
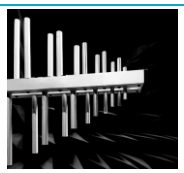
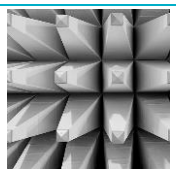

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

# TEST REPORT

**Test report no.: 1-4809/17-01-02-D**

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

## Testing laboratory


**CTC advanced GmbH**
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
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Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.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-12076-01-03

## Applicant


**ADC Automotive Distance Control Systems GmbH**
Peter-Dornier-Str. 10
88131 Lindau/Bodensee / GERMANY
Phone: 08382 9699 - 0
Fax: +49 8382 9699-22435
Contact: Frank Gruson
e-mail: frank.gruson@continental-corporation.com
Phone: +49 8382 9699-435


## Manufacturer


**Conti Temic microelectronic GmbH**
Ringlerstrasse 17
85057 Ingolstadt / GERMANY


## Test standard/s

| | |
|---|---|
| 47 CFR Part 15 | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |
| RSS - 310 Issue 4 | Licence-Exempt Radio Apparatus: Category II Equipment |

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

## Test Item

| | |
|---|---|
| **Kind of test item:** | **SRD for RTTT (for blind spot detection)** |
| **Model name:** | **SRR2-A** |
| **FCC ID:** | **OAYSRR2A** |
| Frequency: | 24.00 – 24.25 GHz |
| Antenna: | Integrated planar patch antenna |
| Power supply: | 9.0 V to 16.0 V DC |
| Temperature range: | -40°C to +85°C |

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

## Test report authorized:

B. Gerber

cn=Benedikt Gerber, o=CTC advanced GmbH, ou=GRB-180503, email=benedikt.gerber@ctcadvanced.com, c=DE
2019.04.05 14:10:14 +02'00'

Benedikt Gerber
Lab Manager
Radio Communications & EMC

## Test performed:

Geraldy Karsten

cn=Karsten Geraldy, o=CTC advanced GmbH, ou=GER-2017-03-14, email=Karsten.Geraldy@ctcadvanced.com, c=DE
2019.04.05 13:55:46 +02'00'

Karsten Geraldy
Lab Manager
Radio Communications & EMC

# 1 Table of contents

# 2 General information

## 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

**This test report replaces the test report with the number 1-4809/17-01-02-C and dated 2019-02-01**

## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2017-07-26 |
| Date of receipt of test item: | 2017-11-20 |
| Start of test: | 2017-11-20 |
| End of test: | 2017-12-05 |
| Person(s) present during the test: | Mr. Raimund Münch |

## 2.3 Test laboratories sub-contracted

None

## 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 - 310 Issue 4 | July 2015 | Licence-Exempt Radio Apparatus: Category II Equipment |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Reference | Date | Description |
|---|---|---|
| | | |
| ANSI C63.4-2014 | 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 | 2013 | American national standard of procedures for compliance testing of unlicensed wireless devices |
| | | |

## 4 Test environment

| | | | |
|---|---|---|---|
| Temperature | : | $T_{nom}$<br>$T_{max}$<br>$T_{min}$ | +22 °C during room temperature tests<br>-/- °C during high temperature tests<br>-/- °C during low temperature tests |
| Relative humidity content | : | | 45 % |
| Barometric pressure | : | | 1021 hpa |
| Power supply | : | $V_{nom}$<br>$V_{max}$<br>$V_{min}$ | 13.5 V DC<br>16.0 V<br>9.0 V |

# 5 Test item

## 5.1 General description

| | | |
|---|---|---|
| Kind of test item | : | SRD for RTTT (for blind spot detection) |
| Type identification | : | SRR2-A |
| S/N serial number | : | FCC-Stop-Mode $f_{lmh}$: A2C735923000008217101623 2104<br>Normal Mode Master: A2C735923000008217101623 4346 |
| HW hardware status | : | A2C7547660300 |
| SW software status | : | 7.4.2 (special SW for stop mode: EVS 5.12.6) |
| Frequency band | : | 24.00 – 24.25 GHz |
| Type of modulation | : | FMCW |
| Number of channels | : | 1 |
| Antenna | : | Integrated planar patch antenna |
| Power supply | : | 9.0 V to 16.0 V DC |
| Temperature range | : | -40°C to +85°C |

## 5.2 Additional information

The customer provided following test samples for the measurements:

- Special test mode (EVS) with frequency sweep stopped at $f_{low}$, $f_{mid}$, $f_{high}$ as per CFR 47 Part 15.31(c)
- Normal operation mode (APP) with FMCW active.

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: 1-4809/17-01-02_AnnexA
1-4809/17-01-02_AnnexB
1-4809/17-01-02_AnnexC

# 6 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).

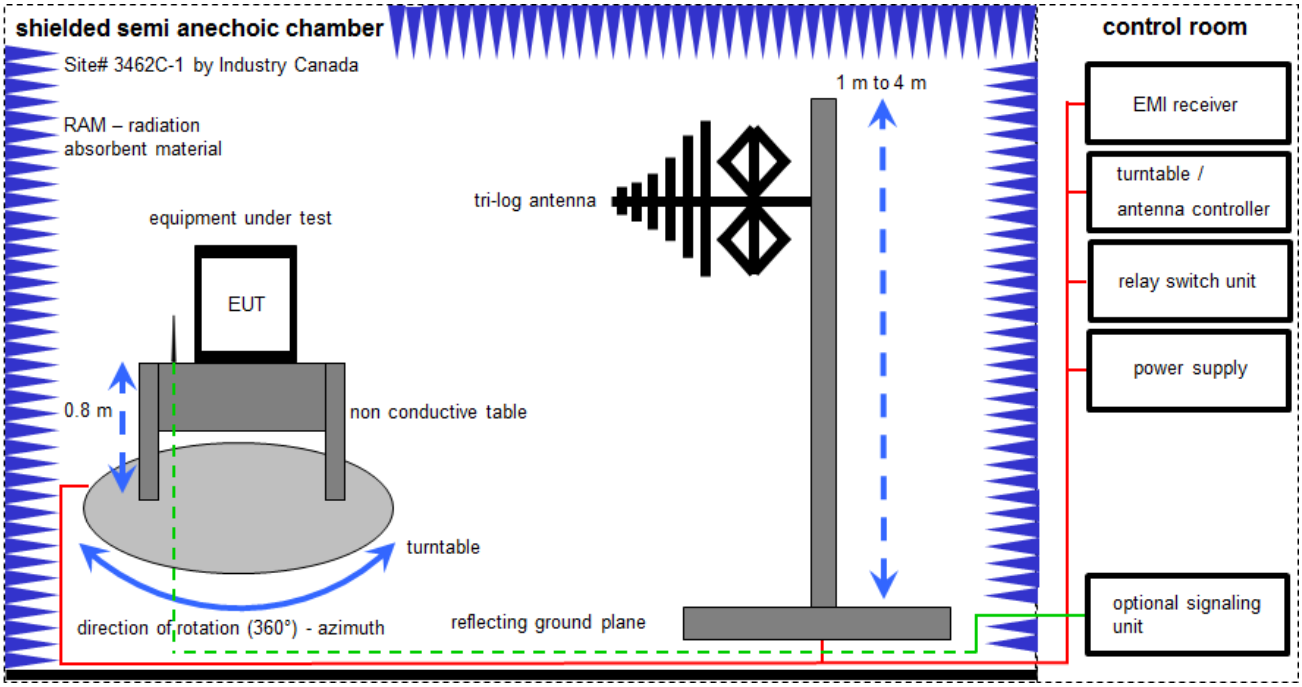
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**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 |

## 6.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz 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 conform to 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

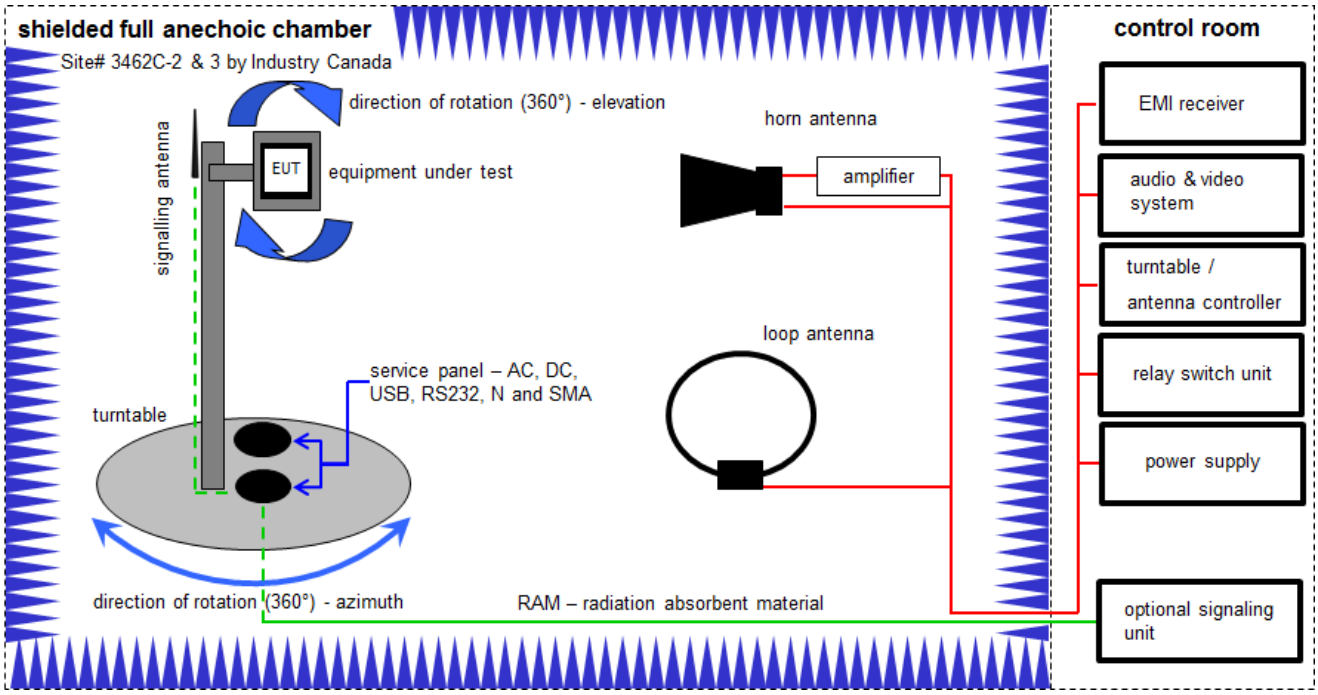
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

*Example calculation:*
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

**Equipment table:**

| No. | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|
| 1 | Switch-Unit | 3488A | HP | 2719A14505 | 300000368 | ev | -/- | -/- |
| 2 | DC power supply, 60Vdc, 50A, 1200 W | 6032A | HP | 2920A04466 | 300000580 | ne | -/- | -/- |
| 3 | Meßkabine 1 | HF-Absorberhalle | MWB AG 300023 | | 300000551 | ne | -/- | -/- |
| 4 | EMI Test Receiver | ESCI 3 | R&S | 100083 | 300003312 | k | 01.02.2017 | 31.01.2018 |
| 5 | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1 | SPS | A3509 07/0 0205 | 300003314 | vIKI! | 02.02.2016 | 01.02.2018 |
| 6 | Antenna Tower | Model 2175 | ETS-Lindgren | 64762 | 300003745 | izw | -/- | -/- |
| 7 | Positioning Controller | Model 2090 | ETS-Lindgren | 64672 | 300003746 | izw | -/- | -/- |
| 8 | Turntable Interface-Box | Model 105637 | ETS-Lindgren | 44583 | 300003747 | izw | -/- | -/- |
| 9 | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163 | Schwarzbeck | 295 | 300003787 | k | 25.04.2016 | 25.04.2018 |
| 10 | Spectrum-Analyzer | FSU26 | R&S | 200809 | 300003874 | k | 31.01.2017 | 30.01.2018 |
| 11 | Double Ridge Broadband Horn Antenna 1-10 GHz | BBHA9120 B | Schwarzbeck | 188 | 300003896 | k | 20.05.2015 | 20.05.2018 |

## 6.2 Shielded fully anechoic chamber




Measurement distance: 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)

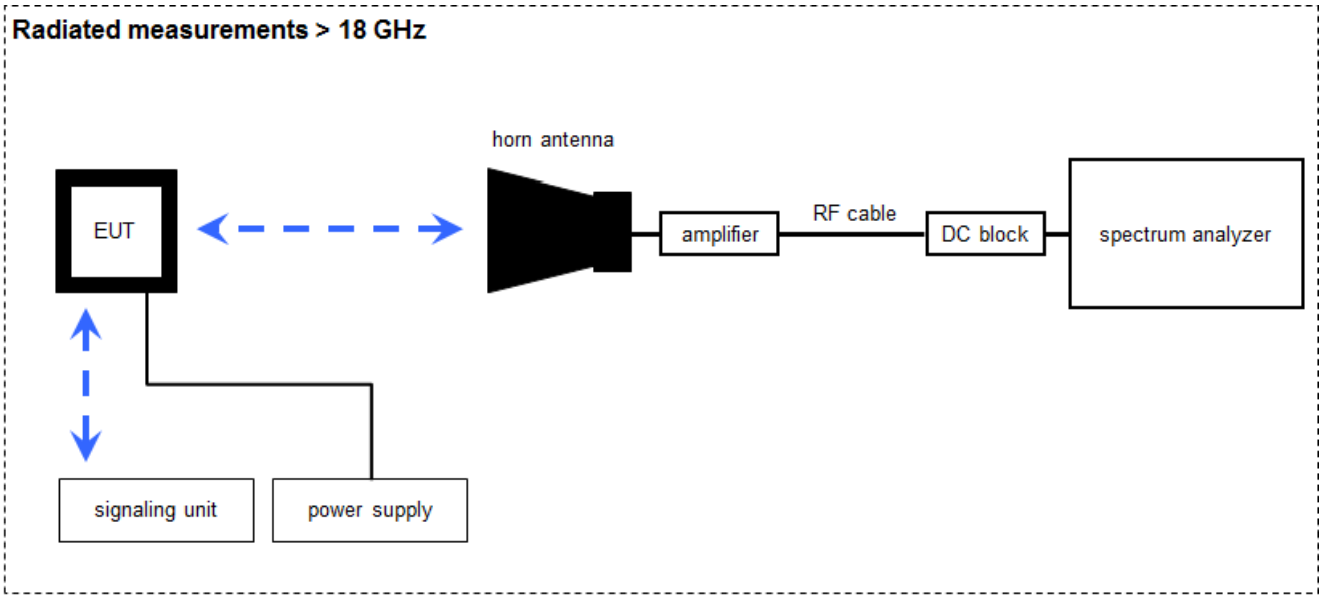
*Example calculation:*
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

