FCC and ISED Test Report

Apple Inc
Model: A3241

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

TUV SUD Limited
Digitally signed by TUV SUD Limited
Date: 2024.11.18 16:13:13 Z

Prepared for: Apple Inc
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FCC ID: BCGA3241 IC: 579C-A3241

COMMERCIAL-IN-CONFIDENCE

Document 75962766-36 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Connor Lee	Senior Engineer	Authorised Signatory	18 November 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	Callum Pennells	18 November 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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United Kingdom

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	18-November-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	29-October-2024
Finish of Test	30-October-2024
Name of Engineer(s)	Callum Pennells
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 (2020)
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 (2020)
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 (2020)
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 (2020)
Configuration and Mode: AC Powered Thread				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020)
Configuration and Mode: AC Powered Narrowband				
2.1	15.207, 3.1 and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020)

Table 2

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 USB-C output.	No
USB 1 Port	1 m	Data	USB Type C	No
USB 2 Port	1 m	Data	USB Type C	No
Audio Jack Port	1 m	Data	Audio Jack 3.5 mm	No

Table 3

1.4.3 Test Configuration

Configuration	Description
AC Powered	The EUT was powered from a 120 V 60 Hz AC supply via an AC to DC power adapter with USB-C output. PSU model: A2164 The Audio Jack Port was unterminated. A mouse was used to terminate the USB 1 Port. A keyboard was used to terminate the USB 2 Port.

Table 4

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 5

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: A3241		
Serial Number	Hardware Version	Software Version
KJJKFX1X6V	REV1.0	24C62
DJWWJ0W7TW	REV1.0	24A12461c

Table 6

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: A3241, Serial Number: KJJKFX1X6V			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A3241, Serial Number: DJWWJ0W7TW			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 7

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	Callum Pennells	UKAS
Configuration and Mode: AC Powered 2.4 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: AC Powered 5 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: AC Powered 6 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: AC Powered Thread		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: AC Powered Narrowband		
AC Power Line Conducted Emissions	Callum Pennells	UKAS

Table 8

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

A3241, S/N: KJJKFX1X6V - Modification State 0
A3241, S/N: DJWWJ0W7TW - Modification State 0

2.1.3 Date of Test

29-October-2024 to 30-October-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 Environmental Conditions

Ambient Temperature	20.4 - 21.2 °C
Relative Humidity	57.3 - 59.2 %
Atmospheric Pressure	1013.0 – 1015.0 mbar

2.1.6 Example Test Setup Diagram

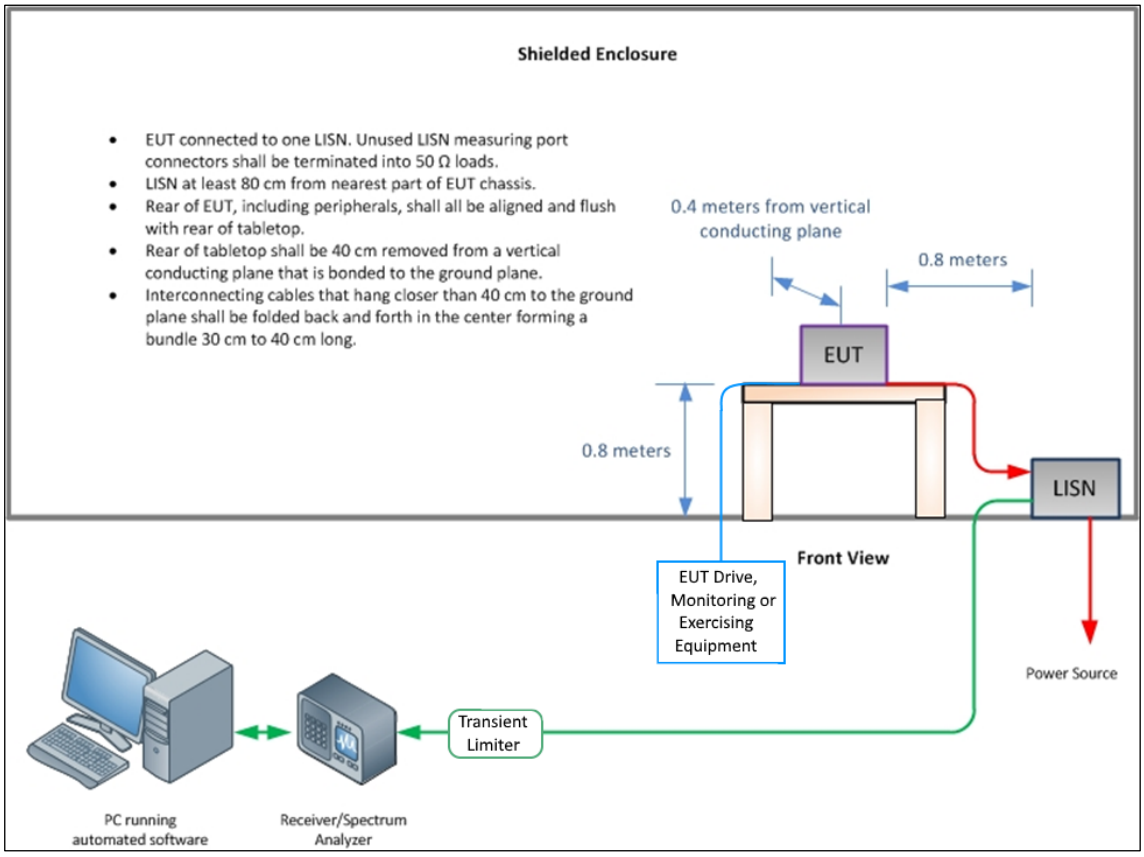

Figure 1 - Conducted Disturbance

2.1.7 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	59.2 %
Atmospheric Pressure	1015.0 mbar

