

# FCC TEST REPORT

**Test Report No. :** T39286-00-00KJ

1 July 2015

Date of issue

**Type / Model Name** : 9764 Compact Metro Cell Outdoor / MECLGA41**Product Description** : 9764 Compact Metro Cell Outdoor B41 2x6W**Applicant** : Alcatel-Lucent Deutschland AG

Address : Lorenzstraße 10

70435 STUTTGART, GERMANY

**Manufacturer** : FLEXTRONICS Romania SRL

Address : Calea Torontalului DN6

30000 TIMISOARA, ROMANIA

**Licence holder** : Alcatel-Lucent

Address : 148/152 route de la Reine

92100 BOULOGNE-BILLANCOURT, FRANCE

**Test Result** according to the  
standards listed in clause 1 test  
standards:**POSITIVE**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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Attachment A as separately supplement

# **1 TEST STANDARDS**

The tests were performed according to following standards:

## **FCC Rules and Regulations Part 2, Subpart J - General (September, 2014)**

|                                           |                                                                                                                                                                         |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part 2, Subpart J, Section 2.1033 (c)(14) | Applications for equipment other than that operating under parts 15 and 18 of the rules shall be accompanied by a technical report containing the following information |
| Part 2, Subpart J, Section 2.1046         | RF power output                                                                                                                                                         |
| Part 2, Subpart J, Section 2.1047         | Modulation characteristics                                                                                                                                              |
| Part 2, Subpart J, Section 2.1049         | Occupied bandwidth                                                                                                                                                      |
| Part 2, Subpart J, Section 2.1051         | Spurious emissions at antenna terminals                                                                                                                                 |
| Part 2, Subpart J, Section 2.1053         | Field strength of spurious radiation                                                                                                                                    |
| Part 2, Subpart J, Section 2.1055         | Frequency stability                                                                                                                                                     |

## **FCC Rules and Regulations Part 27, Subpart C - General (September, 2014)**

|                                   |                              |
|-----------------------------------|------------------------------|
| Part 27, Subpart C, Section 27.50 | Power limits and duty cycle. |
| Part 27, Subpart C, Section 27.53 | Emission limits              |
| Part 27, Subpart C, Section 27.54 | Frequency stability          |

|                        |                  |                                                                                                                                              |
|------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| OET Rules 412172 D01   | (November, 2011) | Guidelines for Determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of a RF Transmitting System |
| OET Rules 662911 D01   | (October, 2013)  | Emission Testing of Transmitters with Multiple Outputs in the Same Band                                                                      |
| OET Rules 662911 D02   | (October, 2011)  | MIMO with Cross-Polarized Antenna                                                                                                            |
| OET Rules 971168 D01   | (October, 2014)  | Measurement Guidance for Certification of Licensed Digital Transmitters                                                                      |
| OET Rules 971168 D02   | (October, 2014)  | Measurement Guidance for Specific Service Rules                                                                                              |
| ANSI C63.4: 2009       |                  | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.        |
| ANSI / TIA-603-C: 2004 |                  | Land Mobile FM or PM – Communication Equipment – Measurement and Performance Standards                                                       |
| CISPR 16-4-2: 2013     |                  | Uncertainty in EMC measurement                                                                                                               |

## 2 Test result summary

LTE base station using digital modulation: QPSK, 16QAM and 64QAM

Operating in the 2496 MHz – 2690 MHz band

| Test Case                                       | Description                             | Requirements                                           | Result |
|-------------------------------------------------|-----------------------------------------|--------------------------------------------------------|--------|
| <b>BRS &amp; EBS Band</b>                       |                                         |                                                        |        |
| 2.1046<br>27.50(h)(1)<br>KDB 971168 D01 (5.1.1) | RF power output                         | EIRP not exceed 33 dBW + 10log(X/Y) dBW                | Pass   |
| 2.1047<br>KDB 971168 D01 (3)                    | Modulation characteristics              | Digital modulation                                     | Pass   |
| 27.50(B)<br>KDB 971168 D01 (5.7.1)              | Peak-to-average power ratio (PAPR)      | Peak-to-average power ratio not exceed 13 dB           | Pass   |
| 2.1049<br>27.50(m)(6)<br>KDB 971168 D01 (4.1)   | Emission bandwidth (26 dB)              | Emission bandwidth below 26 dB                         | Pass   |
| 2.1049(h)                                       | Occupied bandwidth (99 %)               | (not specified)                                        | Pass   |
| 2.1051<br>27.53(m)(6)                           | Band edges compliance                   | Below -13 dBm / 1%*EBW, in 1 MHz range                 | Pass   |
| 2.1051<br>27.53(m)(6)<br>KDB 971168 D01 (6)     | Spurious emissions at antenna terminals | Below -13 dBm from 9 kHz to 10 <sup>th</sup> harmonics | Pass   |
| 2.1053<br>KDB 971168 D01 (7)                    | Field strength of spurious radiation    | Below -13 dBm from 9 kHz to 10 <sup>th</sup> harmonics | Pass   |
| 2.1055<br>27.54<br>KDB 971168 D01 (9)           | Frequency stability                     | Stay within the authorized bands of operation          | Pass   |

### 2.1 Final assessment

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 20 April 2015

Testing concluded on : 23 June 2015

Checked by:

  
Klaus Gegenfurtner  
I confirm the correctness and  
integrity of this documents  
2015.07.01 09:47:24 +02'00'

Klaus Gegenfurtner  
Teamleader Radio

Tested by:

  
Josef Knab  
I'm the autor of this  
document  
2015.07.01 09:41:06 +02'00'

Josef Knab  
Radio Team

### **3 EQUIPMENT UNDER TEST**

#### **3.1 Photo documentation of the EUT – Detailed photos see attachment A**

#### **3.2 Short description of the equipment under test (EUT)**

This application for the 9764 Compact Metro Cell Outdoor B41 2x6W under FCC ID: 2AEEH-CMCOB41AC2X6, is for operation in the domestic Broadband Radio Service (BRS) and the Educational Broadband Service (EBS) bands with a LTE signal. The data summarized below is in the form presently used by the Commission's Radio Equipment List.

|                           |                                                                         |
|---------------------------|-------------------------------------------------------------------------|
| Manufacturer:             | Alcatel-Lucent                                                          |
| Equipment Identification: | 3BK 61423 AAAB 01                                                       |
| Frequency Range:          | 2496 – 2690 MHz                                                         |
| Output Power:             | +27.8 dBm (0.6 W) to +37.8 dBm (6 W) varied by software for cell sizing |
| Frequency Tolerance:      | ±0.1 ppm                                                                |
| Temperature Range:        | -40 °C to +50 °C                                                        |

The 9764 Compact Metro Cell Outdoor (CMCO) B41 2x6W is a small, lightweight Base Station Unit designed to fill coverage gaps between macro cells in a LTE network. It can be easily mounted on walls, lamp posts and poles. The 9764 CMCO consists of the RF components, the baseband unit and the backhaul module. As options a Wi-Fi access point module and two types of integrated antennas can be added. It is also possible to use external antennas via normal antenna connectors of type N.

The 9764 CMCO contains two identical transceiver paths and is typically operated as 2x2 multiple input multiple output (MIMO) configuration. Each transceiver has a RF output power of maximal 6 watts at the External Antenna Connector (EAC) port.

The radio design is FPGA generated pre-distorted baseband signal delivered to a TX ROC (Radio On Chip) with direct upconversion to the RF frequency. Then the signal passes through the power amplifier and transmit filter to the antenna port (EAC).

The 9764 CMCO is designed to transmit in the frequency band of 2496 - 2690 MHz with a 20 MHz carrier emission bandwidth. The signal modulation is QPSK, 16QAM or 64QAM.

|                           |                         |
|---------------------------|-------------------------|
| Number of tested samples: | 1                       |
| Serial number:            | LBALLU-RT151781495      |
| Firmware version:         | FV_ENB_LR1403_JD_E00046 |
| Software release          | LR14.3                  |

#### **EUT configuration:**

(The CDF filled by the applicant can be viewed at the test laboratory.)

#### **3.3 Variants of the EUT**

There are no variants of the EUT.

### 3.4 Operation frequency and channel plan

| E-UTRA Band | Duplex Mode | Downlink (TX)   |       | Uplink (RX) |       |
|-------------|-------------|-----------------|-------|-------------|-------|
|             |             | Frequency (MHz) |       |             |       |
| 41          | TDD         | 2496            | 2690  | 2496        | 2690  |
|             |             | Channel Number  |       |             |       |
|             |             | 39650           | 41589 | 39650       | 41589 |

| BW <sub>Channel</sub> (MHz) | Channel | Frequency (MHz) |
|-----------------------------|---------|-----------------|
| 20                          | Bottom  | 2506.0          |
|                             | Middle  | 2593.0          |
|                             | Top     | 2680.0          |

### 3.5 Power supply system utilised

Power supply voltage,  $V_{nom}$  : 110 V AC / 60 Hz / 1 $\phi$

### 3.6 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- Desktop PC Model : HP Compaq dc7900
- Spectrum analyzer Model : Agilent, PXA 9030A with LTE-TDD option
- Power analyzer Model : Tektronics, PA1000
  - unscreened power cables
  - customer specific cables

### 3.7 Determination of worst case conditions for final measurement

The radiated emission test was performed with “Dual Element Antenna” which has an antenna gain of 9.5 dBi. Following channels and test modes are selected as worst case for the final tests:

#### FCC Measurement, E-UTRA Band 41

| Description                                 | Channel bandwidth | Modulation |       |       | Channel |     |     | Antenna |     |
|---------------------------------------------|-------------------|------------|-------|-------|---------|-----|-----|---------|-----|
|                                             | 20 MHz            | QPSK       | 16QAM | 64QAM | B       | M   | T   | A       | B   |
| RF power output                             | X                 | X          | X     | X     | ---     | X   | --- | X       | X   |
| Modulation characteristics                  | X                 | X          | X     | X     | ---     | X   | --- | X       | --- |
| Peak to average ratio (PAR)                 | X                 | X          | X     | X     | ---     | X   | --- | X       | --- |
| Emission bandwidth (26 dB)                  | X                 | X          | X     | X     | ---     | X   | --- | X       | --- |
| Occupied bandwidth (99 %)                   | X                 | X          | X     | X     | ---     | X   | --- | X       | --- |
| Band edge                                   | X                 | X          | X     | X     | X       | --- | X   | X       | --- |
| Spurious emissions at transmit antenna port | X                 | X          | X     | X     | ---     | X   | --- | X       | --- |
| Field strength of spurious radiation        | X                 | ---        | ---   | X     | ---     | X   | --- | X       | --- |
| Frequency stability, temperature change     | X                 | ---        | ---   | X     | ---     | X   | --- | X       | --- |
| Frequency stability, voltage change         | X                 | ---        | ---   | X     | ---     | X   | --- | X       | --- |

X measured  
--- not measured

All test modes used 100 RB (resource blocks) this corresponds to 100% load. The offset is therefore zero.

An pre-measurement has shown, that a lower number over RB (for example 1 RB), the output power becomes smaller. The height of the envelop curve is still similar. Therefore all following measurements where performed with the worst case condition of 100 RB.

#### 3.7.1 Test jig

No test jig is used.

#### 3.7.2 Test software

The test software for the EUT provides a special factory mode to set up different E-UTRA test models to transmit data during the tests with maximum output power and different modulations.

Output power: 2 x 6 Watt (2 x 37.8 dBm)

Modulation: QPSK, 16QAM and 64QAM

For E-UTRA TDD, test models are derived based on the uplink/downlink configuration 3 and special subframe configuration 8. Number of frames for the test models is 2.

#### Configurations of TDD eNB test models

| Downlink-to-uplink<br>Switch-point<br>periodicity | Number of UL/DL sub-frames per<br>radio frame (10 ms) |    | DwPTS             | GP               | UpPTS            |
|---------------------------------------------------|-------------------------------------------------------|----|-------------------|------------------|------------------|
|                                                   | DL                                                    | UL |                   |                  |                  |
| 10ms                                              | 6                                                     | 3  | $24144 \cdot T_s$ | $2192 \cdot T_s$ | $4384 \cdot T_s$ |

### 3.7.3 Test Modes

| Test Mode | Test Modes Description                                     |
|-----------|------------------------------------------------------------|
| E-TM1.1   | 3GPP TS 36.141, clause 6.1.1.1, E-TM 1.1, QPSK modulation  |
| E-TM3.2   | 3GPP TS 36.141, clause 6.1.1.5, E-TM 3.2, 16QAM modulation |
| E-TM3.1   | 3GPP TS 36.141, clause 6.1.1.4, E-TM 3.1, 64QAM modulation |

## **4 TEST ENVIRONMENT**

### **4.1 Address of the test laboratories**

**CSA Group Bayern GmbH  
Ohmstrasse 1-4  
94342 STRASSKIRCHEN  
GERMANY**

**Alcatel-Lucent Deutschland AG  
Lorenzstraße 10  
70435 STUTTGART  
GERMANY**

### **4.2 Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

## 5 TEST CONDITIONS AND RESULTS

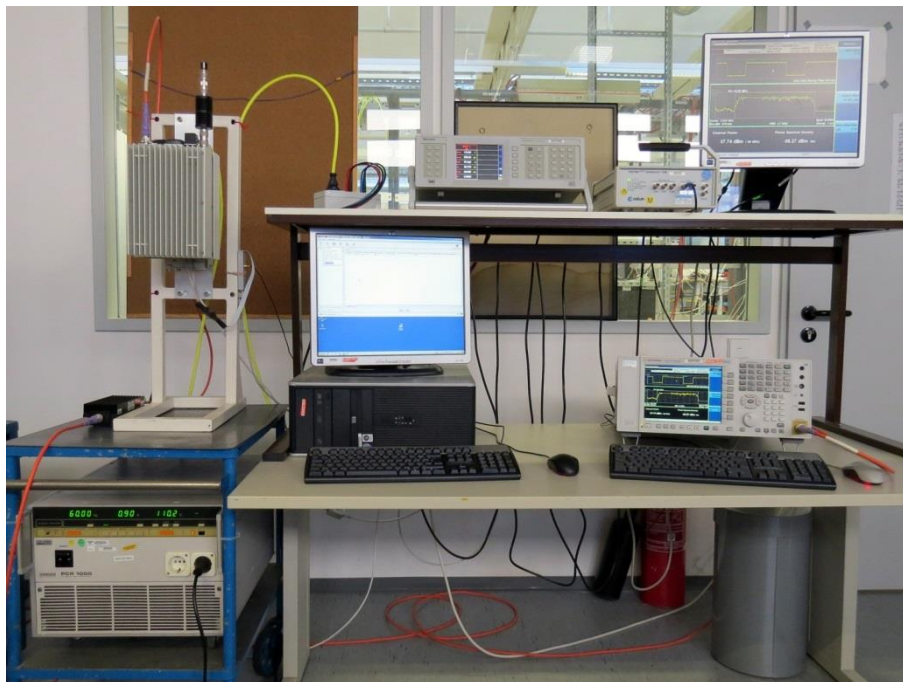
### 5.1 RF power output

For test instruments and accessories used see section 6 Part **SEC3**.

#### 5.1.1 Description of the test location

Test location: Room 008/00/132

#### 5.1.2 Photo documentation of the test set-up



#### 5.1.3 Applicable standard

According to FCC Part 27, Section 27.50(h):

(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed  $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$ , where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section. Description of Measurement

#### 5.1.4 Description of measurement – Measurement guidance KDB 971168 D01 (5.1.1)

The RF power output is measured conducted using a spectrum analyser with the function “LTE - Channel Power”. The EUT is set in TX continuous mode and E-UTRA test model described below while measuring. The EUT is measured at antenna port 1 and port 2. The resulting values are listed in the following tables.

The measurement values at antenna port 1 and port 2 are converted into linear values and the antenna 1 and antenna 2 is summed and converted back into log values. The resulting values are also listed in the following tables.

**5.1.5 Spectrum analyser settings**

The settings are automatically changed by analyser software and is dependent to the used channel bandwidth. Please refer to the test result plots under point 5.1.6.1. & 5.1.6.2.

**5.1.6 Test result table**

| Antenna              | Modulation | E-UTRA Test Model | Channel | RF power output (dBm) | RF power output (Watt) |
|----------------------|------------|-------------------|---------|-----------------------|------------------------|
| 1                    | QPSK       | E-TM1.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.7                  | 5.93                   |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 16QAM      | E-TM3.2           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.5                  | 5.66                   |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 64QAM      | E-TM3.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.8                  | 6.04                   |
|                      |            |                   | T       | ---                   | ---                    |
| 2                    | QPSK       | E-TM1.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.7                  | 5.86                   |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 16QAM      | E-TM3.2           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.5                  | 5.56                   |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 64QAM      | E-TM3.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 37.8                  | 6.00                   |
|                      |            |                   | T       | ---                   | ---                    |
| Sum of Ant.1 & Ant.2 | QPSK       | E-TM1.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 40.7                  | 11.79                  |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 16QAM      | E-TM3.2           | B       | ---                   | ---                    |
|                      |            |                   | M       | 40.5                  | 11.22                  |
|                      |            |                   | T       | ---                   | ---                    |
|                      | 64QAM      | E-TM3.1           | B       | ---                   | ---                    |
|                      |            |                   | M       | 40.8                  | 12.04                  |
|                      |            |                   | T       | ---                   | ---                    |

### 5.1.6.1 Test result plot – Antenna port 1

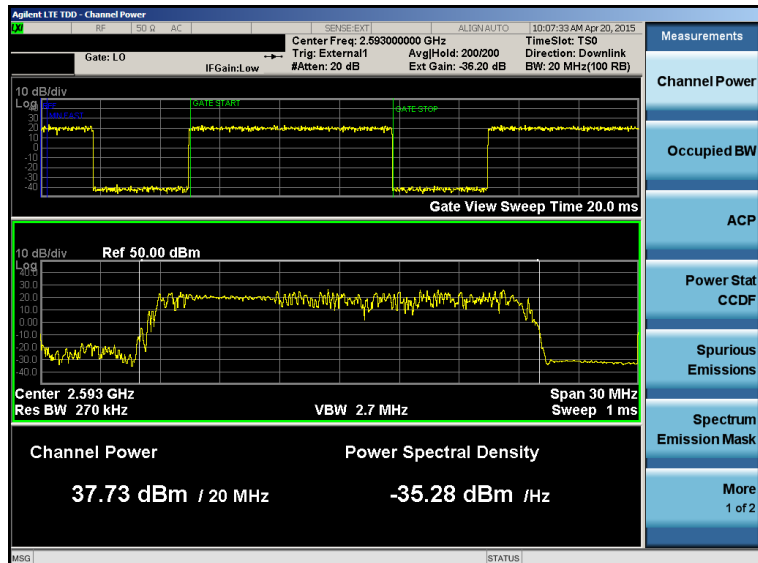
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1



