

# FCC and ISED Test Report

Apple Inc  
Model: A2337

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

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



Add value.  
Inspire trust.

FCC ID: BCGA2337

IC: 579C-A2337

## COMMERCIAL-IN-CONFIDENCE

Document 75949395-13 Issue 01

### SIGNATURE

| NAME        | JOB TITLE       | RESPONSIBLE FOR      | ISSUE DATE      |
|-------------|-----------------|----------------------|-----------------|
| Andy Lawson | Senior Engineer | Authorised Signatory | 07 October 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 ISED 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 October 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 Part 15C: 2019 and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.



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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           | 07 October 2020 |

**Table 1**

## 1.2 Introduction

|                               |                                                                             |
|-------------------------------|-----------------------------------------------------------------------------|
| Applicant                     | Apple Inc                                                                   |
| Manufacturer                  | Apple Inc                                                                   |
| Model Number(s)               | A2337                                                                       |
| Serial Number(s)              | C02D100QQ9MQ                                                                |
| Hardware Version(s)           | REV 1.0                                                                     |
| Software Version(s)           | 20A2352                                                                     |
| Number of Samples Tested      | 1                                                                           |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C: 2019<br>ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) |
| Order Number                  | 0540196335                                                                  |
| Date                          | 29-June-2020                                                                |
| Date of Receipt of EUT        | 18-August-2020 and 28-August-2020                                           |
| Start of Test                 | 03-September-2020                                                           |
| Finish of Test                | 03-September-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 ISSED 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   |                        |
| Configuration and Mode: 5 GHz WLAN        |                      |         |                                   |        |                        |
| 2.1                                       | 15.207               | 8.8     | AC Power Line Conducted Emissions | Pass   |                        |
| Configuration and Mode: 2.4 GHz Bluetooth |                      |         |                                   |        |                        |
| 2.1                                       | 15.207               | 8.8     | AC Power Line Conducted Emissions | Pass   |                        |

**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: A2337, Serial Number: C02D100QQ9MQ |                                                 |                        |                          |
| 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: 5 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          |

**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  
ISED RSS-GEN, Clause 8.8

#### 2.1.2 Equipment Under Test and Modification State

A2337, S/N: C02D100QQ9MQ - Modification State 0

#### 2.1.3 Date of Test

03-September-2020

#### 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 0.8 m above a reference ground plane. A vertical coupling plane was placed 0.4 m from the EUT boundary.

A Line Impedance Stabilisation Network (LISN) was directly bonded to the ground-plane. The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m.

Interconnecting cables that hanged closer than 0.4 m to the ground plane were folded back and forth in the centre forming a bundle 0.3 m to 0.4 m long.

Input and output cables were terminated with equipment or loads representative of real usage conditions.

The EUT was configured to give the highest level of emissions within reason of a typical installation as described by the manufacturer.

#### 2.1.5 Example Calculation

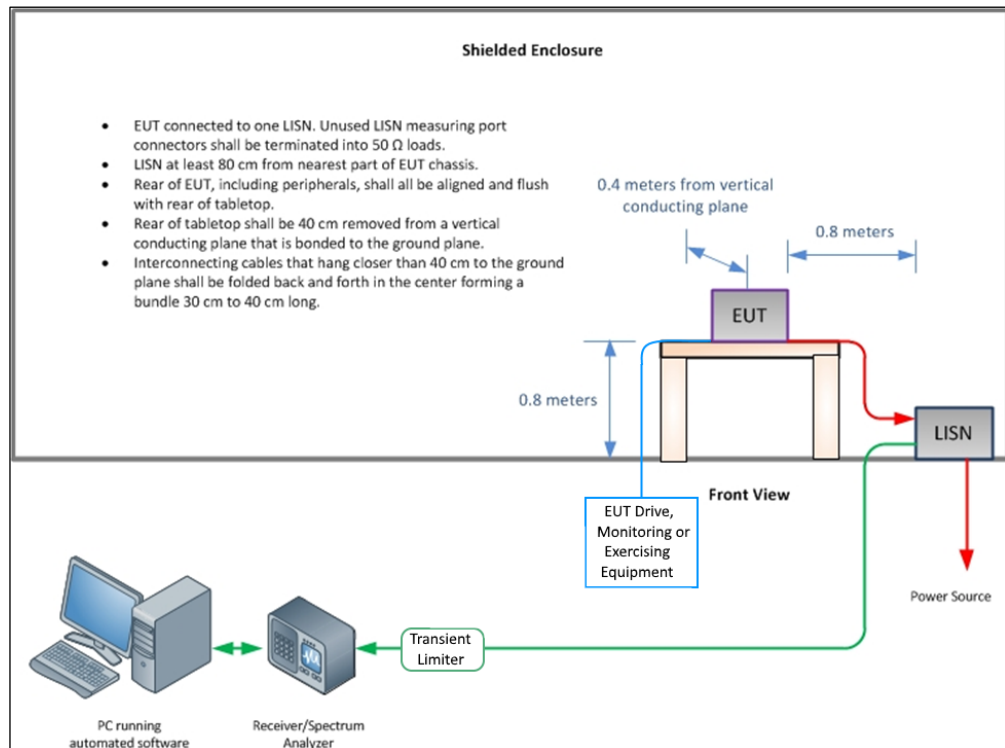
Quasi-Peak level (dB $\mu$ V) = Receiver level (dB $\mu$ V) + Correction Factor (dB)

