FCC and ISED Test Report

Apple Inc
Model: A2918

In accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN (Bluetooth, 2.4 GHz WLAN, 5 GHz WLAN, 6 GHz WLAN, Thread and 5 GHz Narrowband)

Add value.
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Prepared for: Apple Inc
One Apple Park Way
Cupertino
California
95014,
USA

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FCC ID: BCGA2918 IC: 579C-A2918

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Document 75957632-26 Issue 01

SIGNATURE			
AJ Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andrew Lawson	EMC Chief Engineer	Authorised Signatory	15 May 2023

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, 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
Report Generation	Lauren Walters	15 May 2023	

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: 2021, ISED RSS-247: Issue 2 (02-2017) and ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) 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	15-May-2023

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2918
Serial Number(s)	DX2L73NQNJ FL94Q49H6Q F9P9MMVGDG
Hardware Version(s)	REV 1.0
Software Version(s)	22F15, 22F15 and 22E21820r
Number of Samples Tested	3
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2021 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Start of Test	30-March-2023
Finish of Test	02-May-2023
Name of Engineer(s)	Callum Pennells and James Cumming
Related Document(s)	ANSI C63.10 (2020) 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, ISED RSS-247 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15C	RSS-247	RSS-GEN			
Configuration and Mode: AC Powered - 2.4 GHz Bluetooth						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
Configuration and Mode: AC Powered - 2.4 GHz WLAN						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
Configuration and Mode: AC Powered - 5 GHz WLAN						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
Configuration and Mode: AC Powered - 6 GHz WLAN						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
Configuration and Mode: AC Powered - Thread						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)
Configuration and Mode: AC Powered – 5 GHz Narrowband						
2.1	15.207	3.1	8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2020) ANSI C63.10 (2013)

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	2 m	Mains power to the EUT's AC/DC adapter.	AC/DC adapter with USB-C output to EUT.	No
USB-1	2 m	Data	USB-C	No
USB-2	2 m	Data	USB-C	No
Audio Output	2 m	Audio Output	3.5 mm Jack	No
HDMI	2 m	Display output	HDMI	No

Table 3

1.4.3 Test Configuration

Configuration	Description
AC Powered	The EUT was powered from a 120 V 60 Hz AC supply. A set of headphones were used to terminate the EUT's 3.5 mm audio jack port. A USB-C to USB-A adapter and a USB optical mouse were used to terminate the EUT's USB-1 port. A monitor was used to terminate the EUT's HDMI port.

Table 4

1.4.4 Modes of Operation

Mode	Description
2.4 GHz Bluetooth	The EUT was connected to a R&S CMW 500 test set.
2.4 GHz WLAN	The EUT was continuously pinging to the IP Address of a Wi-Fi router.
5 GHz WLAN	The EUT was continuously pinging to the IP Address of a Wi-Fi router.
6 GHz WLAN	The EUT was continuously pinging to the IP Address of a Wi-Fi router.
Thread	The EUT was placed in a link with another customer provided sample.
5 GHz Narrowband	The EUT was placed in a link with another customer provided sample.

Table 5

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: A2918, Serial Number: DX2L73NQNJ			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2918, Serial Number: FL94Q49H6Q			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2918, Serial Number: F9P9MMVGDG			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 6

1.7 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: 2.4 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: 5 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: 6 GHz WLAN		
AC Power Line Conducted Emissions	Callum Pennells	UKAS
Configuration and Mode: Thread		
AC Power Line Conducted Emissions	James Cumming	UKAS
Configuration and Mode: 5 GHz Narrowband		
AC Power Line Conducted Emissions	James Cumming	UKAS

Table 7

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

2.1.2 Equipment Under Test and Modification State

A2918, S/N: DX2L73NQNJ - Modification State 0
A2918, S/N: FL94Q49H6Q - Modification State 0
A2918, S/N: F9P9MMVGDG - Modification State 0

