FCC and ISED Test Report

MPI Holdings FZE
ISS (Intelligent Safety System)

In accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN
(915 MHz)

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 75960007-03 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 15C, 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	Ahmad Javid	25 September 2024	
	Tom Biddlecombe	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 15C: 2022, ISED RSS-247: Issue 3 (08-2023) and 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	21-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 White RCM (Radio Communication Module) - S/N: IMS_IMS-RCM2_1V31_27FEB2024_135637 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	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2022 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	08-February-2024 and 05-February-2024
Start of Test	28-February-2024
Finish of Test	28-March-2024
Name of Engineer(s)	Ahmad Javid and Tom Biddlecombe
Related Document(s)	ANSI C63.10 (2020) ANSI C63.10 (2013) ANSI C63.4 (2014)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15	RSS-247	RSS-GEN			
Configuration and Mode: 915 MHz (frequency)						
2.1	15.247 (a)(1)	5.1	6.7	Frequency Hopping Systems - 20 dB Bandwidth	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.2	15.247 (a)(1)	5.1	-	Frequency Hopping Systems - Channel Separation	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.3	15.247 (a)(1)	5.1	-	Frequency Hopping Systems - Number of Hopping Channels	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.4	15.247 (a)(1)	5.1	-	Frequency Hopping Systems - Average Time of Occupancy	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.5	15.247 (b)(2)	5.4a	6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.6	15.247 (d)	5.5	-	Authorised Band Edges	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
2.7	15.209 & 15.247 (d)	3.3 & 5.5	6.13 & 8.9	Spurious Radiated Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013) ANSI C63.4 (2014)
2.8	15.209 & 15.247 (d)	3.3 & 5.5	6.13 & 8.9	Conducted Spurious Emissions from the Antenna Port	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)

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			
IC ID of the product under test – see guidance here			
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 MHz)	0.2 1.4	0.2 1.4	0.2 1.4	0.2 1.4	0.2 1.4
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

Table 4

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

Table 5

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

Table 6

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 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:	24	V
Extreme upper voltage:	30	V
Extreme lower voltage:	10	V
Max current:	2	A

Table 9

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 10

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Table 11

Temperature

Minimum temperature:	-20	°C
Maximum temperature:	80	°C

Table 12

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 13

Antenna Characteristics (LTE)

Antenna connector ☒ UFL			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	TRIO mXTEND	Gain	2.4	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 14

Antenna Characteristics (ISM)

Antenna connector ☒ SMA			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	RUN mXTEND	Gain	2.1	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 15

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 16

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
1	Firmware update to reduce the ISM output power to 10 dBm and reduce the ISM transmission time. S/N: IMS_IMS-RCM2_1V31_27FEB2024_135637	Ahmad Javid	11th March 2024
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 17

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: 915 MHz (frequency)		
Frequency Hopping Systems - 20 dB Bandwidth	Thomas Biddlecombe	UKAS
Frequency Hopping Systems - Channel Separation	Thomas Biddlecombe	UKAS
Frequency Hopping Systems - Number of Hopping Channels	Thomas Biddlecombe	UKAS
Frequency Hopping Systems - Average Time of Occupancy	Thomas Biddlecombe	UKAS
Maximum Conducted Output Power	Thomas Biddlecombe	UKAS
Authorised Band Edges	Ahmad Javid	UKAS
Spurious Radiated Emissions	Ahmad Javid	UKAS

Table 18

Office Address:

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

2 Test Details

2.1 Frequency Hopping Systems - 20 dB Bandwidth

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(1)
ISED RSS-247, Clause 5.1
ISED RSS-GEN, Clause 6.7

2.1.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 1
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.1.3 Date of Test

28-February-2024 to 14-March-2024

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.9.2.

2.1.5 Environmental Conditions

Ambient Temperature	21.0 - 23.1 °C
Relative Humidity	42.5 - 44.1 %

2.1.6 Test Results

915 MHz (frequency)

20 dB Bandwidth (kHz)		
915.00 MHz	921.50 MHz	927.50 MHz
174.4	197.5	174.4

Table 19 - 20 dB Bandwidth

Figure 1 - 915.00 MHz, 20 dB Bandwidth

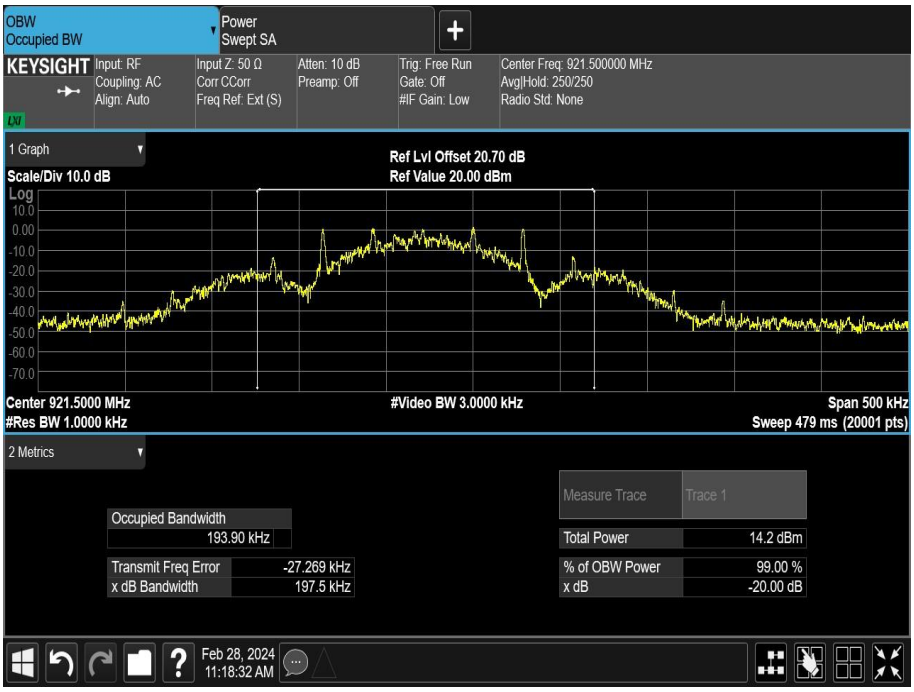

Figure 2 - 921.50 MHz, 20 dB Bandwidth

Figure 3 - 927.50 MHz, 20 dB Bandwidth

FCC 47 CFR Part 15, Limit Clause 15.247 (a)(1)(i) and ISED RSS-247, Limit Clause 5.1 (3)

The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	79 Series III	611	12	15-Dec-2024
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	21-May-2024
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	18-Sep-2025
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
Cable (SMA to SMA 3m)	Junkosha	MWX221-03000AMSAMS/B	6000	12	05-Jun-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024
Signal Conditioning Unit	TUV SUD	SPECTRUM_SCU001	6350	-	26-Jul-2024
SCU Cable Assembly SCU	TUV SUD	SPECTRUM_SCU_CA	6638	12	26-Jul-2024

Table 20

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

2.2 Frequency Hopping Systems - Channel Separation

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(1)
ISED RSS-247, Clause 5.1

2.2.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 0
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.2.3 Date of Test

28-February-2024

2.2.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 7.8.2.

2.2.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	42.5 %

2.2.6 Test Results

915 MHz (frequency)

FCC 47 CFR Part 15, Limit Clause 15.247 (a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

ISED RSS-247, Limit Clause 5.1 (b)

FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

Channel Separation (MHz)
0.251

Table 21

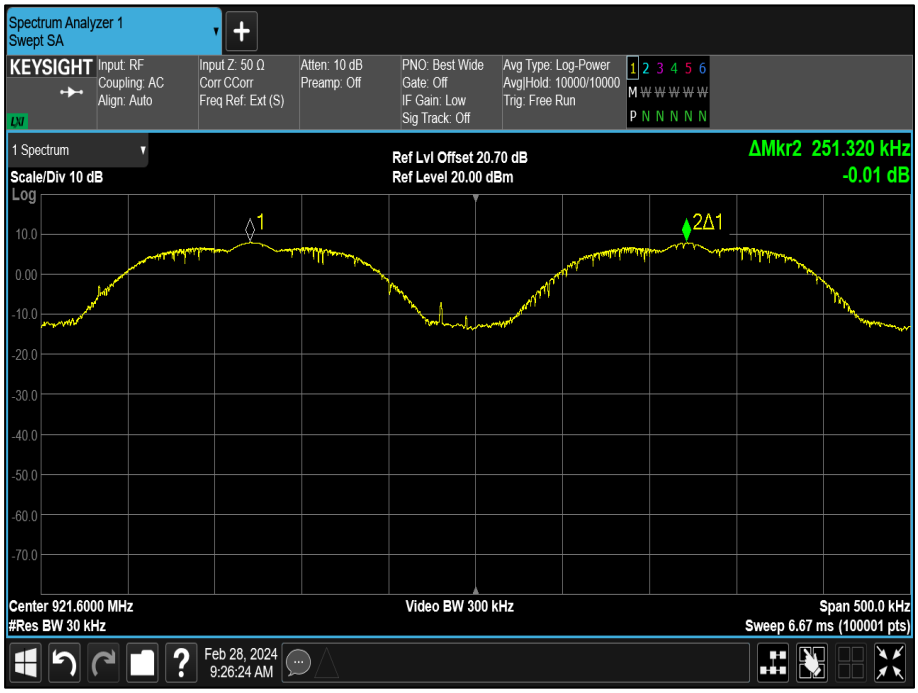

Figure 4

FCC 47 CFR Part 15, Limit Clause 15.247 (a)(1)(i)

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

ISED RSS-247, Limit Clause 5.1 (c)

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	79 Series III	611	12	15-Dec-2024
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	21-May-2024
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	18-Sep-2025
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
Cable (SMA to SMA 3m)	Junkosha	MWX221-03000AMSAMS/B	6000	12	05-Jun-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	12-Mar-2024

Table 22

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

2.3 Frequency Hopping Systems - Number of Hopping Channels

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(1)
ISED RSS-247, Clause 5.1

2.3.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 0
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.3.3 Date of Test

28-February-2024

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 7.8.3.

2.3.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	42.5 %

2.3.6 Test Results

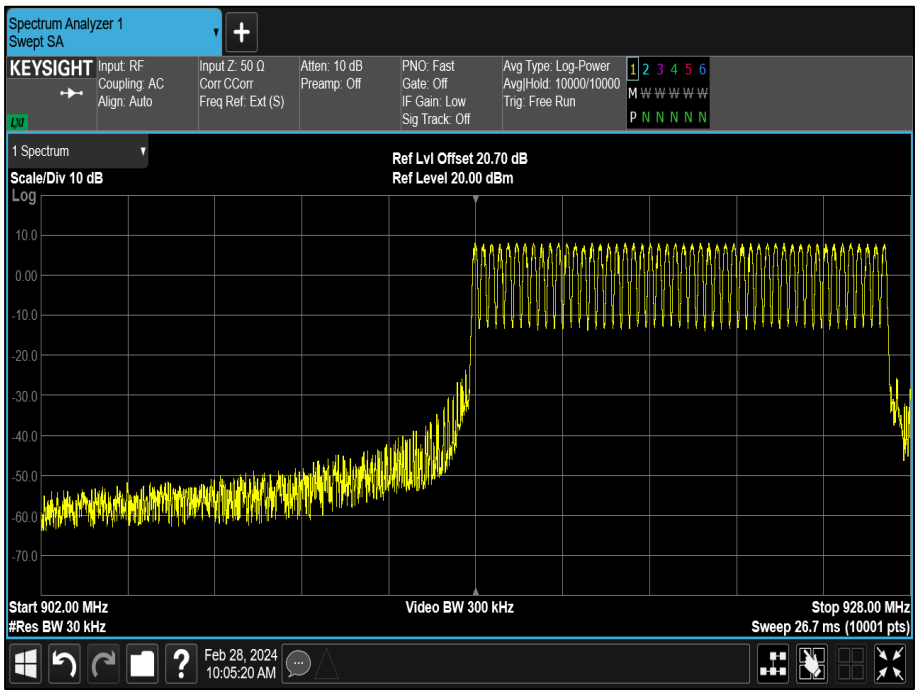

Figure 5 - Measurement Frequency Range: 902 MHz to 928 MHz

Number of Hopping Channels:
50

<u>FCC 47 CFR Part 15, Limit Clause 15.247 (a)(1)(i) and ISED RSS-247, Limit Clause 5.1 (3)</u>

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	79 Series III	611	12	15-Dec-2024
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	21-May-2024
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	18-Sep-2025
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
Cable (SMA to SMA 3m)	Junkosha	MWX221-03000AMSAMS/B	6000	12	05-Jun-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	12-Mar-2024

Table 23

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

2.4 Frequency Hopping Systems - Average Time of Occupancy

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(1)
ISED RSS-247, Clause 5.1

2.4.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 0
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.4.3 Date of Test

28-February-2024

2.4.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 7.8.4.

2.4.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	42.5 %

2.4.6 Test Results

915 MHz (frequency)

Dwell Time (ms)	Number of Transmissions	Average Occupancy Time (ms)
6.5	4	26

Table 24

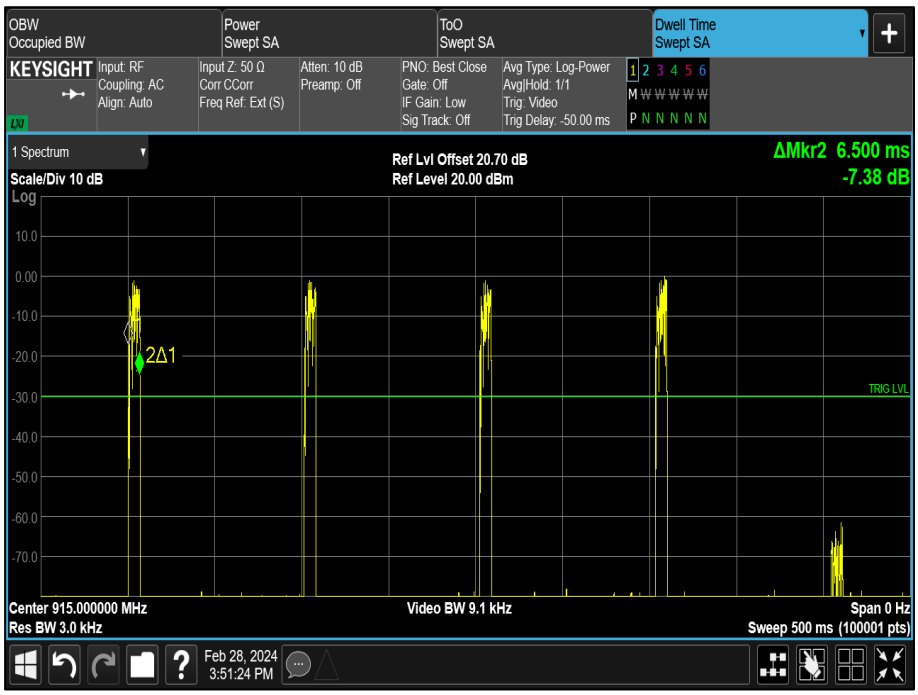

Figure 6 - Dwell Time

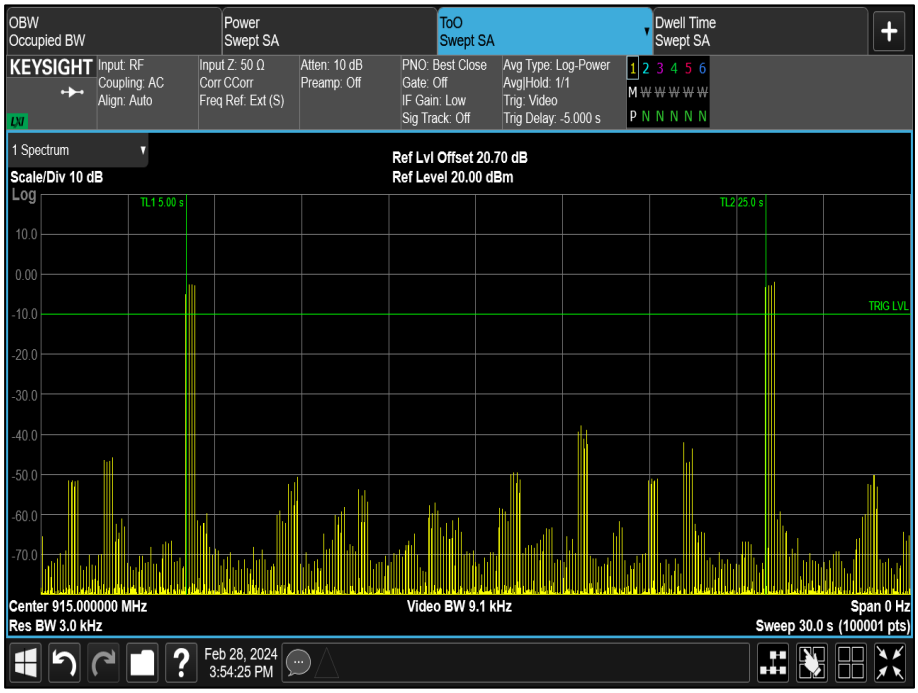

Figure 7 - Total Average Time of Occupancy

<u>FCC 47 CFR Part 15, Limit Clause (a)(1)(i)</u>

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

<u>Industry Canada RSS-247, Limit Clause 5.1 (c)</u>

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	79 Series III	611	12	15-Dec-2024
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	21-May-2024
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	18-Sep-2025
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
Cable (SMA to SMA 3m)	Junkosha	MWX221-03000AMSAMS/B	6000	12	05-Jun-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	12-Mar-2024

Table 25

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

2.5 Maximum Conducted Output Power

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)(2)
ISED RSS-247, Clause 5.4a
ISED RSS-GEN, Clause 6.12

2.5.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 1
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.5.3 Date of Test

11-March-2024 to 14-March-2024

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10 clause 7.8.5 using a spectrum analyser.

