

FCC and ISED Test Report

Apple Inc

Model: A2169

In accordance with FCC 47 CFR Part 15C,
ISED RSS-247 and ISED RSS-GEN
(2.4 GHz WLAN)

Prepared for: Apple Inc
One Apple Park Way, Cupertino, California
95014, USA

FCC ID: BCGA2169

IC: 579C-A2169

COMMERCIAL-IN-CONFIDENCE

Document 75946858-11 Issue 01



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SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Phil Harrison	Senior Engineer	Authorised Signatory	21 January 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	George Porter	21 January 2021	
Testing	Connor Lee	21 January 2021	
Testing	Mohammad Malik	21 January 2021	
Testing	Faisal Malyar	21 January 2021	
Testing	Ahmad Javid	21 January 2021	
Testing	Jaiyanth Balendrarajah	21 January 2021	
Testing	Colin Brain	21 January 2021	
Testing	Liang Tian	21 January 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.



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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 January 2021

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2169
Serial Number(s)	C07CM0F4Q4TG and C07CL0AMQ4TG
Hardware Version(s)	REV1.0
Software Version(s)	18J42710o
Number of Samples Tested	2
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	0540188556
Date	07-April-2020
Date of Receipt of EUT	01-June-2020 and 08-July-2020
Start of Test	27-June-2020
Finish of Test	13-January-2021
Name of Engineer(s)	George Porter, Connor Lee, Mohammad Malik, Faisal Malyar, Ahmad Javid, Jaiyanth Balendrarajah, Colin Brain and Liang Tian
Related Document(s)	ANSI C63.10 (2013) KDB 662911 D01 v02r01



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						
2.1	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	
2.2	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	
2.3	15.247 (a)(2)	5.2	6.7	Emission Bandwidth	Pass	
2.4	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	
2.5	15.247 (d)	5.5	-	Authorised Band Edges	Pass	
2.6	15.205	-	8.10	Restricted Band Edges	Pass	

Table 2



1.4 Product Information

1.4.1 Technical Description

The Equipment under test (EUT) was an Apple TV Set Top Box with Bluetooth, Bluetooth Low Energy, Thread and 802.11 a/b/g/n/ac/ax capabilities in the 2.4 GHz and 5 GHz bands.

1.4.2 Test Modes

The 2.4 GHz 802.11 radio supports SISO and 2x2 MIMO. 802.11b and 802.11g only supports SISO operation. 802.11n and 802.11ax are supported for both SISO and 2x2 MIMO at 20 MHz channel bandwidths only. 802.11ax supports Single User (SU) and Multi-User MIMO (MU-MIMO) modes. MU-MIMO modes support Resource Unit (RU) sizes of 26/52/106/242 subcarriers.

The EUT uses different output powers per core dependent on how many cores are used. It uses the same conducted power across all cores in any given mode, but due to the different antenna gains the radiated power per core differs.

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

- SISO Modes (Core 0):
 - 802.11b 1 Mbps
 - 802.11g 6 Mbps
 - 802.11n HT20 MCS7
 - 802.11ax HE20 MCS7x1 SU & MU
- 2x2 MIMO Modes (Core 0 + Core 1):
 - 802.11n HT20 MCS7 – CDD
 - 802.11ax HE20 MCS7x1 CDD SU & MU

For 802.11ax modes, only SU modes (highest power) are reported for Output Power. For Bandwidth tests, only SU modes (widest BW) and MU-MIMO with 26 subcarriers (narrowest) are reported. For Power Spectral Density (PSD), RU sizes of 26 to 106 subcarriers are reported.

1.4.3 Test Set-up

For conducted tests the EUT antennas were disconnected and replaced with U.FL to SMA test cables to enable conducted testing on each core. The loss of these test cables were known and compensated for in any conducted measurements.

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.

All testing was performed with the EUT powered via a 120 V AC, 60 Hz source.

1.4.4 Antenna Gain Table (2.4GHz WLAN)

Antenna Port	Frequency Range (MHz)	Peak Gain (dBi)	Conducted Cable Loss (dB)
2.4 GHz Core 0	2400 to 2480	2.63	0.50
2.4 GHz Core 1	2400 to 2480	2.60	0.50

Table 3



1.5 Deviations from the Standard

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

1.6 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: A2169, Serial Number: C07CL0AMQ4TG			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2169, Serial Number: C07CM0F4Q4TG			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 4

1.7 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		
Maximum Conducted Output Power	George Porter	UKAS
Power Spectral Density	George Porter	UKAS
Emission Bandwidth	George Porter	UKAS
Spurious Radiated Emissions	Connor Lee, Liang Tian and Colin Brain	UKAS
Authorised Band Edges	Mohammad Malik, Faisal Malyar, Ahmad Javid, Jaiyanth Balendrarajah, and Liang Tian	UKAS
Restricted Band Edges	Mohammad Malik, Faisal Malyar, Ahmad Javid, Jaiyanth Balendrarajah, and Liang Tian	UKAS

Table 5

Office Address:

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



2 Test Details

2.1 Maximum Conducted Output Power

2.1.1 Specification Reference

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

2.1.2 Equipment Under Test and Modification State

A2169, S/N: C07CM0F4Q4TG - Modification State 0

2.1.3 Date of Test

17-July-2020 to 13-January-2021

2.1.4 Test Method

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

The output power was verified as being the same from each transmit core, but the antenna gains were not identical, therefore the modes reported for SISO or 2x2 MIMO operation are those giving the highest EIRP and/or lowest conducted limit based on the combination of antennas giving highest total directional gain.

MIMO output port summing was performed in accordance with KDB 662911 D01. For the CDD results the Directional Gain was calculated in accordance with clause F)2)f)(ii) using the calculations from F)2)f)(i) with worst-case individual gain and an array gain of zero.

2.1.5 Environmental Conditions

Ambient Temperature	20.9 - 22.9 °C
Relative Humidity	41.4 - 58.9 %



2.1.6 Test Results

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Conducted Power (dBm)	19.17	22.27	11.20
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	21.80	24.90	13.83

Table 6 - 802.11b / 1 Mbps / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Conducted Power (dBm)	13.67	22.31	-0.10
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	16.30	24.94	2.53

Table 7 - 802.11g / 6 Mbps / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Conducted Power (dBm)	13.79	22.17	-0.26
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	16.42	24.80	2.37

Table 8 - 802.11n / HT20 MCS7 / SISO / Core 0



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted Power Core 0 (dBm)	12.96	19.23	-0.21
Conducted Power Core 1 (dBm)	12.70	19.35	-0.18
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Total Conducted Power (dBm)	15.84	22.30	2.81
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	18.47	24.93	5.44

Table 9 - 802.11n / HT20 MCS7 / MIMO CDD / Cores 0+1

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Conducted Power (dBm)	13.87	22.31	-0.07
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	16.50	24.94	2.56

Table 10 - 802.11ax / HE20 MCS7x1 / SU / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted Power Core 0 (dBm)	12.89	19.41	-0.24
Conducted Power Core 1 (dBm)	12.77	19.42	-0.02
Antenna Directional Gain (dBi)	2.63	2.63	2.63
15.247 Conducted Power Limit (dBm)	30.00	30.00	30.00
RSS-247 Conducted Power Limit (dBm)	30.00	30.00	30.00
Total Conducted Power (dBm)	15.84	22.43	2.88
RSS-247 EIRP Limit (dBm)	36.00	36.00	36.00
EIRP Power (dBm)	18.47	25.06	5.51

Table 11 - 802.11ax / HE20 MCS7x1 / SU / MIMO CDD / Cores 0+1



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.



2.1.7 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 Due
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Multimeter	Fluke	177	3813	12	09-Oct-2020
1800-6000 MHz Power Splitter	Mini-Circuits	ZN2PD-63-S+	4055	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Power splitter - 2 port	Mini-Circuits	ZN2PD-63-S+	4743	12	23-Sep-2020
EXA	Keysight Technologies	N9010B	4968	24	23-Dec-2021
Cable (40 GHz)	Rosenberger	LU1-001-500	5021	12	22-Jun-2021
Cable (18 GHz)	Rosenberger	LU7-071-1000	5096	12	22-Jun-2021
USB Power Sensor	Boonton	RTP5006	5186	12	28-Nov-2020
AC Programmable Power Supply	iTech	IT7324	5227	-	06-Feb-2020
Power Splitter, 2 way	Mini-Circuits	ZN2PD2-63-S+	5238	-	O/P Mon
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5417	12	22-Jun-2021
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5418	12	22-Jun-2021
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5575	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5579	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5580	-	O/P Mon

Table 12

O/P Mon – Output Monitored using calibrated equipment



2.2 Power Spectral Density

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

A2169, S/N: C07CM0F4Q4TG - Modification State 0

2.2.3 Date of Test

17-July-2020 to 13-January-2021

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.3 (AVG PSD-1) or 11.10.5 (AVG PSD-2).

Where the EUT duty cycle was $< 98\%$ and repeatable within 2%, the spectrum analyser was set to trace (power) averaging and a duty cycle correction was added as calculated in the result tables below (Method AVG PSD-2). Where the duty cycle was $\geq 98\%$ the spectrum analyser was set to trace (power) averaging and no duty cycle correction made (Method AVG PSD-1).

The output power was verified as being the same from each transmit core (within negligible tolerances), but the antenna gains were not identical. Therefore, the modes reported here for SISO or 2x2 MIMO operation are those giving the highest EIRP and/or lowest conducted limit based on the combination of antennas giving highest total directional gain.

MIMO output port summing was performed in accordance with KDB 662911 D01. For the CDD results the Directional Gain was calculated in accordance with the equation given in clause F)2)f)(ii) summed for a single spatial stream.

2.2.5 Environmental Conditions

Ambient Temperature	20.9 - 22.9 °C
Relative Humidity	41.4 - 58.9 %



2.2.6 Test Results

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-2.25	-0.19	-10.12
Duty Cycle Correction (dB)	N/A SA-1	N/A SA-1	N/A SA-1
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-2.25	-0.19	-10.12

Table 13 - 802.11b / 1 Mbps / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-8.61	-1.31	-22.18
Duty Cycle Correction (dB)	N/A SA-1	N/A SA-1	N/A SA-1
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-8.61	-1.31	-22.18

Table 14 - 802.11g / 6 Mbps / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-8.60	-1.44	-23.29
Duty Cycle Correction (dB)	0.35	0.36	0.37
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-8.25	-1.08	-22.92

Table 15 - 802.11n / HT20 MCS7 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-9.77	-4.70	-22.82
Conducted PSD Core 1 (dBm/30kHz)	-9.50	-5.28	-22.98
Duty Cycle Correction (dB)	0.35	0.36	0.37
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-6.27	-1.61	-19.52

Table 16 - 802.11n / HT20 MCS7 / MIMO CDD / Cores 0+1



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-9.30	-2.10	-23.73
Duty Cycle Correction (dB)	0.40	0.41	0.42
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-8.90	-1.69	-23.31

Table 17 - 802.11ax / HE20 MCS7x1 / SU / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-4.58	-5.32	-19.49
Duty Cycle Correction (dB)	0.37	0.38	0.38
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-4.21	-4.94	-19.11

Table 18 - 802.11ax / HE20 MCS7x1 / RU 26-0 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-4.44	-5.66	-17.90
Duty Cycle Correction (dB)	0.37	0.38	0.38
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-4.07	-5.29	-17.52

Table 19 - 802.11ax / HE20 MCS7x1 / RU 26-8 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-7.16	-4.58	-21.58
Duty Cycle Correction (dB)	0.09	0.40	0.09
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-7.07	-4.18	-21.49

Table 20 - 802.11ax / HE20 MCS7x1 / RU 52-37 / SISO / Core 0



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-7.38	-5.02	-20.98
Duty Cycle Correction (dB)	0.09	0.40	0.09
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-7.28	-4.62	-20.89

Table 21 - 802.11ax / HE20 MCS7x1 / RU 52-40 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-10.36	-4.34	-24.26
Duty Cycle Correction (dB)	N/A SA-1	0.21	N/A SA-1
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-10.36	-4.13	-24.26

Table 22 - 802.11ax / HE20 MCS7x1 / RU 106-53 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Raw Conducted PSD (dBm/30kHz)	-10.30	-4.57	-23.92
Duty Cycle Correction (dB)	N/A SA-1	0.21	N/A SA-1
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-10.30	-4.35	-23.92

Table 23 - 802.11ax / HE20 MCS7x1 / RU 106-54 / SISO / Core 0

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-10.12	-5.18	-23.68
Conducted PSD Core 1 (dBm/30kHz)	-10.81	-5.78	-23.52
Duty Cycle Correction (dB)	0.38	0.41	0.38
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-7.06	-2.04	-20.21

Table 24 - 802.11ax / HE20 MCS7x1 / SU / MIMO CDD / Cores 0+1



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-4.89	-5.68	-18.22
Conducted PSD Core 1 (dBm/30kHz)	-4.96	-6.19	-18.15
Duty Cycle Correction (dB)	0.36	0.38	0.38
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-1.56	-2.54	-14.80

Table 25 - 802.11ax / HE20 MCS7x1 / RU 26-0 / MIMO CDD / Cores 0+1

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-5.18	-5.68	-17.66
Conducted PSD Core 1 (dBm/30kHz)	-4.94	-6.38	-17.88
Duty Cycle Correction (dB)	0.37	0.38	0.36
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-1.67	-2.63	-14.40

Table 26 - 802.11ax / HE20 MCS7x1 / RU 26-8 / MIMO CDD / Cores 0+1

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-7.96	-4.62	-21.49
Conducted PSD Core 1 (dBm/30kHz)	-8.52	-5.31	-22.42
Duty Cycle Correction (dB)	0.09	0.40	0.09
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-5.13	-1.54	-18.83

Table 27 - 802.11ax / HE20 MCS7x1 / RU 52-37 / MIMO CDD / Cores 0+1

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-8.72	-5.05	-21.29
Conducted PSD Core 1 (dBm/30kHz)	-8.98	-5.38	-21.74
Duty Cycle Correction (dB)	0.09	0.40	0.09
15.247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/3kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-5.75	-1.81	-18.40

Table 28 - 802.11ax / HE20 MCS7x1 / RU 52-40 / MIMO CDD / Cores 0+1



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-10.80	-4.27	-24.53
Conducted PSD Core 1 (dBm/30kHz)	-11.50	-4.78	-24.77
Duty Cycle Correction (dB)	N/A SA-1	0.21	N/A SA-1
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-8.13	-1.29	-21.64

Table 29 - 802.11ax / HE20 MCS7x1 / RU 106-53 / MIMO CDD / Cores 0+1

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
Conducted PSD Core 0 (dBm/30kHz)	-11.16	-4.65	-23.63
Conducted PSD Core 1 (dBm/30kHz)	-11.95	-5.01	-24.46
Duty Cycle Correction (dB)	N/A SA-1	0.21	N/A SA-1
15.247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
RSS-247 Conducted PSD Limit (dBm/30kHz)	8.00	8.00	8.00
Conducted PSD Result (dBm/30kHz)	-8.53	-1.61	-21.01

Table 30 - 802.11ax / HE20 MCS7x1 / RU 106-54 / MIMO CDD / Cores 0+1

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



2.2.7 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	08-Nov-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Multimeter	Fluke	177	3813	12	09-Oct-2020
1800-6000 MHz Power Splitter	Mini-Circuits	ZN2PD-63-S+	4055	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Power splitter - 2 port	Mini-Circuits	ZN2PD-63-S+	4743	12	23-Sep-2020
EXA	Keysight Technologies	N9010B	4968	24	23-Dec-2021
Cable (40 GHz)	Rosenberger	LU1-001-500	5021	12	22-Jun-2021
Cable (18 GHz)	Rosenberger	LU7-071-1000	5096	12	22-Jun-2021
AC Programmable Power Supply	iTech	IT7324	5227	-	06-Feb-2020
Power Splitter, 2 way	Mini-Circuits	ZN2PD2-63-S+	5238	-	O/P Mon
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5417	12	22-Jun-2021
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5418	12	22-Jun-2021
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5575	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5579	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5580	-	O/P Mon
Cable 2.92m	Junkosha	MWX241/B	5411	12	22-Jun-2021
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5430	12	22-Jun-2021
MXA Signal Analyser	Keysight Technologies	N9020B	5529	24	04-Mar-2022
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5581	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	08-Sep-2021

Table 31

O/P Mon – Output Monitored using calibrated equipment



2.3 Emission Bandwidth

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

A2169, S/N: C07CM0F4Q4TG - Modification State 0

2.3.3 Date of Test

17-July-2020 to 13-January-2021

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.8.2.

2.3.5 Environmental Conditions

Ambient Temperature 20.9 - 22.9 °C
Relative Humidity 41.4 - 58.9 %

2.3.6 Test Results

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	8.160	8.160	8.160
99% Bandwidth (MHz)	12.900	13.350	12.830

Table 32 - 802.11b / 1 Mbps / SISO / Core 0

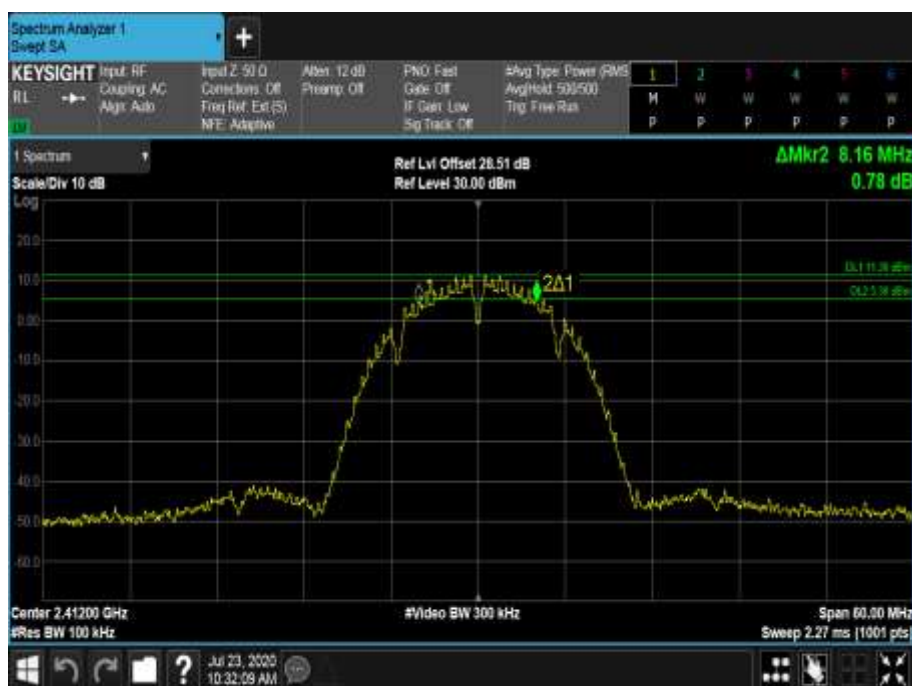


Figure 1 - 2412 MHz - 6 dB DTS Bandwidth

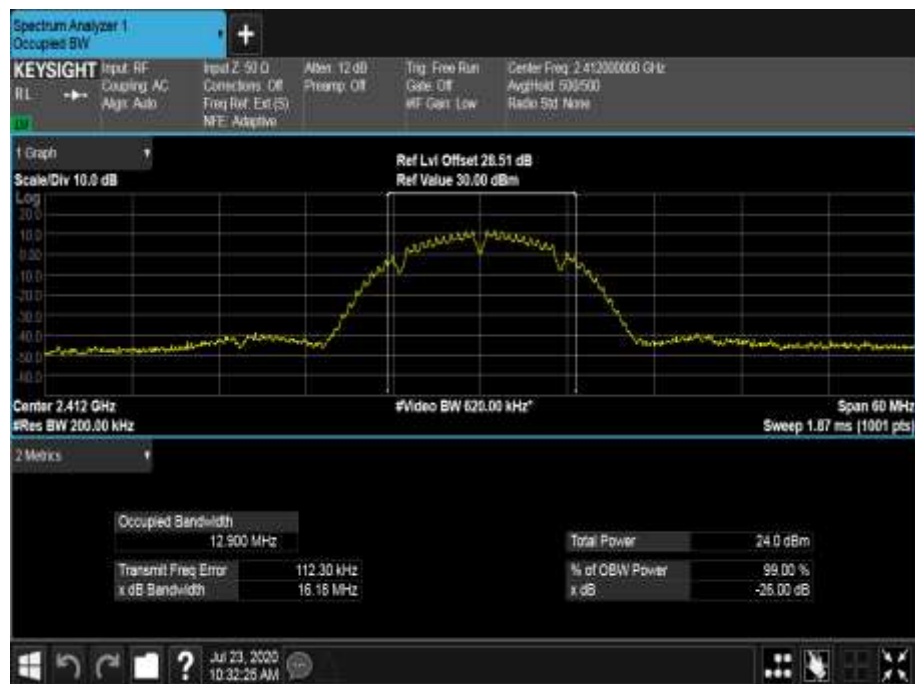


Figure 2 - 2412 MHz - 99% Occupied Bandwidth



Figure 3 - 2437 MHz - 6 dB DTS Bandwidth

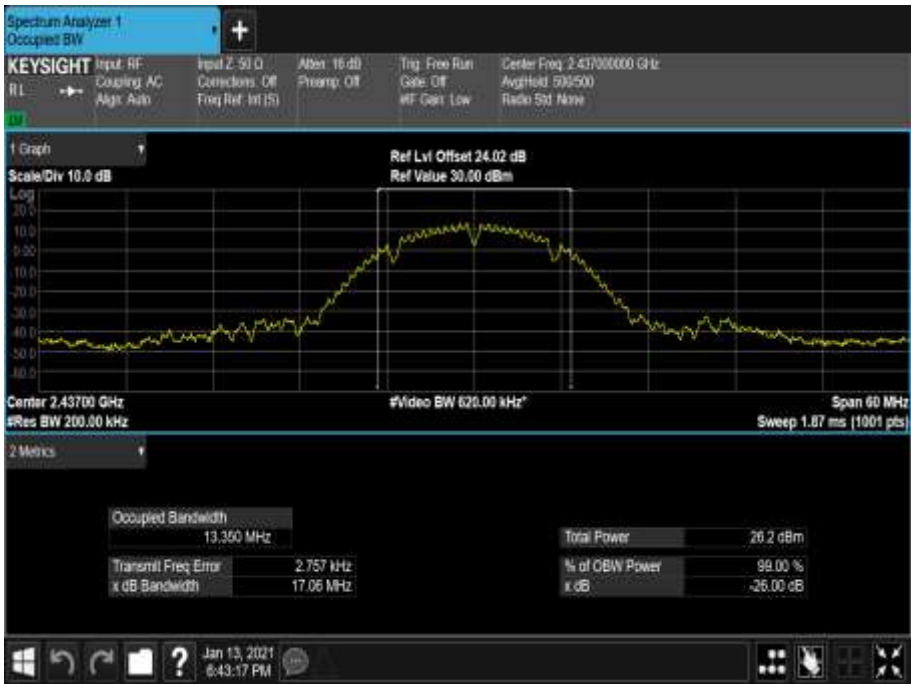


Figure 4 - 2437 MHz - 99% Occupied Bandwidth

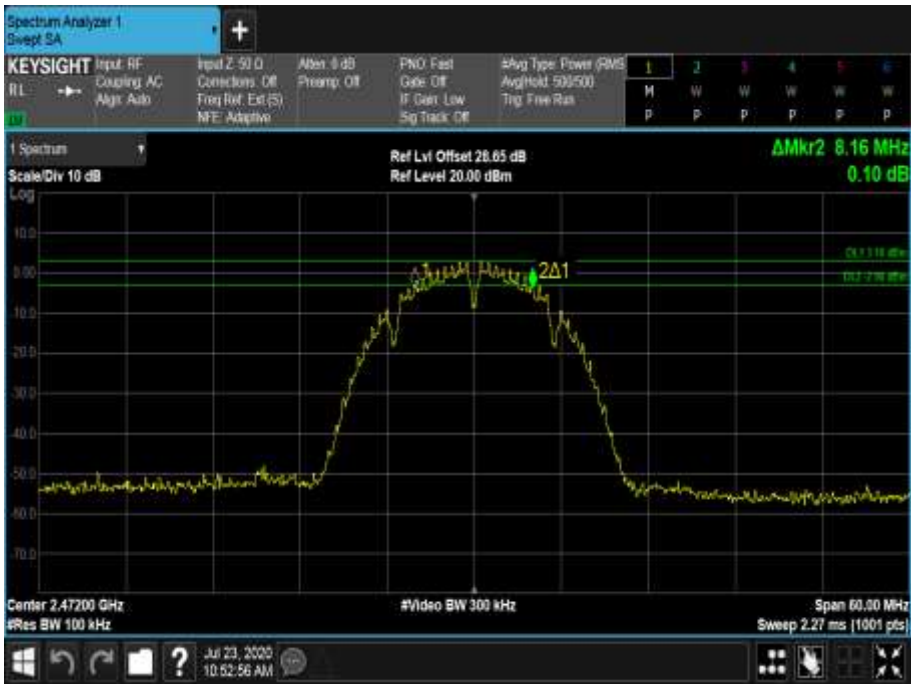


Figure 5 - 2472 MHz - 6 dB DTS Bandwidth

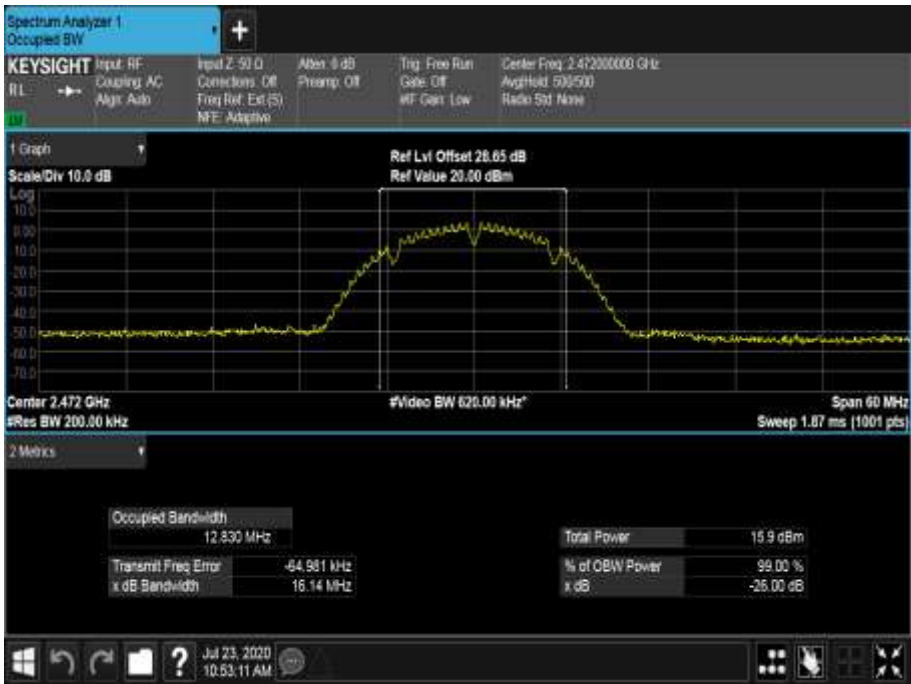


Figure 6 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	15.180	15.240	15.240
99% Bandwidth (MHz)	16.295	16.659	16.284

Table 33 - 802.11g / 6 Mbps / SISO / Core 0

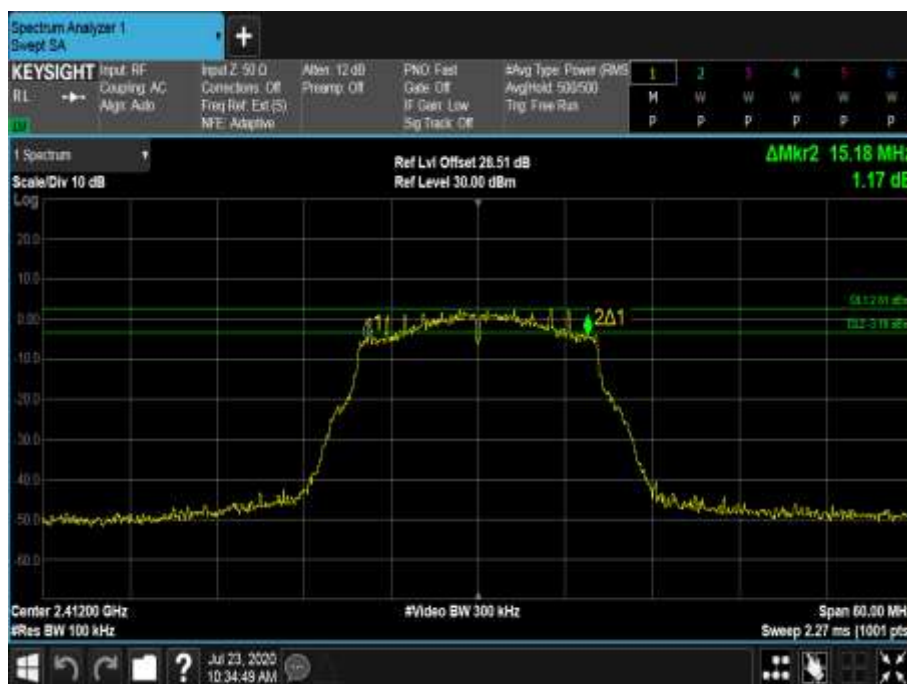


Figure 7 - 2412 MHz - 6 dB DTS Bandwidth

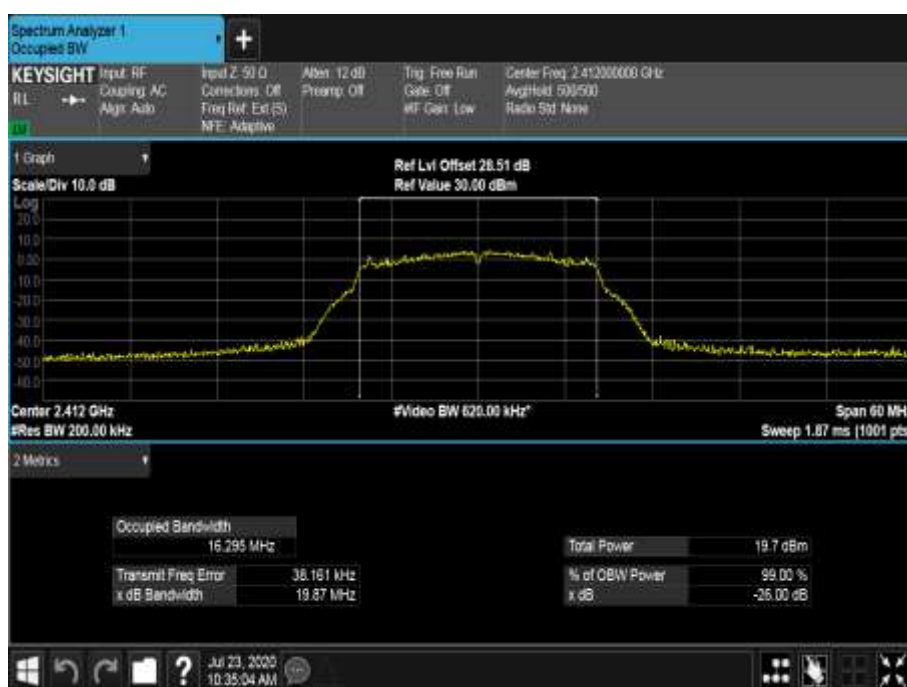


Figure 8 - 2412 MHz - 99% Occupied Bandwidth



Figure 9 - 2437 MHz - 6 dB DTS Bandwidth

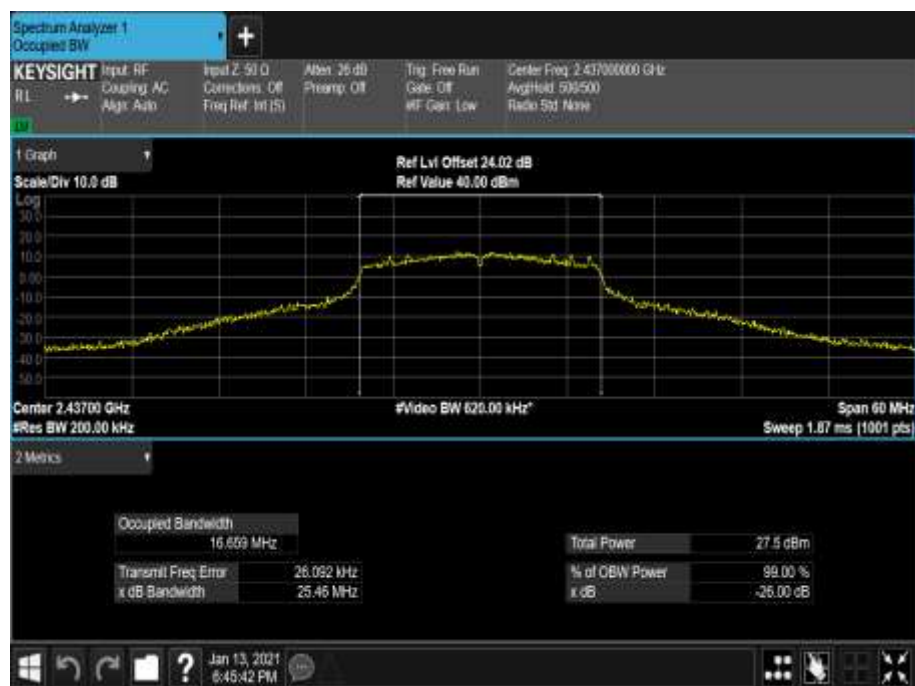


Figure 10 - 2437 MHz - 99% Occupied Bandwidth

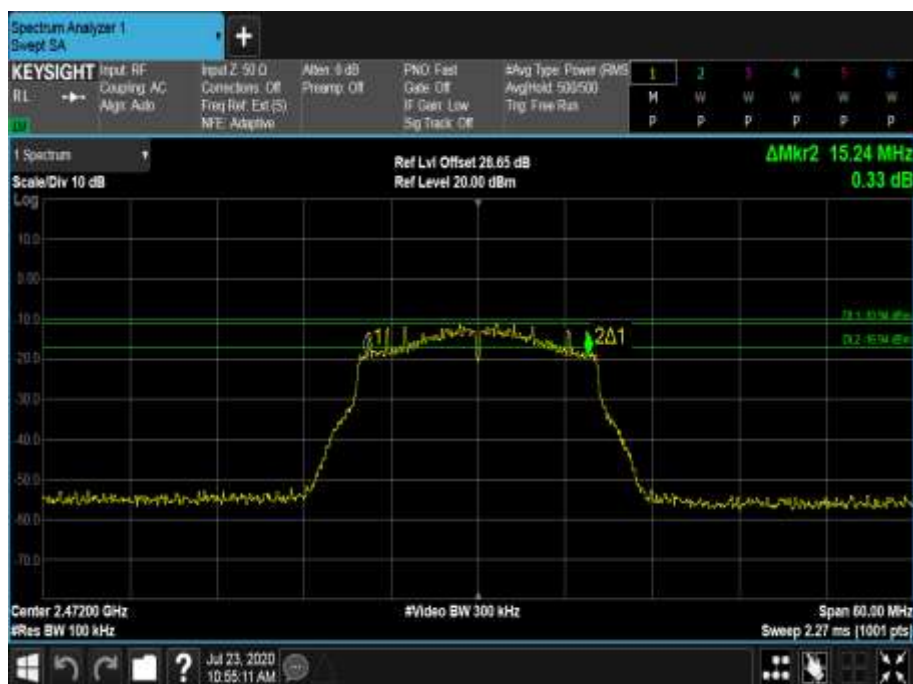


Figure 11 - 2472 MHz - 6 dB DTS Bandwidth



Figure 12 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	17.700	17.760	17.760
99% Bandwidth (MHz)	17.679	17.996	17.633