2.1.8 Test Results

AC Powered 2.4 GHz Bluetooth

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

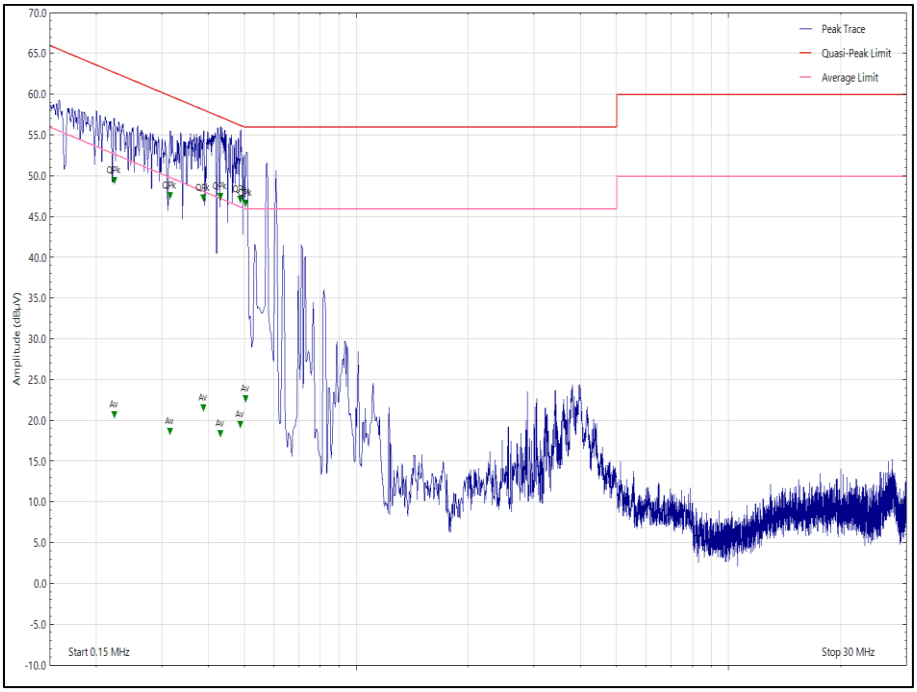

Figure 2 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.224	48.78	62.70	-13.92	Q-Peak
0.224	20.02	52.70	-32.68	CISPR Avg
0.316	18.06	49.80	-31.74	CISPR Avg
0.316	46.89	59.80	-12.91	Q-Peak
0.389	20.86	48.10	-27.24	CISPR Avg
0.389	46.59	58.10	-11.51	Q-Peak
0.431	17.70	47.20	-29.50	CISPR Avg
0.431	46.85	57.20	-10.35	Q-Peak
0.488	18.87	46.20	-27.33	CISPR Avg
0.488	46.44	56.20	-9.76	Q-Peak
0.504	22.04	46.00	-23.96	CISPR Avg
0.504	45.97	56.00	-10.03	Q-Peak

