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## TEST REPORT

Test report no.: 1-0228/15-02-02-A

Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-00

### Testing laboratory

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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

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Im alten Riet 143

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### Manufacturer

**NEUTRIK AG**

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9494 Schaan / LIECHTENSTEIN

### Test standard/s

47 CFR Part 15

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

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

### Test Item

**Kind of test item:** Digital Wireless Audio Network**Model name:** XIRIUM PRO**FCC ID:** 2ABA7XPT**Frequency:**Band 1: 5150 MHz to 5250 MHz  
(lowest channel: 5180 MHz; highest channel 5240 MHz)  
Band 2: 5725 MHz to 5850 MHz  
(lowest channel: 5745 MHz; highest channel 5825 MHz)**Technology tested:** Proprietary**Antenna:** External antenna**Power supply:** 100.0 V to 240.0 V AC**Temperature range:** 0°C to +50°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.

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## 2 General information

### 2.1 Notes and disclaimer

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

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**This test report replaces the test report with the number 1-0228/15-02-02 and dated 2015-10-16**

### 2.2 Application details

|                                    |            |
|------------------------------------|------------|
| Date of receipt of order:          | 2015-10-05 |
| Date of receipt of test item:      | 2015-10-06 |
| Start of test:                     | 2015-10-06 |
| End of test:                       | 2015-10-13 |
| Person(s) present during the test: | -/-        |

## 3 Test standard/s

| Test standard  | Date | Test standard description                                                                 |
|----------------|------|-------------------------------------------------------------------------------------------|
| 47 CFR Part 15 | -/-  | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |

### 3.1 Measurement guidance

| Guidance             | Version | Description                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNII: KDB 789033 D02 | v01     | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E<br>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<br>American national standard of procedures for compliance testing of unlicensed wireless devices |
| ANSI C63.4-2014      | -/-     |                                                                                                                                                                                                                                                                                                                                                                                                   |
| ANSI C63.10-2013     | -/-     |                                                                                                                                                                                                                                                                                                                                                                                                   |

#### 4 Test environment

|                             |                                                          |                                                                                                                                                   |
|-----------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature :               | T <sub>nom</sub><br>T <sub>max</sub><br>T <sub>min</sub> | +22 °C during room temperature tests<br>+50 °C during high temperature tests (not performed)<br>0 °C during low temperature tests (not performed) |
| Relative humidity content : |                                                          | 55 %                                                                                                                                              |
| Barometric pressure :       |                                                          | not relevant for this kind of testing                                                                                                             |
| Power supply :              | V <sub>nom</sub><br>V <sub>max</sub><br>V <sub>min</sub> | 120.0 V AC<br>240.0 V<br>100.0 V                                                                                                                  |
|                             |                                                          |                                                                                                                                                   |

#### 5 Test item

##### 5.1 General description

|                              |                                                                                                                                                                              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of test item :          | Digital Wireless Audio Network                                                                                                                                               |
| Type identification :        | XIRIUM PRO                                                                                                                                                                   |
| PMN :                        | NXP2TX                                                                                                                                                                       |
| HVIN :                       | NXP2TX                                                                                                                                                                       |
| FVIN :                       | -/-                                                                                                                                                                          |
| HMN :                        | -/-                                                                                                                                                                          |
| S/N serial number :          | -/-                                                                                                                                                                          |
| HW hardware status :         | A                                                                                                                                                                            |
| SW software status :         | -/-                                                                                                                                                                          |
| Frequency band :             | Band 1: 5150 MHz to 5250 MHz<br>(lowest channel: 5180 MHz; highest channel 5240 MHz)<br>Band 2: 5725 MHz to 5850 MHz<br>(lowest channel: 5745 MHz; highest channel 5825 MHz) |
| Type of radio transmission : | OFDM                                                                                                                                                                         |
| Use of frequency spectrum :  |                                                                                                                                                                              |
| Type of modulation :         | BPSK, QPSK, 16-QAM, 64-QAM                                                                                                                                                   |
| Antenna :                    | External antenna                                                                                                                                                             |
| Power supply :               | 100.0 V to 240.0 V AC, 50/60 Hz                                                                                                                                              |
| Temperature range :          | 0°C to +50°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: 1-0228/15-02-01\_AnnexA  
1-0228/15-02-01\_AnnexB  
1-0228/15-02-01\_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).

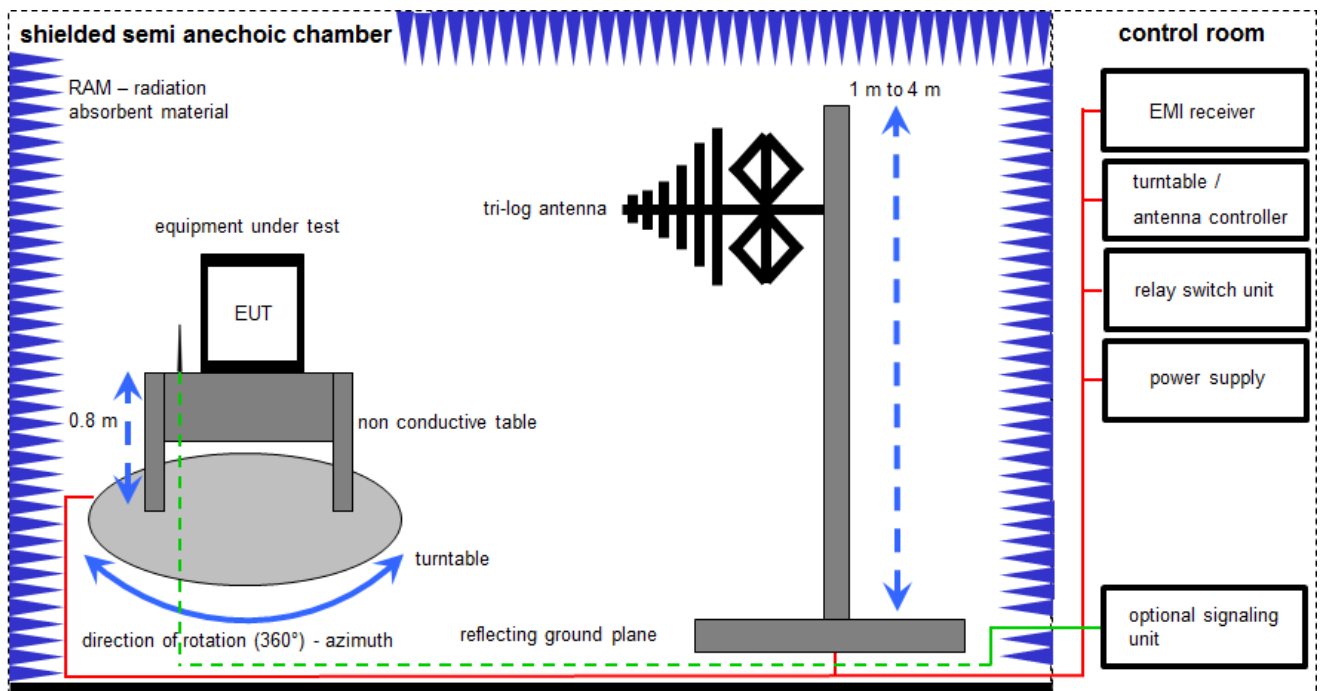
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

**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                       |
| vlk! | Attention: extended calibration interval   |     |                                                      |
| NK!  | Attention: not calibrated                  | *)  | next calibration ordered / currently in progress     |

## 7.1 Shielded semi anechoic chamber

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

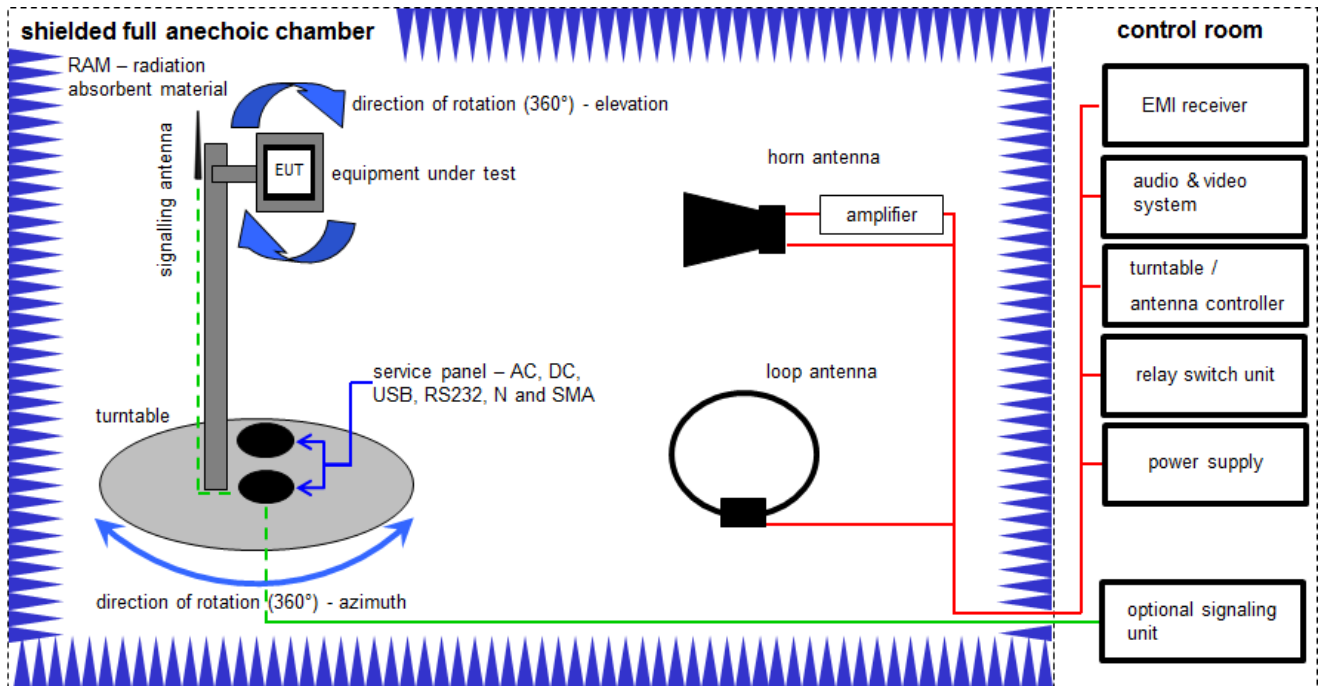
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

### Equipment table:

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

## 7.2 Shielded fully anechoic chamber



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)

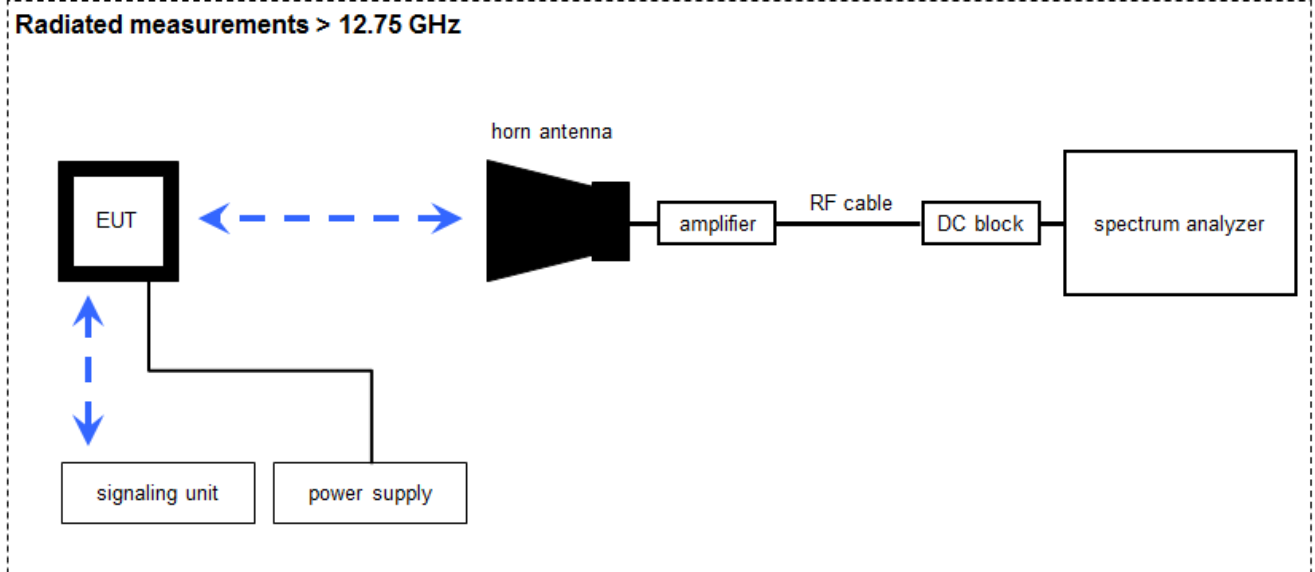
Example calculation:

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

### Equipment table:

| No. | Lab / Item | Equipment                                      | Type                                  | Manufacturer         | Serial No.      | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|------------------------------------------------|---------------------------------------|----------------------|-----------------|-----------------|---------------------|------------------|------------------|
| 1   | B          | Active Loop Antenna 10 kHz to 30 MHz           | 6502                                  | EMCO/2               | 8905-2342       | 300000256       | k                   | 24.06.2015       | 24.06.2017       |
| 2   | C          | Double-Ridged Waveguide Horn Antenna 1-18.0GHz | 3115                                  | EMCO                 | 9709-5290       | 300000212       | k                   | 13.08.2015       | 13.08.2017       |
| 3   | B+C        | EMI Test Receiver 20Hz- 26,5GHz                | ESU26                                 | R&S                  | 100037          | 300003555       | k                   | 22.01.2015       | 22.01.2016       |
| 4   | C          | Highpass Filter                                | WHK1.1/15G-10SS                       | Wainwright           | 37              | 400000148       | ne                  | -/-              | -/-              |
| 5   | C          | Highpass Filter                                | WHKX7.0/18G-8SS                       | Wainwright           | 18              | 300003789       | ne                  | -/-              | -/-              |
| 6   | C          | Broadband Amplifier 0.5-18 GHz                 | CBLU5184540                           | CERNEX               | 22050           | 300004482       | ev                  | -/-              | -/-              |
| 7   | B+C        | 4U RF Switch Platform                          | L4491A                                | Agilent Technologies | MY50000032      | 300004510       | ne                  | -/-              | -/-              |
| 8   | B+C        | Messrechner und Monitor                        | Intel Core i3 3220/3,3 GHz, Prozessor | Agilent Technologies | 2V2403033A54 21 | 300004591       | ne                  | 22.01.2015       | 22.01.2016       |
| 9   | B+C        | NEXIO EMV-Software                             | BAT EMC                               | EMCO                 | 2V2403033A54 21 | 300004682       | ne                  | -/-              | -/-              |

### 7.3 Radiated measurements > 12.75 GHz



Measurement distance: horn antenna 50 cm

FS = UR + CA + AF

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

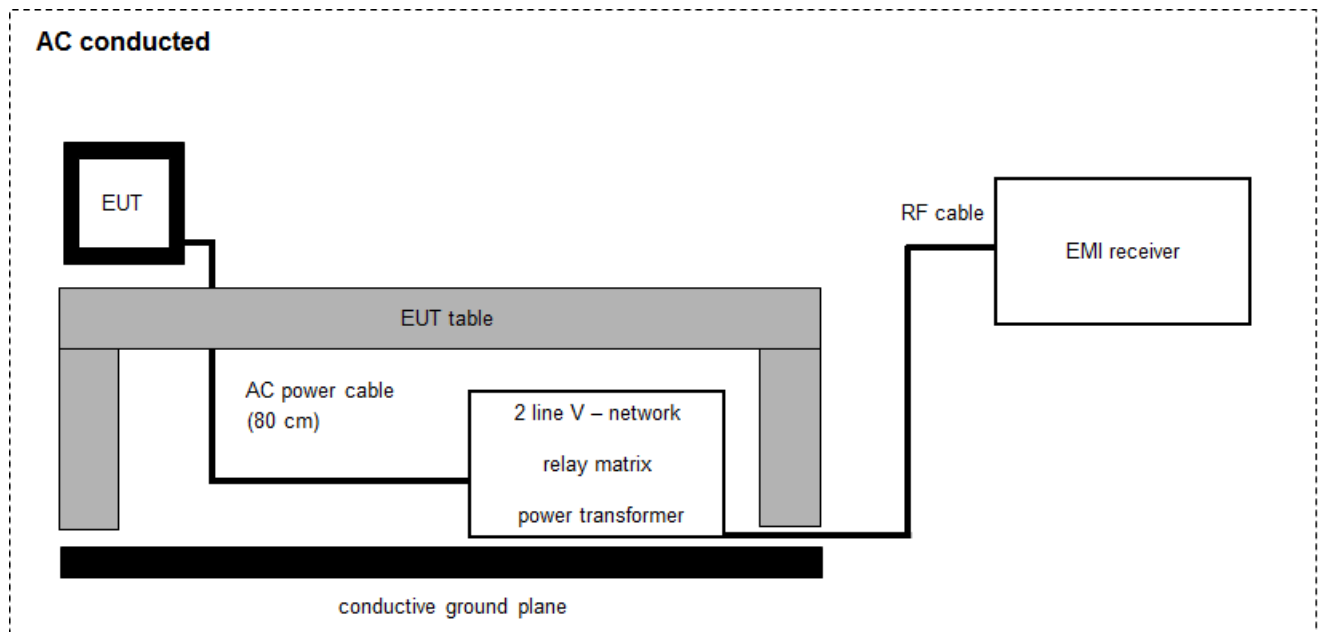
Example calculation:

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

#### Equipment table:

| No. | Lab / Item | Equipment                               | Type                | Manufacturer   | Serial No.       | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|-----------------------------------------|---------------------|----------------|------------------|-----------------|---------------------|------------------|------------------|
| 1   | D          | Signal Analyzer 40 GHz                  | FSV40               | R&S            | 101042           | 300004517       | k                   | 22.01.2015       | 22.01.2016       |
| 2   | D          | Amplifier 2-40 GHz                      | JS32-02004000-57-5P | MITEQ          | 1777200          | 300004541       | ev                  | -/-              | -/-              |
| 3   | D          | RF-Cable                                | ST18/SMAM/SMAM/72   | Huber & Suhner | Batch no. 699714 | 400001184       | ev                  | -/-              | -/-              |
| 4   | D          | Horn Antenna 18,0-40,0 GHz              | LHAF180             | Microw.Devel   | 39180-103-022    | 300001748       | k                   | 22.05.2015       | 22.05.2018       |
| 5   | D          | Std. Gain Horn Antenna 12.4 to 18.0 GHz | 639                 | Narda          | 8402             | 300000787       | k                   | 14.08.2015       | 14.08.2017       |

## 7.4 AC conducted



$$FS = UR + CF + VC$$

(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:

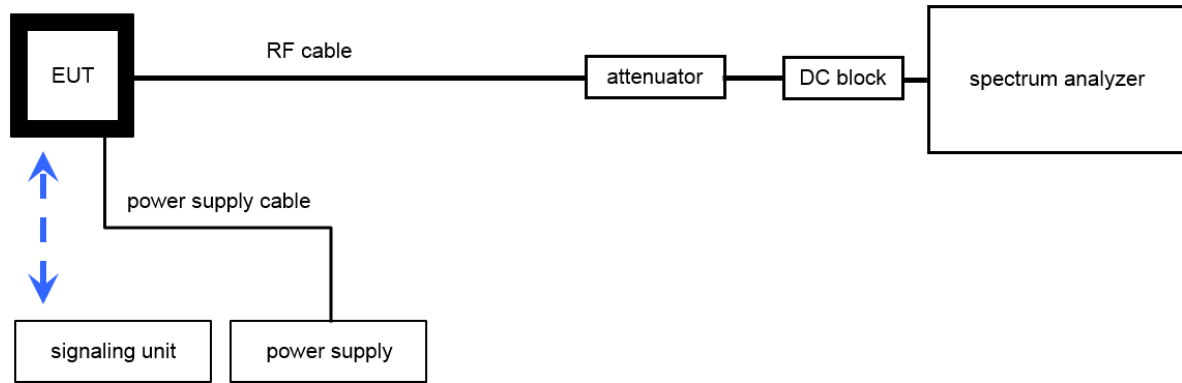
$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

**Equipment table:**

| No. | Lab / Item | Equipment                                         | Type     | Manufacturer | Serial No.      | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|---------------------------------------------------|----------|--------------|-----------------|-----------------|---------------------|------------------|------------------|
| 1   | E          | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1 | SPS          | A3509 07/0 0205 | 300003314       | Ve                  | 11.02.2014       | 11.02.2016       |
| 2   | E          | Netznachbildung                                   | ESH3-Z5  | R&S          | 892475/017      | 300002209       | k                   | 17.06.2014       | 17.06.2016       |
| 3   | E          | EMI-Receiver                                      | 8542E    | HP           | 3617A00170      | 300000568       | k                   | 28.01.2015       | 28.01.2016       |

## 7.5 Conducted measurements

### Conducted measurements normal conditions



$$OP = AV + CA$$

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

#### Example calculation:

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

#### Equipment table:

| No. | Lab / Item | Equipment                         | Type                                  | Manufacturer              | Serial No.       | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|-----------------------------------|---------------------------------------|---------------------------|------------------|-----------------|---------------------|------------------|------------------|
| 1   | F+G        | PC-WLAN Tester                    | Intel Core i3 3220/3,3 GHz, Prozessor | MITEQ                     | 2V2403033A4523   | 300004589       | ne                  | -/-              | -/-              |
| 2   | F          | Teststand                         | Teststand Custom Sequence Editor      | National Instruments GmbH | 2V2403033A4523   | 300004590       | ne                  | -/-              | -/-              |
| 3   | F+G        | RF-Cable                          | ST18/SMAM/SMAM/60                     | Huber & Suhner            | Batch no. 606844 | 400001181       | ev                  | -/-              | -/-              |
| 4   | F          | DC-Blocker 0.1-40 GHz             | 8141A                                 | Inmet                     | Batch no. 699714 | 400001185       | ev                  | 17.06.2014       | 17.06.2016       |
| 5   | F+G        | Coax Attenuator 10 dB 2W 0-40 GHz | MCL BW-K10-2W44+                      | Mini Circuits             | Batch no. 699714 | 400001186       | ev                  | 28.01.2015       | 28.01.2016       |
| 6   | G          | Power Sensor                      | NRP-Z81                               | R&S                       | 100010           | 300003780       | k                   | 08.12.2014       | 08.12.2016       |
| 7   | F          | Signal Analyzer 40 GHz            | FSV40                                 | R&S                       | 101042           | 300004517       | k                   | 22.01.2015       | 22.01.2016       |

## **8 Sequence of testing**

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

#### **Setup**

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

#### **Premeasurement**

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

#### **Final measurement**

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

## 8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position  $\pm 45^\circ$  and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

### 8.3 Sequence of testing radiated spurious 1 GHz to 12.75 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 12.75 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                                             | $\pm 3$ dB                              |
| Power spectral density                                   | $\pm 1.5$ dB                            |
| DTS bandwidth                                            | $\pm 100$ kHz (depends on the used RBW) |
| Occupied bandwidth                                       | $\pm 100$ kHz (depends on the used RBW) |
| Maximum output power                                     | $\pm 1.5$ dB                            |
| Detailed spurious emissions @ the band edge - conducted  | $\pm 1.5$ dB                            |
| Band edge compliance radiated                            | $\pm 3$ dB                              |
| Spurious emissions conducted                             | $\pm 3$ dB                              |
| Spurious emissions radiated below 30 MHz                 | $\pm 3$ dB                              |
| Spurious emissions radiated 30 MHz to 1 GHz              | $\pm 3$ dB                              |
| Spurious emissions radiated 1 GHz to 12.75 GHz           | $\pm 3.7$ dB                            |
| Spurious emissions radiated above 12.75 GHz              | $\pm 4.5$ dB                            |
| Spurious emissions conducted below 30 MHz (AC conducted) | $\pm 2.6$ dB                            |

## 10 Summary of measurement results

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

| TC Identifier | Description | Verdict   | Date       | Remark |
|---------------|-------------|-----------|------------|--------|
| RF-Testing    | CFR Part 15 | see table | 2015-12-09 | -/-    |

| Test specification clause | Test case                                          | Temperature conditions | Power source voltages | C                                   | NC                       | NA                       | NP                                  | Remark                     |
|---------------------------|----------------------------------------------------|------------------------|-----------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|----------------------------|
| -/-                       | Gain                                               | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Provided by manufacturer!  |
| U-NII Part 15             | Duty cycle                                         | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | No passed / fail criteria! |
| §15.407(a)                | Maximum output power                               | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |
| §15.407(a)                | Power spectral density                             | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |
| §15.407(a)                | Spectrum bandwidth<br>26dB bandwidth               | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |
| KDB789033 D02             | Spectrum bandwidth<br>99% bandwidth                | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | No passed / fail criteria! |
| §15.407(a)                | Peak excursion measurements                        | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | -/-                        |
| §15.205                   | Band edge compliance radiated                      | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |
| §15.407(b)                | TX spurious emissions radiated                     | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | *1                         |
| §15.109                   | RX spurious emissions radiated                     | Nominal                | Nominal               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Transmitter only!          |
| §15.209(a)                | Spurious emissions radiated<br>< 30 MHz            | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |
| §15.107(a)<br>§15.207     | Spurious emissions conducted<br>emissions < 30 MHz | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | -/-                        |

**Note:** C = Compliant; NC = Not Compliant; NA = Not Applicable; NP = Not Performed; \*1 = worst case configuration tested (with regards to the output power).

**11 Additional comments**

Reference documents: Antenna specification: MobileMark antenna solutions ECO9-5500-BLK.

Special test descriptions: None

Configuration descriptions: The DUT supports two modulation schemes for Stereo or Mono audio broadcast. All tests were performed with both modulation schemes except the radiated spurious emission measurements. Spurious measurements were performed with the X-Rock modulation scheme due to the higher output power.

Power settings depending on channel configuration:

| Channel | Power setting [dB] |
|---------|--------------------|
| Ch 36   | -15.0              |
| Ch 40   | - 8.0              |
| Ch 48   | - 2.0              |
| Ch 149  | - 2.0              |
| Ch 157  | - 2.0              |
| Ch 165  | - 2.0              |

Test mode:

☐ No test mode available.

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

## 12 Measurement results

### 12.1 Gain

9 dBi as declared by manufacturer (see reference in section 10).

