FCC and ISED Test Report

Sepura Ltd
TETRA Mobile Radio, Model: SCG2229

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

Prepared for: Sepura Ltd
9000 Cambridge Research Park
Beach Drive
Waterbeach
Cambridge
CB25 9TL
United Kingdom

FCC ID: XX6SCG2229W IC: 8739A-SCG2229

COMMERCIAL-IN-CONFIDENCE

Document 75950098-04 Issue 03

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	17 March 2021

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	Liang Tian	17 March 2021	
Testing	Mehadi Choudhury	17 March 2021	

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 15C: 2019, ISED RSS-247: Issue 2 (02-2017) and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

TÜV SÜD
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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	05 January 2021
2	To amend a typographical error and amend the Model number from SCG22 to SCG2229	15 January 2021
3	To modify the FCC ID from XX6SCG2229 to XX6SCG2229W	17 March 2021

Table 1

1.2 Introduction

Applicant	Sepura Ltd
Manufacturer	Sepura Ltd
Model Number(s)	SCG2229
Serial Number(s)	1PR002007GPH5XV
Hardware Version(s)	Pre-production
Software Version(s)	2001 797 10138
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2019 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019)
Order Number Date	PLC-PO017051-1 23-September-2020
Date of Receipt of EUT	30-October-2020
Start of Test	05-November-2020
Finish of Test	11-November-2020
Name of Engineer(s)	Liang Tian and Mehadi Choudhury
Related Document(s)	ANSI C63.10 (2013)

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 15C	RSS-247	RSS-GEN			
Configuration and Mode: 2.4 GHz WLAN						
-	15.203	-	-	Antenna Requirement	N/T	The antenna is only ever fitted during a professional install. See application form for details.
2.1	15.205	-	8.10	Restricted Band Edges	Pass	
2.2	15.247 (a)(2)	5.2	6.7	Emission Bandwidth	Pass	
2.3	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	
2.5	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	
2.6	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	

Table 2

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment)*	TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains, with Wi-Fi, Bluetooth, GPS and Ethernet functions
Manufacturer:	Sepura
Model:	SCG2229 Series
Part Number:	SCG2229
Hardware Version:	Pre-production
Software Version:	2001 797 10138
FCC ID (if applicable)	XX6SCG2229W
IC ID (if applicable)	8739A-SCG2229

Intentional Radiators

Technology	TETRA	Bluetooth LE	Bluetooth Classic / EDR	Wi-Fi 802.11b, g	Wi-Fi 802.11n 20	Wi-Fi 802.11n 40
Frequency Band (MHz)	380 - 470 MHz	2402 - 2480 MHz	2402 - 2480 MHz	2412 - 2462 MHz	2412 - 2462 MHz	2422 - 2452 MHz
Conducted Declared Output Power (dBm)	40	7.4	7.382	16.5	16.5	16.5
Antenna Gain (dBi)	7	2	2	2	2	2
Supported Bandwidth(s) (MHz)	25 kHz	1	2	16.5 22	16.5	33
Modulation Scheme(s)	π/4 DQPSK	GFSK	GFSK π/4 DQPSK 8DPSK	802.11b: CCK, DBPSK, DQPSK 802.11g: BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM
ITU Emission Designator	22K0DXW 20K0DXW	1M81F1D	1M01F1D 1M01G1D	19M7G1D	19M7D1D	36M8D1D
Bottom Frequency (MHz)	380 MHz	2402 MHz	2402 MHz	2412 MHz	2412 MHz	2422 MHz
Middle Frequency (MHz)	425 MHz	2441 MHz	2441 MHz	2437 MHz	2437 MHz	2437 MHz
Top Frequency (MHz)	470 MHz	2480 MHz	2480 MHz	2462 MHz	2462 MHz	2452 MHz

The SCG2229 uses external antennas only. Antenna gains are based on typically provided antennas. For testing the antenna provided is a GPSB4 system with AFB-UT TETRA antenna.

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2480 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	32.768 kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

DC Power Source

Nominal voltage:	12	V
Extreme upper voltage:	15.6	V
Extreme lower voltage:	10.8	V
Max current:	5	A

Charging N/A

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Temperature

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

Antenna Characteristics

Large range of external antennas at https://www.sepura.com/accessories/srg-antennas
This unit has been provided with a sample GPSB4 system as defined in table 2

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:		Gain		dBi
For external antenna only: Standard Antenna Jack ☒ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☒ Non-standard Antenna Jack ☐					

Ancillaries (if applicable)

Manufacturer:	Sepura	Part Number:	GPSB4
Model:	GPSB4 Vehicle Roof Antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	AFB-TET
Model:	AFB-VAR 380-430 MHz antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	AFB-UT
Model:	AFB-VAR 406-472 MHz antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02012 rev001
Model:	Extended SCG Loudspeaker / IO USB Host lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02014 rev001
Model:	Extended SCG Expansion Board Loudspeaker / 8 GPIO lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	Netgear GS105 ProSAFE Gigabit Switch

Model:	Netgear GS105 ProSAFE Gigabit Switch	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02010
Model:	SCG Power/ignition Lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00069
Model:	Mobile Remote Cable 5.0M	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00670
Model:	HBC Interface and Hands-free Box	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00079
Model:	Remote Microphone And Switch Set	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00292
Model:	Remote Microphone (Handsfree Kit) 3m	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01801
Model:	Handset Based Console (HBC3)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00082
Model:	Detachable Loudspeaker extension Cable	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00062
Model:	Fist microphone	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01808
Model:	SCC3 (colour console)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01961
Model:	CC VAC RSM (Long Cable)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00719
Model:	Loudspeaker	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01837
Model:	Loudspeaker	Country of Origin:	Unknown

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

Name: Chris Beecham
Position held: Conformance Engineer
Date: 30 October 2020

1.5 Product Information

1.5.1 Technical Description

TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains, with Wi-Fi, Bluetooth, GPS and Ethernet functions.

1.5.2 Test Modes

For conducted tests the EUT antenna was disconnected and directly connected to the test equipment via a cable and attenuator.

For all tests, the EUT was put into a continuous transmit test mode with the chipset manufacturer's test commands via a script running in the EUTs terminal application. The EUT then transmitted the required type of packeted 802.11 data frames of fixed length, containing the standard headers and with pseudo-random data content, ensuring the measured signals were representative and contained all the symbols at the highest power control level.

After preliminary investigations were performed, the EUT was therefore tested in the following worst-case modes:

- SISO Modes (Port 0):
  - 802.11b 1 Mbps
  - 802.11g 6 Mbps
  - 802.11n HT20 MCS0
  - 802.11n HT40 MCS0

1.6 Deviations from the Standard

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

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: SCG2229, Serial Number: 1PR002007GPH5XV			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz WLAN		
Restricted Band Edges	Liang Tian	UKAS
Emission Bandwidth	Mehadi Choudhury	UKAS
Maximum Conducted Output Power	Mehadi Choudhury	UKAS
Authorised Band Edges	Liang Tian	UKAS
Spurious Radiated Emissions	Liang Tian	UKAS
Power Spectral Density	Mehadi Choudhury	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Restricted Band Edges

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205
ISED RSS-GEN, Clause 8.10

2.1.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.1.3 Date of Test

05-November-2020

2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5.

Peak measurements were performed in accordance with ANSI C63.10, clause 11.12.2.4.

Plots for average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.5. These are shown for information purposes and were used to determine the worst-case measurement point. Final average measurements were then taken in accordance with ANSI C63.10, clause 4.1.4.2.2 to obtain the measurement result recorded in the test results tables.

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

2.1.5 Environmental Conditions

Ambient Temperature	18.6 - 19.4 °C
Relative Humidity	37.2 %

2.1.6 Test Results

2.4 GHz WLAN

Mode	Data Rate/Modulation Coding Scheme	Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBµV/m)	Average Level (dBµV/m)
802.11b	1 Mbps	2412	2390.0	57.19	49.67
802.11b	1 Mbps	2462	2483.5	59.08	51.42
802.11g	6 Mbps	2412	2390.0	61.51	44.85
802.11g	6 Mbps	2462	2483.5	67.30	49.34
802.11n HT20	MCS0	2412	2390.0	67.18	47.45
802.11n HT20	MCS0	2462	2483.5	70.33	49.70
802.11n HT40	MCS0	2422	2390.0	66.95	48.16
802.11n HT40	MCS0	2462	2483.5	63.79	48.04

