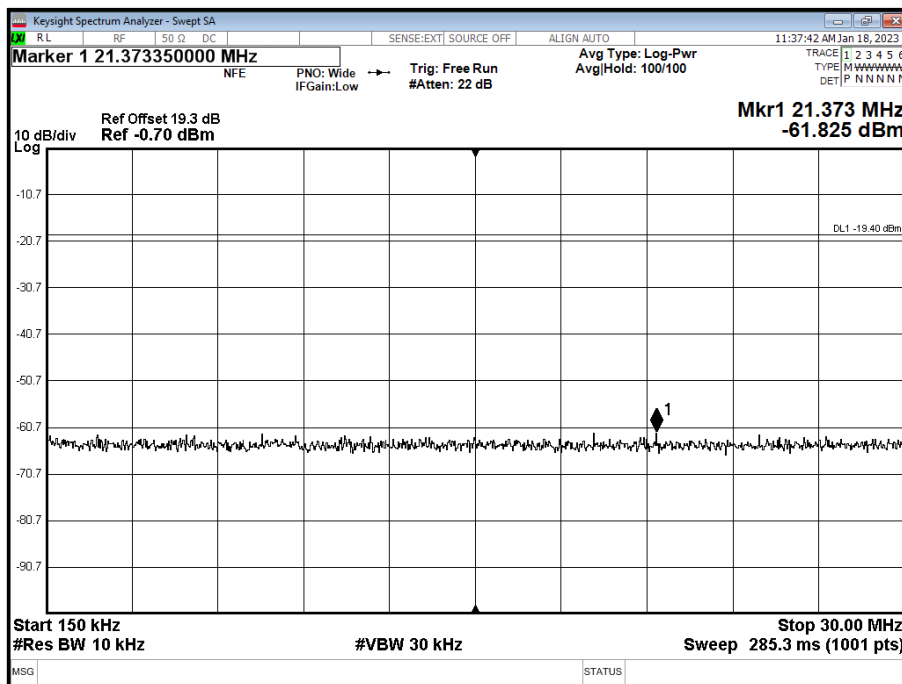


Figure 4 - 150 kHz to 30 MHz

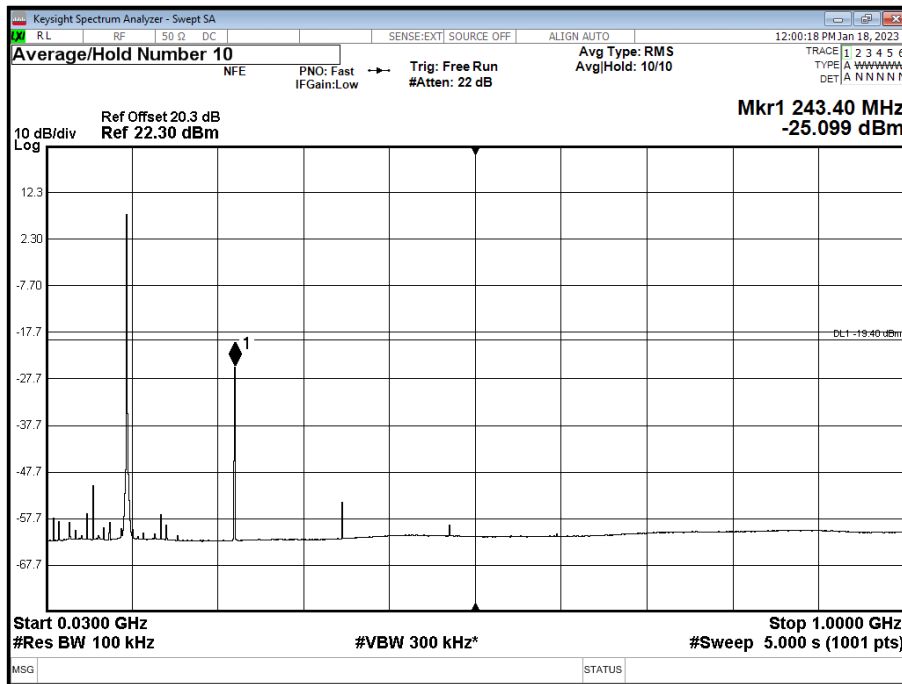


Figure 5 - 30 MHz to 1 GHz

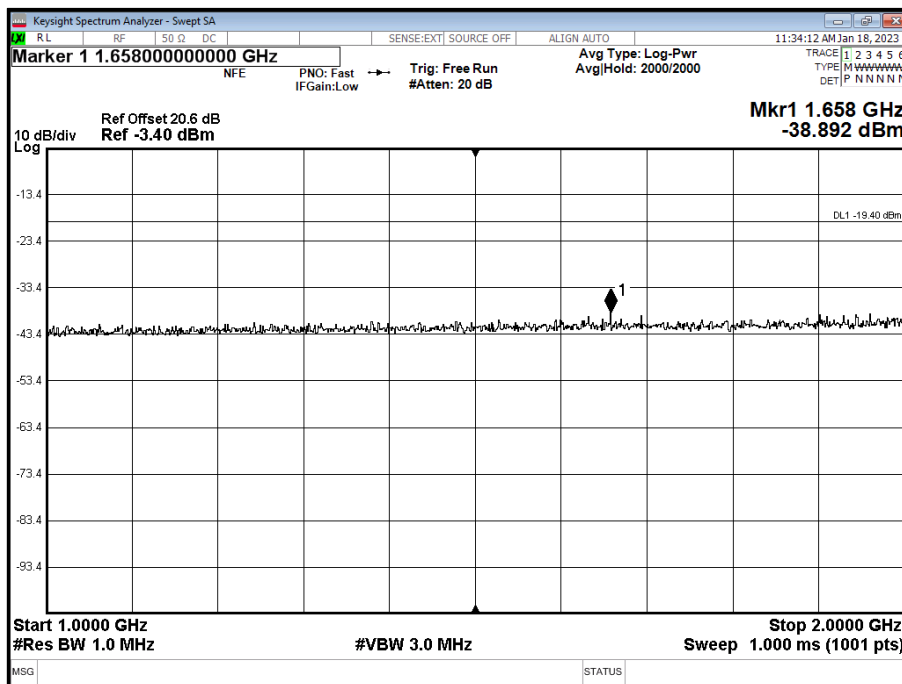
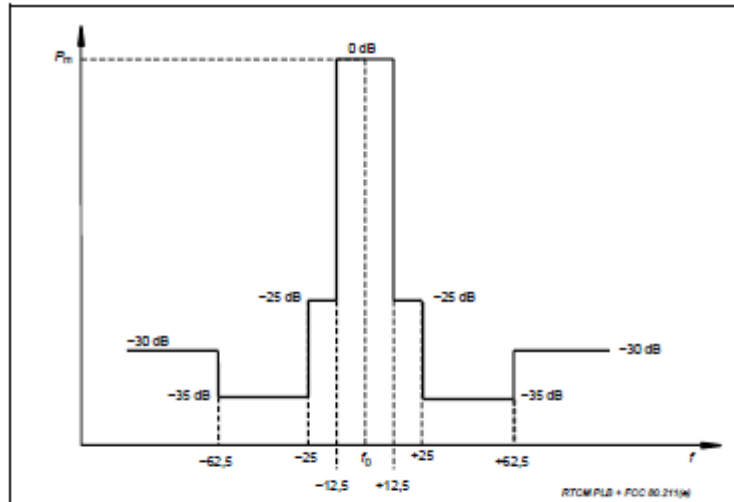


