

FCC and ISED Test Report

LARS THRANE A/S LT-4200 Satellite Communications System

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

Prepared for: LARS THRANE A/S
Skovlytoften 33
Holte
DK-2840
DENMARK



Add value.
Inspire trust.

FCC ID: 2A9Z4-GC542298 IC: 24065-12224200

COMMERCIAL-IN-CONFIDENCE

Document 75956617-07 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Andrew Lawson	Chief Engineer, EMC	Authorised Signatory	03 March 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 15B and ICES-003. The sample tested was found to comply with the requirements defined in the approval rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	James Cumming	03 March 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 15B: 2021 and ICES-003: Issue 7: 2020 for the tests detailed in section 1.3.



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Contents

1 Report Summary2

1.1 Report Modification Record.....2

1.2 Introduction.....2

1.3 Brief Summary of Results3

1.4 Declaration of Build Status4

1.5 Product Information7

1.6 Deviations from the Standard..... 10

1.7 EUT Modification Record 11

1.8 Test Location 11

2 Test Details 12

2.1 Radiated Disturbance..... 12

3 Test Equipment Information 22

3.1 General Test Equipment Used..... 22

4 Incident Reports 23

5 Measurement Uncertainty 24



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	03 March 2023

Table 1

1.2 Introduction

Applicant	LARS THRANE A/S
Manufacturer	LARS THRANE A/S
Model Number(s)	LT-4200 Satellite Communications System comprising:
Part Number(s)	Control unit: LT-4210 Antenna: LT-4230 Handset: LT-3120
Serial Number(s)	Control unit: 00000123 Antenna: 0070011 Handset: 01015132
Hardware Version(s)	1.00
Software Version(s)	0.91
Number of Samples Tested	One system consisting of three units
Test Specification/Issue/Date	FCC 47 CFR Part 15B and ICES-003: 2021 and Issue 7: 2020
Order Number	188988 Rev:0
Date	16-September-2022
Date of Receipt of EUT	23-November-2022
Start of Test	17-December-2022
Finish of Test	17-December-2022
Name of Engineer(s)	James Cumming
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 - Idle				
2.1	15.109 and 3.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2



1.4 Declaration of Build Status

Equipment Description

Technical Description: (Please provide a brief description of the intended use of the equipment including the technologies the product supports)	The LT-4200 Satellite Communication System has voice and data capabilities with 100% global coverage provided by the Iridium Communication Network.	
Manufacturer:	Lars Thrane A/S	
Model:	LT-4200 Satellite Communications System	
Part Number:	Control Unit: LT-4210 Antenna Unit: LT-4230 Handset: LT-3120 Cradle: LT-3121	
Hardware Version:	1.00	
Software Version:	0.91	
FCC ID of the product under test – see guidance here	2A9Z4-GC542298	
IC ID of the product under test – see guidance here	24065-12224200	

Intentional Radiators

Technology	Iridium	Bluetooth
Frequency Range (MHz to MHz)	1616 to 1626.5 MHz	2402 – 2480 MHz
Conducted Declared Output Power (dBm)	41.7	8.3
Antenna Gain (dBi)	2.3	0.5
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	Block1 & C1: 41.667 KHz, C2: 83.334 KHz, C8: 333.333 KHz, 2xC8: 666,666 KHz	1MHz
Modulation Scheme(s) (e.g. GFSK, QPSK etc.)	DQPSK, QPSK	GFSK, $\pi/4$ DQPSK, 8DPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	41k7Q7W , 83k3Q7W, 333kQ7W, 666kQ7W	810KF7D, 1M31G7D, 1M03F7D
Bottom Frequency (MHz)	1616.1667	2402
Middle Frequency (MHz)	1621.1667	2441
Top Frequency (MHz)	1625.8330	2480



Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	4.880 GHz
Lowest frequency generated or used in the device or on which the device operates or tunes	32.768 kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒	
Class B Digital Device (Use in residential environment only) ☐	

AC Power Source

AC supply frequency:		Hz
Voltage		V
Max current:		A
Single Phase ☐ Three Phase ☐		

DC Power Source

Nominal voltage:	24	V
Extreme upper voltage:	32.2	V
Extreme lower voltage:	19.2	V
Max current:	8.0	A

