

Test Report

Report Number:

F212425E1

Equipment under Test (EUT):

TB-M12-H1147

Applicant:

Werner Turck GmbH & Co. KG

Manufacturer:

Werner Turck GmbH & Co. KG



Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

- [1] **ANSI C63.10: 2013** 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 10 (December 2019)**
Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- [4] **RSS-Gen Issue 5 (March 2019) Amendment 1**
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.

Tested and written
by:

Signature

Reviewed and
approved by:

Signature

This test report is only valid in its original form.

Any reproduction of its contents in extracts without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

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 | 5 |
| 1.1 Applicant..... | 5 |
| 1.2 Manufacturer | 5 |
| 1.3 Test Laboratory | 5 |
| 1.4 EUT (Equipment under Test) | 6 |
| 1.5 Technical Data of Equipment | 7 |
| 1.6 Dates | 8 |
| 2 Operational States | 8 |
| 3 Additional Information | 9 |
| 4 Overview..... | 9 |
| 5 Results..... | 10 |
| 5.1 Conducted emissions on AC power supply lines | 10 |
| 5.1.1 Test method..... | 10 |
| 5.1.2 Test results | 11 |
| 5.2 Radiated emissions | 12 |
| 5.2.1 Test method..... | 12 |
| 5.2.2 Test results preliminary measurement 9 kHz to 1 GHz..... | 16 |
| 5.2.3 Test results final measurement 9 kHz to 30 MHz..... | 17 |
| 5.2.4 Test results final measurement 30 MHz to 1 GHz..... | 18 |
| 5.3 99 % bandwidth..... | 19 |
| 5.3.1 Test method..... | 19 |
| 5.3.2 Test results | 20 |
| 6 Test Equipment used for Tests | 21 |
| 7 Test site Validation | 22 |
| 8 Report History..... | 22 |
| 9 List of Annexes | 22 |

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) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06 and D-PL-17186-01-05, 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-M12-H1147 |
| Model number: * | None (engineering sample) |
| Order number: * | 100003024 |
| FCC ID: * | YQ7-TBM12 |
| IC certification number: * | 8821A-TBM12 |
| PMN: * | TB-M12-H1147 Series |
| HVIN: * | 7390/2-12879701 |
| FVIN: * | 1V98 |

| | EUT number | | |
|---------------------|---------------------------|---|---|
| | 1 | 2 | 3 |
| Serial number: * | None (engineering sample) | - | - |
| PCB identifier: * | 7390/2 | - | - |
| Hardware version: * | -- | - | - |
| Software version: * | VN1.98 | - | - |

* Declared by the applicant

One EUT was used for the tests.

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 * | 13.56 MHz | | |
| Channel spacing: * | Not applicable (one channel operation) | | |
| Antenna characteristics: * | Average loop area: $\{\pi \times (4\text{mm})^2\} = 50\text{mm}^2$ | | |
| Antenna gain: * | -30 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: * | $U_{\text{nom}} = 24.0 \text{ V}_{\text{DC}}$ | $U_{\text{min}} = 10.0 \text{ V}_{\text{DC}}$ | $U_{\text{max}} = 30.0 \text{ V}_{\text{DC}}$ |
| 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 | |
|----------------------------|--|
| AC adapter *2 | PHOENIX CONTACT MINI-PS.100-240AC/24DC/1.3 |
| | |
| | |

*2 Provided by the laboratory

| Ancillary equipment | |
|---------------------|--|
| TAG *1 | Type TURCK 37S114 5AZ |
| Gateway *1 | BL67 (consisting of PG-DP, 2RFID-S and 8XSG-PD). |

*1 Provided by the applicant

1.6 Dates

| | |
|---------------------------------|------------|
| Date of receipt of test sample: | 23.11.2021 |
| Start of test: | 25.11.2021 |
| End of test: | 14.03.2022 |

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.

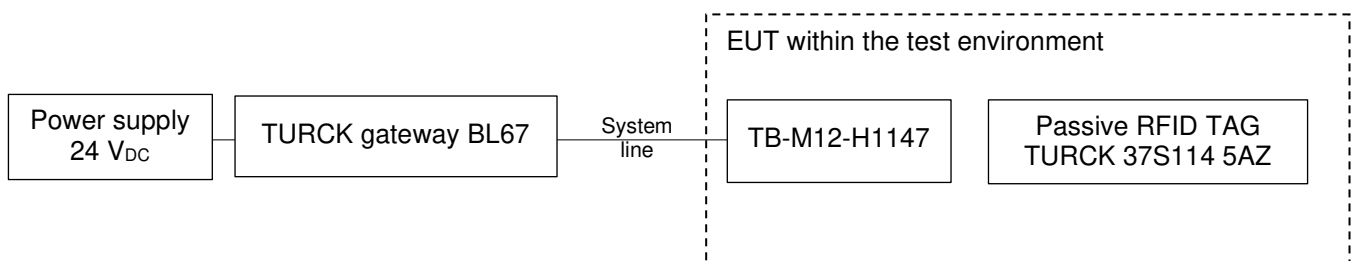
The following states were defined as the operating conditions:

