



## **TEST REPORT**

**No. I19D00035-SRD04**

***For***

**Client: MobiWire SAS**

**Production: 4G Smart Phone**

**Model Name: MobiWire Sora, Altice S32**

**Brand Name: MobiWire, Altice**

**FCC ID : QPN-SORA**

**Hardware Version: V01A**

**Software Version: MOBIWIRE\_GH5024\_V01\_20190313**

**Issued date: 2019-05-09**

## NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. ANSI/TIA-603-E and KDB 971168 D01 has not been accredited by A2LA.
4. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

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**Revision Version**

| Report Number   | Revision | Date       | Memo                            |
|-----------------|----------|------------|---------------------------------|
| I19D00035-SRD04 | 00       | 2019-05-09 | Initial creation of test report |

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## 1. Test Laboratory

### 1.1. Testing Location

|                     |                                                            |
|---------------------|------------------------------------------------------------|
| Company Name        | East China Institute of Telecommunications                 |
| Address             | 7-8/F., Area G, No.668, Beijing East Road, Shanghai, China |
| Postal Code         | 200001                                                     |
| Telephone           | +86 21 63843300                                            |
| Fax                 | +86 21 63843301                                            |
| FCC registration No | 958356                                                     |

### 1.2. Testing Environment

|                    |         |
|--------------------|---------|
| Normal Temperature | 15℃-35℃ |
| Relative Humidity  | 20%-75% |

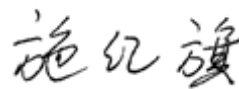
### 1.3. Project Data

|                    |            |
|--------------------|------------|
| Project Leader     | Yu Anlu    |
| Testing Start Date | 2019-03-21 |
| Testing End Date   | 2019-04-01 |

### 1.4. Signature



**Tang Tao**  
(Prepared this test report)



**Shi Hongqi**  
(Reviewed this test report)



**Zheng Zhongbin**  
(Approved this test report)

## 2. Client Information

### 2.1. Applicant Information

|              |                                                       |
|--------------|-------------------------------------------------------|
| Company Name | MobiWire SAS                                          |
| Address      | 79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France. |
| Telephone    | +33668018722                                          |
| Postcode     | /                                                     |

### 2.2. Manufacturer Information

|              |                                                       |
|--------------|-------------------------------------------------------|
| Company Name | MobiWire SAS                                          |
| Address      | 79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France. |
| Telephone    | +33668018722                                          |
| Postcode     | /                                                     |

### 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

#### 3.1. About EUT

|                                   |                                                                            |
|-----------------------------------|----------------------------------------------------------------------------|
| Production                        | 4G Smart Phone                                                             |
| Model name                        | MobiWire Sora, Altice S32                                                  |
| FCC ID                            | QPN-SORA                                                                   |
| GSM Frequency Band                | GSM850/GSM900/GSM1800/GSM1900                                              |
| UMTS Frequency Band               | Band I/II/V/VIII                                                           |
| CDMA Frequency Band               | /                                                                          |
| LTE Frequency Band                | Band 1/2/3/7/20                                                            |
| Additional Communication Function | BT/BLE/2.4G WLAN 802.11 b/g/n20/n40/5G WLAN 802.11 a/n20/n40               |
| Extreme Temperature               | -10/+55°C                                                                  |
| Nominal Voltage                   | 3.8V                                                                       |
| Extreme High Voltage              | 4.35V                                                                      |
| Extreme Low Voltage               | 3.6V                                                                       |
| Maximum of Antenna Gain           | GSM850: -3 dBi; PCS1900: -1 dBi; WCDMA BAND II: -1dBi; WCDMA BAND V: 3 dBi |

**Note:**

- Photographs of EUT are shown in ANNEX A of this test report.
- The value of the antenna gain is provided by the customer. For specific antenna information, please check the antenna specifications of the customer.

#### 3.2. Internal Identification of EUT used during the test

| EUT ID* | Model Name                | SN or IMEI | HW Version | SW Version                   | Date of receipt |
|---------|---------------------------|------------|------------|------------------------------|-----------------|
| N05     | MobiWire Sora, Altice S32 | /          | V01A       | MOBIWIRE_GH5024_V01_20190313 | 2019-03-19      |
| N07     | MobiWire Sora, Altice S32 | /          | V01A       | MOBIWIRE_GH5024_V01_20190313 | 2019-03-19      |

\*EUT ID: is used to identify the test sample in the lab internally.

#### 3.3. Internal Identification of AE used during the test

| AE ID* | Description | Type | Manufacturer |
|--------|-------------|------|--------------|
| AE1    | RF cable    | ---  | AE1          |
|        |             |      |              |

\*AE ID: is used to identify the test sample in the lab internally.

## 4. Reference Documents

### 4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

### 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference      | Title                                                                                                           | Version    |
|----------------|-----------------------------------------------------------------------------------------------------------------|------------|
| FCC Part 24    | PERSONAL COMMUNICATIONS SERVICES                                                                                | 2018/10/01 |
| FCC Part 22    | PUBLIC MOBILE SERVICES                                                                                          | 2018/10/01 |
| FCC Part 2     | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS                                   | 2018/10/01 |
| ANSI-TIA-603-E | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                             | 2016       |
| ANSI C63.26    | American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio | 2015       |
| KDB 971168 D01 | Measurement Guidance for Certification of Licensed Digital Transmitters                                         | v03r01     |

## 5. Test Results

### 5.1. Summary of Test Results

| Measurement Items              | Sub-clause of Part15C              | Sub-clause of IC | Verdict |
|--------------------------------|------------------------------------|------------------|---------|
| Output Power                   | 2.1046/22.913(a)/24.232(c)         | /                | P       |
| Peak-to-Average Ratio          | 24.232(d)                          | /                | P       |
| 99%Occupied Bandwidth          | 2.1049(h)(i)/22.917(b)             | /                | P       |
| -26dB Emission Bandwidth       | 22.917(b)/§24.238(b)               | /                | P       |
| Band Edge at antenna terminals | 22.917(a)/24.238(a)                | /                | P       |
| Frequency stability            | 2.1055/24.235                      | /                | P       |
| Conducted Spurious mission     | 2.1053/22.917(a)/24.238(a)         | /                | P       |
| Emission Limit                 | 2.1051/22.917/24.238/22.913/24.232 | /                | P       |

Note: please refer to Annex A in this test report for the detailed test results.

The following terms are used in the above table.

|    |                                                                                |
|----|--------------------------------------------------------------------------------|
| P  | Pass, the EUT complies with the essential requirements in the standard.        |
| NP | Not Perform, the test was not performed by ECIT.                               |
| NA | Not Applicable, the test was not applicable.                                   |
| F  | Fail, the EUT does not comply with the essential requirements in the standard. |

### 5.2. Statements

The MobiWire Sora, Altice S32, supporting GSM/GPRS/EDGE/WCDMA/LTE/BT/BLE/WLAN, manufactured by MobiWire SAS, is an initial product for testing.

ECIT only performed test cases which identified with P/NP/NA/F results in Annex A.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

## 6. Test Equipments Utilized

### 6.1. Conducted Test System

| No. | Name                         | Type     | SN               | Manufactur<br>e | Calibration<br>date | Cal.interval |
|-----|------------------------------|----------|------------------|-----------------|---------------------|--------------|
| 1   | Spectrum Analyzer            | FSQ26    | 101096           | R&S             | 2018-05-11          | 1 Year       |
| 2   | Universal Radio Communicatio | CMU200   | 123124           | R&S             | 2018-05-11          | 1 Year       |
| 3   | DC Power Supply              | ZUP60-14 | LOC-220Z006-0007 | TDL-Lambda      | 2018-05-11          | 1 Year       |

### 6.2. Radiated Emission Test System

The test equipment and ancillaries used are as follows.

| No. | Equipment                            | Model    | Serial Number | Manufactur<br>er | Calibration<br>date | Cal.interval |
|-----|--------------------------------------|----------|---------------|------------------|---------------------|--------------|
| 1   | Universal Radio Communication Tester | CMU200   | 123123        | R&S              | 2018-05-11          | 1 Year       |
| 2   | EMI Test Receiver                    | ESU40    | 100307        | R&S              | 2018-05-11          | 1 Year       |
| 3   | TRILOG Broadband Antenna             | VULB9163 | VULB9163-515  | Schwarzbec<br>k  | 2017-02-25          | 3 Year       |
| 4   | Double-ridged Waveguide Antenna      | ETS-3117 | 00135890      | ETS              | 2017-01-11          | 3 Year       |
| 5   | 2-Line V-Network                     | ENV216   | 101380        | R&S              | 2018-05-11          | 1 Year       |
| 6   | Substitution Antenna                 | ETS-3117 | 00135890      | ETS              | 2017-01-11          | 3 Year       |

|   |                      |          |          |             |            |        |
|---|----------------------|----------|----------|-------------|------------|--------|
| 7 | RF Signal Generator  | SMF100A  | 102314   | R&S         | 2018-05-11 | 1 Year |
| 8 | Substitution Antenna | VUBA9117 | 9117-266 | Schwarzbeck | 2017-11-18 | 3 Year |
| 9 | Amplifier            | SCU08    | 10146    | R&S         | 2018-05-11 | 1 Year |

**Climate chamber**

| No. | Equipment       | Model  | Serial Number | Manufacturer | Calibration date | Cal.interval |
|-----|-----------------|--------|---------------|--------------|------------------|--------------|
| 1   | Climate chamber | SH-641 | 92012011      | ESPEC        | 2017-12-25       | 2 Year       |

## 7. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents .  
The detailed measurement uncertainty is defined in ECIT documents.

| Measurement Items                       | Range              | Confidence Level | Calculated Uncertainty |
|-----------------------------------------|--------------------|------------------|------------------------|
| Maximum Peak Output Power               | 30MHz-3600MHz      | 95%              | $\pm 0.544\text{dB}$   |
| EBW and VBW                             | 30MHz-3600MHz      | 95%              | $\pm 62.04\text{Hz}$   |
| Transmitter Spurious Emission-Conducted | 30MHz-2GHz         | 95%              | $\pm 0.90\text{dB}$    |
| Transmitter Spurious Emission-Conducted | 2GHz-3.6GHz        | 95%              | $\pm 0.88\text{dB}$    |
| Transmitter Spurious Emission-Conducted | 3.6GHz-8GHz        | 95%              | $\pm 0.96\text{dB}$    |
| Transmitter Spurious Emission-Conducted | 8GHz-20GHz         | 95%              | $\pm 0.94\text{dB}$    |
| Transmitter Spurious Emission-Radiated  | 9KHz-30MHz         | 95%              | $\pm 5.66\text{dB}$    |
| Transmitter Spurious Emission-Radiated  | 30MHz-1000MHz      | 95%              | $\pm 4.98\text{dB}$    |
| Transmitter Spurious Emission-Radiated  | 1000MHz -18000MHz  | 95%              | $\pm 5.06\text{dB}$    |
| Transmitter Spurious Emission-Radiated  | 18000MHz -40000MHz | 95%              | $\pm 5.20\text{dB}$    |
| Frequency stability                     | 1MHz-16GHz         | 95%              | $\pm 62.04\text{Hz}$   |

## 8. Test Environment

**Shielding Room1** (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

|                          |                            |
|--------------------------|----------------------------|
| Temperature              | Min. = 15 °C, Max. = 35 °C |
| Relative humidity        | Min. = 20 %, Max. = 75 %   |
| Shielding effectiveness  | > 100 dB                   |
| Ground system resistance | < 0.5 Ω                    |

**Control room** did not exceed following limits along the EMC testing:

|                          |                            |
|--------------------------|----------------------------|
| Temperature              | Min. = 15 °C, Max. = 35 °C |
| Relative humidity        | Min. =25 %, Max. = 75 %    |
| Shielding effectiveness  | > 100 dB                   |
| Electrical insulation    | > 10 kΩ                    |
| Ground system resistance | < 0.5 Ω                    |

**Fully-anechoic chamber1** (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

|                              |                                            |
|------------------------------|--------------------------------------------|
| Temperature                  | Min. = 15 °C, Max. = 35 °C                 |
| Relative humidity            | Min. = 25 %, Max. = 75 %                   |
| Shielding effectiveness      | > 100 dB                                   |
| Electrical insulation        | > 10 kΩ                                    |
| Ground system resistance     | < 0.5 Ω                                    |
| VSWR                         | Between 0 and 6 dB, from 1GHz to 18GHz     |
| Site Attenuation Deviation   | Between -4 and 4 dB,30MHz to 1GHz          |
| Uniformity of field strength | Between 0 and 6 dB, from 80MHz to 3000 MHz |

## ANNEX A. Detailed Test Results

### ANNEX A.1. OUTPUT POWER

#### A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) to ensure max power transmission and proper modulation. This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

#### A.1.2. Conducted

##### A.1.2.1. Method of Measurements

Method of measurements please refer to KDB971168 D01 v03 clause 5.

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).

These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.2MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range).

These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 1732.6 MHz, 1712.4MHz and 1752.6MHz for WCDMA Band IV; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V. (bottom, middle and top of operational frequency range).

##### A.1.2.2 Test procedures:

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

##### A.1.2.3 Limit:

22.913(a) Mobile stations are limited to 7watts.

24.232(c) Mobile and portable stations are limited to 2 watts.

##### A.1.2.4 Test Procedure:

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

##### A.1.2.5 GSM Test Condition:

| RBW  | VBW   | Sweep time | Span  |
|------|-------|------------|-------|
| 3MHz | 10MHz | Auto       | 50MHz |

#### A.1.2.6 WCDMA Test Condition:

| RBW   | VBW   | Sweep time | Span  |
|-------|-------|------------|-------|
| 10MHz | 30MHz | Auto       | 50MHz |

#### A.1.2.7 Measurement results:

| GSM 850 (GMSK)         |                  |                |
|------------------------|------------------|----------------|
| Channel/fc(MHz)        | Peak power (dBm) | AV power (dBm) |
| Mid 189/836.4          | 32.45            | 32.31          |
| Low 128/824.2          | 32.6             | 32.44          |
| High 251/848.8         | 32.56            | 32.41          |
| GPRS 850 (GMSK 1 Slot) |                  |                |
| Channel/fc(MHz)        | Peak power (dBm) | AV power (dBm) |
| Mid 189/836.4          | 32.46            | 32.31          |
| Low 128/824.2          | 32.61            | 32.44          |
| High 251/848.8         | 32.57            | 32.41          |
| EDGE 850 (8PSK 1 Slot) |                  |                |
| Channel/fc(MHz)        | Peak power (dBm) | AV power (dBm) |
| Mid 189/836.4          | 29.93            | 27.41          |
| Low 128/824.2          | 29.88            | 27.47          |
| High 251/848.8         | 29.85            | 27.33          |

| GSM 1900(GMSK)          |                  |                |
|-------------------------|------------------|----------------|
| Channel/fc(MHz)         | Peak power (dBm) | AV power (dBm) |
| Mid 661/1880            | 29.52            | 29.41          |
| Low 512/1850.2          | 29.84            | 29.72          |
| High 810/1909.8         | 29.81            | 29.65          |
| GPRS 1900 (GMSK 1 Slot) |                  |                |
| Channel/fc(MHz)         | Peak power (dBm) | AV power (dBm) |

|                         |                  |                |
|-------------------------|------------------|----------------|
| Mid 661/1880            | 29.63            | 29.41          |
| Low 512/1850.2          | 29.82            | 29.6           |
| High 810/1909.8         | 29.85            | 29.62          |
| EDGE 1900 (8PSK 1 Slot) |                  |                |
| Channel/fc(MHz)         | Peak power (dBm) | AV power (dBm) |
| Mid 661/1880            | 29.34            | 26.52          |
| Low 512/1850.2          | 29.31            | 26.5           |
| High 810/1909.8         | 29.12            | 26.24          |

|                  |                  |                |
|------------------|------------------|----------------|
| WCDMA II         |                  |                |
| Channel/fc(MHz)  | Peak power (dBm) | AV power (dBm) |
| Mid 9400 /1880   | 25.59            | 22.36          |
| Low 9262/1852.4  | 25.85            | 22.21          |
| High 9538/1907.6 | 25.26            | 22.12          |
| WCDMA BAND V     |                  |                |
| Channel/fc(MHz)  | Peak power (dBm) | AV power (dBm) |
| Mid 4183/836.6   | 25.63            | 22.49          |
| Low 4132/826.4   | 25.47            | 22.33          |
| High 4233/846.6  | 25.65            | 22.40          |

**Conclusion: PASS**

## ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to KDB971168 D01 v03 clause 5.7.

### A.2.1 PAPR Limit

The peak-to-average power ratio (PAPR) of the transmission may not exceed 13dB

### A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2.
  - 1) Select the spectrum analyzer CCDF function.

- 2) Set  $RBW \geq \text{signal's occupied bandwidth}$ .
  - 3) Set the number of counts to a value that stabilizes the measured CCDF curve;
  - 4) Sweep time  $\geq 1s$ .
3. Record the maximum PAPR level associated with a probability of 0.1%.

### A.2.3 Test results:

| GSM850          |       |       |       |
|-----------------|-------|-------|-------|
| Channel         | 128   | 189   | 251   |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 |
| PAPR(dB)        | 7.98  | 7.66  | 8.49  |
| GPRS850         |       |       |       |
| Channel         | 128   | 189   | 251   |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 |
| PAPR(dB)        | 7.99  | 7.73  | 8.26  |
| EDGE850         |       |       |       |
| Channel         | 128   | 189   | 251   |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 |
| PAPR(dB)        | 7.98  | 7.79  | 8.33  |

| GSM1900         |        |      |        |
|-----------------|--------|------|--------|
| Channel         | 512    | 661  | 810    |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| PAPR(dB)        | 7.69   | 7.66 | 8.73   |
| GPRS1900        |        |      |        |
| Channel         | 512    | 661  | 810    |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| PAPR(dB)        | 7.76   | 7.66 | 8.77   |
| EDGE1900        |        |      |        |
| Channel         | 512    | 661  | 810    |

|                 |        |      |        |
|-----------------|--------|------|--------|
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| PAPR(dB)        | 7.69   | 7.63 | 8.73   |

| WCDMA Band II   |        |       |        |
|-----------------|--------|-------|--------|
| Channel         | 9262   | 9400  | 9538   |
| Frequency (MHz) | 1852.4 | 1880  | 1907.6 |
| PAPR(dB)        | 3.43   | 3.66  | 3.69   |
| WCDMA Band V    |        |       |        |
| Channel         | 4132   | 4183  | 4233   |
| Frequency (MHz) | 826.4  | 836.4 | 846.6  |
| PAPR(dB)        | 3.21   | 3.16  | 3.02   |

**Conclusion: PASS**

### **ANNEX A.3. Occupied Bandwidth**

Method of test please refer to KDB971168 D01 v03 clause 4.0.

#### **A.3.1. Occupied Bandwidth**

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900, WCDMA BANDII, WCDMA BANDV.

#### **A.3.2 Test Procedure:**

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW  $\geq$  3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

#### **A.3.3 Test result:**

| GSM850       |                 |                             |
|--------------|-----------------|-----------------------------|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |

|              |                 |                             |
|--------------|-----------------|-----------------------------|
| Mid 189      | 836.4           | 241.987                     |
| Low 128      | 824.2           | 246.795                     |
| High 251     | 848.8           | 243.59                      |
| GPRS850      |                 |                             |
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |
| Mid 189      | 836.4           | 248.397                     |
| Low 128      | 824.2           | 245.192                     |
| High 251     | 848.8           | 245.192                     |
| EDGE850      |                 |                             |
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |
| Mid 189      | 836.4           | 256.41                      |
| Low 128      | 824.2           | 258.013                     |
| High 251     | 848.8           | 254.808                     |

**Conclusion: PASS**

**GSM 850**

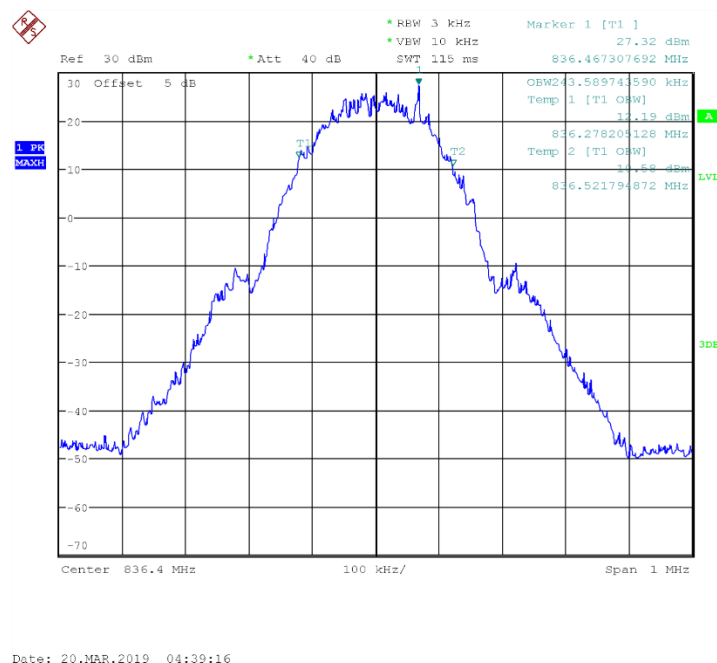


Fig.1 Channel 189-Occupied Bandwidth (99%)

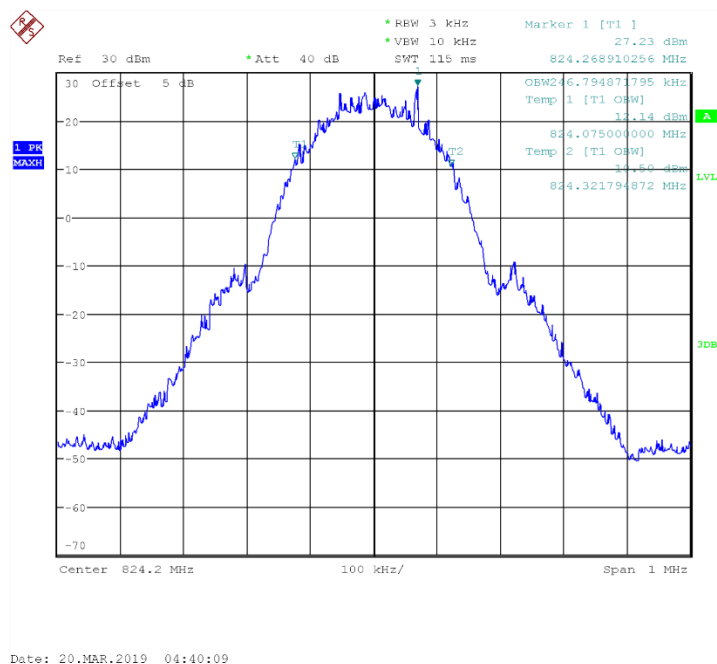


Fig.2 Channel 128-Occupied Bandwidth (99%)

