FCC and ISED Test Report

Logic Energy
Wind speed logger, Model: WINDCRANE

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 22, FCC 47 CFR Part 24, ISED RSS-132, ISED RSS-133 and ISED RSS-GEN (4G - LTE Cat M1)

Add value.
Inspire trust.

Prepared for: Logic Energy Ltd
The Mount, Newfield Main Road
Dundonald, KA2 9BH
UNITED KINGDOM

FCC ID: 2A94L-WINDCRANE IC: N/A

COMMERCIAL-IN-CONFIDENCE

Document 75956499-06 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	15 December 2022

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, ISED RSS-132, ISED RSS-133 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Pier Lorusso	15 December 2022	

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: 2020, FCC 47 CFR Part 22: 2020, FCC 47 CFR Part 24: 2020, ISED RSS-132: Issue 3 (2013-01), ISED RSS-133: Issue 6 (2013-01) + A1 (2018-01) and ISED RSS-GEN: Issue 3 (2015-07) 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	15-December-2022

Table 1

1.2 Introduction

Applicant	Logic Energy
Manufacturer	Logic Energy
Model Number(s)	WINDCRANE
Serial Number(s)	195683602555
Hardware Version(s)	1.12
Software Version(s)	w1.12
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2020 FCC 47 CFR Part 22: 2020 FCC 47 CFR Part 24: 2020, ISED RSS-132: Issue 3 (2013-01) ISED RSS-133: Issue 6 (2013-01) + A1 (2018-01) ISED RSS-GEN is Issue 5 (2018-04) + A1 (2019-03)
Order Number Date	188542 Rev: 1 05-September-2022
Date of Receipt of EUT	28-September-2022
Start of Test	31-October-2022
Finish of Test	31-October-2022
Name of Engineer(s)	Pier Lorusso
Related Document(s)	ANSI C63.26: 2015 ANSI C63.10: 2013 ANSI C63.10: 2020 KDB 996369 D04 Module Integration Guide V02 SRSP-510: Issue 5 (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, ISED RSS-132, ISED RSS-133 and ISED RSS-GEN is shown below.

Section	Specification Clause						Test Description	Result	Comments/Base Standard
	Part 2	Part 22	Part 24	RSS-132	RSS-133	RSS-GEN			
Configuration and Mode: LTE Cat M1 FDD B2 (1900 MHz)									
2.1	2.1053	-	Part 24.238 (a)	-	6.5.1	6.13	Radiated Spurious Emissions	Pass	Measurements as per KDB 996369 D04, clause 3.4 only
Configuration and Mode: LTE Cat M1 FDD B5 (850 MHz)									
2.1	2.1053	22.917(a)	-	5.5	-	6.13	Radiated Spurious Emissions	Pass	Measurements as per KDB 996369 D04, clause 3.4 only

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)*	Wind speed logger unit with cellular telemetry
Manufacturer:	Logic Energy Ltd
Model:	WINDCRANE
Part Number:	n/a
Hardware Version:	1.12
Software Version:	w1.12
FCC ID of the product under test – see guidance here	TBC
IC ID of the product under test – see guidance here	TBC

Table 3

Intentional Radiators

Technology	GSM 850	GSM 1900 (PCS-1900)	LTE Cat-M1 FDD 2	LTE Cat-M1 FDD 4	LTE Cat-M1 FDD 5	LTE Cat-M1 FDD 12
Frequency Range (MHz to MHz)	824-849	1850-1910	1850-1910	1710-1755	824-849	699-716
Conducted Declared Output Power (dBm)	33	30	23	23	23	23
Antenna Gain (dBi)	2	2	2	2	2	2
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.2	0.2	1.4, 3, 5, 10, 20	1.4, 3, 5, 10, 20	1.4, 3, 5, 10	1.4, 3, 5, 10
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GMSK, 8PSK	GMSK, 8PSK	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM	QPSK, 16QAM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	300KGXW, 300KG7W	300KGXW, 300KG7W	1M40G7D, 3M00G7D, 5M00G7D, 10M0G7D, 20M0G7D	1M40G7D, 3M00G7D, 5M00G7D, 10M0G7D, 20M0G7D	1M40G7D, 3M00G7D, 5M00G7D, 10M0G7D	1M40G7D, 3M00G7D, 5M00G7D, 10M0G7D
Bottom Frequency (MHz)	824.2	1850.2	1850.7	1710.7	824.7	699.7
Middle Frequency (MHz)						
Top Frequency (MHz)	848.8	1909.8	1909.3	1754.3	848.3	715.3

