FCC and or ISEDC Test Report

Apple Inc
Model: A2169

In accordance with FCC 47 CFR Part 15, ISED RSS-247 and ISED RSS-GEN (Simultaneous Transmissions)

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

FCC ID: BCGA2169 IC: 579C-A2169

COMMERCIAL-IN-CONFIDENCE

Document 75946858-14 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	11 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 and ISED (Simultaneous Transmission). The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Colin Brain	11 January 2021	
Testing	Liang Tian	11 January 2021	
Testing	Connor Lee	11 January 2021	
Testing	Mohammad Malik	11 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 Parts 15: 2019, ISED RSS-247: Issue 2 (2017-02) and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

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

Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	11-January-2021

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2169
Serial Number(s)	C07CL0AMQ4TG
Hardware Version(s)	REV 1.0
Software Version(s)	18J42710o
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15: 2019 ISED RSS-247: Issue 2 (2017-02) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019)
Order Number Date	5200311918 07-April-2020
Date of Receipt of EUT	01-June-2020
Start of Test	10-September-2020
Finish of Test	12-November-2020
Name of Engineer(s)	Connor Lee, Colin Brain, Liang Tian and Mohammad Malik
Related Document(s)	ANSI C63.10: 2013

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC and ISED (Simultaneous Transmission) is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	FCC Part 15	RSS-247	RSS-GEN			
Configuration and Mode: SDB - 2.4 GHz WLAN and 5 GHz WLAN						
2.1	15.247 (d), 15.407 (b) and 15.209	5.5 and 6.2	8.9 and 8.10	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10: 2013
Configuration and Mode: CoTX - 2.4 GHz WLAN + 5GHz WLAN + Bluetooth						
2.1	15.247 (d), 15.407 (b) and 15.209	5.5 and 6.2	8.9 and 8.10	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10: 2013
Configuration and Mode: CoTX - 5GHz WLAN + Bluetooth + Thread						
2.1	15.247 (d), 15.407 (b) and 15.209	5.5 and 6.2	8.9 and 8.10	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.10: 2013

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.

1.5 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

Table 3

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: SDB - 2.4 GHz WLAN and 5 GHz WLAN		
Radiated Spurious Emissions (Simultaneous Transmission)	Colin Brain, Liang Tian, Connor Lee & Mohammad Malik	UKAS
Configuration and Mode: CoTX - 2.4 GHz WLAN + 5GHz WLAN + Bluetooth		
Radiated Spurious Emissions (Simultaneous Transmission)	Colin Brain, Liang Tian, Connor Lee & Mohammad Malik	UKAS
Configuration and Mode: CoTX - 5GHz WLAN + Bluetooth + Thread		
Radiated Spurious Emissions (Simultaneous Transmission)	Colin Brain, Liang Tian, Connor Lee & Mohammad Malik	UKAS

Table 4

Office Address:

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

2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC 47 CFR Parts 15, Clause 15.247 (d), 15.407 (b) and 15.209
ISED RSS 247, Clause 5.5 and 6.2
ISED RSS GEN, Clause 8.9 and 8.10

2.1.2 Equipment Under Test and Modification State

A2169, S/N: C07CL0AMQ4TG - Modification State 0

2.1.3 Date of Test

10-September-2020 to 12-November-2020

2.1.4 Test Method

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

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

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4 for 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^(Field Strength in dBµV/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*LOG(3/1) = 9.54 dB.

2.1.5 Example Test Setup Diagram

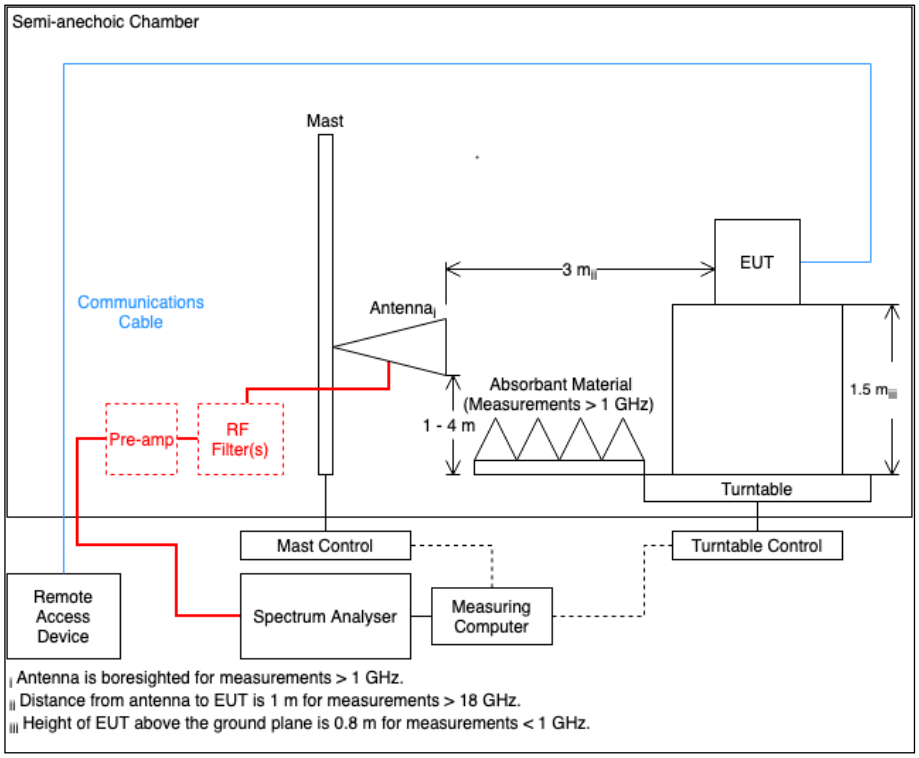

Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	19.3 - 25.5 °C
Relative Humidity	39.1 - 56.1 %

2.1.7 Test Results

SDB - 2.4 GHz WLAN and 5 GHz WLAN

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2745.488	36.1	54.0	-18.0	RMS	241	177	Vertical
4874.032	44.4	54.0	-9.6	RMS	143	109	Horizontal
4874.036	49.2	54.0	-4.8	RMS	336	100	Vertical
7310.066	43.2	54.0	-10.8	RMS	22	100	Vertical

Table 5 – 2437 MHz (CH6) - 802.11b, Core 0 and U-NII-1 5180 MHz (CH36) HT20 CDD, Core 0 + Core 1, 30 MHz to 40 GHz

No other emissions found within 6 dB of the limit.

