FCC and ISED Test Report

Apple Inc
Model: A3185

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 10:00:16 +01'00'

FCC ID: BCGA3185 IC: 579C-A3185

COMMERCIAL-IN-CONFIDENCE

Document 75961394-12 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	28-July-2024
Finish of Test	07-August-2024
Name of Engineer(s)	Nathan Harrison 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: A3185			
Serial Number	Hardware Version	Software Version	Firmware
C2NJW3RH9X	REV1.0	24A295	WLAN: 23.10.864.0.41.51.156 BT: 22.1.116.1034
LJ452N4F23	REV1.0	24A295	WLAN: 23.10.864.0.41.51.156 BT: 22.1.116.1034
D653Q9YV49	REV1.0	24A295	WLAN: 23.10.864.0.41.51.156 BT: 22.1.116.1034
JXYPGXN2T4	REV1.0	24A32191s	WLAN: 23.30.16 BT: 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: A3185, Serial Number: LJ452N4F23			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3185, Serial Number: C2NJW3RH9X			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3185, Serial Number: D653Q9YV49			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3185, Serial Number: JXYPGXN2T4			
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	Nathan Harrison	UKAS

Table 13

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

Table 14

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

Table 15

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

A3185, S/N: C2NJW3RH9X - Modification State 0
A3185, S/N: LJ452N4F23 - Modification State 0
A3185, S/N: D653Q9YV49 - Modification State 0
A3185, S/N: JXYPGXN2T4 - Modification State 0

