FCC and ISED Test Report

MiX Telematics International (Pty) Ltd
Telematics Unit, Model: MiX 4401-B

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-139, ISED RSS-247 and ISED RSS-GEN

Prepared for: MiX Telematics International (Pty) Ltd
Blaauwklip Office Park 2
Cnr Strand & Webersvalley Roads
Stellenbosch, South Africa

FCC ID: 2AFMS-4401XG IC: N/A

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Document 75951936-16 Issue 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	05 May 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 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-139, ISED RSS-247 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	Paul Dickson	05 May 2022	
Testing	Graeme Lawler	05 May 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 15: 2020, FCC 47 CFR Part 22: 2020, FCC 47 CFR Part 24: 2020, FCC 47 CFR Part 27: 2020, ISED RSS-130: Issue 2 (02-2019), ISED RSS-132: Issue 3 (01-2013), ISED RSS-133: Issue 6 (01-2013) + A1 (01-2018), ISED RSS-139: Issue 3 (07-2015), ISED RSS-247: Issue 2 (02-2017) and ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) 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	04 January 2022
2	Addition of hardware revision 3 results	05 May 2022

Table 1

1.2 Introduction

Applicant	MiX Telematics International (Pty) Ltd
Manufacturer	MiX Telematics International (Pty) Ltd
Model Number(s)	MiX 4401-B
Manufacturer's Declared Variant(s)	MiX 4401
Serial Number(s)	55000103
Hardware Version(s)	1
Software Version(s)	4.10.x (HW V1)
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2020 FCC 47 CFR Part 15: 2020 FCC 47 CFR Part 22: 2020 FCC 47 CFR Part 24: 2020 FCC 47 CFR Part 27: 2020 ISED RSS-130: Issue 2 (02-2019) ISED RSS-132: Issue 3 (01-2013) ISED RSS-133: Issue 6 (01-2013) + A1 (01-2018) ISED RSS-139: Issue 3 (07-2015) ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021
Order Number Date	P0094917 13-April-2021
Date of Receipt of EUT	11-October-2021
Start of Test	17-November-2021
Finish of Test	12-December-2021
Name of Engineer(s)	Paul Dickson and Graeme Lawler
Related Document(s)	ANSI C63.10: 2013 ANSI C63.26: 2015

Serial Number(s)	55000206
Hardware Version(s)	3
Software Version(s)	4.12.x (HW V3)
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15: 2020 FCC 47 CFR Part 22: 2020 FCC 47 CFR Part 24: 2020 FCC 47 CFR Part 27: 2020
Order Number Date	P0096230 23-November-2021
Date of Receipt of EUT	07-March-2022
Start of Test	13-March-2022
Finish of Test	17-April-2022
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.26: 2015 ANSI C63.10: 2013 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-139, ISED RSS-247 and 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-139	RSS-247	RSS-GEN			
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B4														
2.1	2.1053	15.247 (d)	-	-	27.53 (h)	-	-	-	6.6	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.10 2013 ANSI C63.26: 2015
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B5														
2.1	2.1053	15.247 (d)	22.917 (a)	-	-	-	6.5	-	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.10 2013 ANSI C63.26: 2015
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B2														
2.1	2.1053	15.247 (d)	-	24.238 (a)	-	-	-	6.5	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.10 2013 ANSI C63.26: 2015
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B12														
2.1	2.1053	15.247 (d)	-	-	27.53 (g)	4.7	-	-	-	5.5	6.13	Radiated Spurious Emissions	Pass	ANSI C63.10 2013 ANSI C63.26: 2015

Table 2

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24 and FCC 47 CFR Part 27 is shown below.

Section	Specification Clause					Test Description	Result	Comments/Base Standard
	Part 2	Part 15	Part 22	Part 24	Part 27			
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + PCS 1900 (middle channel)								
2.2	2.1053	15.247 (d)	-	24.238 (a)	-	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10 2013 ANSI C63.26: 2015
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B4 (middle channel)								
2.2	2.1053	15.247 (d)	-	-	27.53 (h)	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10 2013 ANSI C63.26: 2015
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B5 (middle channel)								
2.2	2.1053	15.247 (d)	22.917 (a)	-	-	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10 2013 ANSI C63.26: 2015

Table 3

1.4 Manufacturer's Declared Variant(s)

The below information was provided by the customer.

Models MiX 4401-B (P/N: U0073MT) and MiX 4401 (P/N: U0071MT), present the same electrical, physical and electro mechanics characteristics, the same PCB, layout and components. The only difference between them is that the model MiX 4401-B has an internal backup battery plugged in, allowing the device to work after the disconnection of the vehicle´s battery. The functionality and purposes of the products are exactly the same.

1.5 Application Form (Hardware Version 1)

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver. The range consists of variants with a LTE CAT M1 cellular module Quectel BG96. All the variants make use of the same PCB, the only difference is the modem to be populated and all the modems have the same foot print.
Manufacturer:	MiX Telematics International (Pty) Ltd.
Model:	MiX 4401 MiX 4401-B
Part Number:	U0071MT U0073MT
Hardware Version:	1
Software Version:	4.10
FCC ID of the product under test – see guidance here	2AFMS-4401XG
IC ID of the product under test – see guidance here	-

Table 4

Intentional Radiators

Technology	LTE Band 2	LTE Band 3	LTE Band 4	LTE Band 5	LTE Band 12	LTE Band 13
Frequency Range (MHz to MHz)	1850-1910	1710-1785	1710-1755	824-849	699-716	777-787
Conducted Declared Output Power (dBm)	23	23	23	23	23	23
Antenna Gain (dBi)	2.07	1.46	1.46	0.21	0.76	1.39
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/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D
Bottom Frequency (MHz)	1850	1710	1710	824	699	777
Middle Frequency (MHz)	1880	1747.5	1732.5	836.5	707.5	782
Top Frequency (MHz)	1910	1785	1755	849	716	787

Table 5

Technology	SRD915	SRD2400
Frequency Band (MHz)	902-928	2400-2480
Conducted Declared Output Power (dBm)	20	7
Antenna Gain (dBi)	0	1.4
Supported Bandwidth(s) (MHz)	0.025	1
Modulation Scheme(s)	2FSK	GFSK
ITU Emission Designator	38K4F7D	1M00G7D
Bottom Frequency (MHz)	902	2402
Middle Frequency (MHz)	915	2440
Top Frequency (MHz)	928	2480

Table 6

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2690 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	699MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Table 7

AC Power Source

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

Table 8

DC Power Source

Nominal voltage:	13.8/27.6 V DC	V
Extreme upper voltage:	32	V
Extreme lower voltage:	10.5	V
Max current:	2A typical ; 4.5A absolute max (7.5A Fused)	A

Table 9

Battery Power Source

Voltage:	3.2	V
End-point voltage:	2.7	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 10

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Table 11

Temperature

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

Table 12

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 13

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	LTE BLE SRD915 GNSS	Gain	3 1.4 0 4	dBi
External antenna ☐	Type:	GNSS	Gain	4	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 ☐					

Table 14

Ancillaries (if applicable)

Manufacturer:	MiX Telematics	Part Number:	440FT0930 440FT0623
Model:	Code Plug Harness with Socket CP2, Code Plug Socket	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0033
Model:	Power (MP10)	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0931
Model:	Serial Harness SR1	Country of Origin:	South Africa
Manufacturer:	RF Design	Part Number:	440FT0933
Model:	External GNSS Antenna PA2	Country of Origin:	South Africa

Table 15

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

Name: Ben van der Merwe
Position held: Senior Engineer
Date: 06 October 2021

1.6 Application Form (Hardware Version 3)

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver. The range consists of variants with GSM and LTE CAT M1 cellular module Quectel BG96. Models MiX 4401-B and MiX 4401, present the same electrical, physical and electro mechanics characteristics, the same PCB, layout and components. The only difference between them is that the "-B" variant has an internal backup battery plugged in, allowing the device to work after the disconnection of the vehicle´s battery. The functionality and purposes of the products are exactly the same.
Manufacturer:	MiX Telematics International (Pty) Ltd.
Model:	MiX 4401 MiX 4401-B
Part Number:	U0071MT U0073MT
Hardware Version:	3
Software Version:	4.12.x
FCC ID of the product under test – see guidance here	2AFMS-4401XG
IC ID of the product under test – see guidance here	-

Table 16

Intentional Radiators

Technology	LTE Band 2	LTE Band 3	LTE Band 4	LTE Band 5	LTE Band 12	LTE Band 13
Frequency Range (MHz to MHz)	1850-1910	1710-1785	1710-1755	824-849	699-716	777-787
Conducted Declared Output Power (dBm)	23	23	23	23	23	23
Antenna Gain (dBi)	2.07	1.46	1.46	0.21	0.76	1.39
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/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM	QPSK/ 16-QAM
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D	1M40W7D
Bottom Frequency (MHz)	1850	1710	1710	824	699	777
Middle Frequency (MHz)	1880	1747.5	1747.5	836.5	707.5	782
Top Frequency (MHz)	1910	1785	1755	849	716	787

Table 17

Technology	SRD915	SRD434	SRD2400
Frequency Band (MHz)	902-928	434.3 ± 0.01	2400-2480
Conducted Declared Output Power (dBm)	20	10	4
Antenna Gain (dBi)	0	0	1.4
Supported Bandwidth(s) (MHz)	0.025	0.025	1
Modulation Scheme(s)	2FSK	2FSK	GFSK
ITU Emission Designator	38K4F7D	38K4F7D	1M00G7D
Bottom Frequency (MHz)	902	434.31	2402
Middle Frequency (MHz)	915	434.3	2440
Top Frequency (MHz)	928	434.29	2480

Table 18

Technology	GSM-850	PCS 1900
Frequency Range (MHz to MHz)	824-848	1850-1910
Conducted Declared Output Power (dBm)	33	30
Antenna Gain (dBi)	<4	<4
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.2	0.2
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GMSK	GMSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	300KGXW	300KGXW
Bottom Frequency (MHz)	824.2	1850.2
Middle Frequency (MHz)	836.6	1880.0
Top Frequency (MHz)	848.8	1909.8

Table 19

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2690 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	699MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Table 20

AC Power Source

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

Table 21

DC Power Source

Nominal voltage:	13.8/27.6	V
Extreme upper voltage:	32	V
Extreme lower voltage:	10.5	V
Max current:	2A typical ; 4.5A absolute max (7.5A Fused)	A

Table 22

Battery Power Source

Voltage:	3.2	V
End-point voltage:	2.7	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 23

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Table 24

Temperature

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

Table 25

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 26

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	LTE BLE SRD915 GNSS	Gain	3 1.4 0 4	dBi
External antenna ☐	Type:	GNSS	Gain	4	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 ☐					

Table 27

Ancillaries (if applicable)

Manufacturer:	MiX Telematics	Part Number:	440FT0930 440FT0623
Model:	Code Plug Harness with Socket CP2, Code Plug Socket	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0033
Model:	Power (MP10)	Country of Origin:	South Africa
Manufacturer:	MiX Telematics	Part Number:	440FT0931
Model:	Serial Harness SR1	Country of Origin:	South Africa
Manufacturer:	RF Design	Part Number:	440FT0933
Model:	External GNSS Antenna PA2	Country of Origin:	South Africa

Table 28

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

Name: Ben van der Merwe
Position held: Senior Engineer
Date: 03 March 2022

1.7 Product Information

1.7.1 Technical Description

The MiX 4000 series is a range of fleet products used in the automotive industry that incorporates the latest market trends. It consists mainly of an on-board computer, a modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives, and an optional 434 / 915 MHz short range transceiver.

1.8 Deviations from the Standard

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

1.9 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: MiX 4401-B, Serial Number: 55000103			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: MiX 4401-B, Serial Number: 55000206			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 29

1.10 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B2		
Radiated Spurious Emissions (Simultaneous Transmission)	Paul Dickson and Graeme Lawler	UKAS
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B4		
Radiated Spurious Emissions (Simultaneous Transmission)	Paul Dickson and Graeme Lawler	UKAS
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B5		
Radiated Spurious Emissions (Simultaneous Transmission)	Paul Dickson and Graeme Lawler	UKAS
Configuration and Mode: Bluetooth Low Energy + 915 MHz SRD + LTE FDD B12		
Radiated Spurious Emissions (Simultaneous Transmission)	Paul Dickson and Graeme Lawler	UKAS

Table 30

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + PCS 1900 (middle channel)		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B4 (middle channel)		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS
Configuration and Mode: Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B5 (middle channel)		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS

Table 31

Office Address:

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

2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission) (Hardware Version 1)

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(h) and 27.53(g)
ISED RSS-130, Clause 4.7
ISED RSS-132, Clause 5.5
ISED RSS-133, Clause 6.5
ISED RSS-139, Clause 4.2
ISED RSS-247, Clause 5.5
ISED RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

MiX 4401-B, S/N: 55000103 - Modification State 0

2.1.3 Date of Test

17-November-2021 to 12-December-2021

2.1.4 Test Method

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 10th 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.

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)

2.1.5 Example Test Setup Diagram

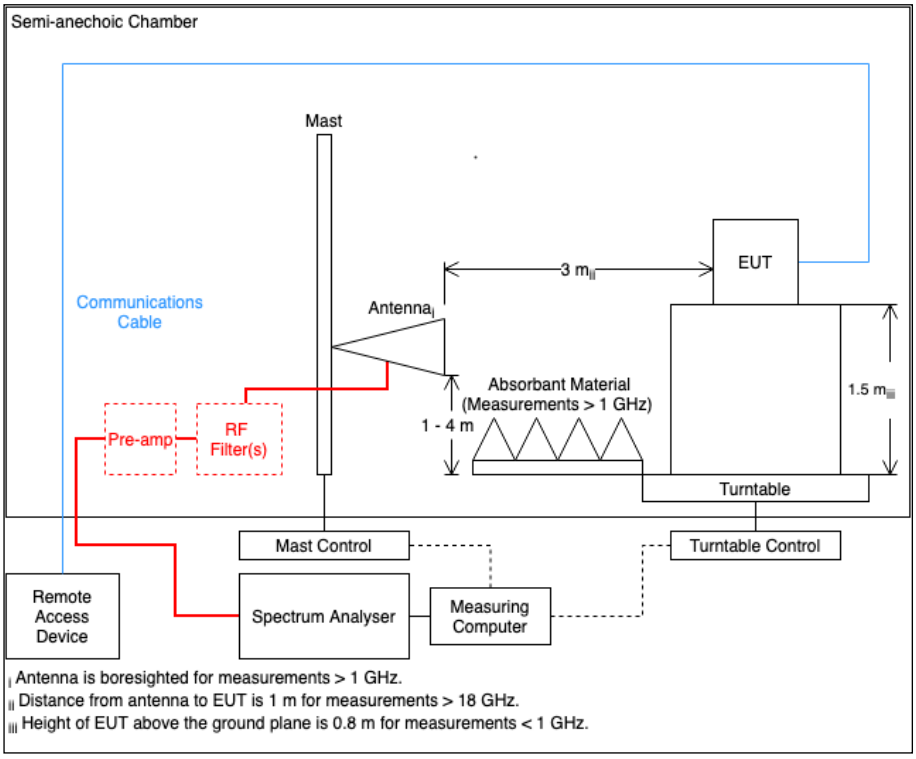

Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	20.4 - 25.7 °C
Relative Humidity	35.3 - 47.0 %

2.1.7 Test Results

Bluetooth Low Energy + 915 MHz SRD + LTE FDD B2

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1829.982	-21.0	-13.0	-8.0	Peak	0	160	Horizontal
2744.861	-17.3	-13.0	-4.3	Peak	12	297	Horizontal
2744.878	-17.9	-13.0	-4.9	Peak	104	250	Vertical

Table 32 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: X, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