Table 5 - SISO

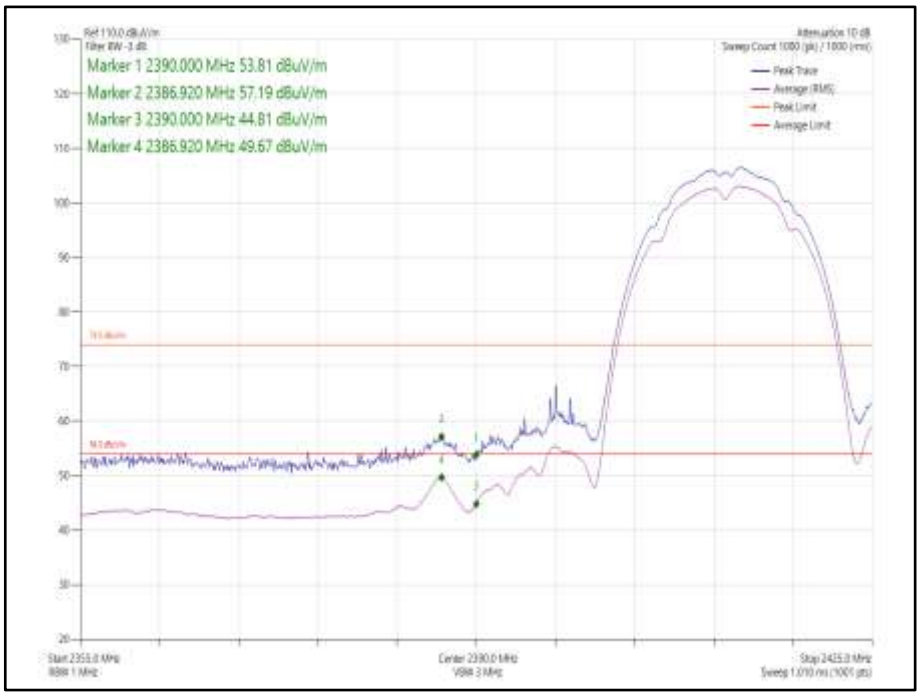

Figure 1 - 802.11b, 2412 MHz, Band Edge Frequency 2390.0 MHz

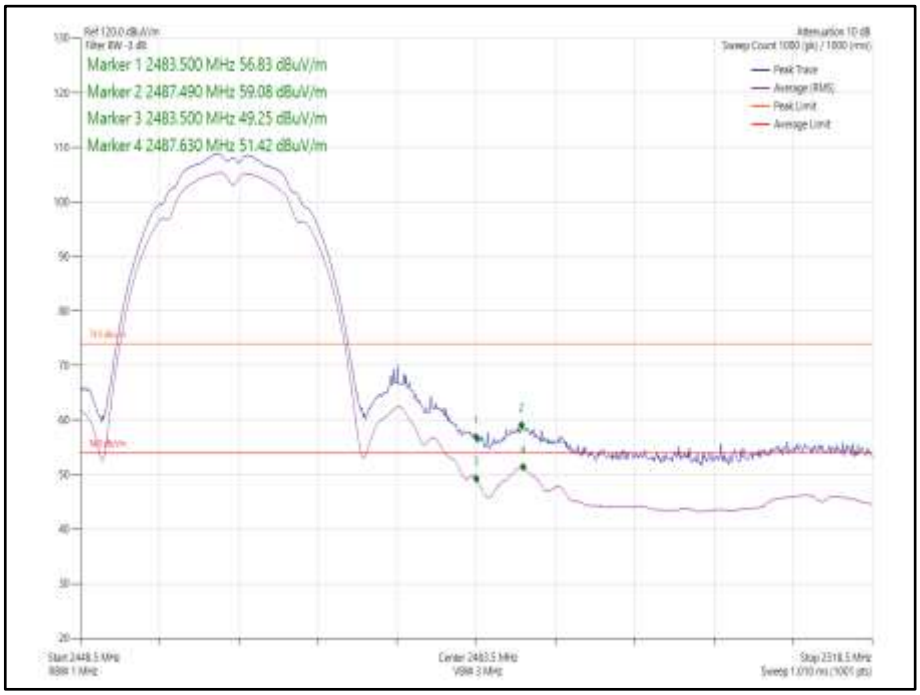

Figure 2 - 802.11b, 2462 MHz, Band Edge Frequency 2483.5 MHz

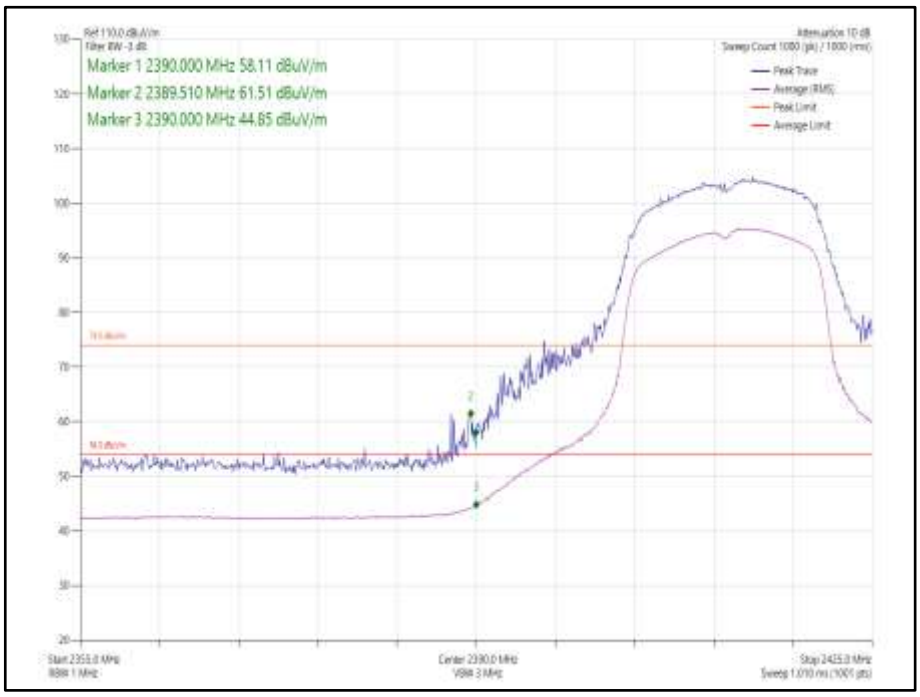

Figure 3 - 802.11g, 2412 MHz, Band Edge Frequency 2390.0 MHz

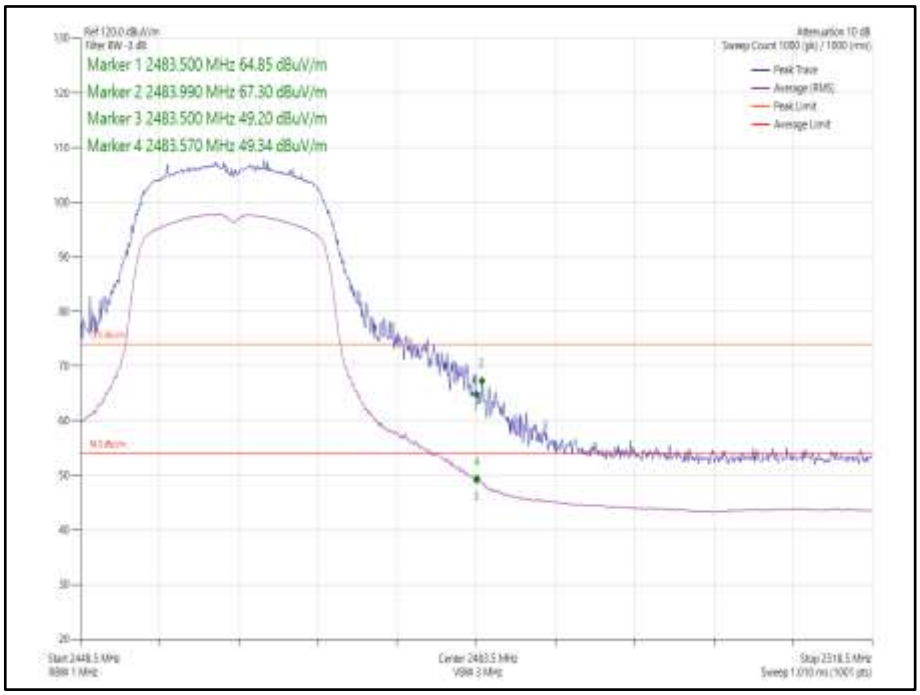

Figure 4 - 802.11g, 2462 MHz, Band Edge Frequency 2483.5 MHz

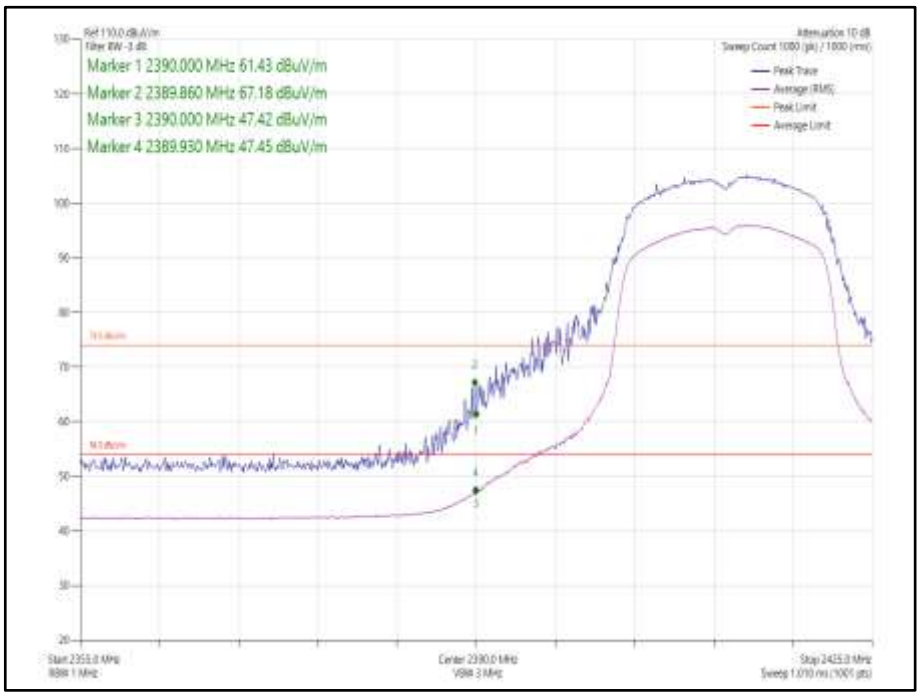

Figure 5 - 802.11n HT20 ,2412 MHz, Band Edge Frequency 2390 MHz

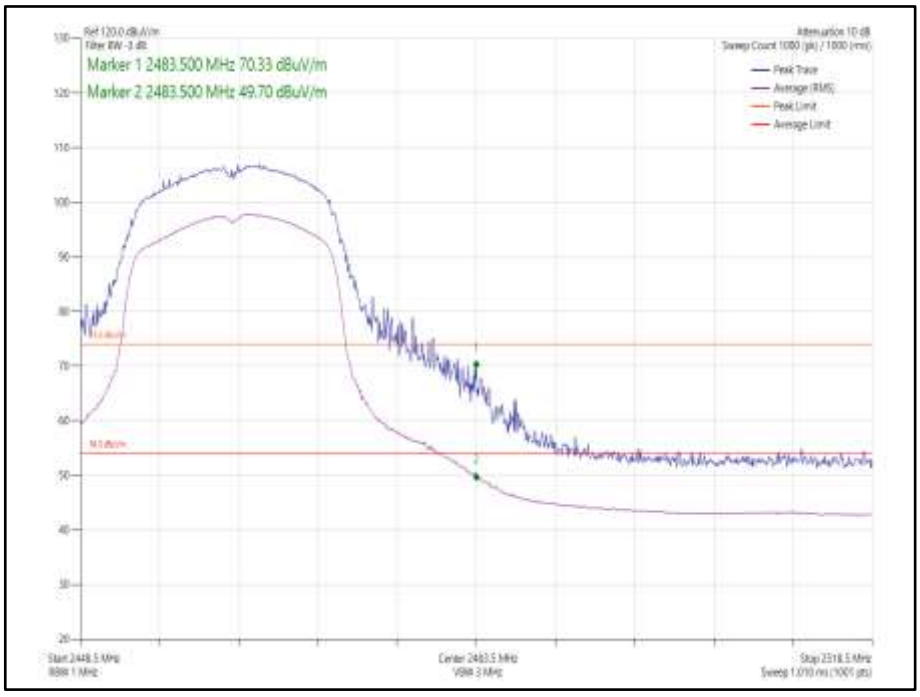

Figure 6 - 802.11n HT20, 2462 MHz, Band Edge Frequency 2483.5 MHz

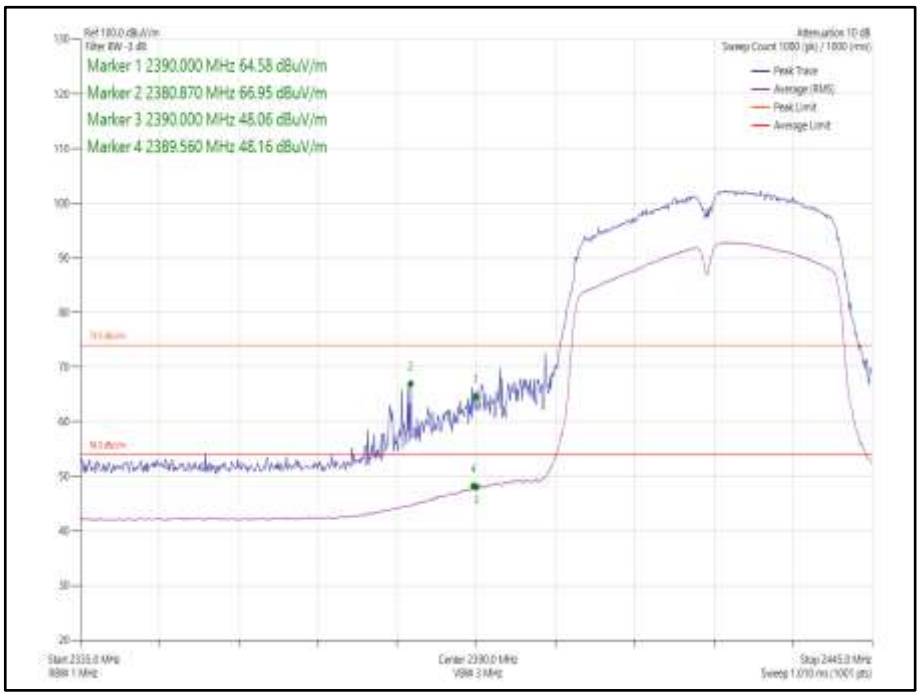

Figure 7 - 802.11n HT40, 2412 MHz, Band Edge Frequency 2390 MHz

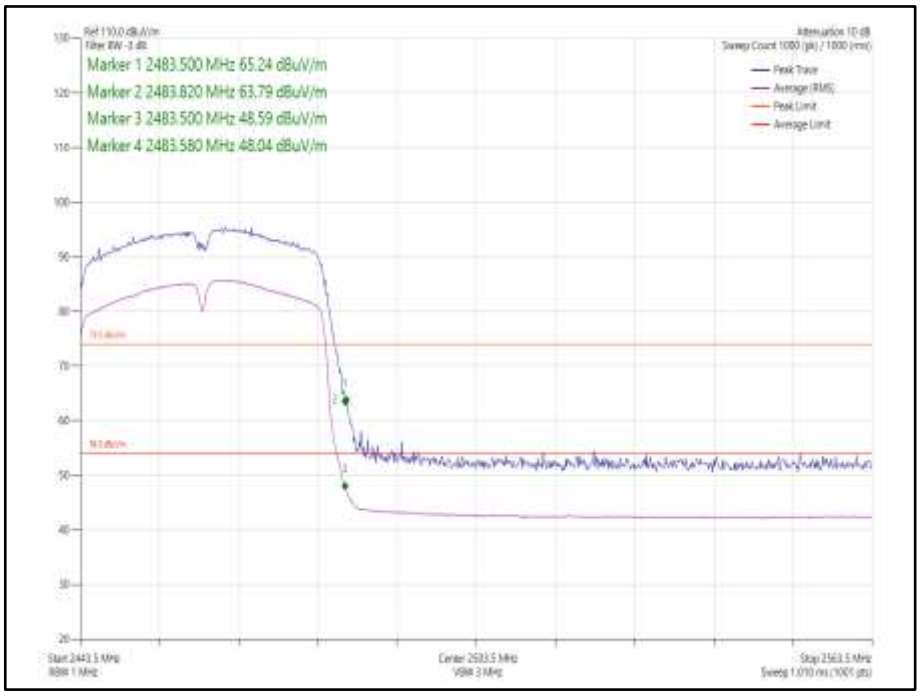

Figure 8 - 802.11n HT40, 2462 MHz, Band Edge Frequency 2483.5 MHz

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6

ISED RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960*	500

Table 7

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	10-Mar-2021
Cable (18 GHz)	Rosenberger	LU7-071-2000	5106	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V2.0.1	5125	-	Software
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5517	12	01-Apr-2021
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	06-Feb-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021

Table 8

TU - Traceability Unscheduled

2.2 Emission Bandwidth

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.7

2.2.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.2.3 Date of Test

09-November-2020

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.8.1.

2.2.5 Environmental Conditions

Ambient Temperature	24.3 °C
Relative Humidity	48.9 %

2.2.6 Test Results

2.4 GHz WLAN

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11b	Duty Cycle (%):	N/A
Data Rate:	1 Mbps	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 9

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Minimum		
2412	10.120	-	-	-	10.120	≥500.0	-9.620
2437	10.120	-	-	-	10.120	≥500.0	-9.620
2462	10.120	-	-	-	10.120	≥500.0	-9.620

Table 10 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Maximum		
2412	14.600	-	-	-	14.600	-	-
2437	14.680	-	-	-	14.680	-	-
2462	14.680	-	-	-	14.680	-	-

Table 11 - 99% Bandwidth Results

Figure 9 - (A) 2412 MHz (CH1) 99% Bandwidth

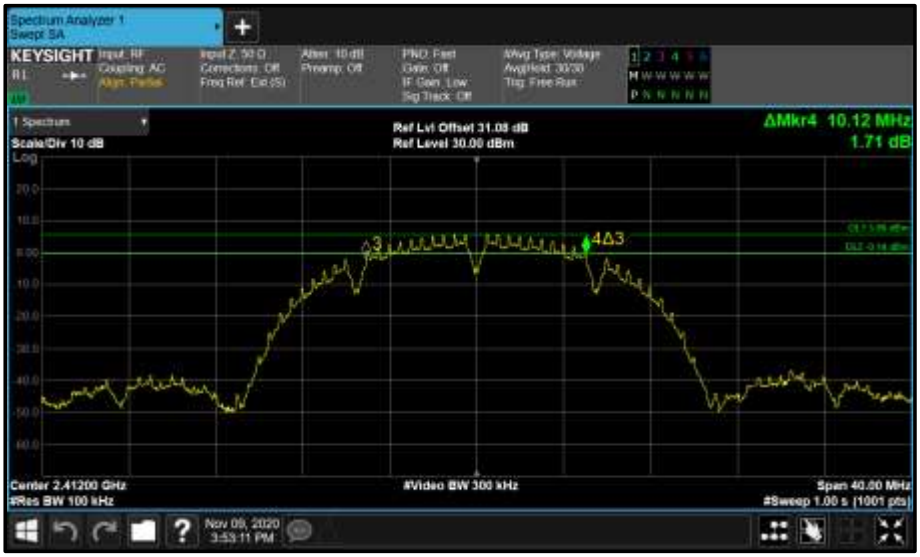

Figure 10 - (A) 2412 MHz (CH1) 6 dB Bandwidth

Figure 11 - (A) 2437 MHz (CH6) 99% Bandwidth

Figure 12 - (A) 2437 MHz (CH6) 6 dB Bandwidth

Figure 13 - (A) 2462 MHz (CH11) 99% Bandwidth

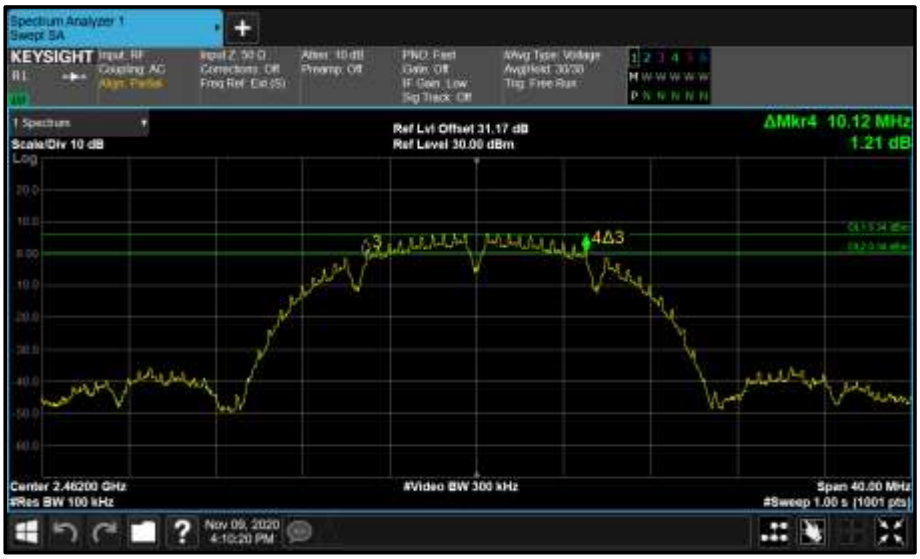

Figure 14 - (A) 2462 MHz (CH11) 6 dB Bandwidth

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11g	Duty Cycle (%):	N/A
Data Rate:	6 Mbps	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 12

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Minimum		
2412	15.200	-	-	-	15.200	≥500.0	-14.700
2437	15.240	-	-	-	15.240	≥500.0	-14.740
2462	15.200	-	-	-	15.200	≥500.0	-14.700

Table 13 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Maximum		
2412	16.320	-	-	-	16.320	-	-
2437	20.460	-	-	-	20.460	-	-
2462	16.320	-	-	-	16.320	-	-

Table 14 - 99% Bandwidth Results

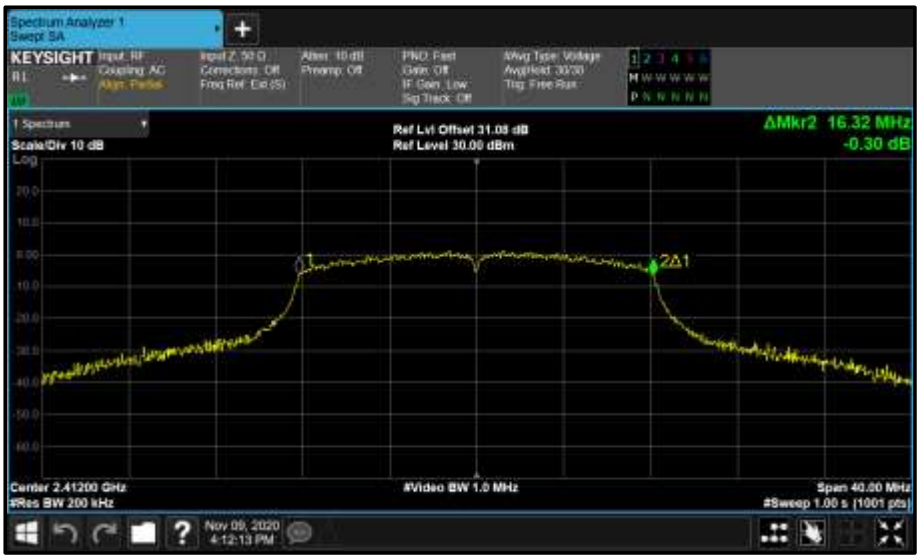

Figure 15 - (A) 2412 MHz (CH1) 99% Bandwidth

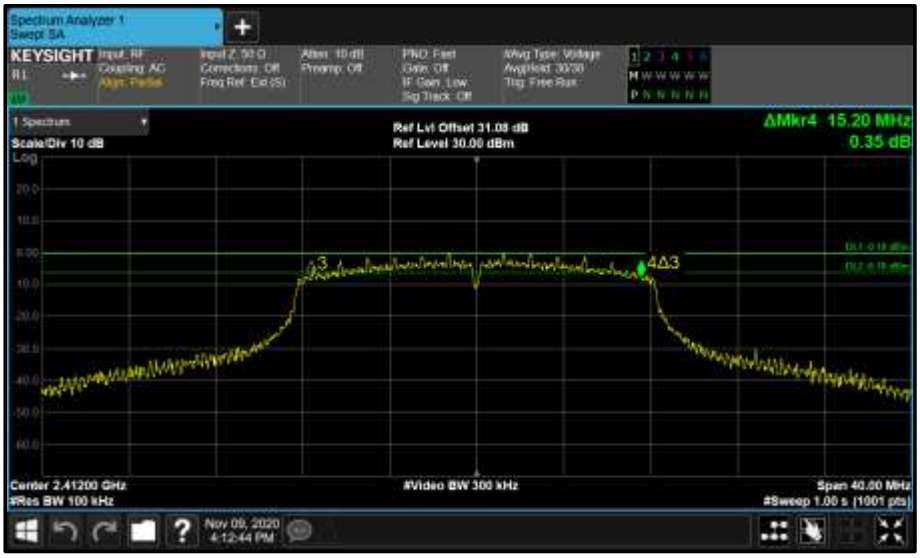

Figure 16 - (A) 2412 MHz (CH1) 6 dB Bandwidth

Figure 17 - (A) 2437 MHz (CH6) 99% Bandwidth

Figure 18 - (A) 2437 MHz (CH6) 6 dB Bandwidth

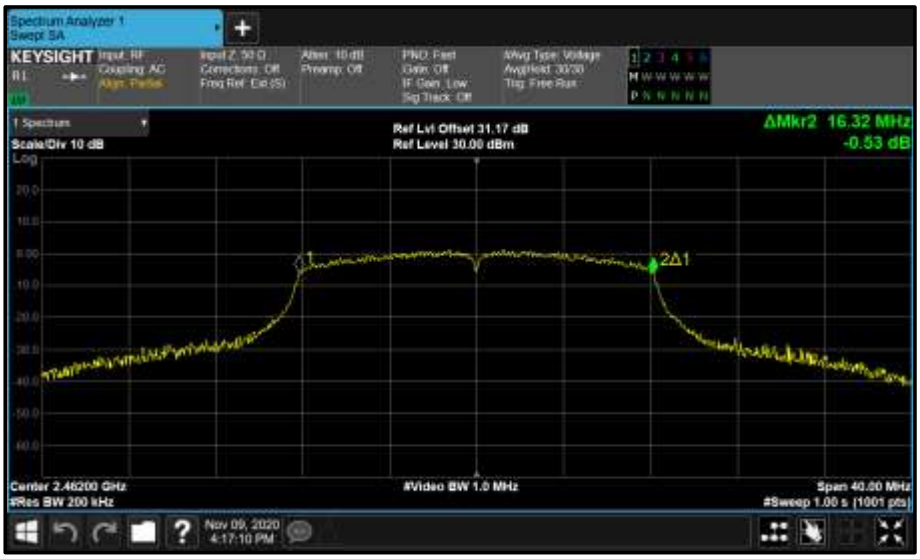

Figure 19 - (A) 2462 MHz (CH11) 99% Bandwidth

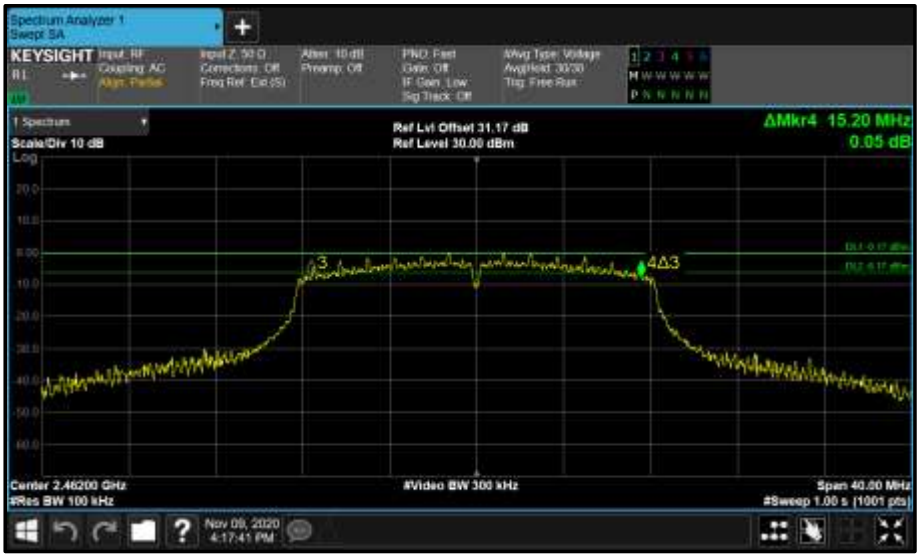

Figure 20 - (A) 2462 MHz (CH11) 6 dB Bandwidth

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT20	Duty Cycle (%):	N/A
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 15

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Minimum		
2412	15.200	-	-	-	15.200	≥500.0	-14.700
2437	15.240	-	-	-	15.240	≥500.0	-14.740
2462	15.160	-	-	-	15.160	≥500.0	-14.660

Table 16 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Maximum		
2412	17.440	-	-	-	17.440	-	-
2437	19.020	-	-	-	19.020	-	-
2462	17.440	-	-	-	17.440	-	-

Table 17 - 99% Bandwidth Results

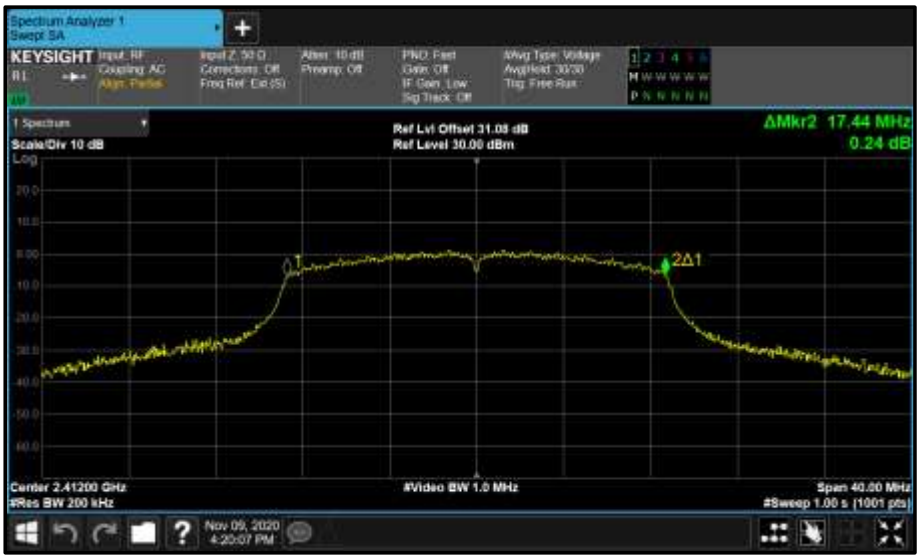

Figure 21 - (A) 2412 MHz (CH1) 99% Bandwidth

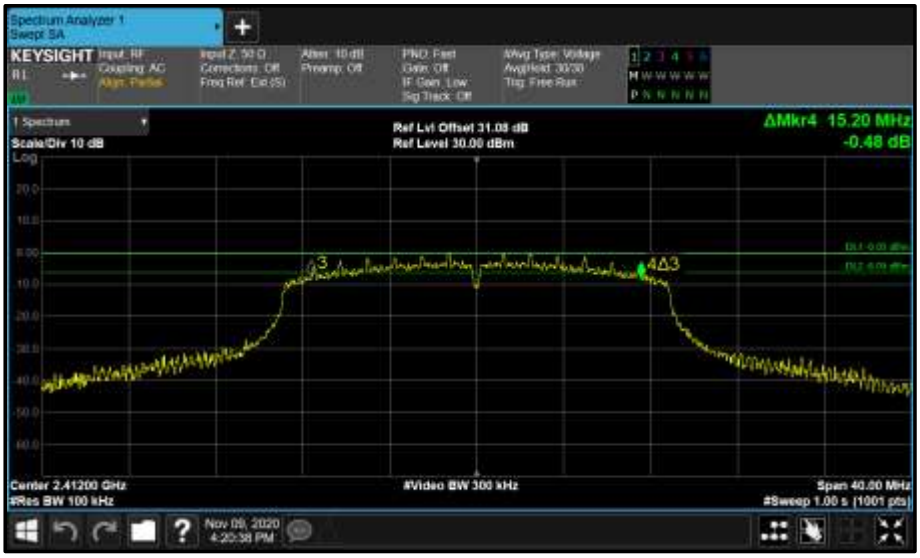

Figure 22 - (A) 2412 MHz (CH1) 6 dB Bandwidth

Figure 23 - (A) 2437 MHz (CH6) 99% Bandwidth

Figure 24 - (A) 2437 MHz (CH6) 6 dB Bandwidth

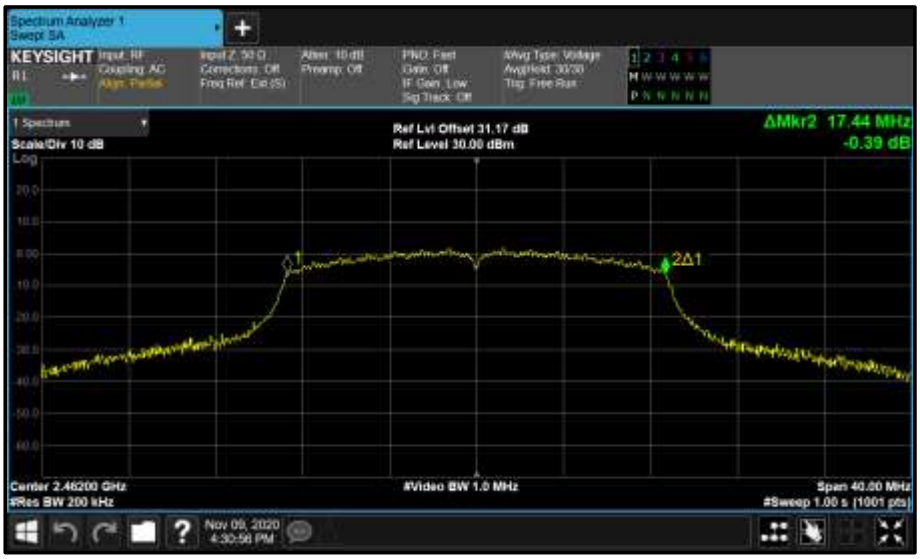

Figure 25 - (A) 2462 MHz (CH11) 99% Bandwidth

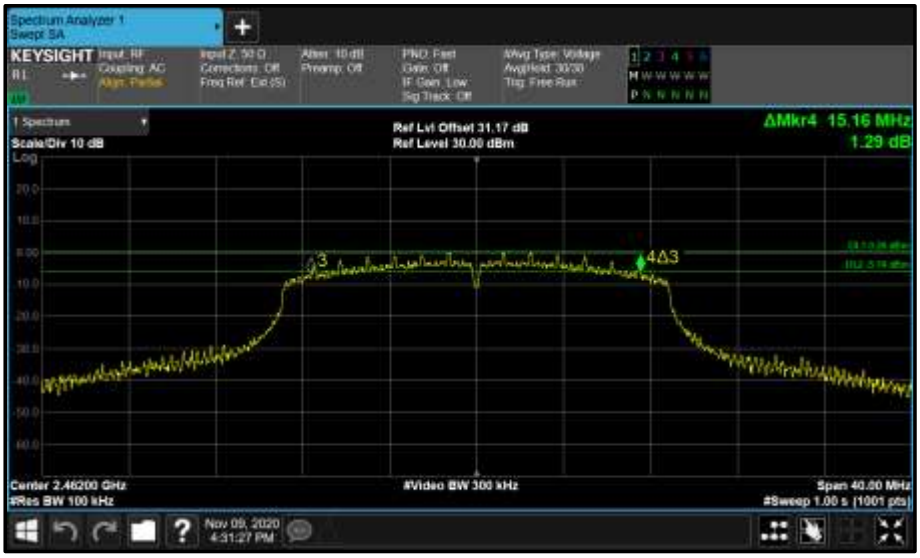

Figure 26 - (A) 2462 MHz (CH11) 6 dB Bandwidth

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT40	Duty Cycle (%):	N/A
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 18