Margin (dB) = Quasi-Peak level (dB $\mu$ V) - Limit (dB $\mu$ V)

CISPR Average level (dB $\mu$ V) = Receiver level (dB $\mu$ V) + Correction Factor (dB)

Margin (dB) = CISPR Average level (dB $\mu$ V) - Limit (dB $\mu$ V)

### 2.1.6 Example Test Setup Diagram



**Figure 1 – AC Power Line Conducted Emissions - Example Test Setup**

### 2.1.7 Environmental Conditions

|                     |         |
|---------------------|---------|
| Ambient Temperature | 21.6 °C |
| Relative Humidity   | 62.4 %  |

## 2.1.8 Test Results

### 2.4 GHz WLAN

Applied supply voltage: 120 V AC

Applied supply frequency: 60 Hz

| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.183           | 51.4                    | 64.4                    | -13.0                  | 26.2                       | 54.4                       | -28.1                     |
| 0.198           | 50.8                    | 63.7                    | -12.9                  | 24.2                       | 53.7                       | -29.5                     |
| 0.222           | 49.8                    | 62.8                    | -12.9                  | 21.7                       | 52.8                       | -31.0                     |
| 0.243           | 49.2                    | 62.0                    | -12.8                  | 20.8                       | 52.0                       | -31.2                     |
| 0.299           | 48.1                    | 60.3                    | -12.1                  | 19.9                       | 50.3                       | -30.4                     |
| 0.314           | 48.0                    | 59.9                    | -11.8                  | 20.3                       | 49.9                       | -29.6                     |
| 0.428           | 48.4                    | 57.3                    | -8.9                   | 19.9                       | 47.3                       | -27.4                     |
| 0.490           | 46.4                    | 56.2                    | -9.7                   | 19.6                       | 46.2                       | -26.6                     |
| 0.580           | 41.2                    | 56.0                    | -14.8                  | 18.7                       | 46.0                       | -27.3                     |
| 0.637           | 36.7                    | 56.0                    | -19.3                  | 13.9                       | 46.0                       | -32.1                     |
| 0.708           | 31.8                    | 56.0                    | -24.2                  | 14.7                       | 46.0                       | -31.3                     |
| 0.753           | 31.7                    | 56.0                    | -24.3                  | 19.2                       | 46.0                       | -26.8                     |
| 0.810           | 29.0                    | 56.0                    | -27.0                  | 12.5                       | 46.0                       | -33.5                     |

