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File Number **24/36405295**

TEST REPORT
Electromagnetic Compatibility

Petitioner's Reference:	Lock Up Smart Doors S.L.		
Company Address:	Escritor Jeronimo Tristante, N10, 3B. 30100- Murcia – Spain.		
Represented by:	Juan Jesus Pinuaga Cascales		
Equipment:	Operto Controller		
Brand:	Operto	Model:	OC1-EXT
Sample #1:	--	Applus Id:	22725-00002
FCC Id #1:	Not provided		
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 (October 2023)[1]** **ICES-003 Issue 7 – 2020 (updated October 2020)**		
[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	March 7, 2024		
Test Initial Date:	April 8, 2024		
Test Final Date:	April 9, 2024		

Test Manager: Antoni Martinez
Date of issue: Bellaterra, October 30, 2024

JOSE MANUEL SUAREZ ROMAN
Firmado digitalmente por JOSE MANUEL SUAREZ ROMAN
Fecha: 2024.10.31 10:33:22 +01'00'

EMC & Wireless Technical Manager
Electrical and Electronics
LGAI Technological Center S.A.

ENSAYO ISO 17025 Nº9 / LE894

The results refer only and exclusively to the sample, product or material delivered for testing, and tested under conditions stipulated in this document. The equipment has been tested under conditions stipulated by standard(s) quoted in this document. This document will not be reproduced otherwise than in full.
This is the first page of the document, which consists of 23 pages.

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	N/A[1]	--

Note 1: Test do not apply for DC devices. Customer do not provide an AC adapter.

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	A device that uses a mobile key to control access to common areas, elevators, and other entry points.			
EUT Version	**SW Version**		**HW Version**	
	7.6.2		LockUpAIR_V4	
Power supply	DC	+/-	12 V	-- Hz
Applicability	**Fixed Equipment**	**Vehicular Equipment**	**Portable Equipment**	
	☒	☐	☐	
Equipment Size	**Length**	**Width**	**Height**	
	80 mm	80 mm	30 mm	
Maximum internal frequency	2500 MHz			

Table 1: Equipment description

I/O CABLES						
	Port #	**Name**	**Type**	**Cable length**	**Cable Shielded**	**Comments**
Description	1	Mains	DC	> 3 m	No	Provided by Applus
	2	I/O	Relay output	< 3 m	No	Provided by Applus

Table 2: Input/output ports description

RF FEATURES					
	Communication Technology	**Radio Chipset**	**Brand**	**Module Model**	**Antenna Peak Gain**
Description	Bluetooth	CC2640	Texas Instruments	Not provided	3.3 dBi
	Wi-Fi 2.4 GHz	ESP8266	Espressif	ESP-WROOM-02	2 dBi

Table 3: RF Features

3.1.1 Samples

For confidentiality reasons photos were reported in the document annex file number 24/36405296.

3.1.2 Auxiliary Equipment

For confidentiality reasons photos were reported in the document annex file number 24/36405296.

3.1.3 DUT Modifications performed

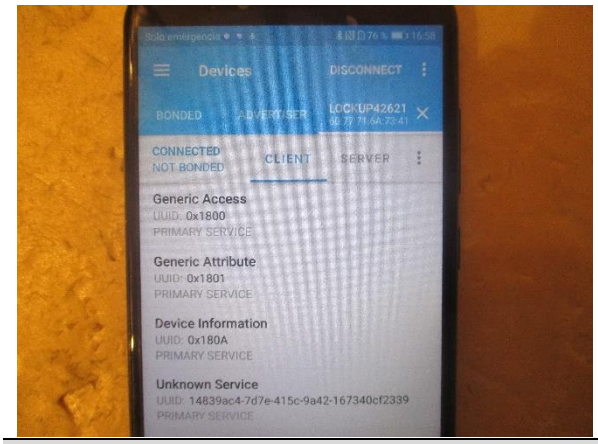
For confidentiality reasons photos were reported in the document annex file number 24/36405296.