**Equipment table:**

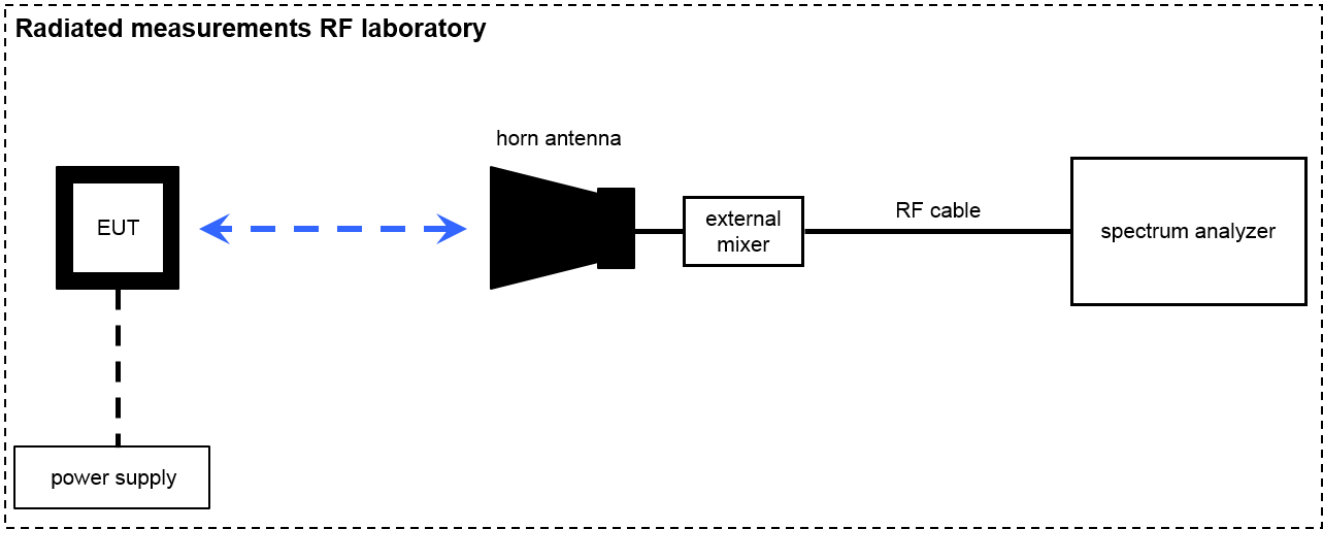
| No. | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|
| 1 | DC power supply, 60Vdc, 50A, 1200 W | 6032A | HP | 2818A03450 | 300001040 | vIKI! | 20.01.2015 | 19.01.2018 |
| 2 | Active Loop Antenna 9 kHz to 30 MHz | 6502 | EMCO | 2210 | 300001015 | k | 07.07.2017 | 06.07.2019 |
| 3 | Anechoic chamber | FAC 3/5m | MWB / TDK | 87400/02 | 300000996 | ev | -/- | -/- |
| 4 | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115 | EMCO | 9107-3697 | 300001605 | vIKI! | 14.02.2017 | 13.02.2019 |
| 5 | Switch / Control Unit | 3488A | HP | * | 300000199 | ne | -/- | -/- |
| 6 | Variable isolating transformer | MPL IEC625 Bus Variable isolating transformer | Erfi | 91350 | 300001155 | ne | -/- | -/- |
| 7 | Active Loop Antenna 9 kHz to 30 MHz | 6502 | EMCO/2 | 8905-2342 | 300000256 | k | 24.06.2015 | 24.06.2018 |
| 8 | Band Reject filter | WRCG1850/1910-1835/1925-40/8SS | Wainwright | 7 | 300003350 | ev | -/- | -/- |
| 9 | Band Reject filter | WRCG2400/2483-2375/2505-50/10SS | Wainwright | 11 | 300003351 | ev | -/- | -/- |
| 10 | Highpass Filter | WHKX2.9/18G-12SS | Wainwright | 1 | 300003492 | ev | -/- | -/- |
| 11 | EMI Test Receiver 20Hz-26,5GHz | ESU26 | R&S | 100037 | 300003555 | k | 31.01.2017 | 30.01.2018 |
| 12 | Highpass Filter | WHK1.1/15G-10SS | Wainwright | 3 | 300003255 | ev | -/- | -/- |
| 13 | Highpass Filter | WHKX7.0/18G-8SS | Wainwright | 19 | 300003790 | ne | -/- | -/- |
| 14 | MXG Microwave Analog Signal Generator | N5183A | Agilent Technologies | MY47420220 | 300003813 | k | 27.01.2017 | 26.01.2020 |
| 15 | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz | VULB9163 | Schwarzbeck | 371 | 300003854 | vIKI! | 29.10.2014 | 29.10.2018 |
| 16 | High Pass Filter | VHF-3500+ | Mini Circuits | -/- | 400000193 | ne | -/- | -/- |
| 17 | Broadband Amplifier 0.5-18 GHz | CBLU5184540 | CERNEX | 22049 | 300004481 | ev | -/- | -/- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18 | Broadband Amplifier 5-13 GHz | CBLU5135235 | CERNEX | 22010 | 300004491 | ev | -/- | -/- |
| 19 | 4U RF Switch Platform | L4491A | Agilent Technologies | MY50000037 | 300004509 | ne | -/- | -/- |
| 20 | NEXIO EMV-Software | BAT EMC V3.16.0.49 | EMCO | | 300004682 | ne | -/- | -/- |
| 21 | PC | ExOne | F+W | | 300004703 | ne | -/- | -/- |
| 22 | Highpass Filter (Chebyshev) | WHKX10-4432.5-4925-18000-40SS | Wainwright | 1 | 300005028 | ev | -/- | -/- |
| 23 | Lowpass Filter (Chebyshev) | WLK12-5975-6333.5-18000-40SS | Wainwright | 1 | 400001213 | ev | -/- | -/- |
| 24 | RF-Amplifier | AMF-6F06001800-30-10P-R | NARDA-MITEQ Inc | 2011572 | 300005241 | ev | -/- | -/- |
| 25 | TRILOG Broadband Test-Antenna | VULB9163 | Schwarzbeck Mess Elektronik | 01029 | 300005379 | k | 07.04.2017 | 06.04.2020 |

## 6.3 Radiated measurements > 18 GHz




## 6.4 Radiated measurements > 50 GHz




Measurement distance is shown in table with each test.

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

*Example calculation:*
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

**Note:** conversion loss of mixer is already included in analyzer value.
Due to the directional nature and test distance used for measurements above 18 GHz, all measurements were found to be line of sight such that use of absorber material on the ground plane was found to not be necessary.

## Equipment table:

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | n. a. | Broadband LNA 18-50 GHz | CBL18503070PN | CERNEX | 25240 | 300004948 | ev | -/- | -/- |
| 2 | n. a. | Harmonic Mixer 2-Port, 50-75 GHz | FS-Z75 | R&S | 100099 | 300003949 | k | 30.06.2017 | 29.06.2018 |
| 3 | n. a. | Harmonic Mixer 3-Port, 75-110 GHz | FS-Z110 | R&S | 101411 | 300004959 | k | 03.07.2017 | 02.07.2018 |
| 4 | A039 | Netzgerät | LA30/1BA-1 | Zentro | 2027 | 300000194 | ev | -/- | -/- |
| 5 | n. a. | Spectrum Analyzer 20 Hz - 50 GHz | FSU50 | R&S | 200012 | 300003443 | k | 28.10.2016 | 27.10.2018 |
| 6 | A027 | Std. Gain Horn Antenna 18.0-26.5 GHz | 638 | Narda | | 300000486 | k | 10.09.2015 | 10.09.2018 |
| 7 | A031 | Std. Gain Horn Antenna 26.5-40.0 GHz | V637 | Narda | 82-16 | 300000510 | k | 14.08.2015 | 14.08.2018 |
| 8 | A039 | Std. Gain Horn Antenna 33.0-50.1 GHz | 2324-20 | Flann | 57 | 400000683 | ne | -/- | -/- |
| 9 | A023 | Std. Gain Horn Antenna 39.3-59.7 GHz | 2424-20 | Flann | 75 | 300001979 | ne | -/- | -/- |
| 10 | A025 | Std. Gain Horn Antenna 49.9-75.8 GHz | 2524-20 | Flann | * | 300001983 | ne | -/- | -/- |
| 11 | A028 | Std. Gain Horn Antenna 73.8-112 GHz | 2724-20 | Flann | * | 300001991 | ne | -/- | -/- |

# 7 Sequence of testing

## 7.1 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, it is placed on a table with 0.8 m height.
- 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 63.10.
- 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 63.10) – see test details.
- EUT is set into operation.

**Premeasurement***

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 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 pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.10).
- 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.

*)Note: The sequence will be repeated three times with different EUT orientations.

## 7.2 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 63.10.
- 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 63.10) – 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 63.10).
- 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.

## 7.3 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 63.10.
- 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 63.10) – 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 63.10).
- 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.

## 7.4 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 63.10.
- 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 63.10).
- 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.

## 7.5 Sequence of testing radiated spurious above 50 GHz with external mixers

**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 63.10.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate for far field (e.g. 0.25 m).
- The EUT is set into operation.

**Premeasurement**

- The test antenna with external mixer is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.
- Caution is taken to reduce the possible overloading of the external mixer.

**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 63.10).
- As external mixers may generate false images care is taken to ensure that any emission measured by the spectrum analyzer does indeed originate in the EUT. Signal identification feature of spectrum analyzer is used to eliminate false mixer images (i.e., it is not the fundamental emission or a harmonic falling precisely at the measured frequency).
- 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.

**Note:** see also FCC's Millimeter Wave Test Procedures

## 8 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 | FCC 47 CFR Part 15 /<br>IC RSS-310 | Passed | 2019-04-05 | -/- |

| Test specification clause | Test case | Temperature conditions | Power supply | C | NC | NA | NP | Results (max.) |
|---|---|---|---|---|---|---|---|---|
| §15.249(a) / RSS-310, 3.10 | Field strength of emissions (wanted signal) | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | PK: 109.7 dBµV/m<br>AVG: 84.0 dBµV/m<br>@ 3 m |
| §2.1049 | Occupied bandwidth | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | 99%: 174.0 MHz<br>26 dB: 215.5 MHz |
| §15.209(a) / §15.249 (c)(d)(e) RSS-Gen | Field strength of emissions (spurious / band edge / harmonics) | Nominal | Nominal | ☒ | ☐ | ☐ | ☐ | complies |

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

# 9 Detailed measurement results

## 9.1 Field strength of emissions (wanted signal)

**Description:**

Measurement of the maximum radiated field strength of the wanted signal.

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Pos-Peak / AVG |
| Sweep time: | 100 s |
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Filter type: | 6 dB filter |
| Span: | 300 MHz |
| Trace-Mode: | Max Hold |

**Limits:**

| FCC | IC | |
|---|---|---|
| CFR Part 15.249(a) | RSS-310, 3.10 | |
| Field strength of emissions | | |
| The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: | | |
| Frequency | Field Strength | Measurement distance |
| 24.0 GHz – 24.25 GHz | 108 dBµV/m (Average)<br>128 dBµV/m (PEAK) | 3 m |

§15.249 (e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

§15.31 (c) Except as otherwise indicated in §15.256, for swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

**Measurement results:**

| Test condition | Maximum field strength (Peak) (dBµV/m @3m) | Maximum field strength (Average) (dBµV/m @3m) | Maximum field strength (Average, calculated) (dBµV/m @3m) |
|---|---|---|---|
| normal operation mode | 109.2 | 84.0 | 104.7 |
| test mode - $f_{low}$ | 109.7 | -/- | 105.2 |
| test mode - $f_{mid}$ | 108.8 | -/- | 104.3 |
| test mode - $f_{high}$ | 108.6 | -/- | 104.1 |
| Measurement uncertainty | ± 3 dB | | |

**Note:**

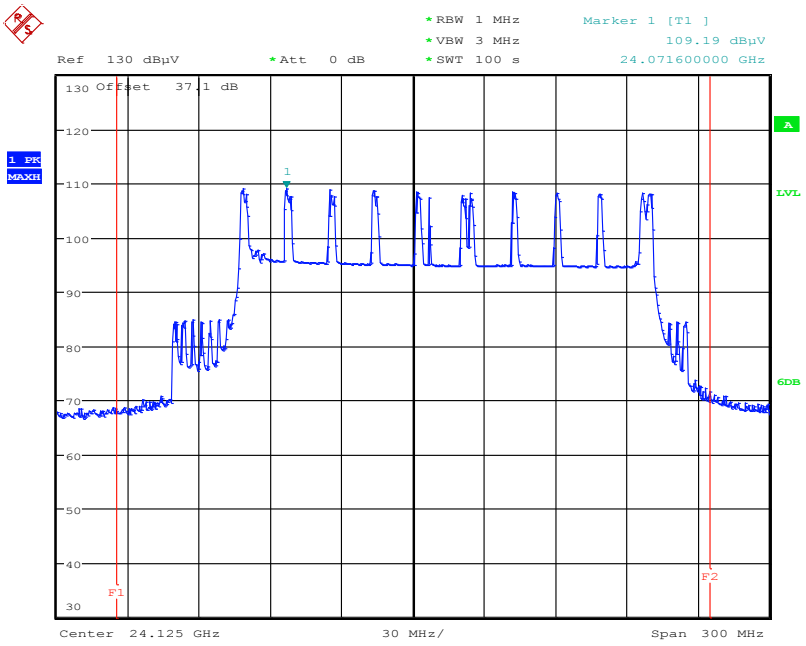
Above test was performed on a test distance of 1 m. The correction factor consisting of antenna factor, cable loss and distance correction factor of 20*log(1m/3m) is already considered in the corresponding plots.
In addition to above described correction +0.8 dB correction factor is added to the measured values based on test site substitution with a calibrated 24 GHz precision CW signal source provided by the applicant. This additional correction is already included as an offset in the plots, too.

