Bittium

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# Spot Check Test Report– part 2, part 22h, part 24e, part 27, part 90

V27SD-42

HW Build 0502

Bittium

# Table of Contents:

Document information

| | |
|---|---|
| Version: | 4.0.0 |
| Approved by: | Mikko Miettinen |
| Owner: | Pekka Pulkkinen |
| Delivery: | FCC, Project |

Version history

| Version | Date | Notes | Author | Status |
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| 0.0.1 | 2015.09.16 | Template created | | Draft |
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| 0.1.0 | 2016.06.15 | Proposal send to review | PulkPek | Proposal |
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| 4.0.0 | 2016.08.16 | Approved | MietMik | Approved |

# 1 ADMINISTRATIVE DATA

## 1.1 Identification of laboratory

| | |
|---|---|
| Company name: | Bittium Wireless Ltd |
| Department: | Engineering Finland |
| Address: | Tutkijantie 8<br>90590 OULU |
| Telephone: | +358 40 344 2000 |
| Responsible test lab Manager: | M.Sc.(EE) Mikko Miettinen |

## 1.2 Identification of customer

| | |
|---|---|
| Company name: | Bittium Wireless Ltd |
| Address: | Tutkijantie 8<br>90590 OULU |
| Telephone: | +358 40 344 2000 |
| Contact person: | Tomi Latvasalo |
| Organizational items: | Internal Customer |

## 1.3 Organizational items

| | |
|---|---|
| Laboratory manager: | Mikko Miettinen |
| Test Engineer: | Pekka Pulkkinen |

# 2 TEST RESULTS

## 2.1 Summary of test results

Table 1 shows summary of test results. Detailed results for each test case are documented in Chapter 8 of this test report.

| Test case | Frequency band | Setup | Result |
|---|---|---|---|
| FCC CFR47 part 2, 99% Occupied Bandwidth | LTE FDD Band 14 | Conducted setup | PASS |
| FCC CFR47 part 2, Frequency stability | LTE FDD Band 14 | Conducted setup | PASS |
| FCC CFR47 part 22, Conducted RF output power | GSM 850 / WCDMA FDD 5 / LTE FDD 5 | Conducted setup | PASS |
| FCC CFR47 part 22, Band edge compliance | GSM 850 / WCDMA FDD 5 / LTE FDD 5 | Conducted setup | PASS |
| FCC CFR47 part 22, Spurious emissions at antenna terminals | GSM 850 / WCDMA FDD 5 / LTE FDD 5 | Conducted setup | PASS |
| FCC CFR47 part 22, Spurious radiated emissions –TX on (up to 10$^{th}$ harm.) | GSM 850 / WCDMA FDD 5 / LTE FDD 5 | Radiated setup | PASS |
| FCC CFR47 part 24, Conducted RF output power | GSM 1900 / WCDMA FDD 2 / LTE FDD 2 | Conducted setup | PASS |
| FCC CFR47 part 24, Band edge compliance | GSM 1900 / WCDMA FDD 2 / LTE FDD 2 | Conducted setup | PASS |
| FCC CFR47 part 24, Spurious emissions at antenna terminals | GSM 1900 / WCDMA FDD 2 / LTE FDD 2 | Conducted setup | PASS |
| FCC CFR47 part 24, Spurious radiated emissions –TX on (up to 10$^{th}$ harm.) | GSM 1900 / WCDMA FDD 2 / LTE FDD 2 | Radiated setup | PASS |

| Test case | Frequency band | Setup | Result |
|---|---|---|---|
| FCC CFR47 part 27, Conducted RF output power | WCDMA FDD4 / LTE FDD 4 | Conducted setup | PASS |
| FCC CFR47 part 27, Band edge compliance | WCDMA FDD4 / LTE FDD 4 | Conducted setup | PASS |
| FCC CFR47 part 27, Spurious emissions at antenna terminals | WCDMA FDD4 / LTE FDD 4 | Conducted setup | PASS |
| FCC CFR47 part 27, Spurious radiated emissions –TX on (up to 10th harm.) | WCDMA FDD4 / LTE FDD 4 | Radiated setup | PASS |
| FCC CFR47 part90, Maximum channel power | LTE FDD 14 | Conducted setup | PASS |
| FCC CFR47 part90, Band edge compliance | LTE FDD 14 | Conducted setup | PASS |
| FCC CFR47 part90, Spurious emissions at antenna terminals | LTE FDD 14 | Conducted setup | PASS |
| FCC CFR47 part90, Spurious radiated emissions –TX on (up to 10th harm.) | LTE FDD 14 | Radiated setup | PASS |

*Table 1: Summary of test results*

## 2.2 Validity of test results

The Test Results given is this report only relate to the EUT's listed in chapter 4.2.

## 2.3 Conclusion

Bittium EMC laboratory has verified that relevant test cases as presented above in the chapter 2.1, have been performed and final conclusion of results is PASS.

M.Sc.(EE) Mikko Miettinen
Bittium Ltd. HW laboratory manager

B.Sc. Pekka Pulkkinen
Specialist, EMC

# 3 TEST EQUIPMENT

| Device | Manufacturer | Model | Calibration date / Calibration due date |
|---|---|---|---|
| EMC test receiver | Rohde Schwarz | ESR26 | 2015-10-31 / 2016-10-31 |
| EMC-Chamber | ETS-Lindgren | 3 Meter compact Anechoic Chamber 7m x 3m x 3m | |
| Bilog antenna | EMCO | 3142D | |
| Horn antenna 1 – 18 GHz | EMCO | 3115 | |
| Horn antenna 18 – 26.5 GHz | Microwave vision Italy s.r.l | SGH1800-27 | |
| Emission test software | Bittium | Agilent Vee tailor made | |
| Radio communication tester | Rohde Schwarz | CMU200 | 2016-02-10 / 2017-02-10 |
| Radio Communication tester | Rohde Schwarz | CMW500 | 2016-03-10 / 2017-03-10 |
| Radio communication tester | Anritsu | MT8820C | 2016-05-26 / 2017-05-26 |
| High Pass Filter | Wainwright | WHKX1.0/15G-12SS | |
| Turn device | Innco | DE3700-RH | |
| Antenna stand | ETS-Lindgren | TR-7 antenna stand | |
| Device controller | EMCO | EMCO Model 2090 | |
| Directional coupler | Narda | 4226-10 | |
| Temperature chamber | Vötcsh | VT4004 | |
| Power splitter | Mini-circuits | ZN2PD2-50-S+ (500-5000MHz) | |

*Table 2: List of test equipment*

# 4 Equipment under test

## 4.1 Identification of EUT

Manufacturer: Bittium Wireless Ltd.

Type Name: V27SD-42

Frequency bands: GSM 850/900/1800/1900, WCDMA FDD 1/FDD 2/ FDD 4/ FDD 5/FDD 8, LTE FDD 1 / FDD 2 / FDD 3 / FDD 4 / FDD 5 / FDD7 / FDD 8 / FDD 14 / FDD 20 / FDD 28

Notes: Photos of EUT's can be found at appendix chapter.

## 4.2 Identification of used Test Samples of EUT

| EUT Id | Serial number | HW Version | SW Version |
|---|---|---|---|
| Rad_1 | K0161603805 | 0502 | 5.6.5 |
| Cond_2 | K0161603808 | 0502 | 5.6.5 |
| Cond_3 | K0161603820 | 0502 | 5.6.5 |

*Table 3: Used sample ID's*

## 4.3 Identification of used accessories

| Accessory ID | Description | Serial number | HW version | SW version |
|---|---|---|---|---|
| 1 | Celltech Li-Ion battery | N/A | Model 3700034 | N/A |

*Table 4: Used accessories*

# 5 APPLIED TEST STANDARDS

The equipment under test has been tested in Bittium EMC laboratory according to harmonized EMC standards listed in the table 5 below.

| No. | Identity | Document title | Version / Date |
|---|---|---|---|
| 1 | FCC CFR47 part 2 | Frequency allocations and radio treaty matters; general rules and regulations | Current |
| 2 | FCC CFR47 part 22 | Public mobile services, Subpart H – Cellular Radiotelephone Service | Current |
| 3 | FCC CFR47 part 24 | Personal communications services, Subpart E - Broadband PCS | Current |
| 4 | FCC CFR47 part 27 | Miscellaneous wireless communications services, Subpart C – Technical standards | Current |
| 5 | FCC CFR47 part 90 | Private land mobile radio services, Subpart I - General Technical Standards, Subpart S - Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands | Current |
| 6 | TIA-603-D | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards | Revision D |

*Table 5: Applied test standards*

# 6 Test Specifications

## 6.1 FCC part 2 and 22

### 6.1.1 RF power output §2.1046, §22.913

### 6.1.2 Spurious emissions at antenna terminals §2.1051, §22.917

### 6.1.3 Field strength of spurious radiation §2.1053, §22.917

Frequency band = 850, Mode = GSM, Channel = 128, Frequency = 824.2MHz

Frequency band = 850, Mode = GSM, Channel = 190, Frequency = 836.6MHz

Frequency band = 850, Mode = GSM, Channel = 251, Frequency = 848.8MHz

Frequency band = WCDMA FDD 5, Mode =WCDMA, Channel = 4132, Frequency = 826.4

Frequency band = WCDMA FDD 5, Mode =WCDMA, Channel = 4183, Frequency = 836.6MHz

Frequency band = WCDMA FDD 5, Mode =WCDMA, Channel = 4233, Frequency = 846.6MHz

Frequency band = LTE FDD 5, Mode = QPSK 5 MHz, Channel = 20425, Frequency = 826.5MHz

Frequency band = LTE FDD 5, Mode = QPSK 5 MHz, Channel = 20525, Frequency = 836.5MHz

Frequency band = LTE FDD 5, Mode = QPSK 5 MHz, Channel = 20625, Frequency = 846.5MHz

### 6.1.4 Band edge compliance §2.1053, §22.917

## 6.2 FCC part 2 and 24

### 6.2.1 RF power output §2.1046, §24.232

### 6.2.2 Spurious emissions at antenna terminals §2.1051, §24.238

### 6.2.3 Field strength of spurious radiation §2.1053, §24.238

Frequency band = 1900, Mode = GSM, Channel = 512, Frequency = 1850.2MHz

Frequency band = 1900, Mode = GSM, Channel = 661, Frequency = 1880MHz

Frequency band = 1900, Mode = GSM, Channel = 810, Frequency = 1909.8MHz

Frequency band = WCDMA FDD 2, Mode = WCDMA, Channel = 9262, Frequency = 1852.4MHz

Frequency band = WCDMA FDD 2, Mode = WCDMA, Channel = 9400, Frequency = 1880MHz

Frequency band = WCDMA FDD 2 Mode = WCDMA, Channel = 9538, Frequency = 1907.6MHz

Frequency band = LTE FDD 2, Mode = QPSK 5MHz, Channel =18625, Frequency = 1852.5Hz

Frequency band = LTE FDD 2, Mode = QPSK 5MHz, Channel = 18900, Frequency = 1880MHz

Frequency band = LTE FDD 2, Mode = QPSK 5MHz, Channel = 19175, Frequency = 1907.5MHz

### 6.2.4 Band edge compliance §2.1053, §24.238

## 6.3 FCC part 2 and 27

### 6.3.1 RF power output §2.1046, §27.250

### 6.3.2 Spurious emissions at antenna terminals §2.1051, §27.53

### 6.3.3 Field strength of spurious radiation §2.1053, 27.53

Frequency band = WCDMA FDD 4, Channel = 19975, Frequency = 1712.4 MHz

Frequency band = WCDMA FDD 4, Channel = 1412, Frequency = 1732.4MHz

Frequency band = WCDMA FDD 4, Channel = 1513, Frequency = 1752.6MHz

Frequency band = LTE FDD 4, Mode = QPSK 5 MHz, Channel = 19975, Frequency = 1712.5 MHz

Frequency band = LTE FDD 4, Mode = QPSK 5 MHz, Channel = 20175, Frequency = 1732.5MHz

Frequency band = LTE FDD 4, Mode = QPSK 5 MHz, Channel = 20375, Frequency = 1752.5MHz

### 6.3.4 Band edge compliance §2.1053, §27.53

## 6.4 FCC part 2 and 90

### 6.4.1 Maximum Channel Power, §2.1046, §90.205 & §90.542

### 6.4.2 Occupied Bandwidth, §2.1046, §90.209

### 6.4.3 Frequency stability, §2.1055, §90.230

### 6.4.4 Spurious emissions at antenna terminals, §2.1051, §90.210 & §90.543

### 6.4.5 Radiated spurious emission, §2.1053, §90.210

Frequency band = LTE FDD 14, Mode = QPSK 5 MHz, Channel = 23305, Frequency = 790.5 MHz

Frequency band = LTE FDD 14, Mode = QPSK 5 MHz, Channel = 23330, Frequency = 793 MHz

Frequency band = LTE FDD 14, Mode = QPSK 5 MHz, Channel = 23355, Frequency = 795.5 MHz

### 6.4.6 Band edge compliance, §2.1053, §90.543

# 7 Test Setups

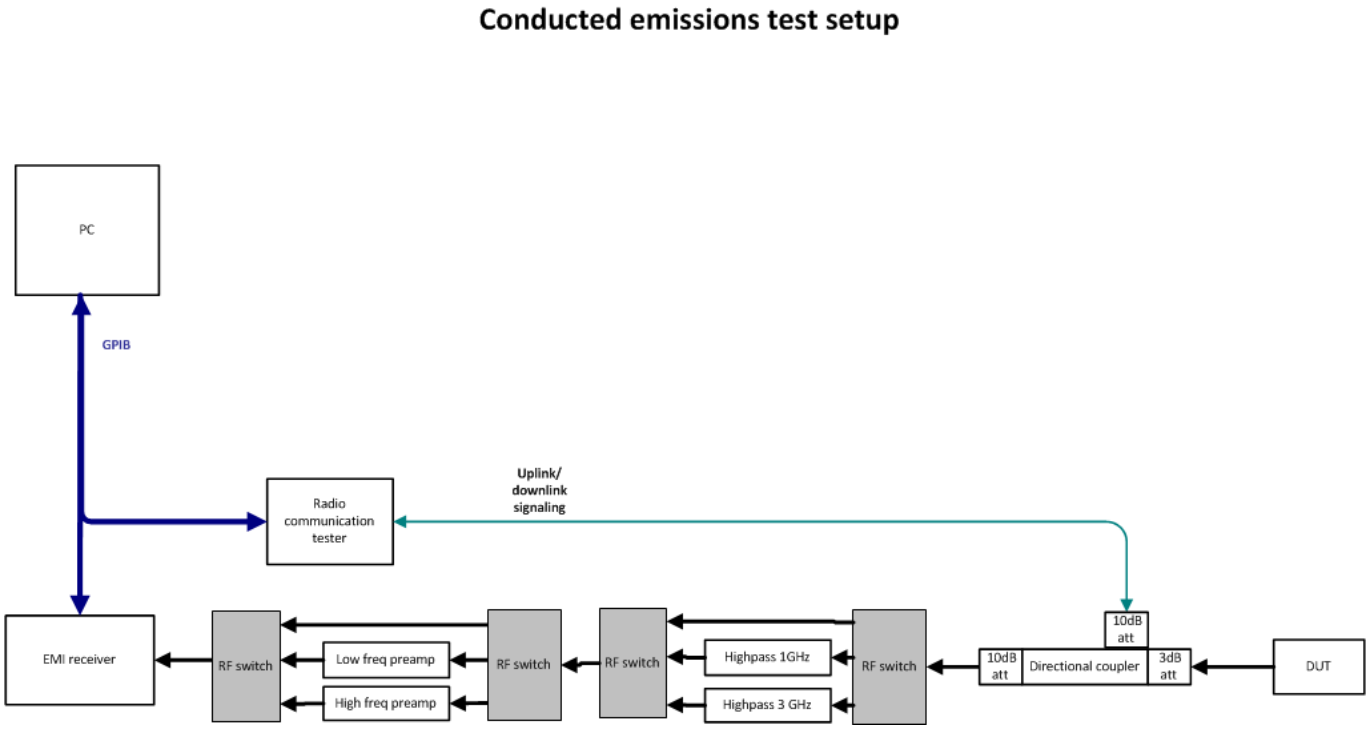
Photos of test setups can be found at appendix A.1.

## 7.1 Conducted setup

Conducted measurements setup is represented at picture 1 below. All items of setup except PC, Radio communication tester and EMI receiver were inside shielded box. Temperature chamber VT4004 was used at Frequency stability at temperatures test.

EUT was placed inside shielded box and cable from directional coupler was connected to antenna connector. Active call was setup and maintained with radio communication tester. PC software controlled EMI receiver was used to perform all the measurements.

Total insertion losses were measured and used to correct readings from EMI receiver.




*Picture 1: Conducted setup*

### 7.1.1 Conducted measurements test procedures

#### 7.1.1.1 RF Output power

1) Conducted measurement setup was used
2) A call with maximum power level was established on a Traffic Channel between the EUT and Communication Tester.
3) The transmitted power of the EUT was recorded by using an EMI receiver.
4) RBW = 30 kHz, VBW = 300 kHz

#### 7.1.1.2 Emission and occupied bandwidth

5) Conducted measurement setup was used
6) A call with maximum power level was established on a Traffic Channel between the EUT and Communication Tester.
7) Important EMI receiver settings:
    a. RBW: >1% of the manufacturer stated occupied bandwidth
8) The maximum spectral level of the modulated signal was recorded as the reference.
9) The emission bandwidth is measured as follows: the furthest frequencies above and below the frequency of the maximum reference level where the spectrum is -26 dB down have to be found.
10) The occupied Bandwidth (99% bandwidth) is measured as follows: the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 percent of the total mean power.

#### 7.1.1.3 Spurious emissions at antenna terminals

1) Conducted measurement setup was used
2) A call with maximum power level was established on a Traffic Channel between the EUT and Communication Tester.
3) Important EMI receiver settings:
    a. [RBW]
        i. [1 kHz] from 9 kHz to 150 kHz
        ii. [10 kHz] from 150 kHz to 30 MHz
        iii. [100 kHz] from 30 MHz to 1 GHz
        iv. [1 MHz] above 1 GHz to $10^{th}$ harmonic of transmitting signal
    b. Sweep time: depending on the transmitting signal, the span and the RBW
4) The spurious emissions peaks were measured in the frequency range 9 kHz to $10^{th}$ harmonic of transmitting signal during the call was established. The amplitude of spurious emission which are attenuated more than 20 dB below the permissible value was not reported.

#### 7.1.1.4 Frequency stability

1) The EUT was placed inside a temperature chamber
2) The EUT was coupled to a Communication tester
3) The EUT was powered by laboratory power supple via adapter at nominal supply voltage. A call was established on a Traffic channel between the EUT and The Communication tester. The frequency error of the EUT was recorded by using an internal measurement function of the Communication tester.
4) Supply voltage was reduced to battery operating end point and the frequency error of the EUT was recorded by using an internal measurement function of the Communication tester.
5) Supply voltage was set to nominal voltage.
6) The temperature chamber was cycled down/up to a certain temperature, starting with the EUT minimum temperature.
7) After the temperature was stabilized the EUT was switched on and a call was established on a Traffic channel between the EUT and The Communication tester. Mid channel was used and output power set to maximum.
8) The frequency error of the EUT was recorded by using an internal measurement function of the Communication tester one minute, five minutes and 10 minutes after call was established.
9) This measurement procedure was performed for temperature variation from -30°C to +50°C in increments of 10°C.

