FCC and ISED Test Report

Trackunit ApS
Model: TU700-5

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-GEN, ISED RSS-130, ISED RSS-132, ISED RSS-133 and ISED RSS-139, (GSM 850, PCS 1900, LTE Cat M1, LTE Cat NB2)

Prepared for: Trackunit ApS
Gasværksvej 24
4. Sal
Aalborg
9000, DENMARK

FCC ID: ZMF-TUCELLM01, ZMF-TUBLEWIM01
IC: 9746A-TUCELLM01, 9746A-TUBLEWIM01

COMMERCIAL-IN-CONFIDENCE

Document 75958850-10 Issue 03

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	15 March 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 2, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-GEN, ISED RSS-130, ISED RSS-132, ISED RSS-133 and ISED RSS-139, The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Pier-Angelo Lorusso	15 March 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 2: 2021, FCC 47 CFR Part 22: 2022, FCC 47 CFR Part 24: 2022, FCC 47 CFR Part 27: 2022, ISED RSS-GEN: Issue 5 (2018) + A2 (2021), ISED RSS-130 Issue 2 (2019), ISED RSS-132 Issue 3 (2013), ISED RSS-133 Issue 6 (2018), and ISED RSS-139 Issue 4 (2022) for the tests detailed in section 1.3.

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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	07-December-2023
2	Re-test of PCS 1900	31-January-2024
3	Change FCC and IC ID, correction to BLE and 2.4GHz WLAN antenna gains	15-March-2024

Table 1

1.2 Introduction

Applicant	Trackunit ApS
Manufacturer	Trackunit ApS
Model Number(s)	TU700-5
Serial Number(s)	10010116
Hardware Version(s)	Prototype 3, revision F
Software Version(s)	1.0.1
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2021 FCC 47 CFR Part 22: 2022 FCC 47 CFR Part 24: 2022 FCC 47 CFR Part 27: 2022 ISED RSS-GEN: Issue 5 (2018) + A2 (2021) ISED RSS-130: Issue 2 (2019) ISED RSS-132: Issue 3 (2013) ISED RSS-133: Issue 6 (2018) ISED RSS-139: Issue 4 (2022)
Order Number	TU700 EMC + RF Compliance
Date	13-June-2023
Date of Receipt of EUT	21-September-2023
Start of Test	10-October-2023
Finish of Test	19-January-2024
Name of Engineer(s)	Pier-Angelo Lorusso
Related Document(s)	ANSI C63.26: 2015 KDB 996369 D04 (2020-10) KDB 971168 D01 (2018-04) SRSP-510 (2009-02)

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 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, RSS-GEN, RSS-130, RSS-132, RSS-133 and RSS-139 is shown below.

Section	Specification Clause									Test Description	Result	Comments/Base Standard
	Part 2	Part 22	Part 24	Part 27	RSS-GEN	RSS-130	RSS-132	RSS-133	RSS-139			
Configuration and Mode: GSM 850												
2.1	2.1046	22.913 (a)(5)	-	-	6.12		5.4			ERP/EIRP Verification	Pass	
Configuration and Mode: PCS 1900												
2.1	2.1046		24.232 (c)	-	6.12			6.4		ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 2 Tx												
2.1	2.1046		24.232 (c)	-	6.12			6.4		ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 4 Tx												
2.1	2.1046		-	27.50 (d)(4)	6.12				5.5	ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 5 Tx												
2.1	2.1046	22.913 (a)(5)	-	-	6.12		5.4			ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 12 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 13 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 25 Tx												

Section	Specification Clause									Test Description	Result	Comments/Base Standard
	Part 2	Part 22	Part 24	Part 27	RSS-GEN	RSS-130	RSS-132	RSS-133	RSS-139			
2.1	2.1046		24.232 (c)	-	6.12			6.4		ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 26 Tx												
2.1	2.1046	22.913 (a)(5)	-	-	6.12		5.4			ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 66 Tx												
2.1	2.1046		-	27.50 (d)(4)	6.12				5.5	ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat M1 Band 85 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 2 Tx												
2.1	2.1046		24.232 (c)	-	6.12			6.4		ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 4 Tx												
2.1	2.1046		-	27.50 (d)(4)	6.12				5.5	ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 5 Tx												
2.1	2.1046	22.913 (a)(5)	-	-	6.12		5.4			ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 12 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 13 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 25 Tx												

