

# FCC and ISED Test Report

Apple Inc  
Model: A2439

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

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



FCC ID: BCGA2439

IC: 579C-A2439

## COMMERCIAL-IN-CONFIDENCE

Document 75949506-13 Issue 01

| SIGNATURE |                 |                      |                  |
|-----------|-----------------|----------------------|------------------|
|           |                 |                      |                  |
| NAME      | JOB TITLE       | RESPONSIBLE FOR      | ISSUE DATE       |
| A Lawson  | Senior Engineer | Authorised Signatory | 11 February 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         | Connor Lee | 11 February 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: 2019 and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

|  |  |                                                                                                                                                                                                                                                                                                                                                                   |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <b>DISCLAIMER AND COPYRIGHT</b><br>This non-binding report has been prepared by TÜV SÜD with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD. No part of this document may be reproduced without the prior written approval of TÜV SÜD. © 2021 TÜV SÜD. This report relates only to the actual item/items tested. |
|  |  | <b>ACCREDITATION</b><br>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).                                                                                               |

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](http://www.tuv-sud.co.uk)

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



## Contents

|          |                                         |           |
|----------|-----------------------------------------|-----------|
| <b>1</b> | <b>Report Summary .....</b>             | <b>2</b>  |
| 1.1      | Report Modification Record.....         | 2         |
| 1.2      | Introduction.....                       | 2         |
| 1.3      | Brief Summary of Results .....          | 3         |
| 1.4      | Product Information .....               | 4         |
| 1.5      | Deviations from the Standard.....       | 4         |
| 1.6      | EUT Modification Record .....           | 4         |
| 1.7      | Test Location .....                     | 4         |
| <b>2</b> | <b>Test Details .....</b>               | <b>5</b>  |
| 2.1      | AC Power Line Conducted Emissions ..... | 5         |
| <b>3</b> | <b>Measurement Uncertainty .....</b>    | <b>13</b> |



# 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 February 2021 |

**Table 1**

## 1.2 Introduction

|                               |                                                                             |
|-------------------------------|-----------------------------------------------------------------------------|
| Applicant                     | Apple Inc                                                                   |
| Manufacturer                  | Apple Inc                                                                   |
| Model Number(s)               | A2439                                                                       |
| Serial Number(s)              | C02DM00M0FTN                                                                |
| Hardware Version(s)           | REV1.0                                                                      |
| Software Version(s)           | 20W430340t                                                                  |
| Number of Samples Tested      | 2                                                                           |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C: 2019<br>ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) |
| Order Number                  | 0540205414                                                                  |
| Date                          | 13-July-2020                                                                |
| Date of Receipt of EUT        | 11-December-2020                                                            |
| Start of Test                 | 03-January-2021                                                             |
| Finish of Test                | 03-January-2021                                                             |
| 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 ISED RSS-GEN is shown below.

| Section                                   | Specification Clause |         | Test Description                  | Result | Comments/Base Standard |
|-------------------------------------------|----------------------|---------|-----------------------------------|--------|------------------------|
|                                           | Part 15C             | RSS-GEN |                                   |        |                        |
| Configuration and Mode: 5 GHz WLAN        |                      |         |                                   |        |                        |
| 2.1                                       | 15.207               | 8.8     | AC Power Line Conducted Emissions | Pass   | ANSI C63.10 (2013)     |
| 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)     |

**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: A2439, Serial Number: C02DM00M0FTN      |                                                 |                        |                          |
| 0                                              | As supplied by the customer                     | Not Applicable         | Not Applicable           |
| Model: A2388, Serial Number: C4H039400ELPQGK9G |                                                 |                        |                          |
| 0                                              | 0                                               | 0                      | 0                        |

**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: 5 GHz WLAN        |                     |               |
| AC Power Line Conducted Emissions         | Connor Lee          | UKAS          |
| 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          |

**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

A2439, S/N: C02DM00M0FTN - Modification State 0  
A2388, S/N: C4H039400ELPQGK9G - Modification State 0

#### 2.1.3 Date of Test

03-January-2021

#### 2.1.4 Test Method

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

#### 2.1.5 Environmental Conditions

|                     |         |
|---------------------|---------|
| Ambient Temperature | 18.7 °C |
| Relative Humidity   | 34.6 %  |