Table 34 - 802.11n / HT20 MCS7 / SISO / Core 0

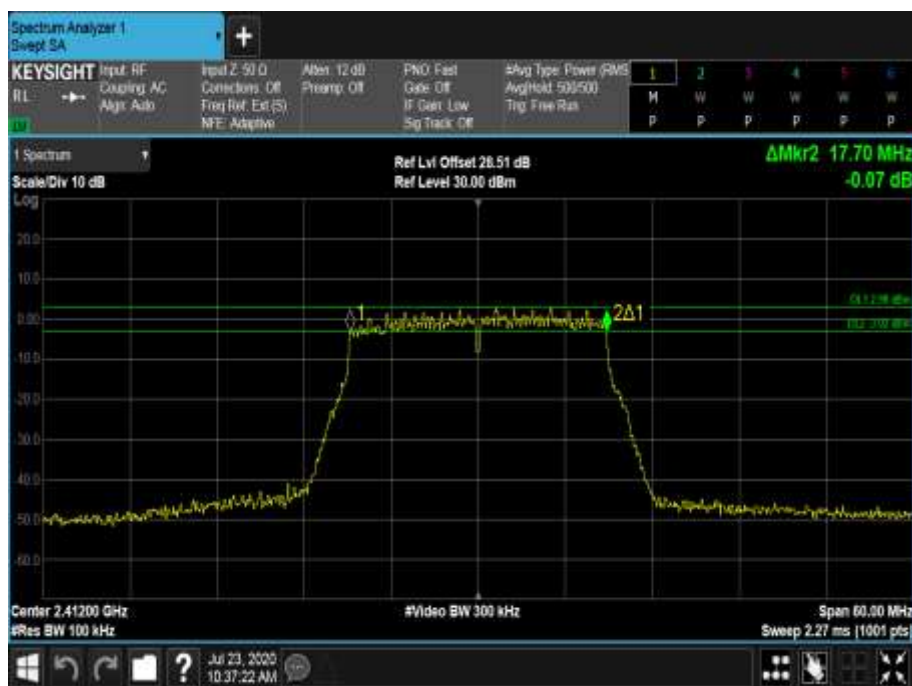


Figure 13 - 2412 MHz - 6 dB DTS Bandwidth



Figure 14 - 2412 MHz - 99% Occupied Bandwidth



Figure 15 - 2437 MHz - 6 dB DTS Bandwidth

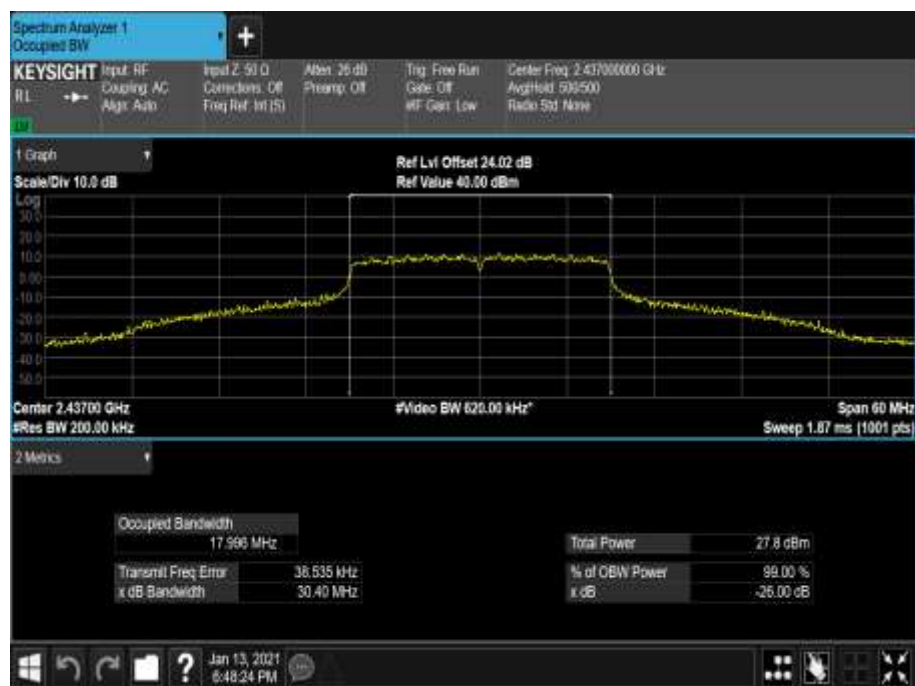


Figure 16 - 2437 MHz - 99% Occupied Bandwidth

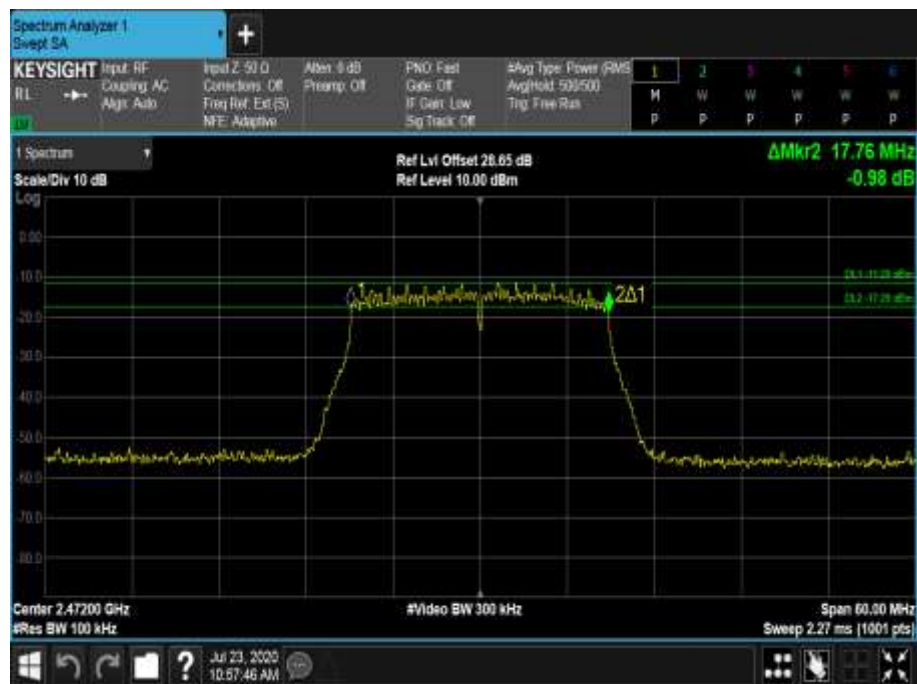


Figure 17 - 2472 MHz - 6 dB DTS Bandwidth

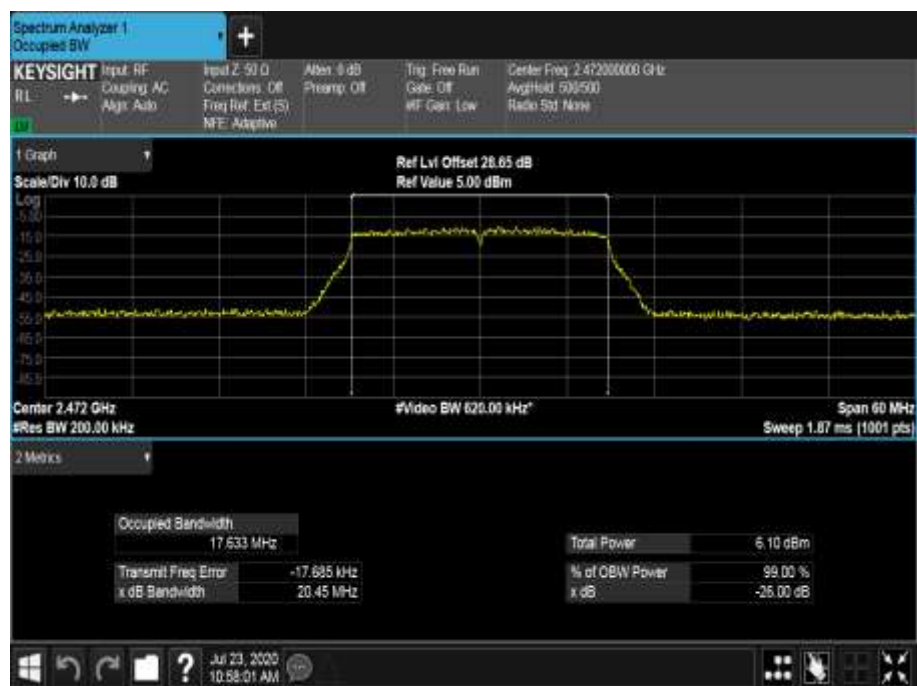


Figure 18 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	17.820	17.760	17.760
99% Bandwidth (MHz)	17.701	17.692	17.670

Table 35 - 802.11n / HT20 MCS7 / MIMO CDD / Cores 0+1

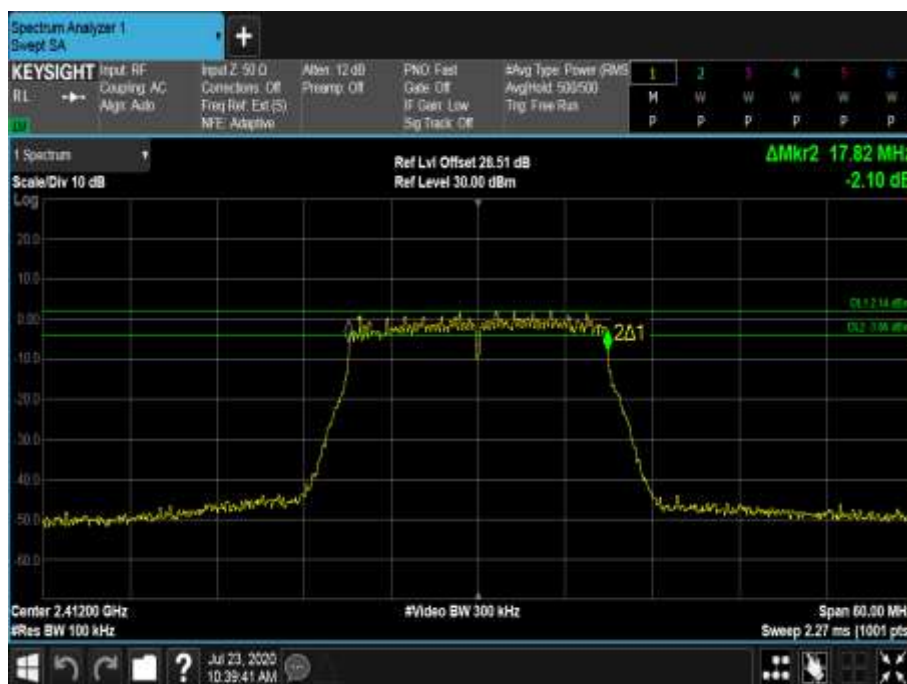


Figure 19 - 2412 MHz - 6 dB DTS Bandwidth



Figure 20 - 2412 MHz - 99% Occupied Bandwidth



Figure 21 - 2437 MHz - 6 dB DTS Bandwidth

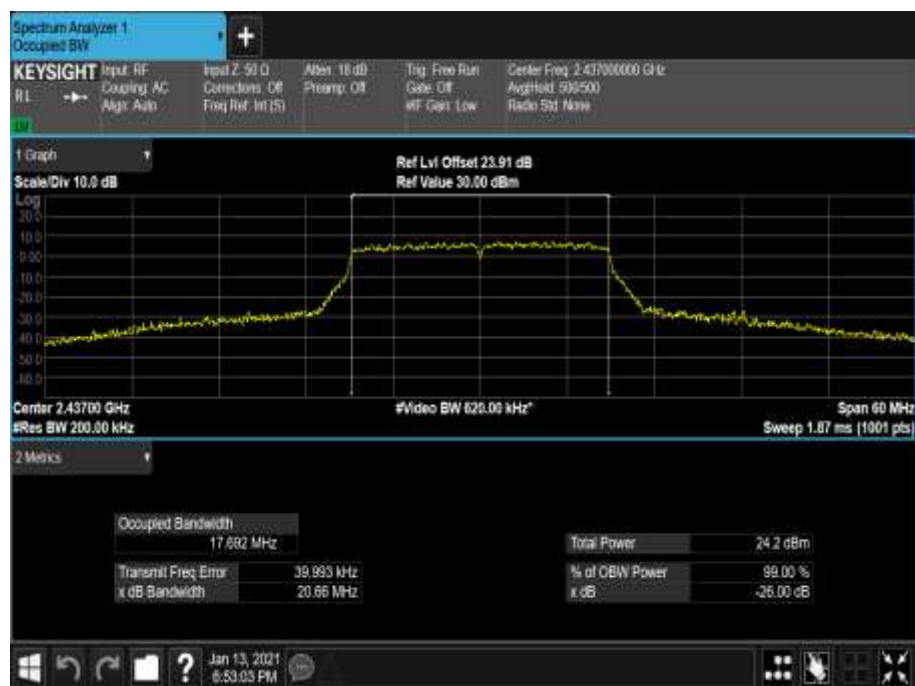


Figure 22 - 2437 MHz - 99% Occupied Bandwidth

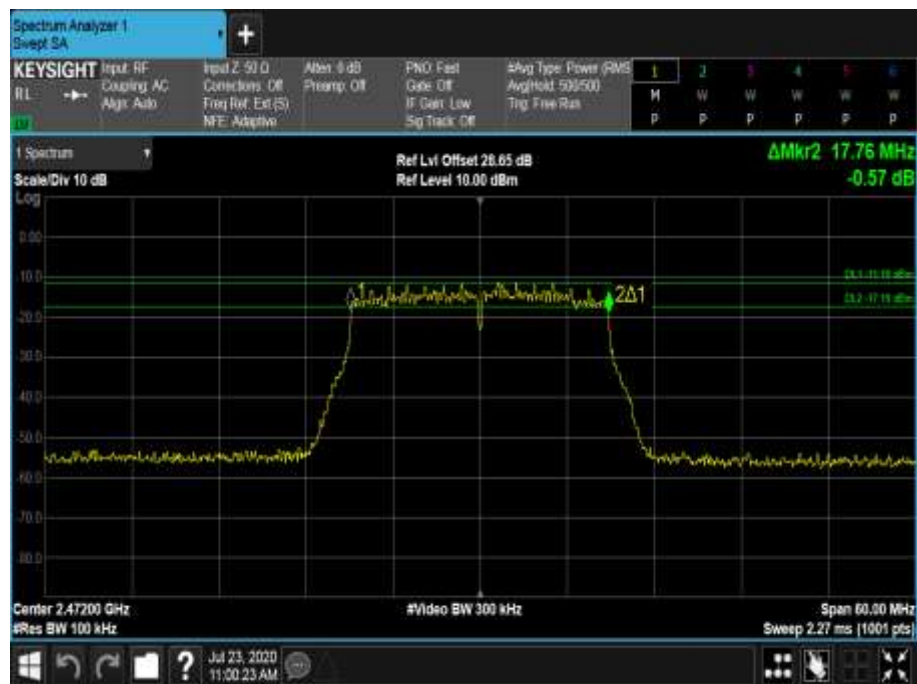


Figure 23 - 2472 MHz - 6 dB DTS Bandwidth

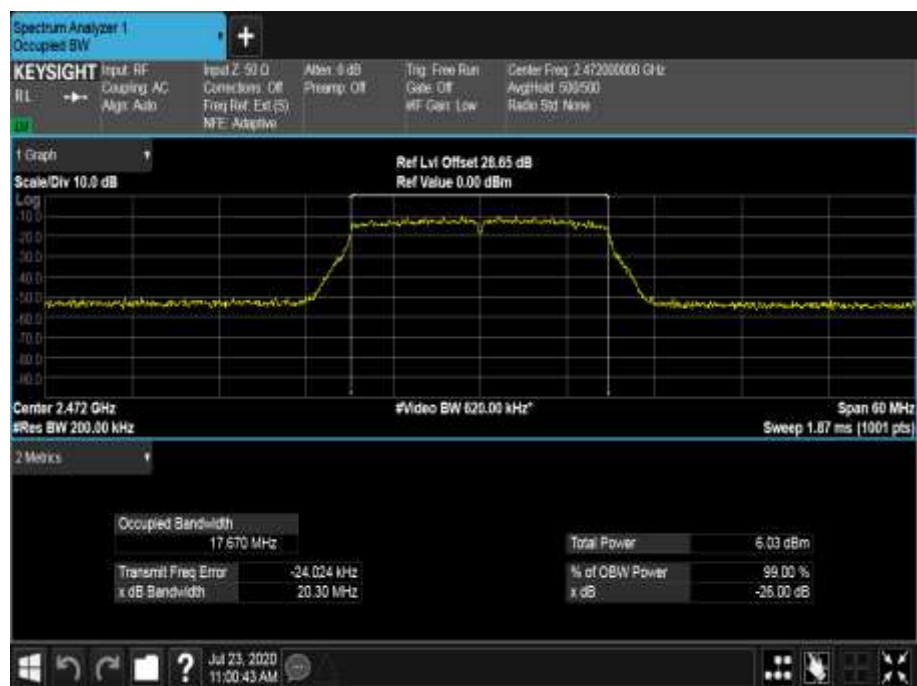


Figure 24 - 2472 MHz - 99% Occupied Bandwidth

Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	19.020	18.540	18.600
99% Bandwidth (MHz)	18.886	19.105	18.847

Table 36 - 802.11ax / HE20 MCS7x1 / SU / SISO / Core 0

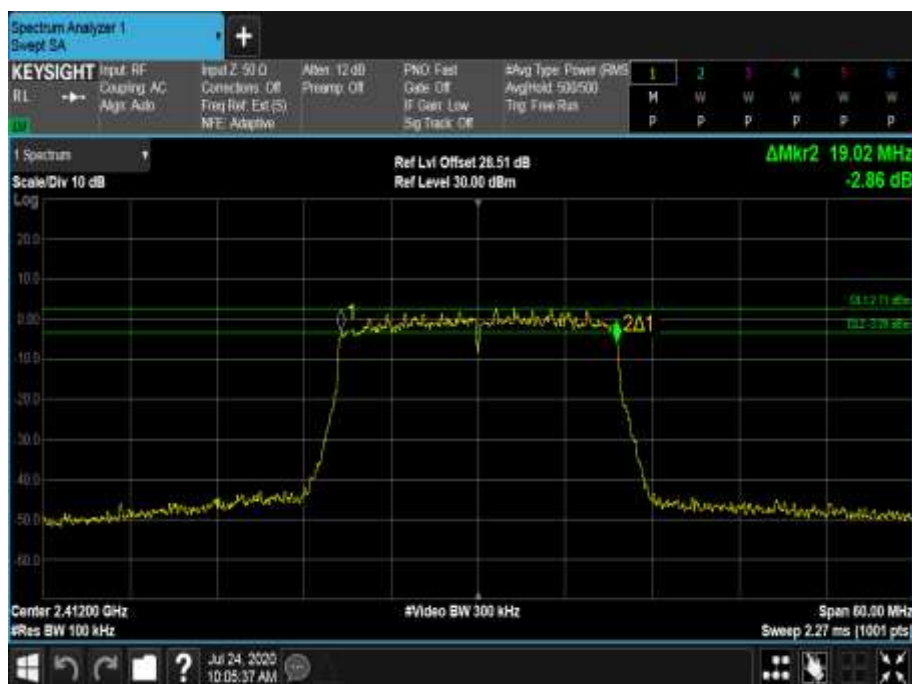
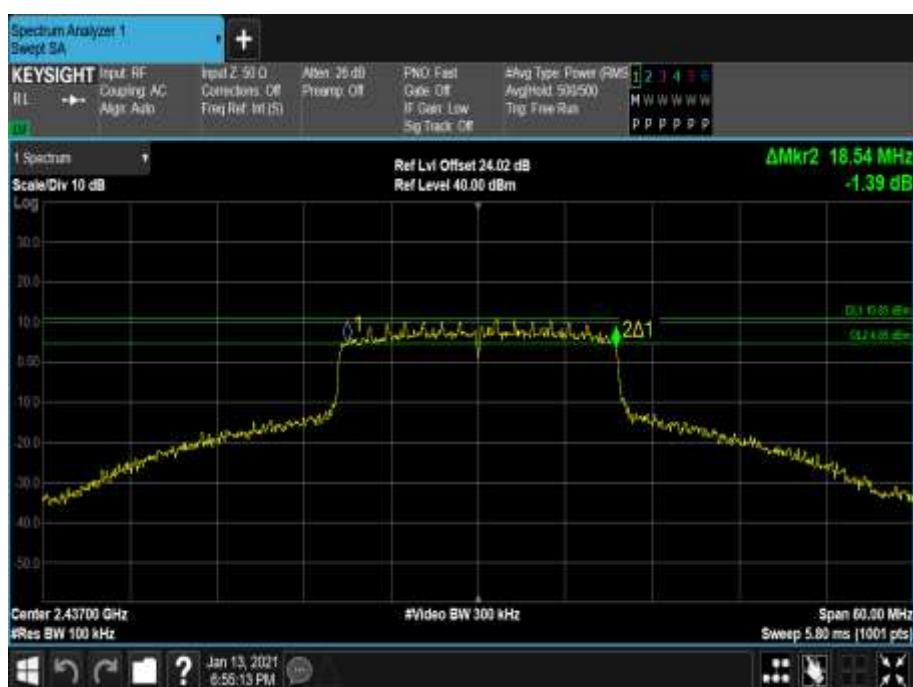


Figure 25 - 2412 MHz - 6 dB DTS Bandwidth



Figure 26 - 2412 MHz - 99% Occupied Bandwidth



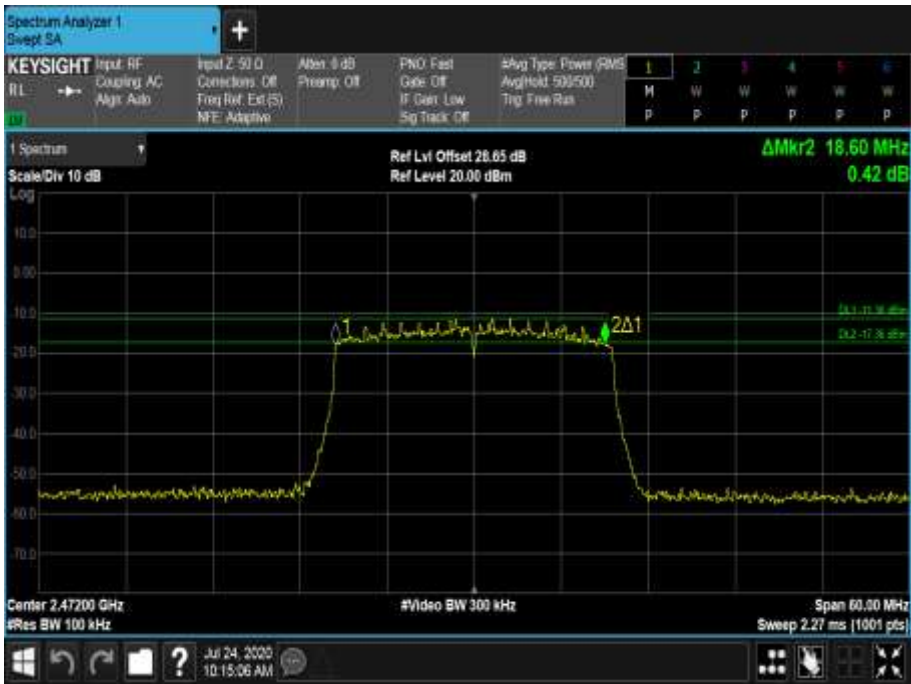


Figure 29 - 2472 MHz - 6 dB DTS Bandwidth



Figure 30 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	14.580	10.860	12.180
99% Bandwidth (MHz)	18.268	18.227	18.156

Table 37 - 802.11ax / HE20 MCS7x1 / RU 26-0 / SISO / Core 0

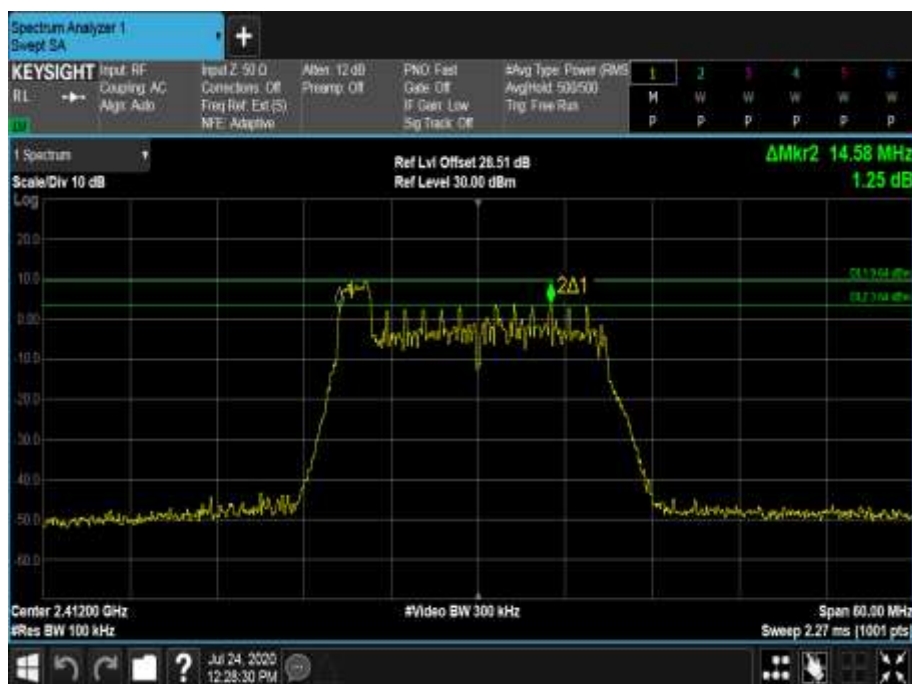


Figure 31 - 2412 MHz - 6 dB DTS Bandwidth



Figure 32 - 2412 MHz - 99% Occupied Bandwidth



Figure 33 - 2437 MHz - 6 dB DTS Bandwidth

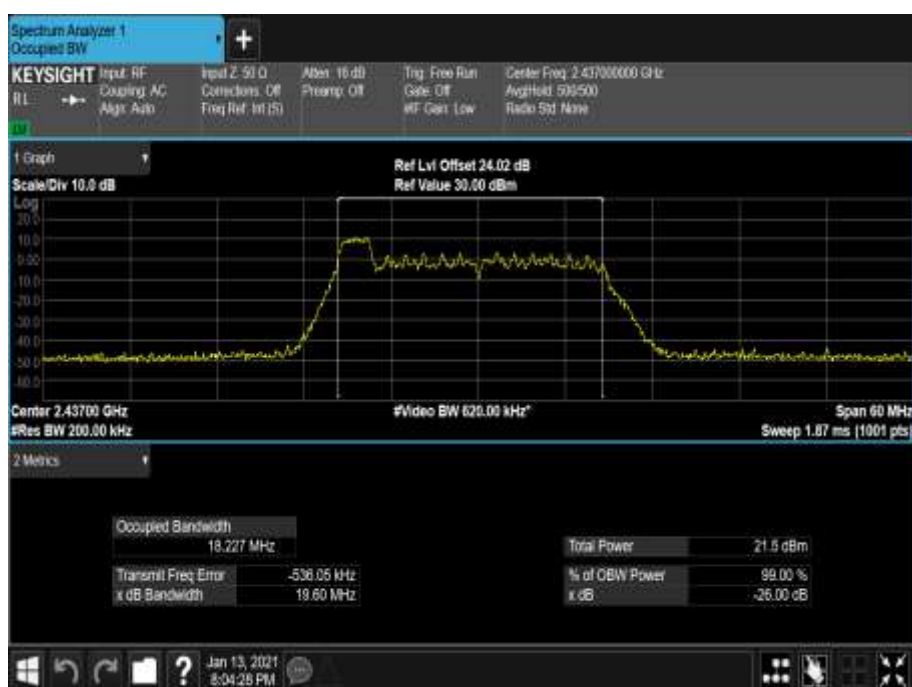


Figure 34 - 2437 MHz - 99% Occupied Bandwidth



Figure 35 - 2472 MHz - 6 dB DTS Bandwidth



Figure 36 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	2.160	2.160	7.140
99% Bandwidth (MHz)	18.287	18.366	18.401

Table 38 - 802.11ax / HE20 MCS7x1 / RU 26-8 / SISO / Core 0

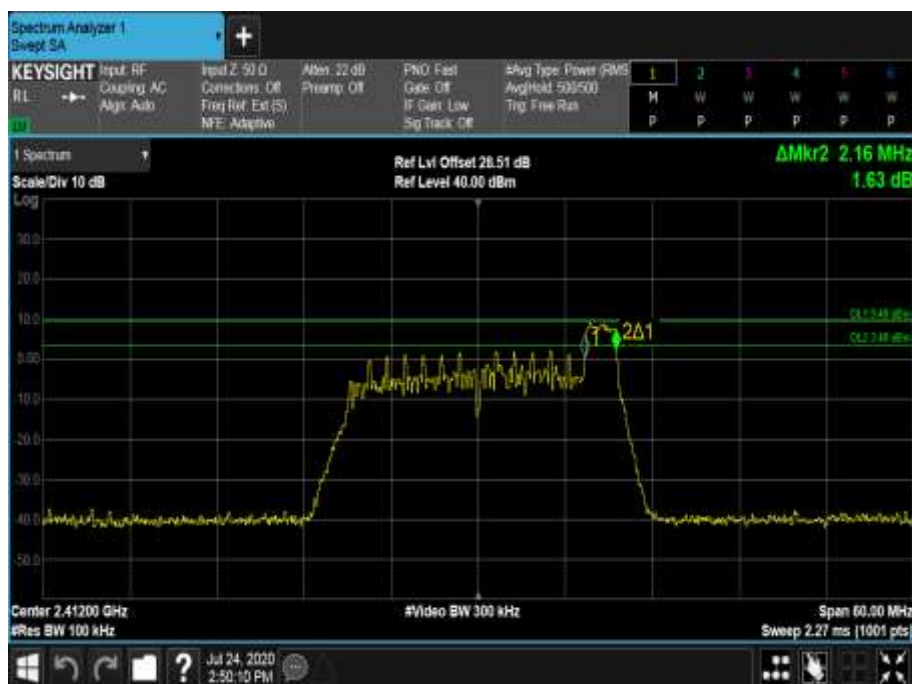


Figure 37 - 2412 MHz - 6 dB DTS Bandwidth

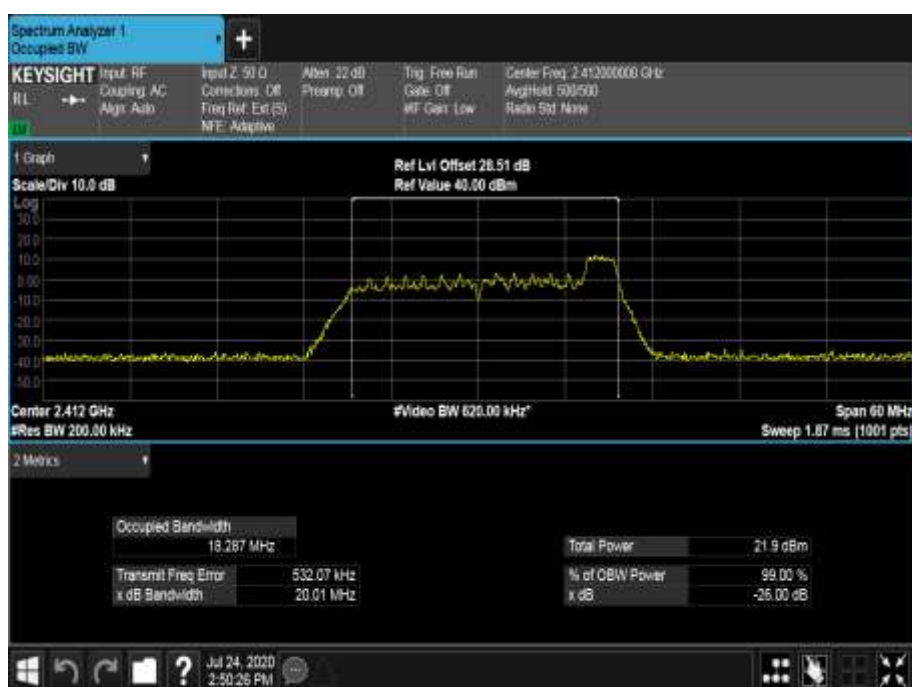


Figure 38 - 2412 MHz - 99% Occupied Bandwidth

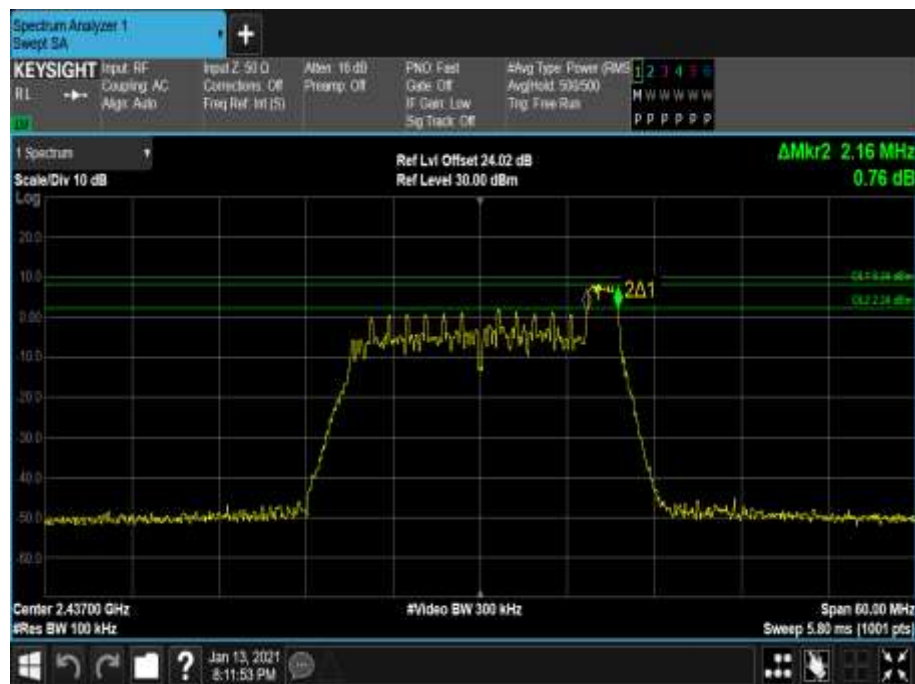


Figure 39 - 2437 MHz - 6 dB DTS Bandwidth

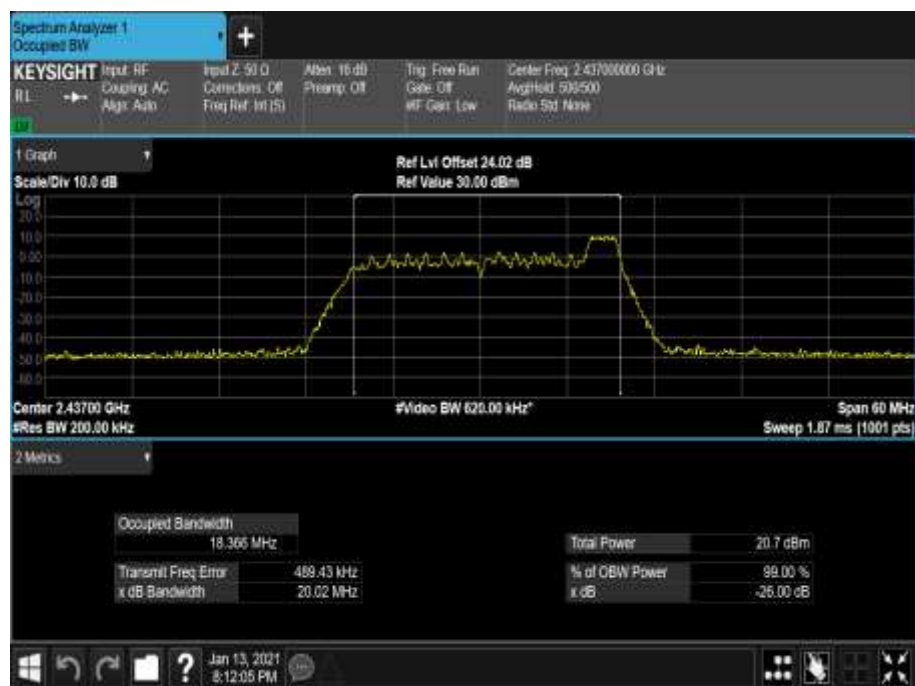


Figure 40 - 2437 MHz - 99% Occupied Bandwidth

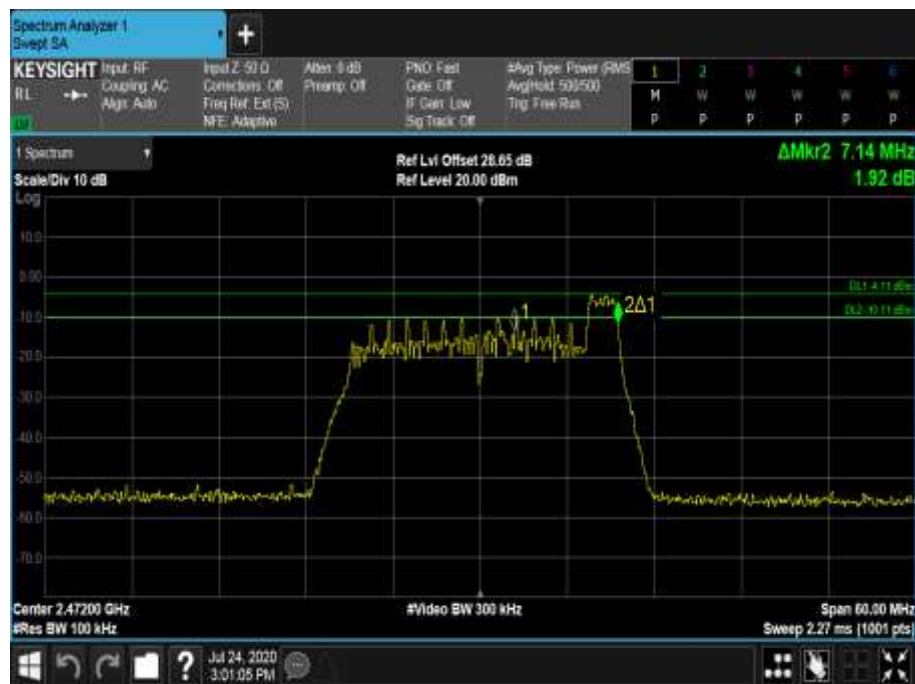


Figure 41 - 2472 MHz - 6 dB DTS Bandwidth



Figure 42 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	18.600	18.780	18.240
99% Bandwidth (MHz)	18.936	18.936	18.890

Table 39 - 802.11ax / HE20 MCS7x1 / SU / MIMO CDD / Cores 0+1

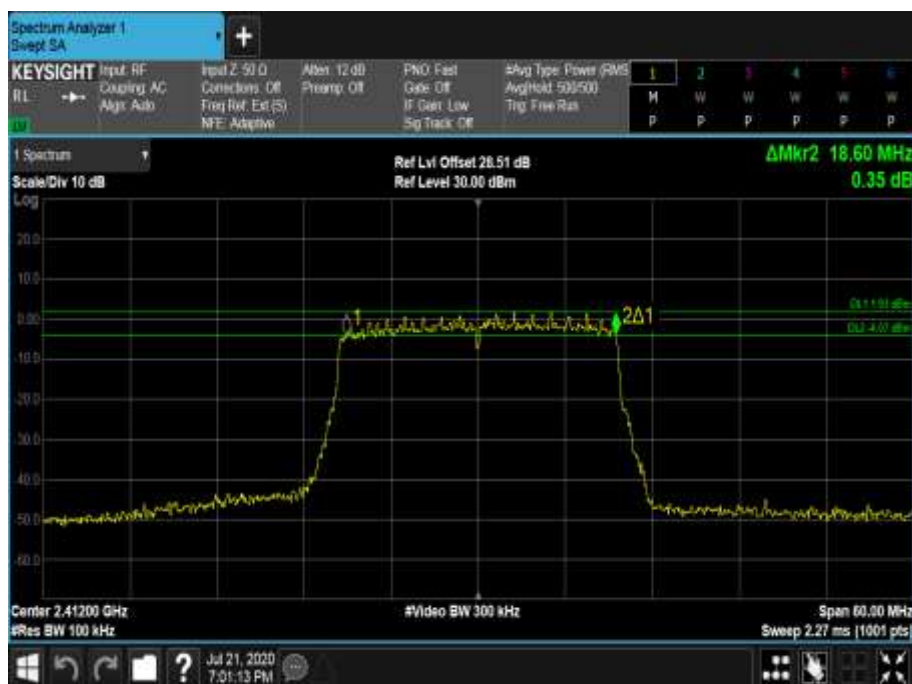


Figure 43 - 2412 MHz - 6 dB DTS Bandwidth



Figure 44 - 2412 MHz - 99% Occupied Bandwidth



Figure 45 - 2437 MHz - 6 dB DTS Bandwidth



Figure 46 - 2437 MHz - 99% Occupied Bandwidth

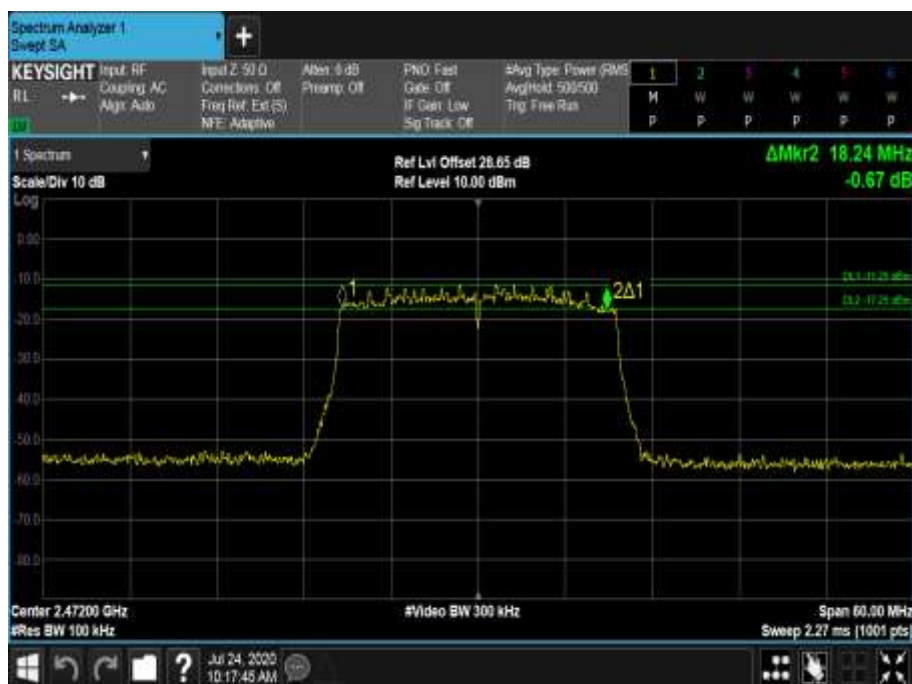


Figure 47 - 2472 MHz - 6 dB DTS Bandwidth



Figure 48 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	14.580	2.160	12.120
99% Bandwidth (MHz)	18.281	18.262	18.176

