**CETECOM<sup>TM</sup>****CETECOM ICT Services**  
consulting - testing - certification >>>

## TEST REPORT

Test report no.: 1-0905/15-01-08

Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing laboratory

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Internet: <http://www.cetecom.com>e-mail: [ict@cetecom.com](mailto:ict@cetecom.com)**Accredited Testing Laboratory:**

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

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

### Applicant

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### Manufacturer

**beyerdynamic GmbH & Co. KG**

Theresienstraße 8

74072 Heilbronn / GERMANY

### Test standard/s

47 CFR Part 15

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

RSS - 247 Issue 1

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence - Exempt Local Area Network (LE-LAN) Devices

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

### Test Item

**Kind of test item:** Wireless microphone system**Model name:** Quinta TB**FCC ID:** OSDSTEGOSTB**IC:** 3628A-STEGOSTB

Frequency: 5150 MHz to 5250 MHz &amp; 5725 MHz to 5850 MHz

Technology tested: Proprietary

Antenna: Integrated antenna

Power supply: 100 V to 240 V AC-Main / 4.8V NiMH battery

Temperature range: 0°C to +40°C



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

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## 2 General information

### 2.1 Notes and disclaimer

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

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

### 2.2 Application details

|                                    |            |
|------------------------------------|------------|
| Date of receipt of order:          | 2016-04-07 |
| Date of receipt of test item:      | 2016-07-11 |
| Start of test:                     | 2016-07-12 |
| End of test:                       | 2016-07-15 |
| Person(s) present during the test: | -/-        |

## 3 Test standard/s and references

| Test standard     | Date          | Description                                                                                                                                               |
|-------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47 CFR Part 15    | -/-           | Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices                                                                 |
| RSS - 247 Issue 1 | May 2015      | Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices                            |
| RSS - Gen Issue 4 | November 2014 | Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus |

| Guidance             | Version | Description                                                                                                                                                                                         |
|----------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNII: KDB 789033 D02 | v01r02  | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E                                                                            |
| UNII: KDB 905462 D02 | v02     | Compliance measurement procedures for unlicensed - national information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection |
| ANSI C63.4-2014      | -/-     | American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz                                 |
| ANSI C63.10-2013     | -/-     | American national standard of procedures for compliance testing of unlicensed wireless devices                                                                                                      |

#### 4 Test environment

|                           |   |                                                          |                                                                                                                                 |
|---------------------------|---|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Temperature               | : | T <sub>nom</sub><br>T <sub>max</sub><br>T <sub>min</sub> | +24 °C during room temperature tests<br>+40 °C during high temperature tests<br>0 °C during low temperature tests               |
| Relative humidity content | : |                                                          | 55 %                                                                                                                            |
| Barometric pressure       | : |                                                          | not relevant for this kind of testing                                                                                           |
| Power supply              | : | V <sub>nom</sub><br>V <sub>max</sub><br>V <sub>min</sub> | 115 V AC-Main / 4.8V NiMH battery<br>-/- V (no extreme condition tests required)<br>-/- V (no extreme condition tests required) |

#### 5 Test item

##### 5.1 General description

|                            |   |                                                                                                     |
|----------------------------|---|-----------------------------------------------------------------------------------------------------|
| Kind of test item          | : | Wireless microphone system                                                                          |
| Type identification        | : | Quinta TB                                                                                           |
| HMN                        | : | -/-                                                                                                 |
| PMN                        | : | Quinta TB                                                                                           |
| HVIN                       | : | Quinta TB                                                                                           |
| FVIN                       | : | -/-                                                                                                 |
| S/N serial number          | : | Rad. 000005 (QPSK Sample), 000001 (BPSK Sample)<br>Cond. 000007 (QPSK Sample), 000008 (BPSK Sample) |
| HW hardware status         | : | Release 1                                                                                           |
| SW software status         | : | Release 1                                                                                           |
| Frequency band             | : | 5150 MHz to 5250 MHz & 5725 MHz to 5850 MHz                                                         |
| Type of radio transmission | : | DSSS                                                                                                |
| Use of frequency spectrum  | : |                                                                                                     |
| Type of modulation         | : | BPSK, QPSK                                                                                          |
| Number of channels         | : | 6                                                                                                   |
| Antenna                    | : | Integrated antenna                                                                                  |
| Power supply               | : | 100 V to 240 V AC-Main / 4.8V NiMH battery                                                          |
| Temperature range          | : | 0°C to +40°C                                                                                        |

##### 5.2 Additional information

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

Test setup- and EUT-photos are included in test report: 1-0905/15-01-02\_AnnexA  
1-0905/15-01-02\_AnnexB  
1-0905/15-01-02\_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).

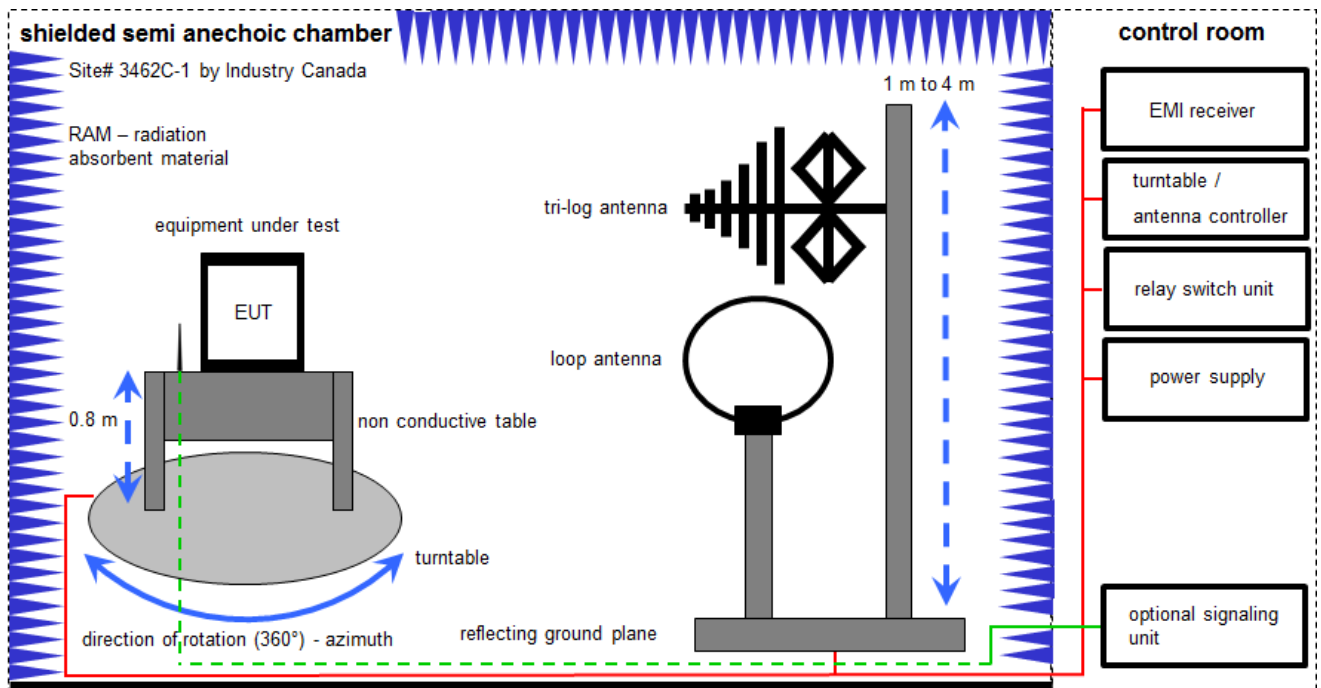
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

## 7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices. 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; loop antenna 10 meter

FS = UR + CL + AF

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

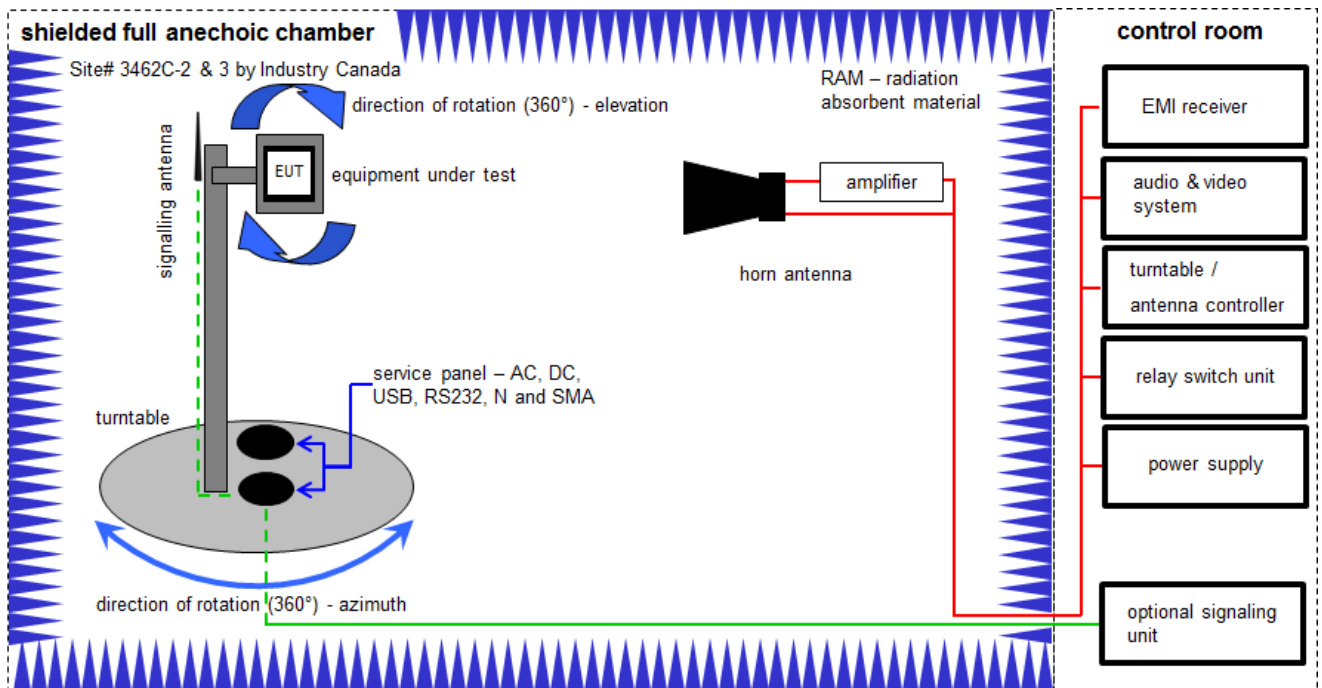
Example calculation:

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

### Equipment table:

| No. | 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   | A          | Switch-Unit                                       | 3488A        | HP           | 2719A14505      | 300000368       | ev                  | -/-              | -/-              |
| 3   | A+B        | EMI Test Receiver                                 | ESCI 3       | R&S          | 100083          | 300003312       | k                   | 08.03.2016       | 08.03.2017       |
| 4   | A+B        | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1     | SPS          | A3509 07/0 0205 | 300003314       | Ve                  | 02.02.2016       | 02.02.2018       |
| 5   | A          | Antenna Tower                                     | Model 2175   | ETS-Lindgren | 64762           | 300003745       | izw                 | -/-              | -/-              |
| 6   | A+B        | Positioning Controller                            | Model 2090   | ETS-Lindgren | 64672           | 300003746       | izw                 | -/-              | -/-              |
| 7   | A          | Turntable Interface-Box                           | Model 105637 | ETS-Lindgren | 44583           | 300003747       | izw                 | -/-              | -/-              |
| 8   | A          | TRILOG Broadband Test-Antenna 30 MHz - 3 GHz      | VULB9163     | Schwarzbeck  | 295             | 300003787       | k                   | 25.04.2016       | 25.04.2018       |

## 7.2 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter / 1 meter

$$FS = UR + CA + AF$$

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

Example calculation:

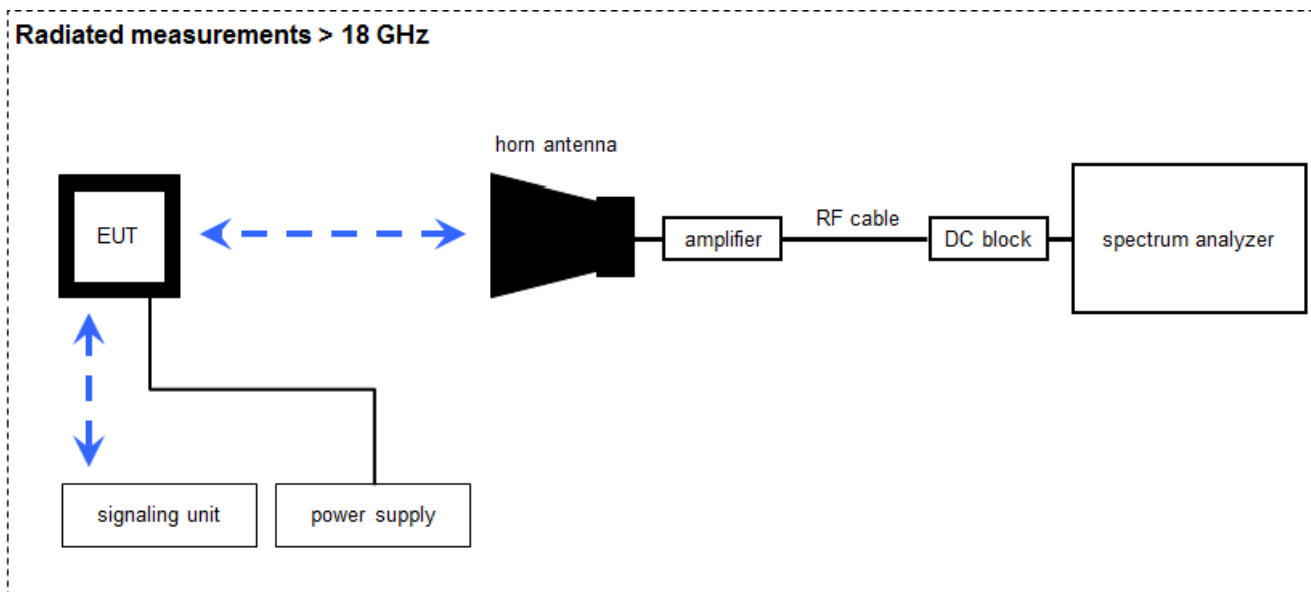
$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$$

### Equipment table:

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

### 7.3 Radiated measurements > 18 GHz

#### Radiated measurements > 18 GHz



Measurement distance: horn antenna 25 cm

FS = UR + CA + AF

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

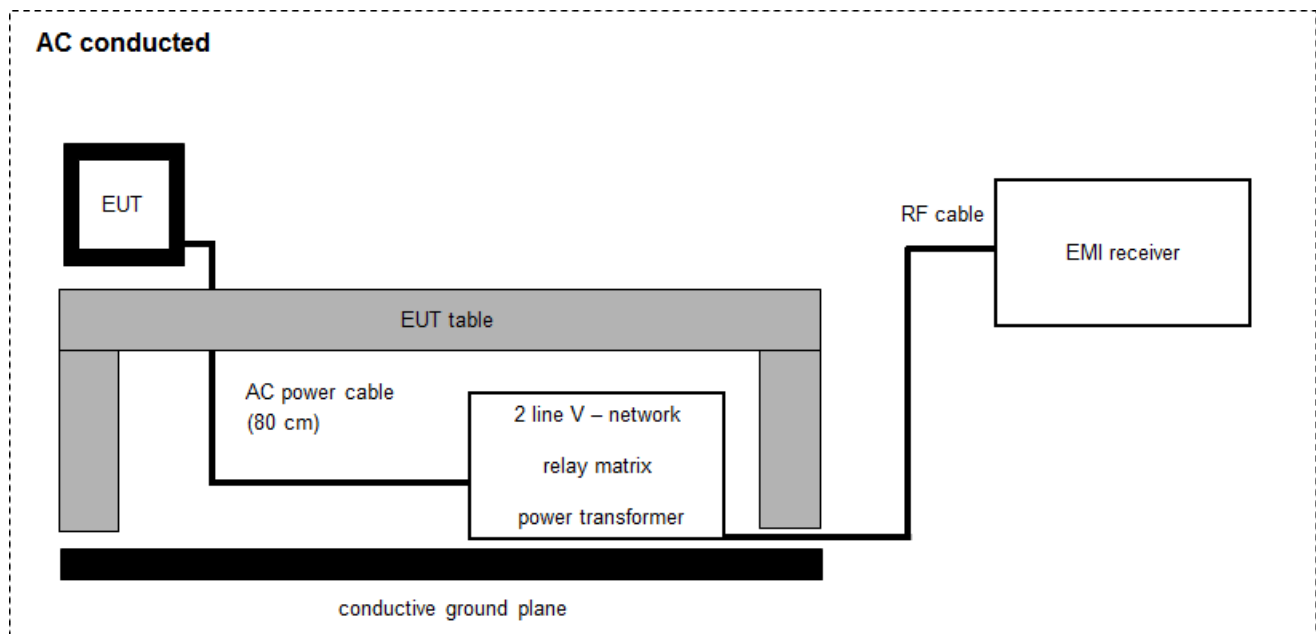
Example calculation:

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   | A          | Signal Analyzer 40 GHz                  | FSV40               | R&S            | 101042           | 300004517       | k                   | 21.01.2016       | 21.01.2017       |
| 2   | A          | Amplifier 2-40 GHz                      | JS32-02004000-57-5P | MITEQ          | 1777200          | 300004541       | ev                  | -/-              | -/-              |
| 3   | A          | RF-Cable                                | ST18/SMAM/SMAM/60   | Huber & Suhner | Batch no. 606844 | 400001181       | ev                  | -/-              | -/-              |
| 4   | A          | DC-Blocker 0.1-40 GHz                   | 8141A               | Inmet          | Batch no. 606844 | 400001185       | ev                  | -/-              | -/-              |
| 5   | A          | Std. Gain Horn Antenna 12.4 to 18.0 GHz | 639                 | Narda          | 8402             | 300000787       | k                   | 14.08.2015       | 14.08.2017       |
| 6   | A          | Std. Gain Horn Antenna 18.0 to 26.5 GHz | 638                 | Narda          | 8402             | 300000486       | k                   | 10.09.2015       | 10.09.2017       |
| 7   | A          | Std. Gain Horn Antenna 26.5 to 40.0 GHz | V637                | Narda          | 82-16            | 300000510       | 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:

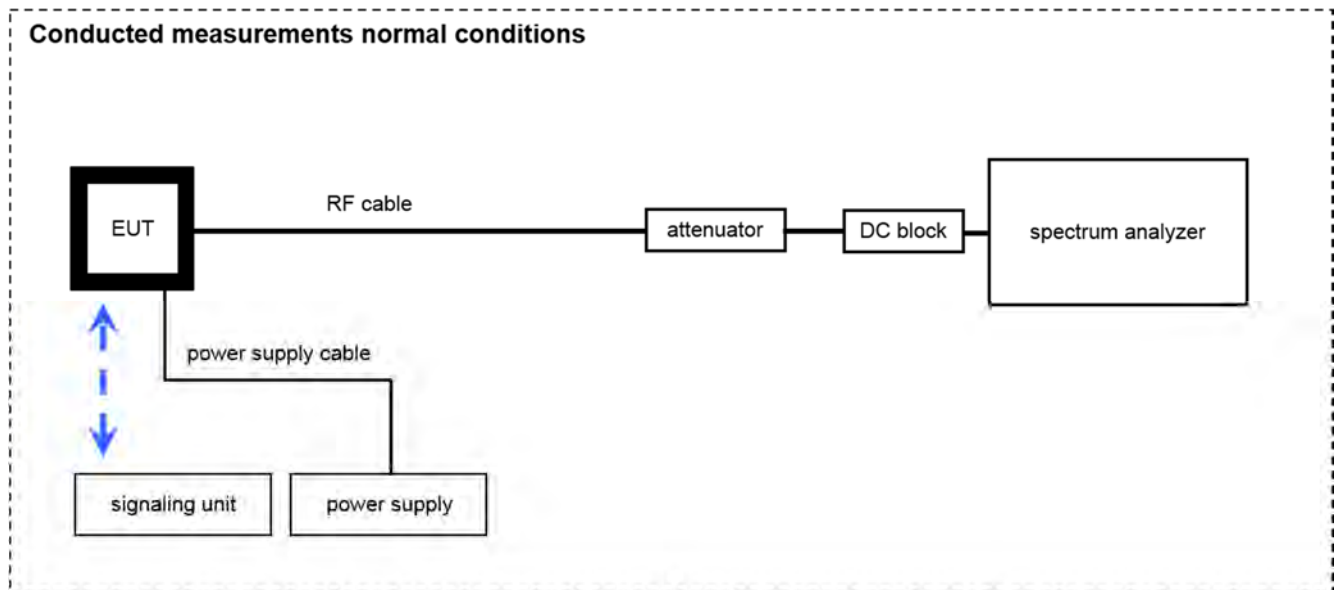
$$FS [dB\mu V/m] = 37.62 [dB\mu V/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dB\mu V/m] (244.06 \mu V/m)$$

**Equipment table:**

| No. | Lab / Item | Equipment                                         | Type     | Manufacturer         | Serial No.      | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|-----|------------|---------------------------------------------------|----------|----------------------|-----------------|-----------------|---------------------|------------------|------------------|
| 1   | A          | Two-line V-Network (LISN) 9 kHz to 30 MHz         | ESH3-Z5  | R&S                  | 893045/004      | 300000584       | k                   | 02.02.2016       | 02.02.2017       |
| 2   | A          | MXE EMI Receiver 20 Hz to 26,5 GHz                | N9038A   | Agilent Technologies | MY51210197      | 300004405       | k                   | 04.02.2016       | 04.02.2017       |
| 3   | A          | Analyzer-Reference-System (Harmonics and Flicker) | ARS 16/1 | SPS                  | A3509 07/0 0205 | 300003314       | Ve                  | 02.02.2016       | 02.02.2018       |

## 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   | A          | PC-WLAN Tester        | Intel Core i3 3220/3,3 GHz, Prozessor | MITEQ                     | 2V2403033A4523   | 300004589       | ne                  | -/-              | -/-              |
| 2   | A          | Teststand             | Teststand Custom Sequence Editor      | National Instruments GmbH | 2V2403033A4523   | 300004590       | ne                  | -/-              | -/-              |
| 3   | A          | RF-Cable              | ST18/SMAM/SMAM/60                     | Huber & Suhner            | Batch no. 606844 | 400001181       | ev                  | -/-              | -/-              |
| 4   | A          | DC-Blocker 0.1-40 GHz | 8141A                                 | Inmet                     | Batch no. 606844 | 400001185       | ev                  | -/-              | -/-              |

## 8 Sequence of testing

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

#### Setup

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

#### Premeasurement

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

#### Final measurement

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

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

### Setup

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

### Premeasurement

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

### Final measurement

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

### 8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

#### Setup

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

#### Premeasurement

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

#### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 8.4 Sequence of testing radiated spurious above 18 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

### Premeasurement

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

### Final measurement

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

**9 Measurement uncertainty**

| Measurement uncertainty                                  |                                     |
|----------------------------------------------------------|-------------------------------------|
| Test case                                                | Uncertainty                         |
| Antenna gain                                             | ± 3 dB                              |
| Power spectral density                                   | ± 1.5 dB                            |
| Spectrum bandwidth                                       | ± 100 kHz (depends on the used RBW) |
| Occupied bandwidth                                       | ± 100 kHz (depends on the used RBW) |
| Maximum output power                                     | ± 1.5 dB                            |
| Minimum emissions bandwidth                              | ± 100 kHz (depends on the used RBW) |
| Spurious emissions conducted                             | ± 3 dB                              |
| Spurious emissions radiated below 30 MHz                 | ± 3 dB                              |
| Spurious emissions radiated 30 MHz to 1 GHz              | ± 3 dB                              |
| Spurious emissions radiated 1 GHz to 12.75 GHz           | ± 3.7 dB                            |
| Spurious emissions radiated above 12.75 GHz              | ± 4.5 dB                            |
| Spurious emissions conducted below 30 MHz (AC conducted) | ± 2.6 dB                            |

## 10 Summary of measurement results

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

| TC Identifier | Description                     | Verdict   | Date       | Remark |
|---------------|---------------------------------|-----------|------------|--------|
| RF-Testing    | CFR Part 15<br>RSS 247, Issue 1 | see table | 2016-08-04 | -/-    |

| Test specification clause                                                                                      | Test case                                       | Temperature conditions | Power source voltages | C                                   | NC                       | NA                       | NP                       | Remark                                           |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------|-----------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------------------------------|
| -/-                                                                                                            | Output power verification (conducted)           | Nominal                | Nominal               | -/-                                 |                          |                          |                          | -/-                                              |
| -/-                                                                                                            | Antenna gain                                    | Nominal                | Nominal               | -/-                                 |                          |                          |                          | Declared                                         |
| U-NII Part 15                                                                                                  | Duty cycle                                      | Nominal                | Nominal               | -/-                                 |                          |                          |                          | -/-                                              |
| §15.407(a)<br>RSS - 247 (6.2.1) (1)<br>RSS - 247 (6.2.2) (1)<br>RSS - 247 (6.2.3) (1)<br>RSS - 247 (6.2.4) (1) | Maximum output power (conducted & radiated)     | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.407(a)<br>RSS - 247 (6.2.1) (1)<br>RSS - 247 (6.2.2) (1)<br>RSS - 247 (6.2.3) (1)<br>RSS - 247 (6.2.4) (1) | Power spectral density                          | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| RSS - 247 (6.2.4)                                                                                              | Spectrum bandwidth 6dB bandwidth                | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.407(a)                                                                                                     | Spectrum bandwidth 26dB bandwidth               | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| RSS Gen clause 6.6                                                                                             | Spectrum bandwidth 99% bandwidth                | Nominal                | Nominal               | -/-                                 |                          |                          |                          | -/-                                              |
| §15.205<br>RSS - 247 (6.2.1) (2)<br>RSS - 247 (6.2.2) (2)<br>RSS - 247 (6.2.3) (2)<br>RSS - 247 (6.2.4) (2)    | Band edge compliance radiated                   | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.407(b)<br>RSS - 247 (6.2.1) (2)<br>RSS - 247 (6.2.2) (2)<br>RSS - 247 (6.2.3) (2)<br>RSS - 247 (6.2.4) (2) | TX spurious emissions radiated                  | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.109<br>RSS-Gen                                                                                             | RX spurious emissions radiated                  | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.209(a)<br>RSS-Gen                                                                                          | Spurious emissions radiated < 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 emissions < 30 MHz | Nominal                | Nominal               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -/-                                              |
| §15.407<br>RSS - 247 (6.3)                                                                                     | DFS                                             | Nominal                | Nominal               | -/-                                 |                          |                          |                          | Not required since no DFS frequencies supported. |

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

## 11 Additional comments

Reference documents: Antenna specification: Application Note W3006 DualBand WiFi Antenna by Pulse Finland Oy (Version 1.0.3).

Special test descriptions: None

Configuration descriptions: Power Setting:  
QPSK: d 2 B0 00061F 000000  
BPSK: d 2 B0 938326 000000

Test mode:

☐ No test mode available.  
Iperf was used to ping another device with the largest support packet size

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

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

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

☐ Operating mode 2 (multiple antennas, no beamforming)

- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.

☐ Operating mode 3 (multiple antennas, with beamforming)

- Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.  
In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

## 12 Measurement results

### 12.1 Gain

Gain as specified in antenna documentation: 4.2 dBi (Peak)

### 12.2 Duty cycle

#### Description:

The duty cycle is necessary to compute the maximum power during an actual transmission. The shown plots and values are to show an example of the measurement procedure. The real value is measured direct during the power measurement or power density measurement. The correction value is shown in each plot of these measurements.

#### Measurement:

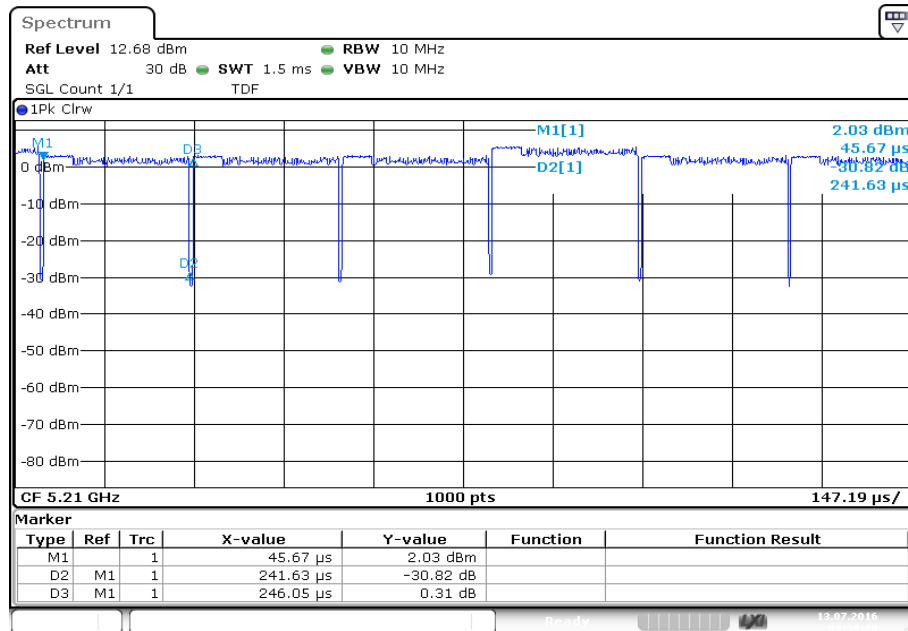
| Measurement parameter           |                                     |
|---------------------------------|-------------------------------------|
| According to: KDB789033 D02, B. |                                     |
| Detector:                       | Peak                                |
| Sweep time:                     | Auto                                |
| Resolution bandwidth:           | 10 MHz                              |
| Video bandwidth:                | 10 MHz                              |
| Span:                           | Zero                                |
| Trace mode:                     | Video trigger / view / single sweep |
| Used test setup:                | See chapter 7.5 – A                 |
| Measurement uncertainty:        | See chapter 9                       |

#### Results:

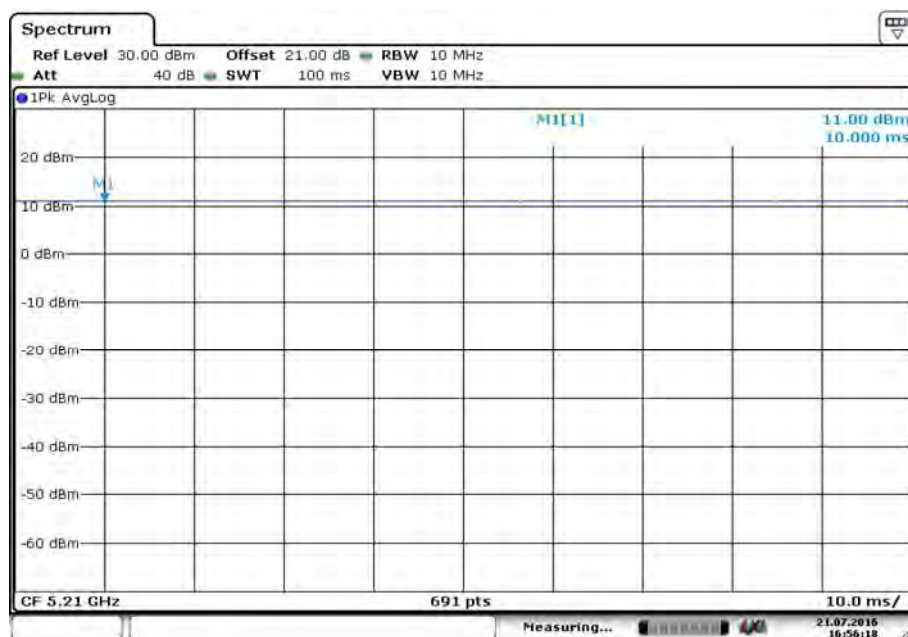
##### Duty cycle and correction factor:

BPSK – mode:            98.2 % duty cycle            =>    0.1 dB

QPSK – mode:           100 % duty cycle           =>    0.0 dB

**Plots:****Duty cycle and correction factor:****Plot 1:** duty cycle of the transmitter – BPSK - mode

Date: 13.JUL.2016 09:39:21

**Plot 2:** duty cycle of the transmitter – QPSK - mode

Date: 21.JUL.2016 16:56:18

## 12.3 Maximum output power

### 12.3.1 Maximum output power conducted – for FCC requirements

#### Description:

Measurement of the maximum output power conducted

#### Measurement:

| Measurement parameter               |                                                              |
|-------------------------------------|--------------------------------------------------------------|
| According to: KDB789033 D02, E.2.e. |                                                              |
| Detector:                           | RMS                                                          |
| Sweep time:                         | $\geq 10 * (\text{swp points}) * (\text{total on/off time})$ |
| Resolution bandwidth:               | 1 MHz                                                        |
| Video bandwidth:                    | 3 MHz                                                        |
| Span:                               | > EBW                                                        |
| Trace mode:                         | Max hold                                                     |
| Analyzer function                   | Band power / channel power<br>Interval > 26 dB EBW           |
| Used test setup:                    | See chapter 7.5 – Items A                                    |
| Measurement uncertainty:            | See chapter 9                                                |

#### Limits:

| Radiated output power                | Conducted output power for mobile equipment |
|--------------------------------------|---------------------------------------------|
| Conducted power + 6 dBi antenna gain | 250mW 5.150-5.250 GHz<br>1W 5.725-5.85 GHz  |

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | Maximum output power conducted [dBm] |          |          |     |
|--------------------------|--------------------------------------|----------|----------|-----|
|                          | 5180 MHz                             | 5210 MHz | 5240 MHz | -/- |
|                          | 1.0                                  | 0.5      | 0.6      | -/- |
| Frequency                | 5736 MHz                             | 5762 MHz | 5814 MHz | -/- |
|                          | 6.0                                  | 5.6      | 5.0      | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | Maximum output power conducted [dBm] |          |          |     |
|--------------------------|--------------------------------------|----------|----------|-----|
|                          | 5180 MHz                             | 5210 MHz | 5240 MHz | -/- |
|                          | 0.2                                  | 0.2      | 0.7      | -/- |
| Frequency                | 5736 MHz                             | 5762 MHz | 5814 MHz | -/- |
|                          | 4.0                                  | 3.5      | 3.2      | -/- |

## QPSK – mode / Antenna A

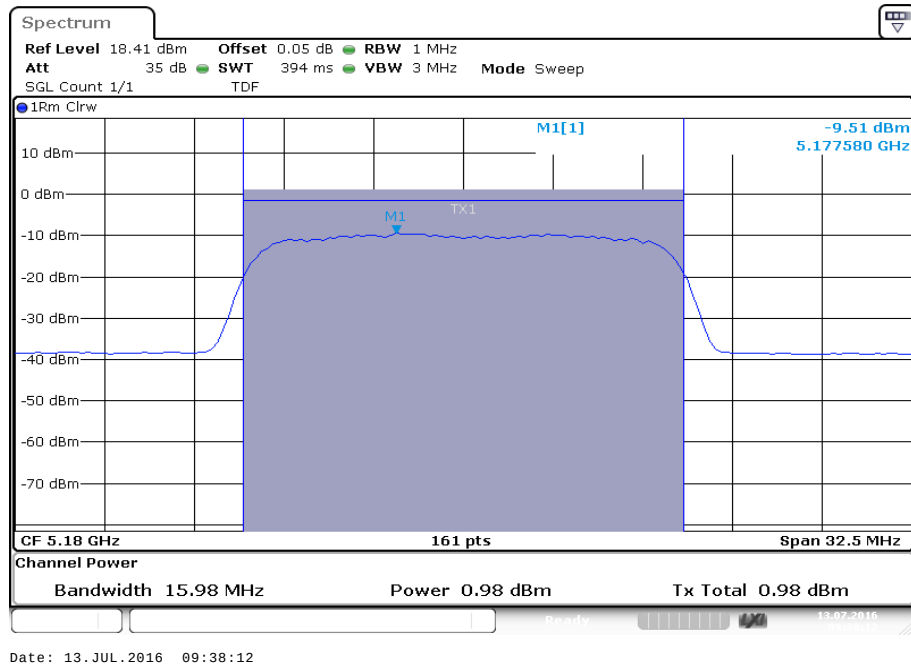
| QPSK – mode<br>Frequency | Maximum output power conducted [dBm] |          |          |     |
|--------------------------|--------------------------------------|----------|----------|-----|
|                          | 5180 MHz                             | 5210 MHz | 5240 MHz | -/- |
|                          | 9.2                                  | 8.1      | 7.7      | -/- |
| Frequency                | 5736 MHz                             | 5762 MHz | 5814 MHz | -/- |
|                          | 13.2                                 | 13.1     | 12.6     | -/- |

## QPSK – mode / Antenna B

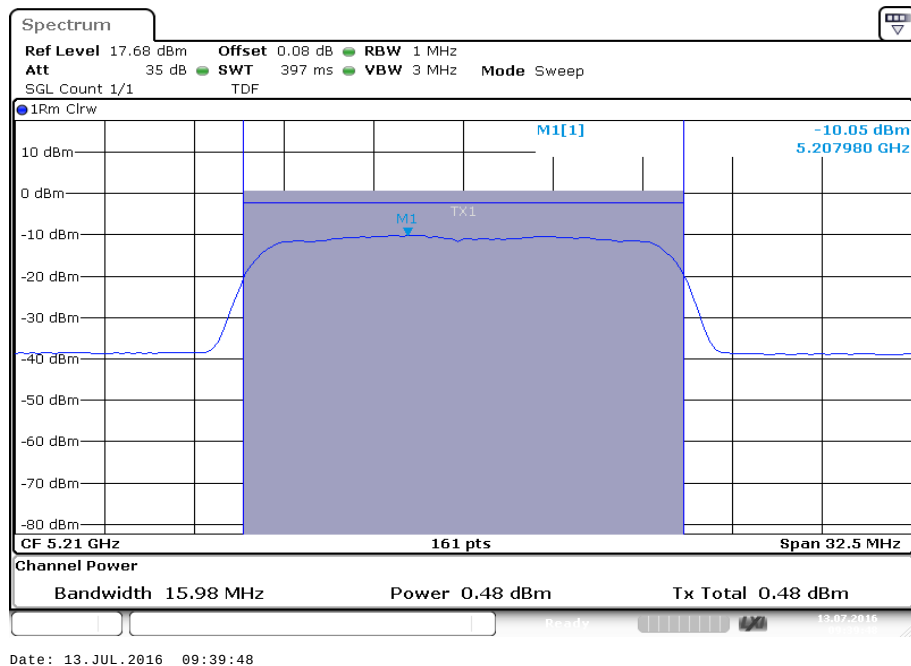
| QPSK – mode<br>Frequency | Maximum output power conducted [dBm] |          |          |     |
|--------------------------|--------------------------------------|----------|----------|-----|
|                          | 5180 MHz                             | 5210 MHz | 5240 MHz | -/- |
|                          | 6.6                                  | 6.1      | 6.5      | -/- |
| Frequency                | 5736 MHz                             | 5762 MHz | 5814 MHz | -/- |
|                          | 12.2                                 | 11.7     | 12.1     | -/- |