Figure 6 - 1 GHz to 2 GHz

RTCM 11010.4, Limit Clause 4.2.4, 121.5 MHz emission limitations

The transmitter power output spectrum shall remain within the limits of the emission mask shown in Figure 4.



Relative frequency to 121,5 MHz homing device in kHz
 P_m = mean power
 P_m = $D(\text{PERP})$ power output of 121,5 MHz homing device
 D = modulation duty cycle
PERP = peak effective radiated power
Measurement Resolution Bandwidth 100 Hz

ISED RSS-287, Limit Clause 7.4.4

The average power of unwanted emissions in a 300 Hz resolution bandwidth shall be attenuated below the level of the average transmitter power P (dBW) by:

- (a) at least 25 dB on any frequency removed from the centre of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth; and
- (b) at least 30 dB on any frequency removed from the centre of the authorized bandwidth by more than 100%

where the authorized bandwidth is set at 25 kHz with the transmit frequency at the centre of the bandwidth.



2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	13-Jul-2023
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	23-Oct-2023
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	24-Feb-2023
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Feb-2023
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	08-Mar-2023
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	25-Apr-2023
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5498	12	16-May-2023

Table 26



2.6 Occupied Bandwidth

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
ISED RSS-GEN, Clause 6.7

2.6.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 151 - Modification State 0

2.6.3 Date of Test

18-January-2023

2.6.4 Test Method

This test was performed in accordance with ANSI C63.26, Clause 5.4.3.

2.6.5 Environmental Conditions

Ambient Temperature	20.8 °C
Relative Humidity	33.3 %



2.6.6 Test Results

Battery Powered - 121.5 MHz Homer

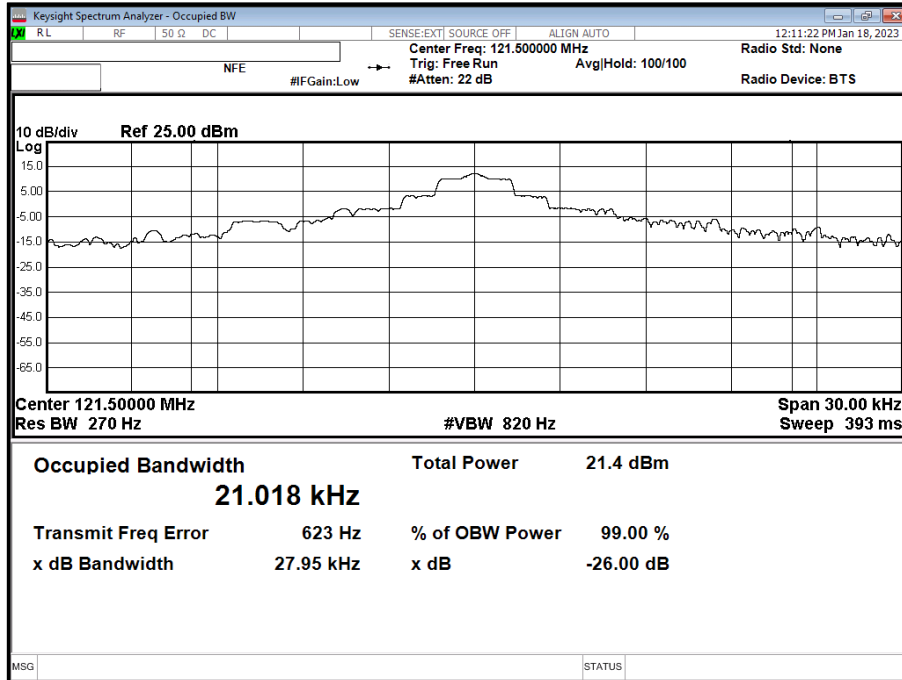


Figure 7 - 99% Occupied Bandwidth

FCC Part 2 and ISED RSS-GEN Limit Clause

None Specified

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	13-Jul-2023
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	23-Oct-2023
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	08-Mar-2023
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	25-Apr-2023
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5498	12	16-May-2023

Table 27

2.7 Radiated Spurious Emissions

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
ISED RSS-287, Clause 7.4.4
ISED RSS-GEN, Clause 6.13

2.7.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 107 - Modification State 0

2.7.3 Date of Test

28-January-2023 to 29-January-2023

2.7.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.5.

Measurements were made at a distance of 3m. Field strength values were converted to EIRP using the formula in ANSI C63.26 clause 5.2.7 – equation d) as follows:

$EIRP (dBm) = E (dB\mu V/m) + 20 * LOG(D) - 104.8$ where $D = 3$ meters.