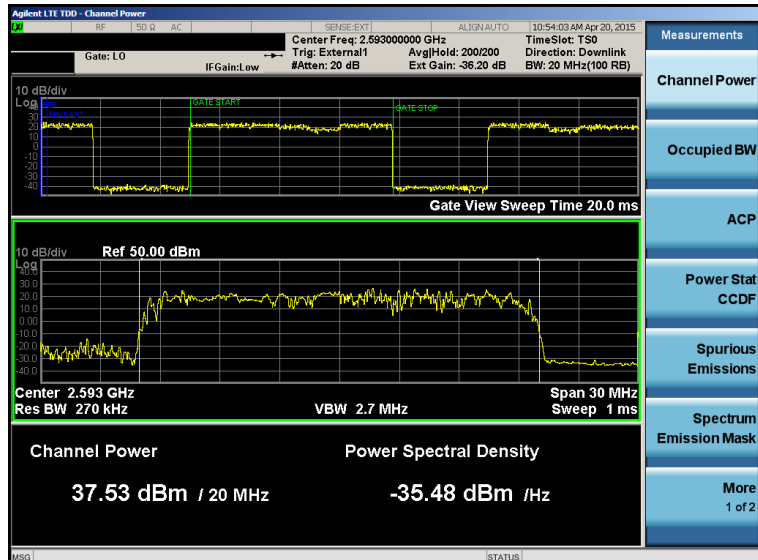
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1



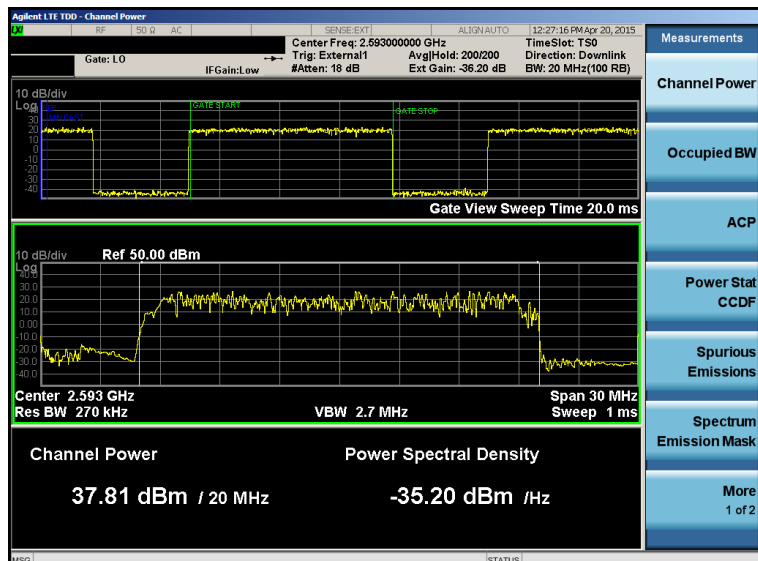
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1



### 5.1.6.2 Test result plot – Antenna port 2

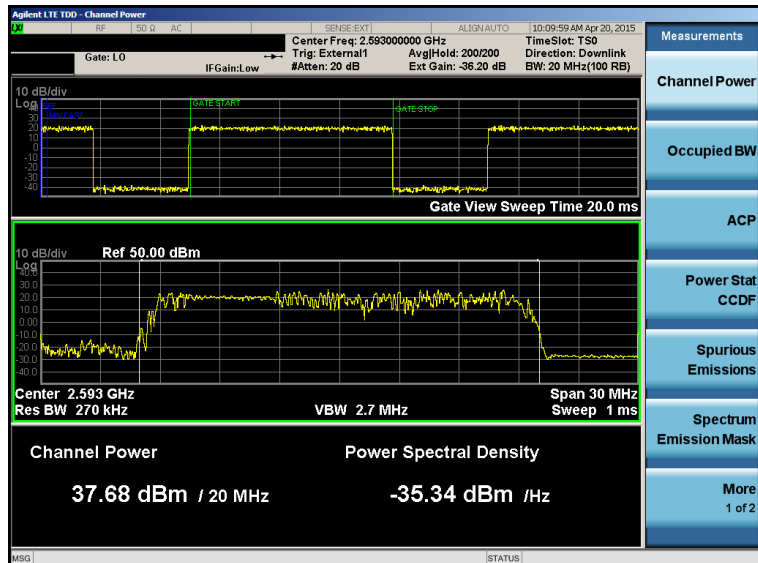
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 2



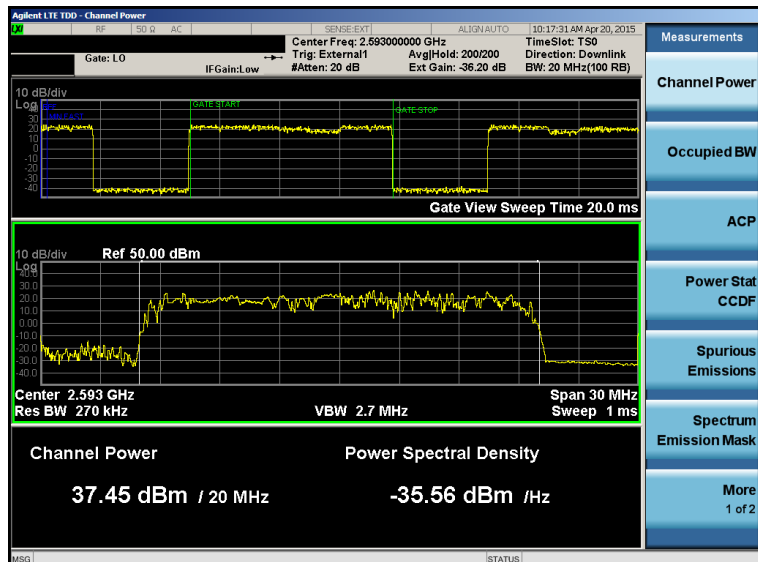
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 2



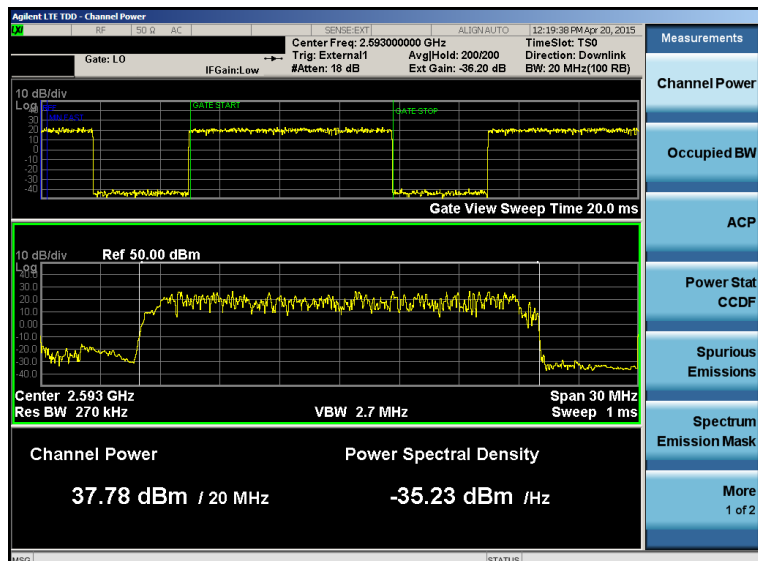
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 2



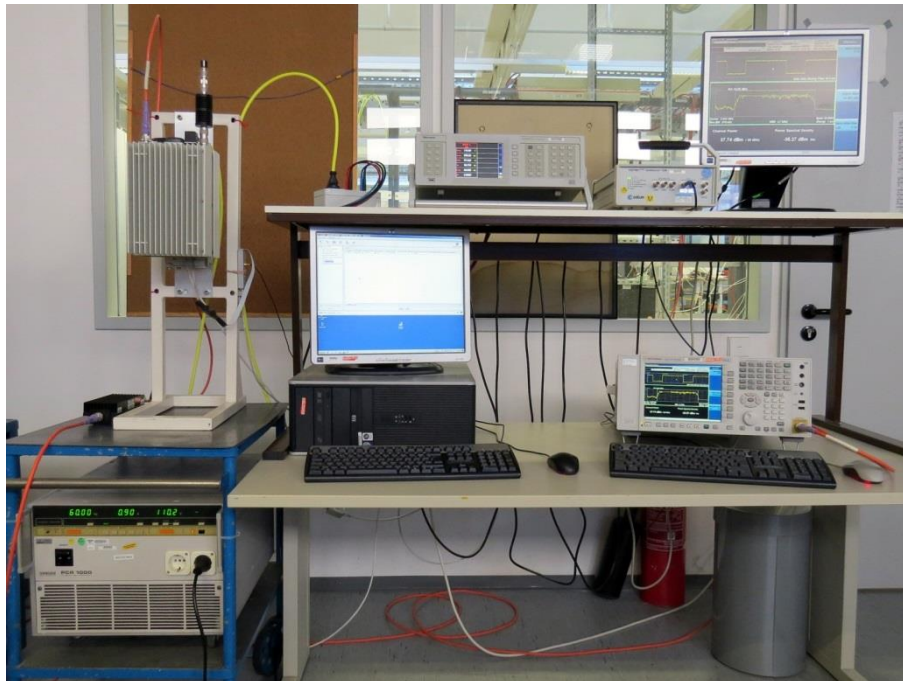
## 5.2 Modulation characteristics

For test instruments and accessories used see section 6 Part MB.

### 5.2.1 Description of the test location

Test location: Room 008/00/132

### 5.2.2 Photo documentation of the test set-up



### 5.2.3 Applicable standard

According to FCC Part 2, Section 2.1033(c):

(13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wavetrain, shall be submitted for the maximum rated conditions under which the equipment will be operated.

### 5.2.4 Description of measurement – Measurement guidance KDB 971168 D01 (3)

The modulation characteristic is measured conducted using a spectrum analyser with the function “LTE - Modulation Analysis”. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

### 5.2.5 Spectrum analyser settings

The settings are automatically changed by analyser software and is dependent to the used channel bandwidth. Please refer to the test result plots under point 5.2.6.1.

**5.2.6 Test result table**

| Antenna | Modulation | E-UTRA<br>Test<br>Model | Channel | Modulation<br>Character-<br>istics |
|---------|------------|-------------------------|---------|------------------------------------|
| 1       | QPSK       | E-TM1.1                 | B       | ---                                |
|         |            |                         | M       | Passed                             |
|         |            |                         | T       | ---                                |
|         | 16QAM      | E-TM3.2                 | B       | ---                                |
|         |            |                         | M       | Passed                             |
|         |            |                         | T       | ---                                |
|         | 64QAM      | E-TM3.1                 | B       | ---                                |
|         |            |                         | M       | Passed                             |
|         |            |                         | T       | ---                                |

#### 5.2.6.1 Test result plot – Antenna port 1

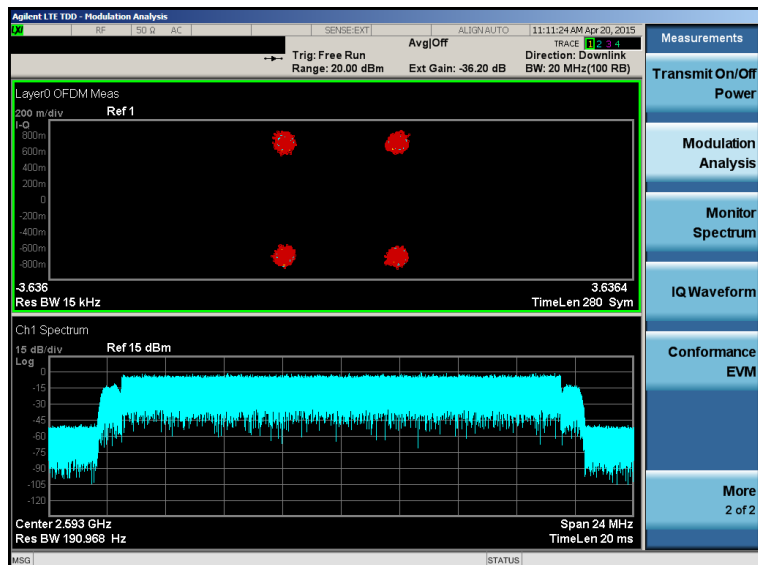
Modulation: QPSK

## E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1



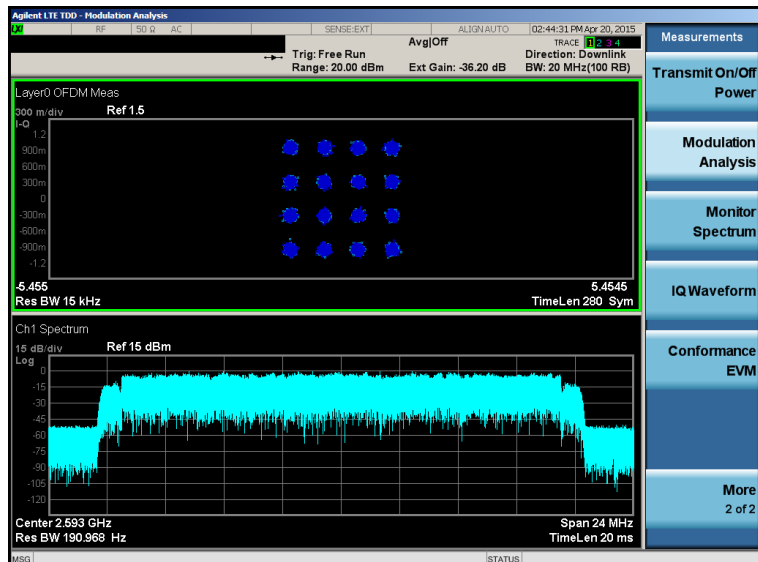
Modulation: 16QAM

## E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1



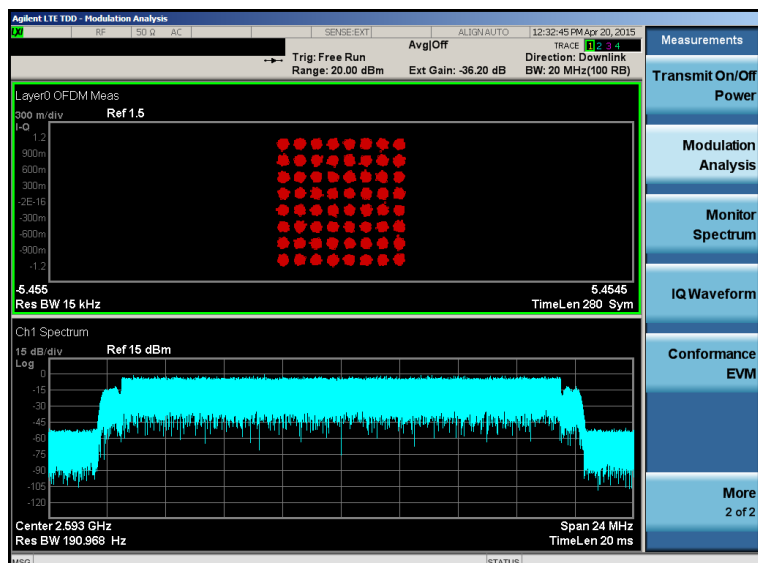
Modulation: 64QAM

## E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1



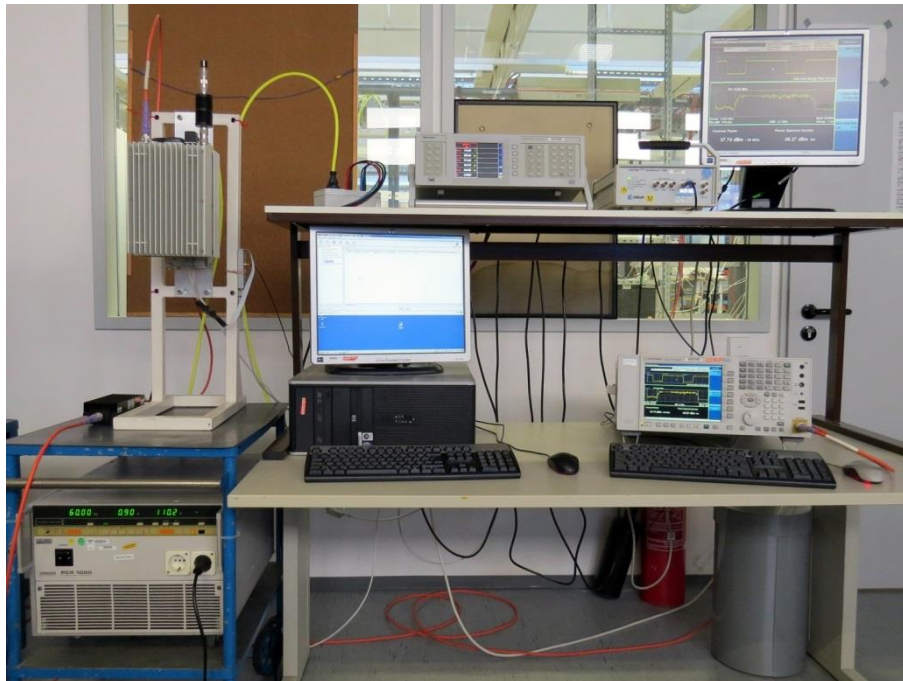
### 5.3 Peak to average power ratio (PAPR)

For test instruments and accessories used see section 6 Part **SEC3**.

#### 5.3.1 Description of the test location

Test location: Room 008/00/132

#### 5.3.2 Photo documentation of the test set-up



#### 5.3.3 Applicable standard

According to FCC Part 27, Section 27.50(B):

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

#### 5.3.4 Description of measurement – Measurement guidance KDB 971168 D01 (5.7.1)

The peak-to-average power ratio (PAPR) is measured conducted using a spectrum analyser with the function “LTE – Power Stat CCDF”. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

#### 5.3.5 Spectrum analyser settings

The settings are automatically changed by analyser software and is dependent to the used channel bandwidth. Please refer to the test result plots under point 5.3.6.1.

