

FCC and ISED Test Report

Apple Inc
Model: A2816

In accordance with FCC 47 CFR Part 15, ISED
RSS-247, ISED RSS-248 and ISED RSS-GEN
(2.4 GHz Bluetooth, 2.4 GHz WLAN, 5 GHz
WLAN, 6 GHz WLAN and Narrowband)

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



Add value.
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FCC ID: BCG A2816

IC: 579C-A2816

COMMERCIAL-IN-CONFIDENCE

Document 75954420-10 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	18 November 2022

Signatures in this approval box have checked this document in line with the requirements of TUV SUD 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 15, ISED RSS-247, ISED RSS-248 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Report Generation	Lauren Walters	18 November 2022	

FCC Accreditation

90987 Octagon House, Fareham Test Laboratory

ISED Accreditation

12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15: 2020, ISED RSS-247: Issue 2 (2017-02), ISED RSS-248: Issue 1 (2021-11) and ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02) for the tests detailed in section 1.3.



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ACCREDITATION

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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	17-November-2022

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2816
Serial Number(s)	Q64HTFJ22X
Hardware Version(s)	REV 1.0
Software Version(s)	22A12320r
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15: 2020 ISED RSS-247: Issue 2 (2017-02) ISED RSS-248: Issue 1 (2021-11) ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02)
Order Number	0540246998
Start of Test	14-October-2022
Finish of Test	31-October-2022
Name of Engineer(s)	Mohammad Malik, Elliot Callender, James Woods and Taha Shafique
Related Document(s)	ANSI C63.26: 2015 ANSI C63.10: 2013 ANSI C63.10: 2020 KDB 987594 D02 v01r01



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15, ISSED RSS-247, ISSED RSS-248 and ISSED RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 15	RSS-247	RSS-248	RSS-GEN			
Configuration and Mode: CoTX - Bluetooth + 5 GHz WLAN							
2.1	15.209, 15.247(d) and 15.407(b)	5.5 and 6.2	-	8.9	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	
Configuration and Mode: CoTX - 2.4 GHz WLAN + Narrowband							
2.1	15.209, 15.247(d) and 15.407(b)	5.5 and 6.2	-	8.9	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	
Configuration and Mode: CoTX - 2.4 GHz Bluetooth + 6 GHz WLAN							
2.1	15.209, 15.247(d) and 15.407(b)	5.5	4.7	8.9	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	

Table 2



1.4 Product Information

1.4.1 Technical Description

The equipment under test was an Apple desktop computer with Bluetooth® and IEEE 802.11 a/b/g/n/ac/ax Wi-Fi in the 2.4GHz, 5GHz and 6GHz bands.

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: A2816, Serial Number: Q64HTFJ22X			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.7 Test Location

TÜV SÜD conducted the following tests at our Concorde Park Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: CoTX - Bluetooth + 5 GHz WLAN		
Radiated Spurious Emissions (Simultaneous Transmission)	Mohammad Malik, Elliot Callender and James Woods	UKAS
Configuration and Mode: CoTX - 2.4 GHz WLAN + Narrowband		
Radiated Spurious Emissions (Simultaneous Transmission)	Mohammad Malik, Elliot Callender and Taha Shafique	UKAS
Configuration and Mode: CoTX - 2.4 GHz Bluetooth + 6 GHz WLAN		
Radiated Spurious Emissions (Simultaneous Transmission)	Mohammad Malik, James Woods and Elliot Callender	UKAS

Table 4

Office Address:

TÜV SÜD
Concorde Park
Concorde Way
Fareham
Hampshire
PO15 5FG
United Kingdom



2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.209, 15.247(d) and 15.407(b)
ISED RSS-247, Clause 5.5 and 6.2
ISED RSS-248, Clause 4.7
ISED RSS-GEN, Clause 8.9

2.1.2 Equipment Under Test and Modification State

A2816, S/N: Q64HTFJ22X - Modification State 0

2.1.3 Date of Test

14-October-2022 to 31-October-2022

2.1.4 Test Method

CoTX - 2.4 GHz WLAN + Narrowband and CoTX - Bluetooth + 5 GHz WLAN

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 each type of port on the EUT.

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, 11.11, 11.12, 12.7.2 or 12.7.3 depending on the nature of the emission measured.

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

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

At a measurement distance of 1 meter the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54$ dB.



CoTX - 2.4 GHz Bluetooth + 6 GHz WLAN

Testing was performed in accordance with KDB 987594 D02 and 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 each type of port on the EUT.

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, 11.11, 11.12, 12.7.2 or 12.7.3 depending on the nature of the emission measured.

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

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

At a measurement distance of 1 meter the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54$ dB.

2.1.5 Test Setup Diagram

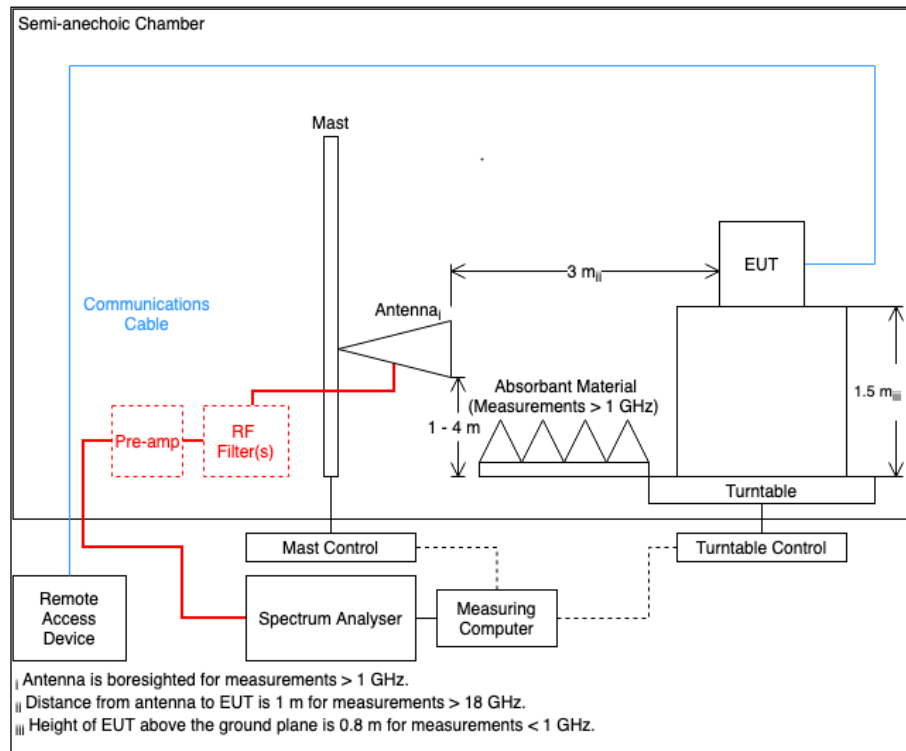


Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	21.5 - 22.7 °C
Relative Humidity	46.5 - 59.6 %

2.1.7 Test Results

CoTX - Bluetooth + 5 GHz WLAN

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

Table 5 - U-NII-1 – 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

*No emissions found within 10 dB of the limit.

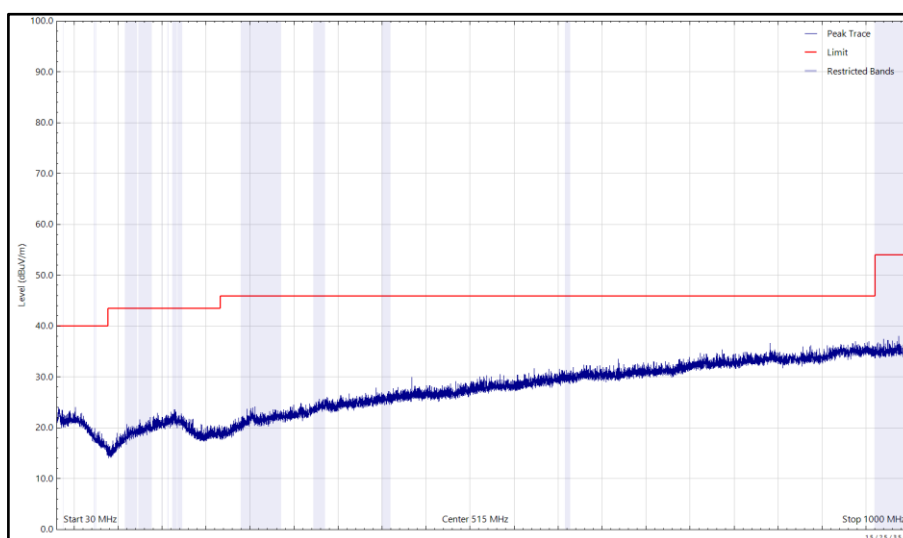


Figure 2 - U-NII-1 – 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

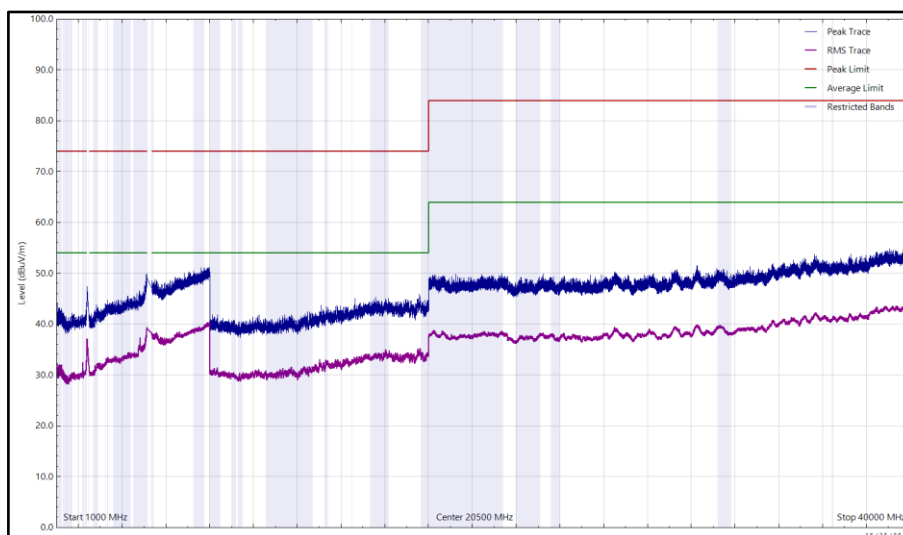


Figure 3 - U-NII-1 – 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

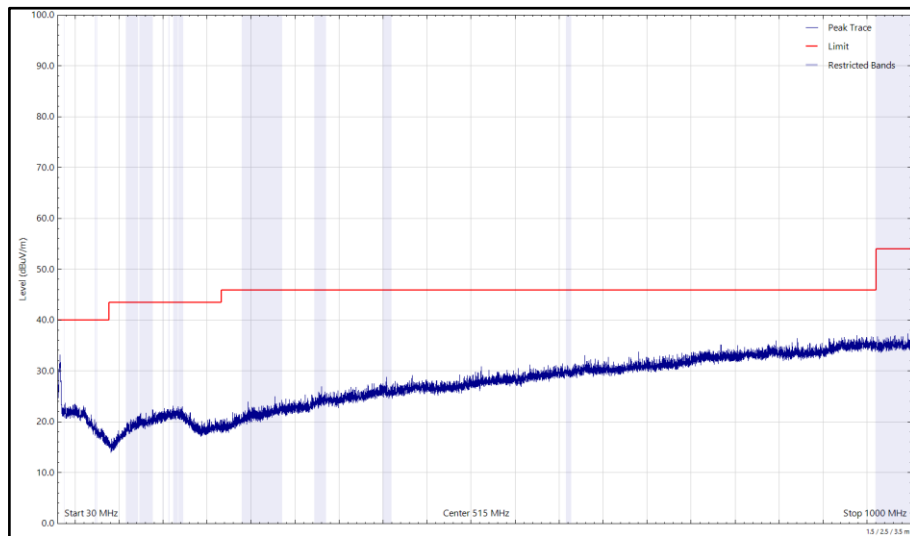


Figure 4 - U-NII-1 - 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

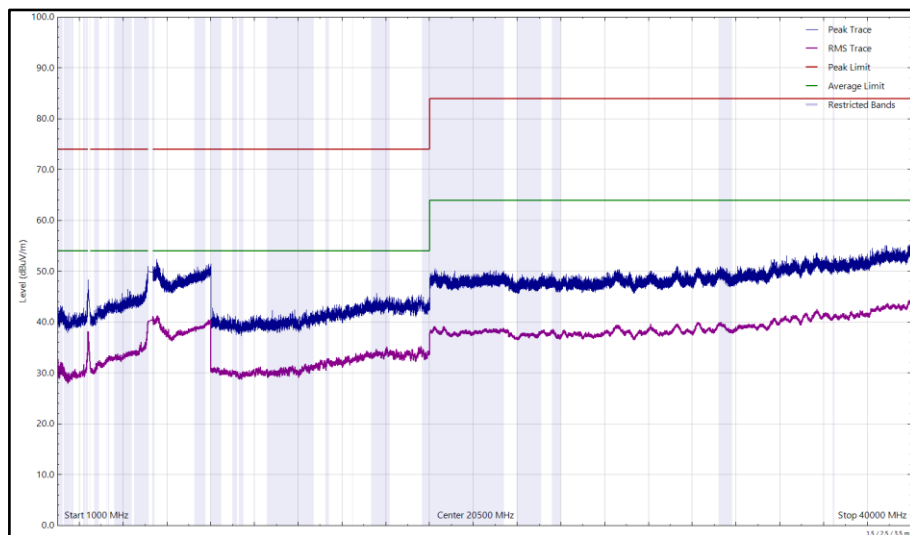


Figure 5 - U-NII-1 - 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4960.249	35.27	54.00	-18.73	CISPR Avg	270	110	Horizontal