2.7.5 Test Setup Diagram

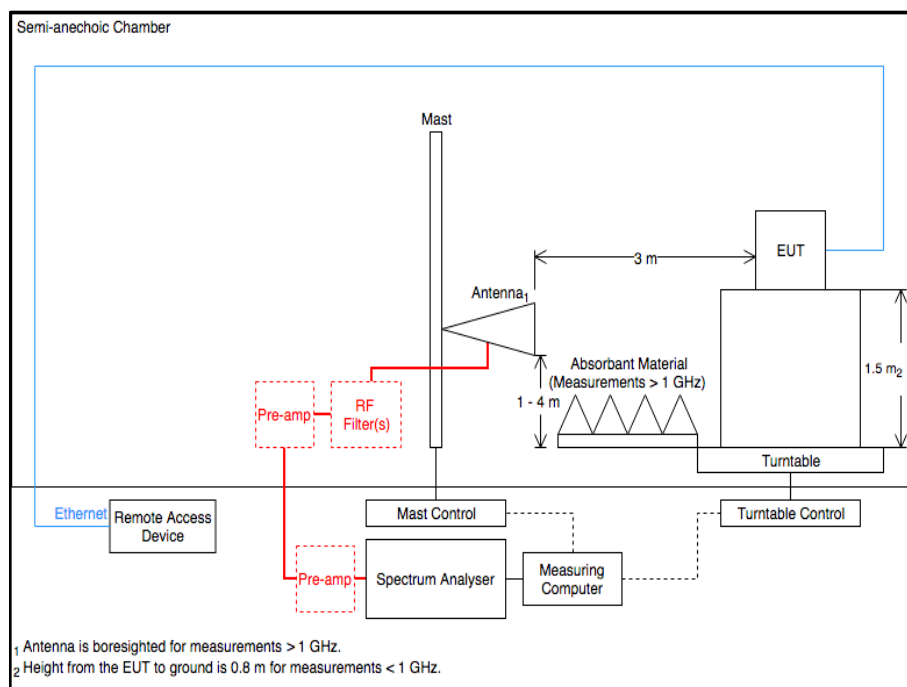


Figure 8

2.7.6 Environmental Conditions

Ambient Temperature 20.2 °C
Relative Humidity 38.4 %



2.7.7 Test Results

Battery Powered - 121.5 MHz Homer

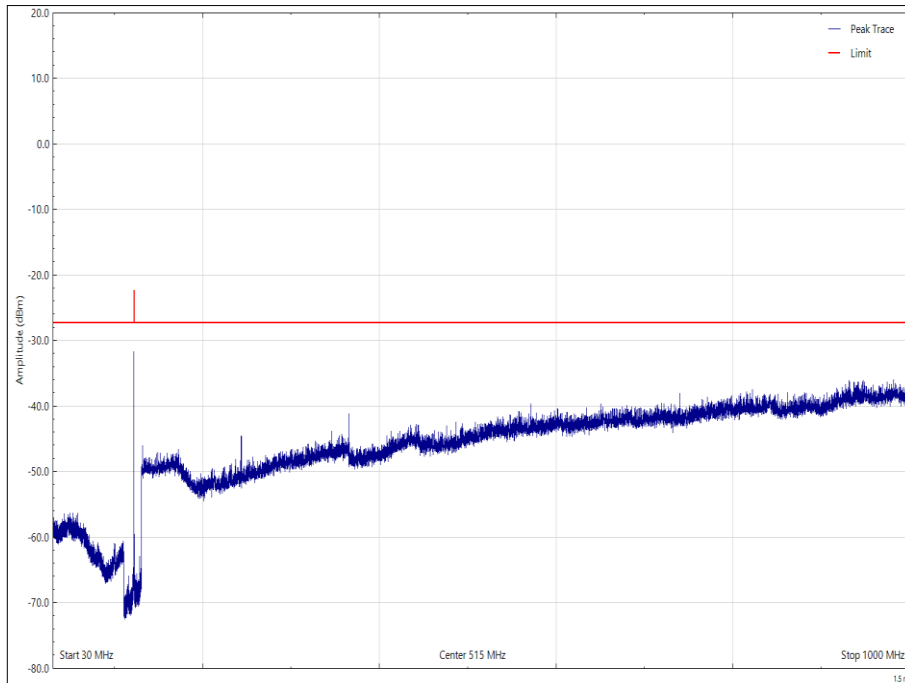


Figure 8 - EUT Orientation X: 30 MHz to 1 GHz: Horizontal

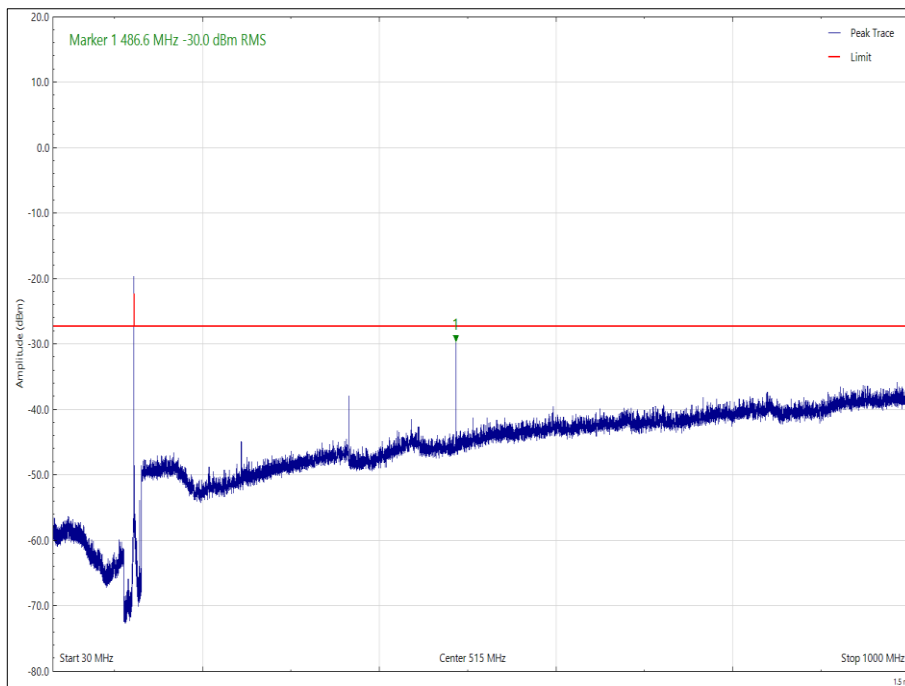


Figure 9 - EUT Orientation X: 30 MHz to 1 GHz: Vertical

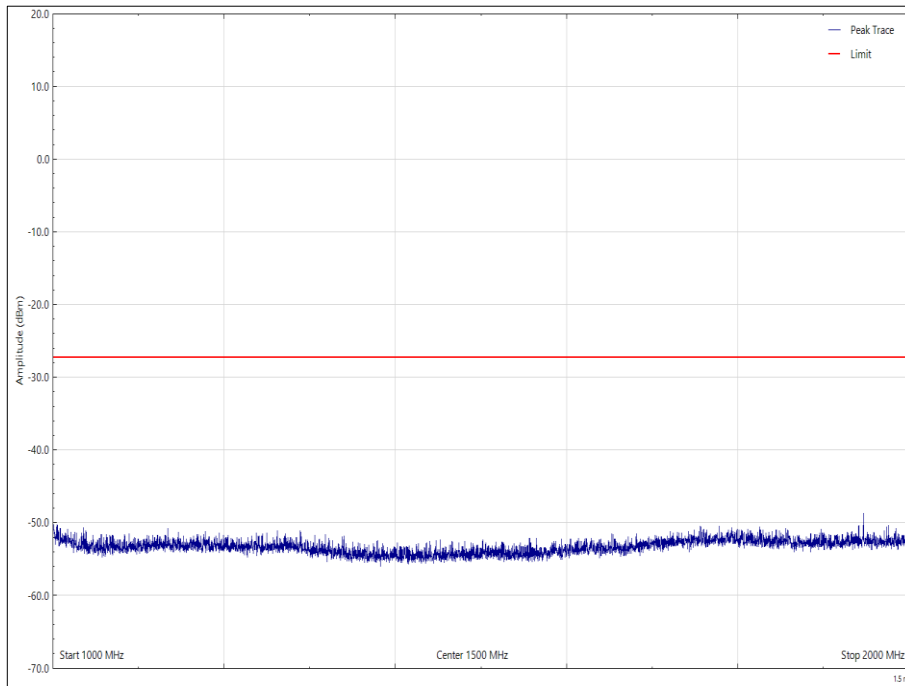


Figure 10 - EUT Orientation X: 1 GHz to 2 GHz: Horizontal

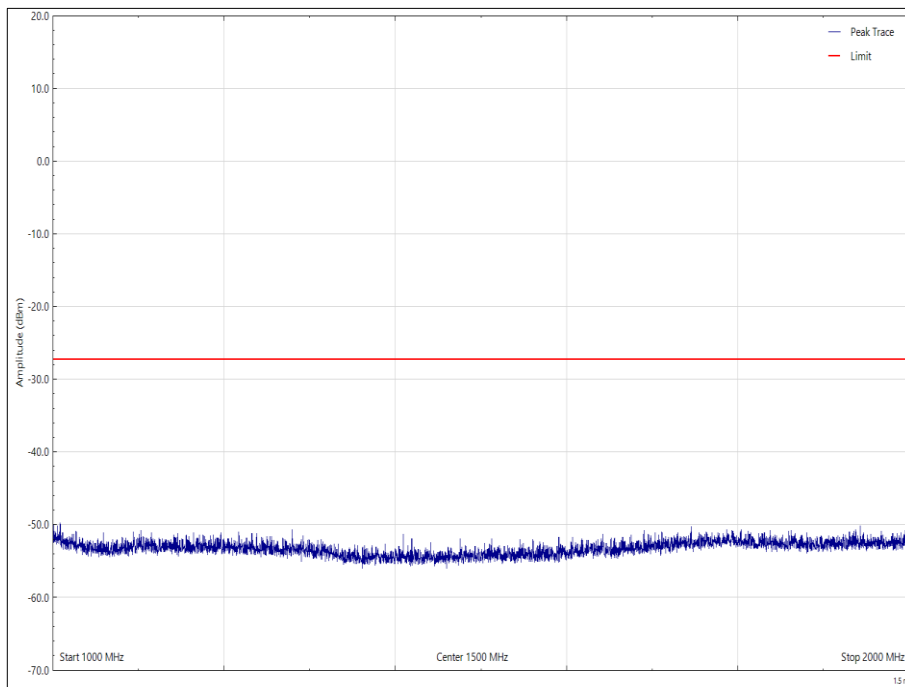


Figure 11 - EUT Orientation X: 1 GHz to 2 GHz: Vertical

