

## TEST REPORT

Test report no.: 1-9417/15-01-03-C



Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing laboratory

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#### Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

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

### Applicant

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### Manufacturer

#### Roche Diabetes Care

9115 Hague Road

IN 46256 Indianapolis / UNITED STATES

### Test standard/s

47 CFR Part 15

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

RSS - 247 Issue 1

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

Kind of test item: **Blood Glucose Meter**

Model name: **Accu-Chek Guide**

FCC ID: **WX3-126**

IC: **3100A-126**

Frequency: **DTS band 2400 MHz to 2483.5 MHz**

Technology tested: **Bluetooth®, LE**

Antenna: **Integrated antenna**

Power supply: **3.0 V DC by battery**

Temperature range: **-10°C to 60°C**



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

### Test report authorised:

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## 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.

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**This test report replaces the test report with the number 1-9417/15-01-03-B and dated 2017-01-17.**

### 2.2 Application details

|                                    |            |
|------------------------------------|------------|
| Date of receipt of order:          | 2015-03-26 |
| Date of receipt of test item:      | 2015-04-23 |
| Start of test:                     | 2015-05-19 |
| End of test:                       | 2015-05-27 |
| Person(s) present during the test: | -/-        |

## 3 Test standard/s

| Test standard     | Date    | Test standard description                                                                                                    |
|-------------------|---------|------------------------------------------------------------------------------------------------------------------------------|
| 47 CFR Part 15    | -/-     | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices                                    |
| RSS - 247 Issue 1 | 2015-05 | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices |

### 3.1 Measurement guidance

|                  |         |                                                                                                               |
|------------------|---------|---------------------------------------------------------------------------------------------------------------|
| DTS : KDB 558074 | 2014-06 | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 |
|------------------|---------|---------------------------------------------------------------------------------------------------------------|

## 4 Test environment

|                            |           |                                             |
|----------------------------|-----------|---------------------------------------------|
| Temperature:               | $T_{nom}$ | +22 °C during room temperature tests        |
|                            | $T_{max}$ | No tests under extreme conditions required. |
|                            | $T_{min}$ | No tests under extreme conditions required. |
| Relative humidity content: |           | 50 %                                        |
| Barometric pressure:       |           | not relevant for this kind of testing       |
| Power supply:              | $V_{nom}$ | 3.0 V DC by battery                         |
|                            | $V_{max}$ | No tests under extreme conditions required. |
|                            | $V_{min}$ | No tests under extreme conditions required. |

## 5 Test item

|                            |   |                                                                                        |
|----------------------------|---|----------------------------------------------------------------------------------------|
| Kind of test item          | : | Blood Glucose Meter                                                                    |
| Type identification        | : | Accu-Chek Guide                                                                        |
| PMN                        | : | Accu-Chek Guide                                                                        |
| HMN                        | : | -/-                                                                                    |
| HVIN                       | : | 930                                                                                    |
| FVIN                       | : | 1.8.3                                                                                  |
| S/N serial number          | : | Radiated unit: 92500052735<br>Conducted unit 92500052737                               |
| HW hardware status         | : | PPB2                                                                                   |
| SW software status         | : | V1.8.3                                                                                 |
| Frequency band             | : | DTS band 2400 MHz to 2483.5 MHz<br>(lowest channel 2402 MHz; highest channel 2480 MHz) |
| Type of radio transmission | : | DSSS                                                                                   |
| Use of frequency spectrum  | : |                                                                                        |
| Type of modulation         | : | GFSK                                                                                   |
| Number of channels         | : | 40                                                                                     |
| Antenna                    | : | Integrated antenna                                                                     |
| Power supply               | : | 3.0 V DC by battery                                                                    |
| Temperature range          | : | -10°C to 60°C                                                                          |

### 5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-9417/15-01-01\_AnnexA  
 1-9417/15-01-01\_AnnexB  
 1-9417/15-01-01\_AnnexD

## 6 Test laboratories sub-contracted

None

## 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 signalling equipment as well as measuring receivers and analysers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

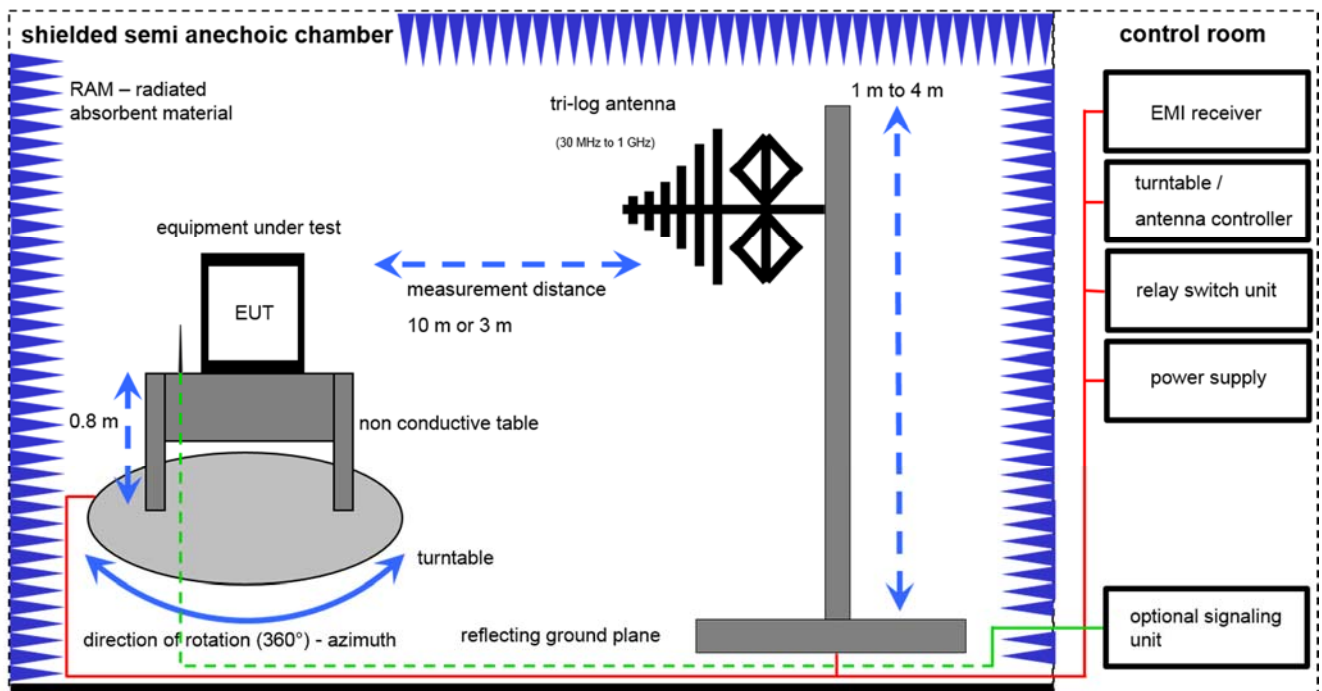
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**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 semi anechoic chamber

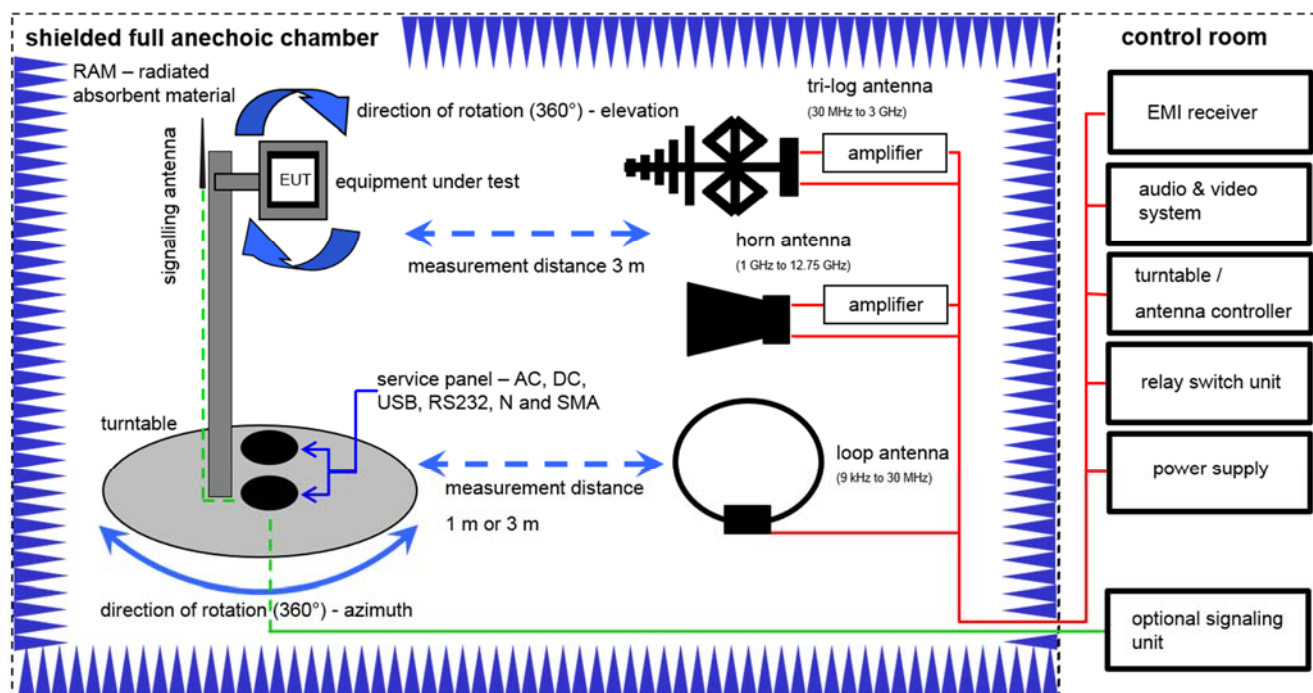
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



### Equipment table:

| No. | Lab / Item | Equipment                                    | Type         | Manufact.    | Serial No. | INV. No   | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|----------------------------------------------|--------------|--------------|------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Switch-Unit                                  | 3488A        | HP           | 2719A14505 | 300000368 | g                   | -/-              | -/-              |
| 2   | A          | EMI Test Receiver                            | ESCI 3       | R&S          | 100083     | 300003312 | k                   | 26.01.2015       | 26.01.2016       |
| 3   | A          | Antenna Tower                                | Model 2175   | ETS-Lindgren | 64762      | 300003745 | izw                 | -/-              | -/-              |
| 4   | A          | Positioning Controller                       | Model 2090   | ETS-Lindgren | 64672      | 300003746 | izw                 | -/-              | -/-              |
| 5   | A          | Turntable Interface-Box                      | Model 105637 | ETS-Lindgren | 44583      | 300003747 | izw                 | -/-              | -/-              |
| 6   | A          | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163     | Schwarzbeck  | 295        | 300003787 | k                   | 22.04.2014       | 22.04.2016       |

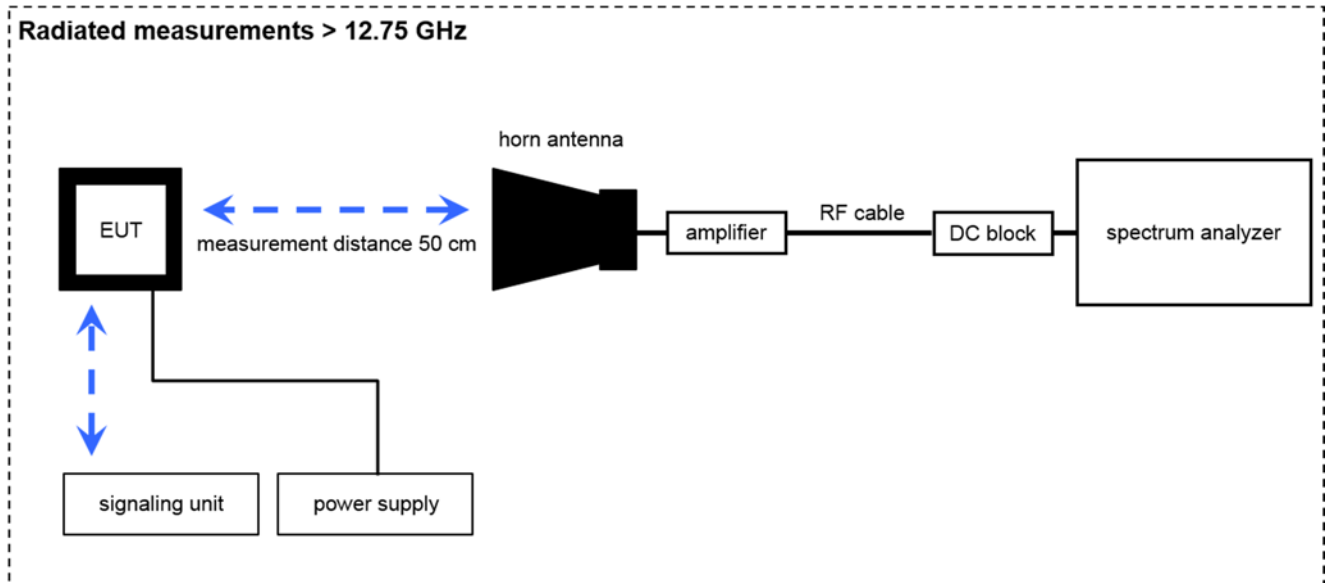
## 7.2 Shielded fully anechoic chamber



### Equipment table:

| No. | Lab / Item | Equipment                                          | Type        | Manufact.            | Serial No. | INV. No   | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|----------------------------------------------------|-------------|----------------------|------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Double-Ridged Waveguide Horn Antenna 1-18.0GHz     | 3115        | EMCO                 | 9709-5290  | 300000212 | k                   | 23.07.2013       | 23.07.2015       |
| 2   | A, B, C    | EMI Test Receiver 20Hz- 26,5GHz                    | ESU26       | R&S                  | 100037     | 300003555 | k                   | 22.01.2015       | 22.01.2016       |
| 3   | A          | Band Reject Filter WRCG2400/2483-2375/2505-50/10SS |             | Wainwright           | 26         | 300003792 | ne                  | -/-              | -/-              |
| 4   | A, B       | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz       | VULB9163    | Schwarzbeck          | 318        | 300003696 | k                   | 22.04.2014       | 22.04.2017       |
| 5   | A          | Broadband Amplifier                                | CBLU5135235 | CERNEX               | 22011      | 300004492 | ev                  | -/-              | -/-              |
| 6   | A, B, C    | 4U RF Switch Platform                              | L4491A      | Agilent Technologies | MY50000032 | 300004510 | ne                  | -/-              | -/-              |
| 7   | A, B, C    | NEXIO EMV-Software                                 | BAT EMC     | EMCO                 | MY50000032 | 300004682 | ne                  | -/-              | -/-              |
| 8   | A, B, C    | Anechoic chamber                                   | FAC 3/5m    | MWB / TDK            | 87400/02   | 300000996 | ev                  | -/-              | -/-              |
| 9   | C          | Artificial Mains 9 kHz to 30 MHz                   | ESH3-Z5     | R&S                  | 828576/020 | 300001210 | Ve                  | 30.01.2014       | 30.01.2016       |
| 10  | C          | Active Loop Antenna 10 kHz to 30 MHz               | 6502        | Kontron Psychotech   | 8905-2342  | 300000256 | k                   | 13.06.2013       | 13.06.2015       |
| 11  | A, B, C    | MXE EMI Receiver 20 Hz to 26,5 GHz                 | N9038A      | Agilent Technologies | MY51210197 | 300004405 | k                   | 06.03.2015       | 06.03.2016       |
| 12  | A, B, C    | 4U RF Switch Platform                              | L4491A      | Agilent Technologies | MY50000037 | 300004509 | ne                  | -/-              | -/-              |