#### 7.1.1.5 Band edge compliance

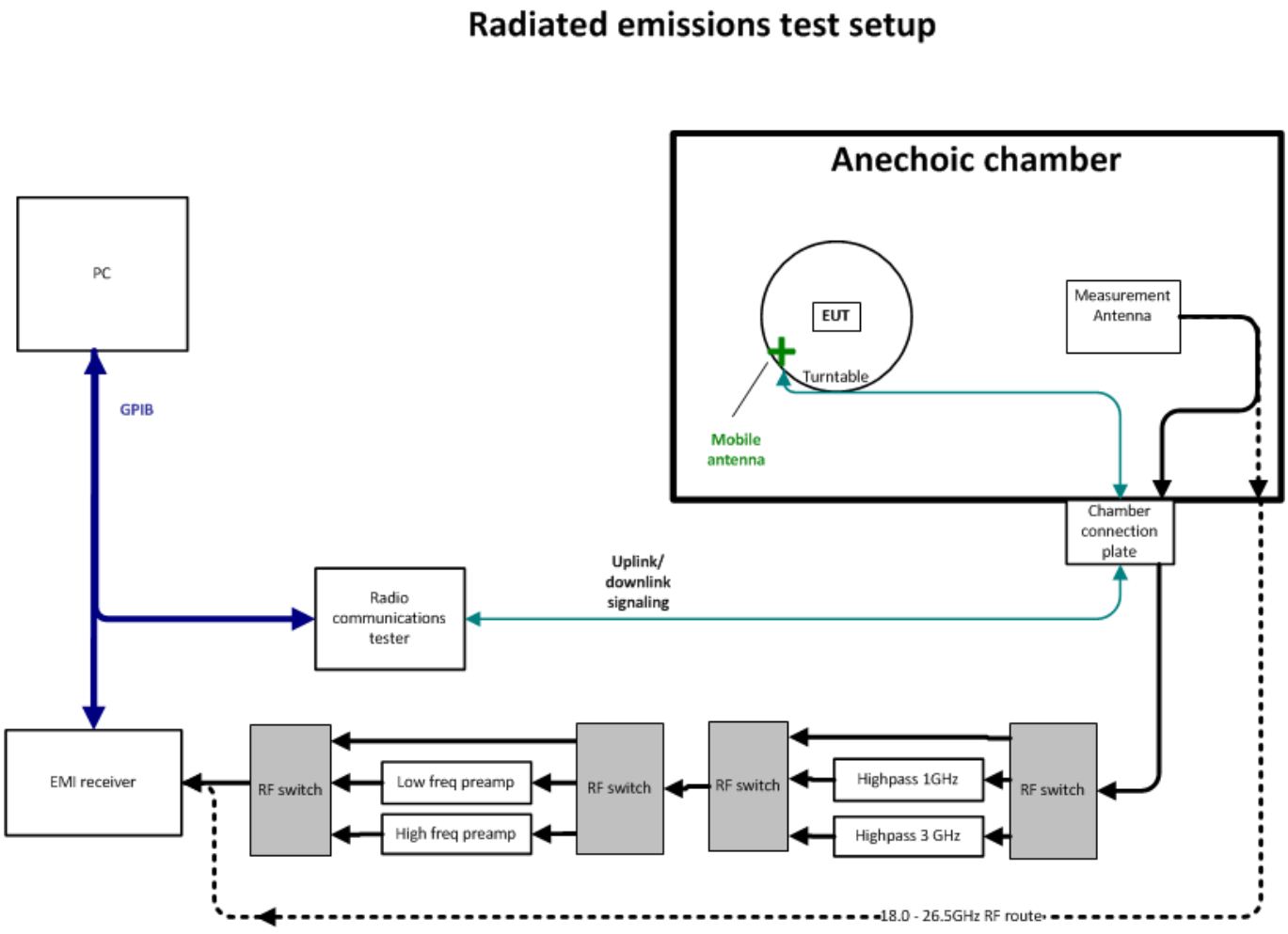
1) Conducted measurement setup was used
2) A call with maximum power level was established on a Traffic Channel between the EUT and Communication Tester.
3) EMI receiver settings:
    a. RBW = VBW: 1% of occupied bandwidth

## 7.2 Radiated test setup

### 7.2.1 Description of test facilities

Radiated emissions tests were performed at full-anechoic chamber ETS-Lindgren's SpaceSaver 3 Meter compact Anechoic Chamber (Size 7m x 3m x 3m). At full-anechoic chamber absorbers are fitted to all four walls, ceiling and floor to attenuate all reflections of radiation. Turntable and antenna mast controller is EMCO2090.

Radiated measurements setup is presented at picture 2 below.




*Picture 2: Radiated spurious emissions setup*

### 7.2.2 Radiated measurement test procedure

Measurements were done with both vertical and horizontal antenna polarization and all orientations (X, Y, Z) of EUT have been measured. Pre-sweep was performed at four turn table angles (0, 90, 180 and 270 degrees) and if peaks less than 20 dB margin occurs they were selected to final measurement.

The EUT was placed inside a full-anechoic chamber at non-conductive support height of 150cm. Height of measuring antenna is also 150cm. The EUT was coupled to a Communication Tester via signaling antenna. Refer to picture 2.

1) A call with maximum power level was established on a Traffic Channel between the EUT and Communication Tester.
2) A pre-calibration procedure was used so the readings from EMI receiver are corrected and represent directly the equivalent power.
3) All spurious radiation measurements were made from 30 MHz to 10$^{th}$ harmonic of transmit frequency. The frequency range from 9 kHz to 30 MHz has been examined during the conducted spurious emission measurements.
4) Important EMI receiver settings
   a) [RBW/VBW]
      i. [100 kHz / 300 kHz] from 30 MHz to 1 GHz
      ii. [1 MHz / 3MHz] above 1GHz
   - Sweep time: Depending on the transmitting signal, the span and the RBW
5) After this initial test, final test according to TIA-603-D 2.2.12 Unwanted Emissions is performed on signals which are identified as being close to limit.

# 8 DETAILED TEST RESULTS

## 8.1 FCC Part 2 and 22

### 8.1.1 RF power output §2.1046, §22.913

Result: Passed

Setup: Conducted setup, Cond_2 EUT

Test specification FCC part 2 and part 22

V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 12 (GSM 850 and WCDMA FDD5)

MDE_ELEKT_1502_FCCh, page 11 (LTE FDD5)

Note: Testing has been done according to KDB 971168 D01.
Equation for determining the EIRP is: EIRP = $P_{Meas}$ + $G_T$ - $L_C$
Where $P_{Meas}$ = measured transmitter output power (dBm)
$G_T$ = gain of the transmitting antenna (dBi)
$L_C$ = signal attenuation in the connecting cable between the transmitter and antenna (negligible)

$G_T$ used to calculate EIRP for GSM/EDGE 850, WCDMA FDD5 and LTE FDD5 is -3.5dBi.

| Band | Mode | Channel | Frequency (MHz) | Peak Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| 850 | GSM | Low | 824.2 | 32.77 | 40.6 | 29.27 | PASS |
| | | Mid | 836.6 | 32.94 | 40.6 | 29.44 | PASS |
| | | High | 846.6 | 32.83 | 40.6 | 29.33 | PASS |
| 850 | EDGE | Low | 858.2 | 30.92 | 40.6 | 27.42 | PASS |
| | | Mid | 869.4 | 30.95 | 40.6 | 27.45 | PASS |
| | | High | 880.6 | 30.64 | 40.6 | 27.14 | PASS |

*Table 6: Detailed results GSM/EDGE 850*

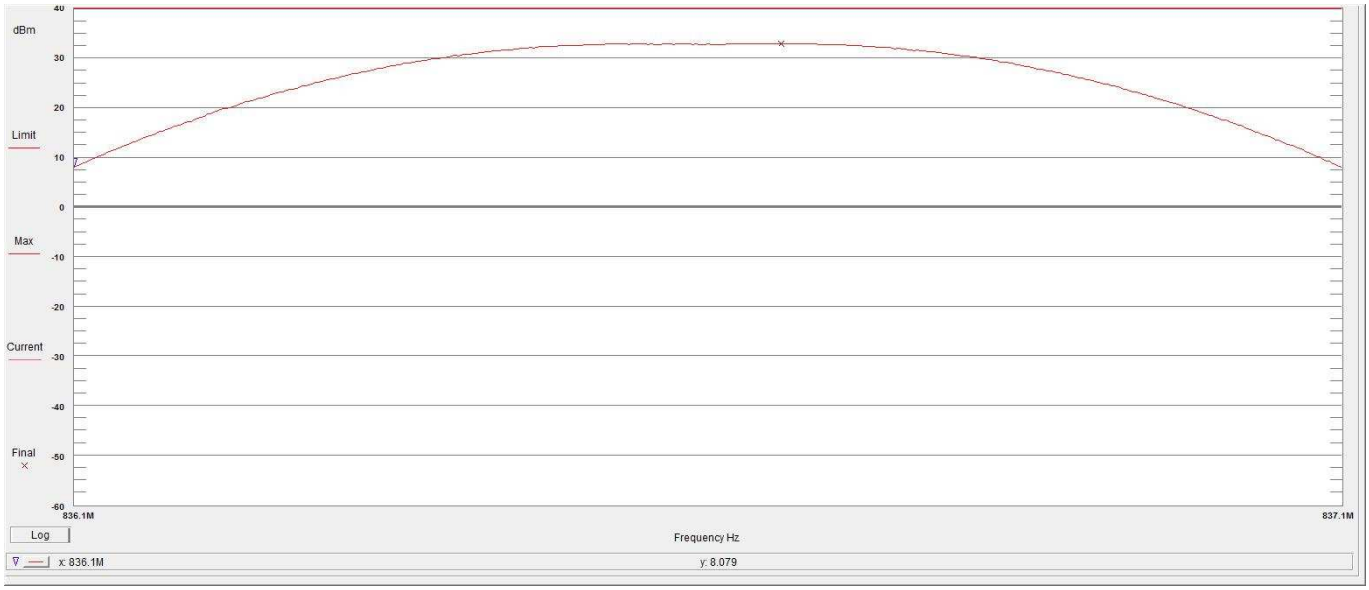
| Band | Mode | Channel | Frequency (MHz) | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| FDD 5 | WCDMA | Low | 826.4 | 24.2 | 40.6 | 20.7 | PASS |
| | | Mid | 836.6 | 24.3 | 40.6 | 20.8 | PASS |
| | | High | 846.6 | 24.3 | 40.6 | 20.8 | PASS |

*Table 7: Detailed results WCDMA FDD 5*

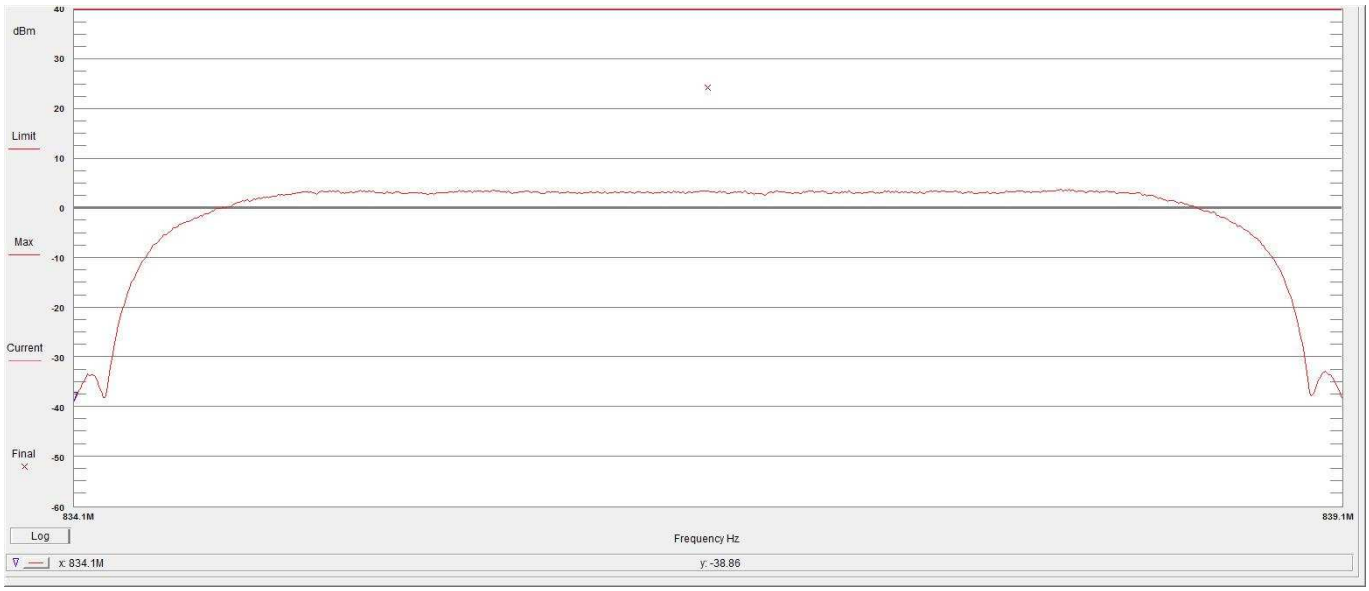
| Band | Bandwidth | Channel | Modulation | RB | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| LTE FDD 5 | 1.4 MHz | 20425 | QPSK | 1 | 22.85 | 40.6 | 19.35 | PASS |
| | | | QPSK | 3 | 22.9 | 40.6 | 19.4 | PASS |
| | | | QPSK | 6 | 21.88 | 40.6 | 18.38 | PASS |
| | | | 16QAM | 1 | 22.06 | 40.6 | 18.56 | PASS |
| | | | 16QAM | 6 | 20.94 | 40.6 | 17.44 | PASS |
| | | 20525 | QPSK | 1 | 23.14 | 40.6 | 19.64 | PASS |
| | | | QPSK | 3 | 23.3 | 40.6 | 19.8 | PASS |
| | | | QPSK | 6 | 22.3 | 40.6 | 18.8 | PASS |
| | | | 16QAM | 1 | 22.04 | 40.6 | 18.54 | PASS |
| | | | 16QAM | 6 | 21.18 | 40.6 | 17.68 | PASS |
| | | 20625 | QPSK | 1 | 23.37 | 40.6 | 19.87 | PASS |
| | | | QPSK | 3 | 23.4 | 40.6 | 19.9 | PASS |
| | | | QPSK | 6 | 22.3 | 40.6 | 18.8 | PASS |
| | | | 16QAM | 1 | 22.16 | 40.6 | 18.66 | PASS |
| | | | 16QAM | 6 | 21.2 | 40.6 | 17.7 | PASS |
| LTE FDD 5 | 3 MHz | 20425 | QPSK | 1 | 22.92 | 40.6 | 19.42 | PASS |
| | | | QPSK | 15 | 21.77 | 40.6 | 18.27 | PASS |
| | | | 16QAM | 1 | 22.07 | 40.6 | 18.57 | PASS |
| | | | 16QAM | 15 | 20.85 | 40.6 | 17.35 | PASS |
| | | 20525 | QPSK | 1 | 23.22 | 40.6 | 19.72 | PASS |
| | | | QPSK | 15 | 22.24 | 40.6 | 18.74 | PASS |
| | | | 16QAM | 1 | 22.04 | 40.6 | 18.54 | PASS |
| | | | 16QAM | 15 | 21.21 | 40.6 | 17.71 | PASS |
| | | 20625 | QPSK | 1 | 23.42 | 40.6 | 19.92 | PASS |
| | | | QPSK | 15 | 22.25 | 40.6 | 18.75 | PASS |
| | | | 16QAM | 1 | 22.07 | 40.6 | 18.57 | PASS |
| | | | 16QAM | 15 | 21.21 | 40.6 | 17.71 | PASS |
| LTE FDD 5 | 5 MHz | 20425 | QPSK | 1 | 22.78 | 40.6 | 19.28 | PASS |

| Band | Bandwidth | Channel | Modulation | RB | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | | QPSK | 12 | 21.8 | 40.6 | 18.3 | PASS |
| | | | QPSK | 25 | 21.77 | 40.6 | 18.27 | PASS |
| | | | 16QAM | 1 | 22.04 | 40.6 | 18.54 | PASS |
| | | | 16QAM | 25 | 20.83 | 40.6 | 17.33 | PASS |
| | | | QPSK | 1 | 23.4 | 40.6 | 19.9 | PASS |
| | | | QPSK | 12 | 22.3 | 40.6 | 18.8 | PASS |
| | | | QPSK | 25 | 22.34 | 40.6 | 18.84 | PASS |
| | | | 16QAM | 1 | 22.18 | 40.6 | 18.68 | PASS |
| | | 20525 | 16QAM | 25 | 21.27 | 40.6 | 17.77 | PASS |
| | | | QPSK | 1 | 23.35 | 40.6 | 19.85 | PASS |
| | | | QPSK | 12 | 22.28 | 40.6 | 18.78 | PASS |
| | | | QPSK | 25 | 22.3 | 40.6 | 18.8 | PASS |
| | | | 16QAM | 1 | 22.21 | 40.6 | 18.71 | PASS |
| | | 20625 | 16QAM | 25 | 21.28 | 40.6 | 17.78 | PASS |
| | | | QPSK | 1 | 23.06 | 40.6 | 19.56 | PASS |
| | | | QPSK | 25 | 22.13 | 40.6 | 18.63 | PASS |
| | | | 16QAM | 1 | 22.09 | 40.6 | 18.59 | PASS |
| | | 20425 | 16QAM | 25 | 21.21 | 40.6 | 17.71 | PASS |
| | | | QPSK | 1 | 23.21 | 40.6 | 19.71 | PASS |
| | | | QPSK | 50 | 22.27 | 40.6 | 18.77 | PASS |
| | | | 16QAM | 1 | 22.02 | 40.6 | 18.52 | PASS |
| | | 20525 | 16QAM | 50 | 21.19 | 40.6 | 17.69 | PASS |
| | | | QPSK | 1 | 23.38 | 40.6 | 19.88 | PASS |
| | | | QPSK | 50 | 22.24 | 40.6 | 18.74 | PASS |
| | | | 16QAM | 1 | 22.07 | 40.6 | 18.57 | PASS |
| LTE FDD 5 | 10 MHz | 20625 | 16QAM | 50 | 21.21 | 40.6 | 17.71 | PASS |

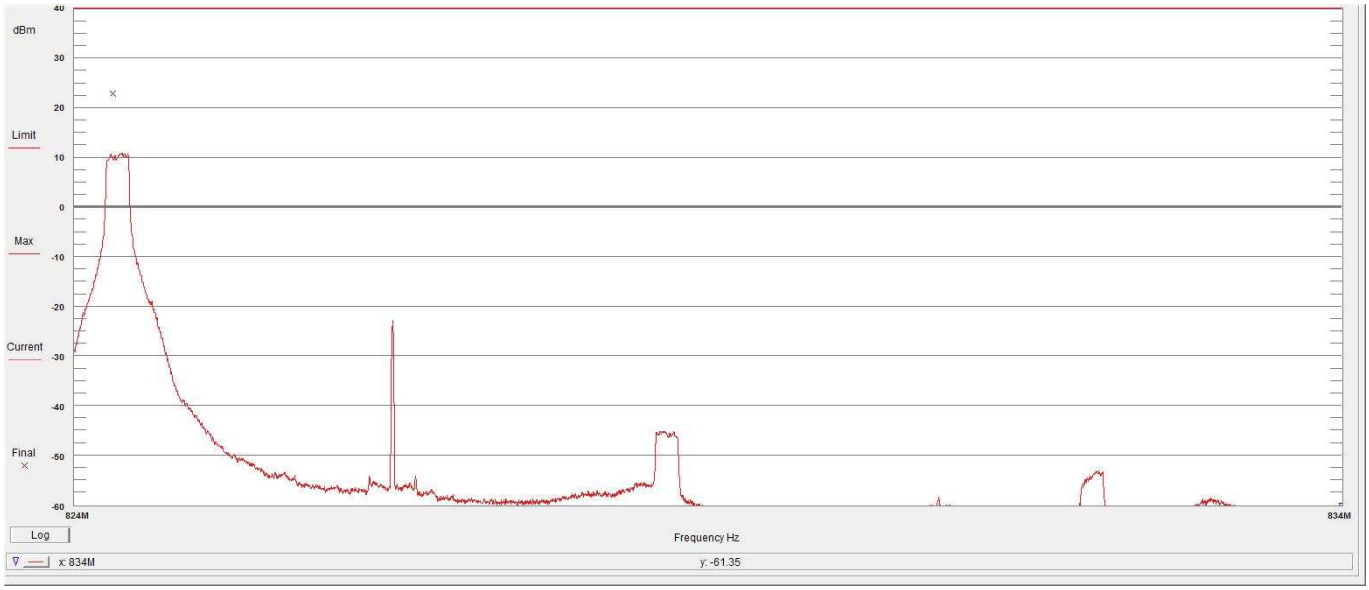
*Table 8: Detailed results LTE FDD 5*




*Picture 3: GSM 850 Output power measurement, Ch128 (824.2MHz), RBW 300 kHz, VBW 300 kHz*




*Picture 4: WCDMA FDD 5, Output power measurement, Ch4183 (836.6 MHz), RBW 30 kHz, VBW 300 kHz*




*Picture 5: LTE FDD 5, Output power measurement, Ch20425 (826.5 MHz), 1 RB, RBW 30 KHz, VBW 300 kHz*

### 8.1.2 Spurious emissions at antenna terminals §2.1051, §22.917

Result: Passed. With WCDMA FDD 5 and LTE FDD 5 band there were no peaks with a margin less than 30 dB