Section	Specification Clause									Test Description	Result	Comments/Base Standard
	Part 2	Part 22	Part 24	Part 27	RSS-GEN	RSS-130	RSS-132	RSS-133	RSS-139			
2.1	2.1046		24.232 (c)	-	6.12			6.4		ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 66 Tx												
2.1	2.1046		-	27.50 (d)(4)	6.12				5.5	ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 71 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	
Configuration and Mode: LTE Cat NB2 Band 85 Tx												
2.1	2.1046		-	27.50 (c)(10)	6.12	4.6				ERP/EIRP Verification	Pass	

Table 2

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Telematic unit for Fleet Management. This equipment is a telematic device to be mounted in and on construction machines / vehicles. The equipment contains technologies 4G LTE Cat M1, Narrow band IoT NB2, 2G GPRS/EGPRS, BLE, WLAN, and GNSS. This equipment is intended to be connected to power lines of the host equipment.		
Manufacturer:	Trackunit Aps		
Model:	TU700-5		
Part Number:	9795.XXXXXX(X)		
Hardware Version:	Prototype 3, revision F		
Software Version:	1.0.1		
FCC ID of the product under test – see guidance here		ZMF-TUCELLM01, ZMF-TUBLEWIM01	
IC ID of the product under test – see guidance here		9746A-TUCELLM01, 9746A-TUBLEWIM01	
Device Category	Mobile ☐	Portable ☐	Fixed ☒
Equipment is fitted with an Audio Low Pass Filter		Yes ☐	No ☒

Table 3

Intentional Radiators*

Technology	GSM 850	PCS 1900	Bluetooth Low Energy	2.4 GHz Wi-Fi
Frequency Range (MHz to MHz)	824-849	1850-1910	2402-2480	2412-2462
Conducted Declared Output Power (dBm)	33	30	14 dBm [1)] <10 dBm EIRP for wolrldwide deployment	16 dBm [1)] <10 dBm EIRP for wolrldwide deployment
Antenna Gain (dBi)	<4.7	<5.4	1.66	1.66
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.2	0.2	1, 2	20
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GMSK, 8PSK	GMSK, 8PSK	GFSK	DSSS, OFDM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	200KG7D	200KG7D	1M00F7D, 2M00F7D	20M0G7D
Bottom Frequency (MHz)	824	1850	2402	2412
Middle Frequency (MHz)	836.5	1880	2441	2437
Top Frequency (MHz)	849	1910	2480	2462

Table 4

Technology	LTE Cat M1 B2	LTE Cat M1 B4	LTE Cat M1 B5	LTE Cat M1 B12	LTE Cat M1 B13	LTE Cat M1 B25
Frequency Range (MHz to MHz)	1850-1910	1710-1755	824-849	699-716	777-787	1850-1915
Conducted Declared Output Power (dBm)	21	21	21	21	21	21
Antenna Gain (dBi)	5.4	5.4	4.7	3.9	3.0	5.4
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	1.4	1.4	1.4	1.4	1.4	1.4
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M40G7D	1M40G7D	1M40G7D	1M40G7D	1M40G7D	1M40G7D
Bottom Frequency (MHz)	1850	1710	824	699	777	1850
Middle Frequency (MHz)	1880	1732.5	836.5	707.5	782	1882.5
Top Frequency (MHz)	1910	1755	849	716	787	1915

Table 5

Technology	LTE Cat M1 B26	LTE Cat M1 B66	LTE Cat M1 B85	LTE Cat NB2 B2	LTE Cat NB2 B4	LTE Cat NB2 B5
Frequency Range (MHz to MHz)	814-824 824-849	1710-1780	698-716	1850-1910	1710-1755	824-849
Conducted Declared Output Power (dBm)	21	21	21	21	21	21
Antenna Gain (dBi)	4.7	5.4	3.9	5.4	5.4	4.7
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	1.4	1.4	1.4	0.2	0.2	0.2
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM	BPSK, QPSK	BPSK, QPSK	BPSK, QPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M40G7D	1M40G7D	1M40G7D	180KG7D	180KG7D	180KG7D
Bottom Frequency (MHz)	814	1710	698	1850	1710	824
Middle Frequency (MHz)	831.5	1745	707	1880	1732.5	836.5
Top Frequency (MHz)	849	1780	716	1910	1755	849

