

FCC and ISED Test Report

Apple Inc
Model: A2330

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

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



Add value.
Inspire trust.

FCC ID: BCGA2330

IC: 579C-A2330

COMMERCIAL-IN-CONFIDENCE

Document 75948763-14 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	08 June 2020

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 Parts 15, 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	Faisal Malyar	08 June 2020	
Testing	Ahmad Javid	08 June 2020	

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.



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

TÜV SÜD 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



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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	08 June 2020

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2330
Serial Number(s)	C07CF029PW92
Hardware Version(s)	REV1.0
Software Version(s)	20A2236b
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	0540201015
Date	07-April-2020
Date of Receipt of EUT	08-April-2020
Start of Test	24-April-2020
Finish of Test	06-June-2020
Name of Engineer(s)	Faisal Malyar and Ahmad Javid
Related Document(s)	ANSI C63.10: 2013



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Parts 15, ISED RSS-247 and ISED RSS-GEN 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 - 5 GHz WLAN and 2.4 GHz 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 - 2.4 GHz 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

Table 2



1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was a desktop computer with Bluetooth, Bluetooth Low Energy 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: A2330, Serial Number: C07CF029PW92			
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)	Faisal Malyar and Ahmad Javid	UKAS
Configuration and Mode: CoTX - 5 GHz WLAN and 2.4 GHz Bluetooth		
Radiated Spurious Emissions (Simultaneous Transmission)	Faisal Malyar and Ahmad Javid	UKAS
Configuration and Mode: CoTX - 2.4 GHz WLAN + Bluetooth		
Radiated Spurious Emissions (Simultaneous Transmission)	Faisal Malyar and Ahmad Javid	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

A2330, S/N: C07CF029PW92 - Modification State 0

2.1.3 Date of Test

24-April-2020 to 06-June-2020

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clauses 6.5, 6.6 & 6.3

Plots were taken in accordance with ANSI C63.10 clause 12.7 with max-hold trace to characterize the EUT.

Where emissions were detected, quasi-peak or average measurements were taken in accordance with ANSI C63.10-2013 clause 4.1.4.2.1 and 4.1.4.2.2.

2.1.5 Environmental Conditions

Ambient Temperature 18.8 - 19.3 °C
Relative Humidity 25.0 - 45.9 %

2.1.6 Test Results

SDB - 2.4 GHz WLAN and 5 GHz WLAN

The EUT was configured for simultaneous transmission in the following mode of operation:

Technology	Frequency Band	Channel Frequency (MHz)
802.11n - 20 MHz Bandwidth	U-NII 3 (5725-5850 MHz)	5825
802.11n - 20 MHz Bandwidth	2412 MHz to 2472 MHz	2412

Table 5 - Modes of Operation



Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
31.016	32.5	40.0	-7.5	Q-Peak	350	338	Vertical	-

Table 6 - 30 MHz to 1 GHz

No other emissions were detected within 10 dB of the limit.