Setup: Conducted setup, Cond_2 EUT

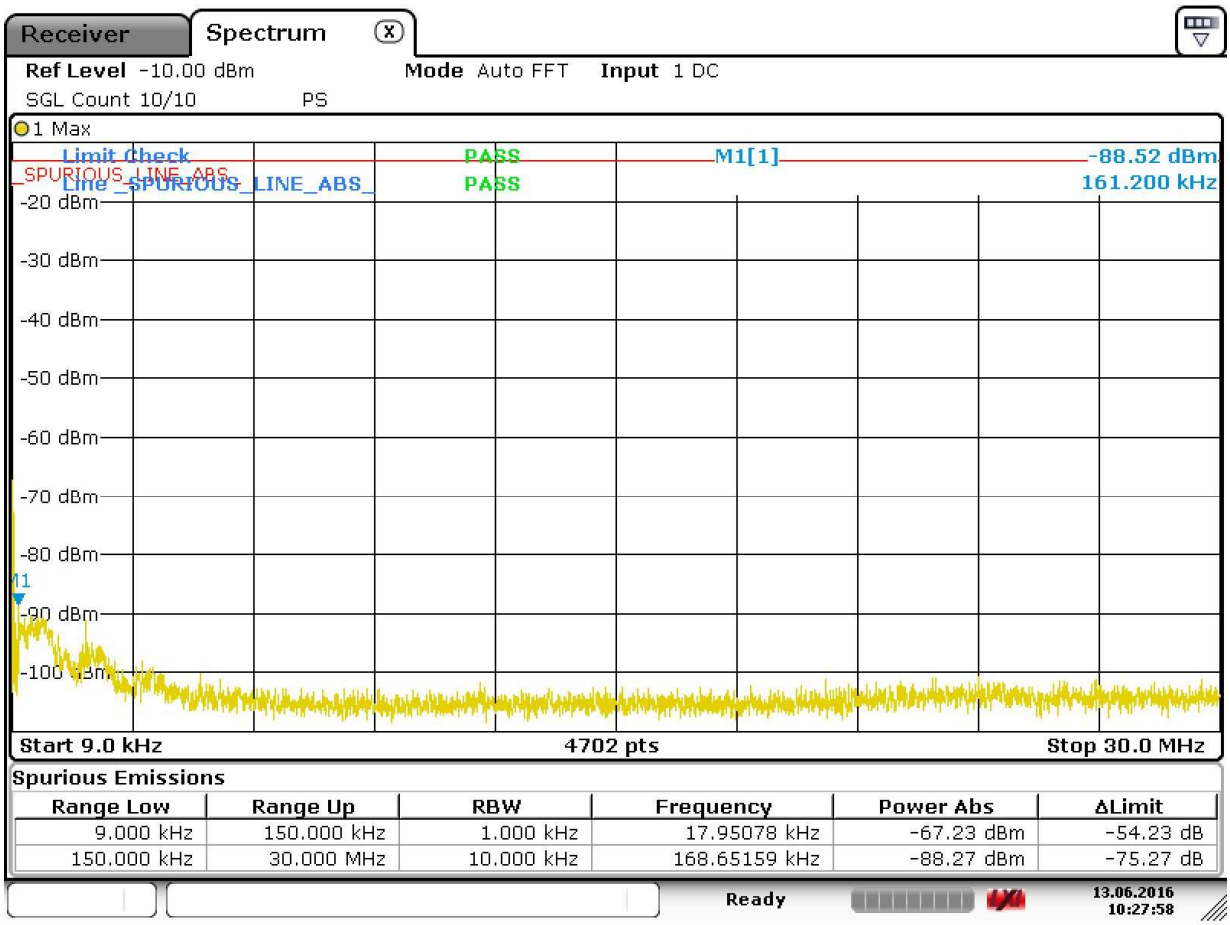
Test specification FCC part 2 and part 22

V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 25 (GSM 850 and WCDMA FDD5)

MDE_ELEKT_1502_FCCh, page 15 (LTE FDD5)

| Band | Mode | Channel | Detector | Frequency | Peak value | FCC limit | Margin | Verdict |
|---|---|---|---|---|---|---|---|---|
| 850 | GSM | 128 | Peak | 8242 MHz | -34.6 dBm | -13 dBm | -21.6 dB | PASS |
| 850 | GSM | 190 | Peak | 7529.4 MHz | -35.2 dBm | -13 dBm | -22.2 dB | PASS |
| 850 | GSM | 251 | Peak | 8488 MHz | -34.4 dBm | -13 dBm | -21.4 dB | PASS |

*Table 9: Detailed results GSM 850, Spurious emissions at antenna terminals*

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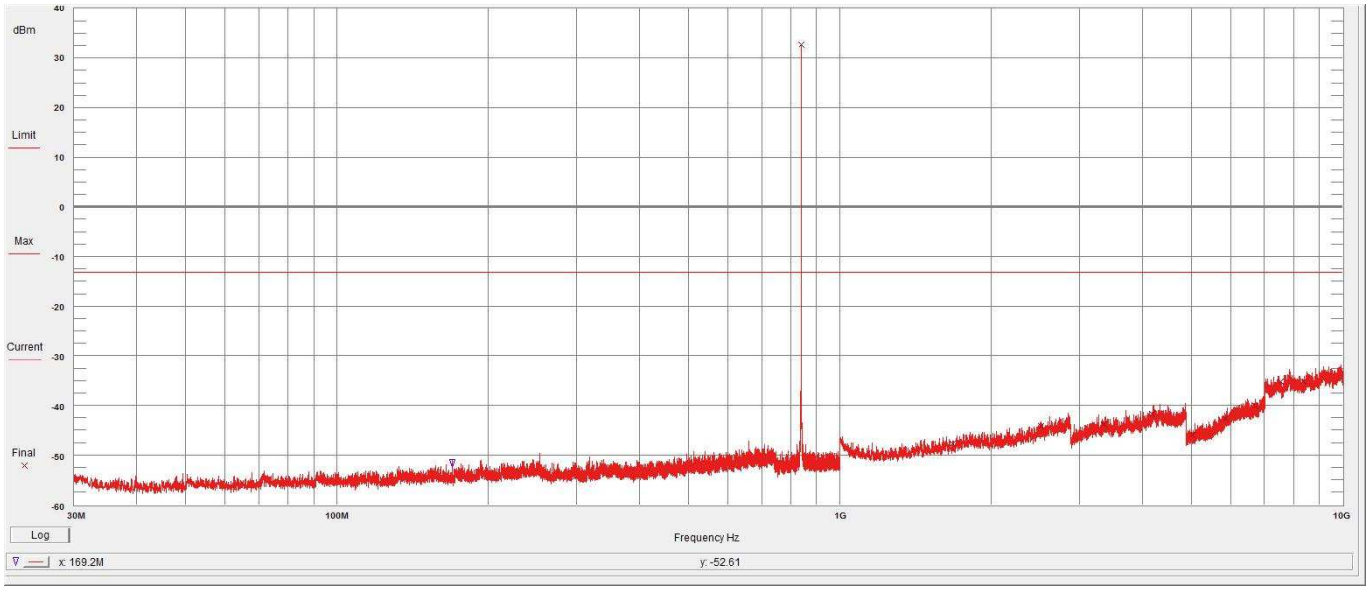
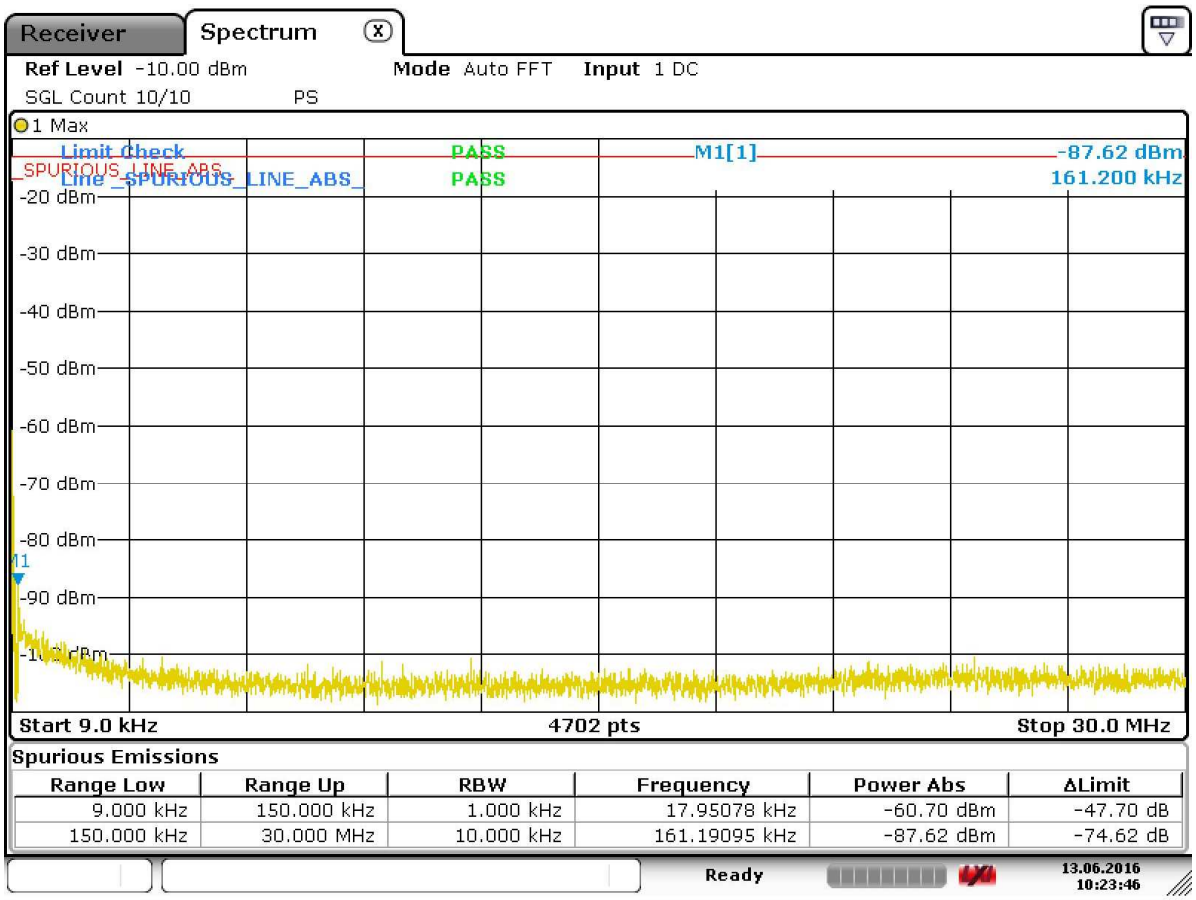
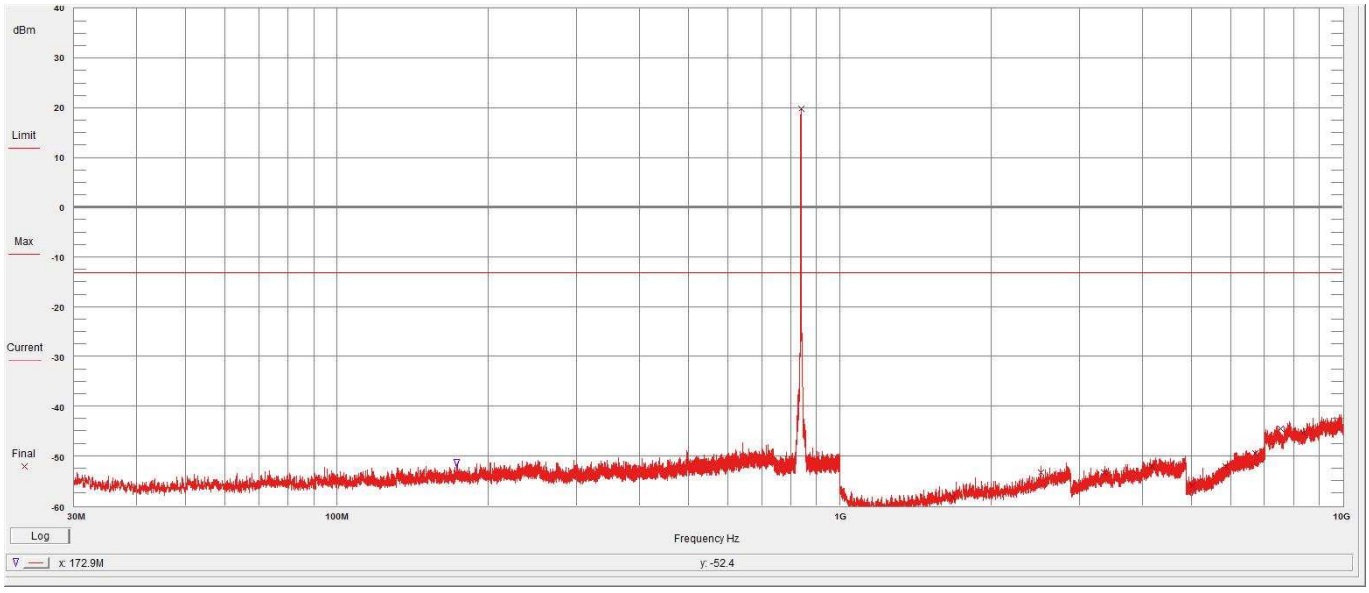
*Picture 6: GSM850, Ch. 190, Spurious emissions at antenna terminals 9kHz – 30 MHz*



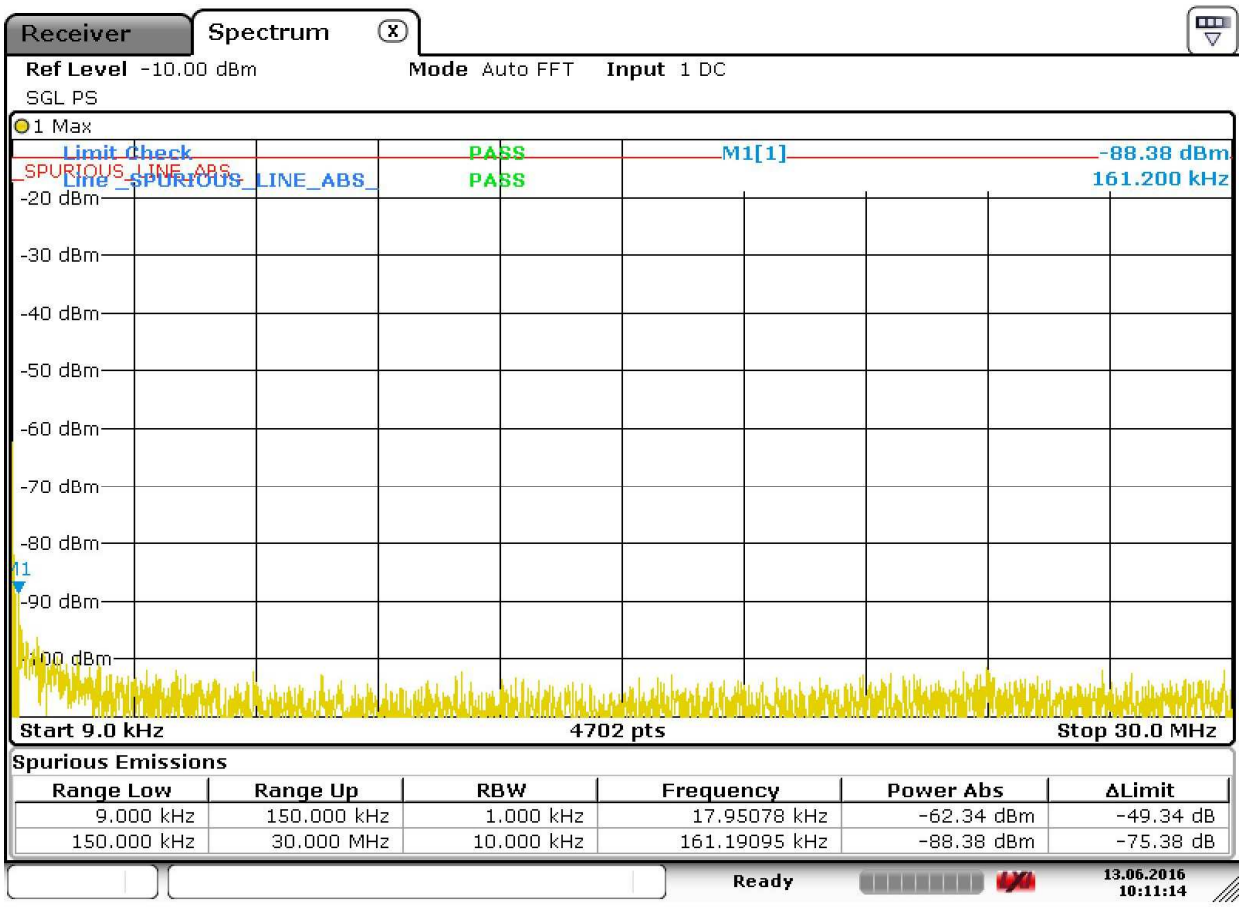

*Picture 7: GSM850, Ch. 190, Spurious emissions at antenna terminals 30 MHz – 10 GHz. Peak at 836.6 MHz is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz)*




*Picture 8: WCDMA FDD 5, Ch4183, Spurious emissions at antenna terminals 9kHz – 30 MHz*




*Picture 9: WCDMA FDD 5, Ch4183, Spurious emissions at antenna terminals 30 MHz – 10 GHz. Peak at 836.6 MHz is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz)*

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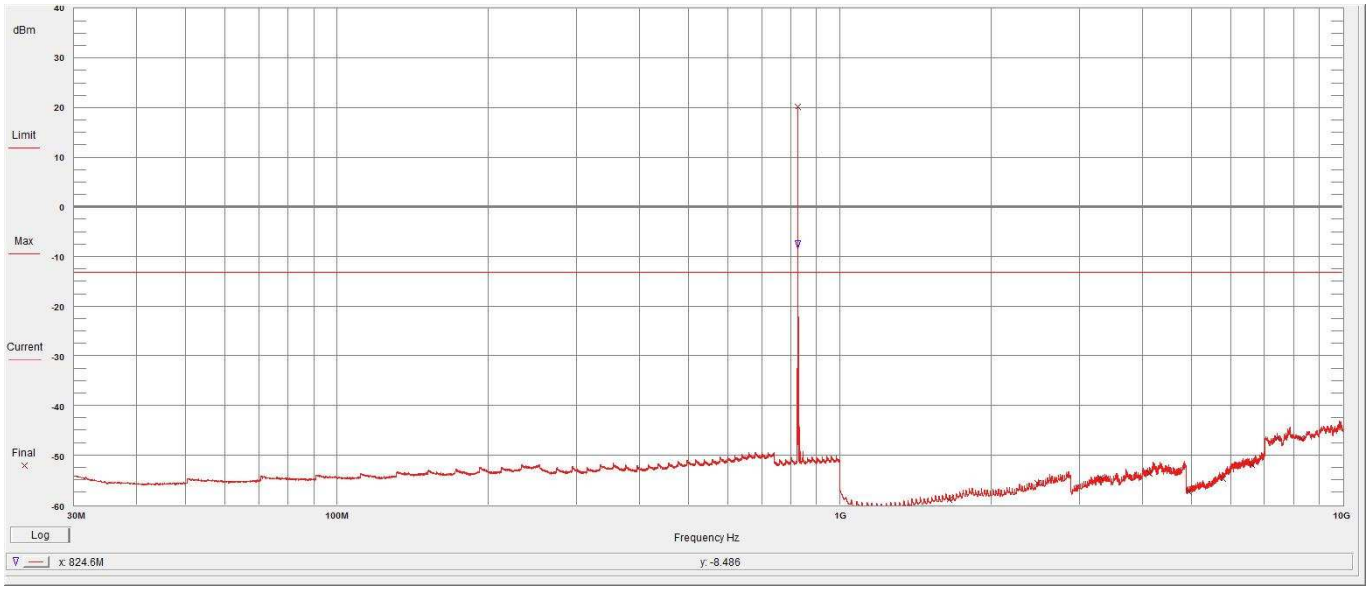
*Picture 10: LTE FDD 5, Ch. 20525, BW 5 MHz, 1 RB, Spurious emissions at antenna terminals 9kHz – 30 MHz*

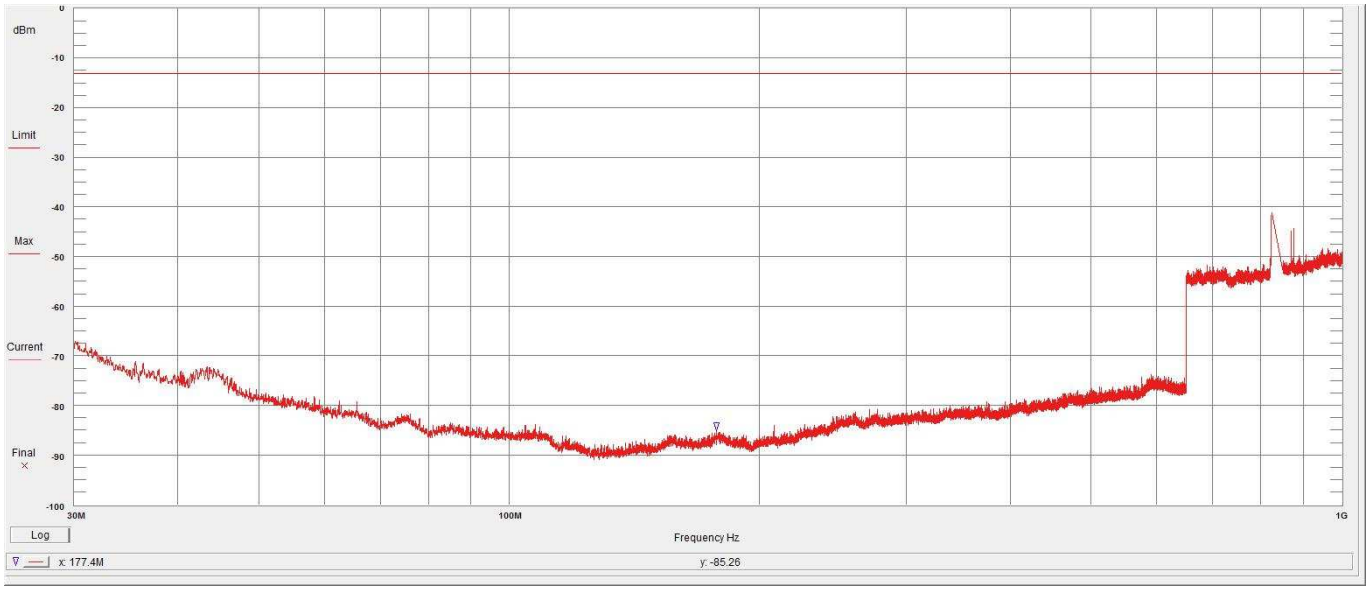



*Picture 11: LTE FDD 5, Ch. 20525, BW 5 MHz, 1 RB, Spurious emissions at antenna terminals 30 MHz – 10 GHz. Peak at 836.5 MHz is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz).*