Table 40 - 802.11ax / HE20 MCS7x1 / RU 26-0 / MIMO CDD / Cores 0+1

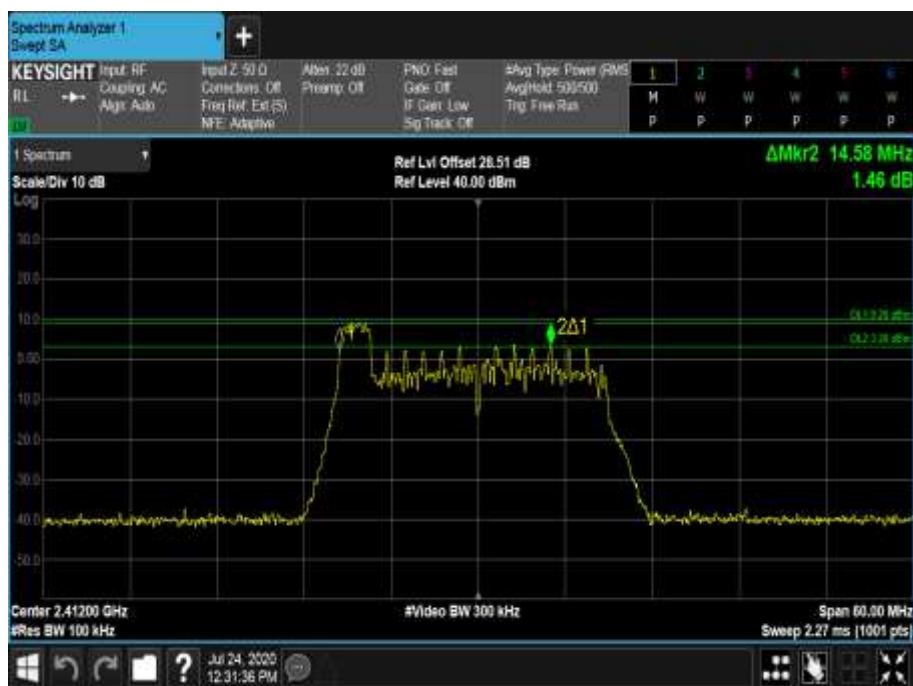


Figure 49 - 2412 MHz - 6 dB DTS Bandwidth



Figure 50 - 2412 MHz - 99% Occupied Bandwidth



Figure 51 - 2437 MHz - 6 dB DTS Bandwidth

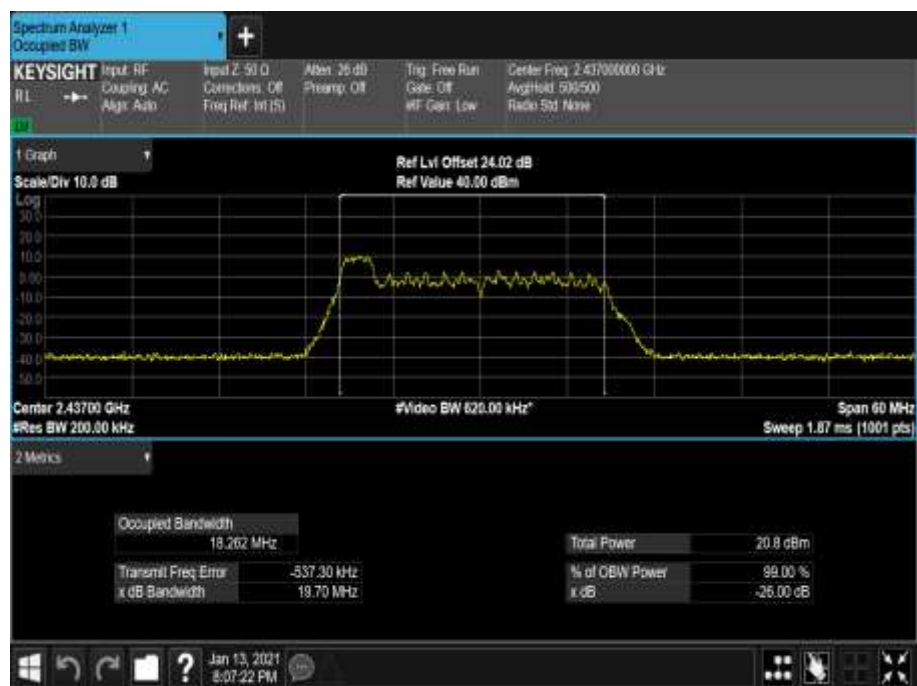


Figure 52 - 2437 MHz - 99% Occupied Bandwidth

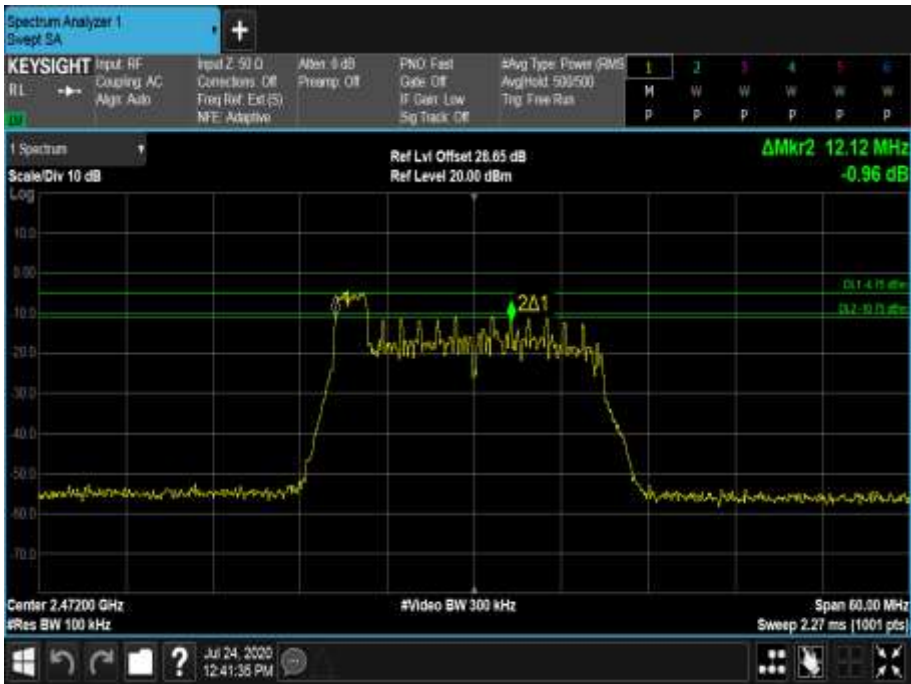


Figure 53 - 2472 MHz - 6 dB DTS Bandwidth



Figure 54 - 2472 MHz - 99% Occupied Bandwidth



Channel	Bottom	Middle	Top
Frequency (MHz)	2412	2437	2472
6 dB Bandwidth (MHz)	2.160	2.160	10.860
99% Bandwidth (MHz)	18.321	18.369	18.409

Table 41 - 802.11ax / HE20 MCS7x1 / RU 26-8 / MIMO CDD / Cores 0+1

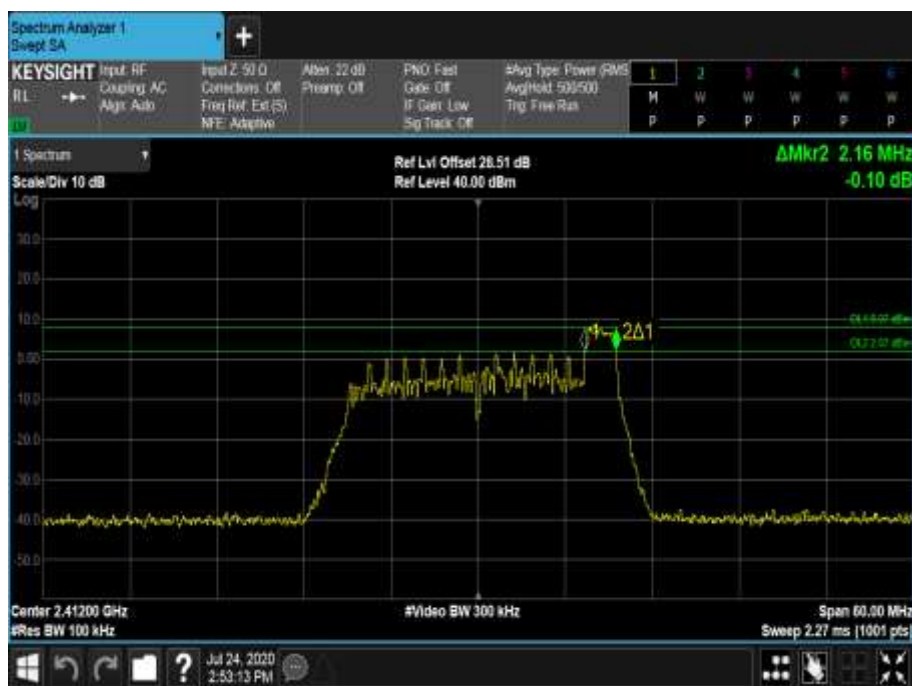


Figure 55 - 2412 MHz - 6 dB DTS Bandwidth



Figure 56 - 2412 MHz - 99% Occupied Bandwidth



Figure 57 - 2437 MHz - 6 dB DTS Bandwidth



Figure 58 - 2437 MHz - 99% Occupied Bandwidth

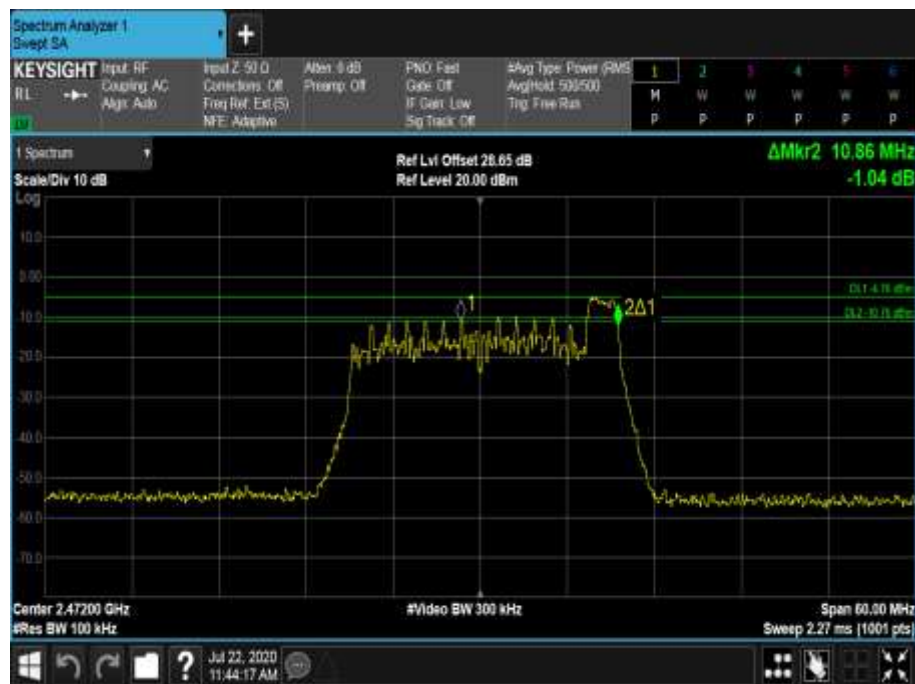


Figure 59 - 2472 MHz - 6 dB DTS Bandwidth



Figure 60 - 2472 MHz - 99% Occupied 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.



2.3.7 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
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Multimeter	Fluke	177	3813	12	09-Oct-2020
1800-6000 MHz Power Splitter	Mini-Circuits	ZN2PD-63-S+	4055	-	O/P Mon
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Power splitter - 2 port	Mini-Circuits	ZN2PD-63-S+	4743	12	23-Sep-2020
EXA	Keysight Technologies	N9010B	4968	24	23-Dec-2021
Cable (40 GHz)	Rosenberger	LU1-001-500	5021	12	22-Jun-2021
Cable (18 GHz)	Rosenberger	LU7-071-1000	5096	12	22-Jun-2021
AC Programmable Power Supply	iTech	IT7324	5227	-	06-Feb-2020
Power Splitter, 2 way	Mini-Circuits	ZN2PD2-63-S+	5238	-	O/P Mon
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5417	12	22-Jun-2021
3.5 mm 1m Cable	Junkosha	MWX221-01000DMS	5418	12	22-Jun-2021
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5575	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5579	-	O/P Mon
Attenuator 2W 10dB DC-10GHz	Telegartner	J01156A0031	5580	-	O/P Mon

Table 42

O/P Mon – Output Monitored using calibrated equipment



2.4 Spurious Radiated Emissions

2.4.1 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

2.4.2 Equipment Under Test and Modification State

A2169, S/N: C07CL0AMQ4TG - Modification State 0

2.4.3 Date of Test

09-September-2020 to 19-September-2020

2.4.4 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. One port of each type was loaded.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 11.12.2.5.2.

Where duty cycle corrections were required for average results, these are included in the result tables but are not shown on the plots.

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 -30 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.

Note the edges of the fundamental may be visible and in some cases appear to exceed the limit in these pre-scans. These band edge emissions were not measured in this section and are investigated fully in sections 2.3 and 2.4.

The following conversion can be applied to convert from dBuV/m to uV/m:
 $10^{(\text{Field Strength in dBuV/m}/20)}$

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 was 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 $20 \cdot \text{LOG}(3/1) = 9.54$ dB.

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

In the 30 MHz to 1 GHz range pre-scans were only performed on the main radio mid channel (2440 MHz).

2.4.5 Example Test Setup Diagram

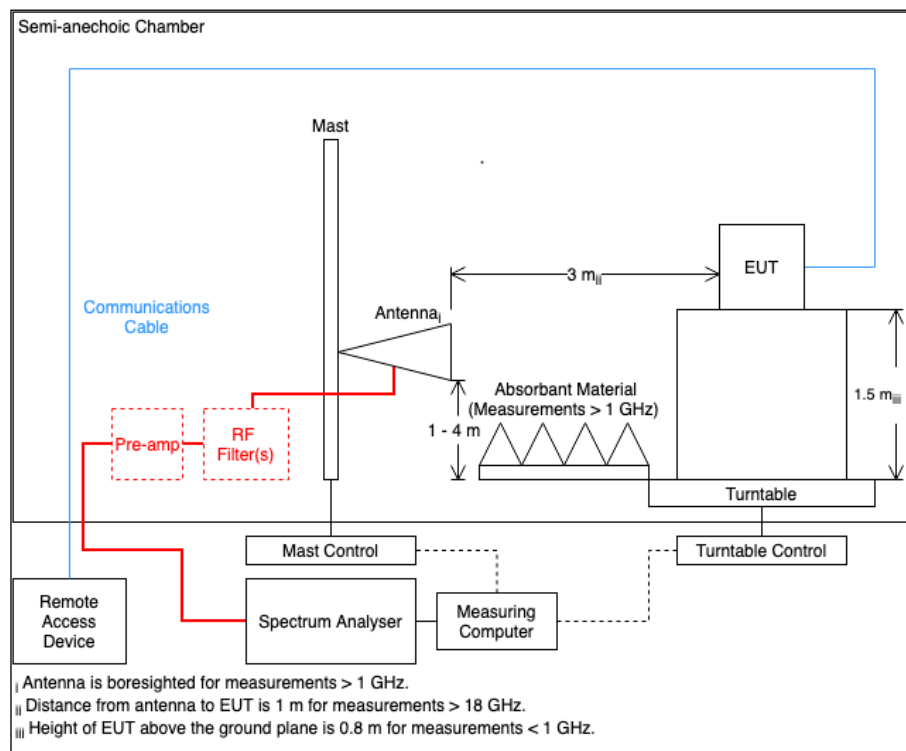


Figure 61

2.4.6 Environmental Conditions

Ambient Temperature	20.9 - 24.2 °C
Relative Humidity	43.6 - 55.9 %

2.4.7 Test Results

2.4 GHz WLAN

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4823.956	42.9	54.0	-11.1	RMS	360	100	Vertical
4823.970	36.2	54.0	-17.8	RMS	271	157	Horizontal

Table 43 - 2412 MHz (CH1), 802.11b, Core 0, 1 GHz to 26 GHz

No other emissions found within 6 dB of the limit.

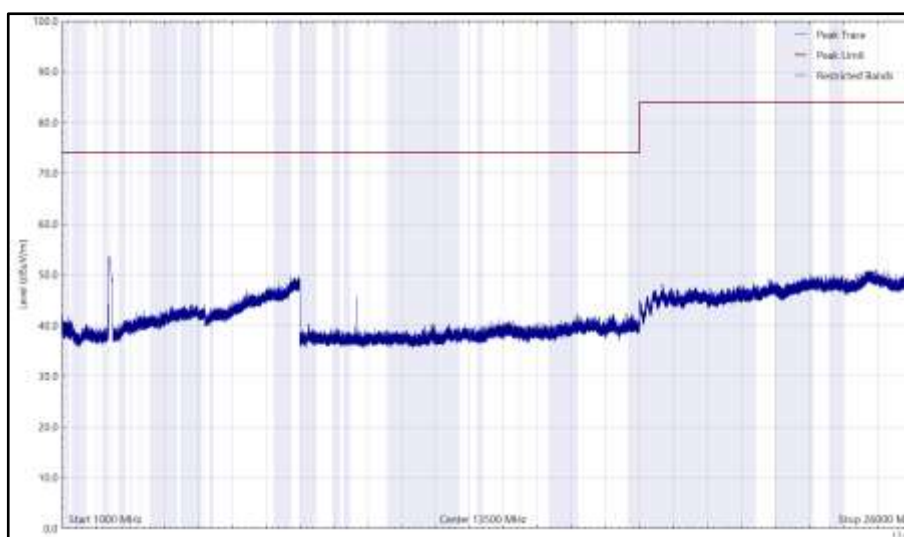


Figure 62 - 2412 MHz (CH1), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

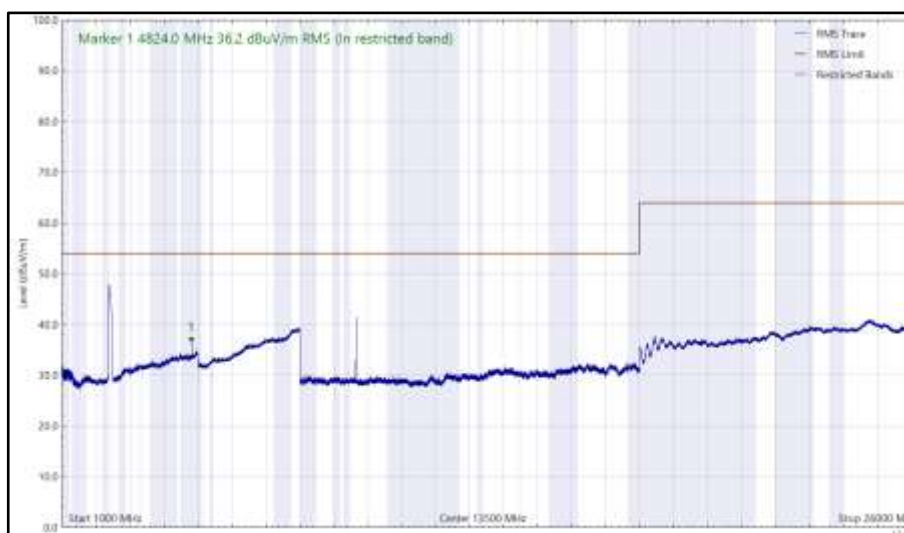


Figure 63 - 2412 MHz (CH1), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

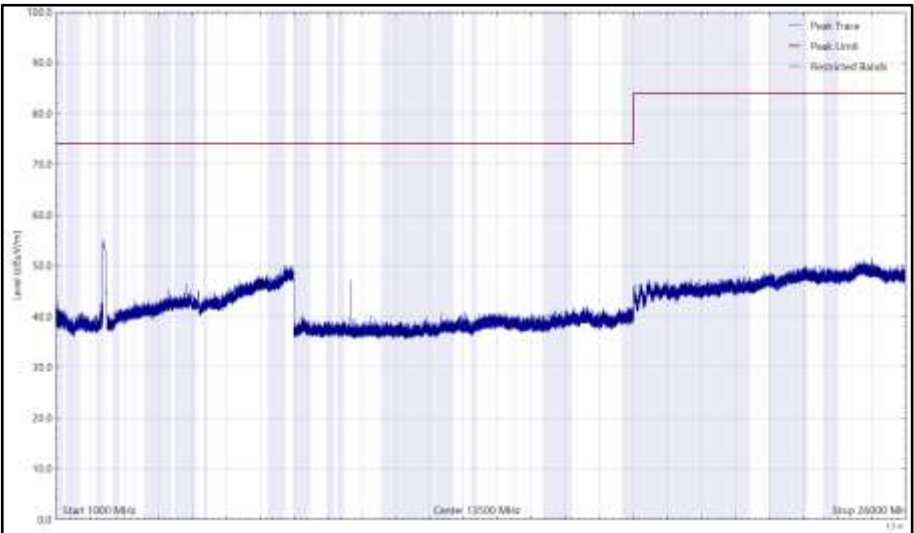


Figure 64 - 2412 MHz (CH1), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

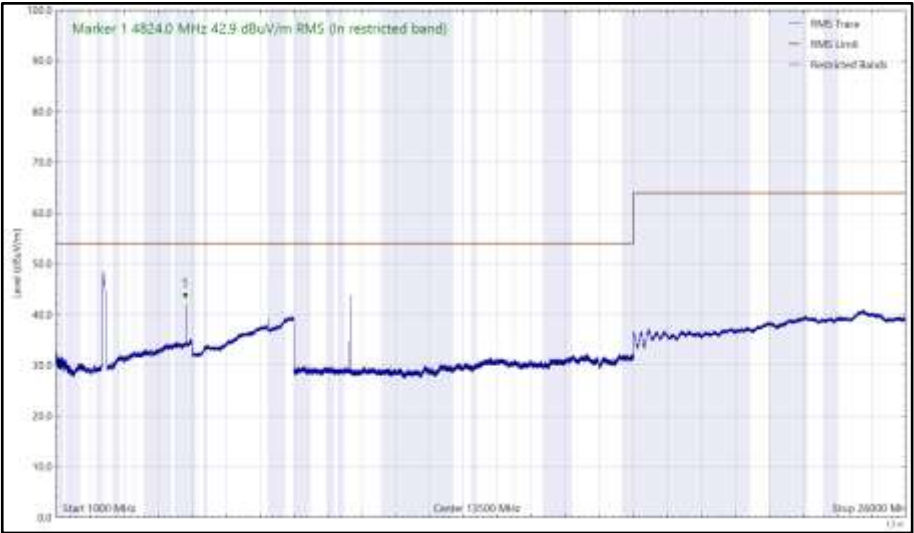


Figure 65 - 2412 MHz (CH1), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.616	14.8	40.0	-25.2	Q-Peak	21	150	Horizontal
38.011	15.0	40.0	-25.0	Q-Peak	0	110	Vertical
119.248	19.3	43.5	-24.2	Q-Peak	266	100	Vertical
7376.803	48.6	74.0	-25.4	Peak	183	100	Vertical

Table 44 - 2437 MHz (CH6), 802.11b, Core 0, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.

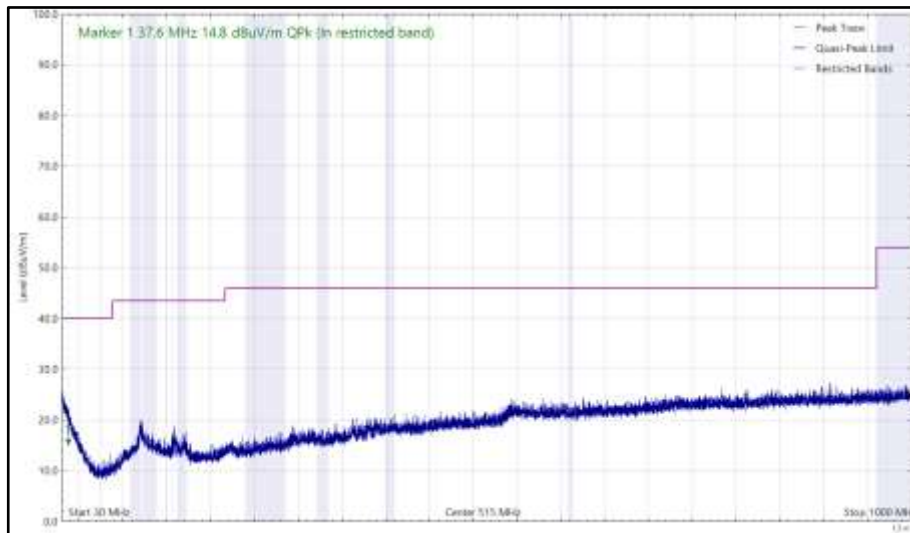


Figure 66 - 2437 MHz (CH6), 802.11b, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

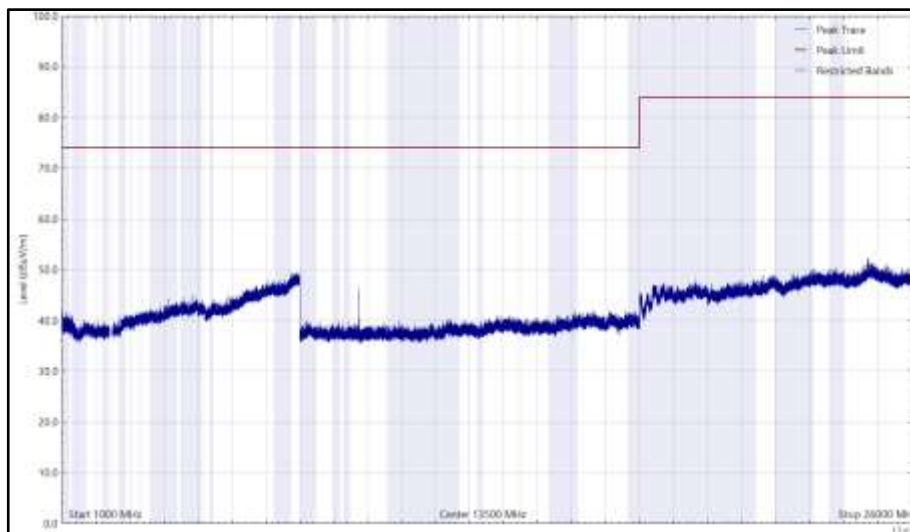


Figure 67 - 2437 MHz (CH6), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

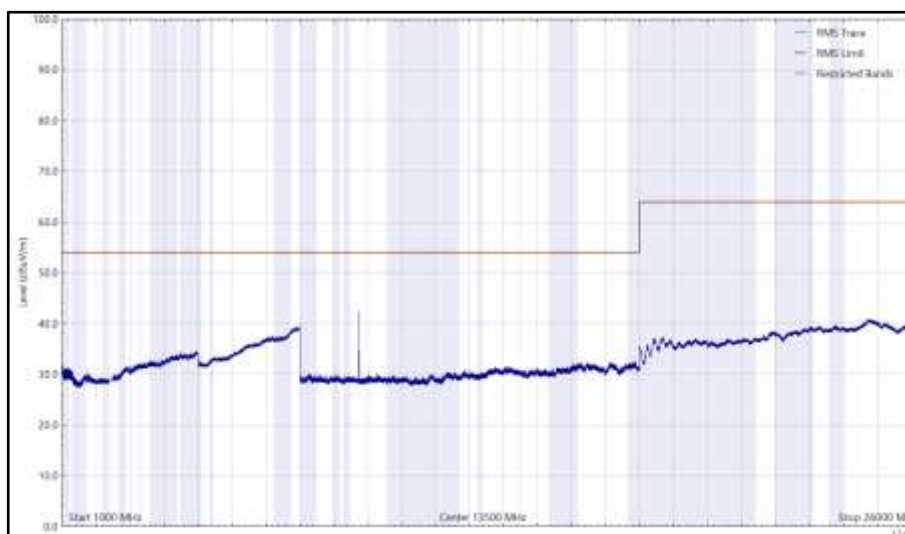


Figure 68 - 2437 MHz (CH6), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

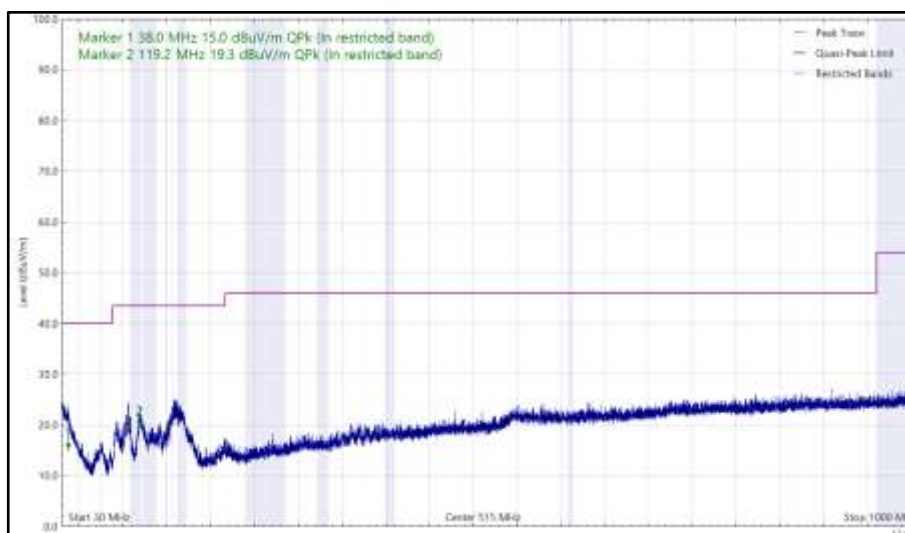


Figure 69 - 2437 MHz (CH6), 802.11b, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

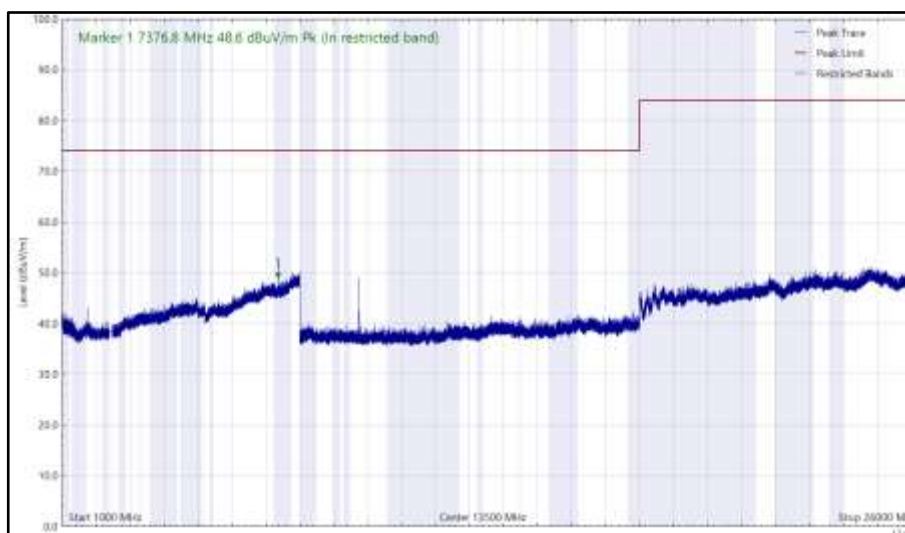


Figure 70 - 2437 MHz (CH6), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

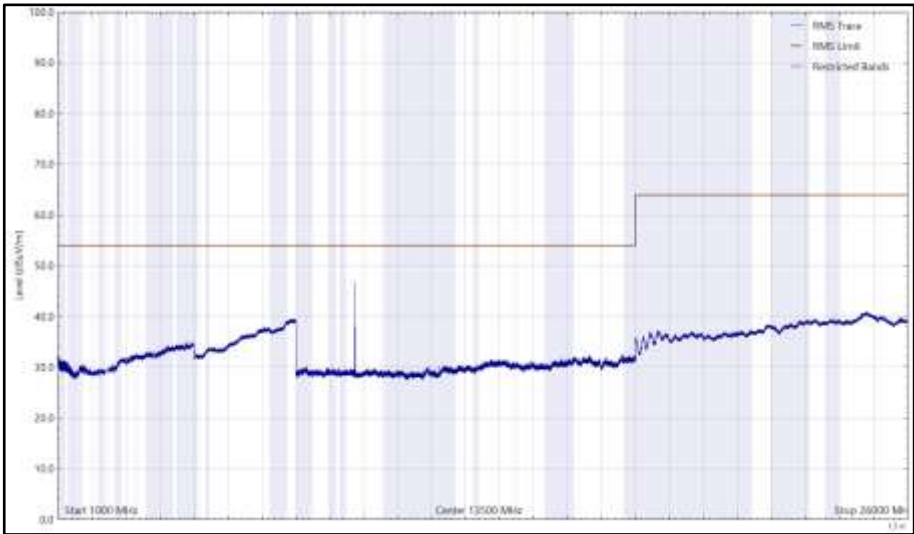


Figure 71 - 2437 MHz (CH6), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4943.969	40.1	54.0	-14.0	RMS	264	393	Horizontal
4943.994	44.3	54.0	-9.7	RMS	3	142	Vertical
7416.838	41.7	54.0	-12.4	RMS	174	198	Vertical
7417.063	38.4	54.0	-15.6	RMS	337	400	Horizontal
7417.303	55.0	74.0	-19.0	Peak	33	100	Vertical

Table 45 - 2472 MHz (CH13), 802.11b, Core 0, 1 GHz to 26 GHz

No other emissions found within 6 dB of the limit.

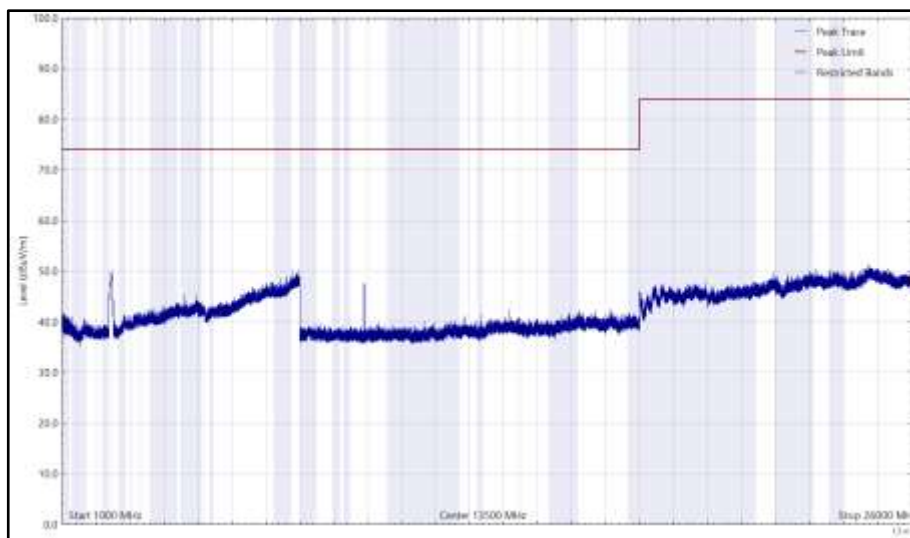


Figure 72 - 2472 MHz (CH13), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

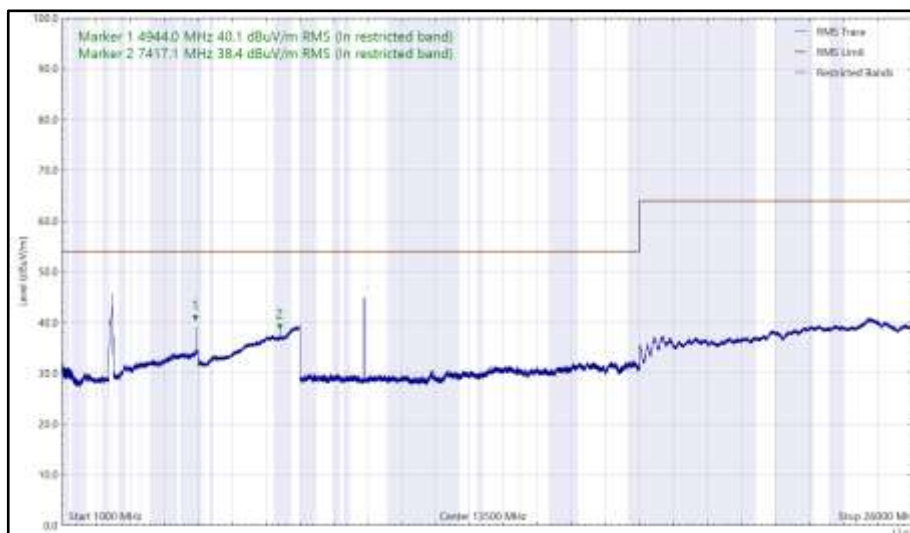


Figure 73 - 2472 MHz (CH13), 802.11b, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

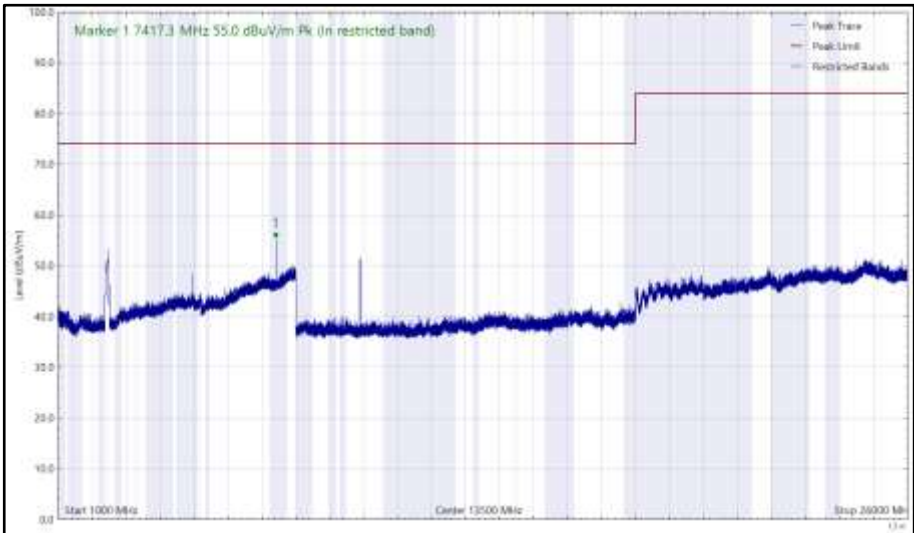


Figure 74 - 2472 MHz (CH13), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

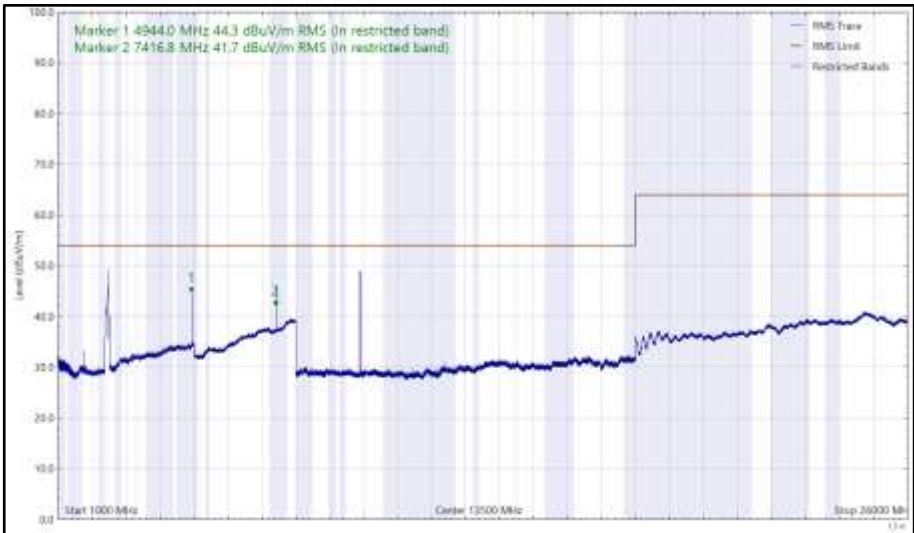


Figure 75 - 2472 MHz (CH13), 802.11b, Core 0, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4824.011	36.8	54.0	-17.3	RMS	5	296	Horizontal
4824.030	45.6	54.0	-8.4	RMS	346	100	Vertical
7236.203	55.9	74.0	-18.1	Peak	224	201	Vertical
7237.228	53.8	74.0	-20.2	Peak	70	100	Horizontal