Table 6 - U-NII-2C - 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

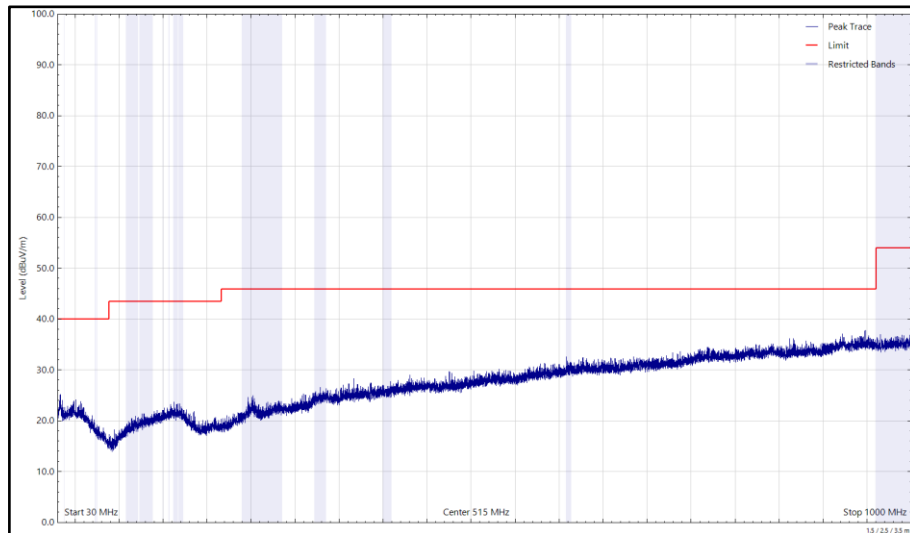


Figure 6 - U-NII-2C – 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

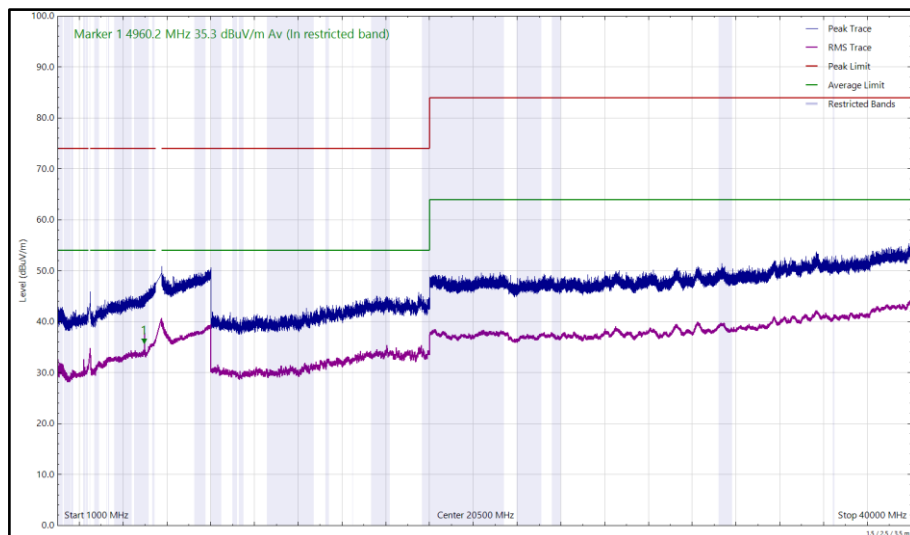


Figure 7 - U-NII-2C – 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

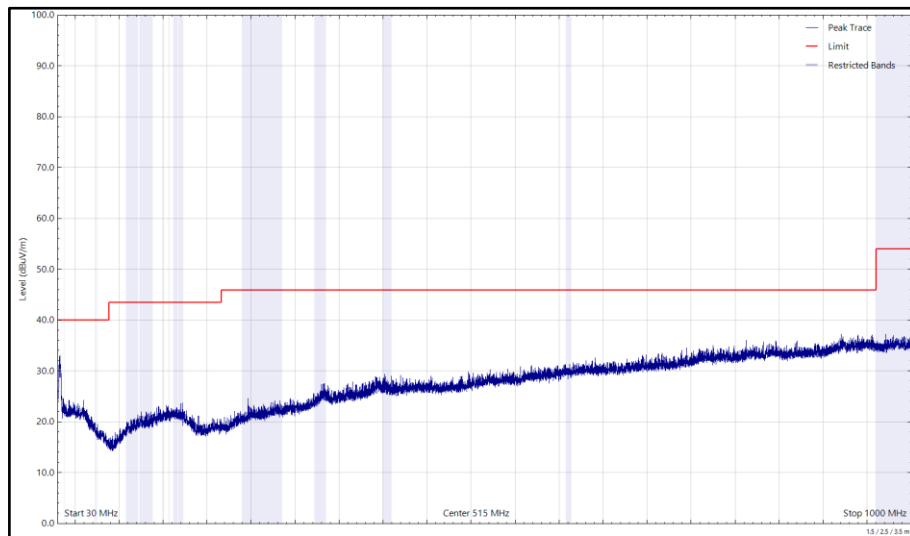


Figure 8 - U-NII-2C – 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

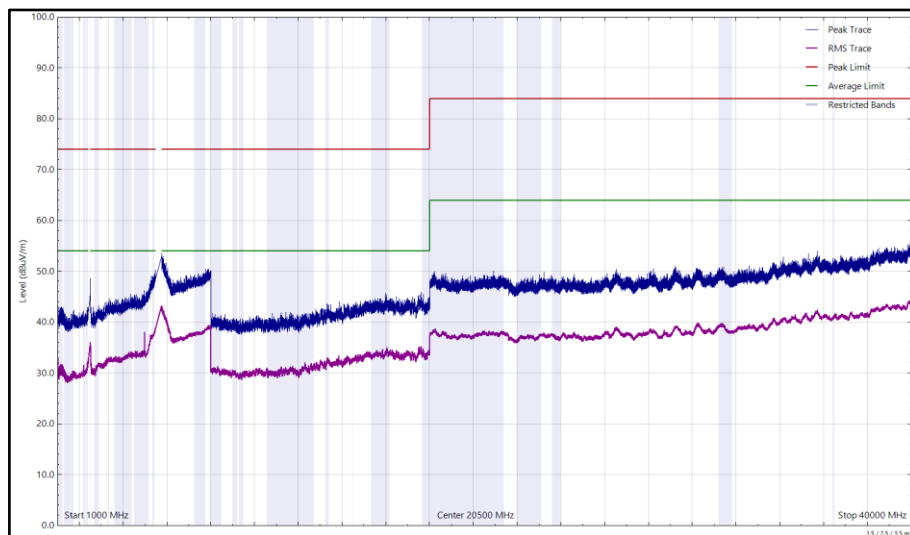


Figure 9 - U-NII-2C - 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2241.839	35.81	54.00	-18.19	RMS	72	203	Vertical
4959.856	36.90	54.00	-17.10	CISPR Avg	270	100	Horizontal

Table 7 - U-NII-1 – 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

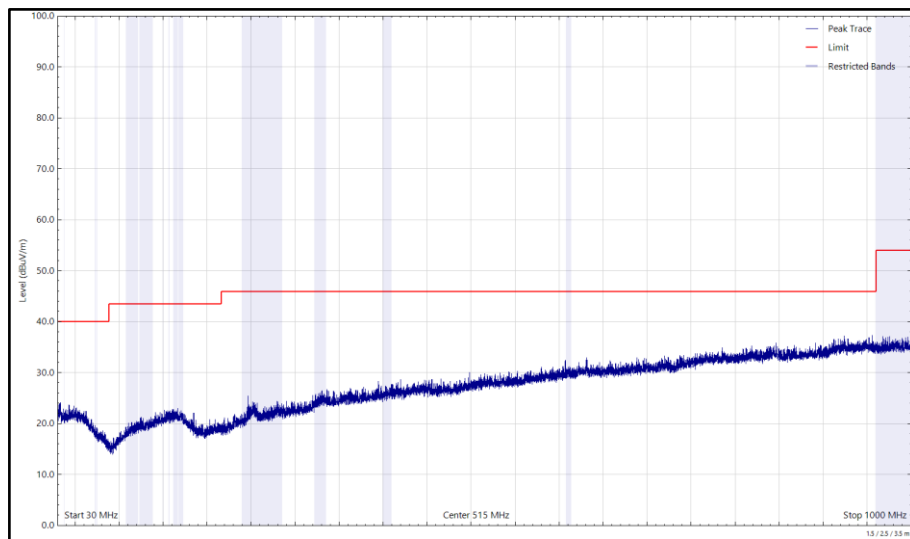


Figure 10 - U-NII-1 – 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

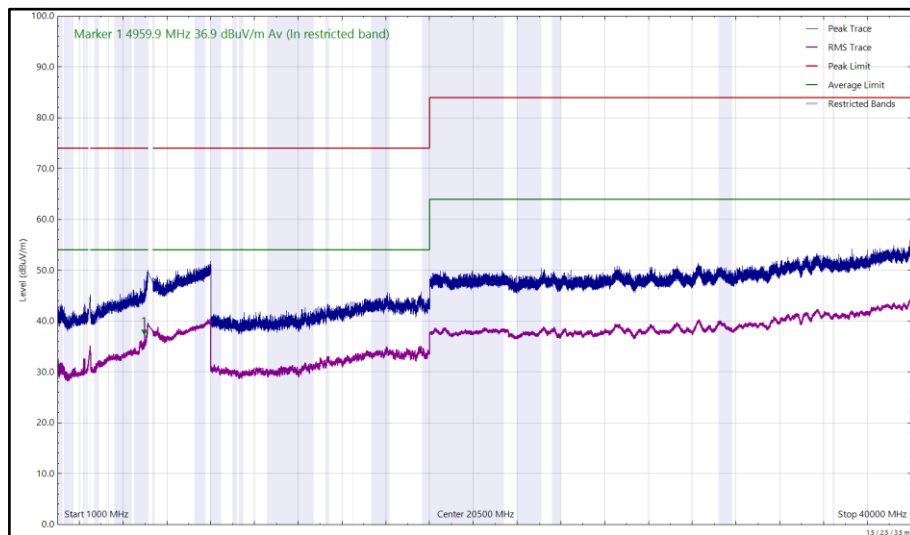


Figure 11 - U-NII-1 - 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

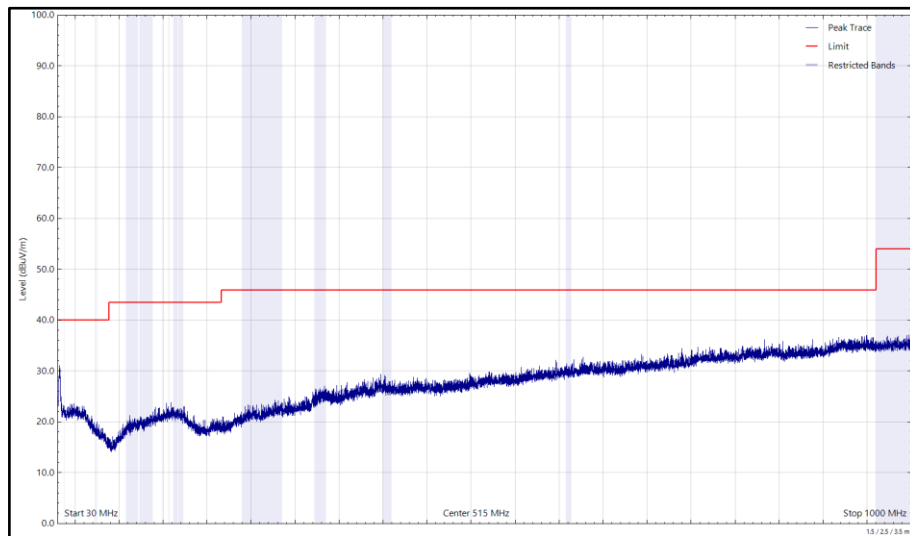


Figure 12 - U-NII-1 - 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

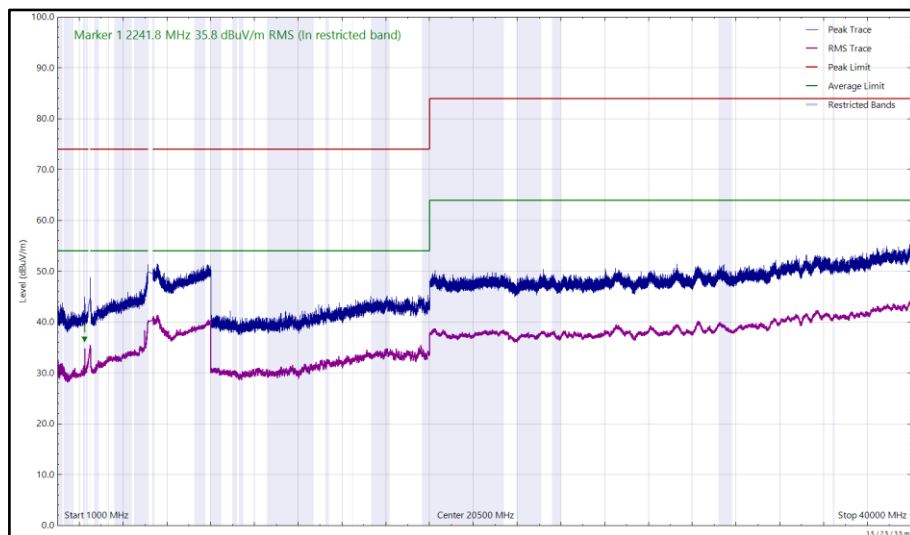


Figure 13 - U-NII-1 - 5200 MHz (CH40), VHT20, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

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

Table 8 - U-NII-2C – 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

*No emissions found within 10 dB of the limit.