3.2 DUT TEST MODES

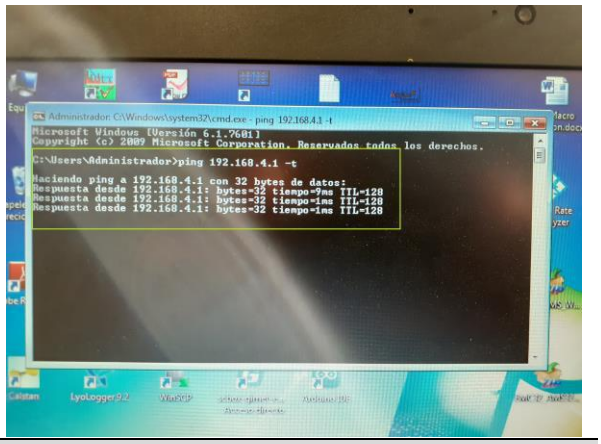
DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	Test mode used for emissions test: - Configure power supply to 12 VDC output. - Connect the sample 1 to DC power supply. - Open NRF Connect app in the smpartphone and scan BT devices. - A continuosly connection is configured selecting "LockUp42621". - Open laptop and connect it to WiFi "WIFI_AIR_V4". - A continuosly ping is configured to "192.168.4.1" (gateway address).	Table top

Table 4: DUT test modes

3.3 CONTROL AND MONITORING



BLE Technology



WiFi Laptop

Fig. 1: SW of control and monitoring. Mode 1

3.4 ACCEPTANCE CRITERIA

According to standard **FCC 47 CFR Part 15 Subpart B and ICES-003 Issue 7**

3.5 TEST FACILITIES ID

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

Table 5: Test facilities ID

3.6 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.
In order to assure the traceability to other national and international laboratories, Applus+ Laboratories has a calibration and maintenance program for its measurement equipment.
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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

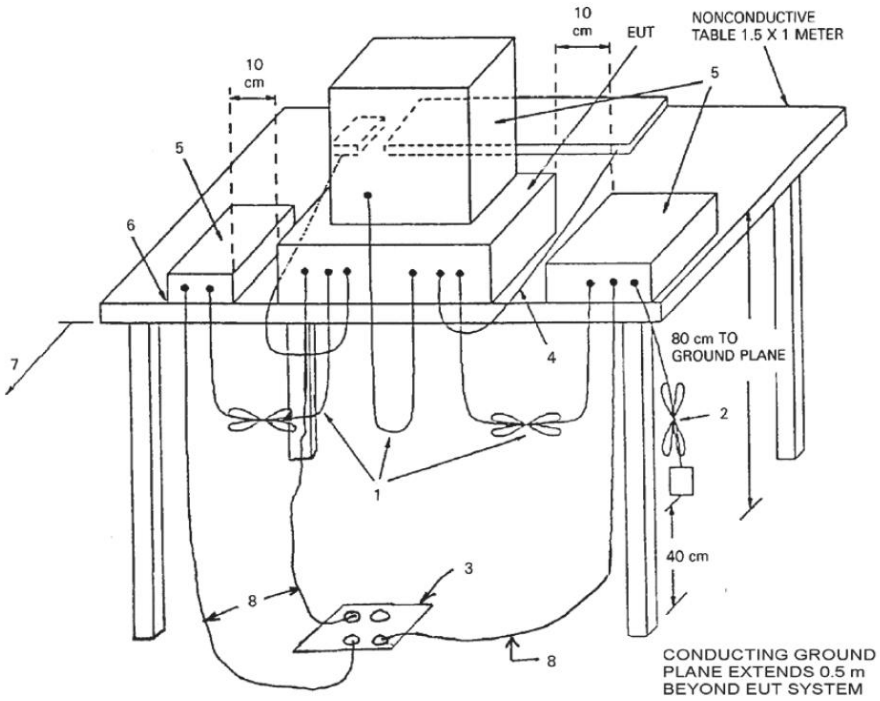


Fig. 2: Radio-frequency radiated emissions setup of table top equipment.