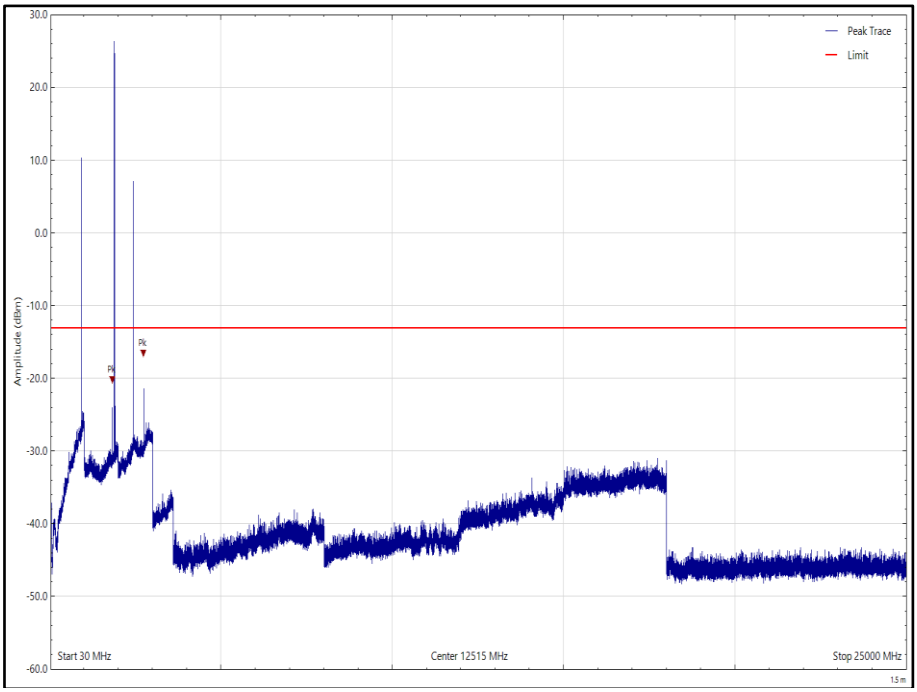

Figure 2 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: X, 30 MHz to 25 GHz, Horizontal (Peak)

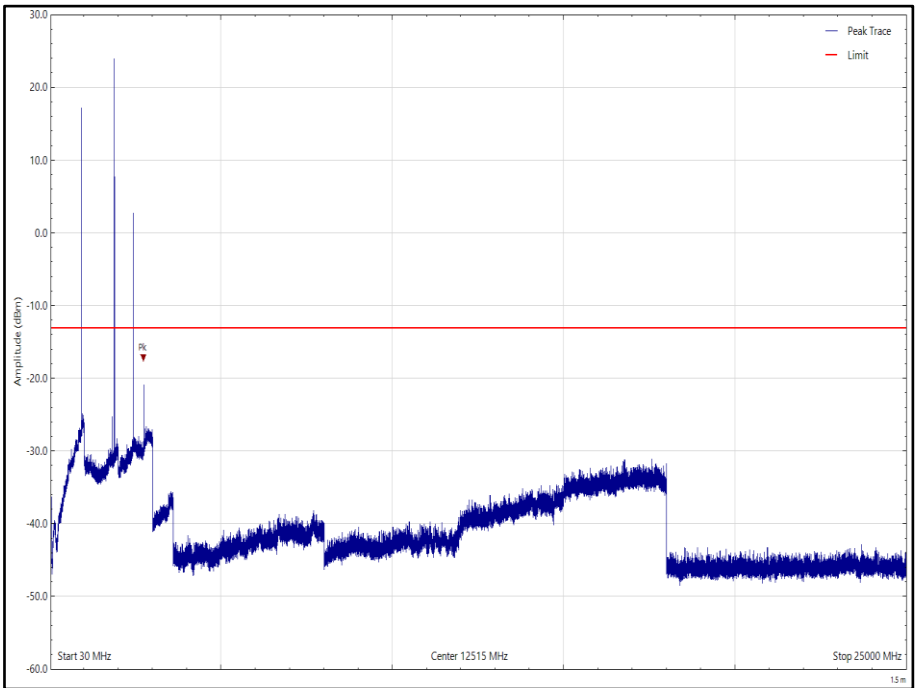

Figure 3- BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: X, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.942	-15.8	-13.0	-2.8	Peak	129	150	Horizontal
2744.945	-15.7	-13.0	-2.7	Peak	199	150	Vertical

Table 33 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Y, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

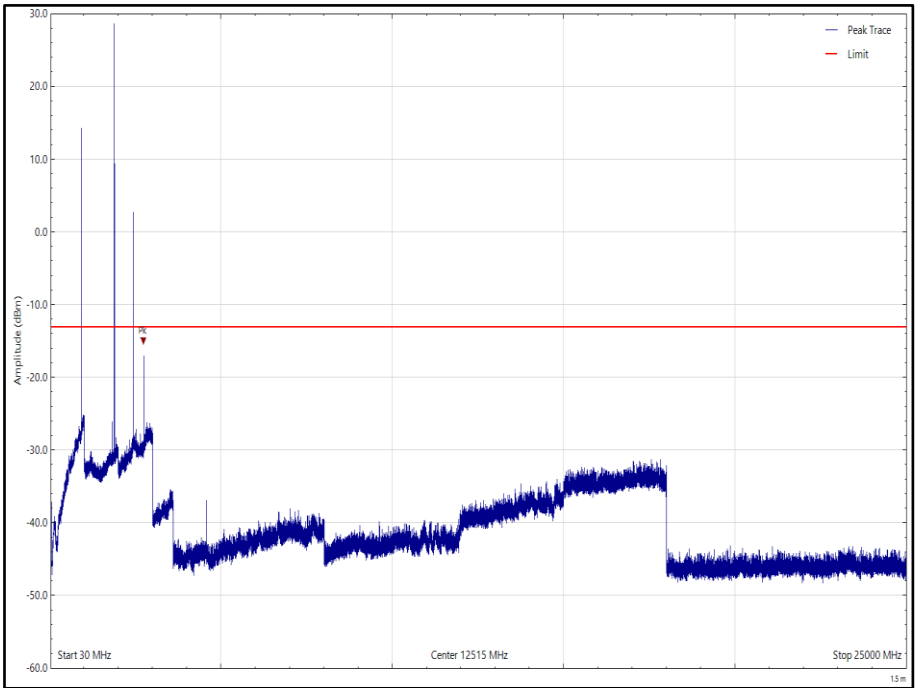

Figure 4 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Y, 30 MHz to 25 GHz, Horizontal (Peak)

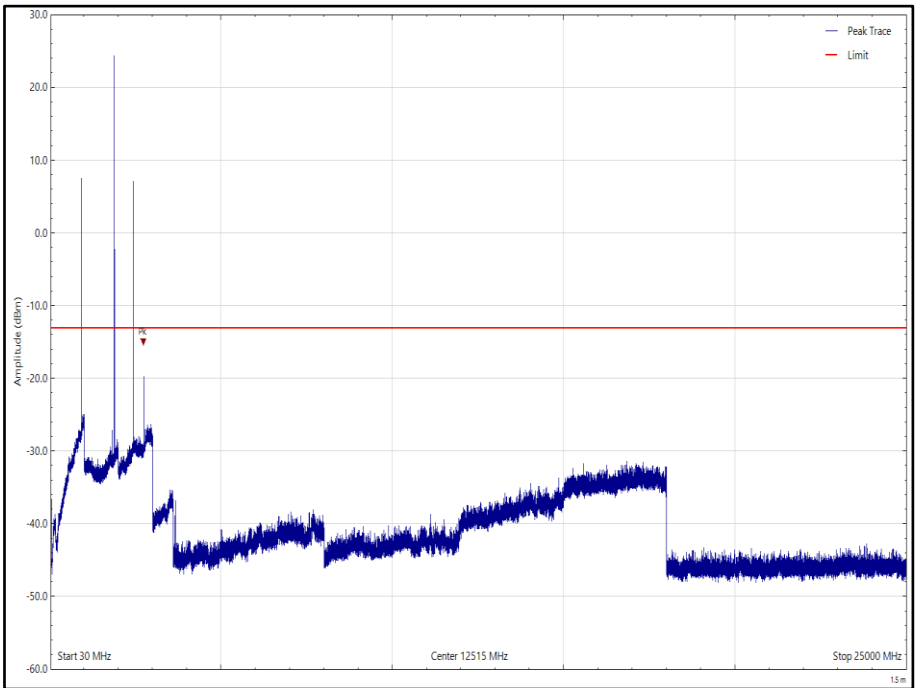

Figure 5 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Y, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1830.066	-19.9	-13.0	-6.9	Peak	326	152	Vertical

Table 34 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Z, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

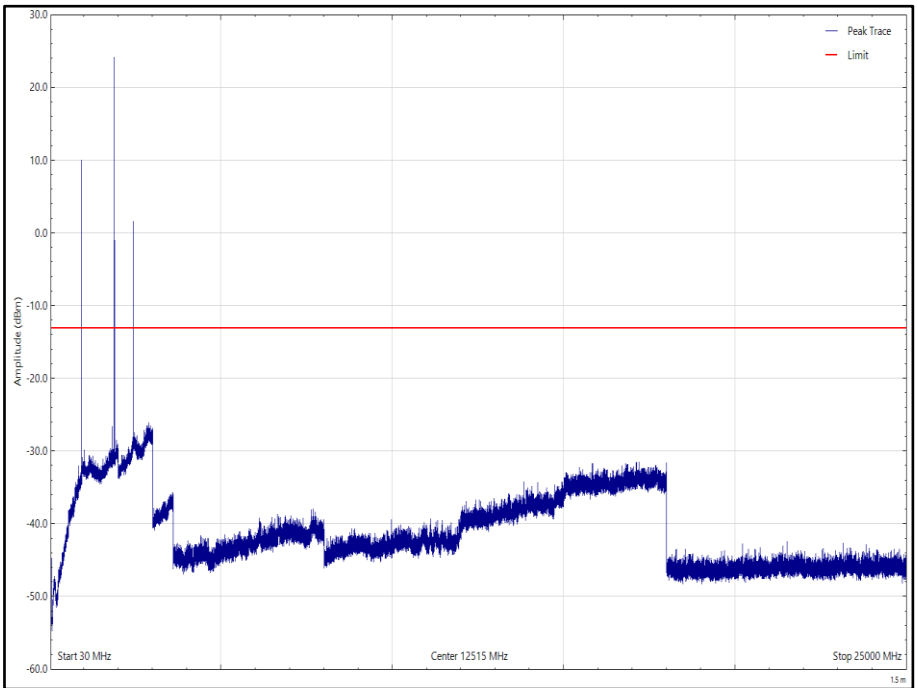

Figure 6 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Z, 30 MHz to 25 GHz, Horizontal (Peak)

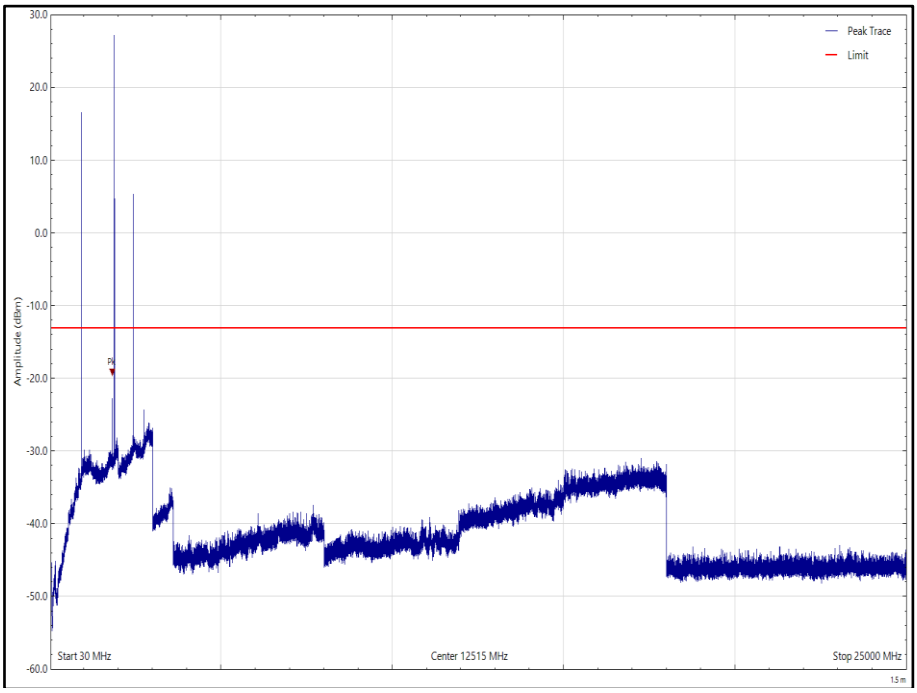

Figure 7 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 2 (1880 MHz), Orientation: Z, 30 MHz to 25 GHz, Vertical (Peak)

Bluetooth Low Energy + 915 MHz SRD + LTE FDD B4

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.967	-16.3	-13.0	-3.3	Peak	213	386	Horizontal
2745.065	-16.0	-13.0	-3.0	Peak	60	252	Vertical

Table 35 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: X, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

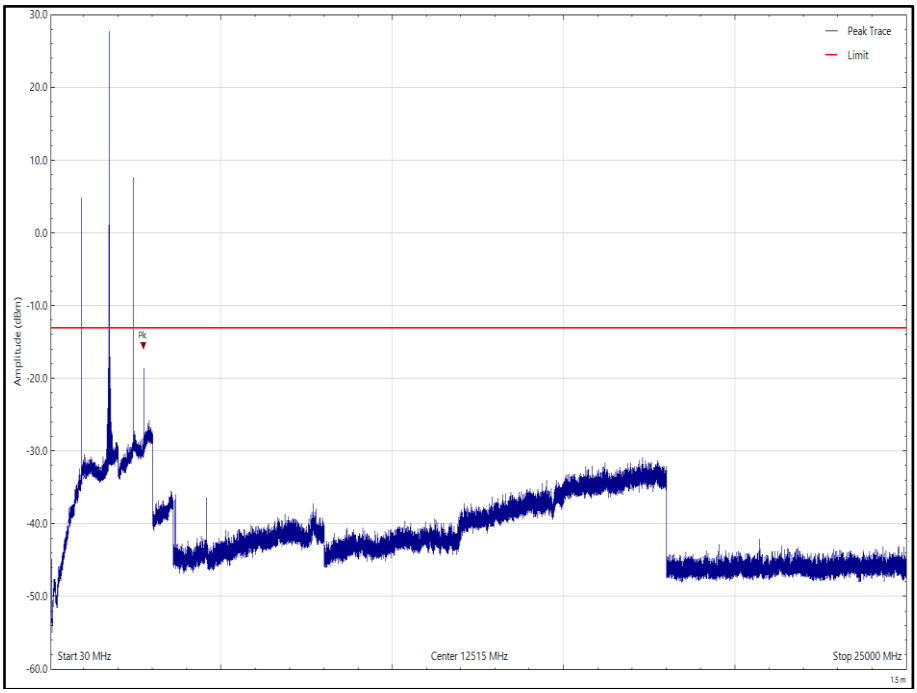

Figure 8- BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: X, 30 MHz to 25 GHz, Horizontal (Peak)

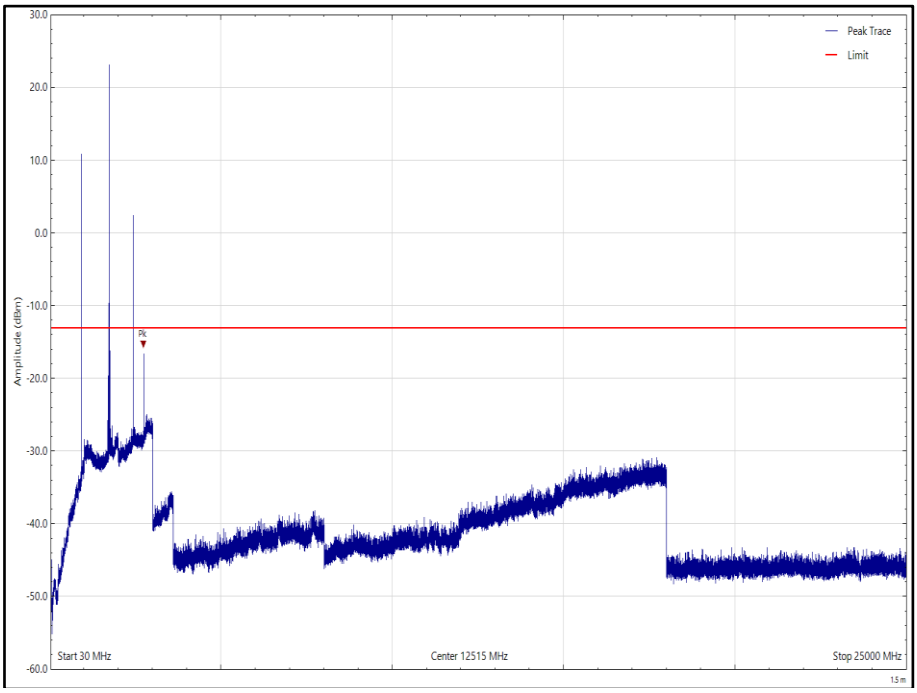

Figure 9 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: X, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.933	-14.3	-13.0	-1.3	Peak	189	100	Horizontal

Table 36 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Y, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

