FCC and ISED Test Report

MPI Holdings FZE

ISS (Intelligent Safety System)

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-132, ISED RSS-133, ISED RSS-247 & ISED RSS-GEN (LTE / BT / WLAN Simultaneous Tx)

Prepared for: MPI Holdings FZE
The Offices 3 – One Central
Smart desk 375-16
Dubai World Trade Centre
Dubai
0000

FCC ID: 2BFLQISSMP1ZA IC: 32306-ISSMP1ZACAN

COMMERCIAL-IN-CONFIDENCE

Document 75960007-02 Issue 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	25 September 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 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-132, ISED RSS-133, ISED RSS-247 & 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-Angelo Lorusso	25 September 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: 2022 FCC 47 CFR Part 15: 2022 FCC 47 CFR Part 22: 2022, FCC 47 CFR Part 24: 2022 FCC 47 CFR Part 27: 2022, ISED RSS-130: Issue 2 (02-2019), ISED RSS-132: Issue 4 (01-2023), ISED RSS-133: Issue 4 (02-2008), ISED RSS-247: Issue 3 (08-2023) & ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) 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). Results of tests covered by our Flexible UKAS Accreditation Schedule are marked FS (Flexible Scope).

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

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

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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	14-May-2024
2	Second Issue – change in declared variant names	25-September-2024

Table 1

1.2 Introduction

Applicant	MPI Holdings FZE
Manufacturer	MPI Holdings FZE
Component Number(s)	GDU (Graphical Display Unit) - 641-9401 (no LTE) GDU (Graphical Display Unit) - 641-9395 – (compact) GDU (Graphical Display Unit) – 641-9400 (With LTE) Power Hub CCU (Central Control Unit) – 641-9399 White RCM (Radio Communication Module) – 641-9389 RTD (Real Time Detection) Unit – 641-9404 E6 Handset – 641-9403
Manufacturers Declared Variant Model(s)	The “IMS-HME” consists of the Power Hub CCU (641-9399), E6-Handset (641-9403), GDU (641-9400 or 641-9401) and RTD (641-9404). “IMS-Antenna” consists of just the White 915 MHz RCM (641-9389) “IMS-LV” consists of the GDU Compact (641-9395)
Serial Number(s)	Power Hub CCU (Central Control Unit) – S/N: 251684 White RCM (Radio Communication Module) - S/N: 253990 GDU (Graphical Display Unit) – S/N: 250240 RTD (Real Time Detection) Unit – S/N: 249477 E6 Handset – S/N: 254506
Hardware Version(s)	GDU-1V6 CCU-1V4 RCM-2V2 E6-1V3 RTD+-1V2
Software Version(s)	Power Hub CCU (Central Control Unit) – S/N: MHE2_IMS-CCU_1V42_1DEC2023_140746 White RCM (Radio Communication Module) - S/N: IMS_IMS-RCM2_1V30_12FEB2024_082125 GDU (Graphical Display Unit) – S/N: IMS_IMS-GDU_1V53_6MAR2024_143344 RTD (Real Time Detection) Unit – S/N: IMS_IMS-

	RTD2_1V7_11DEC2023_093723 E6 Handset – S/N: MHE2_MCS-E6_1V8_17JAN2024_101125
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2022 FCC 47 CFR Part 15: 2022 FCC 47 CFR Part 22: 2022 FCC 47 CFR Part 24: 2022 FCC 47 CFR Part 27: 2022 ISED RSS-130: Issue 2 (02-2019) ISED RSS-132: Issue 4 (01-2023) ISED RSS-133: Issue 4 (02-2008) ISED RSS-247: Issue 3 (08-2023) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	003752
Date	06-December-2023
Date of Receipt of EUT	05-February-2024
Start of Test	26-February-2024
Finish of Test	26-February-2024
Name of Engineer(s)	Pier-Angelo Lorusso
Related Document(s)	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02

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 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-132, ISED RSS-133, ISED RSS-247 & ISED RSS-GEN is shown below.

Section	Specification Clause										Test Description	Result	Comments/Base Standard
	Part 2	Part 15	Part 22	Part 24	Part 27	RSS-130	RSS-132	RSS-133	RSS -247	RSS-GEN			
Configuration and Mode: 2.4 GHz Bluetooth (Middle Channel) + LTE Cat M1 FDD B2 (1900 MHz)													
2.1	2.1053	15.247 (d)	-	24.238 (a)	-	-	-	6.5.1	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02
Configuration and Mode: 2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B5 (850 MHz)													
2.1	2.1053	15.247 (d)	22.917 (a)	-	-	-	5.5	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02
Configuration and Mode: 2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B12 (700 MHz)													
2.1	2.1053	15.247 (d)	-	-	27.53 (g)	4.7.1	-	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02
Configuration and Mode: 2.4GHz WLAN - 802.11b (middle channel)													
2.1	-	15.247 (d)	-	-	-	-	-	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02

Table 2

1.4 Manufacturers Declared Variant(s)

The customer has declared the following variants to the items tested:

1. “IMS-Antenna” consists of just the White 915 MHz RCM (641-9389)
2. “IMS-LV” consists of the GDU Compact (641-9395)

All other hardware, software and wireless module remain the same.

