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File Number **24/36405323**

TEST REPORT
Radiofrequency

Petitioner's Reference:	Lock Up Smart Doors S.L.		
Company Address:	Escritor Jeronimo Tristante, N10, 3B. 30100- Murcia – Spain.		
Represented by:	Juan Jesús Pinuaga Cascales		
PMN:	Access controller - Lock up smart door		
Brand:	OPERTO	HMN:	OC1-EXT
Sample #1:	42622	Applus Id:	22053-00001
Result:	**complies**		

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

Applicable Standard:	
RF standard/s:	**FCC 47 CFR Part 15 Subpart C[1]** **ANSI C63.10 (2013)**

[v1] 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:	July 29, 2024
Test Final Date:	August 13, 2024

Test Manager: Javier Miguel Nadales Lisbona
Date of issue: Bellaterra, December 12, 2024

JORGE GEIS ESTRADA
Firmado digitalmente por JORGE GEIS ESTRADA
Fecha: 2024.12.12 17:41:26 +01'00'

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	Results	Criteria Note
ANTENNA REQUIEREMENTS FCC Part 15.203	#1	Mode 1	PASS	CN4
RADIOFREQUENCY RADIATED EMISSIONS FCC Part 15.247 (d)	#1	Mode 1	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	The device is WiFi and BLE access system controller used to interact with a variety of access systems as can be common doors, entrance doors, electrical strikes, parking barriers, and elevators among others.		
EUT Version	**FVIN**	**HVIN**	
	7.6.2	LockUpAIR_V4	
Power supply	+/-	12 V	-- Hz
Equipment Size	**Length**	**Width**	**Height**
	80 mm	80 mm	30 mm

Table 1: Equipment description

Technology #1	Bluetooth LE
Modulation	GFSK
Operating Frequency Band	2400 - 2483.5
Maximum RF Output Power [dBm]	5
Operating Channel(s) Width(s) [MHz]	1
Equipment Type	DTS
Number of Hopping Channels	N/A
Emission Designator	
FCC ID	

Table 2: Technology #1 description

Technology #2	WiFi2G4
Modulation	B
Operating Frequency Band	2400 MHz – 2483.5 MHz
Maximum RF Output Power [dBm]	30
Operating Channel(s) Width(s) [MHz]	20
Equipment Type	DTS
Number of Hopping Channels	N/A
Emission Designator	
FCC ID	

Table 3: Technology #2 description

RF FEATURES					
Description	**Communication Technology**	**Radio Chipset**	**Brand**	**Module Model**	**Antenna Gain [dBi]**
	Bluetooth	CC2640	TI	Not provided	3.3
	WiFi	ESP8266	Espressif	ESP-WROOM-02	2 dBi

Table 4: RF Features - ISM

3.2 TEST CONFIGURATION

DUT Operation Modes	
Mode #	**Description**
1	The customer provides the laboratory with a commissioning guide for the equipment under test via a PCB, which can be configured via software for continuous single-channel modulated transmission with 5 dBm adjustment according to the instructions on the provided configuration software. In addition, instructions are provided for configuring WiFi2G4 with continuous single channel modulated transmission via customer supplied software.

Table 5: Test Configuration

3.3 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: 24/36405327

3.4 TEST FACILITIES ID

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

Table 6: Test facilities ID

3.5 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 ANTENNA REQUIREMENT

4.1.1 Requirements

For intentional device, according to FCC 47 CFR, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to RSS-Gen, the applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

4.1.2 Summary Test Results

The laboratory checks that the sample has an internal antenna, so that no hardware modifications are possible. Complying with the requirements of this section.

4.2 RADIO-FREQUENCY RADIATED EMISSIONS

4.2.1 Test Setup Required

4.2.1.1 Tabletop equipment

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

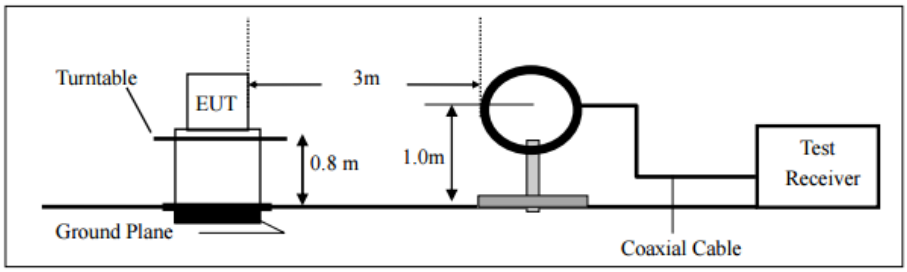


Fig. 2: Radio-frequency radiated emissions of table top equipment from 9 kHz to 30 MHz

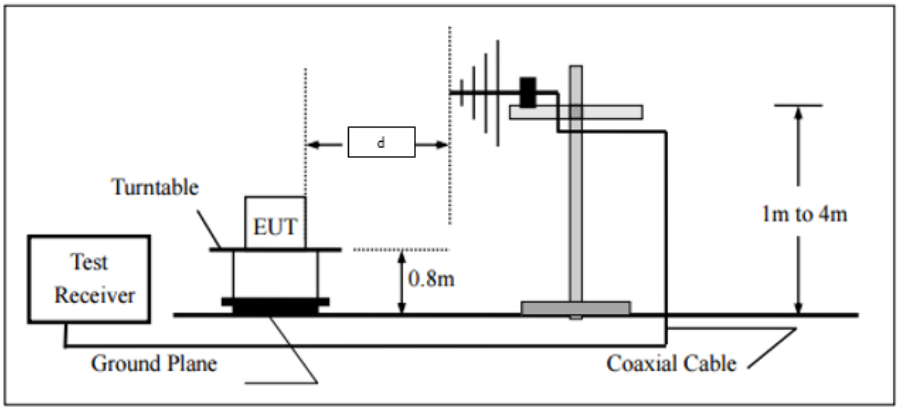


Fig. 3: Radio-frequency radiated emissions of table top equipment from 30 MHz to 1000 MHz

Distance "d" depends on test chamber.

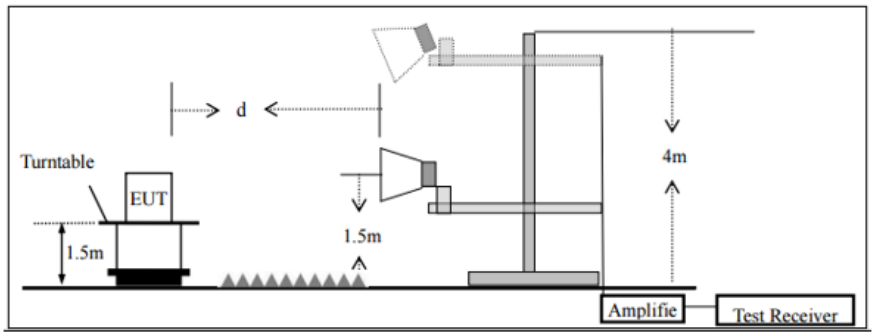


Fig. 4: Radio-frequency radiated emissions setup of table top equipment above 1 GHz

Distance "d" depends on test chamber.

4.2.2 Requirements

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.

The provisions of § 15.205 apply to intentional radiators operating under this section.

Only spurious emissions are permitted in any of the frequency bands listed below:

Frequency [MHz]	Frequency [MHz]	Frequency [MHz]	Frequency [GHz)]
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
(1)0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41			

Table 7. Restricted bands of operation

1 Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
2 Above 38.6

According to § 15.209(a) and RSS-Gen section 8.9, the radiated emission limits for restricted bands are:

Frequency Range [MHz]	Quasi-peak detector (QP) [dBµV/m]	Peak detector (PK) [dBµV/m]		Average detector (AVG) [dBµV/m]	
	3 m measuring distance	3 m measuring distance	1 m measuring distance[1]	3 m measuring distance	1 m measuring distance[1]
0.009 – 0.490	20log(2400/F[kHz]) + 80	N/A	N/A	N/A	N/A
0.490 – 1.705	20log(24000/F[kHz]) + 40	N/A	N/A	N/A	N/A
1.705 - 30	20log(24000/F[kHz]) + 40	N/A	N/A	N/A	N/A
30 – 88	40.0	N/A	N/A	N/A	N/A
88 – 216	43.5	N/A	N/A	N/A	N/A
216 – 960	46.0	N/A	N/A	N/A	N/A
960 – 1000	54.0	N/A	N/A	N/A	N/A
1000 – 18000	N/A	74	N/A	54	N/A
18000 - 40000	N/A	N/A	83.54	N/A	63.54

Table 8: Radio-frequency radiated emissions requirements

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: 1 meter (new measurement distance).