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Minimum		
2422	34.000	-	-	-	34.000	≥500.0	-33.500
2437	34.000	-	-	-	34.000	≥500.0	-33.500
2452	34.000	-	-	-	34.000	≥500.0	-33.500

Table 19 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)	Margin (MHz)
	A	B	C	D	Maximum		
2422	35.840	-	-	-	35.840	-	-
2437	36.320	-	-	-	36.320	-	-
2452	35.840	-	-	-	35.840	-	-

Table 20 - 99% Bandwidth Results

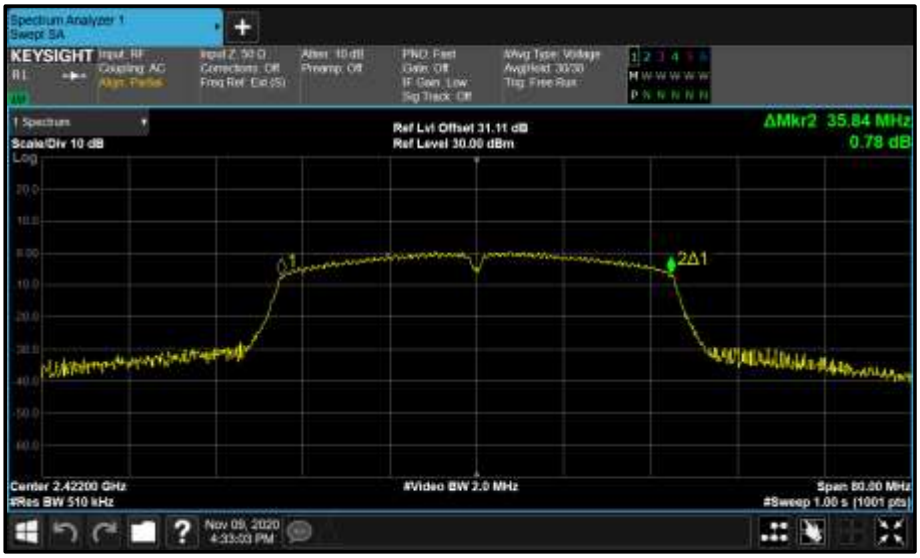

Figure 27 - (A) 2422 MHz (CH3) 99% Bandwidth

Figure 28 - (A) 2422 MHz (CH3) 6 dB Bandwidth

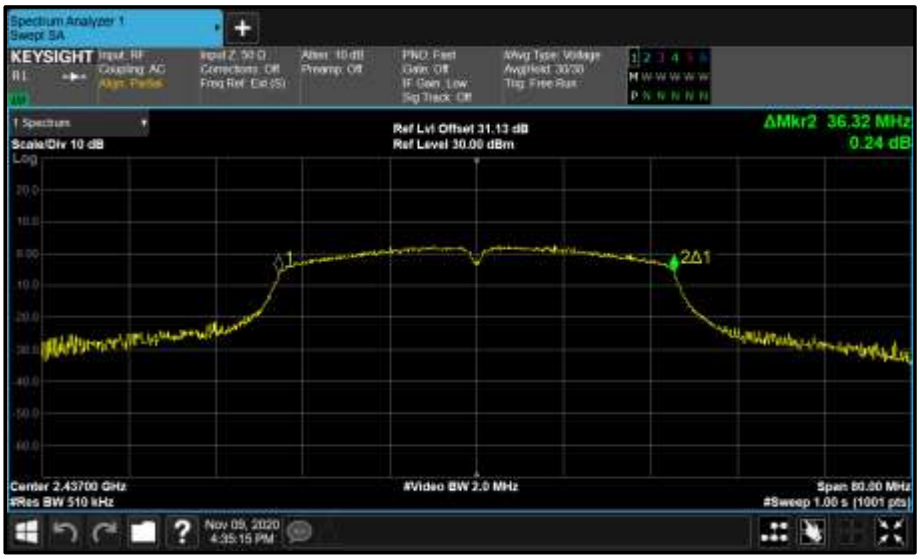

Figure 29 - (A) 2437 MHz (CH6) 99% Bandwidth

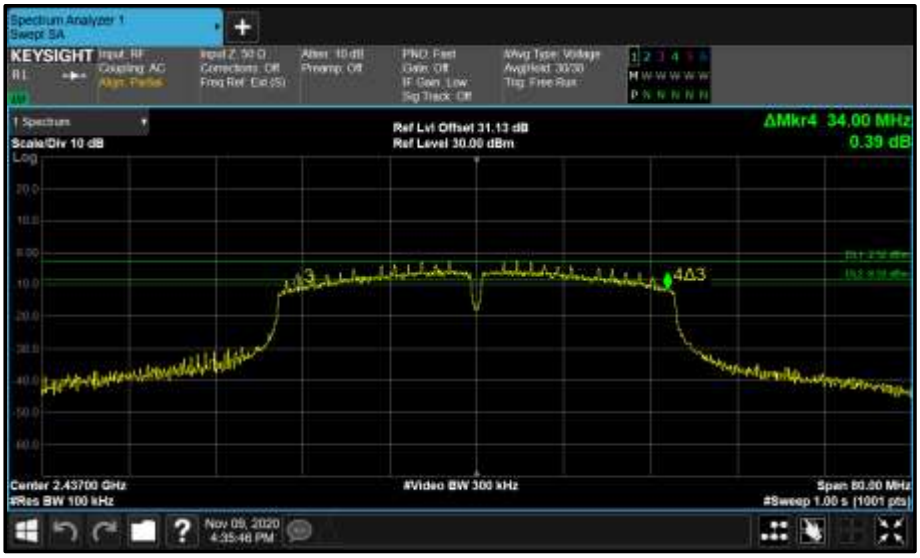

Figure 30 - (A) 2437 MHz (CH6) 6 dB Bandwidth

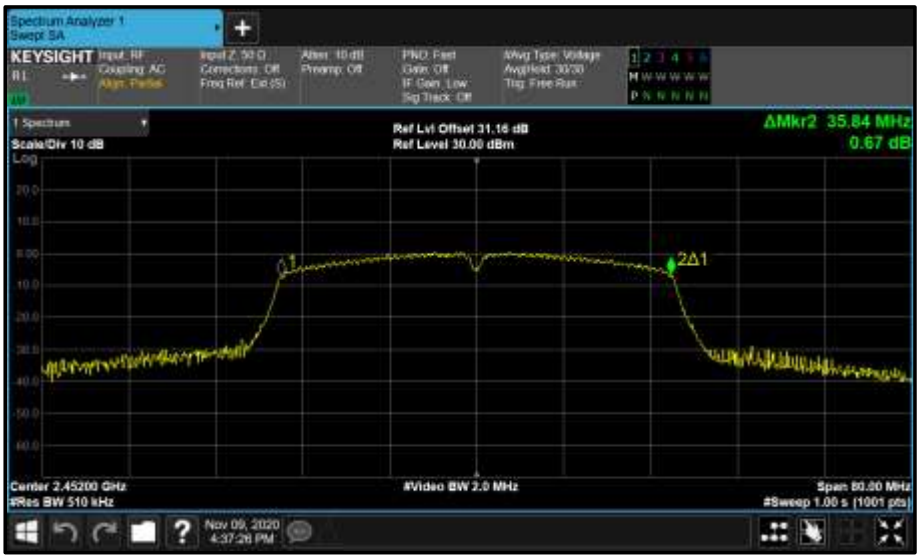

Figure 31 - (A) 2452 MHz (CH9) 99% Bandwidth

Figure 32 - (A) 2452 MHz (CH9) 6 dB Bandwidth

FCC 47 CFR Part 15, Limit Clause 15.247(a)(2) and ISED RSS-247, Clause 5.2(a)

The minimum 6 dB Bandwidth shall be at least 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 Due
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	17-May-2021
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	17-May-2021
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	04-Mar-2022
Signal Commissioning Unit	TUV SUD	SCU001	5546	12	15-Apr-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	08-Sep-2021

Table 21

2.3 Maximum Conducted Output Power

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.3.3 Date of Test

09-November-2020

2.3.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 11.9.2.3.2 Method AVGPM-G.

2.3.5 Environmental Conditions

Ambient Temperature	24.3 °C
Relative Humidity	48.9 %

2.3.6 Test Results

2.4 GHz WLAN

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11b	Duty Cycle (%):	N/A
Data Rate:	1 Mbps	Antenna Gain (dBi):	2.00
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 22

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2412	15.0	-	-	-	-	30.00	-15.01
2437	15.5	-	-	-	-	30.00	-14.48
2462	15.6	-	-	-	-	30.00	-14.43

Table 23 - Maximum Conducted (average) Output Power Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11g	Duty Cycle (%):	N/A
Data Rate:	6 Mbps	Antenna Gain (dBi):	2.00
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 24

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2412	10.7	-	-	-	-	30.00	-19.33
2437	15.3	-	-	-	-	30.00	-14.65
2462	10.7	-	-	-	-	30.00	-19.34

Table 25 - Maximum Conducted (average) Output Power Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT20	Duty Cycle (%):	N/A
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	2.00
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 26

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2412	10.7	-	-	-	-	30.00	-19.33
2437	14.5	-	-	-	-	30.00	-15.45
2462	10.8	-	-	-	-	30.00	-19.16

Table 27 - Maximum Conducted (average) Output Power Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT40	Duty Cycle (%):	N/A
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	2.00
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 28

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2422	8.6	-	-	-	-	30.00	-21.43
2437	10.8	-	-	-	-	30.00	-19.21
2452	8.7	-	-	-	-	30.00	-21.28

Table 29 - Maximum Conducted (average) Output Power Results

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

ISED RSS-247, Limit Clause 5.4 (b)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

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 Due
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
USB Power Sensor	Boonton	RTP5006	5184	12	09-Jan-2021
Signal Commissioning Unit	TUV SUD	SCU001	5546	12	15-Apr-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	08-Sep-2021

Table 30

2.4 Authorised Band Edges

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.4.3 Date of Test

05-November-2020

2.4.4 Test Method

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

2.4.5 Environmental Conditions

Ambient Temperature	19.4 °C
Relative Humidity	37.2 - 37.3 %

2.4.6 Test Results

2.4 GHz WLAN

Mode	Data Rate/Modulation Coding Scheme	Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
802.11b	1 Mbps	2412	2400	-47.04
802.11g	6 Mbps	2412	2400	-35.16
802.11n HT20	MCS0	2412	2400	-34.94
802.11n HT40	MCS0	2422	2400	-39.15

Table 31 - SISO

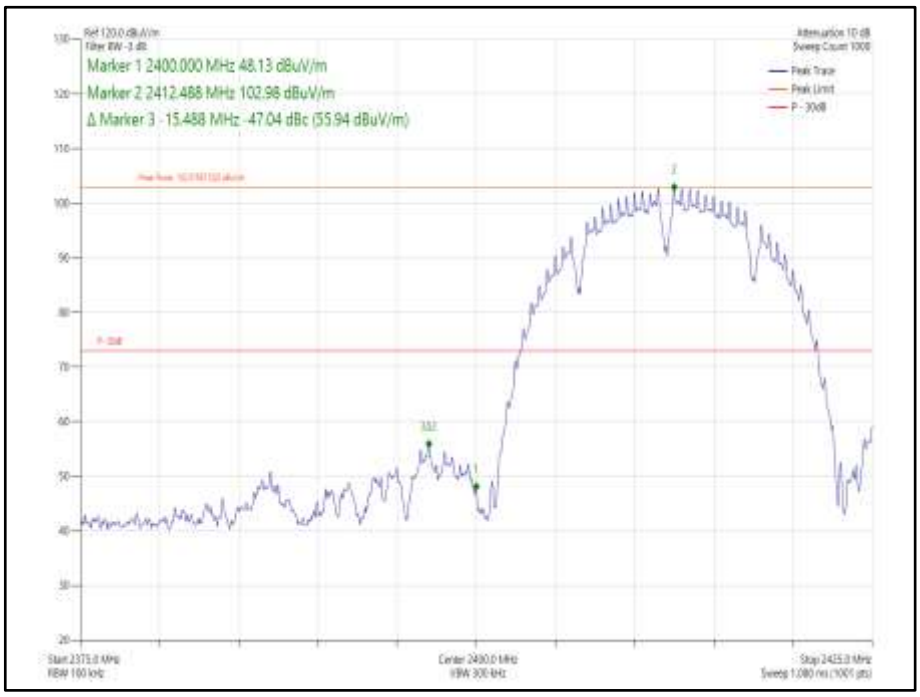

Figure 33 - 802.11b, - 2412 MHz
Band Edge Frequency 2400 MHz

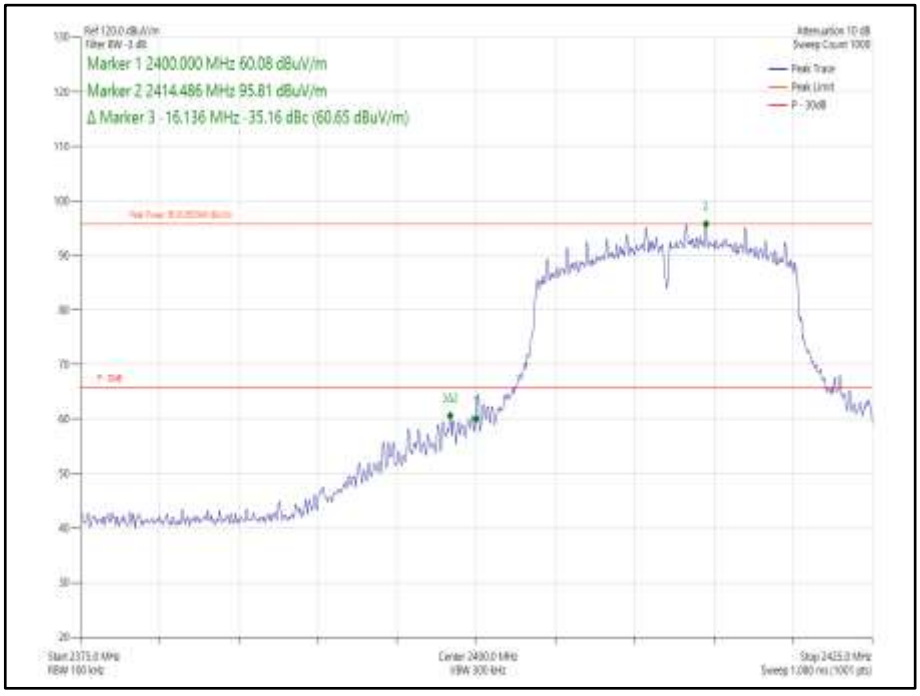

Figure 34- 802.11g, - 2412 MHz
Band Edge Frequency 2400 MHz

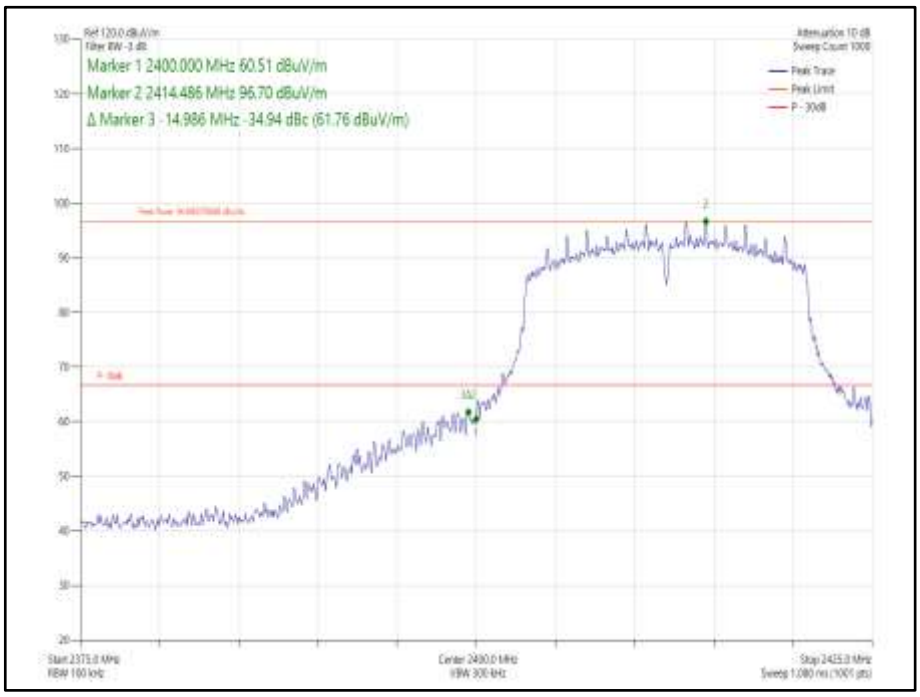

Figure 35- 802.11n HT20 - 2412 MHz
Band Edge Frequency 2400 MHz

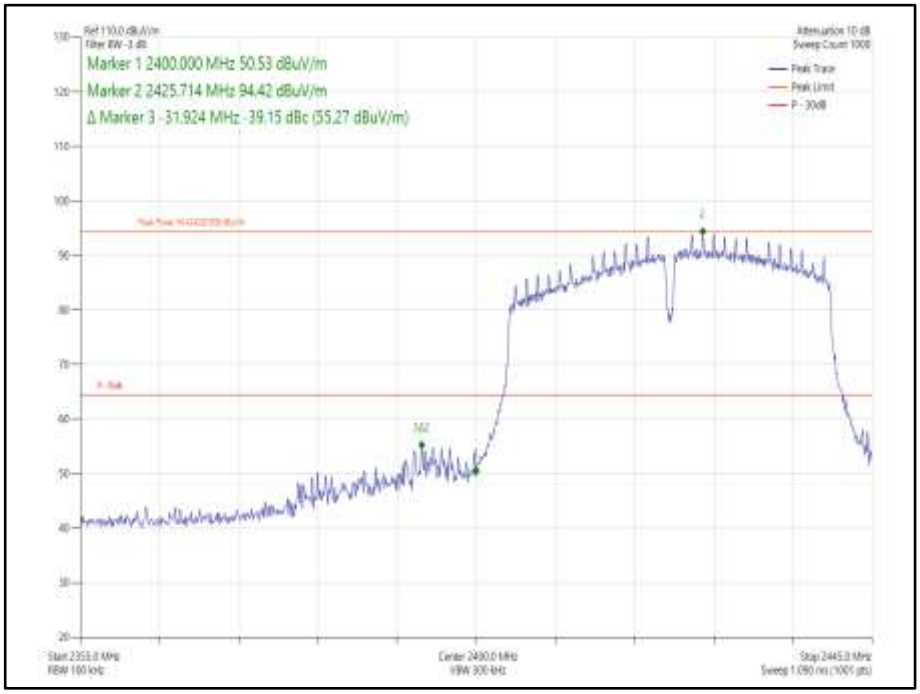

Figure 36- 802.11n HT40 - 2422 MHz
Band Edge Frequency 2400 MHz

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.