**2.1.6 Test Results**

5 GHz WLAN

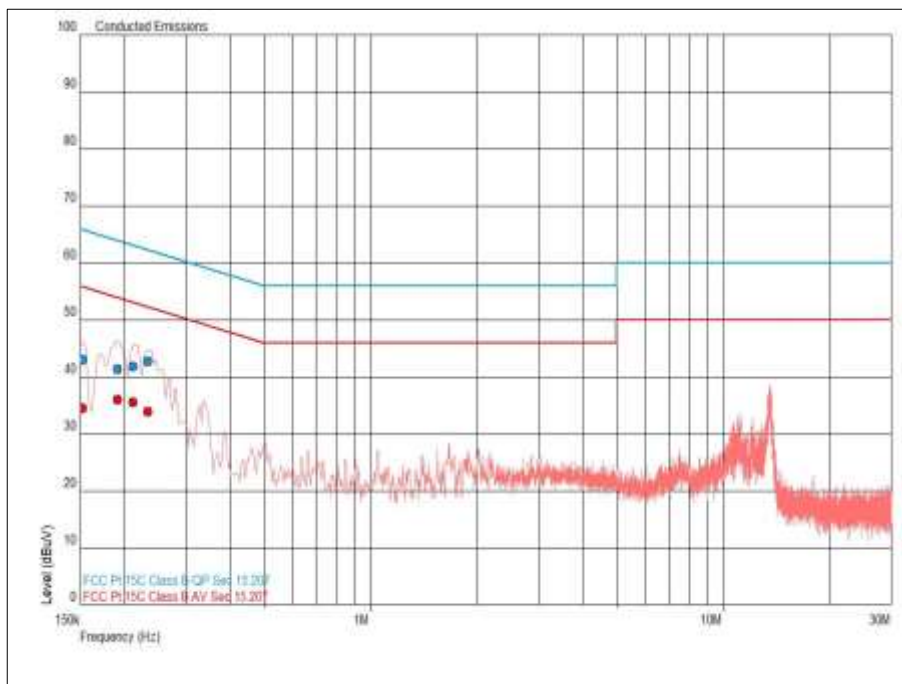
Applied supply voltage: 120 V AC

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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.153           | 43.1                    | 65.8                    | -22.7                  | 34.5                       | 55.8                       | -21.3                     |
| 0.192           | 41.5                    | 64.0                    | -22.5                  | 36.0                       | 54.0                       | -18.0                     |
| 0.213           | 41.9                    | 63.1                    | -21.2                  | 35.6                       | 53.1                       | -17.5                     |
| 0.234           | 42.8                    | 62.3                    | -19.5                  | 33.9                       | 52.3                       | -18.4                     |

**Table 5 - Live Line Emissions Results**

No other final measurements were made as all other peak emissions seen above the system noise floor during the pre-scan were greater than 10 dB below the CISPR Average test limit.



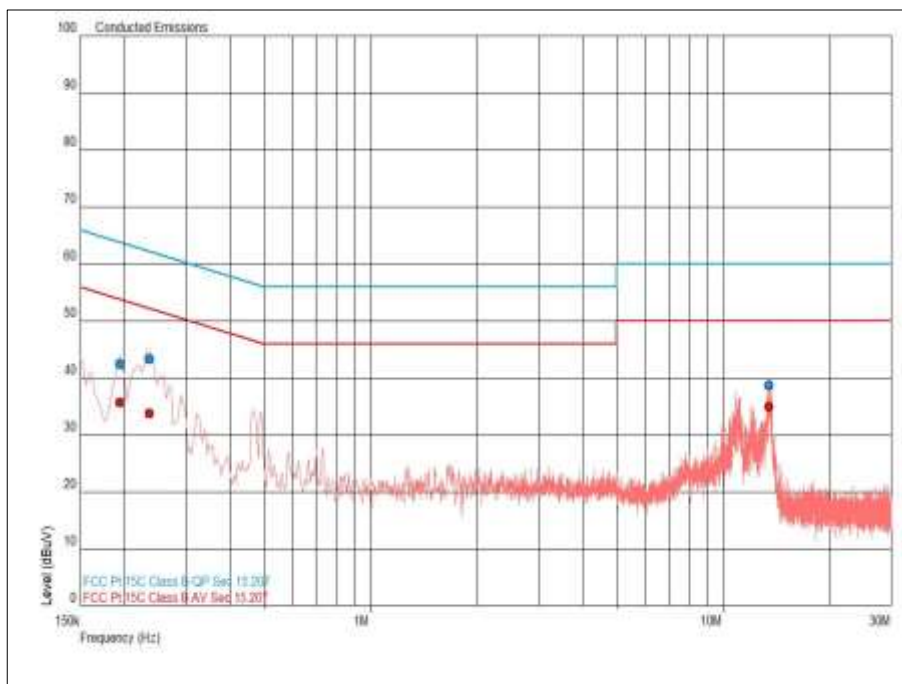
**Figure 1 - Live Line - 150 kHz to 30 MHz**



| 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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.195           | 42.4                    | 63.8                    | -21.4                  | 35.7                       | 53.8                       | -18.2                     |
| 0.237           | 43.3                    | 62.2                    | -18.9                  | 33.8                       | 52.2                       | -18.4                     |
| 13.520          | 38.8                    | 60.0                    | -21.2                  | 35.0                       | 50.0                       | -15.0                     |