**5.3.6 Test result table**

| Antenna | Modulation | E-UTRA<br>Test<br>Model | Channel | PAR<br>(dB) | Limit<br>(dB) |
|---------|------------|-------------------------|---------|-------------|---------------|
| 1       | QPSK       | E-TM1.1                 | B       | ---         | 13.0          |
|         |            |                         | M       | 7.17        |               |
|         |            |                         | T       | ---         |               |
|         | 16QAM      | E-TM3.2                 | B       | ---         |               |
|         |            |                         | M       | 7.87        |               |
|         |            |                         | T       | ---         |               |
|         | 64QAM      | E-TM3.1                 | B       | ---         |               |
|         |            |                         | M       | 7.12        |               |
|         |            |                         | T       | ---         |               |

### 5.3.6.1 Test result plot – Antenna port 1

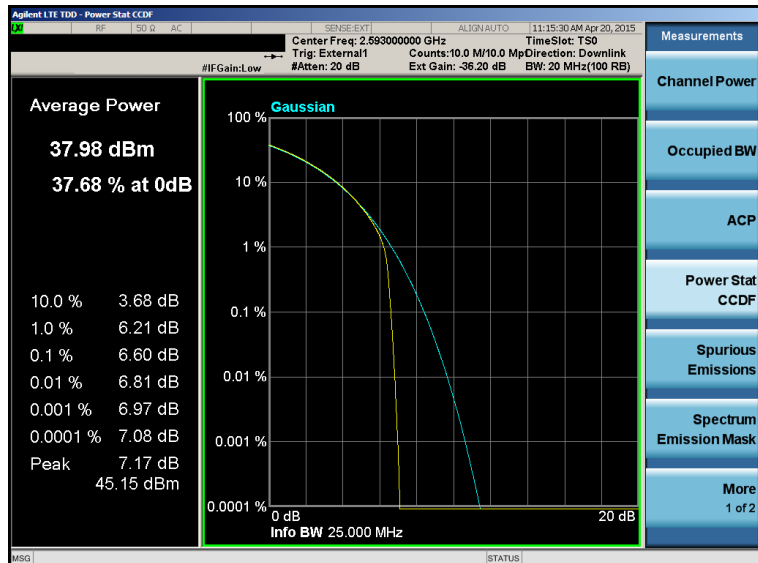
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1



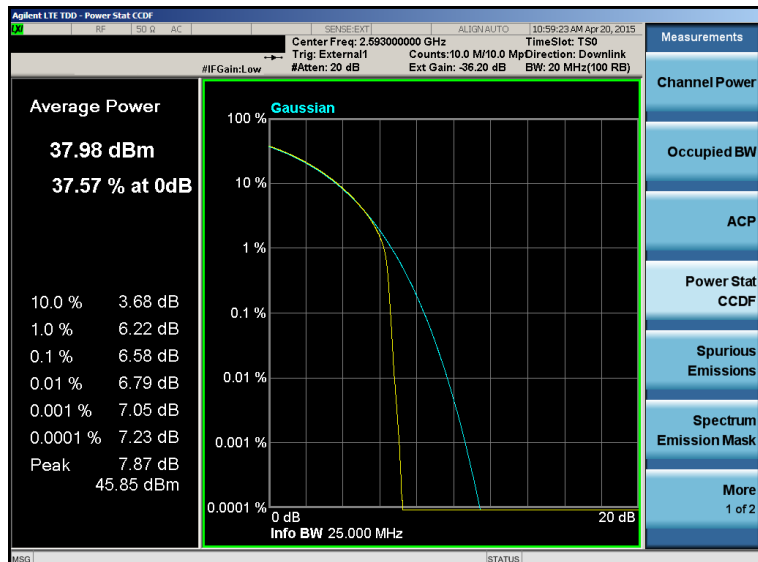
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1



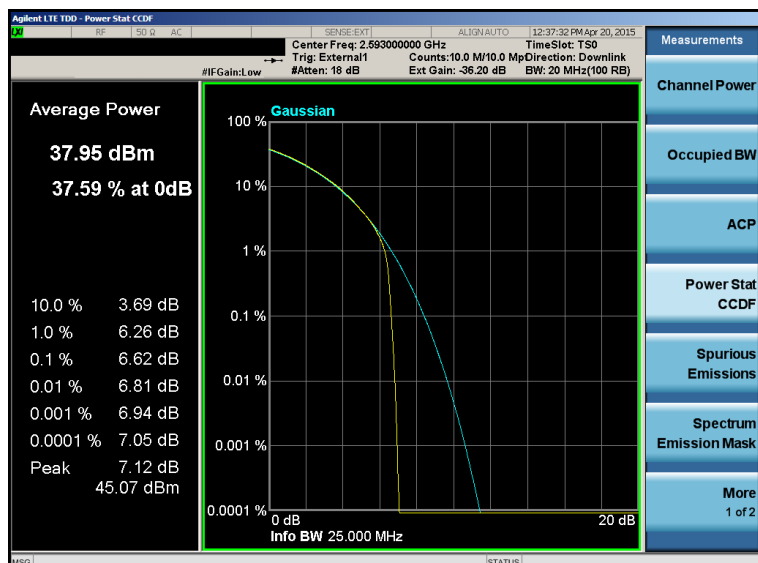
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1



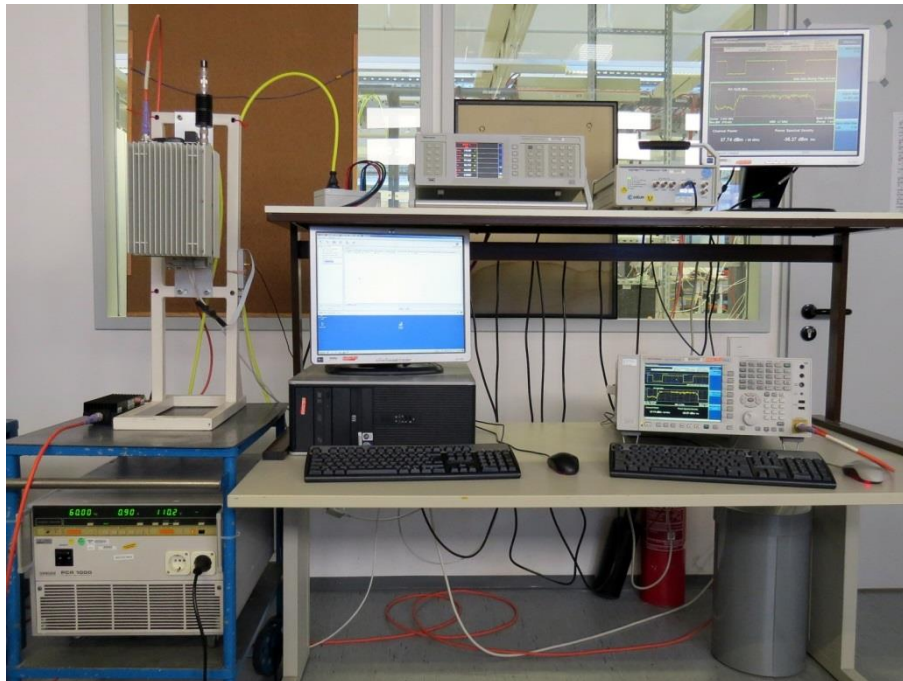
## 5.4 Emission bandwidth

For test instruments and accessories used see section 6 Part MB.

### 5.4.1 Description of the test location

Test location: Room 008/00/132

### 5.4.2 Photo documentation of the test set-up



### 5.4.3 Applicable standard

According to FCC Part 2, Section 2.53(m):

(6) ...The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

According to FCC Part 2, Section 2.1049(h):

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

### 5.4.4 Description of measurement – Measurement guidance KDB 971168 D01 (4.1 & 4.2)

The emission bandwidth is measured conducted using a spectrum analyser with the function “LTE – Occupied BW”. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

**5.4.5 Spectrum analyser settings**

|        |       |        |                |           |             |
|--------|-------|--------|----------------|-----------|-------------|
| RBW:   | VBW:  | Span:  | Detector:      | Trigger:  | Sweep time: |
| 30 kHz | 1 MHz | 40 MHz | AV (10 Sweeps) | External1 | 52.8 ms     |

**5.4.6 Test result table**

| Antenna | Modulation | E-UTRA<br>Test<br>Model | 26 dB Bandwidth<br>(MHz) |       |     | 99 % Bandwidth<br>(MHz) |       |     |
|---------|------------|-------------------------|--------------------------|-------|-----|-------------------------|-------|-----|
|         |            |                         | B                        | M     | T   | B                       | M     | T   |
| 1       | QPSK       | E-TM1.1                 | ---                      | 19.79 | --- | ---                     | 18.20 | --- |
|         | 16QAM      | E-TM3.2                 | ---                      | 19.69 | --- | ---                     | 17.88 | --- |
|         | 64QAM      | E-TM3.1                 | ---                      | 19.74 | --- | ---                     | 17.99 | --- |

#### 5.4.6.1 Test result plot – Antenna port 1

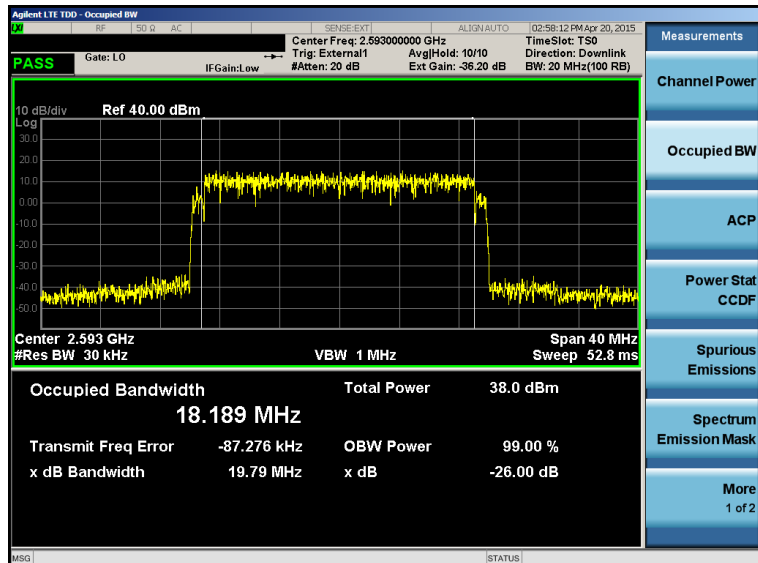
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1



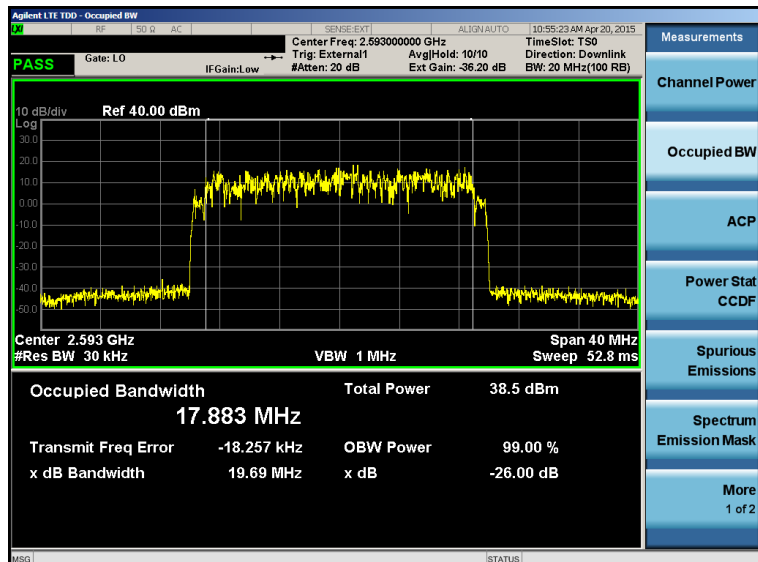
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1



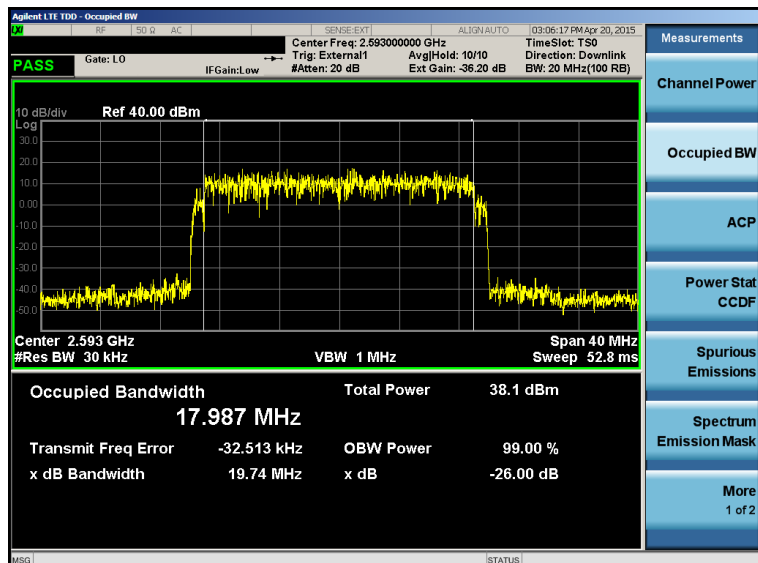
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1



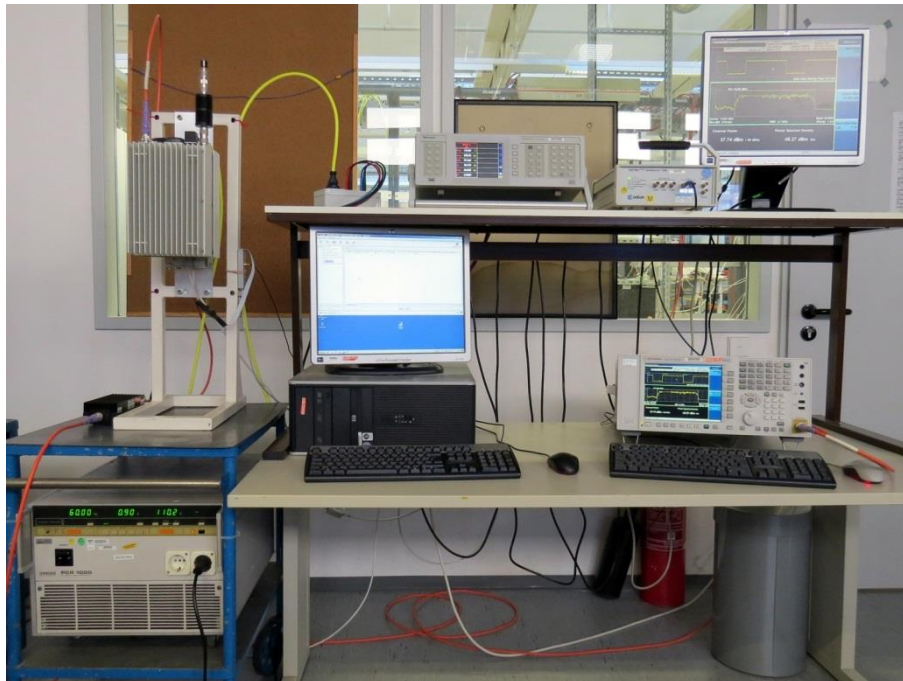
## 5.5 Band edge

For test instruments and accessories used see section 6 Part MB.

### 5.5.1 Description of the test location

Test location: Room 008/00/132

### 5.5.2 Photo documentation of the test set-up



### 5.5.3 Applicable standard

According to FCC Part 27, Section 27.53(m):

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495 - 2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495 - 2496 MHz).

Pursuant to FCC OET RULES 662911 D01 and D02 for two antenna MIMO mode of operations, the FCC limit of -13 dBm shall be 3 dB more stringent, therefore all channel edge and out of band spurious emissions shall be -16 dBm. Further limits are adjusted for lower resolution BW using  $10 \log(100\text{kHz}/1\% \text{ of channel BW})$ .

#### 5.5.4 Limit calculation

The -24.24 dBm level was computed as follows.

The limit is specified as

$$- \{43 + 10 \log (\text{mean power output in watts}) \} \text{ dB} = -13 \text{ dBm}$$

Within the 1st MHz outside the band the limit of -13 dBm is specified when measured with a 1% bandwidth. When measured with a different bandwidth the adjustment is made against 1% of the signal bandwidth.

Since the carrier is a 20 MHz bandwidth signal and the 1% signal bandwidth is 200 kHz, the limit is adjusted to

$$-13 + 10 \log (30 \text{ kHz} / 200 \text{ kHz}) \text{ dBm} = -21.24 \text{ dBm}$$

When accounting for a 2 Transmitter signal, ( per KDB 662911 D01 Multiple Transmitter Output v01r01), the level needs be adjusted by  $10 \log (n)$  where  $n$ = number of outputs. The adjustment for  $n=2$  is:

$$3 \text{ dB} = 10 \log (2)$$

The resultant limit for 2 TX operation is  $-21.24 \text{ dBm} - 3 \text{ dB} = \underline{\underline{-24.24 \text{ dBm}}}$

#### 5.5.5 Description of measurement – Measurement guidance

The emission bandwidth is measured conducted using a spectrum analyser. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

#### 5.5.6 Spectrum analyser settings

|        |       |       |           |          |             |
|--------|-------|-------|-----------|----------|-------------|
| RBW:   | VBW:  | Span: | Detector: | Trigger: | Sweep time: |
| 30 kHz | 1 MHz | 2 MHz | RMS       | Free Run | 5 sec.      |

#### 5.5.7 Test result table

| Antenna | Modulation | E-UTRA Test Model | Channel | Band edges emissions (dBm) | Limit (dBm) | Spectrum Mask |
|---------|------------|-------------------|---------|----------------------------|-------------|---------------|
| 1       | QPSK       | E-TM1.1           | B       | -33.92                     | -24.24      | Passed        |
|         |            |                   | M       | ---                        | ---         | ---           |
|         |            |                   | T       | -33.27                     | -24.24      | Passed        |
|         | 16QAM      | E-TM3.2           | B       | -34.71                     | -24.24      | Passed        |
|         |            |                   | M       | ---                        | ---         | ---           |
|         |            |                   | T       | -33.38                     | -24.24      | Passed        |
|         | 64QAM      | E-TM3.1           | B       | -34.54                     | -24.24      | Passed        |
|         |            |                   | M       | ---                        | ---         | ---           |
|         |            |                   | T       | -32.24                     | -24.24      | Passed        |

### 5.5.7.1 Test result plot – Antenna port 1

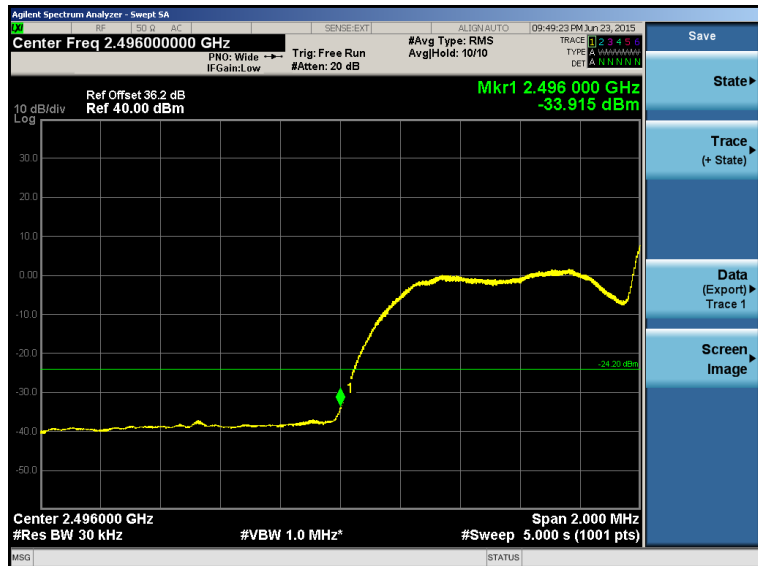
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: B

CH BW: 20 MHz

Antenna port: 1



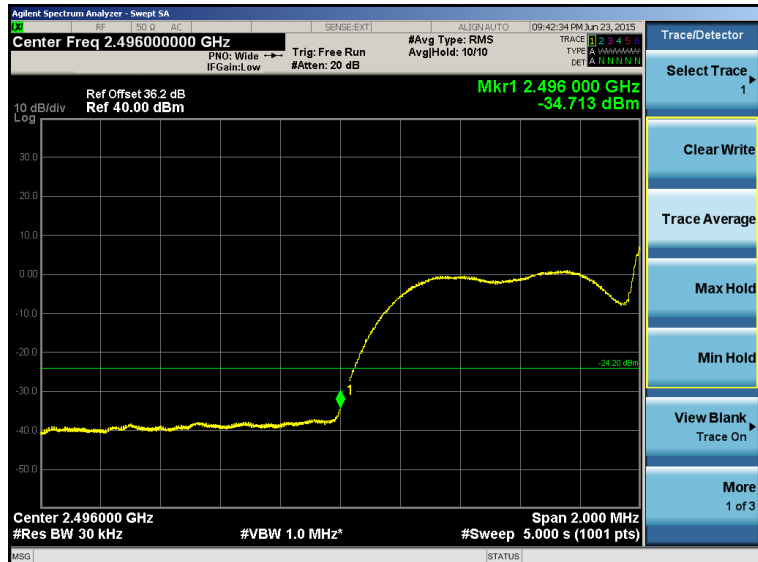
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: B