2.1.3 Date of Test

28-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

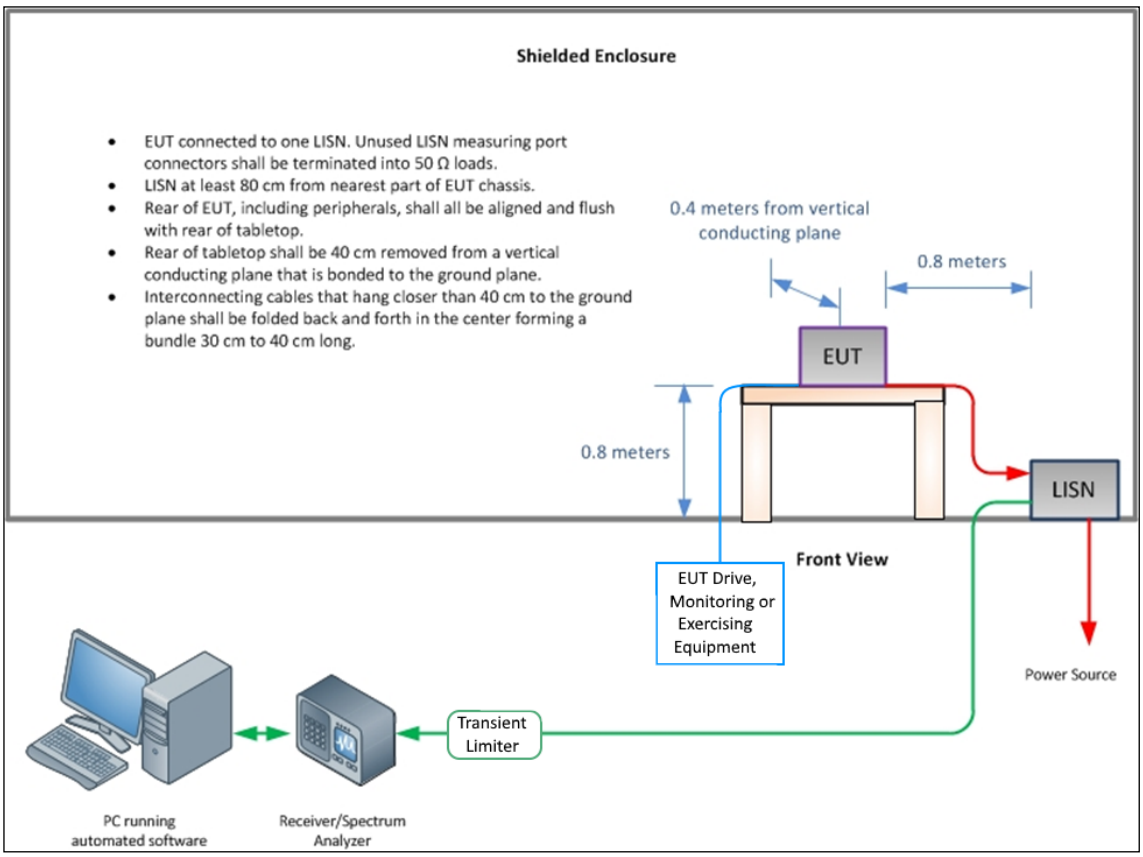

Figure 1 - Conducted Disturbance

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

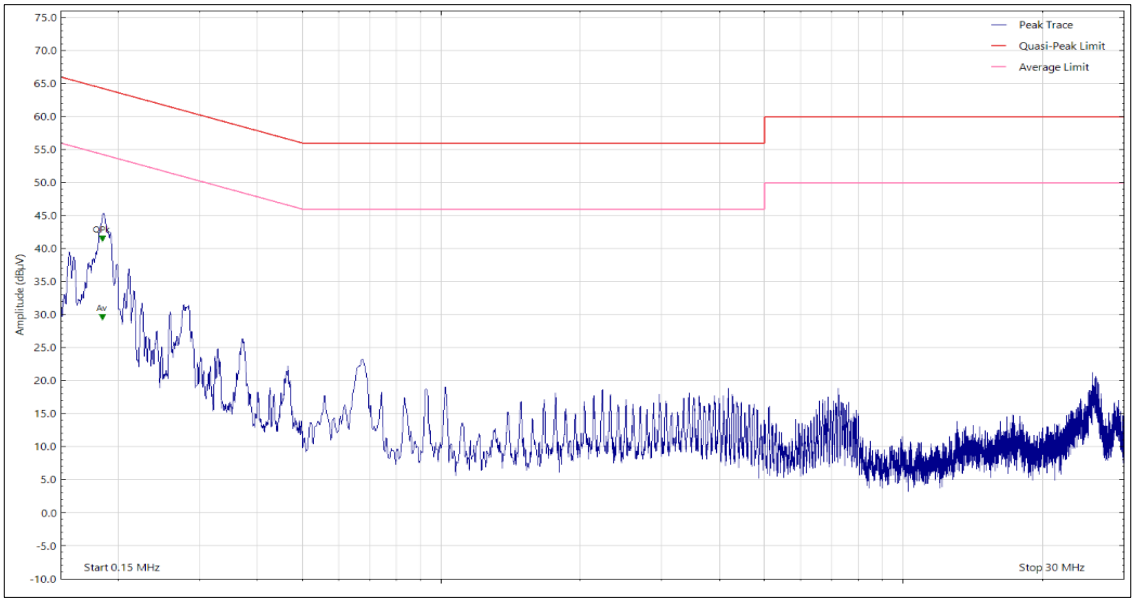

Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.185	40.76	64.30	-23.54	Q-Peak
0.185	28.92	54.30	-25.38	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.

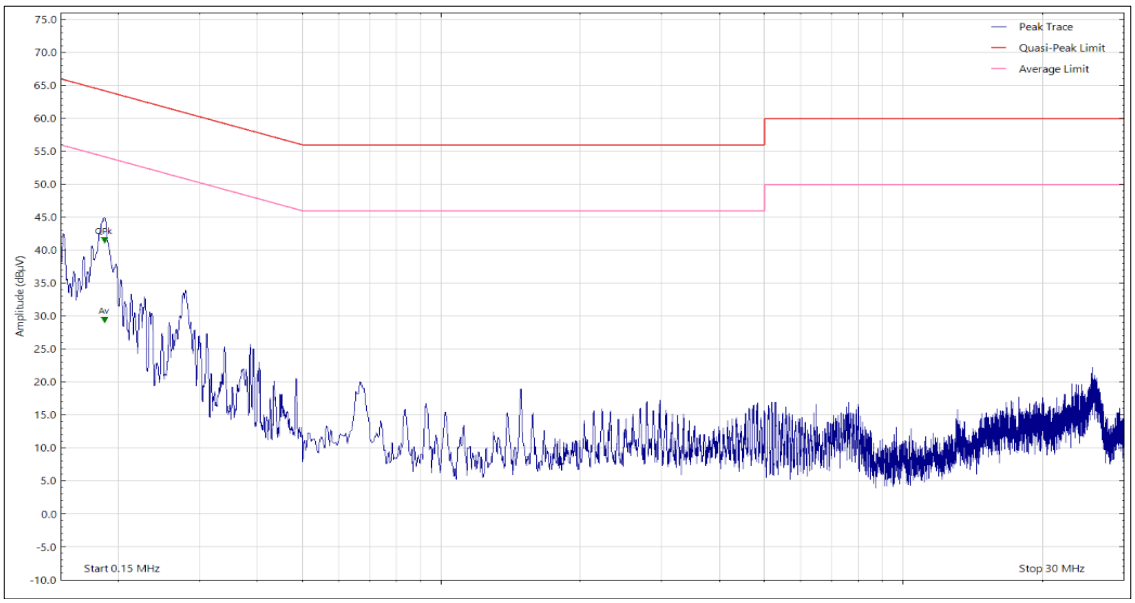

Figure 3 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.187	40.79	64.20	-23.41	Q-Peak
0.187	28.73	54.20	-25.47	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

