# TEST REPORT

## No. I22N00716-RF-GSM

for

**HMD Global Oy.**

**Smart Phone**

**Model Name: TA-1413**

**FCC ID: 2AJOTTA-1413**

**with**

**Hardware Version: V01**

**Software Version: 00WW_0_017**

**Issued Date: 2022-04-24**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

**Test Laboratory:**

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# REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I22N00716-RF-GSM | Rev.0 | 1st edition | 2022-04-24 |

# CONTENTS

# 1. SUMMARY OF TEST REPORT

## 1.1. Test Items

| | |
|---|---|
| Description | Smart Phone |
| Model Name | TA-1413 |
| Applicant's name | HMD Global Oy. |
| Manufacturer's Name | HMD Global Oy. |

## 1.2. Test Standards

| | |
|---|---|
| FCC Part 2/22/24 | 10-1-19 Edition |
| ANSI C63.26 | 2015 |
| KDB971168 D01 | v03r01 |

## 1.3. Test Result

All test items are passed. Please refer to "6 Summary of Test Results" for detail.

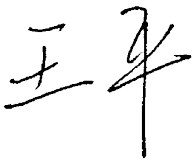
## 1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000

## 1.5. Project Data

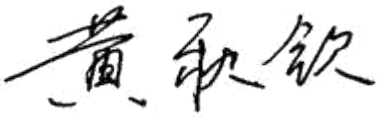
Testing Start Date: 2022-03-21 Testing End Date: 2022-04-24

## 1.6. Signature



**Wang Ping**

**(Prepared this test report)**



**Huang Qiuqin**

**(Reviewed this test report)**

**Zhang Hao**

**(Approved this test report)**

# 2. CLIENT INFORMATION

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | HMD Global Oy. |
| Address /Post: | Bertel Jungin aukio 9, 02600 Espoo, Finland |
| Contact Person: | Reza Serafat |
| Contact Email | reza.serafat@hmdglobal.com |
| Telephone: | +393 31 6272922 |
| Fax: | / |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | HMD Global Oy. |
| Address /Post: | Bertel Jungin aukio 9, 02600 Espoo, Finland |
| Contact Person: | Reza Serafat |
| Contact Email | reza.serafat@hmdglobal.com |
| Telephone: | +393 31 6272922 |
| Fax: | / |

# 3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE)

## 3.1. About EUT

| | |
|---|---|
| Description | Smart Phone |
| Model Name | TA-1413 |
| FCC ID | 2AJOTTA-1413 |
| Frequency Bands | GSM850; GSM1900 |
| Antenna | Integrated |
| Extreme vol. Limits | 3.60V to 4.35V (nominal: 3.80V) |
| Condition of EUT as received | No abnormality in appearance |

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of SAICT.

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

| EUT ID* | IMEI | HW Version | SW Version | Sample Arrival Date |
|---|---|---|---|---|
| UT09aa | 355400570002629 | V01 | 00WW_0_017 | 2022-03-21 |
| UT01aa | 355400570002843 | V01 | 00WW_0_017 | 2022-03-21 |

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

UT01aa is used for conduction test, UT09aa is used for radiation test.

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

| AE ID* | Description |
|---|---|
| AE1 | Battery |

AE1

| | |
|---|---|
| Model | GH6581 |
| Manufacturer | Shenzhen Aerospace Electronic CO.,Ltd. |
| Capacity | 4850mAh |
| Nominal Voltage | 3.85v |

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

## 3.4. General Description

The Equipment Under Test (EUT) is a model Smart Phone with integrated antenna. It consists of normal options: Battery, Charger USB Cable and headset. Manual and specifications of the EUT were provided to fulfill the test. Samples undergoing test were selected by the Client.

# 4. REFERENCE DOCUMENTS

## 4.1. Reference Documents for testing

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

| Reference | Title | Version |
|---|---|---|
| FCC Part 22 | PUBLIC MOBILE SERVICES | 10-1-19 Edition |
| FCC Part 2 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS | 10-1-19 Edition |
| FCC Part 24 | PERSONAL COMMUNICATIONS SERVICES | 10-1-19 Edition |
| ANSI C63.26 | American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services | 2015 |
| KDB971168 D01 | Power Meas License Digital Systems | v03r01 |

# 5. LABORATORY ENVIRONMENT

**Shielded room** did not exceed following limits along the RF testing:

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 35 ˚C |
| Relative humidity | Min. = 20 %, Max. = 75 % |
| Shielding effectiveness | 0.014MHz-1MHz>60 dB; 1MHz-18000MHz>90 dB |
| Electrical insulation | >2 MΩ |
| Ground system resistance | < 4 Ω |