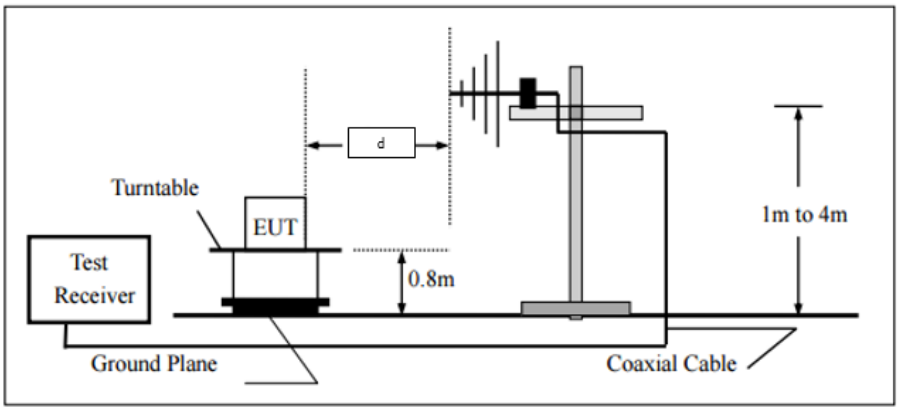


Fig. 3: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

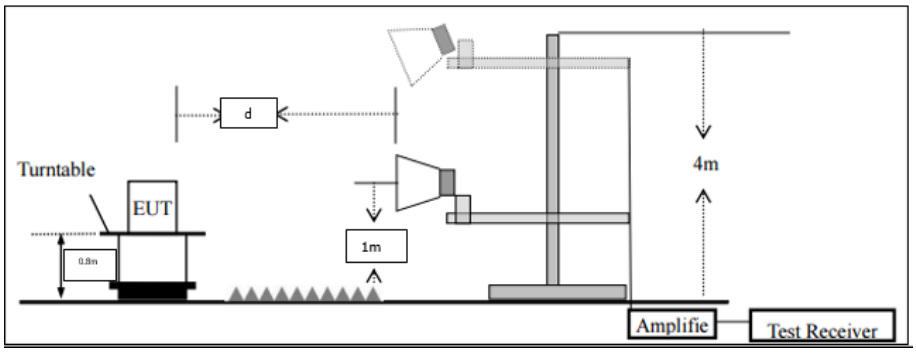


Fig. 4: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.1.1.2 Floor standing equipment

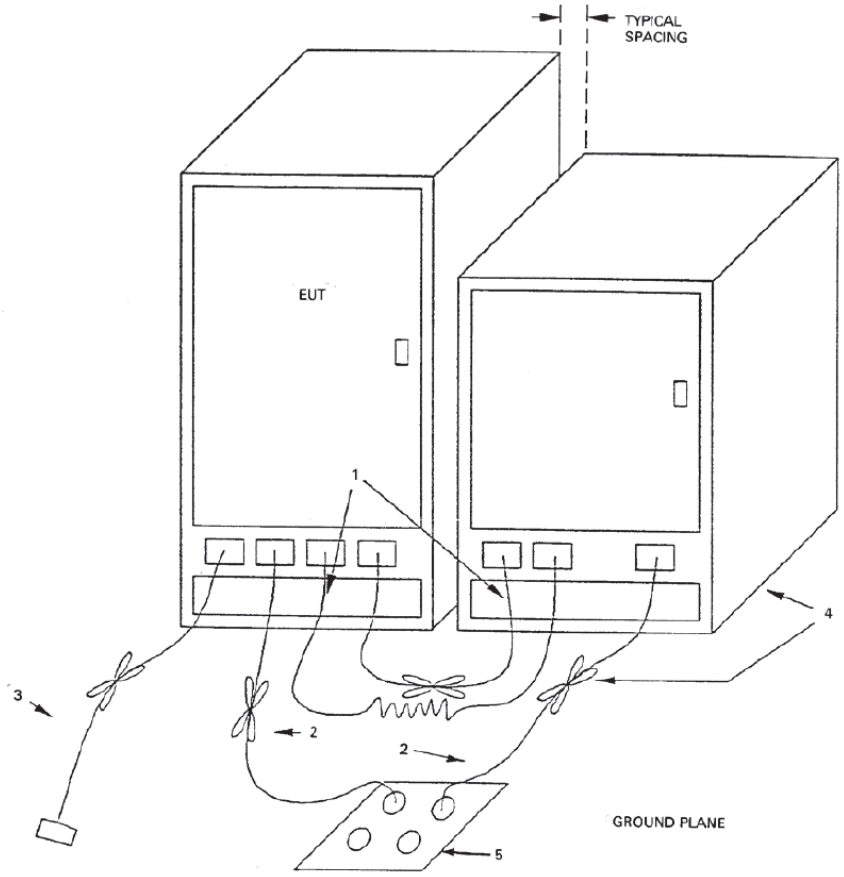


Fig. 5: Radio-frequency radiated emissions of floor-standing setup equipment.