1.5 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Vehicle Intelligent Safety System (ISS) which serves as a semi autonomous, modular component based collision avoidance system (CAS) for both Controlled Level 8 and 9 applications. The system encapsulates various RF technologies that being WiFi, Bluetooth, LTE, UWB/RTLS, as well as GNSS and an RF ISM band. The system functionality for the previously stated RF technologies is as follows: - WiFi is responsible to uploading event and position data to an online tracking platform. - Bluetooth is tasked with initiating firmware uploads, software configuration adjustments as well as log downloads of both event and position data. - LTE uploads event and position data to the online tracking platform via cellular networks or service providers. - UWB/RTLS augments the GNSS data to provide real time distance data of surrounding systems as fail to safe in the event of weak GNSS signal strength which include under-roof and dead zone scenarios. - GNSS and and an ISM RF band (915 MHz) are collectively responsible for retrieving augmented location based data such as time, latitude, longitude etc from surrounding constellation satellites (GPS, GLONASS, Beidou, Galileo) on a vehicle/machine system to broadcast, on the configured ISM band (915 MHz in this case), to surrounding system units to be processed via a series of complex algorithms in order to determine the potential risk of collision whilst a vehicle/machine maintains a certain trajectory.		
Manufacturer:	MHE Electronics		
Model:			
Part Number:	638-3304		
Hardware Version:	GDU-1V6 CCU-1V4 RCM-2V2 E6-1V3 RTD+-1V2		
Software Version:			
FCC ID of the product under test – see guidance here		2BFLQISSMP1ZA	
IC ID of the product under test – see guidance here		32306-ISSMP1ZACAN	
Device Category	Mobile ☒	Portable ☐	Fixed ☐
Equipment is fitted with an Audio Low Pass Filter		Yes ☐	No ☐

Table 3

Intentional Radiators

Technology	LTE CatM1/NB1 B2	LTE CatM1/NB1 B4	LTE CatM1/NB1 B5	LTE CatM1/NB1 B12	LTE CatM1/NB1 B13
Frequency Range (MHz to MHz)	1850-1910	1710-1755	824-849	698-716	776-788
Conducted Declared Output Power (dBm)	21	21	21	21	21
Antenna Gain (dBi)	2.7	2.7	1.5	1.5	1.5
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40	0.2 1.4	0.2 1.4	0.2 1.4	0.2 1.4	0.2 1.4

MHz)					
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK	QPSK	QPSK	QPSK	QPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	200KGXW 1M40GXW	200KGXW 1M40GXW	200KGXW 1M40GXW	200KGXW 1M40GXW	200KGXW 1M40GXW
Bottom Frequency (MHz)	1850.2	1710.2	824.2	698.2	776.2
Middle Frequency (MHz)	1880.0	1732.5	836.5	707.0	782.0
Top Frequency (MHz)	1909.8	1754.8	848.8	715.8	787.8

Technology	LTE CatM1/NB1 B25	LTE CatM1/NB1 B26	LTE CatM1/NB1 B66	LTE NB1 B71
Frequency Range (MHz to MHz)	1850-1915	814-849	1710-1780	663-698
Conducted Declared Output Power (dBm)	21	21	21	21
Antenna Gain (dBi)	2.7	1.5	1.5	Antenna may not work at his frequency Band
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.2 1.4	0.2 1.4	0.2 1.4	0.2
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK	QPSK	QPSK	QPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	200KGXW 1M40GXW	200KGXW 1M40GXW	200KGXW 1M40GXW	200KGXW
Bottom Frequency (MHz)	1850.2	814.2	1710.2	663.2
Middle Frequency (MHz)	1882.5	831.5	1745.0	680.5
Top Frequency (MHz)	1914.8	848.8	1779.2	697.8

Technology	ISM	Bluetooth	WiFi	UWB
Frequency Range (MHz to MHz)	915-928	2400-2483.5	2400-2483.5	6240-6739.2
Conducted Declared Output Power (dBm)	12	12	15	33.5
Antenna Gain (dBi)	2.1	3.4	3.4	4.16
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	TBC	1	20	500
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GFSK	GFSK	DSSS, OFDM	BPM/BPSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15	N/A	N/A	N/A	N/A

devices)				
Bottom Frequency (MHz)	915	2402	2412	-
Middle Frequency (MHz)	921.5	2440	2437	6489.6
Top Frequency (MHz)	928	2480	2462	-

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	6Ghz
Lowest frequency generated or used in the device or on which the device operates or tunes	915
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:	30	V
Extreme lower voltage:	9	V
Max current:	2	A

Table 7

Battery Power Source

Voltage:	N/A	V
End-point voltage:	N/A	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:	80	°C
Maximum temperature:	-20	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 11

Antenna Characteristics

Antenna connector ☐			State impedance		Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		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:		Part Number:	
Model:		Country of Origin:	

Table 13

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

Name: Shayne Watson
Position held: Director
Date: 13 December 2023

1.6 Product Information

1.6.1 Technical Description

Vehicle mounted collision avoidance equipment.

1.7 Deviations from the Standard

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

1.8 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
Power Hub CCU (Central Control Unit), Serial Number: 641-9399			
0	As supplied by the customer	Not Applicable	Not Applicable
White RCM (Radio Communication Module), Serial Number: 253-961			
0	As supplied by the customer	Not Applicable	Not Applicable
GDU (Graphical Display Unit), Serial Number: 250240			
0	As supplied by the customer	Not Applicable	Not Applicable
RTD (Real Time Detection) Unit, Serial Number: 249591			
0	As supplied by the customer	Not Applicable	Not Applicable
E6 Handset, Serial Number: 254506			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 14

1.9 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth (Middle Channel) + LTE Cat M1 FDD B2 (1900 MHz)		
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS
Configuration and Mode: 2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B5 (850 MHz)		
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS
Configuration and Mode: 2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B12 (700 MHz)		
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS
Configuration and Mode: 2.4GHz WLAN - 802.11b (middle channel)		
Radiated Spurious Emissions	Pier-Angelo 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 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 15 Clause 15.247 (d)
FCC 47 CFR Part 22, Clause 22.917 (a)
FCC 47 CFR Part 24, Clause 24.238 (a)
FCC 47 CFR Part 27, Clause 27.53 (g)
ISED RSS-130, Clause 4.7.1
ISED RSS-132, Clause 5.5
ISED RSS-133, Clause 6.5.1
ISED RSS-247, Clause 5.5
ISED RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399
White RCM (Radio Communication Module), Serial Number: 253-961
GDU (Graphical Display Unit), Serial Number: 250240
RTD (Real Time Detection) Unit, Serial Number: 249591
E6 Handset, Serial Number: 254506

2.1.3 Date of Test

26-February-2024

2.1.4 Test Method

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 5th harmonic of the lowest intentional transmitter, as required by KDB 996369 D04, clause 3.2, 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.