2.5.5 Environmental Conditions

Ambient Temperature	20.3 - 23.1 °C
Relative Humidity	41.6 - 44.1 %

2.5.6 Test Results

915 MHz (frequency)

Frequency (MHz)	Maximum Output Power	
	dBm	mW
915.00	7.86	6.11
921.50	7.74	5.94
927.25	7.90	6.17

Table 26

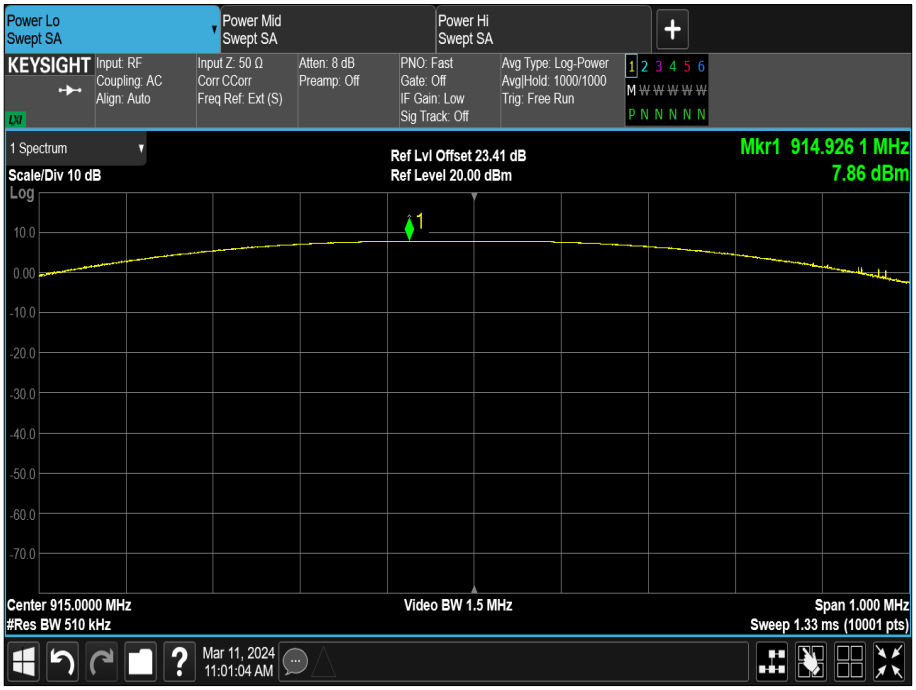

Figure 8- 915.00

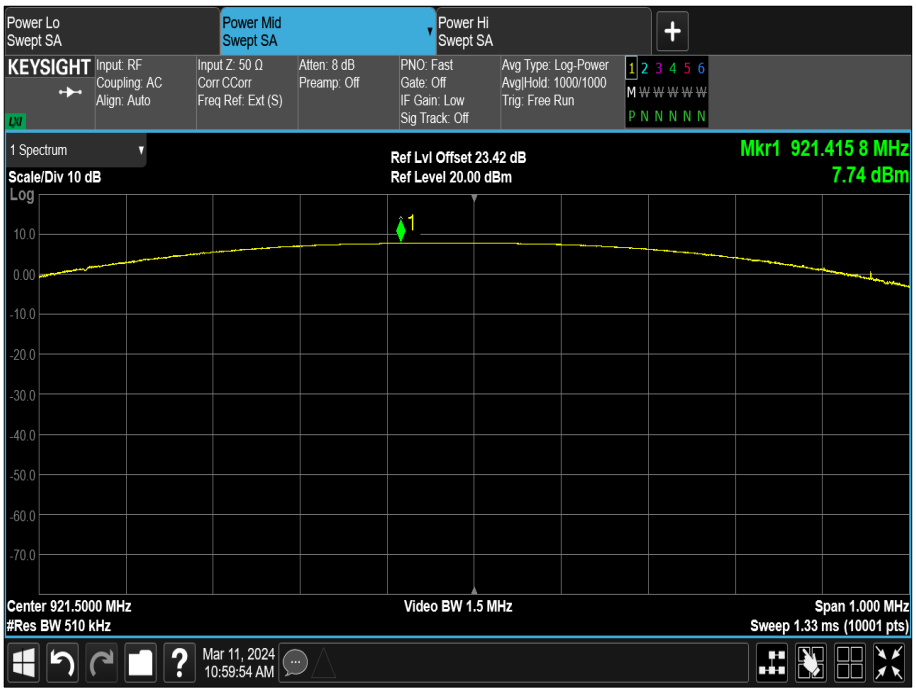

Figure 9- 921.50

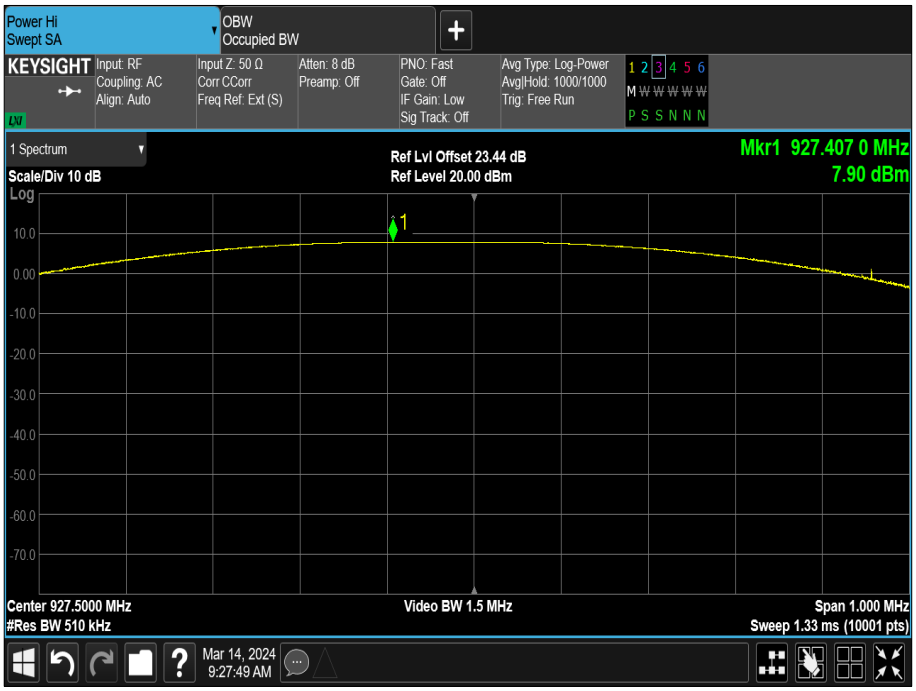

Figure 10- 927.50

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(2)

For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels.

ISED RSS-247, Limit Clause 5.4 (a)

For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	79 Series III	611	12	15-Dec-2024
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	18-Sep-2025
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	12-Mar-2024
Signal Conditioning Unit	TUV SUD	SPECTRUM_SCU001	6350	-	26-Jul-2024
SCU Cable Assembly SCU	TUV SUD	SPECTRUM_SCU_CA	6638	12	26-Jul-2024

Table 27

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

2.6 Authorised Band Edges

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d),
ISED RSS-247, Clause 5.5

2.6.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 1
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.6.3 Date of Test

14-March-2024

2.6.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

2.6.5 Environmental Conditions

Ambient Temperature	20.6 °C
Relative Humidity	46.9 %

2.6.6 Test Results

915 MHz (frequency)

Mode	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Static	927.5	928	-36.75
Static	927.5	902	-53.01
Static	915	928	-53.50
Static	915	902	-52.92
FHSS	Hopping	928	-42.63
FHSS	Hopping	902	-53.95

Table 28

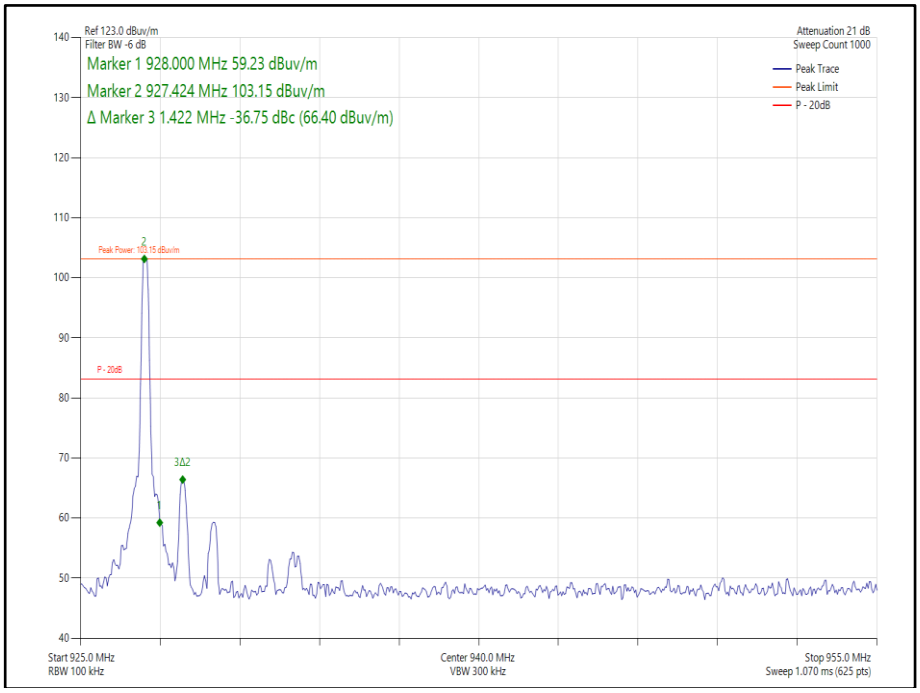

Figure 11 - ISM 915_Tx_Top_Y, 927.5 MHz, Band Edge Frequency 928 MHz

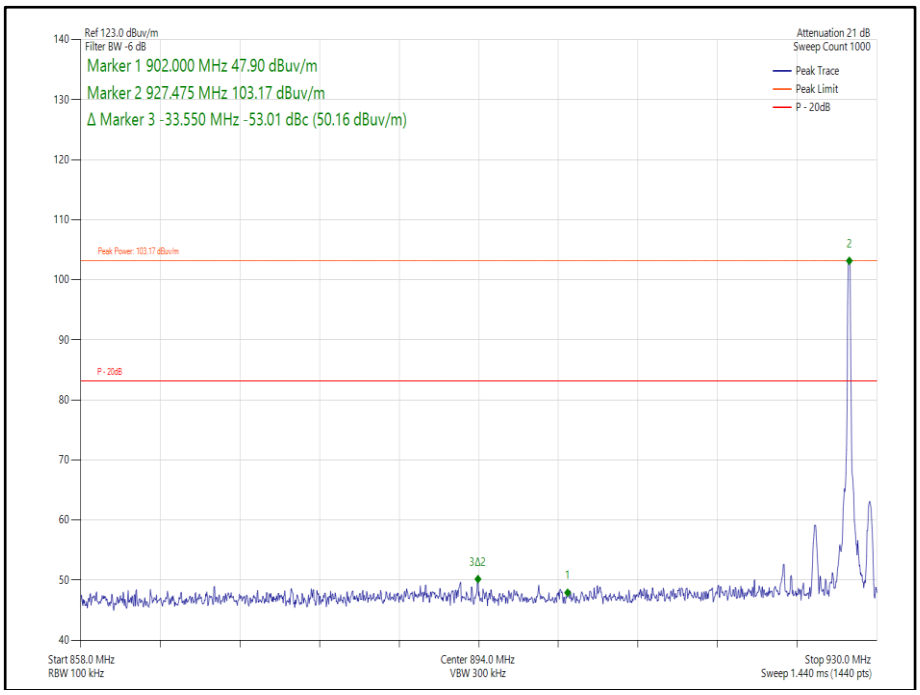

Figure 12 - ISM 915_Tx_Top_Y, 927.5 MHz, Band Edge Frequency 902 MHz

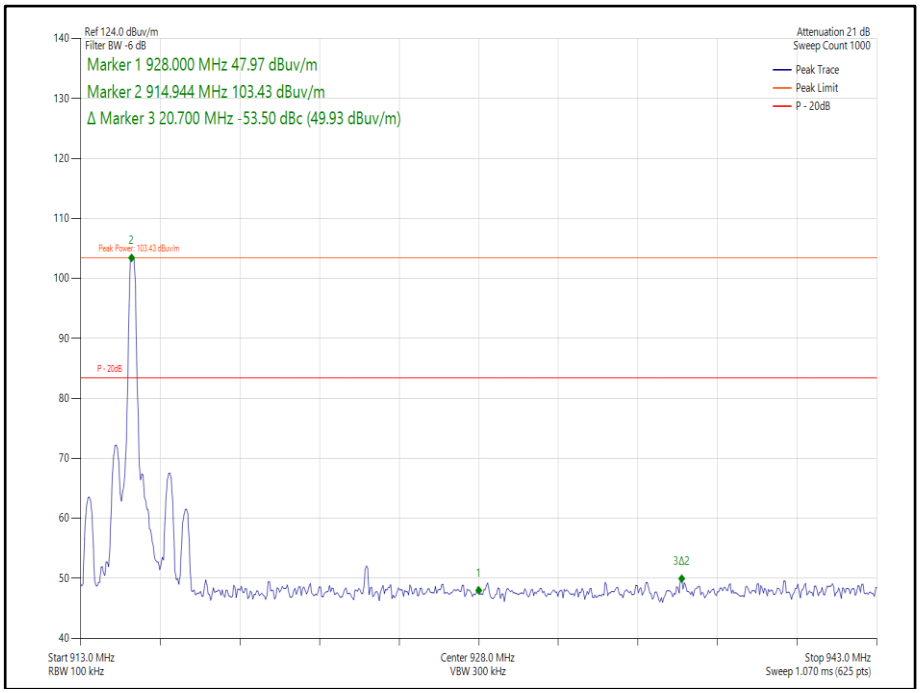

Figure 13 - ISM 915_Tx_Bottom_Y, 915 MHz, Band Edge Frequency 928 MHz

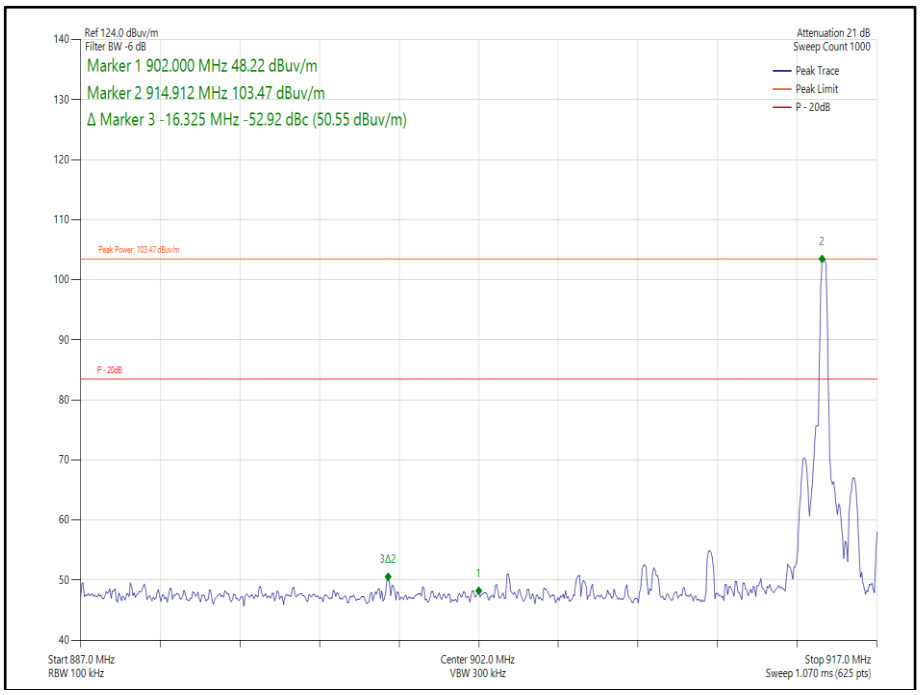

Figure 14 - ISM 915_Tx_Bottom_Y, 915 MHz, Band Edge Frequency 902 MHz

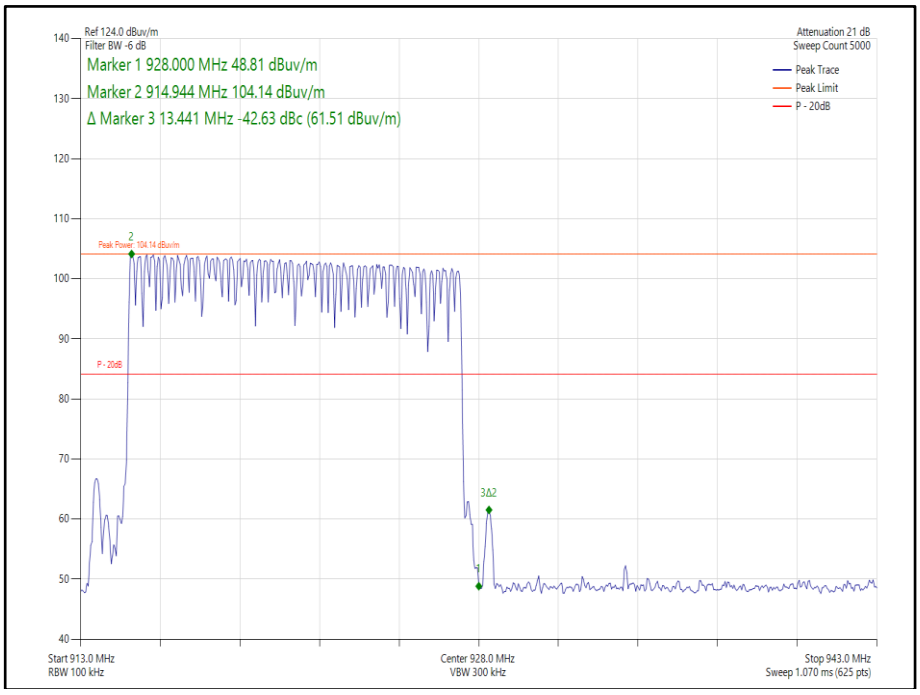

Figure 15 - FHSS_ Y, Band Edge Frequency 928 MHz

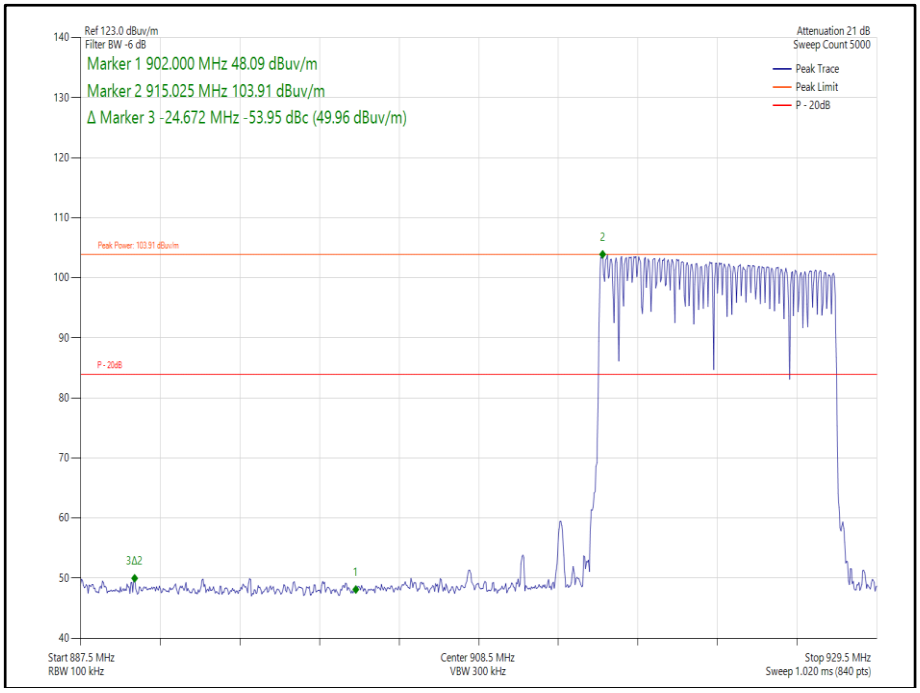

Figure 16 - FHSS, Band Edge Frequency 902 MHz

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Attenuator	Pasternack	PE7047-4	4935	12	20-Jul-2024
Test Receiver	Rohde & Schwarz	ESW44	5084	12	31-Aug-2024
Emissions Software	TUV SUD	EmX V3.2.0	5125	-	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
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	20-Apr-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
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025

Table 27

TU - Traceability Unscheduled

2.7 Spurious Radiated Emissions

2.7.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.209 and 15.247 (d)
ISED RSS-247, Clause 3.3 and 5.5
ISED RSS-GEN, Clause 6.13 and 8.9

2.7.2 Equipment Under Test and Modification State

Power Hub CCU (Central Control Unit), Serial Number: 641-9399, Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 0
White RCM (Radio Communication Module), Serial Number: 253-96,1 Modification State: 1
GDU (Graphical Display Unit), Serial Number: 250240, Modification State: 0
RTD (Real Time Detection) Unit, Serial Number: 249591, Modification State: 0
E6 Handset, Serial Number: 254506, Modification State: 0

2.7.3 Date of Test

02-March-2024 to 16-March-2024

2.7.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.
For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10 (2013), clause 4.1.4.2.4 and ANSI C63.10 (2020) clause 4.1.5.2.6 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10 (2013), clause 4.1.4.2.2 and ANSI C63.10 (2020) clause 4.1.5.2.1.

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. As the EUT was considered mobile/portable and therefore reasonable to be used in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4. For EUT's with multiple connectors of the same type, additional interconnecting cables were connected, and pre-scans performed to determine whether the level of the emissions were increased by >2 dB.

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 20 dBc outside restricted bands. 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).

Where formal measurements have been necessary, the results have been presented in the emissions table.