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	8.0 MHz
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 5

AC Power Source

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

Table 6

DC Power Source

Nominal voltage:	24	V
Extreme upper voltage:	36	V
Extreme lower voltage:	9	V
Max current:	0.3	A

Table 7

Battery Power Source

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

Table 8

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Table 9

Temperature

Minimum temperature:	-30	°C
Maximum temperature:	+60	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)	TBC	dB

Table 11

Antenna Characteristics

Antenna connector ☐			State impedance		Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	Bloomice DELGADO 2G/3G/4G-LTE Self Adhesive Patch Antenna	Gain	2	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 maybe photographs, length of wire antenna etc.					

Table 12

Ancillaries (if applicable)

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

Table 13

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

Name: Eduardo Estelles
Position held: Director
Date: 24 November 2022

1.5 Product Information

1.5.1 Technical Description

Data logger for remote monitoring of wind speed on tower and mobile cranes, with GSM/LTE-M cellular connectivity.

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: WINDCRANE, Serial Number: 195683602555			
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: LTE Cat M1 FDD B2 (1900 MHz)		
Radiated Spurious Emissions (Simultaneous Transmission)	Pier Lorusso	UKAS
Configuration and Mode: LTE Cat M1 FDD B5 (850 MHz)		
Radiated Spurious Emissions (Simultaneous Transmission)	Pier Lorusso	UKAS

Table 15

Office Address:

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

2 Test Details

2.1 Radiated Spurious Emissions

2.1.1 Specification Reference

FCC CFR Part 2, Clause 2.1053
FCC 47 CFR Part 22, Clause 22.917(a)
FCC 47 CFR Part 24, Clause 24.238(a)
ISED RSS-132, Clause 5.5
ISED RSS-133, Clause 6.5.1
ISED RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

WINDCRANE, S/N: 195683602555 - Modification State 0

2.1.3 Date of Test

31-October-2022

2.1.4 Test Method

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 5th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation:

E (dBuV/m) + 20log(d) - 104.8 = EIRP (dBm) where (d) is the measurement distance.

82.2 (dBuV/m) + 20log(3) – 104.8 = EIRP (dBm)

-13.0 = EIRP (dBm)

The frequency spectrum investigated was up to the 5th harmonic, as specified in 15.33 (b) required by KDB 996369 D04 Module Integration Guide clause 3.2. Measurements were made on the worst case modulation and channel as specified in the original equipment filing.