Table 6

Technology	LTE Cat NB2 B12	LTE Cat NB2 B13	LTE Cat NB2 B25	LTE Cat NB2 B66	LTE Cat NB2 B71	LTE Cat NB2 B85
Frequency Range (MHz to MHz)	699-716	777-787	1850-1915	1710-1780	663-698	698-716
Conducted Declared Output Power (dBm)	21	21	21	21	21	21
Antenna Gain (dBi)	3.9	3.0	5.4	5.4	N/A	3.9
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.2	0.2	0.2	0.2	0.2	0.2
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	BPSK, QPSK	BPSK, QPSK	BPSK, QPSK	BPSK, QPSK	BPSK, QPSK	BPSK, QPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	180KG7D	180KG7D	180KG7D	180KG7D	180KG7D	180KG7D
Bottom Frequency (MHz)	699	777	1850	1710	663	698
Middle Frequency (MHz)	707.5	782	1882.5	1745	680.5	707
Top Frequency (MHz)	716	787	1915	1780	698	716

Table 7

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2.48 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) ☐	

Table 8

AC Power Source

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

Table 9

DC Power Source

Nominal voltage:	12 / 24 / 36 / 48	V
Extreme upper voltage:	58	V
Extreme lower voltage:	9	V
Max current:	0.5	A

Table 10

Battery Power Source

Voltage:	3.6	V
End-point voltage:	2.75	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☒ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 11

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Table 12

Temperature

Minimum temperature:	-20	°C
Maximum temperature:	60	°C

Table 13

Cable Loss

Adapter Cable Loss (Conducted sample)	N/A	dB

Table 14

Antenna Characteristics

Antenna connector ☐			State impedance	N/A	Ohm
Temporary antenna connector ☐			State impedance	N/A	Ohm
Integral antenna ☒	Type:	Cellular: Inverted F antenna on PCB	Gain	5.4	dBi
Integral antenna ☒	Type:	BLE/Wi-Fi: Antenna on module	Gain	1.66	dBi
Integral antenna ☒	Type:	GNSS: Inverted F antenna on PCB	Gain	4.8	dBi
External antenna ☐	Type:		Gain	N/A	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 maybe photographs, length of wire antenna etc.					

Table 15

Ancillaries (if applicable)

Manufacturer:	N/A	Part Number:	N/A
Model:	N/A	Country of Origin:	N/A

Table 16

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

Name: Lan My Tran/ Bjarke Ebbesen

Position held: Product Compliance Specialist/ Team Lead, Hardware Engineering

Date: 11.March.2024

1.5 Product Information

1.5.1 Technical Description

The equipment under test (EUT) was Telematic unit for Fleet Management which is to be mounted in and on construction machines / vehicles. The EUT contains technologies 4G LTE Cat M1, Narrow band IoT NB2, 2G GPRS/EGPRS, BLE, WLAN, and GNSS, and is intended to be connected to power lines of the host equipment. The EUT contains the following modules:

Module	FCC ID	IC ID
Trackunit TUCELLM01	ZMF- TUCELLM01	9746A-TUCELLM01
Trackunit TUBLEWIM01	ZMF- TUBLEWIM01	9746A-TUBLEWIM01

Table 17

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: TU700-5, Serial Number: 10010116			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 18

Prior to testing, handmade modifications were made to Modification State 0 (Hardware version: Prototype 3, Revision F). The cellular antenna was shortened using controlled router and 2 capacitors were added to the design. To be able to mass-produce the product including those changes, the cellular antenna was shortened in the PCB design, and the capacitors were added on the same location using a dedicated PCB footprint.
Those changes were included in (PCB) Version 4, and the BOM for automated SMD population was updated to reflect those changes in Version 4, revision D. Therefore, Modification State 0 (Hardware version: Prototype 3, Revision F) can be considered as equivalent to Hardware version: 4, revision D.

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: GSM 850		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: PCS 1900		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 2 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 4 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 5 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 12 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 13 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 25 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 26 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 66 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat M1 Band 85 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 2 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 4 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 5 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 12 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 13 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 15 Tx		

Test Name	Name of Engineer(s)	Accreditation
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 66 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 71 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS
Configuration and Mode: LTE Cat NB2 Band 85 Tx		
ERP/EIRP Verification	Pier-Angelo Lorusso	UKAS

Table 19

Office Address:

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

2 Test Details

2.1 ERP/EIRP Verification

2.1.1 Specification Reference

FCC 47 CFR Part 2: Clause 2.1046
FCC 47 CFR Part 22: Clause 22.913(a)(5)
FCC 47 CFR Part 24: Clause 24.232 (c)
FCC 47 CFR Part 27: Clause 27.50(d)(4) and 27.50 (c)(10)
ISED RSS-GEN: Clause 6.12
ISED RSS-130: Clause 4.6
ISED RSS-132: Clause 5.4
ISED RSS-133: Clause 6.4
ISED RSS-139: Clause 5.5

2.1.2 Equipment Under Test and Modification State

TU700-5, S/N: 10010116 - Modification State 0

2.1.3 Date of Test

10-October-2023 to 19-January-2024

2.1.4 Test Method

The following test was performed to check the fundamental of the integrated module was not adversely affected when integrated into the host device as required by KDB 996369 D04, clause 3.4.