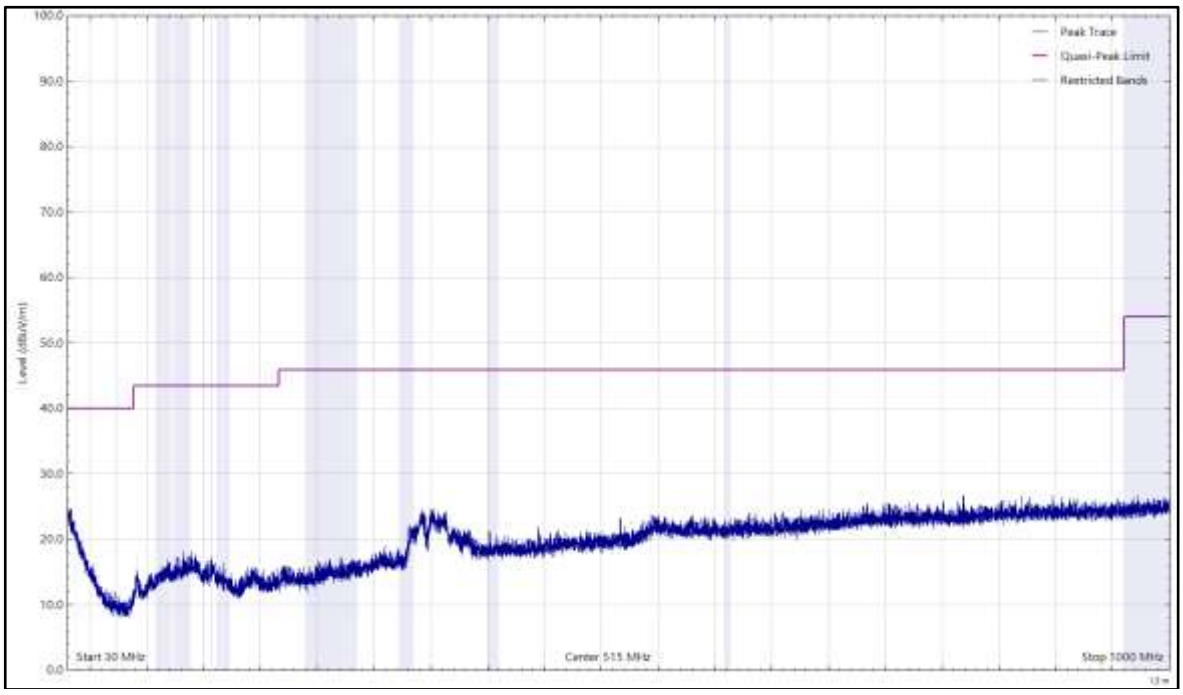

Figure 2 – 2437 MHz (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

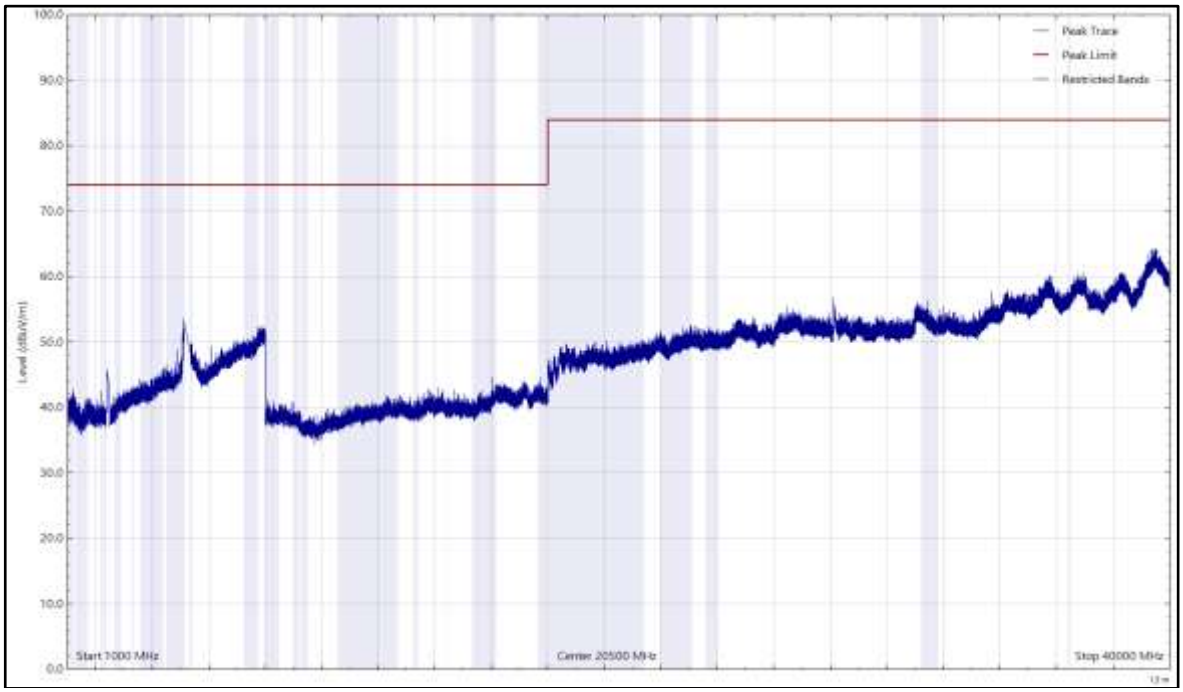

Figure 3 – 2437 MHz (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal (Peak)

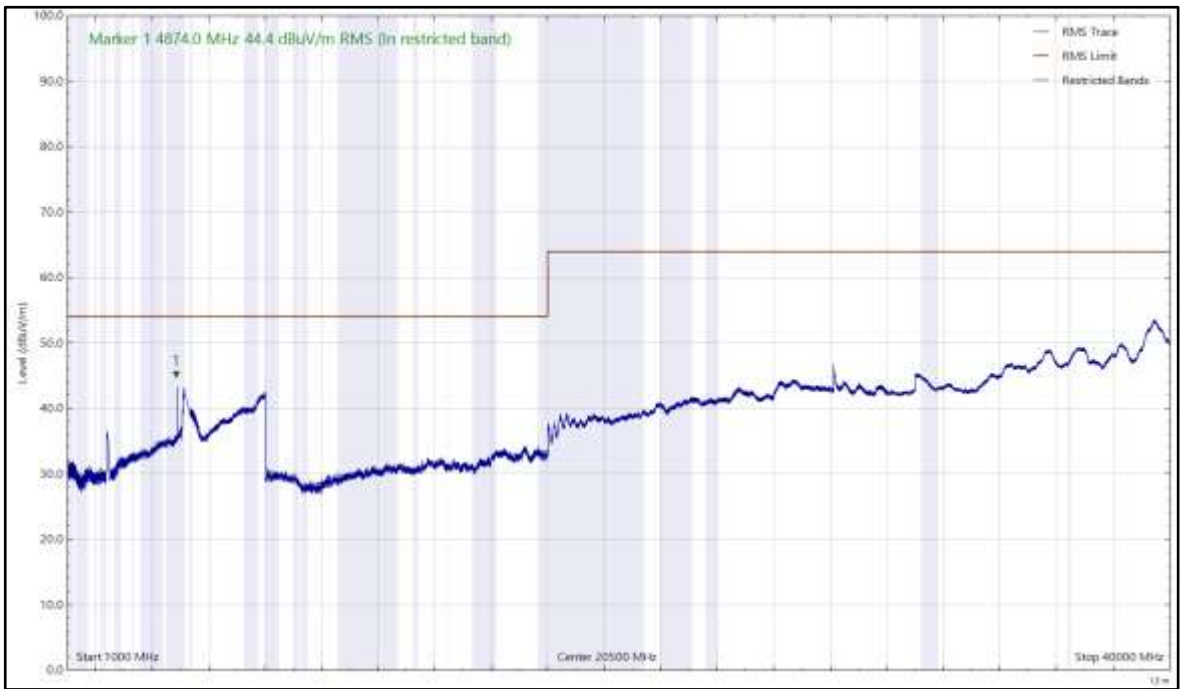

Figure 4 – 2437 MHz (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 1 GHz to 40 GHz, Horizontal (rms)