2.1.5 Example Test Setup Diagram

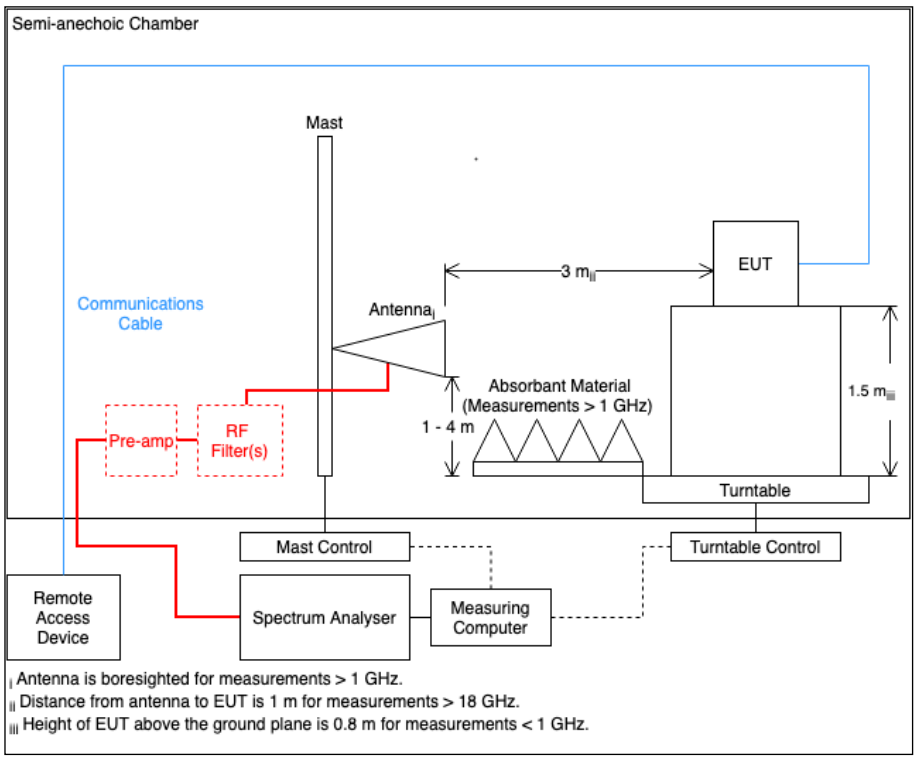

Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	18.5 - 20.1 °C
Relative Humidity	56.6 - 59.4 %

2.1.7 Test Results

LTE Cat M1 FDD B2 (1900 MHz)

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

Table 16 - - LTE Cat M1_FDD Band 2_QPSK_BW1.4 MHz_1880 MHz, 30 MHz to 10 GHz

*No emissions found within 10 dB of the limit.

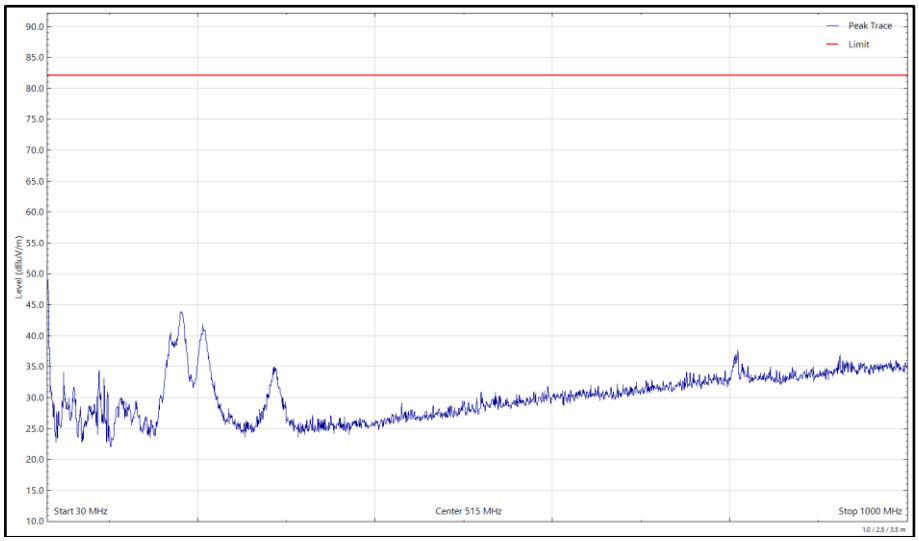

Figure 2 - LTE Cat M1_FDD Band 2_QPSK_BW1.4 MHz_1880 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

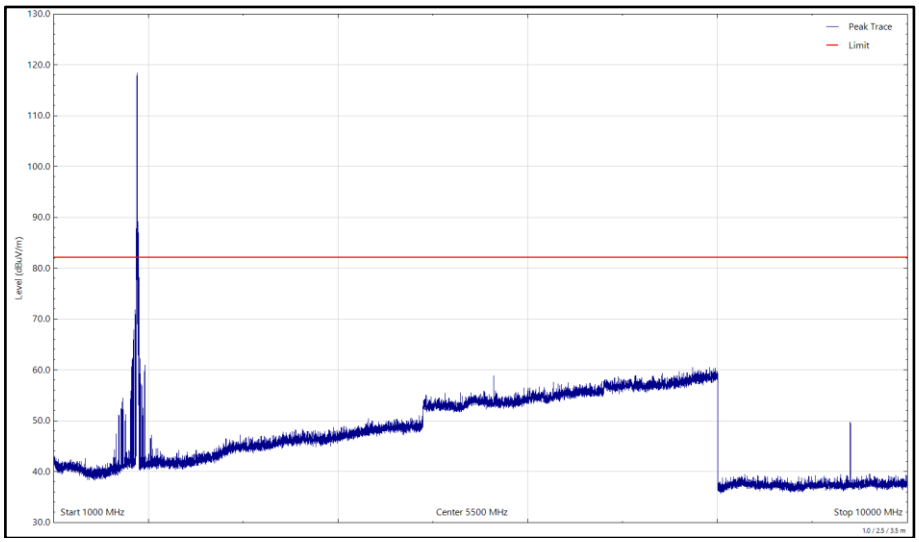

Figure 3 LTE Cat M1_FDD Band 2_QPSK_BW1.4 MHz_1880 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