### 12.2 Duty cycle

#### Measurement:

| Measurement parameter   |                                     |
|-------------------------|-------------------------------------|
| Detector:               | Peak                                |
| Sweep time:             | Auto                                |
| Resolution bandwidth:   | 10 MHz                              |
| Video bandwidth:        | 10 MHz                              |
| Span:                   | Zero                                |
| Trace-Mode:             | Video trigger / view / single sweep |
| Test setup:             | See sub clause 7.5 (Item F)         |
| Measurement uncertainty | See sub clause 9                    |

#### Results:

#### Duty cycle and correction factor:

|                    |                   |    |        |
|--------------------|-------------------|----|--------|
| OFDM / X-Rock ON:  | 54.2 % duty cycle | => | 2.7 dB |
| OFDM / X-Rock OFF: | 43.0 % duty cycle | => | 3.7 dB |

### 12.3 Maximum output power conducted

**Description:**

Measurement of the maximum output power conducted

**Measurement:**

| Measurement parameter   |                             |
|-------------------------|-----------------------------|
| Detector:               | Peak power meter used!      |
| Sweep time:             |                             |
| Resolution bandwidth:   |                             |
| Video bandwidth:        |                             |
| Span:                   |                             |
| Integration bandwidth:  |                             |
| Trace mode:             |                             |
| Measurement function:   |                             |
| Test setup:             | See sub clause 7.5 (Item G) |
| Measurement uncertainty | See sub clause 9            |

**Limits:**

| Radiated output power               | Conducted output power                  |
|-------------------------------------|-----------------------------------------|
| Conducted power + 6dBi antenna gain | 1W 5.150-5.250 GHz<br>1W 5.725-5.85 GHz |

**Result: OFDM / X-Rock ON**

| OFDM<br>Channel | Maximum output power conducted [dBm] |                    |                     |     |
|-----------------|--------------------------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz                   | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 11.7                                 | 18.1               | 19.8                | -/- |
| Channel         | Lowest<br>5745 MHz                   | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 20.8                                 | 20.7               | 20.1                | -/- |

| OFDM<br>Channel | Maximum calculated EIRP [dBm] |                    |                     |     |
|-----------------|-------------------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz            | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 20.7                          | 27.1               | 28.8                | -/- |
| Channel         | Lowest<br>5745 MHz            | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 29.8                          | 29.7               | 29.1                | -/- |

**Result: OFDM / X-Rock OFF**

| OFDM<br>Channel | Maximum output power conducted [dBm] |                    |                     |     |
|-----------------|--------------------------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz                   | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 11.6                                 | 18.1               | 19.9                | -/- |
| Channel         | Lowest<br>5745 MHz                   | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 20.5                                 | 20.7               | 20.3                | -/- |

| OFDM<br>Channel | Maximum calculated EIRP [dBm] |                    |                     |     |
|-----------------|-------------------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz            | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 20.6                          | 27.1               | 28.9                | -/- |
| Channel         | Lowest<br>5745 MHz            | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 29.5                          | 29.7               | 29.3                | -/- |

## 12.4 Power spectral density

### Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

### Measurement:

| Measurement parameter   |                                                                      |
|-------------------------|----------------------------------------------------------------------|
| Detector:               | RMS                                                                  |
| Sweep time:             | $\geq 10 \cdot (\text{swp points}) \cdot (\text{total on/off time})$ |
| Resolution bandwidth:   | 1 MHz (500 kHz for 5.8 GHz band)                                     |
| Video bandwidth:        | $\geq 3 \cdot \text{RBW}$                                            |
| Span:                   | > EBW                                                                |
| Trace-Mode:             | Max hold                                                             |
| Test setup:             | See sub clause 7.5 (Item F)                                          |
| Measurement uncertainty | See sub clause 9                                                     |

### Limits:

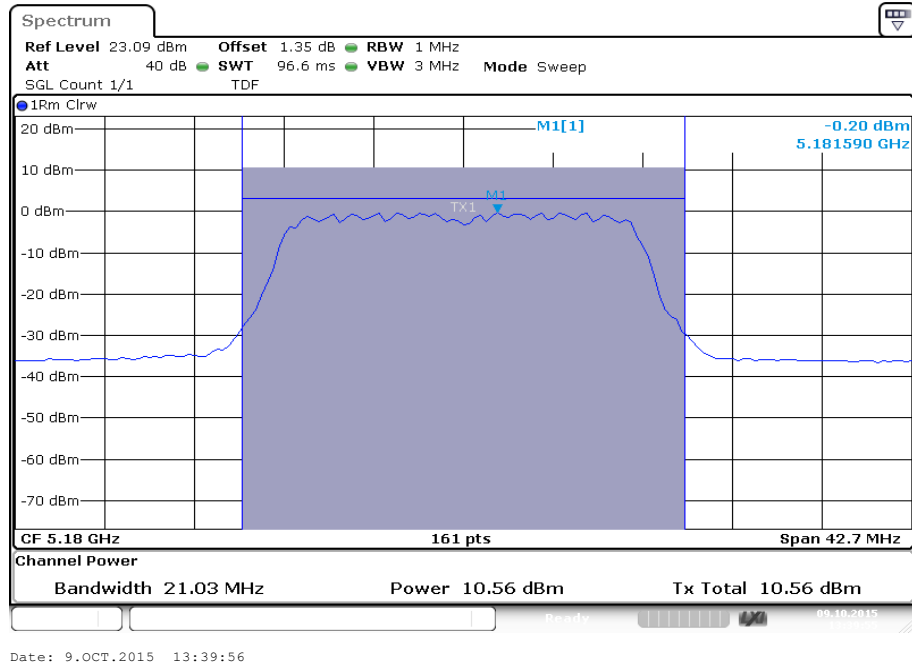
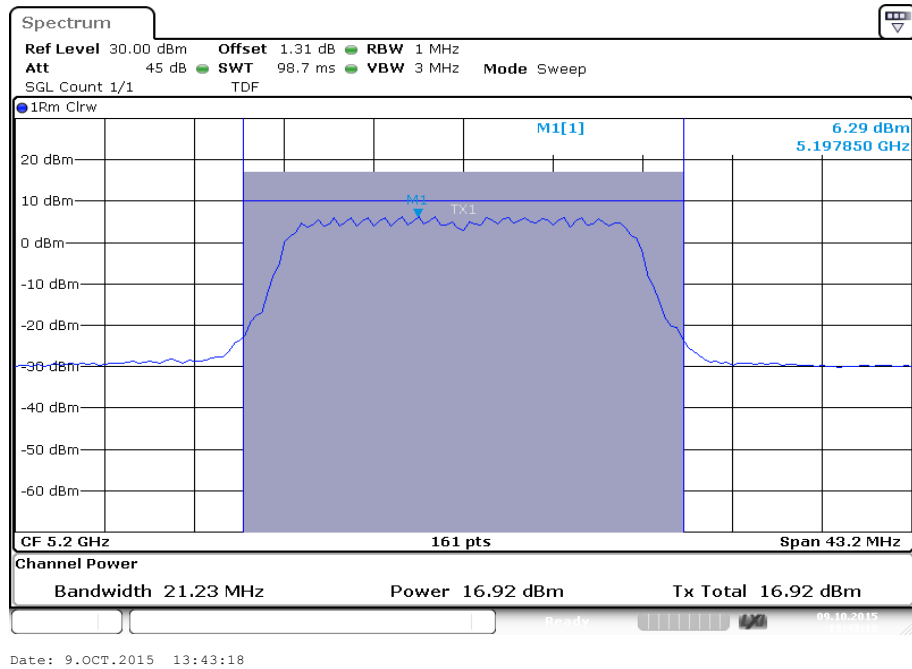
| Power Spectral Density                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| power spectral density conducted $\leq 17$ dBm in any 1 MHz band (band 5150 – 5250 MHz)<br>power spectral density conducted $\leq 30$ dBm in any 1 MHz band (band 5725 – 5850 MHz) |

### Result: OFDM / X-Rock ON

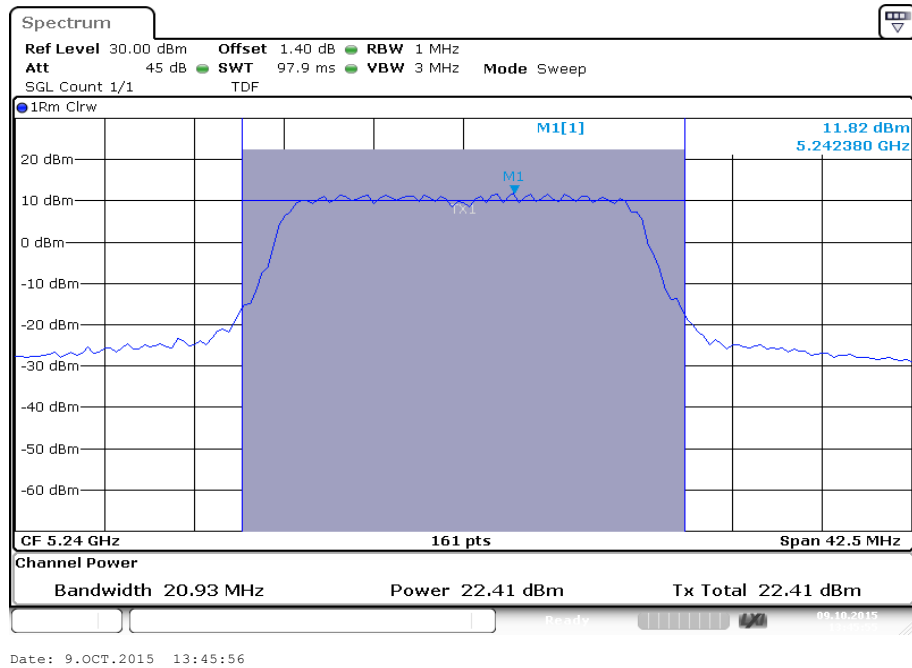
| OFDM<br>Channel                          | Power Spectral density [dBm/MHz] |                    |                     |     |
|------------------------------------------|----------------------------------|--------------------|---------------------|-----|
|                                          | Lowest<br>5180 MHz               | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
| including duty cycle correction (2.7 dB) | 1.2                              | 7.7                | 13.1                | -/- |
| Channel                                  | Lowest<br>5745 MHz               | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                                          | 11.2                             | 10.6               | 10.6                | -/- |

**Result: OFDM / X-Rock OFF**

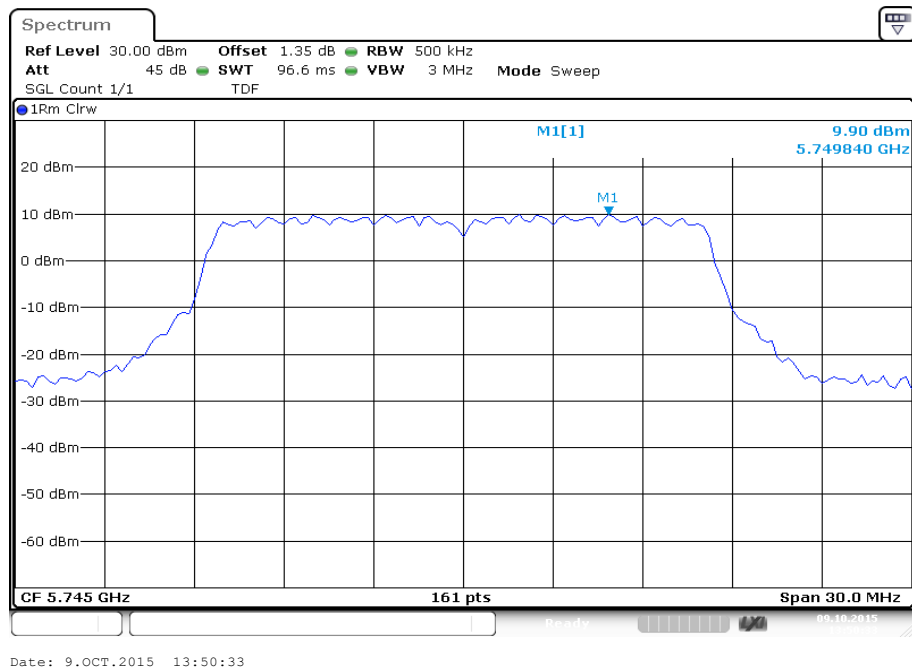
| OFDM<br>Channel                          | Power Spectral density [dBm/MHz] |                    |                     |     |
|------------------------------------------|----------------------------------|--------------------|---------------------|-----|
|                                          | Lowest<br>5180 MHz               | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
| including duty cycle correction (3.7 dB) | -0.2                             | 6.4                | 12.6                | -/- |
| Channel                                  | Lowest<br>5745 MHz               | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
| including duty cycle correction (3.7 dB) | 10.3                             | 10.2               | 10.0                | -/- |

**Plots: OFDM / X-Rock ON****Plot 1: 5180 MHz****Plot 2: 5200 MHz**

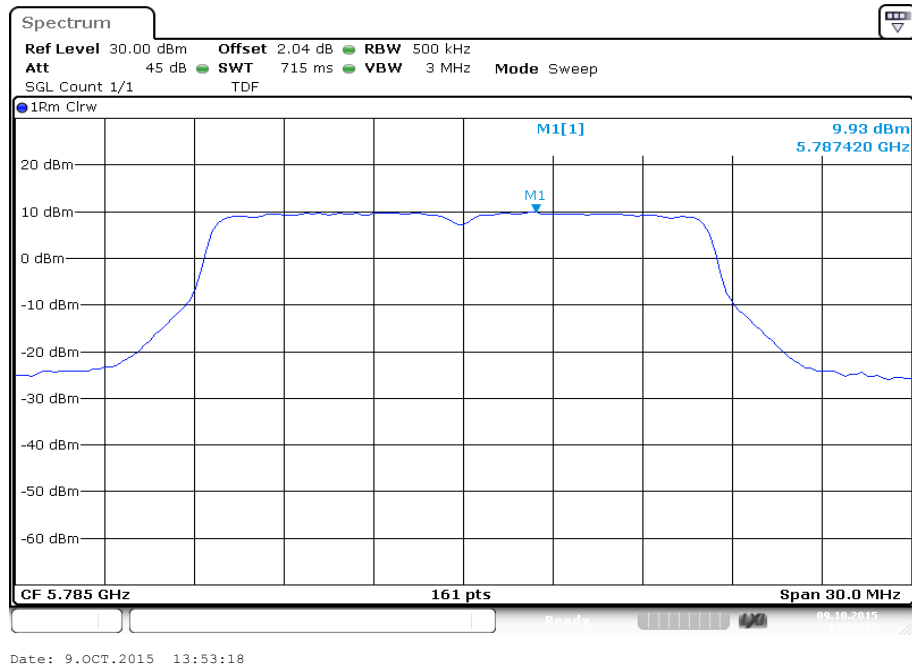
Plot 3: 5240 MHz



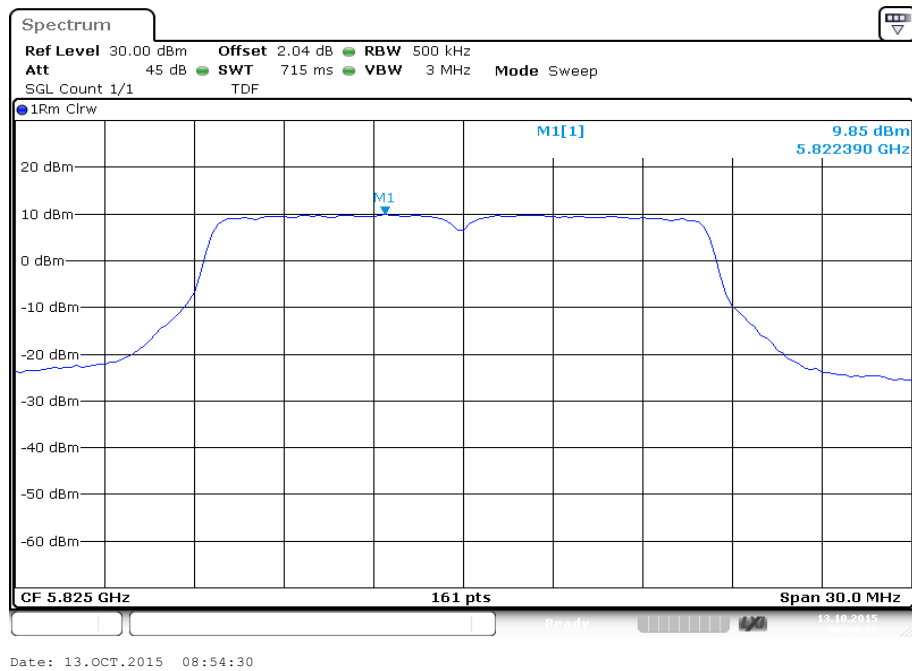
Plot 4: 5745 MHz

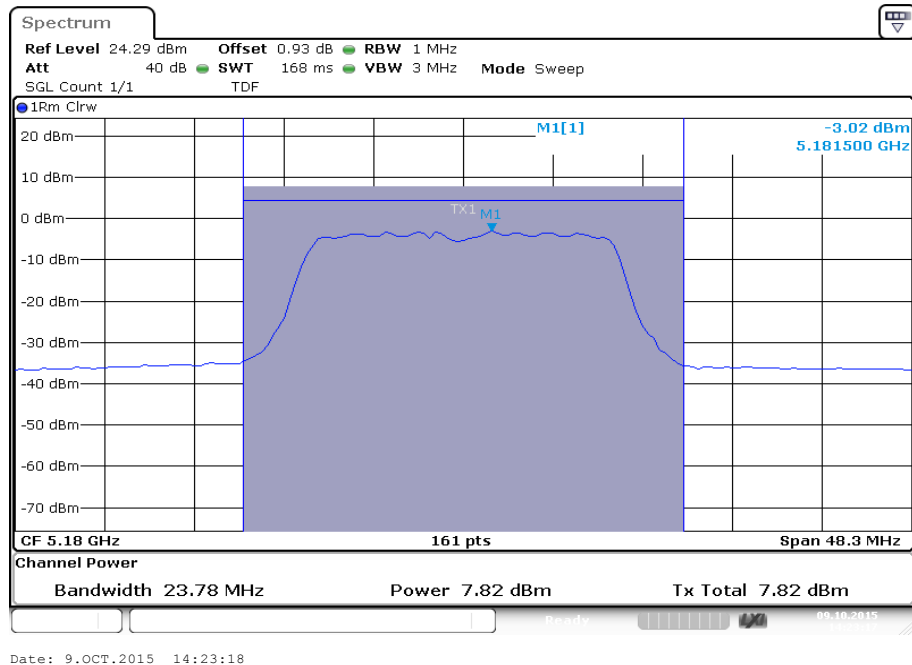
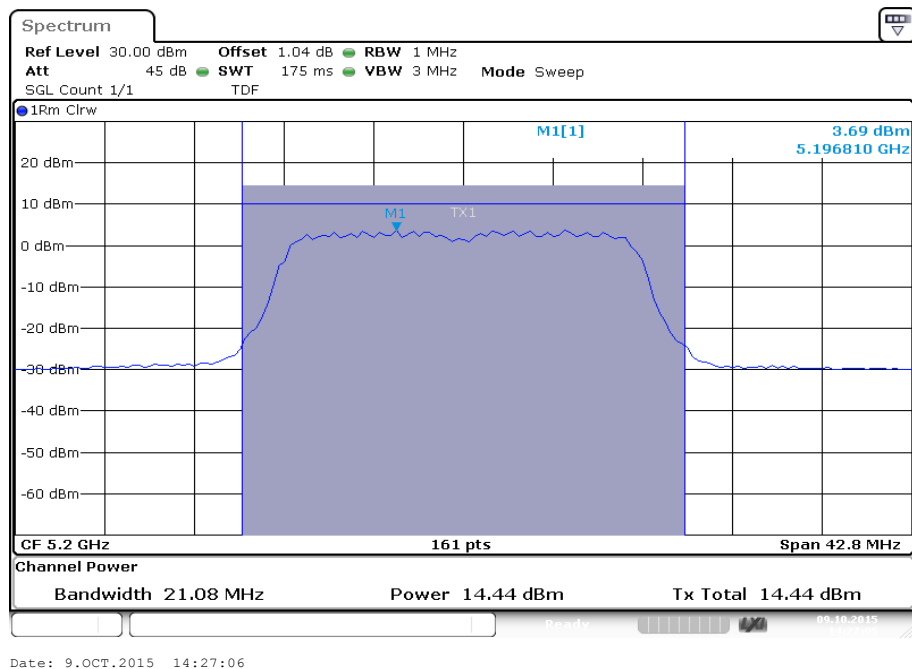


Plot 5: 5785 MHz

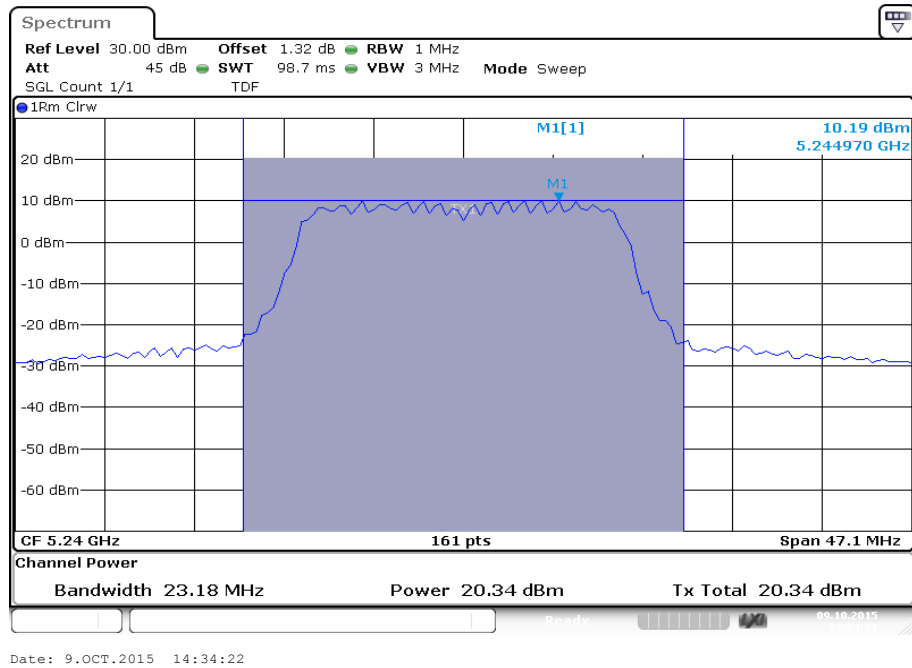


Plot 6: 5825 MHz

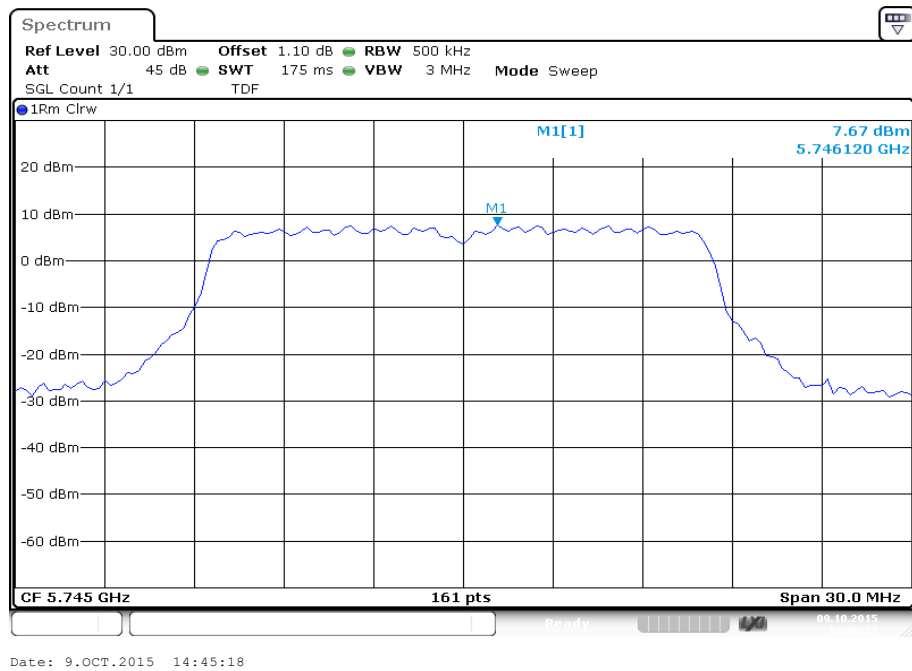


**Plots: OFDM / X-Rock OFF****Plot 7: 5180 MHz****Plot 8: 5200 MHz**

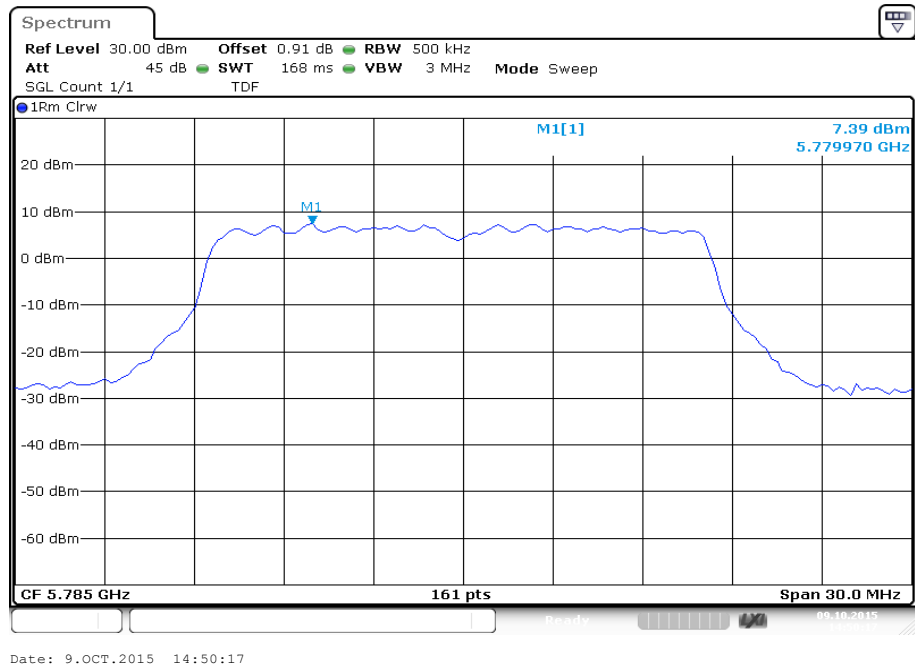
Plot 9: 5240 MHz



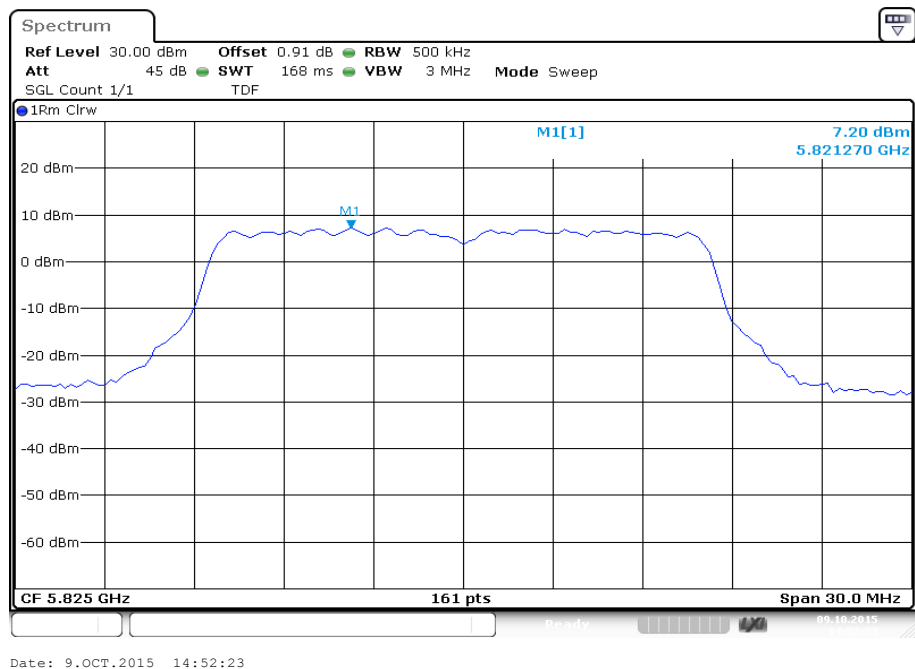
Plot 10: 5745 MHz



Plot 11: 5785 MHz



Plot 12: 5825 MHz



## 12.5 Spectrum bandwidth – 26 dB bandwidth

### Description:

Measurement of the 26 dB bandwidth of the modulated signal.

