FCC and ISEDC Test Report

Apple Inc
Model: A2179

In accordance with FCC 47 CFR Part 15C and ISEDC RSS-GEN

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

Add value.
Inspire trust.

FCC ID: BCGA2179 IC: 579C-A2179

COMMERCIAL-IN-CONFIDENCE

Document 75945251-14 Issue 02

SIGNATURE			
AJ Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Senior Engineer	Authorised Signatory	07 February 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 Part 15C and ISEDC RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Connor Lee	07 February 2020	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISEDC 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: 2018 and ISEDC RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

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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	05 February 2020
2	Updated FCC ID	07 February 2020

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2179
Serial Number(s)	C02ZC009M8N2
Hardware Version(s)	REV 1.0
Software Version(s)	19C4
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2018 ISEDC RSS-247: Issue 2 (2017-02) ISEDC RSS-GEN: Issue 5 (04-2018) + A1 (03-2019
Order Number Date	0540189084 25-February-2019
Date of Receipt of EUT	12-November-2019
Start of Test	30-January-2020
Finish of Test	30-January-2020
Name of Engineer(s)	Connor Lee
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 Part 15C and ISEDC RSS-GEN is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
Configuration and Mode: 2.4 GHz WLAN					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
Configuration and Mode: 2.4 GHz Bluetooth					
2.1	15.207	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
Configuration and Mode: 5 GHz WLAN					
2.1	15.207	8.8	8.AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)

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 capabilities in the 2.4 GHz and 5 GHz bands.

The EUT was tested in conjunction with a USB power adapter model A1882.

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: A2179: Serial Number: C02ZC009M8N2			
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	Connor Lee	UKAS
Configuration and Mode: 2.4 GHz Bluetooth		
AC Power Line Conducted Emissions	Connor Lee	UKAS
Configuration and Mode: 5 GHz WLAN		
AC Power Line Conducted Emissions	Connor Lee	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
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
ISEDC RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

A2179, S/N: C02ZC009M8N2 - Modification State 0

2.1.3 Date of Test

30-January-2020

2.1.4 Test Method

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

2.1.5 Example Calculation

Quasi-Peak level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = Quasi-Peak level (dBµV) – Limit (dBµV)

CISPR Average level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = CISPR Average level (dBµV) - Limit (dBµV)

