

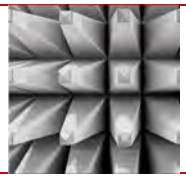

CETECOM™

**CETECOM ICT Services**

*consulting - testing - certification* ➤➤➤

# TEST REPORT

**Test report no.: 1-0682/15-02-07**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

## Testing laboratory


**CETECOM ICT Services GmbH**
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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-12076-01-00

## Applicant


**Oticon A/S**
Kongebakken 9
2765 Smørum / DENMARK
Phone: +45 39 17 71 00
Fax: -/-
Contact: Jørgen Peter Hanuscheck
e-mail: jpha@oticon.com
Phone: +45 39 13 85 38


## Manufacturer


**Oticon A/S**
Kongebakken 9
2765 Smørum / DENMARK


## 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:** | **Hearing Aid, WL HI platform** |
| **Model name:** | **Aurora mini RITE** |
| **FCC ID:** | **U28AUMRIT** |
| **IC:** | **1350B-AUMRIT** |
| Frequency: | DTS band 2400 MHz to 2483.5 MHz |
| Technology tested: | Bluetooth® LE + 2Mbps proprietary |
| Antenna: | Wire antenna |
| Power supply: | 1.4 V DC by Zn air battery |
| Temperature range: | 0°C to +40°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 authorized:**

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Mihail Dorongovskij
Testing Manager
Radio Communications & EMC

# 1 Table of contents

# 2 General information

## 2.1 Notes and disclaimer

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## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2016-02-25 |
| Date of receipt of test item: | 2016-03-14 |
| Start of test: | 2016-03-14 |
| End of test: | 2016-03-17 |
| Person(s) present during the test: | Mr. Søren D. Hansen and Mr. Jørgen Peter Hanuscheck |

# 3 Test standard/s and references

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

| Guidance | Version | Description |
|---|---|---|
| DTS: KDB 558074 D01 | v03r04 | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 |
| 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 | : | $T_{nom}$<br>$T_{max}$<br>$T_{min}$ | 20 °C during room temperature tests<br>+40 °C during high temperature tests*<br>0 °C during low temperature tests* |
| Relative humidity content | : | | 55 % |
| Barometric pressure | : | | not relevant for this kind of testing |
| Power supply | : | $V_{nom}$ | 1.4 V DC (battery powered during radiated tests, external power supply powered during conducted tests) |
| | | $V_{max}$ | 1.4 V DC (battery powered during radiated tests, external power supply powered during conducted tests) |
| | | $V_{min}$ | 1.1 V DC (battery powered during radiated tests, external power supply powered during conducted tests) |

# 5 Test item

## 5.1 General description

| | | |
|---|---|---|
| Kind of test item | : | Hearing Aid, WL HI platform |
| Type identification | : | Aurora mini RITE |
| HMN | : | N/A |
| PMN | : | Aurora mini RITE |
| HVIN | : | Aurora mini RITE |
| FVIN | : | N/A |
| S/N serial number | : | Rad. # 10: 43481331 (used for antenna tests between 30 MHz to 1 GHz)<br>Rad. # 12: 43481355 (used for all other antenna tests)<br>Rad. # 11: 43481332 (used for antenna gain calculation only)<br>Rad. # 13: 43480242 (used for antenna gain calculation only)<br>Cond. # 2: 43483165 (used for all conducted tests)<br>Cond. # 1: 43481009 (used for antenna gain calculation and BW tests)<br>Cond. # 3: 43480978 (used for antenna gain calculation and BW tests) |
| HW hardware status | : | Rev 2 |
| SW software status | : | eSW 5.6.0 |
| Frequency band | : | DTS band 2400 MHz to 2483.5 MHz |
| Type of radio transmission<br>Use of frequency spectrum | :<br>: | BT LE: Other digital transmission<br>2Mbps proprietary: Other digital transmission |
| Type of modulation | : | BT LE: GFSK<br>2Mbps proprietary: GFSK (TX highest duty cycle: >80% / RX is continuous) |
| Number of channels | : | BT LE: 40<br>2Mbps proprietary: 40 |
| Antenna | : | Wire antenna |
| Power supply | : | 1.4 V DC by Zn air battery |
| Temperature range | : | 0°C to +40°C |

## 5.2 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: 1-0682_15-02-01_AnnexA
1-0682_15-02-01_AnnexB
1-0682_15-02-01_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 signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

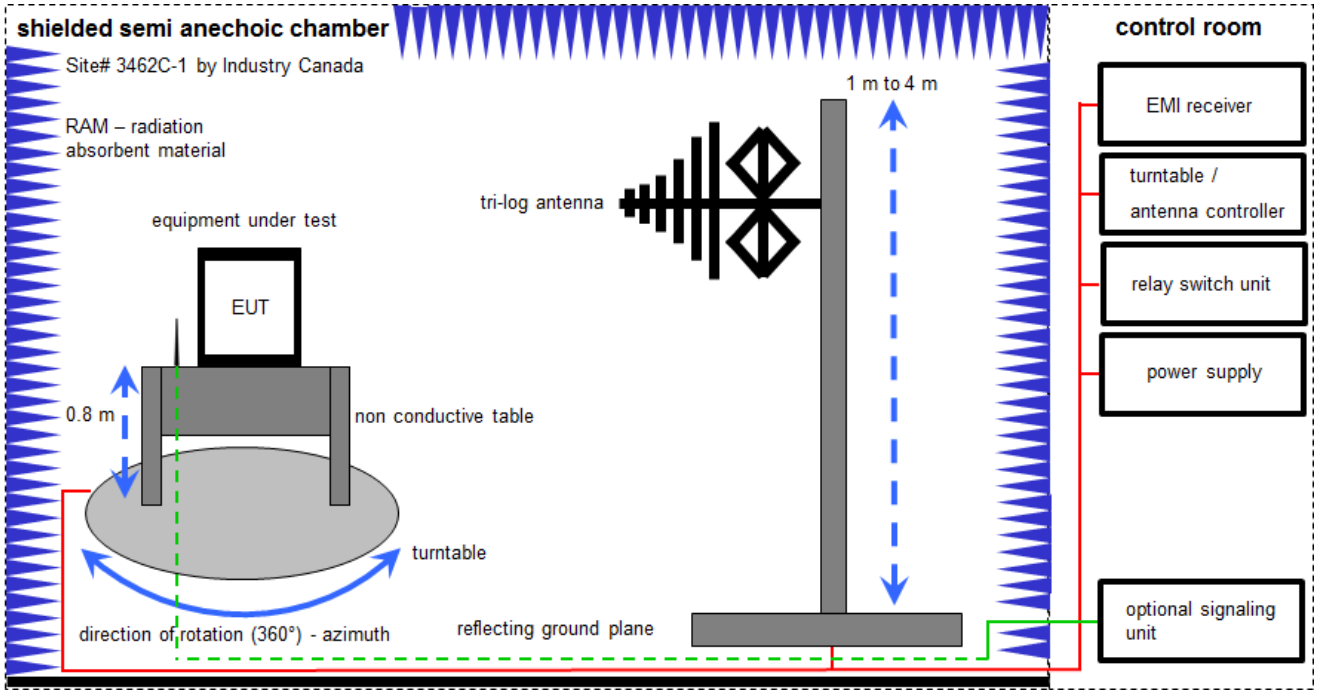
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**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 |
| vlkl! | 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 analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



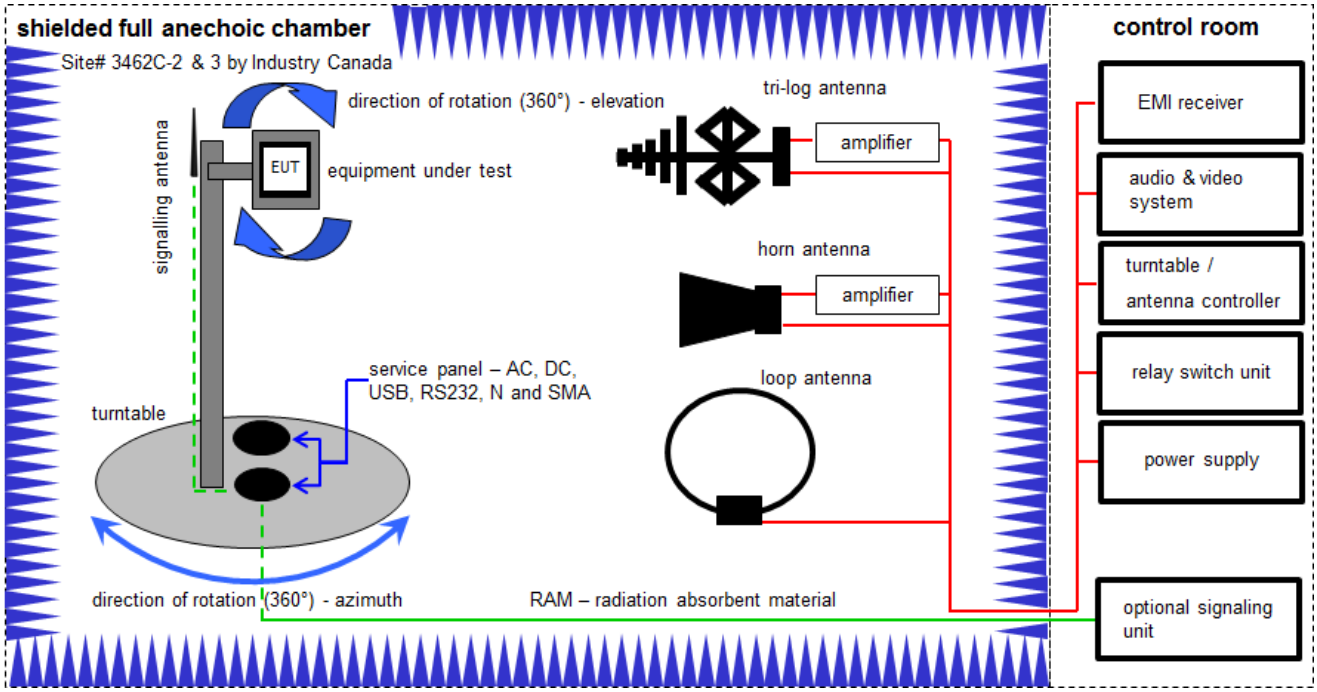

Measurement distance: tri-log antenna 10 meter

FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Switch-Unit | 3488A | HP | 2719A14505 | 300000368 | ev | -/- | -/- |
| 2 | A | RF-Filter-section | 85420E | HP | 3427A00162 | 300002214 | k | 27.11.2006 | -/- |
| 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 | A | EMI Test Receiver | ESCI 3 | R&S | 100083 | 300003312 | k | 28.01.2016 | 27.01.2017 |

## 7.2 Shielded fully anechoic chamber



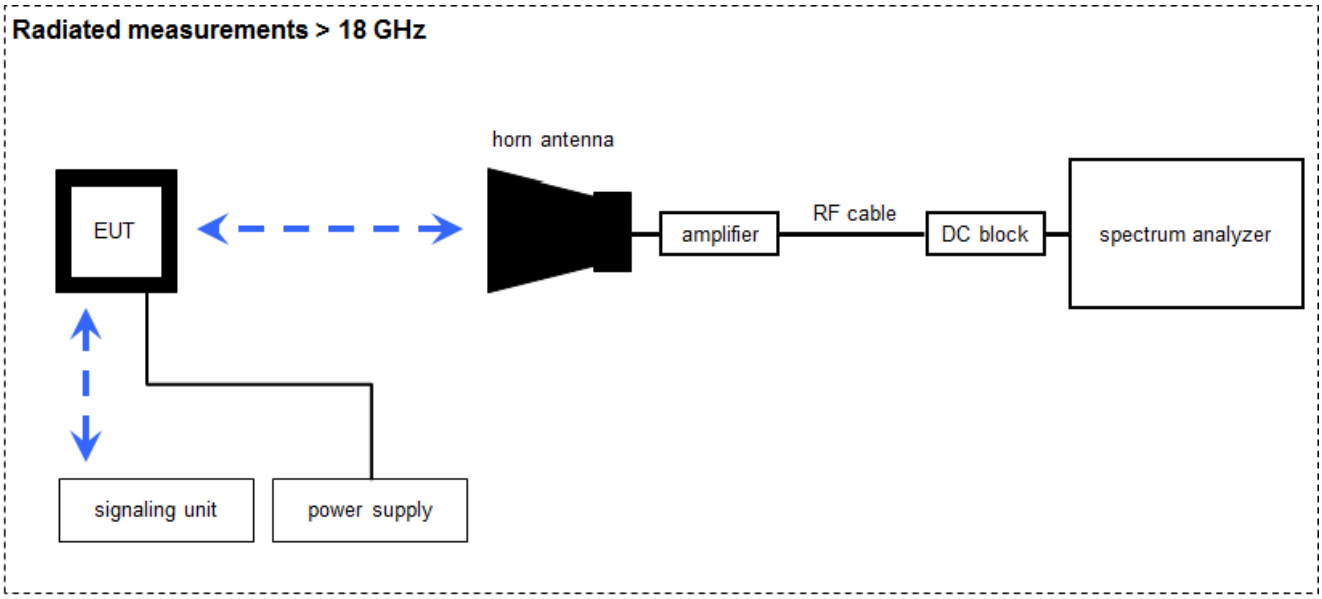

Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter

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

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115 | EMCO | 8812-3088 | 300001032 | vlKI! | 20.05.2015 | 20.05.2017 |
| 2 | A, B, C | Anechoic chamber | FAC 3/5m | MWB / TDK | 87400/02 | 300000996 | ev | -/- | -/- |
| 3 | A, B, C | Switch / Control Unit | 3488A | HP | * | 300000199 | ne | -/- | -/- |
| 4 | C | Active Loop Antenna 10 kHz to 30 MHz | 6502 | EMCO/2 | 8905-2342 | 300000256 | k | 24.06.2015 | 24.06.2017 |
| 5 | A | Amplifier | js42-00502650-28-5a | Parzich GMBH | 928979 | 300003143 | ne | -/- | -/- |
| 6 | A | Band Reject filter | WRCG2400/2483-2375/2505-50/10SS | Wainwright | 11 | 300003351 | ev | -/- | -/- |
| 7 | A, B | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163 | Schwarzbeck | 371 | 30000 | vlKI! | 29.10.2014 | 29.10.2017 |
| 8 | A, B, C | 4U RF Switch Platform | L4491A | Agilent Technologies | MY50000037 | 300004509 | ne | -/- | -/- |
| 9 | A, B, C | EMI Test Receiver 9kHz-26,5GHz | ESR26 | R&S | 101376 | 300005063 | k | 04.09.2015 | 04.09.2016 |
| 10 | B | Highpass Filter | WHKX7.0/18G-8SS | Wainwright | 18 | 300003789 | ne | -/- | -/- |

## 7.3 Radiated measurements > 18 GHz



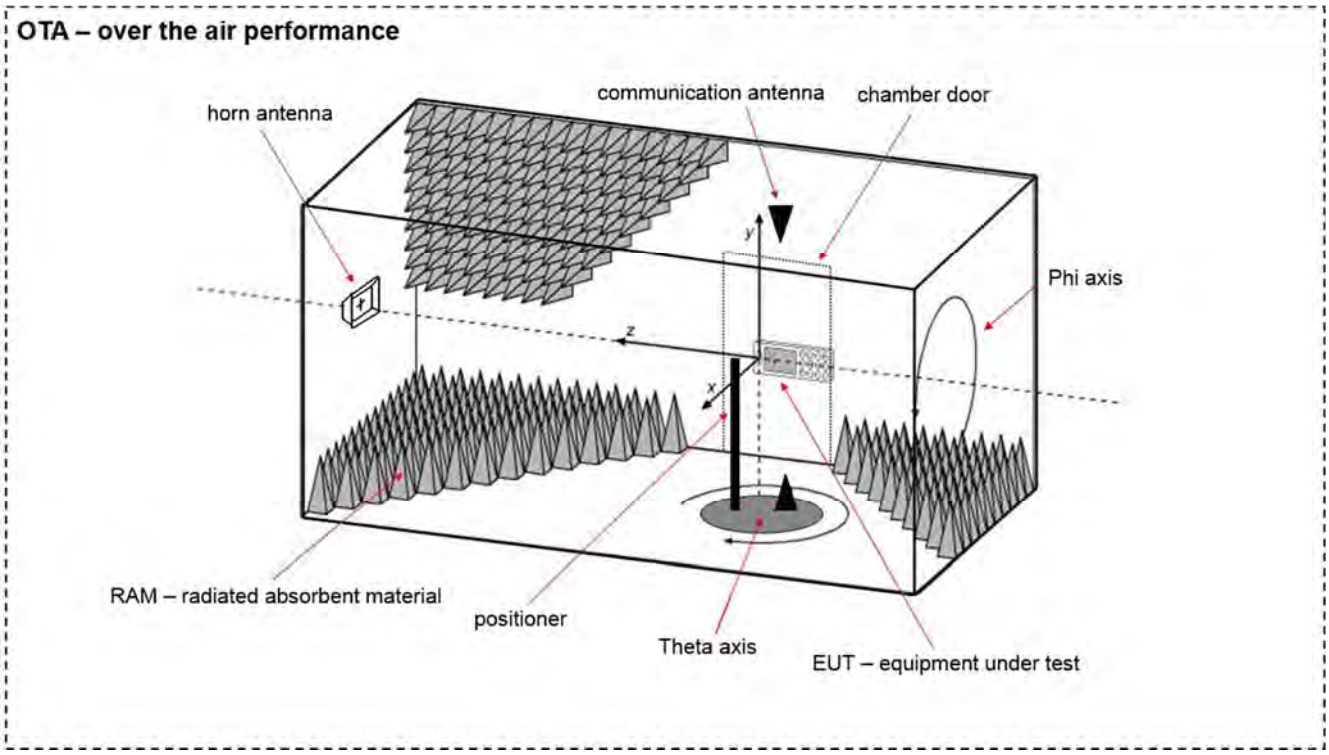

Measurement distance: horn antenna 50 cm

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

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | DC Power Supply 0 – 32V | 1108-32 | Heiden Elektronik | 001802 | 300001383 | Ve | 29.01.2014 | 29.01.2017 |
| 2 | A | Signal Analyzer 40 GHz | FSV40 | R&S | 101042 | 300004517 | k | 21.01.2016 | 21.01.2017 |
| 3 | A | Amplifier 2-40 GHz | JS32-02004000-57-5P | MITEQ | 1777200 | 300004541 | ev | -/- | -/- |
| 4 | A | RF-Cable | ST18/SMAm/SMAm/60 | Huber & Suhner | Batch no. 606844 | 400001181 | ev | -/- | -/- |
| 5 | A | RF-Cable | ST18/SMAm/SMAm/48 | Huber & Suhner | Batch no. 600918 | 400001182 | ev | -/- | -/- |
| 6 | A | DC-Blocker 0.1-40 GHz | 8141A | Inmet | Batch no. 600918 | 400001185 | ev | -/- | -/- |
| 7 | A | Horn Antenna 18,0-40,0 GHz | LHAF180 | Microw.Devel | 39180-103-022 | 300001748 | k | 22.05.2015 | 22.05.2018 |

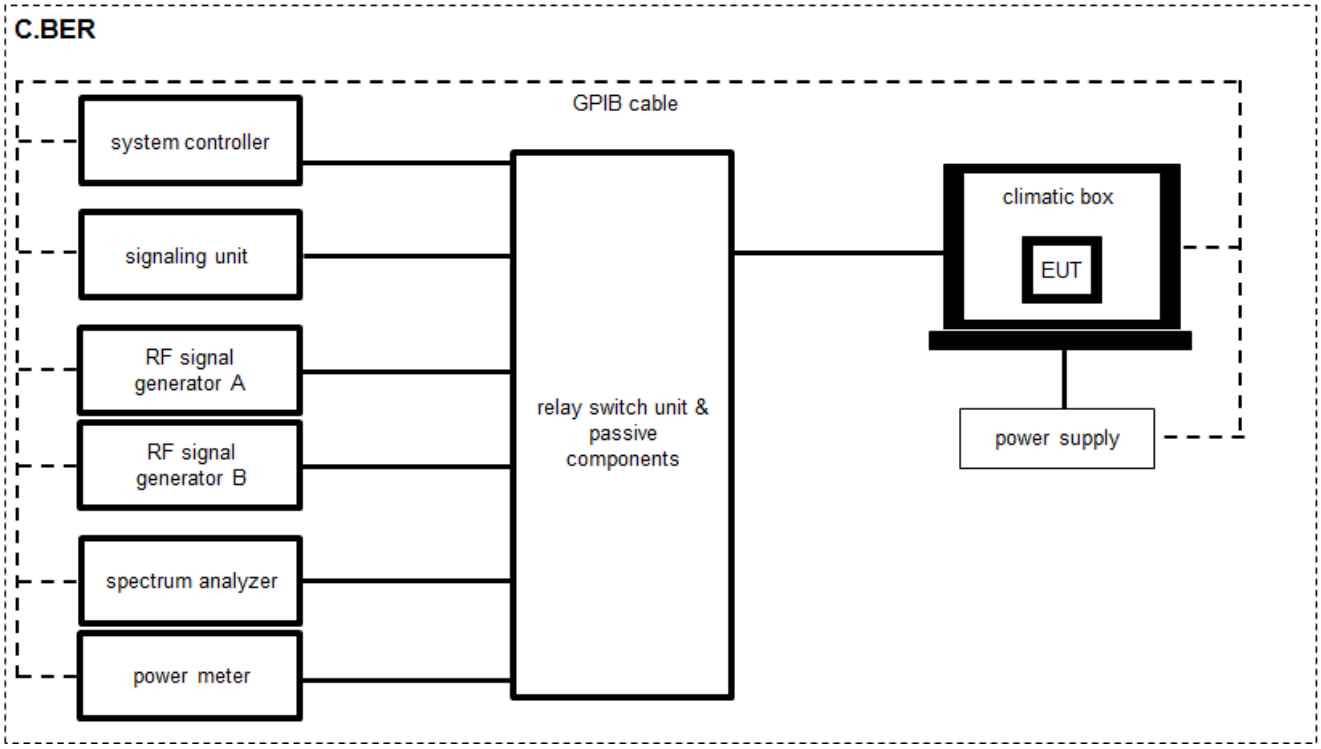
## 7.4 Shielded fully anechoic chamber




**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Switch Unit | TS-RSP | R&S | 100155 | 300003281 | ev | -/- | -/- |
| 2 | A | CTIA-Chamber | CTIA-Chamber AMS 8500 | ETS-Lindgren Finnland | 100155 | 300003327 | ne | -/- | -/- |
| 3 | A | CTIA-Chamber - Software | CTIA-Chamber - Software | EMCO/2 | 100155 | 300003328 | ne | -/- | -/- |
| 4 | A | CTIA-Chamber - Antenna | 3164-04 | EMCO/2 | 00041915 | 300003328 | ne | -/- | -/- |
| 5 | A | Spectrum Analyzer 9kHz - 30 GHz | FSP30 | R&S | 100623 | 300003464 | Ve | 29.01.2015 | 29.01.2017 |
| 6 | A | Conical Log-Spiral Antenna | 3102 L Conical log spir | EMCO/2 | 00040953 | 300003296 | ne | 01.11.2004 | -/- |

## 7.5 Conducted measurements C.BER system




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

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Switch / Control Unit | 3488A | HP | | 300000929 | ne | -/- | -/- |
| 2 | A | CBT (Bluetooth Tester + EDR Signalling) | CBT 1153.9000K35 | R&S | 100185 | 300003416 | vlKI! | 28.01.2015 | 28.01.2017 |
| 3 | A | System DC Power Supply | N5767A | Agilent Technologies | US14J1569P | 300004851 | vlKI! | 04.09.2014 | 04.09.2016 |
| 4 | A | Signal Analyzer 30GHz | FSV30 | R&S | 103170 | 300004855 | k | 25.01.2016 | 25.01.2017 |
| 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/72 | Huber & Suhner | Batch no. 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 ± 45° 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.<br>The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description | Verdict | Date | Remark |
|---|---|---|---|---|
| RF-Testing | CFR Part 15<br>RSS - 247, Issue 1 | See table! | 2016-04-21 | -/- |

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

**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 Cetecom ICT Services GmbH is under license.

Reference documents: None

Special test descriptions: None

Configuration descriptions: see measurement parameter

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.

| 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 7.4 A (radiated)<br>See sub clause 7.5 A (conducted) |
| Measurement uncertainty | See sub clause 9 |

**Limits:**

| FCC | IC |
|---|---|
| Antenna gain | |
| 6 dBi | |

**Results:**

| | *lowest channel 2402 MHz* | *mid channel 2440 MHz* | *highest channel 2480 MHz* |
|---|---|---|---|
| *Conducted peak power #1 [dBm] BT LE GFSK (measured)* | -3.2 | -2.5 | -2.8 |
| *Conducted peak power #2 [dBm] BT LE GFSK (measured)* | -2.7 | -1.9 | -2.4 |
| *Conducted peak power #3 [dBm] BT LE GFSK (measured)* | -2.7 | -1.8 | -2.1 |
| *Conducted peak power average of #1 & #2 & #3* | -2.9 | -2.1 | -2.4 |
| *Radiated peak power [dBm] BT LE GFSK (measured) EIRP*) (Battery powered), Antenna L5 Avg of 3 Samples* | -0.1 | 0.6 | 0.5 |
| *Antenna Gain [dBi] calculated* | 2.8 | 2.7 | 2.9 |

**Results:** radiated

| Frequency [MHz] | 2402 | 2440 | 2480 |
|---|---|---|---|
| EUT #11 Peak EIRP(dBm): | 0.3 | 1.0 | 0.9 |
| EUT #12 Peak EIRP(dBm): | -0.1 (calculated) | 0.6 | 0.5 (calculated) |
| EUT #13 Peak EIRP(dBm): | -0.4 (calculated) | 0.3 | 0.2 (calculated) |
| AVG Peak EIRP(dBm) of 3 samples | -0.1 | 0.6 | 0.5 |

## 12.2 Power spectral density

**Description:**

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

| 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 7.5 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. | |

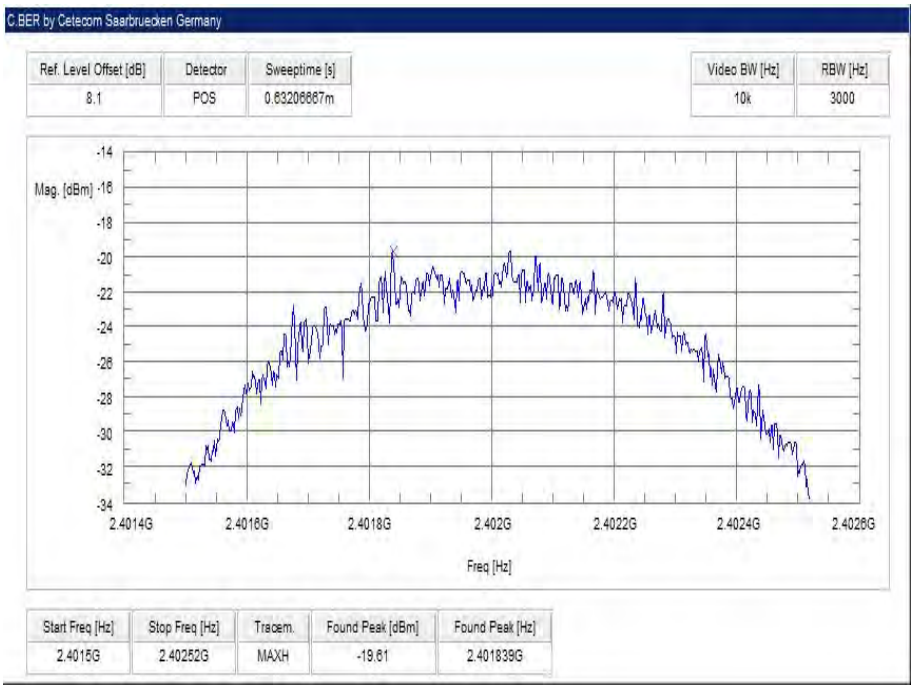
**Results:**

| EUT SAMPLE #2 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Power spectral density [dBm / 3kHz]** | -19.6 | -18.6 | -19.5 |

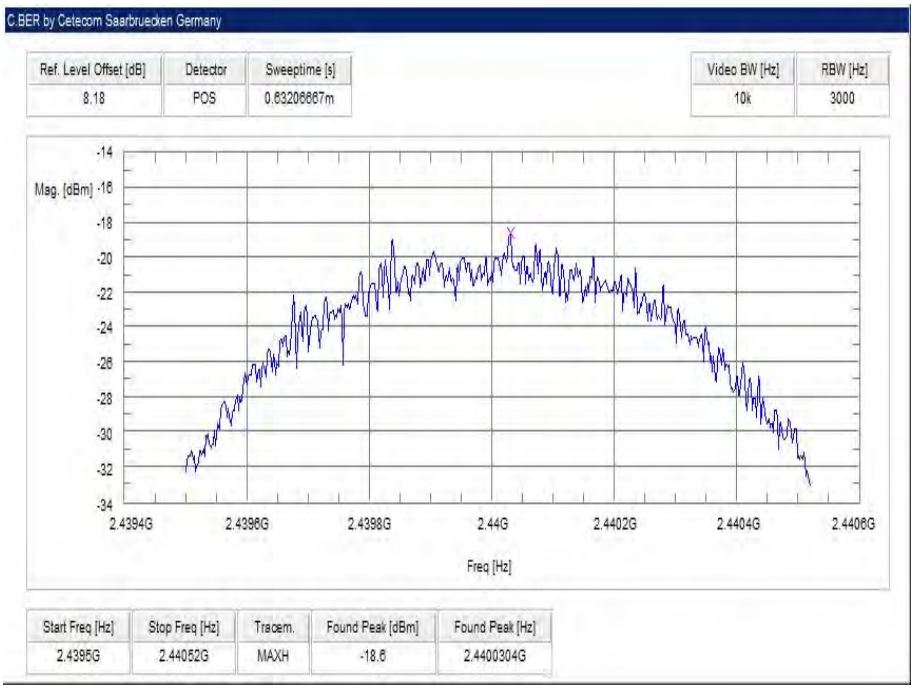
| EUT SAMPLE #2 2Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Power spectral density [dBm / 3kHz]** | -20.2 | -19.2 | -20.0 |

**Plots EUT SAMPLE #2 BT LE:**

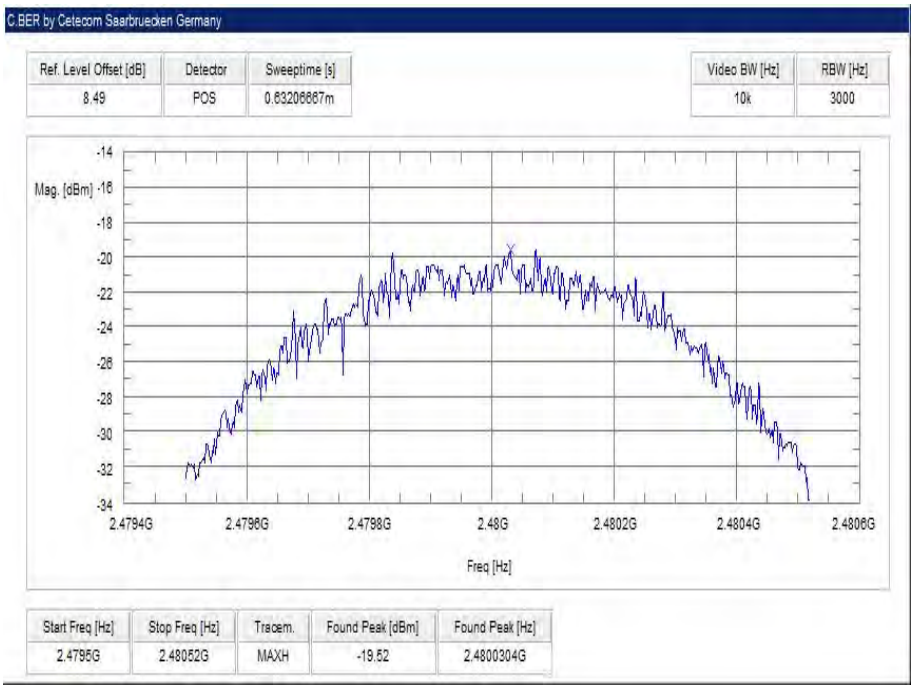
**Plot 1:** lowest channel




**Plot 2:** mid channel

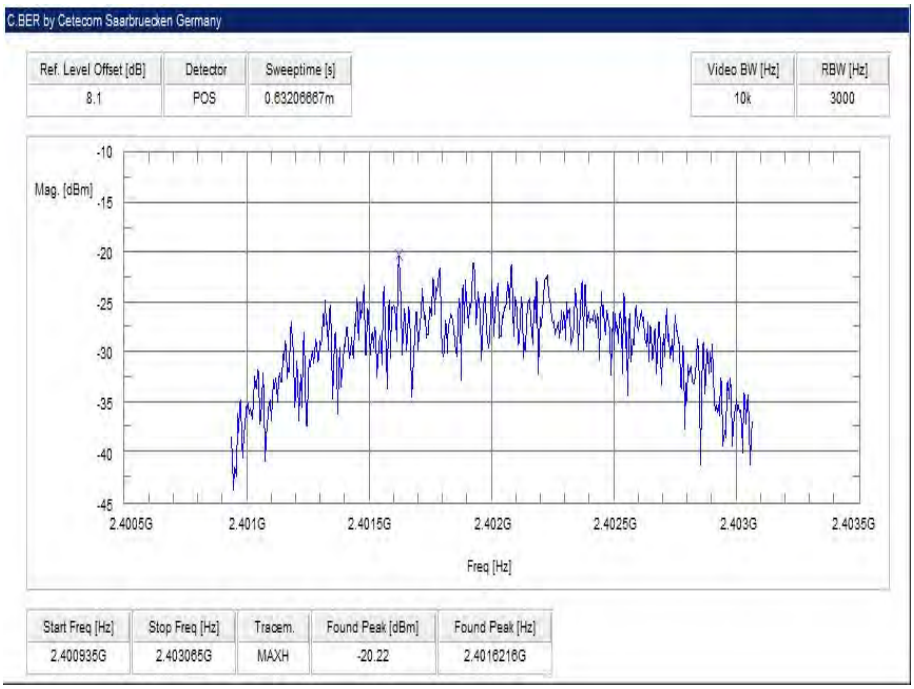


**Plot 3:** highest channel

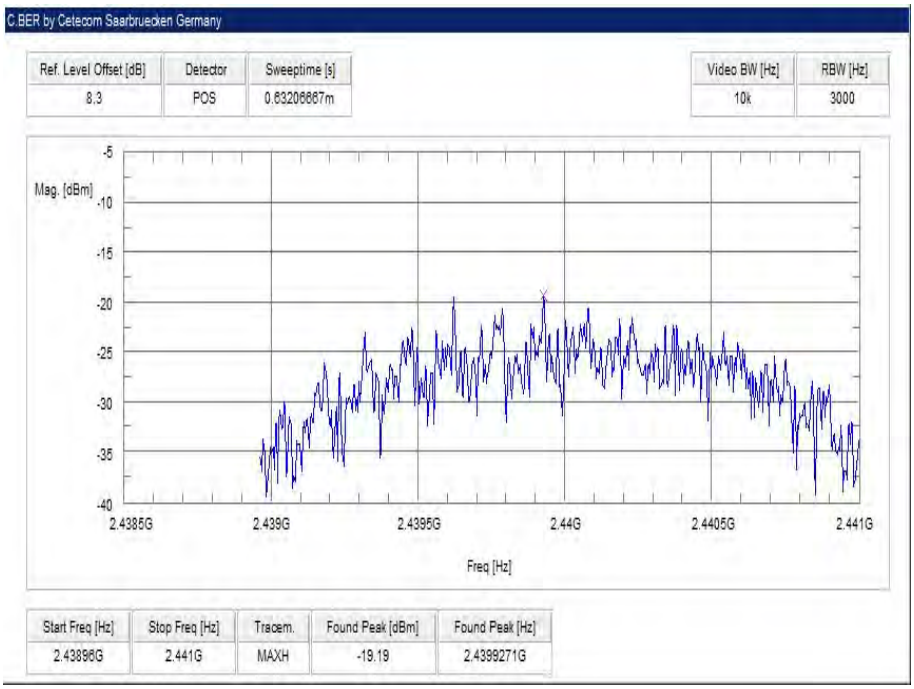


**Plots:** EUT SAMPLE #2 2 Mbps propr

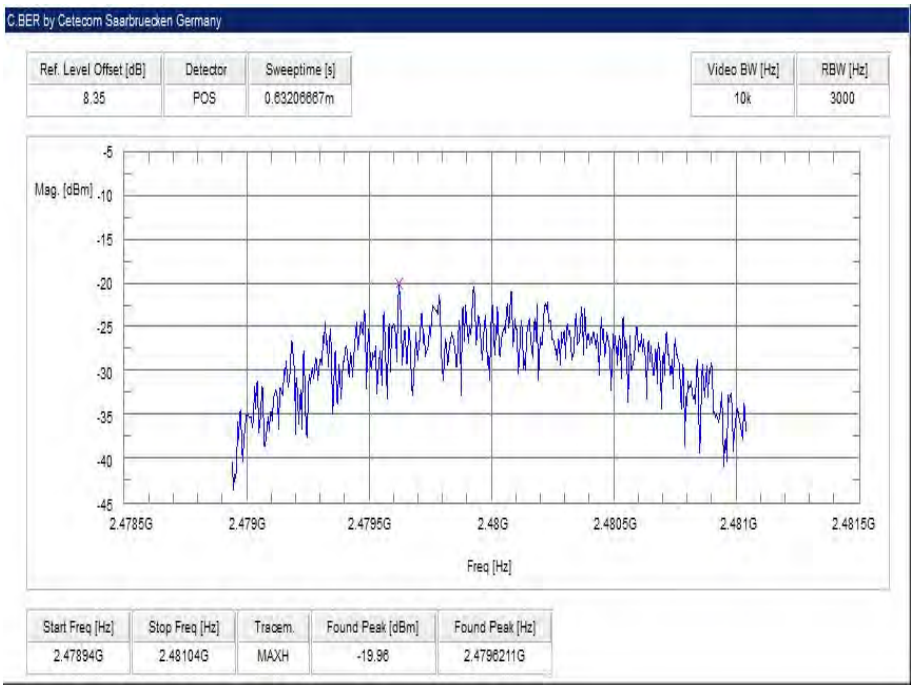
**Plot 1:** lowest channel




**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 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 7.5 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: EUT SAMPLE #2**

| EUT SAMPLE #2 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **6 dB bandwidth [kHz]** | 680 | 680 | 680 |

| EUT SAMPLE #2 2 Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **6 dB bandwidth [kHz]** | 1420 | 1360 | 1400 |

