FCC and ISED Test Report

Apple Inc
Model: A3186

In accordance with FCC 47 CFR Part 15C and ISED RSS-247 and ISED RSS-GEN

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

TUV SUD Digitally signed by TUV SUD Date: 2024.09.03 09:59:48 +01'00'

FCC ID: BCGA3186 IC: 579C-A3186

COMMERCIAL-IN-CONFIDENCE

Document 75961394-36 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Dawkins	Senior Engineer, EMC	Authorised Signatory	03 September 2024

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-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	Nathan Harrison	03 September 2024	
Testing	Ryan Lakeman	03 September 2024	

FCC Accreditation
492497/UK2010 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A/UK0003 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, ISED RSS-247 and ISED RSS-GEN: 2023, Issue 3 (2023-08) and Issue 5 (2018-04) + A2 (2021-02) 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	03-Sept-2024

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
EUT/Sample Identification	Refer to section 1.6
Test Specification/Issue/Date	FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN: 2023, Issue 3 (2023-08) and Issue 5 (2018-04) + A2 (2021-02)
Start of Test	24-July-2024
Finish of Test	07-August-2024
Name of Engineer(s)	Nathan Harrison, Connor Lee and Ryan Lakeman
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-247 and ISED RSS-GEN is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - 2.4 GHz Bluetooth				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 2

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - 2.4 GHz WLAN				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 3

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - 5 GHz WLAN				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 4

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - 6 GHz WLAN				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 5

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - Thread				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 6

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - Narrowband				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10

Table 7

1.4 Product Information

1.4.1 Technical Description

The equipment under test (EUT) was a portable laptop computer.

1.4.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Configuration and Mode: AC Powered – All Modes				
AC Power Port	2 m	Power	AC to DC Power Adapter with MagSafe cable	No
USB Port 1	2 m	Data	USB Type-C	No
USB Port 2	Unterminated	Data	USB Type-C	No
USB Port 3	Unterminated	Data	USB Type-C	No
HDMI Port	2 m	Video output	HDMI	No
Audio Jack Port	1 m	Audio Output	3.5 mm Jack	No

Table 8

1.4.3 Test Configuration

Configuration	Description
AC Powered	The EUT was powered from a 120 V 60 Hz AC supply using an AC to DC adapter with USB-C output. PSU Model: A2743. A PC hub was used to terminate the USB-1 port, HDMI port and 3.5 mm audio jack port. USB port 2 was unterminated. USB port 3 was unterminated.

Table 9

1.4.4 Modes of Operation

Mode	Description
2.4 GHz Bluetooth	The EUT was powered with a connection established with a CMW 500 test set.
2.4 GHz WLAN	The EUT was powered with a network link established with an access point.
5 GHz WLAN	The EUT was powered with a network link established with an access point.
6 GHz WLAN	The EUT was powered with a network link established with an access point.
Thread	The EUT was powered and placed in a link with another customer provided slave device.
Narrowband	The EUT was powered and placed in a link with another customer provided slave device.

Table 10

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 Identification of the EUT

The table below details identification of the EUT(s) that have been used to carry out the testing within this report.

Model: A3186			
Serial Number	Hardware Version	Software Version	Firmware
LY537L0GFK	REV1.0	24A295	WLAN: 23.10.864.0.41.51.156 BT/Thread: 22.1.116.1033
L27WRR2R6P	REV1.0	24A295	WLAN: 23.10.864.0.41.51.156 BT/Thread: 22.1.116.1033
C4WY920D3K	REV1.0	24A32191p	WLAN: 23.30.16 BT/Thread: 22.1.65.459

Table 11

1.7 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: A3186, Serial Number: LY537L0GFK			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3186, Serial Number: L27WRR2R6P			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3186, Serial Number: C4WY920D3K			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 12

1.8 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - 2.4 GHz Bluetooth		
AC Power Line Conducted Emissions	Connor Lee	UKAS

Table 13

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - 2.4 GHz WLAN		
AC Power Line Conducted Emissions	Connor Lee	UKAS

Table 14

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - 5 GHz WLAN		
AC Power Line Conducted Emissions	Connor Lee	UKAS

Table 15

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - 6 GHz WLAN		
AC Power Line Conducted Emissions	Connor Lee	UKAS

Table 16

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - Thread		
AC Power Line Conducted Emissions	Ryan Lakeman	UKAS

Table 17

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - Narrowband		
AC Power Line Conducted Emissions	Nathan Harrison	UKAS

Table 18

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, ISED RSS-247 and ISED RSS-GEN, Clause 15.207, 3.1 and 8.8

2.1.2 Equipment Under Test and Modification State

A3186, S/N: LY537L0GFK - Modification State 0
A3186, S/N: L27WRR2R6P - Modification State 0
A3186, S/N: C4WY920D3K - Modification State 0

2.1.3 Date of Test

24-July-2024 to 07-August-2024

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 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