### Measurement:

| Measurement parameter   |                             |
|-------------------------|-----------------------------|
| Detector:               | Peak                        |
| Sweep time:             | Auto                        |
| Resolution bandwidth:   | 1% EBW                      |
| Video bandwidth:        | ≥ RBW                       |
| Span:                   | > complete signal!          |
| Trace-Mode:             | Max hold                    |
| Test setup:             | See sub clause 7.5 (Item F) |
| Measurement uncertainty | See sub clause 9            |

### Limits:

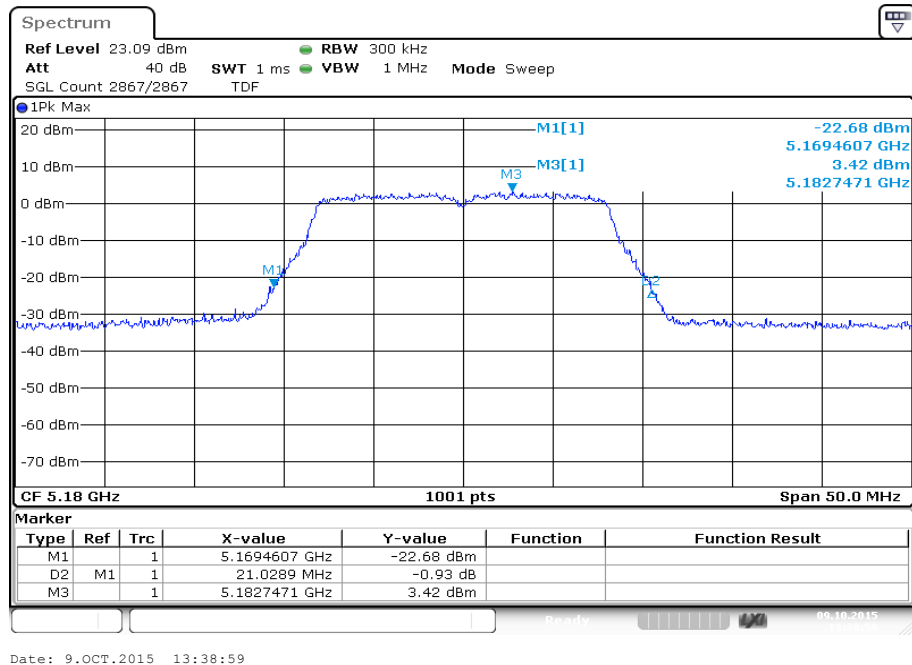
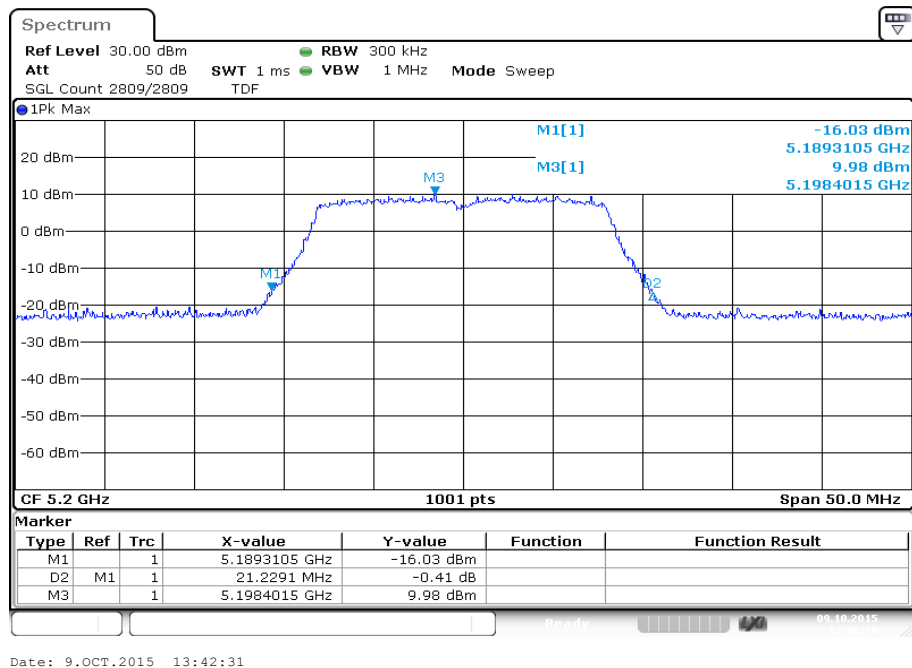
| Spectrum Bandwidth – 26 dB Bandwidth |
|--------------------------------------|
| -/-                                  |

### Result: OFDM / X-Rock ON

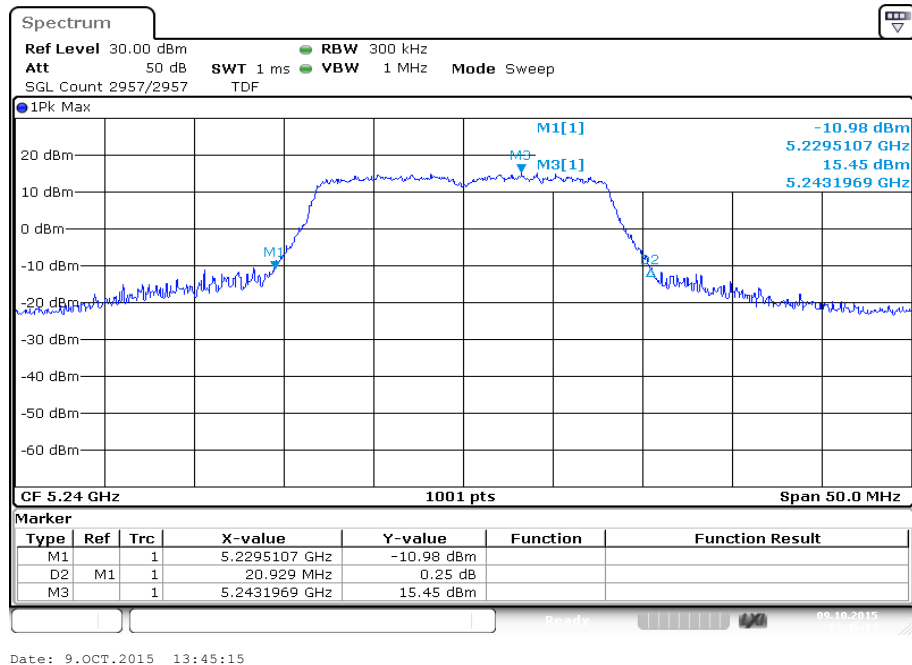
| OFDM<br>Channel | 26 dB BANDWIDTH [MHz] |                    |                     |     |
|-----------------|-----------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz    | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 21.0                  | 21.2               | 20.9                | -/- |
| Channel         | Lowest<br>5745 MHz    | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 25.2                  | 24.6               | 21.3                | -/- |

**Result: OFDM / X-Rock OFF**

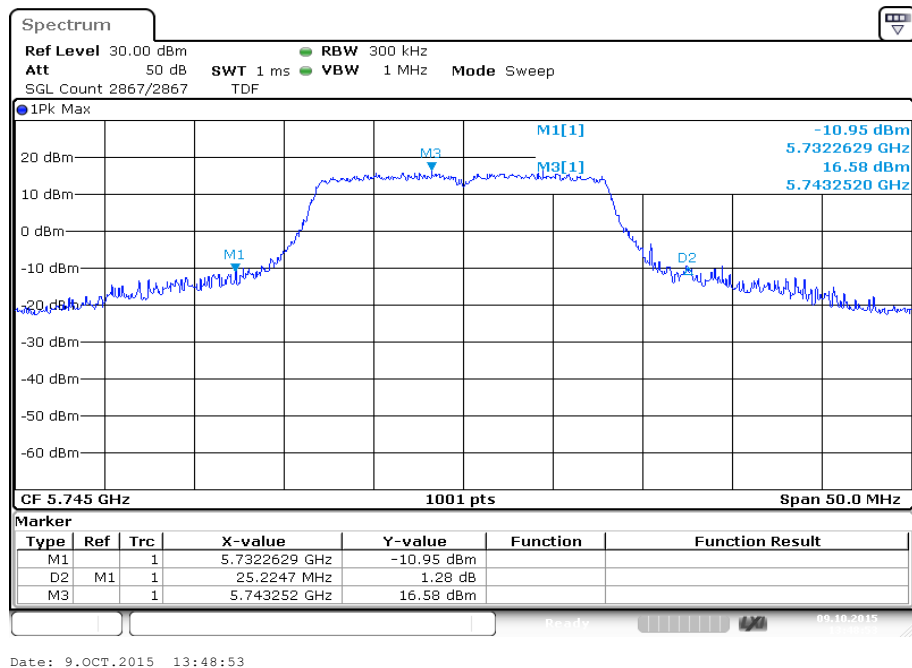
| OFDM<br>Channel | 26 dB BANDWIDTH [MHz] |                    |                     |     |
|-----------------|-----------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz    | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 23.8                  | 21.1               | 23.2                | -/- |
| Channel         | Lowest<br>5745 MHz    | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 25.3                  | 21.0               | 21.3                | -/- |

**Plots: OFDM / X-Rock ON****Plot 1: 5180 MHz****Plot 2: 5200 MHz**

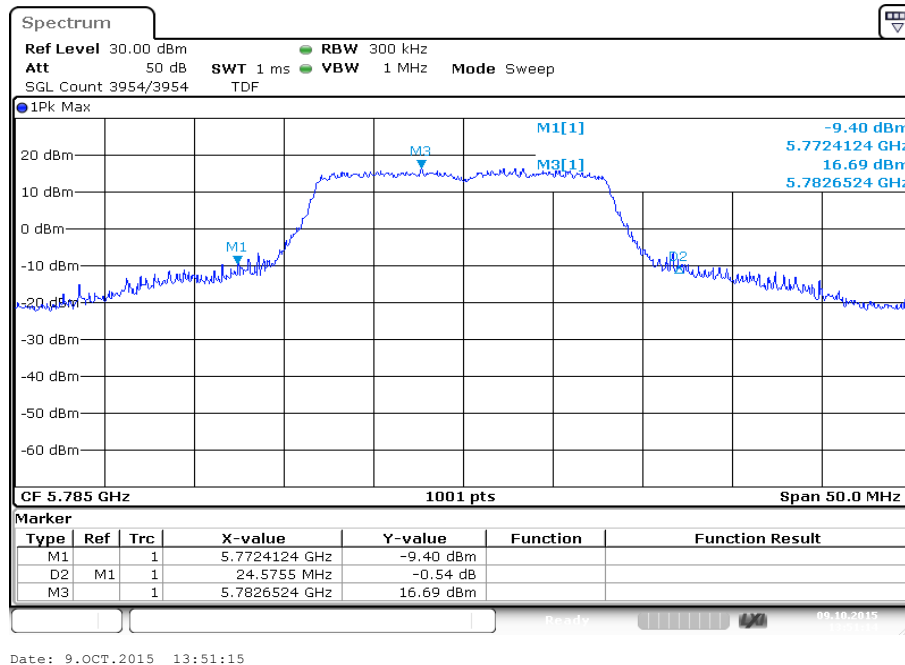
Plot 3: 5240 MHz



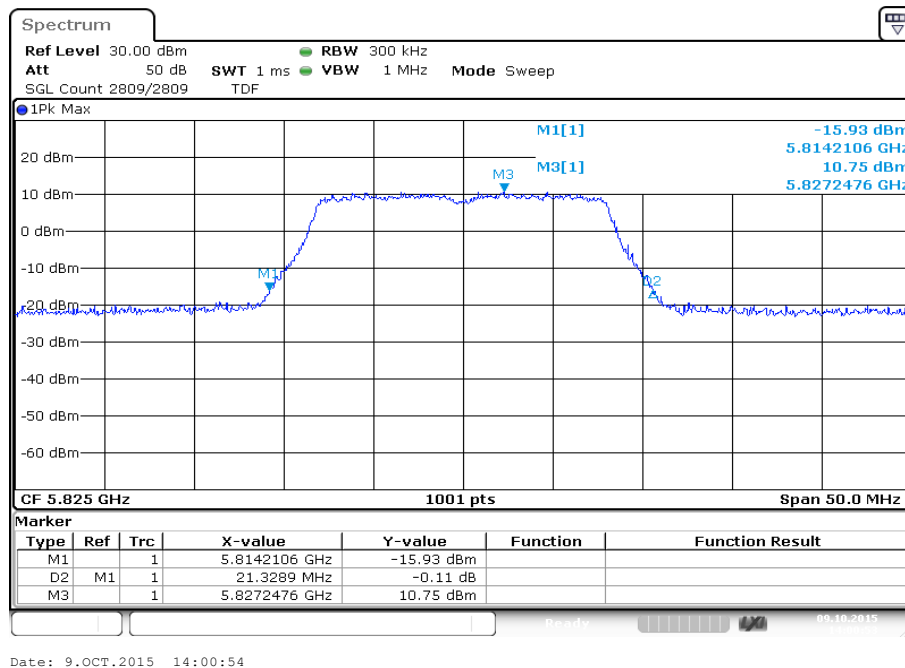
Plot 4: 5745 MHz

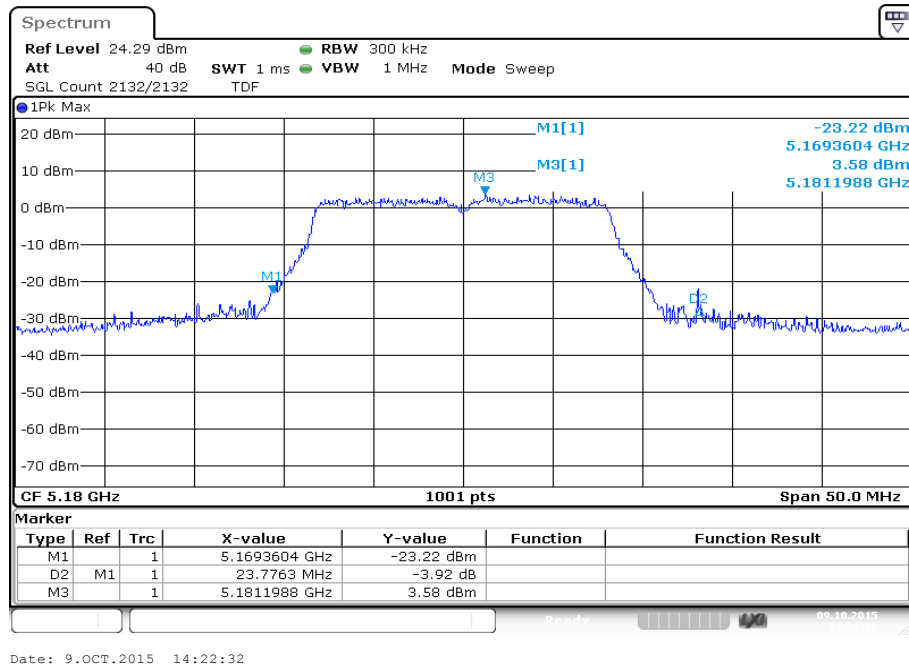
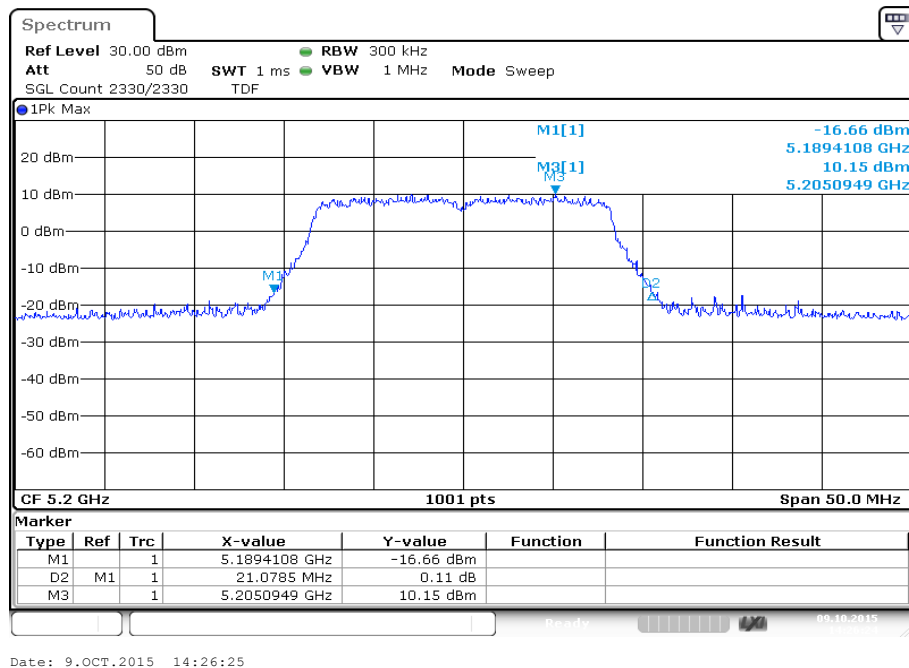


Plot 5: 5785 MHz

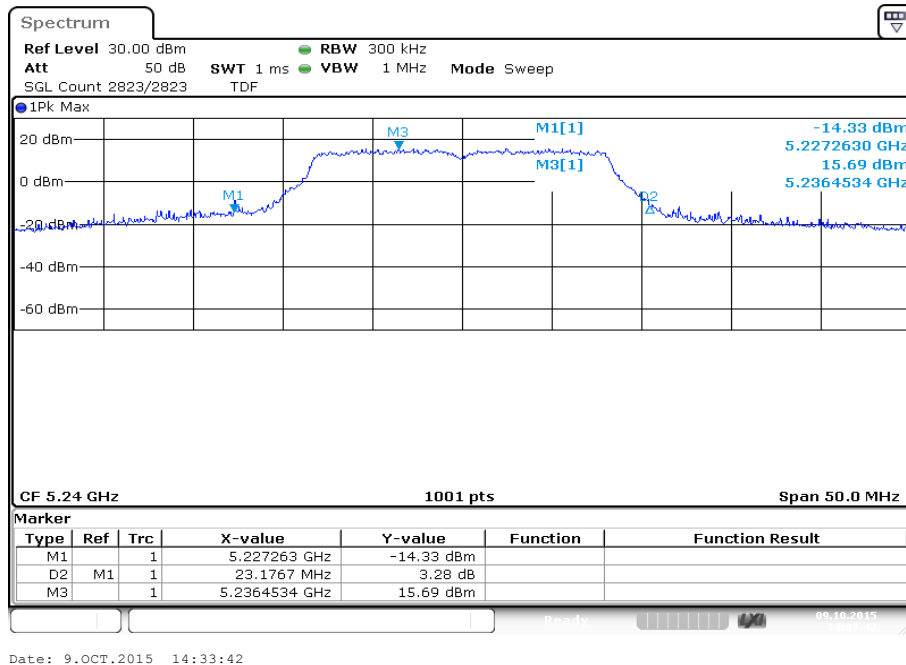


Plot 6: 5825 MHz

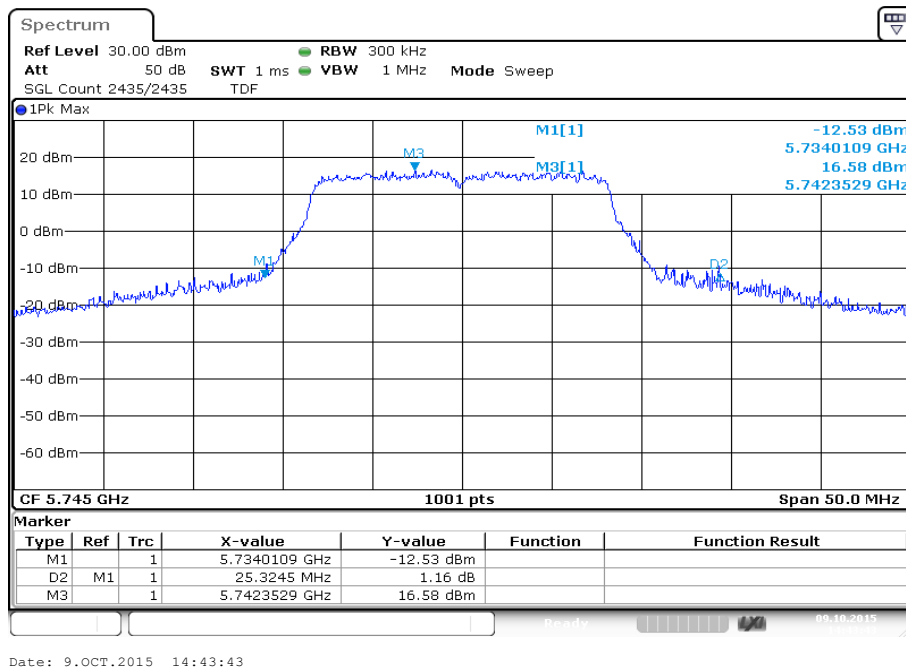


**Plots: OFDM / X-Rock OFF****Plot 7: 5180 MHz****Plot 8: 5200 MHz**

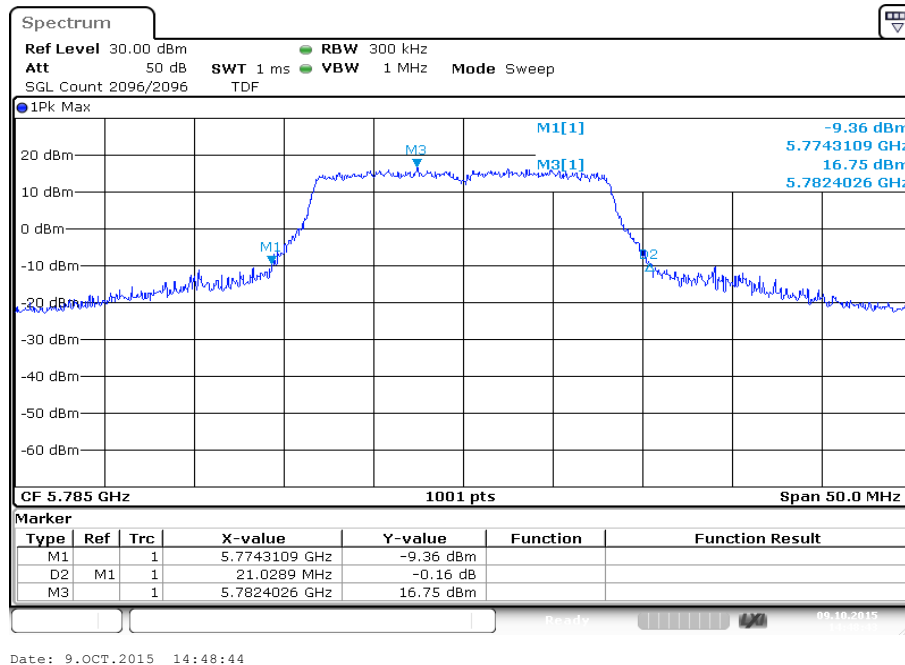
Plot 9: 5240 MHz



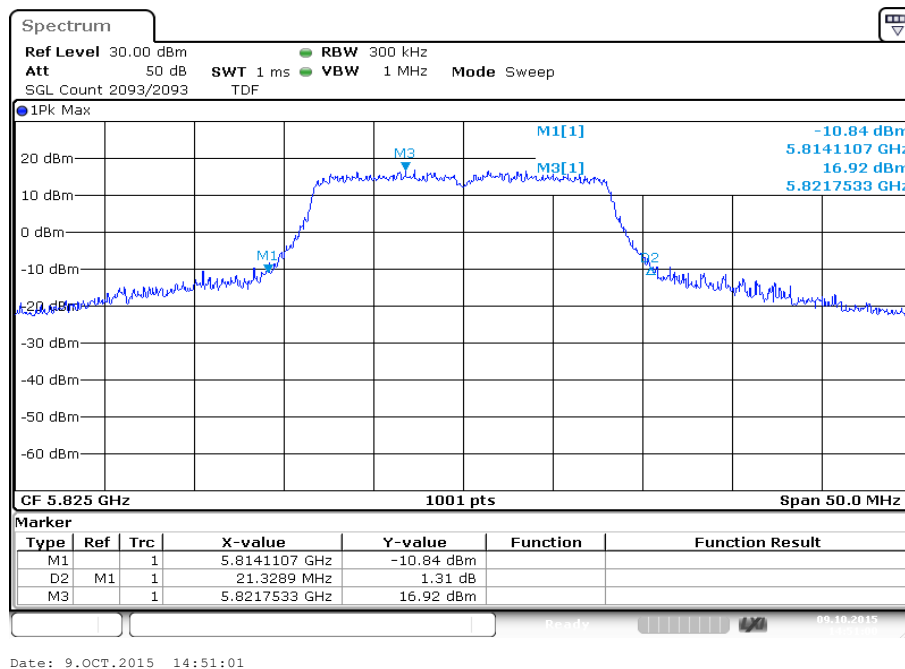
Plot 10: 5745 MHz



Plot 11: 5785 MHz



Plot 12: 5825 MHz



## 12.6 Occupied bandwidth – 99% emission bandwidth

### Description:

Measurement of the 99% bandwidth of the modulated signal acc. KDB789033 D02

### Measurement:

| Measurement parameter   |                                                                                 |
|-------------------------|---------------------------------------------------------------------------------|
| Detector:               | Peak                                                                            |
| Sweep time:             | Auto                                                                            |
| Resolution bandwidth:   | 300 kHz / 500 kHz                                                               |
| Video bandwidth:        | 1 MHz / 3 MHz                                                                   |
| Span:                   | 50 MHz / 100 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 (Item F)                                                     |
| Measurement uncertainty | See sub clause 9                                                                |

### Usage:

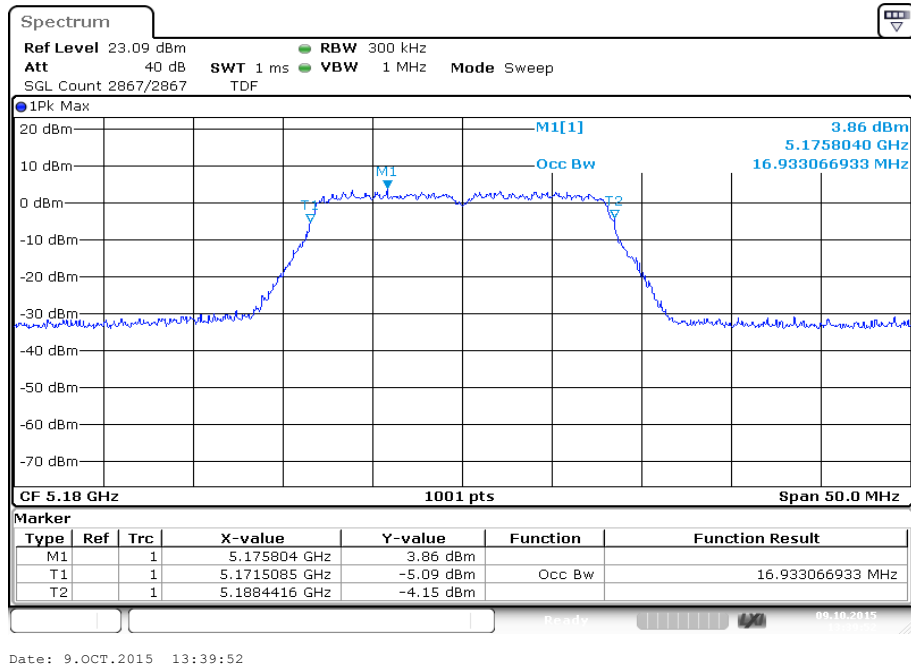
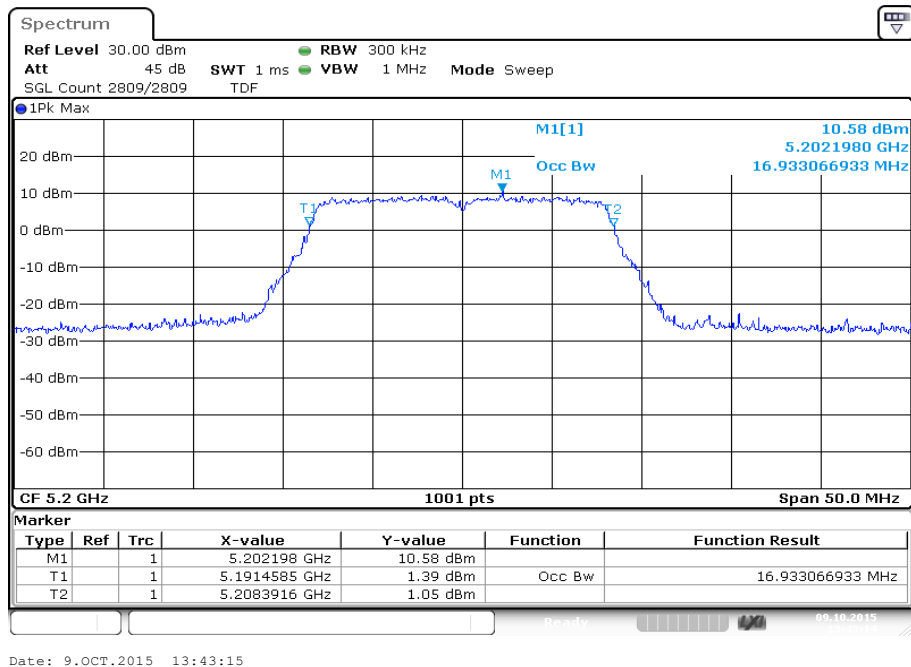
| -/-                                           | IC |
|-----------------------------------------------|----|
| Occupied Bandwidth – 99% emission bandwidth   |    |
| OBW is necessary for output power measurement |    |

### Result: OFDM / X-Rock ON

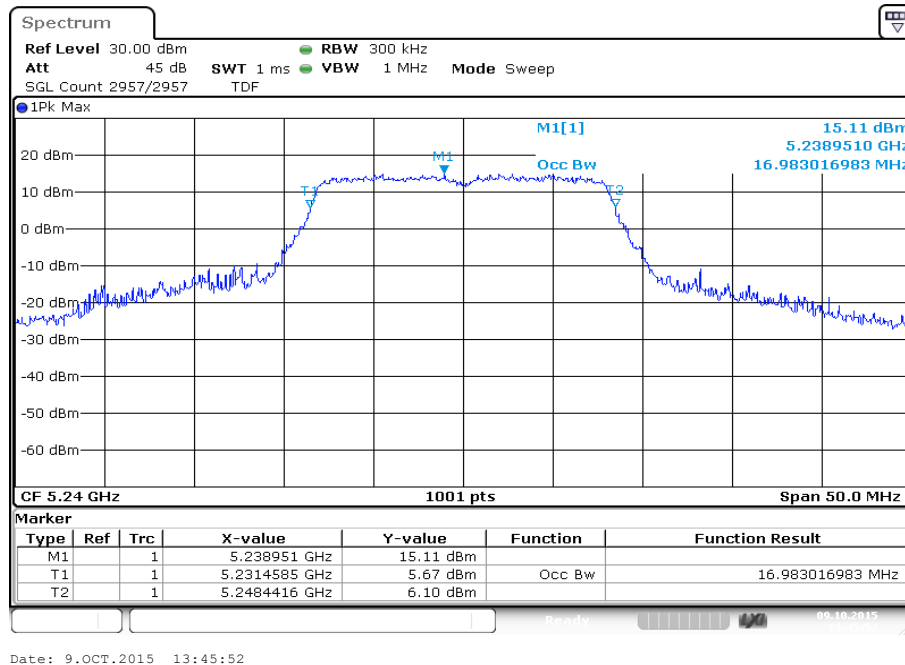
| OFDM<br>Channel | 99% BANDWIDTH [MHz] |                    |                     |     |
|-----------------|---------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz  | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 16.9                | 16.9               | 17.0                | -/- |
| Channel         | Lowest<br>5745 MHz  | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 17.0                | 17.0               | 16.9                | -/- |