According to FCC Part 15 Subpart C FCC 15.247, the limits for unrestricted bands are:

Frequency Range [MHz]	Test Mode	Field strength [µV/m]	Measurement distance [m]
30 – 88	QPK	-20 dBc / -30 dBc	3
88 – 216			
216 – 960			
Above 960	Peak power / RMS averaging		

Table 9. Radiated Emission limits. Unrestricted bands

4.2.2.1 Receiver Parameters

According to standard ANSI C63.4:2014:

Frequency Range [MHz]	Detector	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]
0.009 – 0.15	Quasi-peak (QP)	$200 \cdot 10^{-6}$	$1 \cdot 10^{-3}$
0.15 – 30	Quasi-peak (QP)	$9 \cdot 10^{-3}$	$30 \cdot 10^{-3}$
30 – 1000	Quasi-peak (QP)	0.12	0.30
Above 1000	Peak (PK)	1	3
	Average (AVG)	1	10

Table 10: Receiver parameters – Radio-frequency radiated emissions

4.2.3 Test Environmental Conditions

Test Date	Technician	Supervisor	Temperature [ºC]	Humidity [%]	Atm. Pressure [mbar]
29/07/2024	P. Redondo	J. M. Nadales	20.9	47.2	1011
12/08/2024	P. Redondo	J. M. Nadales	21.7	49.1	1019
13/08/2024	A. Moliner	J. M. Nadales	19.5	51.4	1014

Table 11: Test environmental conditions – Radio-frequency radiated emissions

4.2.4 Summary Test Results

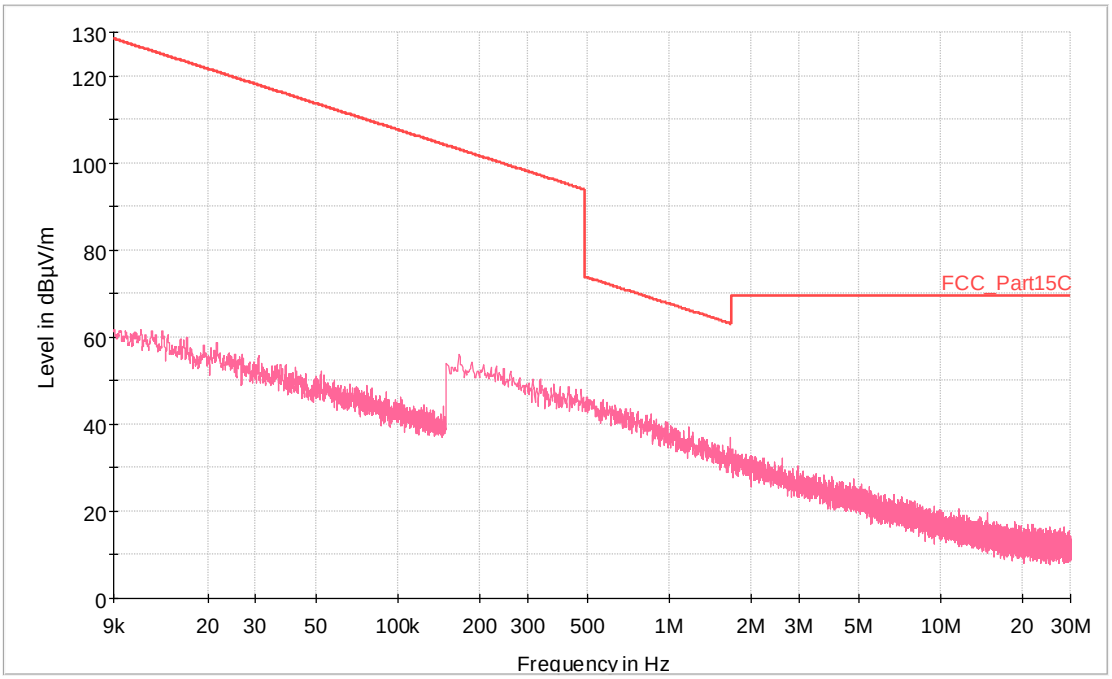
Frequency Range [MHz]	Test Area	Distance [m]	Emissions	Results
9 kHz – 30 MHz	SAC 1	3 m	Limit - I <= QP < Limit	PASS
30 MHz – 1 GHz	SAC 1	3 m	Limit - I <= QP < Limit	PASS
1 GHz – 3.5 GHz	SAC 2	3 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
3.5 GHz – 18 GHz	SAC 2	3 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS
18 GHz – 26 GHz	SAC 2	1 m	Limit - I <= PK < Limit Limit - I <= AVG < Limit	PASS

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

Note 1: According to RSS-Gen section 6.13.2 and ANSI C63.10:2013 section 5.5 as the lowest radio frequency generated by the equipment is above 30 MHz, the spectrum shall be investigated from 30 MHz.