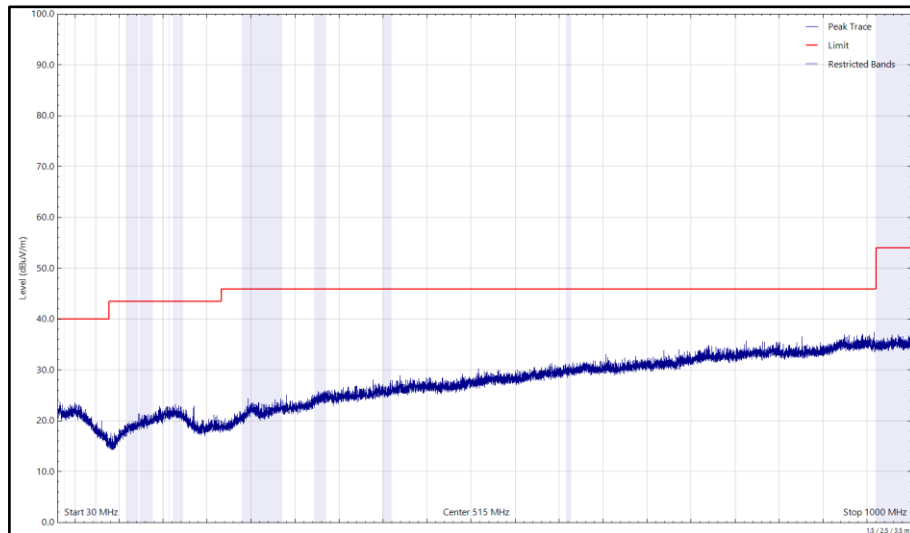


Figure 14 - U-NII-2C – 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

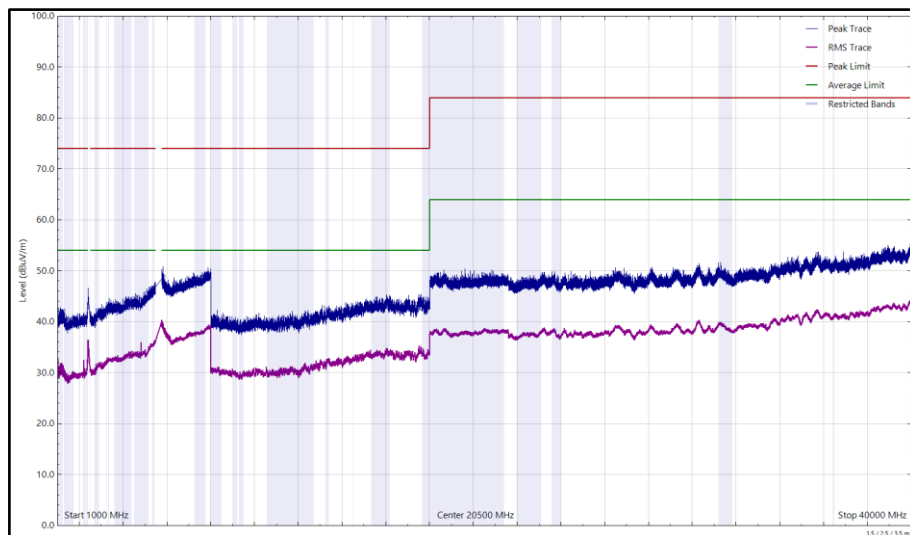


Figure 15 - U-NII-2C - 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

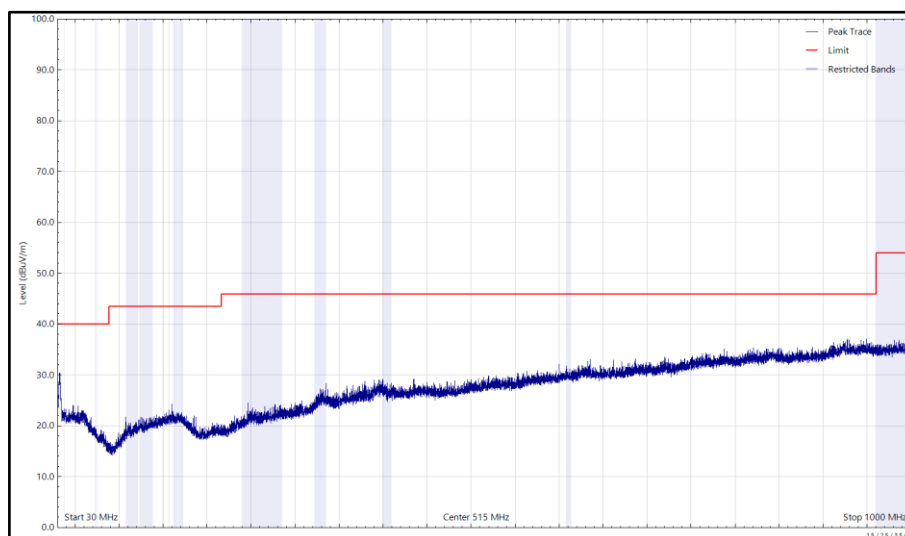


Figure 16 - U-NII-2C - 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

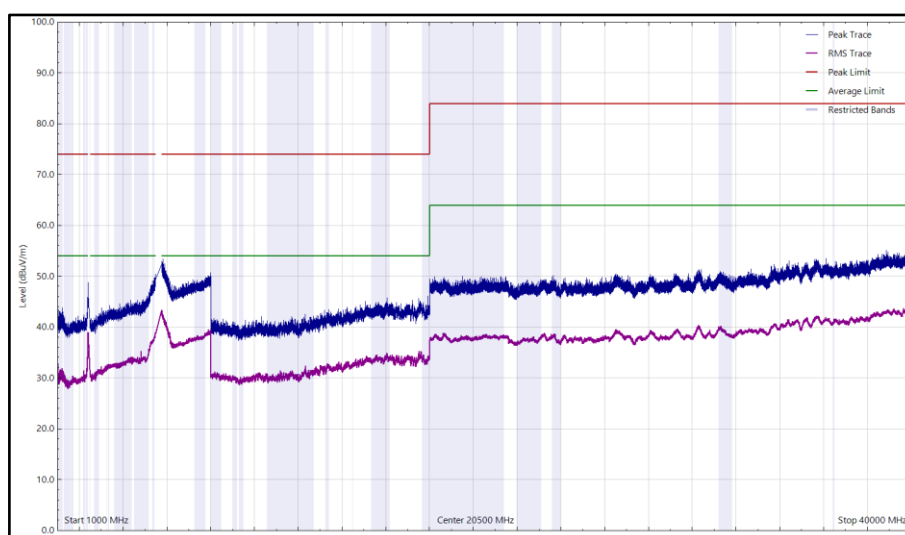


Figure 17 - U-NII-2C - 5680 MHz (CH136), VHT20, CDD, Core 0 + Core 1 and 2402 MHz (CH0),

FCC 47 CFR Part 15, ISSED RSS-247 and ISSED RSS-GEN

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 15.247 (d) / RSS-247 Clause 5.5	-20 dBc
Part 15.407 (b) / RSS-247 Clause 6.2	-27 dBm (EIRP) / 68 dBuV/m at 3m.
Part 15.209 / RSS-GEN Clause 8.9	Peak: 74 dBuV/m at 3m, Average 54 dBuV/m at 3m

Table 9

CoTX - 2.4 GHz WLAN + Narrowband

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
31.454	19.17	40.00	-20.83	Q-Peak	0	311	Vertical

Table 10 - 2412 MHz (CH1), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

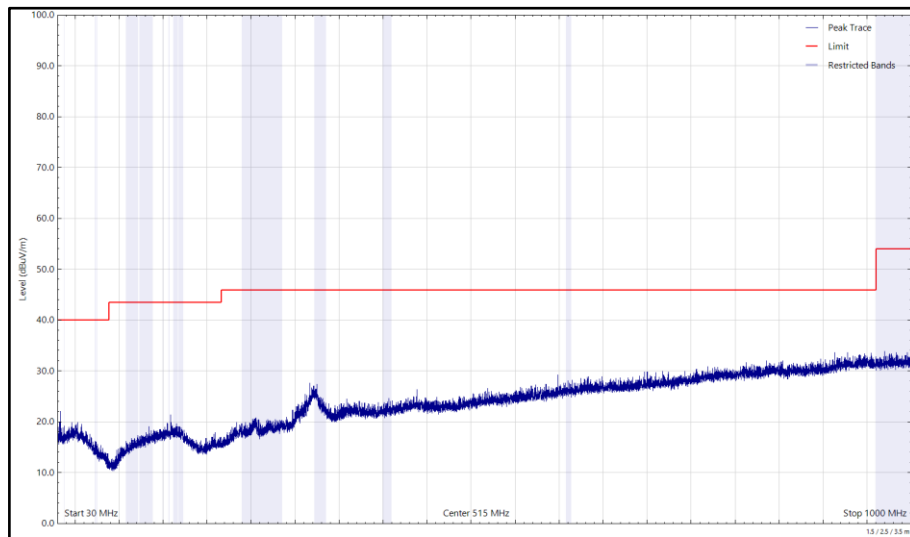


Figure 18 - 2412 MHz (CH1), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

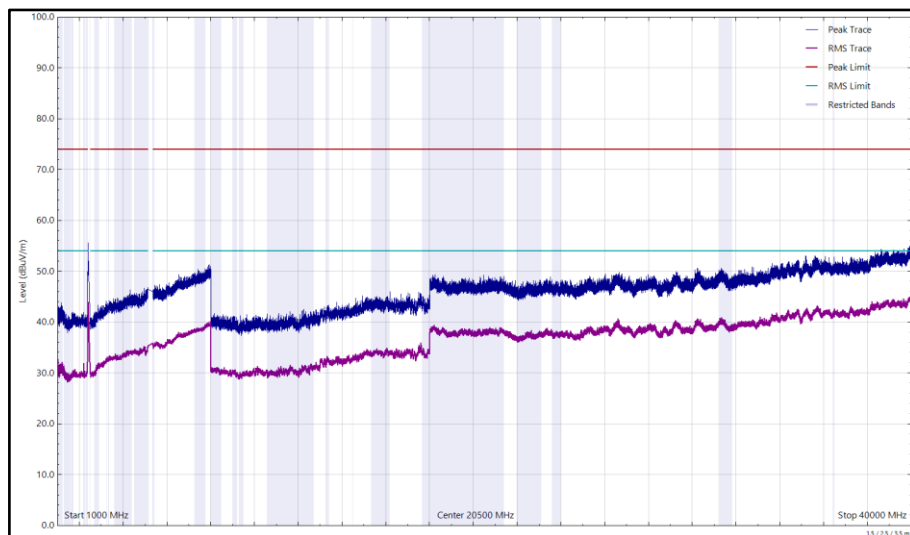


Figure 19 - 2412 MHz (CH1), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1, 1 GHz to 40 GHz, Horizontal

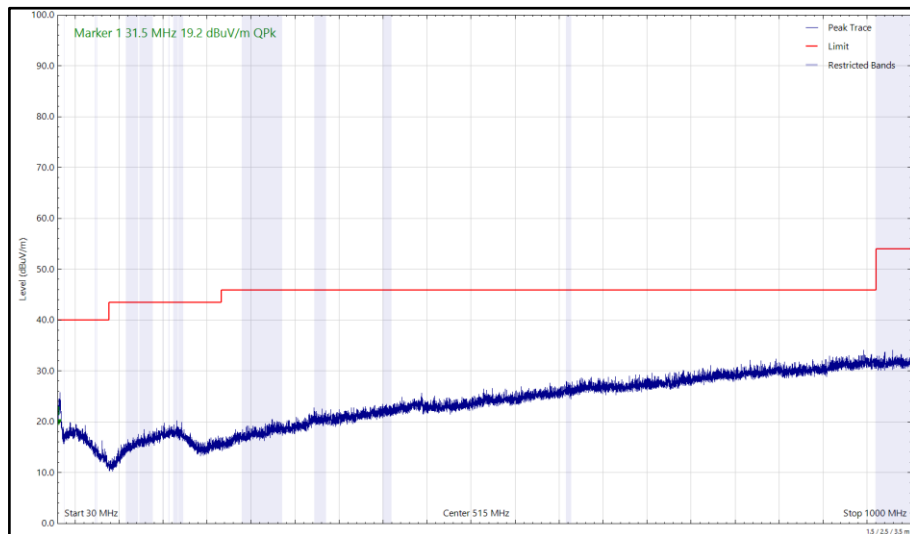


Figure 20 - 2412 MHz (CH1), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1, 30 MHz to 1 GHz, Vertical (Peak)

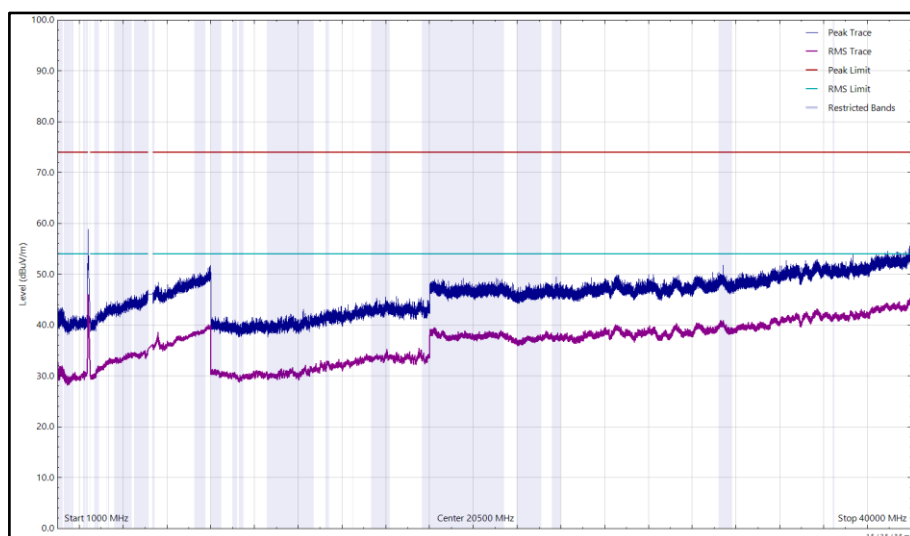
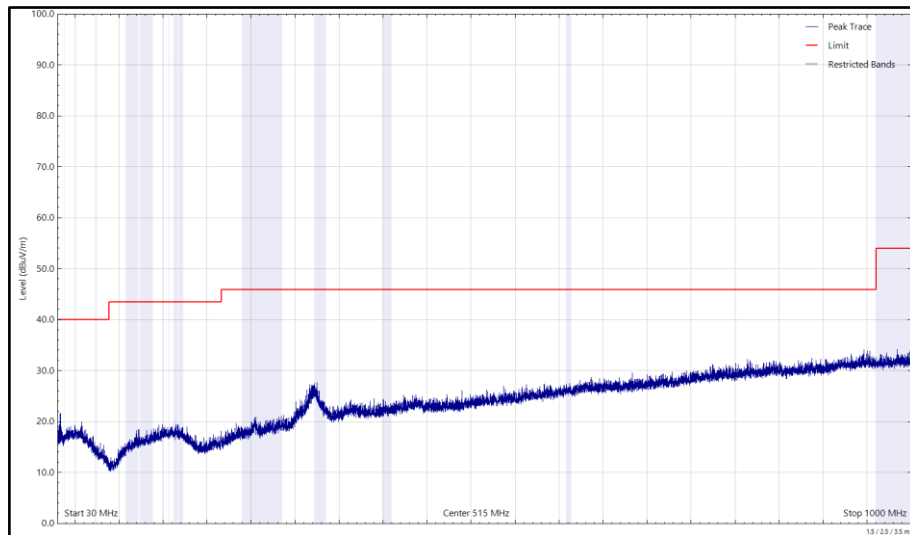


Figure 21 - 2412 MHz (CH1), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1, 1 GHz to 40 GHz, Vertical

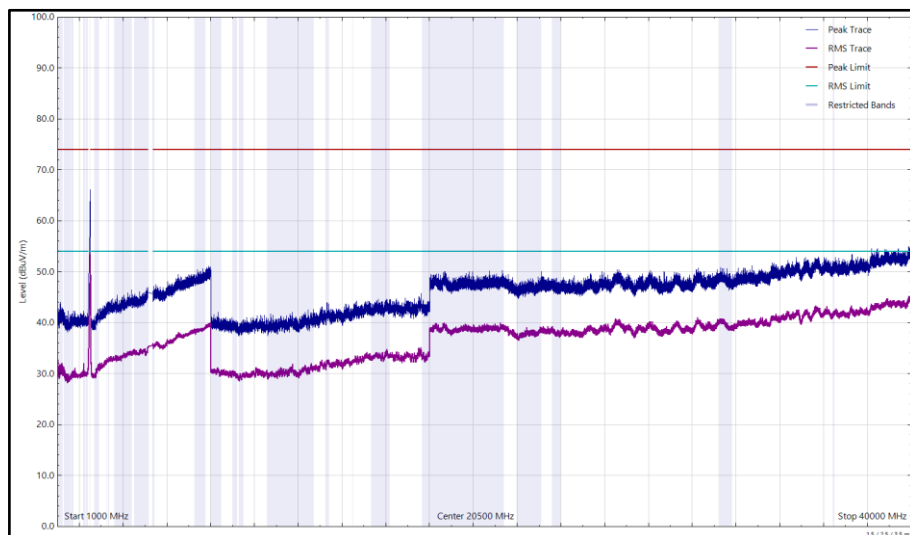
Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
33.003	22.23	40.00	-17.77	Q-Peak	139	100	Vertical

**Table 11 - 2472 MHz (CH13), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1
30 MHz to 40 GHz**

No other emissions found within 10 dB of the limit.