**Plots:** BPSK – mode / Antenna A

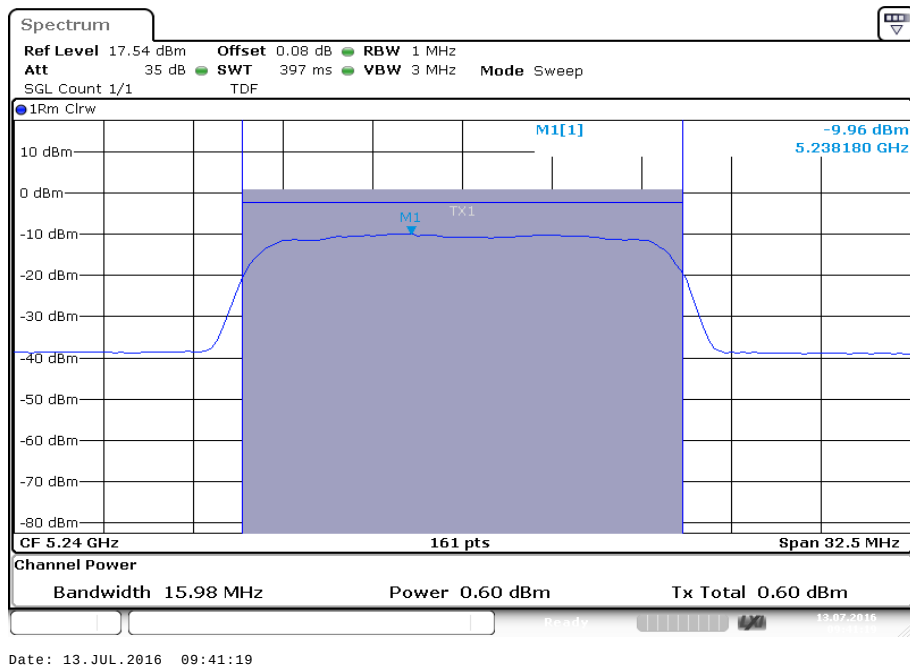
**Plot 1:** 5180 MHz



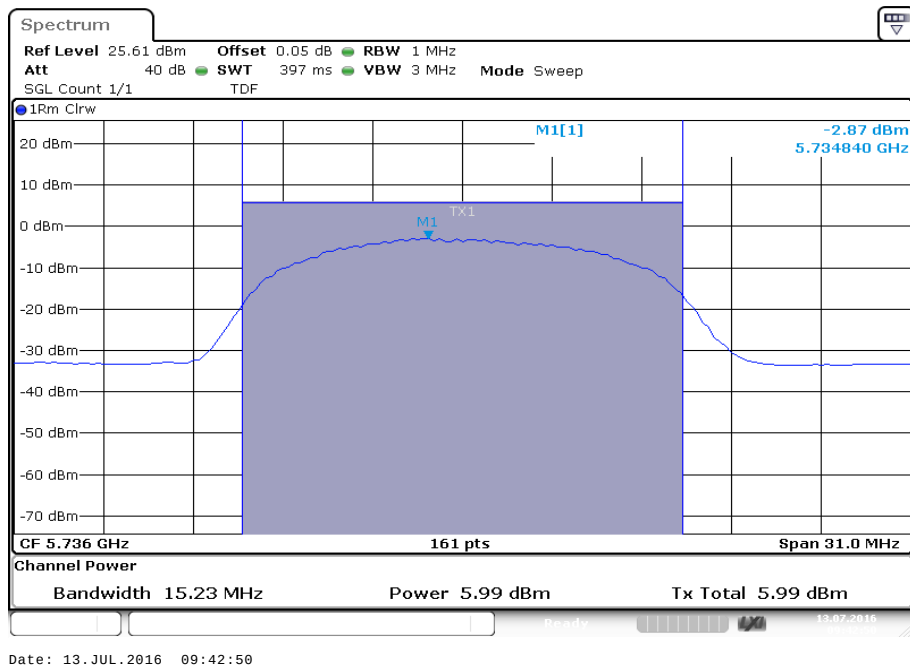
**Plot 2:** 5210 MHz



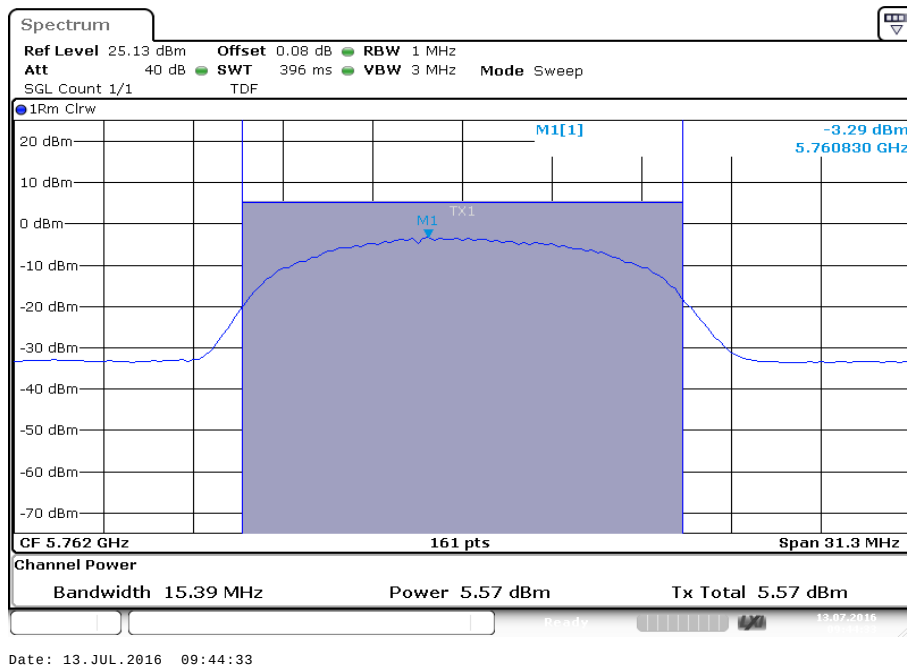
Plot 3: 5240 MHz



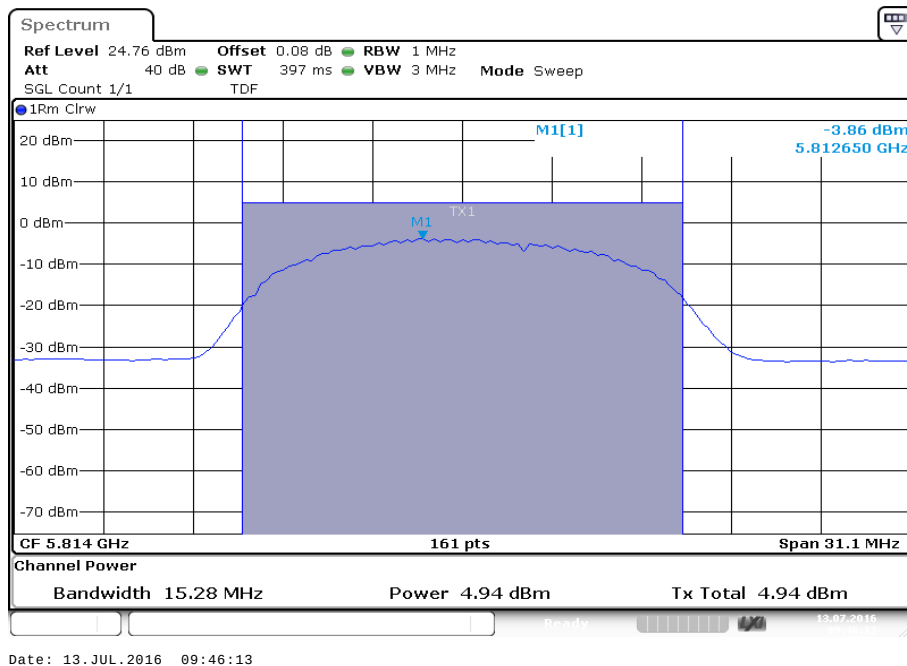
Plot 4: 5736 MHz



Plot 5: 5762 MHz

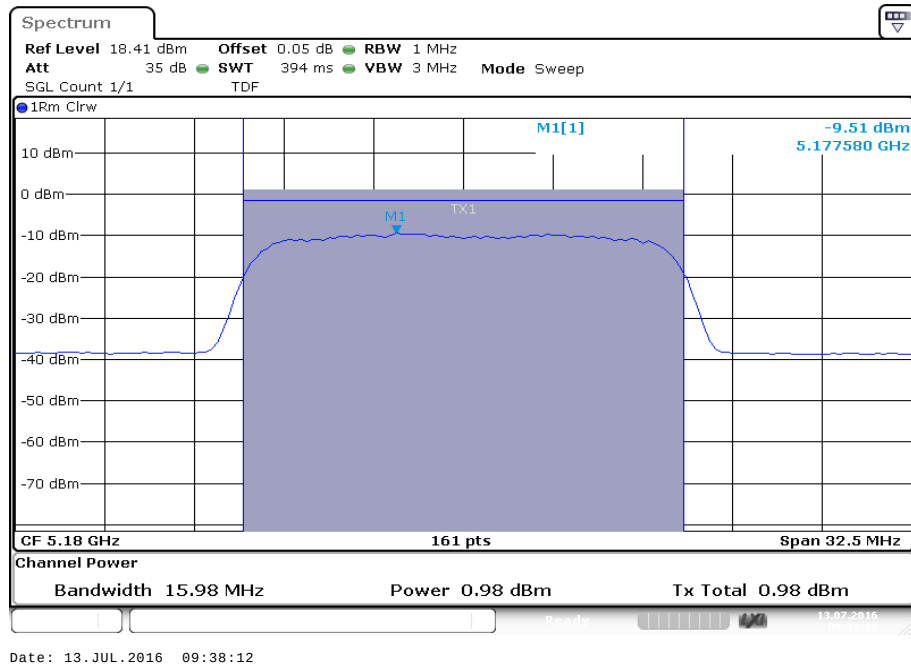


Plot 6: 5814 MHz

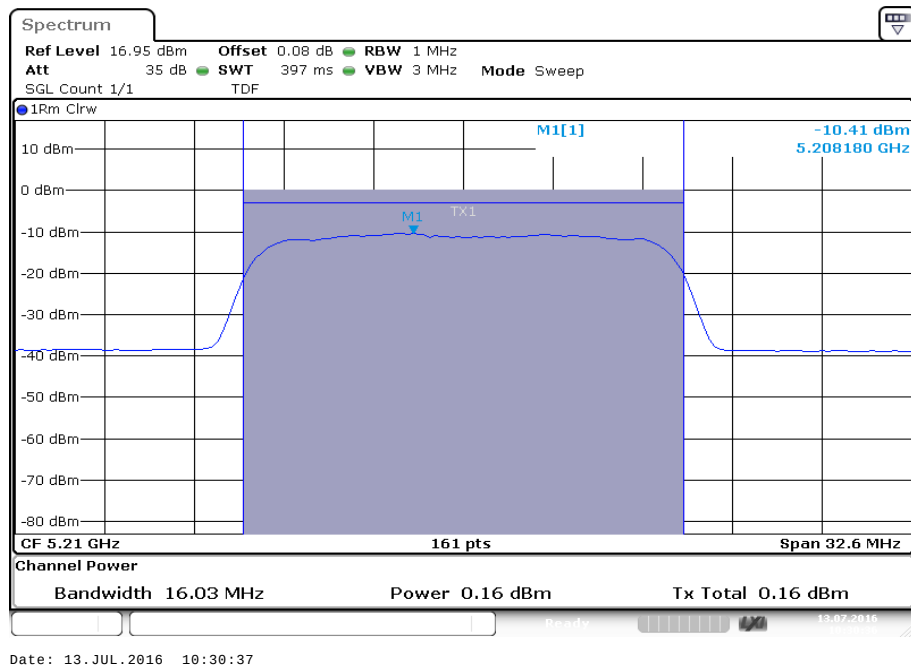


**Plots:** BPSK – mode / Antenna B

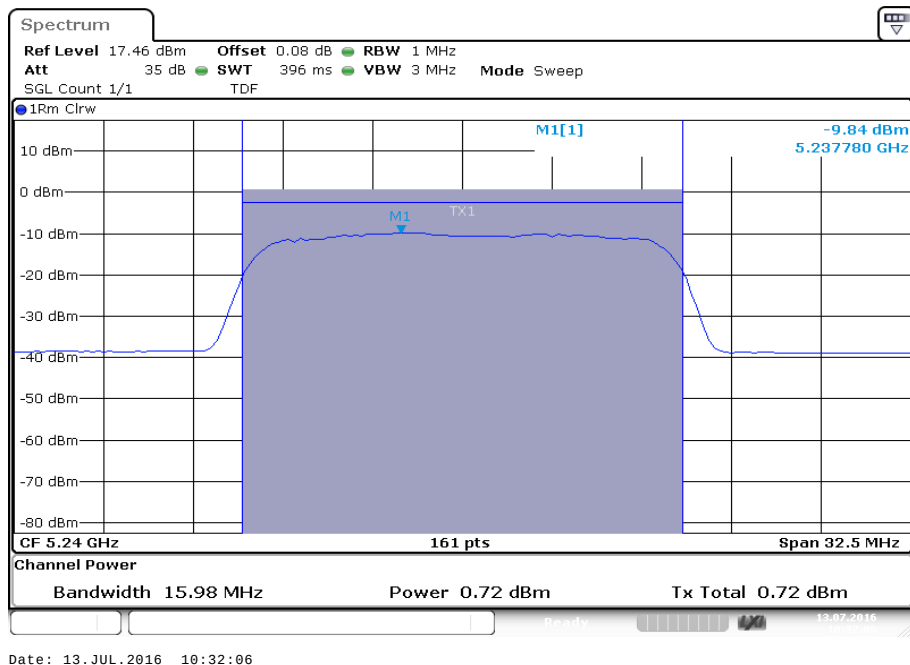
**Plot 7:** 5180 MHz



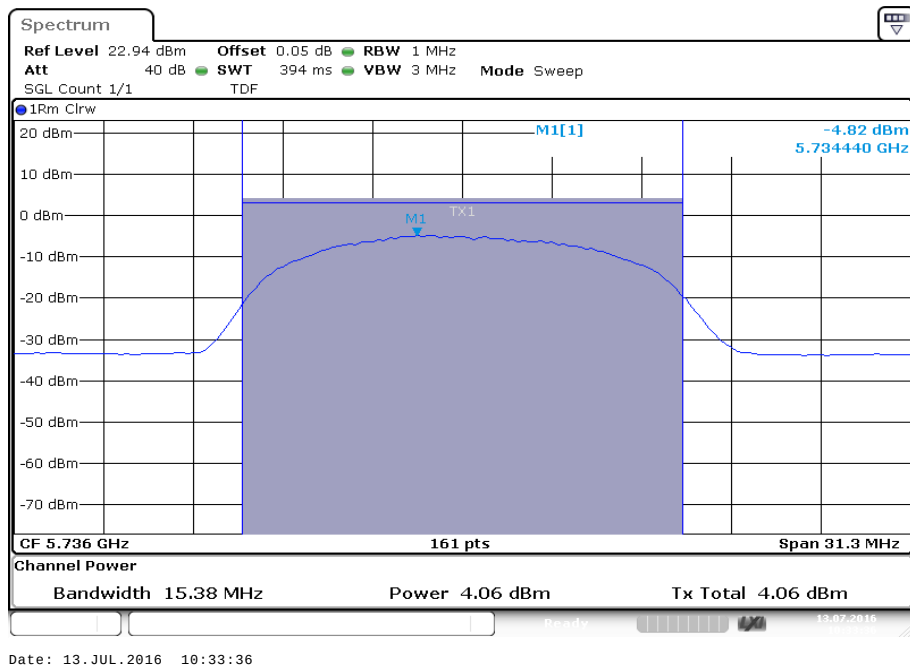
**Plot 8:** 5210 MHz



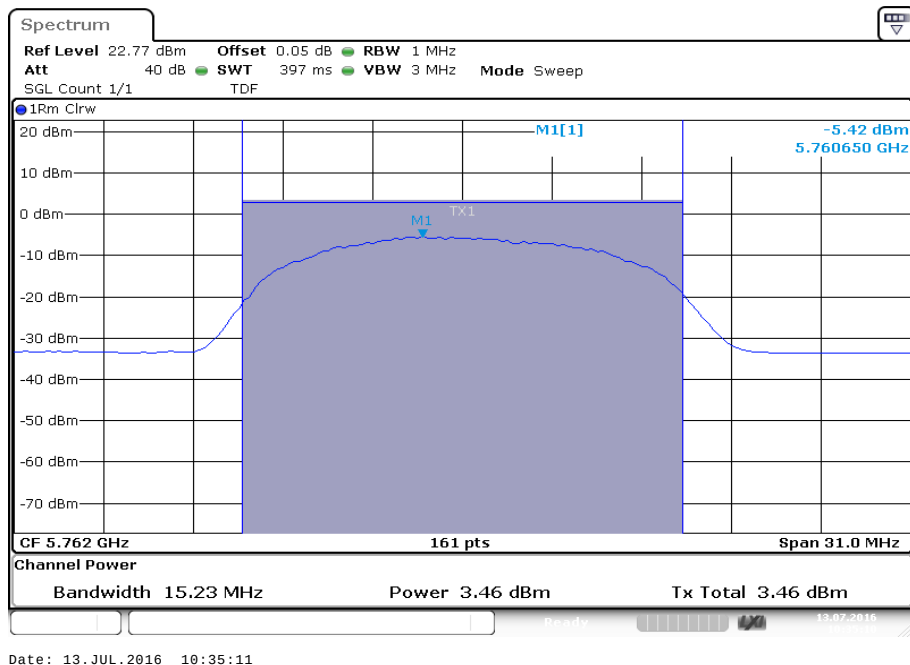
Plot 9: 5240 MHz



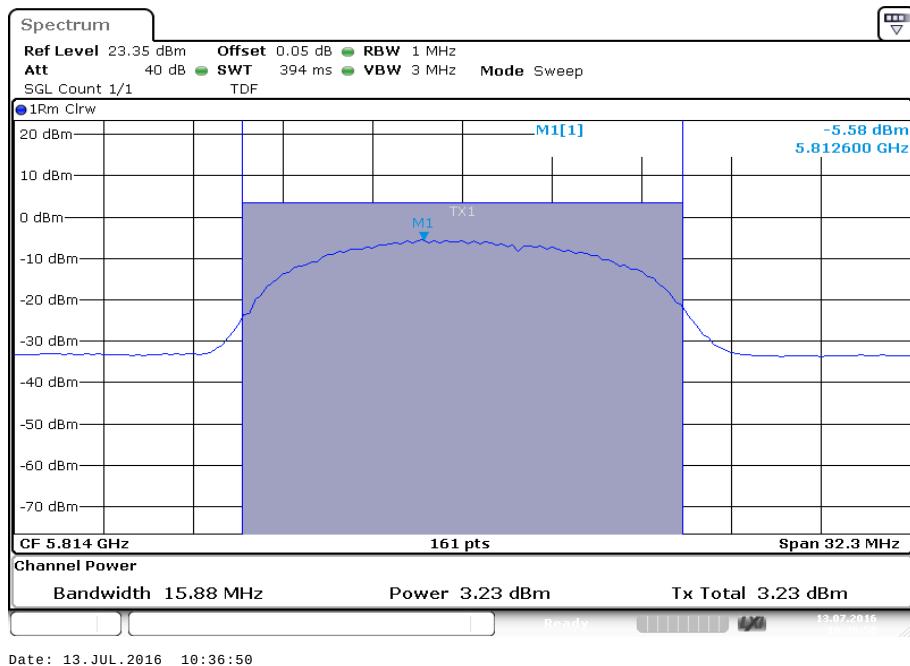
Plot 10: 5736 MHz



Plot 11: 5762 MHz

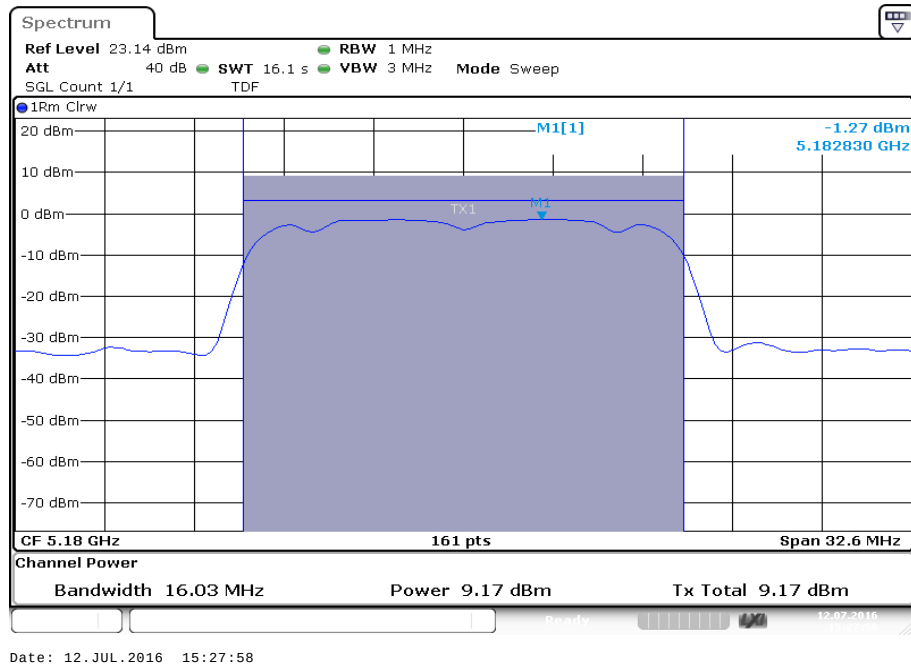


Plot 12: 5814 MHz

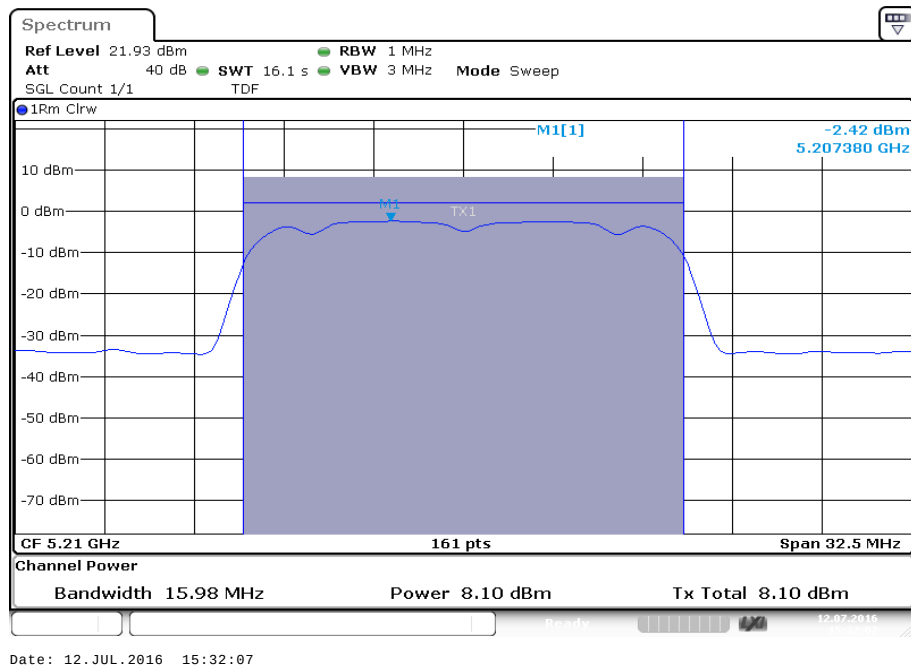


**Plots:** QPSK – mode / Antenna A

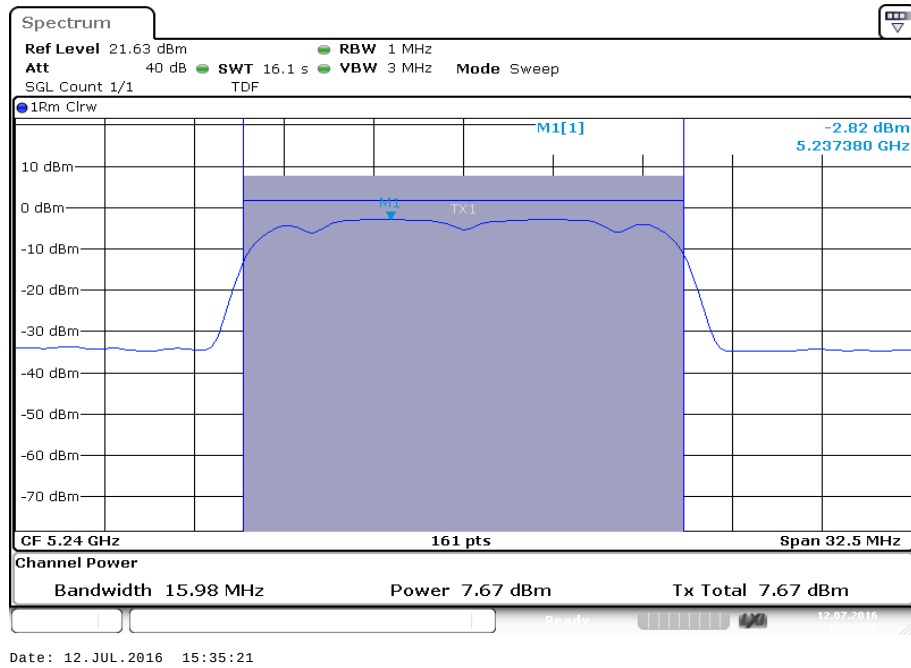
**Plot 13:** 5180 MHz



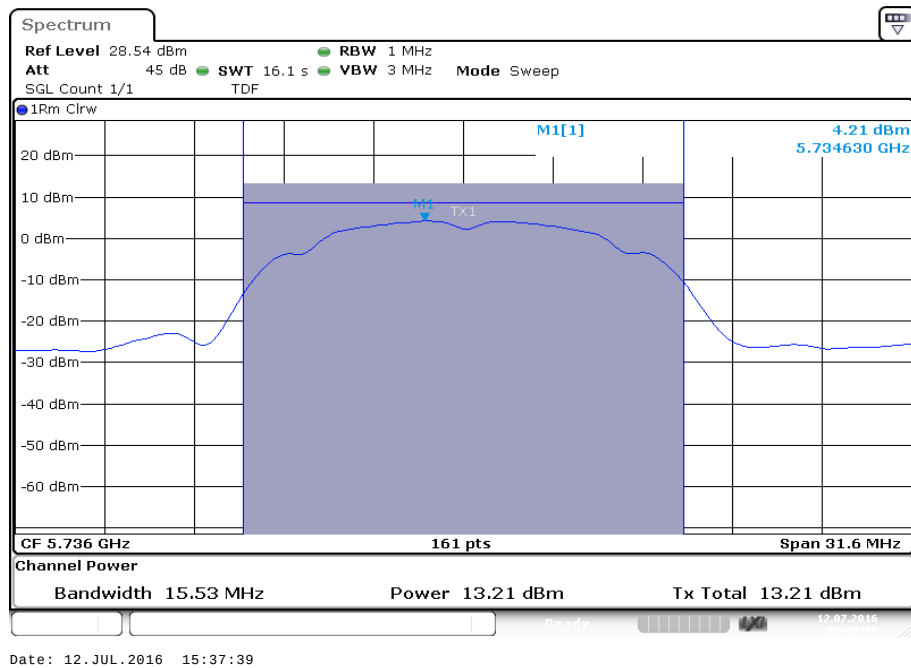
**Plot 14:** 5210 MHz



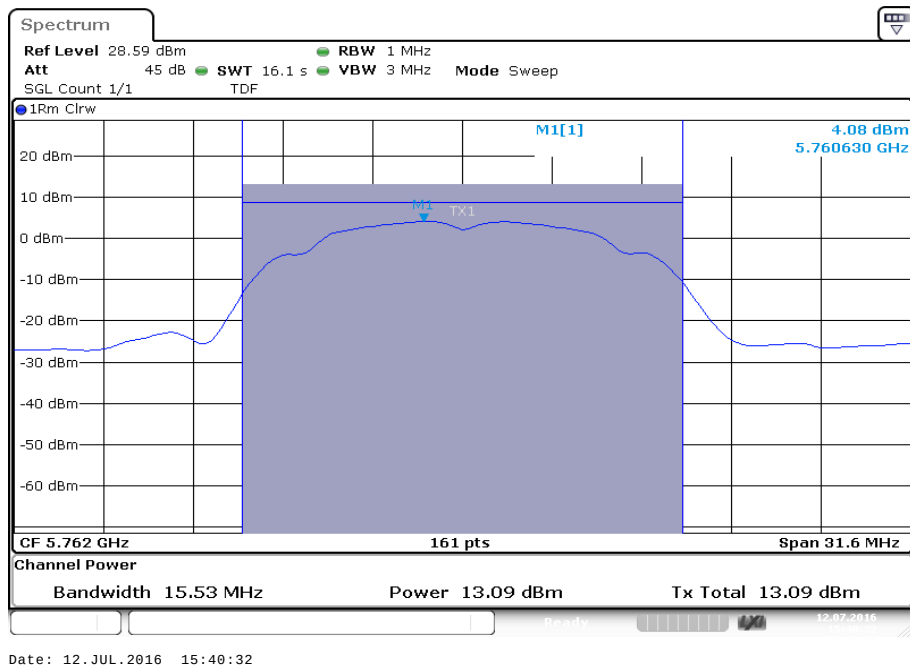
Plot 15: 5240 MHz



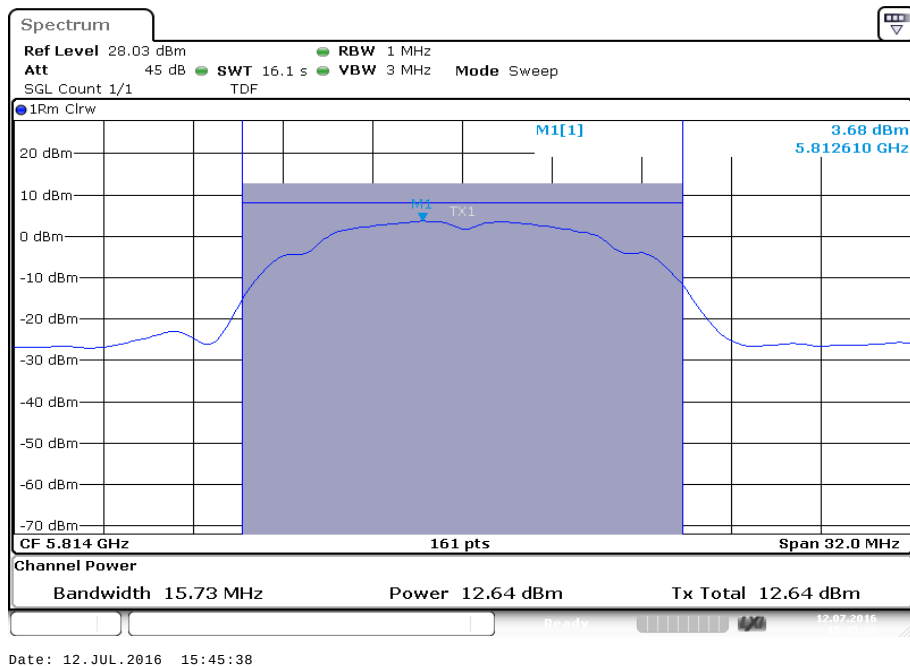
Plot 16: 5736 MHz



Plot 17: 5762 MHz

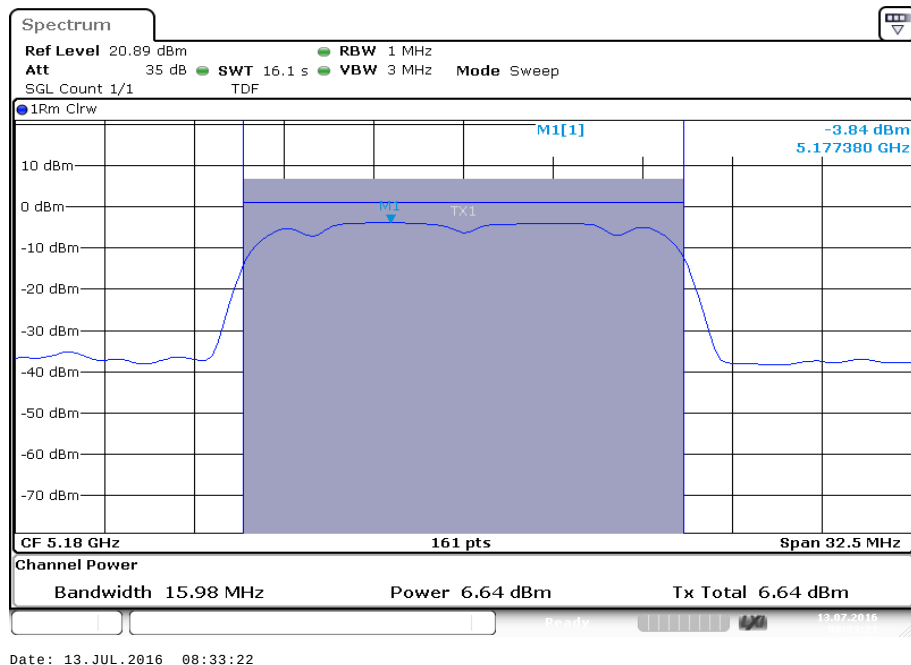


Plot 18: 5814 MHz

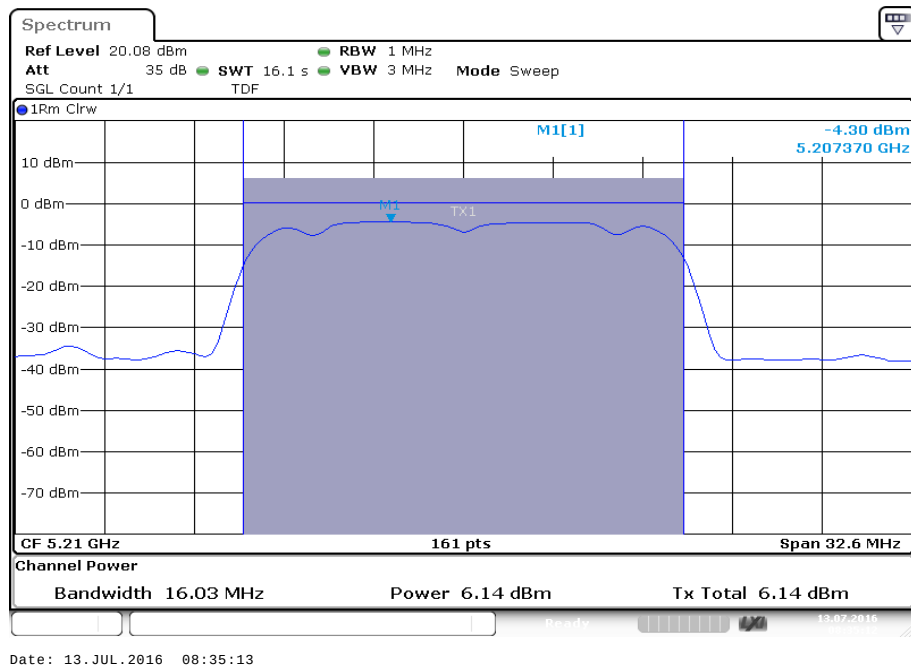


**Plots:** QPSK – mode / Antenna B

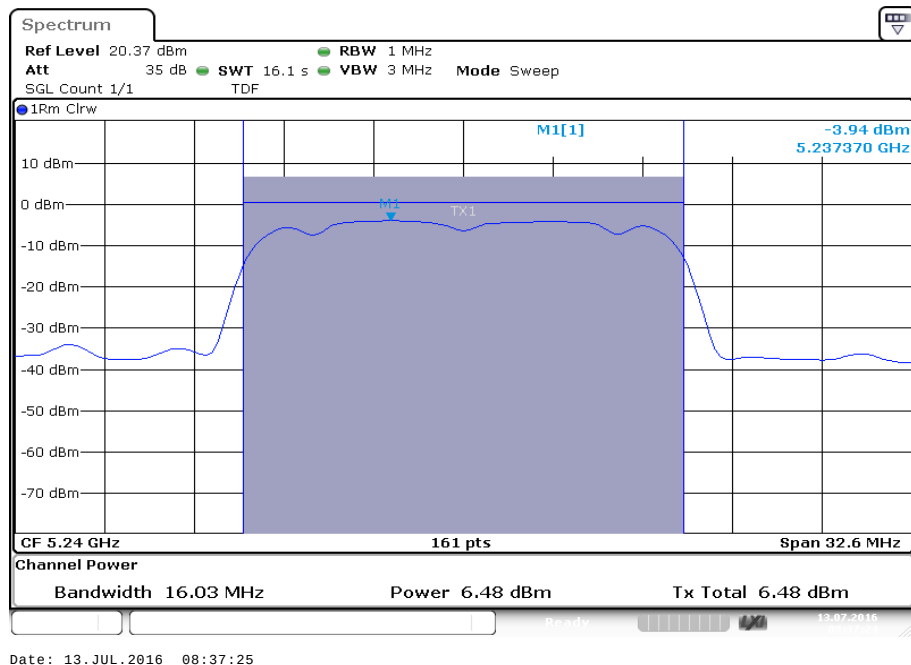
**Plot 19:** 5180 MHz



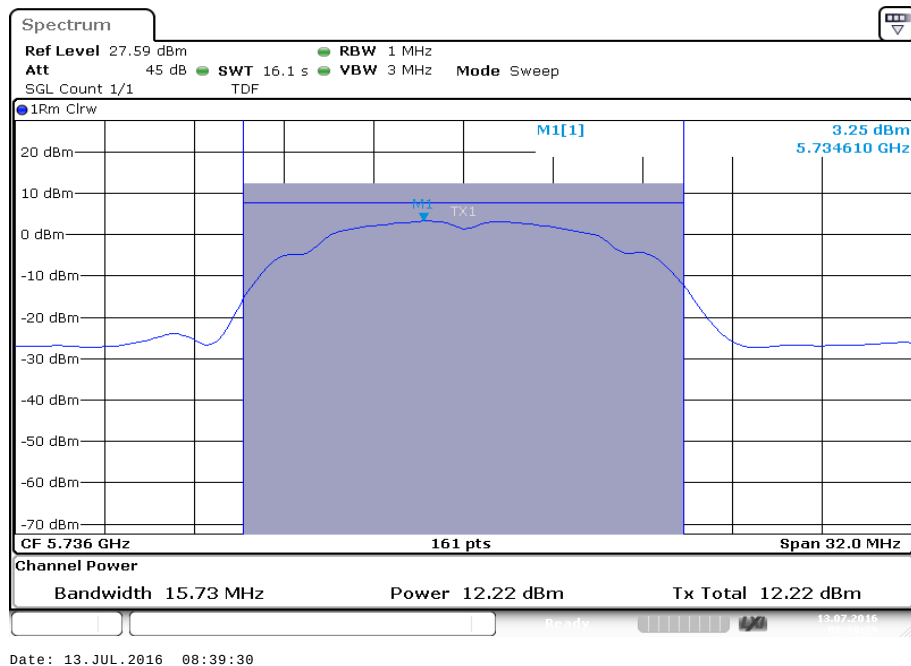
**Plot 20:** 5210 MHz



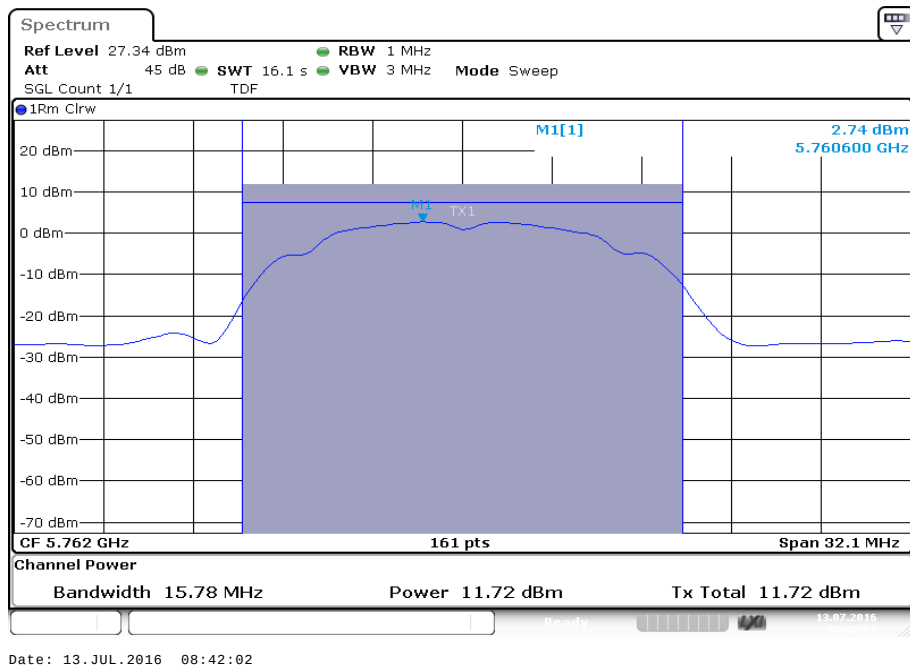
Plot 21: 5240 MHz



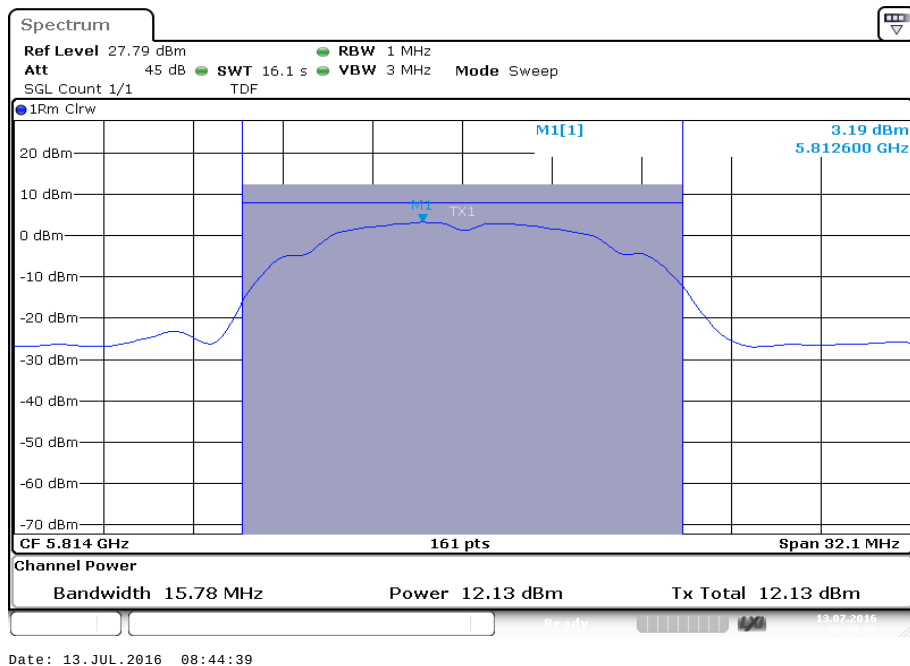
Plot 22: 5736 MHz



Plot 23: 5762 MHz



Plot 24: 5814 MHz



### 12.3.2 Maximum output power – for IC requirements

#### Description:

Measurement of the maximum output power conducted + radiated

#### Measurement:

| Measurement parameter    |                                                              |
|--------------------------|--------------------------------------------------------------|
| Detector:                | RMS                                                          |
| Sweep time:              | $\geq 10 * (\text{swp points}) * (\text{total on/off time})$ |
| Resolution bandwidth:    | 1 MHz                                                        |
| Video bandwidth:         | $\geq 3$ MHz                                                 |
| Span:                    | > EBW                                                        |
| Trace mode:              | Max hold                                                     |
| Analyzer function        | Band power / channel power<br>Interval > 99% OBW             |
| Used test setup:         | See chapter 7.5 – Items A                                    |
| Measurement uncertainty: | See chapter 9                                                |