2.7.5 Example Test Setup Diagram

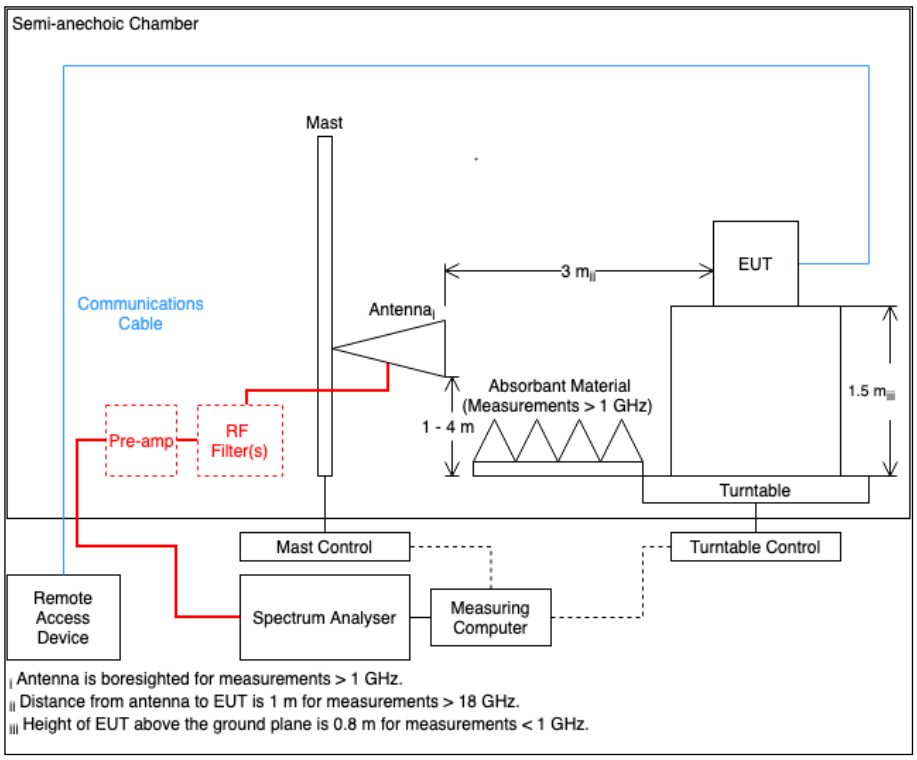

Figure 17

2.7.6 Environmental Conditions

Ambient Temperature	19.6 - 23.1 °C
Relative Humidity	46.1 - 56.2 %

2.7.7 Test Results

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.780	48.76	54.00	-5.24	CISPR Avg	200	164	Horizontal
3660.015	46.36	54.00	-7.64	CISPR Avg	175	214	Horizontal

Table 28 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

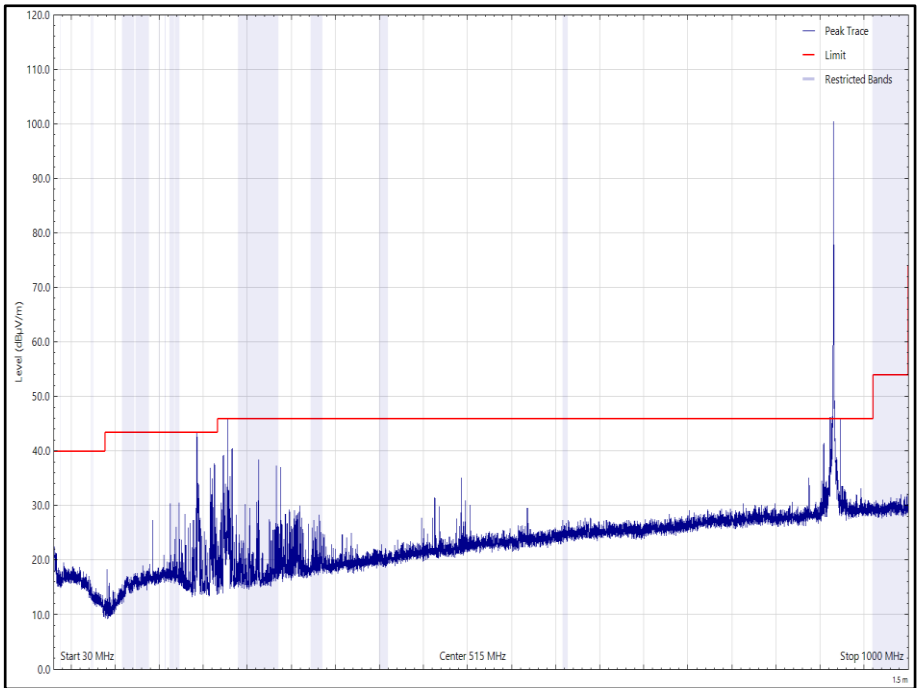

Figure 18 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

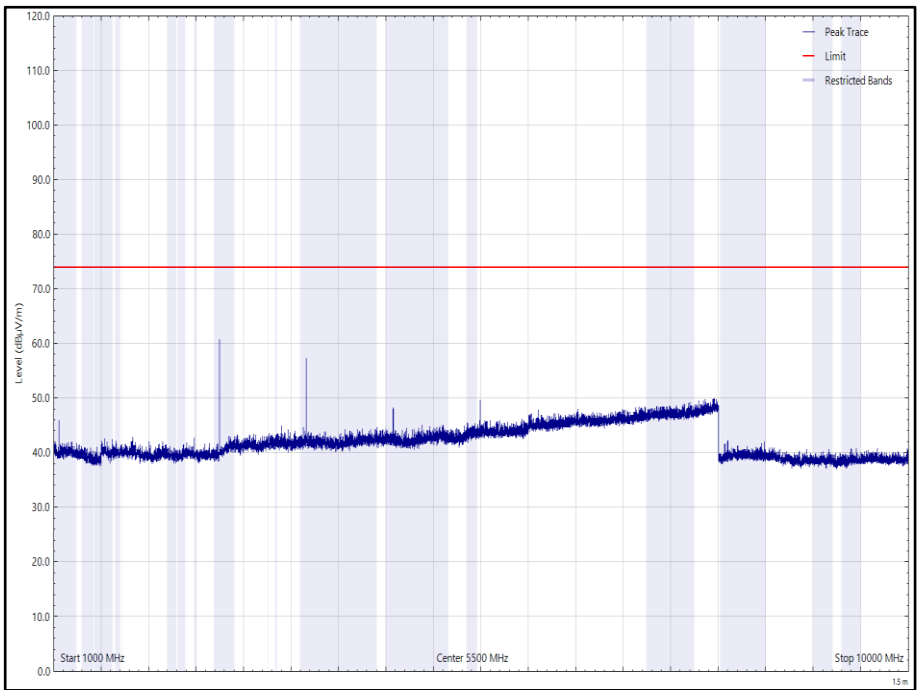

Figure 19 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

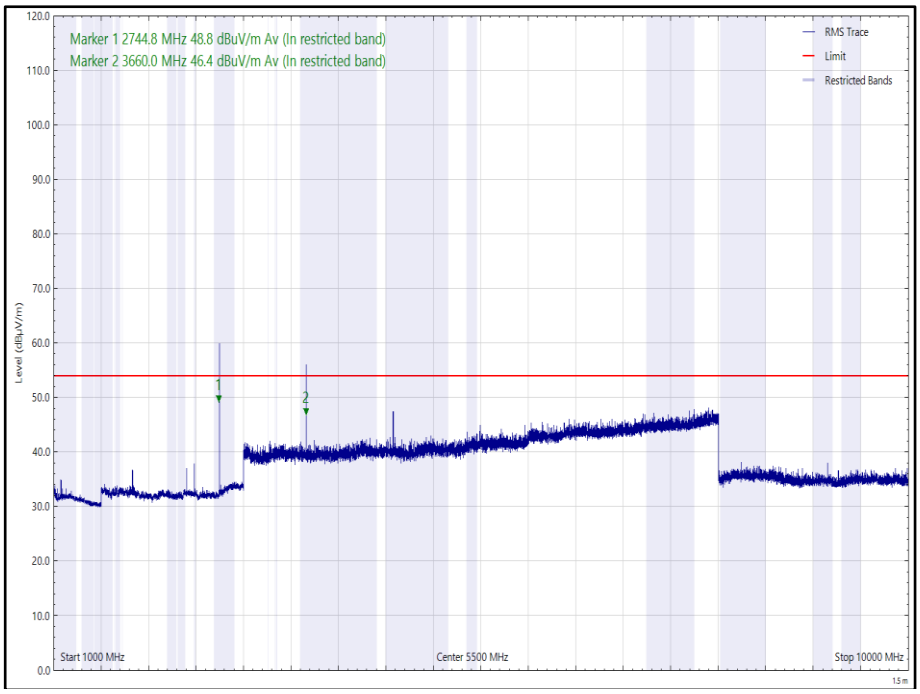

Figure 20 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (rms)

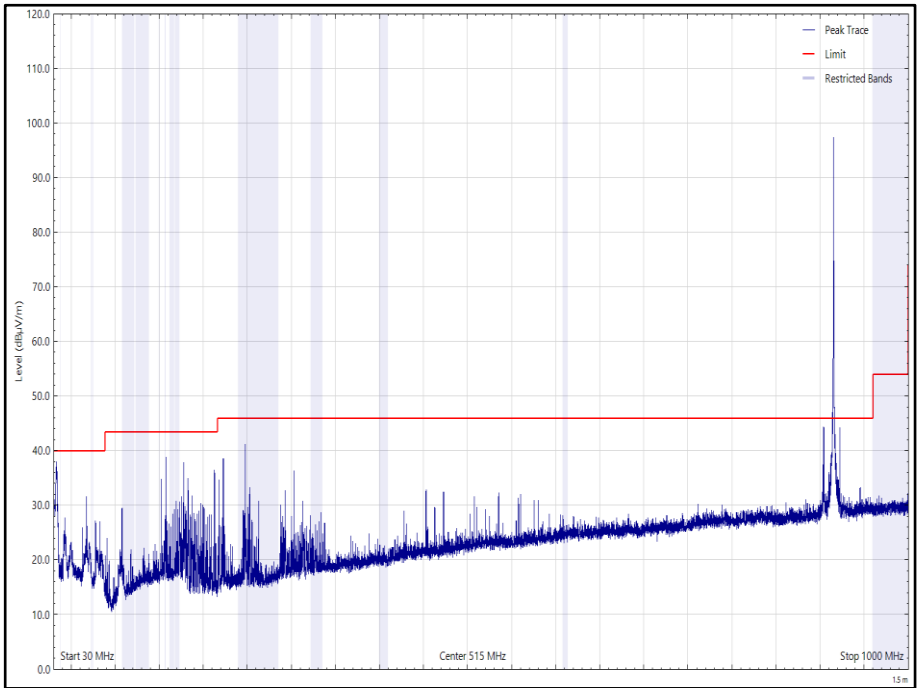

Figure 21 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 30 MHz to 1 GHz, Vertical (Peak)

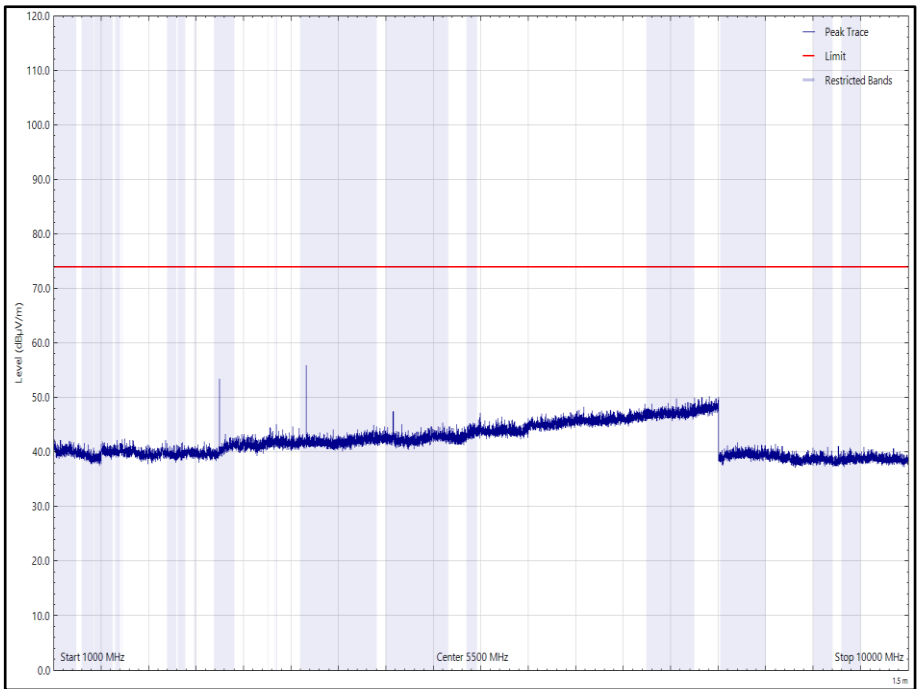

Figure 22 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (Peak)

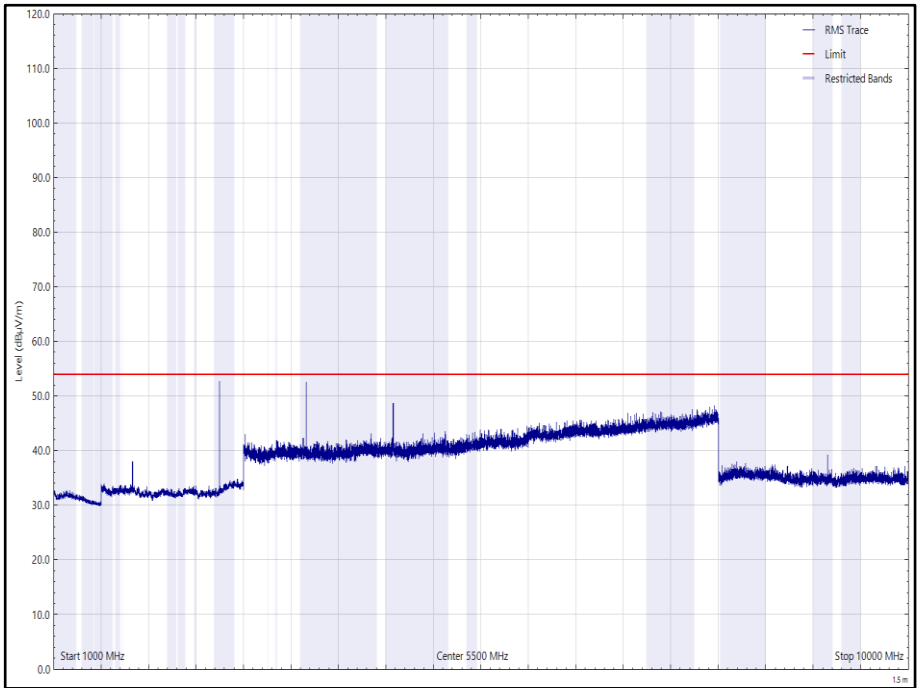

Figure 23 - ISM 915_Tx_Bottom_X Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2744.790	48.50	54.00	-5.50	CISPR Avg	203	164	Horizontal
3659.720	45.29	54.00	-8.71	CISPR Avg	317	176	Horizontal

Table 29 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

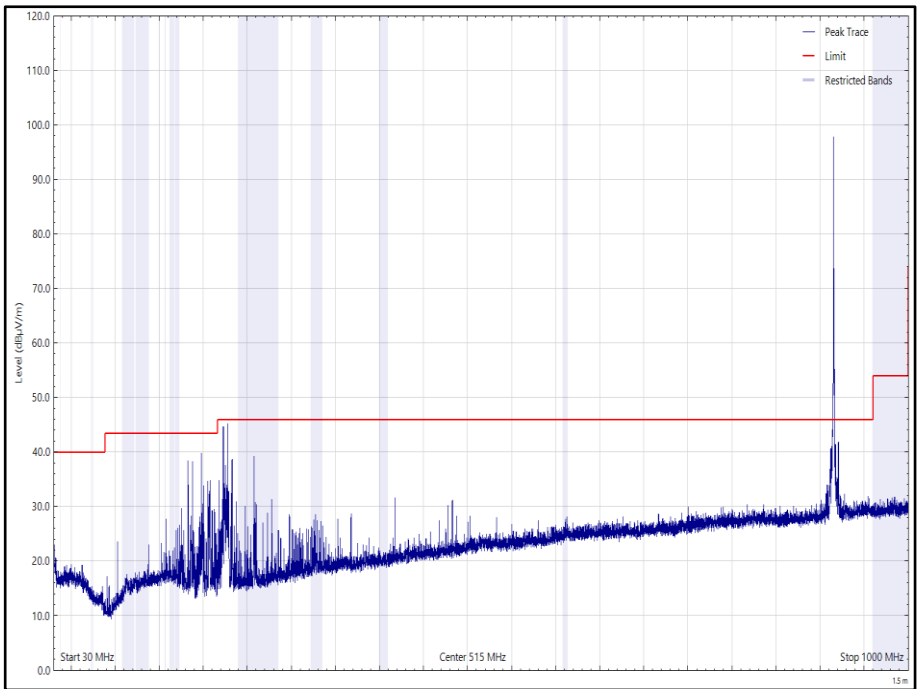

Figure 24 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

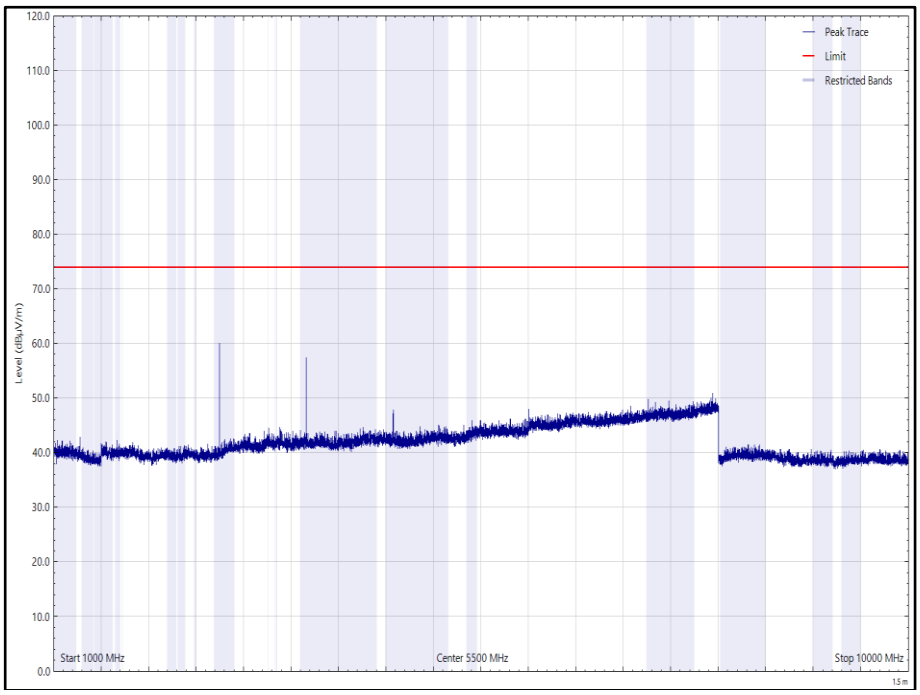

Figure 25 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

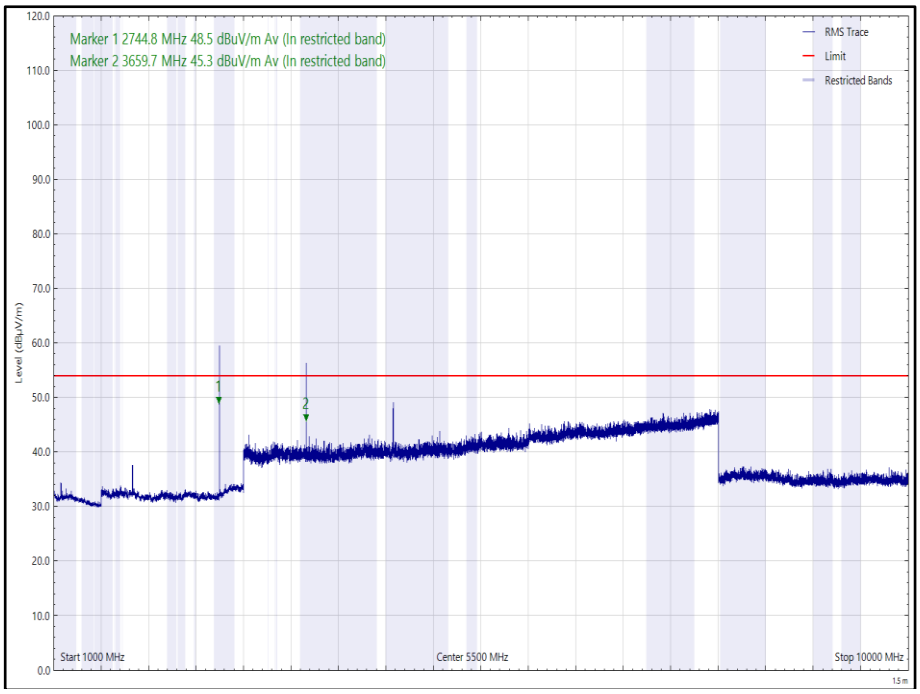

Figure 26 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (rms)