**Figure 22 - 2472 MHz (CH13), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1
30 MHz to 1 GHz, Horizontal (Peak)**



**Figure 23 - 2472 MHz (CH13), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1
1 GHz to 40 GHz, Horizontal**

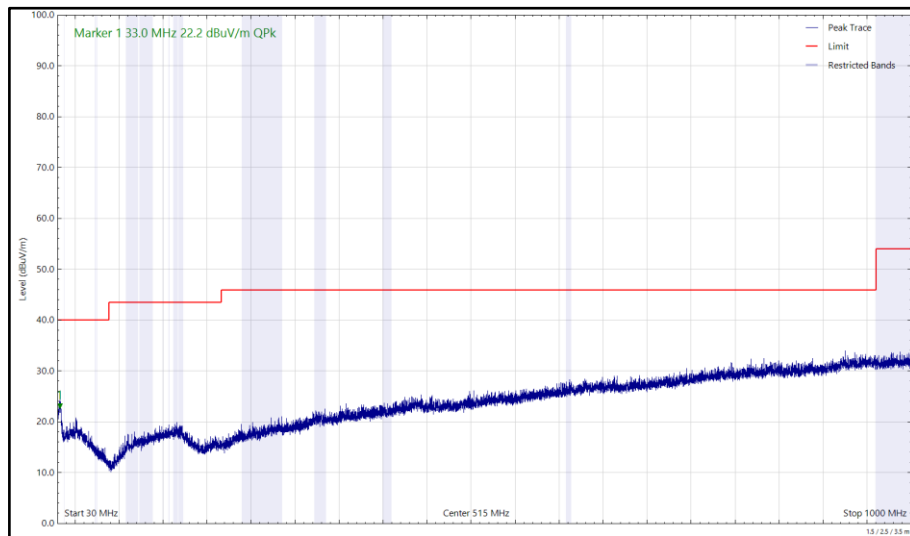


Figure 24 - 2472 MHz (CH13), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1
30 MHz to 1 GHz, Vertical (Peak)

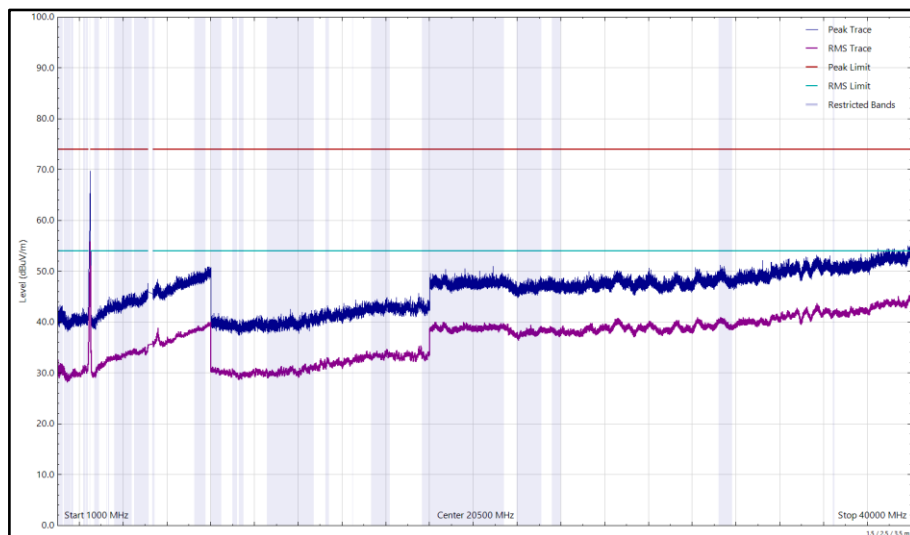


Figure 25 - 2472 MHz (CH13), HT20, Core 0 and 5162 MHz, HDR4, ePA, Core 1
1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
5426.504	37.99	54.00	-16.01	RMS	357	168	Vertical
5426.656	36.29	54.00	-17.71	RMS	351	102	Horizontal

Table 12 - 2412 MHz (CH1), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

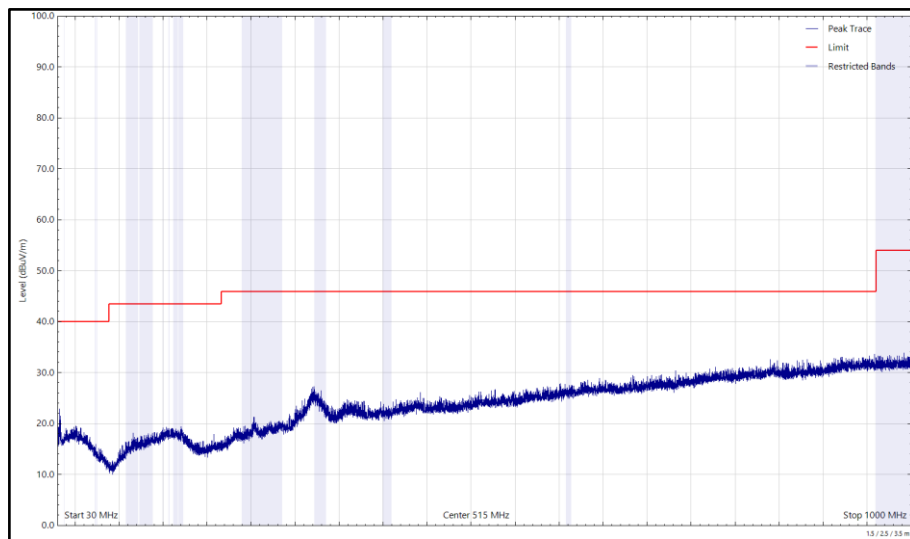


Figure 26 - 2412 MHz (CH1), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

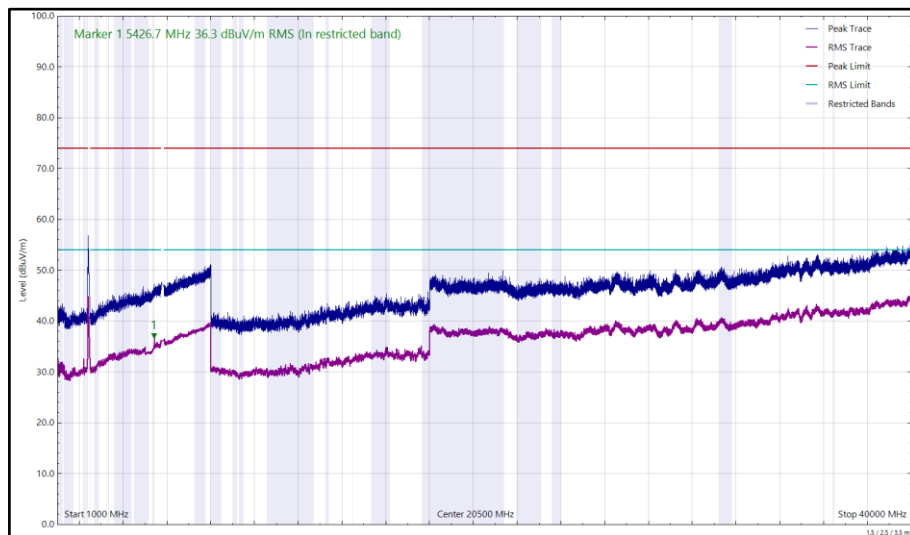


Figure 27 - 2412 MHz (CH1), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 1 GHz to 40 GHz, Horizontal

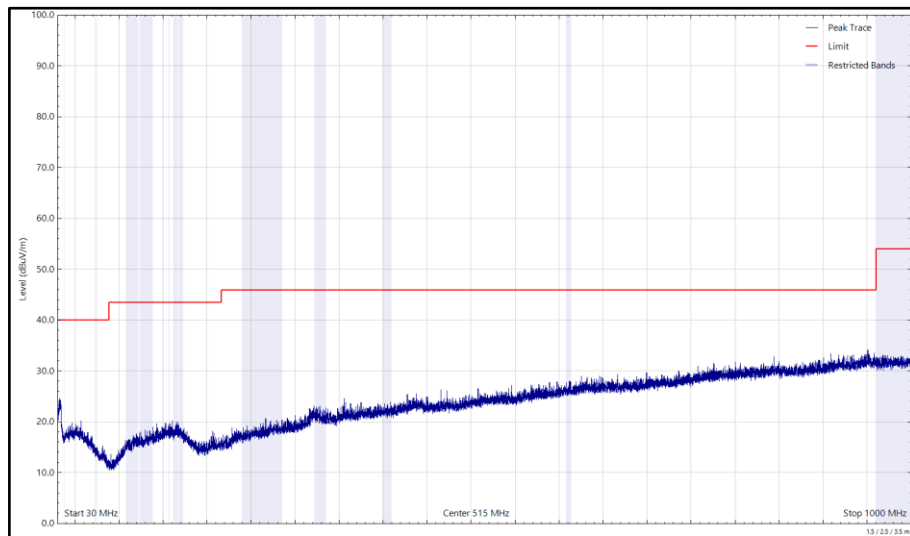


Figure 28 - 2412 MHz (CH1), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 30 MHz to 1 GHz, Vertical (Peak)

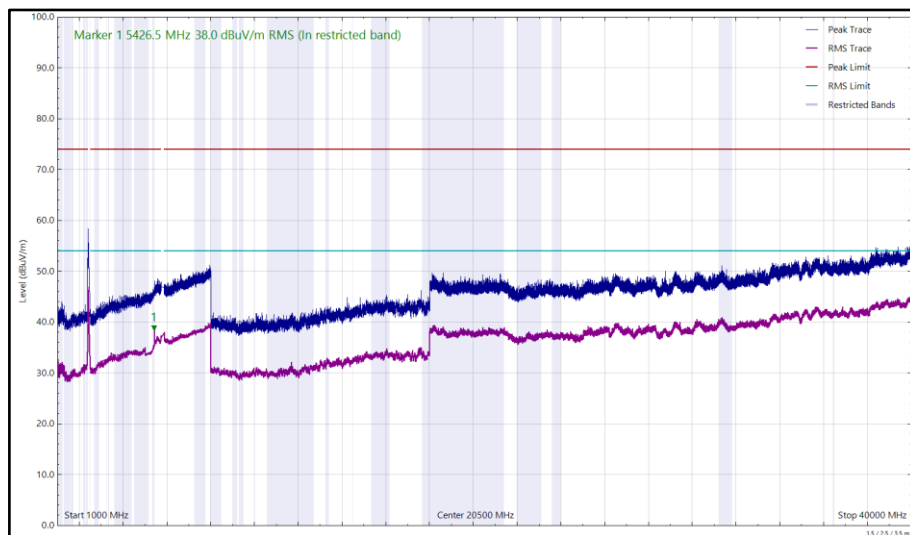
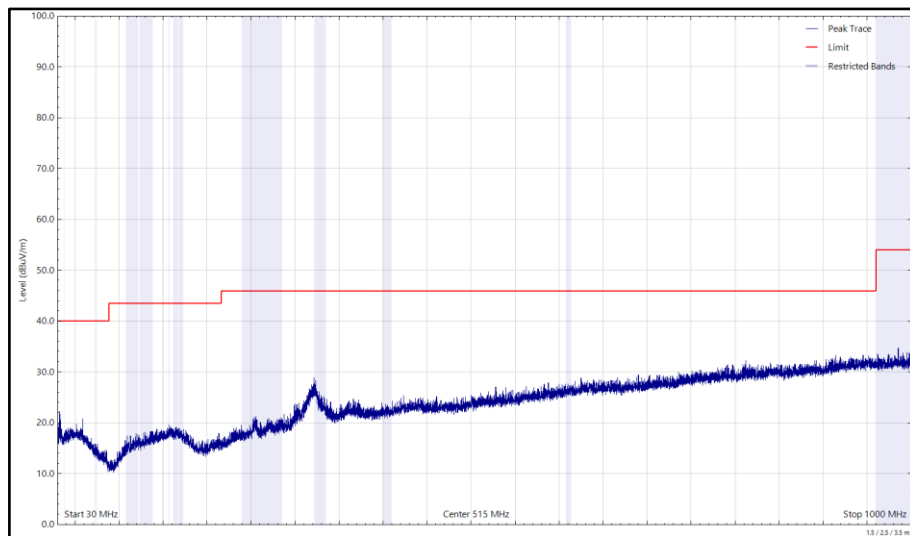


Figure 29 - 2412 MHz (CH1), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 1 GHz to 40 GHz, Vertical

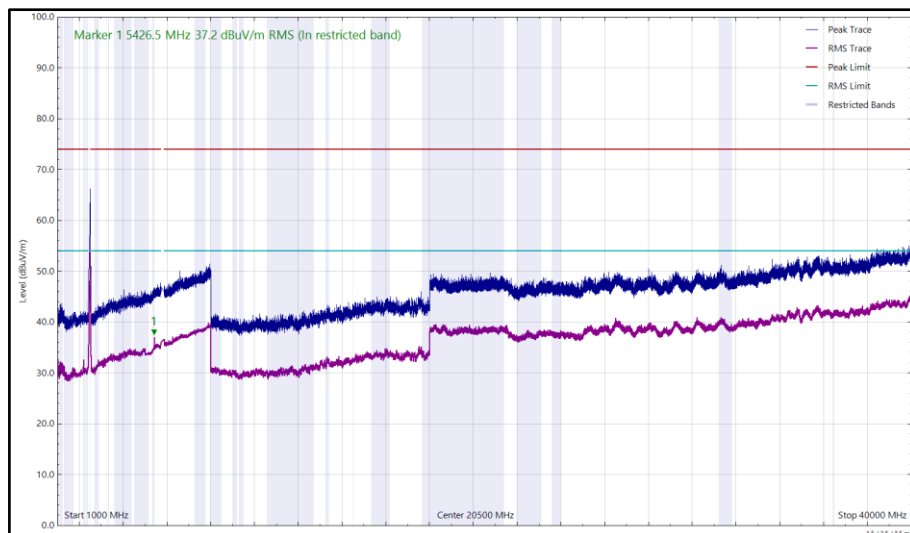
Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
32.793	20.06	40.00	-19.94	Q-Peak	71	114	Vertical
5426.532	37.22	54.00	-16.78	RMS	269	102	Horizontal
5426.539	38.85	54.00	-15.15	RMS	355	236	Vertical

**Table 13 - 2472 MHz (CH13), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1,
30 MHz to 40 GHz**

No other emissions found within 10 dB of the limit.



