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File Number **24/36403473M2**

TEST REPORT
Electromagnetic Compatibility

Petitioner's Reference:	Verisure Sàrl		
Company Address:	Chemin Jean-Baptiste Vandelle 3, Versoix, Geneva, Switzerland		
Represented by:	James Barnett		
PMN:	Wi-Fi Extender		
Brand:	Verisure	HMN:	GWL-WXTND 489937
Sample #1:	3N75 UKDZ	Applus Id:	25556-0002
Result:	**complies**		

It has been tested and complies with the applicable standard. See test result summary section.

Applicable Standard:	
EMC standard/s:	**FCC 47 CFR Part 15 Subpart B[1]** **ANSI C63.4 (2014)** **ANSI C63.4a (2017)**

[1]The latest modifications of the standard, published at the date of the tests reported in this document, have been considered.

Dates and Test Site:	Applus Barcelona, Bellaterra
Equipment Reception Date	December 12, 2023
Test Initial Date:	February 23, 2024
Test Final Date:	March 8, 2024
Modification Description:	M2

This report replaces and supersedes the report 24/36403473M1 dated on September 25, 2024.

Modifications performed: ANSI C63.4 (2014) and ANSI C63.4a (2017) are included in applicable standard. Page 1. It is responsibility of the petitioner to replace the previous version with this one.

Test Manager: Javier Miguel Nadales Lisbona
Date of issue: Bellaterra, October 20, 2024

JORGE GEIS ESTRADA
Firmado digitalmente por JORGE GEIS ESTRADA
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EMC & Wireless Technical Manager
Electrical and Electronics
LGAI Technological Center S.A.

ENSAYO ISO 17025 Nº9 / LE894

1 TEST RESULTS SUMMARY

Test Description	Sample #	DUT Test Modes	Req. Criteria	Results	Criteria Note
RADIO-FREQUENCY RADIATED EMISSIONS (FCC Part 15.109, ICES-003 Issue 7 (3.2.2))	#1	Mode 1	CLASS B	PASS	CN3
POWER LINE CONDUCTED EMISSIONS (FCC Part 15.107, ICES-003 Issue 7 (3.2.1))	#1	Mode 1	CLASS B	PASS	CN4

Table 1: Equipment description

The test results are shown in detail on the following pages.

The criteria to give conformity in those cases where it is not implicit in the standard or specification will be, for EMC emissions tests, a non-simple binary decision rule will be followed with a safety zone equal to the value of the uncertainty (w = U).

In this case, the upper limit of the value of the probability of false acceptance, according to ILAC G8, is 2.5 % and the criteria notes are:

CN1: The measured results are above the upper limit, even considering the uncertainty interval.
CN2: The measured results are above the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that non-compliance is more probable than compliance.
CN3: The measured results are below the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that compliance is more probable than non-compliance.
CN4: The measured results are within the limits, including the uncertainty interval.

2 INDEX

3 GENERAL DESCRIPTION OF TEST ITEMS

3.1 EQUIPMENT DESCRIPTION

This information has been provided by the customer and it is not covered by the accreditation. LGAI does not assume any responsibility from it.

EQUIPMENT DESCRIPTION				
Description	Wi-Fi Extender which can also be controlled and monitored over our proprietary radio protocol over Sub-GHz ISM (SRD).			
EUT Version	**FVIN**		**HVIN**	
	1.0.6		A1	
Power supply	AC	1 PH + N	100~240 V	50~60 Hz
Equipment Size	**Length**	**Width**	**Height**	
	17.5 cm	10.5 cm	2 cm	
Maximum internal frequency	5825 MHz			

Table 2: Equipment description

I/O CABLES						
	Port #	**Name**	**Type**	**Cable length**	**Cable Shielded**	**Comments**
Description	1	Mains	AC	< 3 m	Yes	Provided by customer
	2	Communications	ETH	< 3 m	Yes	Provided by customer

Table 3: Input/output ports description

RF FEATURES				
	Communication Technology	**Radio Chipset**	**Brand**	**Antenna Peak Gain**
Description	ISM	Si4463-C2A-GM	Silicon Labs	-1 dBi
	Wi-Fi 2.4 GHz	SYN4375B4XKFFBG/ BCM4375B4XKFFBG[1]	Synaptics / Broadcom	SISO_1: +2.1 dBi SISO_2: +3.0 dBi
	Wi-Fi 5 GHz	SYN4375B4XKFFBG/ BCM4375B4XKFFBG[1]	Synaptics / Broadcom	SISO_1: +2.3 dBi SISO_2: +3.1 dBi

Table 4: RF Features

Note [1]: This is not dual source, just that Synaptics purchased this business line from Broadcom and the PN is renamed, some documentation may refer to those 2 PN.

3.2 DUT TEST MODES

DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	The equipment is configured in a commercial operation mode, making use of a dual link modem and establishing a connection to it for WiFi technology for both the 2.4 GHz and 5 GHz bands. In the case of ISM, the client provides instructions to emulate this mode of operation with periodic transmission every 3 seconds.	Table top

Table 5: DUT test modes

3.3 CONTROL AND MONITORING

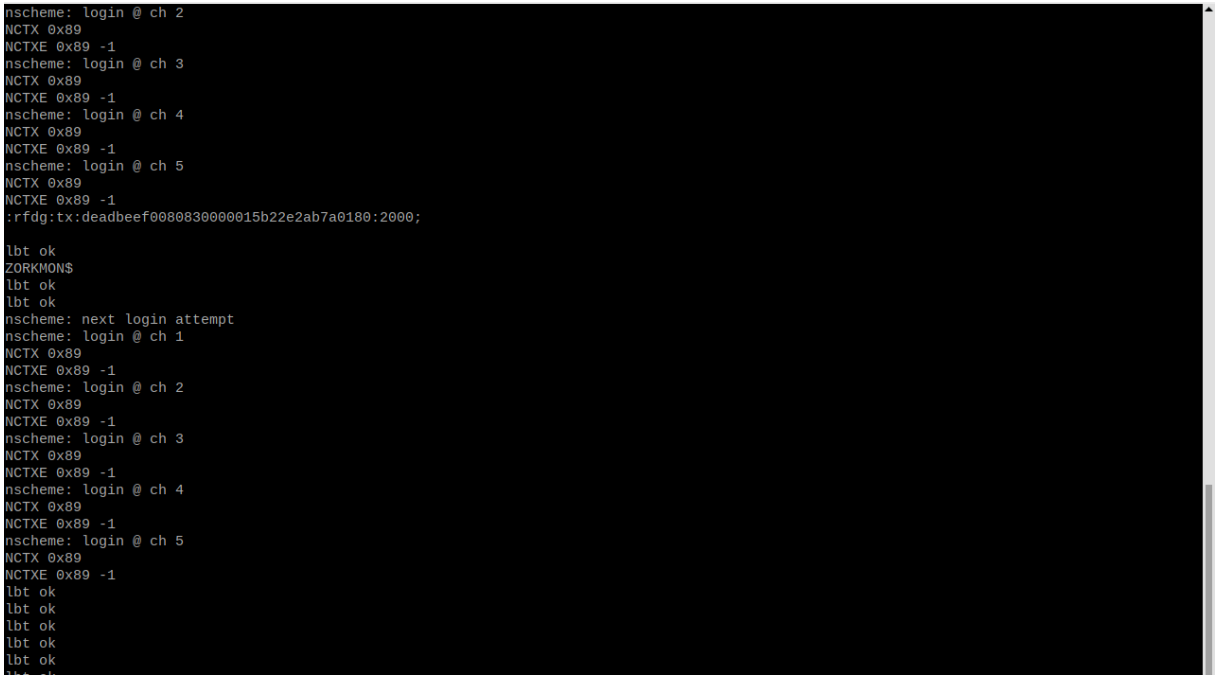

Fig. 1: SW of control and monitoring - ISM

3.4 PHOTOGRAPHS

Photographs identifying the equipment under test and its auxiliaries, as well as assembly photographs for radiated and conducted tests, can be found in the document with ID: 24/36403478M2

3.5 ACCEPTANCE CRITERIA

According to standard **FCC 47 CFR Part 15 Subpart B.**

3.6 TEST FACILITIES ID

TEST FACILITIES ID	
FCC Test Firm Registration Number:	507478
ISED Assigned Code:	5766A
CABID	ES0001

Table 6: Test facilities ID

3.7 COMPETENCES AND GUARANTEES

LGAI Technological Center, S.A. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 9/LE894.
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4 TEST RESULTS