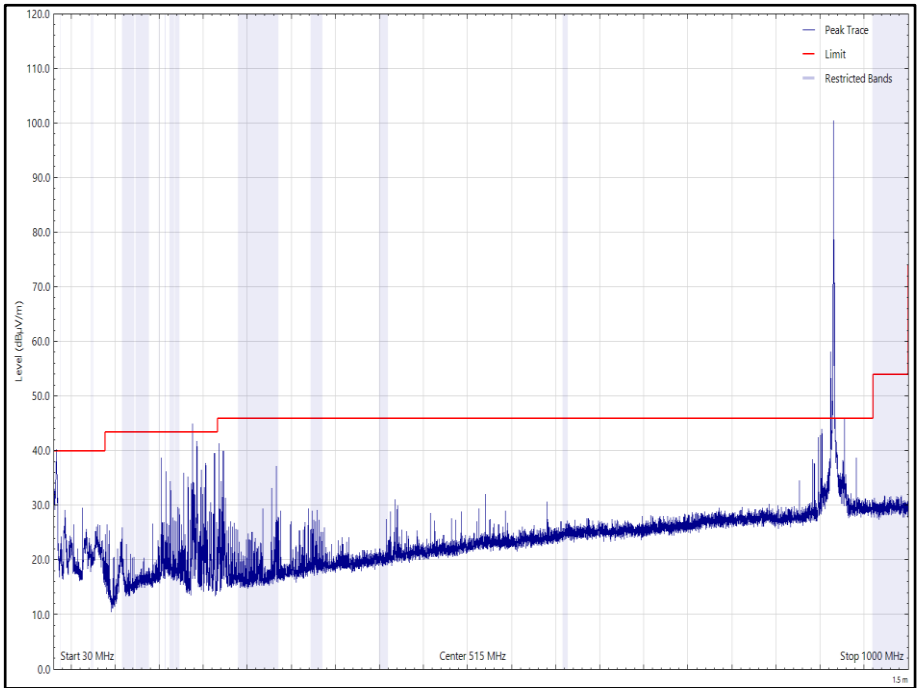

Figure 27 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 30 MHz to 1 GHz, Vertical (Peak)

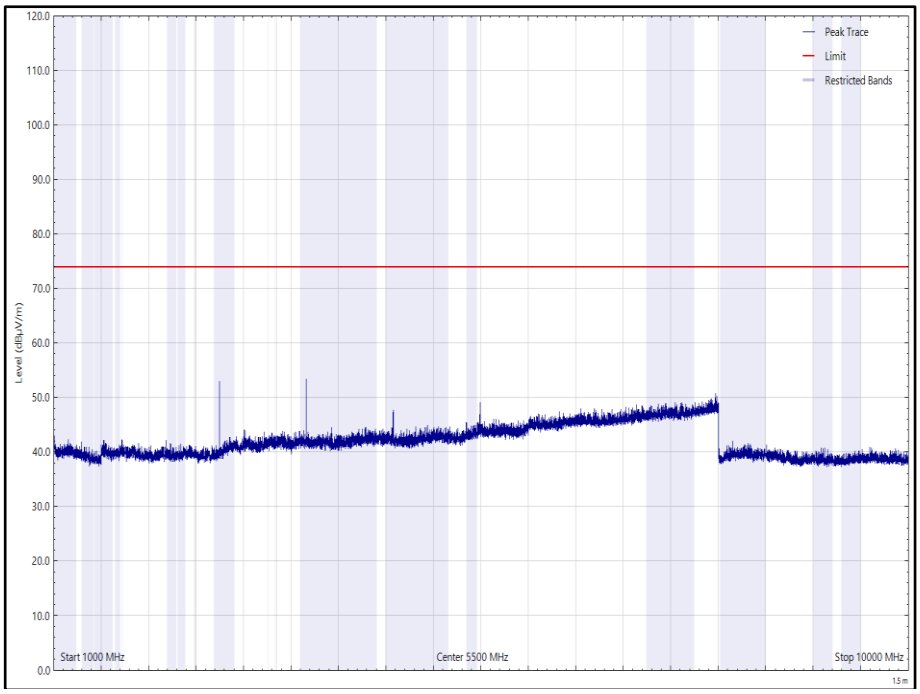

Figure 28 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (Peak)

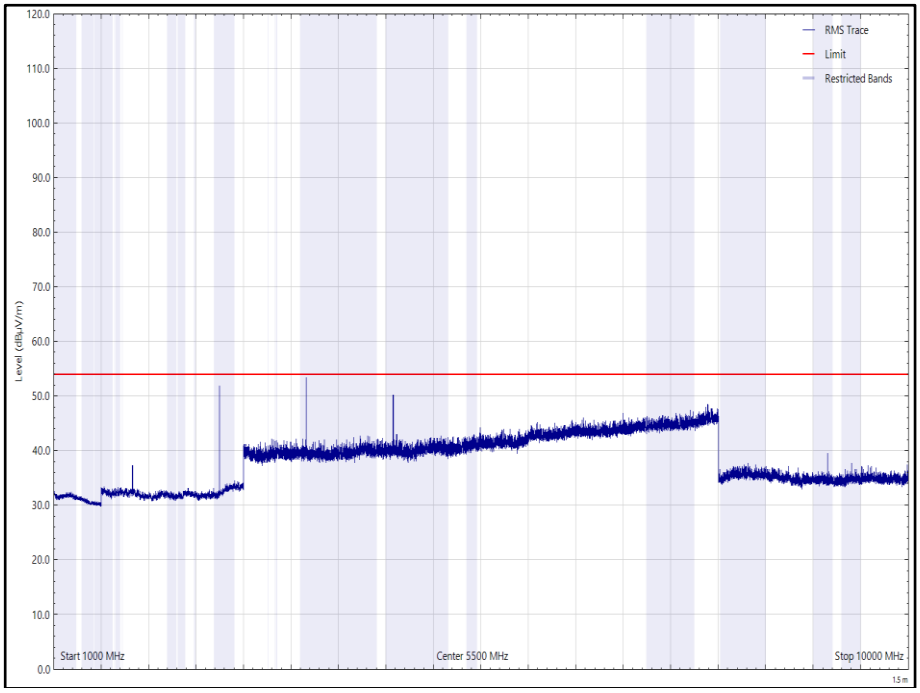

Figure 29 - ISM 915_Tx_Bottom_Y Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
172.474	38.23	43.52	-5.29	Q-Peak	349	104	Vertical
2744.775	47.56	54.00	-6.44	CISPR Avg	134	165	Horizontal
2744.820	47.44	54.00	-6.56	CISPR Avg	169	195	Vertical
3660.090	46.97	54.00	-7.03	CISPR Avg	214	160	Horizontal
3660.115	47.59	54.00	-6.41	CISPR Avg	202	150	Vertical

Table 29 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

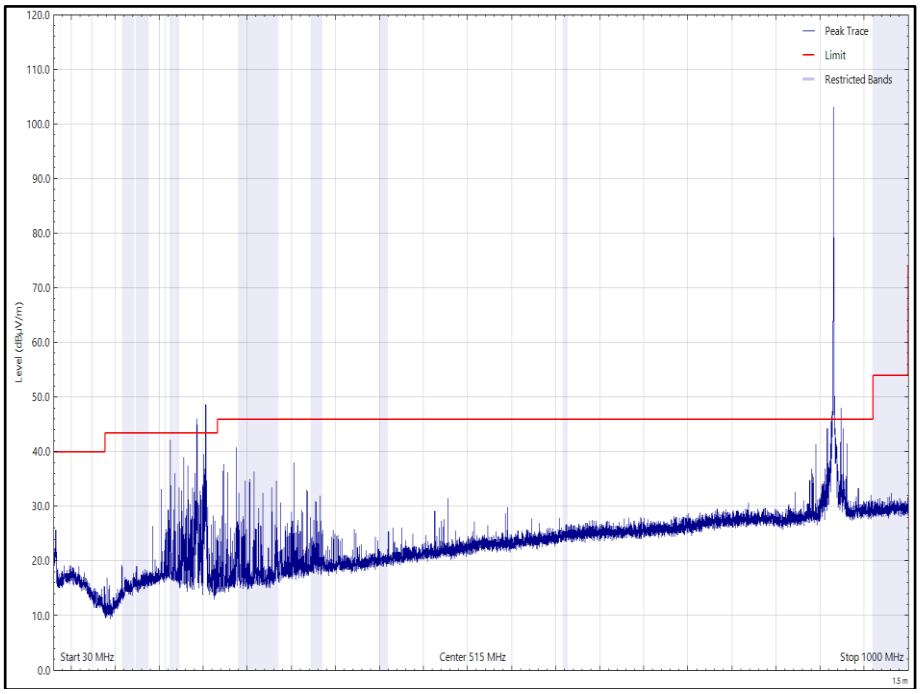

Figure 30 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

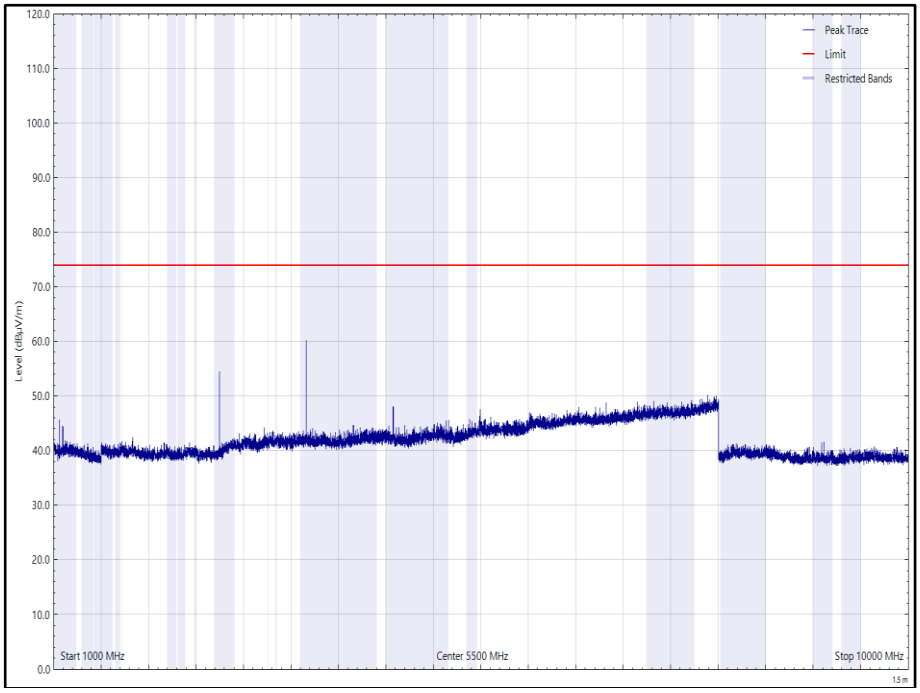

Figure 31 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

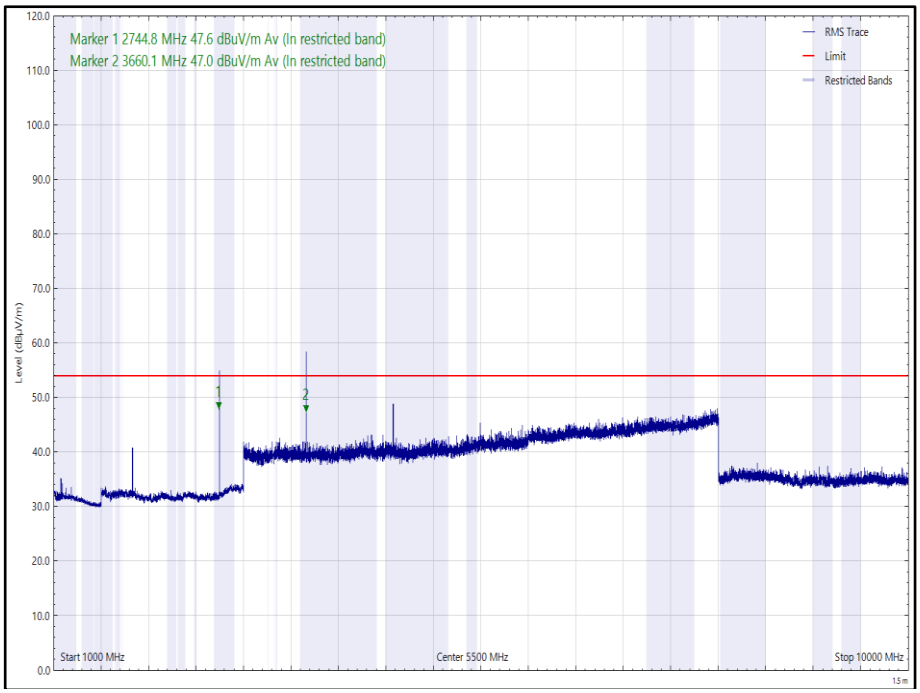

Figure 32 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 1 GHz to 10 GHz, Horizontal (rms)

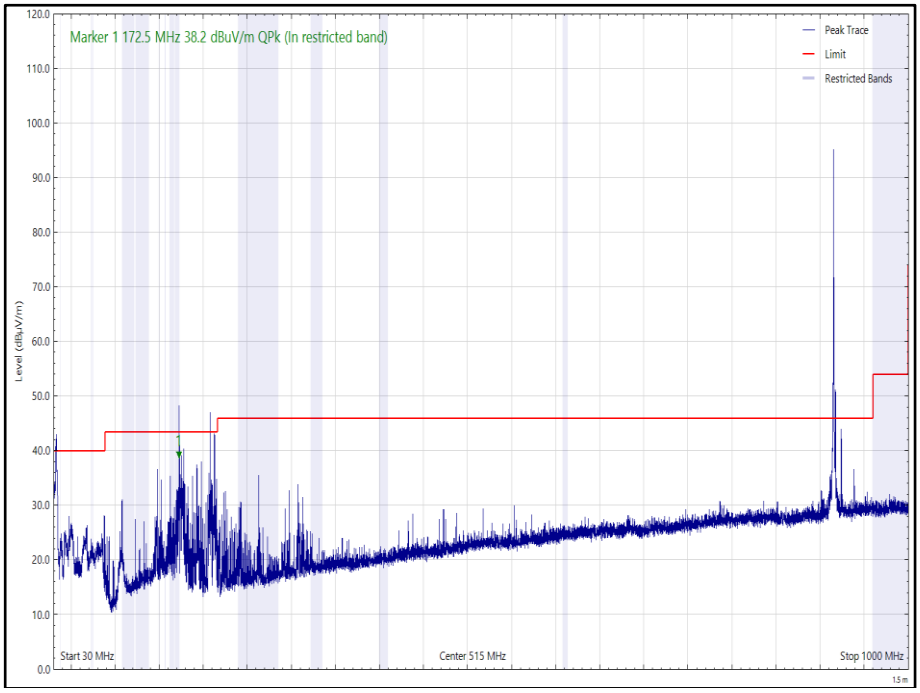

Figure 33 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 30 MHz to 1 GHz, Vertical (Peak)

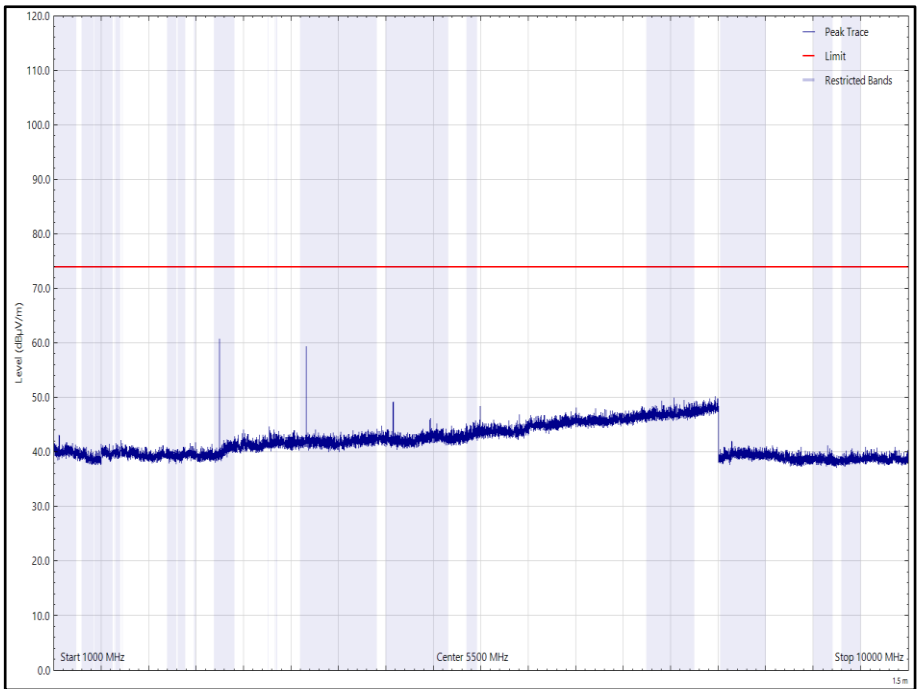

Figure 34 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (Peak)

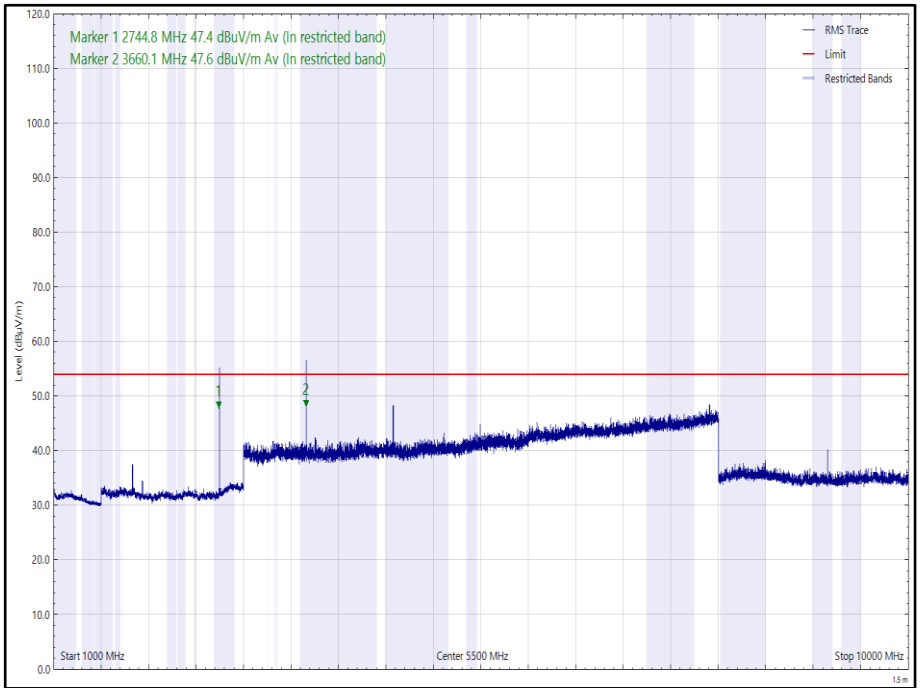

Figure 35 - ISM 915_Tx_Bottom_Z Plane, 915 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2764.305	46.53	54.00	-7.47	CISPR Avg	183	150	Horizontal
3686.025	46.34	54.00	-7.66	CISPR Avg	175	171	Horizontal