Table 5 - Live Line Emissions Results

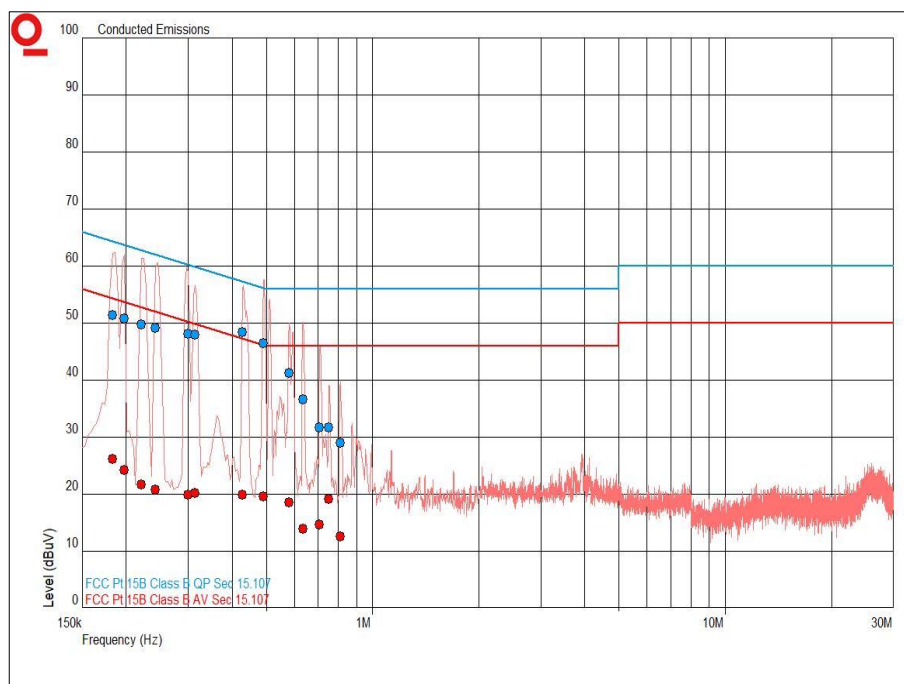


Figure 2 - Live Line - 150 kHz to 30 MHz



| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.165           | 53.7                    | 65.2                    | -11.5                  | 27.0                       | 55.2                       | -28.3                     |
| 0.234           | 51.2                    | 62.3                    | -11.2                  | 22.7                       | 52.3                       | -29.7                     |
| 0.338           | 49.7                    | 59.3                    | -9.6                   | 25.8                       | 49.3                       | -23.5                     |
| 0.371           | 49.8                    | 58.5                    | -8.7                   | 28.2                       | 48.5                       | -20.3                     |
| 0.419           | 50.2                    | 57.5                    | -7.3                   | 21.7                       | 47.5                       | -25.8                     |
| 0.502           | 48.3                    | 56.0                    | -7.7                   | 25.7                       | 46.0                       | -20.3                     |
| 0.517           | 47.7                    | 56.0                    | -8.3                   | 27.4                       | 46.0                       | -18.6                     |
| 0.544           | 46.6                    | 56.0                    | -9.4                   | 30.7                       | 46.0                       | -15.3                     |
| 0.634           | 40.1                    | 56.0                    | -15.9                  | 16.3                       | 46.0                       | -29.7                     |
| 0.677           | 36.9                    | 56.0                    | -19.1                  | 21.9                       | 46.0                       | -24.1                     |
| 0.732           | 34.7                    | 56.0                    | -21.3                  | 26.1                       | 46.0                       | -19.9                     |
| 0.759           | 32.6                    | 56.0                    | -23.4                  | 21.2                       | 46.0                       | -24.8                     |
| 0.786           | 30.8                    | 56.0                    | -25.2                  | 13.7                       | 46.0                       | -32.3                     |
| 0.854           | 28.2                    | 56.0                    | -27.8                  | 18.0                       | 46.0                       | -28.0                     |
| 0.902           | 26.3                    | 56.0                    | -29.7                  | 14.8                       | 46.0                       | -31.2                     |