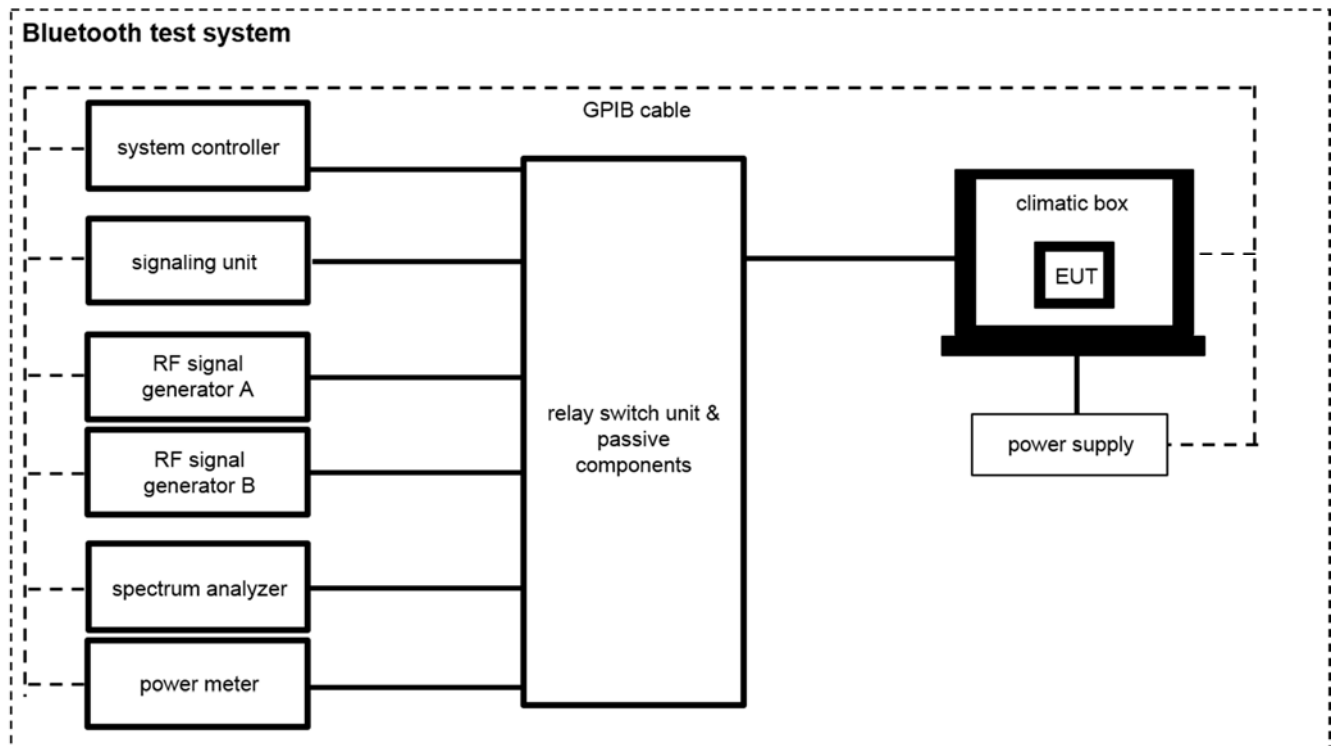
### 7.3 Radiated measurements > 12.75 GHz



#### Equipment table:

| No. | Lab / Item | Equipment                               | Type                | Manufact.      | Serial No.       | INV. No   | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|-----------------------------------------|---------------------|----------------|------------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Std. Gain Horn Antenna 12.4 to 18.0 GHz | 639                 | Narda          | 8402             | 300000787 | k                   | 22.07.2013       | 22.07.2015       |
| 2   | A          | Std. Gain Horn Antenna 18.0 to 26.5 GHz | 638                 | Narda          | 8205             | 300002442 | k                   | 19.07.2013       | 19.07.2015       |
| 3   | A          | Signal Analyzer 40 GHz                  | FSV40               | R&S            | 101042           | 300004517 | k                   | 22.01.2015       | 22.01.2016       |
| 4   | A          | Amplifier 2-40 GHz                      | JS32-02004000-57-5P | MITEQ          | 1777200          | 300004541 | ev                  | 20.05.2015       | 20.05.2017       |
| 5   | A          | RF-Cable                                | ST18/SMAm/SMAm/60   | Huber & Suhner | Batch no. 606844 | 400001181 | ev                  | -/-              | -/-              |
| 6   | A          | RF-Cable                                | ST18/SMAm/SMAm/48   | Huber & Suhner | Batch no. 600918 | 400001182 | ev                  | -/-              | -/-              |
| 7   | A          | DC-Blocker 0.1-40 GHz                   | 8141A               | Inmet          | Batch no. 600918 | 400001185 | ev                  | -/-              | -/-              |

## 7.4 Conducted measurements BT system



**Equipment table:**

| No. | Lab / Item | Equipment                                                 | Type                  | Manufact.            | Serial No.          | INV. No   | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|-----------------------------------------------------------|-----------------------|----------------------|---------------------|-----------|---------------------|------------------|------------------|
| 1   | A          | Switch / Control Unit                                     | 3488A                 | HP                   | -/-                 | 300001691 | ne                  | -/-              | -/-              |
| 2   | A          | Signal Analyzer<br>20Hz-26,5GHz-150<br>to + 30 DBM        | FSIQ26                | R&S                  | 835540/018          | 300002681 | k                   | 30.01.2014       | 30.01.2016       |
| 3   | A          | Frequency Standard<br>(Rubidium<br>Frequency<br>Standard) | MFS (Rubidium)        | R&S (Datum)          | 002                 | 300002681 | Ve                  | 29.01.2015       | 29.01.2017       |
| 4   | A          | USB/GPIB interface                                        | 82357B                | Agilent Technologies | MY52103346          | 300004390 | ne                  | -/-              | -/-              |
| 5   | A          | Directional Coupler                                       | 101020010             | Krytar               | 70215               | 300002840 | ev                  | -/-              | -/-              |
| 6   | A          | DC-Blocker                                                | 8143                  | Inmet Corp.          | none                | 300002842 | ne                  | -/-              | -/-              |
| 7   | A          | Powersplitter                                             | 6005-3                | Inmet Corp.          | none                | 300002841 | ev                  | -/-              | -/-              |
| 8   | A          | RF-Cable                                                  | ST18/SMAM/SMAM/<br>72 | Huber & Suhner       | Batch no.<br>605505 | 400001187 | ev                  | -/-              | -/-              |
| 9   | A          | RF-Cable                                                  | Sucoflex 104          | Huber & Suhner       | 147636/4            | 400001188 | ev                  | -/-              | -/-              |

## 8 Sequence of testing

### 8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

#### 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 height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

#### Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

## 8.2 Sequence of testing radiated spurious 30 MHz to 1 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 table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- 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 10 m or 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 changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak 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 maximize the peaks by changing turntable position  $\pm 45^\circ$  and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, 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.

### 8.3 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.

## 8.4 Sequence of testing radiated spurious above 18 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- 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.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

### Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

### Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

**9 Measurement uncertainty**

| Measurement uncertainty                                  |                                          |
|----------------------------------------------------------|------------------------------------------|
| Test case                                                | Uncertainty                              |
| Antenna gain                                             | ± 3 dB                                   |
| Spectrum bandwidth                                       | ± 21.5 kHz absolute; ± 15.0 kHz relative |
| Maximum output power                                     | ± 1 dB                                   |
| Detailed conducted spurious emissions @ the band edge    | ± 1 dB                                   |
| Band edge compliance radiated                            | ± 3 dB                                   |
| Spurious emissions conducted                             | ± 3 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

- ☒ **No deviations from the technical specifications were ascertained**
- ☐ There were deviations from the technical specifications ascertained
- ☐ This test report is only a partial test report.  
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 1 | See table! | 2017-02-09 | -/-    |

| Test specification clause                                | Test case                                                        | Guideline                                     | Temperature conditions | Power source voltages | Mode | C                                   | NC                       | NA                                  | NP                       | Remark                     |
|----------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------|------------------------|-----------------------|------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|----------------------------|
| §15.247(b)(4)<br>RSS - 247 /<br>5.4 (4)                  | System gain                                                      | -/-                                           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(e)<br>RSS - 247 /<br>5.2 (2)                     | Power spectral density                                           | KDB 558074<br>DTS clause: 10.6                | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(a)(2)<br>RSS - 247 /<br>5.2 (1)                  | DTS bandwidth –<br>6 dB bandwidth                                | KDB 558074<br>DTS clause: 8.1                 | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| RSS Gen<br>clause 4.6.1                                  | Occupied<br>bandwidth                                            | -/-                                           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(b)(3)<br>RSS - 247 /<br>5.4 (4)                  | Maximum output<br>power                                          | KDB 558074<br>DTS clause: 9.1.1               | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(d)<br>RSS - 247 /<br>5.5                         | Detailed spurious<br>emissions @ the<br>band edge -<br>conducted | -/-                                           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.205<br>RSS - 247 /<br>5.5<br>RSS - Gen               | Band edge<br>compliance<br>radiated                              | KDB 558074<br>DTS clause:<br>13.3.2           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(d)<br>RSS - 247 /<br>5.5                         | TX spurious<br>emissions<br>conducted                            | KDB 558074<br>DTS clause: 11.1<br>& 11.2 11.3 | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.209(a)<br>RSS - Gen                                  | TX spurious<br>emissions radiated                                | -/-                                           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(d)<br>RSS - 247 /<br>5.5<br>§15.109<br>RSS - Gen | RX spurious<br>emissions radiated                                | -/-                                           | Nominal                | Nominal               | -/-  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.247(d)<br>RSS - 247 /<br>5.5<br>§15.109<br>RSS - Gen | TX spurious<br>emissions radiated<br>< 30 MHz                    | -/-                                           | Nominal                | Nominal               | GFSK | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | -/-                        |
| §15.107(a)<br>§15.207                                    | Conducted<br>emissions<br>< 30 MHz                               | -/-                                           | Nominal                | Nominal               | GFSK | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Only<br>battery<br>powered |

**Note:** C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

## 11 Additional comments

The Bluetooth® word mark and logos are owned by the Bluetooth SIG Inc. and any use of such marks by CTC advanced GmbH is under license.

Reference documents: None

Special test descriptions: None

Configuration descriptions: TX tests: were performed with LE packets (37 byte payload) and static PRBS pattern.  
 RX/Standby tests: BT enabled, TX Idle  
 tested channels: lowest: 2402 MHz (Ch 0)  
 middle: 2440 MHz (Ch 19)  
 - highest: 2480 MHz (Ch 39)

Test mode:

☐ Bluetooth LE Test mode enabled  
 (EUT is controlled over CBT)

☒ Special software is used.  
 EUT is transmitting pseudo random data by itself

## 12 Measurement results

### 12.1 System gain

#### Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal Bluetooth® devices, the GFSK modulation is used.

#### Measurement parameters:

| Measurement parameters  |                                                                     |
|-------------------------|---------------------------------------------------------------------|
| Detector                | Peak                                                                |
| Sweep time              | Auto                                                                |
| Resolution bandwidth    | 3 MHz                                                               |
| Video bandwidth         | 3 MHz                                                               |
| Span                    | 5 MHz                                                               |
| Trace mode              | Max hold                                                            |
| Test setup              | See sub clause 7.2 B (radiated)<br>See sub clause 7.4 A (conducted) |
| Measurement uncertainty | See sub clause 9                                                    |

#### Limits:

| FCC          | IC |
|--------------|----|
| Antenna Gain |    |
| 6 dBi        |    |

#### Results:

| T <sub>nom</sub>                                       | V <sub>nom</sub> | lowest<br>channel<br>2402 MHz | middle<br>channel<br>2440 MHz | highest<br>channel<br>2480 MHz |
|--------------------------------------------------------|------------------|-------------------------------|-------------------------------|--------------------------------|
| Conducted power [dBm]<br>Measured with GFSK modulation |                  | -3.3                          | -4.3                          | -4.4                           |
| Radiated power [dBm]<br>Measured with GFSK modulation  |                  | -7.8                          | -6.0                          | -6.9                           |
| Gain [dBi]<br>Calculated                               |                  | -4.5                          | -1.7                          | -2.5                           |

## 12.2 Power spectral density

### Description:

Measurement of the power spectral density of a digital modulated system.

### Measurement:

| Measurement parameters  |                      |
|-------------------------|----------------------|
| Detector                | Peak                 |
| Sweep time              | Auto                 |
| Resolution bandwidth    | 3 kHz                |
| Video bandwidth         | 10 kHz               |
| Span                    | ≥ EBW                |
| Trace mode              | Max hold             |
| Test setup              | See sub clause 7.4 A |
| Measurement uncertainty | See sub clause 9     |

### Limits:

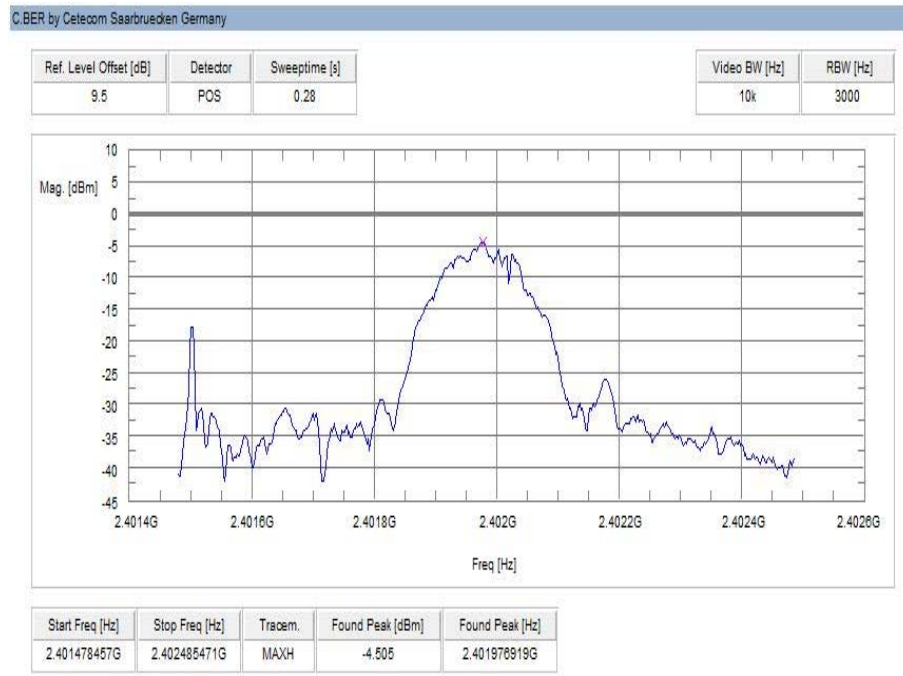
| FCC                                                                                                                                                                                                                                                                                            | IC |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Power Spectral Density                                                                                                                                                                                                                                                                         |    |
| For digitally modulated systems the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration. |    |

### Results:

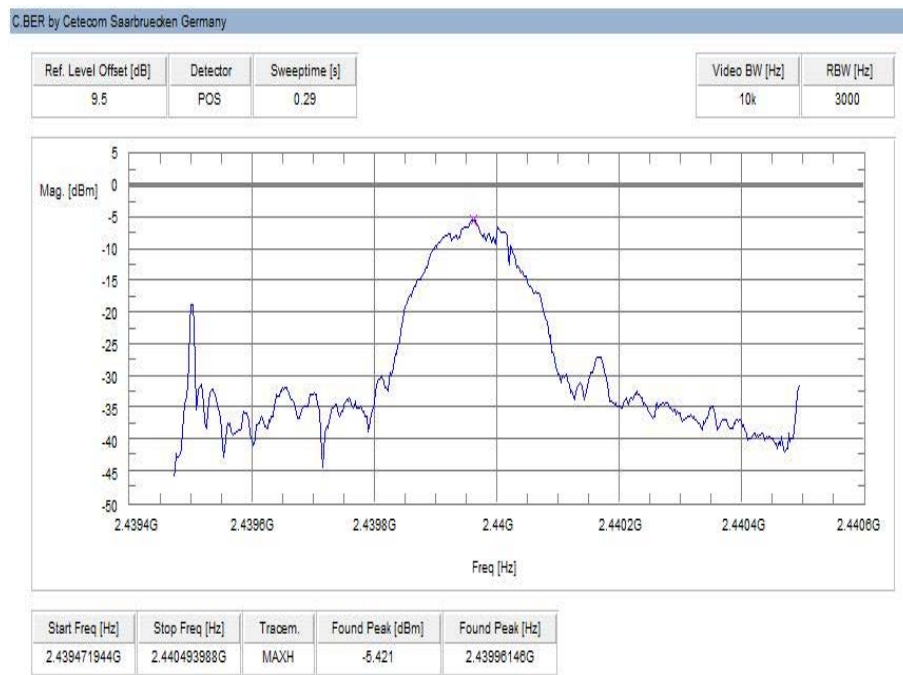
| Modulation   | Power spectral density |          |          |
|--------------|------------------------|----------|----------|
| Frequency    | 2402 MHz               | 2440 MHz | 2480 MHz |
| [dBm / 3kHz] | -4.5                   | -5.4     | -6.0     |

## Plots:

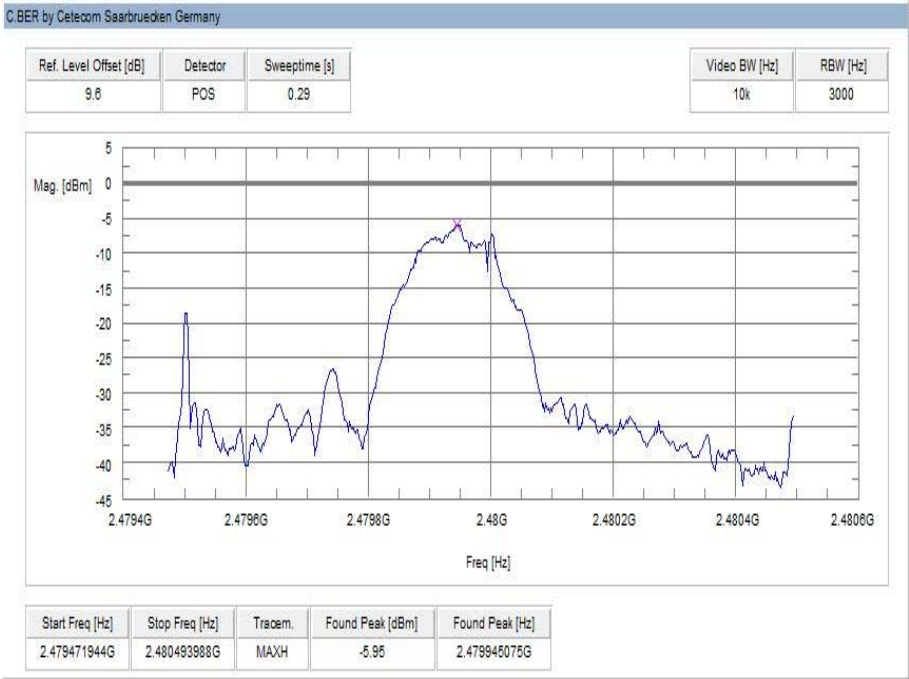
### Plot 1: lowest channel



### Plot 2: mid channel



Plot 3: highest channel



### 12.3 DTS bandwidth – 6 dB bandwidth

#### Description:

Measurement of the 6 dB bandwidth of the modulated signal.