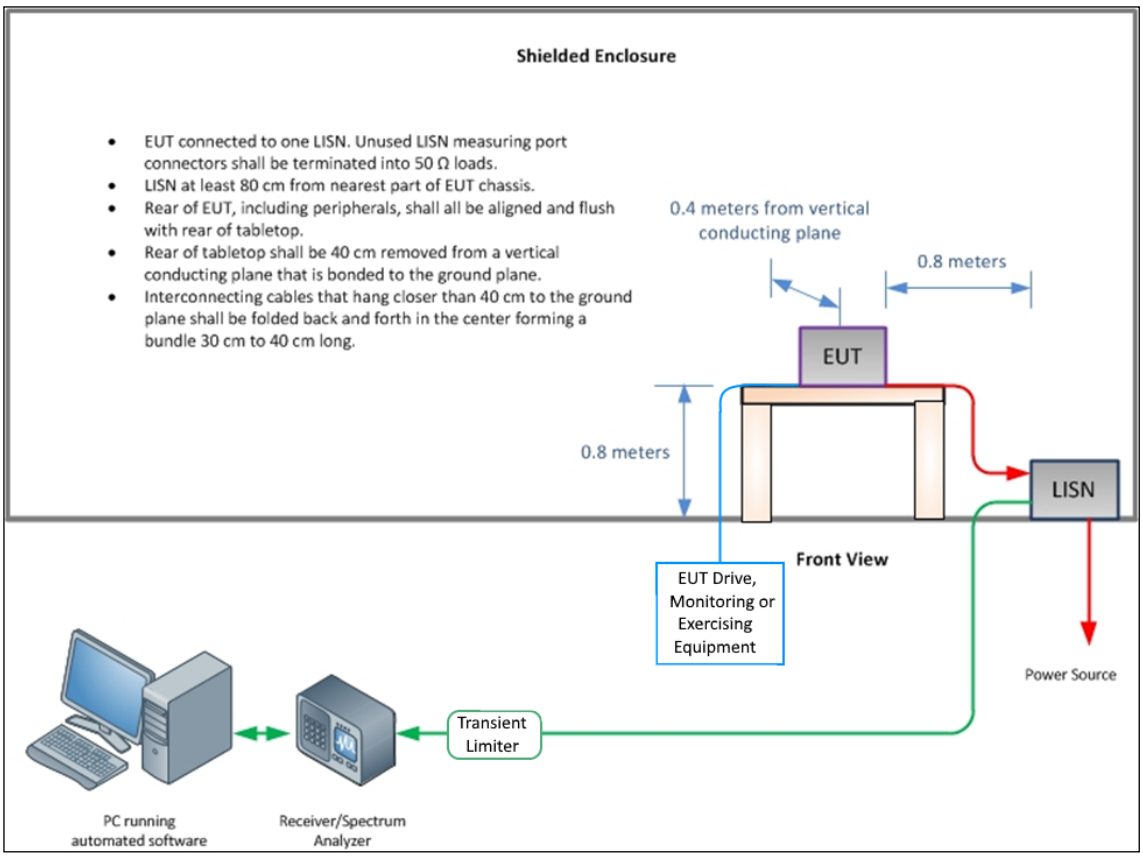

Figure 1 - Conducted Disturbance

2.1.7 Environmental Conditions

Ambient Temperature	17.8 °C
Relative Humidity	51.5 %

2.1.8 Specification Limits

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 19

*Decreases with the logarithm of the frequency.

2.1.9 Test Results

AC Powered - 2.4 GHz Bluetooth

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

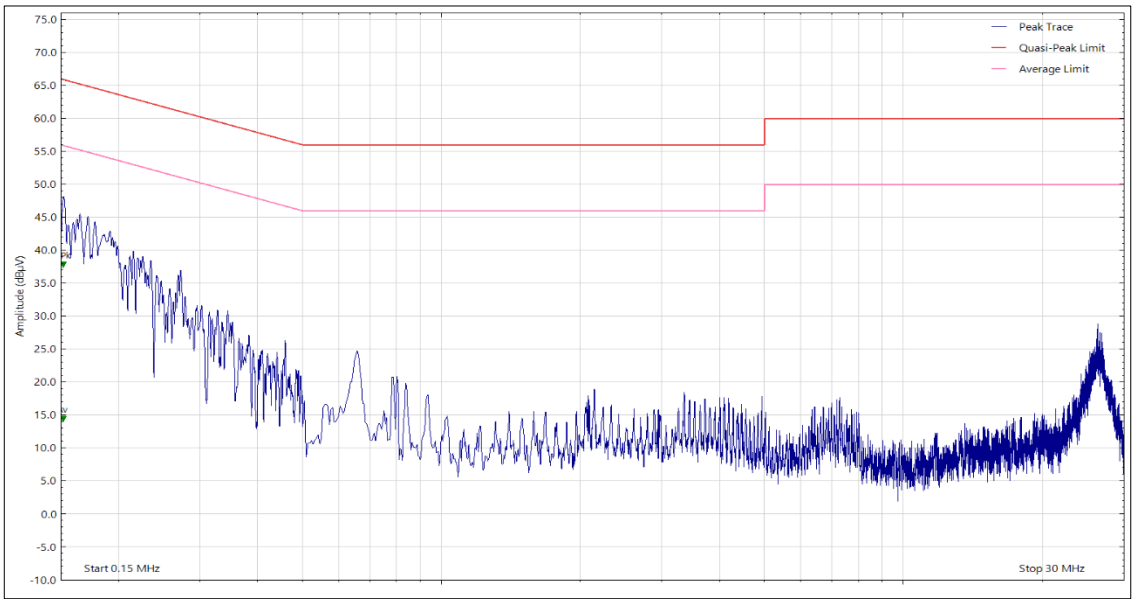

Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.156	36.75	65.70	-28.95	Q-Peak
0.156	14.33	55.70	-41.37	CISPR Avg
0.162	41.42	65.40	-23.98	Q-Peak
0.162	14.99	55.40	-40.41	CISPR Avg

