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File Number **24/36400969M1**

TEST REPORT
Electromagnetic Compatibility

Petitioner's Reference:	**BARCELONA SMART TECHNOLOGIES, S.L.**		
Company Address:	C/ GUITARD 43 2-1 08014 BARCELONA		
Represented by:	Mayte Penella		
Equipment:	U-Spot		
Brand:	Urbiotica	Model:	U-SPOT-3.0
Sample #1:	0080E11505C9EE62	Applus Id:	18168-00001
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 2022)[1]** **ICES-003 Issue 7 – 2020 (updated October 2020)[1]**

[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	October 9, 2023
Test Initial Date:	October 11, 2023
Test Final Date:	October 13, 2023
Modification Description:	M1

This report replaces and supersedes the report 24/36400969 dated on March 7 2024
Modifications performed:

- Eliminated Photographs. For confidentiality issues, all photographs are included in an annexed document. General Description and Test Setup photographs clauses are affected.

It is responsibility of the petitioner to replace the previous version with this one.

Test Manager: Alejandro Sáez
Date of issue: Bellaterra, July 26, 2024

JOSE MANUEL SUAREZ ROMAN
Firmado digitalmente por JOSE MANUEL SUAREZ ROMAN
Fecha: 2024.07.29 08:44:51 +02'00'

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 A	PASS	CN4

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	Wireless smart parking sensor for outdoor vehicle detection in parking spots with LoRaWAN communication.			
EUT Version	**FVIN**		**HVIN**	
	1.0		SPG.1.0.0.0	
Power supply	Battery Powered	+/-	3 V	-- Hz
Equipment Size	**Length**	**Width**	**Height**	
	88 mm	88 mm	79 mm	
Maximum internal frequency	2.4 GHz			
FCC ID	2AYS6-U-SPOT-3.0			
ISED ID	32041-USPOT3			

Table 1: Equipment description

RF FEATURES					
Description	**Communication Technology**	**Radio Chipset**	**Brand**	**Module Model**	**Antenna Peak Gain [dBi]**
	LoraWan	STM32WLE5CC	ST Microelectronics	No Module	-2.02
	BLE	DA14531	Dialog Semiconductor / Renesas	DA14531MOD	-0.5

Table 2: RF Features

3.1.1 DUT Modifications performed

No modifications have been performed.

3.2 DUT TEST MODES

DUT Operation Modes		
Mode #	**Description**	**Set-up**
1	- Once the magnet is removed, the device starts transmitting as intended. - For Lora Wan communication, the auxiliary gateway sends the data frame to the client server. - On the auxiliary computer, the client web Certification Tool is used to monitor the data sent by the DUT. - For the BLE communication, it is also connected to the auxiliary PC where the EMC BLE Supervisor software is used to visualize the data frames it is sending.	Table top

Table 3: DUT test modes

3.3 CONTROL AND MONITORING

Control and monitoring are performed as described in the document provided by the customer U-Spot Certification 3.0 v1.0.

Through the Gateway, data frames related to temperature and magnetic field are sent to the Certifications tool v2.1.2 web server.

For the control and monitoring of the BLE, the Bluetooth of the auxiliary PC is used, and by means of the EMC BLE Supervisor software, the frames sent by the DUT are visualized.

3.4 ACCEPTANCE CRITERIA

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

3.5 PHOTOGRAPHS

Photographs identifying the equipment under test and its auxiliaries, as well as assembly photographs for radiated test, can be found in the document: 24/36403736.

3.6 TEST FACILITIES ID

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

Table 4: 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.
In order to assure the traceability to other national and international laboratories, Applus+ Laboratories has a calibration and maintenance program for its measurement equipment.
Applus+ Laboratories guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at Applus+ Laboratories at the time of performance of the test.
Applus+ Laboratories is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test. The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions:

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of Applus+ Laboratories.