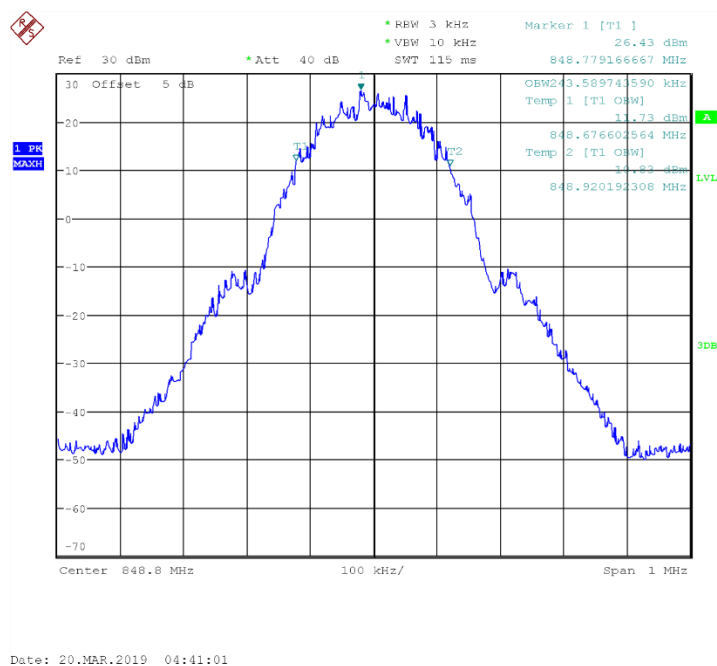
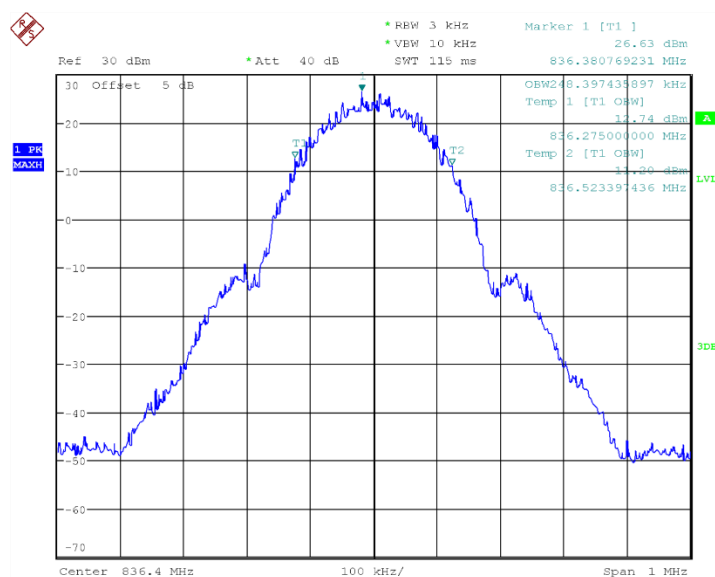


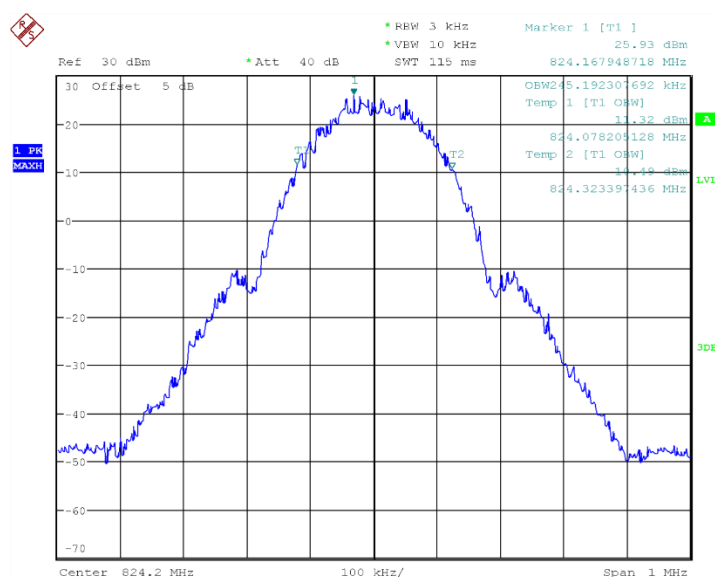
Fig.3 Channel 251-Occupied Bandwidth (99%)

## GPRS 850



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Fig.4 Channel 189-Occupied Bandwidth (99%)



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Fig.5 Channel 128-Occupied Bandwidth (99%)

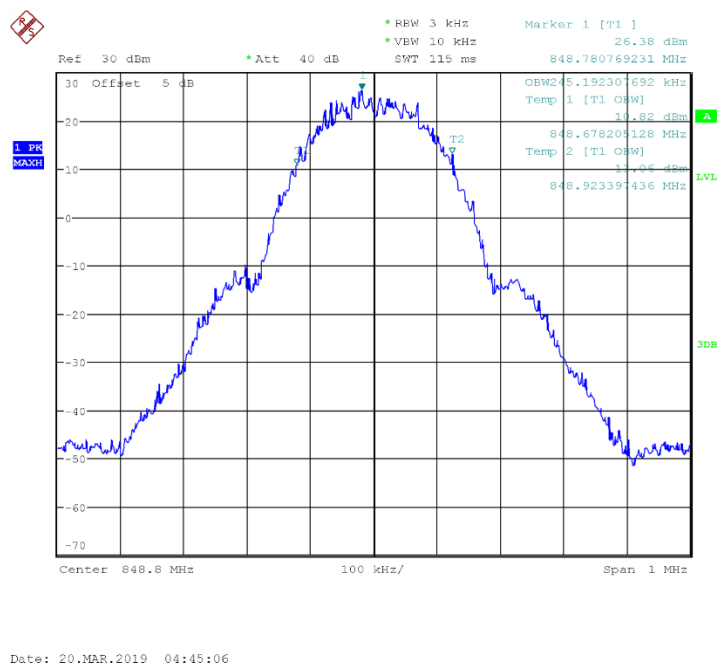


Fig.6 Channel 251-Occupied Bandwidth (99%)

## EDGE 850

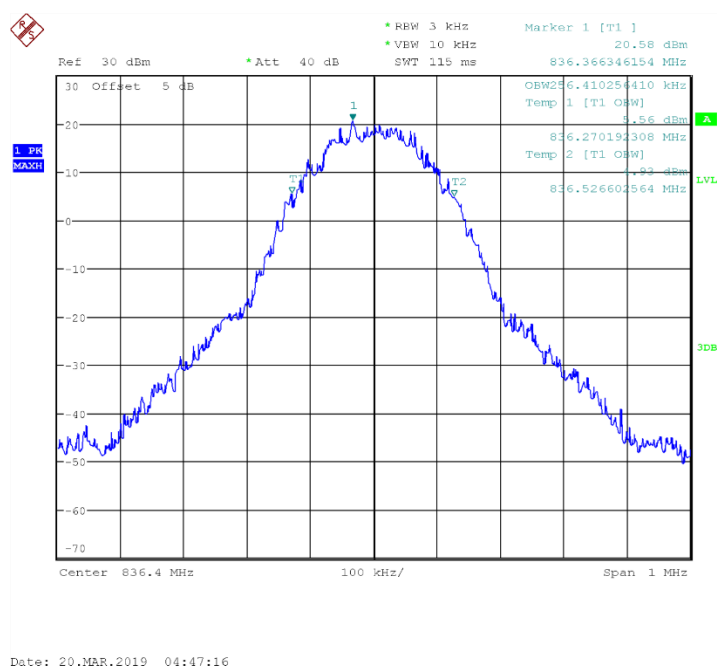


Fig.7 Channel 189-Occupied Bandwidth (99%)

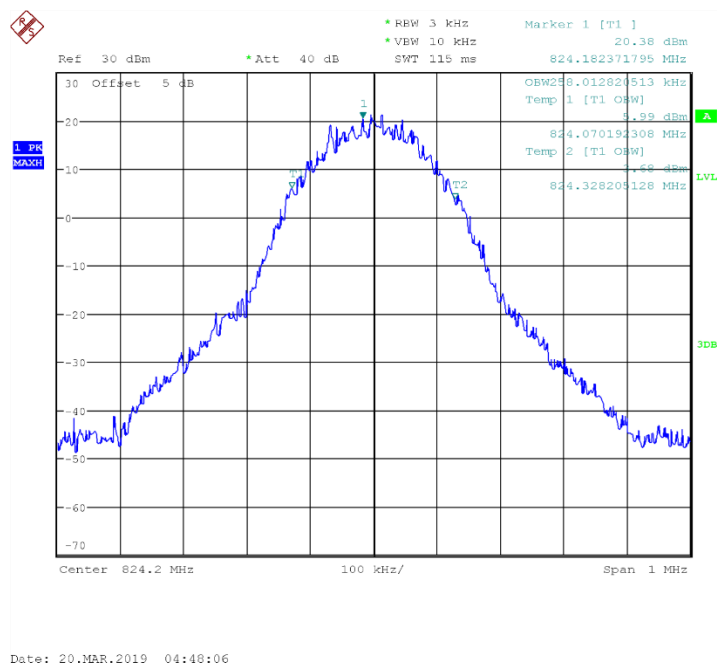


Fig.8 Channel 128-Occupied Bandwidth (99%)

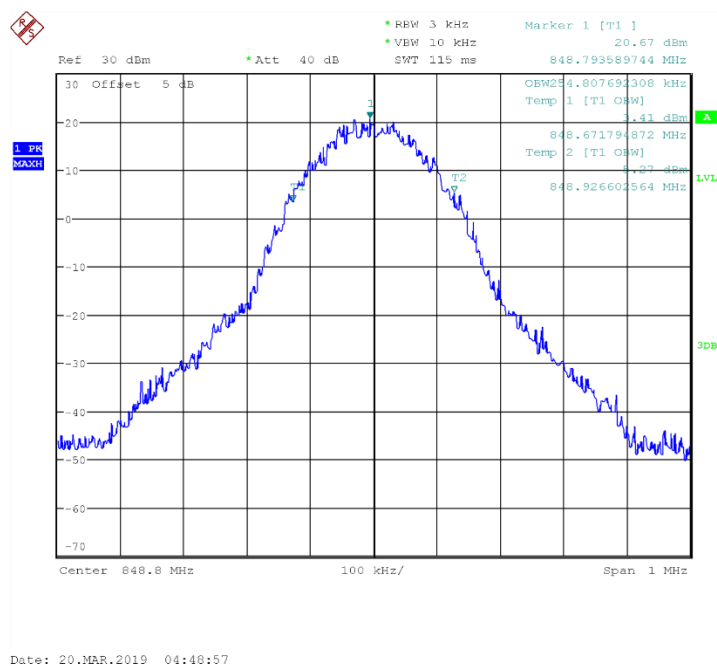


Fig.9 Channel 251-Occupied Bandwidth (99%)

| GSM1900      |                 |                             |
|--------------|-----------------|-----------------------------|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |
| Mid 661      | 1880            | 243.59                      |
| Low 512      | 1850.2          | 248.397                     |

|              |                 |                             |
|--------------|-----------------|-----------------------------|
| High 810     | 1909.8          | 245.192                     |
| GPRS1900     |                 |                             |
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |
| Mid 661      | 1880            | 248.397                     |
| Low 512      | 1850.2          | 243.59                      |
| High 810     | 1909.8          | 243.59                      |
| EDGE1900     |                 |                             |
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(kHz) |
| Mid 661      | 1880            | 250.000                     |
| Low 512      | 1850.2          | 251.603                     |
| High 810     | 1909.8          | 245.192                     |

**Conclusion: PASS**

**GSM 1900**

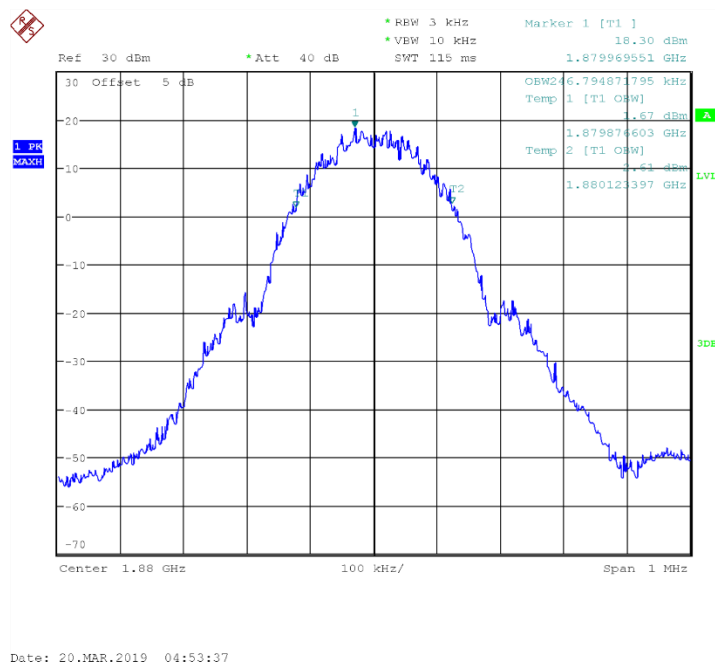


Fig.10 Channel 661-Occupied Bandwidth (99%)

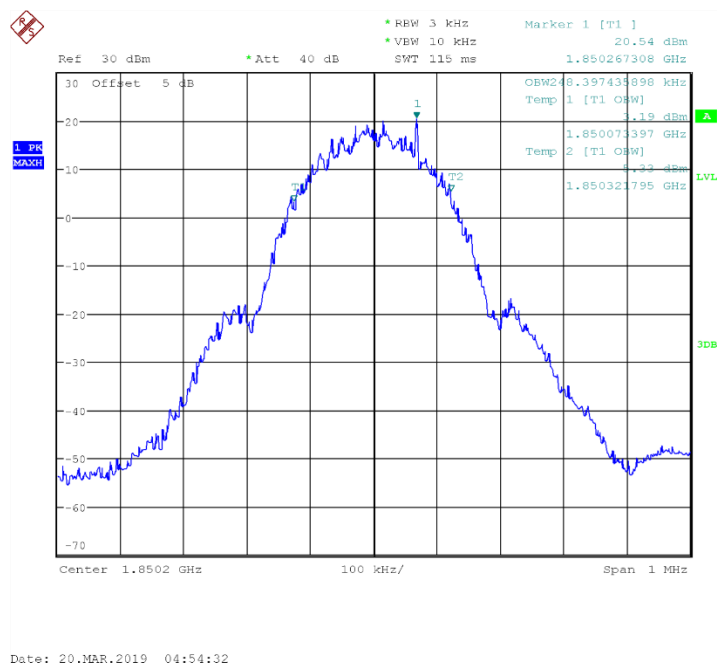


Fig.11 Channel 512-Occupied Bandwidth (99%)

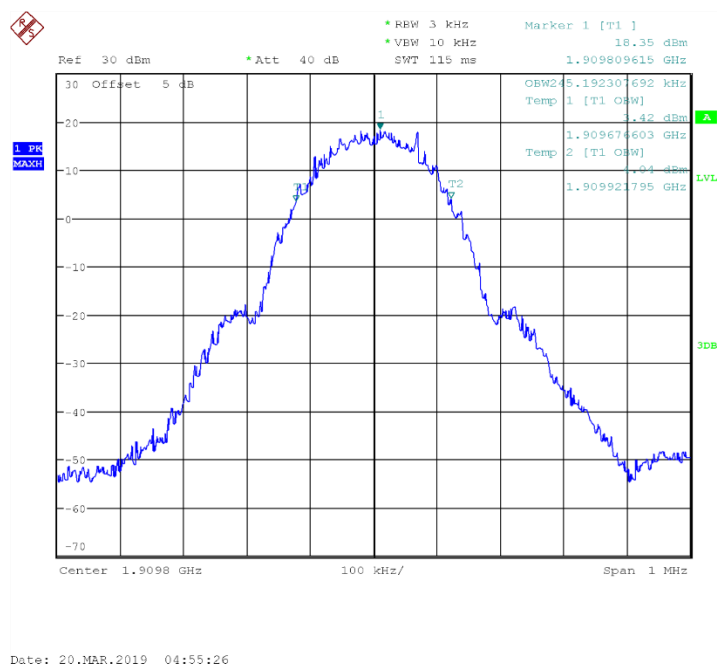
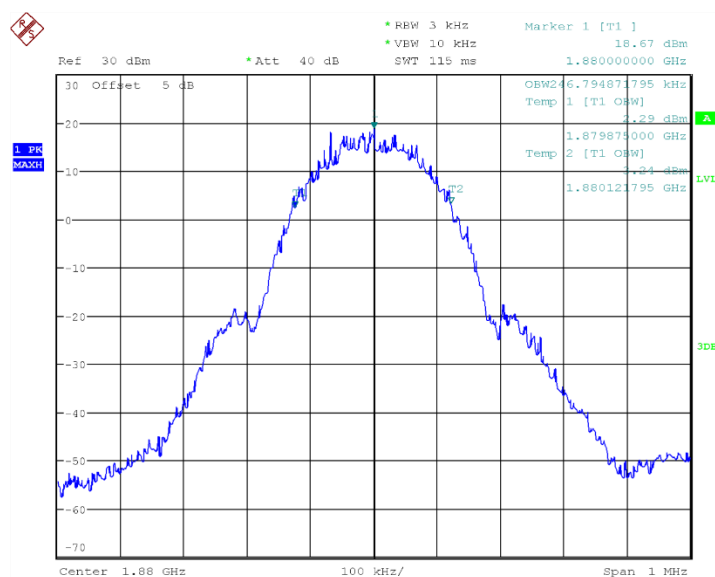


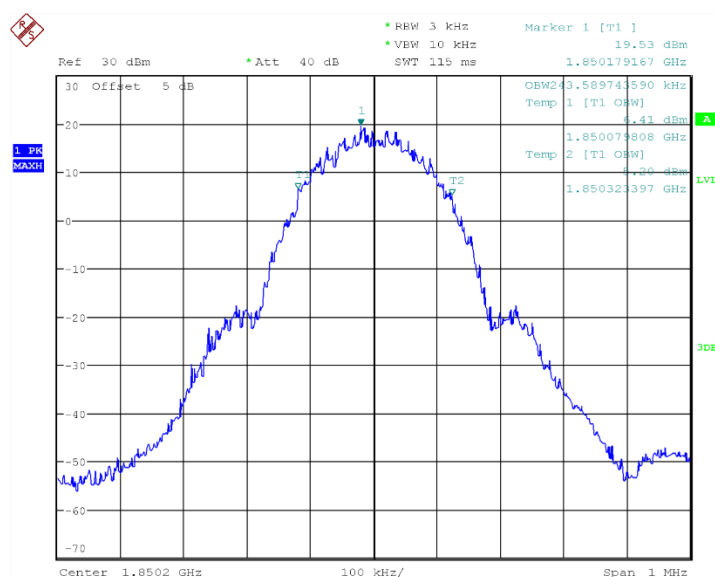
Fig.12 Channel 810-Occupied Bandwidth (99%)

## GPRS 1900



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Fig.13 Channel 661-Occupied Bandwidth (99%)



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Fig.14 Channel 512-Occupied Bandwidth (99%)

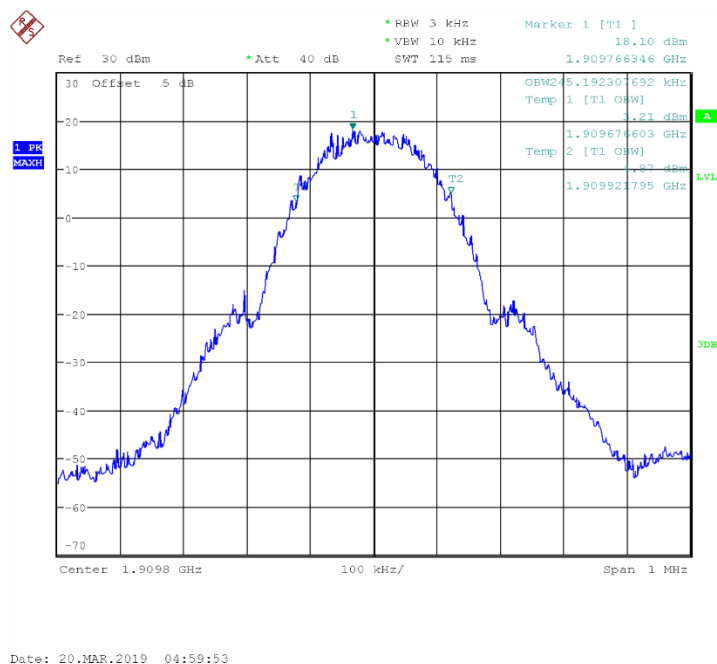


Fig.15 Channel 810-Occupied Bandwidth (99%)

## EDGE 1900

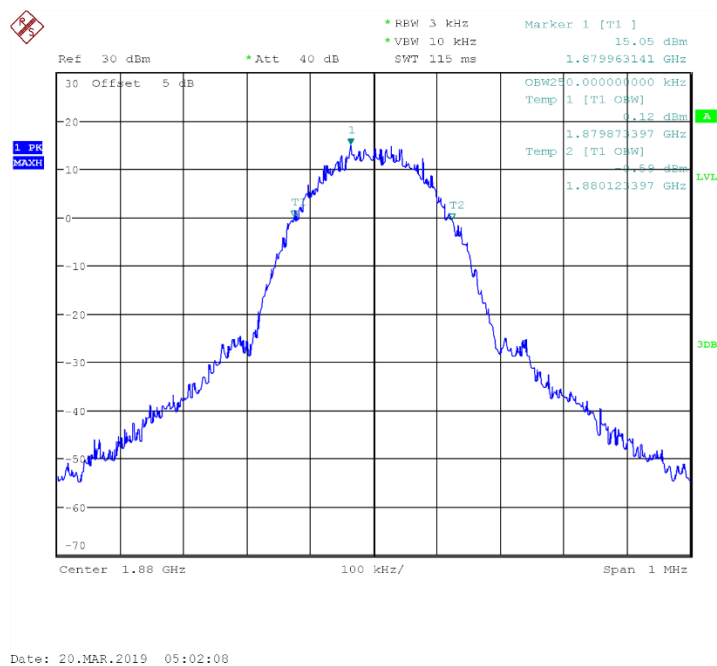


Fig.16 Channel 661-Occupied Bandwidth (99%)

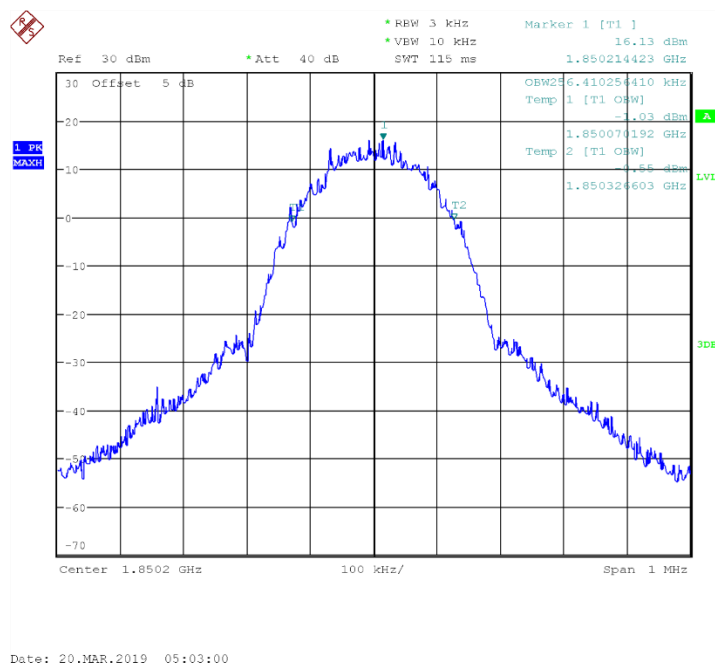


Fig.17 Channel 512-Occupied Bandwidth (99%)

