FCC and ISED Test Report

em-trak Marine Electronics Limited
DSC/VHF Radio, Model: X100

In accordance with FCC 47 CFR Part 15B and ICES-003

Add value.
Inspire trust.

Prepared for: SRT Marine Systems PLC
Wireless House
Westfield Ind Est.
Midsomer Norton
Bath
BA3 4BS
United Kingdom

FCC ID: YYG-4310002 IC:9384A-4310002B

COMMERCIAL-IN-CONFIDENCE

Document 75955807-05 Issue 02

SIGNATURE			
A J Lawson			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andrew Lawson	Chief Engineer	Authorised Signatory	22 October 2024

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 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthew Dawkins	22 October 2024	

FCC Accreditation
492497/UK2010 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 15B and ICES-003: 2021 and Issue 7: 2020 for the tests detailed in section 1.3.

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ACCREDITATION
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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	04-Oct-2023
2	Update to model number	22-Oct-2024

Table 1

1.2 Introduction

Applicant	SRT Marine Systems PLC
Manufacturer	em-trak Marine Electronics Limited
Model Number(s)	X100
Serial Number(s)	4310002011530001
Hardware Version(s)	1.0
Software Version(s)	220200.01.00.00
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B, 2021 ICES-003: Issue 7: 2020
Order Number	POR102834
Date	09-June-2022
Date of Receipt of EUT	14-April-2023
Start of Test	02-May-2023
Finish of Test	02-May-2023
Name of Engineer(s)	Matthew Dawkins
Related Document(s)	ANSI C63.4: 2014

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: DC Powered – Transmitter Active				
2.1	15.109 and 3.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	Integrated DSC/VHF Radio & AIS Class B Transceiver		
MANUFACTURER	Em-trak Marine Electronics Limited		
MODEL	X100		
PART NUMBER	431-0002		
HARDWARE VERSION	1.0		
SOFTWARE VERSION	220200.01.00.00 and 220400.01.00.00		
PSU VOLTAGE/FREQUENCY/CURRENT	12 to 24V dc, 10A		
HIGHEST INTERNALLY GENERATED FREQUENCY	213.68 MHz		
FCC ID (if applicable)	TBD		
INDUSTRY CANADA ID (if applicable)	TBD		
TECHNICAL DESCRIPTION (a brief technical description of the intended use and operation)	VHF Radio with Class D DSC and SOTDMA AIS Class B		
COUNTRY OF ORIGIN	United Kingdom		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	155.5 to 162.425 MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	155.5 to 163.275 MHz		
INTERMEDIATE FREQUENCIES	19.655 , 29.255 , 51.655 , 0.455 MHz TX 36.5 MHz		
EMISSION DESIGNATOR(S): https://fccid.io/Emissions-Designator/	16K0F3E, 16K0G2B, 16K0G1D		
MODULATION TYPES: (i.e. GMSK, QPSK)	Narrow FM, AFSK, TDMA-GMSK		
OUTPUT POWER (W or dBm)	25W		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	GNSS	Wi-Fi/Bluetooth 2.4GHz	N/A
MANUFACTURER	UBLOX	Espressif Systems	N/A
TYPE	CAM M8	ESP32-WROV-IE	N/A
POWER	N/A RX	0.459 W	N/A
FCC ID	N/A	2AC7Z-ESP32WROVERE	N/A
INDUSTRY CANADA ID	N/A	21098-ESPWROVERE	N/A
EMISSION DESIGNATOR	N/A RX	1M19F1D, 36M3D1D	N/A
DHSS/FHSS/COMBINED OR OTHER	N/A	DSSS	N/A
COUNTRY OF ORIGIN	Switzerland	PRC	N/A
ANCILLARIES (if applicable)			

Table 3

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

Name: Shannon Parsons
Position held: Compliance Technician
Date: 02 October 2023

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was an em-trak Marine Electronics Limited DSC/VHF Radio, Model: X100.

The primary function of the EUT is as a VHF Radio with Class D DSC and SOTDMA AIS Class B.