Calculation for final amplitude offset:
antenna factor + cable loss + distance correction factor + additional substitution correction factor
40.9 dB + 4.9 dB+ 20*log(1m/3m) + 0.8 dB = **37.1 dB**

There are two supported modes:
- Mode 1: 19.8 ms ON, 33.2 ms cycle time
- Mode 2: 19.8 ms ON, 40.0 ms cycle time.

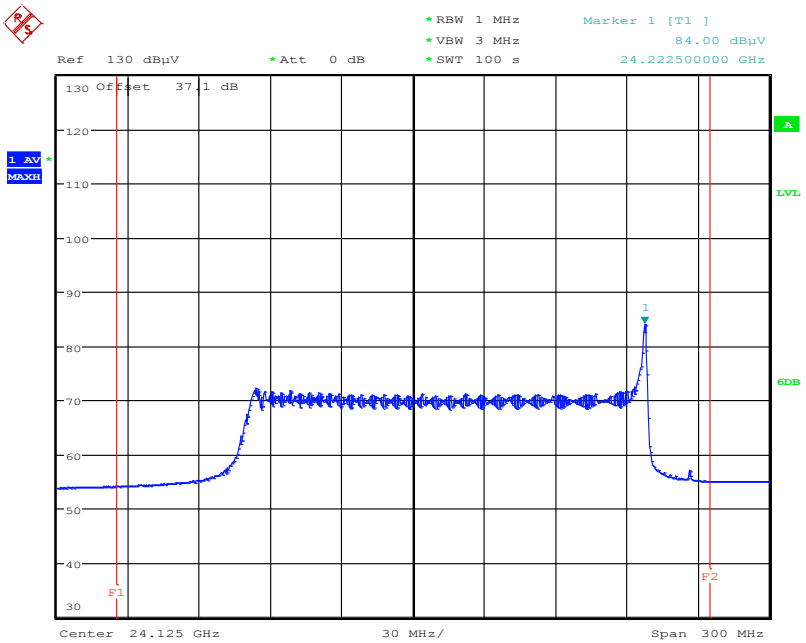
Last column shows calculated AVG values for FCC test mode $f_{low}$ / $f_{mid}$ / $f_{high}$ based on measured peak values and duty cycle correction of 20*log(duty cycle) = 20*log(19.8ms/33.2ms) = -4.5 dB as per customer request. According to ANSI C63.10-2013, this is the worst-case duty cycle to be implemented for the test SW with frequency stop mode. The duty cycle of the other operation mode (APP) with FMCW active is 20*log(19.8ms/40ms) = -6.1 dB

## Plot No. 1: Field strength, peak measurement, normal operation mode



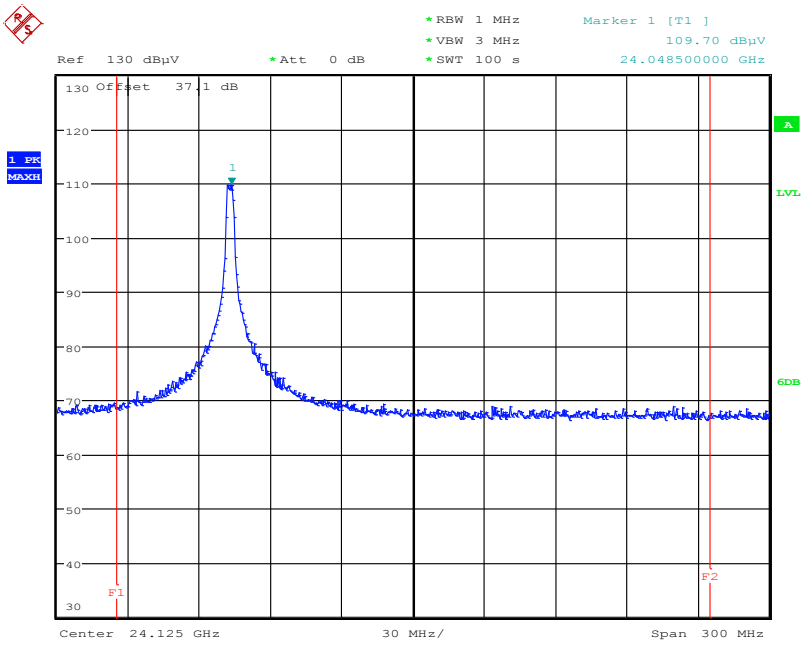

Date: 20.NOV.2017 14:33:35

## Plot No. 2: Field strength, average measurement, normal operation mode



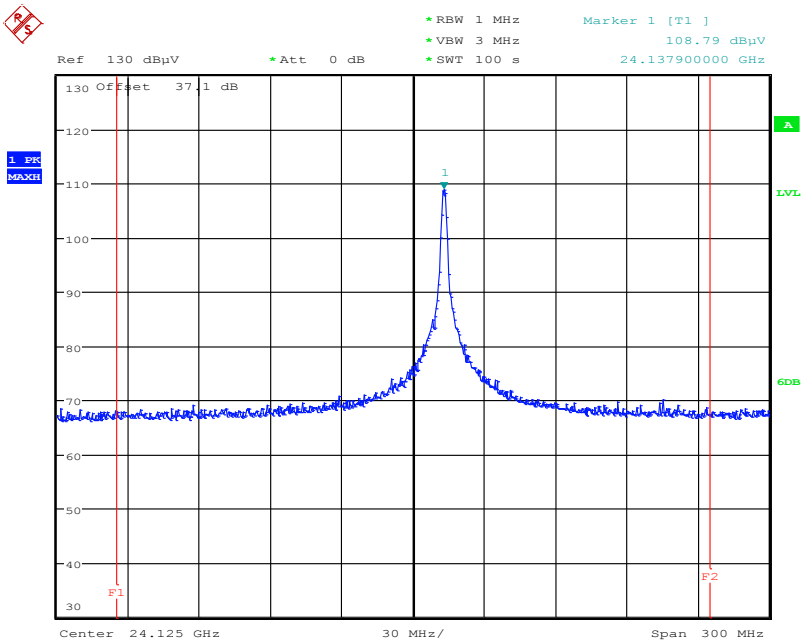

Date: 22.NOV.2017 09:52:57

## Plot No. 3: Field strength, peak measurement, test mode, low frequency



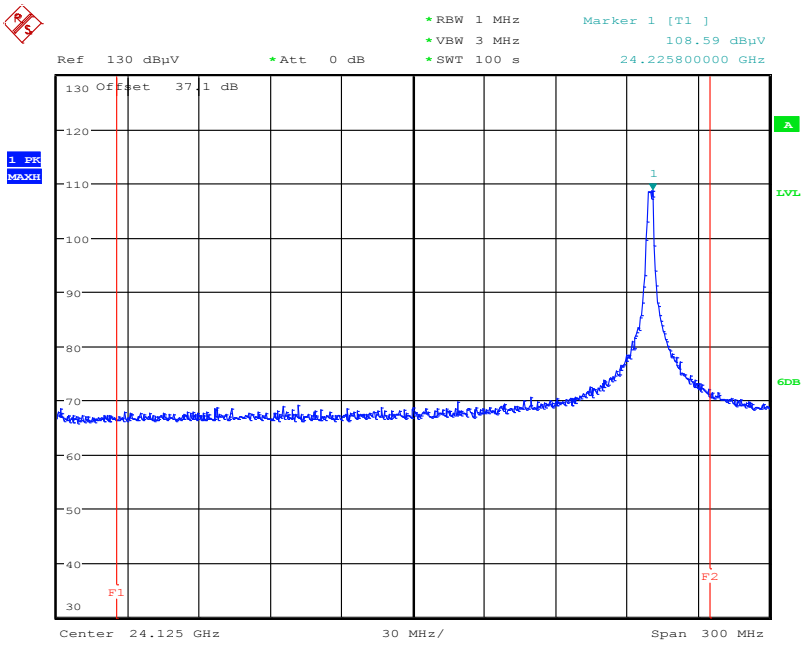

Date: 20.NOV.2017 14:02:03

## Plot No. 4: Field strength, peak measurement, test mode, mid frequency



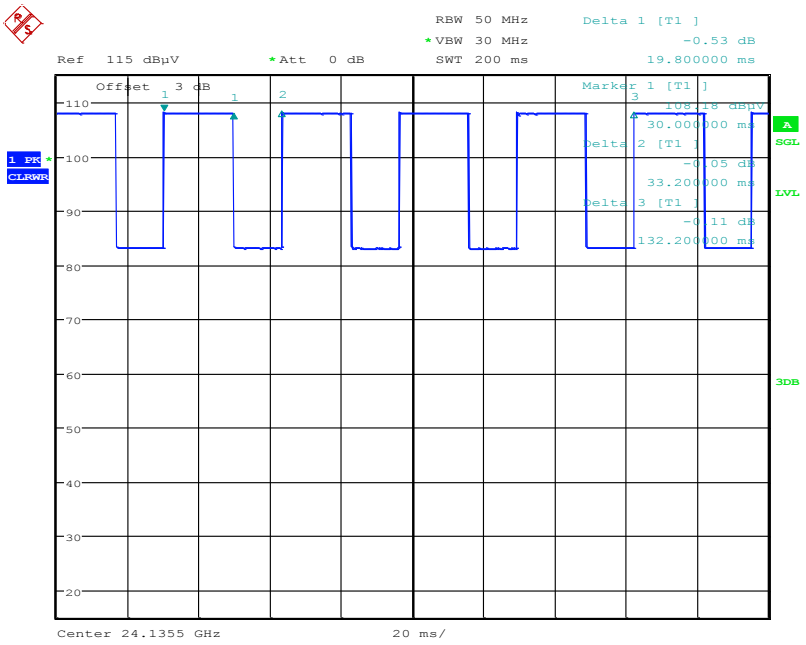

Date: 20.NOV.2017 14:08:18

## Plot No. 5: Field strength, peak measurement, test mode, high frequency




Date: 20.NOV.2017 14:10:41

## Plot No. 6: Duty cycle, test mode




Date: 20.NOV.2017 15:46:51

## 9.2 Occupied bandwidth

**Description:**

Measurement of the 99% bandwidth and 26 dB bandwidth of the wanted signal.

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Pos-Peak |
| Sweep time: | 100 s |
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Filter type: | 3 dB filter |
| Span: | 300 MHz |
| Trace-Mode: | Max Hold |

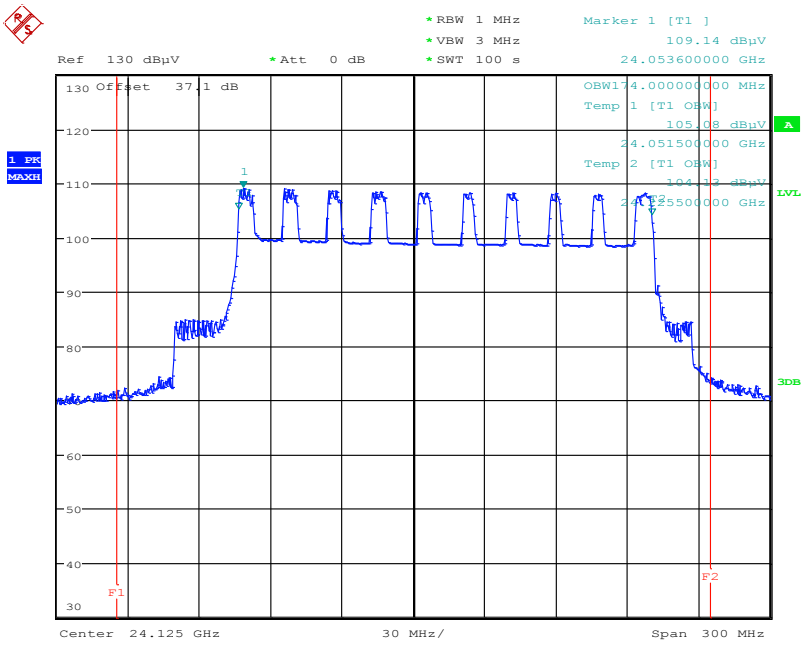
**Limits:**

| | | |
|---|---|---|
| 250 MHz | f(lowest) > 24.0 GHz | f(highest) < 24.25GHz |

**Measurement results:**

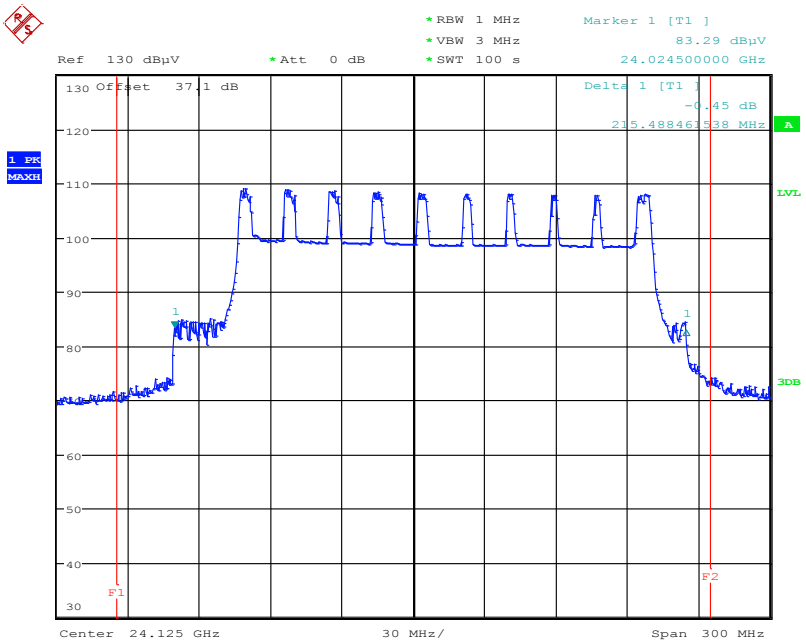
| Test condition | Occupied bandwidth (MHz) |
|---|---|
| **99% Occupied bandwidth** | 174.0 |
| **26 dB Occupied bandwidth** | 215.5 |
| Measurement uncertainty | ± span/1000 |

