FCC and ISED Test Report

Apple Inc
Model: A2485

In accordance with FCC 47 CFR Part 15C and ISED RSS-GEN.
(2.4 GHz Bluetooth, 2.4 GHz WLAN and 5 GHz WLAN)

Add value.
Inspire trust.

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

FCC ID: BCGA2485 IC: 579C-A2485

COMMERCIAL-IN-CONFIDENCE

Document 75952054-13 Issue 01

Jensen Adams
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Date: 2021.09.17 14:41:33 +01'00'

SIGNATURE			
Jensen Adams			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Jensen Adams	Manager – Technical Solutions	Authorised Signatory	17 September 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 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	Matthew Dawkins	17 September 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: 2020, and ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.

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ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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Contents

1 Report Summary

1.1 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	17-September-2021

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2485
Serial Number(s)	L7K9GKXQG7 and CYQ0JJ46X9
Hardware Version(s)	REV1.0
Software Version(s)	21A290
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2020 ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number Date	0540211248 22-April-2021
Date of Receipt of EUT	16-July-2021
Start of Test	28-July-2021
Finish of Test	28-July-2021
Name of Engineer(s)	Matthew Dawkins
Related Document(s)	ANSI C63.10 (2020)

1.3 Brief Summary of Results

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

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15C	RSS-GEN			
Configuration and Mode: 2.4 GHz WLAN					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020)
Configuration and Mode: 2.4 GHz Bluetooth					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020)
Configuration and Mode: 5 GHz WLAN					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020)

Table 2

1.4 Product Information

1.4.1 Technical Description

The Equipment under test (EUT) was a laptop 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: A2485, Serial Number: L7K9GKXQG7			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2485, Serial Number: CYQ0JJ46X9			
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: 2.4 GHz WLAN		
AC Power Line Conducted Emissions	Matthew Dawkins	UKAS
Configuration and Mode: 2.4 GHz Bluetooth		
AC Power Line Conducted Emissions	Matthew Dawkins	UKAS
Configuration and Mode: 5 GHz WLAN		
AC Power Line Conducted Emissions	Matthew Dawkins	UKAS

Table 4

Office Address:

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

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.207
ISED RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

A2485, S/N: L7K9GKXQG7 - Modification State 0
A2485, S/N: CYQ0JJ46X9 - Modification State 0

2.1.3 Date of Test

28-July-2021

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m away from a vertical coupling plane

All power was connected to the EUT through an Artificial Mains Network (AMN).

Conducted disturbance voltage measurements on mains lines were made at the output of the AMN.

2.1.5 Environmental Conditions

Ambient Temperature	20.4 °C
Relative Humidity	64.5 %

2.1.6 Test Results

2.4 GHz WLAN

Applied supply voltage: 120 V AC
Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.150	47.5	66.0	-18.5	Q-Peak
0.150	22.5	56.0	-33.5	CISPR Avg
0.160	47.0	65.5	-18.5	Q-Peak
0.160	26.9	55.5	-28.7	CISPR Avg
0.162	28.5	55.4	-26.9	CISPR Avg
0.162	46.6	65.4	-18.8	Q-Peak
0.169	45.7	65.0	-19.3	Q-Peak
0.169	26.6	55.0	-28.4	CISPR Avg
0.180	44.3	64.5	-20.2	Q-Peak
0.180	21.0	54.5	-33.5	CISPR Avg
0.193	24.7	53.9	-29.2	CISPR Avg
0.193	42.7	63.9	-21.2	Q-Peak
0.203	24.5	53.5	-29.0	CISPR Avg
0.203	41.5	63.5	-22.0	Q-Peak
0.222	18.0	52.7	-34.7	CISPR Avg
0.222	39.4	62.7	-23.3	Q-Peak
0.247	37.0	61.8	-24.8	Q-Peak
0.247	15.6	51.8	-36.2	CISPR Avg
0.265	17.6	51.3	-33.7	CISPR Avg
0.265	35.6	61.3	-25.7	Q-Peak