**Table 6 - Neutral Line Emissions Results**

No other final measurements were made as all other peak emissions seen above the system noise floor during the pre-scan were greater than 10 dB below the CISPR Average test limit.



**Figure 2 - Neutral Line - 150 kHz to 30 MHz**





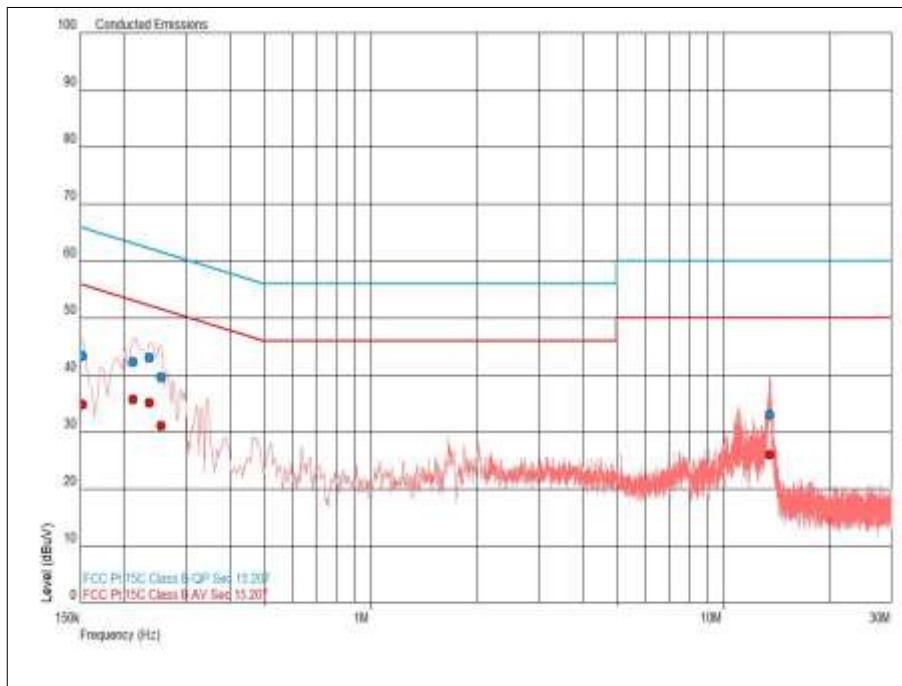
2.4 GHz WLAN

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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.153           | 43.4                    | 65.8                    | -22.5                  | 34.8                       | 55.8                       | -21.1                     |
| 0.213           | 42.3                    | 63.1                    | -20.8                  | 35.8                       | 53.1                       | -17.3                     |
| 0.237           | 43.0                    | 62.2                    | -19.2                  | 35.1                       | 52.2                       | -17.1                     |
| 0.254           | 39.7                    | 61.6                    | -21.9                  | 31.0                       | 51.6                       | -20.6                     |
| 13.567          | 33.1                    | 60.0                    | -26.9                  | 26.0                       | 50.0                       | -24.0                     |

**Table 7 - Live Line Emissions Results**

No other final measurements were made as all other peak emissions seen above the system noise floor during the pre-scan were greater than 10 dB below the CISPR Average test limit.