Table 30 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

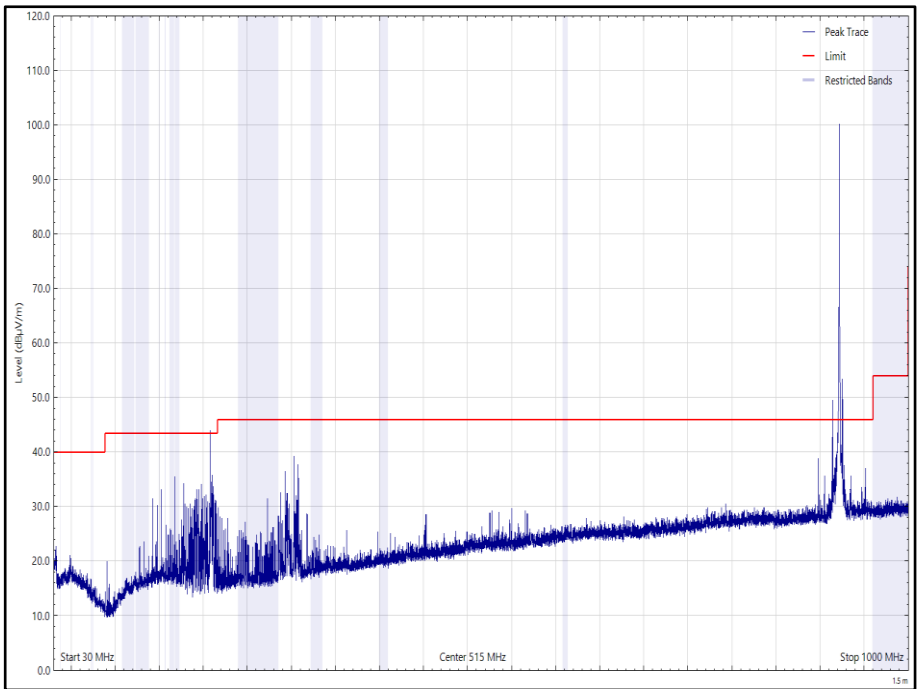

Figure 36 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

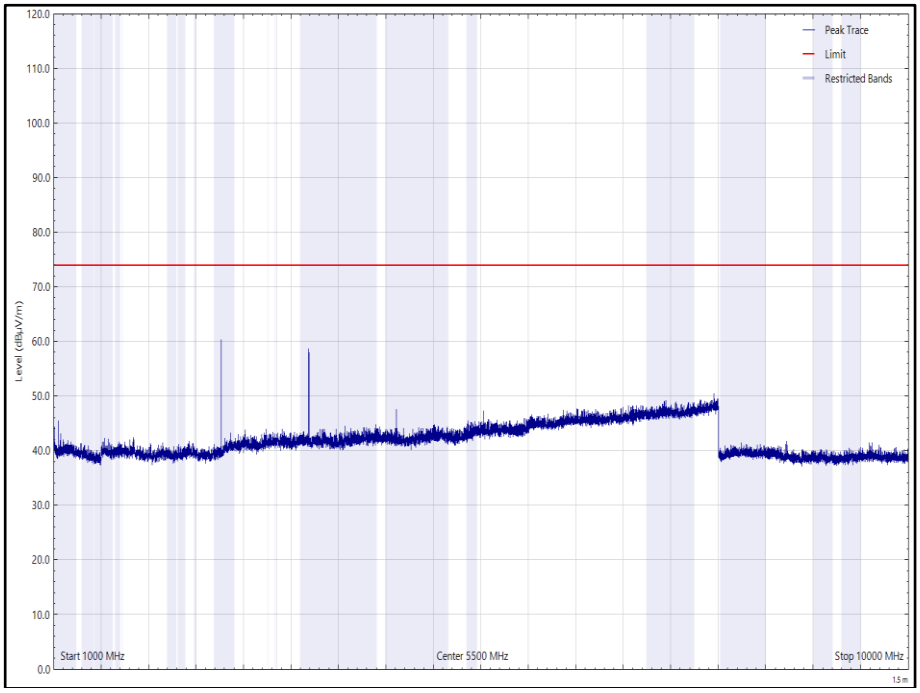

Figure 37 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

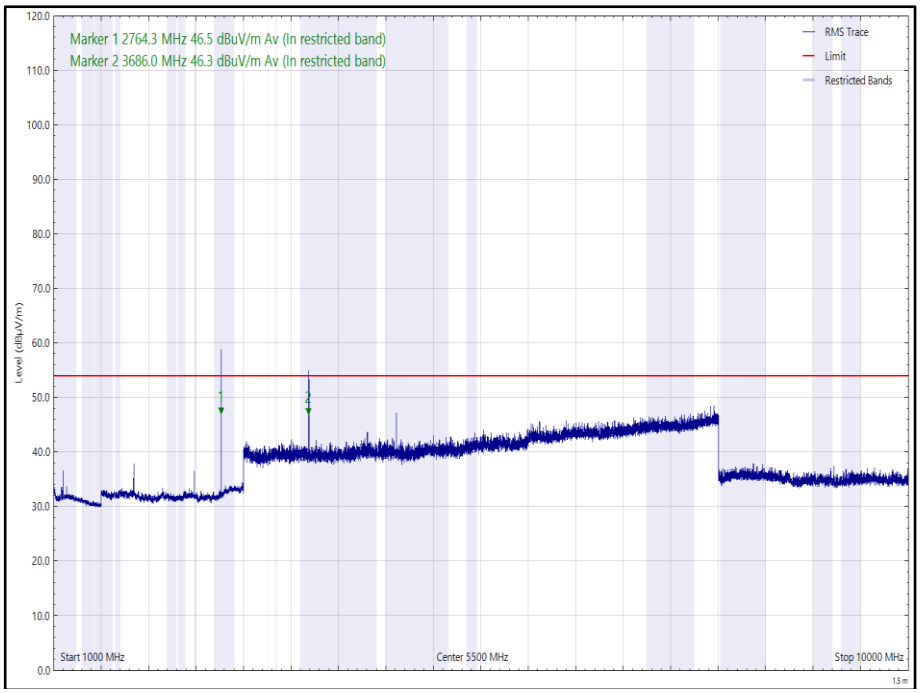

Figure 38 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

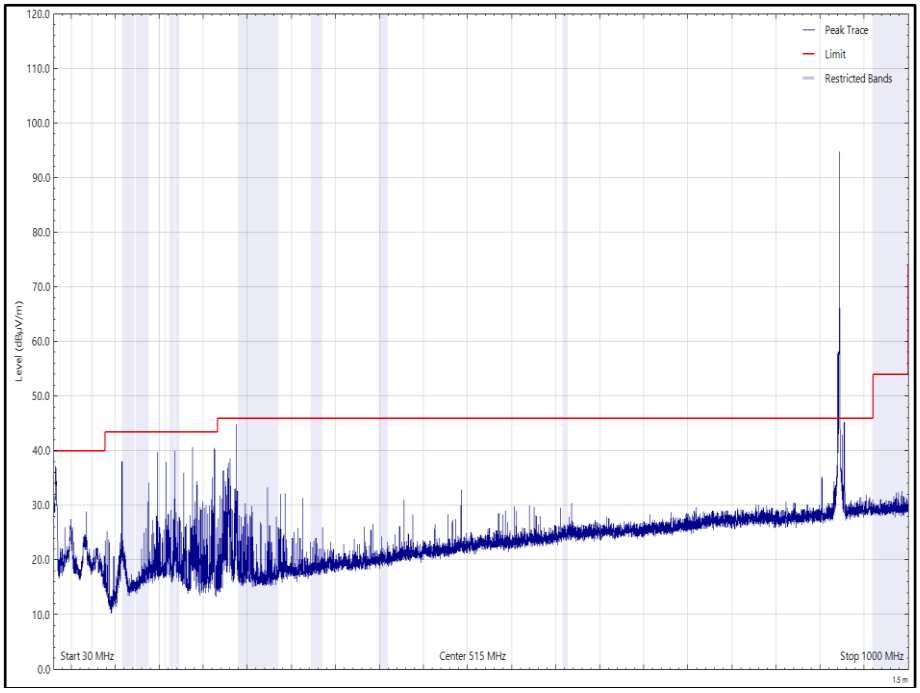

Figure 39 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

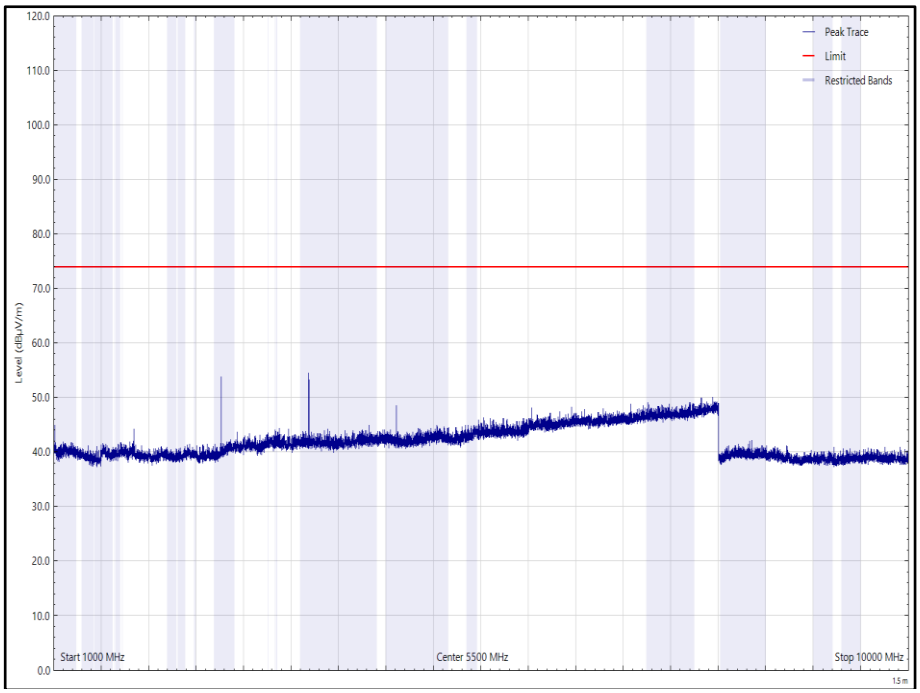

Figure 40 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

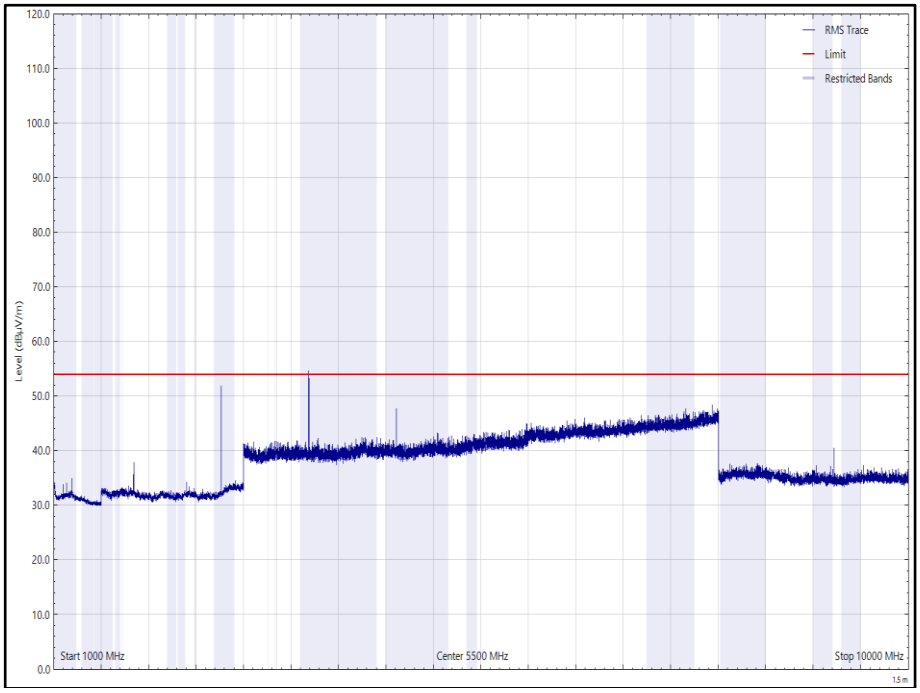

Figure 41 - ISM 915_Tx_Middle_X Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
3685.850	45.76	54.00	-8.24	CISPR Avg	314	203	Horizontal