The EUT was powered via a DC Power Supply unit at a + 12 V DC nominal voltage.

All ports were interconnected via the customer supplied interconnect harness cables. No additional load terminations were applicable. All interconnect cabling on tabletop were arranged / complied to ANSI 63.4 (6.2.5)

Test method for licensed transmitter:

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

Prescans and final measurements were performed using the direct field strength method.

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)

Test method for unlicensed transmitter:

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

The plots shown are the characterisation of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to non-restricted band limits. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBµV/m to µV/m:
10^(Field Strength in dBµV/m/20).

2.1.5 Example Test Setup Diagram

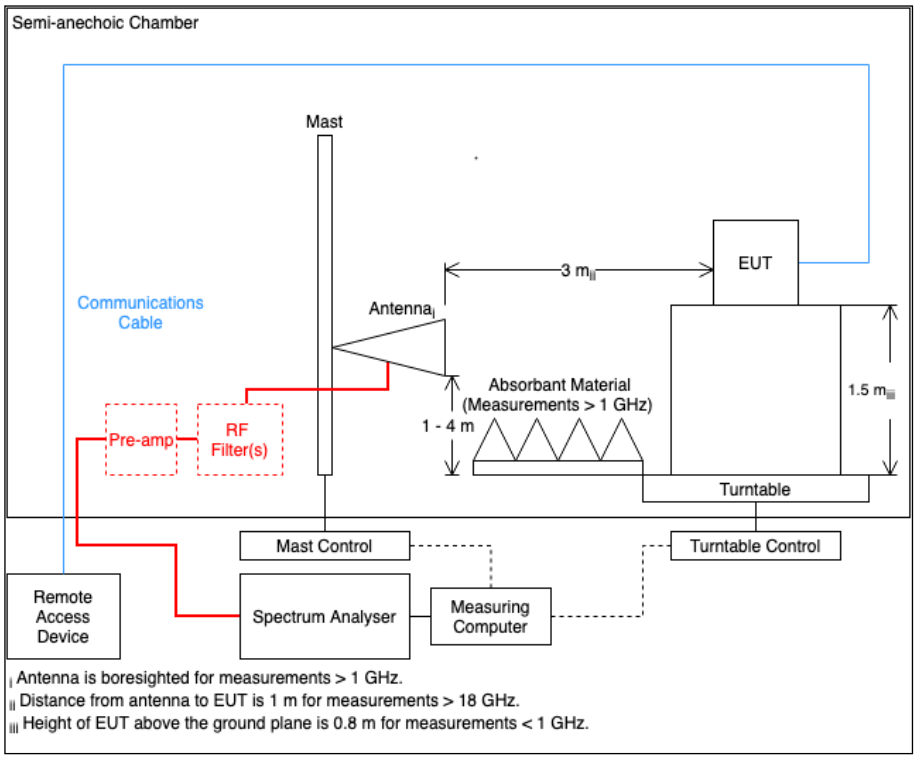

Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	18.1 °C
Relative Humidity	40.1 %

2.1.7 Test Results

2.4 GHz Bluetooth (Middle Channel) + LTE Cat M1 FDD B2 (1900 MHz)

Downlink Channel Number	Downlink Channel Frequency (MHz)	Uplink Channel Number	Uplink Channel Frequency (MHz)	Setup Configuration	Power Class
900	1960	18900	1880	QPSK	3

Table 16 – LTE Cat M1 FDD B2 Configuration

Emissions on the plots below at the above downlink frequency, were confirmed as the intentional transmit frequency of the base station simulator and therefore do not originate from the EUT so are not subject to the requirements of this test.

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

Table 17 - LTE CATM1 B2_BT, 1880 MHz_2440 MHz, 30 MHz to 13 GHz

*No emissions found within 10 dB of the limit.

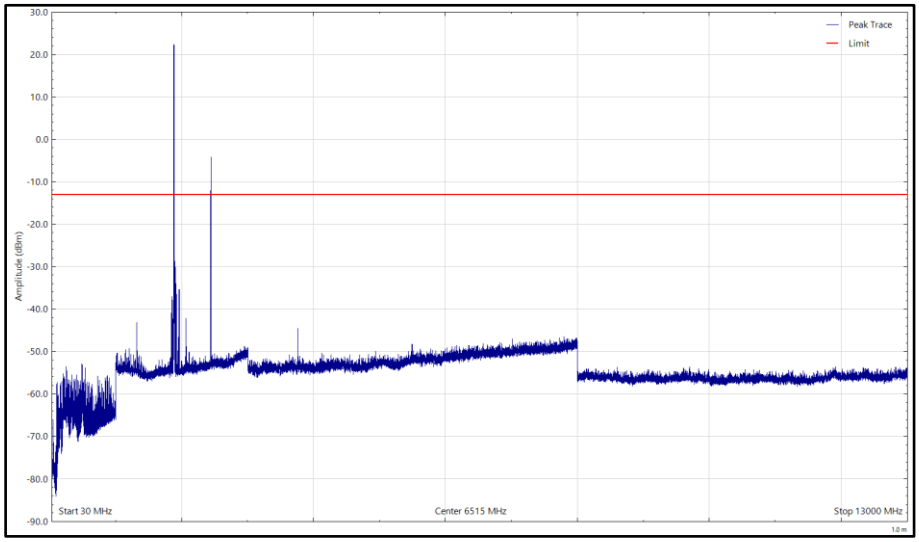

Figure 2 - LTE CATM1 B2_BT, 1880 MHz_2440 MHz, 30 MHz to 13 GHz, Horizontal (Peak)