#### Limits:

| Radiated output power                                                                                                                                                                                                                                                                                           | Conducted output power for mobile equipment                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The lesser one of</p> <p>200 mW or 10 dBm + 10 log Bandwidth 5.150-5.250 GHz</p> <p>1 W or 17 dBm + 10 log Bandwidth 5.250-5.350 GHz</p> <p>1 W or 17 dBm + 10 log Bandwidth 5.470-5.725 GHz<br/>(where Bandwidth is the 99% Bandwidth [MHz])</p> <p>Conducted power + 6dBi antenna gain 5.725-5.825 GHz</p> | <p>The lesser one of</p> <p>250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz</p> <p>250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz<br/>(where Bandwidth is the 99% Bandwidth [MHz])</p> <p>1W 5.725-5.825 GHz</p> |

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | Maximum calculated EIRP. [dBm] |          |          |     |
|--------------------------|--------------------------------|----------|----------|-----|
|                          | 5180 MHz                       | 5210 MHz | 5240 MHz | -/- |
|                          | 5.1                            | 4.6      | 4.7      | -/- |
| Frequency                | 5736 MHz                       | 5762 MHz | 5814 MHz | -/- |
|                          | 6.0                            | 5.6      | 4.9      | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | Maximum calculated EIRP. [dBm] |          |          |     |
|--------------------------|--------------------------------|----------|----------|-----|
|                          | 5180 MHz                       | 5210 MHz | 5240 MHz | -/- |
|                          | 4.3                            | 4.3      | 4.9      | -/- |
| Frequency                | 5736 MHz                       | 5762 MHz | 5814 MHz | -/- |
|                          | 4.0                            | 3.4      | 3.2      | -/- |

QPSK – mode / Antenna A

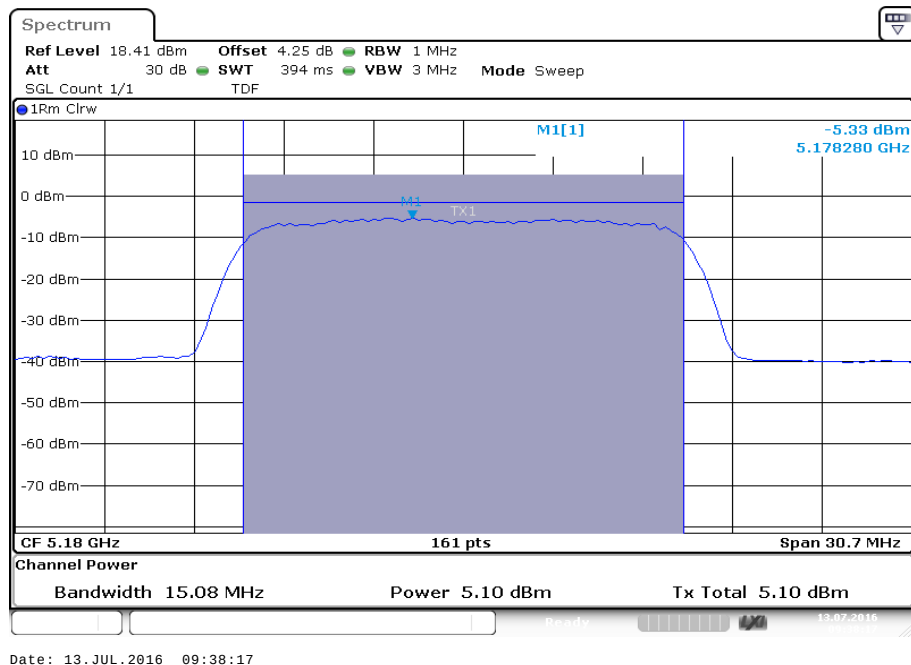
| QPSK – mode<br>Frequency | Maximum calculated EIRP. [dBm] |          |          |     |
|--------------------------|--------------------------------|----------|----------|-----|
|                          | 5180 MHz                       | 5210 MHz | 5240 MHz | -/- |
|                          | 13.3                           | 12.3     | 11.8     | -/- |
| Frequency                | 5736 MHz                       | 5762 MHz | 5814 MHz | -/- |
|                          | 13.2                           | 13.1     | 12.6     | -/- |

QPSK – mode / Antenna B

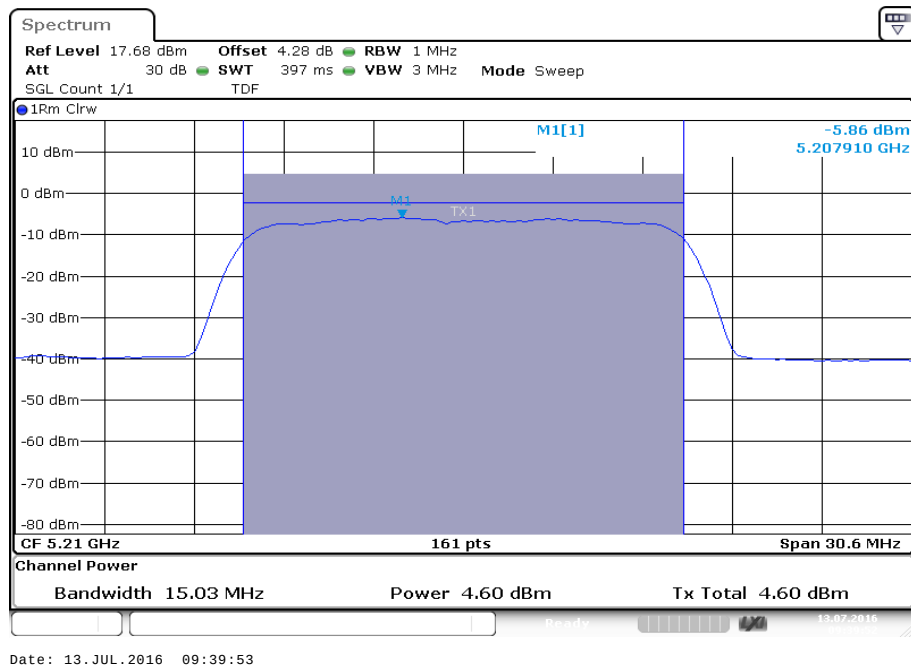
| QPSK – mode<br>Frequency | Maximum calculated EIRP. [dBm] |          |          |     |
|--------------------------|--------------------------------|----------|----------|-----|
|                          | 5180 MHz                       | 5210 MHz | 5240 MHz | -/- |
|                          | 10.7                           | 10.3     | 10.6     | -/- |
| Frequency                | 5736 MHz                       | 5762 MHz | 5814 MHz | -/- |
|                          | 12.2                           | 11.7     | 12.1     | -/- |

**Plots:** BPSK – mode / Antenna A

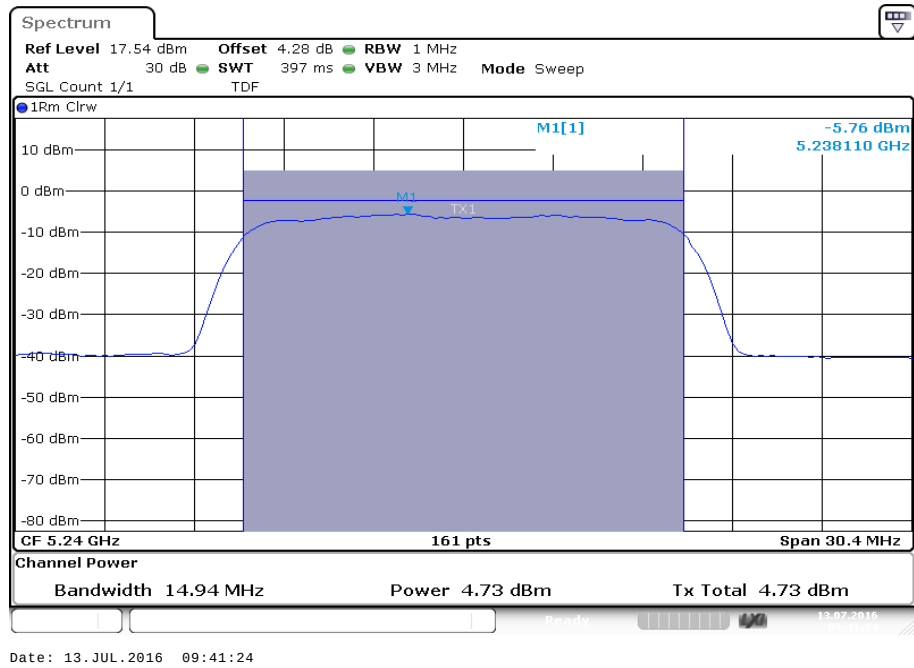
**Plot 25:** 5180 MHz



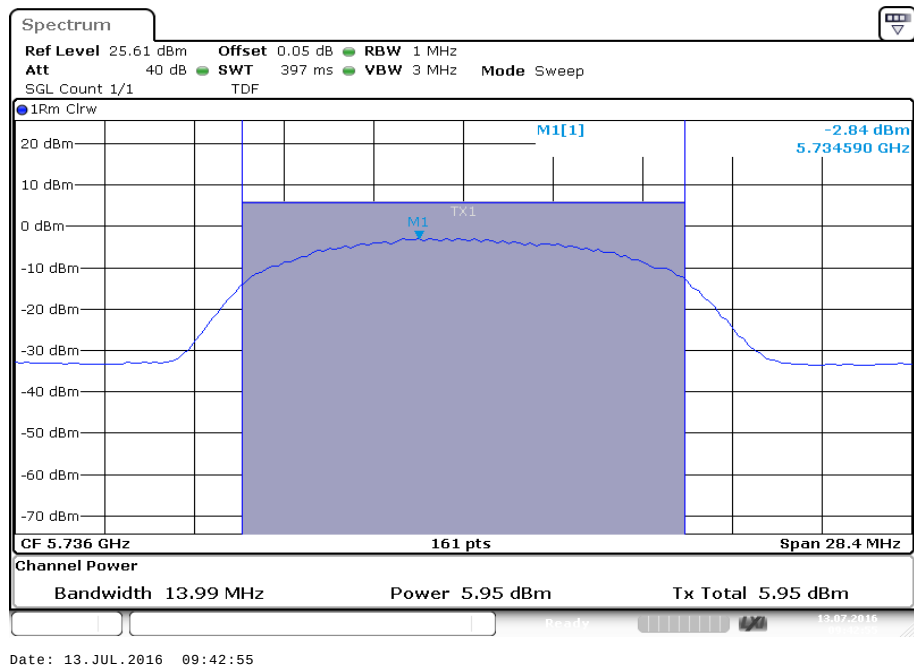
**Plot 26:** 5210 MHz



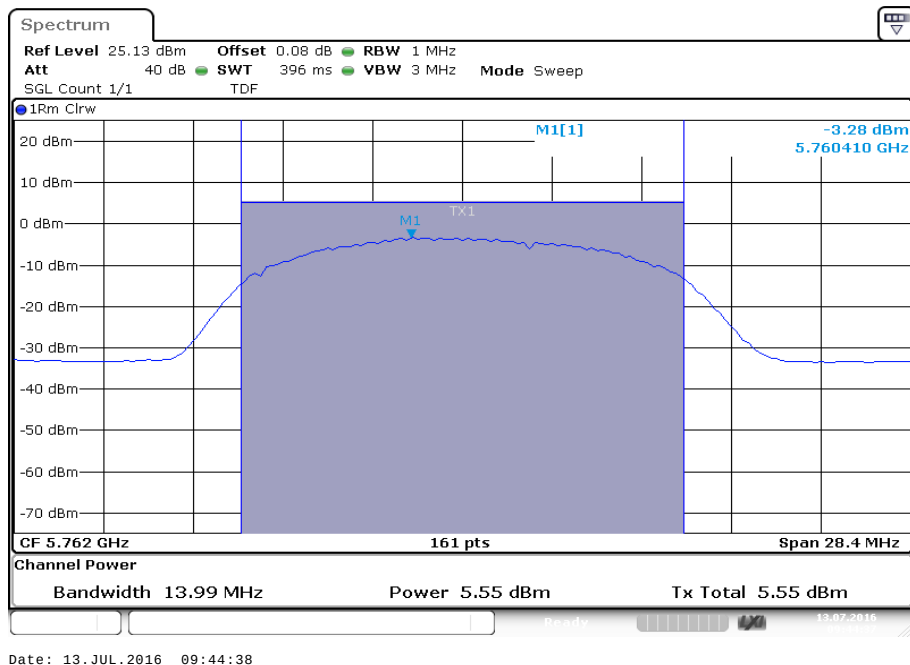
Plot 27: 5240 MHz



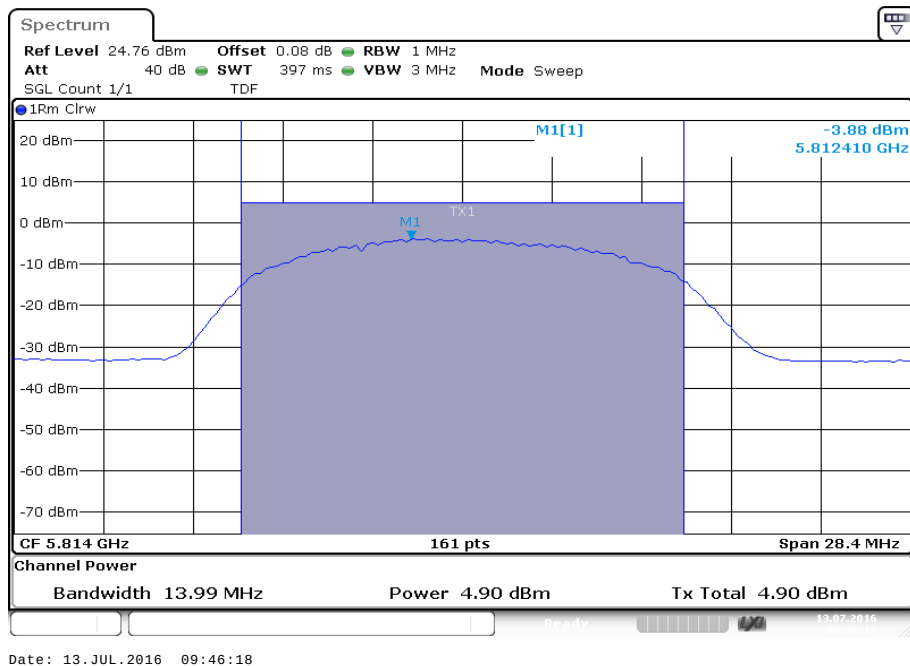
Plot 28: 5736 MHz

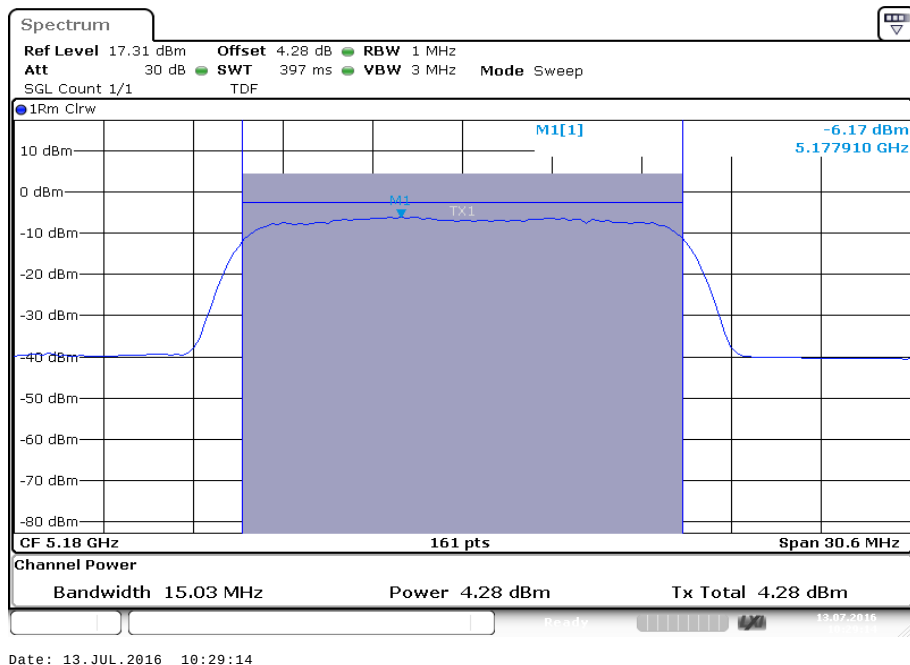
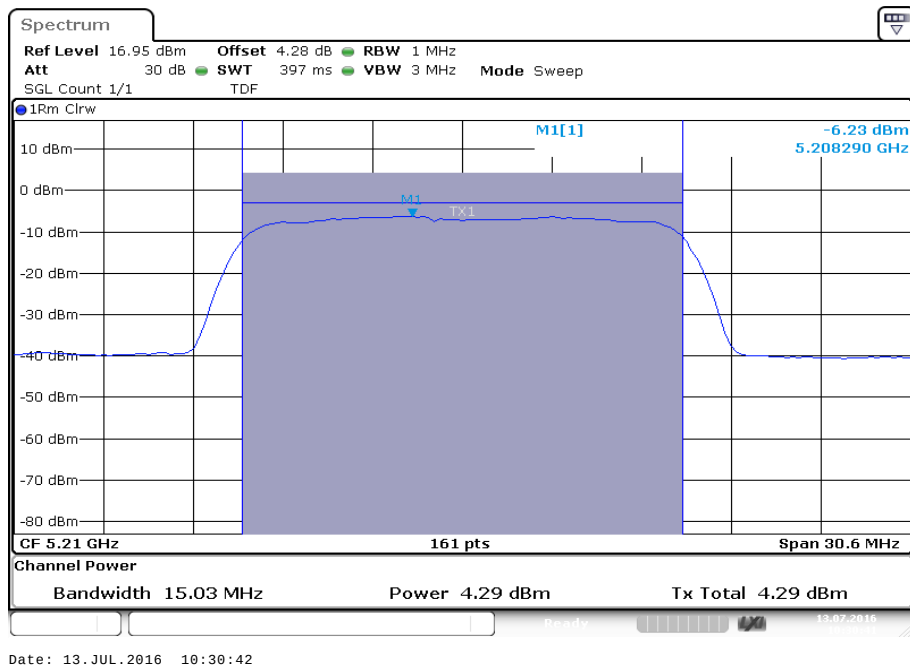