Table 9 - AC Power Port Live Line Emissions Results

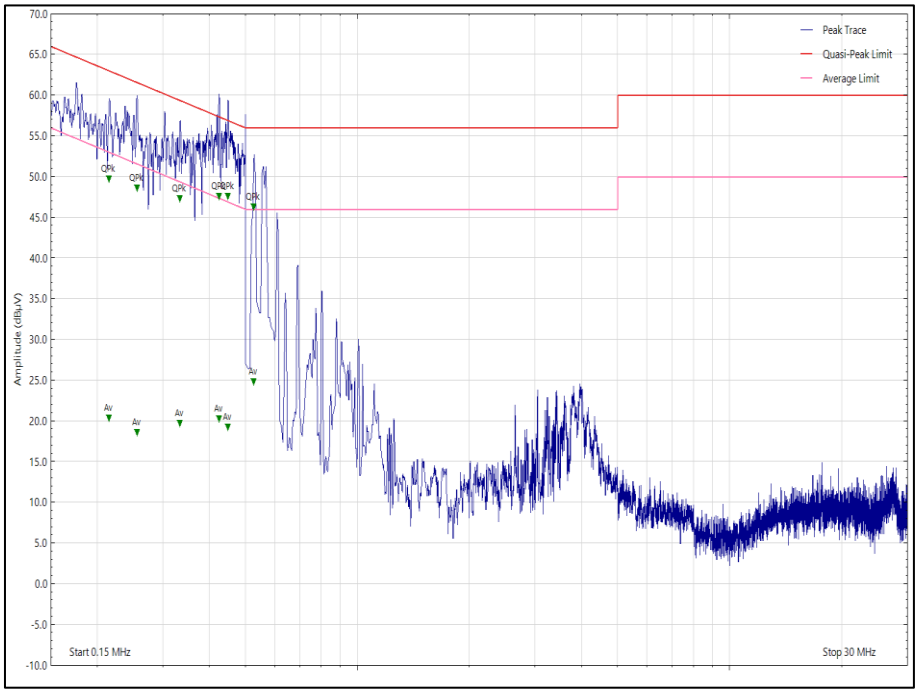

Figure 3 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.215	49.05	63.00	-13.95	Q-Peak
0.215	19.68	53.00	-33.32	CISPR Avg
0.256	47.91	61.60	-13.69	Q-Peak
0.256	17.94	51.60	-33.66	CISPR Avg
0.334	46.61	59.30	-12.69	Q-Peak
0.334	18.99	49.30	-30.31	CISPR Avg
0.425	46.90	57.40	-10.50	Q-Peak
0.425	19.55	47.40	-27.85	CISPR Avg
0.449	46.90	56.90	-10.00	Q-Peak
0.449	18.53	46.90	-28.37	CISPR Avg
0.527	45.58	56.00	-10.42	Q-Peak
0.527	24.11	46.00	-21.89	CISPR Avg

Table 10 - AC Power Port Neutral Line Emissions Results

AC Powered 2.4 GHz WLAN

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

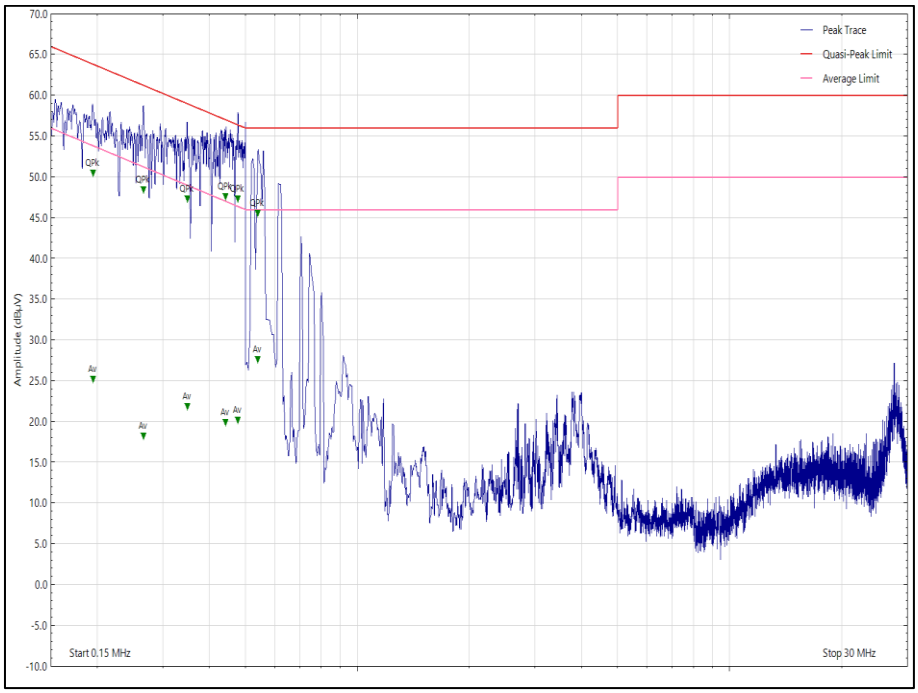

Figure 4 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.195	49.79	63.80	-14.01	Q-Peak
0.195	24.52	53.80	-29.28	CISPR Avg
0.266	47.72	61.20	-13.48	Q-Peak
0.266	17.53	51.20	-33.67	CISPR Avg
0.349	46.66	59.00	-12.34	Q-Peak
0.349	21.17	49.00	-27.83	CISPR Avg
0.443	19.19	47.00	-27.81	CISPR Avg
0.443	46.90	57.00	-10.10	Q-Peak
0.477	46.63	56.40	-9.77	Q-Peak
0.477	19.46	46.40	-26.94	CISPR Avg
0.541	44.82	56.00	-11.18	Q-Peak
0.541	26.93	46.00	-19.07	CISPR Avg