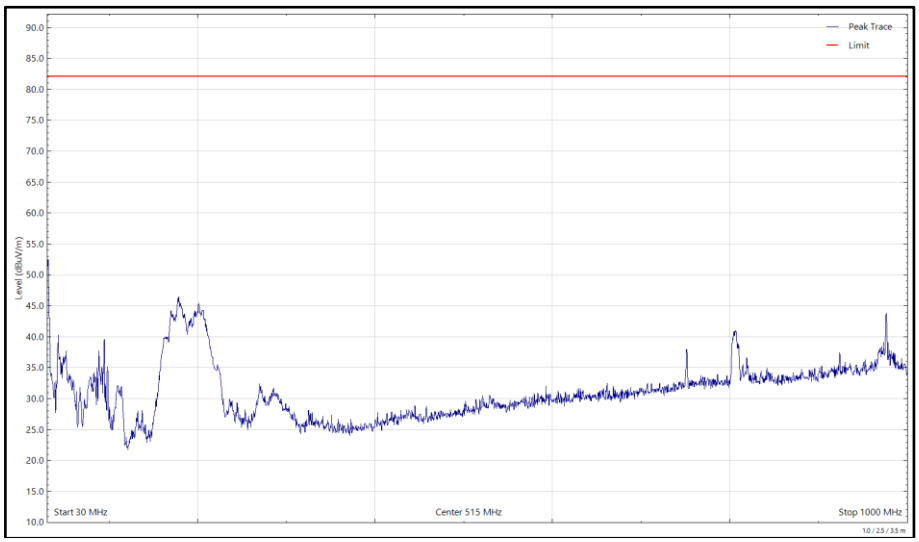

Figure 4 - LTE Cat M1_FDD Band 2_QPSK_BW1.4 MHz_1880 MHz, 30 MHz to 1 GHz, Vertical (Peak)

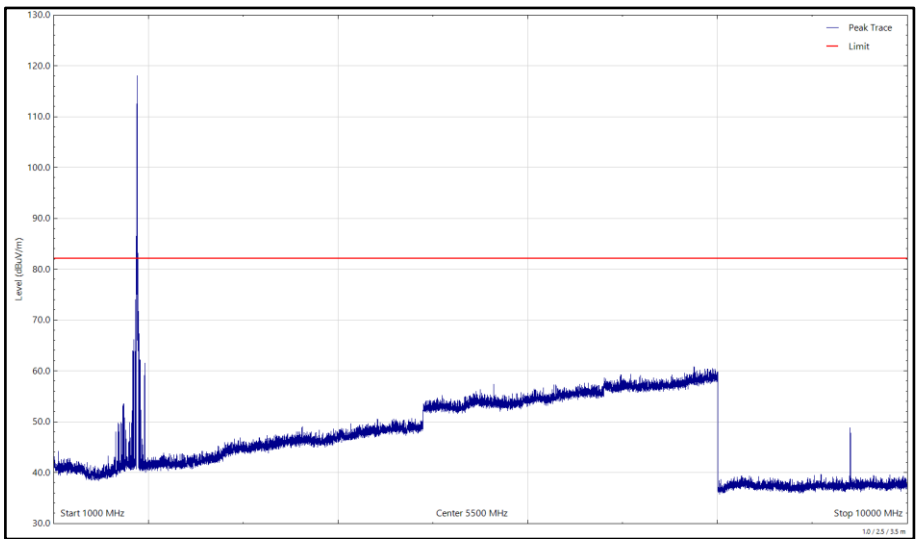

Figure 5 - LTE Cat M1_FDD Band 2_QPSK_BW1.4 MHz_1880 MHz, 1 GHz to 10 GHz, Vertical (Peak)

FCC 47 CFR Part 24 and ISED RSS-133

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 24.238 (a) / RSS-133 Clause 6.5.1	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 17

LTE Cat M1 FDD B5 (850 MHz)

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

Table 18 - LTE Cat M1_FDD Band 5_QPSK_BW1.4 MHz_836.5 MHz, 30 MHz to 5 GHz

*No emissions found within 10 dB of the limit.