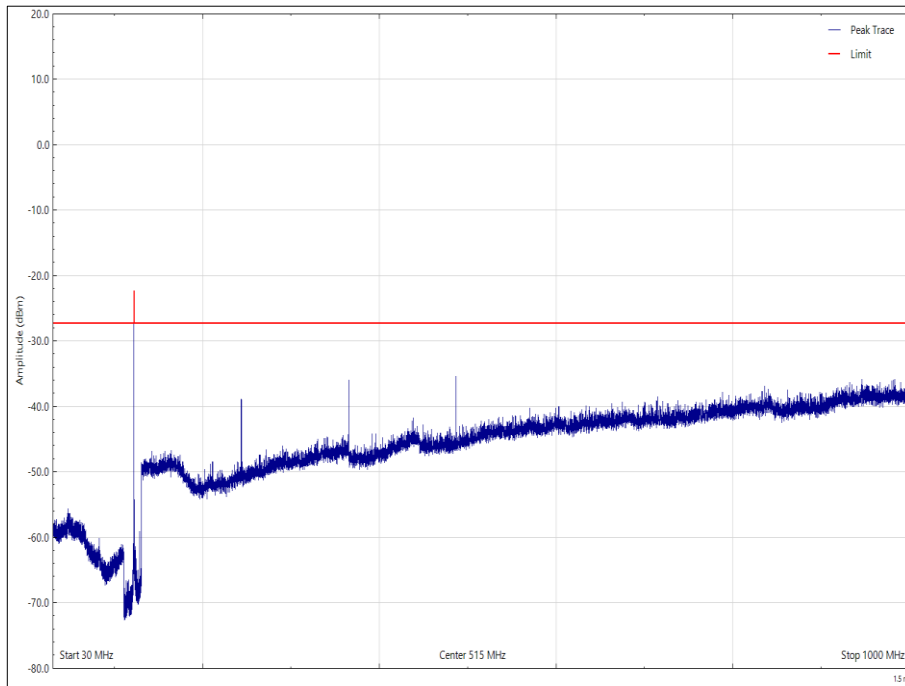


Figure 12 - EUT Orientation Y: 30 MHz to 1 GHz: Horizontal

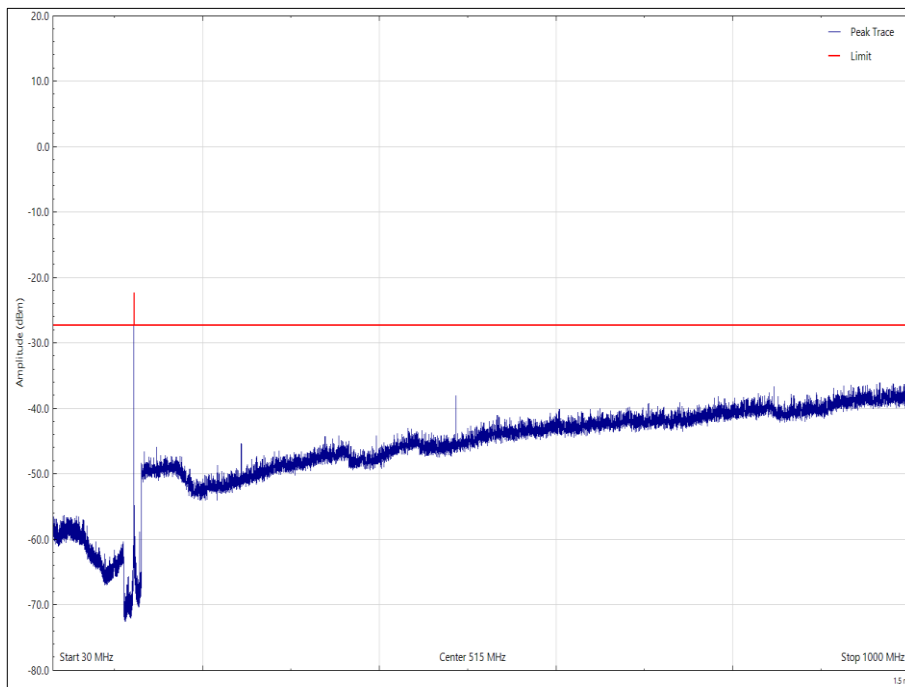


Figure 13 - EUT Orientation Y: 30 MHz to 1 GHz: Vertical

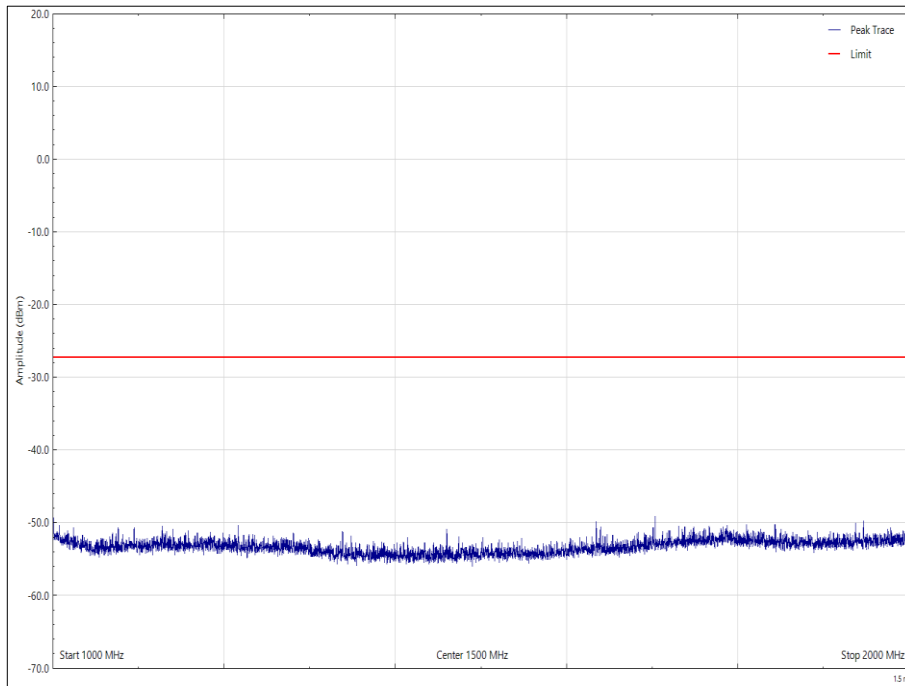


Figure 14 - EUT Orientation Y: 1 GHz to 2 GHz: Horizontal

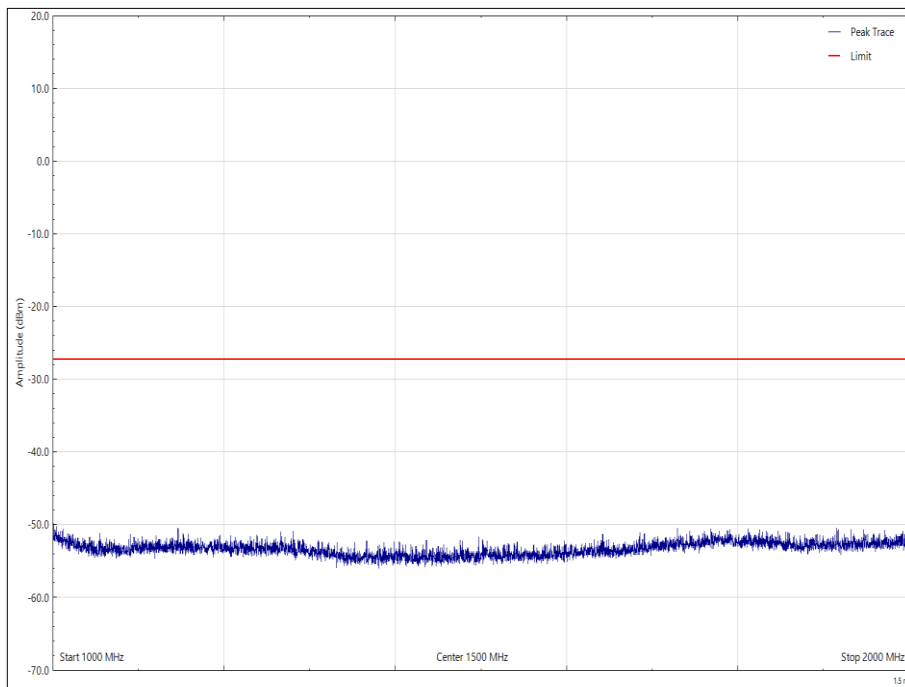


Figure 15 - EUT Orientation Y: 1 GHz to 2 GHz: Vertical

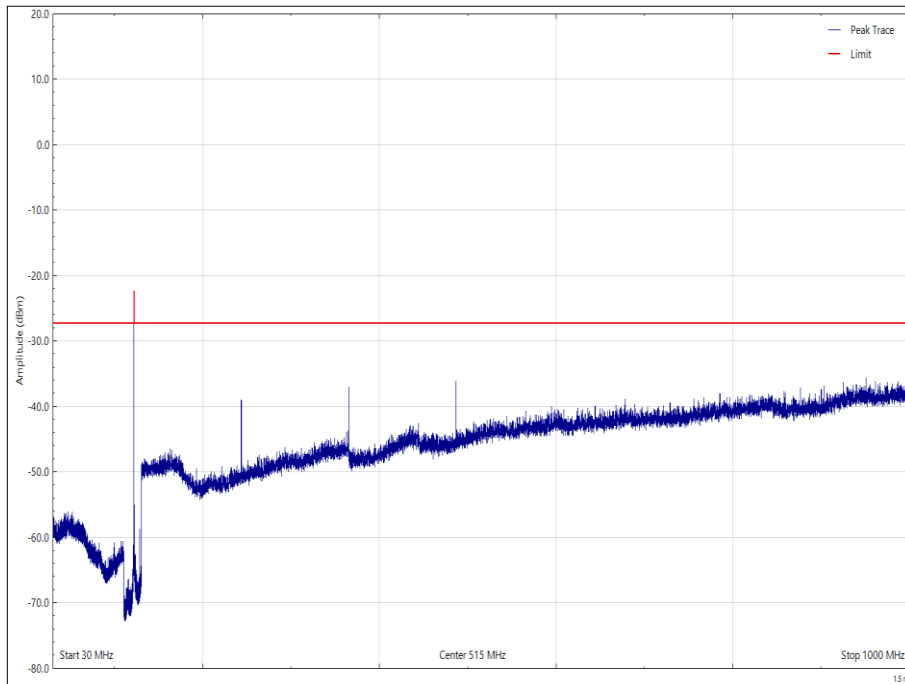


Figure 16 - EUT Orientation Z: 30 MHz to 1 GHz: Horizontal

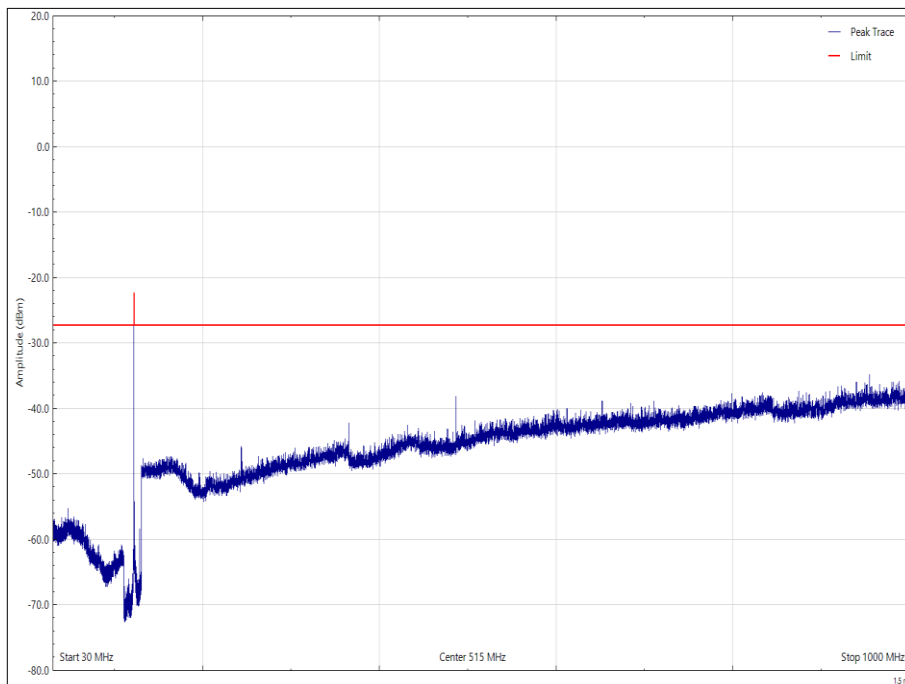


Figure 17 - EUT Orientation Z: 30 MHz to 1 GHz: Vertical

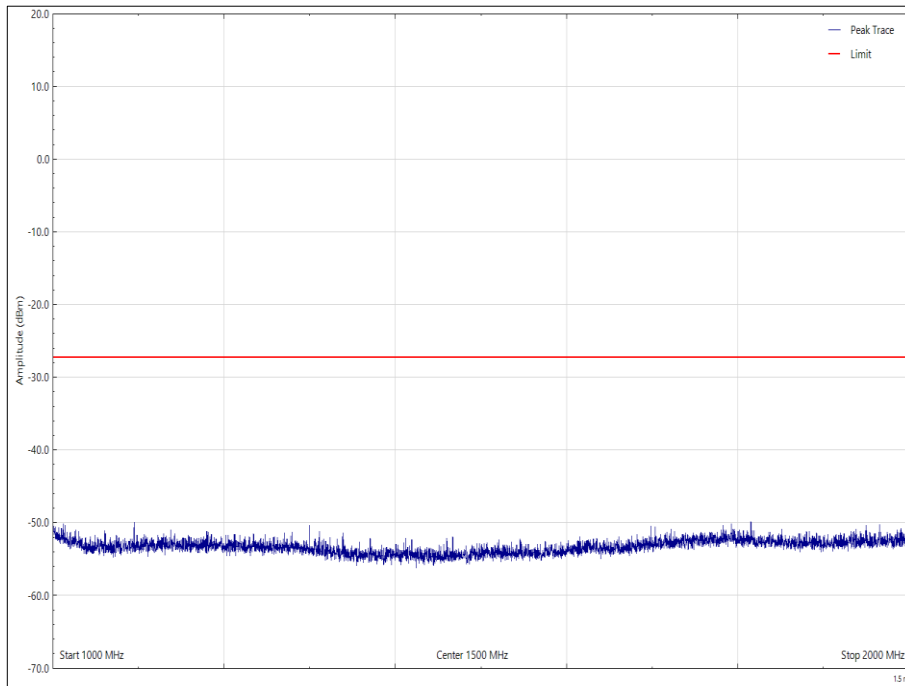


