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# Test Report

Report Number:

**F250464E2**

Equipment under Test (EUT):

**TB-UNP-1.0-RS4.47T**

Applicant:

**Werner Turck GmbH & Co. KG**

Manufacturer:

**Werner Turck GmbH & Co. KG**



## References

- [1] **ANSI C63.10: 2020 + Cor. 1-2023+C63.10a-2024** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15** Radio Frequency Devices
- [3] **RSS-210 Issue 11 (June 2024)**  
Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- [4] **RSS-Gen, Issue 5 Amendment 2 (February 2021)**  
General Requirements for Compliance of Radio Apparatus

## Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in clause 1.4 of ANSI C63.10 (2020). However, the measurement uncertainty is calculated and shown in this test report.

Tested and written  
by:

---

Signature

Reviewed and  
approved by:

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Signature

**This test report is only valid in its original form.**

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The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

## Contents:

## Page

1	Identification .....	6
1.1	Applicant.....	6
1.2	Manufacturer .....	6
1.3	Test Laboratory .....	6
1.4	EUT (Equipment under Test) .....	7
1.5	Technical Data of Equipment .....	8
1.6	Dates .....	9
2	Operational States .....	9
3	Additional Information .....	10
4	Overview.....	10
5	Results.....	11
5.1	Test setups .....	11
5.1.1	Radiated: Test fixture .....	11
5.1.2	Radiated: 9 kHz to 30 MHz.....	11
5.1.2.1	Preliminary measurement 9 kHz to 30 MHz	11
5.1.2.2	Final measurement 9 kHz to 30 MHz	13
5.1.3	Radiated: 30 MHz to 1 GHz.....	14
5.1.3.1	Preliminary and final measurement 30 MHz to 1 GHz	14
5.1.4	Radiated: 1 GHz to 40 GHz.....	15
5.1.4.1	Preliminary and final measurement 1 to 40 GHz	15
5.1.5	Conducted: AC power line .....	17
5.1.6	Method 99% bandwidth .....	18
5.2	99 % bandwidth .....	20
5.2.1	Test setup (99 % bandwidth).....	20
5.2.2	Test method (99 % bandwidth).....	20
5.2.3	Test results (99 % bandwidth) .....	21
5.3	Radiated emissions .....	22
5.3.1	Test setup (Maximum unwanted emissions) .....	22
5.3.2	Test method (Maximum unwanted emissions).....	22
5.3.3	Test results (Maximum unwanted emissions) .....	22
5.3.3.1	Test results preliminary measurement 9 kHz to 30 MHz	22
5.3.3.2	Test results final measurement 9 kHz to 30 MHz	24
5.3.3.3	Test results (30 MHz – 1 GHz)	25
5.4	AC power-line conducted emissions .....	27

5.4.1	Test setup (Conducted emissions on power supply lines) .....	27
5.4.2	Test method (Conducted emissions on power supply lines) .....	27
5.4.3	Test results (Conducted emissions on power supply lines) .....	28
6	Measurement Uncertainties .....	30
7	Test Equipment used for Tests .....	31
8	Test site Verification.....	32
9	Report History.....	32
10	List of Annexes .....	32

## 1 Identification

### 1.1 Applicant

Name:	Werner Turck GmbH & Co. KG
Address:	Goethestr. 7, 58553 Halver
Country:	Germany
Name for contact purposes:	Mr. Markus TEUBNER
Phone:	+49 23 53 709 – 61 24
eMail address:	markus.teubner@turck.com
Applicant represented during the test by the following person:	None

### 1.2 Manufacturer

Name:	Werner Turck GmbH & Co. KG
Address:	Goethestr. 7, 58553 Halver
Country:	Germany
Name for contact purposes:	Mr. Markus TEUBNER
Phone:	+49 23 53 709 – 61 24
eMail address:	markus.teubner@turck.com
Manufacturer represented during the test by the following person:	None

### 1.3 Test Laboratory

The tests were carried out by:

**PHOENIX TESTLAB GmbH**  
**Königswinkel 10**  
**32825 Blomberg**  
**Germany**

accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) according to DIN EN ISO/IEC 17025:2018. The accreditation is only valid for the scope of accreditation listed in the annex of the certificate D-PL-17186-01-00. FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

## 1.4 EUT (Equipment under Test)

Test object: *	RFID read/write device
Model name: *	TB-UNP-1.0-RS4.47T
Model number: *	-
Order number: *	100049514
FCC ID: *	YQ7-TBUNP
IC certification number: *	8821A-TBUNP
PMN: *	TB-UNP-1.0-RS4.47T Series
HVIN: *	TB-UNP-1.0-RS4.47T
FVIN: *	V1.9A

	EUT number		
	1	2	3
Serial number: *	Prototype	Prototype	Prototype (with dummy load)
PCB identifier: *	7390/3	7390/3	7390/3
Hardware version: *	1	1	1
Software version: *	V1.9A	V1.9A	V1.9A

\* Declared by the applicant

2 EUTs were used for the tests. In the overview (chapter 4) is shown which EUT was used for each test case.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

## 1.5 Technical Data of Equipment

Equipment category: *	Equipment with integral antenna		
Operating frequency *	13.56MHz		
Channel spacing: *	Not applicable (one channel operation)		
Antenna characteristics: *	Average loop area: 80 mm <sup>2</sup>		
Antenna gain: *	-40 dB		
ITU classification: *	424KK1D (FC/32=423.75KHz)		
Alignment range: *	Not applicable (one channel operation)		
Switching range: *	Not applicable (one channel operation)		
Modulation: *	ASK		
Bit rate of transmitter: *	26.48 kbaud		
Supply voltage: *	$U_{\text{nom}} = 24.0 \text{ V}_{\text{DC}}$	$U_{\text{min}} = 10 \text{ V}_{\text{DC}}$	$U_{\text{max}} = 30 \text{ V}_{\text{DC}}$
Type of power supply: *	External DC		
Temperature range: *	-25 °C to +70 °C		

\* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
System line (DC and Data)	Four-pole M12 connector	Four pole M12-connector	~9.5 m	Yes

Equipment used for testing	
TAG *1	TW-R7,5-B128
Gateway*1	BL67-2RFID-A
Power adapter*2	bel HC24-2.4-AG

\*1 Provided by the applicant

\*2 Provided by the laboratory

Ancillary equipment	
-	-
-	-
-	-

\*1 Provided by the applicant

## 1.6 Dates

Date of receipt of test sample:	17.04.2025
Start of test:	12.05.2025
End of test:	07.07.2025

## 2 Operational States

### Description of function of the EUT:

The EUT is a RFID Reader/Writer. All tests were carried out with an unmodified test sample.