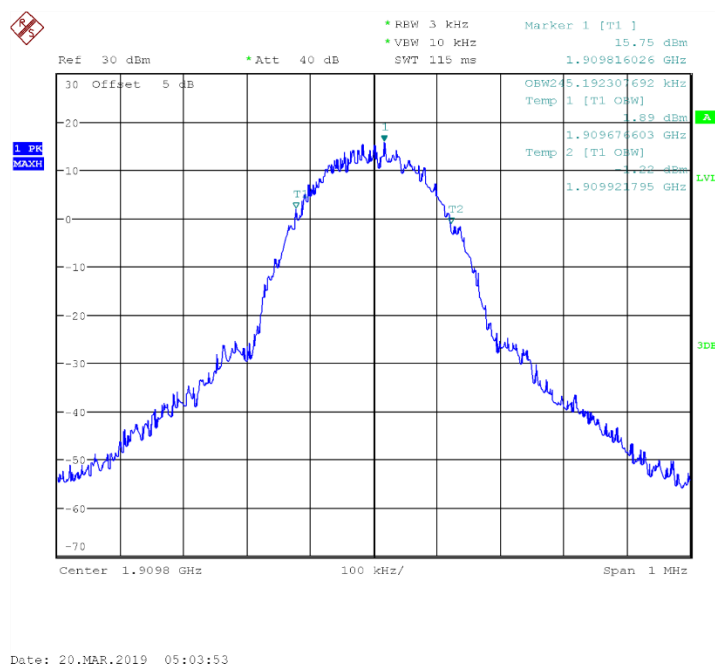


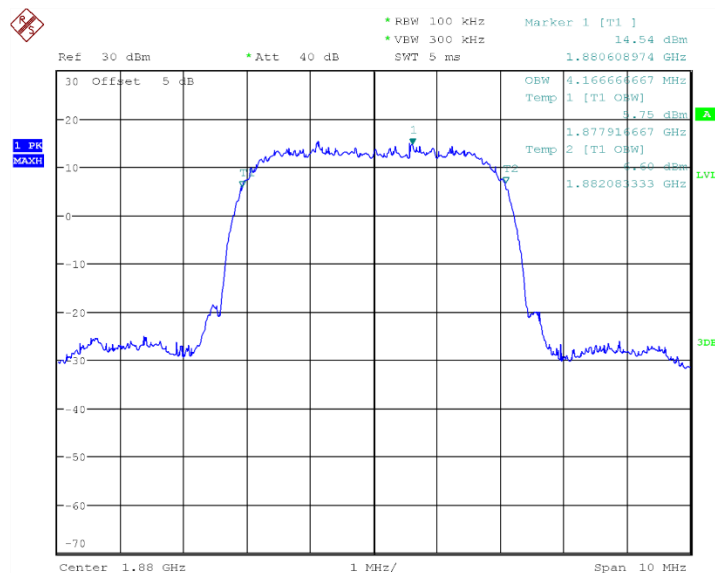
Fig.18 Channel 810-Occupied Bandwidth (99%)

| WCDMA BAND II |                 |                             |
|---------------|-----------------|-----------------------------|
| Test channel  | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| Mid 9400      | 1880            | 4.167                       |

|           |        |       |
|-----------|--------|-------|
| Low 9262  | 1852.4 | 4.151 |
| High 9538 | 1907.6 | 4.167 |

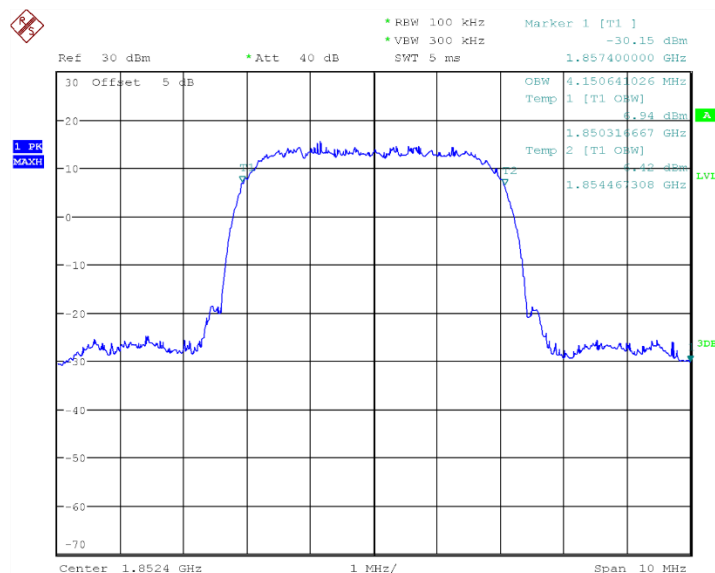
**Conclusion: PASS**

**WCDMA BAND II**



Date: 20.MAR.2019 09:05:23

**Fig.19 Channel 9400-Occupied Bandwidth (99%)**



Date: 20.MAR.2019 09:06:22

**Fig.20 Channel 9262-Occupied Bandwidth (99%)**

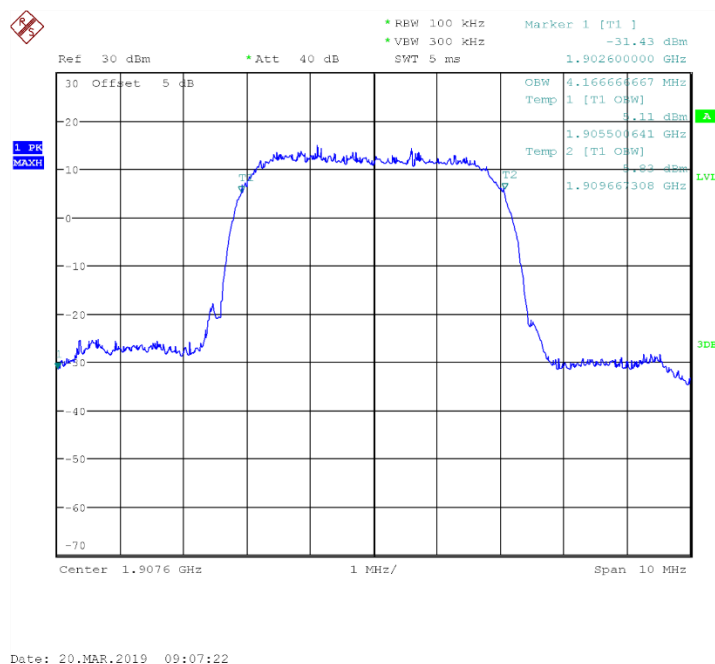
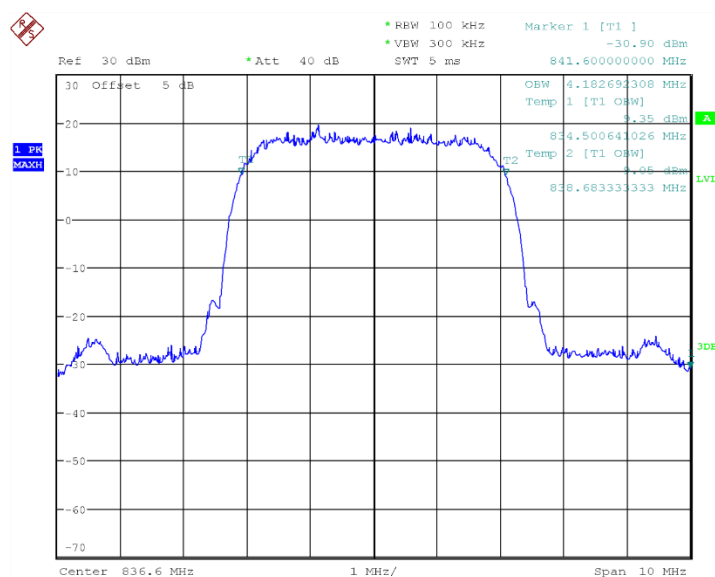


Fig.21 Channel 9538-Occupied Bandwidth (99%)

| WCDMA BAND V |                 |                             |
|--------------|-----------------|-----------------------------|
| Test channel | Frequency (MHz) | 99% Occupied Bandwidth(MHz) |
| Mid 4183     | 836.6           | 4.183                       |
| Low 4132     | 826.4           | 4.167                       |
| High 4233    | 846.6           | 4.167                       |

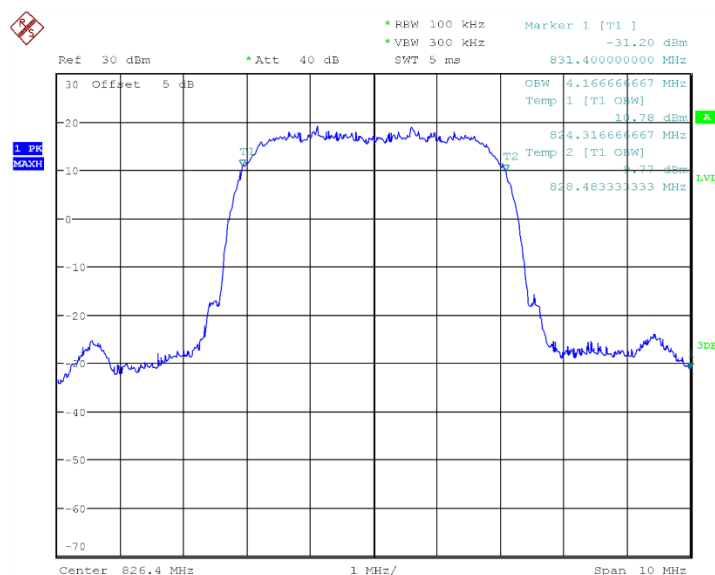
**Conclusion: PASS**

# WCDMA BAND V



Date: 20.MAR.2019 09:08:31

Fig.22 Channel 4183-Occupied Bandwidth (99%)



Date: 20.MAR.2019 09:09:32

Fig.23 Channel 4132-Occupied Bandwidth (99%)

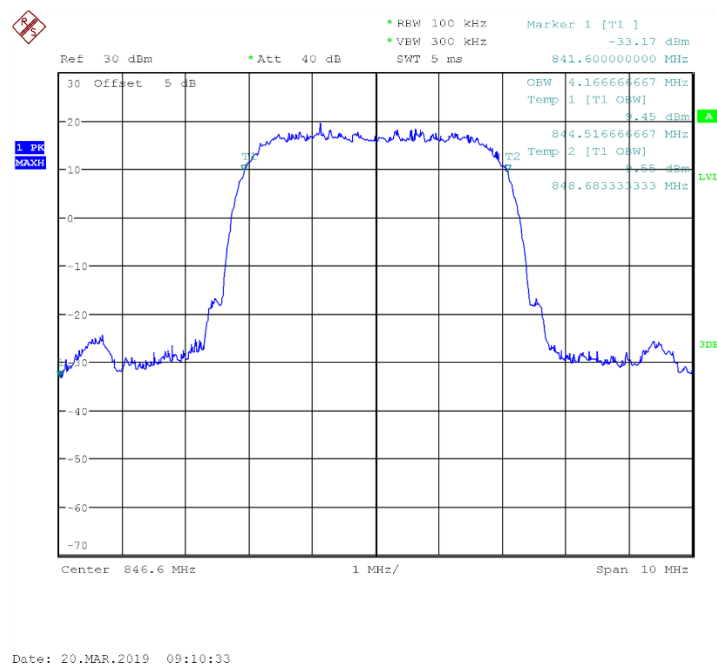


Fig.24 Channel 4233-Occupied Bandwidth (99%)

## ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to KDB971168 D01 v03 clause 4.0.

### A.4.1. -26dB Emission Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900, WCDMA BANDII, WCDMA BANDV.

### A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW  $\geq$  3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

### A.4.3 Measurement methods:

For GSM: signal analyzer setting as: RBW=3KHz;VBW=10KHz;Span=1MHz.

For WCDMA: signal analyzer setting as: RBW=50KHz;VBW=200KHz;Span=10MHz.

### A.4.4 Test results:

| GSM 850      |                 |                                |
|--------------|-----------------|--------------------------------|
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 189      | 836.4           | 320.513                        |

|              |                 |                                |
|--------------|-----------------|--------------------------------|
| Low 128      | 824.2           | 309.295                        |
| High 251     | 848.8           | 309.295                        |
| GPRS 850     |                 |                                |
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 189      | 836.4           | 323.718                        |
| Low 128      | 824.2           | 315.705                        |
| High 251     | 848.8           | 315.705                        |
| EDGE 850     |                 |                                |
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 189      | 836.4           | 326.923                        |
| Low 128      | 824.2           | 326.923                        |
| High 251     | 848.8           | 328.526                        |

**Conclusion: PASS**

## GSM 850

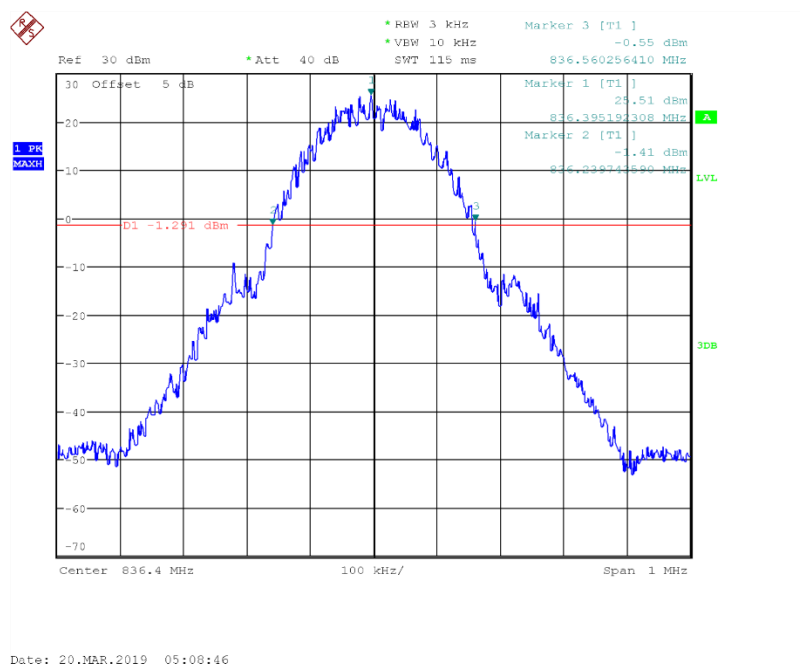


Fig.25 Channel 189- Emission Bandwidth (-26dBc BW)

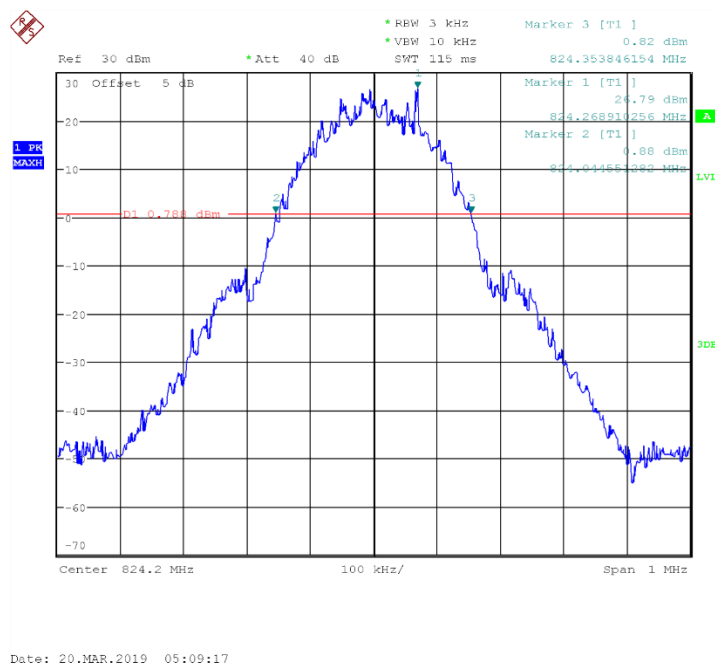


Fig.26 Channel 128- Emission Bandwidth (-26dBc BW)

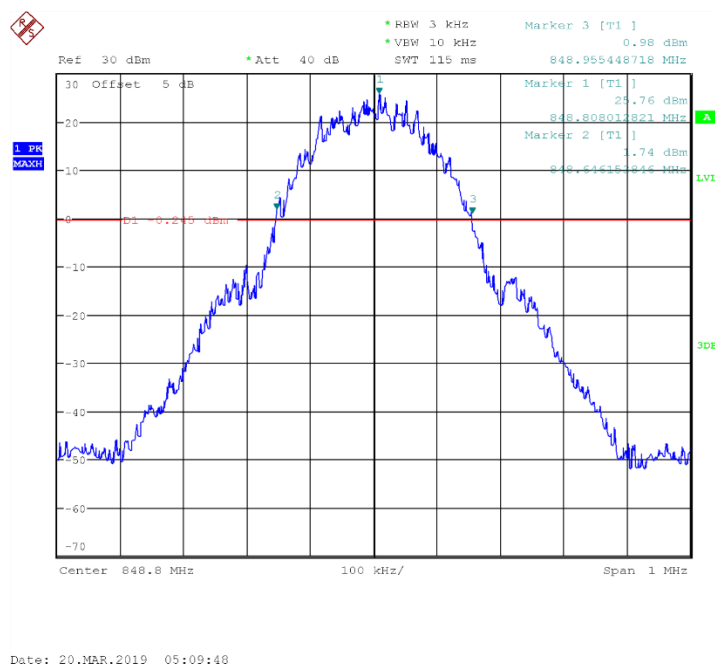


Fig.27 Channel 251- Emission Bandwidth (-26dBc BW)

## GPRS 850

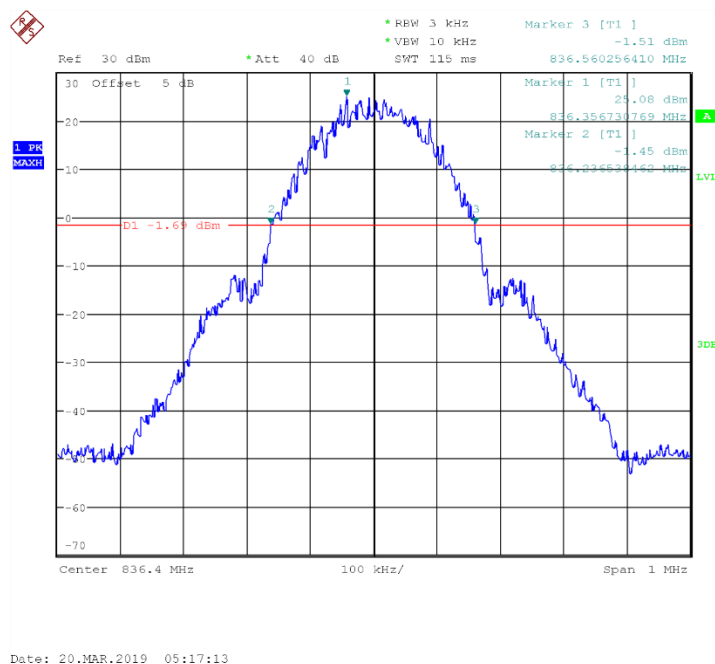


Fig.28 Channel 189- Emission Bandwidth (-26dBc BW)

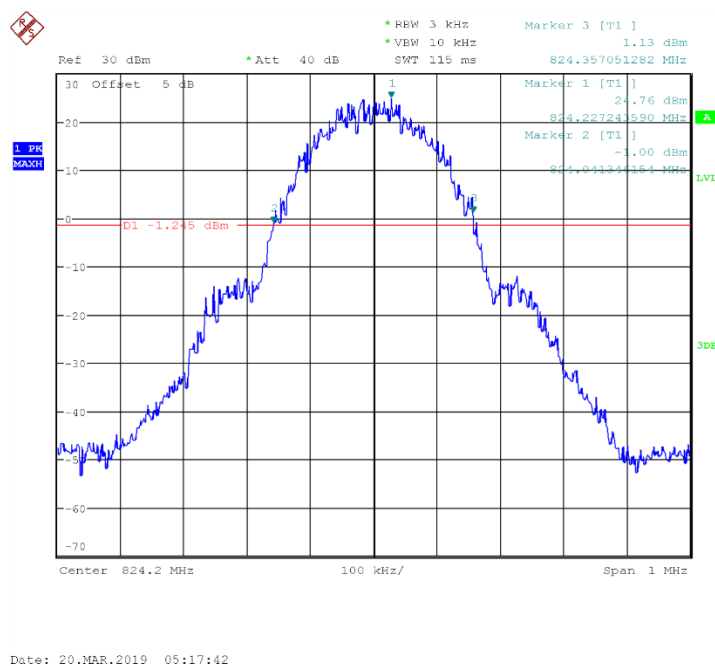


Fig.29 Channel 128- Emission Bandwidth (-26dBc BW)

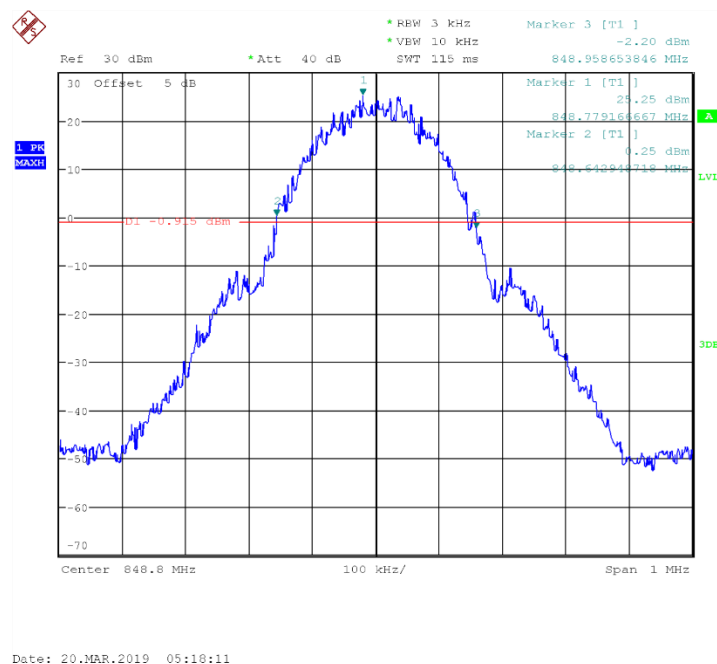


Fig.30 Channel 251- Emission Bandwidth (-26dBc BW)

**EDGE 850**

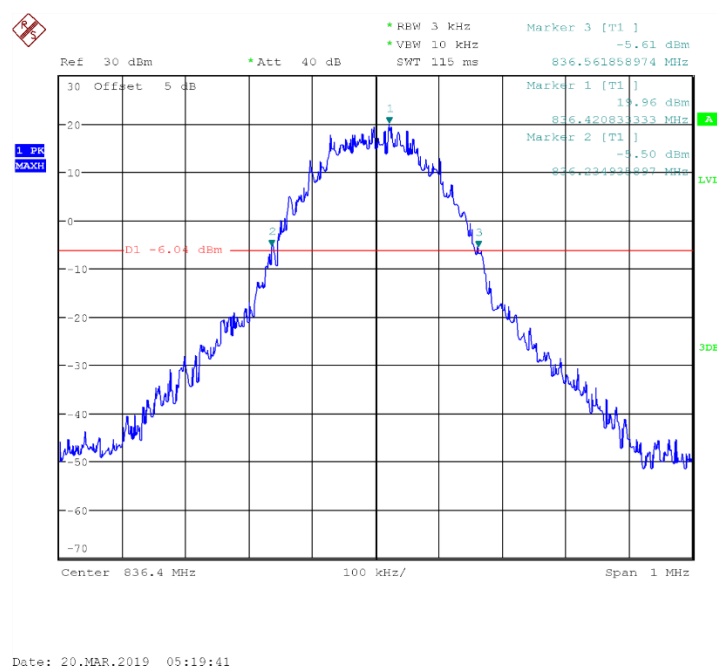


Fig.31 Channel 189- Emission Bandwidth (-26dBc BW)