**Result: OFDM / X-Rock OFF**

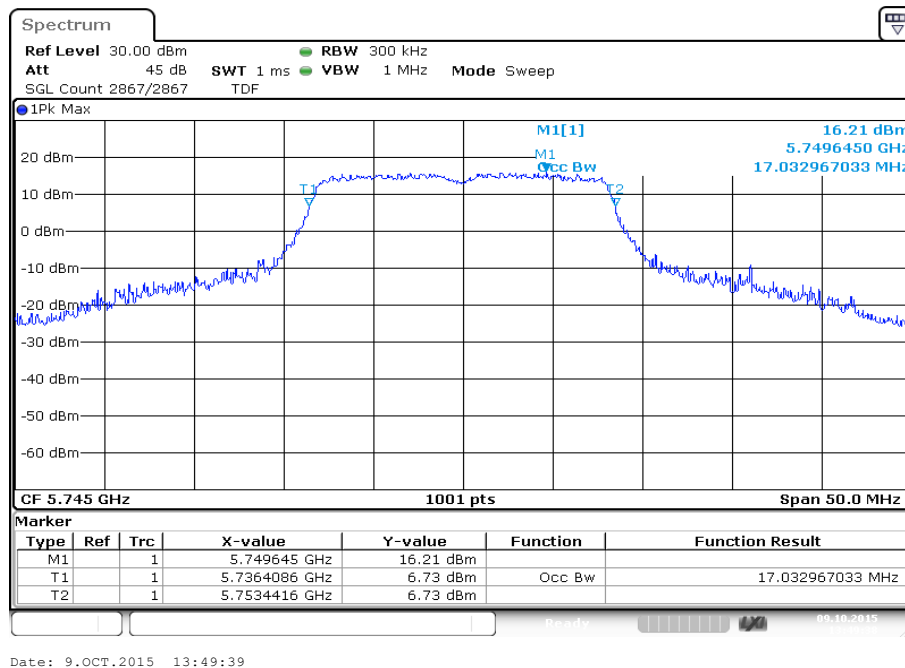
| OFDM<br>Channel | 99% BANDWIDTH [MHz] |                    |                     |     |
|-----------------|---------------------|--------------------|---------------------|-----|
|                 | Lowest<br>5180 MHz  | Middle<br>5200 MHz | Highest<br>5240 MHz | -/- |
|                 | 16.8                | 16.9               | 16.9                | -/- |
| Channel         | Lowest<br>5745 MHz  | Middle<br>5785 MHz | Highest<br>5825 MHz | -/- |
|                 | 16.9                | 16.9               | 16.9                | -/- |

**Plots: OFDM / X-Rock ON****Plot 13: 5180 MHz****Plot 14: 5200 MHz**

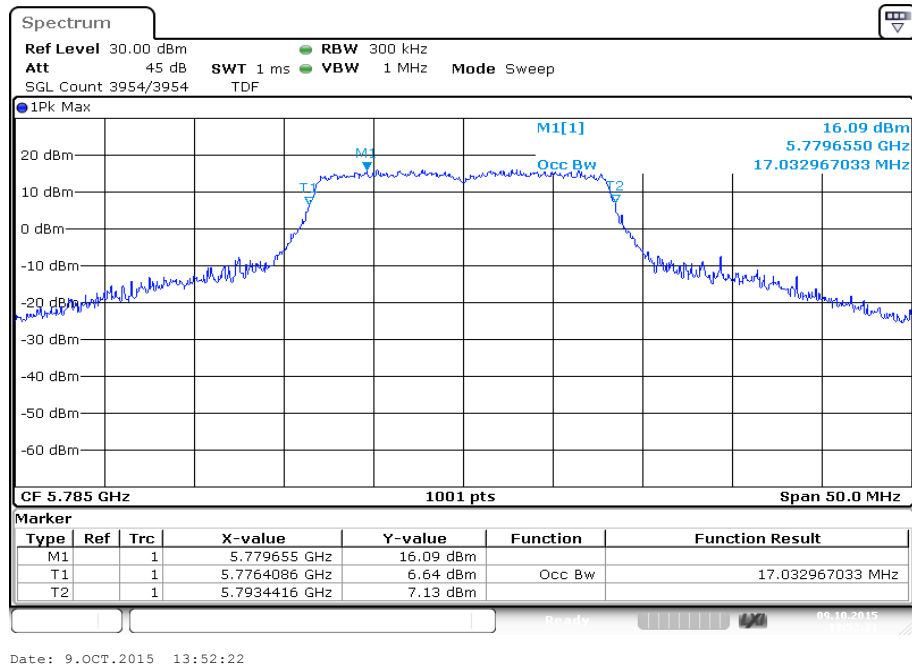
Plot 15: 5240 MHz



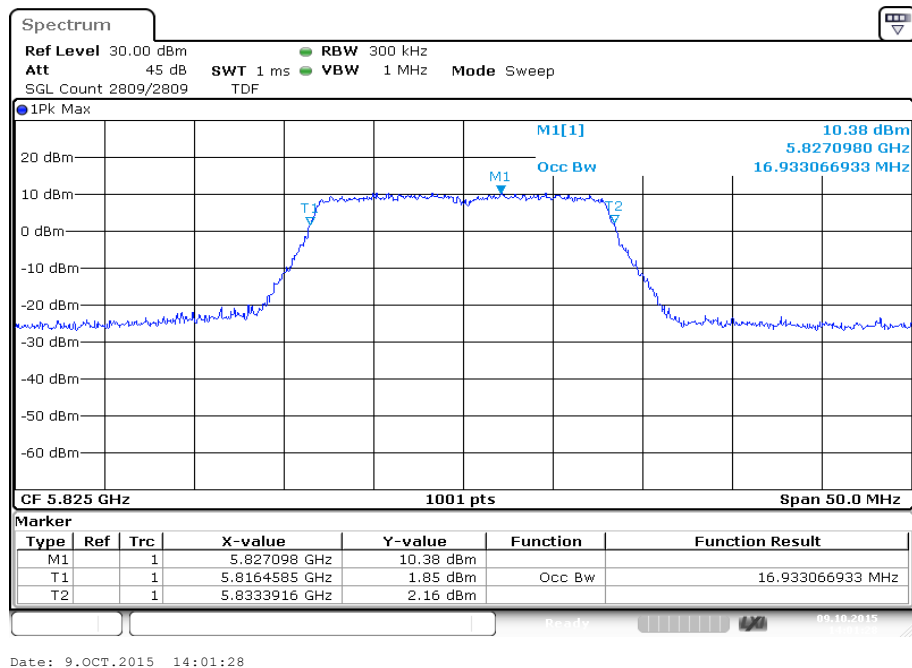
Plot 16: 5745 MHz

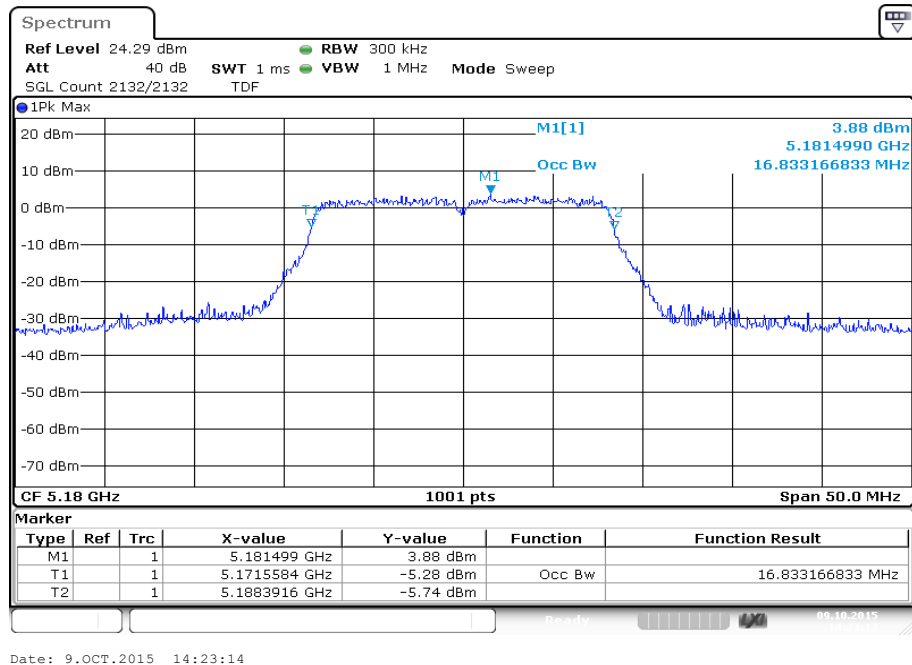
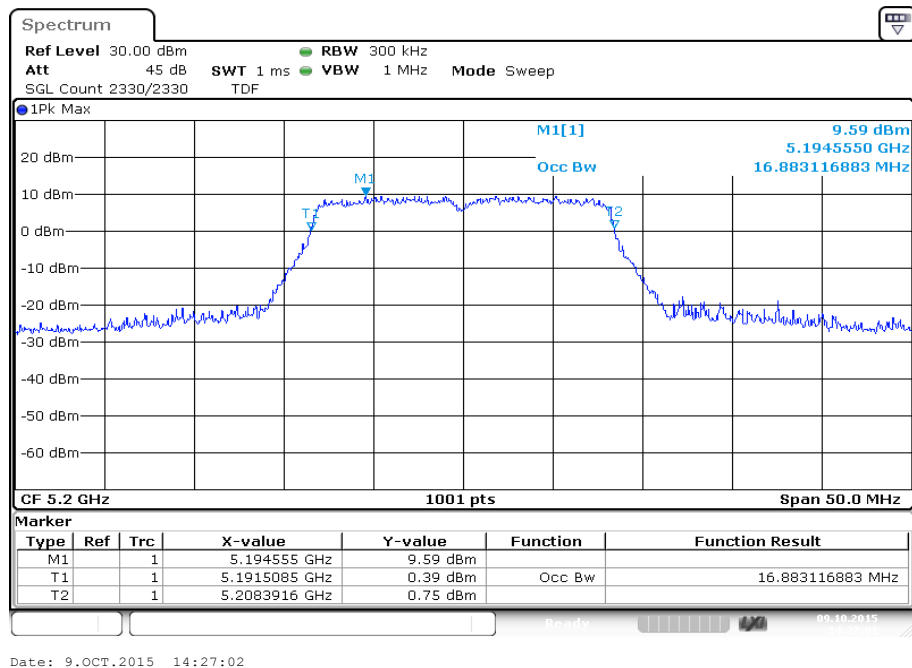


Plot 17: 5785 MHz

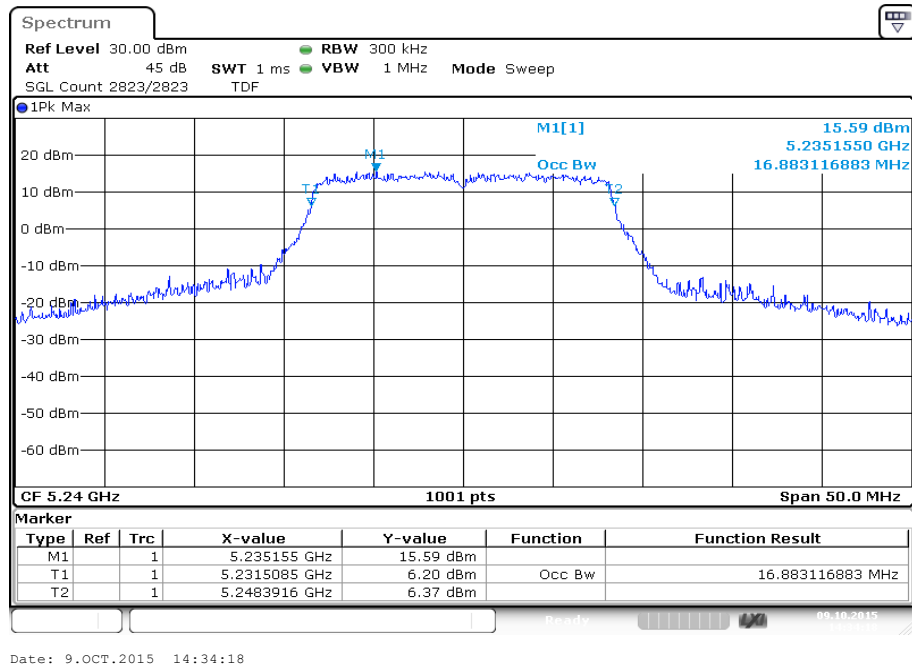


Plot 18: 5825 MHz

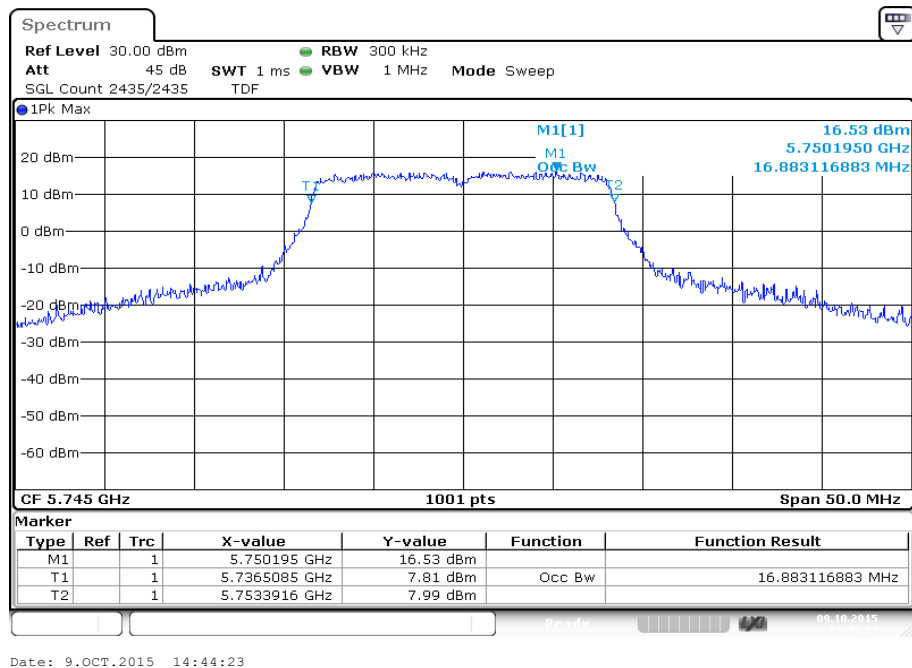


**Plots: OFDM / X-Rock OFF****Plot 19: 5180 MHz****Plot 20: 5200 MHz**

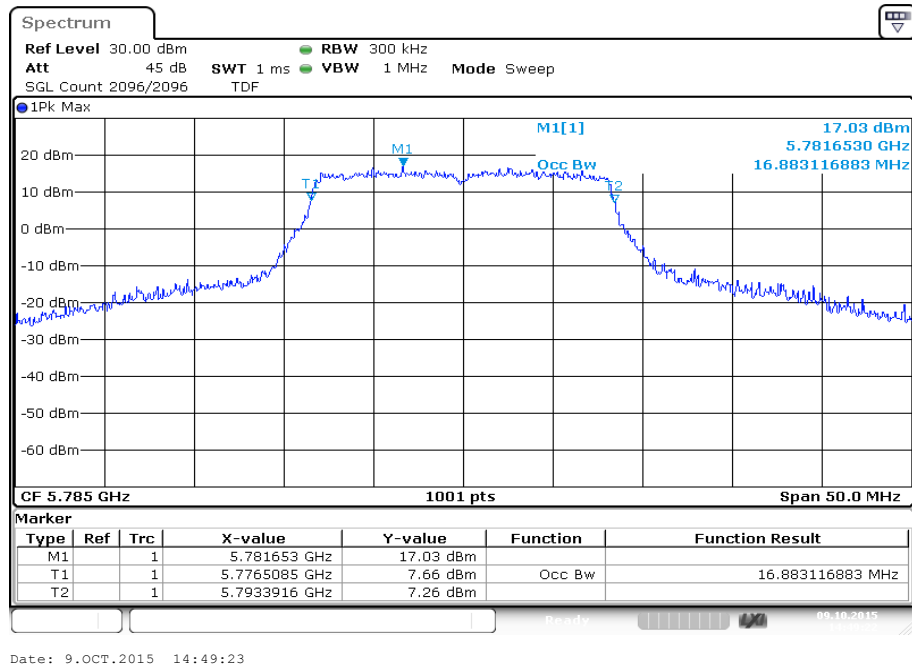
Plot 21: 5240 MHz



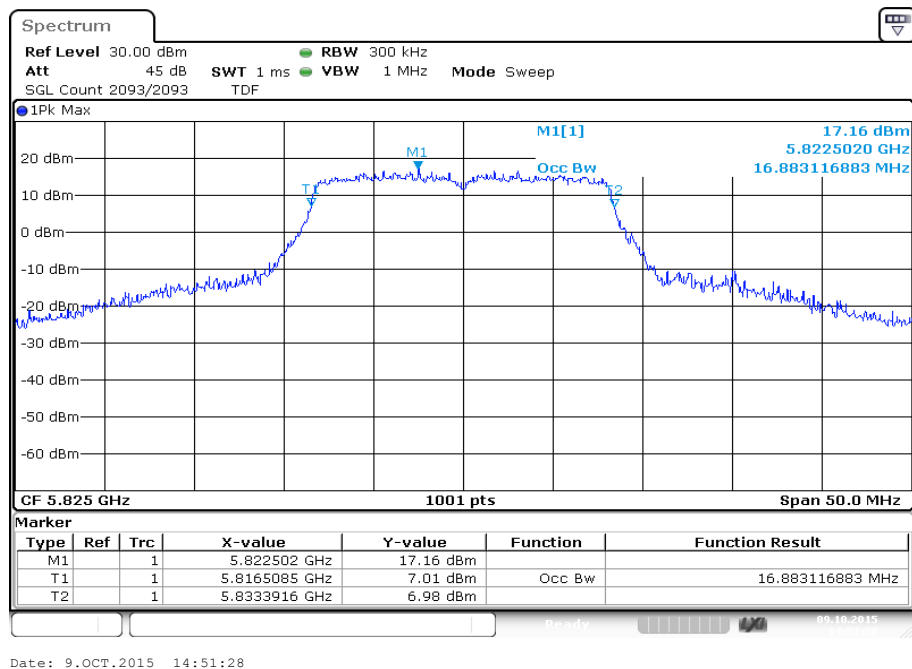
Plot 22: 5745 MHz



Plot 23: 5785 MHz



Plot 24: 5825 MHz



## 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 the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. Measurement distance is 3m.

### Measurement:

| Measurement parameter   |                                 |
|-------------------------|---------------------------------|
| Detector:               | Peak / RMS                      |
| Sweep time:             | Auto                            |
| Resolution bandwidth:   | 1 MHz                           |
| Video bandwidth:        | 3 MHz / 10 Hz                   |
| Span:                   | See plots!                      |
| Trace-Mode:             | Max Hold                        |
| Test setup:             | See sub clause 7.2 (Lab item C) |
| Measurement uncertainty | See sub clause 9                |

### Limits:

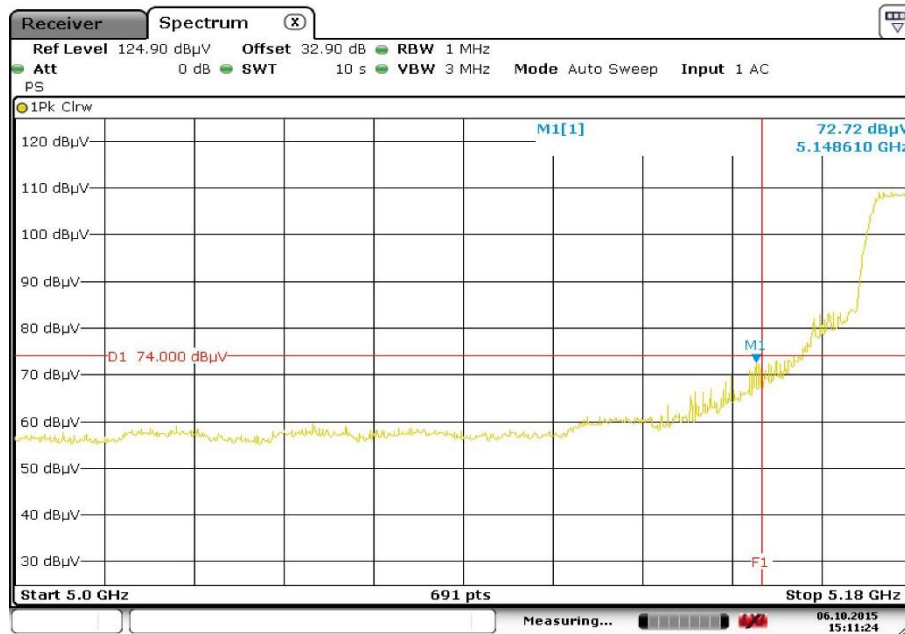
| Band Edge Compliance Radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).</p> |
| <p>74 dB<math>\mu</math>V/m PEAK<br/>54 dB<math>\mu</math>V/m AVG</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### Result:

| Scenario  | Band Edge Compliance Radiated [dB $\mu$ V/m]                                        |
|-----------|-------------------------------------------------------------------------------------|
| band edge | <p>&lt; 54 dB<math>\mu</math>V/m (AVG)<br/>&lt; 74 dB<math>\mu</math>V/m (PEAK)</p> |

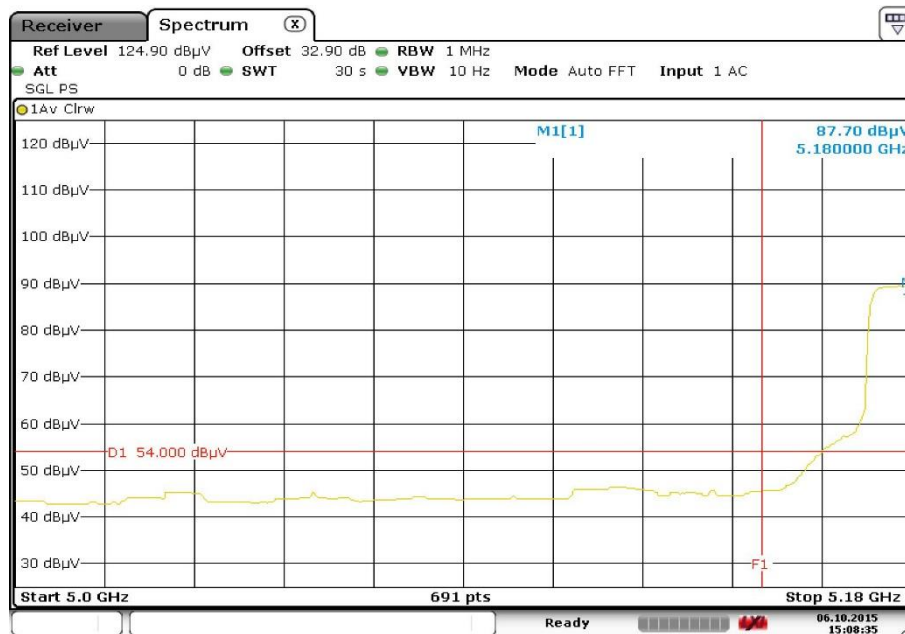
### Plots:

**Plot 1:** lower band edge, vertical & horizontal polarization (X-Rock ON), channel 36 (PEAK)

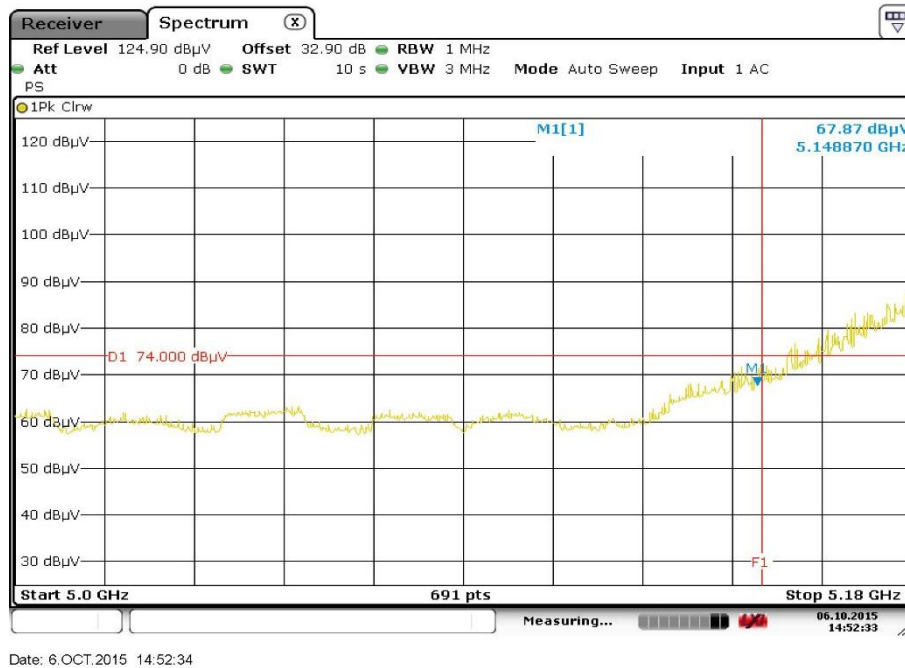
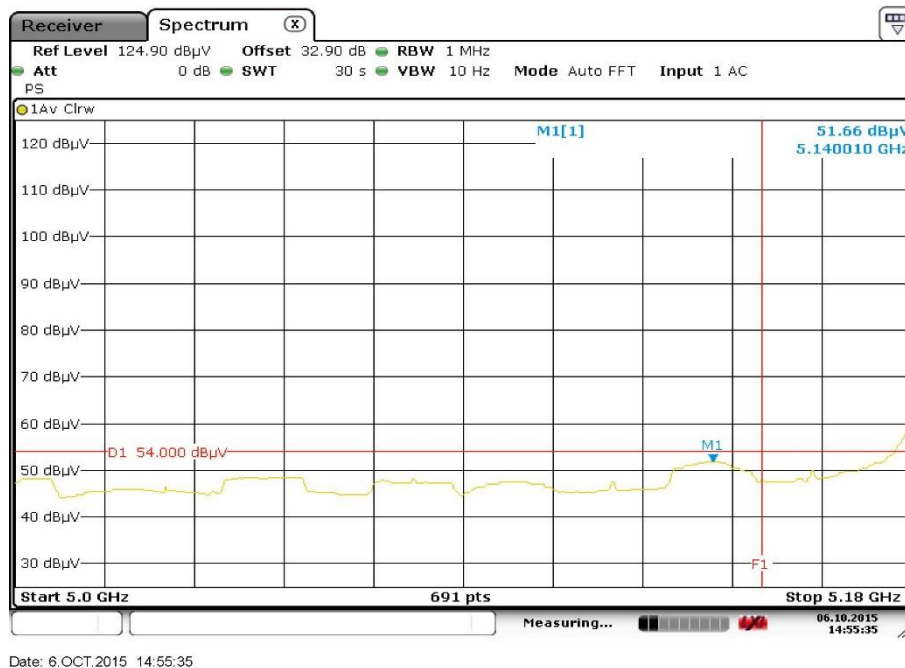


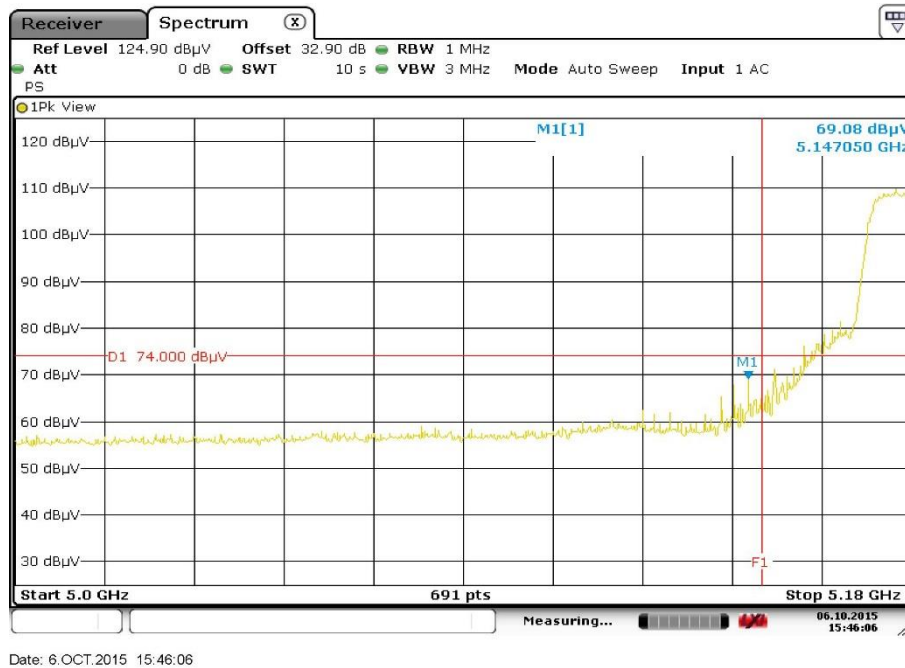
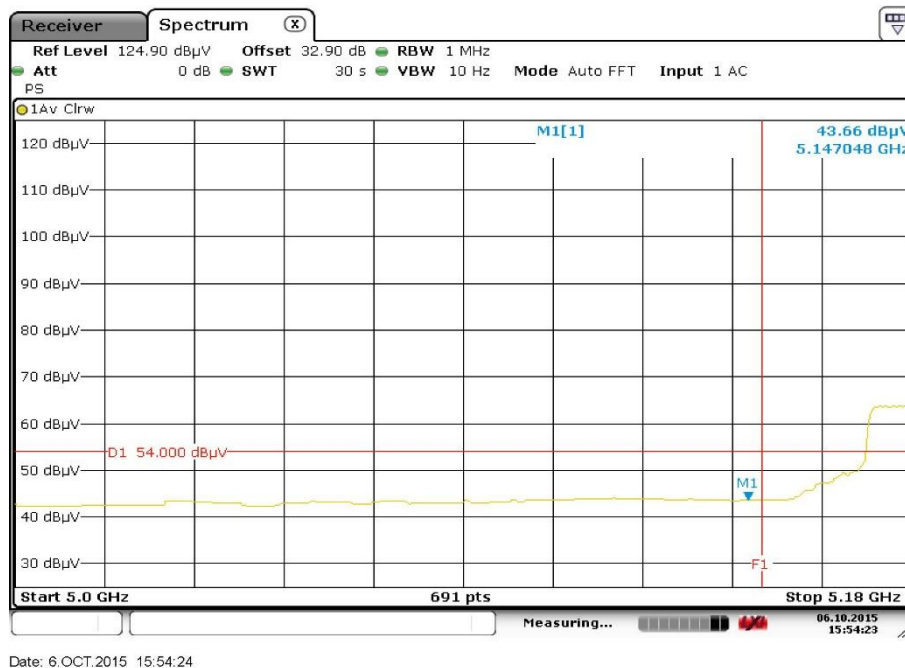
Date: 6.OCT.2015 15:11:24