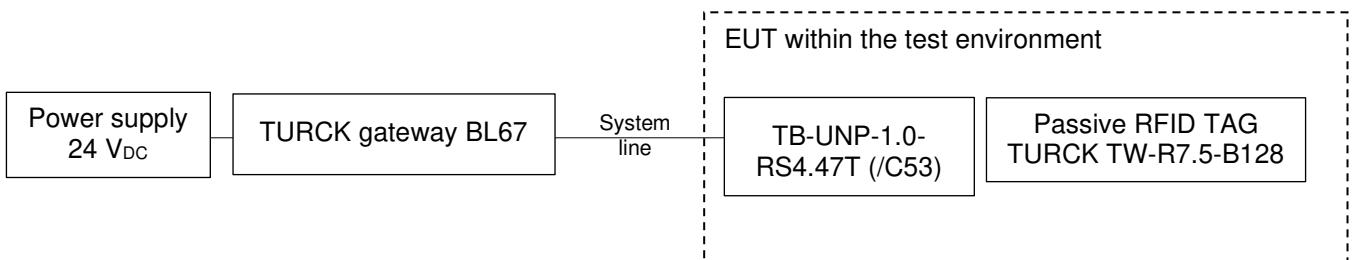
### The following states were defined as the operating conditions:

To set the EUT in operation, it was connected to a TURCK gateway BL67, which was placed outside the measurement environment. During all tests the EUT was supplied with a 24.0 V<sub>DC</sub> via the gateway, which was connected to an external power supply.

All tests were carried out with an unmodified test sample, which operates in normal operation mode. If not otherwise stated a TAG type TURCK TW-R7.5-B128 was presented in the front of the EUT.

Because no dedicated position of operating is defined by the applicant, all radiated measurements were carried out with the EUT in two orthogonal positions: Mode 1 (laying) and Mode 2 (Standing). For details of the different positions, refer to annex A of this test report.

### The system was setup as follows:



### 3 Additional Information

The EUT was not labeled as required by FCC / IC.

### 4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-Gen, Issue 5 [4] and RSS-210, Issue 11 [3]	Status	EUT
Conducted emissions on supply line	0.15 – 30	15.207 (a)	8.8 [4]	Passed	1, 3
Radiated emissions	0.009 – 1000 **	15.205 (a) 15.209 (a)	8.9 and 8.10 [4] 8.3 [3]	Passed	1
99 % bandwidth	13.56	-	6.7 [4]	Passed	1
Antenna requirement	-	15.203 [2]	6.8 [4]	Passed *	1

\*: Integrated antenna only, requirement fulfilled.

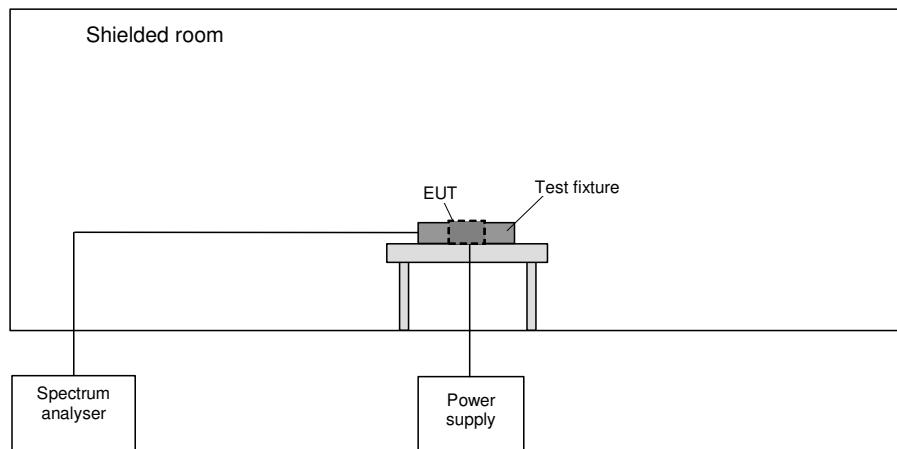
\*\*: As declared by the applicant the highest radio clock frequency is 13.56 MHz. Therefore, the radiated emission measurement must be carried out up to 1 GHz.

## 5 Results

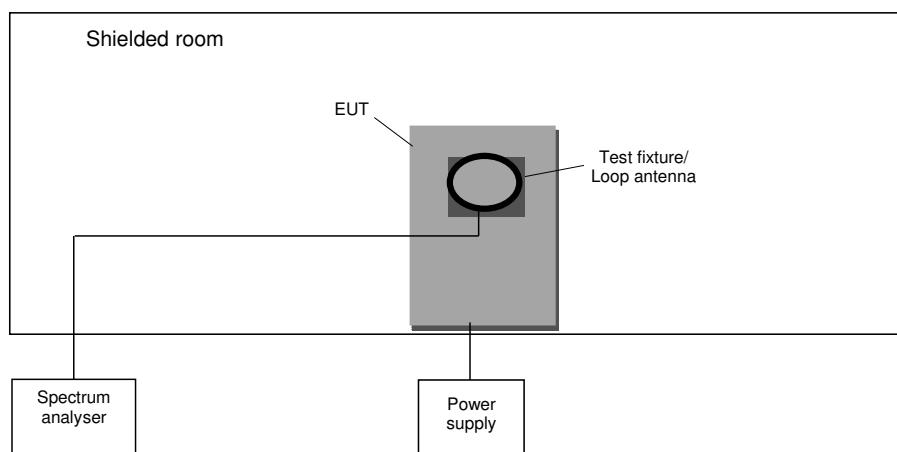
### 5.1 Test setups

#### 5.1.1 Radiated: Test fixture

The test is carried out in a shielded chamber. Table-top devices are set up on a table and the spectrum analyser is connected to a test fixture / loop antenna, which is placed around / on top of the EUT.



The test is carried out in a shielded chamber. Floor standing devices are set up on a floor and the spectrum analyser is connected to a test fixture / loop antenna, which is placed at the antenna of the EUT.