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

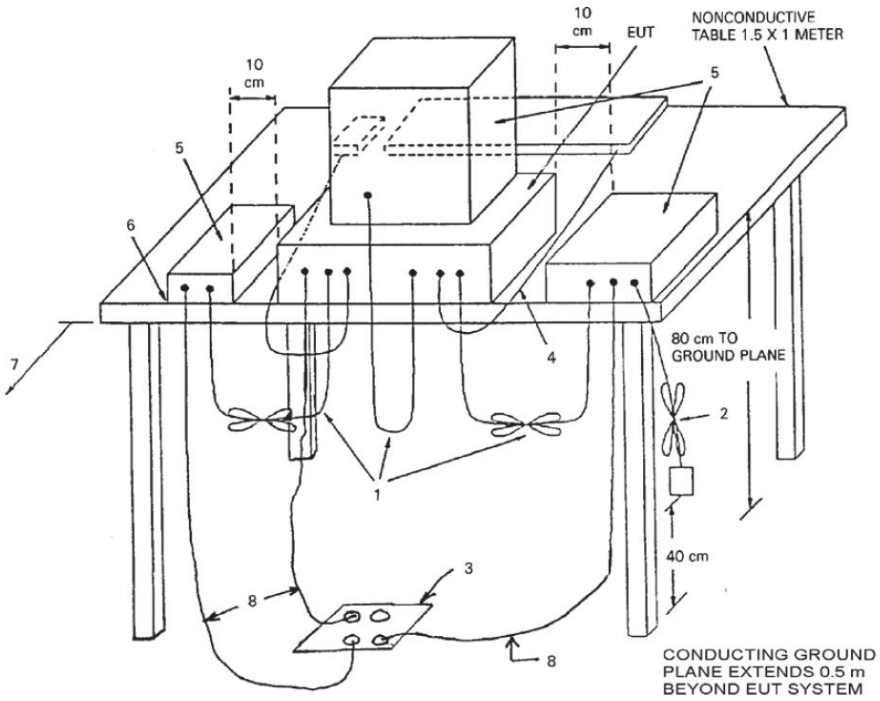


Fig. 1: Radio-frequency radiated emissions setup of table top equipment.

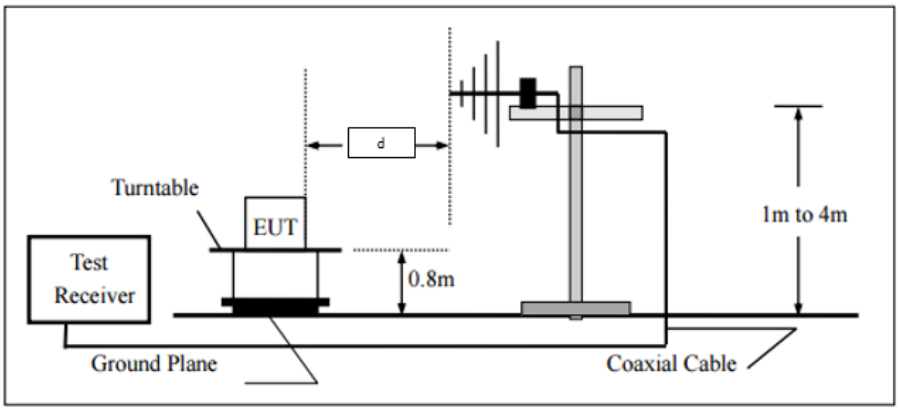


Fig. 2: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

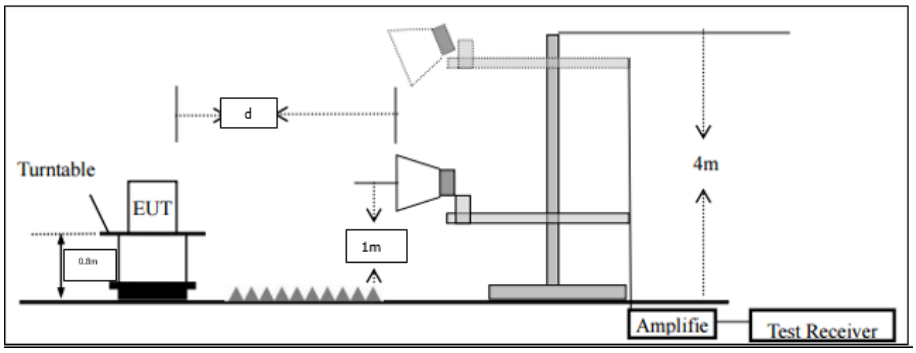


Fig. 3: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.1.1.2 Floor standing equipment

