



## TEST REPORT

Test report no.: 1-4085/22-01-02-A

BNetzA-CAB-02/21-102

### Testing laboratory

**CTC advanced GmbH**

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <https://www.ctcadvanced.com>

e-mail: [mail@ctcadvanced.com](mailto:mail@ctcadvanced.com)

**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

### Applicant

**Ingenico Group**

9 Avenue de la Gare Rovaltain

26958 Valence Cedex 9 / FRANCE

Phone: -/-

Contact: Nicolas Jacquemont

e-mail: [nicolas.jacquemont@ingenico.com](mailto:nicolas.jacquemont@ingenico.com)

### Manufacturer

**Ingenico Group**

9 Avenue de la Gare Rovaltain

26958 Valence Cedex 9 / FRANCE

### Test standard/s

FCC - Title 47 CFR Part 15    FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 247 Issue 2    Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

For further applied test standards please refer to section 3 of this test report.

### Test Item

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Kind of test item:</b>         | <b>Payment terminal</b>   |
| <b>Model name:</b>                | <b>Move/5000 CL/4G/WI</b> |
| <b>FCC ID:</b>                    | <b>XKB-M5000CL4GWI</b>    |
| <b>ISED certification number:</b> | <b>2586D-M5000CL4GWI</b>  |
| Frequency:                        | 2400 MHz to 2483.5 MHz    |
| Technology tested:                | WLAN                      |
| Antenna:                          | Integrated antenna        |
| Power supply:                     | 3.6 V DC by battery       |
| Temperature range:                | 10°C to 50°C              |

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorized:

Michael Dorongovski  
Lab Manager  
Radio Communications

### Test performed:

Andreas Kurzkurt  
Testing Manager  
Radio Communications

## 1 Table of contents

|      |   |    |
|------|---|----|
| 1    | Table of contents .....                                     | 2  |
| 2    | General information .....                                   | 3  |
| 2.1  | Notes and disclaimer .....                                  | 3  |
| 2.2  | Application details .....                                   | 3  |
| 2.3  | Test laboratories sub-contracted .....                      | 3  |
| 3    | Test standard/s, references and accreditations .....        | 4  |
| 4    | Reporting statements of conformity – decision rule .....    | 5  |
| 5    | Test environment .....                                      | 6  |
| 6    | Test item .....   | 6  |
| 6.1  | General description .....                                   | 6  |
| 6.2  | Additional information .....                                | 6  |
| 7    | Description of the test setup.....                          | 7  |
| 7.1  | Shielded fully anechoic chamber .....                       | 8  |
| 8    | Sequence of testing .....                                   | 9  |
| 8.1  | Sequence of testing radiated spurious 1 GHz to 18 GHz ..... | 9  |
| 9    | Measurement uncertainty .....                               | 10 |
| 10   | Summary of measurement results .....                        | 11 |
| 11   | Additional information and comments .....                   | 13 |
| 12   | Additional EUT parameter .....                              | 14 |
| 13   | Measurement results .....                                   | 15 |
| 13.1 | Band edge compliance radiated .....                         | 15 |
| 13.2 | Spurious emissions radiated above 1 GHz .....               | 19 |
| 14   | Observations .....  | 27 |
| 15   | Glossary .....  | 27 |
| 16   | Document history.....                                       | 28 |
| 17   | Accreditation Certificate – D-PL-12076-01-04 .....          | 28 |
| 18   | Accreditation Certificate – D-PL-12076-01-05 .....          | 29 |

## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.

The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".

CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.

All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH. In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

**This test report replaces the test report with the number 1-4085/22-01-02 and dated 2022-07-08.**

### 2.2 Application details

|                                    |            |
|------------------------------------|------------|
| Date of receipt of order:          | 2022-03-30 |
| Date of receipt of test item:      | 2022-05-18 |
| Start of test:*                    | 2022-06-17 |
| End of test:*                      | 2022-06-17 |
| Person(s) present during the test: | -/-        |

\*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.



### 2.3 Test laboratories sub-contracted

None

### 3 Test standard/s, references and accreditations

| Test standard                           | Date          | Description  |
|---|---------------|--|
| FCC - Title 47 CFR Part 15              |               | FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices                                      |
| RSS - 247 Issue 2                       | February 2017 | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices       |
| RSS - Gen Issue 5 incl. Amendment 1 & 2 | February 2021 | Spectrum Management and Telecommunications Radio Standards Specification<br>- General Requirements for Compliance of Radio Apparatus |

| Guidance         | Version | Description  |
|------------------|---------|--|
| KDB 558074 D01   | v05r02  | 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 |
| ANSI C63.10-2013 | -/-     | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices   |

| Accreditation    | Description   |   |
|------------------|---|---|
| D-PL-12076-01-04 | Telecommunication and EMC Canada<br><a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf</a>   |  <br>Deutsche Akkreditierungsstelle<br>D-PL-12076-01-04 |
| D-PL-12076-01-05 | Telecommunication FCC requirements<br><a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf</a> |  <br>Deutsche Akkreditierungsstelle<br>D-PL-12076-01-05 |

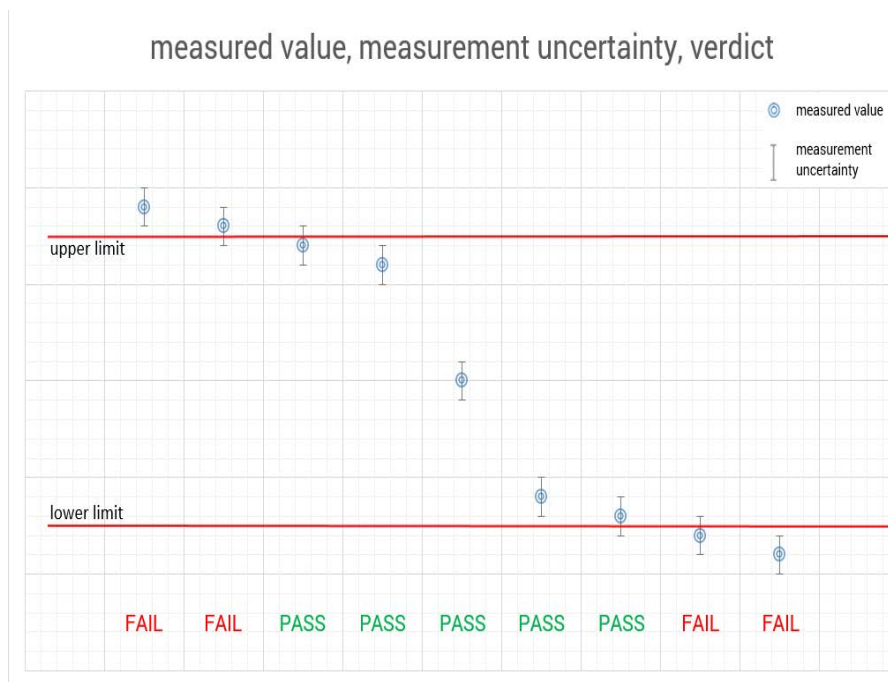
ISED Testing Laboratory Recognized Listing Number: DE0001

FCC designation number: DE0002

#### 4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9 but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."





## 7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

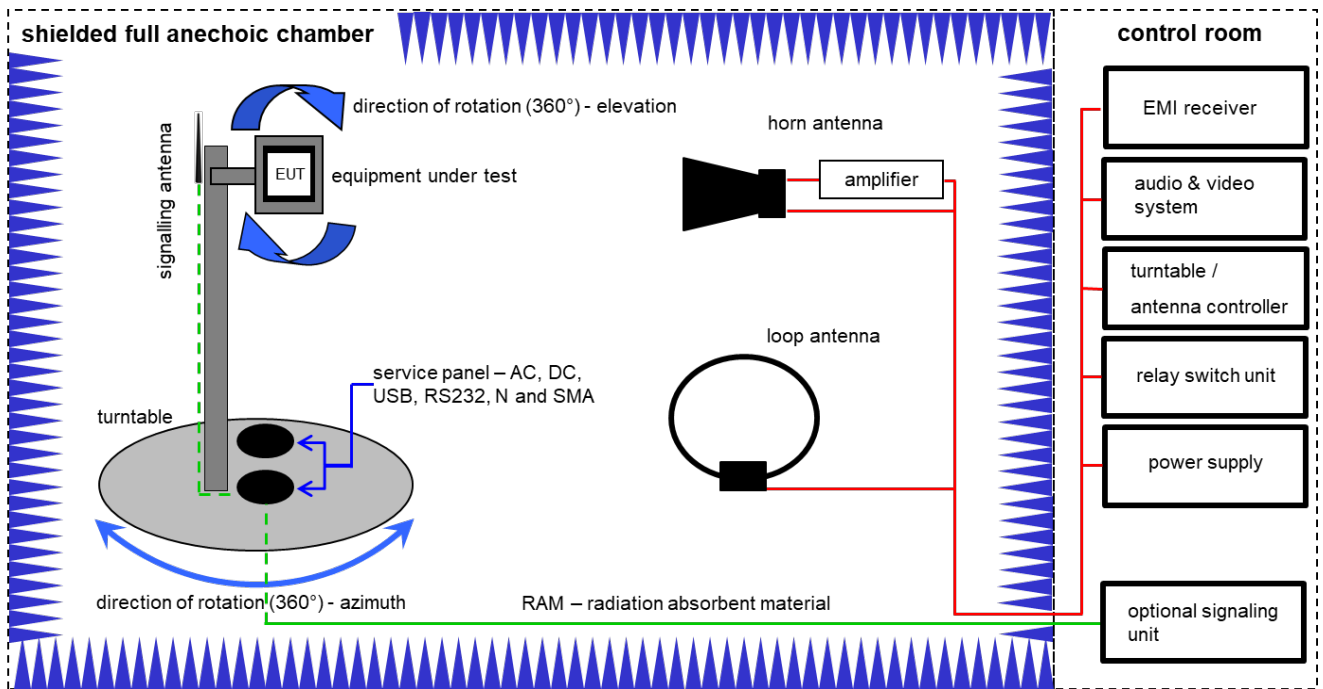
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