2.1.3 Date of Test

30-March-2023 to 02-May-2023

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

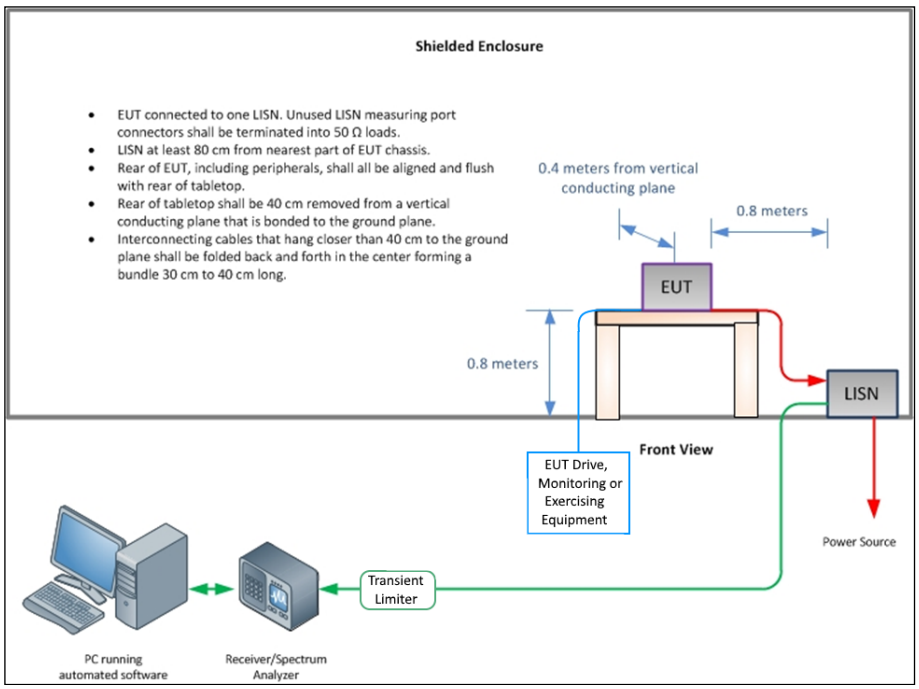

Figure 1 - Conducted Emissions

2.1.7 Environmental Conditions

Ambient Temperature	20.9 - 23.3 °C
Relative Humidity	30.3 - 44.1 %

2.1.8 Test Results

2.4 GHz Bluetooth

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

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.151	48.35	65.90	-17.55	Q-Peak
0.151	20.64	55.90	-35.26	CISPR Avg
0.160	19.30	55.50	-36.20	CISPR Avg
0.160	47.09	65.50	-18.41	Q-Peak
0.183	44.36	64.30	-19.94	Q-Peak
0.183	24.22	54.30	-30.08	CISPR Avg
0.200	29.15	53.60	-24.45	CISPR Avg
0.200	43.87	63.60	-19.73	Q-Peak
0.223	14.71	52.70	-37.99	CISPR Avg
0.223	39.16	62.70	-23.54	Q-Peak
0.260	12.85	51.40	-38.55	CISPR Avg
0.260	35.39	61.40	-26.01	Q-Peak

Table 8 - Live Line Emissions Results

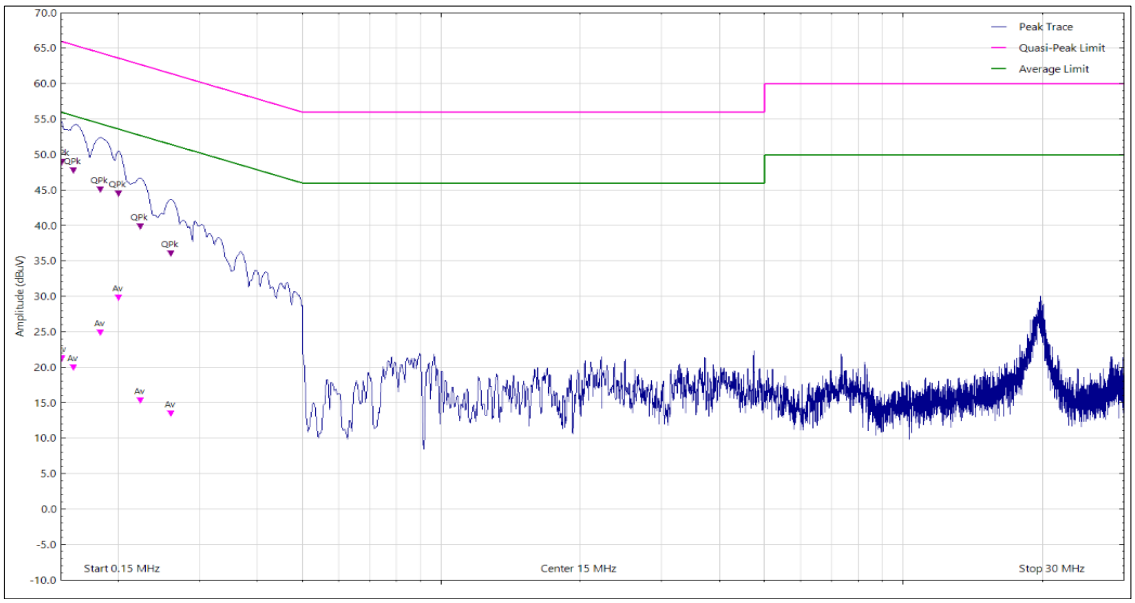

Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.159	47.16	65.50	-18.34	Q-Peak
0.159	19.29	55.50	-36.21	CISPR Avg
0.176	18.27	54.70	-36.43	CISPR Avg
0.176	44.92	64.70	-19.78	Q-Peak
0.194	45.02	63.90	-18.88	Q-Peak
0.194	31.25	53.90	-22.65	CISPR Avg
0.203	42.93	63.50	-20.57	Q-Peak
0.203	24.30	53.50	-29.20	CISPR Avg
0.221	14.89	52.80	-37.91	CISPR Avg
0.221	39.87	62.80	-22.93	Q-Peak
0.246	37.54	61.90	-24.36	Q-Peak
0.246	13.59	51.90	-38.31	CISPR Avg
0.262	36.19	61.40	-25.21	Q-Peak
0.262	13.15	51.40	-38.25	CISPR Avg
0.289	34.64	60.50	-25.86	Q-Peak
0.289	21.90	50.50	-28.60	CISPR Avg