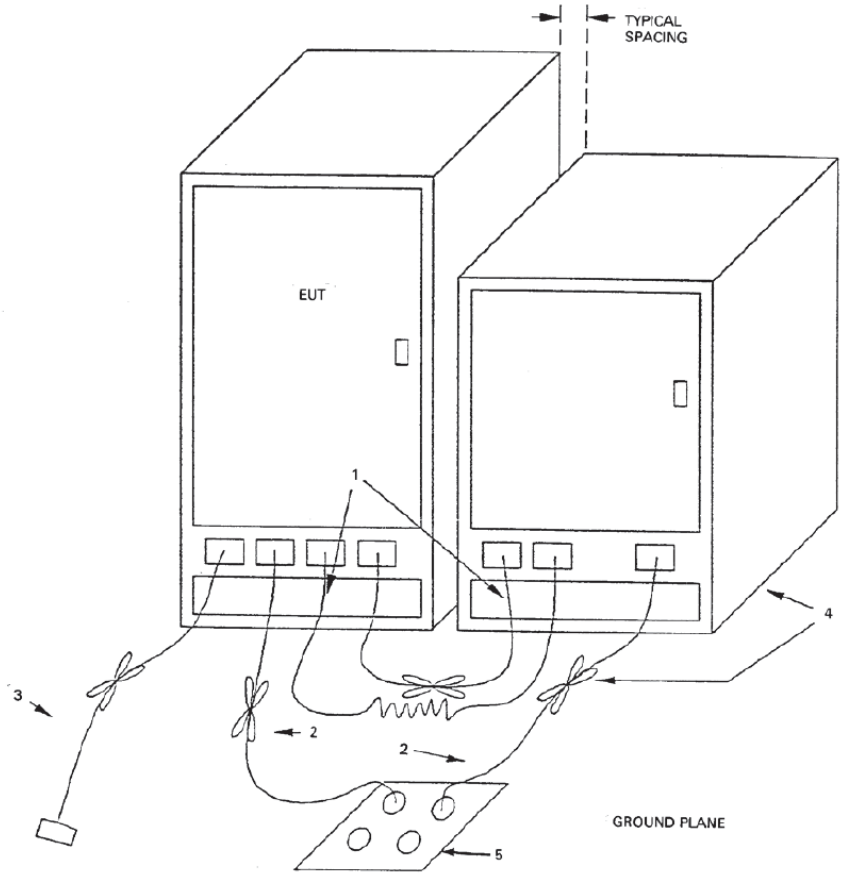


Fig. 4: Radio-frequency radiated emissions of floor-standing setup equipment.

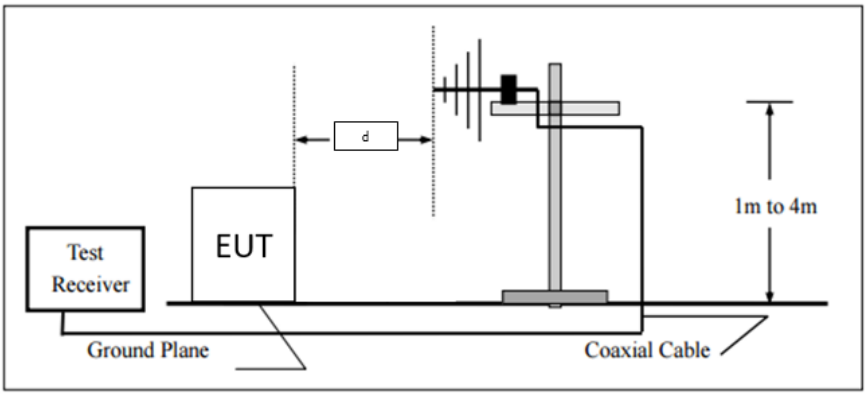


Fig. 5: Radio-frequency radiated emissions of floor-standing setup equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