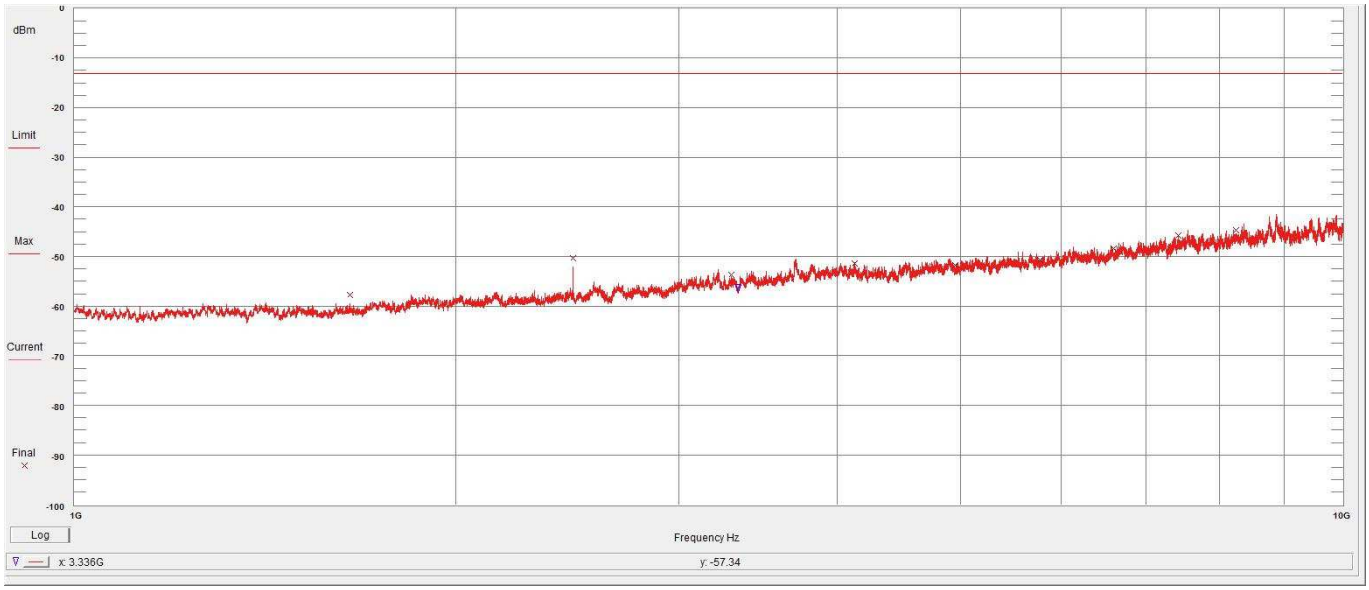
### 8.1.3 Field strength of spurious radiation §2.1053, §22.917

| | |
|---|---|
| Result: | Passed, at pre-tests there were no peaks with a margin less than 20 dB with all measured channels (low, mid, high) |
| Setup: | Radiated pre-test setup, Rad_1 EUT |
| Test specification | FCC part 2 and part 22 |
| V27SD-41 reference data: | MDE_ELEKT_1502_FCCg, page 27 (GSM 850 and WCDMA FDD 5) |
| | MDE_ELEKT_1502_FCCh, page 16 (LTE FDD5) |

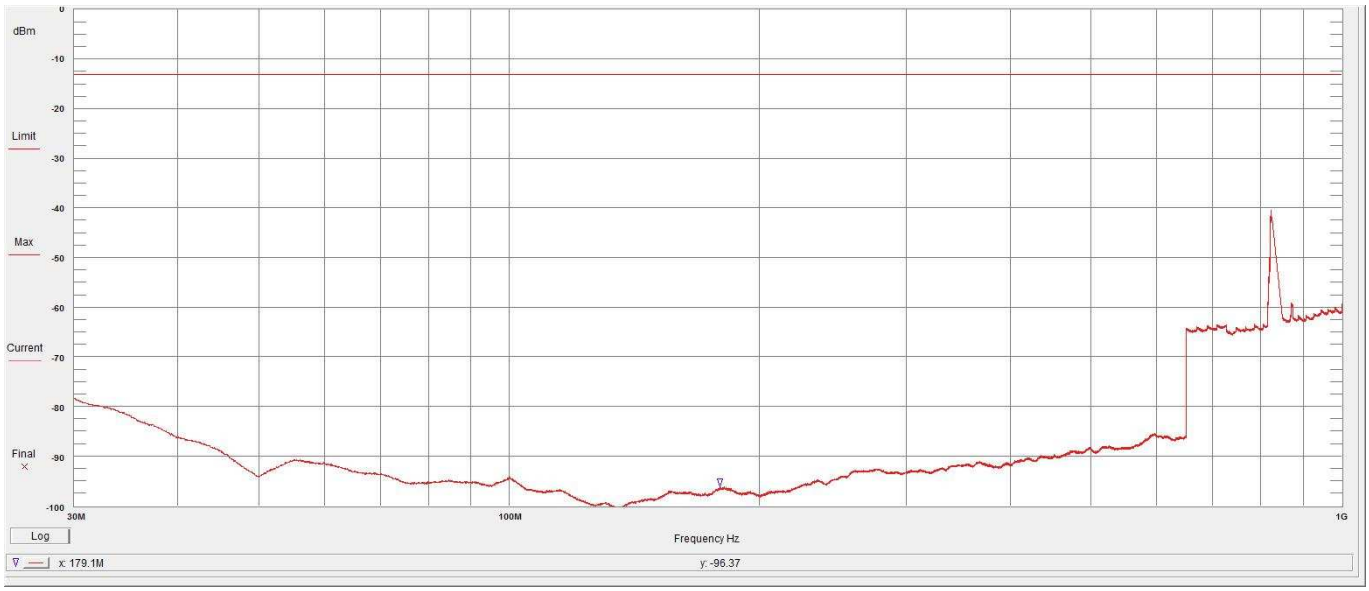
Limit = 43+log10(P) = -13dBm



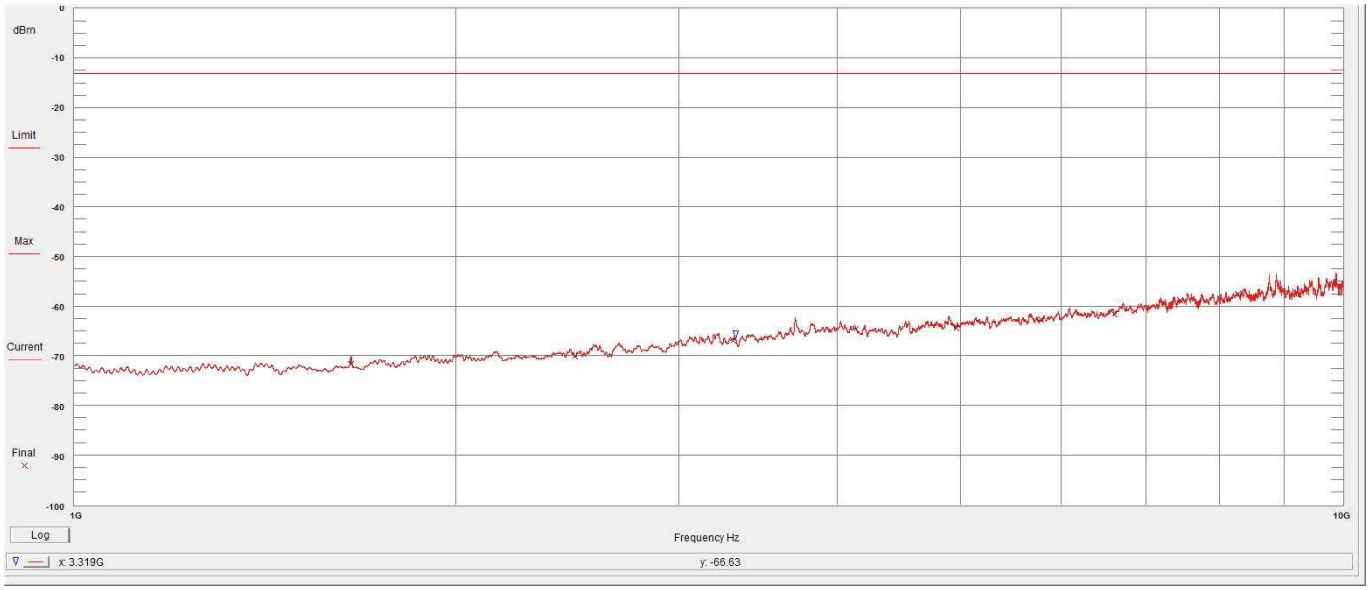

*Picture 12: Field strength of spurious radiation, GSM 850, ch128, 30 – 1000 MHz, RBW 100 kHz, VBW 300 kHz.*



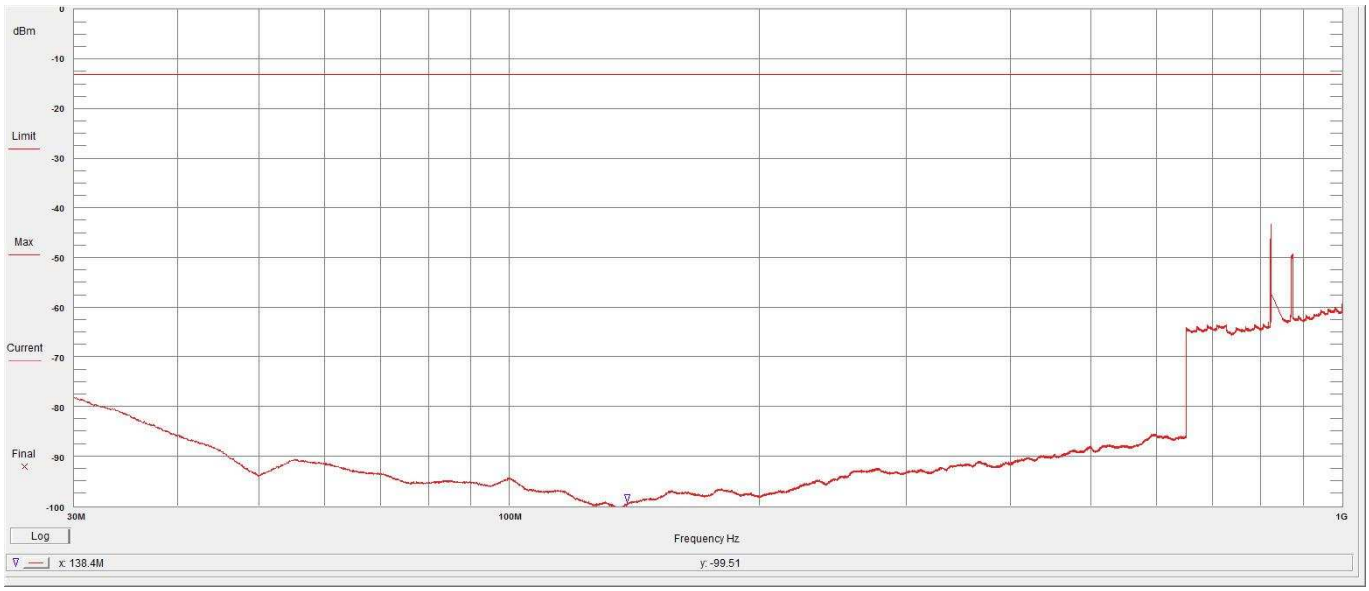

*Picture 13: Field strength of spurious radiation, GSM 850, ch128, 1 – 10 GHz, RBW 1 MHz, VBW 3 MHz*



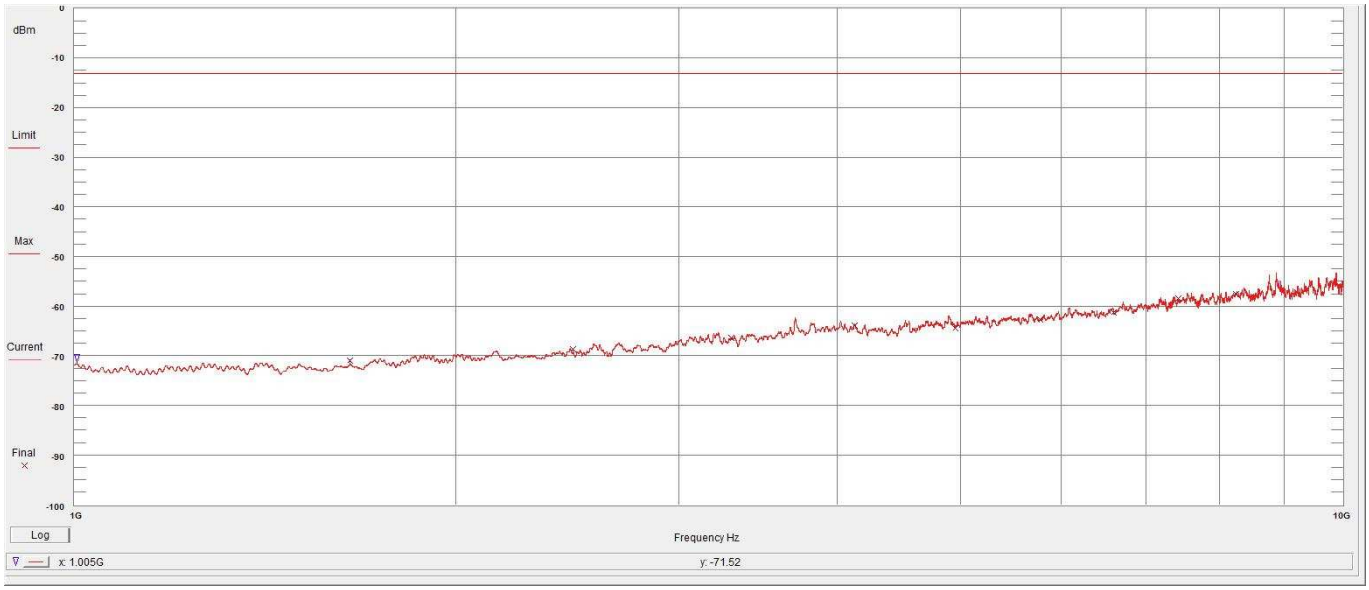

*Picture 14: Field strength of spurious radiation, WCDMA FDD 5, ch4132, 30 – 1000 MHz, RBW 100kHz, VBW 300 kHz.*




*Picture 15: Field strength of spurious radiation, WCDMA FDD 5, ch4132, 1 – 10 GHz, RBW 1 MHz, VBW 3 MHz*




*Picture 16: Field strength of spurious radiation, LTE FDD 5, ch20425, BW 5 MHz, 1 RB, 30 – 1000MHz, RBW 100kHz, VBW 300 kHz.*




*Picture 17: Field strength of spurious radiation, LTE FDD 5, ch20425, BW 5 MHz, 1RB, 1 – 10 GHz, RBW 1 MHz, VBW 3 MHz*

### 8.1.4 Band edge compliance §2.1053, §22.917

Result: Passed

Setup: Conducted setup, Cond_2 EUT

Test specification FCC part 2 and part 22

V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 45 (GSM 850 and WCDMA FDD5)

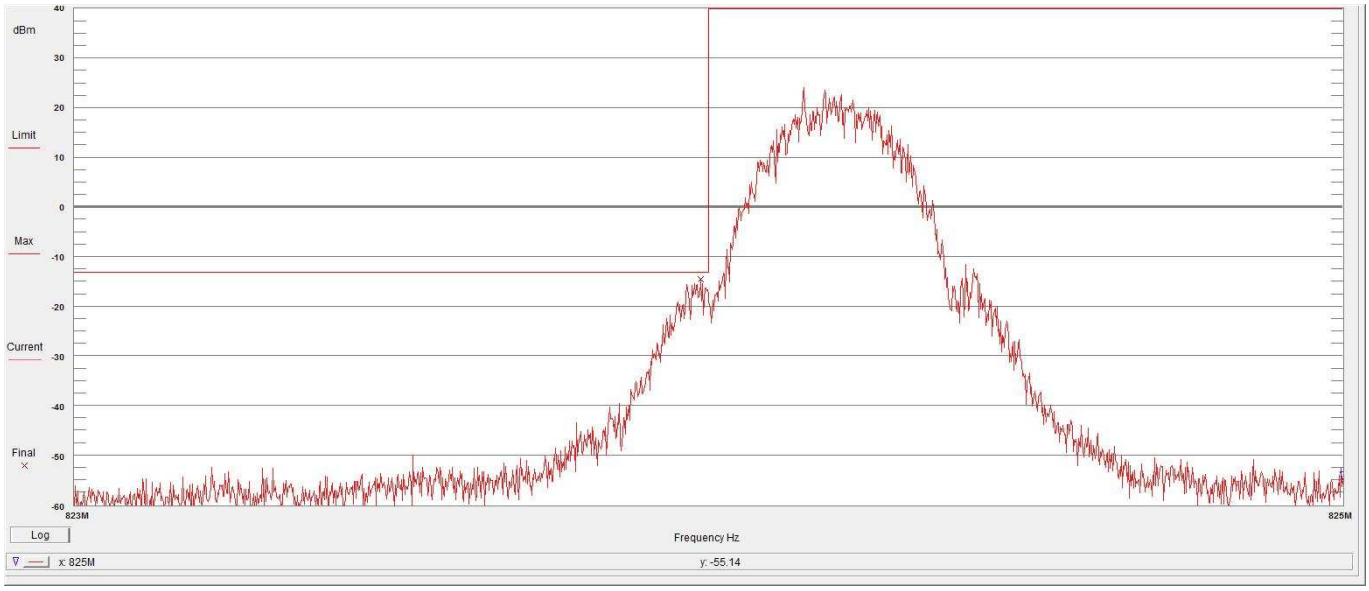
MDE_ELEKT_1502_FCCh, page 25 (LTE FDD5)

| Band | Mode | Channel | Detector | RBW / VBW | Frequency MHz | Peak value | FCC limit | Margin dB | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| 850 | GSM | 128 | Peak | 3kHz | 823.98 | -14.4 | -13 | 1.4 | PASS |
| | | 251 | Peak | 3kHz | 849.02 | -14.1 | -13 | 1.1 | PASS |
| 850 | EDGE | 128 | Peak | 3kHz | 824 | -21 | -13 | 8.0 | PASS |
| | | 251 | Peak | 3kHz | 849.02 | -21.2 | -13 | 8.2 | PASS |
| FDD 5 | WCDMA | 4132 | RMS | 50 kHz | 823.97 | -24.6 | -13 | 11.6 | PASS |
| | | 4233 | RMS | 50 kHz | 849.01 | -21.7 | -13 | 8.7 | PASS |

