**CETECOM™****CETECOM ICT Services**  
consulting - testing - certification >>>

## TEST REPORT

Test report no.: 1-9943/15-01-07

Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-00

### Testing laboratory

**CETECOM ICT Services GmbH**

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Internet: <http://www.cetecom.com>e-mail: [ict@cetecom.com](mailto:ict@cetecom.com)**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-12076-01-00

### Applicant

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Abbey Road, Whitley

Coventry, CV3 4LF / UNITED KINGDOM

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Fax: -/-

Contact: Mr. Stuart Vaughan

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Phone: +44 (0) 1926 924 130

### Manufacturer

**Jaguar Land Rover Limited**

Abbey Road, Whitley

Coventry, CV3 4LF / UNITED KINGDOM

### Test standard/s

47 CFR Part 15

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

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

### Test Item

**Kind of test item:** Infotainment Master Controller**Model name:** IMC1.0\_ROW**FCC ID:** 2AE5I-IMC10ROW**IC:** -/-**Frequency:** DTS band 2400 MHz to 2483.5 MHz**Technology tested:** Bluetooth®, +EDR**Antenna:** External PCB BT/WIFI dualband antennas (JLR NGI)**Power supply:** 13.5 V DC by external power supply (vehicular use)**Temperature range:** -/-°C to -/-°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. CETECOM ICT Services 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 is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### 2.2 Application details

|                                    |                   |
|------------------------------------|-------------------|
| Date of receipt of order:          | 2015-05-23        |
| Date of receipt of test item:      | 2015-05-21        |
| Start of test:                     | 2015-05-21        |
| End of test:                       | 2015-05-23        |
| Person(s) present during the test: | Mr. Knut Schrader |

## 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 |

### 3.1 Measurement guidance

| Guidance         | Version | Description                                                                                                                                                         |
|------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C63.4-2014  | -/-     | American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz |
| ANSI C63.10-2013 | -/-     | American national standard of procedures for compliance testing of unlicensed wireless devices                                                                      |

#### 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: |           | 44 %                                               |
| Barometric pressure:       |           | not relevant for this kind of testing              |
| Power supply:              | $V_{nom}$ | 13.5 V DC by external power supply (vehicular use) |
|                            | $V_{max}$ | No tests under extreme conditions required.        |
|                            | $V_{min}$ | No tests under extreme conditions required.        |

#### 5 Test item

|                            |   |                                                                                        |
|----------------------------|---|----------------------------------------------------------------------------------------|
| Kind of test item          | : | Infotainment Master Controller                                                         |
| Type identification        | : | IMC1.0_ROW                                                                             |
| PMN                        | : | Infotainment System                                                                    |
| HMN                        | : | n/a                                                                                    |
| HVIN                       | : | IMC1.0_ROW                                                                             |
| FVIN                       | : | n/a                                                                                    |
| S/N serial number          | : | 0003163                                                                                |
| HW hardware status         | : | 7612053073                                                                             |
| SW software status         | : | 1.12.3.7 LSV:Vanilla                                                                   |
| Frequency band             | : | DTS band 2400 MHz to 2483.5 MHz<br>(lowest channel 2402 MHz; highest channel 2480 MHz) |
| Type of radio transmission | : | FHSS                                                                                   |
| Use of frequency spectrum  | : |                                                                                        |
| Type of modulation         | : | GFSK, Pi/4 QPSK, 8 DPSK                                                                |
| Number of channels         | : | 79                                                                                     |
| Antenna                    | : | External PCB BT/WIFI dualband antennas (JLR NGI)                                       |
| Power supply               | : | 13.5 V DC by external power supply (vehicular use)                                     |
| Temperature range          | : | -/-°C to -/-°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: 1-9943/15-01-13\_AnnexA  
1-9943/15-01-13\_AnnexB  
1-9943/15-01-13\_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).

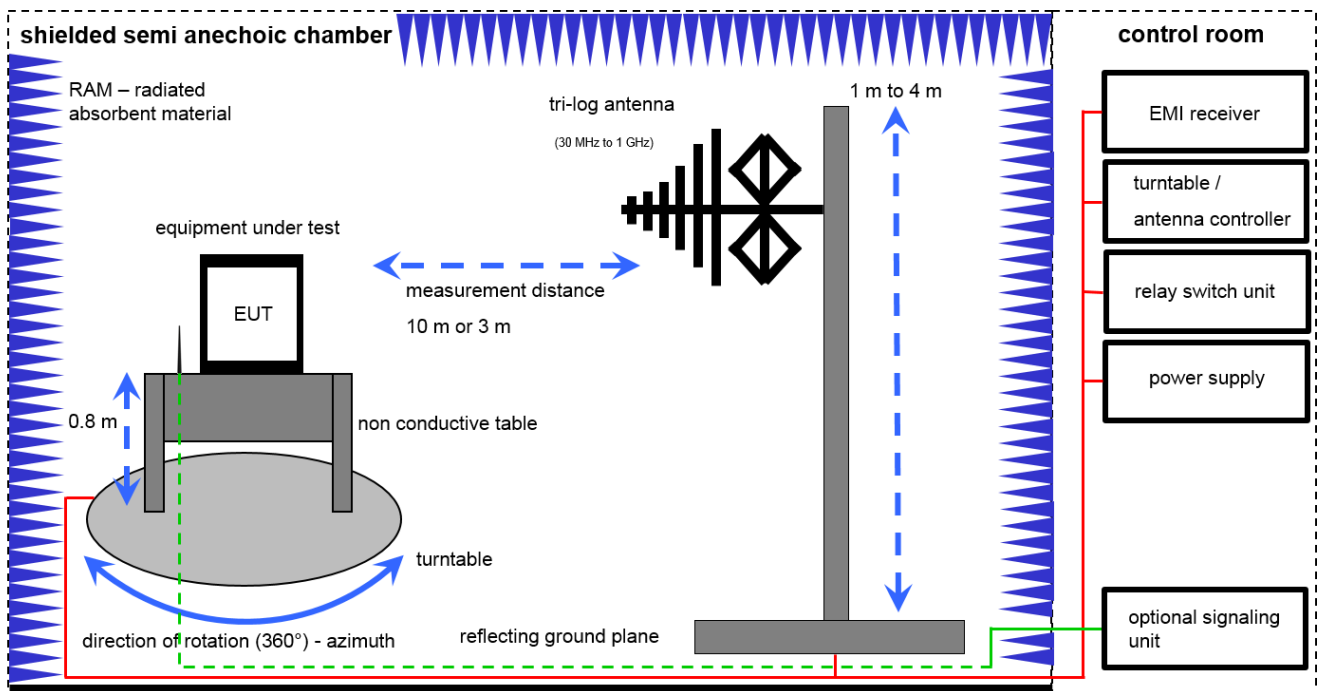
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**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                       |
| v/k! | 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.



$$SS = U_R + CL + AF$$

(SS-signal strength;  $U_R$ -voltage at the receiver; CL-loss of the cable; AF-antenna factor)

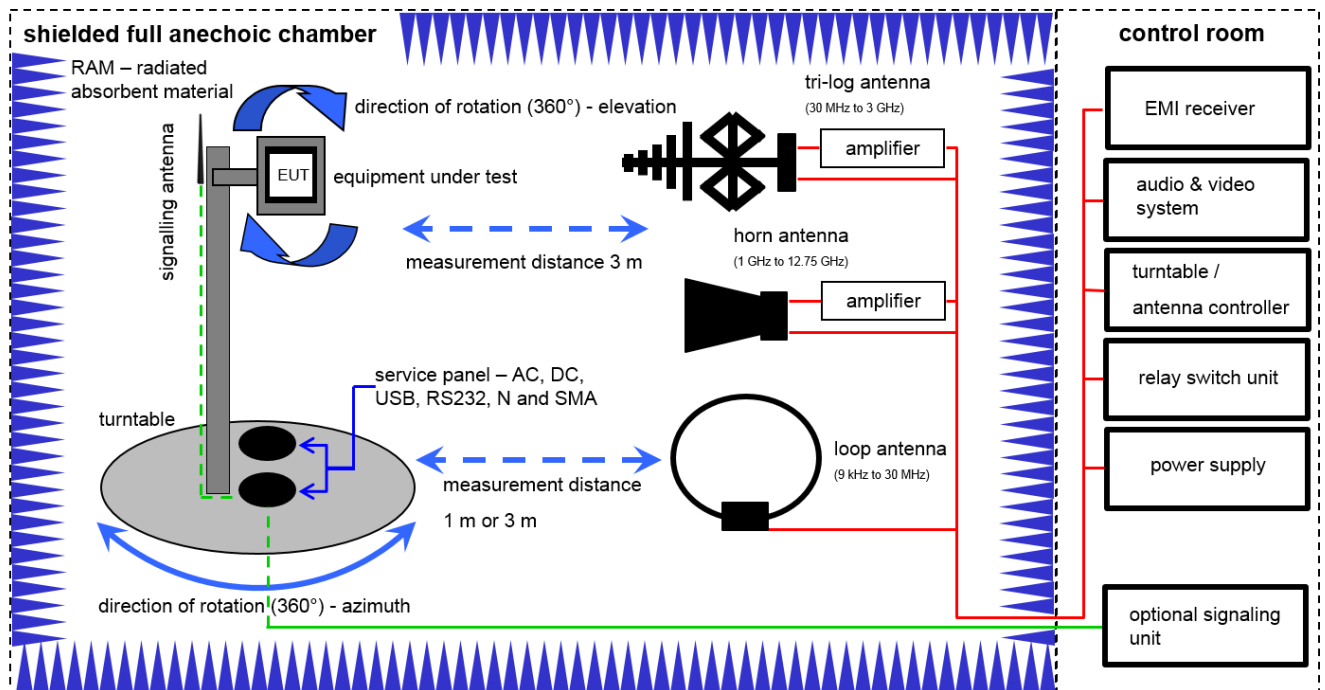
### Example calculation:

$$SS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V/m]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB}\mu\text{V/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m)}$$

### Equipment table:

| No. | Lab / Item | Equipment                                    | Type         | Manufact.    | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|----------------------------------------------|--------------|--------------|------------|-----------------|---------------------|------------------|------------------|
| 1   | A          | Switch-Unit                                  | 3488A        | HP           | 2719A14505 | 300000368       | g                   |                  |                  |
| 2   | A          | DC power supply, 60Vdc, 50A, 1200 W          | 6032A        | HP           | 2920A04466 | 300000580       | ne                  |                  |                  |
| 3   | A          | EMI Test Receiver                            | ESCI 3       | R&S          | 100083     | 300003312       | k                   | 26.01.2015       | 26.01.2016       |
| 4   | A          | Antenna Tower                                | Model 2175   | ETS-Lindgren | 64762      | 300003745       | izw                 |                  |                  |
| 5   | A          | Positioning Controller                       | Model 2090   | ETS-Lindgren | 64672      | 300003746       | izw                 |                  |                  |
| 6   | A          | Turntable Interface-Box                      | Model 105637 | ETS-Lindgren | 44583      | 300003747       | izw                 |                  |                  |
| 7   | A          | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163     | Schwarzbeck  | 295        | 300003787       | k                   | 22.04.2014       | 22.04.2016       |
| 8   | A          | Bluetooth Tester                             | CBT35        | R&S          | 100635     | 300003907       | ne signalling only  | -/-              | -/-              |

## 7.2 Shielded fully anechoic chamber



$$SS = U_R + CA + AF$$

(SS-signal strength;  $U_R$ -voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

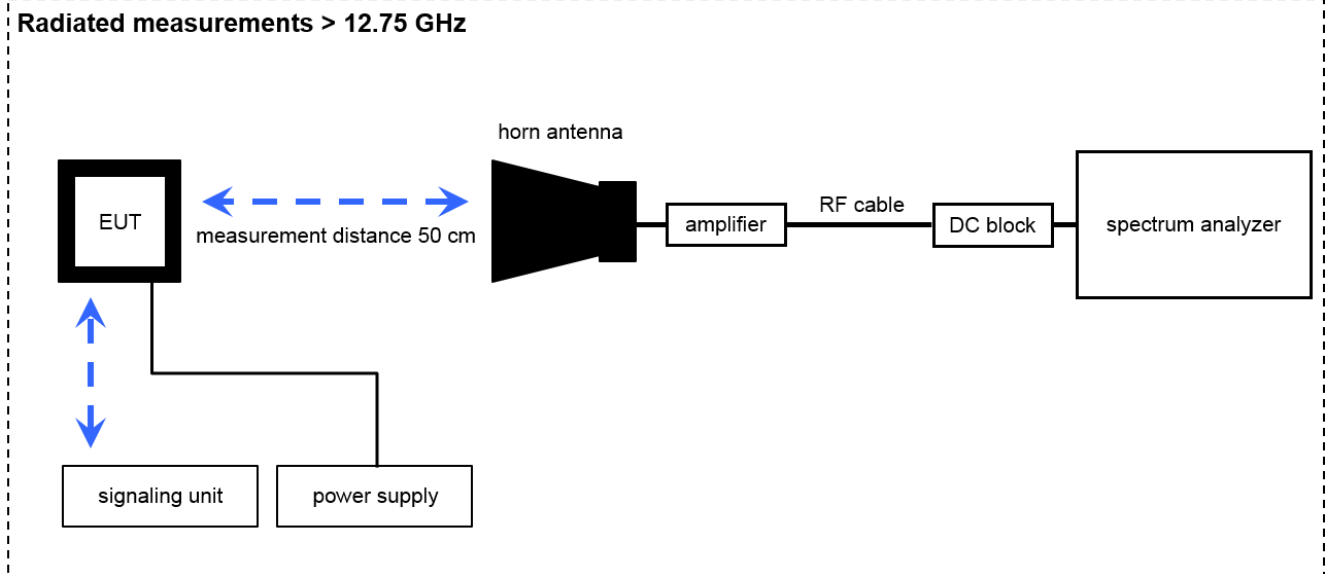
### Example calculation:

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

### Equipment table:

| No. | Lab / Item | Equipment                                      | Type                            | Manufact.            | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|------------------------------------------------|---------------------------------|----------------------|------------|-----------------|---------------------|------------------|------------------|
| 1   | A, B, C, D | DC power supply, 60Vdc, 50A, 1200 W            | 6032A                           | HP                   | 2818A03450 | 300001040       | Ve                  | 20.01.2015       | 20.01.2018       |
| 2   | B, C, D    | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115                            | EMCO                 | 8812-3088  | 300001032       | vKI!                | 20.05.2015       | 20.05.2017       |
| 3   | A, B, C, D | Anechoic chamber                               | FAC 3/5m                        | MWB / TDK            | 87400/02   | 300000996       | ev                  |                  |                  |
| 4   | A, B, C, D | Switch / Control Unit                          | 3488A                           | HP                   | *          | 300000199       | ne                  |                  |                  |
| 5   | A, C       | Active Loop Antenna 10 kHz to 30 MHz           | 6502                            | Kontron Psychotech   | 8905-2342  | 300000256       | k                   | 13.06.2013       | 13.06.2015       |
| 6   | B, C, D    | Amplifier                                      | js42-00502650-28-5a             | Parzich GMBH         | 928979     | 300003143       | ne                  |                  |                  |
| 7   | C          | Band Reject filter                             | WRCG2400/2483-2375/2505-50/10SS | Wainwright           | 11         | 300003351       | ev                  |                  |                  |
| 8   | B, C       | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz   | VULB9163                        | Schwarzbeck          | 371        | 300003854       | vKI!                | 29.10.2014       | 29.10.2017       |
| 9   | A, B, C, D | MXE EMI Receiver 20 Hz to 26,5 GHz             | N9038A                          | Agilent Technologies | MY51210197 | 300004405       | k                   | 06.03.2015       | 06.03.2016       |
| 10  | A, B, C, D | Bluetooth Tester                               | CBT35                           | R&S                  | 100635     | 300003907       | ne signalling only  | -/-              | -/-              |

### 7.3 Radiated measurements > 12.75 GHz



$$SS = U_R + CA + AF$$

(SS-signal strength;  $U_R$ -voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:

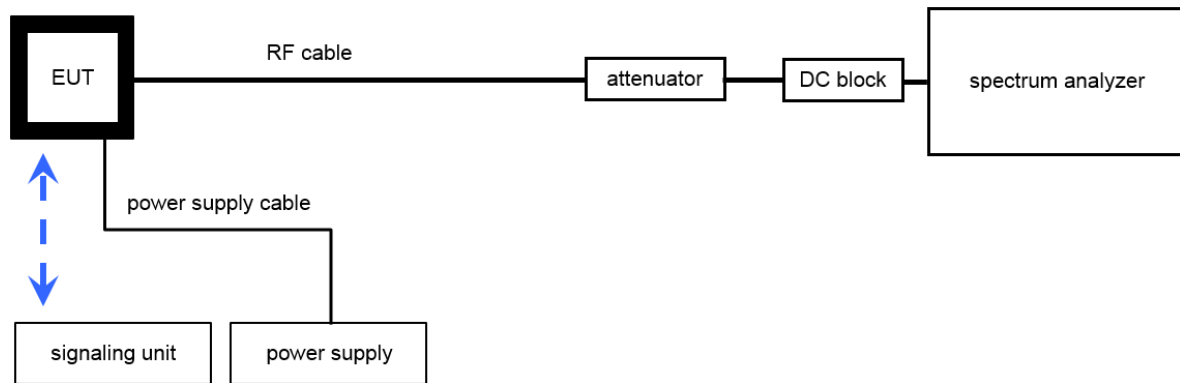
$$SS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-60.1) \text{ [dB]} + 36.74 \text{ [dB}\mu\text{V/m]} = 16.64 \text{ [dB}\mu\text{V/m]} \text{ (6.79 } \mu\text{V/m)}$$

**Equipment table:**

| No. | Lab / Item | Equipment                               | Type                | Manufact.      | Serial No.       | INV. No Cetecom | 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                  |                  |                  |
| 5   | A          | Bluetooth Tester                        | CBT35               | R&S            | 100635           | 300003907       | ne signalling only  | -/-              | -/-              |
| 6   | A          | RF-Cable                                | ST18/SMAm/SMAm/48   | Huber & Suhner | Batch no. 600918 | 400001182       | ev                  | -/-              | -/-              |
| 7   | A          | RF-Cable                                | ST18/SMAm/SMm/48    | Huber & Suhner | Batch no. 127377 | 400001183       | ev                  | -/-              | -/-              |

## 7.4 Conducted measurements

### Conducted measurements normal conditions



$$OP = AV + CA$$

(OP-output power; AV-analyzer value; CA-loss signal path)

#### Example calculation:

$$OP \text{ [dBm]} = 6.0 \text{ [dBm]} + (11.7) \text{ [dB]} = 17.7 \text{ [dBm]} (58.88 \text{ mW})$$

#### Equipment table:

| No. | Lab / Item | Equipment                         | Type              | Manufact.      | Serial No.       | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|-----------------------------------|-------------------|----------------|------------------|-----------------|---------------------|------------------|------------------|
| 1   | A          | Signal Analyzer 40 GHz            | FSV40             | R&S            | 101042           | 300004517       | k                   | 22.01.2015       | 22.01.2016       |
| 2   | A          | Bluetooth Tester                  | CBT35             | R&S            | 100635           | 300003907       | ne signalling only  | -/-              | -/-              |
| 3   | A          | RF-Cable                          | ST18/SMAM/SMAM/60 | Huber & Suhner | Batch no. 606844 | 400001181       | ev                  | -/-              | -/-              |
| 4   | A          | DC-Blocker 0.1-40 GHz             | 8141A             | Inmet          | Batch no. 127377 | 400001185       | ev                  | -/-              | -/-              |
| 5   | A          | Coax Attenuator 10 dB 2W 0-40 GHz | MCL BW-K10-2W44+  | Mini Circuits  | Batch no. 127377 | 400001186       | ev                  | -/-              | -/-              |

**8 Measurement uncertainty**

| Measurement uncertainty                                  |                                          |
|----------------------------------------------------------|------------------------------------------|
| Test case                                                | Uncertainty                              |
| System gain                                              | ± 3 dB                                   |
| Carrier frequency separation                             | ± 21.5 kHz                               |
| Number of hopping channels                               | -/-                                      |
| Time of occupancy                                        | -/-                                      |
| 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                                 |

## **9 Sequence of testing**

### **9.1 Sequence of testing 9 kHz to 30 MHz**

#### **Setup**

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were 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.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

#### **Premeasurement**

- The turntable rotates from 0° to 315° with 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

#### **Final measurement**

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK (QPK / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 9.2 Sequence of testing 30 MHz to 1 GHz

### Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by 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 were 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.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

### Premeasurement

- The turntable rotates from 0° to 315° with 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- 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 will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP (Quasi-Peak / see ANSI C 63.4) detector with an EMI receiver
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

### 9.3 Sequence of testing 1 GHz to 12.75 GHz

#### Setup

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were 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.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

#### Premeasurement

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

#### Final measurement

- The final measurement will be performed with minimum the six highest peaks according the requirements of the ANSI C63.4.
- According to the maximum found antenna polarisation and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarisations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

#### **9.4 Sequence of testing above 12.75 GHz**

##### **Setup**

- The equipment was setup to simulate a typical usage like described in the user manual or described by manufacturer.
- Auxiliary equipment and cables were 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.
- The measurement distance is 0.5 meter
- The EUT was set into operation.

##### **Premeasurement**

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

##### **Final measurement**

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit, and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 10 Summary of measurement results

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

| TC Identifier | Description | Verdict    | Date       | Remark                                 |
|---------------|-------------|------------|------------|----------------------------------------|
| RF-Testing    | CFR Part 15 | See table! | 2015-07-27 | Delta tests according customer demand! |

| Test specification clause | Test case                                           | Temperature conditions | Power source voltages | Mode                         | C                                                                                                                 | NC                                                                               | NA                                                                               | NP                                                                                                                | Remark                   |
|---------------------------|-----------------------------------------------------|------------------------|-----------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------|
| §15.247(b)(4)             | Antenna gain                                        | Nominal                | Nominal               | GFSK                         | <input checked="" type="checkbox"/>                                                                               | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                                                          | complies                 |
| §15.247(e)                | Power spectral density                              | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/>                                                                                          | <input type="checkbox"/>                                                         | <input checked="" type="checkbox"/>                                              | <input type="checkbox"/>                                                                                          | Not applicable for FHSS! |
| §15.247(a)(1)             | Carrier frequency separation                        | Nominal                | Nominal               | GFSK                         | <input type="checkbox"/>                                                                                          | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input checked="" type="checkbox"/>                                                                               | -/-                      |
| §15.247(a)(1)             | Number of hopping channels                          | Nominal                | Nominal               | GFSK                         | <input type="checkbox"/>                                                                                          | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input checked="" type="checkbox"/>                                                                               | -/-                      |
| §15.247(a)(1) (iii)       | Time of occupancy (dwell time)                      | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/>                                                                                          | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input checked="" type="checkbox"/>                                                                               | -/-                      |
| §15.247(a)(1)             | Spectrum bandwidth of a FHSS system 20 dB bandwidth | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                                  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input checked="" type="checkbox"/> | -/-                      |
| §15.247(b)(1)             | Maximum output power                                | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                                  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input checked="" type="checkbox"/> | -/-                      |
| §15.247(d)                | Band edge compliance conducted                      | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                                  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input checked="" type="checkbox"/> | -/-                      |
| §15.205                   | Band edge compliance radiated                       | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input checked="" type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                                  | complies                 |
| §15.247(d)                | TX spurious emissions conducted                     | Nominal                | Nominal               | GFSK<br>Pi/4 DQPSK<br>8 DPSK | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                                  | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> | <input checked="" type="checkbox"/><br><input checked="" type="checkbox"/><br><input checked="" type="checkbox"/> | -/-                      |
| §15.247(d)                | TX spurious emissions radiated                      | Nominal                | Nominal               | GFSK                         | <input checked="" type="checkbox"/>                                                                               | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                                                          | complies                 |
| §15.109                   | RX spurious emissions radiated                      | Nominal                | Nominal               | -/-                          | <input checked="" type="checkbox"/>                                                                               | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                                                          | complies                 |
| §15.209(a)                | TX spurious emissions radiated < 30 MHz             | Nominal                | Nominal               | GFSK                         | <input checked="" type="checkbox"/>                                                                               | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                         | <input type="checkbox"/>                                                                                          | complies                 |
| §15.107(a)<br>§15.207     | Conducted emissions < 30 MHz                        | Nominal                | Nominal               | GFSK                         | <input type="checkbox"/>                                                                                          | <input type="checkbox"/>                                                         | <input checked="" type="checkbox"/>                                              | <input type="checkbox"/>                                                                                          | Battery powered only!    |

**Note:** C = Complies; NC = Not complies; 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 Cetecom ICT Services GmbH is under license.

Reference documents:            Main report:            NTS (National Technical System) – Silicon Valley

Report identification: R93649

Date: 2013-10-25

Special test descriptions: Delta tests according customer demand!

Configuration descriptions: TX tests: were performed with x-DH5 packets and static PRBS pattern payload.

RX/Standby tests: BT test mode enabled, scan enabled, TX Idle

Test mode: ☒ Bluetooth Test mode loop back enabled  
(EUT is controlled over CBT/CMU)

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

Antennas and transmit ☒ Operating mode 1 (single antenna)

- Equipment with 1 antenna,
- Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,
- Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)

## 12 Measurement results

### 12.1 Antenna 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 parameter   |                        |
|-------------------------|------------------------|
| 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 7.4 - A |
| Measurement uncertainty | See sub clause 8       |

#### Limits:

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

#### Results: (Antenna with a 2 meter antenna cable)

| T <sub>nom</sub>       | V <sub>nom</sub> | lowest<br>channel<br>2402 MHz | middle<br>channel<br>2441 MHz | highest<br>channel<br>2480 MHz |
|------------------------|------------------|-------------------------------|-------------------------------|--------------------------------|
| Gain [dBi]<br>Measured |                  | -0.58                         | -1.21                         | -0.99                          |

#### Verdict: **complies**

## 12.2 Usability of the module

### Measurement:

This test case is a pre-check to show the behavior of the module and compare it with the main report.