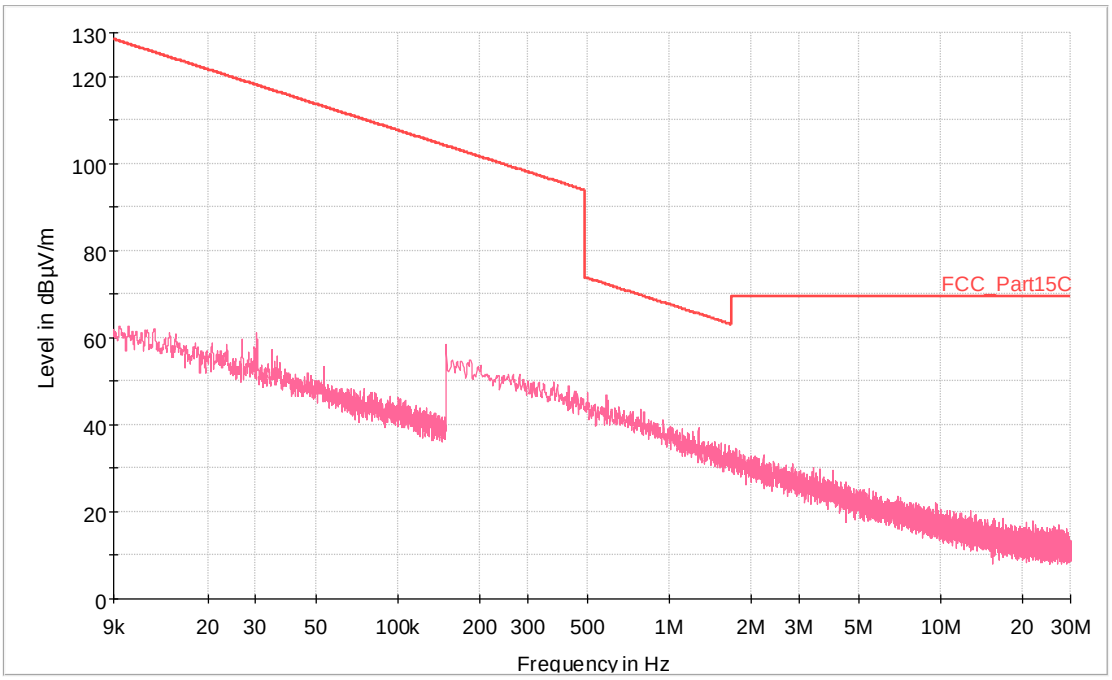
4.2.5 Test Results

4.2.5.1 Ambient Levels.Frequency range: 9 kHz – 30 MHz



Preview Result 1V-PK+ FCC_Part15C

Fig. 5: Ambient level. Frequency range: 9 kHz – 30 MHz - Axis X



Preview Result 1V-PK+ FCC_Part15C

Fig. 6: Ambient level. Frequency range: 9 kHz – 30 MHz - Axis Y

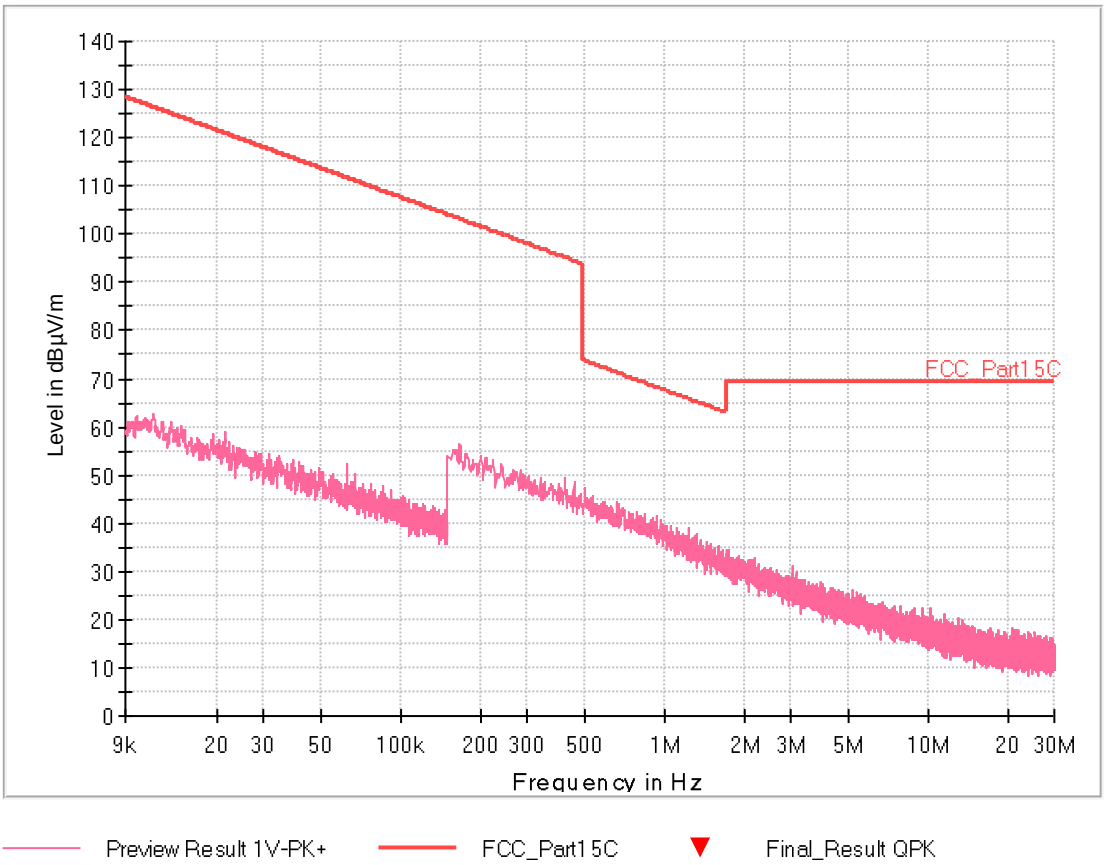


Fig. 7: Ambient level. Frequency range: 9 kHz – 30 MHz - Axis Z

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

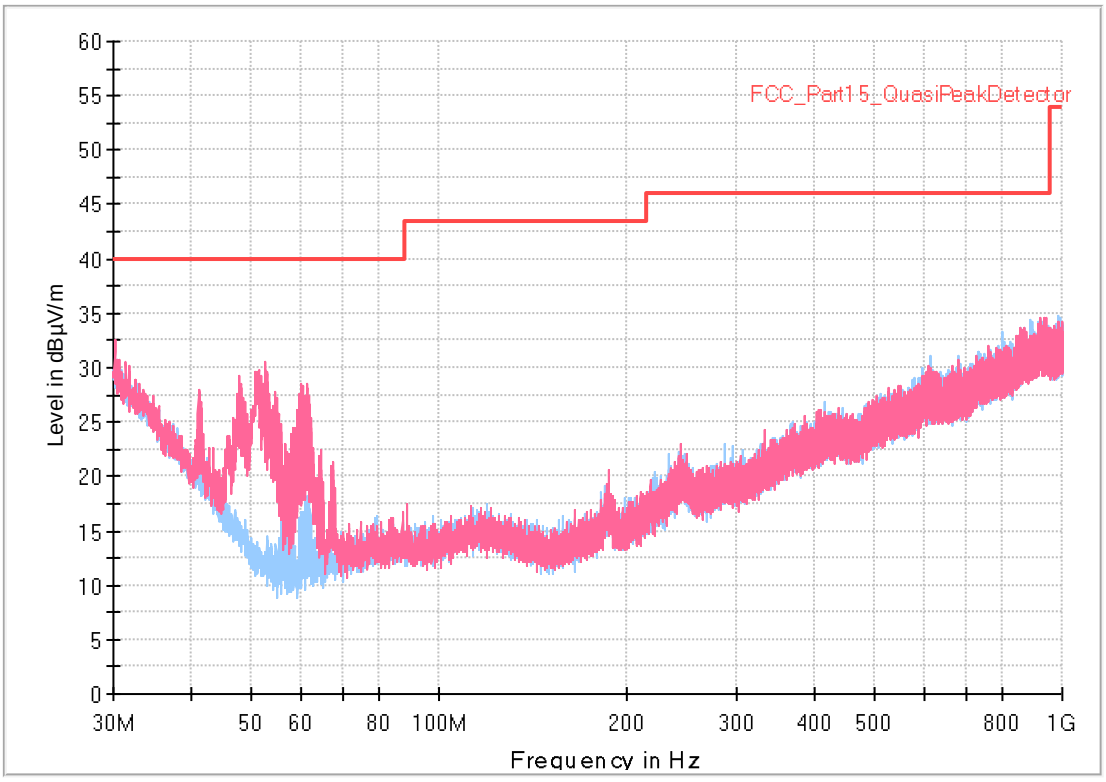


Fig. 8: Ambient level. Frequency range: 30 MHz – 1 GHz

4.2.5.3 Ambient Levels. Frequency range: 1 GHz – 3.5 GHz

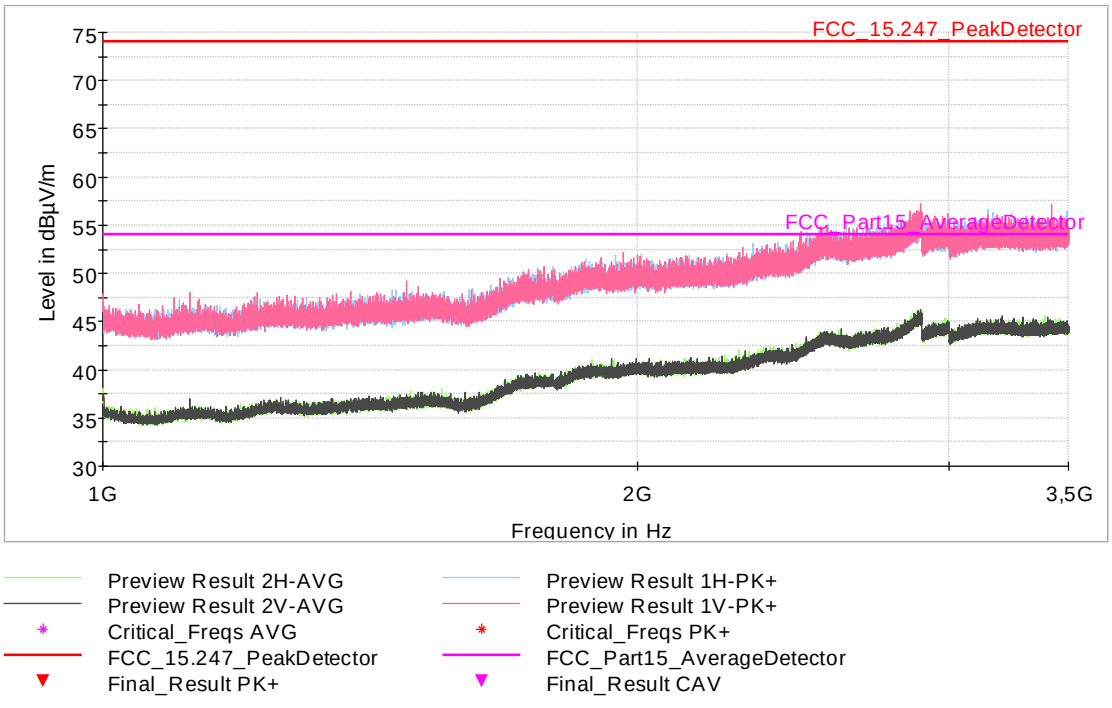


Fig. 9: Ambient level. Frequency range: 1 GHz – 3.5 GHz