Table 9 - Neutral Line Emissions Results

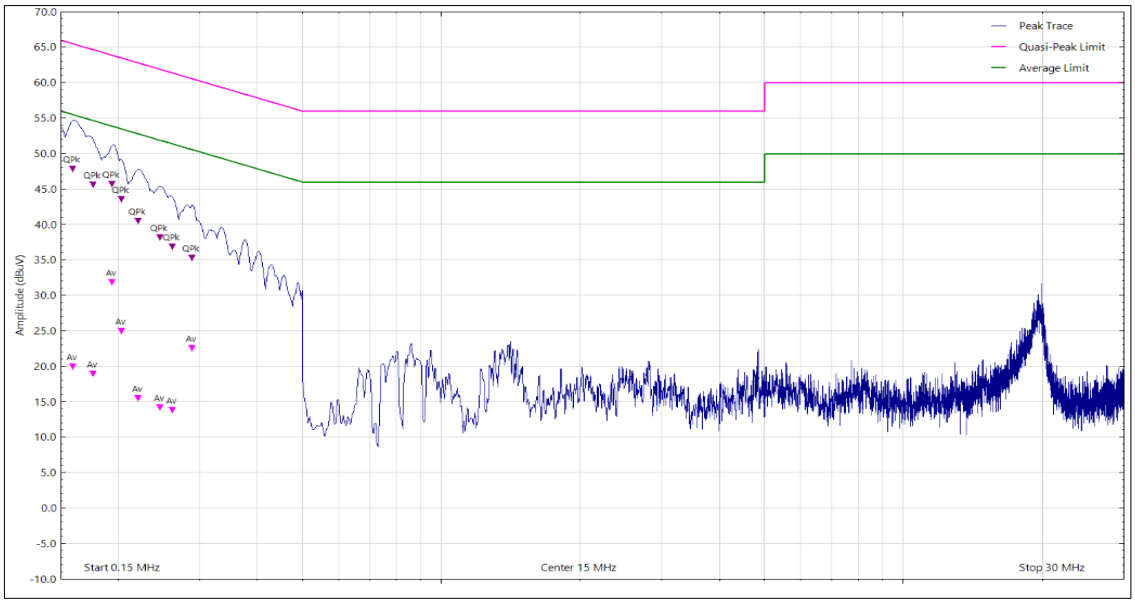

Figure 3 - Neutral Line - 150 kHz to 30 MHz

2.4 GHz WLAN

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

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.156	45.92	65.70	-19.78	Q-Peak
0.156	19.60	55.70	-36.10	CISPR Avg
0.175	23.02	54.70	-31.68	CISPR Avg
0.175	43.35	64.70	-21.35	Q-Peak
0.220	37.79	62.80	-25.01	Q-Peak
0.220	15.52	52.80	-37.28	CISPR Avg
0.241	14.21	52.10	-37.89	CISPR Avg
0.241	35.46	62.10	-26.64	Q-Peak
0.255	13.48	51.60	-38.12	CISPR Avg
0.255	34.04	61.60	-27.56	Q-Peak
0.273	19.68	51.00	-31.32	CISPR Avg
0.273	32.63	61.00	-28.37	Q-Peak

Table 10 - Live Line Emissions Results

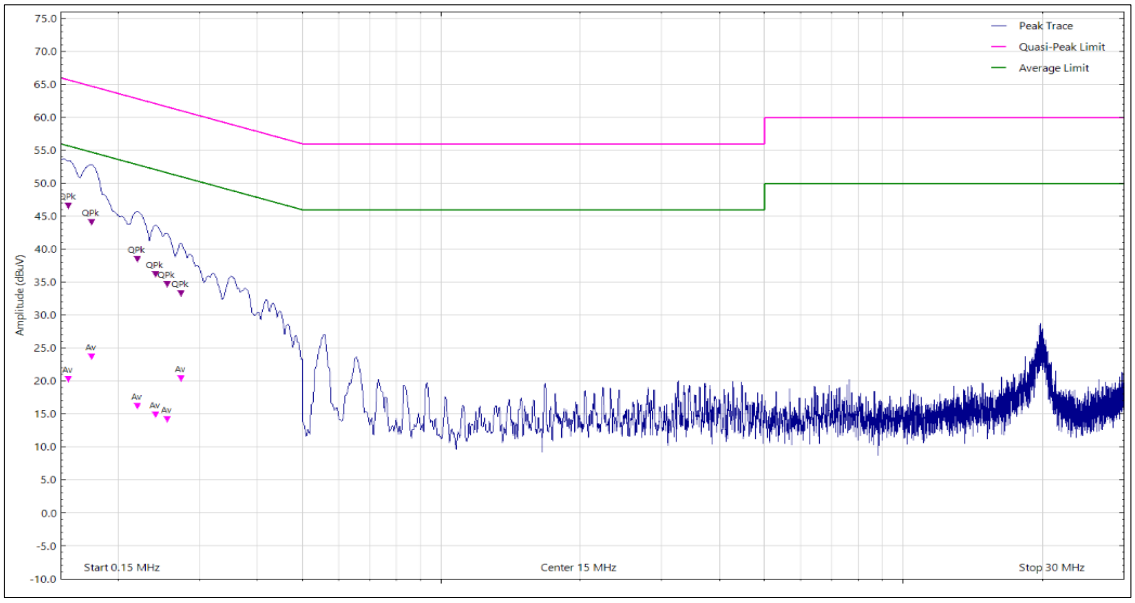

Figure 4 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.157	19.46	55.60	-36.14	CISPR Avg
0.157	45.74	65.60	-19.86	Q-Peak
0.180	43.10	64.50	-21.40	Q-Peak
0.180	26.55	54.50	-27.95	CISPR Avg
0.205	18.46	53.40	-34.94	CISPR Avg
0.205	39.67	63.40	-23.73	Q-Peak
0.225	37.55	62.60	-25.05	Q-Peak
0.225	15.89	52.60	-36.71	CISPR Avg
0.254	34.96	61.60	-26.64	Q-Peak
0.254	13.79	51.60	-37.81	CISPR Avg
0.274	33.82	61.00	-27.18	Q-Peak
0.274	22.21	51.00	-28.79	CISPR Avg
0.293	31.97	60.50	-28.53	Q-Peak
0.293	14.26	50.50	-36.24	CISPR Avg

