

# Test Report

Report Number:

**F251884E6**

Equipment under Test (EUT):

**Controlunit PILOT**

Applicant:

**Fronius International GmbH**

Manufacturer:

**Fronius International GmbH**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-00

## References

- [1] **ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 + Errata to C63.10a-2024\***, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices  
\*Remark: This standard is not in the annex of the laboratory yet
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **558074 D01 15.247 Meas Guidance v05r02 (April 2019)**, GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
- [4] **RSS-247, Issue 4 (2025-07)** Digital Transmission Systems, Frequency Hopping Systems and Licence-Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350 MHz, and 5470-5895 MHz bands
- [5] **RSS-Gen, Issue 5 Amendment 2 (2021-02)** 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 [1]. However, the measurement uncertainty is calculated and shown in this test report.

Tested by:

Signature

Written by:

Signature

Reviewed and  
approved by:

Signature

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The test results herein refer only to the tested sample. NMI TESTLAB GmbH is not responsible for any generalizations 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 NMI TESTLAB Logo and the TEST REPORT NUMBER.

| <b>Contents:</b>                              | <b>Page</b> |
|-----------------------------------------------|-------------|
| 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 .....                    | 9           |
| 2.1 Description of function of the EUT .....  | 9           |
| 3 Additional Information .....                | 11          |
| 4 Overview .....                              | 11          |
| 5 Results .....                               | 12          |
| 5.1 Test setups .....                         | 12          |
| 5.2 Duty cycle .....                          | 17          |
| 5.3 DTS band-edge emission measurements ..... | 18          |
| 5.4 Radiated emissions .....                  | 20          |
| 5.5 AC power-line conducted emissions .....   | 26          |
| 6 Measurement Uncertainties .....             | 28          |
| 7 Test Equipment used for Tests .....         | 29          |
| 8 Test site Verification .....                | 30          |
| 9 Report History .....                        | 30          |
| 10 List of Annexes .....                      | 30          |

# 1 Identification

## 1.1 Applicant

|                                                                |                                             |
|----------------------------------------------------------------|---------------------------------------------|
| Name:                                                          | Fronius International GmbH                  |
| Address:                                                       | Günter-Fronius-Straße 1, 4600 Wels-Thalheim |
| Country:                                                       | Austria                                     |
| Name for contact purposes:                                     | Mr. Jan HERNDLER                            |
| Phone:                                                         | +43 7242 241 0                              |
| eMail address:                                                 | herndler.jan@fronius.com                    |
| Applicant represented during the test by the following person: | ---                                         |

## 1.2 Manufacturer

|                                                                   |                                 |
|-------------------------------------------------------------------|---------------------------------|
| Name:                                                             | Fronius International GmbH      |
| Address:                                                          | Fronius Straße 5, 4642 Sattledt |
| Country:                                                          | Austria                         |
| Name for contact purposes:                                        | Mr. Jan HERNDLER                |
| Phone:                                                            | +43 7242 241 0                  |
| eMail address:                                                    | herndler.jan@fronius.com        |
| Manufacturer represented during the test by the following person: | ---                             |

## 1.3 Test Laboratory

The tests were carried out by: **NMi 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: *             | Control and steering unit for solar inverters |
| Model name: *              | Controlunit PILOT                             |
| Model number: *            | 43,0001,3553                                  |
| Order number: *            | N/A                                           |
| FCC ID: *                  | QKWPILOT1                                     |
| IC certification number: * | 12270A-PILOT1                                 |
| PMN: *                     | Controlunit PILOT                             |
| HVIN: *                    | V0.8A_B                                       |
| FVIN: *                    | N/A                                           |

|                     | EUT number   |              |                                                                                     |
|---------------------|--------------|--------------|-------------------------------------------------------------------------------------|
|                     | 1            | 2            | Type plate                                                                          |
| Serial number: *    | 035942 0016  | 035942 0015  |  |
| PCB identifier: *   | 4,071,452,RD | 4,071,452,RD |                                                                                     |
| Hardware version: * | V0.8A_B      | V0.8A_B      |                                                                                     |
| Software version: * | N/A          | N/A          |                                                                                     |

\* Declared by the applicant

2 EUTs were used for the tests, see Overview for details.

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

## 1.5 Technical Data of Equipment

| General EUT data                             |                                                |                            |                            |
|----------------------------------------------|------------------------------------------------|----------------------------|----------------------------|
| Power supply EUT: *                          | DC                                             |                            |                            |
| Supply voltage EUT: *                        | $U_{nom} = 12 \text{ V}$                       | $U_{min} = 10.8 \text{ V}$ | $U_{max} = 13.2 \text{ V}$ |
| Temperature range: *                         | $-40^{\circ}\text{C}$ to $+65^{\circ}\text{C}$ |                            |                            |
| Lowest / Highest internal clock frequency: * | 32.768 kHz (quartz) / 2462 MHz                 |                            |                            |

| Ports / Connectors     |                             |            |                    |                      |
|------------------------|-----------------------------|------------|--------------------|----------------------|
| Identification         | Connector                   |            | Length during test | Shielding (Yes / No) |
|                        | EUT                         | Ancillary  |                    |                      |
| Power connection cable | Customized                  | Customized | 3m                 | no                   |
| Ethernet               | RJ45                        | RJ45       | 3m                 | yes                  |
| Ethernet               | RJ45                        | Left open  | ---                | ---                  |
| RS485                  | RJ45/ Customized (parallel) | Left open  | ---                | ---                  |
| DC / IO 16 pin         | Customized 16 pol plug      | Left open  | ---                | ---                  |
| IN / OUT 4 pin         | Customized 4 pol plug       | Left open  | ---                | ---                  |
| -                      | -                           | -          | -                  | -                    |

| IEEE 802.11 frequencies |          |
|-------------------------|----------|
| 20 MHz                  |          |
| Channel 1               | 2412 MHz |
| Channel 2               | 2417 MHz |
| Channel 3               | 2422 MHz |
| Channel 4               | 2427 MHz |
| Channel 5               | 2432 MHz |
| Channel 6               | 2437 MHz |
| Channel 7               | 2442 MHz |
| Channel 8               | 2447 MHz |
| Channel 9               | 2452 MHz |
| Channel 10              | 2457 MHz |
| Channel 11              | 2462 MHz |
| 40 MHz                  |          |
| Channel 03              | 2422 MHz |
| Channel 04              | 2427 MHz |
| Channel 05              | 2432 MHz |
| Channel 06              | 2437 MHz |
| Channel 07              | 2442 MHz |
| Channel 08              | 2447 MHz |
| Channel 09              | 2452 MHz |