### **Agenda:** Kind of Calibration

|      |  |     |  |
|------|--|-----|--|
| k    | calibration / calibrated                   | EK  | limited calibration                                  |
| ne   | not required (k, ev, izw, zw not required) | zw  | cyclical maintenance (external cyclical maintenance) |
| ev   | periodic self verification                 | izw | internal cyclical maintenance                        |
| Ve   | long-term stability recognized             | g   | blocked for accredited testing                       |
| vlk! | Attention: extended calibration interval   |     |  |
| NK!  | Attention: not calibrated                  | *)  | next calibration ordered / currently in progress     |

## 7.1 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m)}$$

### Equipment table:

| No. | Setup | Equipment                                      | Type                            | Manufacturer         | Serial No. | INV. No.  | Kind of Calibration | Last Calibration | Next Calibration |
|-----|-------|--|---------------------------------|----------------------|------------|-----------|---------------------|------------------|------------------|
| 1   | A, B  | Anechoic chamber                               | FAC 3/5m                        | MWB / TDK            | 87400/02   | 300000996 | ev                  | -/-              | -/-              |
| 2   | A, B  | Switch / Control Unit                          | 3488A                           | HP                   | *          | 300000199 | ne                  | -/-              | -/-              |
| 3   | A, B  | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115                            | EMCO                 | 8812-3089  | 300000307 | vKI!                | 11.02.2022       | 29.02.2024       |
| 4   | A     | Band Reject filter                             | WRCG2400/2483-2375/2505-50/10SS | Wainwright           | 11         | 300003351 | ev                  | -/-              | -/-              |
| 5   | A, B  | Highpass Filter                                | WHKX2.9/18G-12SS                | Wainwright           | 1          | 300003492 | ev                  | -/-              | -/-              |
| 6   | A, B  | EMI Test Receiver 20Hz- 26,5GHz                | ESU26                           | R&S                  | 100037     | 300003555 | k                   | 09.12.2021       | 31.12.2022       |
| 7   | A, B  | Highpass Filter                                | WHK1.1/15G-10SS                 | Wainwright           | 3          | 300003255 | ev                  | -/-              | -/-              |
| 8   | A, B  | Highpass Filter                                | WHKX7.0/18G-8SS                 | Wainwright           | 19         | 300003790 | ne                  | -/-              | -/-              |
| 9   | A,B   | Broadband Amplifier 0.5-18 GHz                 | CBLU5184540                     | CERNEX               | 22049      | 300004481 | ev                  | -/-              | -/-              |
| 10  | A, B  | 4U RF Switch Platform                          | L4491A                          | Agilent Technologies | MY50000037 | 300004509 | ne                  | -/-              | -/-              |
| 11  | A, B  | NEXIO EMV-Software                             | BAT EMC V3.21.0.32              | EMCO                 |            | 300004682 | ne                  | -/-              | -/-              |
| 12  | A, B  | PC   | ExOne                           | F+W                  |            | 300004703 | ne                  | -/-              | -/-              |
| 13  | A, B  | RF-Amplifier                                   | AMF-6F06001800-30-10P-R         | NARDA-MITEQ Inc      | 2011572    | 300005241 | ev                  | -/-              | -/-              |



## 8 Sequence of testing

### 8.1 Sequence of testing radiated spurious 1 GHz to 18 GHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

#### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 9 Measurement uncertainty

| Measurement uncertainty                                  |                                     |           |
|--|-------------------------------------|-----------|
| Test case  | Uncertainty                         |           |
| Antenna gain   | ± 3 dB                              |           |
| Power spectral density                                   | ± 1.56 dB                           |           |
| DTS bandwidth  | ± 100 kHz (depends on the used RBW) |           |
| Occupied bandwidth                                       | ± 100 kHz (depends on the used RBW) |           |
| Maximum output power conducted                           | ± 1.56 dB                           |           |
| Detailed spurious emissions @ the band edge - conducted  | ± 1.56 dB                           |           |
| Band edge compliance radiated                            | ± 3 dB                              |           |
| Spurious emissions conducted                             | > 3.6 GHz                           | ± 1.56 dB |
|  | > 7 GHz                             | ± 1.56 dB |
|  | > 18 GHz                            | ± 2.31 dB |
|  | ≥ 40 GHz                            | ± 2.97 dB |
| Spurious emissions radiated below 30 MHz                 | ± 3 dB                              |           |
| Spurious emissions radiated 30 MHz to 1 GHz              | ± 3 dB                              |           |
| Spurious emissions radiated 1 GHz to 12.75 GHz           | ± 3.7 dB                            |           |
| Spurious emissions radiated above 12.75 GHz              | ± 4.5 dB                            |           |
| Spurious emissions conducted below 30 MHz (AC conducted) | ± 2.6 dB                            |           |

## 10 Summary of measurement results

|                                     |  |
|-------------------------------------|--|
| <input type="checkbox"/>            | No deviations from the technical specifications were ascertained   |
| <input type="checkbox"/>            | There were deviations from the technical specifications ascertained  |
| <input checked="" type="checkbox"/> | This test report is only a partial test report.<br>The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description                       | Verdict    | Date       | Remark                                   |
|---------------|-----------------------------------|------------|------------|--|
| RF-Testing    | CFR Part 15<br>RSS - 247, Issue 2 | See table! | 2022-12-12 | Reduced testplan acc.<br>customer demand |

| Test specification clause                | Test case   | Guideline                            | Temperature conditions | Power source voltages | Mode      | C                                   | NC                       | NA                       | NP                                  | Remark                                    |
|--|---|--------------------------------------|------------------------|-----------------------|-----------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|---|
| §15.247(b)(4)<br>RSS - 247 / 5.4 (f)(ii) | Antenna gain  | -/-                                  | Nominal                | Nominal               | DSSS      |                                     | -/-                      |                          |                                     | -/-                                       |
| §15.35                                   | Duty cycle  | -/-                                  | Nominal                | Nominal               | DSSS OFDM |                                     | -/-                      |                          |                                     | -/-                                       |
| §15.247(e)<br>RSS - 247 / 5.2 (b)        | Power spectral density                              | KDB 558074<br>DTS clause: 8.4        | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.247(a)(2)<br>RSS - 247 / 5.2 (a)     | DTS bandwidth                                       | KDB 558074<br>DTS clause: 8.2        | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| RSS Gen<br>clause 4.6.1                  | Occupied bandwidth                                  | -/-                                  | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.247(b)(3)<br>RSS - 247 / 5.4 (d)     | Maximum output power                                | KDB 558074<br>DTS clause:<br>8.3.1.3 | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.247(d)<br>RSS - 247 / 5.5            | Detailed spurious emissions @ the band edge – cond. | -/-                                  | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.205<br>RSS - 247 / 5.5<br>RSS - Gen  | Band edge compliance cond. & rad.                   | KDB 558074<br>DTS clause: 8.7.3      | Nominal                | Nominal               | DSSS OFDM | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Only OFDM modes                           |
| §15.247(d)<br>RSS - 247 / 5.5            | TX spurious emissions cond.                         | KDB 558074<br>DTS clause: 8.5        | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.209(a)<br>RSS-Gen                    | TX spurious emissions rad. below 30 MHz             | -/-                                  | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.247(d)<br>RSS - 247 / 5.5<br>RSS-Gen | TX spurious emissions rad. 30 MHz to 1 GHz          | -/-                                  | Nominal                | Nominal               | DSSS OFDM | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.247(d)<br>RSS - 247 / 5.5<br>RSS-Gen | TX spurious emissions rad. above 1 GHz              | -/-                                  | Nominal                | Nominal               | DSSS OFDM | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | 1 GHz to 18 GHz only<br>Only 20 MHz modes |
| §15.109<br>RSS-Gen                       | RX spurious emissions rad. 30 MHz to 1 GHz          | -/-                                  | Nominal                | Nominal               | RX / idle | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |
| §15.109<br>RSS-Gen                       | RX spurious emissions rad. above 1 GHz              | -/-                                  | Nominal                | Nominal               | RX / idle | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                                       |