4.2.5.4 Ambient Levels.Frequency range: 3.5 GHz – 18 GHz

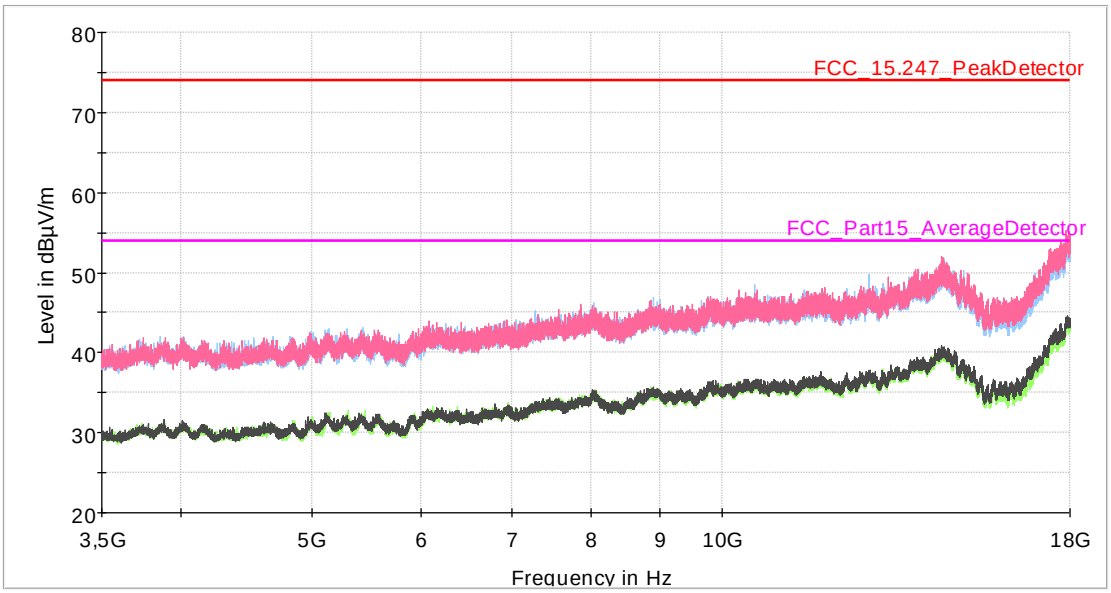


Fig. 10: Ambient level. Frequency range: 3.5 GHz – 18 GHz

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

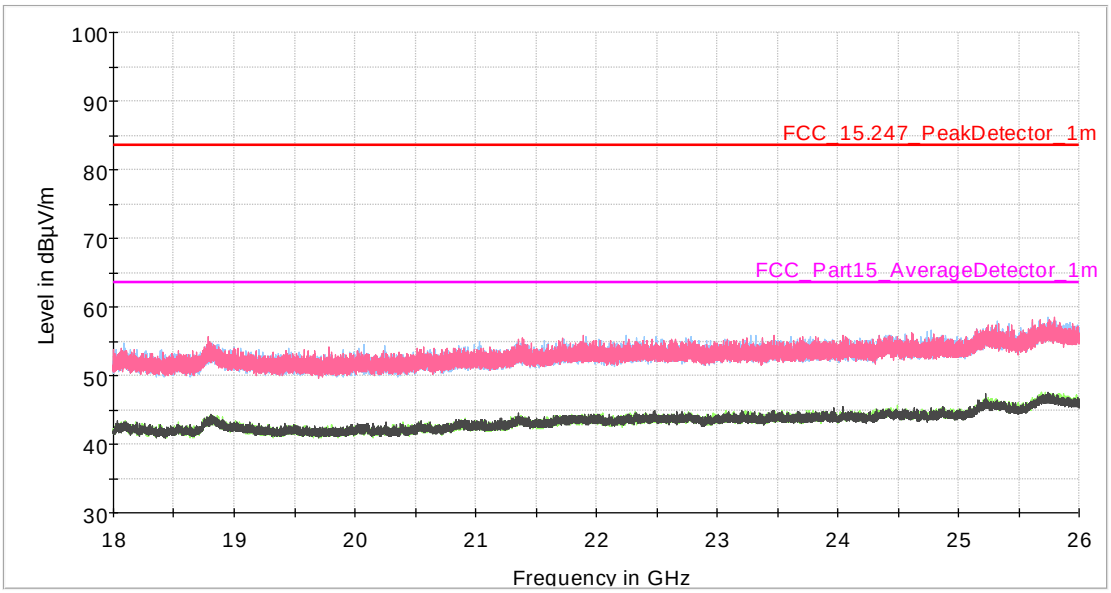


Fig. 11: Ambient level. All Mode. Frequency range: 18 GHz – 26 GHz

4.2.5.6 Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz

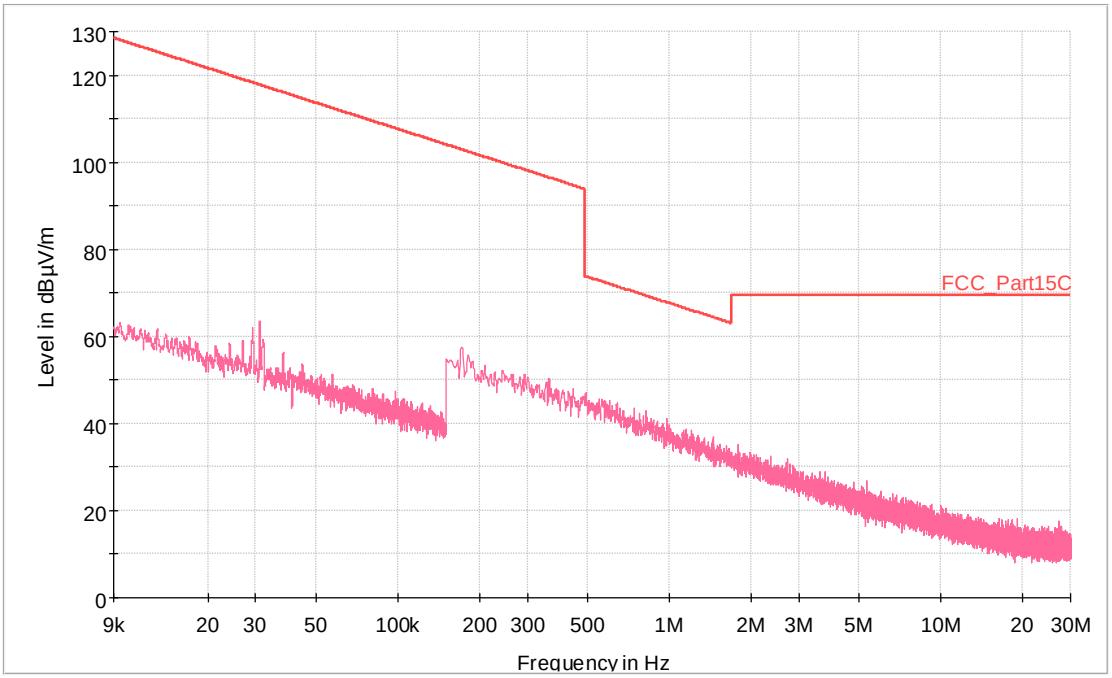


Fig. 12: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz – Axis X

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the QPK limit

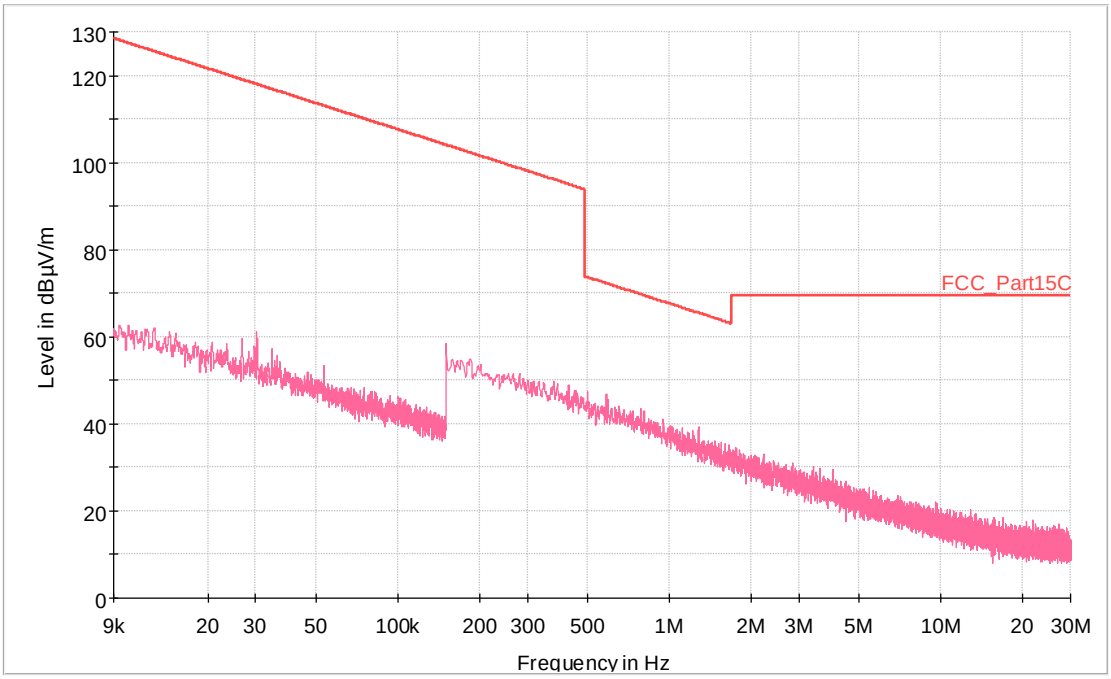


Fig. 13: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz – Axis Y