Table 20 - Live Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

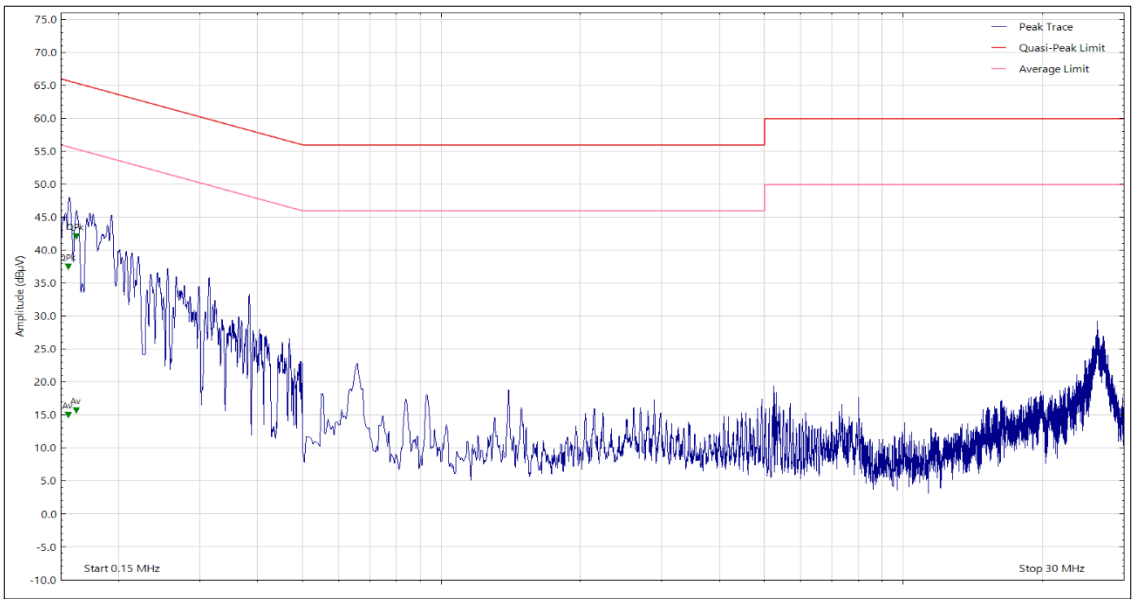

Figure 3 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.152	37.08	65.90	-28.82	Q-Peak
0.152	13.69	55.90	-42.21	CISPR Avg

Table 21 - Neutral Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

AC Powered - 2.4 GHz WLAN

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

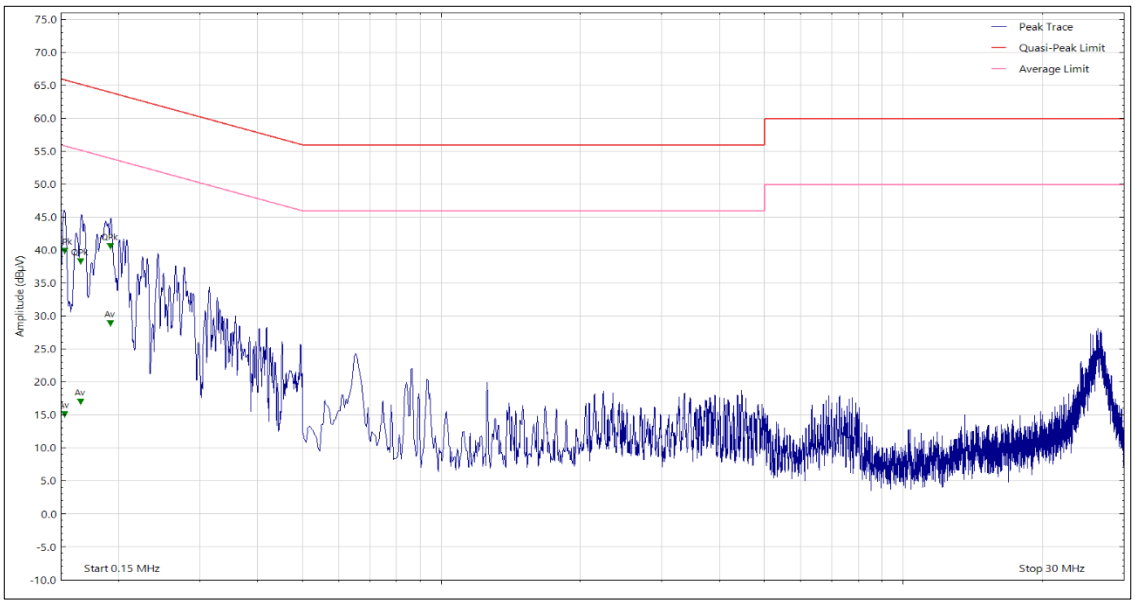

Figure 4 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.153	39.16	65.90	-26.74	Q-Peak
0.153	14.41	55.90	-41.49	CISPR Avg
0.166	37.62	65.10	-27.48	Q-Peak
0.166	16.27	55.10	-38.83	CISPR Avg
0.192	39.92	64.00	-24.08	Q-Peak
0.192	28.24	54.00	-25.76	CISPR Avg