Table 11 - AC Power Port Live Line Emissions Results

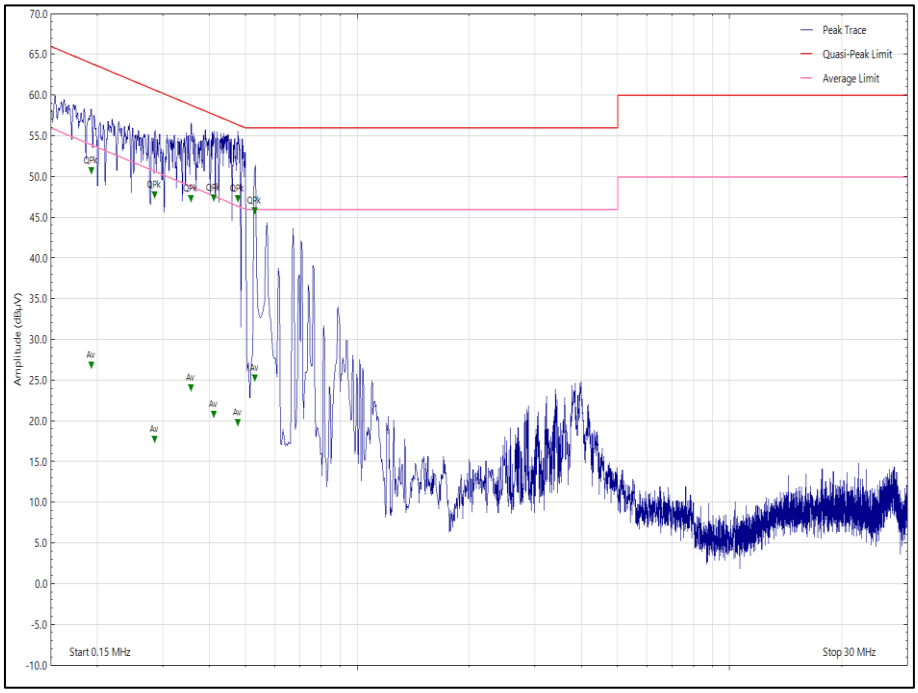

Figure 5 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.193	26.19	53.90	-27.71	CISPR Avg
0.193	50.06	63.90	-13.84	Q-Peak
0.285	17.10	50.70	-33.60	CISPR Avg
0.285	47.14	60.70	-13.56	Q-Peak
0.357	23.38	48.80	-25.42	CISPR Avg
0.357	46.62	58.80	-12.18	Q-Peak
0.412	20.19	47.60	-27.41	CISPR Avg
0.412	46.77	57.60	-10.83	Q-Peak
0.477	19.14	46.40	-27.26	CISPR Avg
0.477	46.64	56.40	-9.76	Q-Peak
0.531	24.62	46.00	-21.38	CISPR Avg
0.531	45.12	56.00	-10.88	Q-Peak

Table 12 - AC Power Port Neutral Line Emissions Results

AC Powered 5 GHz WLAN

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

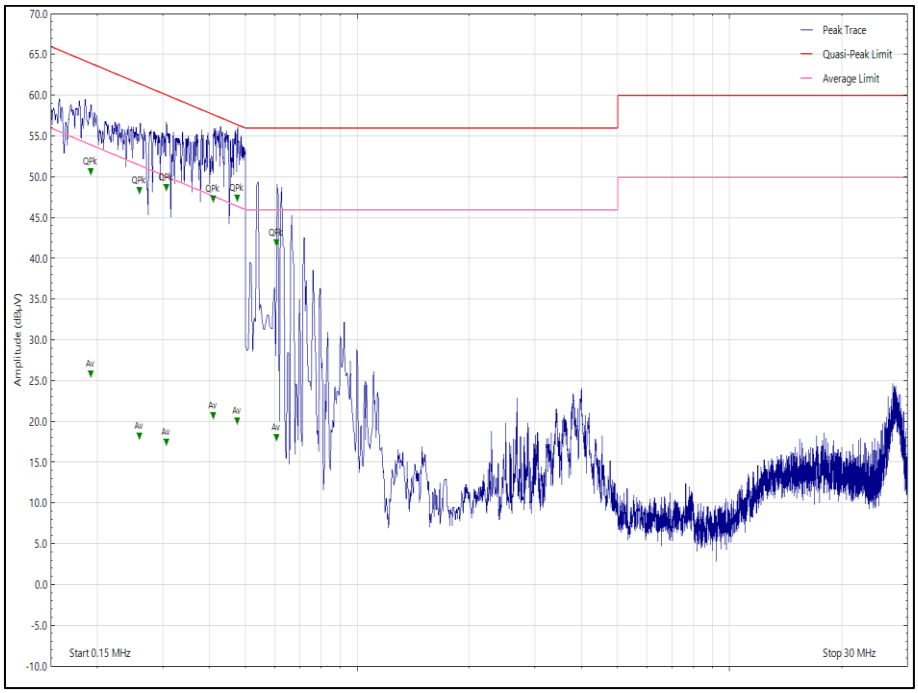

Figure 6 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.192	50.00	64.00	-14.00	Q-Peak
0.192	25.16	54.00	-28.84	CISPR Avg
0.260	17.51	51.40	-33.89	CISPR Avg
0.260	47.66	61.40	-13.74	Q-Peak
0.307	16.80	50.10	-33.30	CISPR Avg
0.307	48.07	60.10	-12.03	Q-Peak
0.410	20.08	47.60	-27.52	CISPR Avg
0.410	46.65	57.60	-10.95	Q-Peak
0.476	19.39	46.40	-27.01	CISPR Avg
0.476	46.75	56.40	-9.65	Q-Peak
0.607	41.23	56.00	-14.77	Q-Peak
0.607	17.33	46.00	-28.67	CISPR Avg