| IEEE 802.11 radio mode         |                                                                                    |                                                                              |                                          |
|--------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------|
| Fulfil radio specification: *1 | IEEE 802.11 b<br>IEEE 802.11 g<br>IEEE 802.11 n (20 MHz)<br>IEEE 802.11 n (40 MHz) |                                                                              |                                          |
| Radio chip: *1                 | SPB 209A; H&D Wireless AB                                                          |                                                                              |                                          |
| Antenna type: *1               | Dipole antenna                                                                     |                                                                              |                                          |
| Antenna name: *1               | Taoglas GW.40                                                                      |                                                                              |                                          |
| Antenna gain: *2               | 3.15 dBi                                                                           |                                                                              |                                          |
| Antenna connector: *1          | RP SMA                                                                             |                                                                              |                                          |
| Supply voltage WLAN module: *1 | $U_{nom} = 3 V_{DC}$                                                               | $U_{min} = 2.7 V_{DC}$                                                       | $U_{max} = 3.3 V_{DC}$                   |
| Type of modulation: *1         | IEEE 802.11b                                                                       | DSSS (1 Mbps<br>DSSS (2 Mbps<br>DSSS (5.5/11 Mbps                            | DBPSK)<br>DQPSK)<br>CCK)                 |
|                                | IEEE 802.11g                                                                       | OFDM (6/9 Mbps<br>OFDM (12 / 18 Mbps<br>OFDM (24/36 Mbps<br>OFDM (48/54 Mbps | BPSK)<br>QPSK)<br>16-QAM)<br>64-QAM)     |
|                                | IEEE 802.11n<br>20 MHz<br>(SISO 1x1:1)                                             | MCS0 OFDM<br>MCS1/2 OFDM<br>MCS3/4 OFDM<br>MCS5/6/7 OFDM                     | (BPSK)<br>(QPSK)<br>(16-QAM)<br>(64-QAM) |
|                                | IEEE 802.11n<br>40 MHz<br>(SISO 1x1:1)                                             | MCS0 OFDM<br>MCS1/2 OFDM<br>MCS3/4 OFDM<br>MCS5/6/7 OFDM                     | (BPSK)<br>(QPSK)<br>(16-QAM)<br>(64-QAM) |
|                                |                                                                                    |                                                                              |                                          |
| Operating frequency range: *1  | IEEE 802.11b                                                                       | 2412 – 2462 MHz                                                              |                                          |
|                                | IEEE 802.11g                                                                       | 2412 – 2462 MHz                                                              |                                          |
|                                | IEEE 802.11n 20 MHz                                                                | 2412 – 2462 MHz                                                              |                                          |
|                                | IEEE 802.11n 40 MHz                                                                | 2422 – 2452 MHz                                                              |                                          |
| Number of channels: *1         | IEEE 802.11b                                                                       | 11 (5 MHz channel spacing)                                                   |                                          |
|                                | IEEE 802.11g                                                                       | 11 (5 MHz channel spacing)                                                   |                                          |
|                                | IEEE 802.11n 20 MHz                                                                | 11 (5 MHz channel spacing)                                                   |                                          |
|                                | IEEE 802.11n 40 MHz                                                                | 7 (5 MHz channel spacing)                                                    |                                          |

\*1 declared by the applicant

\*2 based on the antenna data sheet provided by the applicant

### 1.5.1 Ancillary Equipment / Equipment used for testing

| Equipment used for testing |                                        |
|----------------------------|----------------------------------------|
| AC adapter *1              | enercell™ AC adaptor, Cat. No. 273-316 |
| --                         | --                                     |

\*1 Provided by the laboratory

### 1.6 Dates

|                                 |            |
|---------------------------------|------------|
| Date of receipt of test sample: | 18.12.2025 |
| Start of test:                  | 18.12.2025 |
| End of test:                    | 25.03.2026 |

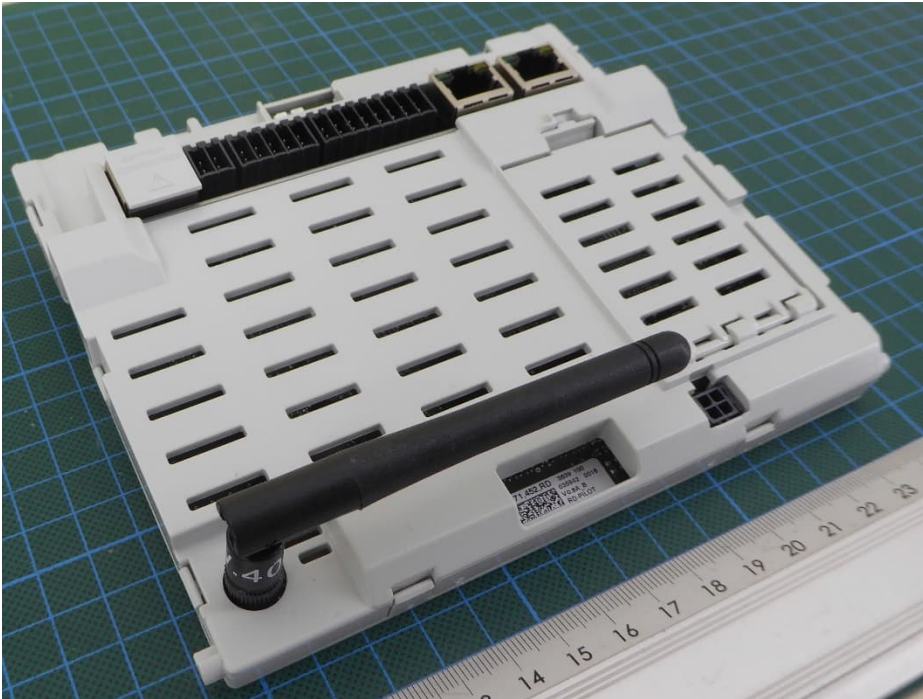


## 2 Operational States

### 2.1 Description of function of the EUT

The EUT is a control unit for solar inverters, equipped with IEEE 802.11 WiFi for communication purposes. As declared by the applicant, only IEEE 802.11 radio is active, BT/BLE and NFC are disabled by software.

The EUT:



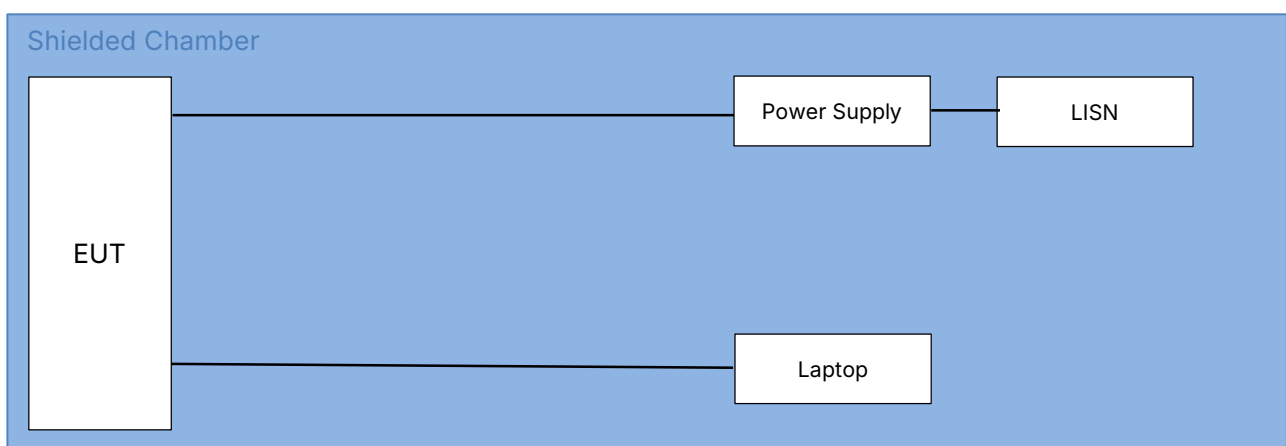
#### 2.1.1 Operation modes

| Operation mode # | Radio technology    | Frequency [MHz] | Channel / Band | Modulation / Mode | Data rate | Power setting |
|------------------|---------------------|-----------------|----------------|-------------------|-----------|---------------|
| 1                | IEEE 802.11, b-mode | 2412            | 01             | DSSS              | 1 Mbit/s  | "18 dBm"      |
| 2                | IEEE 802.11, g-mode | 2462            | 11             | OFDM              | 6 Mbit/s  | "18 dBm"      |

## 2.1.2 Block Diagram (Radiated)



## 2.1.3 Block Diagram (Conducted)



### 3 Additional Information

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

This test report contains the results of hardware changes of the product as declared by the applicant.