Table 5 - Live Line Emissions Results

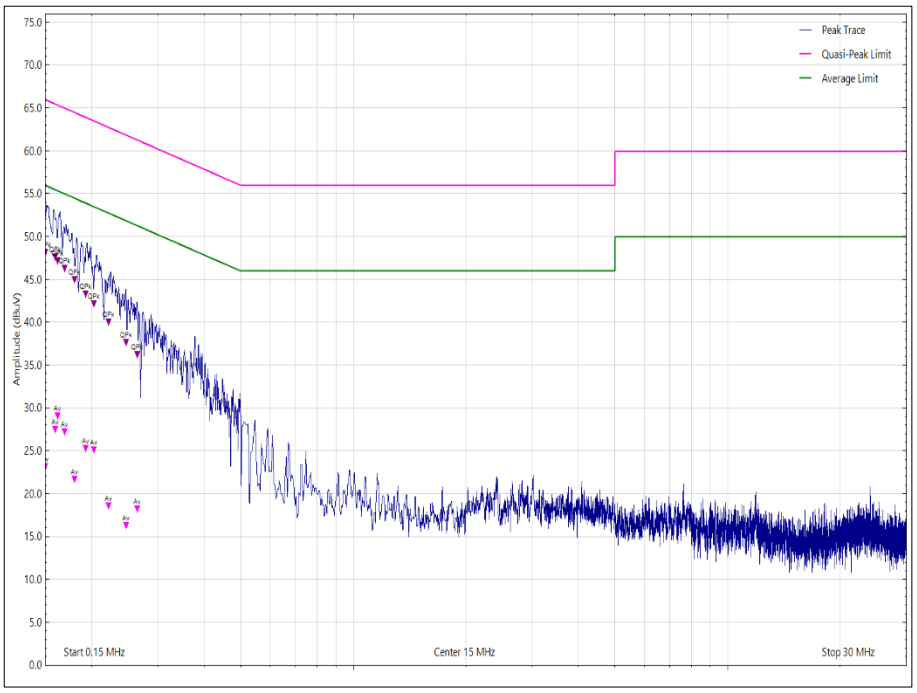

Figure 1 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.153	23.4	55.8	-32.4	CISPR Avg
0.153	47.7	65.8	-18.1	Q-Peak
0.160	27.4	55.5	-28.1	CISPR Avg
0.160	46.8	65.5	-18.7	Q-Peak
0.170	25.6	55.0	-29.4	CISPR Avg
0.170	45.3	65.0	-19.7	Q-Peak
0.177	21.6	54.6	-33.0	CISPR Avg
0.177	44.4	64.6	-20.2	Q-Peak
0.185	20.9	54.2	-33.3	CISPR Avg
0.185	43.4	64.2	-20.8	Q-Peak
0.195	42.3	63.8	-21.5	Q-Peak
0.195	23.5	53.8	-30.3	CISPR Avg
0.214	40.1	63.0	-22.9	Q-Peak
0.214	17.6	53.0	-35.4	CISPR Avg
0.224	18.7	52.7	-34.0	CISPR Avg
0.224	39.0	62.7	-23.7	Q-Peak
0.241	15.9	52.1	-36.2	CISPR Avg
0.241	37.5	62.1	-24.6	Q-Peak
0.265	35.5	61.3	-25.8	Q-Peak
0.265	17.7	51.3	-33.6	CISPR Avg