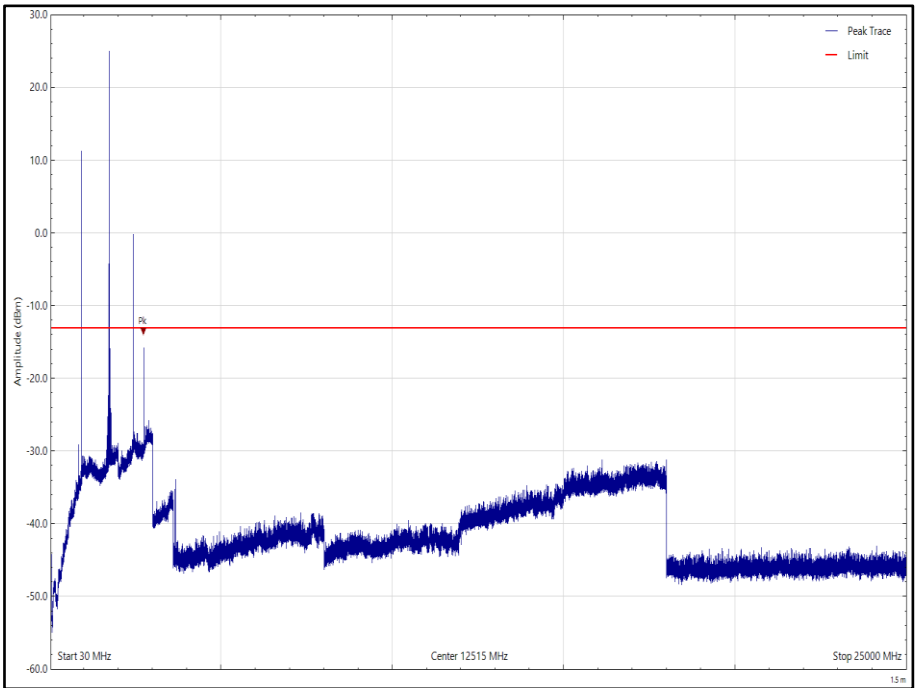

Figure 10 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Horizontal (Peak)

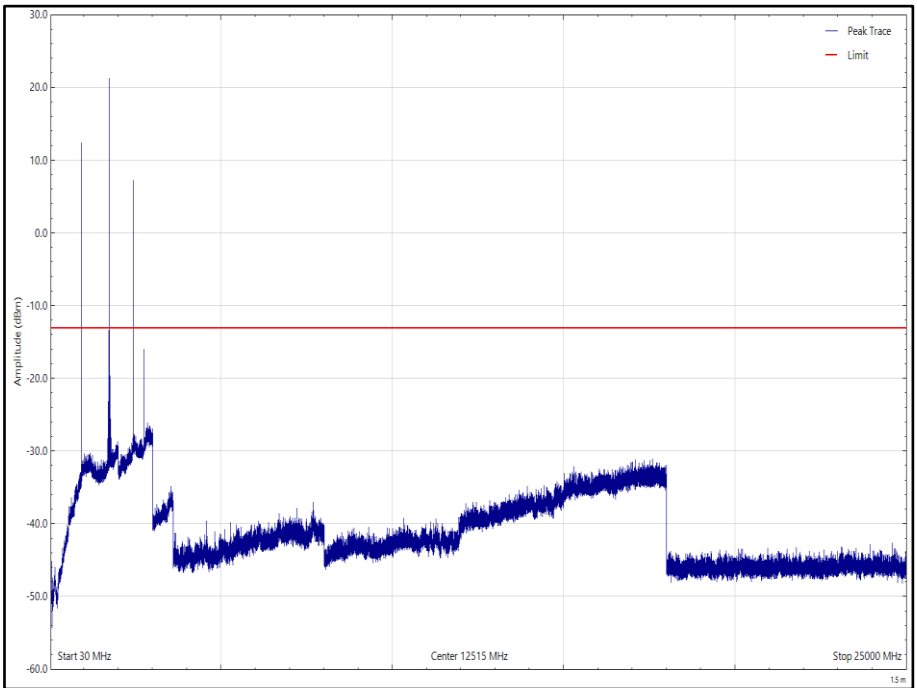

Figure 11 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.948	-14.0	-13.0	-1.0	Peak	0	112	Vertical
2745.022	-13.1	-13.0	-0.1	Peak	352	135	Horizontal

Table 37 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Z, 30 MHz to 25 GHz

No other emissions found within 10 dB of the limit.

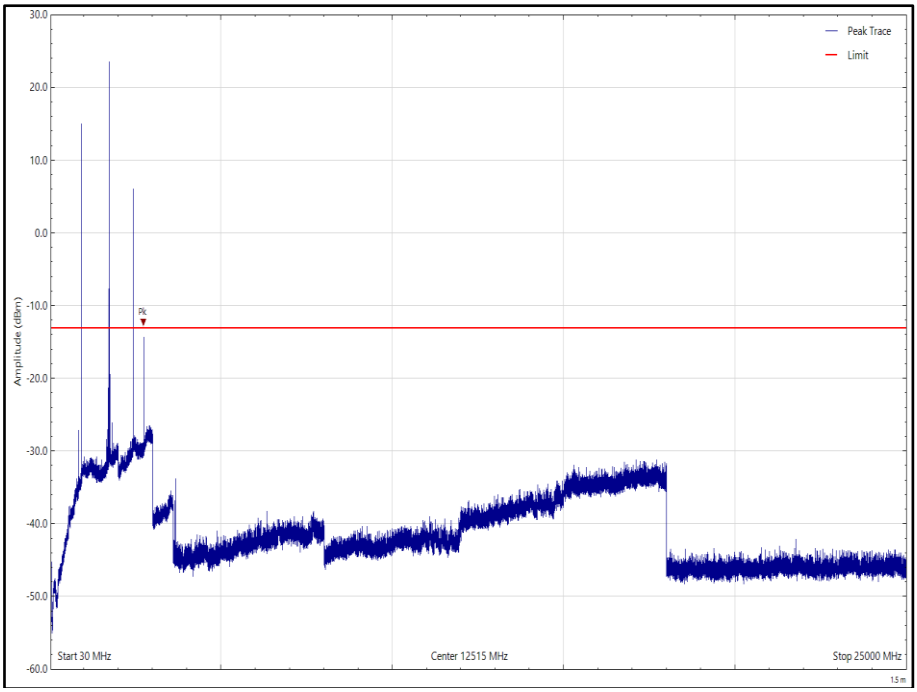

Figure 12 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Horizontal (Peak)

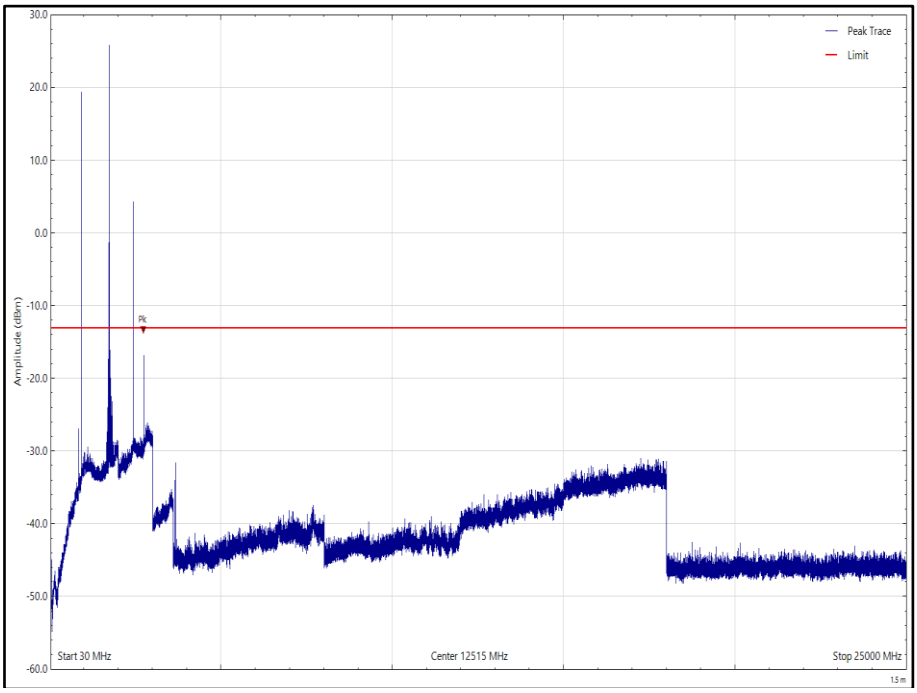

Figure 13 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 4 (1732.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Vertical (Peak)

Bluetooth Low Energy + 915 MHz SRD + LTE FDD B5

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

Table 38 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: X, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

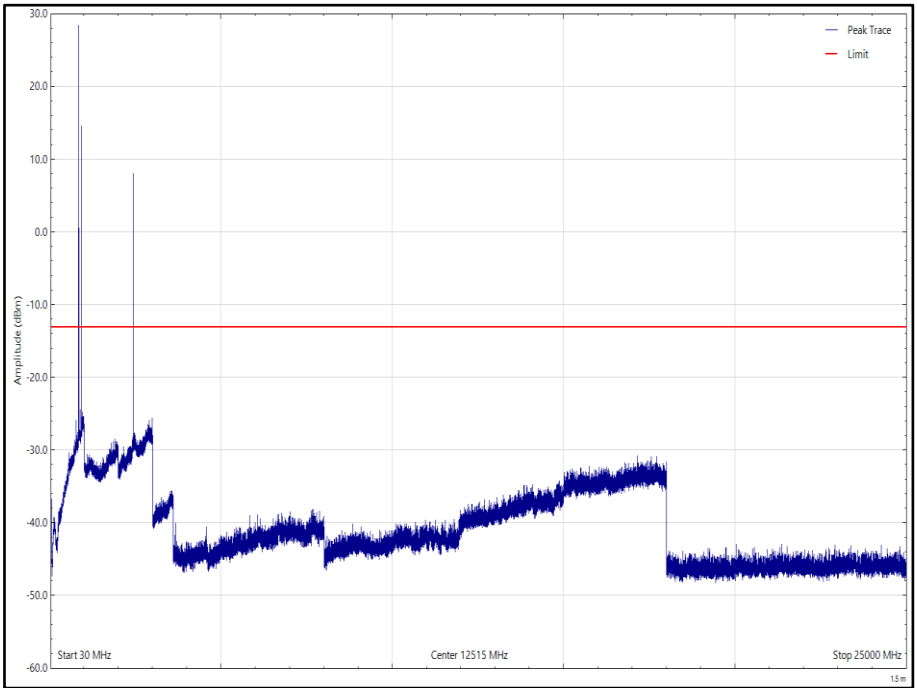

Figure 14 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: X, 30 MHz to 25 GHz, Horizontal (Peak)

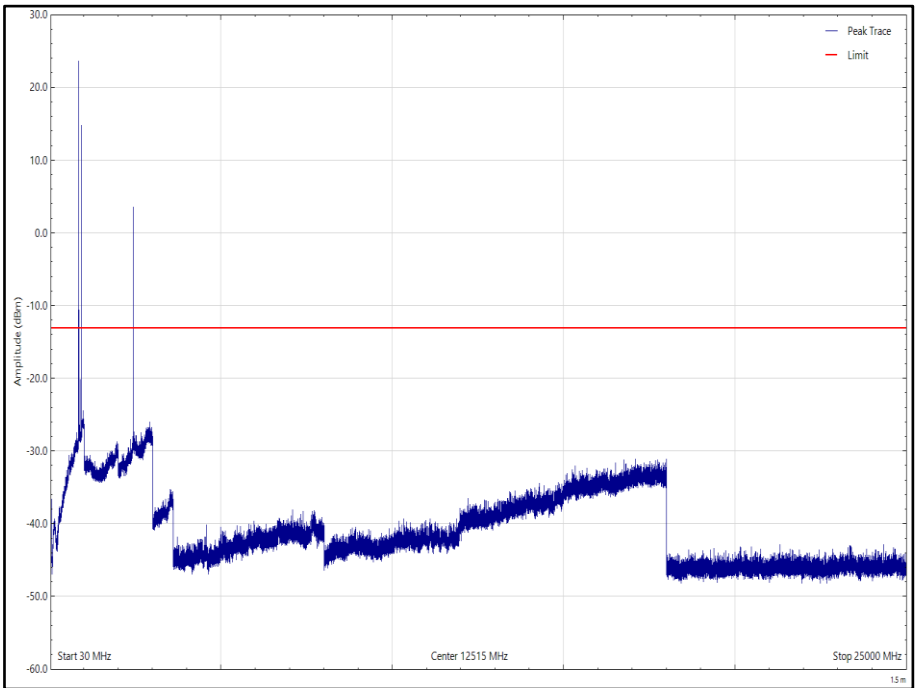

Figure 15 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: X, 30 MHz to 25 GHz, Vertical (Peak)

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

Table 39 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Y, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

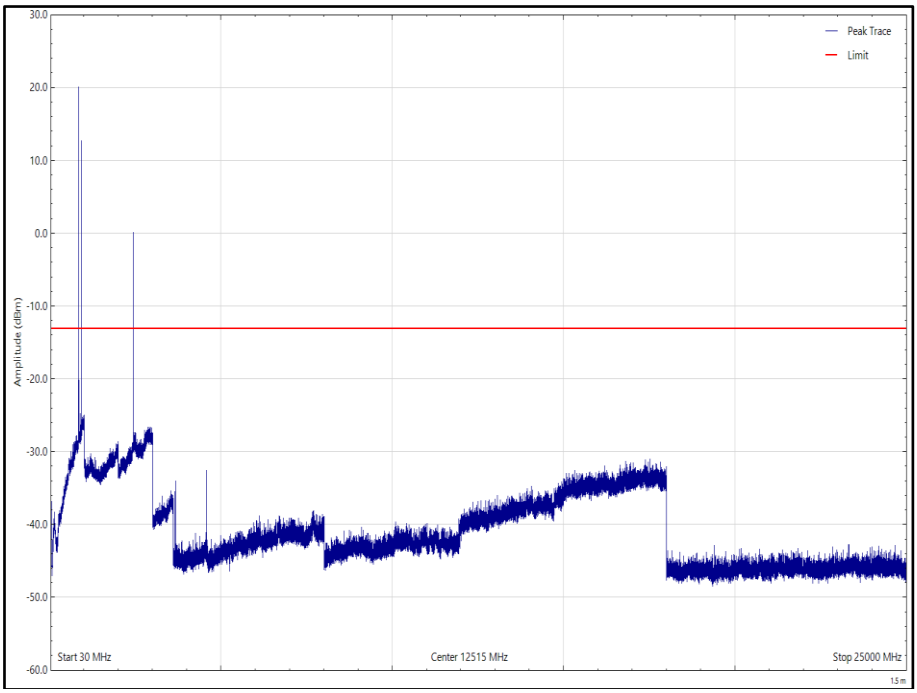

Figure 16 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Horizontal (Peak)

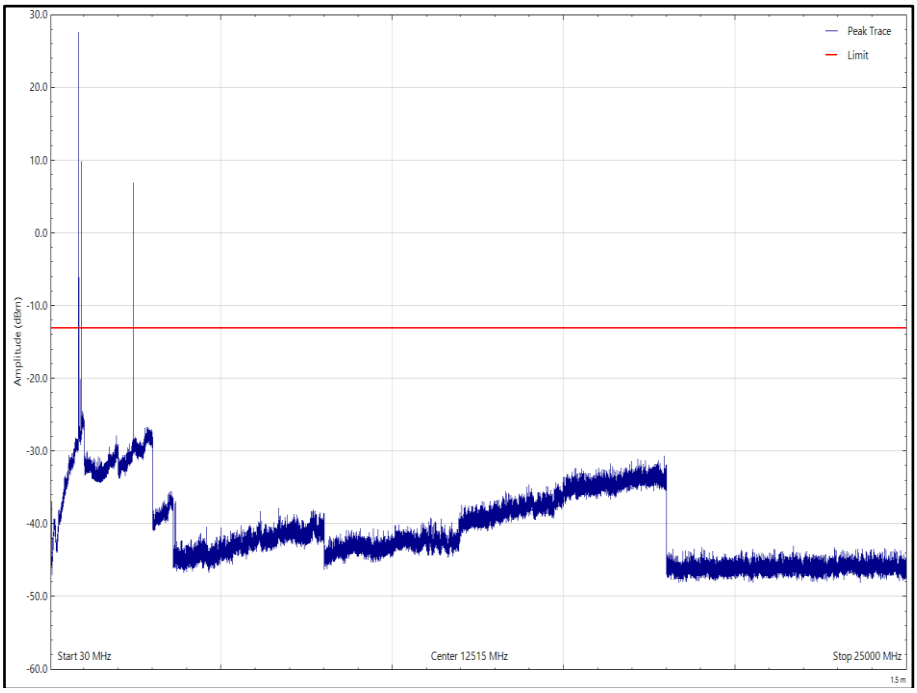

Figure 17 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Vertical (Peak)