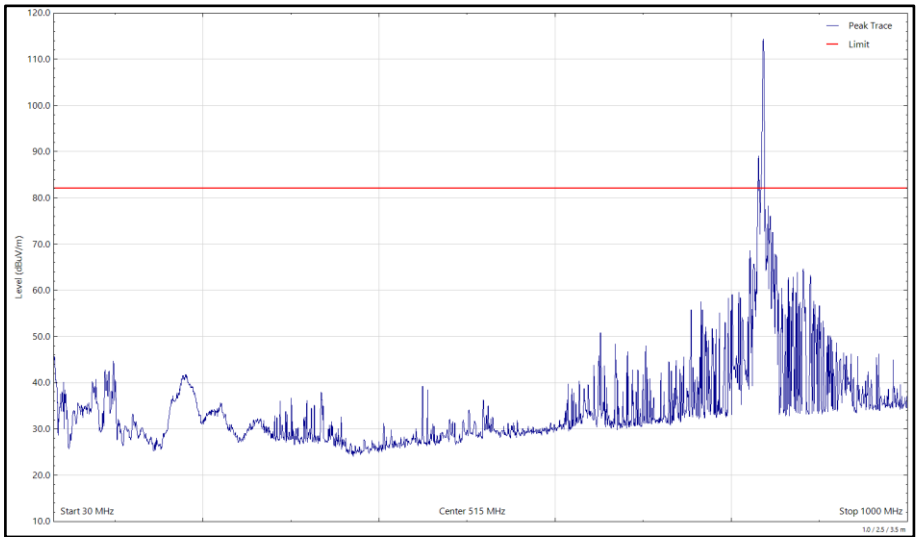

Figure 6 - LTE Cat M1_FDD Band 5_QPSK_BW1.4 MHz_836.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

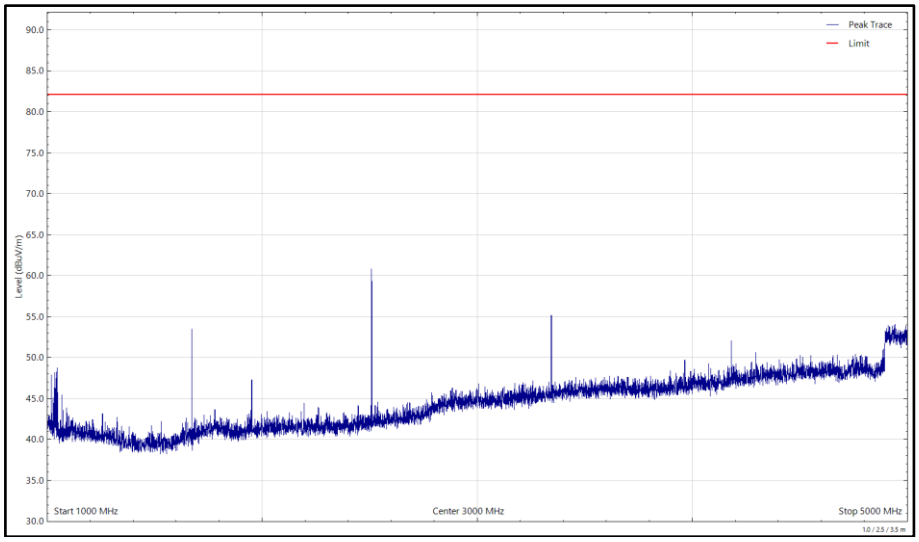

Figure 7 - LTE Cat M1_FDD Band 5_QPSK_BW1.4 MHz_836.5 MHz, 1 GHz to 5 GHz, Horizontal (Peak)