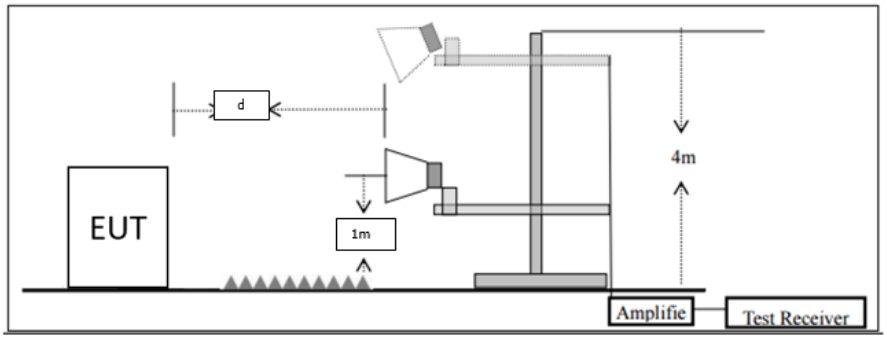


Fig. 6: Radio-frequency radiated emissions of floor-standing setup equipment above 1 GHz

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 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 30MHz to 1GHz 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 5: Radio-frequency radiated emissions requirements – Class A equipment's

Note 1: 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).

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

Note 1: 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 3 meters.
d_1: 3 meters (standard distance).
d_2: 10 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 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 7: 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[2]	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 8: Radio-frequency radiated emissions requirements – Class B equipment's

Note 1: 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 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	$10\ 10^{-6}$

Table 9: Receiver parameters – Radio-frequency radiated emissions

4.1.4 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
11/10/2023	J.M. Llauradó	--	19.8	42.3	1010.1
11/10/2023	I. Serrano	--	21.8	48.6	1012.1
13/10/2023	J.M. Nadales	--	22.9	59.7	1001.2

Table 10: Test environmental conditions – Radio-frequency radiated emissions

13/10/2023 Ignacio Serrano -- 22.9 59.7 1001.2

4.1.5 Summary Test Results

Frequency Range [MHz]	Equipment Class	Test Area	Distance [m]	Emissions	Results
30 – 1000	A	SAC2	3	QP < Limit - I	PASS
1000 – 6000	A	SAC2	3	PK < Limit - I AVG < Limit - I	PASS
6000 – 13000	A	SAC2	3	PK < Limit - I AVG < Limit - I	PASS