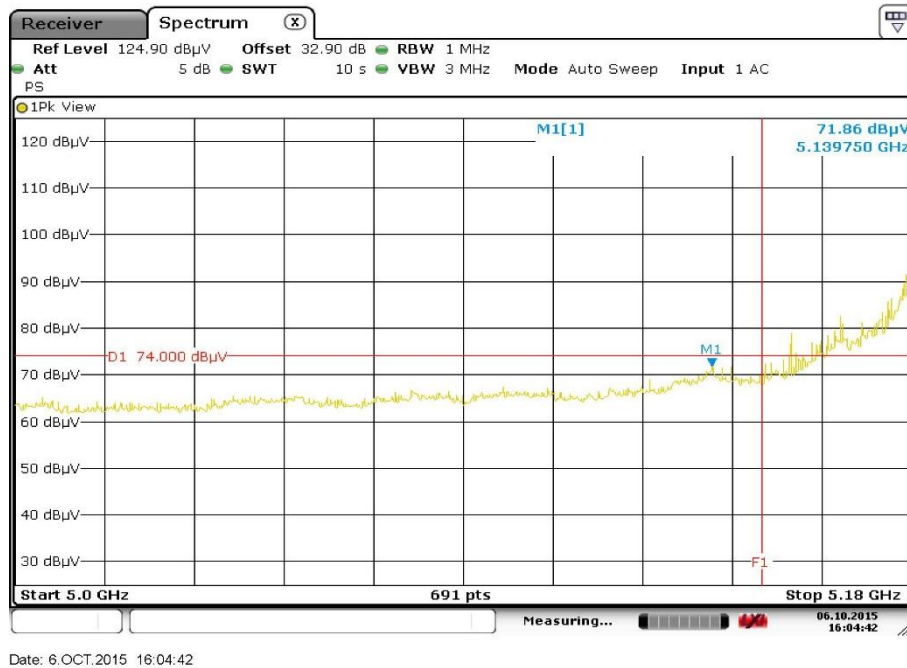
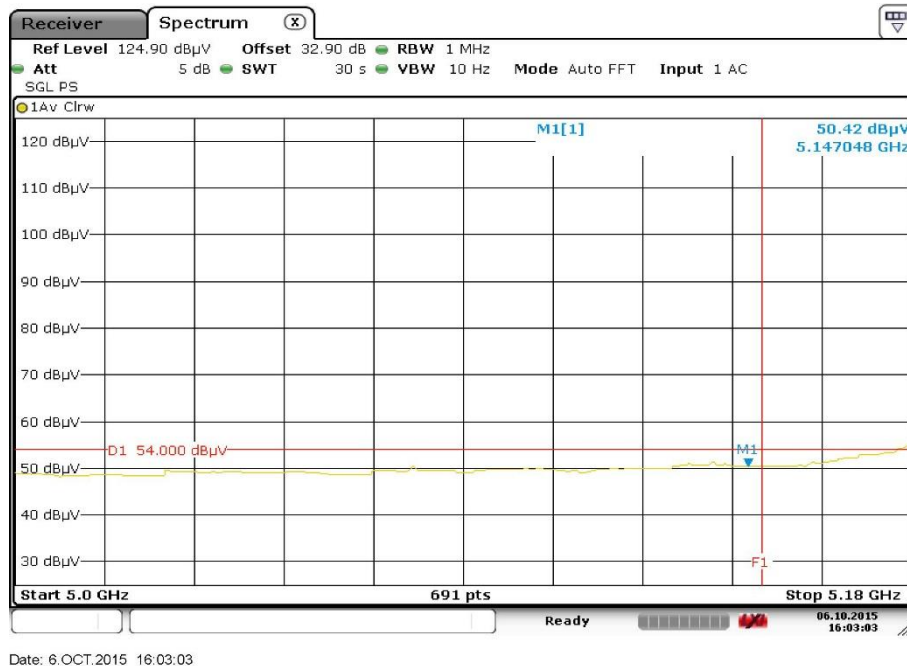
**Plot 2:** lower band edge, vertical & horizontal polarization (X-Rock ON), channel 36 (AVG)



Date: 6.OCT.2015 15:08:35

**Plot 3:** upper band edge, vertical & horizontal polarization (X-Rock ON), channel 40 (PEAK)**Plot 4:** upper band edge, vertical & horizontal polarization (X-Rock ON), channel 40 (AVG)

**Plot 5:** lower band edge, vertical & horizontal polarization (X-Rock OFF), channel 36 (PEAK)**Plot 6:** lower band edge, vertical & horizontal polarization (X-Rock OFF), channel 36 (AVG)

**Plot 7:** lower band edge, vertical & horizontal polarization (X-Rock OFF), channel 40 (PEAK)**Plot 8:** lower band edge, vertical & horizontal polarization (X-Rock OFF), channel 40 (AVG)

## 12.8 TX spurious emissions radiated

### Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

### Measurement:

| Measurement parameter   |                                                                                        |
|-------------------------|----------------------------------------------------------------------------------------|
| Detector:               | Quasi Peak below 1 GHz<br>(alternative Peak)<br><br>Peak above 1 GHz / RMS             |
| Sweep time:             | Auto                                                                                   |
| Resolution bandwidth:   | F < 1 GHz: 100 kHz<br>F > 1 GHz: 1 MHz                                                 |
| Video bandwidth:        | F < 1 GHz: 300 kHz<br>F > 1 GHz: 3 MHz                                                 |
| Span:                   | 30 MHz to 40 GHz                                                                       |
| Trace-Mode:             | Max Hold / Average with 100 counts + 20 log (1 / X)<br>for duty cycle lower than 100 % |
| Test setup:             | See sub clause 7.1 (Item A), 7.2 (Item B+C) and 7.3<br>(Item D)                        |
| Measurement uncertainty | See sub clause 9                                                                       |

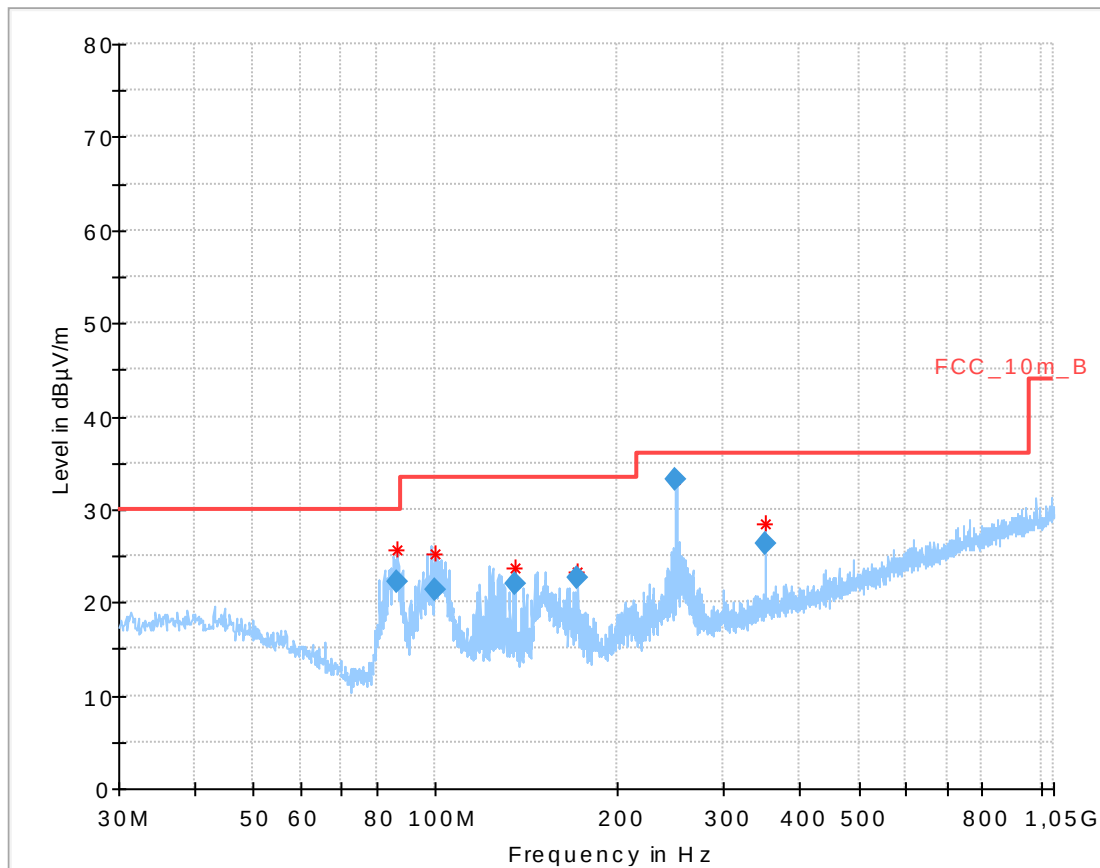
### Limits:

| TX Spurious Emissions Radiated |                         |                      |
|--------------------------------|-------------------------|----------------------|
| §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                    |
| §15.407                        |                         |                      |
| Outside the restricted bands!  | -27 dBm / MHz           |                      |

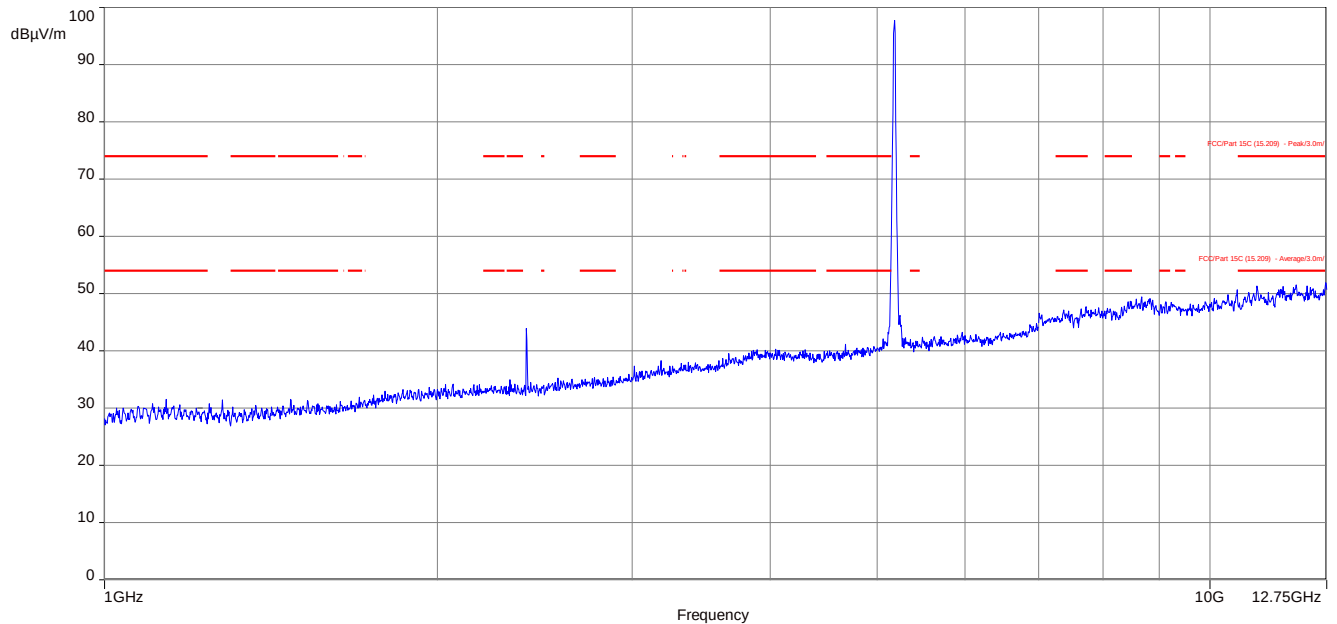
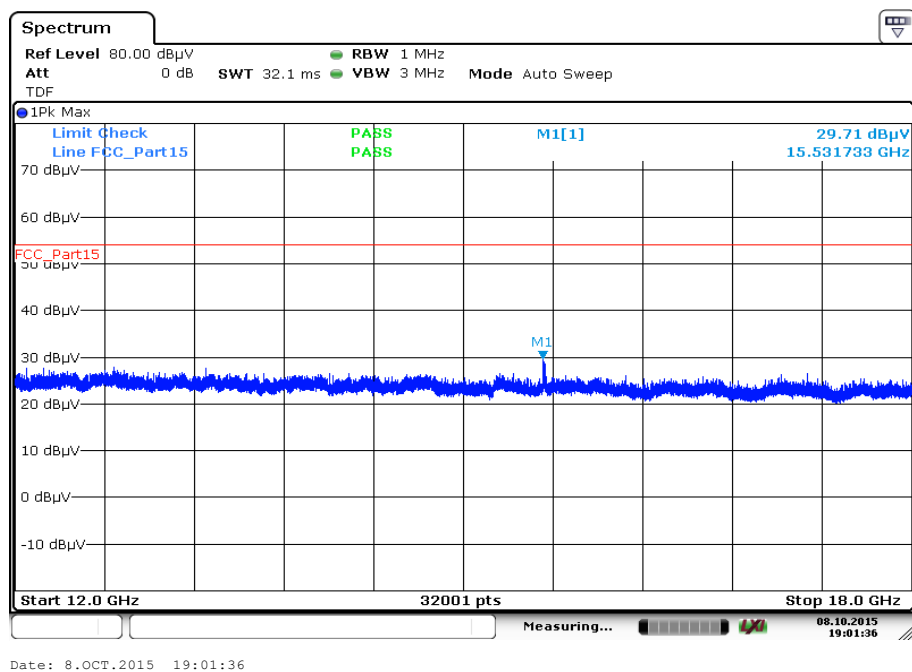
**Results: OFDM / X-Rock ON**

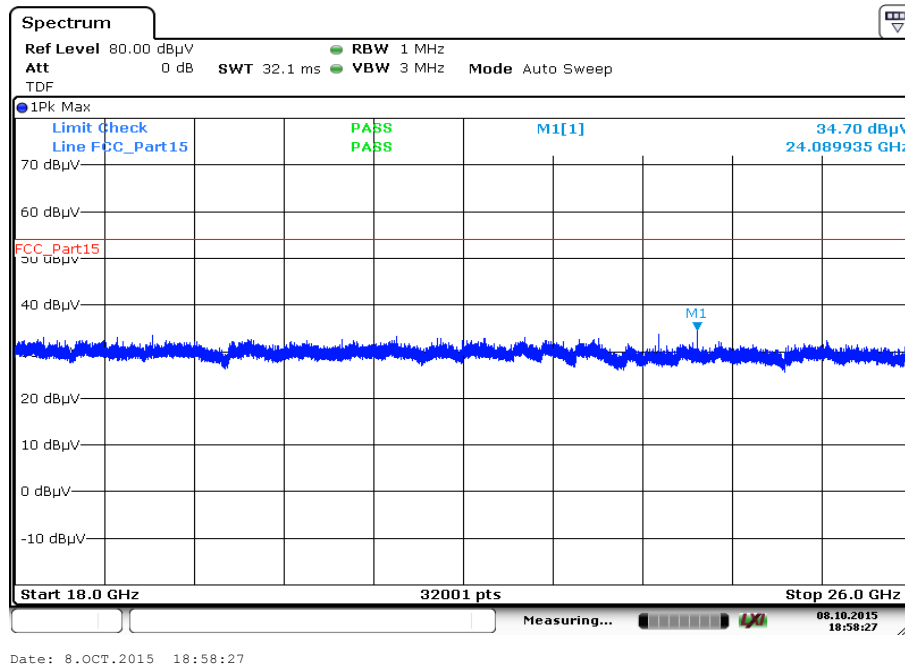
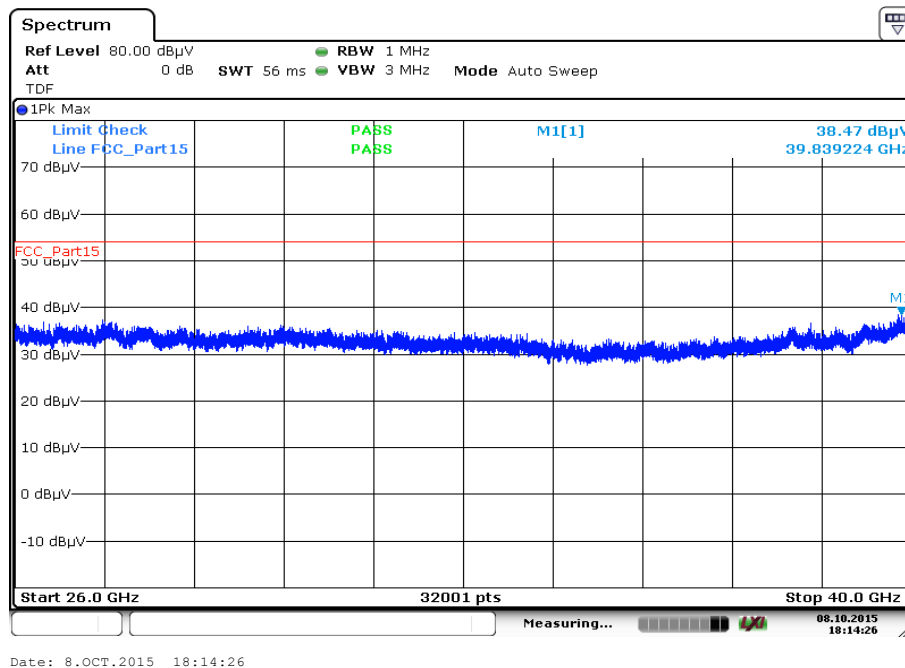
| TX Spurious Emissions Radiated [dBμV/m] / dBm |          |                   |                                          |          |                   |                                          |          |                   |
|-----------------------------------------------|----------|-------------------|------------------------------------------|----------|-------------------|------------------------------------------|----------|-------------------|
| OFDM                                          |          |                   |                                          |          |                   |                                          |          |                   |
| Lowest<br>5180 MHz                            |          |                   | Middle<br>5200 MHz                       |          |                   | Highest<br>5240 MHz                      |          |                   |
| F [MHz]                                       | Detector | Level<br>[dBμV/m] | F [MHz]                                  | Detector | Level<br>[dBμV/m] | F [MHz]                                  | Detector | Level<br>[dBμV/m] |
| For results < 1GHz see table below plots.     |          |                   | For results < 1GHz see table below plots |          |                   | For results < 1GHz see table below plots |          |                   |
| 2408                                          | Peak     | 43.9              | 15602                                    | Peak     | 30.8              | 2412                                     | Peak     | 40.6              |
| 15531                                         | Peak     | 29.7              | 19544                                    | Peak     | 33.1              | 17228                                    | Peak     | 48.3              |
| 24089                                         | Peak     | 34.7              | 39825                                    | Peak     | 38.7              | 39825                                    | Peak     | 38.7              |
| 39839                                         | Peak     | 38.5              | -/-                                      | -/-      | -/-               | 39798                                    | Peak     | 37.9              |

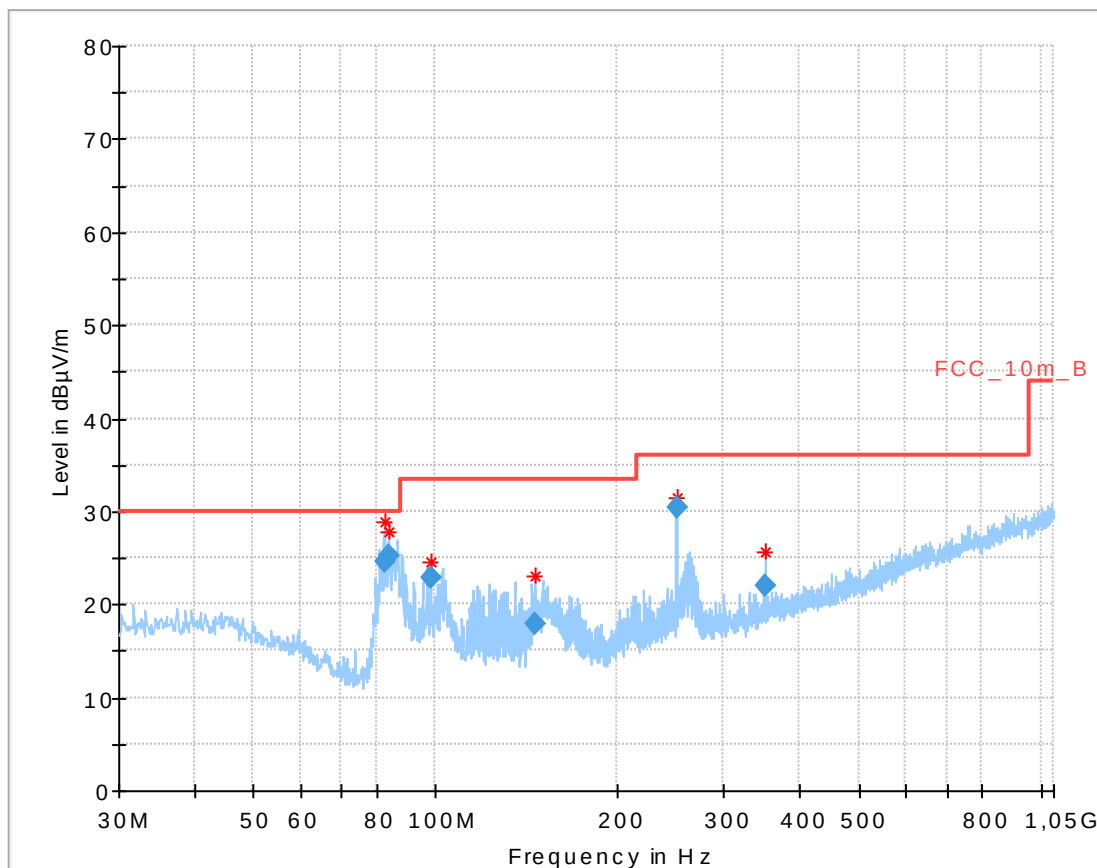
| TX Spurious Emissions Radiated [dBμV/m] / dBm |          |                   |                                          |          |                   |                                          |          |                   |
|-----------------------------------------------|----------|-------------------|------------------------------------------|----------|-------------------|------------------------------------------|----------|-------------------|
| OFDM                                          |          |                   |                                          |          |                   |                                          |          |                   |
| Lowest<br>5745 MHz                            |          |                   | Middle<br>5785 MHz                       |          |                   | Highest<br>5825 MHz                      |          |                   |
| F [MHz]                                       | Detector | Level<br>[dBμV/m] | F [MHz]                                  | Detector | Level<br>[dBμV/m] | F [MHz]                                  | Detector | Level<br>[dBμV/m] |
| For results < 1GHz see table below plots      |          |                   | For results < 1GHz see table below plots |          |                   | For results < 1GHz see table below plots |          |                   |
| 2416                                          | Peak     | 39.2              | 2411                                     | Peak     | 46.7              | 2409                                     | Peak     | 43.3              |
| 17228                                         | Peak     | 48.3              | 17341                                    | Peak     | 47.2              | 17483                                    | Peak     | 37.2              |
| 21175                                         | Peak     | 33.8              | 22129                                    | Peak     | 32.9              | 21351                                    | Peak     | 33.1              |
| 39856                                         | Peak     | 38.2              | 39780                                    | Peak     | 38.0              | 39862                                    | Peak     | 38.3              |

**Plots: OFDM / X-Rock ON**
**Plot 1:** 30 MHz to 1 GHz, 5180 MHz, vertical & horizontal polarization


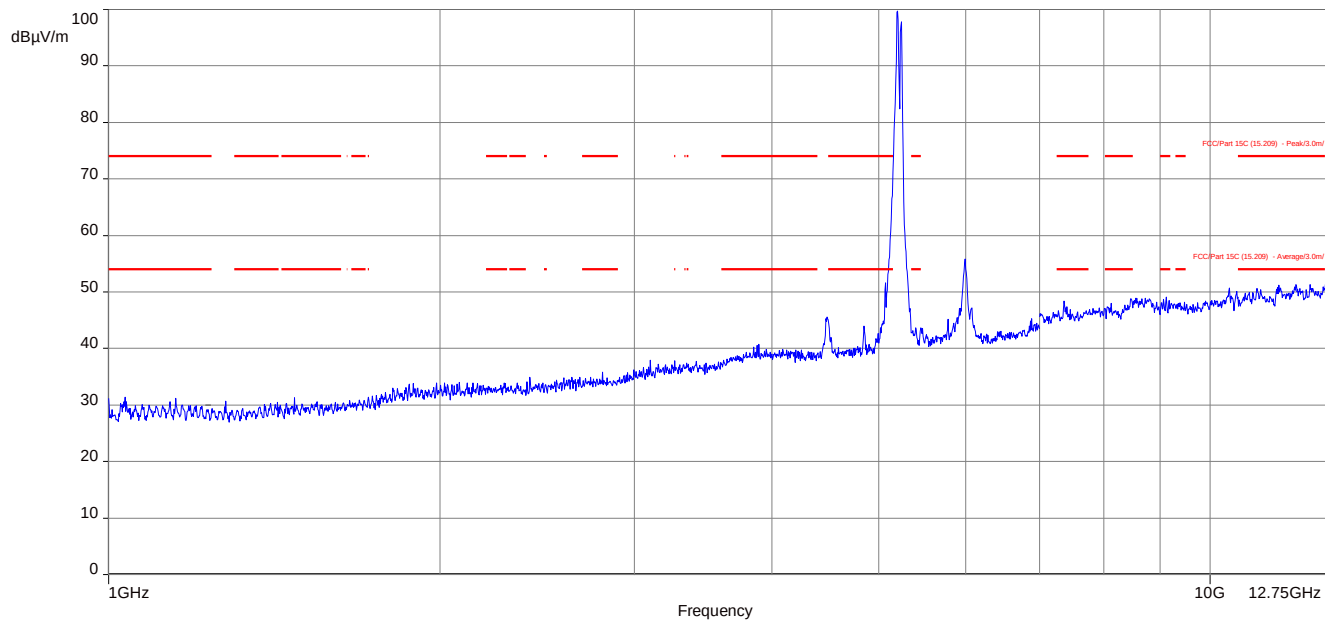
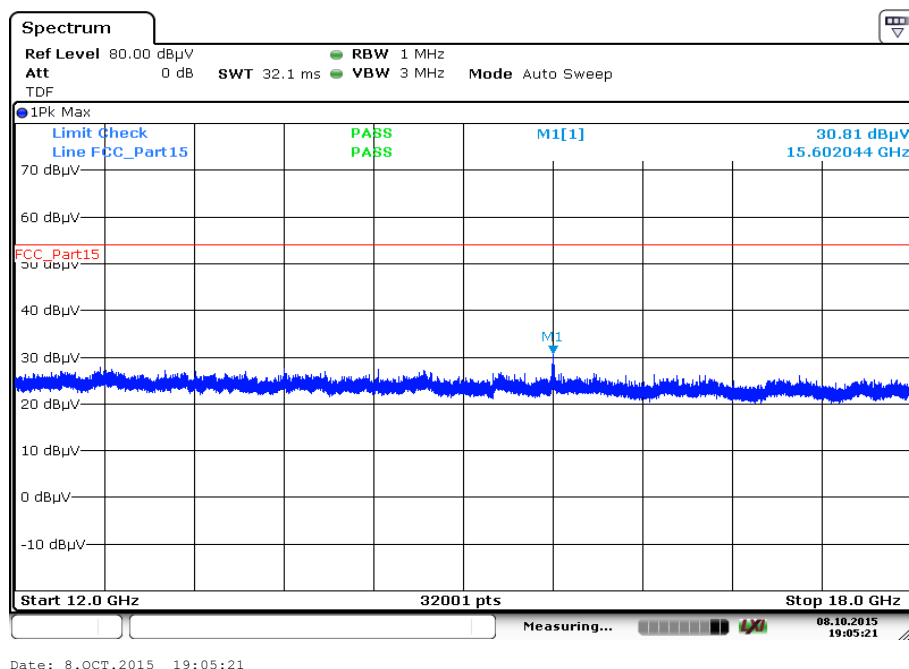
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 86.750400       | 22.22              | 30.00          | 7.78        | 1000.0          | 120.000         | 98.0        | V   | 359           | 9.7        |
| 99.971250       | 21.45              | 33.50          | 12.05       | 1000.0          | 120.000         | 98.0        | V   | 192           | 12.2       |
| 135.155550      | 22.09              | 33.50          | 11.41       | 1000.0          | 120.000         | 98.0        | V   | 142           | 9.0        |
| 172.021350      | 22.65              | 33.50          | 10.85       | 1000.0          | 120.000         | 98.0        | V   | 237           | 9.9        |
| 249.995100      | 33.22              | 36.00          | 2.78        | 1000.0          | 120.000         | 98.0        | V   | 96            | 13.3       |
| 349.989750      | 26.30              | 36.00          | 9.70        | 1000.0          | 120.000         | 98.0        | V   | 13            | 16.0       |