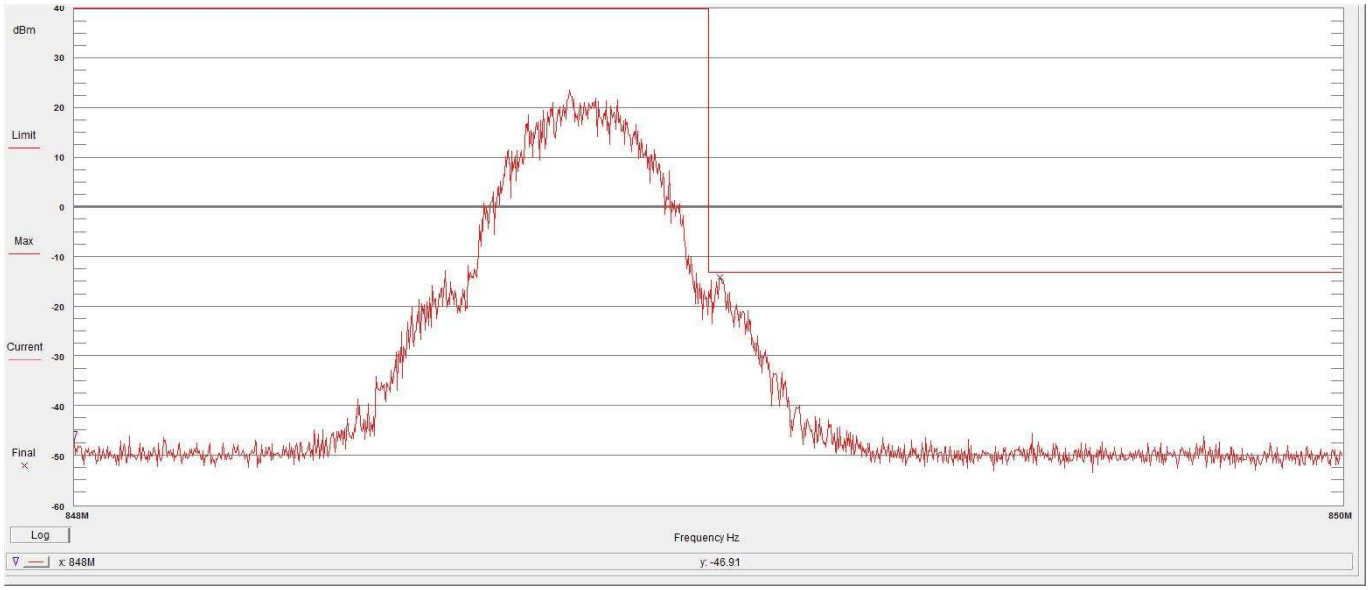
*Table 10: Detailed results GSM 850 and WCDMA FDD 5, Band edge*

| Band | Mode | BW MHz | Modulation | RB | Channel | Frequency MHz | Detector | RBW / VBW | Peak value | FCC limit | Margin dB | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FDD 5 | LTE | 1.4 | QPSK | 6 | 20407 | 824 | RMS | 30kHz | -27 | -13 | 14 | PASS |
| | | | | 6 | 20643 | 849 | RMS | 30kHz | -29.2 | -13 | 16.2 | PASS |
| | | | 16QAM | 6 | 20407 | 824 | RMS | 30kHz | -29.3 | -13 | 16.3 | PASS |
| | | | | 6 | 20643 | 849 | RMS | 30kHz | -31.1 | -13 | 28.1 | PASS |
| | | 3 | QPSK | 15 | 20415 | 824 | RMS | 30kHz | -29.9 | -13 | 16.9 | PASS |
| | | | | 15 | 20635 | 849 | RMS | 30kHz | -28.1 | -13 | 15.1 | PASS |
| | | | 16QAM | 15 | 20415 | 824 | RMS | 30kHz | -29.9 | -13 | 16.9 | PASS |
| | | | | 15 | 20635 | 849 | RMS | 30kHz | -29.5 | -13 | 16.5 | PASS |
| | | 5 | QPSK | 25 | 20425 | 824 | RMS | 50kHz | -28.8 | -13 | 15.8 | PASS |
| | | | | 25 | 20625 | 849 | RMS | 50kHz | -28.9 | -13 | 15.9 | PASS |
| | | | 16QAM | 25 | 20425 | 824 | RMS | 50kHz | -30.7 | -13 | 17.7 | PASS |
| | | | | 25 | 20625 | 849 | RMS | 50kHz | -31 | -13 | 17 | PASS |
| | | 10 | QPSK | 50 | 20450 | 824 | RMS | 100kHz | -27.8 | -13 | 14.8 | PASS |
| | | | | 50 | 20600 | 849 | RMS | 100kHz | -31.3 | -13 | 28.3 | PASS |
| | | | 16QAM | 50 | 20450 | 824 | RMS | 100kHz | -29.5 | -13 | 16.5 | PASS |
| | | | | 50 | 20600 | 849 | RMS | 100kHz | -32.9 | -13 | 19.9 | PASS |

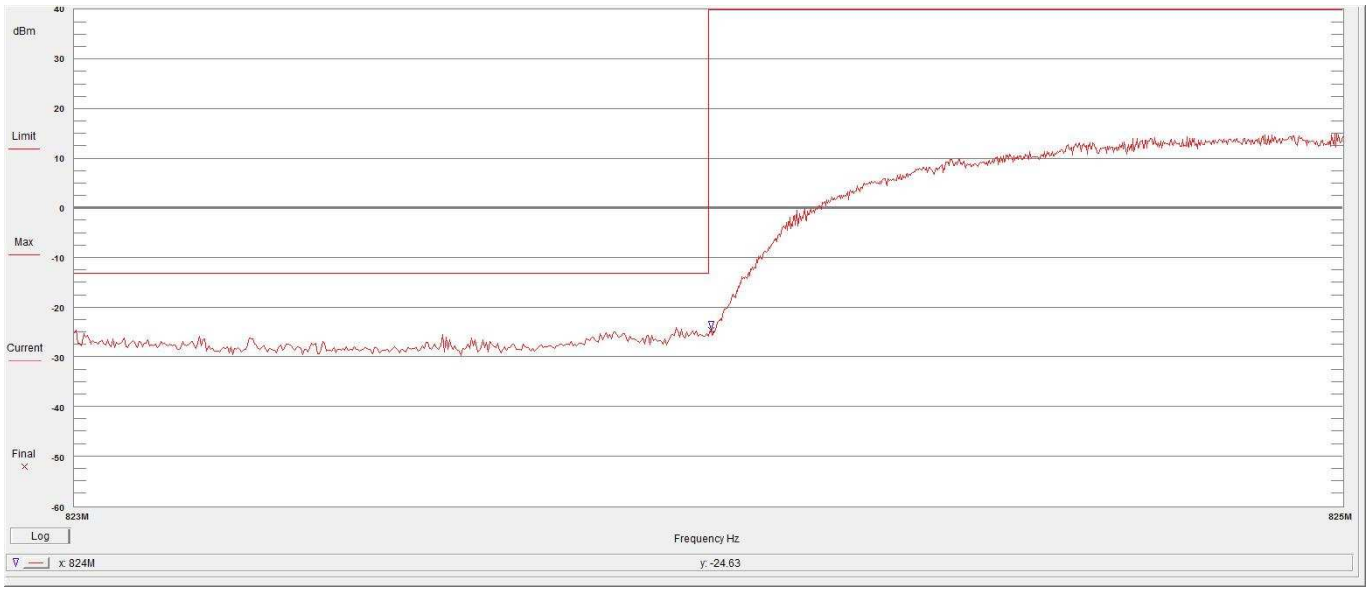
*Table 11: Detailed results LTE FDD 5, Band edge*



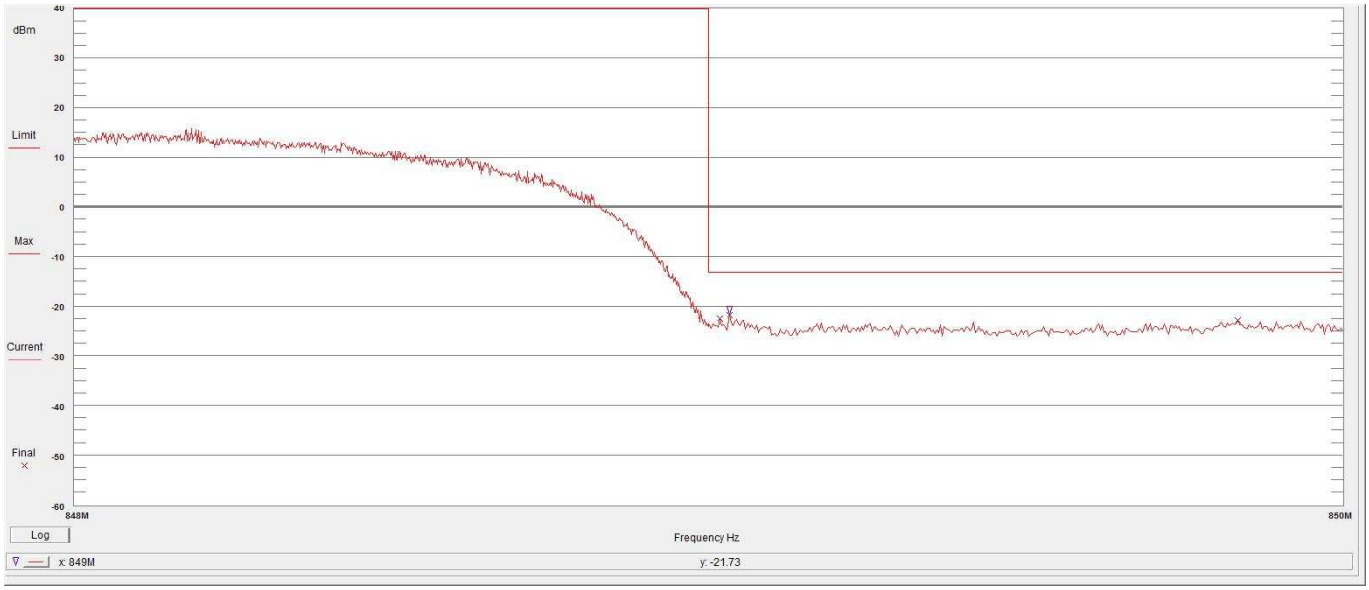

*Picture 18: GSM 850 Band Edge, Ch128*



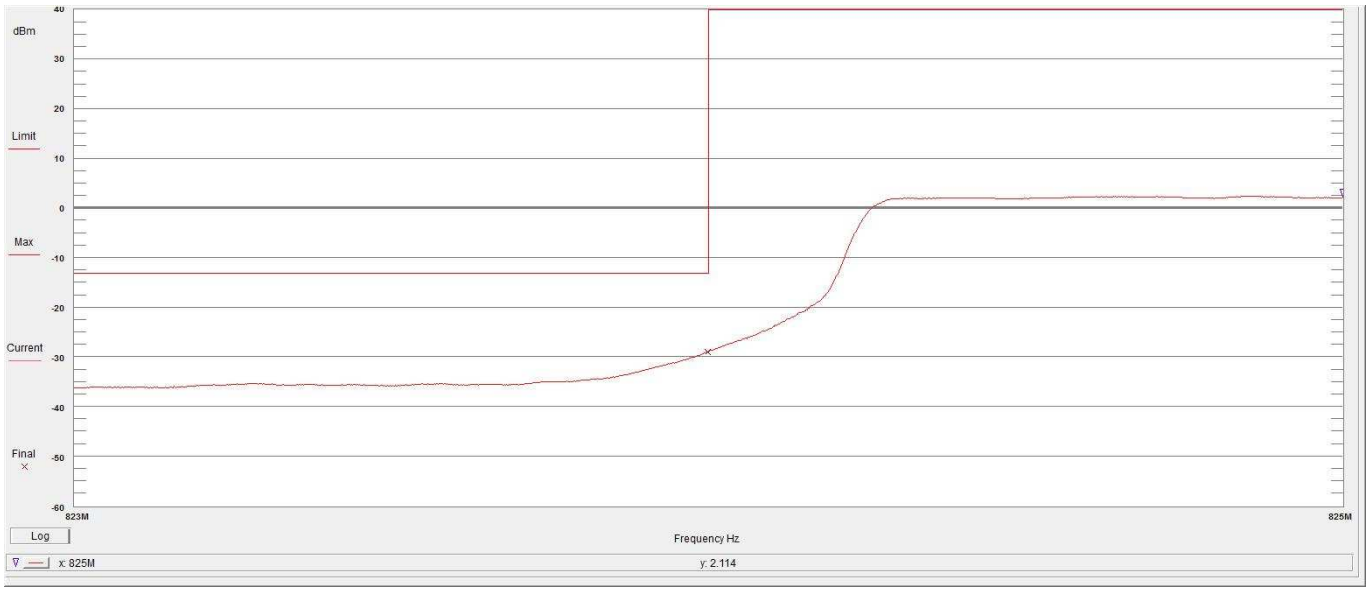

*Picture 19: GSM 850 Band Edge, Ch251*



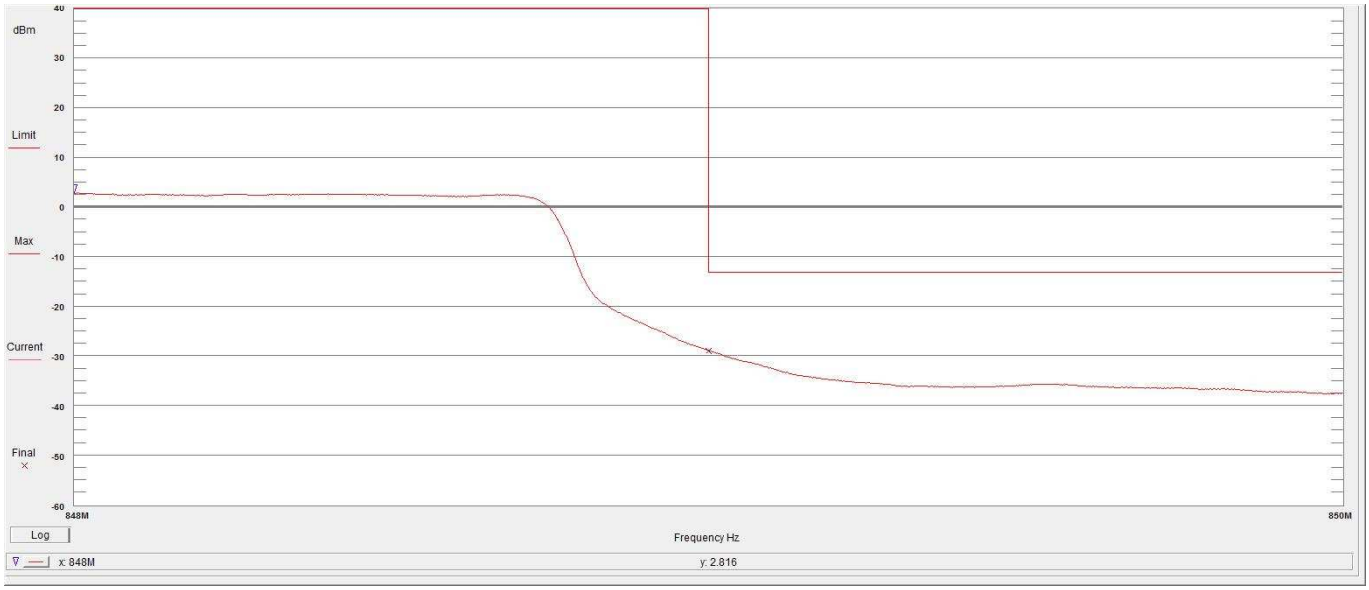

*Picture 20: WCDMA FDD 5 Band Edge, Ch4132*




*Picture 21: WCDMA FDD 5 Band Edge, Ch4233*




*Picture 22: LTE FDD 5 Band Edge, Ch20425*




*Picture 23: LTE FDD 5 Band Edge, Ch20625*

## 8.2 FCC Part 2 and 24

### 8.2.1 RF power output §2.1046, §24.232

Result: Passed

Setup: Conducted setup, Cond_2 EUT

Test specification: FCC part 2 and part 24

V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 48 (GSM 1900 and WCDMA FDD2)

MDE_ELEKT_1502_FCCh, page 30 (LTE FDD2)

Note: Testing has been done according to KDB 971168 D01.
Equation for determining the EIRP is: EIRP = $P_{Meas}$ + $G_T$ - $L_C$
Where $P_{Meas}$ = measured transmitter output power (dBm)
$G_T$ = gain of the transmitting antenna (dBi)
$L_C$ = signal attenuation in the connecting cable between the transmitter and antenna (negligible)

$G_T$ used to calculate EIRP for GSM/EDGE 1900, WCDMA FDD2 and LTE FDD2 is 0dBi.

| Band | Mode | Channel | Frequency (MHz) | Peak Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| | | Low | 1850.2 | 28.96 | 33 | 28.96 | PASS |
| | | Mid | 1880 | 28.8 | 33 | 28.8 | PASS |
| 1900 | GSM | High | 1909.8 | 29.02 | 33 | 29.02 | PASS |
| | | Low | 1850.2 | 28.34 | 33 | 28.34 | PASS |
| | | Mid | 1880 | 28.3 | 33 | 28.3 | PASS |
| 1900 | EDGE | High | 1909.8 | 28.37 | 33 | 28.37 | PASS |

*Table 12: Detailed results GSM/EDGE 1900, RF power output*

| Band | Mode | Channel | Frequency (MHz) | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|
| | | Low | 1852.4 | 24.01 | 33 | 24.01 | PASS |
| | | Mid | 1880 | 24.3 | 33 | 24.3 | PASS |
| FDD 2 | WCDMA | High | 1907.6 | 24.39 | 33 | 24.39 | PASS |

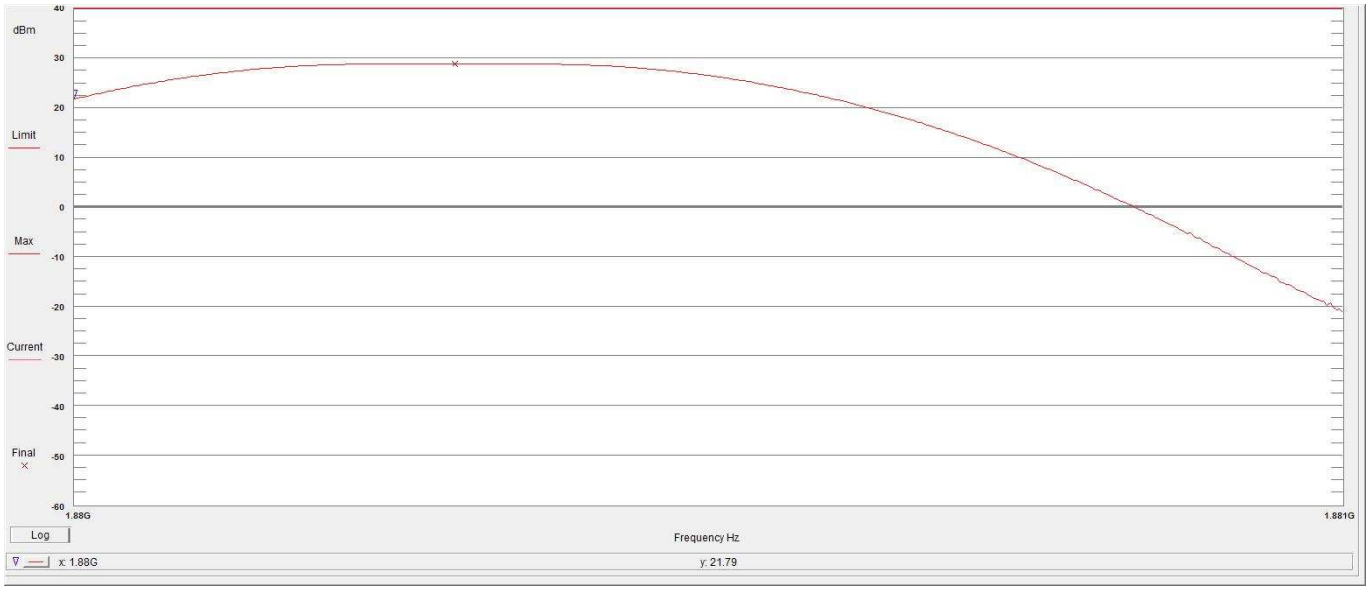
*Table 13: Detailed results WCDMA FDD 2, RF power output*

| Band | Bandwidth | Channel | Modulation | RB | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| LTE FDD 2 | 1.4 MHz | 18607 | QPSK | 1 | 23.63 | 33 | 23.63 | PASS |
| | | | QPSK | 3 | 23.63 | 33 | 23.63 | PASS |
| | | | QPSK | 6 | 22.57 | 33 | 22.57 | PASS |
| | | | 16QAM | 1 | 22.4 | 33 | 22.4 | PASS |
| | | | 16QAM | 6 | 21.5 | 33 | 21.5 | PASS |
| | | 18900 | QPSK | 1 | 23.49 | 33 | 23.49 | PASS |
| | | | QPSK | 3 | 23.52 | 33 | 23.52 | PASS |
| | | | QPSK | 6 | 22.51 | 33 | 22.51 | PASS |
| | | | 16QAM | 1 | 22.3 | 33 | 22.3 | PASS |
| | | | 16QAM | 6 | 21.47 | 33 | 21.47 | PASS |
| | | 19193 | QPSK | 1 | 23.61 | 33 | 23.61 | PASS |
| | | | QPSK | 3 | 23.58 | 33 | 23.58 | PASS |
| | | | QPSK | 6 | 22.59 | 33 | 22.59 | PASS |
| | | | 16QAM | 1 | 22.5 | 33 | 22.5 | PASS |
| | | | 16QAM | 6 | 21.55 | 33 | 21.55 | PASS |
| | 3 MHz | 18615 | QPSK | 1 | 23.67 | 33 | 23.67 | PASS |
| | | | QPSK | 15 | 22.52 | 33 | 22.52 | PASS |
| | | | 16QAM | 1 | 22.42 | 33 | 22.42 | PASS |
| | | | 16QAM | 15 | 21.5 | 33 | 21.5 | PASS |
| | | 18900 | QPSK | 1 | 23.54 | 33 | 23.54 | PASS |
| | | | QPSK | 15 | 22.47 | 33 | 22.47 | PASS |
| | | | 16QAM | 1 | 22.36 | 33 | 22.36 | PASS |
| | | | 16QAM | 15 | 21.46 | 33 | 21.46 | PASS |
| | | 19185 | QPSK | 1 | 23.66 | 33 | 23.66 | PASS |
| | | | QPSK | 15 | 22.62 | 33 | 22.62 | PASS |
| | | | 16QAM | 1 | 22.54 | 33 | 22.54 | PASS |
| | | | 16QAM | 15 | 21.58 | 33 | 21.58 | PASS |
| | 5 MHz | 18625 | QPSK | 1 | 23.66 | 33 | 23.66 | PASS |
| | | | QPSK | 12 | 21.6 | 33 | 21.6 | PASS |
| | | | QPSK | 25 | 22.5 | 33 | 22.5 | PASS |
| | | | 16QAM | 1 | 22.43 | 33 | 22.43 | PASS |
| | | | 16QAM | 25 | 21.57 | 33 | 21.57 | PASS |
| | | 18900 | QPSK | 1 | 23.59 | 33 | 23.59 | PASS |
| | | | QPSK | 12 | 21.51 | 33 | 21.51 | PASS |
| | | | QPSK | 25 | 22.5 | 33 | 22.5 | PASS |
| | | | 16QAM | 1 | 22.33 | 33 | 22.33 | PASS |
| | | | 16QAM | 25 | 21.51 | 33 | 21.51 | PASS |
| | | 19175 | QPSK | 1 | 23.66 | 33 | 23.66 | PASS |