Table 11: Summary test results – Radio-frequency radiated emissions

4.1.6 Test Results

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

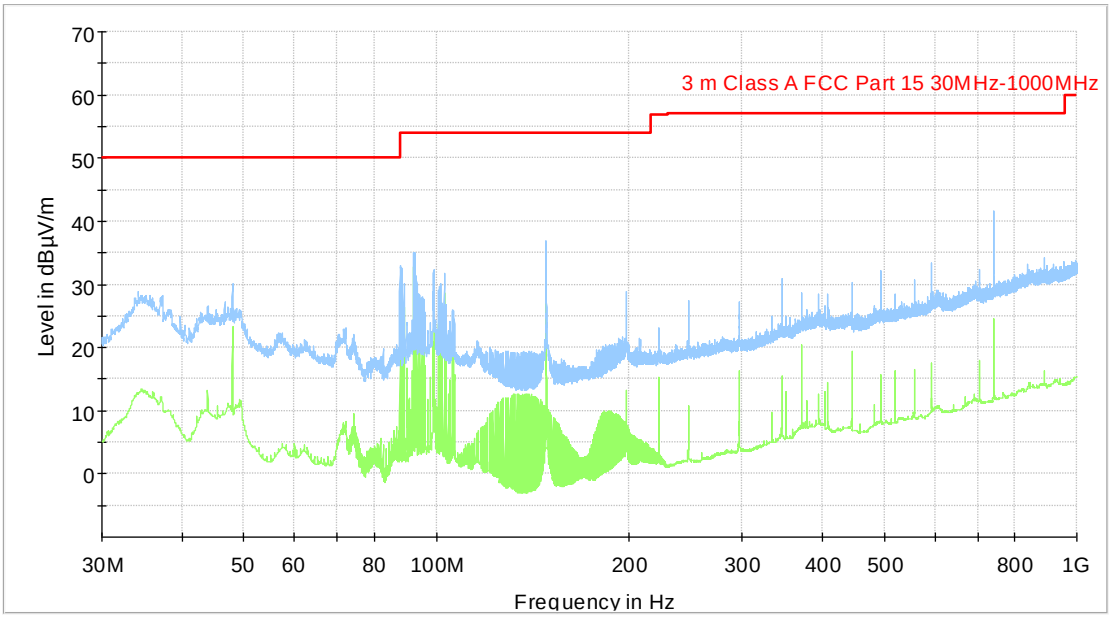


Fig. 7: Ambient level. Frequency range: 30 MHz – 1 GHz

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

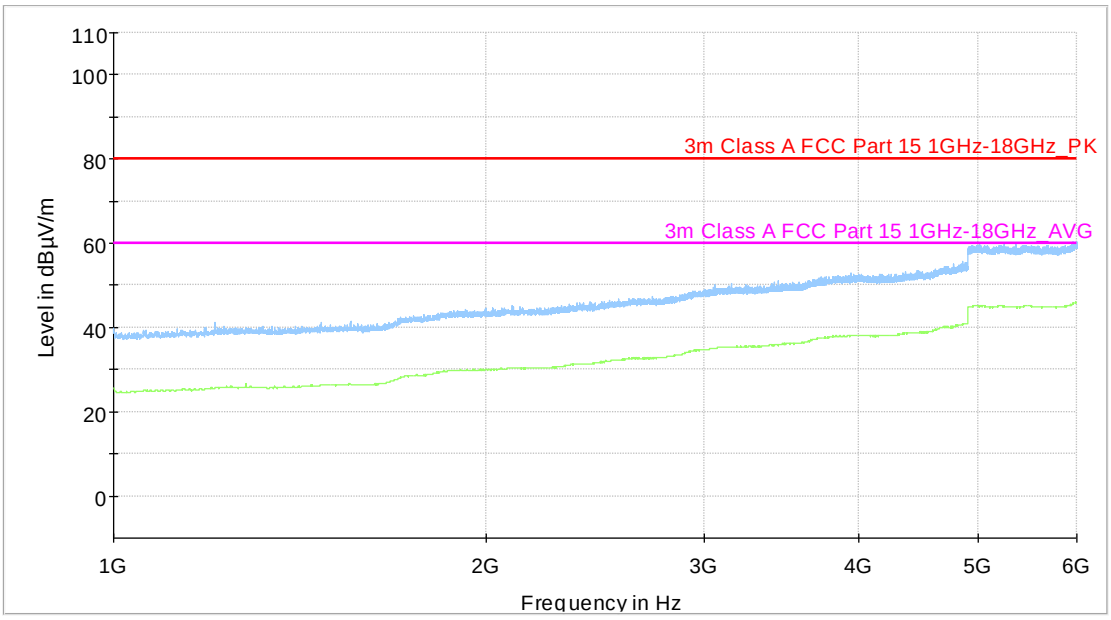
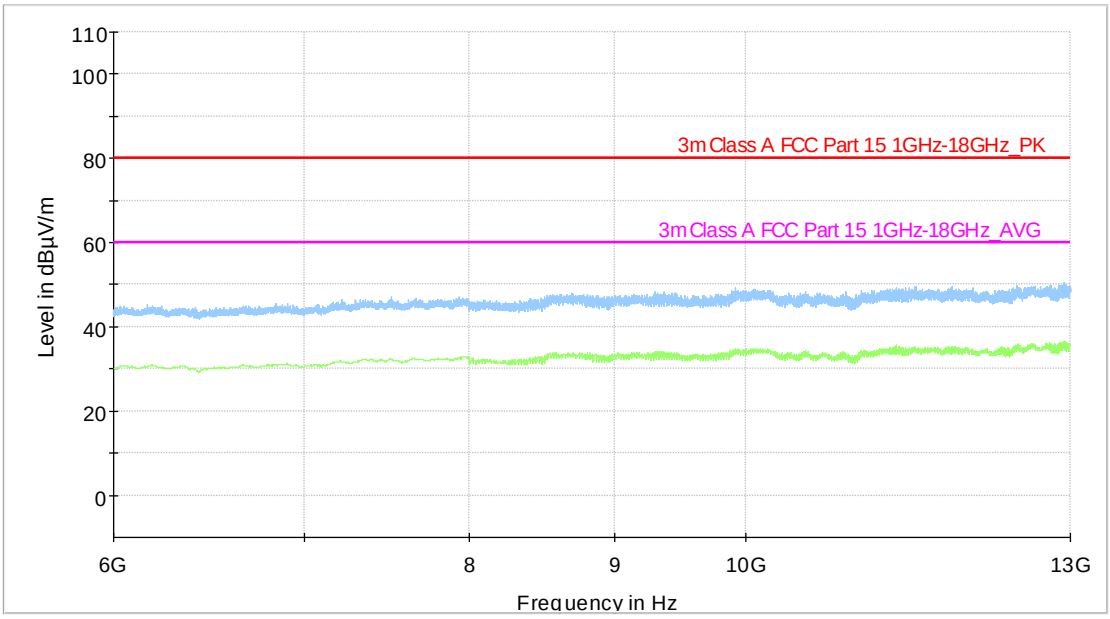