**Results:** **EUT SAMPLE #3**

| EUT SAMPLE #3 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **6 dB bandwidth [kHz]** | 680 | 680 | 680 |

| EUT SAMPLE #3 2 Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **6 dB bandwidth [kHz]** | 1360 | 1370 | 1350 |

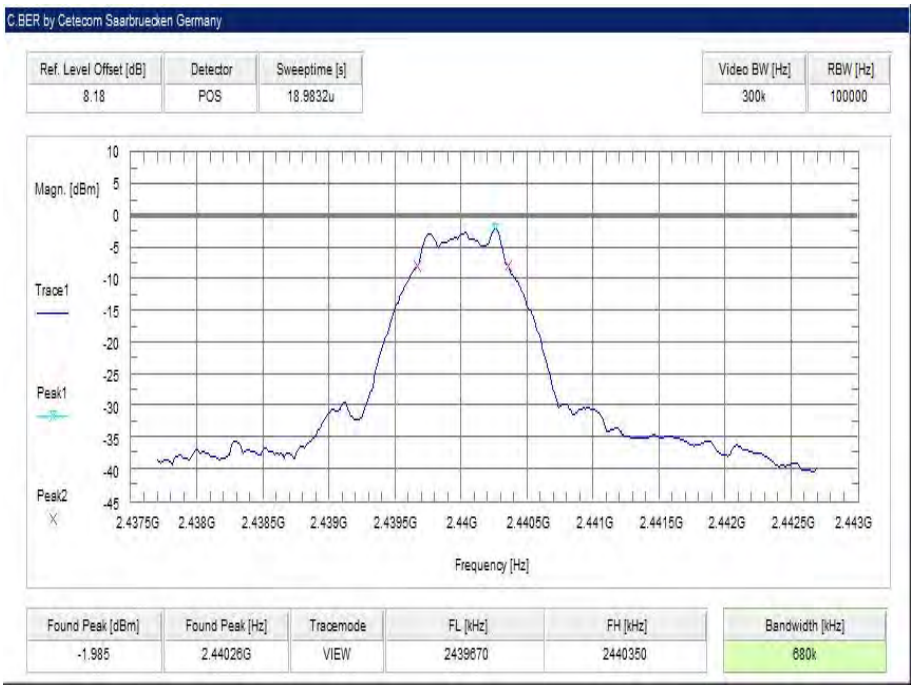
**Results:** **EUT SAMPLE #1**

| EUT SAMPLE #1 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **6 dB bandwidth [kHz]** | 670 | 690 | 690 |

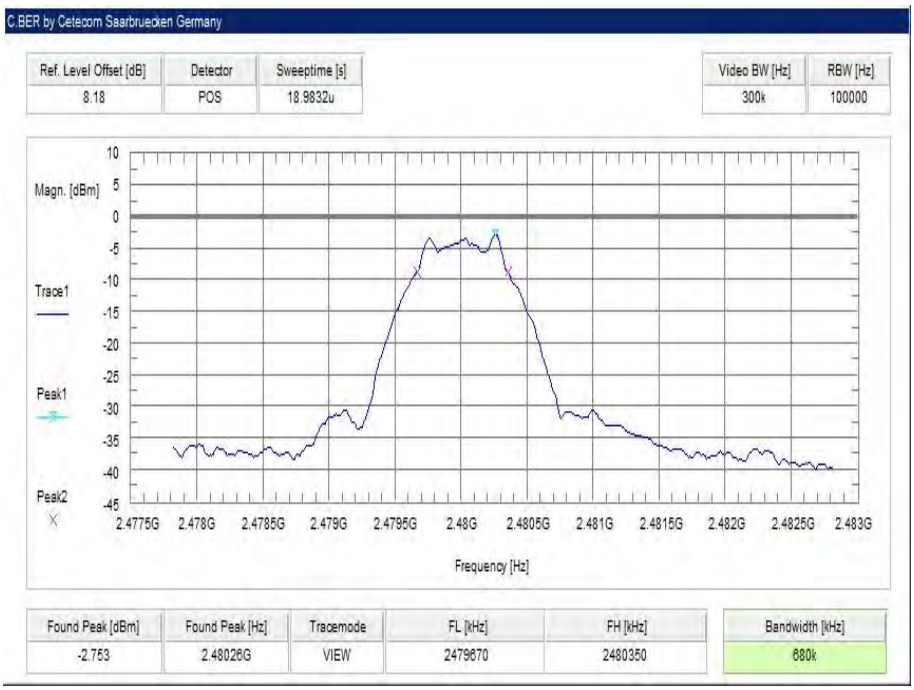
**Plots:** EUT SAMPLE #2 BT LE

**Plot 1:** lowest channel


**Plot 2:** mid channel

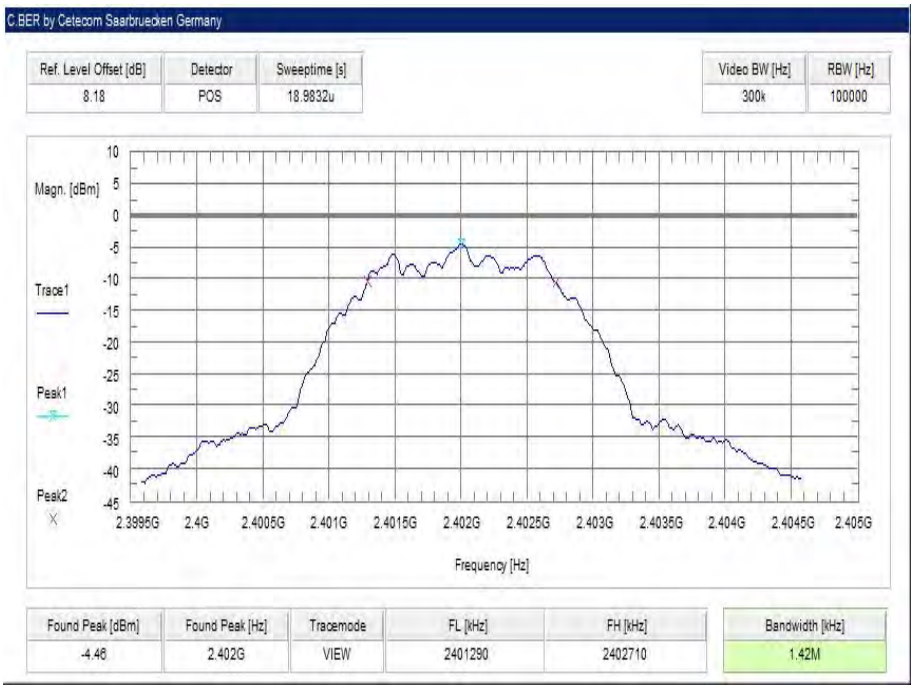


**Plot 3:** highest channel



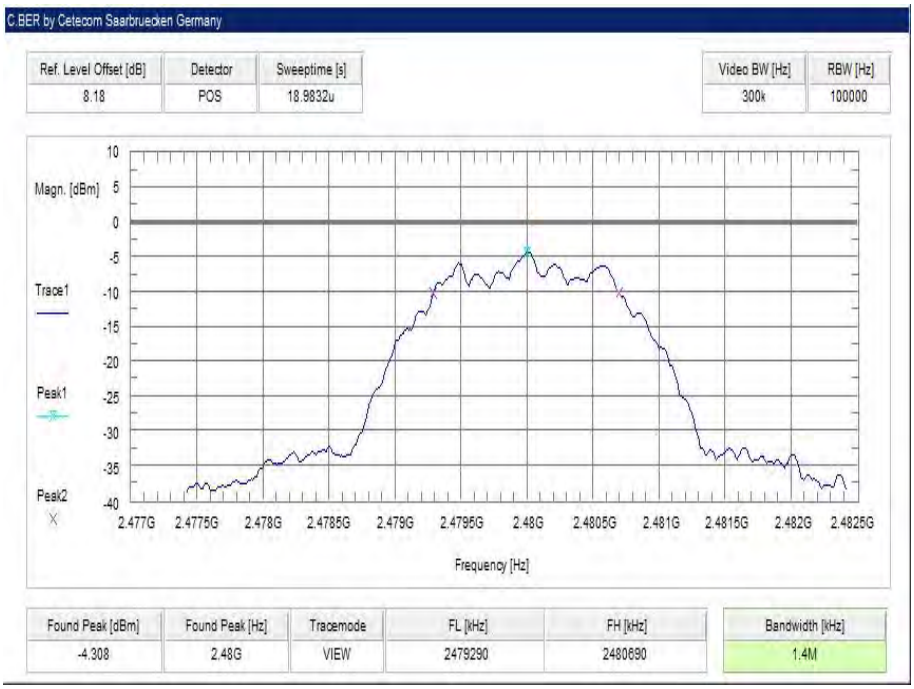
**Plots:** EUT SAMPLE #2 2Mbps propr

**Plot 1:** lowest channel



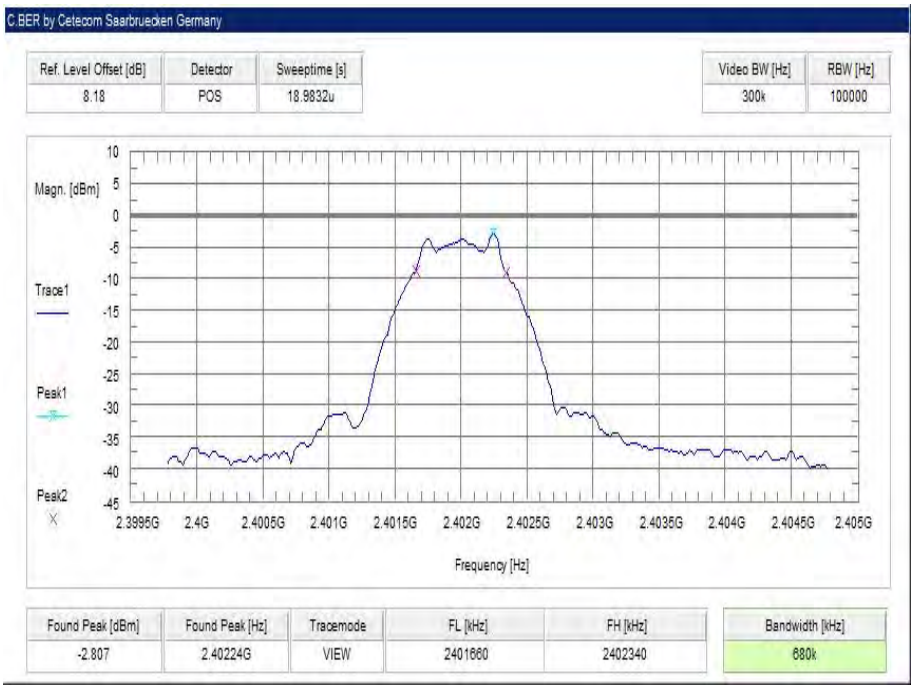

**Plot 2:** mid channel

**Plot 3:** highest channel



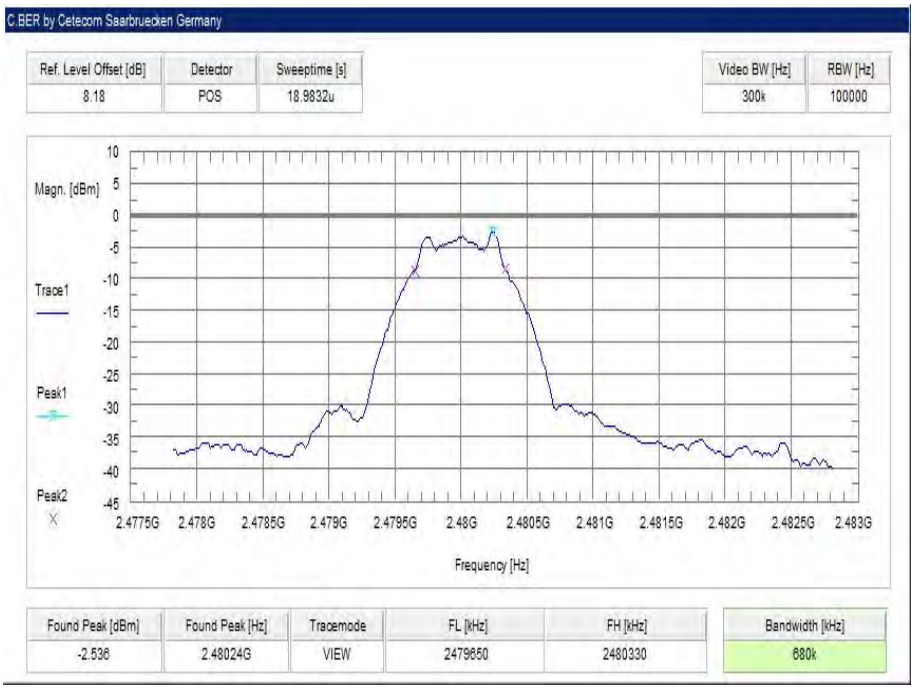
**Plots:** EUT SAMPLE #3 BT LE

**Plot 1:** lowest channel



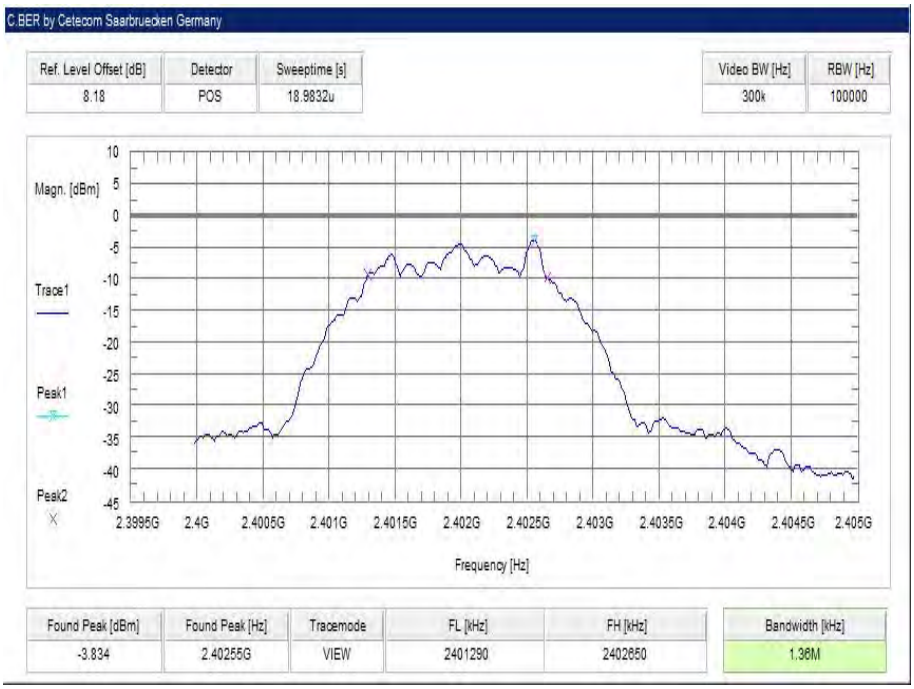

**Plot 2:** mid channel

**Plot 3:** highest channel



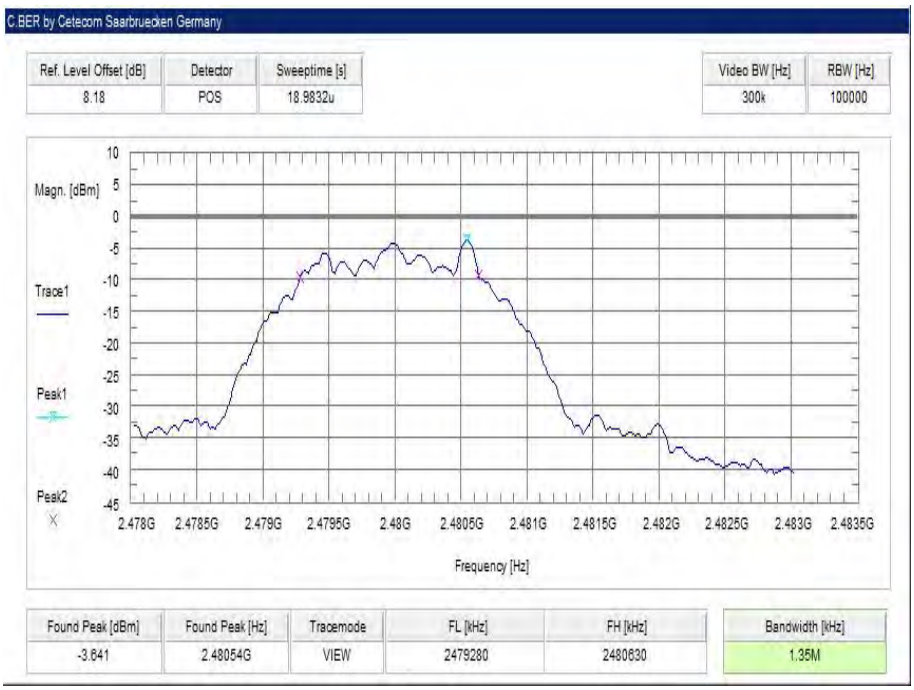
**Plots:** EUT SAMPLE #3 2Mbps propr

**Plot 1:** lowest channel



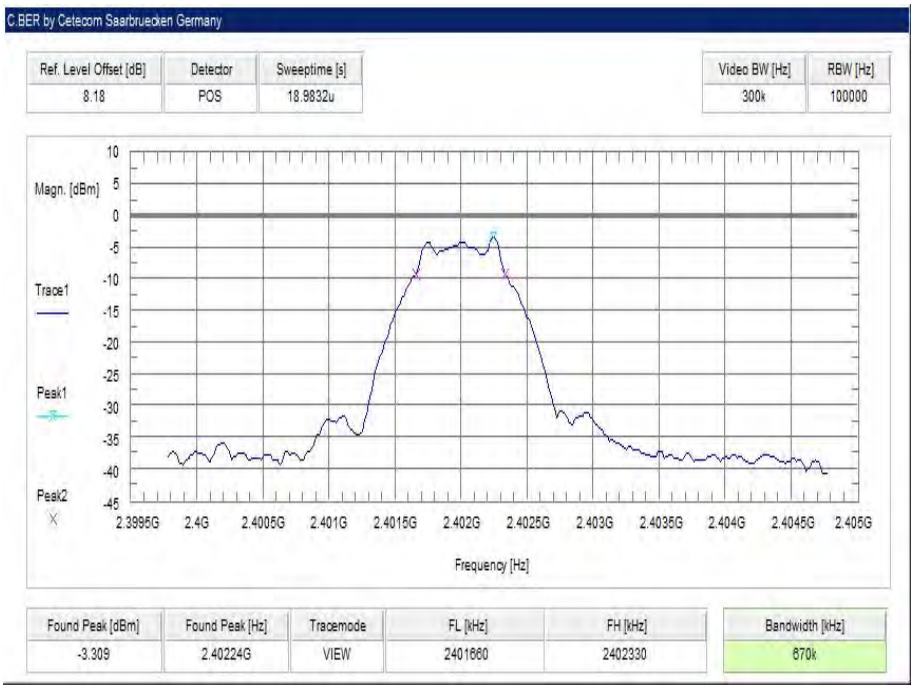

**Plot 2:** mid channel

**Plot 3:** highest channel



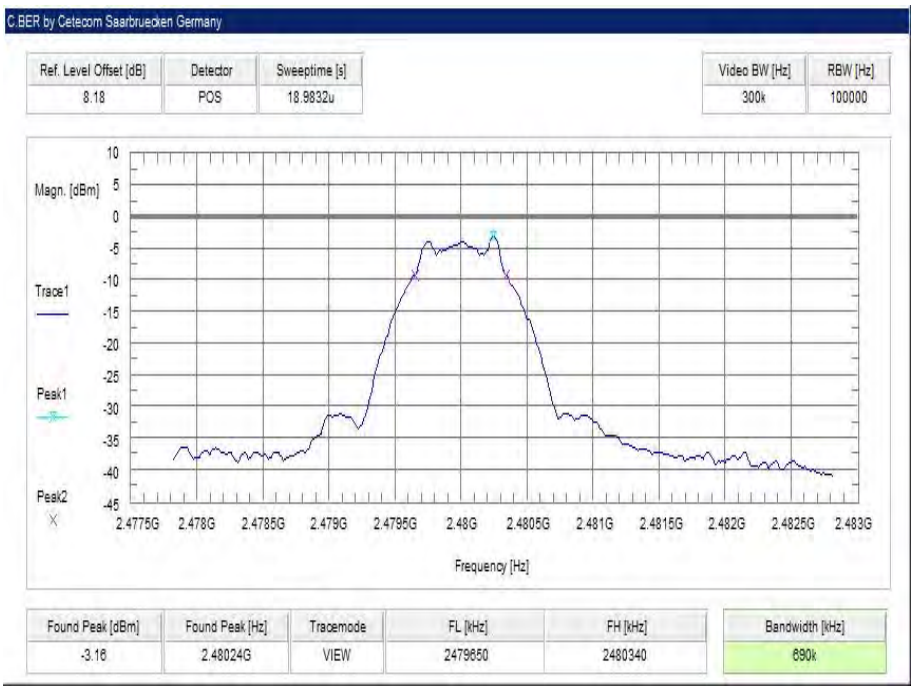
**Plots:** EUT SAMPLE #1 BT LE

**Plot 1:** lowest channel




**Plot 2:** mid channel

**Plot 3:** highest channel



## 12.4 Occupied bandwidth – 99% emission bandwidth

**Description:**

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

| Measurement parameters | |
|---|---|
| Detector | Peak |
| Sweep time | Auto |
| Resolution bandwidth | 30 kHz |
| Video bandwidth | 100 kHz |
| Span | 5 MHz |
| Measurement procedure | Measurement of the 99% bandwidth using the integration function of the analyzer |
| Trace mode | Max hold (allow trace to stabilize) |
| Test setup | See sub clause 7.5 A |
| Measurement uncertainty | See sub clause 9 |

**Usage:**

| -/- | IC |
|---|---|
| Occupied bandwidth – 99% emission bandwidth | |
| OBW is necessary for emission designator | |

**Results:** **EUT SAMPLE #2**

| EUT SAMPLE #2 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **99% bandwidth [kHz]** | 1087 | 1087 | 1097 |

| EUT SAMPLE #2 2Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **99% bandwidth [kHz]** | 2105 | 2105 | 2125 |

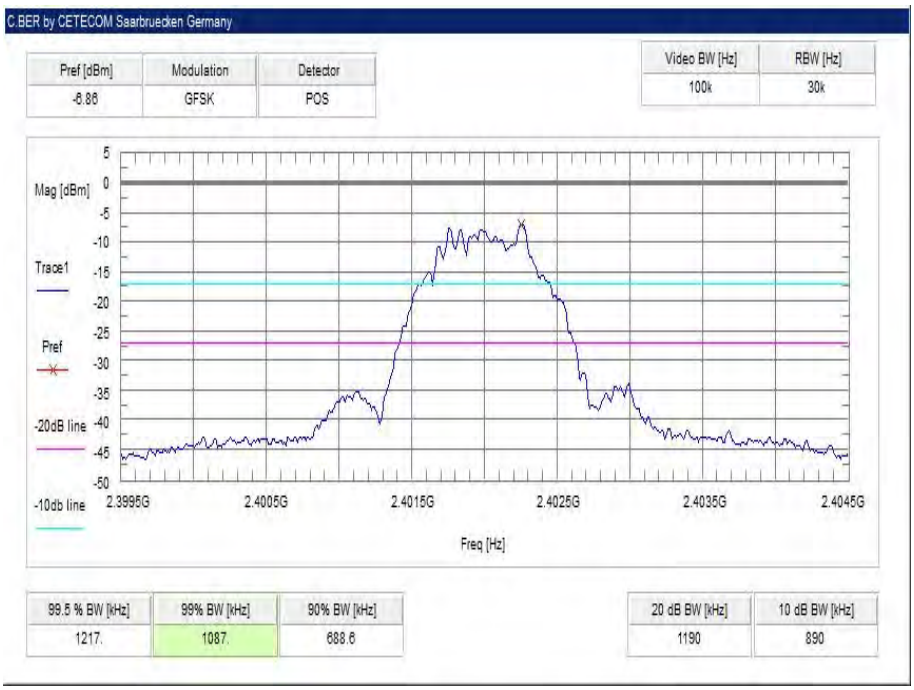
**Results:** **EUT SAMPLE #3**

| EUT SAMPLE #3 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **99% bandwidth [kHz]** | 1087 | 1087 | 1097 |

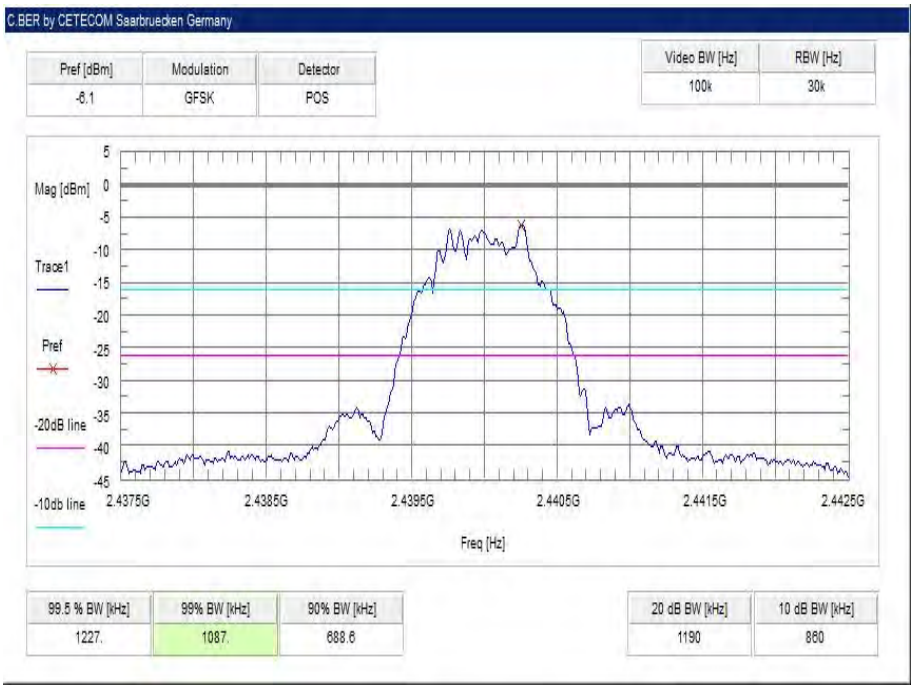
| EUT SAMPLE #3 2Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **99% bandwidth [kHz]** | 2105 | 2095 | 2105 |