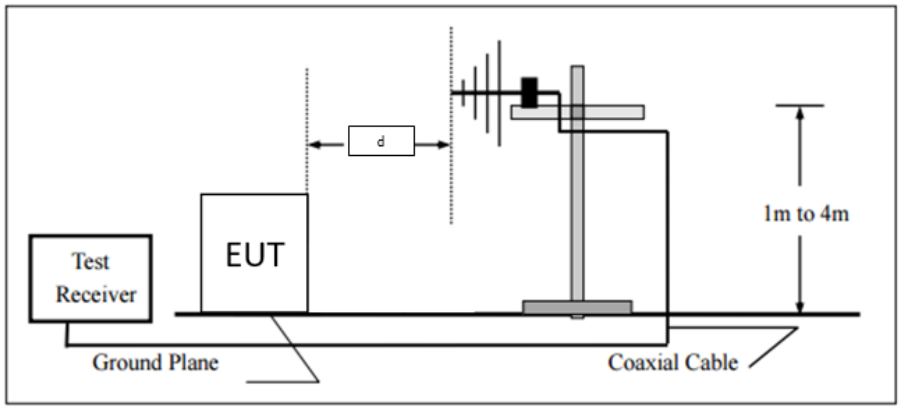


Fig. 6: Radio-frequency radiated emissions of floor-standing setup equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

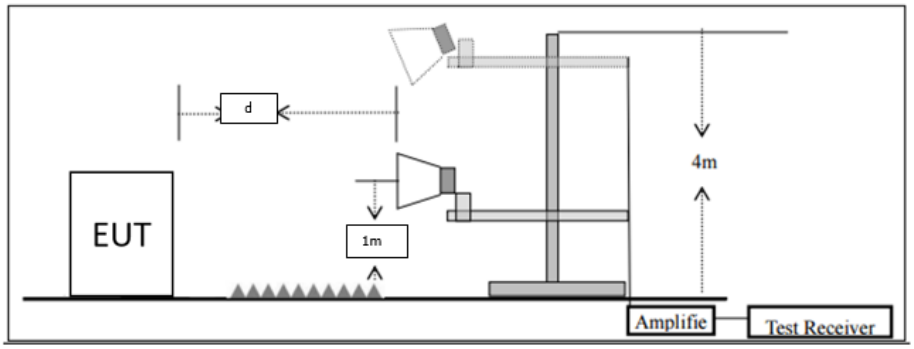


Fig. 7: Radio-frequency radiated emissions of floor-standing setup equipment above 1 GHz

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 conform 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 – 88	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 6: 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 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: 8.5 meters (new measurement distance).

Note 3: 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).

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 – 88	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 7: 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 – 88	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 8: 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 – 88	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 9: 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 10: Receiver parameters – Radio-frequency radiated emissions

4.1.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
08/04/2024	C. Rojas	--	24.1	65.7	1005
09/04/2024	A.Perez; R.Gonzalo	--	22.5	31.9	998.1

Table 11: 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 2	3	QP < Limit - I	PASS
1000 – 6000	B	SAC 1	3	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
6000 – 13000	B	SAC 1	3	PK < Limit - I AVG < Limit - I	PASS