Table 31 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

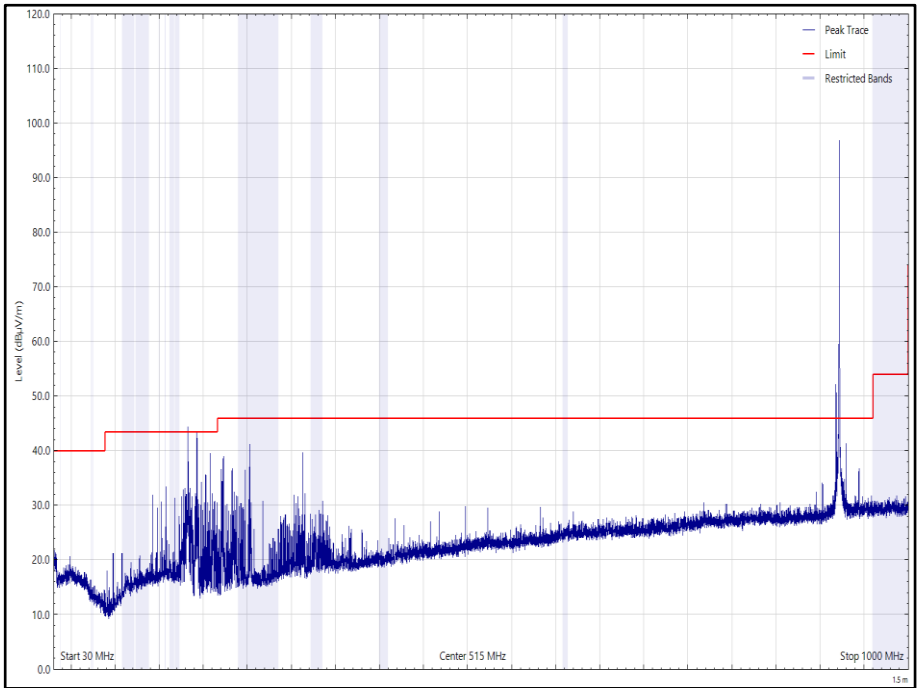

Figure 42 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

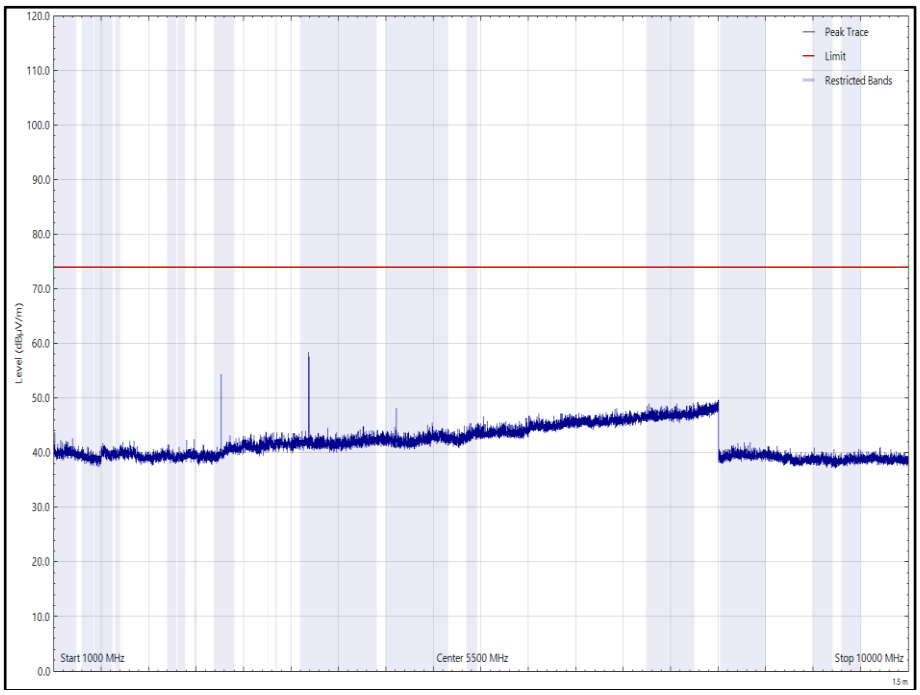

Figure 43 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

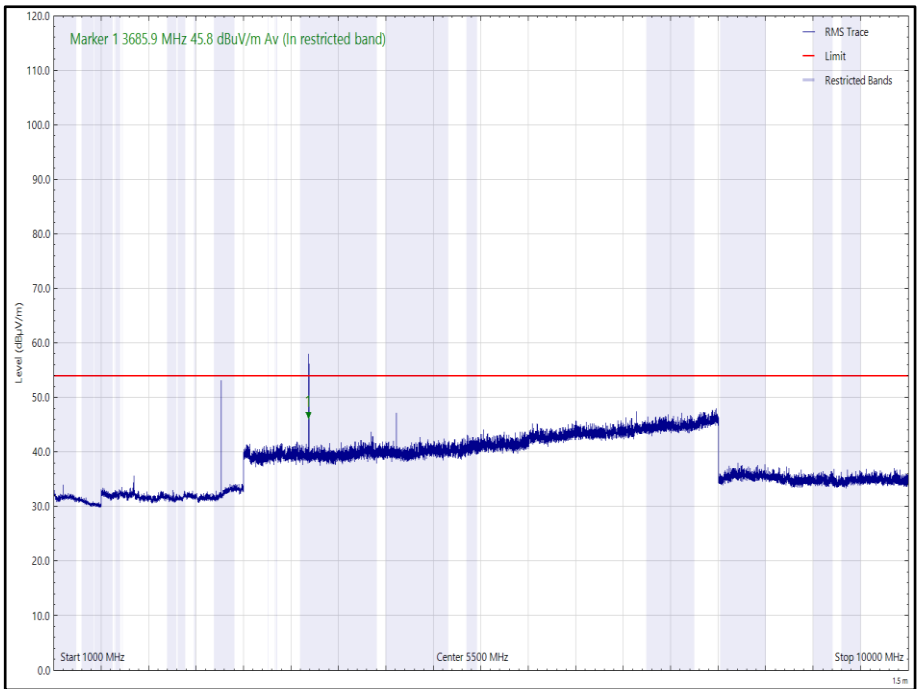

Figure 44 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

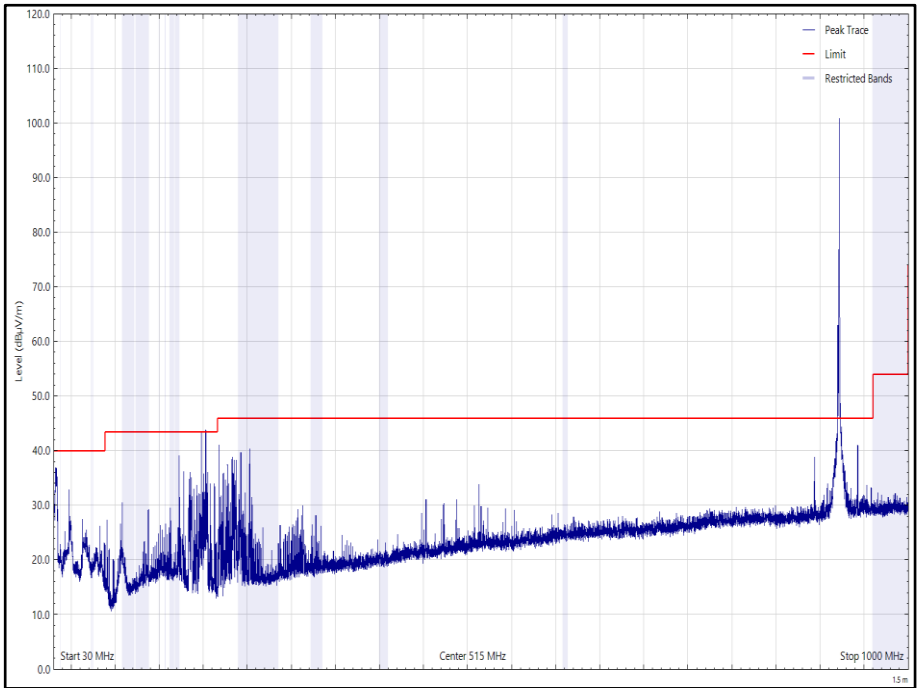

Figure 45 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

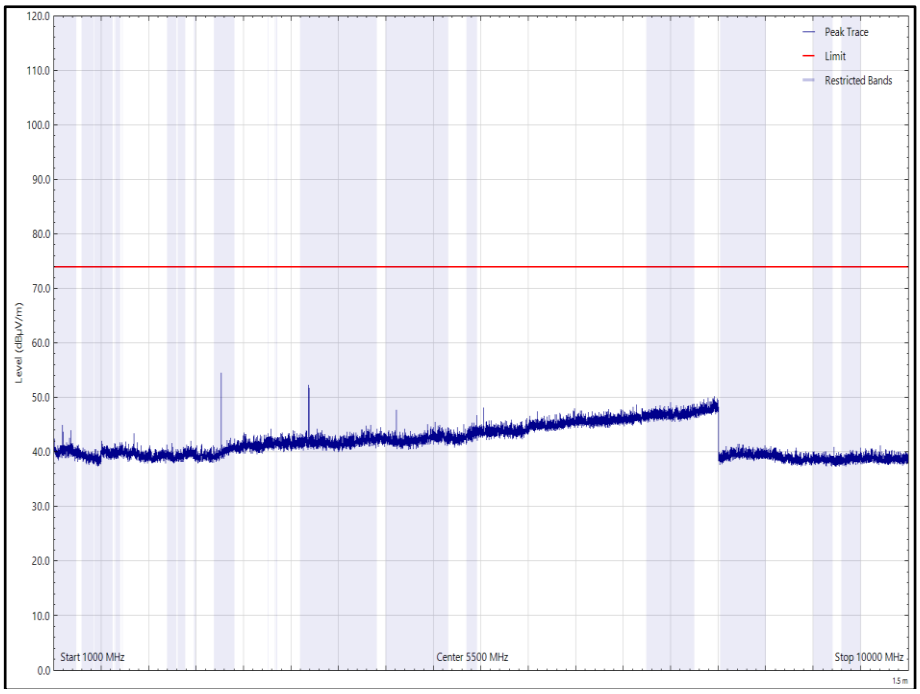

Figure 46 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

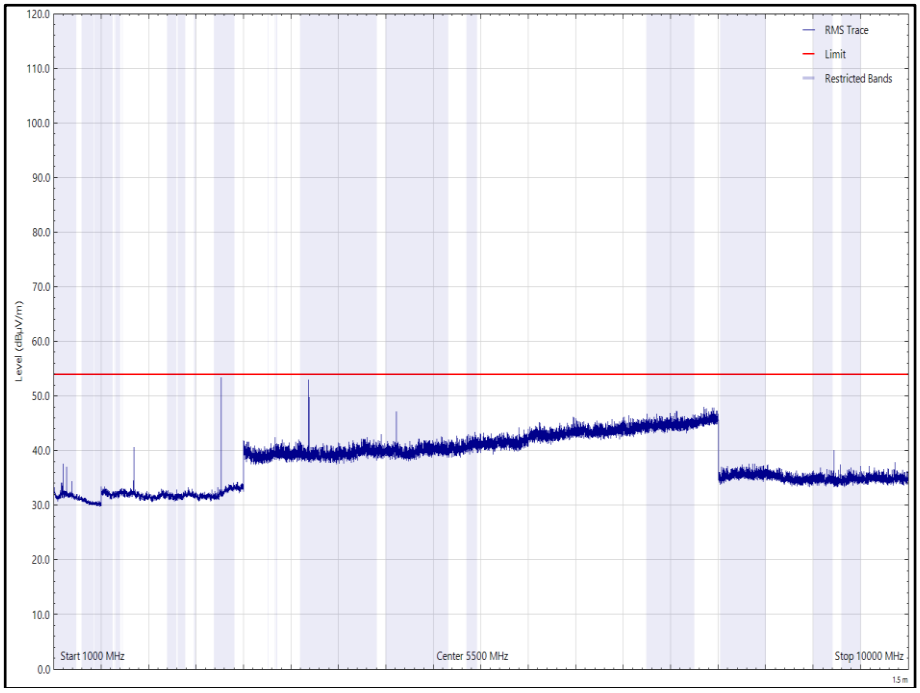

Figure 47 - ISM 915_Tx_Middle_Y Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
172.509	36.27	43.52	-7.25	Q-Peak	340	100	Vertical
2764.285	46.84	54.00	-7.16	CISPR Avg	182	251	Vertical
3685.735	47.03	54.00	-6.97	CISPR Avg	220	150	Vertical
3685.755	47.66	54.00	-6.34	CISPR Avg	212	150	Horizontal

Table 32 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

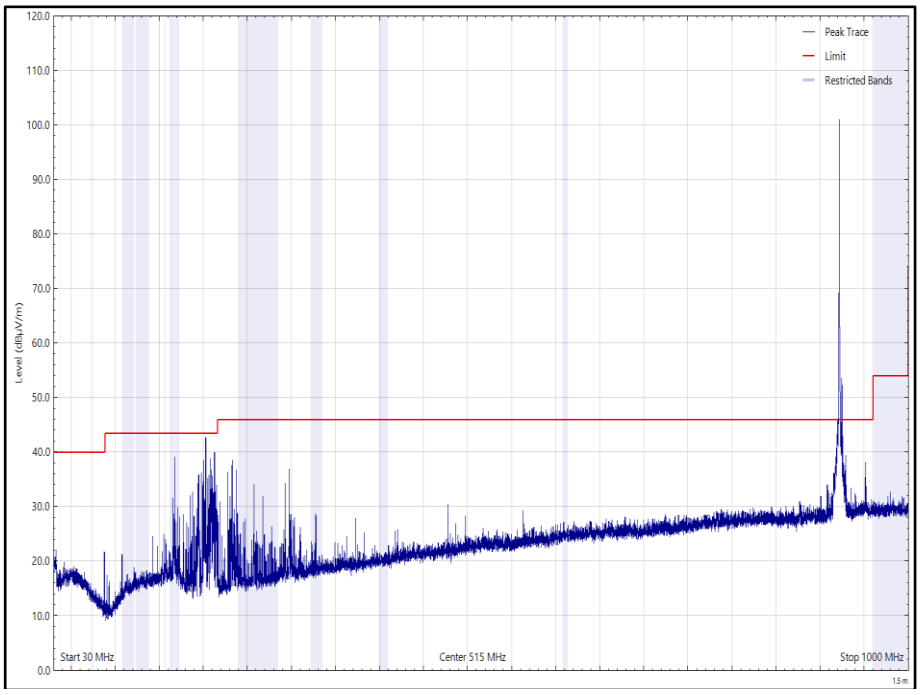

Figure 48 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

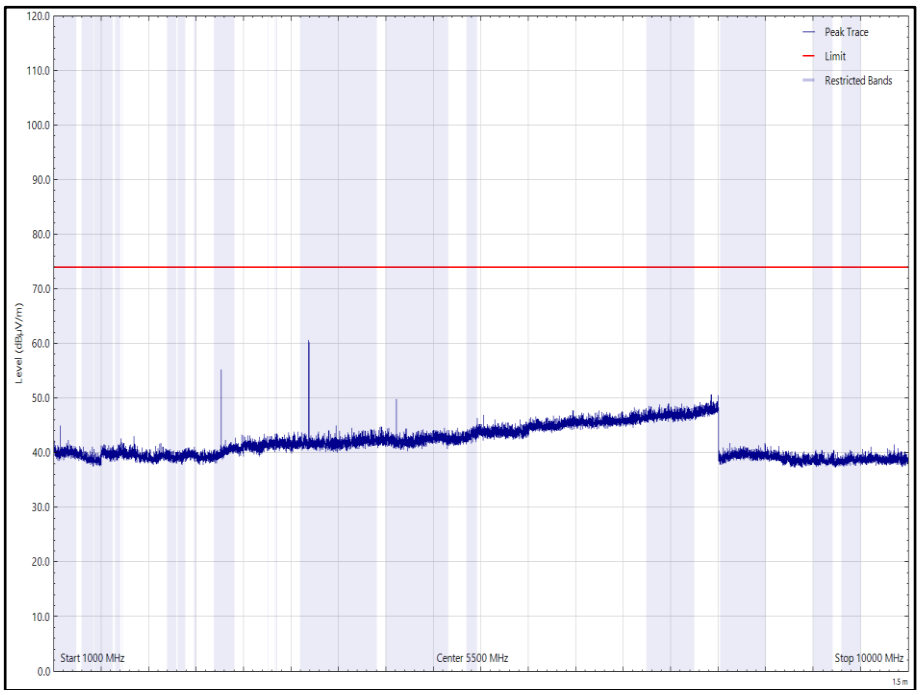

Figure 49 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

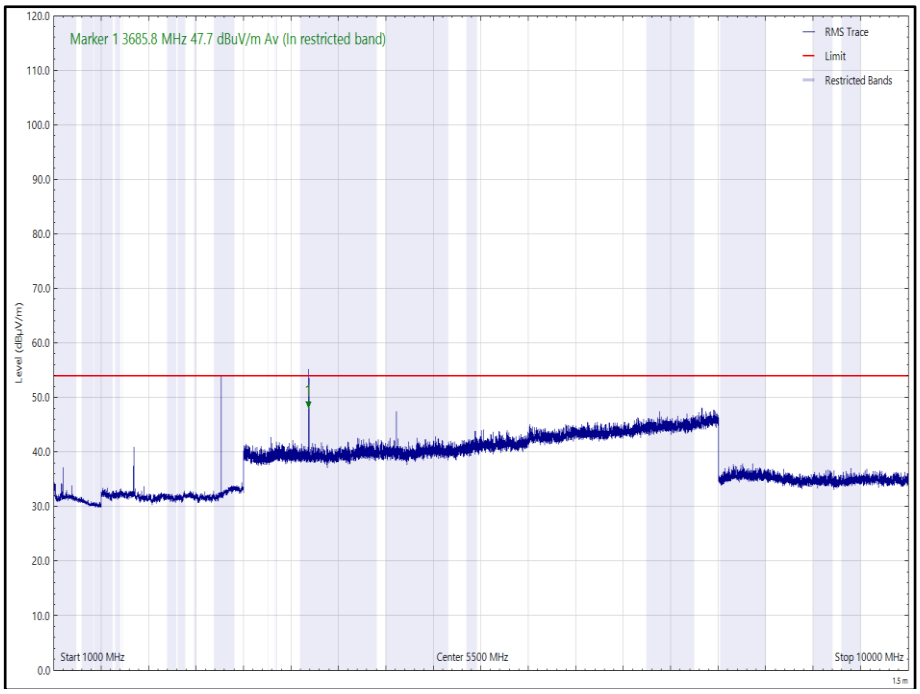

Figure 50 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

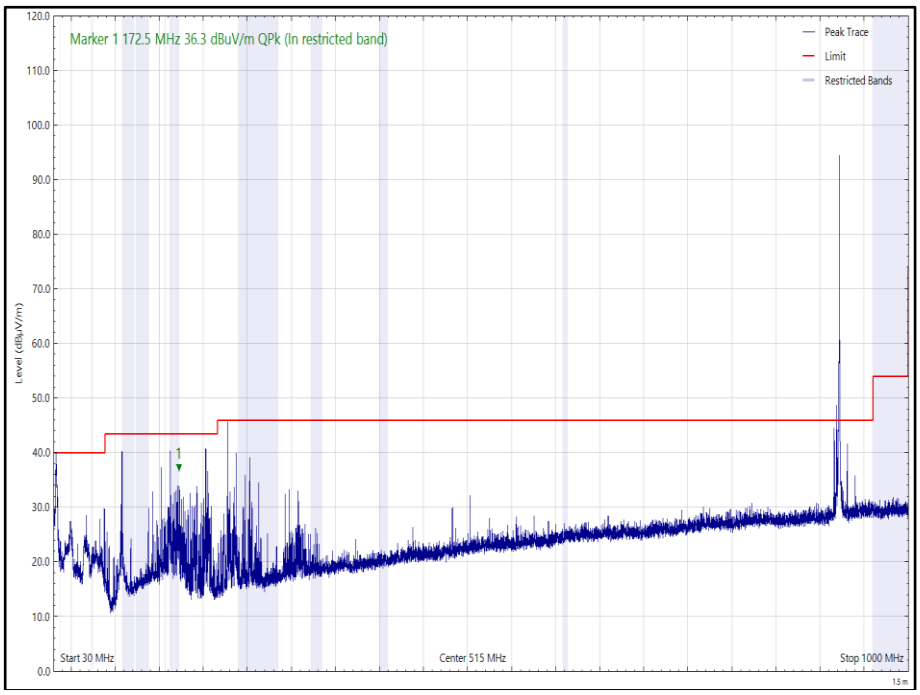

Figure 51 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

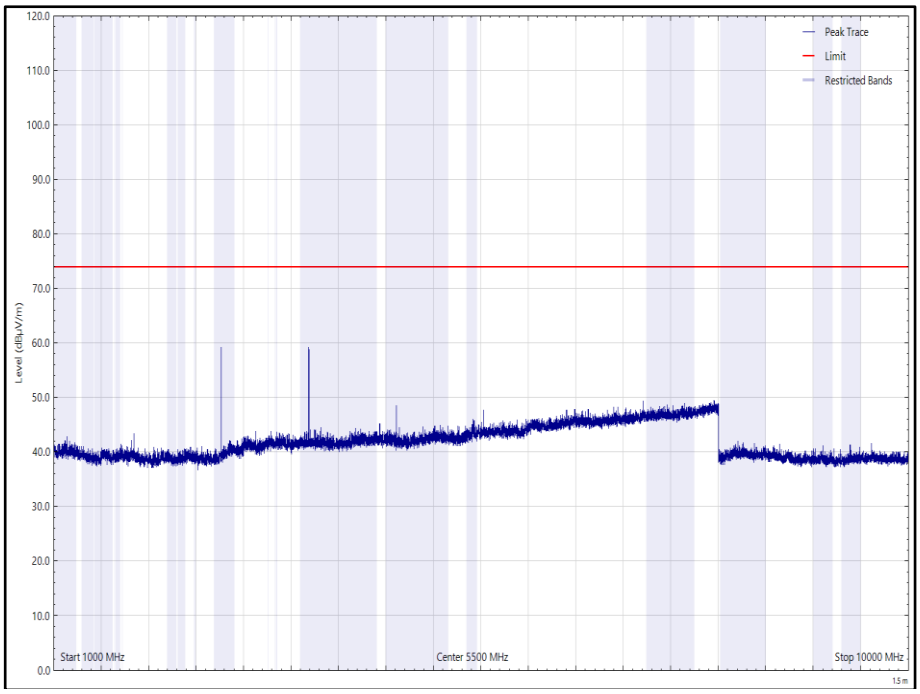

Figure 52 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

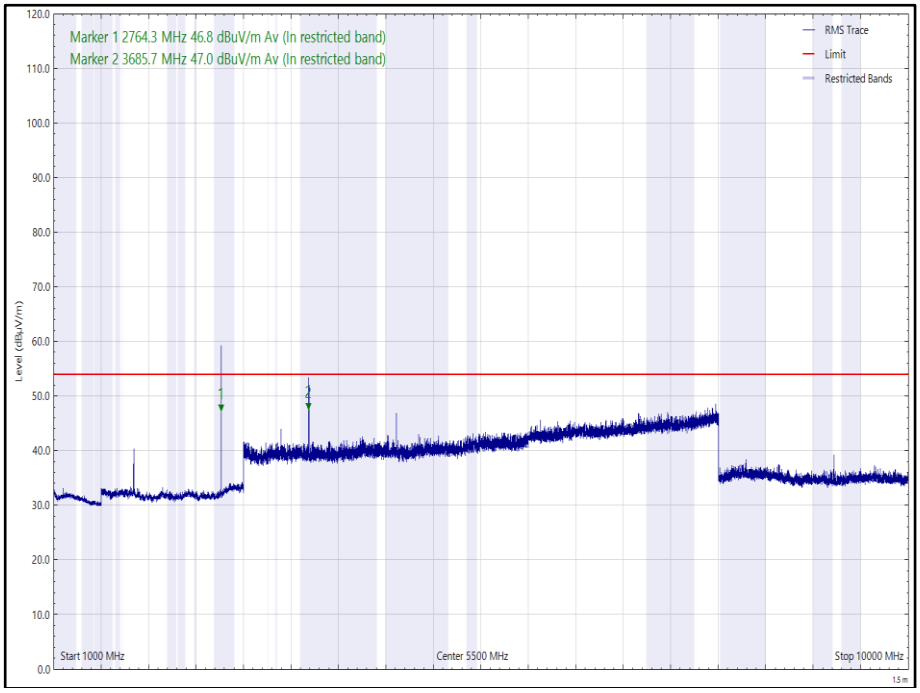

Figure 53 - ISM 915_Tx_Middle_Z Plane, 921.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
172.504	35.16	43.52	-8.36	Q-Peak	350	104	Vertical
3707.990	46.72	54.00	-7.28	CISPR Avg	173	151	Horizontal