### Measurement parameters:

| Measurement parameter   |                        |
|-------------------------|------------------------|
| Detector:               | Peak                   |
| Sweep time:             | Auto                   |
| Resolution bandwidth:   | ≥ occupied bandwidth   |
| Video bandwidth:        | ≥ RBW                  |
| Trace mode:             | Max hold               |
| Test setup:             | See sub clause 7.4 - A |
| Measurement uncertainty | See sub clause 8       |

### Results:

| Modulation | output power main report | output power used module |
|------------|--------------------------|--------------------------|
| BT basic   | 5.6*                     | 4.7                      |
| BT EDR     | 0.7*                     | 0.4                      |

\* Note: results added from main report page 47

### 12.3 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 78 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

#### Measurement:

| Measurement parameter   |                                                             |
|-------------------------|-------------------------------------------------------------|
| Detector:               | Peak / RMS                                                  |
| Sweep time:             | Auto                                                        |
| Video bandwidth:        | 1 MHz                                                       |
| Resolution bandwidth:   | 1 MHz                                                       |
| Span:                   | Lower Band: 2370 – 2400 MHz<br>higher Band: 2480 – 2500 MHz |
| Trace mode:             | Max Hold                                                    |
| Test setup:             | See sub clause 7.2 - D                                      |
| Measurement uncertainty | See sub clause 8                                            |

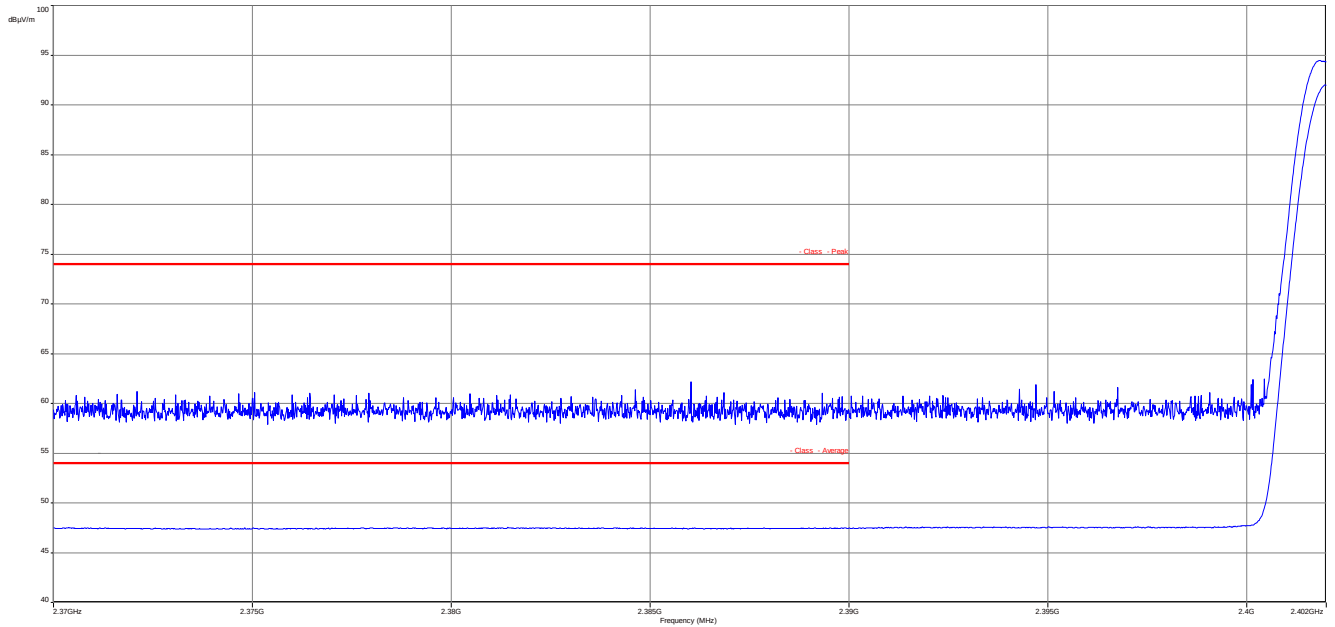
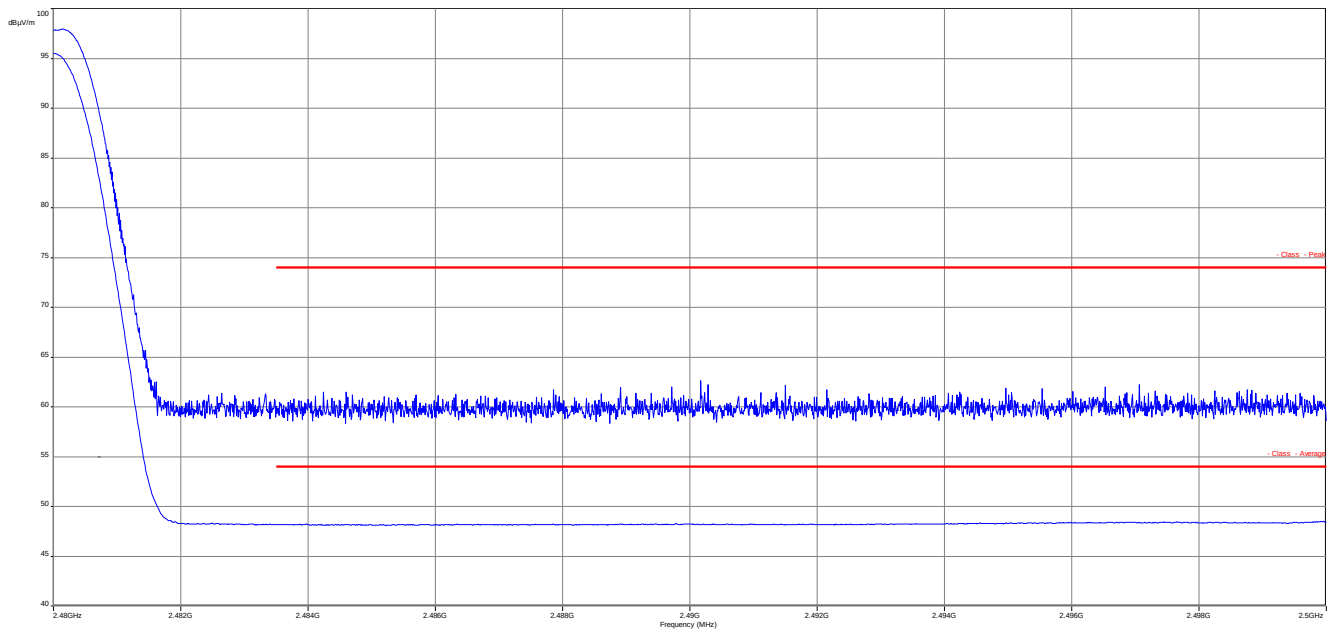
#### Limits:

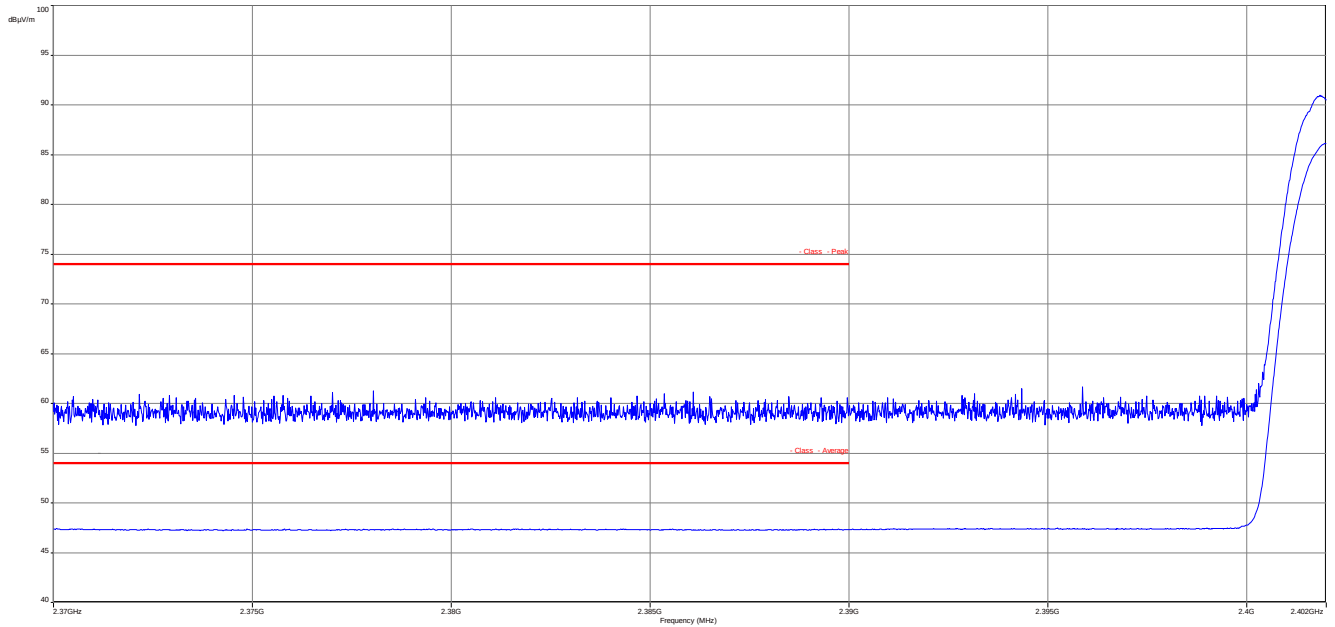
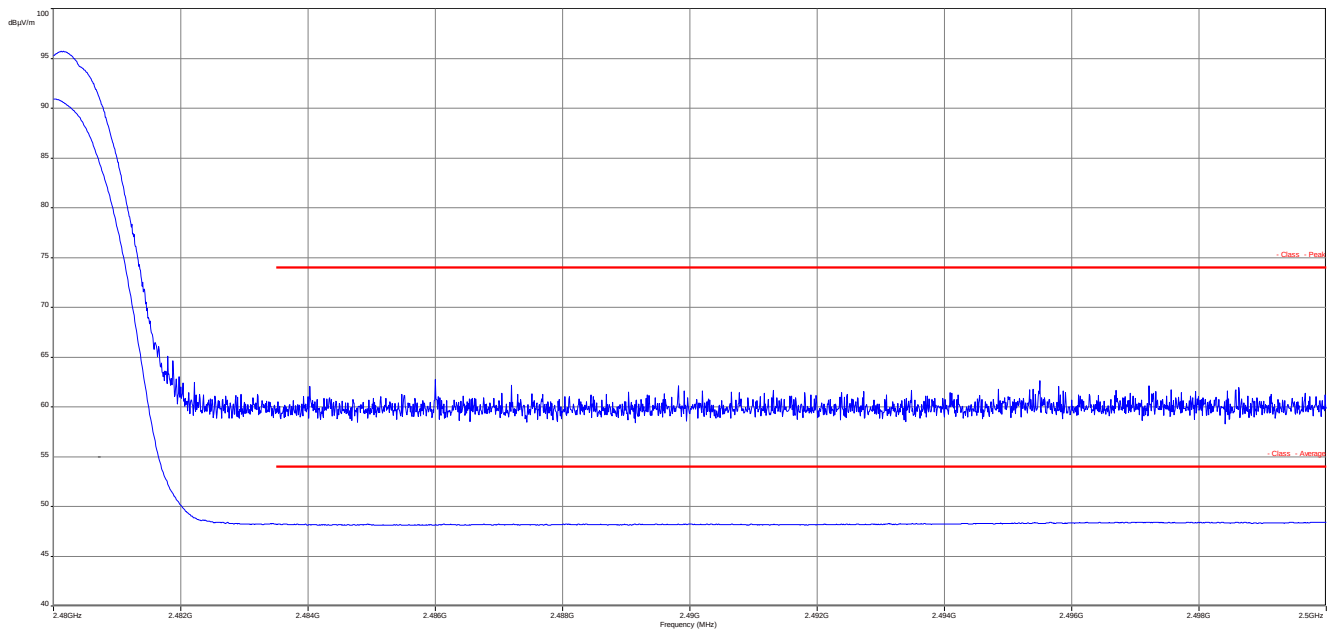
| FCC                                                                                                                                                                                                                                                                                                       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