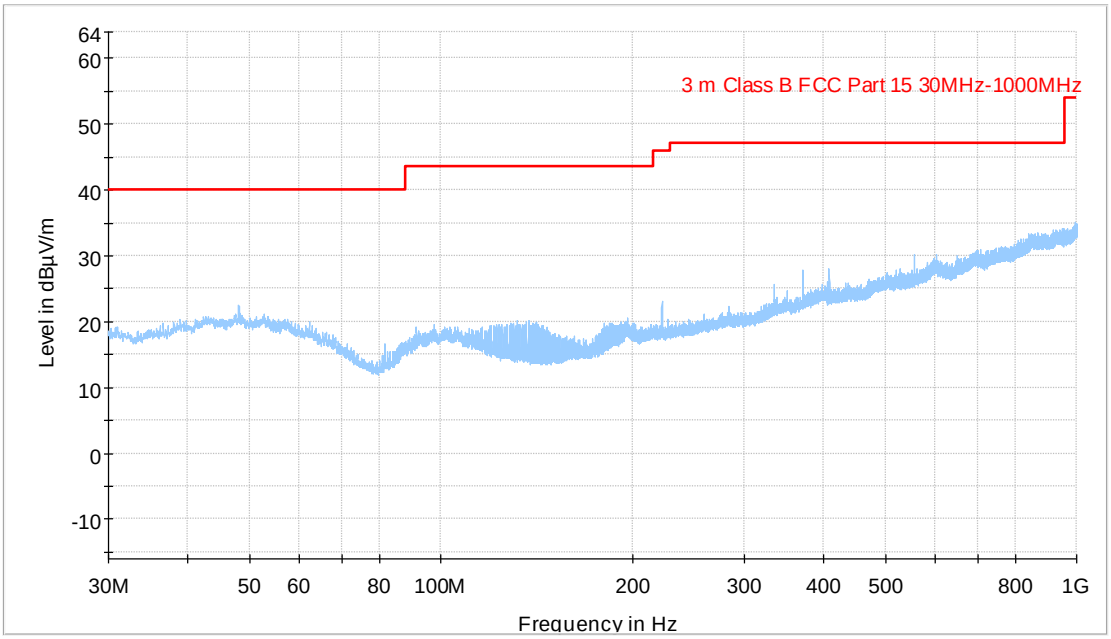
Table 12: Summary test results – Radio-frequency radiated emissions

4.1.6 Test Setup Photographs

For confidentiality reasons photos were reported in the document annex file number 24/36405296

4.1.7 Test Results

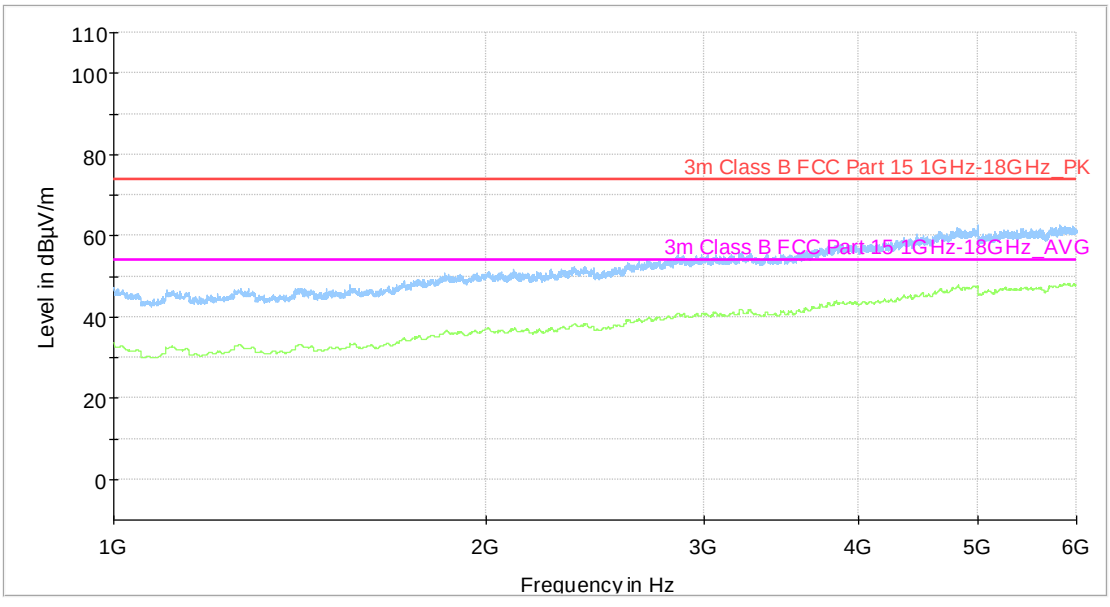
4.1.7.1 Ambient Levels. Frequency range: 30 MHz – 1 GHz