4.1 RADIO-FREQUENCY RADIATED EMISSIONS

4.1.1 Test Setup Required

According to standard ANSI C63.4:2014

4.1.1.1 Tabletop equipment

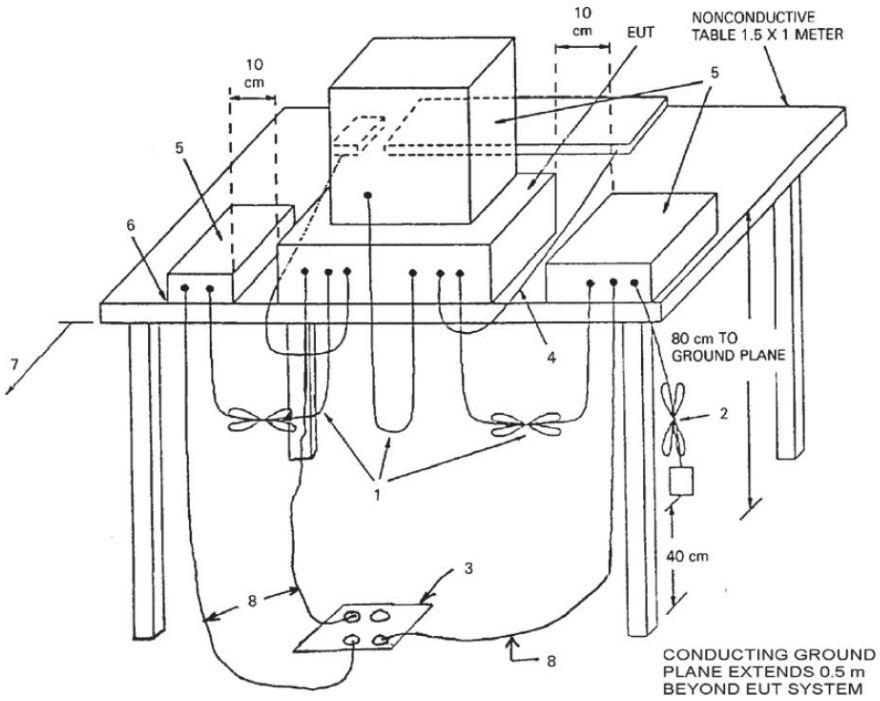


Fig. 2: Radio-frequency radiated emissions setup of table top equipment.

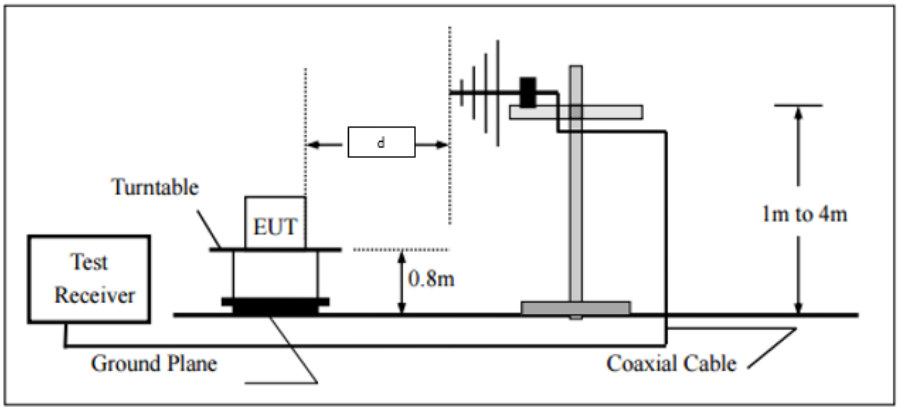


Fig. 3: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

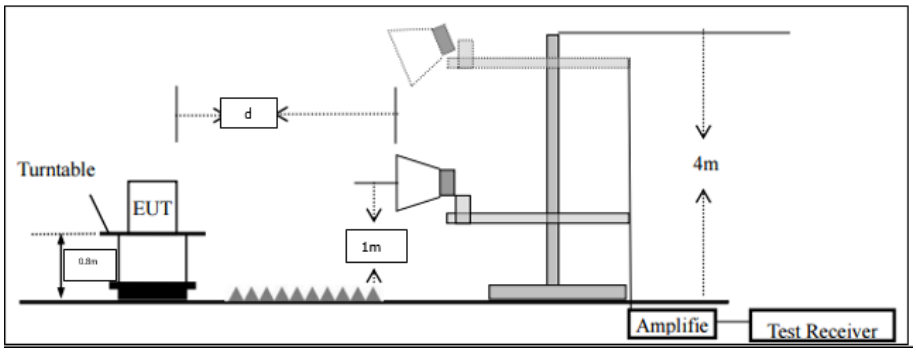


Fig. 4: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.1.2 Test Procedure

The test site, 3 or 10 m semi-anechoic chamber, has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4-2014

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The receiving antennas are conforming to specifications ANSI C63. These antennas can be moved over the height range between 1 m and 4 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

Pre-measurement

- The turntable rotates from 0° to 315° using 45° steps
- The antenna is polarized vertical and horizontal
- The antenna height changes from 1 m to 4 m
- At each turntable position, antenna polarization and height the receiver finds the maximum of all emissions

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position 360 º and antenna height between 1 m and 4 m
- The final measurement is done with quasi-peak detector (as described in ANSI C63.4) for 30 MHz to 1 GHz emissions test
- The final measurement is done in the position (azimuth, height and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C63.4) for 1 GHz to 18 GHz test
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factors, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is shown

Correction Factor:

Emission Level = Read Level +Corrections (Antenna Factor + Cable Loss – Amplifier Gain (if applies) + Attenuator (if applies))

4.1.3 Test Parameters

4.1.3.1 Requirements

According to FCC Part 15.109 :

Class A Equipment's						
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV/m]**		**Peak detector (PK) [dBµV/m]**		**Average detector (AVG) [dBµV/m]**	
	10 m measuring distance	3 m measuring distance[1]	8.5 m measuring distance[2]	3 m measuring distance[3]	8.5 m measuring distance[2]	3 m measuring distance[3]
30 – 288	39.0	49.5	N/A	N/A	N/A	N/A
88 – 216	43.5	54	N/A	N/A	N/A	N/A
216 – 960	46.4	56.9	N/A	N/A	N/A	N/A
960 – 1000	49.5	60	N/A	N/A	N/A	N/A
Above 1000	N/A	N/A	70.95	80	50.95	60

Table 7: Radio-frequency radiated emissions requirements – Class A equipment's

Note 1: The limits has been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 10 meters.
d_1: 10 meters (standard distance).
d_2: 3 meters (new measurement distance).

Note 2: The limits have been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*
L_2: New Limit.
L_1: Limit at 10 meters.
d_1: 10 meters (standard distance).
d_2: 8.5 meters (new measurement distance).

Note 3: The limits have been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 10 meters.
d_1: 10 meters (standard distance).
d_2: 3 meters (new measurement distance).

Class B Equipment's						
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV/m]**		**Peak detector (PK) [dBµV/m]**		**Average detector (AVG) [dBµV/m]**	
	10 m measuring distance[1]	3 m measuring distance	8.5 m measuring distance[2]	3 m measuring distance	8.5 m measuring distance[2]	3 m measuring distance
30 – 288	29.5	40	N/A	N/A	N/A	N/A
88 – 216	33.0	43.5	N/A	N/A	N/A	N/A
216 – 960	35.5	46	N/A	N/A	N/A	N/A
960 – 1000	43.5	54	N/A	N/A	N/A	N/A
Above 1000	N/A	N/A	65	74	45	54

Table 8: Radio-frequency radiated emissions requirements – Class B equipment's

Note 1: The limits has been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*

L_2: New Limit.
L_1: Limit at 3 meters.
d_1: 3 meters (standard distance).
d_2: 10 meters (new measurement distance).

Note 2: The limits has been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*
L_2: New Limit.
L_1: Limit at 3 meters.
d_1: 3 meters (standard distance).
d_2: 8.5 meters (new measurement distance).

According to ICES-003 Issue 7 (3.2.2):

Class A Equipment's						
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV/m]**		**Peak detector (PK) [dBµV/m]**		**Average detector (AVG) [dBµV/m]**	
	10 m measuring distance	3 m measuring distance[1]	8.5 m measuring distance[1]	3 m measuring distance	8.5 m measuring distance[1]	3 m measuring distance
30 – 288	40.0	50.0	N/A	N/A	N/A	N/A
88 – 216	43.5	54.0	N/A	N/A	N/A	N/A
216 – 230	46.4	56.9	N/A	N/A	N/A	N/A
230 – 960	47.0	57.0	N/A	N/A	N/A	N/A
960 – 1000	49.5	60.0	N/A	N/A	N/A	N/A
Above 1000	N/A	N/A	71	80	51	60

Table 9: Radio-frequency radiated emissions requirements – Class A equipment's

Class B Equipment's						
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV/m]**		**Peak detector (PK) [dBµV/m]**		**Average detector (AVG) [dBµV/m]**	
	10 m measuring distance	3 m measuring distance	8.5 m measuring distance[1]	3 m measuring distance	8.5 m measuring distance[1]	3 m measuring distance
30 – 288	30.0	40.0	N/A	N/A	N/A	N/A
88 – 216	33.1	43.5	N/A	N/A	N/A	N/A
216 – 230	35.6	46.0	N/A	N/A	N/A	N/A
230 – 960	37.0	47.0	N/A	N/A	N/A	N/A
960 – 1000	43.5	54.0	N/A	N/A	N/A	N/A
Above 1000	N/A	N/A	65	74	45	54

Table 10: Radio-frequency radiated emissions requirements – Class B equipment's

Note 1: The limits has been modified according to the applicable standard applying the formula: $L_2 = L_1 - 20log\,(d_2/d_1)$*, where:*
L_2: New Limit.
L_1: Limit at 3 meters.
d_1: 3 meters (standard distance).
d_2: 8.5 meters (new measurement distance).