|                       |                                 |     |         |         |              |                          |                          |                          |                                     |     |
|-----------------------|---------------------------------|-----|---------|---------|--------------|--------------------------|--------------------------|--------------------------|-------------------------------------|-----|
| §15.107(a)<br>§15.207 | Conducted emissions<br>< 30 MHz | -/- | Nominal | Nominal | DSSS<br>OFDM | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/- |
|-----------------------|---------------------------------|-----|---------|---------|--------------|--------------------------|--------------------------|--------------------------|-------------------------------------|-----|

**Notes:**

|          |           |           |               |           |                |           |               |
|----------|-----------|-----------|---------------|-----------|----------------|-----------|---------------|
| <b>C</b> | Compliant | <b>NC</b> | Not compliant | <b>NA</b> | Not applicable | <b>NP</b> | Not performed |
|----------|-----------|-----------|---------------|-----------|----------------|-----------|---------------|

## 11 Additional information and comments

Reference documents: Test report 1-2648\_16-01-03.pdf  
ICO-OPE-03994 Wifi\_Labtool\_Radio\_agreement\_procedure

Special test descriptions:

Used power settings:

| Channel | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
|---------|----|----|----|----|----|----|----|----|----|----|----|
| 11b     | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 11g     | 14 | 15 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 14 |
| 11n-20  | 13 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 14 |
| 11n-40  |    |    | 10 | 11 | 12 | 13 | 13 | 12 | 10 |    |    |

Configuration descriptions: None

- EUT selection:
- Only one device available
  - Devices selected by the customer
  - Devices selected by the laboratory (Randomly)

Provided channels:

Channels with 20 MHz channel bandwidth:

| channel number & center frequency |             |      |      |      |      |             |      |      |      |      |             |      |      |
|-----------------------------------|-------------|------|------|------|------|-------------|------|------|------|------|-------------|------|------|
| channel                           | 1           | 2    | 3    | 4    | 5    | 6           | 7    | 8    | 9    | 10   | 11          | 12   | 13   |
| f <sub>c</sub> / MHz              | <b>2412</b> | 2417 | 2422 | 2427 | 2432 | <b>2437</b> | 2442 | 2447 | 2452 | 2457 | <b>2462</b> | 2467 | 2472 |

Channels with 40 MHz channel bandwidth:

| channel number & center frequency |     |     |             |      |      |             |      |      |             |      |      |     |     |
|-----------------------------------|-----|-----|-------------|------|------|-------------|------|------|-------------|------|------|-----|-----|
| channel                           | -/- | -/- | 3           | 4    | 5    | 6           | 7    | 8    | 9           | 10   | 11   | -/- | -/- |
| f <sub>c</sub> / MHz              | -/- | -/- | <b>2422</b> | 2427 | 2432 | <b>2437</b> | 2442 | 2447 | <b>2452</b> | 2457 | 2462 | -/- | -/- |

Note: The channels used for the tests are marked in bold in the list.

## 12 Additional EUT parameter

- Test mode:
- No test mode available  
lperf was used to ping another device with the largest support packet size
  - Test mode available  
Special software is used.  
EUT is transmitting pseudo random data by itself
- Modulation types:
- Wide Band Modulation (None Hopping – e.g. DSSS, OFDM)
  - Frequency Hopping Spread Spectrum (FHSS)
- Antennas and transmit operating modes:
- Operating mode 1 (single antenna)
    - *Equipment with 1 antenna,*
    - *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
    - *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*
  - Operating mode 2 (multiple antennas, no beamforming)
    - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*
  - Operating mode 3 (multiple antennas, with beamforming)
    - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.  
In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.*

## 13 Measurement results

### 13.1 Band edge compliance radiated

#### Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3 meter.

#### Measurement:

|                         | Measurement parameter for peak measurements | Measurement parameter for average measurements                                    |
|-------------------------|---|---|
|                         |   | According to DTS clause: 8.7.3  |
| Detector                | Peak  | RMS   |
| Sweep time              | Auto  | Auto  |
| Resolution bandwidth    | 1 MHz                                       | 100 kHz   |
| Video bandwidth         | 3 MHz                                       | 300 kHz   |
| Span                    | See plot                                    | 2 MHz   |
| Trace mode              | Max. hold                                   | RMS Average over 101 sweeps   |
| Analyzer function       | -/-   | Band power function<br>(Compute the power by integrating the spectrum over 1 MHz) |
| Test setup              | See chapter 7.1 – B                         |   |
| Measurement uncertainty | See chapter 9                               |   |

#### Limits:

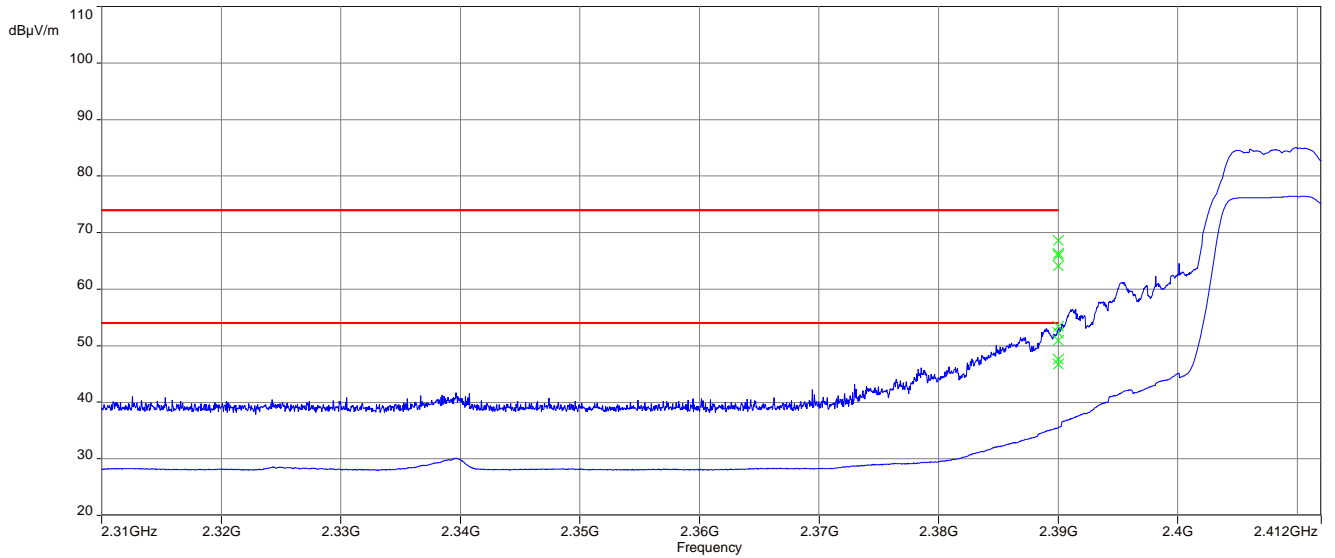
| FCC   | ISED |
|---|------|
| 74 dB $\mu$ V/m @ 3 m (Peak)<br>54 dB $\mu$ V/m @ 3 m (AVG) |      |