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the QPK limit

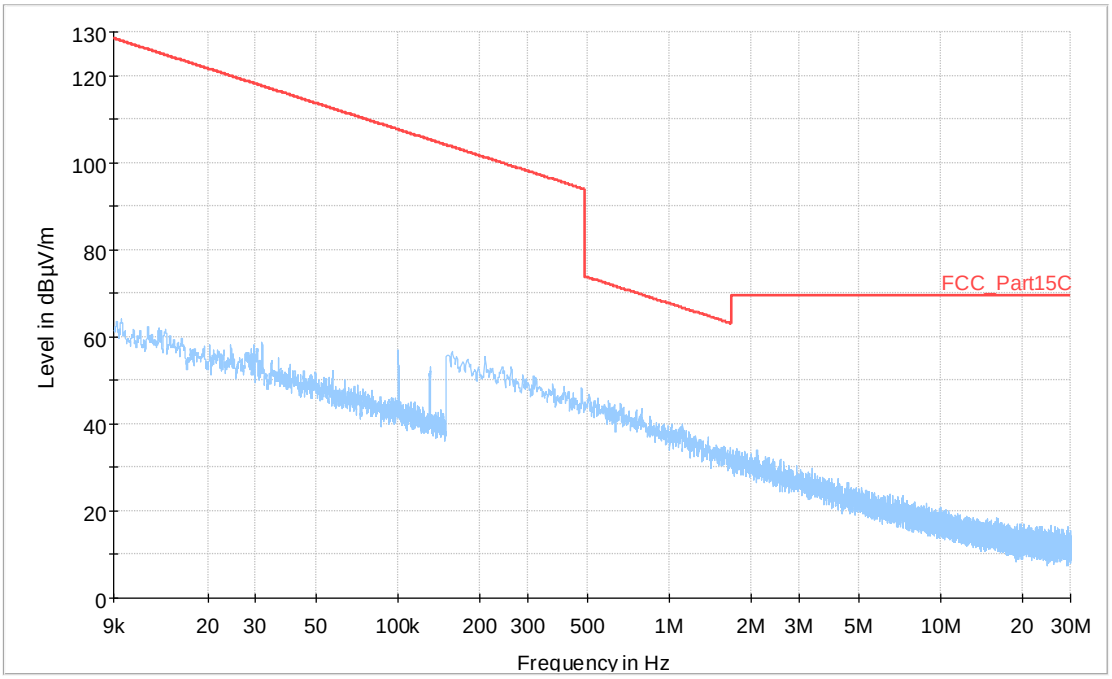


Fig. 14: Sample #1. Mode 1. Frequency range: 9 kHz – 30 MHz – Axis Z

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the QPK limit

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

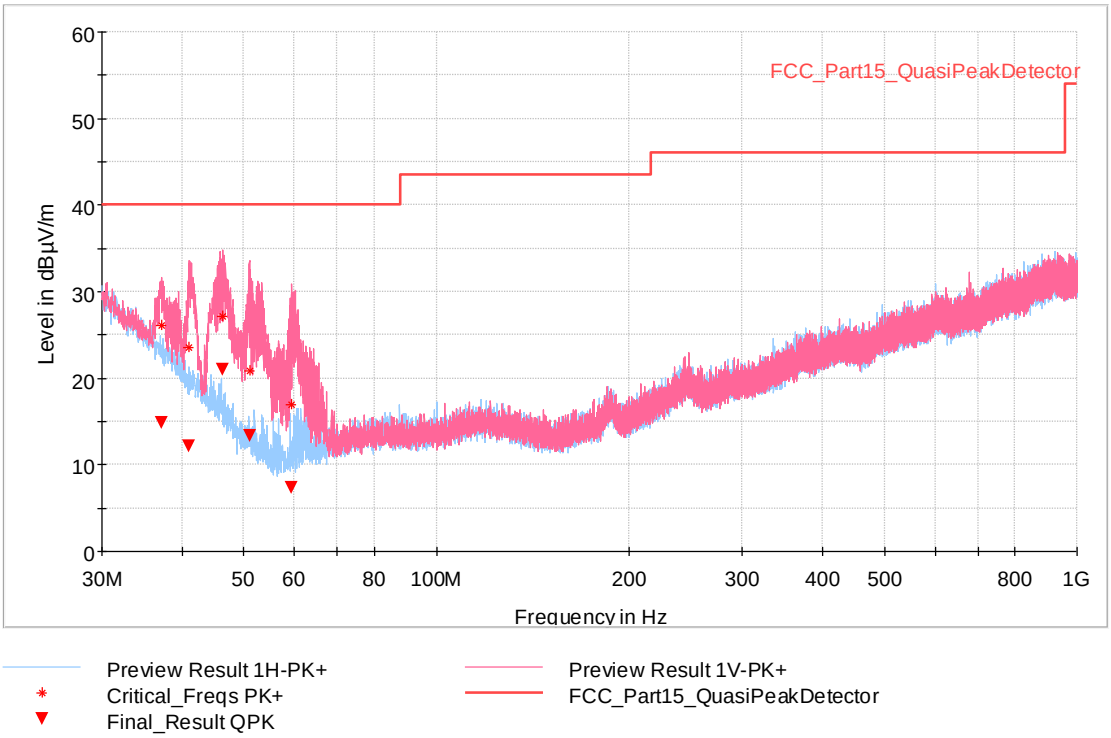


Fig. 15: Sample #1. Mode 1. Frequency range: 30 MHz – 1GHz

FINAL MEASUREMENTS

Frequency [MHz]	QuasiPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
37.113	14.9	40.0	25.1	236.0	V	185.0	21.7
`41.090	12.1	40.0	27.9	133.0	V	194.0	18.7
46.296	21.0	40.0	19.0	100.0	V	143.0	14.7
50.984	13.3	40.0	26.7	104.0	V	194.0	11.3
59.4555	7.4	40.0	32.6	197.0	V	287.0	9.4