Table 46 - 2412 MHz (CH1), 802.11b, Core 1, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

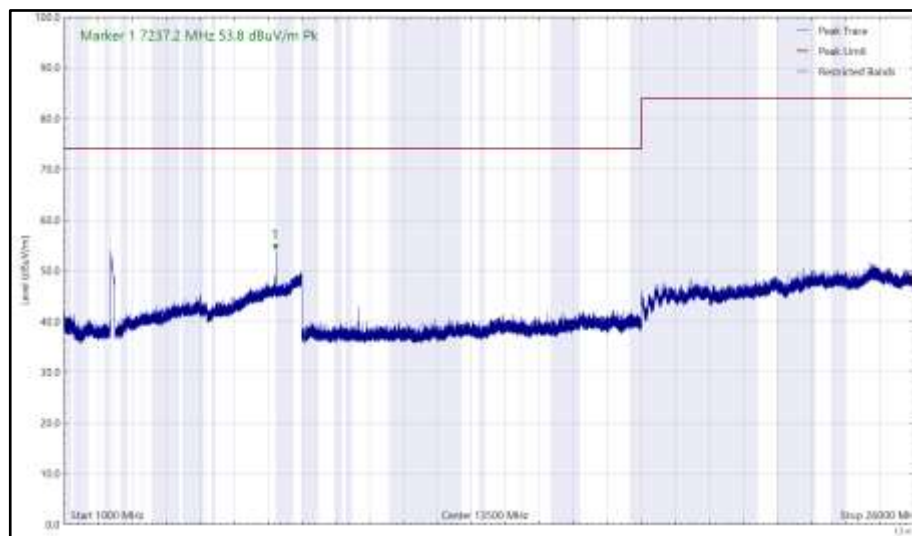


Figure 76 - 2412 MHz (CH1), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

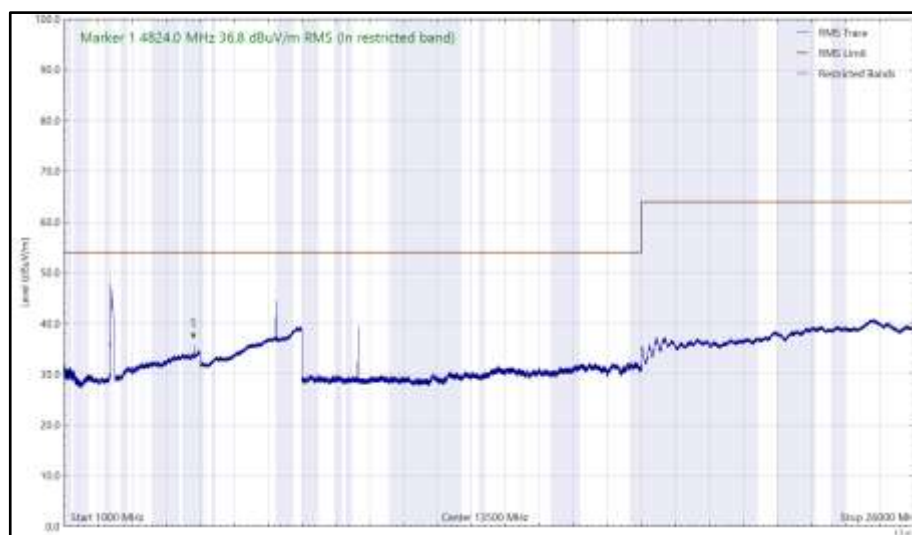


Figure 77 - 2412 MHz (CH1), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

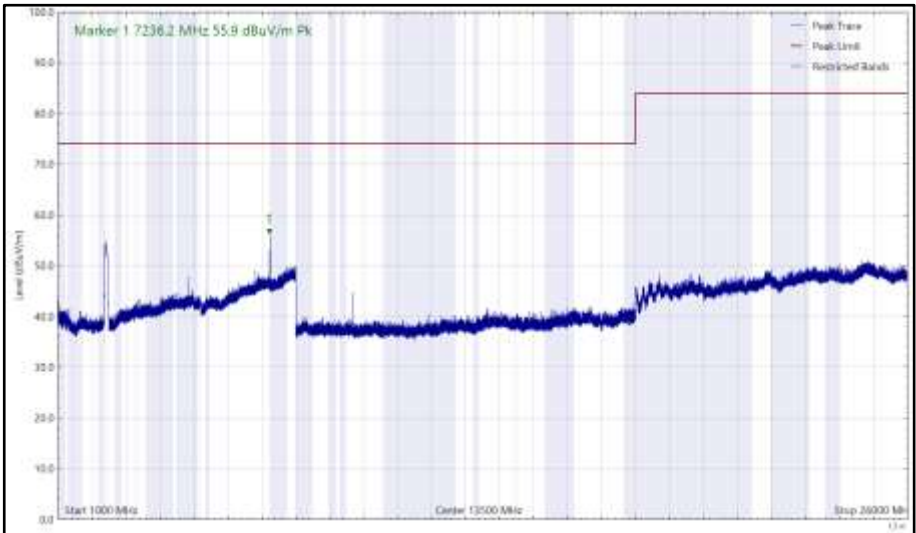


Figure 78 - 2412 MHz (CH1), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (Peak)

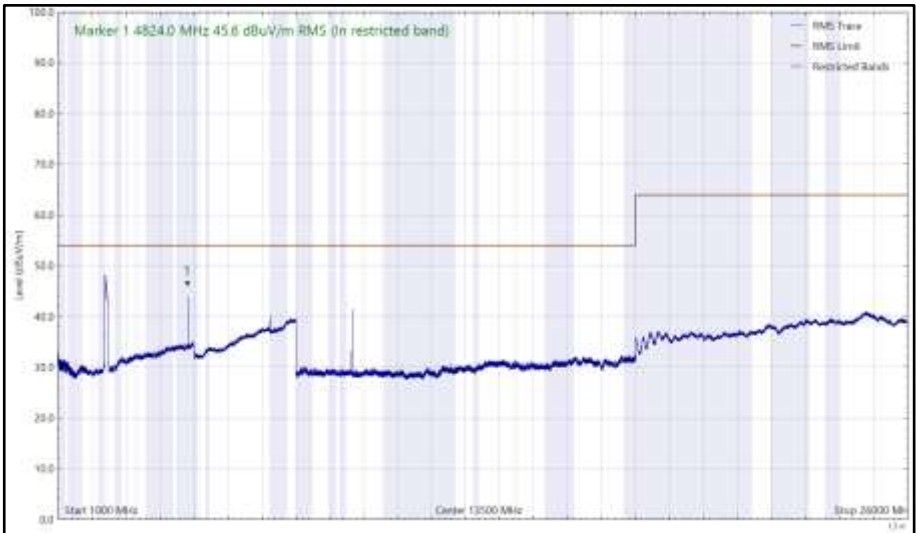


Figure 79 - 2412 MHz (CH1), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.729	15.0	40.0	-25.0	Q-Peak	133	100	Horizontal
37.908	16.7	40.0	-23.3	Q-Peak	293	104	Vertical
119.705	18.9	43.5	-24.6	Q-Peak	276	100	Vertical

Table 47 - 2437 MHz (CH6), 802.11b, Core 1, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.



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

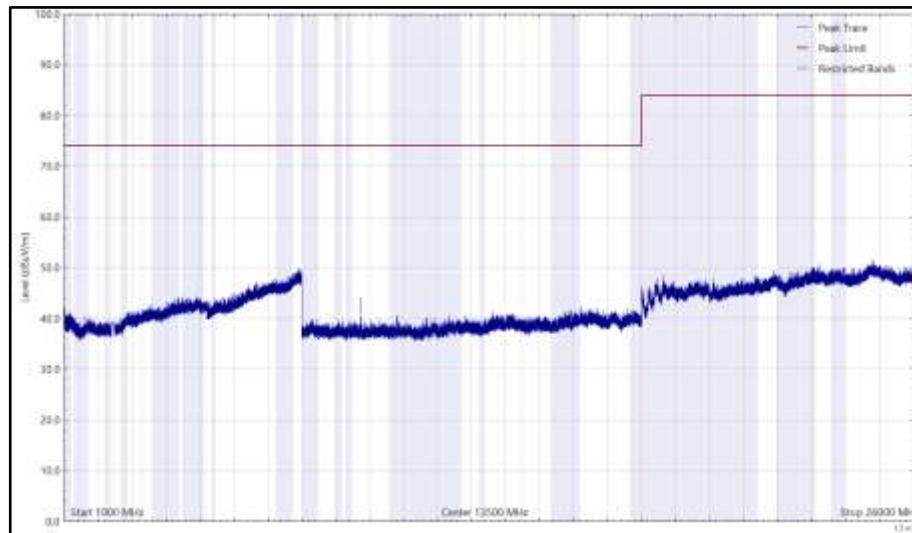


Figure 81 - 2437 MHz (CH6), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

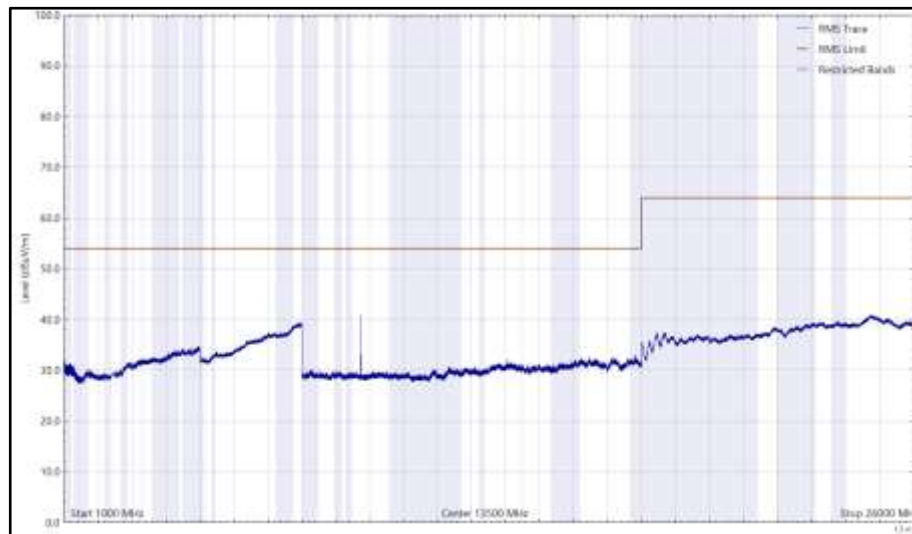


Figure 82 - 2437 MHz (CH6), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)



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

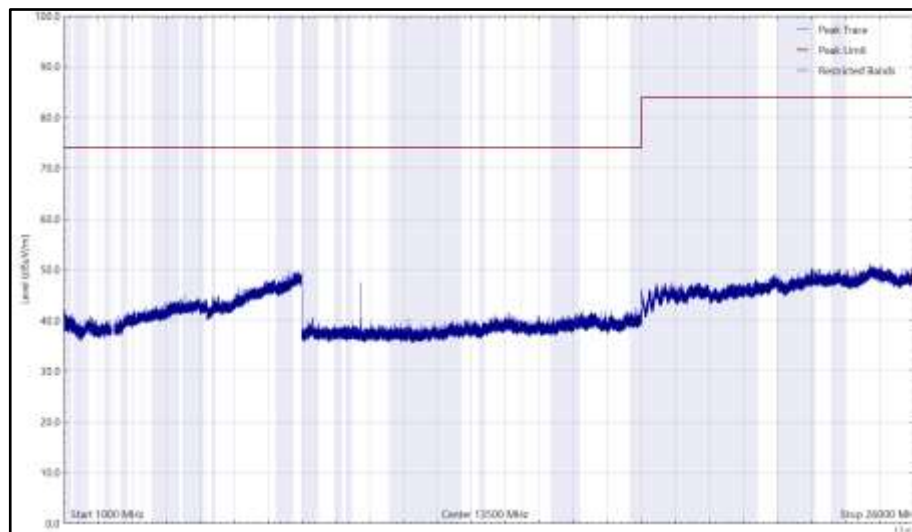


Figure 84 - 2437 MHz (CH6), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (Peak)

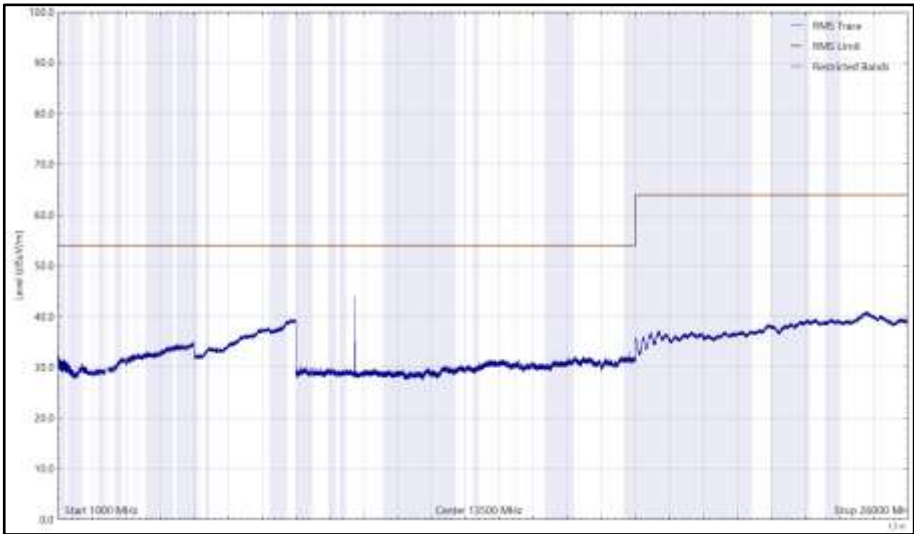


Figure 85 - 2437 MHz (CH6), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (RMS)



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

Table 48 - 2472 MHz (CH13), 802.11b, Core 1, 1 to 26 GHz

*No emissions found within 6 dB of the limit.

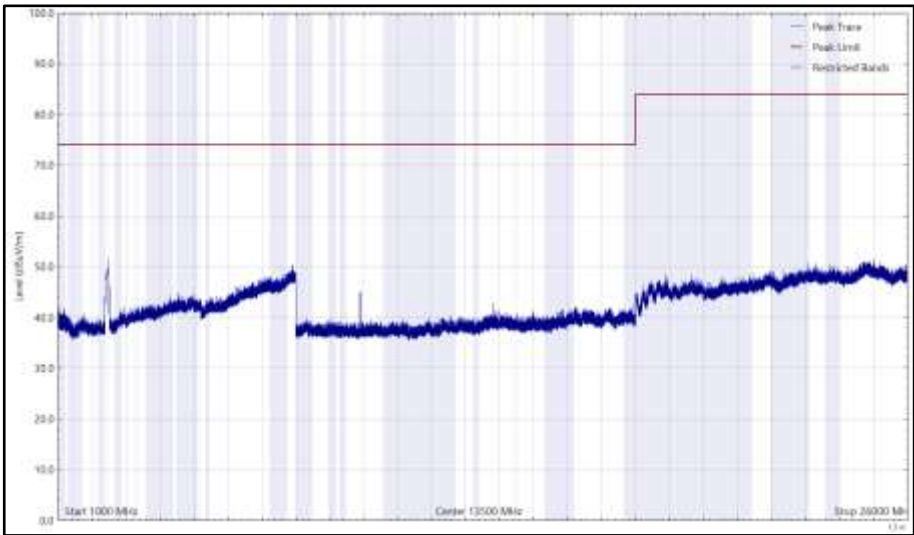


Figure 86 - 2472 MHz (CH13), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

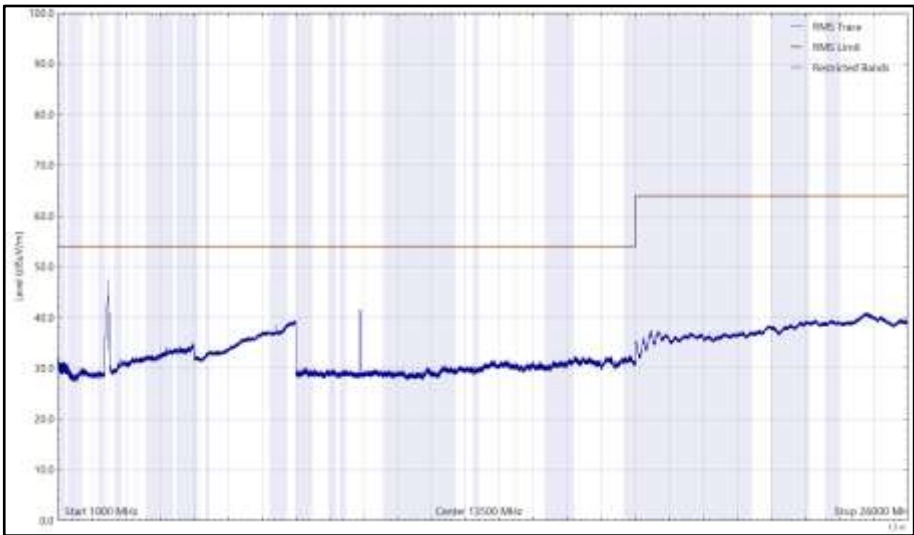


Figure 87 - 2472 MHz (CH13), 802.11b, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

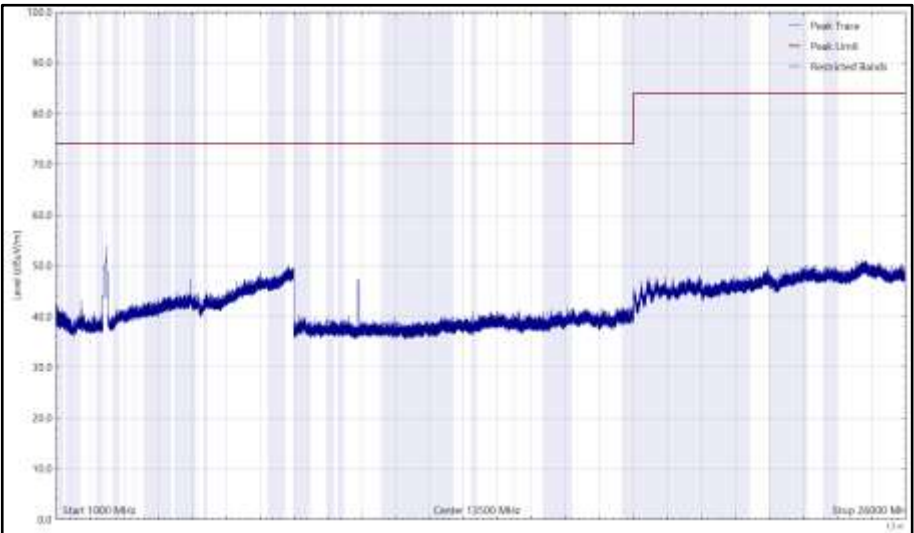


Figure 88 - 2472 MHz (CH13), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (Peak)

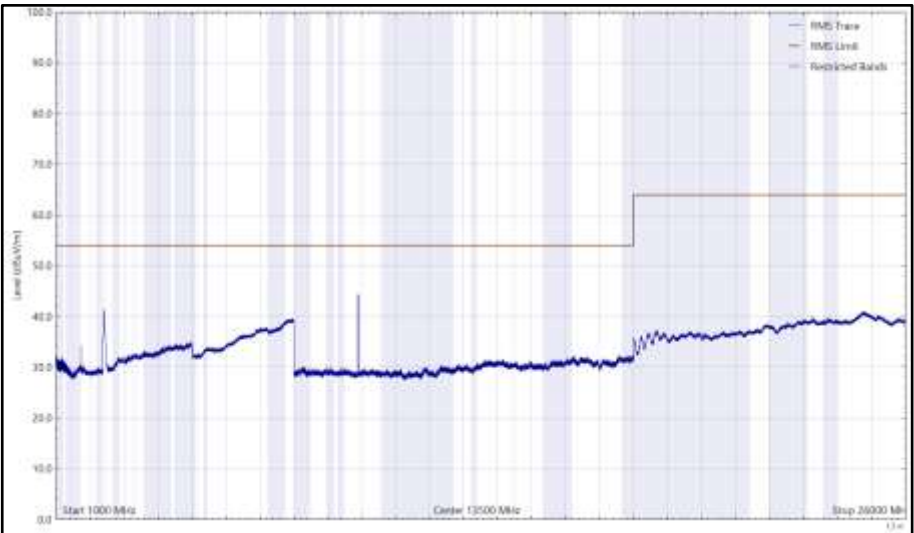


Figure 89 - 2472 MHz (CH13), 802.11b, Core 1, 1 GHz to 26 GHz, Vertical (RMS)



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

Table 49 - 2412 MHz (CH1), 802.11g, Core 0, 1 to 26 GHz

*No emissions found within 6 dB of the limit.

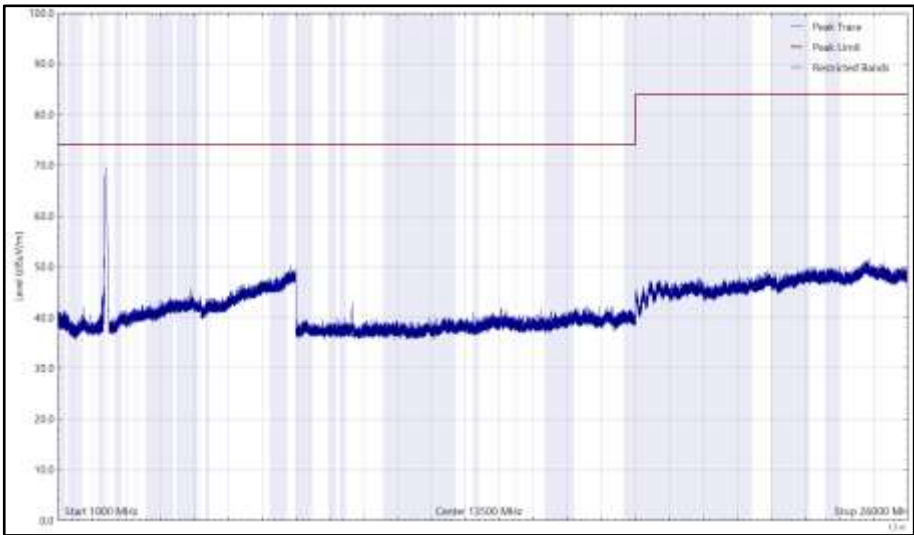


Figure 90 - 2412 MHz (CH1), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

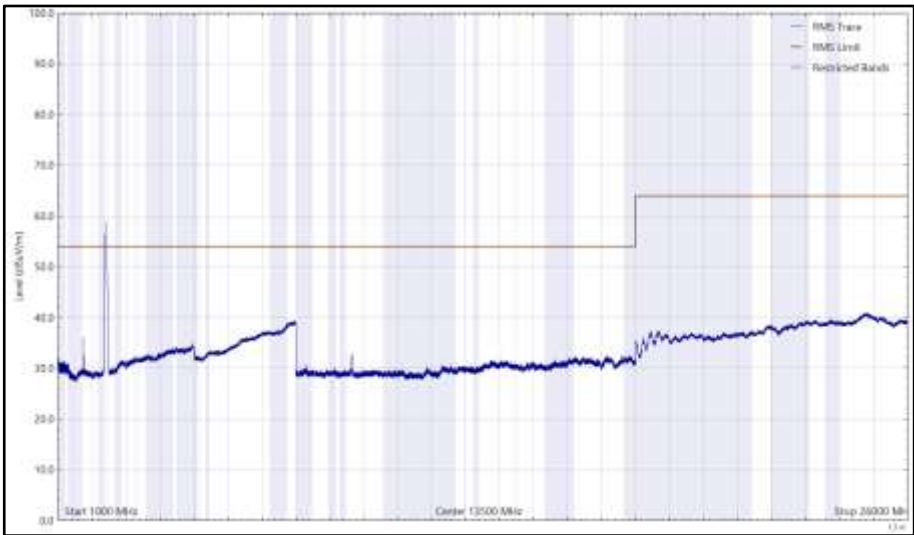


Figure 91 - 2412 MHz (CH1), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

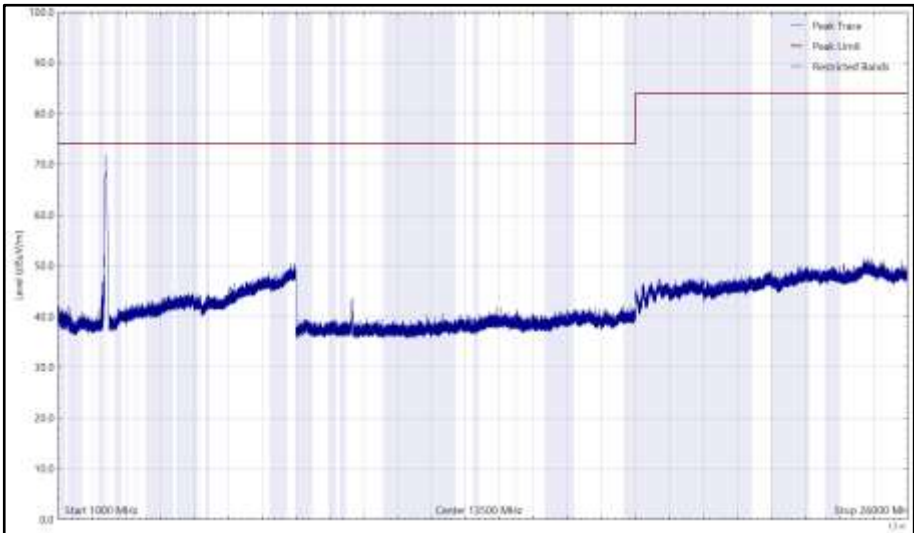


Figure 92 - 2412 MHz (CH1), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

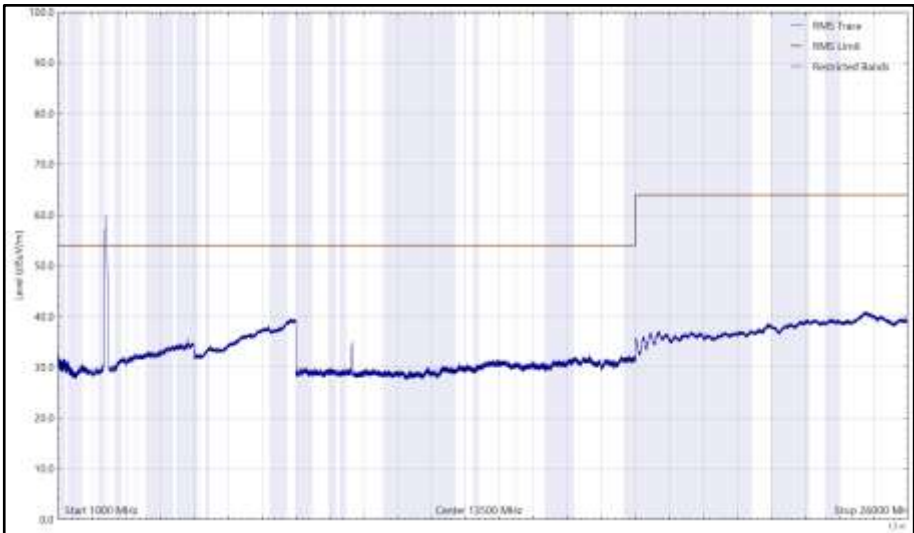


Figure 93 - 2412 MHz (CH1), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.562	14.9	40.0	-25.1	Q-Peak	342	356	Horizontal
37.741	15.6	40.0	-24.4	Q-Peak	70	100	Vertical
121.186	21.1	43.5	-22.4	Q-Peak	242	102	Vertical

Table 50 - 2437 MHz (CH6), 802.11g, Core 0, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.



Figure 94 - 2437 MHz (CH6), 802.11g, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

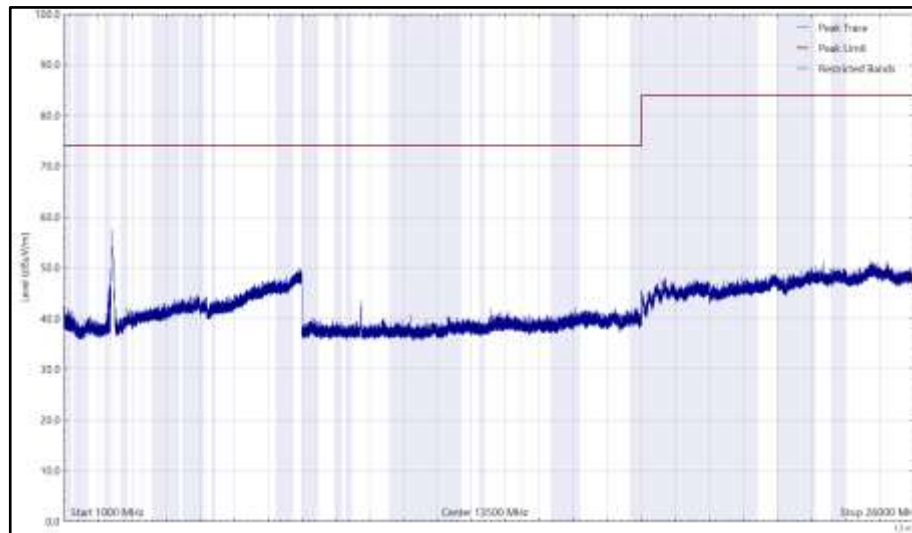


Figure 95 - 2437 MHz (CH6), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

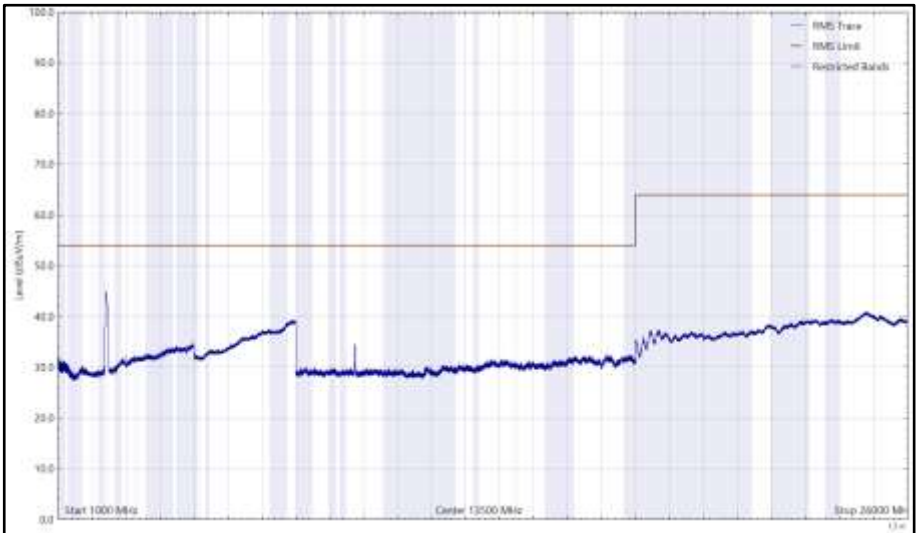


Figure 96 - 2437 MHz (CH6), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

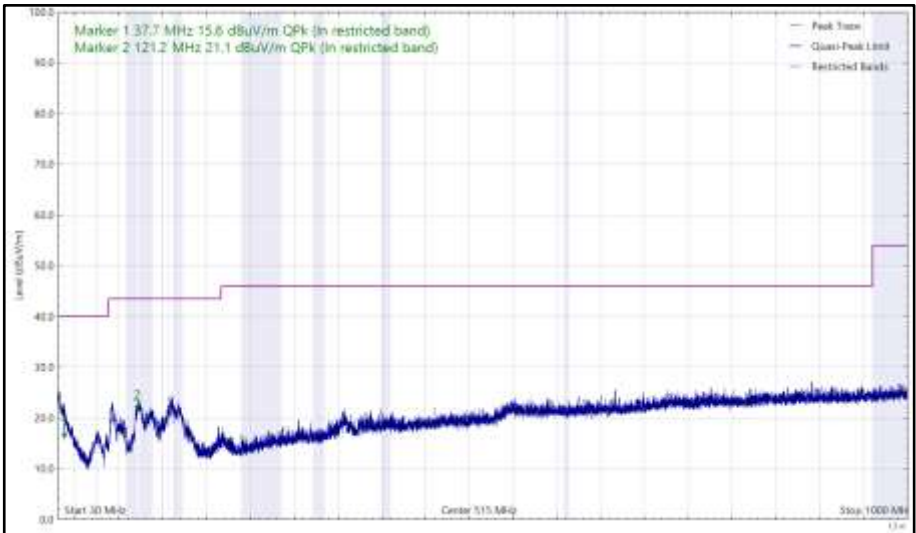


Figure 97 - 2437 MHz (CH6), 802.11g, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

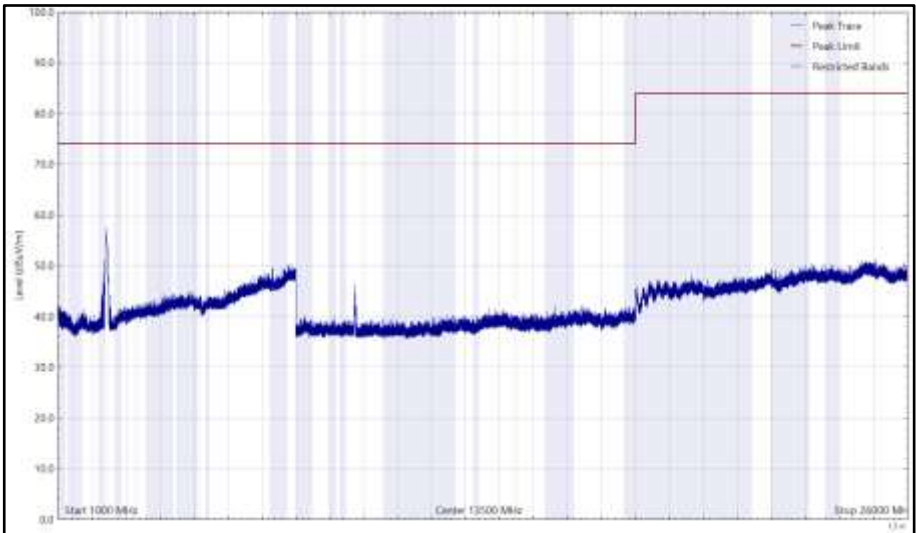


Figure 98 - 2437 MHz (CH6), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

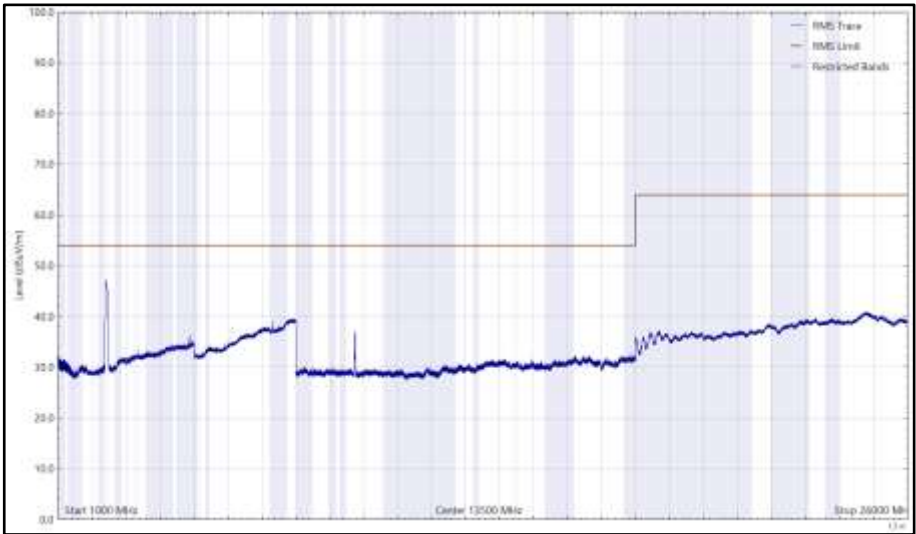


Figure 99 - 2437 MHz (CH6), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
7417.228	39.2	54.0	-14.8	RMS	62	105	Vertical

Table 51 - 2472 MHz (CH13), 802.11g, Core 0, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

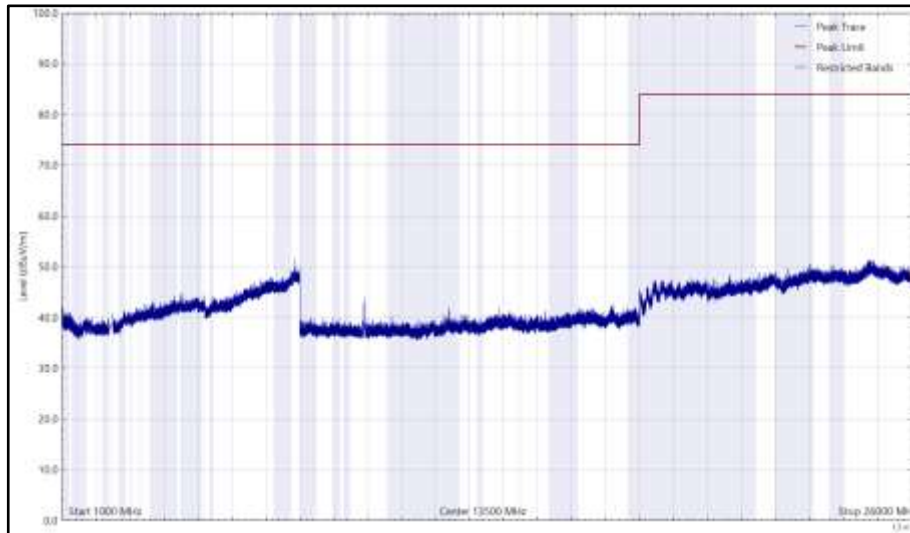


Figure 100 - 2472 MHz (CH13), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (Peak)

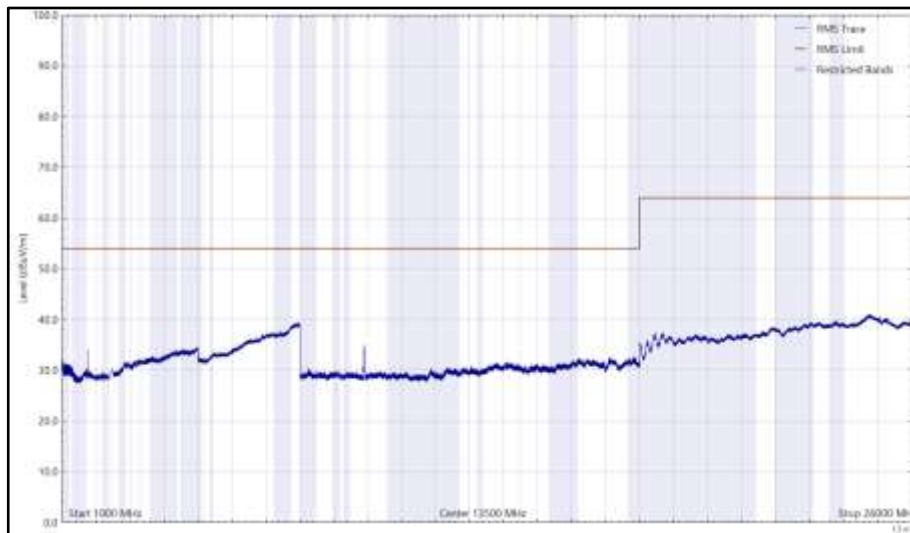


Figure 101 - 2472 MHz (CH13), 802.11g, Core 0, 1 GHz to 26 GHz, Horizontal (RMS)