Plot 29: 5762 MHz

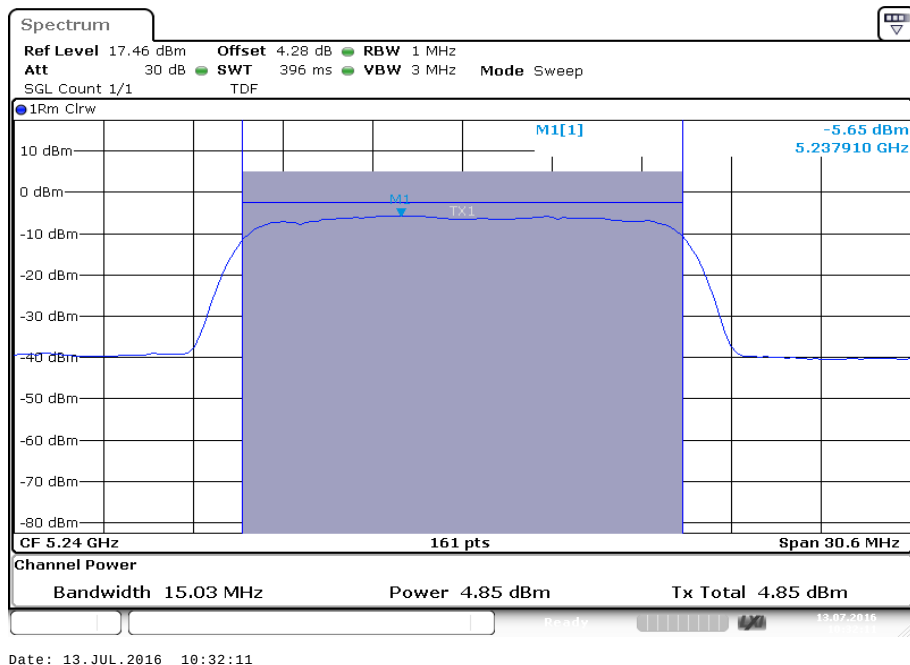


Plot 30: 5814 MHz

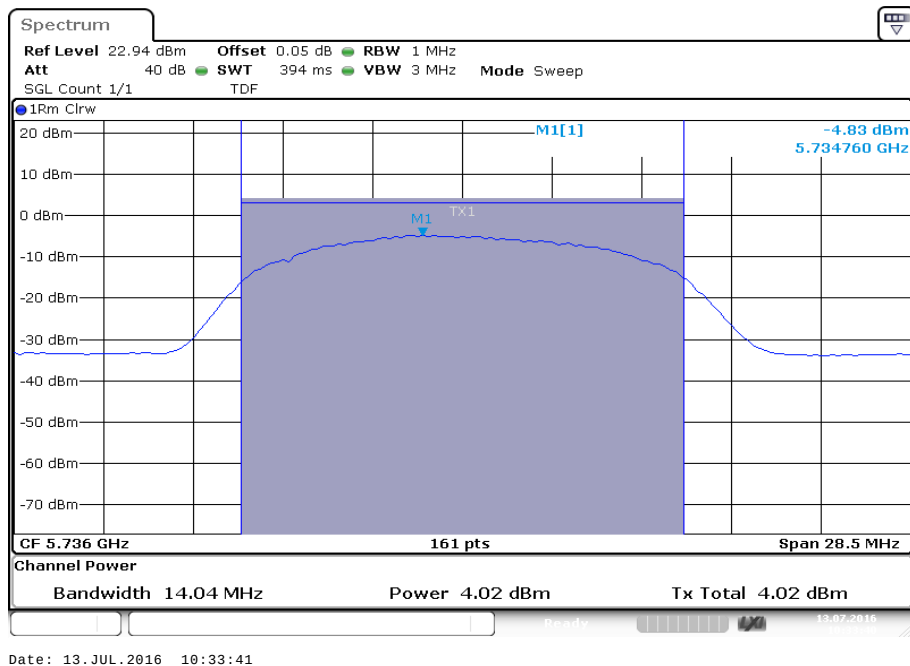


**Plots:** BPSK – mode / Antenna B**Plot 31:** 5180 MHz**Plot 32:** 5210 MHz

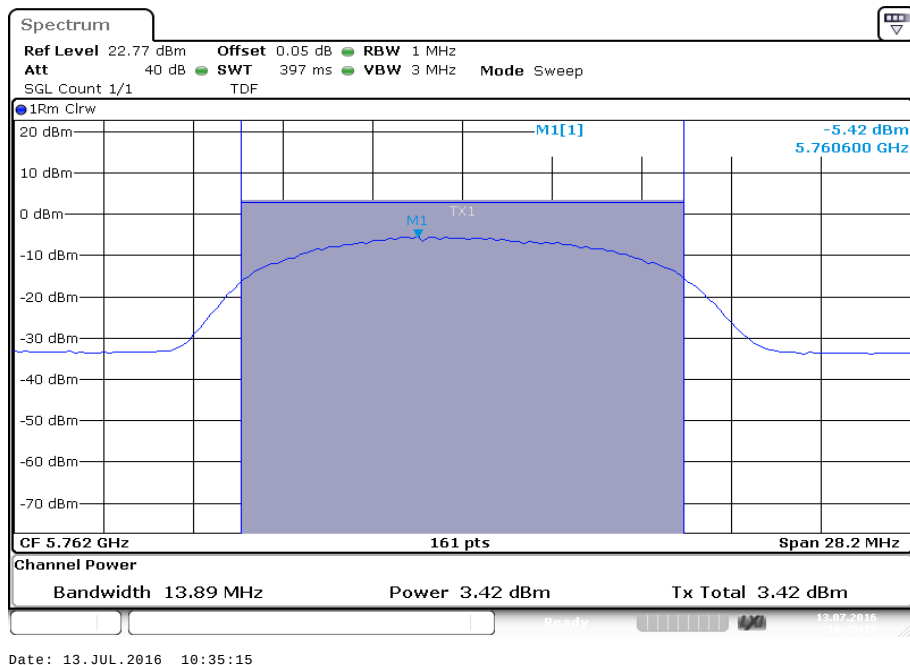
Plot 33: 5240 MHz



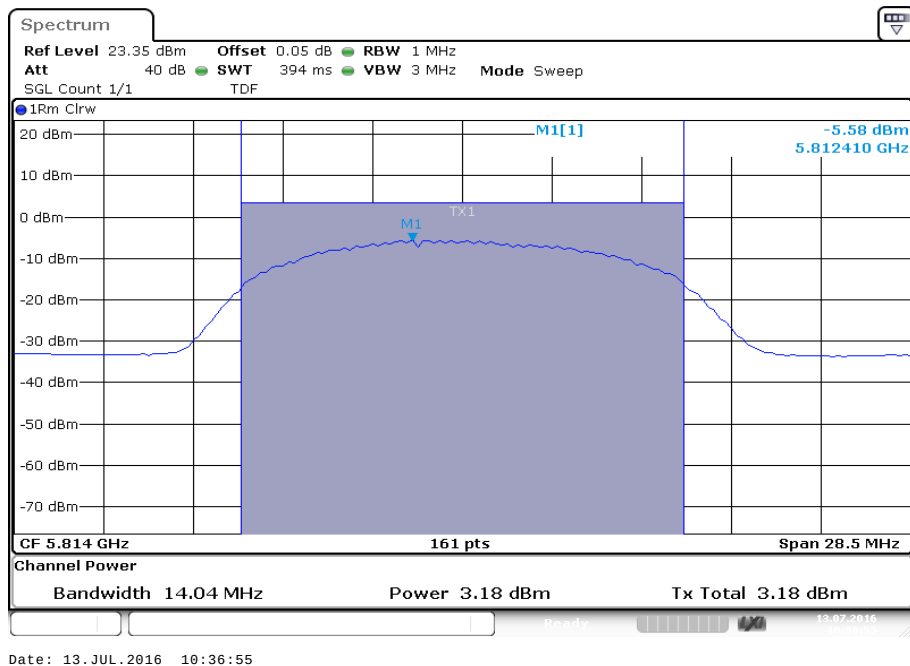
Plot 34: 5736 MHz



Plot 35: 5762 MHz

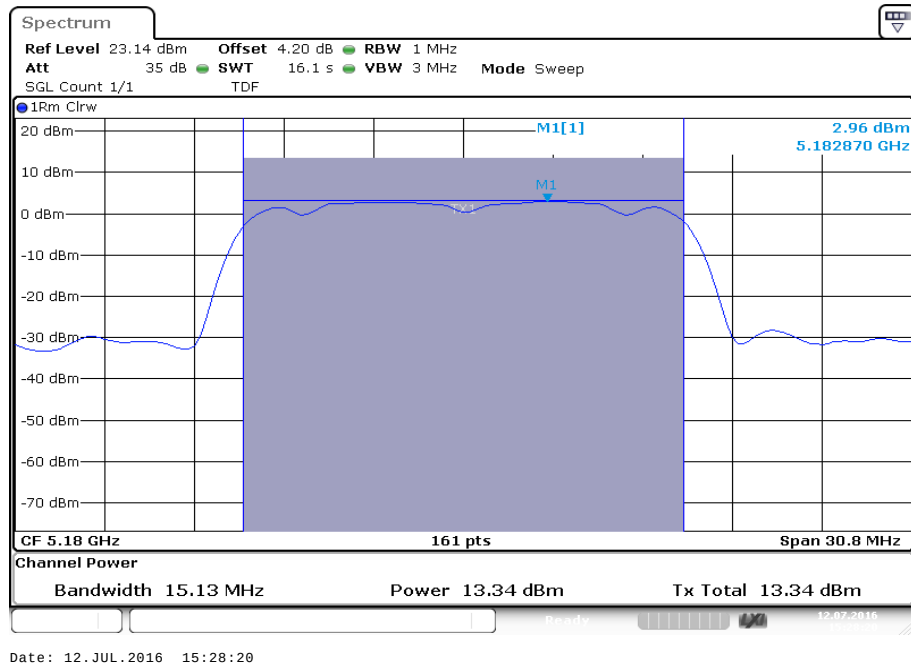


Plot 36: 5814 MHz

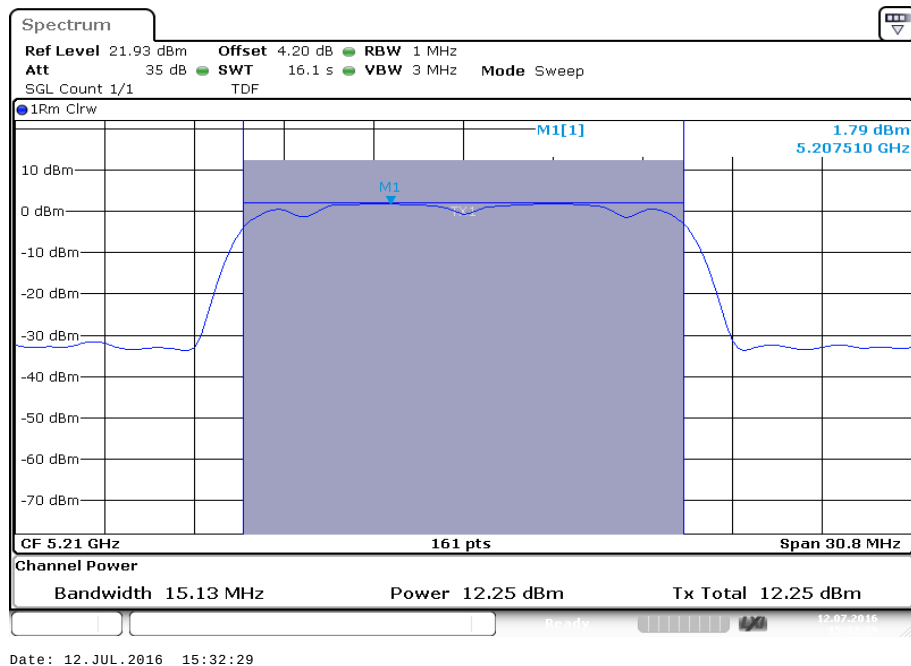


**Plots:** QPSK – mode / Antenna A

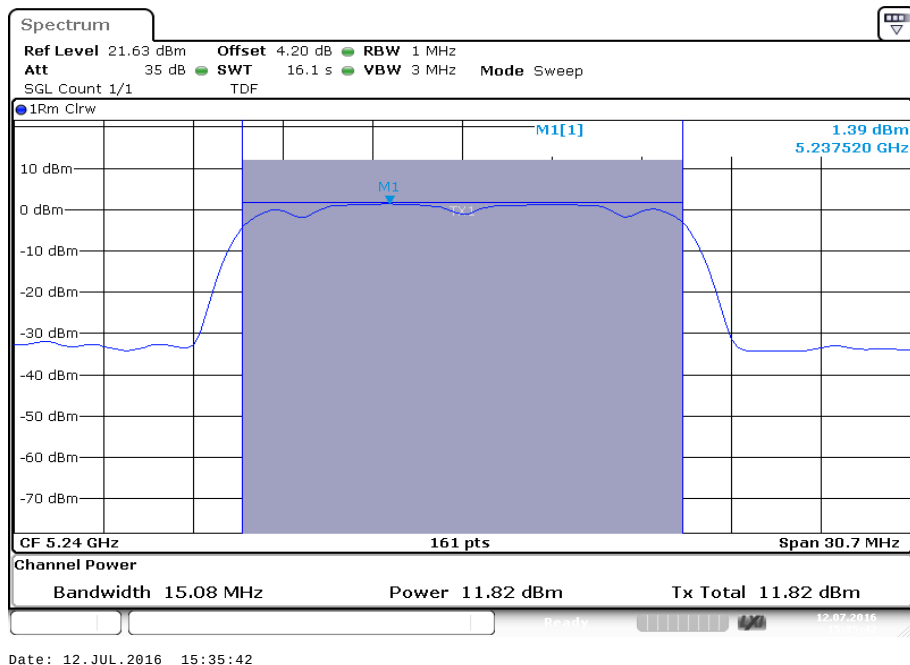
**Plot 37:** 5180 MHz



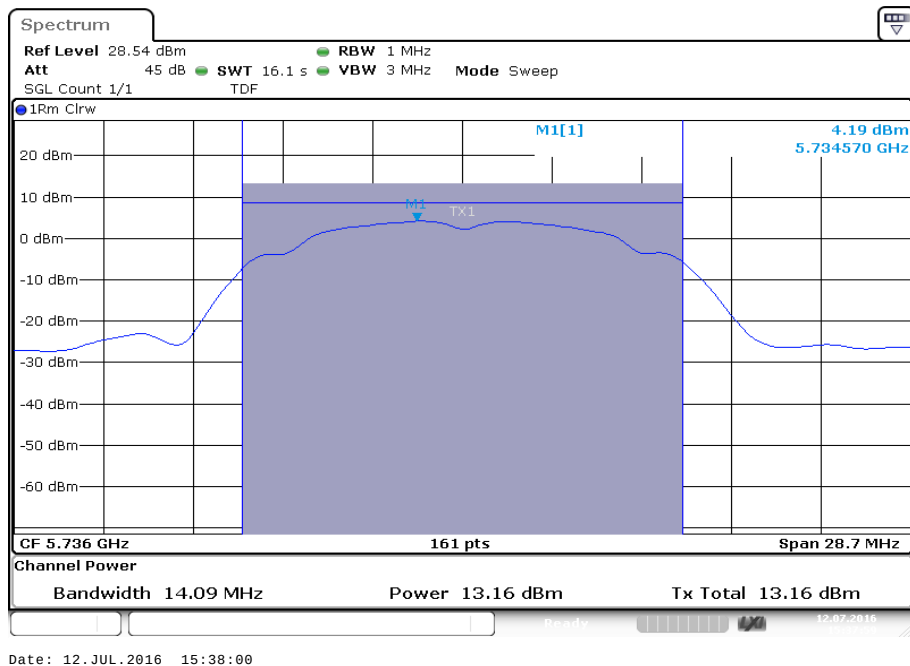
**Plot 38:** 5210 MHz



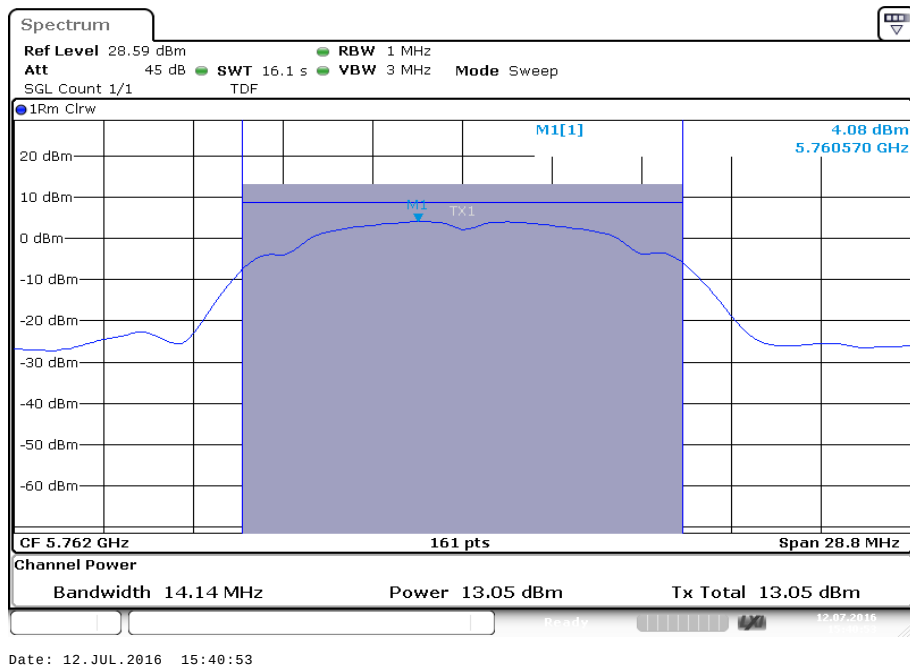
Plot 39: 5240 MHz



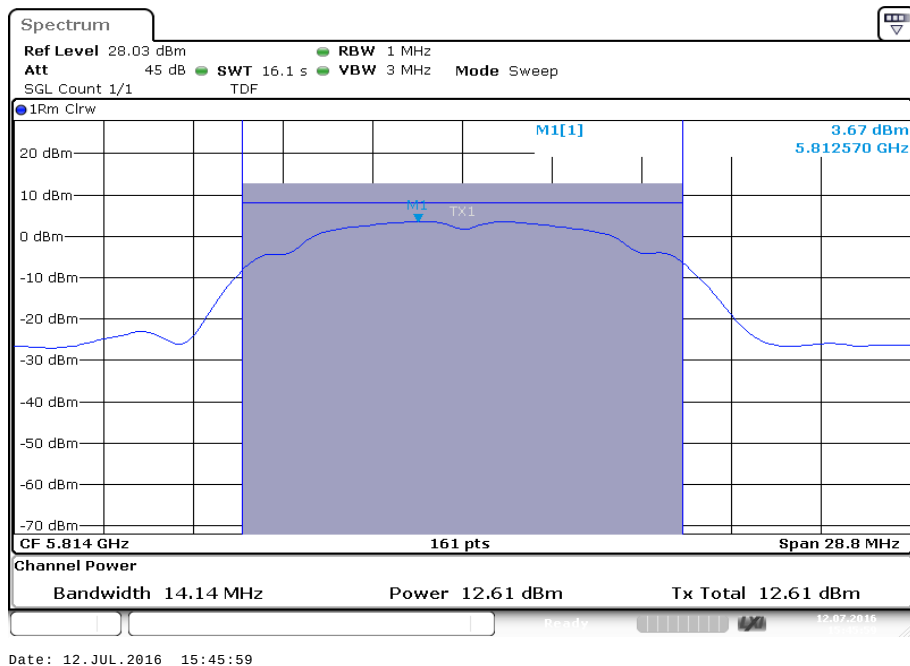
Plot 40: 5736 MHz



Plot 41: 5762 MHz

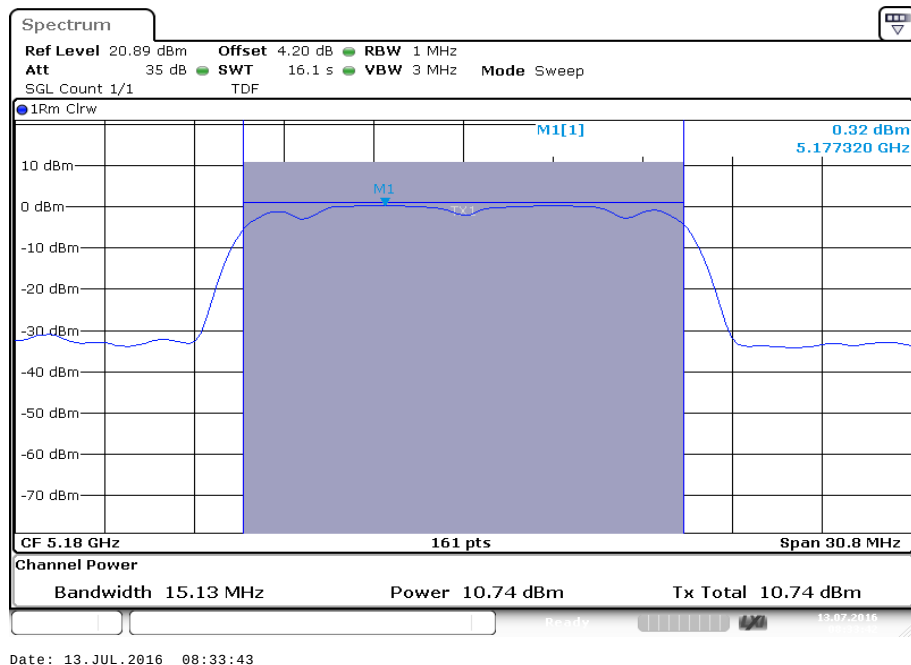


Plot 42: 5814 MHz

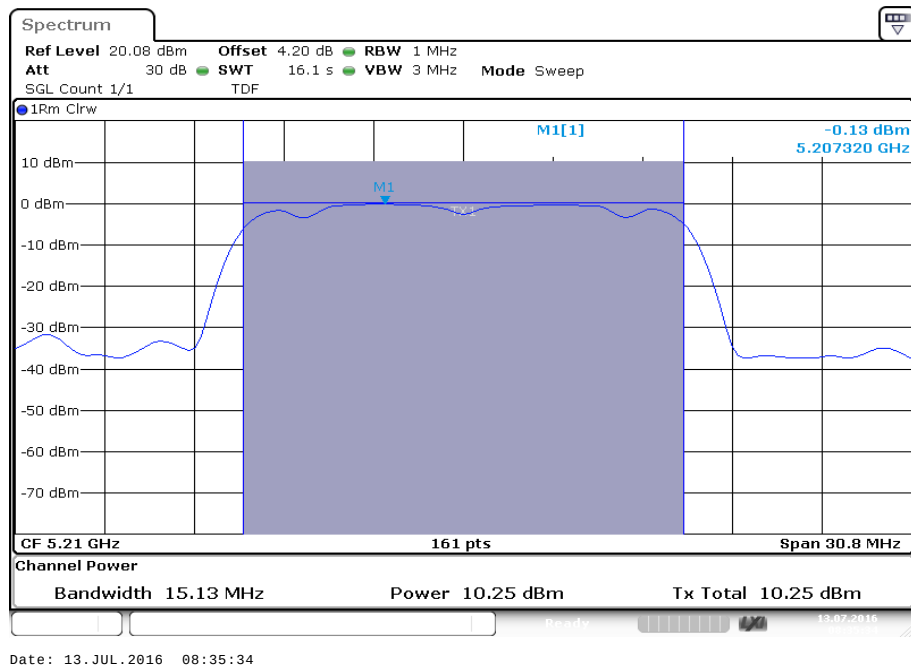


**Plots:** QPSK – mode / Antenna B

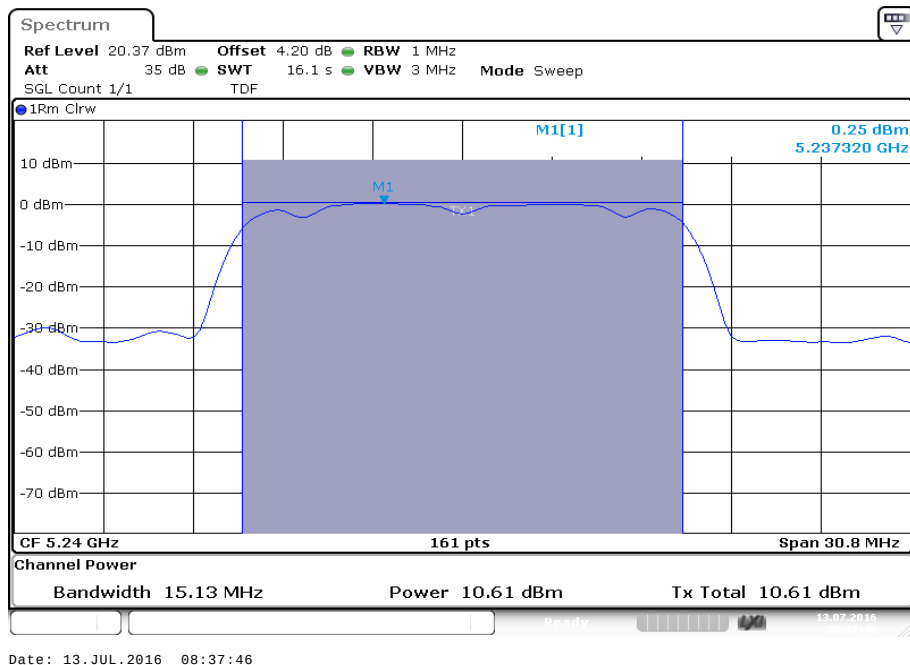
**Plot 43:** 5180 MHz



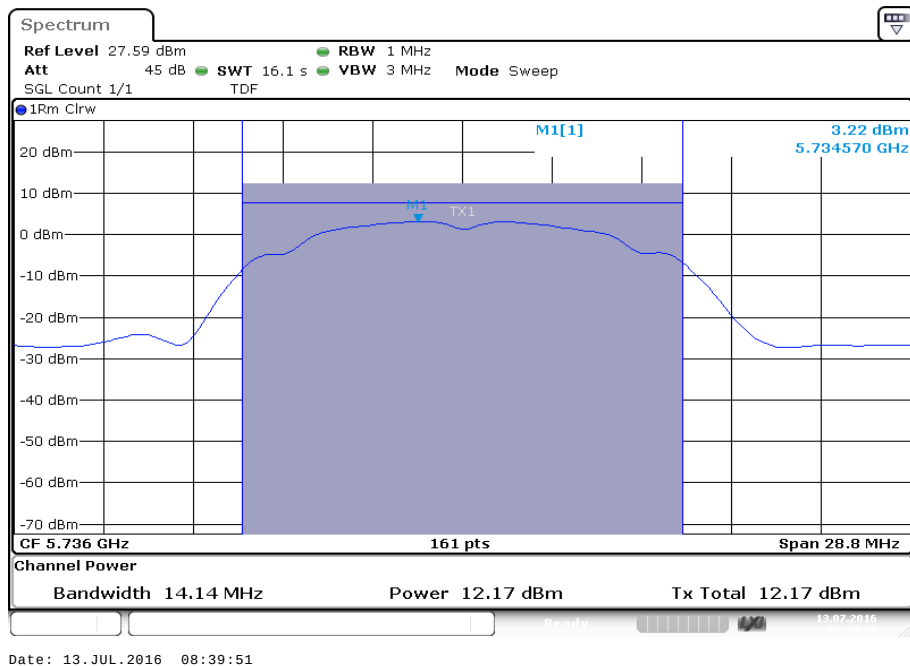
**Plot 44:** 5210 MHz



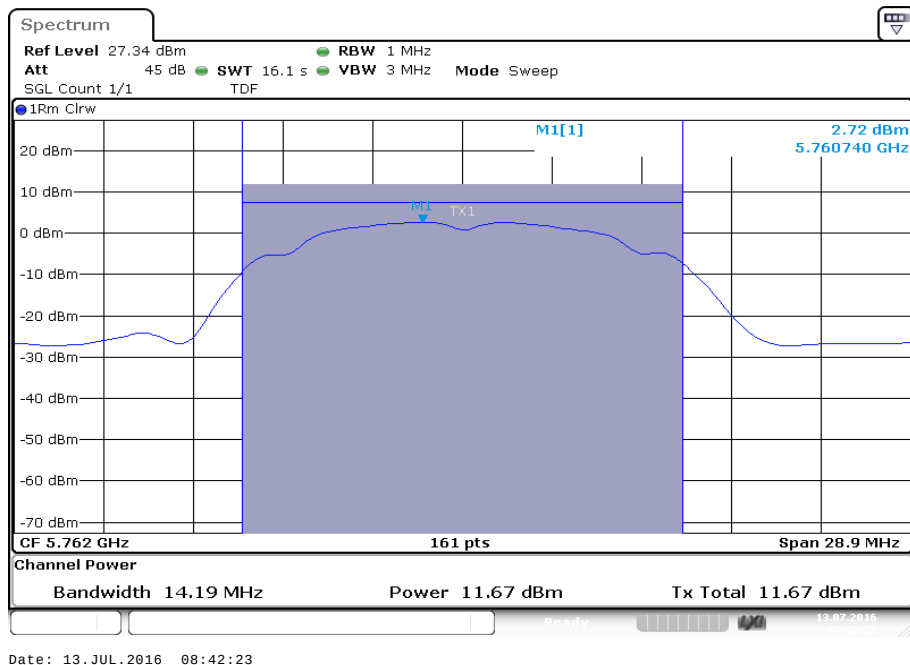
Plot 45: 5240 MHz



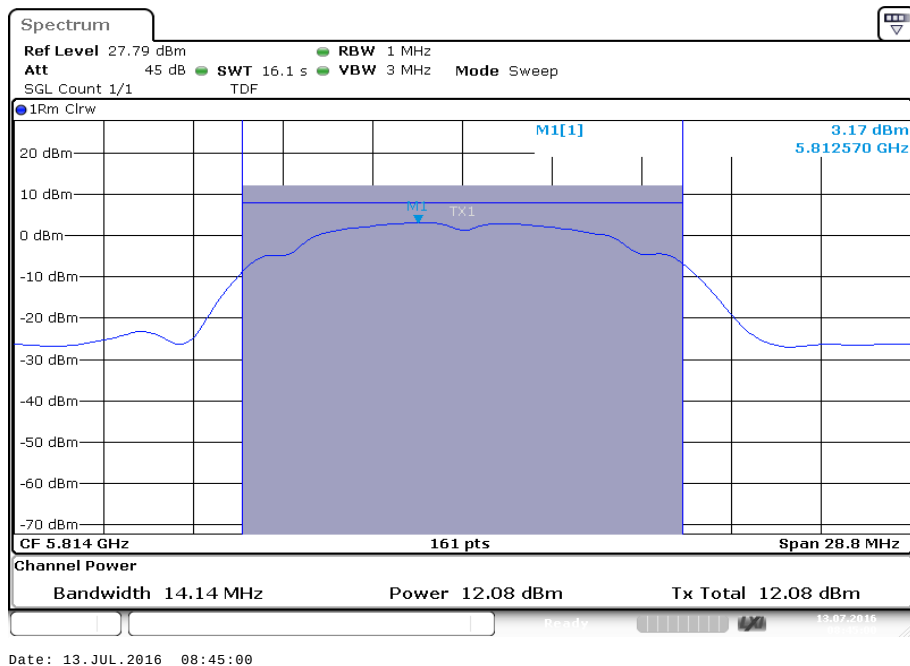
Plot 46: 5736 MHz



Plot 47: 5762 MHz



Plot 48: 5814 MHz



**12.4 Power spectral density****12.4.1 Power spectral density – for FCC requirements****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           |                                                              |
|---------------------------------|--------------------------------------------------------------|
| According to: KDB789033 D02, F. |                                                              |
| Detector:                       | RMS                                                          |
| Sweep time:                     | $\geq 10 * (\text{swp points}) * (\text{total on/off time})$ |
| Resolution bandwidth:           | 1 MHz (500 kHz for 5.8 GHz band)                             |
| Video bandwidth:                | $\geq 3 \times \text{RBW}$                                   |
| Span:                           | $> \text{EBW}$                                               |
| Trace mode:                     | Max hold                                                     |
| Used test setup:                | See chapter 7.5 – Items A                                    |
| Measurement uncertainty:        | See chapter 9                                                |

**Limits:**

| Power Spectral Density                                                                    |
|-------------------------------------------------------------------------------------------|
| power spectral density conducted $\leq 11$ dBm in any 1 MHz band (band 5150 – 5250 MHz)   |
| power spectral density conducted $\leq 30$ dBm in any 500 kHz band (band 5725 – 5850 MHz) |

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -9.5                             | -10.1    | -10.0    | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | -5.8                             | -6.2     | -6.8     | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -9.5                             | -10.4    | -9.8     | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | -7.7                             | -8.3     | -8.5     | -/- |

QPSK – mode / Antenna A

| QPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -1.3                             | -2.4     | -2.8     | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | 1.6                              | 1.6      | 1.2      | -/- |

QPSK – mode / Antenna B

| QPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -3.8                             | -4.3     | -3.9     | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | 0.6                              | 0.3      | 0.7      | -/- |

**Plots:** BPSK – mode / Antenna A

**Plot 1:** 5180 MHz

See Plot 1 section 12.3.1

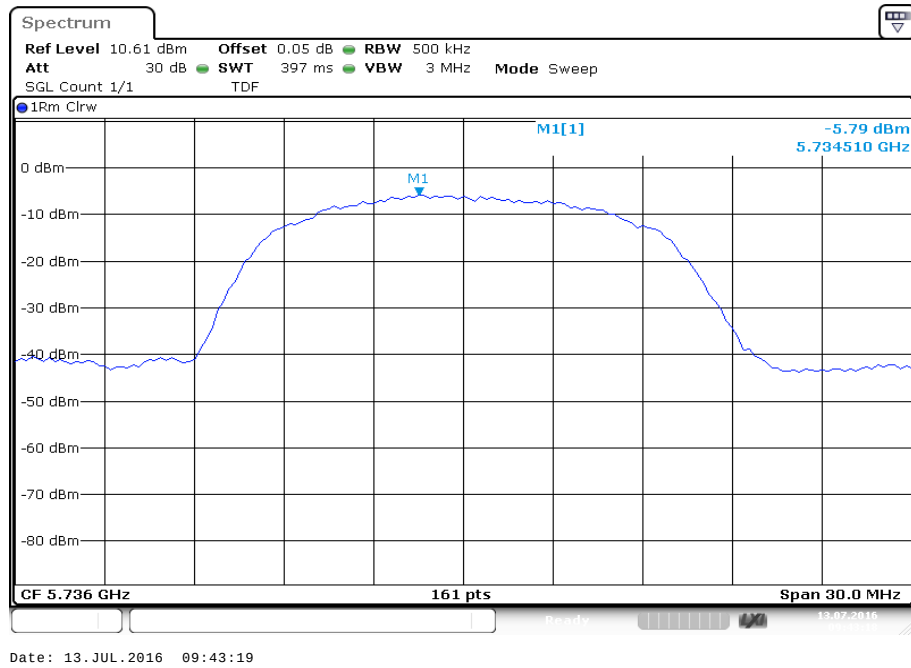
**Plot 2:** 5210 MHz

See Plot 2 section 12.3.1

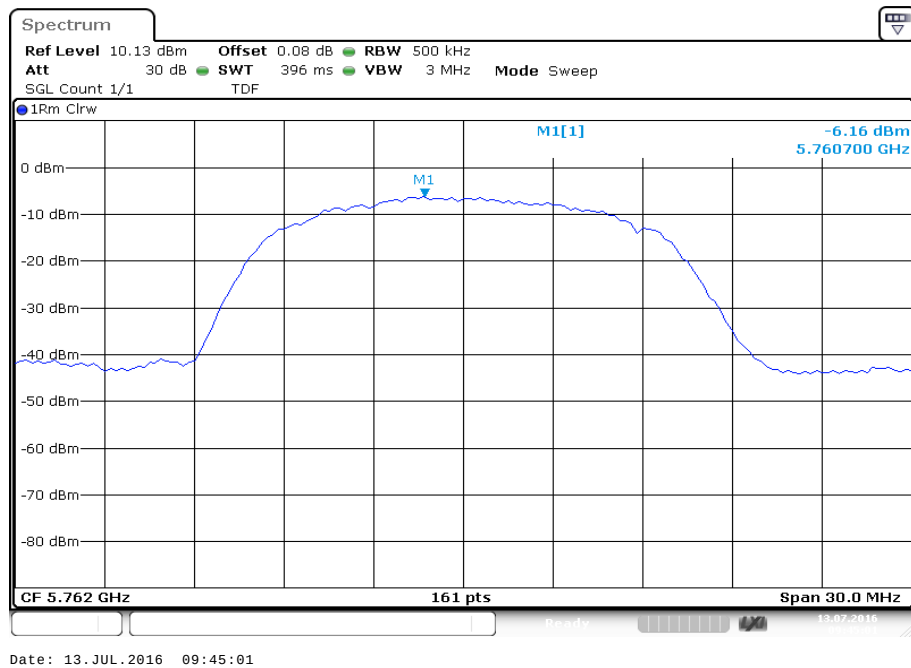
**Plot 3:** 5240 MHz

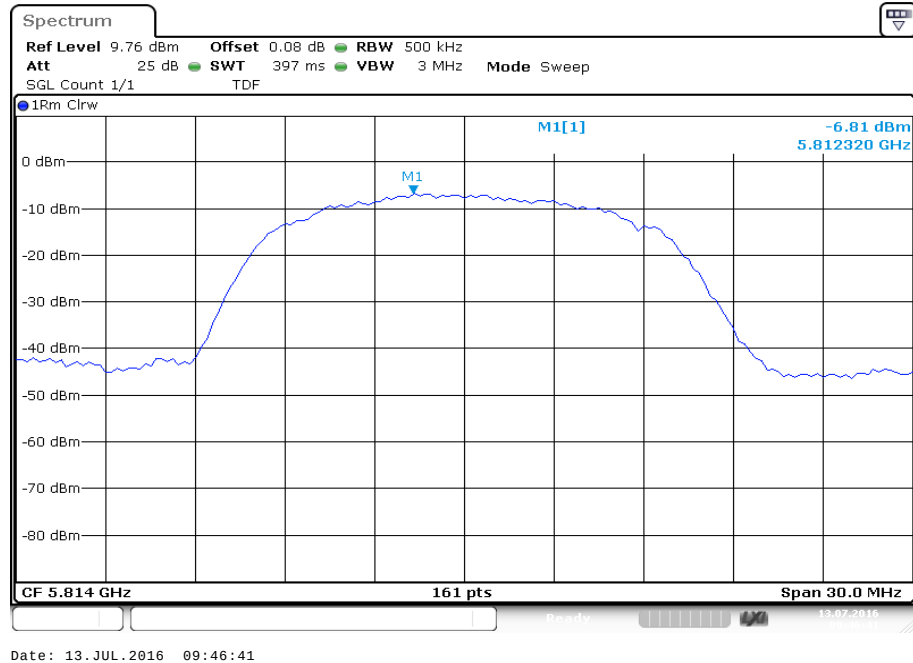
See Plot 3 section 12.3.1

Plot 4: 5736 MHz



Plot 5: 5762 MHz



**Plot 6: 5814 MHz**

**Plots:** BPSK – mode / Antenna B

**Plot 1:** 5180 MHz

See Plot 7 section 12.3.1

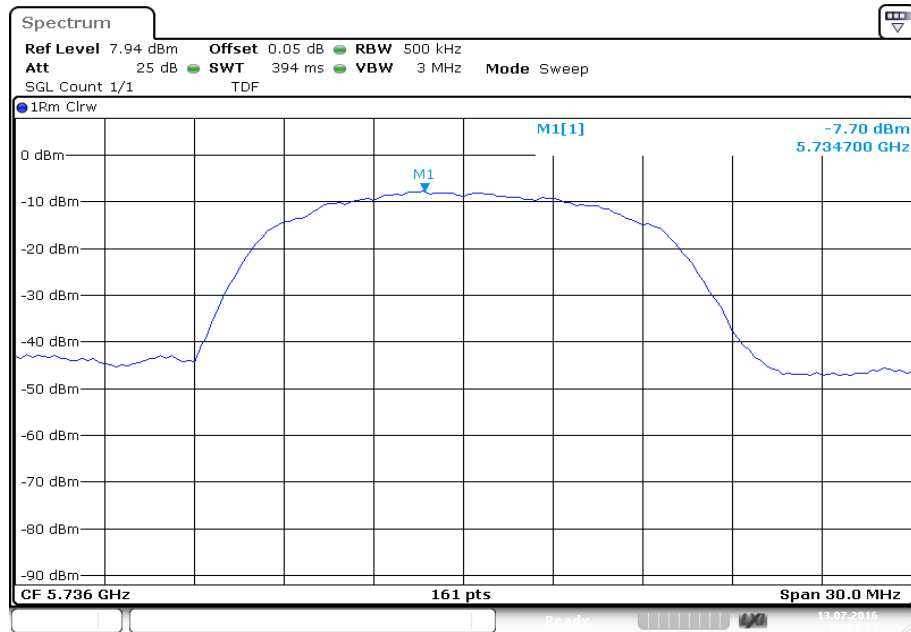
**Plot 2:** 5210 MHz

See Plot 8 section 12.3.1

**Plot 3:** 5240 MHz

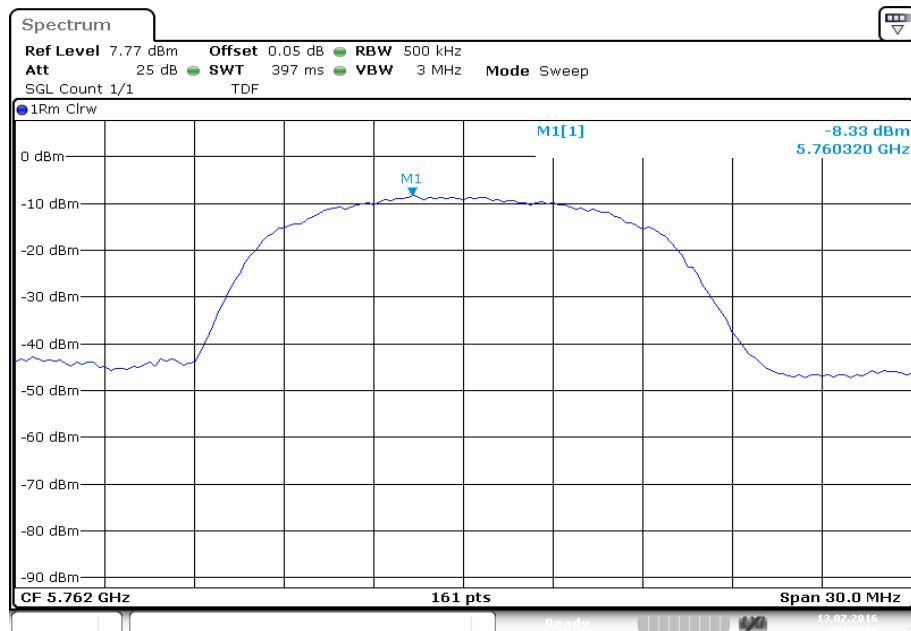
See Plot 9 section 12.3.1

Plot 4: 5736 MHz



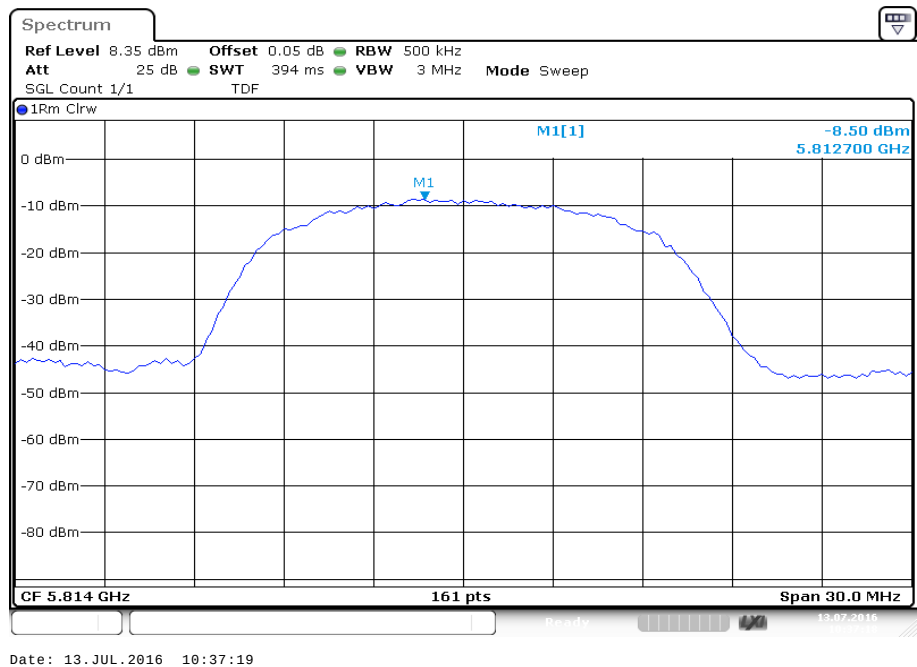
Date: 13.JUL.2016 10:34:04

Plot 5: 5762 MHz



Date: 13.JUL.2016 10:35:39

Plot 6: 5814 MHz



**Plots:** QPSK – mode / Antenna A

**Plot 1:** 5180 MHz

See Plot 13 section 12.3.1

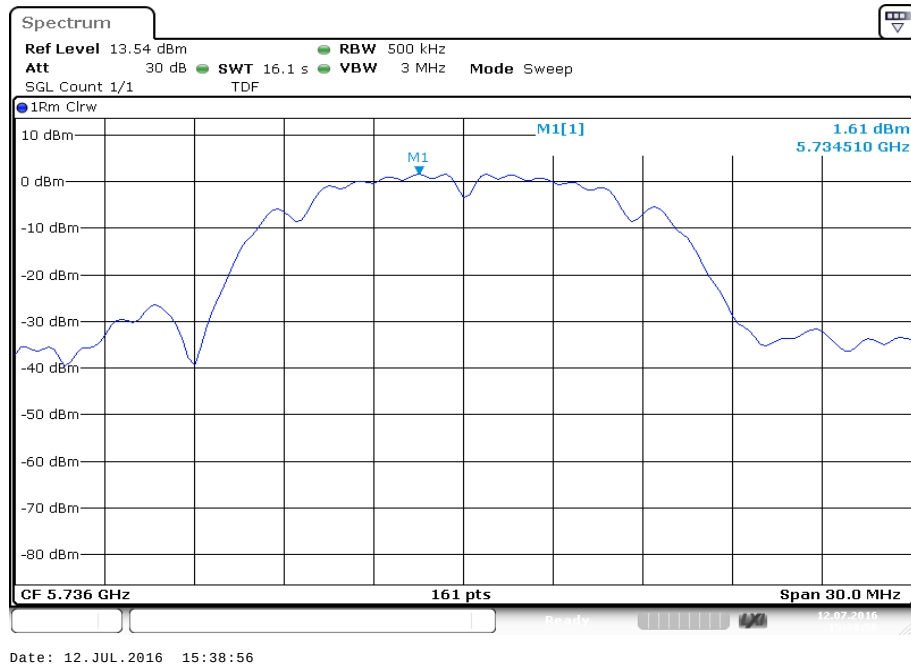
**Plot 2:** 5210 MHz

See Plot 14 section 12.3.1

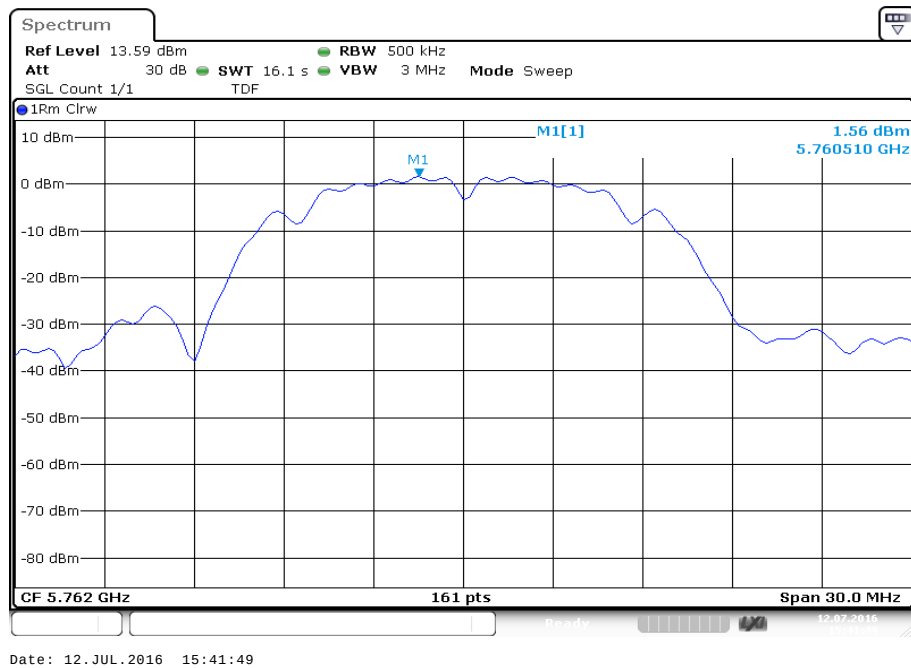
**Plot 3:** 5240 MHz

See Plot 15 section 12.3.1

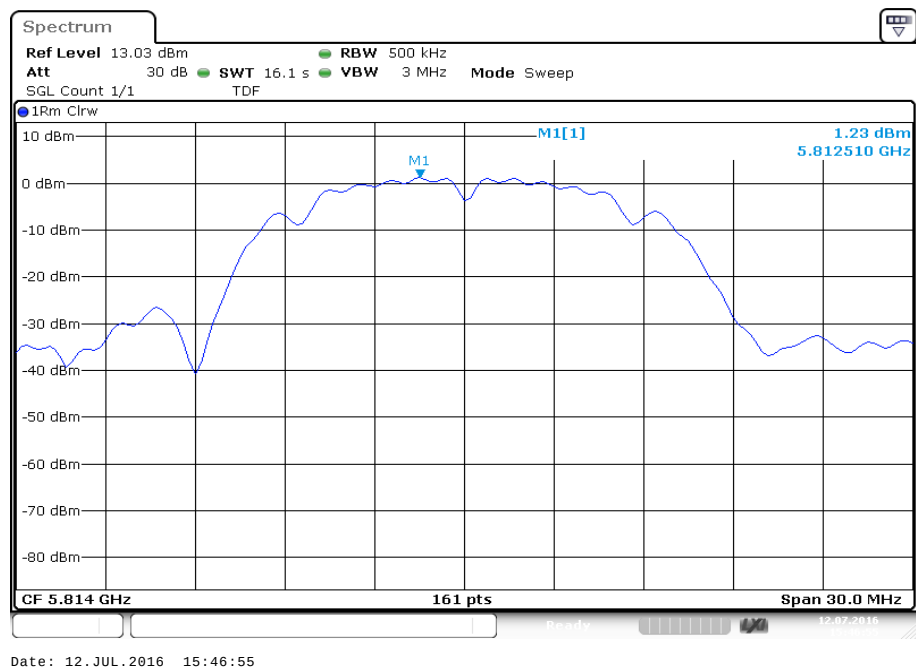
Plot 4: 5736 MHz



Plot 5: 5762 MHz



Plot 6: 5814 MHz



**Plots:** QPSK – mode / Antenna B

**Plot 1:** 5180 MHz

See Plot 19 section 12.3.1

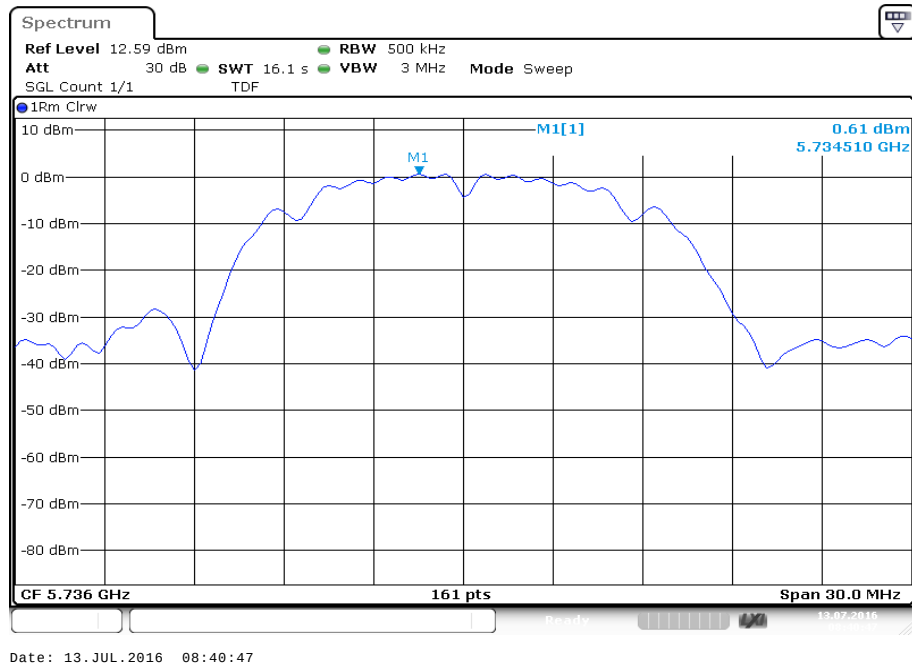
**Plot 2:** 5210 MHz

See Plot 20 section 12.3.1

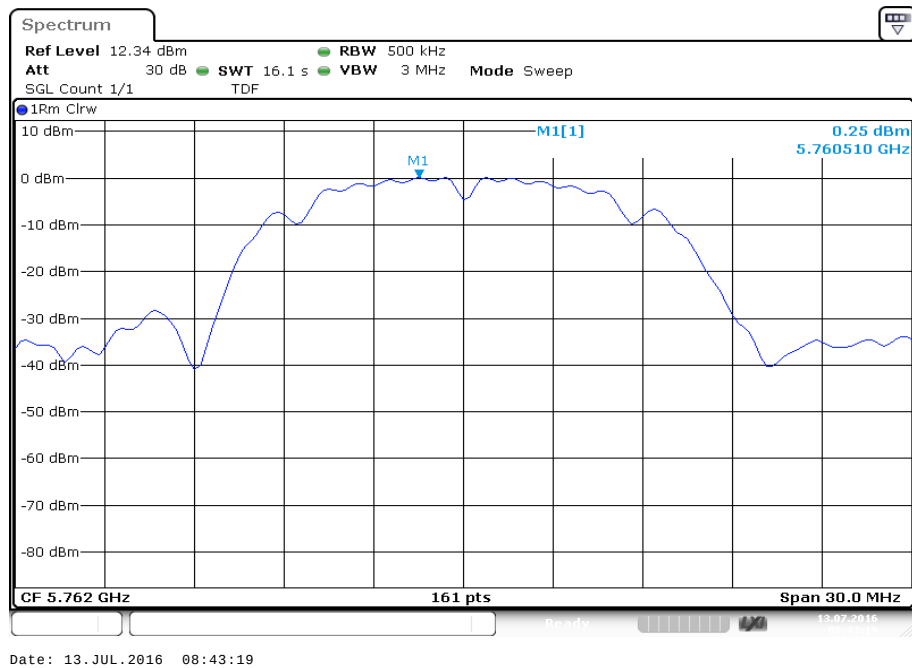
**Plot 3:** 5240 MHz

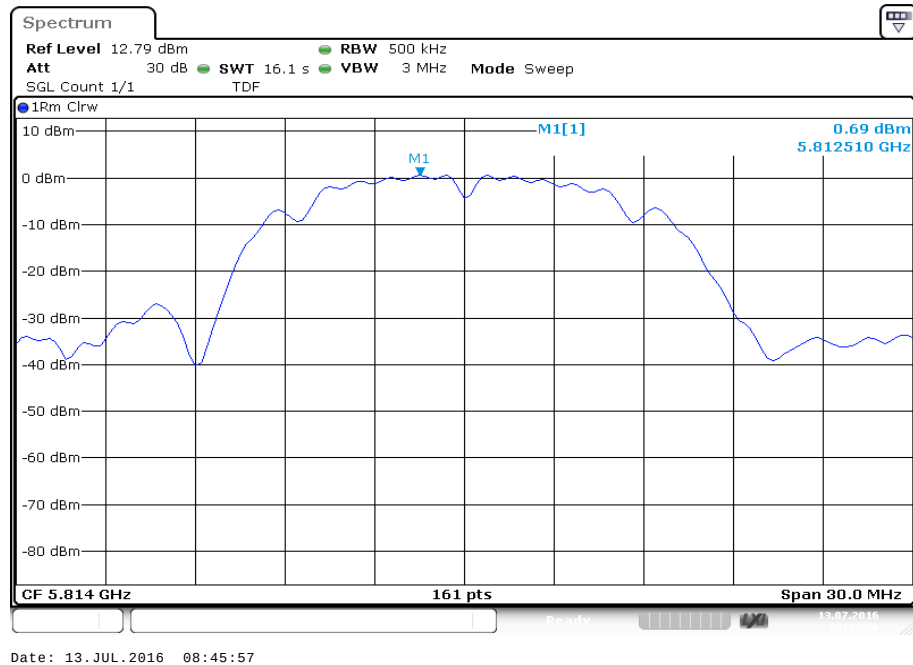
See Plot 21 section 12.3.1

Plot 4: 5736 MHz



Plot 5: 5762 MHz



**Plot 6: 5814 MHz**

**12.4.2 Power spectral density – for IC requirements****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                                                             |
| Used test setup:         | See chapter 7.5 – Items A                                            |
| Measurement uncertainty: | See chapter 9                                                        |