Table 33 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

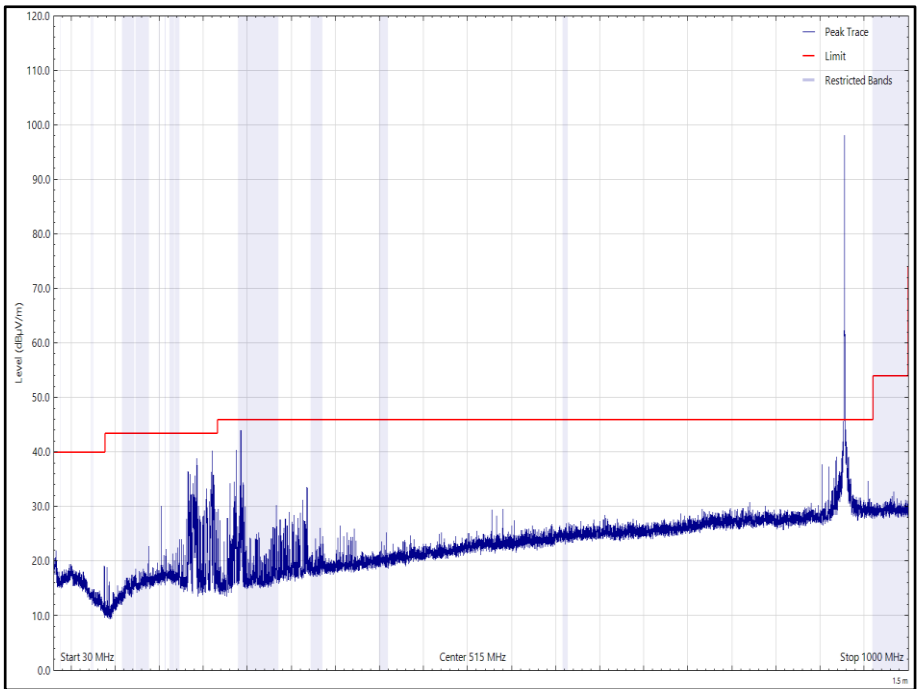

Figure 54 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

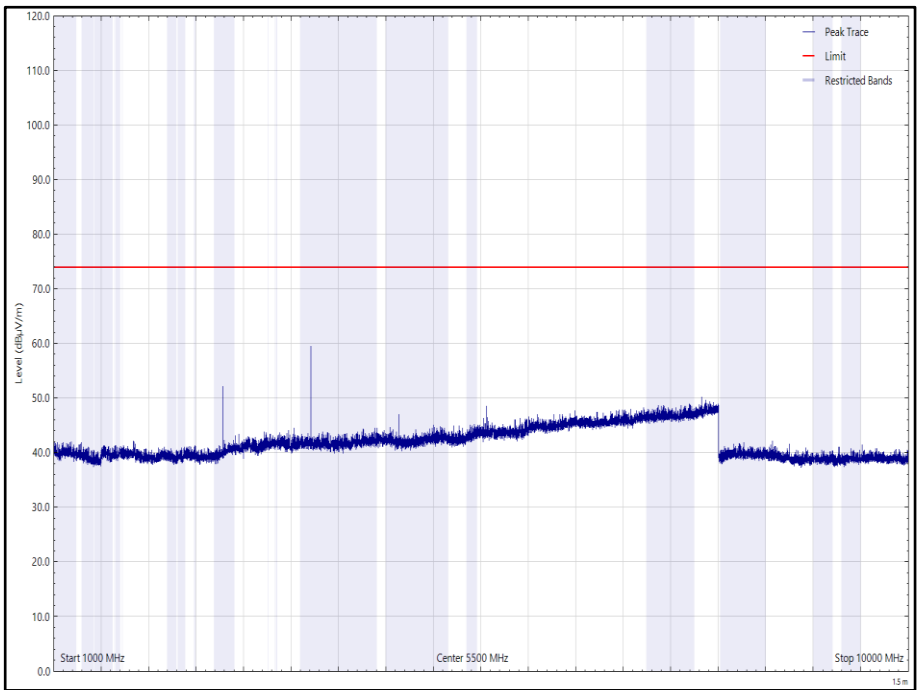

Figure 55 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

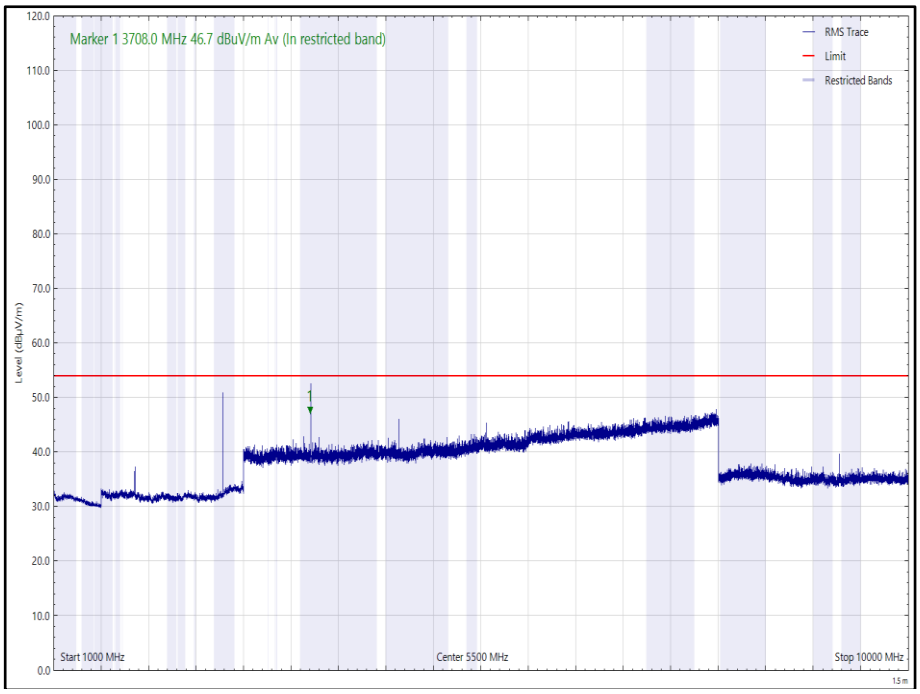

Figure 56 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

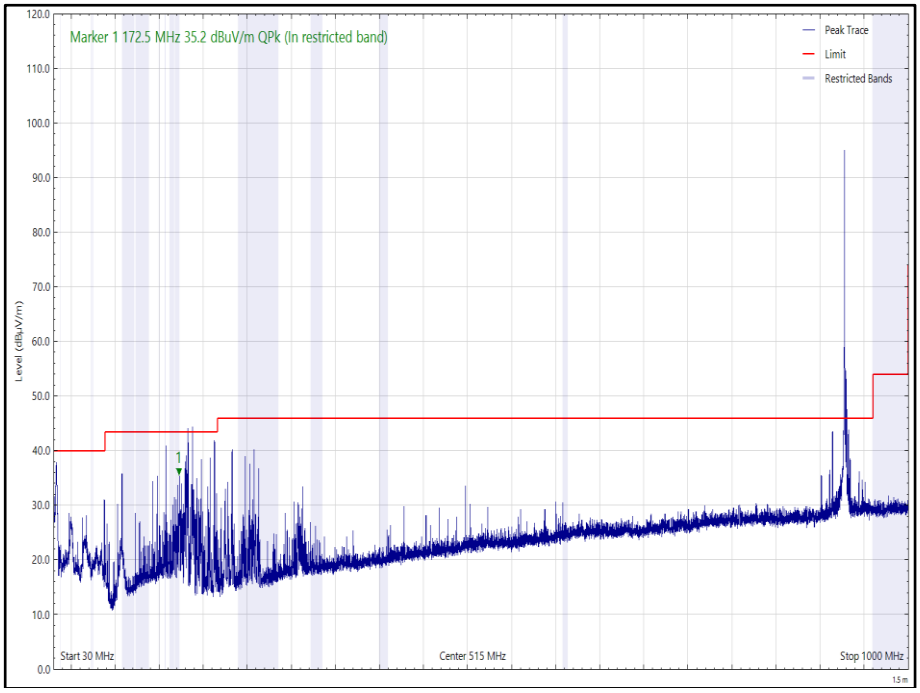

Figure 57 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

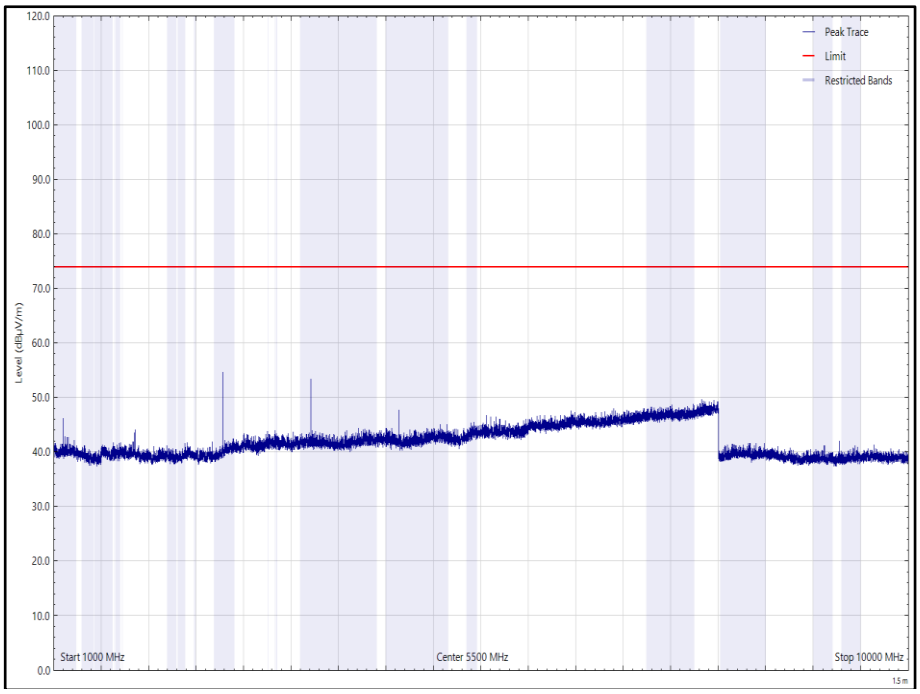

Figure 58 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

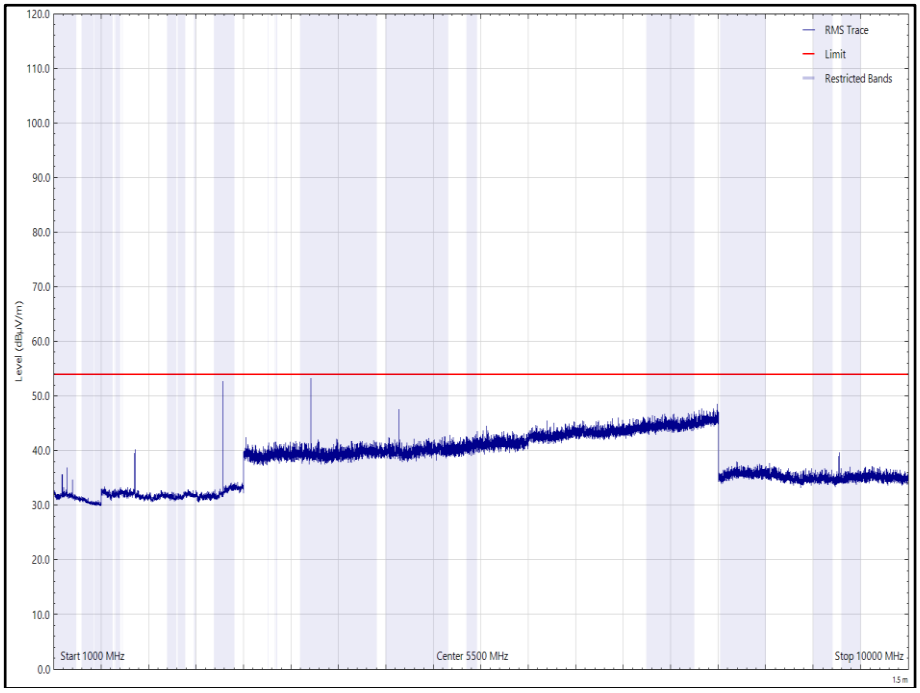

Figure 59 - ISM 915_Tx_Top_X Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
172.487	38.10	43.52	-5.42	Q-Peak	351	104	Vertical
3707.850	47.03	54.00	-6.97	CISPR Avg	337	247	Horizontal

Table 34 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

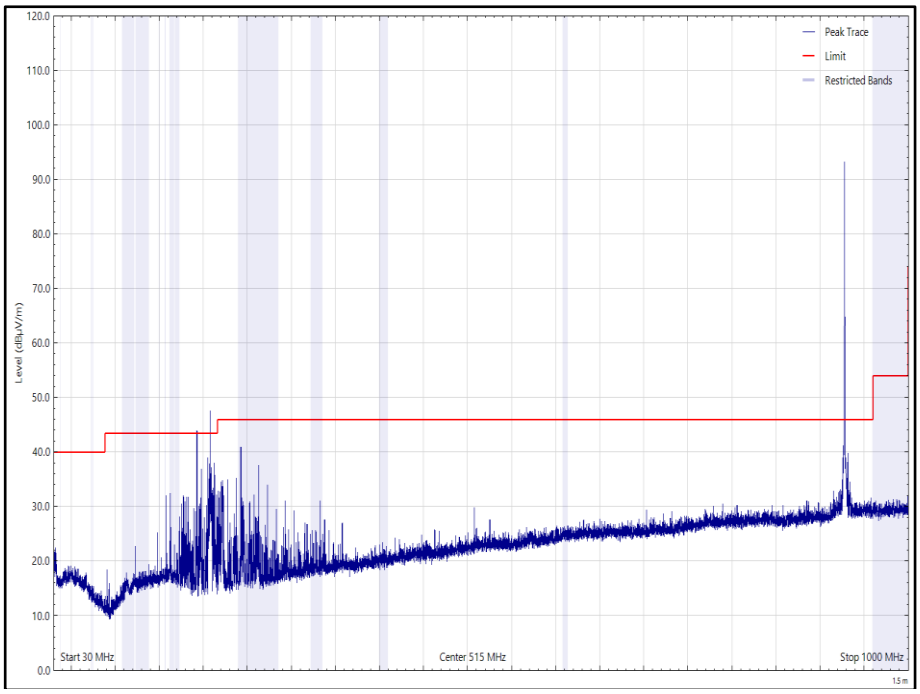

Figure 60 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

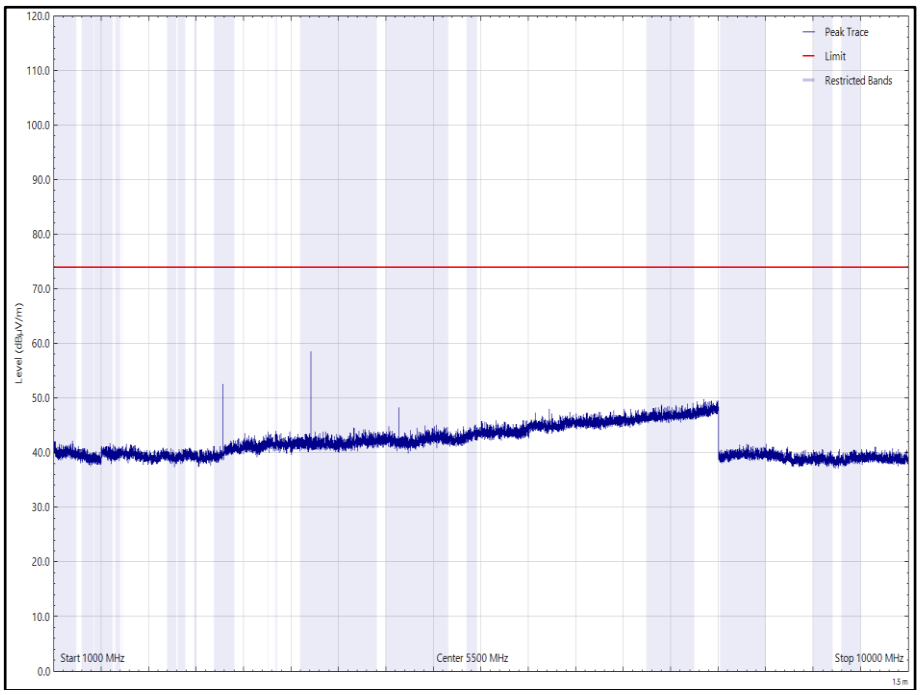

Figure 61 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

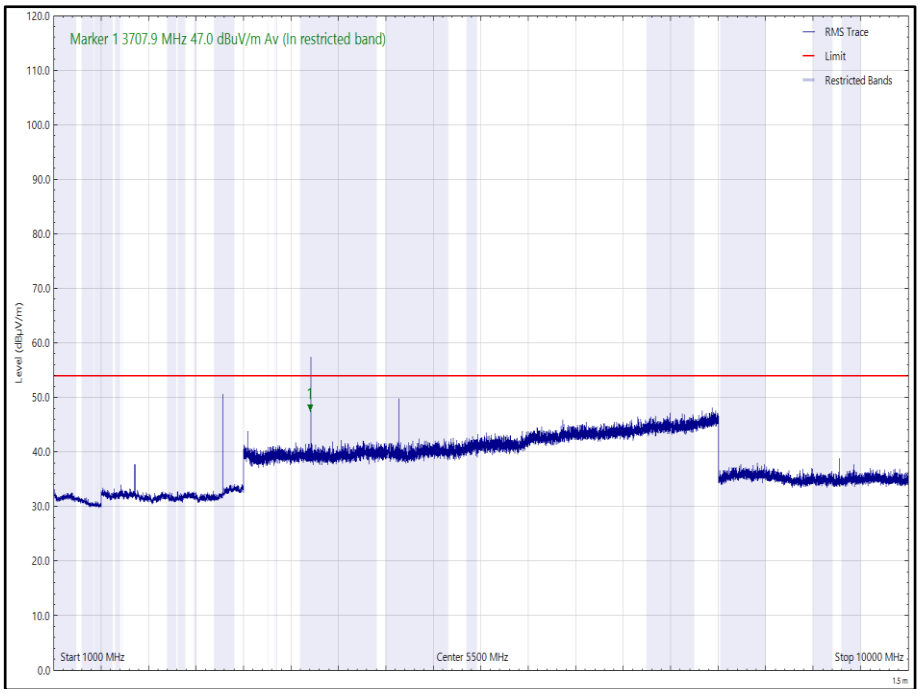

Figure 62 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

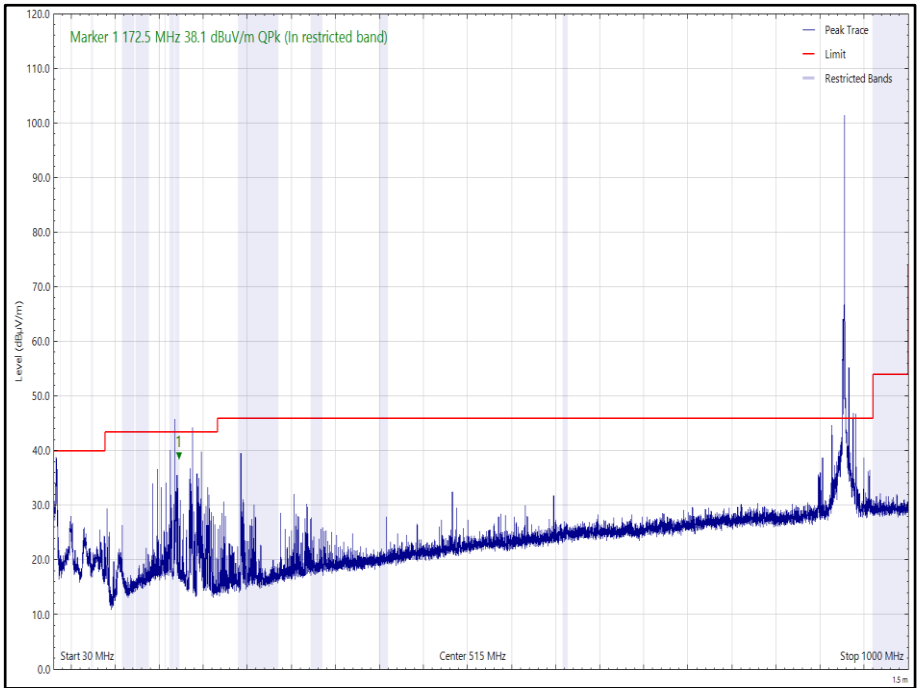

Figure 63 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

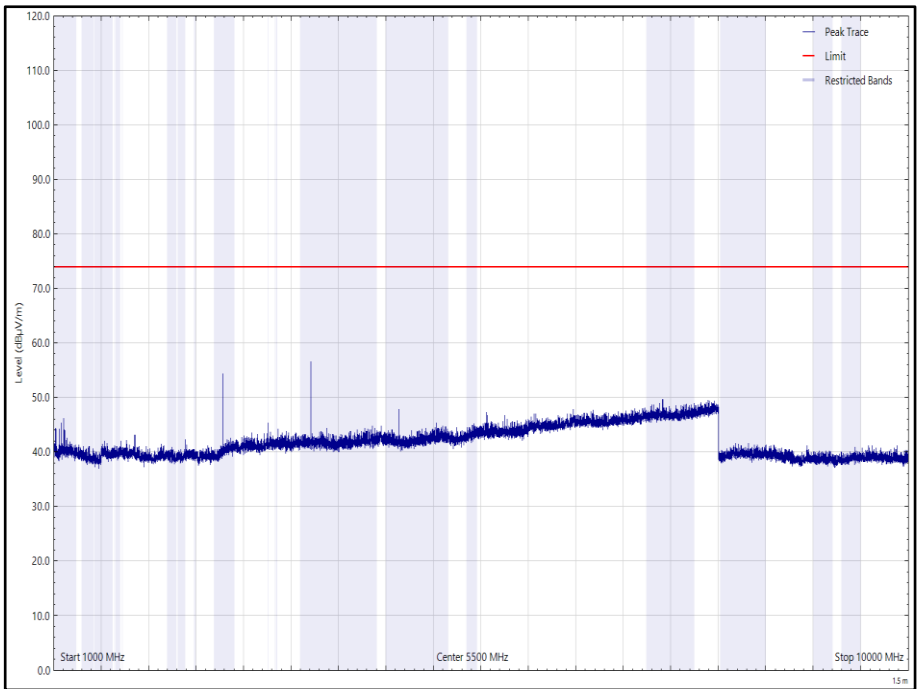

Figure 64 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

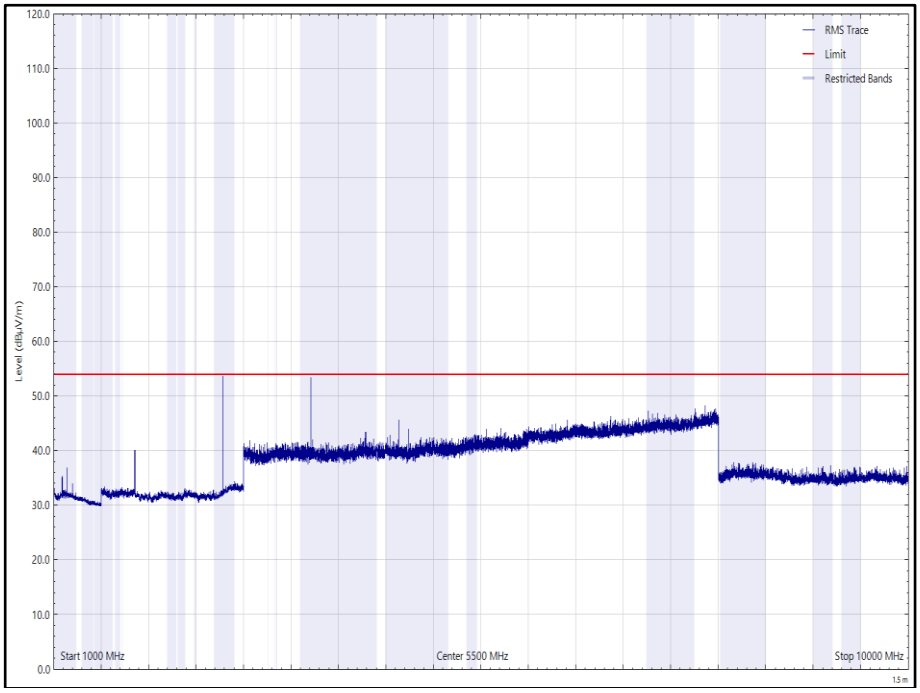

Figure 65 - ISM 915_Tx_Top_Y Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
172.510	35.67	43.52	-7.85	Q-Peak	349	100	Vertical
2782.425	45.89	54.00	-8.11	CISPR Avg	173	299	Vertical
3707.740	47.57	54.00	-6.43	CISPR Avg	202	157	Vertical
3708.035	48.31	54.00	-5.69	CISPR Avg	210	151	Horizontal

Table 35 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 30 MHz to 10 GHz

No other emissions found within 10 dB of the limit.