This test was performed in accordance with KDB 971168 D01 Clause 5.8.

2.1.5 Environmental Conditions

Ambient Temperature	22.7 - 23.2 °C
Relative Humidity	55.0 - 63.9 %

2.1.6 Test Results

GSM 850

EUT Configuration: CS-4 GPRS, 1 DL 1UP Timeslots and GMSK

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
836.383	30.47	32.90	38.45	dBm

Table 20 - ERP Verification Results

PCS 1900

EUT Configuration: CS-4 GPRS, 1 DL 1UP Timeslots and GMSK

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1879.988	30.62	31.26	33.01	dBm

Table 21 - EIRP Verification Results

LTE Cat M1 Band 2 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1879.534	20.70	21.47	33.01	dBm

Table 22 - EIRP Verification Results

LTE Cat M1 Band 4 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1732.052	20.03	22.47	30.00	dBm

Table 23 - EIRP Verification Results

LTE Cat M1 Band 5 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
836.038	17.86	21.09	38.45	dBm

Table 24 - ERP Verification Results

LTE Cat M1 Band 12 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
707.074	15.21	21.70	34.77	dBm

Table 25 - ERP Verification Results

LTE Cat M1 Band 13 Tx

EUT Configuration: 5 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
779.832	17.48	22.66	34.77	dBm

Table 26 - ERP Verification Results

LTE Cat M1 Band 25 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1882.048	20.46	21.31	33.01	dBm

Table 27 - EIRP Verification Results

LTE Cat M1 Band 26 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
831.037	17.48	21.34	38.45	dBm

Table 28 - ERP Verification Results

LTE Cat M1 Band 66 Tx

EUT Configuration: 1.4 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1744.567	19.58	21.80	30.00	dBm

Table 29 - EIRP Verification Results

LTE Cat M1 Band 85 Tx

EUT Configuration: 5 MHz Bandwidth, QPSK, 1 RB, Start 0, Index 0

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
707.036	19.22	23.03	34.77	dBm

Table 30 - ERP Verification Results

LTE Cat NB2 Band 2 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1879.930	24.95	21.57	33.01	dBm

Table 31 - EIRP Verification Results

LTE Cat NB2 Band 4 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1732.432	24.29	22.04	30	dBm

Table 32 - EIRP Verification Results

LTE Cat NB2 Band 5 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
836.429	18.75	21.55	38.45	dBm

Table 33 - ERP Verification Results

LTE Cat NB2 Band 12 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
707.425	20.33	22.37	34.77	dBm

Table 34 - ERP Verification Results

LTE Cat NB2 Band 13 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
781.939	19.74	22.79	34.77	dBm

Table 35 - ERP Verification Results

LTE Cat NB2 Band 25 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1882.435	25.14	21.62	33.01	dBm

Table 36 - EIRP Verification Results

LTE Cat NB2 Band 66 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
1744.931	23.19	21.95	30	dBm

Table 37 - EIRP Verification Results

LTE Cat NB2 Band 71 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
680.433	16.80	21.05	34.77	dBm

Table 38 - ERP Verification Results

LTE Cat NB2 Band 85 Tx

EUT Configuration: 1 Tone, QPSK, Tone start 0,

Frequency (MHz)	Host Product Result	Modular Test Result	Limit	Unit
706.931	20.23	22.65	34.77	dBm

Table 39 - ERP Verification Results

2.1.7 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
Dual Power Supply Unit	Hewlett Packard	6253A	292	-	O/P Mon
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	26-Aug-2024
True RMS Multimeter	Fluke	179	4007	12	18-Nov-2023
Test Receiver	Rohde & Schwarz	ESW44	5084	12	31-Aug-2024
Emissions Software	TUV SUD	EmX V3.1.12	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 (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5215	12	09-Jul-2024
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	20-Apr-2024
Cable (K-Type to K-Type, 1 m)	Junkosha	MWX241-01000KMSKMS/A	5512	12	21-May-2024
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/A	5518	12	14-Apr-2024
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5521	12	05-Jun-2024
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	5522	12	14-Apr-2024
Antenna (Tri-log, 30 MHz to 1 GHz)	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024
Cable (N to N 3m)	Junkosha	MWX221-03000NMSNMS/A	6024	12	14-Sep-2024
Attenuator (4 dB)	Pasternack	PE7074-4	6202	24	16-Jul-2024
Spectrum Analyser	Anritsu	MT8821C	6543	12	23-Feb-2024