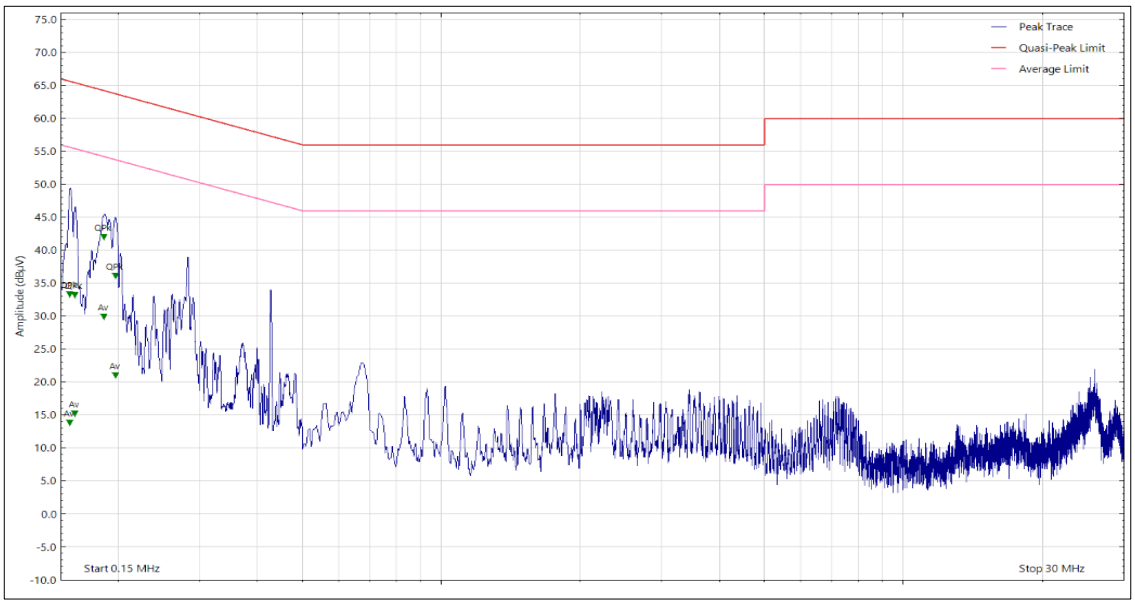

Figure 4 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.157	32.58	65.60	-33.02	Q-Peak
0.157	13.13	55.60	-42.47	CISPR Avg
0.161	32.55	65.40	-32.85	Q-Peak
0.161	14.51	55.40	-40.89	CISPR Avg
0.186	41.29	64.20	-22.91	Q-Peak
0.186	29.21	54.20	-24.99	CISPR Avg
0.197	35.41	63.70	-28.29	Q-Peak
0.197	20.32	53.70	-33.38	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.

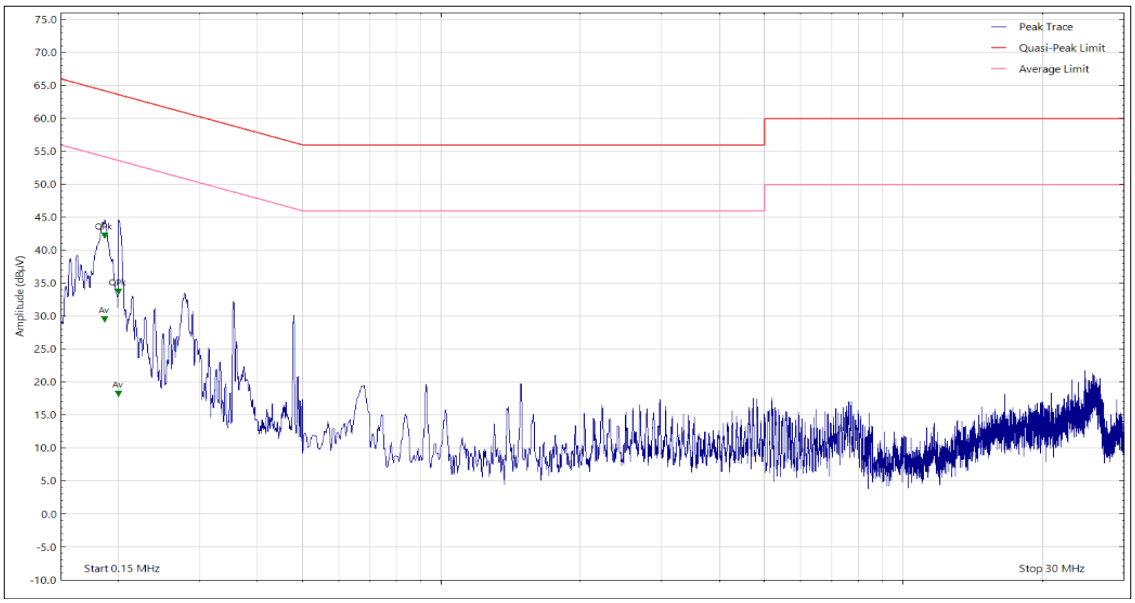

Figure 5 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.187	41.46	64.20	-22.74	Q-Peak
0.187	28.82	54.20	-25.38	CISPR Avg
0.200	33.04	63.60	-30.56	Q-Peak
0.200	17.48	53.60	-36.12	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