Table 6 - Neutral Line Emissions Results

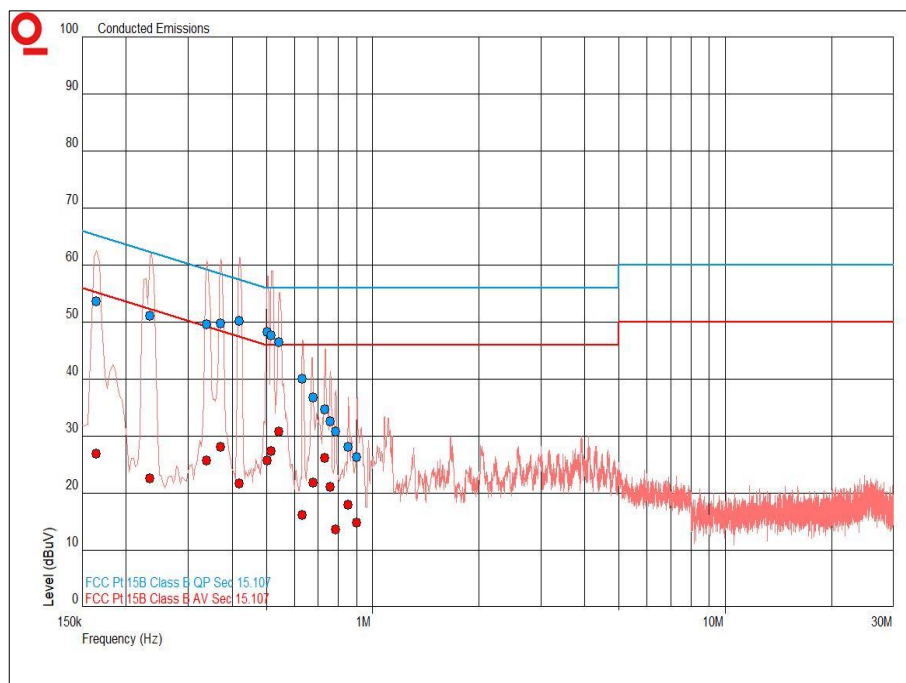


Figure 3 - Neutral Line - 150 kHz to 30 MHz

## 5 GHz WLAN

Applied supply voltage: 120 V AC

Applied supply frequency: 60 Hz

| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.162           | 53.8                    | 65.4                    | -11.5                  | 26.8                       | 55.4                       | -28.6                     |
| 0.181           | 53.4                    | 64.5                    | -11.1                  | 29.0                       | 54.5                       | -25.5                     |
| 0.246           | 51.3                    | 61.9                    | -10.6                  | 21.8                       | 51.9                       | -30.1                     |
| 0.311           | 50.3                    | 59.9                    | -9.7                   | 21.4                       | 49.9                       | -28.5                     |
| 0.364           | 50.5                    | 58.6                    | -8.1                   | 27.7                       | 48.6                       | -20.9                     |
| 0.413           | 51.2                    | 57.6                    | -6.4                   | 21.6                       | 47.6                       | -26.0                     |
| 0.475           | 49.5                    | 56.4                    | -6.9                   | 21.6                       | 46.4                       | -24.8                     |
| 0.529           | 46.4                    | 56.0                    | -9.6                   | 25.6                       | 46.0                       | -20.4                     |
| 0.556           | 44.4                    | 56.0                    | -11.6                  | 28.1                       | 46.0                       | -17.9                     |
| 0.684           | 34.9                    | 56.0                    | -21.1                  | 19.4                       | 46.0                       | -26.6                     |
| 0.717           | 32.9                    | 56.0                    | -23.1                  | 17.7                       | 46.0                       | -28.3                     |
| 0.762           | 31.0                    | 56.0                    | -25.0                  | 14.8                       | 46.0                       | -31.2                     |
| 0.801           | 29.2                    | 56.0                    | -26.8                  | 12.1                       | 46.0                       | -33.9                     |