Figure 1 - General View

Figure 2 - Rear View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Configurations and Modes: DC Powered – Transmitter Active				
DC Power Port	0.8 m	DC Power To EUT	2 Core Cable	No
AIS RF Cable	8 m	Signal	N-Type to BNC connector	No
GPS Coaxial Cable	5 m	Signal/Data	TNC connector	No
NMEA0183 port	3 m	Data	NMEA to USB-B adaptor and USB cable	No

Table 4

1.5.3 Test Configuration

Configuration	Description
DC Powered	The EUT was powered from a 24 V DC supply. The EUT had the following connections: • One GPS cable loaded with an antenna. • One RF cable with two 30 dB attenuators loaded with an AIS Class B device. • One NMEA to USB adapter with USB cable loaded with a support laptop.

Table 5

1.5.4 Modes of Operation

Mode	Description
Transmitter Active	The EUT's transmitters were disabled. The EUT's display was active and outputting system information.

Table 6

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: X100, Serial Number: 4310002011530001			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 7

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: DC Powered - Transmitter Active.		
Radiated Disturbance	Matthew Dawkins	UKAS

Table 8

Office Address:

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

2 Test Details

2.1 Radiated Disturbance

2.1.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.109 and 3.2

2.1.2 Equipment Under Test and Modification State

X100, S/N: 4310002011530001 - Modification State 0

2.1.3 Date of Test

02-May-2023

2.1.4 Test Method

The EUT was set up on a non-conductive table 0.8 m above a reference ground plane within a semi-anechoic chamber on a remotely controlled turntable.

A pre-scan of the EUT emissions profile using a peak detector was made at a 3 m antenna distance whilst varying the antenna-to-EUT azimuth and polarisation.

For an EUT which could reasonable be used in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

Using a list of the highest emissions detected during the pre-scan along with their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak or CISPR Average detector as appropriate.

The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

2.1.5 Example Calculation

Below 1 GHz:

Quasi-Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Quasi-Peak level (dBµV/m) - Limit (dBµV/m)

Above 1 GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = CISPR Average level (dBµV/m) - Limit (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Peak level (dBµV/m) - Limit (dBµV/m)