CH BW: 20 MHz

Antenna port: 1



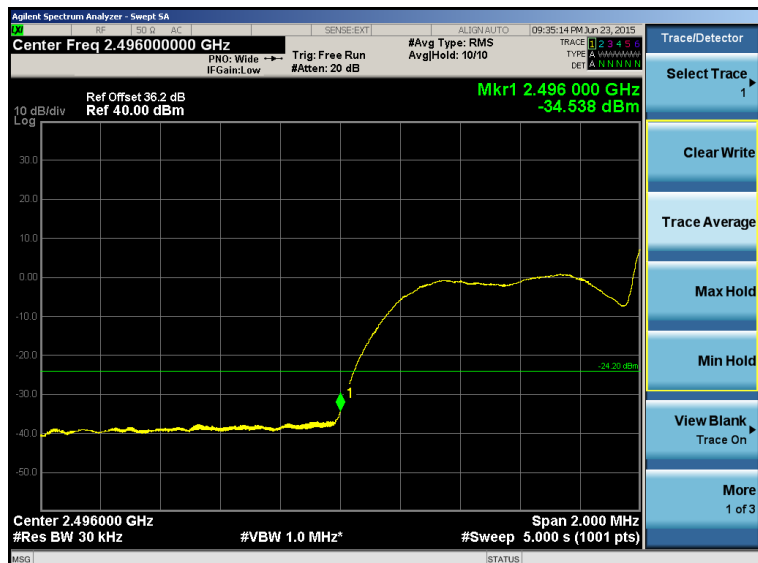
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: B

CH BW: 20 MHz

Antenna port: 1



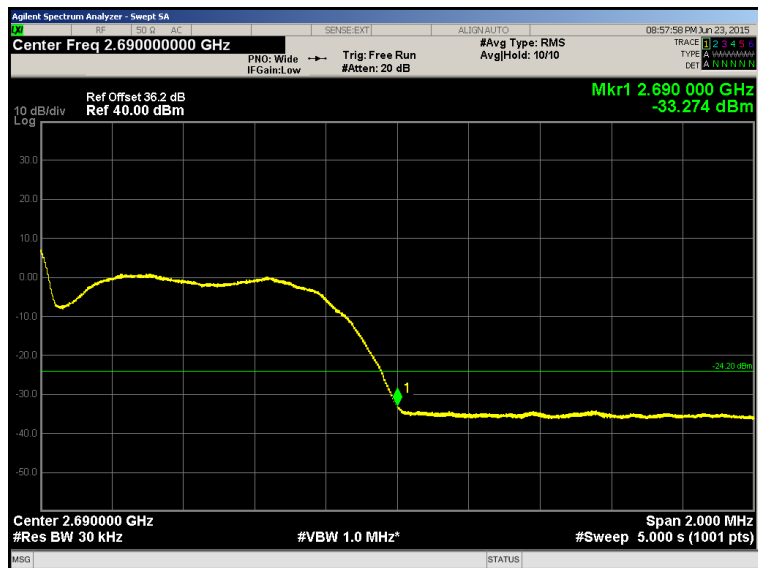
Modulation: QPSK

E.UTRA Test Model: E-TM1.1

CH: T

CH BW: 20 MHz

Antenna port: 1



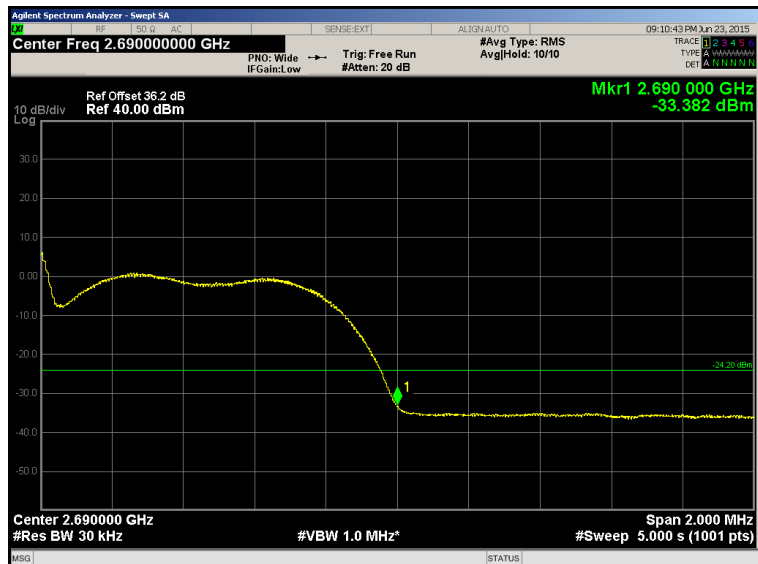
Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: T

CH BW: 20 MHz

Antenna port: 1



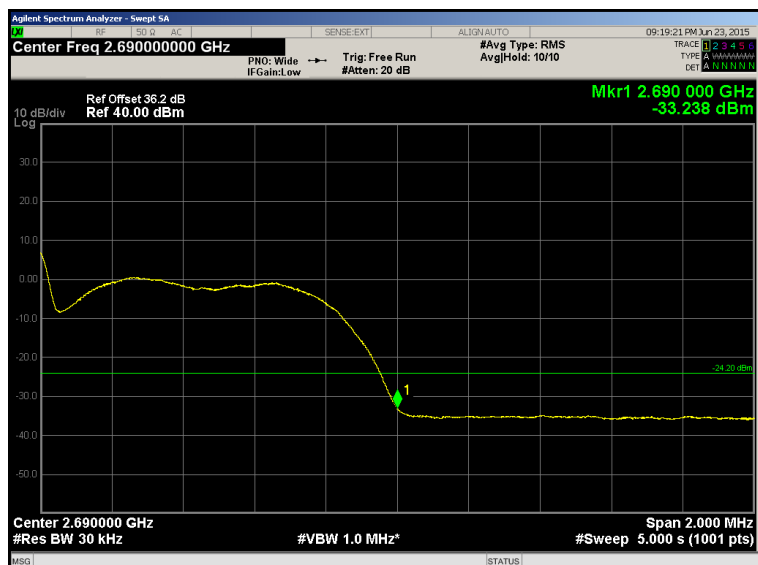
Modulation: 64QAM

E.UTRA Test Model: E-TM3.1

CH: T

CH BW: 20 MHz

Antenna port: 1



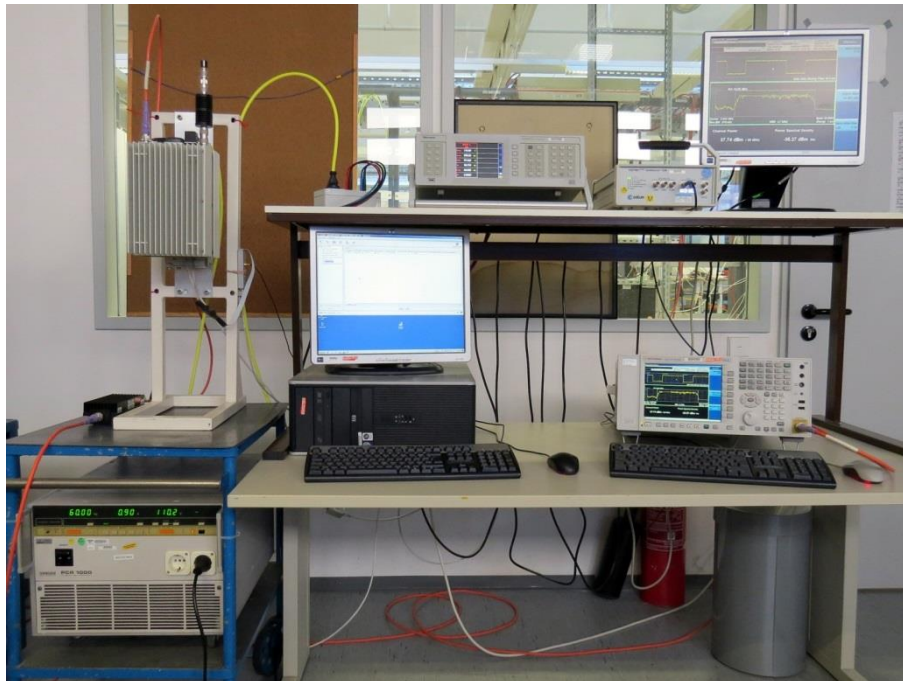
## 5.6 Spurious emissions at antenna terminals

For test instruments and accessories used see section 6 Part **SEC1-3**.

### 5.6.1 Description of the test location

Test location: Room 008/00/132

### 5.6.2 Photo documentation of the test set-up



### 5.6.3 Applicable standard

According to FCC Part 27, Section 27.53(m):

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495 - 2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495 - 2496 MHz).

Pursuant to FCC OET RULES 662911 D01 and D02 for two antenna MIMO mode of operations, the FCC limit of -13 dBm shall be 3 dB more stringent, therefore all channel edge and out of band spurious emissions shall be -16 dBm. Further limits are adjusted for lower resolution BW using  $10 \log(100\text{kHz}/1\% \text{ of channel BW})$

**5.6.4 Description of measurement – Measurement guidance KDB 971168 D01 (6)**

The spurious emission at the antenna terminal is measured conducted using a spectrum analyser. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

**5.6.5 Spectrum analyser settings**
**9 kHz to 150 kHz:**

|       |       |       |           |          |             |
|-------|-------|-------|-----------|----------|-------------|
| RBW:  | VBW:  | Span: | Detector: | Trigger: | Sweep time: |
| 1 kHz | 3 kHz | -     | RMS       | Free run | 20 sec.     |

**150 kHz to 30 MHz:**

|        |        |       |           |          |             |
|--------|--------|-------|-----------|----------|-------------|
| RBW:   | VBW:   | Span: | Detector: | Trigger: | Sweep time: |
| 10 kHz | 30 kHz | -     | RMS       | Free run | 20 sec.     |

**30 MHz to 1 GHz:**

|         |         |       |           |          |             |
|---------|---------|-------|-----------|----------|-------------|
| RBW:    | VBW:    | Span: | Detector: | Trigger: | Sweep time: |
| 100 kHz | 300 kHz | -     | RMS       | Free run | 20 sec.     |

**1 GHz to 27 GHz:**

|       |       |       |           |          |             |
|-------|-------|-------|-----------|----------|-------------|
| RBW:  | VBW:  | Span: | Detector: | Trigger: | Sweep time: |
| 1 MHz | 3 MHz | -     | RMS       | Free run | 20 sec.     |

**5.6.6 Test result tables**
**QPSK-Modulation**

| Channel | Start Frequency (MHz) | Stop Frequency (MHz) | Antenna 1  |                 | Limit (dBm) |
|---------|-----------------------|----------------------|------------|-----------------|-------------|
|         |                       |                      | Peak (dBm) | Frequency (MHz) |             |
| Middle  | 0.009                 | 0.15                 | -62.25     | 0.13            | -16.0       |
|         | 0.15                  | 30                   | -65.33     | 29.86           |             |
|         | 30                    | 1000                 | -54.35     | 31.94           |             |
|         | 1000                  | 3500                 | -38.36     | 3157.50         |             |
|         | 3500                  | 12750                | -43.02     | 12320.80        |             |
|         | 12750                 | 25930                | -30.37     | 23986.50        |             |

**16QAM-Modulation**

| Channel | Start<br>Frequency<br>(MHz) | Stop<br>Frequency<br>(MHz) | Antenna 1     |                    | Limit<br>(dBm) |
|---------|-----------------------------|----------------------------|---------------|--------------------|----------------|
|         |                             |                            | Peak<br>(dBm) | Frequency<br>(MHz) |                |
| Middle  | 0.009                       | 0.15                       | -62.72        | 0.13               | -16.0          |
|         | 0.15                        | 30                         | -65.04        | 29.86              |                |
|         | 30                          | 1000                       | -51.77        | 31.94              |                |
|         | 1000                        | 3500                       | -38.40        | 3151.50            |                |
|         | 3500                        | 12750                      | -42.25        | 12750.00           |                |
|         | 12750                       | 25930                      | -30.85        | 24003.00           |                |

**64QAM-Modulation**

| Channel | Start<br>Frequency<br>(MHz) | Stop<br>Frequency<br>(MHz) | Antenna 1     |                    | Limit<br>(dBm) |
|---------|-----------------------------|----------------------------|---------------|--------------------|----------------|
|         |                             |                            | Peak<br>(dBm) | Frequency<br>(MHz) |                |
| Middle  | 0.009                       | 0.15                       | -63.24        | 0.13               | -16.0          |
|         | 0.15                        | 30                         | -65.11        | 29.80              |                |
|         | 30                          | 1000                       | -54.52        | 31.55              |                |
|         | 1000                        | 3500                       | -38.42        | 3154.00            |                |
|         | 3500                        | 12750                      | -42.32        | 12748.15           |                |
|         | 12750                       | 25930                      | -30.86        | 23975.50           |                |

### 5.6.6.1 Test result plot – Antenna port 1

Modulation: QPSK

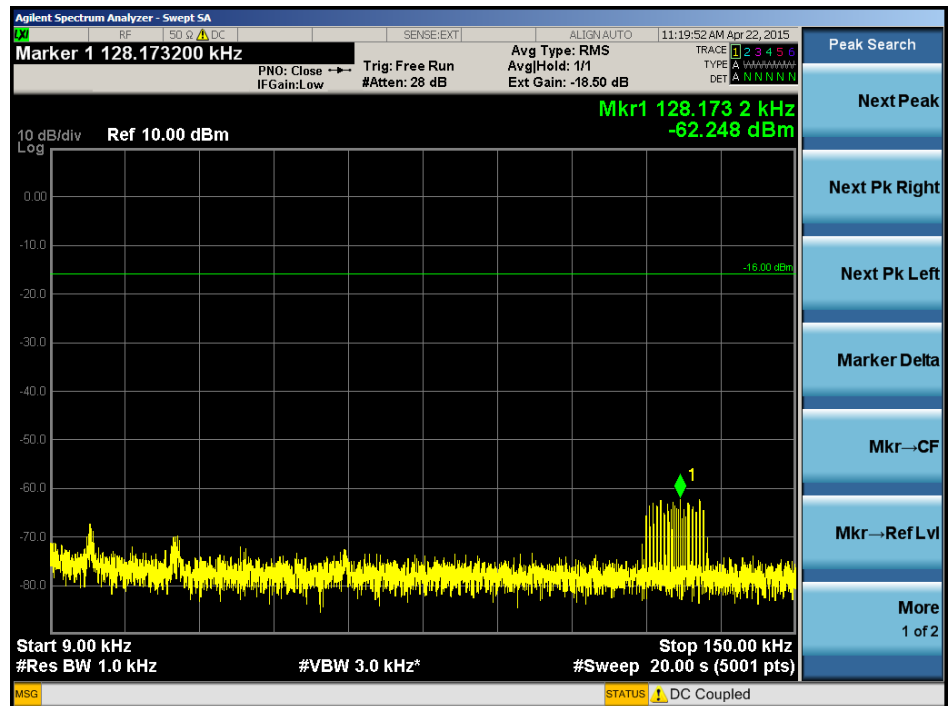
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
9 kHz to 150 kHz



Modulation: QPSK

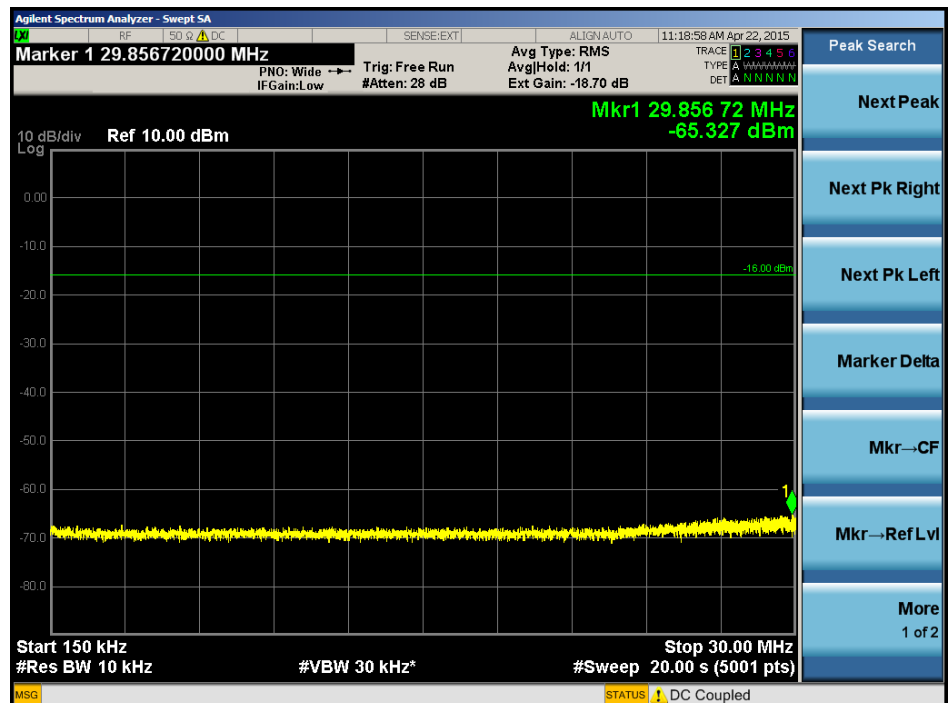
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
150 kHz to 30 MHz



Modulation: QPSK

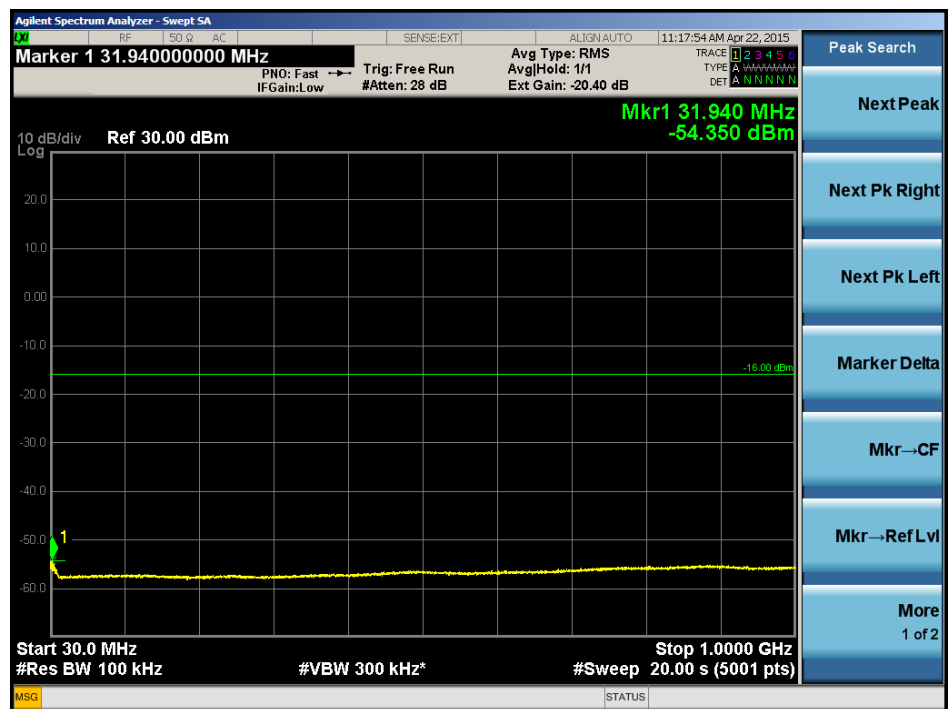
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
30 MHz to 1000 MHz