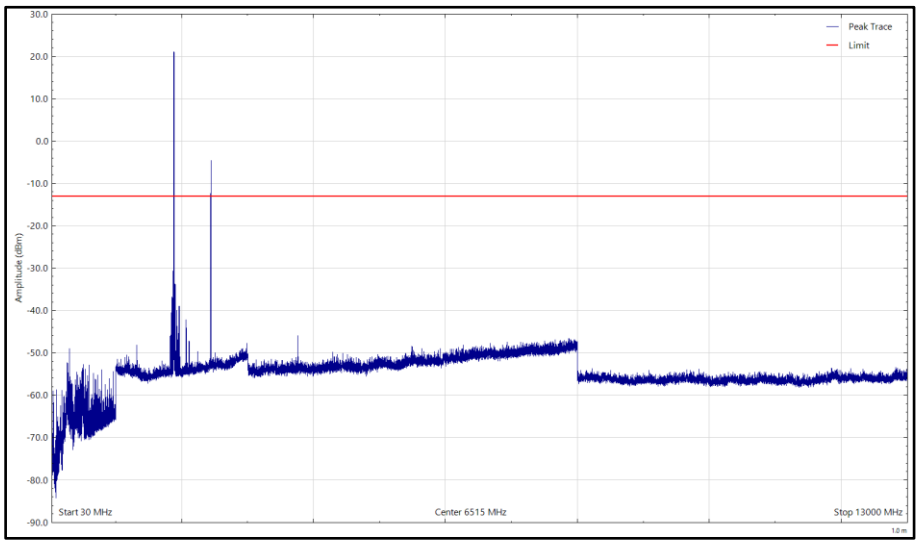

Figure 3 - LTE CATM1 B2_BT, 1880 MHz_2440 MHz, 30 MHz to 13 GHz, Vertical (Peak)

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 18

2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B5 (850 MHz)

Downlink Channel Number	Downlink Channel Frequency (MHz)	Uplink Channel Number	Uplink Channel Frequency (MHz)	Setup Configuration	Power Class
2525	881.5	20525	836.5	QPSK	3

Table 19 – LTE Cat M1 FDD B5 Configuration

Emissions on the plots below at the above downlink frequency, were confirmed as the intentional transmit frequency of the base station simulator and therefore do not originate from the EUT so are not subject to the requirements of this test.

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1672.021	-16.61	-13.00	-3.61	Peak	198	153	Vertical

Table 20 - LTE CATM1 B5_BT, 836.5 MHz_2440 MHz, 30 MHz to 13 GHz

No other emissions found within 10 dB of the limit.

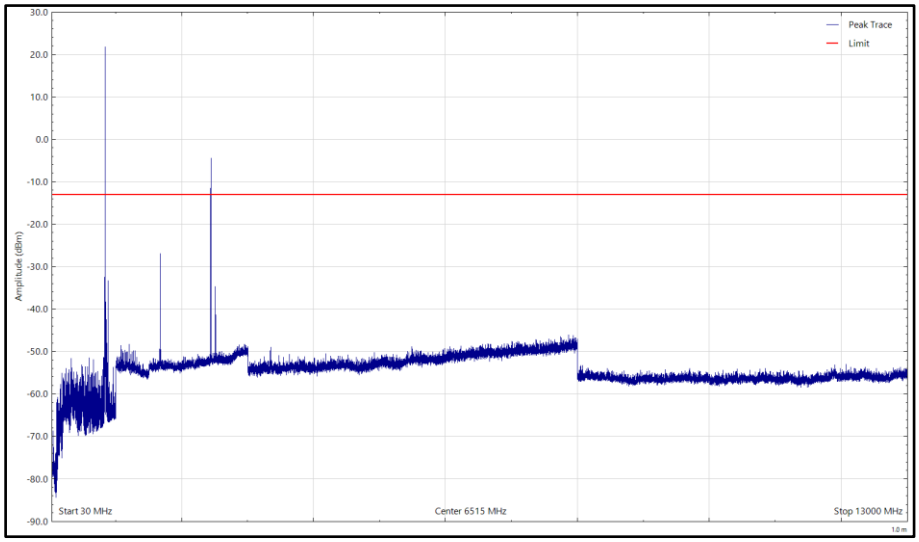

Figure 4 - LTE CATM1 B5_BT, 836.5 MHz_2440 MHz, 30 MHz to 13 GHz, Horizontal (Peak)