#### Measurement:

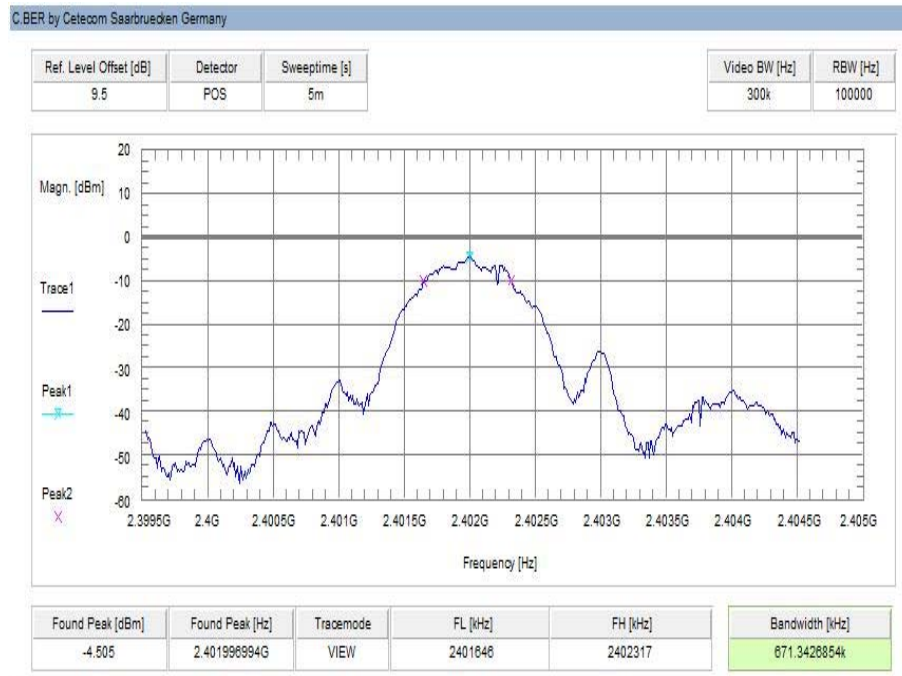
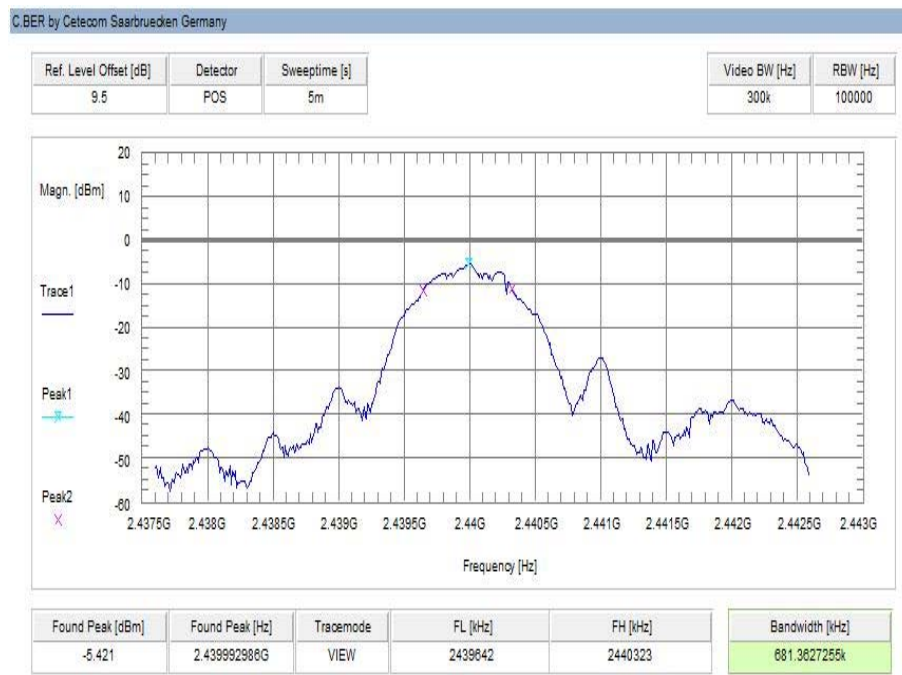
| Measurement parameters       |                                     |
|------------------------------|-------------------------------------|
| According to DTS clause: 8.1 |                                     |
| Detector                     | Peak                                |
| Sweep time                   | Auto                                |
| Resolution bandwidth         | 100 kHz                             |
| Video bandwidth              | 300 kHz                             |
| Span                         | 5 MHz                               |
| Measurement procedure        | Using 3 marker (max + 2x-6dB)       |
| Trace mode                   | Max hold (allow trace to stabilize) |
| Test setup                   | See sub clause 7.4 A                |
| Measurement uncertainty      | See sub clause 9                    |

#### Limits:

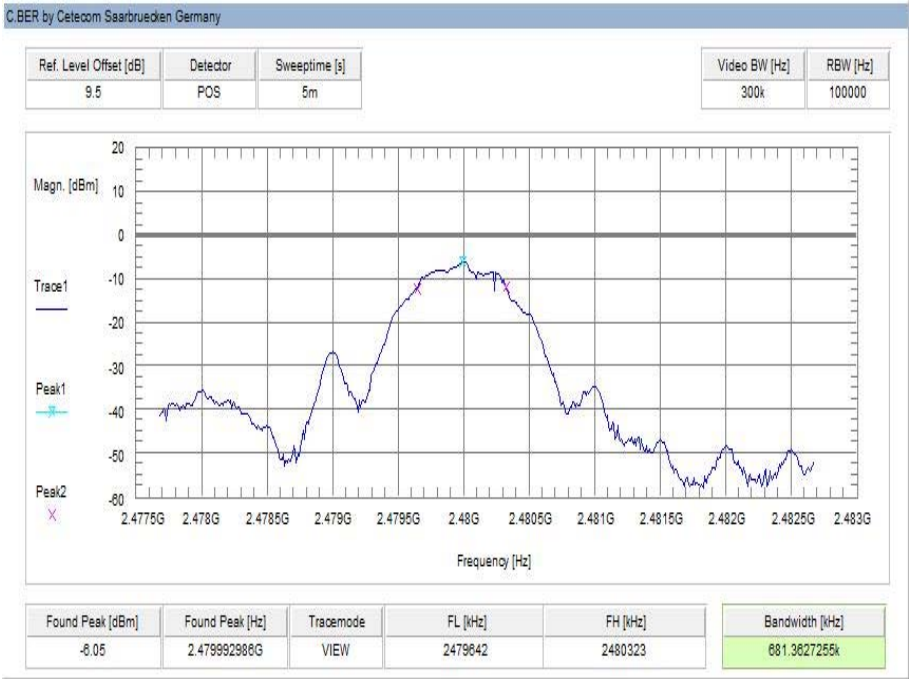
| FCC                                                                                                                                           | IC |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----|
| DTS bandwidth – 6 dB bandwidth                                                                                                                |    |
| Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band.<br>The minimum 6 dB bandwidth shall be at least 500 kHz. |    |

#### Results:

| Modulation | 6 dB BANDWIDTH [kHz] |          |          |
|------------|----------------------|----------|----------|
|            | 2402 MHz             | 2440 MHz | 2480 MHz |
| Frequency  |                      |          |          |
| GFSK       | 671.3                | 681.4    | 681.4    |

**Plots:****Plot 1: lowest channel****Plot 2: mid channel**

Plot 3: highest channel



## 12.4 Occupied bandwidth – 20 dB bandwidth

### Description:

Measurement of the 20 dB bandwidth of the modulated signal. EUT in single channel mode.

### Measurement:

| Measurement parameter   |                                     |
|-------------------------|-------------------------------------|
| Detector:               | Peak                                |
| Sweep time:             | Auto                                |
| Resolution bandwidth:   | 10 kHz                              |
| Video bandwidth:        | 30 kHz                              |
| Span:                   | 4 MHz                               |
| Trace mode              | Max hold (allow trace to stabilize) |
| Test setup              | See sub clause 7.4 A                |
| Measurement uncertainty | See sub clause 9                    |

### Limits:

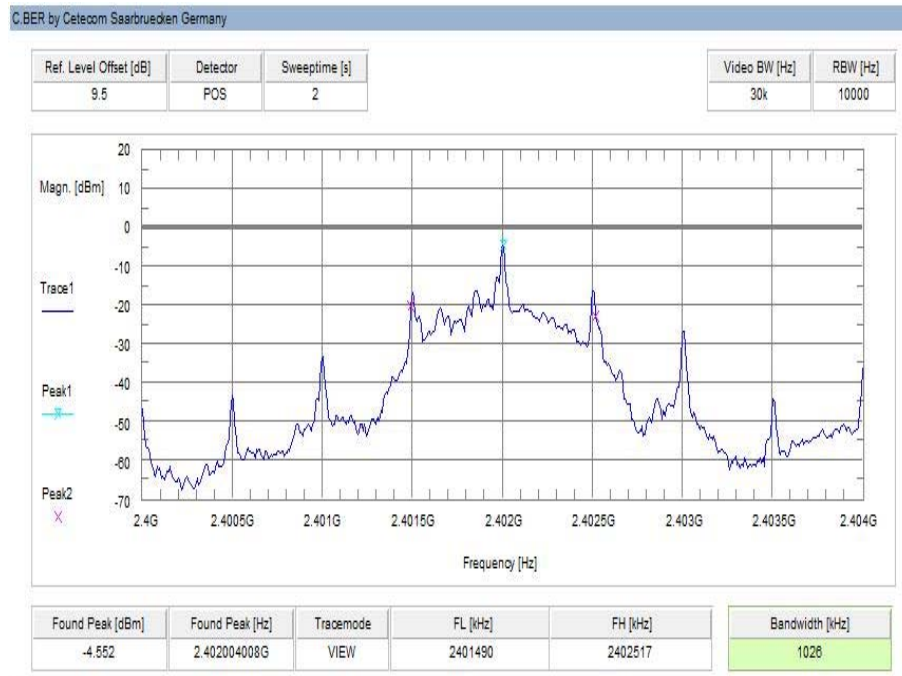
| FCC                                                                                  | IC |
|--------------------------------------------------------------------------------------|----|
| Occupied bandwidth – 20 dB bandwidth                                                 |    |
| No restriction – only necessary for further measurements and IC emission designator. |    |

### Results:

| Modulation<br>Frequency | 20 dB BANDWIDTH [kHz] |          |          |
|-------------------------|-----------------------|----------|----------|
|                         | 2402 MHz              | 2440 MHz | 2480 MHz |
| GFSK                    | 1026                  | 1026     | 1026     |

## Plots:

### Plot 1: lowest channel



### Plot 2: mid channel



Plot 3: highest channel



## 12.5 Maximum output power

### Description:

Measurement of the maximum output power conducted and radiated. EUT in single channel mode.

### Measurement:

| Measurement parameters  |                      |
|-------------------------|----------------------|
| Detector                | Peak                 |
| Sweep time              | Auto                 |
| Resolution bandwidth    | 3 MHz                |
| Video bandwidth         | 10 MHz               |
| Span                    | 10 MHz               |
| Trace mode              | Max hold             |
| Test setup              | See sub clause 7.4 A |
| Measurement uncertainty | See sub clause 9     |

### Limits:

| FCC                                                                                                                                          | IC |
|----------------------------------------------------------------------------------------------------------------------------------------------|----|
| Maximum output power                                                                                                                         |    |
| [Conducted: 0.125 W – antenna gain max. 6 dBi]<br>Systems using more than 75 hopping channels:<br>Conducted: 1.0 W – antenna gain max. 6 dBi |    |

### Results:

| Modulation<br>Frequency | Maximum output power conducted [dBm] |          |          |
|-------------------------|--------------------------------------|----------|----------|
|                         | 2402 MHz                             | 2440 MHz | 2480 MHz |
| GFSK                    | -3.2                                 | -4.1     | -4.3     |

| Modulation<br>Frequency | Maximum output power radiated - EIRP [dBm] |          |          |
|-------------------------|--------------------------------------------|----------|----------|
|                         | 2402 MHz                                   | 2440 MHz | 2480 MHz |
| GFSK                    | -7.8                                       | -6.0     | -6.9     |

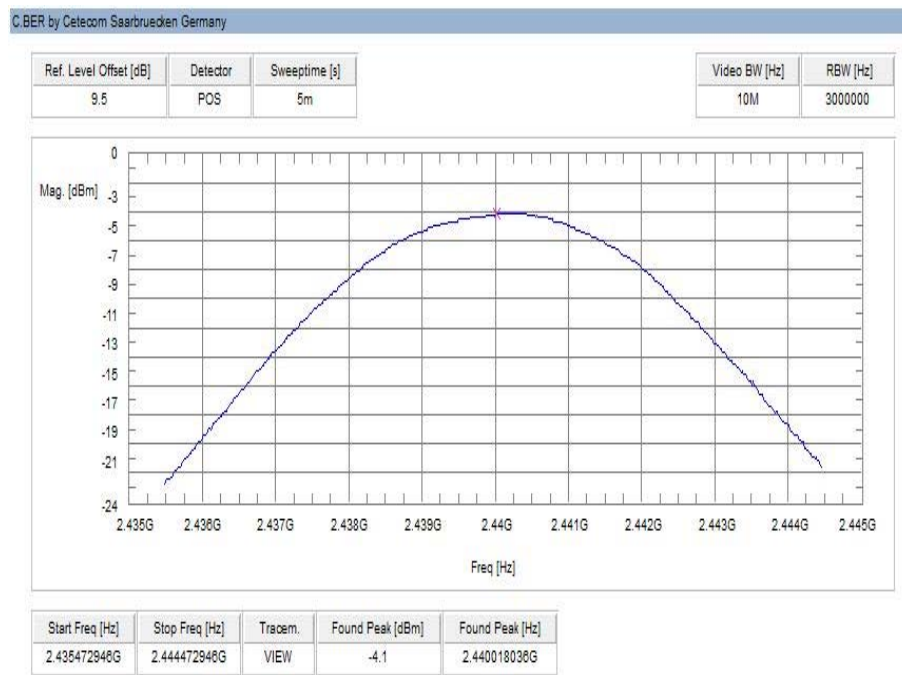
\*) - Values calculated with antenna gain