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

Fig. 8: Ambient level. Frequency range: 30 MHz – 1 GHz

4.1.7.2 Ambient Levels. Frequency range: 1 GHz – 6 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. 9: Ambient level. Frequency range: 1 GHz – 6 GHz

4.1.7.3 Ambient Levels. Frequency range: 6 GHz – 13 GHz

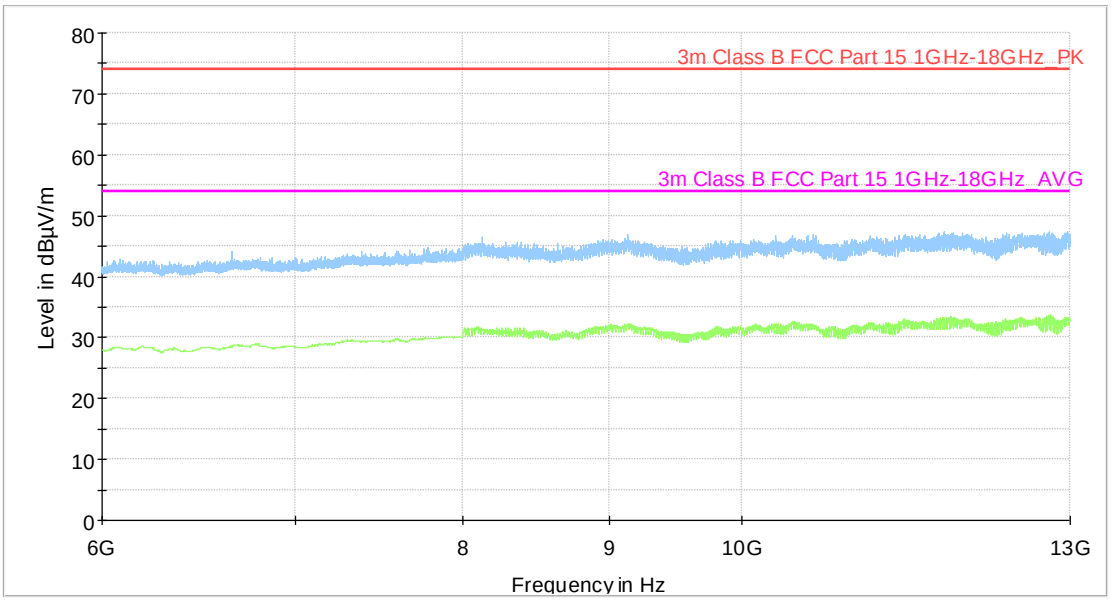


Fig. 10: Ambient level. Frequency range: 6 GHz – 13 GHz

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

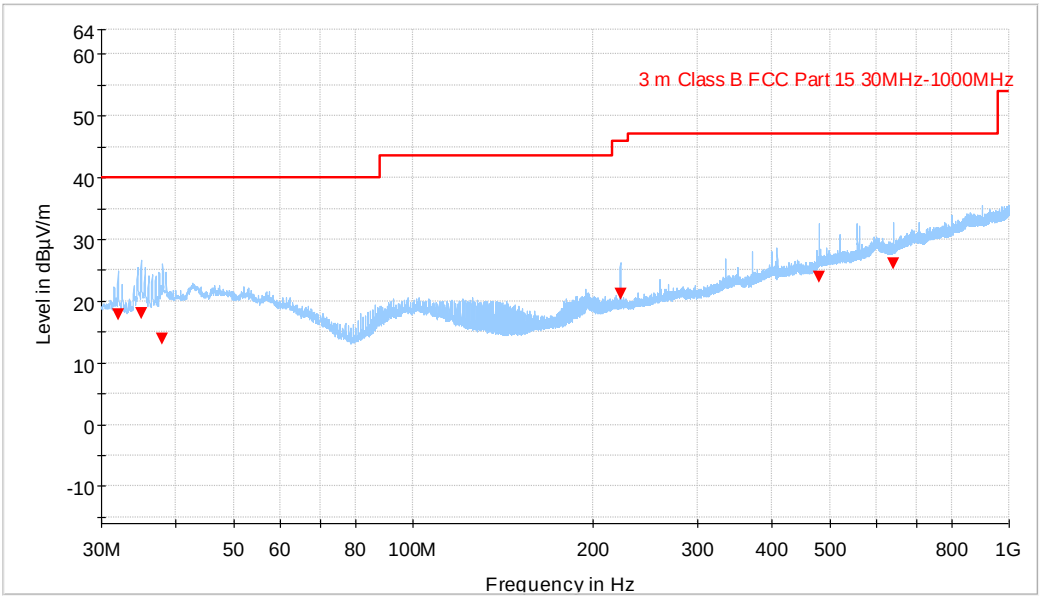


Fig. 11: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.010	17.8	40.0	22.2	100.0	V	269.0	13.9
34.980	18.0	40.0	22.0	100.0	V	283.0	14.6
38.010	13.8	40.0	26.2	100.0	V	260.0	15.9