4.1.3.2 Receiver Parameters

According to standard ANSI C63.4:2014:

Frequency Range [MHz]	Detector	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]
30 – 1000	Quasi-peak (QP)	0.12	0.30
Above 1000	Peak (PK)	1	3
	Average (AVG)	1	$10 \cdot 10^{-6}$

Table 11: Receiver parameters – Radio-frequency radiated emissions

4.1.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
23/02/2024	J.M. Llauradó	-	21.3	51	1012.2
23/02/2024	O. Merchán	-	23.5	45	994.4
26/02/2024	J.M Llauradó	-	22.1	45	1023.3

Table 12: Test environmental conditions – Radio-frequency radiated emissions

4.1.5 Summary Test Results

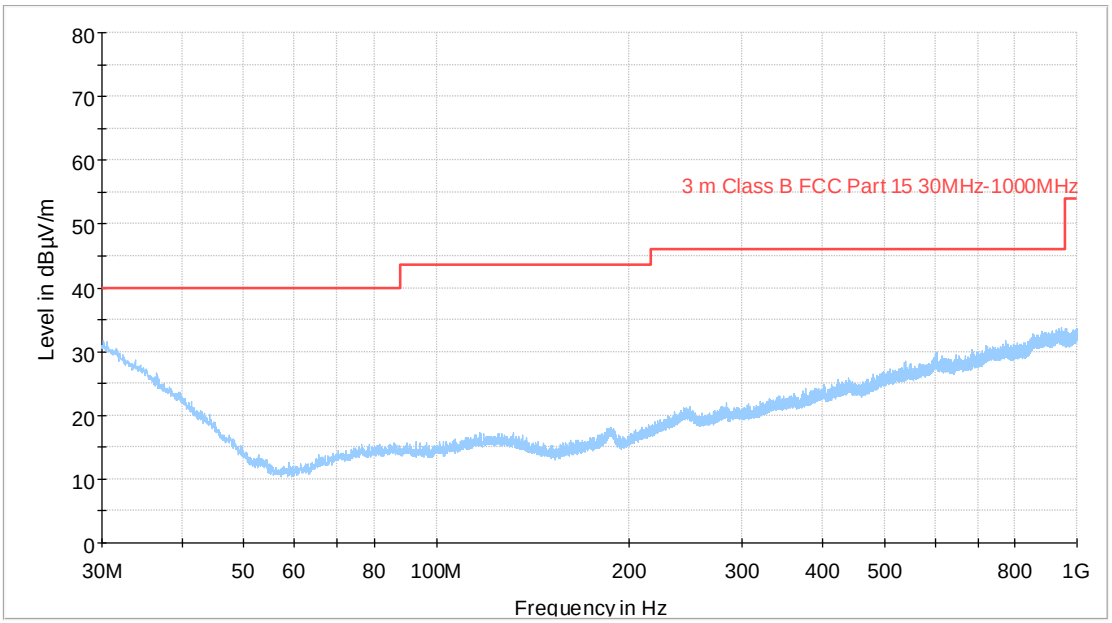
Frequency Range[1] [MHz]	Equipment Class	Test Area	Distance [m]	Emissions	Results
30 – 1000	B	SAC 1	3	QP < Limit - I	PASS
1000 – 6000	B	SAC 1	3	PK < Limit - I AVG < Limit - I	PASS
6000 – 18000	B	SAC 1	3	PK < Limit - I Limit - I <= AVG < Limit	PASS
18000 - 260000	B	SAC 1	1	PK < Limit - I AVG < Limit - I	PASS
26000 - 30000	B	SAC 1	1	PK < Limit - I AVG < Limit - I	PASS

Table 13: Summary test results – Radio-frequency radiated emissions

Note 1: Upper limit according to the fifth harmonic of the maximum internal frequency declared by the manufacturer or to 40 GHz, whichever is lower.

4.1.6 Test Results

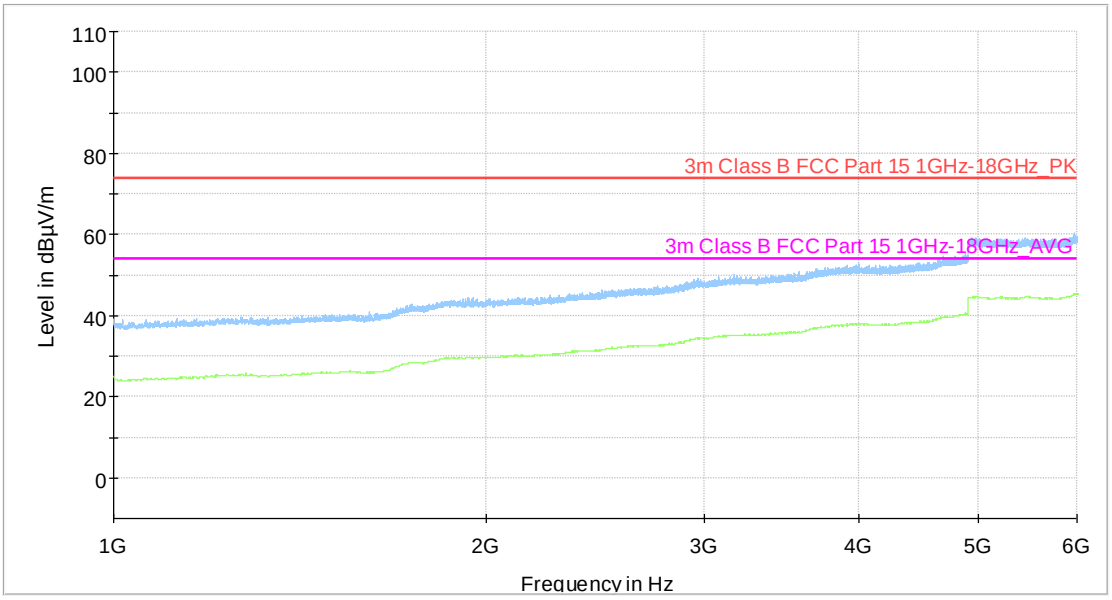
4.1.6.1 Ambient Levels. Frequency range: 30 MHz – 1 GHz



Preview Result 1-PK+ 3 m Class B FCC Part 15 30MHz-1000MHz

Fig. 5: Ambient level. Frequency range: 30 MHz – 1 GHz

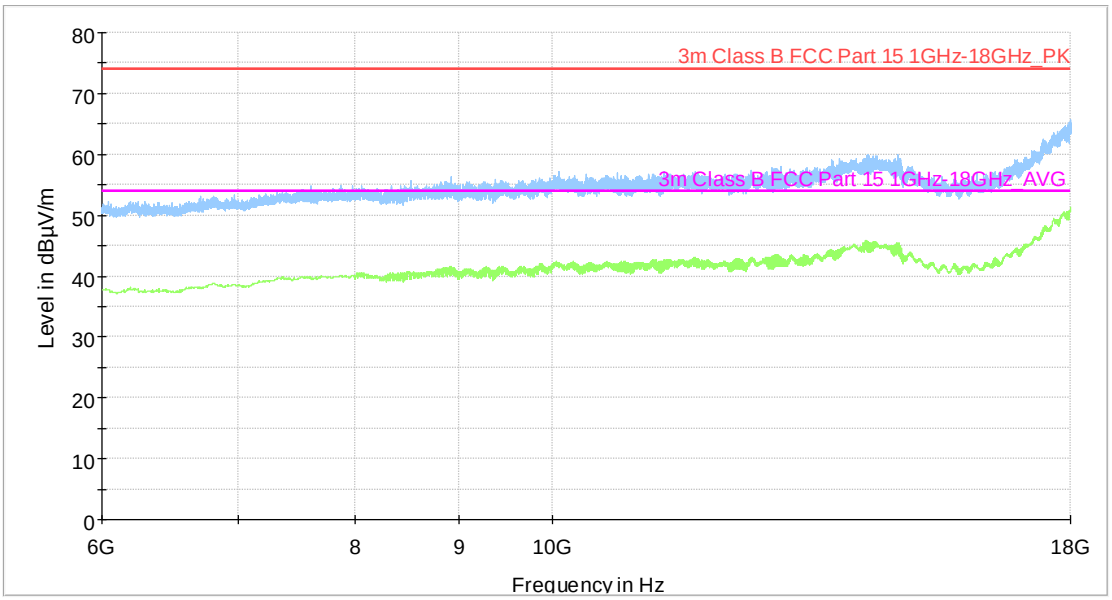
4.1.6.2 Ambient Levels. Frequency range: 1 GHz – 6 GHz



Preview Result 2-CAV
3m Class B FCC Part 15 1GHz-18GHz_PK
Preview Result 1-PK+
3m Class B FCC Part 15 1GHz-18GHz_AVG