Table 13: Sample #1. Mode 1. Frequency range: 30 MHz – 1 GHz

4.2.5.8 Sample #1. Mode 1. Frequency range: 1 GHz – 3.5 GHz

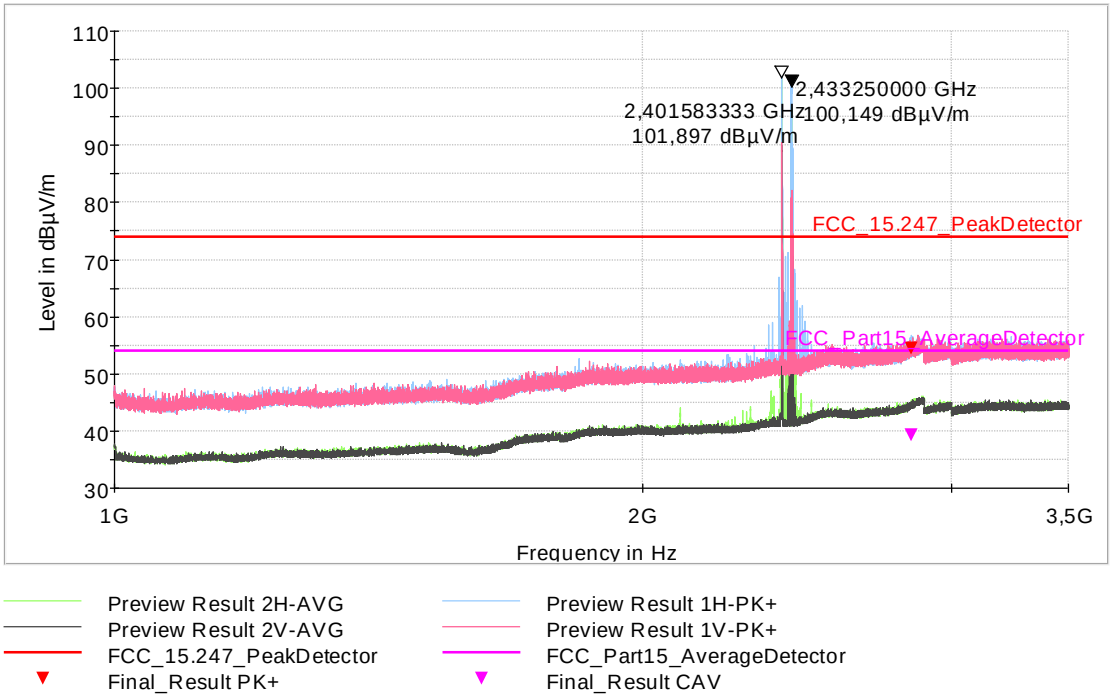


Fig. 16: Mode 1. Frequency range: 1 GHz – 3.5 GHz

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
2847.000[1]	54.5	74.0	19.5	299.0	H	161.0	32.5

Table 14: Mode 1. Frequency range: 1 GHz – 3.5 GHz

Note [1]: The final frequency measurements within the restricted band correspond to the ambient level as can be seen in the graphs above. Therefore, a maximization with peak detector as worst case is performed.

4.2.5.9 Sample #1. Mode 1. Frequency range: 3.5 GHz – 18 GHz

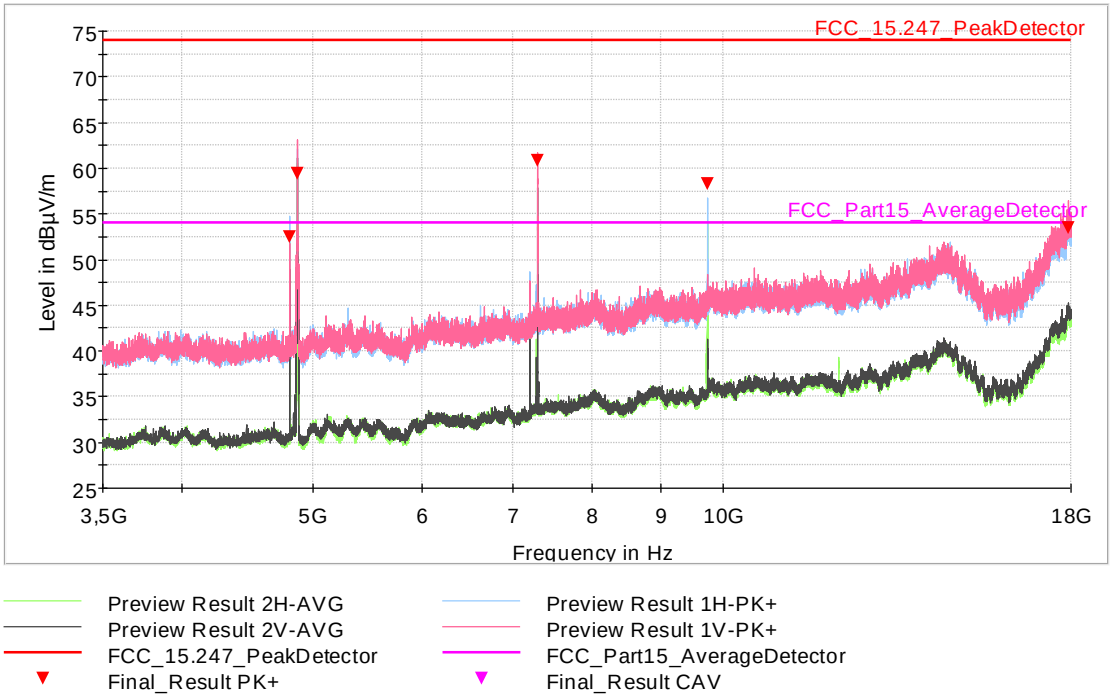


Fig. 17:Sample #1. Mode 1. Frequency range:3.5 GHz – 18 GHz

FINAL MEASUREMENTS

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Corr. [dB/m]
4803.066	52.5	74.0	24.5	301.0	H	235.0	-13.6
4863.483	59.5	74.0	14.5	109.0	V	94.0	-13.5
7298.033	60.8	74.0	13.2	338.0	V	312.0	-9.4
9727.750	58.2	74.0	15.8	343.0	H	57.0	-7.1
17936.683[1]	53.5	74.0	20.5	235.0	V	274.0	6.1

Table 15: Sample #1. Mode 1. Frequency range:3.5 GHz – 8 GHz

Note [1]: The final frequency measurements within the restricted band correspond to the ambient level as can be seen in the graphs above. Therefore, a maximization with peak detector as worst case is performed.