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

Table 40 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Z, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

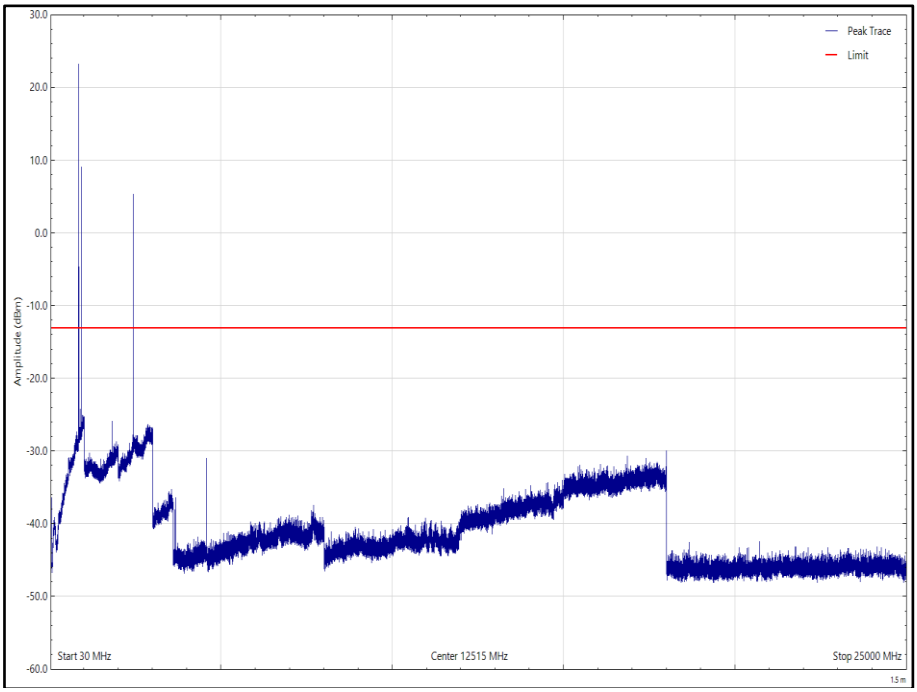

Figure 18 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Horizontal (Peak)

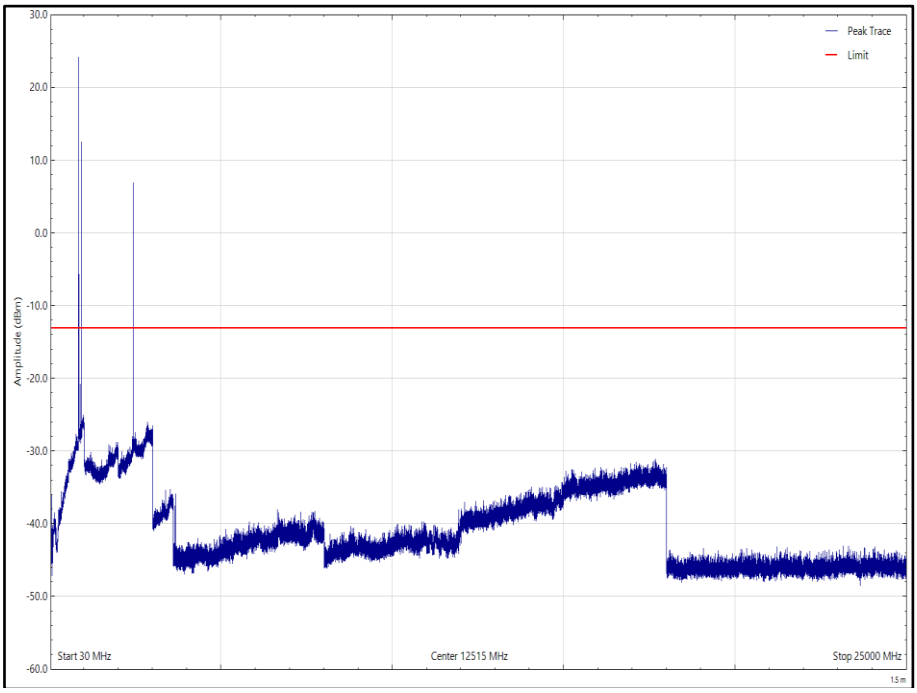

Figure 19 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 5 (836.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Vertical (Peak)

Bluetooth Low Energy + 915 MHz SRD + LTE FDD B12

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

Table 41 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: X, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

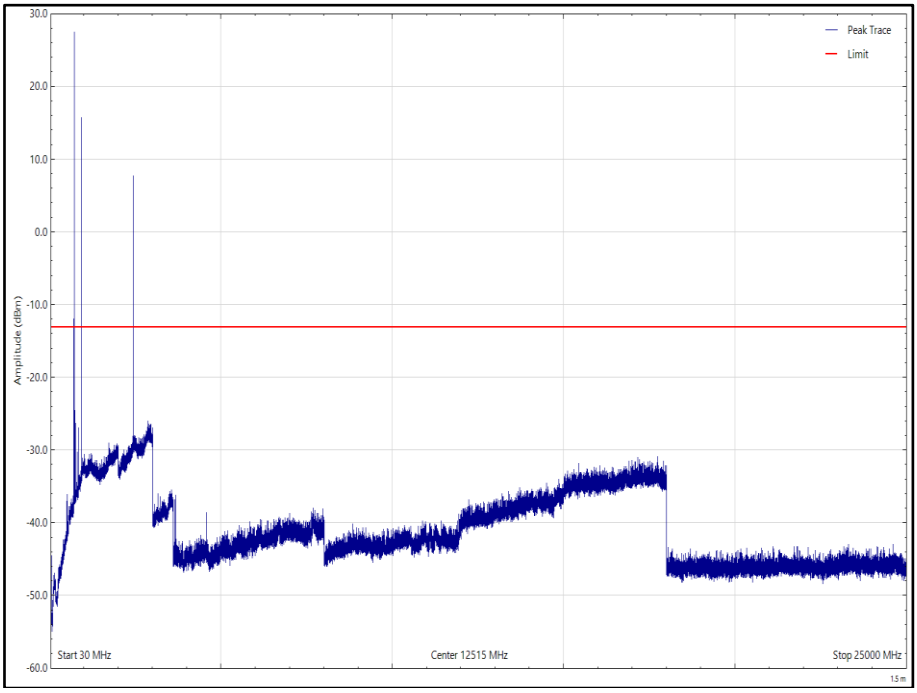

Figure 20 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: X, 30 MHz to 25 GHz, Horizontal (Peak)

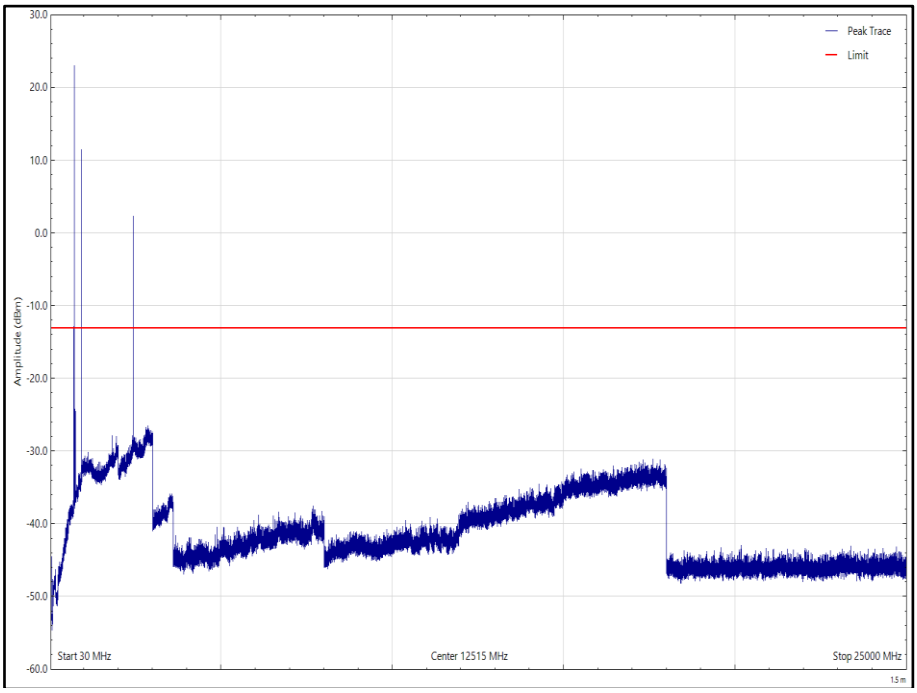

Figure 21 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: X, 30 MHz to 25 GHz, Vertical (Peak)

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

Table 42 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Y, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

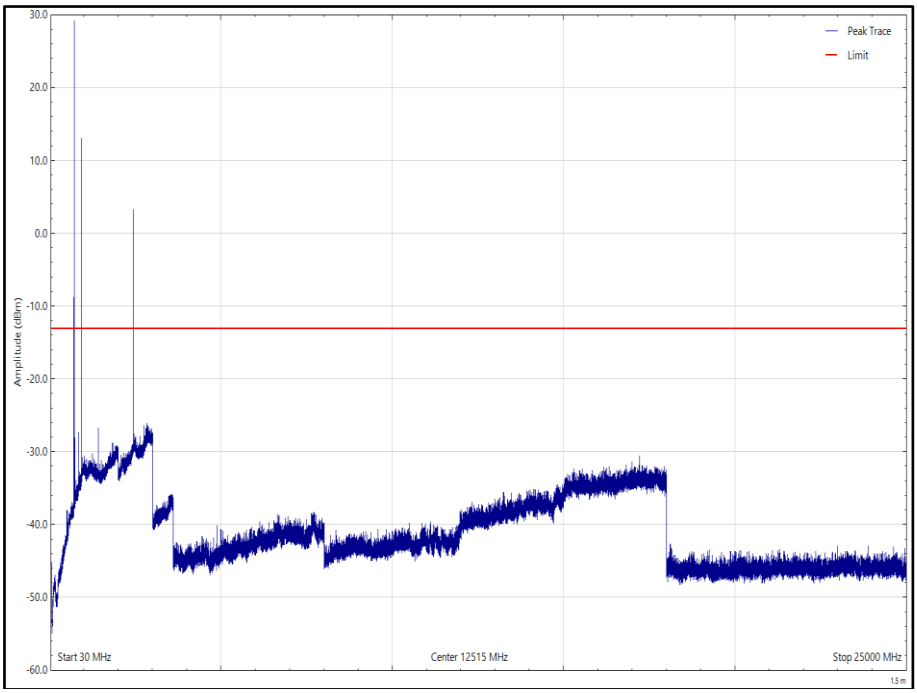

Figure 22 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Horizontal (Peak)

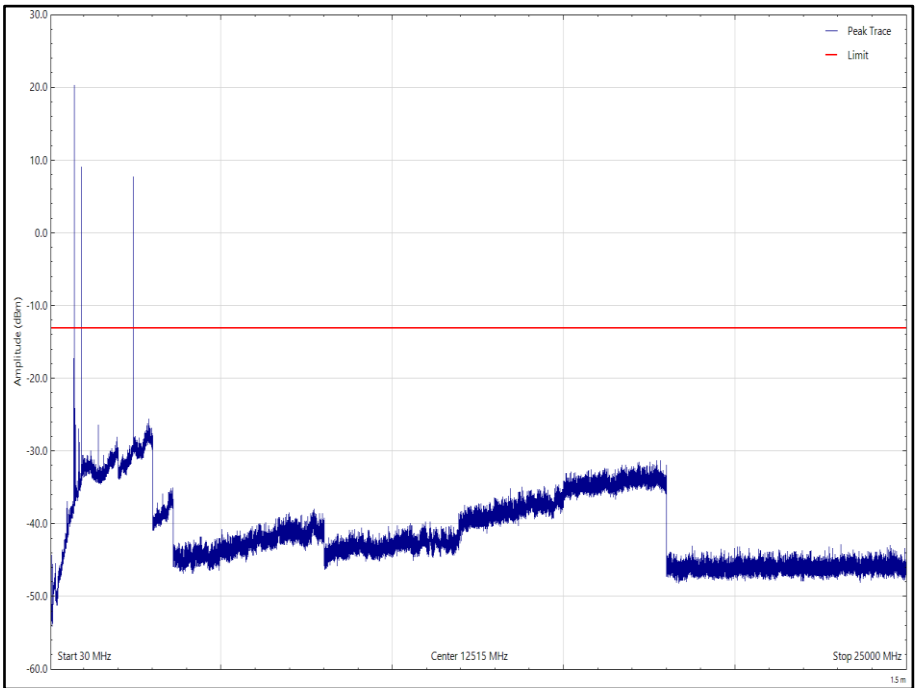

Figure 23 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Y, 30 MHz to 25 GHz, Vertical (Peak)

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

Table 43 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Z, 30 MHz to 25 GHz

*No emissions found within 10 dB of the limit.

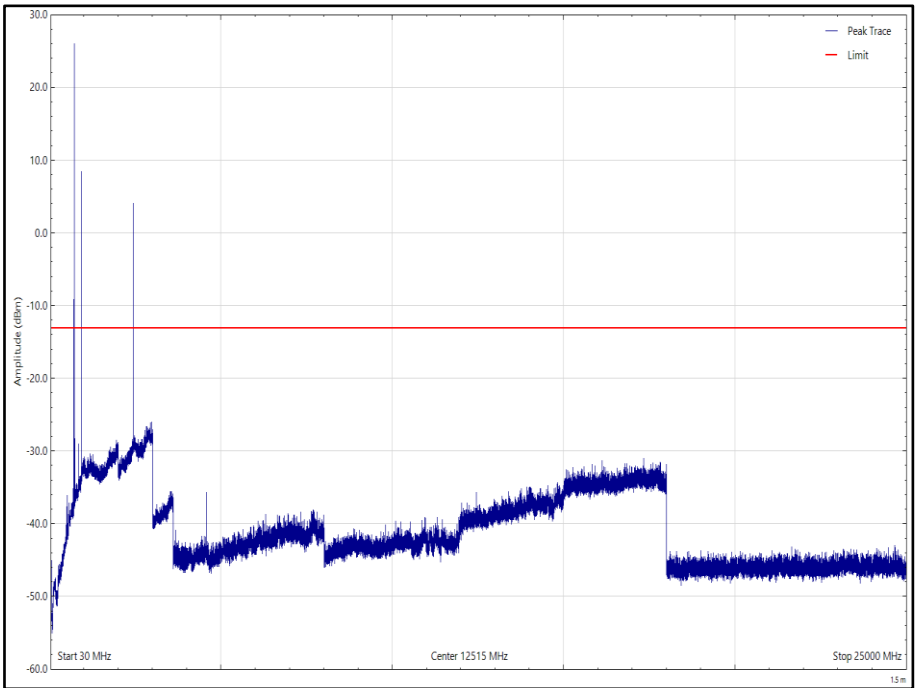

Figure 24 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Horizontal (Peak)

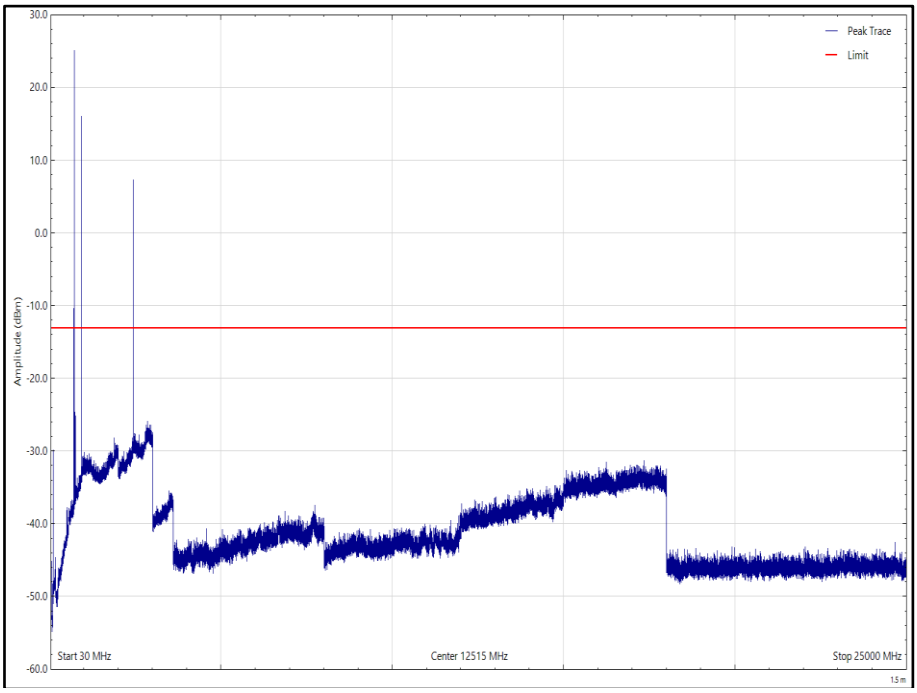

Figure 25 - BLE (2440 MHz), SRD (915 MHz) & LTE FDD Band 12 (707.5 MHz), Orientation: Z, 30 MHz to 25 GHz, Vertical (Peak)