Table 22 - Live Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

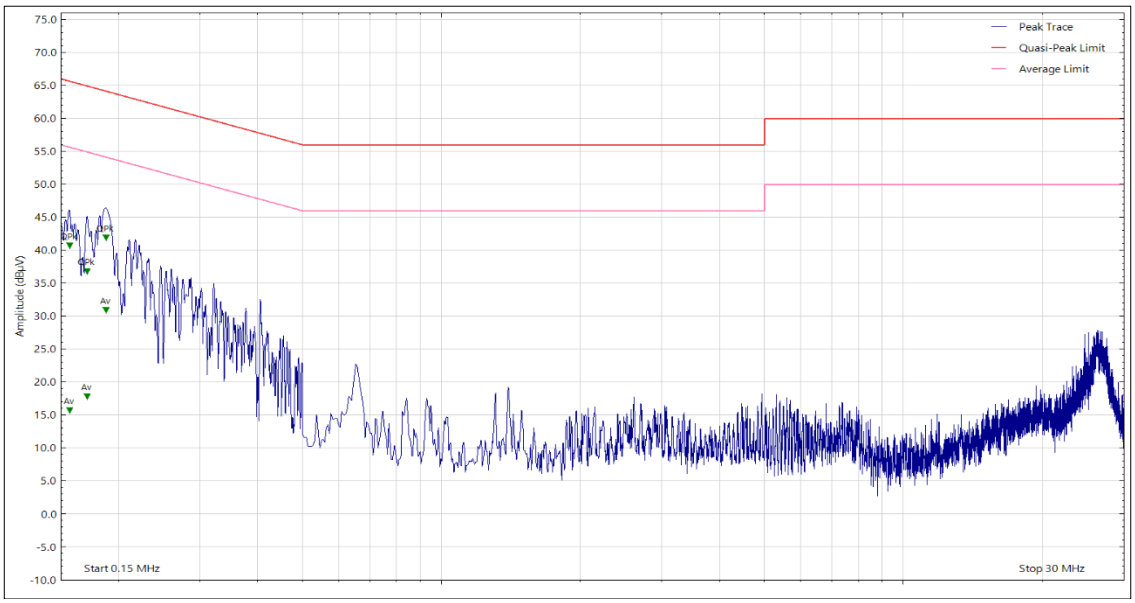

Figure 5 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.157	40.00	65.60	-25.60	Q-Peak
0.157	14.99	55.60	-40.61	CISPR Avg
0.171	36.14	64.90	-28.76	Q-Peak
0.171	17.14	54.90	-37.76	CISPR Avg
0.188	41.16	64.10	-22.94	Q-Peak
0.188	30.24	54.10	-23.86	CISPR Avg

Table 23 - Neutral Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

AC Powered - 5 GHz WLAN

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

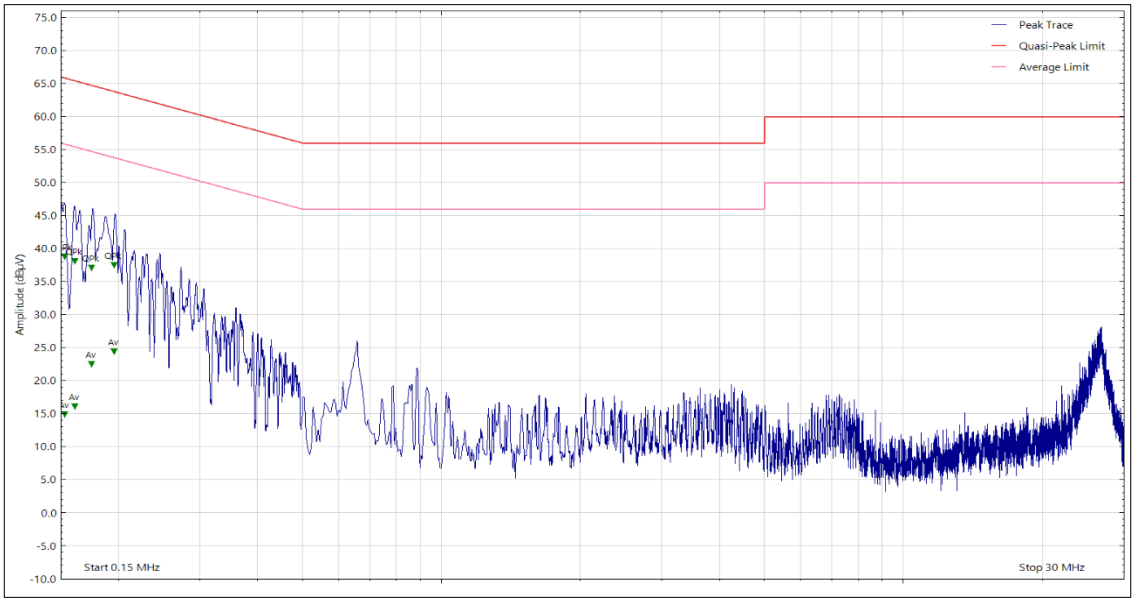

Figure 6 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.153	38.07	65.80	-27.73	Q-Peak
0.153	14.24	55.80	-41.56	CISPR Avg
0.161	37.39	65.40	-28.01	Q-Peak
0.161	15.44	55.40	-39.96	CISPR Avg
0.175	36.42	64.70	-28.28	Q-Peak
0.175	21.82	54.70	-32.88	CISPR Avg
0.196	36.76	63.80	-27.04	Q-Peak
0.196	23.71	53.80	-30.09	CISPR Avg