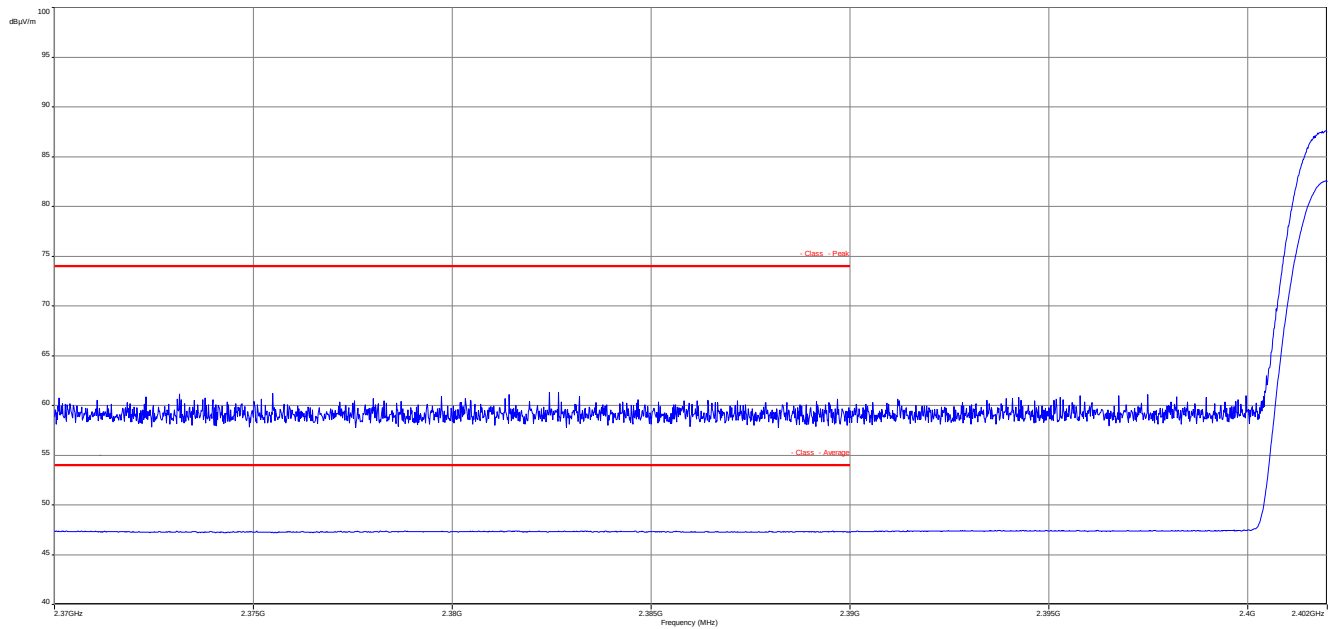
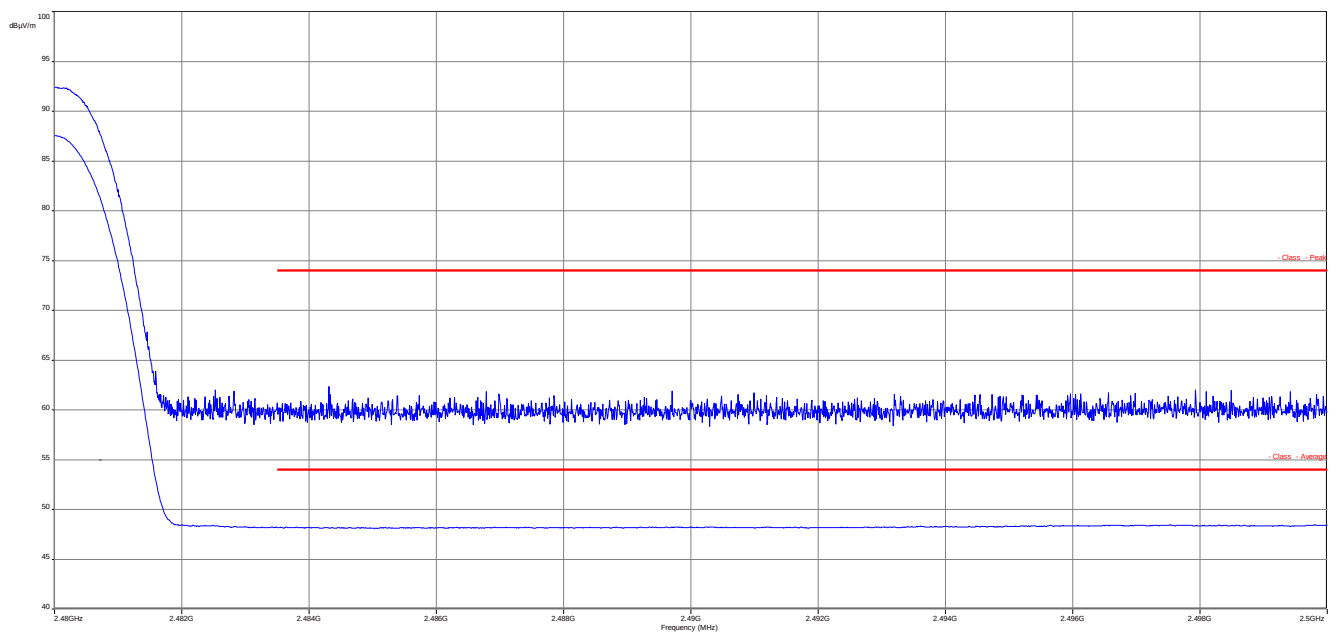
#### Results:

| Scenario<br>Modulation | Band edge compliance radiated [dBµV/m] |                    |                    |
|------------------------|----------------------------------------|--------------------|--------------------|
|                        | GFSK                                   | Pi/4 DQPSK         | 8DPSK              |
| Lower restricted band  | < 54 AVG / < 74 PP                     | < 54 AVG / < 74 PP | < 54 AVG / < 74 PP |
| Upper restricted band  | < 54 AVG / < 74 PP                     | < 54 AVG / < 74 PP | < 54 AVG / < 74 PP |

**Verdict:** **complies**

**Plots:****Plot 1:** Lower band edge, GFSK modulation, vertical & horizontal polarization**Plot 2:** Upper band edge, GFSK modulation, vertical & horizontal polarization

**Plot 3:** Lower band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization**Plot 4:** Upper band edge, Pi/4 DQPSK modulation, vertical & horizontal polarization

**Plot 5:** Lower band edge, 8 DPSK modulation, vertical & horizontal polarization**Plot 6:** Upper band edge, 8 DPSK modulation, vertical & horizontal polarization

## 12.4 TX spurious emissions radiated

### 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 parameter   |                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------|
| Detector:               | Peak / Quasi Peak / RMS                                                                                     |
| Sweep time:             | Auto                                                                                                        |
| Video bandwidth:        | 3 x RBW                                                                                                     |
| Resolution bandwidth:   | F < 1 GHz: 100 kHz<br>F > 1 GHz: 1 MHz                                                                      |
| Span:                   | 30 MHz to 26 GHz                                                                                            |
| Trace mode:             | Max Hold                                                                                                    |
| Measured modulation:    | <input checked="" type="checkbox"/> GFSK <input type="checkbox"/> Pi/4 DQPSK <input type="checkbox"/> 8DPSK |
| Test setup:             | See sub clause 7.1 - A<br>See sub clause 7.2 - C                                                            |
| Measurement uncertainty | See sub clause 8                                                                                            |

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                    |

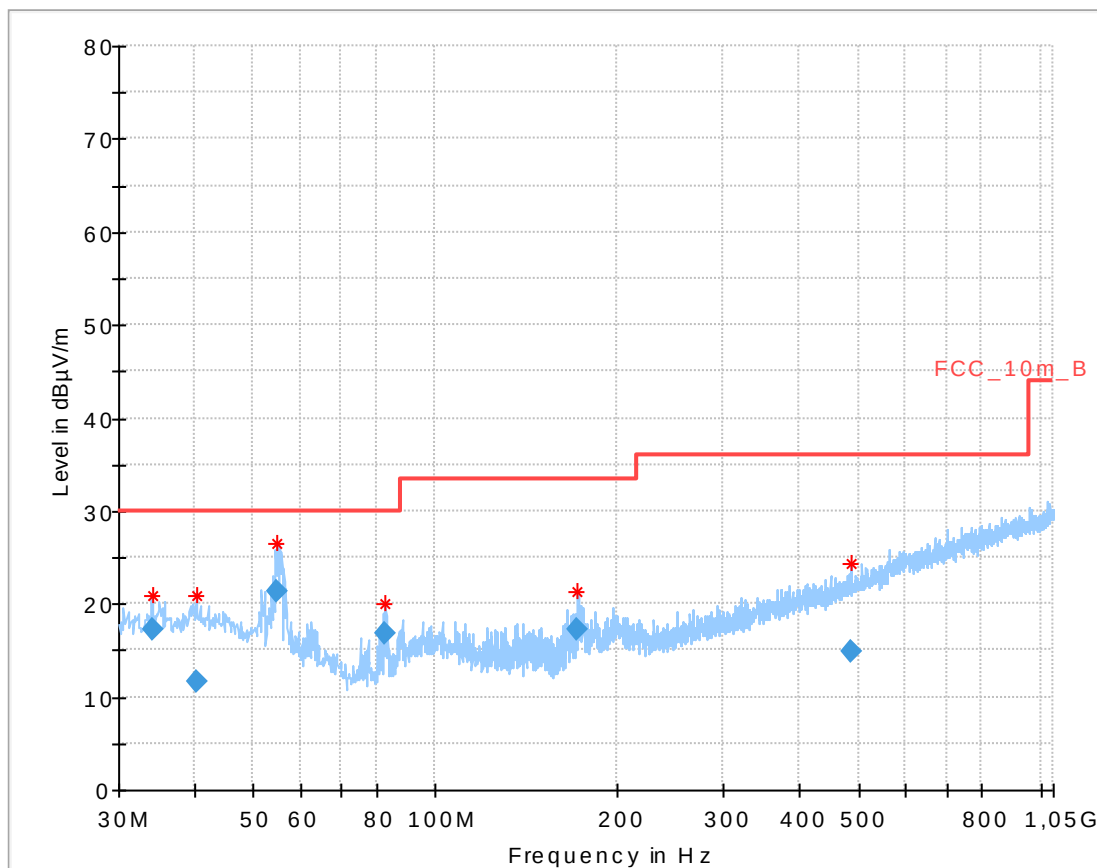
**Results:**

| TX spurious emissions radiated [dB $\mu$ V/m]                                    |          |                      |                                                                                  |          |                      |                                                                                  |          |                      |
|----------------------------------------------------------------------------------|----------|----------------------|----------------------------------------------------------------------------------|----------|----------------------|----------------------------------------------------------------------------------|----------|----------------------|
| 2402 MHz                                                                         |          |                      | 2441 MHz                                                                         |          |                      | 2480 MHz                                                                         |          |                      |
| F [MHz]                                                                          | Detector | Level [dB $\mu$ V/m] | F [MHz]                                                                          | Detector | Level [dB $\mu$ V/m] | F [MHz]                                                                          | Detector | Level [dB $\mu$ V/m] |
| For emissions below 1 GHz, please take a look at the table below the 1 GHz plot. |          |                      | For emissions below 1 GHz, please take a look at the table below the 1 GHz plot. |          |                      | For emissions below 1 GHz, please take a look at the table below the 1 GHz plot. |          |                      |
| 1500                                                                             | Peak     | 42.58                | 1500                                                                             | Peak     | 42.58                | 1500                                                                             | Peak     | 42.58                |
| 1938                                                                             | Peak     | 43.92                | 1938                                                                             | Peak     | 43.92                | 1938                                                                             | Peak     | 43.92                |
| 2522                                                                             | Peak     | 45.38                | 2522                                                                             | Peak     | 45.38                | 2522                                                                             | Peak     | 45.38                |
| 3000                                                                             | Peak     | 55.12<br>No RB!      | 3000                                                                             | Peak     | 55.12<br>No RB!      | 3000                                                                             | Peak     | 55.12<br>No RB!      |
| All detected peak emissions are below the average limit.                         |          |                      | All detected peak emissions are below the average limit.                         |          |                      | All detected peak emissions are below the average limit.                         |          |                      |
|                                                                                  |          |                      |                                                                                  |          |                      |                                                                                  |          |                      |