**Fully-anechoic chamber** did not exceed following limits along the EMC testing

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 35 ˚C |
| Relative humidity | Min. = 20 %, Max. = 75 % |
| Shielding effectiveness | 0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB |
| Electrical insulation | > 2MΩ |
| Ground system resistance | < 4 Ω |
| Voltage Standing Wave Ratio （VSWR） | ≤ 6 dB, from 1 to 18 GHz，3 m distance |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 6000 MHz |

# 6. SUMMARY OF TEST RESULTS

| Abbreviations used in this clause: | | |
|---|---|---|
| Verdict Column | P | Pass |
| | F | Fail |
| | NA | Not applicable |
| | NM | Not measured |
| Location Column | A/B/C/D | The test is performed in test location A, B, C or D which are described in section 1.1 of this report |

**GSM850**

| Items | List | Clause in FCC rules | Section in this report | Verdict |
|---|---|---|---|---|
| 1 | Output Power | 2.1046/22.913 | A.1 | P |
| 2 | Field Strength of Spurious Radiation | 2.1053/22.917 | A.2 | P |
| 3 | Frequency Stability | 2.1055/22.355 | A.3 | P |
| 4 | Occupied Bandwidth | 2.1049/22.917 | A.4 | P |
| 5 | Emission Bandwidth | 2.1049/22.917 | A.5 | P |
| 6 | Band Edge Compliance | 2.1051/22.917 | A.6 | P |
| 7 | Conducted Spurious Emission | 2.1051/22.917 | A.7 | P |
| 8 | Peak-to-Average Power Ratio | KDB971168 D01 | A.8 | P |

**PCS1900**

| Items | List | Clause in FCC rules | Section in this report | Verdict |
|---|---|---|---|---|
| 1 | Output Power | 2.1046/24.232 | A.1 | P |
| 2 | Field Strength of Spurious Radiation | 2.1053/24.238 | A.2 | P |
| 3 | Frequency Stability | 2.1055/24.235 | A.3 | P |
| 4 | Occupied Bandwidth | 2.1049/24.238 | A.4 | P |
| 5 | Emission Bandwidth | 2.1049/24.238 | A.5 | P |
| 6 | Band Edge Compliance | 2.1051/24.238 | A.6 | P |
| 7 | Conducted Spurious Emission | 2.1051/24.238 | A.7 | P |
| 8 | Peak-to-Average Power Ratio | 24.232/KDB971168 D01 | A.8 | P |

## 7. STATEMENT

Since the information of samples in this report is provided by the client, the laboratory is not respo nsible for the authenticity of sample information.
This report takes measured values as criterion of test conclusion. The test conlusion meets the li mit requirements.

## 8. TEST EQUIPMENTS UTILIZED

| NO. | Description | TYPE | Manufacture | series number | CAL DUE DATE |
|---|---|---|---|---|---|
| 1 | Test Receiver | ESR7 | R&S | 101676 | 2022-11-24 |
| 2 | BiLog Antenna | 3142E | ETS-Lindgren | 0224831 | 2024-05-27 |
| 3 | Horn Antenna | 3117 | ETS-Lindgren | 00066577 | 2023-04-02 |
| 4 | Horn Antenna | QSH-SL-18 -26-S-20 | Q-par | 17013 | 2023-01-06 |
| 5 | Antenna | BBHA 9120D | Schwarzbeck | 1593 | 2022-12-05 |
| 6 | Antenna | VUBA 9117 | Schwarzbeck | 207 | 2023-07-15 |
| 7 | Antenna | QWH-SL-18 -40-K-SG | Q-par | 15979 | 2023-01-06 |
| 8 | preamplifier | 83017A | Agilent | MY39501110 | / |
| 9 | Signal Generator | SMB100A | R&S | 179725 | 2022-11-24 |
| 10 | Fully Anechoic Chamber | FACT3-2.0 | ETS-Lindgren | 1285 | 2023-05-29 |
| 11 | Spectrum Analyzer | FSV40 | R&S | 101192 | 2023-01-12 |
| 12 | Universal Radio Communication Tester | CMW500 | R&S | 152499 | 2022-07-15 |
| 13 | Universal Radio Communication Tester | CMW500 | R&S | 129146 | 2023-04-24 |
| 14 | Spectrum Analyzer | FSW | R&S | 102197 | 2022.11.24 |
| 15 | Temperature Chamber | SH-241 | ESPEC | 92007516 | 2022-10-15 |
| 16 | DC Power Supply | U3606A | Agilent Technologies | MY50450012 | 2022-11-13 |

**Test software**

| Item | Name | Vesion |
|---|---|---|
| Radiated | EMC32 | V10.50.40 |

# ANNEX A: MEASUREMENT RESULTS

## A.1 OUTPUT POWER

**Reference**

FCC: CFR Part 2.1046, 22.913, 24.232.