Table 6 - Neutral Line Emissions Results

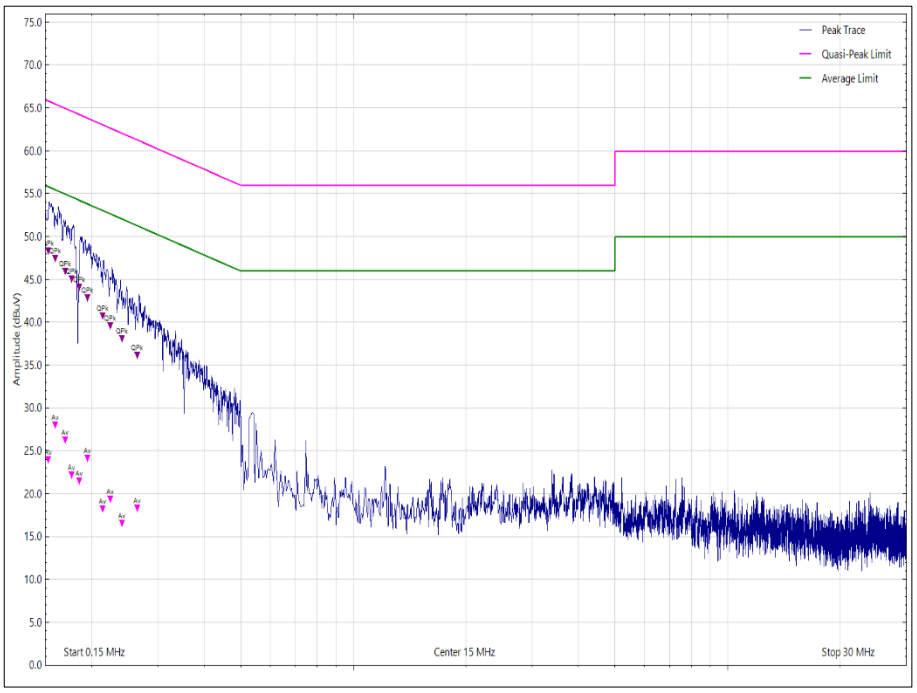

Figure 2 - Neutral Line - 150 kHz to 30 MHz

2.4 GHz Bluetooth

Applied supply voltage: 120 V AC
Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.150	47.9	66.0	-18.1	Q-Peak
0.150	23.2	56.0	-32.8	CISPR Avg
0.159	27.0	55.5	-28.5	CISPR Avg
0.159	46.7	65.5	-18.8	Q-Peak
0.177	44.3	64.6	-20.3	Q-Peak
0.177	22.4	54.6	-32.2	CISPR Avg
0.183	21.1	54.4	-33.4	CISPR Avg
0.183	43.6	64.4	-20.9	Q-Peak
0.200	25.6	53.6	-28.0	CISPR Avg
0.200	41.6	63.6	-22.0	Q-Peak
0.210	20.3	53.2	-32.9	CISPR Avg
0.210	40.4	63.2	-22.8	Q-Peak
0.227	20.0	52.6	-32.6	CISPR Avg
0.227	38.6	62.6	-24.0	Q-Peak
0.232	17.1	52.4	-35.3	CISPR Avg
0.232	38.1	62.4	-24.3	Q-Peak
0.240	16.2	52.1	-35.9	CISPR Avg
0.240	37.4	62.1	-24.7	Q-Peak