To set the EUT in operation, it was connected to a TURCK gateway BL67, which was placed outside the measurement environment via a filter type Epcos B84312-C30-H3 of the anechoic chamber. During all tests the EUT was supplied with a 24.0 V_{DC} 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. For details of the different positions, refer annex A of this test report.

The system was setup as follows:



The radiated emission measurement is divided into three stages:

1. A preliminary measurement inside a semi anechoic chamber with 3 m distance;
2. A final measurement inside a semi anechoic chamber with 3 m distance for frequencies above 30 MHz;
3. A final measurement on an outdoor test site without reflecting groundplane and 3 m / 10 m distance for frequencies below 30 MHz.

3 Additional Information

The EUT was not labeled.

4 Overview

| Application | Frequency range [MHz] | FCC 47 CFR Part 15 section [2] | RSS-Gen, Issue 5 [4] and RSS-210, Issue 10 [3] | Status |
|------------------------------------|-----------------------|--------------------------------|--|----------|
| Conducted emissions on supply line | 0.15 – 30 | 15.207 (a) | 8.8 [4] | Passed |
| Radiated emissions | 0.009 – 1000 ** | 15.205 (a) 15.209 (a) | 8.9 and 8.10 [4] 7.1 and 7.3 [3] | Passed |
| 99 % bandwidth | 13.56 | - | 6.7 [4] | Passed |
| Antenna requirement | - | 15.203 [2] | 6.8 [4] | Passed * |

*: 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

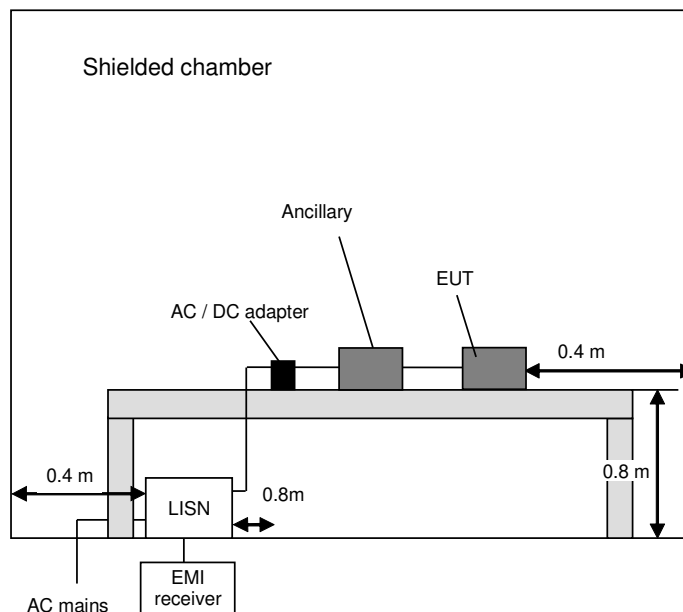
5.1 Conducted emissions on AC power supply lines

5.1.1 Test method

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 to [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 |
|-------------------|----------------------|
| 150 kHz to 30 MHz | 9 kHz |