Table 24 - Live Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

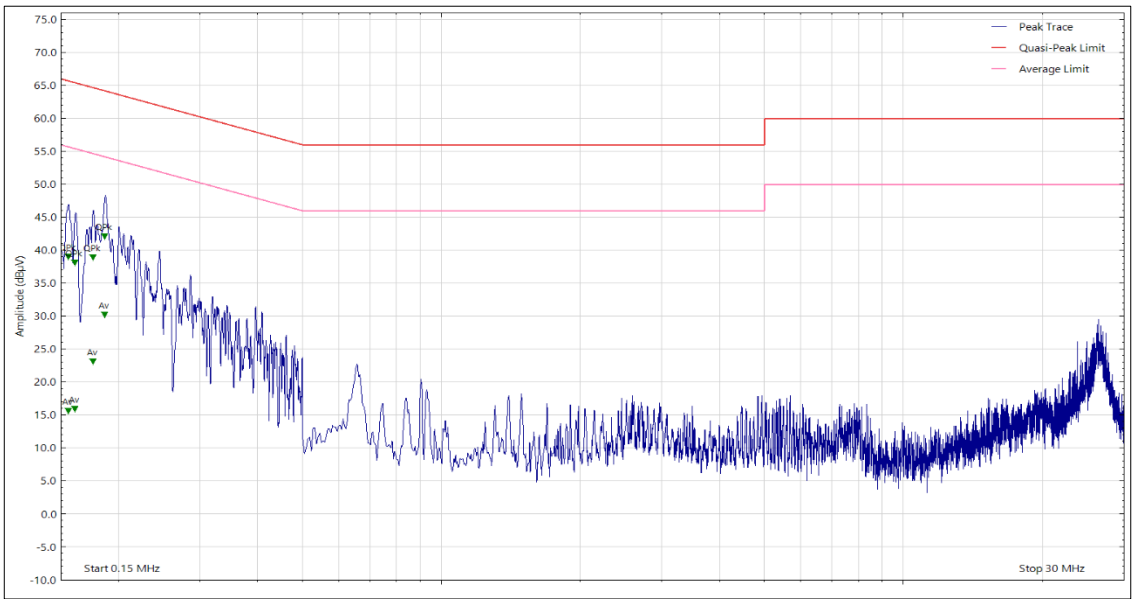

Figure 7 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.156	38.29	65.70	-27.41	Q-Peak
0.156	14.92	55.70	-40.78	CISPR Avg
0.161	37.42	65.40	-27.98	Q-Peak
0.161	15.27	55.40	-40.13	CISPR Avg
0.176	38.16	64.70	-26.54	Q-Peak
0.176	22.42	54.70	-32.28	CISPR Avg
0.187	41.36	64.20	-22.84	Q-Peak
0.187	29.46	54.20	-24.74	CISPR Avg

Table 25 - Neutral Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

AC Powered - 6 GHz WLAN

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

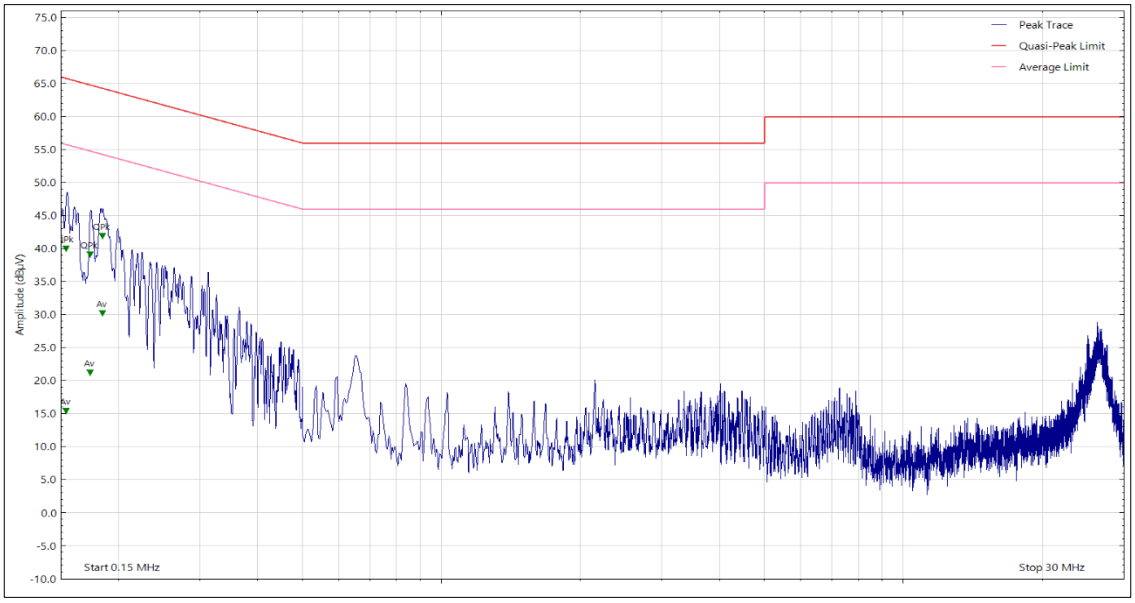

Figure 8 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.154	39.27	65.80	-26.53	Q-Peak
0.154	14.77	55.80	-41.03	CISPR Avg
0.174	38.39	64.80	-26.41	Q-Peak
0.174	20.48	54.80	-34.32	CISPR Avg
0.185	41.15	64.30	-23.15	Q-Peak
0.185	29.55	54.30	-24.75	CISPR Avg