2.4.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	10-Mar-2021
Cable (18 GHz)	Rosenberger	LU7-071-2000	5106	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V2.0.1	5125	-	Software
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5517	12	01-Apr-2021
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	06-Feb-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021

Table 32

TU - Traceability Unscheduled

2.5 Spurious Radiated Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d) and 15.205
ISED RSS-247, Clause 5.5
ISED RSS-GEN, Clause 6.13

2.5.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.5.3 Date of Test

11-November-2020

2.5.4 Test Method

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

The EUT was placed on the non-conducting platform in a manner typical of a normal installation.

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.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.5 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.2.

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.

To determine the emission characteristic of the EUT above 18 GHz, the test antenna was swept over all faces of the EUT whilst observing a spectral display. The frequency of any emissions of interest were noted for formal measurement at the correct measurement distance of 1m. This procedure was repeated for all relevant transmit operating channels.

At a measurement distance of 1 meter the limit line was increased by 20*LOG(3/1) = 9.54 dB.

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

2.5.5 Example Test Setup Diagram

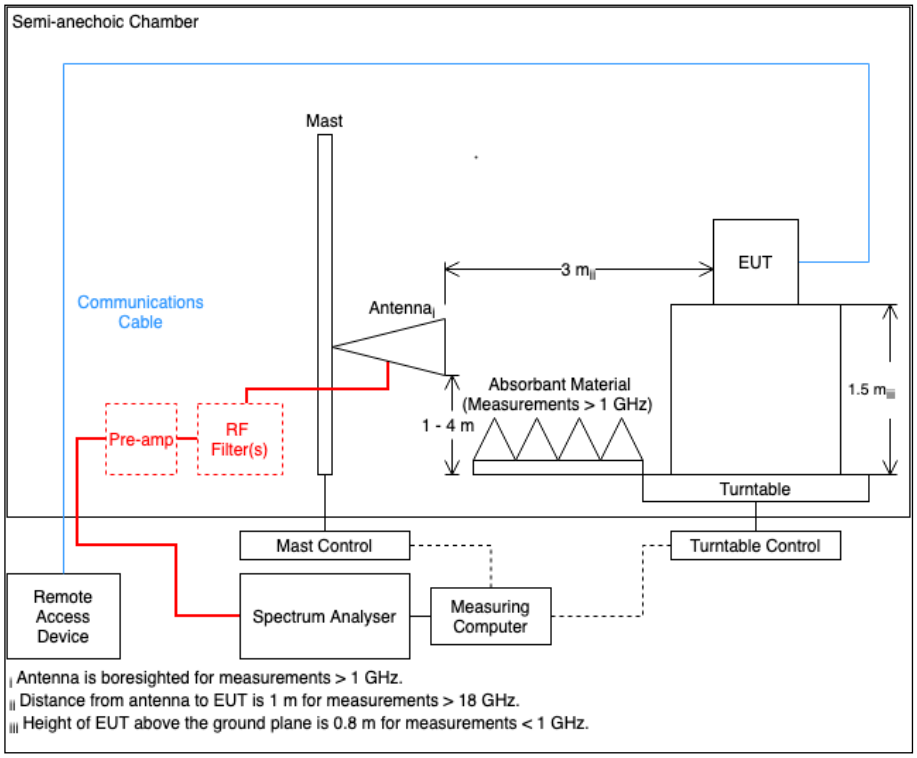

Figure 37

2.5.6 Environmental Conditions

Ambient Temperature	19.5 - 24.3 °C
Relative Humidity	35.9 - 47.3 %

2.5.7 Test Results

2.4 GHz WLAN

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
7234.803	69.5	74.0	-4.5	Peak	216	274	Vertical

Table 33 - 2412 MHz (CH1), 802.11b, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.

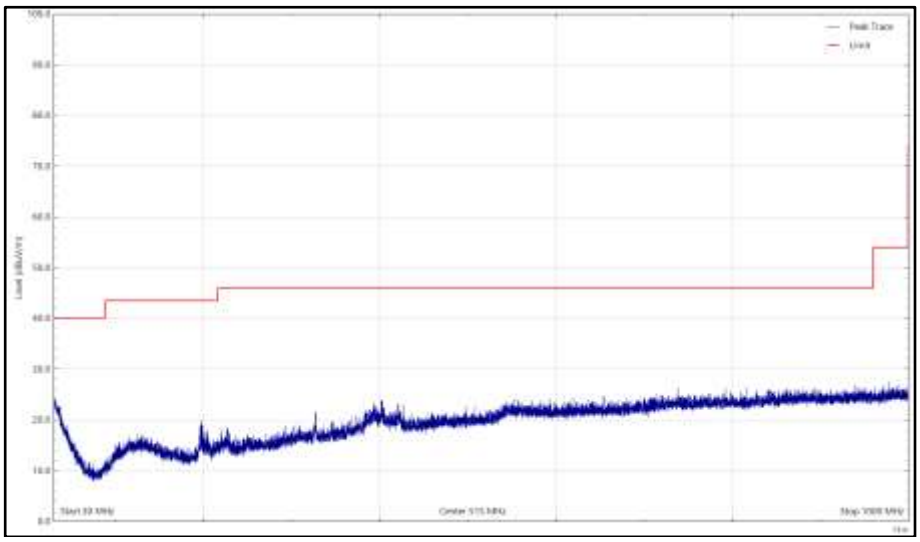

Figure 38 - 2412 MHz (CH1), 802.11b, 30 MHz to 1 GHz, Horizontal (Peak)

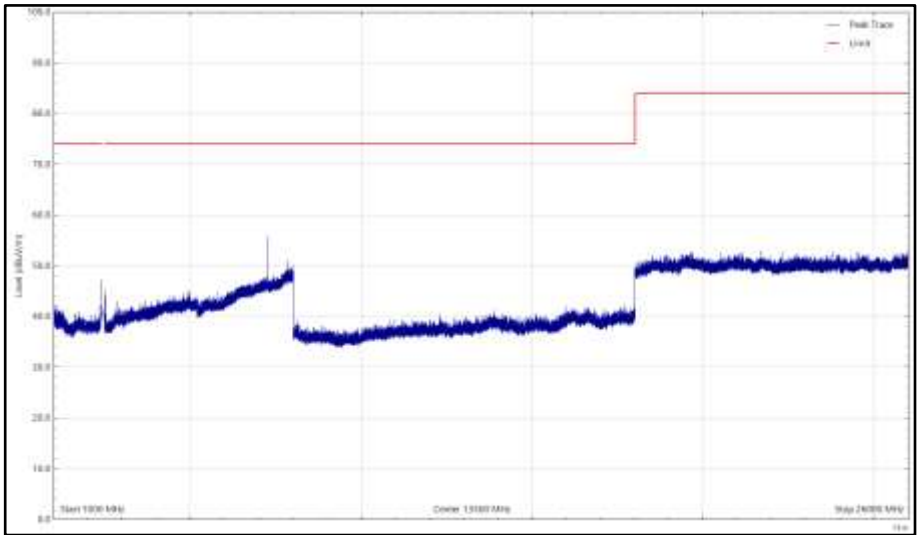

Figure 39 - 2412 MHz (CH1), 802.11b, 1 GHz to 26 GHz, Horizontal (Peak)

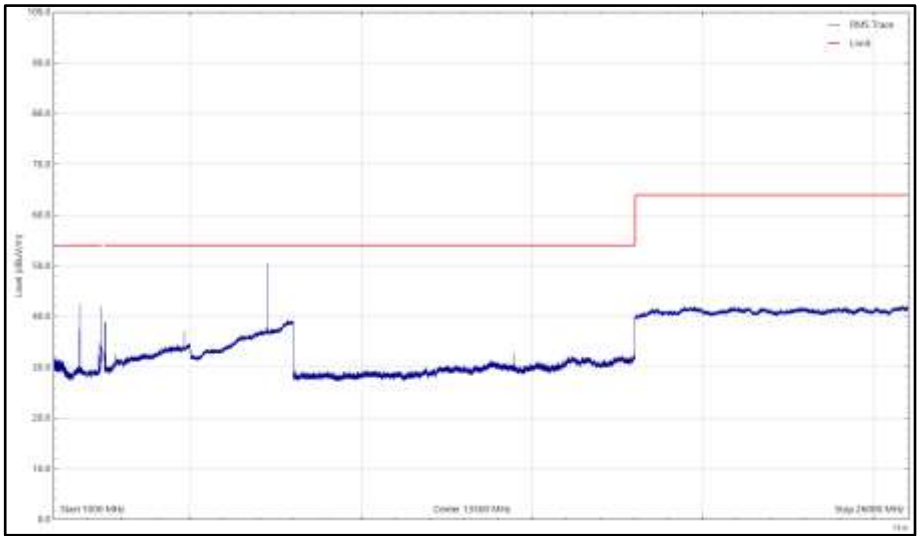

Figure 40 - 2412 MHz (CH1), 802.11b, 1 GHz to 26 GHz, Horizontal (rms)

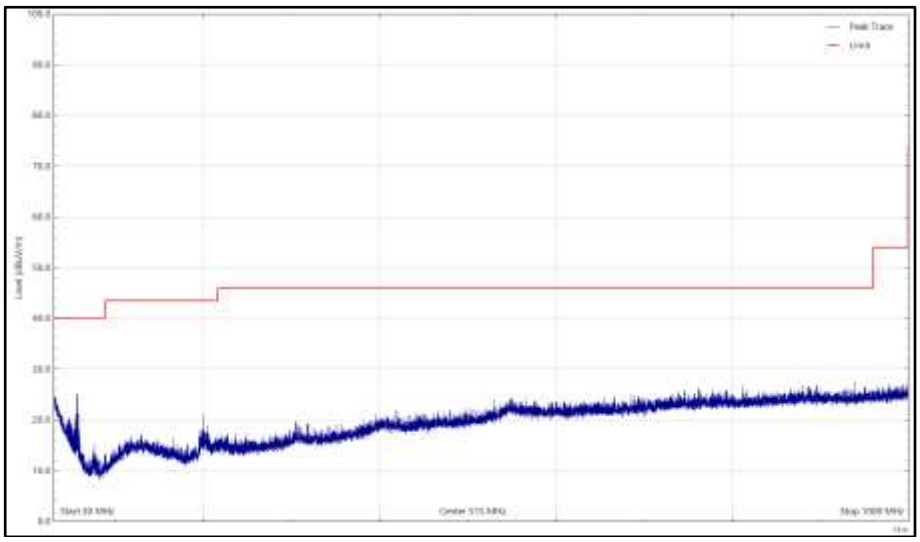

Figure 41 - 2412 MHz (CH1), 802.11b, 30 MHz to 1 GHz, Vertical (Peak)

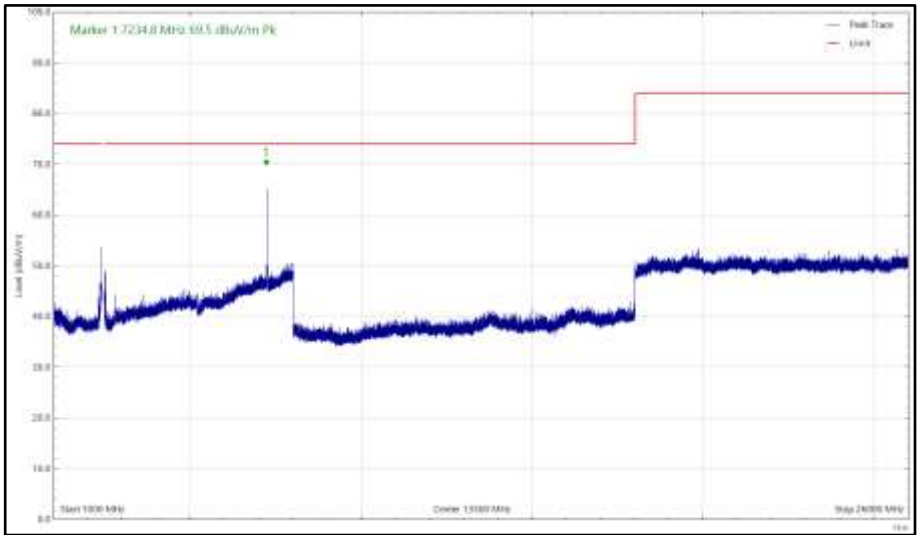

Figure 42 - 2412 MHz (CH1), 802.11b, 1 GHz to 26 GHz, Vertical (Peak)

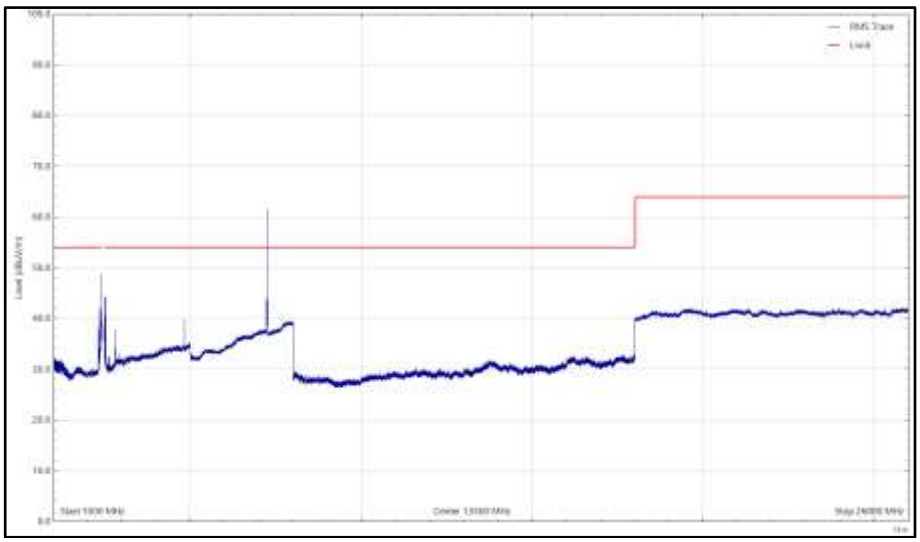

Figure 43 - 2412 MHz (CH1), 802.11b, 1 GHz to 26 GHz, Vertical (rms)

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

Table 34 - 2437 MHz (CH6), 802.11b, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

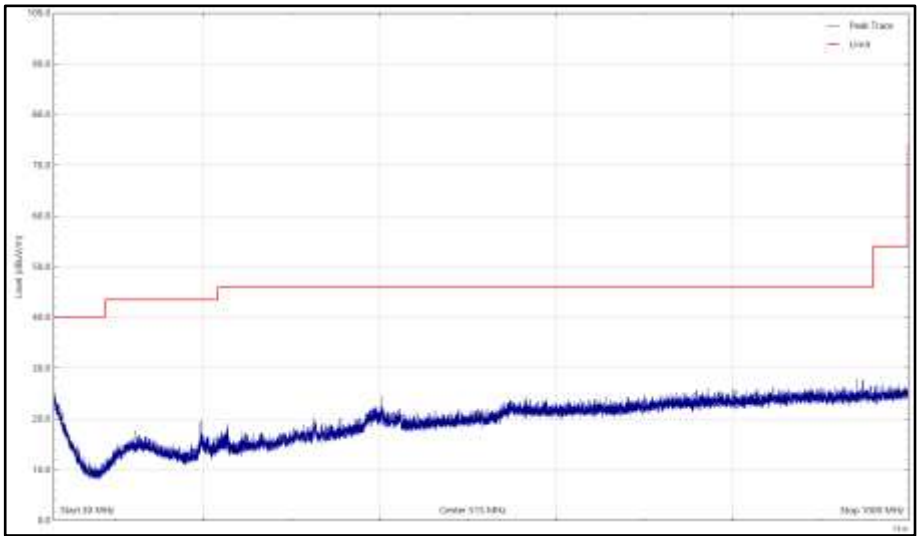

Figure 44 - 2437 MHz (CH6), 802.11b, 30 MHz to 1 GHz, Horizontal (Peak)

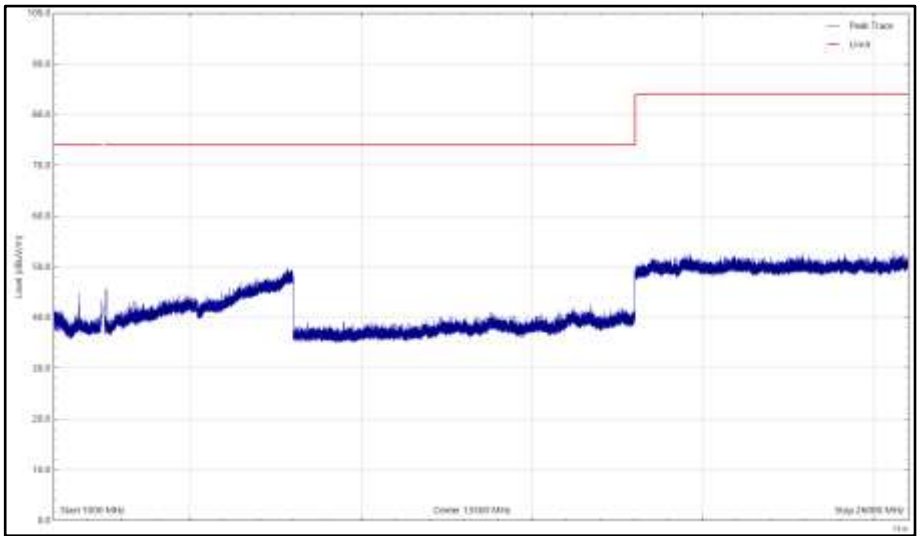

Figure 45 - 2437 MHz (CH6), 802.11b, 1 GHz to 26 GHz, Horizontal (Peak)

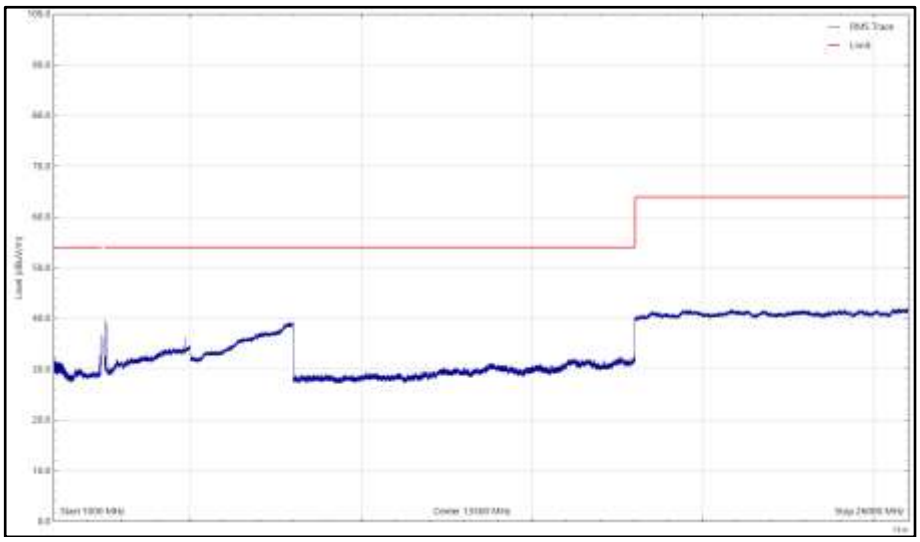

Figure 46 - 2437 MHz (CH6), 802.11b, 1 GHz to 26 GHz, Horizontal (rms)

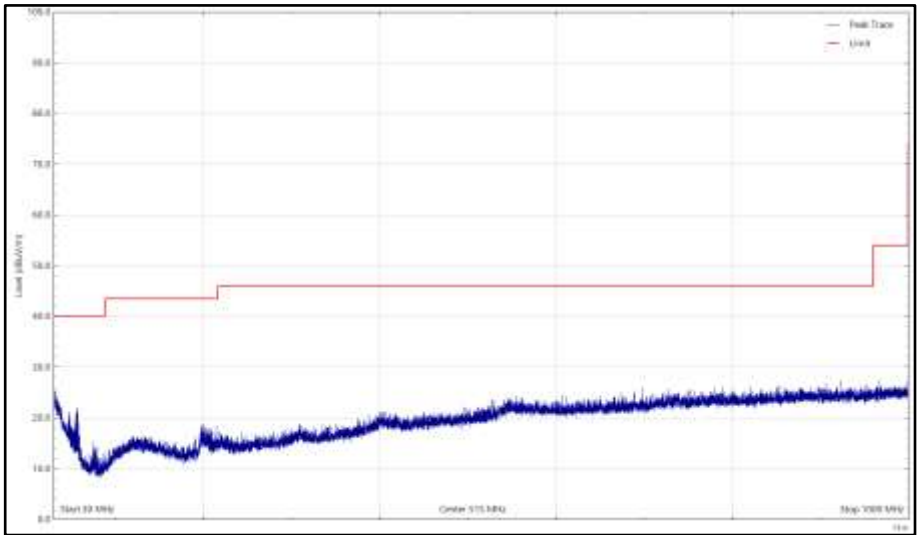

Figure 47 - 2437 MHz (CH6), 802.11b, 30 MHz to 1 GHz, Vertical (Peak)