2.1.6 Example Test Setup Diagram

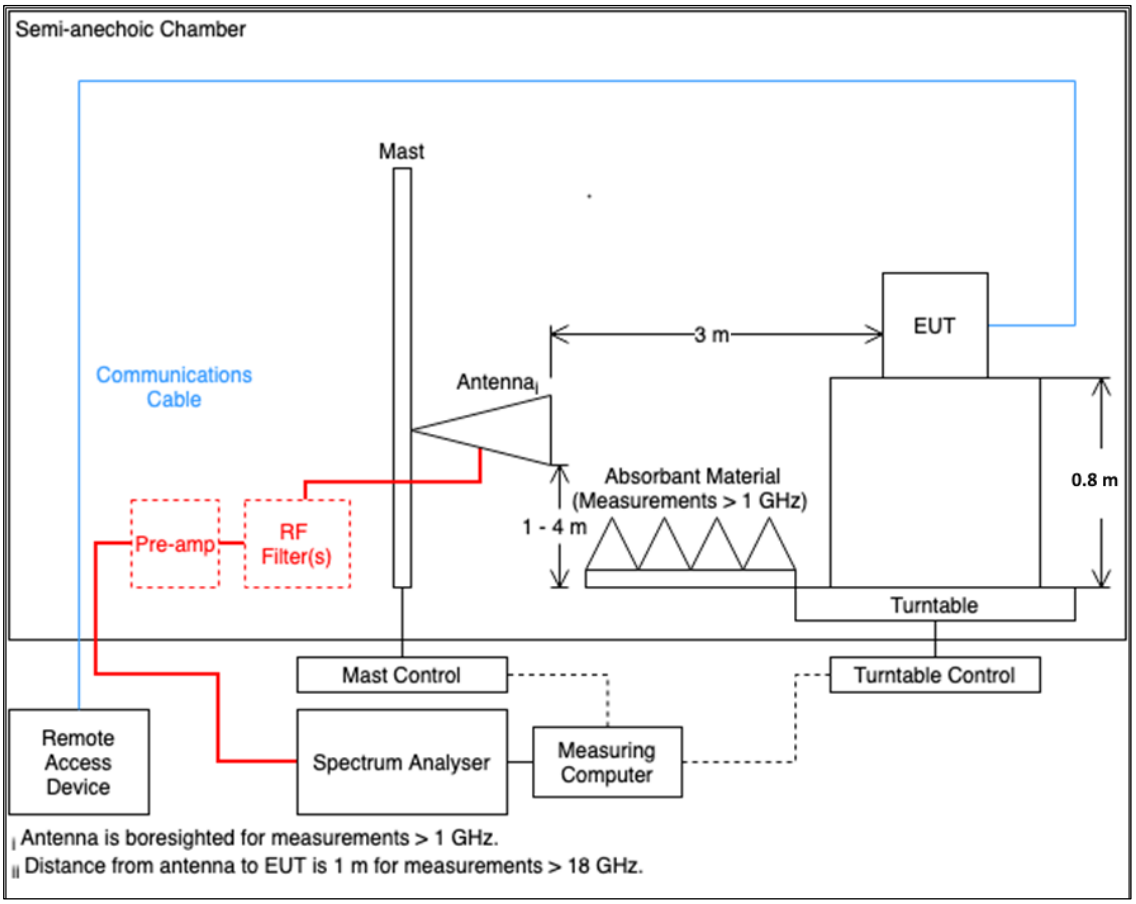

Figure 3 - Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature	18.9 °C
Relative Humidity	38.4 %
Atmospheric Pressure	1013.0 mbar

2.1.8 Specification Limits

Required Specification Limits, Field Strength - Class B Test Limit at a 3 m Measurement Distance		
Frequency Range (MHz)	Test Limit (µV/m)	Test Limit (dBµV/m)
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0
Supplementary information: Note 1. A Quasi-peak detector is to be used for measurements below 1 GHz. Note 2. A CISPR Average detector is to be used for measurements above 1 GHz. Note 3. The Peak test limit above 1 GHz is 20 dB higher than the CISPR Average test limit.		

Table 9

2.1.9 Test Results

Results for Configuration and Mode: DC Powered – Transmitter Active.

This test was performed to the requirements of the Class B limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 213.68 MHz
Which necessitates an upper frequency test limit of: 12 GHz

Frequency Range of Test: 30 MHz to 1 GHz

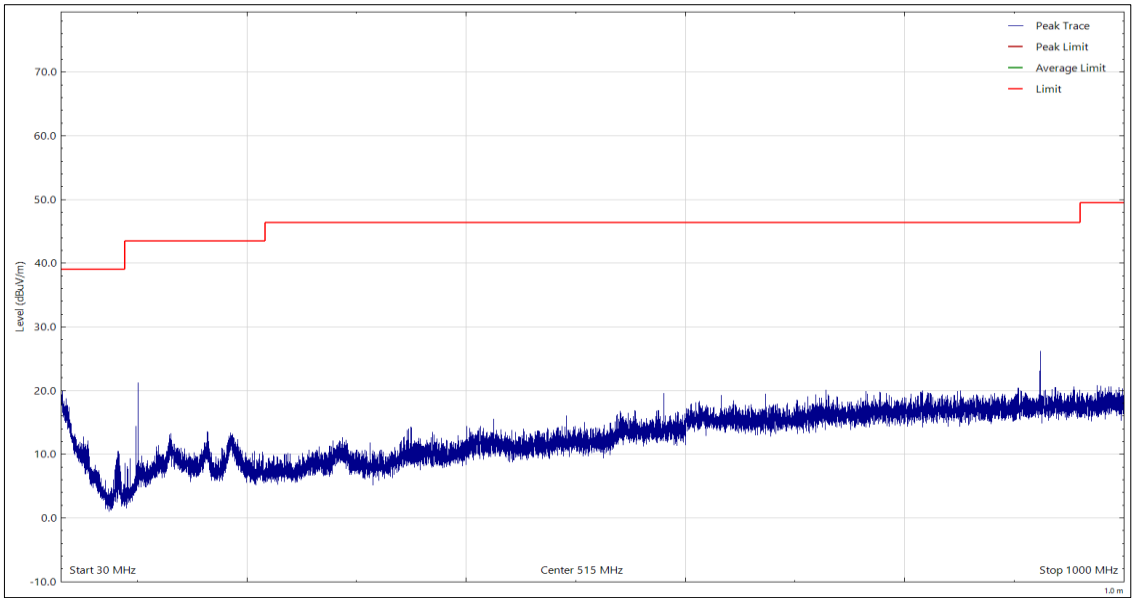

Figure 4 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level	Limit	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 10

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Frequency Range of Test: 30 MHz to 1 GHz