**Plots:** EUT SAMPLE #2 BT LE

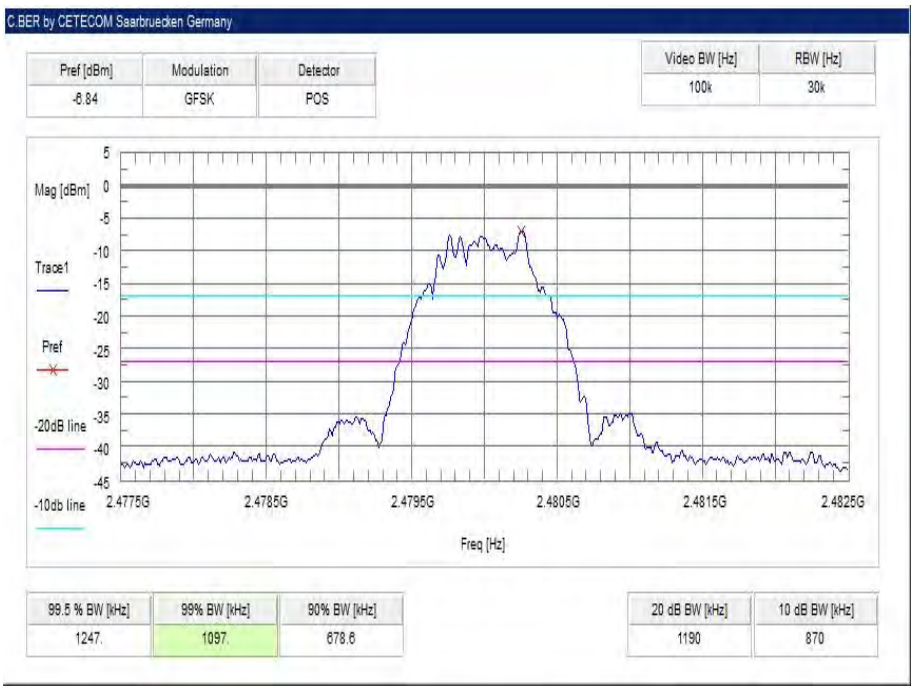
**Plot 1:** lowest channel




**Plot 2:** mid channel

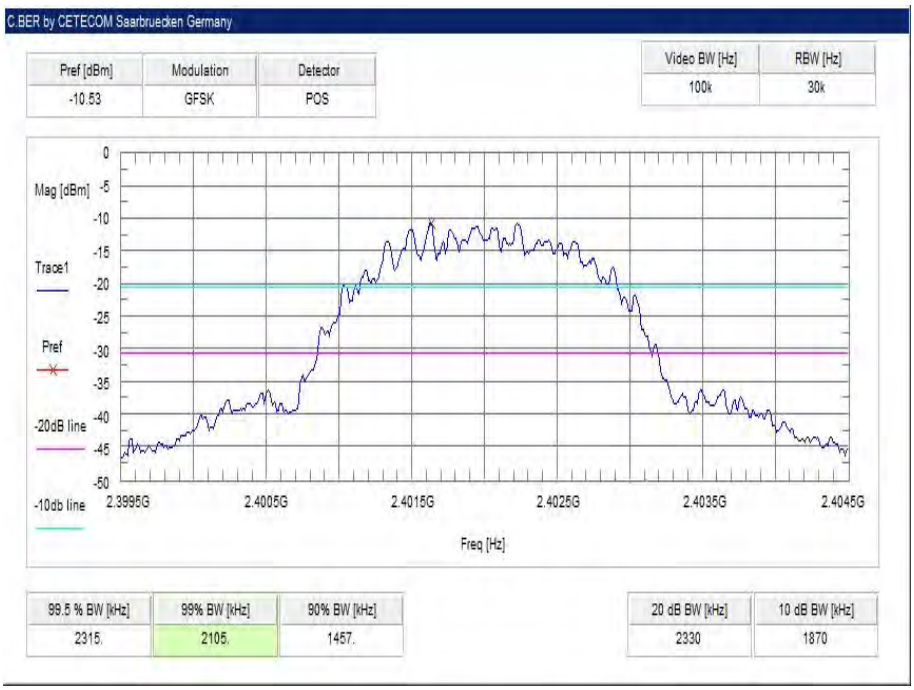


**Plot 3:** highest channel

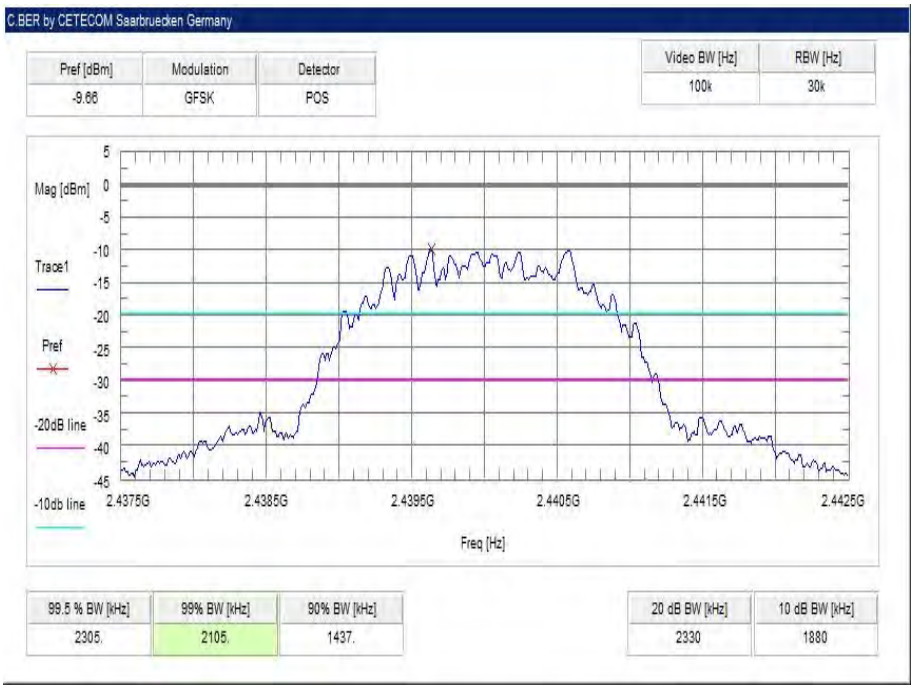


**Plots:** EUT SAMPLE #2 2Mbps propr

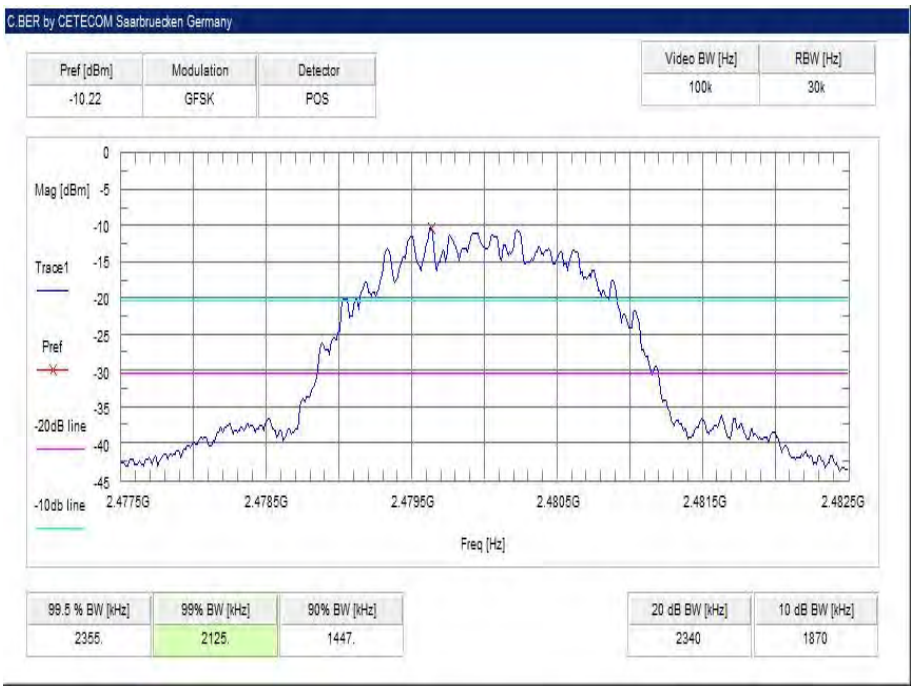
**Plot 1:** lowest channel




**Plot 2:** mid channel

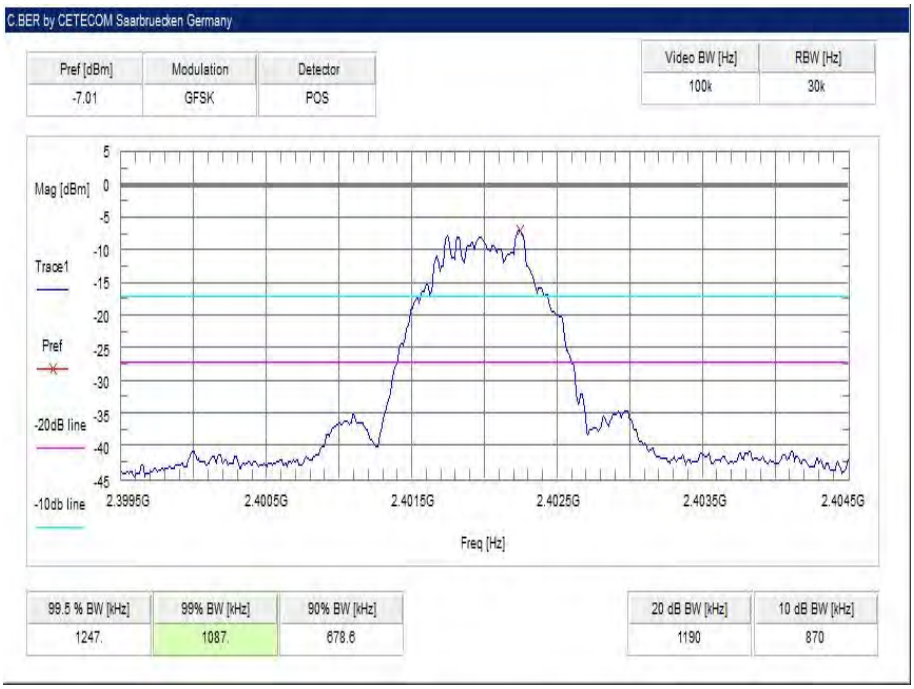


**Plot 3:** highest channel

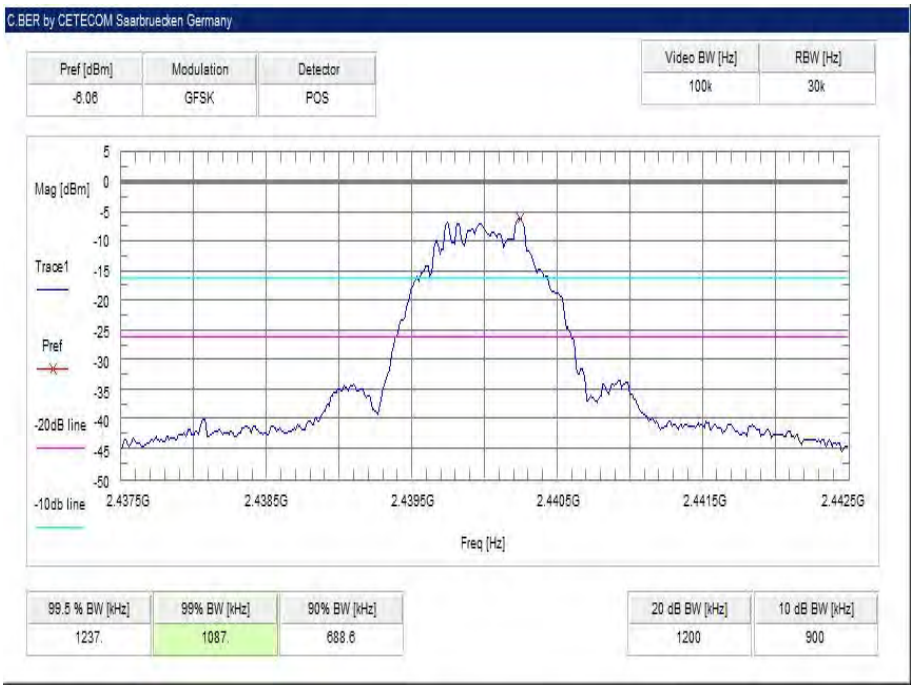


**Plots:** EUT SAMPLE #3 BT LE

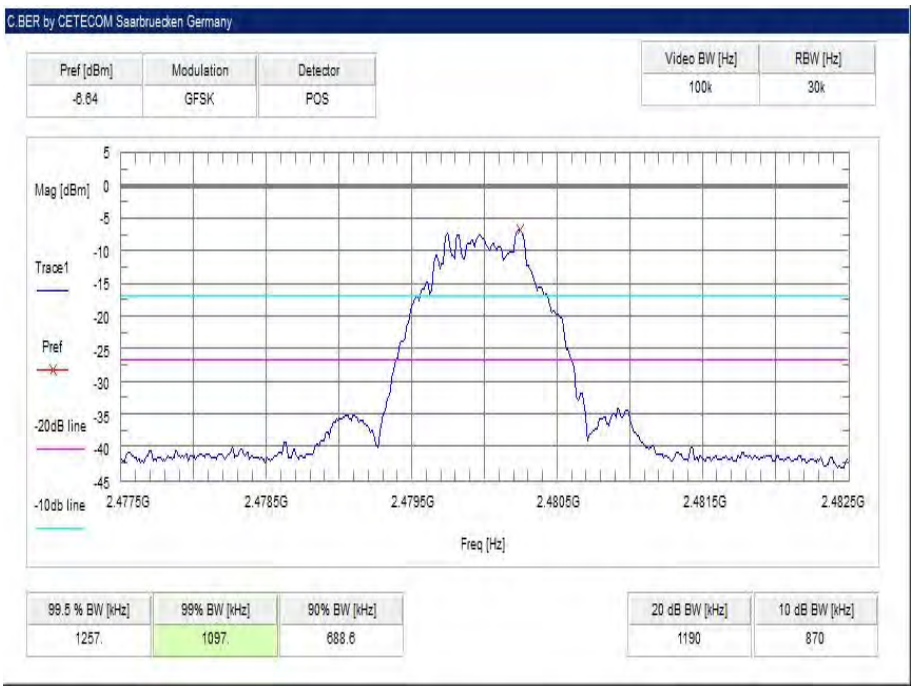
**Plot 1:** lowest channel




**Plot 2:** mid channel

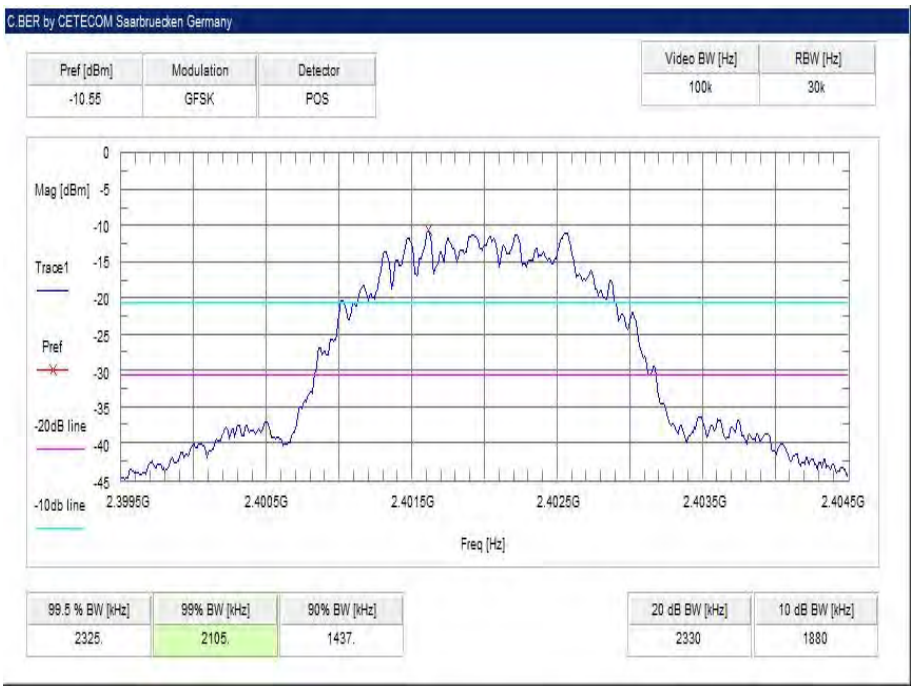


**Plot 3:** highest channel

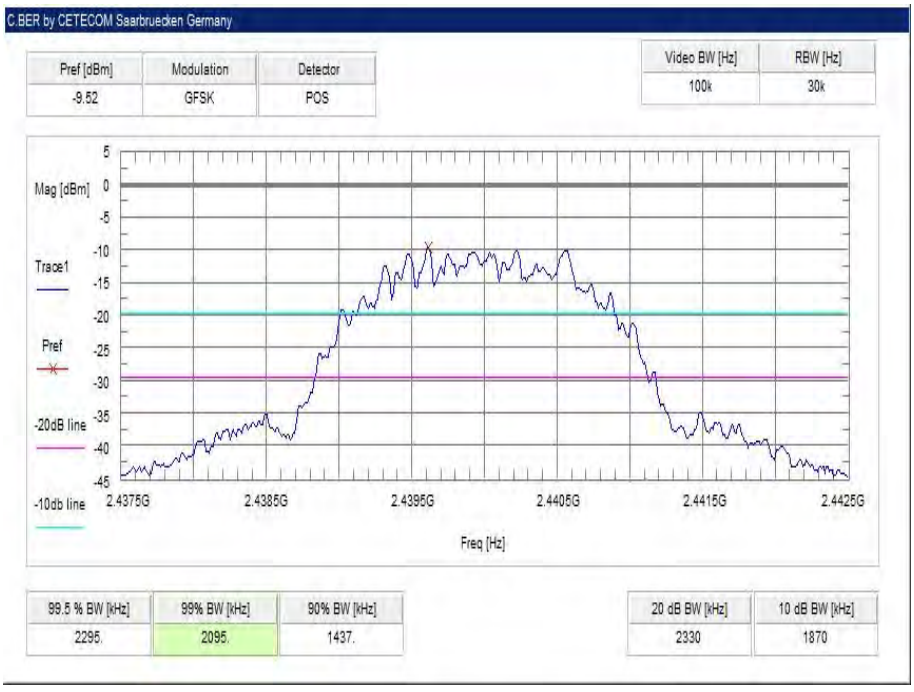


**Plots:** EUT SAMPLE #3 2Mbps propr

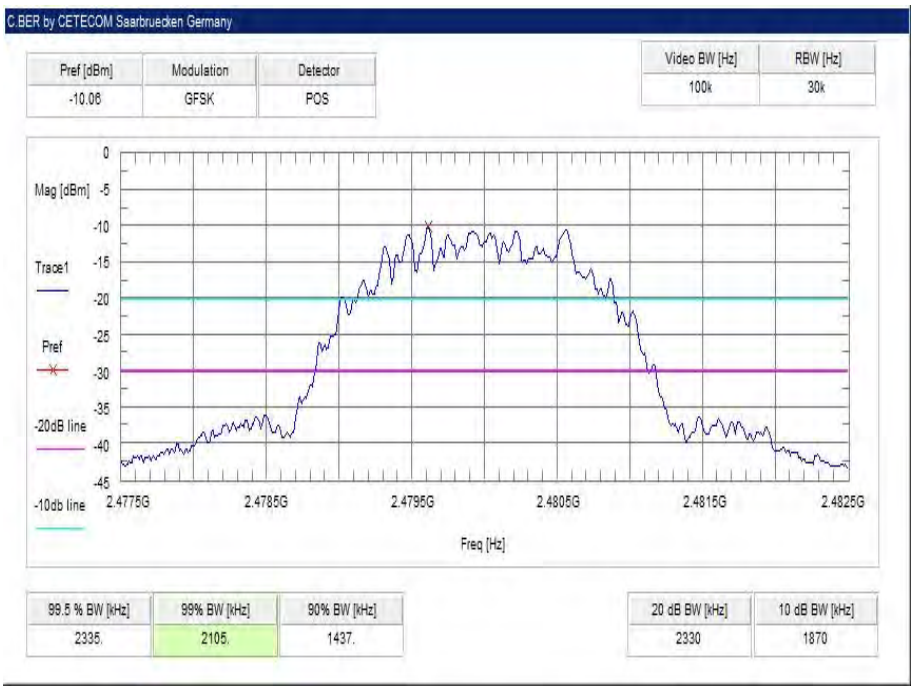
**Plot 1:** lowest channel




**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 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 7.5 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>DSSS conducted: 1.0 W – antenna gain max. 6 dBi | |

**Results:**

| EUT SAMPLE #2 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Maximum output power conducted [dBm]** | -2.7 | -1.9 | -2.4 |

| EUT SAMPLE #2 2Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Maximum output power conducted [dBm]** | -2.9 | -2.0 | -2.6 |

| EUT SAMPLE #3 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Maximum output power conducted [dBm]** | -2.8 | -1.7 | -2.3 |

| EUT SAMPLE #3 2Mbps propr. | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Maximum output power conducted [dBm]** | -2.8 | -1.8 | -2.4 |

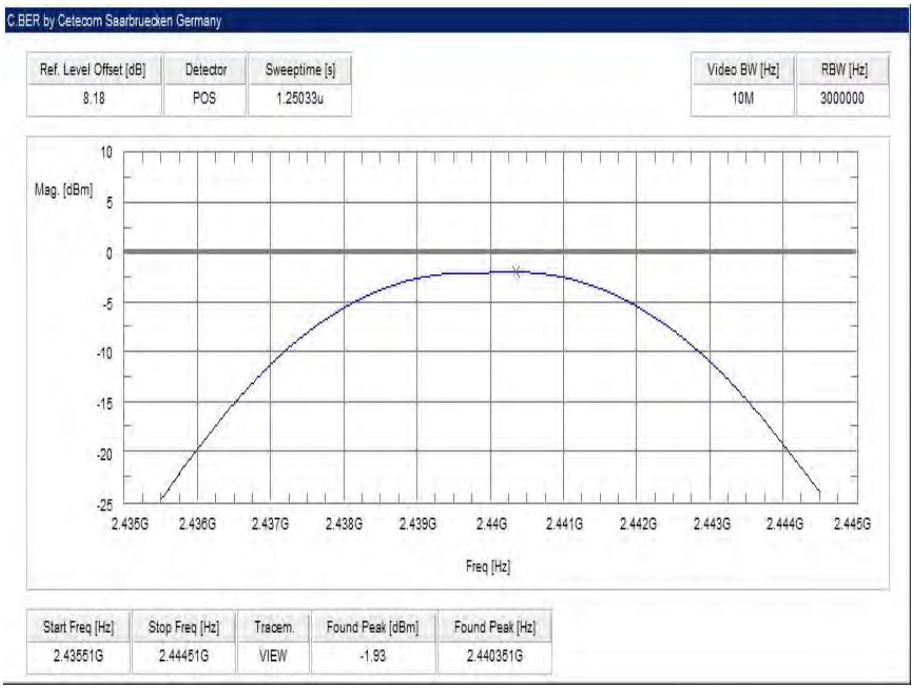
| EUT SAMPLE #1 BT LE | Frequency | | |
|---|---|---|---|
| | 2402 MHz | 2440 MHz | 2480 MHz |
| **Maximum output power conducted [dBm]** | -3.3 | -2.4 | -2.9 |

*) - Values calculated with the highest antenna gain and conducted power values

**Plots:** EUT SAMPLE #2 BT LE

**Plot 1:** lowest channel

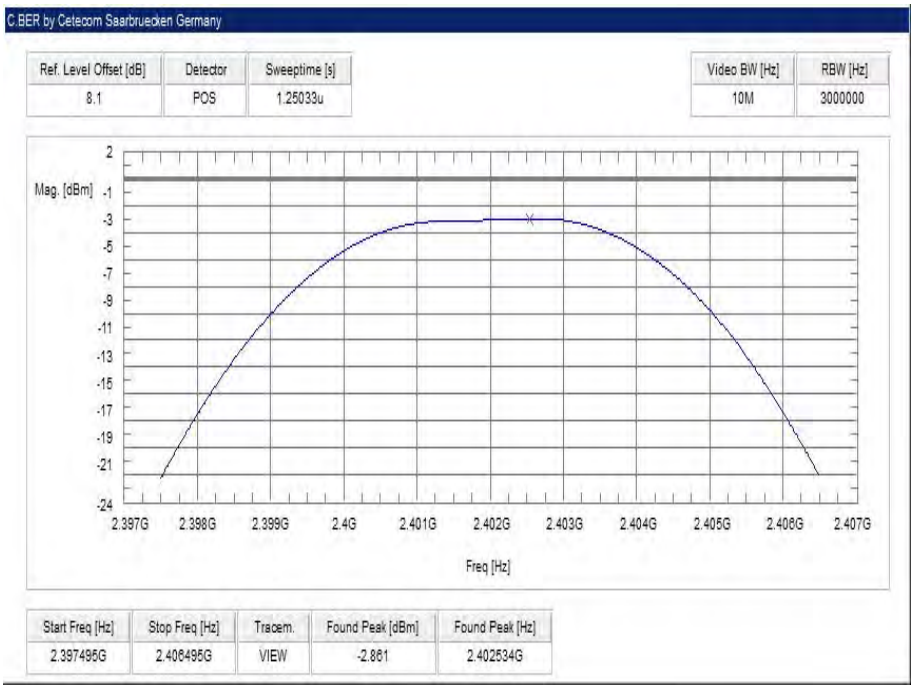

**Plot 2:** mid channel



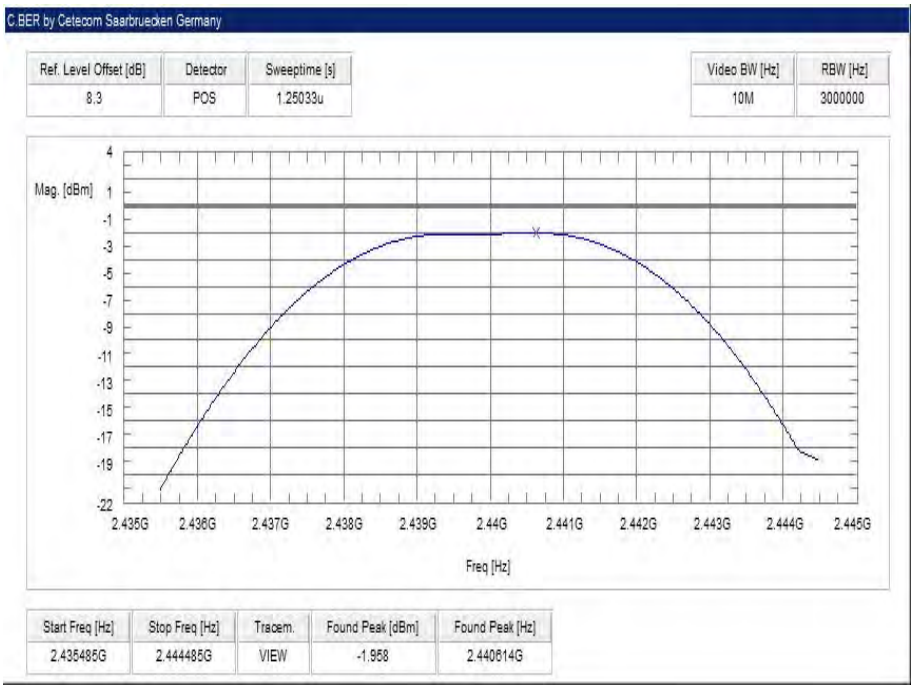
**Plot 3:** highest channel

**Plots:** EUT SAMPLE #2 2Mbps propr

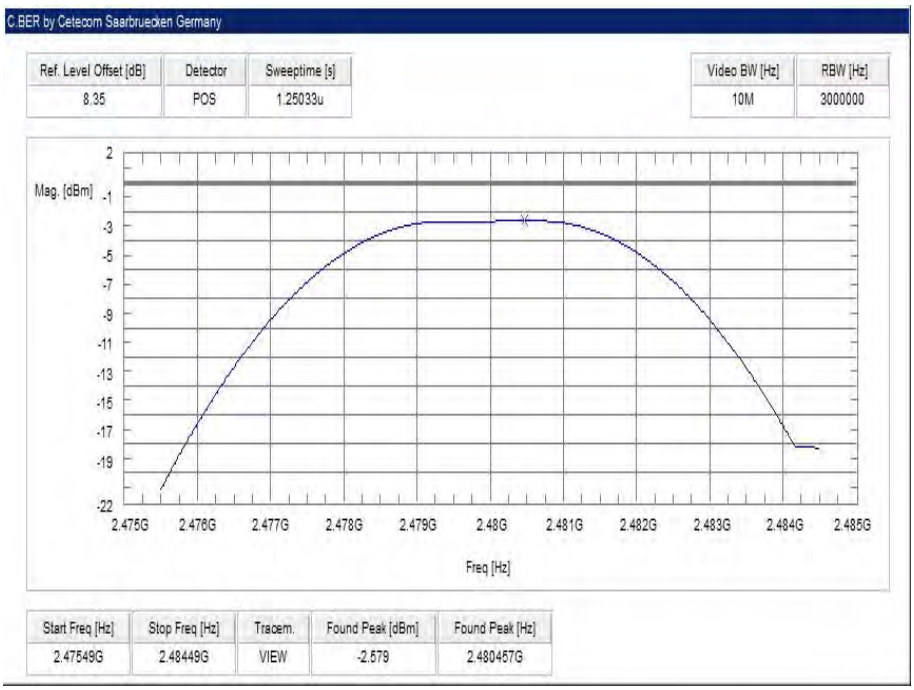
**Plot 1:** lowest channel




**Plot 2:** mid channel

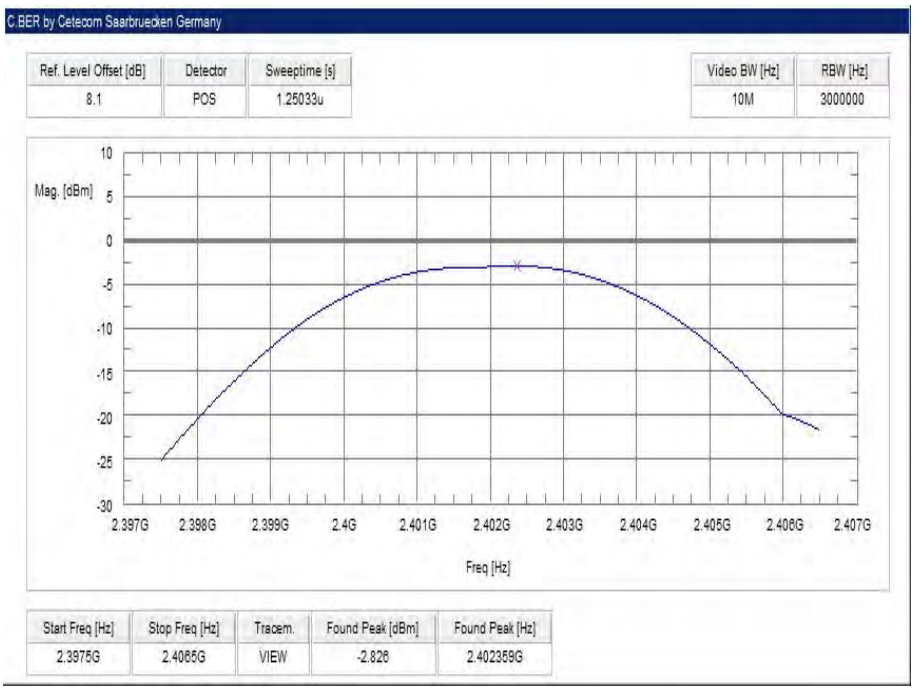


**Plot 3:** highest channel

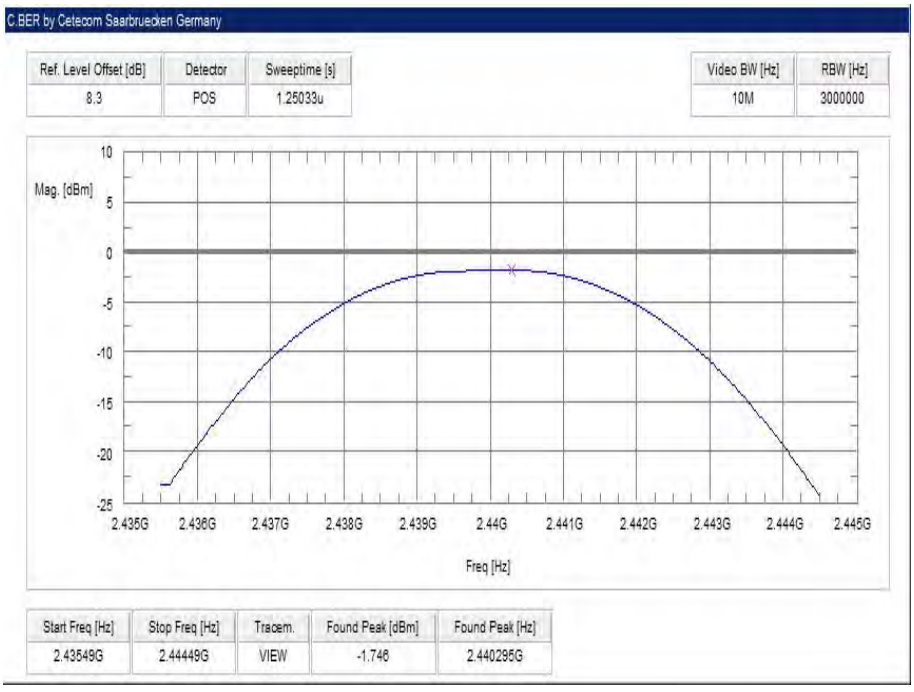


**Plots:** EUT SAMPLE #3 BT LE

**Plot 1:** lowest channel



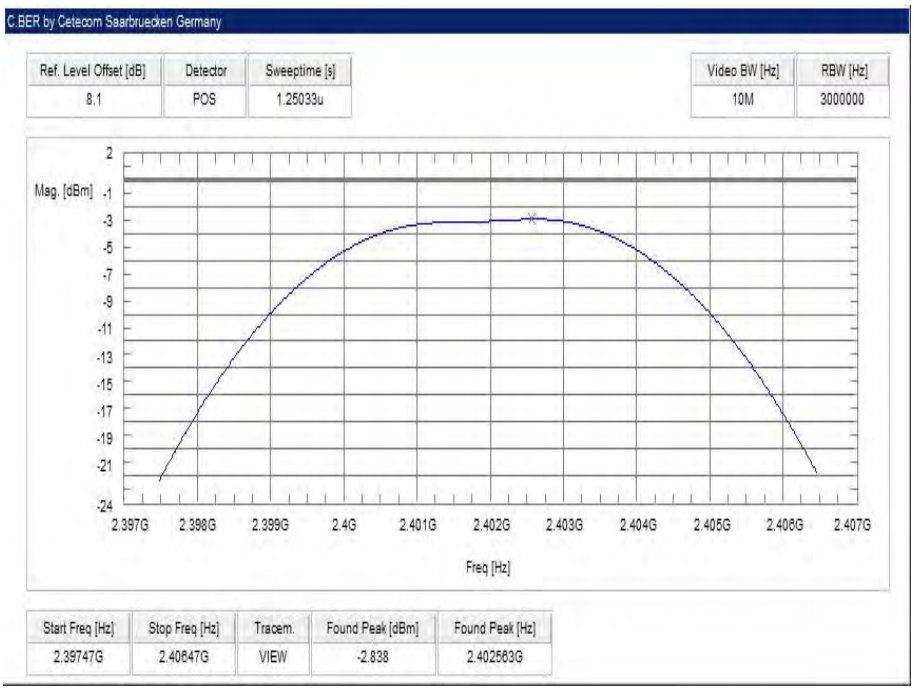

**Plot 2:** mid channel



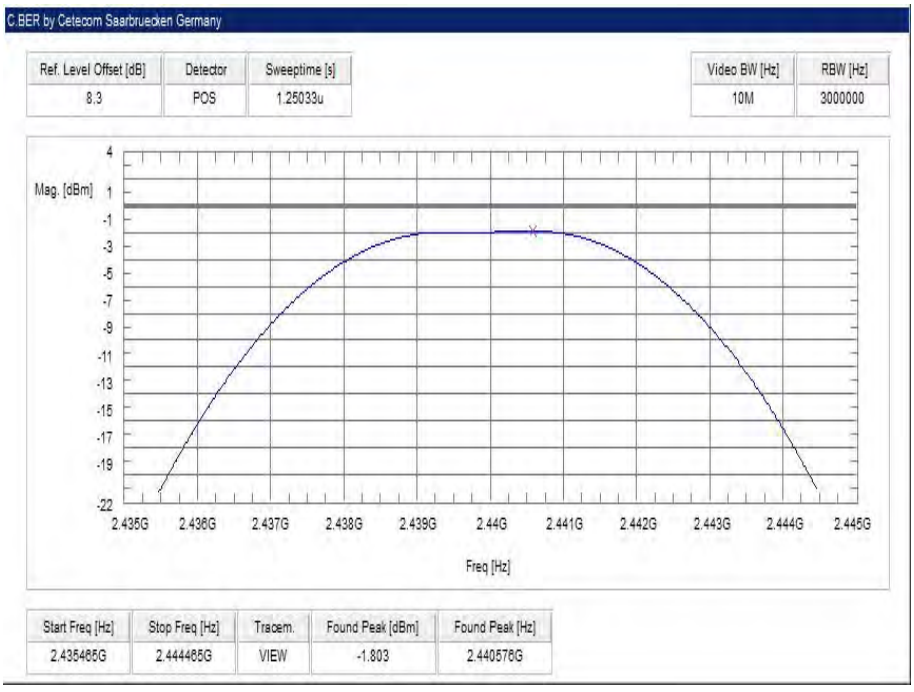
**Plot 3:** highest channel

**Plots:** EUT SAMPLE #3 2Mbps propr

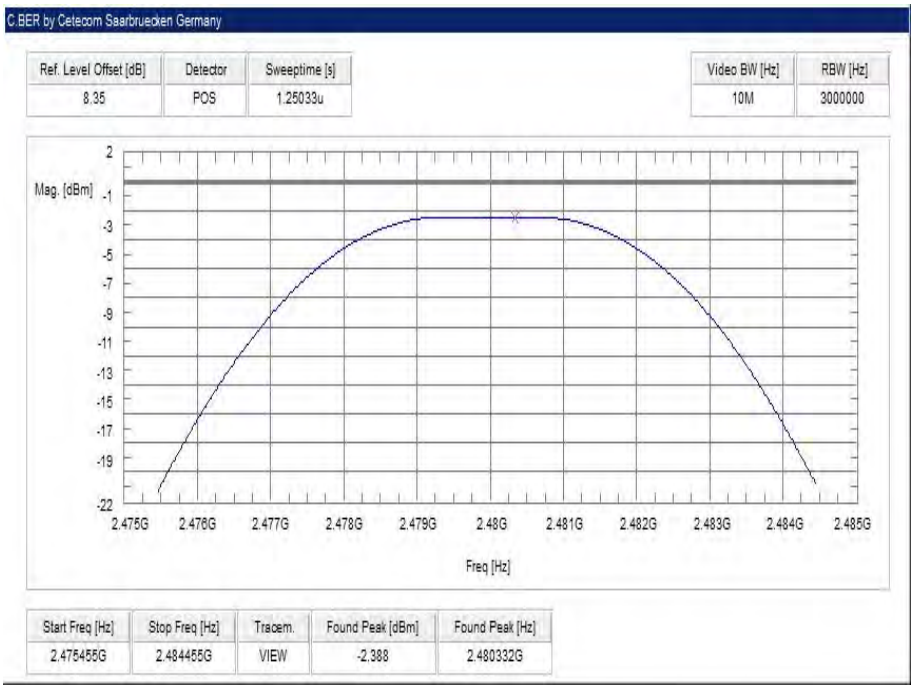
**Plot 1:** lowest channel




**Plot 2:** mid channel

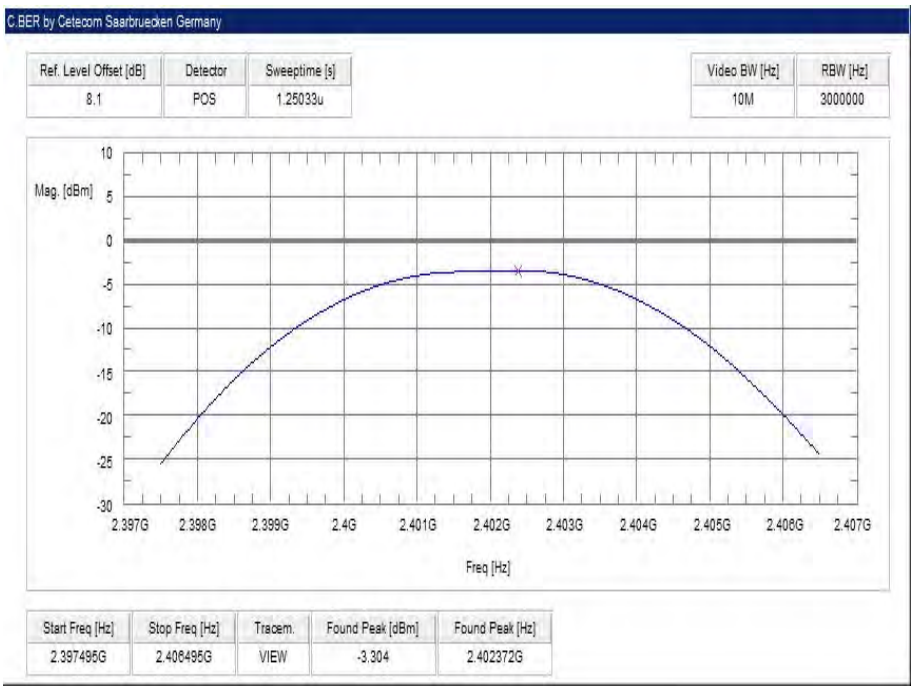


**Plot 3:** highest channel

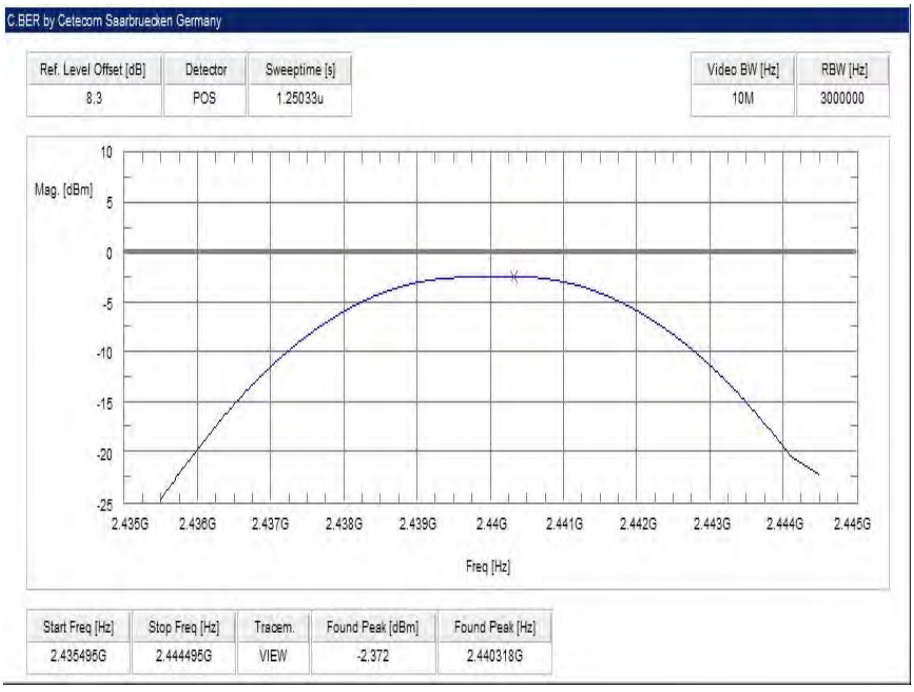


**Plots:** EUT SAMPLE #1 BT LE

**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 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 |
|---|---|
| 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. | |