Battery Power Source

Voltage:		V
End-point voltage:		V (Point at which the battery will terminate)
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ *(Vehicle regulated)		
Other ☐	Please detail:	

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐
---	--

Temperature

Minimum temperature:	-40 ambient	°C
Maximum temperature:	+55 ambient	°C

Cable Loss

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



Antenna Characteristics

Antenna connector ☐			State impedance		Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:		Gain	2.3	dBi
External antenna ☐	Type:		Gain		dBi
For external antenna only: Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☐ Non-standard Antenna Jack ☐ 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 may be photographs, length of wire antenna etc.					

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

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

Name: Carsten Thomsen
Position held: CTO
Date: 18-01-2023

1.5 Product Information

1.5.1 Technical Description

The Equipment under test (EUT) was a LARS THRANE A/S Satellite Communications System, Model: LT-4200.

The primary function of the EUT is to provide voice and data communication capabilities to users with 100% global coverage using the Iridium satellite network.

Additionally, the EUT has functionality to provide AUX interfaces for LAN, RS-422, Radio Silence, external ringer and Bluetooth.



Figure 1 – LT-4210 Control Unit and LT-3120 Handset

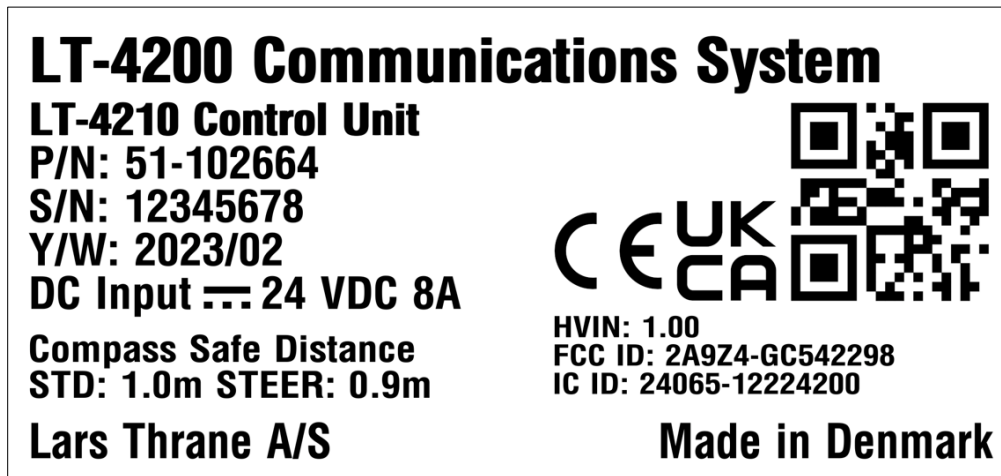


Figure 2 – LT-4210 Control Unit Example Rating Plate (Manufacturer Supplied)



Figure 3 – LT-4230 Antenna Unit

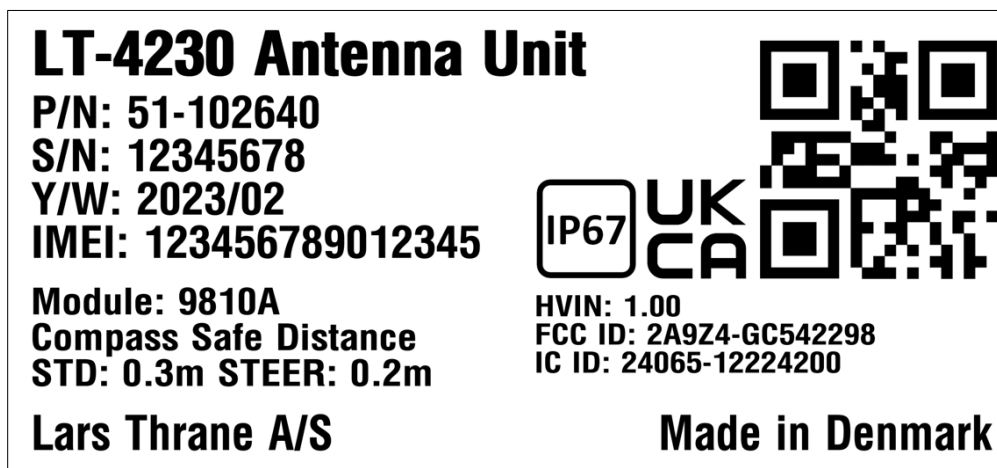


Figure 4 – LT-4230 Antenna Example Rating Plate (Manufacturer Supplied)