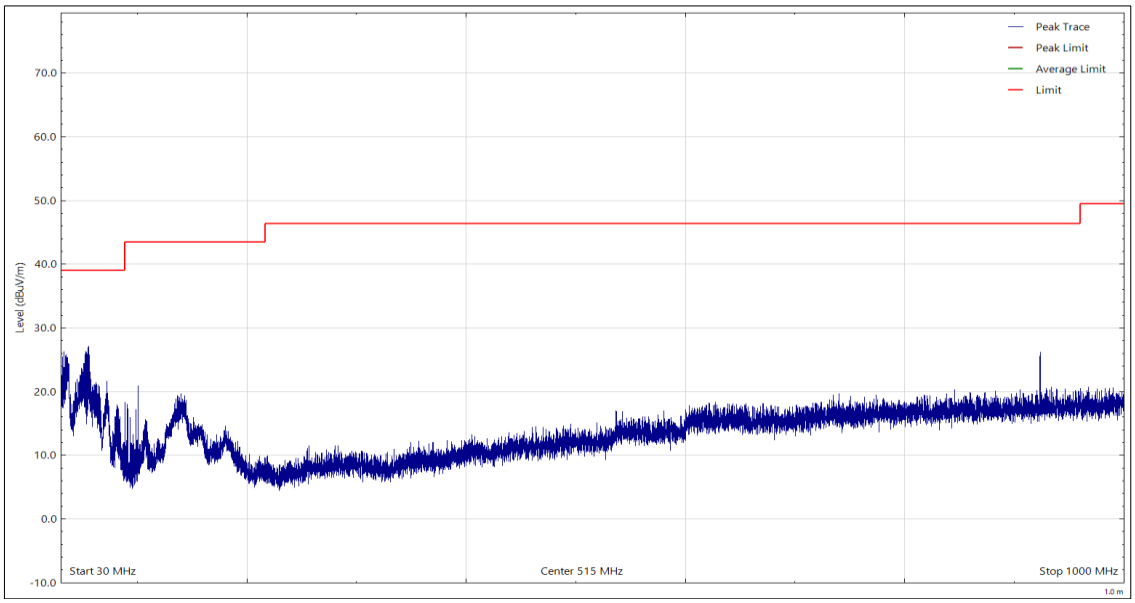

Figure 5 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level	Limit	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 11

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Frequency Range of Test: 1 GHz to 12 GHz

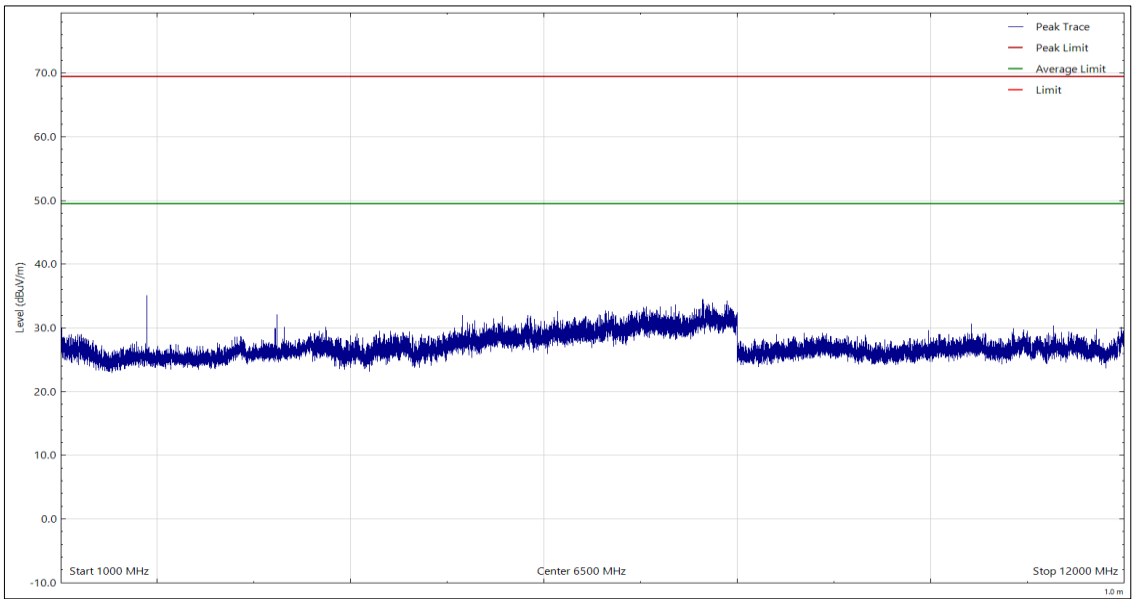

Figure 6 - 1 GHz to 12 GHz, Peak and CISPR Average, Horizontal

Frequency (MHz)	Level	Limit	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 12

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

The emission seen at 2420 MHz in an intentionally generated transmission from the EUT and is therefore not subject to the test limit.