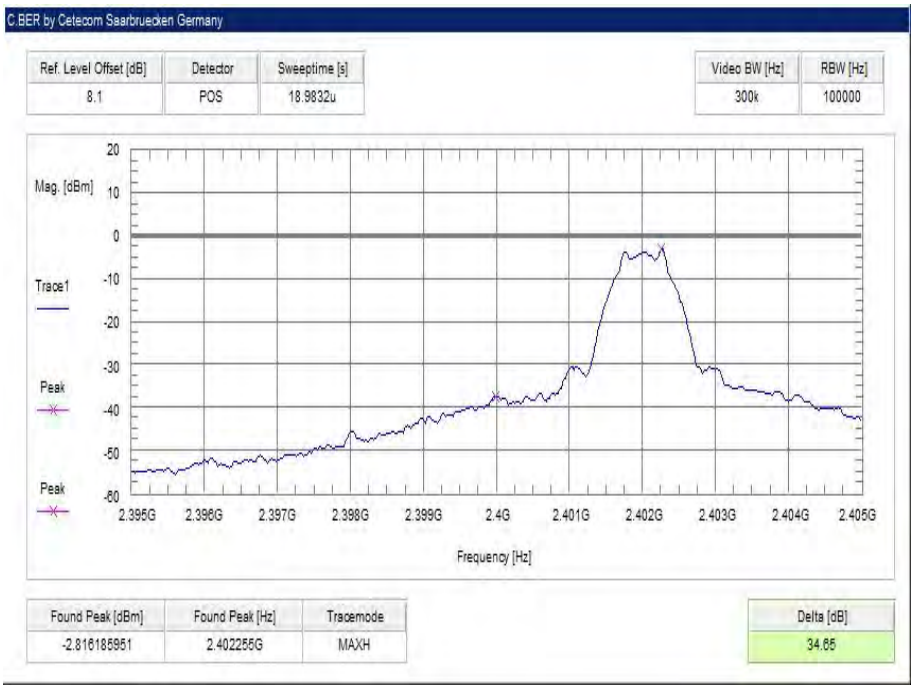
**Result:**

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

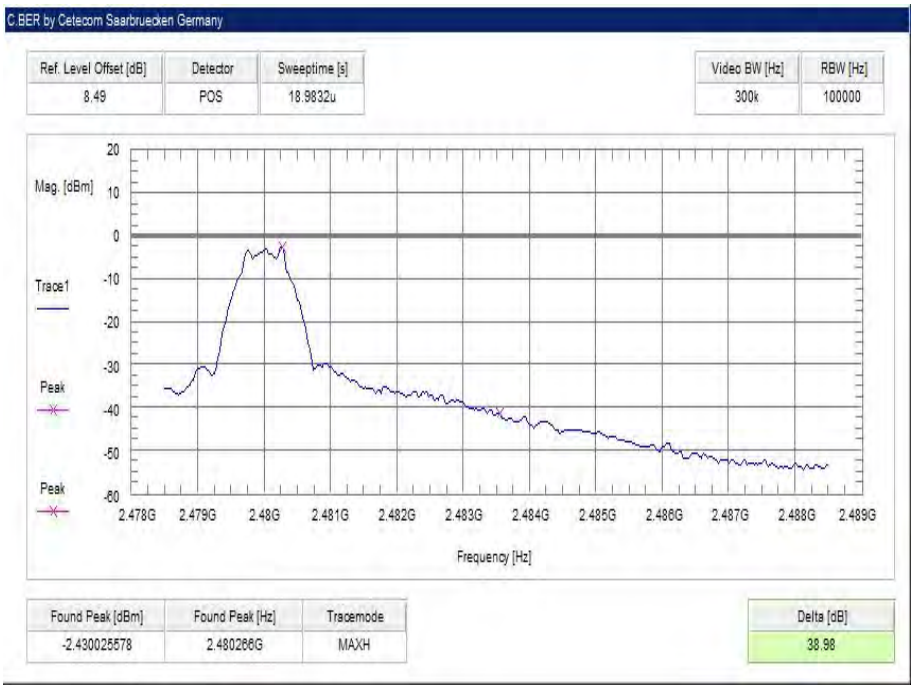
| Scenario | Spurious band edge conducted [dB] |
|---|---|
| Modulation | 2 Mbps propr |
| Lower band edge – hopping off | > 20 dB |
| Upper band edge – hopping off | > 20 dB |

**Plots EUT SAMPLE #2 BT LE:**

**Plot 1:** Lower band edge

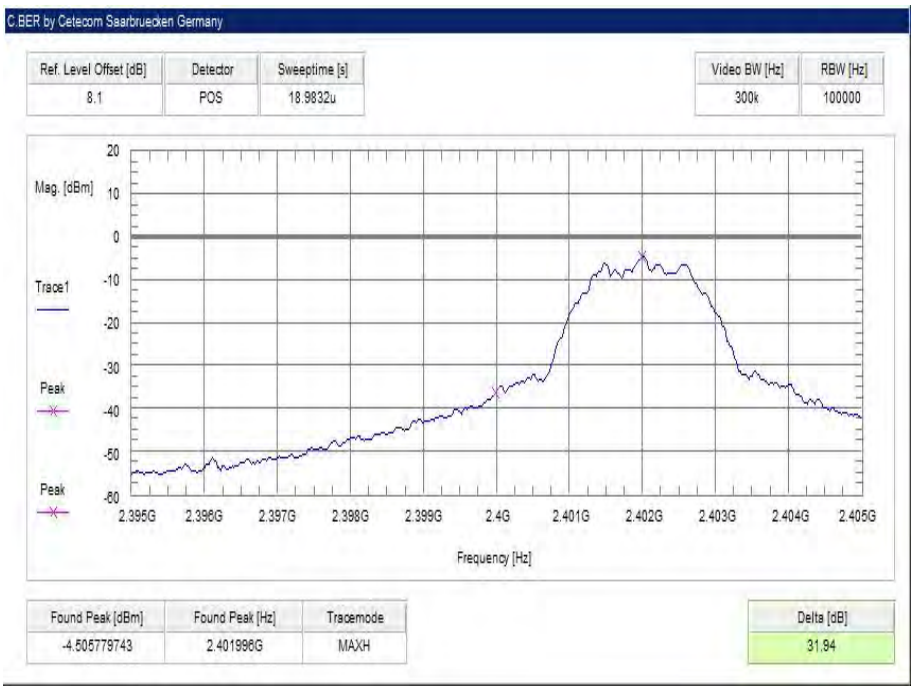



**Plot 2:** Upper band edge

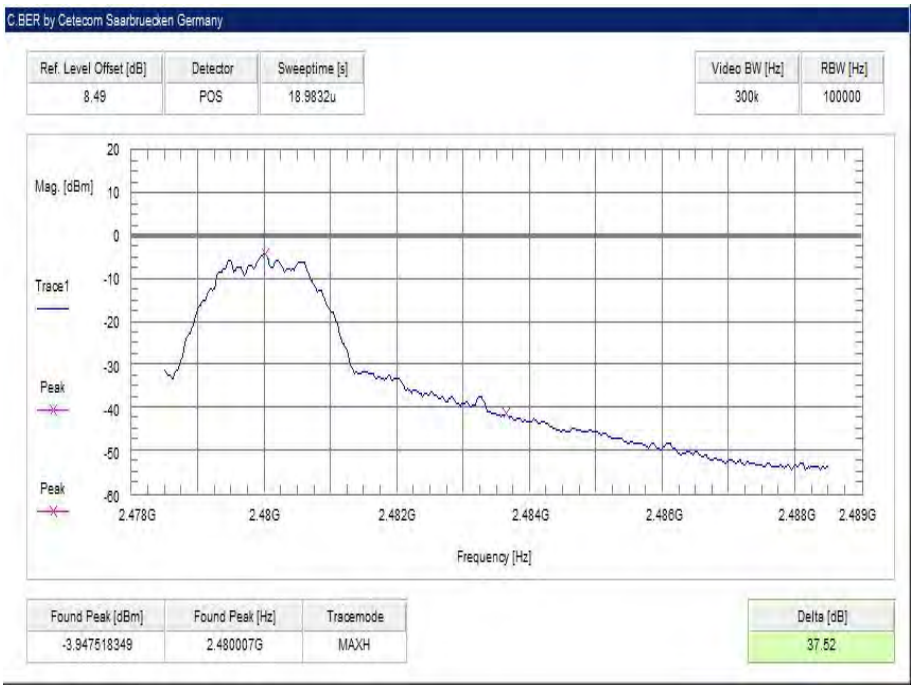


**Plots EUT SAMPLE #2 2Mbps propr:**

**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 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 | |
| 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 | |

**Result:** EUT SAMPLE #12 BT LE, antenna L5

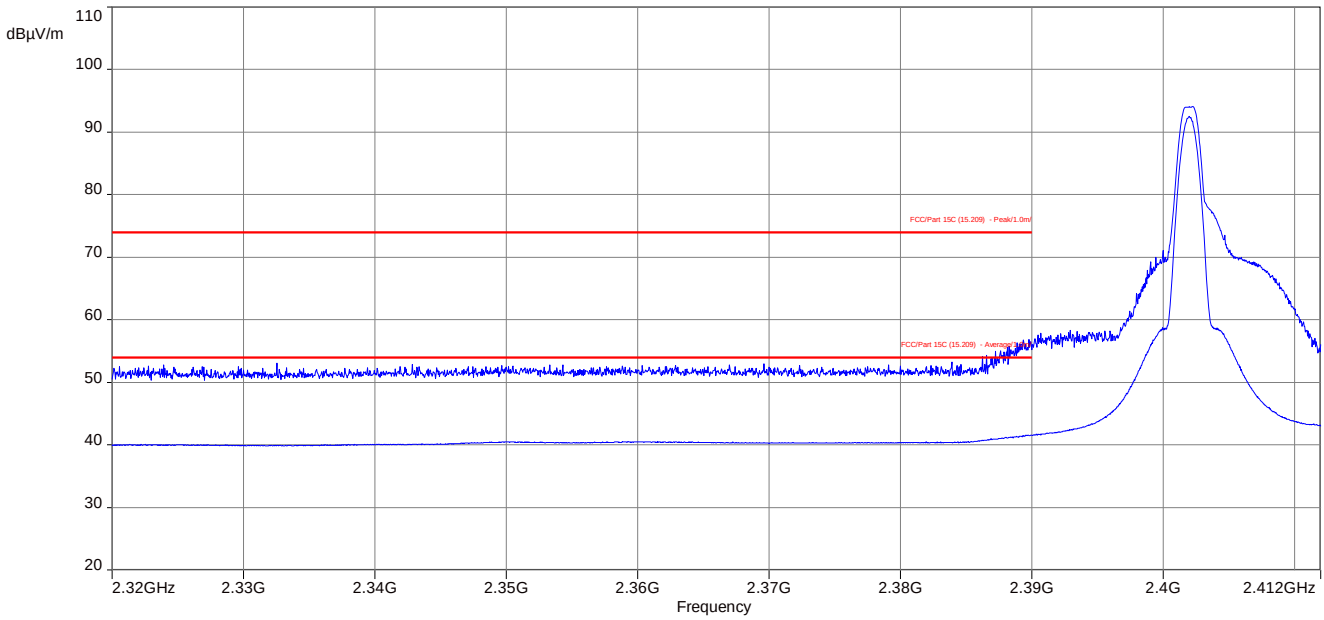
| Scenario | Band edge compliance radiated [dBµV/m] |
|---|---|
| Modulation | BT LE |
| Lower restricted band | < 54 AVG / < 74 PP |
| Upper restricted band | < 54 AVG / < 74 PP |

**Result:** EUT SAMPLE #12 2Mbps propr, antenna L5

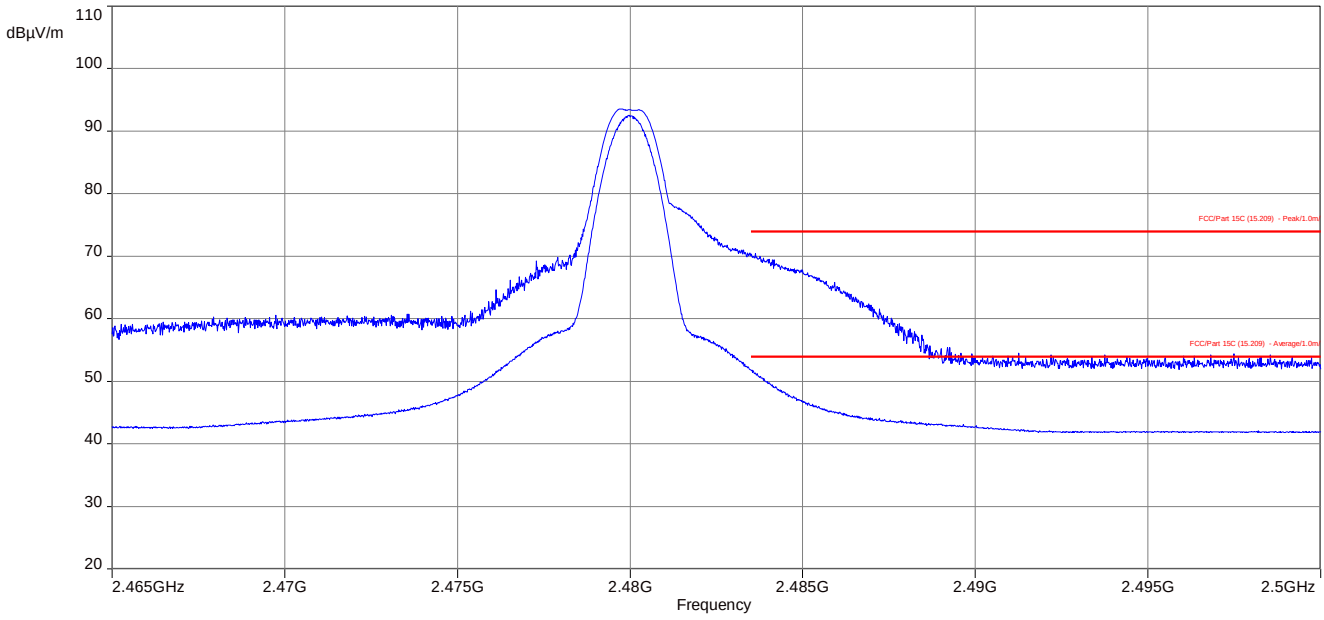
| Scenario | Band edge compliance radiated [dBµV/m] |
|---|---|
| Modulation | 2 Mbps propr |
| Lower restricted band | < 54 AVG / < 74 PP |
| Upper restricted band | < 54 AVG / < 74 PP |

**Plots:** EUT SAMPLE #12 BT LE, antenna L5

**Plot 1:** Lower band edge

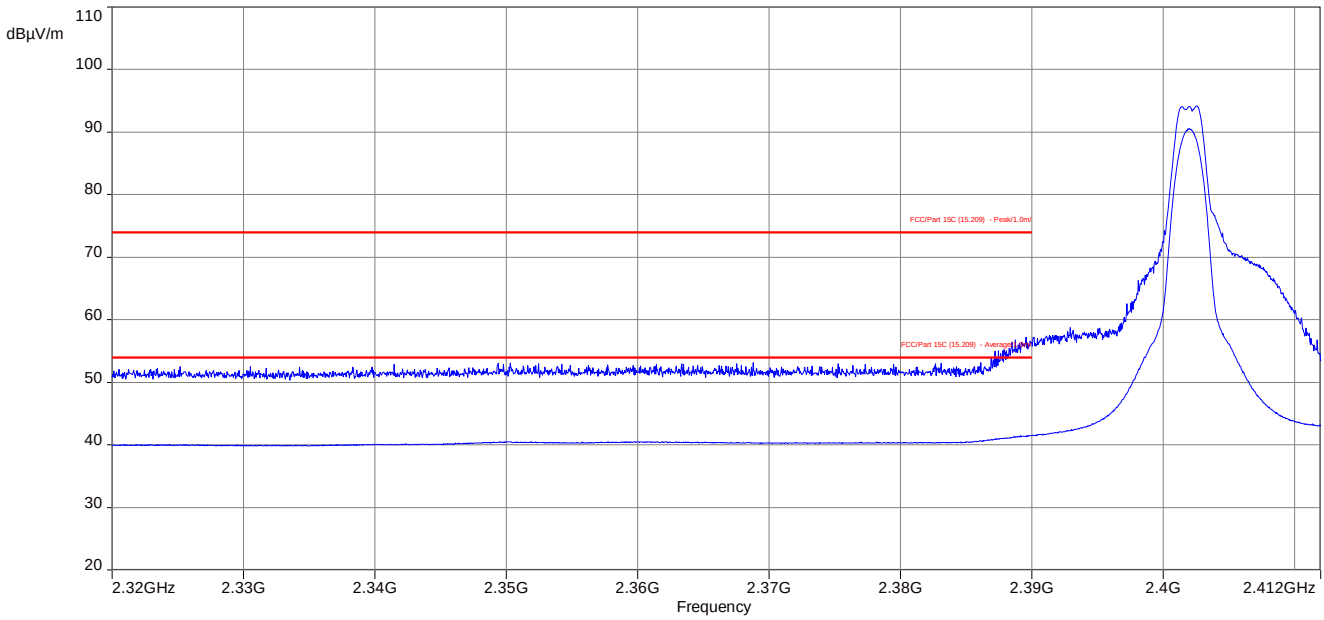



**Plot 2:** Upper band edge

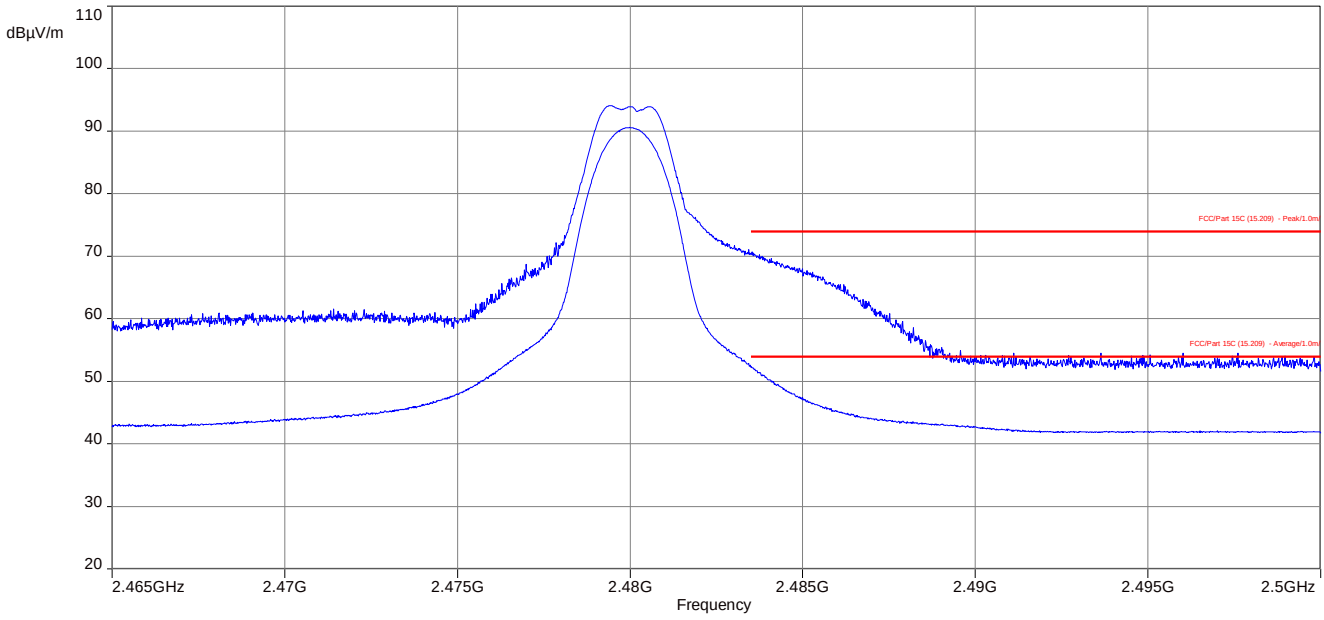


**Plots:** EUT SAMPLE #12 2Mbps propr, antenna L5

**Plot 1:** Lower band edge




**Plot 2:** Upper band edge



## 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 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 7.5 A |
| Measurement uncertainty | See sub clause 9 |

**Limits:**

| FCC | IC |
|---|---|
| TX spurious emissions conducted | |
| 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 | |

**Results:** EUT SAMPLE #2 BT LE

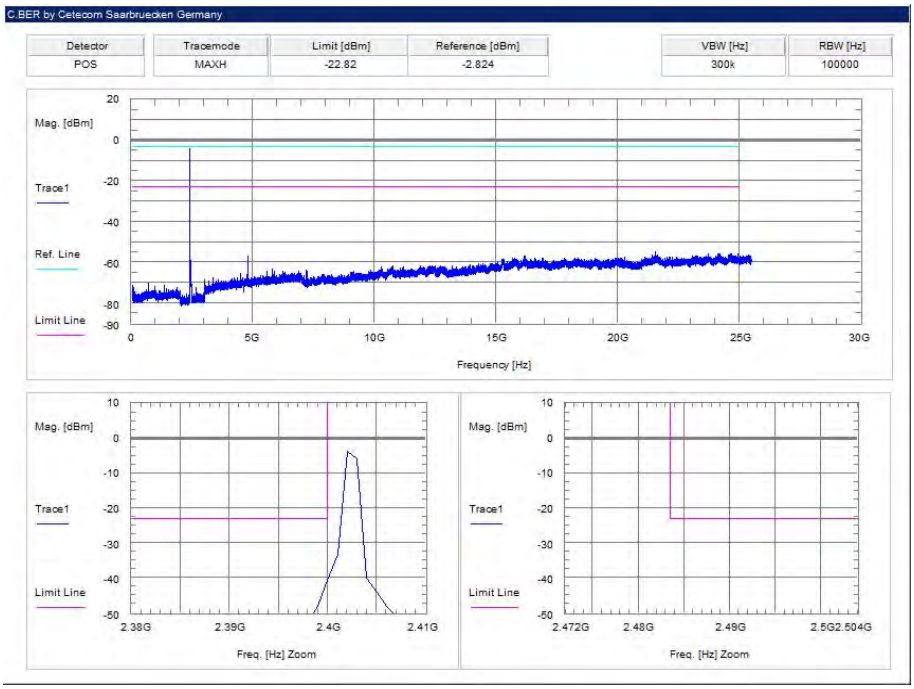
| TX spurious emissions conducted EUT SAMPLE #2 BT LE | | | | | |
|---|---|---|---|---|---|
| f [MHz] | | amplitude of emission [dBm] | limit max. allowed emission power | actual attenuation below frequency of operation [dB] | results |
| 2402 | | -2.8 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |
| 2440 | | -2.0 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |
| 2480 | | -2.4 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |

**Results:** EUT SAMPLE #2 2Mbps propr

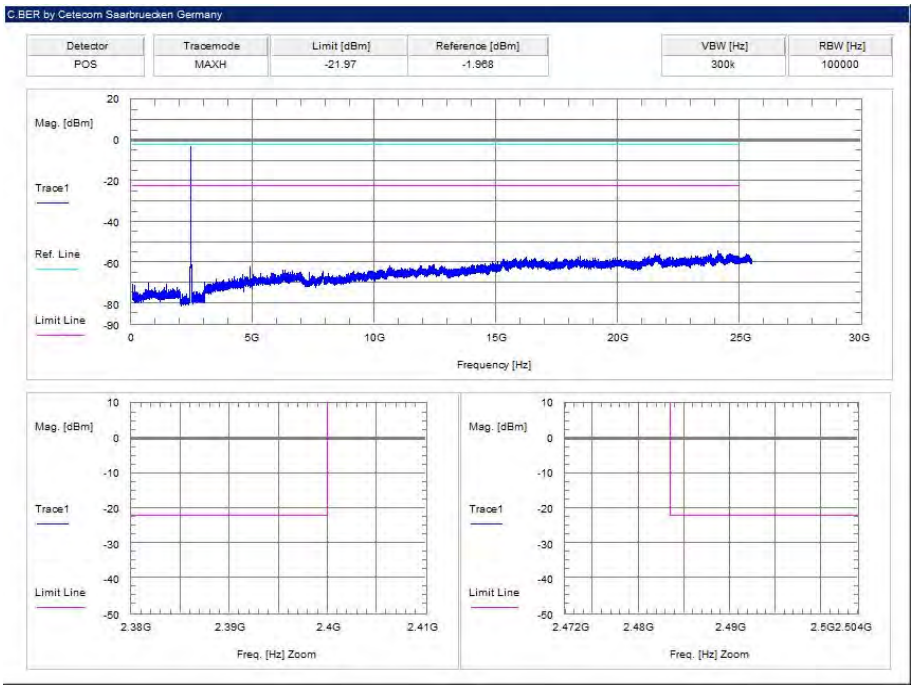
| TX spurious emissions conducted EUT SAMPLE #2 2 Mbps propr. | | | | | |
|---|---|---|---|---|---|
| f [MHz] | | amplitude of emission [dBm] | limit max. allowed emission power | actual attenuation below frequency of operation [dB] | results |
| 2402 | | -4.6 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |
| 2440 | | -3.7 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |
| 2480 | | -4.6 | 30 dBm | | Operating frequency |
| *All detected emissions are more than 6 dB below the limit!* | | | -20 dBc | >20 dBc | compliant |
| | | | | | |
| | | | | | |

**Plots:** EUT SAMPLE #2 BT LE

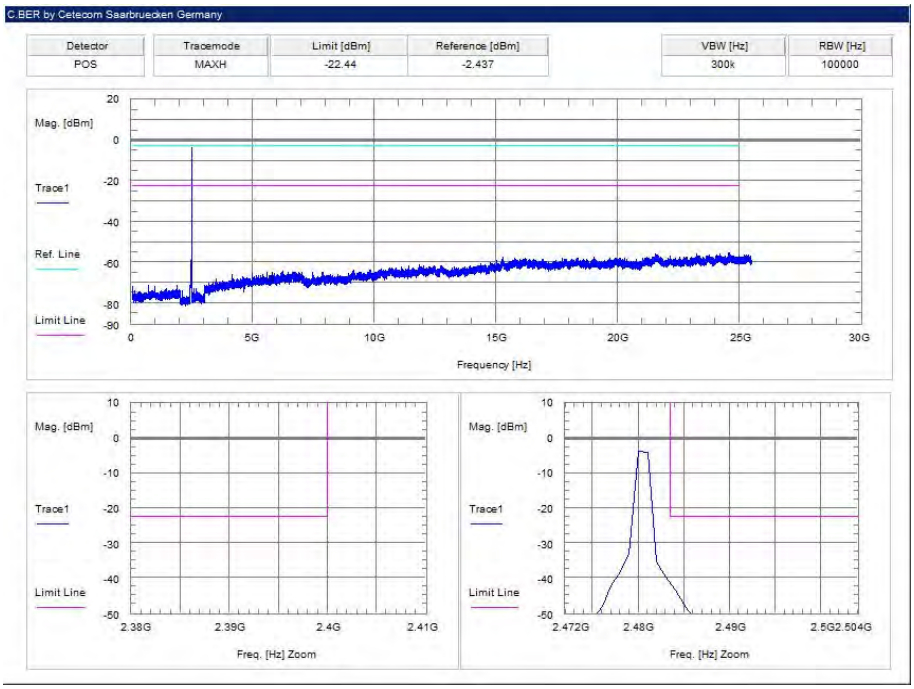
**Plot 1:** lowest channel




**Plot 2:** mid channel

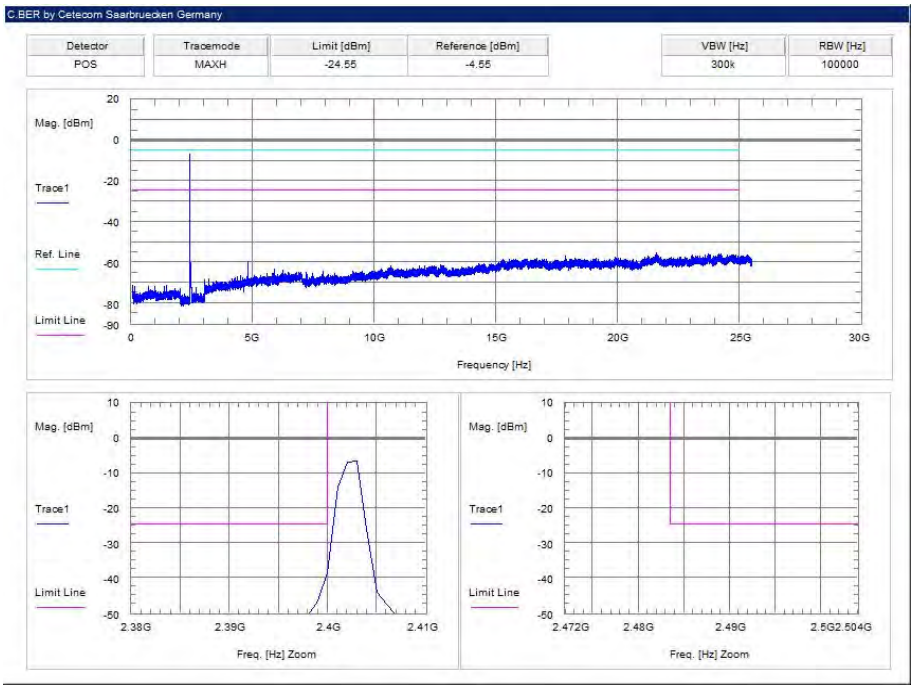


**Plot 3:** highest channel

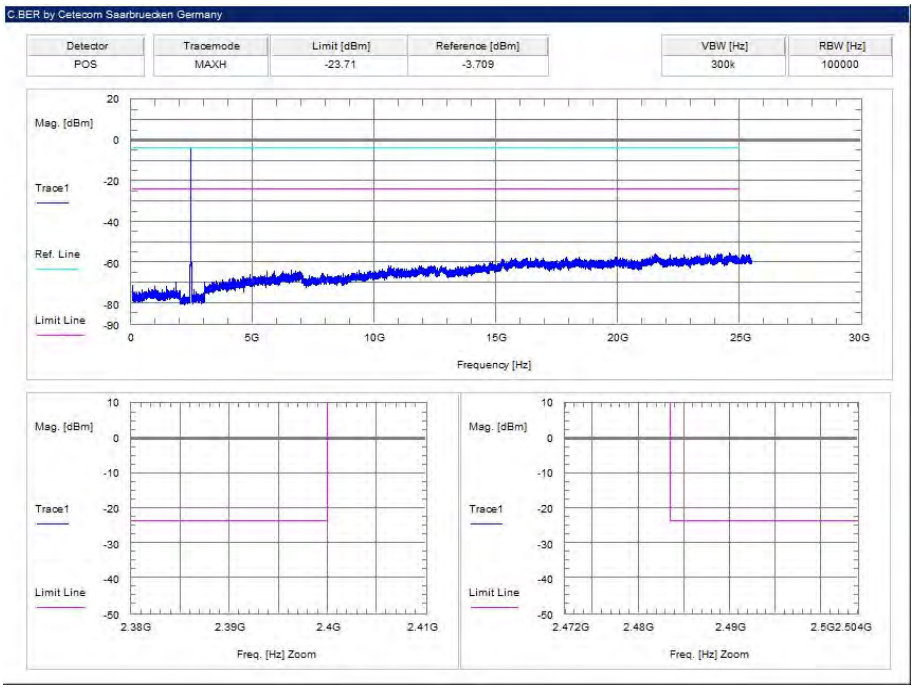


**Plots:** EUT SAMPLE #2 2Mbps propr

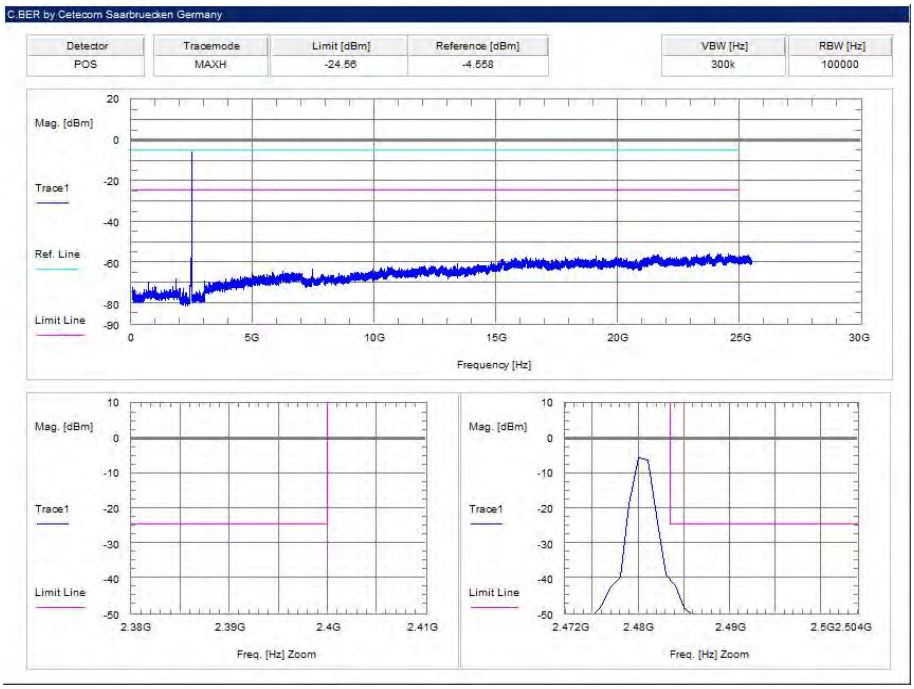
**Plot 1:** lowest channel




**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 according the ANSI C63.10.

| Measurement parameters | |
|---|---|
| Detector | Peak / Quasi peak |
| Sweep time | Auto |
| Resolution bandwidth | F < 150 kHz: 1 kHz<br>F > 150 kHz: 100 kHz |
| Video bandwidth | F < 150 kHz: 200 Hz<br>F > 150 kHz: 9 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 below 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:** EUT SAMPLE #12 BT LE, antenna L5