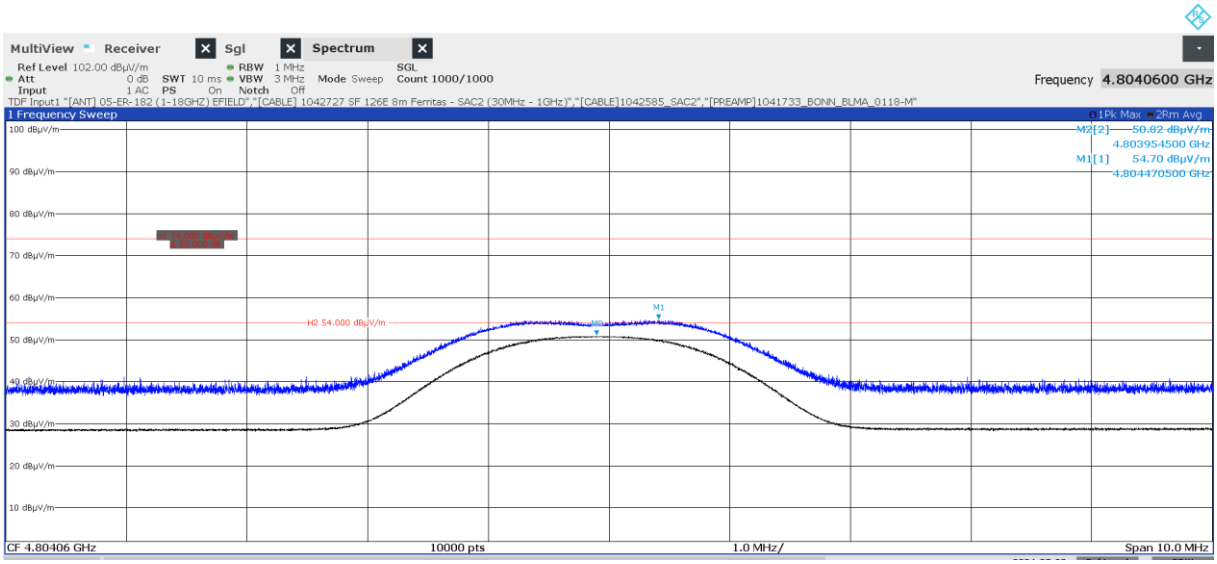


Fig. 18: Final Measurement – Unwanted emission in restricted band

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	AVG [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
4803.066	54.7	74.0	19.3	50.8	54.0	3.2	301.0	H	235.0

Table 16: Final Measurement – Unwanted emission in restricted band

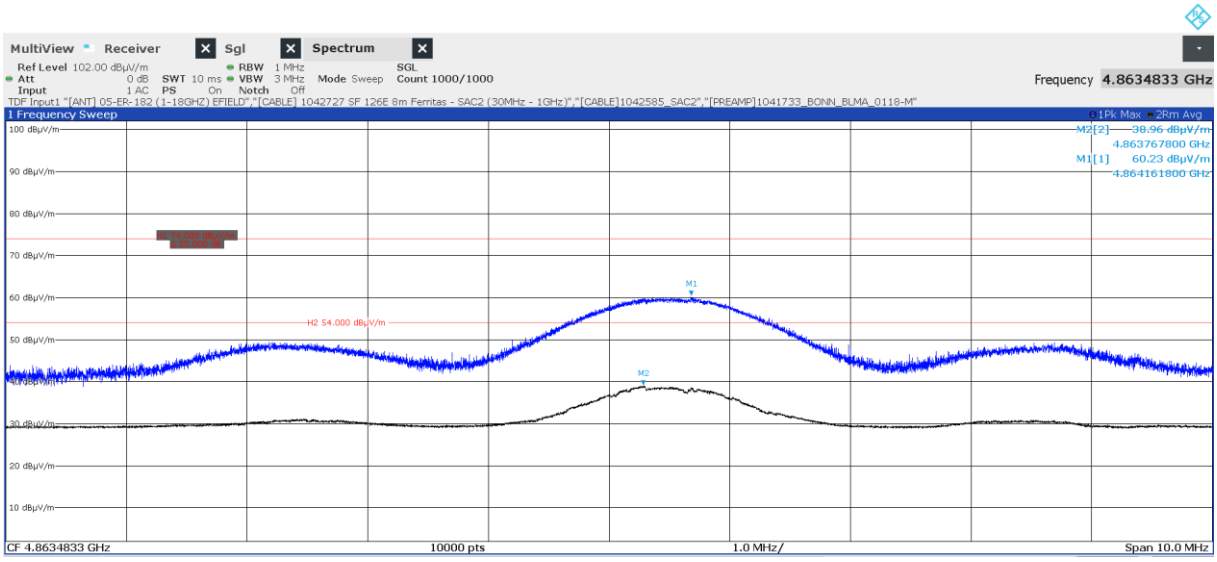


Fig. 19: Final Measurement – Unwanted emission in restricted band

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	AVG [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
4863.483	60.2	74.0	13.8	39.0	54.0	15.0	109.0	V	94.0

Table 17: Final Measurement – Unwanted emission in restricted band

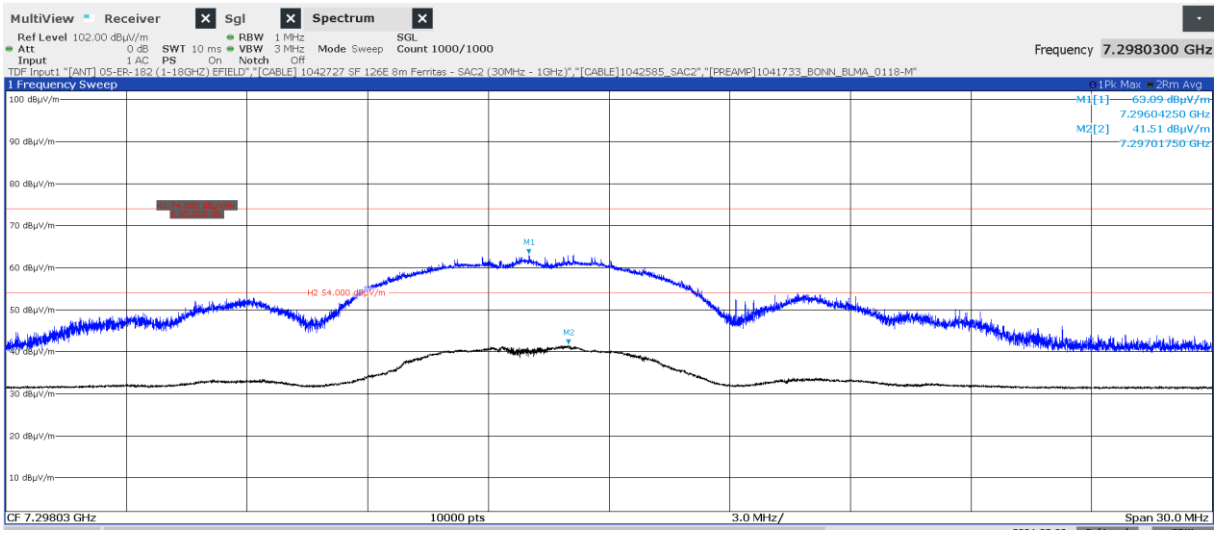


Fig. 20: Final Measurement – Unwanted emission in restricted band

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	AVG [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
7298.033	63.1	74.0	10.9	41.5	54.0	12.5	338.0	V	312.0