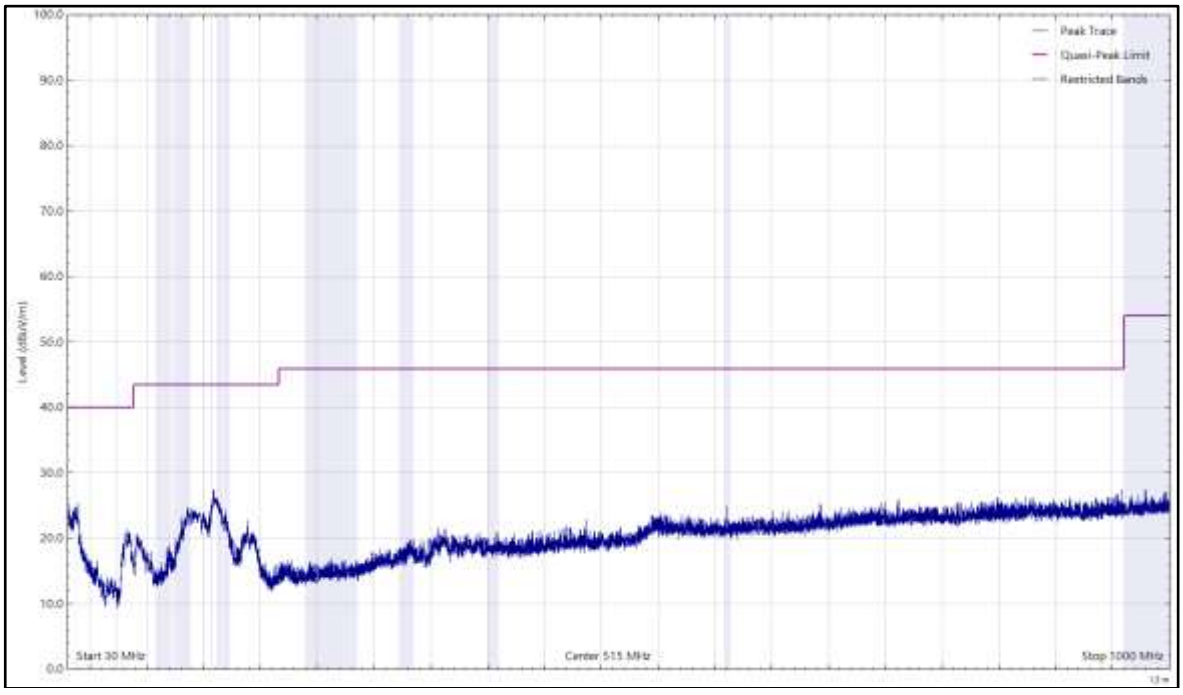

Figure 5 – 2437 MHZ (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

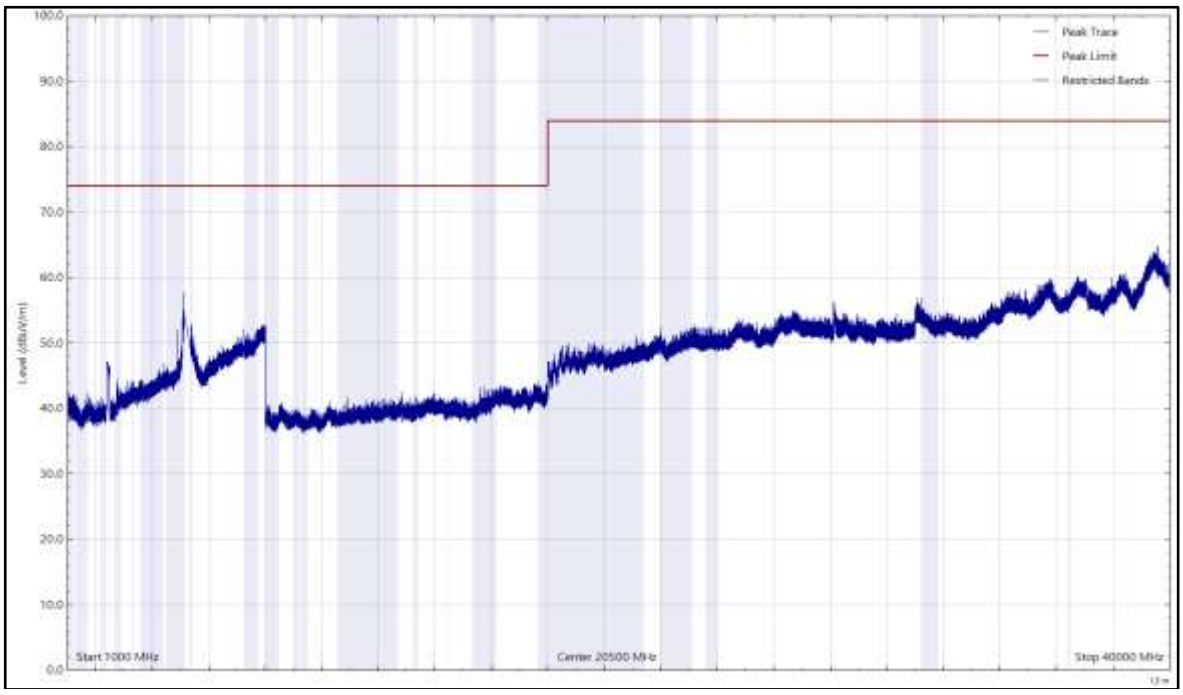

Figure 6 – 2437 MHz (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical (Peak)

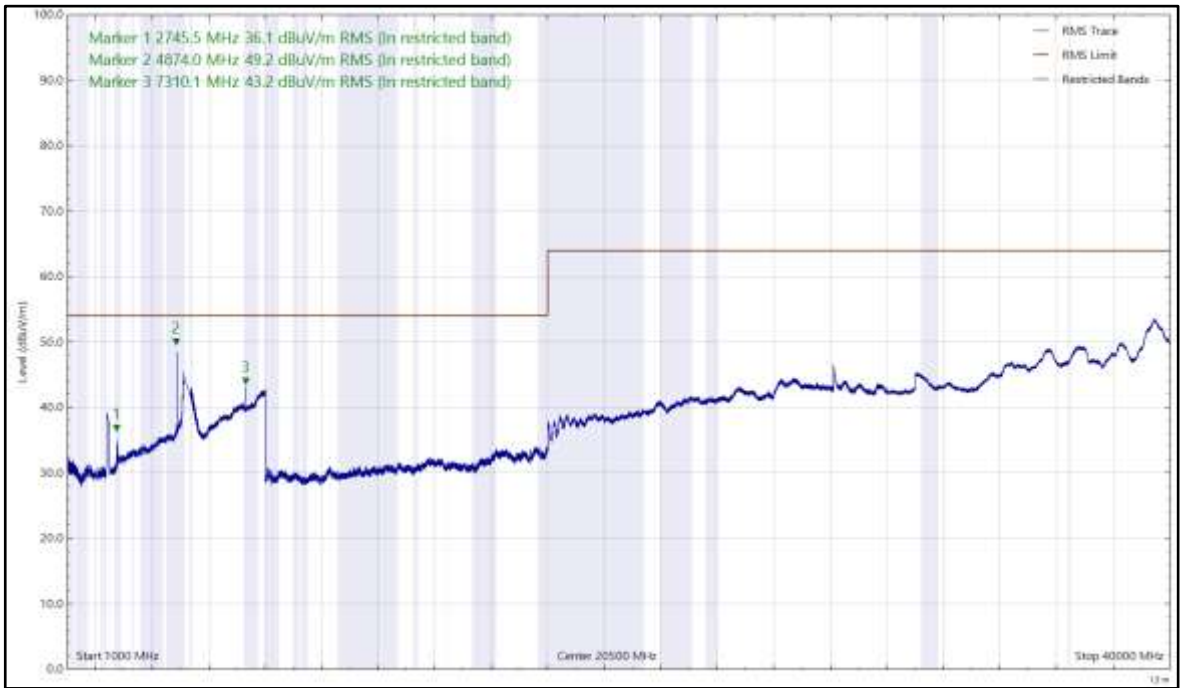

Figure 7 – 2437 MHz (CH6), 802.11b, Core 0 and U-NII-1 5180 MHz (CH36), HT20, CDD, Core 0 + Core 1, 1 GHz to 40 GHz, Vertical (rms)

CoTX - 2.4 GHz WLAN + 5GHz WLAN + Bluetooth

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2277.264	31.5	54.0	-22.5	CISPR Avg	326	339	Vertical
2277.719	30.4	54.0	-23.6	CISPR Avg	72	207	Horizontal
2339.874	61.2	74.0	-12.8	Peak	292	159	Horizontal
2339.874	42.2	54.0	-11.8	Peak (See Note)	292	159	Horizontal
2340.574	62.1	74.0	-12.0	Peak	140	158	Vertical
2340.574	43.1	54.0	-10.9	Peak (See Note)	140	158	Vertical
2526.338	64.4	74.0	-9.6	Peak	69	163	Horizontal
2526.423	65.8	74.0	-8.2	Peak	319	236	Vertical

Table 6 – 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 30 MHz to 40 GHz

No other emissions found within 6 dB of the limit.