#### Results:

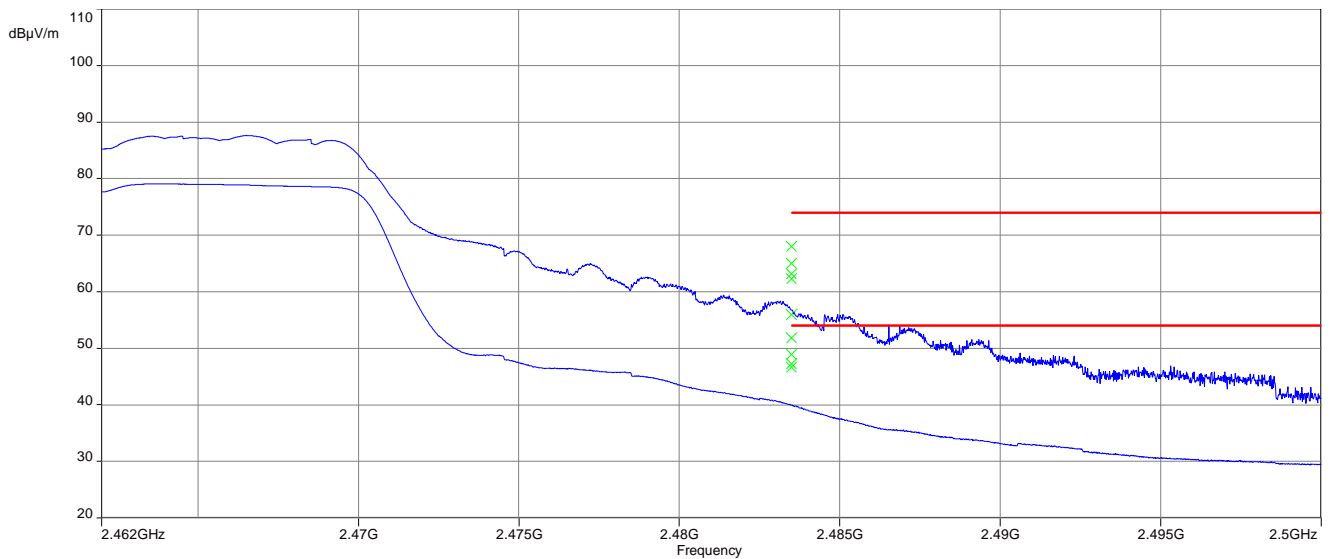
| band edge compliance radiated / (dB $\mu$ V / m) @ 3 m |                           |                           |                           |
|--|---------------------------|---------------------------|---------------------------|
|  | OFDM<br>g-mode            | OFDM<br>n20-mode          | OFDM<br>n40-mode          |
| Lower<br>band edge                                     | 68.6 (Peak)<br>53.4 (AVG) | 67.1 (Peak)<br>48.8 (AVG) | 56.9 (Peak)<br>43.4 (AVG) |
| Upper<br>band edge                                     | 68.0 (Peak)<br>51.8 (AVG) | 68.1 (Peak)<br>50.5 (AVG) | 57.1 (Peak)<br>36.7 (AVG) |

**Plots:** OFDM g-mode - peak / average

**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization



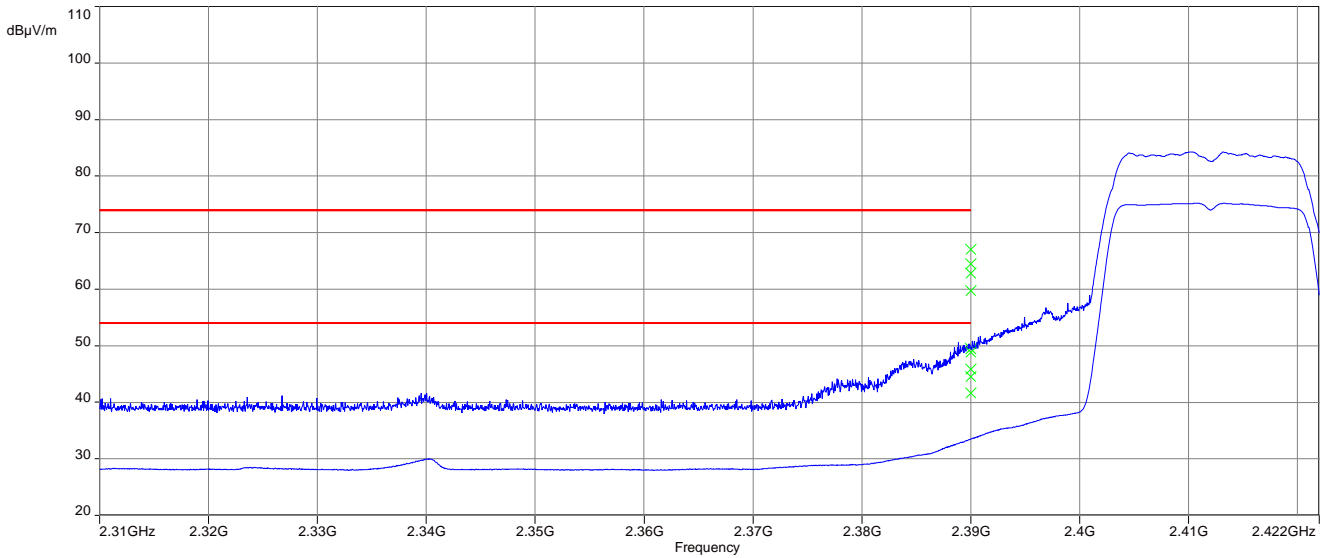
**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization



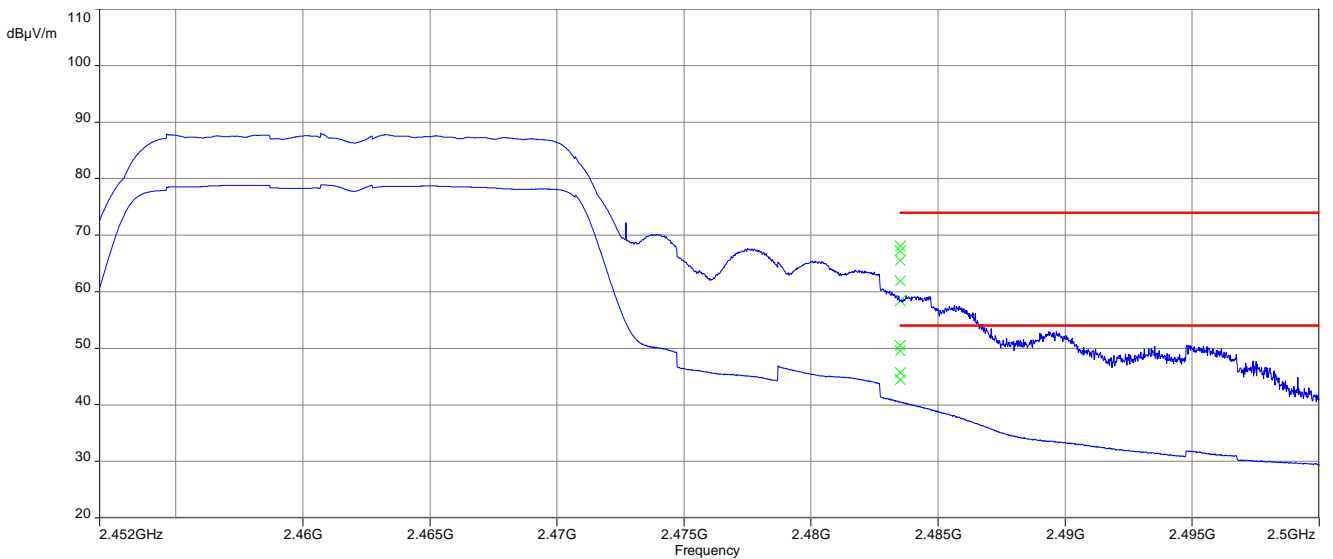


**Plots:** OFDM n20 - mode peak / average

**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization

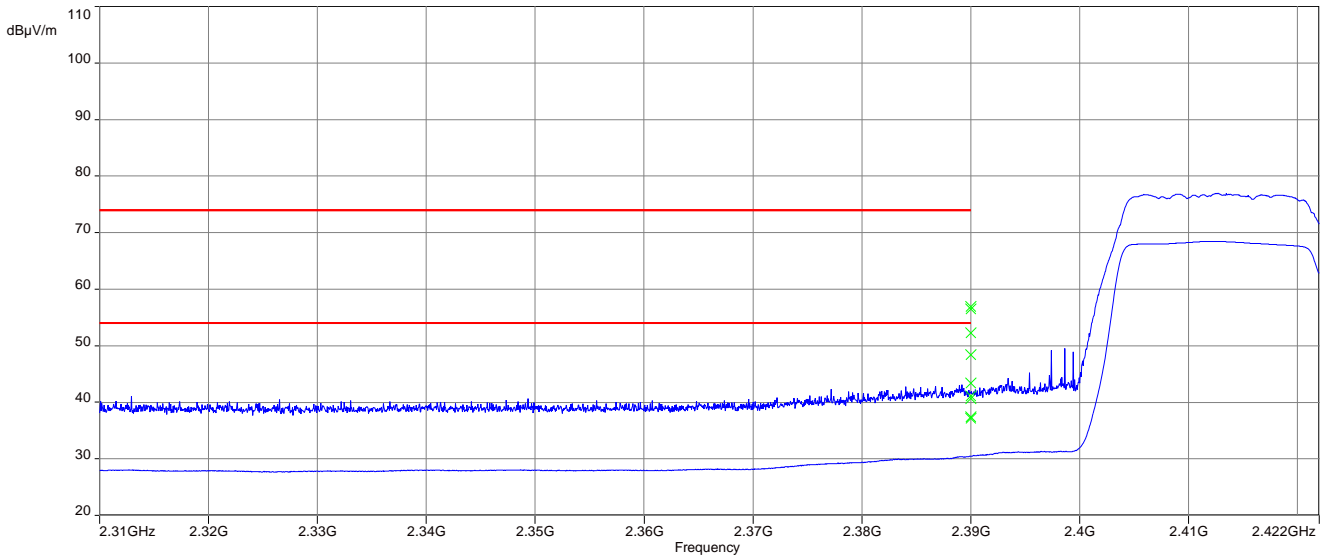


**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization

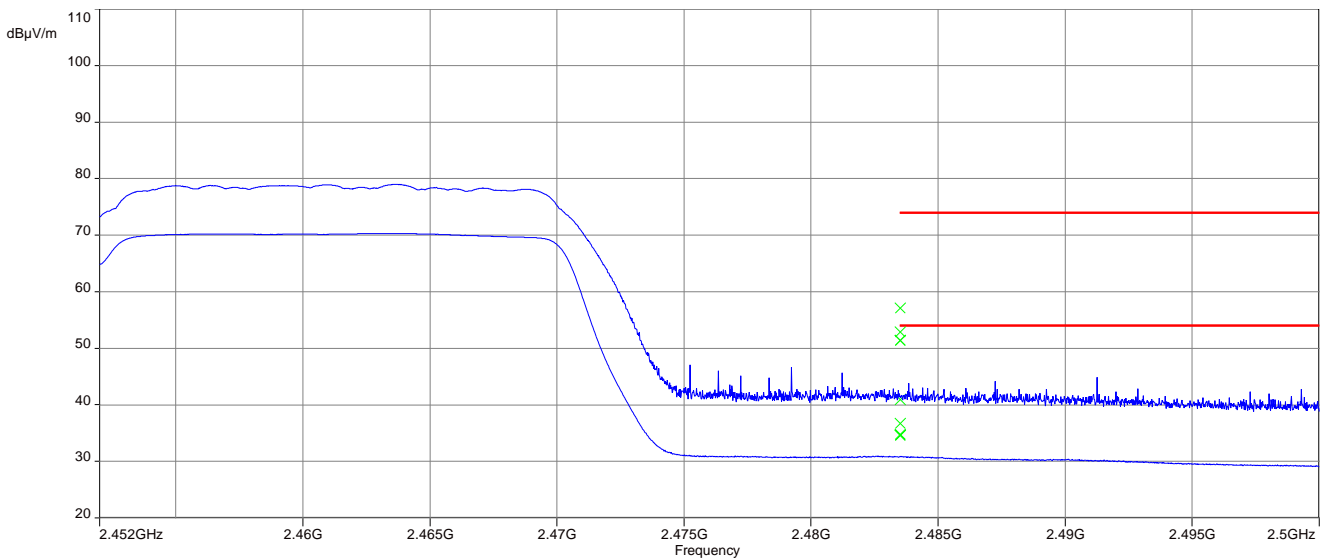


**Plots:** OFDM n40 - mode peak / average

**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization



**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization



## 13.2 Spurious emissions radiated above 1 GHz

### Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode.

### Measurement:

| Measurement parameter   |   |
|-------------------------|---|
| Detector                | Peak / RMS  |
| Sweep time              | Auto  |
| Resolution bandwidth    | 1 MHz   |
| Video bandwidth         | 3 x RBW   |
| Span                    | 1 GHz to 26 GHz   |
| Trace mode              | Max Hold  |
| Measured modulation     | <input checked="" type="checkbox"/> DSSS b – mode<br><input checked="" type="checkbox"/> OFDM g – mode<br><input checked="" type="checkbox"/> OFDM n HT20 – mode<br><input type="checkbox"/> OFDM n HT40 – mode |
| Test setup              | See chapter 7.1 - A   |
| Measurement uncertainty | See chapter 9   |

### Limits:

| FCC  |                                   | ISED                     |  |
|--|-----------------------------------|--------------------------|--|
| In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |                                   |                          |  |
| Frequency / MHz  | Field Strength / (dB $\mu$ V / m) | Measurement distance / m |  |
| Above 960  | 54.0 (AVG)                        | 3                        |  |
|  | 74.0 (peak)                       |                          |  |

**Results:** DSSS b-mode

| TX spurious emissions radiated / dBµV/m @ 3 m |          |                |                |          |                |                 |          |                |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| lowest channel                                |          |                | middle channel |          |                | highest channel |          |                |
| f / MHz                                       | Detector | Level / dBµV/m | f / MHz        | Detector | Level / dBµV/m | f / MHz         | Detector | Level / dBµV/m |
| 4824  | RMS      | 53.9           | 4874           | RMS      | 53.3           | 4924            | RMS      | 50.6           |
|   | Peak     | 56.1           |                | Peak     | 55.7           |                 | Peak     | 53.6           |

**Results:** OFDM g-mode

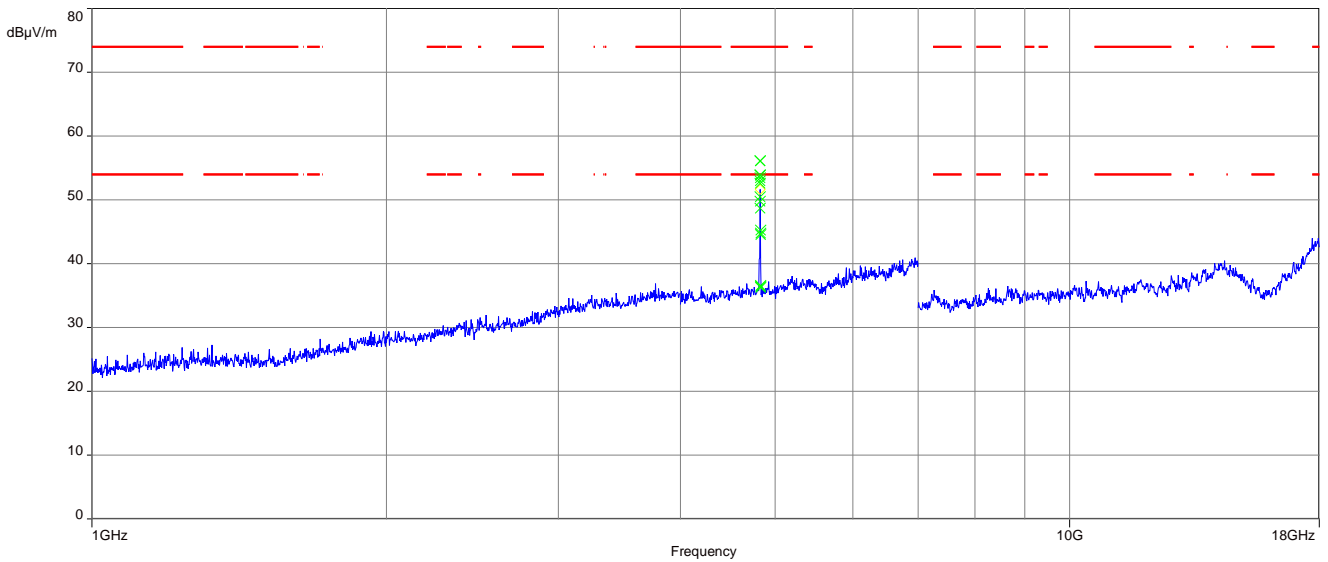
| TX spurious emissions radiated / dBµV/m @ 3 m |          |                |                |          |                |   |          |                |
|---|----------|----------------|----------------|----------|----------------|---|----------|----------------|
| lowest channel                                |          |                | middle channel |          |                | highest channel   |          |                |
| f / MHz                                       | Detector | Level / dBµV/m | f / MHz        | Detector | Level / dBµV/m | f / MHz   | Detector | Level / dBµV/m |
| 4824  | RMS      | 49.9           | 4874           | RMS      | 52.1           | All detected emissions are more than 10 dB below the limit. |          |                |
|   | Peak     | 59.4           |                | Peak     | 61.9           |   |          |                |