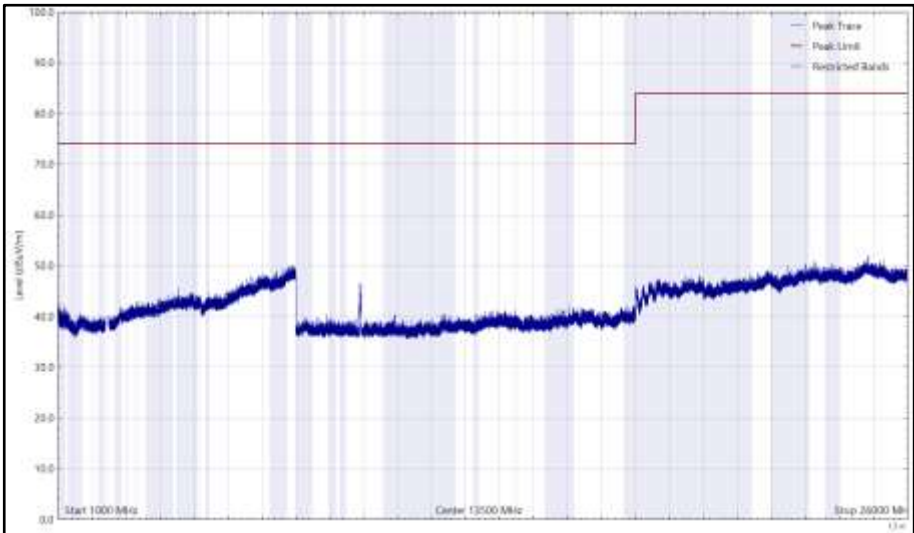


Figure 102 - 2472 MHz (CH13), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (Peak)

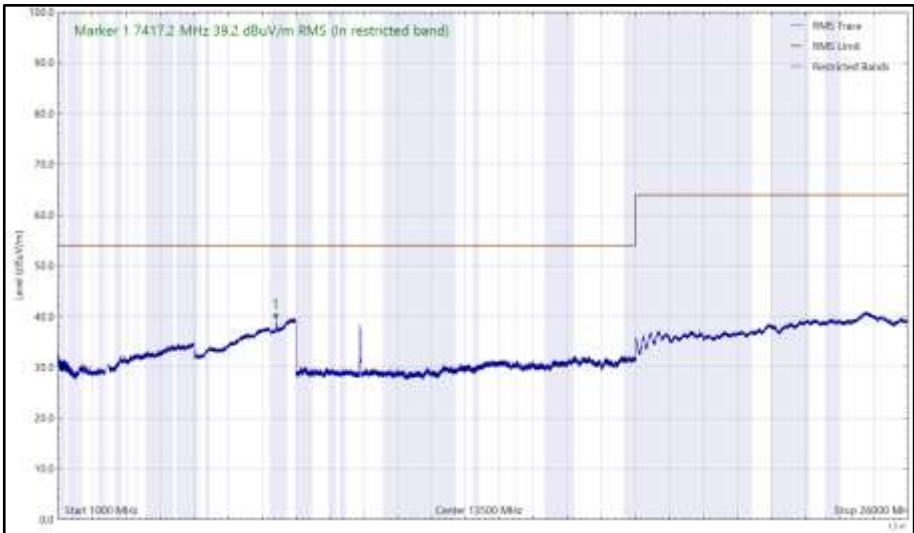


Figure 103 - 2472 MHz (CH13), 802.11g, Core 0, 1 GHz to 26 GHz, Vertical (RMS)



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4823.720	36.1	54.0	-17.9	RMS	350	113	Vertical

Table 52 - 2412 MHz (CH1), 802.11g, Core 1, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

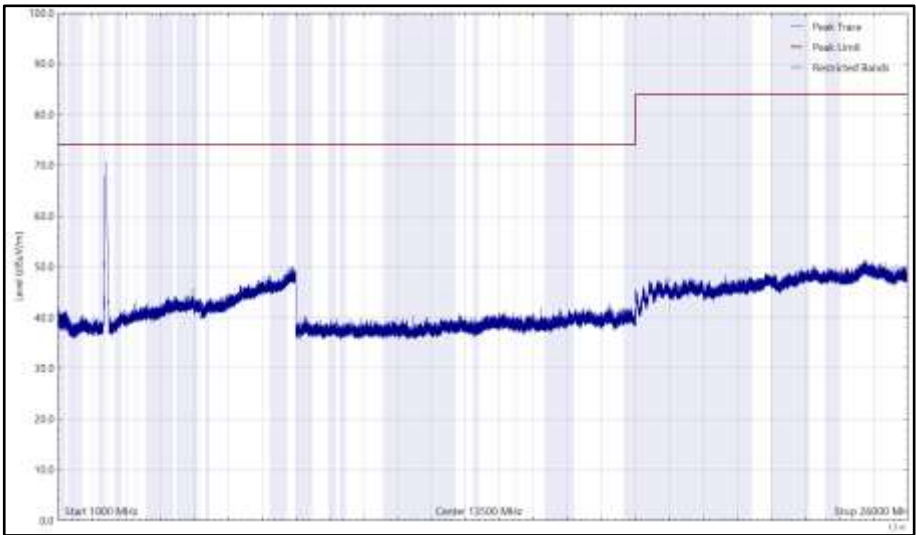


Figure 104 - 2412 MHz (CH1), 802.11g, Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

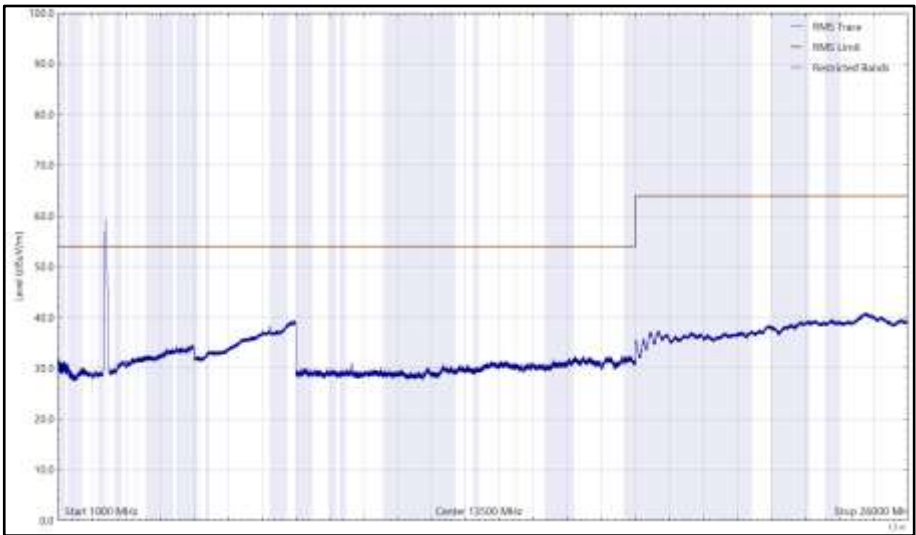


Figure 105 - 2412 MHz (CH1), 802.11g, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

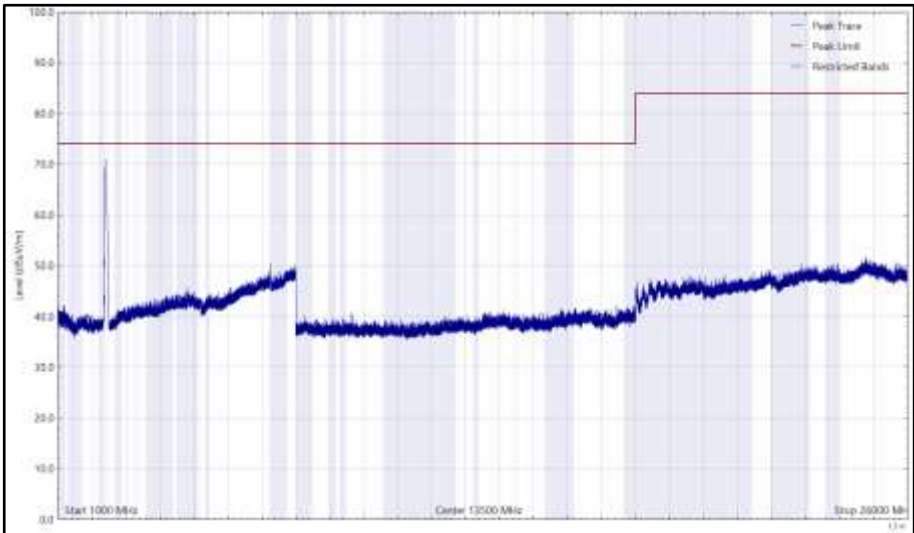


Figure 106 - 2412 MHz (CH1), 802.11g, Core 1, 1 GHz to 26 GHz, Vertical (Peak)

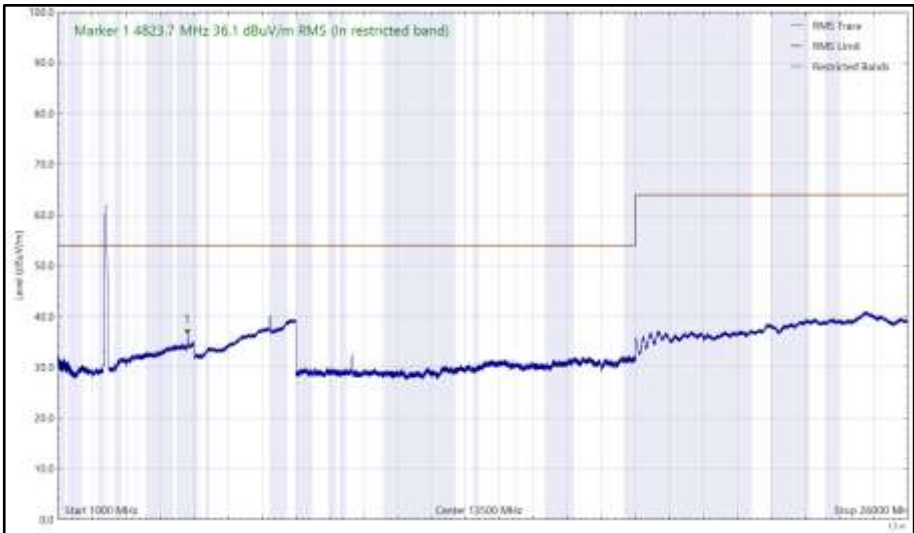


Figure 107 - 2412 MHz (CH1), 802.11g, Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.533	14.9	40.0	-25.1	Q-Peak	160	103	Horizontal
37.561	14.8	40.0	-25.2	Q-Peak	155	211	Vertical
135.463	16.7	43.5	-26.8	Q-Peak	277	100	Vertical
4876.100	35.0	54.0	-19.0	RMS	357	107	Vertical
7311.955	40.1	54.0	-14.0	RMS	106	106	Vertical
7312.115	39.1	54.0	-15.0	RMS	350	283	Horizontal

Table 53 - 2437 MHz (CH6), 802.11g, Core 1, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.

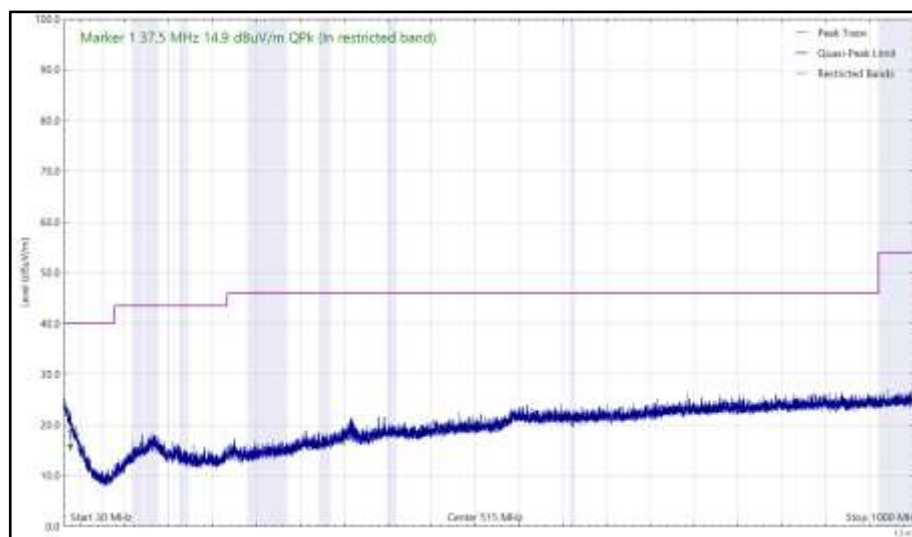


Figure 108 - 2437 MHz (CH6), 802.11g, Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

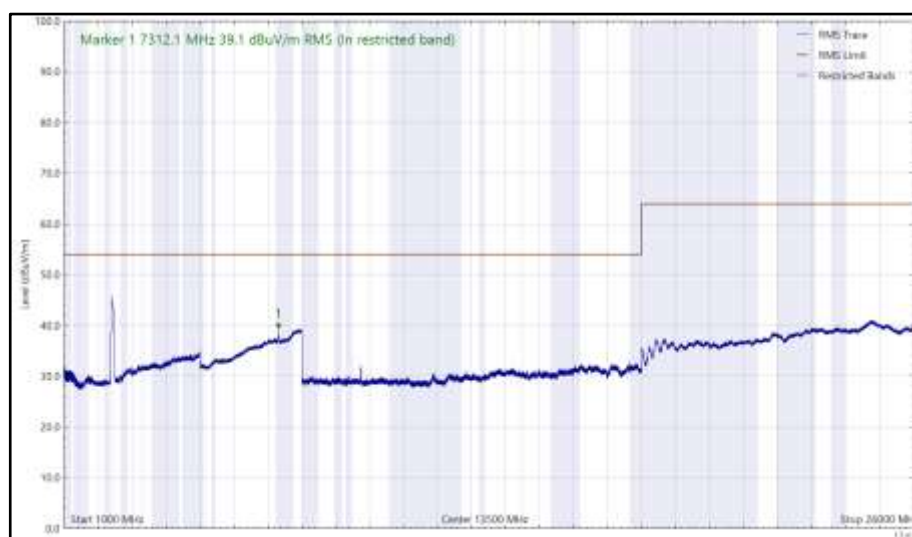


Figure 109 - 2437 MHz (CH6), 802.11g, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

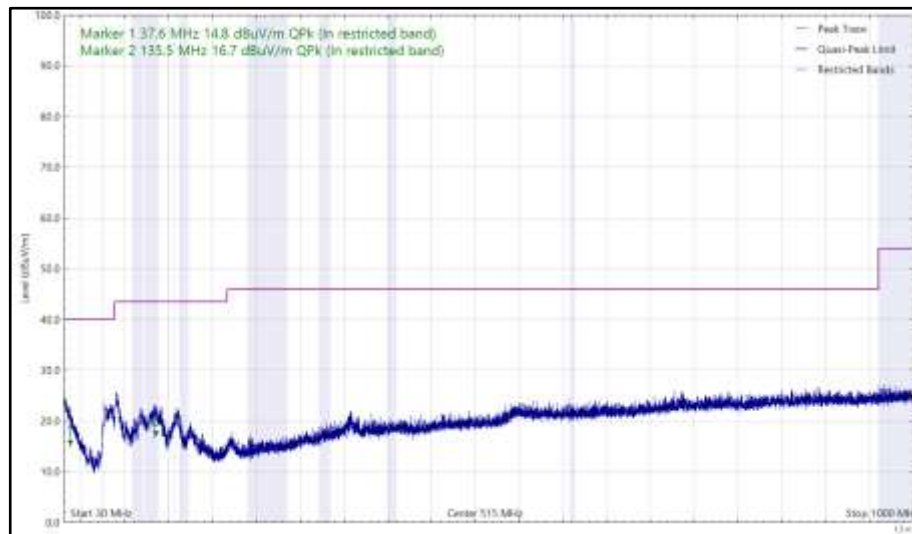


Figure 110 - 2437 MHz (CH6), 802.11g, Core 1, 30 MHz to 1 GHz, Vertical (Peak)

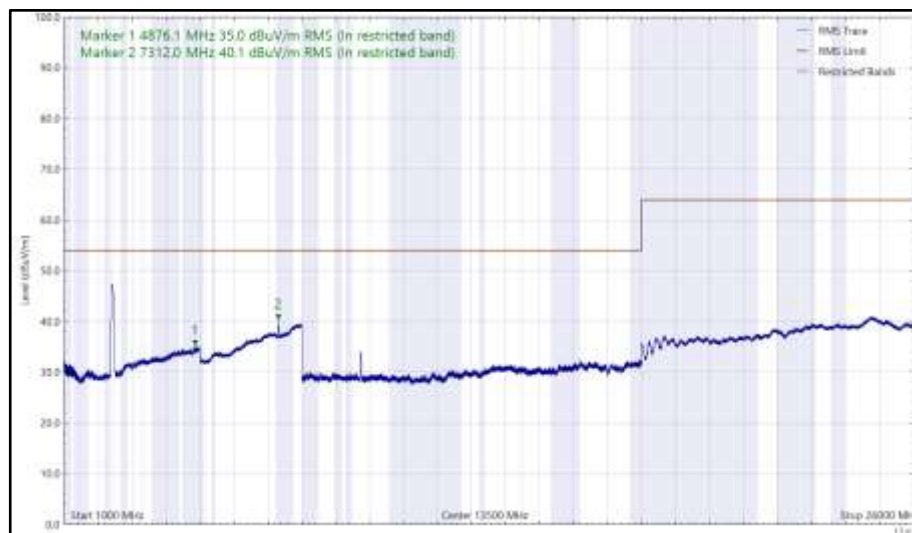


Figure 111 - 2437 MHz (CH6), 802.11g, Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
7415.428	46.7	54.0	-7.3	RMS	278	257	Vertical
7417.007	45.5	54.0	-8.5	RMS	6	343	Horizontal
7420.123	59.2	74.0	-14.8	Peak	278	108	Vertical

Table 54 - 2472 MHz (CH13), 802.11g, Core 1, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

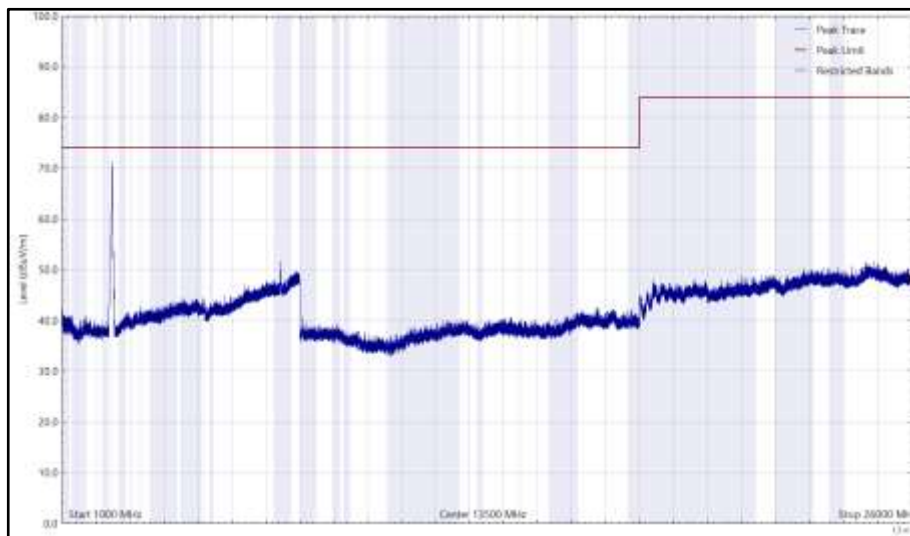


Figure 112 - 2472 MHz (CH13), 802.11g, Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

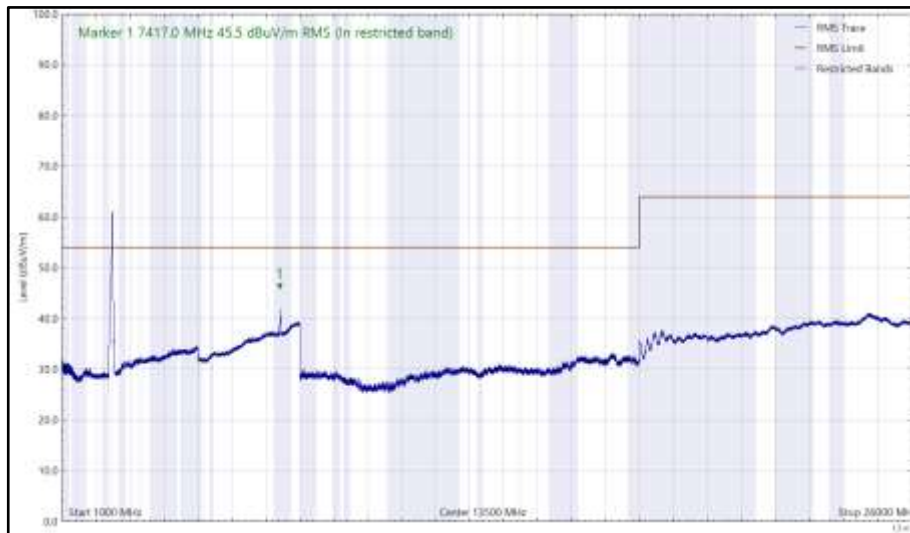


Figure 113 - 2472 MHz (CH13), 802.11g, Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

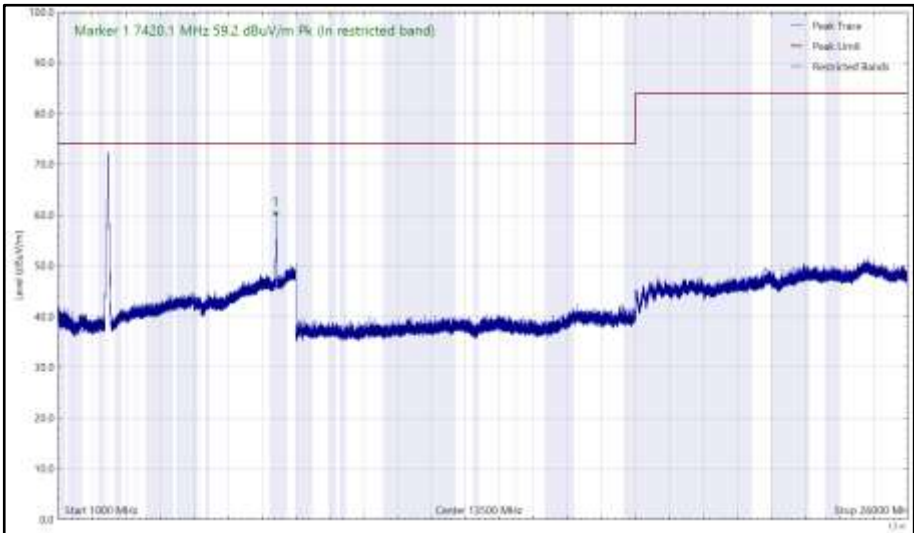


Figure 114 - 2472 MHz (CH13), 802.11g, Core 1, 1 GHz to 26 GHz, Vertical (Peak)

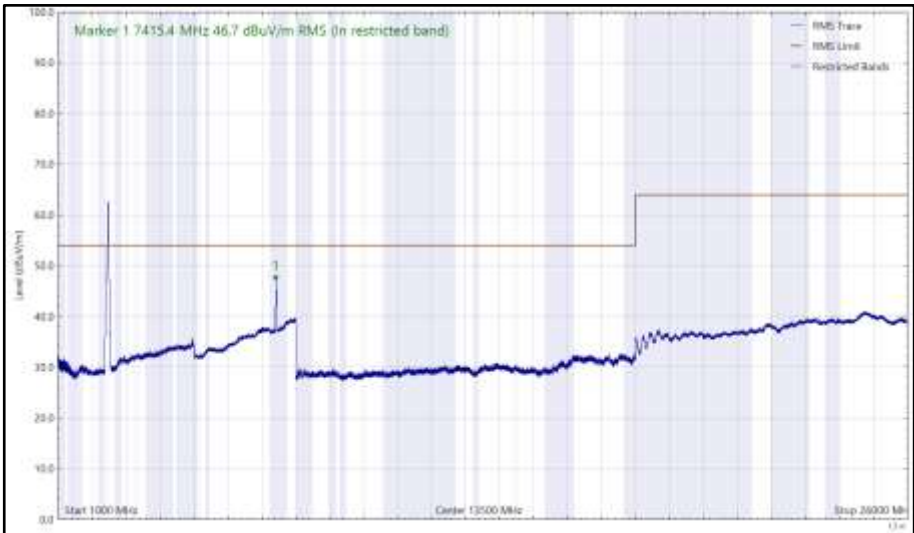


Figure 115 - 2472 MHz (CH13), 802.11g, Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4823.219	37.1	54.0	-16.9	RMS	337	102	Vertical

Table 55 - 2412 MHz (CH1), HT20, CDD, Core 0 + Core 1, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

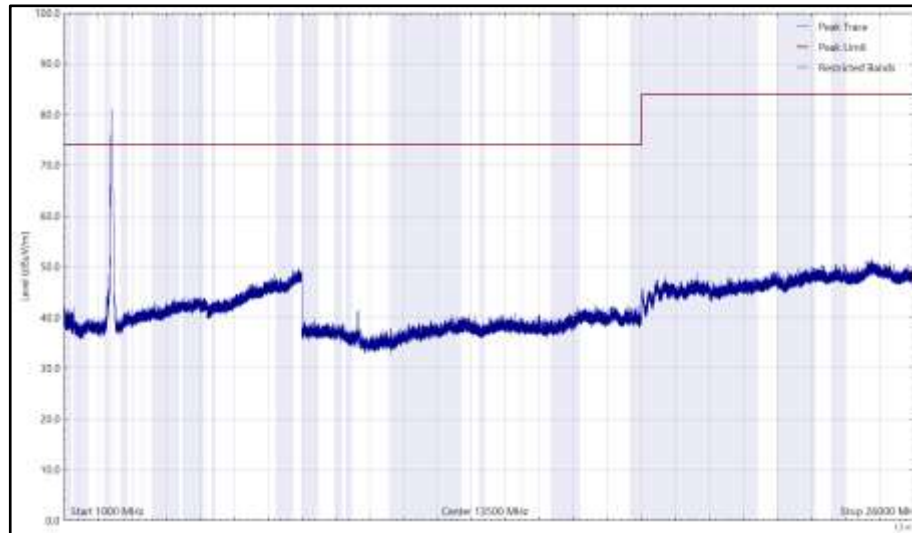


Figure 116 - 2412 MHz (CH1), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

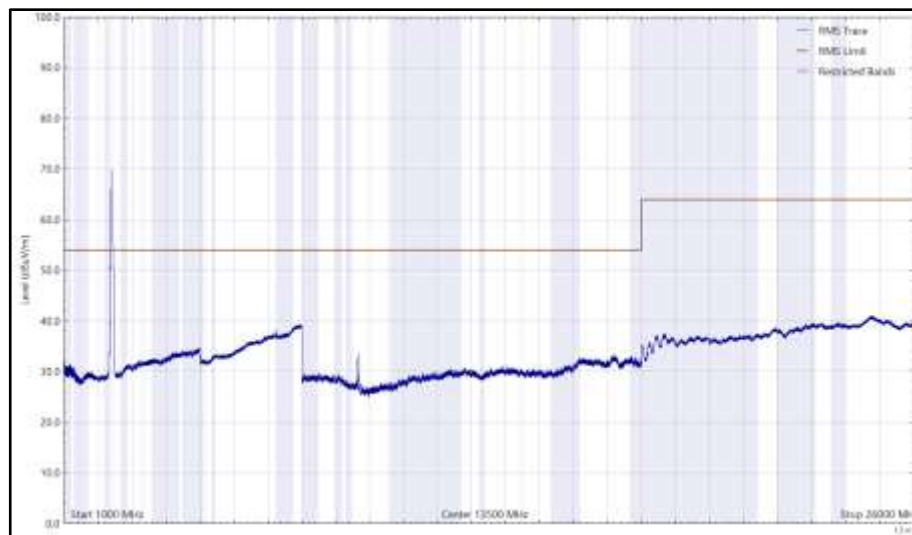


Figure 117 - 2412 MHz (CH1), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

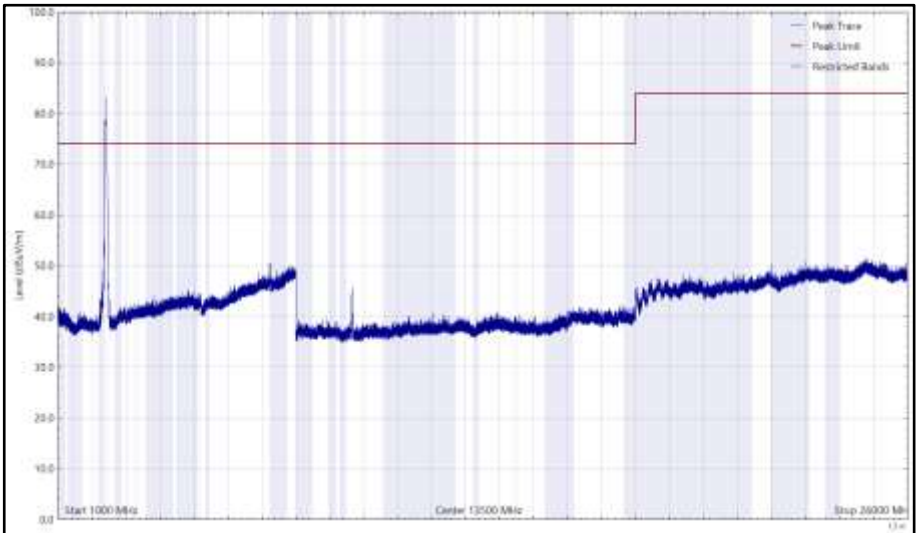


Figure 118 - 2412 MHz (CH1), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (Peak)

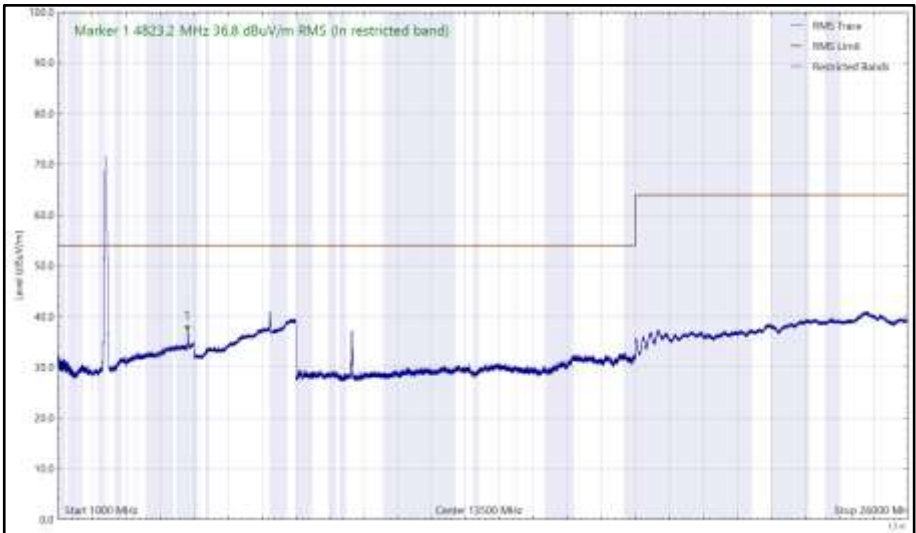


Figure 119 - 2412 MHz (CH1), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.505	15.1	40.0	-24.9	Q-Peak	353	196	Horizontal
37.526	15.8	40.0	-24.2	Q-Peak	247	205	Vertical
136.854	22.8	43.5	-20.7	Q-Peak	133	104	Vertical
4872.975	37.4	54.0	-16.6	RMS	349	100	Vertical
7311.285	41.8	54.0	-12.2	RMS	24	391	Horizontal
7311.375	43.1	54.0	-10.9	RMS	288	247	Vertical

Table 56 - 2437 MHz (CH6), HT20, CDD, Core 0 + Core 1, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.

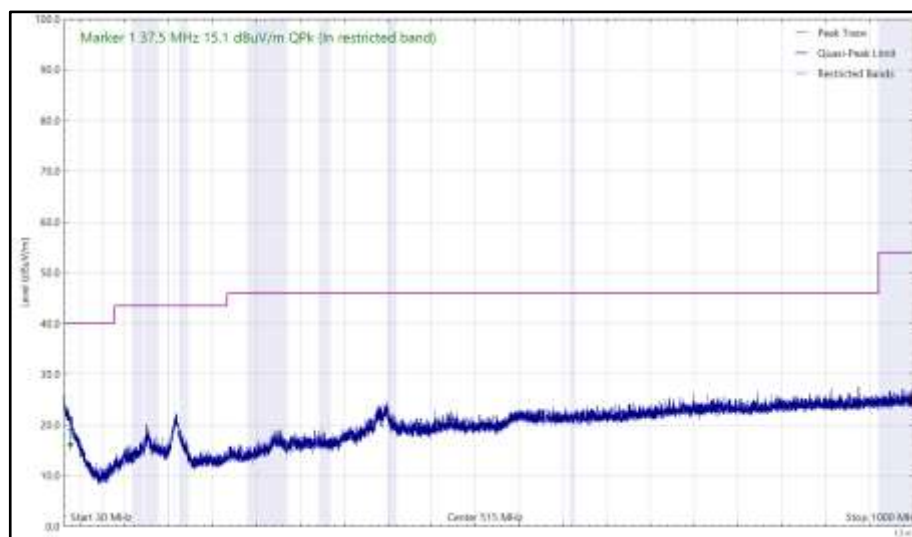


Figure 120 - 2437 MHz (CH6), HT20, CDD, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

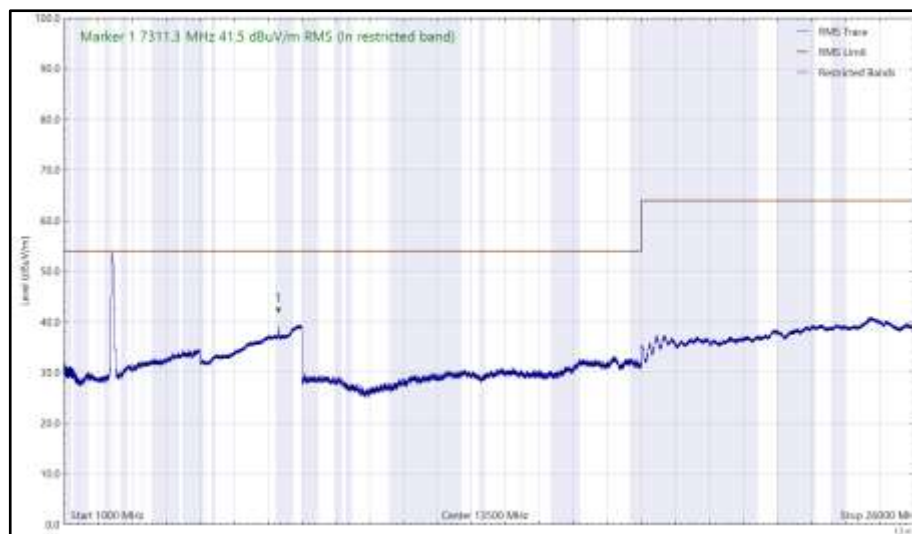


Figure 121 - 2437 MHz (CH6), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

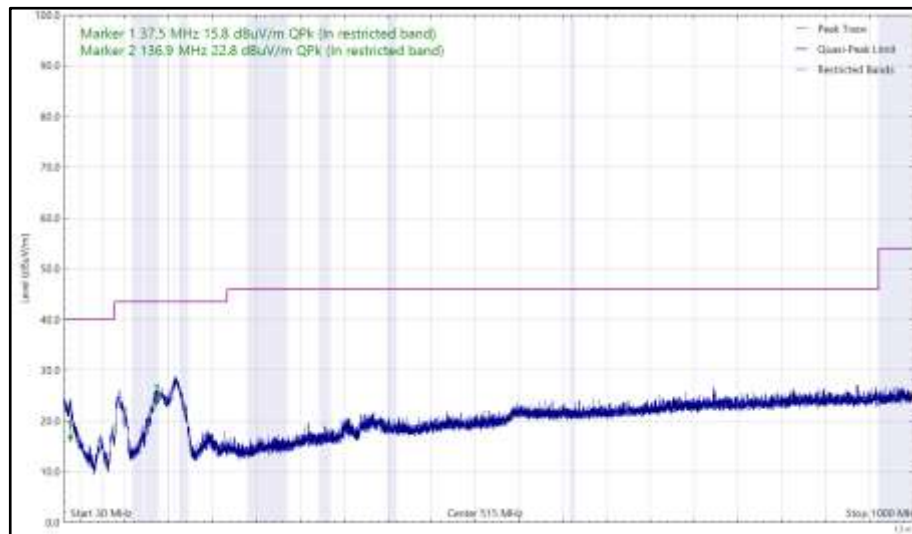


Figure 122 - 2437 MHz (CH6), HT20, CDD, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

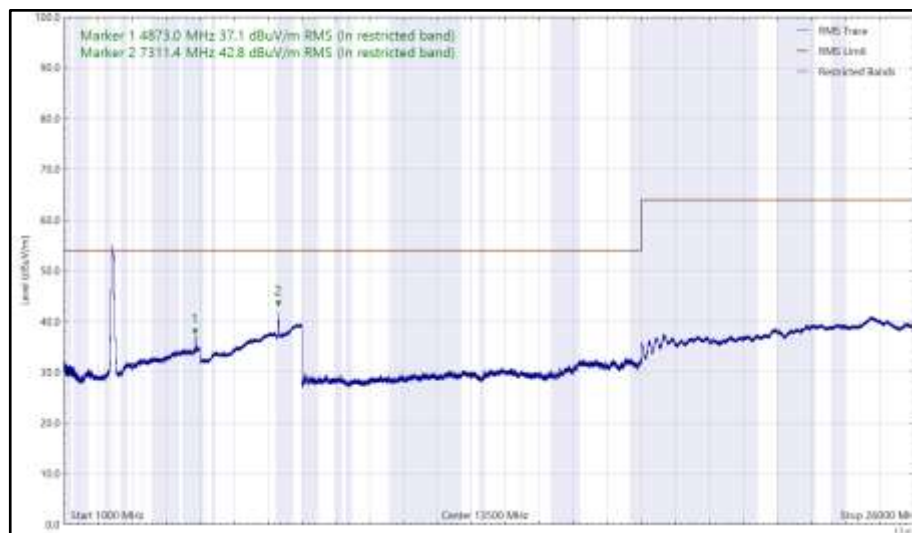


Figure 123 - 2437 MHz (CH6), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4943.488	37.0	54.0	-17.0	RMS	335	110	Vertical
7412.143	47.4	54.0	-6.6	RMS	356	316	Horizontal
7415.592	46.5	54.0	-7.5	RMS	176	100	Vertical
7415.888	60.0	74.0	-14.0	Peak	170	111	Vertical

Table 57 - 2472 MHz (CH13), HT20, CDD, Core 0 + Core 1, 1 to 26 GHz

No other emissions found within 6 dB of the limit.