Table 13 - AC Power Port Live Line Emissions Results

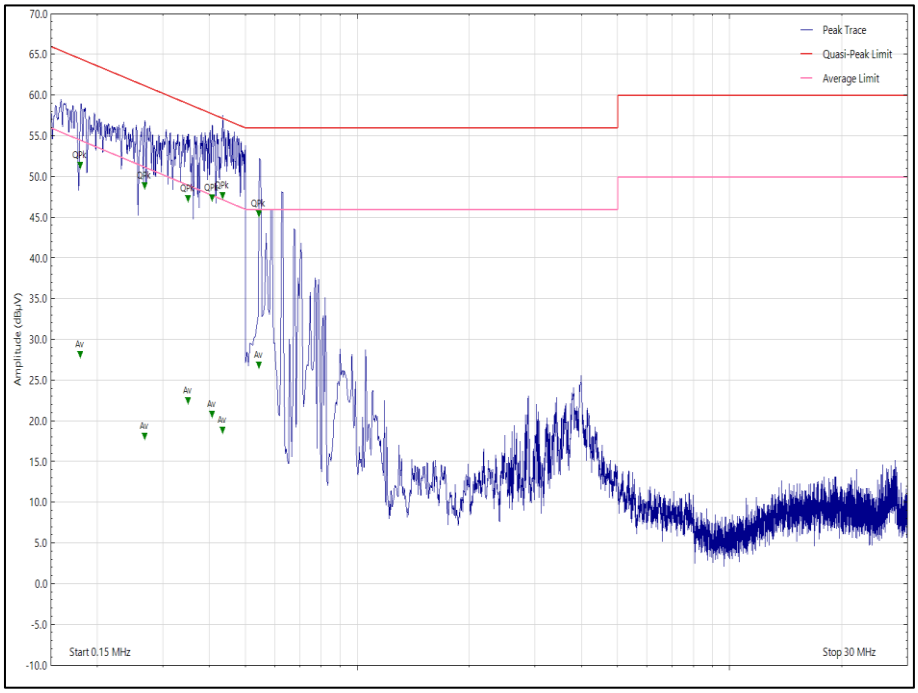

Figure 7 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.180	50.73	64.50	-13.77	Q-Peak
0.180	27.48	54.50	-27.02	CISPR Avg
0.268	48.20	61.20	-13.00	Q-Peak
0.268	17.41	51.20	-33.79	CISPR Avg
0.351	46.66	58.90	-12.24	Q-Peak
0.351	21.78	48.90	-27.12	CISPR Avg
0.407	46.75	57.70	-10.95	Q-Peak
0.407	20.19	47.70	-27.51	CISPR Avg
0.434	47.02	57.20	-10.18	Q-Peak
0.434	18.20	47.20	-29.00	CISPR Avg
0.545	26.19	46.00	-19.81	CISPR Avg
0.545	44.80	56.00	-11.20	Q-Peak

Table 14 - AC Power Port Neutral Line Emissions Results

AC Powered 6 GHz WLAN

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

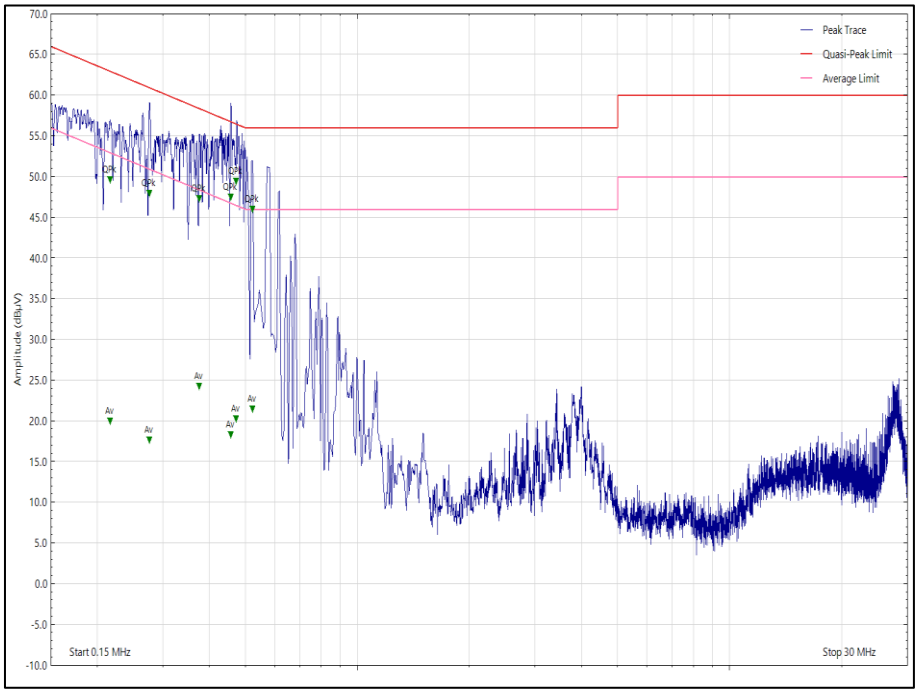

Figure 8 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.217	48.95	62.90	-13.95	Q-Peak
0.217	19.36	52.90	-33.54	CISPR Avg
0.276	47.30	60.90	-13.60	Q-Peak
0.276	16.98	50.90	-33.92	CISPR Avg
0.376	46.62	58.40	-11.78	Q-Peak
0.376	23.56	48.40	-24.84	CISPR Avg
0.457	17.68	46.80	-29.12	CISPR Avg
0.457	46.81	56.80	-9.99	Q-Peak
0.473	48.81	56.50	-7.69	Q-Peak
0.473	19.55	46.50	-26.95	CISPR Avg
0.522	45.37	56.00	-10.63	Q-Peak
0.522	20.76	46.00	-25.24	CISPR Avg