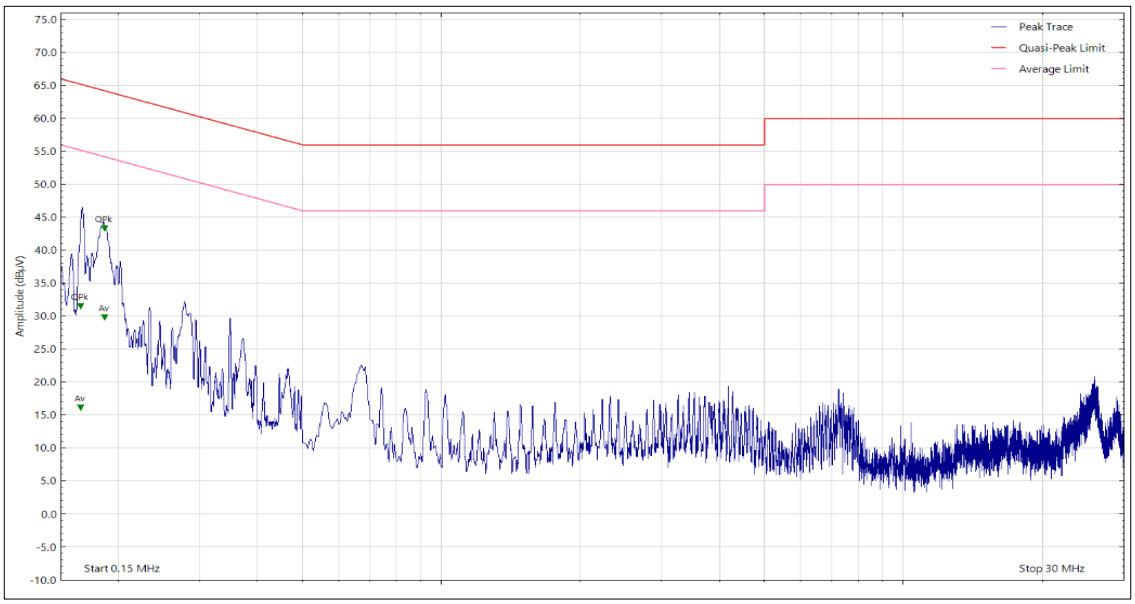

Figure 6 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.166	30.82	65.20	-34.38	Q-Peak
0.166	15.39	55.20	-39.81	CISPR Avg
0.187	42.63	64.20	-21.57	Q-Peak
0.187	29.12	54.20	-25.08	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.

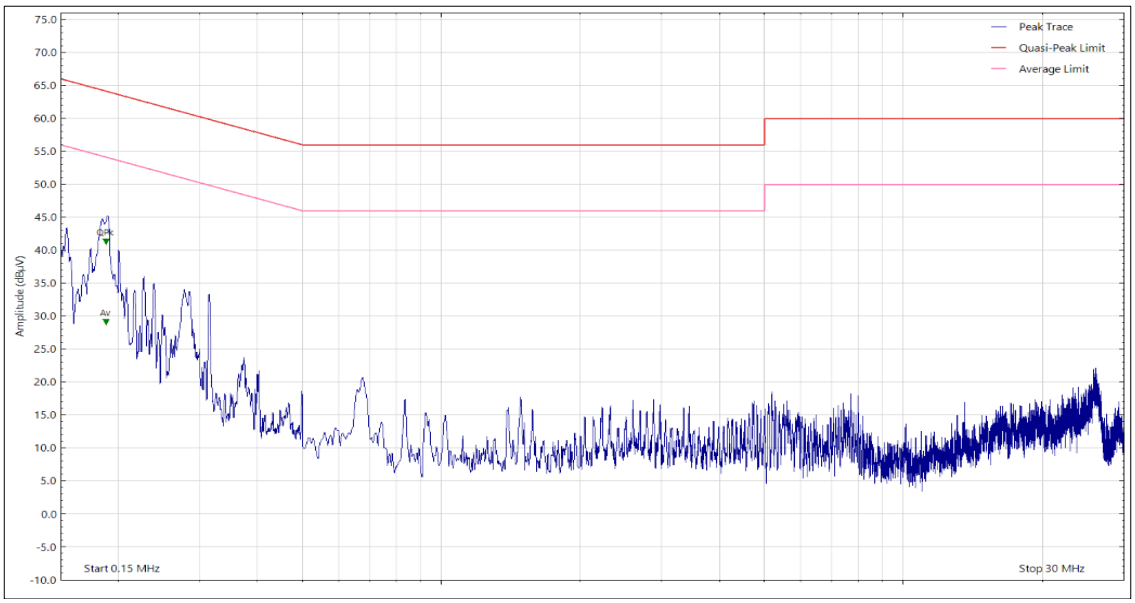

Figure 7 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.188	40.55	64.10	-23.55	Q-Peak
0.188	28.45	54.10	-25.65	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