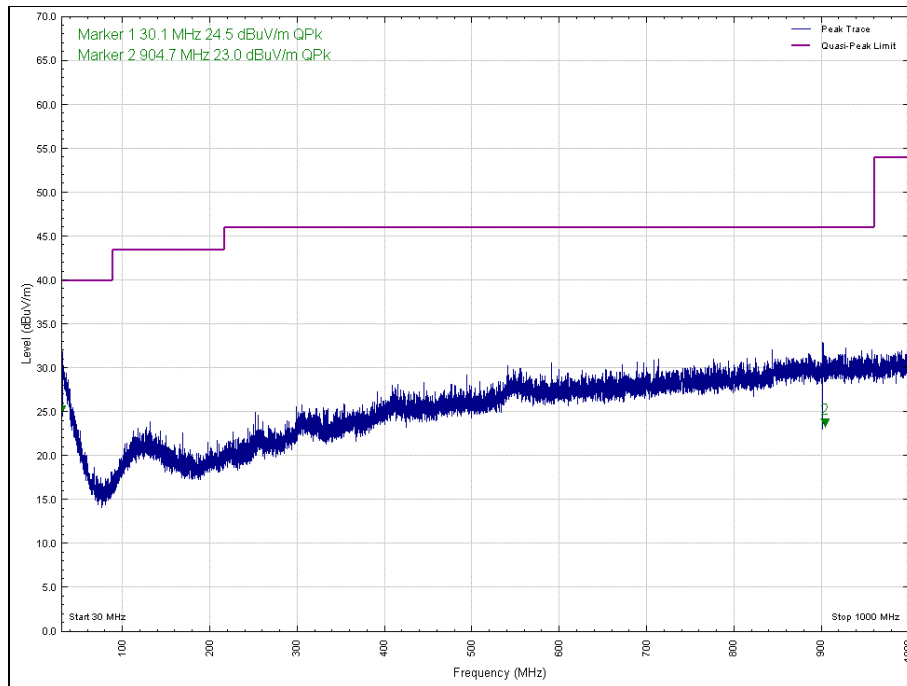


Figure 1 - 30 MHz to 1 GHz – Horizontal

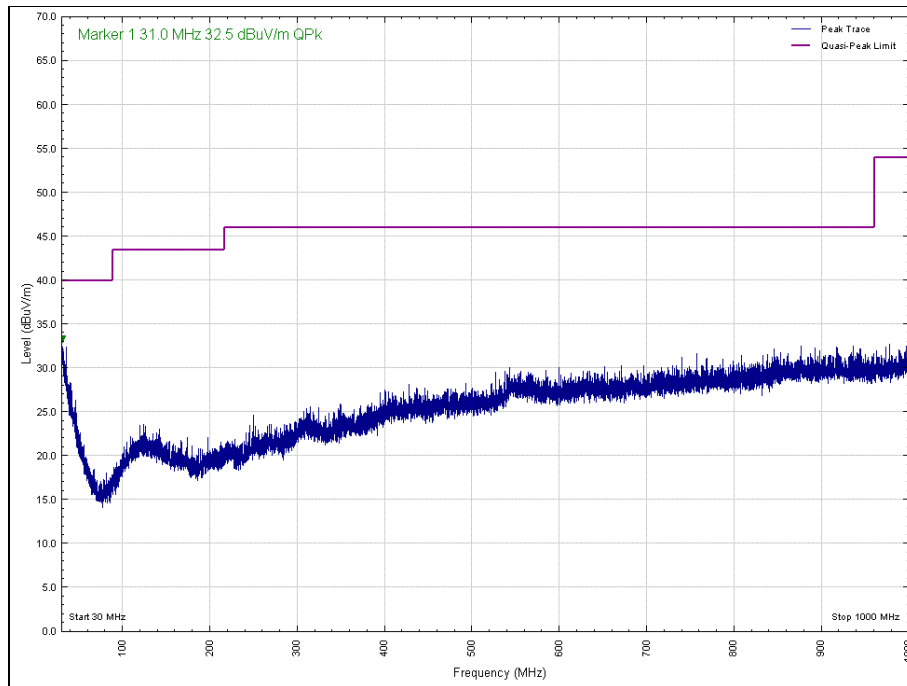


Figure 2 - 30 MHz to 1 GHz - Vertical



Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
11647.3	58.1	74.0	-15.9	Peak	188	140	Vertical	-
11649.9	40.4	54.0	-13.6	Average	194	107	Horizontal	-

Table 7 - 1 GHz to 40 GHz

No other emissions were detected within 10 dB of the limit.