Table 15 - AC Power Port Live Line Emissions Results

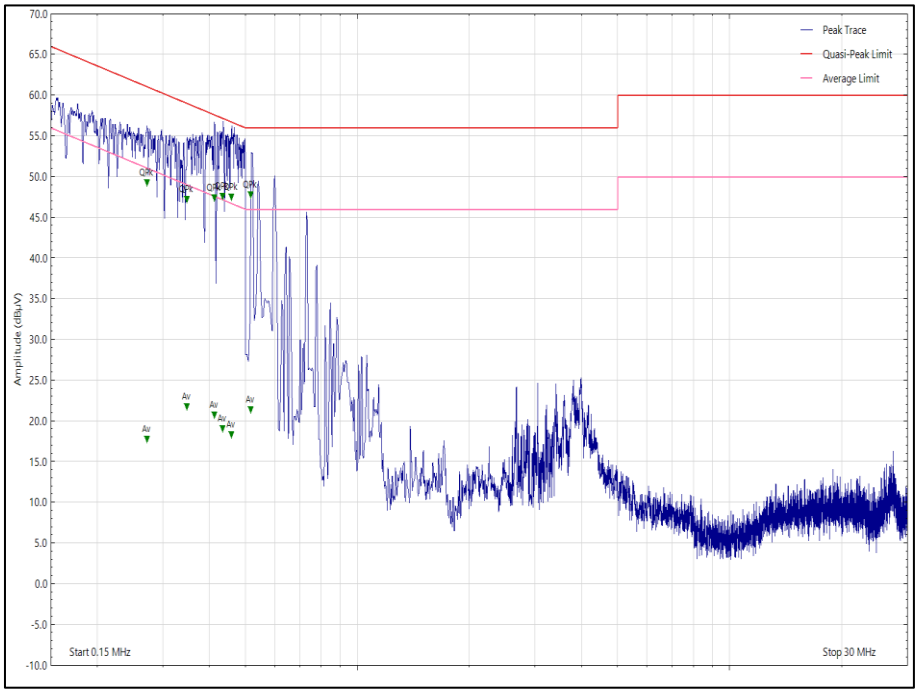

Figure 9 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.272	17.10	51.10	-34.00	CISPR Avg
0.272	48.60	61.10	-12.50	Q-Peak
0.348	21.07	49.00	-27.93	CISPR Avg
0.348	46.51	59.00	-12.49	Q-Peak
0.413	20.03	47.60	-27.57	CISPR Avg
0.413	46.75	57.60	-10.85	Q-Peak
0.435	18.35	47.10	-28.75	CISPR Avg
0.435	46.88	57.10	-10.22	Q-Peak
0.459	17.64	46.70	-29.06	CISPR Avg
0.459	46.83	56.70	-9.87	Q-Peak
0.517	20.73	46.00	-25.27	CISPR Avg
0.517	47.05	56.00	-8.95	Q-Peak