Table 11 - Neutral Line Emissions Results

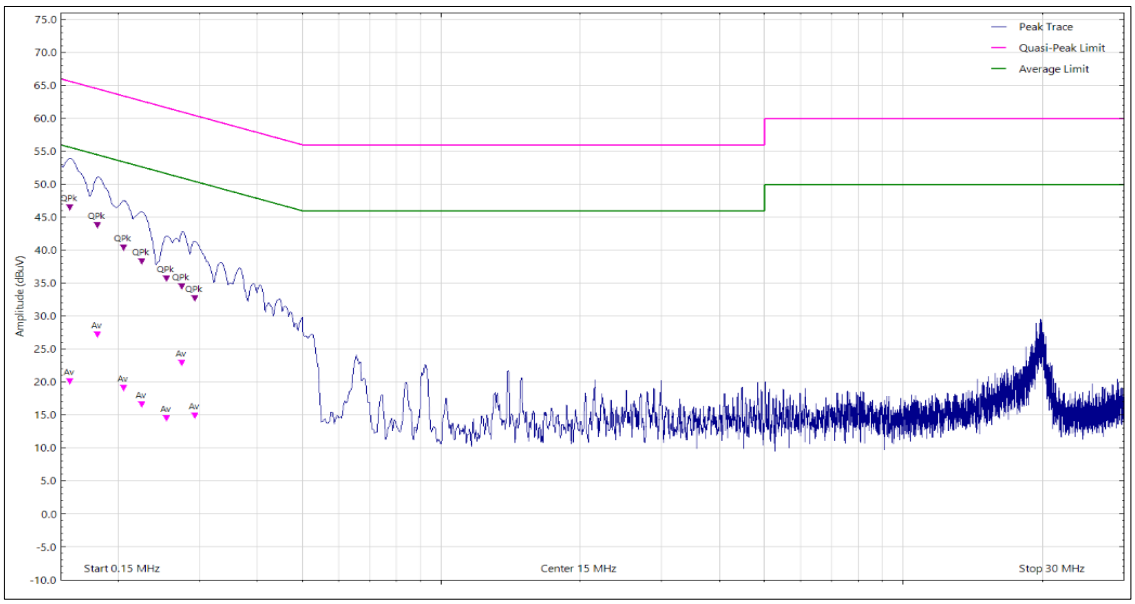

Figure 5 - Neutral Line - 150 kHz to 30 MHz

5 GHz WLAN

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

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.152	48.36	65.90	-17.54	Q-Peak
0.152	20.62	55.90	-35.28	CISPR Avg
0.161	47.00	65.40	-18.40	Q-Peak
0.161	19.19	55.40	-36.21	CISPR Avg
0.177	44.92	64.60	-19.68	Q-Peak
0.177	18.07	54.60	-36.53	CISPR Avg
0.192	44.92	64.00	-19.08	Q-Peak
0.192	31.85	54.00	-22.15	CISPR Avg
0.195	31.66	53.80	-22.14	CISPR Avg
0.195	44.61	63.80	-19.19	Q-Peak
0.204	23.02	53.40	-30.38	CISPR Avg
0.204	42.06	63.40	-21.34	Q-Peak
0.249	13.24	51.80	-38.56	CISPR Avg
0.249	36.41	61.80	-25.39	Q-Peak