Table 40

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

3 Photographs

3.1 Test Setup Photographs

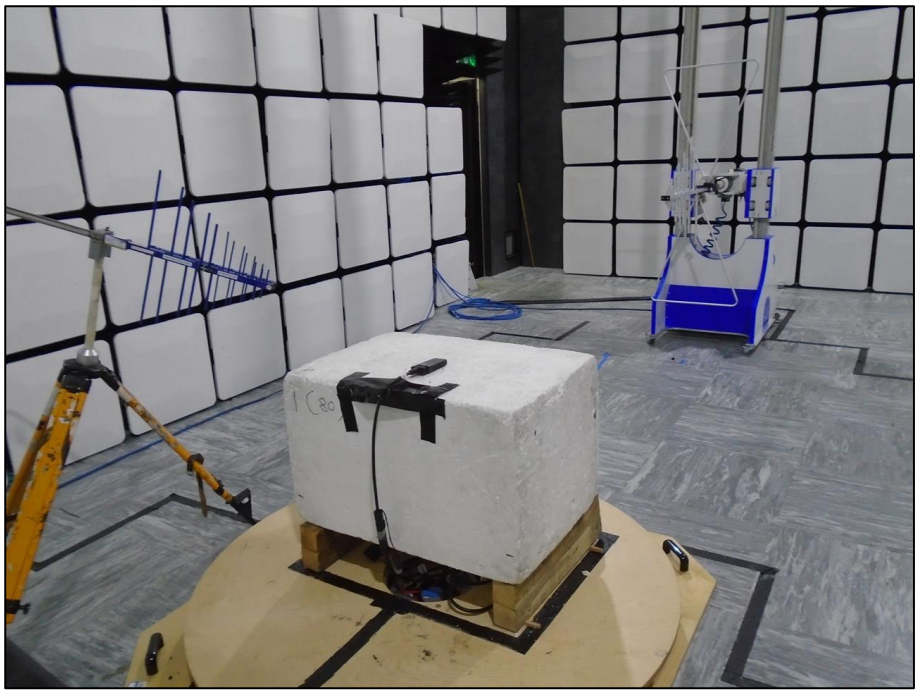

Figure 1 - Test Setup – ERP Measurement

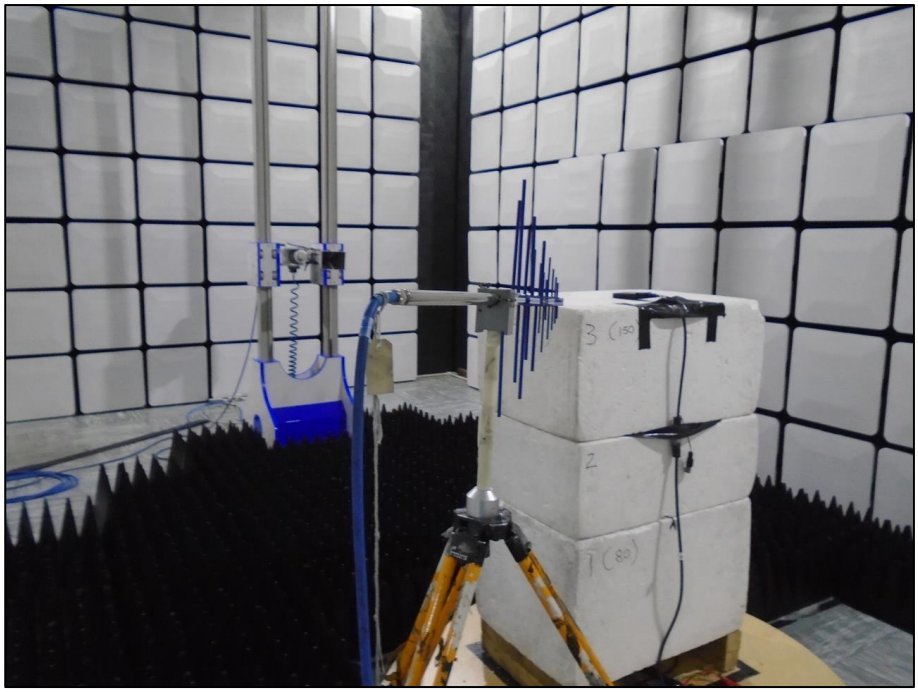

Figure 2 - Test Setup – EIRP Measurement

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
ERP/EIRP Verification	± 3.2 dB

Table 41

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.