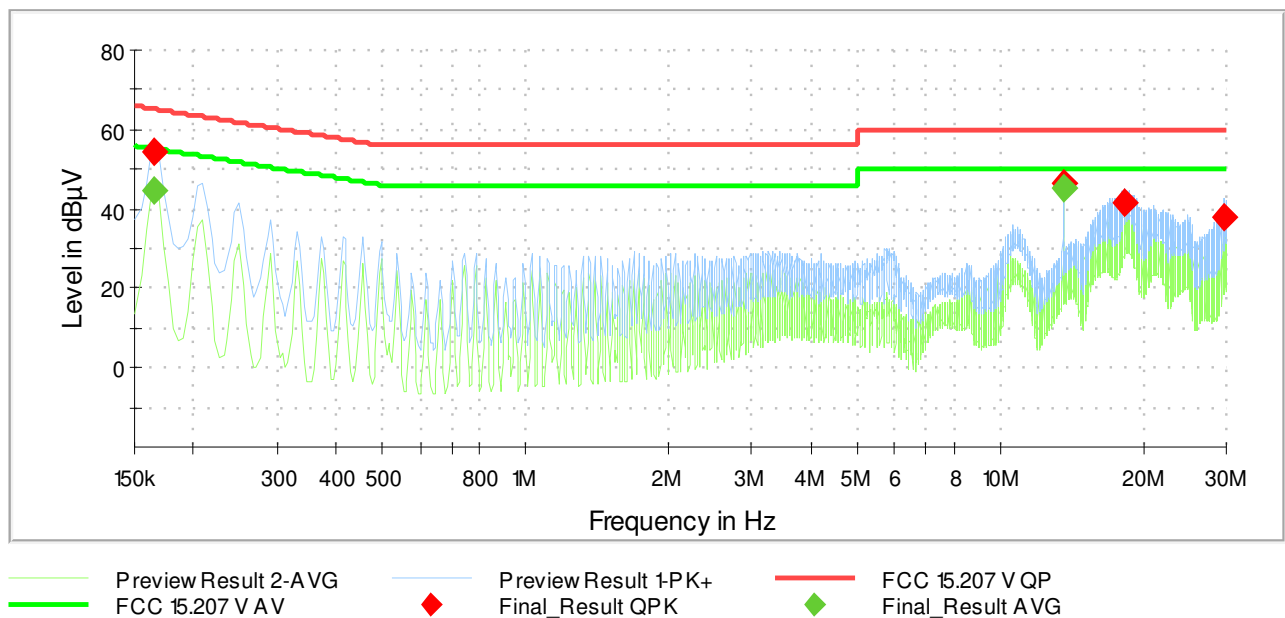


5.1.2 Test results

| | |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity: | 32 % |

| | |
|------------|------------|
| Date: | 24.01.2022 |
| Tested by: | Th. KÜHN |

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 ◆



| Frequency in MHz | QuasiPeak in dB(µV) | Average in dB(µV) | Limit in dB(µV) | Margin in dB | Meas. Time in ms | Bandwidth in kHz | Line | PE | Corr. in dB |
|------------------|---------------------|-------------------|-----------------|--------------|------------------|------------------|------|-----|-------------|
| 0.165300 | --- | 44.88 | 55.19 | 10.31 | 5000.0 | 9.000 | L1 | GND | 9.8 |
| 0.165300 | 54.44 | --- | 65.19 | 10.76 | 5000.0 | 9.000 | L1 | FLO | 9.8 |
| 13.560000 | --- | 45.49 | 50.00 | 4.51 | 5000.0 | 9.000 | L1 | GND | 10.7 |
| 13.560000 | 46.54 | --- | 60.00 | 13.46 | 5000.0 | 9.000 | L1 | FLO | 10.7 |
| 18.285000 | 41.71 | --- | 60.00 | 18.29 | 5000.0 | 9.000 | L1 | FLO | 10.9 |
| 29.718600 | 37.86 | --- | 60.00 | 22.14 | 5000.0 | 9.000 | L1 | GND | 11.2 |

Measurement uncertainty ± 2.76 dB

Remark: The limits of FCC part 15.209 [2] are identical to the general limits of the RSS-Gen [4]

Test result: Passed

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 1 – 7 |

5.2 Radiated emissions

5.2.1 Test method

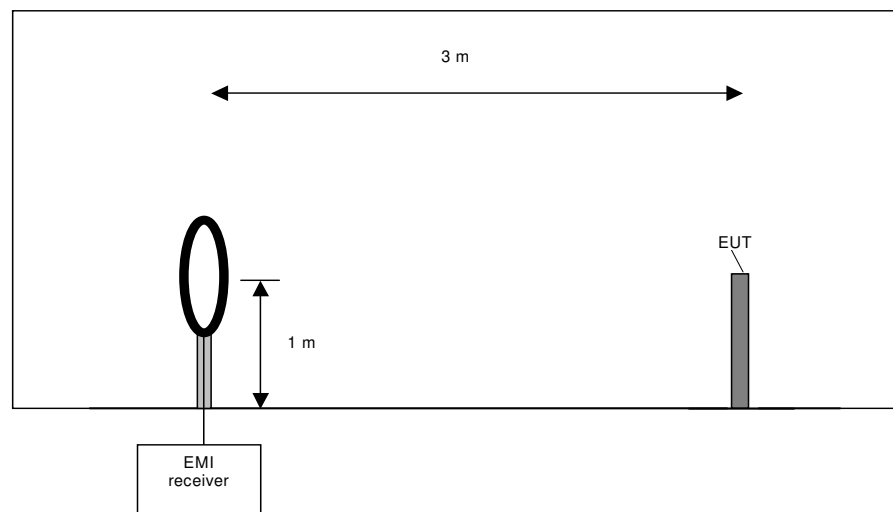
Preliminary measurement 9 kHz to 30 MHz

In the first stage a preliminary measurement is performed in an anechoic chamber with 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 to [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.