Fig. 6: Ambient level. Frequency range: 1 GHz – 6 GHz

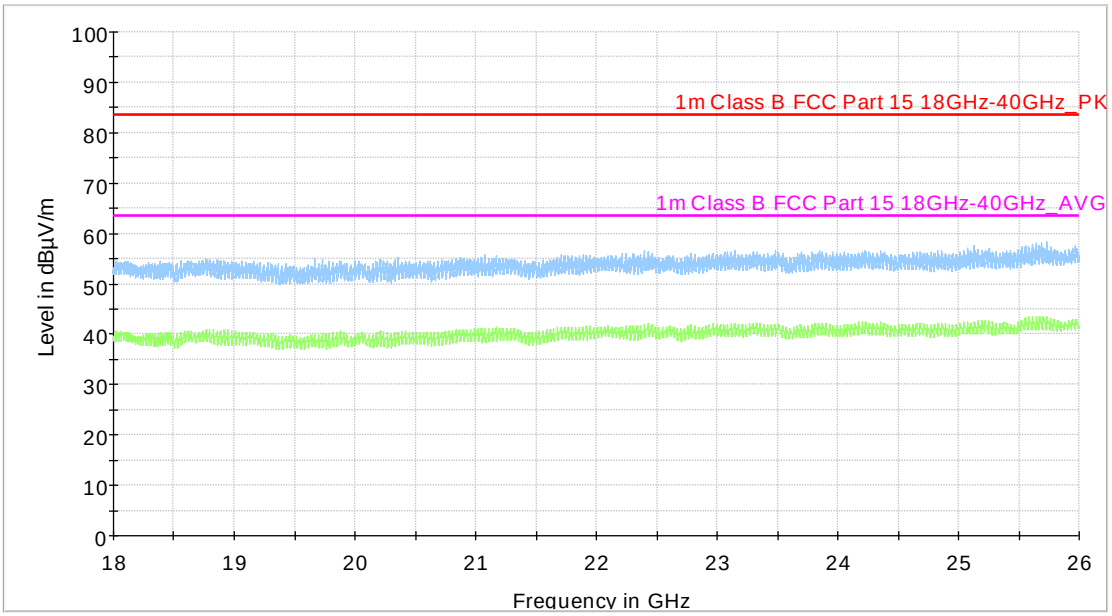
4.1.6.3 Ambient Levels. Frequency range: 6 GHz – 18 GHz



Preview Result 2-AVG
3m Class B FCC Part 15 1GHz-18GHz_PK
Preview Result 1-PK+
3m Class B FCC Part 15 1GHz-18GHz_AVG

Fig. 7: Ambient level. Frequency range: 6 GHz – 18 GHz

4.1.6.4 Ambient Levels. Frequency range: 18 GHz – 26 GHz



Preview Result 2-AVG
1m Class B FCC Part 15 18GHz-40GHz_PK
Preview Result 1-PK+
1m Class B FCC Part 15 18GHz-40GHz_AVG

Fig. 8: Ambient level. Frequency range: 18 GHz – 26 GHz

4.1.6.5 Ambient Levels. Frequency range: 26 GHz – 30 GHz

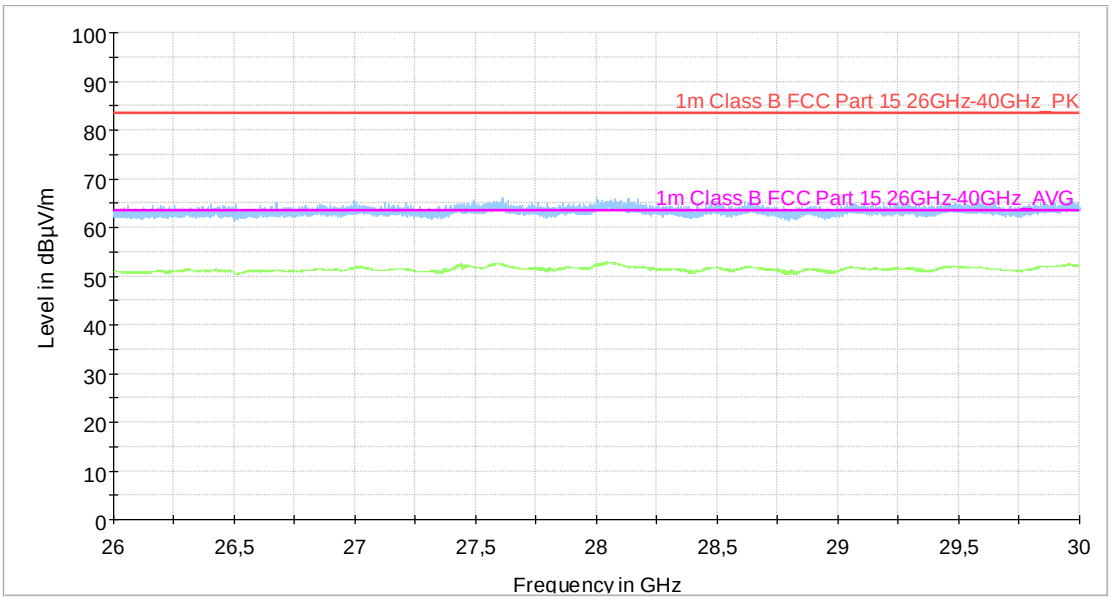


Fig. 9: Ambient level. Frequency range: 26 GHz – 30 GHz

4.1.6.6 Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

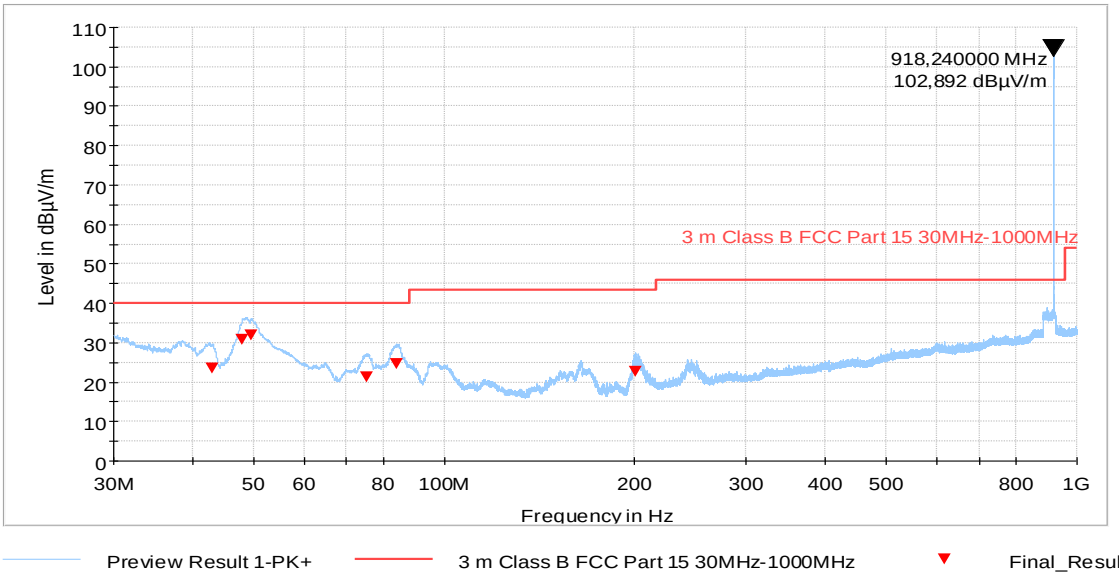


Fig. 10: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
42.990	23.6	40.0	16.4	100.0	V	31.0	17.3
47.880	30.7	40.0	9.4	100.0	V	0.0	13.5
49.620	32.1	40.0	8.0	100.0	V	225.0	12.2
75.570	21.5	40.0	18.6	105.0	V	162.0	12.2
84.000	24.7	40.0	15.4	100.0	V	140.0	12.8
200.460	22.6	43.5	20.9	100.0	V	39.0	14.6