Table 26 - Live Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

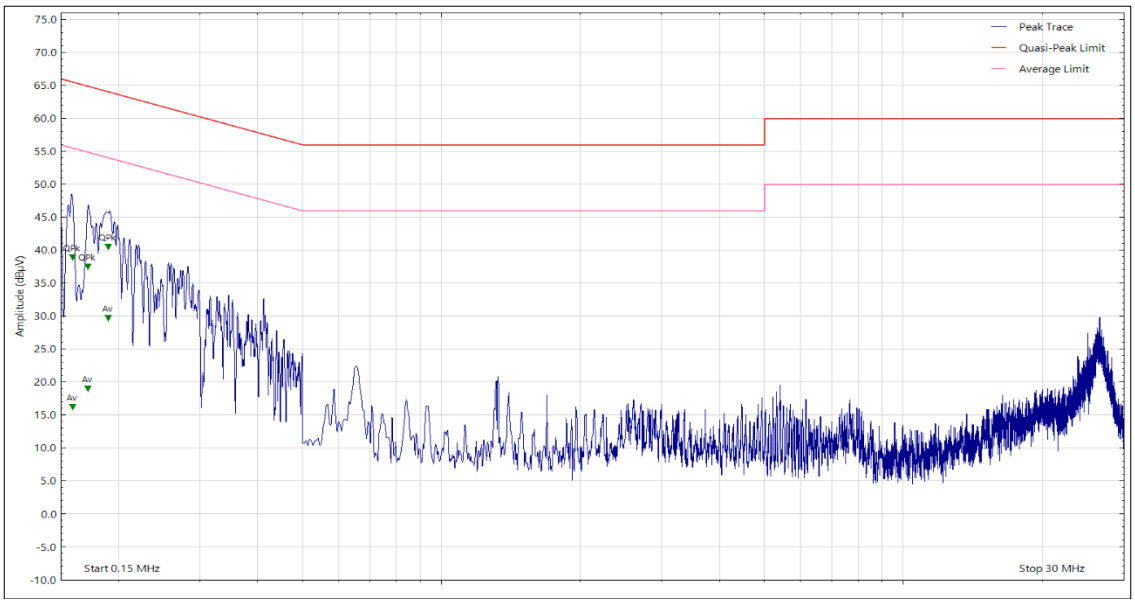

Figure 9 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.159	38.24	65.50	-27.26	Q-Peak
0.159	15.52	55.50	-39.98	CISPR Avg
0.172	36.83	64.90	-28.07	Q-Peak
0.172	18.35	54.90	-36.55	CISPR Avg
0.190	39.83	64.00	-24.17	Q-Peak
0.190	29.02	54.00	-24.98	CISPR Avg

Table 27 - Neutral Line Emissions Results

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 6 dB below the CISPR Average test limit.

AC Powered - Thread

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

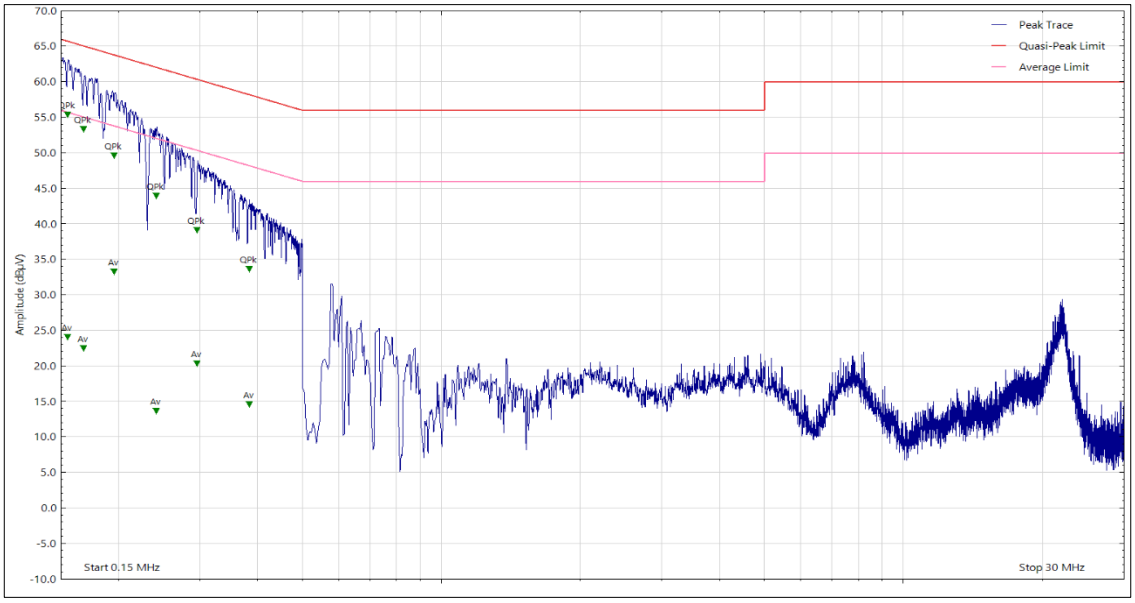

Figure 10 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.155	54.74	65.70	-10.96	Q-Peak
0.155	23.44	55.70	-32.26	CISPR Avg
0.168	21.83	55.00	-33.17	CISPR Avg
0.168	52.69	65.00	-12.31	Q-Peak
0.196	49.00	63.80	-14.80	Q-Peak
0.196	32.64	53.80	-21.16	CISPR Avg
0.242	12.96	52.00	-39.04	CISPR Avg
0.242	43.31	62.00	-18.69	Q-Peak
0.296	19.73	50.30	-30.57	CISPR Avg
0.296	38.44	60.30	-21.86	Q-Peak
0.384	13.97	48.20	-34.23	CISPR Avg
0.384	32.93	58.20	-25.27	Q-Peak