2.1.6 Example Test Setup Diagram

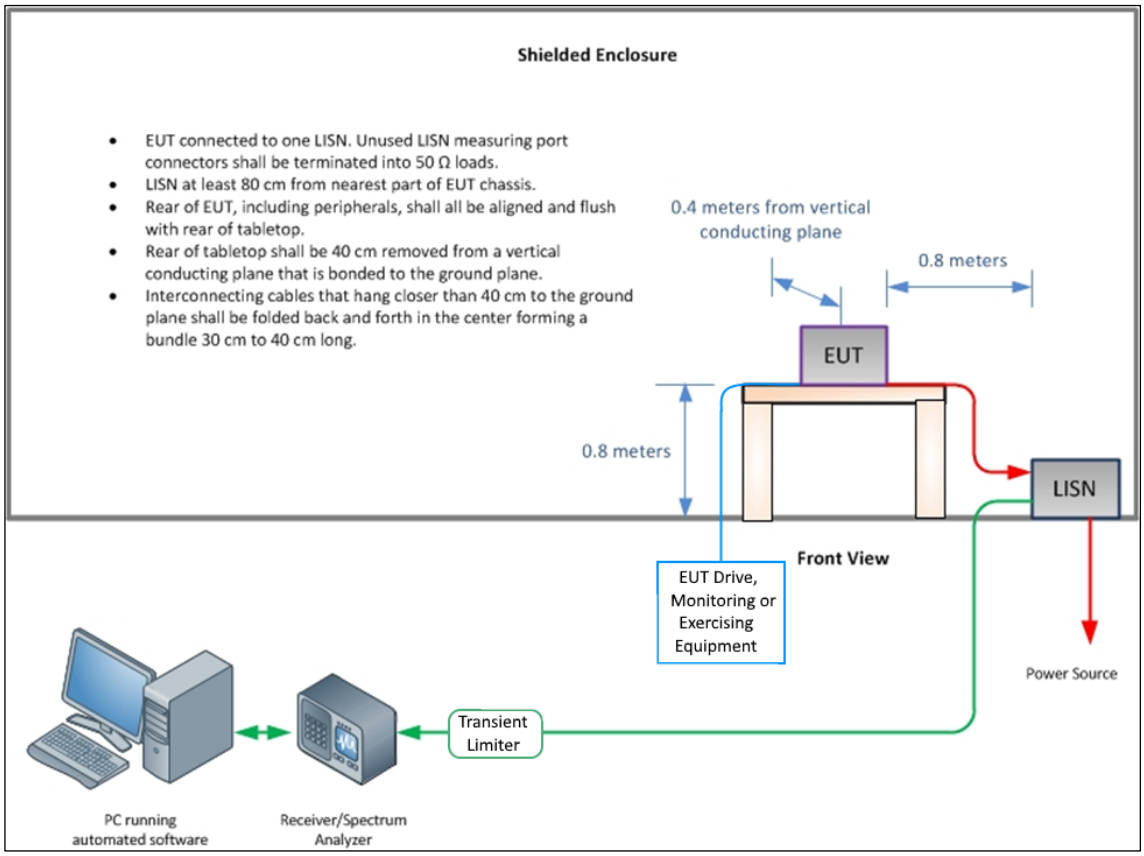

Figure 1 - Conducted Disturbance Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature	18.9 °C
Relative Humidity	49.7 %

2.1.8 Test Results

2.4 GHz WLAN

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

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.195	56.6	63.8	-7.3	28.5	53.8	-25.4
0.281	50.2	60.8	-10.6	22.5	50.8	-28.3
0.311	48.9	59.9	-11.1	21.7	49.9	-28.2
0.377	45.9	58.3	-12.5	20.1	48.3	-28.2
0.449	42.6	26.9	-14.3	17.8	46.9	-29.1
0.589	38.1	56.0	-17.9	15.3	46.0	-30.7
0.625	36.9	56.0	-19.1	15.8	46.0	-30.2
0.857	31.9	56.0	-24.1	14.3	46.0	-31.7
6.475	35.0	60.0	-25.0	14.2	50.0	-35.8