Figure 18 - EUT Orientation Z: 1 GHz to 2 GHz: Horizontal

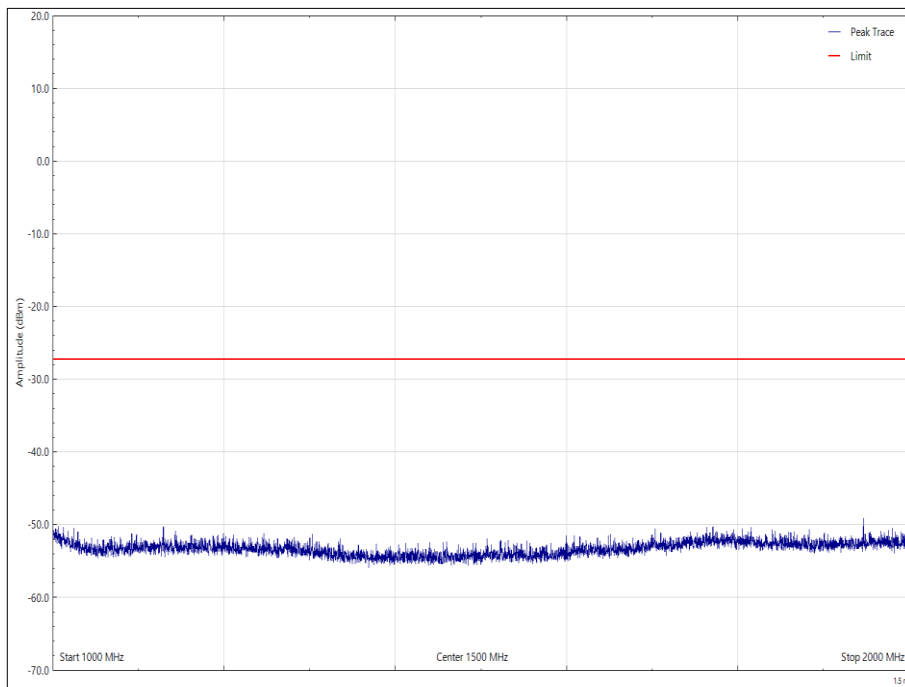


Figure 19 - EUT Orientation Z: 1 GHz to 2 GHz: Vertical



ISED RSS-287, Limit Clause 7.4.4

The average power of unwanted emissions in a 300 Hz resolution bandwidth shall be attenuated below the level of the average transmitter power P (dBW) by:

- (a) at least 25 dB on any frequency removed from the centre of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth; and
- (b) at least 30 dB on any frequency removed from the centre of the authorized bandwidth by more than 100%

where the authorized bandwidth is set at 25 kHz with the transmit frequency at the centre of the bandwidth.

2.7.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Emissions Software	TUV SUD	EmX V3.1.10	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	24-Nov-2024
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
Antenna	Schwarzbeck	BBHA9120B	5215	12	28-May-2023
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-Apr-2023
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/A	5517	12	12-Apr-2023
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5522	12	24-Mar-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024
Attenuator 4dB	Pasternack	PE7074-4	6202	24	16-Jul-2024