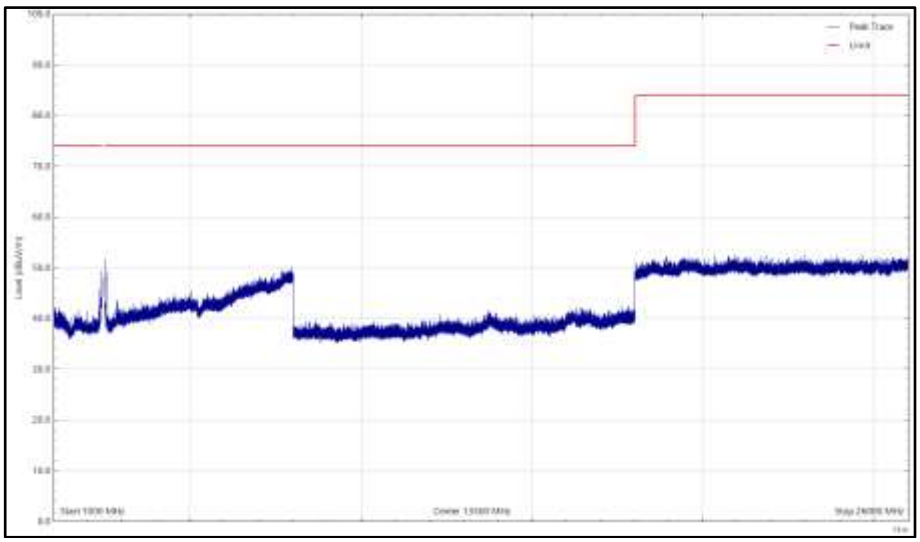

Figure 48 - 2437 MHz (CH6), 802.11b, 1 GHz to 26 GHz, Vertical (Peak)

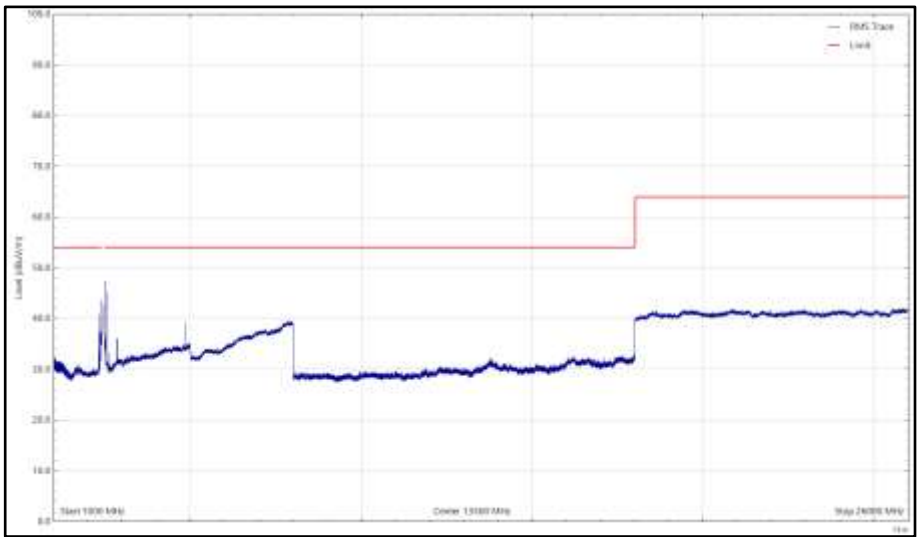

Figure 49 - 2437 MHz (CH6), 802.11b, 1 GHz to 26 GHz, Vertical (rms)

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

Table 35 - 2462 MHz (CH11), 802.11b, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

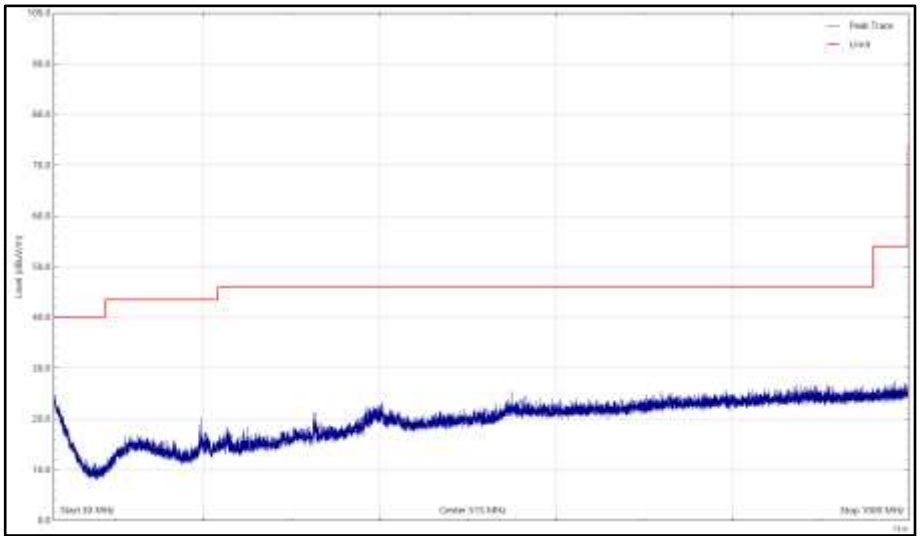

Figure 50 - 2462 MHz (CH11), 802.11b, 30 MHz to 1 GHz, Horizontal (Peak)

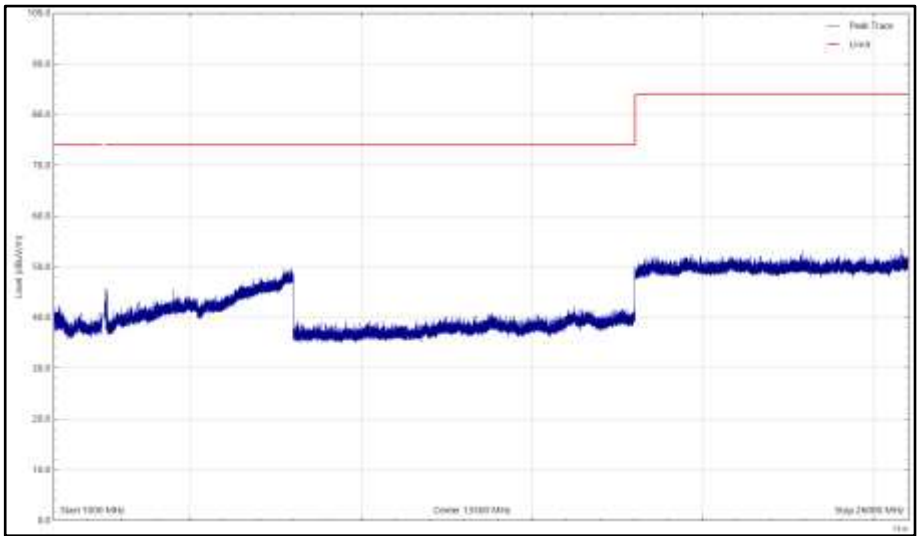

Figure 51 - 2462 MHz (CH11), 802.11b, 1 GHz to 26 GHz, Horizontal (Peak)

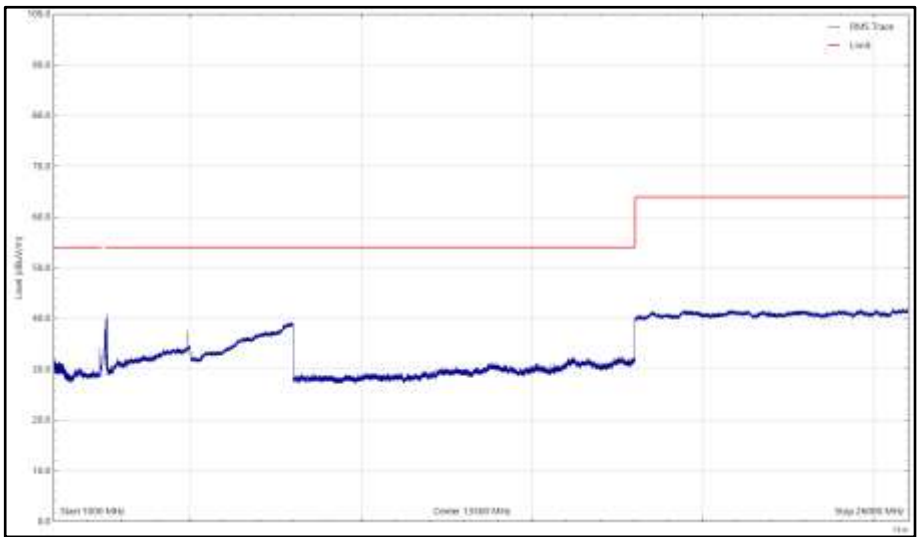

Figure 52 - 2462 MHz (CH11), 802.11b, 1 GHz to 26 GHz, Horizontal (rms)

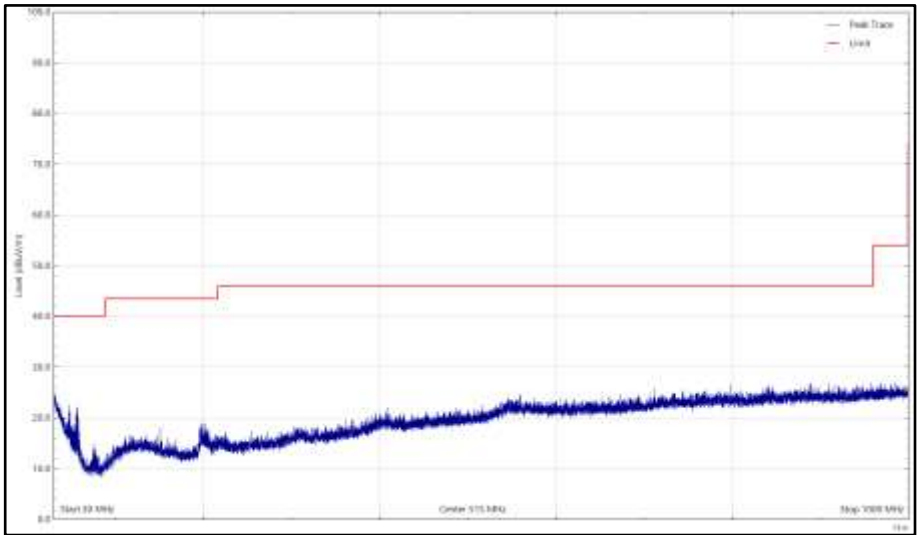

Figure 53 - 2462 MHz (CH11), 802.11b, 30 MHz to 1 GHz, Vertical (Peak)

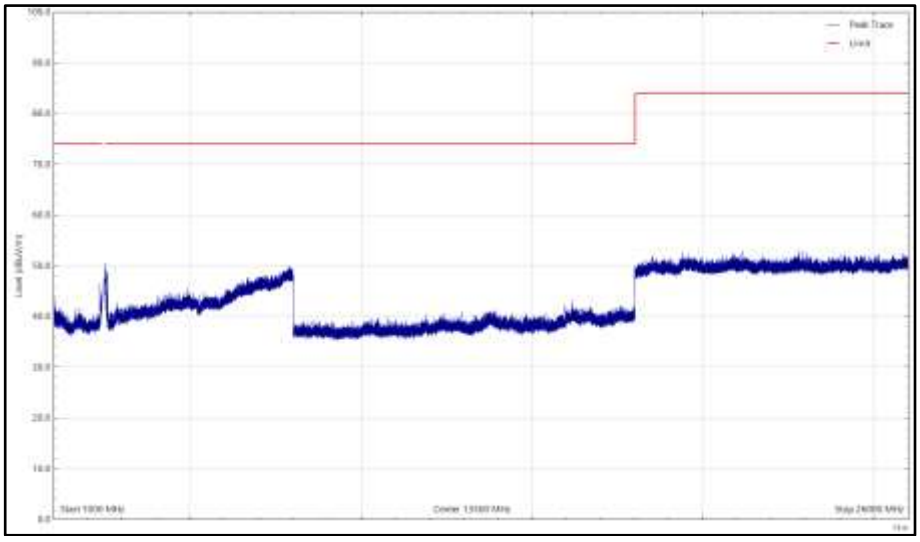

Figure 54 - 2462 MHz (CH11), 802.11b, 1 GHz to 26 GHz, Vertical (Peak)

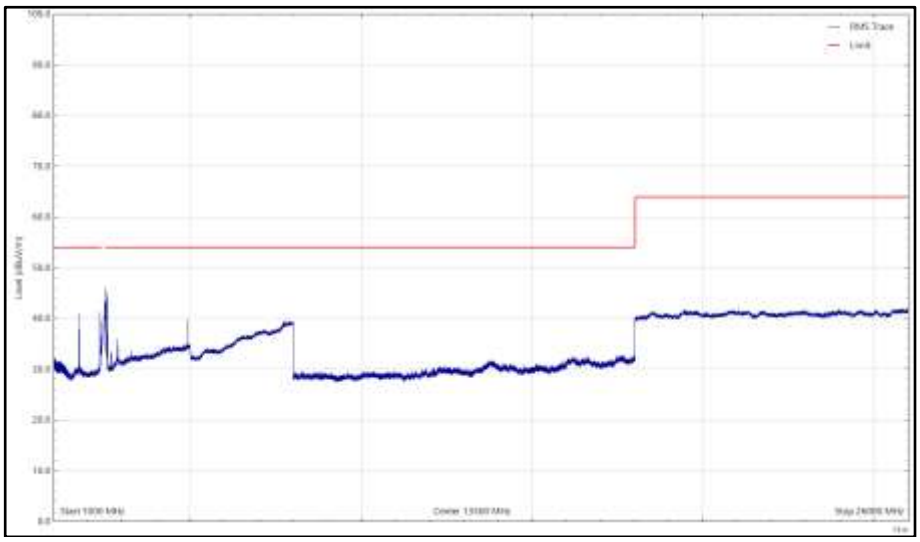

Figure 55 - 2462 MHz (CH11), 802.11b, 1 GHz to 26 GHz, Vertical (rms)

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

Table 36 - 2412 MHz (CH1), 802.11g, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

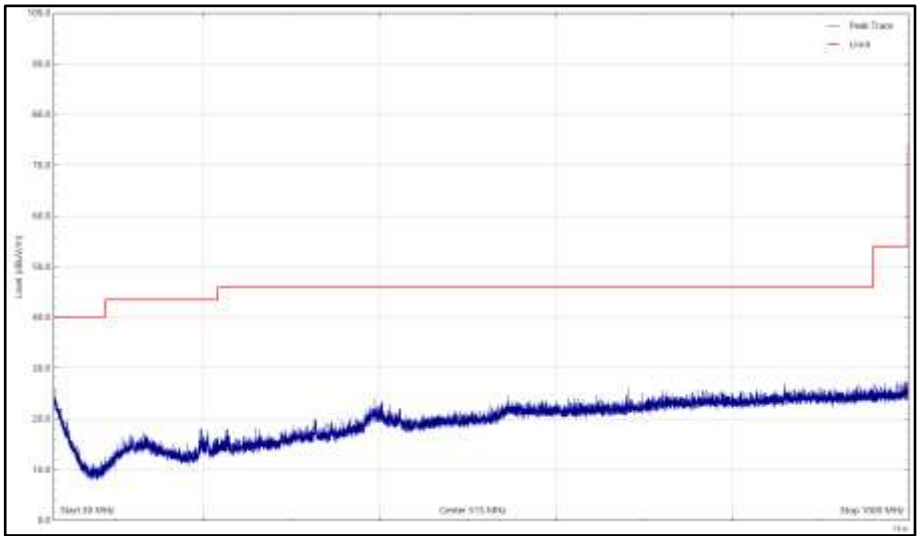

Figure 56 - 2412 MHz (CH1), 802.11g, 30 MHz to 1 GHz, Horizontal (Peak)

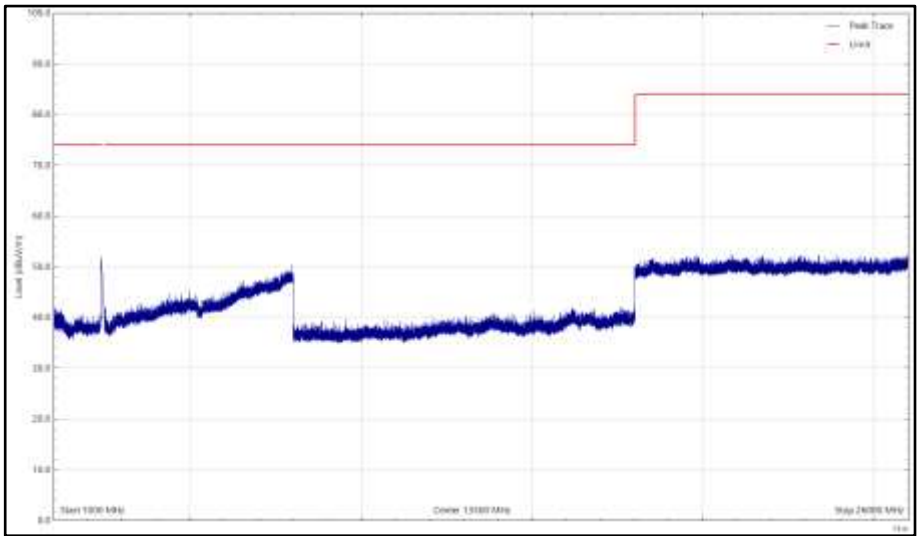

Figure 57 - 2412 MHz (CH1), 802.11g, 1 GHz to 26 GHz, Horizontal (Peak)

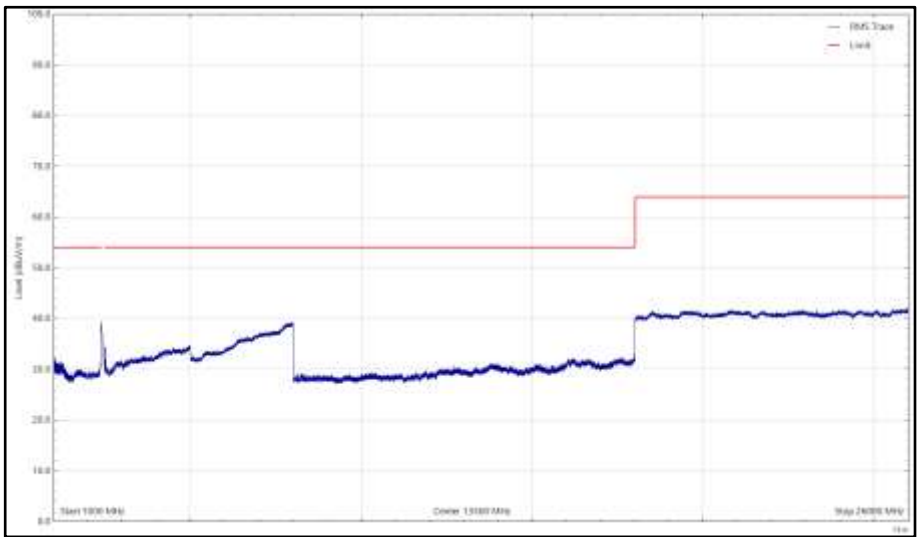

Figure 58 - 2412 MHz (CH1), 802.11g, 1 GHz to 26 GHz, Horizontal (rms)

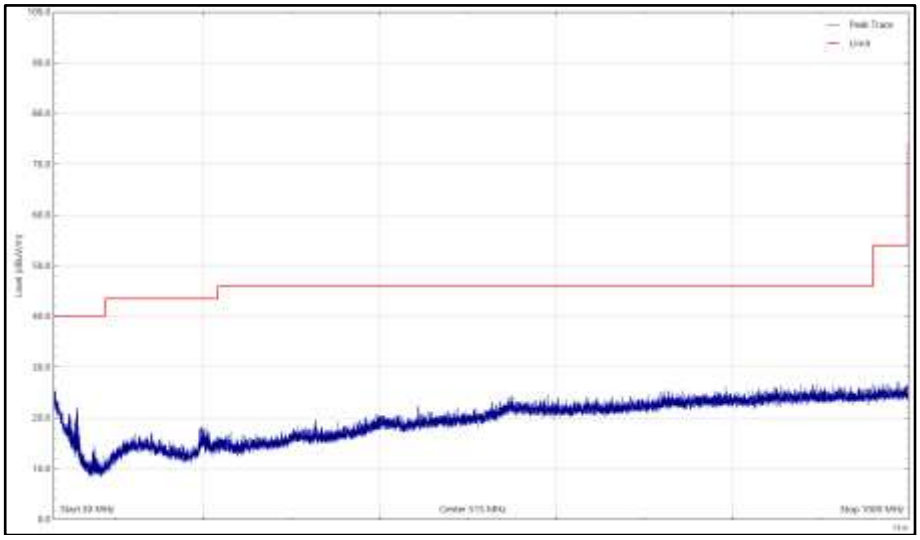

Figure 59 - 2412 MHz (CH1), 802.11g, 30 MHz to 1 GHz, Vertical (Peak)