**Verdict:** [complies](#)

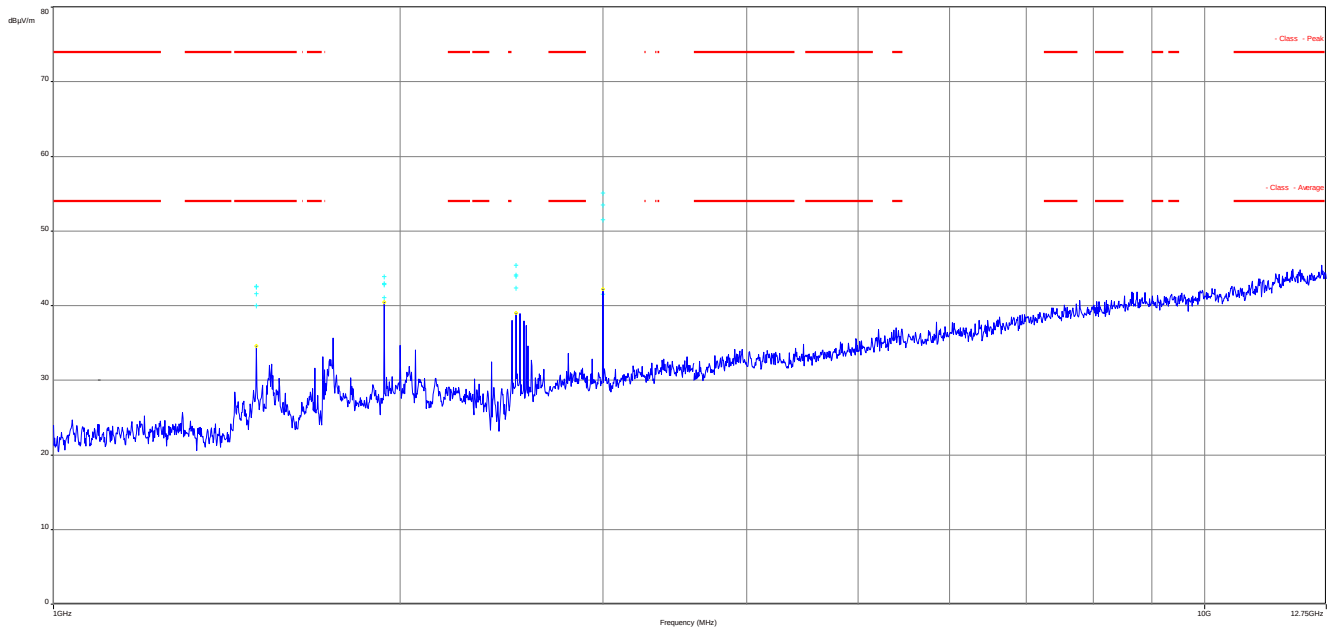
### Plots:

**Plot 1:** 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization

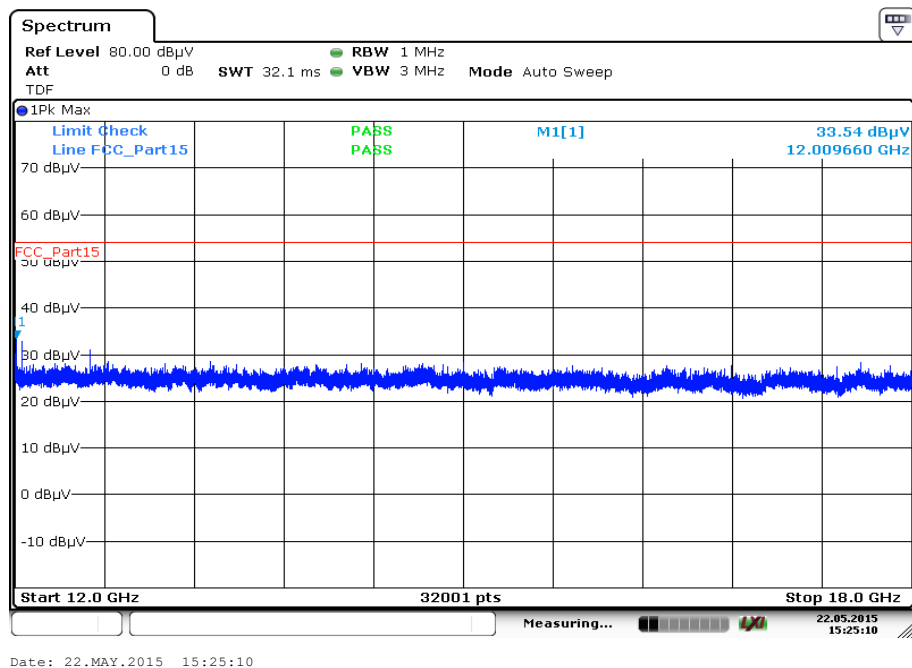


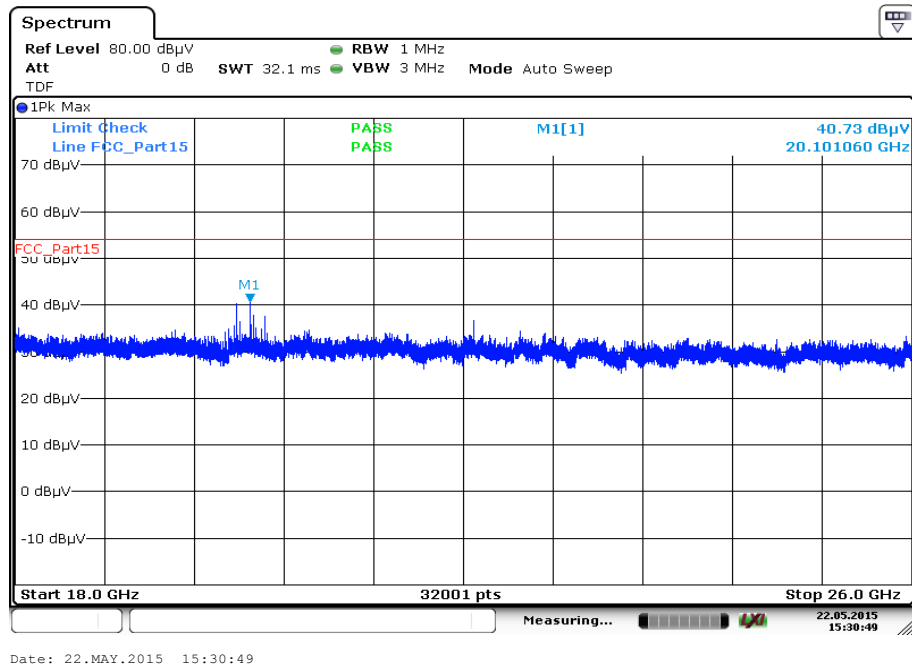
### Final\_Result:

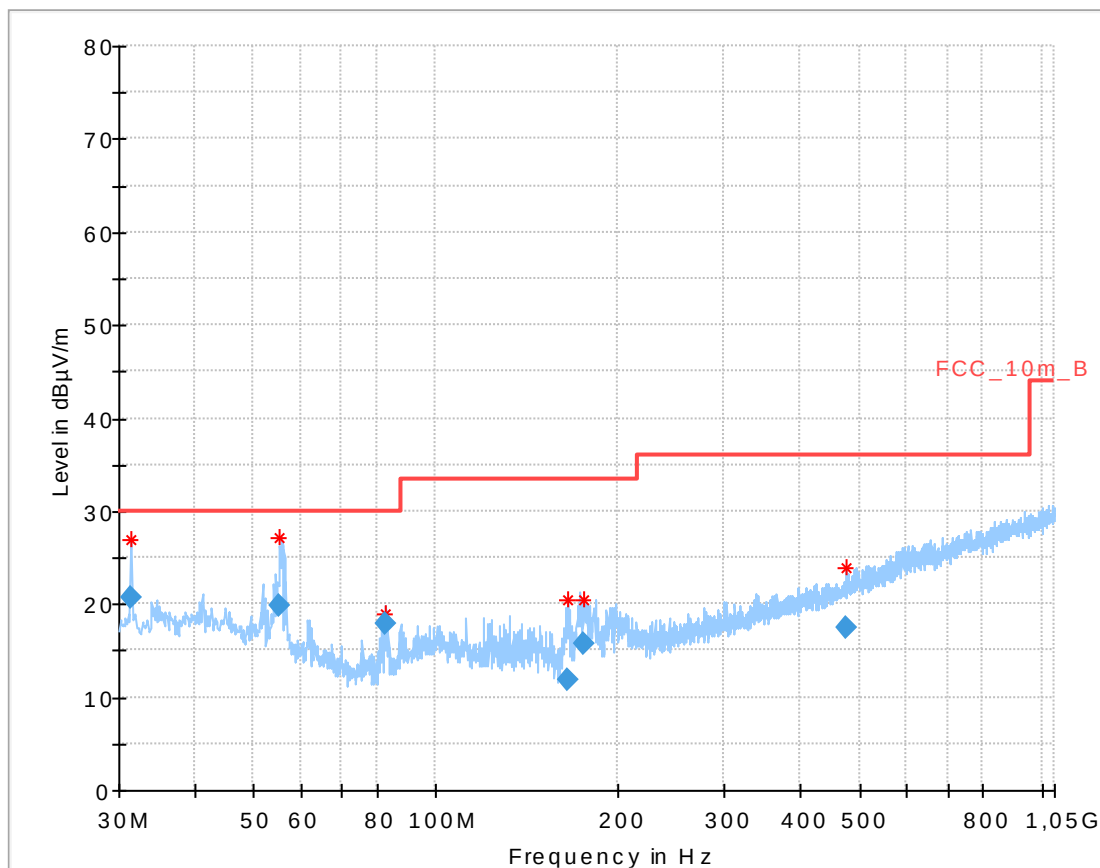
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 34.016100       | 17.34              | 30.00          | 12.66       | 1000.0          | 120.000         | 98.0        | V   | 123           | 13.7       |
| 40.377300       | 11.65              | 30.00          | 18.35       | 1000.0          | 120.000         | 170.0       | V   | 64            | 14.0       |
| 54.892200       | 21.34              | 30.00          | 8.66        | 1000.0          | 120.000         | 101.0       | V   | 279           | 11.9       |
| 82.862400       | 16.80              | 30.00          | 13.20       | 1000.0          | 120.000         | 101.0       | V   | 123           | 8.8        |
| 171.616200      | 17.19              | 33.50          | 16.31       | 1000.0          | 120.000         | 98.0        | V   | 359           | 9.8        |
| 486.517350      | 14.98              | 36.00          | 21.02       | 1000.0          | 120.000         | 170.0       | H   | 327           | 18.4       |

**Plot 2:** 1 GHz to 12.75 GHz, TX mode, channel 00, vertical & horizontal polarization

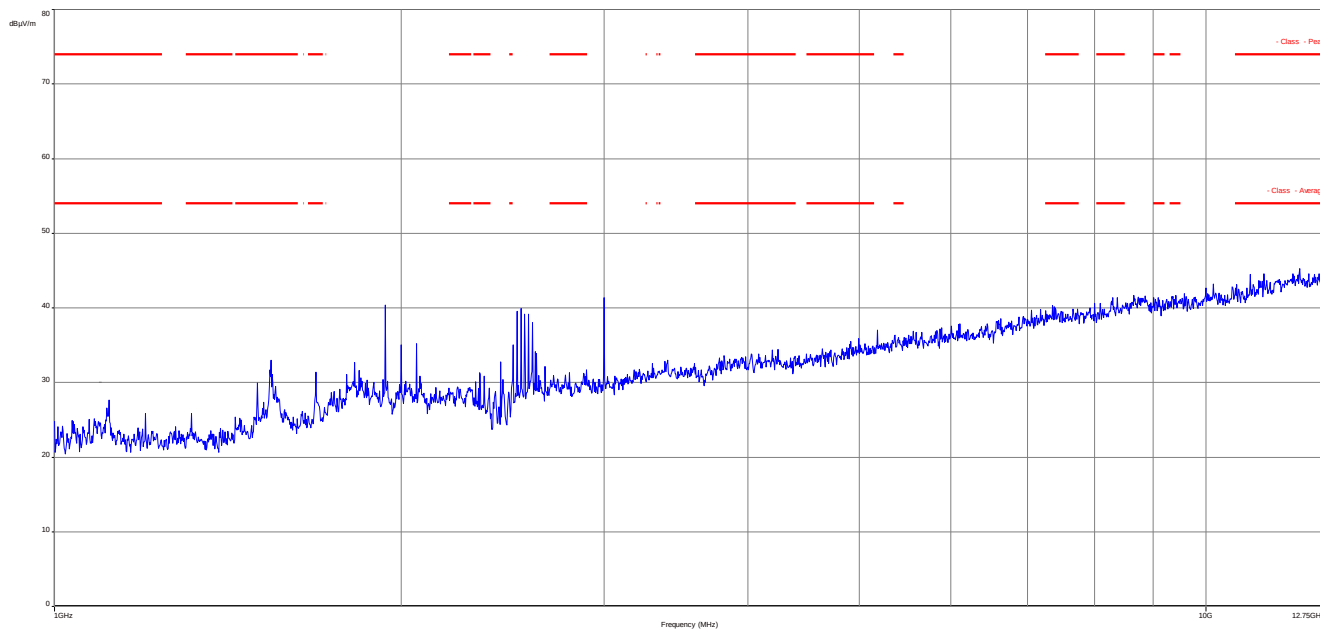
The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 3:** 12.75 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization

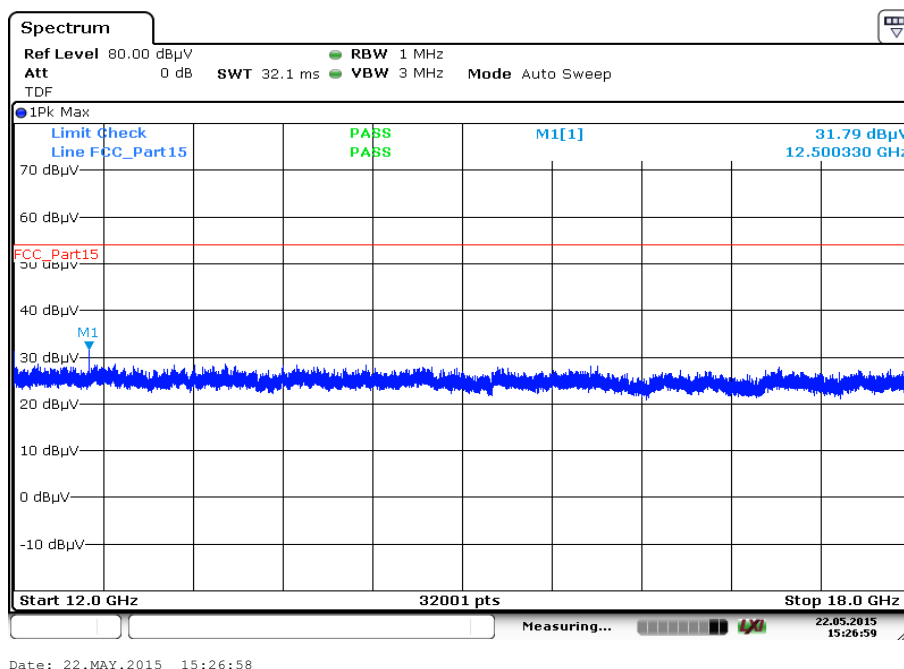
**Plot 4:** 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization

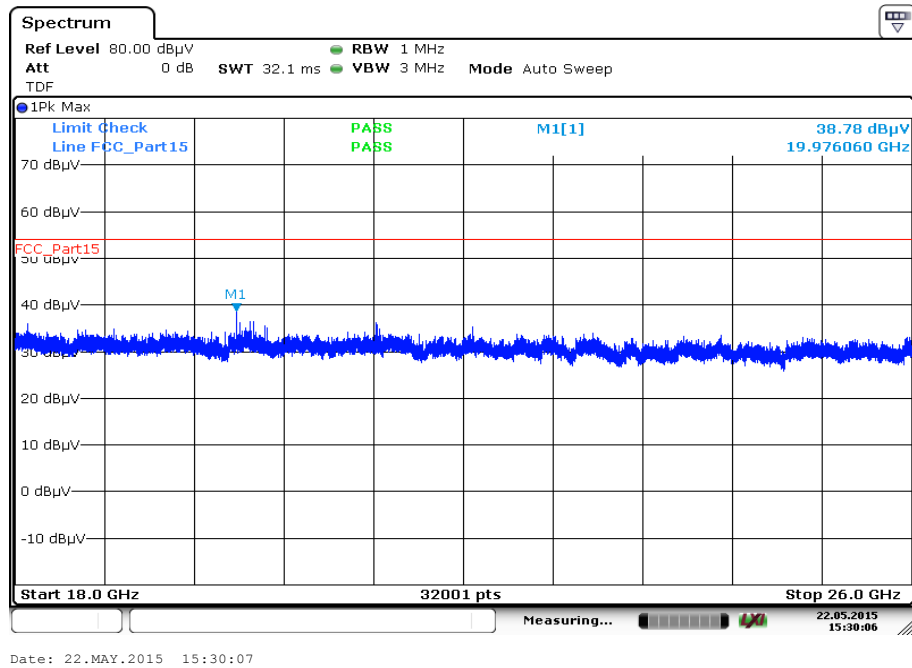
**Plot 5:** 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization**Final\_Result:**

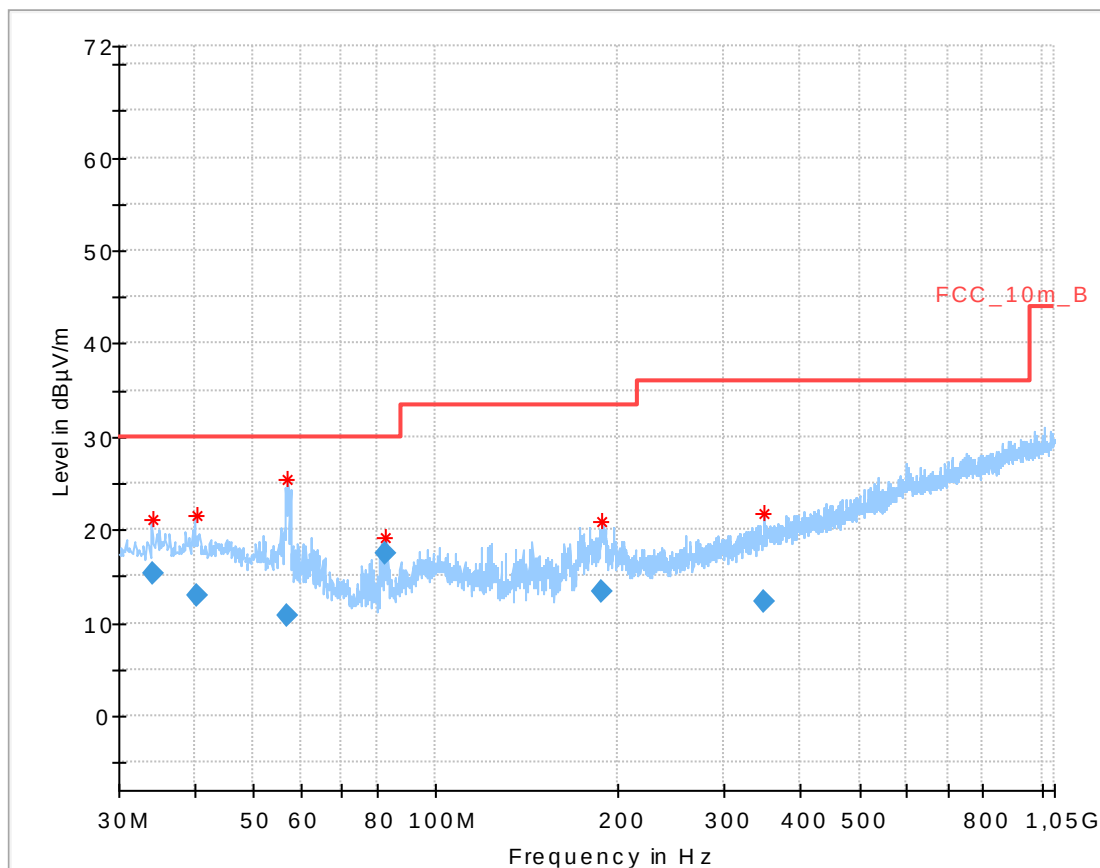
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 31.362450       | 20.62              | 30.00          | 9.38        | 1000.0          | 120.000         | 101.0       | H   | 310           | 13.5       |
| 55.262700       | 19.83              | 30.00          | 10.17       | 1000.0          | 120.000         | 170.0       | V   | 251           | 11.8       |
| 82.838700       | 17.86              | 30.00          | 12.14       | 1000.0          | 120.000         | 170.0       | V   | 134           | 8.8        |
| 164.552550      | 11.96              | 33.50          | 21.54       | 1000.0          | 120.000         | 170.0       | V   | 90            | 9.4        |
| 175.745400      | 15.76              | 33.50          | 17.74       | 1000.0          | 120.000         | 98.0        | V   | 355           | 10.1       |
| 473.908650      | 17.50              | 36.00          | 18.50       | 1000.0          | 120.000         | 170.0       | H   | 0             | 18.1       |

**Plot 6:** 1 GHz to 12.75 GHz, TX mode, channel 39, vertical & horizontal polarization

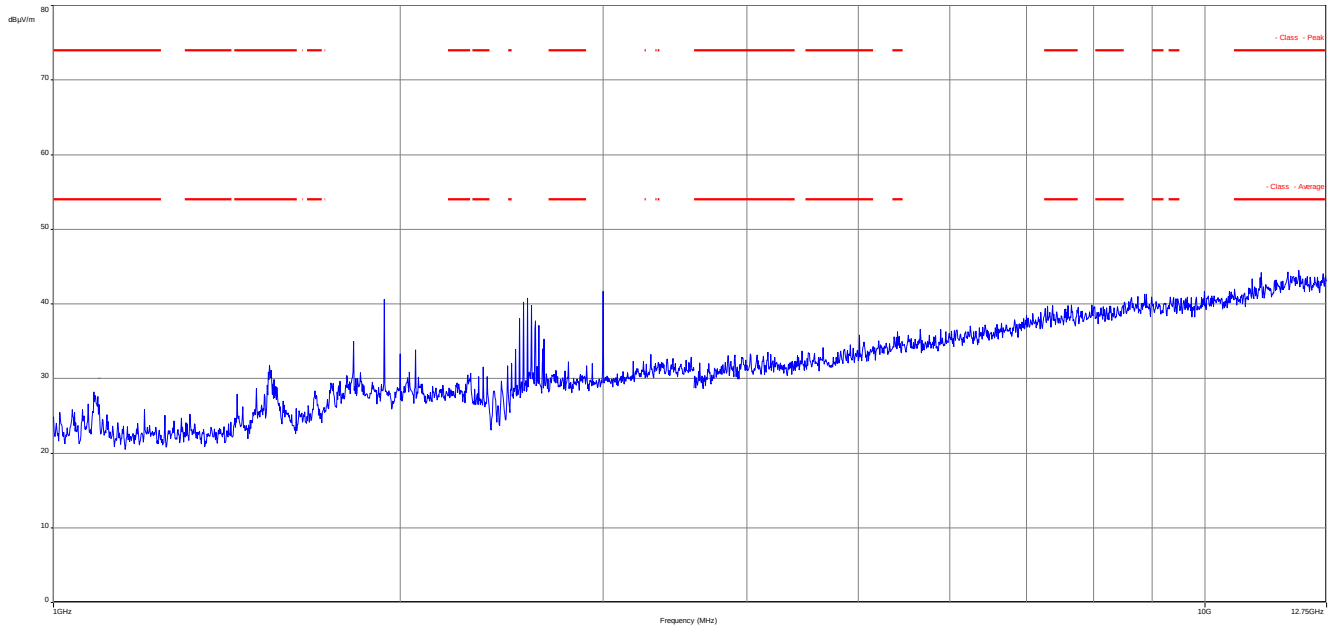
The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 7:** 12.75 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization

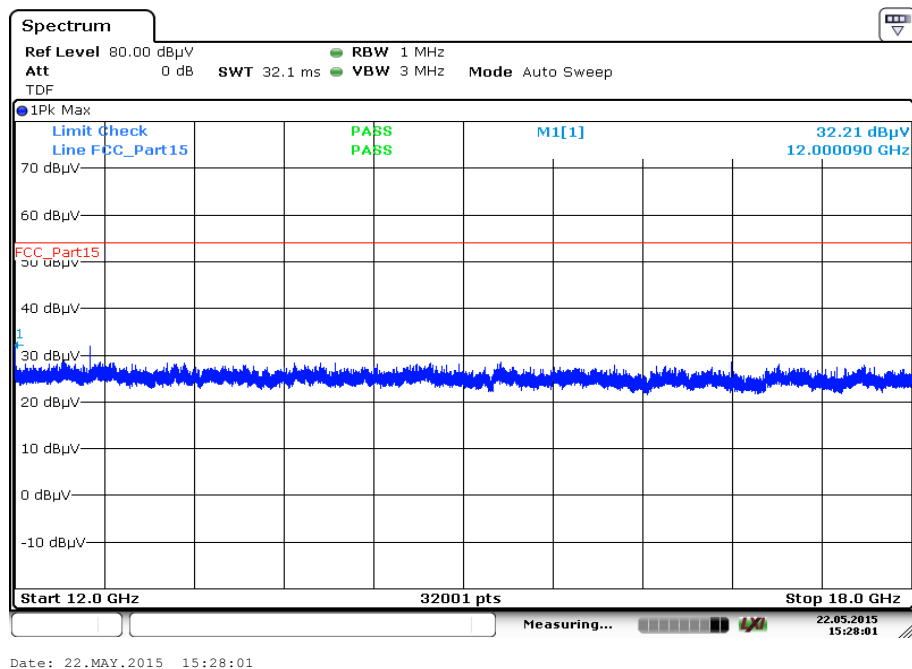
**Plot 8:** 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization

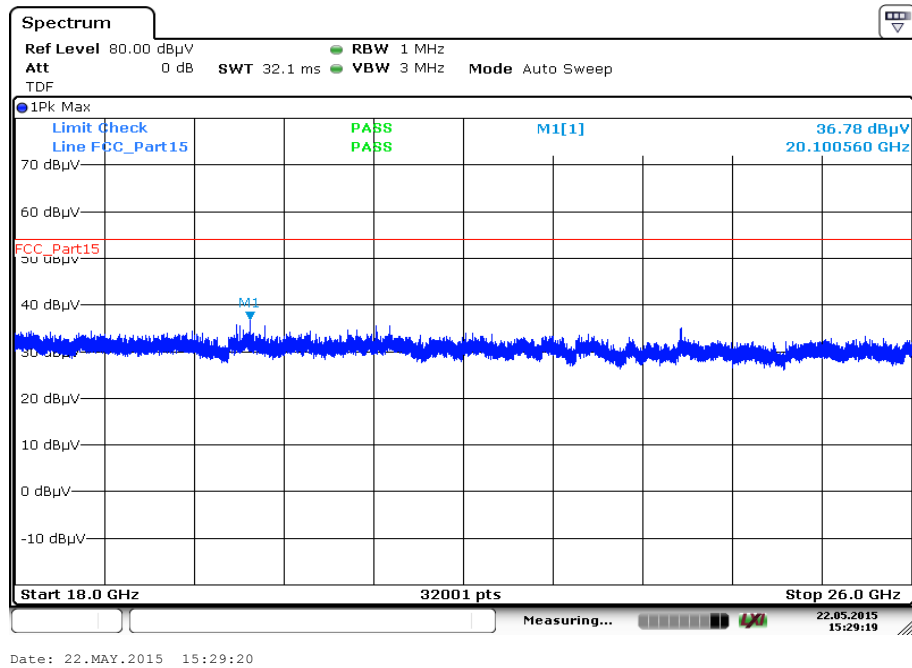
**Plot 9:** 30 MHz to 1 GHz, TX mode, channel 78, vertical & horizontal polarization

**Final\_Result:**

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 34.057500       | 15.36              | 30.00          | 14.64       | 1000.0          | 120.000         | 98.0        | V   | 2             | 13.7       |
| 40.512900       | 12.81              | 30.00          | 17.19       | 1000.0          | 120.000         | 101.0       | V   | 169           | 14.0       |
| 56.740800       | 10.71              | 30.00          | 19.29       | 1000.0          | 120.000         | 170.0       | V   | 258           | 11.4       |
| 82.805400       | 17.48              | 30.00          | 12.52       | 1000.0          | 120.000         | 101.0       | V   | 181           | 8.8        |
| 187.950150      | 13.43              | 33.50          | 20.07       | 1000.0          | 120.000         | 170.0       | V   | 188           | 10.9       |
| 348.743550      | 12.31              | 36.00          | 23.69       | 1000.0          | 120.000         | 170.0       | V   | 246           | 16.0       |

**Plot 10:** 1 GHz to 12.75 GHz, TX mode, channel 78, vertical & horizontal polarization

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

**Plot 11:** 12.75 GHz to 18 GHz, TX mode, channel 78, vertical & horizontal polarization

**Plot 12:** 18 GHz to 26 GHz, TX mode, channel 78, vertical & horizontal polarization

## 12.5 RX spurious emissions radiated

### Description:

Measurement of the radiated spurious emissions in idle/receive mode. The EUT is detached so all oscillators are active.

### Measurement:

| Measurement parameter   |                                                  |
|-------------------------|--------------------------------------------------|
| Detector:               | Peak / Quasi peak / RMS                          |
| Sweep time:             | Auto                                             |
| Video bandwidth:        | 3 x RBW                                          |
| Resolution bandwidth:   | F < 1 GHz: 100 kHz<br>F > 1 GHz: 1 MHz           |
| Span:                   | 30 MHz to 26 GHz                                 |
| Trace mode:             | Max Hold                                         |
| Test setup:             | See sub clause 7.1 - A<br>See sub clause 7.2 - B |
| Measurement uncertainty | See sub clause 8                                 |

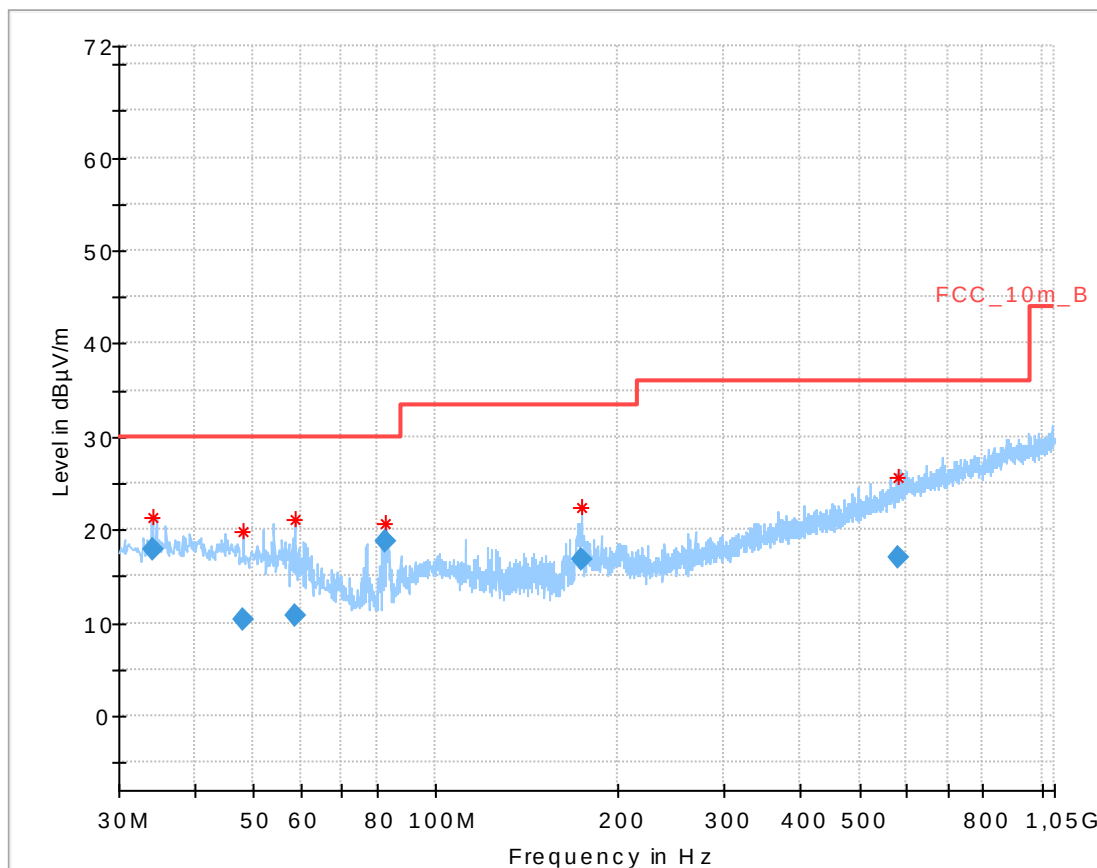
### Limits:

| FCC                            |                               | IC                   |
|--------------------------------|-------------------------------|----------------------|
| RX Spurious Emissions Radiated |                               |                      |
| Frequency (MHz)                | Field strength (dB $\mu$ V/m) | Measurement distance |
| 30 - 88                        | 30.0                          | 10                   |
| 88 – 216                       | 33.5                          | 10                   |
| 216 – 960                      | 36.0                          | 10                   |
| Above 960                      | 54.0                          | 3                    |

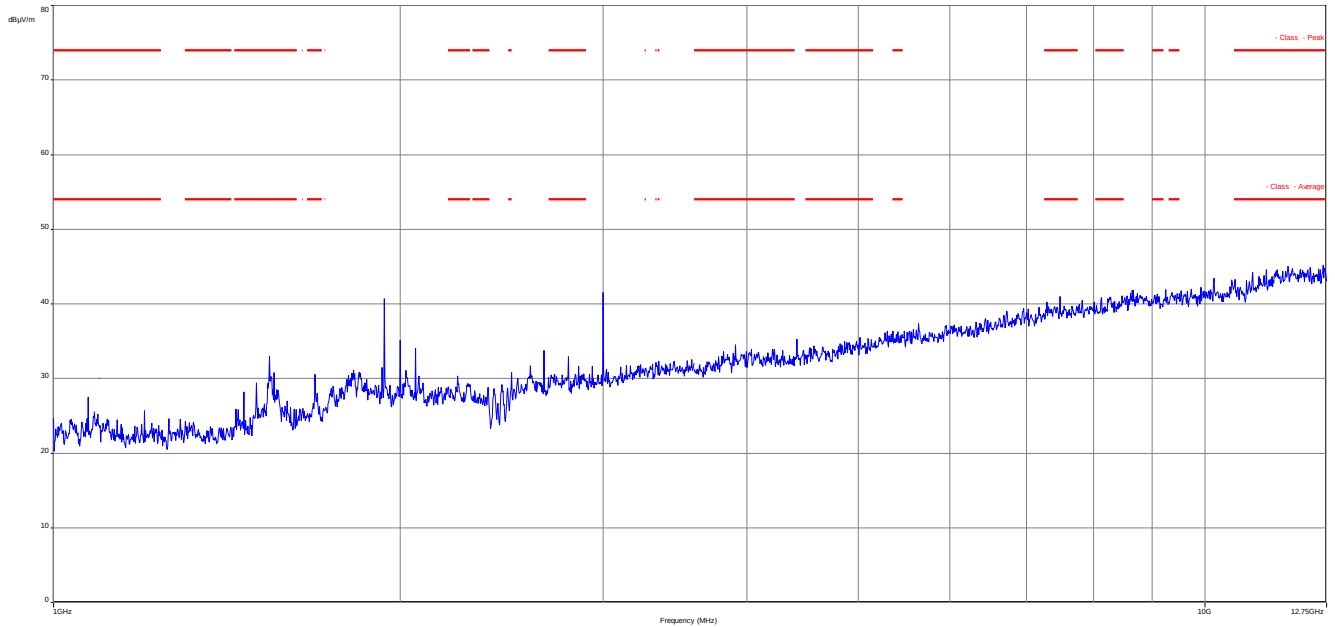
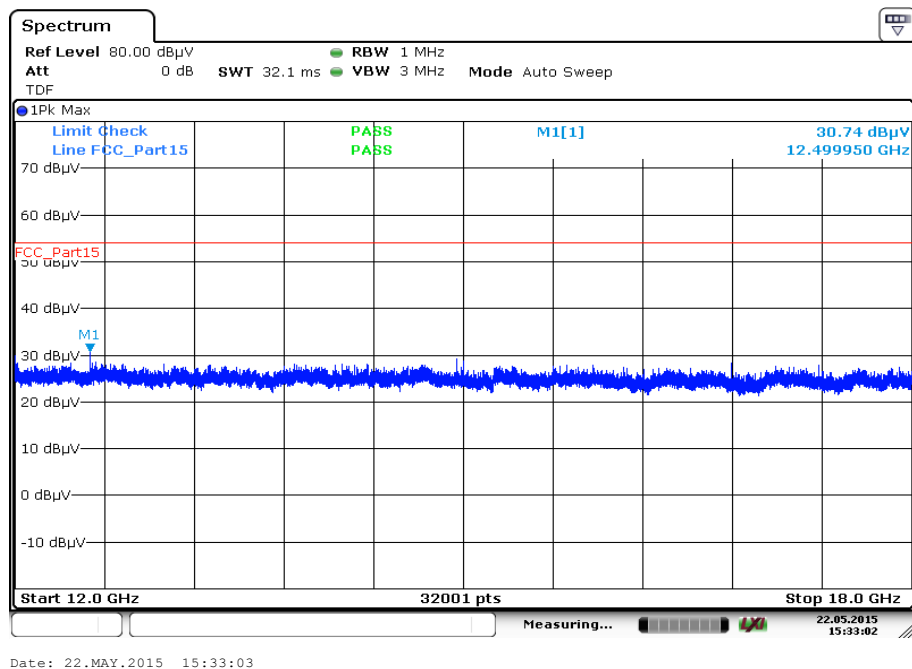
### Results:

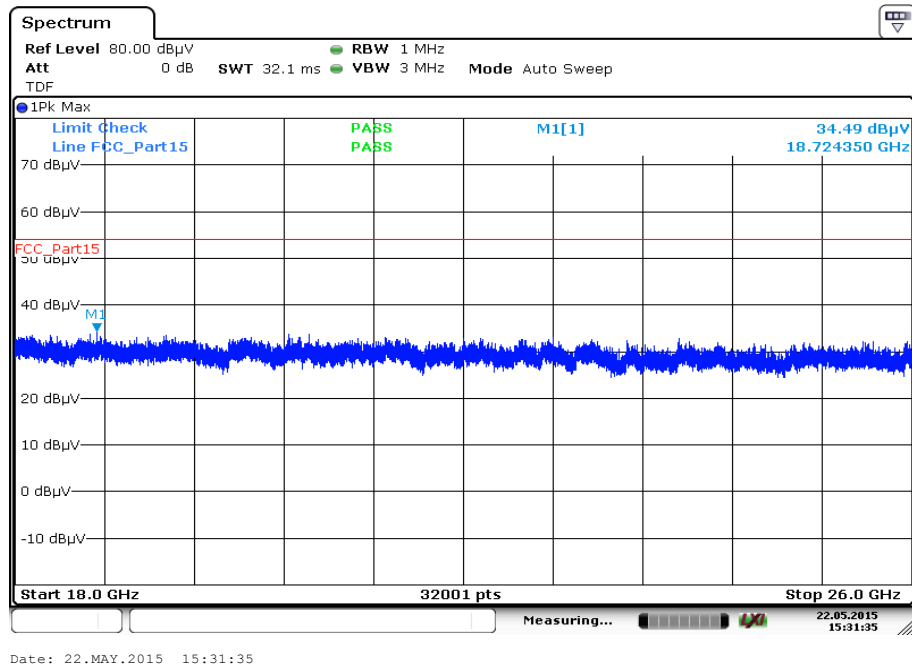
| RX spurious emissions radiated [dB $\mu$ V/m]                                    |          |                      |
|----------------------------------------------------------------------------------|----------|----------------------|
| F [MHz]                                                                          | Detector | Level [dB $\mu$ V/m] |
| For emissions below 1 GHz, please take a look at the table below the 1 GHz plot. |          |                      |
| 1500                                                                             | Peak     | 42.58                |
| 1938                                                                             | Peak     | 43.92                |
| 2522                                                                             | Peak     | 45.38                |
| 3000                                                                             | Peak     | 55.12<br>No RB!      |
| All detected peak emissions are below the average limit.                         |          |                      |