Table 7 - Live Line Emissions Results

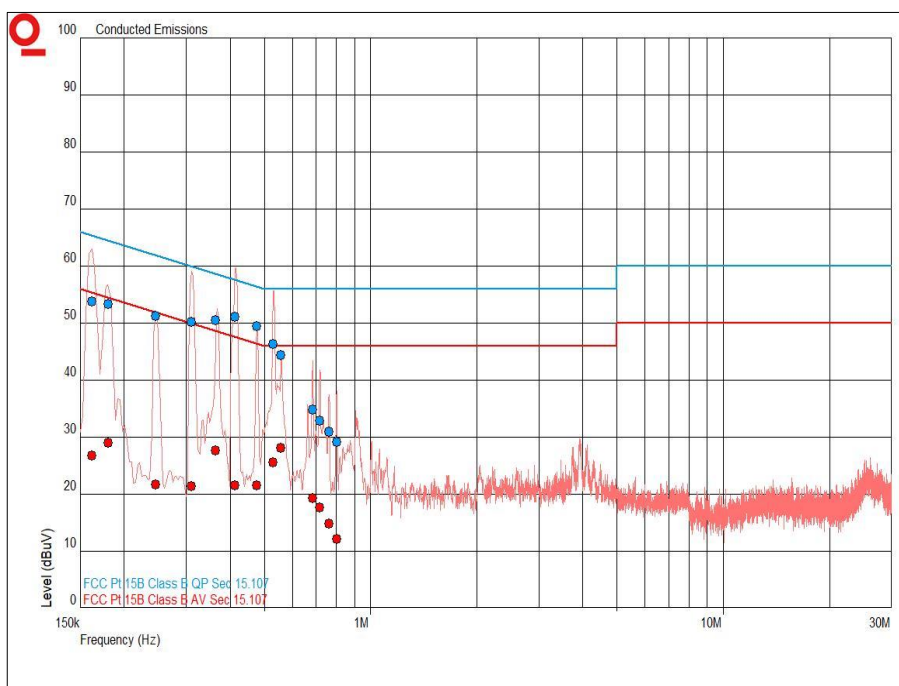
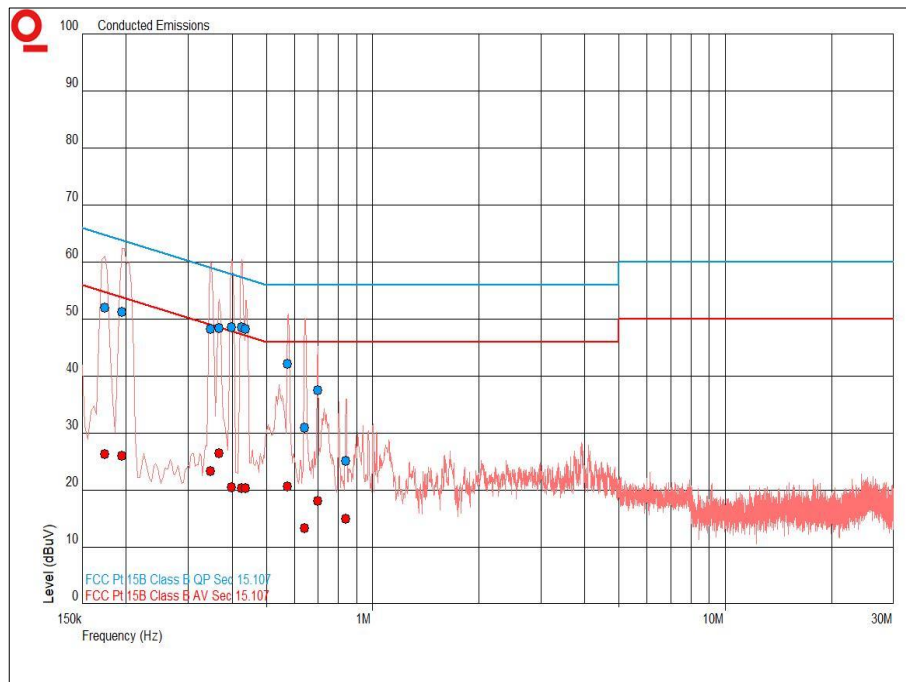


Figure 4 - Live Line - 150 kHz to 30 MHz

| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.174           | 51.9                    | 64.8                    | -12.8                  | 26.3                       | 54.8                       | -28.5                     |
| 0.195           | 51.2                    | 63.8                    | -12.6                  | 26.0                       | 53.8                       | -27.8                     |
| 0.347           | 48.2                    | 59.0                    | -10.8                  | 23.4                       | 49.0                       | -25.6                     |
| 0.368           | 48.4                    | 58.5                    | -10.1                  | 26.4                       | 48.5                       | -22.1                     |
| 0.398           | 48.5                    | 57.9                    | -9.4                   | 20.6                       | 47.9                       | -27.3                     |
| 0.425           | 48.6                    | 57.4                    | -8.7                   | 20.4                       | 47.4                       | -27.0                     |
| 0.437           | 48.3                    | 57.1                    | -8.8                   | 20.4                       | 47.1                       | -26.8                     |
| 0.574           | 42.1                    | 56.0                    | -13.9                  | 20.7                       | 46.0                       | -25.3                     |
| 0.643           | 30.9                    | 56.0                    | -25.1                  | 13.4                       | 46.0                       | -32.6                     |
| 0.701           | 37.6                    | 56.0                    | -18.4                  | 18.1                       | 46.0                       | -27.9                     |
| 0.840           | 25.2                    | 56.0                    | -30.8                  | 15.0                       | 46.0                       | -31.0                     |