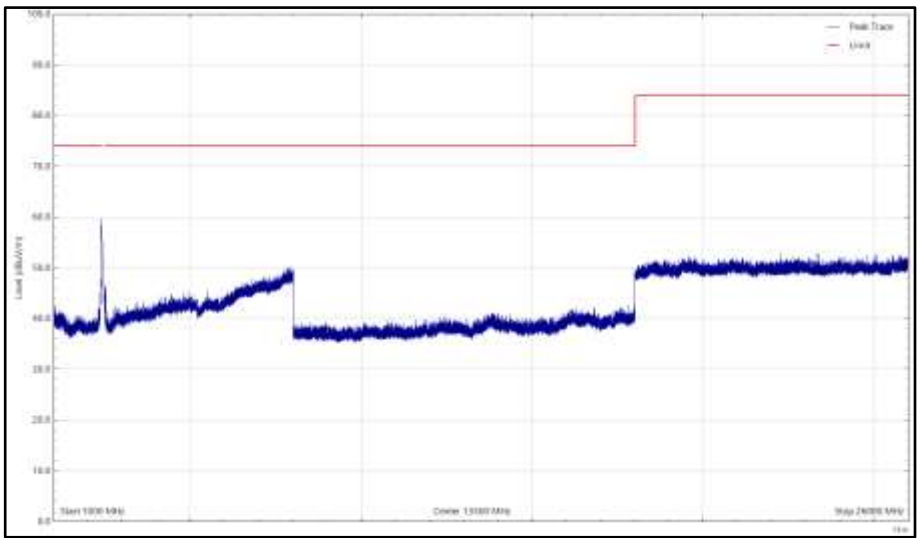

Figure 60 - 2412 MHz (CH1), 802.11g, 1 GHz to 26 GHz, Vertical (Peak)

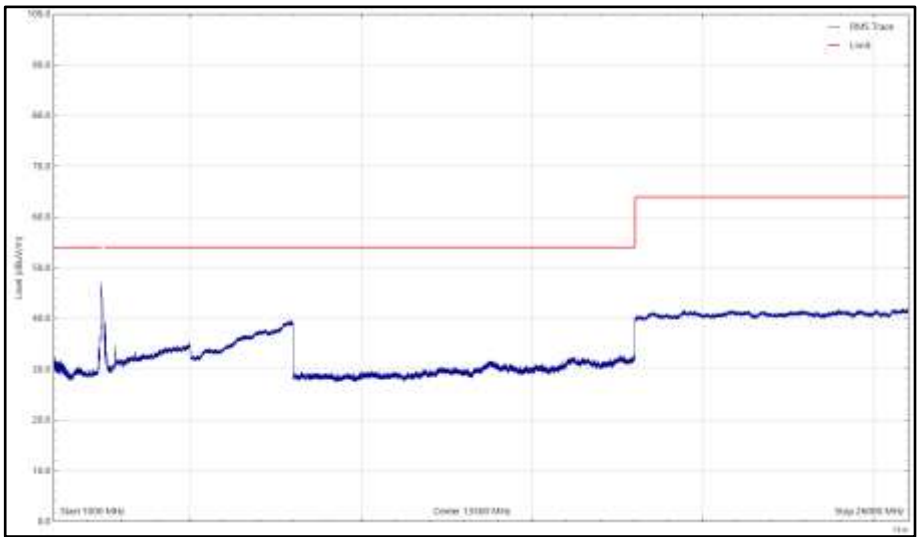

Figure 61 - 2412 MHz (CH1), 802.11g, 1 GHz to 26 GHz, Vertical (rms)

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

Table 37 - 2437 MHz (CH6), 802.11g, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

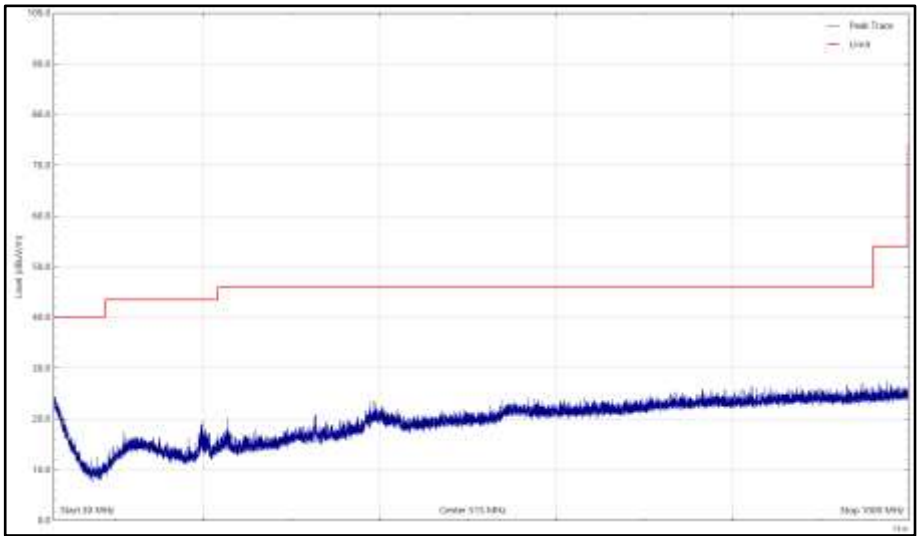

Figure 62 - 2437 MHz (CH6), 802.11g, 30 MHz to 1 GHz, Horizontal (Peak)

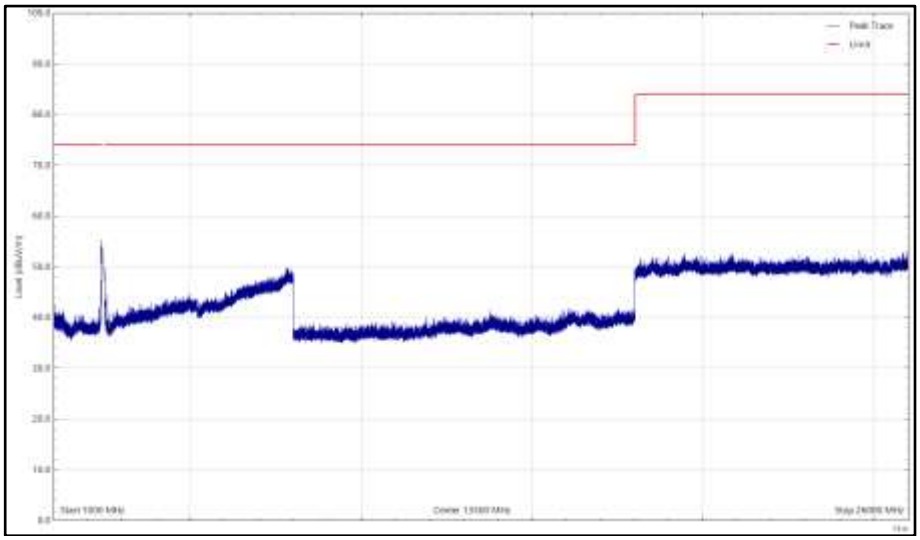

Figure 63 - 2437 MHz (CH6), 802.11g, 1 GHz to 26 GHz, Horizontal (Peak)

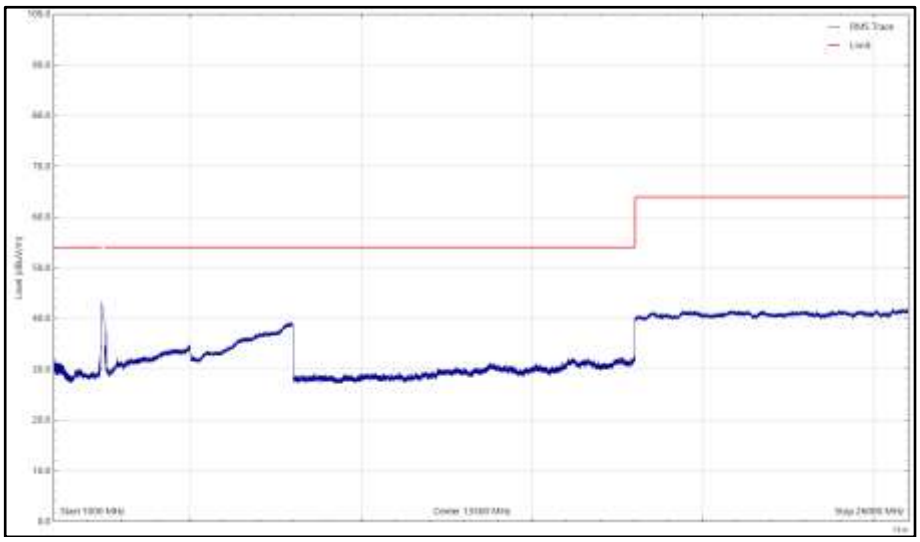

Figure 64 - 2437 MHz (CH6), 802.11g, 1 GHz to 26 GHz, Horizontal (rms)

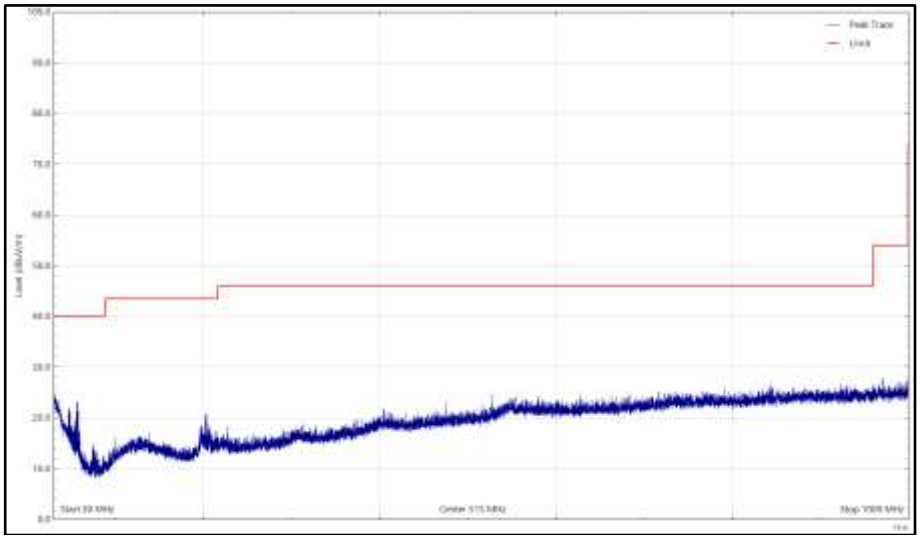

Figure 65 - 2437 MHz (CH6), 802.11g, 30 MHz to 1 GHz, Vertical (Peak)

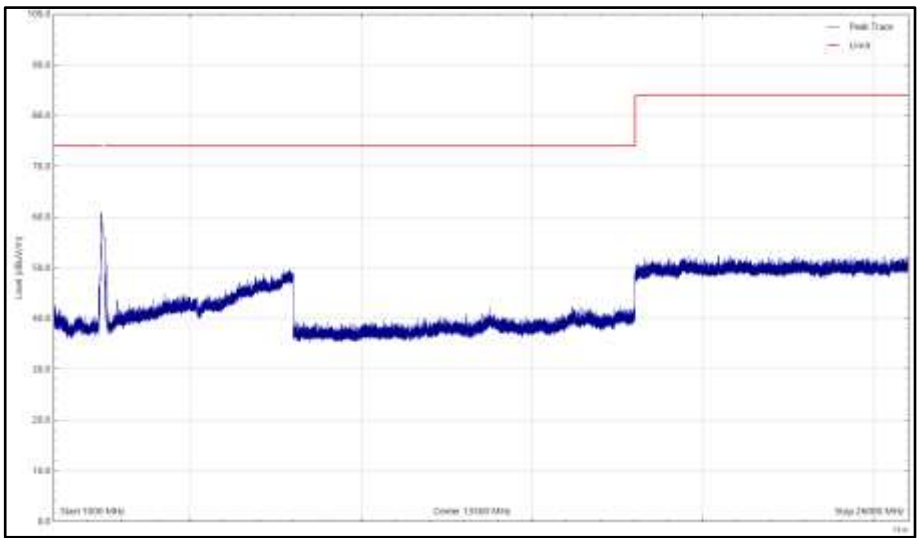

Figure 66 - 2437 MHz (CH6), 802.11g, 1 GHz to 26 GHz, Vertical (Peak)

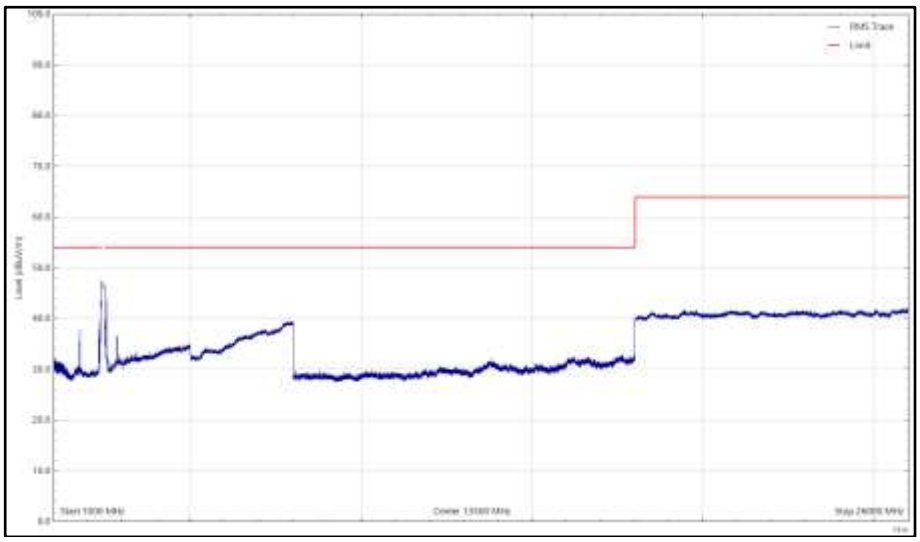

Figure 67 - 2437 MHz (CH6), 802.11g, 1 GHz to 26 GHz, Vertical (rms)

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

Table 38 - 2462 MHz (CH11), 802.11g, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

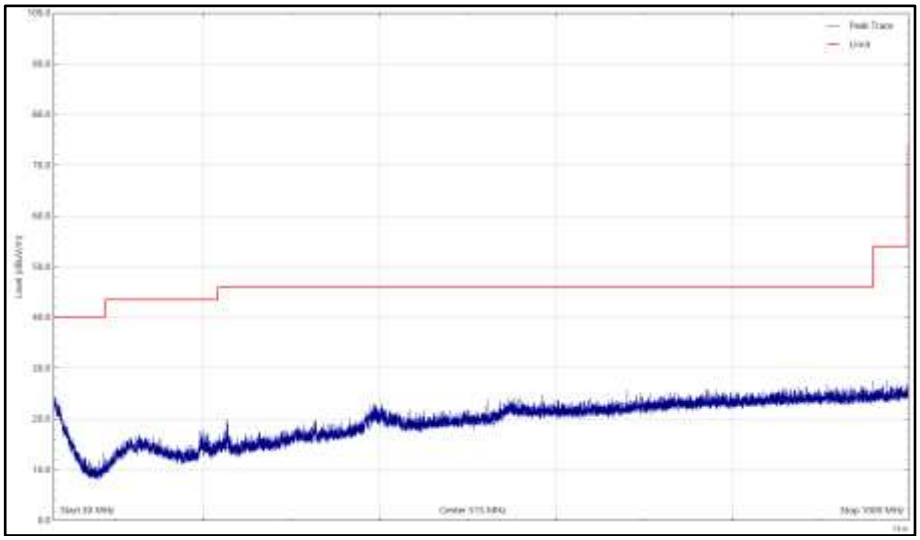

Figure 68 - 2462 MHz (CH11), 802.11g, 30 MHz to 1 GHz, Horizontal (Peak)

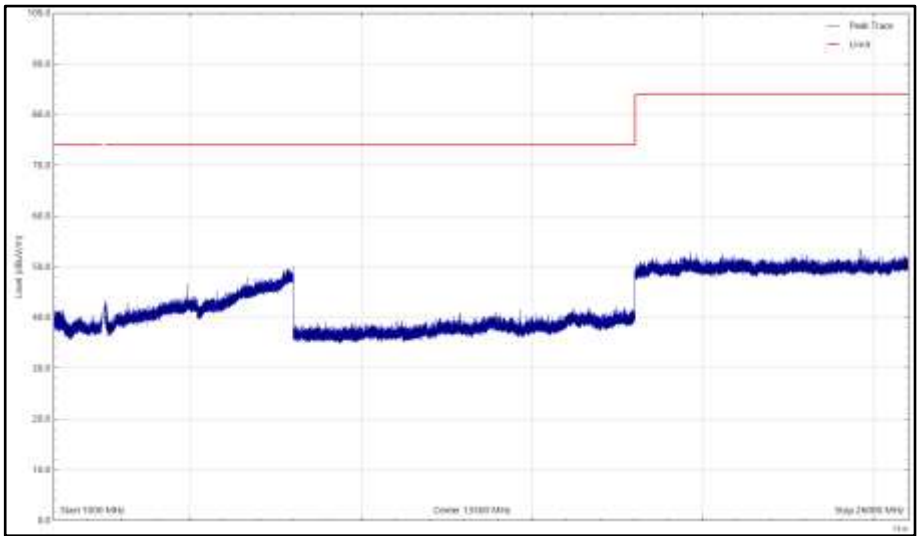

Figure 69 - 2462 MHz (CH11), 802.11g, 1 GHz to 26 GHz, Horizontal (Peak)

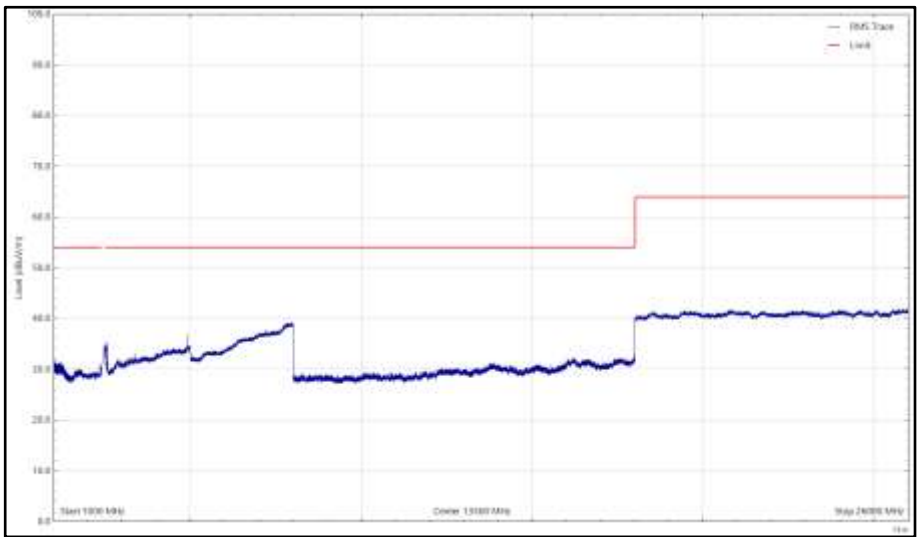

Figure 70 - 2462 MHz (CH11), 802.11g, 1 GHz to 26 GHz, Horizontal (rms)

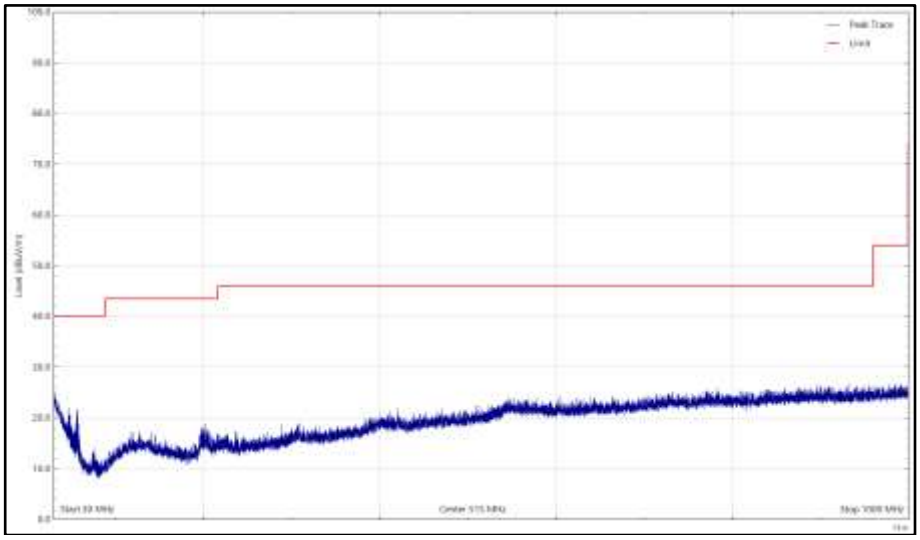

Figure 71 - 2462 MHz (CH11), 802.11g, 30 MHz to 1 GHz, Vertical (Peak)