Note: Average emission level was determined by subtracting
(DCCF = 20 * log (11.25 ms / 100 ms) = -19.0 dB) from the measured peak level as per ANSI C63.10-2013, clause 7.5.

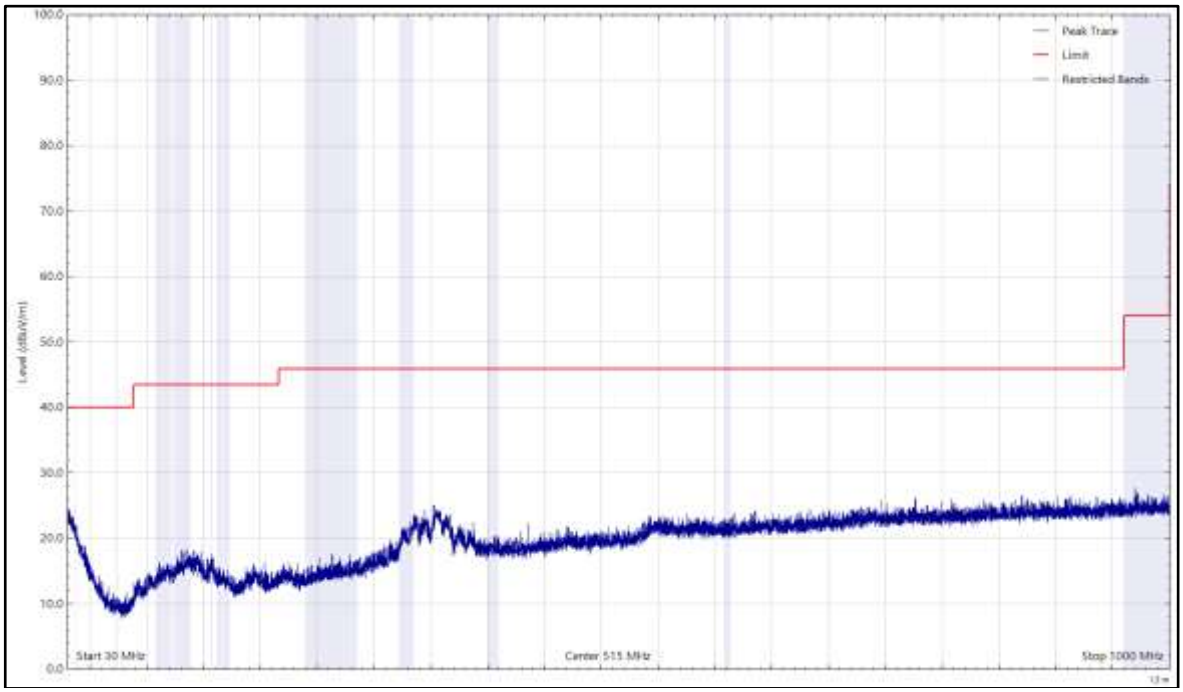

Figure 8 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 30 MHz to 40 GHz, 30 MHz to 1 GHz, Horizontal (Peak)

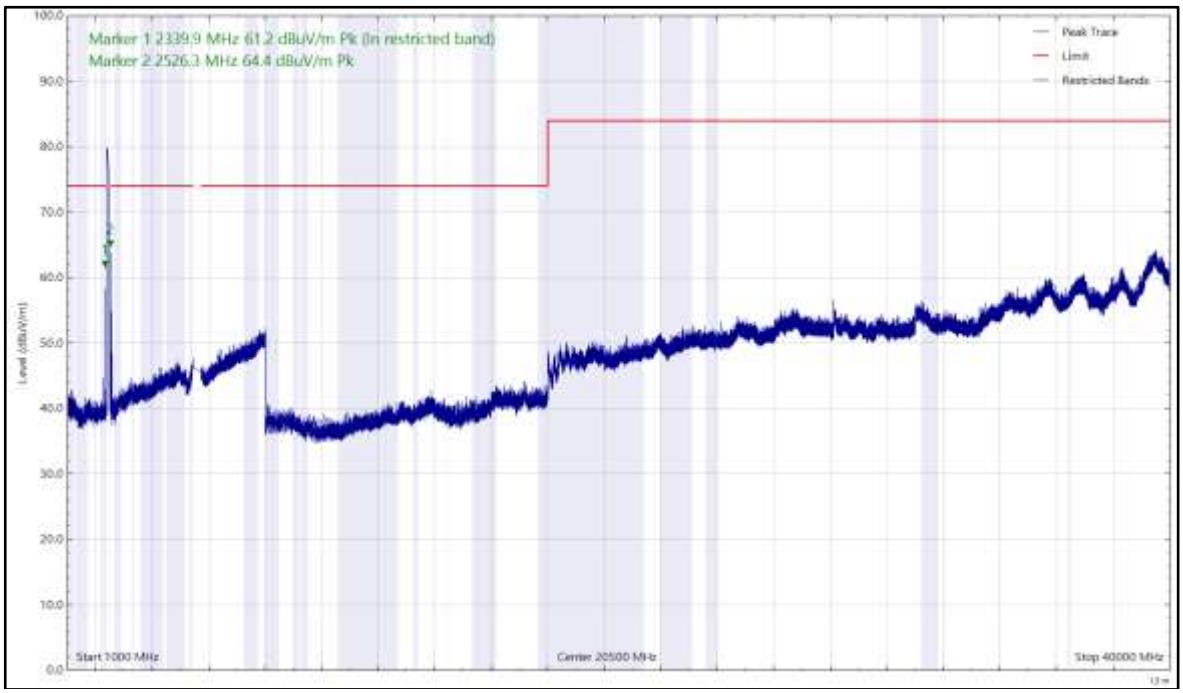

Figure 9 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 1 GHz to 40 GHz, Horizontal (Peak)