**Limits:**

| Power Spectral Density                                                                    |
|-------------------------------------------------------------------------------------------|
| power spectral density e.i.r.p. $\leq 10$ dBm in any 1 MHz band (band 5150 – 5250 MHz)    |
| power spectral density conducted $\leq 30$ dBm in any 500 kHz band (band 5725 – 5850 MHz) |

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -5.3                             | -5.9     | -5.8     | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | -5.7                             | -6.2     | -6.8     | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | -6.2                             | -6.2     | -5.7     | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | -7.6                             | -8.3     | -8.5     | -/- |

QPSK – mode / Antenna A

| QPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | 3.0                              | 1.8      | 1.4      | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | 1.6                              | 1.6      | 1.2      | -/- |

QPSK – mode / Antenna B

| QPSK – mode<br>Frequency | Power spectral density [dBm/MHz] |          |          |     |
|--------------------------|----------------------------------|----------|----------|-----|
|                          | 5180 MHz                         | 5210 MHz | 5240 MHz | -/- |
|                          | 0.3                              | -0.1     | 0.3      | -/- |
| Frequency                | 5736 MHz                         | 5762 MHz | 5814 MHz | -/- |
|                          | 0.6                              | 0.3      | 0.7      | -/- |

**Plots:** BPSK – mode / Antenna A

**Plot 7:** 5180 MHz

See Plot 25 section 12.3.2

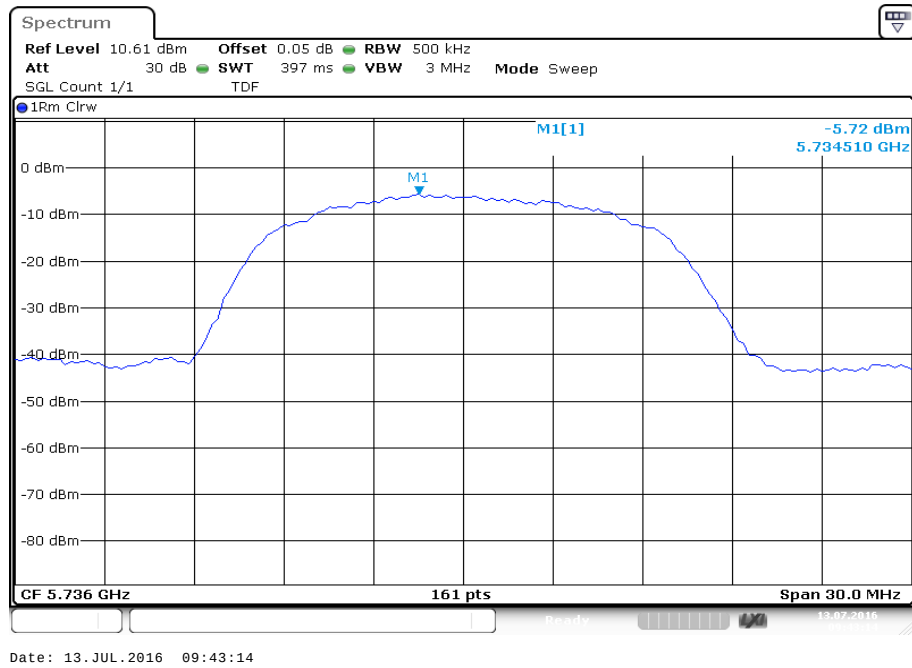
**Plot 8:** 5210 MHz

See Plot 26 section 12.3.2

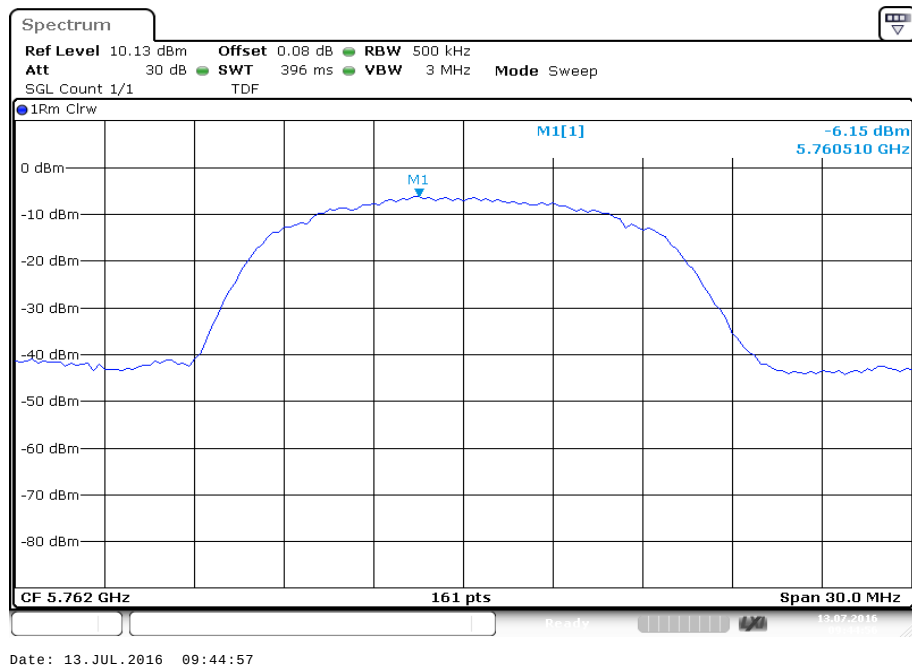
**Plot 9:** 5240 MHz

See Plot 27 section 12.3.2

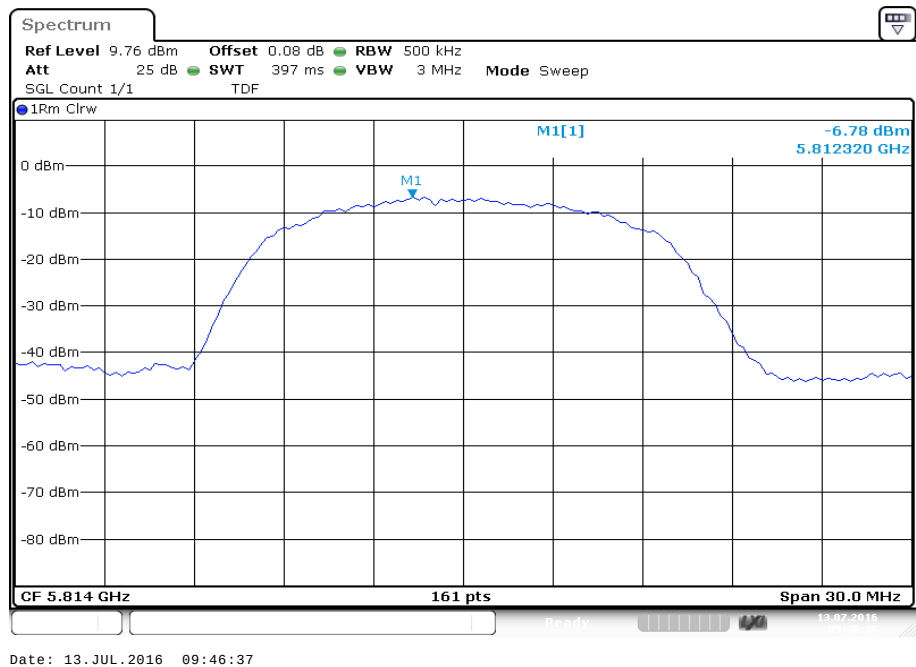
Plot 10: 5736 MHz



Plot 11: 5762 MHz



Plot 12: 5814 MHz



**Plots:** BPSK – mode / Antenna B

**Plot 7:** 5180 MHz

See Plot 31 section 12.3.2

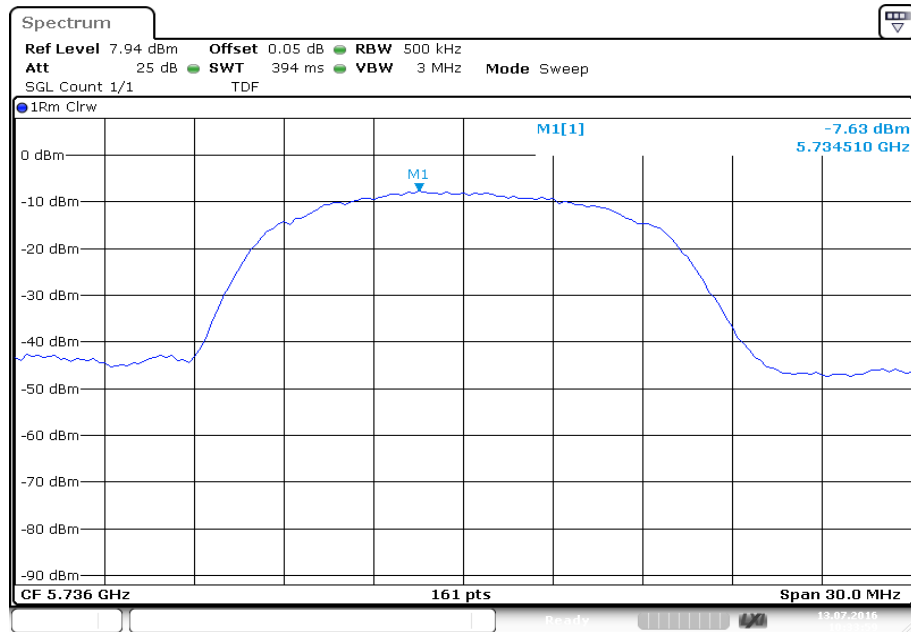
**Plot 8:** 5210 MHz

See Plot 32 section 12.3.2

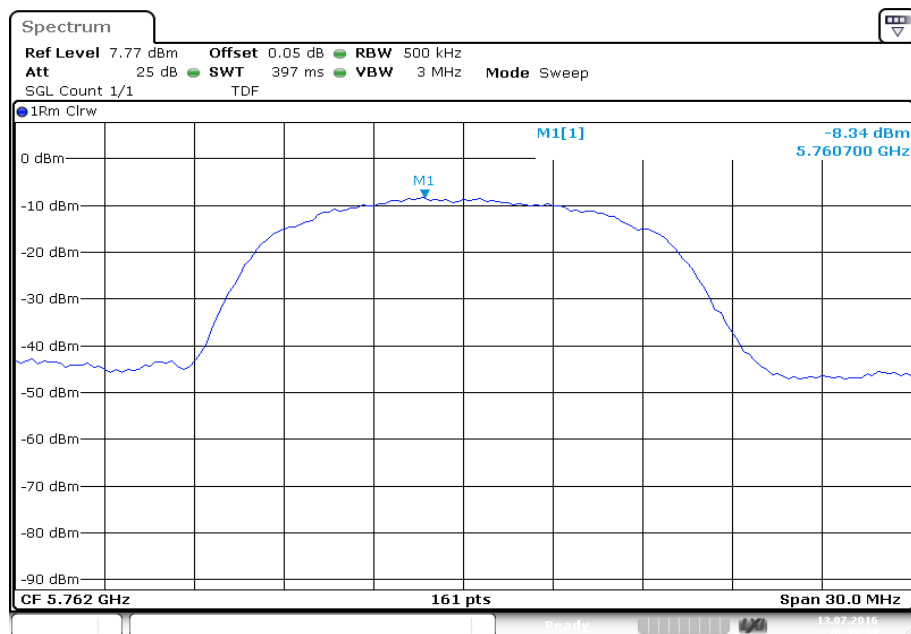
**Plot 9:** 5240 MHz

See Plot 34 section 12.3.2

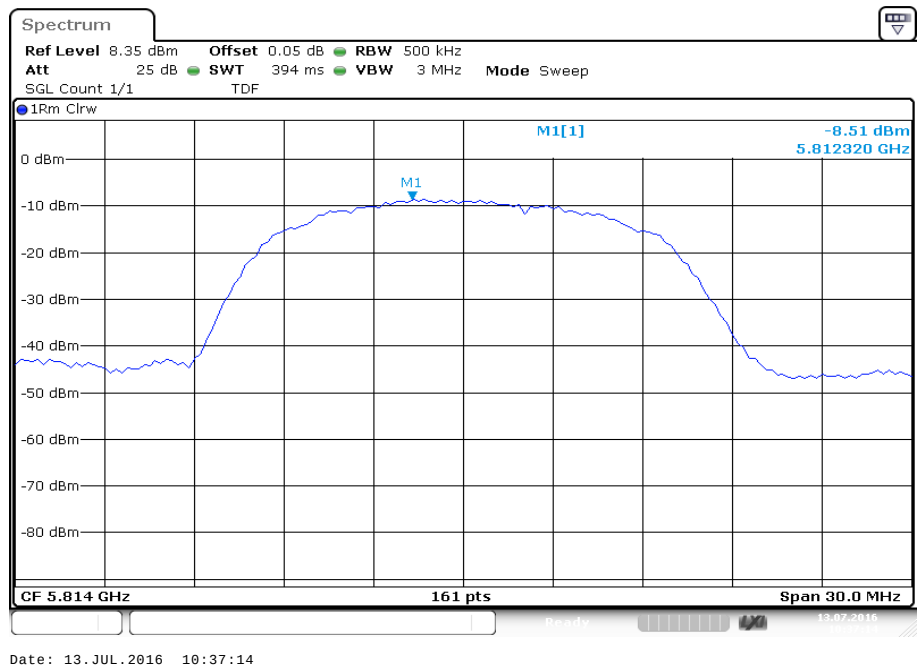
Plot 10: 5736 MHz



Plot 11: 5762 MHz



Plot 12: 5814 MHz



**Plots:** QPSK – mode / Antenna A

**Plot 7:** 5180 MHz

See Plot 37 section 12.3.2

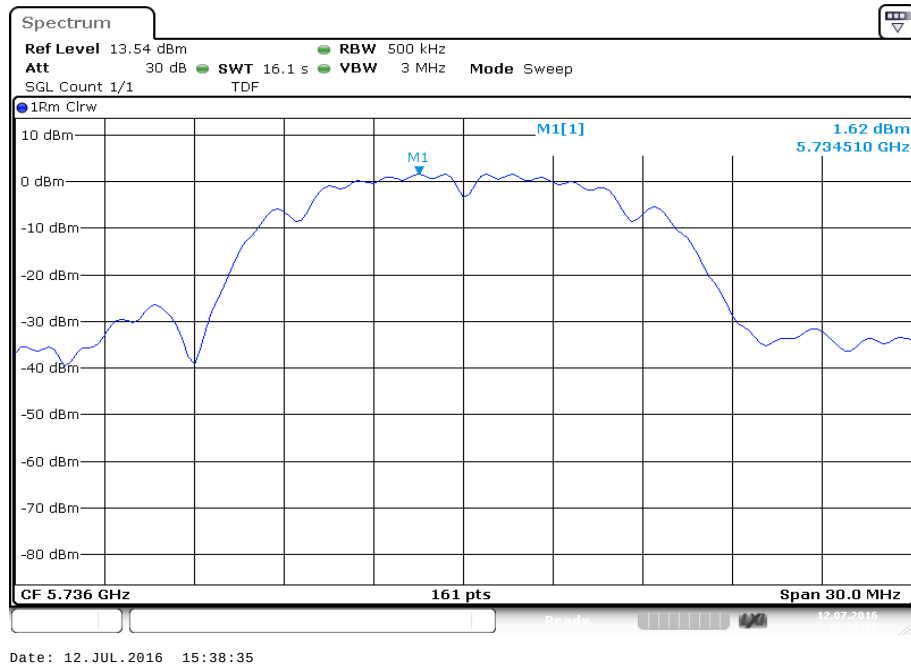
**Plot 8:** 5210 MHz

See Plot 38 section 12.3.2

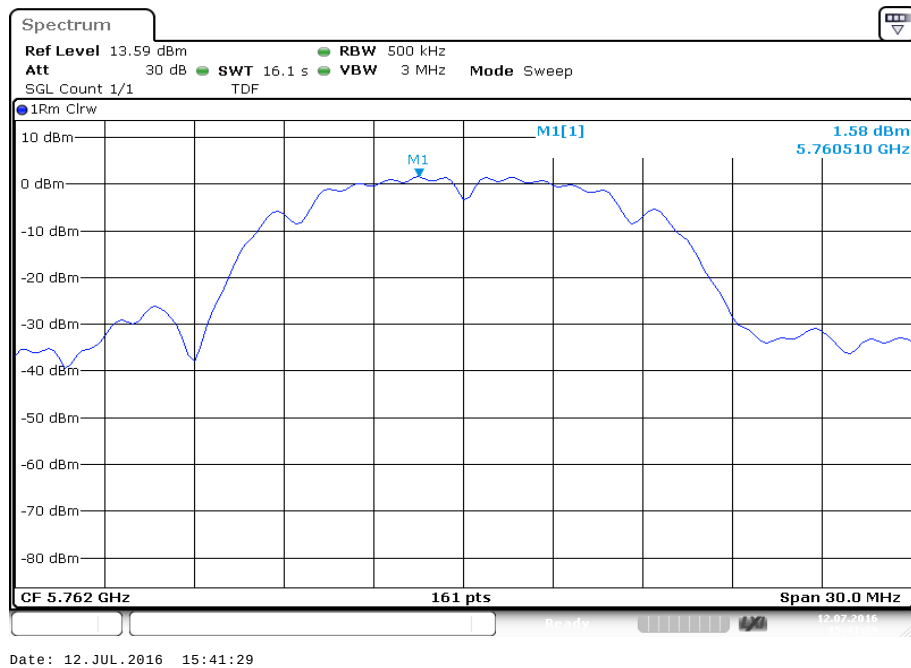
**Plot 9:** 5240 MHz

See Plot 39 section 12.3.2

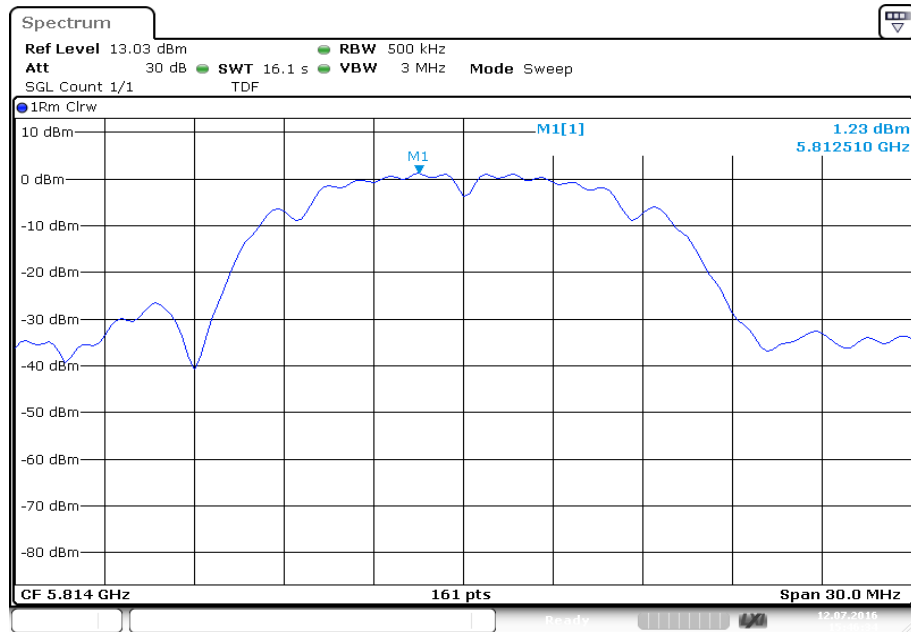
Plot 10: 5736 MHz



Plot 11: 5762 MHz



Plot 12: 5814 MHz



Date: 12.JUL.2016 15:46:34

**Plots:** QPSK – mode / Antenna B

**Plot 7:** 5180 MHz

See Plot 43 section 12.3.2

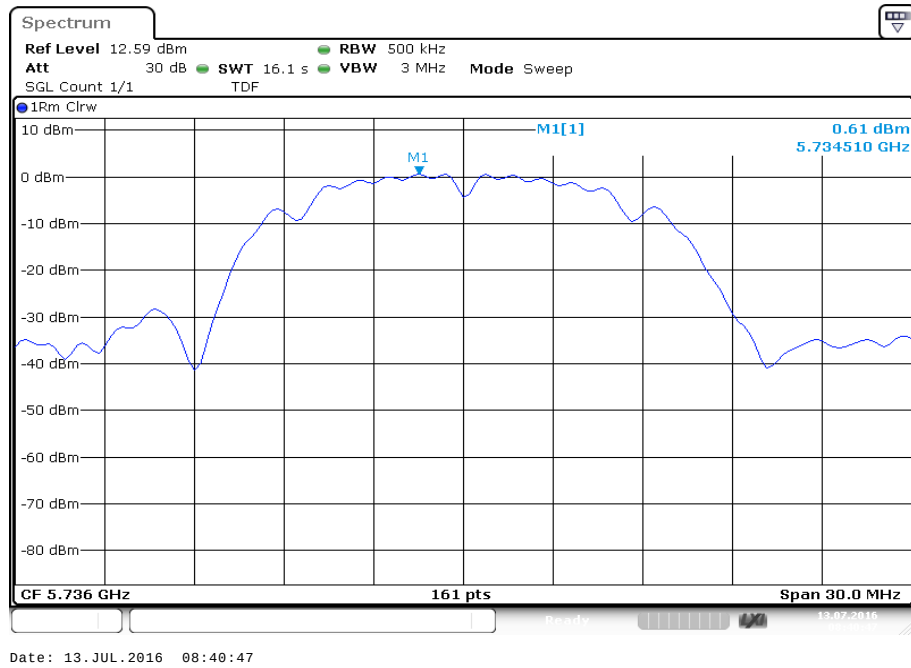
**Plot 8:** 5210 MHz

See Plot 44 section 12.3.2

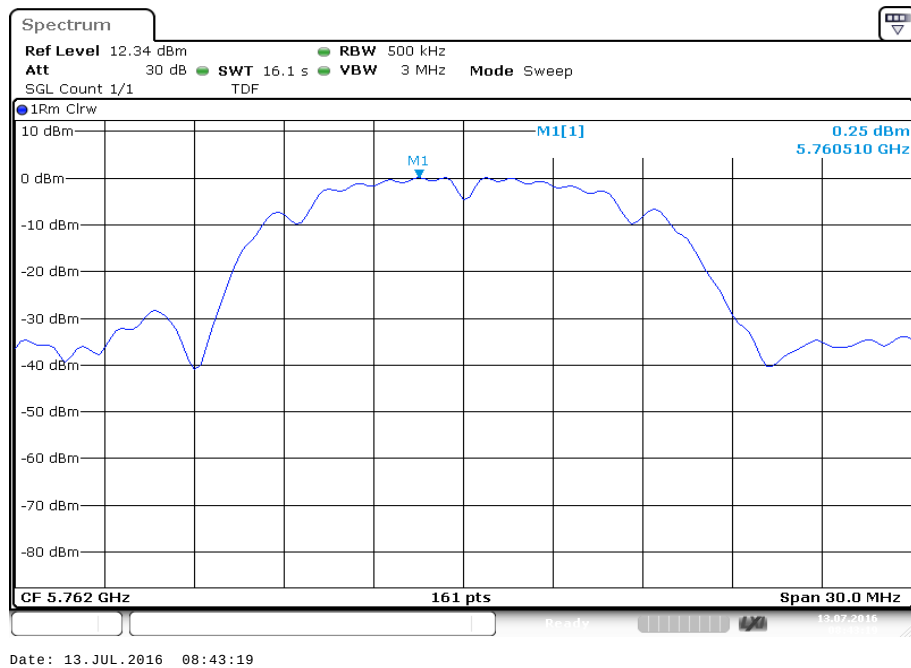
**Plot 9:** 5240 MHz

See Plot 45 section 12.3.2

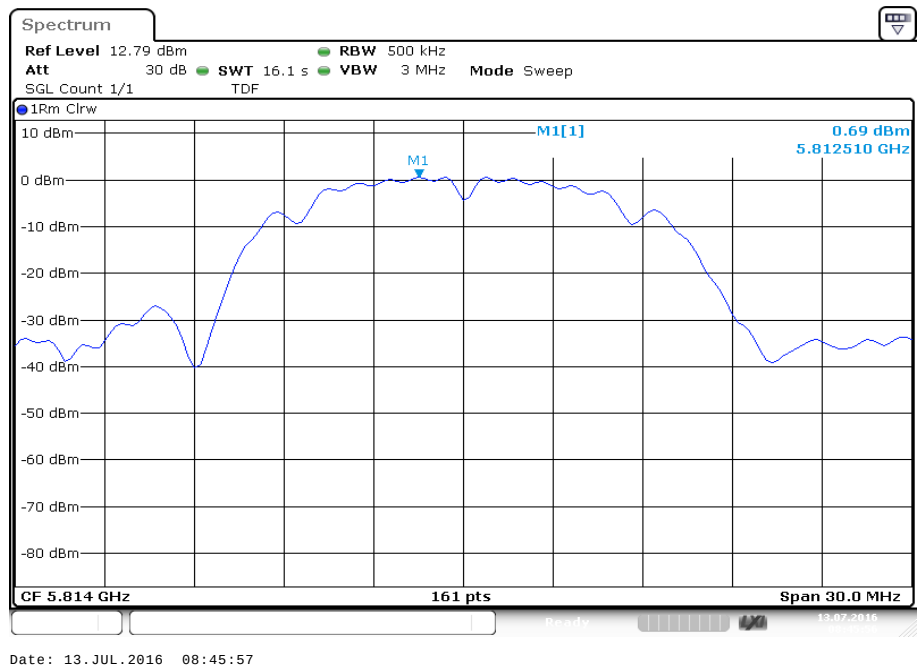
Plot 10: 5736 MHz



Plot 11: 5762 MHz



Plot 12: 5814 MHz



## 12.5 Minimum emission bandwidth for the band 5.725-5.85 GHz

### Description:

Measurement of the 6 dB bandwidth of the modulated signal.

### Measurement:

| Measurement parameter             |                                        |
|-----------------------------------|----------------------------------------|
| According to: KDB789033 D02, C.2. |                                        |
| Detector:                         | Peak                                   |
| Sweep time:                       | Auto                                   |
| Resolution bandwidth:             | 100 kHz                                |
| Video bandwidth:                  | 300 kHz                                |
| Span:                             | 40 MHz                                 |
| Measurement procedure:            | Using marker to find -6dBc frequencies |
| Trace mode:                       | Max hold (allow trace to stabilize)    |
| Used test setup:                  | See chapter 7.5 – Items A              |
| Measurement uncertainty:          | See chapter 9                          |

### Limits:

| FCC                                                    | IC |
|--------------------------------------------------------|----|
| Minimum Emission Bandwidth for the band 5.725-5.85 GHz |    |
| The minimum 6 dB bandwidth shall be at least 500 kHz.  |    |

**Result:**

BPSK – mode / Antenna A

| BPSK - mode<br>Channel | 6 dB bandwidth [MHz] |          |          |
|------------------------|----------------------|----------|----------|
|                        | 5736 MHz             | 5762 MHz | 5814 MHz |
|                        | 10.8                 | 10.0     | 11.1     |

BPSK – mode / Antenna B

| BPSK - mode<br>Channel | 6 dB bandwidth [MHz] |          |          |
|------------------------|----------------------|----------|----------|
|                        | 5736 MHz             | 5762 MHz | 5814 MHz |
|                        | 9.9                  | 9.9      | 9.9      |

QPSK – mode / Antenna A

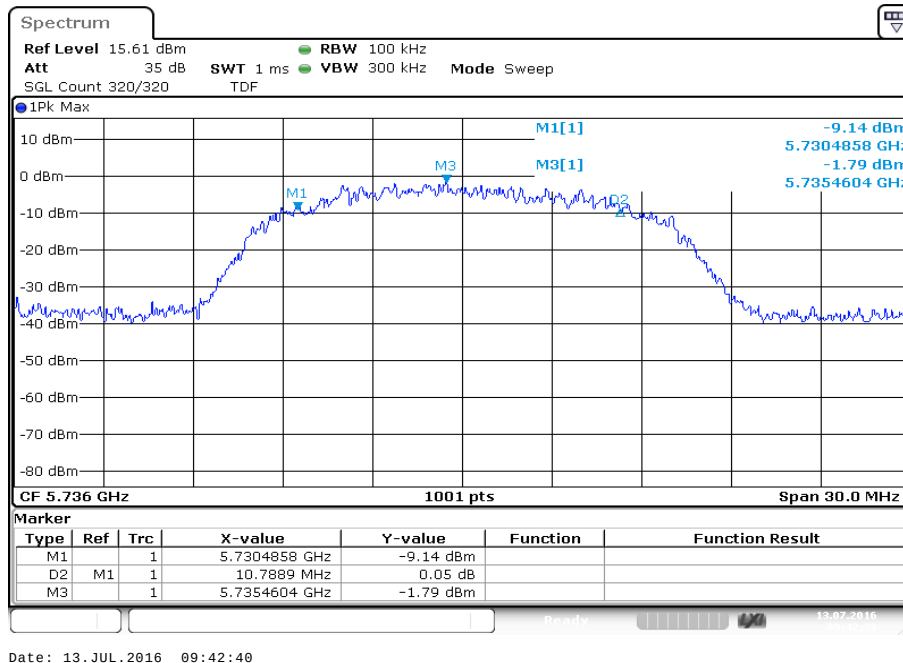
| QPSK - mode<br>Channel | 6 dB bandwidth [MHz] |          |          |
|------------------------|----------------------|----------|----------|
|                        | 5736 MHz             | 5762 MHz | 5814 MHz |
|                        | 9.9                  | 9.9      | 9.9      |

QPSK – mode / Antenna B

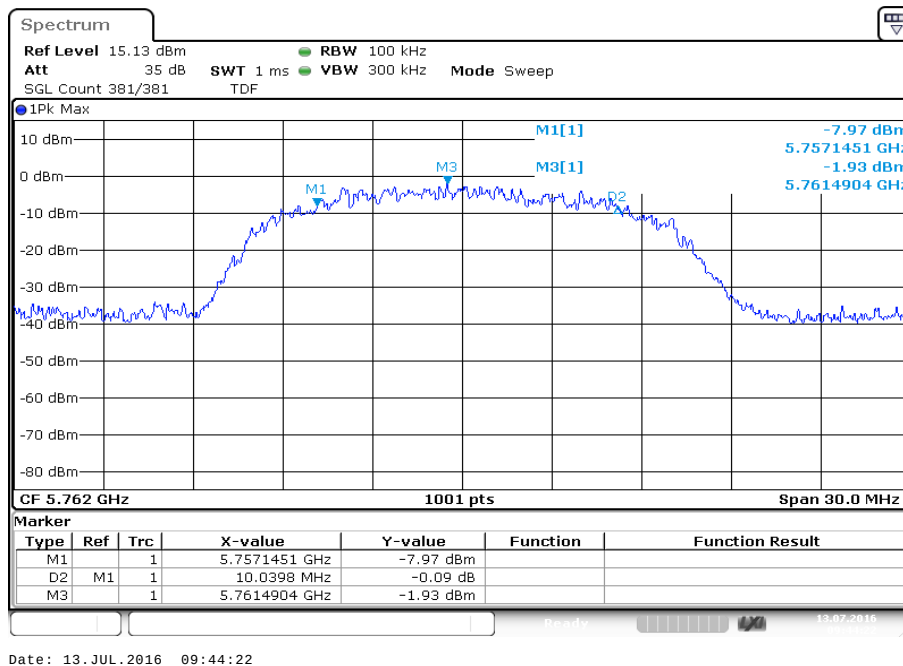
| QPSK - mode<br>Channel | 6 dB bandwidth [MHz] |          |          |
|------------------------|----------------------|----------|----------|
|                        | 5736 MHz             | 5762 MHz | 5814 MHz |
|                        | 9.9                  | 9.9      | 9.9      |

