

FCC and ISED Test Report

Apple Inc
Model: A2737

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

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

FCC ID: BCGA2737

IC: 579C-A2737

COMMERCIAL-IN-CONFIDENCE

Document 75954422-13 Issue 01



Add value.
Inspire trust.

TUV
SUD

Digitally signed
by TUV SUD
Date: 2022.09.28
09:09:12 +01'00'

SIGNATURE

Andrew Lawson

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Andrew Lawson	Chief Engineer (EMC)	Authorised Signatory	28 September 2022

Signatures in this approval box have checked this document in line with the requirements of TUV SUD 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
Report Author	Lauren Walters	28 September 2022	<i>Lauren Walters</i>

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, ISED RSS-247 and ISED RSS-GEN: 2020, Issue 2 (02-2017) and Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.



DISCLAIMER AND COPYRIGHT

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. © 2022 TÜV SÜD. This report relates only to the actual item/items tested.

ACCREDITATION

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.tuvsud.com/en

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

TÜV SÜD

TÜV®



Contents

1 Report Summary2

1.1 Report Modification Record.....2

1.2 Introduction.....2

1.3 Brief Summary of Results3

1.4 Product Information4

1.5 Deviations from the Standard.....4

1.6 EUT Modification Record4

1.7 Test Location4

2 Test Details5

2.1 AC Power Line Conducted Emissions5

3 Measurement Uncertainty 14



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	28 September 2022

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2737
Serial Number(s)	QQRXMCWXL5
Hardware Version(s)	REV 1.0
Software Version(s)	20J42560n
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2020 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	540246998
Date of Receipt of EUT	01-July-2022
Start of Test	21-September-2022
Finish of Test	21-September-2022
Name of Engineer(s)	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: 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: 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: 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)

Table 2



1.4 Product Information

1.4.1 Technical Description

The equipment under test (EUT) was an Apple TV Set Top Box with Bluetooth® and IEEE 802.11 a/b/g/n/ac/ax Wi-Fi 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: A2737, Serial Number: QQRXMCWXL5			
0	As supplied by the customer	Not Applicable	Not Applicable

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: 2.4 GHz WLAN		
AC Power Line Conducted Emissions	James Cumming	UKAS
Configuration and Mode: 2.4 GHz Bluetooth		
AC Power Line Conducted Emissions	James Cumming	UKAS
Configuration and Mode: 5 GHz WLAN		
AC Power Line Conducted Emissions	James Cumming	UKAS