Table 12 - Live Line Emissions Results

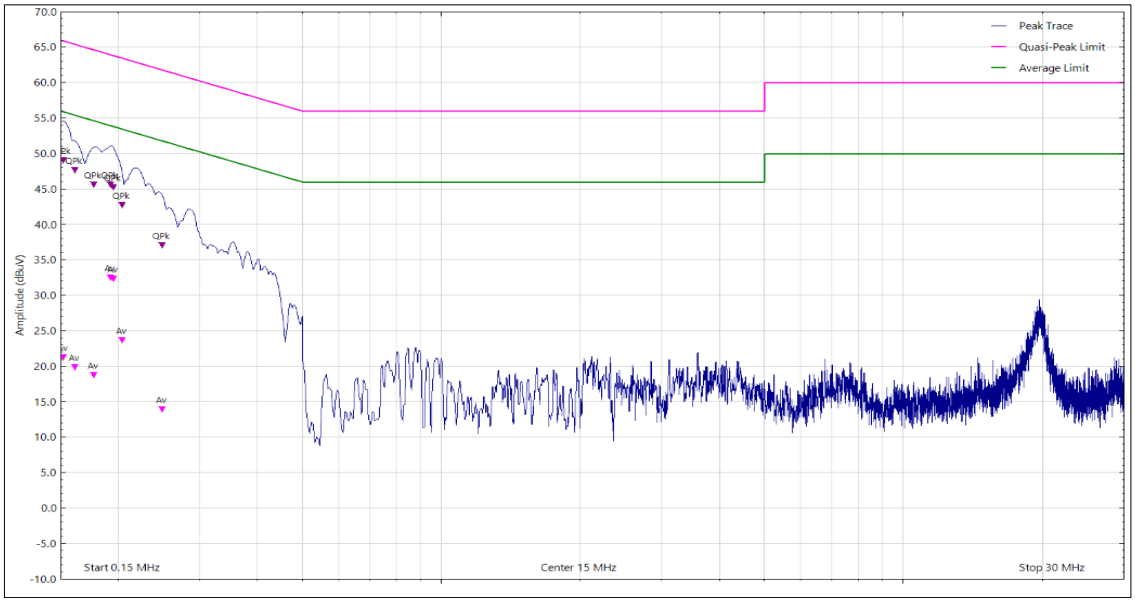

Figure 6 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.151	48.38	66.00	-17.62	Q-Peak
0.151	20.87	56.00	-35.13	CISPR Avg
0.158	47.31	65.60	-18.29	Q-Peak
0.158	19.46	55.60	-36.14	CISPR Avg
0.168	46.04	65.10	-19.06	Q-Peak
0.168	18.63	55.10	-36.47	CISPR Avg
0.180	19.57	54.50	-34.93	CISPR Avg
0.180	44.57	64.50	-19.93	Q-Peak
0.191	31.27	54.00	-22.73	CISPR Avg
0.191	45.46	64.00	-18.54	Q-Peak
0.199	44.56	63.70	-19.14	Q-Peak
0.199	29.86	53.70	-23.84	CISPR Avg
0.223	39.84	62.70	-22.86	Q-Peak
0.223	14.78	52.70	-37.92	CISPR Avg
0.292	34.51	60.50	-25.99	Q-Peak
0.292	21.76	50.50	-28.74	CISPR Avg

Table 13 - Neutral Line Emissions Results

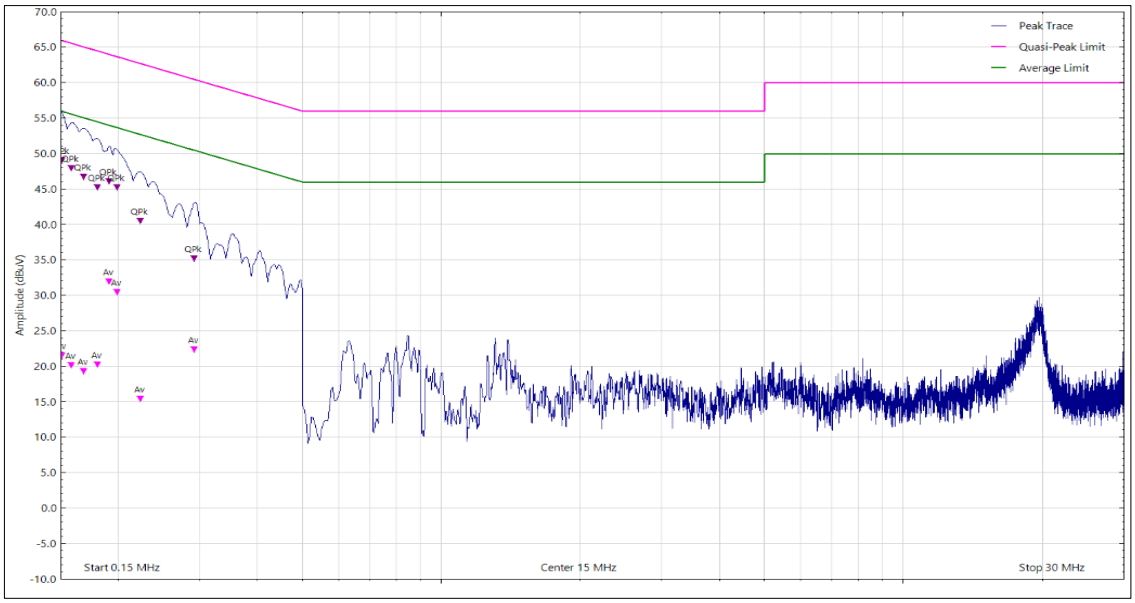

Figure 7 - Neutral Line - 150 kHz to 30 MHz

6 GHz WLAN

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

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.152	46.39	65.90	-19.51	Q-Peak
0.152	20.63	55.90	-35.27	CISPR Avg
0.158	45.36	65.60	-20.24	Q-Peak
0.158	19.37	55.60	-36.23	CISPR Avg
0.181	28.30	54.40	-26.10	CISPR Avg
0.181	42.80	64.40	-21.60	Q-Peak
0.206	18.29	53.40	-35.11	CISPR Avg
0.206	39.41	63.40	-23.99	Q-Peak
0.218	15.58	52.90	-37.32	CISPR Avg
0.218	37.77	62.90	-25.13	Q-Peak
0.239	14.02	52.10	-38.08	CISPR Avg
0.239	35.35	62.10	-26.75	Q-Peak