**Plots:** BPSK – mode / Antenna A

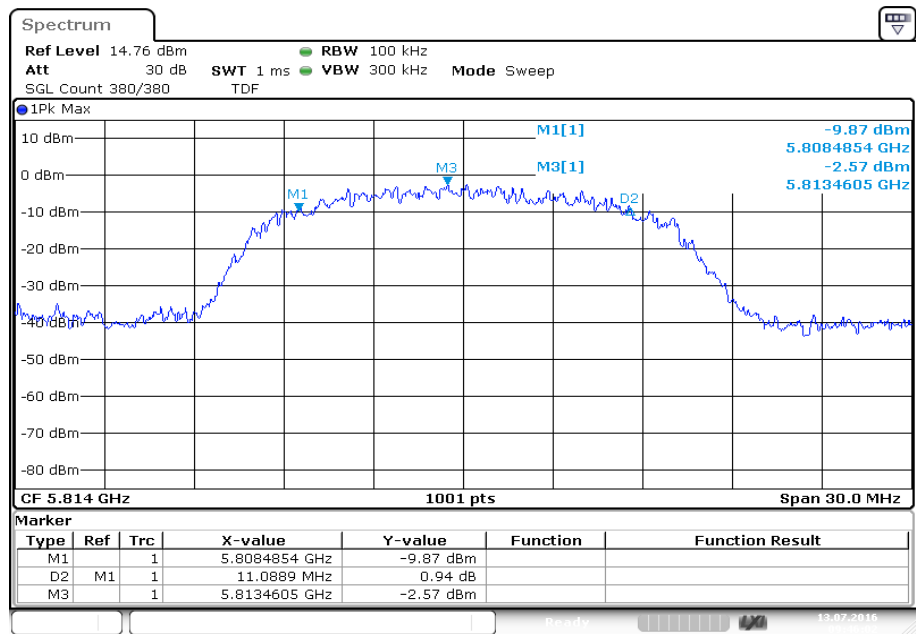
**Plot 1:** 5736 MHz



**Plot 2:** 5762 MHz



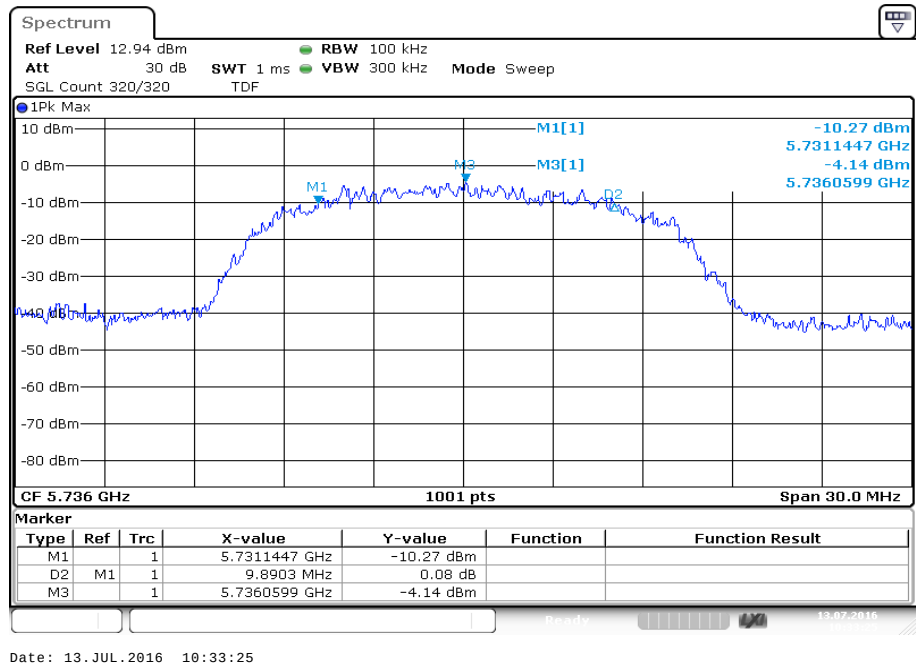
Plot 3: 5814 MHz



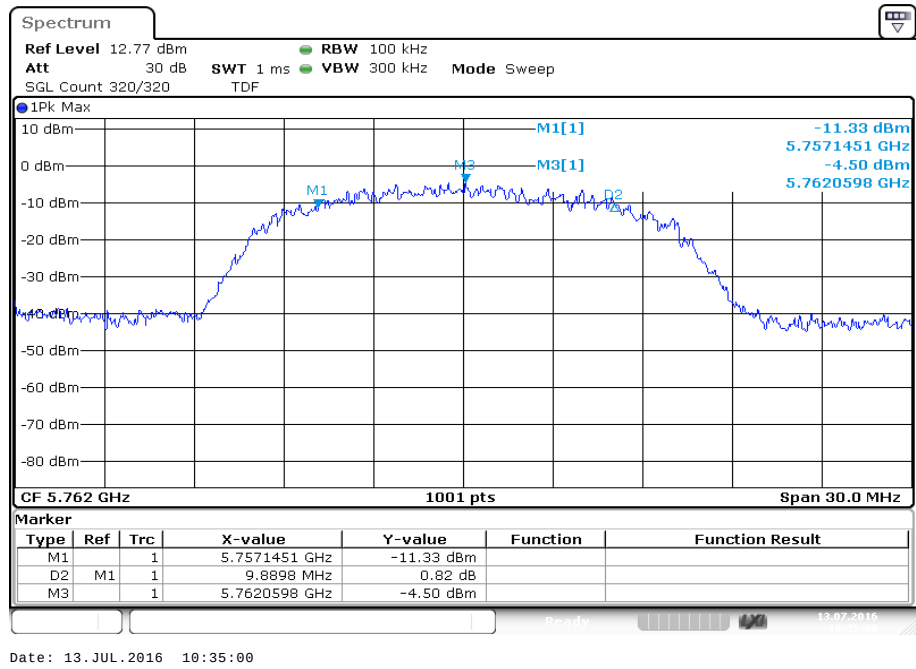
Date: 13.JUL.2016 09:46:02

**Plots:** BPSK – mode / Antenna B

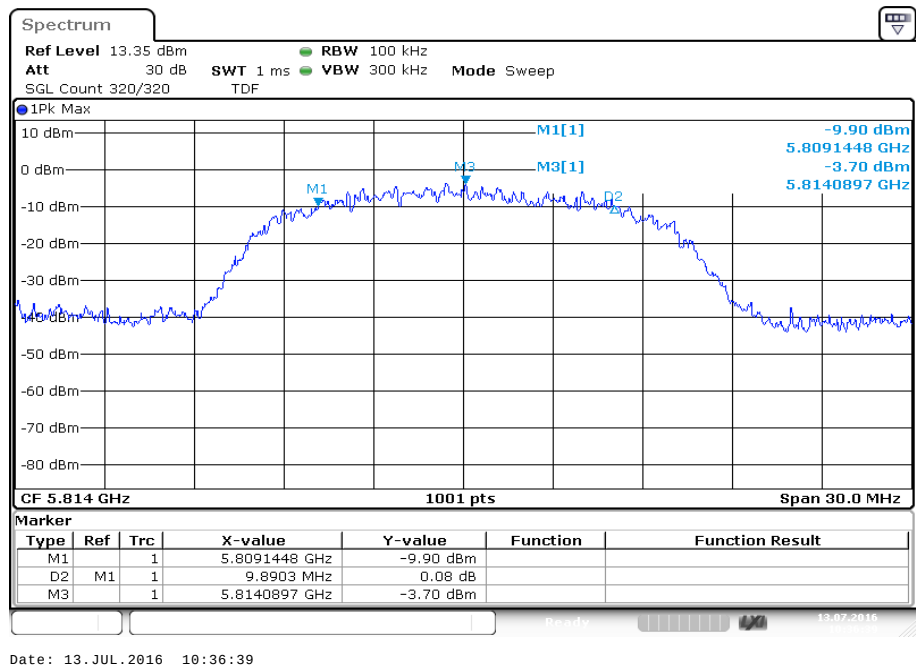
**Plot 4:** 5736 MHz



**Plot 5:** 5762 MHz

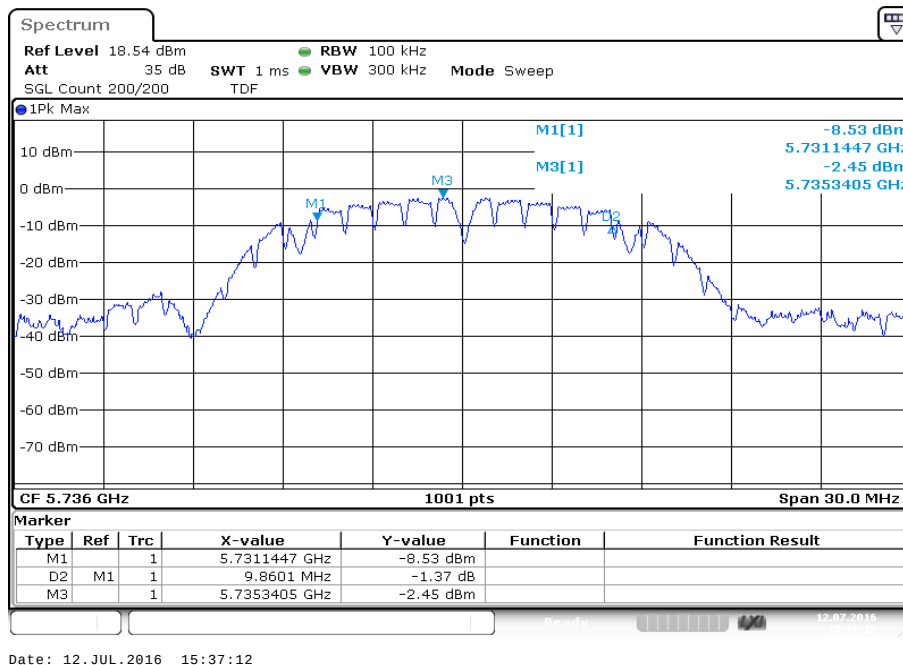


Plot 6: 5814 MHz

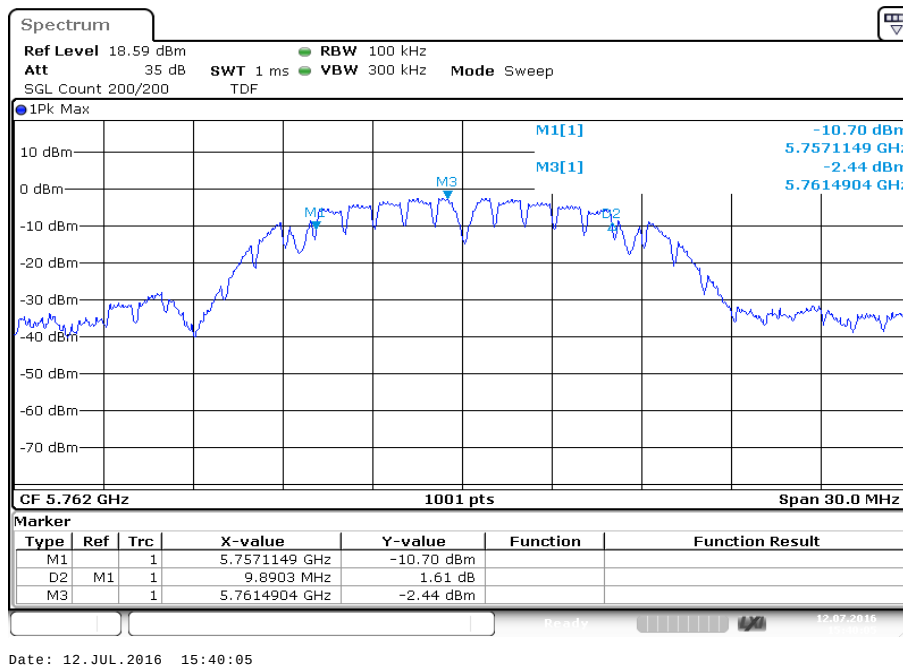


**Plots:** QPSK – mode / Antenna A

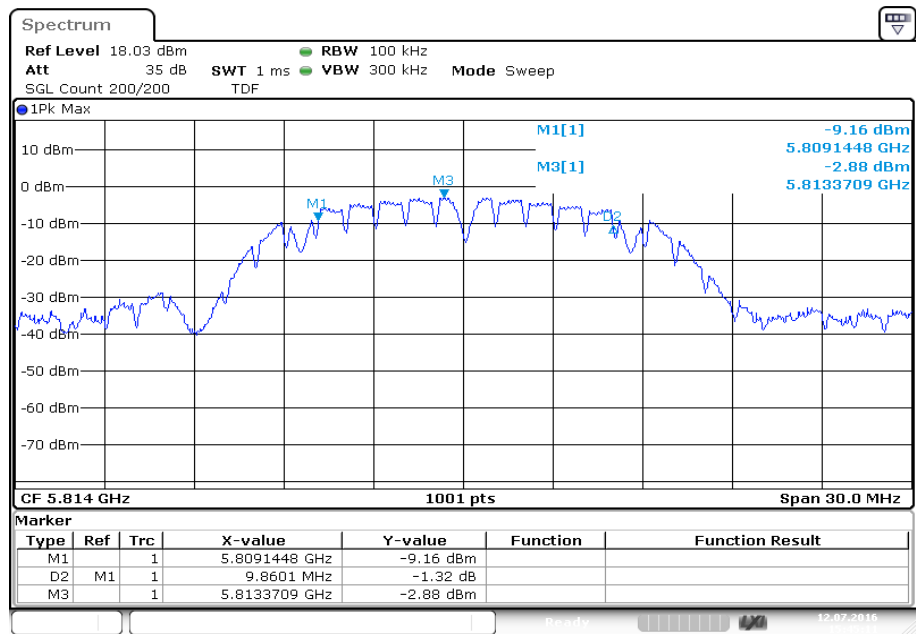
**Plot 7:** 5736 MHz



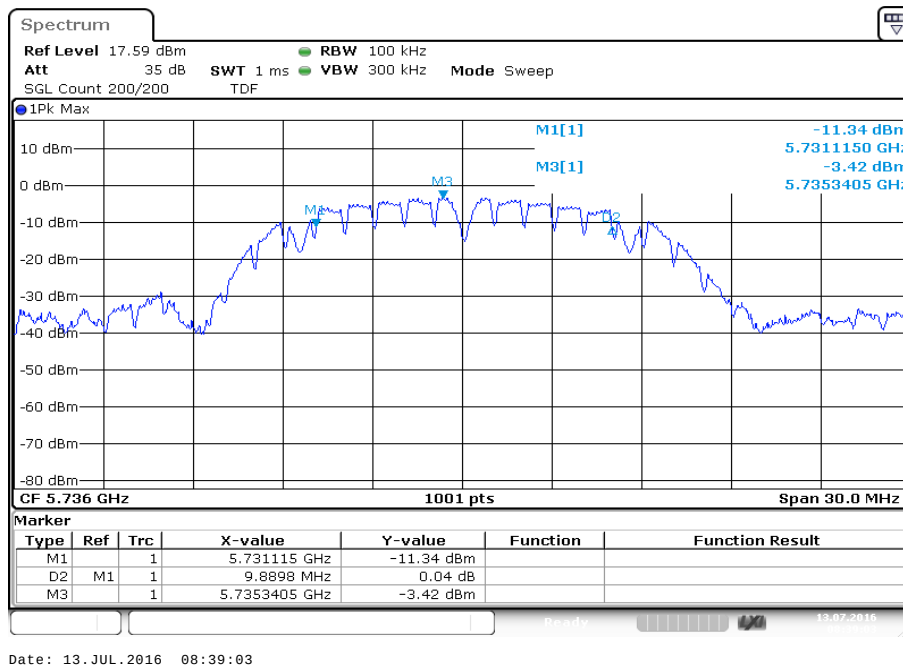
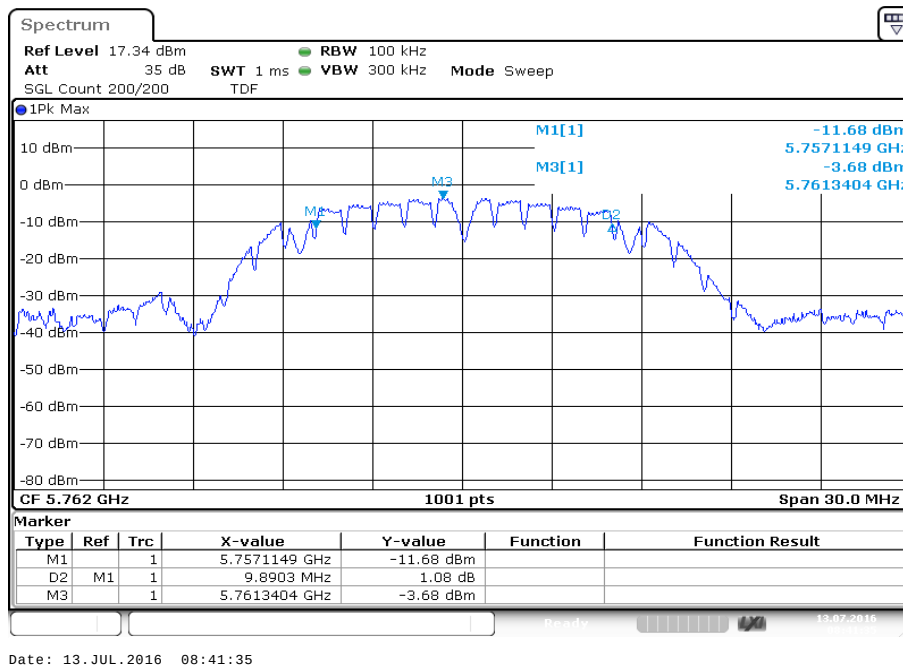
**Plot 8:** 5762 MHz



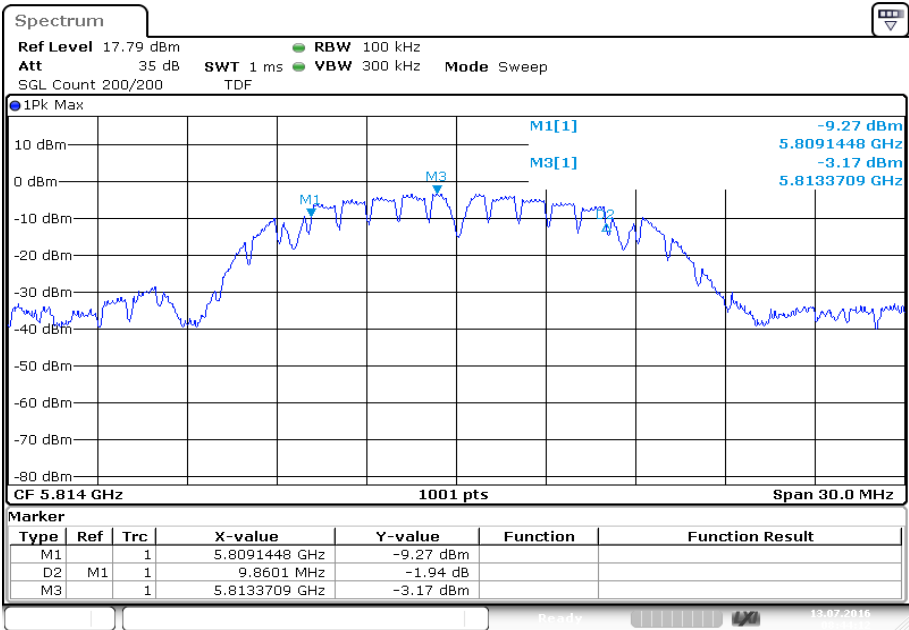
Plot 9: 5814 MHz



Date: 12.JUL.2016 15:45:11

**Plots:** QPSK – mode / Antenna B**Plot 10:** 5736 MHz**Plot 11:** 5762 MHz

Plot 12: 5814 MHz



Date: 13.JUL.2016 08:44:13

**12.6 Spectrum bandwidth – 26 dB bandwidth****Description:**

Measurement of the 26 dB bandwidth of the modulated signal.

**Measurement:**

| Measurement parameter             |                           |
|-----------------------------------|---------------------------|
| According to: KDB789033 D02, C.1. |                           |
| Detector:                         | Peak                      |
| Sweep time:                       | Auto                      |
| Resolution bandwidth:             | 1% EBW                    |
| Video bandwidth:                  | ≥ RBW                     |
| Span:                             | > complete signal!        |
| Trace-Mode:                       | Max hold                  |
| Used test setup:                  | see chapter 7.5 – Items A |
| Measurement uncertainty:          | see chapter 9             |

**Limits:**

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

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | 26 dB bandwidth [MHz] |          |          |     |
|--------------------------|-----------------------|----------|----------|-----|
|                          | 5180 MHz              | 5210 MHz | 5240 MHz | -/- |
|                          | 16.3                  | 16.3     | 16.3     | -/- |
| Frequency                | 5736 MHz              | 5762 MHz | 5814 MHz | -/- |
|                          | 16.8                  | 16.4     | 16.3     | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | 26 dB bandwidth [MHz] |          |          |     |
|--------------------------|-----------------------|----------|----------|-----|
|                          | 5180 MHz              | 5210 MHz | 5240 MHz | -/- |
|                          | 16.3                  | 16.5     | 16.4     | -/- |
| Frequency                | 5736 MHz              | 5762 MHz | 5814 MHz | -/- |
|                          | 16.2                  | 16.8     | 16.4     | -/- |

QPSK – mode / Antenna A

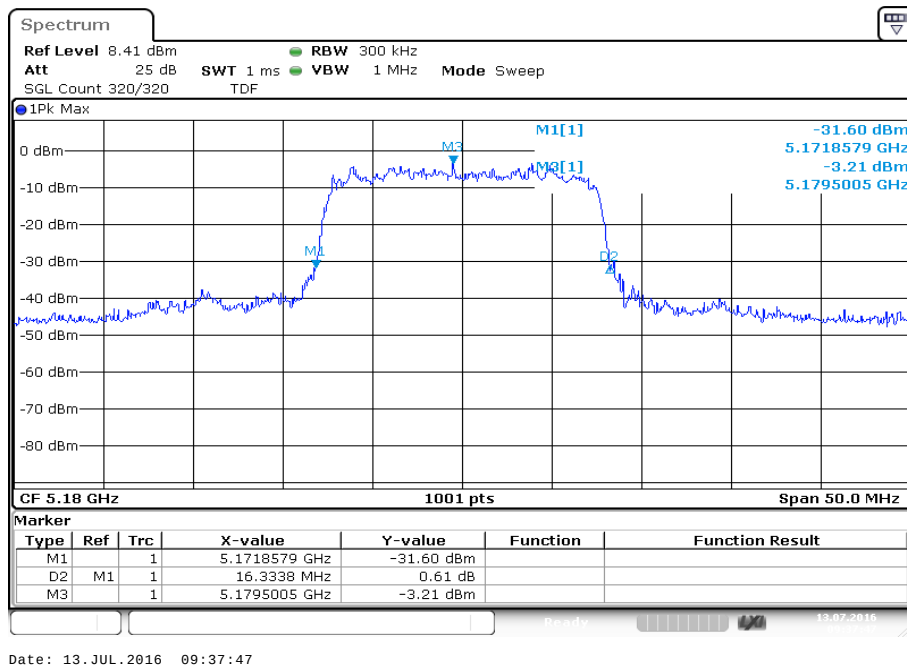
| QPSK – mode<br>Frequency | 26 dB bandwidth [MHz] |          |          |     |
|--------------------------|-----------------------|----------|----------|-----|
|                          | 5180 MHz              | 5210 MHz | 5240 MHz | -/- |
|                          | 16.4                  | 16.4     | 16.4     | -/- |
| Frequency                | 5736 MHz              | 5762 MHz | 5814 MHz | -/- |
|                          | 16.9                  | 16.9     | 16.8     | -/- |

QPSK – mode / Antenna B

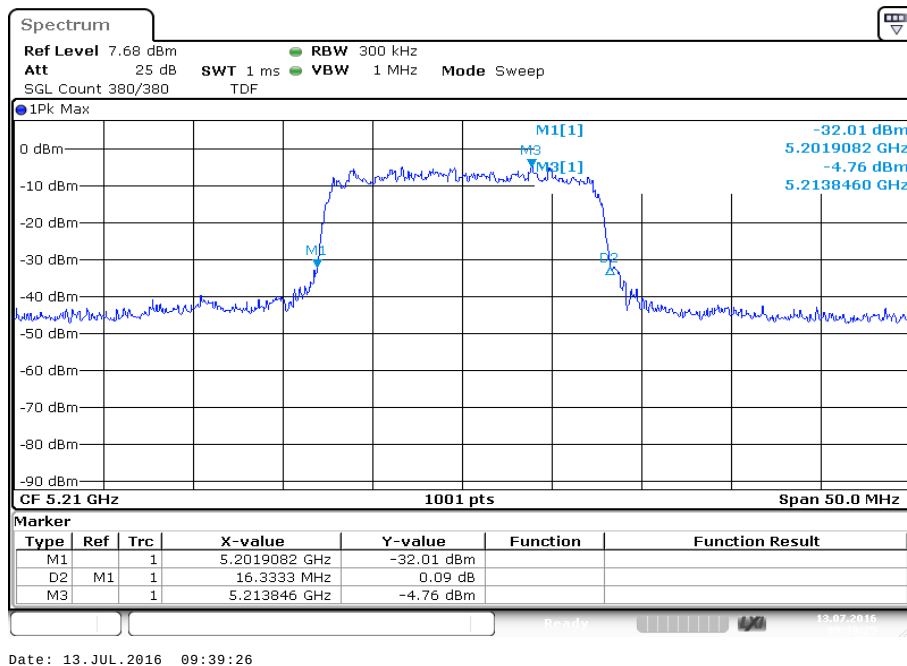
| QPSK – mode<br>Frequency | 26 dB bandwidth [MHz] |          |          |     |
|--------------------------|-----------------------|----------|----------|-----|
|                          | 5180 MHz              | 5210 MHz | 5240 MHz | -/- |
|                          | 16.4                  | 16.4     | 16.5     | -/- |
| Frequency                | 5736 MHz              | 5762 MHz | 5814 MHz | -/- |
|                          | 16.9                  | 16.8     |          | -/- |

**Plots:** BPSK – mode / Antenna A

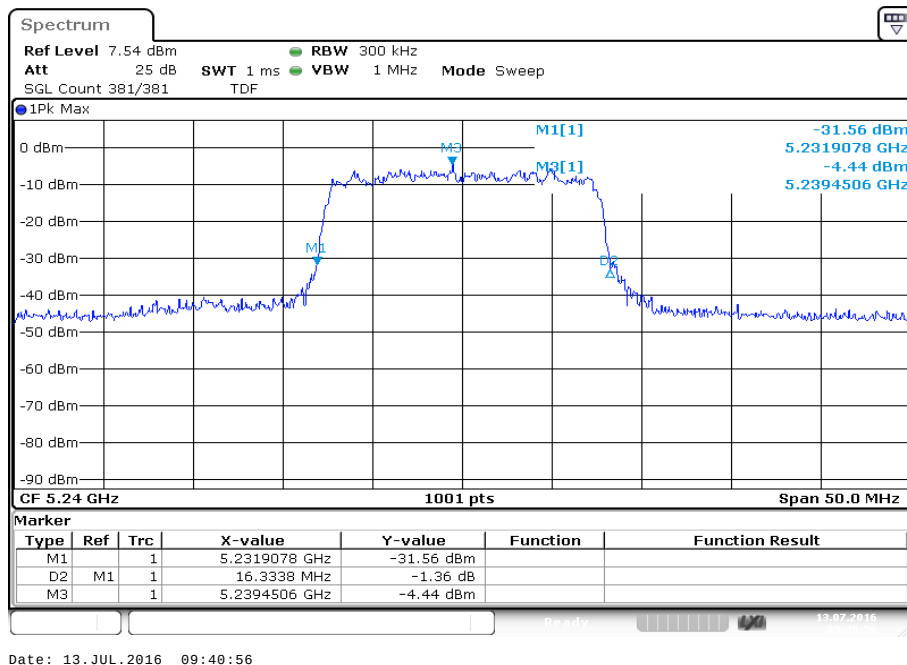
**Plot 1:** 5180 MHz



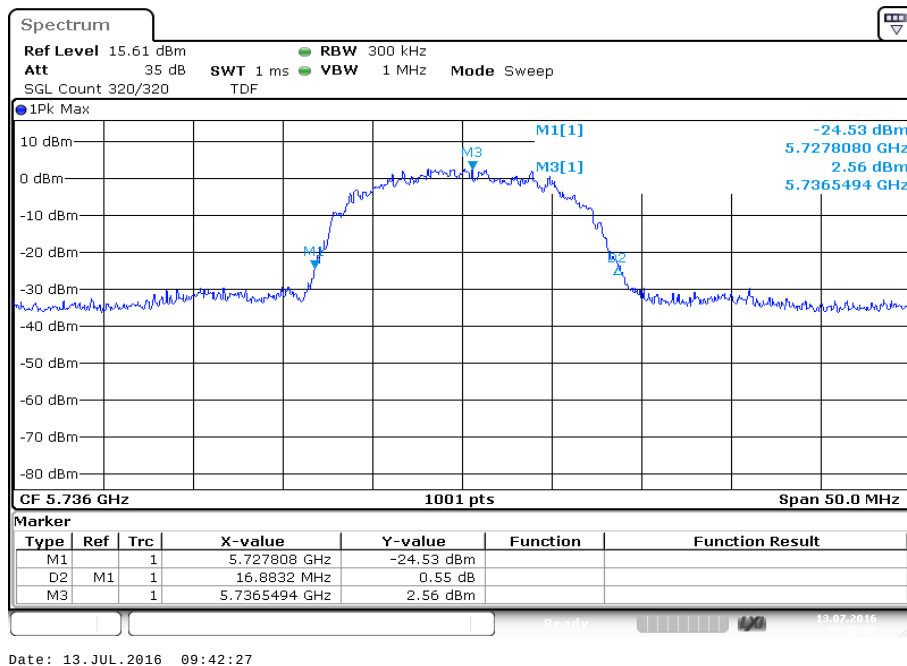
**Plot 2:** 5210 MHz



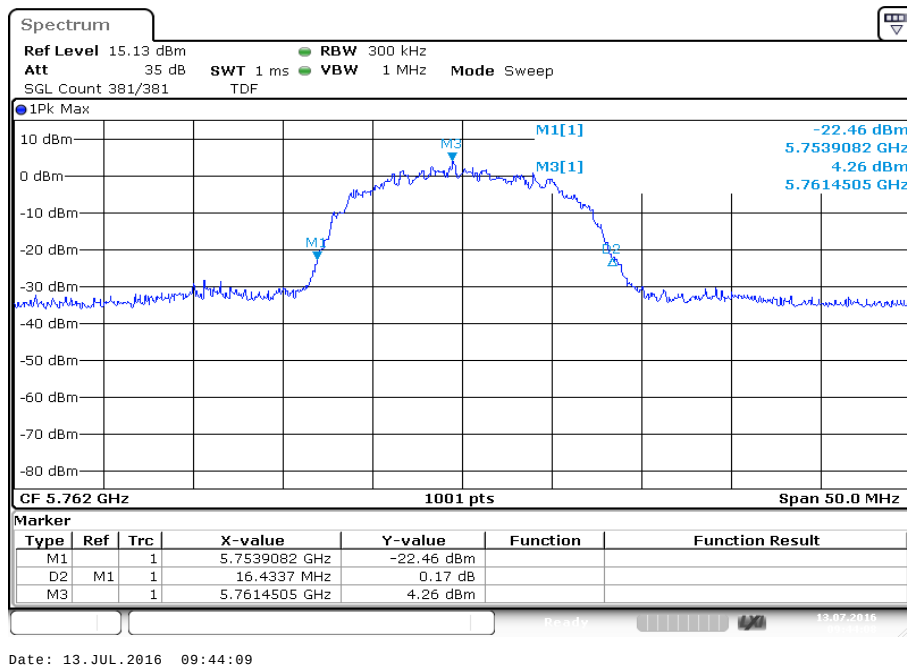
Plot 3: 5240 MHz



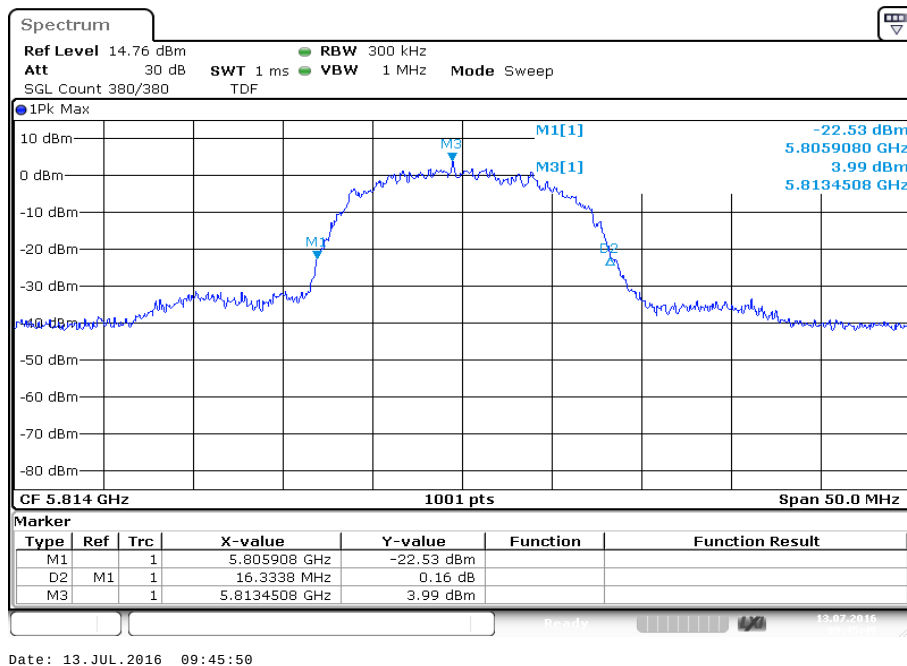
Plot 4: 5736 MHz

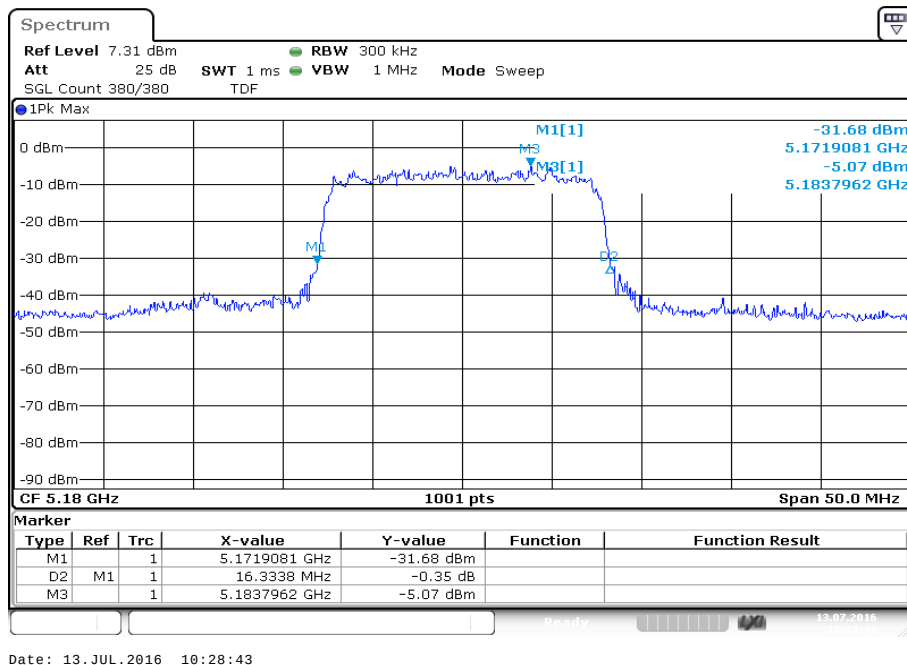
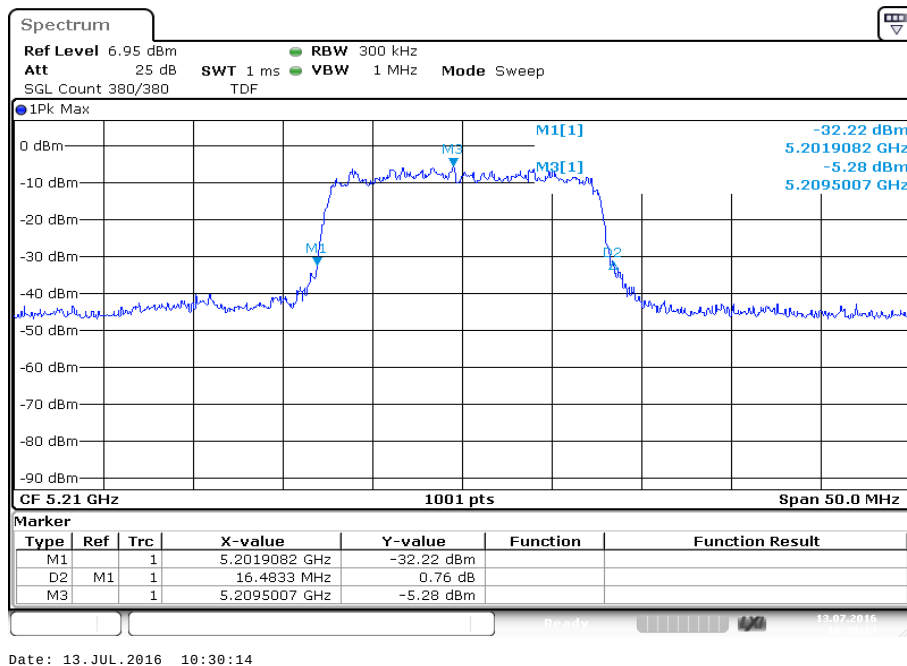