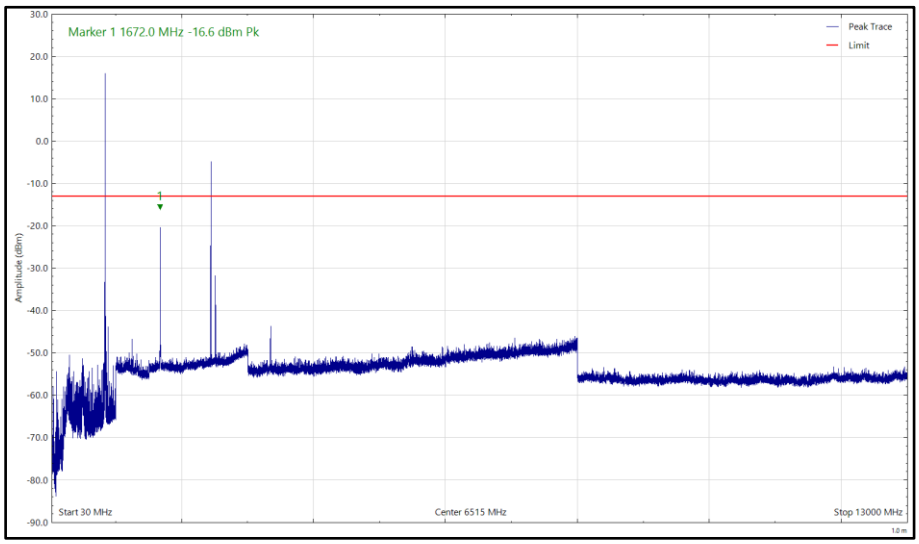

Figure 5 - LTE CATM1 B5_BT, 836.5 MHz_2440 MHz, 30 MHz to 13 GHz, Vertical (Peak)

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 21

2.4 GHz Bluetooth (middle channel) + LTE Cat M1 FDD B12 (700 MHz)

Downlink Channel Number	Downlink Channel Frequency (MHz)	Uplink Channel Number	Uplink Channel Frequency (MHz)	Setup Configuration	Power Class
5095	737.5	23095	707.5	QPSK	3

Table 22 – LTE Cat M1 FDD B12 Configuration

Emissions on the plots below at the above downlink frequency, were confirmed as the intentional transmit frequency of the base station simulator and therefore do not originate from the EUT so are not subject to the requirements of this test.

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

Table 23 - LTE CATM1 B12_BT, 707.5 MHz_2440 MHz, 30 MHz to 13 GHz

*No emissions found within 10 dB of the limit.

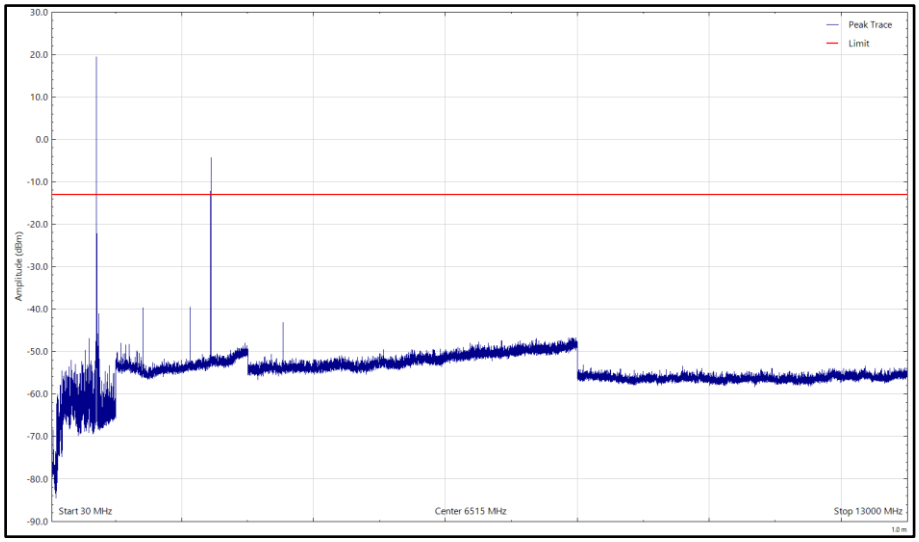

Figure 6 - LTE CATM1 B12_BT, 707.5 MHz_2440 MHz, 30 MHz to 13 GHz, Horizontal (Peak)

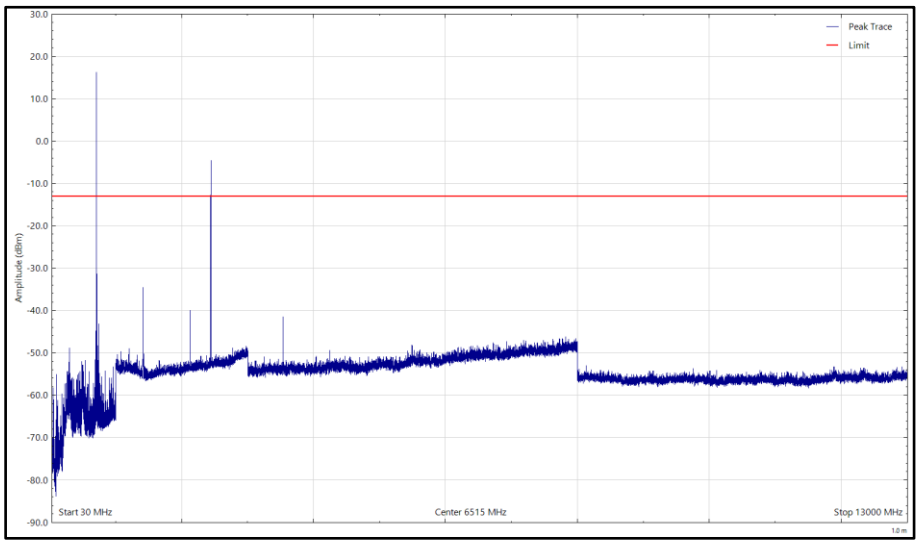

Figure 7 - LTE CATM1 B12_BT, 707.5 MHz_2440 MHz, 30 MHz to 13 GHz, Vertical (Peak)

FCC 47 CFR Part 27 and ISED RSS-130

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 27.53 (g) / RSS-130 Clause 4.7	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 24

2.4GHz WLAN - 802.11b (middle channel)

The EUT was configured in the following mode of operation:

Technology	Frequency Band	Channel Frequency (MHz)
802.11b	2400 MHz to 2483.5 MHz	2412

Table 25 - Modes of Operation

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
128.141	33.73	43.52	-9.79	Q-Peak	161	105	Vertical
162.477	36.60	43.52	-6.92	Q-Peak	347	104	Vertical
167.487	33.79	43.52	-9.73	Q-Peak	285	100	Horizontal
240.002	44.26	46.02	-1.76	Q-Peak	65	166	Horizontal
278.611	40.97	46.02	-5.05	Q-Peak	192	100	Horizontal
325.861	42.96	46.02	-3.06	Q-Peak	84	100	Horizontal
4823.970	47.04	54.00	-6.96	CISPR Avg	330	100	Horizontal
4824.040	47.10	54.00	-6.90	CISPR Avg	348	100	Vertical

Table 26 - CH1_802.11b_1Mbps, 2412 MHz, 30 to 13 GHz

No other emissions found within 10 dB of the limit.