FCC 47 CFR Part 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24, FCC 47 CFR Part 27 and ISED RSS-130, ISED RSS-132, ISED RSS-133 and ISED RSS-139

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
22.917 (a), 24.238 (a), 27.53(g)(h) and RSS-130 clause 4.7, RSS-132 clause 5.5, RSS-133 clause 6.5, RSS-139 clause 6.6.	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 44

2.1.8 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
Power Supply Unit	Hewlett Packard	6269B	113	-	O/P Mon
Antenna (DRG, 18 GHz to 40 GHz)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022
Pre-Amplifier (18 GHz to 40 GHz)	Phase One	PSO4-0087	1534	12	02-Aug-2022
Comb Generator	Schaffner	RSG1000	3034	-	TU
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	13-Aug-2022
Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Multimeter	Fluke	177	3832	12	08-Jul-2022
Cable (K-Type to K-Type, 2 m)	Scott Cables	KPS-1501-2000-KPS	4526	6	06-Mar-2022
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	Software
Cellular Signalling Box	Keysight Technologies	UXM	5267	12	16-Mar-2022
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	08-Mar-2022
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	31-Mar-2022
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5512	12	09-Apr-2022
2m K Type Cable	Junkosha	MWX241-02000KMSKMS/A	5524	12	24-Mar-2022
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5548	12	07-May-2022
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5610	12	15-Oct-2022
Antenna (DRG, 1 GHz to 10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	15-Oct-2022
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	16-Oct-2022
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023

Table 45

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

2.2 Radiated Spurious Emissions (Simultaneous Transmission) (Hardware Version 3)

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1503
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 (h)

2.2.2 Equipment Under Test and Modification State

MiX 4401-B, S/N: 55000206 - Modification State 0

2.2.3 Date of Test

13-March-2022 to 17-April-2022

2.2.4 Test Method

Measurements were only performed over the frequency range specified in FCC Part 15.35(b) as required by KDB 996369 D04, clause 3.4.

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.

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)

The limit line on the plots shows the most stringent limit. This is the limit from FCC pt 22.917 and is -13dBm. This has been applied to emissions which fall into the restricted bands as defined in FCC 15.205(a). For emissions that fall outside of restricted bands as defined in 15.205 (a), the limit from 15.247 (d) has been applied. The power of the 915 MHz transmitter has been measured in 100kHz RBW, and the limit calculated from this.

2.2.5 Example Test Setup Diagram

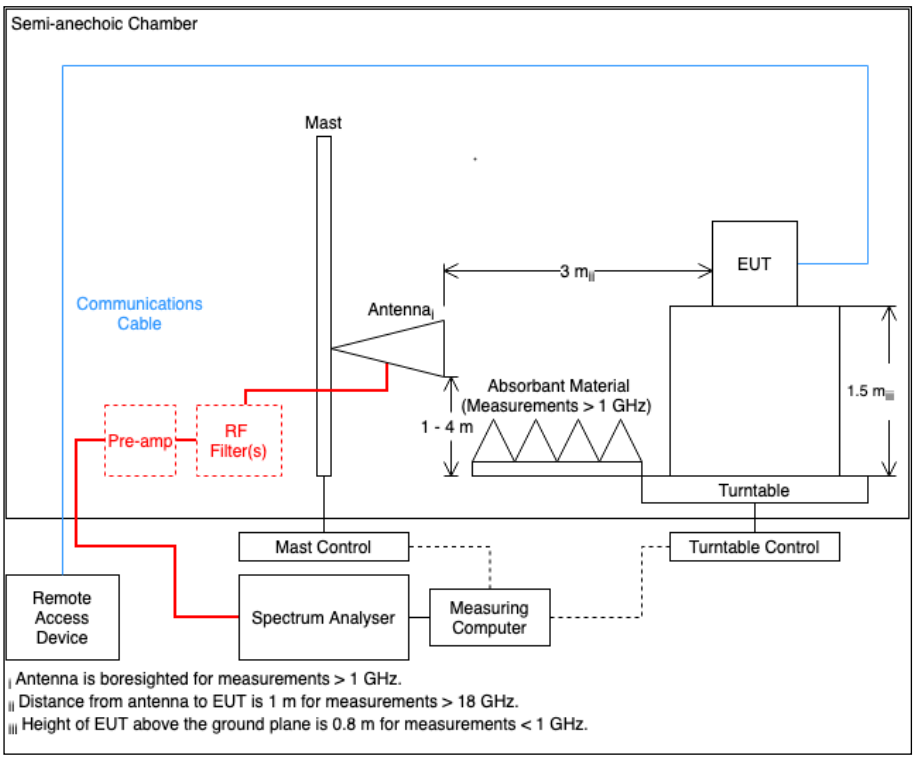

Figure 26

2.2.6 Environmental Conditions

Ambient Temperature	19.1 - 25.7 °C
Relative Humidity	30.6 - 51.1 %

2.2.7 Test Results

Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + PCS 1900 (middle channel)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.985	-18.6	-13.0	-5.6	Peak	111	244	Vertical
2745.022	-16.8	-13.0	-3.8	Peak	360	100	Horizontal

Table 46 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

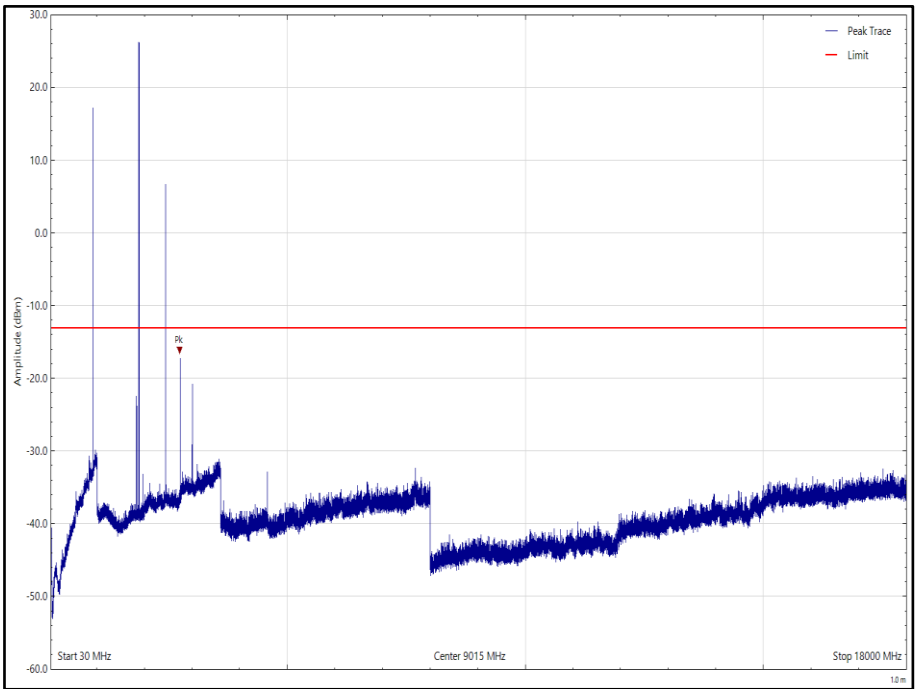

Figure 27 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

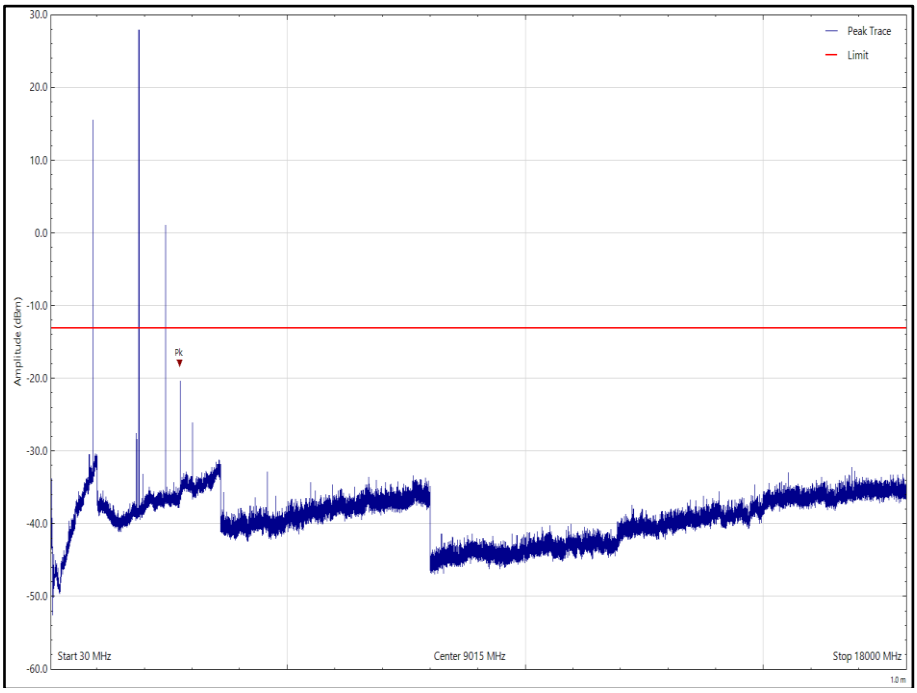

Figure 28 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2745.002	-13.6	-13.0	-0.6	Peak	211	100	Vertical
2745.060	-13.4	-13.0	-0.4	Peak	210	224	Horizontal

Table 47 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - Y - Orientation, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

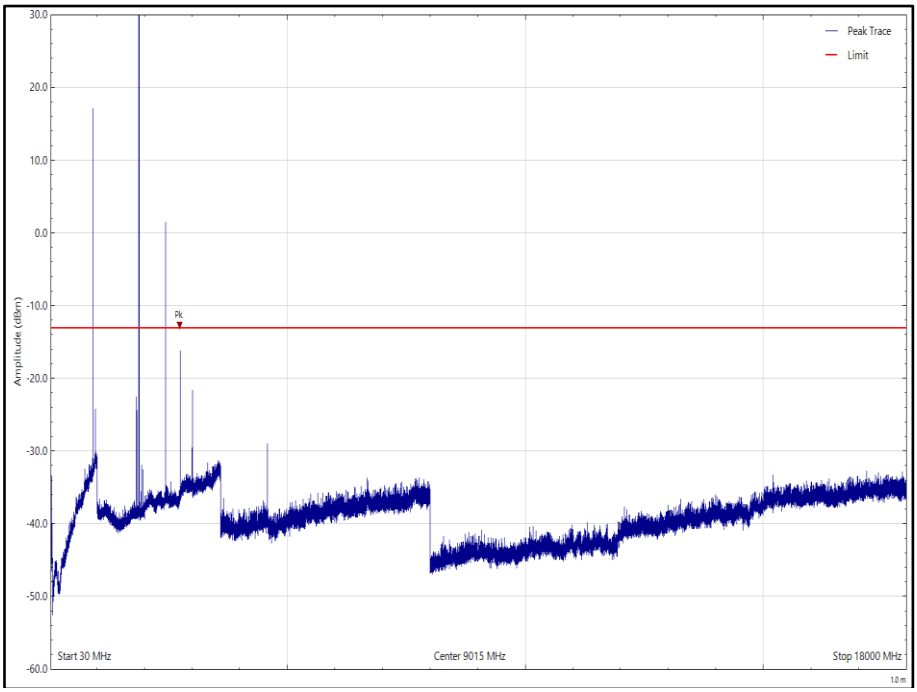

Figure 29 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - Y - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

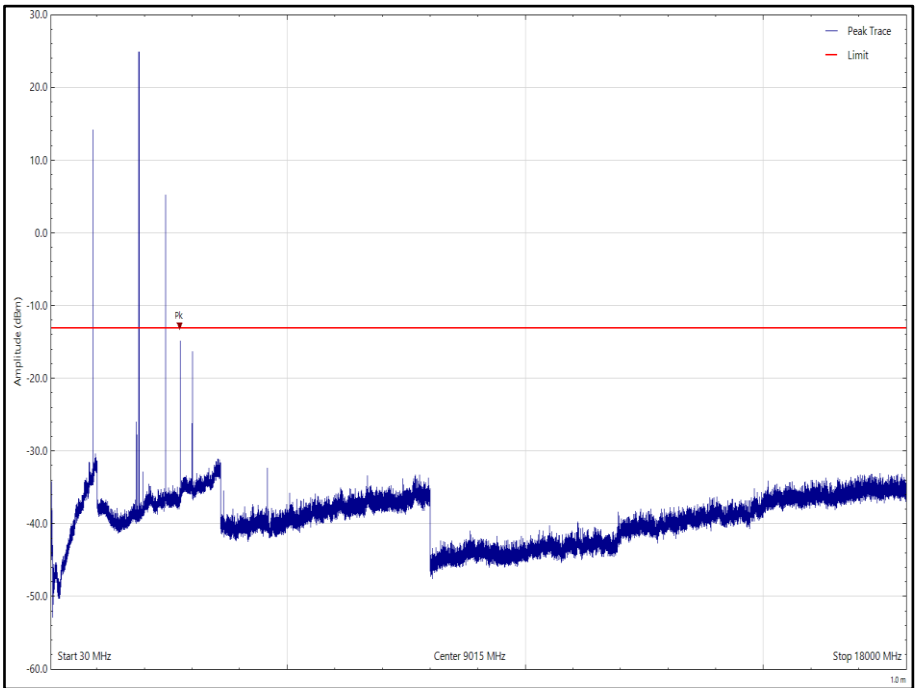

Figure 30 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - Y - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.991	-15.5	-13.0	-2.5	Peak	299	127	Vertical
2745.001	-14.7	-13.0	-1.7	Peak	33	259	Horizontal

Table 48 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

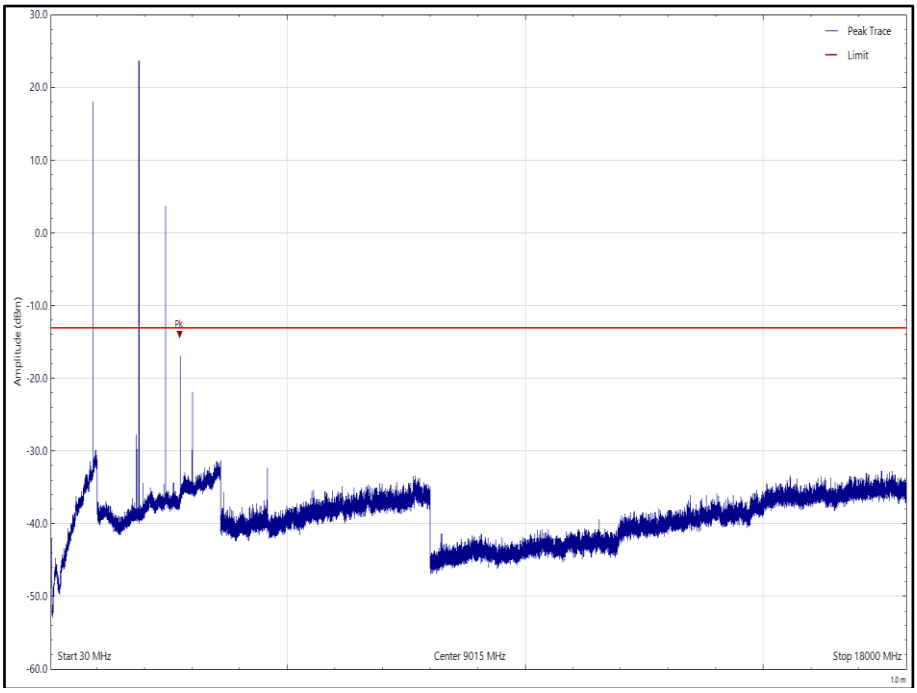

Figure 31 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

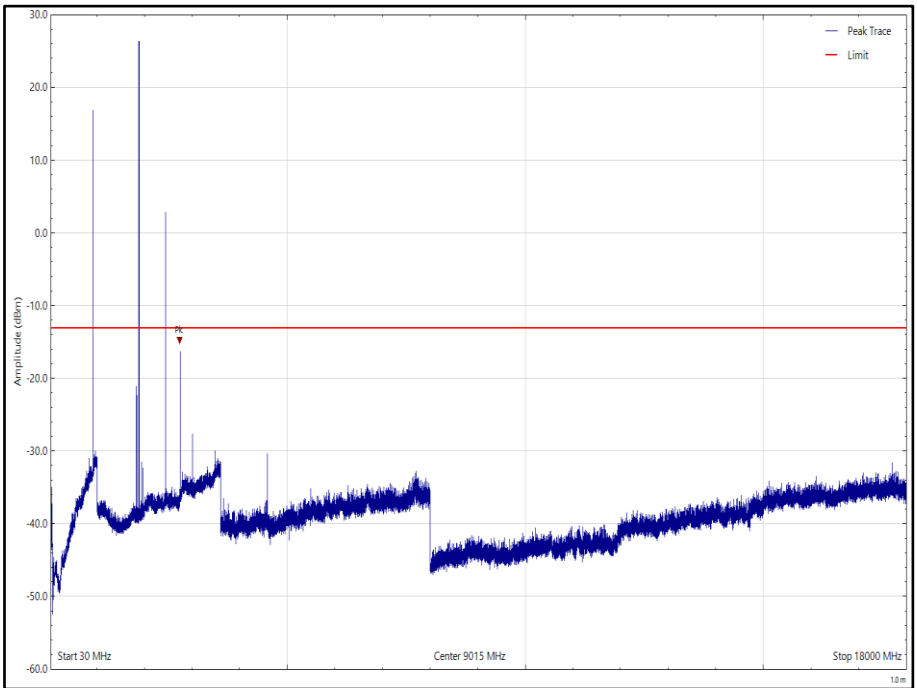

Figure 32 - BLE (2440 MHz), SRD (915 MHz) & PCS 1900 (1880 MHz) - X - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B4 (middle channel)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.964	-17.6	-13.0	-4.6	Peak	105	256	Vertical
2745.032	-15.6	-13.0	-2.6	Peak	332	101	Horizontal