Table 4

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

A2737, S/N: QQRXMCWXL5 - Modification State 0

2.1.3 Date of Test

21-September-2022

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 Test Setup Diagram

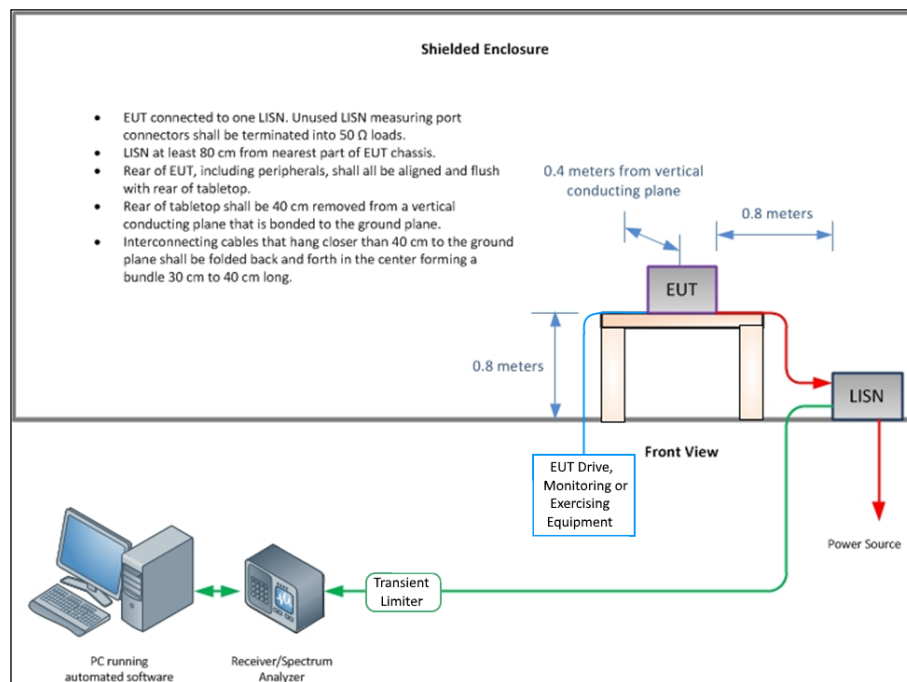


Figure 1 - Conducted Emissions

2.1.7 Environmental Conditions

Ambient Temperature	19.9 - 21.0 °C
Relative Humidity	48.2 - 54.1 %

2.1.8 Test Results

2.4 GHz WLAN

Applied supply voltage: 115 V AC

Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.151	45.1	65.9	-20.8	Q-Peak
0.151	18.7	55.9	-37.2	CISPR Avg
0.160	43.9	65.5	-21.6	Q-Peak
0.160	18.4	55.5	-37.1	CISPR Avg
0.169	43.3	65.0	-21.7	Q-Peak
0.169	17.9	55.0	-37.1	CISPR Avg
0.175	43.0	64.7	-21.7	Q-Peak
0.175	17.8	54.7	-36.9	CISPR Avg
0.185	41.8	64.2	-22.4	Q-Peak
0.185	17.4	54.2	-36.8	CISPR Avg
0.210	39.5	63.2	-23.7	Q-Peak
0.210	23.7	53.2	-29.5	CISPR Avg