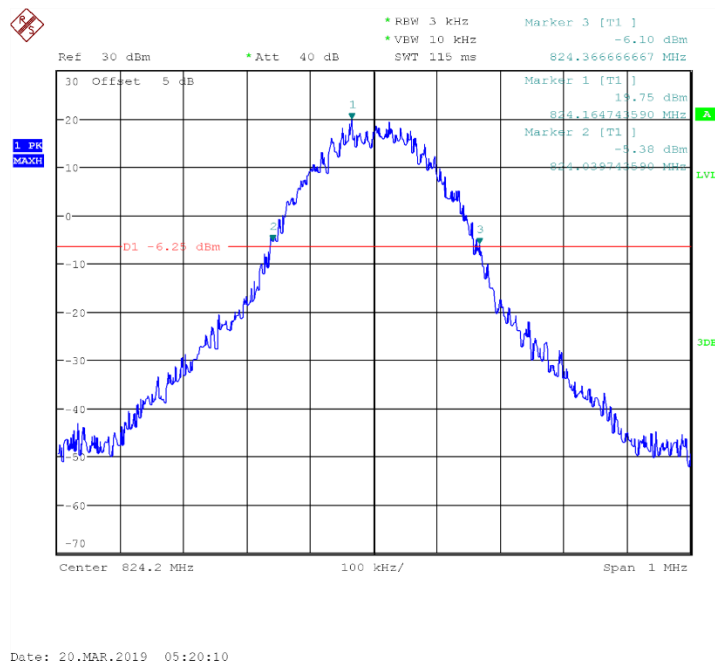


Fig.32 Channel 128- Emission Bandwidth (-26dBc BW)

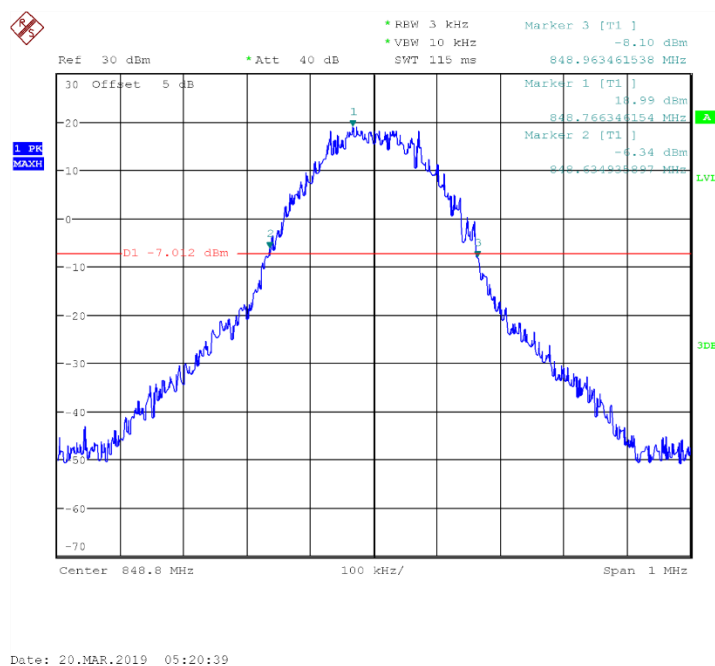


Fig.33 Channel 251- Emission Bandwidth (-26dBc BW)

| GSM1900      |                 |                                |
|--------------|-----------------|--------------------------------|
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 661      | 1880            | 320.513                        |
| Low 512      | 1850.2          | 312.5                          |
| High 810     | 1909.8          | 314.103                        |

| GPRS1900     |                 |                                |
|--------------|-----------------|--------------------------------|
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 661      | 1880            | 315.705                        |
| Low 512      | 1850.2          | 314.103                        |
| High 810     | 1909.8          | 317.308                        |
| EDGE1900     |                 |                                |
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(kHz) |
| Mid 661      | 1880            | 314.103                        |
| Low 512      | 1850.2          | 309.295                        |
| High 810     | 1909.8          | 312.5                          |

**Conclusion: PASS**

**GSM 1900**

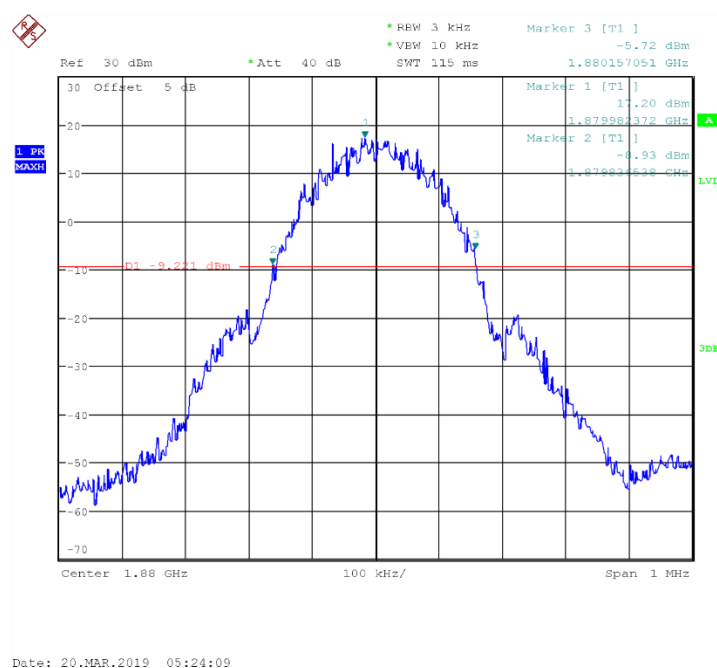
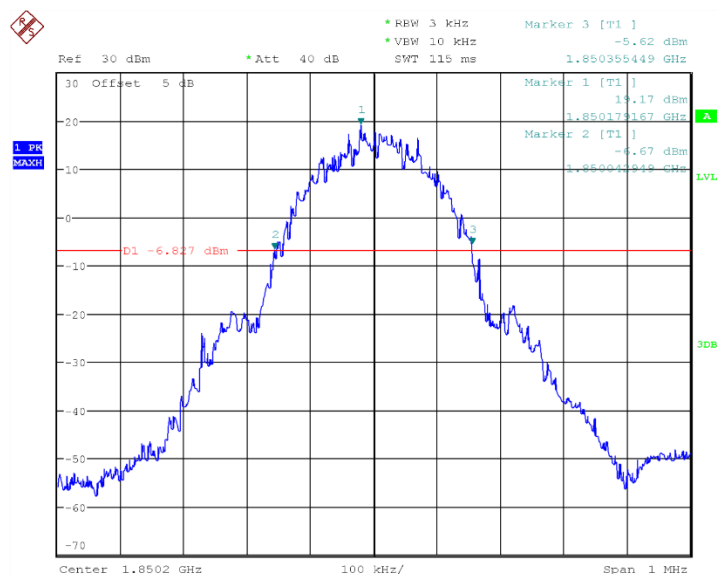
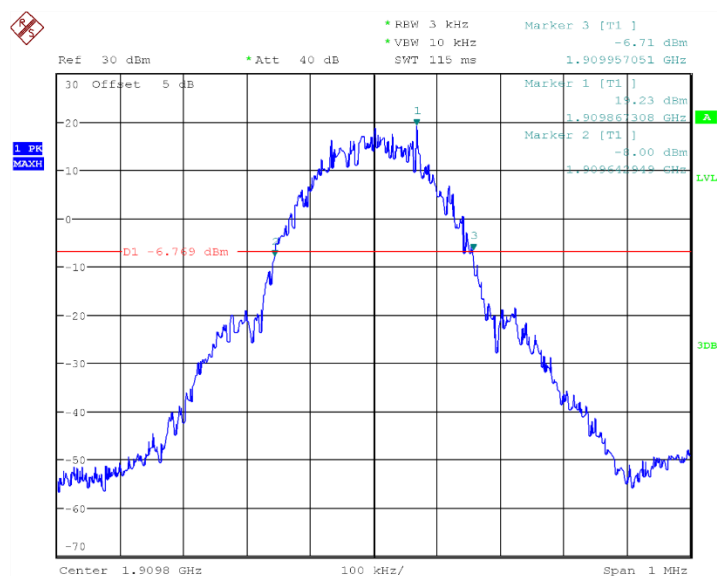


Fig.34 Channel 661- Emission Bandwidth (-26dBc BW)



Date: 20.MAR.2019 05:24:39

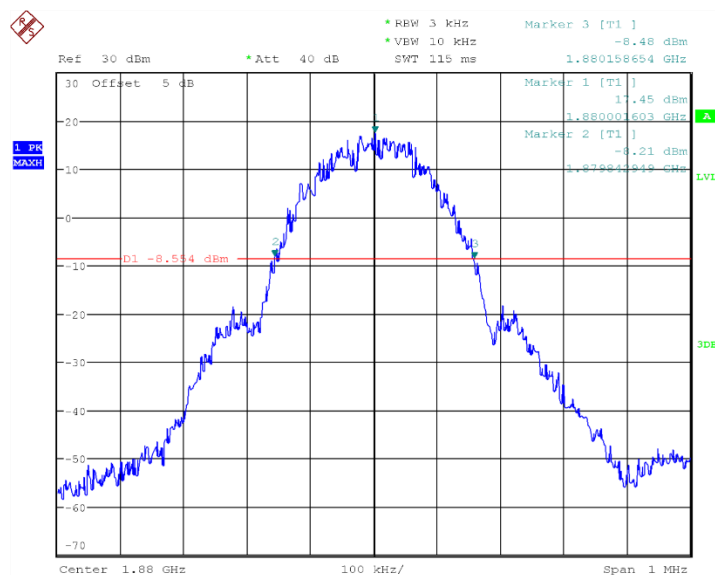
Fig.35 Channel 512- Emission Bandwidth (-26dBc BW)



Date: 20.MAR.2019 05:25:09

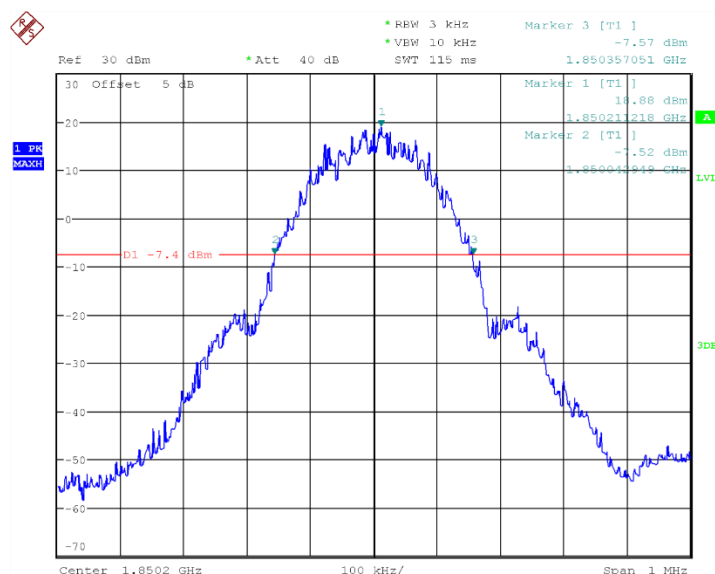
Fig.36 Channel 810- Emission Bandwidth (-26dBc BW)

## GPRS 1900



Date: 20.MAR.2019 05:26:50

Fig.37 Channel 661- Emission Bandwidth (-26dBc BW)



Date: 20.MAR.2019 05:27:18

Fig.38 Channel 512- Emission Bandwidth (-26dBc BW)

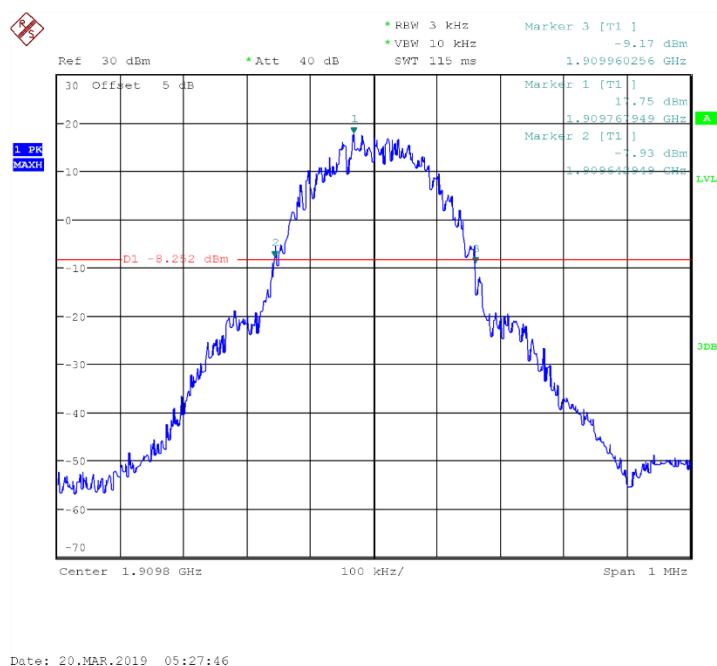
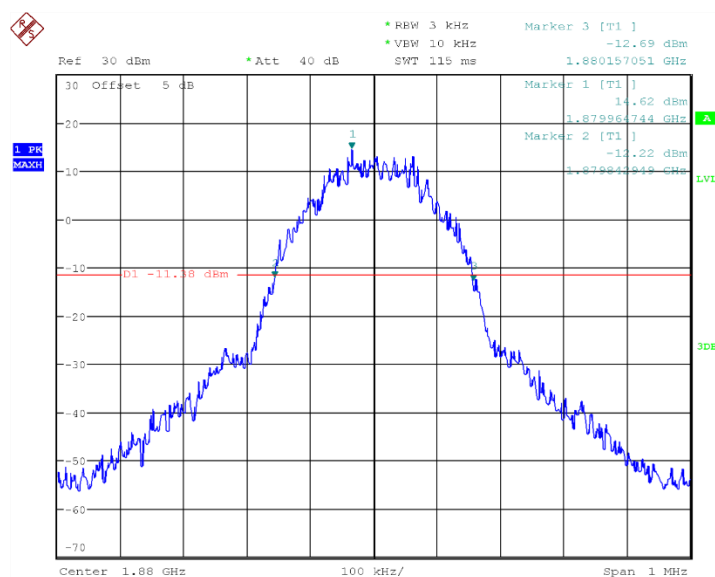


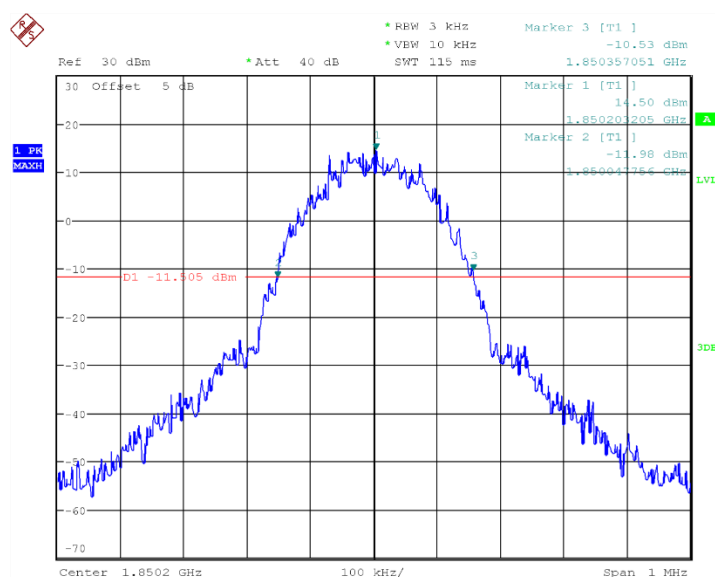
Fig.39 Channel 810- Emission Bandwidth (-26dBc BW)

**EDGE 1900**



Date: 20.MAR.2019 05:54:44

**Fig.40 Channel 661- Emission Bandwidth (-26dBc BW)**



Date: 20.MAR.2019 05:55:12

**Fig.41 Channel 512- Emission Bandwidth (-26dBc BW)**

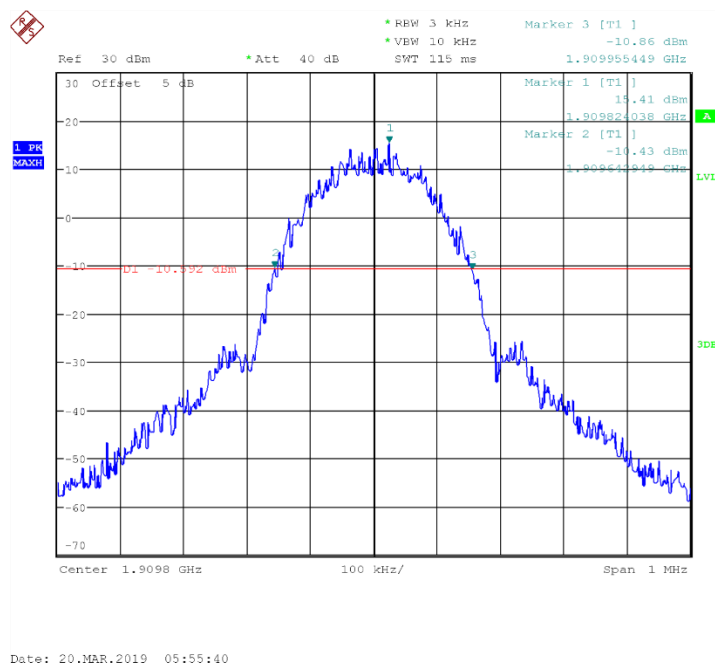
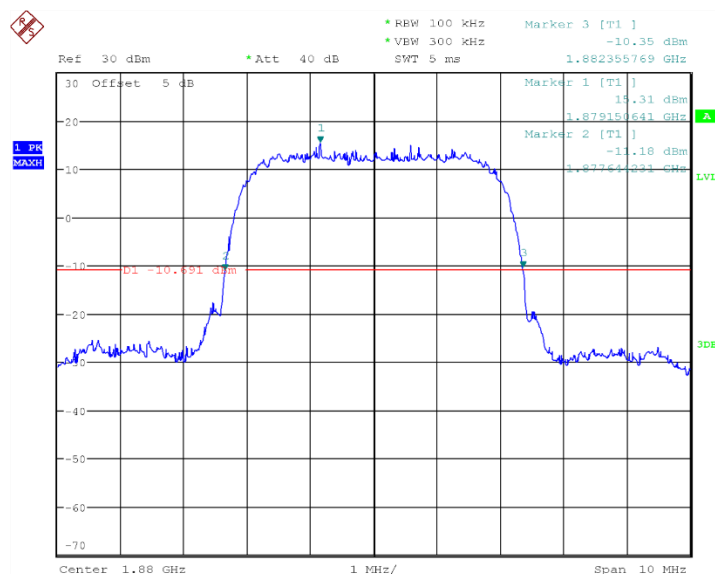


Fig.42 Channel 810- Emission Bandwidth (-26dBc BW)

| WCDMA BAND II |                 |                                |
|---------------|-----------------|--------------------------------|
| Test channel  | Frequency (MHz) | -26dBc Emission Bandwidth(MHz) |
| Mid 9400      | 1880            | 4.712                          |
| Low 9262      | 1852.4          | 4.696                          |
| High 9538     | 1907.6          | 4.728                          |

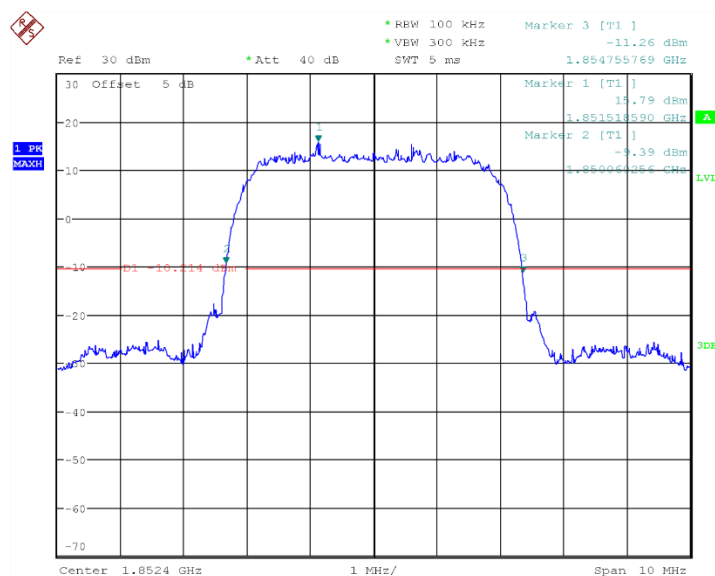
**Conclusion: PASS**

**WCDMA BAND II**



Date: 20.MAR.2019 09:15:26

Fig.43 Channel 9400- Emission Bandwidth (-26dBc BW)



Date: 20.MAR.2019 09:15:57

Fig.44 Channel 9262- Emission Bandwidth (-26dBc BW)

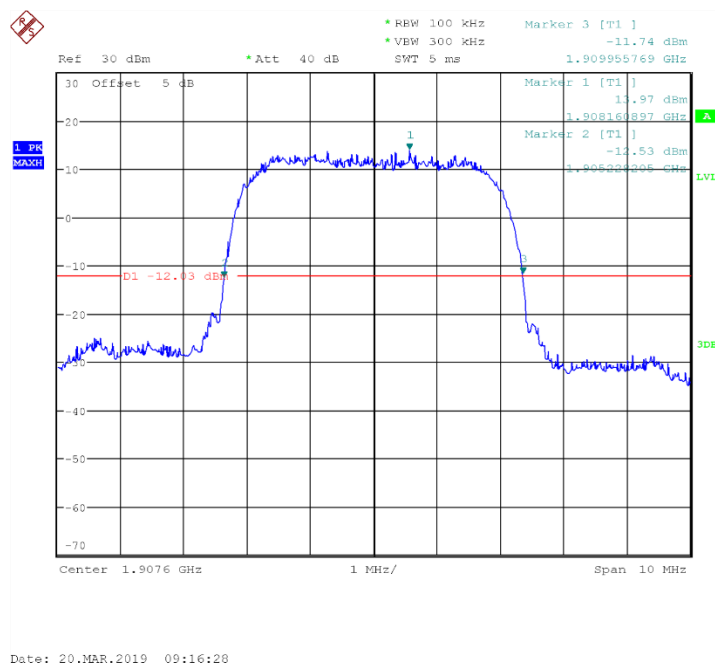
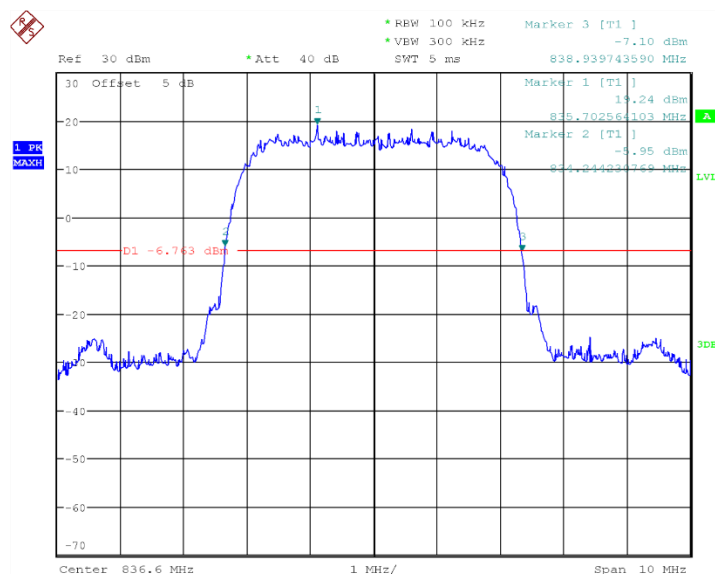