**Plots:**

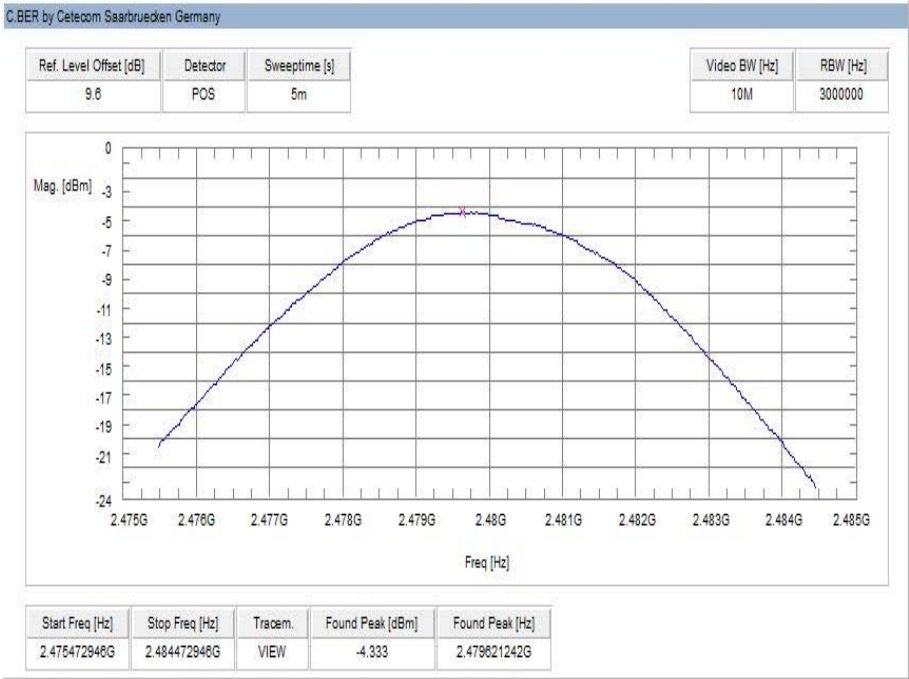
**Plot 1: lowest channel**



**Plot 2: mid channel**



Plot 3: highest channel



## 12.6 Detailed spurious emissions @ the band edge - conducted

### Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in single channel.

### Measurement:

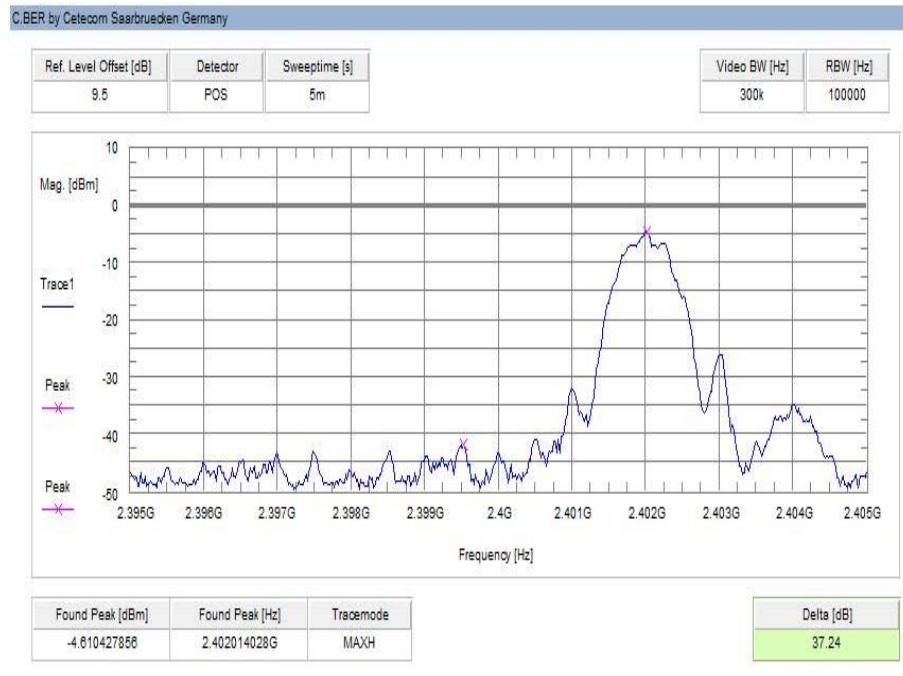
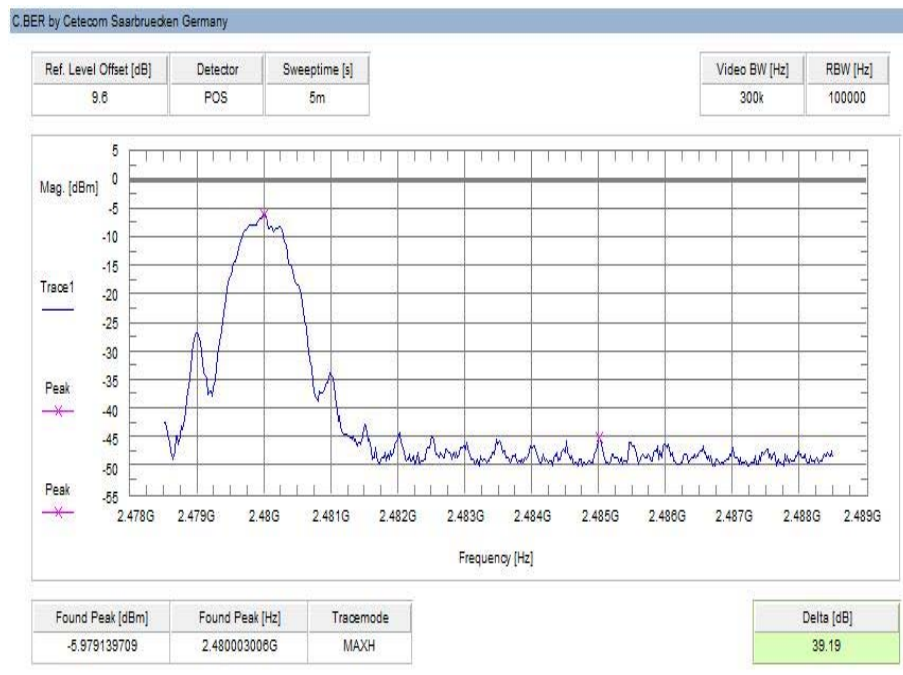
| Measurement parameters  |                                                                       |
|-------------------------|-----------------------------------------------------------------------|
| Detector                | Peak                                                                  |
| Sweep time              | Auto                                                                  |
| Resolution bandwidth    | 100 kHz                                                               |
| Video bandwidth         | 300 kHz / 500 kHz                                                     |
| Span                    | Lower Band Edge: 2395 – 2405 MHz<br>higher Band Edge: 2478 – 2489 MHz |
| Trace mode              | Max hold                                                              |
| Test setup              | See sub clause 7.4 A                                                  |
| Measurement uncertainty | See sub clause 9                                                      |

### Limits:

| FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | IC |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <p>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 20 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.</p> |    |

### Result:

| Scenario                      | Spurious band edge conducted [dB] |
|-------------------------------|-----------------------------------|
| Modulation                    | GFSK                              |
| Lower band edge – hopping off | > 20 dB                           |
| Upper band edge – hopping off | > 20 dB                           |

**Plots:****Plot 1: Lower band edge****Plot 2: Upper band edge**

## 12.7 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 single channel mode and the transmit channel is channel 00 for the lower restricted band and channel 39 for the upper restricted band. Measurement distance is 3m.

### Measurement:

| Measurement parameters  |                                                             |
|-------------------------|-------------------------------------------------------------|
| Detector                | Peak / RMS                                                  |
| Sweep time              | Auto                                                        |
| Resolution bandwidth    | 1 MHz                                                       |
| Video bandwidth         | 3 MHz                                                       |
| Span                    | Lower Band: 2300 – 2400 MHz<br>higher Band: 2480 – 2500 MHz |
| Trace mode              | Max hold                                                    |
| Test setup              | See sub clause 7.2 B                                        |
| Measurement uncertainty | See sub clause 9                                            |

### Limits:

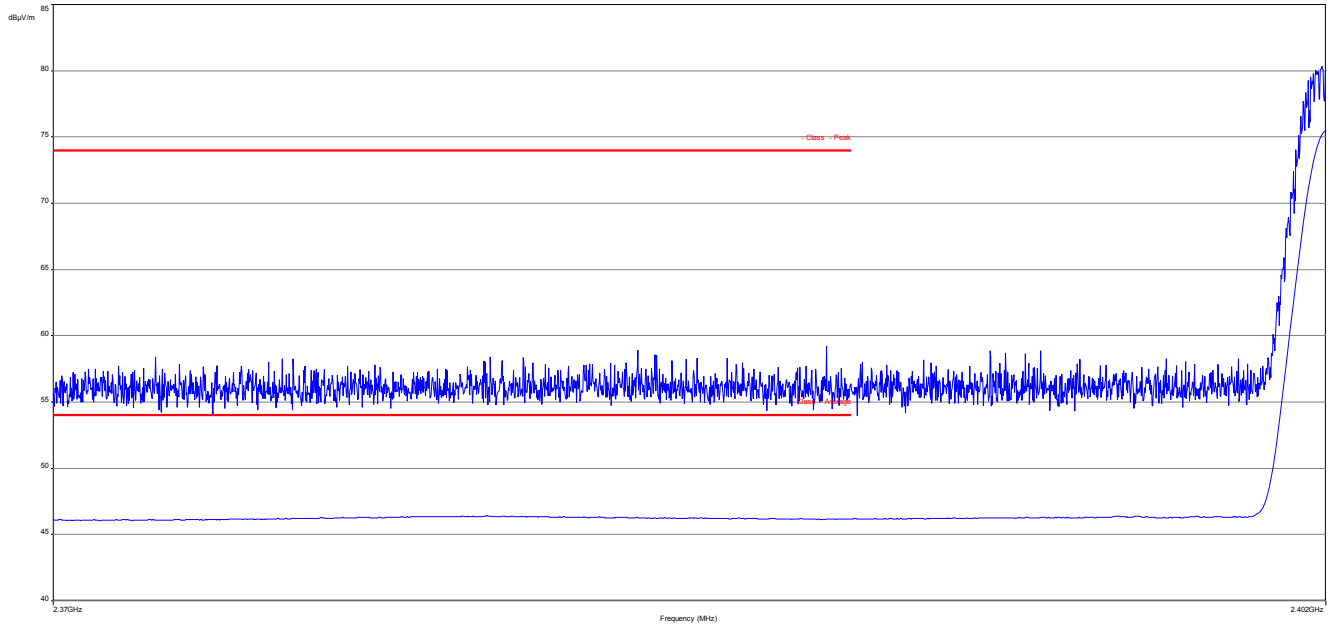
| FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | IC |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Band edge compliance radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| <p>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 20 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).</p> |    |
| 54 dBµV/m AVG<br>74 dBµV/m Peak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |

### Result:

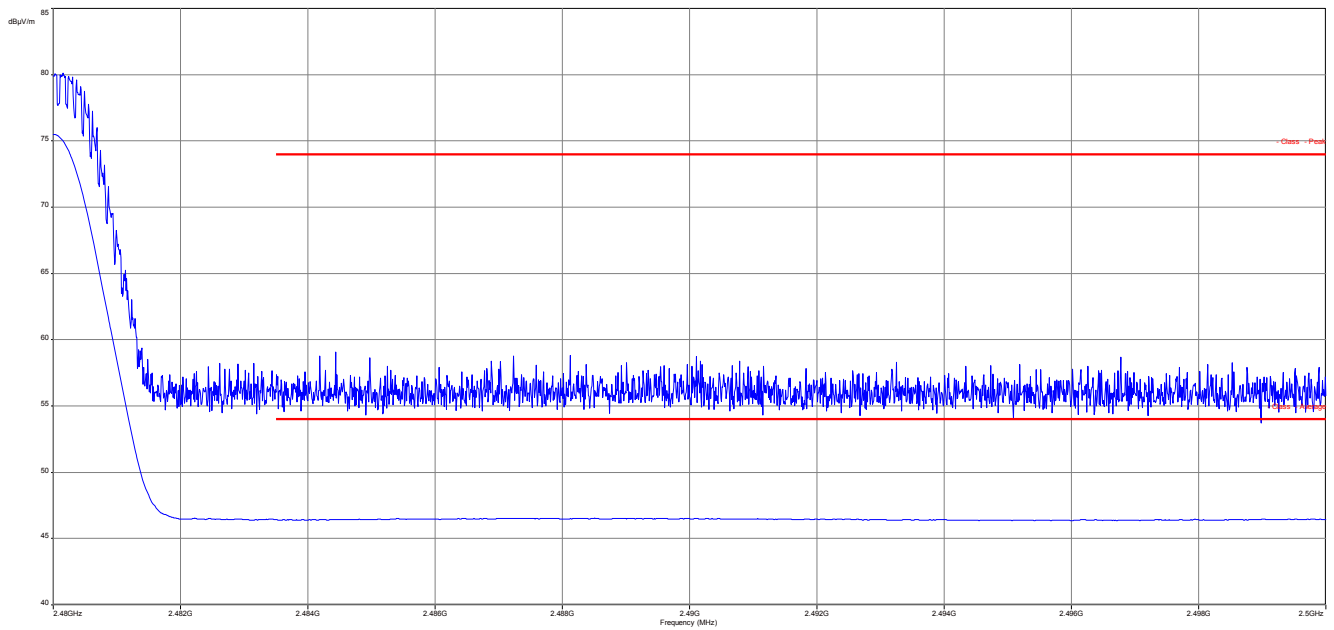
| Scenario              | Band edge compliance radiated [dBµV/m] |
|-----------------------|----------------------------------------|
| Modulation            | GFSK                                   |
| Lower restricted band | < 54 AVG / < 74 PP                     |
| Upper restricted band | < 54 AVG / < 74 PP                     |

## Plots:

**Plot 1: Lower restricted band**



**Plot 2: Upper restricted band**



## 12.8 TX spurious emissions conducted

### Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 19 and channel 39.