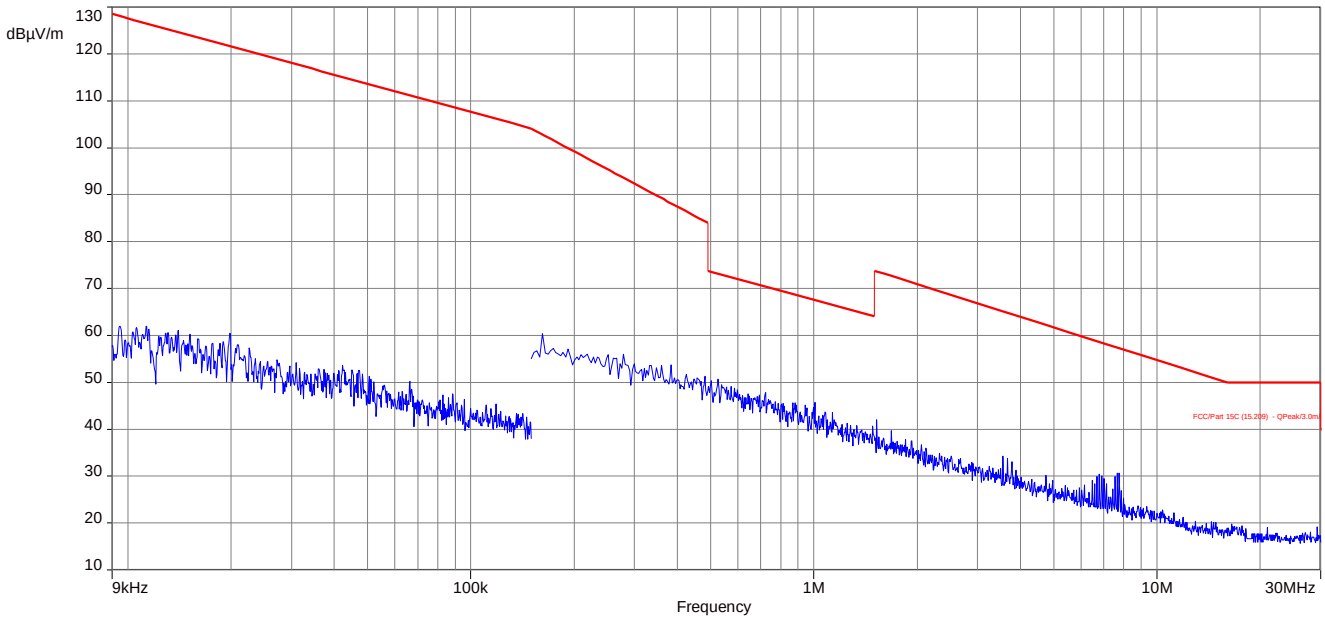
| TX spurious emissions radiated below 30 MHz [dBµV/m] | | |
|---|---|---|
| F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | |
| | | |
| | | |

**Results:** EUT SAMPLE #12 2 Mbps propr, antenna L5

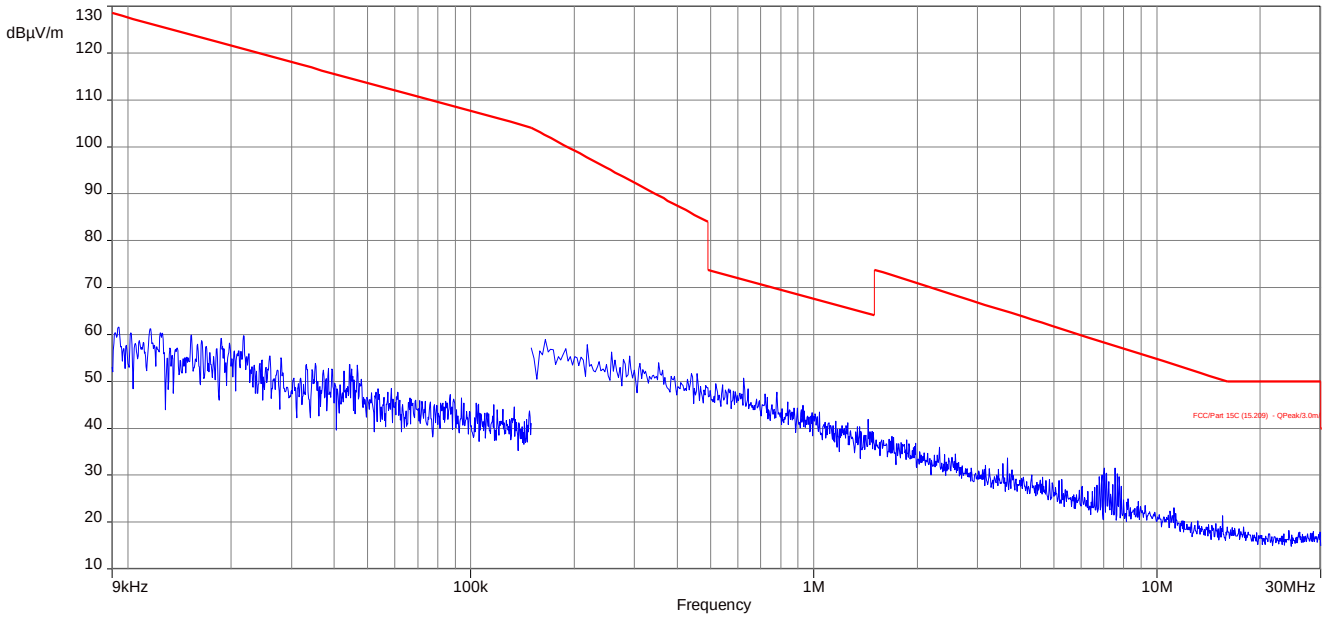
| TX spurious emissions radiated below 30 MHz [dBµV/m] | | |
|---|---|---|
| F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | |
| | | |
| | | |

**Plots:** EUT SAMPLE #12 BT LE, antenna L5

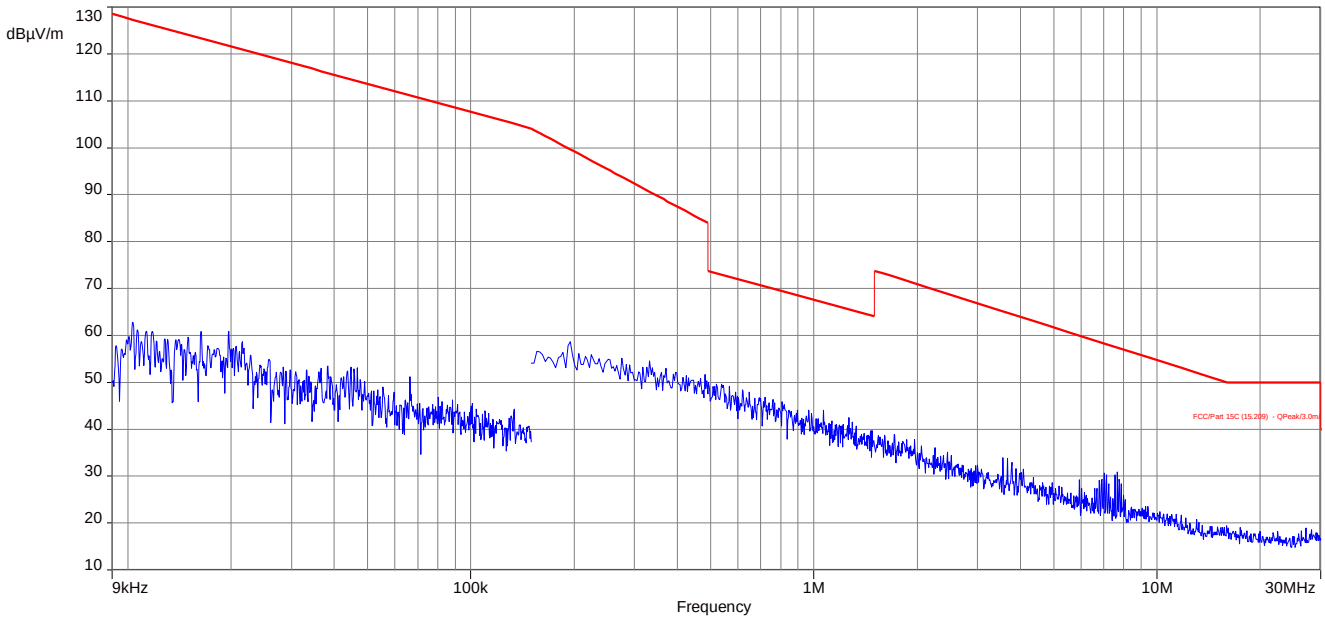
**Plot 1:** 9 kHz to 30 MHz, channel 00, transmit mode, antenna L5



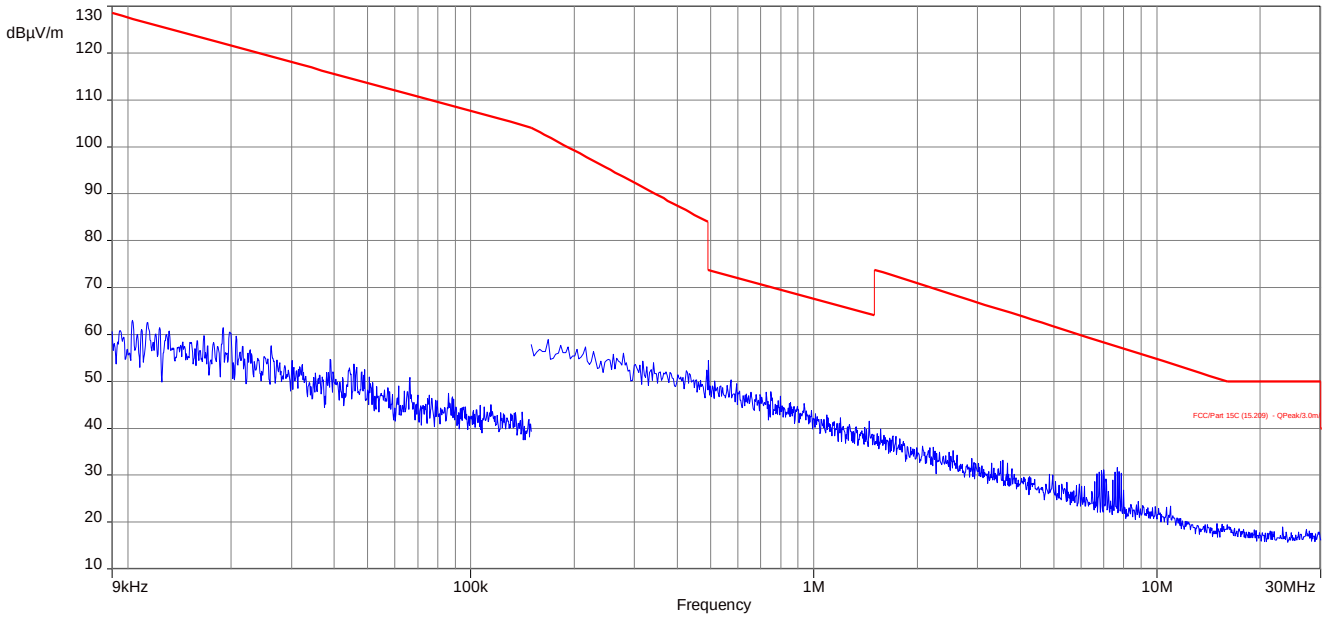

**Plot 2:** 9 kHz to 30 MHz, channel 19, transmit mode, antenna L5



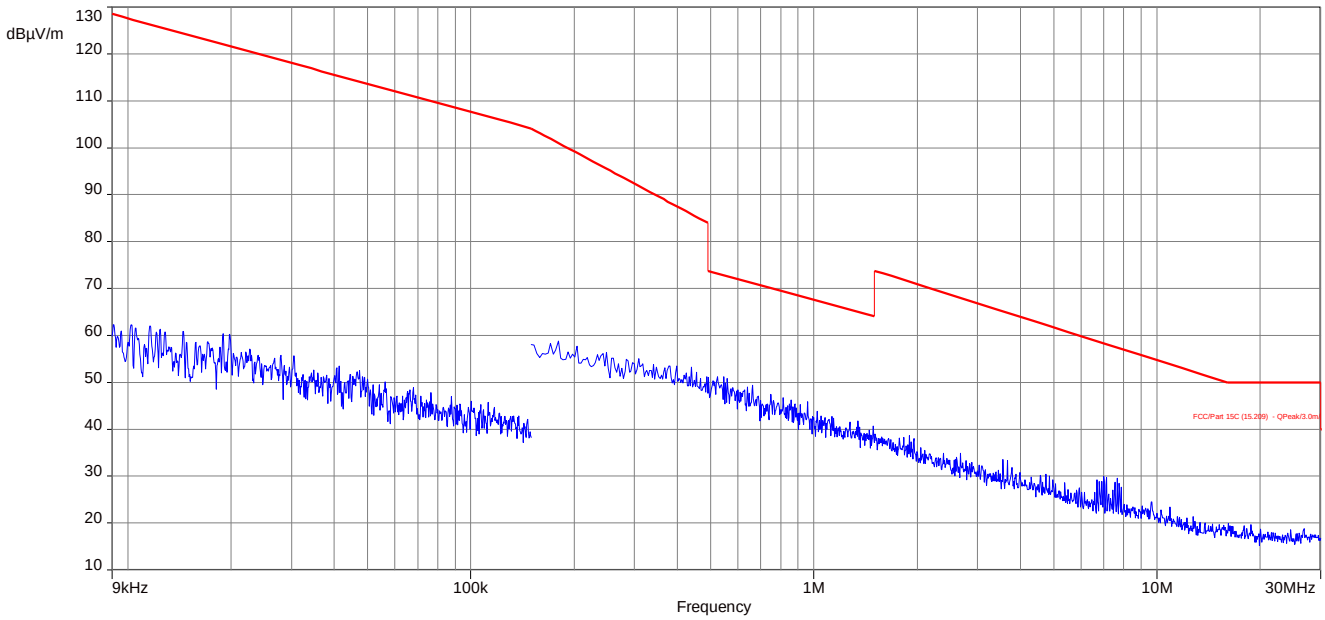
**Plot 3:** 9 kHz to 30 MHz, channel 39, transmit mode, antenna L5



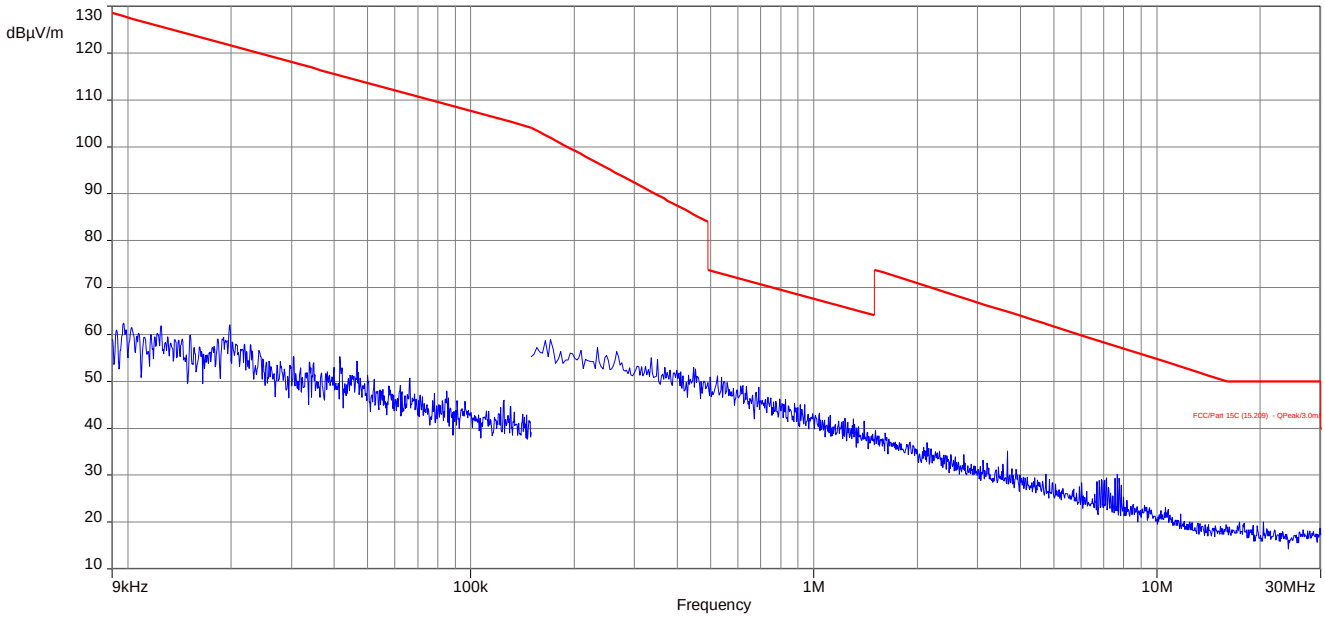

**Plot 4:** 9 kHz to 30 MHz, channel 0, receiver mode, antenna L5



**Plot 5:** 9 kHz to 30 MHz, channel 19, receive mode, antenna L5

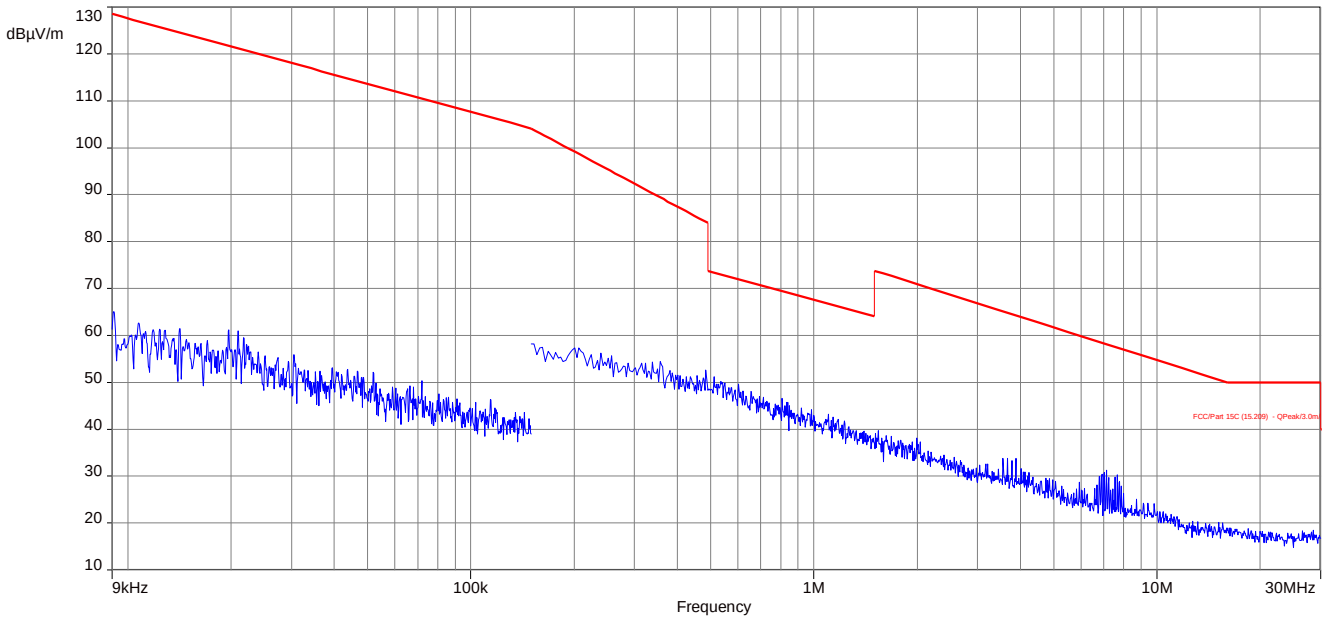



**Plot 6:** 9 kHz to 30 MHz, channel 39, receive mode, antenna L5

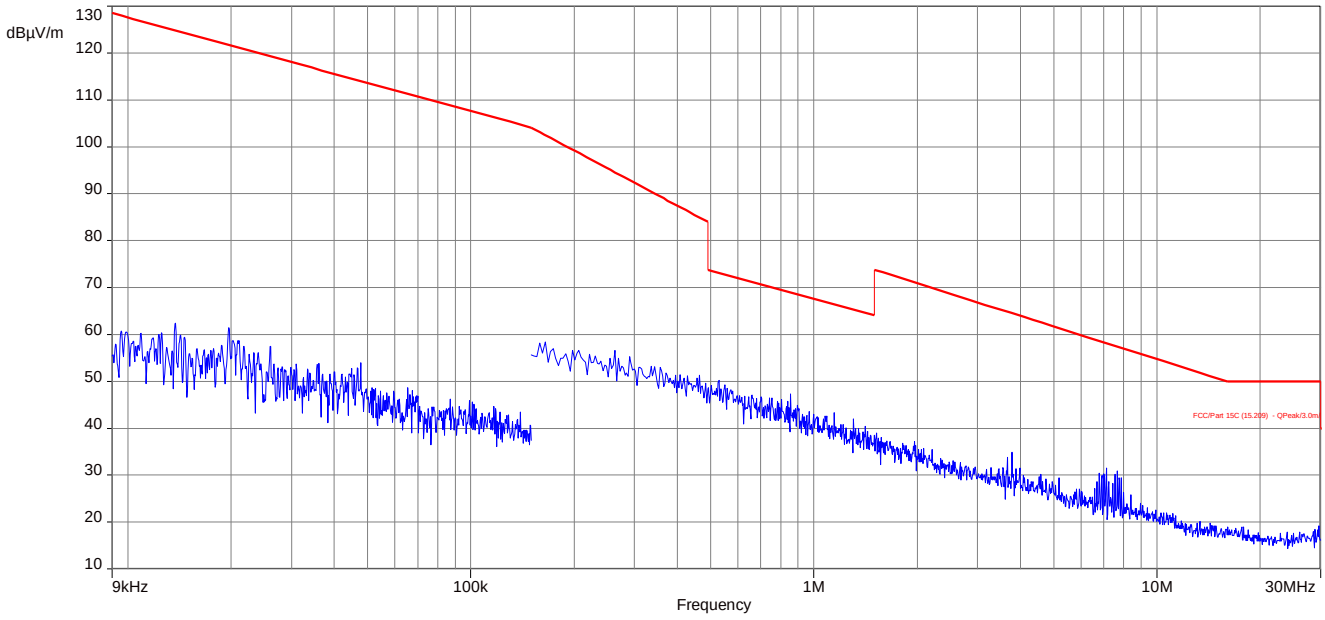


**Plots:** EUT SAMPLE #12 2 Mbps propr, antenna L5

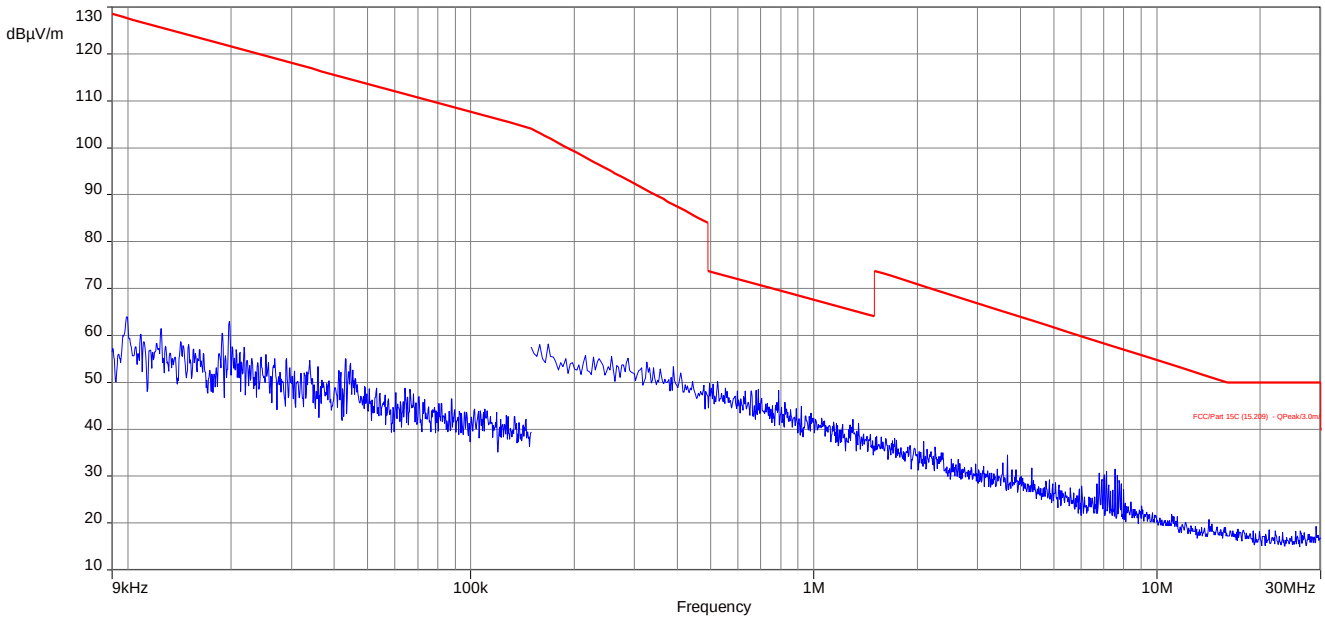
**Plot 1:** 9 kHz to 30 MHz, channel 00, transmit mode, antenna L5



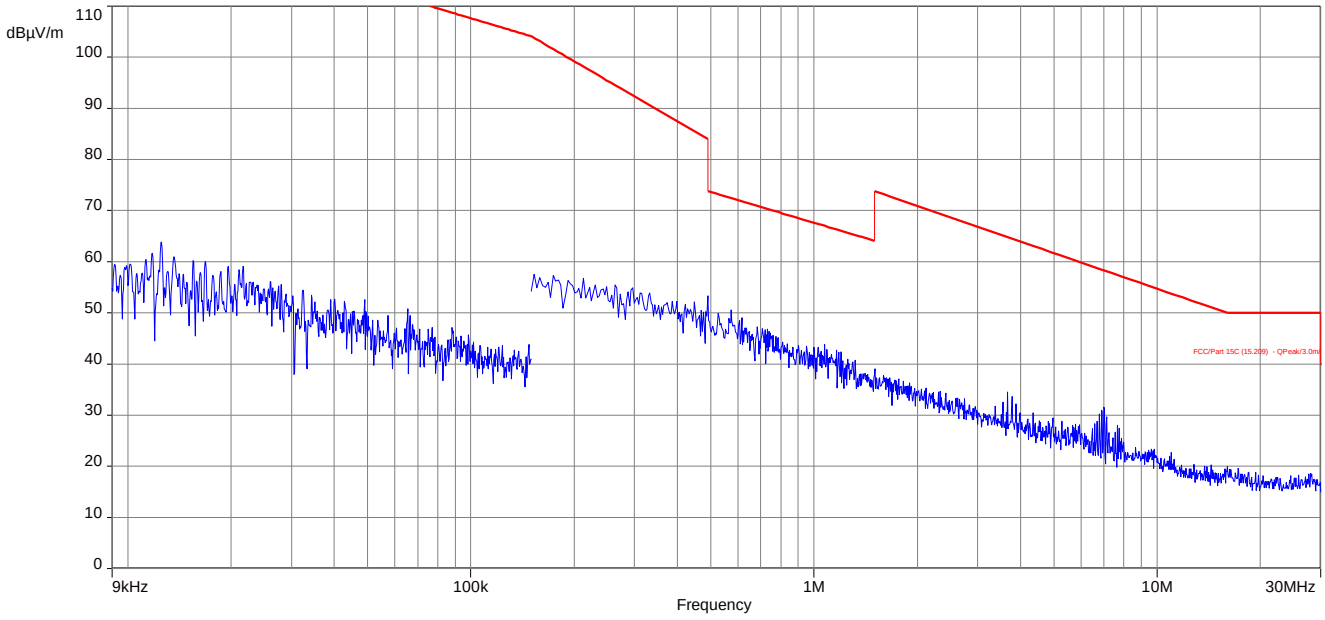

**Plot 2:** 9 kHz to 30 MHz, channel 19, transmit mode, antenna L5



**Plot 3:** 9 kHz to 30 MHz, channel 39, transmit mode, antenna L5




**Plot 4:** 9 kHz to 30 MHz, channel 19, receiver mode, antenna L5



## 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 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 |

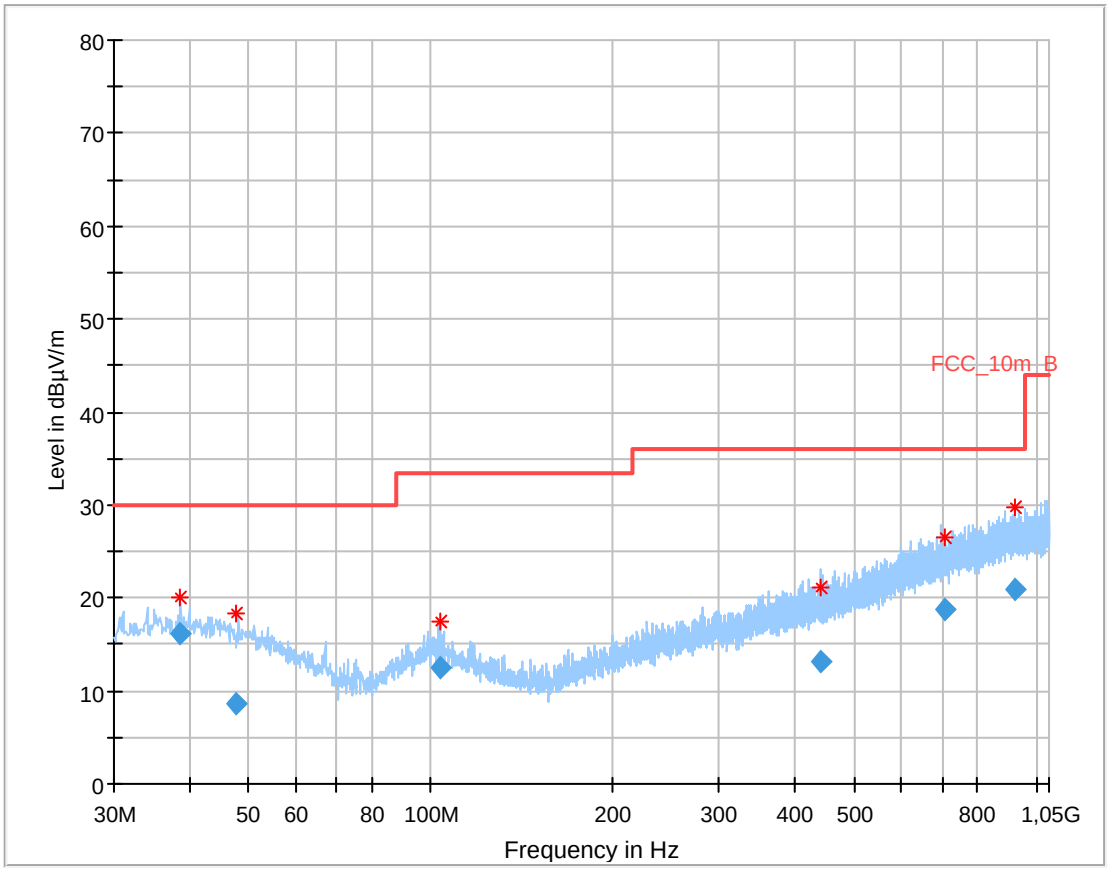
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

**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:** EUT SAMPLE #10 BT LE, antenna L5

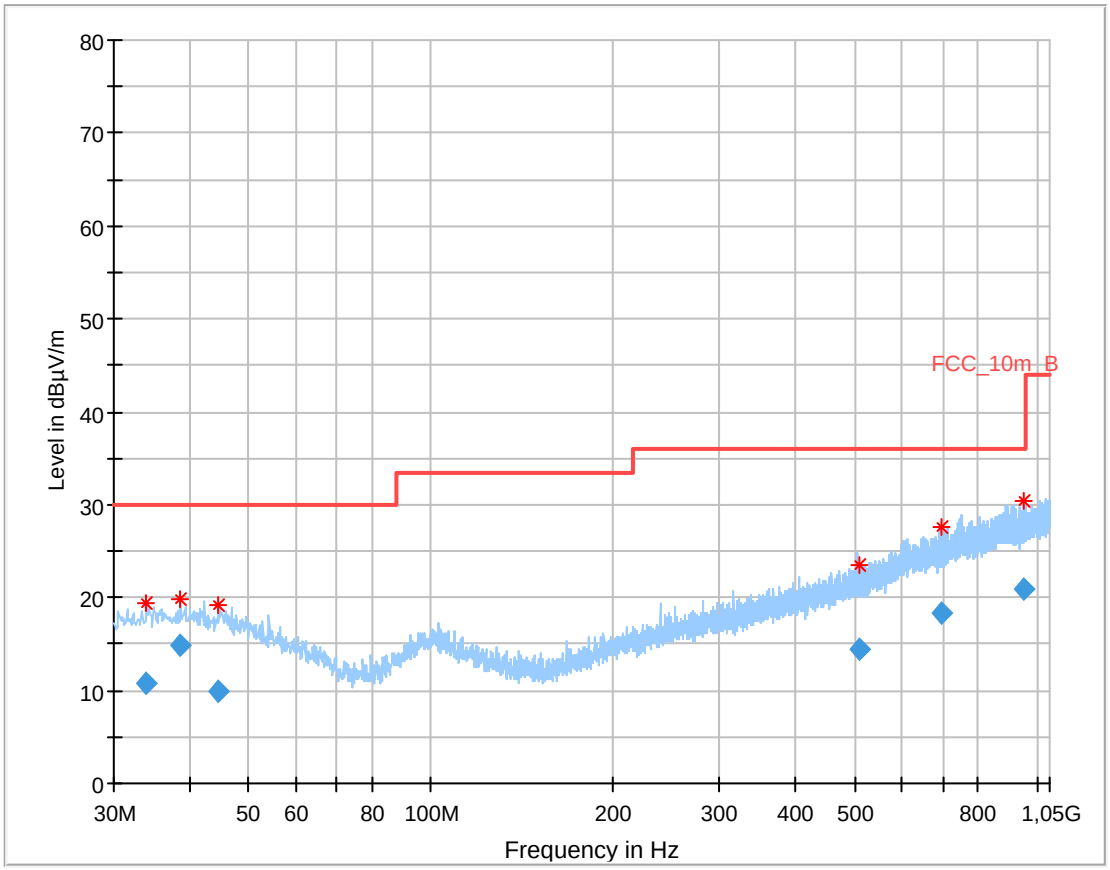
**Plot 1:** 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization, transmit mode




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.709300 | 16.15 | 30.00 | 13.85 | 1000.0 | 120.000 | 98.0 | V | 100.0 | 14.0 |
| 47.723100 | 8.63 | 30.00 | 21.37 | 1000.0 | 120.000 | 101.0 | H | 190.0 | 13.2 |
| 104.008200 | 12.58 | 33.50 | 20.92 | 1000.0 | 120.000 | 101.0 | V | 100.0 | 11.7 |
| 440.932200 | 13.16 | 36.00 | 22.84 | 1000.0 | 120.000 | 170.0 | V | 190.0 | 17.5 |
| 707.694300 | 18.70 | 36.00 | 17.30 | 1000.0 | 120.000 | 170.0 | V | 80.0 | 21.7 |
| 921.355650 | 20.97 | 36.00 | 15.03 | 1000.0 | 120.000 | 170.0 | V | 81.0 | 24.2 |

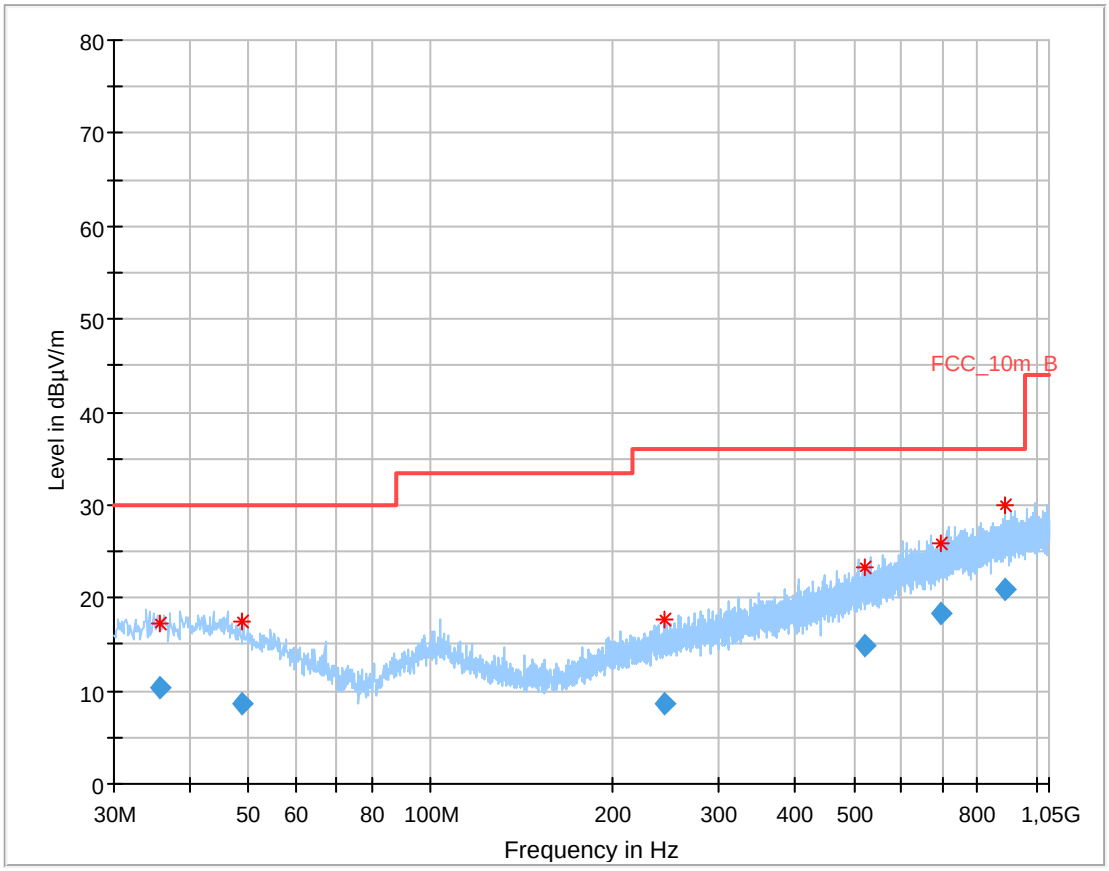
**Plot 2:** 30 MHz to 1 GHz, TX mode, channel 19, vertical & horizontal polarization, transmit mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 33.992700 | 10.80 | 30.00 | 19.20 | 1000.0 | 120.000 | 101.0 | V | 28.0 | 13.7 |
| 38.700300 | 14.93 | 30.00 | 15.07 | 1000.0 | 120.000 | 101.0 | V | 256.0 | 14.0 |
| 44.654550 | 9.92 | 30.00 | 20.08 | 1000.0 | 120.000 | 101.0 | H | 0.0 | 13.9 |
| 508.581750 | 14.47 | 36.00 | 21.53 | 1000.0 | 120.000 | 170.0 | H | 82.0 | 18.8 |
| 693.573300 | 18.31 | 36.00 | 17.69 | 1000.0 | 120.000 | 170.0 | V | 332.0 | 21.5 |
| 951.322200 | 20.92 | 36.00 | 15.08 | 1000.0 | 120.000 | 170.0 | H | 332.0 | 24.3 |