Table 5 - Live Line Emissions Results

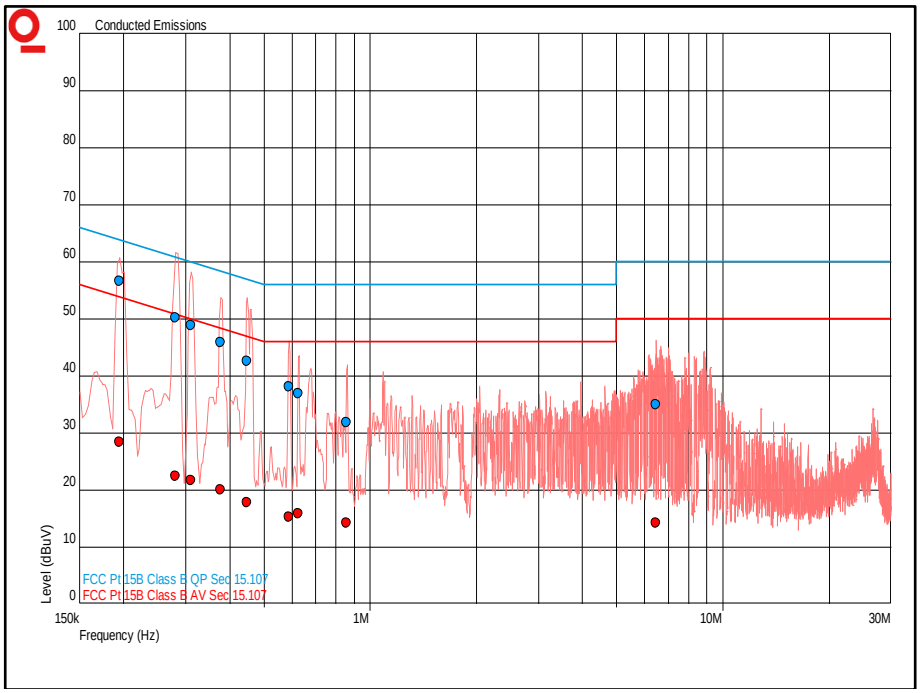

Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.275	51.0	61.0	-10.0	24.2	51.0	-26.8
0.475	41.9	56.4	-14.5	17.2	46.4	-29.2
0.490	41.6	56.2	-14.6	16.9	46.2	-29.3
0.669	37.2	56.0	-18.8	17.4	46.0	-28.6
0.714	37.1	56.0	-18.9	18.3	46.0	-27.7
0.780	33.6	56.0	-22.4	15.2	46.0	-30.8
0.887	33.9	56.0	-22.1	14.1	46.0	-31.9
7.001	21.6	60.0	-38.4	8.5	50.0	-41.5

Table 6 - Neutral Line Emissions Results

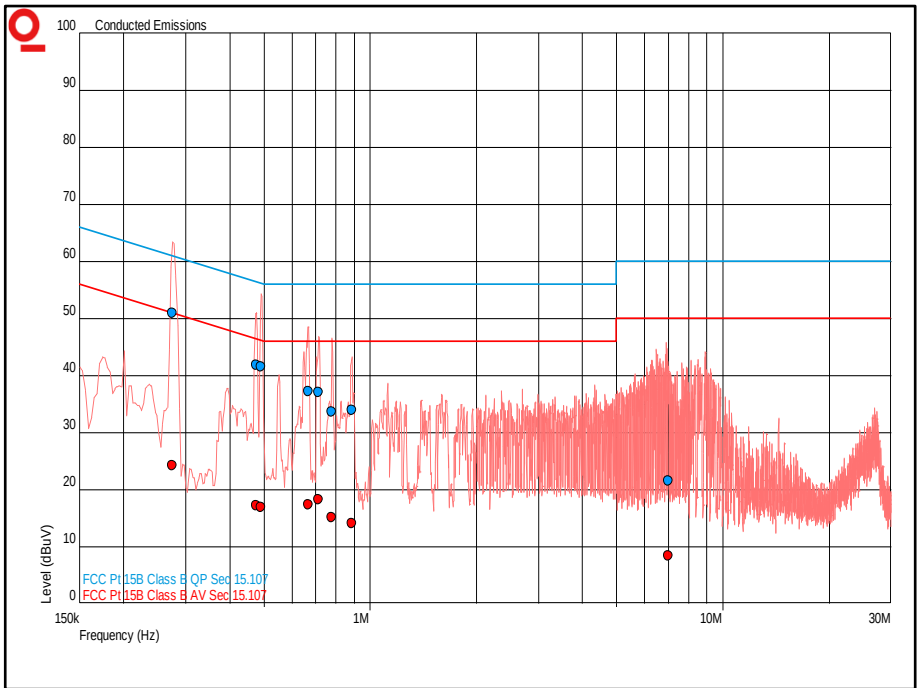

Figure 3 - Neutral Line - 150 kHz to 30 MHz

2.4 GHz Bluetooth

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

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.180	57.3	64.5	-7.1	30.0	54.5	-24.5
0.219	54.8	62.9	-8.1	27.1	52.9	-25.8
0.275	51.2	61.0	-9.8	23.8	51.0	-27.2
0.308	49.4	60.0	-10.6	22.2	50.0	-27.8
0.428	44.0	57.3	-13.3	18.8	47.3	-28.5
0.508	41.2	56.0	-14.8	16.8	46.0	-29.2
0.619	37.5	56.0	-18.5	16.0	46.0	-30.0
0.679	37.6	56.0	-18.4	20.3	46.0	-25.7
0.747	34.7	56.0	-21.3	17.1	46.0	-28.9
0.848	32.4	56.0	-23.6	14.3	46.0	-31.7
7.672	31.1	60.0	-28.9	11.5	50.0	-38.5