**Figure 30 - 2472 MHz (CH13), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1,
30 MHz to 1 GHz, Horizontal (Peak)**



**Figure 31 - 2472 MHz (CH13), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1,
1 GHz to 40 GHz, Horizontal**

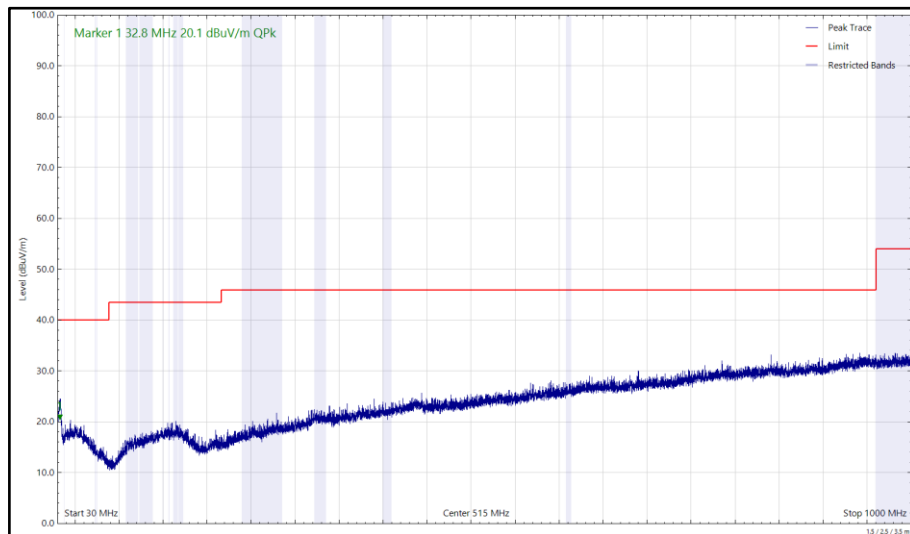


Figure 32 - 2472 MHz (CH13), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 30 MHz to 1 GHz, Vertical (Peak)

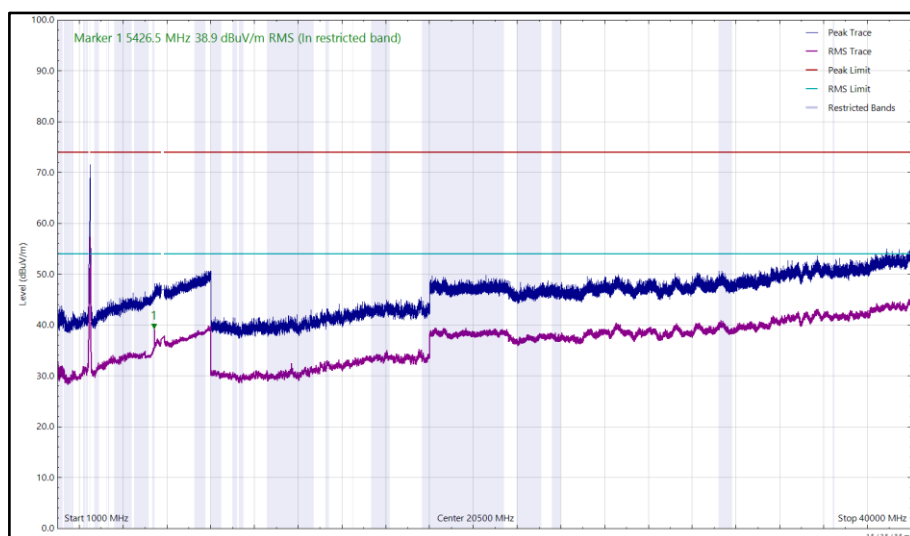


Figure 33 - 2472 MHz (CH13), HT20, Core 0 and 5844 MHz, HDR4, ePA, Core 1, 1 GHz to 40 GHz, Vertical



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

Table 14 - 2412 MHz (CH1), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 40 GHz

*No emissions found within 10 dB of the limit.

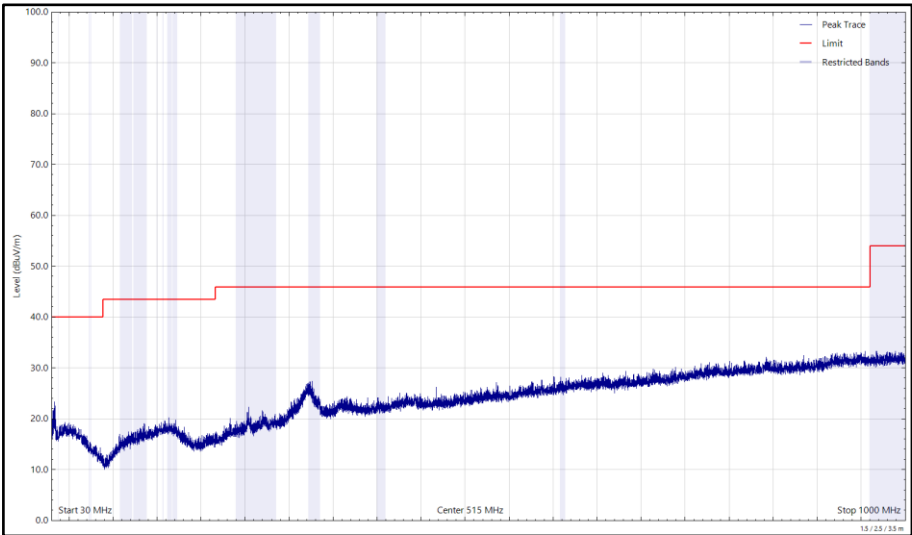


Figure 34 - 2412 MHz (CH1), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

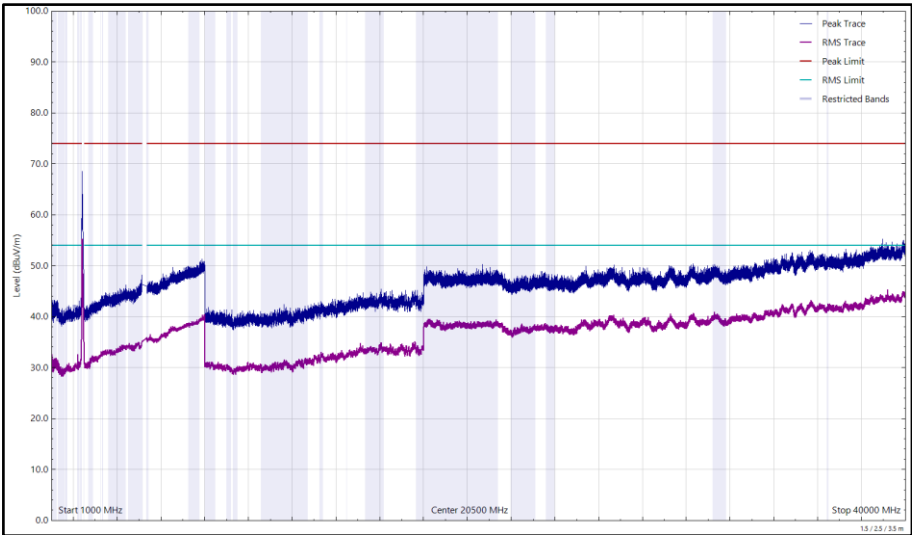


Figure 35 - 2412 MHz (CH1), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Horizontal

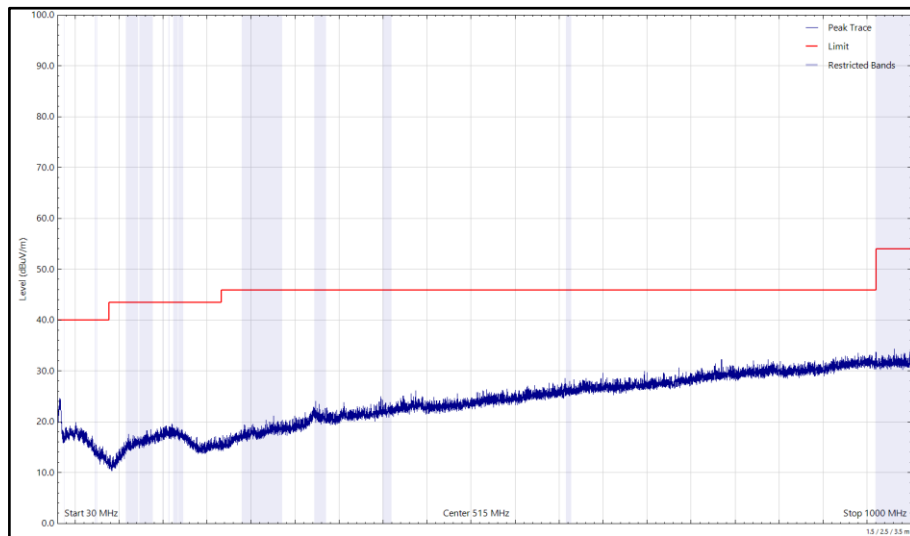


Figure 36 - 2412 MHz (CH1), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

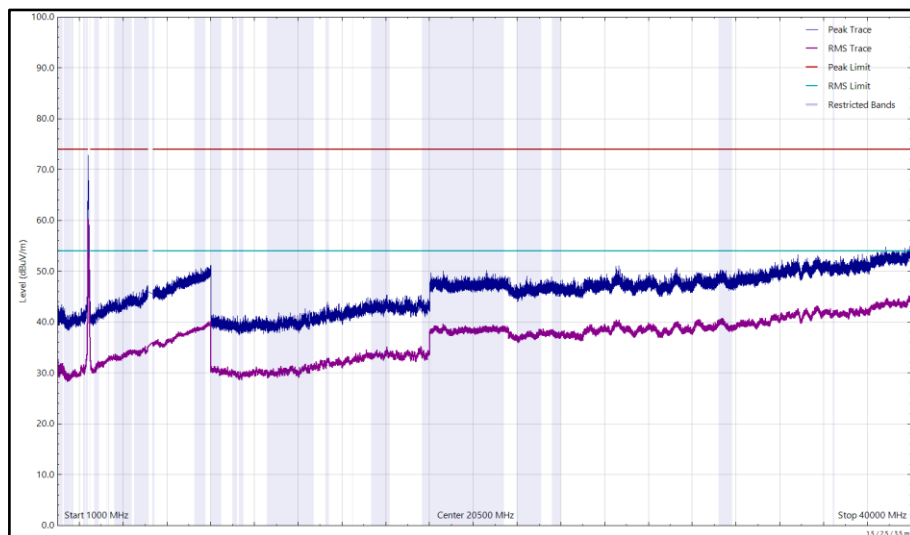


Figure 37 - 2412 MHz (CH1), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Vertical



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

Table 15 - 2472 MHz (CH13), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 40 GHz

*No emissions found within 10 dB of the limit.

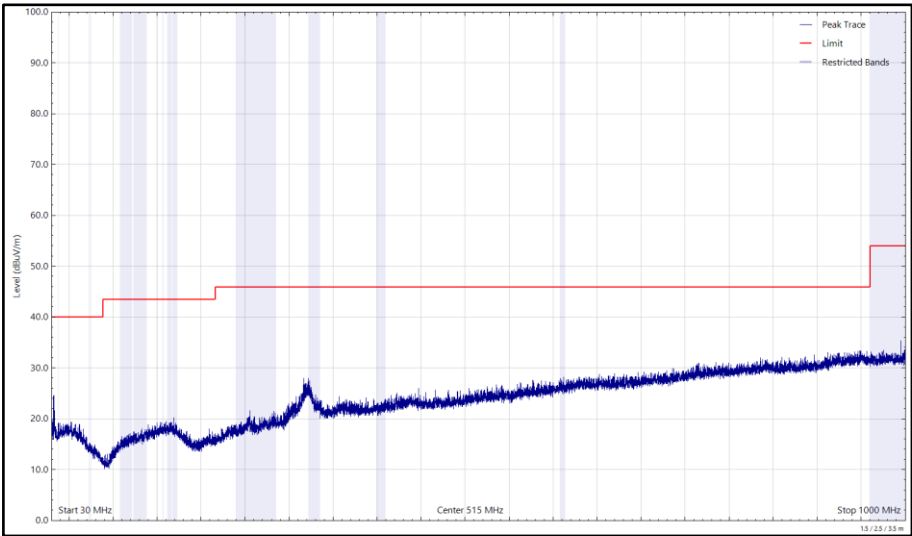


Figure 38 - 2472 MHz (CH13), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

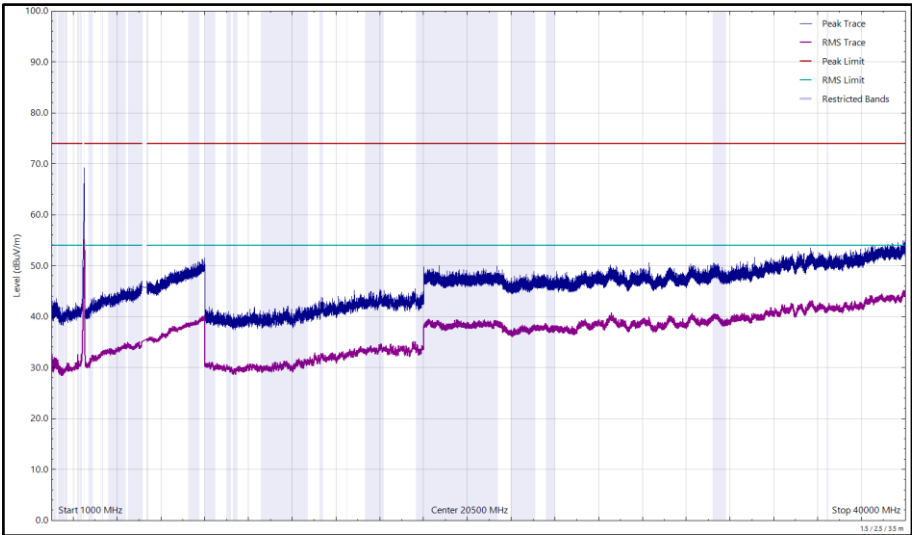


Figure 39 - 2472 MHz (CH13), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Horizontal

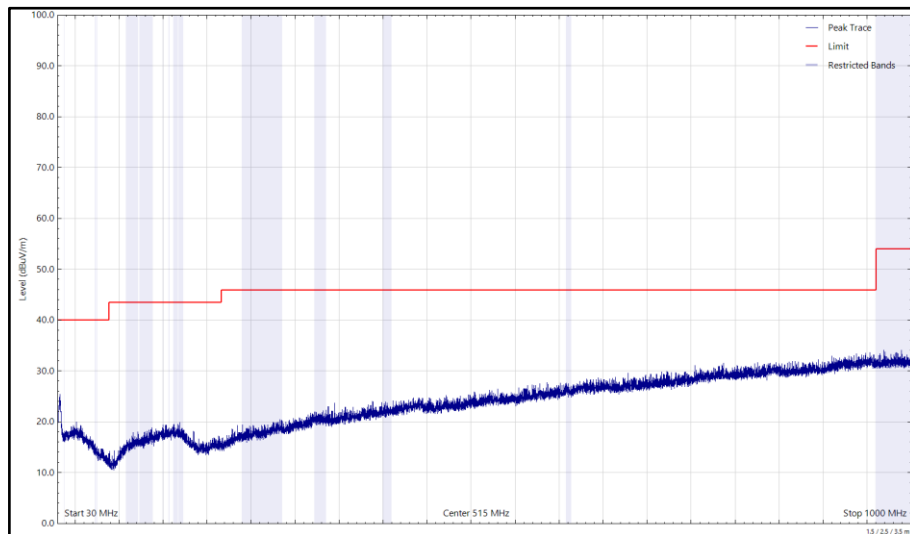


Figure 40 - 2472 MHz (CH13), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

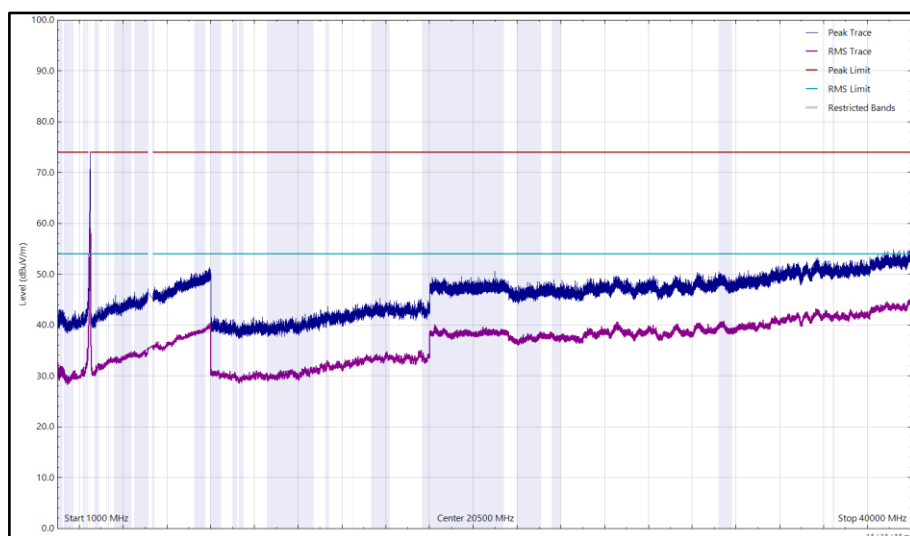


Figure 41 - 2472 MHz (CH13), HT20, Core 1 and 5162 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
5426.530	36.66	54.00	-17.34	RMS	242	141	Vertical