Fig.45 Channel 9538- Emission Bandwidth (-26dBc BW)

| WCDMA BAND V |                 |                                |
|--------------|-----------------|--------------------------------|
| Test channel | Frequency (MHz) | -26dBc Emission Bandwidth(MHz) |
| Mid 4183     | 836.6           | 4.696                          |
| Low 4132     | 826.4           | 4.728                          |
| High 4233    | 846.6           | 4.712                          |

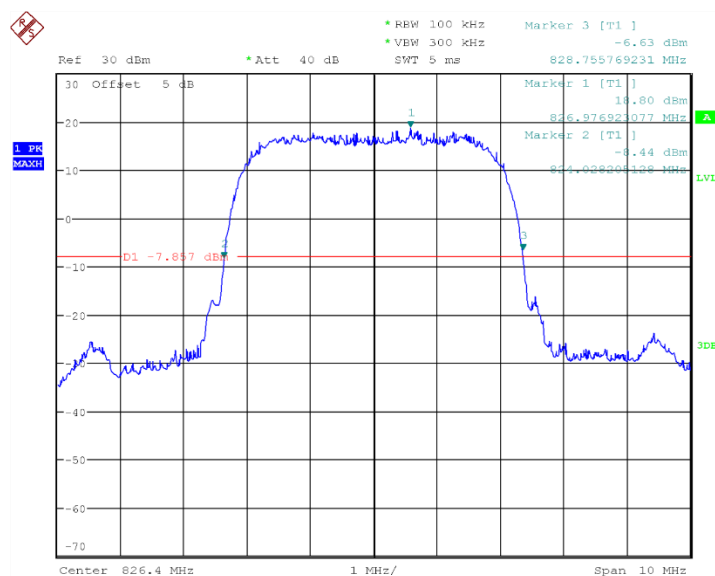
**Conclusion: PASS**

**WCDMA BAND V**



Date: 20.MAR.2019 09:17:08

Fig.46 Channel 4183- Emission Bandwidth (-26dBc BW)



Date: 20.MAR.2019 09:17:40

Fig.47 Channel 4132- Emission Bandwidth (-26dBc BW)

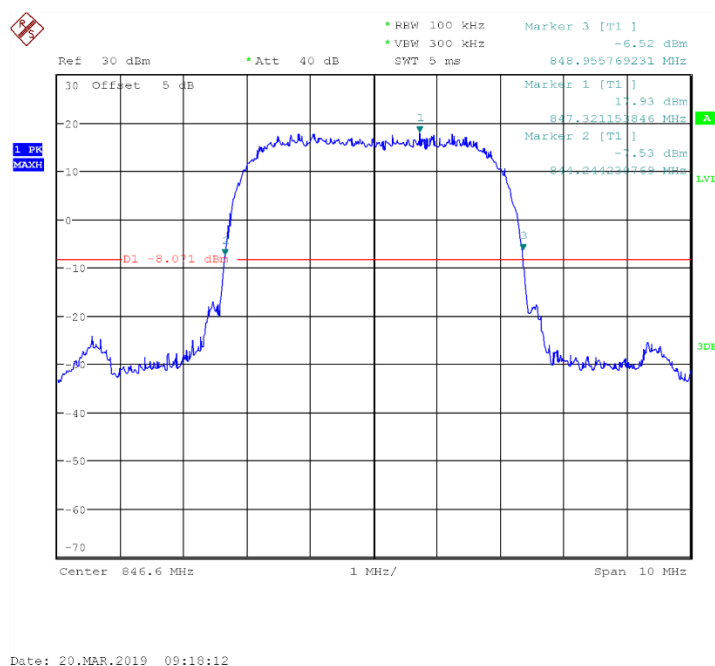


Fig.48 Channel 4233- Emission Bandwidth (-26dBc BW)

## ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to KDB971168 D01 v03 clause 6

### A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than  $43+10\log(\text{Mean power in watts})$  dBc below the mean power output outside a license's frequency block(-13dBm).

### A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz 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.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from  $43+10\log(P)$  Db below the transmitter power P(Watts)  
 $=P(W)-[43+10\log(P)](Db)$   
 $=[30+10\log(P)](dBm)-[43+10\log(P)](Db)$   
 $=-13dBm$