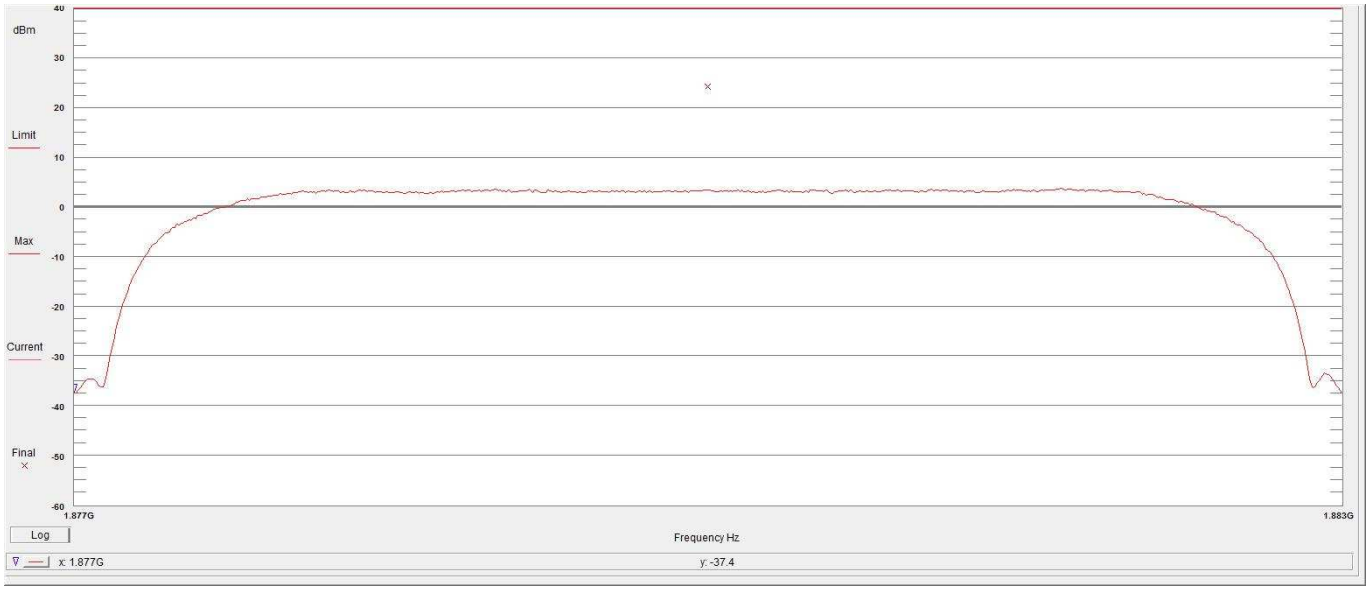
| Band | Bandwidth | Channel | Modulation | RB | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | | QPSK | 12 | 21.62 | 33 | 21.62 | PASS |
| | | | QPSK | 25 | 22.57 | 33 | 22.57 | PASS |
| | | | 16QAM | 1 | 22.48 | 33 | 22.48 | PASS |
| | | | 16QAM | 25 | 21.61 | 33 | 21.61 | PASS |
| | | | QPSK | 1 | 23.67 | 33 | 23.67 | PASS |
| | | | QPSK | 50 | 22.47 | 33 | 22.47 | PASS |
| | | | 16QAM | 1 | 22.5 | 33 | 22.5 | PASS |
| | | 18650 | 16QAM | 50 | 21.43 | 33 | 21.43 | PASS |
| | | | QPSK | 1 | 23.52 | 33 | 23.52 | PASS |
| | | | QPSK | 50 | 22.46 | 33 | 22.46 | PASS |
| | | | 16QAM | 1 | 22.39 | 33 | 22.39 | PASS |
| | | 18900 | 16QAM | 50 | 21.49 | 33 | 21.49 | PASS |
| | | | QPSK | 1 | 23.6 | 33 | 23.6 | PASS |
| | | | QPSK | 50 | 22.61 | 33 | 22.61 | PASS |
| | | | 16QAM | 1 | 22.51 | 33 | 22.51 | PASS |
| | 10 MHz | 19150 | 16QAM | 50 | 21.62 | 33 | 21.62 | PASS |
| | | | QPSK | 1 | 22.48 | 33 | 22.48 | PASS |
| | | | QPSK | 36 | 21.44 | 33 | 21.44 | PASS |
| | | | QPSK | 75 | 21.38 | 33 | 21.38 | PASS |
| | | | 16QAM | 1 | 22.47 | 33 | 22.47 | PASS |
| | | 18675 | 16QAM | 75 | 21.37 | 33 | 21.37 | PASS |
| | | | QPSK | 1 | 22.41 | 33 | 22.41 | PASS |
| | | | QPSK | 36 | 21.47 | 33 | 21.47 | PASS |
| | | | QPSK | 75 | 21.48 | 33 | 21.48 | PASS |
| | | | 16QAM | 1 | 22.39 | 33 | 22.39 | PASS |
| | | 18900 | 16QAM | 75 | 21.51 | 33 | 21.51 | PASS |
| | | | QPSK | 1 | 22.49 | 33 | 22.49 | PASS |
| | | | QPSK | 36 | 21.58 | 33 | 21.58 | PASS |
| | | | QPSK | 75 | 21.66 | 33 | 21.66 | PASS |
| | | | 16QAM | 1 | 22.48 | 33 | 22.48 | PASS |
| | 15 MHz | 19125 | 16QAM | 75 | 21.67 | 33 | 21.67 | PASS |
| | | | QPSK | 1 | 22.52 | 33 | 22.52 | PASS |
| | | | QPSK | 100 | 21.43 | 33 | 21.43 | PASS |
| | | | 16QAM | 1 | 22.51 | 33 | 22.51 | PASS |
| | | 18650 | 16QAM | 100 | 21.44 | 33 | 21.44 | PASS |
| | | | QPSK | 1 | 22.41 | 33 | 22.41 | PASS |
| | | | QPSK | 100 | 21.49 | 33 | 21.49 | PASS |
| | 20 MHz | 18900 | 16QAM | 1 | 22.41 | 33 | 22.41 | PASS |

| Band | Bandwidth | Channel | Modulation | RB | RMS Conducted power (dBm) | FCC EIRP limit (dBm) | Calculated EIRP (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| | | | 16QAM | 100 | 21.51 | 33 | 21.51 | PASS |
| | | | QPSK | 1 | 22.49 | 33 | 22.49 | PASS |
| | | | QPSK | 100 | 21.68 | 33 | 21.68 | PASS |
| | | | 16QAM | 1 | 22.5 | 33 | 22.5 | PASS |
| | | 19150 | 16QAM | 100 | 21.68 | 33 | 21.68 | PASS |

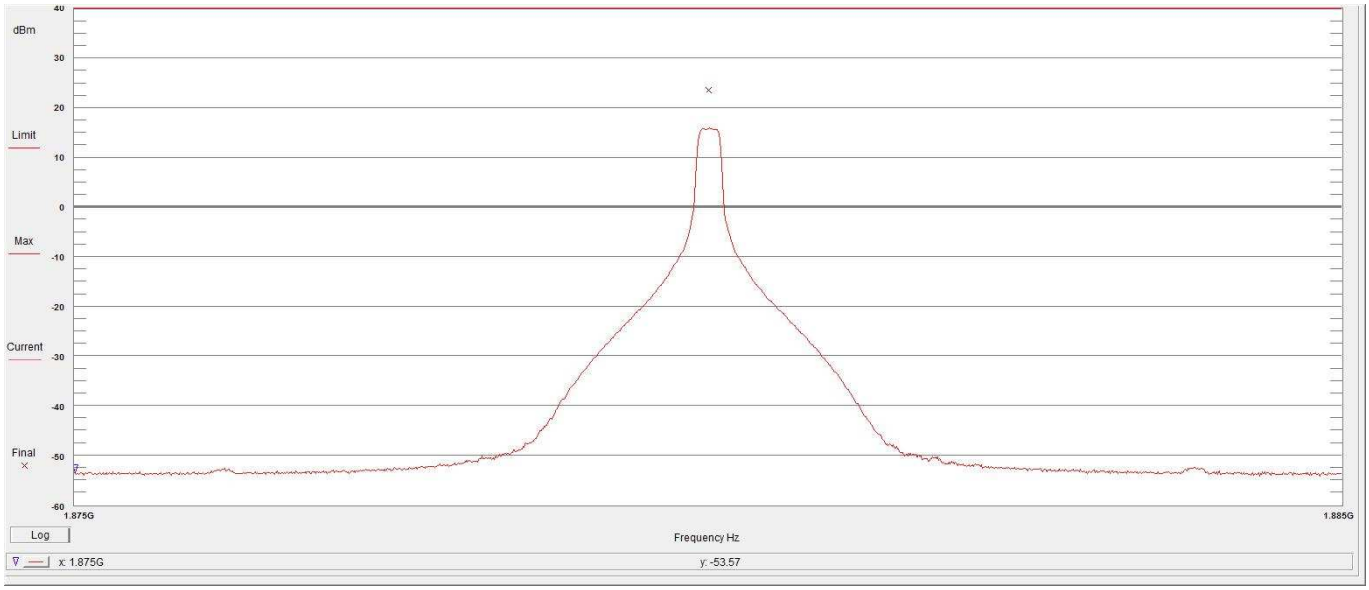
*Table 14: Detailed results LTE FDD 2, RF power output*




*Picture 24: GSM 1900, Ch. 661, RF power output, RBW 300kHz, VBW 300 kHz*




*Picture 25: WCDMA FDD 2, Ch. 9400, RF power output, RBW 30 kHz, VBW 300 kHz*




*Picture 26: LTE FDD 2, Ch. 18900,BW 5MHz, QPSK, 1 RB, RF power output, RBW 30 kHz, VBW 300 kHz*

### 8.2.2 Spurious emissions at antenna terminals §2.1051, §24.238

Result: Passed, with WCDMA FDD 2 and LTE FDD 2 bands there were no peaks with a margin less than 20 dB

Setup: Conducted setup, Cond_2 EUT

Test specification FCC part 2 and part 24

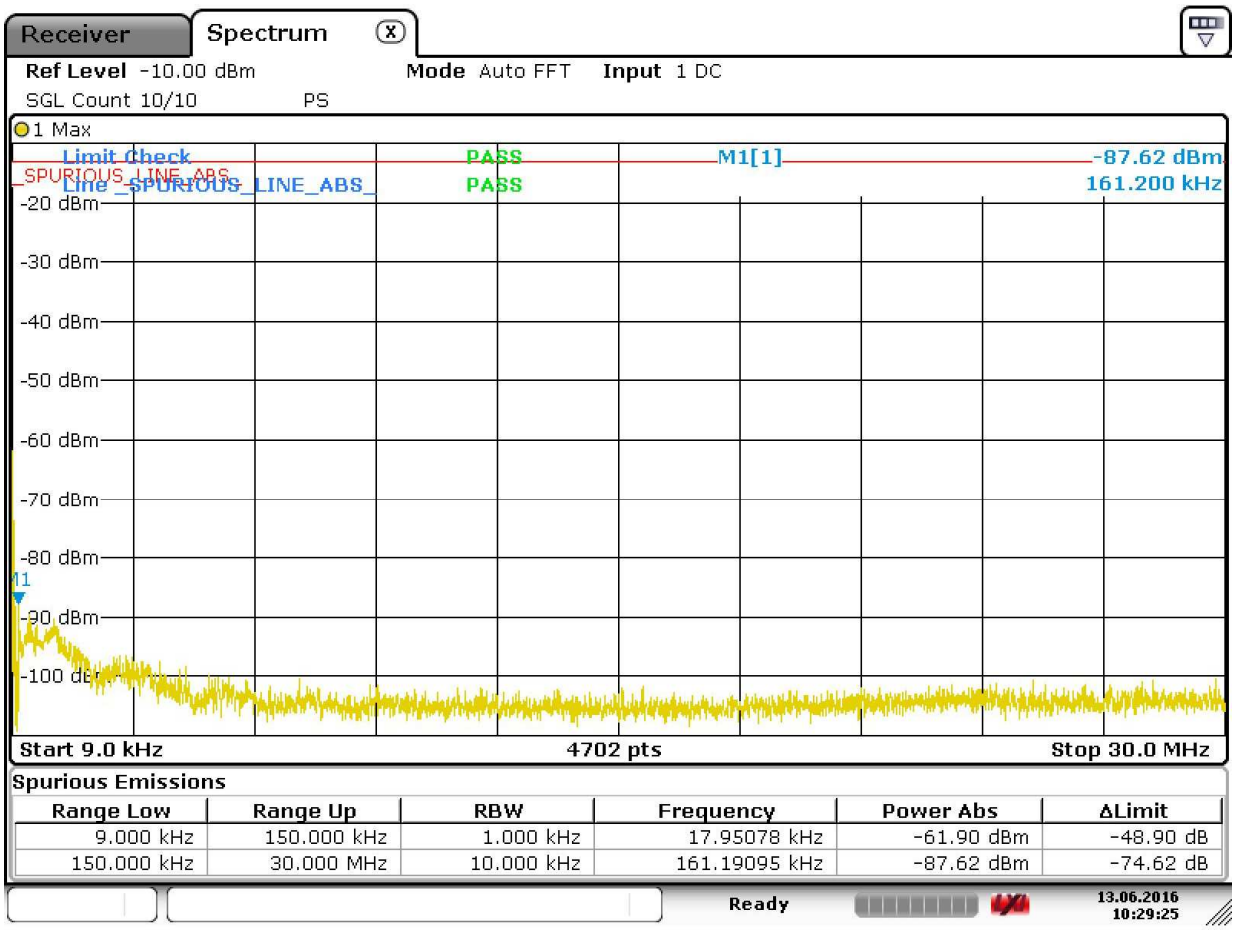
V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 61 (GSM 1900 and WCDMA FDD2)

MDE_ELEKT_1502_FCCh, page 35 (LTE FDD2)

| Band | Mode | Channel | Detector | Frequency | Peak value | FCC limit | Margin | Verdict |
|---|---|---|---|---|---|---|---|---|
| 1900 | GSM | 512 | Peak | 2845.75 MHz | -23.4 dBm | -13 dBm | -10.4 dB | PASS |
| 1900 | GSM | 512 | Peak | 11101.2 MHz | -32.7 dBm | -13 dBm | -19.7 dB | PASS |
| 1900 | GSM | 512 | Peak | 12951.4 MHz | -32.0 dBm | -13 dBm | -19.0 dB | PASS |
| 1900 | GSM | 512 | Peak | 14801.6 MHz | -27.8 dBm | -13 dBm | -14.8 dB | PASS |
| 1900 | GSM | 512 | Peak | 15685.5 MHz | -23.7 dBm | -13 dBm | -10.7 dB | PASS |

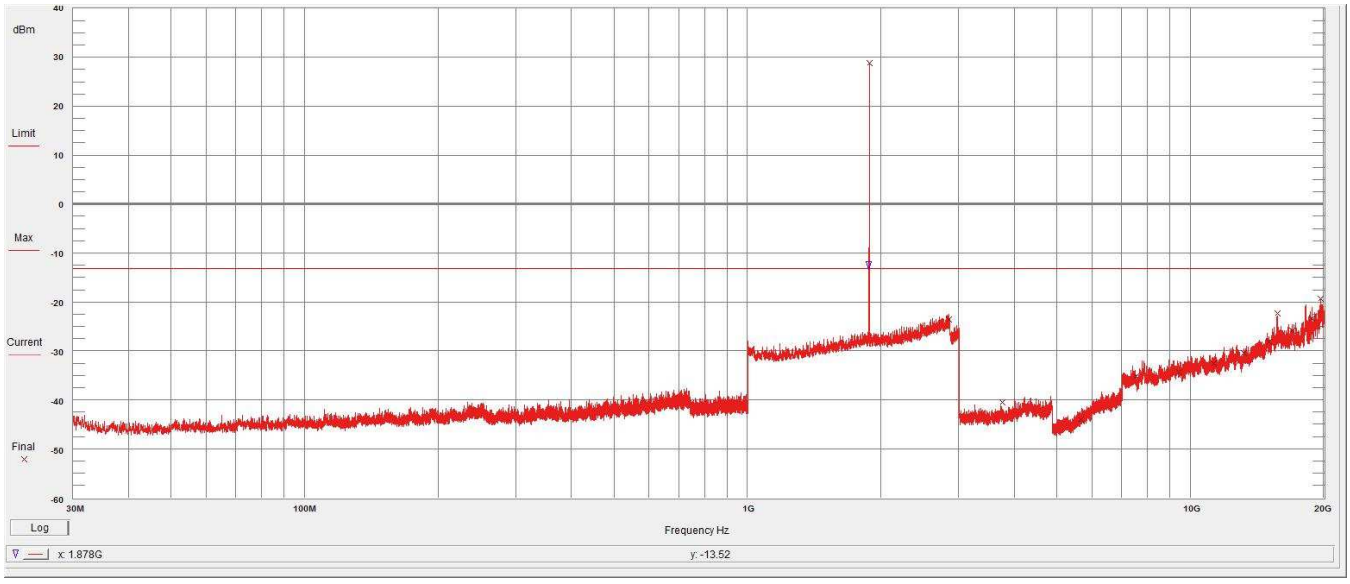
| Band | Mode | Channel | Detector | Frequency | Peak value | FCC limit | Margin | Verdict |
|---|---|---|---|---|---|---|---|---|
| 1900 | GSM | 512 | Peak | 16651.8 MHz | -27.8 dBm | -13 dBm | -14.8 dB | PASS |
| 1900 | GSM | 512 | Peak | 18502 MHz | -26.2 dBm | -13 dBm | -13.2 dB | PASS |
| 1900 | GSM | 512 | Peak | 19630.75 MHz | -19.9 dBm | -13 dBm | -6.91 dB | PASS |
| 1900 | GSM | 661 | Peak | 2837.5 MHz | -23.4 dBm | -13 dBm | -10.4 dB | PASS |
| 1900 | GSM | 661 | Peak | 11280 MHz | -32.4 dBm | -13 dBm | -19.4 dB | PASS |
| 1900 | GSM | 661 | Peak | 13160 MHz | -30.3 dBm | -13 dBm | -17.3 dB | PASS |
| 1900 | GSM | 661 | Peak | 15040 MHz | -28.0 dBm | -13 dBm | -15.0 dB | PASS |
| 1900 | GSM | 661 | Peak | 15687.25 MHz | -22.3 dBm | -13 dBm | -9.32 dB | PASS |
| 1900 | GSM | 661 | Peak | 16920 MHz | -25.7 dBm | -13 dBm | -12.7 dB | PASS |
| 1900 | GSM | 661 | Peak | 18800 MHz | -23.2 dBm | -13 dBm | -10.2 dB | PASS |
| 1900 | GSM | 661 | Peak | 19614.5 MHz | -19.1 dBm | -13 dBm | -6.19 dB | PASS |
| 1900 | GSM | 810 | Peak | 2814.25 MHz | -23.8 dBm | -13 dBm | -10.8 dB | PASS |
| 1900 | GSM | 810 | Peak | 11458.8 MHz | -32.9 dBm | -13 dBm | -19.9 dB | PASS |
| 1900 | GSM | 810 | Peak | 13368.6 MHz | -31.2 dBm | -13 dBm | -18.2 dB | PASS |
| 1900 | GSM | 810 | Peak | 15278.4 MHz | -26.9 dBm | -13 dBm | -13.9 dB | PASS |
| 1900 | GSM | 810 | Peak | 15688.75 MHz | -23.9 dBm | -13 dBm | -10.9 dB | PASS |
| 1900 | GSM | 810 | Peak | 17188.2 MHz | -27.4 dBm | -13 dBm | -14.4 dB | PASS |
| 1900 | GSM | 810 | Peak | 19098 MHz | -23.4 dBm | -13 dBm | -10.4 dB | PASS |
| 1900 | GSM | 810 | Peak | 19610.25 MHz | -19.4 dBm | -13 dBm | -6.48 dB | PASS |