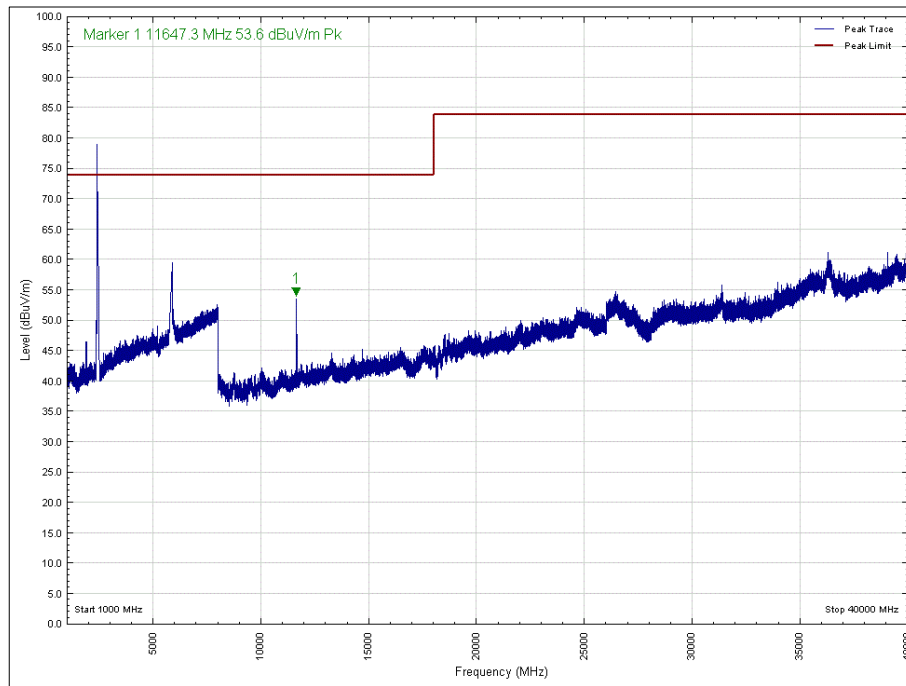


Figure 3 - 1 GHz to 40 GHz (Peak) – Horizontal

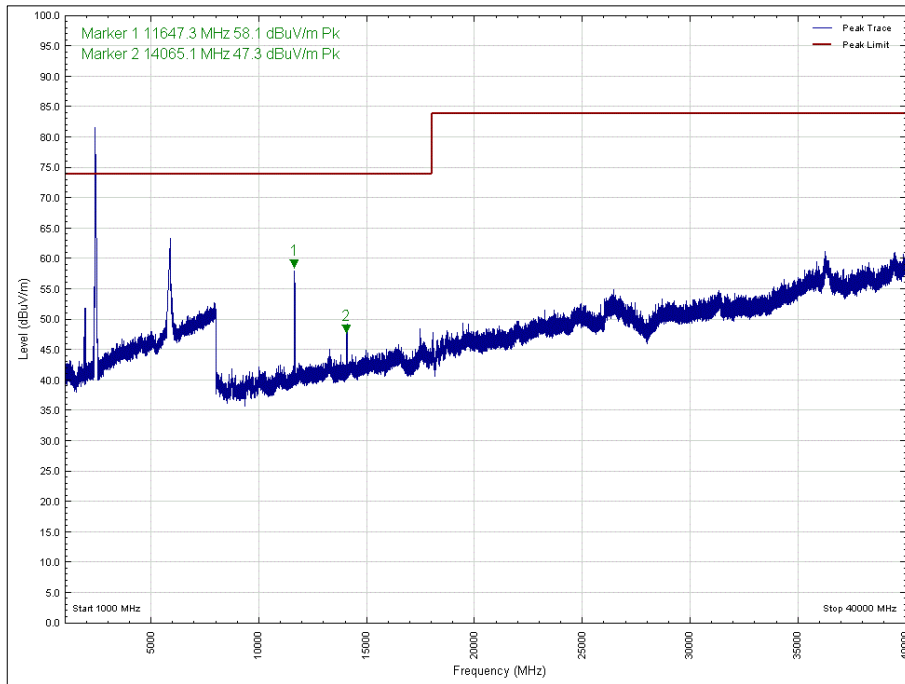


Figure 4 - 1 GHz to 40 GHz (Peak) – Vertical

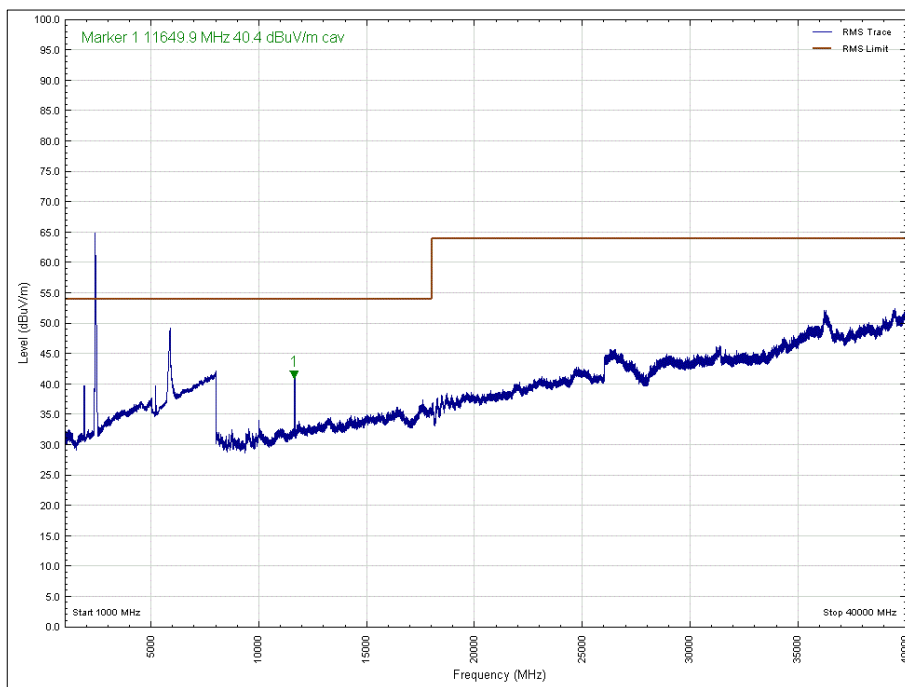


Figure 5 - 1 GHz to 40 GHz (Average) - Horizontal

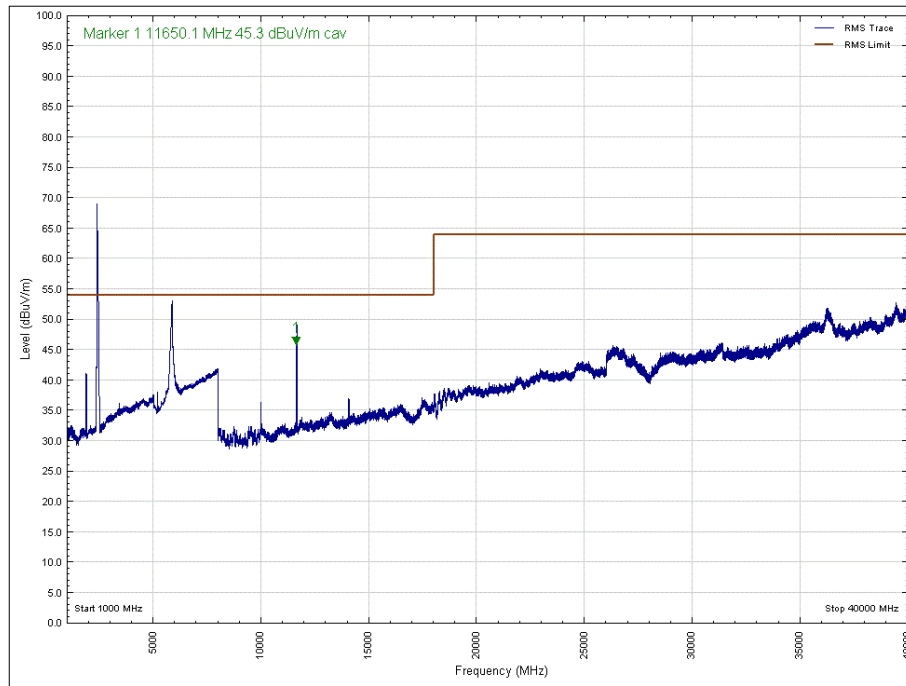


Figure 6 - 1 GHz to 40 GHz (Average) - Vertical



CoTX - 5 GHz WLAN and 2.4 GHz Bluetooth

The EUT was configured for simultaneous transmission in the following mode of operation:

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
802.11n - 20 MHz Bandwidth	U-NII 2C (5470 to 5725 MHz)	5680
Bluetooth	2402 MHz to 2480 MHz	2402

Table 8 - Modes of Operation

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
30.469	31.0	40.0	-9.0	Q-Peak	346	335	Vertical	-

Table 9 - 30 MHz to 1 GHz

No other emissions were detected within 10 dB of the limit.