### Measurement:

| Measurement parameters  |                      |
|-------------------------|----------------------|
| Detector                | Peak                 |
| Sweep time              | Auto                 |
| Resolution bandwidth    | 100 kHz              |
| Video bandwidth         | 300 kHz or 500 kHz   |
| Span                    | 9 kHz to 25 GHz      |
| Trace mode              | Max hold             |
| Test setup              | See sub clause 7.4 A |
| Measurement uncertainty | See sub clause 9     |

### Limits:

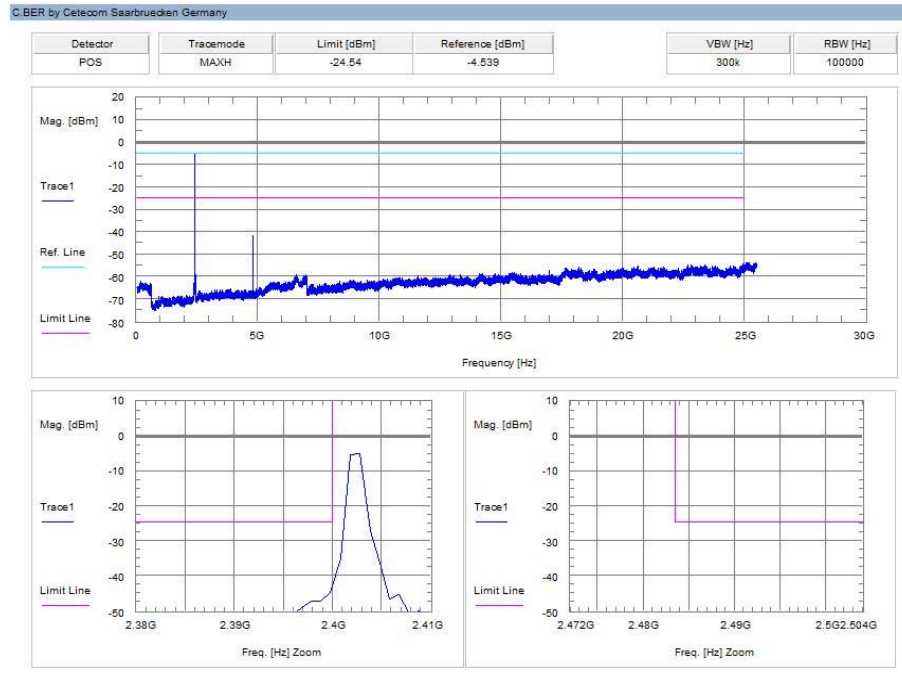
| FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | IC |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| TX spurious emissions conducted                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <p>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 20 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</p> |    |

### Results:

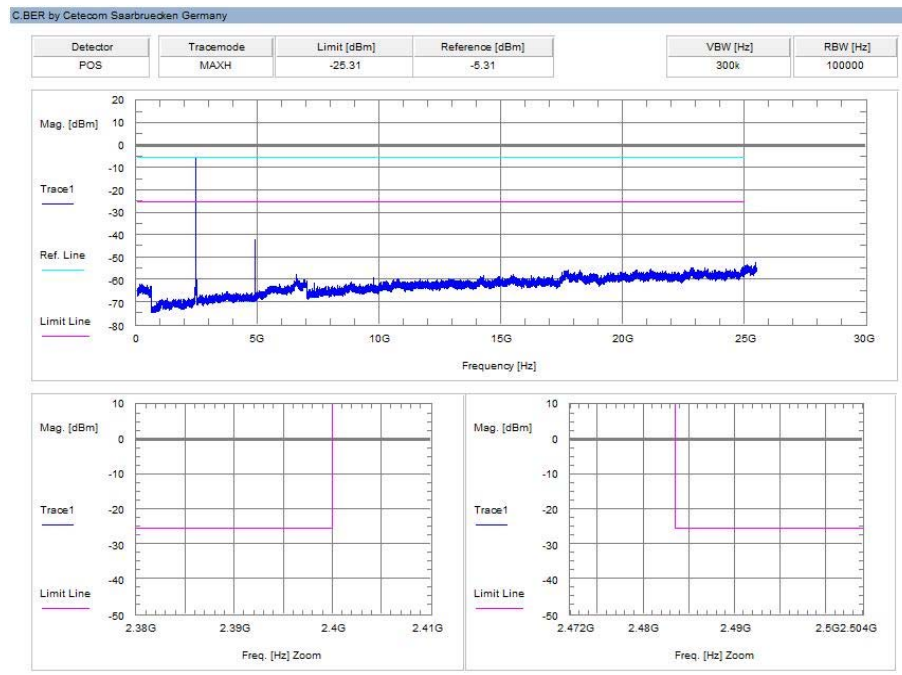
| TX spurious emissions conducted                                                       |  |                             |                                   |                                                      |                     |
|---------------------------------------------------------------------------------------|--|-----------------------------|-----------------------------------|------------------------------------------------------|---------------------|
| f [MHz]                                                                               |  | amplitude of emission [dBm] | limit max. allowed emission power | actual attenuation below frequency of operation [dB] | results             |
| 2402                                                                                  |  | -4.5                        | 30 dBm                            |                                                      | Operating frequency |
| No critical peaks found! All detected emissions are more than 10 dB below the limit!  |  |                             | -20 dBc                           |                                                      | complies            |
|                                                                                       |  |                             |                                   |                                                      |                     |
|                                                                                       |  |                             |                                   |                                                      |                     |
| 2440                                                                                  |  | -5.3                        | 30 dBm                            |                                                      | Operating frequency |
| No critical peaks found! All detected emissions are more than 10 dB below the limit!  |  |                             | -20 dBc                           |                                                      | complies            |
|                                                                                       |  |                             |                                   |                                                      |                     |
|                                                                                       |  |                             |                                   |                                                      |                     |
| 2480                                                                                  |  | -6.2                        | 30 dBm                            |                                                      | Operating frequency |
| No critical peaks found! All detected emissions are more than 106 dB below the limit! |  |                             | -20 dBc                           |                                                      | complies            |
|                                                                                       |  |                             |                                   |                                                      |                     |
|                                                                                       |  |                             |                                   |                                                      |                     |

## Plots:

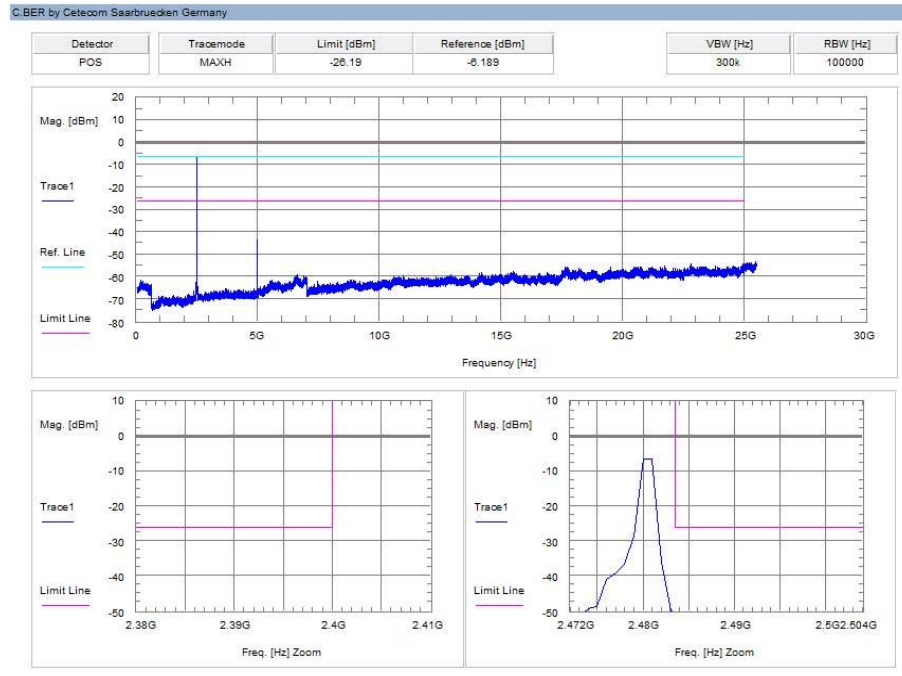
### Plot 1: lowest channel



### Plot 2: mid channel



**Plot 3: highest channel**



## 12.9 Spurious emissions radiated below 30 MHz

### Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channel is channel 19. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 39 will be measured too. The measurement is performed in the mode with the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

### Measurement:

| Measurement parameters  |                                            |
|-------------------------|--------------------------------------------|
| Detector                | Peak / Quasi peak                          |
| Sweep time              | Auto                                       |
| Resolution bandwidth    | F < 150 kHz: 200 Hz<br>F > 150 kHz: 9 kHz  |
| Video bandwidth         | F < 150 kHz: 1 kHz<br>F > 150 kHz: 100 kHz |
| Span                    | 9 kHz to 30 MHz                            |
| Trace mode              | Max hold                                   |
| Test setup              | See sub clause 7.2 C                       |
| Measurement uncertainty | See sub clause 9                           |

### Limits:

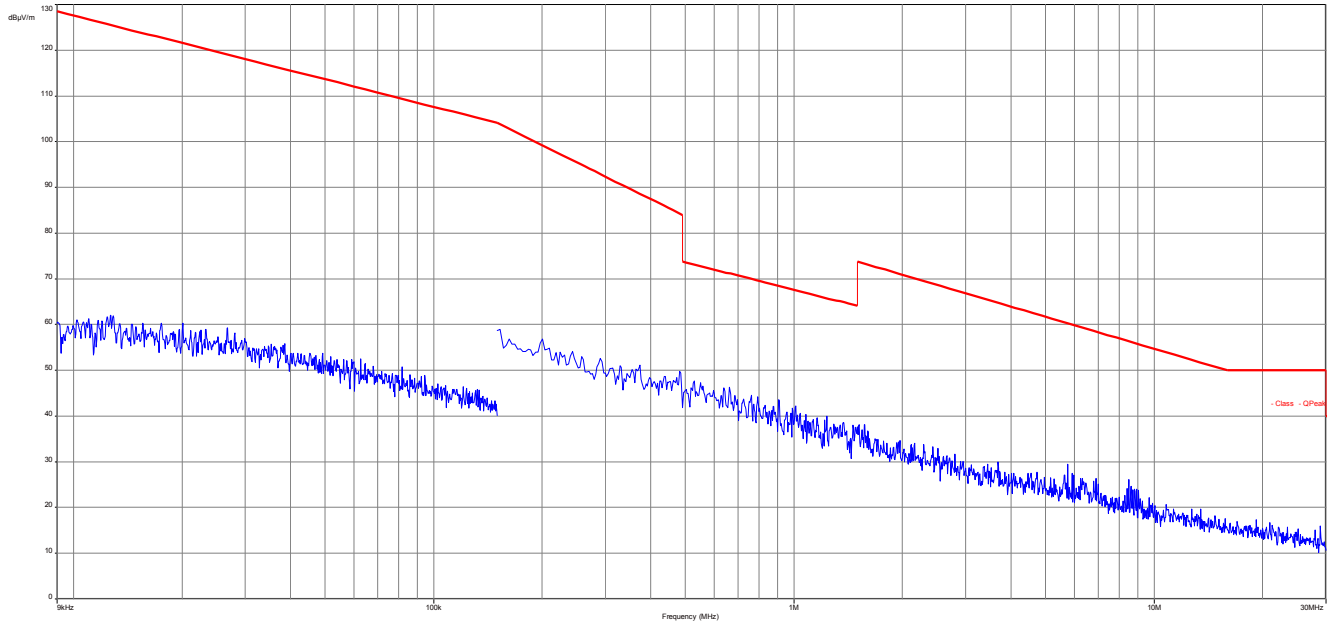
| FCC                                     |                         | IC                   |
|-----------------------------------------|-------------------------|----------------------|
| TX spurious emissions radiated < 30 MHz |                         |                      |
| Frequency (MHz)                         | Field strength (dBµV/m) | Measurement distance |
| 0.009 – 0.490                           | 2400/F(kHz)             | 300                  |
| 0.490 – 1.705                           | 24000/F(kHz)            | 30                   |
| 1.705 – 30.0                            | 30                      | 30                   |

### Results:

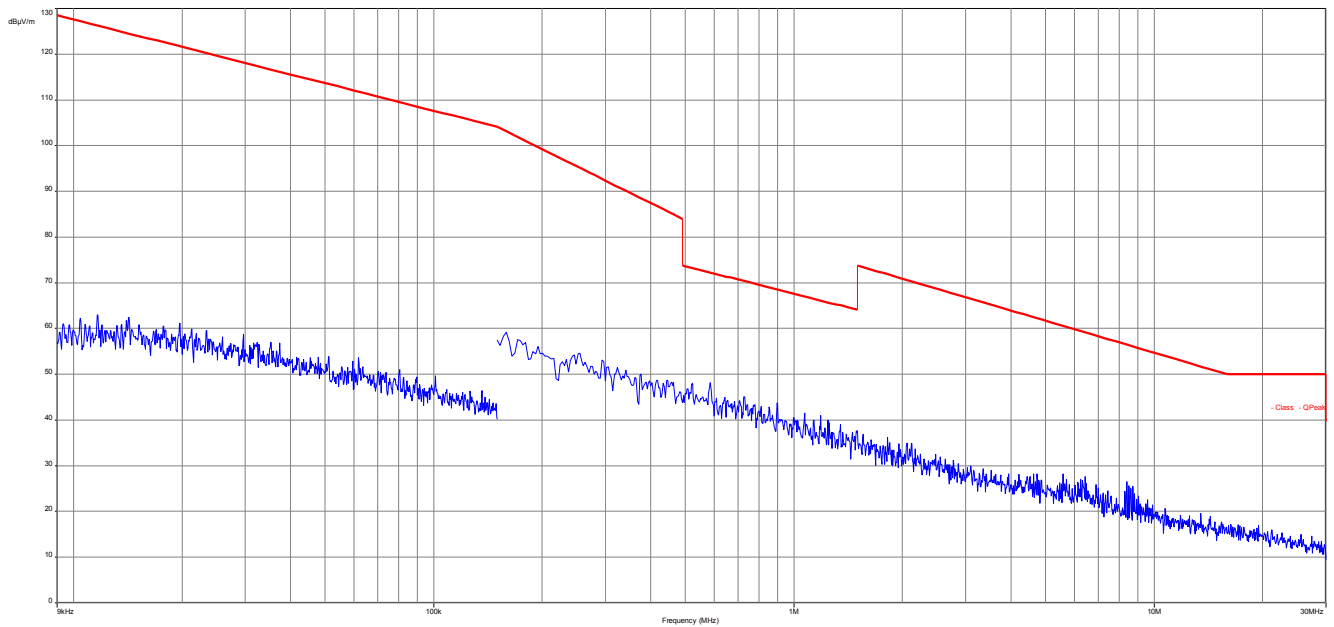
| TX spurious emissions radiated < 30 MHz [dBµV/m]            |          |                |
|-------------------------------------------------------------|----------|----------------|
| F [MHz]                                                     | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. |          |                |
|                                                             |          |                |

**Plot:**

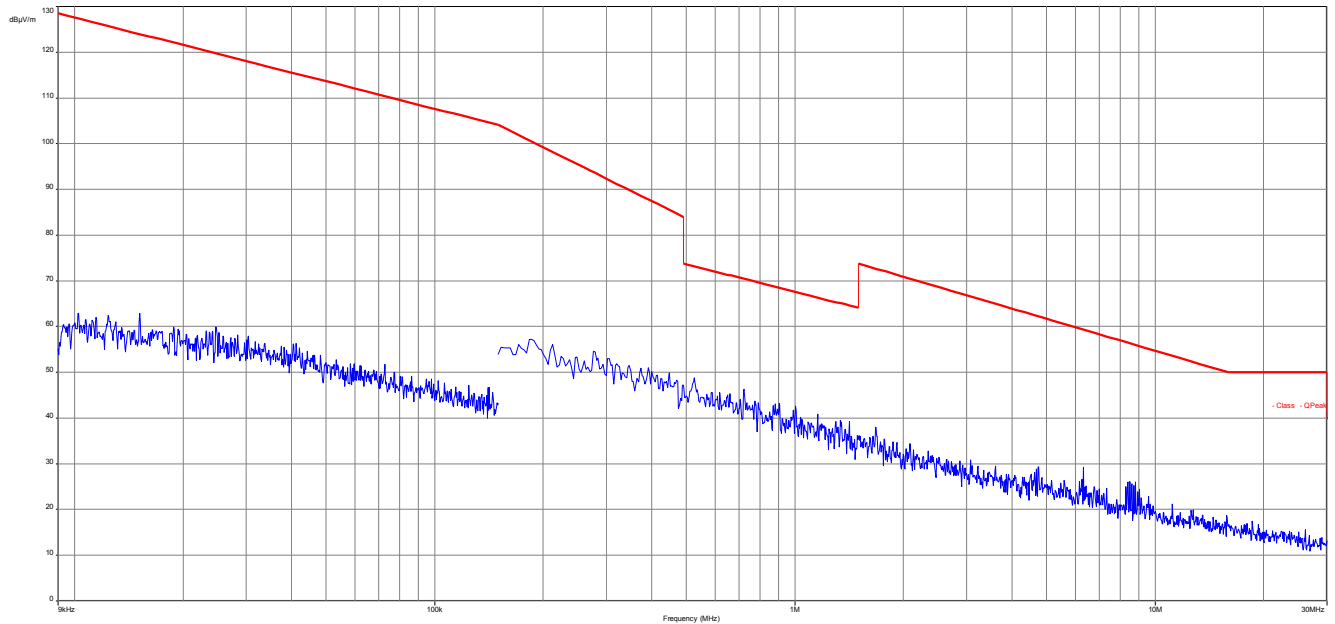
**Plot 1:** 9 kHz to 30 MHz, lowest channel



**Plot 2:** 9 kHz to 30 MHz, middle channel



**Plot 3:** 9 kHz to 30 MHz, highest channel



## 12.10 Spurious emissions radiated 30 MHz to 1 GHz

### Description:

Measurement of the radiated spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 19 and channel 39. The measurement is performed in the mode with the highest output power.