### A.5.3 Test Result:

#### GSM 850

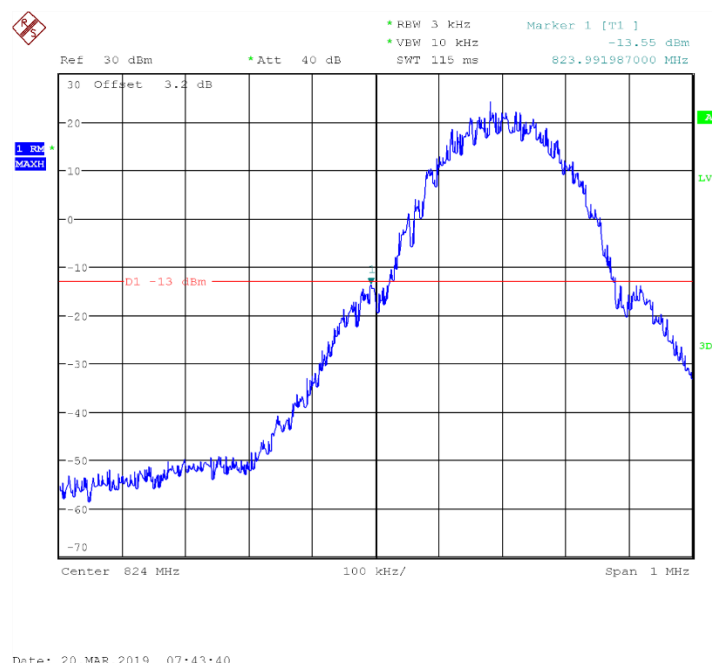


Fig.49 Channel 128- LOW BAND EDGE BLOCK

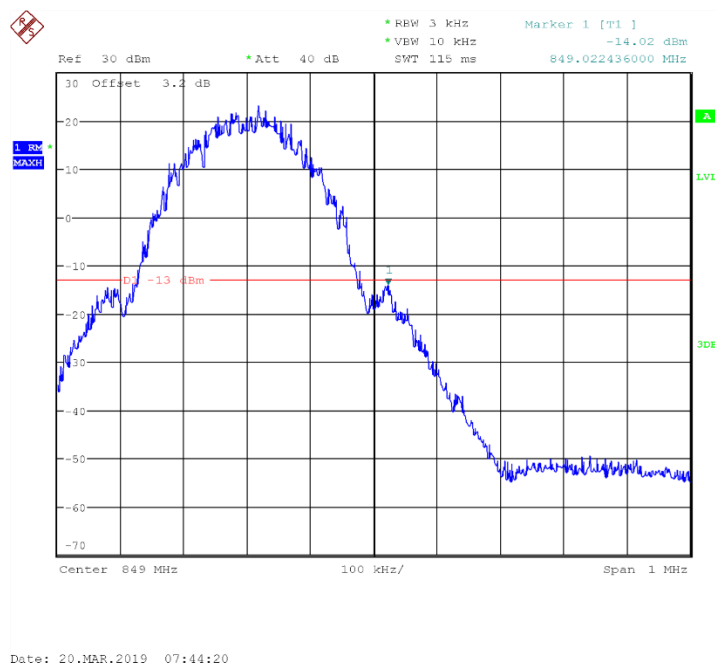


Fig.50 Channel 251- LOW BAND EDGE BLOCK

## GPRS 850

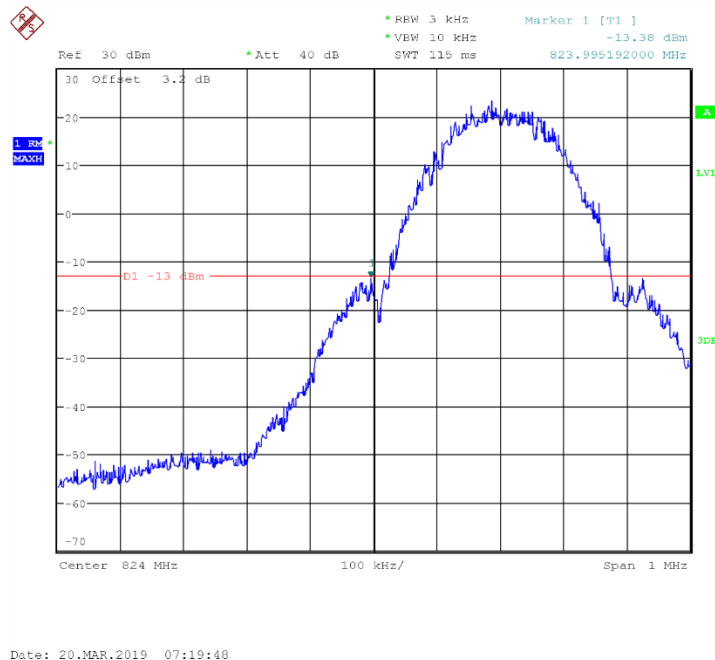


Fig.51 Channel 128- LOW BAND EDGE BLOCK

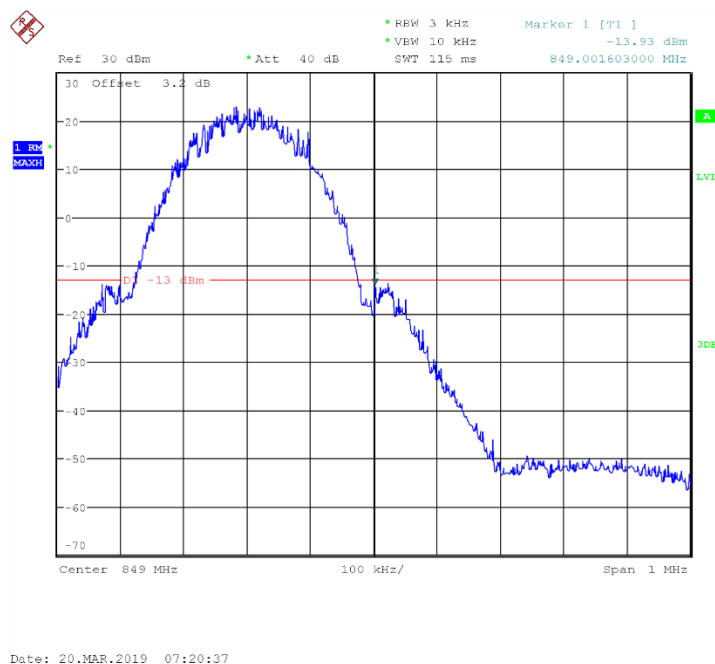


Fig.52 Channel 251- LOW BAND EDGE BLOCK

## EDGE 850

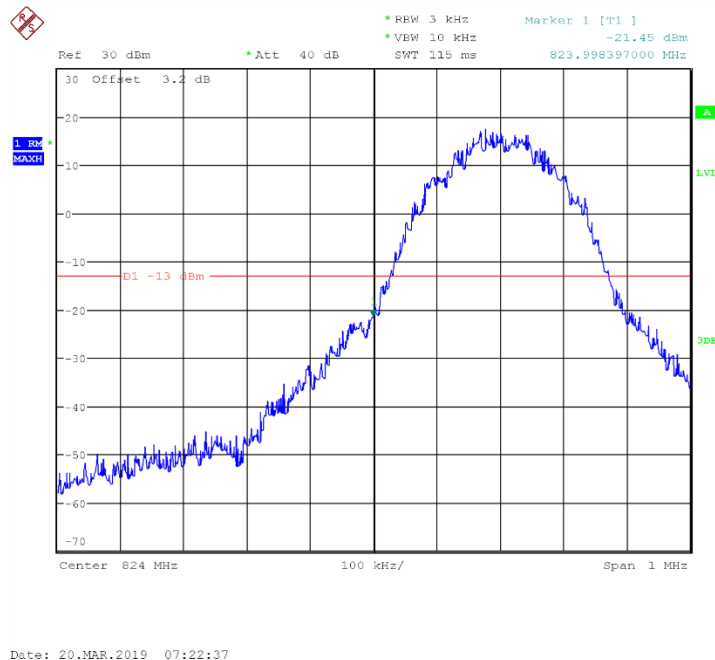


Fig.53 Channel 128- LOW BAND EDGE BLOCK

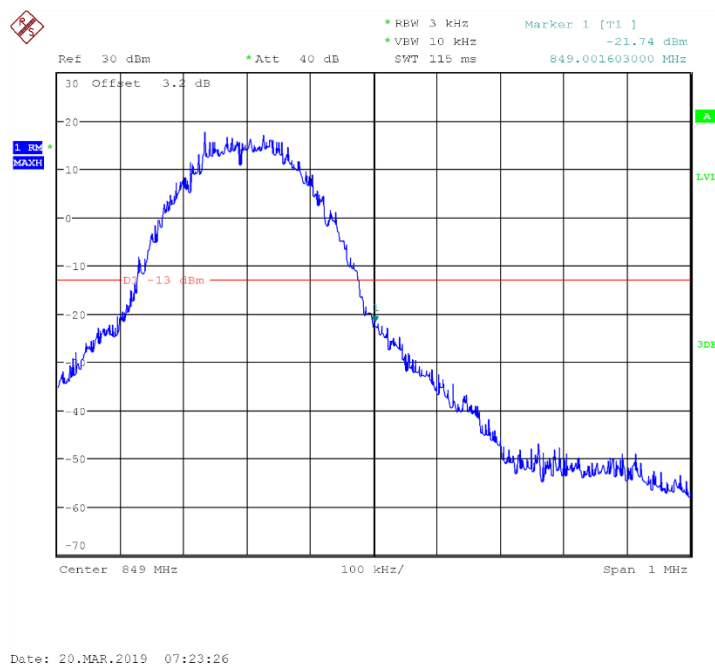


Fig.54 Channel 251- LOW BAND EDGE BLOCK

## GSM 1900

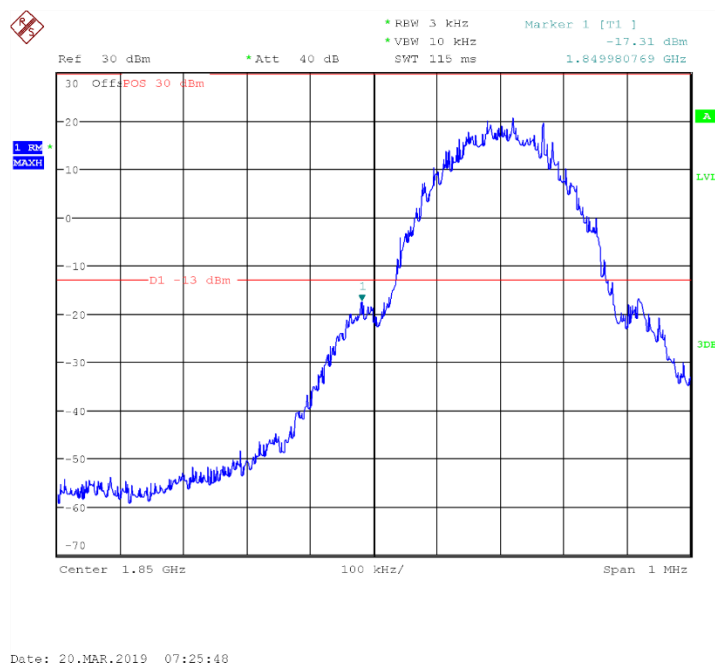


Fig.55 Channel 512- LOW BAND EDGE BLOCK

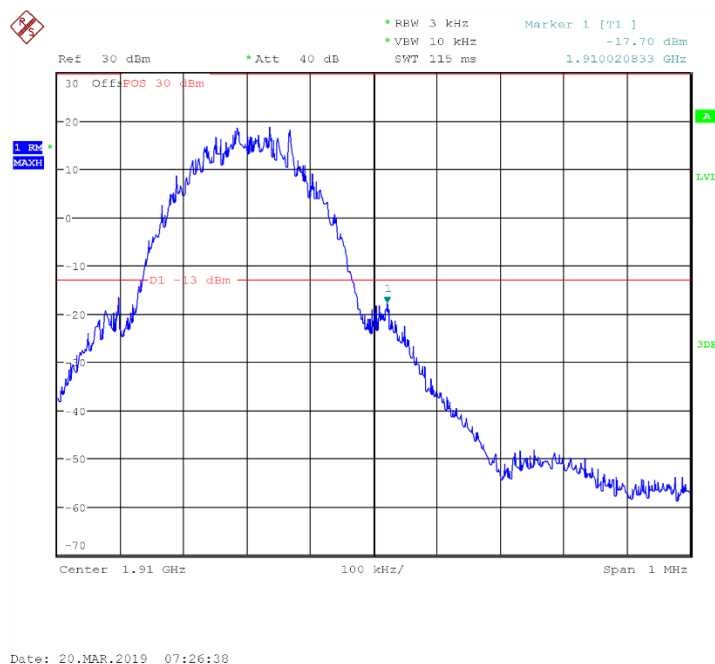


Fig.56 Channel 810- LOW BAND EDGE BLOCK

## GPRS 1900

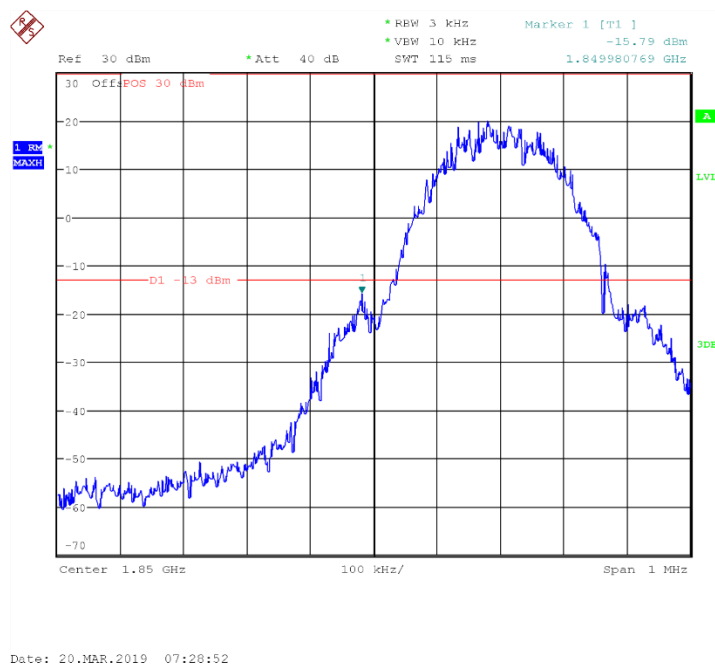


Fig.57 Channel 512- LOW BAND EDGE BLOCK

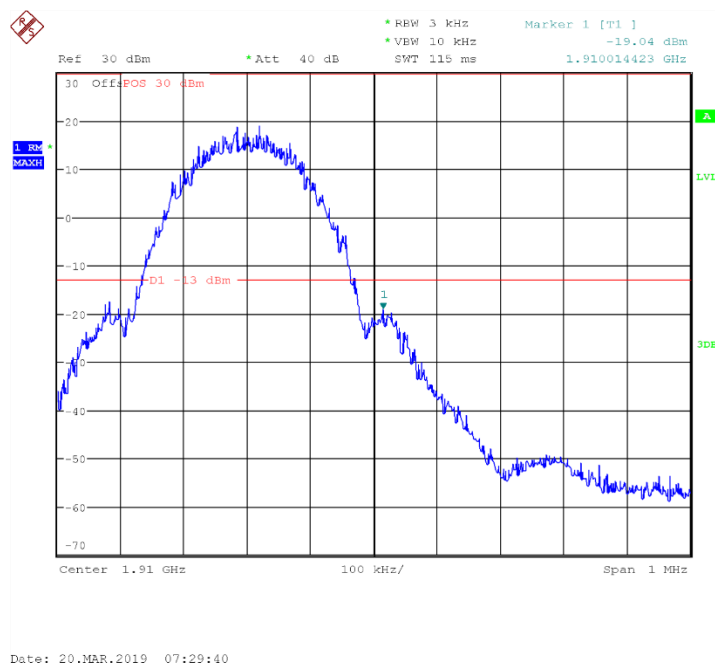


Fig.58 Channel 810- LOW BAND EDGE BLOCK

## EDGE 1900

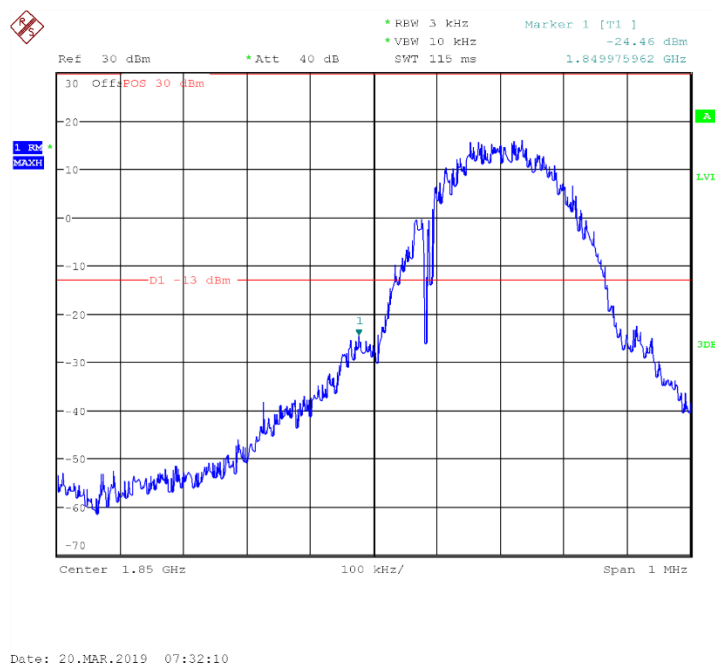


Fig.59 Channel 512- LOW BAND EDGE BLOCK

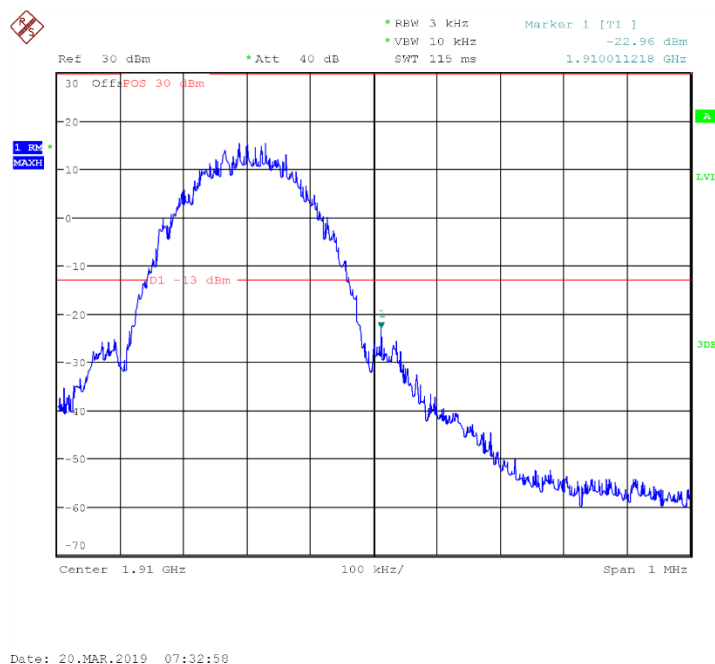


Fig.60 Channel 810- LOW BAND EDGE BLOCK

## WCDMA BAND II

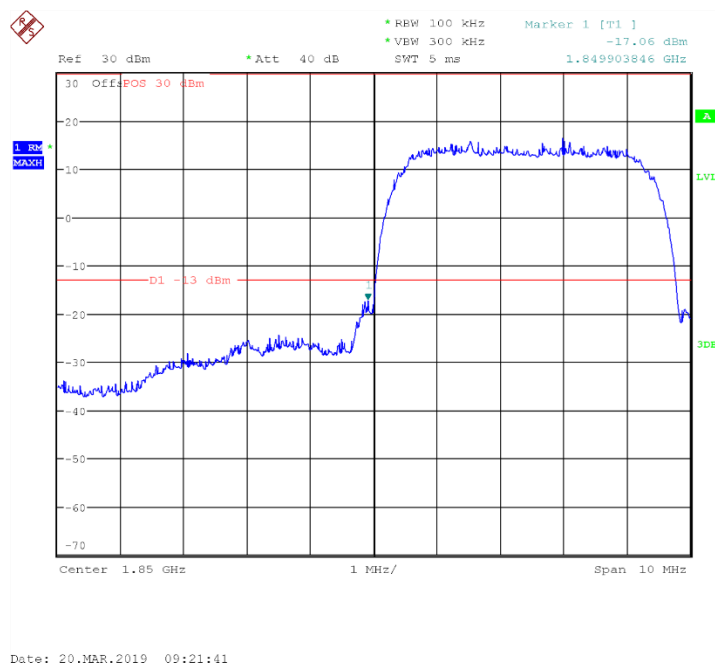


Fig.61 Channel 9262- LOW BAND EDGE BLOCK

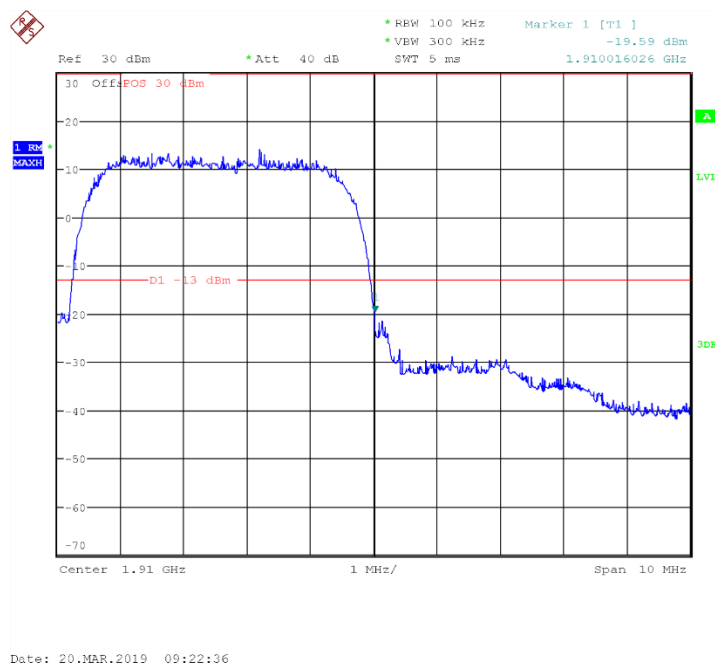


Fig.62 Channel 9538- LOW BAND EDGE BLOCK

**Conclusion: PASS**

## WCDMA BAND V

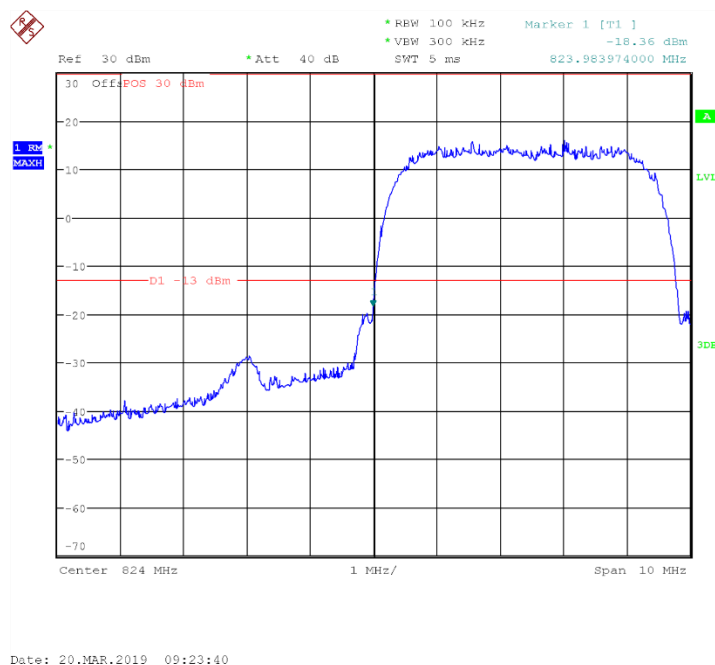


Fig.63 Channel 4132- LOW BAND EDGE BLOCK

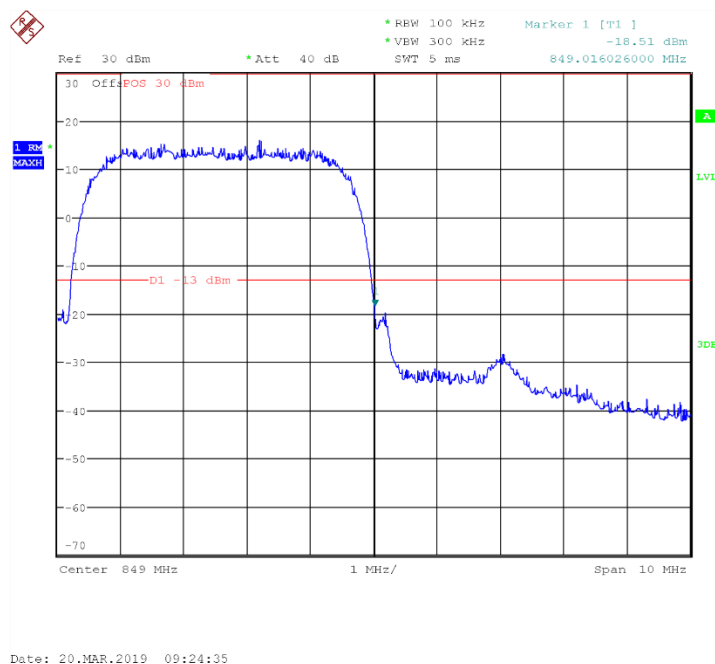


Fig.64 Channel 4233- LOW BAND EDGE BLOCK

**Conclusion: PASS**

## **ANNEX A.6. FREQUENCY STABILITY**

Method of test measurements please refer to KDB971168 D01 v03 clause 9

### **A.6.1.Method of Measurement and test procedures**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of GSM850, PCS1900, WCDMA BANDII, WCDMA BANDIV and WCDMA BANDV, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

### **A.6.2. Measurement Limit**

#### **A.6.2.1. For Hand carried battery powered equipment**

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.35VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages was varied from 85% to 115%.

**A.6.2.2. For equipment powered by primary supply voltage**

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

**A.6.3 Test results****GSM850Mid Channel/fc(MHz) 189/836.4****Frequency Error VS Temperature**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.8                | -10                         | 9.1                 | 84         |
| 3.8                | 0                           | 11.36               | 84         |
| 3.8                | 10                          | 11.62               | 84         |
| 3.8                | 20                          | 8.91                | 84         |
| 3.8                | 30                          | 8.46                | 84         |
| 3.8                | 40                          | 9.88                | 84         |
| 3.8                | 50                          | 8.98                | 84         |

**Frequency Error VS Voltage**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.6                | 25                          | 11.62               | 84         |
| 3.8                | 25                          | 10.33               | 84         |
| 4.35               | 25                          | 7.55                | 84         |

**PCS1900 Mid Channel/fc(MHz) 661/1880****Frequency Error VS Temperature**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.8                | -10                         | 19.69               | 196        |
| 3.8                | 0                           | 16.21               | 196        |
| 3.8                | 10                          | 20.66               | 196        |
| 3.8                | 20                          | 23.89               | 196        |
| 3.8                | 30                          | 18.53               | 196        |
| 3.8                | 40                          | 15.11               | 196        |
| 3.8                | 50                          | 20.53               | 196        |

**Frequency Error VS Voltage**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.6                | 25                          | 17.95               | 196        |
| 3.8                | 25                          | 17.95               | 196        |
| 4.35               | 25                          | 19.44               | 196        |

**WCDMA BAND II Mid Channel/fc(MHz) 9400 /1880****Frequency Error VS Temperature**

| Power Supply<br>(VDC) | Environment<br>Temperature(°C) | Frequency error(Hz) | Limit<br>(Hz) |
|-----------------------|--------------------------------|---------------------|---------------|
| 3.8                   | -10                            | -10.45              | 4700          |
| 3.8                   | 0                              | -13.09              | 4700          |
| 3.8                   | 10                             | -13.52              | 4700          |
| 3.8                   | 20                             | -13.2               | 4700          |
| 3.8                   | 30                             | -8.68               | 4700          |
| 3.8                   | 40                             | -11.26              | 4700          |
| 3.8                   | 50                             | -11.55              | 4700          |

#### Frequency Error VS Voltage

| Power Supply<br>(VDC) | Environment<br>Temperature(°C) | Frequency error(Hz) | Limit<br>(Hz) |
|-----------------------|--------------------------------|---------------------|---------------|
| 3.6                   | 25                             | -3.28               | 4700          |
| 3.8                   | 25                             | -13.55              | 4700          |
| 4.35                  | 25                             | -12.79              | 4700          |

**WCDMA BAND V Mid Channel/fc(MHz) 4183/836.6****Frequency Error VS Temperature**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.8                | -10                         | -3.66               | 2091.5     |
| 3.8                | 0                           | -5.37               | 2091.5     |
| 3.8                | 10                          | -6.21               | 2091.5     |
| 3.8                | 20                          | -6.16               | 2091.5     |
| 3.8                | 30                          | -7.05               | 2091.5     |
| 3.8                | 40                          | -8.1                | 2091.5     |
| 3.8                | 50                          | -8.42               | 2091.5     |

**Frequency Error VS Voltage**

| Power Supply (VDC) | Environment Temperature(°C) | Frequency error(Hz) | Limit (Hz) |
|--------------------|-----------------------------|---------------------|------------|
| 3.6                | 25                          | -7.8                | 2091.5     |
| 3.8                | 25                          | -11.08              | 2091.5     |
| 4.35               | 25                          | -9.31               | 2091.5     |

**Conclusion: PASS**

## **ANNEX A.7. CONDUCTED SPURIOUS EMISSION**

### **A.7.1. GSM Measurement Method and test procedures**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

#### **GSM 850 Transmitter**

| Channel | Frequency(MHz) |
|---------|----------------|
| 128     | 824.2          |
| 189     | 836.4          |
| 251     | 848.8          |

#### **PCS 1900 Transmitter**

| Channel | Frequency(MHz) |
|---------|----------------|
| 512     | 1850.2         |
| 661     | 1880.0         |
| 810     | 1909.8         |

### A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

### A.7.1.2. Measurement result

**Spurious emission limit -13dBm.**

**Note: peak above the limit line is the carrier frequency.**

#### A.7.1.2.1. GSM850

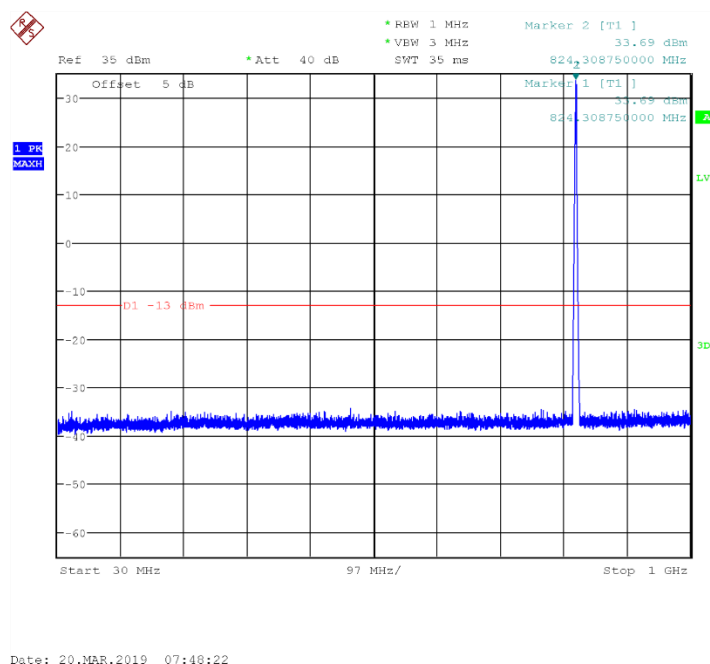


Fig.65 Channel 128: 30MHz~1GHz

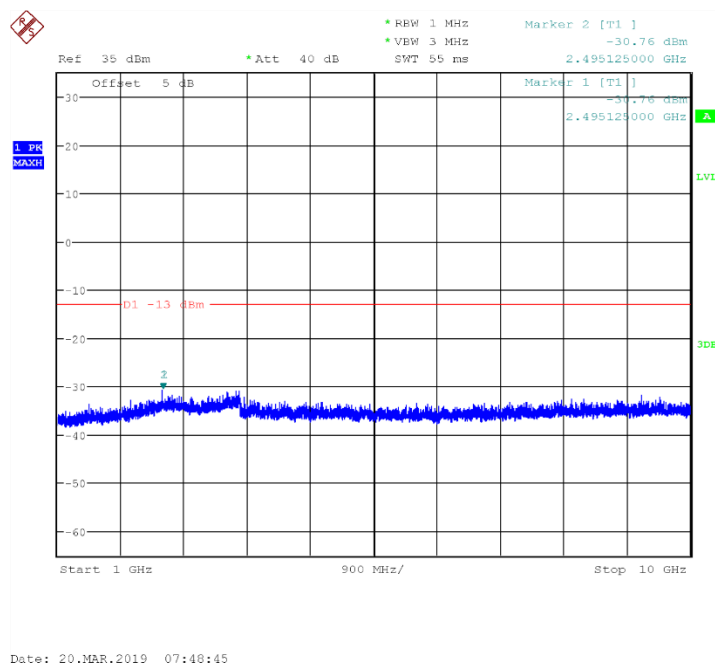


Fig.66 Channel 128: 1GHz~10GHz

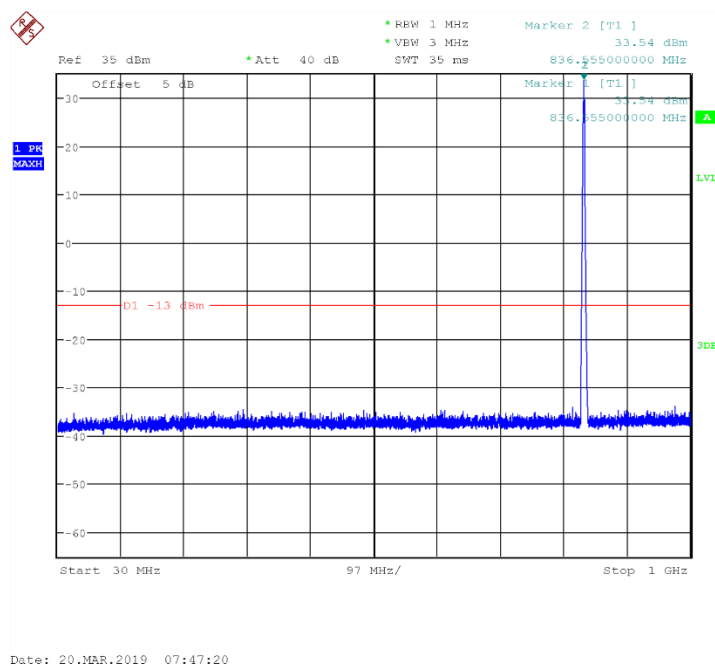


Fig.67 Channel 189: 30MHz~1GHz



Fig.68 Channel 189: 1GHz~10GHz



Fig.69 Channel 251: 30MHz~1GHz

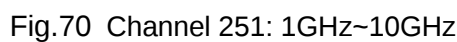
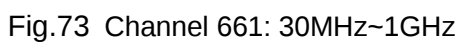
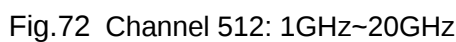


Fig.71 Channel 512: 30MHz~1GHz



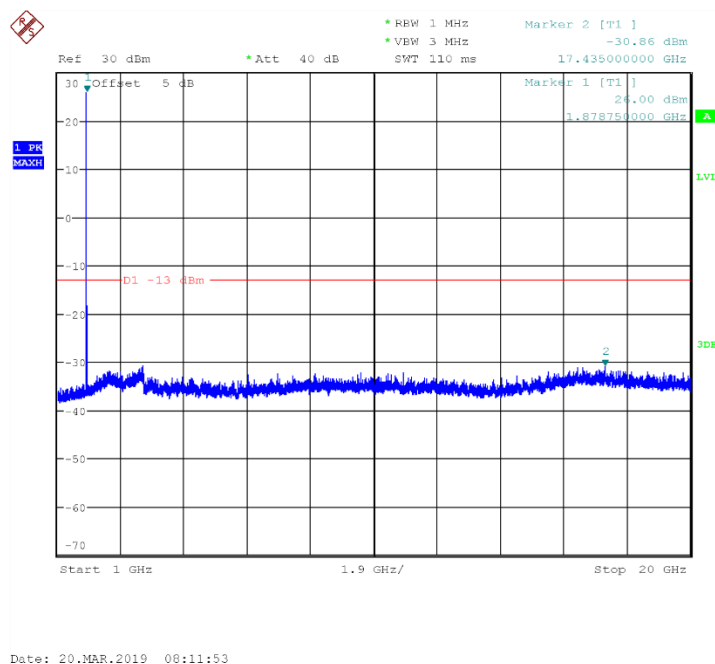


Fig.74 Channel 661: 1GHz~20GHz

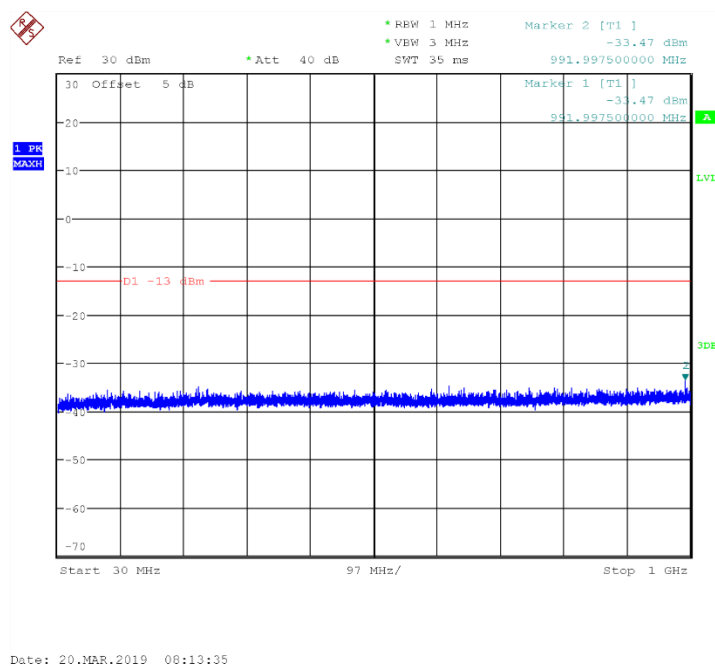


Fig.75 Channel 810: 30MHz~1GHz

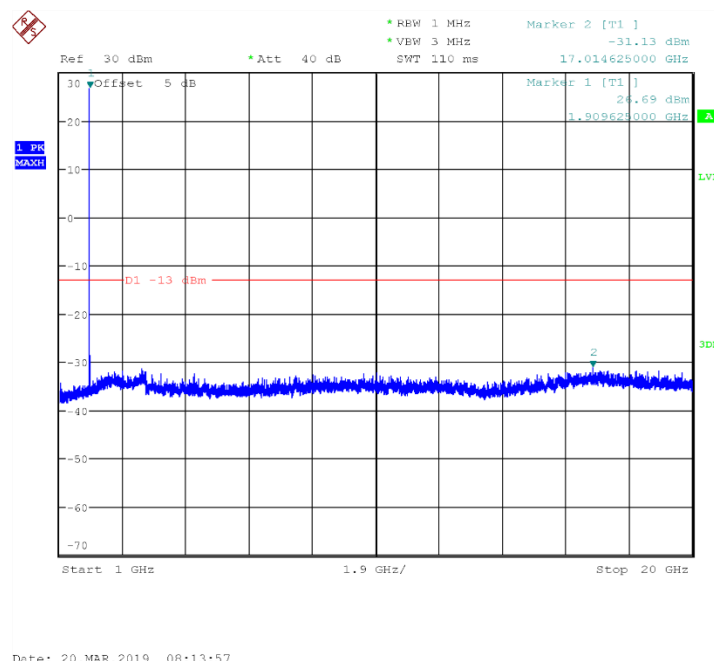


Fig.76 Channel 810: 1GHz~20GHz

**Conclusion: PASS**

#### A.7.2. WCDMA Measurement Method and test procedures

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA Band II and WCDMA BANDIV, these equate to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For WCDMA Band V, data taken from 30 MHz to 10GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;  
Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

#### WCDMA Band II Transmitter

| Channel | Frequency (MHz) |
|---------|-----------------|
|---------|-----------------|

|      |         |
|------|---------|
| 9262 | 1852.40 |
| 9400 | 1880.00 |
| 9538 | 1907.60 |

**WCDMA Band V Transmitter**

| Channel | Frequency (MHz) |
|---------|-----------------|
| 4132    | 826.40          |
| 4183    | 836.60          |
| 4233    | 846.60          |

**A.7.2.1. Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**A.7.2.2. Measurement result****Spurious emission limit -13dBm.**