### 4 Overview

| Application                              | Frequency range [MHz] | FCC 47 CFR Part 15 section [2]         | RSS-247 [4]<br>RSS-Gen [5]  | Tested EUT | Status        |
|------------------------------------------|-----------------------|----------------------------------------|-----------------------------|------------|---------------|
| Maximum (average) conducted output power | 2400.0 - 2483.5       | 15.247 (b) (3), (4)                    | 6.3.2 [4]                   | 1          | Verified only |
| DTS Bandwidth / 99% Bandwidth            | 2400.0 - 2483.5       | 15.247 (a) (2)                         | 6.3.1 [4]                   | ---*1      | ---           |
| Peak Power Spectral Density              | 2400.0 - 2483.5       | 15.247 (e)                             | 6.3.1 [4]                   | ---*1      | ---           |
| Average Power Spectral Density           | 2400.0 - 2483.5       | 15.247 (e)                             | 6.3.1 [4]                   | ---*1      | ---           |
| Band edge compliance                     | 2400.0 - 2483.5       | 15.247 (d) 15.205 (a)<br>15.209 (a)    | 6.6 [4]                     | 1          | Passed *2     |
| Maximum unwanted emissions               | 30 – 26500            | 15.247 (d)<br>15.205 (a)<br>15.209 (a) | 8.9 [5]                     | 1          | Passed *2 3   |
| Antenna Requirement                      | -                     | 15.203<br>15.247 (b)                   | 6.8 [5]<br>6.5 (c) (ii) [4] | 1          | Passed        |
| Conducted emissions on supply line       | 0.15 – 30             | 15.207 (a)                             | 8.8 [5]                     | 2          | Passed        |

\*1: These tests were not ordered by the applicant

\*2: Only the worst-cases as taken from FCC ID XO2SPB209A

\*3 As declared by the applicant the highest radio frequency is 2.462 GHz.

Therefore, the radiated emission measurement must be carried out up to 10<sup>th</sup> of the highest radio clock frequency in this case 26.5 GHz.

## 5 Results

### 5.1 Test setups

#### 5.1.1 Radiated: 30 MHz to 1 GHz

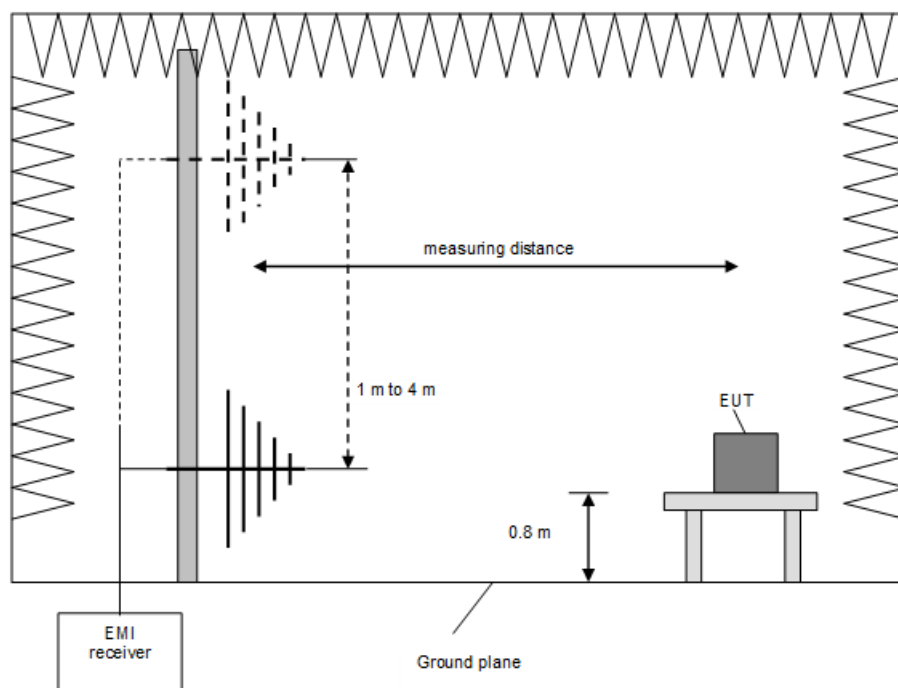
##### 5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

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   | $\pm 120$ 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 by 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.

## 5.1.2 Radiated: 1 GHz to 40 GHz

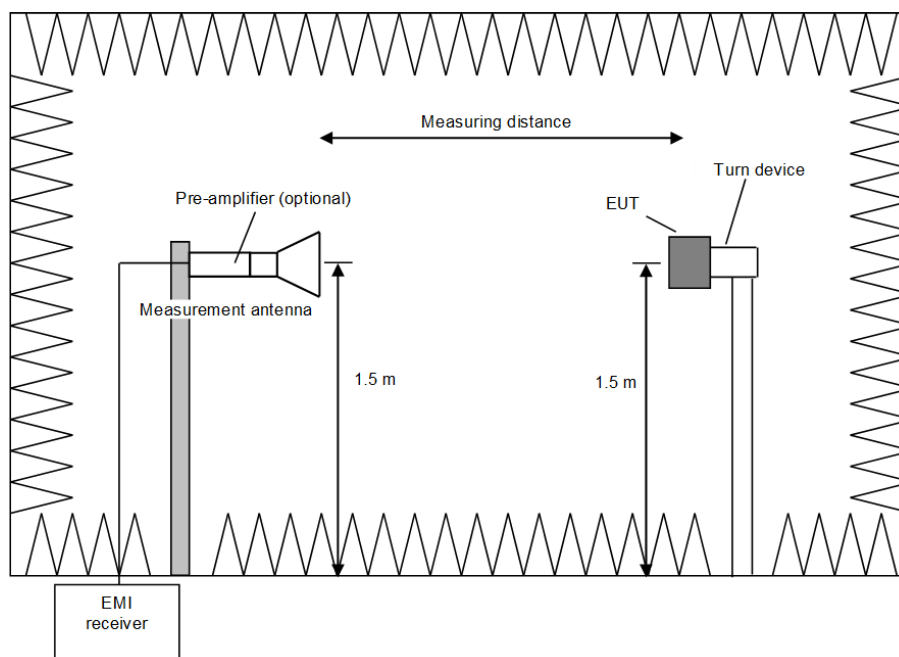
### 5.1.2.1 Preliminary and final measurement 1 to 40 GHz

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 polarization 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 polarization 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.

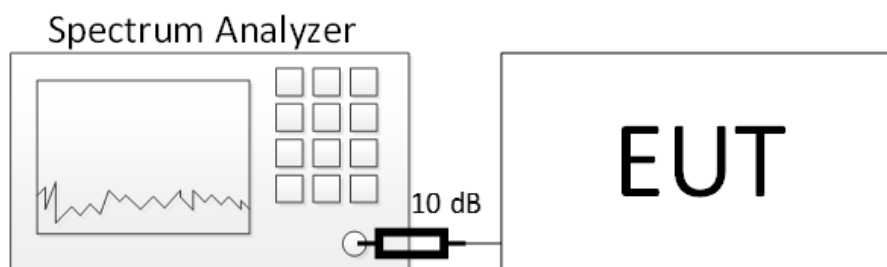
Procedure final measurement:

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 polarization which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyzer 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.