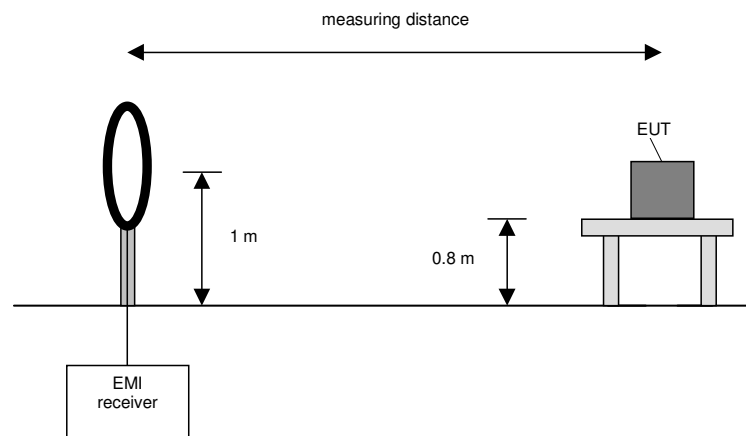
Final measurement 9 kHz to 30 MHz

In the second stage a final measurement is performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m or 30 m. In the case where larger measuring distances are required the results are extrapolated based on the values measured on the closer distances 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 |
|-------------------|----------------------|
| 9 kHz to 150 kHz | 200 Hz |
| 150 kHz to 30 MHz | 9 kHz |



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.

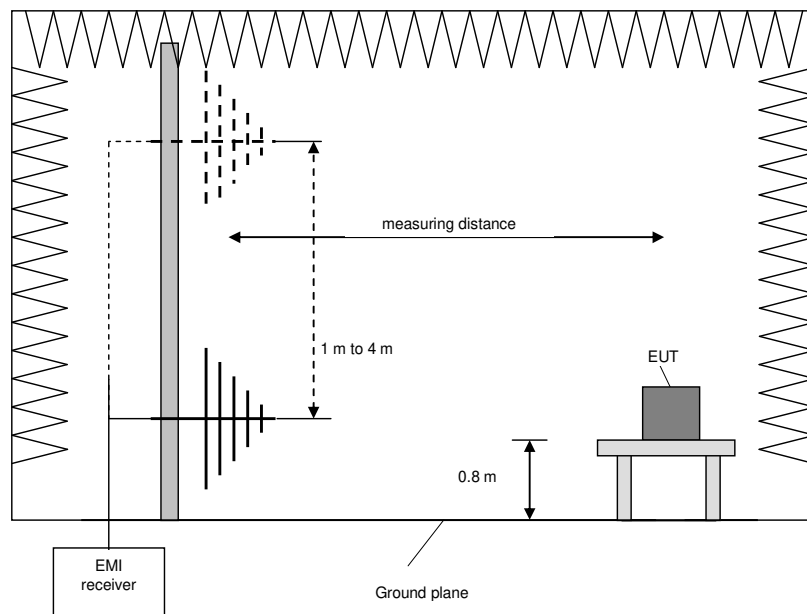
Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane in a 3 m distance.

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 | Resolution bandwidth |
|-------------------------|-----------------|----------------------|
| Preliminary measurement | 30 MHz to 1 GHz | 100 kHz |
| Frequency peak search | + / - 1 MHz | 10 kHz |
| Final measurement | 30 MHz to 1 GHz | 120 kHz |



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarisation 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 polarisation 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:

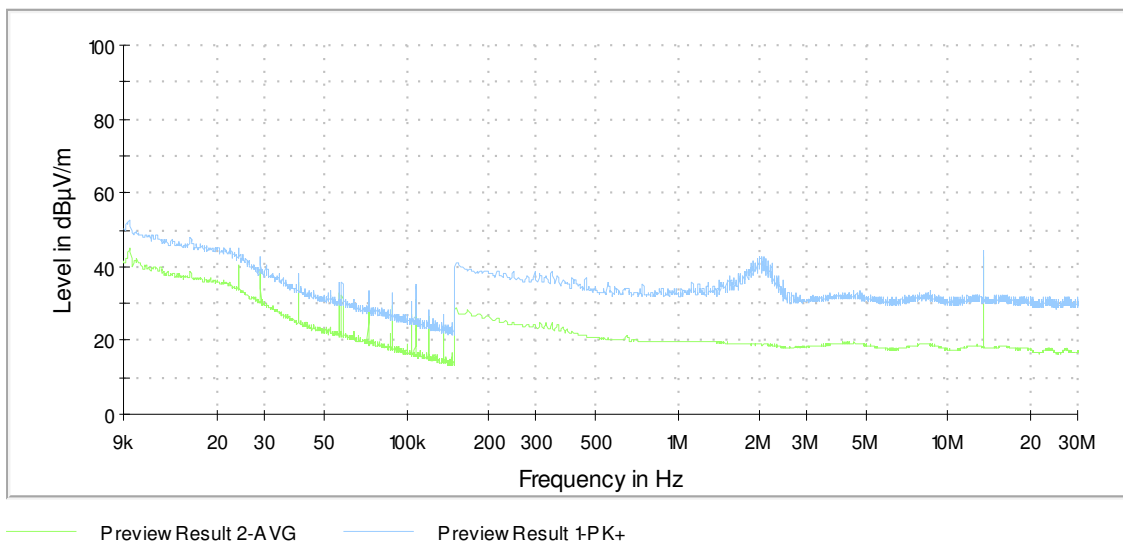
- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced RBW with +/- 10 times the RBW of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, 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.

5.2.2 Test results preliminary measurement 9 kHz to 1 GHz

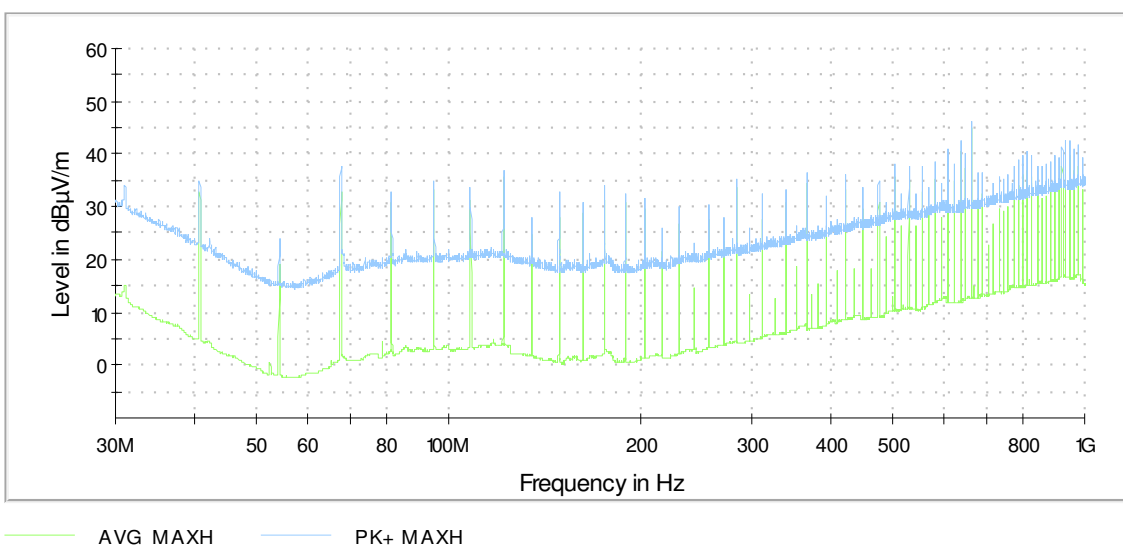
| | |
|----------------------|-------|
| Ambient temperature: | 21 °C |
| Relative humidity: | 27 % |

| | |
|------------|------------|
| Date: | 25.11.2022 |
| Tested by: | Y. KHALEK |

The curves in the diagrams only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with various EUT and antenna positions. The worst case was at the EUT horizontal position.



Spurious emissions from 9 kHz to 30 MHz



Spurious emissions from 30 MHz to 1 GHz

The following emission was found according to [2] and [3] (fundamental of transmitter): 13.56 MHz.

The results of the final measurement were presented on the following pages. The measured results (levels) refer to the above-mentioned standard taking into account the specified requirements for a 3 m measuring distance.

The following emissions were found during the preliminary measurement:

31.100 MHz, 40.680 MHz, 67.800 MHz, 94.920 MHz, 122.040 MHz, 176.280 MHz and 664.440 MHz

A final measurement on these frequencies has to be carried out. The final results are presented in the following.

Remark: No further emissions caused by the equipment under test were found.