Table 16 - 2412 MHz (CH1), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

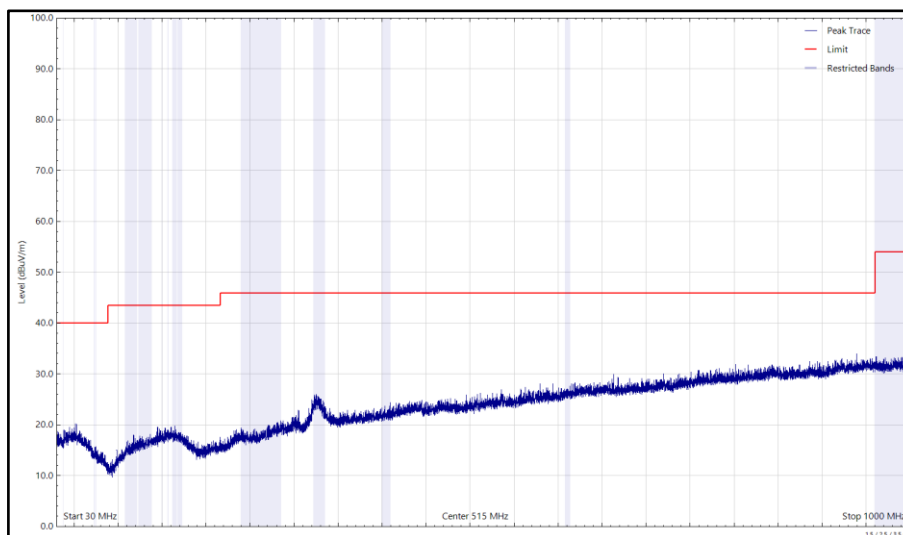


Figure 42 - 2412 MHz (CH1), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

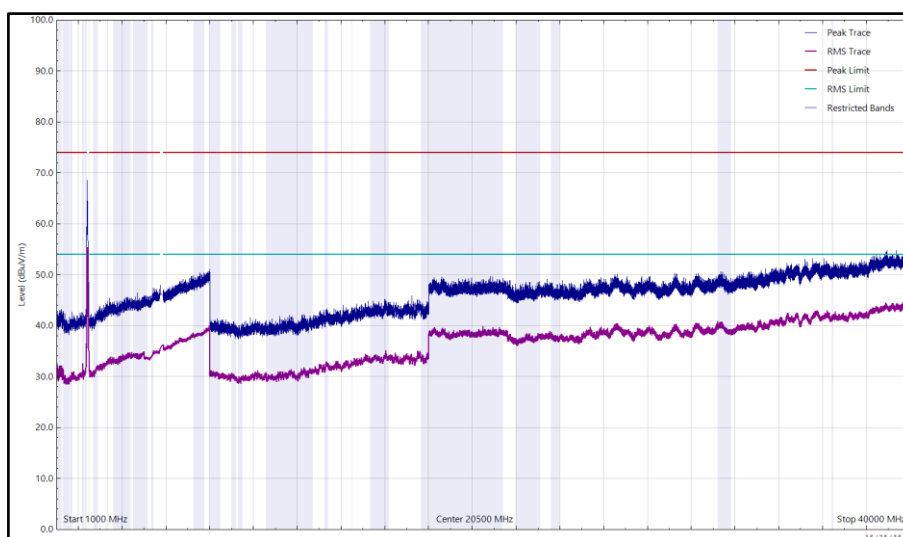


Figure 43 - 2412 MHz (CH1), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Horizontal

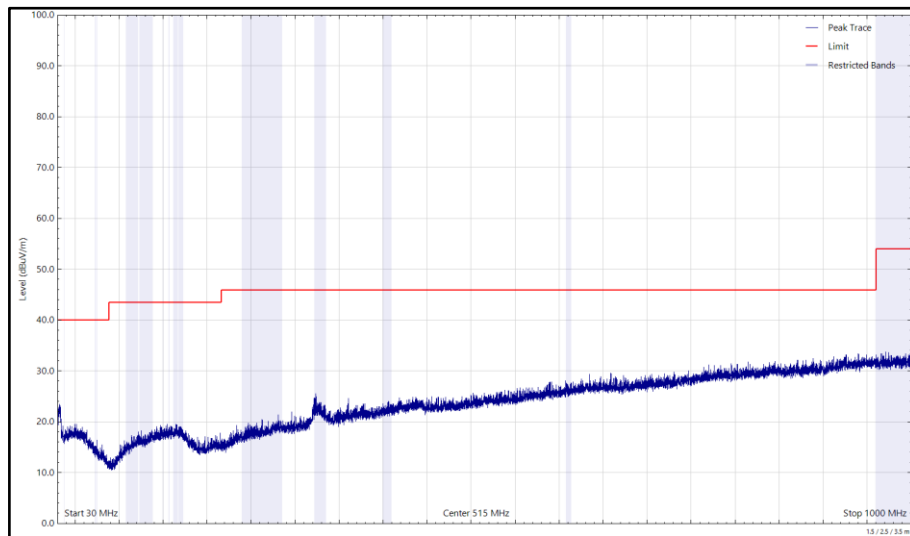


Figure 44 - 2412 MHz (CH1), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

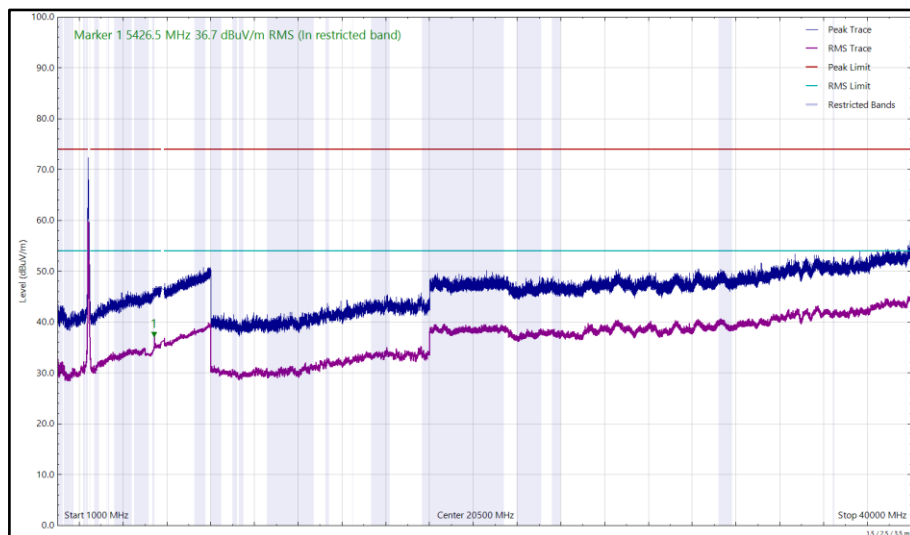


Figure 45 - 2412 MHz (CH1), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
5426.684	36.53	54.00	-17.47	RMS	242	152	Vertical

Table 17 - 2472 MHz (CH13), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

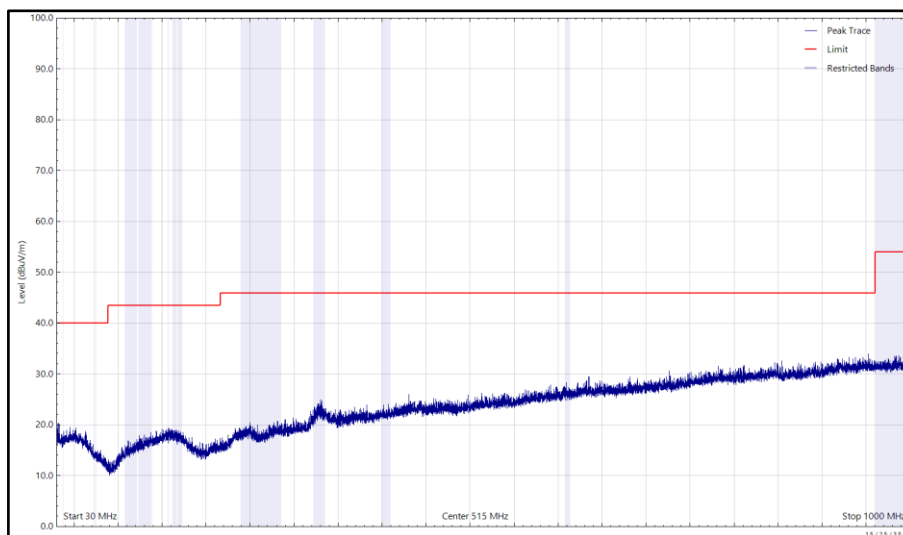


Figure 46 - 2472 MHz (CH13), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Horizontal (Peak)

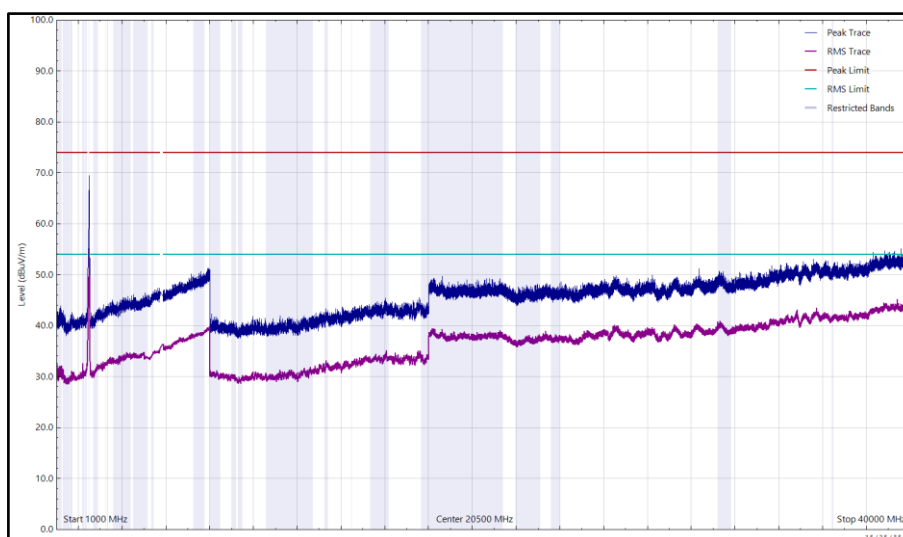


Figure 47 - 2472 MHz (CH13), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Horizontal

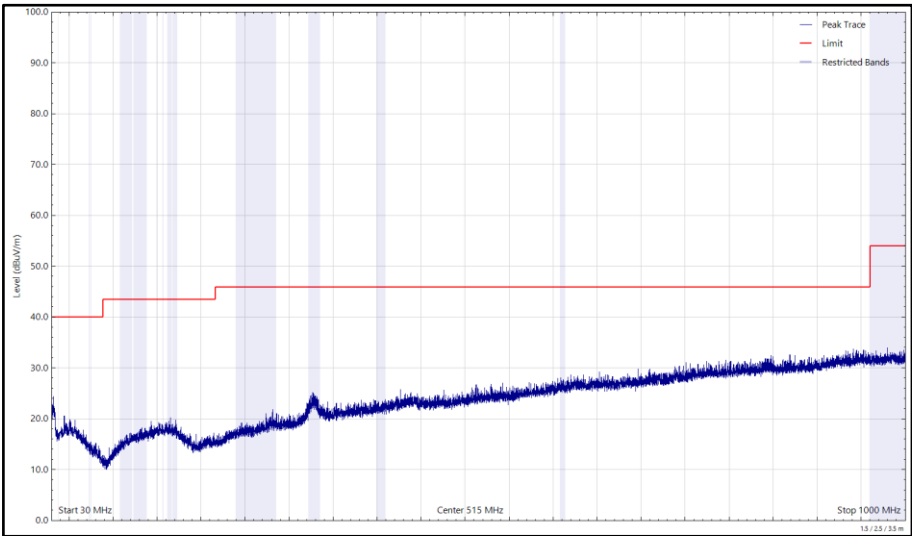


Figure 48 - 2472 MHz (CH13), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 30 MHz to 1 GHz, Vertical (Peak)

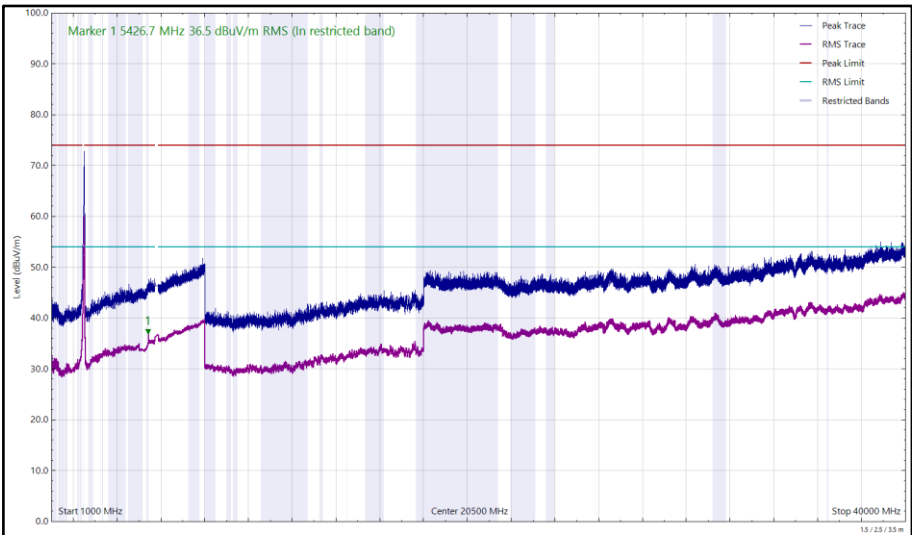


Figure 49 - 2472 MHz (CH13), HT20, Core 1 and 5844 MHz, HDR4, ePA, Core 0, 1 GHz to 40 GHz, Vertical



FCC 47 CFR Part 15, ISED RSS-247 and ISED RSS-GEN

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 15.247 (d) / RSS-247 Clause 5.5	-30 dBc
Part 15.407 (b) / RSS-247 Clause 6.2	-27 dBm (EIRP) / 68 dBµV/m at 3m.
Part 15.209 / RSS-GEN Clause 8.9	Peak: 74 dBµV/m at 3m, Average 54 dBµV/m at 3m

Table 18

CoTX - 2.4 GHz Bluetooth + 6 GHz WLAN

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
32.319	22.75	40.00	-17.25	Q-Peak	190	115	Vertical
11912.505	34.33	54.00	-19.67	RMS	12	145	Vertical