### 5.1.3 Conducted: Antenna port

| Test setup (conducted)              |                             |                              |
|-------------------------------------|-----------------------------|------------------------------|
| Used                                | Antenna connector           | Comment                      |
| <input type="checkbox"/>            | Temporary antenna connector | As provided by the applicant |
| <input checked="" type="checkbox"/> | Normal antenna connector    | -                            |



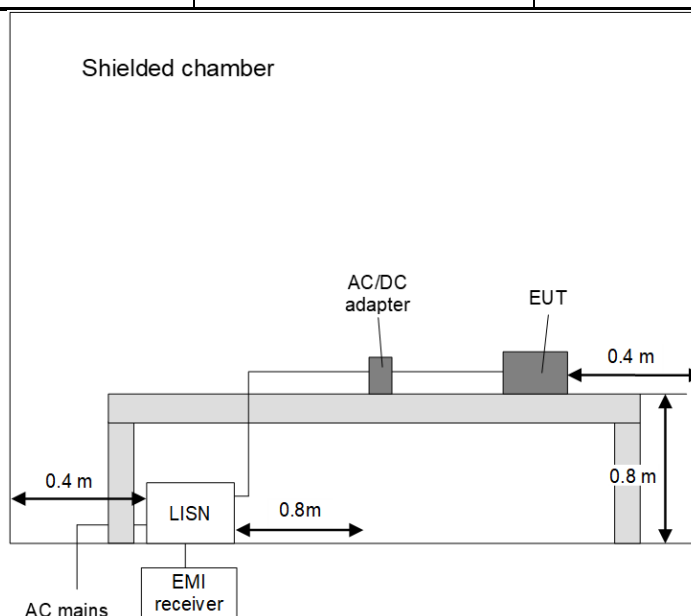
The 10 dB external attenuation are considered in all relevant plots

### 5.1.4 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 appropriable 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            |





## 5.2 Duty cycle

### 5.2.1 Test setup (Duty cycle)

| Test setup (Duty cycle)             |                           |                |         |
|-------------------------------------|---------------------------|----------------|---------|
| Used                                | Setup                     | See sub-clause | Comment |
| <input type="checkbox"/>            | Radiated: 1 GHz to 40 GHz | 5.1.2          | -       |
| <input checked="" type="checkbox"/> | Conducted: Antenna port   | 5.1.3          | -       |

### 5.2.2 Test method (Duty cycle)

| Test method (Duty cycle)            |                |                |               |         |
|-------------------------------------|----------------|----------------|---------------|---------|
| Used                                | Sub-Clause [1] | Name of method | Applicability | Comment |
| <input type="checkbox"/>            | 11.6. a)       | Diode detector | No limitation | -       |
| <input checked="" type="checkbox"/> | 11.6. b)       | Zero span      | No limitation | -       |

### 5.2.3 Test results (Duty cycle)

|                      |       |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity:   | 30 %  |

|            |            |
|------------|------------|
| Date:      | 25.03.2026 |
| Tested by: | P. NEUFELD |

The DCCF (duty cycle correction factor) is calculated by:

$$DCCF_{Power} = 10 * \log_{10} \left( \frac{1}{Duty\ cycle} \right)$$

$$DCCF_{Fieldstrength} = 20 * \log_{10} \left( \frac{1}{Duty\ cycle} \right)$$

Preliminary tests have shown that the duty cycle is  $\geq 98\%$  for every operation mode. Therefore, no DCCF is applied.

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

### 5.3 DTS band-edge emission measurements

#### 5.3.1 Test setup (Band edge – restricted bands)

| Test setup (Band edge – restricted bands) |                           |                |         |
|-------------------------------------------|---------------------------|----------------|---------|
| Used                                      | Setup                     | See sub-clause | Comment |
| <input checked="" type="checkbox"/>       | Radiated: 1 GHz to 40 GHz | 5.1.2          |         |
| <input type="checkbox"/>                  | Conducted: Antenna port   | 5.1.3          |         |

#### 5.3.2 Test method (Band edge – restricted bands)

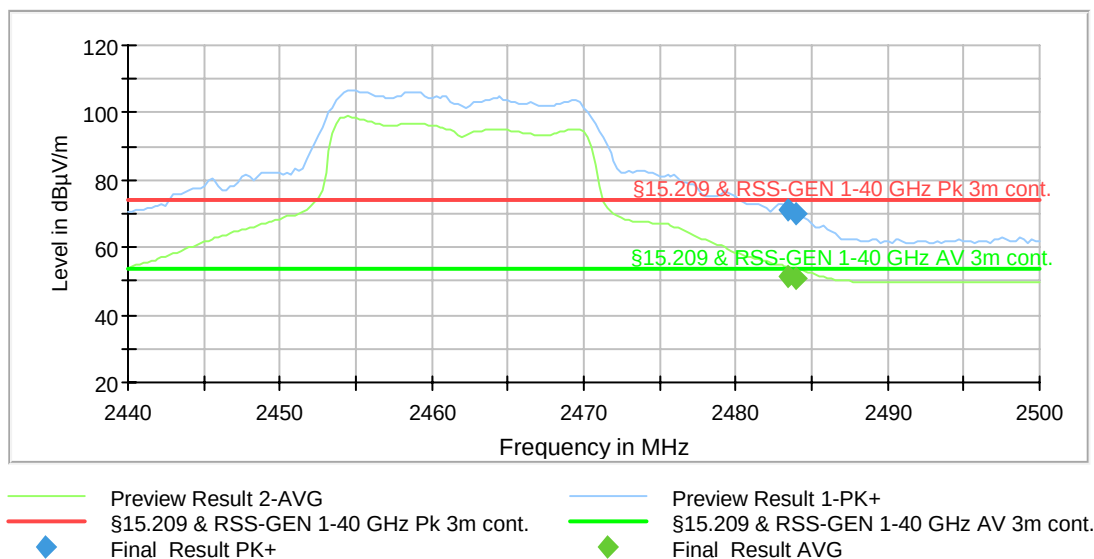
| Test method (Band edge – restricted bands) |                |                     |                |                                   |
|--------------------------------------------|----------------|---------------------|----------------|-----------------------------------|
| Used                                       | Sub-Clause [1] | Name of method      | Applicability  | Comment                           |
| <input checked="" type="checkbox"/>        | 11.12.1        | Standard method     | No limitations |                                   |
| <input type="checkbox"/>                   | 11.12.3.1      | Marker-delta method |                | See 6.10.6 [3]<br>2 MHz from band |
| <input type="checkbox"/>                   | 11.12.3.2      | Integration method  |                | 2 MHz from band                   |

#### 5.3.3 Test results (Band edge – restricted bands)

|                      |       |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity:   | 30 %  |

|            |            |
|------------|------------|
| Date:      | 25.03.2026 |
| Tested by: | P. NEUFELD |

#### Worst case plot upper band edge (operation mode 2):



**Upper band edge (operation mode 2):**

| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB/m) |
|-----------------|------------------|------------------|----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.500        | 71.43            | ---              | 74.00          | 2.57        | H   | 279.0         | 60.0            | 33.7         |
| 2483.500        | ---              | 51.48            | 54.00          | 2.52        | H   | 279.0         | 60.0            | 33.7         |
| 2484.000        | 69.90            | ---              | 74.00          | 4.10        | H   | 276.0         | 60.0            | 33.7         |
| 2484.000        | ---              | 50.83            | 54.00          | 3.17        | H   | 276.0         | 60.0            | 33.7         |

Test result: Passed

Test equipment (please refer to chapter 7 for details)