Fig. 8: Ambient level. Frequency range: 1 GHz – 6 GHz

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



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

Fig. 9: Ambient level. Frequency range: 6 GHz – 13 GHz

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

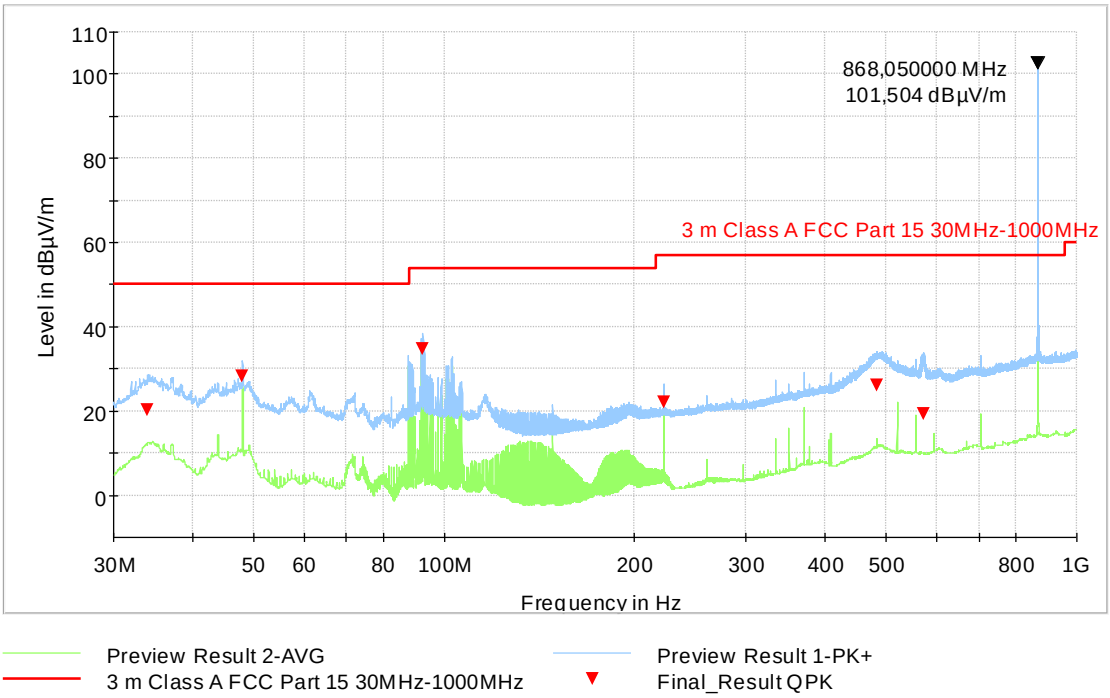


Fig. 10: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

Note 1: The frequency of 868.05 MHz is an intentional transmission and is therefore not evaluated.

FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
33.990	20.13	50.00	29.87	100.0	V	103.0	14.3
48.000	28.36	50.00	21.64	100.0	V	335.0	18.1
92.460	34.61	54.00	19.39	100.0	V	47.0	15.2
222.750	22.06	56.90	34.84	188.0	H	287.0	16.6
483.270	26.05	57.00	30.95	105.0	V	298.0	23.2
573.870	19.34	57.00	37.66	100.0	V	0.0	24.6

Table 12: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

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

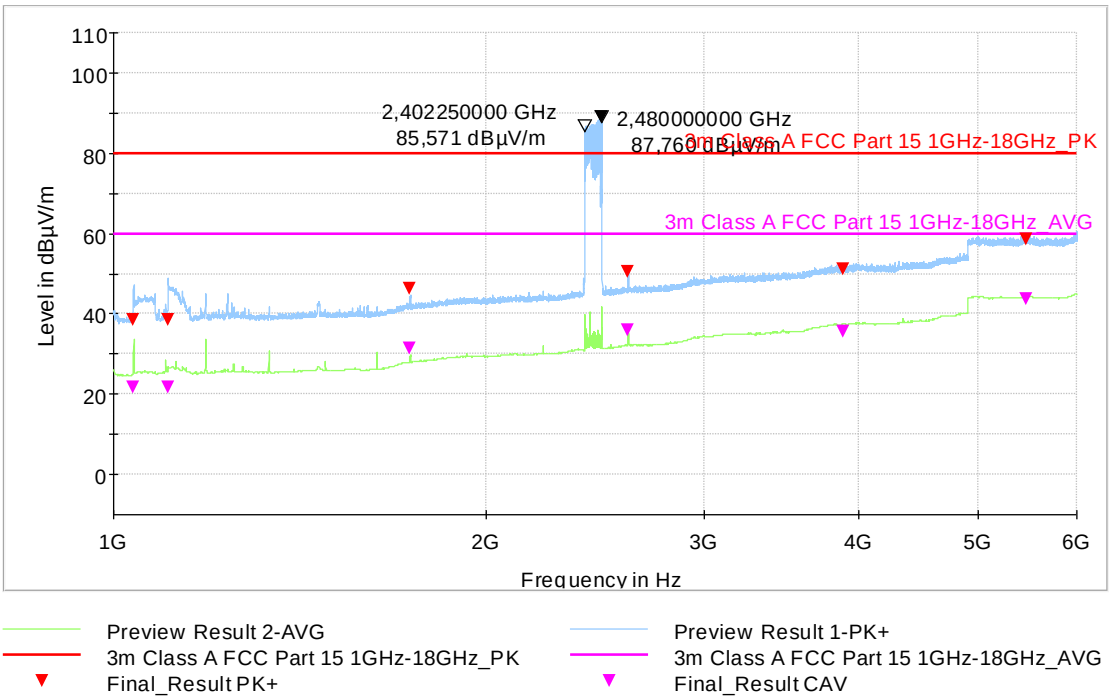


Fig. 11: Sample #1. Mode 1. Frequency range: 1 GHz – 6 GHz

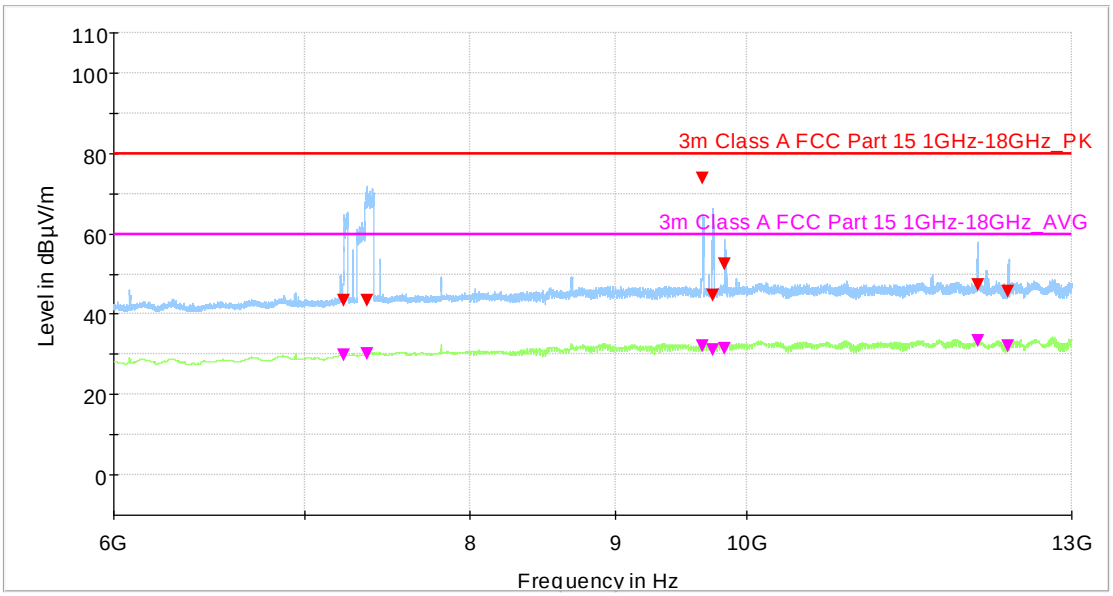
Note 1: The frequency range between 2.403 and 2.480 GHz an intentional transmission and is therefore not evaluated.