**Results:** OFDM n20-mode

| TX spurious emissions radiated / dBµV/m @ 3 m |          |                |                |          |                |   |          |                |
|---|----------|----------------|----------------|----------|----------------|---|----------|----------------|
| lowest channel                                |          |                | middle channel |          |                | highest channel   |          |                |
| f / MHz                                       | Detector | Level / dBµV/m | f / MHz        | Detector | Level / dBµV/m | f / MHz   | Detector | Level / dBµV/m |
| 4824  | RMS      | 45.6           | 4874           | RMS      | 50.1           | All detected emissions are more than 10 dB below the limit. |          |                |
|   | Peak     | 55.1           |                | Peak     | 59.0           |   |          |                |

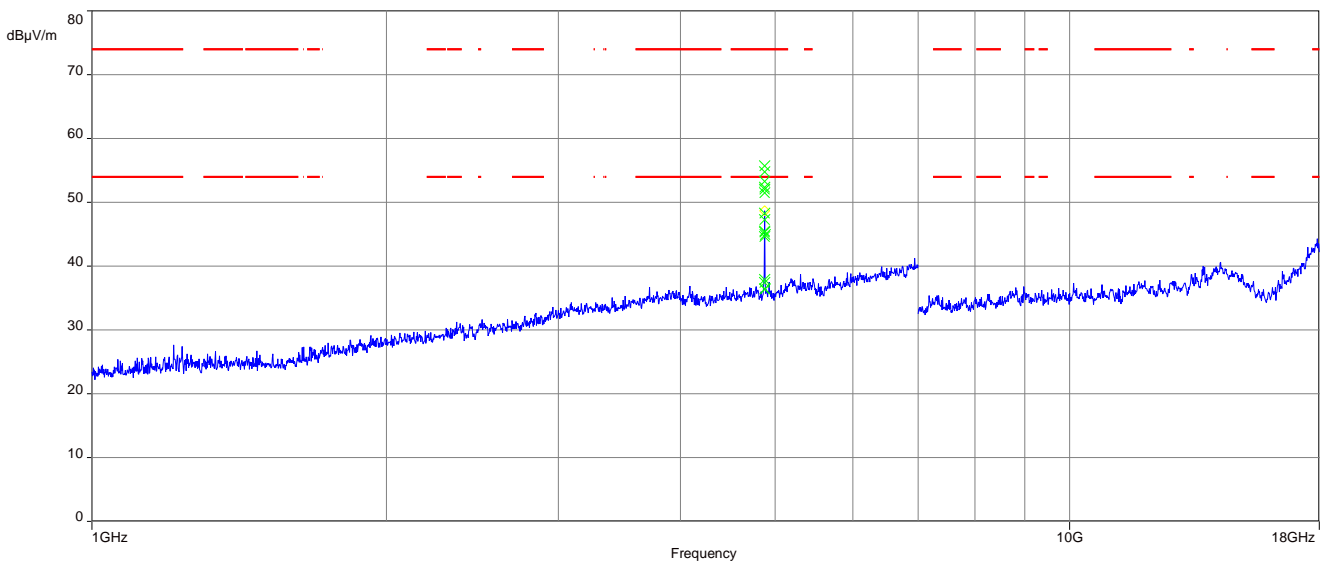
**Plots:** DSSS b-mode

**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



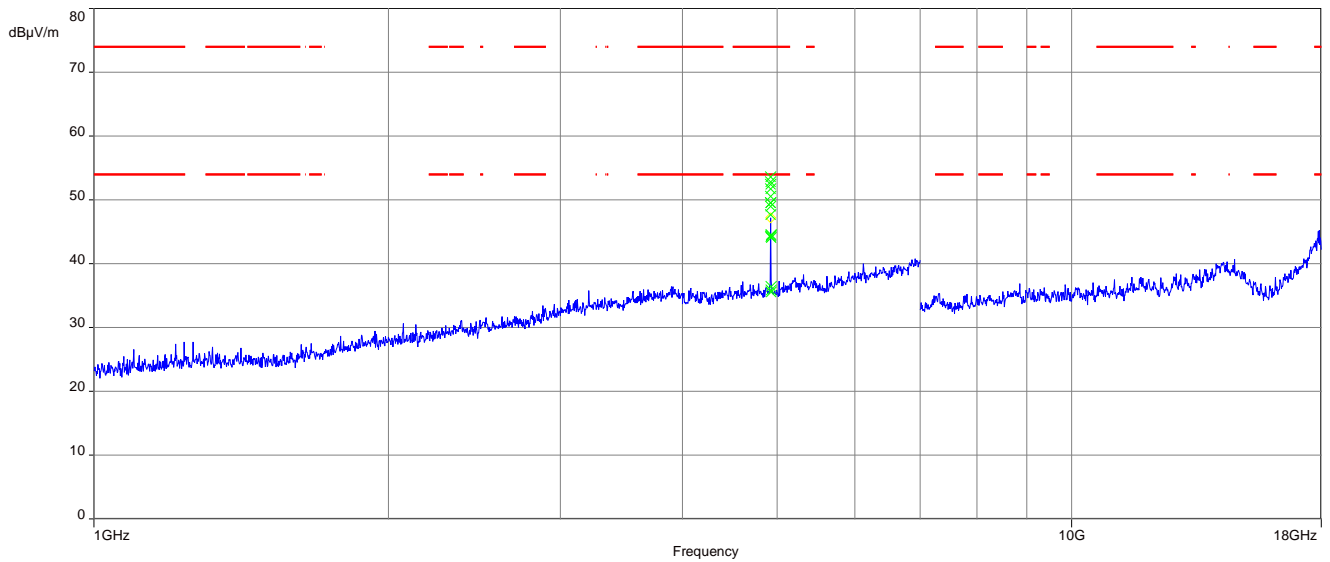
The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 2:** Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

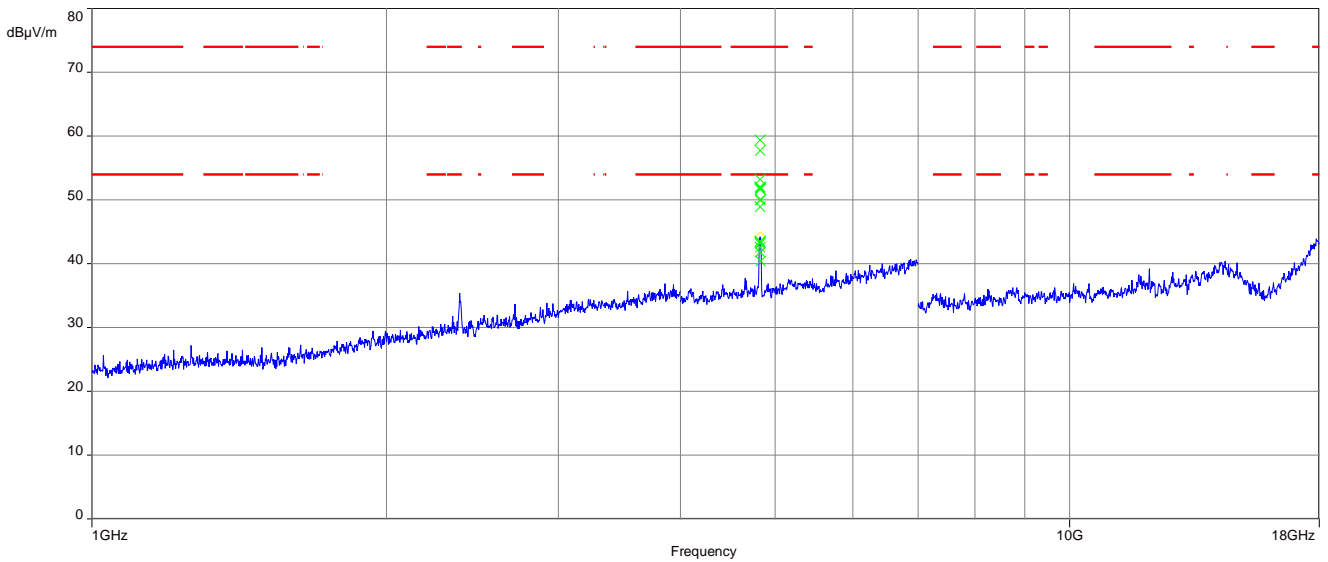
**Plot 3:** Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