Table 14: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

4.1.6.7 Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz

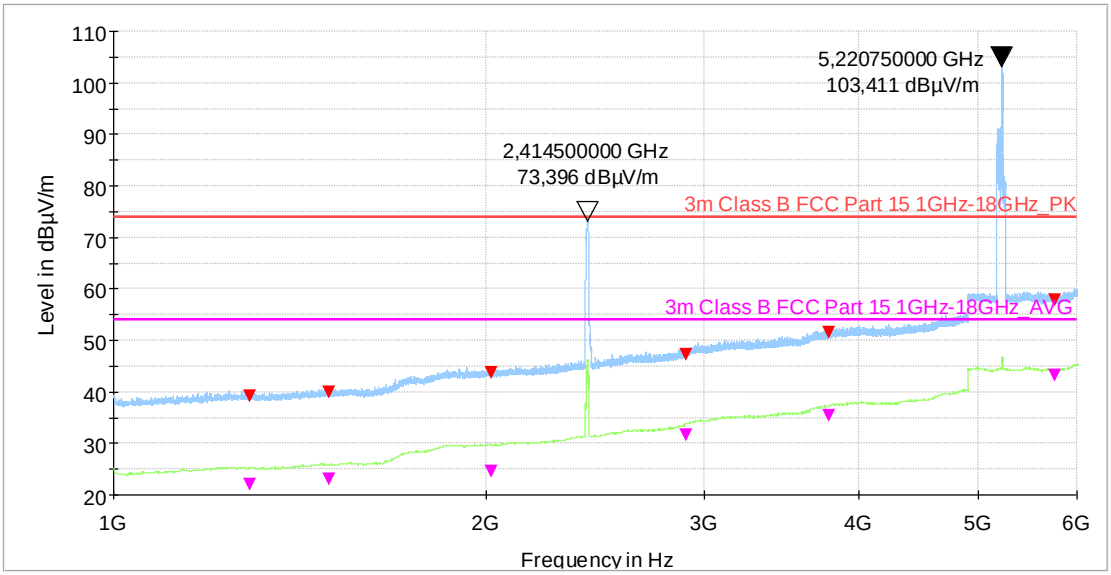


Fig. 11: Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz

FINAL MEASUREMENTS

Frequency [MHz]	Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
1290.000	39.3	74.0	34.7	100	H	161	27.4
1492.250	40.0	74.0	34.0	330	H	285	27.6
2017.000	43.8	74.0	30.2	100	H	324	30.6
2903.000	47.3	74.0	26.7	100	V	55	33.1
3787.000	51.6	74.0	22.3	325	H	88	36.6
5755.500	57.8	74.0	16.2	106	H	0	38.9

Table 15: Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz – Peak Details

Frequency [MHz]	CAverage [dBµV/m]	CAverage Limit	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
1290.000	22.0	54.0	32.0	100	H	161	27.4
1492.250	23.0	54.0	31.0	330	H	285	27.6
2017.000	24.6	54.0	29.4	100	H	324	30.6
2903.000	31.5	54.0	22.5	100	V	55	33.1
3787.000	35.4	54.0	18.6	325	H	88	36.6
5755.500	43.2	54.0	10.8	106	H	0	38.9

Table 16: Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz – CAverage Details

4.1.6.8 Sample #1. Mode 1. Frequency range: 6 GHz – 18 GHz

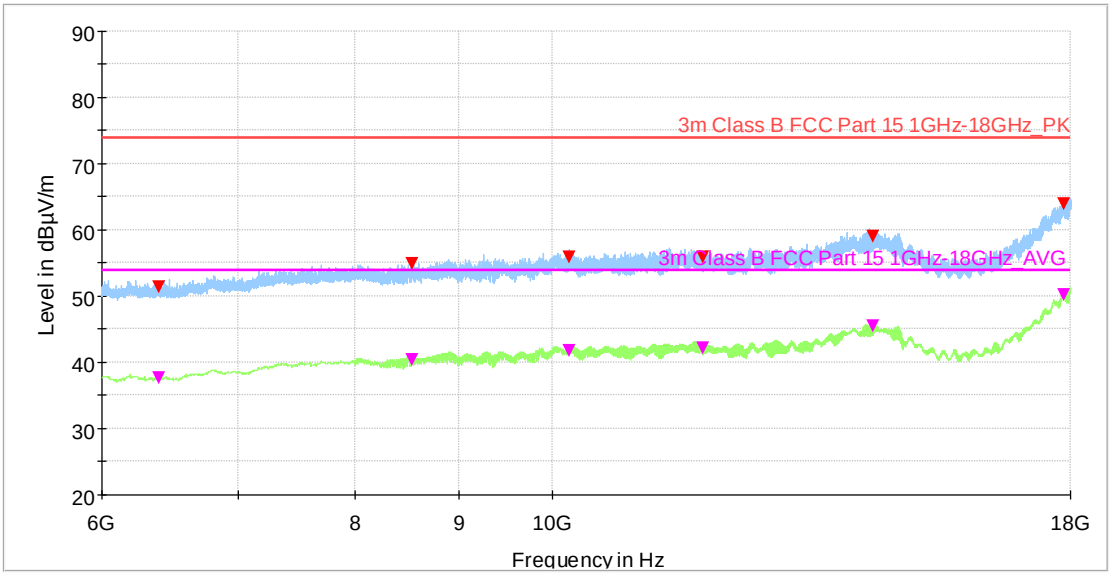


Fig. 12: Sample #1. Mode 1. Frequency range: 6 GHz – 18 GHz

FINAL MEASUREMENTS

Frequency [MHz]	Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
6401.750	51.4	74.0	22.6	400	V	202	-1.7
8537.250	55.0	74.0	19.0	400	V	267	2.0
10199.000	56.0	74.0	18.0	400	V	267	3.9
11857.000	55.8	74.0	18.2	400	V	283	6.6
14395.000	59.1	74.0	14.9	400	V	350	9.7
17867.750	64.0	74.0	10.0	400	V	338	17.0

Table 17: Sample #1. Mode 1. Frequency range: 6 GHz – 18 GHz – Peak Details

Frequency [MHz]	CAverage [dBµV/m]	CAverage Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
6401.750	37.7	54.0	16.3	400	V	202	-1.7
8537.250	40.4	54.0	13.6	400	V	267	2.0
10199.000	41.7	54.0	12.3	400	V	267	3.9
11857.000	42.1	54.0	11.9	400	V	283	6.6
14395.000	45.5	54.0	8.5	400	V	350	9.7
17867.750	50.3	54.0	3.7	400	V	338	17.0

Table 18: Sample #1. Mode 1. Frequency range: 6 GHz – 18 GHz – CAverage Details

4.1.6.9 Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz

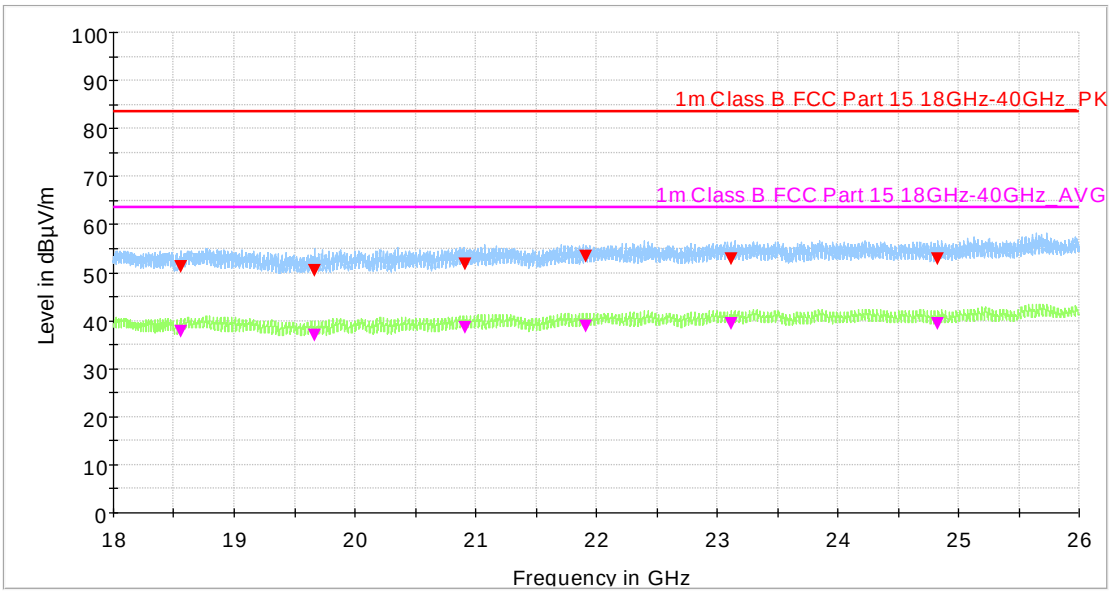


Fig. 13: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz

FINAL MEASUREMENTS

Frequency [MHz]	Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
21620.000	61.1	83.54	22.4	150	V	0	16.1
22400.000	59.7	83.54	23.8	150	V	222	16.9
23259.500	51.7	83.54	31.8	150	H	153	17.9
23810.250	62.4	83.54	21.1	150	H	241	18.0
24832.000	62.9	83.54	20.6	150	V	0	18.0
25760.250	66.0	83.54	17.5	150	H	66	18.2

Table 19: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz – Peak Details

Frequency [MHz]	CAverage [dBµV/m]	CAverage Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
21620.000	45.6	63.54	18.0	150	V	0	16.1
22400.000	46.8	63.54	16.8	150	V	222	16.9
23259.500	46.9	63.54	16.7	150	H	153	17.9
23810.250	47.2	63.54	16.4	150	H	241	18.0
24832.000	48.4	63.54	15.2	150	V	0	18.0
25760.250	51.8	63.54	11.8	150	H	66	18.2

Table 20: Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz – CAverage Details