Table 7 - Live Line Emissions Results

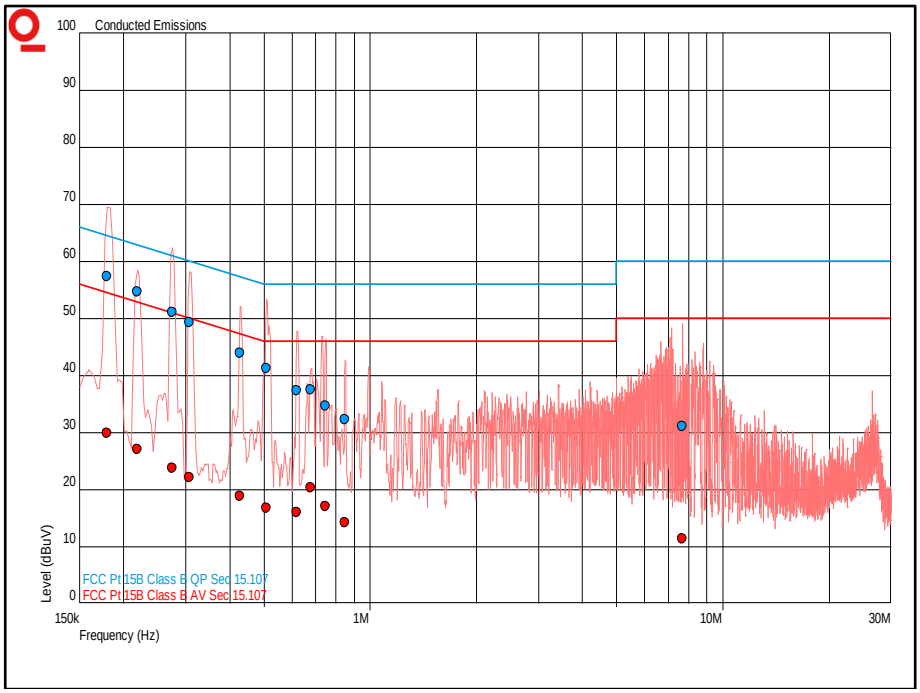

Figure 4 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.204	55.9	63.5	-7.6	27.6	53.5	-25.9
0.326	45.1	59.5	-14.5	18.6	49.5	-30.9
0.368	42.0	58.5	-16.6	16.4	48.5	-32.2
0.451	16.6	56.8	-40.2	10.5	46.8	-36.4
0.466	25.7	56.6	-30.9	11.2	46.6	-35.4
0.490	24.7	56.2	-31.5	11.0	46.2	-35.2
0.514	21.0	56.0	-35.0	10.7	46.0	-35.3
0.753	34.8	56.0	-21.2	15.5	46.0	-30.5
0.825	33.7	56.0	-22.3	14.7	46.0	-31.3
6.645	36.2	60.0	-23.8	15.9	50.0	-34.1