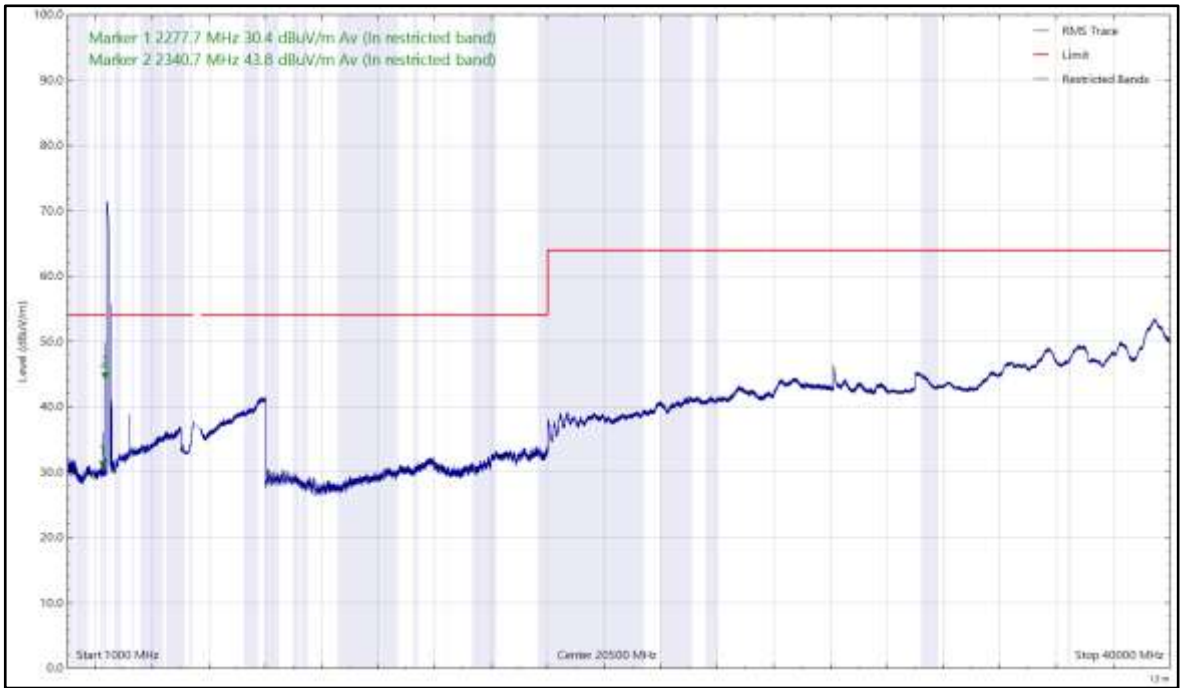

Figure 10 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 1 GHz to 40 GHz, Horizontal (rms)

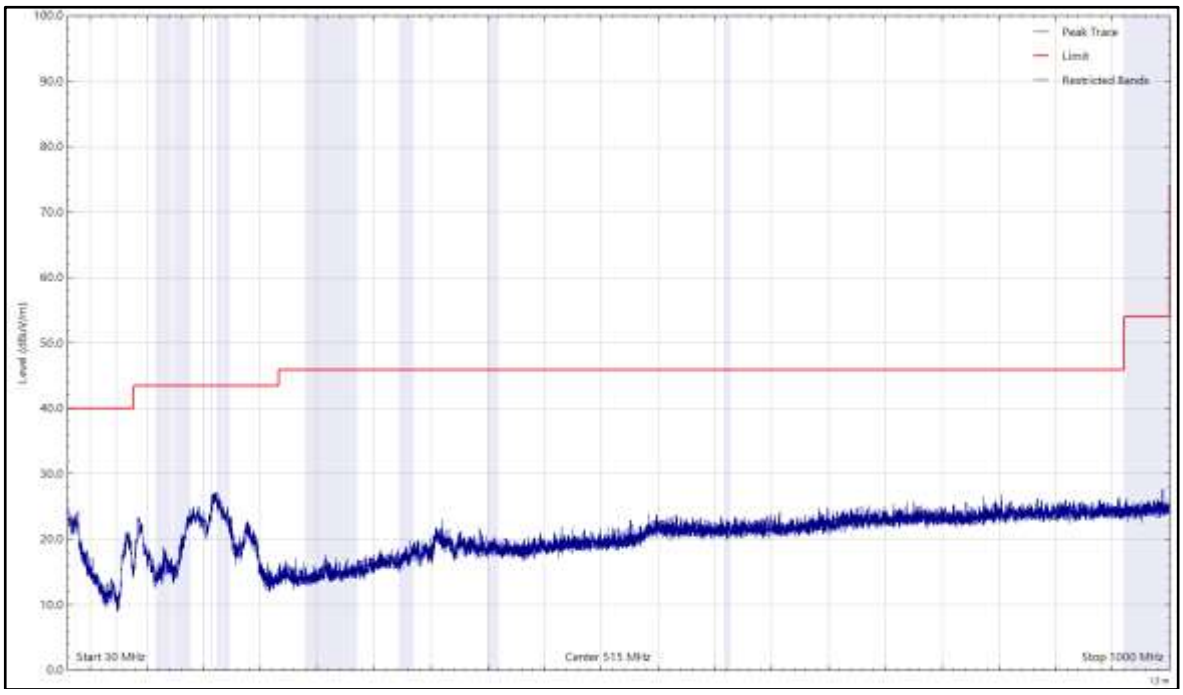

Figure 11 - (CH13), HE20, RU26-0, Core 0 + Core 1, (CH100), HE20, RU52-37, Core 0 + Core 1 and (CH0), DH5, iPA, Core 2, 30 MHz to 1 GHz, Vertical (Peak)

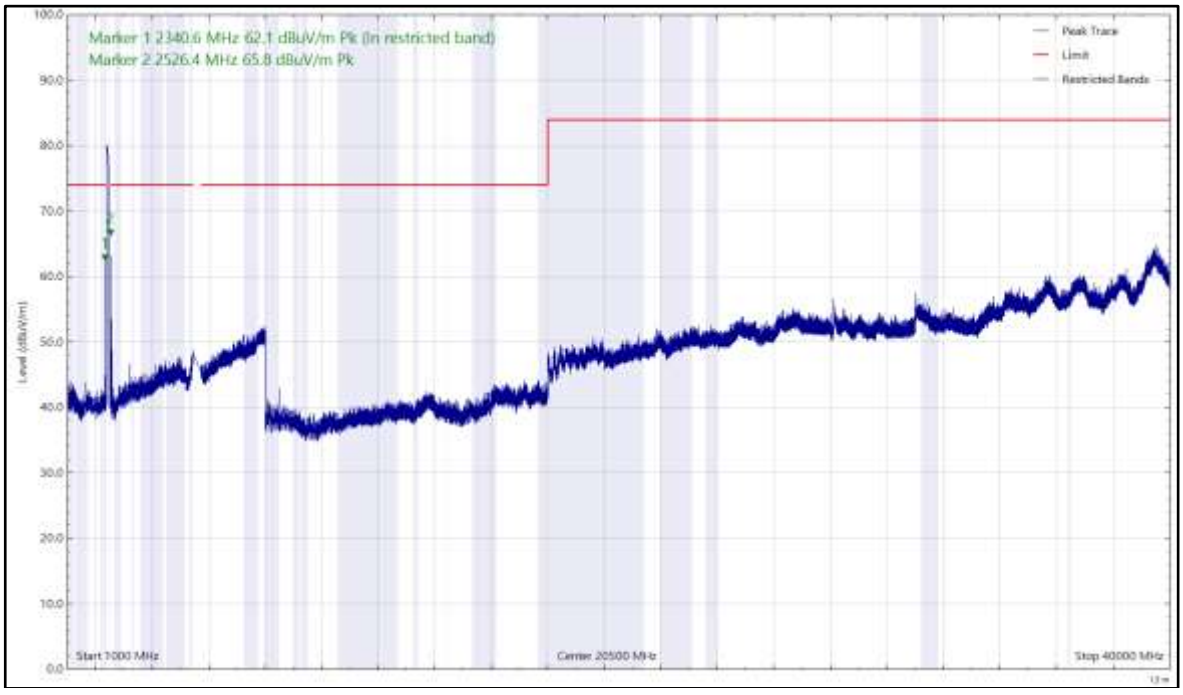

Figure 12 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 1 GHz to 40 GHz, Vertical (Peak)