## Plot No. 7: 99% occupied bandwidth, peak measurement, normal operation mode




Date: 20.NOV.2017 14:47:36

## Plot No. 8: 26 dB occupied bandwidth, peak measurement, normal operation mode




Date: 20.NOV.2017 14:57:21

## 9.3 Field strength of emissions (radiated spurious)

**Description:**

Measurement of the radiated spurious emissions in transmit mode.

**Measurement:**

| Measurement parameter | |
|---|---|
| Detector: | Quasi Peak / AVG / Peak |
| Sweep time: | Auto |
| Resolution bandwidth: | F < 1 GHz: 120 kHz<br>F > 1 GHz: 1 MHz |
| Video bandwidth: | =3 x RBW |
| Filter type: | 6 dB filter |
| Frequency range: | 30 MHz to 100 GHz |
| Trace-Mode: | Max Hold |

**Limits:**

| FCC | IC | |
|---|---|---|
| CFR Part 15.209(a) / CFR Part 15.249(d) | RSS - GEN | |
| Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation. | | |
| Frequency (MHz) | Field Strength (µV/m) | Measurement distance (m) |
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30  88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 – 960 | 200 | 3 |
| Above 960 | 500 | 3 |

§15.249 (a) Harmonic emissions shall not exceed 2.5 mV/m measured at 3 m.

§15.249 (e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

§15.31 (c) Except as otherwise indicated in §15.256, for swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

**Measurement results:**

| TX Spurious Emissions Radiated [dBµV/m] | | | | | | | |
|---|---|---|---|---|---|---|---|
| Low Frequency | | | | | | | |
| Frequency [GHz] | Detector | Bandwidth [MHz] | Correction [dB] | Distance [m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
| 0.6576 | QP | 0.1 | 21.2 | 10 | 30.1 | 36 | 5.9 |
| 1.192 | PK | 1.0 | -9.2 | 3.0 | 53.7 | 74 | 20.3 |
| 1.192 | AVG | 1.0 | -9.2 | 3.0 | 52.0 | 54 | 2.0 |
| 24.00 | PK | 1.0 | 37.1 | 1.0 | 64.6 | 74 | 9.4 |
| 24.00 | AVG | 1.0 | 37.1 | 1.0 | 44.3 | 54 | 9.7 |
| 24.25 | PK | 1.0 | 37.1 | 1.0 | 69.4 | 74 | 4.6 |
| 24.25 | AVG | 1.0 | 37.1 | 1.0 | 46.2 | 54 | 7.8 |
| 48.11 | PK | 1.0 | 1.6 | 0.5 | 73.9 | 88 | 14.1 |
| 48.11 | AVG | 1.0 | 1.6 | 0.5 | 60.9 | 68 | 7.1 |
| 72.16 | PK | 1.0 | 20.4 | 0.2 | 63.3 | 88 | 24.7 |
| 72.16 | AVG | 1.0 | 20.4 | 0.2 | 48.4 | 68 | 19.6 |
| 96.22 | PK | 1.0 | 19.7 | 0.1 | 58.8 | 88 | 29.2 |
| 96.22 | AVG | 1.0 | 19.7 | 0.1 | 43.4 | 68 | 24.6 |
| | | | | | | | |
| **24.00** | **PK** | **1.0** | **37.1** | **1.0** | **63.1** | **74** | **10.9** |
| **24.00** | **AVG** | **1.0** | **37.1** | **1.0** | **38.6** | **54** | **15.4** |

| TX Spurious Emissions Radiated [dBµV/m] | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mid Frequency | | | | | | | |
| Frequency [GHz] | Detector | Bandwidth [MHz] | Correction [dB] | Distance [m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
| 0.6576 | QP | 0.1 | 21.2 | 10 | 26.7 | 36 | 9.3 |
| 1.192 | PK | 1.0 | -9.2 | 3.0 | 53.7 | 74 | 20.3 |
| 1.192 | AVG | 1.0 | -9.2 | 3.0 | 52.0 | 54 | 2.0 |
| 24.00 | PK | 1.0 | 37.1 | 1.0 | 64.6 | 74 | 9.4 |
| 24.00 | AVG | 1.0 | 37.1 | 1.0 | 44.3 | 54 | 9.7 |
| 24.25 | PK | 1.0 | 37.1 | 1.0 | 69.4 | 74 | 4.6 |
| 24.25 | AVG | 1.0 | 37.1 | 1.0 | 46.2 | 54 | 7.8 |
| 48.28 | PK | 1.0 | 1.6 | 0.5 | 74.0 | 88 | 14.0 |
| 48.28 | AVG | 1.0 | 1.6 | 0.5 | 60.2 | 68 | 7.8 |
| 72.41 | PK | 1.0 | 20.4 | 0.2 | 61.0 | 88 | 27.0 |
| 72.41 | AVG | 1.0 | 20.4 | 0.2 | 45.4 | 68 | 22.6 |
| 96.55 | PK | 1.0 | 19.7 | 0.1 | 60.6 | 88 | 27.4 |
| 96.55 | AVG | 1.0 | 19.7 | 0.1 | 45.5 | 68 | 22.5 |

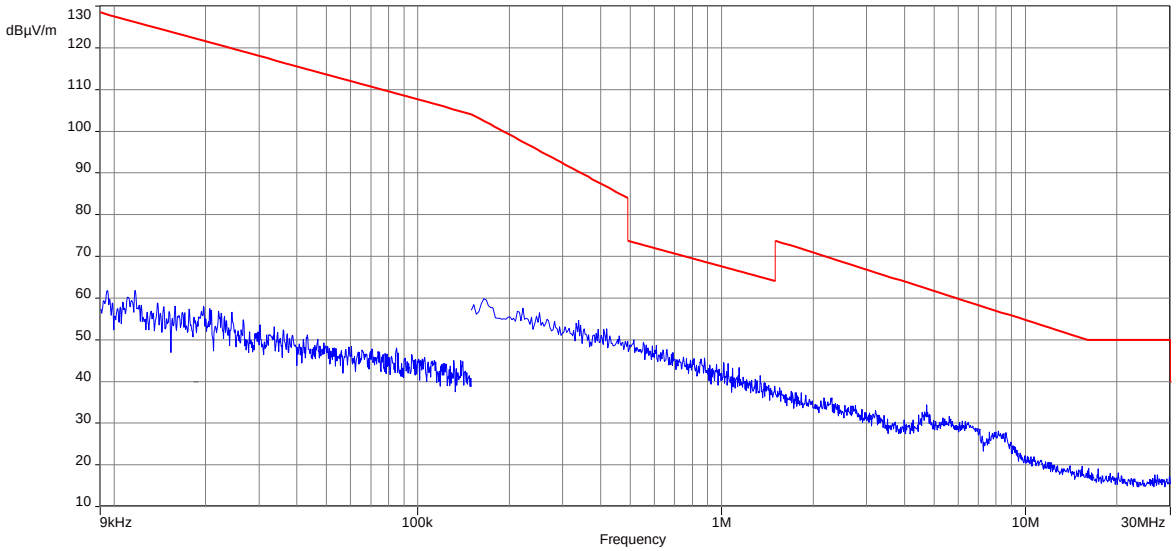
| TX Spurious Emissions Radiated [dBµV/m] | | | | | | | |
|---|---|---|---|---|---|---|---|
| High Frequency | | | | | | | |
| Frequency [GHz] | Detector | Bandwidth [MHz] | Correction [dB] | Distance [m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
| 0.6576 | QP | 0.1 | 21.2 | 10 | 30.0 | 36 | 6.0 |
| 1.192 | PK | 1.0 | -9.2 | 3.0 | 53.7 | 74 | 20.3 |
| 1.192 | AVG | 1.0 | -9.2 | 3.0 | 52.0 | 54 | 2.0 |
| 24.00 | PK | 1.0 | 37.1 | 1.0 | 64.6 | 74 | 9.4 |
| 24.00 | AVG | 1.0 | 37.1 | 1.0 | 44.3 | 54 | 9.7 |
| 24.25 | PK | 1.0 | 37.1 | 1.0 | 69.4 | 74 | 4.6 |
| 24.25 | AVG | 1.0 | 37.1 | 1.0 | 46.2 | 54 | 7.8 |
| 48.45 | PK | 1.0 | 1.6 | 0.5 | 74.2 | 88 | 13.8 |
| 48.45 | AVG | 1.0 | 1.6 | 0.5 | 58.2 | 68 | 9.8 |
| 72.38 | PK | 1.0 | 20.4 | 0.2 | 60.3 | 88 | 27.7 |
| 72.38 | AVG | 1.0 | 20.4 | 0.2 | 44.8 | 68 | 23.2 |
| 96.89 | PK | 1.0 | 19.7 | 0.1 | 63.8 | 88 | 24.2 |
| 96.89 | AVG | 1.0 | 19.7 | 0.1 | 46.6 | 68 | 21.4 |
| | | | | | | | |
| **24.25** | **PK** | **1.0** | **37.1** | **1.0** | **69.4** | **74** | **4.6** |
| **24.25** | **AVG** | **1.0** | **37.1** | **1.0** | **41.3** | **54** | **12.7** |

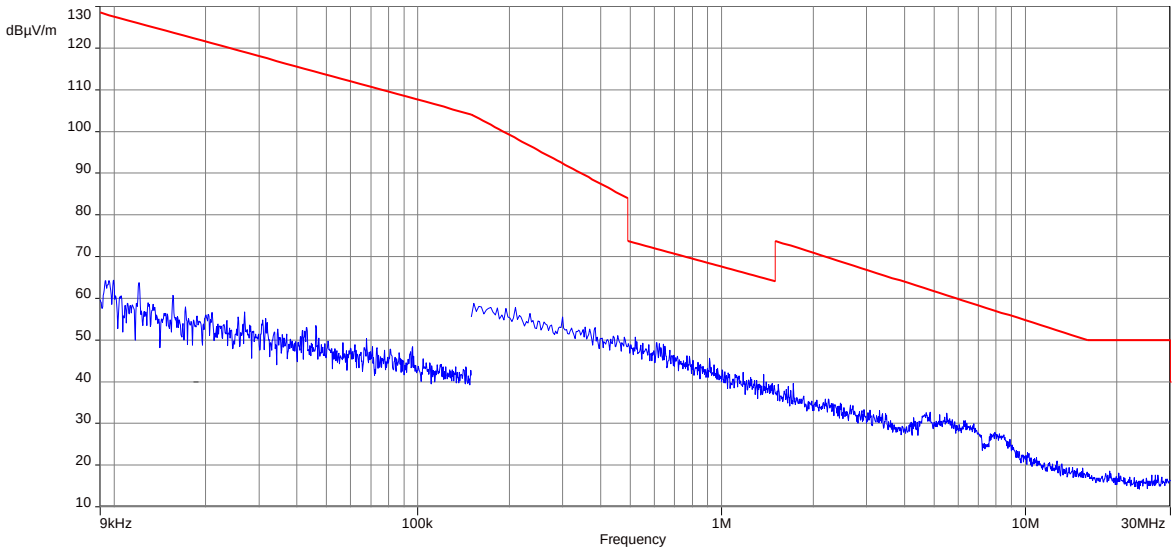
Note: QP = Quasi-Peak, PK = Peak, AVG = Linear Average

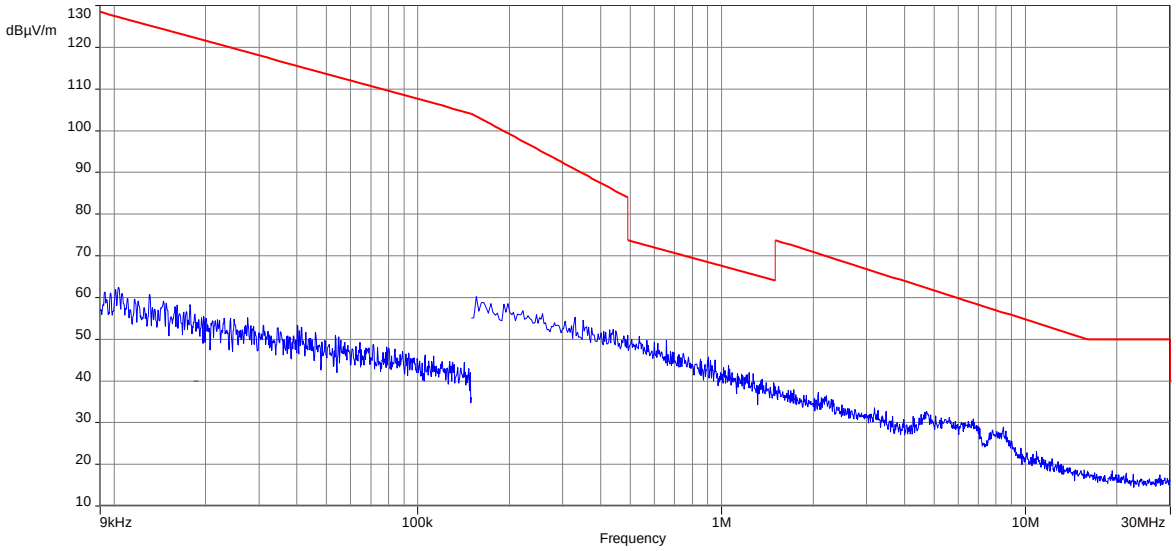
Measurements above 18 GHz were performed on a short measurement distance (≤1m) to improve the minimum sensitivity of the test system. A correction factor of 20*log(d/3m) is already considered in the plots.