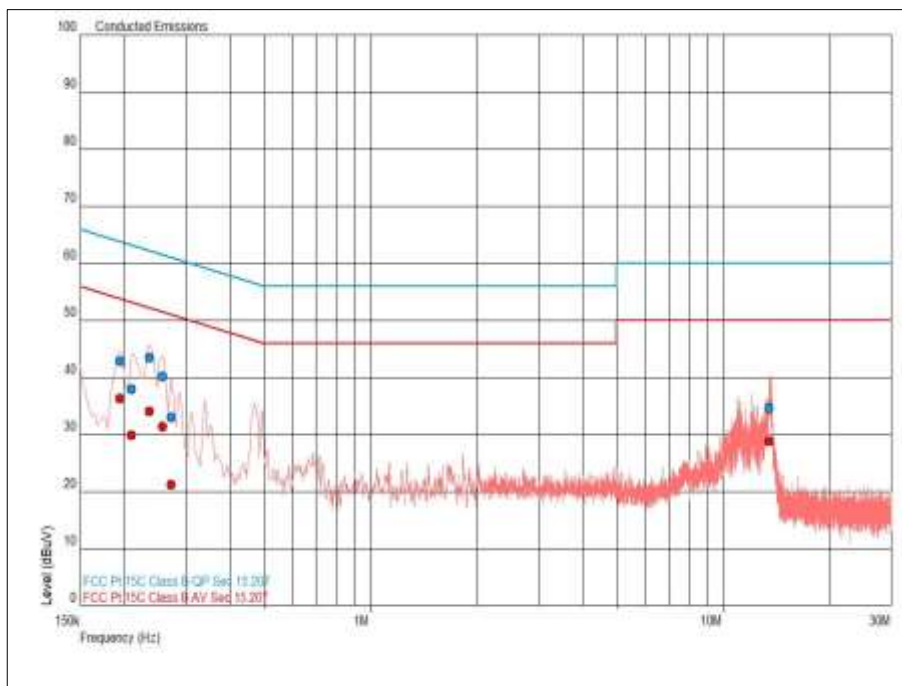


**Figure 3 - Live Line - 150 kHz to 30 MHz**



| 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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.195           | 42.9                    | 63.8                    | -20.9                  | 36.4                       | 53.8                       | -17.4                     |
| 0.210           | 38.0                    | 63.2                    | -25.2                  | 29.9                       | 53.2                       | -23.4                     |
| 0.237           | 43.5                    | 62.2                    | -18.7                  | 34.2                       | 52.2                       | -18.0                     |
| 0.257           | 40.2                    | 61.5                    | -21.3                  | 31.5                       | 51.5                       | -20.1                     |
| 0.272           | 33.0                    | 61.0                    | -28.0                  | 21.2                       | 51.0                       | -29.8                     |
| 13.514          | 34.7                    | 60.0                    | -25.3                  | 28.9                       | 50.0                       | -21.1                     |

**Table 8 - Neutral Line Emissions Results**



**Figure 4 - Neutral Line - 150 kHz to 30 MHz**



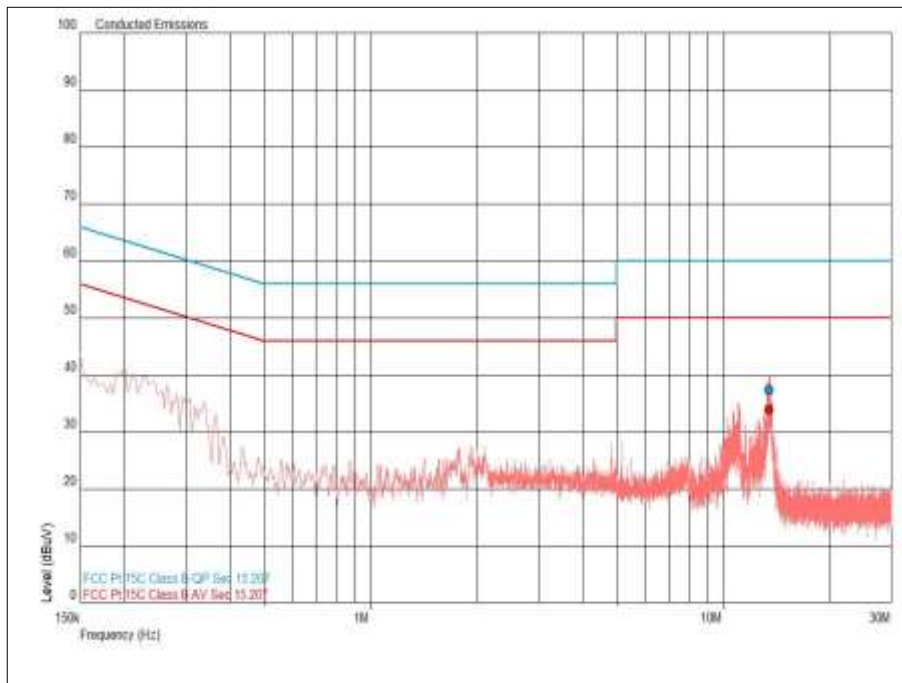
2.4 GHz Bluetooth

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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 13.520          | 37.4                    | 60.0                    | -22.6                  | 34.0                       | 50.0                       | -16.0                     |

**Table 9 - Live Line Emissions Results**

No other final measurements were made as all other peak emissions seen above the system noise floor during the pre-scan were greater than 10 dB below the CISPR Average test limit.