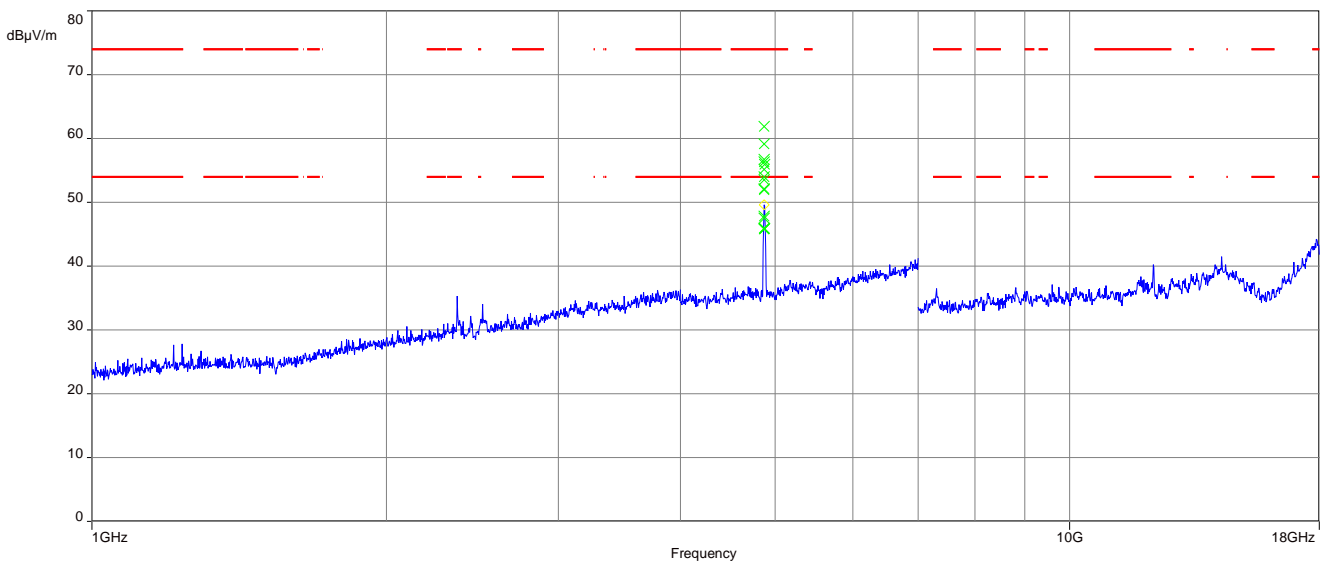
**Plots:** OFDM g-mode

**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



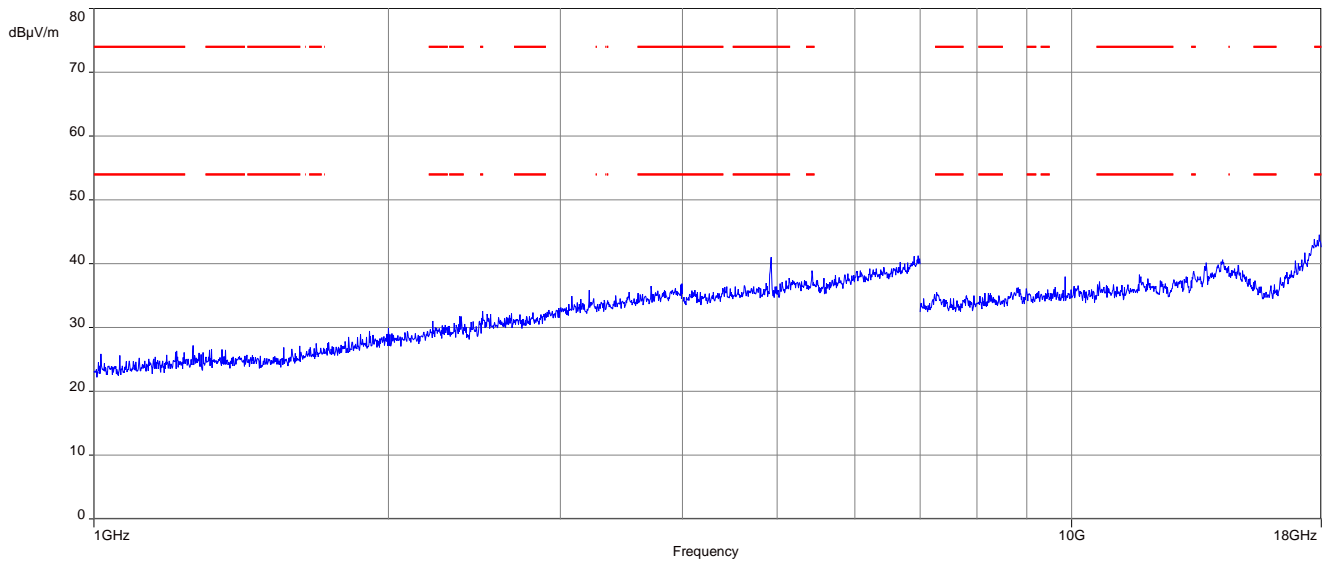
The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 2:** Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 3:** Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

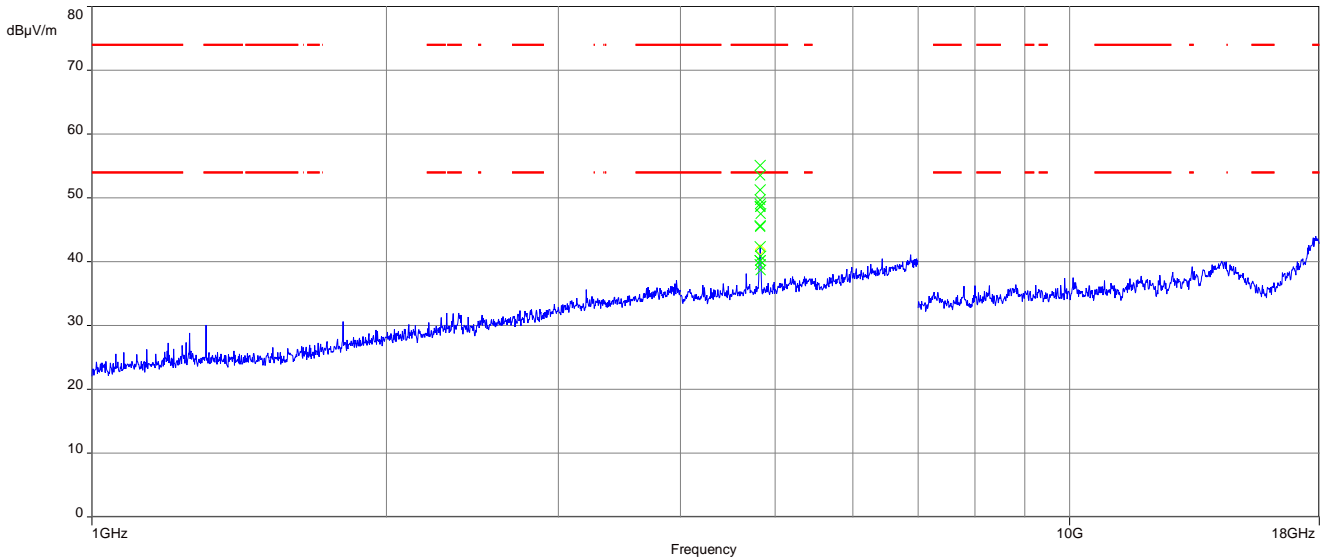


The carrier signal is notched with a 2.4 GHz band rejection filter.