**Note: peak above the limit line is the carrier frequency.**

**A.7.2.2.1. WCDMA Band II**

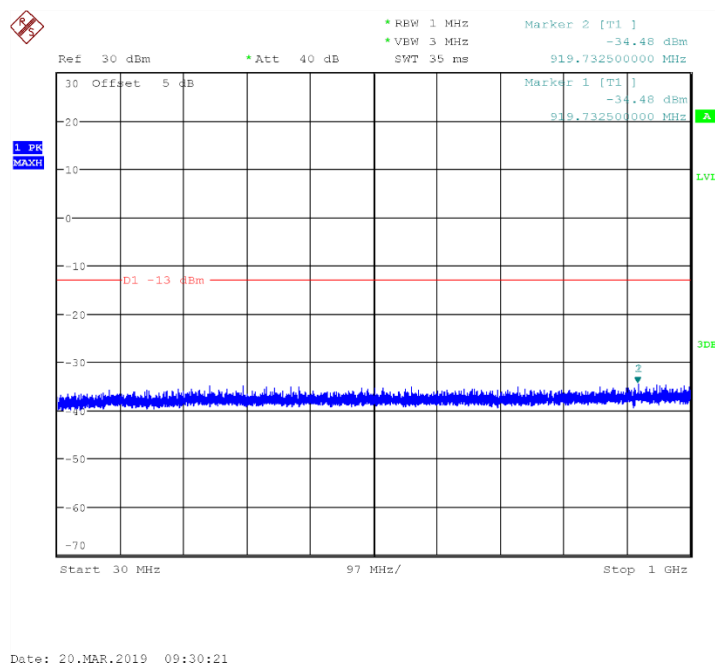


Fig.77 Channel 9262: 30MHz~1GHz

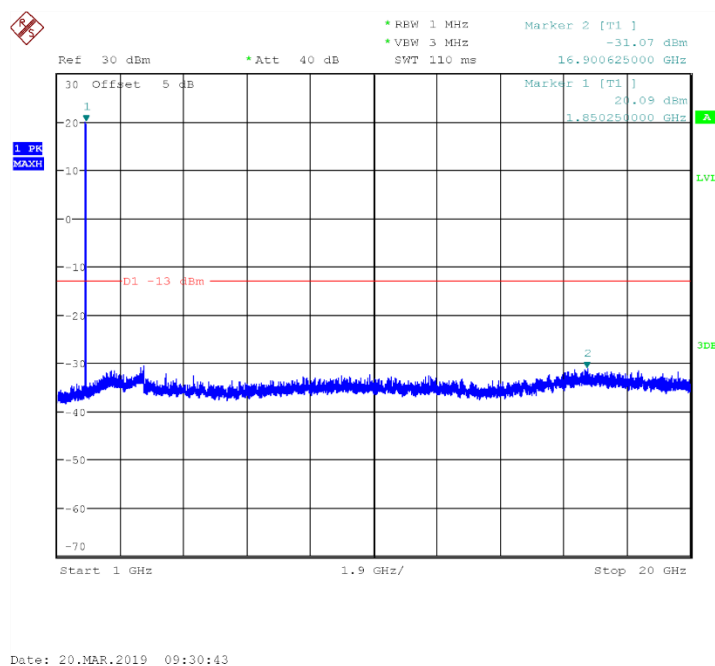


Fig.78 Channel 9262: 1GHz~20GHz

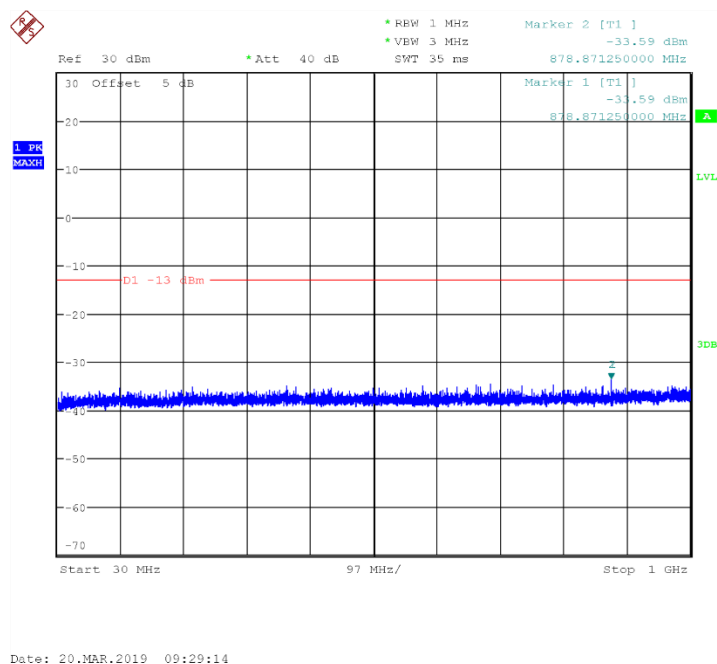


Fig.79 Channel 9400: 30MHz~1GHz

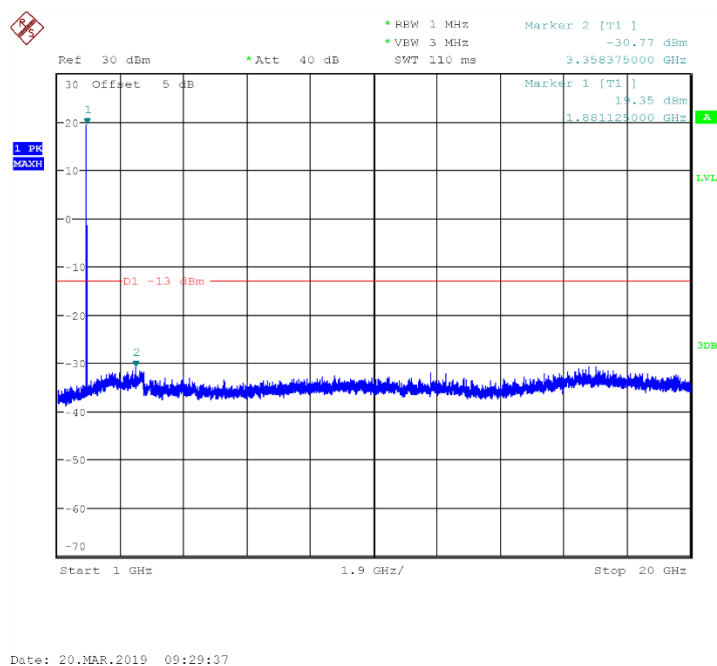


Fig.80 Channel 9400: 1GHz~20GHz

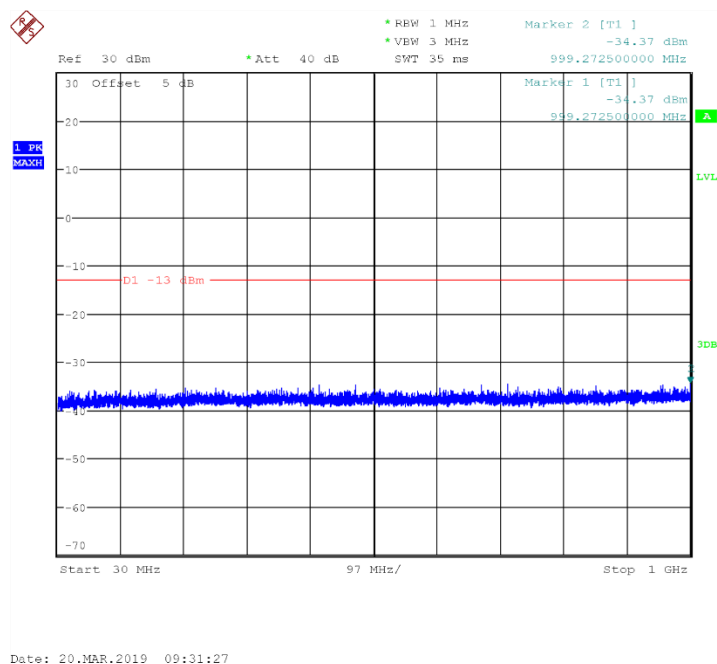


Fig.81 Channel 9538: 30MHz~1GHz

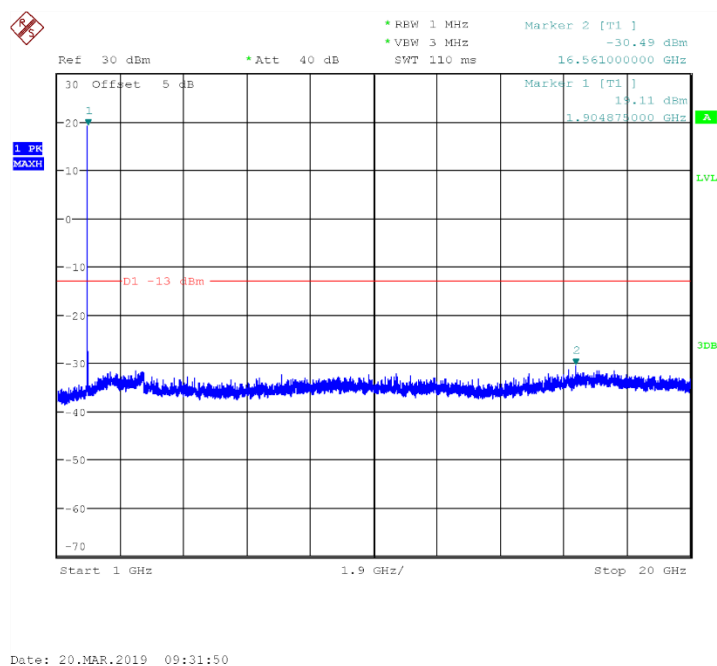


Fig.82 Channel 9538: 1GHz~20GHz

**Conclusion: PASS**

#### A.7.2.2.2. WCDMA Band V



Fig.83 Channel 4132: 30MHz~1GHz

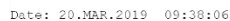


Fig.84 Channel 4132: 1GHz~10GHz

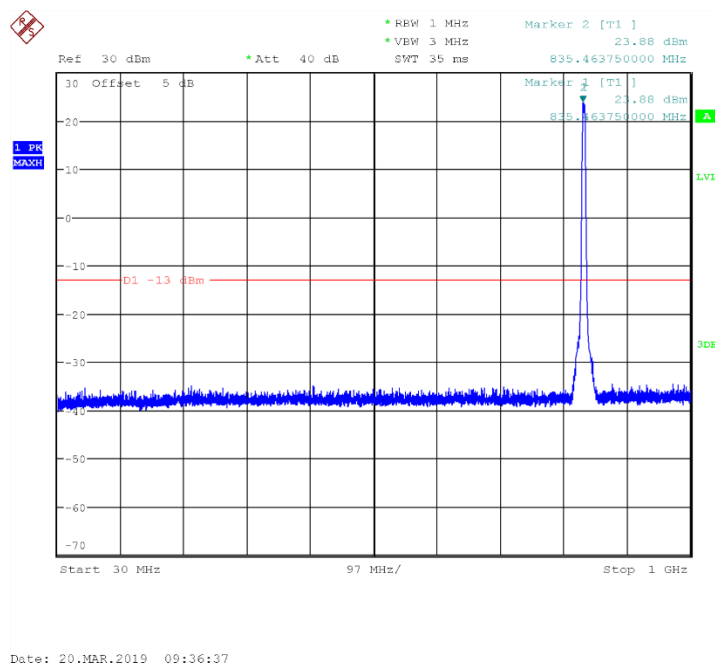


Fig.85 Channel 4183: 30MHz~1GHz

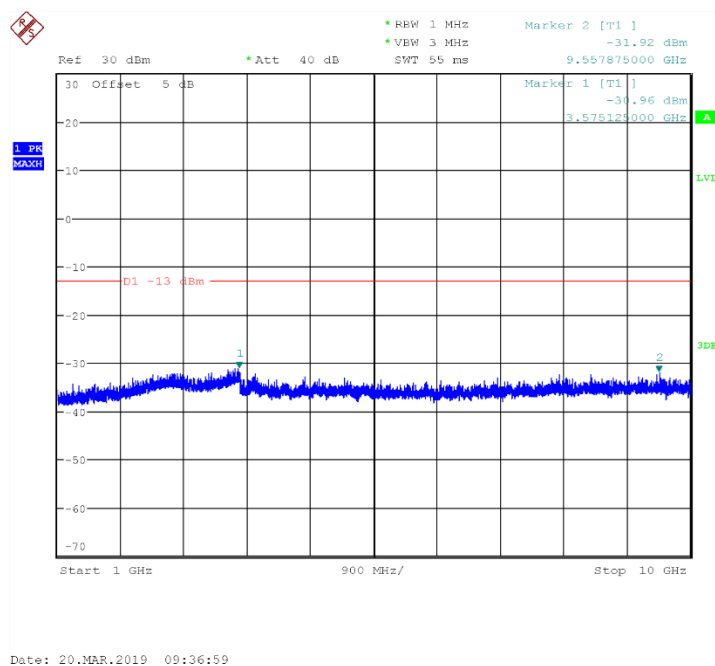


Fig.86 Channel 4183: 1GHz~10GHz

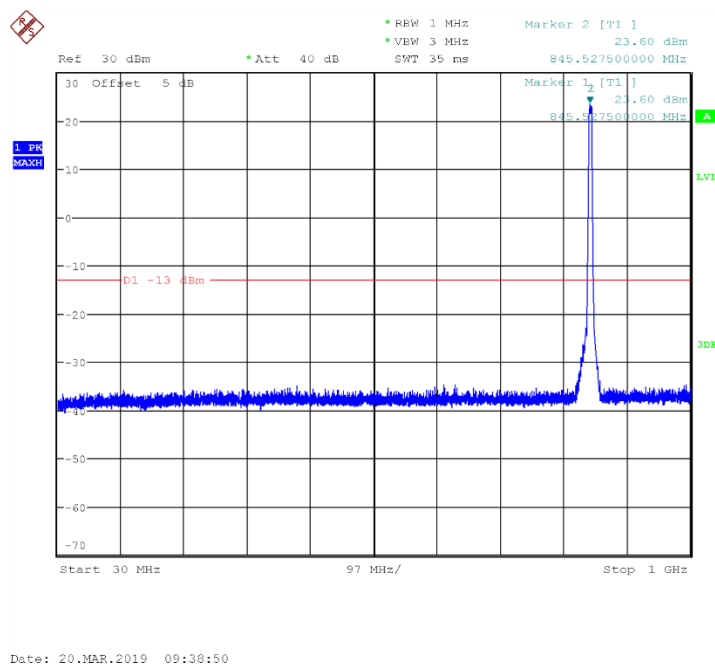


Fig.87 Channel 4233: 30MHz~1GHz

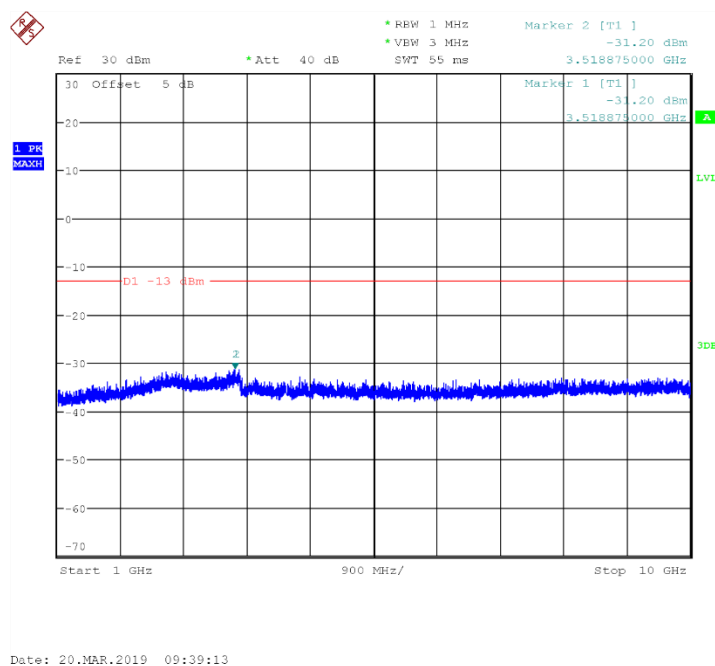


Fig.88 Channel 4233: 1GHz~10GHz

**Conclusion: PASS**

## ANNEX A.8. RADIATED

### A.8.1. EIRP

#### A.8.1.1. GSM EIRP

##### A.8.1.1.1. Description

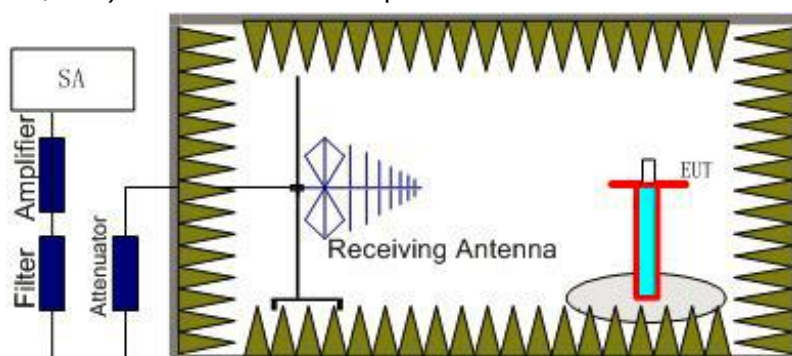
This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

##### A.8.1.1.2. Method of Measurement

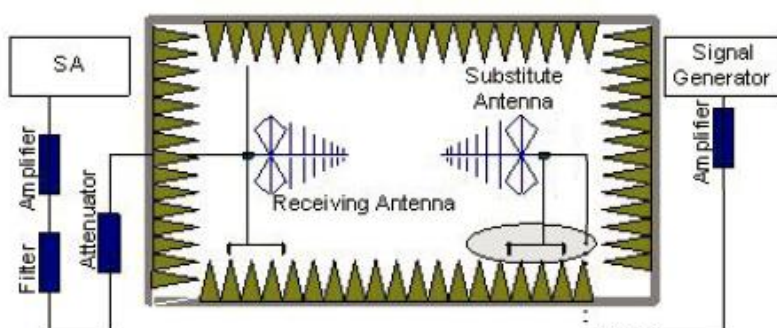
The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A

power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connected between the Amplifier and the Substitution Antenna.

The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

#### A.8.1.1.3 GSM 850-ERP 22.913(a)

##### A.8.1.1.3.1 Limits

|      | Power Step | Burst Peak ERP (dBm)        |
|------|------------|-----------------------------|
| GSM  | 5          | $\leq 38.45\text{dBm}$ (7W) |
| GPRS | 3          | $\leq 38.45\text{dBm}$ (7W) |
| EDGE | 6          | $\leq 38.45\text{dBm}$ (7W) |

##### A.8.1.1.3.2 Measurement result

###### GSM(GMSK)

| Frequency (MHz) | $P_{Mea}(\text{dBm})$ | $P_{cl}(\text{dB})$ | $P_{Ag}(\text{dB})$ | $G_a$ Antenna Gain(dBd) | PeakERP(dBm) | Polarization |
|-----------------|-----------------------|---------------------|---------------------|-------------------------|--------------|--------------|
| 824.2           | -9.58                 | 3.1                 | 37                  | 3.11                    | 27.43        | H            |
| 836.6           | -11.23                | 3.1                 | 37                  | 3.11                    | 25.78        | H            |
| 848.8           | -10.76                | 3.1                 | 37                  | 3.11                    | 26.25        | H            |

###### GPRS(GMSK)

| Frequency (MHz) | $P_{Mea}(\text{dBm})$ | $P_{cl}(\text{dB})$ | $P_{Ag}(\text{dB})$ | $G_a$ Antenna Gain(dBd) | PeakERP(dBm) | Polarization |
|-----------------|-----------------------|---------------------|---------------------|-------------------------|--------------|--------------|
| 824.2           | -9.51                 | 3.1                 | 37                  | 3.11                    | 27.50        | H            |
| 836.6           | -11.18                | 3.1                 | 37                  | 3.11                    | 25.83        | H            |
| 848.8           | -10.76                | 3.1                 | 37                  | 3.11                    | 26.25        | H            |

###### EDGE(8PSK)

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | P <sub>Ag</sub> (dB) | G <sub>a</sub> Antenna Gain(dBd) | PeakERP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|----------------------------------|--------------|--------------|
| 824.2           | -12.13                 | 3.1                  | 37                   | 3.11                             | 24.88        | H            |
| 836.6           | -13.81                 | 3.1                  | 37                   | 3.11                             | 23.20        | H            |
| 848.8           | -13.9                  | 3.1                  | 37                   | 3.11                             | 23.11        | H            |

Frequency: 824.2MHz

$$\text{Peak ERP(dBm)} = P_{\text{Mea}}(-12.13\text{dBm}) - P_{\text{cl}}(3.1\text{dB}) + P_{\text{Ag}}(37\text{dB}) + G_{\text{a}}(3.11\text{dBd})$$

$$= 24.88\text{dBm}$$

Note: ANALYZER SETTINGS: RBW = VBW = 3MHz

#### A.8.1.1.4 PCS 1900-EIRP 24.232(c)

##### A.8.1.1.4.1 Limits

|      | Power Step | Burst Peak EIRP (dBm) |
|------|------------|-----------------------|
| GSM  | 5          | ≤33dBm (2W)           |
| GPRS | 3          | ≤33dBm (2W)           |
| EDGE | 6          | ≤33dBm (2W)           |

##### A.8.1.1.4.2 Measurement result

###### GSM(GMSK)

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | P <sub>Ag</sub> (dB) | G <sub>a</sub> Antenna Gain(dBi) | PeakEIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|----------------------------------|---------------|--------------|
| 1850.2          | -3.32                  | 4.6                  | 36                   | 4.7                              | 32.78         | V            |
| 1880.0          | -2.61                  | 4.6                  | 35.6                 | 4.7                              | 32.73         | H            |
| 1909.8          | -4                     | 4.7                  | 36                   | 4.7                              | 32.00         | V            |

###### GPRS(GMSK)

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | P <sub>Ag</sub> (dB) | G <sub>a</sub> Antenna Gain(dBi) | PeakEIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|----------------------------------|---------------|--------------|
| 1850.2          | -3.32                  | 4.6                  | 36                   | 4.7                              | 32.78         | V            |
| 1880.0          | -2.68                  | 4.6                  | 35.6                 | 4.7                              | 32.79         | H            |
| 1909.8          | -4.03                  | 4.7                  | 36                   | 4.7                              | 31.97         | V            |

###### EDGE(8PSK)

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | P <sub>Ag</sub> (dB) | G <sub>a</sub> Antenna Gain(dBi) | PeakEIRP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|----------------------------------|---------------|--------------|
| 1850.2          | -8.43                  | 4.6                  | 36                   | 4.7                              | 27.67         | V            |
| 1880.0          | -7.68                  | 4.6                  | 35.6                 | 4.7                              | 28.02         | H            |
| 1909.8          | -9.17                  | 4.7                  | 36                   | 4.7                              | 26.83         | V            |

**Frequency: 1850.2MHz**

**Peak EIRP(dBm)= P<sub>Mea</sub>(-8.43dBm) - P<sub>cl</sub>(4.6dB)+ P<sub>Ag</sub>(36dB) +G<sub>a</sub>(4.7dB)=27.67dBm**

**ANALYZER SETTINGS: RBW = VBW = 3MHz**

### A.8.1.2. WCDMA EIRP

#### A.8.1.2.1. Description

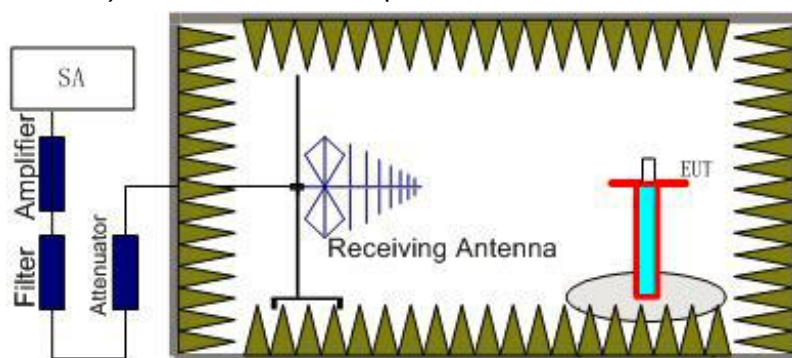
This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

#### A.8.1.2.2. Method of Measurement

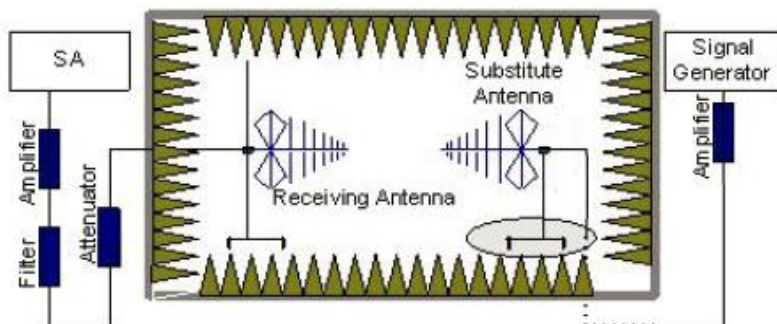
The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.