2 - 11

## 5.4 Radiated emissions

### 5.4.1 Test setup (Maximum unwanted emissions)

| Test setup (Maximum unwanted emissions) |                                             |                |         |
|-----------------------------------------|---------------------------------------------|----------------|---------|
| Used                                    | Setup                                       | See sub-clause | Comment |
| <input checked="" type="checkbox"/>     | Radiated: 30 MHz to 1 GHz / 1 GHz to 40 GHz | 5.1            | -       |
| <input type="checkbox"/>                | Conducted: Antenna port                     | 5.1.3          | -       |

### 5.4.2 Test method (Maximum unwanted emissions)

☒ Test method (radiated) see sub-clause 5.1 as described herein

### 5.4.3 Test results (Maximum unwanted emissions)

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

|                      |       |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity:   | 21 %  |

|            |                |
|------------|----------------|
| Date:      | 27.03.2026     |
| Tested by: | D. BRUSCHINSKI |

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 detailed 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: All 3 orthogonal planes were tested separately

Calculations:

Result [dBμV/m] = Reading [dBμV] + Correction [dB/m]

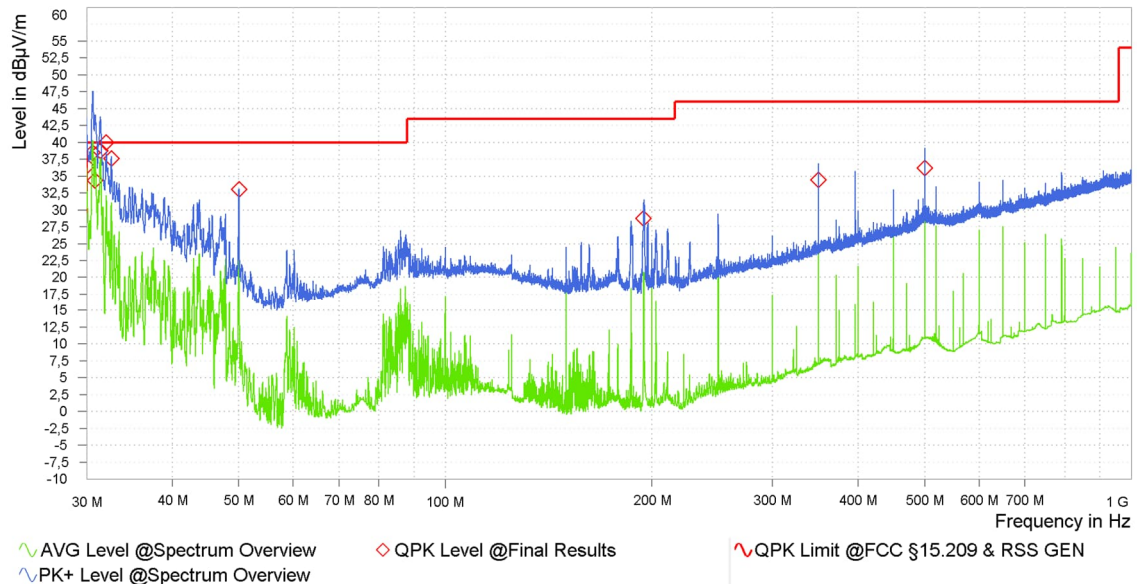
Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dBμV/m] - Result [dBμV/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 "◇" 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 1):



### Result tables:

(Operation mode 1 – Position 1):

| Frequency [MHz] | Result (QP) [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Correction [dB/m] | Pol. (H/V) | Azimuth [deg] | Height [m]  |
|-----------------|----------------------|----------------|-------------|-------------------|------------|---------------|-------------|
| 30.000          | 36.48                | 40.00          | 3.52        | 26.66             | V          | 17            | 3.30        |
| 30.630          | 38.49                | 40.00          | 1.51        | 26.28             | V          | -13           | 3.62        |
| 30.870          | 34.32                | 40.00          | 5.68        | 26.13             | V          | 17            | 3.40        |
| 31.410          | 38.74                | 40.00          | 1.26        | 25.78             | V          | -3            | 3.44        |
| <b>32.040</b>   | <b>39.99</b>         | <b>40.00</b>   | <b>0.01</b> | <b>25.36</b>      | <b>V</b>   | <b>43</b>     | <b>3.59</b> |
| 32.610          | 37.60                | 40.00          | 2.40        | 25.04             | V          | 101           | 3.70        |
| 50.010          | 33.02                | 40.00          | 6.98        | 13.75             | V          | 13            | 1.01        |
| 194.670         | 28.76                | 43.50          | 14.74       | 14.93             | V          | 183           | 3.51        |
| 350.010         | 34.44                | 46.00          | 11.56       | 20.43             | H          | 137           | 1.05        |
| 500.010         | 36.24                | 46.00          | 9.76        | 24.19             | H          | 27            | 1.54        |

Test result: Passed

Test equipment (please refer to chapter 7 for details)

12 - 20

#### 5.4.3.2 Test results (radiated 1 GHz to 40 GHz)

|                      |       |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity:   | 30 %  |

|            |            |
|------------|------------|
| Date:      | 25.03.2026 |
| Tested by: | P. NEUFELD |

Position of EUT: For tests for f between 1 GHz and the 10<sup>th</sup> harmonic, the EUT was set-up on a positioner device with a height of 150 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detailed 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: -

#### Calculation:

Max Peak [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Average [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB] + DCCF\* [dB]  
\* (if applicable – only for Average values, that are fundamental related)

Margin [dB] = Limit [dBμV/m] – Max Peak | Average [dBμV/m]

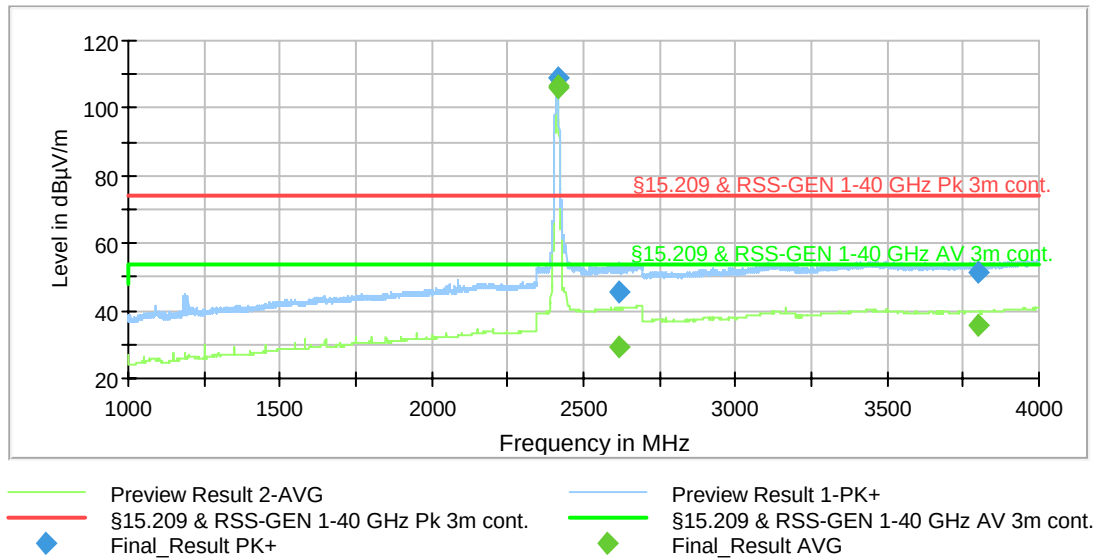
The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with various EUT and antenna positions.

The top measured curve represents the peak measurement. The measured points marked with "◇" are frequency points for the final peak detector measurement. These values are indicated in the following table.