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length Specified	Usage	Type	Screened
Configuration and Mode: All Configurations and Modes				
DC Power Cable	2 m	Power	2 Core Cable	No
Ethernet	> 30 m	Data	RJ45	Yes
AUX Cable	> 3 m	External I/O Port	Multi Core Cable	Yes
Antenna Cable	> 3 m	Signal + 5 V DC Power	50 Ω Coaxial Cable (RG400)	Yes

Table 3



1.5.3 Test Configuration

Configuration	Description
DC Powered	The EUT was powered from a 24 V DC power supply. The following additional connections were made to the EUT. 1) The LT-4230 Antenna Unit was connected to the antenna port of the LT-4210 Control Unit. 2) The I/O test device was connected to the External I/O port of the LT-4210 Control Unit. 3) The Ethernet port of the Control Unit was connected to the test laptop via an Ethernet cable through the customers LAN Switch device. 4) The LT-3120 Handset was connected to the designated port on the front of the Control Unit. The EUT was set up in accordance with the customers LT-4200 Test Setup Document as shown in Figure

Table 4

1.5.4 Mode(s) of Operation

Mode	Description
Wireless Traffic	The EUT was configured using a laptop running Environmental Test Utility software activating the GNSS receive, Iridium uplink and downlink and Bluetooth in a loopback test program.
Idle	The EUT was configured using a laptop running Environmental Test Utility software where the intentional transmitters of the EUT were configured to be in an idle state.

Table 5

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: LT-4210, Serial Number: 00000123			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: LT-4230, Serial Number: 0070011			
1	As supplied by the customer (change of resistor value email ref CT03032023)	Not Applicable	Not Applicable
Model: LT-3120, Serial Number: 01015132			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 6

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 - Idle		
Radiated Disturbance	James Cumming	UKAS

Table 7

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

LT-4210, S/N: 00000123 - Modification State 0
LT-4230, S/N: 0070011 - Modification State 1
LT-3120, S/N: 01015132 - Modification State 0

2.1.3 Date of Test

17-December-2022

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

Above 1 GHz:

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

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

2.1.6 Example Test Setup Diagram

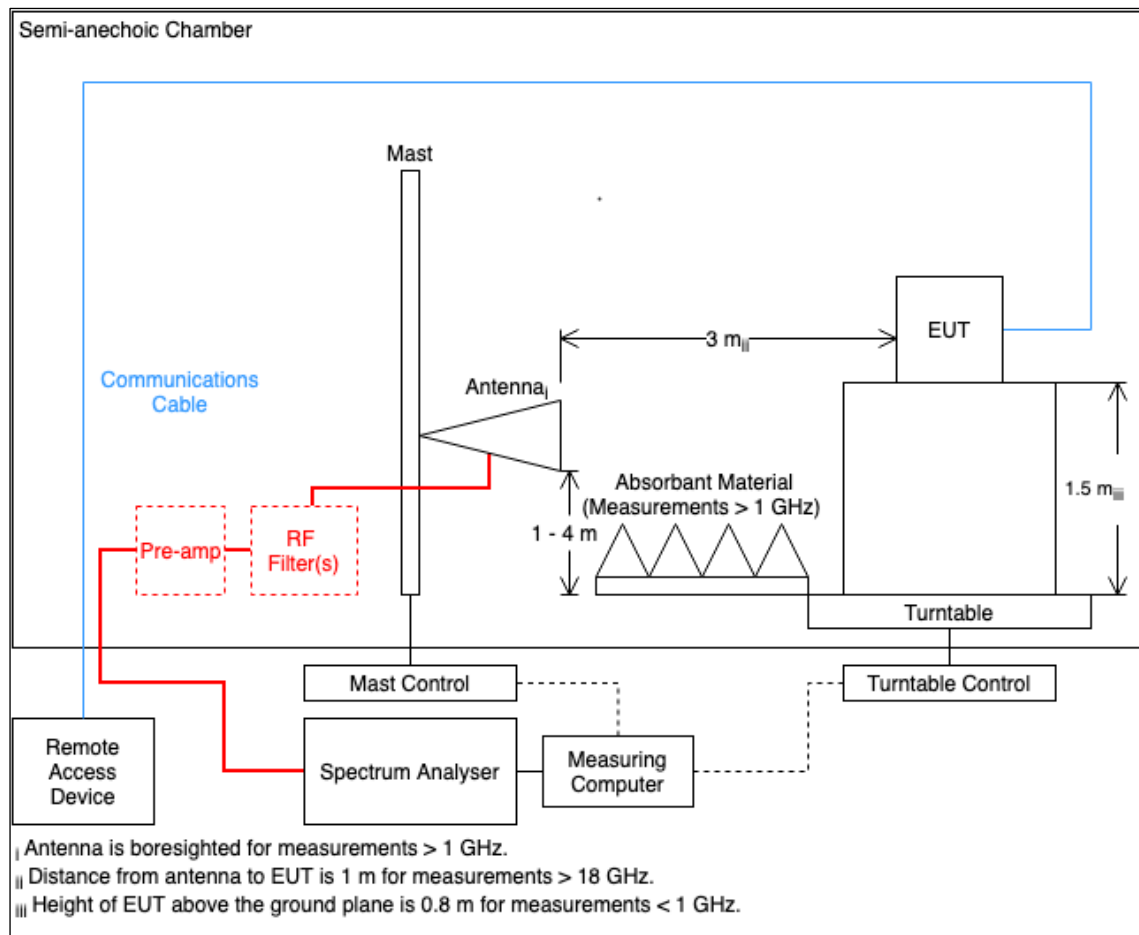


Figure 5

2.1.7 Environmental Conditions

Ambient Temperature	18.8 - 23.8 °C
Relative Humidity	23.2 - 46.0 %



2.1.8 Specification Limits

Required Specification Limits, Field Strength - Class A Test Limit at a 10 m Measurement Distance		
Frequency Range (MHz)	Test Limit ($\mu\text{V/m}$)	Test Limit ($\text{dB}\mu\text{V/m}$)
30 to 88	90	39.1
88 to 216	150	43.5
216 to 960	210	46.4
Above 960	300	49.5
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 8



2.1.9 Test Results

Results for Configuration and Mode: DC Powered - Idle.

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

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

Detailed results are shown below.

Highest frequency generated or used within the EUT: 3.6 GHz
Which necessitates an upper frequency test limit of: 18 GHz