Modulation: QPSK

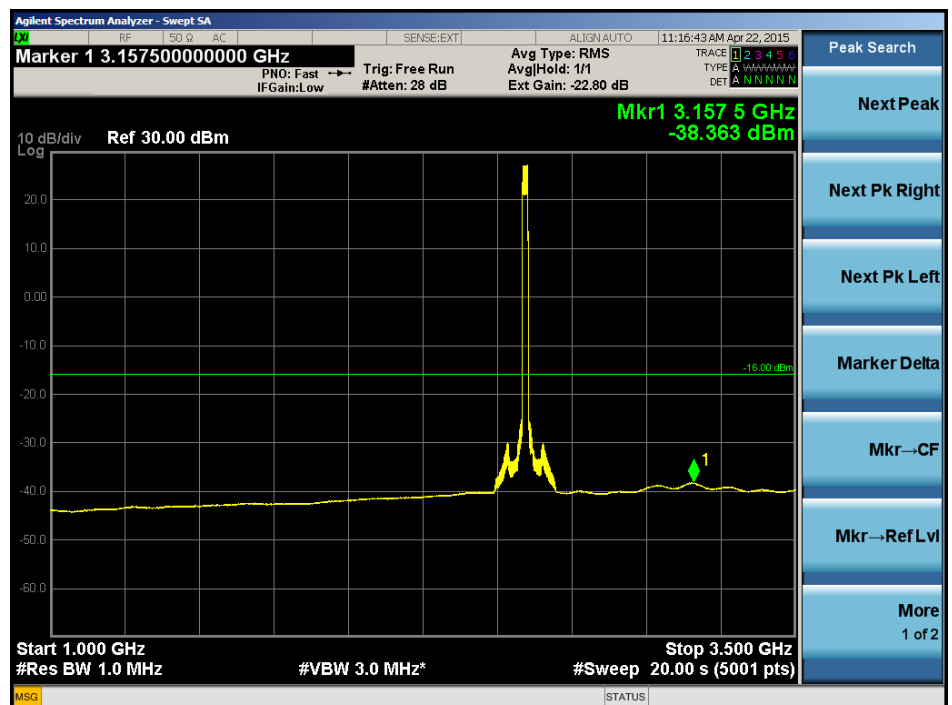
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
1 GHz to 3.5 GHz



Modulation: QPSK

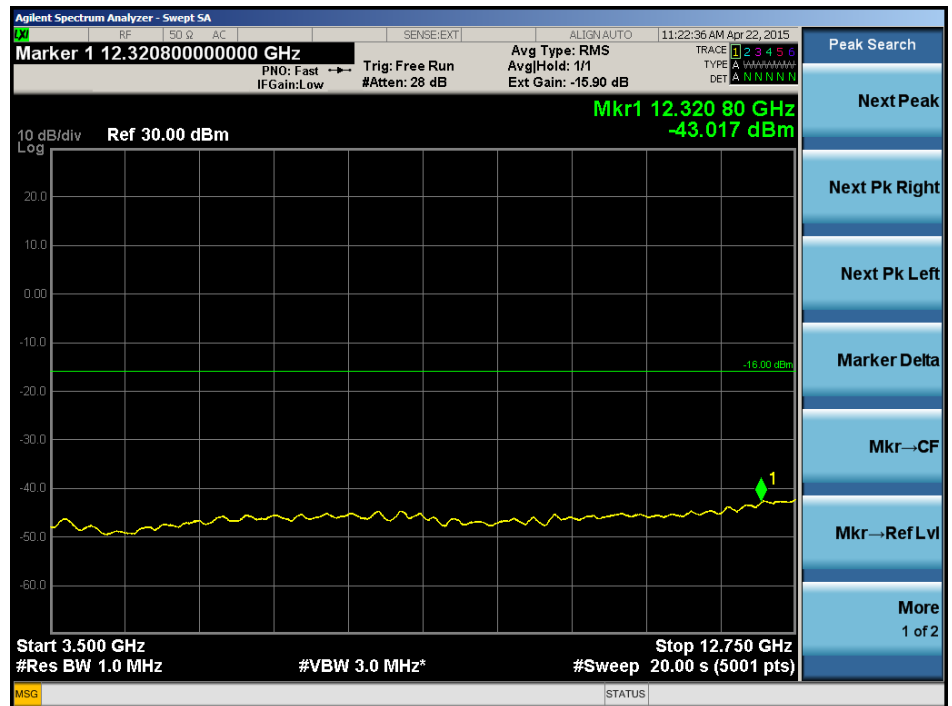
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
3.5 GHz to 12.75 GHz



Modulation: QPSK

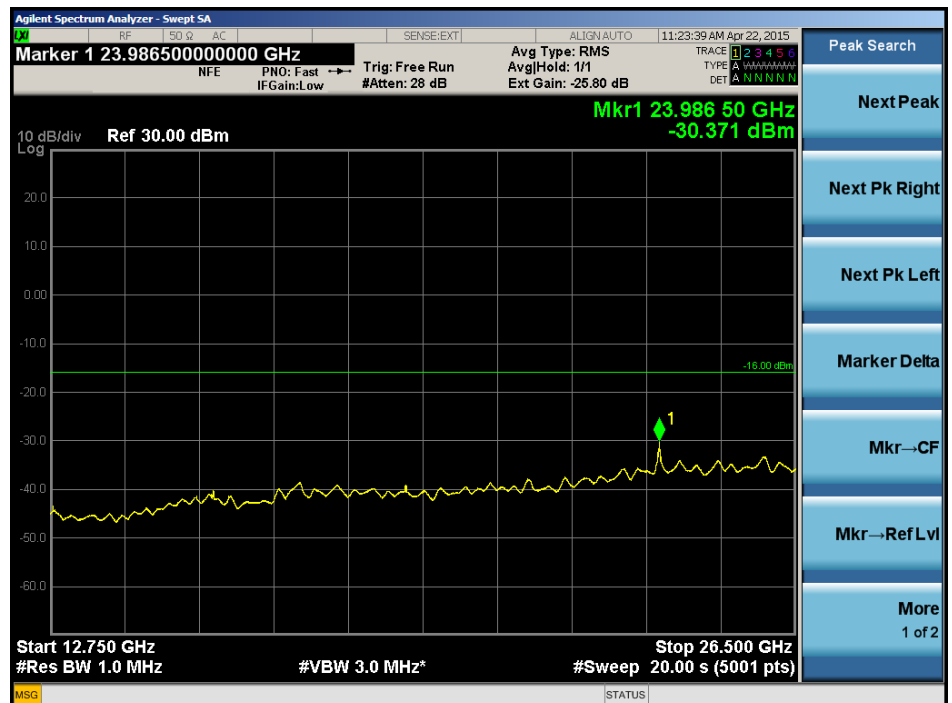
E.UTRA Test Model: E-TM1.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
12.75 GHz to 26.5 GHz



Modulation: 16QAM

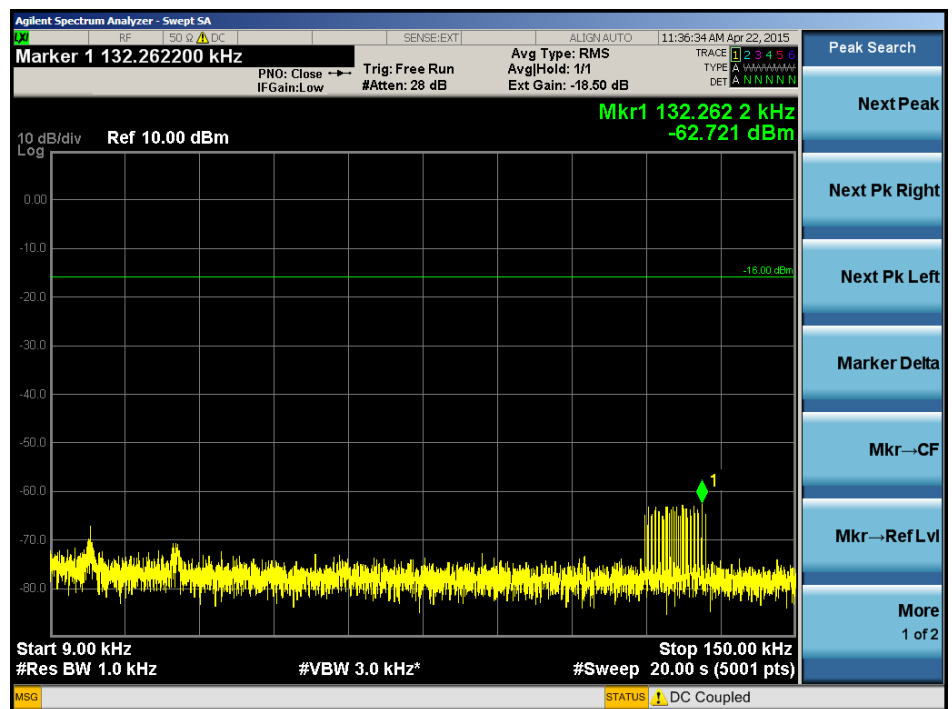
E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
9 kHz to 150 kHz



Modulation: 16QAM

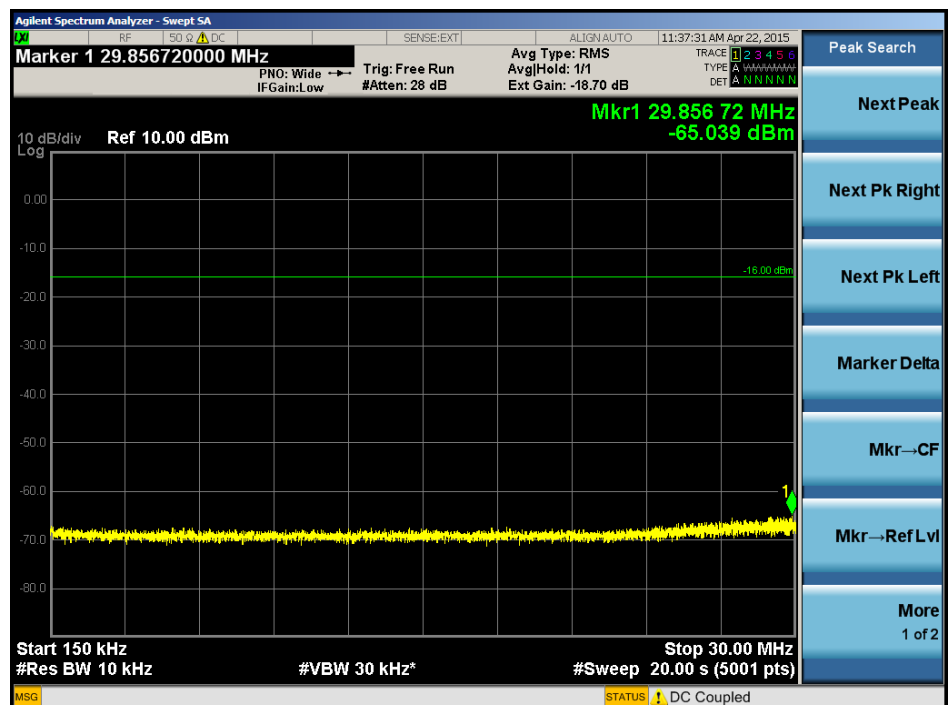
E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
150 kHz to 30 MHz



Modulation: 16QAM

E.UTRA Test Model: E-TM3.2

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
30 MHz to 1000 MHz



Modulation: 16QAM

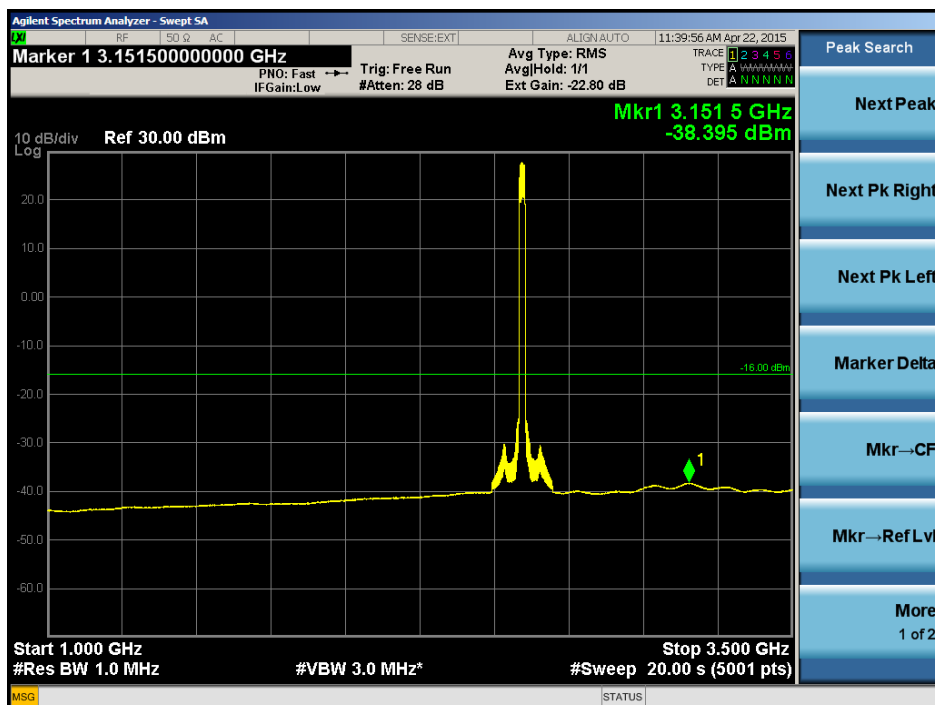
E.UTRA Test Model: E-TM3.2

CH: M

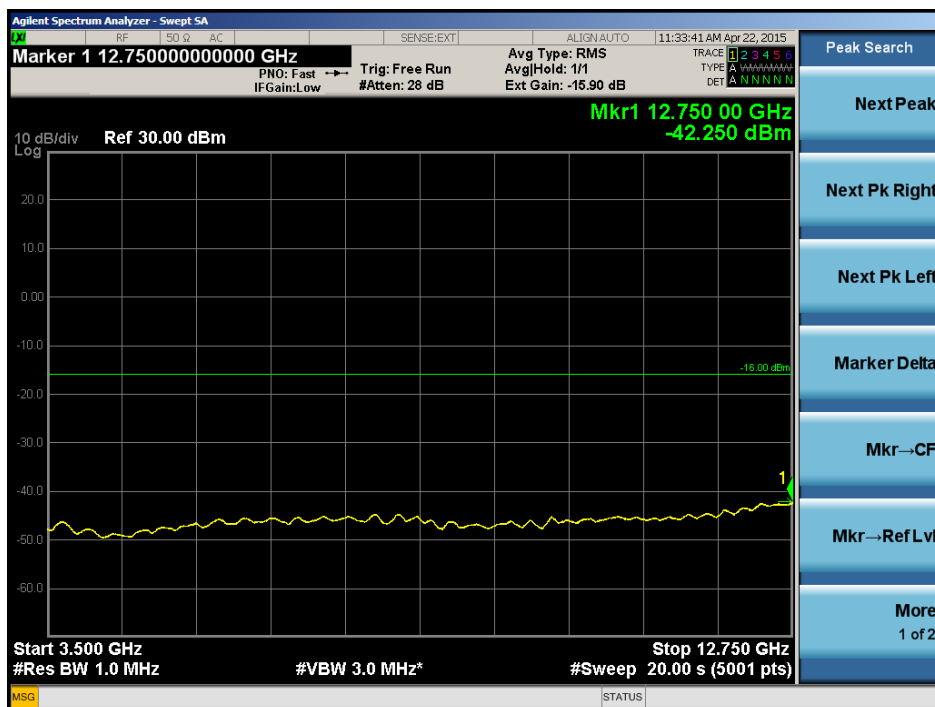
CH BW: 20 MHz

Antenna port: 1

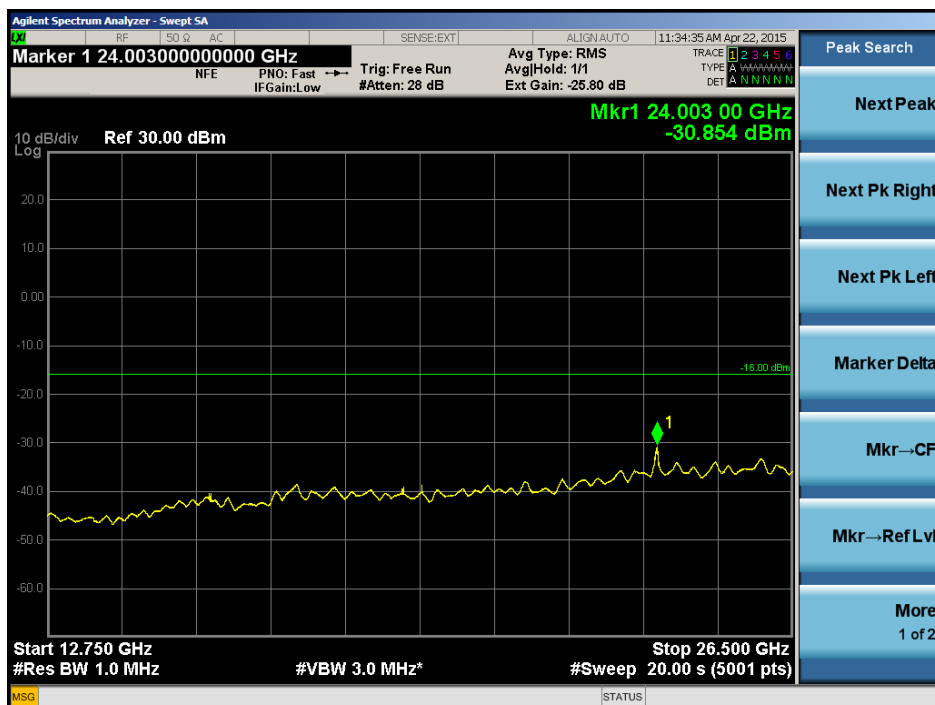
Frequency range:  
1 GHz to 3.5 GHz



Modulation: 16QAM  
E.UTRA Test Model: E-TM3.2  
CH: M  
CH BW: 20 MHz  
Antenna port: 1  
Frequency range:  
3.5 GHz to 12.75 GHz



Modulation: 16QAM  
E.UTRA Test Model: E-TM3.2  
CH: M  
CH BW: 20 MHz  
Antenna port: 1  
Frequency range:  
12.75 GHz to 26.5 GHz