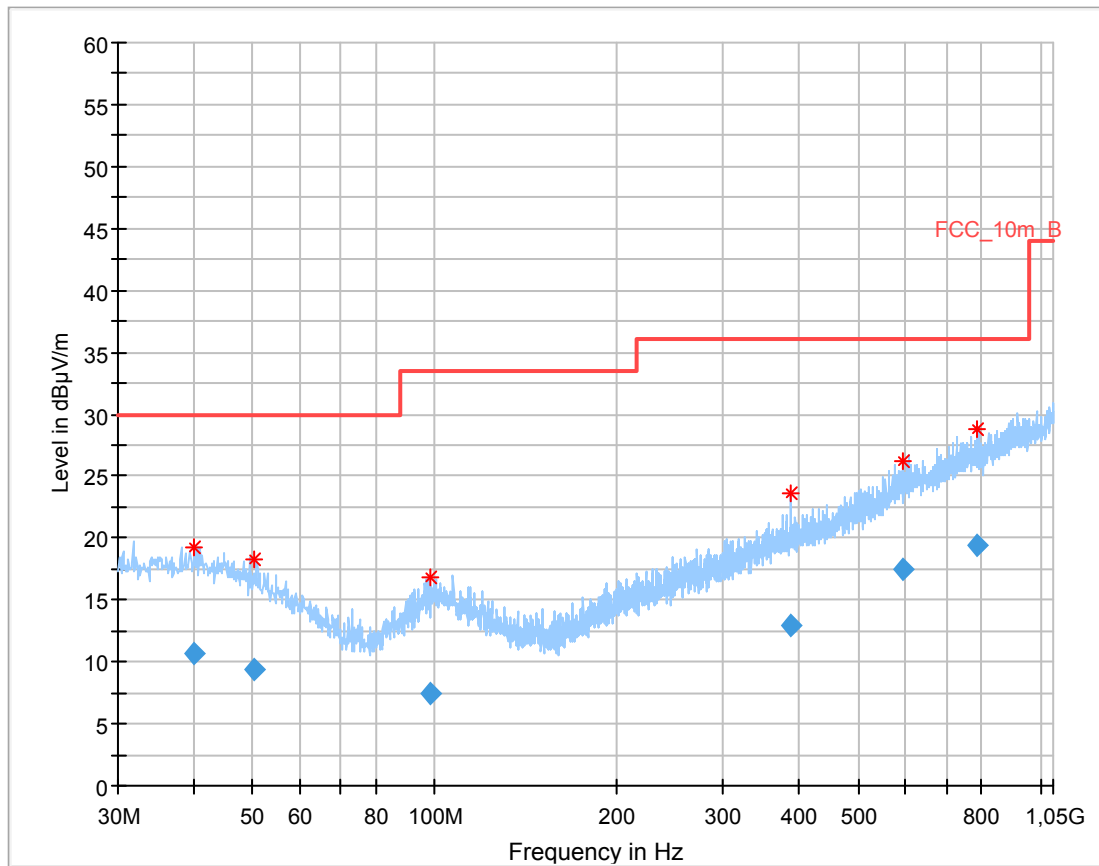
### Measurement:

| Measurement parameters  |                      |
|-------------------------|----------------------|
| Detector                | Peak / Quasi Peak    |
| Sweep time              | Auto                 |
| Resolution bandwidth    | 3 x VBW              |
| Video bandwidth         | 120 kHz              |
| Span                    | 30 MHz to 1 GHz      |
| Trace mode              | Max hold             |
| Measured modulation     | GFSK                 |
| Test setup              | See sub clause 7.1 A |
| Measurement uncertainty | See sub clause 9     |

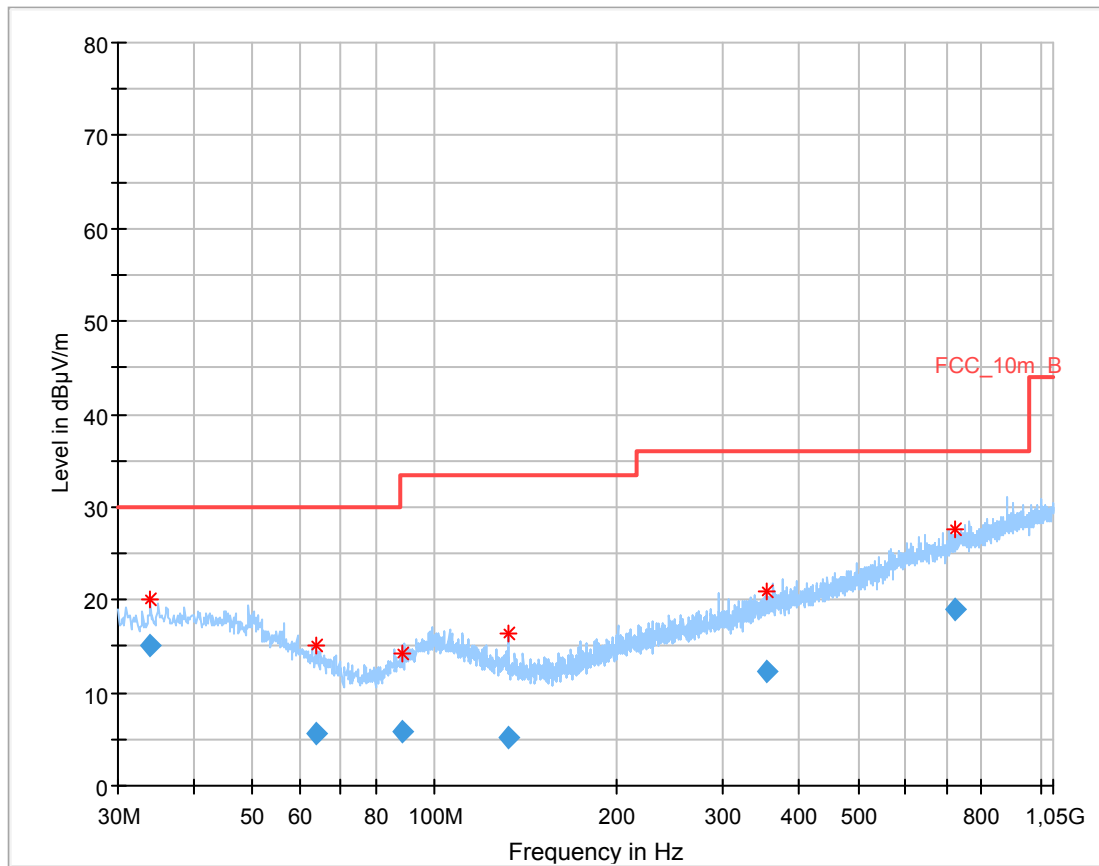
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

### Limits:

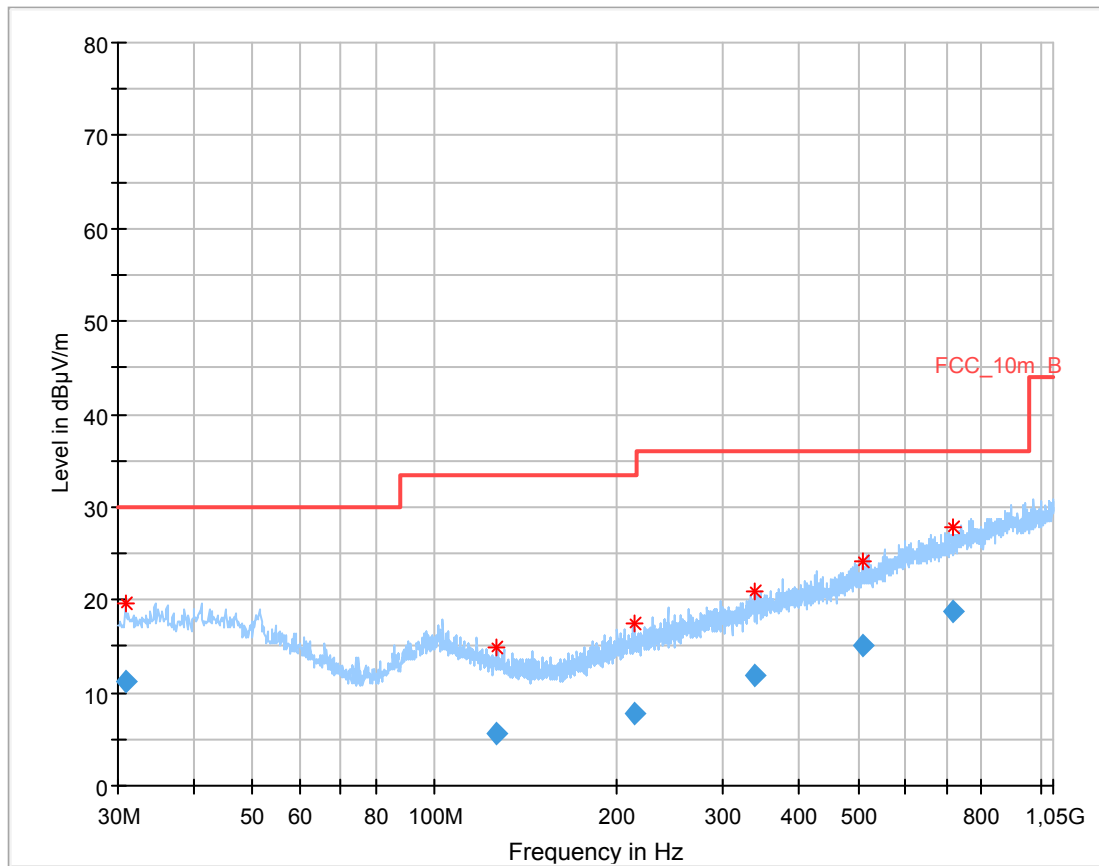
| FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         | IC                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| TX spurious emissions radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |                      |
| 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 20 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)). |                         |                      |
| §15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |                      |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Field strength (dBµV/m) | Measurement distance |
| 30 - 88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30.0                    | 10                   |
| 88 – 216                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 33.5                    | 10                   |
| 216 – 960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 36.0                    | 10                   |
| Above 960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 54.0                    | 3                    |

**Plots:** Transmit mode**Plot 1:** 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization**Final\_Result:**

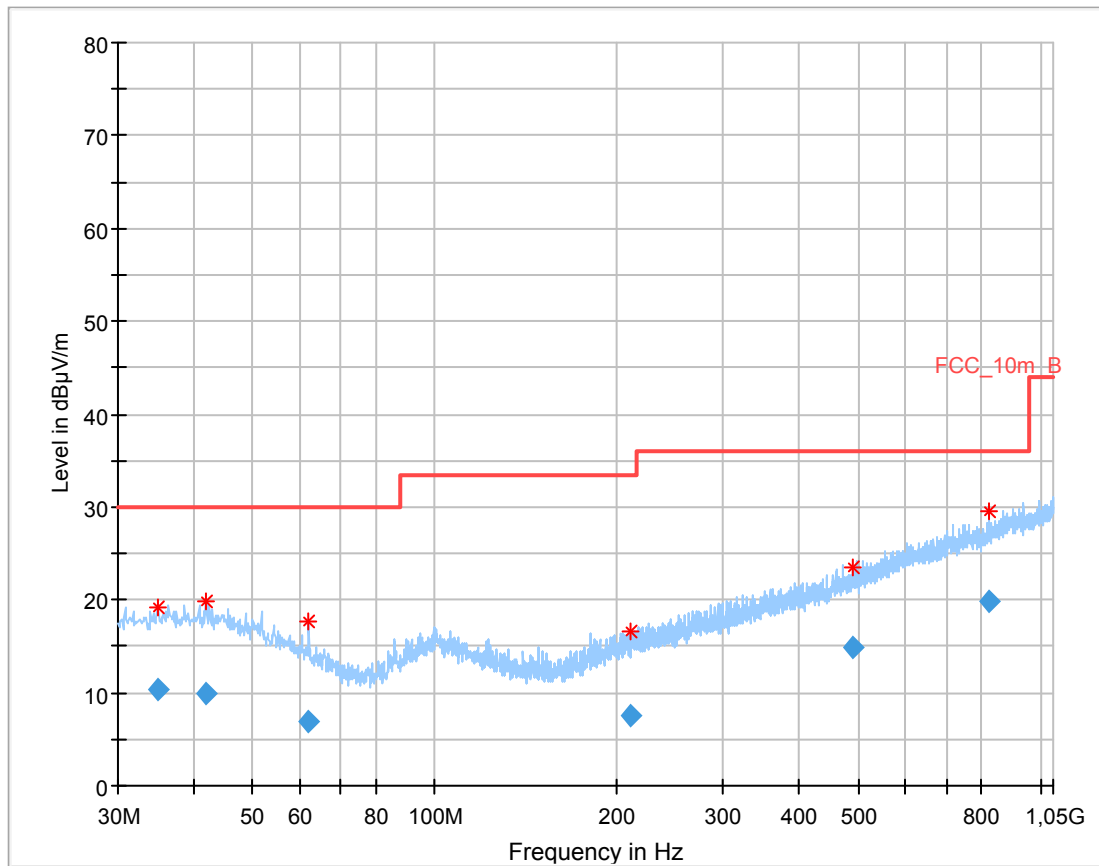
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 40.179000       | 10.70              | 30.00          | 19.30       | 1000.0          | 120.000         | 200.0       | V   | 95            | 14.0       |
| 50.426400       | 9.44               | 30.00          | 20.56       | 1000.0          | 120.000         | 272.0       | V   | 2             | 12.6       |
| 98.290950       | 7.37               | 33.50          | 26.13       | 1000.0          | 120.000         | 200.0       | H   | 282           | 11.9       |
| 386.413500      | 12.86              | 36.00          | 23.14       | 1000.0          | 120.000         | 103.0       | V   | -12           | 16.7       |
| 592.193850      | 17.54              | 36.00          | 18.46       | 1000.0          | 120.000         | 400.0       | H   | 320           | 20.5       |
| 788.371200      | 19.44              | 36.00          | 16.56       | 1000.0          | 120.000         | 200.0       | H   | 142           | 22.7       |

**Plot 2:** 30 MHz to 1 GHz, TX mode, channel 19, vertical & horizontal polarization**Final\_Result:**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 34.004100       | 15.00              | 30.00          | 15.00       | 1000.0          | 120.000         | 101.0       | V   | 0             | 13.7       |
| 63.702450       | 5.69               | 30.00          | 24.31       | 1000.0          | 120.000         | 170.0       | H   | 56            | 9.7        |
| 88.340700       | 5.81               | 33.50          | 27.69       | 1000.0          | 120.000         | 101.0       | H   | 353           | 10.1       |
| 132.310050      | 5.24               | 33.50          | 28.26       | 1000.0          | 120.000         | 101.0       | H   | 268           | 9.2        |
| 353.772750      | 12.28              | 36.00          | 23.72       | 1000.0          | 120.000         | 98.0        | V   | 83            | 16.1       |
| 721.124700      | 18.87              | 36.00          | 17.13       | 1000.0          | 120.000         | 170.0       | V   | 353           | 22.0       |

**Plot 3:** 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization**Final\_Result:**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 31.045200       | 11.19              | 30.00          | 18.81       | 1000.0          | 120.000         | 101.0       | V   | 240           | 13.4       |
| 126.921750      | 5.54               | 33.50          | 27.96       | 1000.0          | 120.000         | 98.0        | H   | 355           | 9.6        |
| 213.556350      | 7.74               | 33.50          | 25.76       | 1000.0          | 120.000         | 170.0       | H   | 92            | 12.2       |
| 338.079450      | 11.82              | 36.00          | 24.18       | 1000.0          | 120.000         | 101.0       | H   | 1             | 15.7       |
| 508.185600      | 15.08              | 36.00          | 20.92       | 1000.0          | 120.000         | 170.0       | V   | 95            | 18.8       |
| 716.940150      | 18.72              | 36.00          | 17.28       | 1000.0          | 120.000         | 98.0        | H   | 267           | 21.9       |

**Plots:** Receiver mode**Plot 1:** 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization**Final\_Result:**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 34.857150       | 10.35              | 30.00          | 19.65       | 1000.0          | 120.000         | 101.0       | H   | 307           | 13.8       |
| 42.022350       | 9.89               | 30.00          | 20.11       | 1000.0          | 120.000         | 101.0       | H   | 44            | 14.0       |
| 61.602750       | 6.80               | 30.00          | 23.20       | 1000.0          | 120.000         | 98.0        | V   | 289           | 10.2       |
| 210.717450      | 7.65               | 33.50          | 25.85       | 1000.0          | 120.000         | 170.0       | H   | 307           | 12.1       |
| 490.879500      | 14.80              | 36.00          | 21.20       | 1000.0          | 120.000         | 170.0       | H   | 122           | 18.5       |
| 825.227550      | 19.90              | 36.00          | 16.10       | 1000.0          | 120.000         | 170.0       | V   | 32            | 23.1       |

## 12.11 Spurious emissions radiated above 1 GHz

### Description:

Measurement of the radiated spurious emissions in transmit mode. The EUT is set to single channel mode and the transmit channel is channel 00, channel 39 and channel 78. The measurement is performed in the mode with the highest output power.