Table 18: Final Measurement – Unwanted emission in restricted band

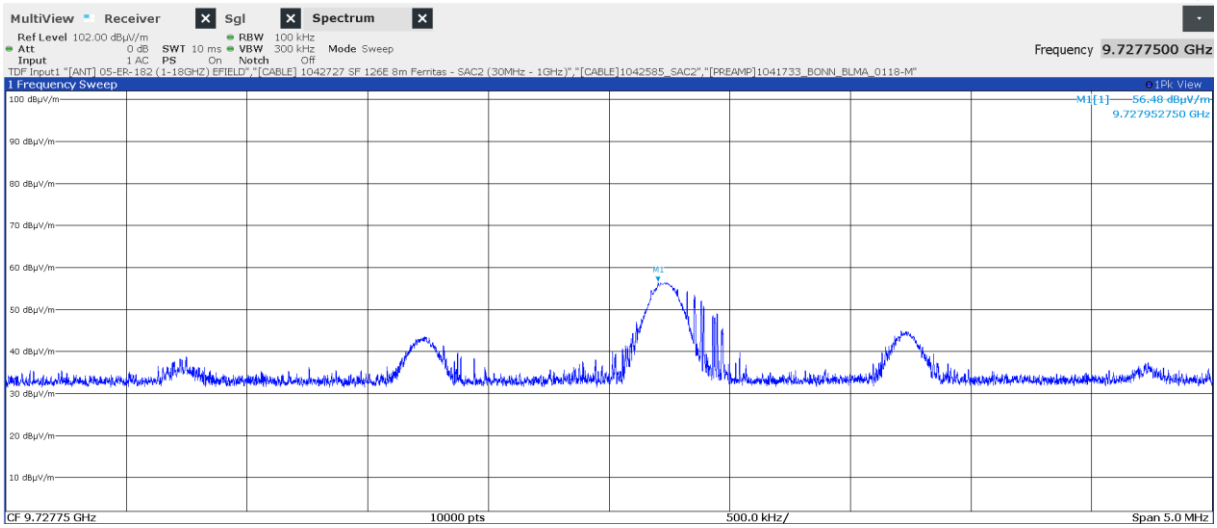


Fig. 21: Final Measurement – Unwanted emission out of restricted band

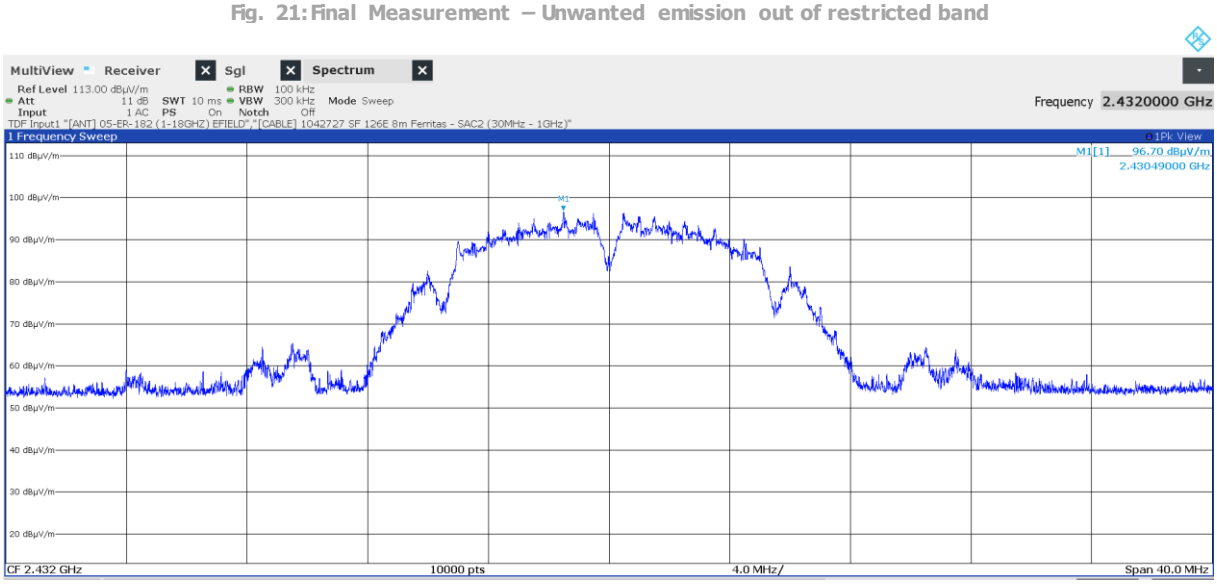


Fig. 22: Fundamental Maximum Radiated Power – PH

Frequency [MHz]	MaxPeak [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]
9727.750	58.2	76.7	18.5	343.0	H	57.0
2432.000	96.7	N/A	N/A	150.0	H	315.0

Table 19: Final Measurement – Unwanted emission in restricted band

4.2.5.10 Sample #1. All mode[1]. Frequency range: 18 GHz – 26 GHz

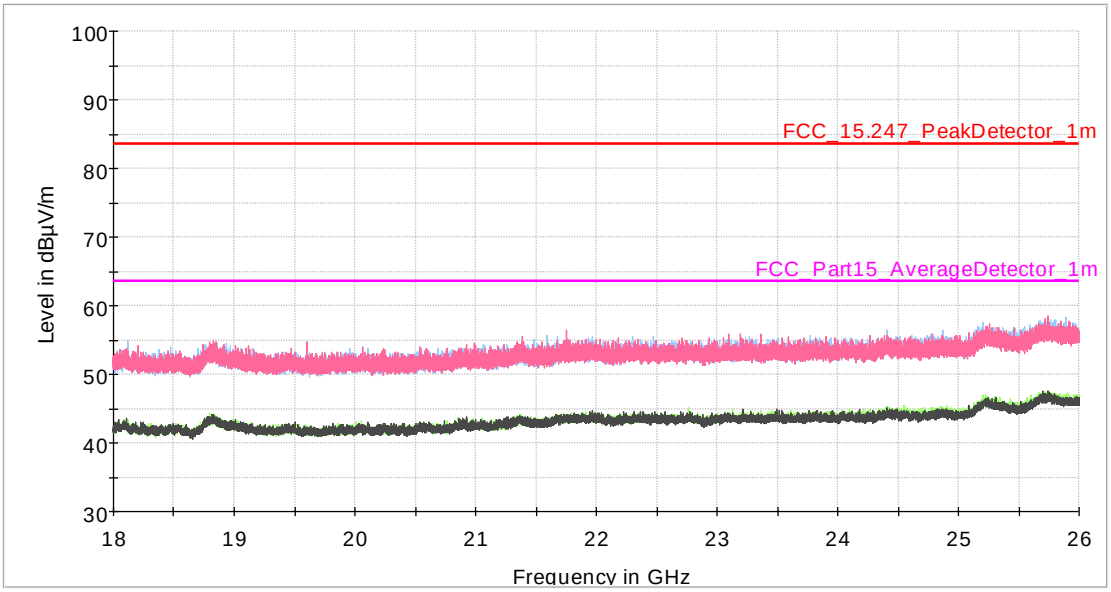


Fig. 23:Sample #1. Mode 1. Frequency range: 18 GHz – 26 GHz

FINAL MEASUREMENTS

No spurious detected. All emissions are below of the AVG limit

4.2.6 Test Equipment Used

Equipment	Brand	Model	Applus Ref.	Last Calibration	Next Calibration
ACTIVE LOOP ANTENNA	EMCO	6502	05-ER-019	04/10/2023	04/10/2024
BILOG ANTENNA	SCHWARZBECK	VULB 9162	1042229	27/02/2024	27/02/2025
HORN ANTENNA	EMCO	3115	05-ER-017	06/12/2023	06/12/2024
HORN ANTENNA	MVG	EH 1840	1042685	21/06/2024	21/06/2026
RF CABLE	HUBER+SUHNER	SF126E	1042728	21/08/2023	21/08/2024
3 DB ATTENUATOR	HUBER+SUHNER	6803.17.B	1042021	08/04/2024	08/04/2025
RF CABLE	RHODE & SCHWARZ	NA	1041502	09/10/2023	09/10/2024
RF CABLE	HUBER+SUHNER	SF104	1041964	20/06/2024	20/06/2025
HIGHPASS FILTER	WAINWRIGHT INSTRUMENTS	WHNX6-2765-3500-26500-40CC	1042511	29/04/2024	29/04/2025
RF CABLE	HUBER+SUHNER	SF104/11N/11N	1042585	25/04/2024	25/04/2025
RF AMPLIFIER	BONN ELEKTRONIK	BLMA 0118-M	1041733	25/04/2024	25/04/2025
RF CABLE	HUBER+SUHNER	SF102	1042546	28/04/2024	28/04/2025
RF CABLE	ASTROLAB	32026-29094-29094-24TC	1041565	29/04/2024	29/04/2025
EMI RECEIVER	R&S	ESW 26	1041791	14/11/2023	14/11/2024
EMI RECEIVER	R&S	ESU 40	1041155	04/08/2023	04/08/2025
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 20: Test Instruments – Radio-frequency radiated emissions

4.2.7 Uncertainty

Test Type	Test Description	Uncertainty
Emissions	RADIO-FREQUENCY RADIATED EMISSIONS 9 kHz – 30 MHz	± 3.9 dB
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

Table 21: 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%.