Table 49 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - X, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

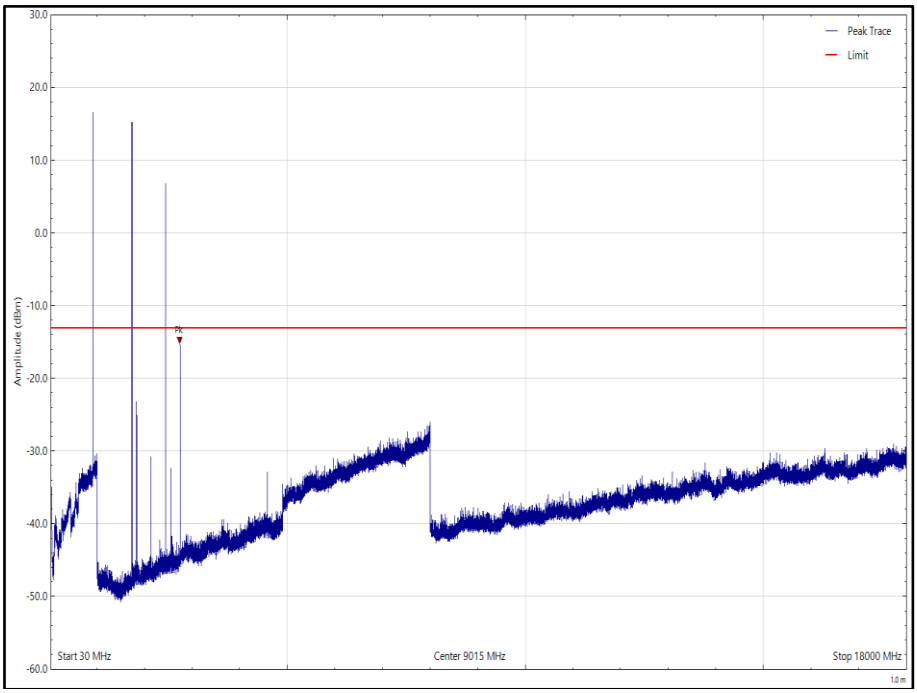

Figure 33 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - X, 30 MHz to 18 GHz, Horizontal (Peak)

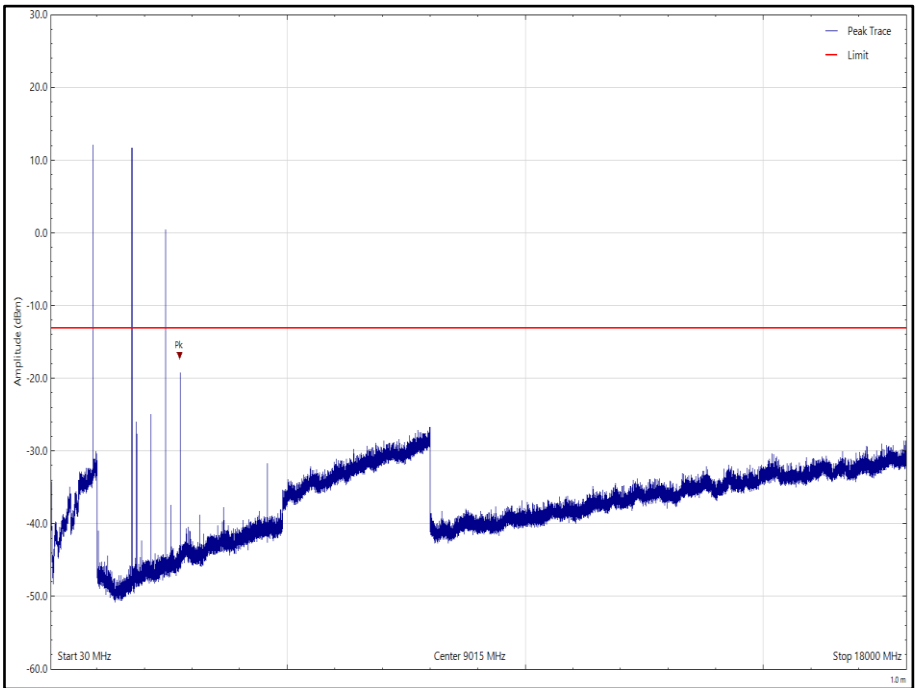

Figure 34 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - X, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.980	-15.7	-13.0	-2.7	Peak	214	231	Horizontal
2745.017	-14.9	-13.0	-1.9	Peak	192	105	Vertical

Table 50 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Y, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

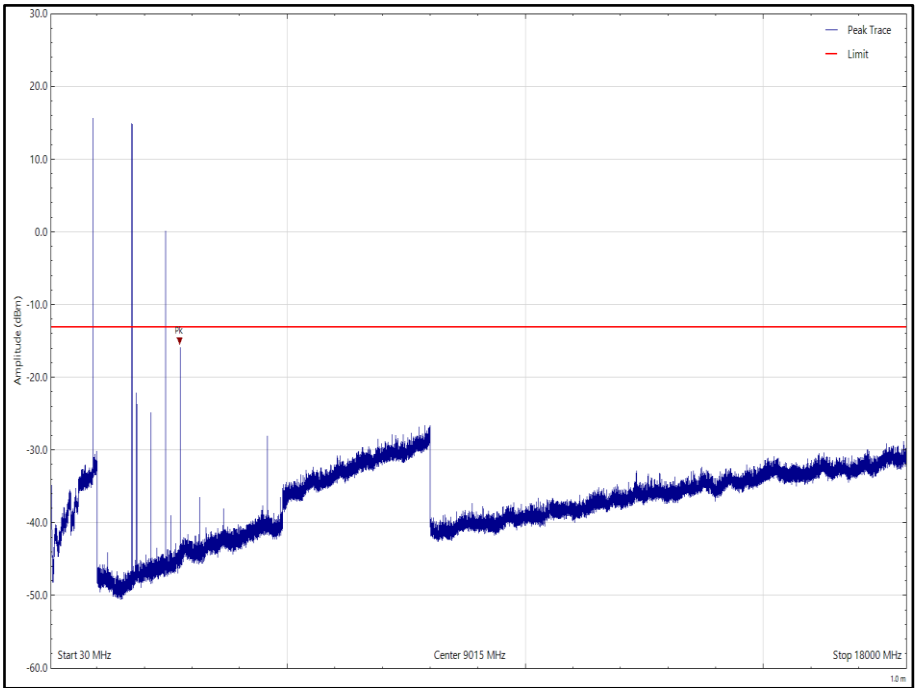

Figure 35 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Y, None, 30 MHz to 18 GHz, Horizontal (Peak)

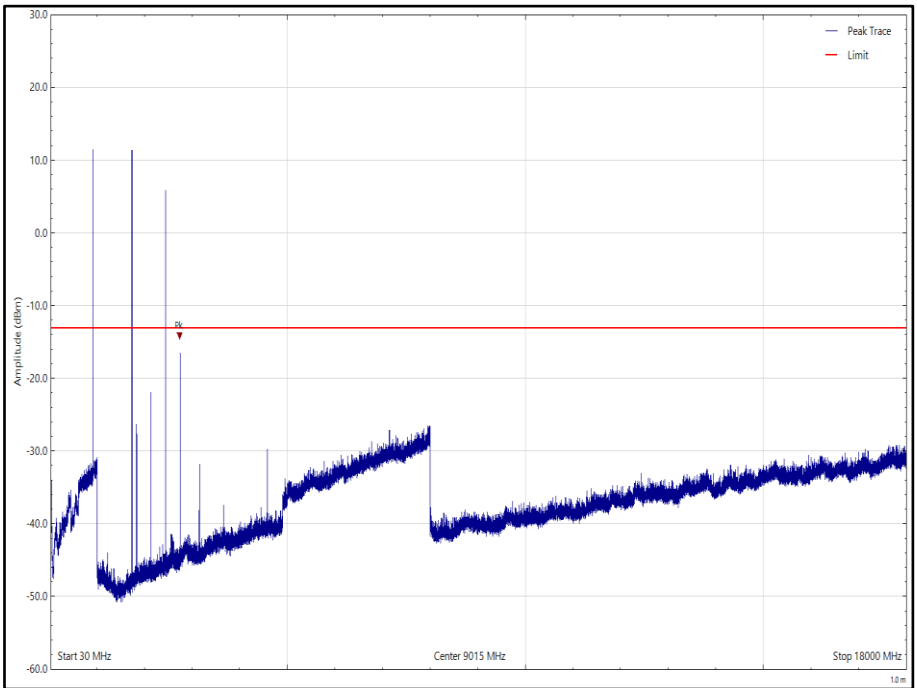

Figure 36 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Y, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2745.029	-13.8	-13.0	-0.8	Peak	39	119	Horizontal
2745.043	-17.1	-13.0	-4.1	Peak	326	102	Vertical

Table 51 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Z, 30 MHz to 18 GHz

No other emissions found within 10 dB of the limit.

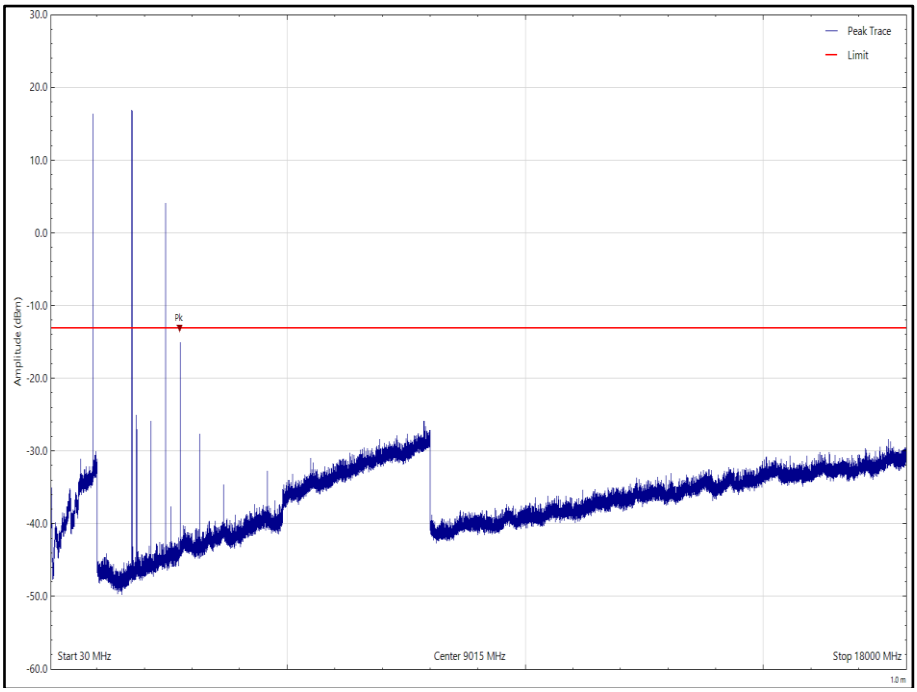

Figure 37 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Z, 30 MHz to 18 GHz, Horizontal (Peak)

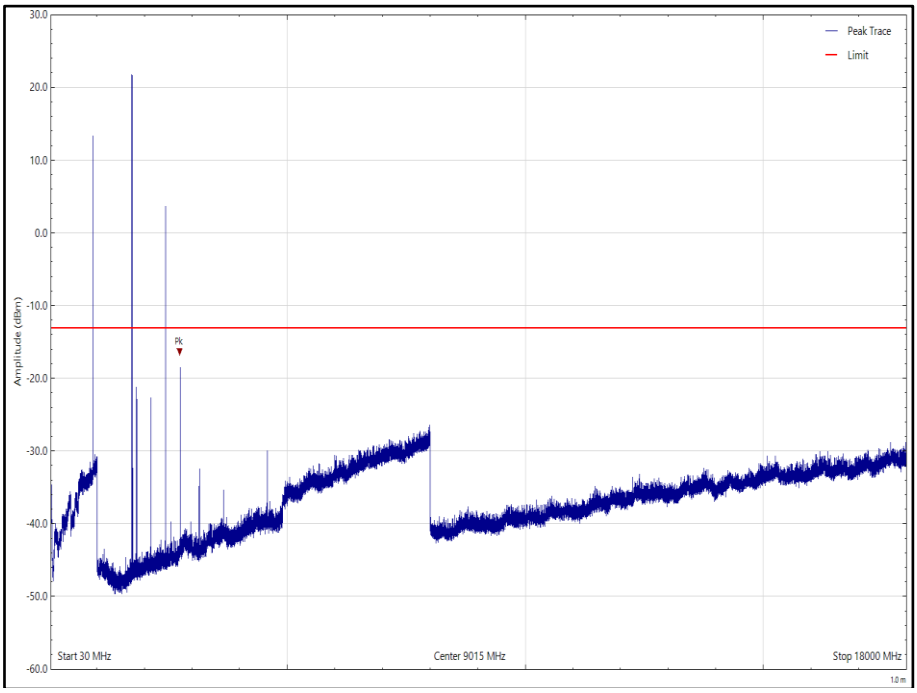

Figure 38 - BLE (2440 MHz) - SRD (915 MHz) & LTE-B4 (1732.5 MHz) - Z, 30 MHz to 18 GHz, Vertical (Peak)

Hardware rev 3:- Bluetooth Low Energy (middle channel) + 915 MHz SRD (middle channel) + LTE FDD B5 (middle channel)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
756.067	-6.0	0.0	-6.0	Peak	126	100	Horizontal
756.067	-12.7	0.0	-12.7	Peak	32	148	Vertical
2745.025	-14.1	-13.0	-1.1	Peak	359	100	Horizontal
2745.698	-16.2	-13.0	-3.2	Peak	102	379	Vertical

Table 52 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - X - Orientation, 30 MHz to 18 GHz

No other emissions found within 6 dB of the limit.