Table 16 - AC Power Port Neutral Line Emissions Results

AC Powered Thread

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

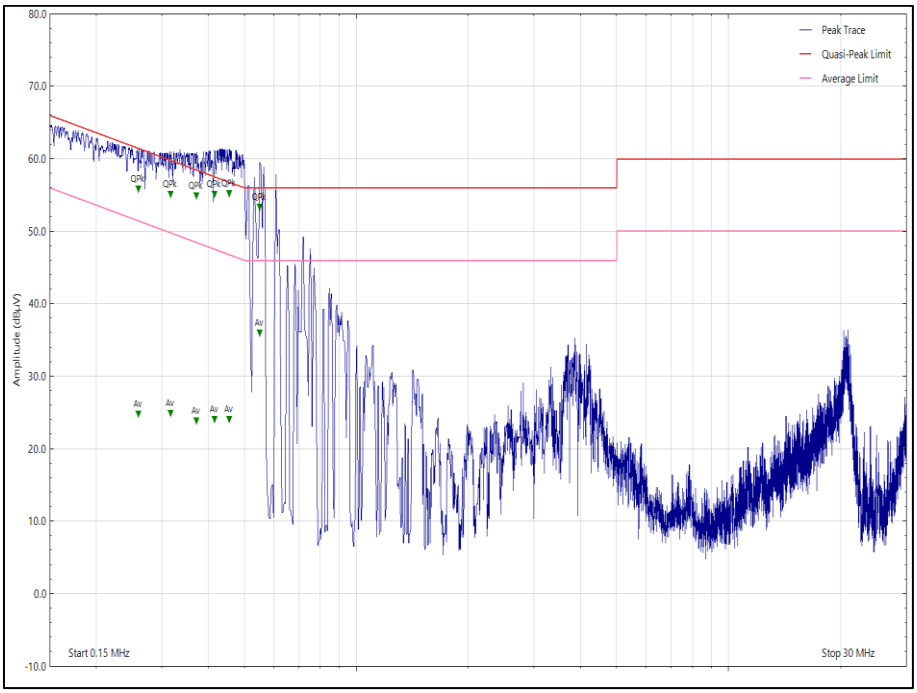

Figure 10 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.260	55.03	61.40	-6.37	Q-Peak
0.260	24.05	51.40	-27.35	CISPR Avg
0.317	54.31	59.80	-5.49	Q-Peak
0.317	24.10	49.80	-25.70	CISPR Avg
0.372	54.17	58.40	-4.23	Q-Peak
0.372	23.13	48.40	-25.27	CISPR Avg
0.416	23.27	47.50	-24.23	CISPR Avg
0.416	54.36	57.50	-3.14	Q-Peak
0.455	54.49	56.80	-2.31	Q-Peak
0.455	23.29	46.80	-23.51	CISPR Avg
0.550	52.57	56.00	-3.43	Q-Peak
0.550	35.20	46.00	-10.80	CISPR Avg

Table 17 - AC Power Port Live Line Emissions Results

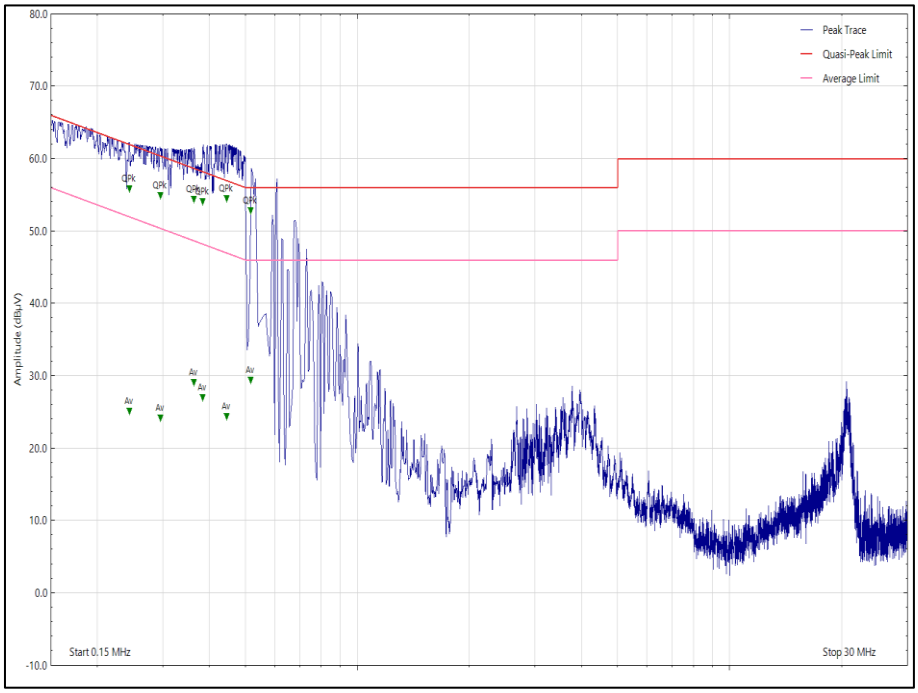

Figure 11 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.244	24.29	52.00	-27.71	CISPR Avg
0.244	55.10	62.00	-6.90	Q-Peak
0.296	23.38	50.40	-27.02	CISPR Avg
0.296	54.16	60.40	-6.24	Q-Peak
0.364	28.27	48.60	-20.33	CISPR Avg
0.364	53.60	58.60	-5.00	Q-Peak
0.384	26.27	48.20	-21.93	CISPR Avg
0.384	53.33	58.20	-4.87	Q-Peak
0.445	23.60	47.00	-23.40	CISPR Avg
0.445	53.75	57.00	-3.25	Q-Peak
0.517	28.66	46.00	-17.34	CISPR Avg
0.517	52.06	56.00	-3.94	Q-Peak