#### 5.1.2 Radiated: 9 kHz to 30 MHz

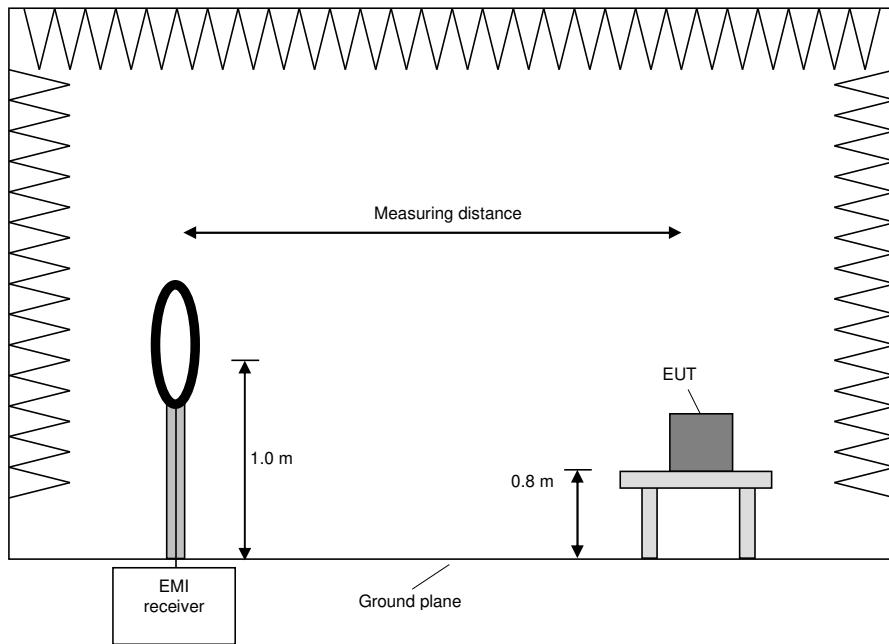
##### 5.1.2.1 Preliminary measurement 9 kHz to 30 MHz

In the first stage a preliminary measurement is performed in a semi-anechoic chamber at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

The frequency range 9 kHz to 30 MHz is monitored with an EMI receiver while the system and its cables are manipulated to find out the configuration with the maximum emission levels if applicable. The EMI receiver is set to MAX hold mode. The EUT and the measuring antenna are rotated around their vertical axis to find the maximum emission levels.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



#### Procedure preliminary measurement:

Pre-scans are performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz. The following procedure is used:

- 1) Monitor the frequency range with the measuring antenna facing the EUT and an EUT / turntable azimuth of 0 °.
- 2) Manipulate the system cables to produce the maximum levels of emissions.
- 3) Rotate the EUT by 360 ° to maximize the detected signals.
- 4) Measure the frequencies of the highest detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency values.
- 5) If the EUT is portable or ceiling mounted, repeat steps 1 to 4 with other orientations (x,y,z) of the EUT.
- 6) Rotate the measuring antenna and repeat steps 1 to 5.

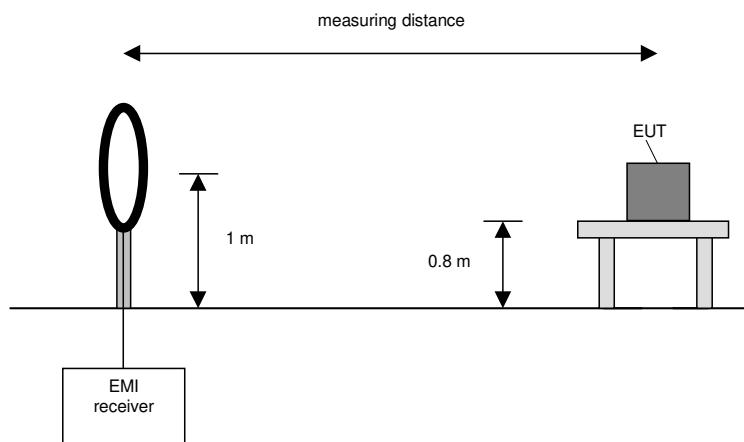
### 5.1.2.2 Final measurement 9 kHz to 30 MHz

In the second stage a final measurement is performed on an open area test site with no conducting ground plane at a measuring distance of 3 m, 10 m, or 30 m. If the standard requires larger measuring distances for a given frequency, the results are extrapolated according to section 15.31 (f) (2) [2]. The final measurement is performed with an EMI receiver set to Quasi-Peak detector, except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an Average detector is used according section 15.209 (d) [2].

At the frequencies, which were detected during the preliminary measurements, the final measurement is performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum level value is found.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth	Measuring time
9 kHz to 150 kHz	200 Hz	1 s
150 kHz to 30 MHz	9 kHz	1 s



Procedure final measurement:

The following procedure is used:

- 1) Monitor the selected frequencies from the preliminary measurement with the measuring antenna facing the EUT and an EUT azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals.
- 3) Rotate the measuring antenna and repeat steps 1 to 2 until the maximum value is found and note it.
- 4) If the EUT is portable or ceiling mounted, repeat steps 1 to 3 with other orientations (x,y,z) of the EUT.

### 5.1.3 Radiated: 30 MHz to 1 GHz

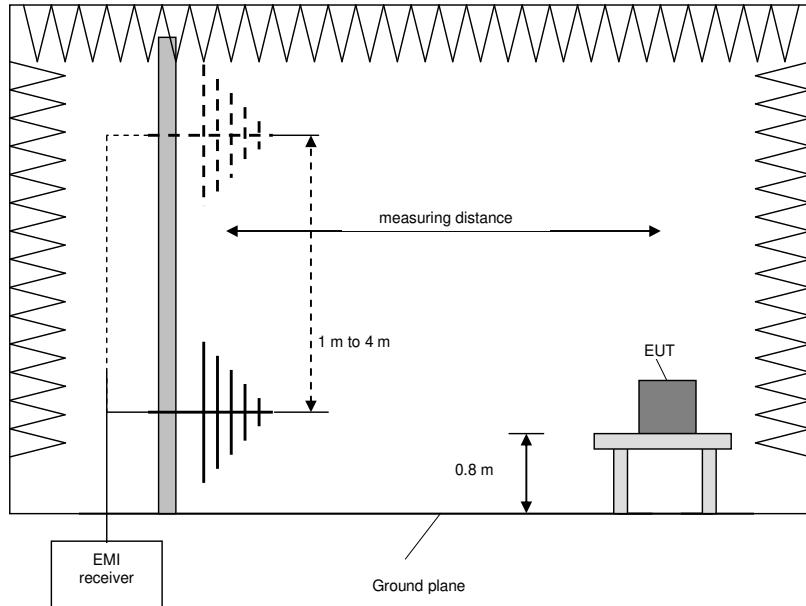
#### 5.1.3.1 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	-	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	1 s	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	1 s	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 3) Rotate the EUT by 360° to maximize the detected signals.
- 4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
- 5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
- 6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