222.750	21.1	46.0	24.9	173.0	H	98.0	16.5
480.000	23.9	47.0	23.1	100.0	V	101.0	23.0
639.990	26.1	47.0	20.9	126.0	V	143.0	25.5

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

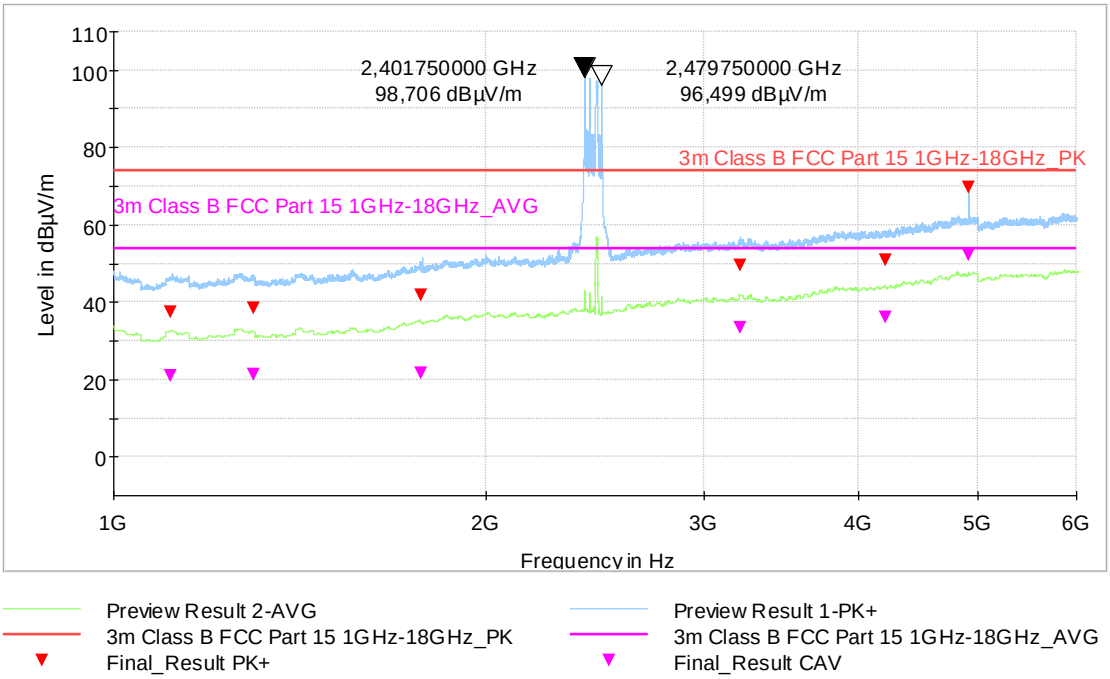


Fig. 12: Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
1113.250	37.5	74.0	36.5	21.0	54.0	33.0	375.0	V	22.0
1296.500	38.4	74.0	35.6	21.3	54.0	32.7	306.0	V	22.0
1772.750	41.9	74.0	32.1	21.7	54.0	32.3	192.0	V	303.0
3213.500	49.5	74.0	24.5	33.5	54.0	20.5	269.0	H	158.0
4202.750	50.8	74.0	23.2	36.0	54.0	18.0	100.0	H	100.0
4914.000	69.6	74.0	4.4	52.2	54.0	1.8	208.0	V	345.0

Note: *Frequencies 2.401 GHz and 2.479 GHz were excluded from the evaluation due to be intentional band.*