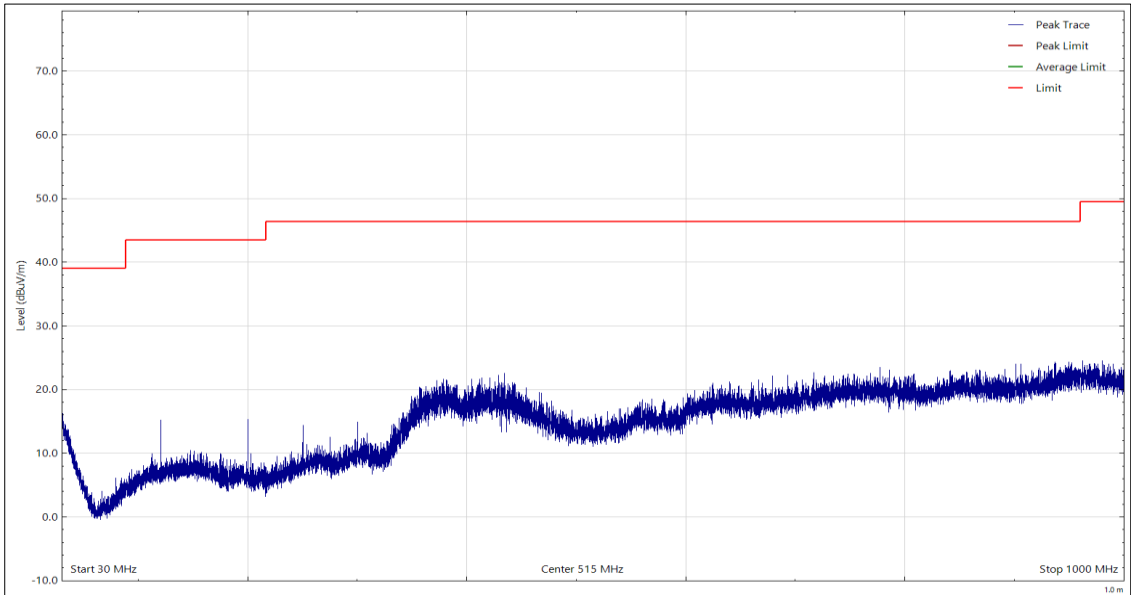


Figure 6 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

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

Table 9

*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.

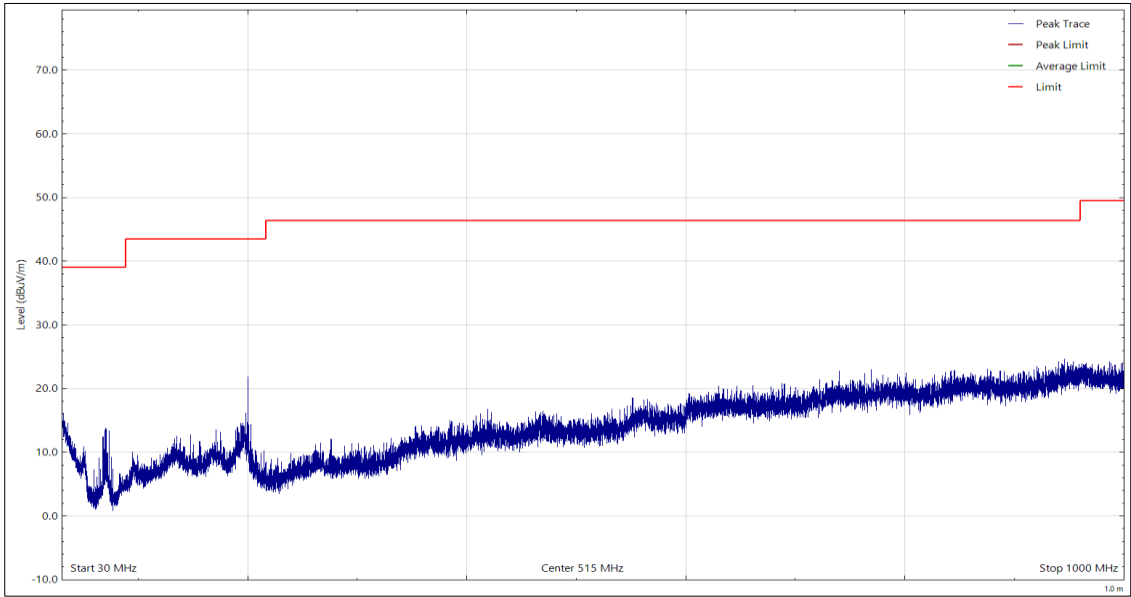


Figure 7 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	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.