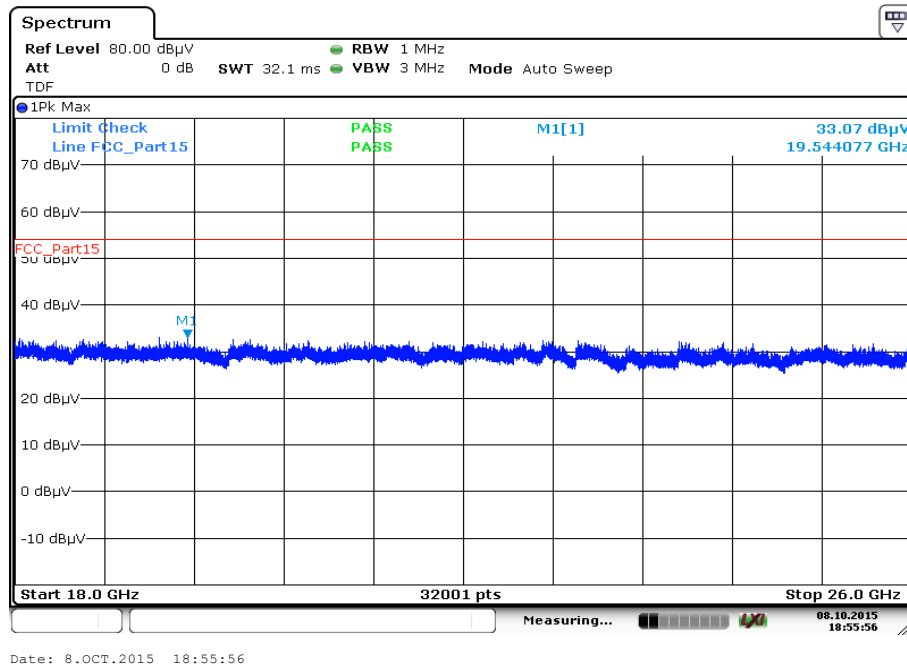
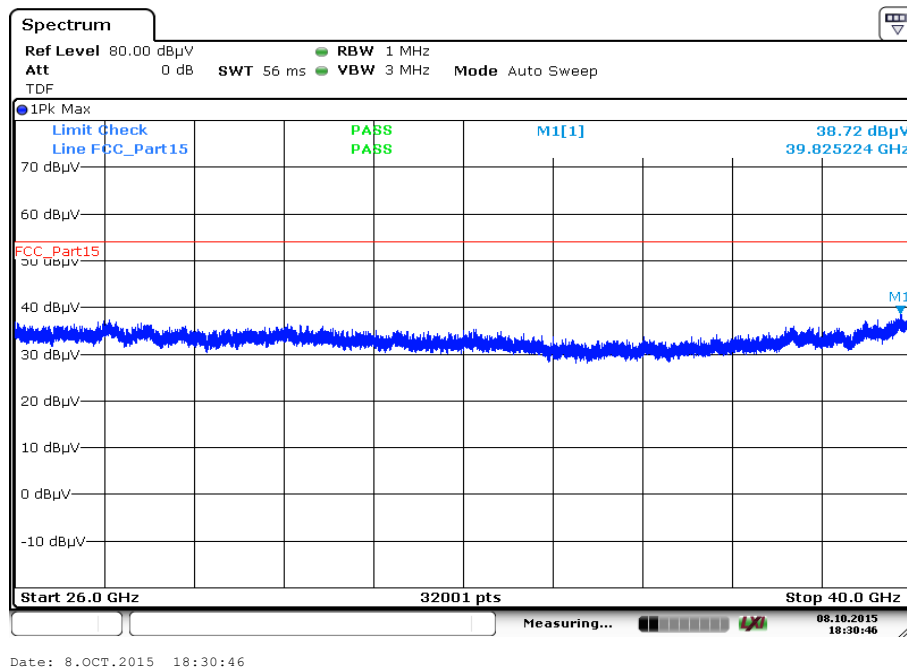
**Plot 2:** 1 GHz to 12.75 GHz, 5180 MHz, vertical & horizontal polarization**Plot 3:** 12 GHz to 18 GHz, 5180 MHz, vertical & horizontal polarization

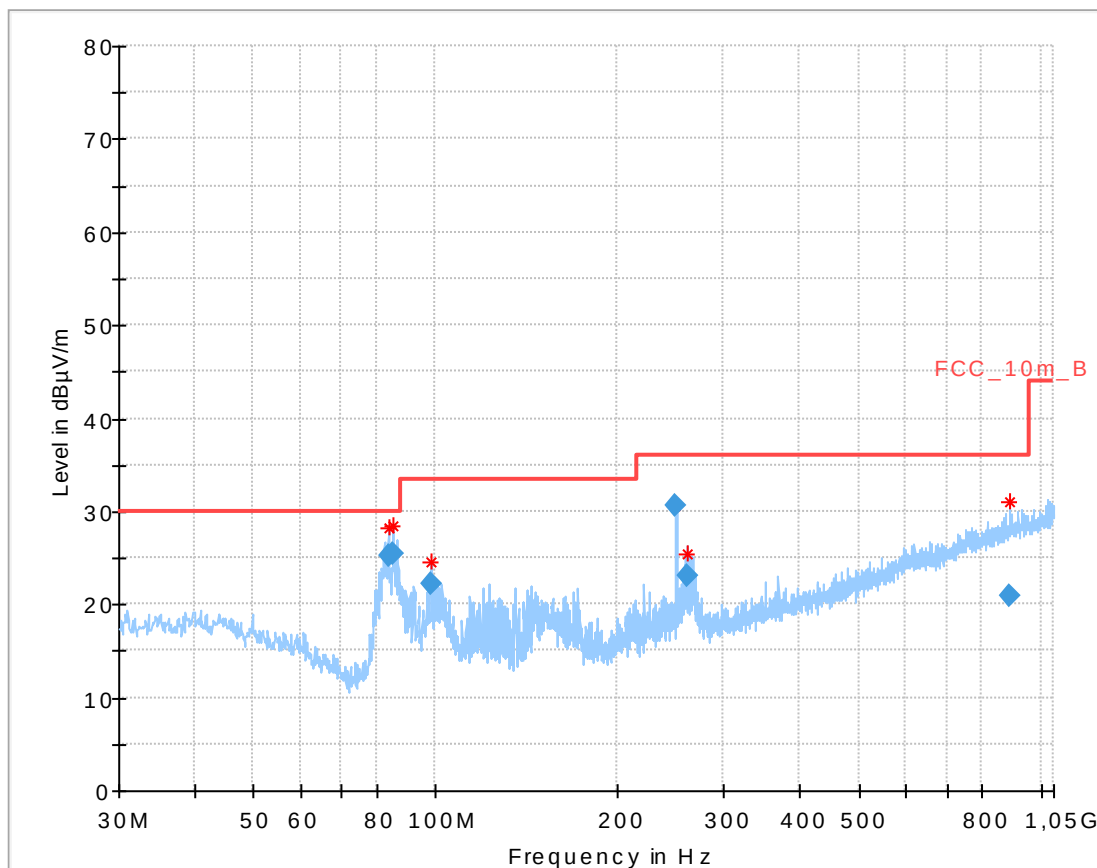
**Plot 4:** 18 GHz to 26 GHz, 5180 MHz, vertical & horizontal polarization**Plot 5:** 26 GHz to 40 GHz, 5180 MHz, vertical & horizontal polarization

**Plot 6:** 30 MHz to 1 GHz, 5200 MHz, vertical & horizontal polarization

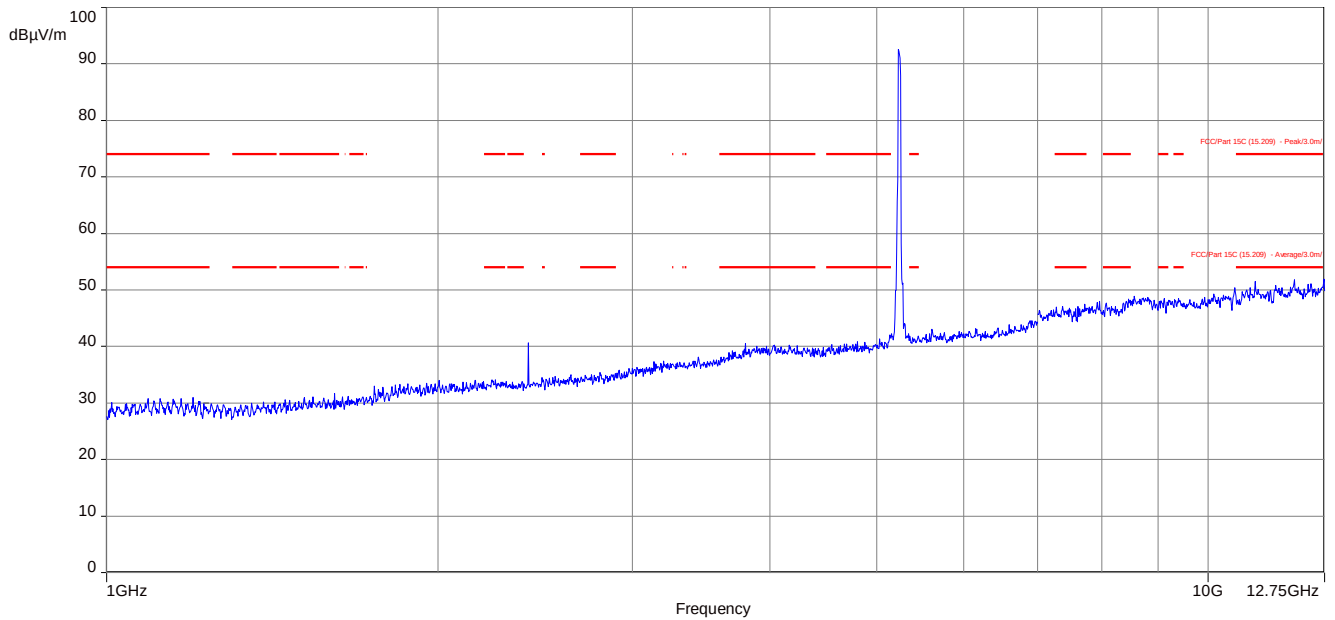
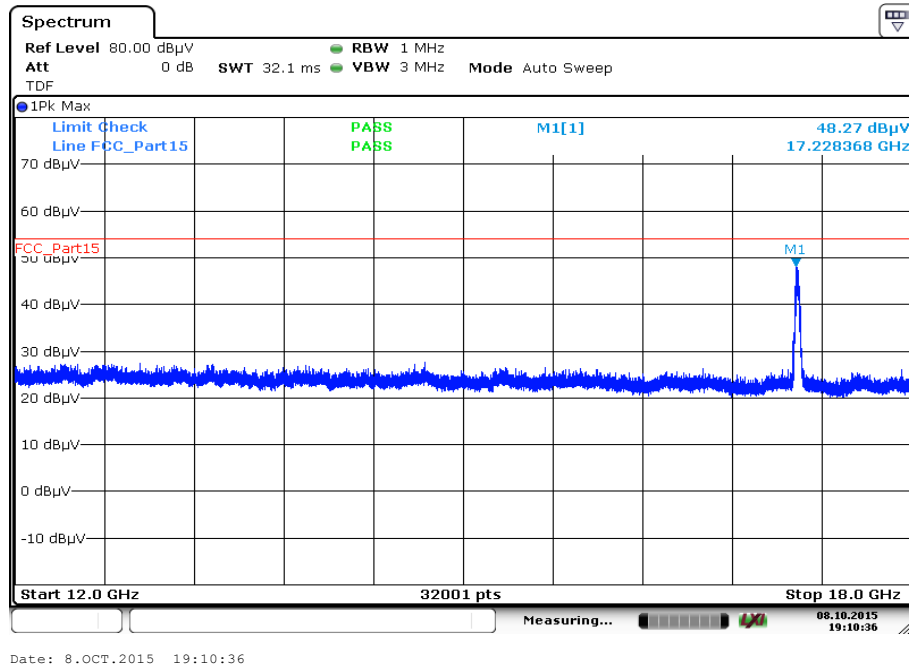
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 82.344750       | 24.64              | 30.00          | 5.36        | 1000.0          | 120.000         | 170.0       | V   | 345           | 8.7        |
| 83.891850       | 25.29              | 30.00          | 4.71        | 1000.0          | 120.000         | 101.0       | V   | 357           | 9.0        |
| 98.303850       | 22.75              | 33.50          | 10.75       | 1000.0          | 120.000         | 170.0       | V   | 243           | 11.9       |
| 145.996050      | 18.00              | 33.50          | 15.50       | 1000.0          | 120.000         | 98.0        | V   | 205           | 8.8        |
| 250.010700      | 30.46              | 36.00          | 5.54        | 1000.0          | 120.000         | 98.0        | V   | 144           | 13.4       |
| 350.004150      | 22.07              | 36.00          | 13.93       | 1000.0          | 120.000         | 98.0        | V   | 0             | 16.0       |

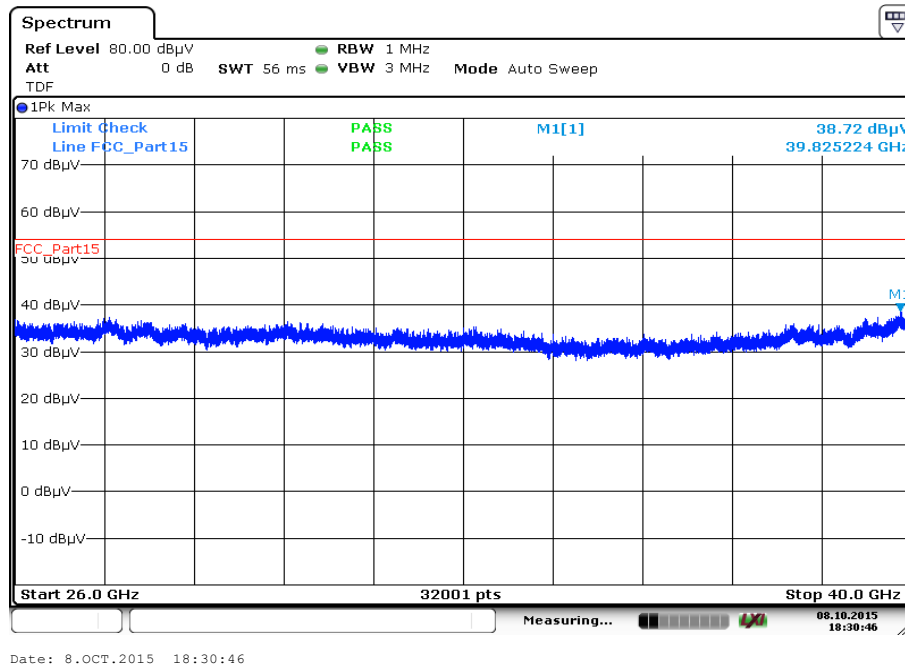
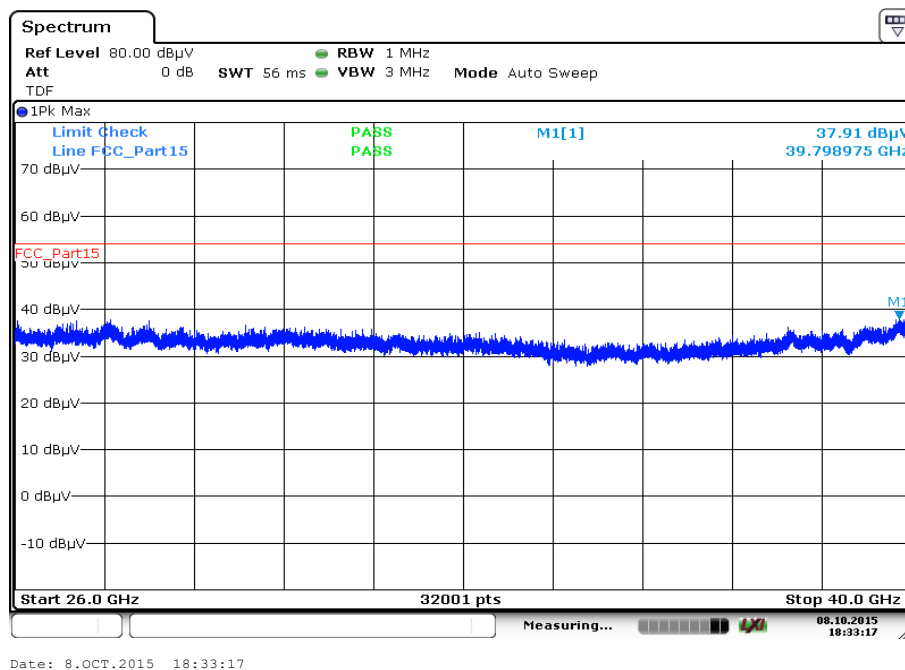
**Plot 7:** 1 GHz to 12.75 GHz, 5200 MHz, vertical & horizontal polarization**Plot 8:** 12 GHz to 18 GHz, 5200 MHz, vertical & horizontal polarization

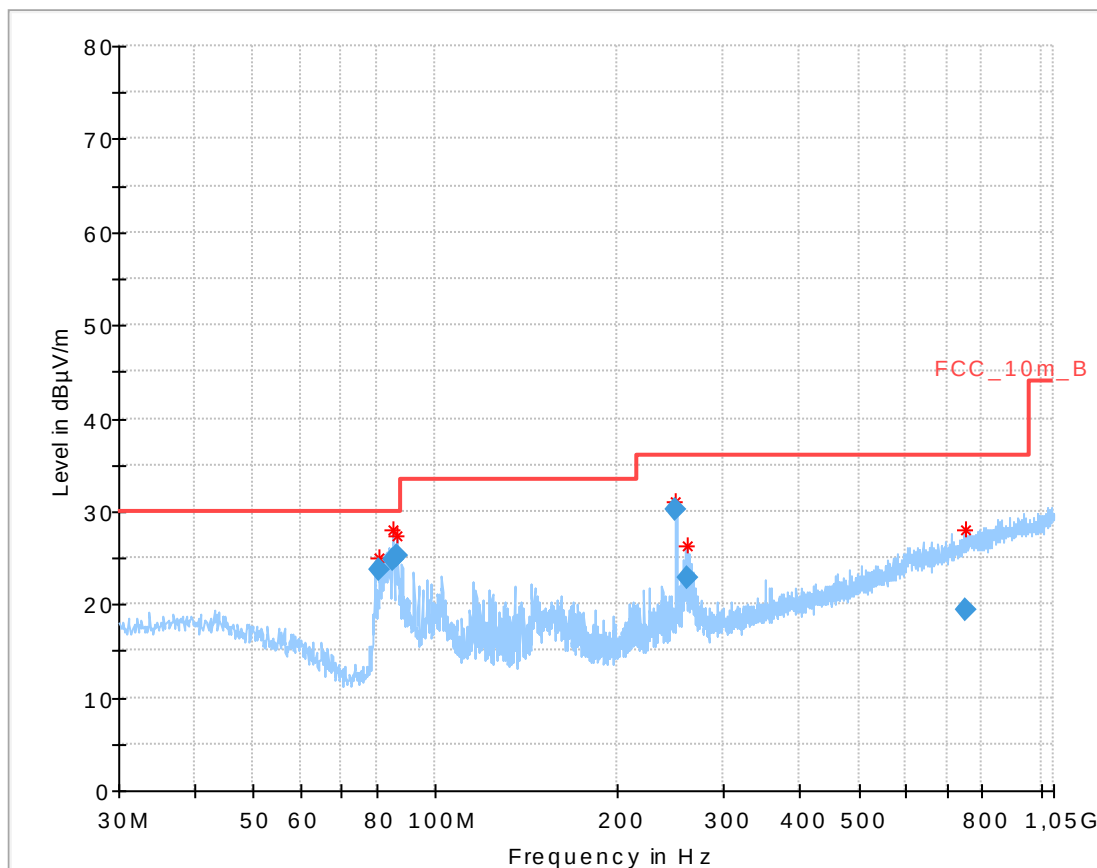
**Plot 9:** 18 GHz to 26 GHz, 5200 MHz, vertical & horizontal polarization**Plot 10:** 26 GHz to 40 GHz, 5200 MHz, vertical & horizontal polarization

**Plot 11:** 30 MHz to 1 GHz, 5240 MHz, vertical & horizontal polarization

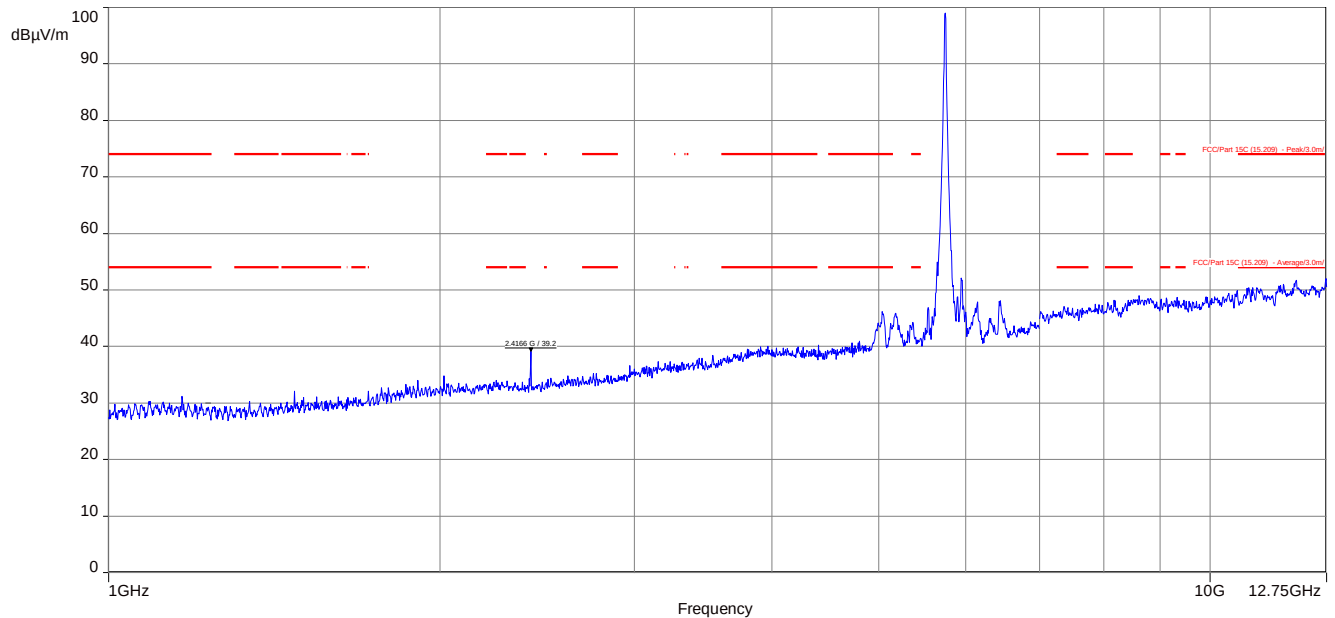
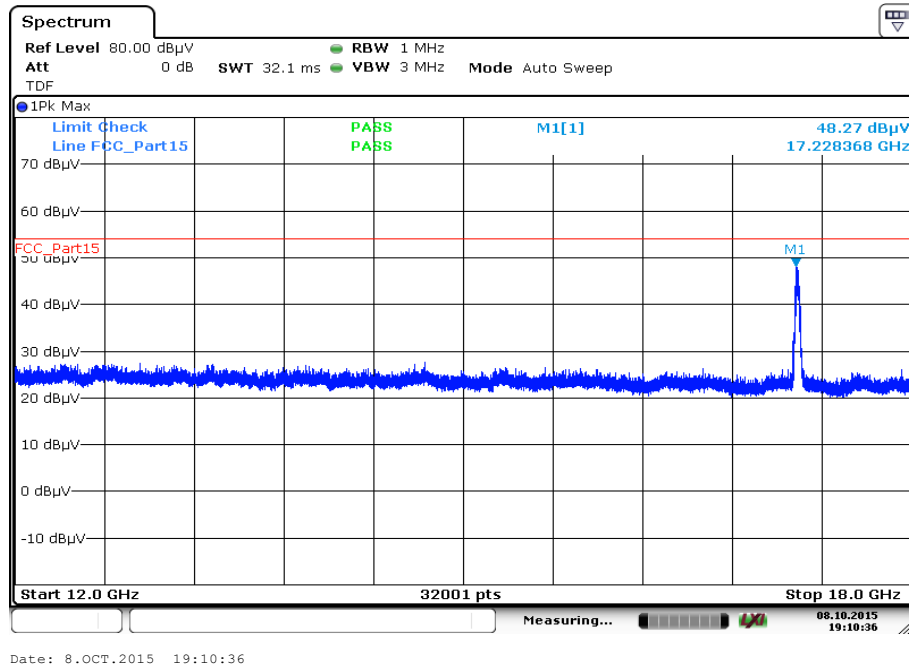
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 83.876100       | 25.30              | 30.00          | 4.70        | 1000.0          | 120.000         | 170.0       | V   | 356           | 9.0        |
| 85.294950       | 25.44              | 30.00          | 4.56        | 1000.0          | 120.000         | 101.0       | V   | 209           | 9.4        |
| 98.324100       | 22.18              | 33.50          | 11.32       | 1000.0          | 120.000         | 98.0        | V   | 278           | 11.9       |
| 249.992100      | 30.56              | 36.00          | 5.44        | 1000.0          | 120.000         | 98.0        | V   | 175           | 13.3       |
| 261.507000      | 23.17              | 36.00          | 12.83       | 1000.0          | 120.000         | 98.0        | V   | 106           | 13.6       |
| 887.013900      | 20.88              | 36.00          | 15.12       | 1000.0          | 120.000         | 170.0       | V   | 278           | 23.9       |