Table 19 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

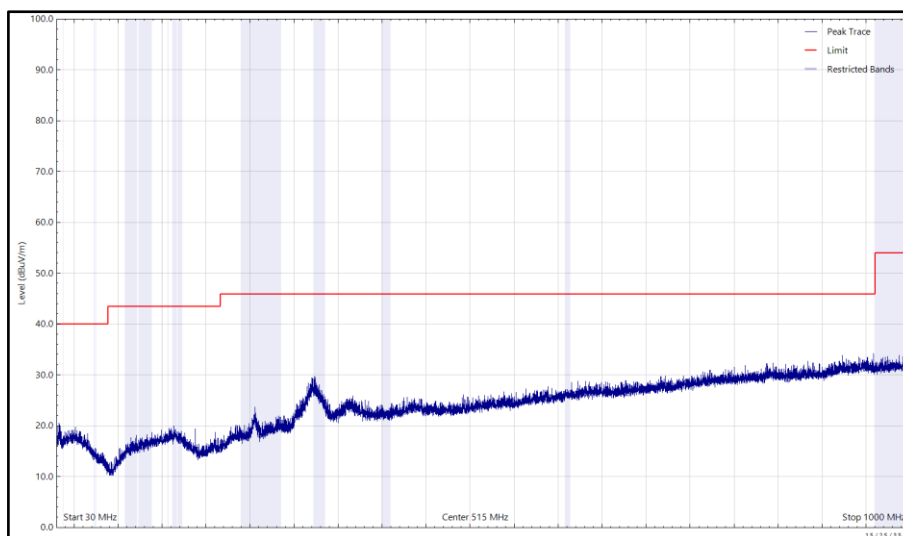


Figure 50 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

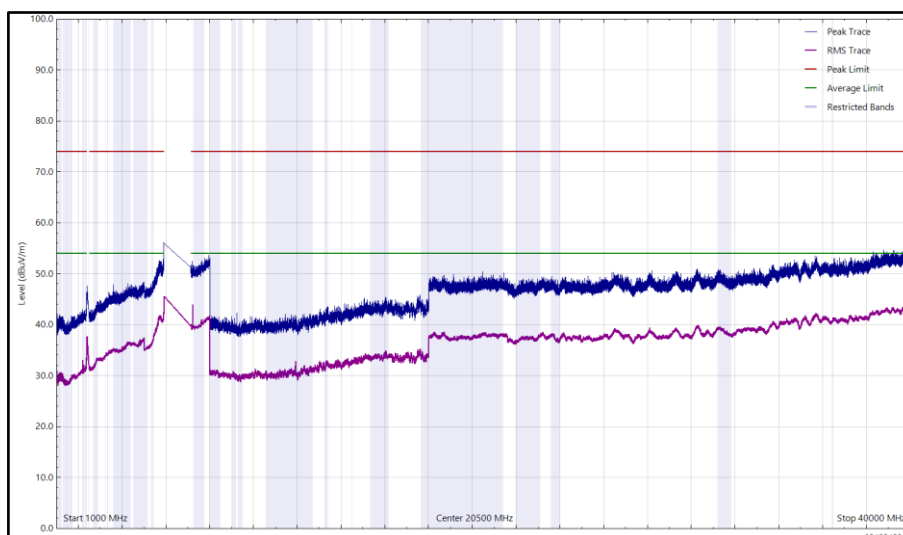


Figure 51 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

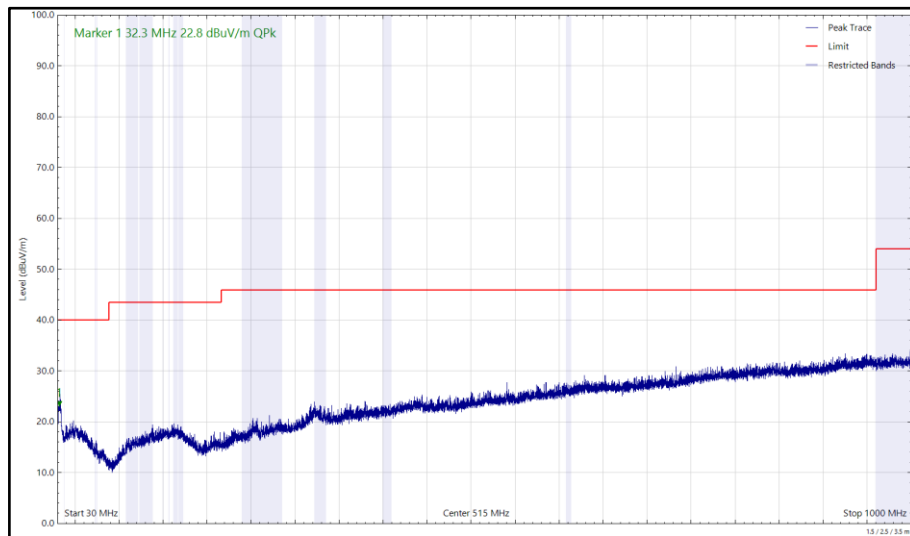


Figure 52 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

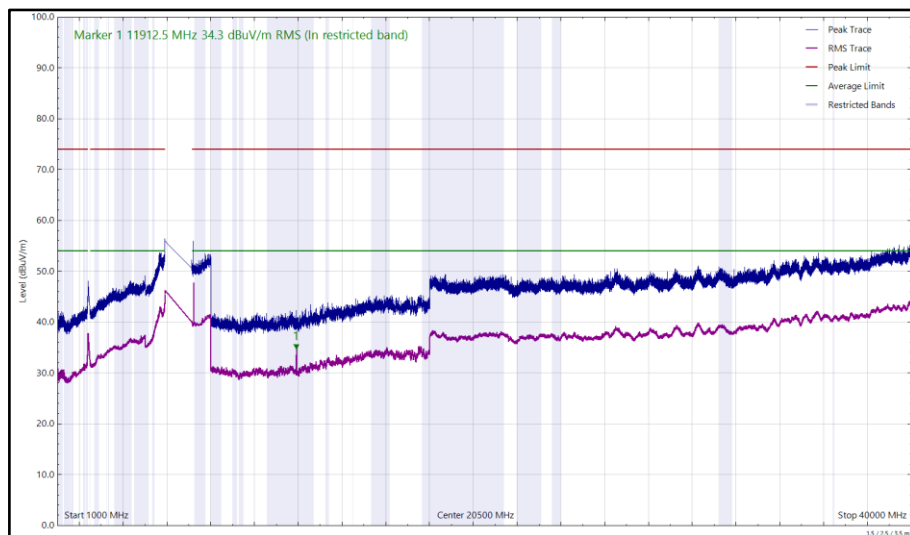


Figure 53 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
32.713	20.43	40.00	-19.57	Q-Peak	326	135	Vertical

Table 20 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

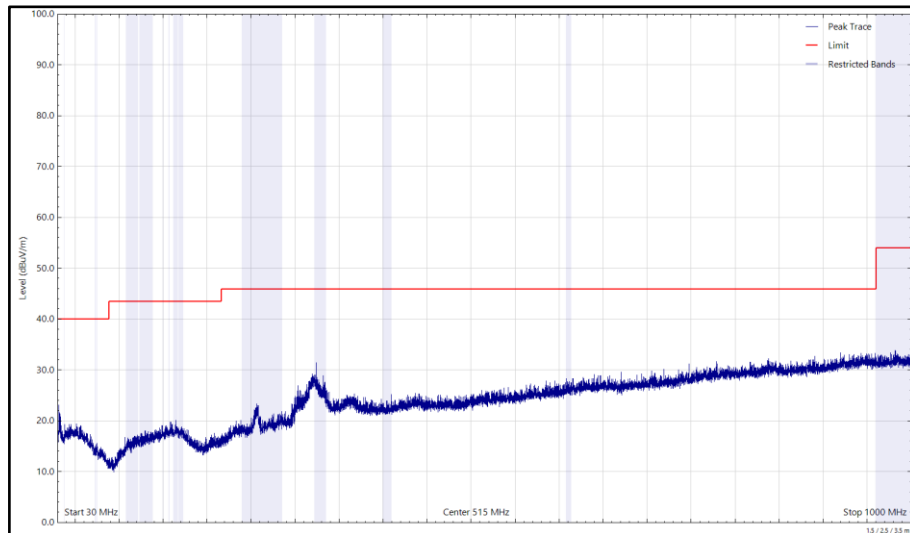


Figure 54 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

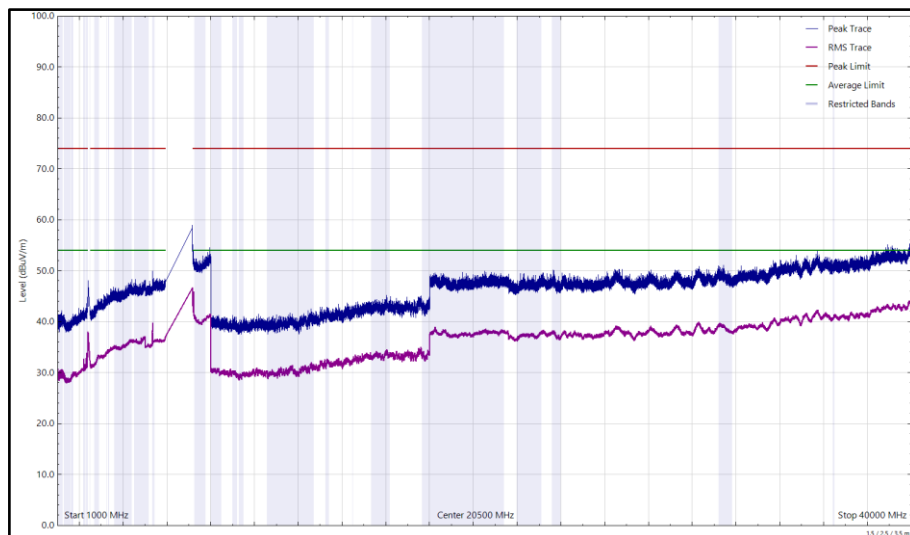


Figure 55 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

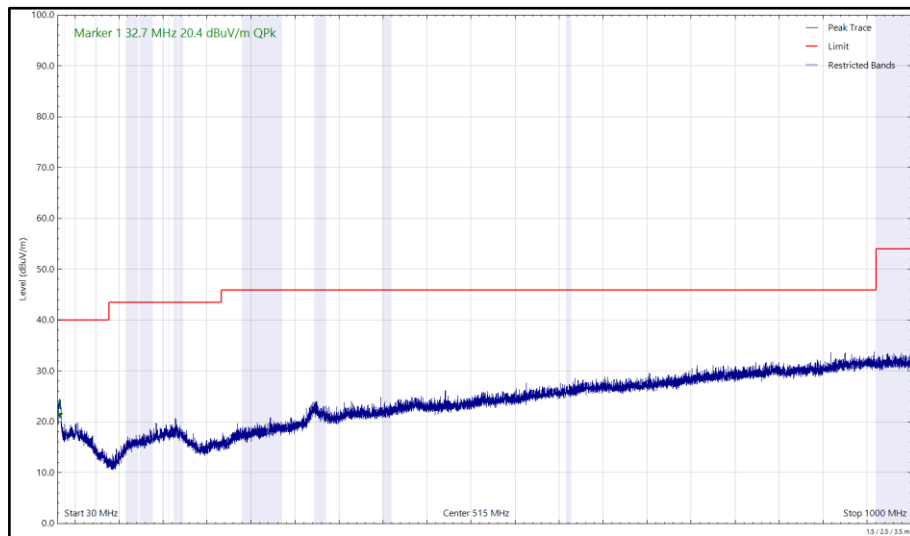


Figure 56 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

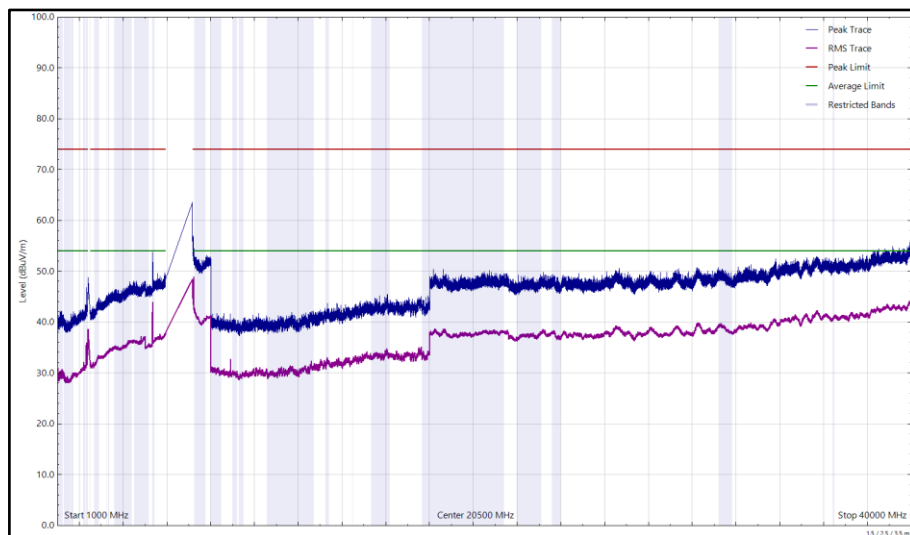


Figure 57 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2402 MHz (CH0), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
7439.757	42.30	54.00	-11.70	CISPR Avg	334	174	Horizontal
7440.217	56.45	74.00	-17.55	Peak	333	181	Horizontal
7440.394	44.99	54.00	-9.01	CISPR Avg	320	100	Vertical
7440.629	59.04	74.00	-14.96	Peak	316	100	Vertical
11910.029	33.49	54.00	-20.51	RMS	14	124	Vertical

Table 21 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

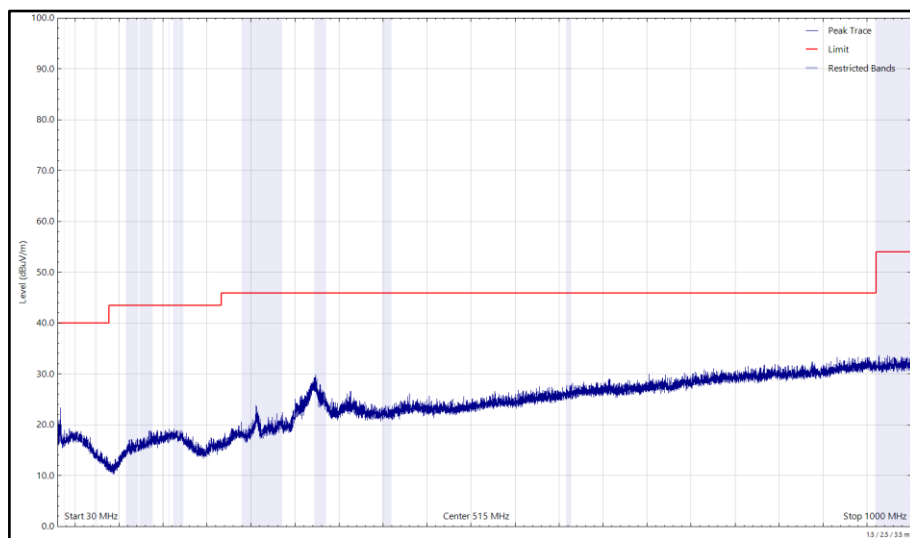


Figure 58 - U-NII-5 - 5955 (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