### Measurement:

| Measurement parameters  |                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------|
| 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     | GFSK                                                                                  |
| Test setup              | See sub clause 7.2 A (1 GHz - 12.75 GHz)<br>See sub clause 7.3 A (12.75 GHz - 26 GHz) |
| Measurement uncertainty | See sub clause 9                                                                      |

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

### Limits:

| FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         | IC                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| TX spurious emissions radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |                      |
| 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 20 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)). |                         |                      |
| §15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |                      |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Field strength (dBµV/m) | Measurement distance |
| Above 960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 54.0                    | 3                    |

**Results:** Transmitter mode

| TX spurious emissions radiated [dBµV/m] |          |                |          |          |                |          |          |                |
|-----------------------------------------|----------|----------------|----------|----------|----------------|----------|----------|----------------|
| 2402 MHz                                |          |                | 2440 MHz |          |                | 2480 MHz |          |                |
| F [MHz]                                 | Detector | Level [dBµV/m] | F [MHz]  | Detector | Level [dBµV/m] | F [MHz]  | Detector | Level [dBµV/m] |
| 4713                                    | Peak     | 53.6           | 4798     | Peak     | 55.1           | 4881     | Peak     | 54.4           |
|                                         | RMS      | 48.5           |          | RMS      | 50.0           |          | RMS      | 49.3           |
| 4789                                    | Peak     | 53.3           | 4842     | Peak     | 54.1           | 4933     | Peak     | 53.9           |
|                                         | RMS      | 48.3           |          | RMS      | 49.0           |          | RMS      | 48.8           |
| 4806                                    | Peak     | 54.7           | 4877     | Peak     | 55.9           | 4958     | Peak     | 52.7           |
|                                         | RMS      | 49.7           |          | RMS      | 49.8           |          | RMS      | 47.7           |
| 4842                                    | Peak     | 53.4           | 4882     | Peak     | 56.6           | 4977     | Peak     | 53.7           |
|                                         | RMS      | 48.0           |          | RMS      | 51.6           |          | RMS      | 48.7           |
| 4886                                    | Peak     | 50.4           | 4887     | Peak     | 55.3           | 5004     | Peak     | 50.4           |
|                                         | RMS      | 45.2           |          | RMS      | 50.2           |          | RMS      | 45.3           |
|                                         |          |                | 4921     | Peak     | 54.2           | 5079     | Peak     | 54.4           |
|                                         |          |                |          | RMS      | 49.0           |          | RMS      | 49.4           |

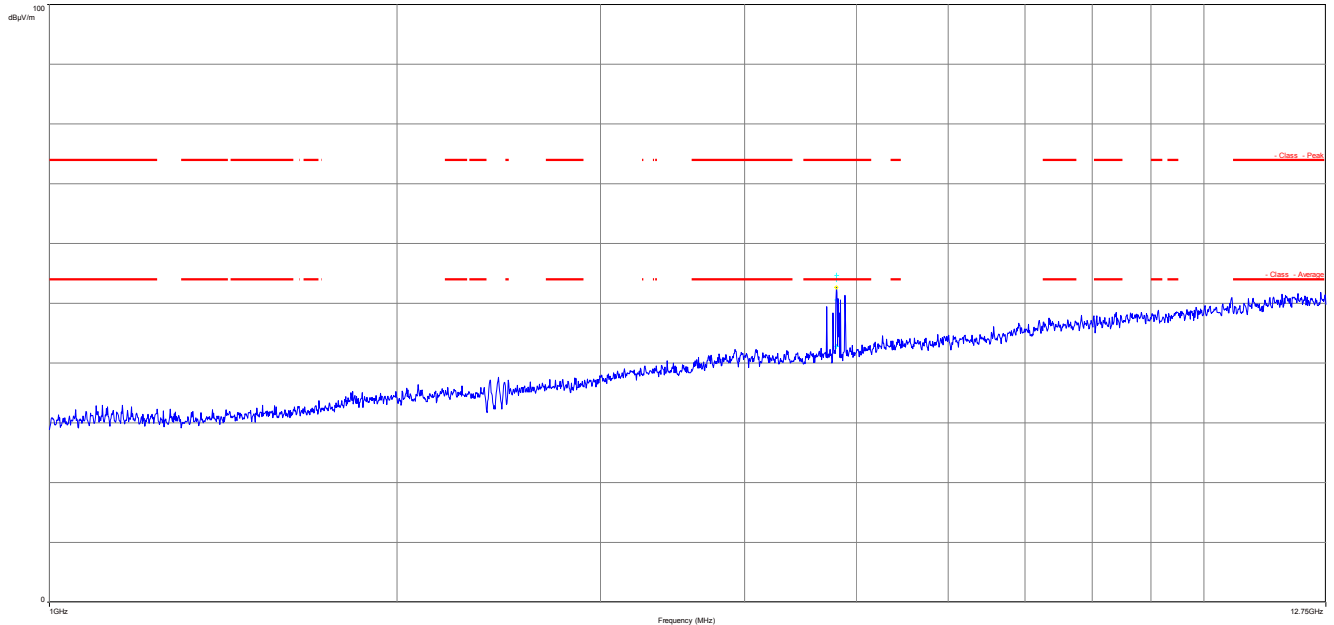
**Results:** Receiver mode

| RX spurious emissions radiated [dBµV/m]                     |          |                |
|-------------------------------------------------------------|----------|----------------|
| F [MHz]                                                     | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. |          |                |

**Note:** The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

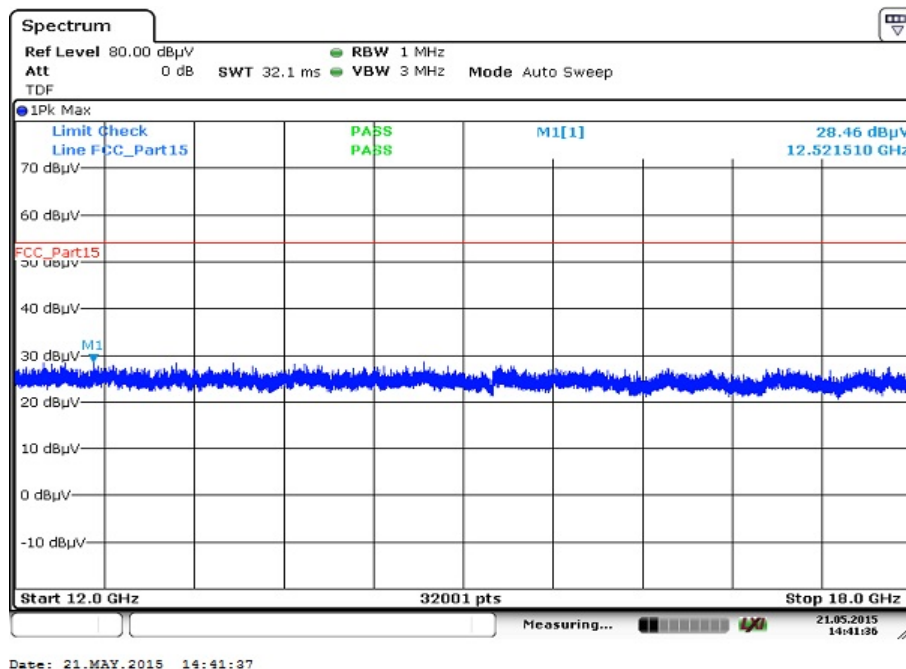
**Plots:** Transmitter mode

**Plot 1:** 1 GHz to 12.75 GHz, TX mode, channel 00, vertical & horizontal polarization

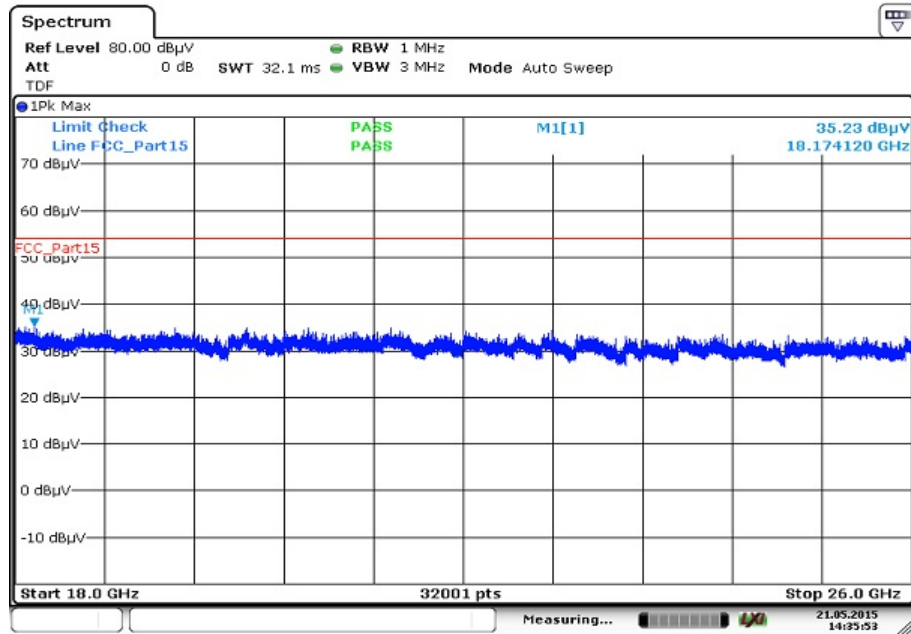


The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 2:** 12.75 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization

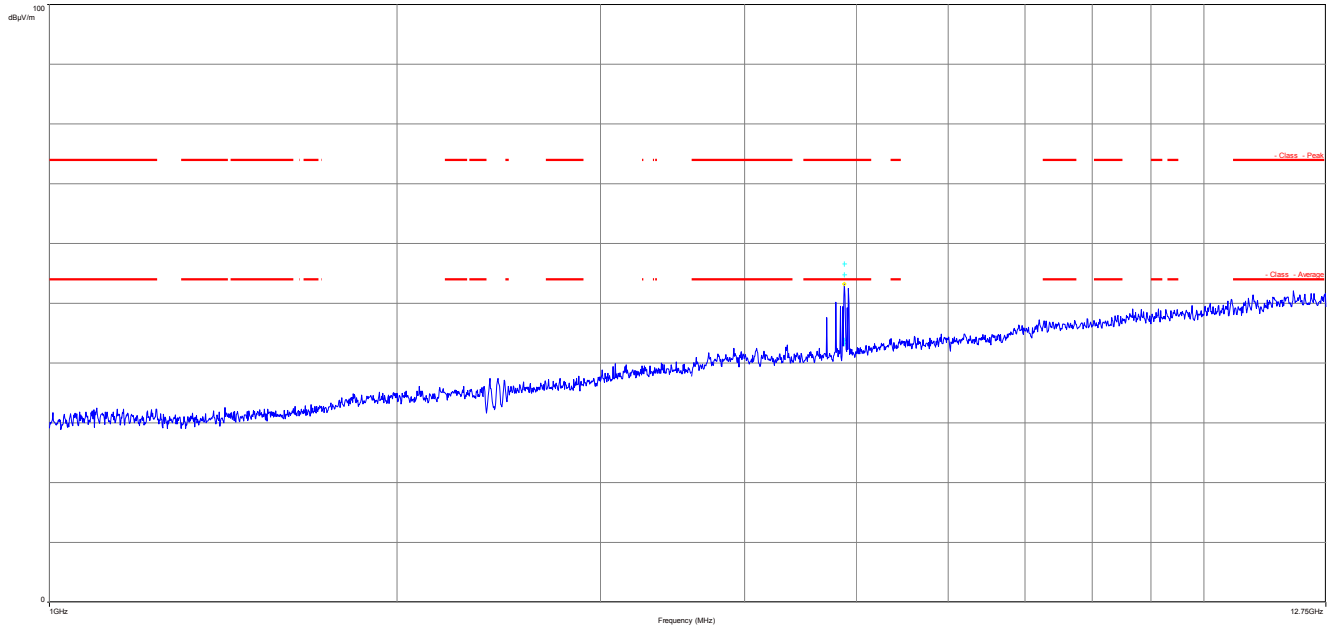


**Plot 3:** 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization



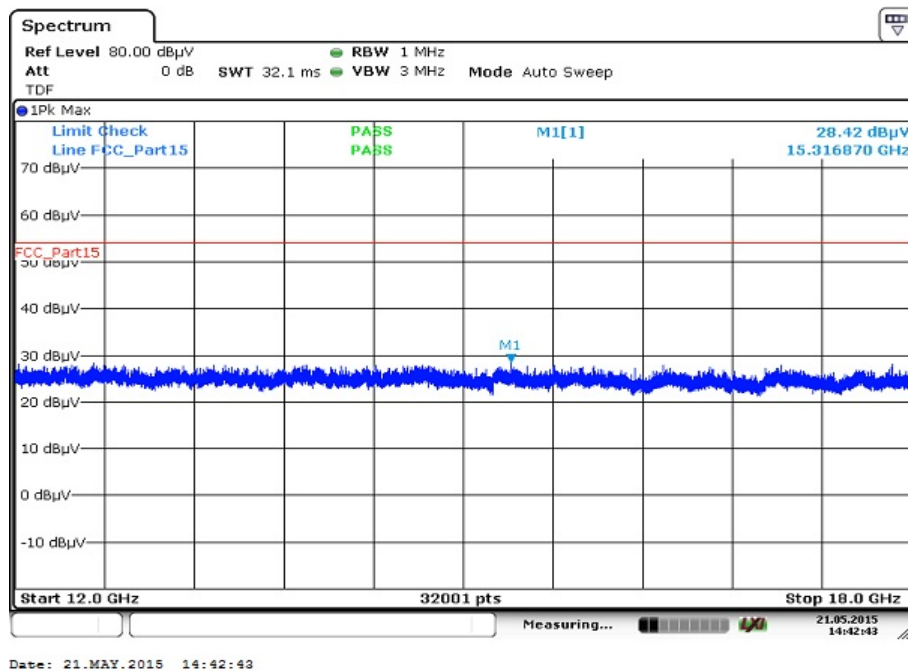
Date: 21.MAY.2015 14:35:54

**Plot 4:** 1 GHz to 12.75 GHz, TX mode, channel 19, vertical & horizontal polarization

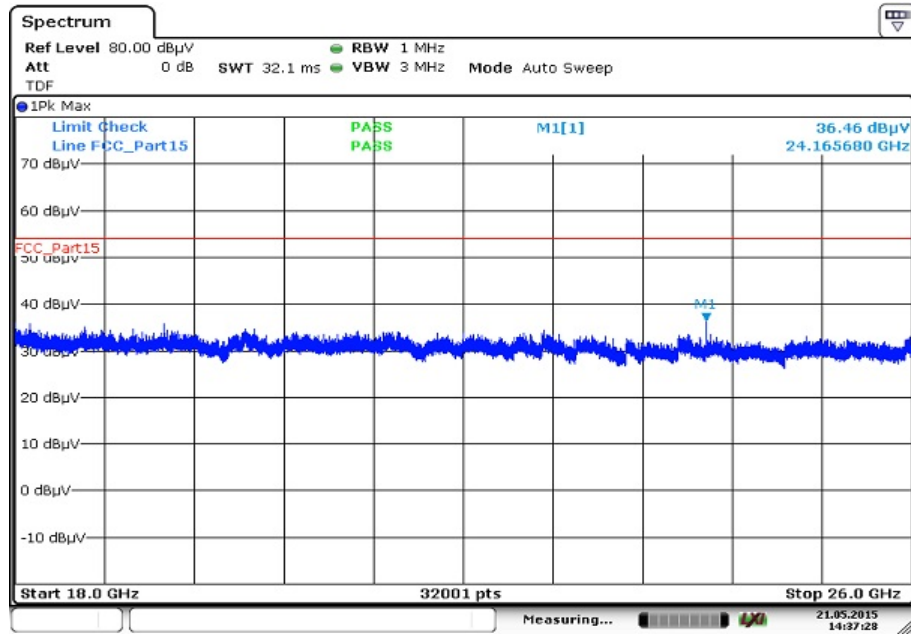


The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 5:** 12.75 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization