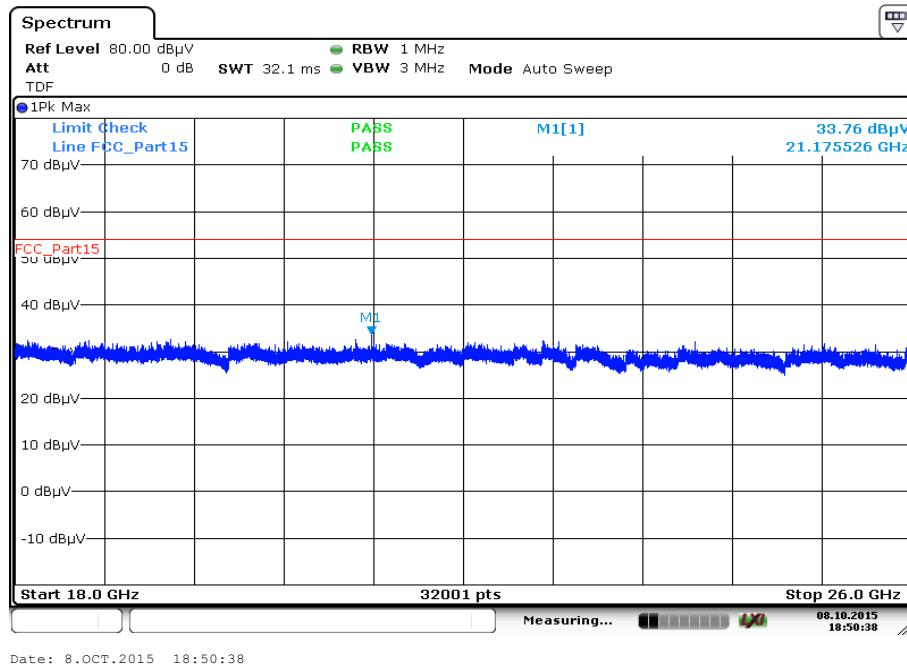
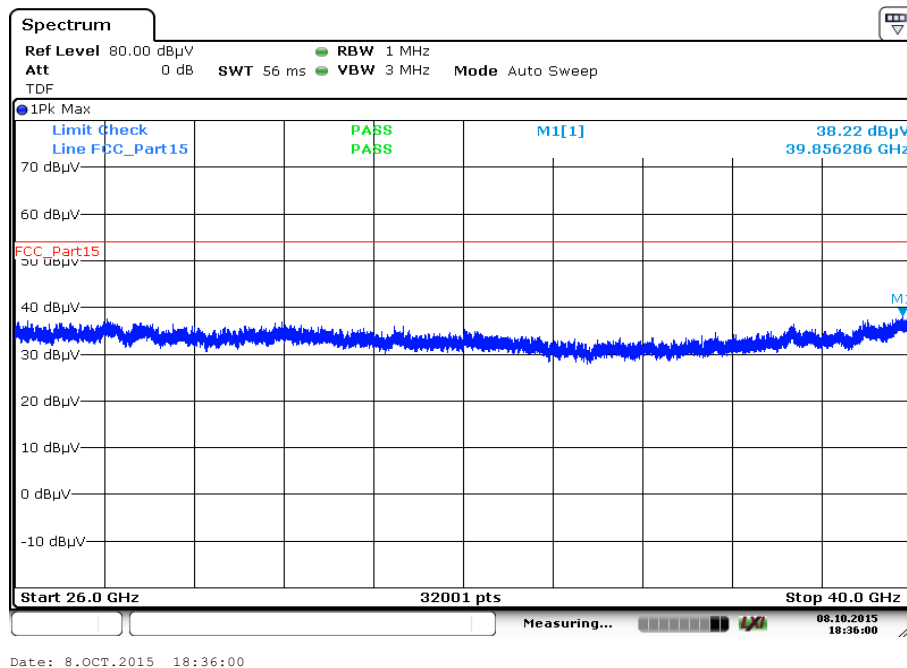
**Plot 12:** 1 GHz to 12.75 GHz, 5240 MHz, vertical & horizontal polarization**Plot 13:** 12 GHz to 18 GHz, 5240 MHz, vertical & horizontal polarization

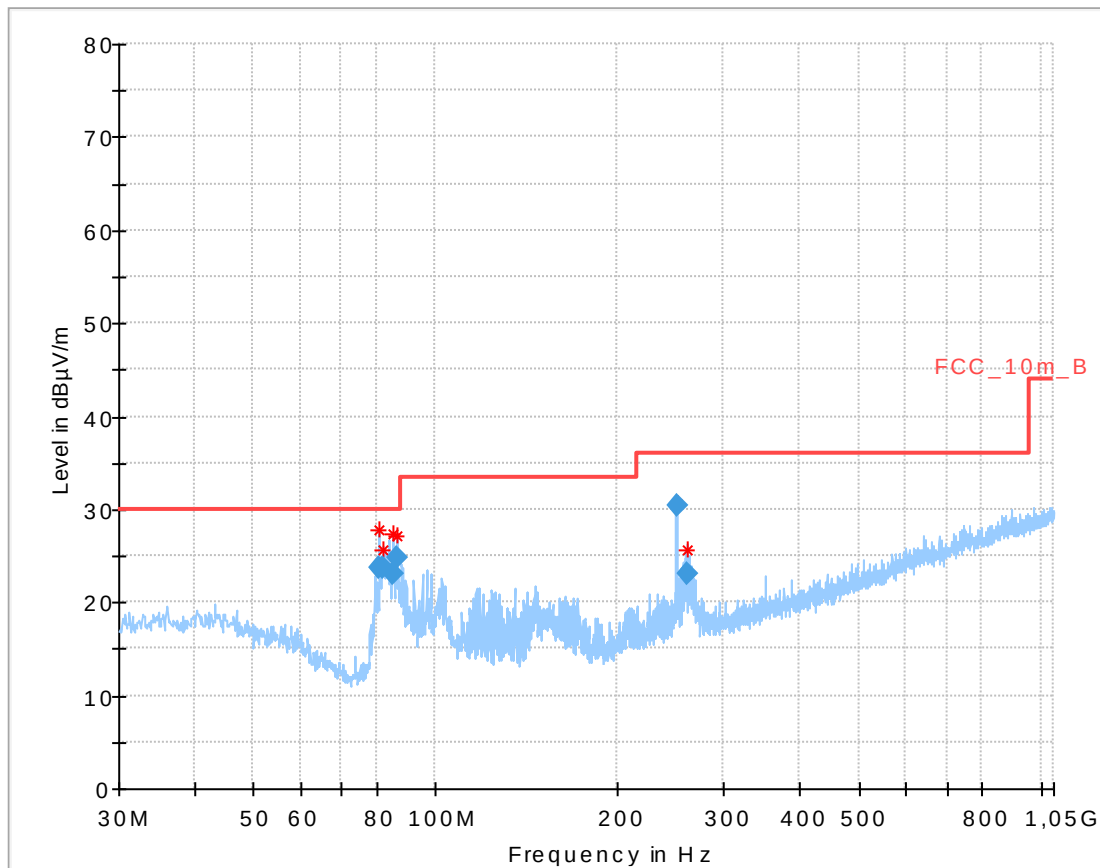
**Plot 14:** 18 GHz to 26 GHz, 5240 MHz, vertical & horizontal polarization**Plot 15:** 26 GHz to 40 GHz, 5240 MHz, vertical & horizontal polarization

**Plot 16:** 30 MHz to 1 GHz, 5745 MHz, vertical & horizontal polarization

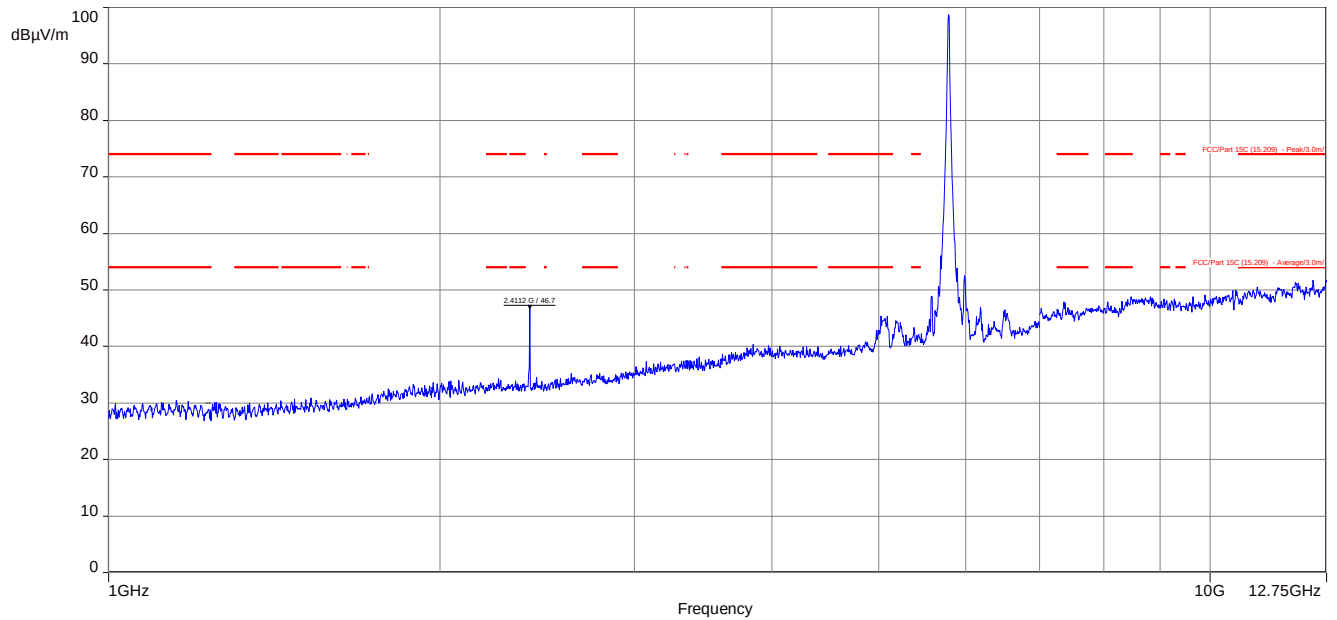
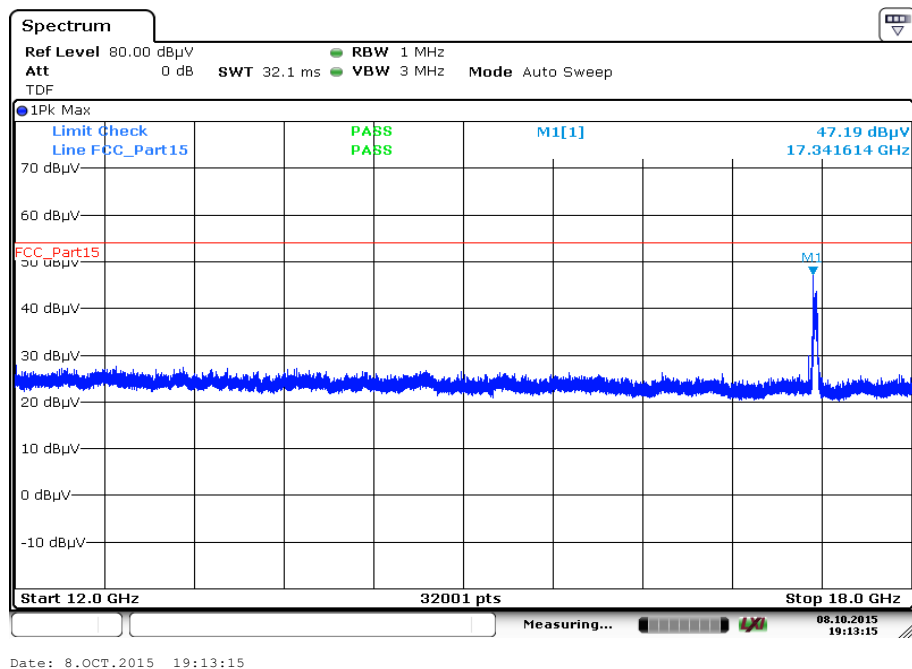
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 80.820300       | 23.72              | 30.00          | 6.28        | 1000.0          | 120.000         | 170.0       | V   | 218           | 8.3        |
| 85.249650       | 24.75              | 30.00          | 5.25        | 1000.0          | 120.000         | 101.0       | V   | 280           | 9.4        |
| 86.593800       | 25.25              | 30.00          | 4.75        | 1000.0          | 120.000         | 101.0       | V   | 338           | 9.7        |
| 249.988050      | 30.23              | 36.00          | 5.77        | 1000.0          | 120.000         | 98.0        | V   | 120           | 13.3       |
| 260.163750      | 22.76              | 36.00          | 13.24       | 1000.0          | 120.000         | 98.0        | V   | 113           | 13.6       |
| 750.679950      | 19.47              | 36.00          | 16.53       | 1000.0          | 120.000         | 170.0       | V   | 160           | 22.7       |

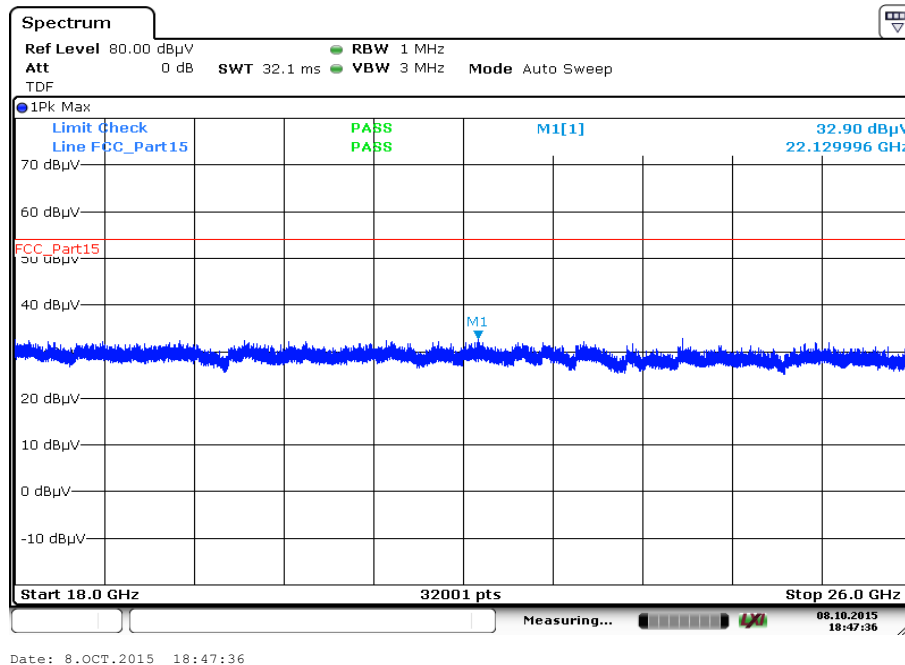
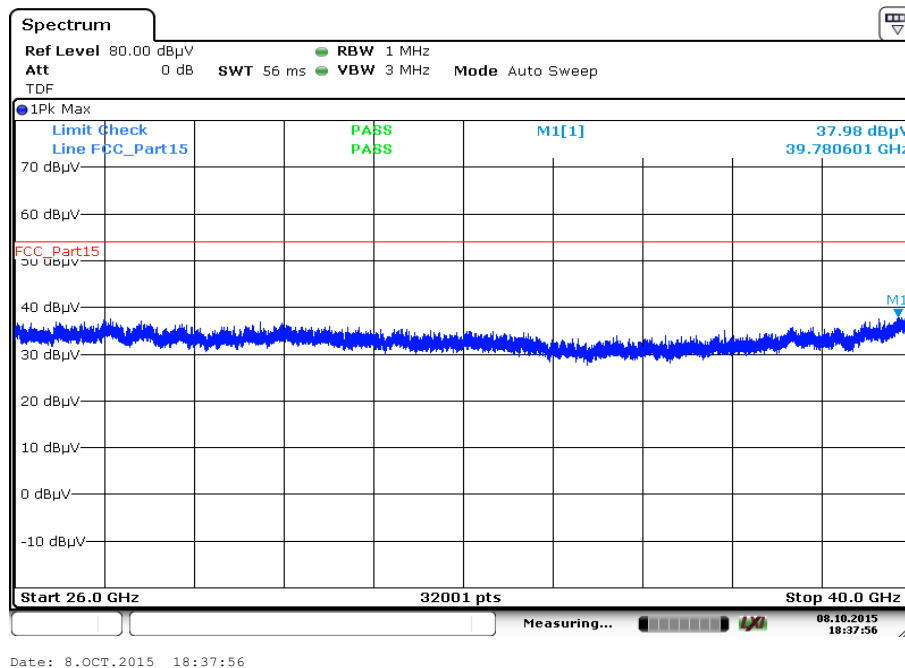
**Plot 17:** 1 GHz to 12.75 GHz, 5745 MHz, vertical & horizontal polarization**Plot 18:** 12 GHz to 18 GHz, 5745 MHz, vertical & horizontal polarization

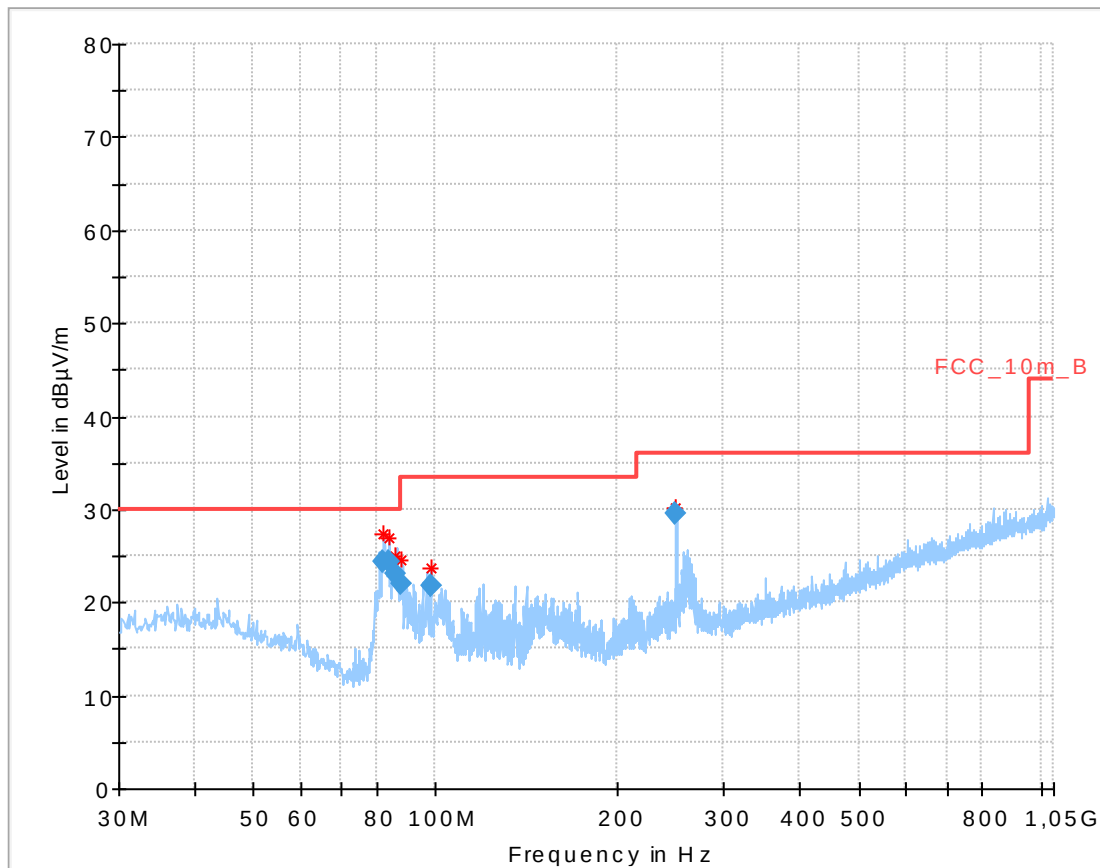
**Plot 19:** 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization**Plot 20:** 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization

**Plot 21:** 30 MHz to 1 GHz, 5785 MHz, vertical & horizontal polarization

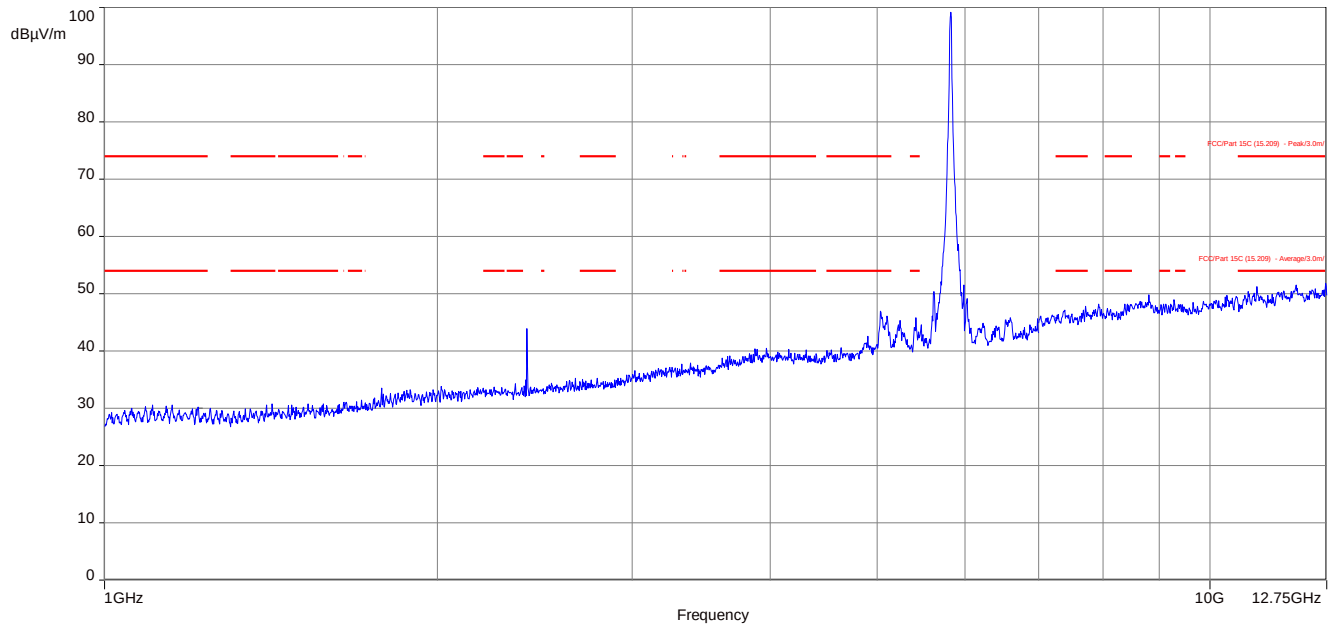
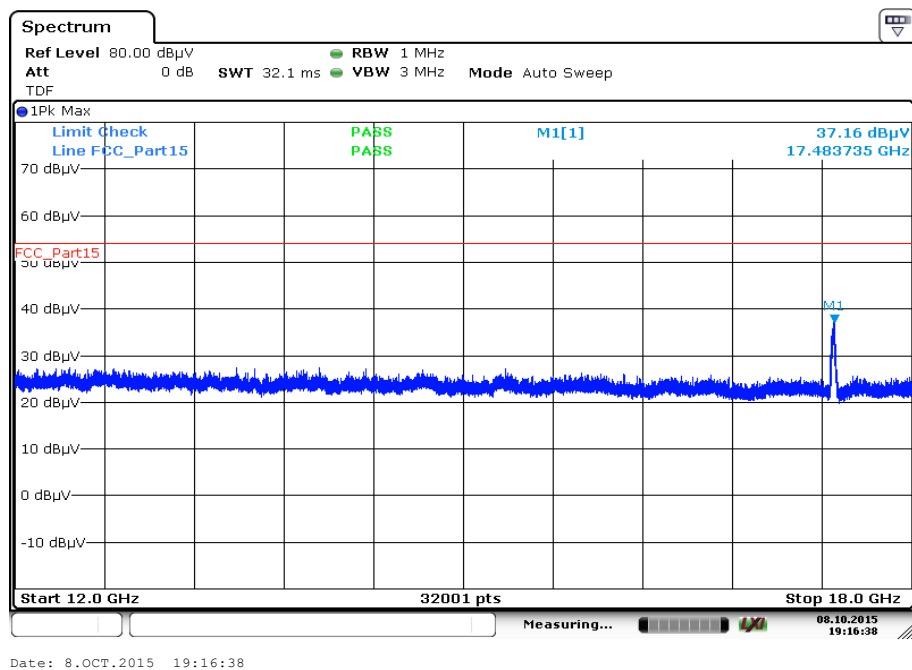
| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 80.837850       | 23.79              | 30.00          | 6.21        | 1000.0          | 120.000         | 170.0       | V   | 229           | 8.3        |
| 82.200600       | 23.82              | 30.00          | 6.18        | 1000.0          | 120.000         | 170.0       | V   | 354           | 8.6        |
| 85.228350       | 23.06              | 30.00          | 6.94        | 1000.0          | 120.000         | 98.0        | V   | 296           | 9.3        |
| 86.607000       | 24.89              | 30.00          | 5.11        | 1000.0          | 120.000         | 101.0       | V   | 284           | 9.7        |
| 250.008450      | 30.36              | 36.00          | 5.64        | 1000.0          | 120.000         | 98.0        | V   | 160           | 13.4       |
| 259.967400      | 22.97              | 36.00          | 13.03       | 1000.0          | 120.000         | 98.0        | V   | 141           | 13.6       |

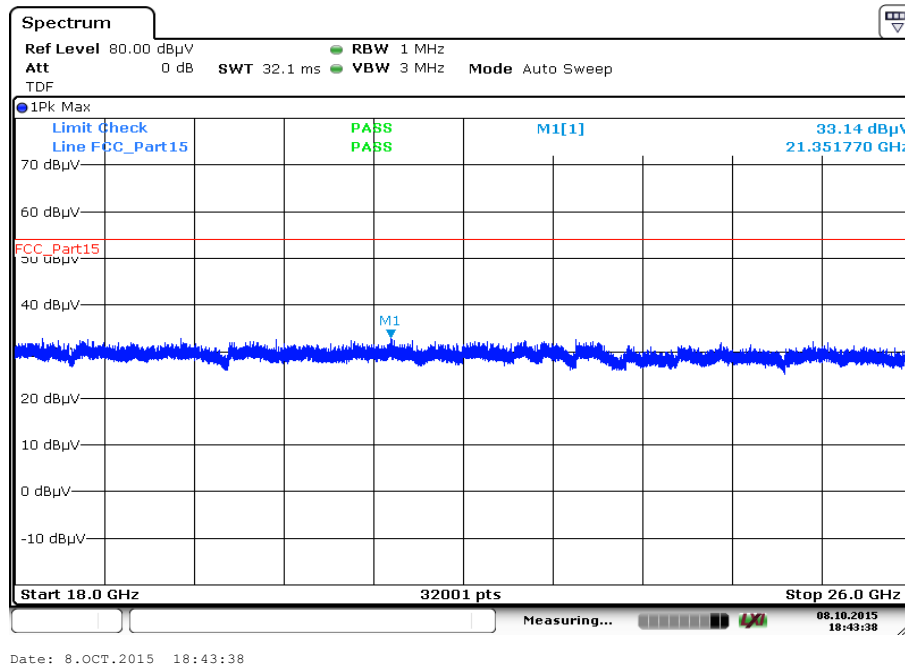
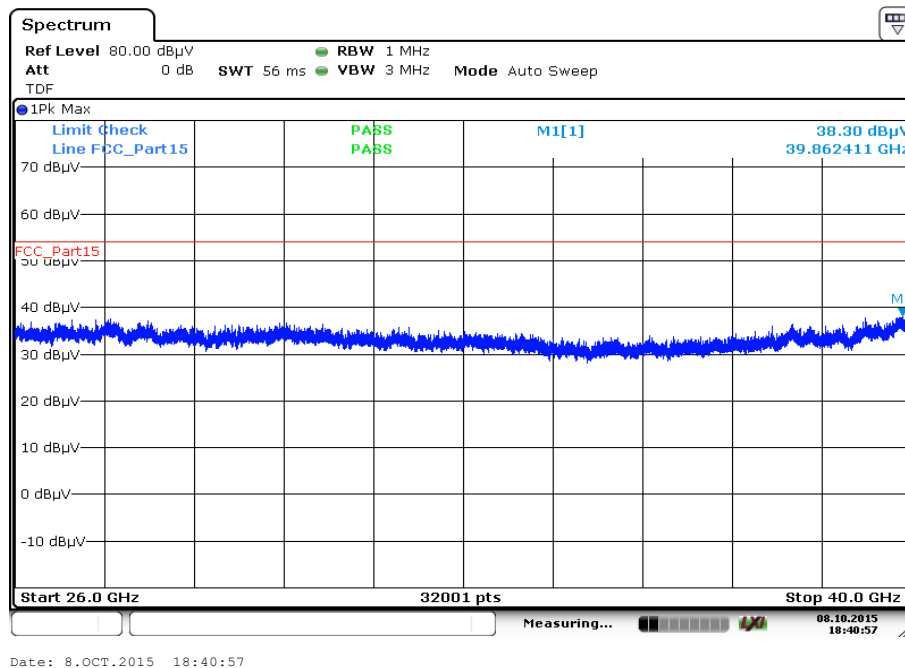
**Plot 22:** 1 GHz to 12.75 GHz, 5785 MHz, vertical & horizontal polarization**Plot 23:** 12 GHz to 18 GHz, 5785 MHz, vertical & horizontal polarization

**Plot 24:** 18 GHz to 26 GHz, 5785 MHz, vertical & horizontal polarization**Plot 25:** 26 GHz to 40 GHz, 5785 MHz, vertical & horizontal polarization

**Plot 26:** 30 MHz to 1 GHz, 5825 MHz, vertical & horizontal polarization

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 82.170900       | 24.43              | 30.00          | 5.57        | 1000.0          | 120.000         | 170.0       | V   | 323           | 8.6        |
| 83.841000       | 24.34              | 30.00          | 5.66        | 1000.0          | 120.000         | 101.0       | V   | 359           | 9.0        |
| 86.041200       | 23.18              | 30.00          | 6.82        | 1000.0          | 120.000         | 101.0       | V   | 288           | 9.5        |
| 87.940350       | 21.95              | 30.00          | 8.05        | 1000.0          | 120.000         | 101.0       | V   | 197           | 10.0       |
| 98.302350       | 21.70              | 33.50          | 11.80       | 1000.0          | 120.000         | 170.0       | V   | 288           | 11.9       |
| 249.995100      | 29.48              | 36.00          | 6.52        | 1000.0          | 120.000         | 98.0        | V   | 288           | 13.3       |