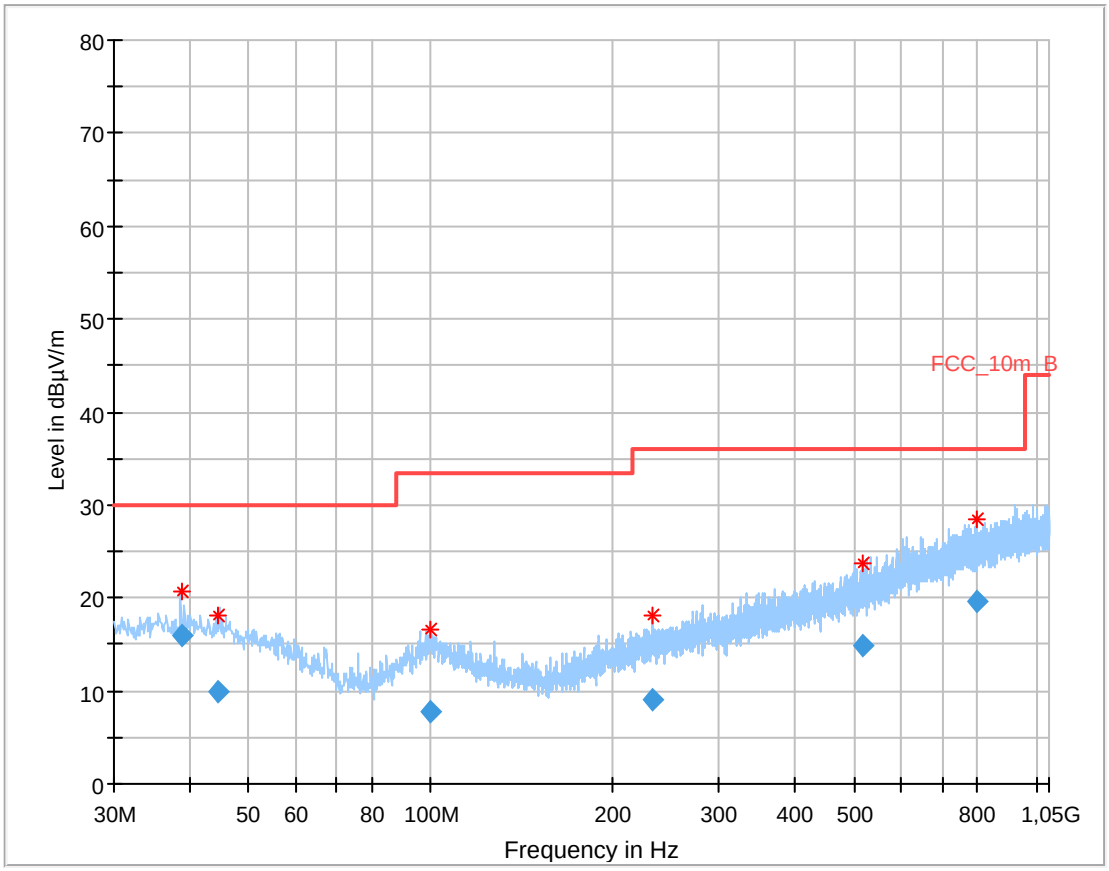
**Plot 3:** 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization, transmit mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 35.866200 | 10.45 | 30.00 | 19.55 | 1000.0 | 120.000 | 170.0 | V | -9.0 | 13.8 |
| 48.763350 | 8.52 | 30.00 | 21.48 | 1000.0 | 120.000 | 101.0 | H | 10.0 | 12.9 |
| 244.007100 | 8.64 | 36.00 | 27.36 | 1000.0 | 120.000 | 170.0 | H | 190.0 | 13.2 |
| 522.230850 | 14.91 | 36.00 | 21.09 | 1000.0 | 120.000 | 170.0 | H | 190.0 | 19.0 |
| 693.817500 | 18.33 | 36.00 | 17.67 | 1000.0 | 120.000 | 101.0 | H | 10.0 | 21.5 |
| 890.294100 | 20.84 | 36.00 | 15.16 | 1000.0 | 120.000 | 170.0 | V | 80.0 | 24.0 |

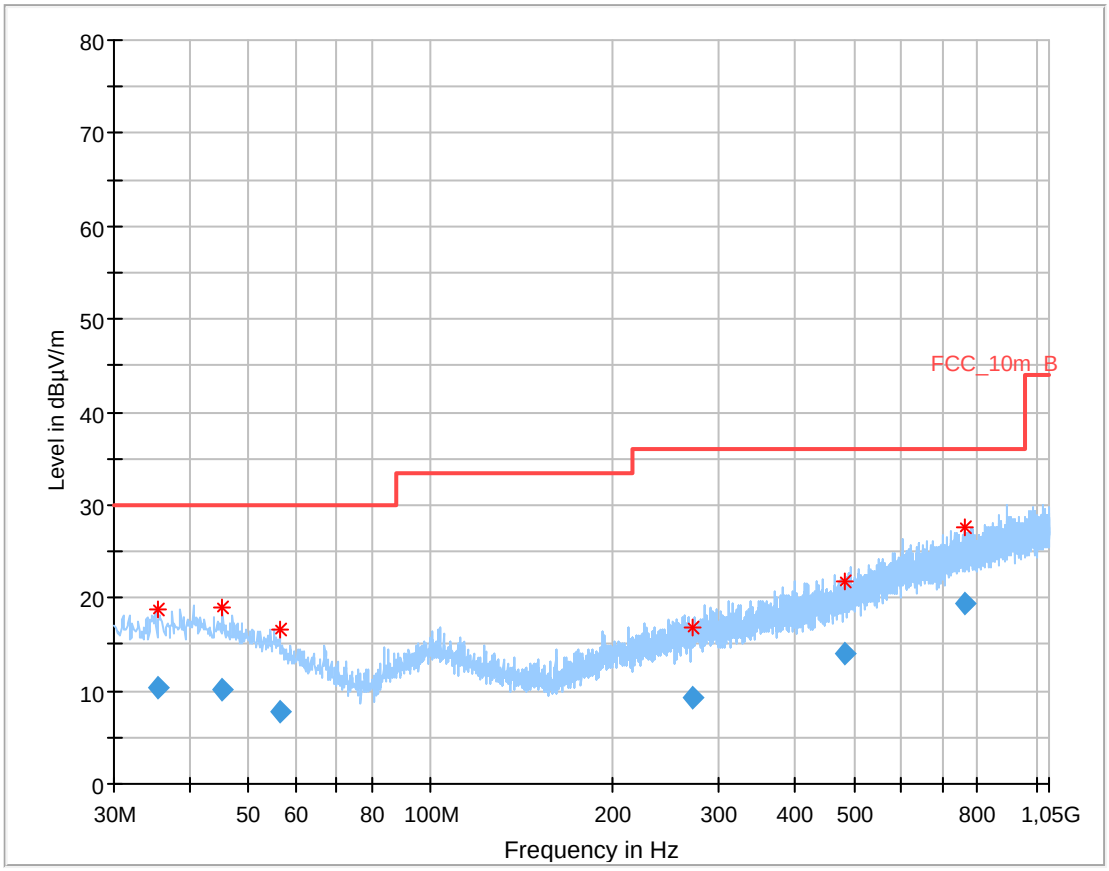
**Plot 4:** 30 MHz to 1 GHz, channel 0, vertical & horizontal polarization, receive mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.717400 | 15.97 | 30.00 | 14.03 | 1000.0 | 120.000 | 101.0 | V | 261.0 | 14.0 |
| 44.572200 | 9.99 | 30.00 | 20.01 | 1000.0 | 120.000 | 101.0 | H | 10.0 | 13.9 |
| 99.861000 | 7.76 | 33.50 | 25.74 | 1000.0 | 120.000 | 101.0 | H | 80.0 | 12.2 |
| 232.937250 | 9.15 | 36.00 | 26.85 | 1000.0 | 120.000 | 170.0 | H | 100.0 | 12.8 |
| 516.968400 | 14.79 | 36.00 | 21.21 | 1000.0 | 120.000 | 98.0 | H | 190.0 | 18.9 |
| 800.857800 | 19.52 | 36.00 | 16.48 | 1000.0 | 120.000 | 170.0 | H | -9.0 | 22.7 |

**Plot 5:** 30 MHz to 1 GHz, channel 39, vertical & horizontal polarization, receive mode, antenna L5

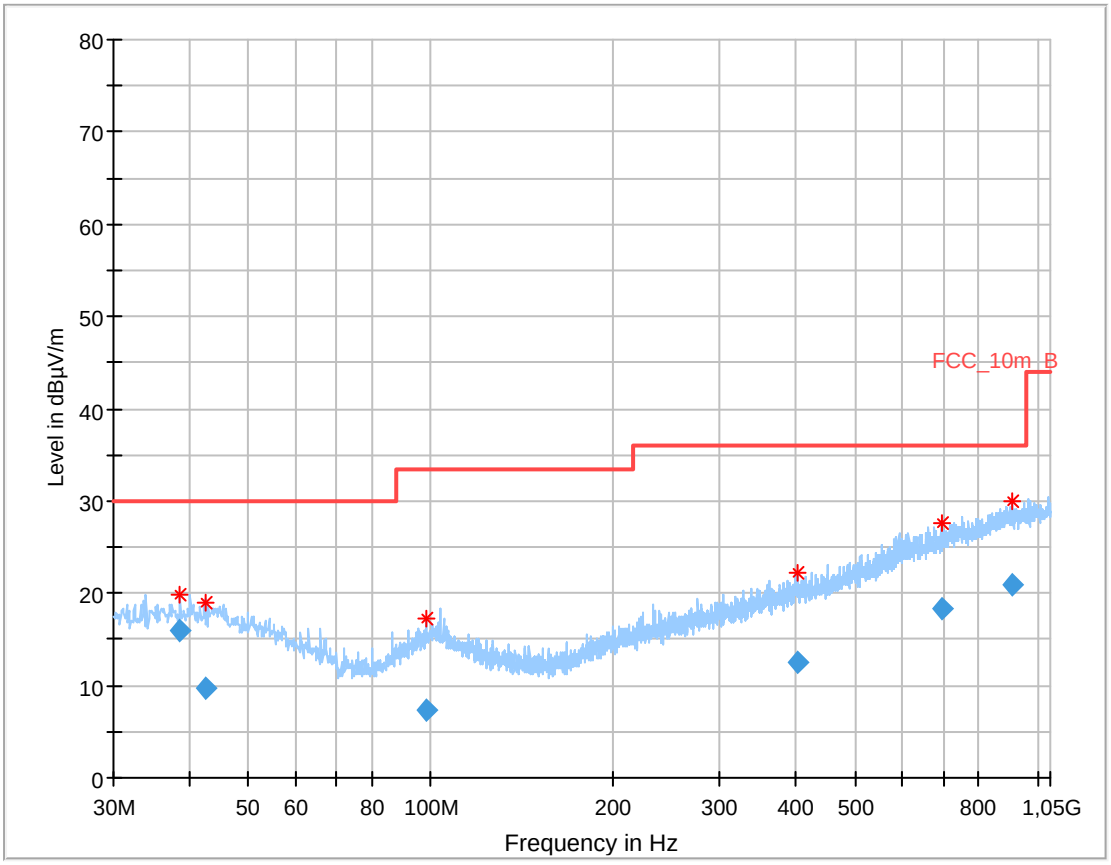



**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 35.345400 | 10.35 | 30.00 | 19.65 | 1000.0 | 120.000 | 101.0 | H | 190.0 | 13.8 |
| 45.312750 | 10.15 | 30.00 | 19.85 | 1000.0 | 120.000 | 101.0 | V | -10.0 | 13.8 |
| 56.385150 | 7.78 | 30.00 | 22.22 | 1000.0 | 120.000 | 101.0 | H | 100.0 | 11.5 |
| 270.292950 | 9.30 | 36.00 | 26.70 | 1000.0 | 120.000 | 170.0 | H | 80.0 | 13.8 |
| 482.224800 | 14.03 | 36.00 | 21.97 | 1000.0 | 120.000 | 170.0 | V | 261.0 | 18.3 |
| 764.650200 | 19.51 | 36.00 | 16.49 | 1000.0 | 120.000 | 170.0 | V | 170.0 | 22.7 |

**Plots:** EUT SAMPLE #10 2 Mbps propr, antenna L5

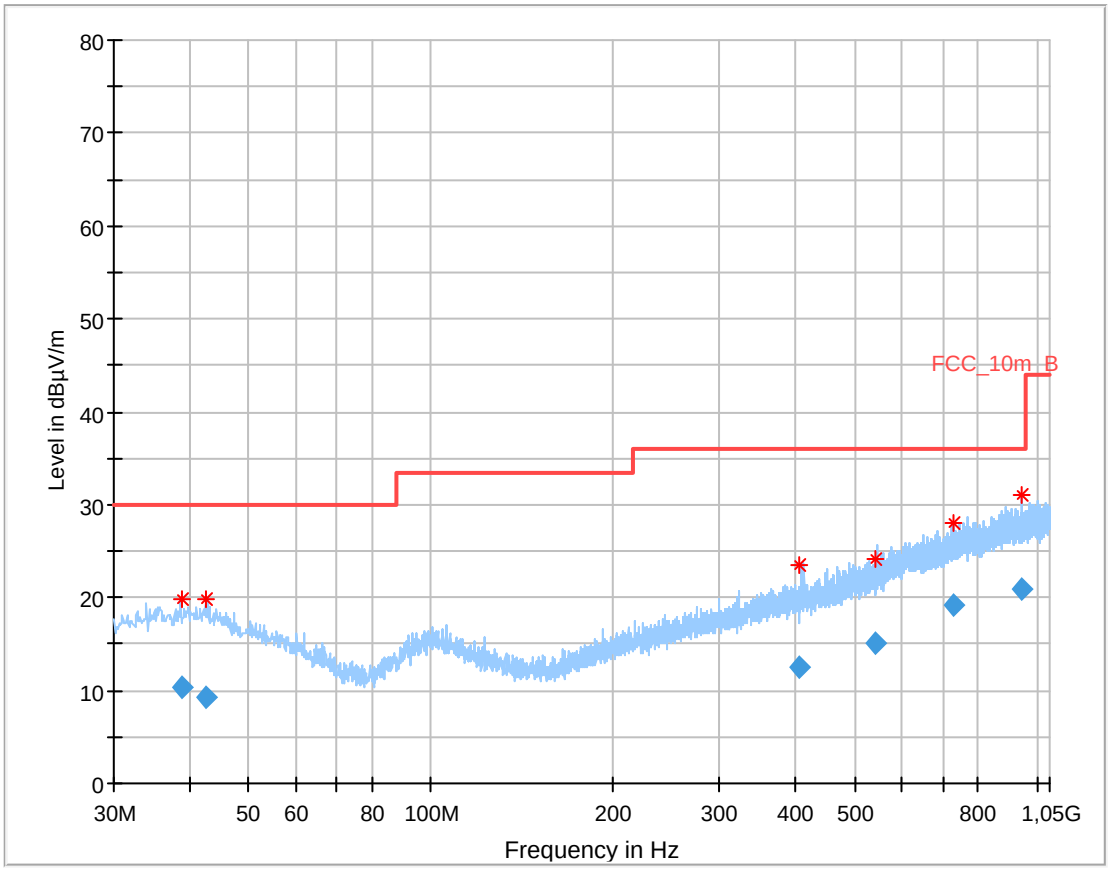
**Plot 1:** 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization, transmit mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.709750 | 16.03 | 30.00 | 13.97 | 1000.0 | 120.000 | 101.0 | V | 137.0 | 14.0 |
| 42.466800 | 9.68 | 30.00 | 20.32 | 1000.0 | 120.000 | 101.0 | V | 353.0 | 13.9 |
| 98.568300 | 7.27 | 33.50 | 26.23 | 1000.0 | 120.000 | 101.0 | V | 223.0 | 11.9 |
| 403.072500 | 12.48 | 36.00 | 23.52 | 1000.0 | 120.000 | 100.0 | V | 94.0 | 16.9 |
| 693.502500 | 18.33 | 36.00 | 17.67 | 1000.0 | 120.000 | 170.0 | H | 347.0 | 21.5 |
| 908.073750 | 20.91 | 36.00 | 15.09 | 1000.0 | 120.000 | 100.0 | H | 84.0 | 24.1 |

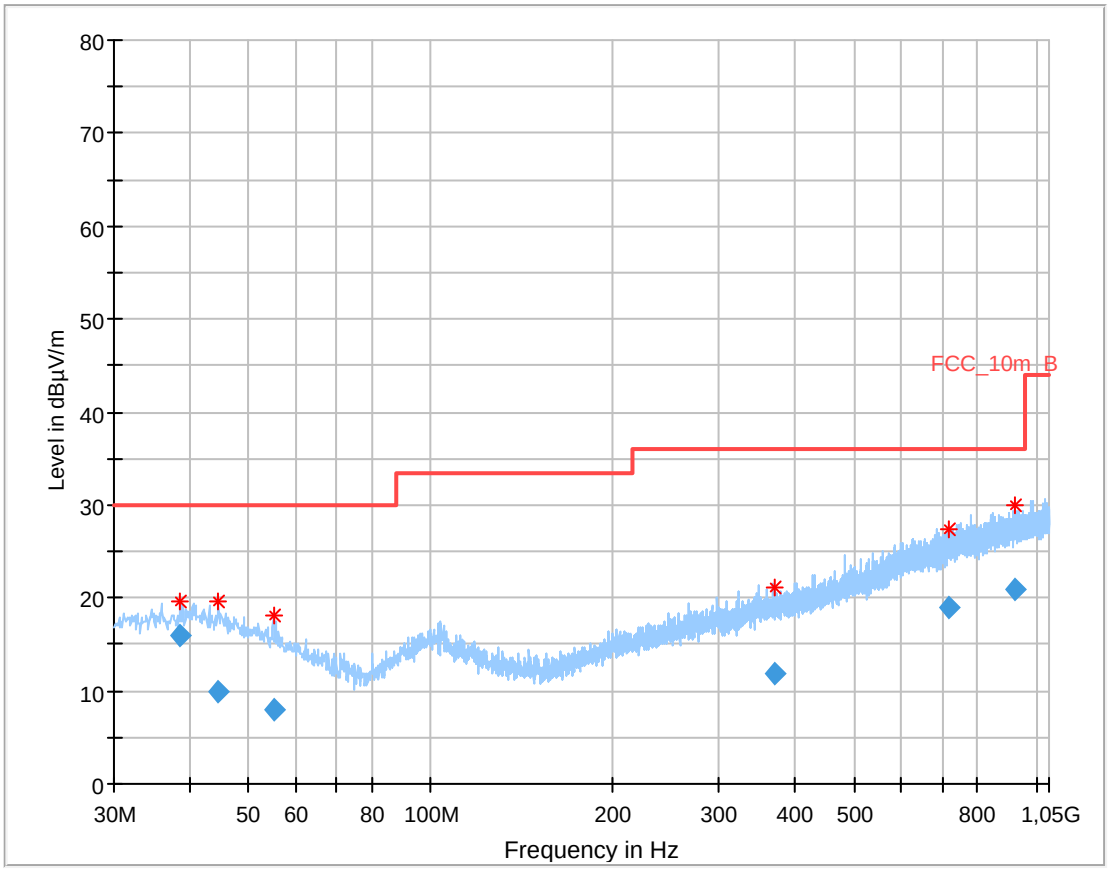
**Plot 2:** 30 MHz to 1 GHz, TX mode, channel 19, vertical & horizontal polarization, transmit mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.985750 | 10.38 | 30.00 | 19.62 | 1000.0 | 120.000 | 170.0 | V | 303.0 | 14.0 |
| 42.435300 | 9.30 | 30.00 | 20.70 | 1000.0 | 120.000 | 101.0 | H | 310.0 | 13.9 |
| 406.863150 | 12.47 | 36.00 | 23.53 | 1000.0 | 120.000 | 170.0 | V | 253.0 | 17.0 |
| 541.344900 | 15.16 | 36.00 | 20.84 | 1000.0 | 120.000 | 170.0 | V | 350.0 | 19.2 |
| 730.163850 | 19.15 | 36.00 | 16.85 | 1000.0 | 120.000 | 170.0 | H | 282.0 | 22.2 |
| 946.206150 | 20.84 | 36.00 | 15.16 | 1000.0 | 120.000 | 98.0 | V | 149.0 | 24.3 |

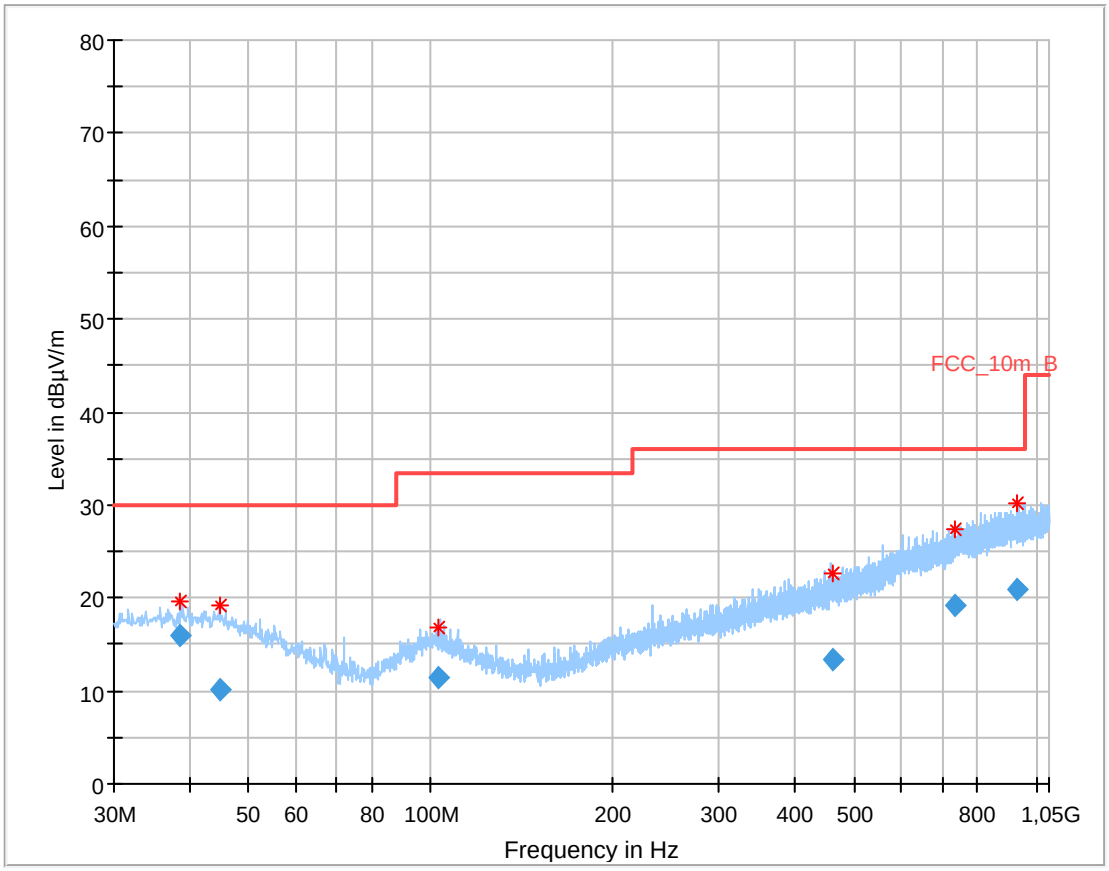
**Plot 3:** 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization, transmit mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.693400 | 15.85 | 30.00 | 14.15 | 1000.0 | 120.000 | 100.0 | V | 219.0 | 14.0 |
| 44.478750 | 9.88 | 30.00 | 20.12 | 1000.0 | 120.000 | 101.0 | H | 318.0 | 13.9 |
| 55.122750 | 7.98 | 30.00 | 22.02 | 1000.0 | 120.000 | 170.0 | V | 289.0 | 11.8 |
| 369.943950 | 11.93 | 36.00 | 24.07 | 1000.0 | 120.000 | 170.0 | H | 168.0 | 16.4 |
| 719.617800 | 18.91 | 36.00 | 17.09 | 1000.0 | 120.000 | 170.0 | V | 246.0 | 22.0 |
| 921.322950 | 20.90 | 36.00 | 15.10 | 1000.0 | 120.000 | 101.0 | V | 51.0 | 24.2 |

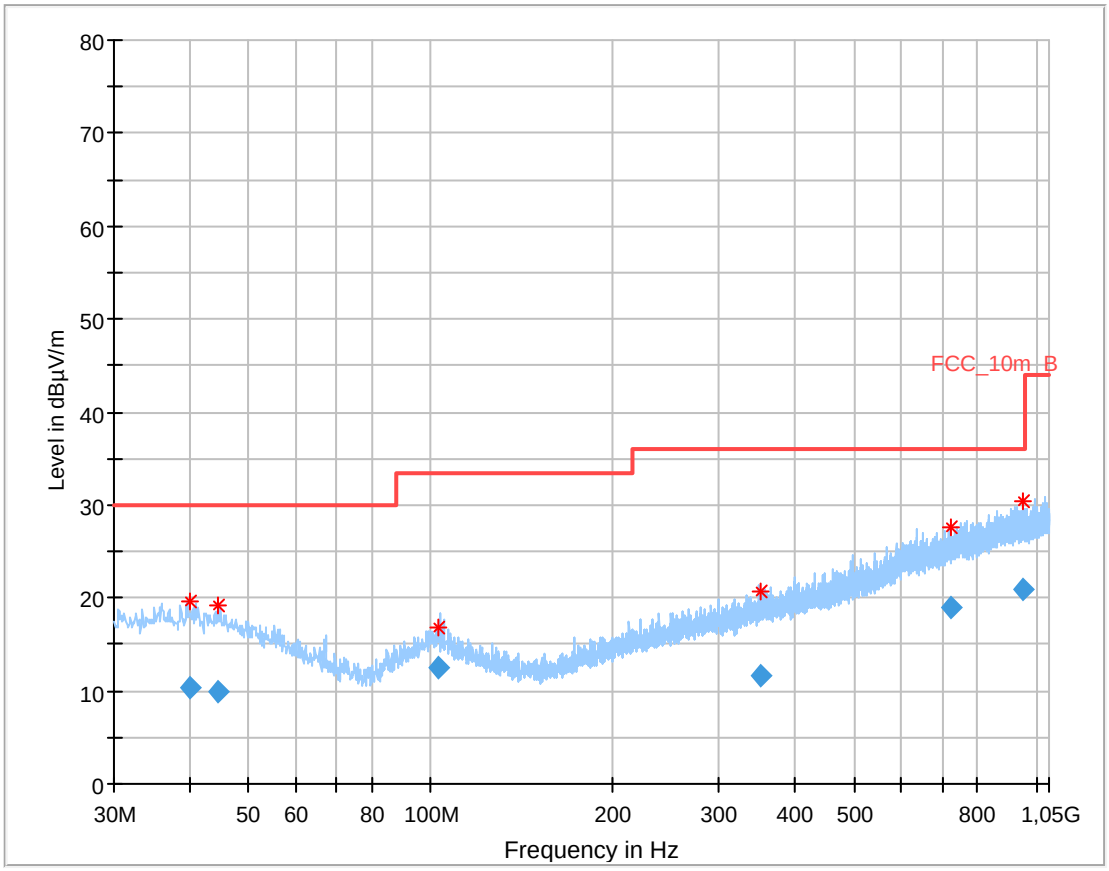
**Plot 4:** 30 MHz to 1 GHz, channel 0, vertical & horizontal polarization, receive mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 38.699400 | 15.97 | 30.00 | 14.03 | 1000.0 | 120.000 | 101.0 | V | 353.0 | 14.0 |
| 44.755050 | 10.03 | 30.00 | 19.97 | 1000.0 | 120.000 | 101.0 | V | 241.0 | 13.9 |
| 102.958950 | 11.34 | 33.50 | 22.16 | 1000.0 | 120.000 | 170.0 | V | 339.0 | 11.9 |
| 461.205450 | 13.44 | 36.00 | 22.56 | 1000.0 | 120.000 | 170.0 | H | 36.0 | 17.9 |
| 735.148950 | 19.24 | 36.00 | 16.76 | 1000.0 | 120.000 | 98.0 | V | 327.0 | 22.4 |
| 931.432200 | 20.90 | 36.00 | 15.10 | 1000.0 | 120.000 | 170.0 | V | 86.0 | 24.2 |

**Plot 5:** 30 MHz to 1 GHz, channel 39, vertical & horizontal polarization, receive mode, antenna L5




**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 40.154550 | 10.43 | 30.00 | 19.57 | 1000.0 | 120.000 | 104.0 | V | 9.0 | 14.0 |
| 44.558850 | 9.94 | 30.00 | 20.06 | 1000.0 | 120.000 | 101.0 | H | 348.0 | 13.9 |
| 103.015050 | 12.58 | 33.50 | 20.92 | 1000.0 | 120.000 | 98.0 | V | 168.0 | 11.9 |
| 351.505350 | 11.67 | 36.00 | 24.33 | 1000.0 | 120.000 | 170.0 | V | 123.0 | 16.0 |
| 721.162650 | 18.89 | 36.00 | 17.11 | 1000.0 | 120.000 | 98.0 | H | 25.0 | 22.0 |
| 948.565650 | 20.96 | 36.00 | 15.04 | 1000.0 | 120.000 | 98.0 | H | 287.0 | 24.3 |

## 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 19 and channel 39. The measurement is performed in the mode with the highest output power.

| 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 (Average) | 3 |
| Above 960 | 74.0 (Peak) | 3 |

**Results:** Transmitter mode, EUT SAMPLE #12 BT LE, antenna L5

| 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] |
| All detected emissions are more than 20 dB below the limit. | | | | | | | | |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |

**Results:** Receiver mode, EUT SAMPLE #12 BT LE, antenna L5

| RX spurious emissions radiated [dBµV/m] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2401 MHz | | | 2440 MHz | | | 2480 MHz | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | | | | | | | |
| 2401 | Peak | 47.9 | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | 43.4 | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |

**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)

**Results:** Transmitter mode, EUT SAMPLE #12 2 Mbps propr: , antenna L5

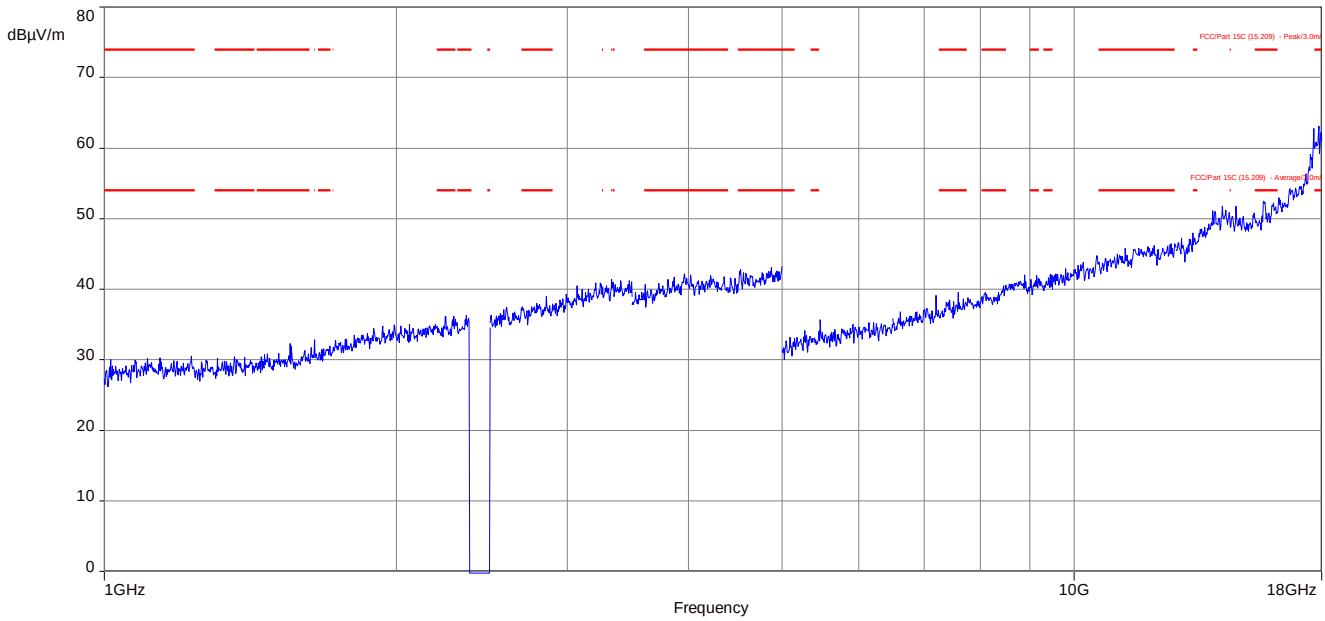
| TX spurious emissions radiated [dBµV/m] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2402 MHz | | | 2440 MHz | | | 2480 MHz | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | | | | | | | |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |

**Results:** Receiver mode, EUT SAMPLE #12 2 Mbps propr: , antenna L5

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

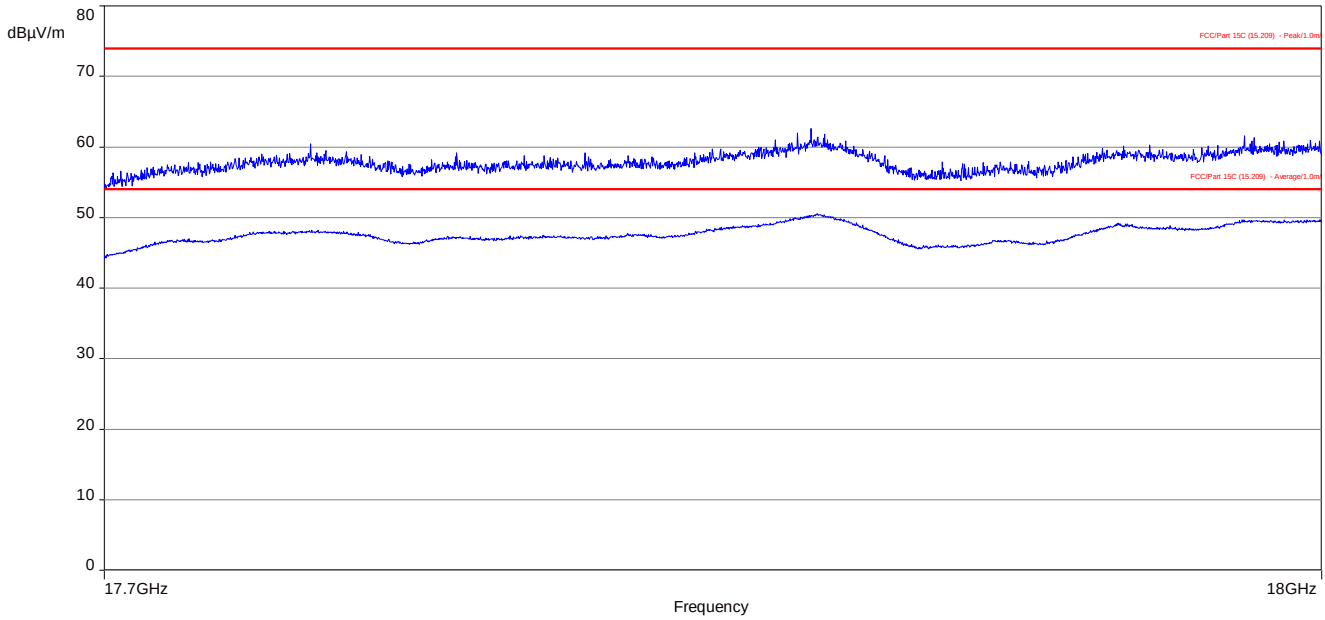
**Plots:** Transmitter mode, EUT SAMPLE #12 BT LE, antenna L5

**Plot 1:** 1 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5

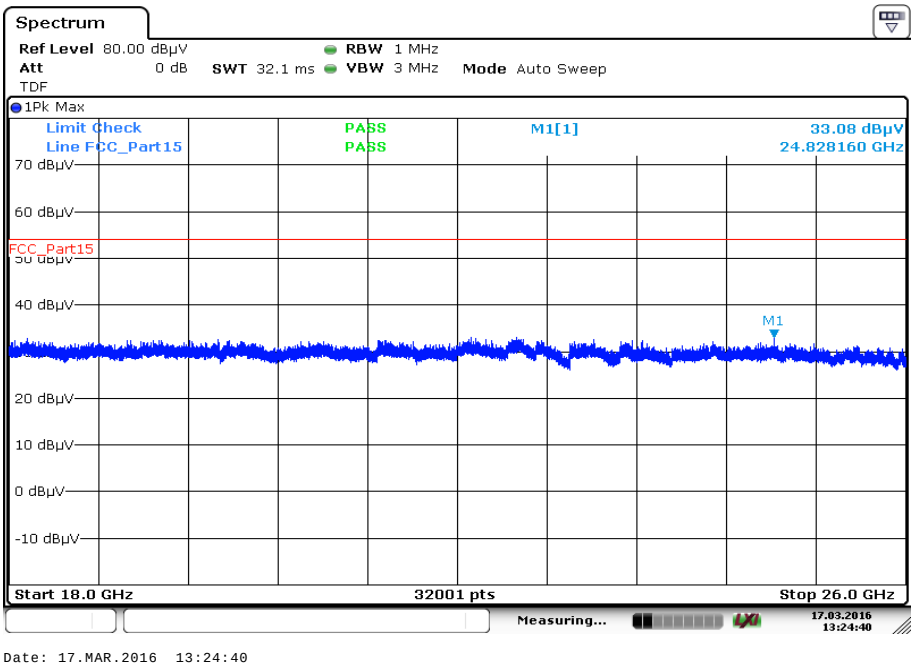



The carrier signal is notched with a 2.4 GHz band rejection filter.