*Table 15: Detailed results GSM 1900, Ch. 661 Spurious at antenna terminal*

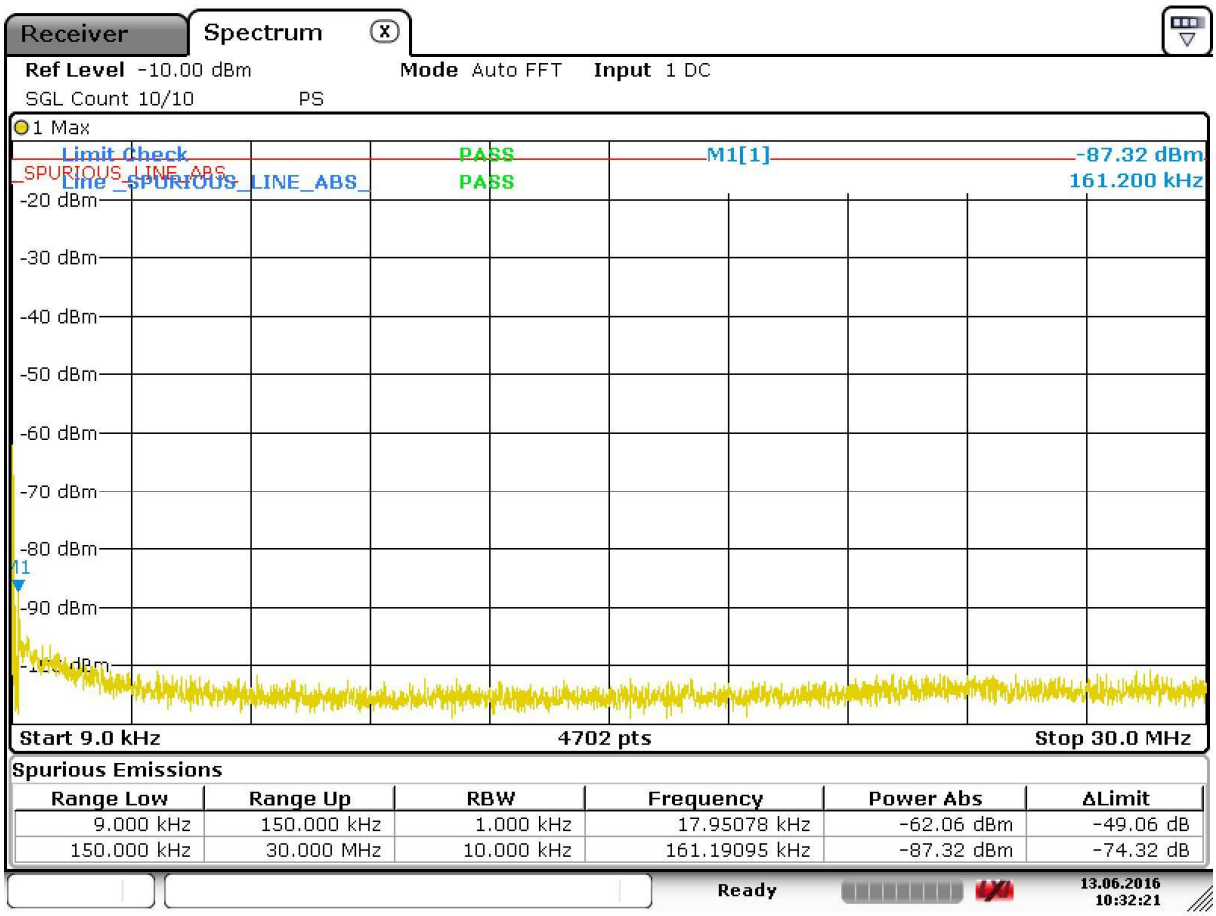



Date: 13.JUN.2016 10:29:26

*Picture 27: GSM 1900, Ch661, spurious at antenna terminal, 9 kHz – 30 MHz*

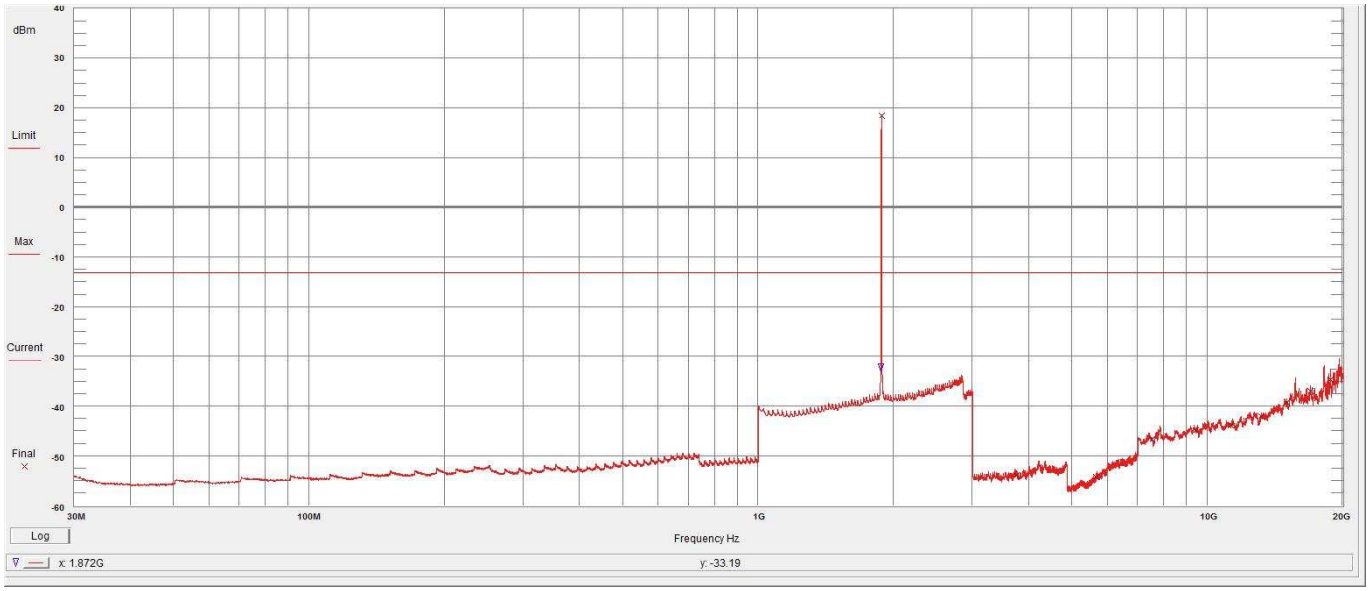



*Picture 28: GSM 1900, Ch661, spurious at antenna terminal, 30 MHz – 20 GHz, peak is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz)*

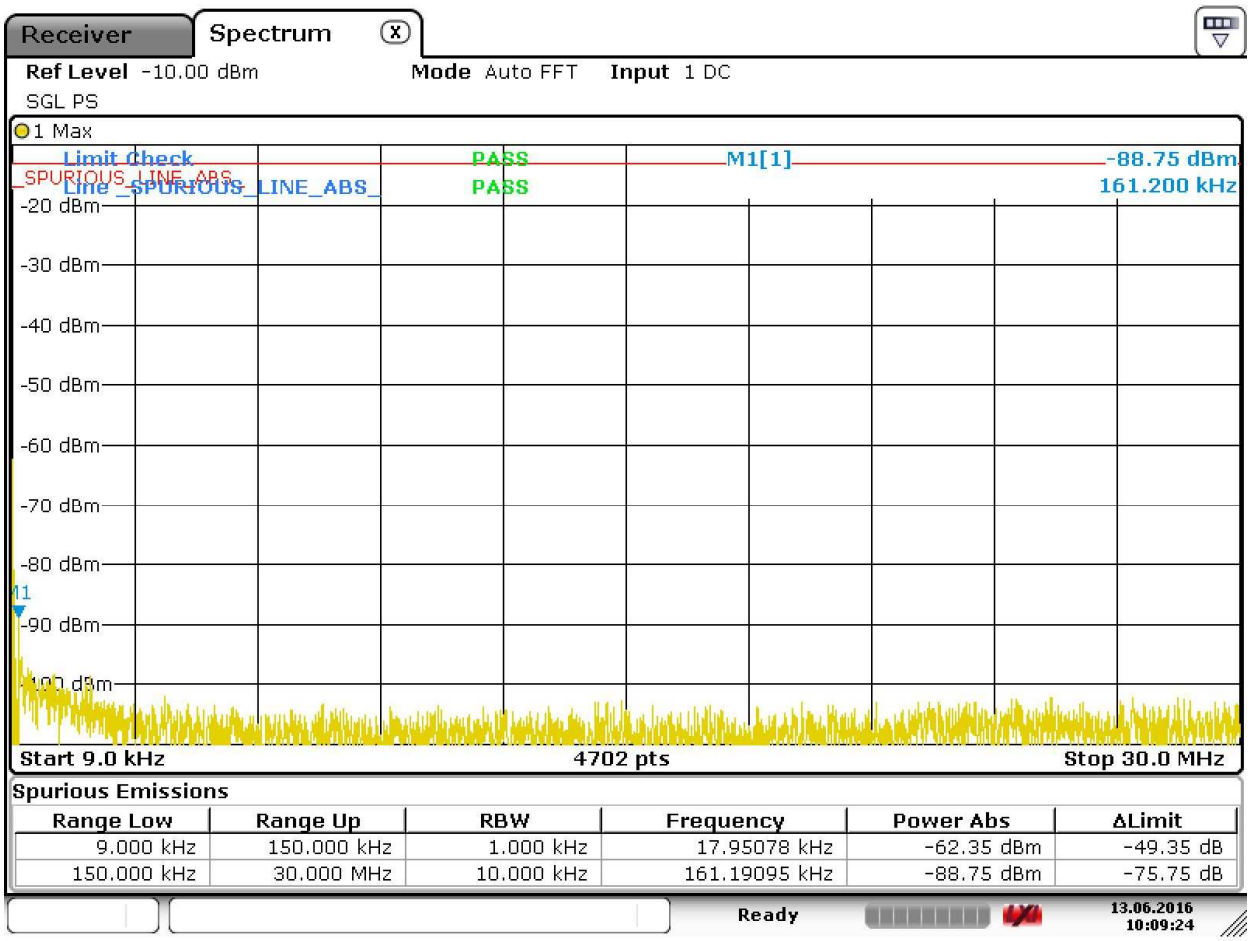



Date: 13.JUN.2016 10:32:21

*Picture 29: WCDMA FDD 2, Ch9400, spurious at antenna terminal, 9 kHz – 30 MHz*

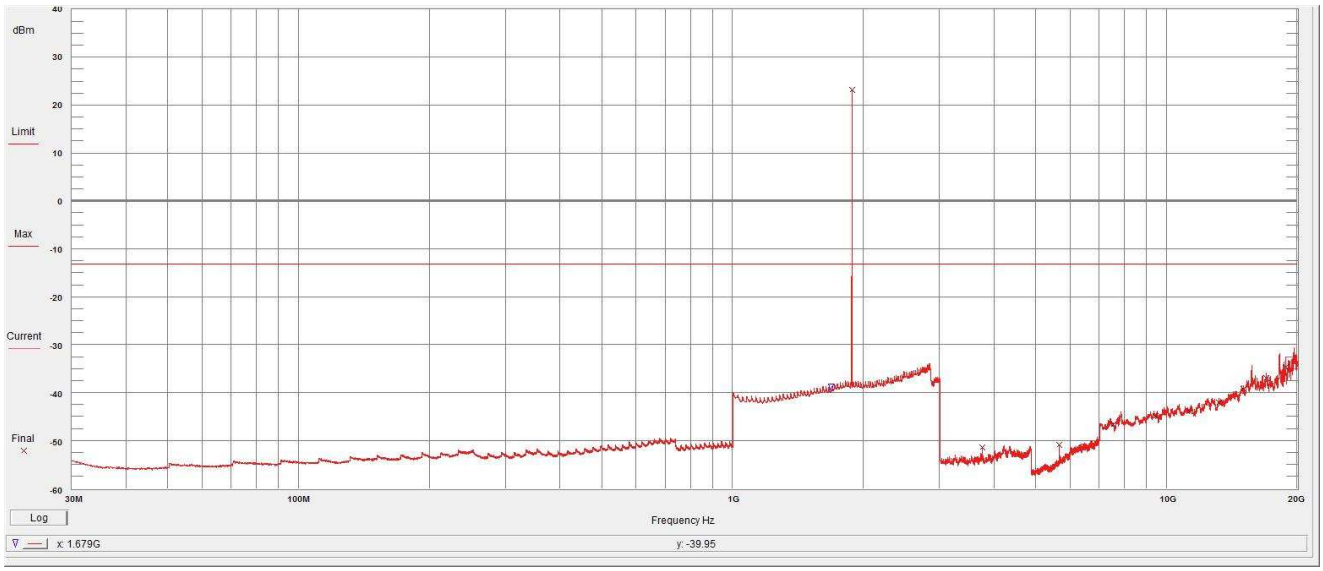



*Picture 30: WCDMA FDD 2, Ch9400, spurious at antenna terminal, 30 MHz – 18 GHz, peak is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz)*




Date: 13.JUN.2016 10:09:24

*Picture 31: LTE FDD 2, Ch18900, spurious at antenna terminal, 9 kHz – 30 MHz*

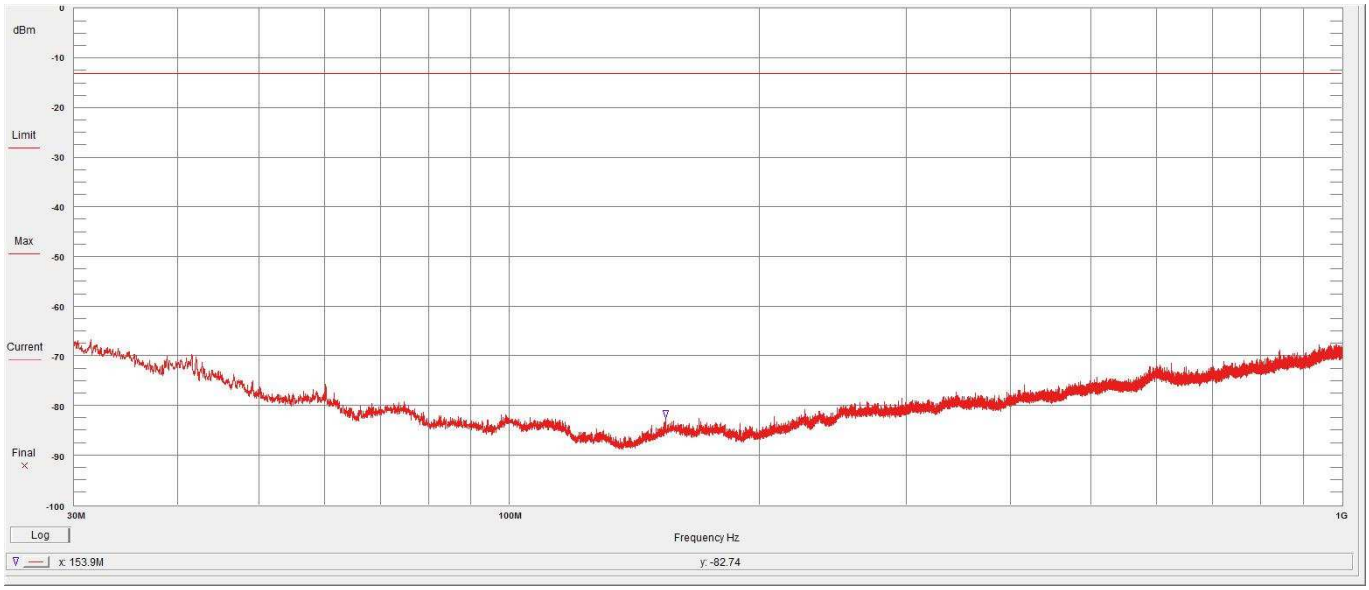



*Picture 32: LTE FDD 2, Ch18900, spurious at antenna terminal, 30 MHz – 18 GHz, peak is fundamental, RBW 100 kHz, VBW 300 kHz (freq<1GHz), RBW 1MHz, VBW 3MHz (freq >1 GHz)*

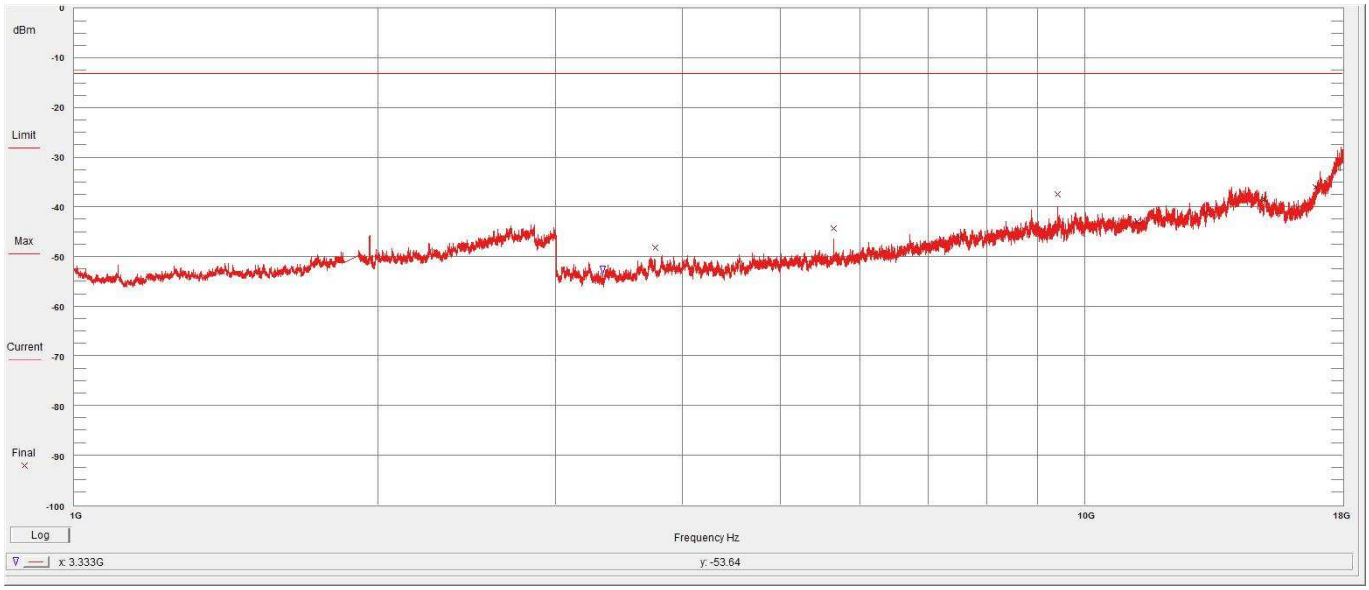
### 8.2.3 Field strength of spurious radiation §2.1053, §24.238

| | |
|---|---|
| Result: | Passed, at pre-tests there were no peaks with a margin less than 20 dB with all measured channels (low, mid, high) |
| Setup: | Radiated pre-test setup, Rad_1 EUT |
| Test specification | FCC part 2 and part 24 |
| V27SD-41 reference data: | MDE_ELEKT_1502_FCCg, page 63 (GSM 1900 and WCDMA FDD2) |
| | MDE_ELEKT_1502_FCCh, page 36 (LTE FDD2) |

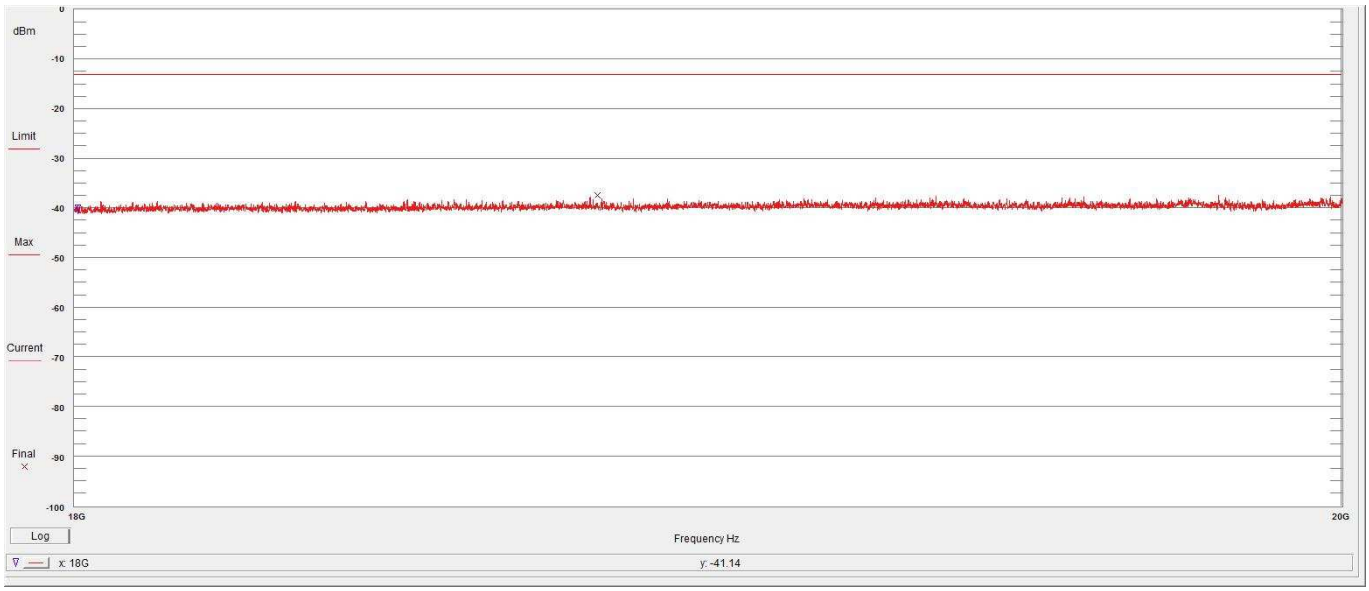
Limit = 43+log10(P) = -13dBm



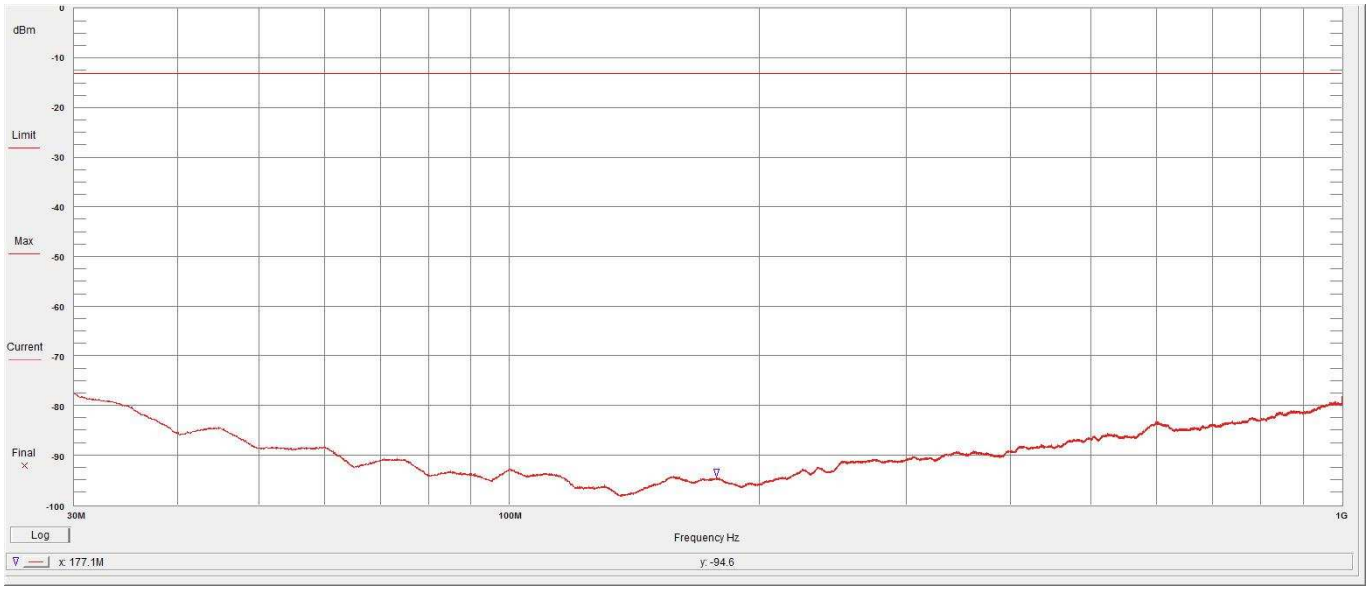

*Picture 33: GSM 1900, Field strength of spurious radiation, Ch661, 30 – 1000 MHz, RBW 100 kHz, VBW 300 kHz.*