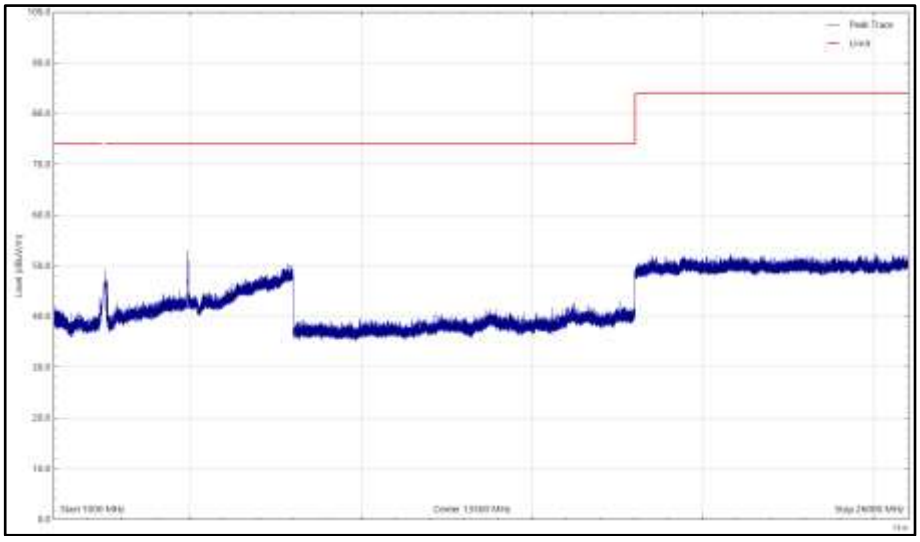

Figure 72 - 2462 MHz (CH11), 802.11g, 1 GHz to 26 GHz, Vertical (Peak)

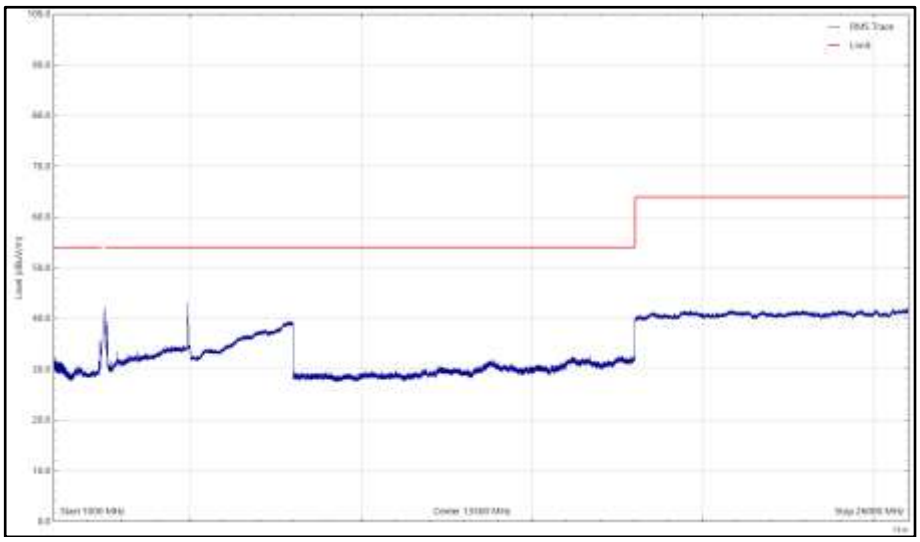

Figure 73 - 2462 MHz (CH11), 802.11g, 1 GHz to 26 GHz, Vertical (rms)

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

Table 39 - 2412 MHz (CH1), 802.11n 20 MHz, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

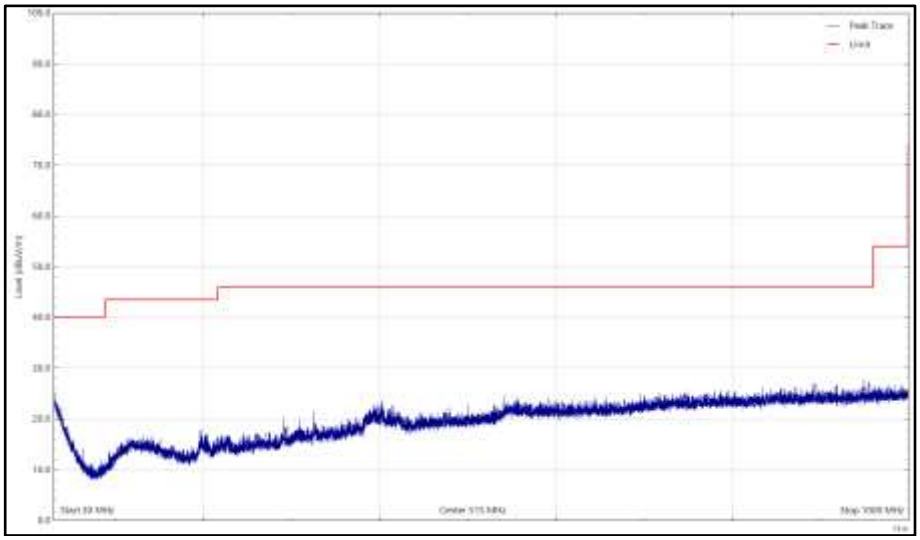

Figure 74 - 2412 MHz (CH1), 802.11n 20 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

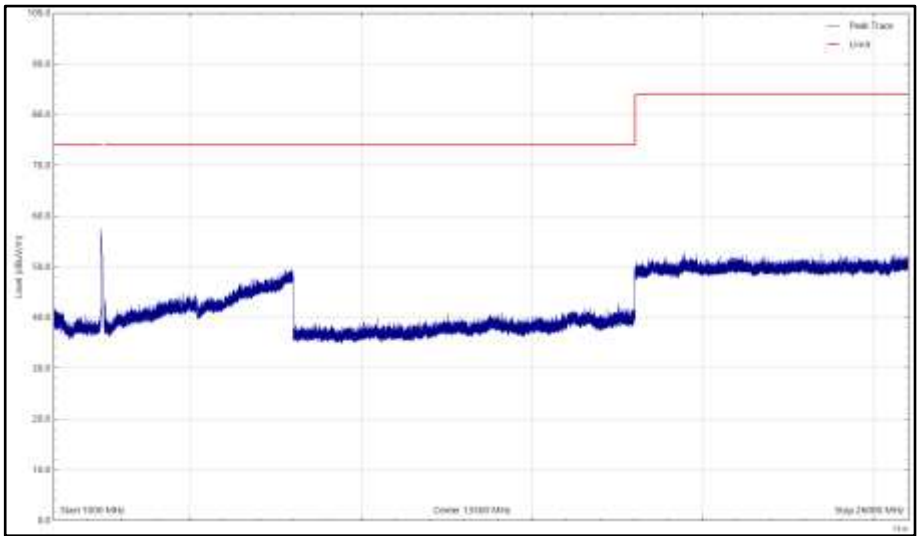

Figure 75 - 2412 MHz (CH1), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (Peak)

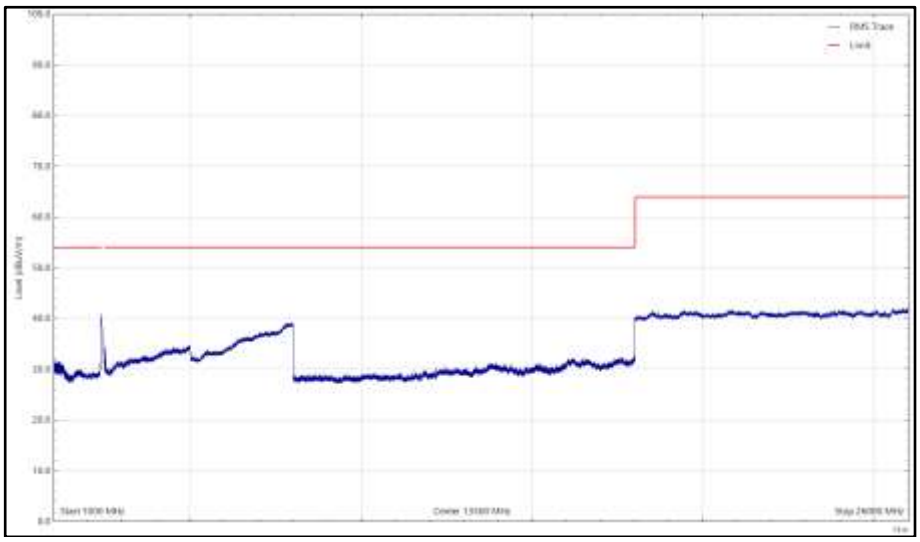

Figure 76 - 2412 MHz (CH1), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (rms)

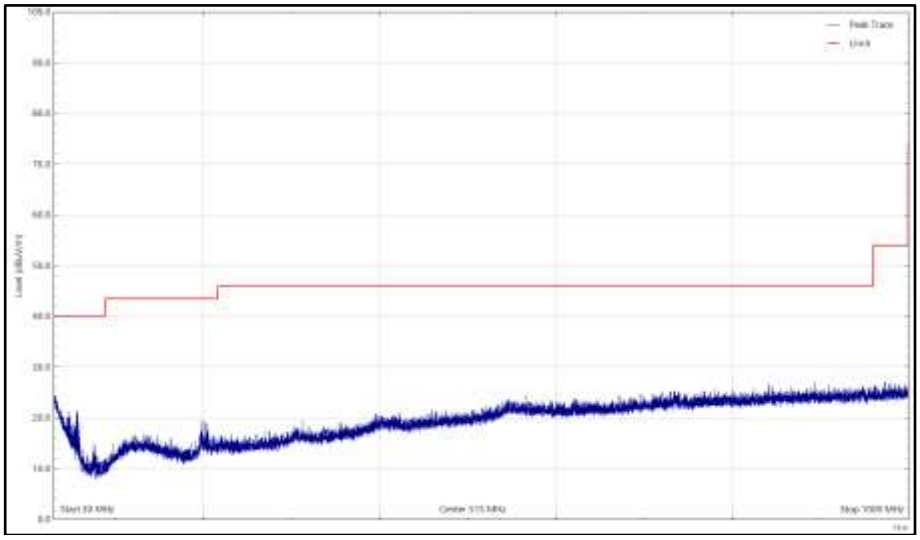

Figure 77 - 2412 MHz (CH1), 802.11n 20 MHz, 30 MHz to 1 GHz, Vertical (Peak)

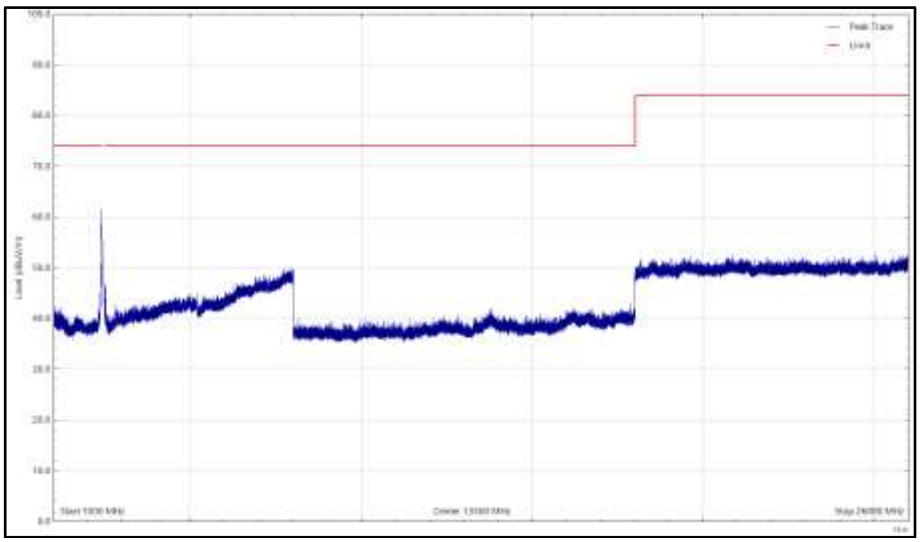

Figure 78 - 2412 MHz (CH1), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (Peak)

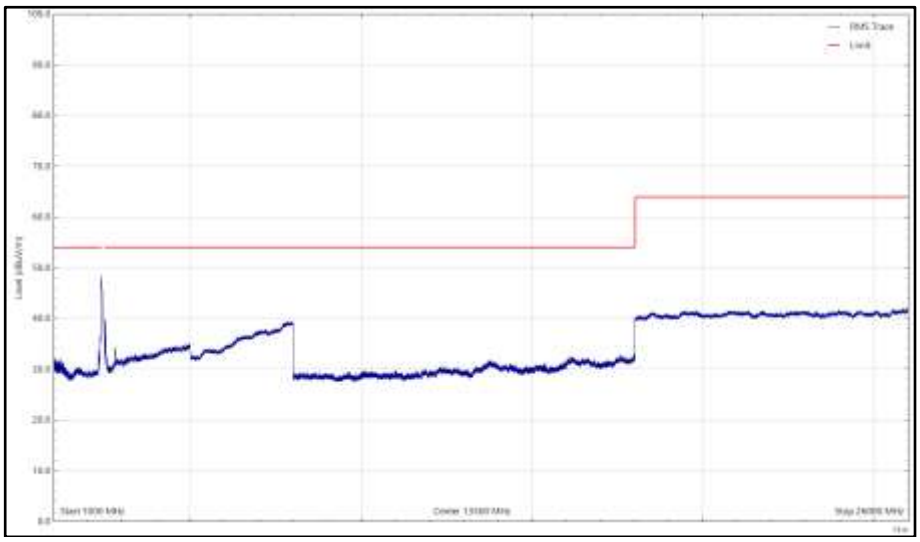

Figure 79 - 2412 MHz (CH1), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (rms)

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

Table 40 - 2437 MHz (CH6), 802.11n 20 MHz, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

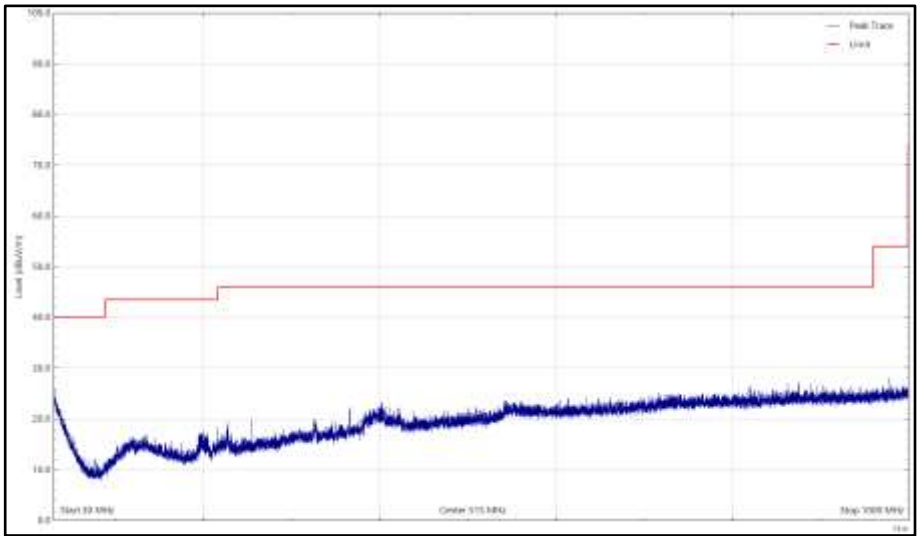

Figure 80 - 2437 MHz (CH6), 802.11n 20 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

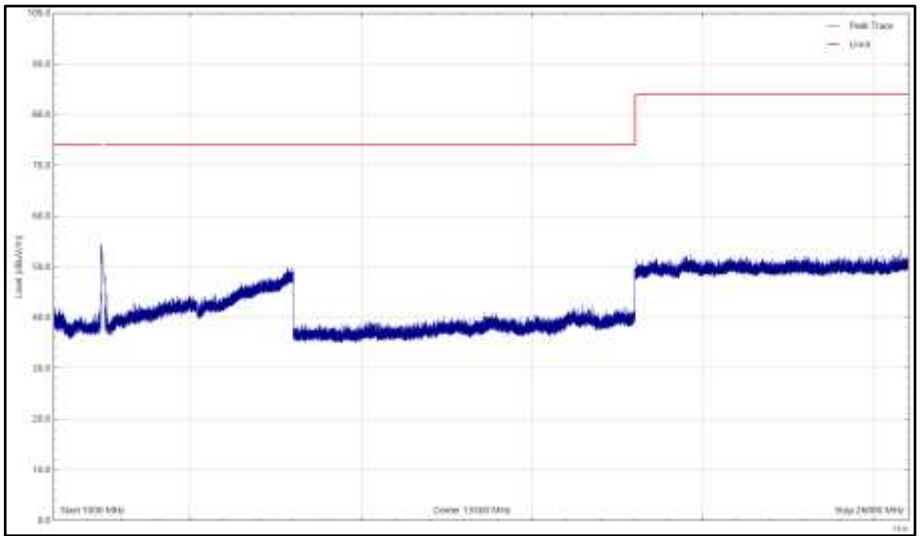

Figure 81 - 2437 MHz (CH6), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (Peak)

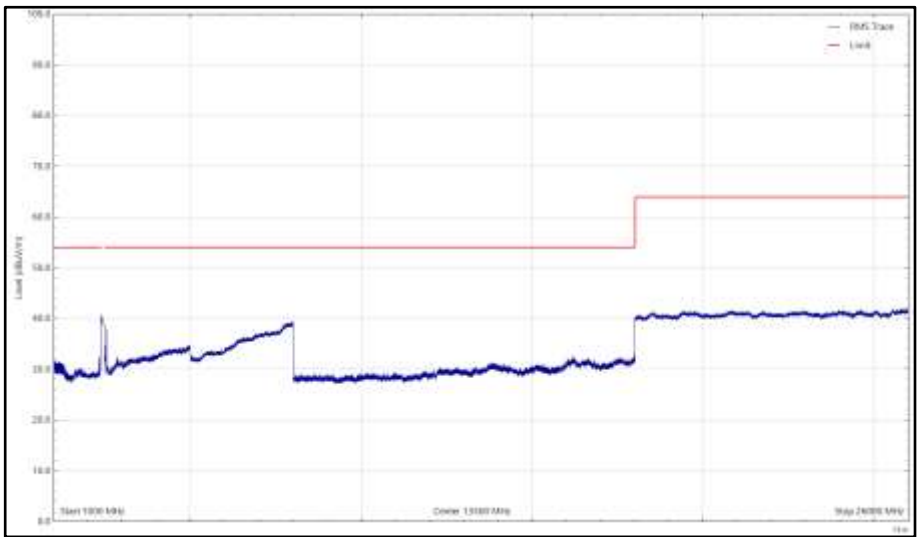

Figure 82 - 2437 MHz (CH6), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (rms)

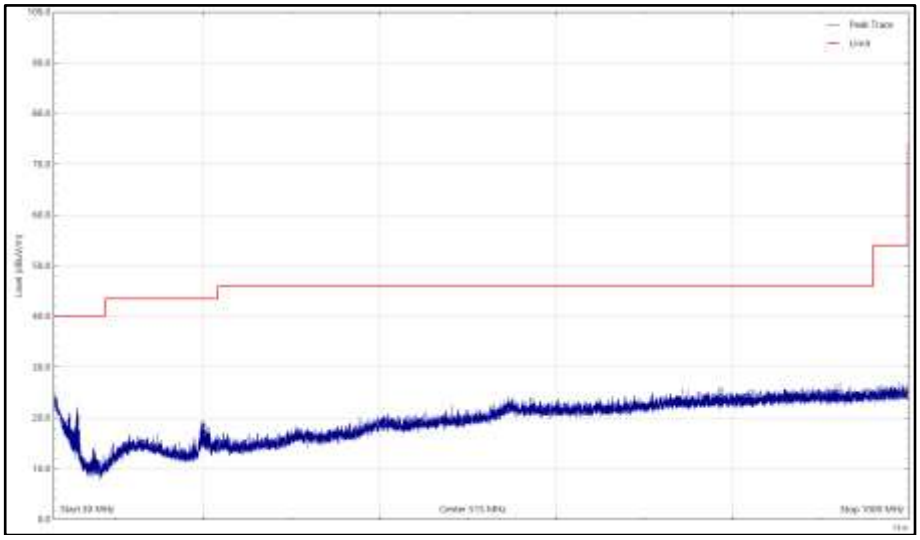

Figure 83 - 2437 MHz (CH6), 802.11n 20 MHz, 30 MHz to 1 GHz, Vertical (Peak)

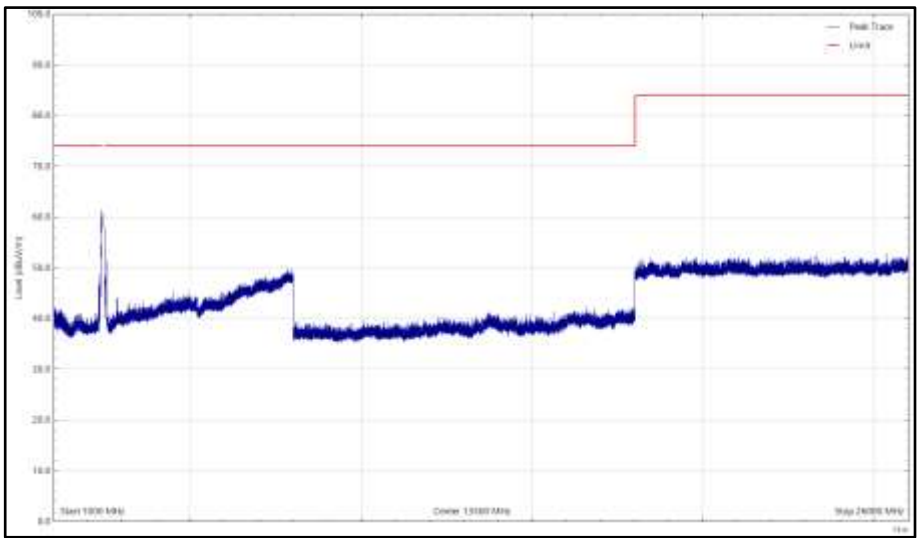

Figure 84 - 2437 MHz (CH6), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (Peak)

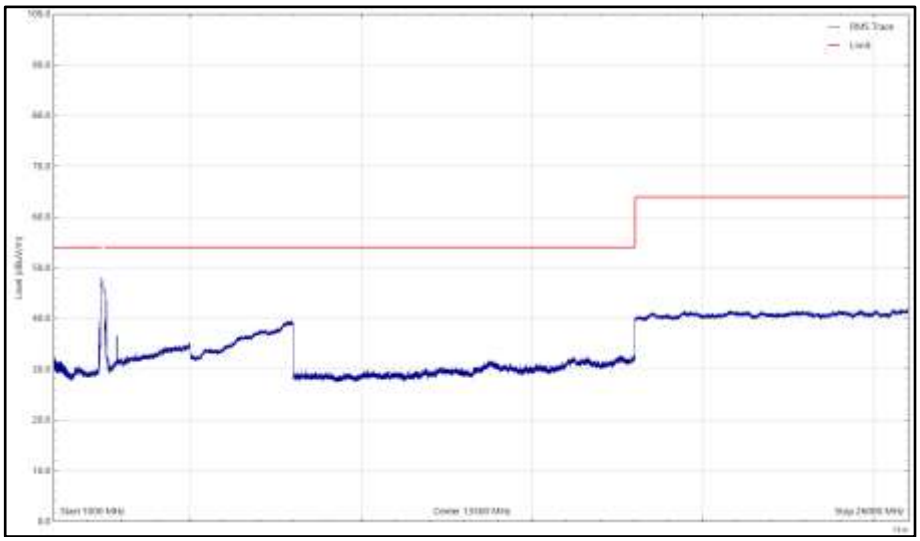

Figure 85 - 2437 MHz (CH6), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (rms)

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

Table 41 - 2462 MHz (CH11), 802.11n 20 MHz, 30 MHz to 26 GHz

*No emissions found within 6 dB of the limit.