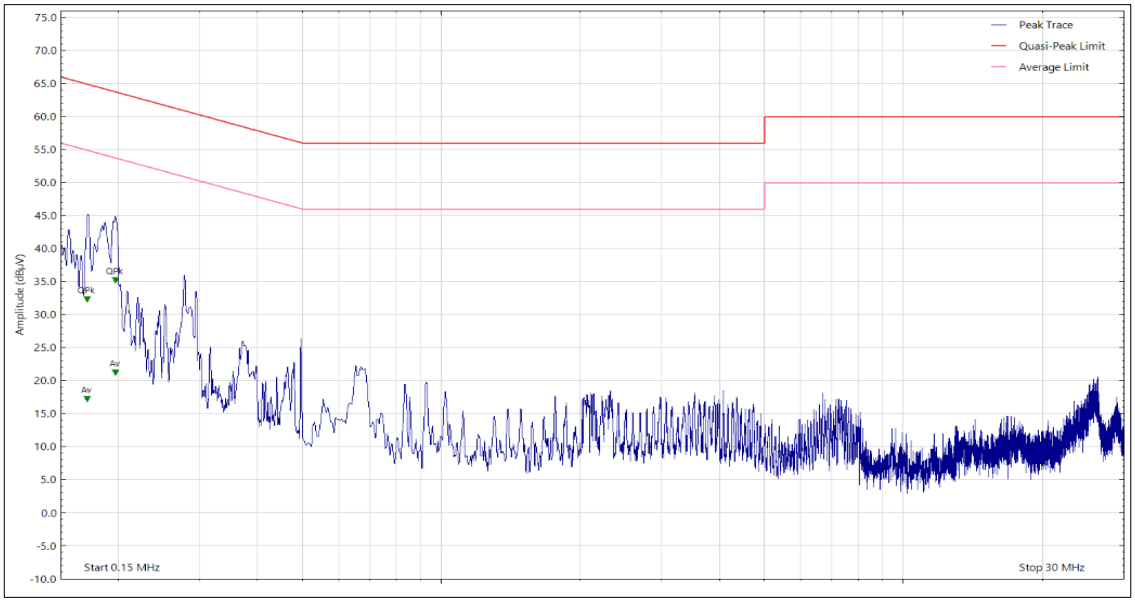

Figure 8 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.171	31.56	64.90	-33.34	Q-Peak
0.171	16.50	54.90	-38.40	CISPR Avg
0.197	34.52	63.70	-29.18	Q-Peak
0.197	20.48	53.70	-33.22	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.