4.1.6.10 Sample #1. Mode 1. Frequency range: 26 GHz – 30 GHz

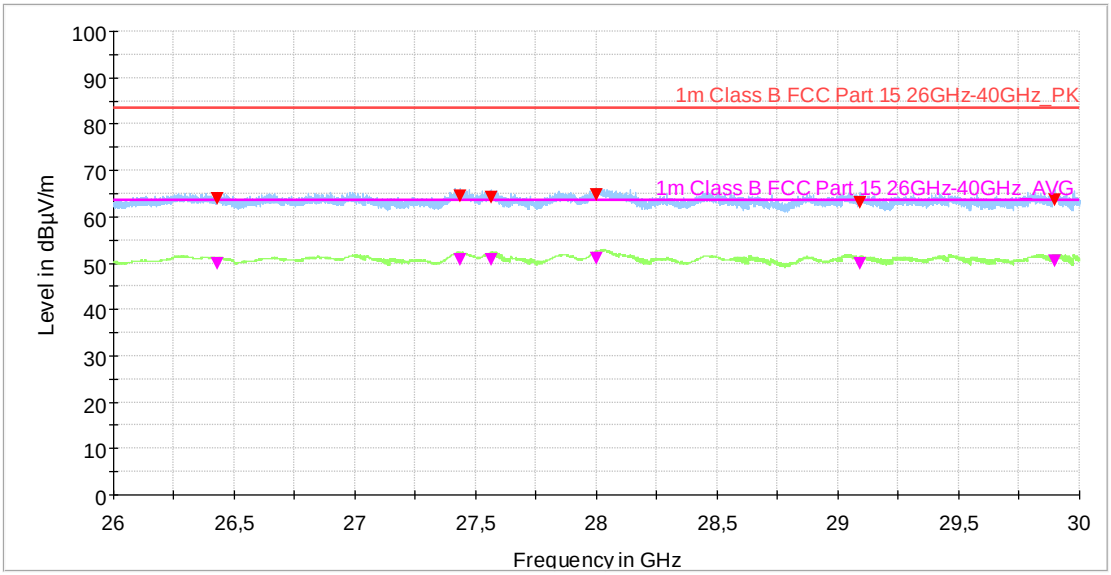


Fig. 14: Sample #1. Mode 1. Frequency range: 26 GHz – 30 GHz

FINAL MEASUREMENTS

Frequency [MHz]	Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
26430.750	63.8	83.54	19.8	100	H	0	47.5
27435.750	64.3	83.54	19.3	100	V	0	47.4
27562.000	64.1	83.54	19.5	100	H	315	47.4
28002.250	64.8	83.54	18.8	100	H	270	47.5
29092.000	62.9	83.54	20.7	100	H	270	47.4
29897.500	63.7	83.54	19.9	100	V	0	47.3

Table 21: Sample #1. Mode 1. Frequency range: 26 GHz – 30 GHz – Peak Details

Frequency [MHz]	CAverage [dBµV/m]	CAverage Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
26430.750	49.7	63.54	13.9	100	H	0	47.5
27435.750	50.6	63.54	13.0	100	V	0	47.4
27562.000	50.8	63.54	12.8	100	H	315	47.4
28002.250	51.1	63.54	12.5	100	H	270	47.5
29092.000	49.9	63.54	13.7	100	H	270	47.4
29897.500	50.4	63.54	13.2	100	V	0	47.3

Table 22: Sample #1. Mode 1. Frequency range: 26 GHz – 30 GHz – CAverage Details

4.1.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
BILOG ANTENNA	SCHWARZBECK	VULB 9162	1042740	08/11/2023	08/11/2024
HORN ANTENNA	EMCO	3115	05-ER-017	06/12/2023	06/12/2024
HORN ANTENNA	MVG	EH 1840	1042685	14/04/2022	14/04/2024
RF CABLE	HUBER+SUHNER	SF126E	1042728	21/08/2023	21/08/2024
3 DB ATTENUATOR	HUBER+SUHNER	6803.17.B	1042021	25/05/2023	25/05/2024
RF CABLE	RHODE & SCHWARZ	NA	1041502	09/10/2023	09/10/2024
RF CABLE	HUBER+SUHNER	SF104	1041964	22/06/2023	22/06/2024
HIGHPASS FILTER	WAINWRIGHT INSTRUMENTS	WHNX6-2765-3500-26500-40CC	1042511	12/05/2023	12/05/2024
RF CABLE	HUBER+SUHNER	SF104/11N/11N	1042585	12/05/2023	12/05/2024
RF AMPLIFIER	BONN ELEKTRONIK	BLMA 0118-M	1041733	12/05/2023	12/05/2024
RF CABLE	HUBER+SUHNER	SF102	1042546	18/05/2023	18/05/2024
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	16/05/2023	16/05/2024
EMI RECEIVER	R&S	ESW 26	1041791	14/11/2023	14/11/2024
THERMOHIGROMETER	PCE IBERICA	THB 40	1042022	07/11/2023	07/11/2024
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	MATURO	NCD	1042758	--	--

Table 23: Test Instruments – Radio-frequency radiated emissions

4.1.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 30 MHz – 1 GHz	± 5.3 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 1 GHz – 6 GHz	± 5.3 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 6 GHz – 18 GHz	± 5.5 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 18 GHz – 26 GHz	± 5.1 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 26 GHz – 40 GHz	± 5.6 dB

Table 24: Radio-frequency radiated emissions measuring Uncertainties

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.

4.2 POWER LINE CONDUCTED EMISSIONS

4.2.1 Test Setup Required

According to standard ANSI C63.4:2014

4.2.1.1 Tabletop equipment

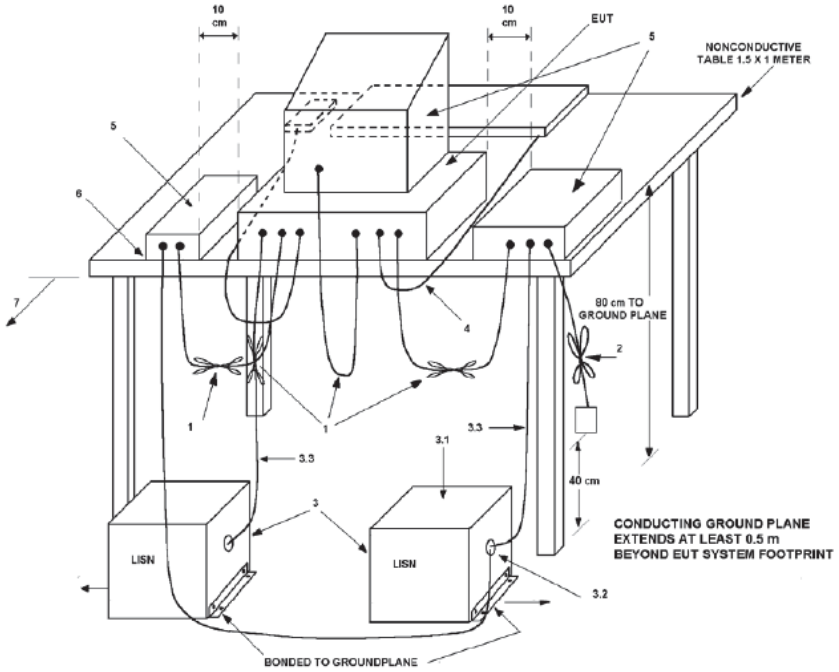


Fig. 15: Power line conducted emissions of table top equipment setup in shielded room

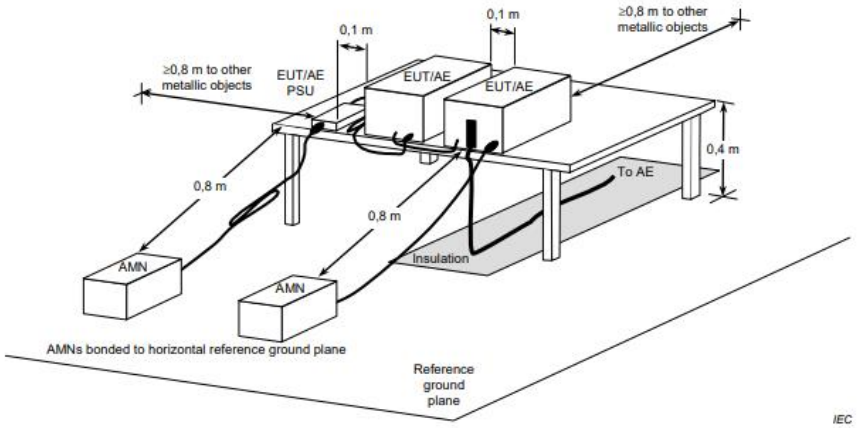


Fig. 16: Power line conducted emissions of table top equipment setup in semi anechoic chamber