Modulation: 64QAM

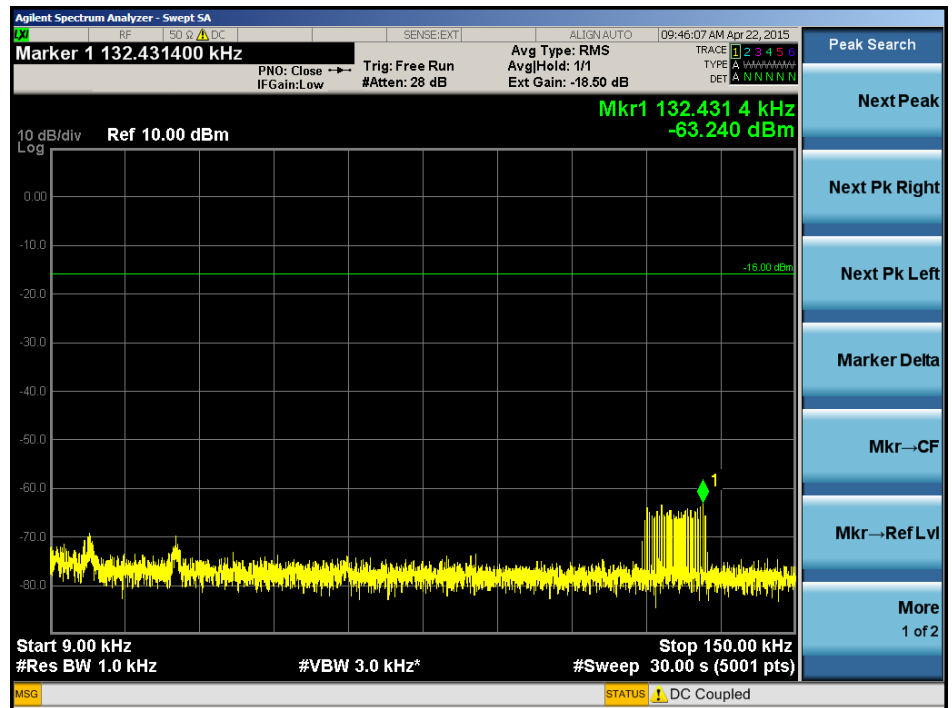
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
9 kHz to 150 kHz



Modulation: 64QAM

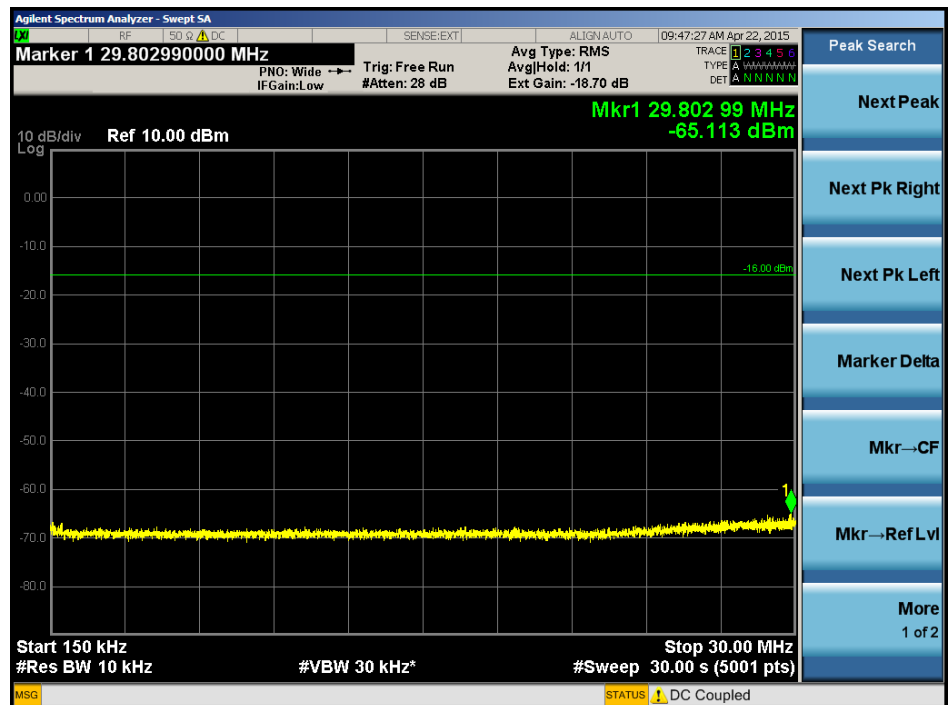
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
150 kHz to 30 MHz



Modulation: 64QAM

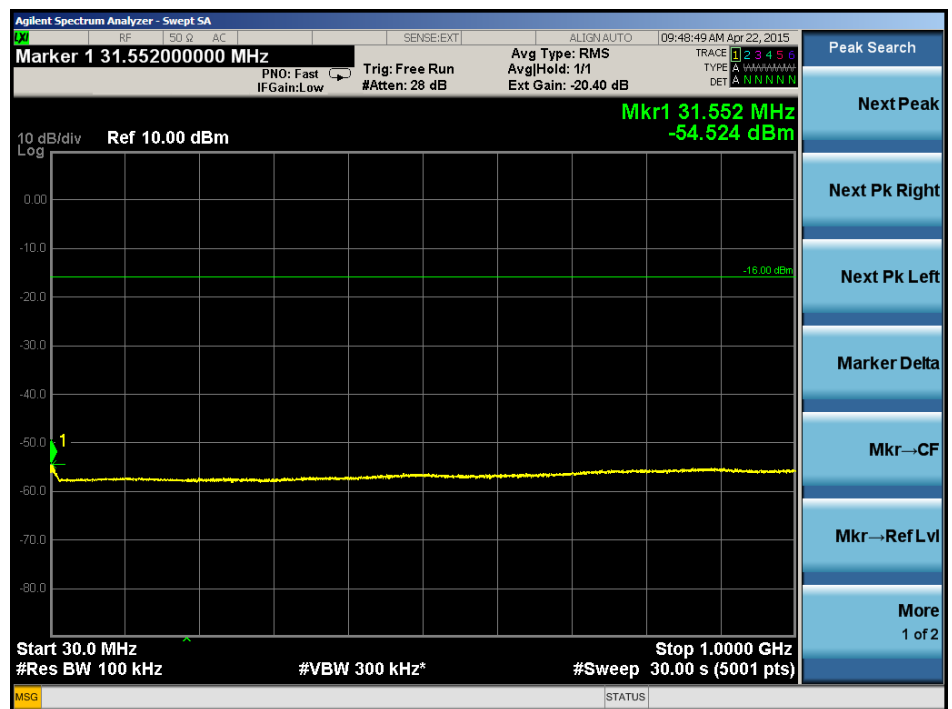
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
30 MHz to 1000 MHz



Modulation: 64QAM

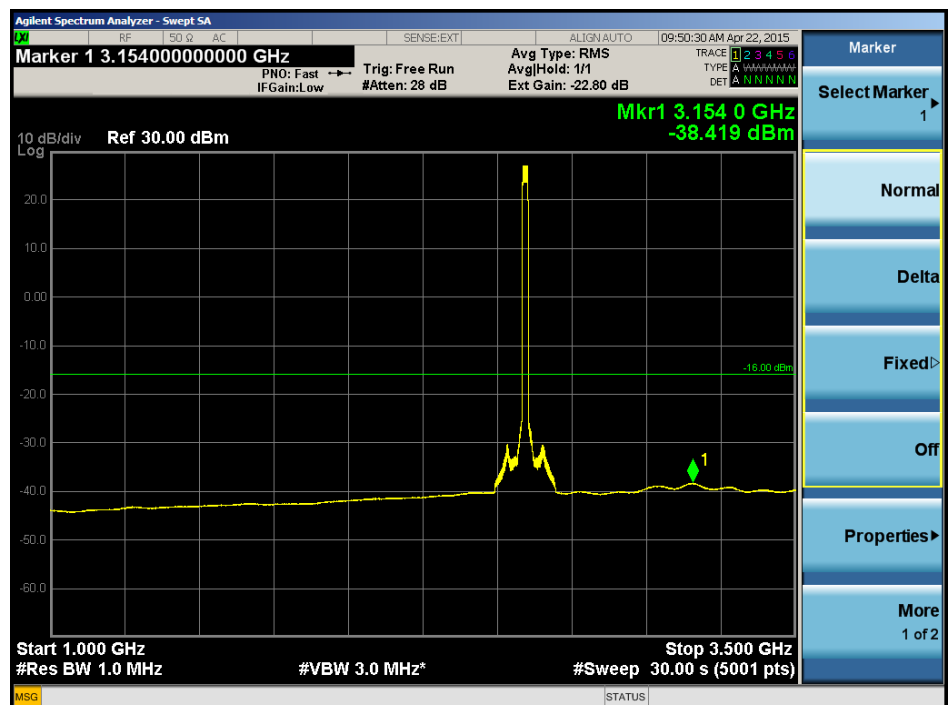
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
1 GHz to 3.5 GHz



Modulation: 64QAM

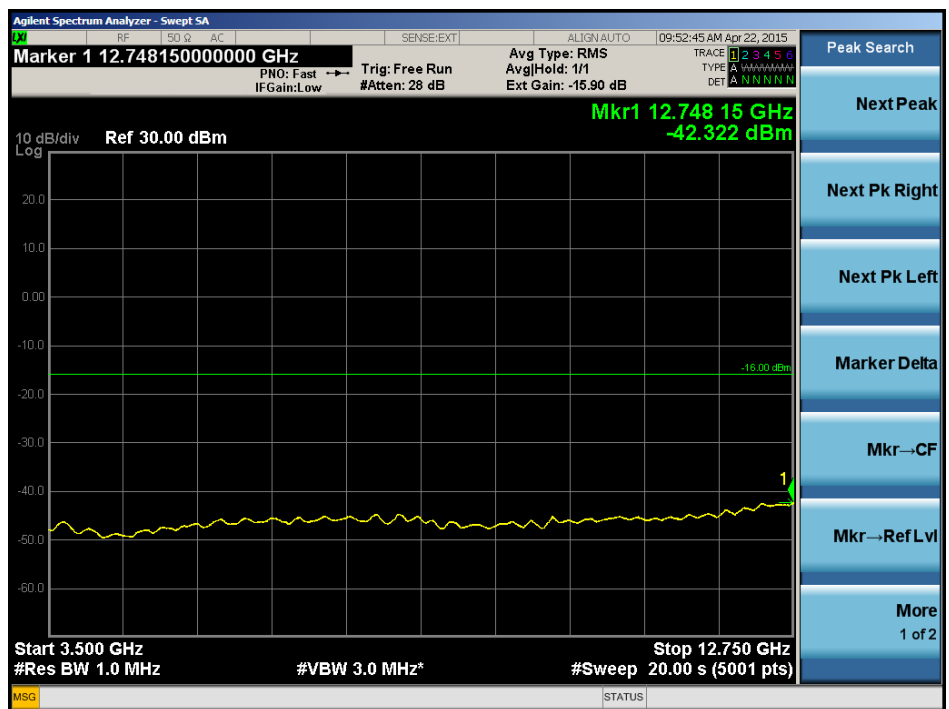
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
3.5 GHz to 12.75 GHz



Modulation: 64QAM

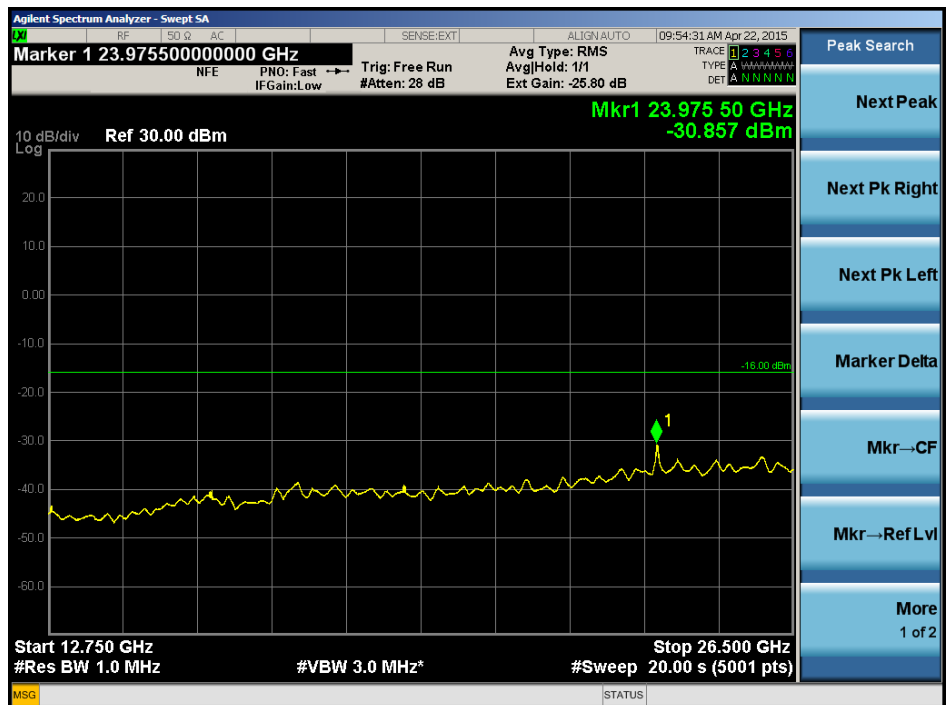
E.UTRA Test Model: E-TM3.1

CH: M

CH BW: 20 MHz

Antenna port: 1

Frequency range:  
12.75 GHz to 26.5 GHz



## 5.7 Field strength of spurious radiation

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**, **SER 3**.

### 5.7.1 Description of the test location

Test location: OATS 1  
Test location: Anechoic chamber 1

### 5.7.2 Photo documentation of the test set-up

Open area test site, 9 kHz - 30 MHz (test distance: 3 m)

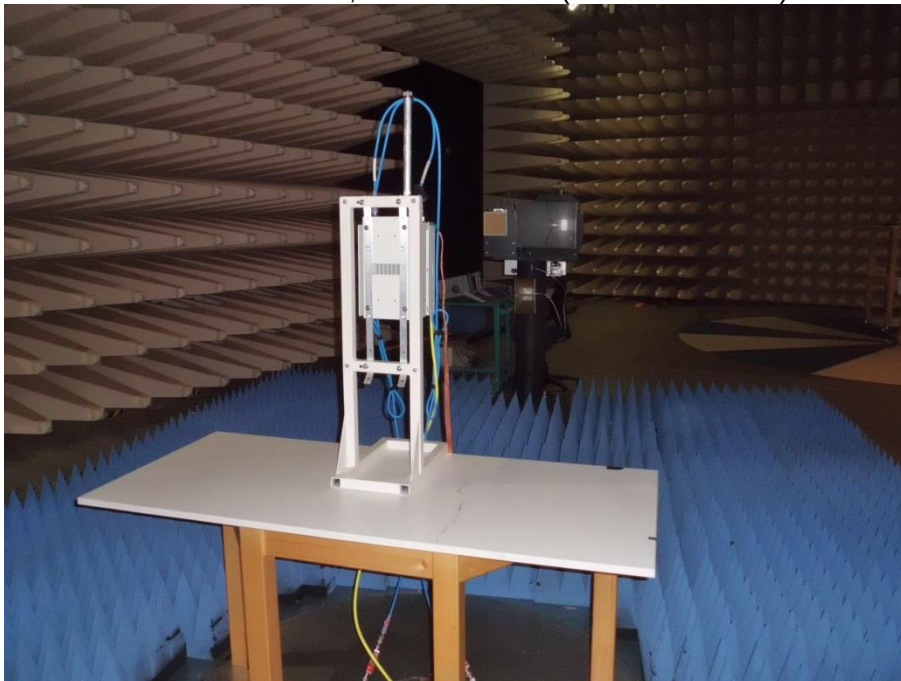


Open area test site, 30 MHz - 1000 MHz (test distance: 10 m)

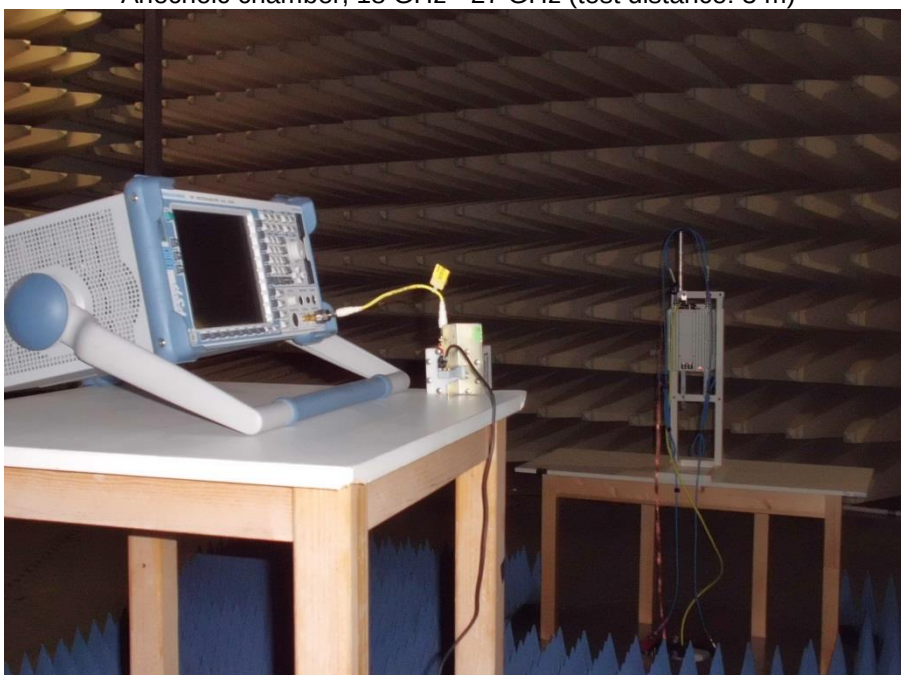


**FCC ID: 2AEEH-CMCOB41AC2X6**

Anechoic chamber, 1 GHz - 18 GHz (test distance: 3 m)



Anechoic chamber, 18 GHz - 27 GHz (test distance: 3 m)



### 5.7.3 Applicable standard

According to FCC Part 27, Section 27.53(m):

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495 - 2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495 - 2496 MHz).

Pursuant to FCC OET RULES 662911 D01 and D02 for two antenna MIMO mode of operations, the FCC limit of -13 dBm shall be 3 dB more stringent, therefore all channel edge and out of band spurious emissions shall be -16 dBm. Further limits are adjusted for lower resolution BW using 10 log (100kHz/1% of channel BW)

### 5.7.4 Description of measurement – Measurement guidance KDB 971168 D01 (7)

The spurious emission at the antenna terminal is measured radiated using a spectrum analyser. The EUT is set in TX continuous mode while measuring. The EUT is measured at antenna port 1. The resulting values are listed in the following tables.