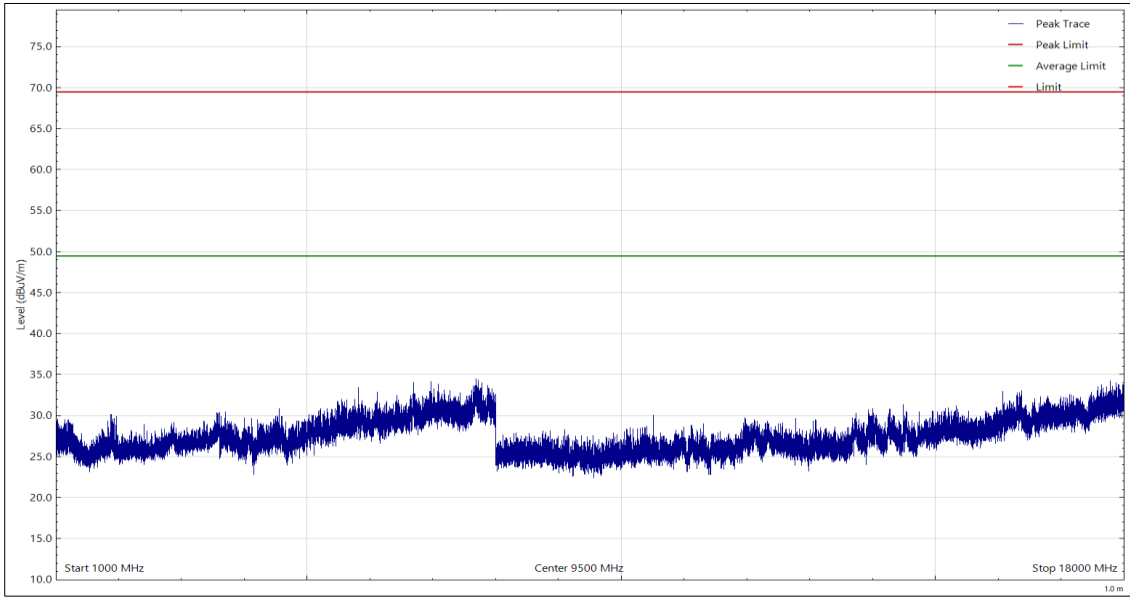


Figure 8 - 1 GHz to 18 GHz, CISPR Average, Horizontal

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	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.

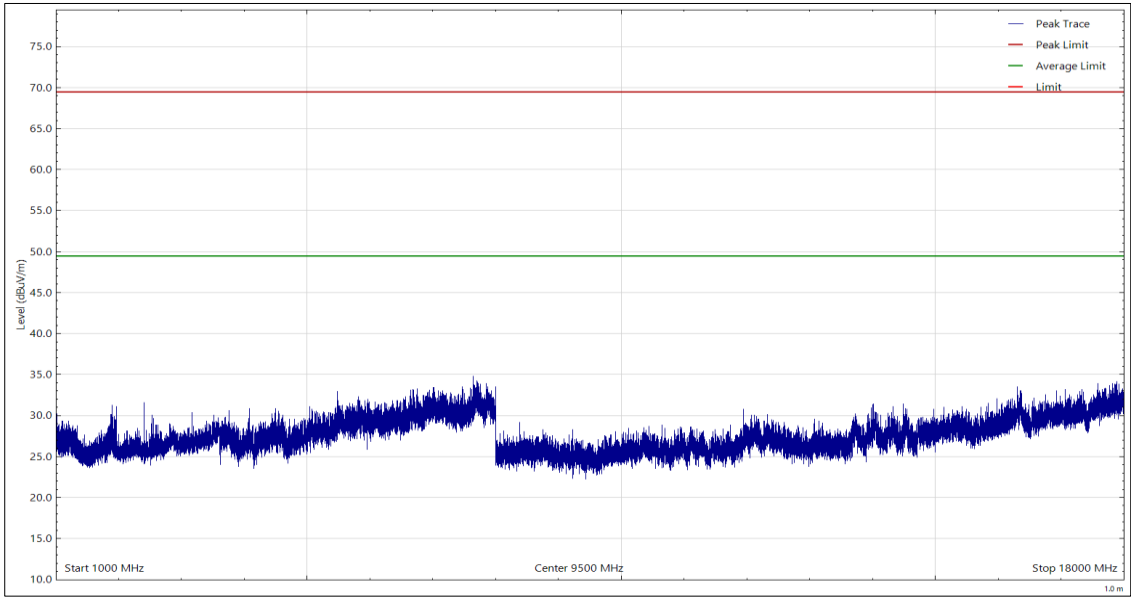


Figure 9 - 1 GHz to 18 GHz, CISPR Average, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	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.