Lines in bold letters show band edge compliance for normal operation mode.

**Plot No. 9: 9 kHz to 30 MHz, magnetic / loop antenna, low / mid / high frequency**

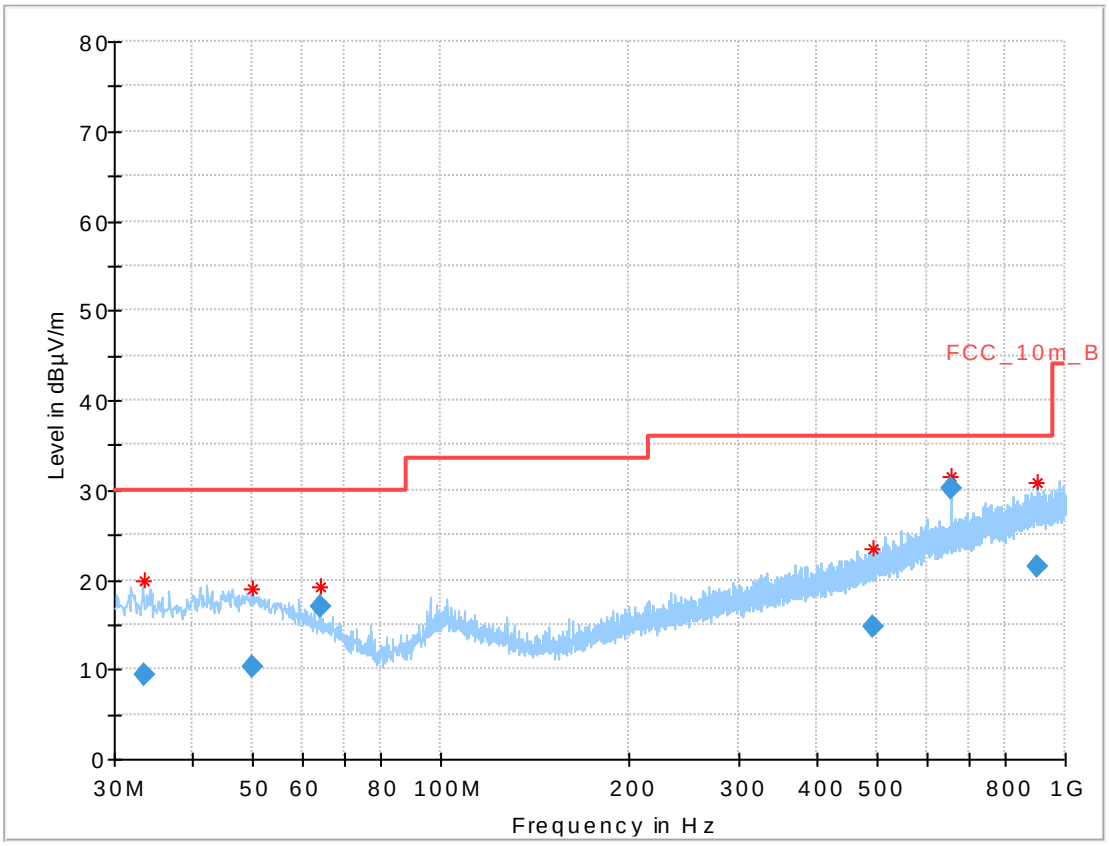


**Plot No. 10: 30 MHz to 1 GHz, horizontal / vertical polarization, low frequency**

| | |
|---|---|
| EUT: | SRR2-A |
| Serial number: | A2C7547660300 |
| Test description: | FCC part 15 class B @ 10 m |
| Operating condition: | tx lower |
| Operator name: | Wolsdorfer |
| Comment: | DC 13.5V |

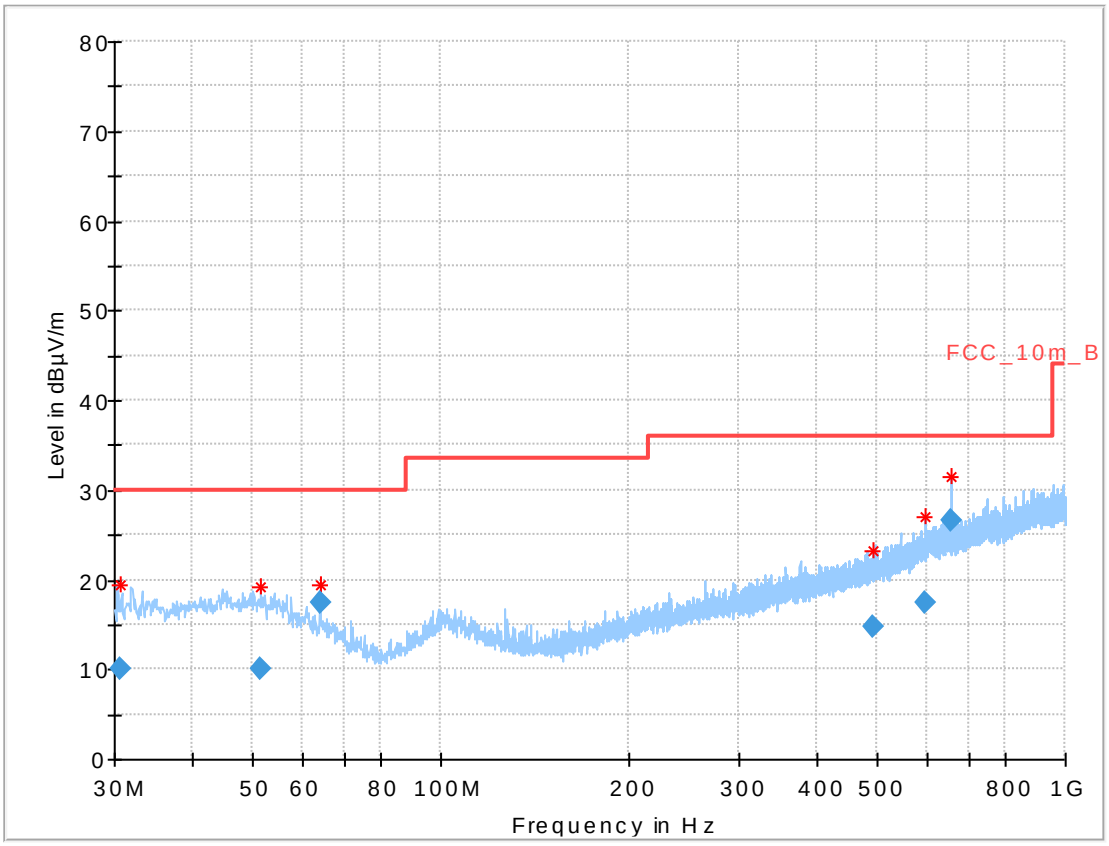



**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 33.554 | 9.40 | 30.0 | 20.60 | 1000 | 120 | 101.0 | H | 35.0 | 12.4 |
| 49.841 | 10.36 | 30.0 | 19.64 | 1000 | 120 | 98.0 | V | 140.0 | 13.7 |
| 64.019 | 16.96 | 30.0 | 13.04 | 1000 | 120 | 170.0 | V | 99.0 | 11.0 |
| 493.835 | 14.75 | 36.0 | 21.25 | 1000 | 120 | 98.0 | H | 260.0 | 18.6 |
| 657.586 | 30.14 | 36.0 | 5.86 | 1000 | 120 | 98.0 | H | 286.0 | 21.2 |
| 904.564 | 21.35 | 36.0 | 14.65 | 1000 | 120 | 170.0 | V | 73.0 | 24.2 |

**Plot No. 11: 30 MHz to 1 GHz, horizontal / vertical polarization, mid frequency**

| | |
|---|---|
| EUT: | SRR2-A |
| Serial number: | A2C7547660300 |
| Test description: | FCC part 15 class B @ 10 m |
| Operating condition: | tx center |
| Operator name: | Wolsdorfer |
| Comment: | DC 13.5V |

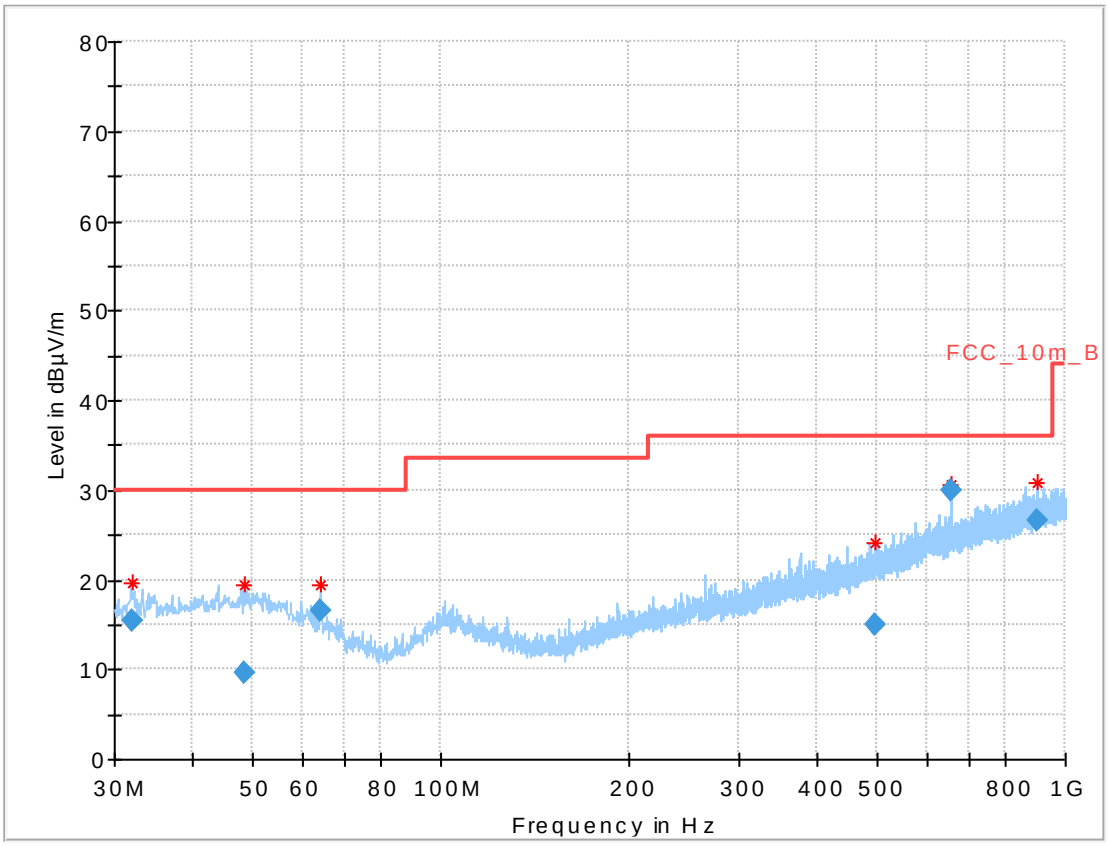



**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 30.714 | 10.09 | 30.0 | 19.91 | 1000 | 120 | 101.0 | V | 68.0 | 12.0 |
| 51.608 | 10.02 | 30.0 | 19.98 | 1000 | 120 | 101.0 | V | 103.0 | 13.5 |
| 63.999 | 17.35 | 30.0 | 12.65 | 1000 | 120 | 170.0 | V | 88.0 | 11.0 |
| 491.555 | 14.69 | 36.0 | 21.31 | 1000 | 120 | 170.0 | H | 153.0 | 18.5 |
| 594.415 | 17.36 | 36.0 | 18.64 | 1000 | 120 | 101.0 | H | 237.0 | 20.6 |
| 657.613 | 26.68 | 36.0 | 9.32 | 1000 | 120 | 98.0 | H | 269.0 | 21.2 |