Frequency Range of Test: 1 GHz to 12 GHz

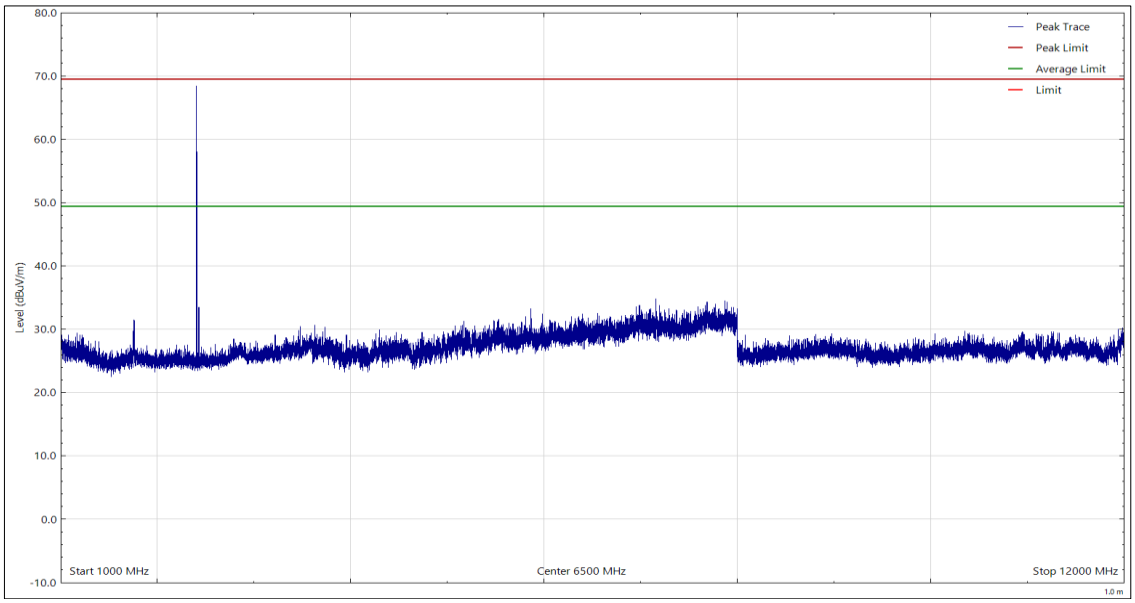

Figure 7 - 1 GHz to 12 GHz, Peak and CISPR Average, Vertical

Frequency (MHz)	Level	Limit	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 13

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

The emission seen at 2420 MHz in an intentionally generated transmission from the EUT and is therefore not subject to the test limit.