## 5.1.4 Radiated: 1 GHz to 40 GHz

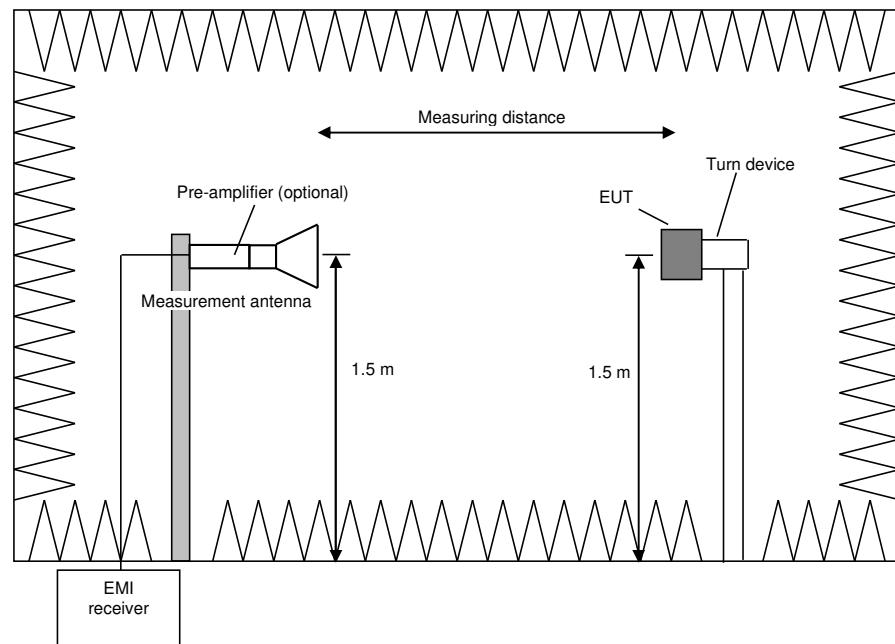
### 5.1.4.1 Preliminary and final measurement 1 to 40 GHz

The preliminary and final measurements are performed in a fully anechoic chamber at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting turn device at the height of 1.5 m. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 ° and the measuring antenna is set to horizontal and vertical polarization to find the maximum level of emissions. After these steps, the measurement is repeated after reorientating the EUT in 30 ° steps.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	1 - 40 GHz	250 kHz	1 MHz	-	Peak Average
Final measurement	1 - 40 GHz	-	1 MHz	100 ms	Peak Average



#### Procedure preliminary measurement:

The following procedure is used:

- 1) Monitor the frequency range at horizontal polarisation of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 2) Rotate the EUT by 360° to maximize the detected signals.
- 3) Repeat steps 1 to 2 with the vertical polarisation of the measuring antenna.
- 4) Repeat steps 1 to 3 with the EUT reorientated by an angle of 30° (60°, 90°, 120° and 150°), according to 6.6.5.4 in [1].
- 5) The highest values for each frequency are saved by the software, including the measuring antenna polarization, the turntable azimuth and the turn device elevation for that value.

#### Procedure final measurement:

The following procedure is used:

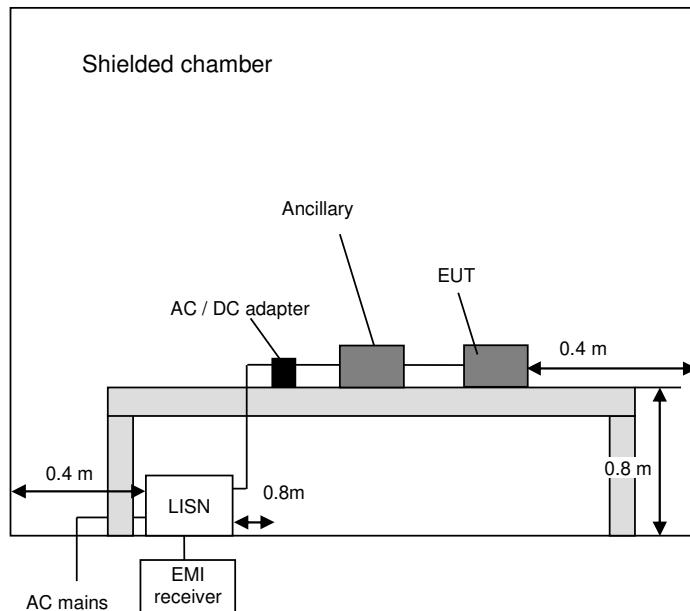
- 1) Set the turntable and the turn device to the position which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna to the polarisation which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyser to EMI mode with Peak and Average detector activated.
- 4) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The final measurement is performed at the worst-case turntable azimuth.
- 6) Repeat steps 1 to 5 for each frequency detected during the preliminary measurements.

#### 5.1.5 Conducted: AC power line

The test is carried out in a shielded chamber. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices are placed directly on the ground plane. In case of DC powered equipment, which is not exclusively powered by a battery, it is connected to the LISN via a suitable AC/DC adaptor. The setup of the equipment under test is in accordance with [1].

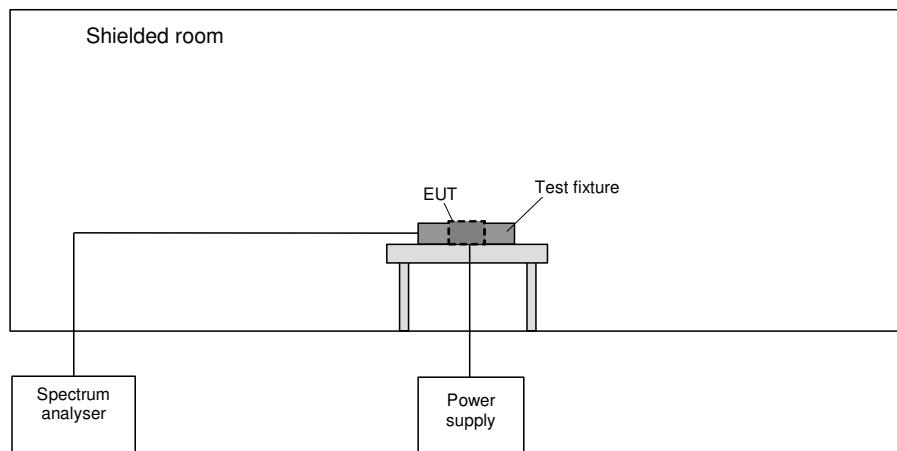
The frequency range 150 kHz to 30 MHz is measured with an EMI receiver set to MAX hold mode with Peak and Average detectors and a resolution bandwidth of 9 kHz. A scan is carried out on the phase and neutral line of the AC mains network. If emissions less than 10 dB below the appropriate limit are detected, these emissions are measured with an Average and Quasi-Peak detector on all lines.