**Plot No. 12: 30 MHz to 1 GHz, horizontal / vertical polarization, high frequency**

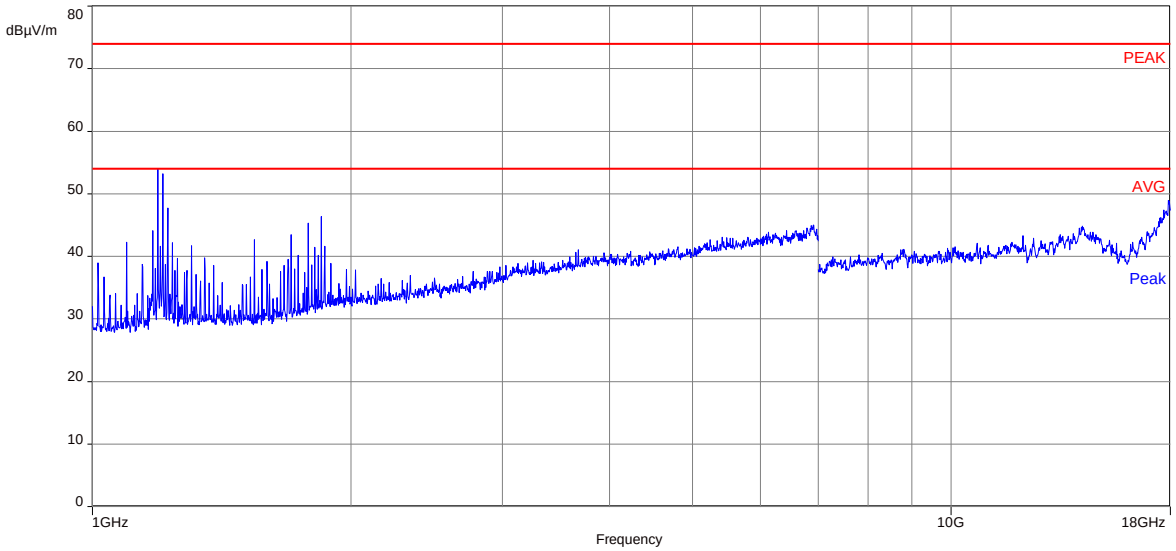
| | |
|---|---|
| EUT: | SRR2-A |
| Serial number: | A2C7547660300 |
| Test description: | FCC part 15 class B @ 10 m |
| Operating condition: | tx upper |
| Operator name: | Wolsdorfer |
| Comment: | DC 13.5V |

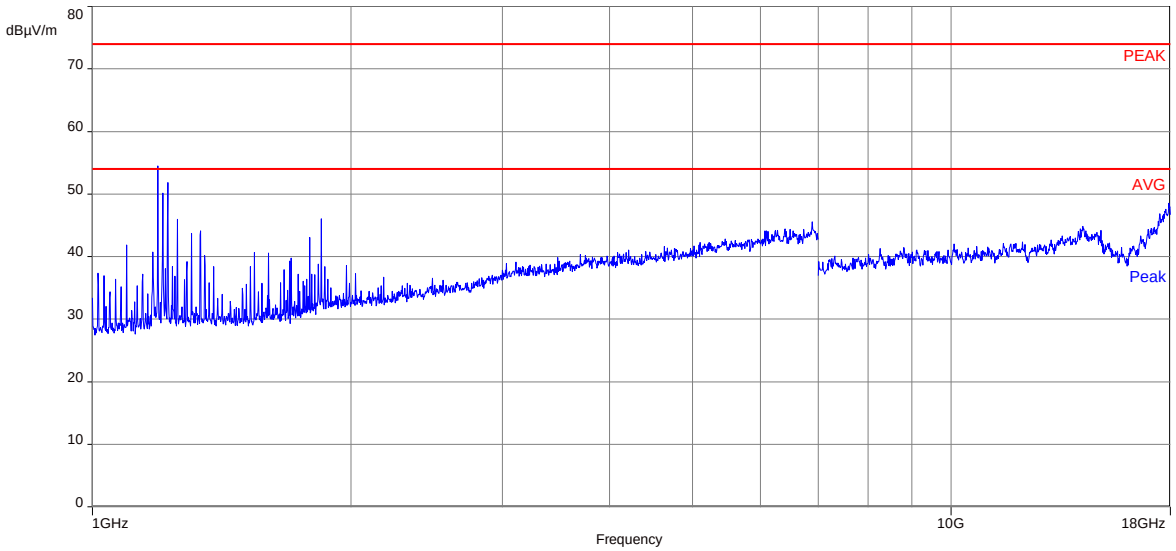


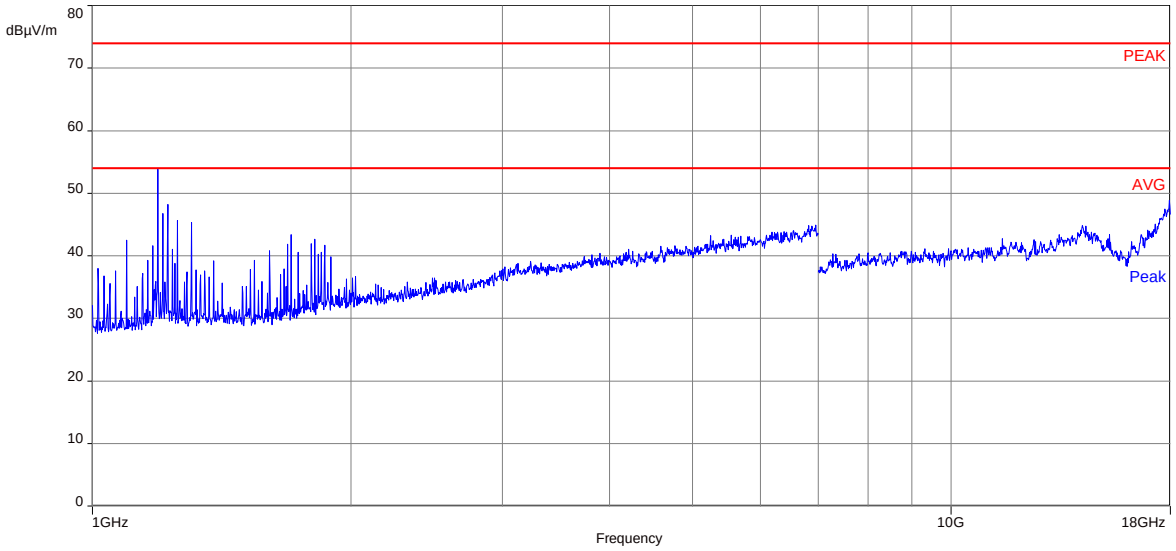

**Final_Result**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 32.029 | 15.36 | 30.0 | 14.64 | 1000 | 120 | 170.0 | V | 274.0 | 12.2 |
| 48.528 | 9.64 | 30.0 | 20.36 | 1000 | 120 | 170.0 | H | 88.0 | 13.7 |
| 64.006 | 16.53 | 30.0 | 13.47 | 1000 | 120 | 98.0 | V | 103.0 | 11.0 |
| 495.193 | 14.87 | 36.0 | 21.13 | 1000 | 120 | 101.0 | V | 142.0 | 18.6 |
| 657.579 | 30.04 | 36.0 | 5.96 | 1000 | 120 | 98.0 | H | 273.0 | 21.2 |
| 904.022 | 26.53 | 36.0 | 9.47 | 1000 | 120 | 98.0 | V | 339.0 | 24.2 |

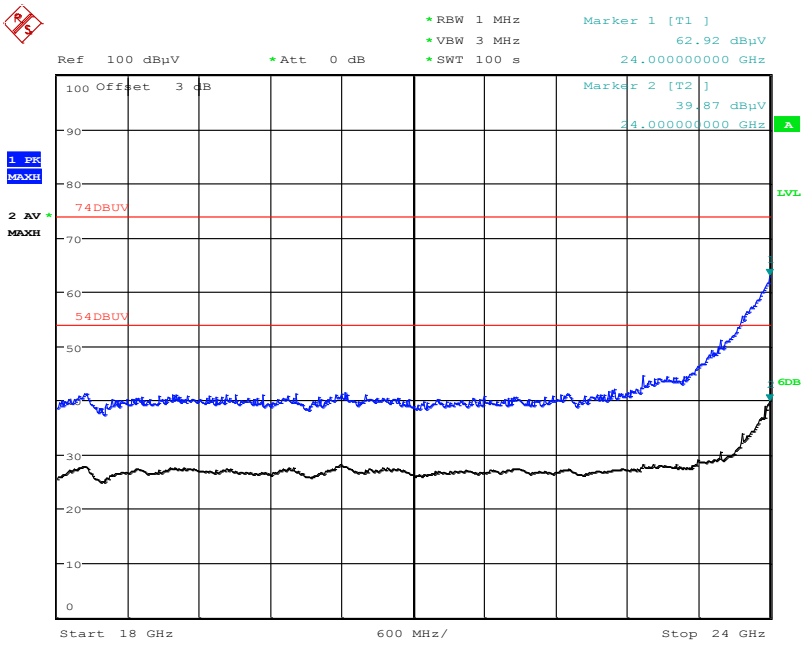
**Plot No. 13: 1.0 GHz to 18.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