Table 28

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

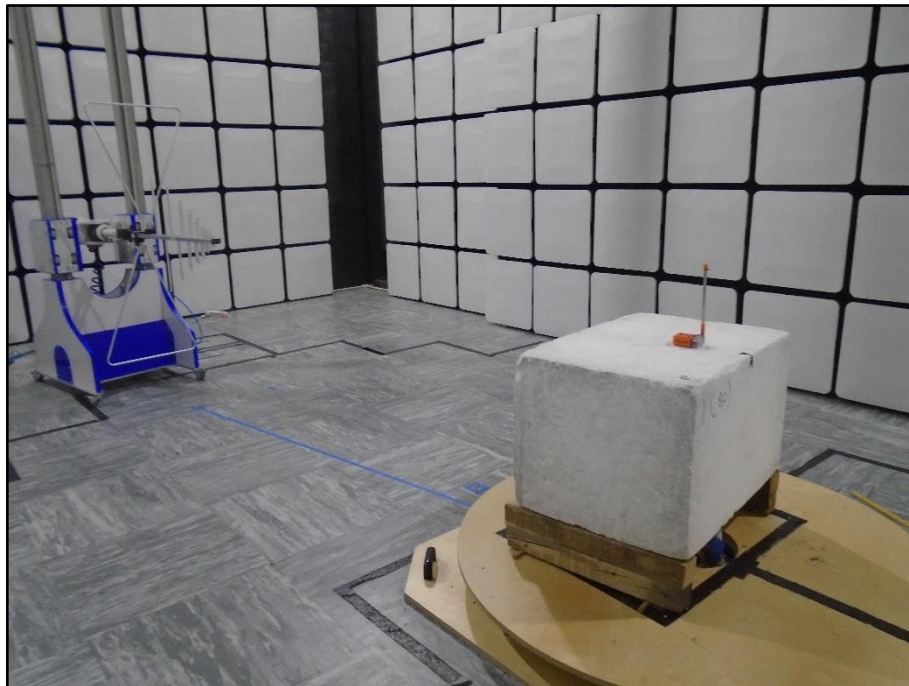


Figure 20 – Test Setup Photo, 30 GHz to 1 GHz

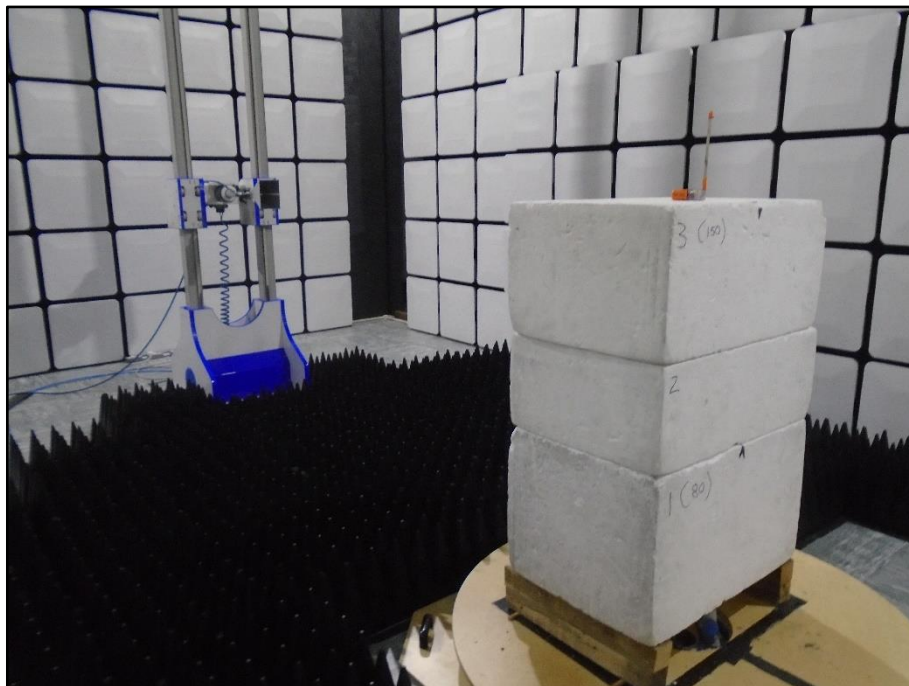


Figure 21 – Test Setup Photo, 1 GHz to 2 GHz

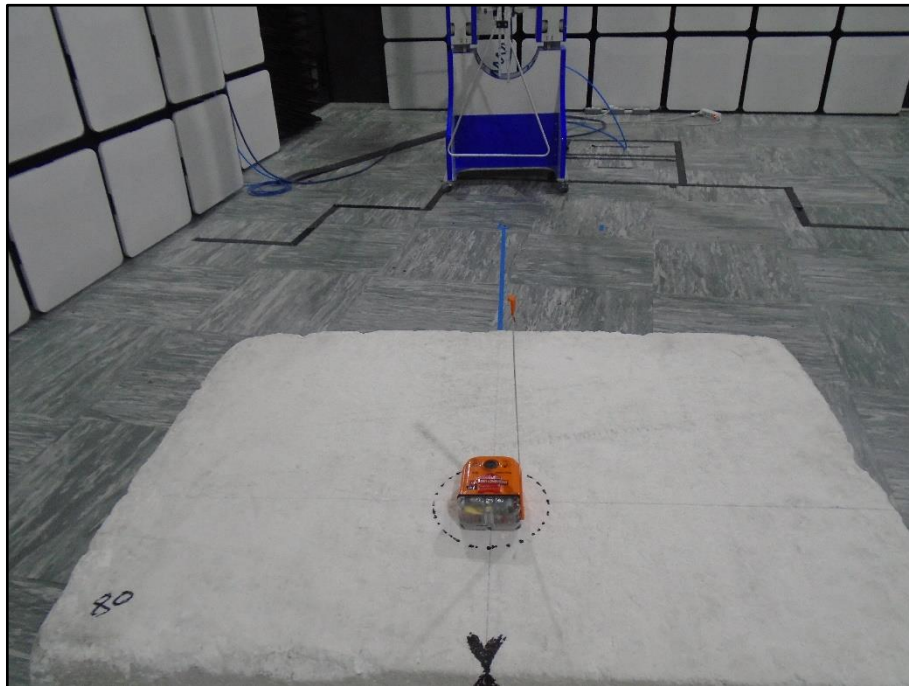


Figure 22 – Test Setup Photo, Orientation X

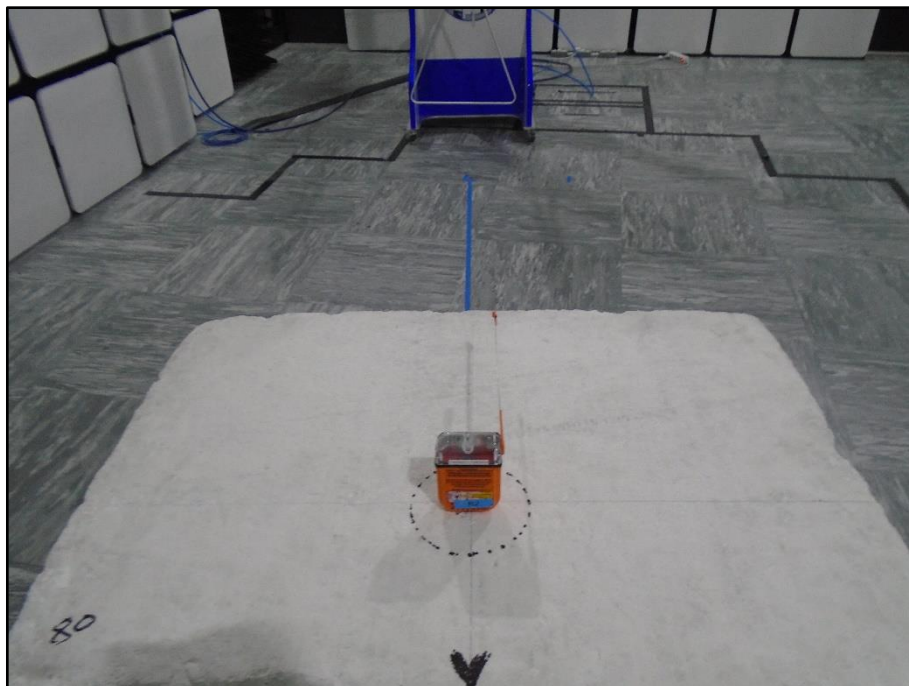


Figure 23 - Test Setup Photo, Orientation Y

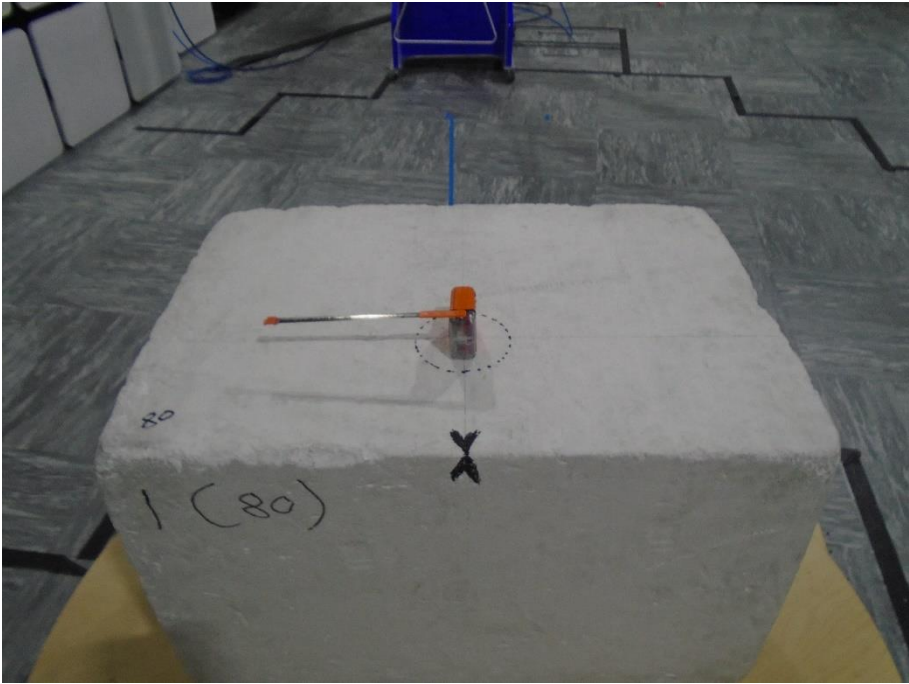


Figure 24 - Test Setup Photo, Orientation Z



4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Transmitter Frequency and Output Power Stabilities	± 11 Hz
Modulation Characteristics	Minimum Audio Frequency: ± 22.4 Hz Maximum Audio Frequency: ± 121.56 Hz Audio Frequency Range: ± 123.6 Hz Sweep Repetition Rate: ± 5 % Modulation Factor: ± 5% Modulation Duty Cycle: ± 5% 30% Occupied Bandwidth: ± 5%
Spectrum Characteristics	± 1.8 dB
Peak Equivalent Isotropic Radiated Power	± 5.2 dB
Spurious Emissions at Antenna Terminals	± 3.45 dB
Occupied Bandwidth	± 300.3 Hz
Radiated Spurious Emissions	± 3.45 dB

Table 29

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.