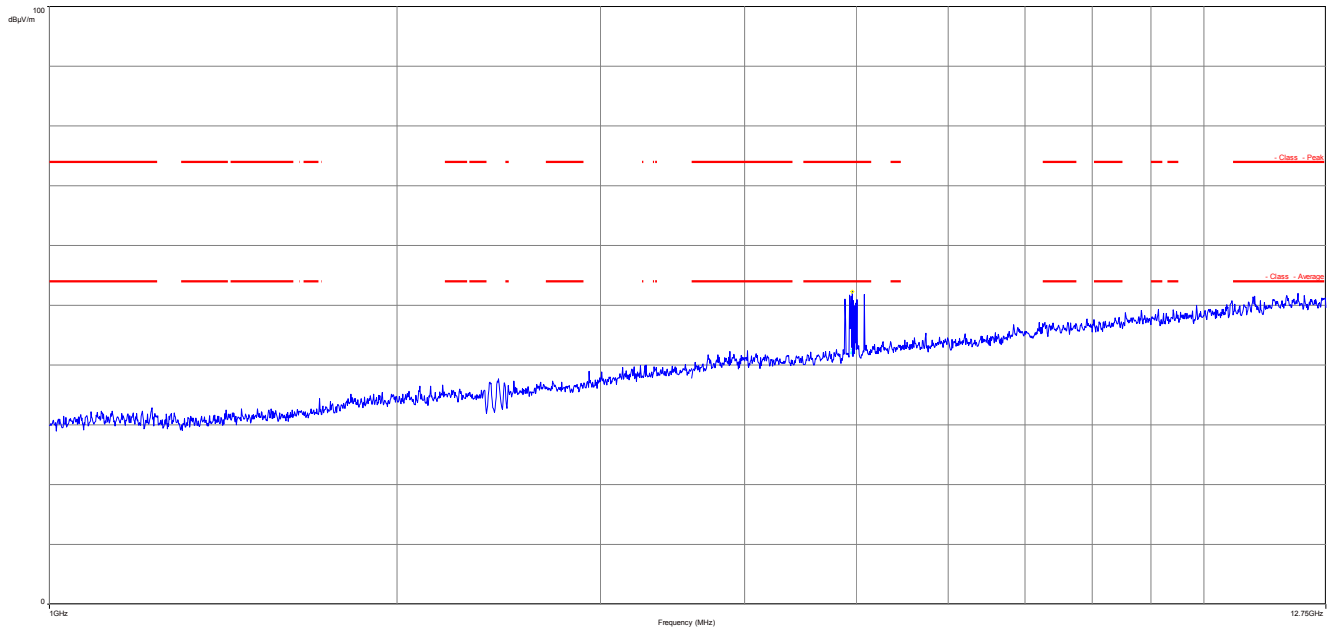


**Plot 6:** 18 GHz to 26 GHz, TX mode, channel 19, vertical & horizontal polarization



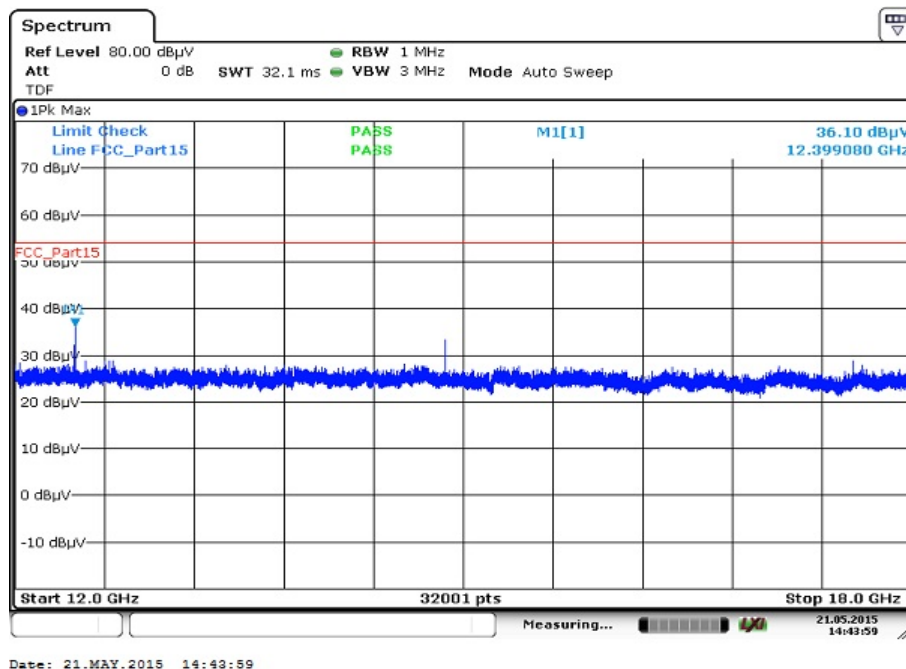
Date: 21.MAY.2015 14:37:28

**Plot 7:** 1 GHz to 12.75 GHz, TX mode, channel 39, vertical & horizontal polarization

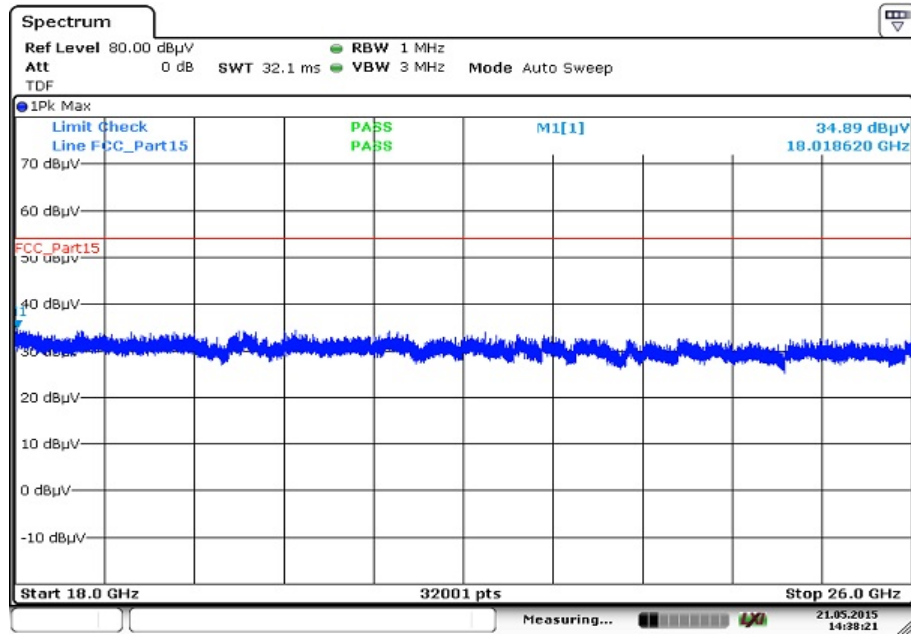


The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 8:** 12.75 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization



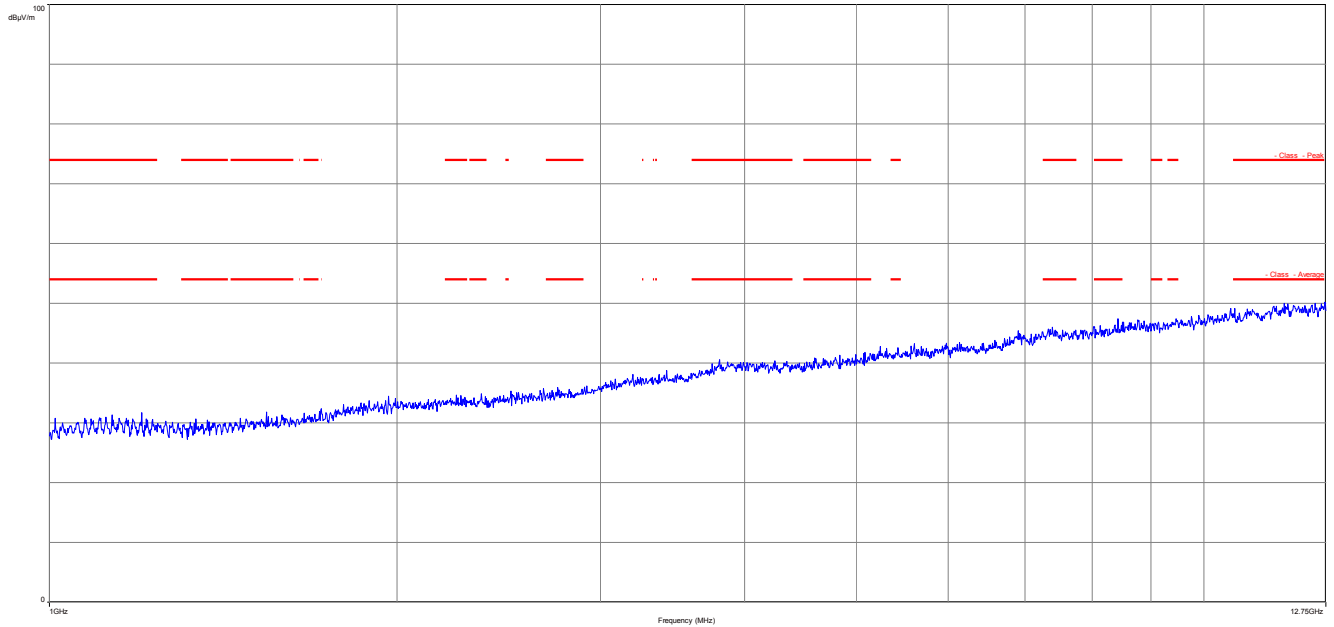
**Plot 9:** 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization



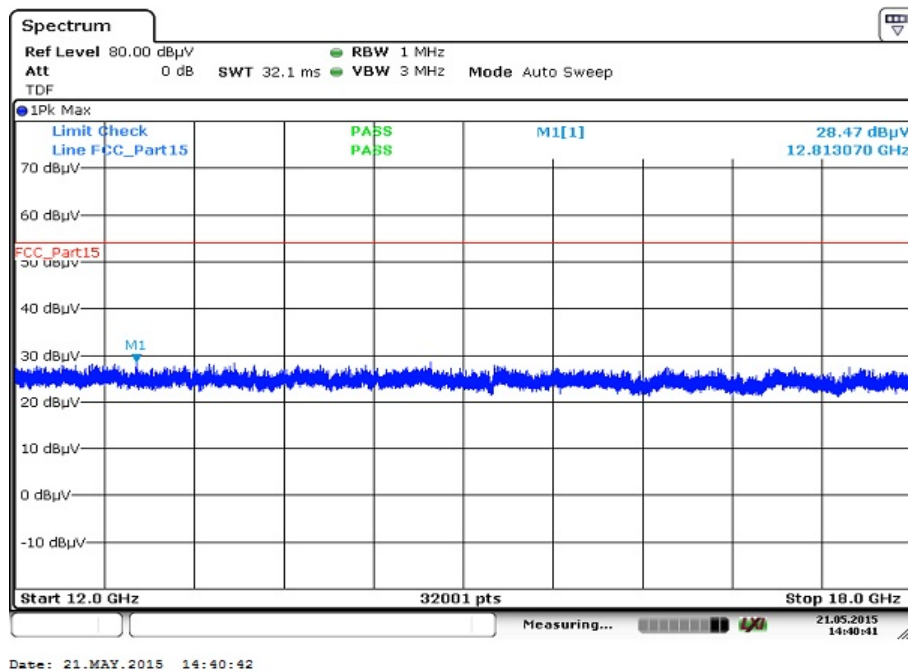
Date: 21.MAY.2015 14:38:22

**Plots:** Receiver mode

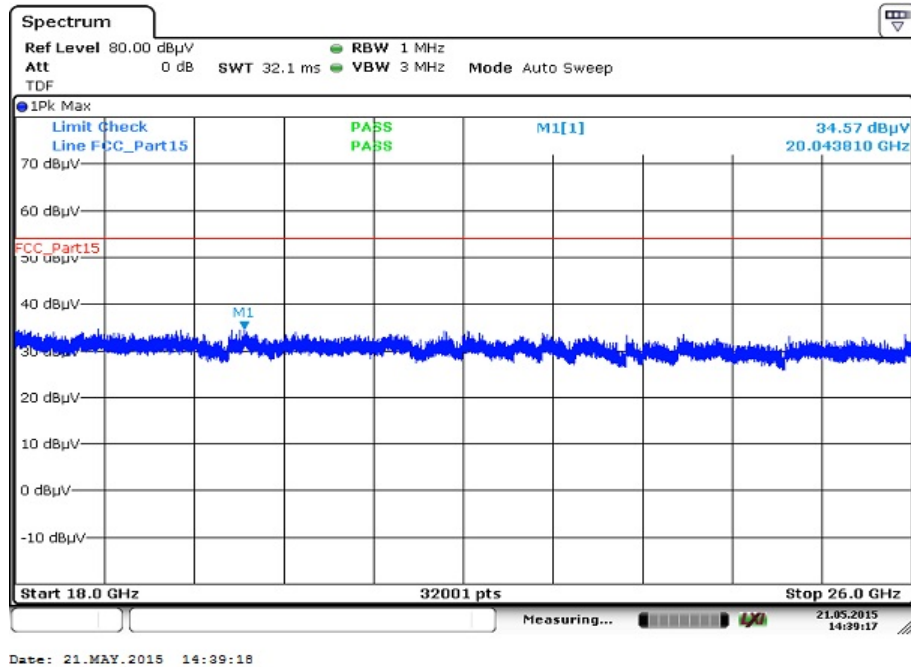
**Plot 1:** 1 GHz to 12.75 GHz, RX / idle – mode, vertical & horizontal polarization



**Plot 2:** 12.75 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization



**Plot 3:** 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization



## 13 Observations

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

## Annex A Document history

| Version | Applied changes                            | Date of release |
|---------|--------------------------------------------|-----------------|
|         | Initial release                            | 2015-06-25      |
| A       | Various editorial changes, Chapter 8 added | 2016-05-17      |
| B       | Editorial changes, Model name changed      | 2017-01-17      |
| C       | HVIN and FVIN changed                      | 2017-02-09      |

## Annex B Further information

### Glossary

|          |   |                                                |
|----------|---|------------------------------------------------|
| AVG      | - | Average                                        |
| DUT      | - | Device under test                              |
| EMC      | - | Electromagnetic Compatibility                  |
| EN       | - | European Standard                              |
| EUT      | - | Equipment under test                           |
| ETSI     | - | European Telecommunications Standard Institute |
| FCC      | - | Federal Communication Commission               |
| FCC ID   | - | Company Identifier at FCC                      |
| HW       | - | Hardware                                       |
| IC       | - | Industry Canada                                |
| Inv. No. | - | Inventory number                               |
| N/A      | - | Not applicable                                 |
| PP       | - | Positive peak                                  |
| QP       | - | Quasi peak                                     |
| S/N      | - | Serial number                                  |
| SW       | - | Software                                       |
| PMN      |   | Product marketing name                         |
| HMN      |   | Host marketing name                            |
| HVIN     |   | Hardware version identification number         |
| FVIN     |   | Firmware version identification number         |

## Annex C Accreditation Certificate

first page

last page



Deutsche Akkreditierungsstelle GmbH

Befehle gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV  
 Unterzeichnerin der Multilateralen Abkommen  
 von EA, ILAC und IAF zur gegenseitigen Anerkennung

### Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

**CTC advanced GmbH**  
 Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

**Funk**  
 Mobilfunk (GSM / DCS) + OTA  
 Elektromagnetische Verträglichkeit (EMV)  
 Produktsicherheit  
 SAR / EMF  
 Umwelt  
 Smart Card Technology  
 Bluetooth®  
 Automotive  
 Wi-Fi-Services  
 Kanadische Anforderungen  
 US-Anforderungen  
 Akustik  
 Near Field Communication (NFC)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 25.11.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

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Frankfurt, 25.11.2016

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Im Auftrag Dipl.-Ing. Jörg Hoff Eigner  
 Abteilungsleiter

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 60327 Frankfurt am Main

Standort Braunschweig  
 Bundesallee 100  
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 IAF: [www.iaf.eu](http://www.iaf.eu)

### Note:

The current certificate including annex can be received on request.