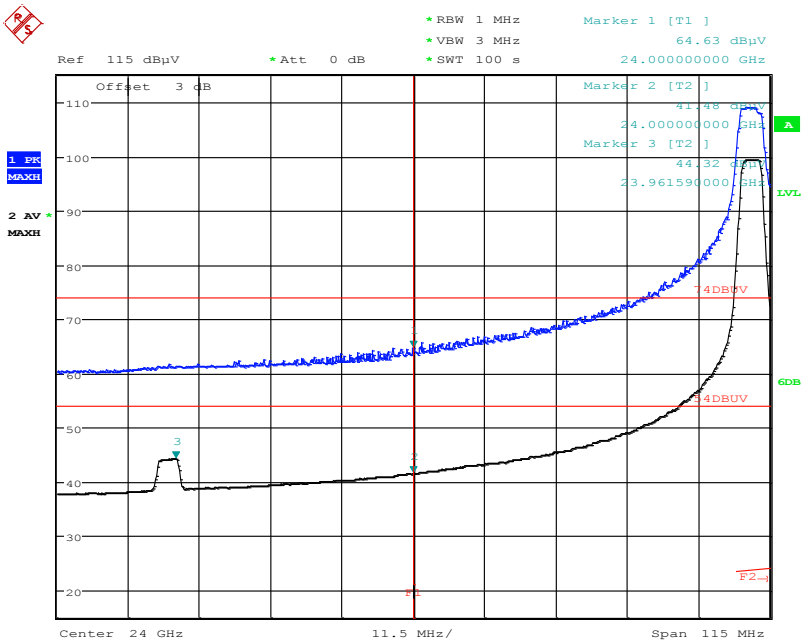



**Plot No. 14: 18.0 GHz to 24.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



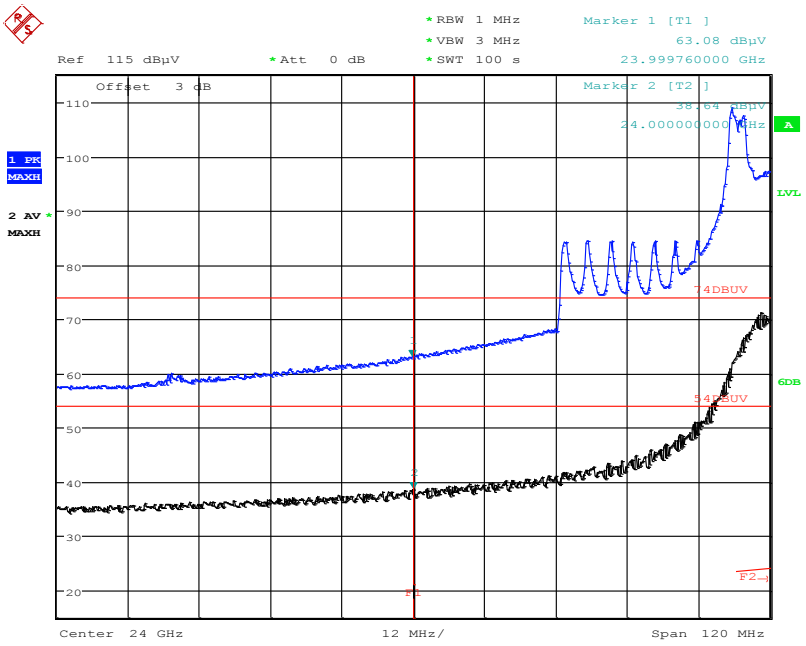

Date: 23.NOV.2017 16:48:01

**Plot No. 15: Band Edge 24.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



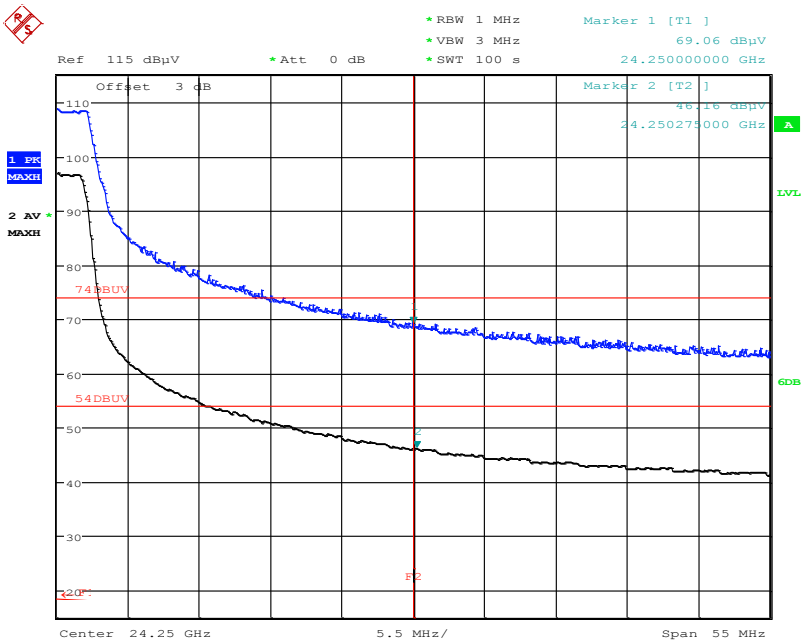

Date: 22.NOV.2017 09:22:27

**Plot No. 16: Band Edge 24.0 GHz, horizontal / vertical polarization, normal operation mode**



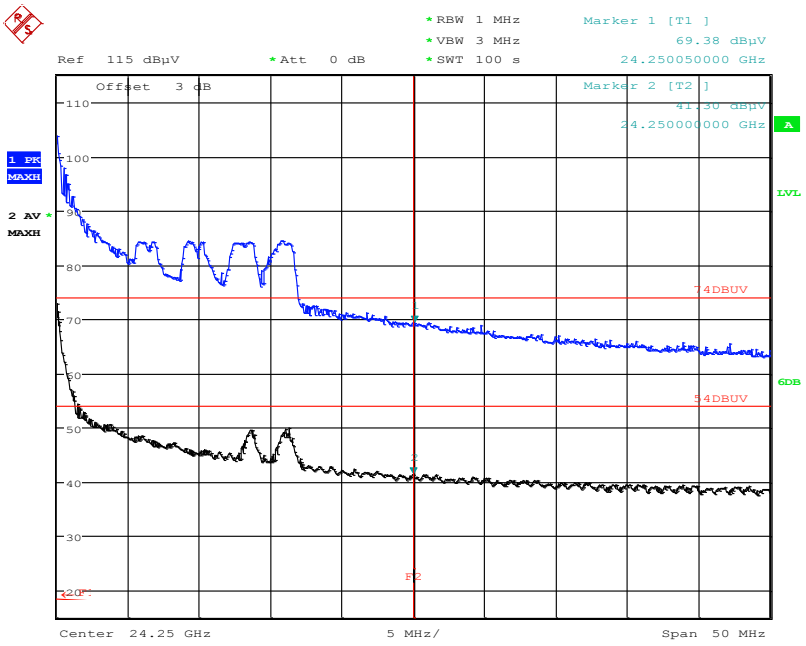

Date: 22.NOV.2017 09:39:09

**Plot No. 17: Band Edge 24.25 GHz, horizontal / vertical polarization, low / mid / high frequency**



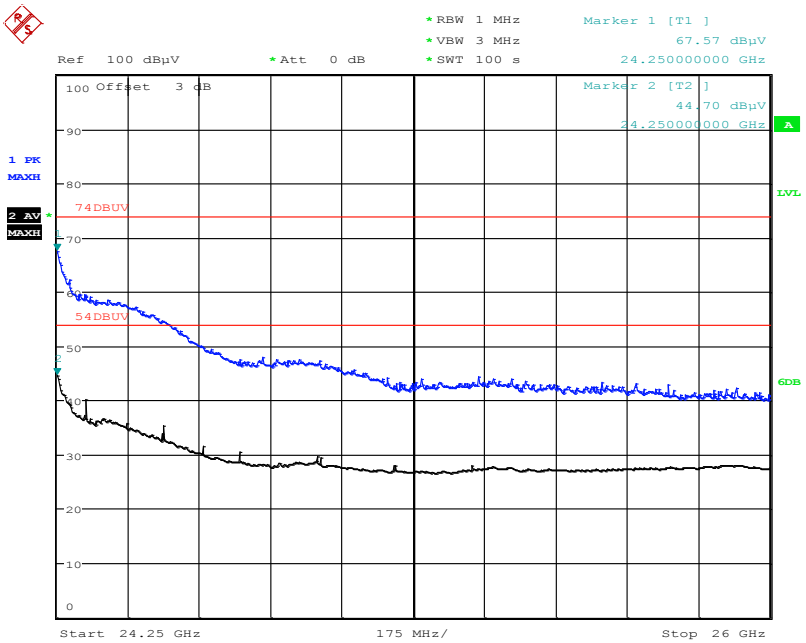

Date: 22.NOV.2017 09:05:55

**Plot No. 18: Band Edge 24.25 GHz, horizontal / vertical polarization, normal operation mode**



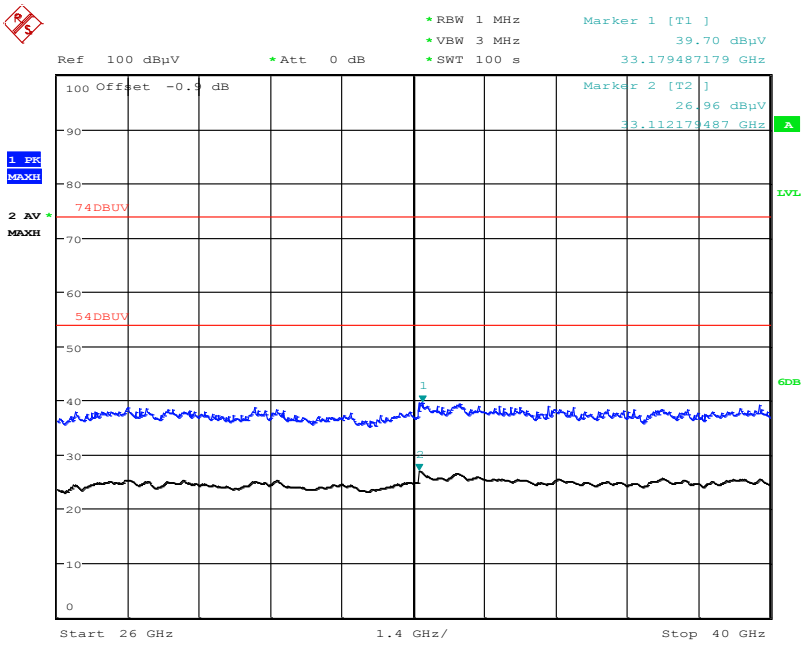

Date: 22.NOV.2017 09:43:59

**Plot No. 19: 24.25 GHz to 26.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



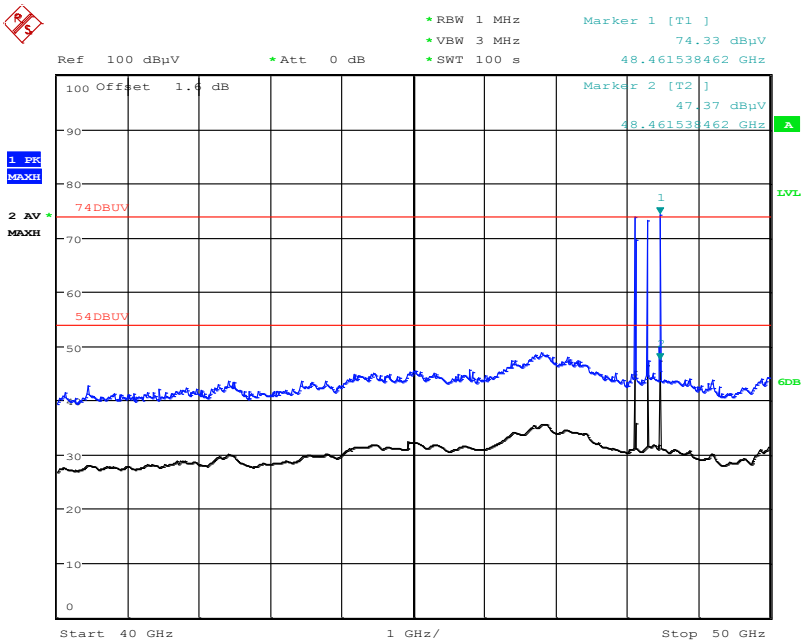

Date: 23.NOV.2017 16:39:14

**Plot No. 20: 26.0 GHz to 40.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



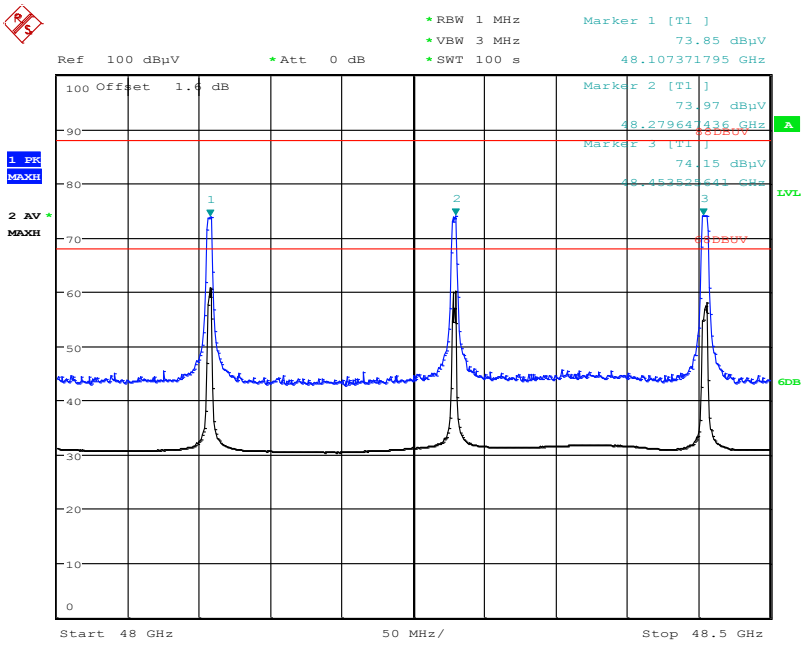

Date: 23.NOV.2017 16:43:23

**Plot No. 21: 40.0 GHz to 50.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



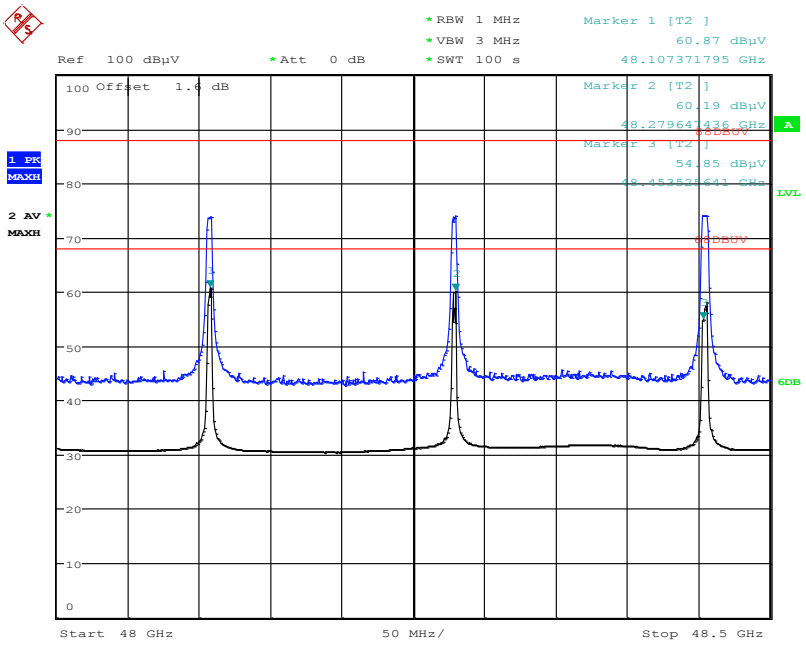

Date: 23.NOV.2017 16:10:14

**Plot No. 22: 48.0 to 48.5 GHz, horizontal / vertical polarization, low / mid / high frequency, PEAK**



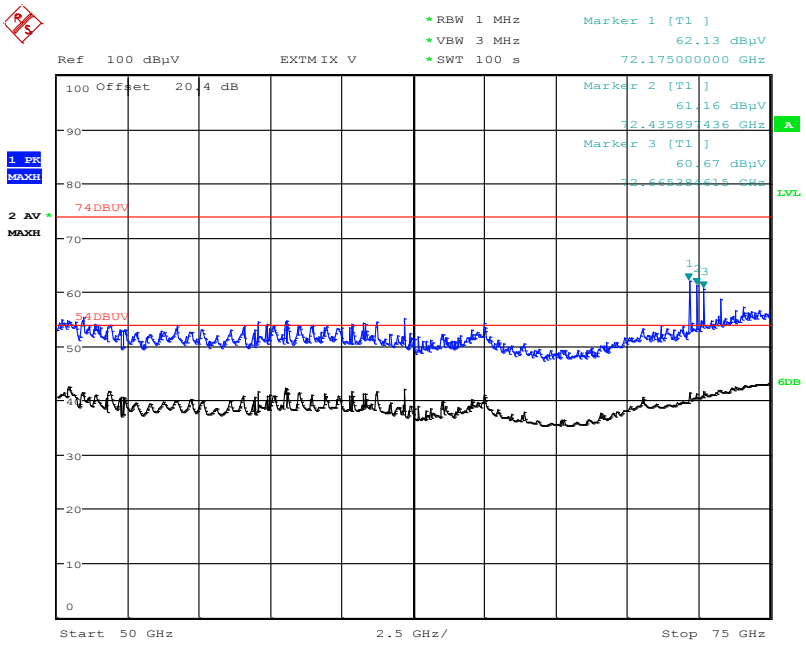

Date: 23.NOV.2017 16:17:59

**Plot No. 23: 48.0 to 48.5 GHz, horizontal / vertical polarization, low / mid / high frequency, AVG**



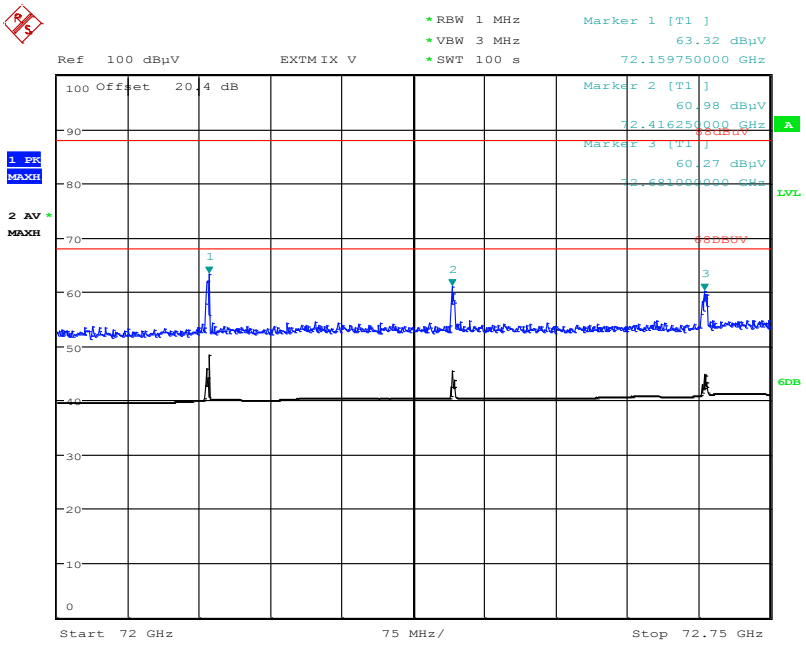

Date: 23.NOV.2017 16:18:39

**Plot No. 24: 50.0 GHz to 75.0 GHz, horizontal / vertical polarization, low / mid / high frequency**



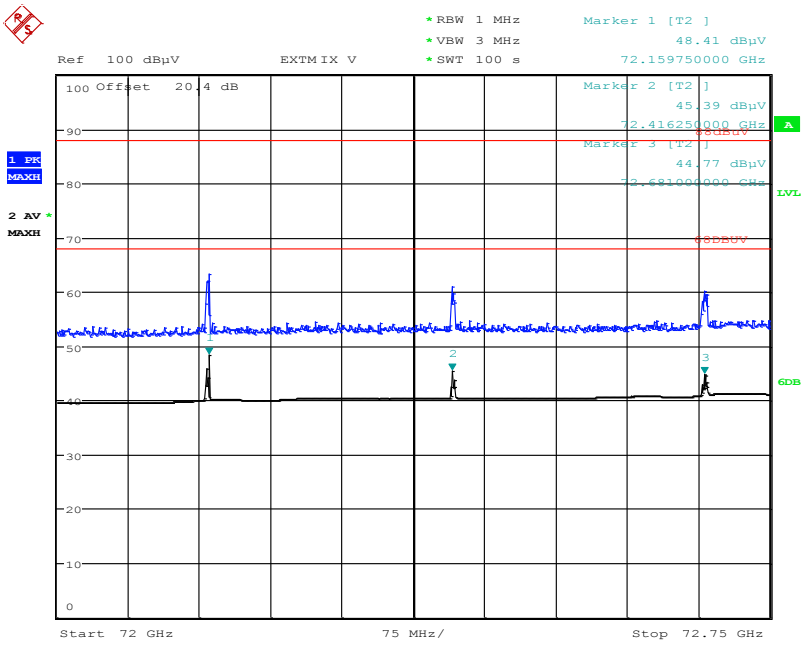

Date: 23.NOV.2017 14:57:07

**Plot No. 25: 72.0 GHz to 72.75 GHz, horizontal / vertical polarization, low / mid / high frequency, PEAK**



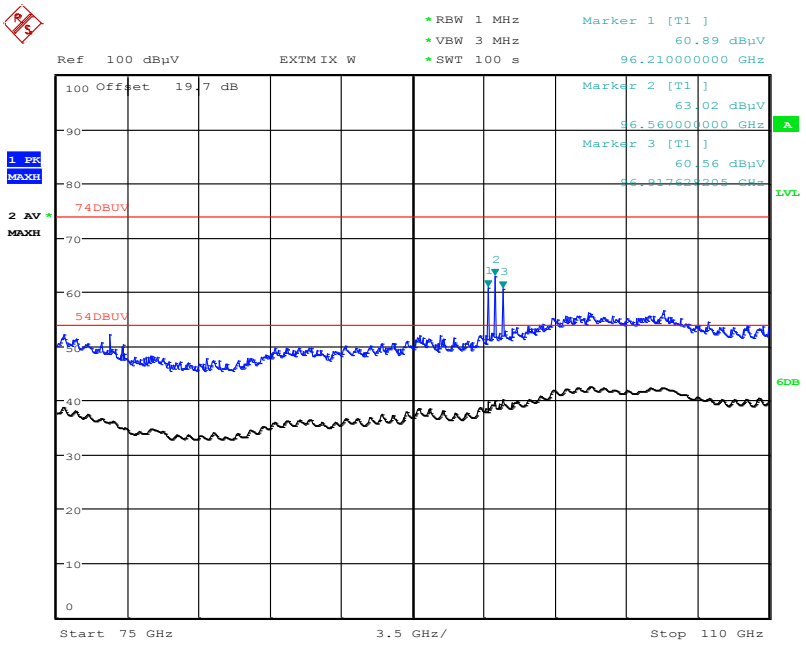

Date: 23.NOV.2017 15:09:08

**Plot No. 26: 72.0 GHz to 72.75 GHz, horizontal / vertical polarization, low / mid / high frequency, AVG**



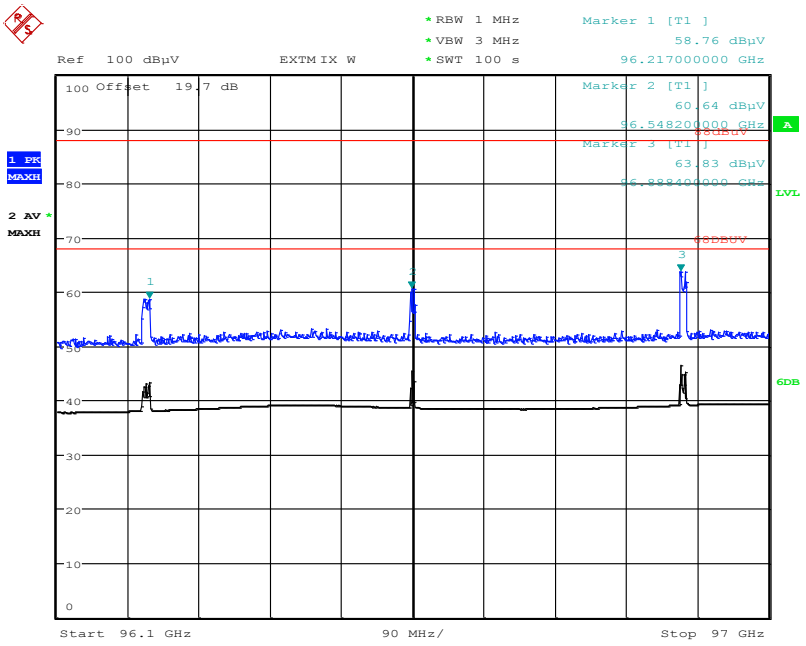

Date: 23.NOV.2017 15:10:40

**Plot No. 27: 75.0 GHz to 110 GHz, horizontal / vertical polarization, low / mid / high frequency**



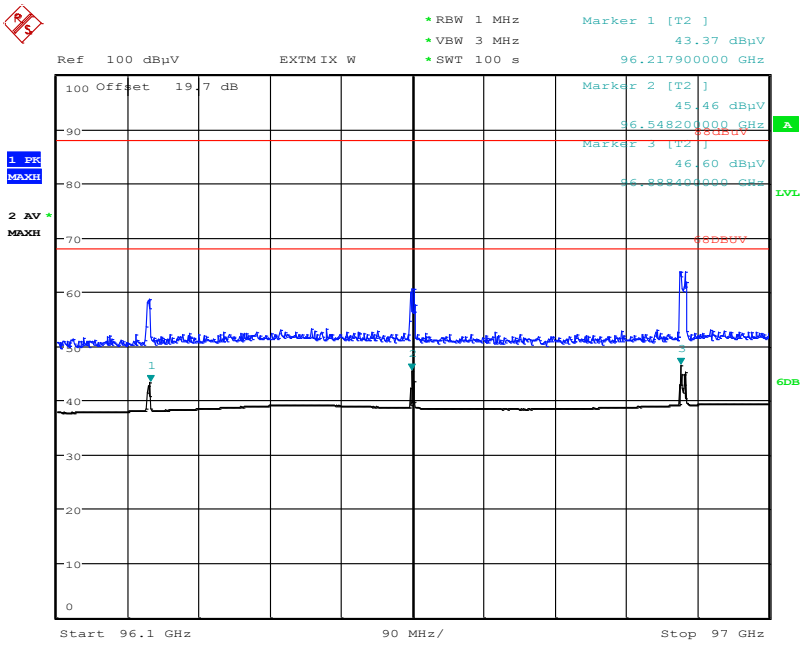

Date: 23.NOV.2017 15:49:13

**Plot No. 28: 96.1 GHz to 97.0 GHz, horizontal / vertical polarization, low / mid / high frequency, PEAK**




Date: 23.NOV.2017 14:04:23

**Plot No. 29: 96.1 GHz to 97.0 GHz, horizontal / vertical polarization, low / mid / high frequency, AVG**

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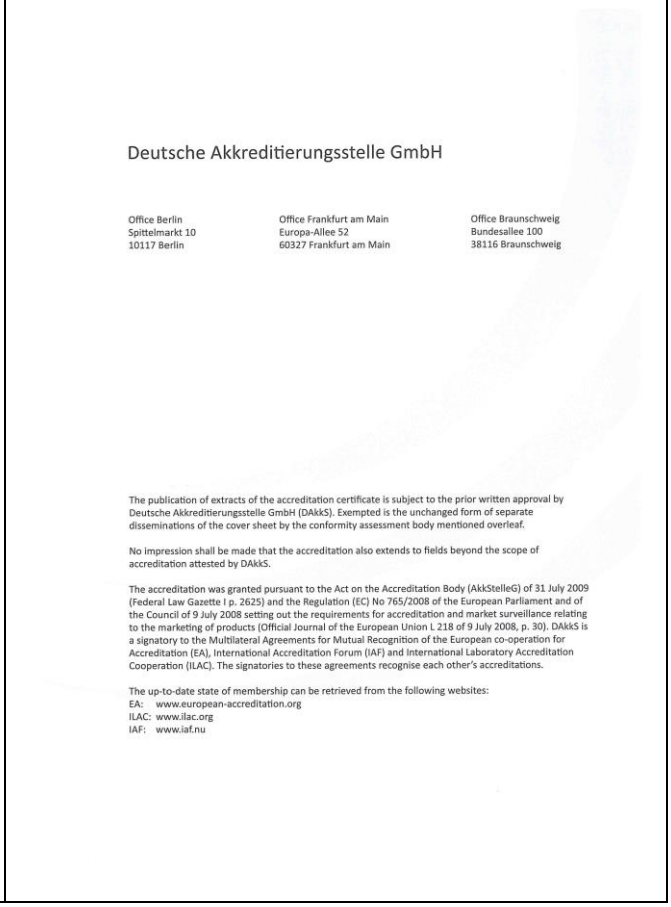