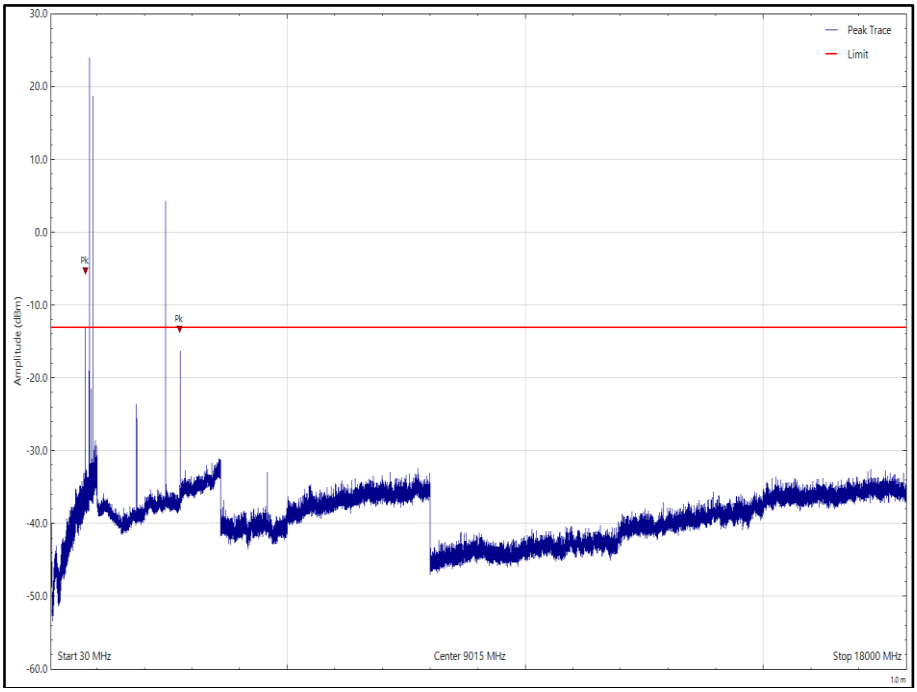

Figure 39 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - X - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

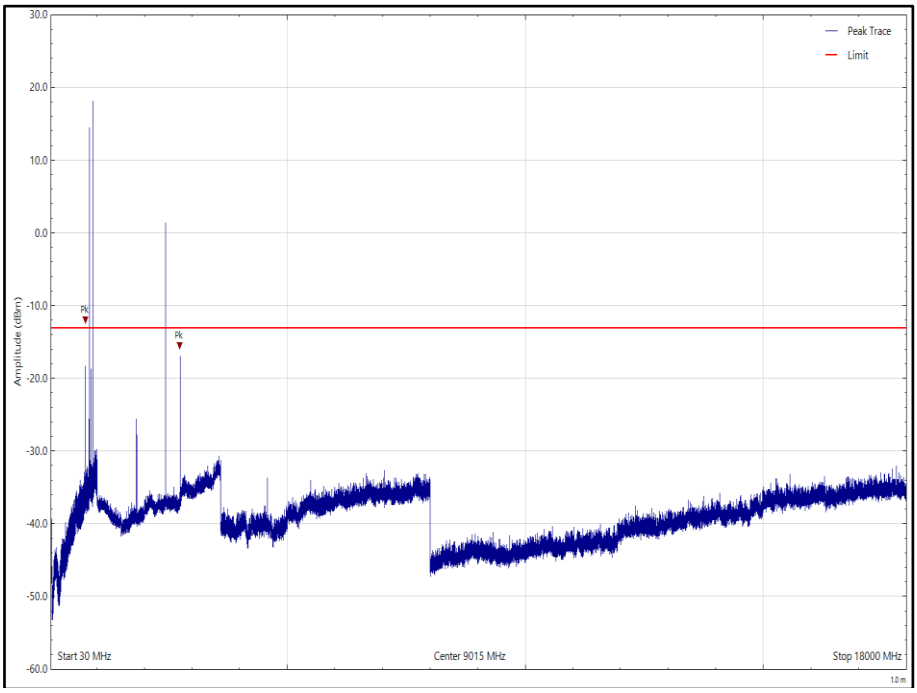

Figure 40 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - X - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
756.067	-9.1	0.0	-9.1	Peak	132	116	Horizontal
756.067	-9.8	0.0	-9.8	Peak	80	139	Vertical
2745.011	-14.0	-13.0	-1.0	Peak	296	100	Vertical

Table 53 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Y - Orientation, 30 MHz to 18 GHz

No other emissions found within 6 dB of the limit.

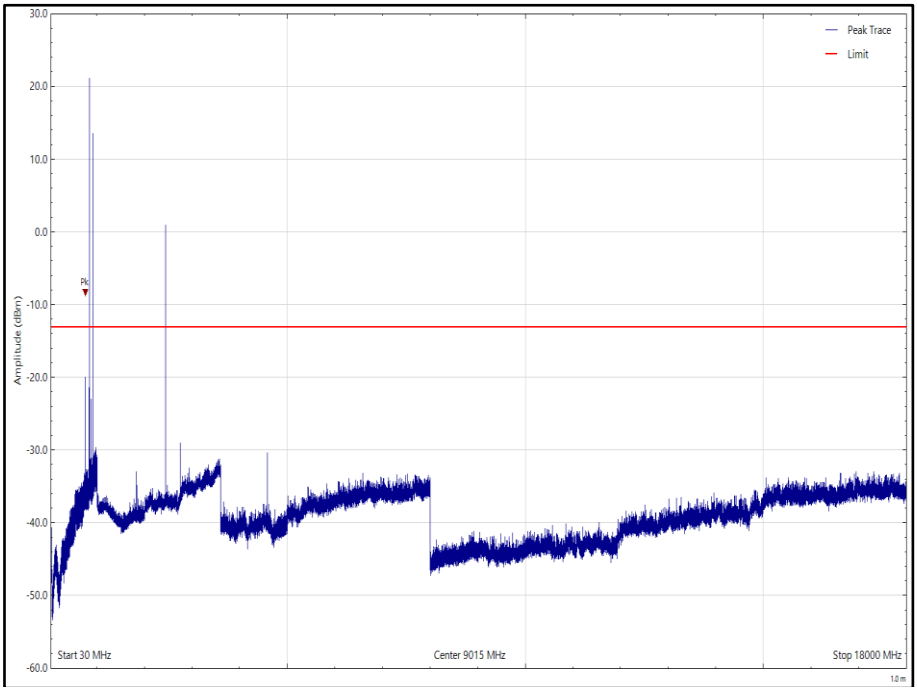

Figure 41 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Y - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

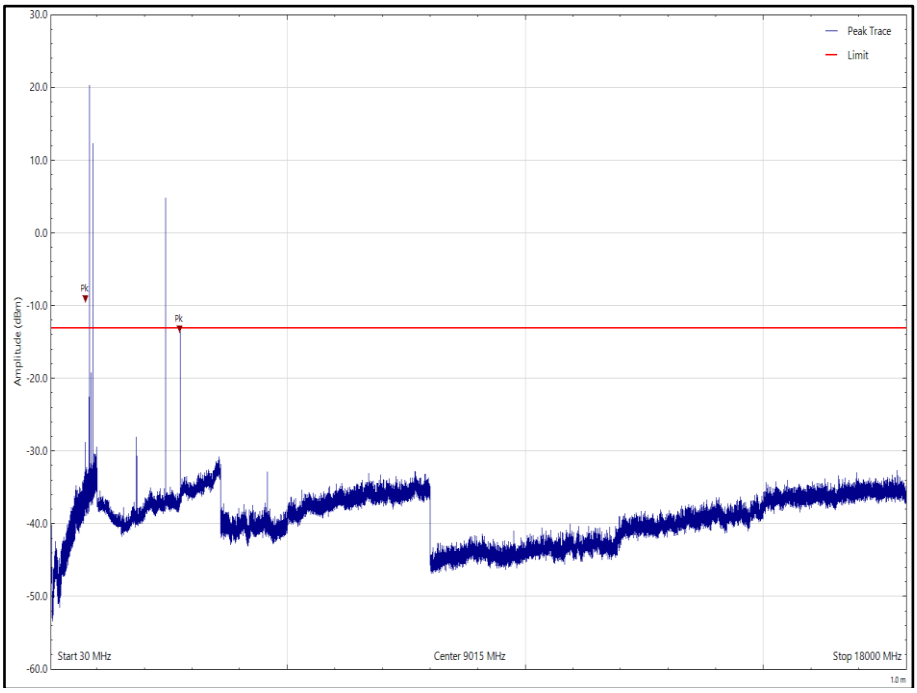

Figure 42 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Y - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
756.067	-5.6	0.0	-5.6	Peak	100	32	Horizontal
756.067	-15.0	0.0	-15.0	Peak	8	100	Vertical
2744.657	-14.4	-13.0	-1.4	Peak	0	103	Vertical
2744.941	-14.8	-13.0	-1.8	Peak	360	145	Horizontal

Table 54 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Z - Orientation, 30 MHz to 18 GHz

No other emissions found within 6 dB of the limit.

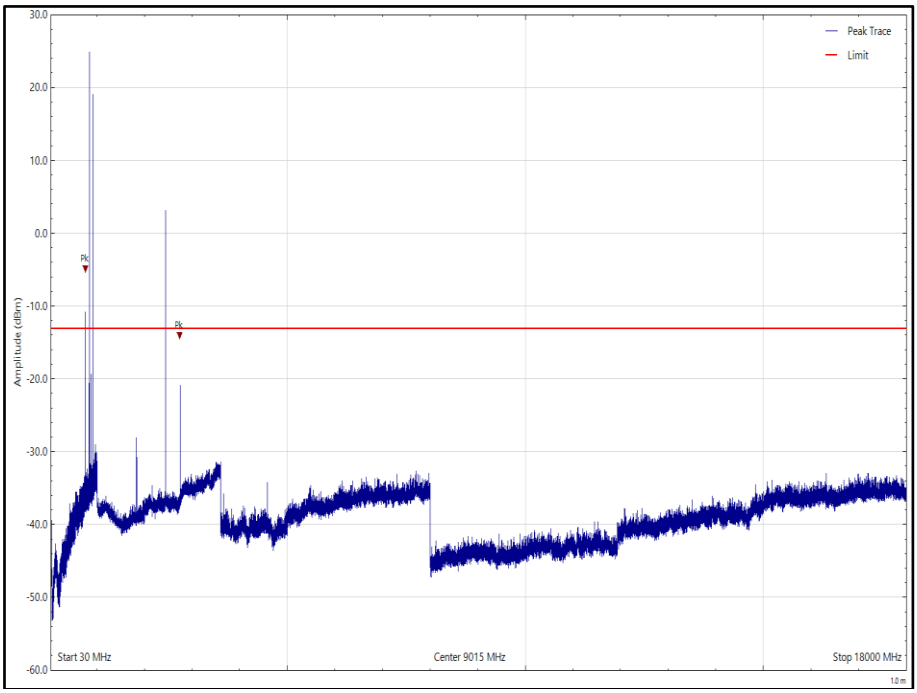

Figure 43 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Z - Orientation, 30 MHz to 18 GHz, Horizontal (Peak)

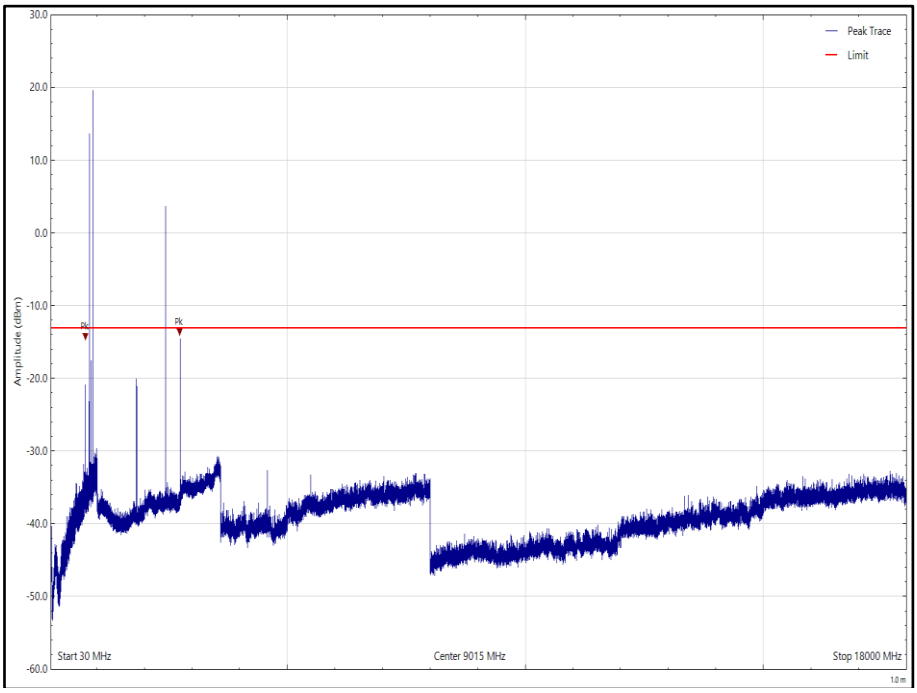

Figure 44 - BLE (2440 MHz), SRD (915 MHz) & LTE-B5 (836.5 MHz) - Z - Orientation, 30 MHz to 18 GHz, Vertical (Peak)

FCC 47 CFR Part 15, FCC 47 CFR Part 22, FCC 47 CFR Part 24 and FCC 47 CFR Part 27

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 15.247 (d)	-20 dBc
Part 22.917 (a)	-13 dBm (EIRP) / 82 dBµV/m at 3m.
Part 24.238 (a)	-13 dBm (EIRP) / 82 dBµV/m at 3m.
Part 27.53 (h)	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 55

2.2.8 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 Expiry Date
Power Supply Unit	Hewlett Packard	6269B	113	-	O/P Mon
Antenna with attenuator (Bilog, 30 MHz to 3 GHz)	Schaffner	CBL6143	287	24	14-Oct-2022
Comb Generator	Schaffner	RSG1000	3034	-	TU
Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Multimeter	Fluke	177	3832	12	08-Jul-2022
Cable (SMA to SMA, 2 m)	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	06-Apr-2022
Digital Multi-meter	Iso-tech	IDM93N	4435	12	07-Mar-2023
Emissions Software	TUV SUD	EmX V2.1.12 V.2.1.12	5125	-	Software
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	06-Sep-2022
Cellular Signalling Box	Keysight Technologies	UXM	5267	12	16-Mar-2022
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	01-Apr-2022
Thermo-hygro-Barometer	PCE Instruments	PCE-THB-40	5472	12	25-Mar-2023
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	31-Mar-2022
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5610	12	15-Oct-2022
Antenna (DRG, 1 GHz to 10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	15-Oct-2022
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	16-Oct-2022
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Radio Communications Analyser	Anritsu	MT8821C	5738	12	08-Mar-2023
EMI Test Receiver	Rohde & Schwarz	ESW44	5914	12	21-Feb-2023