5.2.3 Test results final measurement 9 kHz to 30 MHz

| | |
|----------------------|------|
| Ambient temperature: | 3 °C |
| Relative humidity: | 90 % |

| | |
|------------|------------|
| Date: | 25.11.2021 |
| 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 9kHz - 30 MHz | | | | | | | | | | | | |
|-----------------------|--------------------------|--------------------------|--------------------------|-------------------|----------------------------|----------|----------|----------------|--------------------|--------------------|-------------------------------|----------|
| Frequency | Reading @ meas. distance | Result* @ norm. distance | Result* @ norm. distance | Limit acc. 15.209 | Limit acc. RSS-Gen table 6 | Margin** | Detector | Antenna factor | Measuring distance | Normative distance | Distance correction factor*** | Position |
| [MHz] | [dB(μV)] | [dB(μV/m)] | [dB(μA/m)] | [dB(μV/m)] | [dB(μA/m)] | [dB] | | [dB/m] | [m] | [m] | [dB] | |
| 13.560 | 23.5 | 3.4 | -48.1 | 29.5 | -21.9 | 26.1 | QP | 19.9 | 3 | 30 | 40 | H |

Measurement uncertainty: 4.36 dB

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

Result [dBμA/m] = Result [dBμV/m] - 20*log(377 Ω)

** Margin = Limit [dBμ{V|A}/m] - Result @ norm dist.

*** 40dB/decade according Part §15.31 (f) (2)

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

Test result: Passed

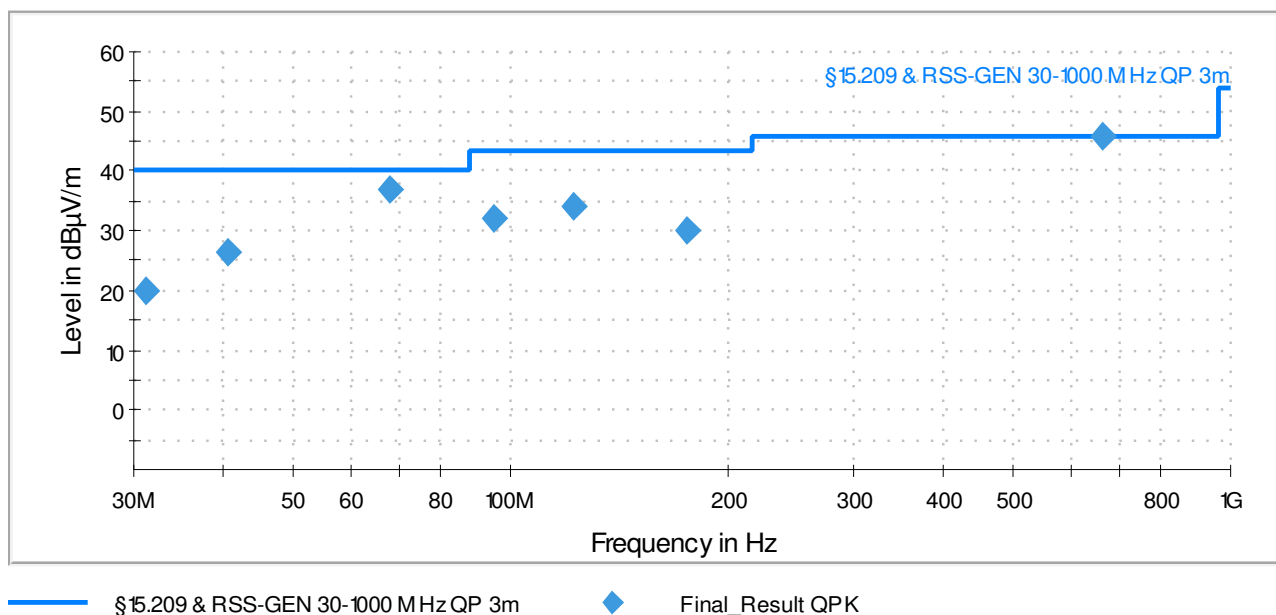
| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 6, 7, 17 – 19 |

5.2.4 Test results final measurement 30 MHz to 1 GHz

| | |
|----------------------|-------|
| Ambient temperature: | 21 °C |
| Relative humidity: | 27 % |

| | |
|------------|------------|
| Date: | 25.11.2021 |
| Tested by: | Y. KHALEK |

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 “◆” are the measured results of the standard subsequent measurement in a semi-anechoic chamber.