Table 8 - Neutral Line Emissions Results

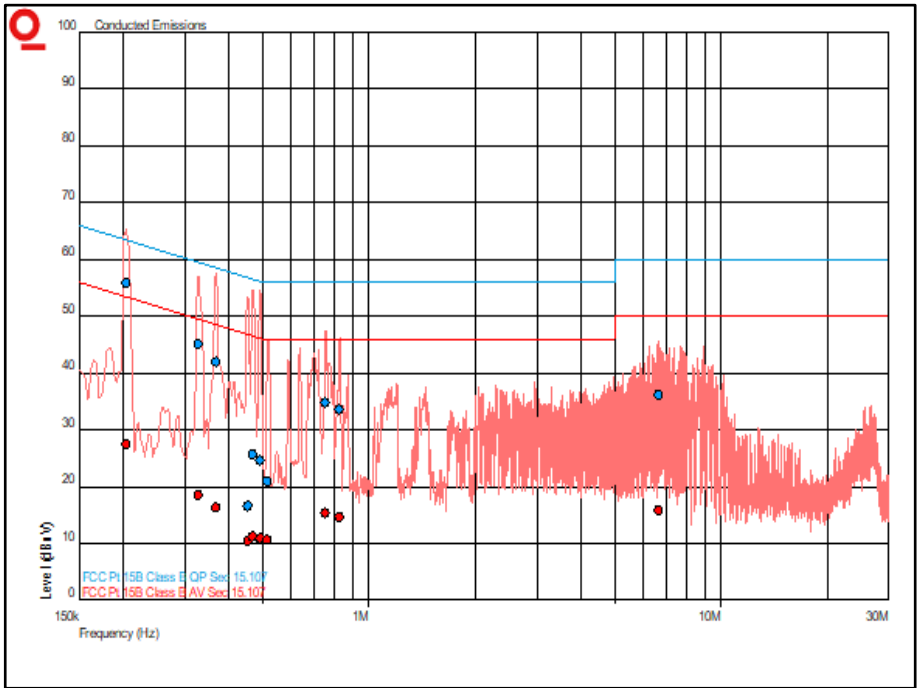

Figure 5 - Neutral Line - 150 kHz to 30 MHz

5 GHz WLAN

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

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.216	54.2	63.0	-8.8	28.0	53.0	-25.0
0.326	51.5	59.5	-8.0	24.0	49.5	-25.5
0.437	44.0	57.1	-13.1	18.8	47.1	-28.4
0.493	41.9	56.1	-14.2	17.0	46.1	-29.1
0.592	38.4	56.0	-17.6	15.3	46.0	-30.7
1.046	24.0	56.0	-32.0	9.7	46.0	-36.3
7.165	23.7	60.0	-36.3	8.5	50.0	-41.5