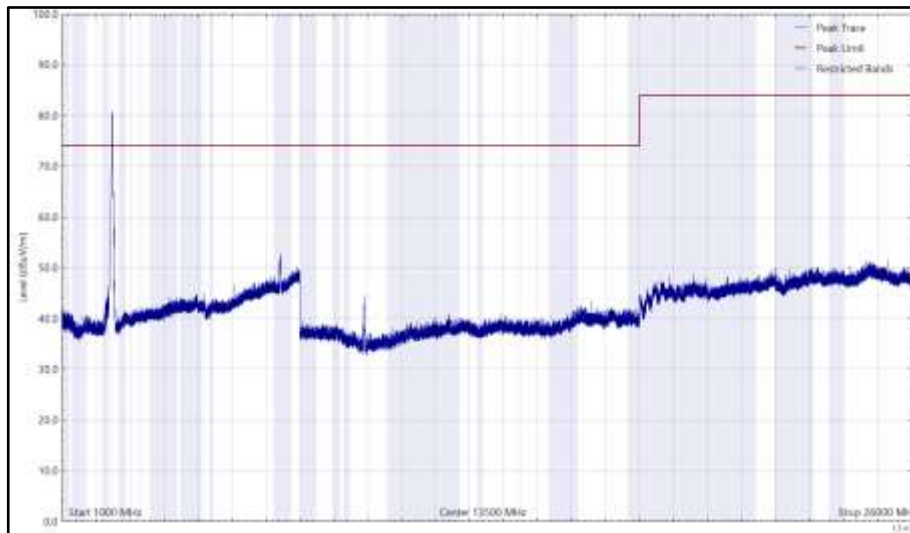


Figure 124 - 2472 MHz (CH13), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

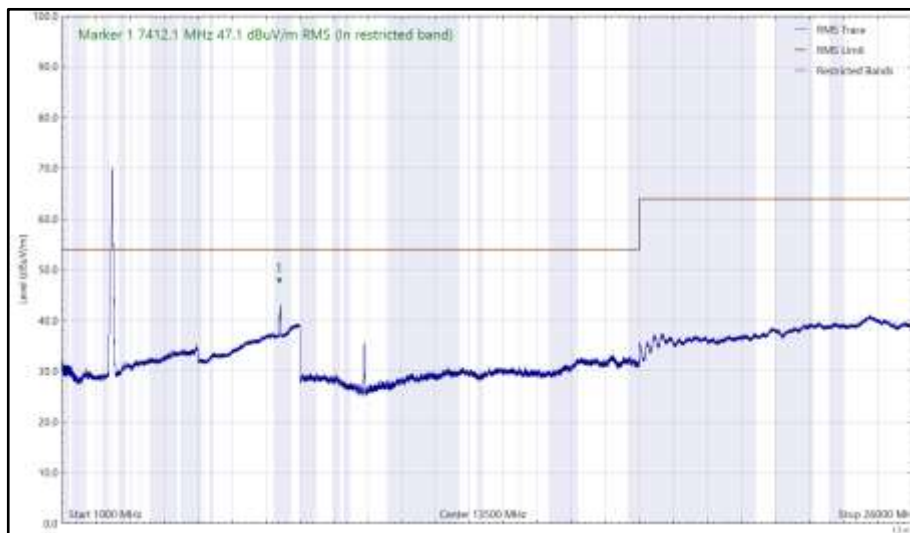


Figure 125 - 2472 MHz (CH13), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

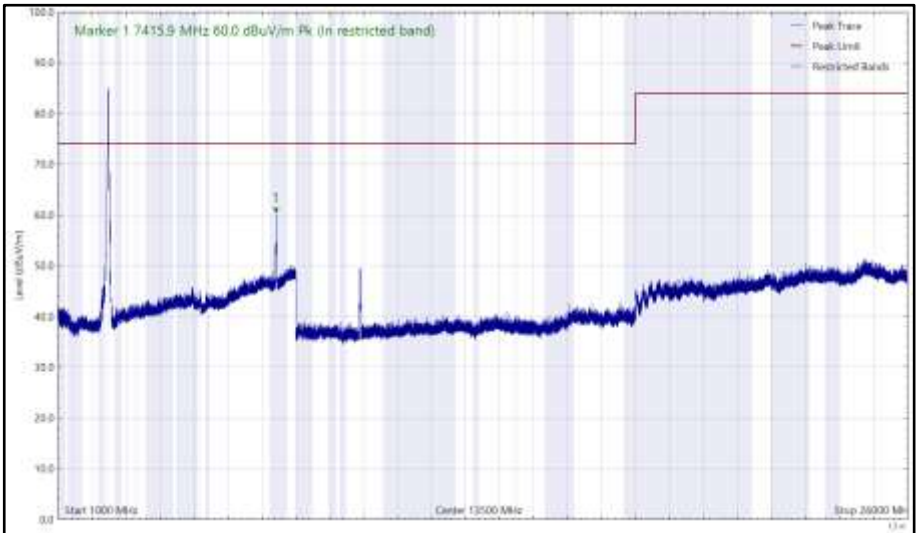


Figure 126 - 2472 MHz (CH13), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (Peak)

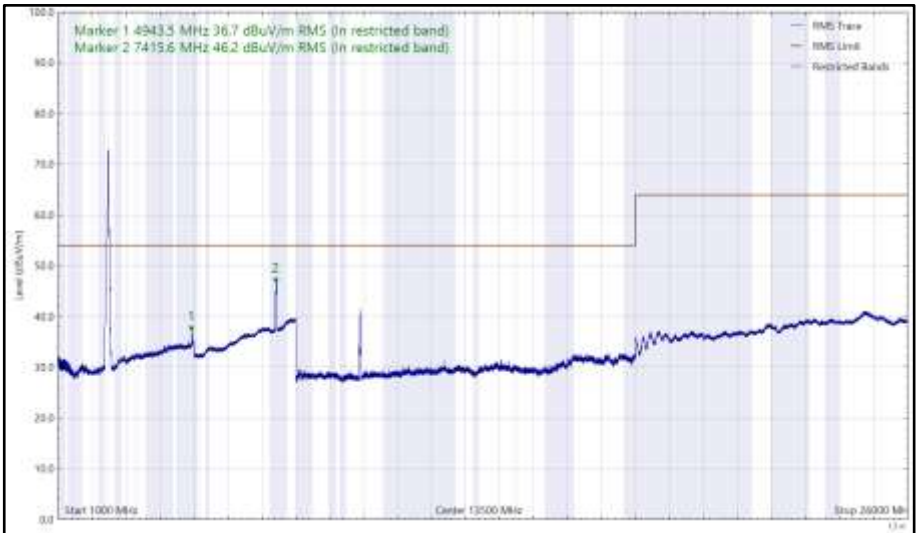


Figure 127 - 2472 MHz (CH13), HT20, CDD, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)

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

Table 58 - 2412 MHz (CH1), HE20, RU26-0, Core 0 + Core 1, 1 to 26 GHz

*No emissions found within 6 dB of the limit.

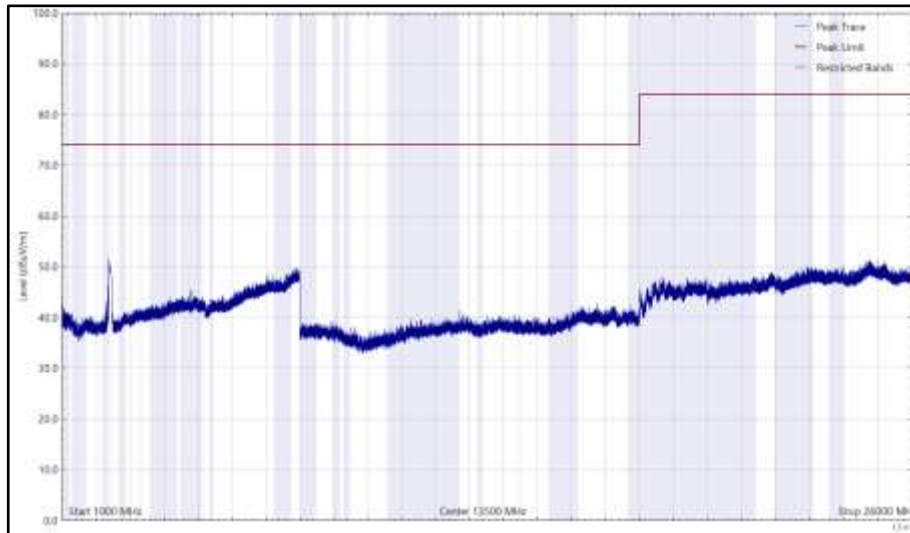


Figure 128 - 2412 MHz (CH1), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

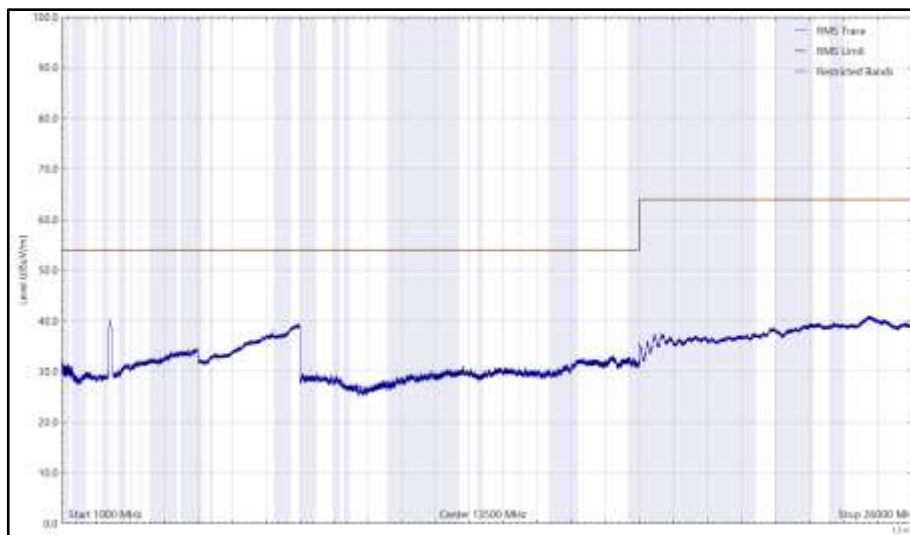


Figure 129 - 2412 MHz (CH1), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

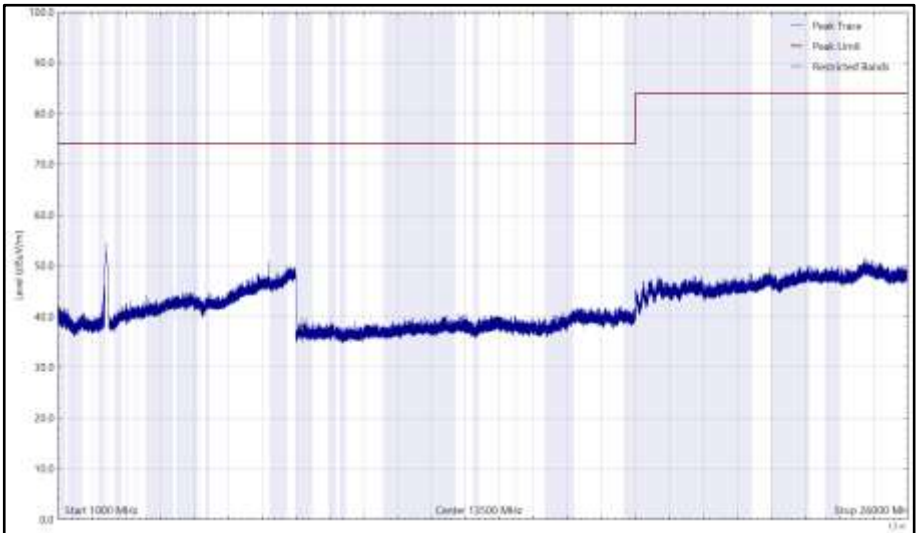


Figure 130 - 2412 MHz (CH1), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (Peak)

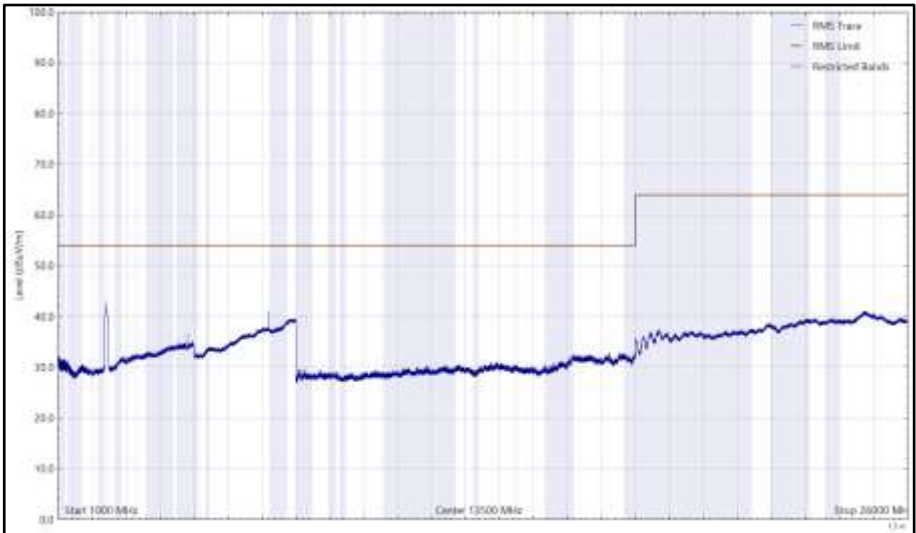


Figure 131 - 2412 MHz (CH1), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
37.605	15.1	40.0	-25.0	Q-Peak	58	304	Horizontal
37.796	16.0	40.0	-24.0	Q-Peak	43	107	Vertical
134.635	21.8	43.5	-21.7	Q-Peak	166	107	Vertical

Table 59 - 2437 MHz (CH6), HE20, RU26-0, Core 0 + Core 1, 30 MHz to 26 GHz

No other emissions found within 6 dB of the limit.

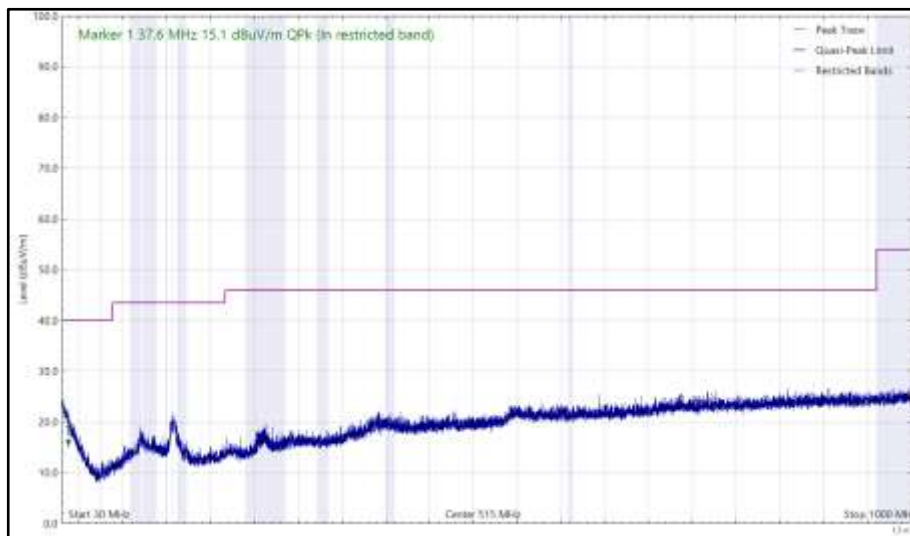


Figure 132 - 2437 MHz (CH6), HE20, RU26-0, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

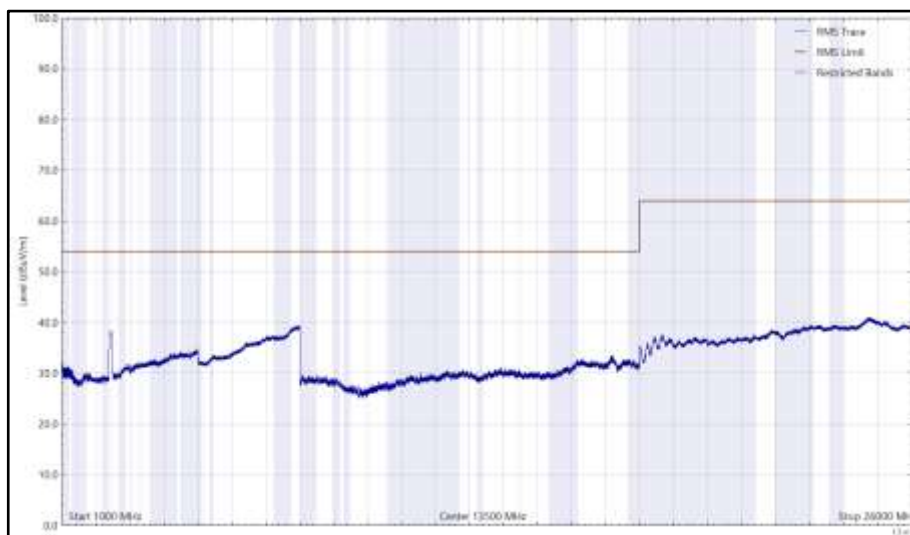


Figure 133 - 2437 MHz (CH6), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

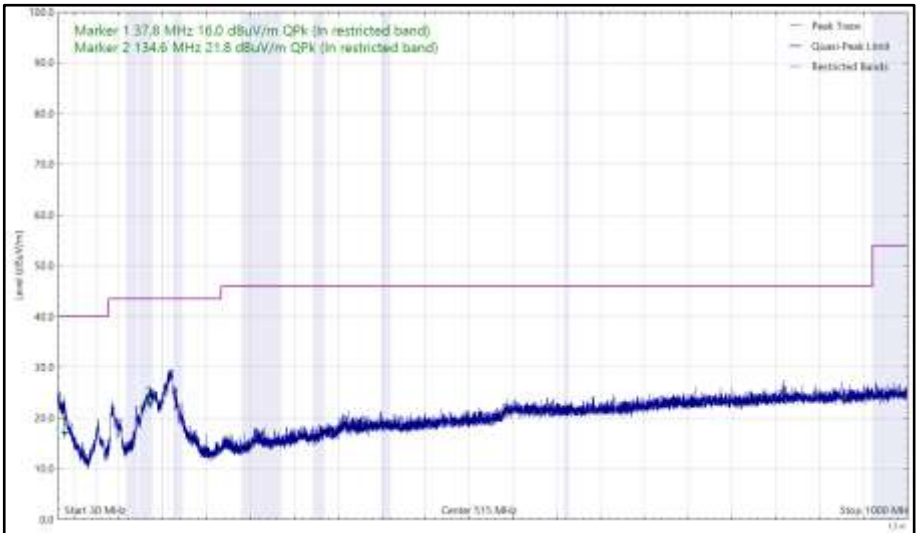


Figure 134 - 2437 MHz (CH6), HE20, RU26-0, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

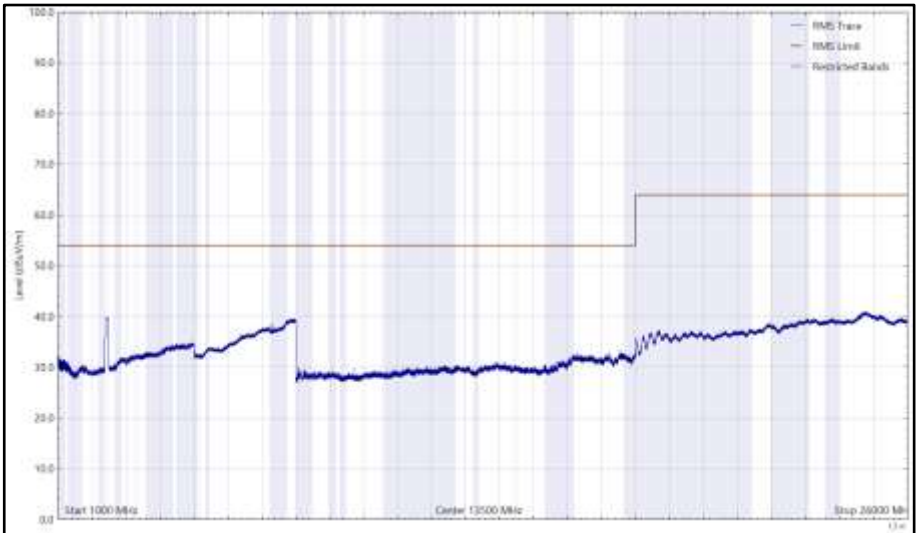


Figure 135 - 2437 MHz (CH6), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)

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

Table 60 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1, 1 to 26 GHz

*No emissions found within 6 dB of the limit.

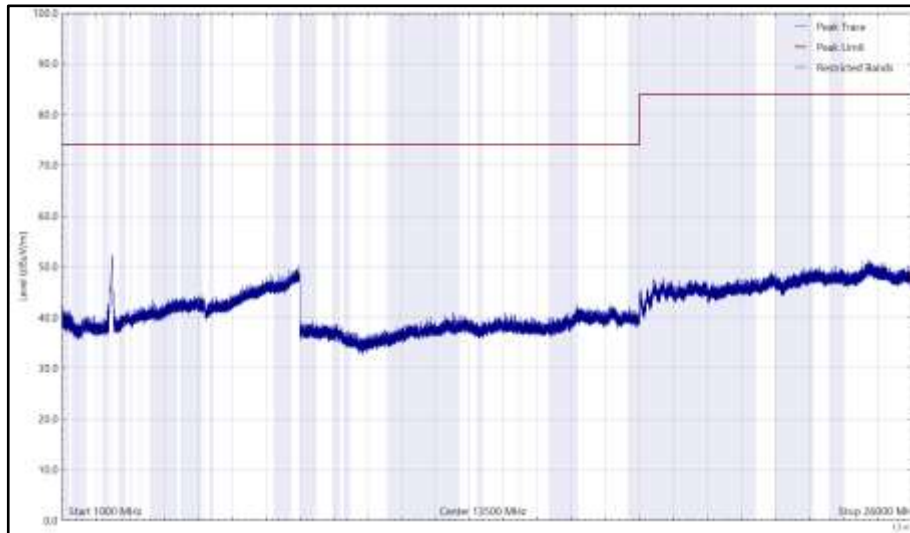


Figure 136 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (Peak)

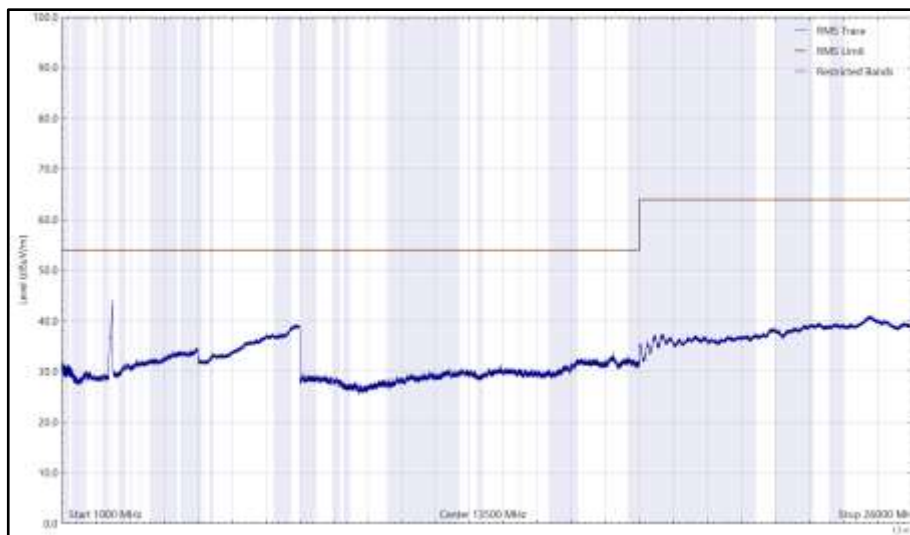


Figure 137 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal (RMS)

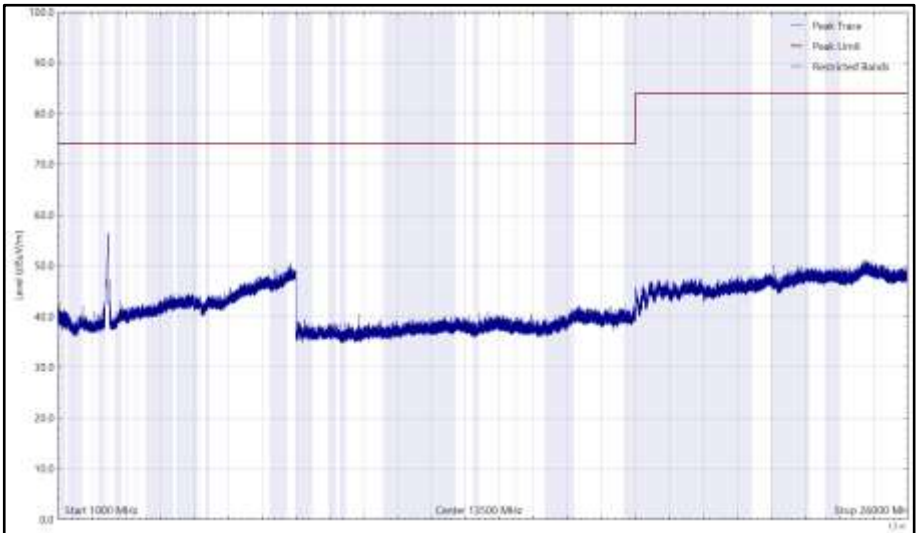


Figure 138 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (Peak)

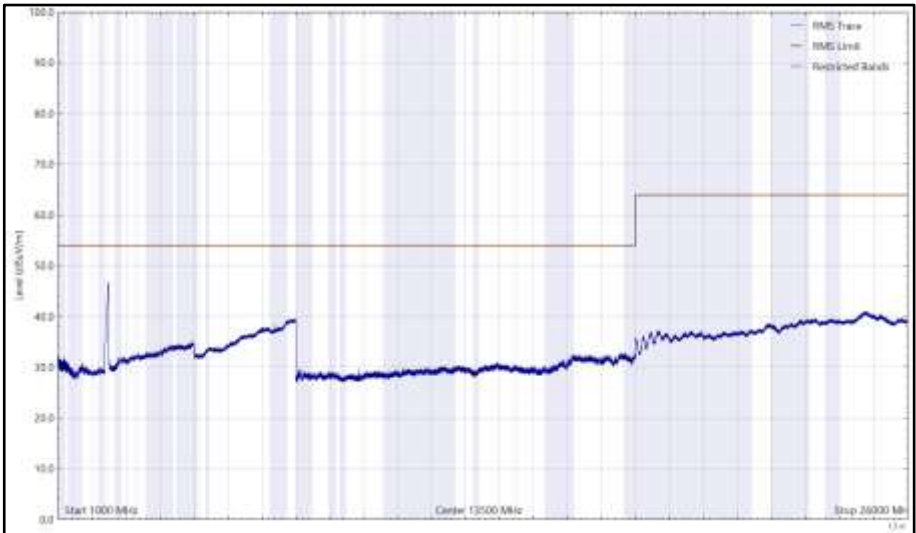


Figure 139 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical (RMS)



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.



2.4.8 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
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	30-Sep-2021
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	10-Mar-2021
Band Reject Filter - 2.425 GHz	Wainwright	WRCGV14-2390-2400-2450-2460-50SS	5067	12	01-Oct-2020
Band Reject Filter - 2.425 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	01-Oct-2020
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	LU7-071-1000	5103	12	06-Oct-2020
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5216	12	10-Mar-2021
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	5217	12	12-Oct-2020
Amplifier	Schwarzbeck	BBV 9721	5218	12	14/10/2020
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	07-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5514	12	01-Apr-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
2 m K Type Cable	Junkosha	MWX241-02000KMSKMS/A	5523	12	03-Apr-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	06-Feb-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
1200 MHz Low Pass Filter (01)	Mini-Circuits	VLF-1200+	5559	12	23-May-2021
8 - 18 GHz Amplifier	Wright Technologies	APS06-0061	5595	12	25-Aug-2021

Table 61

TU - Traceability Unscheduled



2.5 Authorised Band Edges

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

A2169, S/N: C07CL0AMQ4TG - Modification State 0

2.5.3 Date of Test

27-June-2020 to 29-June-2020

2.5.4 Test Method

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

Authorised band edge measurements were performed, with the device operating in SISO and MIMO configurations, across the various modes supported by the device.

Since compliance with the power limits in section 2.1 was shown by RMS averaging across all symbols in the signaling alphabet, a -30 dBc limit rather than -20 dBc limit was applied in accordance with FCC 47 CFR Part 15.247 paragraph (d) and RSS-247 section 5.5.

2.5.5 Environmental Conditions

Ambient Temperature 18.0 – 23.2 °C
Relative Humidity 44.6 – 55.9 %

2.5.6 Test Results

2.4 GHz WLAN

Mode	Data Rate /MCS	Resource size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
802.11b, Core 0	1 Mbps	-	-	2412	2400	-53.75
802.11g, Core 0	6 Mbps	-	-	2412	2400	-43.45
802.11n HT20, Core 0	MCS7	-	-	2412	2400	-45.53
802.11ax HE20, Core 0	MCS7x1	SU	-	2412	2400	-45.02
802.11ax HE20, Core 0	MCS7x1	26	0	2412	2400	-50.38

Table 62 - SISO Authorised Band Edge Results

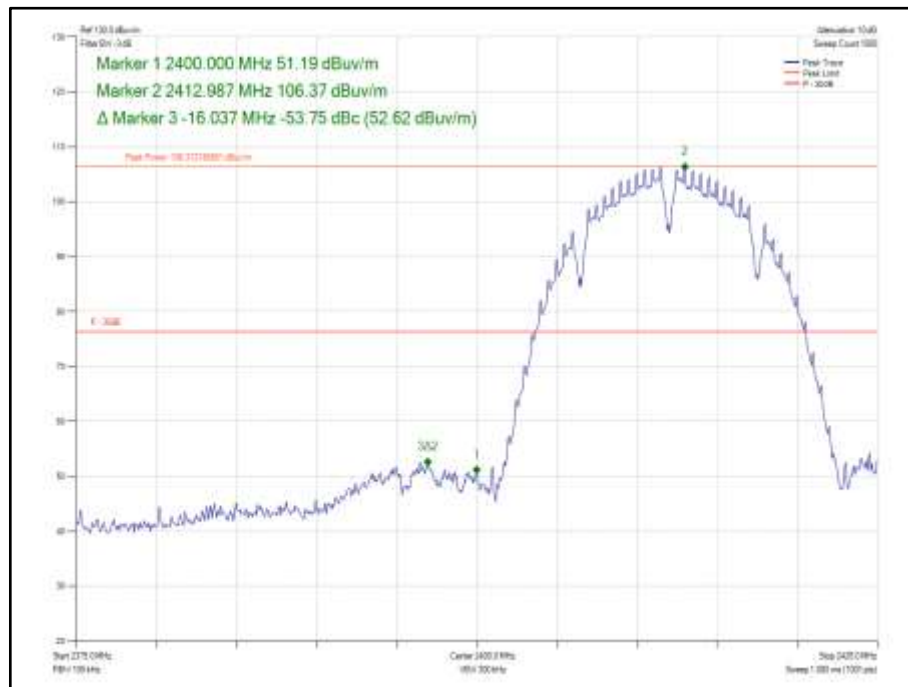


Figure 140 - 802.11b, Core 0 - 2412 MHz
Band Edge Frequency 2400 MHz

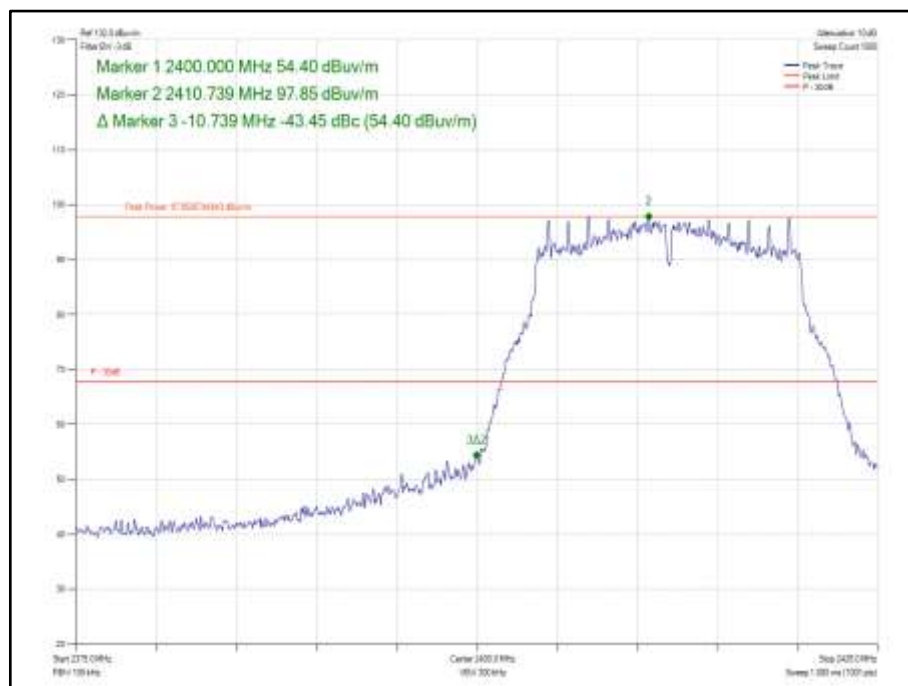


Figure 141- 802.11g, Core 0 - 2412 MHz
Band Edge Frequency 2400 MHz

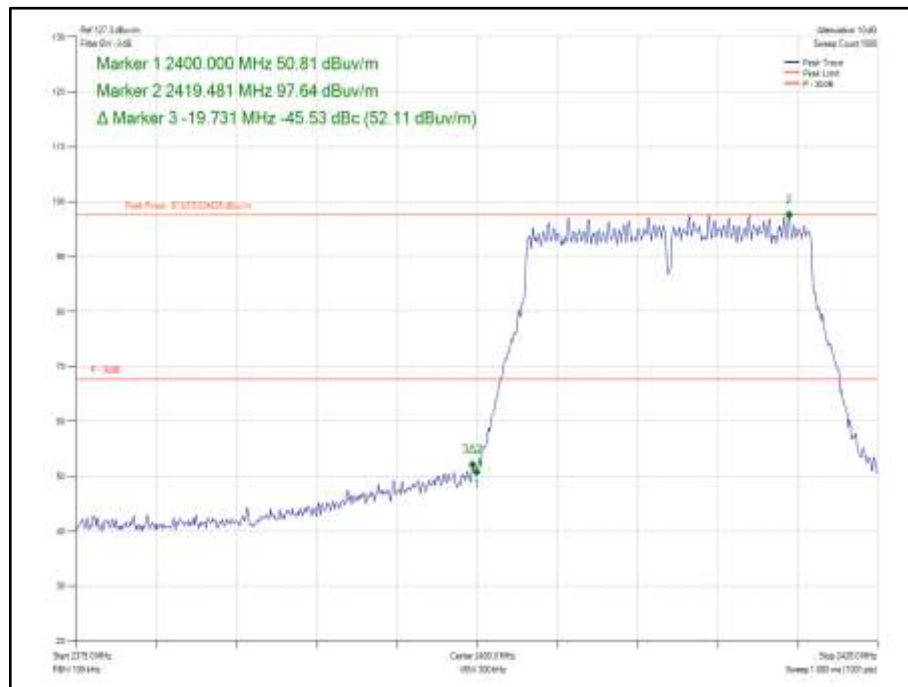


Figure 142- 802.11n HT20, Core 0 - 2412 MHz
Band Edge Frequency 2400 MHz

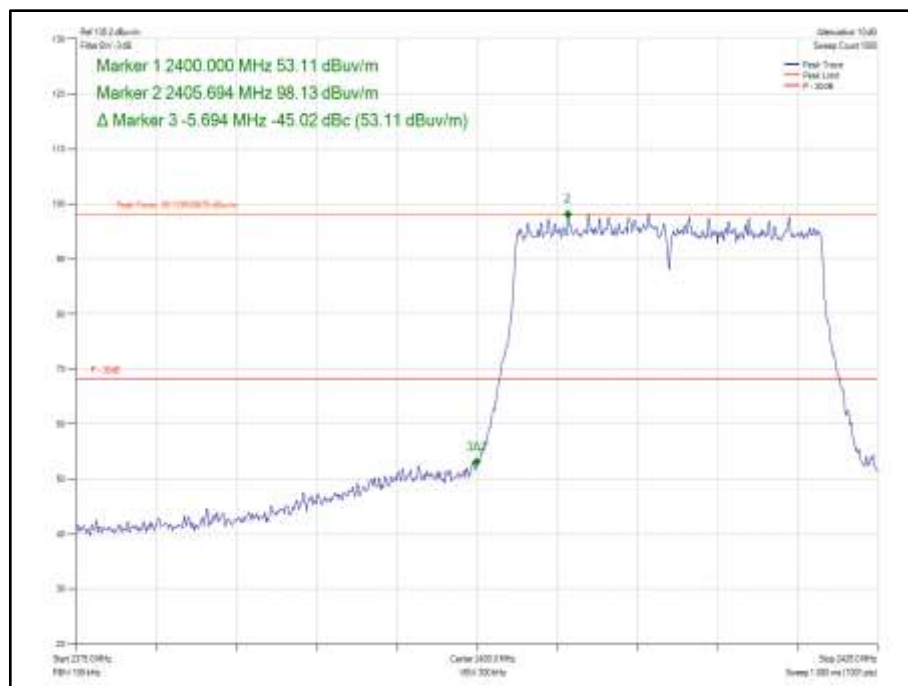


Figure 143- 802.11ax HE20, Core 0, SU - 2412 MHz
Band Edge Frequency 2400 MHz

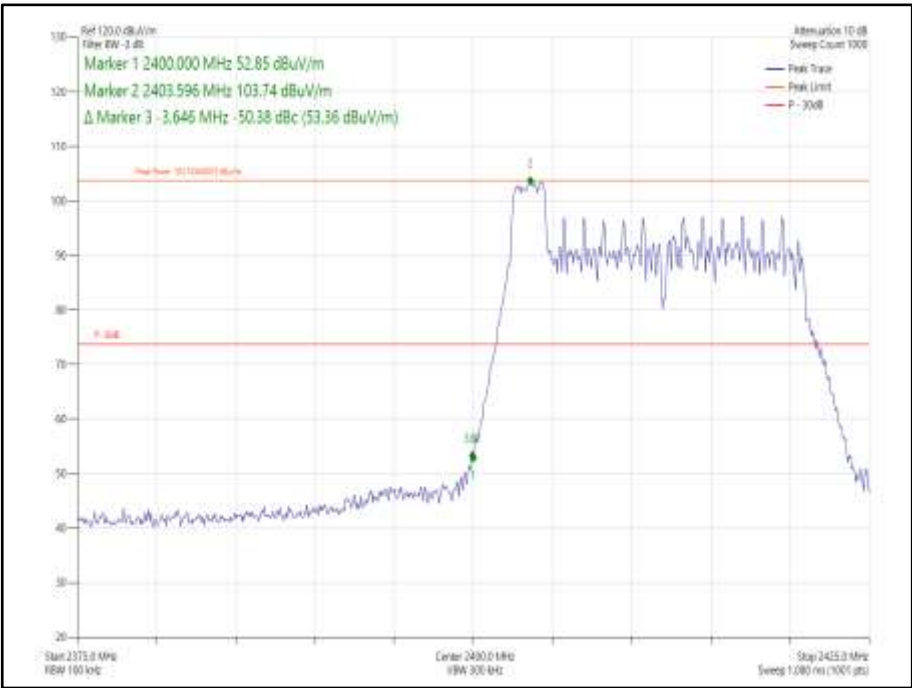
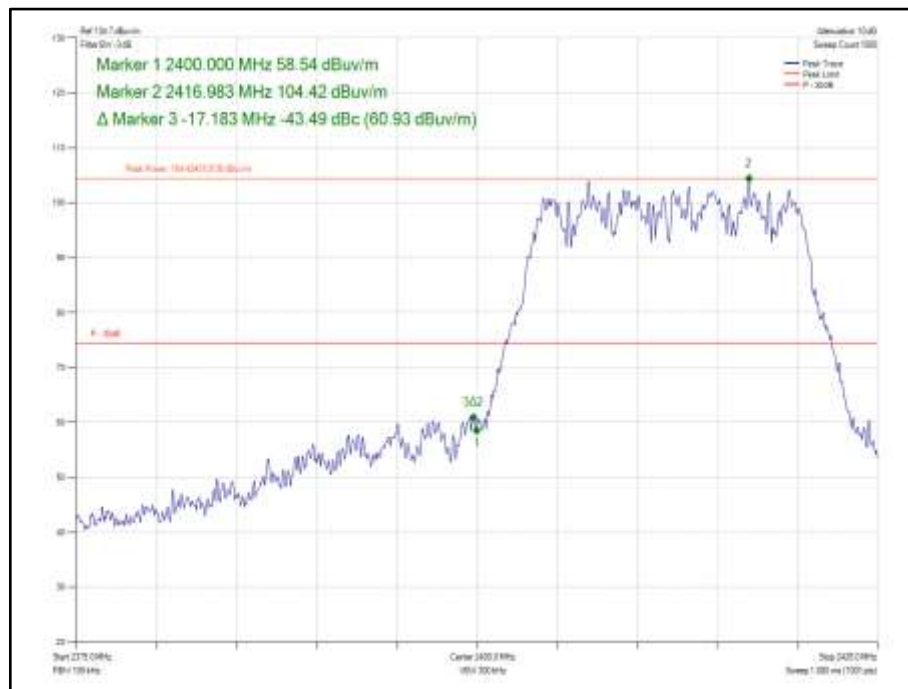