4.1.7.6 Sample #1. Mode 1. Frequency range: 6 GHz – 13 GHz

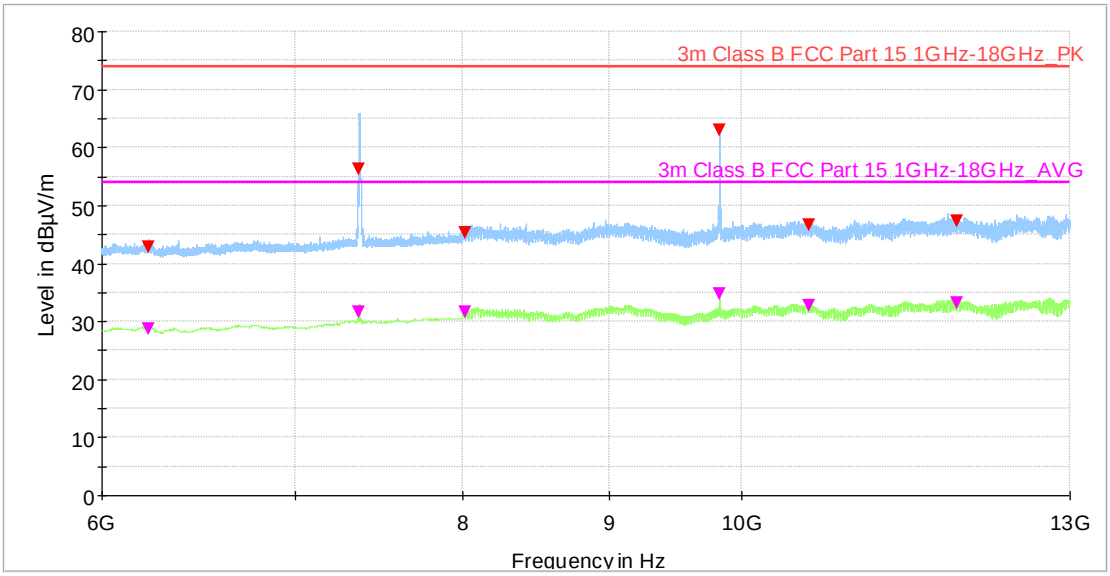


Fig. 13: Sample #1. Mode 1. Frequency range: 6 GHz – 13 GHz

FINAL MEASUREMENTS

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
6230.250	42.9	74.0	31.1	28.7	54.0	25.3	400.0	H	0.0
7370.000	56.1	74.0	17.9	31.6	54.0	22.4	400.0	V	283.0
8019.750	45.2	74.0	28.8	31.6	54.0	22.4	400.0	H	0.0
9828.000	62.9	74.0	11.1	34.7	54.0	19.3	400.0	H	256.0
10552.000	46.5	74.0	27.5	32.7	54.0	21.3	400.0	H	356.0
11879.500	47.2	74.0	26.8	33.2	54.0	20.8	400.0	H	348.0

4.1.8 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
EMI RECEIVER	R&S	ESW 26	1041791	14/11/2023	14/11/2024
BILOG ANTENNA	SCHAWARZBECK	VULB 9162	1042229	27/02/2024	27/02/2025
ATENUADOR 3 DB	HUBER/SUHNER	6803.17.B	1042020	08/08/2023	08/08/2024
CABLE	HUBER/SUHNER	SF103/11N/16N/4000MM	1041909	01/02/2024	01/02/2025
CABLE	HUBER/SUHNER	SF104 WITH FERRITE	1042729	21/08/2023	21/08/2024
RF CABLE (WALL PANEL),	--	--	104572	11/08/2023	11/08/2024
SEMIANECHOIC CHAMBER SAC2	EUROSHIELD	TC2	104563	15/03/2023	15/03/2026
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	COMTEST	4630 – 100	104369	--	--
HORN ANTENNA	EMCO	3115	05-ER-182	08/11/2023	08/11/2024
RF PREAMPLIFIER	BONN ELEKTRONIK	BLMA 0118-M	1041733	12/05/2023	12/05/2024

Table 13: Test Instruments – Radio-frequency radiated emissions

4.1.9 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

Table 14: 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%.