Plot 5: 5762 MHz

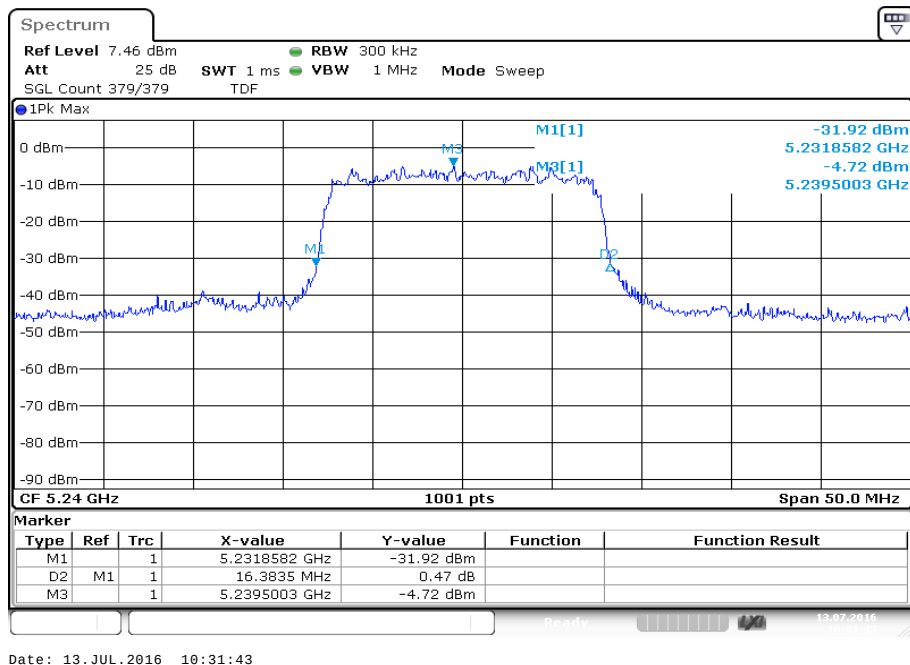


Plot 6: 5814 MHz

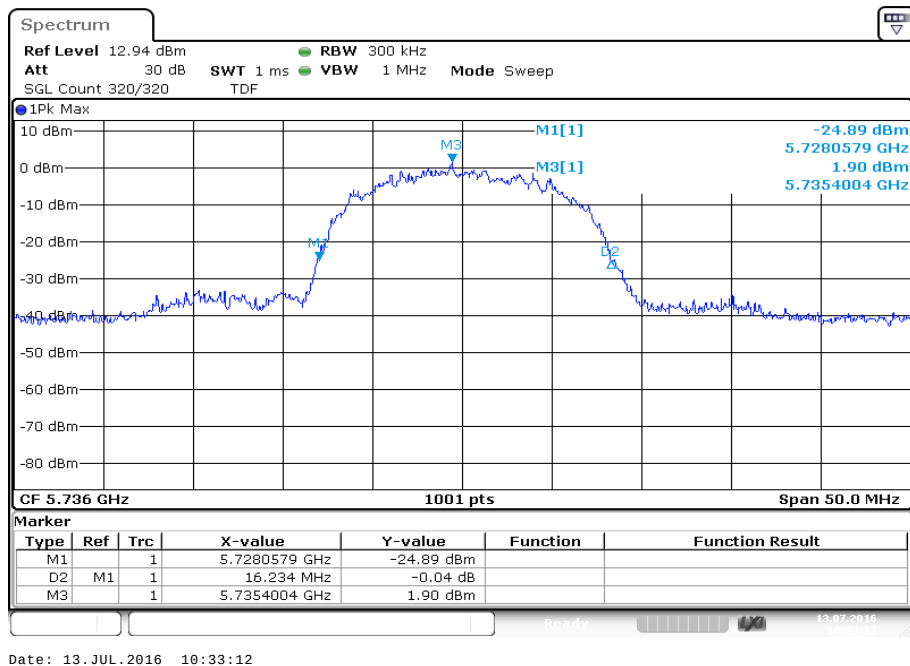


**Plots:** BPSK – mode / Antenna B**Plot 1:** 5180 MHz**Plot 2:** 5210 MHz

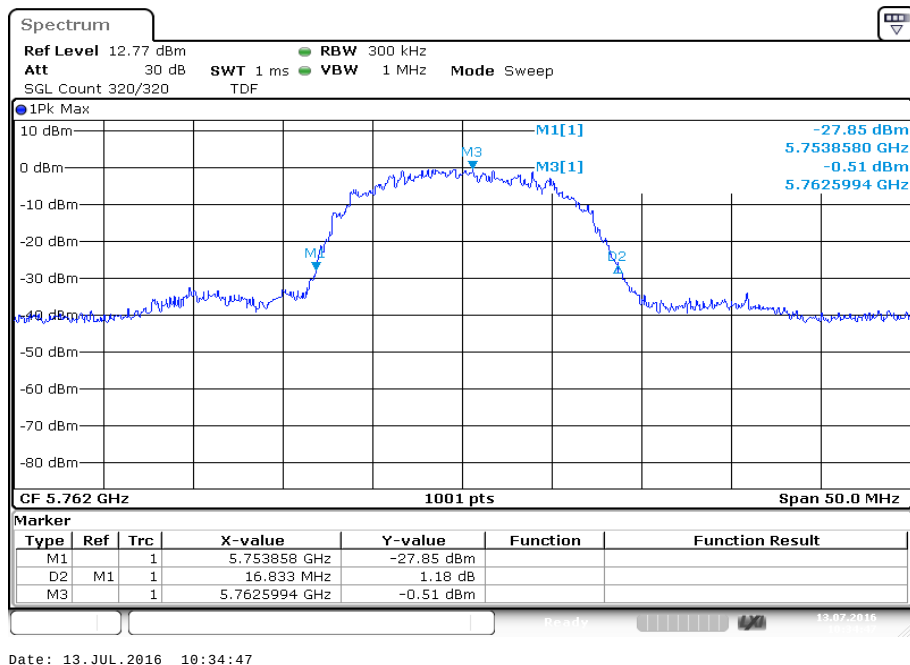
Plot 3: 5240 MHz



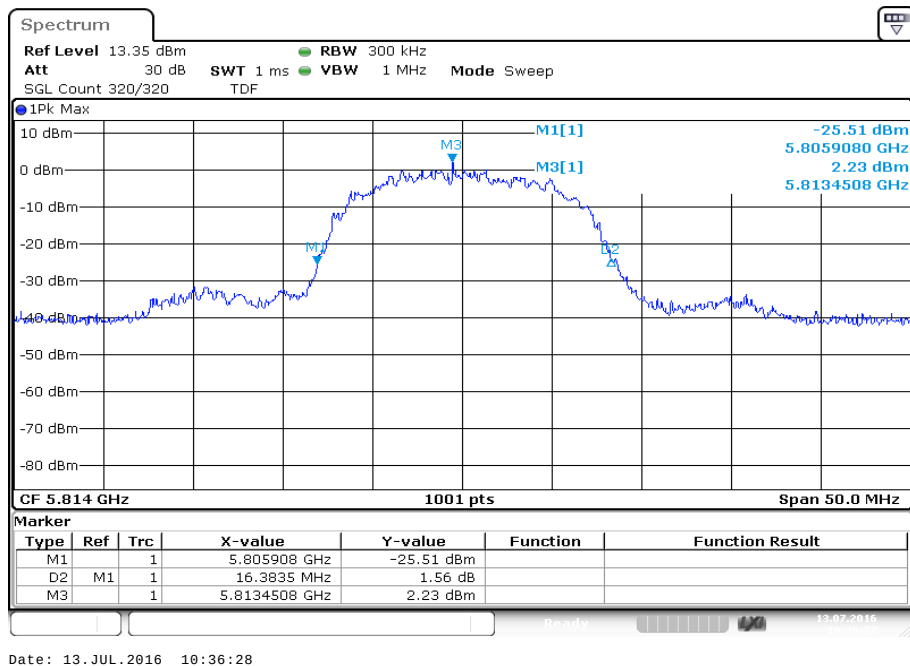
Plot 4: 5736 MHz



Plot 5: 5762 MHz

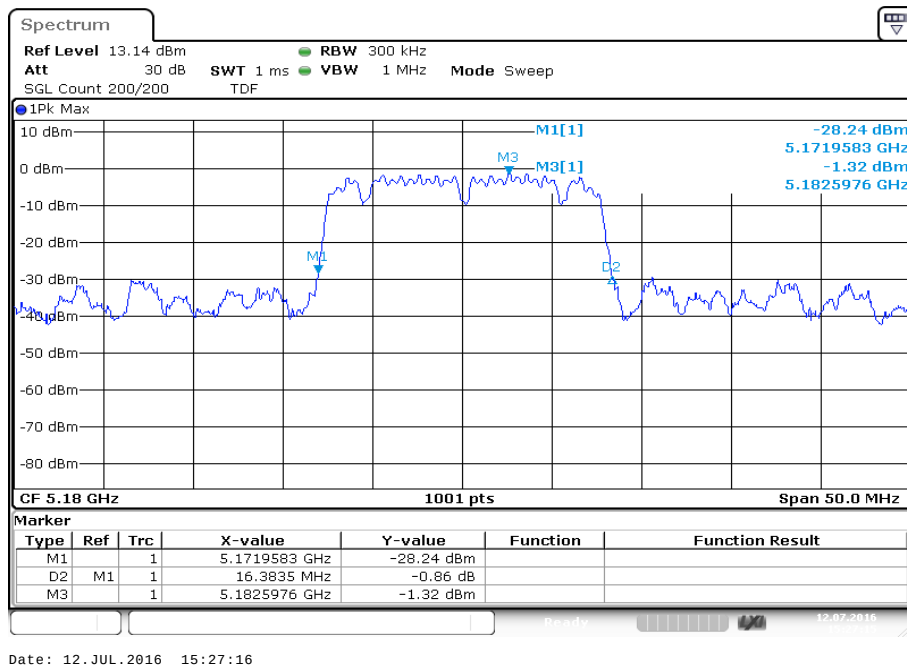


Plot 6: 5814 MHz

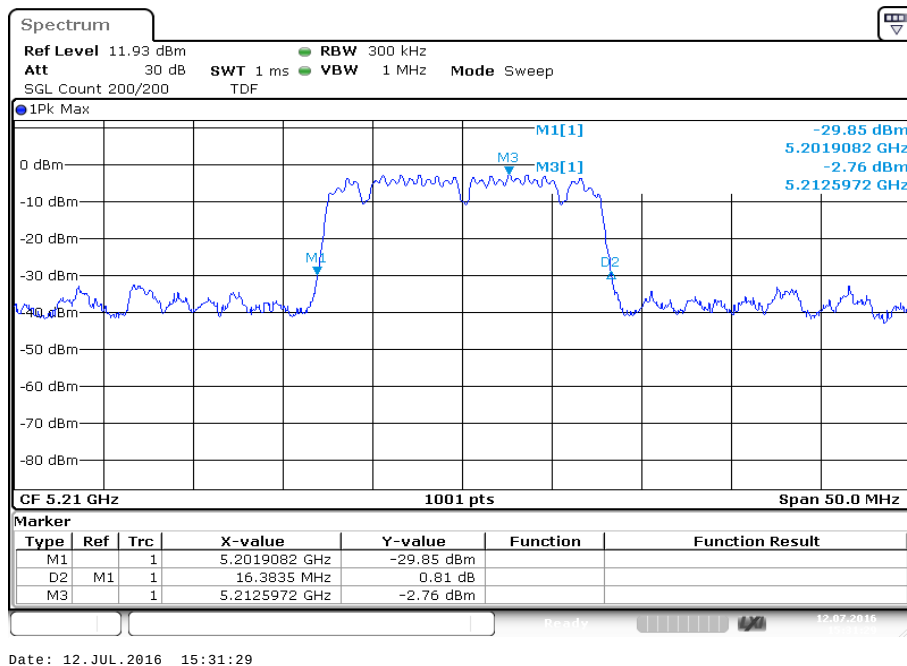


**Plots:** QPSK – mode / Antenna A

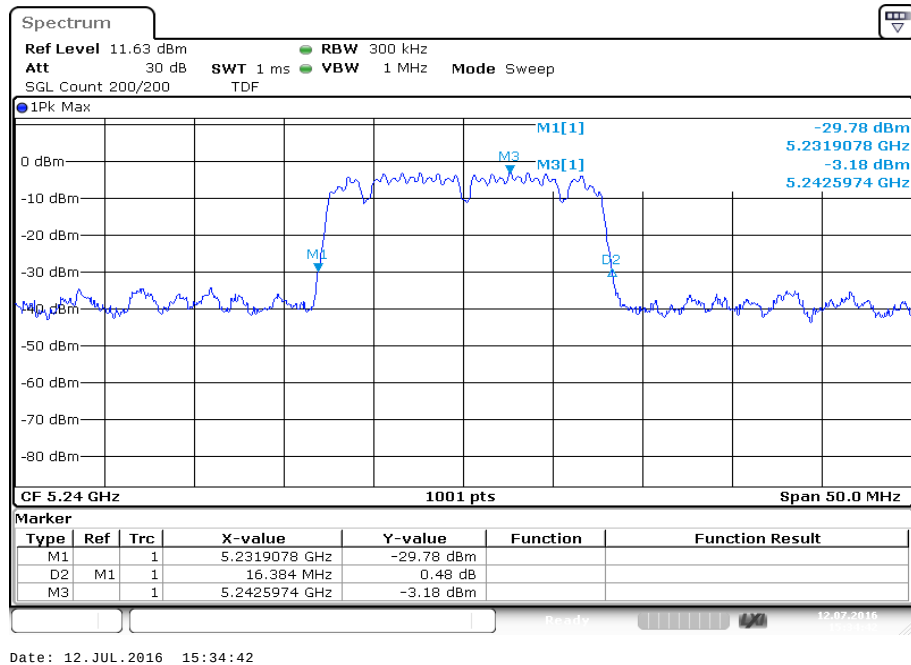
**Plot 1:** 5180 MHz



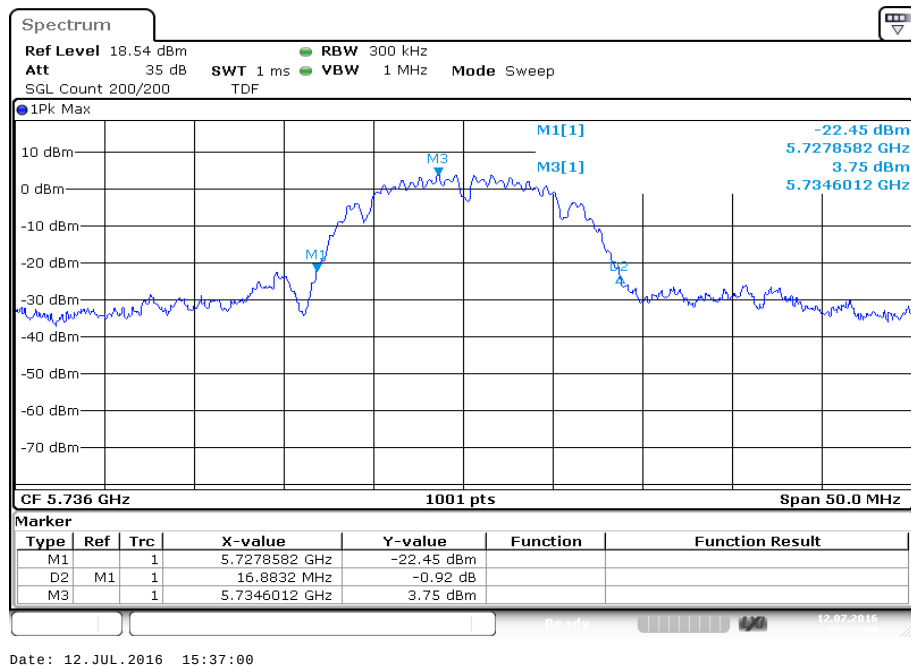
**Plot 2:** 5210 MHz



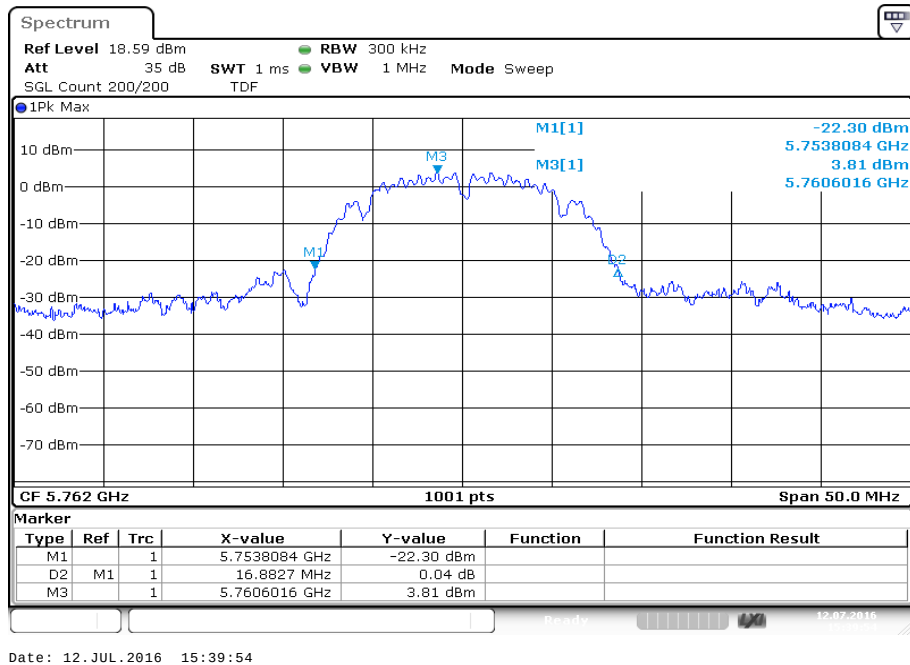
Plot 3: 5240 MHz



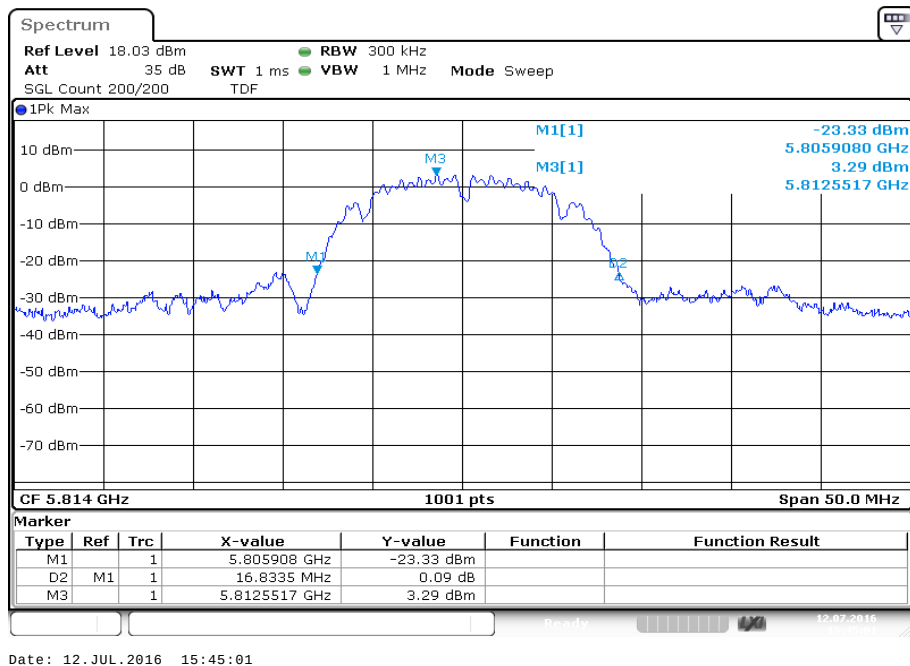
Plot 4: 5736 MHz

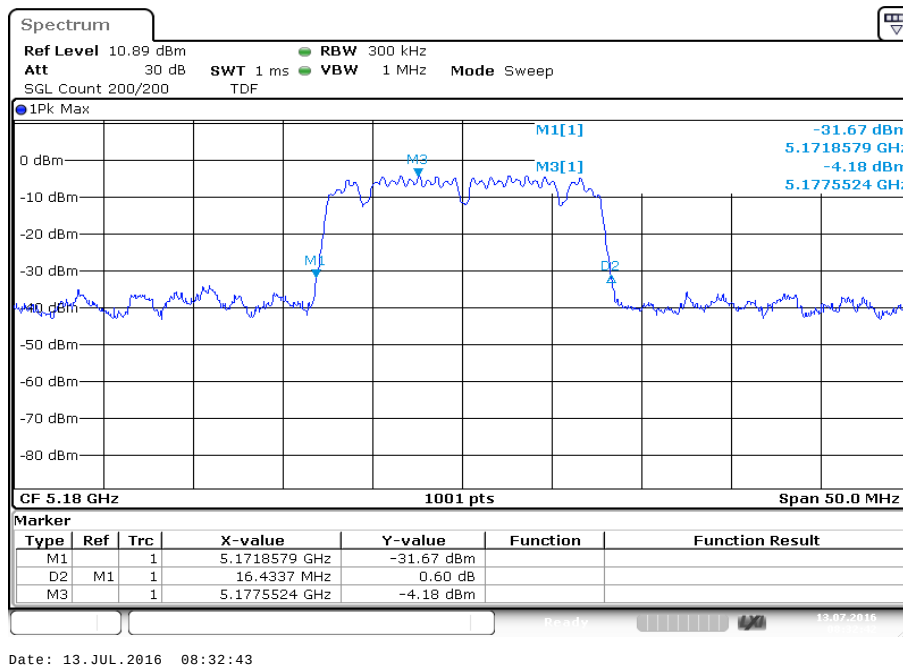
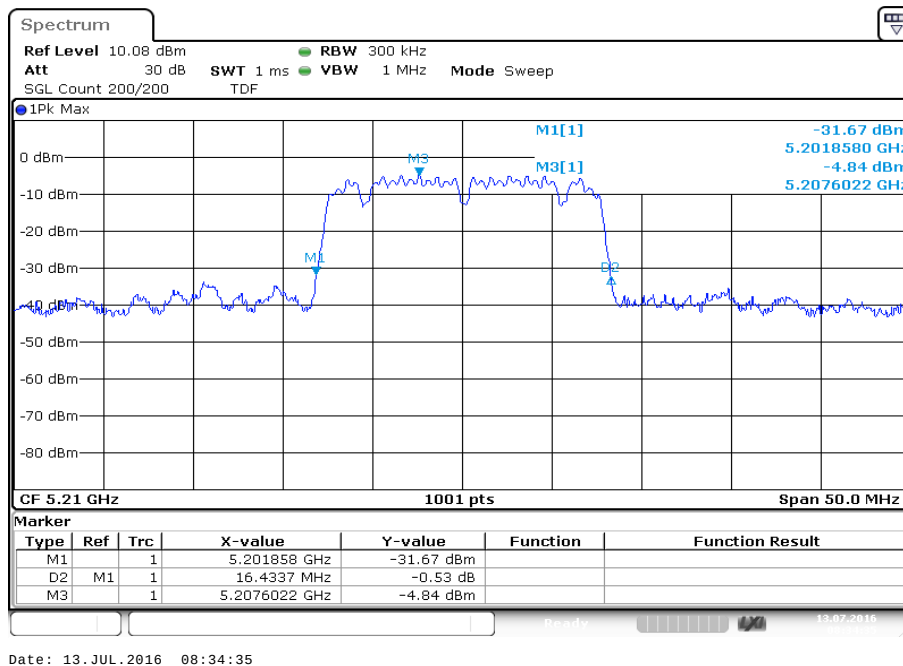


Plot 5: 5762 MHz

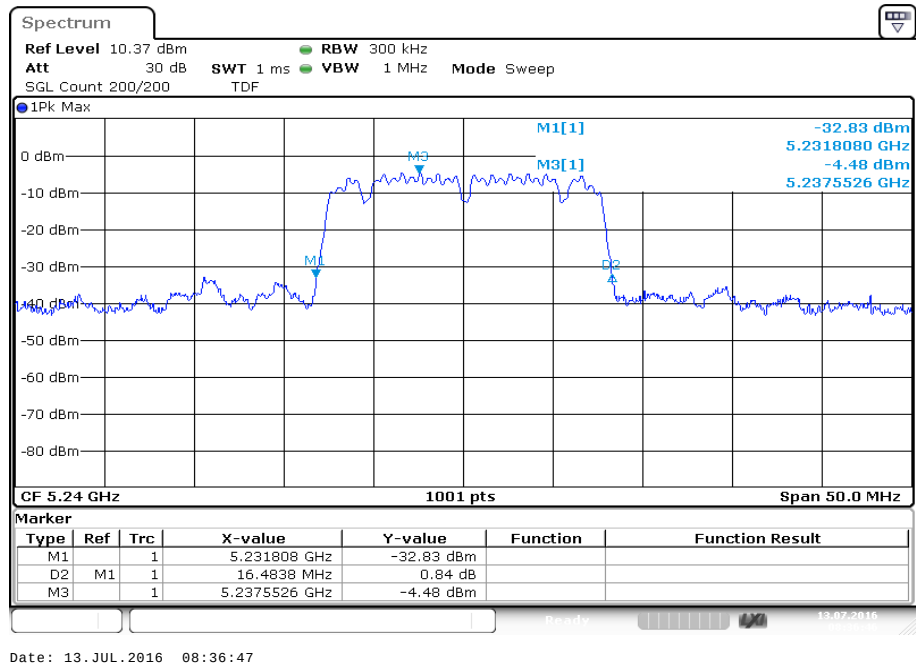


Plot 6: 5814 MHz

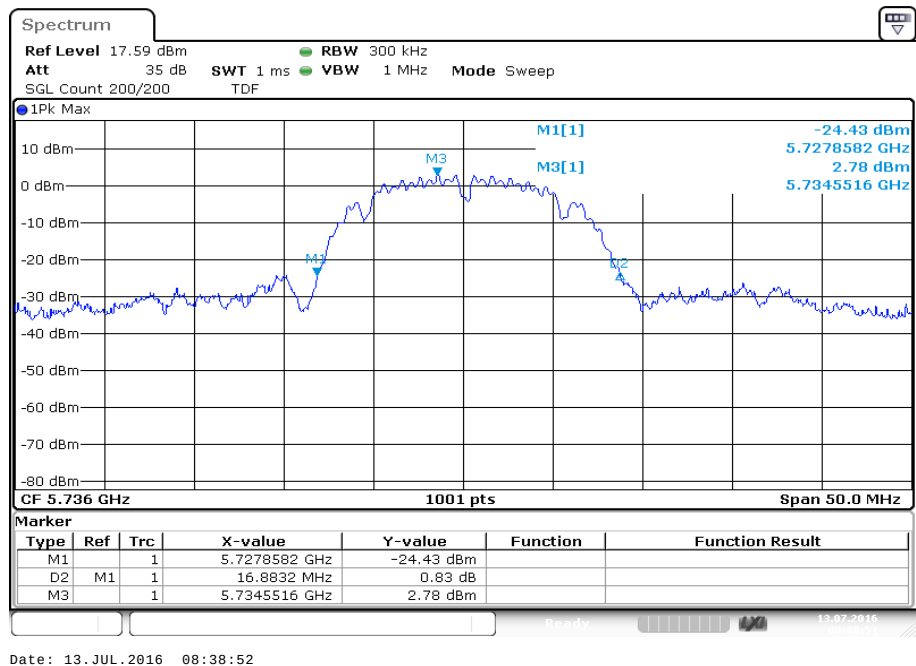


**Plots:** QPSK – mode / Antenna B**Plot 1:** 5180 MHz**Plot 2:** 5210 MHz

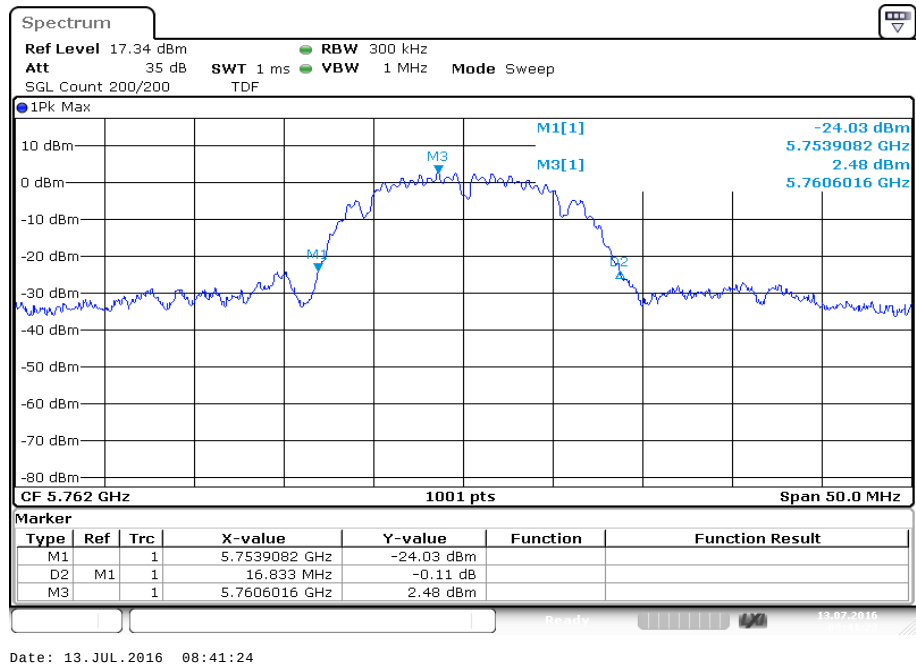
Plot 3: 5240 MHz



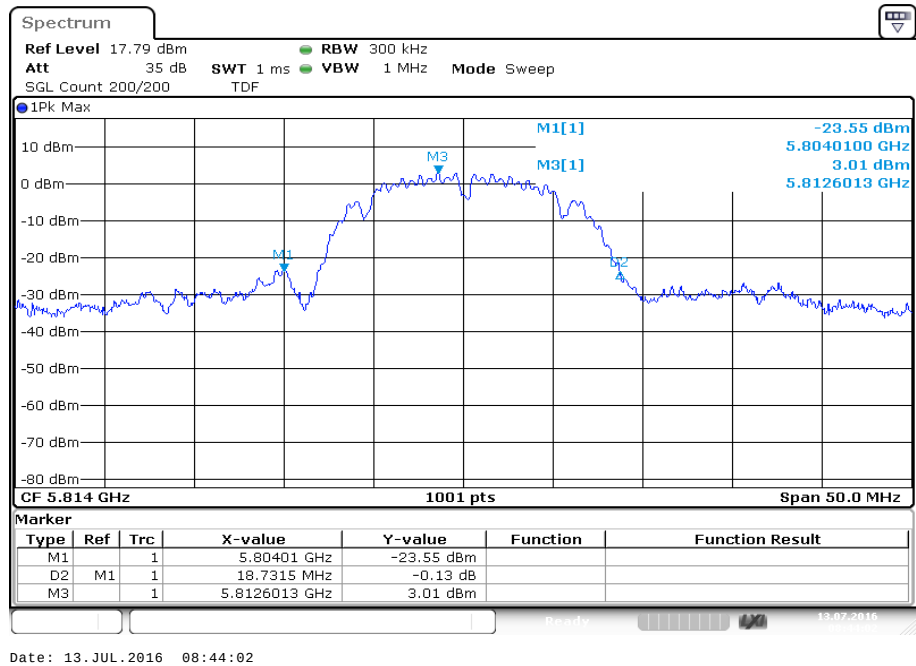
Plot 4: 5736 MHz



Plot 5: 5762 MHz



Plot 6: 5814 MHz



## 12.7 Occupied bandwidth – 99% emission bandwidth

### Description:

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

### 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 – Items A                                                    |
| Measurement uncertainty: | See sub clause 9                                                                |

### Usage:

| -/-                                         | IC |
|---------------------------------------------|----|
| Occupied Bandwidth – 99% emission bandwidth |    |
| OBW is necessary for Emission Designator    |    |

**Result:**

BPSK – mode / Antenna A

| BPSK – mode<br>Frequency | 99% bandwidth [kHz] |          |          |     |
|--------------------------|---------------------|----------|----------|-----|
|                          | 5180 MHz            | 5210 MHz | 5240 MHz | -/- |
|                          | 15084.9             | 150349.7 | 14935.1  | -/- |
| Frequency                | 5736 MHz            | 5762 MHz | 5814 MHz | -/- |
|                          | 13986.0             | 13986.0  | 13986.0  | -/- |

BPSK – mode / Antenna B

| BPSK – mode<br>Frequency | 99% bandwidth [kHz] |          |          |     |
|--------------------------|---------------------|----------|----------|-----|
|                          | 5180 MHz            | 5210 MHz | 5240 MHz | -/- |
|                          | 15035.0             | 15035.0  | 15035.0  | -/- |
| Frequency                | 5736 MHz            | 5762 MHz | 5814 MHz | -/- |
|                          | 14036.0             | 13886.1  | 14036.0  | -/- |

QPSK – mode / Antenna A

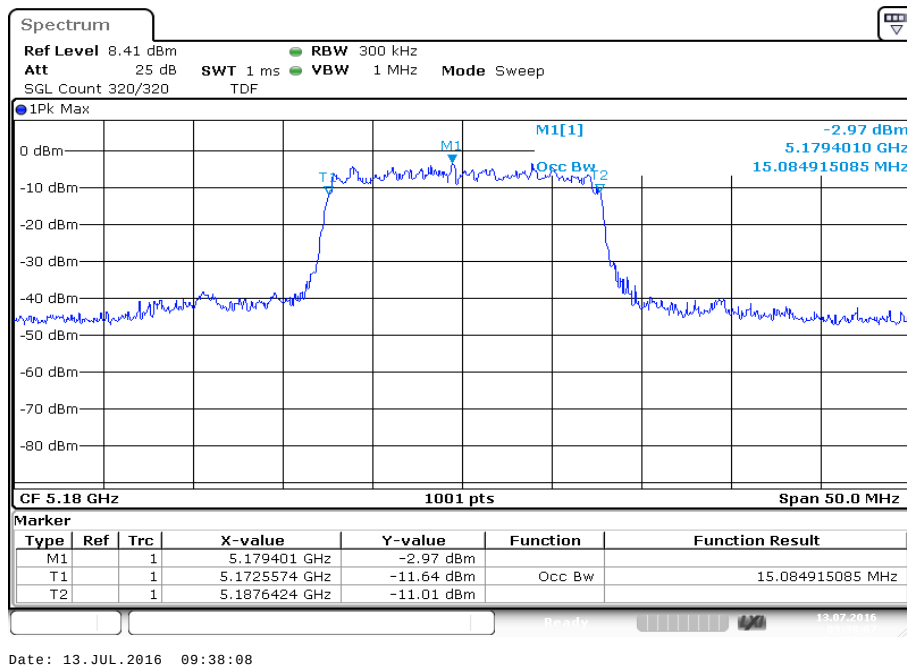
| QPSK – mode<br>Frequency | 99% bandwidth [kHz] |          |          |     |
|--------------------------|---------------------|----------|----------|-----|
|                          | 5180 MHz            | 5210 MHz | 5240 MHz | -/- |
|                          | 15135.0             | 15135.0  | 15085.0  | -/- |
| Frequency                | 5736 MHz            | 5762 MHz | 5814 MHz | -/- |
|                          | 14086.0             | 14136.0  | 14136.0  | -/- |

QPSK – mode / Antenna B

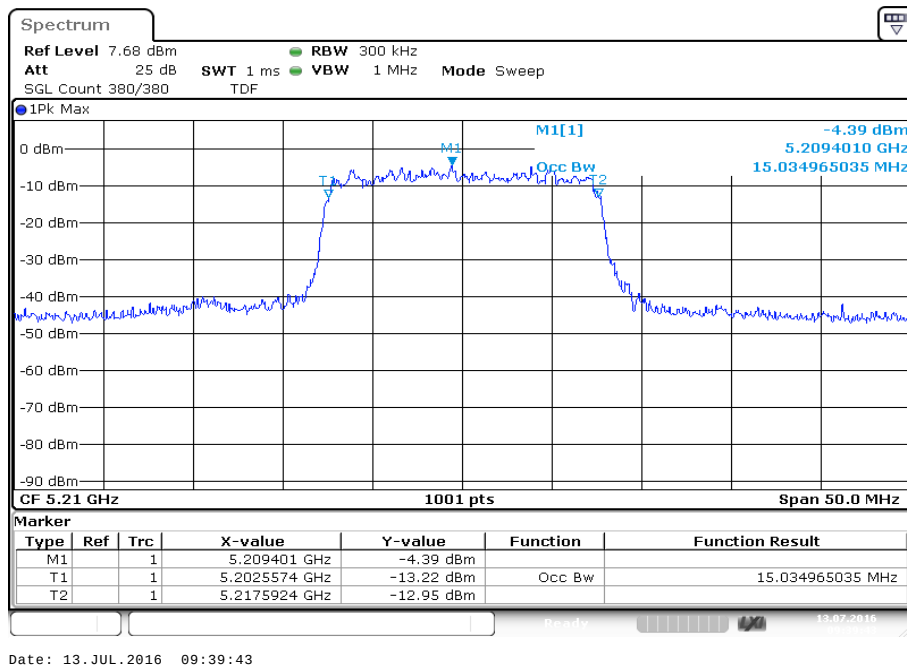
| QPSK – mode<br>Frequency | 99% bandwidth [kHz] |          |          |     |
|--------------------------|---------------------|----------|----------|-----|
|                          | 5180 MHz            | 5210 MHz | 5240 MHz | -/- |
|                          | 15135.0             | 15135.0  | 15135.0  | -/- |
| Frequency                | 5736 MHz            | 5762 MHz | 5814 MHz | -/- |
|                          | 14136.0             | 14186.0  | 14136.0  | -/- |

**Plots:** BPSK – mode / Antenna A

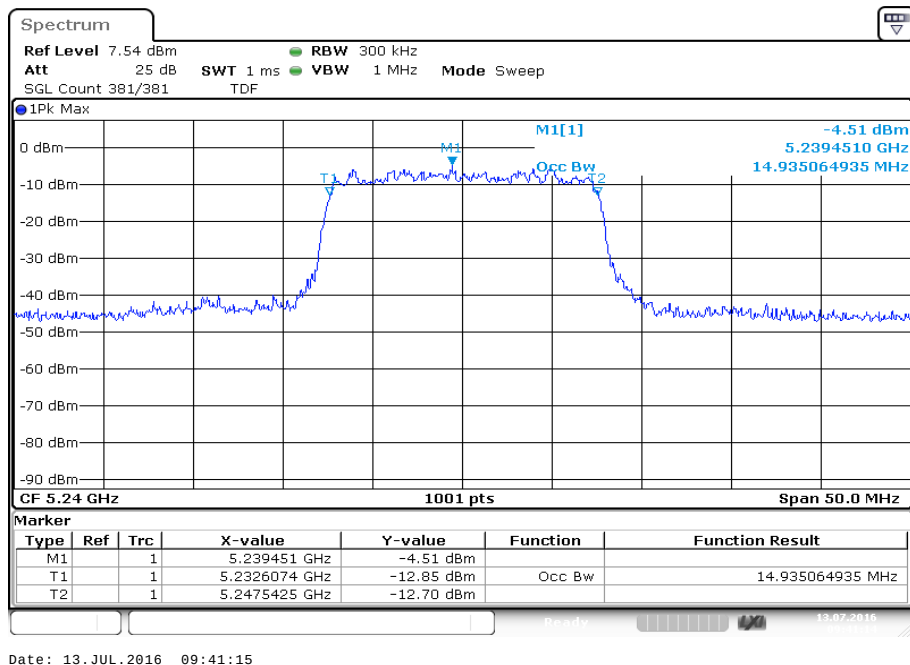
**Plot 1:** 5180 MHz



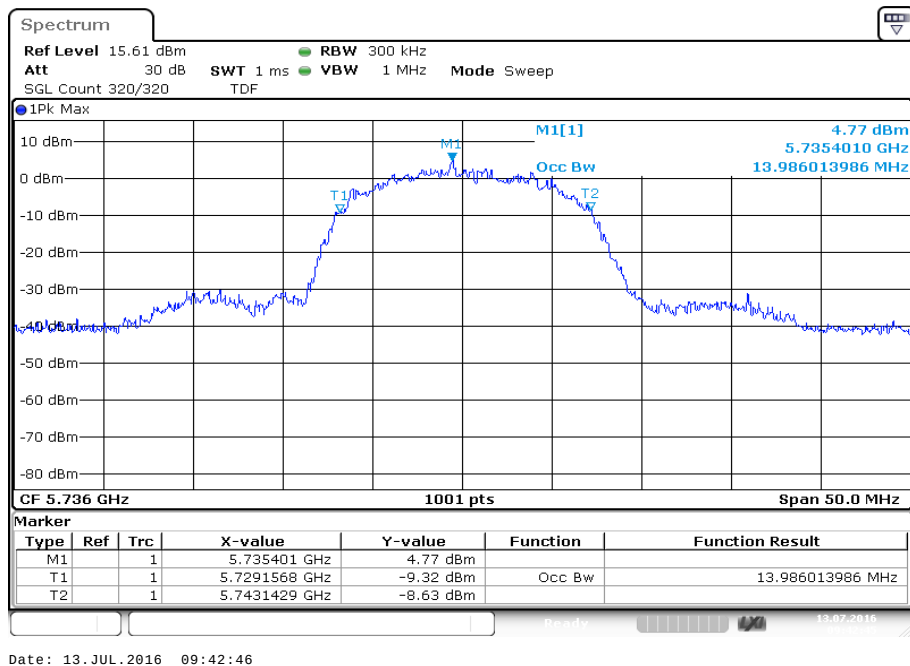
**Plot 2:** 5210 MHz



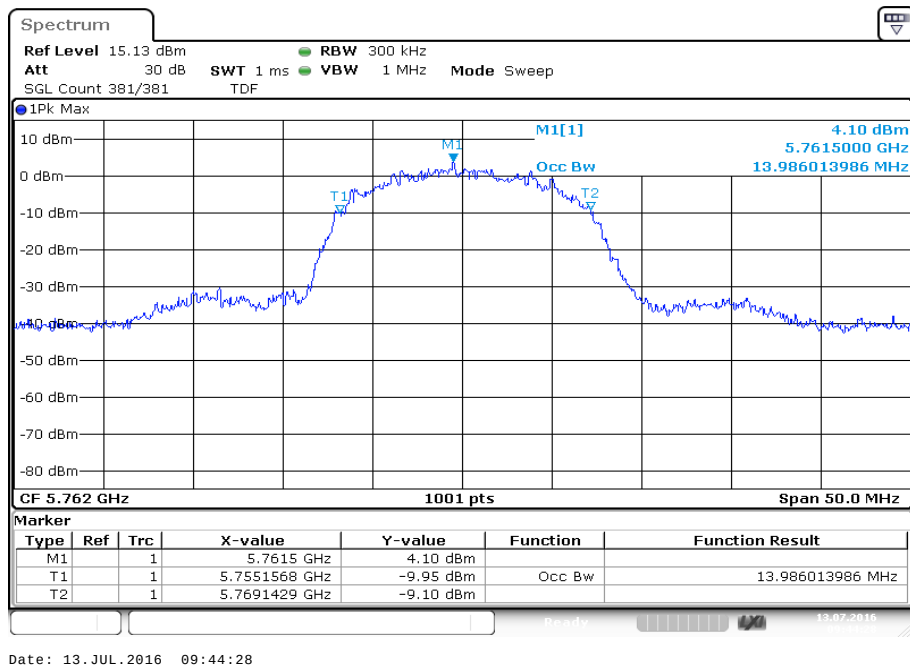
Plot 3: 5240 MHz



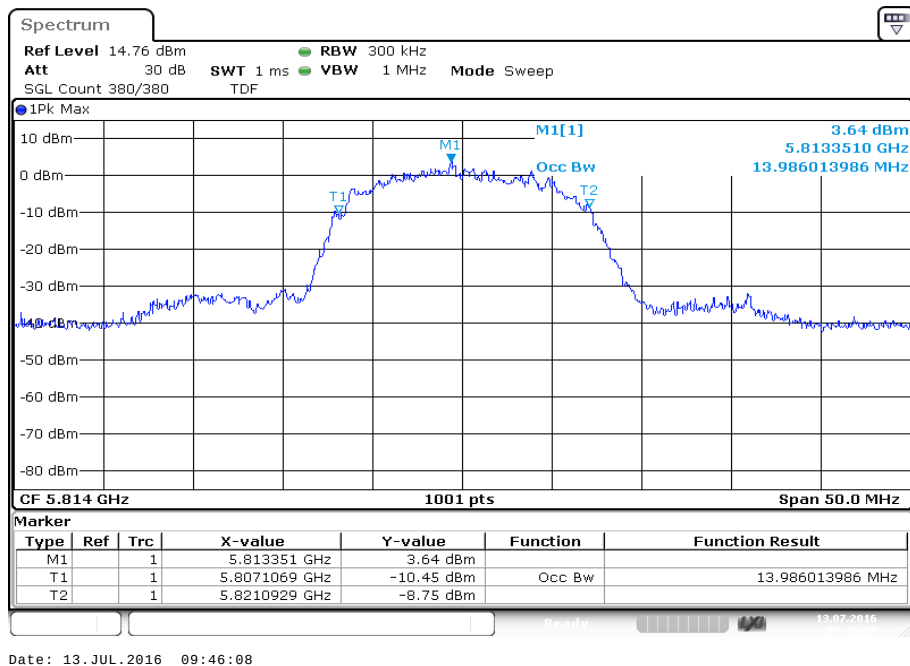
Plot 4: 5736 MHz

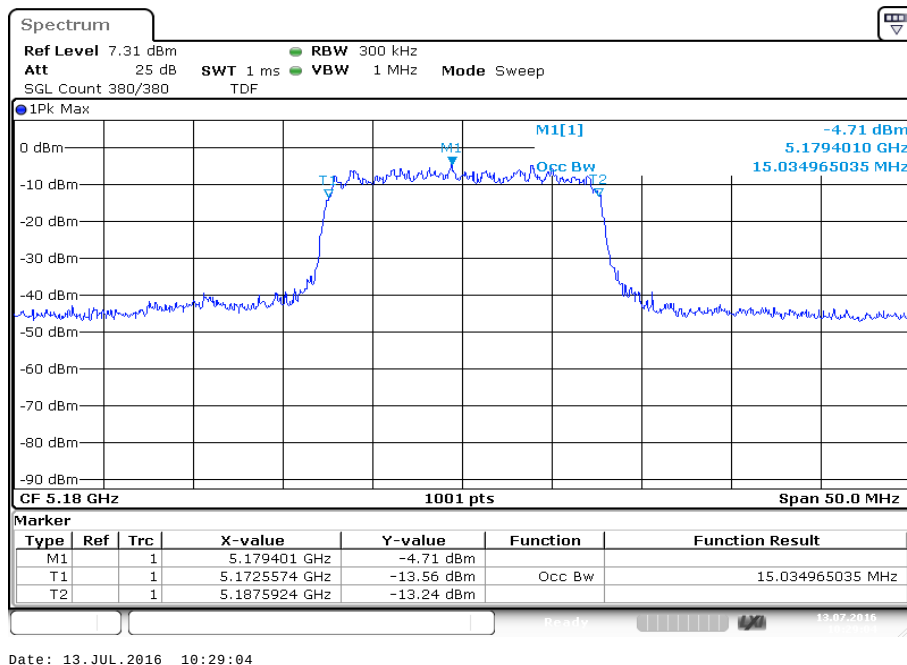
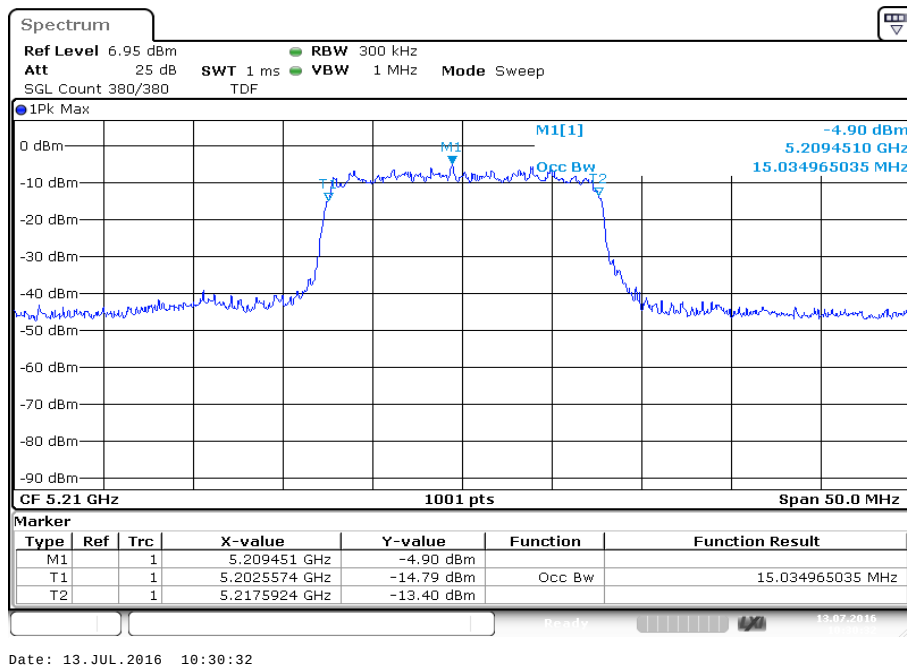