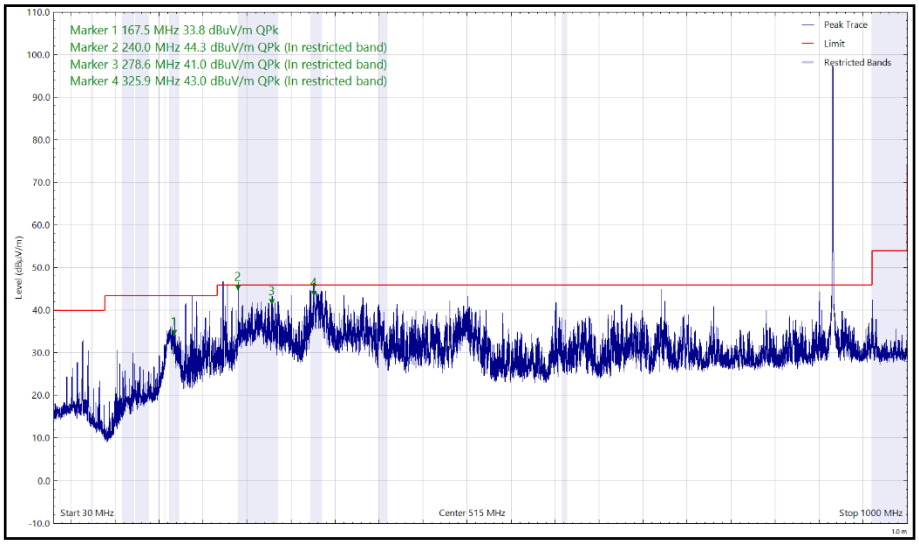

Figure 8 - CH1_802.11b_1Mbps, 2412 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

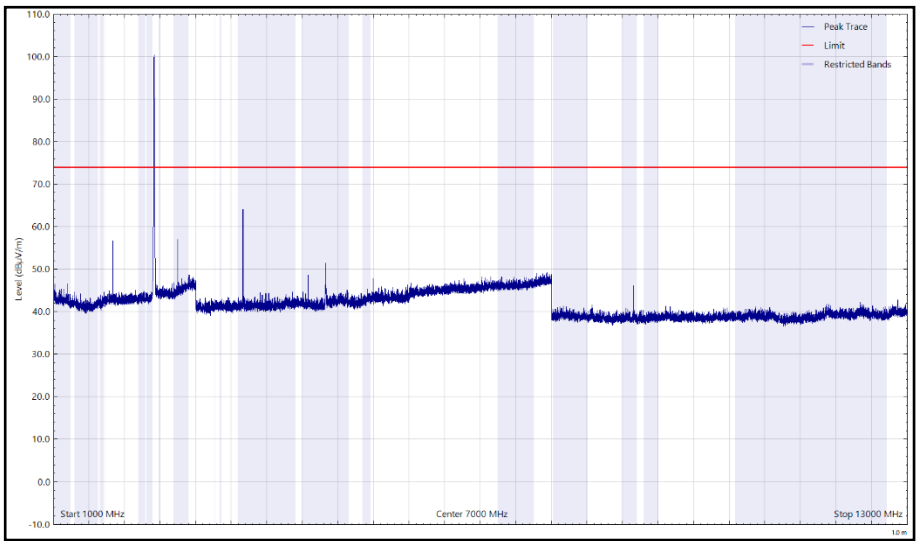

Figure 9 - CH1_802.11b_1Mbps, 2412 MHz, 1 GHz to 13 GHz, Horizontal (Peak)

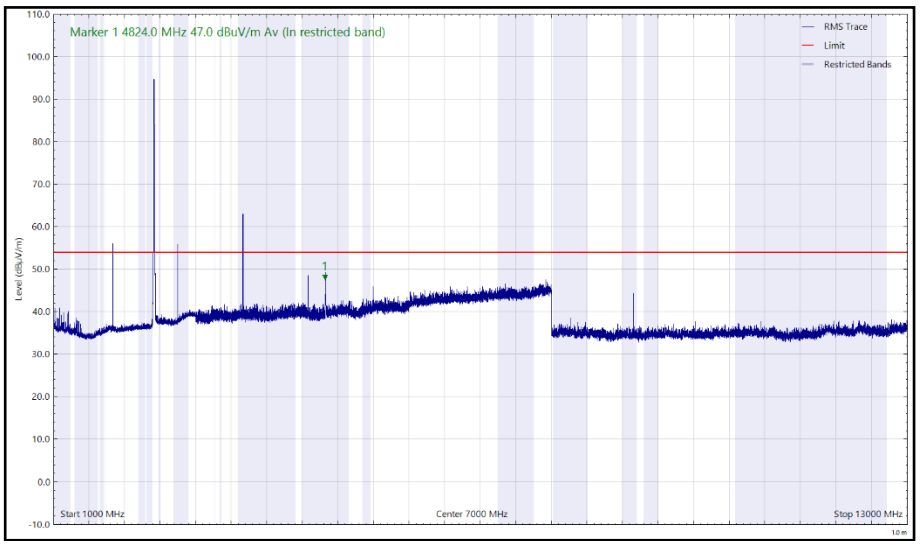

Figure 10 - CH1_802.11b_1Mbps, 2412 MHz, 1 GHz to 13 GHz, Horizontal (rms)