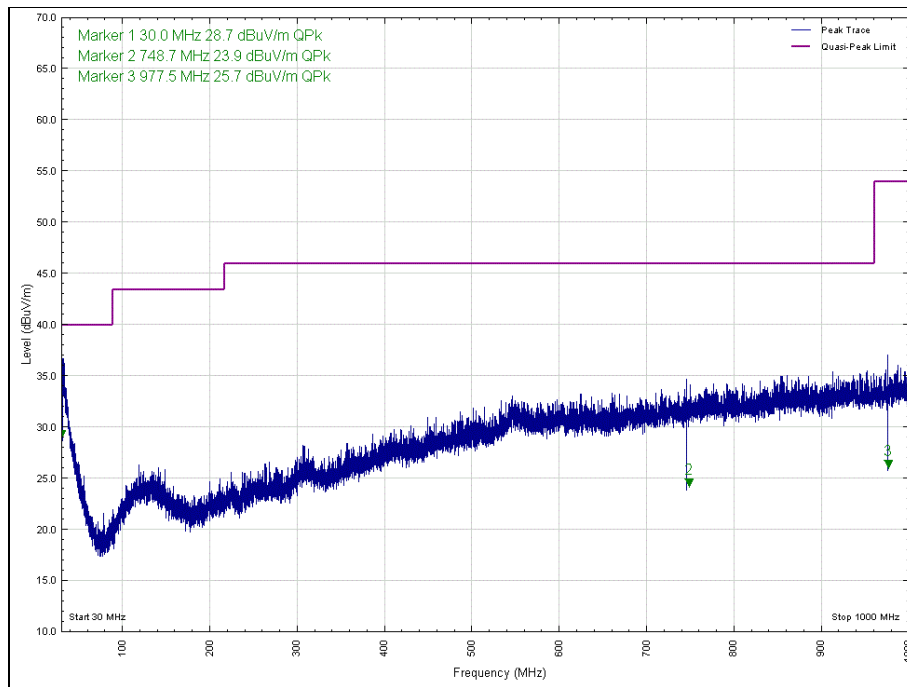


Figure 7 - 30 MHz to 1 GHz - Horizontal

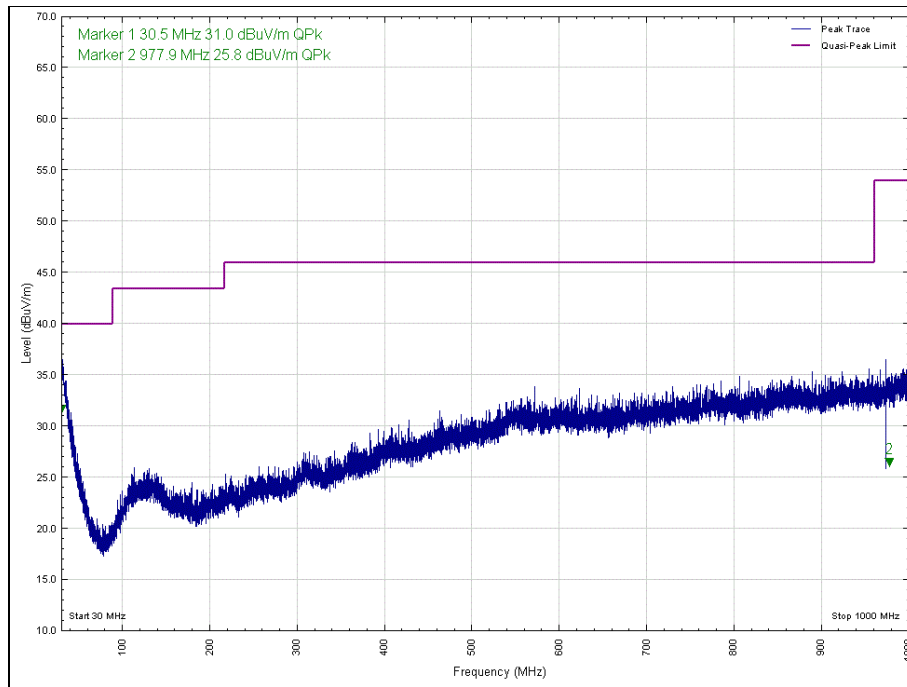


Figure 8 - 30 MHz to 1 GHz - Vertical



Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
*								-

Table 10 - 1 GHz to 40 GHz

* No emissions were detected within 10 dB of the limit.