**A.1.1 Summary**

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.

This result contains max 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**

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

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).

**GSM850**

| | Power step | Nominal Peak output power (dBm) |
|---|---|---|
| GSM | 5 | 33dBm(2W) |
| GPRS | 3 | 33dBm(2W) |
| EGPRS | 6 | 27dBm(0.5W) |

**Measurement result**

**GSM(GMSK)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 824.2 | 5 | 31.96 |
| 836.6 | 5 | 31.99 |
| 848.8 | 5 | 31.92 |

**GPRS(GMSK,1Slot)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 824.2 | 3 | 31.92 |
| 836.6 | 3 | 31.99 |
| 848.8 | 3 | 31.90 |

**EGPRS(8PSK,1Slot)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 824.2 | 6 | 25.63 |
| 836.6 | 6 | 25.87 |
| 848.8 | 6 | 25.93 |

Note: Expanded measurement uncertainty is $U$ = 0.49dB, $k$ = 1.96

**PCS1900**

| | Power step | Nominal Peak output power (dBm) |
|---|---|---|
| GSM | 0 | 30dBm(1W) |
| GPRS | 3 | 30dBm(1W) |
| EGPRS | 5 | 26dBm(0.4W) |

**Measurement result**

**GSM(GMSK)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 1850.2 | 0 | 29.35 |
| 1880.0 | 0 | 29.28 |
| 1909.8 | 0 | 29.17 |

**GPRS(GMSK,1Slot)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 1850.2 | 3 | 29.30 |
| 1880.0 | 3 | 29.22 |
| 1909.8 | 3 | 29.15 |

**EGPRS(8PSK,1Slot)**

| Frequency(MHz) | Power Step | Output power(dBm) |
|---|---|---|
| 1850.2 | 5 | 25.65 |
| 1880.0 | 5 | 23.38 |
| 1909.8 | 5 | 25.78 |

Note: Expanded measurement uncertainty is $U$ = 0.49dB, $k$ = 1.96

**A.1.3 Radiated**

**A.1.3.1 Description**

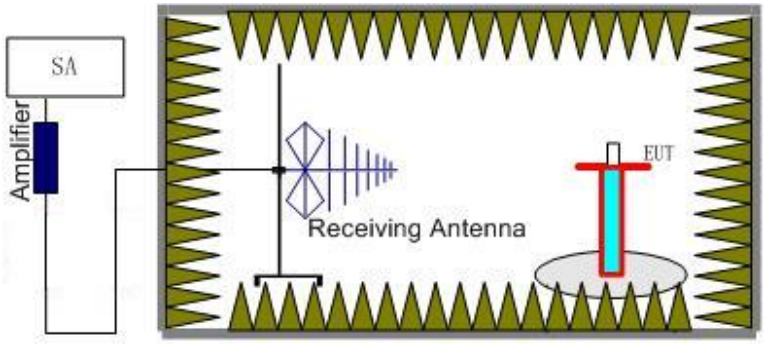
This is the test for the maximum radiated power from the EUT.

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."

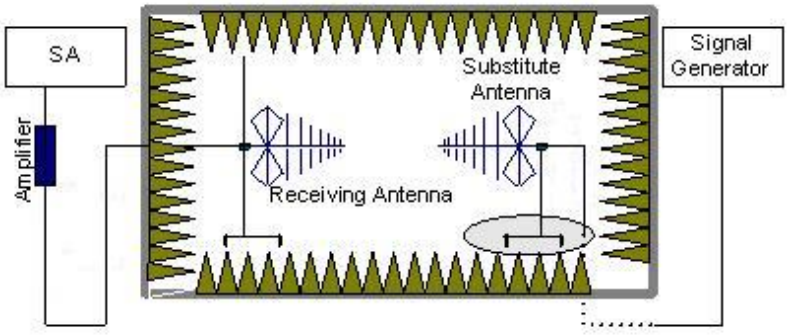
Rule Part 22.913(a) specifies " The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

**A.1.3.2 Method of Measurement**

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, a 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(dBi) ($G_a$) and the Amplifier Gain ($P_{Ag}$) should be recorded after test.
   The measurement results are obtained as described below:
   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 -2.15dB.