**Table 8 - Neutral Line Emissions Results**



**Figure 5 - Neutral Line - 150 kHz to 30 MHz**

## 2.4 GHz Bluetooth

Applied supply voltage: 120 V AC

Applied supply frequency: 60 Hz

| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.213           | 50.1                    | 63.1                    | -13.0                  | 21.7                       | 53.1                       | -31.4                     |
| 0.314           | 49.4                    | 59.9                    | -10.5                  | 21.6                       | 49.9                       | -28.3                     |
| 0.362           | 49.4                    | 58.7                    | -9.2                   | 27.6                       | 48.7                       | -21.0                     |
| 0.383           | 49.7                    | 58.2                    | -8.5                   | 24.7                       | 48.2                       | -23.6                     |
| 0.460           | 49.5                    | 56.7                    | -7.2                   | 21.2                       | 46.7                       | -25.4                     |
| 0.475           | 49.1                    | 56.4                    | -7.3                   | 21.6                       | 46.4                       | -24.8                     |
| 0.553           | 46.8                    | 56.0                    | -9.2                   | 28.1                       | 46.0                       | -17.9                     |
| 0.583           | 44.1                    | 56.0                    | -11.9                  | 18.7                       | 46.0                       | -27.3                     |
| 0.681           | 36.7                    | 56.0                    | -19.3                  | 19.2                       | 46.0                       | -26.8                     |
| 0.714           | 34.7                    | 56.0                    | -21.3                  | 18.6                       | 46.0                       | -27.4                     |
| 0.777           | 31.4                    | 56.0                    | -24.6                  | 12.9                       | 46.0                       | -33.1                     |
| 0.804           | 30.1                    | 56.0                    | -25.9                  | 12.4                       | 46.0                       | -33.6                     |
| 0.822           | 29.4                    | 56.0                    | -26.6                  | 13.5                       | 46.0                       | -32.5                     |

Table 9 - Live Line Emissions Results

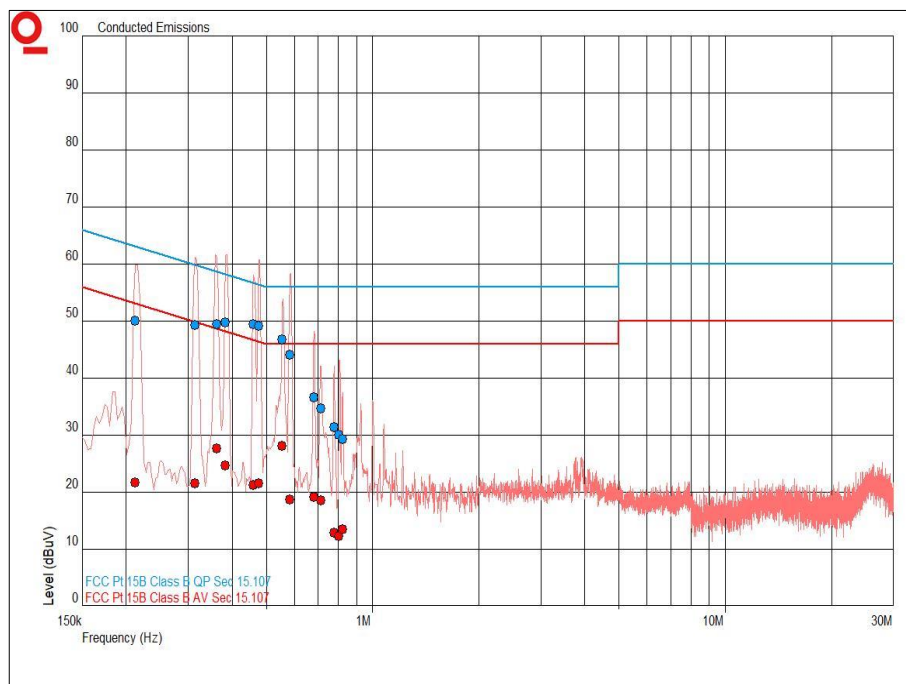
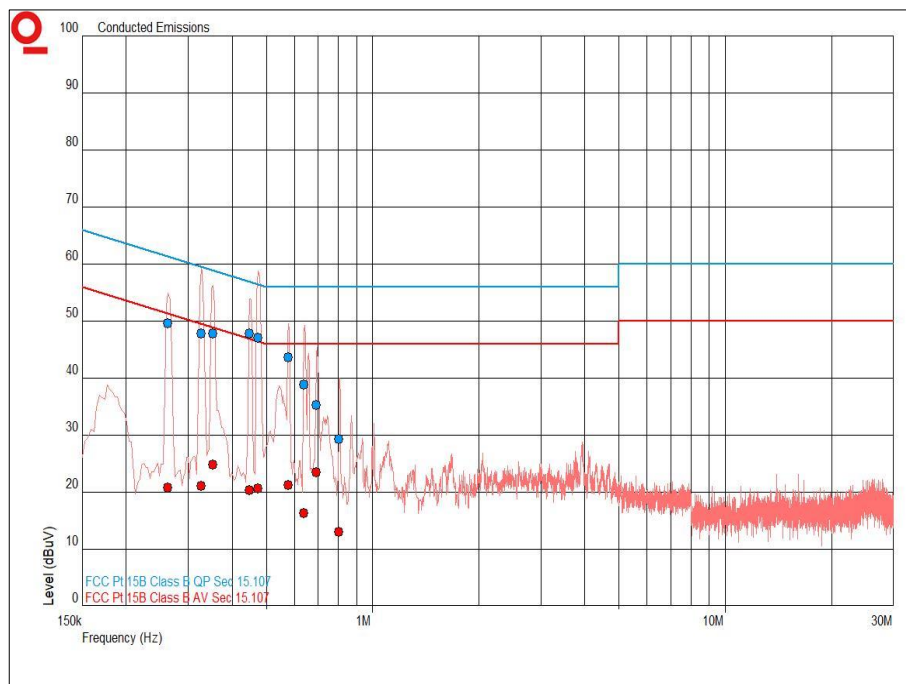