**Plot 27:** 1 GHz to 12.75 GHz, 5825 MHz, vertical & horizontal polarization**Plot 28:** 12 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization

**Plot 29:** 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization**Plot 30:** 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization

## 12.9 Spurious emissions radiated < 30 MHz

### Description:

Measurement of the radiated spurious emissions in transmit mode and receive mode below 30 MHz. The EUT is set first to middle channel. This measurement is representative for all channels and modes. If critical peaks are found the lowest channel and the highest channel will be measured too. Then the EUT is set to receive or idle mode. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

### Measurement:

| Measurement parameter   |                                            |
|-------------------------|--------------------------------------------|
| Detector:               | Peak / Quasi Peak                          |
| Sweep time:             | Auto                                       |
| Video bandwidth:        | F < 150 kHz: 200 Hz<br>F > 150 kHz: 9 kHz  |
| Resolution bandwidth:   | F < 150 kHz: 1 kHz<br>F > 150 kHz: 100 kHz |
| Span:                   | 9 kHz to 30 MHz                            |
| Trace-Mode:             | Max Hold                                   |
| Test setup:             | See sub clause 7.2 (Item B)                |
| Measurement uncertainty | See sub clause 9                           |

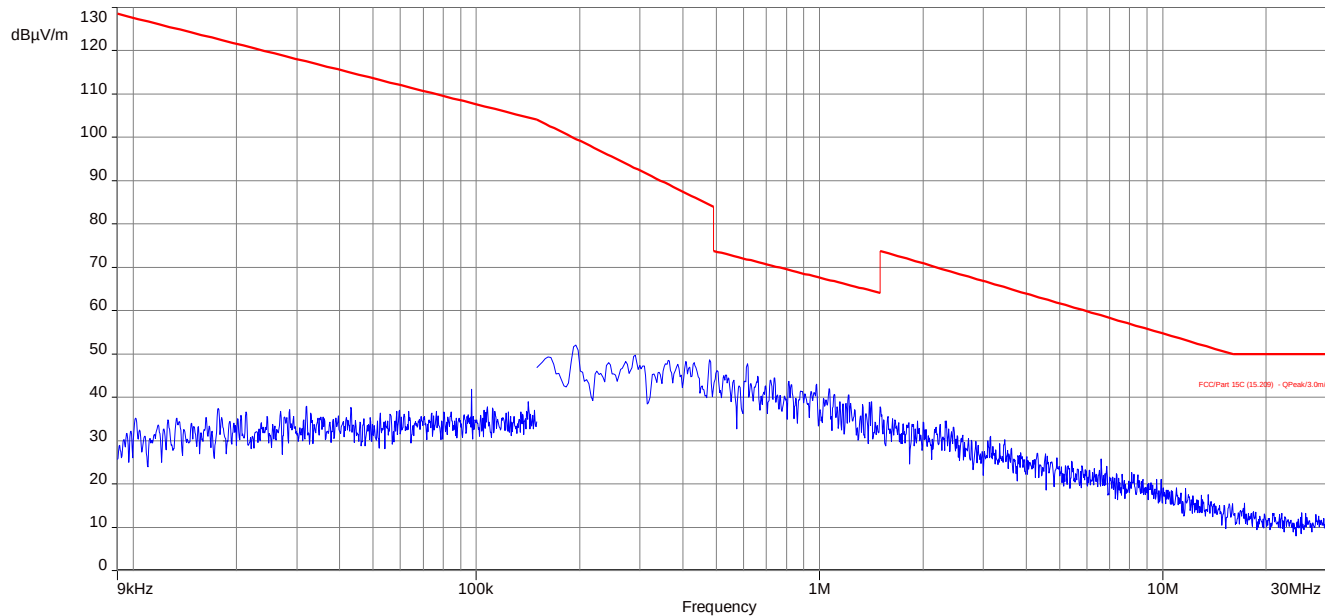
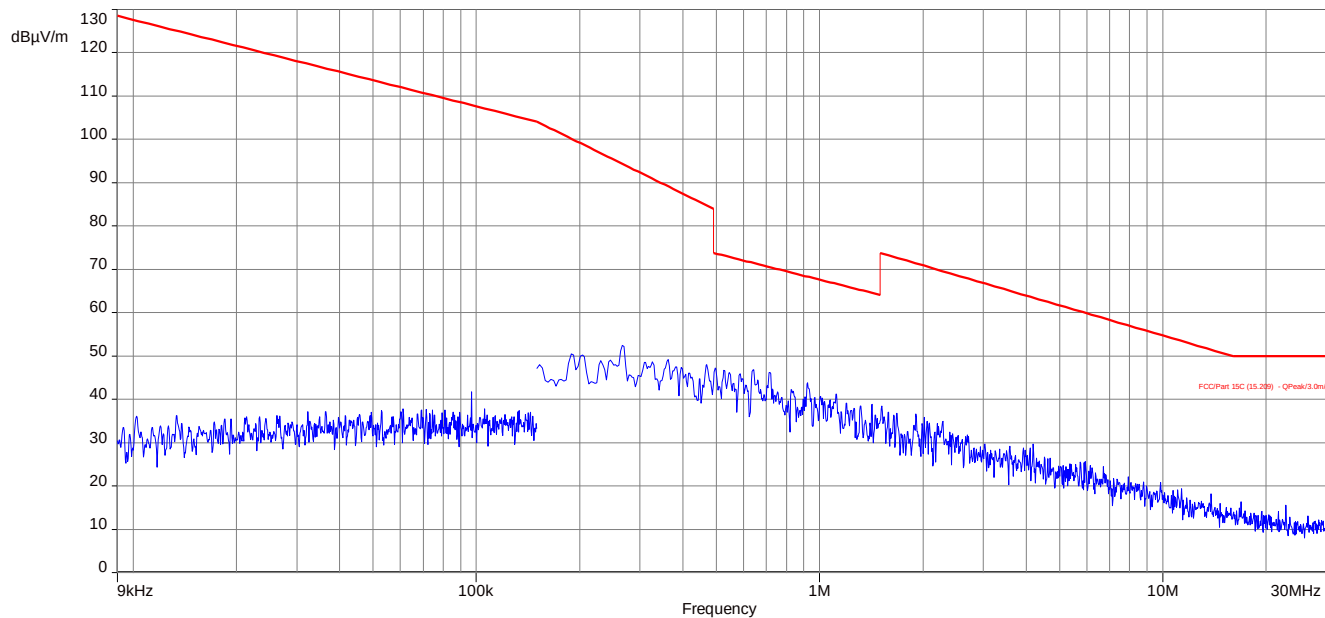
### Limits:

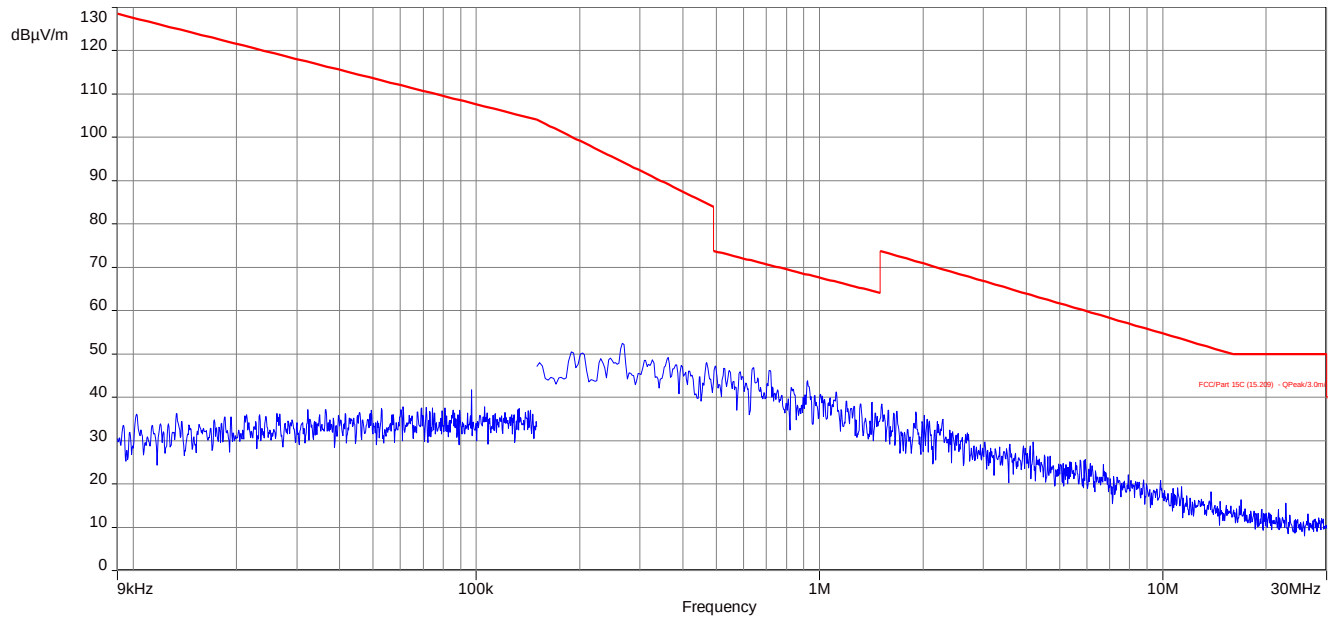
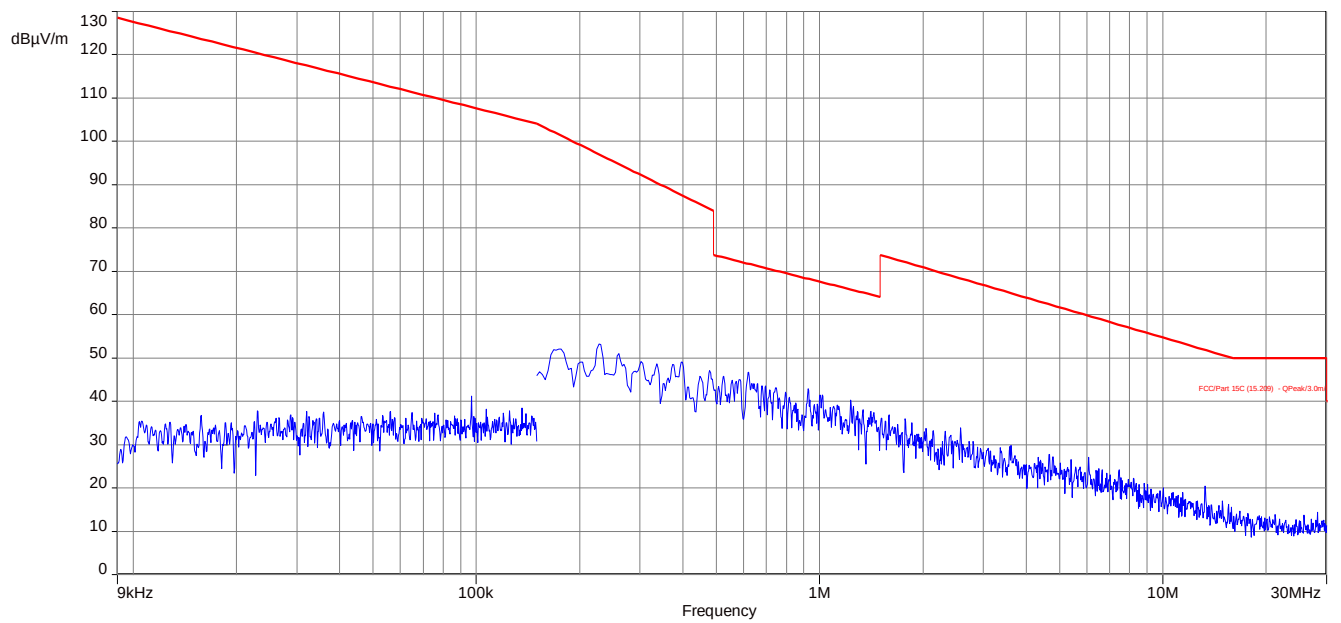
| Spurious Emissions Radiated < 30 MHz |                               |                      |
|--------------------------------------|-------------------------------|----------------------|
| Frequency (MHz)                      | Field Strength (dB $\mu$ V/m) | Measurement distance |
| 0.009 – 0.490                        | 2400/F(kHz)                   | 300                  |
| 0.490 – 1.705                        | 24000/F(kHz)                  | 30                   |
| 1.705 – 30.0                         | 30                            | 30                   |

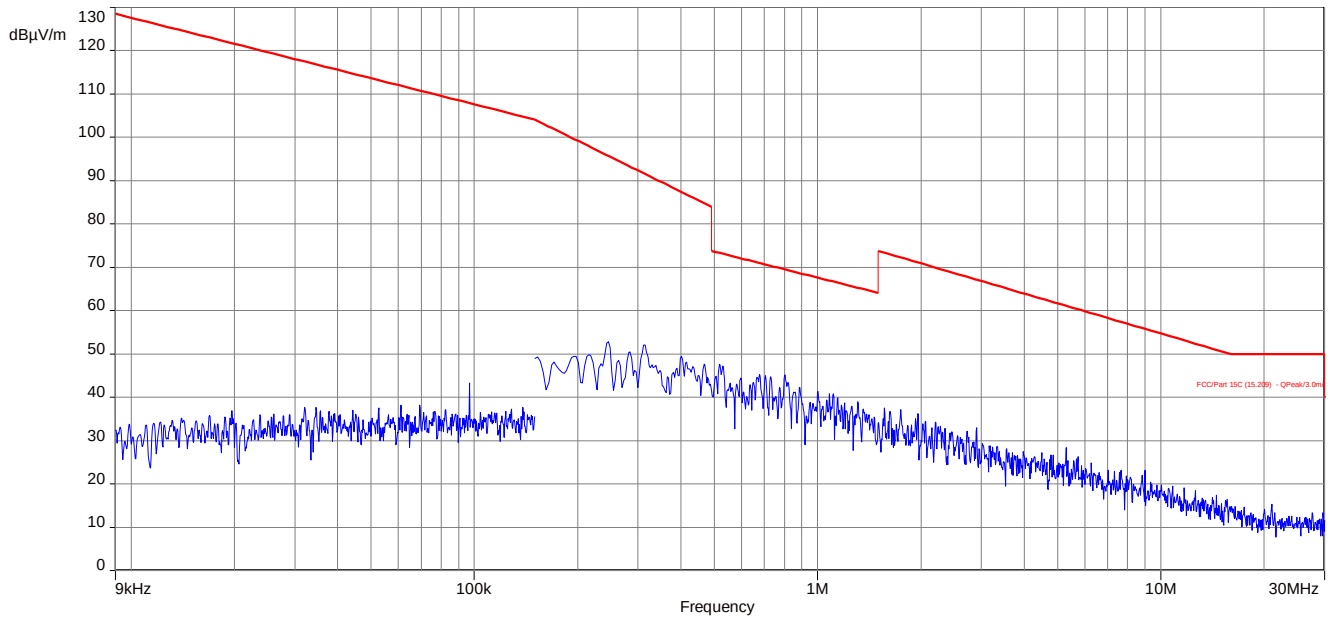
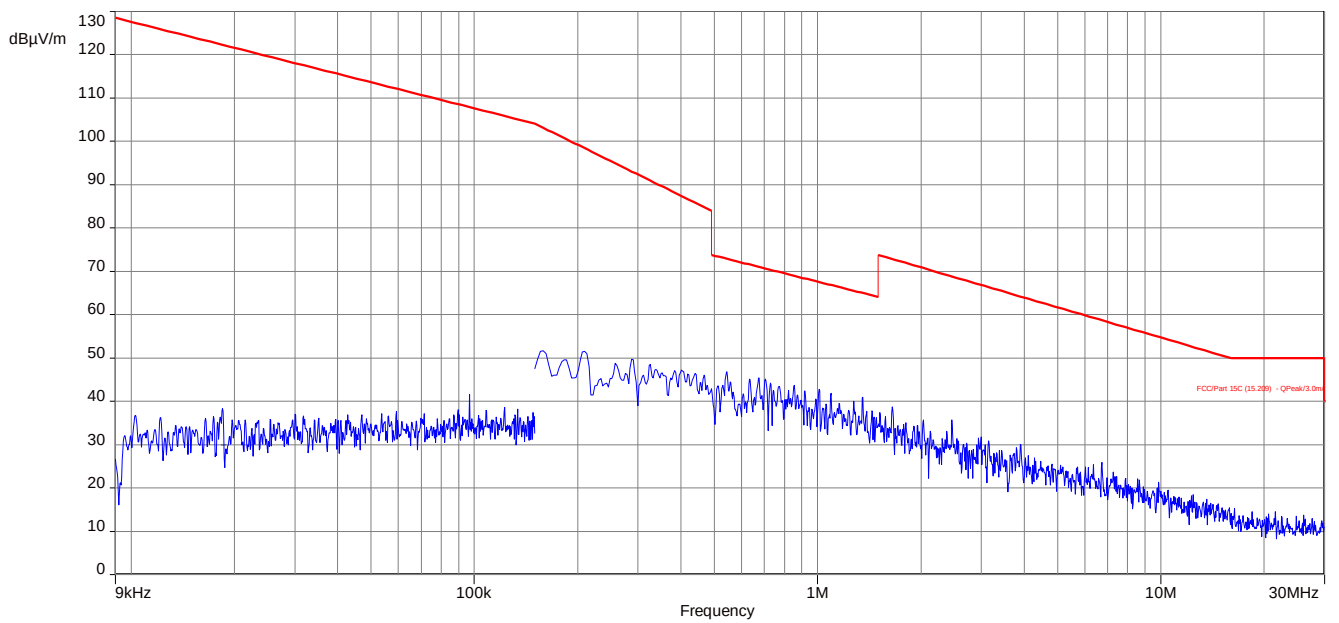
### Results:

| Spurious Emissions Radiated < 30 MHz [dB $\mu$ V/m] |          |                      |
|-----------------------------------------------------|----------|----------------------|
| F [MHz]                                             | Detector | Level [dB $\mu$ V/m] |
| All peaks > 20 dB below limit.                      |          |                      |

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

**Plots: OFDM / X-Rock ON****Plot 1:** 9 kHz to 30 MHz, TX mode – 5180 MHz**Plot 2:** 9 kHz to 30 MHz, TX mode – 5200 MHz

**Plot 3:** 9 kHz to 30 MHz, TX mode – 5240 MHz**Plot 4:** 9 kHz to 30 MHz, TX mode – 5745 MHz

**Plot 5:** 9 kHz to 30 MHz, TX mode – 5785 MHz**Plot 6:** 9 kHz to 30 MHz, TX mode – 5825 MHz

## 12.10 Spurious emissions conducted < 30 MHz

### Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to middle channel. If critical peaks are found the lowest channel and the highest channel will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

### Measurement:

| Measurement parameter   |                             |
|-------------------------|-----------------------------|
| Detector:               | Peak – Quasi Peak / Average |
| Sweep time:             | Auto                        |
| Video bandwidth:        | F > 150 kHz: 9 kHz          |
| Resolution bandwidth:   | F > 150 kHz: 100 kHz        |
| Span:                   | 150 kHz to 30 MHz           |
| Trace-Mode:             | Max Hold                    |
| Test setup:             | See sub clause 7.4 (Item E) |
| Measurement uncertainty | See sub clause 9            |

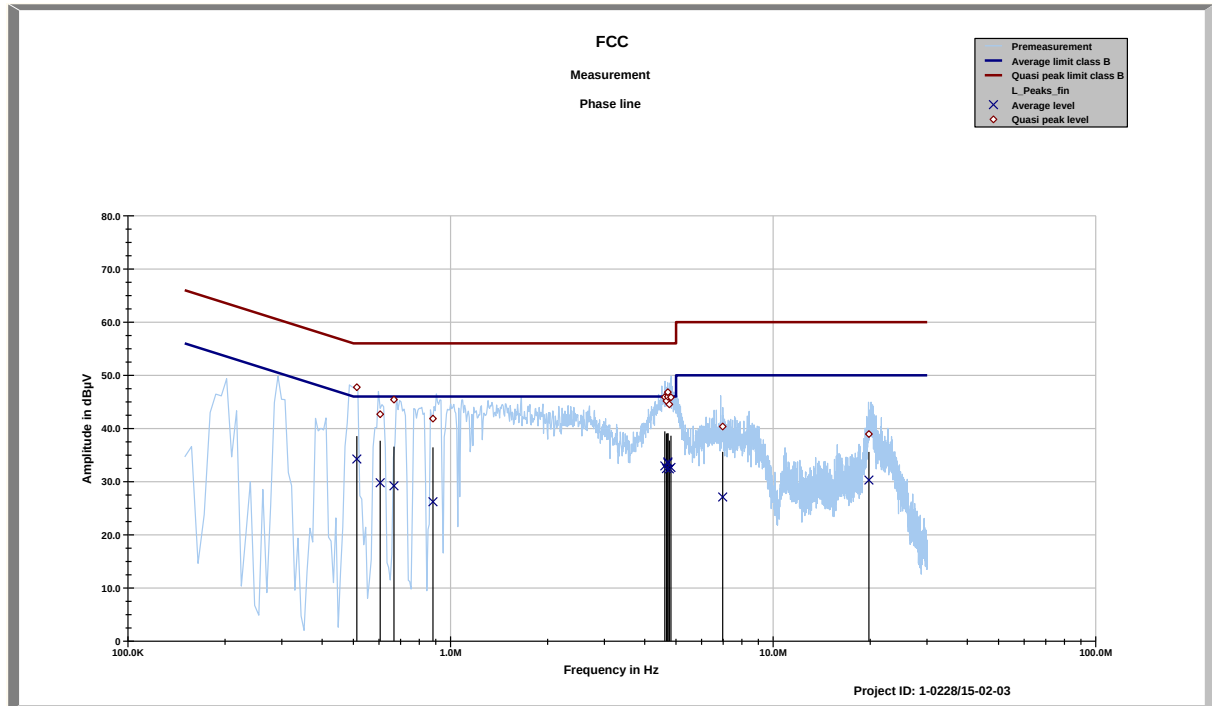
### Limits:

| Spurious Emissions Conducted < 30 MHz |                           |                        |
|---------------------------------------|---------------------------|------------------------|
| Frequency (MHz)                       | Quasi-Peak (dB $\mu$ V/m) | Average (dB $\mu$ V/m) |
| 0.15 – 0.5                            | 66 to 56*                 | 56 to 46*              |
| 0.5 – 5                               | 56                        | 46                     |
| 5 – 30.0                              | 60                        | 50                     |

\*Decreases with the logarithm of the frequency

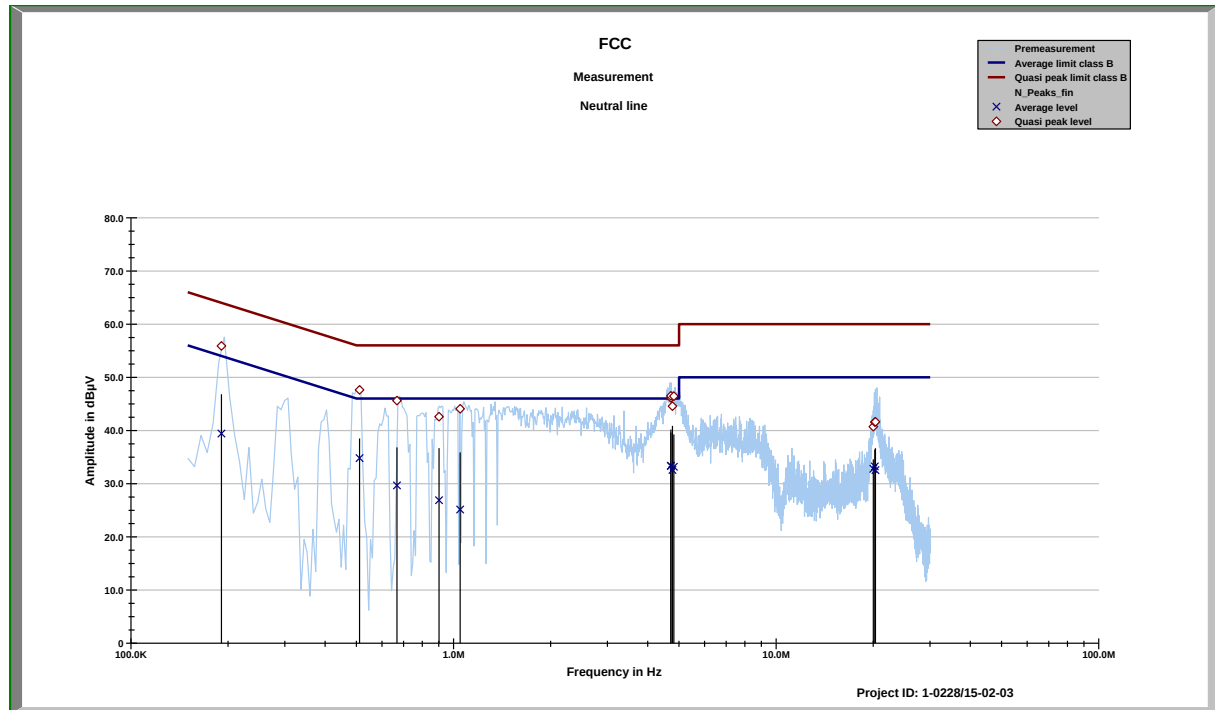
### Results:

| Spurious Emissions Conducted < 30 MHz [dB $\mu$ V/m] |          |                      |
|------------------------------------------------------|----------|----------------------|
| F [MHz]                                              | Detector | Level [dB $\mu$ V/m] |
| See table below plots!                               |          |                      |

**Plots:****Plot 1:** 150 kHz to 30 MHz / phase Line, TX mode

| Frequency<br>MHz | Quasi peak level<br>dBμV | Margin quasi peak<br>dBμV | Average level<br>dBμV | Margin average<br>dBμV |
|------------------|--------------------------|---------------------------|-----------------------|------------------------|
| 0.51215          | 47.75                    | 8.25                      | 34.26                 | 11.74                  |
| 0.60507          | 42.69                    | 13.31                     | 29.80                 | 16.20                  |
| 0.66759          | 45.42                    | 10.58                     | 29.21                 | 16.79                  |
| 0.88189          | 41.86                    | 14.14                     | 26.22                 | 19.78                  |
| 4.6123           | 45.90                    | 10.10                     | 32.96                 | 13.04                  |
| 4.6689           | 45.18                    | 10.82                     | 32.45                 | 13.55                  |
| 4.7138           | 45.99                    | 10.01                     | 33.52                 | 12.48                  |
| 4.7157           | 46.83                    | 9.17                      | 33.71                 | 12.29                  |
| 4.7672           | 44.54                    | 11.46                     | 32.40                 | 13.60                  |
| 4.8197           | 45.86                    | 10.14                     | 32.66                 | 13.34                  |
| 6.974            | 40.37                    | 19.63                     | 27.11                 | 22.89                  |
| 19.797           | 38.95                    | 21.05                     | 30.30                 | 19.70                  |

Plot 2: 150 kHz to 30 MHz / neutral Line, TX mode



| Frequency<br>MHz | Quasi peak level<br>dBμV | Margin quasi peak<br>dBμV | Average level<br>dBμV | Margin average<br>dBμV |
|------------------|--------------------------|---------------------------|-----------------------|------------------------|
| 0.1908           | 55.90                    | 8.11                      | 39.43                 | 15.41                  |
| 0.51113          | 47.64                    | 8.36                      | 34.79                 | 11.21                  |
| 0.66788          | 45.62                    | 10.38                     | 29.67                 | 16.33                  |
| 0.90125          | 42.59                    | 13.41                     | 26.88                 | 19.12                  |
| 1.04804          | 44.08                    | 11.92                     | 25.14                 | 20.86                  |
| 4.7163           | 46.13                    | 9.87                      | 33.37                 | 12.63                  |
| 4.7167           | 46.51                    | 9.49                      | 33.33                 | 12.67                  |
| 4.7688           | 44.57                    | 11.43                     | 32.58                 | 13.42                  |
| 4.818            | 46.44                    | 9.56                      | 33.17                 | 12.83                  |
| 19.999           | 40.72                    | 19.28                     | 32.79                 | 17.21                  |
| 20.204           | 41.57                    | 18.43                     | 33.25                 | 16.75                  |
| 20.303           | 41.63                    | 18.37                     | 32.55                 | 17.45                  |

### 13 Observations

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

### Annex A Document history

| Version | Applied changes                                            | Date of release |
|---------|------------------------------------------------------------|-----------------|
|         | Initial release                                            | 2015-10-16      |
| -A      | Editorial changes (FCC ID corrected), PSD values corrected | 2015-12-09      |

### Annex B Further information

#### Glossary

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

## Annex C Accreditation Certificate

Front side of certificate

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Belehrung 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 / GPRS / UMTS / LTE 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  
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Frankfurt am Main, 07.03.2014

Datei: 00000001-01-00

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Hauptprüfer

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Gartenstraße 6  
60594 Frankfurt am Main

Standort Braunschweig  
Bundesallee 100  
38115 Braunschweig

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31. Juli 2009 (RGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments  
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung  
im Zusammenhang mit der Vermarktung von Produkten (Abt. L 218 vom 9. Juli 2008, S. 30).  
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