Table 7 - Live Line Emissions Results

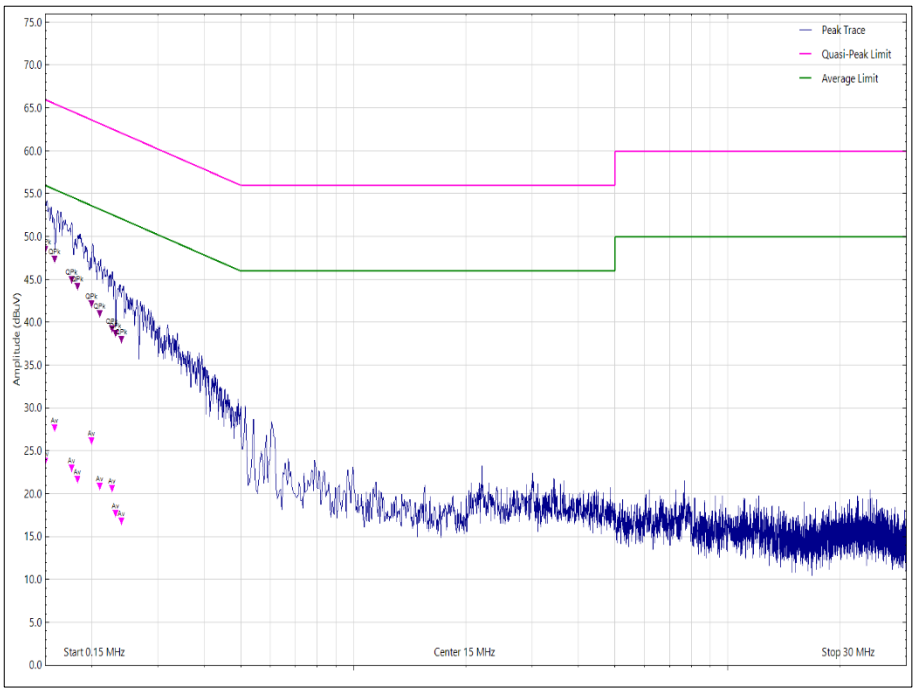

Figure 3 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.152	23.4	55.9	-32.5	CISPR Avg
0.152	47.5	65.9	-18.4	Q-Peak
0.160	46.6	65.5	-18.9	Q-Peak
0.160	27.3	55.5	-28.2	CISPR Avg
0.168	28.4	55.1	-26.7	CISPR Avg
0.168	45.4	65.1	-19.7	Q-Peak
0.178	44.1	64.6	-20.5	Q-Peak
0.178	21.7	54.6	-32.9	CISPR Avg
0.187	21.3	54.2	-33.0	CISPR Avg
0.187	43.1	64.2	-21.1	Q-Peak
0.196	23.5	53.8	-30.3	CISPR Avg
0.196	42.0	63.8	-21.8	Q-Peak
0.201	24.4	53.6	-29.2	CISPR Avg
0.201	41.3	63.6	-22.3	Q-Peak
0.222	39.1	62.7	-23.6	Q-Peak
0.222	17.9	52.7	-34.9	CISPR Avg
0.233	38.0	62.4	-24.4	Q-Peak
0.233	16.7	52.4	-35.7	CISPR Avg
0.256	35.9	61.5	-25.6	Q-Peak
0.256	15.4	51.5	-36.2	CISPR Avg

Table 8 - Neutral Line Emissions Results

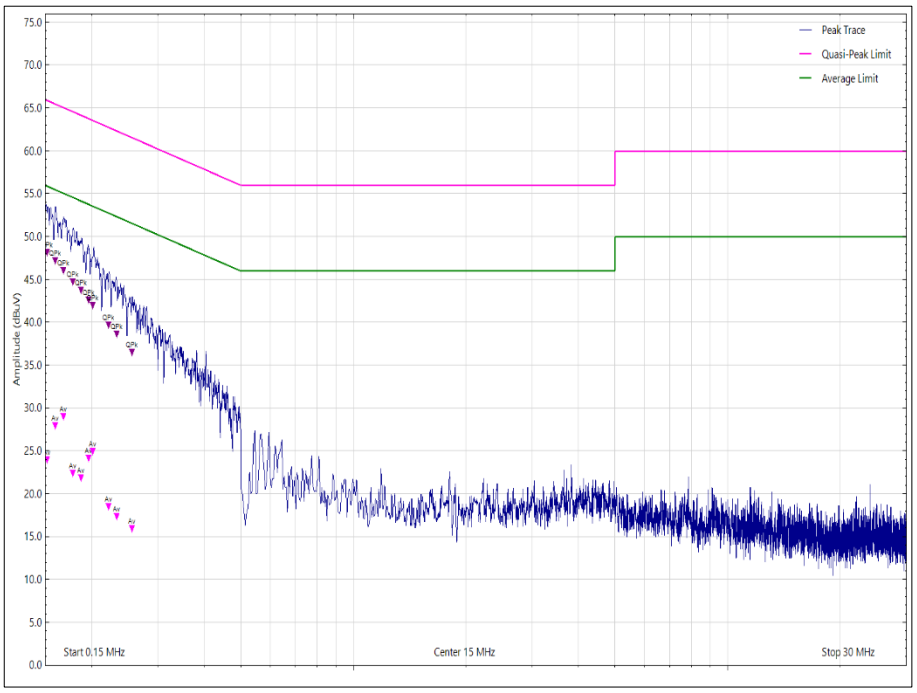

Figure 4 - Neutral Line - 150 kHz to 30 MHz

5 GHz WLAN

Applied supply voltage: 120 V AC
Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.156	44.9	65.7	-20.8	Q-Peak
0.156	23.7	55.7	-32.0	CISPR Avg
0.162	44.4	65.3	-20.9	Q-Peak
0.162	29.5	55.3	-25.8	CISPR Avg
0.175	42.9	64.7	-21.8	Q-Peak
0.175	28.7	54.7	-26.0	CISPR Avg
0.180	42.6	64.5	-21.9	Q-Peak
0.180	29.7	54.5	-24.8	CISPR Avg
0.185	42.0	64.3	-22.3	Q-Peak
0.185	29.4	54.3	-25.0	CISPR Avg
0.197	40.7	63.7	-23.1	Q-Peak
0.197	19.5	53.7	-34.2	CISPR Avg
0.210	39.2	63.2	-24.1	Q-Peak
0.210	17.1	53.2	-36.1	CISPR Avg