**Verdict:** **complies**

**Plots:**
**Plot 1:** 30 MHz to 1 GHz, RX 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) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 34.029750       | 17.92              | 30.00          | 12.08       | 1000.0          | 120.000         | 101.0       | V   | 277           | 13.7       |
| 48.206400       | 10.40              | 30.00          | 19.60       | 1000.0          | 120.000         | 104.0       | V   | 292           | 13.1       |
| 58.427400       | 10.84              | 30.00          | 19.16       | 1000.0          | 120.000         | 170.0       | V   | 54            | 11.0       |
| 82.827300       | 18.73              | 30.00          | 11.27       | 1000.0          | 120.000         | 170.0       | V   | 152           | 8.8        |
| 174.058650      | 16.72              | 33.50          | 16.78       | 1000.0          | 120.000         | 98.0        | V   | 350           | 10.0       |
| 580.754100      | 17.09              | 36.00          | 18.91       | 1000.0          | 120.000         | 101.0       | V   | 269           | 20.2       |

**Plot 2:** 1 GHz to 12.75 GHz, RX mode, vertical & horizontal polarization**Plot 3:** 12.75 GHz to 18 GHz, RX mode, vertical & horizontal polarization

**Plot 4:** 18 GHz to 26 GHz, RX mode, vertical & horizontal polarization

## 12.6 Spurious emissions radiated < 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 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 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 parameter   |                                            |
|-------------------------|--------------------------------------------|
| Detector:               | Peak / Quasi peak                          |
| Sweep time:             | Auto                                       |
| Video bandwidth:        | F < 150 kHz: 200 Hz<br>F > 150 kHz: 9 kHz  |
| Resolution 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 - A                     |
| Measurement uncertainty | See sub clause 8                           |

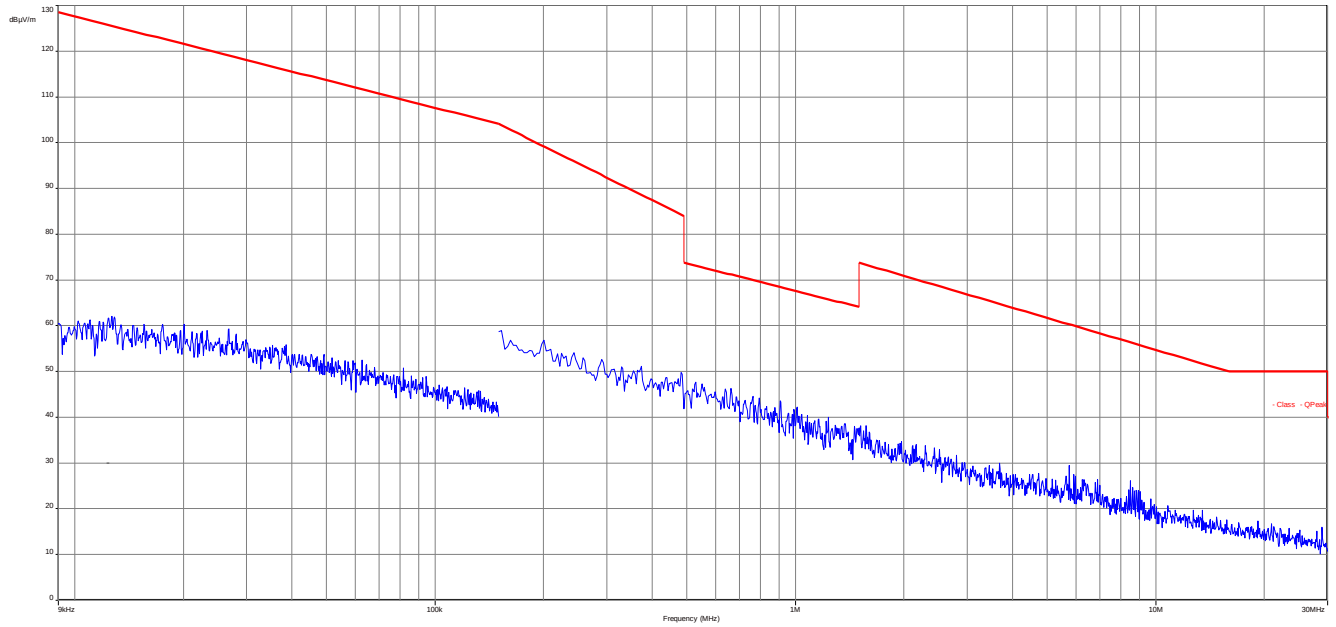
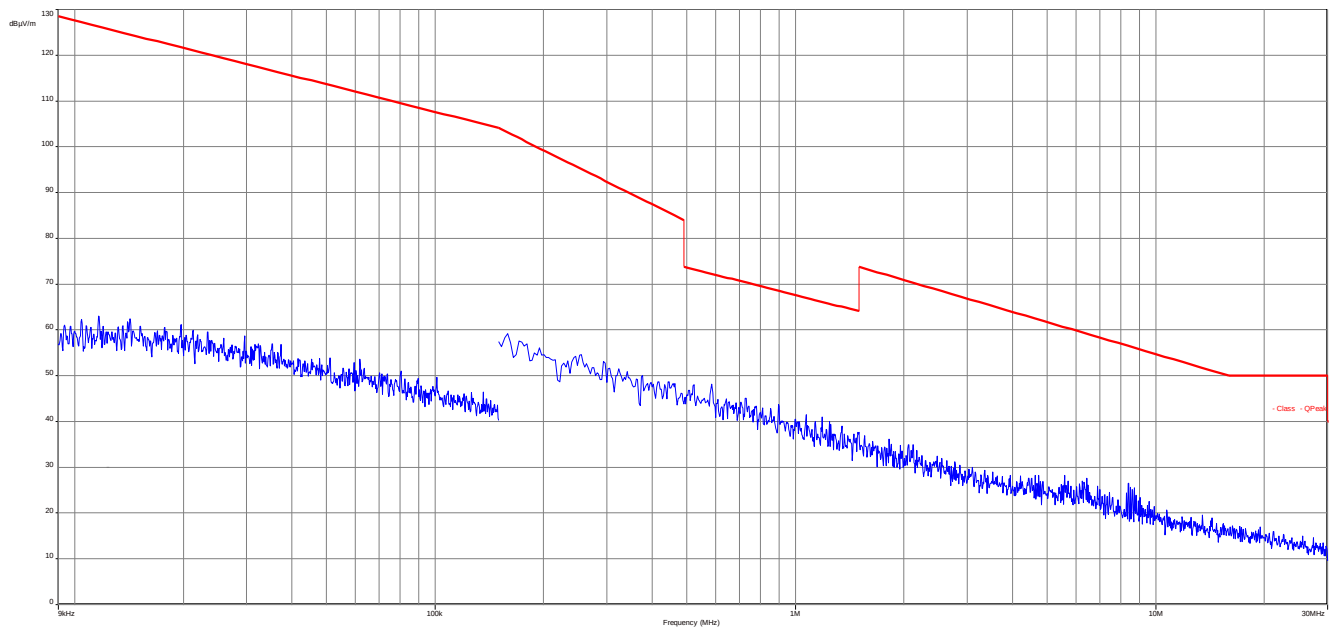
### Limits:

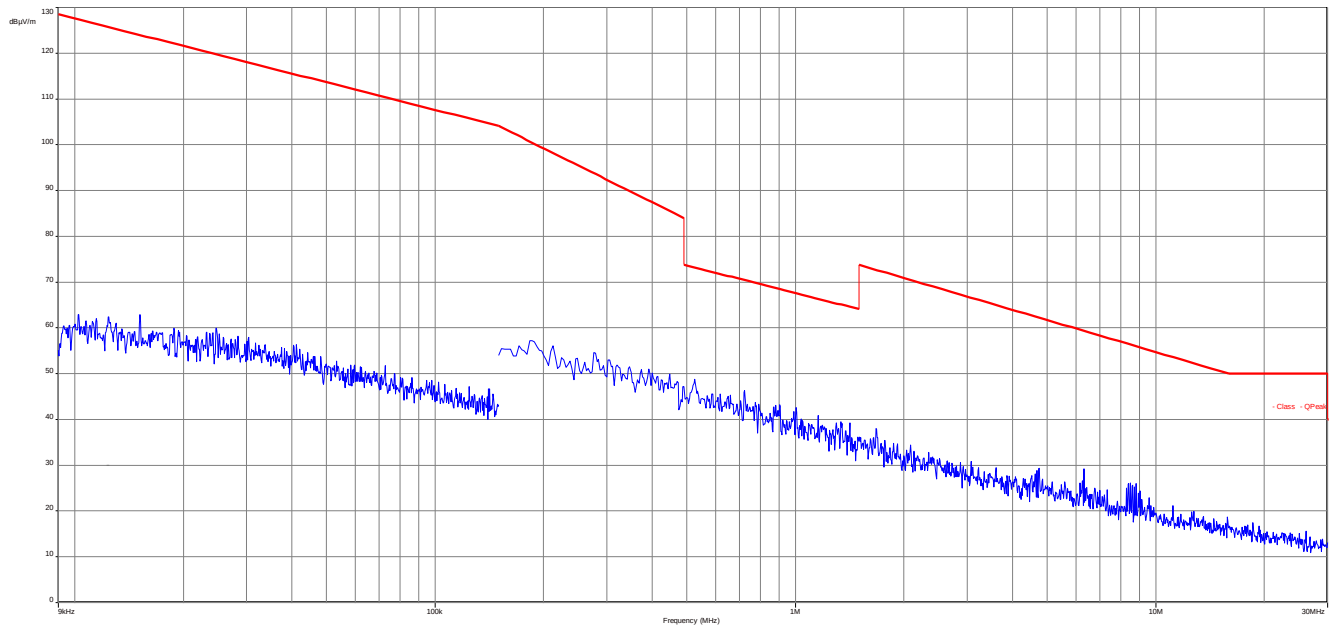
| FCC                                     |                               | IC                   |
|-----------------------------------------|-------------------------------|----------------------|
| TX spurious emissions radiated < 30 MHz |                               |                      |
| Frequency (MHz)                         | Field strength (dB $\mu$ V/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 [dB $\mu$ V/m] |          |                      |
|--------------------------------------------------------|----------|----------------------|
| F [MHz]                                                | Detector | Level [dB $\mu$ V/m] |
| No emissions detected.                                 |          |                      |
|                                                        |          |                      |

**Verdict:** **complies**

**Plots:****Plot 1: 9 kHz to 30 MHz, TX mode, low channel****Plot 2: 9 kHz to 30 MHz, TX mode, mid channel**

**Plot 3: 9 kHz to 30 MHz, TX mode, high channel**

### 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 | 2015-07-27      |

### 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

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Befähigung 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

**CETECOM ICT Services GmbH**  
 Untertürkheimer Straße 6-10, 66117 Saarbrücken

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

Drahtgebundene Kommunikation einschließlich xDSL  
 VoIP und DECT  
 Akustik  
 Funk einschließlich WLAN  
 Short Range Devices (SRD)  
 RFID  
 WiMax und Richtfunk  
 Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)  
 Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive  
 Produktsicherheit  
 SAR und Hearing Aid Compatibility (HAC)  
 Umweltsimulation  
 Smart Card Terminals  
 Bluetooth  
 Wi-Fi-Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt am Main, 07.03.2014

Date of issue of the certificate

Im Auftrag D-PL-12076-01-00  
 Hildegarde

Deutsche Akkreditierungsstelle GmbH

Standort Berlin  
 Spittelmarkt 10  
 10117 Berlin

Standort Frankfurt am Main  
 Gartenstraße 6  
 60594 Frankfurt am Main

Standort Braunschweig  
 Bundesallee 100  
 38115 Braunschweig

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Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstellen (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abt. L 218 vom 9. Juli 2008, S. 30). Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European Cooperation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:  
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 ILAC: [www.ilac.org](http://www.ilac.org)  
 IAF: [www.iaf.eu](http://www.iaf.eu)

### Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>