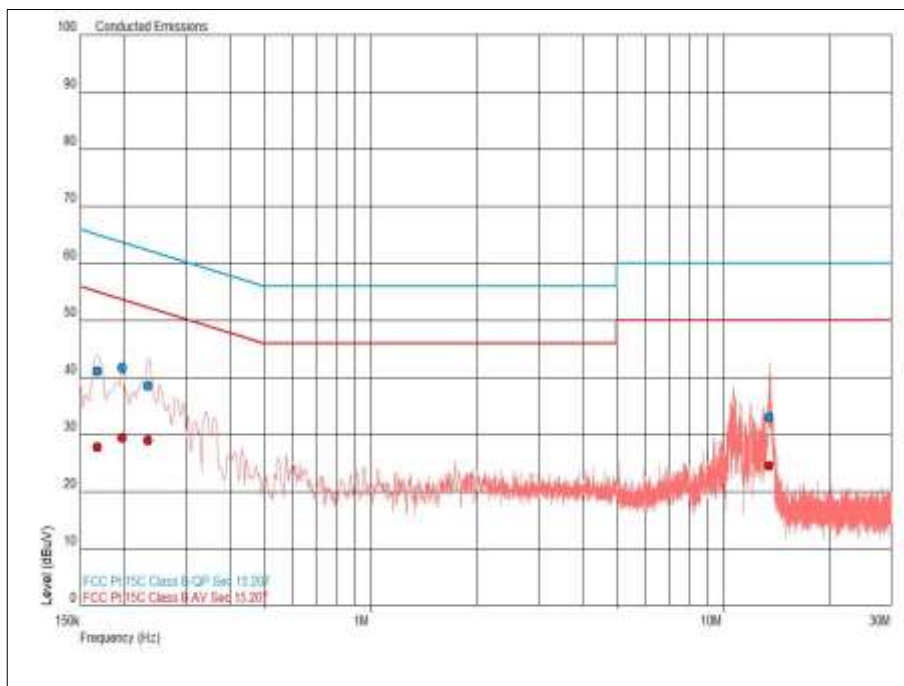
**Figure 5 - Live Line - 150 kHz to 30 MHz**



| 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) |
|-----------------|-------------------------|-------------------------|------------------------|----------------------------|----------------------------|---------------------------|
| 0.168           | 41.1                    | 65.1                    | -24.0                  | 27.9                       | 55.1                       | -27.2                     |
| 0.198           | 41.8                    | 63.7                    | -21.9                  | 29.5                       | 53.7                       | -24.2                     |
| 0.234           | 38.5                    | 62.3                    | -23.8                  | 29.1                       | 52.3                       | -23.3                     |
| 13.511          | 33.1                    | 60.0                    | -26.9                  | 24.5                       | 50.0                       | -25.5                     |

**Table 10 - Neutral Line Emissions Results**

No other final measurements were made as all other peak emissions seen above the system noise floor during the pre-scan were greater than 10 dB below the CISPR Average test limit.



**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             | 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 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  | -                           | N/A - Software  |
| EMI Test Receiver                       | Rohde & Schwarz | ESU40                | 3506  | 12                          | 14-Jan-2022     |
| Transient Limiter                       | Hewlett Packard | 11947A               | 2377  | 12                          | 26-Feb-2021     |
| Transient Limiter                       | Hewlett Packard | 11947A               | 2378  | 12                          | 12-Oct-2021     |
| 2 Meter Cable                           | Teledyne        | PR90-088-2MTR        | 5200  | 12                          | 3-Sep-2021      |
| Cable (18GHz)                           | Junkosha        | MWX221-04000NMSNMS/B | 5262  | 12                          | 22-Jul-2021     |
| 8m N Type Cable                         | Junkosha        | MWX221-08000NMSNMS/B | 5519  | 12                          | 24-Mar-2021     |
| 8m N-Type Cable                         | Junkosha        | MWX221-08000NMSNMS/B | 5520  | 12                          | 24-Mar-2021     |
| 3 Phase Artificial Mains Network (LISN) | Rohde & Schwarz | ESH2-Z5              | 16    | 12                          | 17-Apr-2021     |
| LISN                                    | Rohde & Schwarz | ESH3-Z5              | 1390  | 12                          | 27-Jan-2021     |
| Multimeter                              | Iso-tech        | IDM101               | 2424  | 12                          | 14-Dec-2021     |
| Thermo-Hygro-Barometer                  | PCE Instruments | PCE-THB 40           | 5604  | 12                          | 08-Sep-2021     |

**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, $\pm 3.7$ 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.