Table 5 - Live Line Emissions Results

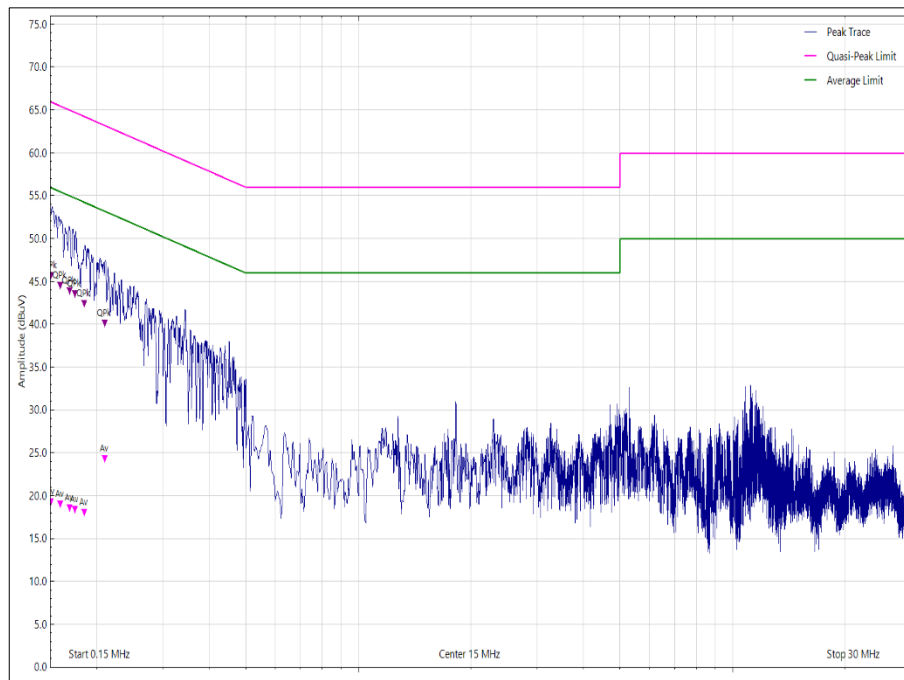


Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.153	45.7	65.9	-20.2	Q-Peak
0.153	19.2	55.9	-36.7	CISPR Avg
0.161	44.7	65.4	-20.7	Q-Peak
0.161	18.8	55.4	-36.6	CISPR Avg
0.173	42.8	64.8	-22.0	Q-Peak
0.173	17.8	54.8	-37.0	CISPR Avg
0.181	42.0	64.4	-22.4	Q-Peak
0.181	17.7	54.4	-36.7	CISPR Avg
0.197	40.7	63.7	-23.0	Q-Peak
0.197	17.9	53.7	-35.8	CISPR Avg
0.218	38.9	62.9	-24.0	Q-Peak
0.218	16.6	52.9	-36.3	CISPR Avg

Table 6 - Neutral Line Emissions Results

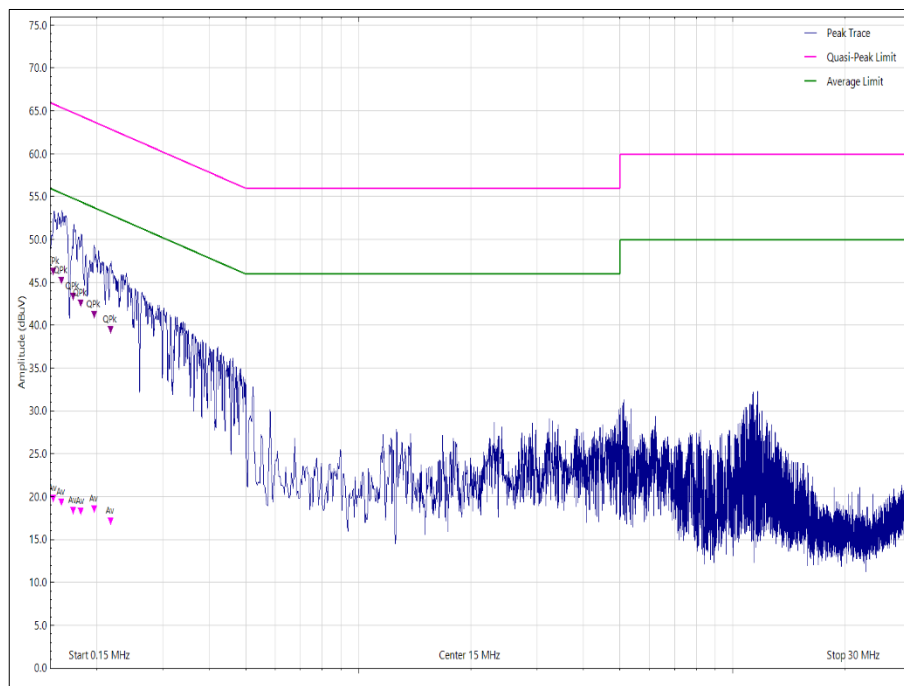


Figure 3 - Neutral Line - 150 kHz to 30 MHz

2.4 GHz Bluetooth

Applied supply voltage: 115 V AC

Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector
0.153	49.7	65.8	-16.1	Q-Peak
0.153	21.6	55.8	-34.2	CISPR Avg
0.161	48.8	65.4	-16.6	Q-Peak
0.161	21.4	55.4	-34.0	CISPR Avg
0.172	47.4	64.8	-17.4	Q-Peak
0.172	20.1	54.8	-34.7	CISPR Avg
0.183	46.4	64.4	-18.0	Q-Peak
0.183	25.6	54.4	-28.8	CISPR Avg
0.191	45.6	64.0	-18.4	Q-Peak
0.191	27.1	54.0	-26.9	CISPR Avg
0.196	46.7	63.8	-17.1	Q-Peak
0.196	26.4	53.8	-27.4	CISPR Avg