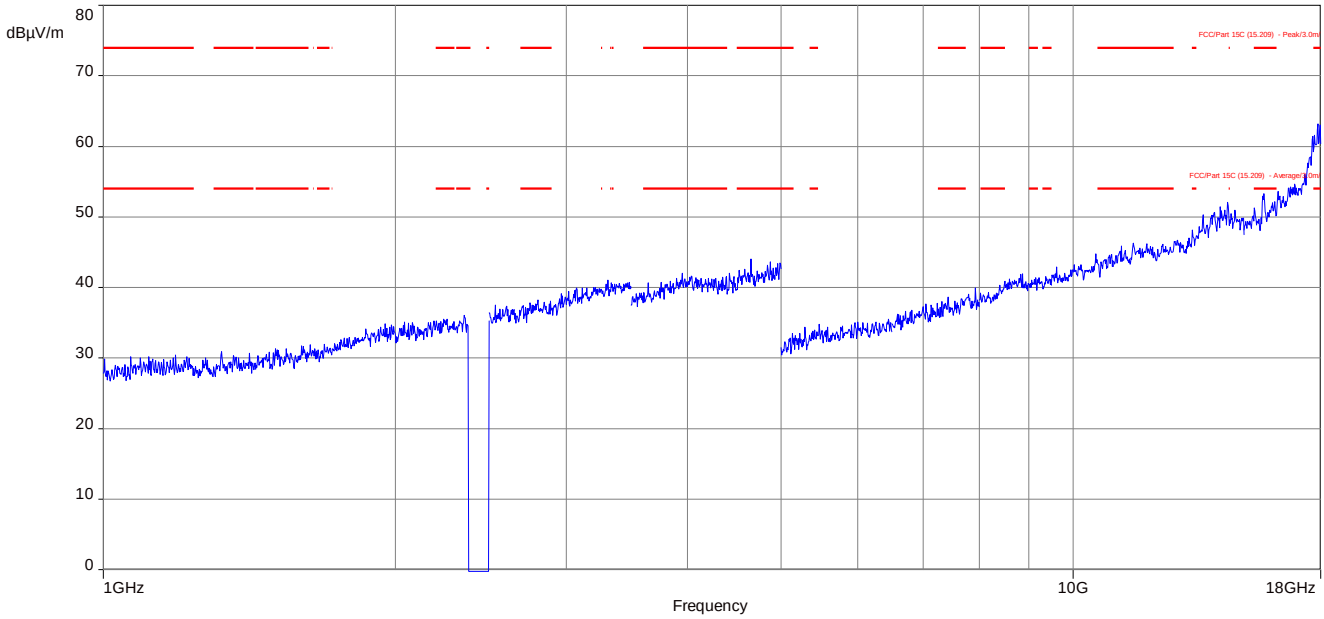
**Plot 2:** 17.7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5



**Plot 3:** 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5

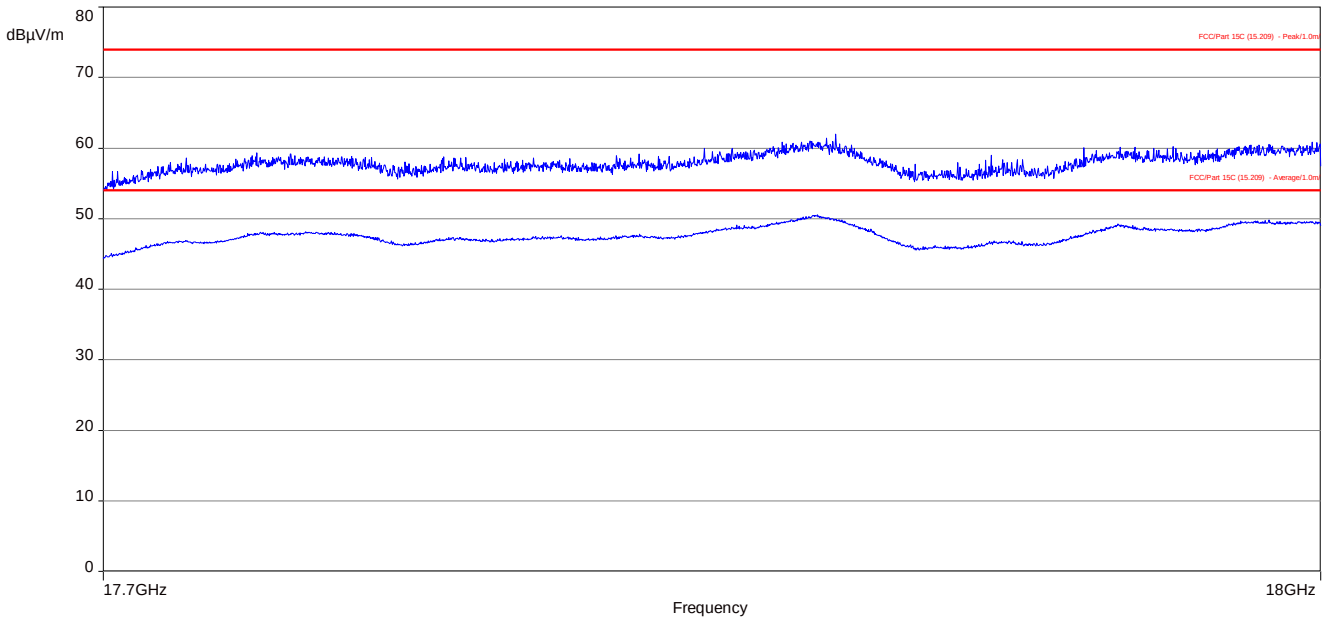



**Plot 4:** 1 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5

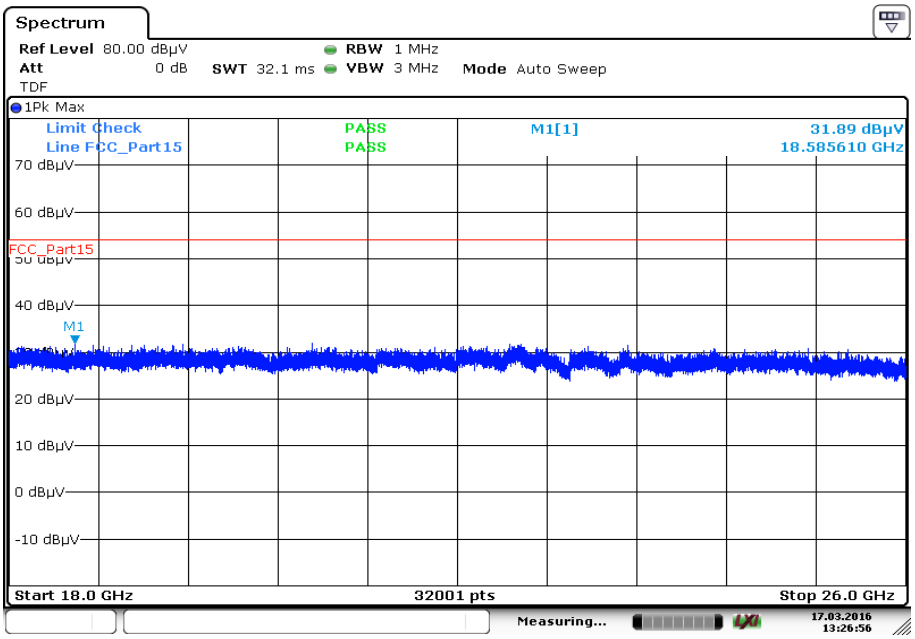



The carrier signal is notched with a 2.4 GHz band rejection filter.

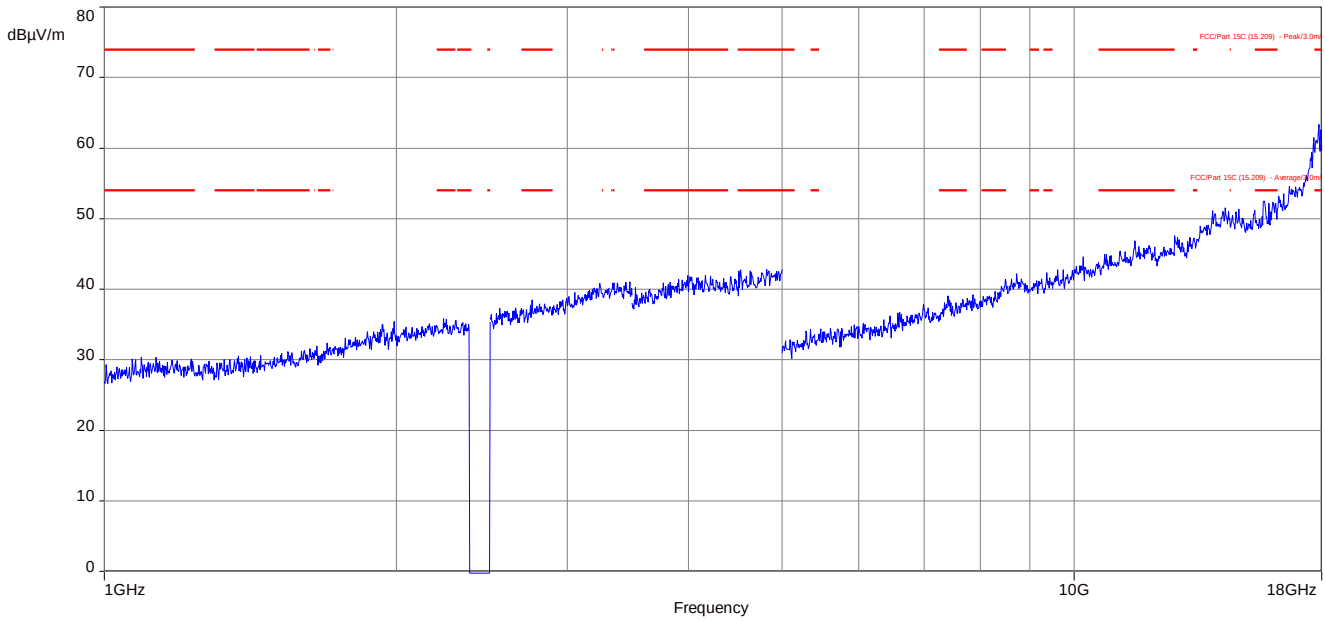
**Plot 5:** 17.7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5




**Plot 6:** 18 GHz to 26 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5

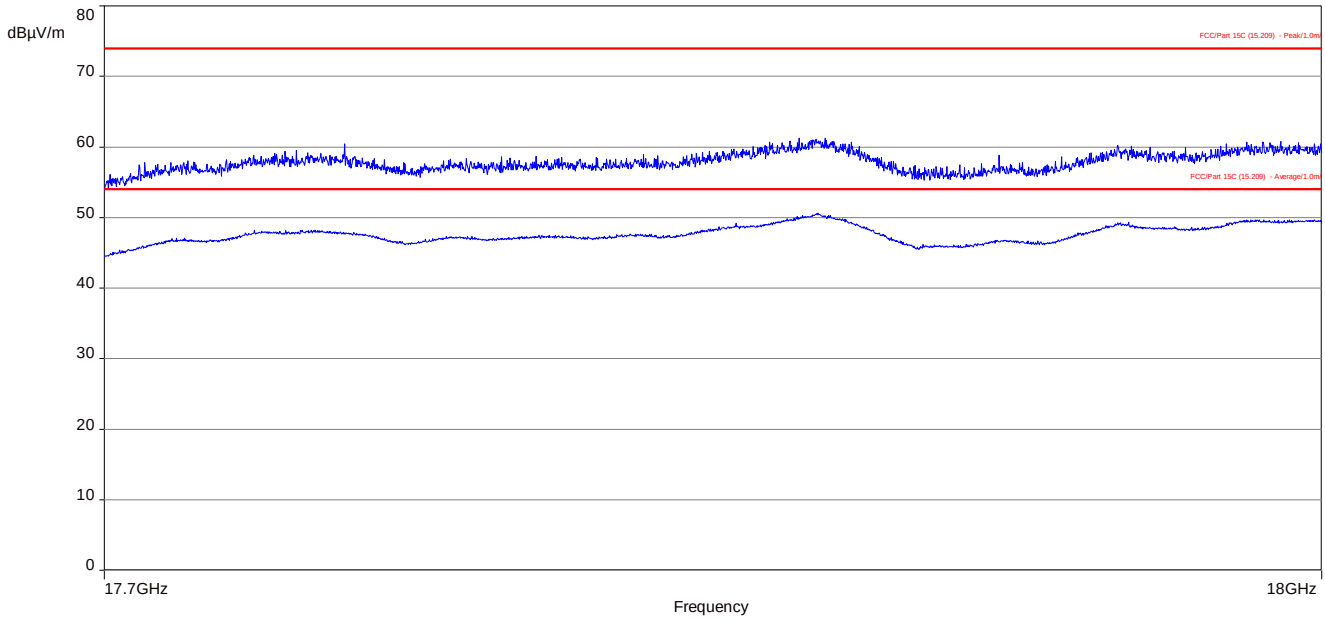


**Plot 7:** 1 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

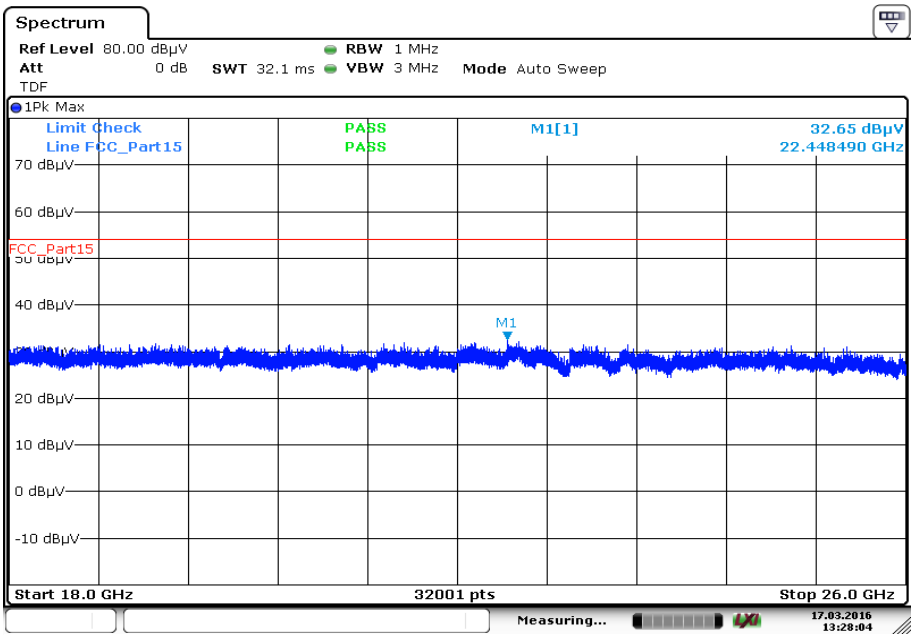



The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 8:** 17.7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

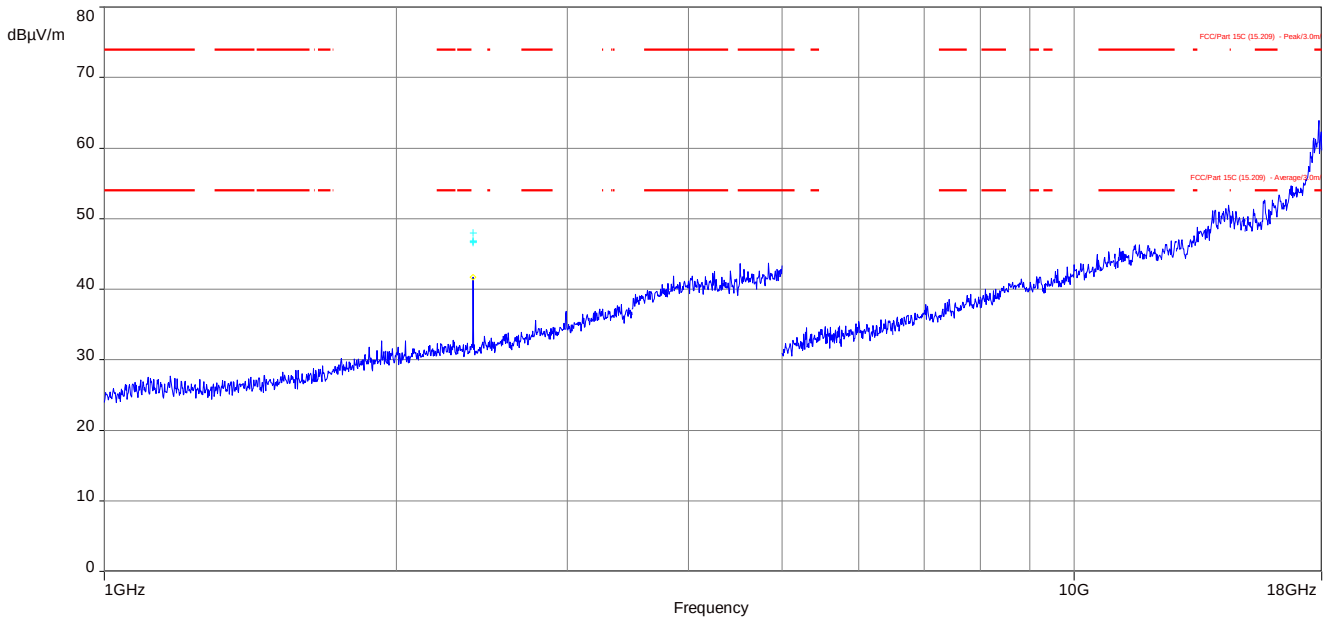


**Plot 9:** 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

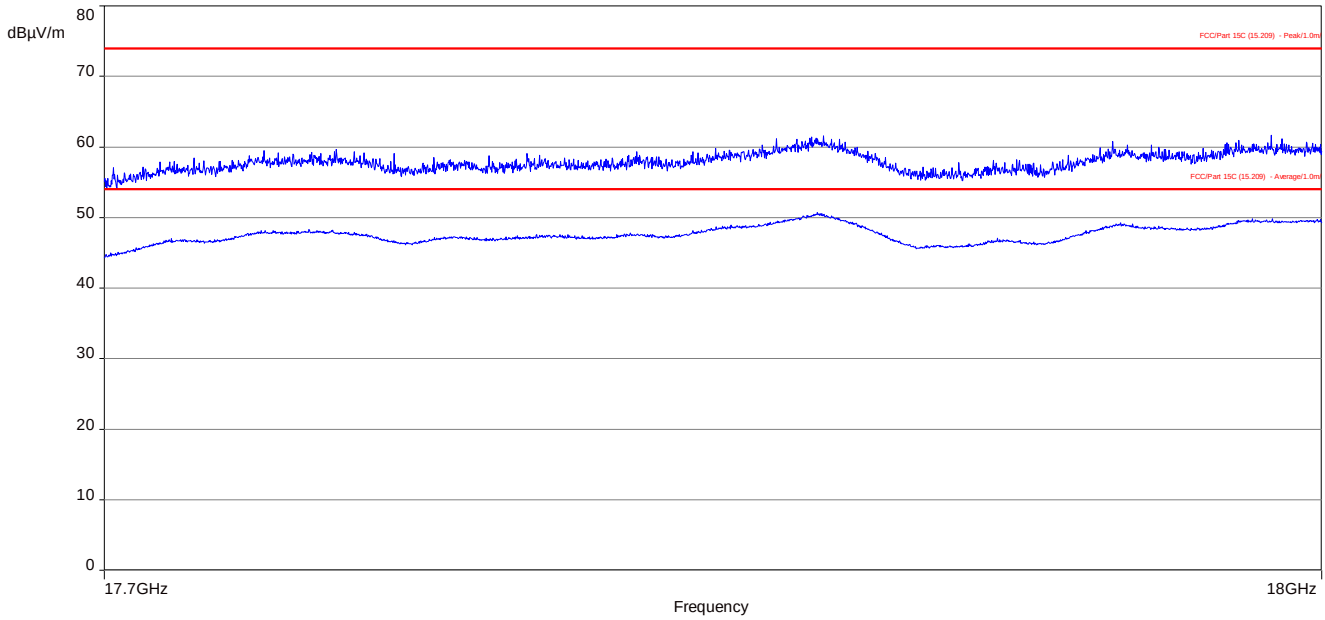


**Plots:** Receiver mode, EUT SAMPLE #12 BT LE, antenna L5

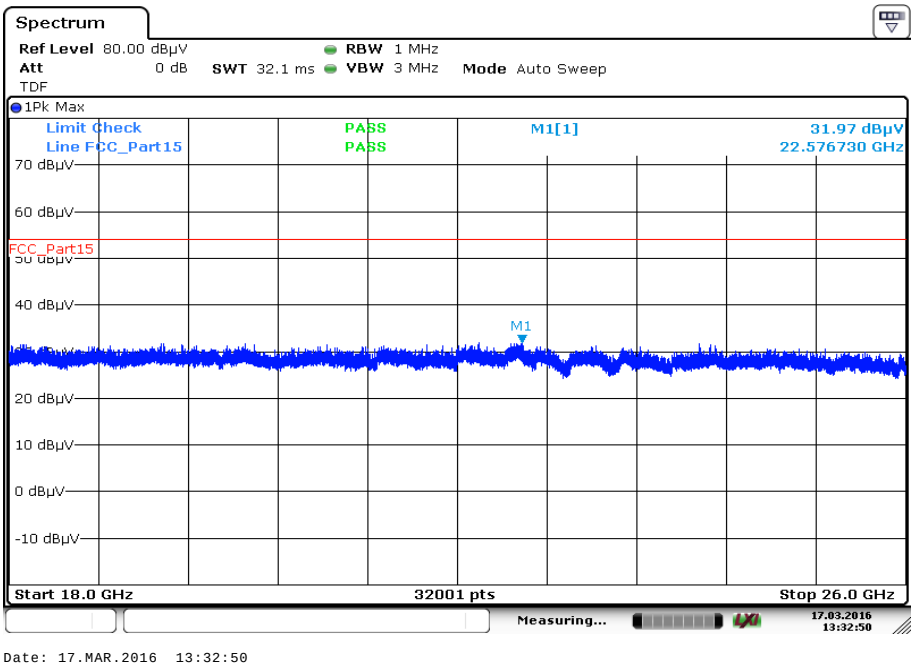
**Plot 1:** 1 GHz to 18 GHz, channel 0, vertical & horizontal polarization, antenna L5



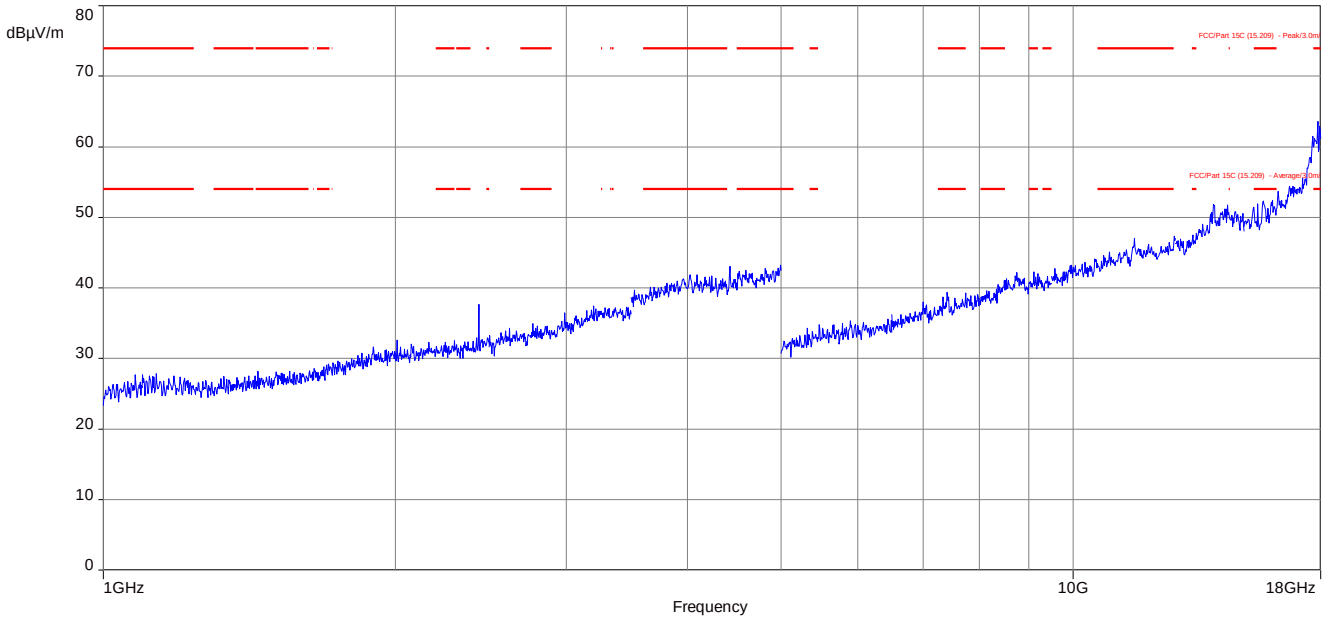

**Plot 2:** 17.7 GHz to 18 GHz, channel 0, vertical & horizontal polarization, antenna L5



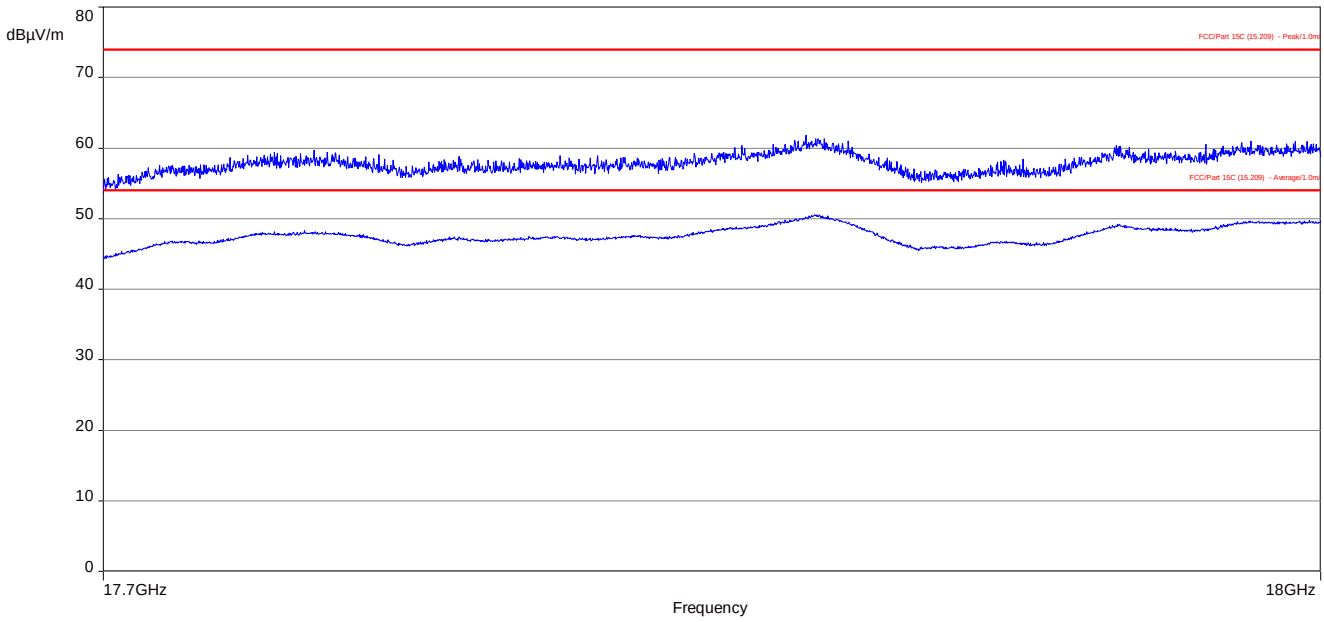
**Plot 3:** 18 GHz to 26 GHz, channel 0, vertical & horizontal polarization, antenna L5



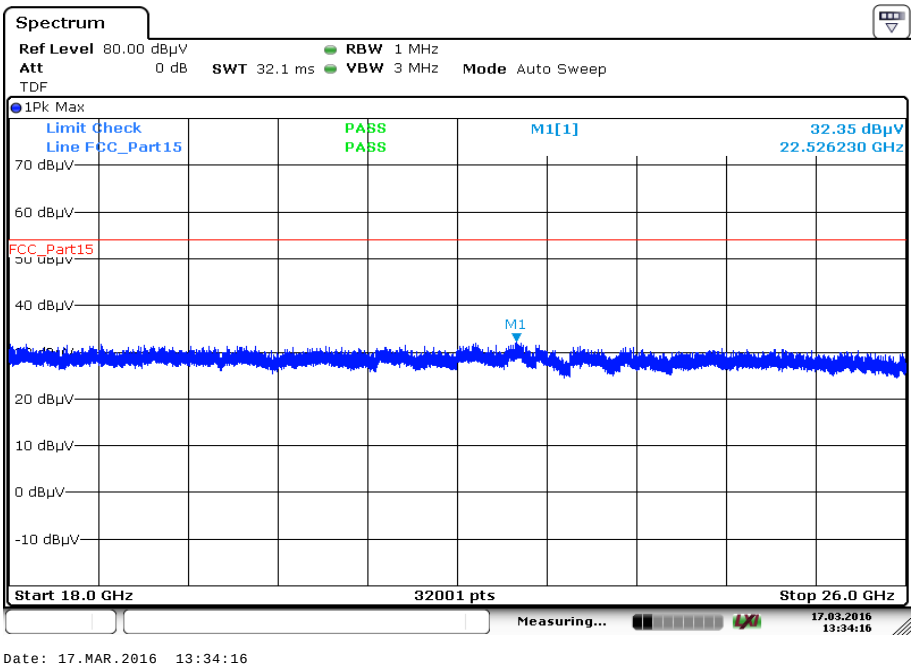

**Plot 4:** 1 GHz to 18 GHz, channel 19, vertical & horizontal polarization, antenna L5



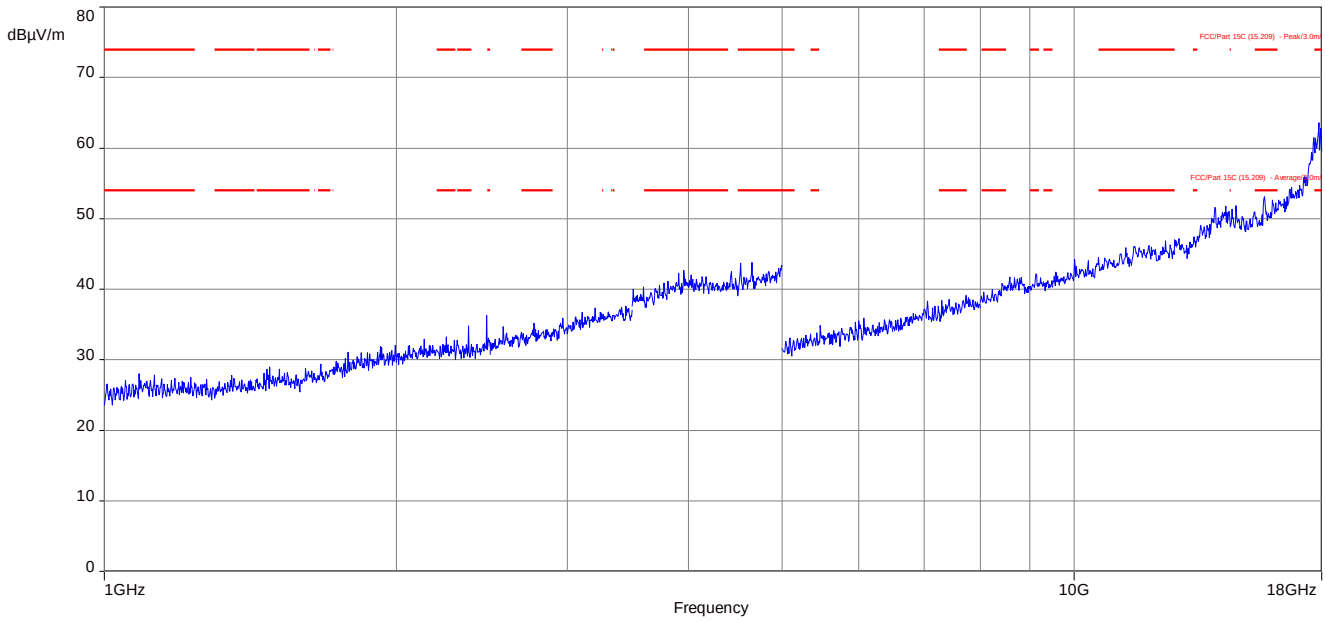
**Plot 5:** 17.7 GHz to 18 GHz, channel 19, vertical & horizontal polarization, antenna L5