Figure 6 - Live Line - 150 kHz to 30 MHz

| Frequency (MHz) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Quasi-Peak Margin (dB) | CISPR Average Level (dBμV) | CISPR Average Limit (dBμV) | CISPR Average Margin (dB) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.263           | 49.6                    | 61.3                    | -11.7                  | 20.8                       | 51.3                       | -30.5                     |
| 0.326           | 47.9                    | 59.5                    | -11.7                  | 21.0                       | 49.5                       | -28.5                     |
| 0.353           | 47.8                    | 58.9                    | -11.1                  | 24.8                       | 48.9                       | -24.1                     |
| 0.449           | 47.9                    | 56.9                    | -9.0                   | 20.3                       | 46.9                       | -26.6                     |
| 0.472           | 47.1                    | 56.5                    | -9.4                   | 20.7                       | 46.5                       | -25.8                     |
| 0.577           | 43.7                    | 56.0                    | -12.3                  | 21.2                       | 46.0                       | -24.8                     |
| 0.640           | 38.8                    | 56.0                    | -17.2                  | 16.3                       | 46.0                       | -29.7                     |
| 0.693           | 35.3                    | 56.0                    | -20.7                  | 23.5                       | 46.0                       | -22.5                     |
| 0.804           | 29.3                    | 56.0                    | -26.7                  | 13.1                       | 46.0                       | -32.9                     |

**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 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.



### 2.1.9 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                          | 3-Jan-2021      |
| Transient Limiter      | Hewlett Packard | 11947A        | 15    | 12                          | 2-Oct-2020      |
| 3 phase LISN           | Rohde & Schwarz | ESH2-Z5       | 323   | 12                          | 21-Jan-2021     |
| 8 Meter Cable          | Teledyne        | PR90-088-8MTR | 5212  | 12                          | 30-Aug-2020     |
| Cable                  | Teledyne        | PRO-088-8MTR  | 5462  | 6                           | 6-Sep-2020      |

**Table 12**



### 3 Test Equipment Information

#### 3.1 General Test Equipment Used

| Instrument             | Manufacturer    | Type No    | TE No | Calibration Period (months) | Calibration Due |
|------------------------|-----------------|------------|-------|-----------------------------|-----------------|
| Power Supply Unit      | Farnell         | LB30-4     | 158   | -                           | O/P Mon         |
| Multimeter             | Iso-tech        | IDM 101    | 2118  | 12                          | 07-Feb-2021     |
| Thermo-Hygro-Barometer | PCE Instruments | PCE-THB-40 | 5473  | 12                          | 16-Mar-2021     |

**Table 13**

O/P Mon – Output Monitored using calibrated equipment



## **4 Incident Reports**

No incidents reports were raised.



## 5 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, $\pm 3.7$ dB |

**Table 14**

### 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.