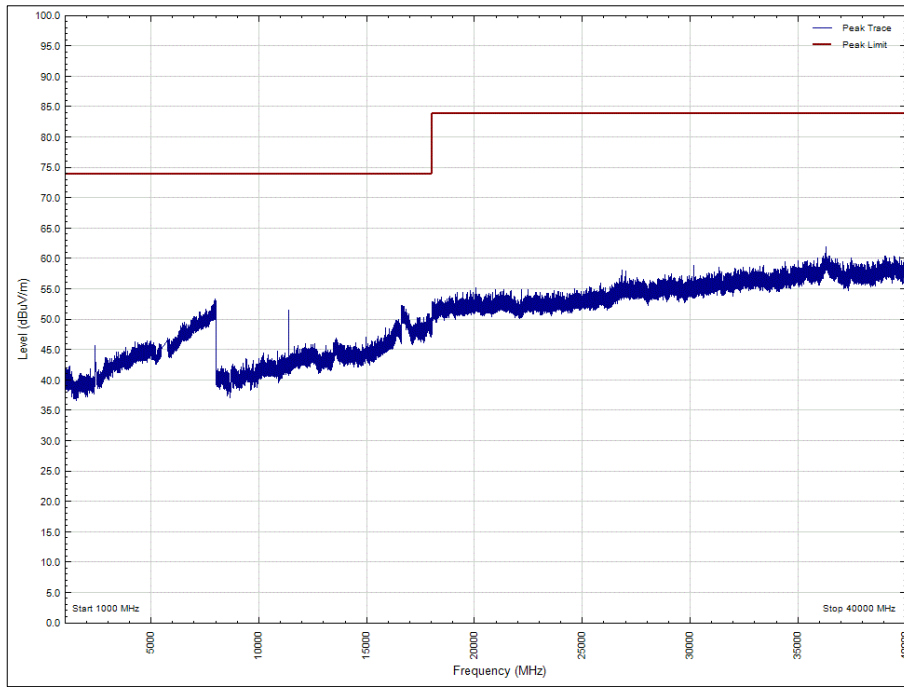


Figure 9 - 1 GHz to 40 GHz (Peak) – Horizontal

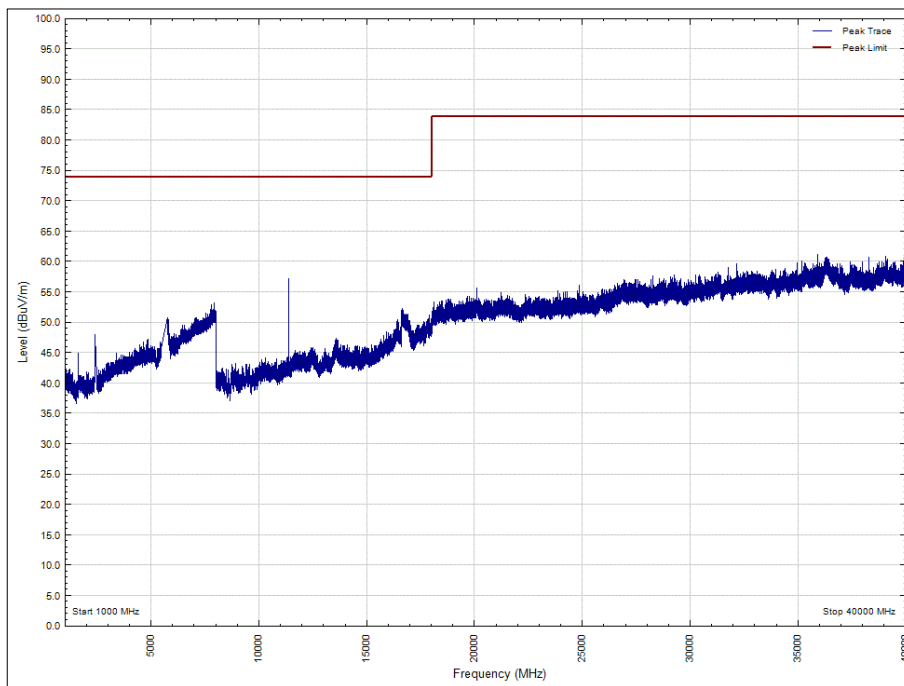


Figure 10 - 1 GHz to 40 GHz (Peak) - Vertical

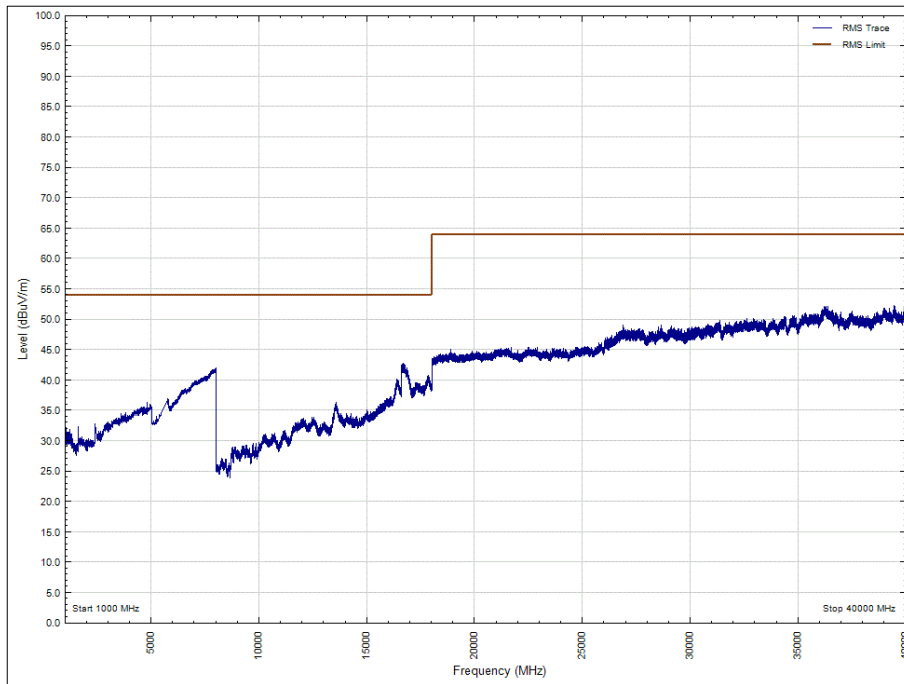


Figure 11 - 1 GHz to 40 GHz (Average) – Horizontal

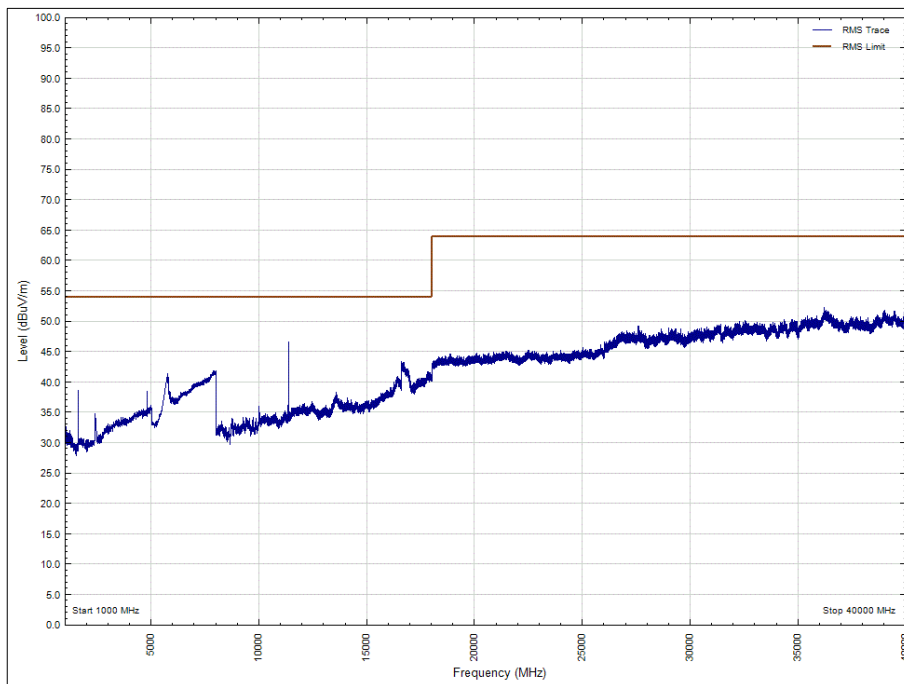


Figure 12 - 1 GHz to 40 GHz (Average) - Vertical



CoTX - 2.4 GHz WLAN + Bluetooth

The EUT was configured for simultaneous transmission in the following mode of operation:

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
802.11n - 20 MHz Bandwidth	2412 MHz to 2472 MHz	2452
Bluetooth	2402 MHz to 2480 MHz	2402

Table 11 - Modes of Operation

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