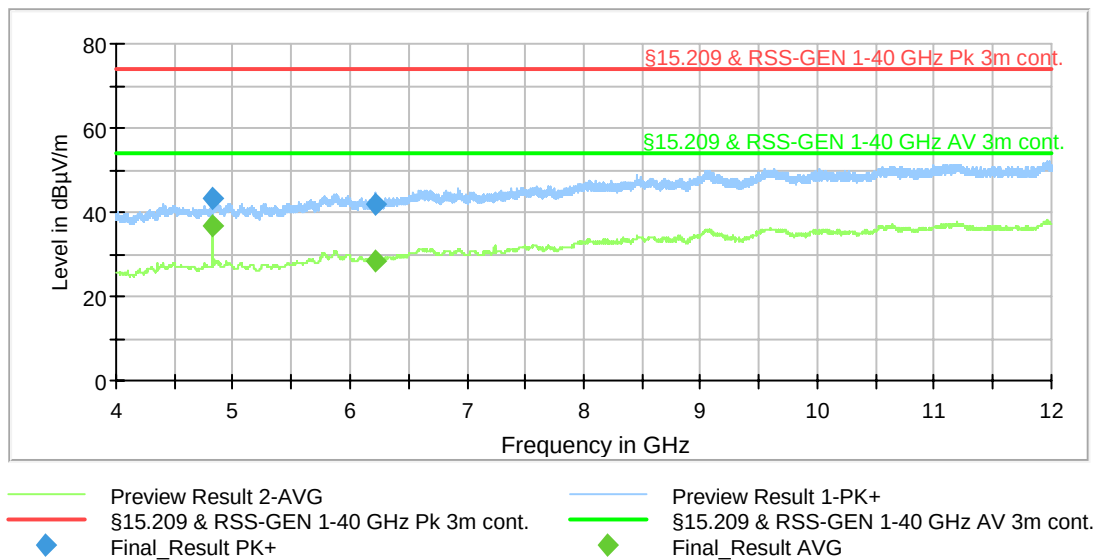
The bottom measured curve represents the average measurement. The measured points marked with "◇" are frequency points for the final average detector measurement.

## Worst case plots:

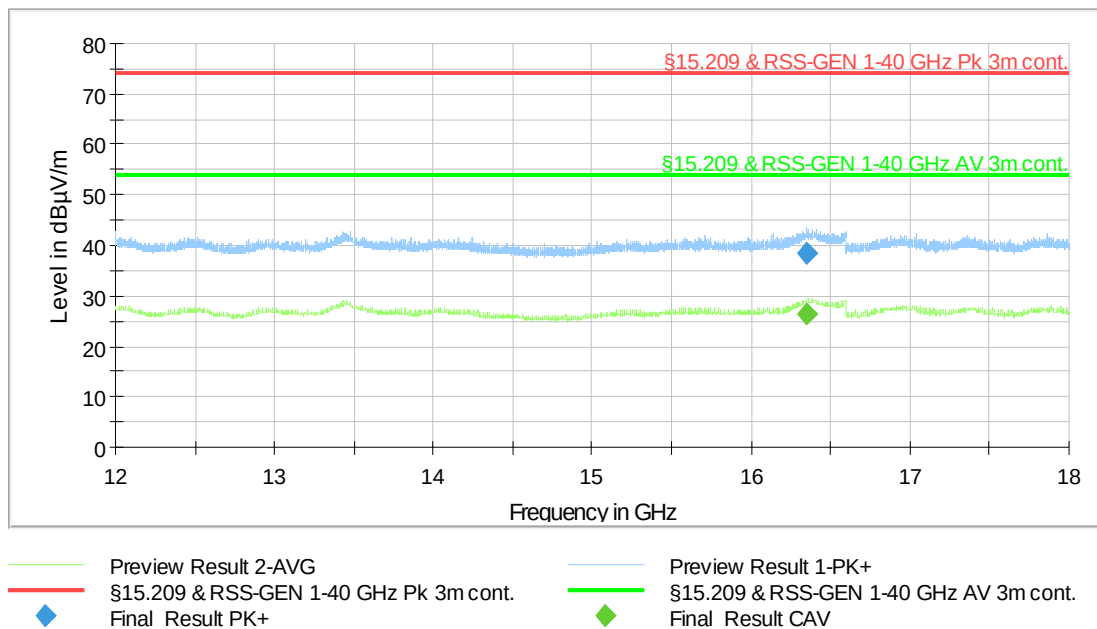
Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



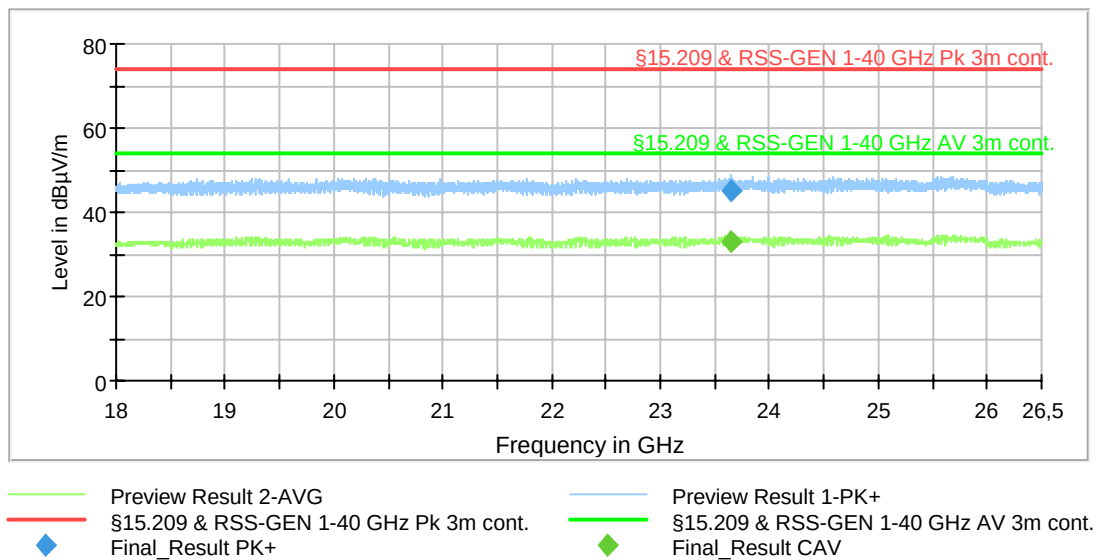
Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



Spurious emissions from 18 GHz to 26.5 GHz (operation mode 1):





# Result tables:

Operation mode 1:

| Frequency (MHz) | Peak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m)       | Margin (dB) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB/m) | Restr. Band Y/N |
|-----------------|---------------|------------------|----------------------|-------------|-----|---------------|-----------------|--------------|-----------------|
| 2412.750        | 108.77        | ---              | Fundamental emission |             | H   | 270.0         | 90.0            | 33.7         | -*              |
| 2412.750        | ---           | 106.49           |                      |             | H   | 270.0         | 90.0            | 33.7         | -*              |
| 2413.500        | 108.93        | ---              |                      |             | H   | 270.0         | 90.0            | 33.7         | -*              |
| 2413.500        | ---           | 106.09           |                      |             | H   | 270.0         | 90.0            | 33.7         | -*              |
| 2614.750        | 45.34         | ---              | 74.00                | 28.66       | H   | 296.0         | 90.0            | 34.3         | -*              |
| 2614.750        | ---           | 29.22            | 54.00                | 24.78       | H   | 296.0         | 90.0            | 34.3         | -*              |
| 3802.500        | 51.41         | ---              | 74.00                | 22.59       | V   | 125.0         | 120.0           | 37.4         | -*              |
| 3802.500        | ---           | 35.51            | 54.00                | 18.49       | V   | 125.0         | 120.0           | 37.4         | -*              |
| 4824.000        | 43.39         | ---              | 74.00                | 30.61       | H   | 260.0         | 30.0            | -2.4         | -*              |
| 4824.000        | ---           | 36.84            | 54.00                | 17.16       | H   | 260.0         | 30.0            | -2.4         | -*              |
| 6225.500        | 41.81         | ---              | 74.00                | 32.19       | V   | 97.0          | 0.0             | 1.6          | -*              |
| 6225.500        | ---           | 28.32            | 54.00                | 25.68       | V   | 97.0          | 0.0             | 1.6          | -*              |
| 16353.500       | ---           | 26.23            | 54.00                | 27.77       | V   | 57.0          | 0.0             | 10.0         | -*              |
| 16353.500       | 38.38         | ---              | 74.00                | 35.62       | V   | 57.0          | 0.0             | 10.0         | -*              |
| 23656.750       | ---           | 32.84            | 54.00                | 21.16       | V   | 120.0         | 0.0             | 6.1          | -*              |
| 23656.750       | 45.31         | ---              | 74.00                | 28.69       | V   | 120.0         | 0.0             | 6.1          | -*              |

\* All results were below the stricter limits for the restricted bands. Therefore, the indication is omitted.

|                                                        |
|--------------------------------------------------------|
| Test equipment (please refer to chapter 7 for details) |
| 2 - 11, 21 - 24, 26 - 28                               |

## 5.5 AC power-line conducted emissions

### 5.5.1 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    | 5.1.4          | -       |
| <input type="checkbox"/>                               | Not applicable, because ... | -              | -       |

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

| Test setup (Conducted emissions on power supply lines) |            |                                  |            |                                                     |
|--------------------------------------------------------|------------|----------------------------------|------------|-----------------------------------------------------|
| Used                                                   | Clause [3] | Name of method                   | Sub-clause | Comment                                             |
| <input checked="" type="checkbox"/>                    | 6.2.3.2    | Tabletop equipment testing       | 5.1.4      | Off the shelf AC adaptor provided by the laboratory |
| <input type="checkbox"/>                               | 6.2.3.3    | Floor-standing equipment testing | -          | -                                                   |

The AC power adaptor provided by the laboratory was used for the tests:

enercell™ AC adaptor, Cat. No. 273-316

The power adaptor itself was supplied by 120V<sub>AC</sub> 60Hz.

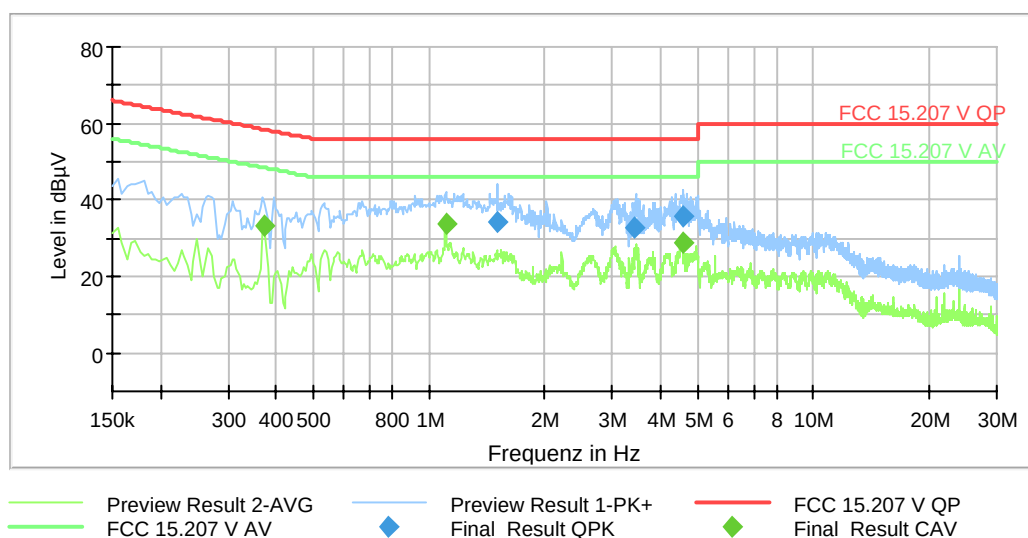
EUT was tested in normal operation mode, EUT opened an AP on ch1, laptop was connected and data was transferred via WLAN and ethernet.

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

|                      |       |
|----------------------|-------|
| Ambient temperature: | 22 °C |
| Relative humidity:   | 40 %  |

|            |            |
|------------|------------|
| Date:      | 18.12.2025 |
| Tested by: | P. NEUFELD |

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 ◆.



# Result table:

Operation mode 1:

| Frequency<br>[MHz] | QuasiPeak<br>[dB(μV)] | Average<br>[dB(μV)] | Limit<br>[dB(μV)] | Margin<br>[dB] | Line | PE  | Corr.<br>[dB] |
|--------------------|-----------------------|---------------------|-------------------|----------------|------|-----|---------------|
| 0.373000           | ---                   | 33.39               | 48.43             | 15.04          | L1   | GND | 9.9           |
| 1.107000           | ---                   | 33.60               | 46.00             | 12.40          | N    | FLO | 9.9           |
| 1.508500           | 34.16                 | ---                 | 56.00             | 21.84          | L1   | FLO | 10.0          |
| 3.440500           | 32.93                 | ---                 | 56.00             | 23.07          | L1   | FLO | 10.3          |
| 4.577000           | 35.55                 | ---                 | 56.00             | 20.45          | L1   | GND | 10.4          |
| 4.594500           | ---                   | 28.84               | 46.00             | 17.16          | L1   | GND | 10.4          |

Test result: Passed

Test equipment (please refer to chapter 7 for details)

29 - 34

## 6 Measurement Uncertainties

| Conducted measurements                               |                                                       |                                                   |
|------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| Measurement method                                   | Standard used for calculating measurement uncertainty | Expanded measurement uncertainty (95 %) $U_{lab}$ |
| Frequency error                                      | ETSI TR 100 028                                       | $4.5 \times 10^{-8}$                              |
| Bandwidth measurements                               | -                                                     | $9.0 \times 10^{-8}$                              |
| Conducted emissions using a spectrum analyzer        |                                                       |                                                   |
| < 3.6 GHz                                            | ETSI TR 100 028                                       | 2.3 dB                                            |
| 3.6 – 8 GHz                                          | ETSI TR 100 028                                       | 2.8 dB                                            |
| 8 – 22 GHz                                           | ETSI TR 100 028                                       | 3.2 dB                                            |
| 22 – 40 GHz                                          | ETSI TR 100 028                                       | 3.6 dB                                            |
| Power measurements                                   |                                                       |                                                   |
| Power meter                                          | ETSI TR 100 028                                       | 0.9 dB                                            |
| Conducted emissions from 150 kHz to 30 MHz with LISN |                                                       |                                                   |
|                                                      | CISPR 16-4-2                                          | 2.8 dB                                            |