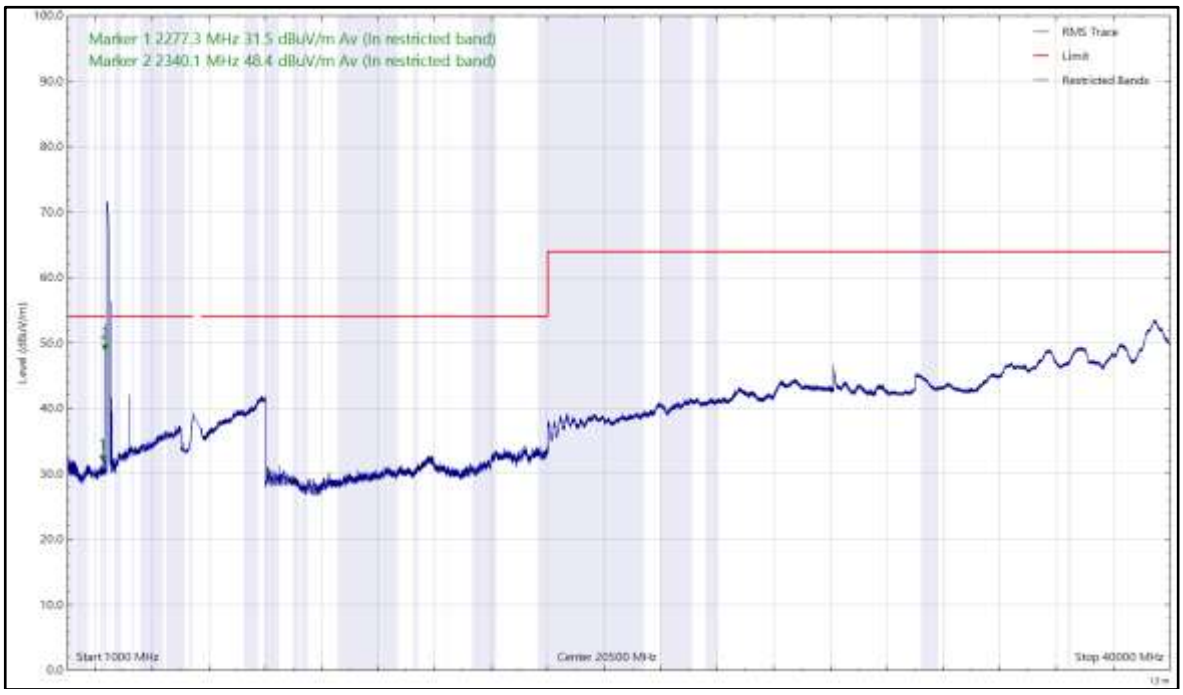

Figure 13 - 2472 MHz (CH13), HE20, RU26-0, Core 0 + Core 1 and U-NII 2a 5500 MHz (CH100), HE20, RU52-37, Core 0 + Core 1 and 2402 MHz (CH0), DH5, iPA, Core 2, 1 GHz to 40 GHz, Vertical (rms)

CoTX - 5GHz WLAN + Bluetooth + Thread

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
2328.925	40.7	54.0	-13.3	RMS	239	269	Vertical
2328.960	37.3	54.0	-16.7	RMS	336	111	Horizontal
2347.016	34.2	54.0	-19.8	RMS	0	112	Horizontal
2347.121	34.7	54.0	-19.3	RMS	330	189	Vertical
2546.958	56.7	74.0	-17.3	Peak	26	265	Vertical
2548.738	55.4	74.0	-18.6	Peak	63	148	Horizontal
4803.911	39.0	54.0	-15.0	RMS	359	103	Vertical
9070.097	35.1	54.0	-18.9	RMS	172	131	Vertical
9608.801	56.1	74.0	-17.9	Peak	299	246	Vertical
11472.707	41.5	54.0	-12.6	RMS	360	244	Vertical
11472.827	35.2	54.0	-18.8	RMS	246	120	Horizontal

Table 7 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread 30 MHz to 40 GHz

No other emissions found within 6 dB of the limit.

Note: Average emission level was determined by subtracting
(DCCF = 20 * log (11.25 ms / 100 ms) = -19.0 dB) from the measured peak level as per ANSI C63.10-2013, clause 7.5.

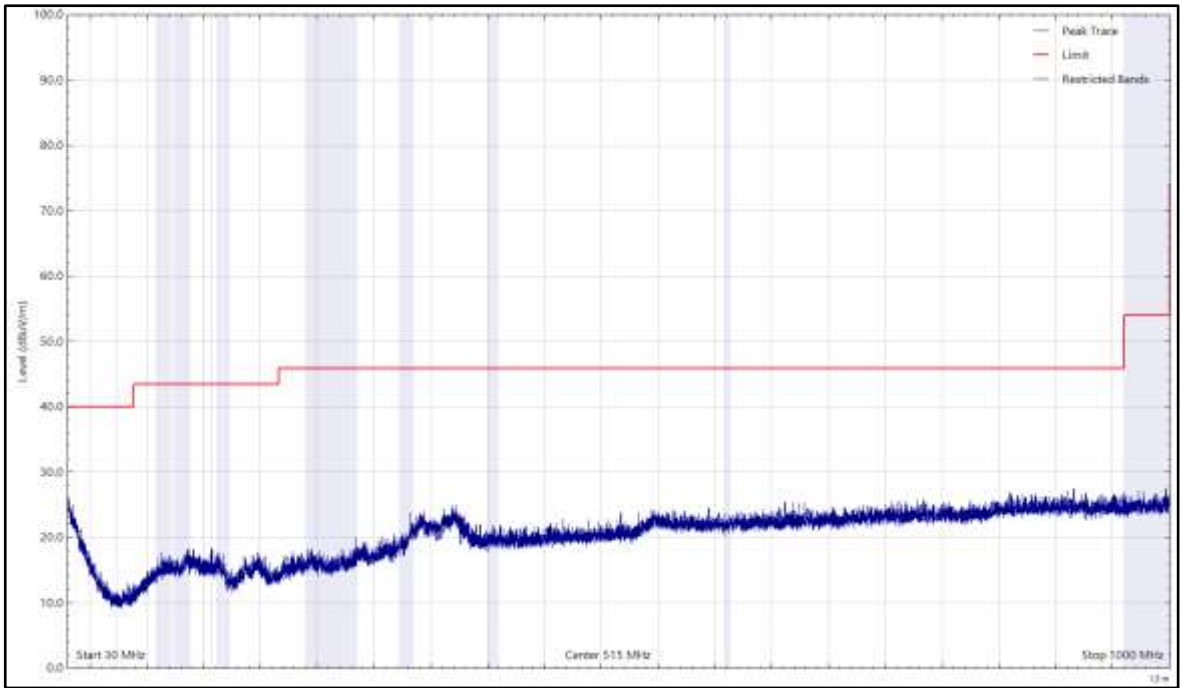

Figure 14 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread 30 MHz to 1 GHz, Horizontal (Peak)