Frequency range	Resolution bandwidth	Measuring time
150 kHz to 30 MHz	9 kHz	5 s

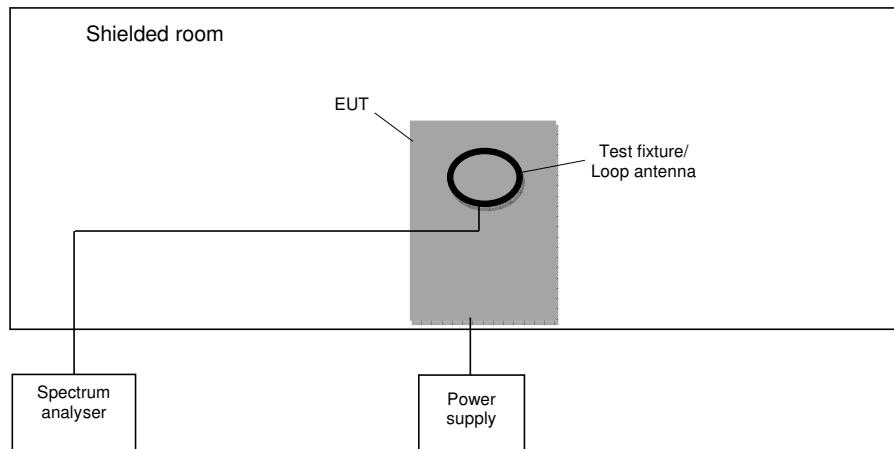


### 5.1.6 Method 99% bandwidth

The test is carried out in a shielded chamber. Table-top devices are set up on a table and the spectrum analyser is connected to a test fixture / loop antenna, which is placed around / on top of the EUT.



The test is carried out in a shielded chamber. Floor standing devices are set up on a floor and the spectrum analyser is connected to a test fixture / loop antenna, which is placed at the antenna of the EUT.



The following procedure will be used for the occupied bandwidth measurement according to [1]:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in 4.1.5.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.

## 5.2 99 % bandwidth

### 5.2.1 Test setup (99 % bandwidth)

Test setup (99 % bandwidth)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Radiated: Test fixture	5.1.1	-
<input type="checkbox"/>	Test setup (antenna port conducted)	-	-

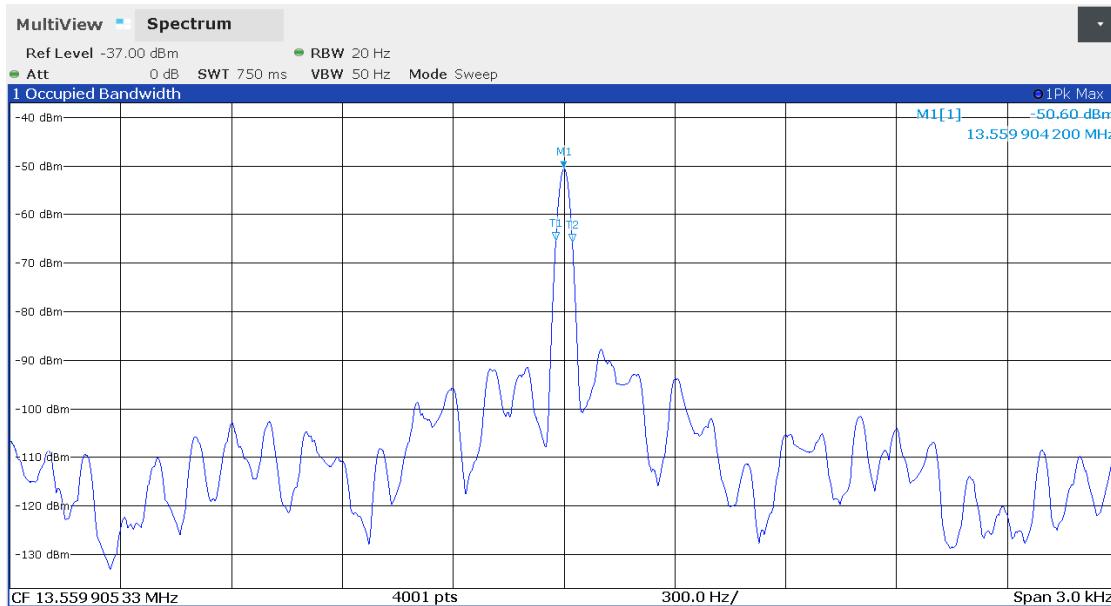
### 5.2.2 Test method (99 % bandwidth)

Test method (99 % bandwidth)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
<input checked="" type="checkbox"/>	6.9.3	Occupied bandwidth – power bandwidth (99%) measurement procedure	-	-

### 5.2.3 Test results (99 % bandwidth)

Ambient temperature:	22 °C
Relative humidity:	47 %

Date:	13.06.2025
Tested by:	Y. KHALEK



$F_L$	$F_U$	BW ( $F_U - F_L$ )
13.559882818 MHz	13.559927686 MHz	44.9 Hz

Test result: Passed

Test equipment (please refer to chapter 7 for details)
20 - 22

## 5.3 Radiated emissions

### 5.3.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Radiated: 9 kHz to 30 MHz / 30 MHz to 1 GHz	5.1.2 / 5.1.3	-

### 5.3.2 Test method (Maximum unwanted emissions)

Test method (radiated) see sub-clause 5.1.2 / 5.1.3 as described herein

### 5.3.3 Test results (Maximum unwanted emissions)

#### 5.3.3.1 Test results preliminary measurement 9 kHz to 30 MHz

Ambient temperature:	23 °C	Date:	07.07.2025
Relative humidity:	59 %	Tested by:	Y. KHALEK

Position of EUT: For tests for f between 9 kHz to 30 MHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: The measurement value was already corrected by 40 dB/decade as described in 47 CFR 15.31(f)(2) regarding to the measurement distance as requested in 47 CFR 15.209(a)