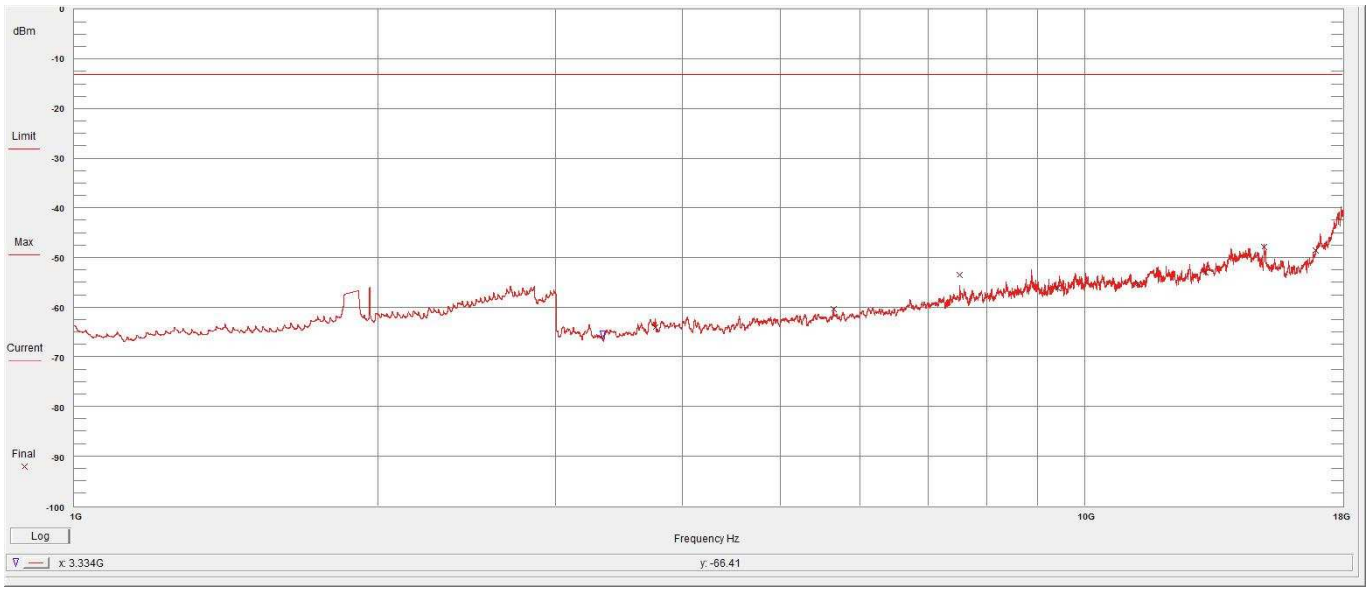

*Picture 34: GSM 1900, Field strength of spurious radiation, Ch661, 1 – 18 GHz, RBW 1 MHz, VBW 3 MHz*



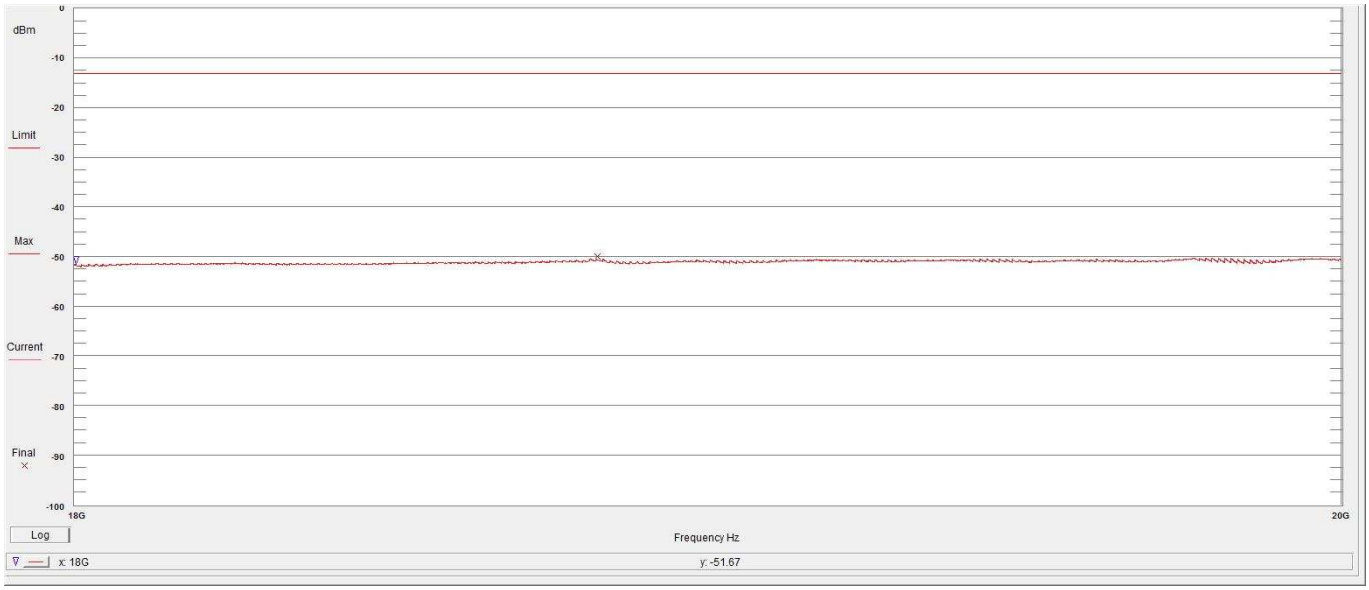

*Picture 35: GSM 1900,Field strength of spurious radiation, Ch661, 18 – 20 GHz, RBW 1 MHz, VBW 3 MHz*



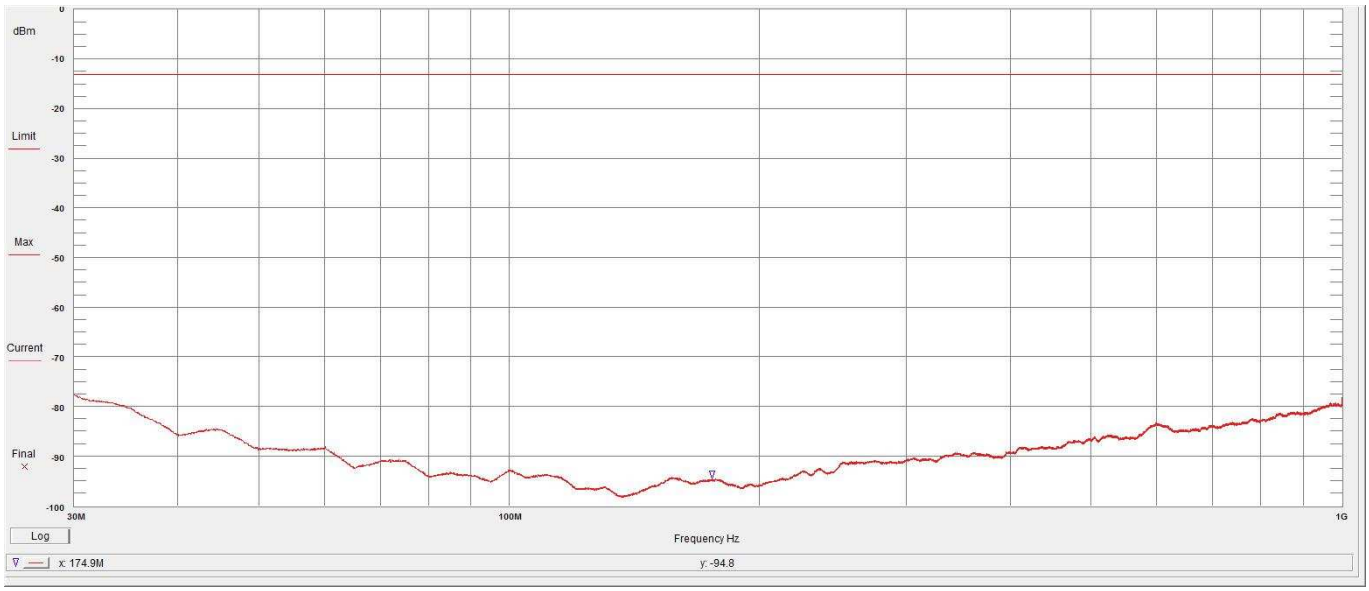

*Picture 36: WCDMA FDD 2, Field strength of spurious radiation, Ch9400, 30 – 1000 MHz, RBW 100 kHz, VBW 300 kHz.*



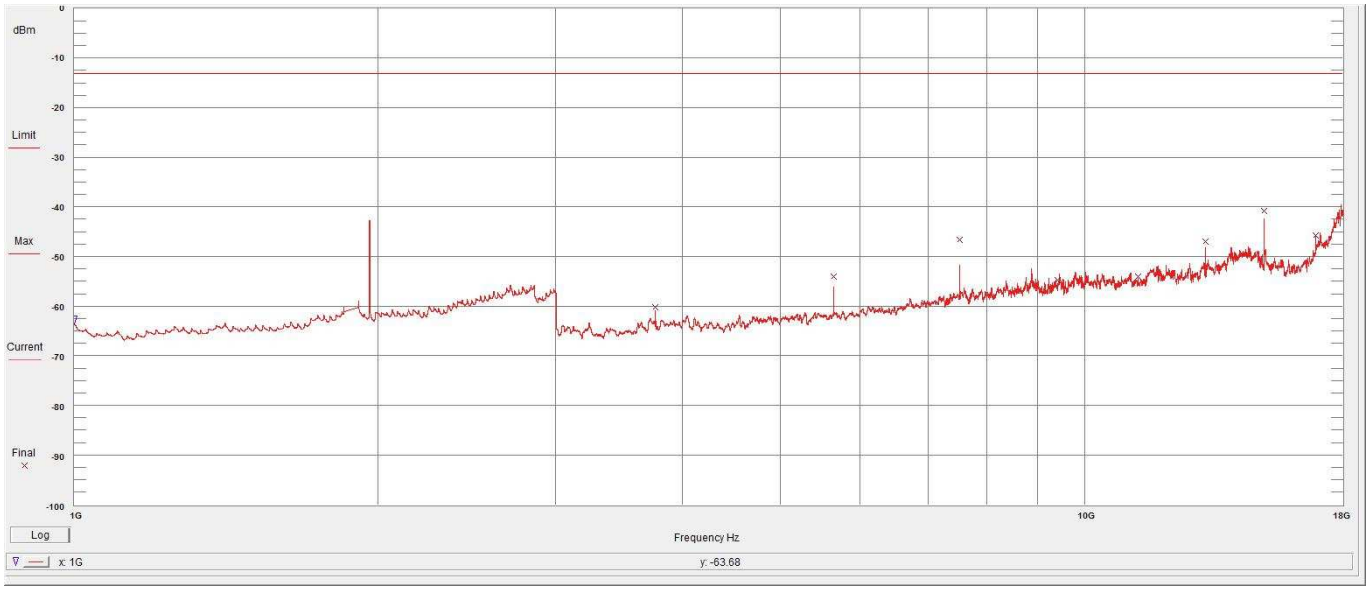

*Picture 37: WCDMA FDD 2, Field strength of spurious radiation, Ch9400, 1 – 18 GHz, RBW 1 MHz, VBW 3 MHz*



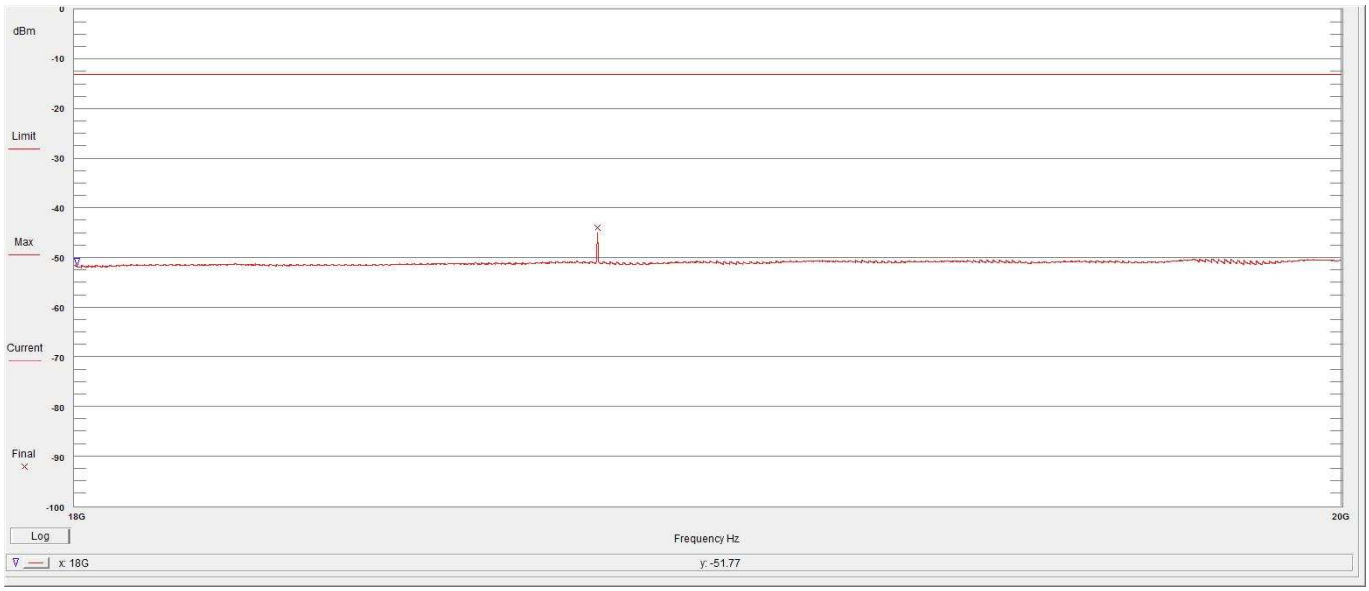

*Picture 38: WCDMA FDD 2, Field strength of spurious radiation, Ch9400, 18 – 20 GHz, RBW 1 MHz, VBW 3 MHz*




*Picture 39: LTE FDD 2, Field strength of spurious radiation, Ch18900, BW 5 MHz, 1 RB, 30 – 1000 MHz, RBW 100 kHz, VBW 300 kHz.*




*Picture 40: LTE FDD 2, Field strength of spurious radiation, 18900, BW 5 MHz, 1 RB, 1 – 18 GHz, RBW 1 MHz, VBW 3 MHz*




*Picture 41: LTE FDD 2, Field strength of spurious radiation, 18900, BW 5 MHz, 1 RB, 18 – 20 GHz, RBW 1 MHz, VBW 3 MHz*

### 8.2.4 Band edge compliance §2.1053, §24.238

Result: Passed

Setup: Conducted setup, Cond_2 EUT

Test specification FCC part 2 and part 24

V27SD-41 reference data: MDE_ELEKT_1502_FCCg, page 81 (GSM 1900 and WCDMA FDD2)

MDE_ELEKT_1502_FCCh, page 47 (LTE FDD2)

| Band | Mode | Channel | Detector | RBW/VBW | Frequency MHz | Peak value (dBm) | FCC limit (dBm) | Margin (dB) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| | | 512 | Peak | 3kHz | 1850 | -15.4 | -13 | 2.45 | PASS |
| 1900 | GSM | 810 | Peak | 3kHz | 1910 | -18.1 | -13 | 5.15 | PASS |
| | | 512 | Peak | 3kHz | 1850 | -25.6 | -13 | 12.6 | PASS |
| 1900 | EDGE | 810 | Peak | 3kHz | 1910 | -24.6 | -13 | 11.6 | PASS |
| | | 9262 | RMS | 50kHz | 1850 | -24.2 | -13 | 11.2 | PASS |
| FDD 2 | WCDMA | 9538 | RMS | 50kHz | 1910 | -18.2 | -13 | 5.2 | PASS |

*Table 16: Detailed results, Band Edge Compliance GSM1900 & WCDMA FDD 2*

| Band | Mode | BW MHz | Modulation | RB / Offset | Channel | Frequency MHz | Detector | RBW / VBW | Peak value | FCC limit | Margin dB | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6 | 18607 | 1850 | RMS | 30kHz | -28.1 | -13 | 15.1 | PASS |
| | | | QPSK | 6 | 19193 | 1910 | RMS | 30kHz | -28.4 | -13 | 15.4 | PASS |
| | | | | 6 | 18607 | 1850 | RMS | 30kHz | -31.1 | -13 | 18.1 | PASS |
| | | 1.4 | 16QAM | 6 | 19193 | 1910 | RMS | 30kHz | -29.4 | -13 | 16.4 | PASS |
| | | | | 15 | 18615 | 1850 | RMS | 30kHz | -29.3 | -13 | 16.3 | PASS |
| | | | QPSK | 15 | 19185 | 1910 | RMS | 30kHz | -28.1 | -13 | 15.1 | PASS |
| | | | | 15 | 18615 | 1850 | RMS | 30kHz | -31.6 | -13 | 18.6 | PASS |
| | | 3 | 16QAM | 15 | 19185 | 1910 | RMS | 50kHz | -29 | -13 | 16 | PASS |
| | | | | 25 | 18625 | 1850 | RMS | 50kHz | -29.7 | -13 | 16.7 | PASS |
| FDD 2 | LTE | | QPSK | 25 | 19175 | 1910 | RMS | 50kHz | -29.3 | -13 | 16.3 | PASS |
| | | | | 25 | 18625 | 1850 | RMS | 50kHz | -32.2 | -13 | 19.2 | PASS |
| | | 5 | 16QAM | 25 | 19175 | 1910 | RMS | 50kHz | -30.3 | -13 | 17.3 | PASS |
| | | | | 50 | 18650 | 1850 | RMS | 100kHz | -31.2 | -13 | 18.2 | PASS |
| | | | QPSK | 50 | 19150 | 1910 | RMS | 100kHz | -27.4 | -13 | 14.4 | PASS |
| | | | | 50 | 18650 | 1850 | RMS | 100kHz | -32.9 | -13 | 19.9 | PASS |
| | | 10 | 16QAM | 50 | 19150 | 1910 | RMS | 100kHz | -28.5 | -13 | 15.5 | PASS |
| | | | | 75 | 18675 | 1850 | RMS | 150kHz | -26.3 | -13 | 13.3 | PASS |
| | | | QPSK | 75 | 19125 | 1910 | RMS | 150kHz | -24.5 | -13 | 11.5 | PASS |
| | | 15 | 16QAM | 75 | 18675 | 1850 | RMS | 150kHz | -28.5 | -13 | 15.5 | PASS |