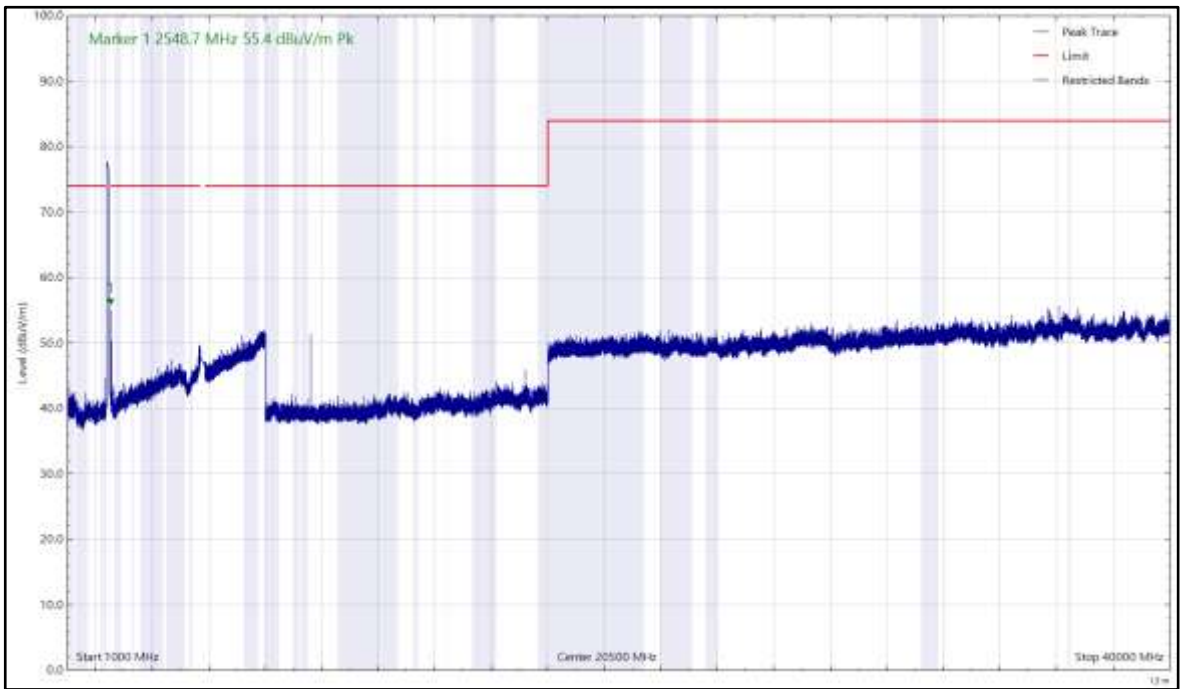

Figure 15 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25 1 GHz to 40 GHz, Horizontal (Peak)

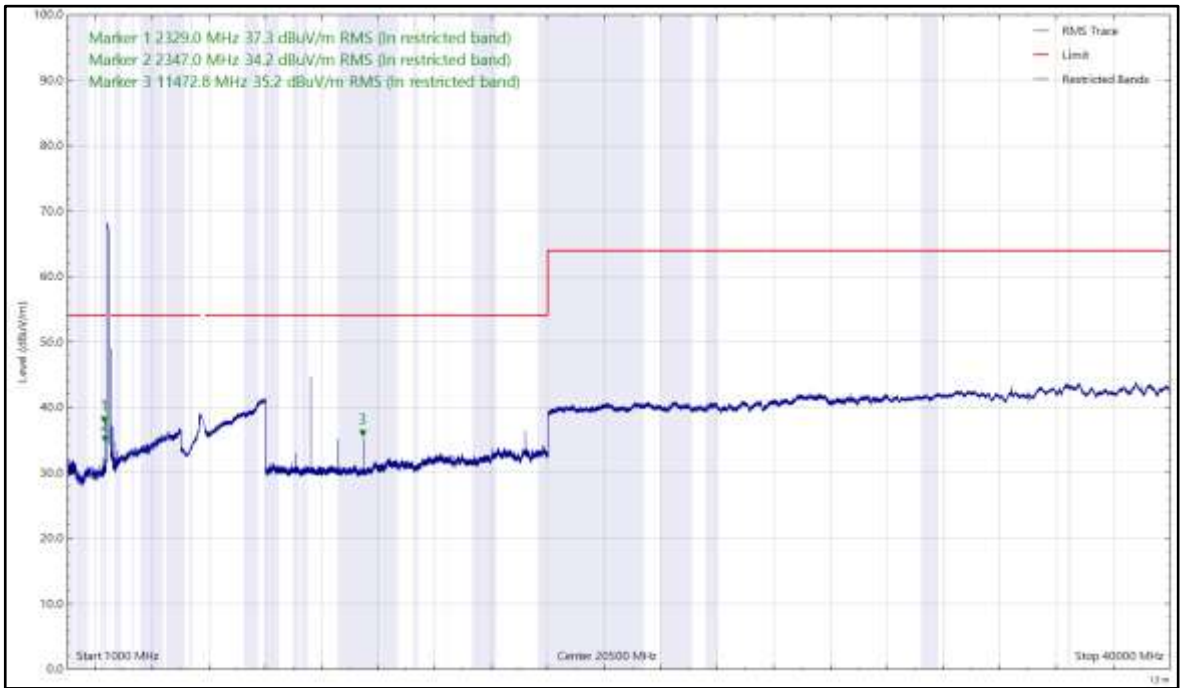

Figure 16 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread 1 GHz to 40 GHz, Horizontal (rms)

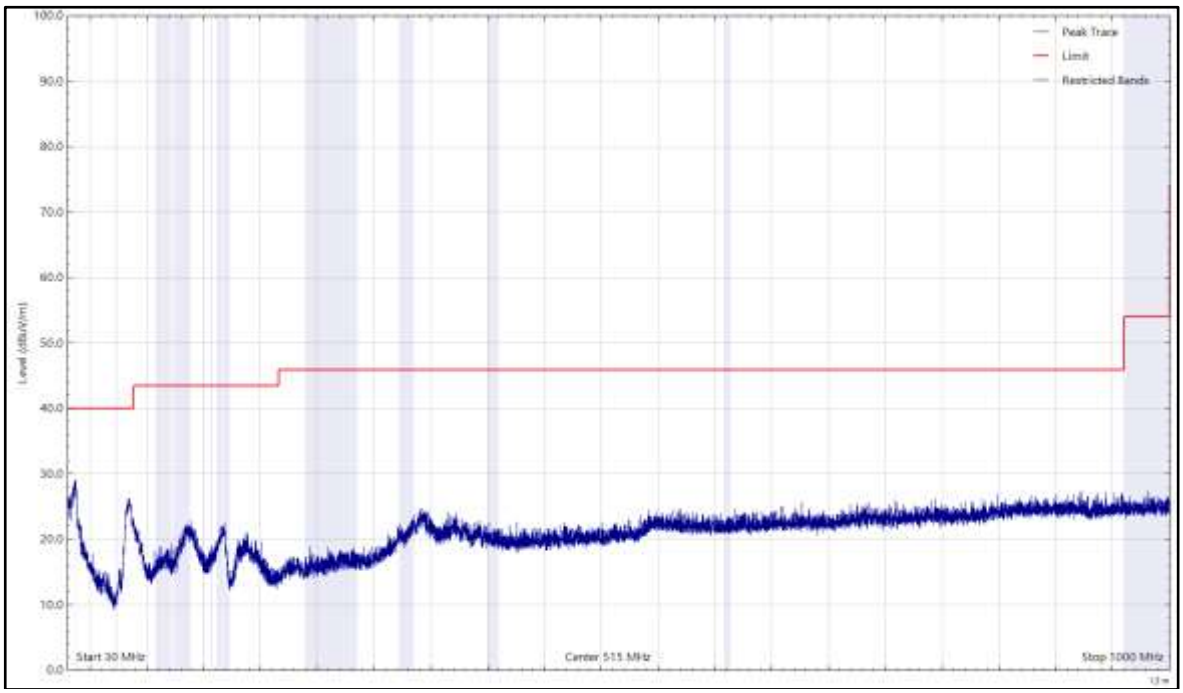

Figure 17 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread) 30 MHz to 1 GHz, Vertical (Peak)