Table 9 - Live Line Emissions Results

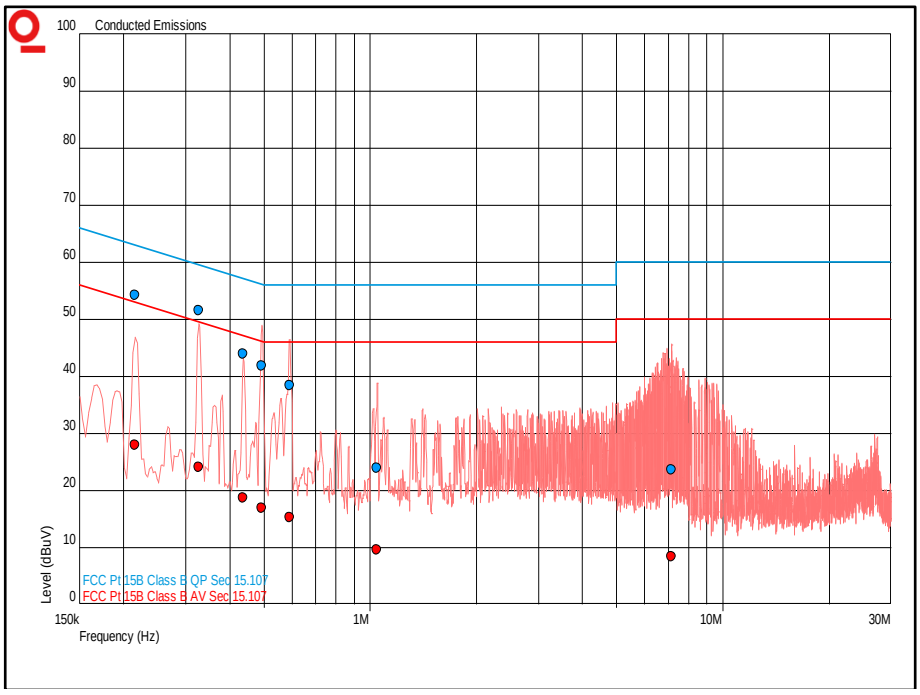

Figure 6 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.165	59.3	65.2	-5.9	29.6	55.2	-25.6
0.216	55.4	63.0	-7.6	25.6	53.0	-27.4
0.338	48.0	59.3	-11.3	20.3	49.3	-29.0
0.410	43.9	57.7	-13.8	19.5	47.7	-28.2
0.460	41.3	56.7	-15.4	16.5	46.7	-30.2
0.484	39.6	56.3	-16.7	15.6	46.3	-30.6
0.517	37.7	56.0	-18.3	14.2	46.0	-31.8
0.723	31.1	56.0	-24.9	14.3	46.0	-31.7
6.875	36.9	60.0	-23.1	17.2	50.0	-32.8

Table 10 - Neutral Line Emissions Results

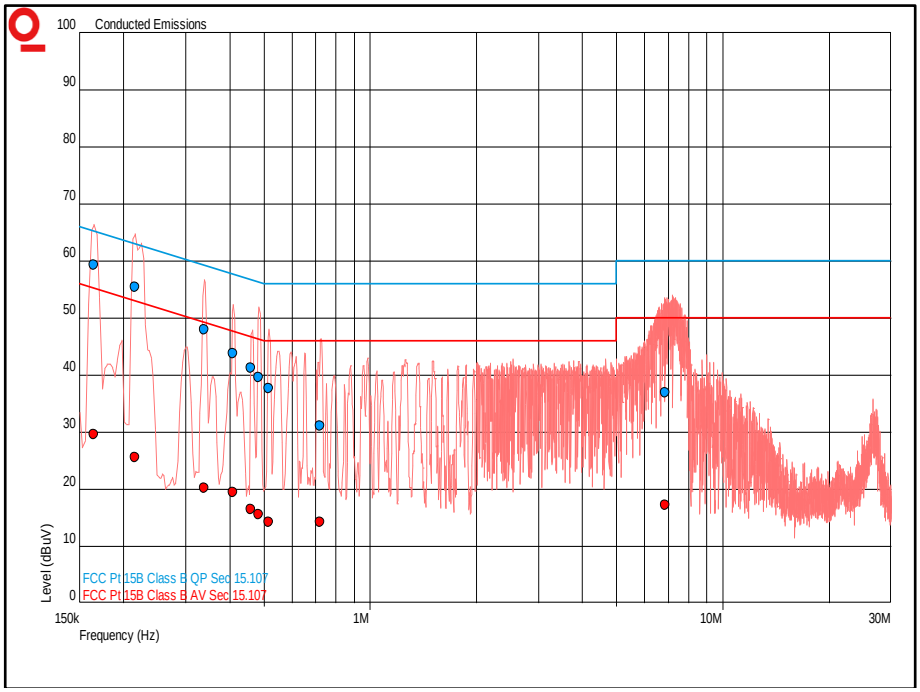

Figure 7 - Neutral Line - 150 kHz to 30 MHz

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

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	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.

2.1.9 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
Compliance 5 Emissions	Teseq	V5.26.51	3275	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	03-Jan-2021
Transient Limiter	Hewlett Packard	11947A	2377	12	26-Feb-2020
LISN And Calibrated Extension	Rohde & Schwarz	ESH3-Z5	1390	12	27-Jan-2021
2 Meter Cable	Teledyne	PR90-088-2MTR	5196	12	06-Oct-2020
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	30-Aug-2020

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.