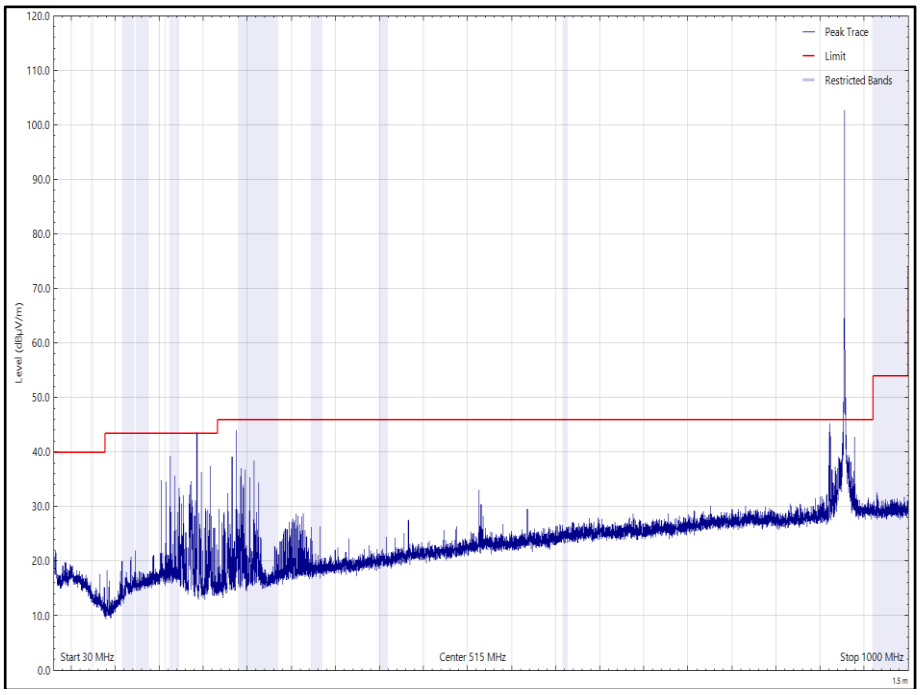

Figure 66 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

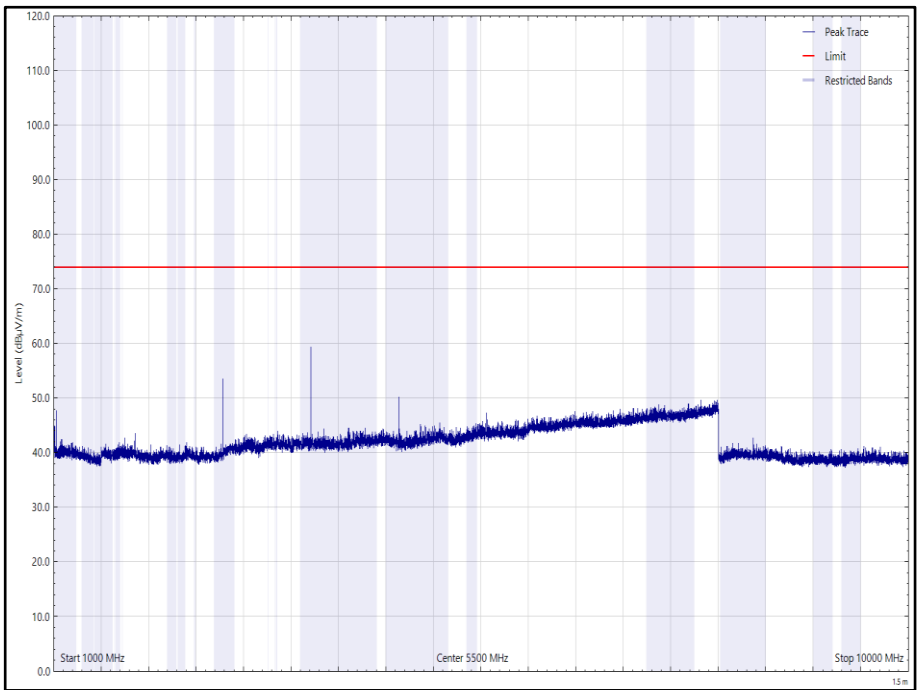

Figure 67 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (Peak)

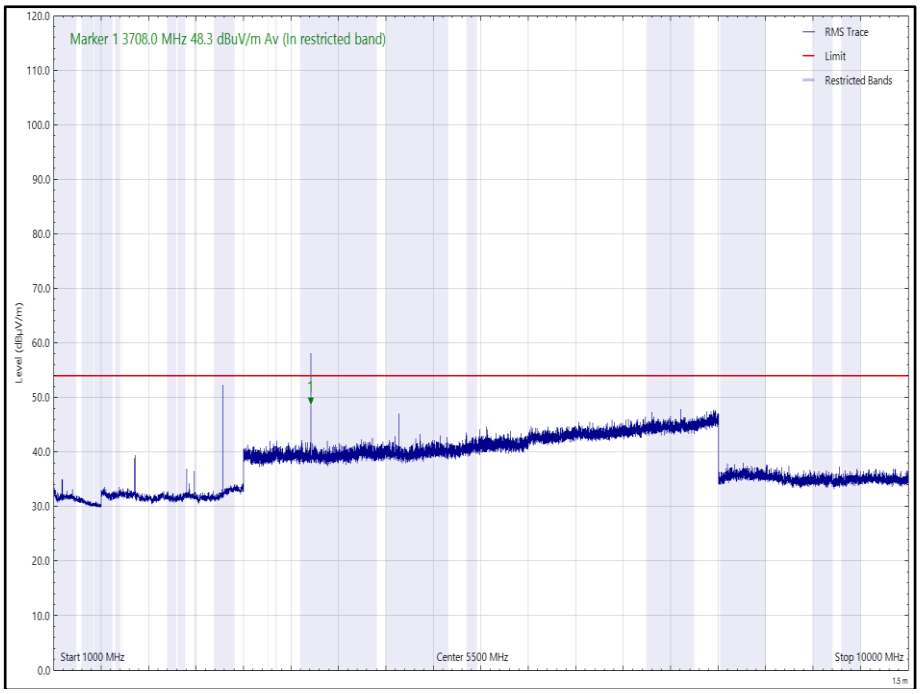

Figure 68 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 1 GHz to 10 GHz, Horizontal (rms)

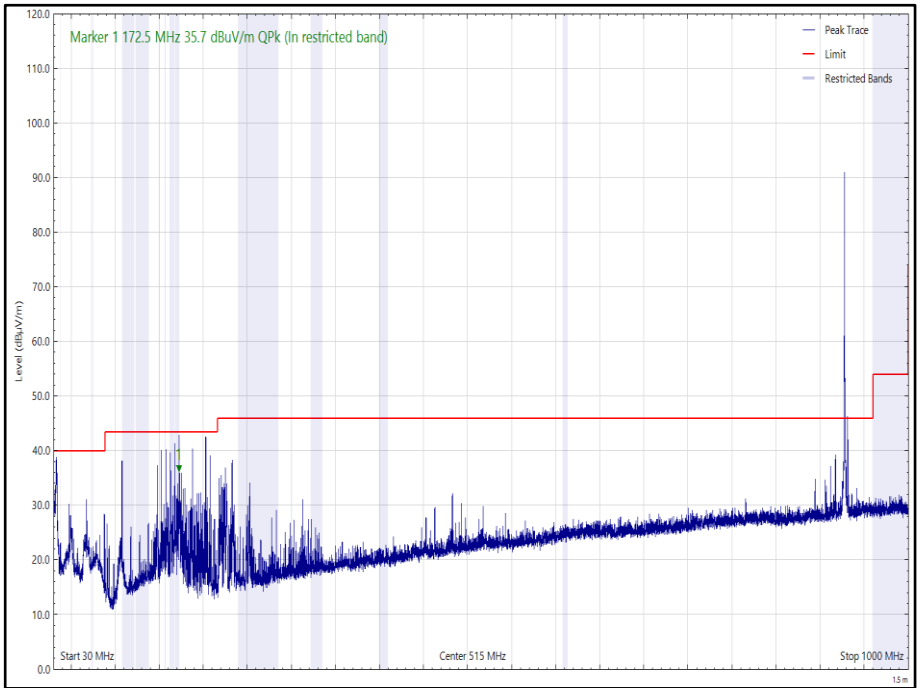

Figure 69 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 30 MHz to 1 GHz, Vertical (Peak)

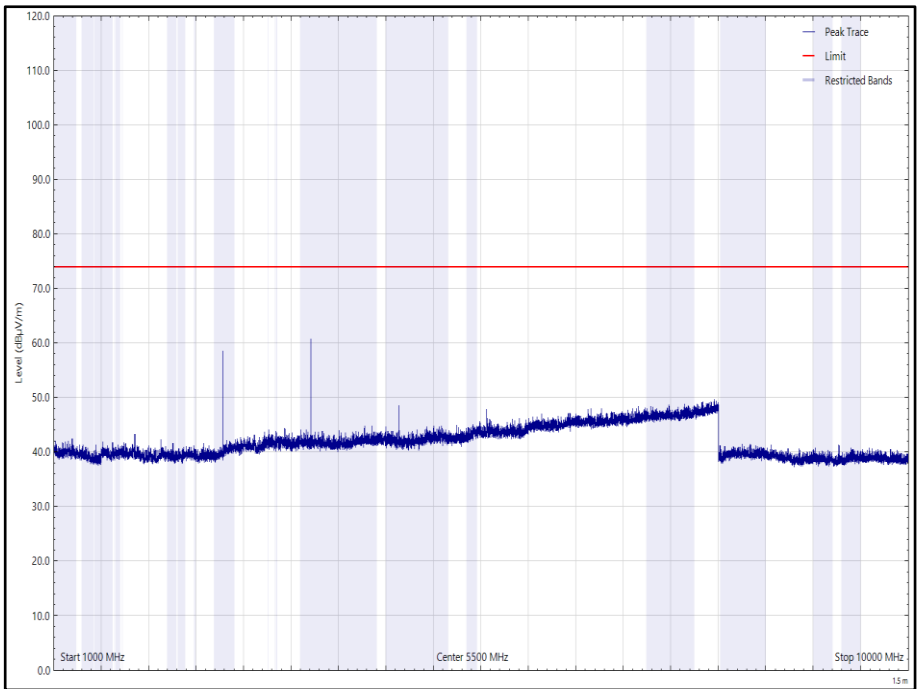

Figure 70 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (Peak)

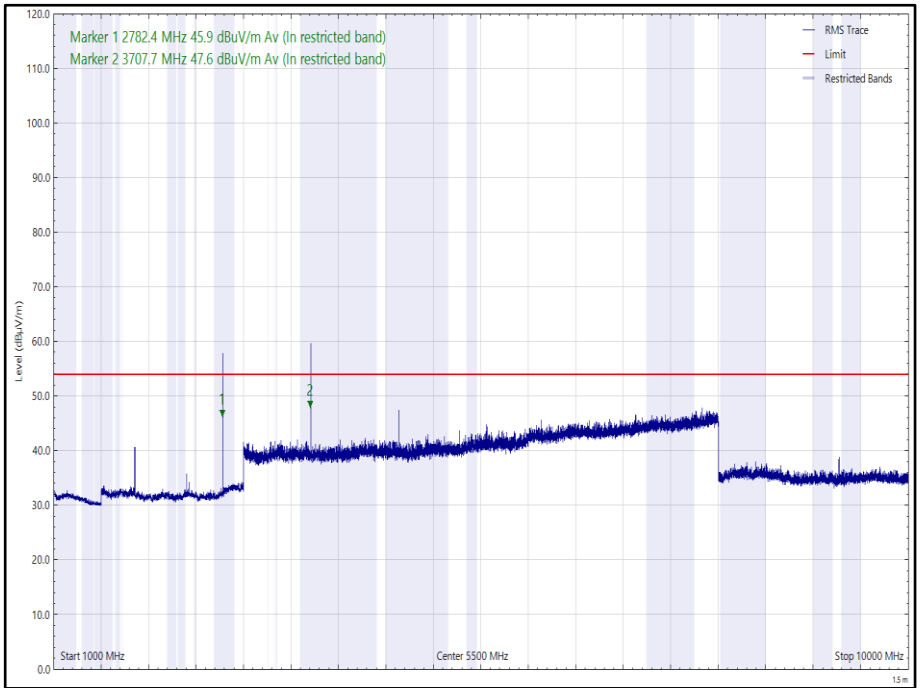

Figure 71 - ISM 915_Tx_Top_Z Plane, 927.5 MHz, 1 GHz to 10 GHz, Vertical (rms)

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in RSS-GEN, clause 8.10, must also comply with the radiated emission limits specified in RSS-GEN clause 8.9.

2.7.8 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
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Attenuator	Pasternack	PE7047-4	4935	12	20-Jul-2024
Test Receiver	Rohde & Schwarz	ESW44	5084	12	31-Aug-2024
Emissions Software	TUV SUD	EmX V3.2.0	5125	-	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
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
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	APS06-0061	5595	12	26-Oct-2024
Cable (K-Type to K-Type, 2 m)	Junkosha	MWX241-02000KMSKMS/B	5934	12	18-Jun-2024
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025

Table 36

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

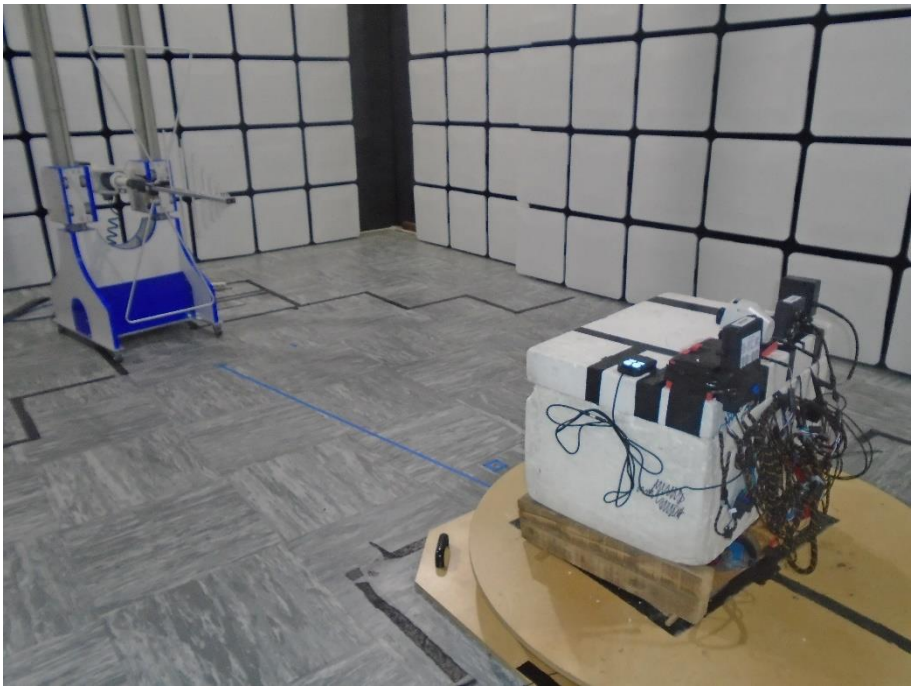

Figure 11 – 30 MHz to 1 GHz

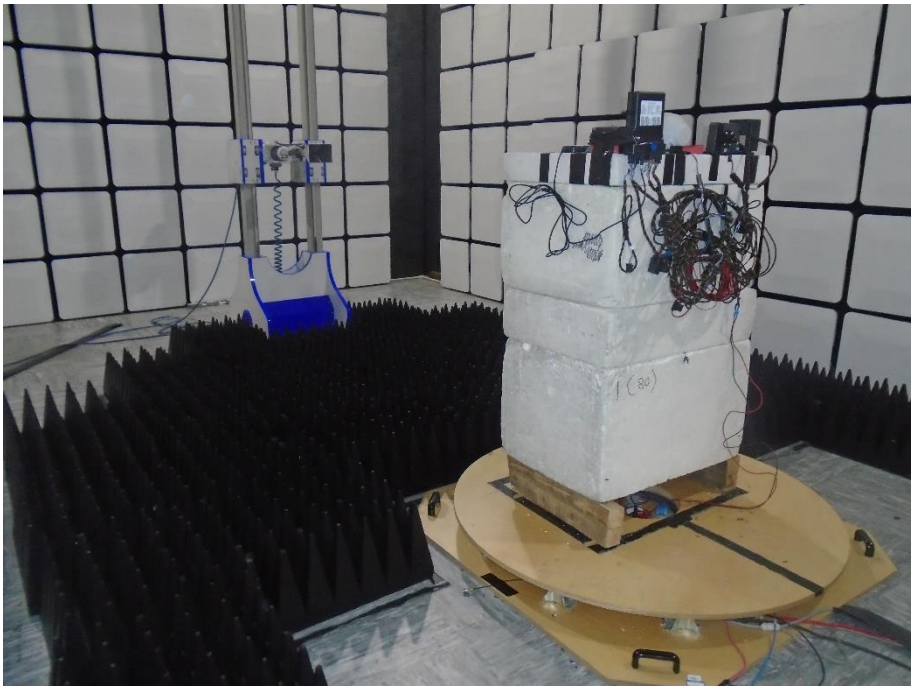

Figure 12 – 1 GHz to 10 GHz

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Frequency Hopping Systems - 20 dB Bandwidth	± 2.13 kHz
Frequency Hopping Systems - Channel Separation	± 2.13 kHz
Frequency Hopping Systems - Number of Hopping Channels	-
Frequency Hopping Systems - Average Time of Occupancy	-
Maximum Conducted Output Power	± 1.38 dB
Authorised Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Conducted Spurious Emissions from the Antenna Port	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.