Table 14 - Live Line Emissions Results

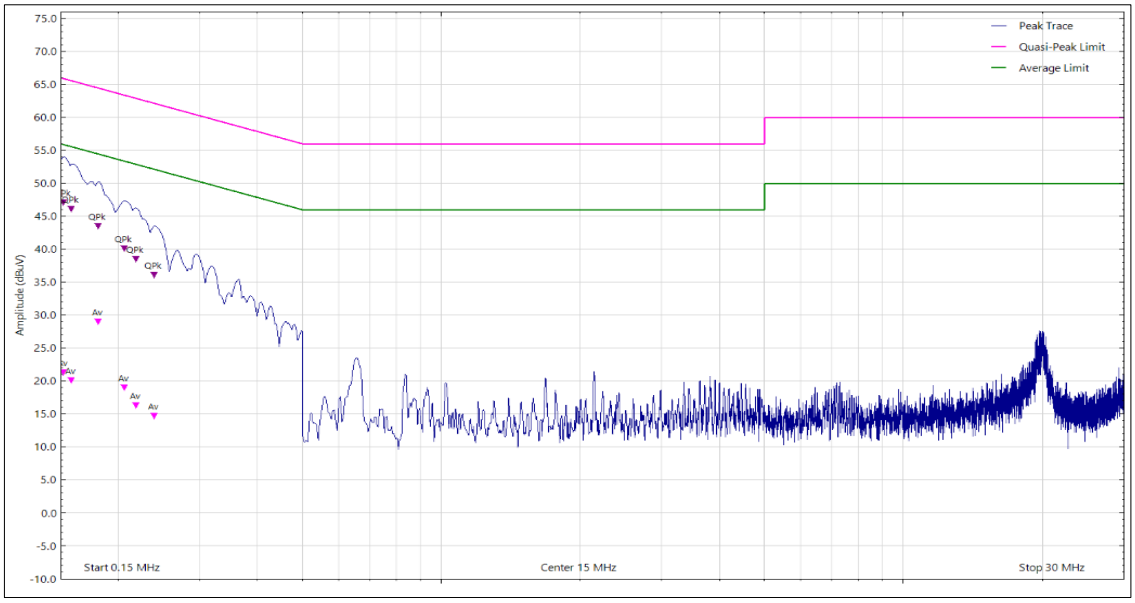

Figure 8 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.152	20.58	55.90	-35.32	CISPR Avg
0.152	46.40	65.90	-19.50	Q-Peak
0.162	19.68	55.40	-35.72	CISPR Avg
0.162	45.01	65.40	-20.39	Q-Peak
0.180	26.77	54.50	-27.73	CISPR Avg
0.180	43.05	64.50	-21.45	Q-Peak
0.203	18.88	53.50	-34.62	CISPR Avg
0.203	40.05	63.50	-23.45	Q-Peak
0.240	36.07	62.10	-26.03	Q-Peak
0.240	14.46	52.10	-37.64	CISPR Avg
0.252	35.00	61.70	-26.70	Q-Peak
0.252	13.63	51.70	-38.07	CISPR Avg

Table 15 - Neutral Line Emissions Results

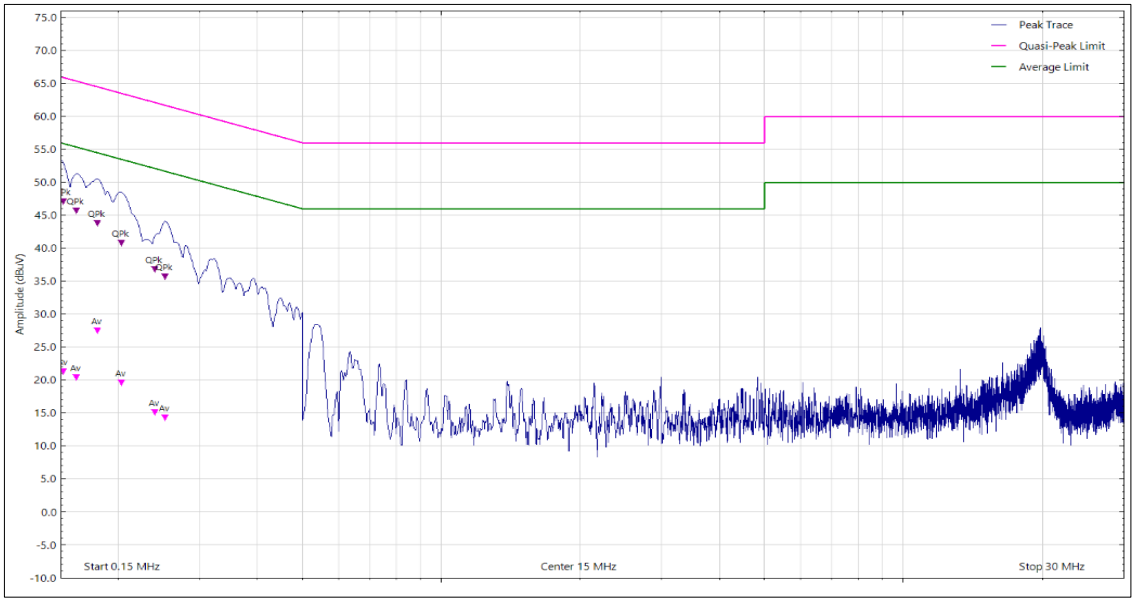

Figure 9 - Neutral Line - 150 kHz to 30 MHz

Thread

Applied supply voltage: 230 V AC
Applied supply frequency: 50 Hz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
*				