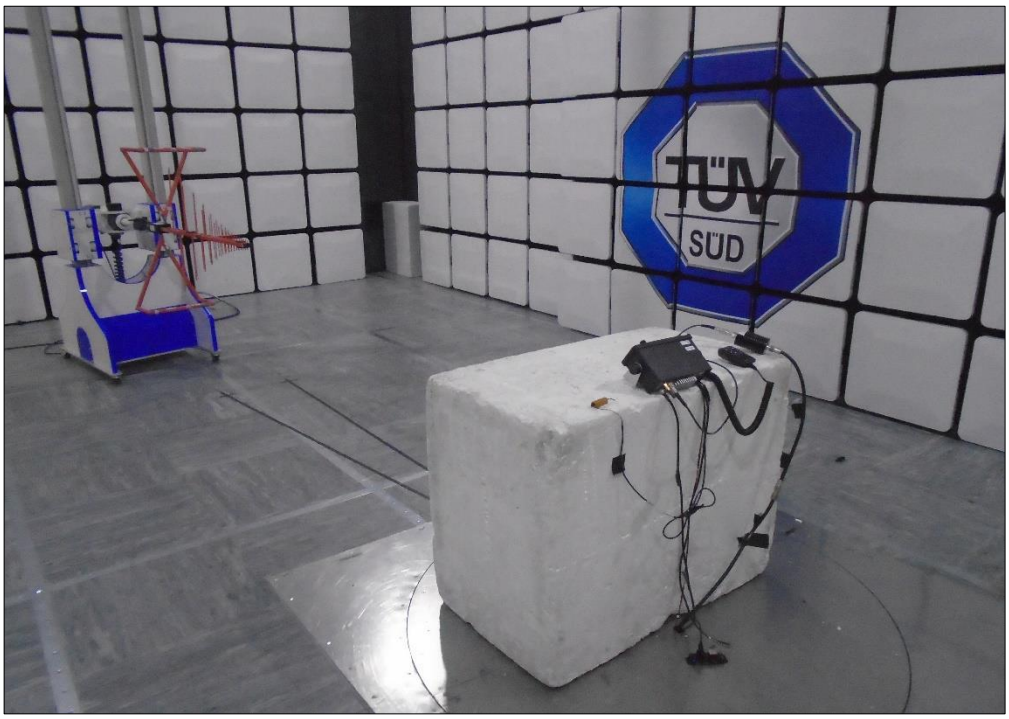

Figure 8 - Test Setup - 30 MHz to 1 GHz

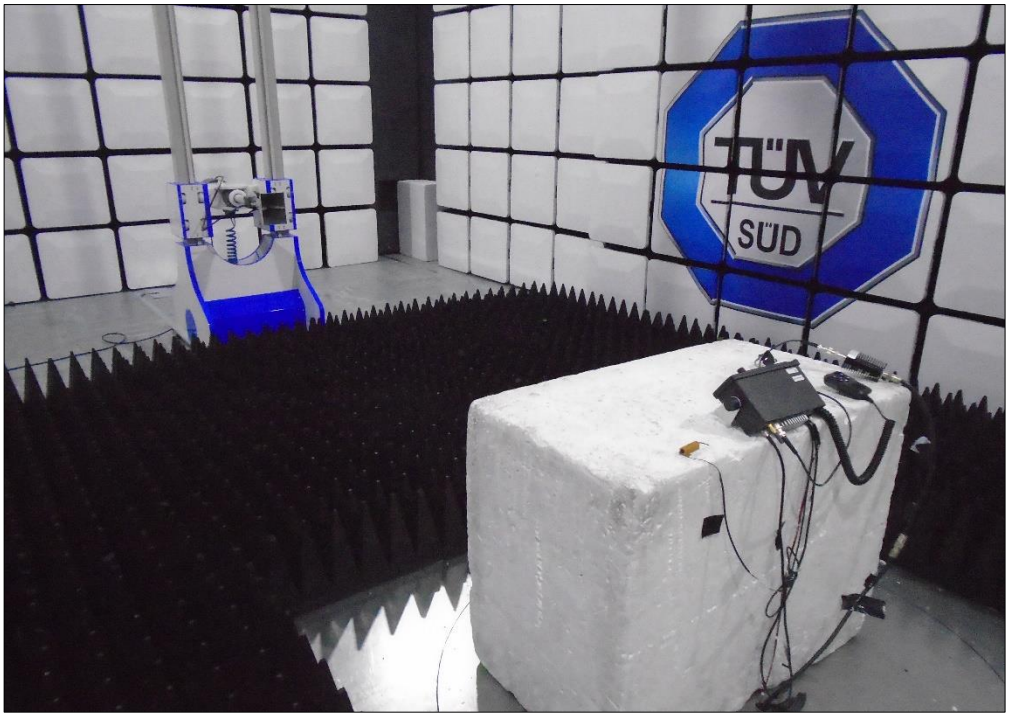

Figure 9 - Test Setup - 1 GHz to 12 GHz

2.1.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V3.1.12	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	30-Mar-2024
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MRT	5451	-	23-Aug-2023
Cable (K-Type to K-Type, 2 m)	Junkosha	MWX241-02000KMSKMS/A	5524	12	24-Oct-2023
Cable (SMA to N-Type, 2 m)	Junkosha	MWX241/B	5817	6	04-Aug-2023
Pre-Amplifier (1 GHz to 18 GHz)	Schwarzbeck	BBV 9718 C	5350	12	20-Oct-2023
Antenna (Bilog with attenuator, 30 MHz to 3 GHz)	Schaffner	CBL6143	287	24	02-Dec-2024
Antenna (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5611	12	16-Oct-2023

Table 14

TU - Traceability Unscheduled

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5474	12	21-Apr-2024

Table 15

4 Incident Reports

No incidents reports were raised.

5 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 16

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

Measurement Uncertainty Decision Rule

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.