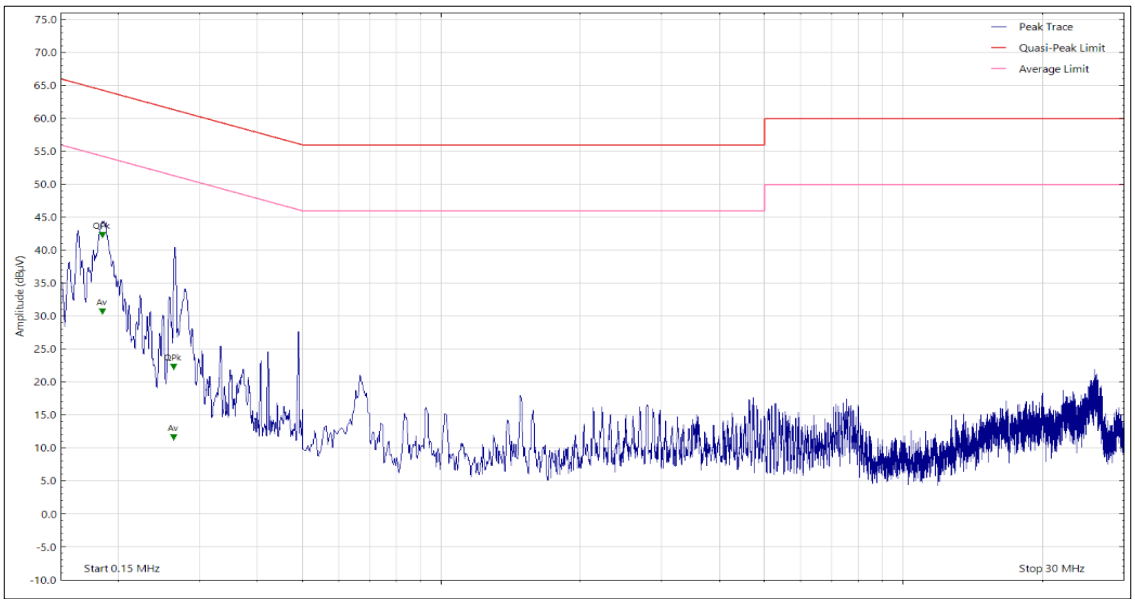

Figure 9 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.185	41.63	64.30	-22.67	Q-Peak
0.185	29.99	54.30	-24.31	CISPR Avg
0.264	21.57	61.30	-39.73	Q-Peak
0.264	10.95	51.30	-40.35	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

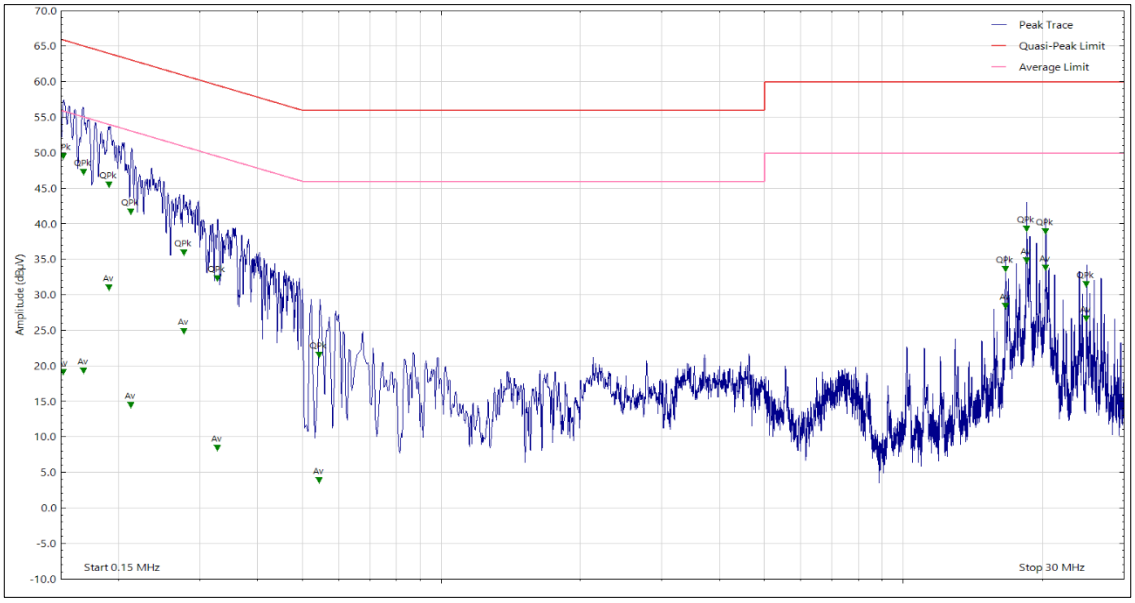

Figure 10 - Live Line - 150 kHz to 30 MHz

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.

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.152	48.87	65.90	-17.03	Q-Peak
0.152	18.46	55.90	-37.44	CISPR Avg
0.168	18.69	55.10	-36.41	CISPR Avg
0.168	46.61	65.10	-18.49	Q-Peak
0.191	44.87	64.00	-19.13	Q-Peak
0.191	30.39	54.00	-23.61	CISPR Avg
0.213	41.07	63.10	-22.03	Q-Peak
0.213	13.85	53.10	-39.25	CISPR Avg
0.277	24.23	50.90	-26.67	CISPR Avg
0.277	35.28	60.90	-25.62	Q-Peak
0.328	7.80	49.50	-41.70	CISPR Avg
0.328	31.71	59.50	-27.79	Q-Peak
0.544	20.88	56.00	-35.12	Q-Peak
0.544	3.22	46.00	-42.78	CISPR Avg
16.618	27.81	50.00	-22.19	CISPR Avg
16.618	32.96	60.00	-27.04	Q-Peak
18.477	34.18	50.00	-15.82	CISPR Avg
18.477	38.65	60.00	-21.35	Q-Peak
20.310	33.16	50.00	-16.84	CISPR Avg
20.310	38.26	60.00	-21.74	Q-Peak
24.918	30.82	60.00	-29.18	Q-Peak
24.918	26.00	50.00	-24.00	CISPR Avg