### 5.7.5 Spectrum analyser settings

#### 9 kHz to 150 kHz:

|       |       |       |           |          |             |
|-------|-------|-------|-----------|----------|-------------|
| RBW:  | VBW:  | Span: | Detector: | Trigger: | Sweep time: |
| 1 kHz | 3 kHz | -     | RMS       | Free run | 10 sec.     |

#### 150 kHz to 30 MHz:

|        |        |       |           |          |             |
|--------|--------|-------|-----------|----------|-------------|
| RBW:   | VBW:   | Span: | Detector: | Trigger: | Sweep time: |
| 10 kHz | 30 kHz | -     | RMS       | Free run | 10 sec.     |

#### 30 MHz to 1 GHz:

|         |         |       |           |          |             |
|---------|---------|-------|-----------|----------|-------------|
| RBW:    | VBW:    | Span: | Detector: | Trigger: | Sweep time: |
| 100 kHz | 300 kHz | -     | RMS       | Free run | 10 sec.     |

#### 1 GHz to 27 GHz:

|       |       |       |           |          |             |
|-------|-------|-------|-----------|----------|-------------|
| RBW:  | VBW:  | Span: | Detector: | Trigger: | Sweep time: |
| 1 MHz | 3 MHz | -     | RMS       | Free run | 10 sec.     |

**5.7.6 Test result table**

| Modulation: QPSK - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - RX Antenna vertical |                |       |       |           |                       |       |        |         |
|--------------------------------------------------------------------------------------|----------------|-------|-------|-----------|-----------------------|-------|--------|---------|
| Start frequency                                                                      | Stop frequency | RBW   | VBW   | Frequency | Max emission observed | Limit | Margin | Verdict |
| (MHz)                                                                                | (MHz)          | (kHz) | (kHz) | (MHz)     | (dBm)                 | (dBm) | dB     |         |
| 0.009                                                                                | 0.075          | 1     | 3     | 0.009     | -32.5                 | -16.0 | 16.5   | OK      |
| 0.075                                                                                | 0.15           | 1     | 3     | 0.150     | -51.9                 | -16.0 | 35.9   | OK      |
| 0.15                                                                                 | 10             | 10    | 30    | 2.221     | -34.2                 | -16.0 | 18.2   | OK      |
| 10                                                                                   | 20             | 10    | 30    | 11.116    | -55.4                 | -16.0 | 39.4   | OK      |
| 20                                                                                   | 30             | 10    | 30    | 21.250    | -71.0                 | -16.0 | 55.0   | OK      |
| 30                                                                                   | 200            | 100   | 300   | 199.75    | -71.4                 | -16.0 | 55.4   | OK      |
| 200                                                                                  | 400            | 100   | 300   | 210.42    | -68.7                 | -16.0 | 52.7   | OK      |
| 400                                                                                  | 600            | 100   | 300   | 597.33    | -73.9                 | -16.0 | 57.9   | OK      |
| 600                                                                                  | 800            | 100   | 300   | 744.77    | -70.1                 | -16.0 | 54.1   | OK      |
| 800                                                                                  | 1000           | 100   | 300   | 964.84    | -67.4                 | -16.0 | 51.4   | OK      |
| 1000                                                                                 | 3000           | 1000  | 3000  | 2584.8    | -21.0                 | -16.0 | 5.0    | ---     |
| 3000                                                                                 | 6000           | 1000  | 3000  | 5182.3    | -60.2                 | -16.0 | 44.2   | OK      |
| 6000                                                                                 | 9000           | 1000  | 3000  | 8830.0    | -61.5                 | -16.0 | 45.5   | OK      |
| 12000                                                                                | 15000          | 1000  | 3000  | 12757.9   | -51.0                 | -16.0 | 35.0   | OK      |
| 15000                                                                                | 18000          | 1000  | 3000  | 17091.8   | -50.8                 | -16.0 | 34.8   | OK      |
| 18000                                                                                | 21000          | 1000  | 3000  | 20282.6   | -62.3                 | -16.0 | 46.3   | OK      |
| 21000                                                                                | 24000          | 1000  | 3000  | 21822.8   | -60.9                 | -16.0 | 44.9   | OK      |
| 24000                                                                                | 27000          | 1000  | 3000  | 26772.8   | -58.1                 | -16.0 | 42.1   | OK      |

--- fundamental frequency

| Modulation: QPSK - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - RX Antenna horizontal |                |       |       |           |                       |       |        |         |
|----------------------------------------------------------------------------------------|----------------|-------|-------|-----------|-----------------------|-------|--------|---------|
| Start frequency                                                                        | Stop frequency | RBW   | VBW   | Frequency | Max emission observed | Limit | Margin | Verdict |
| (MHz)                                                                                  | (MHz)          | (kHz) | (kHz) | (MHz)     | (dBm)                 | (dBm) | dB     |         |
| 30                                                                                     | 200            | 100   | 300   | 199.14    | -72.0                 | -16.0 | 56.0   | OK      |
| 200                                                                                    | 400            | 100   | 300   | 209.21    | -68.8                 | -16.0 | 52.8   | OK      |
| 400                                                                                    | 600            | 100   | 300   | 595.39    | -75.5                 | -16.0 | 59.5   | OK      |
| 600                                                                                    | 800            | 100   | 300   | 781.14    | -72.5                 | -16.0 | 56.5   | OK      |
| 800                                                                                    | 1000           | 100   | 300   | 979.27    | -68.7                 | -16.0 | 52.7   | OK      |
| 1000                                                                                   | 3000           | 1000  | 3000  | 2585.5    | -20.5                 | -16.0 | 4.5    | ---     |
| 3000                                                                                   | 6000           | 1000  | 3000  | 4000.0    | -58.7                 | -16.0 | 42.7   | OK      |
| 6000                                                                                   | 9000           | 1000  | 3000  | 8886.9    | -61.8                 | -16.0 | 45.8   | OK      |
| 12000                                                                                  | 15000          | 1000  | 3000  | 12750.0   | -51.6                 | -16.0 | 35.6   | OK      |
| 15000                                                                                  | 18000          | 1000  | 3000  | 17104.9   | -52.4                 | -16.0 | 36.4   | OK      |
| 18000                                                                                  | 21000          | 1000  | 3000  | 20210.6   | -61.6                 | -16.0 | 45.6   | OK      |
| 21000                                                                                  | 24000          | 1000  | 3000  | 21809.3   | -59.3                 | -16.0 | 43.3   | OK      |
| 24000                                                                                  | 27000          | 1000  | 3000  | 26850.4   | -55.8                 | -16.0 | 39.8   | OK      |

--- fundamental frequency

**5.7.7 Test result remarks**

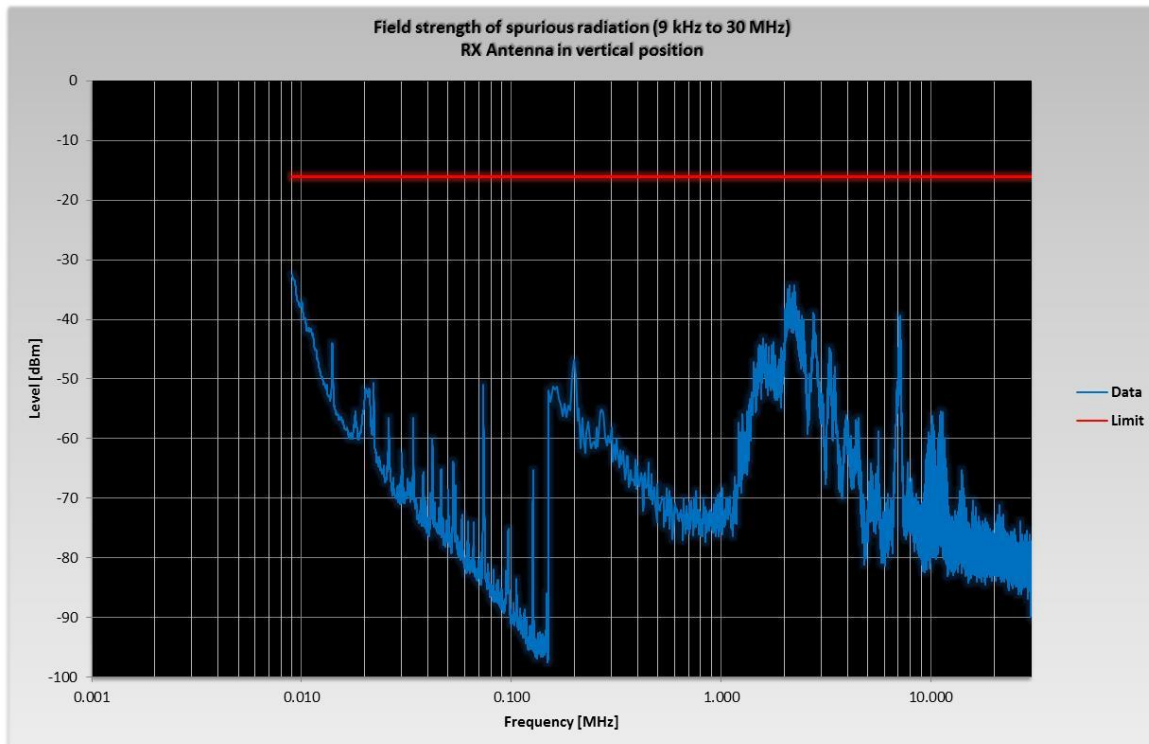
For this particular test, the field strength of any spurious radiation is required to be less then -16 dBm.

No harmonics above noise floor were found (<20 dB to the limit) over the frequency range from 9 kHz

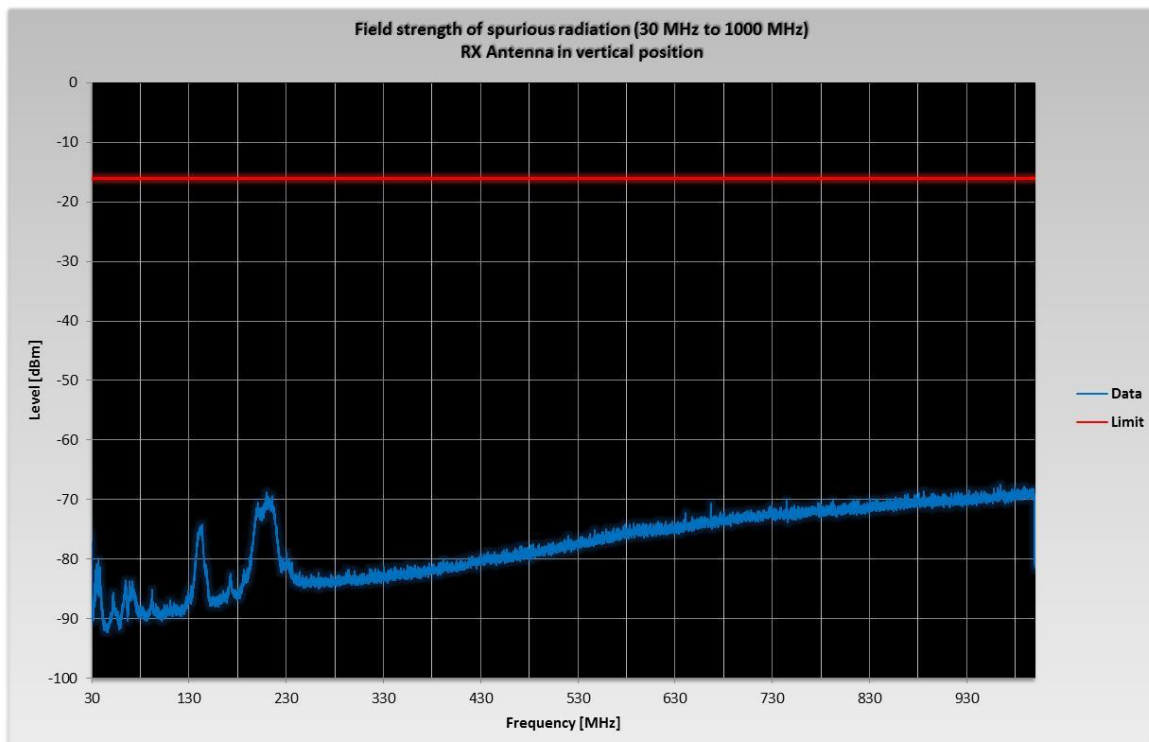
to 27 GHz. Therefore no final measurement where performend.