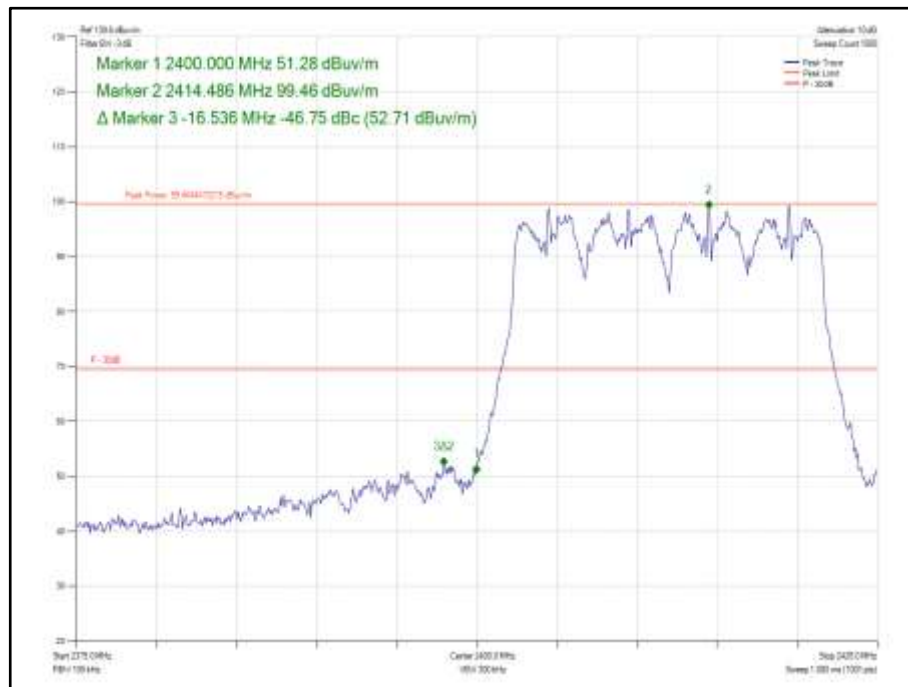
Figure 144- 802.11ax HE20, Core 0, 26-0 - 2412 MHz
Band Edge Frequency 2400 MHz

Mode	Data Rate /MCS	Resource size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
802.11n HT20, Cores 0-1	MCS7	-	-	2412	2400	-43.49
802.11ax HE20, Cores 0 -1	MCS7x1	SU	-	2412	2400	-46.75
802.11ax HE20, Cores 0 -1	MCS7x1	26	0	2412	2400	-52.51

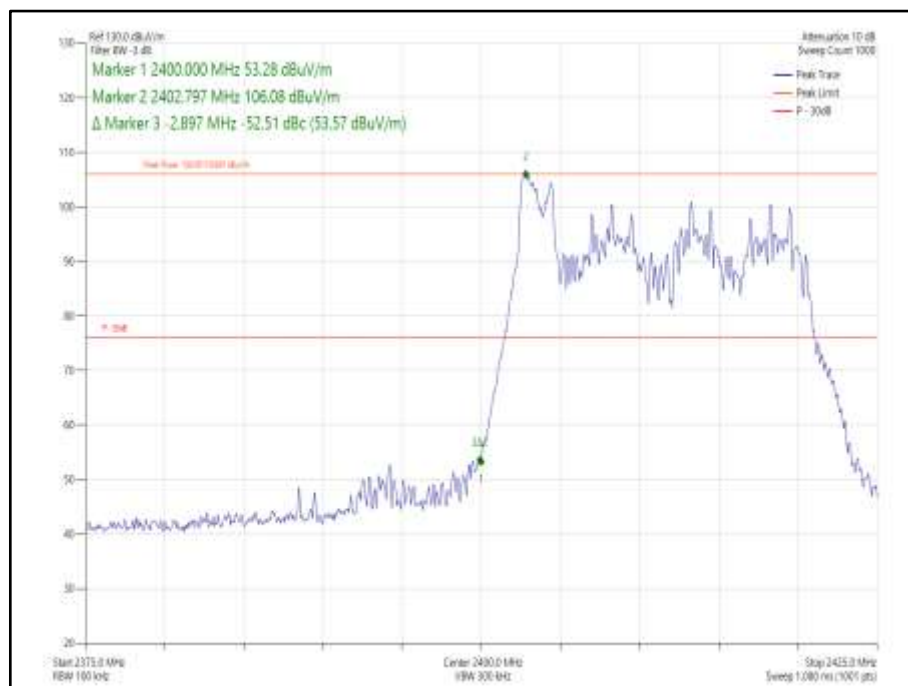
Table 63 - MIMO Authorised Band Edge Results



**Figure 145 - 802.11n HT20, Cores 0-1 - 2412 MHz
Band Edge Frequency 2400 MHz**



**Figure 146- 802.11ax HE20, Cores 0-1, SU - 2412 MHz
Band Edge Frequency 2400 MHz**



**Figure 147- 802.11ax HE20, Cores 0-1, 26-0 - 2412 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.

2.5.7 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 Due
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	28-Nov-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5102	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5104	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V1.6.3	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	01-Nov-2021
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	10-Mar-2021
Pre Amp 1 - 26.5 GHz	Agilent Technologies	8449B	5445	12	06-May-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	17-Mar-2021
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5494	12	14-Apr-2021
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5518	12	01-Apr-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5522	12	24-Mar-2021

Table 64

TU - Traceability Unscheduled



2.6 Restricted Band Edges

2.6.1 Specification Reference

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

2.6.2 Equipment Under Test and Modification State

A2169, S/N: C07CL0AMQ4TG - Modification State 0

2.6.3 Date of Test

27-June-2020 to 29-June-2020

2.6.4 Test Method

Testing was performed in accordance with ANSI C63.10, clause 6.10.5 and 11.12.1.

The following conversion can be applied to convert from dB μ V/m to μ V/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$.

Where duty cycle corrections were required for average results, these are included in the result tables but are not shown on the plots.

Restricted band edge measurements were performed, with the device operating in SISO and MIMO configurations, across the various modes supported by the device.

2.6.5 Environmental Conditions

Ambient Temperature	18.0 – 23.2 °C
Relative Humidity	44.6 – 55.9 %



2.6.6 Test Results

2.4 GHz WLAN

Mode	Data Rate /MCS	Resource Size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11b, Core 0	1 Mbps	-	-	2412	2390.0	56.47	45.84
802.11b, Core 0	1 Mbps	-	-	2462	2483.5	55.44	44.53
802.11b, Core 0	1 Mbps	-	-	2467	2483.5	55.65	44.40
802.11b, Core 0	1 Mbps	-	-	2472	2483.5	55.00	44.30
802.11g, Core 0	6 Mbps	-	-	2412	2390.0	56.14	44.30
802.11g, Core 0	6 Mbps	-	-	2462	2483.5	55.98	43.96
802.11g, Core 0	6 Mbps	-	-	2467	2483.5	61.60	44.76
802.11g, Core 0	6 Mbps	-	-	2472	2483.5	58.49	45.10
802.11n HT20, Core 0	MCS7	-	-	2412	2390.0	57.43	45.74
802.11n HT20, Core 0	MCS7	-	-	2462	2483.5	62.69	48.58
802.11n HT20, Core 0	MCS7	-	-	2467	2483.5	59.02	46.63
802.11n HT20, Core 0	MCS7	-	-	2472	2483.5	58.33	45.10
802.11ax HE20, Core 0	MCS7x1	SU	-	2412	2400	59.37	45.80
802.11ax HE20, Core 0	MCS7x1	26	0	2412	2400	55.24	43.92
802.11ax HE20, Core 0	MCS7x1	SU	-	2462	2483.5	66.27	49.32
802.11ax HE20, Core 0	MCS7x1	26	8	2462	2483.5	56.53	43.83
802.11ax HE20, Core 0	MCS7x1	SU	-	2467	2483.5	59.12	47.34
802.11ax HE20, Core 0	MCS7x1	26	8	2467	2483.5	56.60	44.27
802.11ax HE20, Core 0	MCS7x1	SU	-	2472	2483.5	57.73	43.61
802.11ax HE20, Core 0	MCS7x1	26	8	2472	2483.5	53.68	41.37

Table 65 - SISO Restricted Band Edge Results

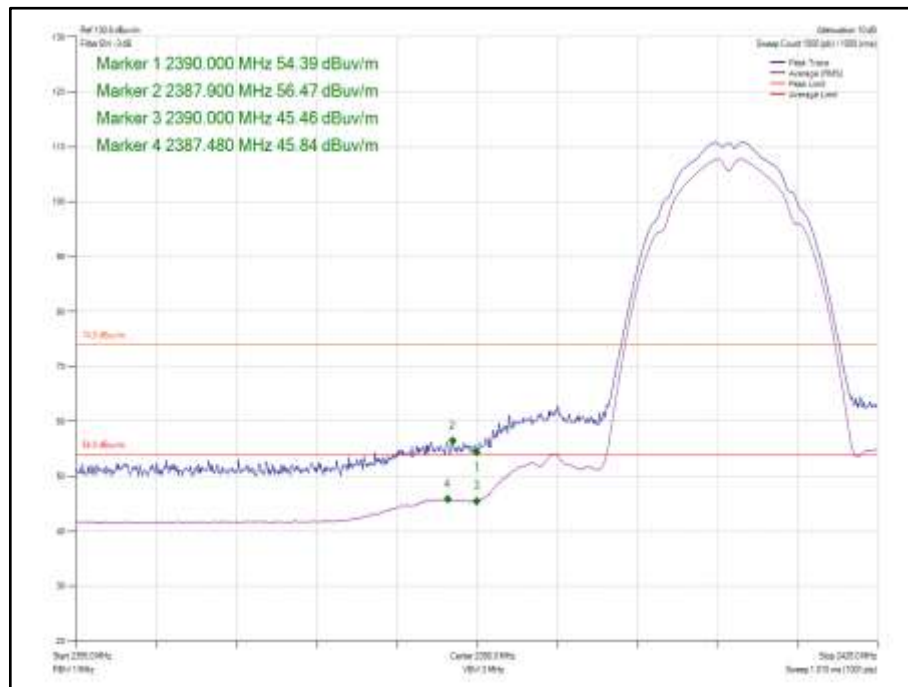


Figure 148 - 802.11b, Core 0 - 2412 MHz, Band Edge Frequency 2390.0 MHz

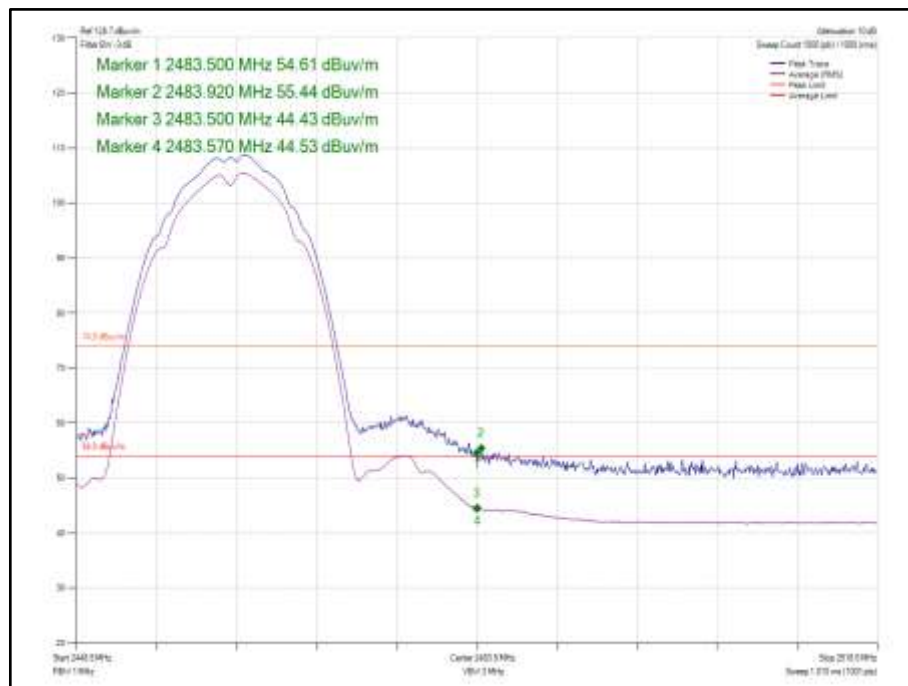


Figure 149 - 802.11b, Core 0 - 2462 MHz, Band Edge Frequency 2483.5 MHz

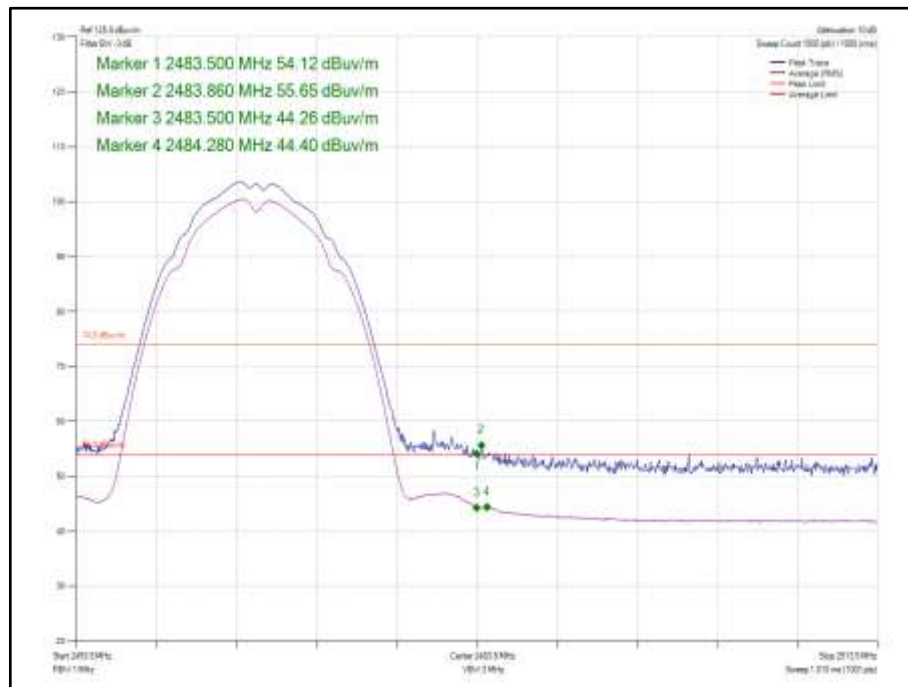


Figure 150 - 802.11b, Core 0 - 2467 MHz, Band Edge Frequency 2483.5 MHz

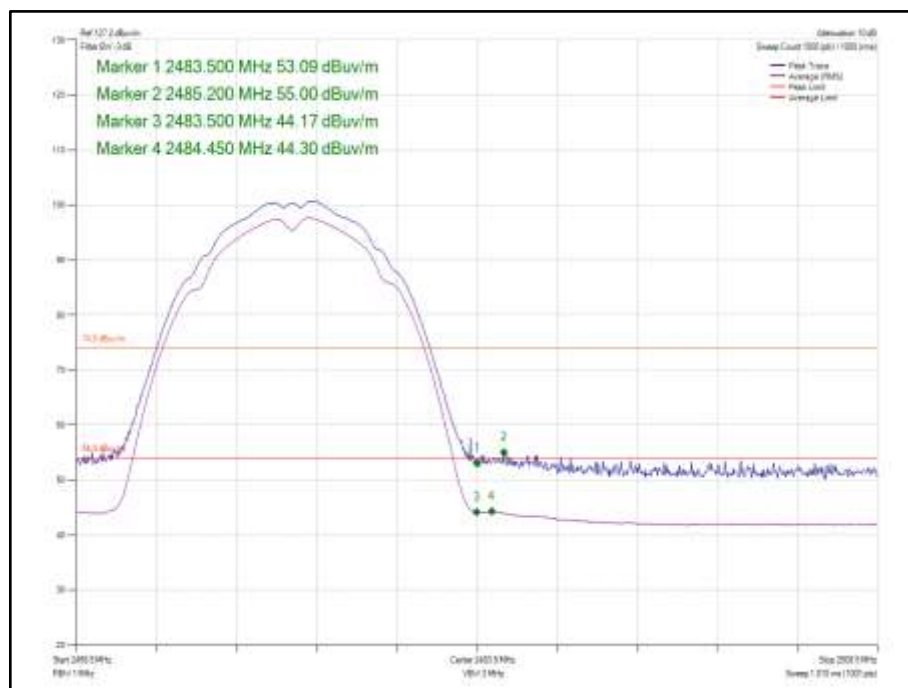


Figure 151 - 802.11b, Core 0 - 2472 MHz, Band Edge Frequency 2483.5 MHz

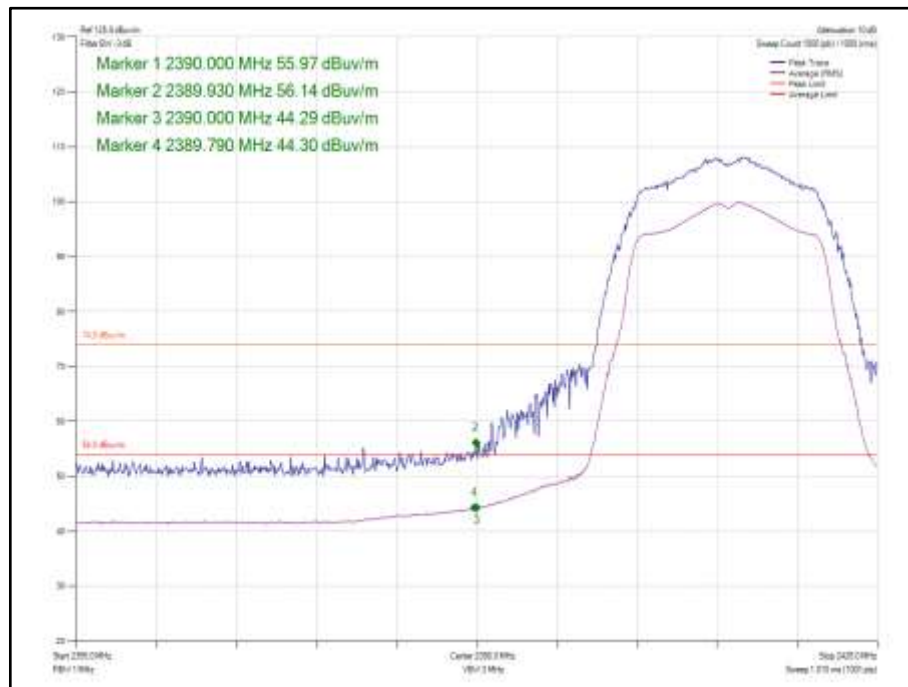


Figure 152 - 802.11g, Core 0 - 2412 MHz, Band Edge Frequency 2390.0 MHz

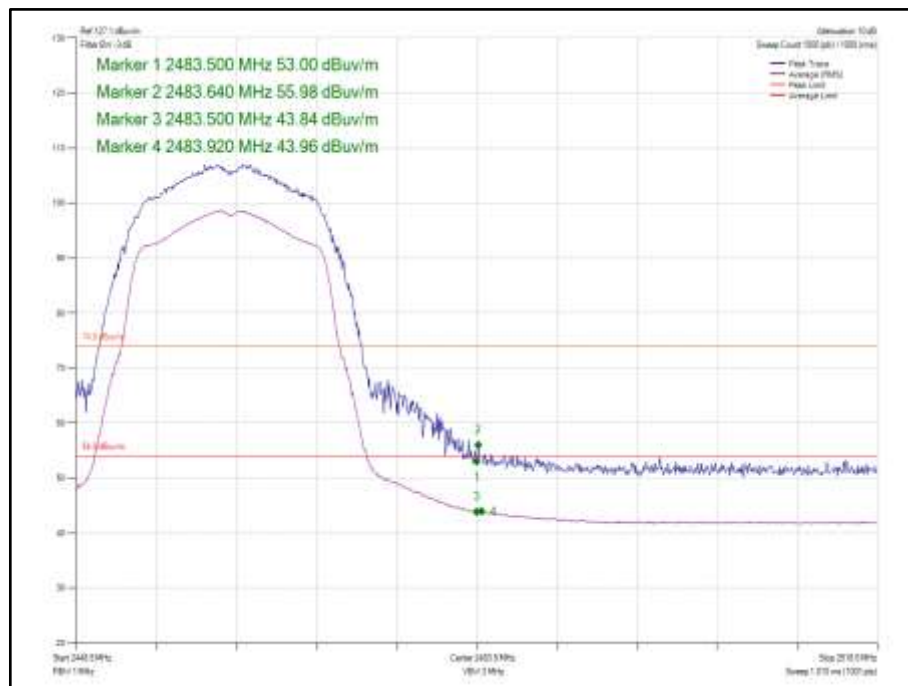


Figure 153 - 802.11g, Core 0 - 2462 MHz, Band Edge Frequency 2483.5 MHz

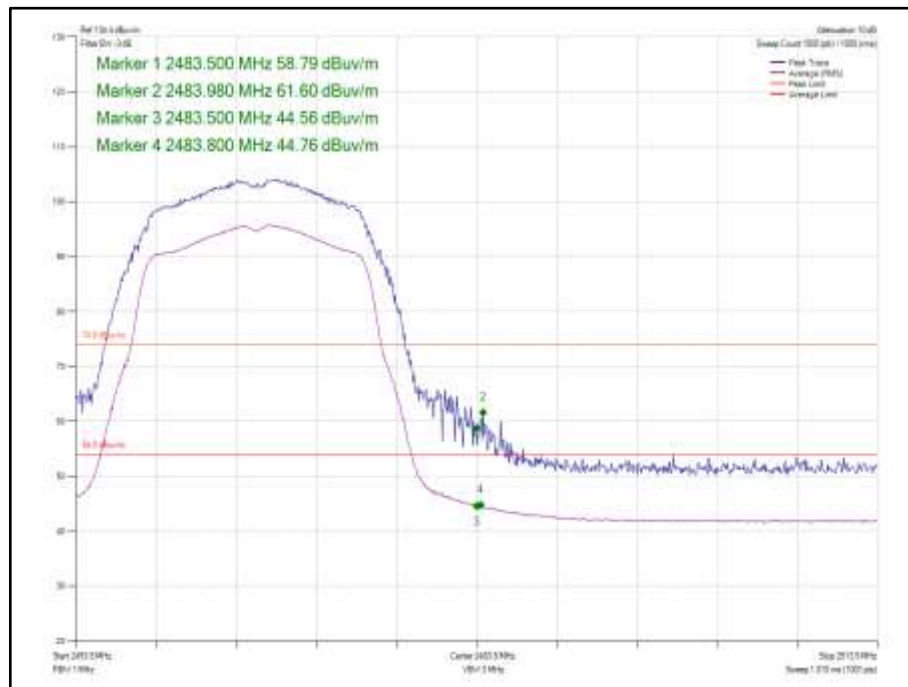


Figure 154 - 802.11g, Core 0 - 2467 MHz, Band Edge Frequency 2483.5 MHz

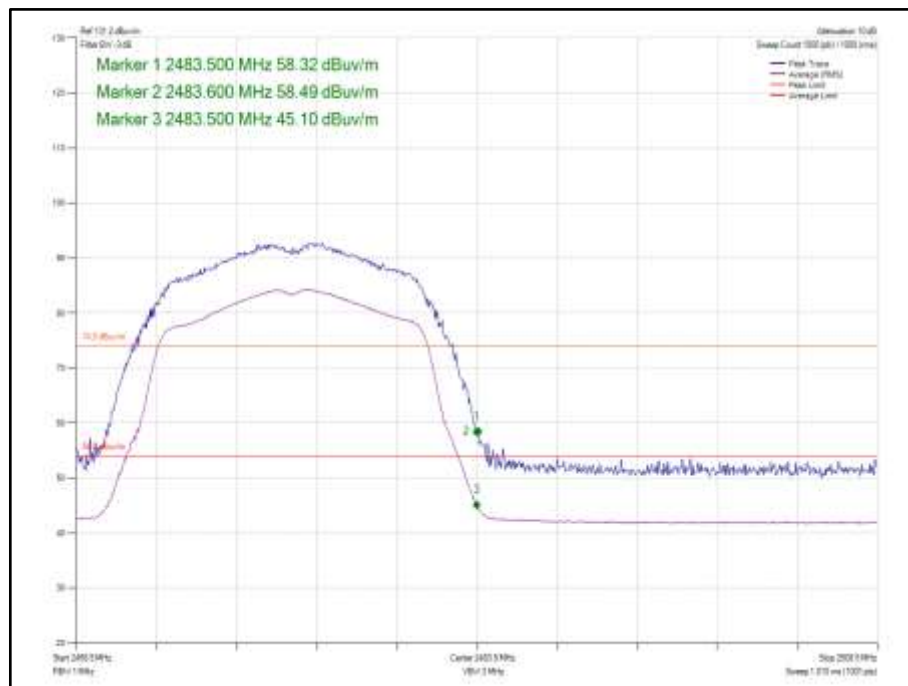


Figure 155 - 802.11g, Core 0 - 2472 MHz, Band Edge Frequency 2483.5 MHz

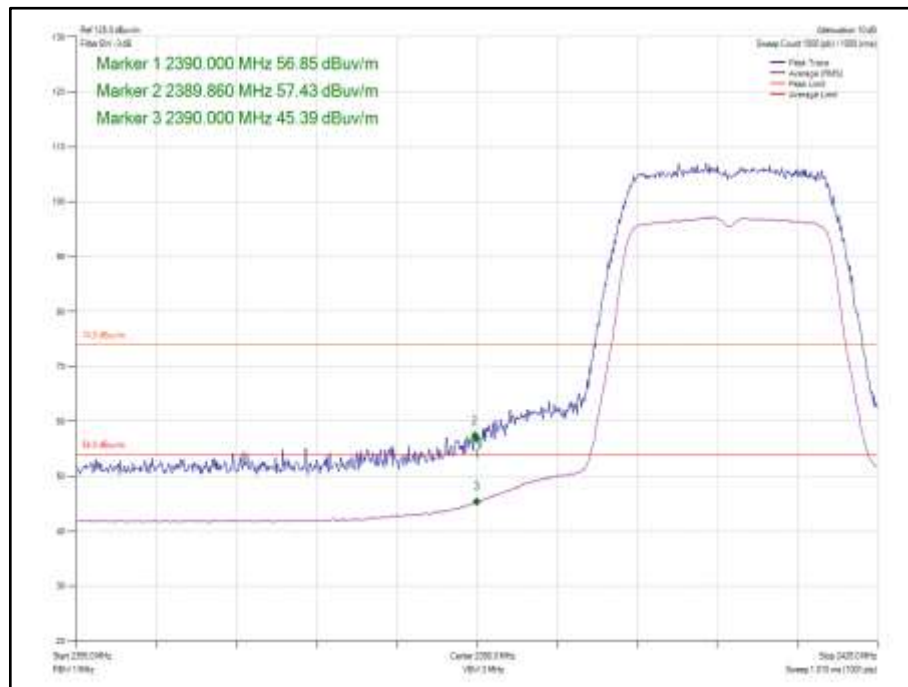


Figure 156 - 802.11n, HT20, Core 0 - 2412 MHz, Band Edge Frequency 2390 MHz

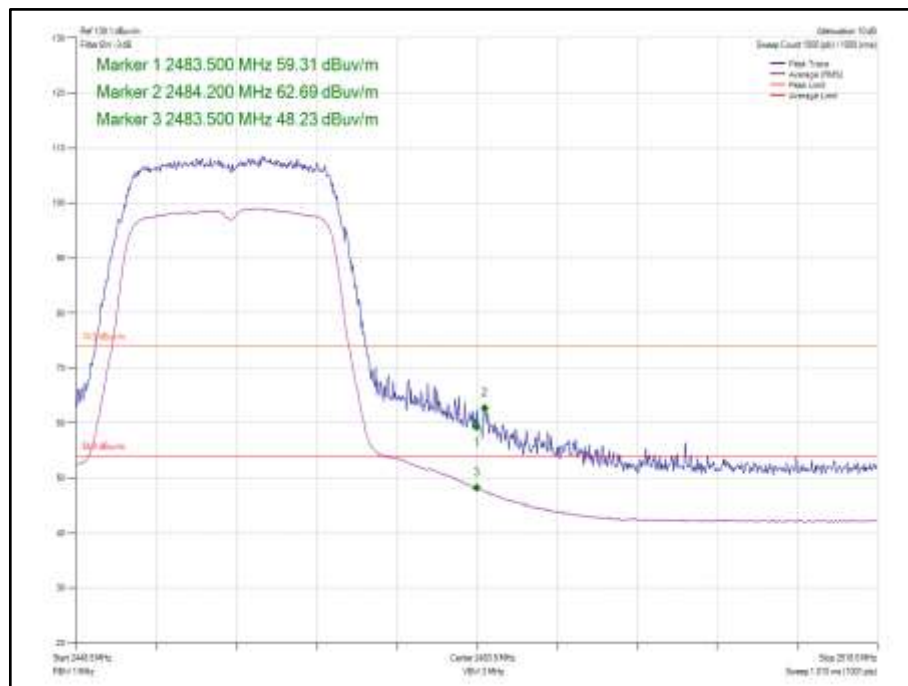


Figure 157 - 802.11n HT20, Core 0 - 2462 MHz, Band Edge Frequency 2483.5 MHz

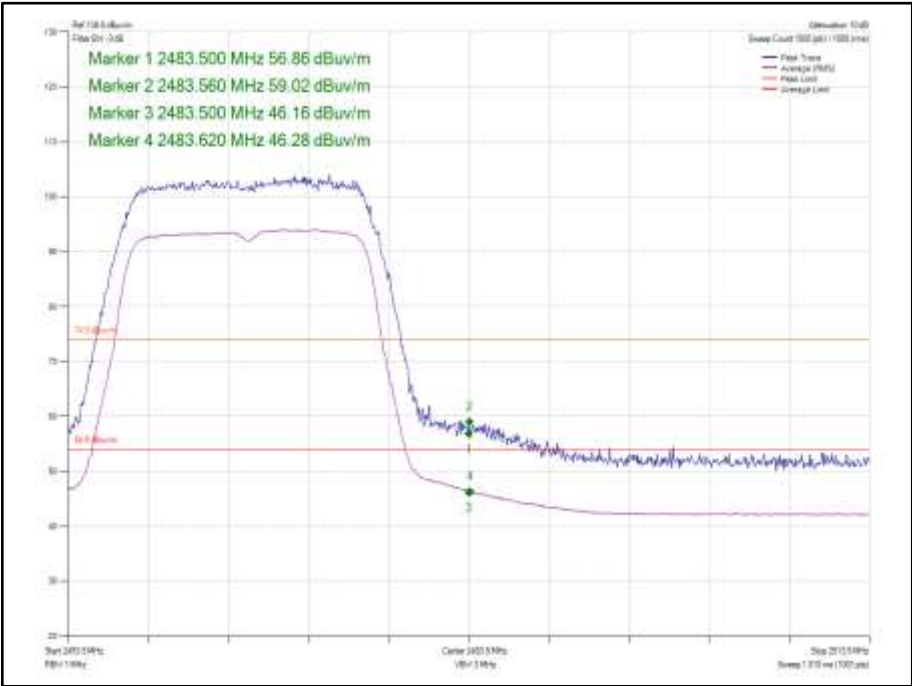


Figure 158 - 802.11n HT20, Core 0 - 2467 MHz, Band Edge Frequency 2483.5 MHz

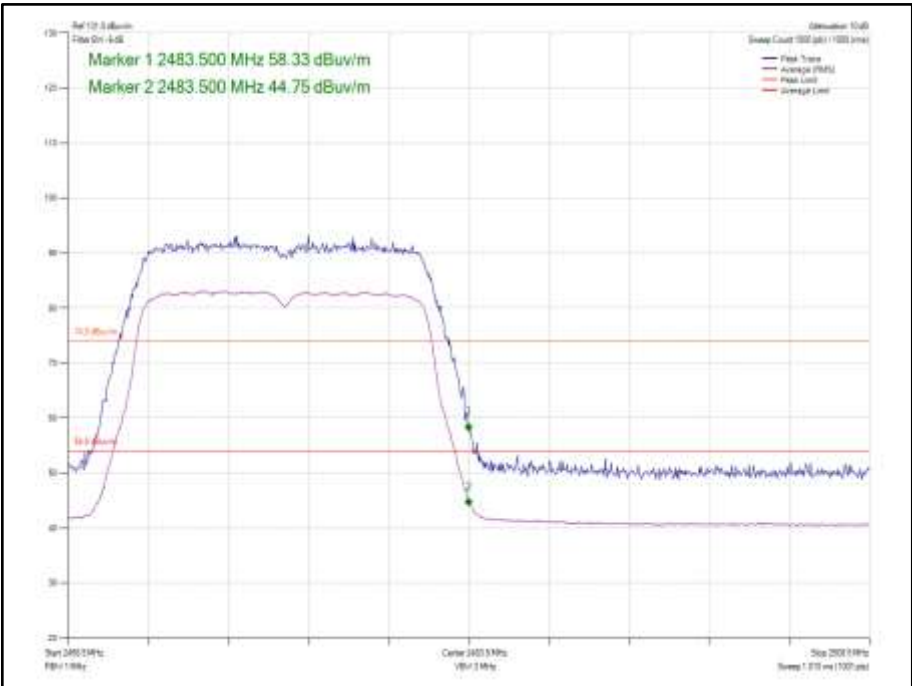


Figure 159 - 802.11n HT20, Core 0 - 2472 MHz, Band Edge Frequency 2483.5 MHz

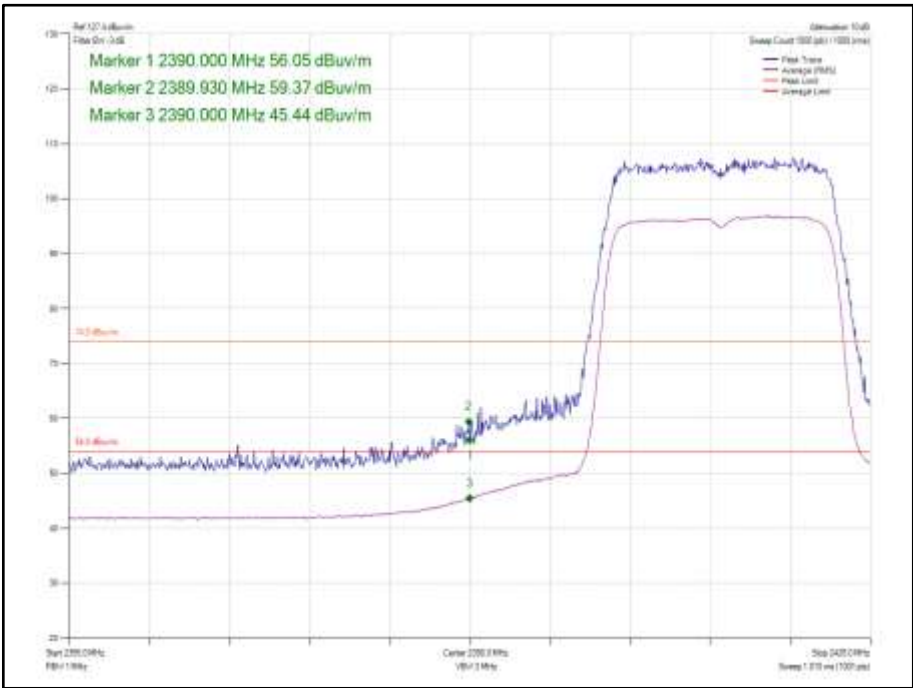


Figure 160 - 802.11ax HE20, Core 0, SU - 2412 MHz, Band Edge Frequency 2390 MHz

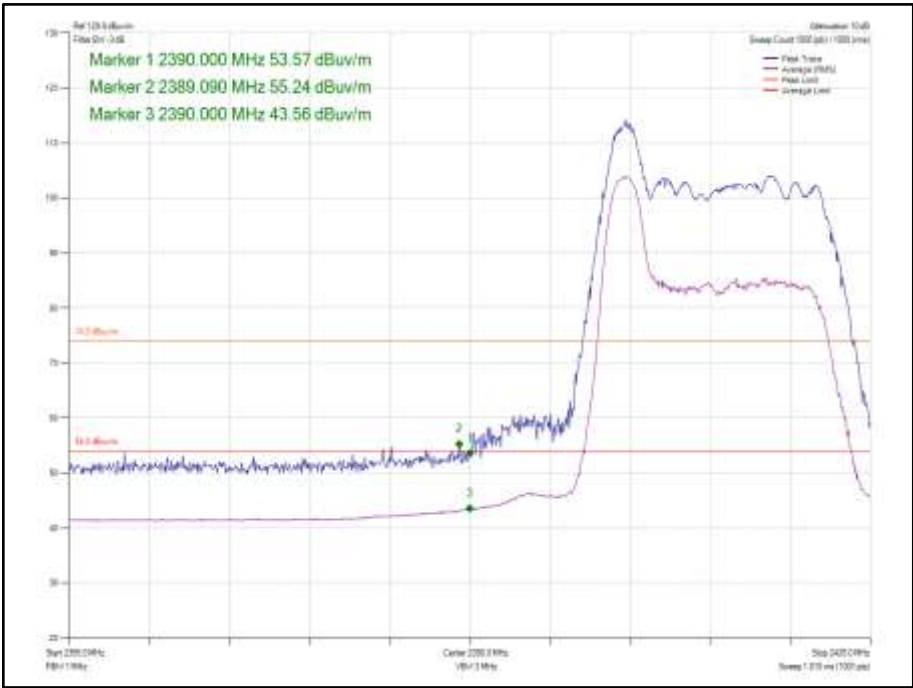


Figure 161 - 802.11ax HE20, Core 0, 26-0 - 2412 MHz, Band Edge Frequency 2390 MHz