Table 28 - Live Line Emissions Results

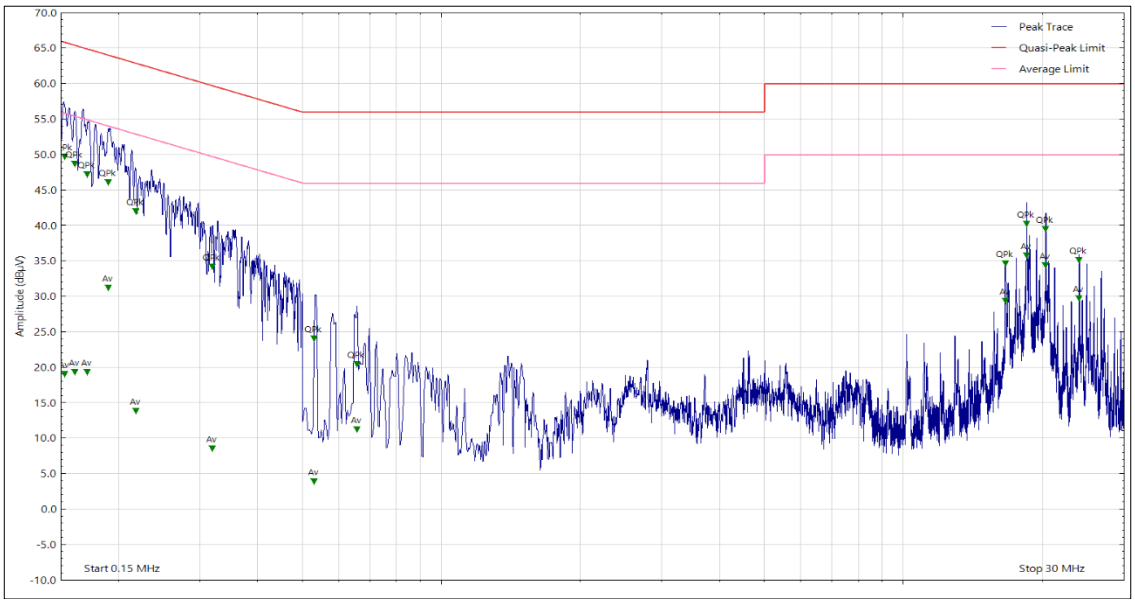

Figure 11 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.153	18.42	55.80	-37.38	CISPR Avg
0.153	49.04	65.80	-16.76	Q-Peak
0.161	48.01	65.40	-17.39	Q-Peak
0.161	18.69	55.40	-36.71	CISPR Avg
0.171	18.62	54.90	-36.28	CISPR Avg
0.171	46.57	64.90	-18.33	Q-Peak
0.190	30.59	54.00	-23.41	CISPR Avg
0.190	45.38	64.00	-18.62	Q-Peak
0.218	13.21	52.90	-39.69	CISPR Avg
0.218	41.30	62.90	-21.60	Q-Peak
0.319	7.89	49.70	-41.81	CISPR Avg
0.319	33.49	59.70	-26.21	Q-Peak
0.531	3.20	46.00	-42.80	CISPR Avg
0.531	23.39	56.00	-32.61	Q-Peak
0.657	19.81	56.00	-36.19	Q-Peak
0.657	10.58	46.00	-35.42	CISPR Avg
16.623	33.97	60.00	-26.03	Q-Peak
16.623	28.72	50.00	-21.28	CISPR Avg
18.477	39.57	60.00	-20.43	Q-Peak
18.477	35.11	50.00	-14.89	CISPR Avg
20.323	33.68	50.00	-16.32	CISPR Avg
20.323	38.85	60.00	-21.15	Q-Peak
24.001	29.11	50.00	-20.89	CISPR Avg
24.001	34.47	60.00	-25.53	Q-Peak