30.373	29.2	40.0	-10.8	Q-Peak	304	377	Vertical	-
30.730	28.1	40.0	-11.9	Q-Peak	357	104	Horizontal	-

Table 12 - 30 MHz to 1 GHz

No emissions were detected within 10 dB of the limit.

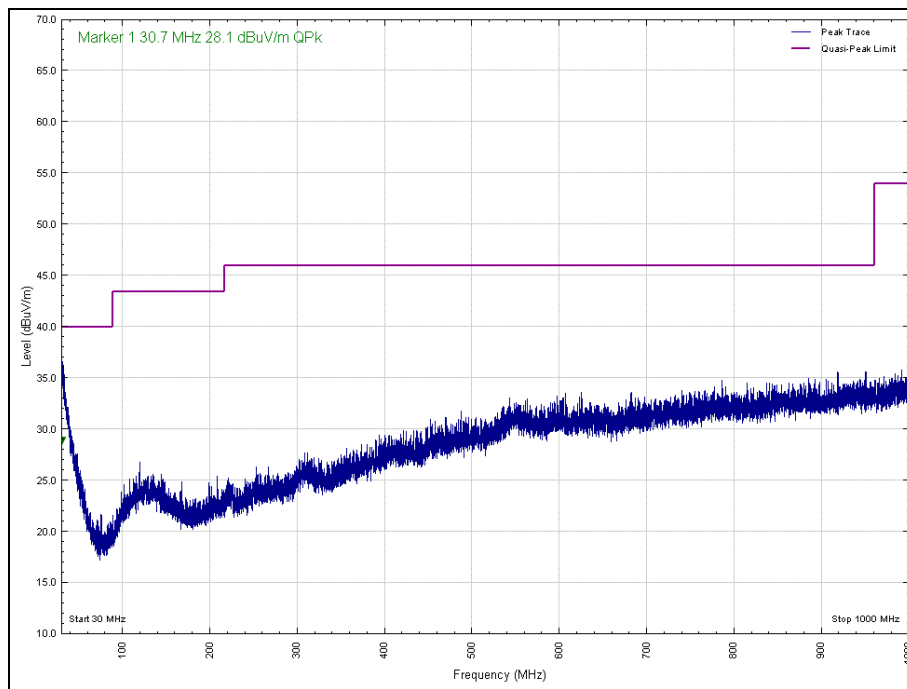


Figure 13 - 30 MHz to 1 GHz - Horizontal

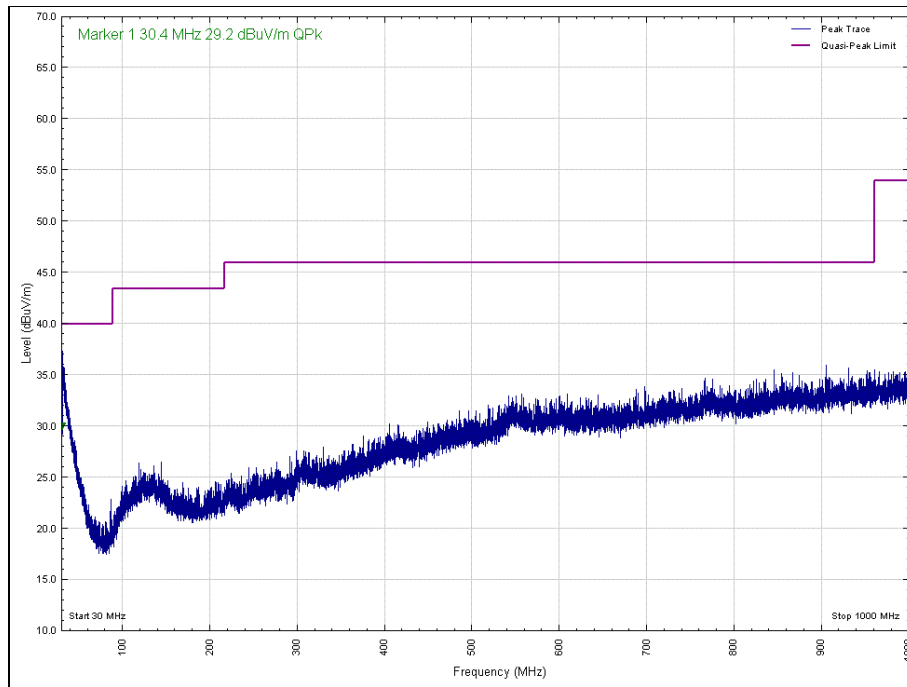


Figure 14 - 30 MHz to 1 GHz - Vertical



Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
2354.1	43.9	54.0	-10.1	Average	63	107	Horizontal	-
2354.1	45.0	54.0	-9.0	Average	345	110	Vertical	-
2354.5	62.9	74.0	-11.1	Peak	63	107	Horizontal	-
2355.0	64.0	74.0	-10.0	Peak	140	150	Vertical	-

Table 13 - 1 GHz to 26 GHz

No other emissions were detected within 10 dB of the limit.