Table 7 - Live Line Emissions Results

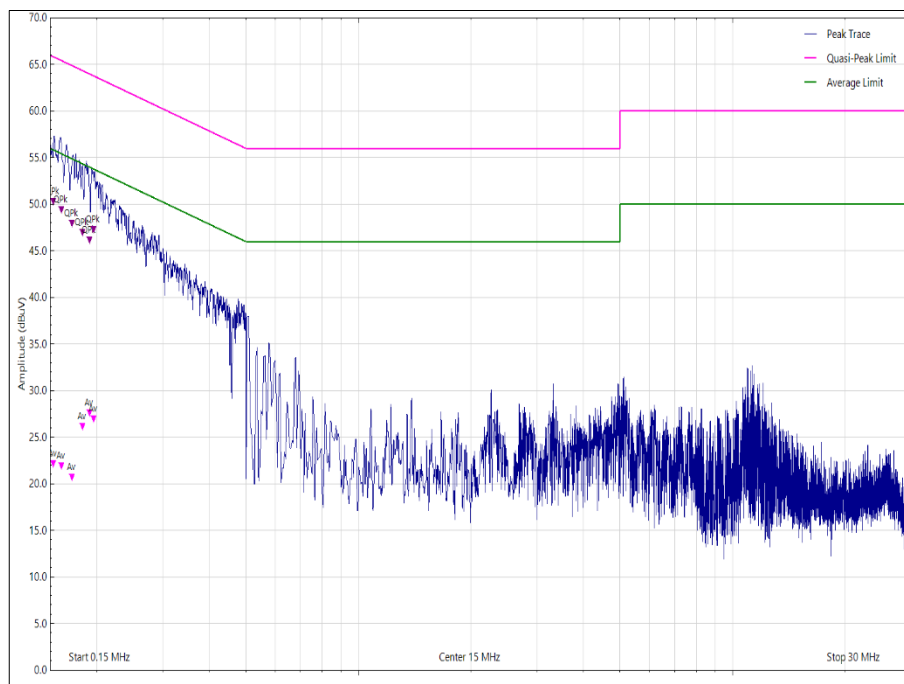


Figure 4 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector
0.153	51.0	65.9	-14.9	Q-Peak
0.153	22.6	55.9	-33.3	CISPR Avg
0.157	50.4	65.6	-15.2	Q-Peak
0.157	22.2	55.6	-33.4	CISPR Avg
0.166	49.3	65.2	-15.9	Q-Peak
0.166	21.8	55.2	-33.4	CISPR Avg
0.171	48.6	64.9	-16.3	Q-Peak
0.171	21.0	54.9	-33.9	CISPR Avg
0.178	47.9	64.6	-16.7	Q-Peak
0.178	21.4	54.6	-33.2	CISPR Avg
0.187	47.0	64.2	-17.2	Q-Peak
0.187	25.7	54.2	-28.5	CISPR Avg