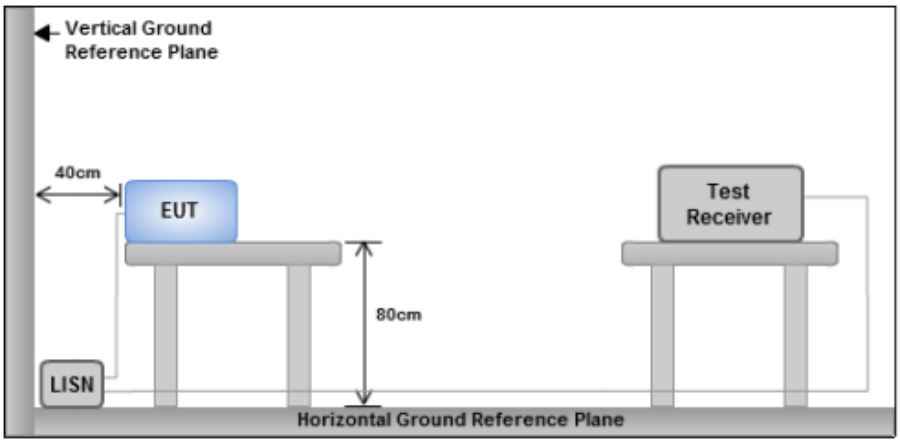


Fig. 17: Power line conducted emissions of table top equipment in shielded room

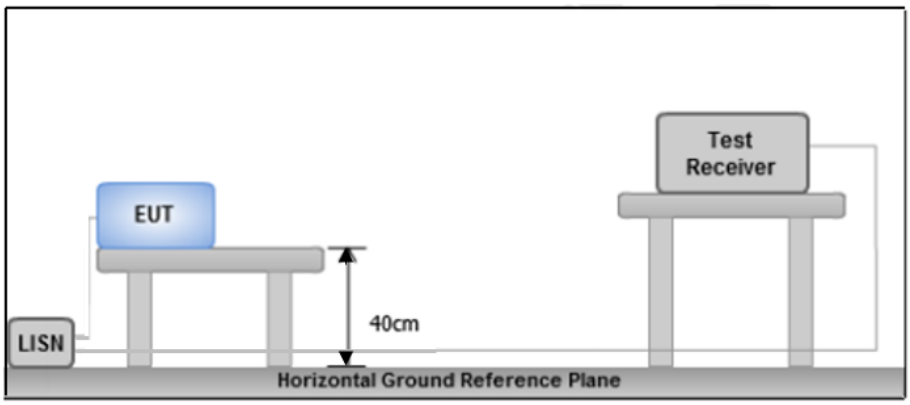


Fig. 18: Power line conducted emissions of table top equipment in in semi anechoic chamber

4.2.2 Test Procedure

The device under test is arranged in table-top or floor-standing position depending on the kind of equipment and keeping the distance from the vertical or horizontal conducting plane located 40 cm to the rear or below of the device, in respective on the test chamber which is evaluated.

The device is connected to line impedance stabilization network (LISN), placed 80 cm far from the device under test and other accessories are connected to other LISN too. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.

AC conducted emission measurements are made over frequency range from 150 kHz to 30 MHz.

Pre-measurement:

- Pre-scan measurement using a peak and average detector is performed in order to show the emissions of the device under test
- Each line of the power cord is evaluated to find the maximum emissions

Final measurement:

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4
- The final measurement is done with quasi-peak and average detector (as described in ANSI C63.4)
- Final levels, frequency, measuring time, bandwidth, correction factors, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is shown

Correction Factor:

Emission Level = Read Level + Corrections (LISN factor + Cable Loss + Attenuator)

4.2.3 Test Parameters

4.2.3.1 Requirements

According to standard ANSI C63.4:2014

The conducted emissions shall not exceed the following levels:

AC main power ports of Class A Equipment's		
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV]**	**Average detector (AVG) [dBµV]**
0.15 – 0.5	79	66
0.5 – 30	73	60

Table 25: Power line conducted emissions requirements – AC main power ports of Class A equipment's

AC main power ports of Class B Equipment's		
Frequency Range [MHz]	**Quasi-peak detector (QP) [dBµV]**	**Average detector (AVG) [dBµV]**
0.15 – 0.5	66 to 56[1]	56 to 46[1]
0.5 – 5	56	46
5 – 30	60	50

Table 26: Power line conducted emissions requirements – AC main power ports of Class B equipment's

Note 1: Decreases with the logarithm of the frequency.

4.2.3.2 Receiver Parameters

According to standard ANSI C63.4:2014

Frequency Range [MHz]	Detector	Resolution Bandwidth [kHz]
0.15 – 30	Peak (PK) Average (AV)	9
0.5 – 5		
5 – 30		

Table 27: Receiver parameters – Power line conducted emissions

4.2.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
08/03/2024	P. Redondo	J. M Nadales	23.1	51	1017.6

Table 28: Test environmental conditions – Power line conducted emissions

4.2.5 Summary Test Results

Frequency Range [MHz]	Ports	Equipment Class	Test Area	Results
0.15 – 30 MHz	AC Mains	B	SR-2	PASS