Table 9 - Live Line Emissions Results

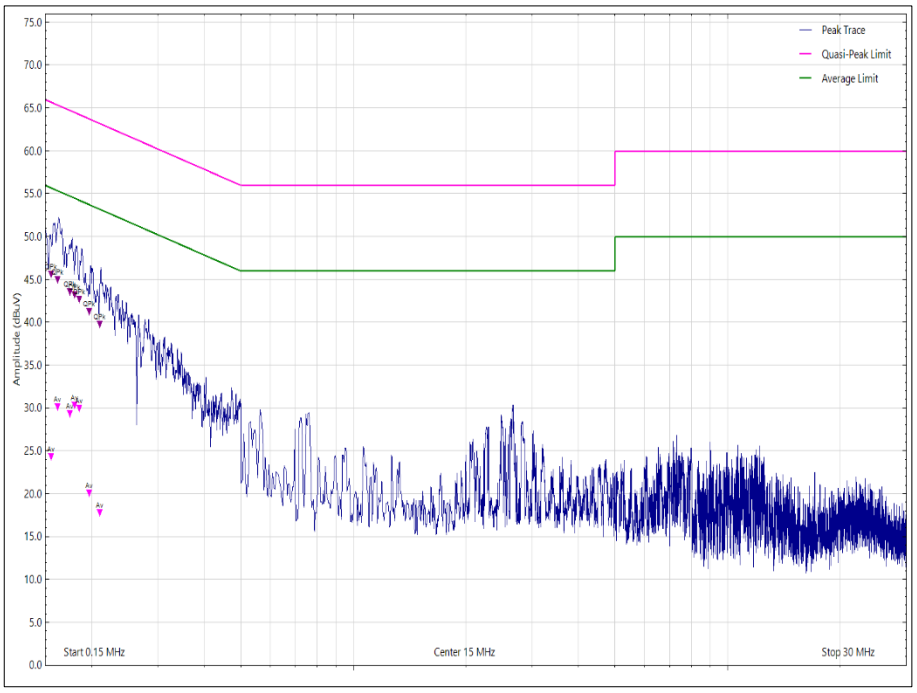

Figure 5 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.181	36.9	64.4	-27.5	Q-Peak
0.181	18.2	54.4	-36.2	CISPR Avg

Table 10 - Neutral Line Emissions Results

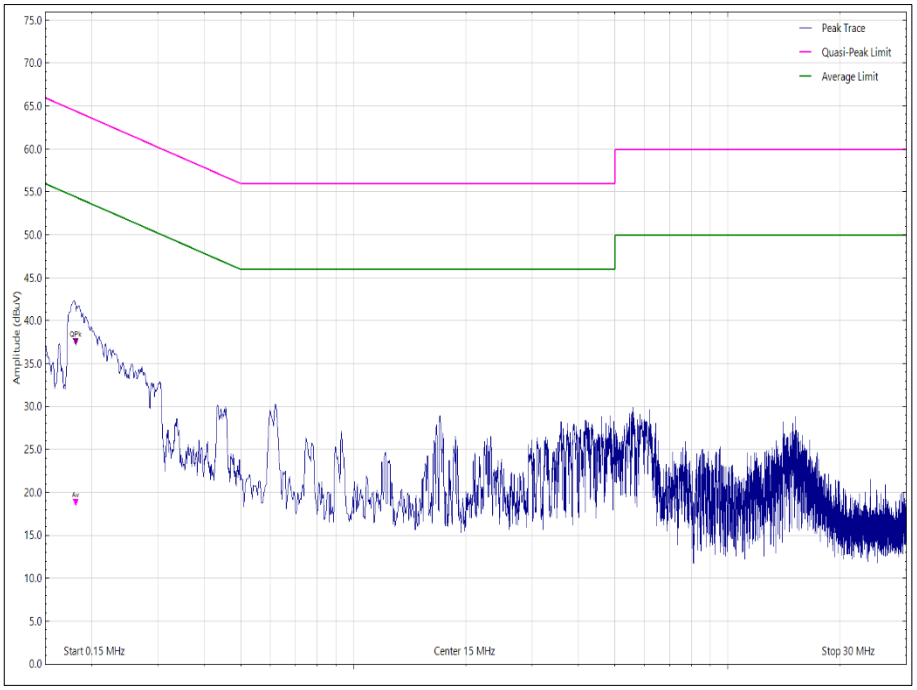

Figure 6 - Neutral Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and ISED RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	CISPR Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 11

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
EmX Emissions Software	TUV SUD	V2.1.11	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Transient Limiter	Hewlett Packard	11947A	2378	12	12-Oct-2021
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5428	12	15-Oct-2021
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5473	12	01-Apr-2022
Cable Assembly - 18GHz 8m	Junkosha	MWX221-08000NMSNMS/B	5732	6	05-Aug-2021
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	28-Jan-2022

Table 12

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ± 3.7 dB

Table 13

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.