Remark: 2 orthogonal planes were tested separately

Calculations:

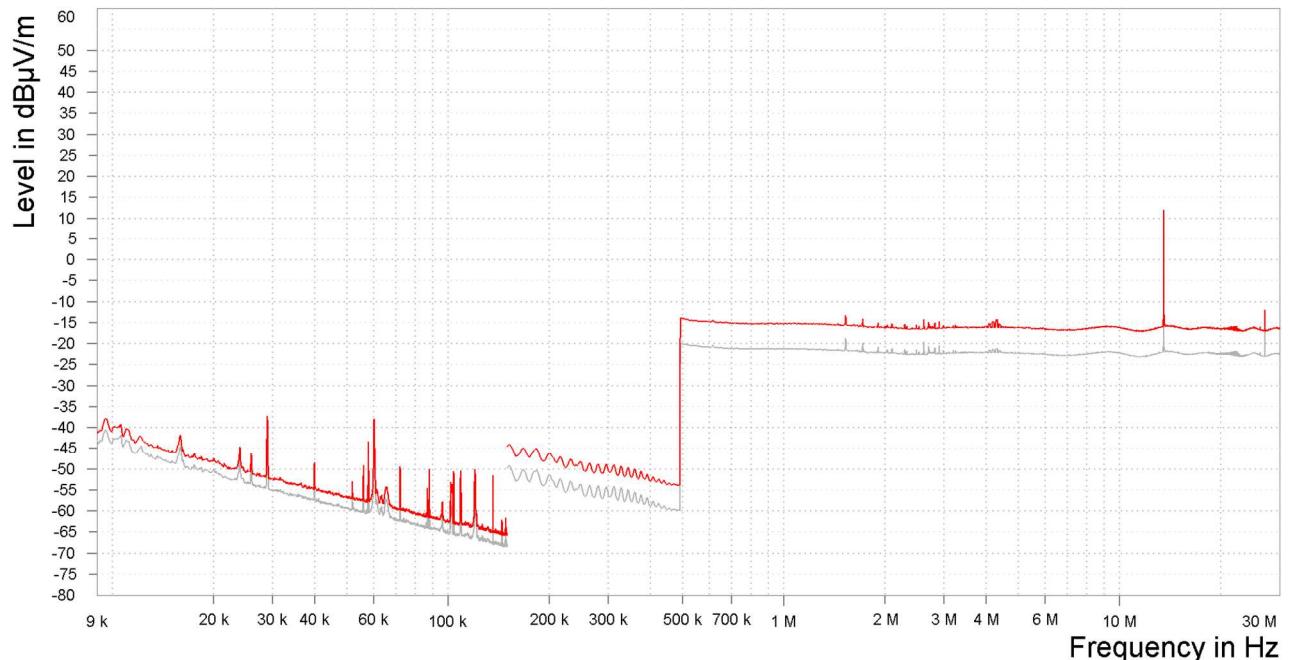
Result @ norm. dist. [dB $\mu$ V/m] = Reading [dB $\mu$ V] + AF [dB/m] - Distance corr. fact. [dB $\mu$ V/m]

Result @ norm. dist. [dB $\mu$ A/m] = Result @ norm. dist. [dB $\mu$ V/m] - 20 x log<sub>10</sub>(377 Ω)

Margin [dB] = Limit [dB( $\mu$ V| $\mu$ A)/m] - Result [dB( $\mu$ V| $\mu$ A)/m]

**Worst case plot:**

Spurious emissions from 9 kHz to 30 MHz (operation mode 2 - standing):



Remark: There were no emissions closer than 20 dB to the limit.

### 5.3.3.2 Test results final measurement 9 kHz to 30 MHz

Ambient temperature:	18 °C
Relative humidity:	72 %

Date:	07.07.2025
Tested by:	Y. KHALEK

The results of the standard subsequent measurement on the outdoor test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 30 | 300 m measuring distance.

Results 9 kHz - 30 MHz												
Frequency [MHz]	Reading @ measuring distance [dB(µV)]	Result @ norm. distance [dB(µV/m)]	Result @ norm. distance [dB(µA/m)]	Limit acc. 15.209	Limit acc. RSS-Gen Table 6 [dB(µA/m)]	Margin	Detector	Antenna factor [dB/m]	Measuring distance [m]	Normative distance [m]	Distance correction factor [dB]	Position #
13.560	30.9	11.8	-39.7	29.50	-21.9	17.7	QP	19.9	3	30	40	2

Result @ norm dist. = Reading + Antenna factor - Distance correction factor;

Remark:

The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of  $377 \Omega$ .

For example, the measurement frequency X kHz resulted in the level of Y [dB $\mu$ V/m], which is equivalent to  $Y - 51.5 = Z$  [dB $\mu$ A/m], which was the same margin, W [dB], to the corresponding RSS-GEN [4] Table 6 as it has to the 15.209(a) limit.

Remark: At 10 m measuring distance the signal of the EUT was below the sensitivity of the measuring system.

Test result: Passed

Test equipment (please refer to chapter 7 for details)
6, 7, 17 – 19

### 5.3.3.3 Test results (30 MHz – 1 GHz)

Ambient temperature:	24 °C
Relative humidity:	29 %

Date:	12.05-14.05.2025
Tested by:	Y. KHALEK

Position of EUT: For tests for  $f$  between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: 2 orthogonal planes were tested separately

Calculations:

Result [dB $\mu$ V/m] = Reading [dB $\mu$ V] + Correction [dB $\mu$ V/m]