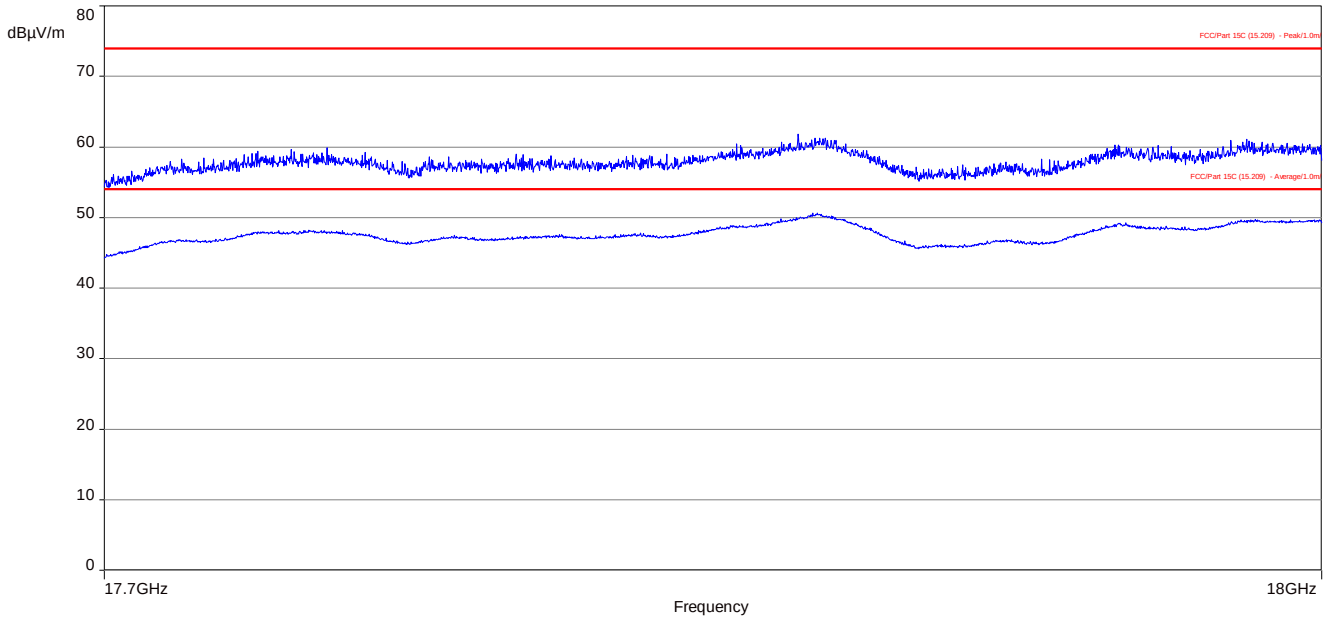

**Plot 6:** 18 GHz to 26 GHz, channel 19, vertical & horizontal polarization, antenna L5



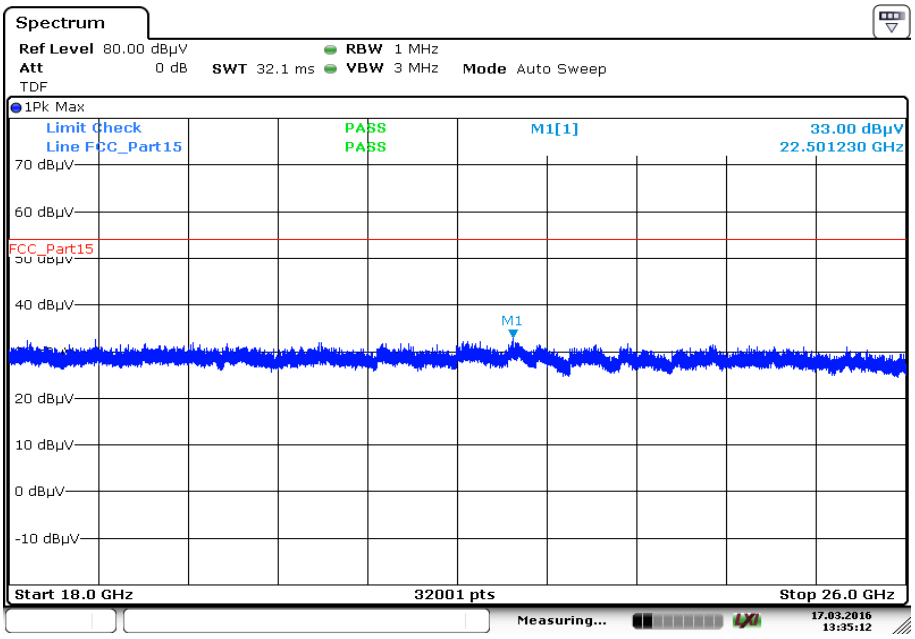
**Plot 7:** 1 GHz to 18 GHz, channel 39, vertical & horizontal polarization, antenna L5




**Plot 8:** 17.7 GHz to 18 GHz, channel 39, vertical & horizontal polarization, antenna L5

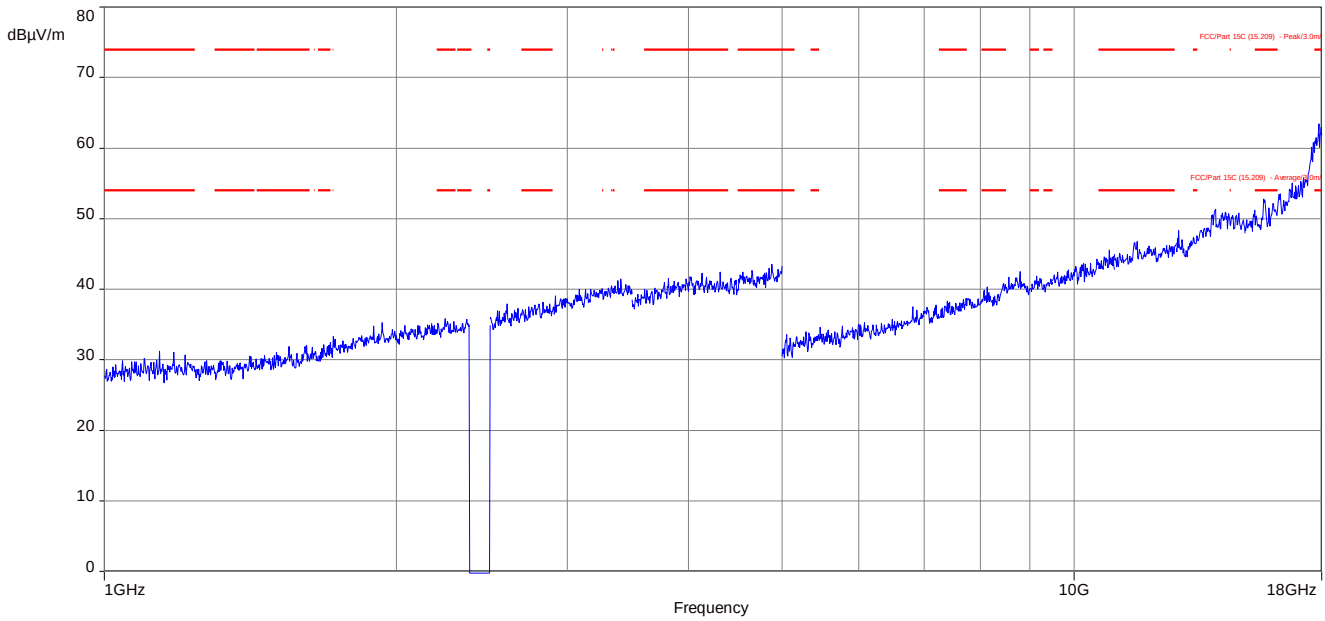


**Plot 9:** 18 GHz to 26 GHz, channel 39, vertical & horizontal polarization, antenna L5



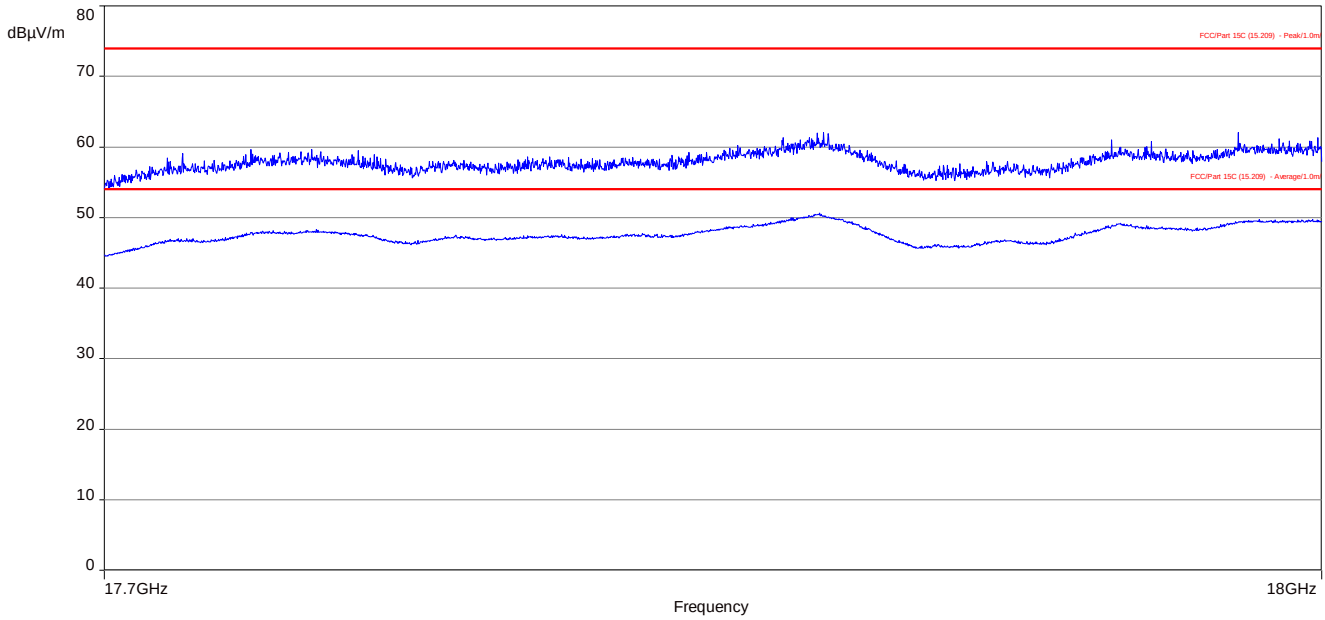
**Plots:** Transmitter mode, EUT SAMPLE #12 2 Mbps propr: , antenna L5

**Plot 1:** 1 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5

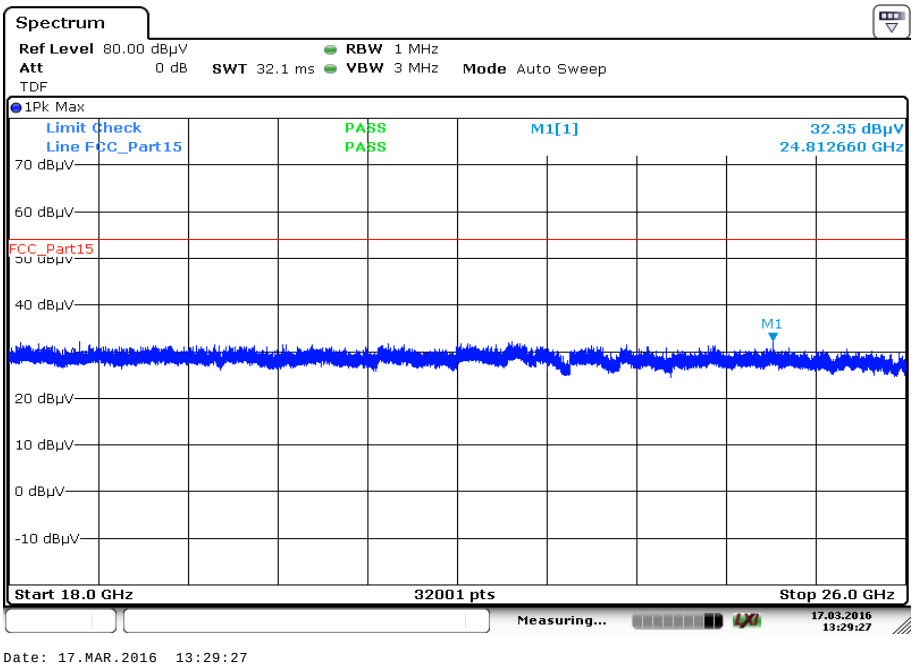



The carrier signal is notched with a 2.4 GHz band rejection filter.

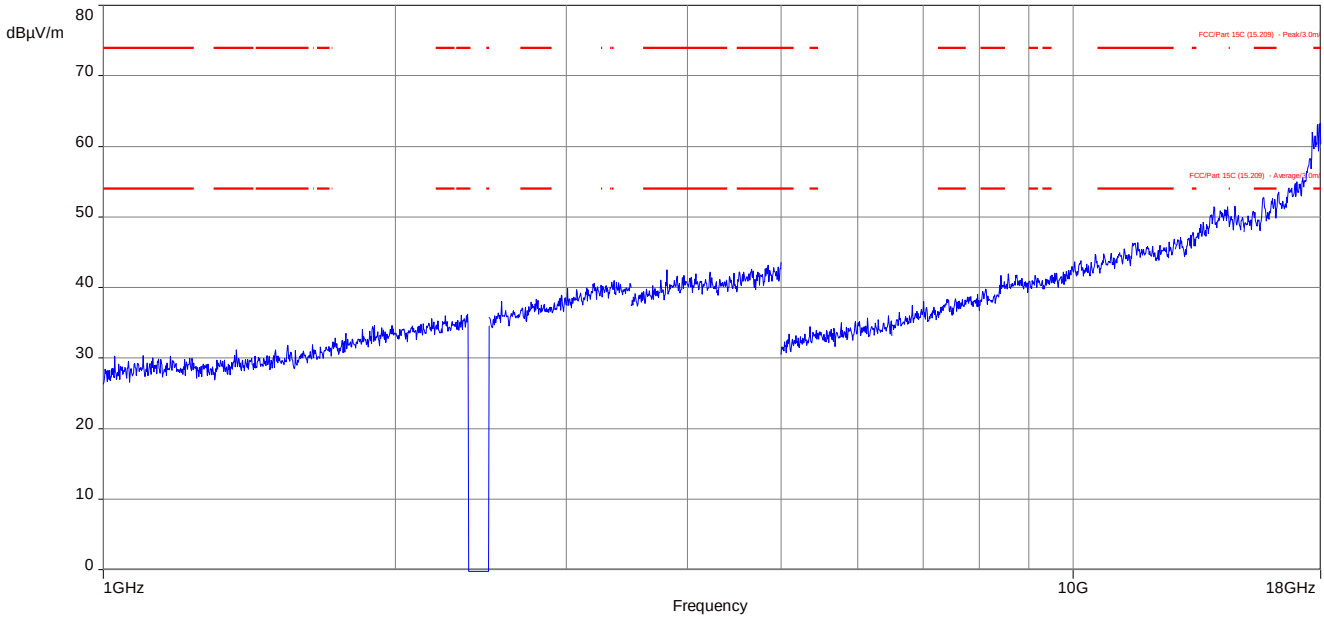
**Plot 2:** 17.7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5



**Plot 3:** 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization, antenna L5

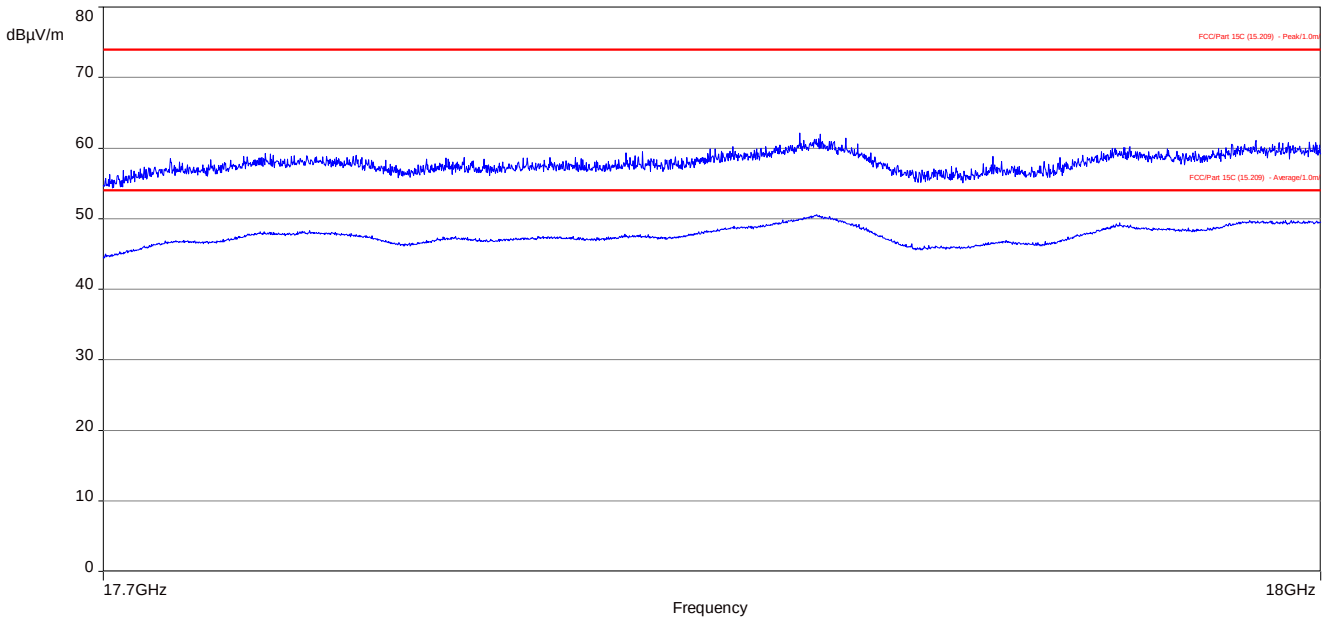



**Plot 4:** 1 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5

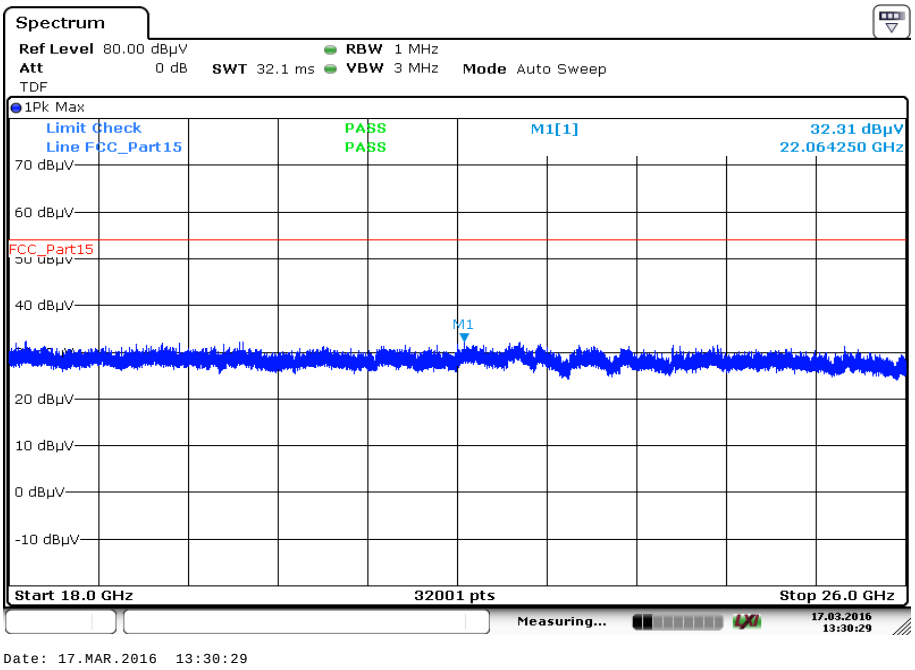



The carrier signal is notched with a 2.4 GHz band rejection filter.

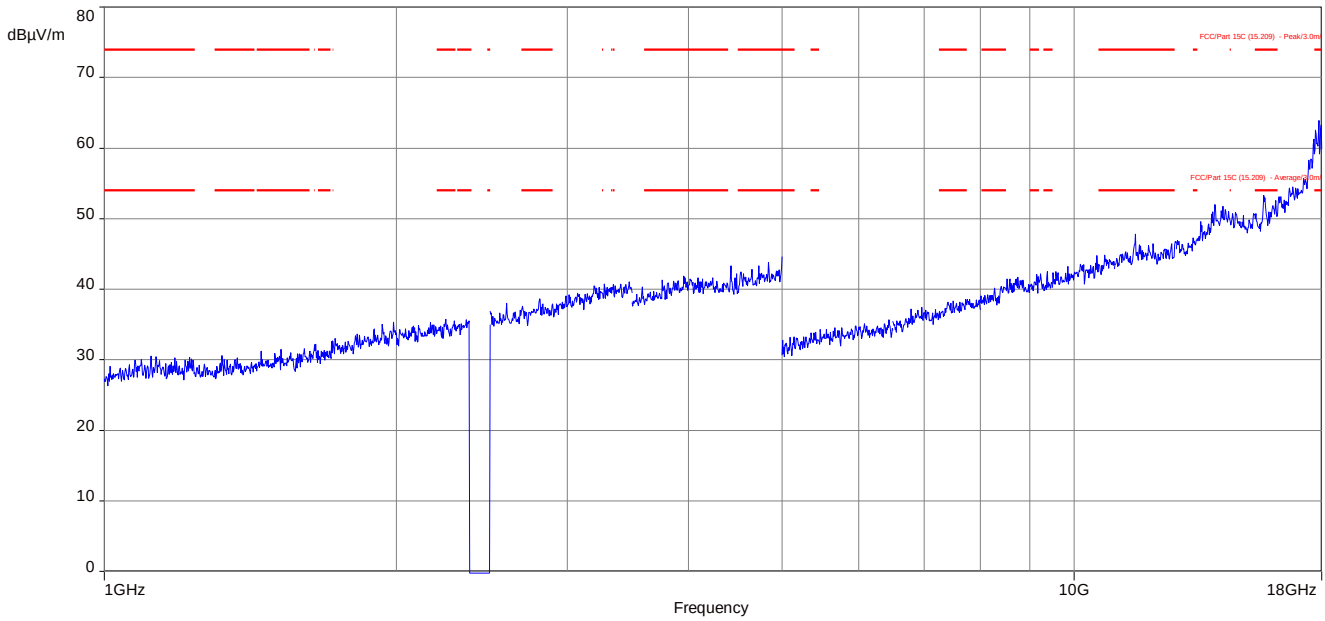
**Plot 5:** 17.7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5




**Plot 6:** 18 GHz to 26 GHz, TX mode, channel 19, vertical & horizontal polarization, antenna L5

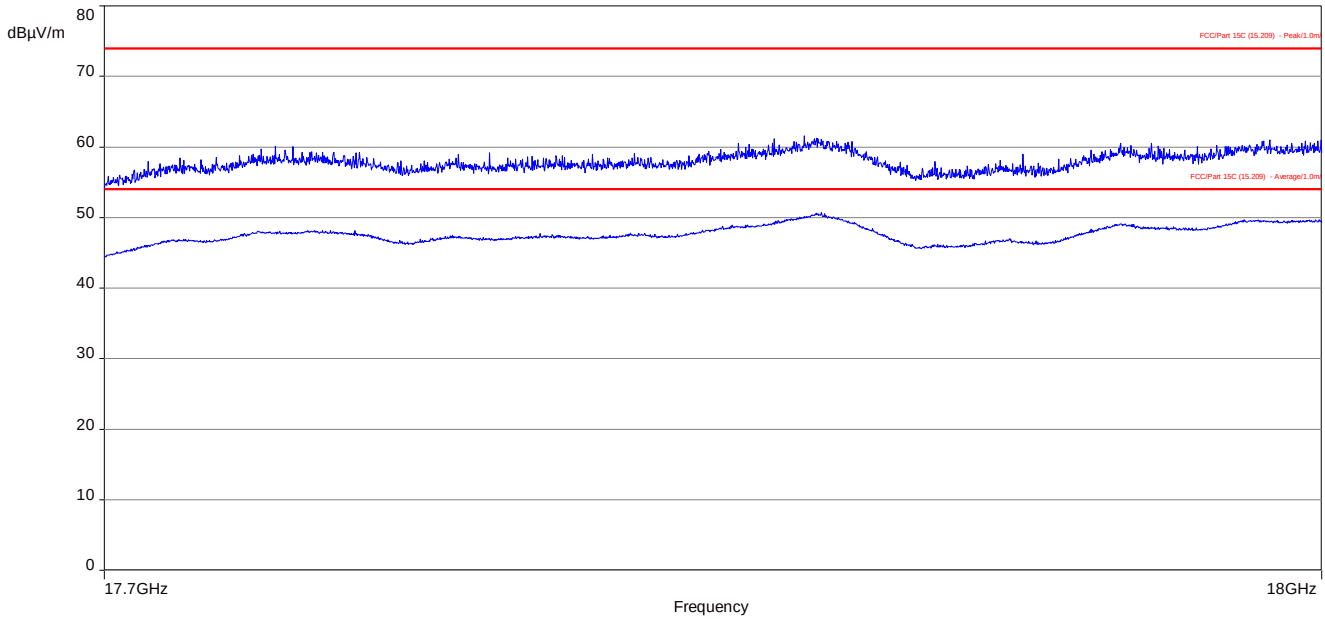


**Plot 7:** 1 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

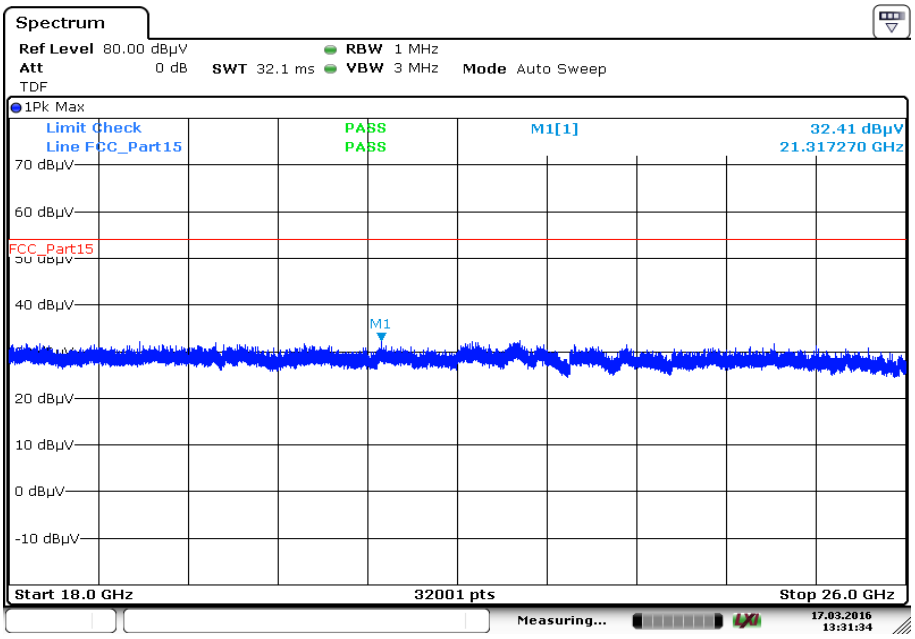



The carrier signal is notched with a 2.4 GHz band rejection filter.

**Plot 8:** 17.7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

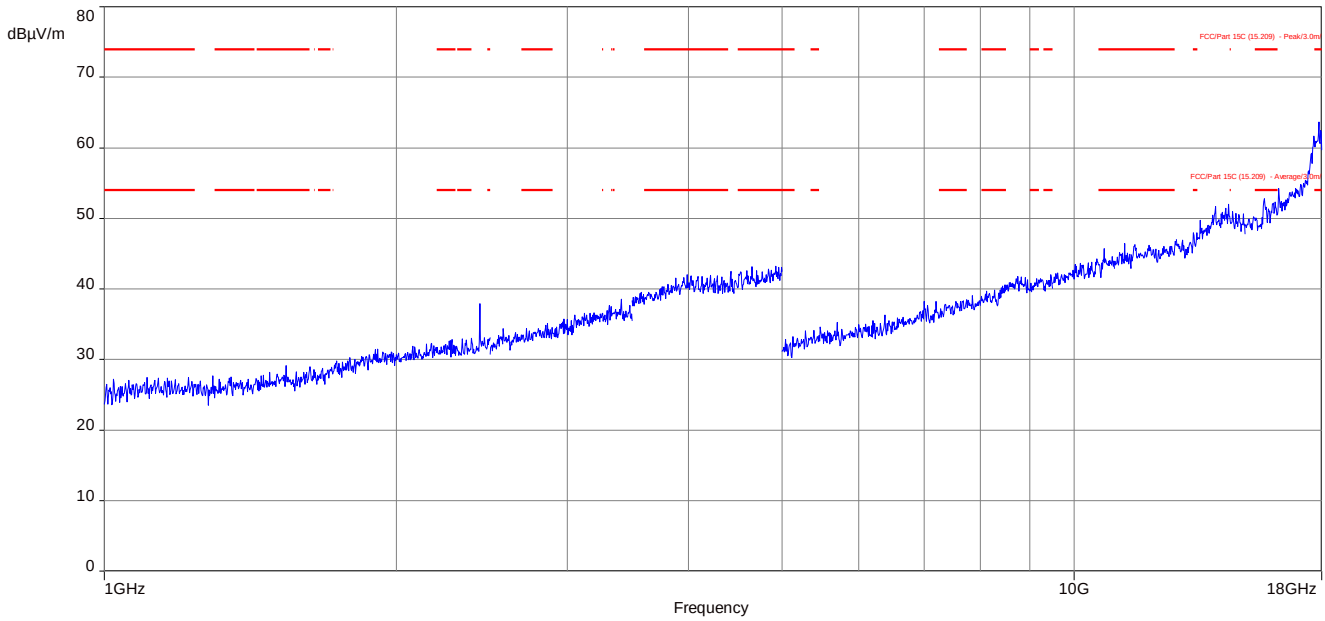


**Plot 9:** 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization, antenna L5

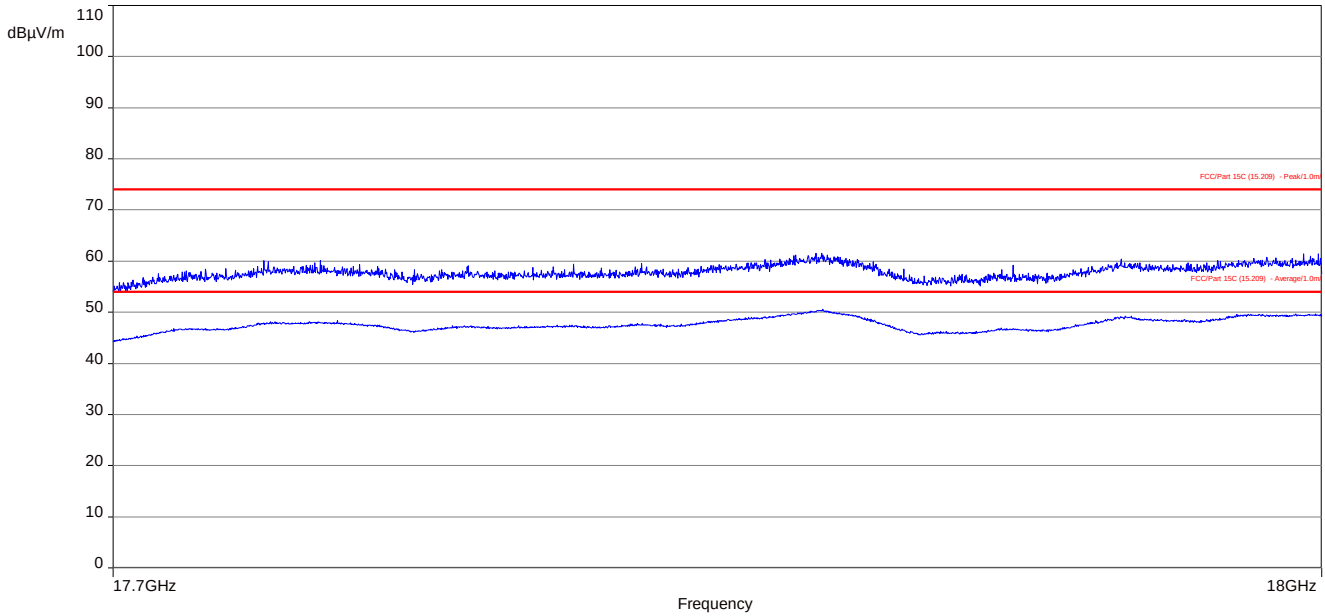


**Plots:** Receiver mode, EUT SAMPLE #12 2 Mbps propr, antenna L5

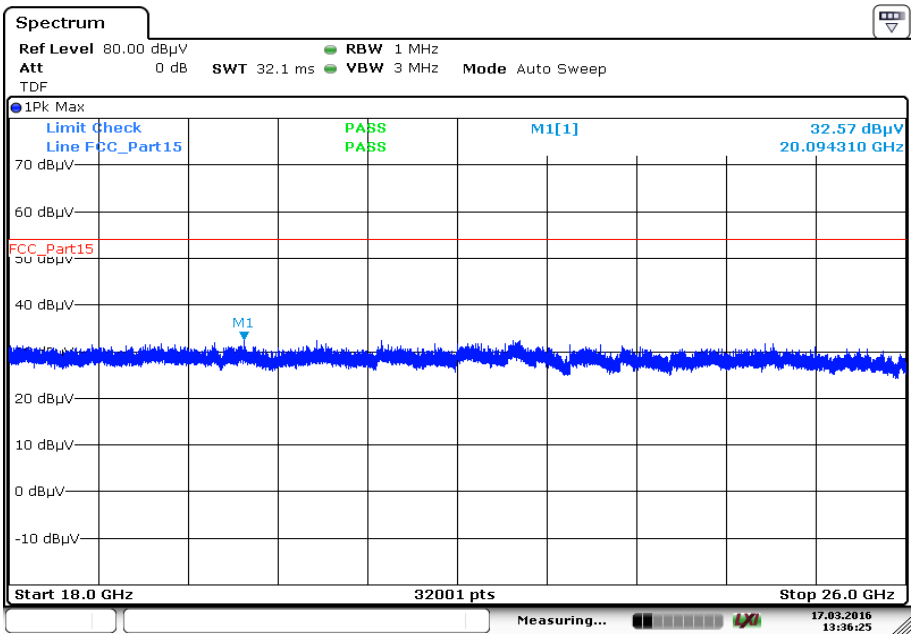
**Plot 1:** 1 GHz to 18 GHz, channel 19, vertical & horizontal polarization, antenna L5




**Plot 2:** 17.7 GHz to 18 GHz, channel 19, vertical & horizontal polarization, antenna L5



**Plot 3:** 18 GHz to 26 GHz, channel 19, vertical & horizontal polarization, antenna L5



## 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 | 2016-04-18 |

## 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

DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

**Beliehene 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**

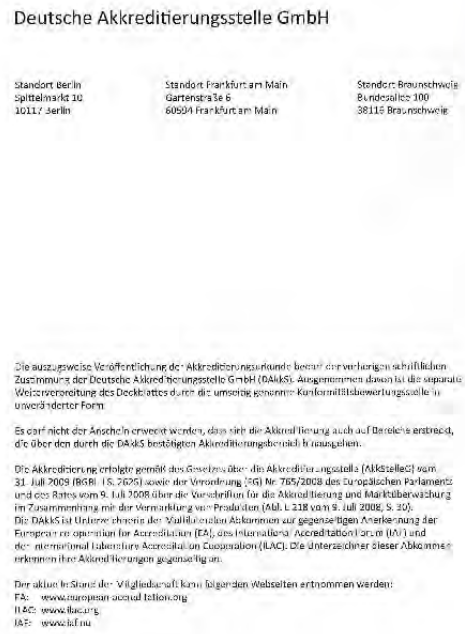
Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

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

Frankfurt am Main, 07.03.2014

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

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Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (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 (Abl. L 218 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

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EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

**Note:**
**The current certificate including annex may be received from CETECOM ICT Services on request.**