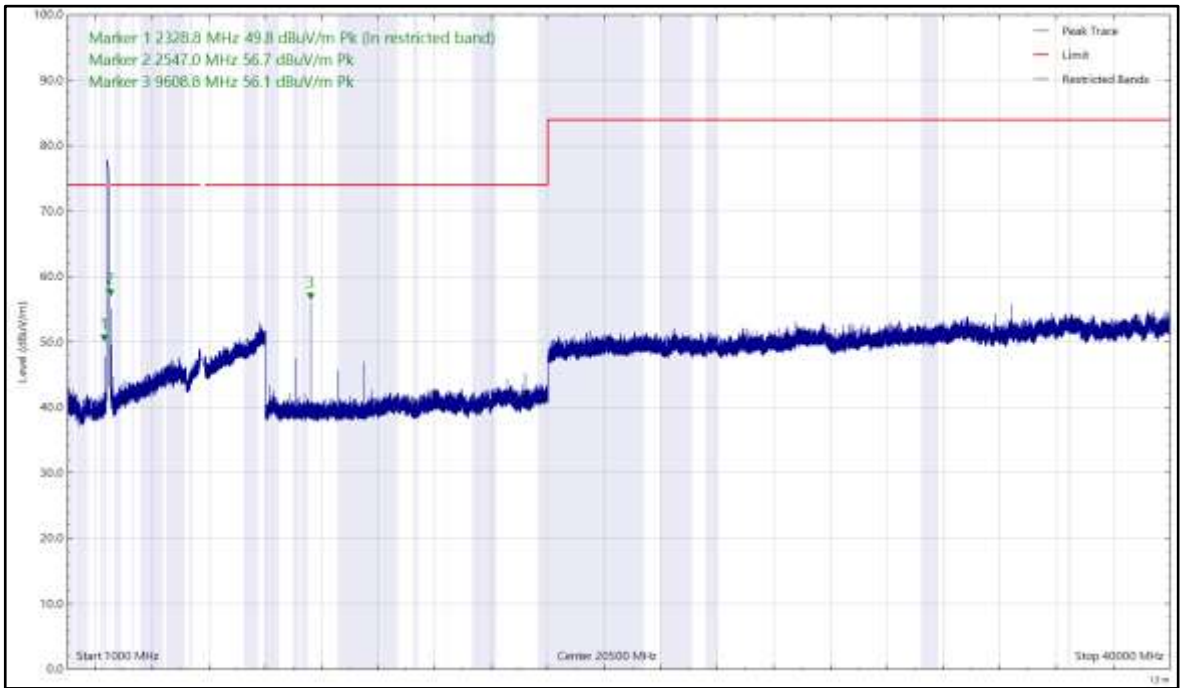

Figure 18 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread) 1 GHz to 40 GHz, Vertical (Peak)

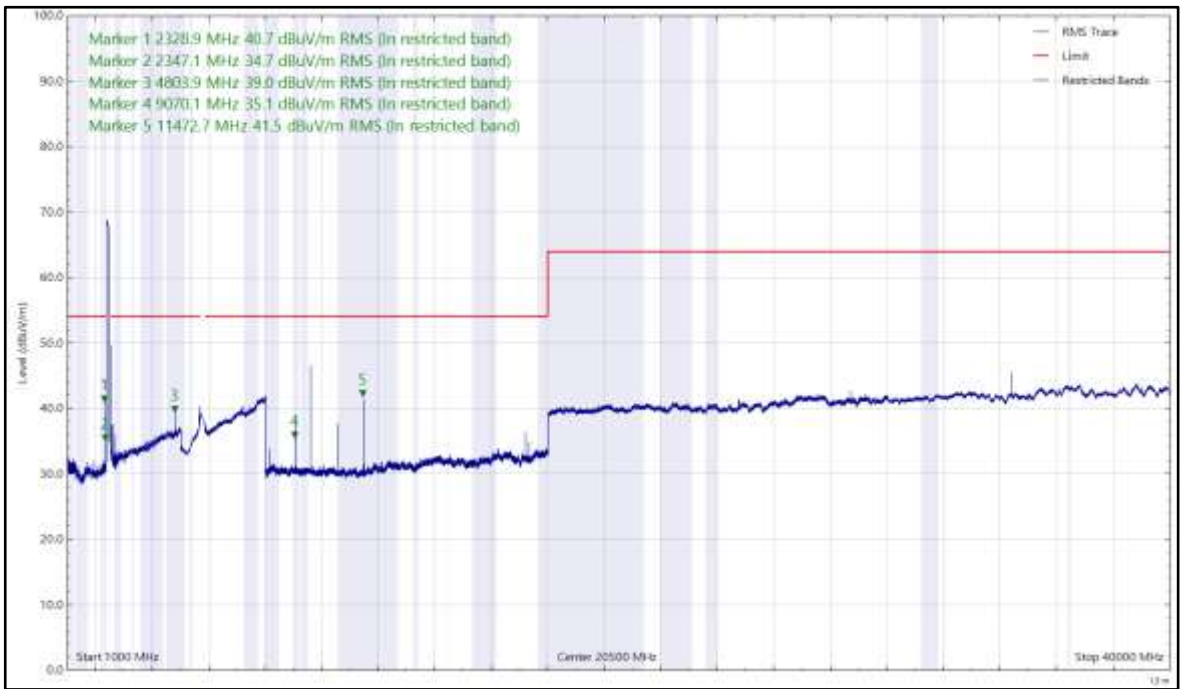

Figure 19 - 5745 MHz (CH149), HE20, RU26-0, Core 0 + Core 1 and 2402 MHz (CH37), LE1M, ePA, Core 0 + Core 1 and 2475 MHz (CH25) Thread) 1 GHz to 40 GHz, Vertical (rms)

Limit Clause

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

Specification and Clause	Limit
FCC Part 15.247 (d)	-20 dBc
FCC Part 15.407 (b)	-27 dBm (EIRP) / 68.2 dBµV/m at 3 m
FCC Part 15.209 (Within restricted bands listed in 15.205)	Peak: 74 dBµV/m at 3 m Average 54 dBµV/m at 3 m
ISED RSS-247, Clause 5.5	-20 dBc
ISED RSS-247, Clause 6.2	-27 dBm (EIRP) / 68.2 dBµV/m at 3 m
ISED RSS-GEN, Clause 8.9 (Within restricted bands listed in clause 8.8)	Peak: 74 dBµV/m at 3 m Average 54 dBµV/m at 3 m

Table 8 - Limit Table

2.1.8 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	02-Oct-2021
Band Reject Filter - 2.4585 GHz	Wainwright	WRCGV14-2423.5-2433.5-2483.5-2493.5-50SS	5069	12	12-Oct-2021
Band Reject Filter - 5.795 GHz	Wainwright	WRCJV10-5725-5755-5835-5865-50SS	5071	12	30-Sept-2021
Band Reject Filter - 5.22 GHz	Wainwright	WRCJV12-5120-5150-5290-5320-50SS	5073	12	02-Oct-2021
Band Reject Filter - 5.28 GHz	Wainwright	WRCJV12-5180-5210-5350-5380-50SS	5075	12	30-Sep-2021
Band Reject Filter - 5.775 GHz	Wainwright	WRCJV10-5700-5735-5815-5850-50SS	5077	12	10-Oct-2021
Band Reject Filter - 5.570 GHz	Wainwright	WRCJV10-5440-5490-5650-5700-50SS	5079	12	10-Oct-2021
Band Reject Filter - 5.690 GHz	Wainwright	WRCJV8-5635-5670-5710-5745-50SS	5081	12	02-Oct-2021
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
Preamplifier (30dB 18-40GHz)	Schwarzbeck	BBV 9721	5218	12	12-Oct-2020
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	07-Apr-2021
Thermo-Hygo-Barometer	PCE Instruments	PCE-THB-40	5470	12	16-Mar-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5513	12	01-Apr-2021
1m -SMA Cable	Junkosha	MWX221-01000AMSAMS/A	5514	12	01-Apr-2021

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
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	5550	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 9

O/P Mon – Output Monitored using calibrated equipment

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 10

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