Table 8 - Neutral Line Emissions Results

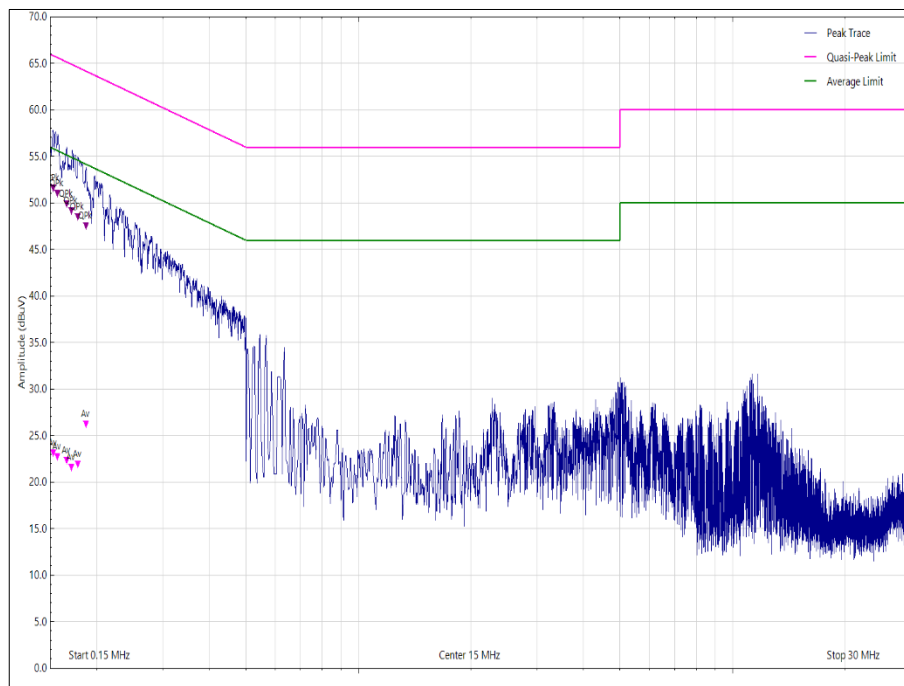


Figure 5 - Neutral Line - 150 kHz to 30 MHz

5 GHz WLAN

Applied supply voltage: 115 V AC

Applied supply frequency: 60 Hz

Frequency (MHz)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector
0.157	43.4	65.6	-22.2	Q-Peak
0.157	17.5	55.6	-38.1	CISPR Avg
0.163	42.9	65.3	-22.4	Q-Peak
0.163	17.5	55.3	-37.8	CISPR Avg
0.173	41.9	64.8	-22.9	Q-Peak
0.173	17.0	54.8	-37.8	CISPR Avg
0.184	40.8	64.3	-23.5	Q-Peak
0.184	16.6	54.3	-37.7	CISPR Avg
0.199	39.1	63.7	-24.6	Q-Peak
0.199	16.1	53.7	-37.6	CISPR Avg
0.215	37.2	63.0	-25.8	Q-Peak
0.215	14.7	53.0	-38.3	CISPR Avg