Table 56

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

3 Photographs

3.1 Test Setup Photographs

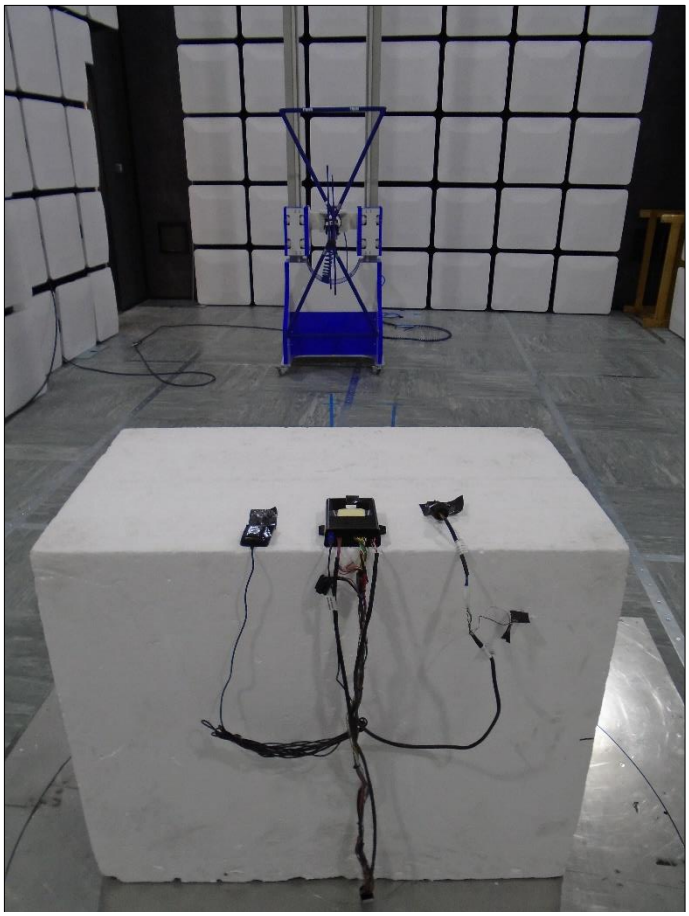

Figure 45 - Test Setup - 30 MHz to 1 GHz - X Orientation

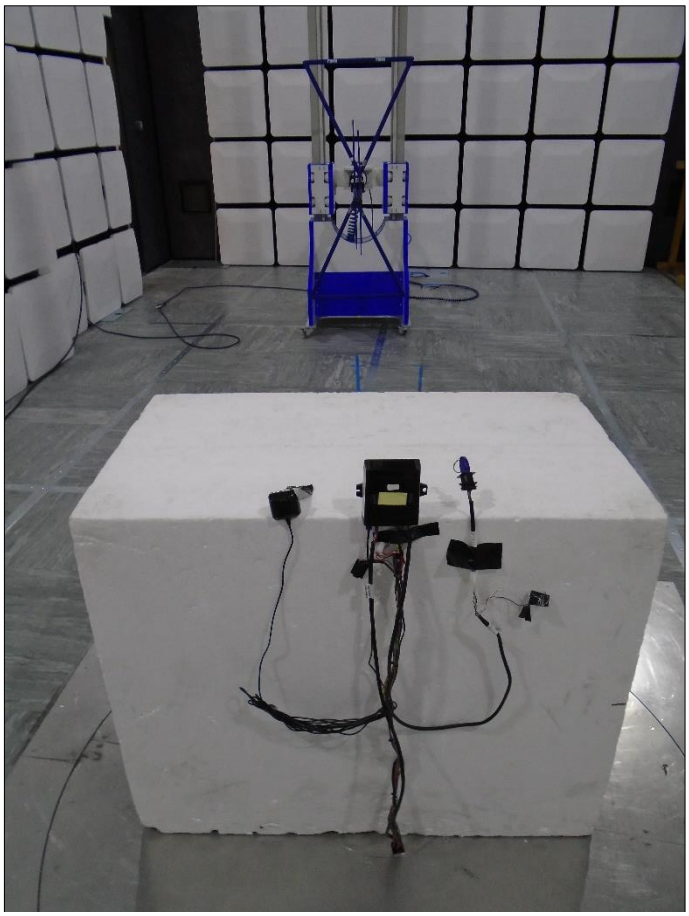

Figure 46 - Test Setup - 30 MHz to 1 GHz - Y Orientation

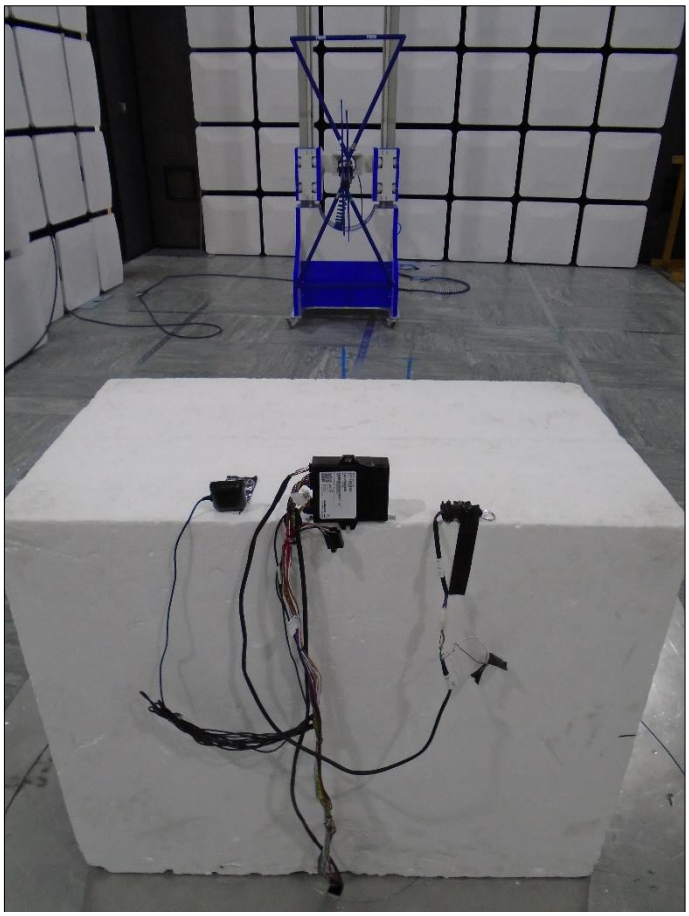

Figure 47 - Test Setup - 30 MHz to 1 GHz - Z Orientation

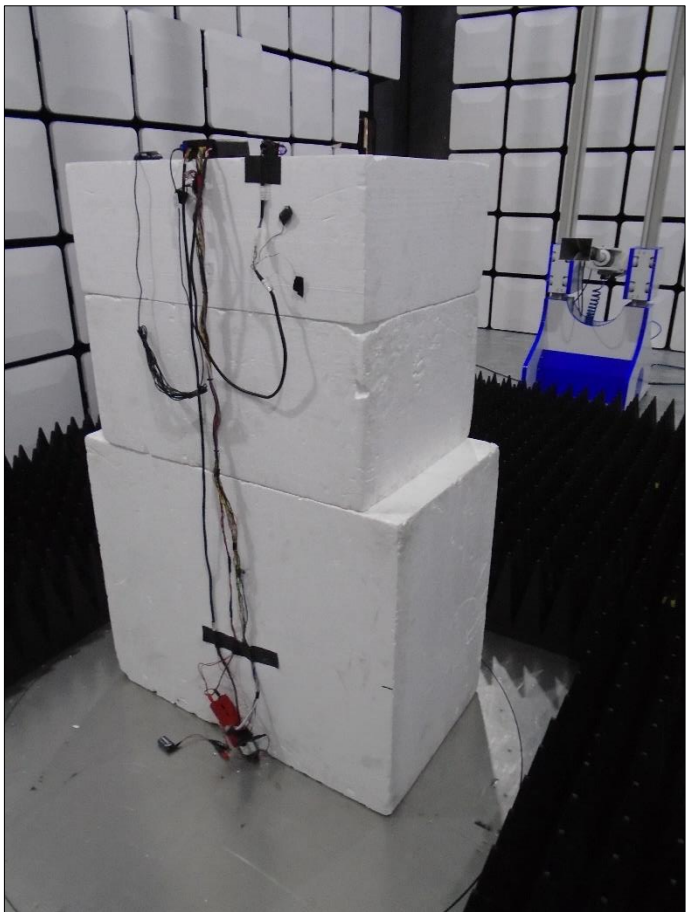

Figure 48 - Test Setup - 1 GHz to 18 GHz - X Orientation

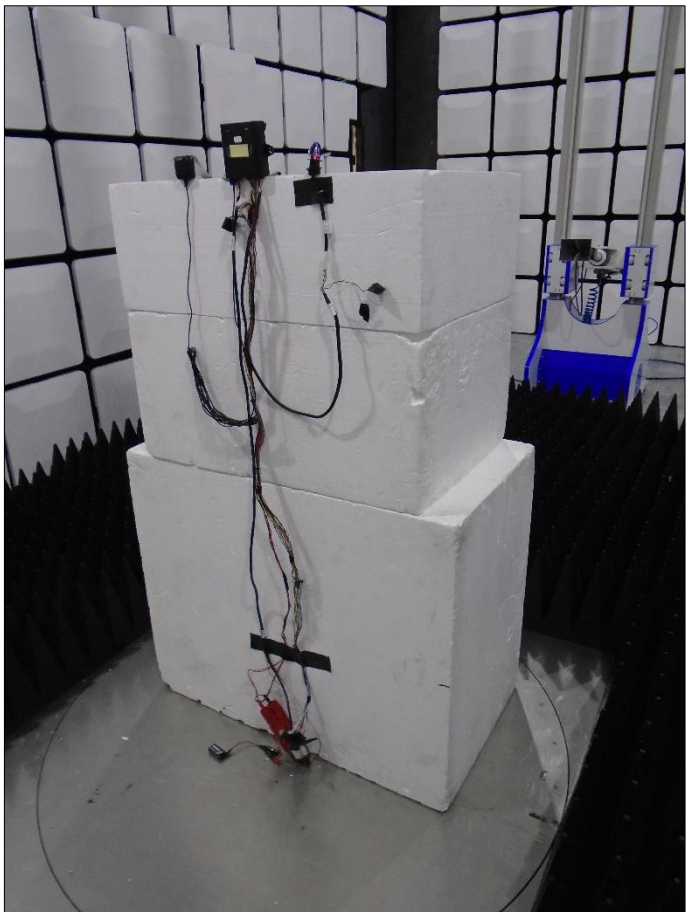

Figure 49 - Test Setup - 1 GHz to 18 GHz - Y Orientation

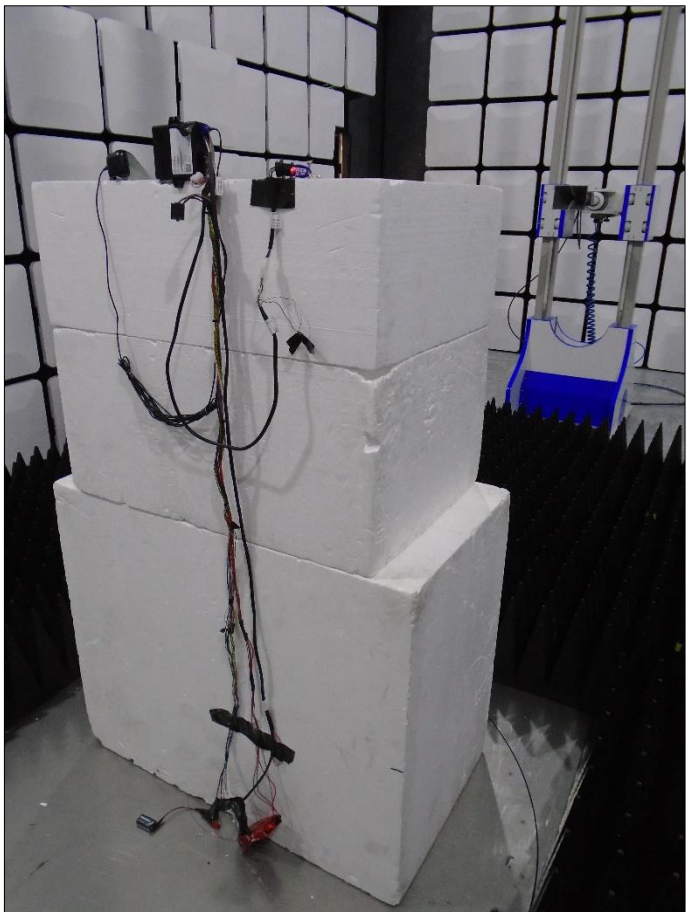

Figure 50 - Test Setup - 1 GHz to 18 GHz - Z Orientation

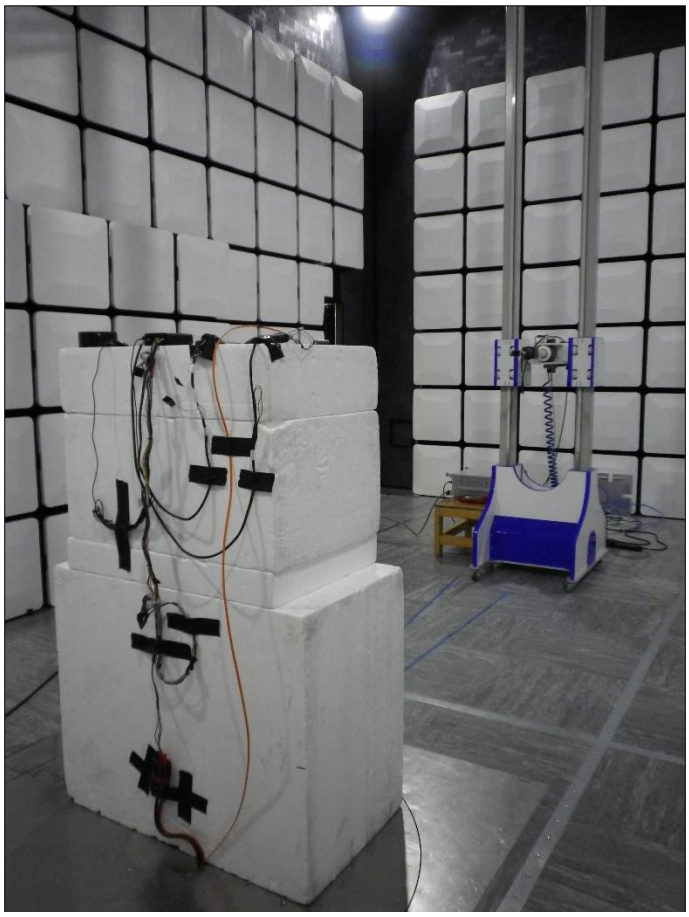

Figure 51 - Test Setup - 18 GHz to 25 GHz - X Orientation

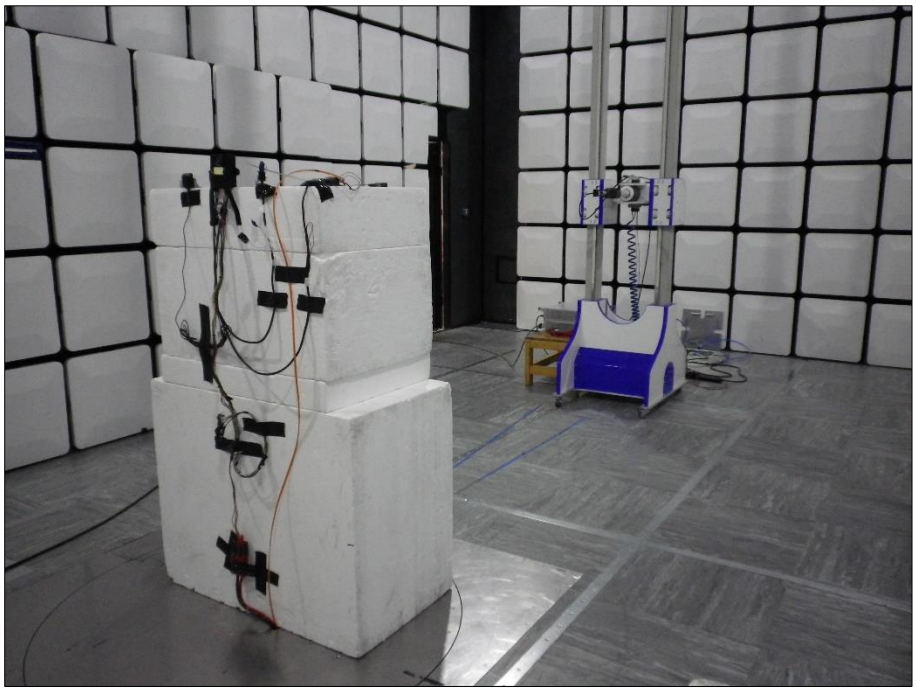

Figure 52 - Test Setup - 18 GHz to 25 GHz - Y Orientation

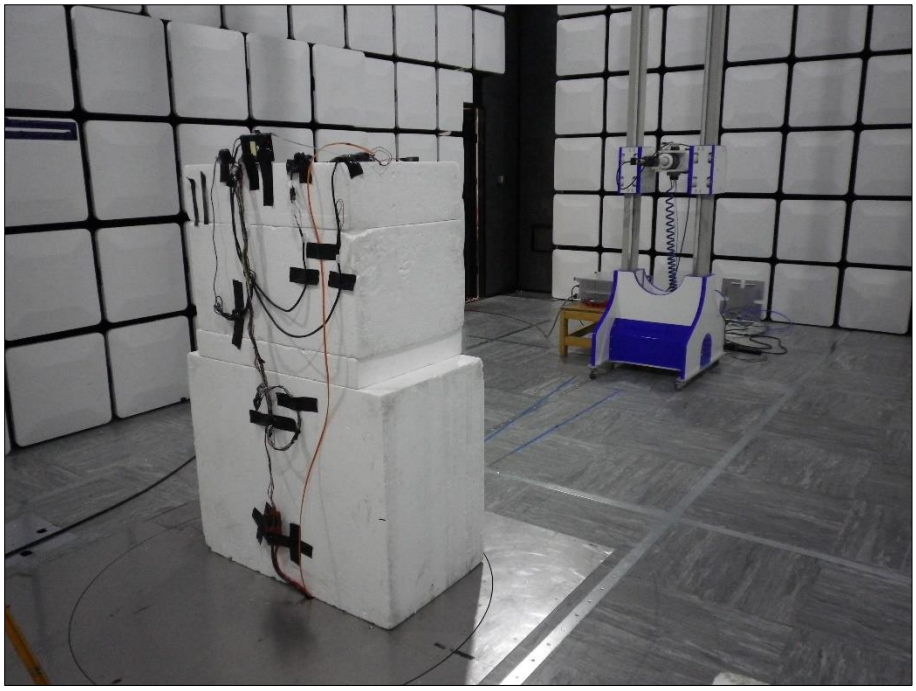

Figure 53- Test Setup - 18 GHz to 25 GHz - Z Orientation

4 Measurement Uncertainty

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

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

Table 57

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (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.