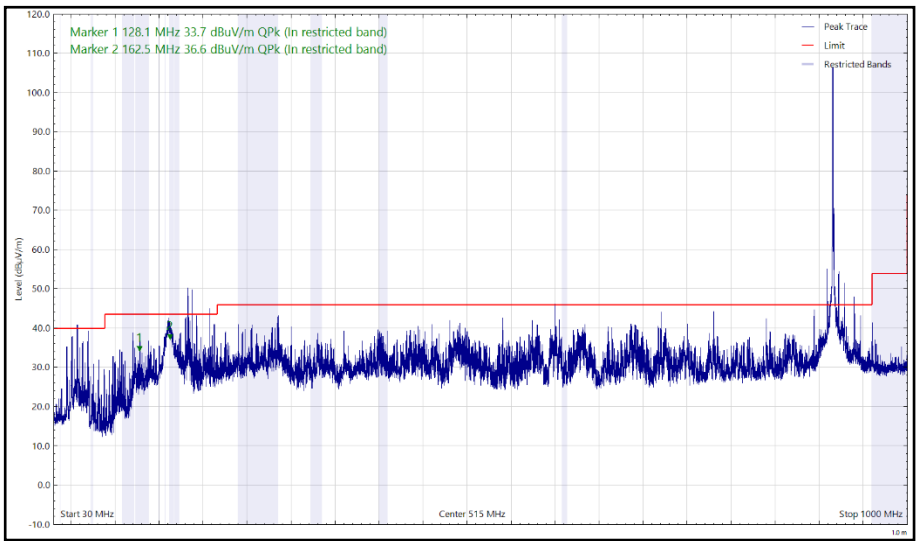

Figure 11 - CH1_802.11b_1Mbps, 2412 MHz, 30 MHz to 1 GHz, Vertical (Peak)

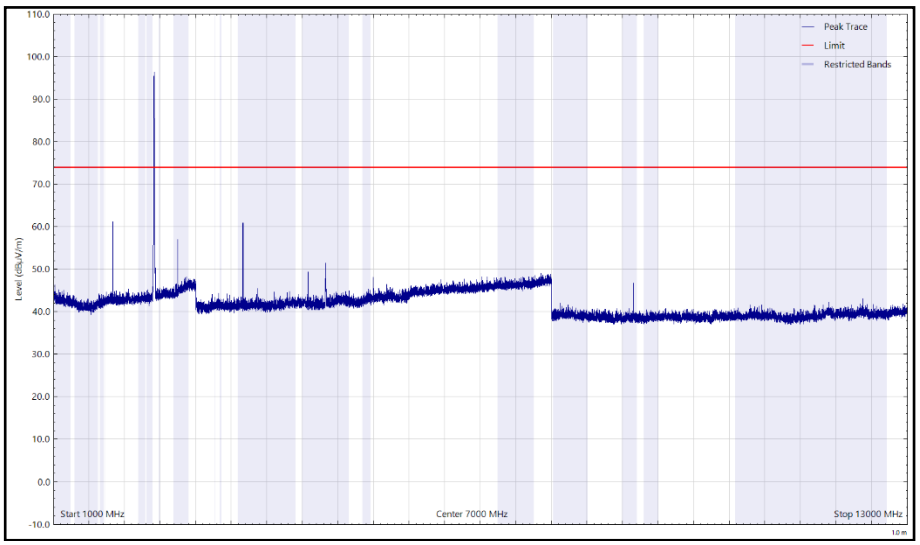

Figure 12 - CH1_802.11b_1Mbps, 2412 MHz, 1 GHz to 13 GHz, Vertical (Peak)

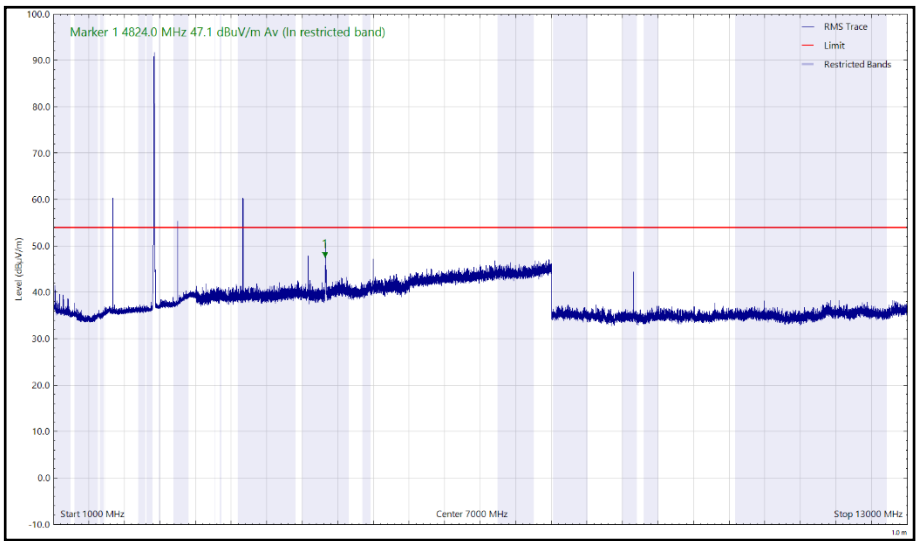

Figure 13 - CH1_802.11b_1Mbps, 2412 MHz, 1 GHz to 13 GHz, Vertical (rms)