### 5.7.7.1 Test result plot – 64QAM

Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 9 kHz to 30 MHz

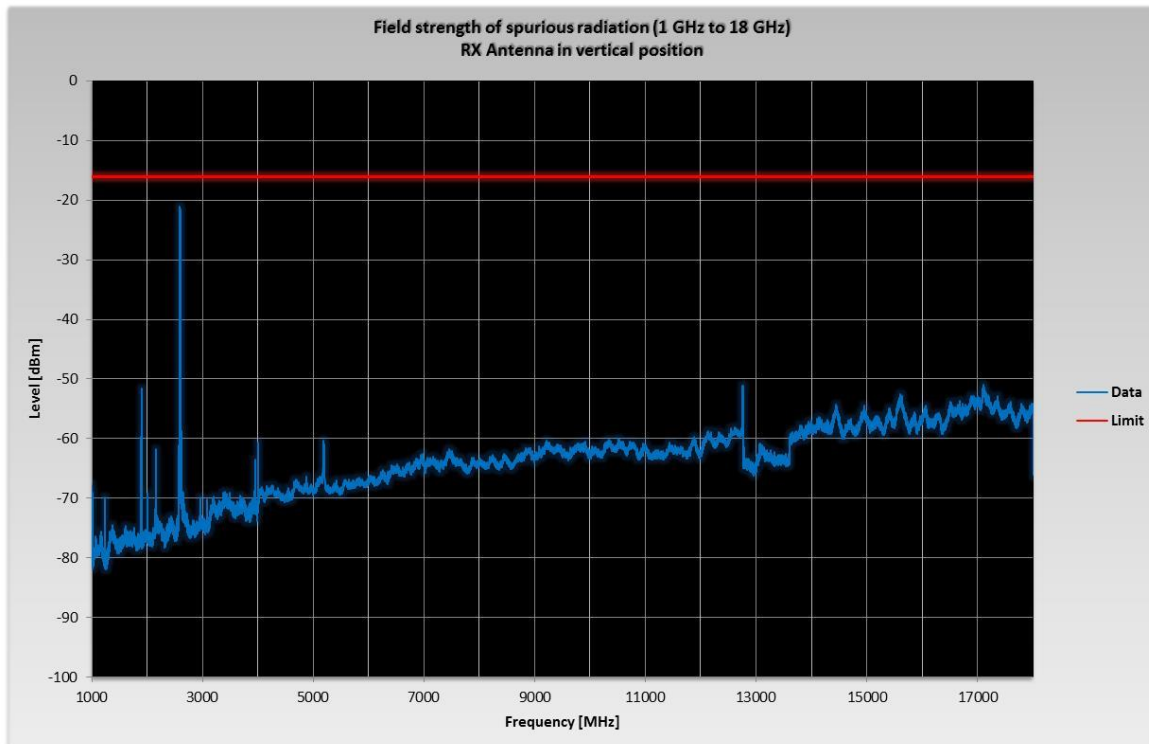


Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 30 MHz to 1000 MHz

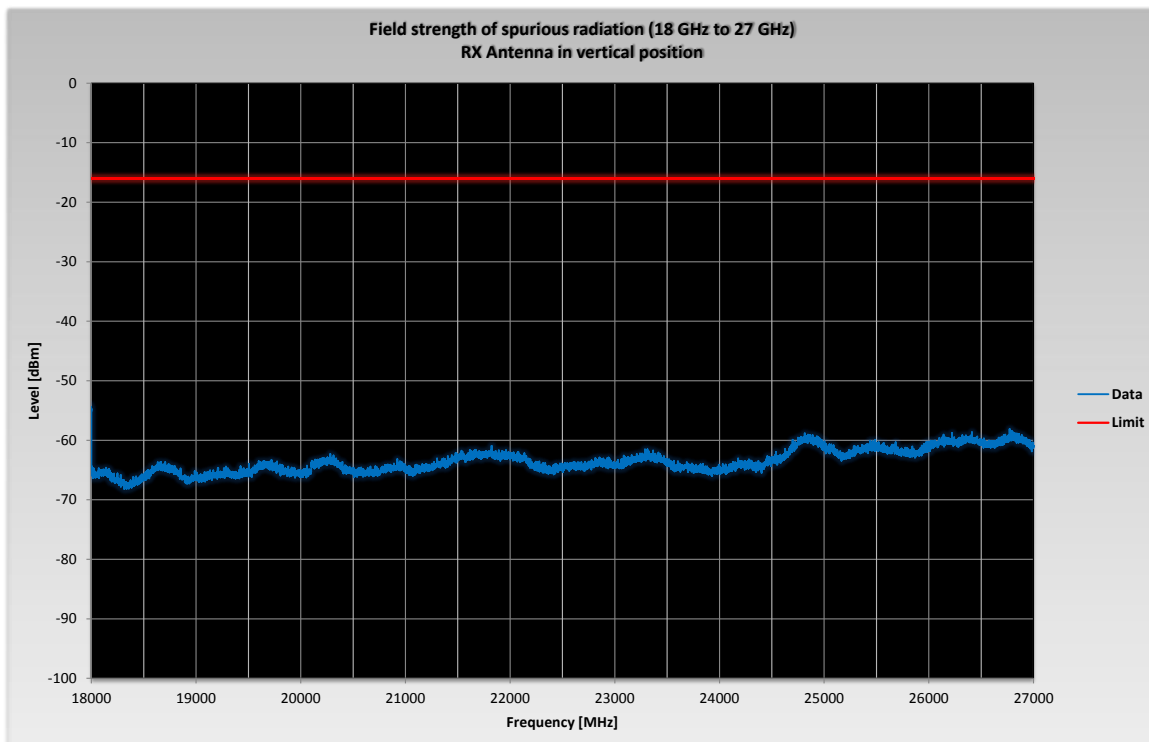


## FCC ID: 2AEEH-CMCOB41AC2X6

Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 1 GHz to 18 GHz

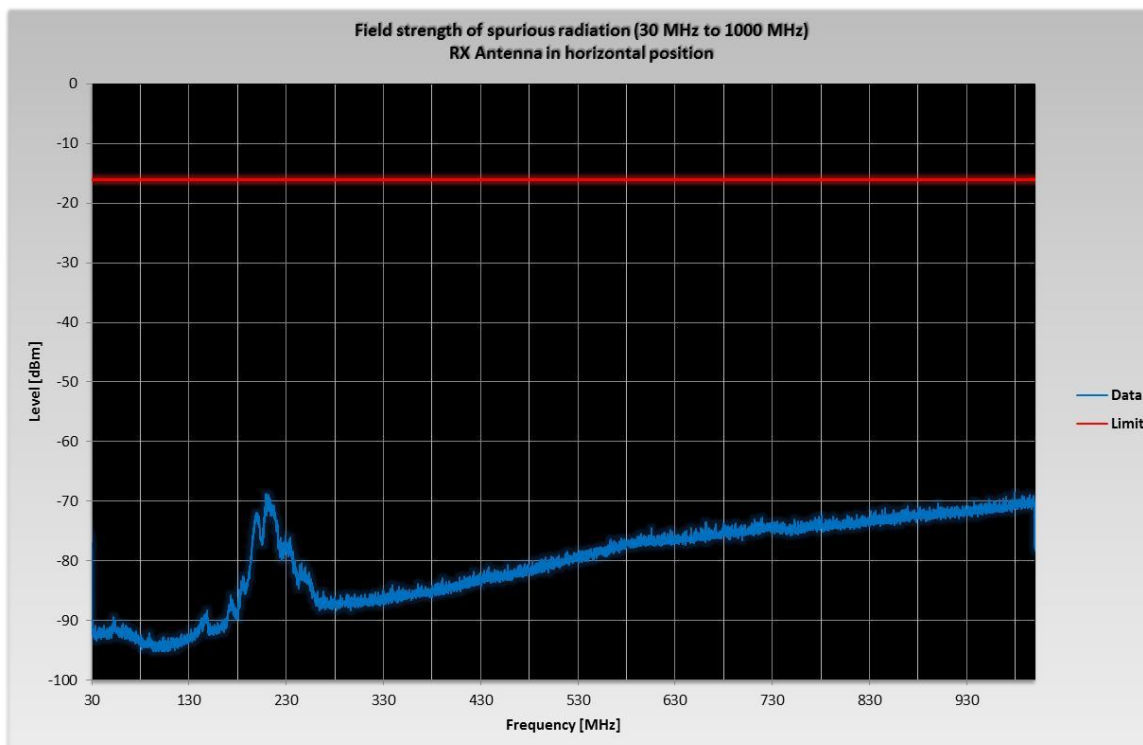


Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 18 GHz to 27 GHz

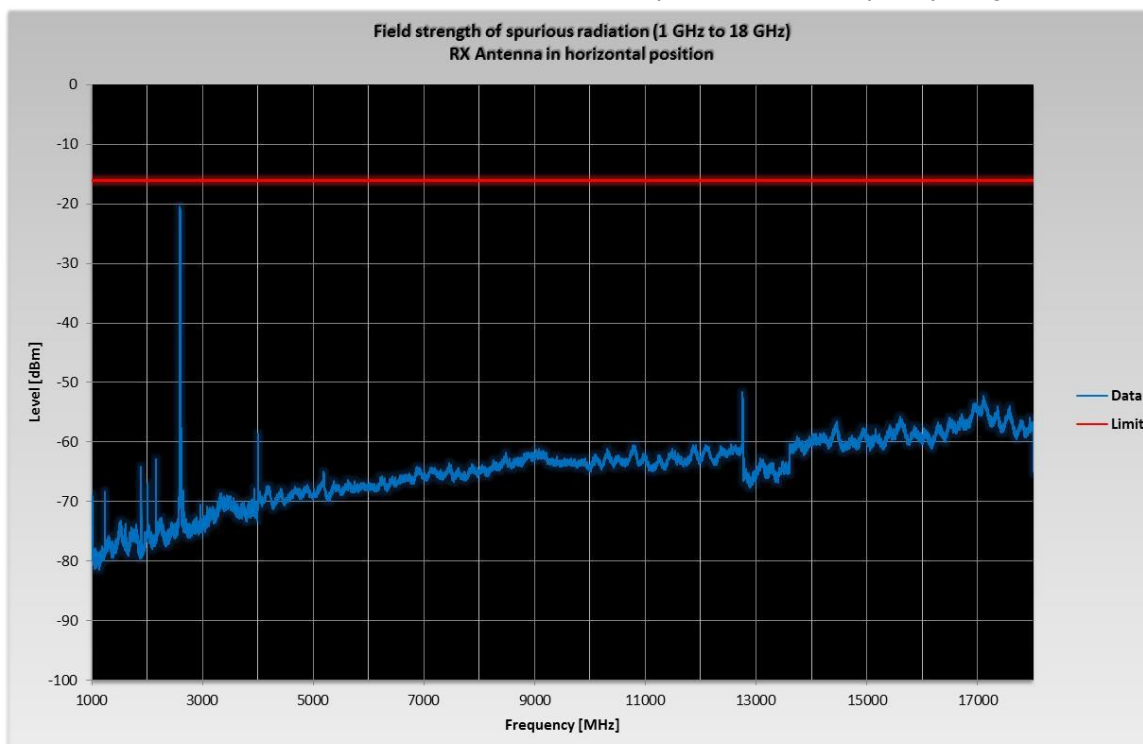


# FCC ID: 2AEEH-CMCOB41AC2X6

Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 30 MHz to 1000 MHz

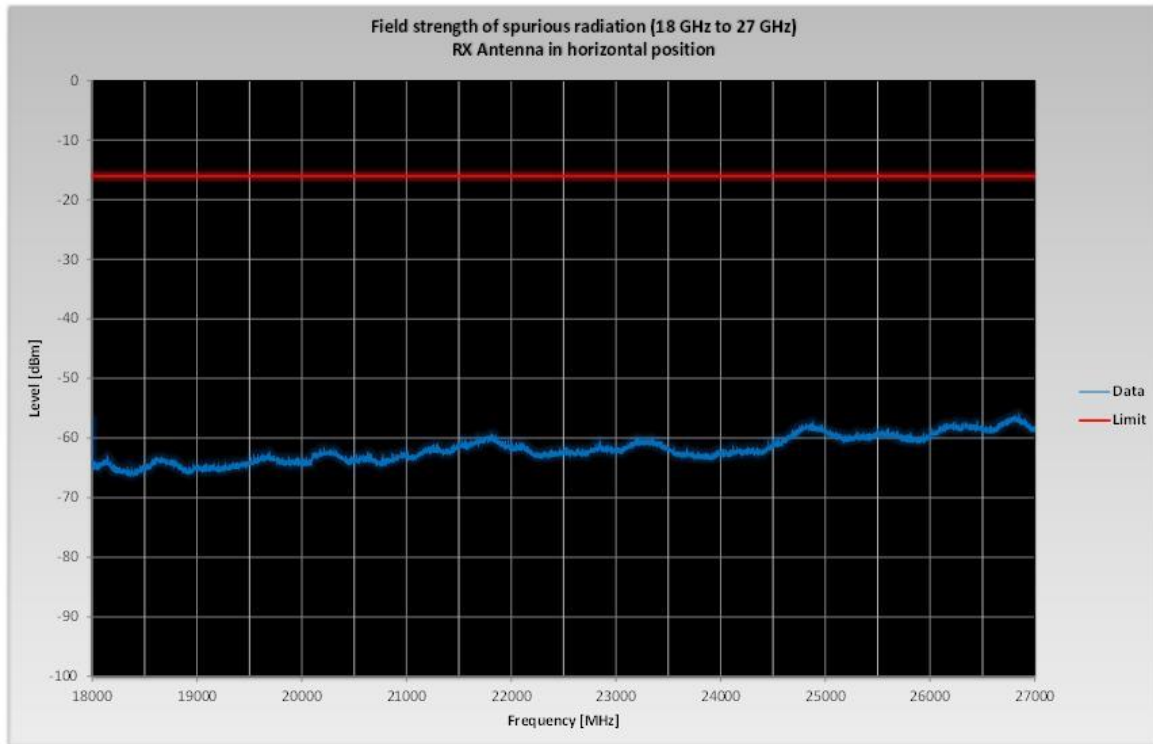


Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 1 GHz to 18 GHz



**FCC ID: 2AEEH-CMCOB41AC2X6**

Modulation: 64QAM - CH: M - CH BW: 20 MHz - Antenna port: 1 & 2 - Frequency range: 18 GHz to 27 GHz



## 5.8 Frequency stability

For test instruments and accessories used see section 6 Part FS.

### 5.8.1 Description of the test location

Test location: Room 008/U1/135

### 5.8.2 Photo documentation of the test set-up



### 5.8.3 Applicable standard

According to FCC Part 2, Section 2.1055:

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

**5.8.4 Description of measurement – Measurement guidance KDB 971168 D01 (9)**

After 60 minutes of temperature stabilization the frequency stability is measured conducted using a spectrum analyser with the function “LTE - Modulation Analysis”. The EUT is set in TX continuous mode with the maximal output power and the test model is E-TM3.1 on middle channel (2593.0 MHz) while measuring. The EUT is measured at antenna port 1. Within 3 minutes after the temperature stabilization, a measurement result was taken every 30 seconds (declared by manufacturer). The resulting values are listed in the following tables.

**5.8.5 Spectrum analyser settings**

The settings are automatically changed by analyser software and is dependent to the used channel bandwidth.

**5.8.6 Limit**

The limit of the frequency stability is  $\pm 0.1$  ppm. For the middle frequency the calculated limit is:  $\pm 259.30$  Hz.

**5.8.7 Test result table**

| Variable temperature and constant voltage |               |                |                      | Variable temperature and constant voltage |               |                |                      |
|-------------------------------------------|---------------|----------------|----------------------|-------------------------------------------|---------------|----------------|----------------------|
| Temperature (°C)                          | Voltage (VAC) | Time (minutes) | Frequency error (Hz) | Temperature (°C)                          | Voltage (VAC) | Time (minutes) | Frequency error (Hz) |
| +50                                       | 110.0         | 0.0            | -0.9                 | 0                                         | 110.0         | 0.0            | -1.9                 |
|                                           |               | 0.5            | -1.5                 |                                           |               | 0.5            | 3.0                  |
|                                           |               | 1.0            | 5.5                  |                                           |               | 1.0            | 0.2                  |
|                                           |               | 1.5            | -2.5                 |                                           |               | 1.5            | -6.9                 |
|                                           |               | 2.0            | -2.2                 |                                           |               | 2.0            | -7.4                 |
|                                           |               | 2.5            | -1.6                 |                                           |               | 2.5            | -8.7                 |
|                                           |               | 3.0            | -20.2                |                                           |               | 3.0            | -1.9                 |
| +40                                       |               | 0.0            | 0.2                  | -10                                       |               | 0.0            | -7.0                 |
|                                           |               | 0.5            | -4.7                 |                                           |               | 0.5            | -1.8                 |
|                                           |               | 1.0            | -5.0                 |                                           |               | 1.0            | 3.8                  |
|                                           |               | 1.5            | 0.2                  |                                           |               | 1.5            | -2.8                 |
|                                           |               | 2.0            | 0.4                  |                                           |               | 2.0            | -3.4                 |
|                                           |               | 2.5            | -3.0                 |                                           |               | 2.5            | -2.6                 |
|                                           |               | 3.0            | -2.8                 |                                           |               | 3.0            | -3.7                 |
| +30                                       |               | 0.0            | -4.3                 | -20                                       |               | 0.0            | -5.6                 |
|                                           |               | 0.5            | -0.6                 |                                           |               | 0.5            | -3.4                 |
|                                           |               | 1.0            | -5.0                 |                                           |               | 1.0            | -10.3                |
|                                           |               | 1.5            | -4.9                 |                                           |               | 1.5            | -5.6                 |
|                                           |               | 2.0            | -9.6                 |                                           |               | 2.0            | -6.4                 |
|                                           |               | 2.5            | -1.9                 |                                           |               | 2.5            | 12.1                 |
|                                           |               | 3.0            | -3.2                 |                                           |               | 3.0            | -7.2                 |
| +20                                       |               | 0.0            | -0.6                 | -30                                       |               | 0.0            | -4.1                 |
|                                           |               | 0.5            | -1.3                 |                                           |               | 0.5            | -3.6                 |
|                                           |               | 1.0            | -1.1                 |                                           |               | 1.0            | -6.6                 |
|                                           |               | 1.5            | -0.5                 |                                           |               | 1.5            | -4.0                 |
|                                           |               | 2.0            | -1.5                 |                                           |               | 2.0            | -1.7                 |
|                                           |               | 2.5            | -3.4                 |                                           |               | 2.5            | -2.8                 |
|                                           |               | 3.0            | -3.1                 |                                           |               | 3.0            | -0.4                 |
| +10                                       |               | 0.0            | -3.2                 | -40                                       |               | 0.0            | 0.7                  |
|                                           |               | 0.5            | -3.4                 |                                           |               | 0.5            | 0.7                  |
|                                           |               | 1.0            | -2.3                 |                                           |               | 1.0            | -1.2                 |
|                                           | 1.5           | -4.0           | 1.5                  |                                           | 0.4           |                |                      |
|                                           | 2.0           | -2.1           | 2.0                  |                                           | -17.7         |                |                      |
|                                           | 2.5           | -1.4           | 2.5                  |                                           | -0.8          |                |                      |
|                                           | 3.0           | -4.3           | 3.0                  |                                           | 0.5           |                |                      |

| Constant temperature and nominal Voltage |               |                |                      |
|------------------------------------------|---------------|----------------|----------------------|
| Temperature (°C)                         | Voltage (VAC) | Time (minutes) | Frequency error (Hz) |
| +25                                      | 110.0         | 0.0            | -1.2                 |
|                                          |               | 0.5            | -2.3                 |
|                                          |               | 1.0            | -3.2                 |
|                                          |               | 1.5            | -1.3                 |
|                                          |               | 2.0            | -2.2                 |
|                                          |               | 2.5            | 1.1                  |
|                                          |               | 3.0            | -1.7                 |

| Constant temperature and variable voltage |               |                |                      |
|-------------------------------------------|---------------|----------------|----------------------|
| Temperature (°C)                          | Voltage (VAC) | Time (minutes) | Frequency error (Hz) |
| +25                                       | 93.5          | 0.0            | -3.2                 |
|                                           |               | 0.5            | -1.4                 |
|                                           |               | 1.0            | -2.3                 |
|                                           |               | 1.5            | -1.7                 |
|                                           |               | 2.0            | -9.5                 |
|                                           |               | 2.5            | 3.9                  |
|                                           |               | 3.0            | 4.5                  |
|                                           | 96.8          | 0.0            | 1.6                  |
|                                           |               | 0.5            | -1.5                 |
|                                           |               | 1.0            | -2.1                 |
|                                           |               | 1.5            | -1.3                 |
|                                           |               | 2.0            | 1.7                  |
|                                           |               | 2.5            | 2.1                  |
|                                           |               | 3.0            | 1.3                  |
|                                           | 100.1         | 0.0            | -1.1                 |
|                                           |               | 0.5            | -1.1                 |
|                                           |               | 1.0            | -0.8                 |
|                                           |               | 1.5            | -1.4                 |
|                                           |               | 2.0            | -1.4                 |
|                                           |               | 2.5            | -5.7                 |
|                                           |               | 3.0            | -6.4                 |
|                                           | 103.4         | 0.0            | 1.8                  |
|                                           |               | 0.5            | -3.1                 |
|                                           |               | 1.0            | -3.4                 |
|                                           |               | 1.5            | -3.2                 |
|                                           |               | 2.0            | -2.5                 |
|                                           |               | 2.5            | -1.6                 |
|                                           |               | 3.0            | -2.6                 |
|                                           | 106.7         | 0.0            | -4.3                 |
|                                           |               | 0.5            | 1.2                  |
|                                           |               | 1.0            | -1.0                 |
|                                           |               | 1.5            | -1.7                 |
|                                           |               | 2.0            | -3.2                 |
|                                           |               | 2.5            | -8.6                 |
|                                           |               | 3.0            | -4.3                 |

| Constant temperature and variable voltage |               |                |                      |
|-------------------------------------------|---------------|----------------|----------------------|
| Temperature (°C)                          | Voltage (VAC) | Time (minutes) | Frequency error (Hz) |
| +25                                       | 113.3         | 0.0            | -1.6                 |
|                                           |               | 0.5            | -7.3                 |
|                                           |               | 1.0            | -3.1                 |
|                                           |               | 1.5            | -3.4                 |
|                                           |               | 2.0            | -1.4                 |
|                                           |               | 2.5            | -1.0                 |
|                                           |               | 3.0            | 2.1                  |
|                                           | 116.6         | 0.0            | -2.0                 |
|                                           |               | 0.5            | -1.1                 |
|                                           |               | 1.0            | -2.0                 |
|                                           |               | 1.5            | -1.9                 |
|                                           |               | 2.0            | -1.5                 |
|                                           |               | 2.5            | -2.2                 |
|                                           |               | 3.0            | -5.6                 |
|                                           | 119.9         | 0.0            | -5.1                 |
|                                           |               | 0.5            | -6.1                 |
|                                           |               | 1.0            | 4.0                  |
|                                           |               | 1.5            | 1.3                  |
|                                           |               | 2.0            | -1.2                 |
|                                           |               | 2.5            | -4.2                 |
|                                           |               | 3.0            | -1.4                 |
|                                           | 123.2         | 0.0            | -1.6                 |
|                                           |               | 0.5            | -2.7                 |
|                                           |               | 1.0            | -1.2                 |
|                                           |               | 1.5            | 1.1                  |
|                                           |               | 2.0            | -2.7                 |
|                                           |               | 2.5            | -1.7                 |
|                                           |               | 3.0            | -1.1                 |
|                                           | 126.5         | 0.0            | -1.7                 |
|                                           |               | 0.5            | -1.0                 |
|                                           |               | 1.0            | -2.1                 |
|                                           |               | 1.5            | -2.1                 |
|                                           |               | 2.0            | 4.2                  |
|                                           |               | 2.5            | -1.8                 |
|                                           |               | 3.0            | -2.8                 |

## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

| <b>Test ID</b> | <b>Model Type</b>      | <b>Equipment No.</b> | <b>Next Calib.</b> | <b>Last Calib.</b> | <b>Next Verif.</b> | <b>Next Verif.</b> |
|----------------|------------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| CPC 3          | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| FS             | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | 34970A                 | 99-02/07-15-002      | 27/03/2016         | 27/03/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | TW-60/24               | 99-02/45-15-001      |                    |                    |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| MB             | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| SEC1           | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| SEC2           | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| SEC3           | 8040 C                 | 99-02/05-15-001      | 27/01/2016         | 27/01/2015         |                    |                    |
|                | N9030A                 | 99-02/11-15-001      | 25/11/2015         | 25/11/2014         |                    |                    |
|                | PCR1000                | 99-02/50-15-001      |                    |                    |                    |                    |
|                | WA 35-10-33            | 99-02/50-15-004      |                    |                    |                    |                    |
| SER 1          | FMZB 1516              | 01-02/24-01-018      |                    |                    | 19/01/2016         | 19/01/2015         |
|                | ESR 7                  | 02-02/03-13-001      | 03/06/2015         | 03/06/2014         |                    |                    |
|                | KK-EF393-21N-16        | 02-02/50-05-033      |                    |                    |                    |                    |
|                | NW-2000-NB             | 02-02/50-05-113      |                    |                    |                    |                    |
|                | KK-SD_7/8-2X21N-33,0M  | 02-02/50-15-028      |                    |                    |                    |                    |
| SER 2          | ESR 7                  | 02-02/03-13-001      | 03/06/2015         | 03/06/2014         |                    |                    |
|                | VULB 9168              | 02-02/24-05-005      | 17/04/2016         | 17/04/2015         | 17/10/2015         | 17/04/2015         |
|                | NW-2000-NB             | 02-02/50-05-113      |                    |                    |                    |                    |
|                | KK-EF393/U-16N-21N20 m | 02-02/50-12-018      |                    |                    |                    |                    |
|                | KK-SD_7/8-2X21N-33,0M  | 02-02/50-15-028      |                    |                    |                    |                    |

**FCC ID: 2AEEH-CMCOB41AC2X6**

| Test ID | Model Type             | Equipment No.   | Next Calib. | Last Calib. | Next Verif. | Next Verif. |
|---------|------------------------|-----------------|-------------|-------------|-------------|-------------|
| SER 3   | FSP 40                 | 02-02/11-11-001 | 02/10/2015  | 02/10/2014  |             |             |
|         | JS4-18004000-30-5A     | 02-02/17-05-017 |             |             |             |             |
|         | AFS5-12001800-18-10P-6 | 02-02/17-06-002 |             |             |             |             |
|         | AFS4-01000400-10-10P-4 | 02-02/17-13-002 |             |             |             |             |
|         | AMF-4F-04001200-15-10P | 02-02/17-13-003 |             |             |             |             |
|         | BBHA 9120 E 251        | 02-02/24-05-006 | 27/04/2016  | 27/04/2015  | 27/10/2015  | 27/04/2015  |
|         | BBHA 9170              | 02-02/24-05-014 | 23/06/2006  | 23/06/2005  |             |             |
|         | WBH2-18NHG             | 02-02/24-08-002 | 27/04/2016  | 27/04/2015  | 27/10/2015  | 27/04/2015  |
|         | Sucoflex N-2000-SMA    | 02-02/50-05-075 |             |             |             |             |
|         | KMS102-0.2 m           | 02-02/50-11-020 |             |             |             |             |
|         | SF104/11N/11N/1500MM   | 02-02/50-13-015 |             |             |             |             |
|         | SF104/11SMA/11N/1500MM | 02-02/50-13-016 |             |             |             |             |
|         | SF104/11SMA/11N/1500MM | 02-02/50-13-017 |             |             |             |             |