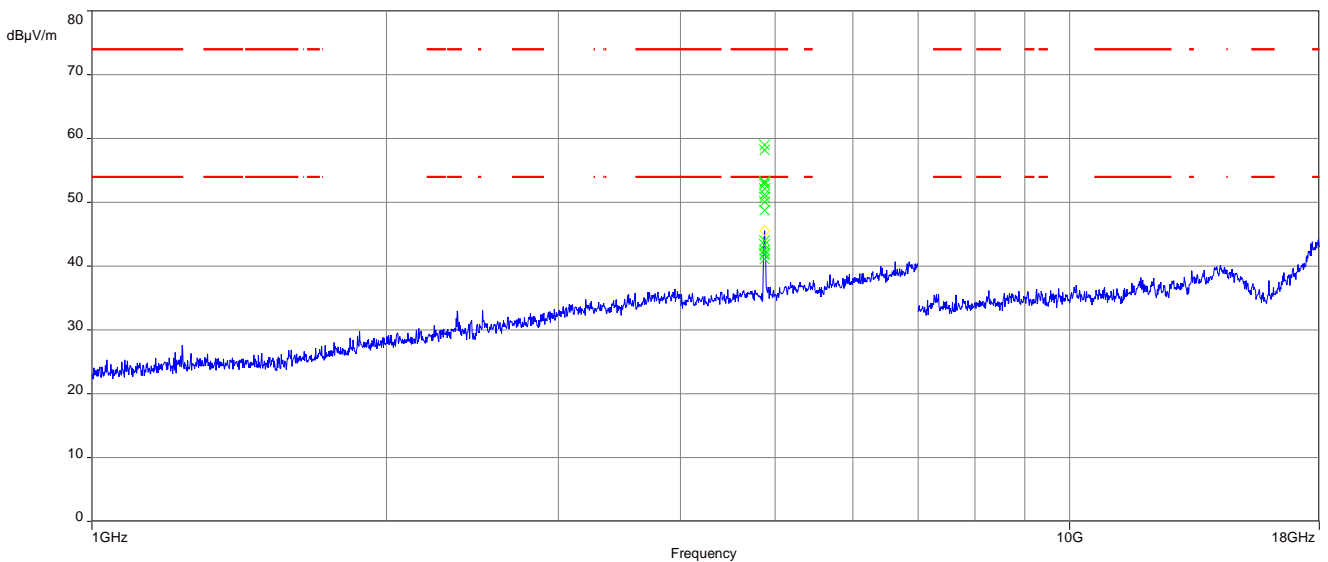
**Plots:** OFDM n20-mode

**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



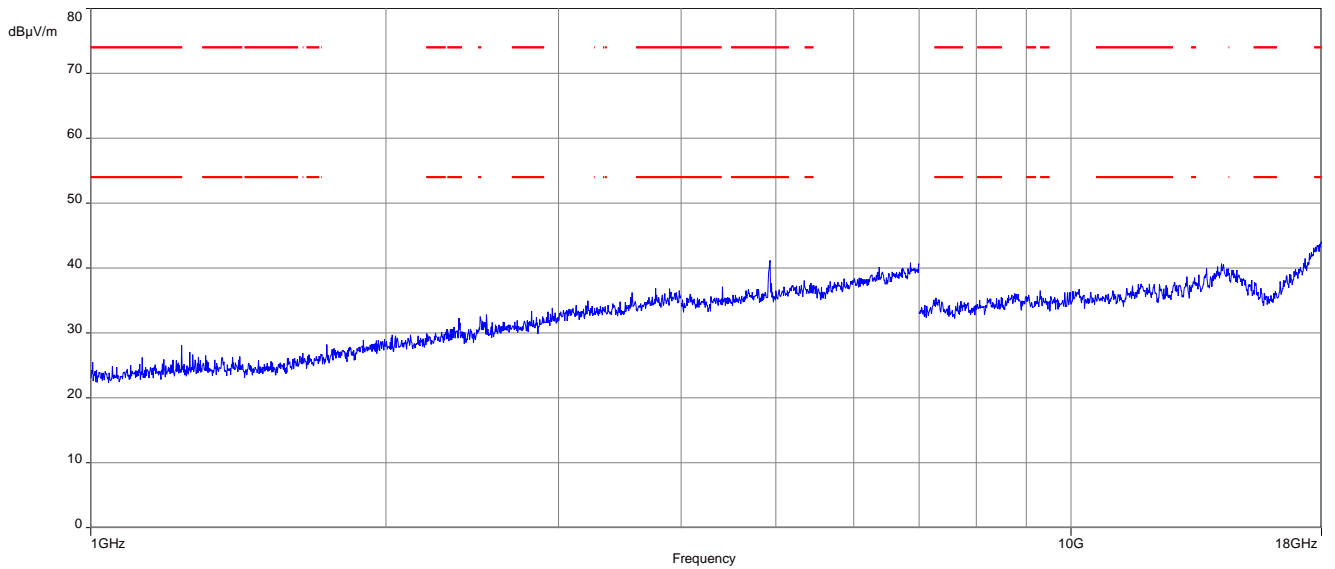
The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 2:** Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 3:** Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

## 14 Observations

No observations except those reported with the single test cases have been made.

## 15 Glossary

|                  |  |
|------------------|--|
| <b>EUT</b>       | Equipment under test                       |
| <b>DUT</b>       | Device under test                          |
| <b>UUT</b>       | Unit under test                            |
| <b>GUE</b>       | GNSS User Equipment                        |
| <b>FCC</b>       | Federal Communications Commission          |
| <b>FCC ID</b>    | Company Identifier at FCC                  |
| <b>IC</b>        | Industry Canada                            |
| <b>PMN</b>       | Product marketing name                     |
| <b>HMN</b>       | Host marketing name                        |
| <b>HVIN</b>      | Hardware version identification number     |
| <b>FVIN</b>      | Firmware version identification number     |
| <b>EMC</b>       | Electromagnetic Compatibility              |
| <b>HW</b>        | Hardware                                   |
| <b>SW</b>        | Software                                   |
| <b>Inv. No.</b>  | Inventory number                           |
| <b>S/N or SN</b> | Serial number                              |
| <b>C</b>         | Compliant                                  |
| <b>NC</b>        | Not compliant                              |
| <b>NA</b>        | Not applicable                             |
| <b>NP</b>        | Not performed                              |
| <b>PP</b>        | Positive peak                              |
| <b>QP</b>        | Quasi peak                                 |
| <b>AVG</b>       | Average                                    |
| <b>OC</b>        | Operating channel                          |
| <b>OCW</b>       | Operating channel bandwidth                |
| <b>OBW</b>       | Occupied bandwidth                         |
| <b>OOB</b>       | Out of band                                |
| <b>DFS</b>       | Dynamic frequency selection                |
| <b>CAC</b>       | Channel availability check                 |
| <b>OP</b>        | Occupancy period                           |
| <b>DC</b>        | Duty cycle                                 |
| <b>PER</b>       | Packet error rate                          |
| <b>CW</b>        | Clean wave                                 |
| <b>MC</b>        | Modulated carrier                          |
| <b>WLAN</b>      | Wireless local area network                |
| <b>RLAN</b>      | Radio local area network                   |
| <b>DSSS</b>      | Dynamic sequence spread spectrum           |
| <b>OFDM</b>      | Orthogonal frequency division multiplexing |

## 16 Document history

| Version | Applied changes | Date of release |
|---------|-----------------|-----------------|
| -/-     | Initial release | 2022-07-08      |
| A       | HVINs adjusted  | 2022-12-12      |

## 17 Accreditation Certificate – D-PL-12076-01-04

| first page   | last page   |
|--|---|
|  <p>The first page of the accreditation certificate includes the DAKKS logo, the name 'Deutsche Akkreditierungsstelle GmbH', and details about its accreditation. It states that CTC advanced GmbH is accredited for testing in the fields of Telecommunication (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards. The certificate is signed by the Head of Division, Ing. (FH) Adolf Egner, on 09.06.2020 in Frankfurt am Main.</p> |  <p>The last page of the accreditation certificate lists the office addresses for Berlin, Frankfurt am Main, and Braunschweig. It also contains a disclaimer regarding the publication of extracts and the scope of accreditation, and provides information on how to retrieve the up-to-date state of membership from various websites.</p> |

**Note: The current certificate annex is published on the websites (link see below).**

<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf>

or

[https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04\\_Canada\\_TCEMC.pdf](https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf)

**18 Accreditation Certificate – D-PL-12076-01-05**

| first page   | last page  |
|--|--|
|  <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV<br/>Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition</p> <p><b>Accreditation</b> </p> <p>The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory<br/><b>CTC advanced GmbH</b><br/>Untertürkheimer Straße 6-10, 66117 Saarbrücken<br/>is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out tests in the following fields:<br/><b>Telecommunication (FCC Requirements)</b></p> <p>The accreditation certificate shall only apply in connection with the notice of accreditation of 09.06.2020 with the accreditation number D-PL-12076-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 05 pages.<br/>Registration number of the certificate: <b>D-PL-12076-01-05</b></p> <p>Frankfurt am Main, 09.06.2020 <br/>by <b>Dipl.-Ing. (FH) Alf Egner</b><br/>Head of Division</p> <p><small>The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH.<br/><a href="https://www.dakks.de/en/content/accredited-bodies-dakks">https://www.dakks.de/en/content/accredited-bodies-dakks</a><br/>09.06.2020</small></p> | <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Office Berlin<br/>Spittelmarkt 10<br/>10117 Berlin</p> <p>Office Frankfurt am Main<br/>Europa-Allee 52<br/>60327 Frankfurt am Main</p> <p>Office Braunschweig<br/>Bundesallee 100<br/>38116 Braunschweig</p> <p>The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.</p> <p>No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkKS.</p> <p>The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.</p> <p>The up-to-date state of membership can be retrieved from the following websites:<br/>EA: <a href="http://www.european-accreditation.org">www.european-accreditation.org</a><br/>ILAC: <a href="http://www.ilac.org">www.ilac.org</a><br/>IAF: <a href="http://www.iaf.nu">www.iaf.nu</a></p> |

**Note: The current certificate annex is published on the websites (link see below).**

<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf>

OR

[https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05\\_TCB\\_USA.pdf](https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf)

##### END OF TEST REPORT #####