Plot 5: 5762 MHz

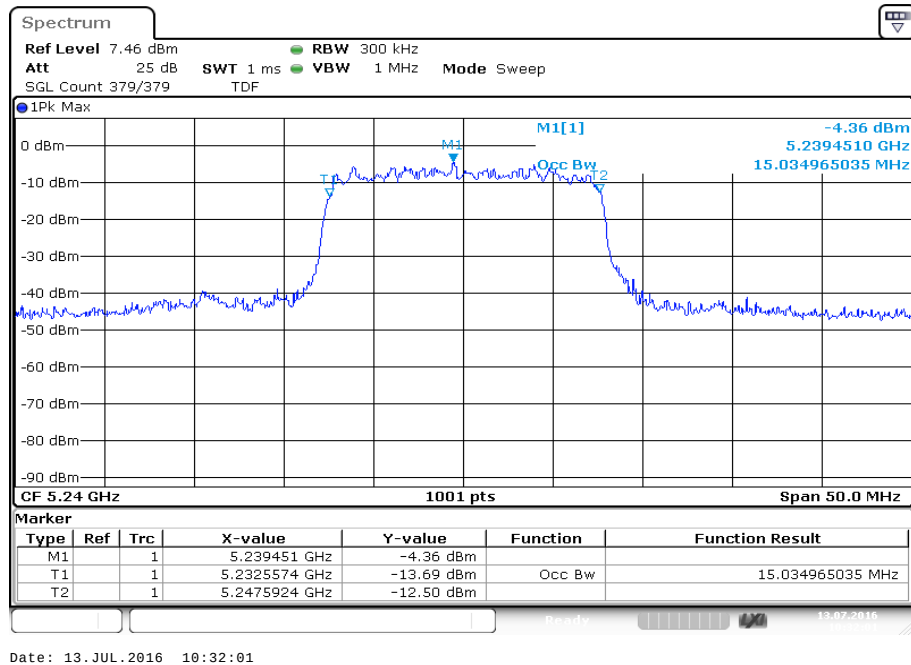


Plot 6: 5814 MHz

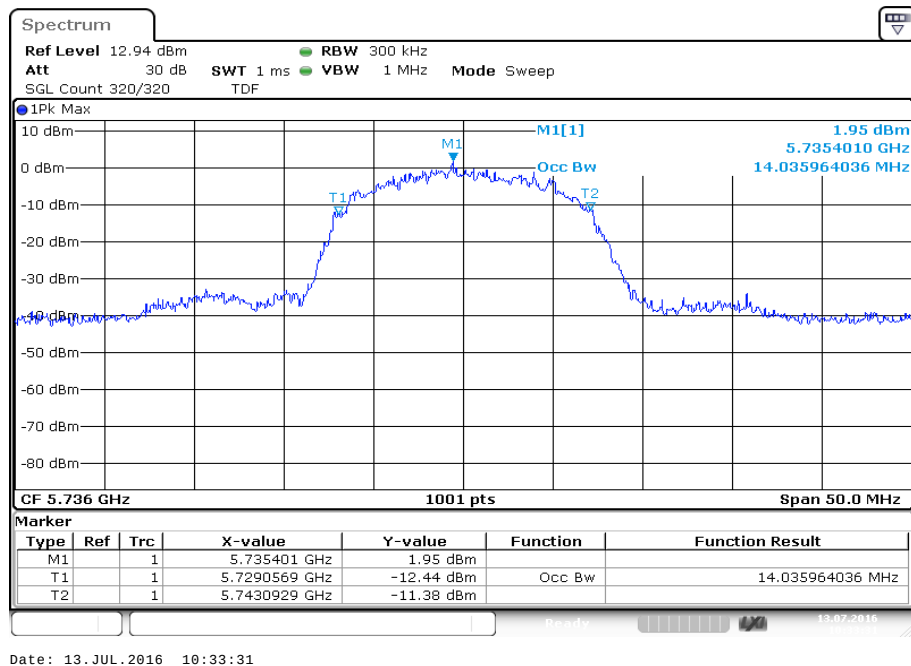


**Plots:** BPSK – mode / Antenna B**Plot 1:** 5180 MHz**Plot 2:** 5210 MHz

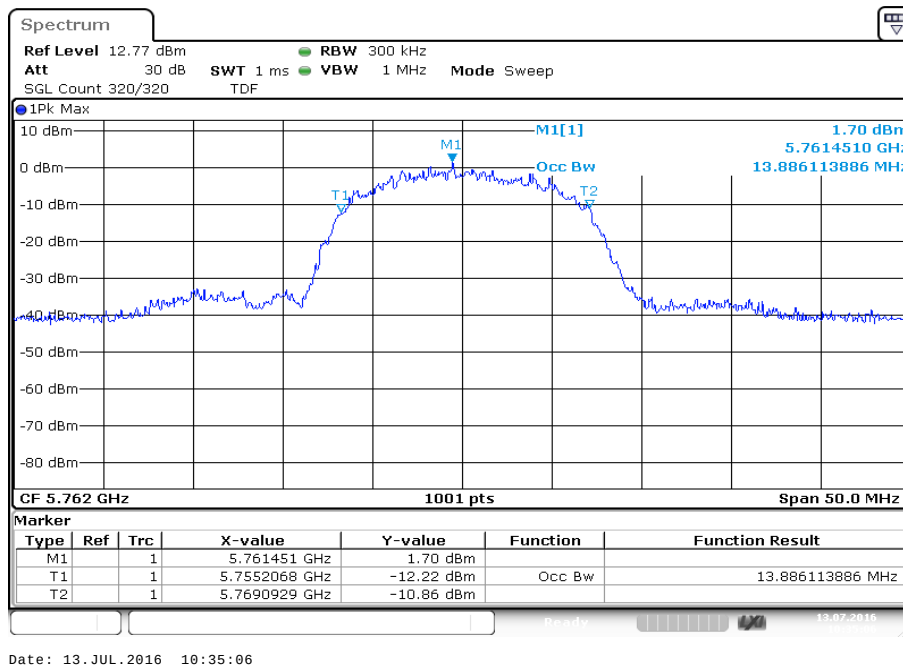
Plot 3: 5240 MHz



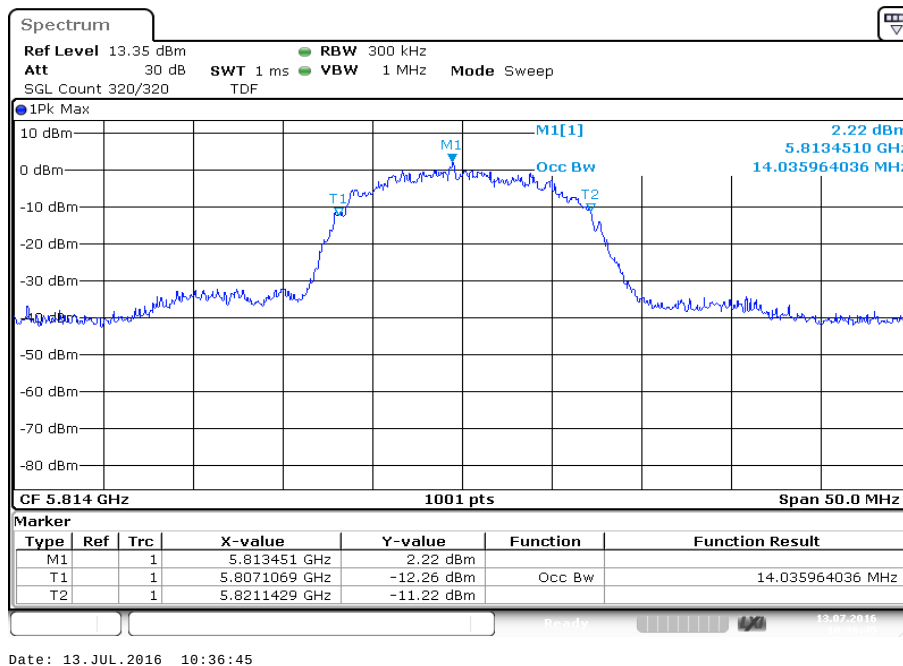
Plot 4: 5736 MHz

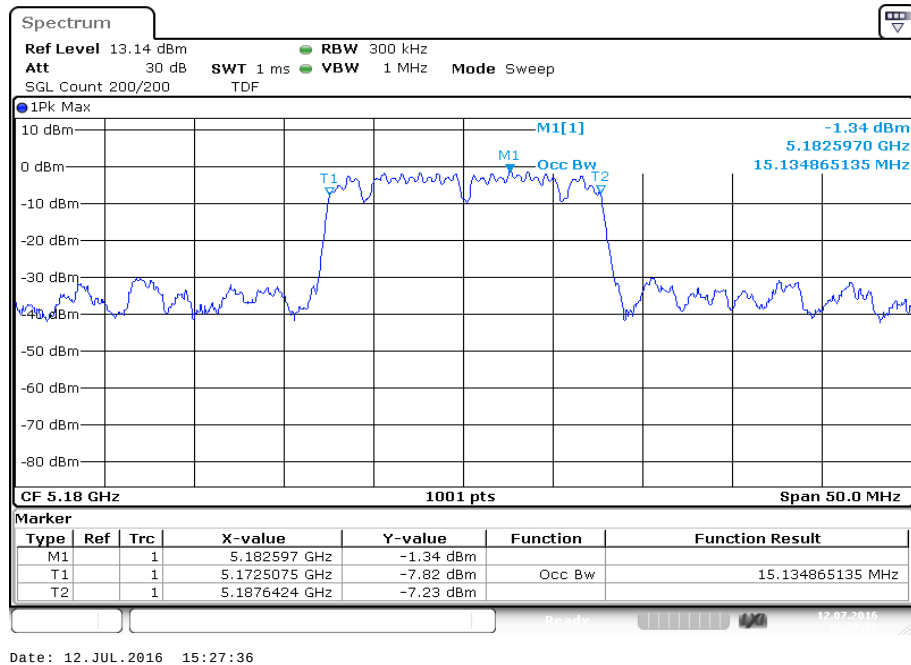
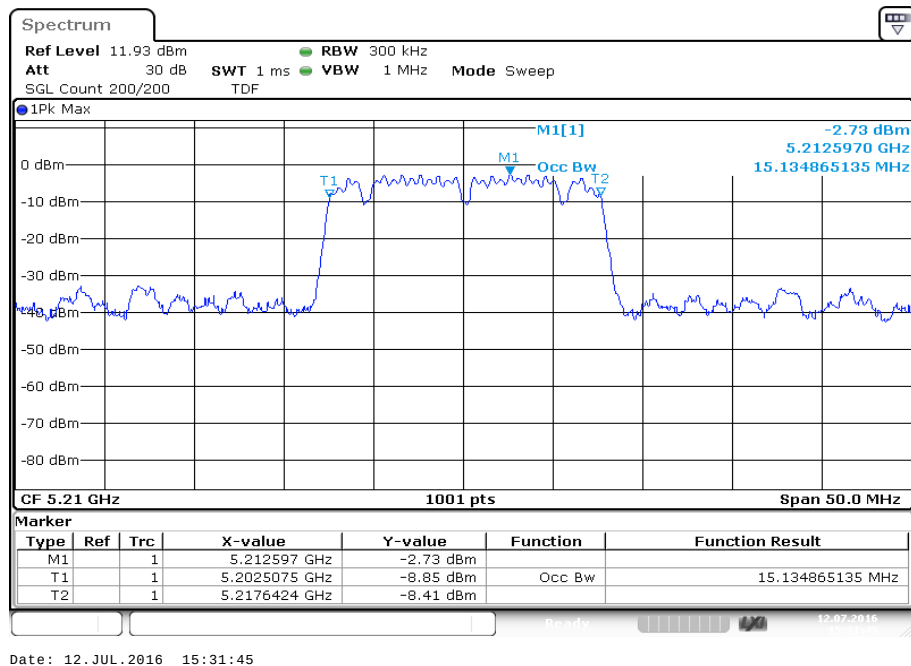


Plot 5: 5762 MHz

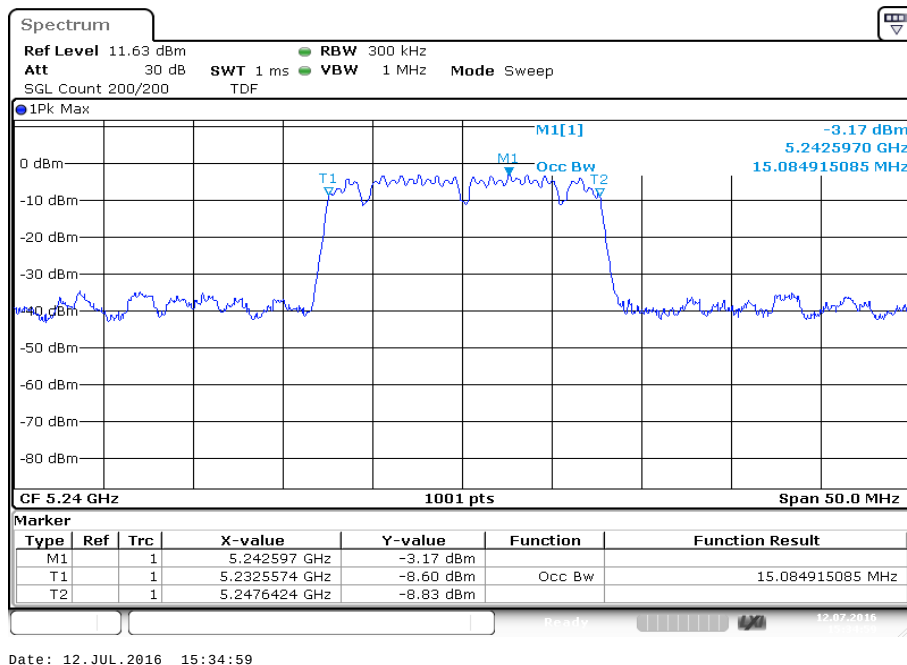


Plot 6: 5814 MHz

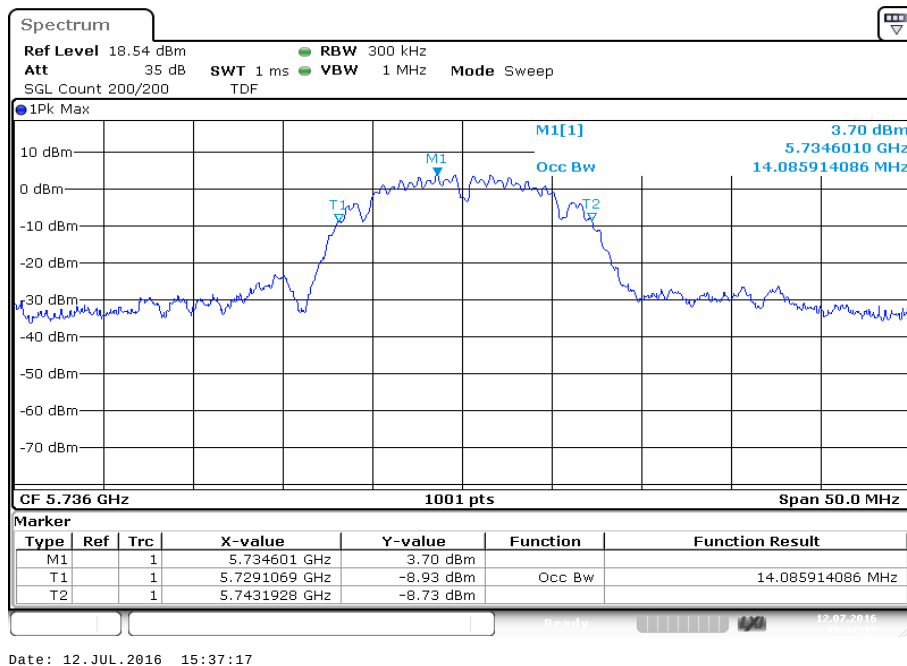


**Plots:** QPSK – mode / Antenna A**Plot 1:** 5180 MHz**Plot 2:** 5210 MHz

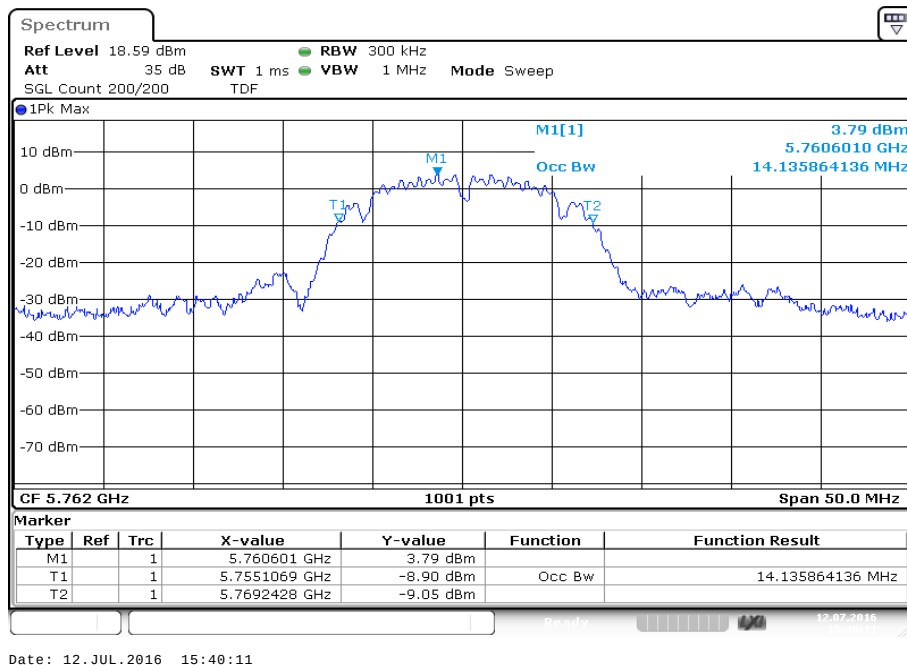
Plot 3: 5240 MHz



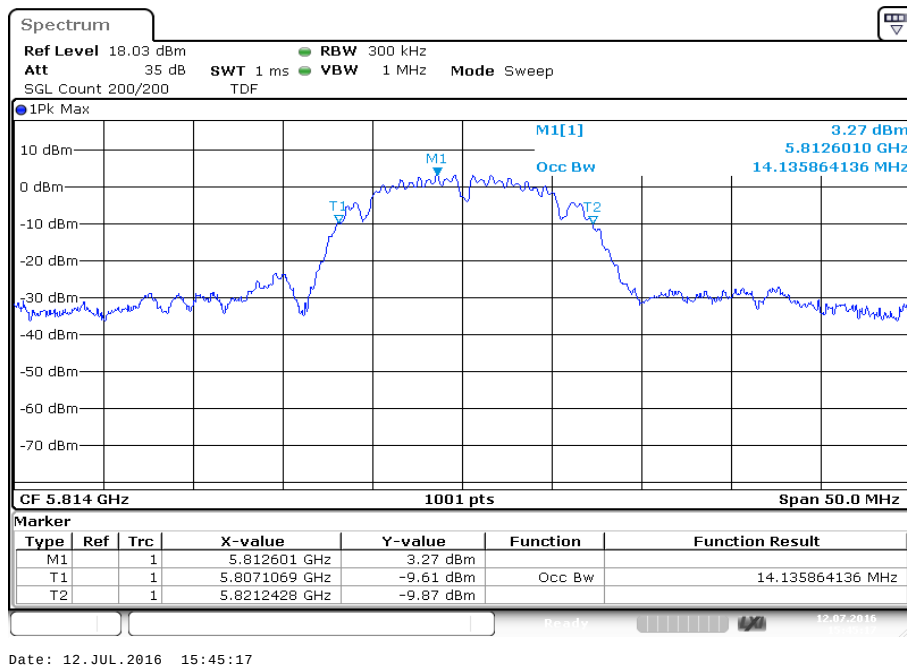
Plot 4: 5736 MHz

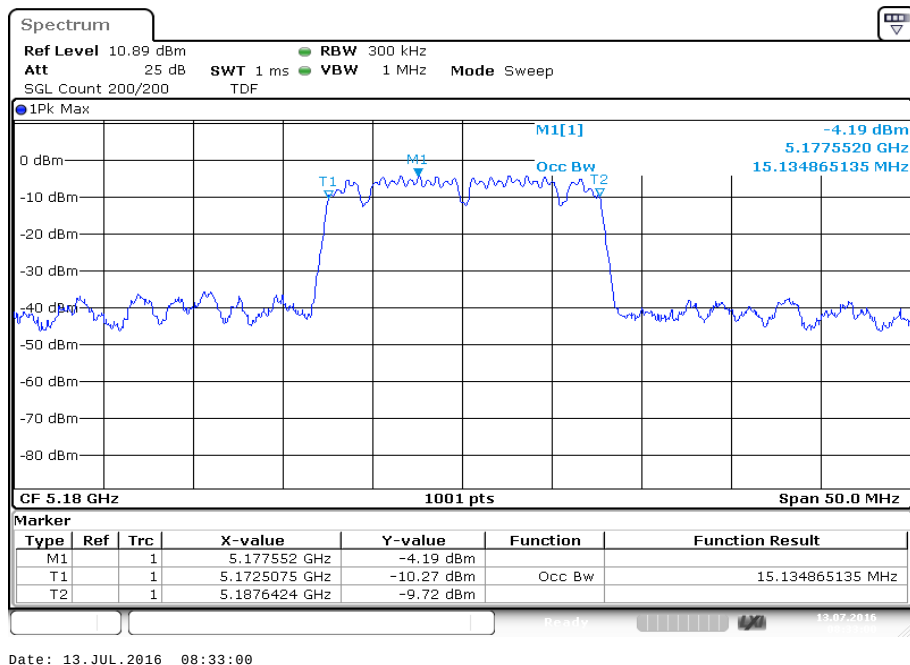
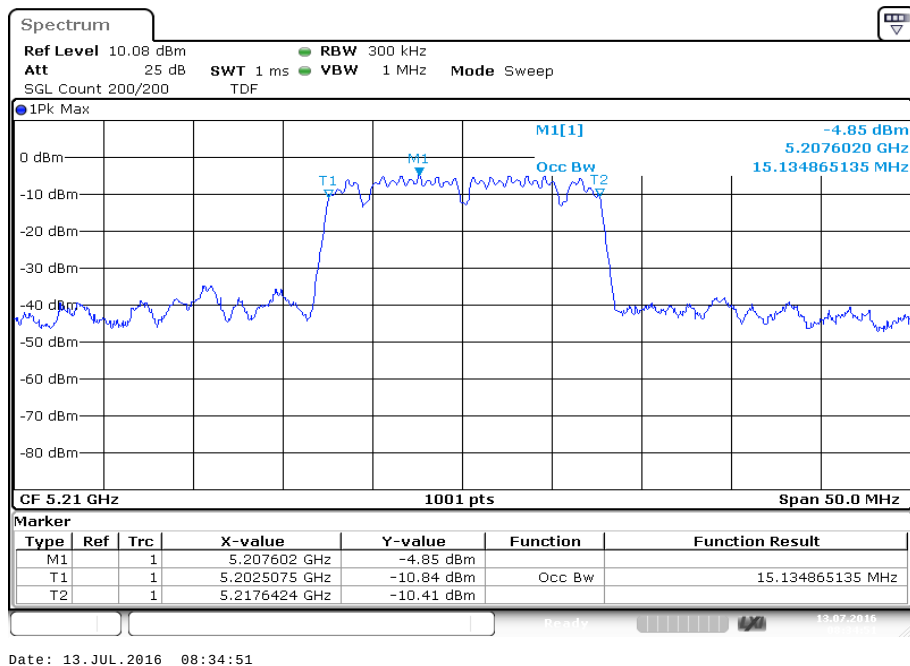


Plot 5: 5762 MHz

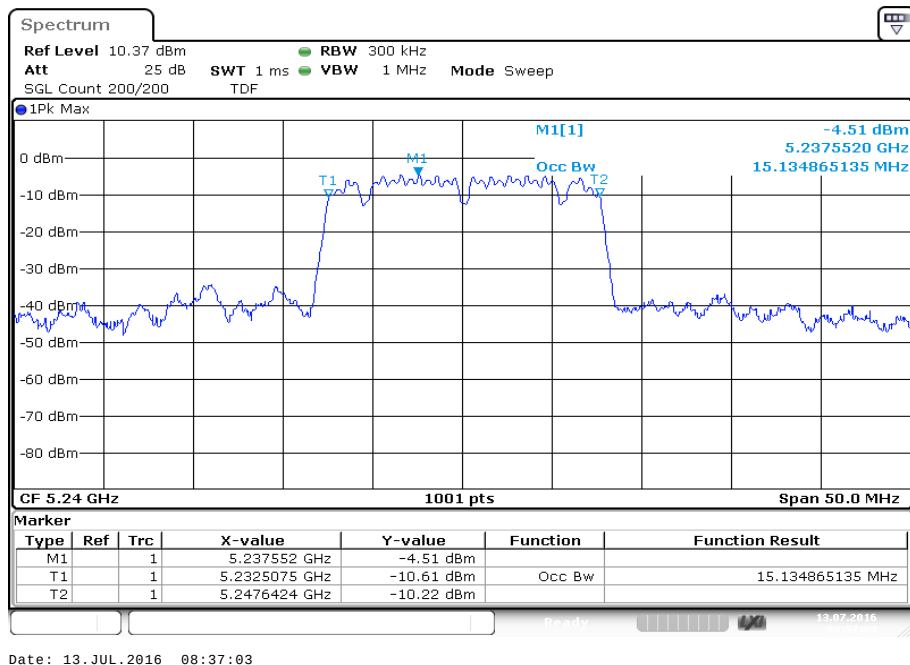


Plot 6: 5814 MHz

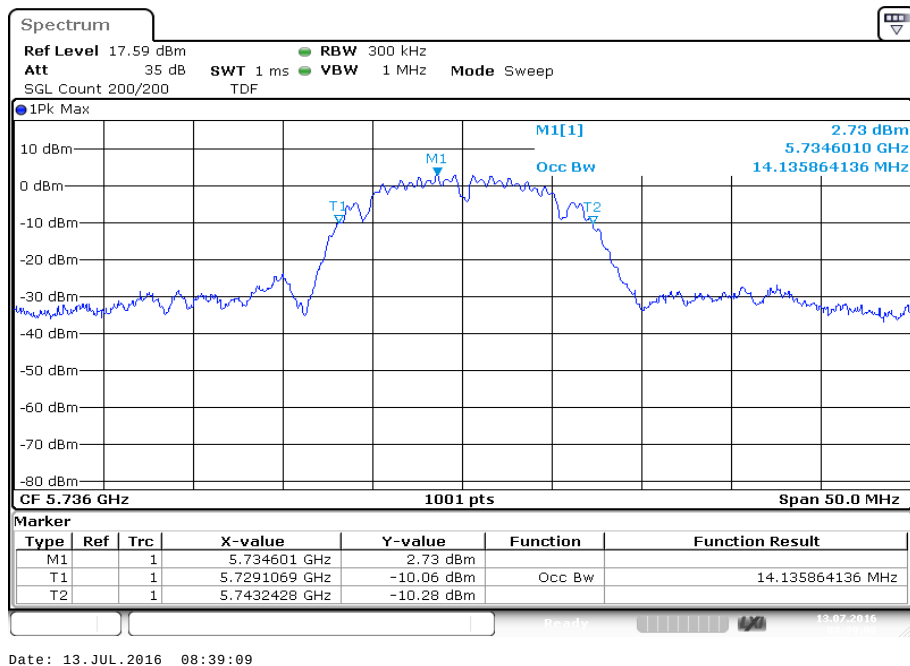


**Plots:** QPSK – mode / Antenna B**Plot 1:** 5180 MHz**Plot 2:** 5210 MHz

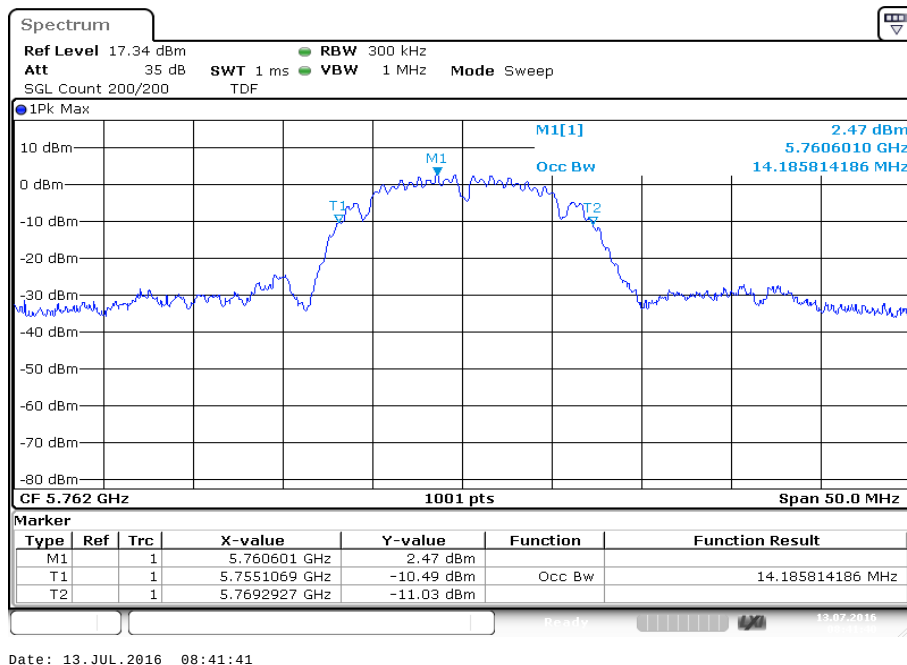
Plot 3: 5240 MHz



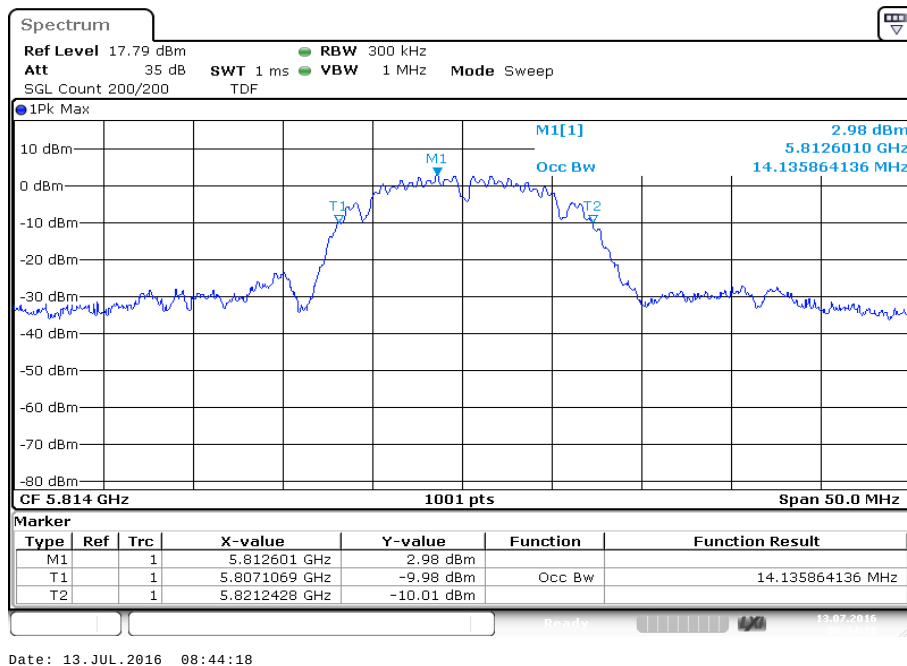
Plot 4: 5736 MHz



Plot 5: 5762 MHz



Plot 6: 5814 MHz



## 12.8 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:         | $\geq 3 \times \text{RBW}$ |
| Span:                    | See plots!                 |
| Trace – mode:            | Max Hold                   |
| Test setup:              | See sub clause 7.2 – A     |
| Measurement uncertainty: | See sub clause 9           |

### Limits:

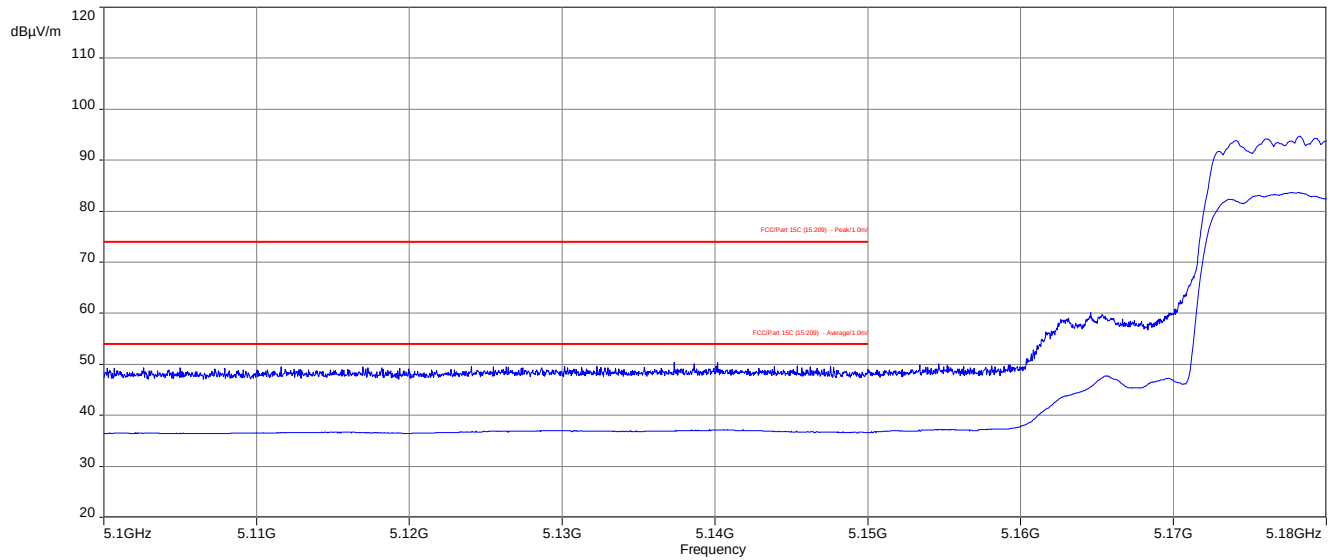
| Band Edge Compliance Radiated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 (average)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### Result:

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

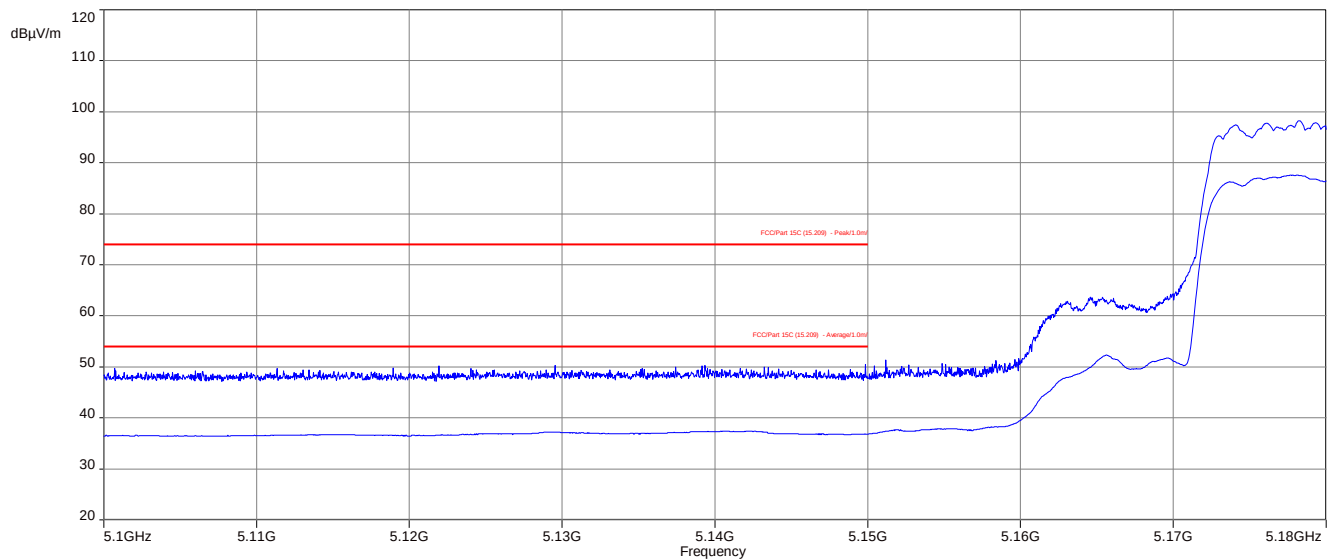
**Plots:** BPSK – mode / Antenna A

**Plot 1:** lower band edge, vertical & horizontal polarization – 5180 MHz



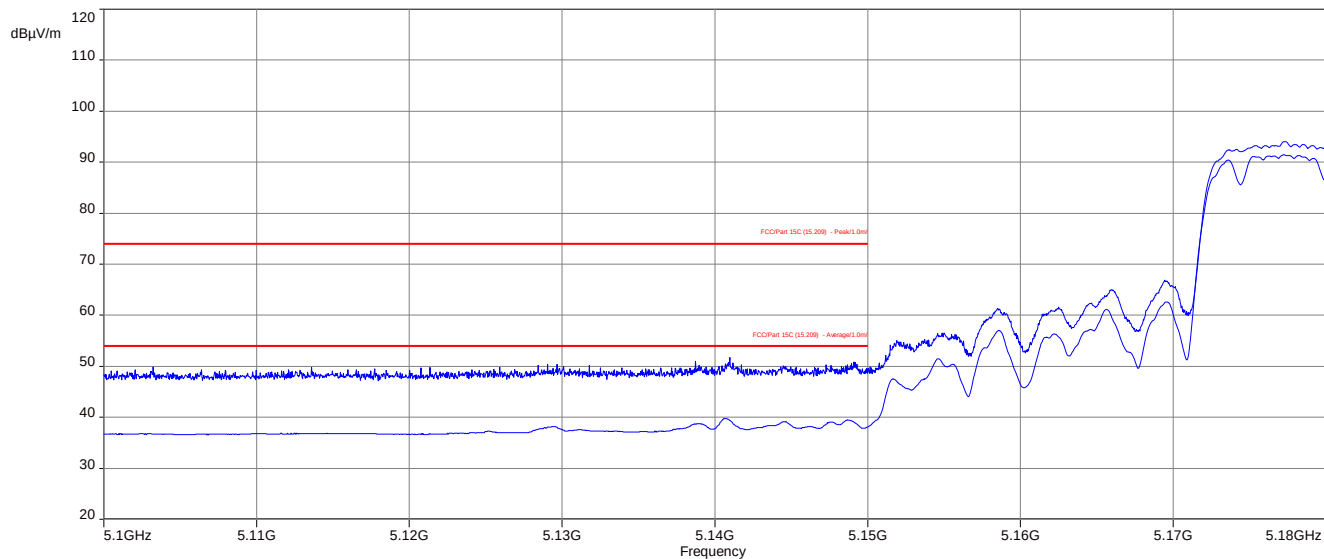
**Plots:** BPSK – mode / Antenna B

**Plot 2:** lower band edge, vertical & horizontal polarization – 5180 MHz



**Plots:** QPSK – mode / Antenna A

**Plot 3:** lower band edge, vertical & horizontal polarization – 5180 MHz



**Plots:** QPSK – mode / Antenna A

**Plot 4:** lower band edge, vertical & horizontal polarization – 5180 MHz