FCC 47 CFR Part 15 and ISED RSS-GEN

Clause	Limit
Part 15.209 / RSS-GEN Clause 8.9	Peak: 74 dBµV/m at 3m, Average 54 dBµV/m at 3m (Restricted bands > 1 GHz)

Table 27

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
Dual Power Supply Unit	Hewlett Packard	6253A	292	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
Multimeter	Fluke	177	3812	12	14-Apr-2024
High Pass filter	Wainwright	WHKX12-1290-1500-18000-80SS	4962	12	14-Jun-2024
Test Receiver	Rohde & Schwarz	ESW44	5084	12	31-Aug-2024
Emissions Software	TUV SUD	EmX V3.2.0 V.	5125	-	N/A - Software
3m Semi-Anechoic Chamber	Rainford	RF Chamber 11	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
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5216	12	09-Jul-2024
3 GHz High pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	5220	12	28-Mar-2024
Pre-Amplifier (1 GHz to 26.5 GHz)	Agilent Technologies	8449B	5445	12	25-May-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
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	5522	12	14-Apr-2024
7 GHz High pass Filter	Wainwright	WHKX12-5850-6800-18000-80SS	5550	12	30-May-2024
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	APS06-0061	5595	12	26-Oct-2024
Attenuator 4dB	Pasternack	PE7074-4	6201	24	16-Jul-2024
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025

Table 28

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

3 Photographs

3.1 Test Setup Photographs

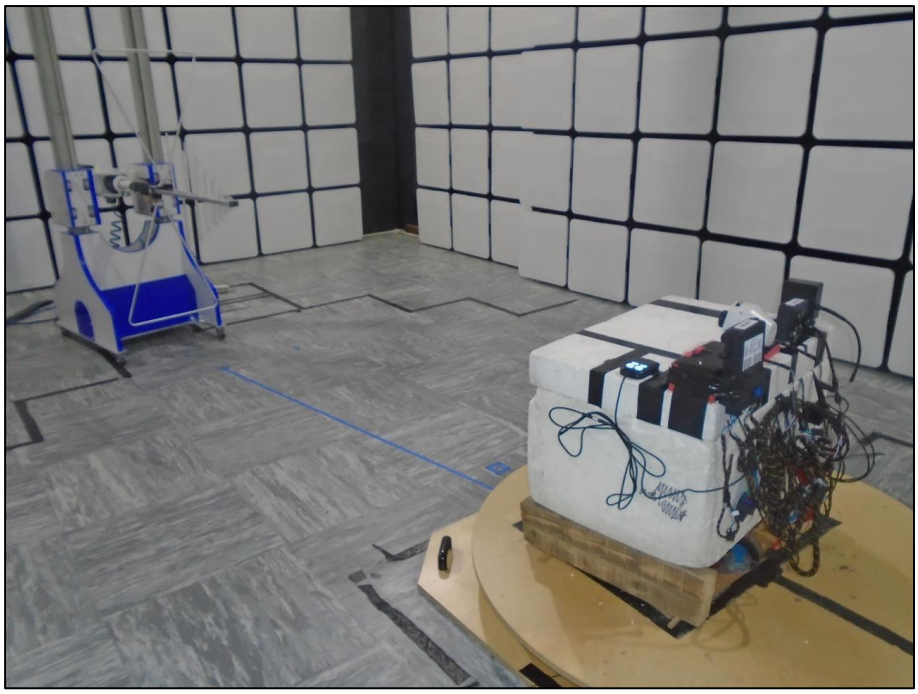

Figure 14 - Test Setup - 30 MHz to 1 GHz

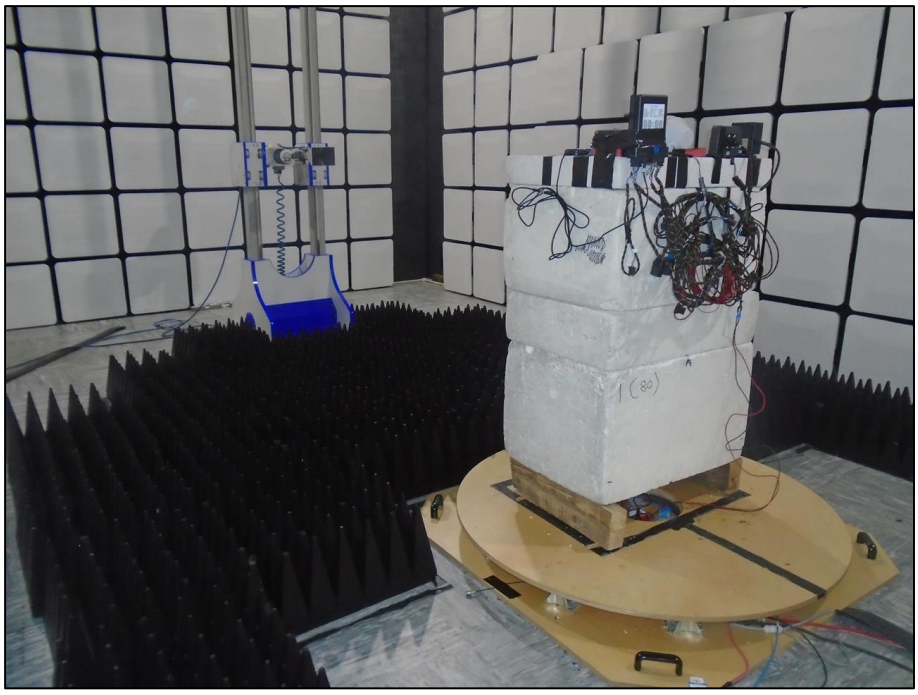

Figure 15 - Test Setup - 1 GHz to 13 GHz

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 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.