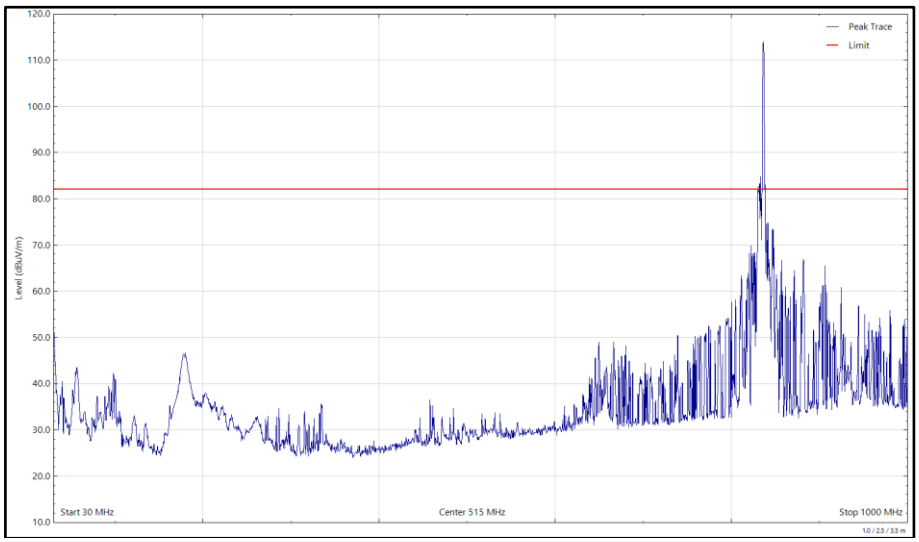

Figure 8 - LTE Cat M1_FDD Band 5_QPSK_BW1.4 MHz_836.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

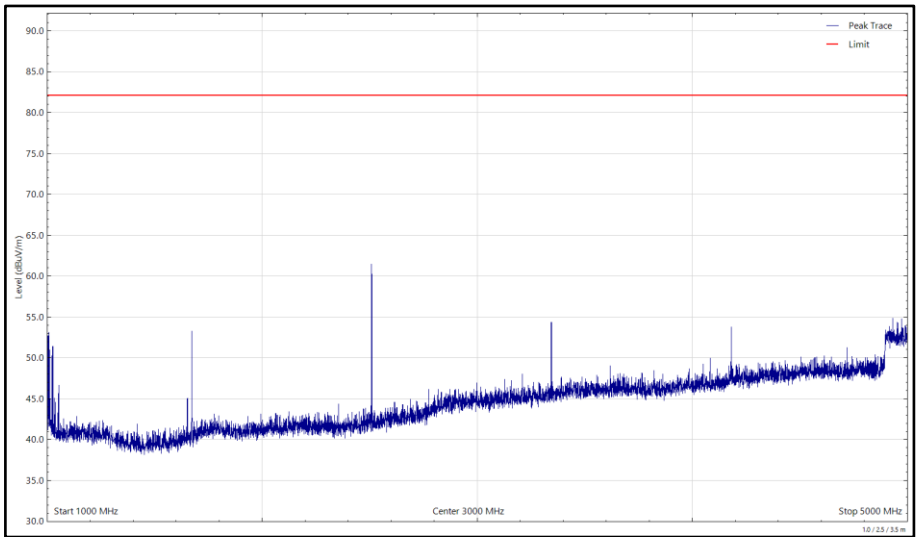

Figure 9 - LTE Cat M1_FDD Band 5_QPSK_BW1.4 MHz_836.5 MHz, 1 GHz to 5 GHz, Vertical (Peak)

FCC 47 CFR Part 22 and ISED RSS-132

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 22.917 (a) / RSS-132 Clause 5.5	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 19

2.1.8 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
Pre-Amplifier (8 GHz to 18 GHz)	Phase One	PS04-0086	1533	12	21-Feb-2023
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	11-Aug-2023
True RMS Multimeter	Fluke	179	4006	12	29-Mar-2023
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	17-Nov-2022
Emissions Software	TUV SUD	EmX V3.1.5	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
2 Meter Cable	Teledyne	PR90-088-2MTR	5200	12	11-Aug-2023
Antenna (DRG 1-10.5GHz)	Schwarzbeck	BBHA9120B	5215	12	28-May-2023
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5216	12	29-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	5518	12	12-Apr-2023
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5522	12	24-Mar-2023
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/B	5731	12	23-Apr-2023
Radio Communications Analyser	Anritsu	MT8821C	5738	12	08-Mar-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024