Table 28 - Live Line Emissions Results

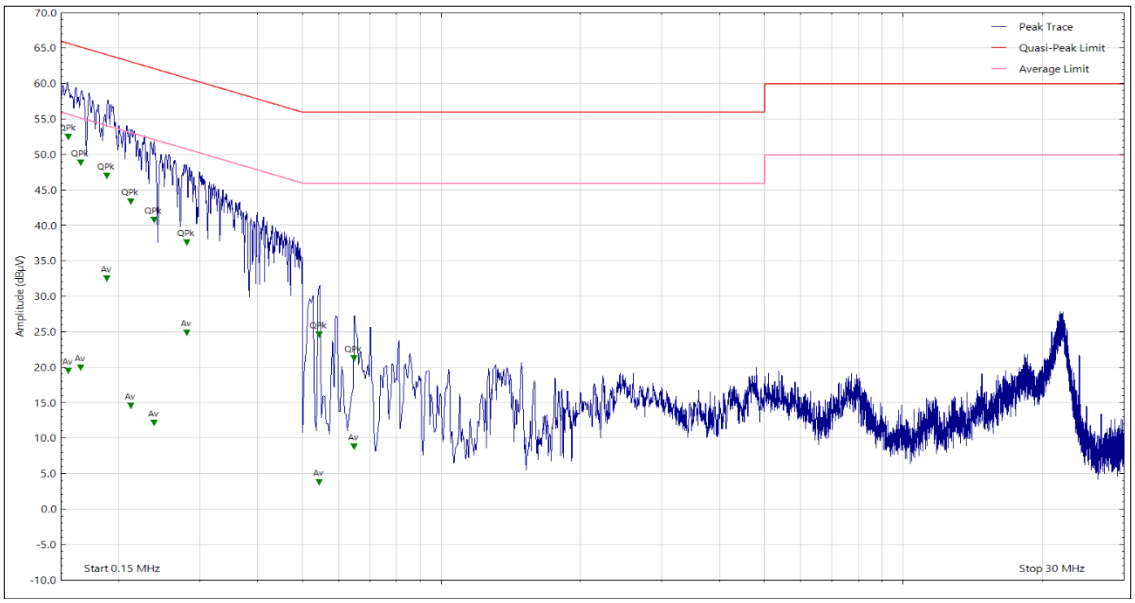

Figure 11 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.156	51.85	65.70	-13.85	Q-Peak
0.156	18.85	55.70	-36.85	CISPR Avg
0.166	19.29	55.10	-35.81	CISPR Avg
0.166	48.24	65.10	-16.86	Q-Peak
0.189	31.85	54.10	-22.25	CISPR Avg
0.189	46.33	64.10	-17.77	Q-Peak
0.213	13.90	53.10	-39.20	CISPR Avg
0.213	42.70	63.10	-20.40	Q-Peak
0.239	40.17	62.10	-21.93	Q-Peak
0.239	11.48	52.10	-40.62	CISPR Avg
0.281	24.28	50.80	-26.52	CISPR Avg
0.281	36.99	60.80	-23.81	Q-Peak
0.544	23.95	56.00	-32.05	Q-Peak
0.544	3.18	46.00	-42.82	CISPR Avg
0.648	20.59	56.00	-35.41	Q-Peak
0.648	8.12	46.00	-37.88	CISPR Avg