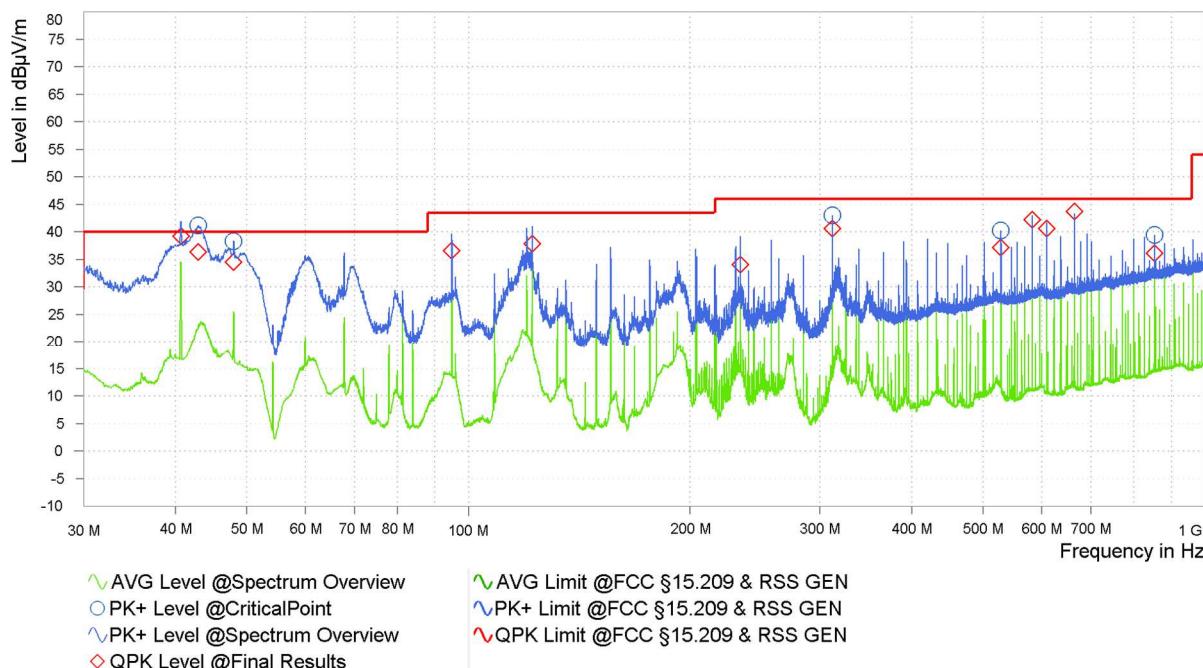
Correction [dB $\mu$ V/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dB $\mu$ V/m] - Result [dB $\mu$ V/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with “ $\diamond$ ” are the measured results of the standard subsequent measurement in a semi-anechoic chamber.

#### Worst case plot:

Spurious emissions from 30 MHz to 1 GHz (operation mode 2 - Standing):



### Result tables:

Worst-case (Operation mode 2):

Frequency [MHz]	Result (QP) [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Correction [dB/m]	Height [m]	Azimuth [deg]	Pol. (H/V)	Position #
40.680	39.18	40.00	0.82	19.85	1.00	372	V	2
42.940	36.29	40.00	3.71	18.28	1.00	219	V	2
47.990	34.51	40.00	5.49	14.91	1.00	372	V	2
94.920	36.60	43.50	6.90	17.03	1.00	-2	V	2
122.040	37.76	43.50	5.74	17.36	1.06	25	V	2
233.970	34.04	46.00	11.96	16.81	1.30	258	H	2
311.900	40.59	46.00	5.41	19.27	1.00	232	H	2
527.930	37.07	46.00	8.93	24.62	1.00	-6	V	2
583.080	42.19	46.00	3.81	25.53	1.40	96	H	2
610.200	40.56	46.00	5.44	25.84	1.24	216	H	2
664.440	43.70	46.00	2.30	26.69	1.14	152	H	2
854.270	36.04	46.00	9.96	29.02	1.00	152	H	2

Test result: Passed

Test equipment (please refer to chapter 7 for details)

6 - 16

## 5.4 AC power-line conducted emissions

### 5.4.1 Test setup (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Conducted: AC power line	5.1.5	-
<input type="checkbox"/>	Not applicable, because ...	-	-

### 5.4.2 Test method (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)				
Used	Clause [1]	Name of method	Sub-clause	Comment
<input type="checkbox"/>	6.2	Tabletop equipment testing	5.1.5	Provided AC switching power adaptor
<input type="checkbox"/>	6.2	Floor-standing equipment testing	-	-

The AC power adaptor provided by the test laboratory was used for the tests: bel HC24-2.4AG  
 The power adaptor itself was supplied by 120V<sub>AC</sub> 60Hz.

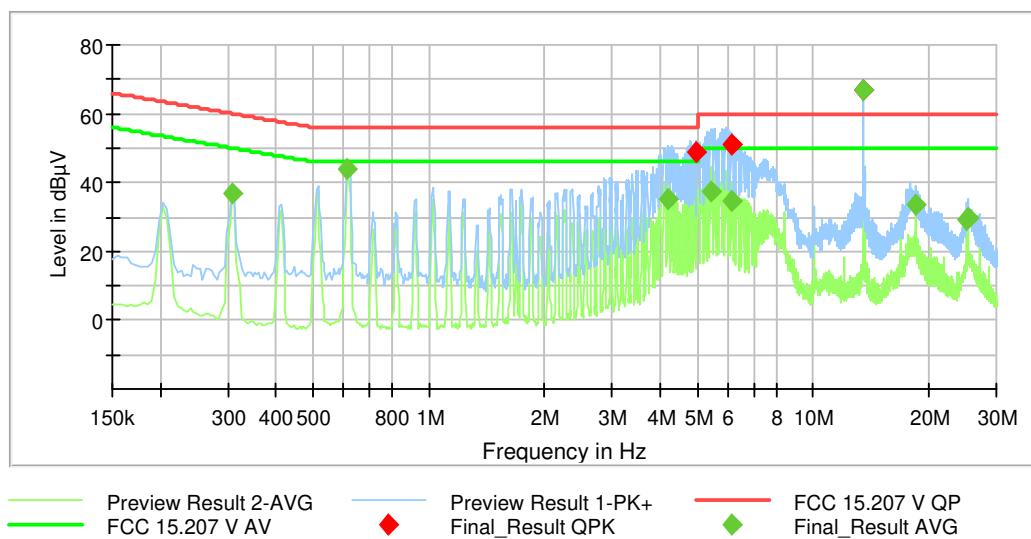
## Test results (Conducted emissions on power supply lines)