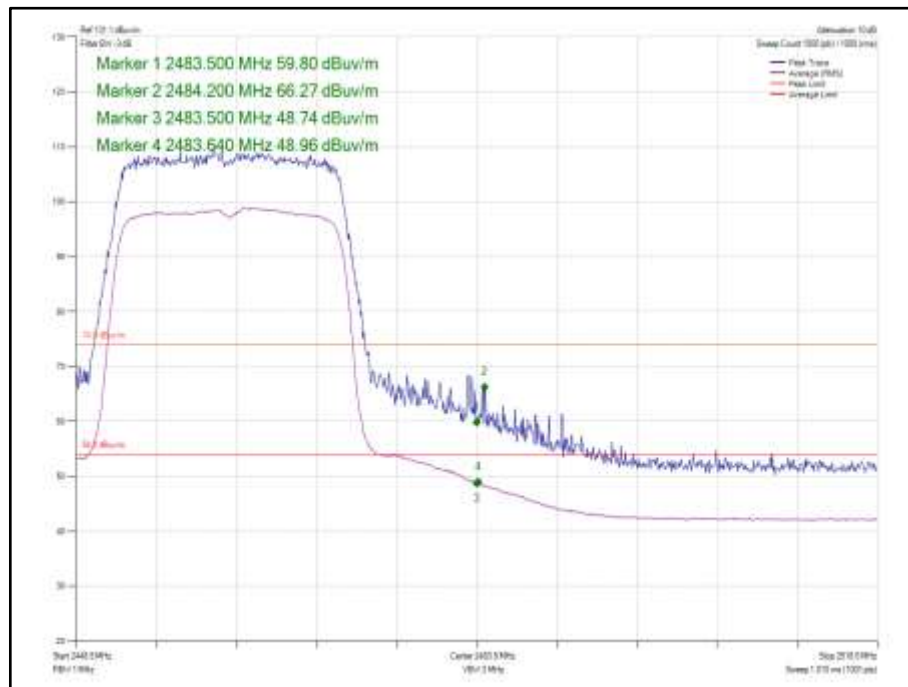


Figure 162 - 802.11ax HE20, Core 0, SU - 2462 MHz, Band Edge Frequency 2483.5 MHz

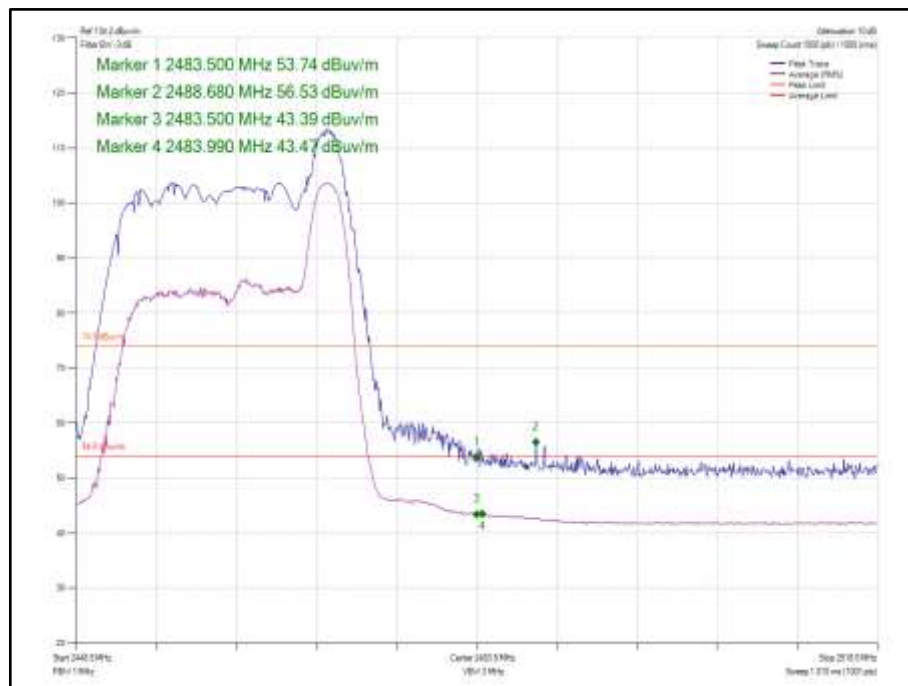


Figure 163 - 802.11ax HE20, Core 0, 26-8 - 2462 MHz, Band Edge Frequency 2483.5 MHz

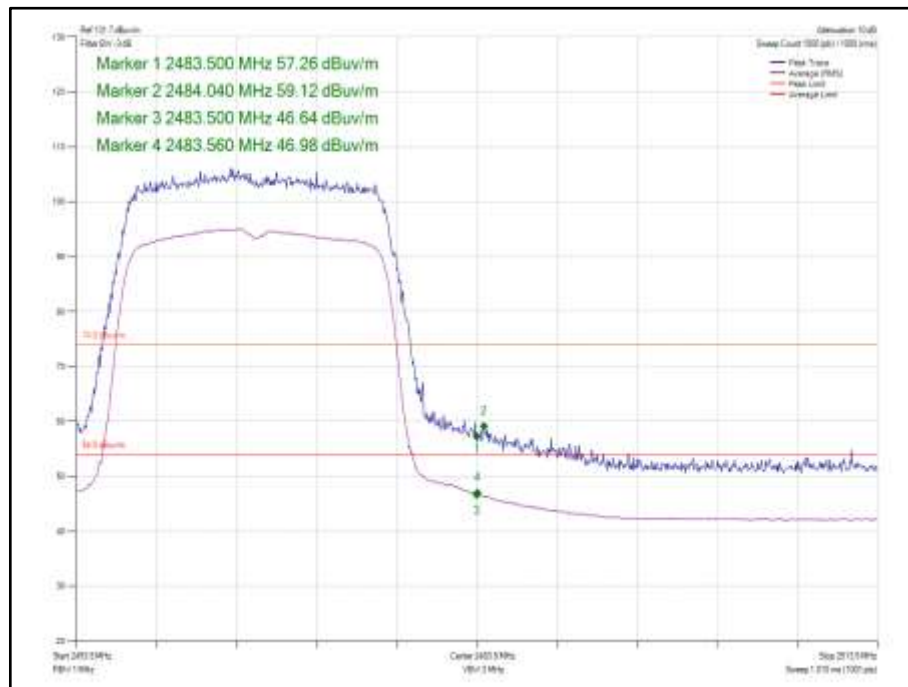


Figure 164 - 802.11ax HE20, Core 0, SU - 2467 MHz, Band Edge Frequency 2483.5 MHz

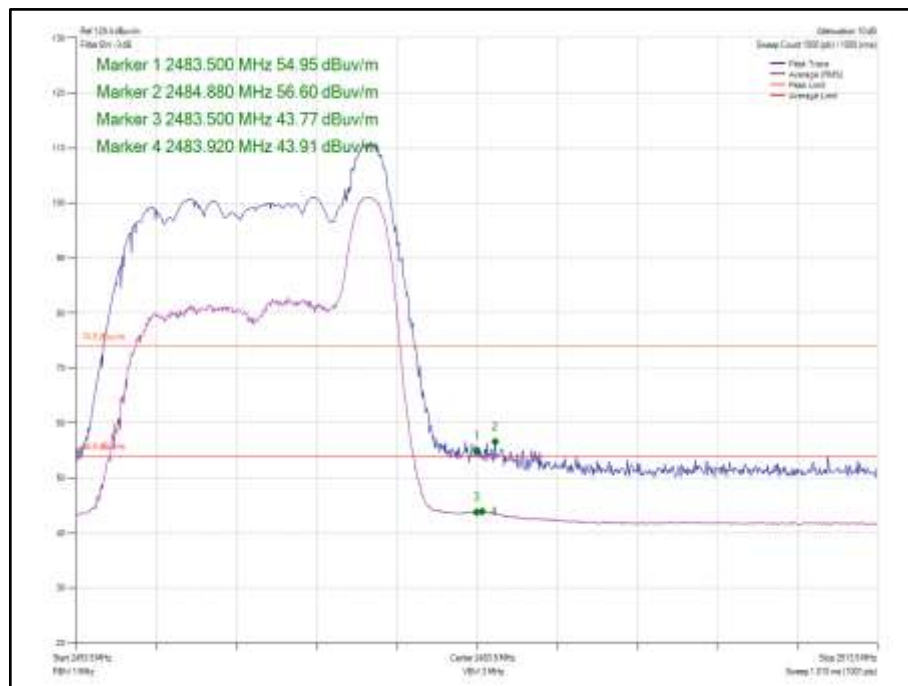


Figure 165 - 802.11ax HE20, Core 0, 26-8 - 2467 MHz, Band Edge Frequency 2483.5 MHz

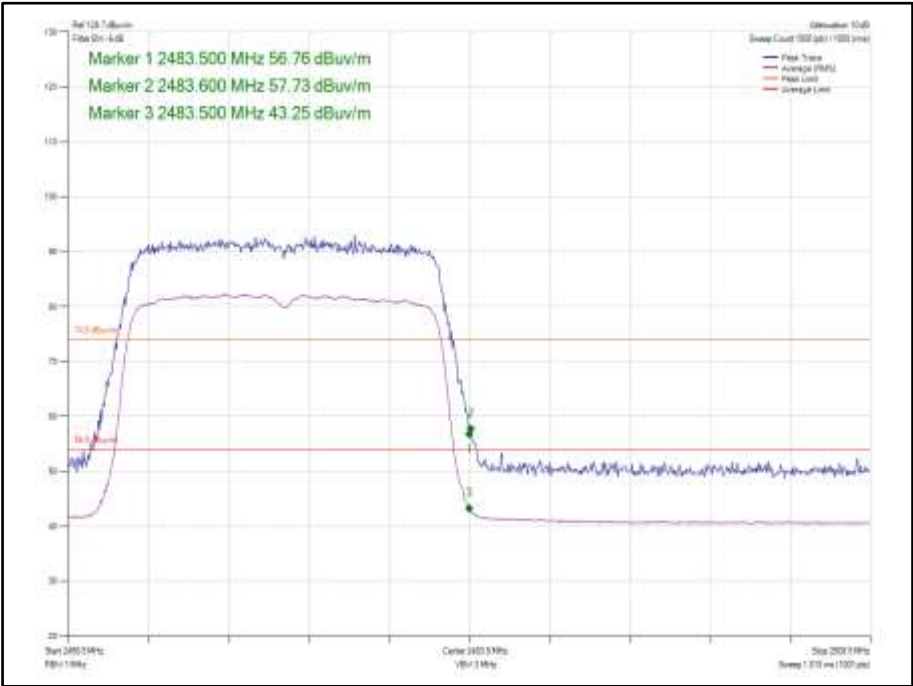


Figure 166 - 802.11ax HE20, Core 0, SU - 2472 MHz, Band Edge Frequency 2483.5 MHz

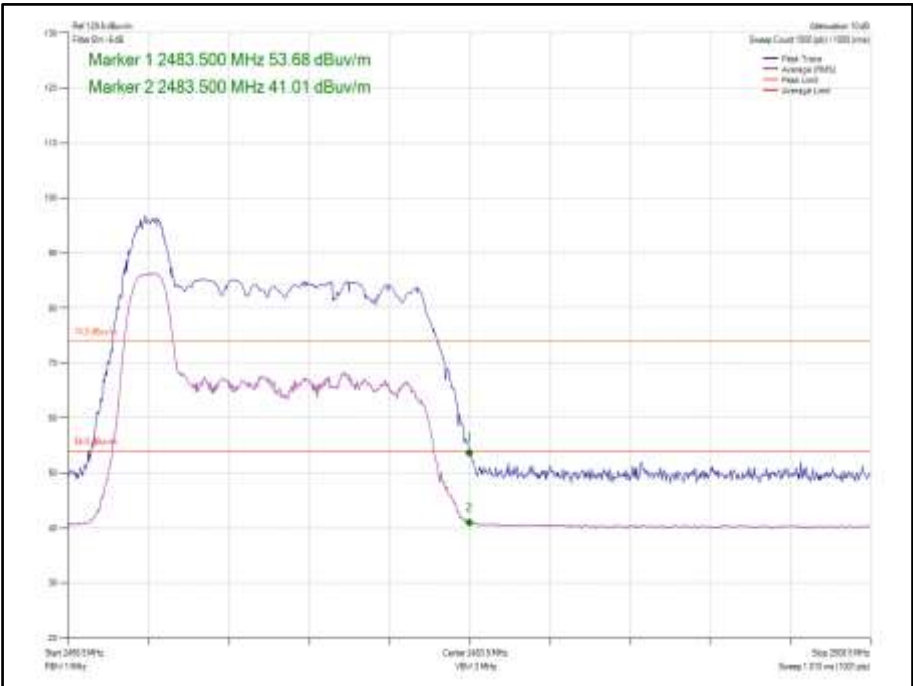


Figure 167 - 802.11ax HE20, Core 0, 26-8 - 2472 MHz, Band Edge Frequency 2483.5 MHz



Mode	Data Rate/MCS	Resource Size	Resource Index	TX Frequency (MHz)	Band Edge Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
802.11n HT20, Core 0-1	MCS7	-	-	2412	2390.0	62.32	46.46
802.11n HT20, Core 0-1	MCS7	-	-	2462	2483.5	60.16	48.41
802.11n HT20, Core 0-1	MCS7	-	-	2467	2483.5	57.54	46.15
802.11n HT20, Core 0-1	MCS7	-	-	2472	2483.5	60.39	45.31
802.11ax HE20, Core 0-1	MCS7x1	SU	-	2412	2400	60.97	46.57
802.11ax HE20, Core 0-1	MCS7x1	26	0	2412	2400	55.56	44.15
802.11ax HE20, Core 0-1	MCS7x1	SU	-	2462	2483.5	61.79	48.48
802.11ax HE20, Core 0-1	MCS7x1	26	8	2462	2483.5	59.21	45.56
802.11ax HE20, Core 0-1	MCS7x1	SU	-	2467	2483.5	58.88	47.41
802.11ax HE20, Core 0-1	MCS7x1	26	8	2467	2483.5	58.43	45.47
802.11ax HE20, Core 0-1	MCS7x1	SU	-	2472	2483.5	56.93	43.3
802.11ax HE20, Core 0-1	MCS7x1	26	8	2472	2483.5	65.11	47.76

Table 66 – MIMO Restricted Band Edge Results

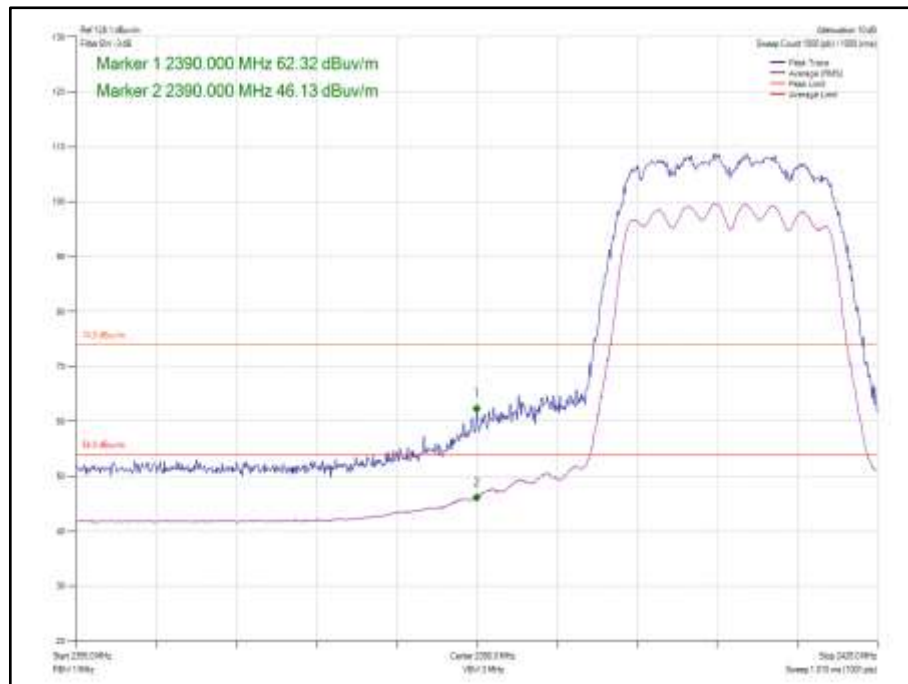


Figure 168 - 802.11n HT20, Core 0-1 - 2412 MHz, Band Edge Frequency 2390 MHz

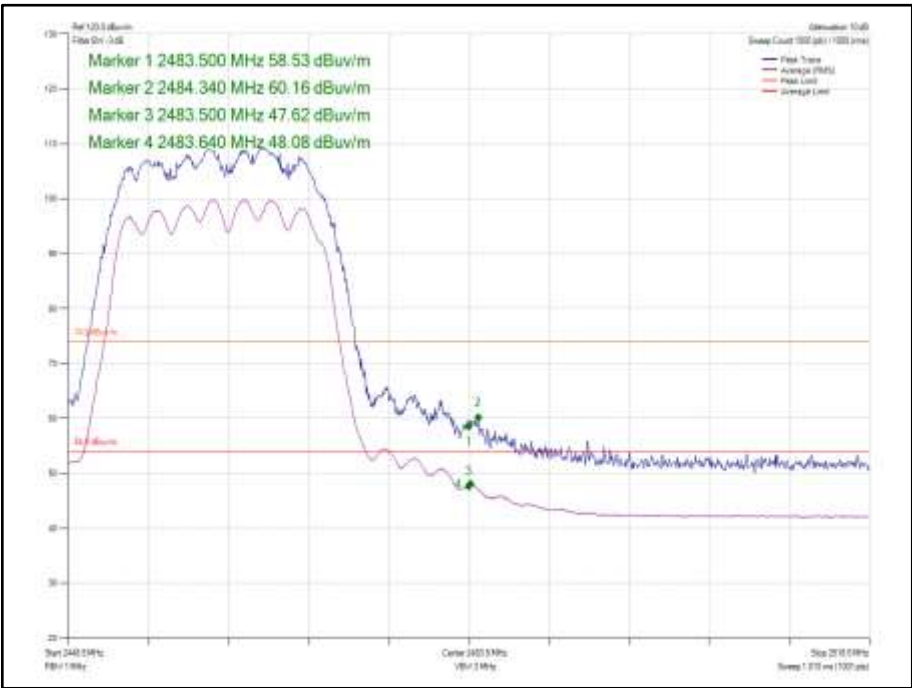


Figure 169 - 802.11n HT20, Core 0-1 - 2462 MHz, Band Edge Frequency 2483.5 MHz

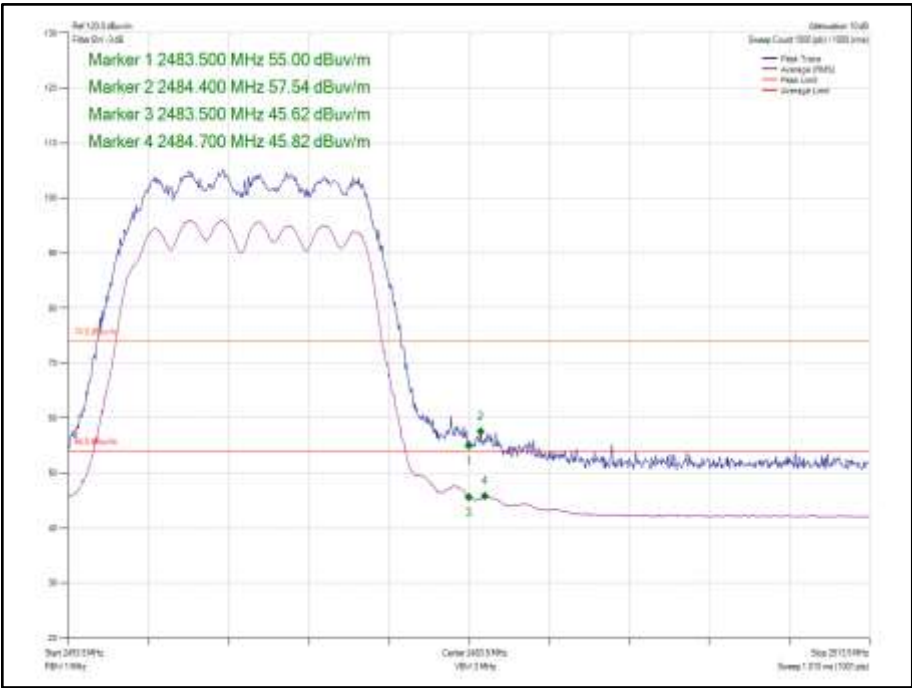


Figure 170 - 802.11n HT20, Core 0-1 - 2467 MHz, Band Edge Frequency 2483.5 MHz

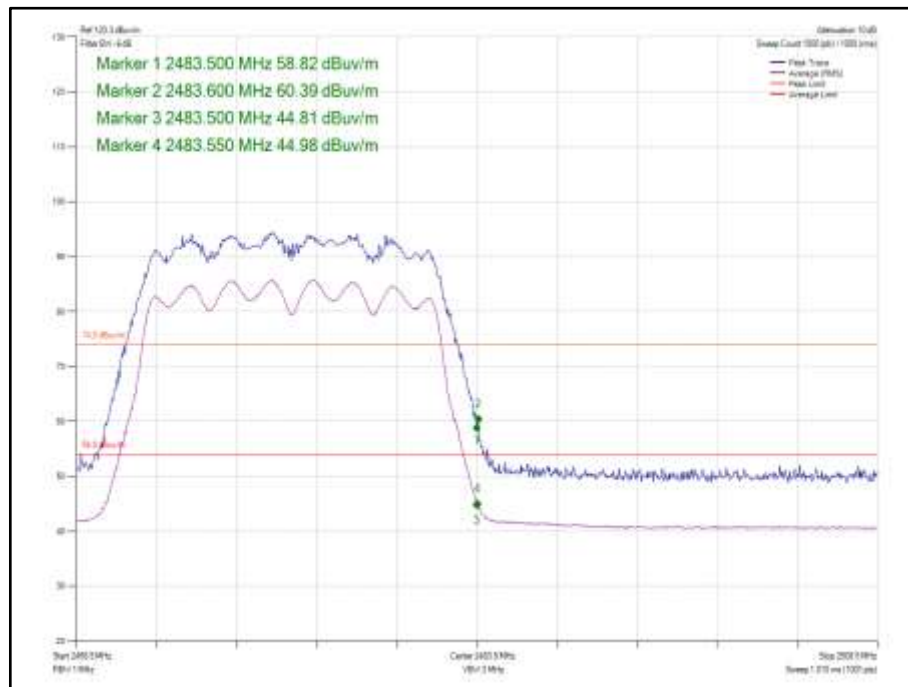


Figure 171 - 802.11n HT20, Core 0-1 - 2472 MHz, Band Edge Frequency 2483.5 MHz

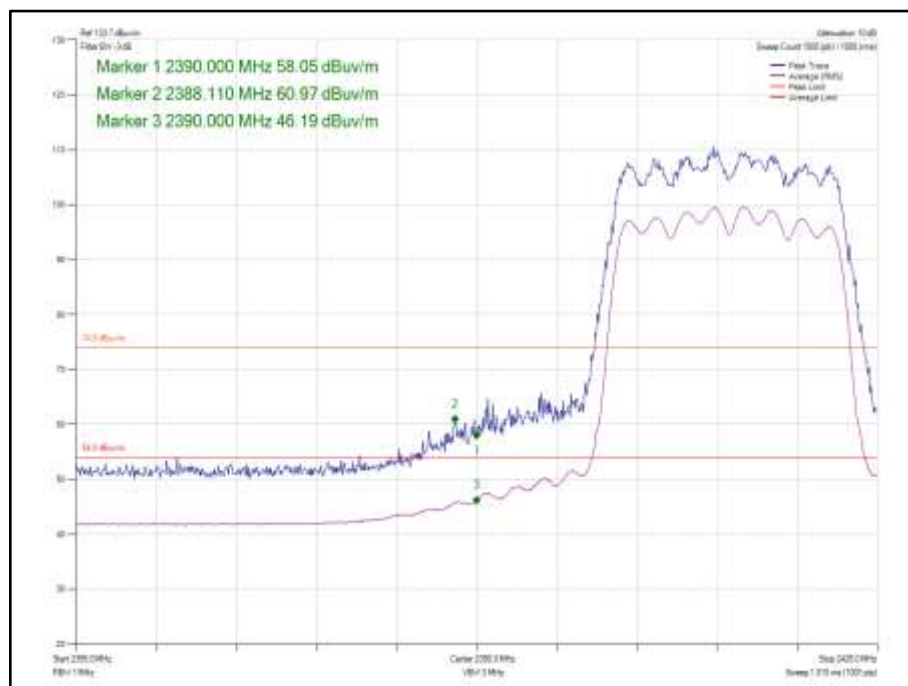


Figure 172 - 802.11ax HE20, Core 0-1, SU - 2412 MHz, Band Edge Frequency 2390 MHz

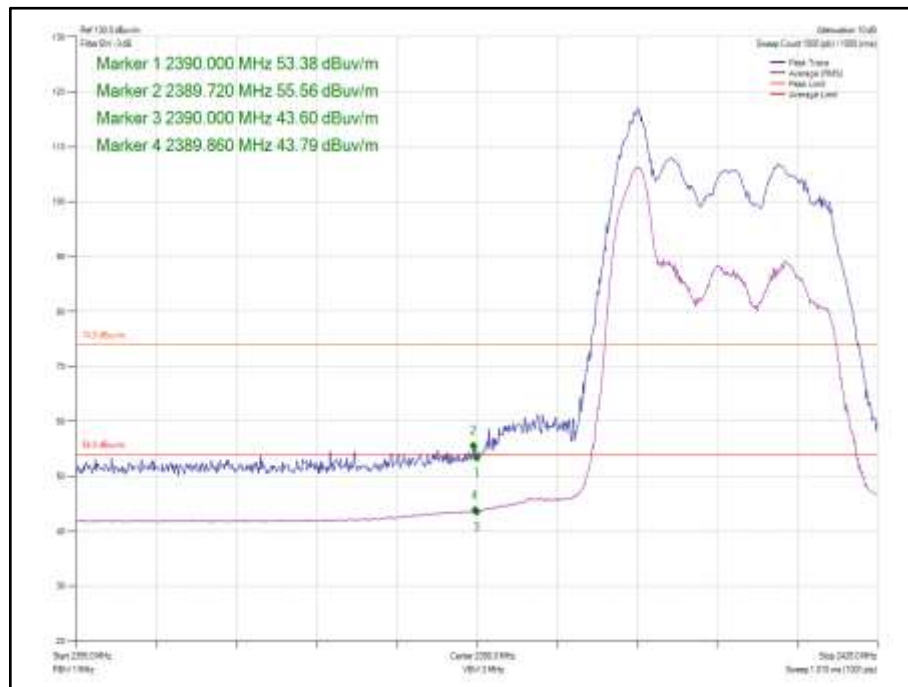


Figure 173 - 802.11ax HE20, Core 0-1, 26-0 - 2412 MHz, Band Edge Frequency 2390 MHz

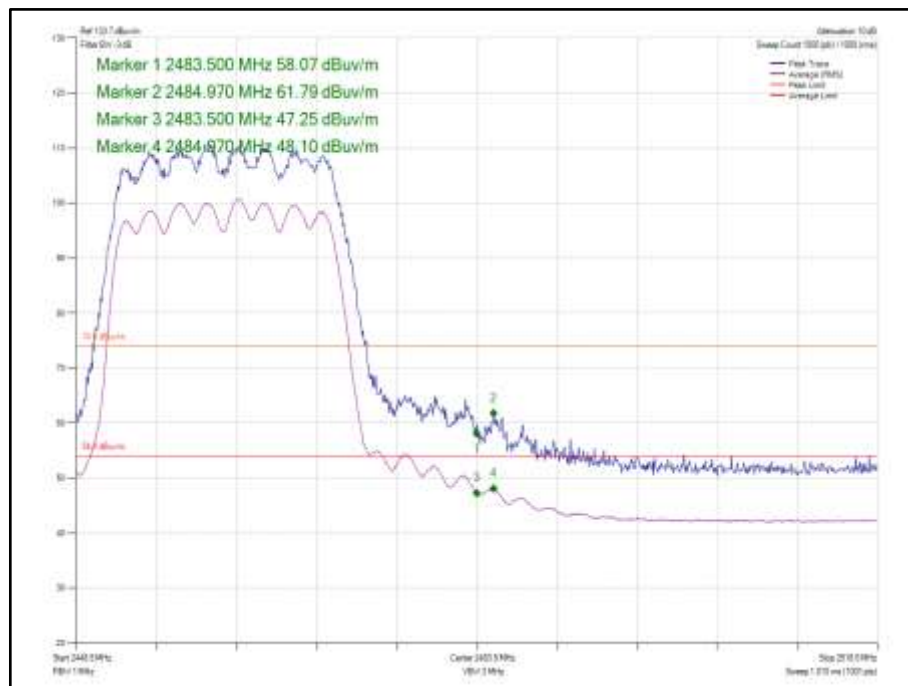


Figure 174 - 802.11ax HE20, Core 0-1, SU - 2462 MHz, Band Edge Frequency 2483.5 MHz

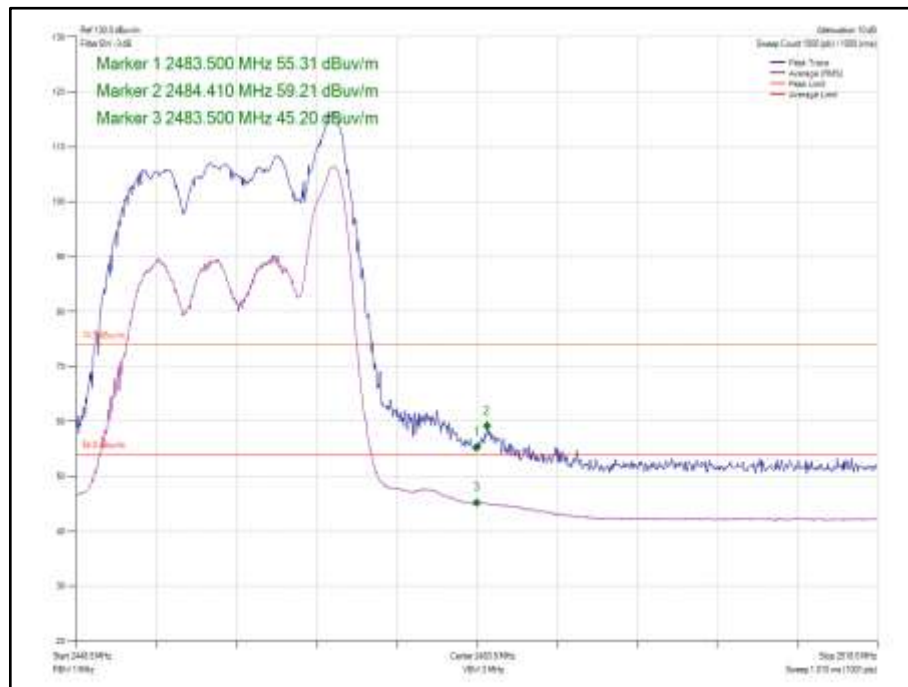


Figure 175 - 802.11ax HE20, Core 0-1, 26-8 - 2462 MHz, Band Edge Frequency 2483.5 MHz

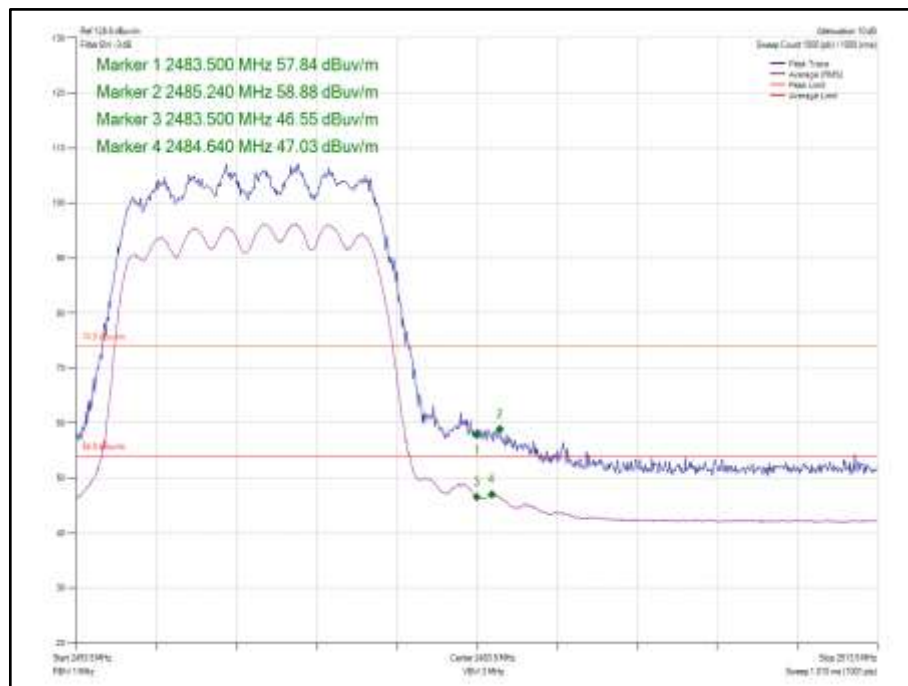


Figure 176 - 802.11ax HE20, Core 0-1, SU - 2467 MHz, Band Edge Frequency 2483.5 MHz

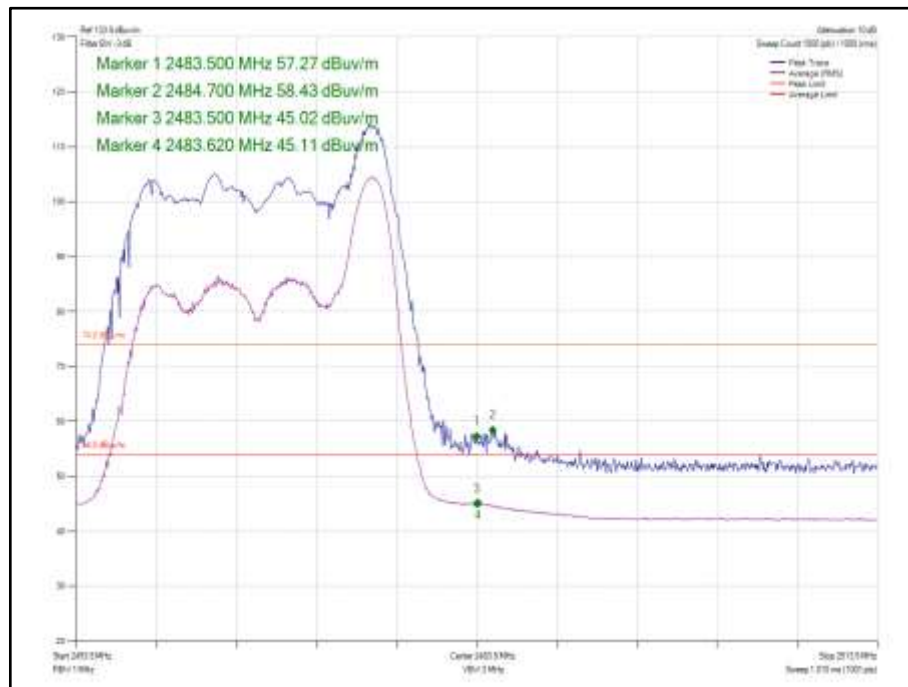


Figure 177 - 802.11ax HE20, Core 0-1, 26-8 - 2467 MHz, Band Edge Frequency 2483.5 MHz

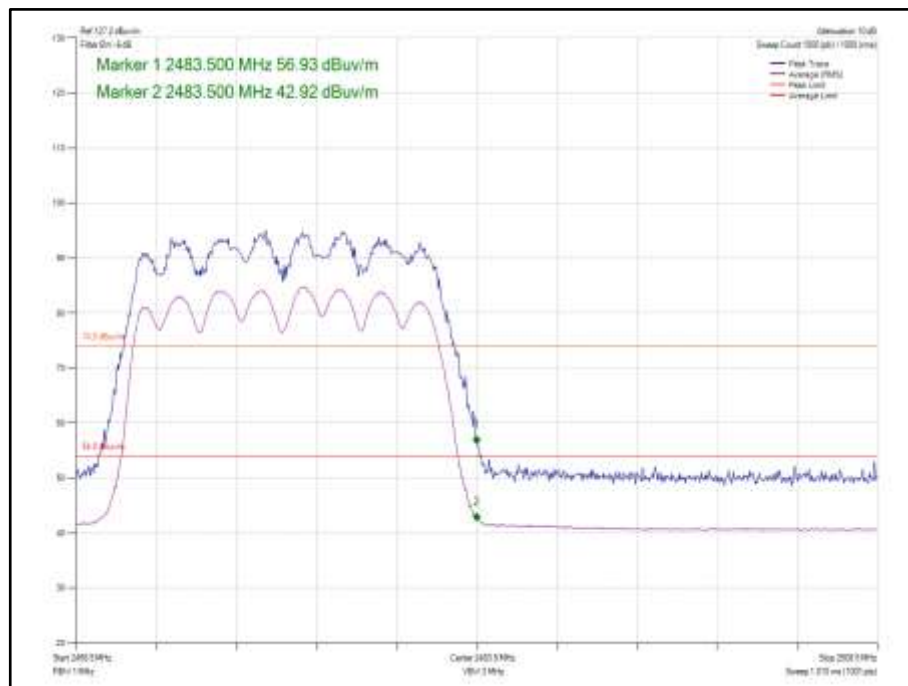


Figure 178 - 802.11ax HE20, Core 0-1, SU - 2472 MHz, Band Edge Frequency 2483.5 MHz

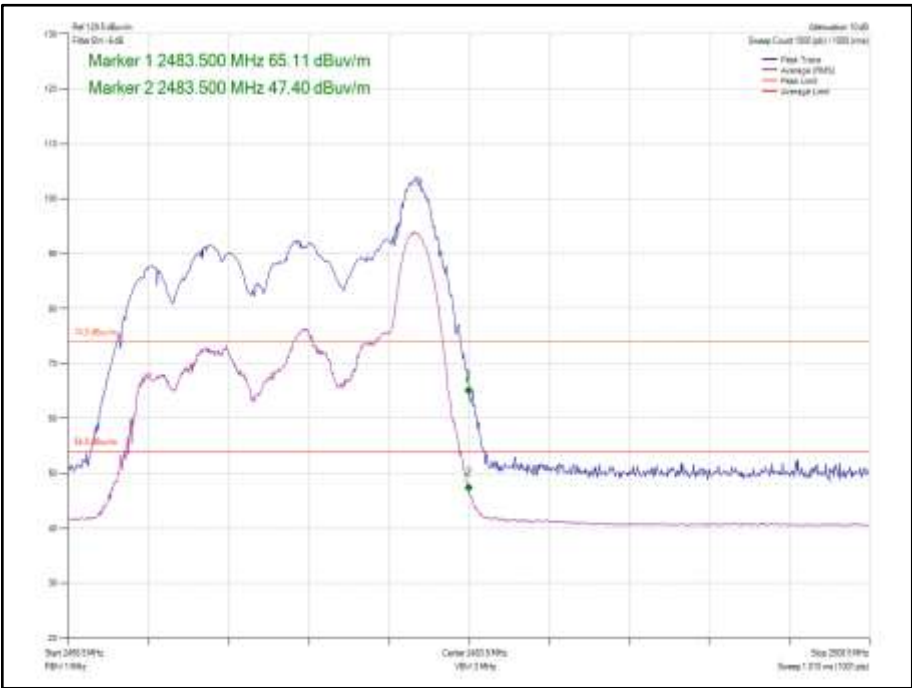


Figure 179 - 802.11ax HE20, Core 0-1, 26-8 - 2472 MHz, Band Edge Frequency 2483.5 MHz

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 67

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 68

*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.



2.6.7 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 Due
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	28-Nov-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5102	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-1000	5104	12	09-Dec-2020
EmX Emissions Software	TUV SUD	V1.6.3	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	01-Nov-2021
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	10-Mar-2021
Pre Amp 1 - 26.5 GHz	Agilent Technologies	8449B	5445	12	06-May-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5475	12	17-Mar-2021
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5494	12	14-Apr-2021
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5518	12	01-Apr-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5522	12	24-Mar-2021

Table 69

TU - Traceability Unscheduled



3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Maximum Conducted Output Power	± 3.2 dB
Power Spectral Density	± 3.2 dB
Emission Bandwidth	± 279.049 kHz
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Authorised Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Restricted Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 70

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.