Table 9 - Live Line Emissions Results

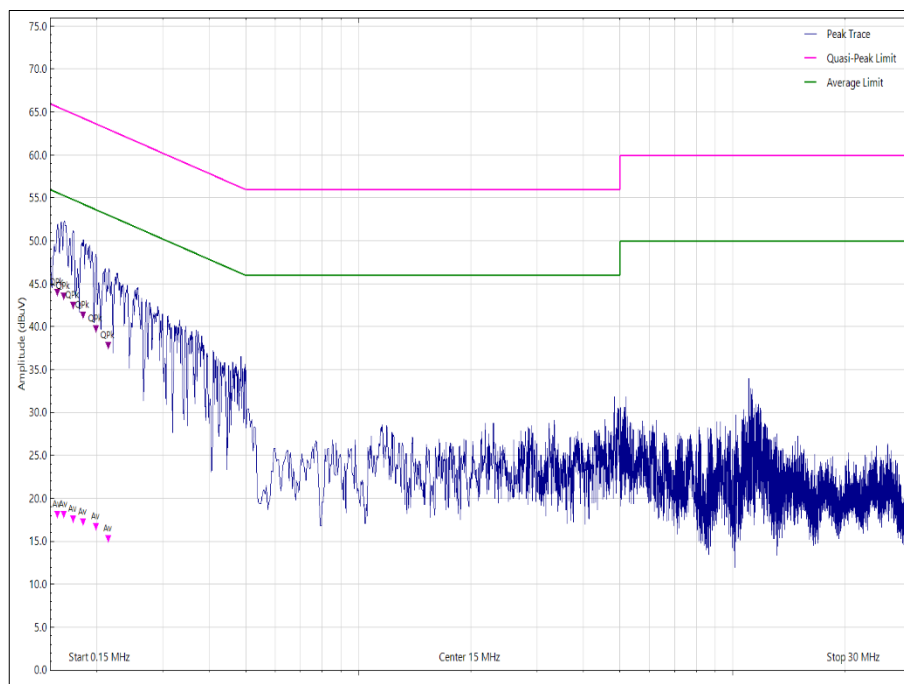


Figure 6 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector
0.154	43.8	65.8	-22.0	Q-Peak
0.154	17.7	55.8	-38.1	CISPR Avg
0.160	43.4	65.5	-22.1	Q-Peak
0.160	17.6	55.5	-37.9	CISPR Avg
0.170	42.4	64.9	-22.5	Q-Peak
0.170	16.9	54.9	-38.0	CISPR Avg
0.179	41.3	64.5	-23.2	Q-Peak
0.179	16.4	54.5	-38.1	CISPR Avg
0.189	40.1	64.1	-24.0	Q-Peak
0.189	16.8	54.1	-37.3	CISPR Avg
0.195	39.0	63.8	-24.8	Q-Peak
0.195	16.2	53.8	-37.6	CISPR Avg

Table 10 - Neutral Line Emissions Results

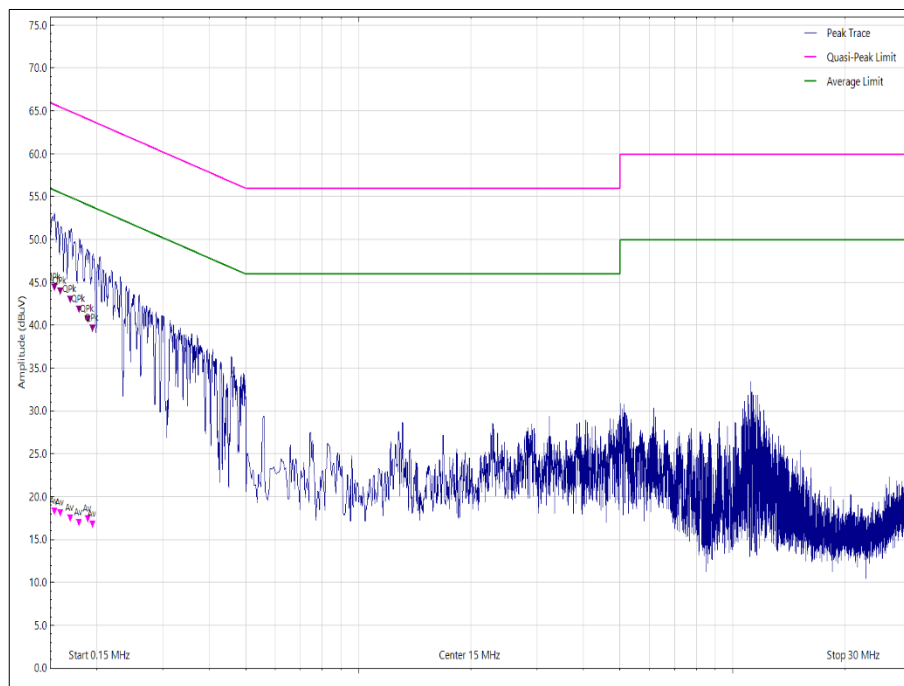


Figure 7 - Neutral Line - 150 kHz to 30 MHz



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 11

*Decreases with the logarithm of the frequency.

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 Expiry Date
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023
Emissions Software	TUV SUD	EmX V3.1.4	5125	-	Software
Test Receiver	Rohde & Schwarz	ESU40	3506	12	25-Mar-2023
Transient Limiter	Hewlett Packard	11947A	2377	12	28-Feb-2023
Termination (50ohm)	Meca	405-1	3517	12	16-Dec-2022
Cable (SMA to SMA, 2 m)	Rhophase	3PS-1801A-2000-3PS	4113	12	27-Jan-2023
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	06-Oct-2022
LISN (CISPR 16, Single Phase)	Chase	MN 2050	336	12	04-Jul-2023
LISN (CISPR 16, Single Phase)	Rohde & Schwarz	ESH3-Z5	1390	12	31-Jan-2023

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, ± 3.7 dB

Table 13

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.