Table 20

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

3 Photographs

3.1 Test Setup Photographs

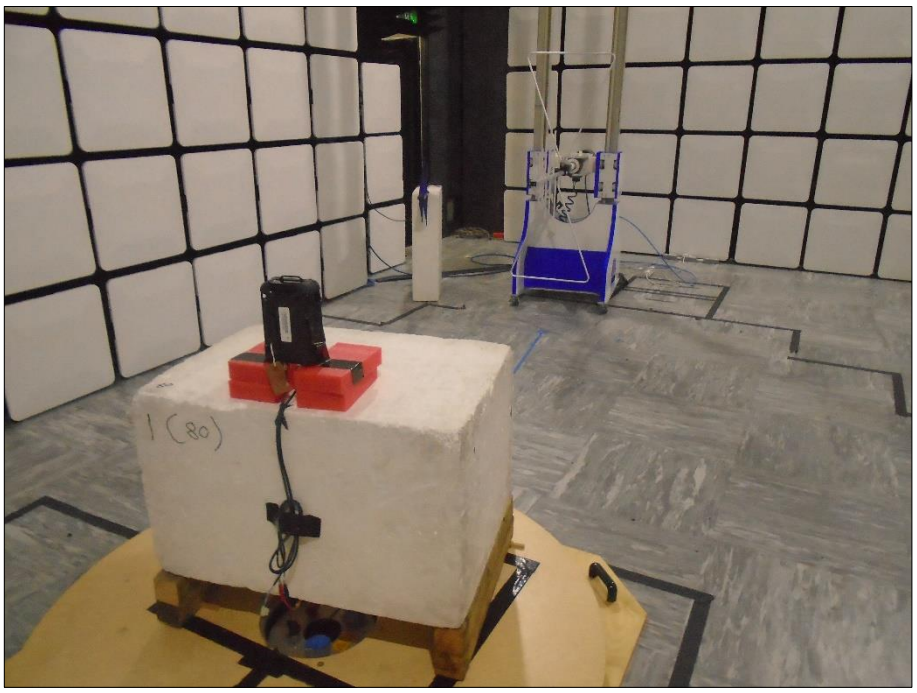

Figure 10 - Test Setup - 30 MHz to 1 GHz

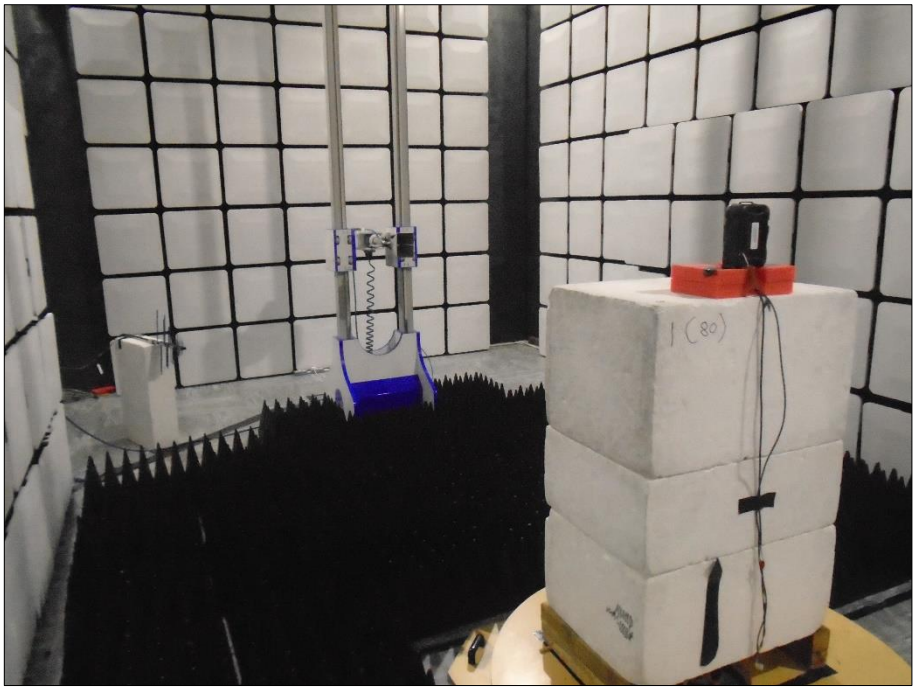

Figure 11 - Test Setup - 1 GHz to 10 GHz

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 21

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.