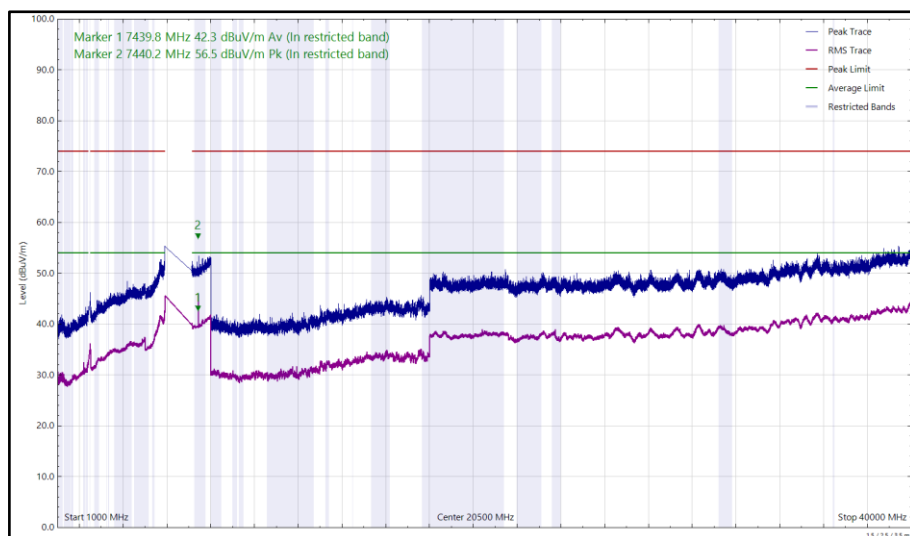


Figure 59 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

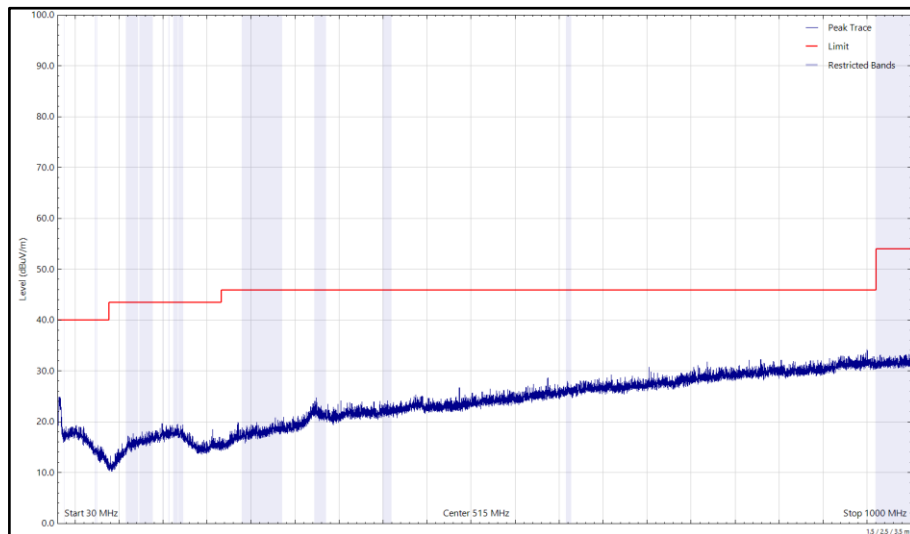


Figure 60 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

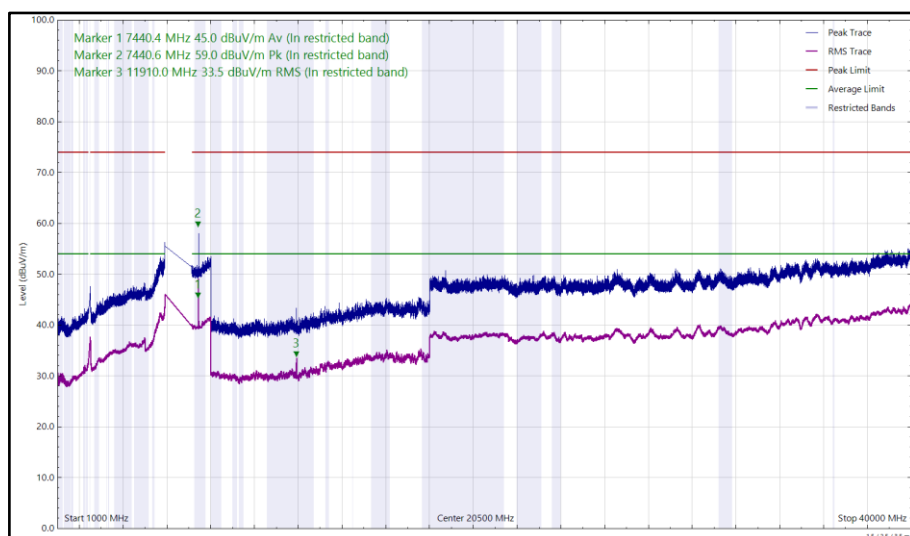


Figure 61 - U-NII-5 – 5955 MHz (CH1-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
7439.412	59.61	74.00	-14.39	Peak	317	110	Vertical
7440.372	43.48	54.00	-10.52	CISPR Avg	285	196	Vertical
7440.595	55.59	74.00	-18.41	Peak	337	159	Horizontal
7440.767	40.65	54.00	-13.35	CISPR Avg	334	183	Horizontal

Table 22 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 10 dB of the limit.

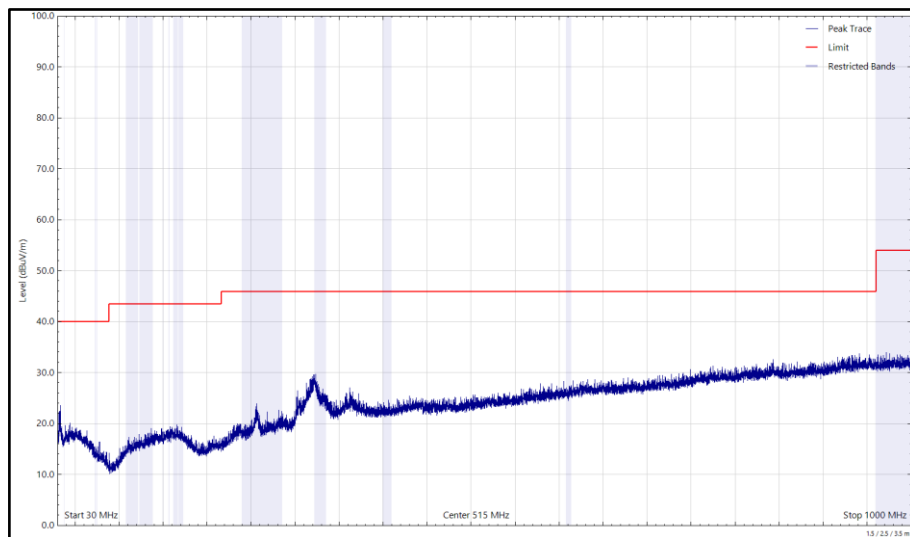


Figure 62 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

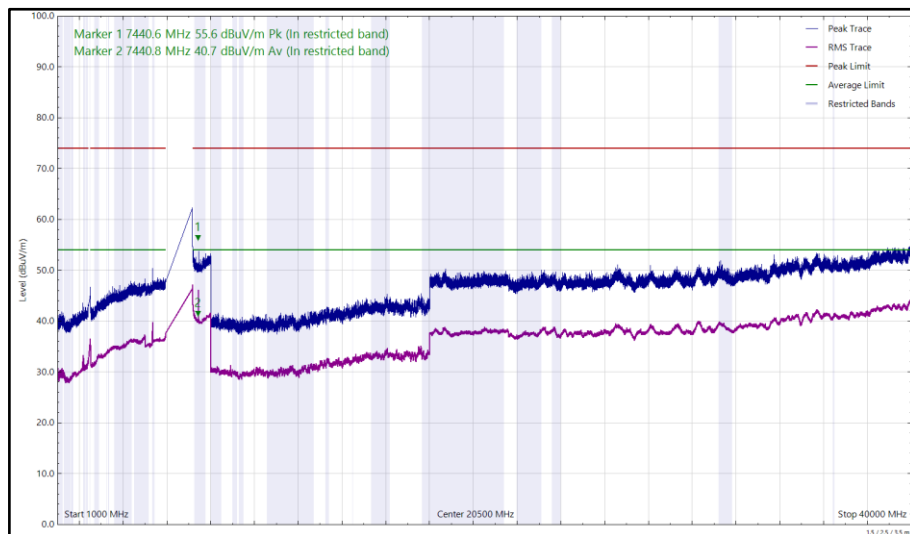


Figure 63 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal

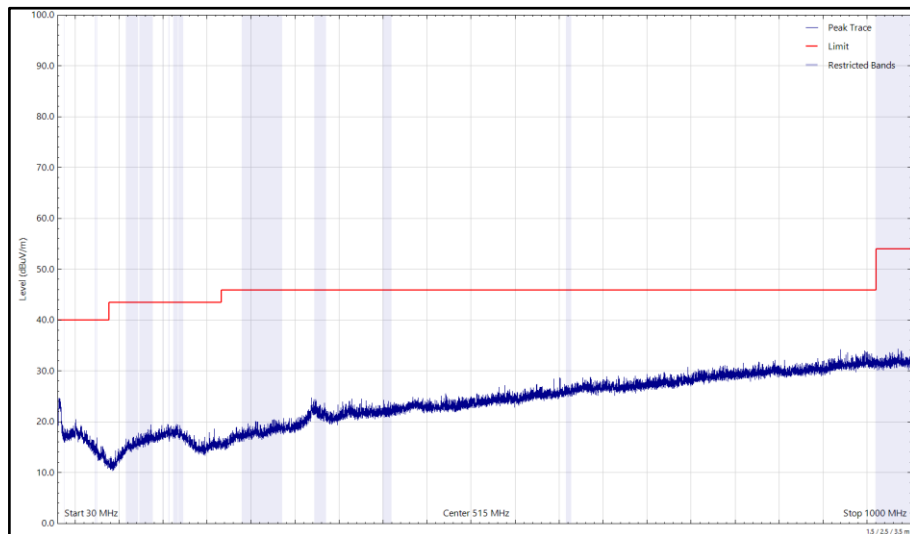


Figure 64 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

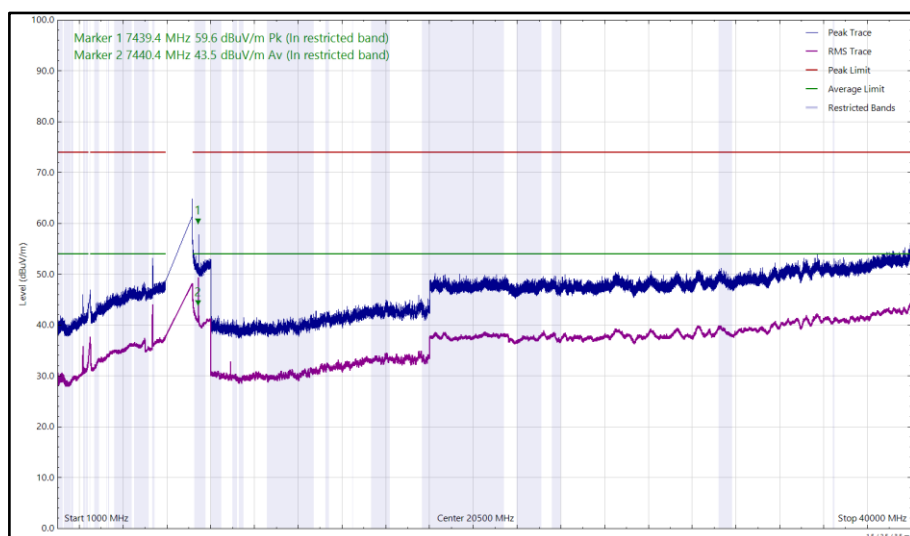


Figure 65 - U-NII-8 – 7115 MHz (CH233-6E), HE20, SU, CDD, Core 0 + Core 1 and 2480 MHz (CH78), 2-DH5, ePA, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical



FCC 47 CFR Part 15, ISED RSS-247, ISED RSS-248 and ISED RSS-GEN

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 15.247 (d) / RSS-247 Clause 5.5	-20 dBc
Part 15.407 (b) / RSS-248 Clause 4.7.2.	Peak: -7 dBm/MHz e.i.r.p, Average: -27 dBm/MHz e.i.r.p
Part 15.209 / RSS-GEN Clause 8.9	Peak: 74 dB μ V/m at 3m, Average 54 dB μ V/m at 3m

Table 23



2.1.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 15.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Expiry Date
Band Reject Filter - 2.425 GHz	Wainwright	WRCGV14-2390-2400-2450-2460-50SS	5067	12	11-Oct-2023
Band Reject Filter - 2.4585 GHz	Wainwright	WRCGV14-2423.5-2433.5-2483.5-2493.5-50SS	5069	12	05-Nov-2022
Band Reject Filter - 5.22 GHz	Wainwright	WRCJV12-5120-5150-5290-5320-50SS	5073	12	11-Oct-2023
Band Reject Filter - 5.690 GHz	Wainwright	WRCJV8-5635-5670-5710-5745-50SS	5081	12	11-Oct-2023
Emissions Software	TUV SUD	EmX V3.1.4 V.3.1.4	5125	-	Software
Pre Amp 1 - 26.5 GHz	Agilent Technologies	8449B	5445	12	12-May-2023
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5548	12	11-May-2023
EMI Test Receiver	Rohde & Schwarz	ESW44	5911	12	24-Feb-2023
Cable (K Type 2m)	Junkosha	MWX241-01000KMSKMS/B	5937	12	14-May-2023
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5939	12	29-May-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5944	24	03-Feb-2024
1500W (300V 12A) AC Power Supply	iTech	IT7324	5956	-	O/P Mon
5m Semi-Anechoic Chamber (Dual-Axis)	Albatross Projects	RF Chamber 15	5963	36	28-Apr-2025
Compact Antenna Mast	Maturo Gmbh	CAM4.0-P	5964	-	TU
Mast & Turntable Controller	Maturo Gmbh	FCU3.0	5966	-	TU
Tilt Antenna Mast	Maturo Gmbh	BAM4.5-P	5967	-	TU
Turntable	Maturo Gmbh	TT1.5SI	5968	-	TU
Cable (SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5996	12	06-Jun-2023
Cable (N to N 1m)	Junkosha	MWX221-01000NMSNMS/B	5999	12	05-Jun-2023
Cable (N to N 7m)	Junkosha	MWX221-07000NMSNMS/B	6005	12	05-Jun-2023
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/A	6006	12	05-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	6007	12	06-Jun-2023
Cable (SMA to SMA 6.5m)	Junkosha	MWX221-06500AMSAMS/B	6014	12	07-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/B	6019	12	07-Jun-2023



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Expiry Date
Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA9120B	6140	12	21-Jun-2023
Digital Multimeter	Fluke	115	6147	12	16-Jun-2023
Humidity & Temperature meter	R.S Components	1364	6150	12	17-Jun-2023
Double Ridge Active Horn Antenna (18-40 GHz)	Com-Power	AHA-840	6188	24	02-Jun-2024
SAC Switch Unit	TUV SUD	SSU003	6191	12	15-Jul-2023
8GHz Highpass Filter	Wainwright	WHKX 7150 8000 18000 50SS	6195	12	15-Jul-2023
Pre Amp 8 - 18 GHz	Wright Technologies	APS06 0061	6198	12	19-Jul-2023
Attenuator 4dB	Pasternack	PE7074-4	6203	24	16-Jul-2024
Cable (SMA to SMA 20cm)	TUV SUD	MH-FH 8-18	6214	12	25-Jul-2023

Table 24

TU - Traceability Unscheduled



3 Measurement Uncertainty

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

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

Table 25

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.