The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

#### A.8.1.2.3 WCDMA Band II-ERP Limits

|               | Burst Peak EIRP (dBm)    |
|---------------|--------------------------|
| WCDMA Band II | $\leq 33\text{dBm}$ (2W) |

#### A.8.1.2.3.1 Measurement result

| Frequency (MHz) | $P_{Mea}(\text{dBm})$ | $P_{cl}(\text{dB})$ | $P_{Ag}(\text{dB})$ | $G_a$ Antenna Gain(dBi) | Peak EIRP(dBm) | Polarization |
|-----------------|-----------------------|---------------------|---------------------|-------------------------|----------------|--------------|
| 1852.4          | -18.97                | 3.54                | 43.8                | 2.9                     | 24.19          | V            |
| 1880.0          | -19.34                | 3.54                | 43.8                | 2.9                     | 23.82          | H            |
| 1907.6          | -20.09                | 3.54                | 43.8                | 2.9                     | 23.07          | V            |

Frequency: 1852.40MHz

$$\text{Peak EIRP(dBm)} = P_{Mea}(-18.97\text{dBm}) - P_{cl}(3.54\text{dB}) + P_{Ag}(43.8\text{dB}) + G_a(2.9\text{dBi}) = 24.19\text{dBm}$$

ANALYZER SETTINGS: RBW = VBW = 5MHz

#### A.8.1.2.4 WCDMA Band V-ERP Limits

|              |                      |
|--------------|----------------------|
|              | Burst Peak ERP (dBm) |
| WCDMA Band V | ≤38.45dBm (7W)       |

##### A.8.1.2.4.1 Measurement result

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | P <sub>Ag</sub> (dB) | G <sub>a</sub> Antenna Gain(dBd) | PeakERP(dBm) | Polarization |
|-----------------|------------------------|----------------------|----------------------|----------------------------------|--------------|--------------|
| 826.4           | -19.51                 | 3.1                  | 37                   | 2.9                              | 17.29        | H            |
| 836.6           | -20                    | 3.1                  | 37                   | 2.9                              | 16.80        | H            |
| 846.6           | -19.88                 | 3.1                  | 37                   | 2.9                              | 16.92        | H            |

Frequency: 826.4 MHz

Peak ERP(dBm)= P<sub>Mea</sub>(-19.51dBm)- P<sub>cl</sub>(3.1dB)+P<sub>Ag</sub>(37dB)+G<sub>a</sub>(2.9dBd)=17.29dBm

ANALYZER SETTINGS: RBW = VBW = 5MHz

Note: the EUT was displayed in several different direction, the worst cases were shown.

#### A.8.2 EMISSION LIMIT (§2.1051/§22.917§24.238)

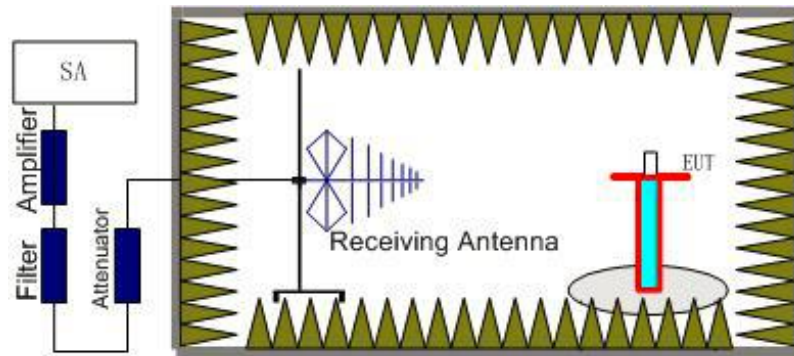
##### A.8.2.1 GSM Measurement Method

The measurement procedures in TIA-603E-2016 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

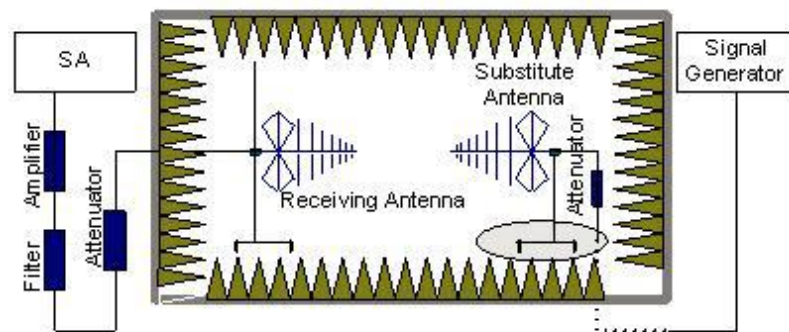
##### A.8.2.2 The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10<sup>th</sup> harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as ( $P_r$ ).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

A amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss .

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} - P_{pl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$

### A.8.2.3 Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power ( $P$ ) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power ( $P$ ) by at least 43

+ 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### A.8.2.4 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900 ,GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

#### A.8.2.5 Measurement Results

Measurements results:

| Frequency      | Channel | Frequency Range | Result |
|----------------|---------|-----------------|--------|
| <b>GSM850</b>  | Low     | 30MHz~10GHz     | P      |
|                | Middle  | 30MHz~10GHz     | P      |
|                | High    | 30MHz~10GHz     | P      |
| <b>GSM1900</b> | Low     | 30MHz~20GHz     | P      |
|                | Middle  | 30MHz~20GHz     | P      |
|                | High    | 30MHz~20GHz     | P      |

#### GSM850

##### GSM Mode Channel 128

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1853.6          | -38.46     | 4.6       | 2.9      | -40.16          | -13         | H            |
| 2537.1          | -37.01     | 5.4       | 3.7      | -38.71          | -13         | V            |
| 4182.7          | -43.51     | 7.0       | 7.7      | -42.81          | -13         | V            |
| 6690.8          | -46.09     | 9.1       | 12.3     | -42.89          | -13         | V            |

|        |        |      |      |        |     |   |
|--------|--------|------|------|--------|-----|---|
| 7529.2 | -47    | 9.7  | 14.6 | -42.1  | -13 | V |
| 9203.1 | -48.21 | 10.5 | 18.5 | -40.21 | -13 | V |

Note:

GSM 850, CH128

Power(ERP)= Pmea-Pcl+Ga=-53.35-10.2+18.1=-45.45dbm

This method Applicable to the following table.

### GSM Mode Channel 189

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1873.9          | -38.09     | 4.6       | 2.9      | -39.79          | -13         | H            |
| 2760.0          | -35.47     | 5.7       | 4.1      | -37.07          | -13         | V            |
| 4251.9          | -50.62     | 7.1       | 7.7      | -50.02          | -13         | V            |
| 5769.2          | -47.21     | 8.5       | 10.5     | -45.21          | -13         | V            |
| 6824.6          | -50.41     | 9.2       | 12.3     | -47.31          | -13         | V            |
| 8750.8          | -51.39     | 10.4      | 18.5     | -43.29          | -13         | V            |

### GSM Mode Channel 251

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1865.4          | -38.44     | 4.6       | 2.9      | -40.14          | -13         | H            |
| 2780.4          | -34.59     | 5.7       | 4.1      | -36.19          | -13         | V            |
| 3394.6          | -45        | 6.3       | 4.7      | -46.6           | -13         | V            |

|        |        |      |      |        |     |   |
|--------|--------|------|------|--------|-----|---|
| 4243.8 | -46.46 | 7.1  | 7.7  | -45.86 | -13 | H |
| 6790.8 | -48.83 | 9.2  | 12.3 | -45.73 | -13 | V |
| 9336.9 | -48.49 | 10.7 | 18.5 | -40.69 | -13 | V |

### GPRS Mode Channel 128

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1863.2          | -38.49     | 4.6       | 2.9      | -40.19          | -13         | H            |
| 3560.8          | -47.5      | 6.4       | 4.7      | -49.2           | -13         | H            |
| 4535.8          | -47.75     | 7.4       | 7.3      | -47.85          | -13         | V            |
| 6030.8          | -49.63     | 8.6       | 10.4     | -47.83          | -13         | V            |
| 7416.9          | -48.17     | 9.7       | 14.6     | -43.27          | -13         | V            |
| 8241.5          | -48.66     | 10.1      | 17.3     | -41.46          | -13         | V            |

### GPRS Mode Channel 189

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1869.6          | -38.37     | 4.6       | 2.9      | -40.07          | -13         | V            |
| 3572.3          | -47.46     | 6.4       | 4.7      | -49.16          | -13         | V            |
| 4849.6          | -48.8      | 7.6       | 7.9      | -48.5           | -13         | V            |

|        |        |      |      |        |     |   |
|--------|--------|------|------|--------|-----|---|
| 5855.8 | -49.65 | 8.4  | 10.5 | -47.55 | -13 | V |
| 7304.6 | -50.14 | 9.6  | 13.7 | -46.04 | -13 | V |
| 9203.1 | -45.22 | 10.5 | 18.5 | -37.22 | -13 | V |

**GPRS Mode Channel 251****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1866.4          | -38.02     | 4.6       | 2.9      | -39.72          | -13         | H            |
| 3580.4          | -46        | 6.5       | 4.7      | -47.8           | -13         | H            |
| 5446.2          | -49.15     | 8.1       | 9.5      | -47.75          | -13         | V            |
| 6715.4          | -50.5      | 9.1       | 12.3     | -47.3           | -13         | H            |
| 7873.8          | -50.11     | 9.9       | 15.3     | -44.71          | -13         | V            |
| 9336.9          | -48.54     | 10.7      | 18.5     | -40.74          | -13         | V            |

**EGPRS Mode Channel 128****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1481.2          | -32.53     | 4.1       | 3.4      | -33.23          | -13         | H            |
| 3580.4          | -46.95     | 6.5       | 4.7      | -48.75          | -13         | H            |
| 5769.2          | -49.22     | 8.5       | 10.5     | -47.22          | -13         | V            |

|        |        |      |      |        |     |   |
|--------|--------|------|------|--------|-----|---|
| 6593.8 | -47.66 | 9.1  | 11.5 | -45.26 | -13 | V |
| 7649.2 | -50.98 | 9.7  | 15.3 | -45.38 | -13 | H |
| 9066.2 | -43.71 | 10.5 | 18.3 | -35.91 | -13 | V |

### EGPRS Mode Channel 189

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1854.6          | -38.15     | 4.6       | 2.9      | -39.85          | -13         | H            |
| 3571.2          | -46.97     | 6.4       | 4.7      | -48.67          | -13         | H            |
| 4242.7          | -48.02     | 7.1       | 7.7      | -47.42          | -13         | H            |
| 5650.4          | -51.18     | 8.3       | 10.5     | -48.98          | -13         | V            |
| 6790.8          | -48.33     | 9.2       | 12.3     | -45.23          | -13         | V            |
| 8407.7          | -52.82     | 10.2      | 18.1     | -44.92          | -13         | V            |

### EGPRS Mode Channel 251

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1873.9          | -38.22     | 4.6       | 2.9      | -39.92          | -13         | V            |
| 3566.5          | -47.27     | 6.4       | 4.7      | -48.97          | -13         | H            |
| 4558.8          | -47.01     | 7.4       | 7.3      | -47.11          | -13         | H            |
| 5544.2          | -50.29     | 8.2       | 9.5      | -48.99          | -13         | H            |
| 6692.3          | -48.51     | 9.1       | 12.3     | -45.31          | -13         | V            |

|        |        |      |      |        |     |   |
|--------|--------|------|------|--------|-----|---|
| 8364.6 | -49.06 | 10.1 | 17.3 | -41.86 | -13 | V |
|--------|--------|------|------|--------|-----|---|

### GSM1900

#### GSM Mode Channel 512

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3759.0          | -47.56     | 6.6       | 7.7      | -46.46          | -13         | V            |
| 5640.6          | -46.57     | 8.3       | 10.5     | -44.37          | -13         | V            |
| 7519.2          | -43.51     | 9.7       | 14.6     | -38.61          | -13         | V            |
| 9399.6          | -38.44     | 10.7      | 18.6     | -30.54          | -13         | V            |
| 13160.4         | -33.48     | 13.0      | 21.8     | -24.68          | -13         | V            |
| 15039.6         | -46.62     | 14.4      | 24.4     | -36.62          | -13         | V            |

#### GSM Mode Channel 661

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3759.6          | -43.92     | 6.6       | 7.7      | -42.82          | -13         | H            |
| 5640.6          | -46.85     | 8.3       | 10.5     | -44.65          | -13         | V            |
| 7520.4          | -42.67     | 9.7       | 14.6     | -37.77          | -13         | V            |
| 9399.6          | -41.68     | 10.7      | 18.6     | -33.78          | -13         | V            |
| 11278.8         | -45.06     | 12.1      | 18.5     | -38.66          | -13         | V            |
| 13160.4         | -34.02     | 13.0      | 21.8     | -25.22          | -13         | V            |

**GSM Mode Channel 810****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3760.2          | -44.18     | 6.6       | 7.7      | -43.08          | -13         | H            |
| 5640.6          | -47.17     | 8.3       | 10.5     | -44.97          | -13         | V            |
| 7519.2          | -43.28     | 9.7       | 14.6     | -38.38          | -13         | V            |
| 9399.6          | -41.49     | 10.7      | 18.6     | -33.59          | -13         | V            |
| 11280.0         | -44.76     | 12.1      | 18.5     | -38.36          | -13         | V            |
| 13160.4         | -33.23     | 13.0      | 21.8     | -24.43          | -13         | V            |

**Conclusion: PASS****Note: the EUT was displayed in several different direction, the worst cases were shown.****GPRS Mode Channel 512****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3700.8          | -44.9      | 6.6       | 7.7      | -43.8           | -13         | V            |
| 5551.2          | -47.07     | 8.2       | 9.5      | -45.77          | -13         | V            |
| 7401.6          | -44.81     | 9.7       | 14.6     | -39.91          | -13         | V            |
| 9250.8          | -42.31     | 10.6      | 18.5     | -34.41          | -13         | V            |
| 11101.2         | -45.72     | 12.1      | 18.1     | -39.72          | -13         | V            |
| 12951.6         | -32.29     | 13.2      | 20.2     | -25.29          | -13         | V            |

**GPRS Mode Channel 661****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3760.2          | -45.12     | 6.6       | 7.7      | -44.02          | -13         | V            |
| 5641.2          | -48.43     | 8.3       | 10.5     | -46.23          | -13         | V            |
| 7519.2          | -42.6      | 9.7       | 14.6     | -37.7           | -13         | V            |
| 9399.6          | -41.26     | 10.7      | 18.6     | -33.36          | -13         | V            |
| 13159.2         | -34.37     | 13.0      | 21.8     | -25.57          | -13         | V            |
| 15039.6         | -45.59     | 14.4      | 24.4     | -35.59          | -13         | V            |

#### GPRS Mode Channel 810

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3820.2          | -42.24     | 6.7       | 7.7      | -41.24          | -13         | V            |
| 5730.6          | -51.15     | 8.5       | 10.5     | -49.15          | -13         | V            |
| 7638.0          | -47.93     | 9.7       | 15.3     | -42.33          | -13         | V            |
| 9548.4          | -38.72     | 10.7      | 18.6     | -30.82          | -13         | V            |
| 13368.0         | -32.56     | 13.7      | 21.8     | -24.46          | -13         | V            |
| 16012.8         | -41.87     | 15.0      | 20.4     | -36.47          | -13         | H            |

Conclusion: PASS

Note: the EUT was displayed in several different direction, the worst cases were shown.

#### EGPRS Mode Channel 512

Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|

|         |        |      |      |        |     |   |
|---------|--------|------|------|--------|-----|---|
| 3700.2  | -45.8  | 6.6  | 7.7  | -44.7  | -13 | V |
| 5551.2  | -48.14 | 8.2  | 9.5  | -46.84 | -13 | V |
| 7400.4  | -43.21 | 9.7  | 14.6 | -38.31 | -13 | V |
| 9250.8  | -37.95 | 10.6 | 18.5 | -30.05 | -13 | V |
| 12951.6 | -32.79 | 13.2 | 20.2 | -25.79 | -13 | V |
| 14800.8 | -38.92 | 14.3 | 23.3 | -29.92 | -13 | V |

#### EGPRS Mode Channel 661

##### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3759.6          | -43.44     | 6.6       | 7.7      | -42.34          | -13         | H            |
| 5640.6          | -45.99     | 8.3       | 10.5     | -43.79          | -13         | V            |
| 7519.2          | -42.4      | 9.7       | 14.6     | -37.5           | -13         | V            |
| 9399.6          | -39.99     | 10.7      | 18.6     | -32.09          | -13         | V            |
| 11280.0         | -44.73     | 12.1      | 18.5     | -38.33          | -13         | V            |
| 13159.2         | -33.38     | 13.0      | 21.8     | -24.58          | -13         | V            |

#### EGPRS Mode Channel 810

##### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3819.0          | -42.94     | 6.7       | 7.7      | -41.94          | -13         | V            |
| 5729.4          | -46.13     | 8.5       | 10.5     | -44.13          | -13         | V            |

|         |        |      |      |        |     |   |
|---------|--------|------|------|--------|-----|---|
| 7639.2  | -47.97 | 9.7  | 15.3 | -42.37 | -13 | V |
| 9548.4  | -38.46 | 10.7 | 18.6 | -30.56 | -13 | V |
| 11458.8 | -42.36 | 12.3 | 18.1 | -36.56 | -13 | V |
| 13369.2 | -32.92 | 13.7 | 21.8 | -24.82 | -13 | V |

**Conclusion: PASS**

**Note: the EUT was displayed in several different direction, the worst cases were shown.**

### A.8.3 WCDMA Measurement Method

The measurements procedures in TIA-603E-2016 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917.

The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band V.

**The procedure of radiated spurious emissions is the same like GSM.**

#### A.8.3.1 Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### A.8.3.2 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band V (826.4MHz, 836.6MHz and 846.6MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

#### A.8.3.3 Measurement Results Table

| Frequency | Channel | Frequency Range | Result |
|-----------|---------|-----------------|--------|
|-----------|---------|-----------------|--------|

|                      |        |             |   |
|----------------------|--------|-------------|---|
| <b>WCDMA Band II</b> | Low    | 30MHz~20GHz | P |
|                      | Middle | 30MHz~20GHz | P |
|                      | High   | 30MHz~20GHz | P |
| <b>WCDMA Band V</b>  | Low    | 30MHz~20GHz | P |
|                      | Middle | 30MHz~20GHz | P |
|                      | High   | 30MHz~20GHz | P |

### WCDMA BAND II Mode Channel 9262

#### Final result:

| Frequency<br>(MHz) | PMea<br>(dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP<br>(dBm) | Limit<br>(dBm) | Polarization |
|--------------------|---------------|-----------|----------|--------------------|----------------|--------------|
| 3750.4             | -60.54        | 6.6       | 7.7      | -59.44             | -13            | H            |
| 5526.0             | -60.42        | 8.2       | 9.5      | -59.12             | -13            | H            |
| 7409.6             | -58.6         | 9.7       | 14.6     | -53.7              | -13            | V            |
| 9212.8             | -61.58        | 10.5      | 18.5     | -53.58             | -13            | V            |
| 10820.8            | -57.05        | 11.7      | 17.3     | -51.45             | -13            | H            |
| 12571.8            | -54.15        | 12.8      | 18.7     | -48.25             | -13            | V            |

### WCDMA BAND II Mode Channel 9400

#### Final result:

| Frequency<br>(MHz) | PMea<br>(dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP<br>(dBm) | Limit<br>(dBm) | Polarization |
|--------------------|---------------|-----------|----------|--------------------|----------------|--------------|
| 3746.8             | -60.79        | 6.6       | 7.7      | -59.69             | -13            | H            |
| 5687.6             | -61.55        | 8.5       | 10.5     | -59.55             | -13            | H            |
| 7520.0             | -56.05        | 9.7       | 14.6     | -51.15             | -13            | V            |
| 9492.0             | -61.57        | 10.7      | 18.6     | -53.67             | -13            | H            |

|         |        |      |      |        |     |   |
|---------|--------|------|------|--------|-----|---|
| 11245.0 | -57.45 | 12.1 | 18.5 | -51.05 | -13 | V |
| 13104.9 | -57.68 | 13.0 | 20.2 | -50.48 | -13 | H |

### WCDMA BAND II Mode Channel 9538

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 3799.2          | -61.05     | 6.7       | 7.7      | -60.05          | -13         | H            |
| 5399.2          | -60.53     | 8.1       | 9.5      | -59.13          | -13         | H            |
| 7340.4          | -60.61     | 9.6       | 13.7     | -56.51          | -13         | V            |
| 9621.2          | -61.14     | 10.8      | 18.6     | -53.34          | -13         | H            |
| 11625.4         | -55.58     | 12.2      | 17.6     | -50.18          | -13         | V            |
| 14002.6         | -59.25     | 13.7      | 24.6     | -48.35          | -13         | V            |

### WCDMA BAND V Mode Channel 4132

#### Final result:

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1863.2          | -51.24     | 4.6       | 2.9      | -52.94          | -13         | H            |
| 2692.3          | -49.13     | 5.6       | 4.1      | -50.63          | -13         | V            |
| 3702.4          | -61.95     | 6.6       | 7.7      | -60.85          | -13         | H            |
| 4470.4          | -59.95     | 7.3       | 7.3      | -59.95          | -13         | V            |
| 5432.8          | -60.81     | 8.1       | 9.5      | -59.41          | -13         | H            |

|        |        |     |      |        |     |   |
|--------|--------|-----|------|--------|-----|---|
| 6611.2 | -58.45 | 9.1 | 11.5 | -56.05 | -13 | V |
|--------|--------|-----|------|--------|-----|---|

**WCDMA BAND V Mode Channel 4183****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1866.8          | -51.43     | 4.6       | 2.9      | -53.13          | -13         | H            |
| 2694.6          | -49.06     | 5.6       | 4.1      | -50.56          | -13         | H            |
| 3727.6          | -61.1      | 6.6       | 7.7      | -60             | -13         | V            |
| 4542.0          | -59.08     | 7.4       | 7.3      | -59.18          | -13         | H            |
| 5421.6          | -60.65     | 8.1       | 9.5      | -59.25          | -13         | H            |
| 6693.2          | -56.99     | 9.1       | 12.3     | -53.79          | -13         | V            |

**WCDMA BAND V Mode Channel 4233****Final result:**

| Frequency (MHz) | PMea (dBm) | Pcl (dBm) | Ga (dBi) | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|-----------------|------------|-----------|----------|-----------------|-------------|--------------|
| 1934.6          | -53.26     | 4.7       | 2.8      | -55.16          | -13         | V            |
| 2732.7          | -49.56     | 5.7       | 4.1      | -51.16          | -13         | H            |
| 3640.4          | -62.6      | 6.6       | 7.7      | -61.5           | -13         | V            |
| 4656.0          | -59.57     | 7.5       | 7.9      | -59.17          | -13         | V            |
| 5492.0          | -60.48     | 8.2       | 9.5      | -59.18          | -13         | V            |
| 6773.2          | -57.82     | 9.2       | 12.3     | -54.72          | -13         | V            |

**Conclusion: PASS**

**Note: the EUT was displayed in several different direction, the worst cases were shown.**

## ANNEX B. Accreditation Certificate



\*\*\*\*\*End of the Report\*\*\*\*\*