Table 16 - Live Line Emissions Results

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

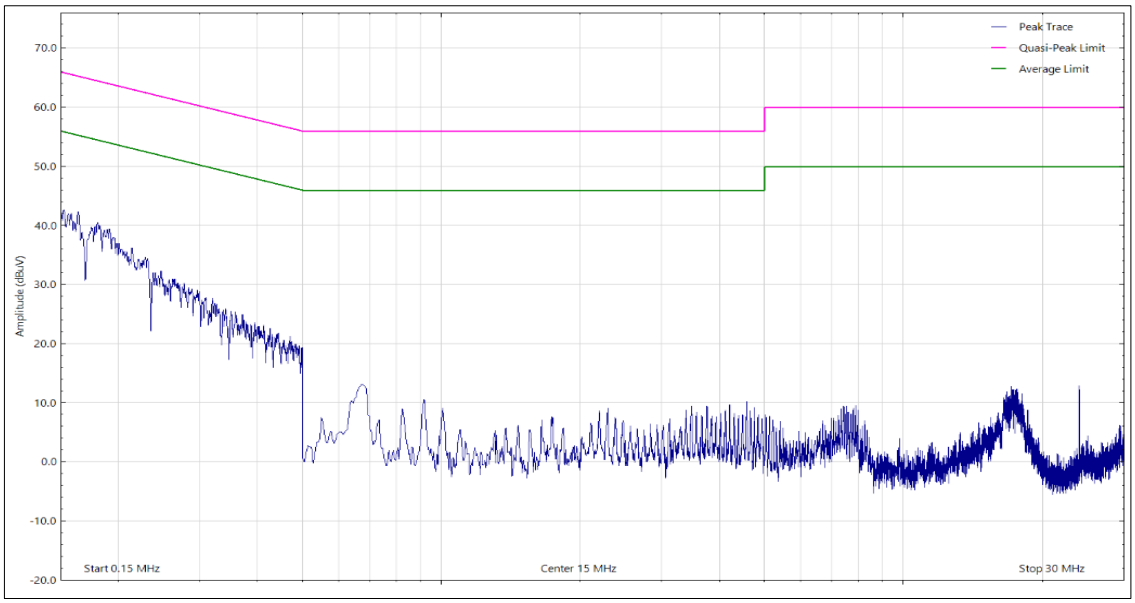

Figure 10 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
*				

Table 17 - Neutral Line Emissions Results

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

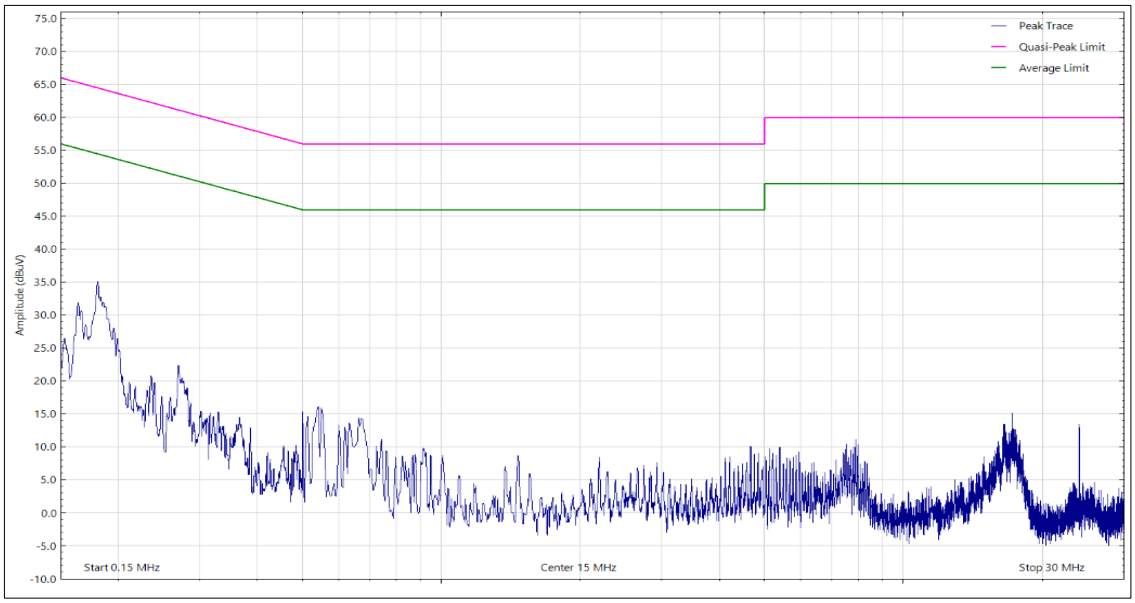

Figure 11 - Neutral Line - 150 kHz to 30 MHz

5 GHz Narrowband

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

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.151	49.51	65.90	-16.39	Q-Peak
0.151	21.88	55.90	-34.02	CISPR Avg
0.157	48.75	65.60	-16.85	Q-Peak
0.157	19.96	55.60	-35.64	CISPR Avg
0.170	47.46	65.00	-17.54	Q-Peak
0.170	18.56	55.00	-36.44	CISPR Avg
0.184	46.07	64.30	-18.23	Q-Peak
0.184	23.93	54.30	-30.37	CISPR Avg
0.196	44.35	63.80	-19.45	Q-Peak
0.196	29.22	53.80	-24.58	CISPR Avg
0.207	42.47	63.30	-20.83	Q-Peak
0.207	17.50	53.30	-35.80	CISPR Avg