Ambient temperature:	22 °C
Relative humidity:	44 - 58%

Date:	23.05. – 11.06.2025
Tested by:	Y. KHALEK

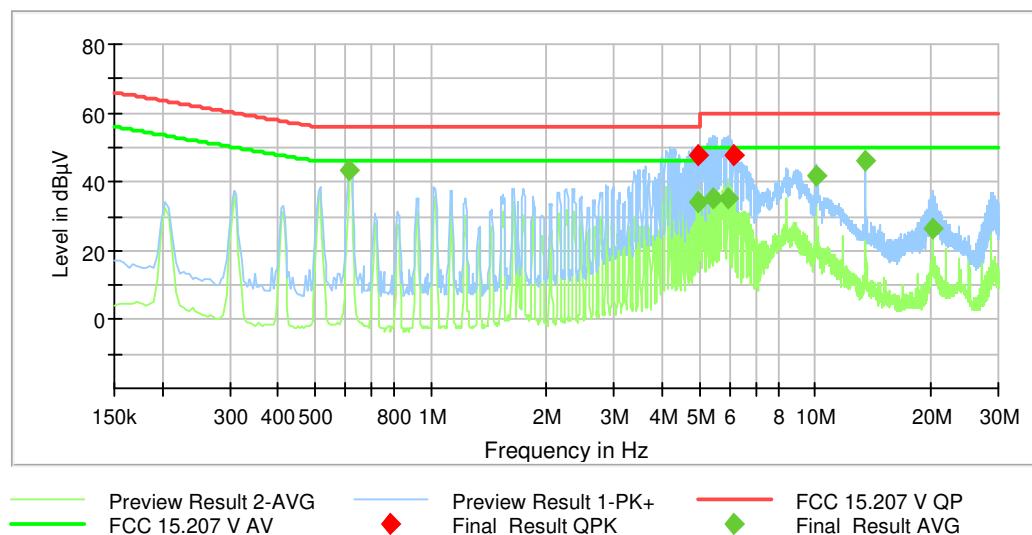
The curves in the diagrams below only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by ♦ and the average measured points by ♦.

Test results for EUT with antenna



Frequency [MHz]	QuasiPeak [dB(μV)]	Average [dB(μV)]	Limit [dB(μV)]	Margin [dB]	Line	PE	Corr. [dB]
0.307500	---	37.06	50.04	12.98	L1	GND	9.9
0.614400	---	43.77	46.00	2.23	L1	GND	9.9
4.212600	---	35.08	46.00	10.92	L1	GND	10.3
4.937100	48.97	---	56.00	7.03	L1	GND	10.3
5.451900	---	37.63	50.00	12.37	N	GND	10.4
6.122400	50.81	---	60.00	9.19	L1	GND	10.4
6.175500	---	34.51	50.00	15.49	L1	GND	10.4
13.560000	---	66.75	50.00	-16.75	L1	GND	10.7
13.560000	66.82	---	60.00	-6.82	L1	GND	10.7
18.558600	---	33.35	50.00	16.65	N	GND	10.9
25.003500	---	29.00	50.00	21.00	N	GND	11.1
25.306800	---	29.78	50.00	20.22	N	GND	11.1

Test results for EUT with dummy load



Frequency [MHz]	QuasiPeak [dB(μV)]	Average [dB(μV)]	Limit [dB(μV)]	Margin [dB]	Line	PE	Corr. [dB]
0.614400	---	43.44	46.00	2.56	L1	GND	9.9
4.936200	---	34.22	46.00	11.78	L1	GND	10.3
4.946100	47.69	---	56.00	8.31	L1	GND	10.3
5.417700	---	35.19	50.00	14.81	N	GND	10.4
5.923500	---	35.38	50.00	14.62	L1	GND	10.4
6.143100	47.49	---	60.00	12.51	L1	GND	10.4
10.121100	---	41.74	50.00	8.26	L1	GND	10.6
13.560000	---	46.33	50.00	3.67	L1	GND	10.7
20.242500	---	26.50	50.00	23.50	N	GND	11.0

Test result: Passed

Test equipment (please refer to chapter 7 for details)

1 - 7

## 6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) $U_{lab}$
Bandwidth measurements	-	$9.0 \times 10^{-8}$
Conducted emissions from 150 kHz to 30 MHz with LISN	CISPR 16-4-2	2.8 dB

Radiated measurements		
Bandwidth measurements		
(Semi-) Anechoic chamber	-	$9.0 \times 10^{-8}$
OATS	-	$9.0 \times 10^{-8}$
Test fixture	-	$9.1 \times 10^{-8}$
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
OATS		
Field strength measurements below 30 MHz on OATS without ground plane	-	4.4 dB

## 7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM No.	Cal Date	Cal Due
1	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
2	EMI Receiver	480138ESIB 26	Rohde & Schwarz	100292	481182	22.02.2024	02.2026
3	LISN	NSLK8128	Schwarzbeck	8128161	480138	28.02.2024	02.2026
4	Transient Filter Limiter	CFL 9206A	Teseq GmbH	38268	481982	Calibration not necessary	
5	EMI Software	EMC32 V10.60.20	Rohde & Schwarz	100061	481022	Calibration not necessary	
6	Digital multimeter	971A	Hewlett Packard	JP39009358	480721	09.10.2024	10.2025
7	AC source	AC6803A	Keysight	JPVJ002509	482350	Calibration not necessary	
8	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
9	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	24.04.2024	04.2027
10	Turntable	TT3.0-3t	Maturo	825/2612/01	483224	Calibration not necessary	
11	Antenna support	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
12	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
13	RF Switch Matrix	OSP220	Rohde & Schwarz	-	482976	Calibration not necessary	
14	Cable 416	Sucoflex 116	Huber & Suhner	500651/119	-	Calibration not necessary	
15	Systemsoftware Elektra M276	Elektra 5.11	Rohde & Schwarz	100970	482972	Calibration not necessary	
16	EMI Testreceiver	ESW44	Rohde & Schwarz	101819	483149	26.02.2024	02.2026
17	Outdoor test site	-	PHOENIX-Testlab	-	480293	Calibration not necessary	
18	Loop antenna	HFH2-Z2	Rohde & Schwarz	100417	481912	21.02.2024	02.2026
19	EMI Receiver / Spectrum Analyser	ESI 40	Rohde & Schwarz	100064/040	480355	20.02.2024	02.2026
20	Loop Antenna Ø = 110 mm	-	Phoenix Test-Lab	-	410084	Calibration not necessary	
21	Spectrum Analyser	FSW43	Rohde & Schwarz	102954	483957	10.07.2024	07.2026
22	Power Supply	TOE8852 (DC)	Toellner	51712	480233	Calibration not necessary	

## 8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	08.11.2022	07.11.2025
OATS Outdoor	480293	9 kHz – 30 MHz	-	ANSI C63.4-2014	-	-
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2014 ANSI C63.4a-2017	01.03.2023	28.02.2026

## 9 Report History

Report Number	Date	Comment
F250464E2	02.09.2025	Initial Test Report
-	-	-
-	-	-

## 10 List of Annexes

Annex A	Test Setup Photos	7 pages
Annex B	EUT External Photos	8 pages
Annex C	EUT Internal Photos	5 pages

----- end of test report -----