## 10 Glossary

| | |
|---|---|
| **EUT** | Equipment under test |
| **DUT** | Device under test |
| **UUT** | Unit under test |
| **GUE** | GNSS User Equipment |
| **ETSI** | European Telecommunications Standards Institute |
| **EN** | European Standard |
| **FCC** | Federal Communications Commission |
| **FCC ID** | Company Identifier at FCC |
| **IC** | Industry Canada |
| **PMN** | Product marketing name |
| **HMN** | Host marketing name |
| **HVIN** | Hardware version identification number |
| **FVIN** | Firmware version identification number |
| **EMC** | Electromagnetic Compatibility |
| **HW** | Hardware |
| **SW** | Software |
| **Inv. No.** | Inventory number |
| **S/N or SN** | Serial number |
| **C** | Compliant |
| **NC** | Not compliant |
| **NA** | Not applicable |
| **NP** | Not performed |
| **PP** | Positive peak |
| **QP** | Quasi peak |
| **AVG** | Average |
| **OC** | Operating channel |
| **OCW** | Operating channel bandwidth |
| **OBW** | Occupied bandwidth |
| **OOB** | Out of band |
| **DFS** | Dynamic frequency selection |
| **CAC** | Channel availability check |
| **OP** | Occupancy period |
| **NOP** | Non occupancy period |
| **DC** | Duty cycle |
| **PER** | Packet error rate |
| **CW** | Clean wave |
| **MC** | Modulated carrier |
| **WLAN** | Wireless local area network |
| **RLAN** | Radio local area network |
| **DSSS** | Dynamic sequence spread spectrum |
| **OFDM** | Orthogonal frequency division multiplexing |
| **FHSS** | Frequency hopping spread spectrum |
| **GNSS** | Global Navigation Satellite System |
| **$C/N_0$** | Carrier to noise-density ratio, expressed in dB-Hz |

## 11 Document history

| Version | Applied changes | Date of release |
|---|---|---|
| -/- | Initial release – DRAFT | 2017-12-09 |
| | Editorial changes based on applicant's remarks | 2017-12-14 |
| -A | Editorial changes based on applicant's remarks | 2018-02-07 |
| -B | Page 19, calculated AVG value for normal operation mode added as per customer request | 2018-09-19 |
| -C | editorial changes based on applicant's remarks: clearly show measurement distance, correction factors, limits, margins, limits for harmonics | 2019-02-01 |
| -D | editorial changes based on applicant's remarks, e.g. description for amplitude offset | 2019-04-05 |

## 12 Accreditation Certificate

| first page | last page |
|---|---|
|  |  |



**Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request**

http://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf

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