Note: Average values shown in the table above, have determined in accordance with ANSI C63.10-2013, Section 7.5 (Procedure for determining the average value of pulsed emissions) & KDB 558074 D01 15.247 Meas Guidance v05r02, Section 9.

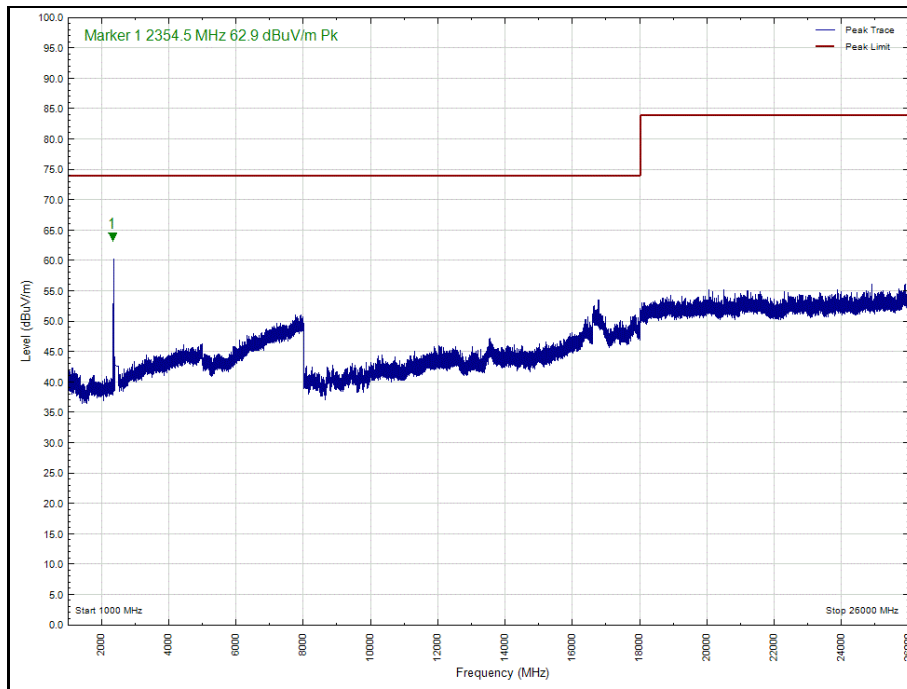


Figure 15 - 1 GHz to 26 GHz (Peak) – Horizontal

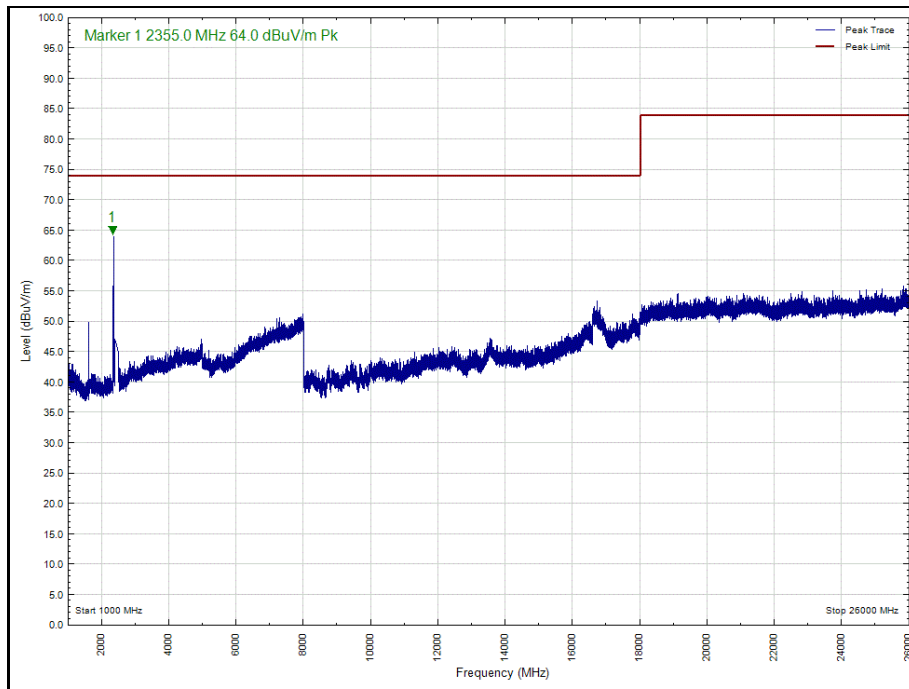


Figure 16 - 1 GHz to 26 GHz (Peak) – Vertical

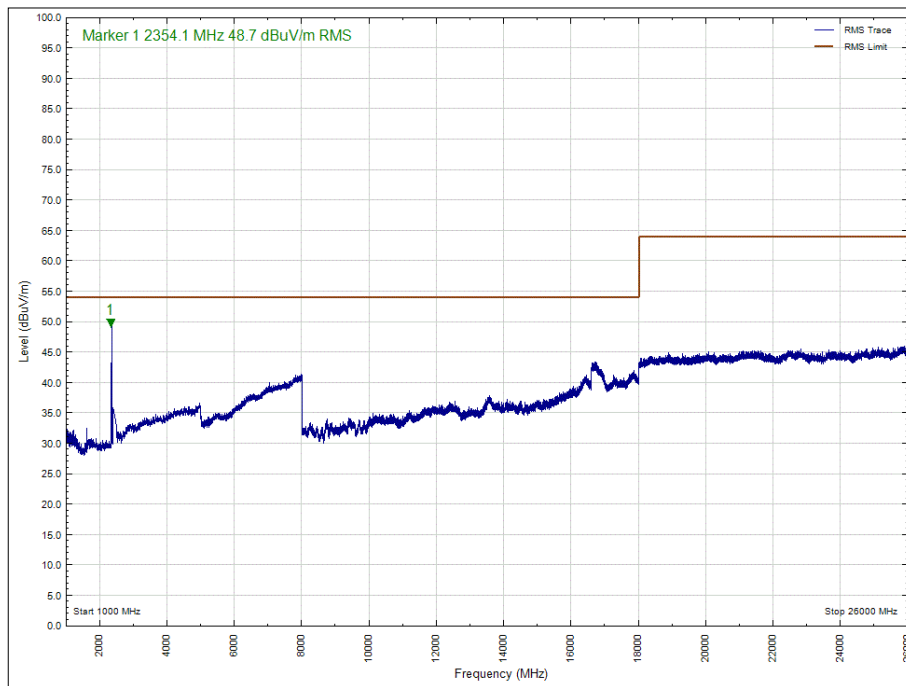


Figure 17 - 1 GHz to 26 GHz (Average) - Horizontal

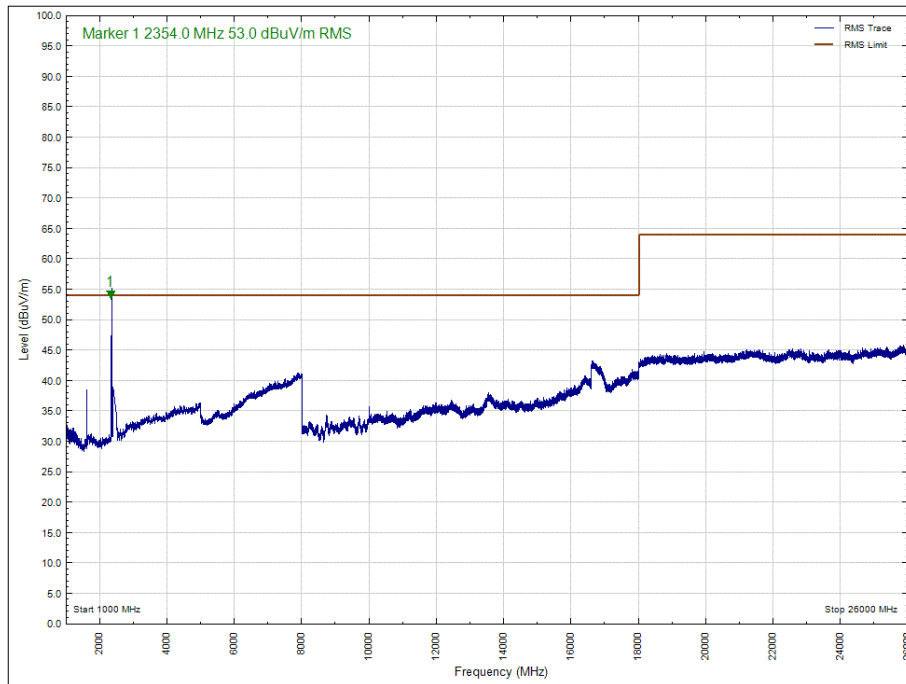


Figure 18 - 1 GHz to 26 GHz (Average) - Vertical



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 14 - Limit Table



2.1.7 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
Antenna with permanent attenuator (Bilog)	Schaffner	CBL6143	287	24	15-May-2020
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	06-Jun-2020
Pre-Amplifier	Phase One	PS04-0086	1533	12	04-Aug-2020
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	07-Aug-2020
Band Reject Filter - 2.425 GHz	Wainwright	WRCGV14-2390-2400-2450-2460-50SS	5066	12	01-Oct-2020
Band Reject Filter - 2.4585 GHz	Wainwright	WRCGV14-2423.5-2433.5-2483.5-2493.5-50SS	5068	12	01-Oct-2020
Band Reject Filter - 5.795GHz	Wainwright	WRCJV10-5725-5755-5835-5865-50SS	5070	12	26-Sep-2020
Band Reject Filter - 5.22 GHz	Wainwright	WRCJV12-5120-5150-5290-5320-50SS	5072	12	24-Sep-2020