Table 18 - Live Line Emissions Results

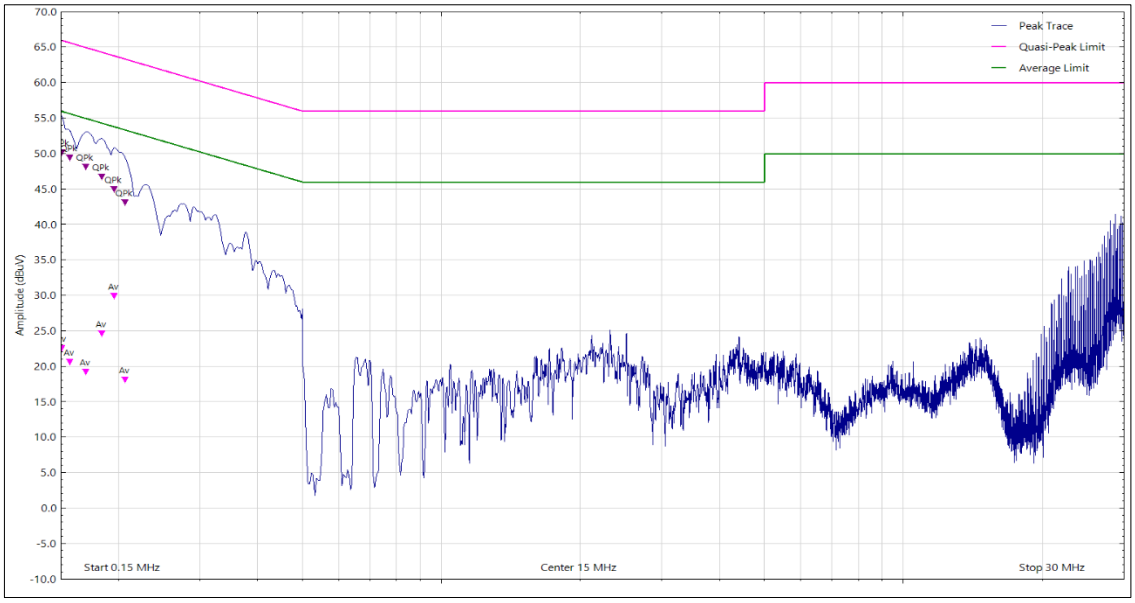

Figure 12 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.151	50.09	66.00	-15.91	Q-Peak
0.151	21.89	56.00	-34.11	CISPR Avg
0.159	49.09	65.50	-16.41	Q-Peak
0.159	20.30	55.50	-35.20	CISPR Avg
0.172	47.39	64.90	-17.51	Q-Peak
0.172	18.85	54.90	-36.05	CISPR Avg
0.188	45.71	64.10	-18.39	Q-Peak
0.188	29.29	54.10	-24.81	CISPR Avg
0.205	44.24	63.40	-19.16	Q-Peak
0.205	20.84	53.40	-32.56	CISPR Avg
0.224	41.32	62.70	-21.38	Q-Peak
0.224	15.53	52.70	-37.17	CISPR Avg

Table 19 - Neutral Line Emissions Results

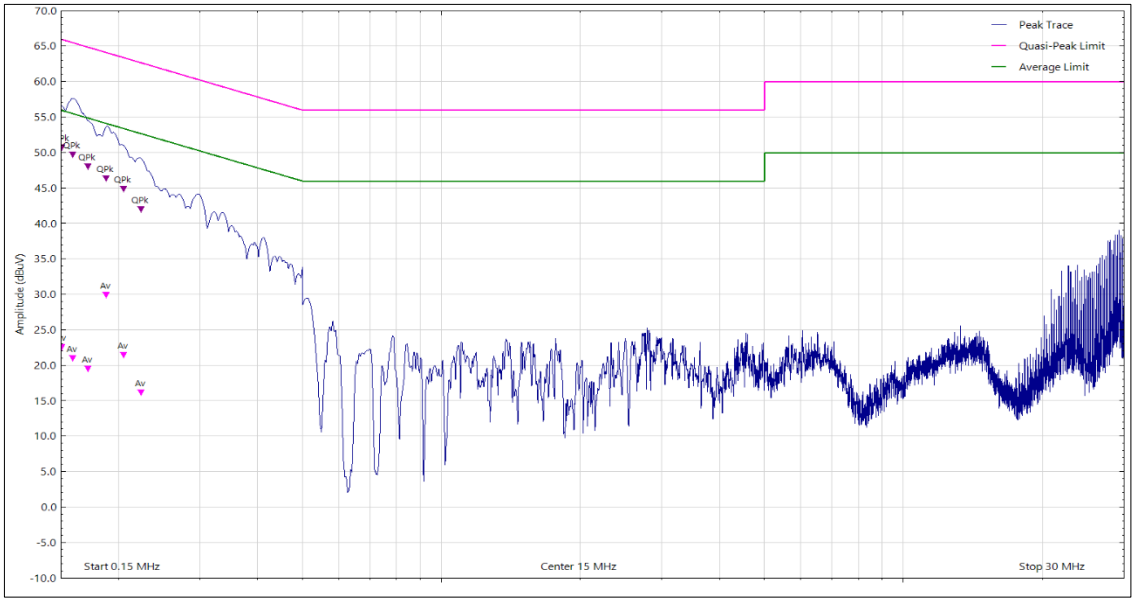

Figure 13 - Neutral Line - 150 kHz to 30 MHz

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 20

*Decreases with the logarithm of the frequency.

2.1.9 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 1 and EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (1)	Rainford	Rainford	1541	12	01-Jul-2023
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V3.1.11	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	30-Mar-2024
Test Receiver	Rohde & Schwarz	ESW44	5802	12	12-Jul-2023
Transient Limiter	Hewlett Packard	11947A	2378	12	25-Oct-2023
Cable (N(m)-N(m), 5 m)	Teledyne	PR90-088-5MTR	5206	12	04-Aug-2023
Cable	Teledyne	PR90-088-8MRT	5451	6	23-Aug-2023
Cable (SMA to N-Type, 2 m)	Junkosha	MWX241/B	5817	6	04-Aug-2023
LISN (CISPR 16, Single Phase)	Chase	MN 2050	336	12	04-Jul-2023
LISN (CISPR 16, Single Phase)	Rohde & Schwarz	ESH3-Z5	1390	12	02-Feb-2024

Table 21

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	06-Apr-2023*
Cable (N(m)-N(m), 5 m)	Teledyne	PR90-088-5MTR	5206	12	04-Aug-2023
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5476	12	06-Oct-2023

Table 22

*Test equipment was in date for calibration on the date that it was used for testing.

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 23

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.