Table 18 - AC Power Port Neutral Line Emissions Results

AC Powered Narrowband

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

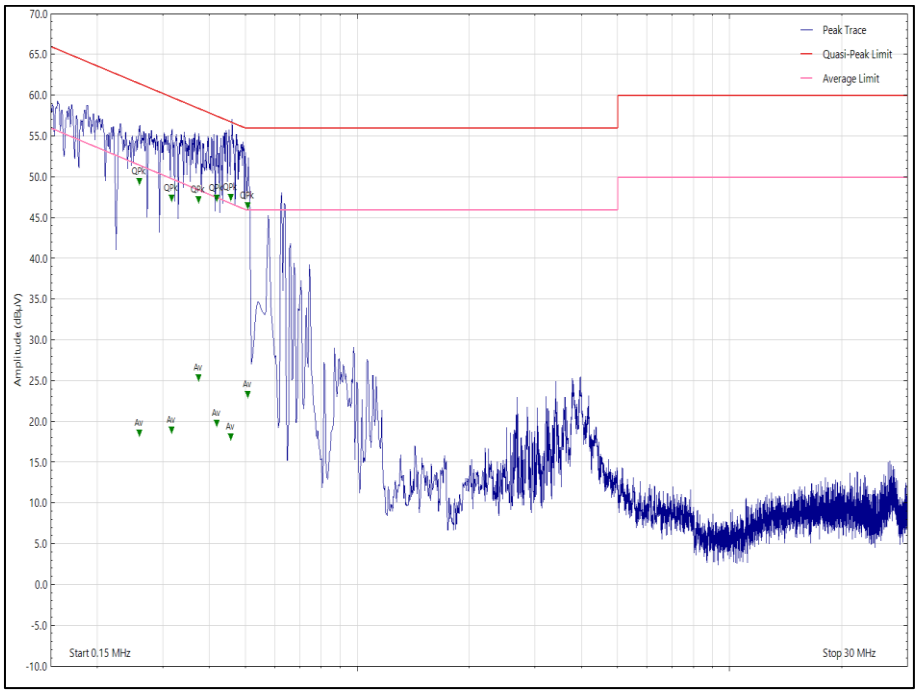

Figure 12 - AC Power Port Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.260	48.75	61.40	-12.65	Q-Peak
0.260	17.95	51.40	-33.45	CISPR Avg
0.317	46.77	59.80	-13.03	Q-Peak
0.317	18.26	49.80	-31.54	CISPR Avg
0.374	46.56	58.40	-11.84	Q-Peak
0.374	24.66	48.40	-23.74	CISPR Avg
0.419	19.15	47.50	-28.35	CISPR Avg
0.419	46.77	57.50	-10.73	Q-Peak
0.457	46.81	56.70	-9.89	Q-Peak
0.457	17.48	46.70	-29.22	CISPR Avg
0.507	22.70	46.00	-23.30	CISPR Avg
0.507	45.79	56.00	-10.21	Q-Peak

Table 19 - AC Power Port Live Line Emissions Results

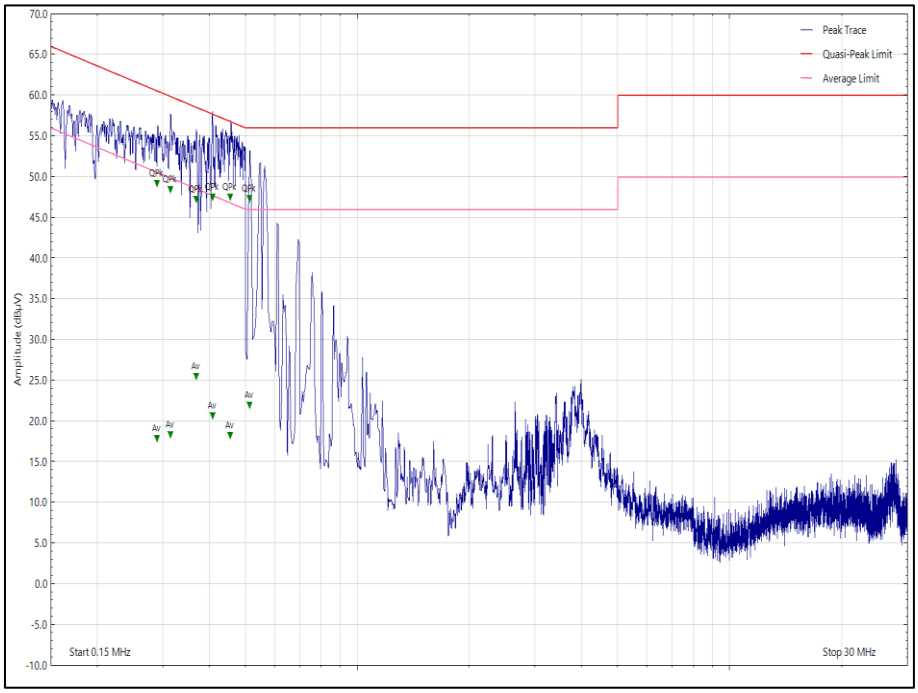

Figure 13 - AC Power Port Neutral Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.290	17.22	50.50	-33.28	CISPR Avg
0.290	48.45	60.50	-12.05	Q-Peak
0.315	17.64	49.80	-32.16	CISPR Avg
0.315	47.75	59.80	-12.05	Q-Peak
0.369	24.76	48.50	-23.74	CISPR Avg
0.369	46.51	58.50	-11.99	Q-Peak
0.408	20.00	47.70	-27.70	CISPR Avg
0.408	46.82	57.70	-10.88	Q-Peak
0.456	17.57	46.80	-29.23	CISPR Avg
0.456	46.86	56.80	-9.94	Q-Peak
0.513	46.60	56.00	-9.40	Q-Peak
0.513	21.28	46.00	-24.72	CISPR Avg

Table 20 - AC Power Port Neutral Line Emissions Results

2.1.9 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
3m Semi-Anechoic Chamber	MVG	EMC Chamber 12	5621	36	07-Aug-2026
Emissions Software	TUV SUD	EmX V3.4.2	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Apr-2025
Transient Limiter	Hewlett Packard	11947A	1032	12	02-Jan-2025
Cable (N-Type to N-Type, 2 m)	Junkosha	MWX221-02000AMSAMS/B	5729	6	02-Feb-2025
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	6321	12	04-Feb-2025
LISN (CISPR 16, Single Phase)	Rohde & Schwarz	ESH3-Z5	1390	12	01-Feb-2025
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5478	12	13-May-2025

Table 21

TU - Traceability Unscheduled

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ± 3.7 dB

Table 22

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.