Band Reject Filter - 5.28 GHz	Wainwright	WRCJV12-5180-5210-5350-5380-50SS	5074	12	24-Sep-2020
Band Reject Filter - 5.775 GHz	Wainwright	WRCJV10-5700-5735-5815-5850-50SS	5076	12	01-Oct-2020
Band Reject Filter - 5.570 GHz	Wainwright	WRCJV10-5440-5490-5650-5700-50SS	5078	12	02-Oct-2020
Band Reject Filter - 5.690 GHz	Wainwright	WRCJV8-5635-5670-5710-5745-50SS	5080	12	25-Sep-2020
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	28-Nov-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5092	12	06-Dec-2020
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5095	12	04-Dec-2019
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
Cable (18 GHz)	Rosenberger	LU7-071-1000	5105	12	06-Oct-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5107	12	06-Oct-2020
EmX Emissions Software	TUV SUD	EmX	5125	-	Software
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU



Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Turntable	Maturo	TT 15WF	5160	-	TU
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	10-Mar-2021
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5216	12	10-Mar-2021
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	5217	12	09-Jul-2020
Preamplifier (30dB 18-40GHz)	Schwarzbeck	BBV 9721	5218	12	09-Jul-2020
3 GHz High pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	5219	12	11-Jan-2021

Table 15

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 16

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.