Table 29: Summary test results – Power line conducted emissions

4.2.6 Test Results

4.2.6.1 Ambient Levels. AC Mains: Neutral. Frequency range: 0.15 MHz – 30 MHz

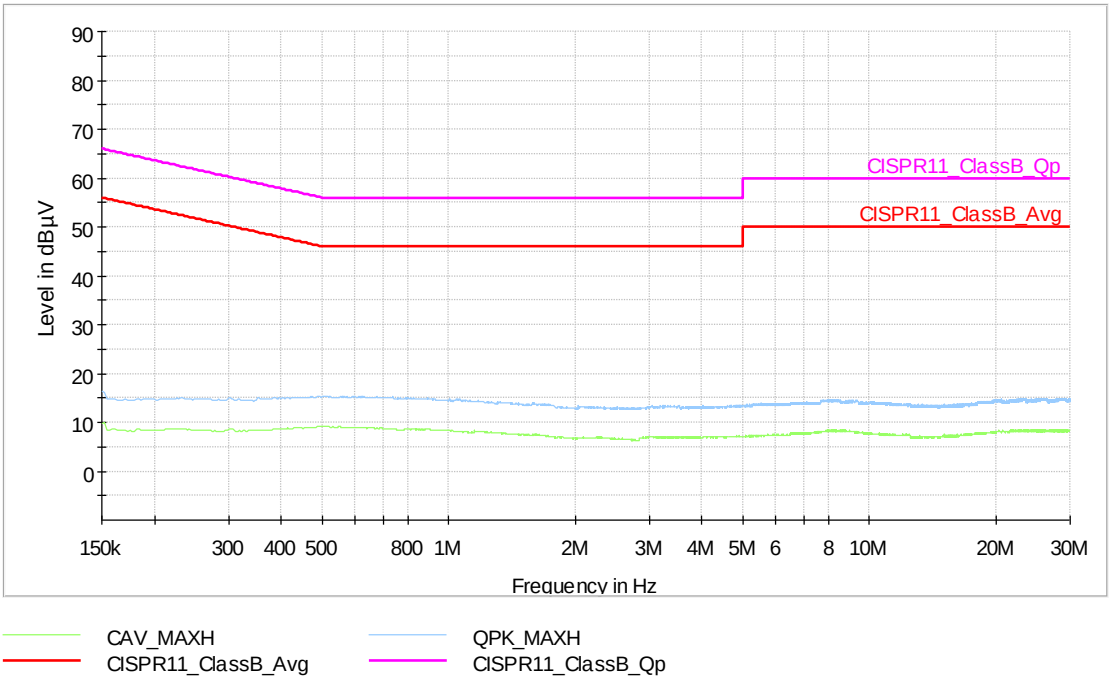


Fig. 19: Ambient level. AC Mains: Neutral. Frequency range: 0.15 MHz – 30 MHz

4.2.6.2 Ambient Levels. AC Mains: Line 1. Frequency range: 0.15 MHz – 30 MHz

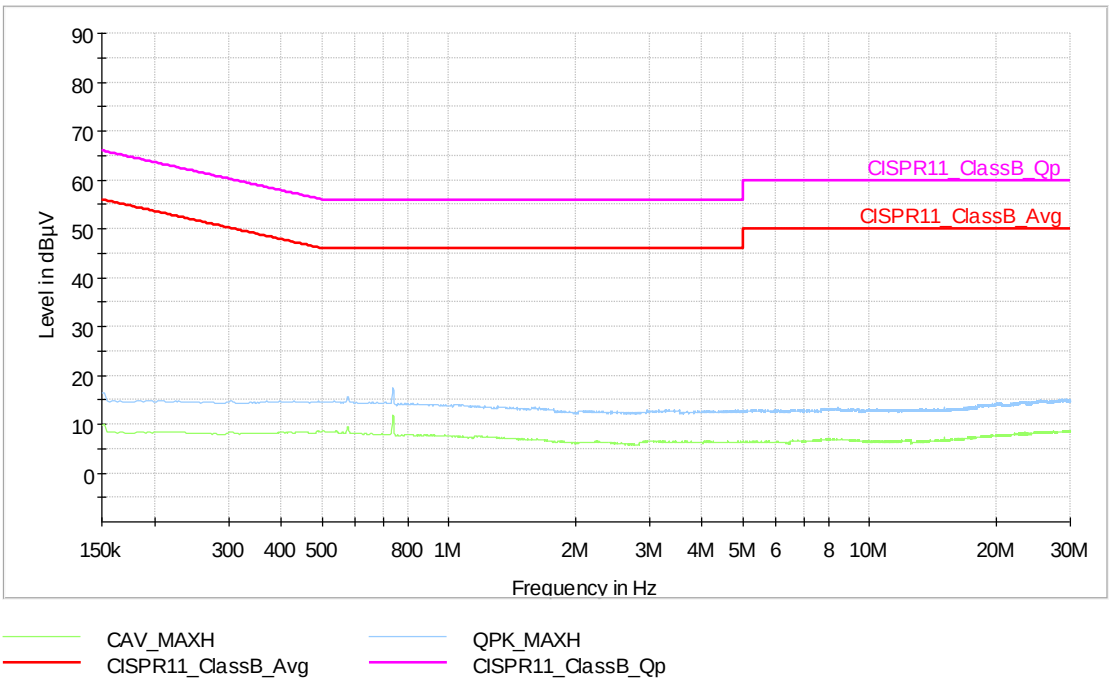


Fig. 20: Ambient level. AC Mains: Line 1. Frequency range: 0.15 MHz – 30 MHz

4.2.6.3 Sample #1. AC Mains: N. Frequency range: 0.15 MHz – 30 MHz

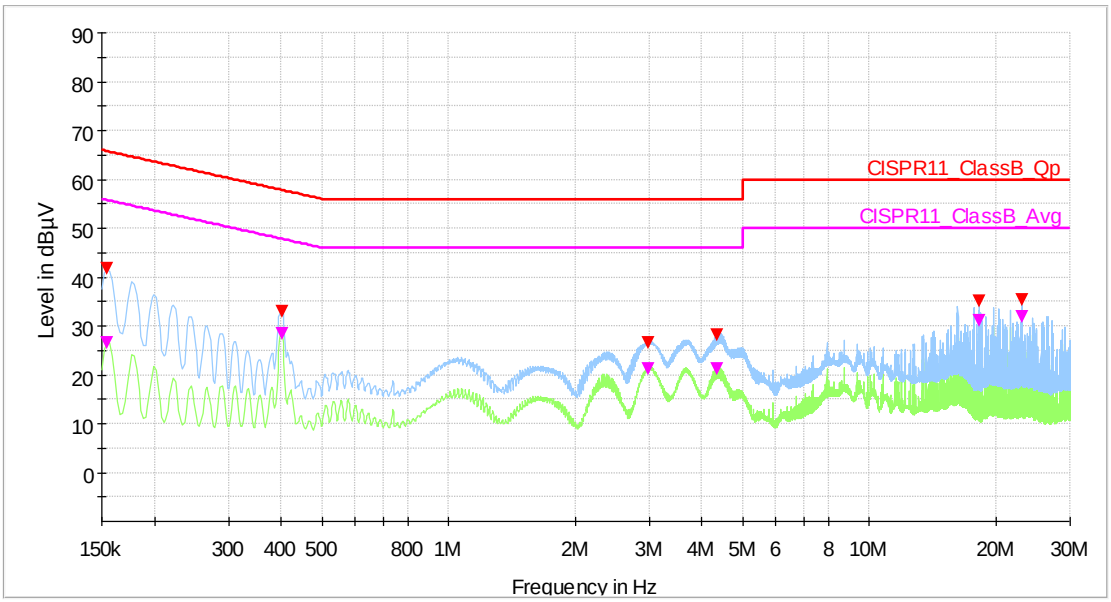


Fig. 21: Sample #1. AC Mains: N. Frequency range: 0.15 MHz – 30 MHz

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV]	QuasiPeak Limit [dBµV]	Margin [dB]	Line	Corr. [dB]
0.154	41.8	83.8	41.9	N	10.7
0.402	32.8	75.8	43.0	N	10.7
2.987	26.5	74.0	47.5	N	10.9
4.355	28.0	74.0	46.0	N	11.0
18.242	35.0	74.0	39.0	N	11.8
23.129	35.2	74.0	38.8	N	12.1

Table 30: Sample #1. AC Mains: N. Frequency range: 0.15 MHz – 30 MHz – QuasiPeak Details

Frequency [MHz]	CAverage [dBµV]	CAverage Limit [dBµV]	Margin [dB]	Line	Corr. [dB]
0.154	26.6	73.8	47.1	N	10.7
0.402	28.4	65.8	37.5	N	10.7
2.987	21.2	64.0	42.8	N	10.9
4.355	21.3	64.0	42.7	N	11.0
18.242	31.0	64.0	33.0	N	11.8
23.129	31.9	64.0	32.1	N	12.1

Table 9: Sample #1. AC Mains: N. Frequency range: 0.15 MHz – 30 MHz – CAverage Details

4.2.6.4 Sample #1. AC Mains: Line 1. Frequency range: 0.15 MHz – 30 MHz

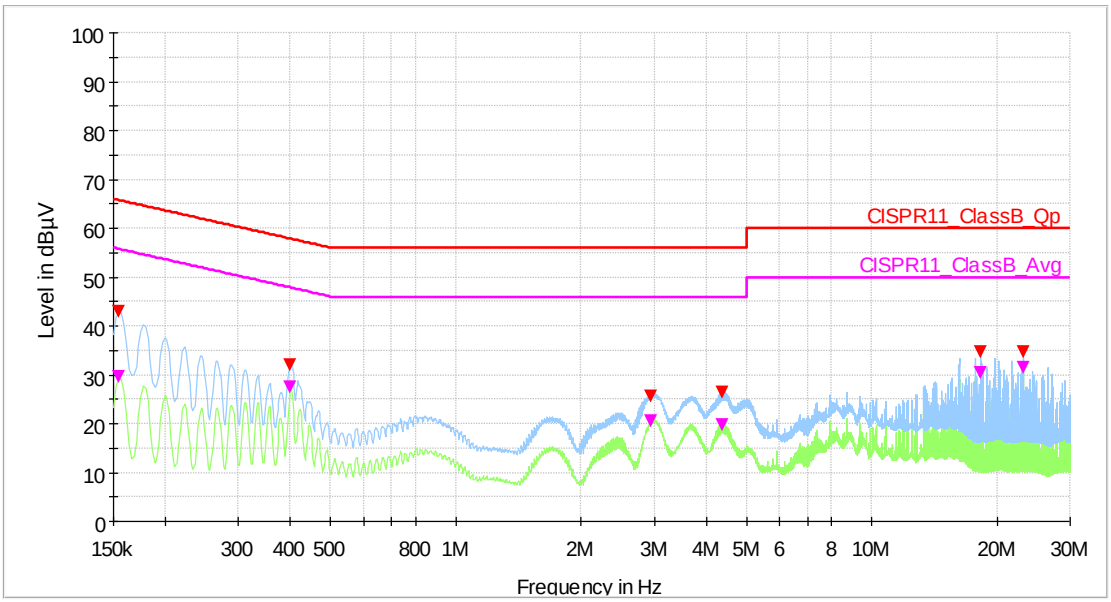


Fig. 22: Sample #1. AC Mains: Line 1. Frequency range: 0.15 MHz – 30 MHz

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV]	QuasiPeak Limit [dBµV]	Margin [dB]	Line	Corr. [dB]
0.154	43.0	65.8	22.7	L	10.7
0.399	32.0	57.9	25.8	L	10.7
2.942	25.7	56.0	30.3	L	10.9
4.380	26.4	56.0	29.6	L	11.0
18.242	34.7	60.0	25.3	L	12.1
23.129	34.8	60.0	25.3	L	12.5

Table 31: Sample #1. AC Mains: Line. Frequency range: 0.15 MHz – 30 MHz – QuasiPeak Details

Frequency [MHz]	CAverage [dBµV]	CAverage Limit [dBµV]	Margin [dB]	Line	Corr. [dB]
0.154	29.5	55.8	26.2	L	10.7
0.399	27.5	47.9	20.4	L	10.7
2.942	20.4	46.0	25.6	L	10.9
4.380	19.9	46.0	26.2	L	11.0
18.242	30.5	50.0	19.5	L	12.1
23.129	31.5	50.0	18.5	L	12.5

Table 9: Sample #1. AC Mains: Line. Frequency range: 0.15 MHz – 30 MHz – CAverage Details

4.2.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
EMI RECEIVER	R&S	ESW26	1042124	15/11/2023	15/11/2024
TRANSIENT LIMITER	R&S	ESH3.Z2	1041267	09/05/2024	09/05/2025
CABLE SR2	HUBER/SUHNER	RG-223	1042154	19/12/2023	19/12/2024
CABLE SR2	HUBER/SUHNER	RG-223	1042155	19/12/2023	19/12/2024
LISN	R&S	ESH3-Z5	05-ER-236	15/03/2024	15/03/2025
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
SHIELDED ROOM	ALBATROSS	SR-2	1042269	--	--

Table 32: Test Instruments – Power line conducted emissions

4.2.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	POWER LINE CONDUCTED EMISSIONS	± 3.4 dB

Table 33: Radio-frequency radiated emissions measuring Uncertainties

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.