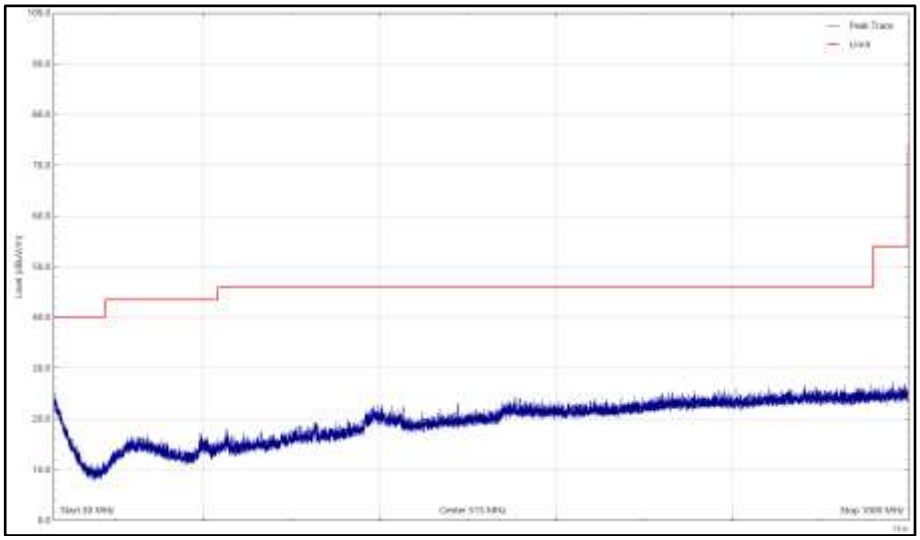

Figure 86 - 2462 MHz (CH11), 802.11n 20 MHz, 30 MHz to 1 GHz, Horizontal (Peak)

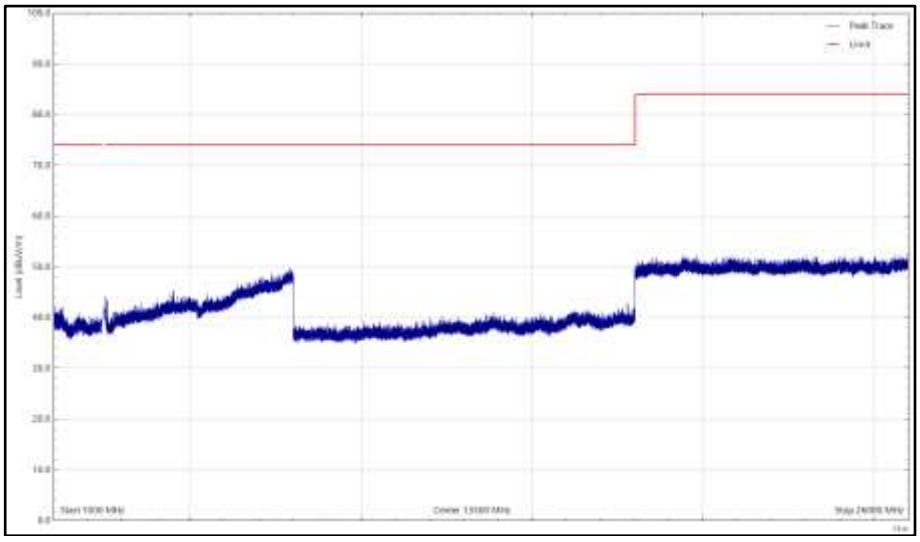

Figure 87 - 2462 MHz (CH11), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (Peak)

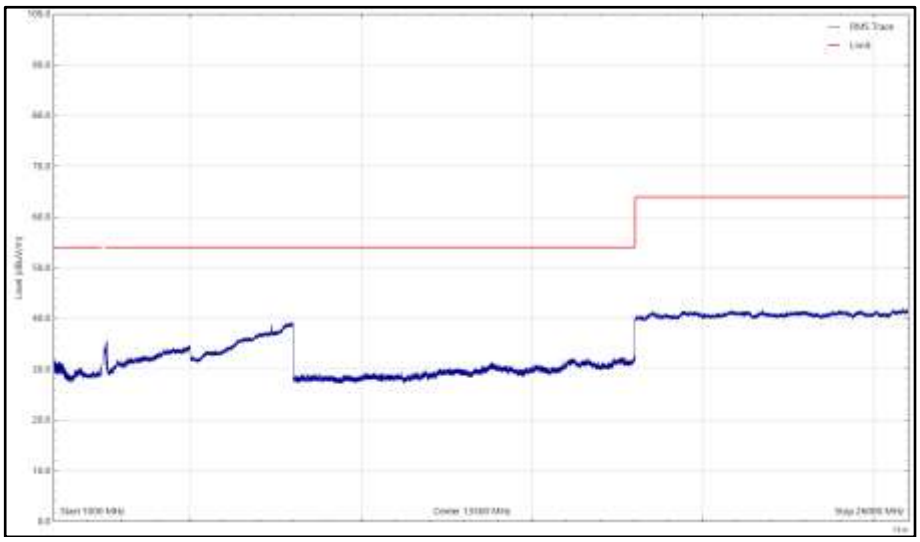

Figure 88 - 2462 MHz (CH11), 802.11n 20 MHz, 1 GHz to 26 GHz, Horizontal (rms)

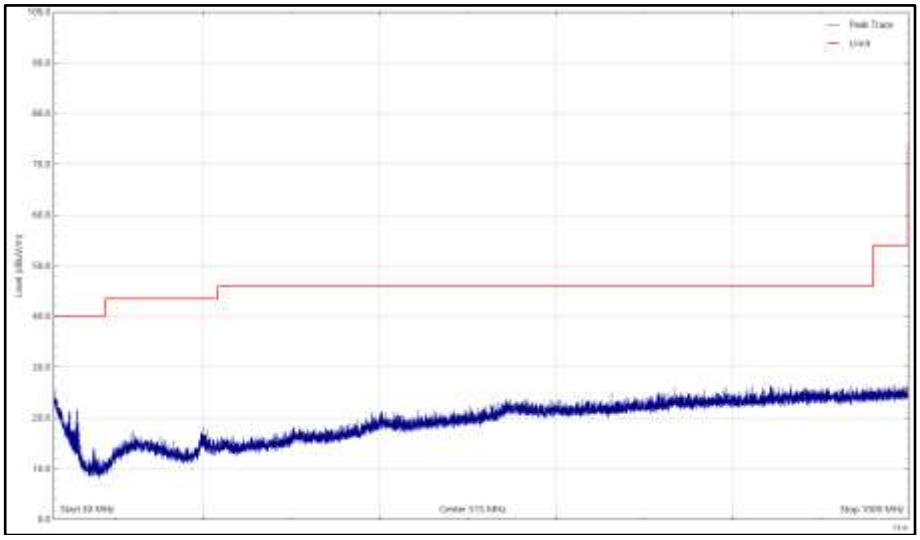

Figure 89 - 2462 MHz (CH11), 802.11n 20 MHz, 30 MHz to 1 GHz, Vertical (Peak)

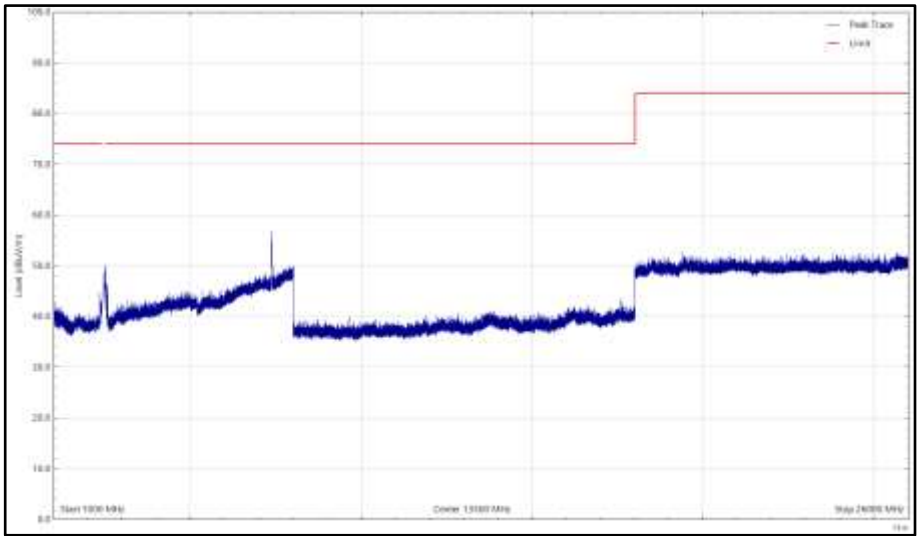

Figure 90 - 2462 MHz (CH11), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (Peak)

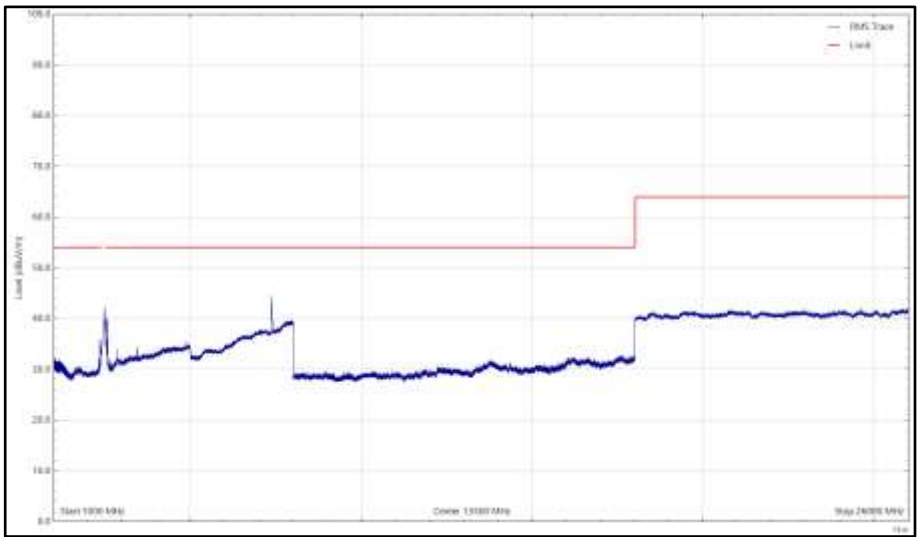

Figure 91 - 2462 MHz (CH11), 802.11n 20 MHz, 1 GHz to 26 GHz, Vertical (rms)

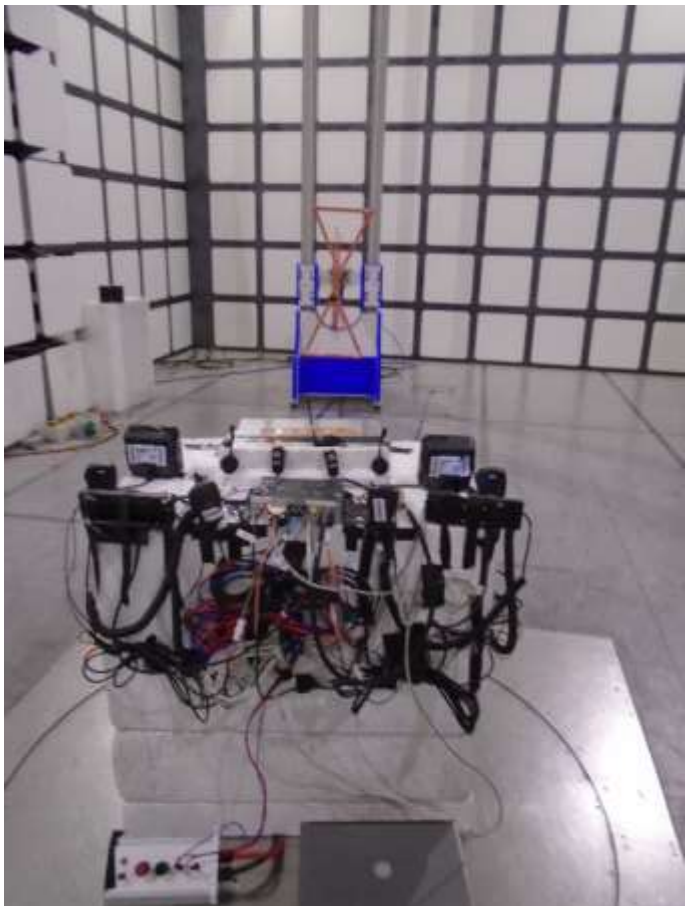

Figure 92 – 30 MHz to 1 GHz

Figure 93 – 1 GHz to 18 GHz

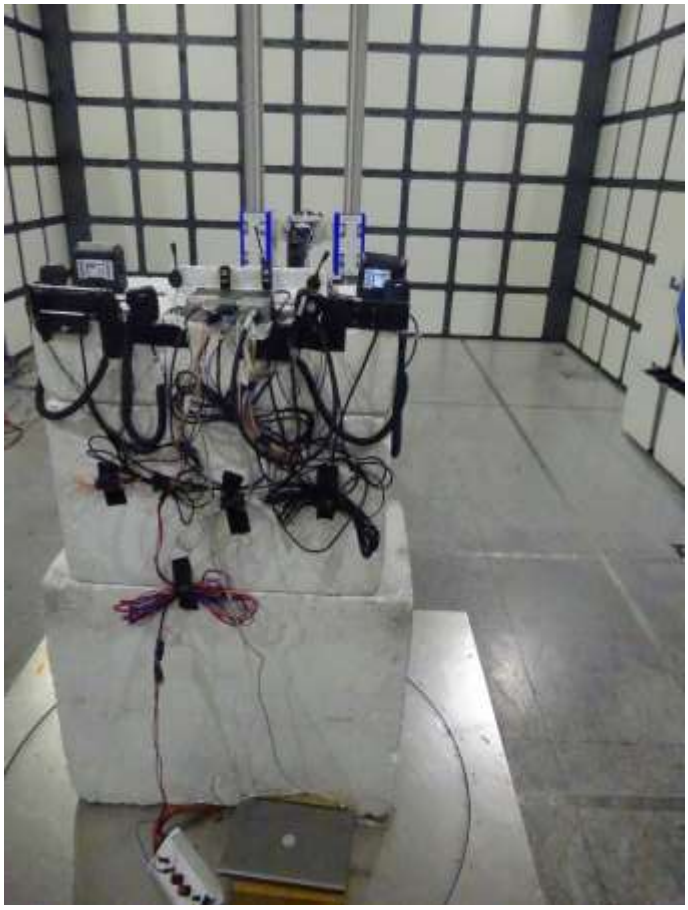

Figure 94 – 18 GHz to 26 GHz

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.

2.5.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	18-Feb-2021
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	2904	24	30-Sep-2021
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	03-Jan-2021
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	10-Mar-2021
Band Reject Filter – 2.2425 GHz	Wainwright	WRCGV14-2390-2400-2450-2460-50SS	5067	12	02-Oct-2021
Band Reject Filter - 2.4585 GHz	Wainwright	WRCGV14-2423.5-2433.5-2483.5-2493.5-50SS	5069	12	12-Oct-2021
Cable (18 GHz)	Rosenberger	LU7-071-2000	5106	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V2.0.1	5125	-	Software
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	07-Apr-2021
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5420	12	22-Jun-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5511	12	03-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5513	12	01-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5514	12	01-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5516	12	01-Apr-2021
MWX221-02000AMSAMS/A	Junkosha	MWX221-02000AMSAMS/A	5517	12	01-Apr-2021
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2021
2 m K Type Cable	Junkosha	MWX241-02000KMSKMS/A	5523	12	03-Apr-2021
3 GHz High pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	5548	12	05-May-2021
7 GHz High pass Filter	Wainwright	WHKX12-5850-6800-18000-80SS	5549	12	23-May-2021
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5610	12	22-Sep-2021

Table 42

TU - Traceability Unscheduled

2.6 Power Spectral Density

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.12

2.6.2 Equipment Under Test and Modification State

SCG2229, S/N: 1PR002007GPH5XV - Modification State 0

2.6.3 Date of Test

09-November-2020

2.6.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.3.

2.6.5 Environmental Conditions

Ambient Temperature	24.3 °C
Relative Humidity	48.9 %

2.6.6 Test Results

2.4 GHz WLAN

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11b	Duty Cycle (%):	97.2
Data Rate:	1 Mbps	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 43

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/3 kHz)					Limit (dBm / 3kHz)	Margin (dB)
		A	B	C	D	∑		
2412	30.0	-7.56	-	-	-	-	8.0	-15.56
2437	30.0	-6.89	-	-	-	-	8.0	-14.89
2462	30.0	-7.15	-	-	-	-	8.0	-15.15

Table 44 - Maximum Power Spectral Density Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11g	Duty Cycle (%):	86.5
Data Rate:	6 Mbps	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 45

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/3 kHz)					Limit (dBm / 3kHz)	Margin (dB)
		A	B	C	D	∑		
2412	30.0	-13.09	-	-	-	-	8.0	-21.09
2437	30.0	-8.78	-	-	-	-	8.0	-16.78
2462	30.0	-13.13	-	-	-	-	8.0	-21.13

Table 46 - Maximum Power Spectral Density Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT20	Duty Cycle (%):	85.6
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 47

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/3 kHz)					Limit (dBm / 3kHz)	Margin (dB)
		A	B	C	D	∑		
2412	30.0	-13.16	-	-	-	-	8.0	-21.16
2437	30.0	-9.28	-	-	-	-	8.0	-17.28
2462	30.0	-12.42	-	-	-	-	8.0	-20.42

Table 48 - Maximum Power Spectral Density Results

Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Mode:	802.11n HT40	Duty Cycle (%):	74.9
Modulation Coding Scheme:	MCS0	Antenna Gain (dBi):	N/A
Antenna Configuration:	SISO	Beamforming Gain (dBi):	N/A
Active Port(s):	A (Port 0)	Active ChainId(s):	-

Table 49

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/3 kHz)					Limit (dBm / 3kHz)	Margin (dB)
		A	B	C	D	∑		
2422	30.0	-17.65	-	-	-	-	8.0	-25.65
2437	30.0	-15.41	-	-	-	-	8.0	-23.41
2452	30.0	-17.69	-	-	-	-	8.0	-25.69

Table 50 - Maximum Power Spectral Density Results

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

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

2.6.7 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 Due
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	17-Nov-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	17-Nov-2020
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	04-Mar-2022
Signal Commissioning Unit	TUV SUD	SCU001	5546	12	15-Apr-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	08-Sep-2021

Table 51

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Restricted Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Emission Bandwidth	± 191.14 kHz
Maximum Conducted Output Power	± 3.2 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
Power Spectral Density	± 3.2 dB

Table 52

Measurement Uncertainty Decision Rule

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.