Table 29 - Neutral Line Emissions Results

AC Powered - Narrowband

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

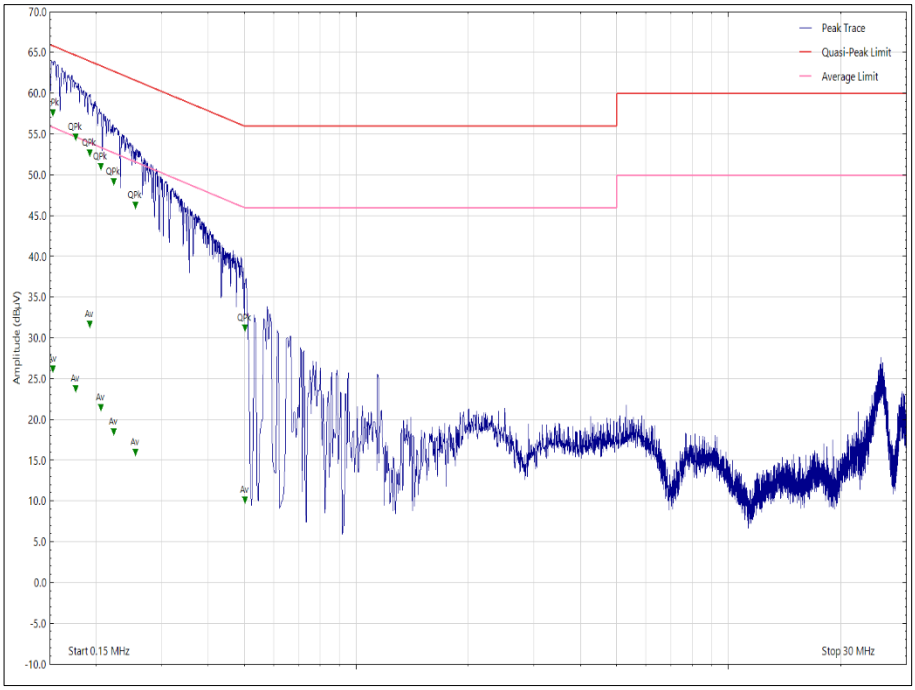

Figure 12 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.153	56.96	65.80	-8.84	Q-Peak
0.153	25.58	55.80	-30.22	CISPR Avg
0.176	23.09	54.70	-31.61	CISPR Avg
0.176	54.01	64.70	-10.69	Q-Peak
0.192	52.02	63.90	-11.88	Q-Peak
0.192	30.98	53.90	-22.92	CISPR Avg
0.206	20.80	53.40	-32.60	CISPR Avg
0.206	50.37	63.40	-13.03	Q-Peak
0.223	17.79	52.70	-34.91	CISPR Avg
0.223	48.52	62.70	-14.18	Q-Peak
0.255	15.35	51.60	-36.25	CISPR Avg
0.255	45.62	61.60	-15.98	Q-Peak
0.503	9.45	46.00	-36.55	CISPR Avg
0.503	30.54	56.00	-25.46	Q-Peak

Table 30 - Live Line Emissions Results

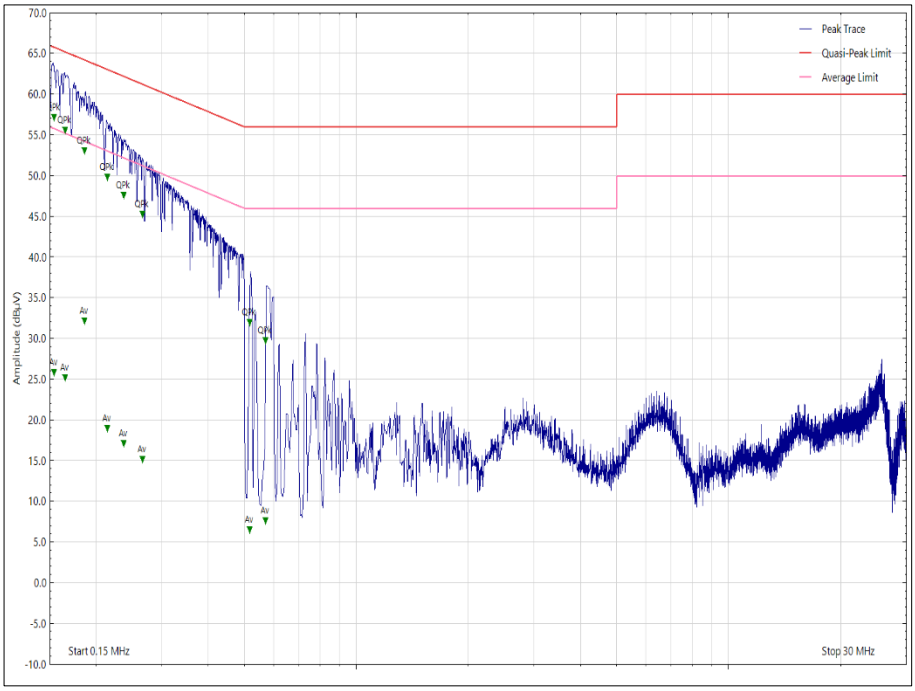

Figure 13 - Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.154	25.20	55.80	-30.60	CISPR Avg
0.154	56.50	65.80	-9.30	Q-Peak
0.165	54.86	65.20	-10.34	Q-Peak
0.165	24.48	55.20	-30.72	CISPR Avg
0.186	31.52	54.20	-22.68	CISPR Avg
0.186	52.35	64.20	-11.85	Q-Peak
0.214	49.13	63.10	-13.97	Q-Peak
0.214	18.33	53.10	-34.77	CISPR Avg
0.237	16.40	52.20	-35.80	CISPR Avg
0.237	46.87	62.20	-15.33	Q-Peak
0.266	44.55	61.20	-16.65	Q-Peak
0.266	14.50	51.20	-36.70	CISPR Avg
0.517	31.33	56.00	-24.67	Q-Peak
0.517	5.83	46.00	-40.17	CISPR Avg
0.571	29.11	56.00	-26.89	Q-Peak
0.571	6.92	46.00	-39.08	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.