Table 29 - Neutral Line Emissions Results

AC Powered - Narrowband

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

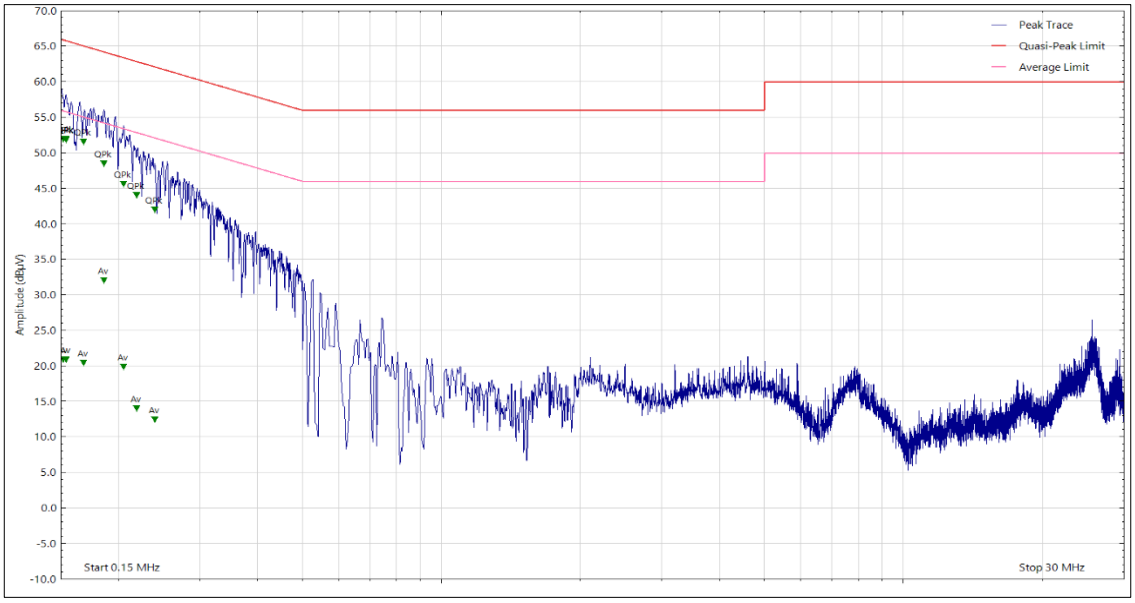

Figure 12 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.152	51.29	65.90	-14.61	Q-Peak
0.152	20.25	55.90	-35.65	CISPR Avg
0.154	51.32	65.80	-14.48	Q-Peak
0.154	51.22	65.80	-14.58	Q-Peak
0.154	20.21	55.80	-35.59	CISPR Avg
0.168	50.89	65.10	-14.21	Q-Peak
0.168	19.75	55.10	-35.35	CISPR Avg
0.186	47.84	64.20	-16.36	Q-Peak
0.186	31.42	54.20	-22.78	CISPR Avg
0.205	19.18	53.40	-34.22	CISPR Avg
0.205	44.94	63.40	-18.46	Q-Peak
0.219	13.33	52.80	-39.47	CISPR Avg
0.219	43.39	62.80	-19.41	Q-Peak
0.240	41.31	62.10	-20.79	Q-Peak
0.240	11.78	52.10	-40.32	CISPR Avg

Table 30 - Live Line Emissions Results

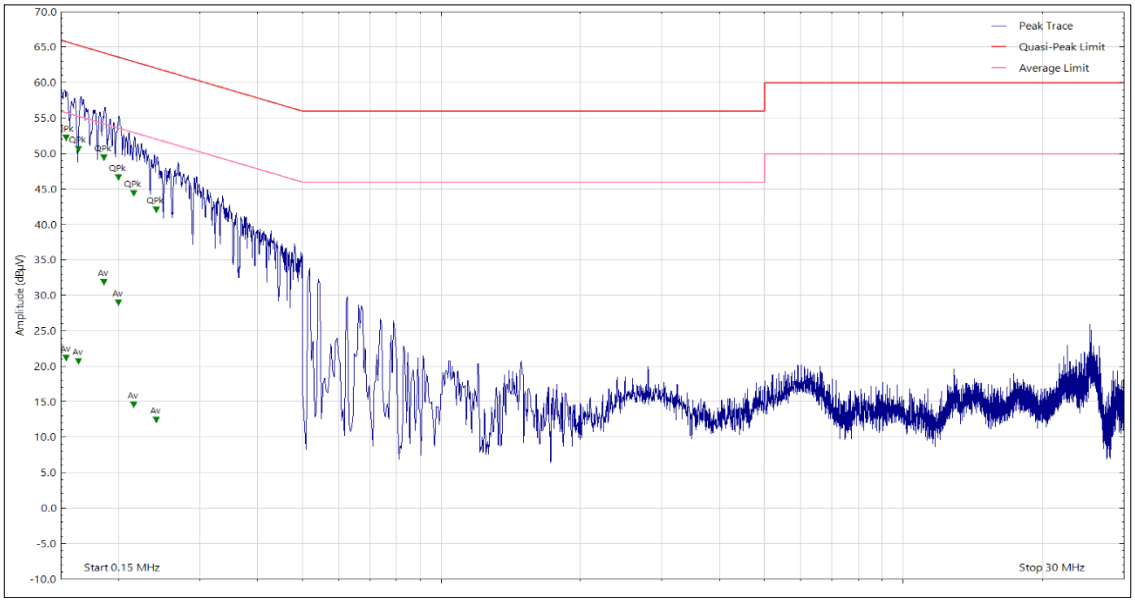

Figure 13 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.154	20.52	55.80	-35.28	CISPR Avg
0.154	51.54	65.80	-14.26	Q-Peak
0.164	20.08	55.30	-35.22	CISPR Avg
0.164	49.94	65.30	-15.36	Q-Peak
0.186	31.23	54.20	-22.97	CISPR Avg
0.186	48.81	64.20	-15.39	Q-Peak
0.200	28.34	53.60	-25.26	CISPR Avg
0.200	45.95	63.60	-17.65	Q-Peak
0.216	13.89	53.00	-39.11	CISPR Avg
0.216	43.79	63.00	-19.21	Q-Peak
0.242	41.45	62.00	-20.55	Q-Peak
0.242	11.77	52.00	-40.23	CISPR Avg

Table 31 - Neutral Line Emissions Results

2.1.10 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
Transient Limiter	Hewlett Packard	11947A	15	12	24-Oct-2024
LISN (CISPR 16, Three Phase)	Rohde & Schwarz	ESH2-Z5	16	12	05-Sep-2024
LISN (CISPR 16, Single Phase)	Rohde & Schwarz	ESH3-Z5	1390	12	01-Feb-2025
Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Apr-2025
Termination (50ohm)	JFW	50T-054	3952	12	20-Mar-2025
Emissions Software	TUV SUD	EmX V3.2.0	5125	-	Software
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-May-2025
3m Semi-Anechoic Chamber	MVG	EMC Chamber 12	5621	36	07-Aug-2026
Cable (N-Type to N-Type, 2 m)	Junkosha	MWX221-02000AMSAMS/B	5726	6	17-Aug-2024
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	6321	12	04-Feb-2025

Table 32

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Antenna (DRG, 1 GHz to 18 GHz)	EMCO	3115	234	-	TU
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	10-Sep-2024
Cable (10 Hz to 1 GHz N(m)-N(m), 2m)	Scott Cables	9918-NMNM-2000	4610	12	18-Apr-2025
Cable (N(m)-N(m), 2 m)	Scott Cables	SCB800-A-NMNM-02.00M	6651	6	11-Aug-2024
5m Cable	Scott Cables	SCB800-A-NMNM-05.00M	6709	6	18-Jan-2025

Table 33

TU - Traceability Unscheduled

4 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 34

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.