The results of the standard subsequent measurement in a semi anechoic chamber 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 3 m measuring distance.

| Frequency in MHz | QuasiPeak in dB(μV/m) | Limit in dB(μV/m) | Margin in dB | Meas. Time in ms | Bandwidth in kHz | Height in cm | Pol | Azimuth in deg | Corr. in dB |
|------------------|-----------------------|-------------------|--------------|------------------|------------------|--------------|-----|----------------|-------------|
| 31.100 | 20.0 | 40.0 | 20.0 | 1000 | 120.000 | 146.0 | V | 112 | 25.3 |
| 40.680 | 26.3 | 40.0 | 13.7 | 1000 | 120.000 | 102.0 | V | 112 | 19.6 |
| 67.800 | 37.0 | 40.0 | 3.0 | 1000 | 120.000 | 157.0 | V | 148 | 14.3 |
| 94.920 | 32.1 | 43.5 | 11.5 | 1000 | 120.000 | 100.0 | V | 272 | 17.1 |
| 122.040 | 34.1 | 43.5 | 9.5 | 1000 | 120.000 | 125.0 | V | 292 | 17.5 |
| 176.280 | 29.9 | 43.5 | 13.6 | 1000 | 120.000 | 150.0 | H | 110 | 16.8 |
| 664.440 | 45.7 | 46.0 | 0.3 | 1000 | 120.000 | 112.0 | H | 142 | 27.1 |

Measurement uncertainty ± 5.12 dB

Test result: Passed

The correction factor was calculated as follows:

Corr. (dB) = cable attenuation (dB) + 6 dB attenuator (dB) + antenna factor (dB)

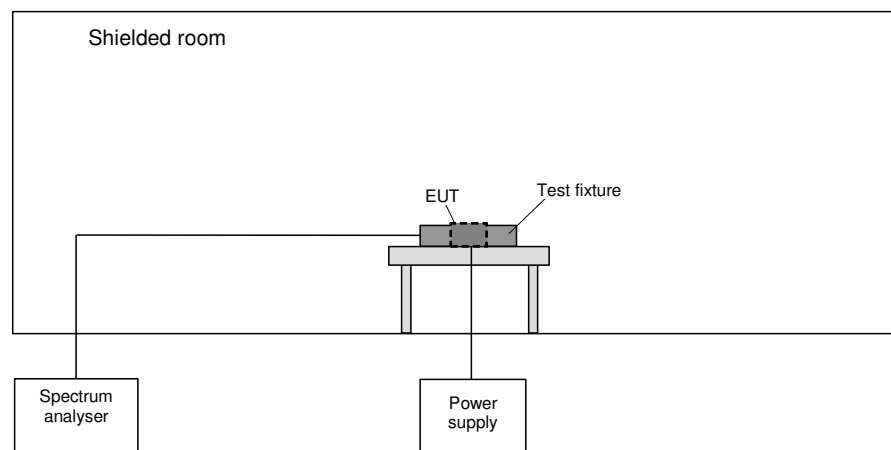
Therefore, the reading can be calculated as follows:

Reading (dB μ V/m) = result QuasiPeak (dB μ V/m) - Corr. (dB)

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 6 - 16 |

5.3 99 % bandwidth

5.3.1 Test method



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

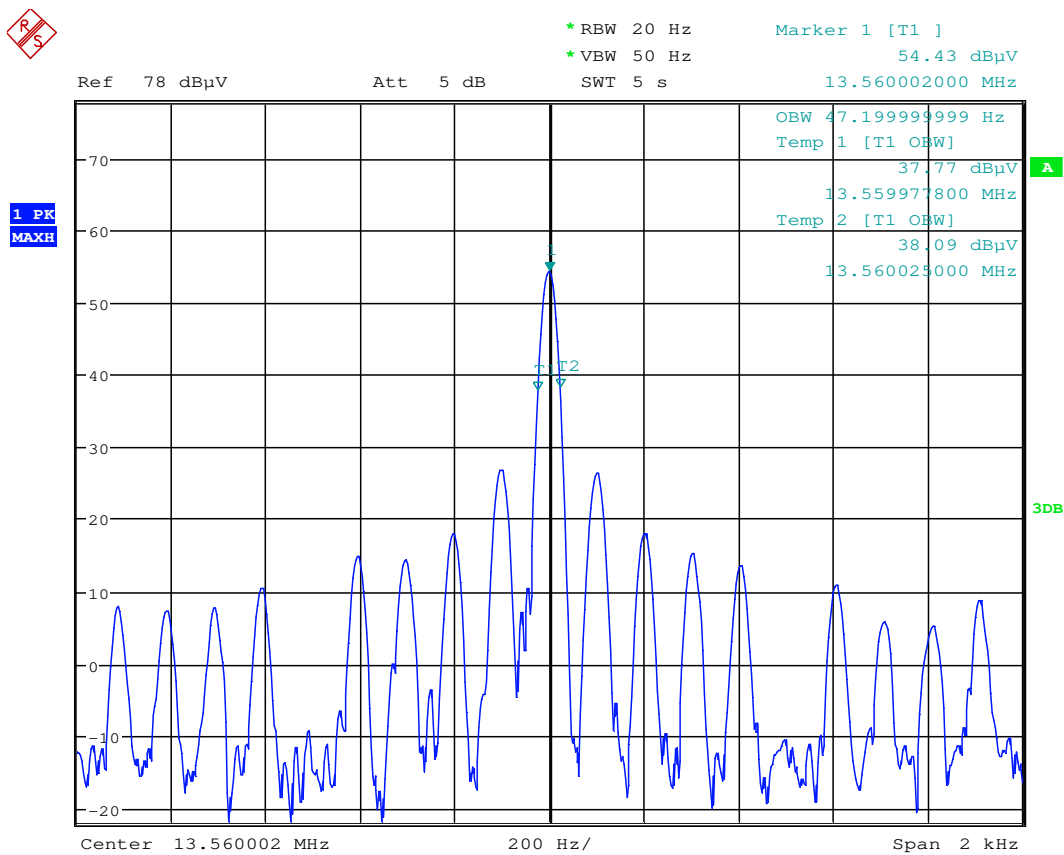
The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure is used for measuring the 99% power bandwidth:

- 1) 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.
- 2) 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.
- 3) 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.
- 4) Step 1) through step 3) might require iteration to adjust within the specified range.

5.3.2 Test results

| | |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity: | 45 % |

| | |
|------------|------------|
| Date: | 14.03.2022 |
| Tested by: | Y. KHALEK |



99% Bandwidth result

| F_L | F_U | BW ($F_U - F_L$) |
|------------------|------------------|--------------------|
| 13.559977800 MHz | 13.560025000 MHz | 47.2 Hz |

Measurement uncertainty < $1 \cdot 10^{-7}$

Test result: Passed

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 20-22 |

6 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 | ESIB 26 | Rohde & Schwarz | 100292 | 481182 | 12.02.2020 | 02.2022 |
| 3 | LISN | NSLK8128 | Schwarzbeck | 8128161 | 480138 | 11.02.2020 | 02.2022 |
| 4 | Transient Filter Limiter | CFL 9206A | Teseq GmbH | 38268 | 481982 | Calibration not necessary | |
| 5 | EMI Software | EMC 32 | Rohde & Schwarz | 100061 | 481022 | Calibration not necessary | |
| 6 | Digital multimeter | 971A | Hewlett Packard | JP39009358 | 480721 | 17.02.2021 | 02.2022 |
| 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 | 18.03.2021 | 03.2024 |
| 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 EMC32 M276 | EMC32 | Rohde & Schwarz | 100970 | 482972 | Calibration not necessary | |
| 16 | EMI Testreceiver | ESW44 | Rohde & Schwarz | 101819 | 483149 | 07.09.2020 | 09.2022 |
| 17 | Outdoor test site | - | PHOENIX-Testlab | - | 480293 | Calibration not necessary | |
| 18 | Loop antenna | HFH2-Z2 | Rohde & Schwarz | 100417 | 480912 | 25.02.2021 | 02.2022 |
| 19 | EMI Receiver / Spectrum Analyser | ESI 40 | Rohde & Schwarz | 100064/040 | 480355 | 25.02.2021 | 02.2022 |
| 20 | Loop Antenna Ø = 110 mm | - | Phoenix Test-Lab | - | 410084 | Calibration not necessary | |
| 21 | Spectrum Analyser | FSU46 | Rohde & Schwarz | 200125 | 480956 | 21.02.2022 | 02.2023 |
| 22 | Power Supply | TOE8852 (DC) | Toellner | 51712 | 480233 | Calibration not necessary | |

7 Test site Validation

| Test equipment | PM. No. | Frequency range | Type of validation | According to | Val. Date | Val Due |
|----------------------------|---------|-----------------|--------------------|---|------------|------------|
| Semi anechoic chamber M276 | 483227 | 30 – 1000 MHz | NSA | ANSI C63.4a-2017 | 03.03.2021 | 02.03.2023 |
| Semi anechoic chamber M276 | 483227 | 1 -18 GHz | SVSWR | CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017 | 25.02.2021 | 24.02.2023 |
| Shielded chamber M4 | 480088 | 9 kHz – 30 MHz | GND-Plane | ANSI C63.4-2014 | 12.05.2020 | 11.05.2022 |

8 Report History

| Report Number | Date | Comment |
|---------------|------------|---------------------|
| F212425E1 | 18.03.2022 | Initial Test Report |
| - | - | - |
| - | - | - |

9 List of Annexes

| | | |
|---------|---------------------|---------|
| Annex A | Test Setup Photos | 8 pages |
| Annex B | External EUT Photos | 2 pages |
| Annex C | Internal EUT Photos | 3 pages |