| Radiated measurements                                                 |                 |                      |
|-----------------------------------------------------------------------|-----------------|----------------------|
| Frequency error                                                       |                 |                      |
| (Semi-) Anechoic chamber                                              | ETSI TR 100 028 | $4.5 \times 10^{-8}$ |
| OATS                                                                  | ETSI TR 100 028 | $4.5 \times 10^{-8}$ |
| Test fixture                                                          | ETSI TR 100 028 | $4.5 \times 10^{-8}$ |
| 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 M20                                           |                 |                      |
| CBL6112B @ 3 m<br>30 MHz – 1 GHz                                      | CISPR 16-4-2    | 5.3 dB               |
| R&S HL050 @ 3 m                                                       |                 |                      |
| 1 – 6 GHz                                                             | CISPR 16-4-2    | 5.1 dB               |
| 6 – 18 GHz                                                            | CISPR 16-4-2    | 5.4 dB               |
| Flann Standard Gain Horns<br>12 – 40 GHz                              | -               | 5.9 dB               |
| Radiated field strength M276                                          |                 |                      |
| R&S HL562E @ 3 m<br>30 MHz – 1 GHz                                    | CISPR 16-4-2    | 4.8 dB               |
| R&S HL050 @ 3 m                                                       |                 |                      |
| 1 – 6 GHz                                                             | CISPR 16-4-2    | 5.1 dB               |
| 6 – 18 GHz                                                            | CISPR 16-4-2    | 5.4 dB               |
| Flann Standard Gain Horns<br>12 – 40 GHz                              | -               | 5.9 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   | Signal & spectrum analyser           | FSW43               | Rohde & Schwarz      | 102954                   | 483957  | 04.02.2026                | 02.2027 |
| 2   | Log.-Per. antenna 850 MHz - 26.5 GHz | HL050               | Rohde & Schwarz      | 100438                   | 481170  | Calibration not necessary |         |
| 3   | RF-cable                             | Sucoflex 106B       | Suhner               | 0709/6B / Kabel 38       | 481328  | Calibration not necessary |         |
| 4   | RF-cable                             | Sucoflex 104        | Huber+Suhner         | 517402                   | 482392  | Calibration not necessary |         |
| 5   | Fully anechoic chamber M20           | B83117-E2439-T232   | Albatross Projects   | 103                      | 480303  | Calibration not necessary |         |
| 6   | Turntable                            | DS420 HE            | Deisel               | 420/620/00               | 480315  | Calibration not necessary |         |
| 7   | Antenna support                      | AS620P              | Deisel               | 620/375                  | 480325  | Calibration not necessary |         |
| 8   | Multiple Control Unit                | MCU                 | Maturo GmbH          | MCU/043/97110 7          | 480832  | Calibration not necessary |         |
| 9   | Positioner                           | TDF 1.5- 10Kg       | Maturo               | 15920215                 | 482034  | Calibration not necessary |         |
| 10  | EMI receiver / Spectrum analyser     | ESW44               | Rohde & Schwarz      | 101635                   | 482467  | 29.10.2025                | 02.2028 |
| 11  | Software                             | EMC32 V10.60.20     | Rohde & Schwarz      | ---                      | 483261  | Calibration not necessary |         |
| 12  | Attenuator 6 dB                      | WA2-6               | Weinschel            | ---                      | 482793  | Calibration not necessary |         |
| 13  | Ultralog antenna 30 MHz - 6 GHz      | HL562E              | Rohde & Schwarz      | 101079                   | 482978  | 24.04.2024                | 04.2027 |
| 14  | EMC test software                    | Elektra V5.21       | Rohde & Schwarz      | ---                      | 483755  | Calibration not necessary |         |
| 15  | RF Switch Matrix                     | OSP220              | Rohde & Schwarz      | 101391                   | 482976  | Calibration not necessary |         |
| 16  | Turntable                            | TT3.0-3t            | Maturo               | 825/2612/.01             | 483224  | Calibration not necessary |         |
| 17  | Antenna support tilt mast            | BAM 4.5-P-10kg      | Maturo               | 222/2612.01              | 483225  | Calibration not necessary |         |
| 18  | Controller                           | NCD                 | Maturo               | 474/2612.01              | 483226  | Calibration not necessary |         |
| 19  | Semi Anechoic Chamber M276           | SAC5-2              | Albatross Projects   | C62128-A540-A138-10-0006 | 483227  | Calibration not necessary |         |
| 20  | EMI receiver / Spectrum analyser     | ESW44               | Rohde & Schwarz      | 101828                   | 482979  | 06.02.2026                | 02.2028 |
| 21  | Standard gain horn 12 GHz - 18 GHz   | 18240-20            | Flann                | 483                      | 480294  | Calibration not necessary |         |
| 22  | Preamplifier 12 GHz - 18 GHz         | JS3-12001800-16-5A  | MITEQ Hauppauge N.Y. | 571667                   | 480343  | 03.02.2026                | 02.2028 |
| 23  | Standard gain horn 18 GHz - 26 GHz   | 20240-20            | Flann                | 411                      | 480297  | Calibration not necessary |         |
| 24  | Preamplifier 18 GHz - 26 GHz         | JS4-18002600-20-5A  | MITEQ Hauppauge N.Y. | 658697                   | 480342  | 03.02.2026                | 02.2028 |
| 25  | Antenna (Horn)                       | 3115                | EMCO Elektronik      | 9609-4918                | 480183  | 13.02.2024                | 02.2027 |
| 26  | High-pass filter                     | WHKX4.0/18G-8SS     | Wainwright           | 1                        | 480587  | Calibration not necessary |         |
| 27  | Microwave cable 2m                   | Insulated Wire Inc. | Insulated Wire       | KPS-1533-800-KPS         | 480302  | Calibration not necessary |         |

| No. | Test equipment                      | Type                                 | Manufacturer    | Serial No. | PM. No. | Cal. Date                 | Cal Due |
|-----|-------------------------------------|--------------------------------------|-----------------|------------|---------|---------------------------|---------|
| 28  | Preamplifier<br>100 MHz - 16 GHz    | AFS6-<br>00101600-23-<br>10P-6-R     | Narda MITEQ     | 2011215    | 482333  | 03.02.2026                | 02.2028 |
| 29  | LISN                                | NSLK8128                             | Schwarzbeck     | 8128155    | 480058  | 04.02.2026                | 02.2028 |
| 30  | AC / DC power supply                | AC6803A AC<br>Power Source<br>2000VA | Keysight        | JPVJ002509 | 482350  | Calibration not necessary |         |
| 31  | Software                            | EMC32<br>V10.60.20                   | Rohde & Schwarz | 100061     | 481022  | Calibration not necessary |         |
| 32  | Shielded chamber M4                 | B83117-S1-X158                       | Siemens         | 190075     | 480088  | Calibration not necessary |         |
| 33  | EMI Receiver /<br>Spectrum Analyser | ESIB 26                              | Rohde & Schwarz | 100292     | 481182  | 06.02.2026                | 02.2028 |
| 34  | Transient Filter<br>Limiter         | CFL 9206A                            | Teseq           | 38268      | 481982  | 05.02.2026                | 02.2028 |

## 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                                | 21.05.2025 | 21.06.2028 |
| Semi anechoic chamber<br>M276 | 483227  | 30 – 1000 MHz   | NSA                | ANSI C63.4-2014<br>ANSI C63.4a-2017            | 05.06.2025 | 04.06.2028 |
| Anechoic chamber<br>M20       | 483227  | 1 -18 GHz       | SVSWR              | CISPR 16-1-4 + Cor1:2010 +<br>A1:2012 +A2:2017 | 02.04.2025 | 01.04.2028 |

## 9 Report History

| Report Number | Date       | Comment             |
|---------------|------------|---------------------|
| F251884E6     | 12.06.2026 | Initial test report |
| -             | -          | -                   |
| -             | -          | -                   |

## 10 List of Annexes

|         |                   |         |
|---------|-------------------|---------|
| Annex A | Test setup photos | 6 pages |
| Annex B | Void              |         |
| Annex C | Void              |         |
| Annex D | Void              |         |

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