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)	Corr. (dB/m)
1038.000	41.58	80.00	35.58	21.59	60.00	38.41	330.0	H	324.0	-23.3
1107.000	41.43	80.00	35.43	21.75	60.00	38.25	105.0	H	177.0	-19.3
1736.250	33.56	80.00	27.56	31.36	60.00	28.64	256.0	H	86.0	-18.6
2604.750	29.53	80.00	23.53	36.03	60.00	23.97	170.0	V	39.0	-14.3
3883.500	28.95	80.00	22.95	35.52	60.00	24.48	348.0	V	42.0	-13.3
5466.500	21.37	80.00	15.37	43.63	60.00	16.37	366.0	V	39.0	-4.8

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

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



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

Fig. 12: 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)	Corr. (dB/m)
7227.750	43.47	80.00	36.53	29.87	60.00	30.13	400.0	H	174.0	35.9
7364.250	43.46	80.00	36.54	29.96	60.00	30.04	400.0	H	314.0	36.4
9648.000	73.83	80.00	6.17	32.14	60.00	27.86	314.0	H	266.0	37.6
9728.000	44.68	80.00	35.32	30.96	60.00	29.04	400.0	H	309.0	37.6
9828.000	52.48	80.00	27.52	31.52	60.00	28.48	100.0	V	323.0	37.9
12050.750	47.26	80.00	32.74	33.46	60.00	26.54	388.0	H	311.0	39.0
12349.250	45.77	80.00	36.53	32.05	60.00	30.13	258.0	H	25.0	38.8

Table 14: Sample #1. Mode 1. Frequency range: 6 GHz – 13 GHz

4.1.7 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
EMI RECEIVER	R&S	ESW 26	1041791	19/12/2022	19/12/2023
BILOG ANTENNA	SCHAWARZBECK	VULB 9164	1042740	08/11/2022	08/11/2023
ATENUADOR 3 DB	HUBER/SUHNER	6803.17.B	1042021	25/05/2023	25/05/2024
CABLE	HUBER/SUHNER	SF103/11N/16N/4000MM	1041964	01/02/2023	01/02/2024
CABLE	HUBER&SUHNER	SF126E Cable de 8m	1042728	21/08/2023	21/08/2024
CABLE	HUBER/SUHNER	FERRITE	1041897	01/02/2023	01/02/2024
RF CABLE (WALL PANEL),	--	--	1041502	09/10/2023	09/10/2024
SEMIANECHOIC CHAMBER SAC1	EUROSHIELD	TC1	104446	12/10/2022	12/10/2024
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
AUTOMATIC ANTENNA MAST	MATURO	--	1042591	--	--
MAST-TABLE CONTROLLER	MATURO	NCD/052/8931211	1042757	--	--

Table 15: Test Instruments – Radio-frequency radiated emissions

4.1.8 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 30 MHz – 1 GHz	± 5.22 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 1 GHz – 6 GHz	± 5.22 dB
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 6 GHz – 18 GHz	± 5.44 dB

Table 16: 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%.