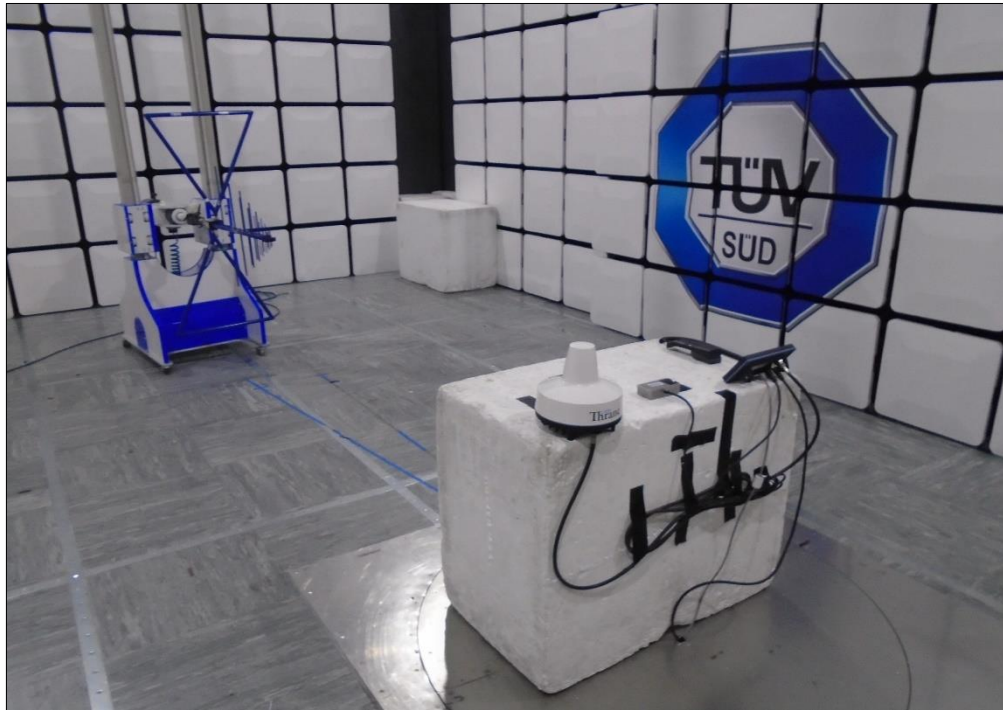


Figure 10 - Test Setup - 30 MHz to 1 GHz

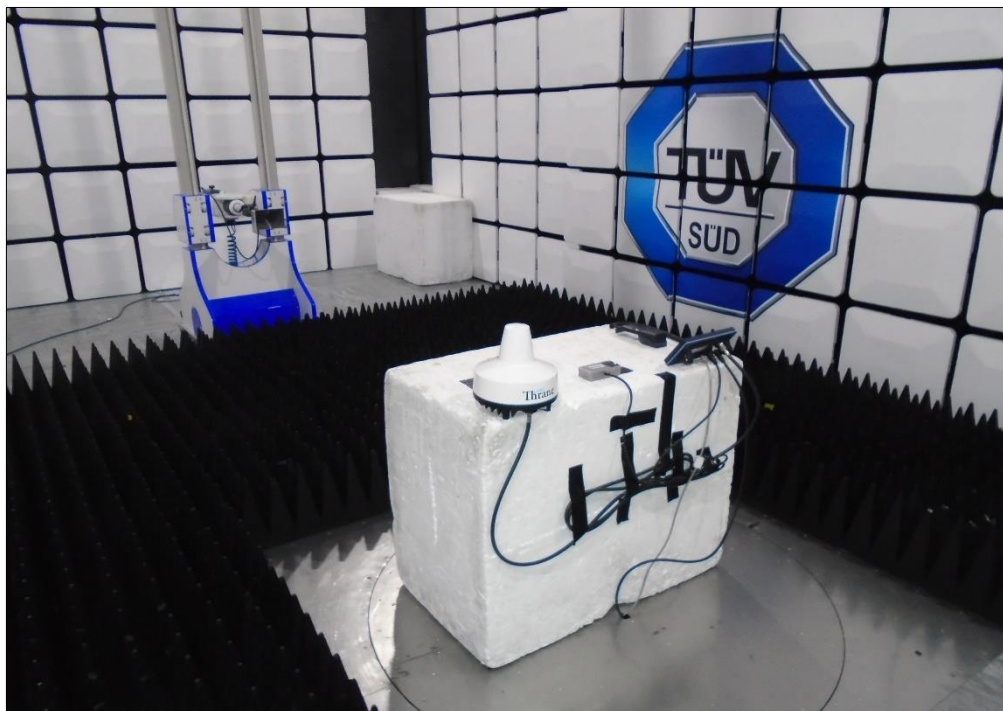


Figure 11 - Test Setup - 1 GHz to 8 GHz

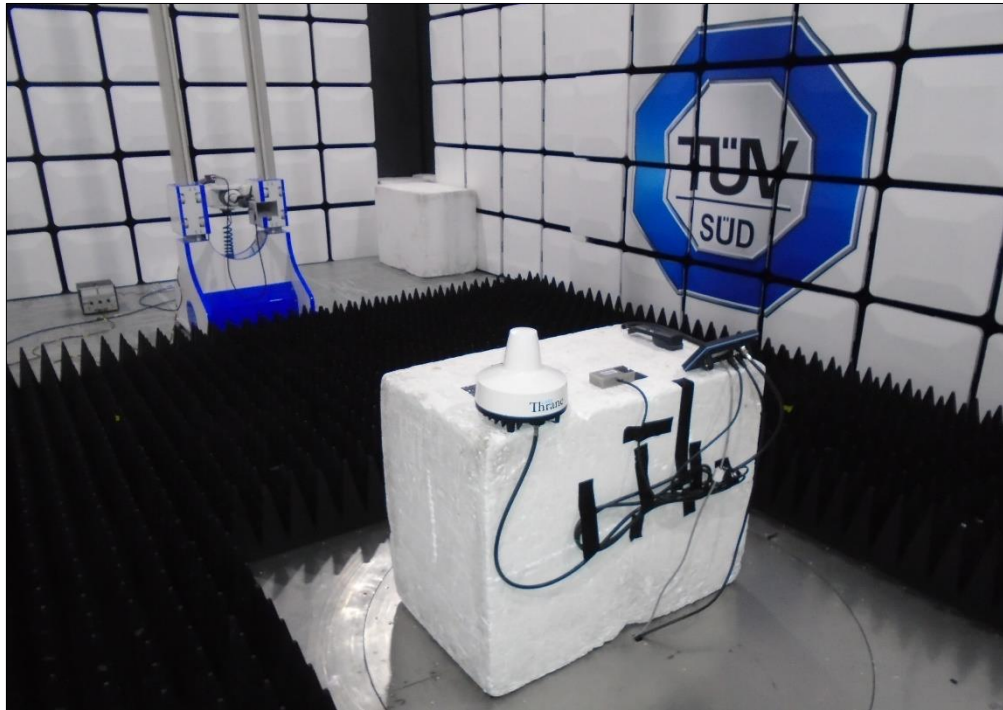


Figure 12 - Test Setup - 8 GHz to 18 GHz



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 V3.1.6	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	25-Mar-2023
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Cable (SMA to SMA, 2 m)	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	23-Apr-2023
Cable (K-Type to K-Type, 2 m)	Junkosha	MWX241-02000KMSKMS/A	5524	12	24-Oct-2023
Pre-Amplifier (1 GHz to 18 GHz)	Schwarzbeck	BBV 9718 C	5350	12	20-Oct-2023
Antenna with attenuator (Bilog, 30 MHz to 3 GHz)	Schaffner	CBL6143	287	24	02-Dec-2024
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	14-Jan-2023
Antenna (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5611	12	16-Oct-2023
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5348	12	16-Oct-2023

Table 13

TU - Traceability Unscheduled



3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Power Supply Unit for HD Camera system	Pontis EMC Products	PSM24	5618	-	TU
HD Camera System Controller	Pontis EMC Products	HDCon4101	5617	-	TU
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	06-Apr-2023
Multimeter	Fluke	177	3812	12	11-Apr-2023

Table 14

TU - Traceability Unscheduled



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 15

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.