**GSM 850-ERP 22.913(a)**

**Limits**

| | Power Step | Burst Peak ERP (dBm) |
|---|---|---|
| GSM | 5 | ≤38.45dBm (7W) |
| GPRS | 3 | ≤38.45dBm (7W) |
| EGPRS | 6 | ≤38.45dBm (7W) |

**Measurement result**

**GSM**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | Correction (dB) | ERP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|---|
| 824.20 | -2.50 | -33.60 | -0.79 | 2.15 | 28.15 | 38.45 | V |
| 836.60 | -2.13 | -33.50 | -0.74 | 2.15 | 28.49 | 38.45 | V |
| **848.80** | **-2.07** | **-33.50** | **-0.73** | **2.15** | **28.55** | **38.45** | **V** |

**GPRS**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | Correction (dB) | ERP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|---|
| 824.20 | -4.02 | -33.60 | -0.79 | 2.15 | 26.64 | 38.45 | V |
| 836.60 | -3.76 | -33.50 | -0.74 | 2.15 | 26.85 | 38.45 | V |
| 848.80 | -3.84 | -33.50 | -0.73 | 2.15 | 26.78 | 38.45 | V |

**EGPRS-8PSK**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | Correction (dB) | ERP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|---|
| 824.20 | -8.69 | -33.60 | -0.79 | 2.15 | 21.97 | 38.45 | V |
| 836.60 | -8.55 | -33.50 | -0.74 | 2.15 | 22.06 | 38.45 | V |
| 848.80 | -8.47 | -33.50 | -0.73 | 2.15 | 22.15 | 38.45 | V |

Frequency: 848.80 MHz

Peak ERP(dBm)=PMea(-2.07dBm)-( Pcl+PAg)(-33.50VdB)+Ga(-0.73dB)-2.15dB=28.55dBm

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

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.87dB(30MHz-3GHz)/3.35dB(3GHz-18GHz)/2.68dB(18GHz-40GHz), k = 2

**Note: Both of Vertical and Horizontal polarizations are evaluated, but only the worst case is recorded in this report.**

**PCS1900-EIRP 24.232(c)**

**Limits**

| | Power Step | Burst Peak EIRP (dBm) |
|---|---|---|
| GSM | 0 | ≤33dBm (2W) |
| GPRS | 3 | ≤33dBm (2W) |
| EGPRS | 5 | ≤33dBm (2W) |

**Measurement result**

**GSM**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | EIRP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|
| 1850.20 | -9.38 | -29.30 | 8.10 | 28.02 | 33.00 | H |
| 1880.00 | -9.10 | -29.40 | 8.10 | 28.40 | 33.00 | H |
| **1909.80** | **-8.94** | **-29.30** | **8.10** | **28.46** | **33.00** | **H** |

**GPRS**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | EIRP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|
| 1850.20 | -11.10 | -29.40 | 8.10 | 26.40 | 33.00 | H |
| 1880.00 | -10.89 | -29.30 | 8.10 | 26.51 | 33.00 | H |
| 1909.80 | -10.86 | -29.30 | 8.10 | 26.54 | 33.00 | H |

**EGPRS-8PSK**

| Frequency(MHz) | $P_{Mea}$(dBm) | $P_{cl}$(dB)+ $P_{Ag}$(dB) | Ga Antenna Gain(dBi) | EIRP(dBm) | Limit(dBm) | Polarization |
|---|---|---|---|---|---|---|
| 1850.20 | -15.23 | -29.40 | 8.10 | 22.28 | 33.00 | H |
| 1880.00 | -15.01 | -29.30 | 8.10 | 22.40 | 33.00 | H |
| 1909.80 | -15.02 | -29.30 | 8.10 | 22.38 | 33.00 | H |

Frequency: 1909.80MHz

Peak EIRP(dBm)= PMea(-8.94dBm) –(Pcl+PAg)(-29.30dB)+Ga (8.10dB) =28.46dBm

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

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.87dB(30MHz-3GHz)/3.35dB(3GHz-18GHz)/2.68dB(18GHz-40GHz), k = 2

**Note: Both of Vertical and Horizontal polarizations are evaluated, but only the worst case is recorded in this report.**

## A.2 FIELD STRENGTH OF SPURIOUS RADIATION

**Reference**

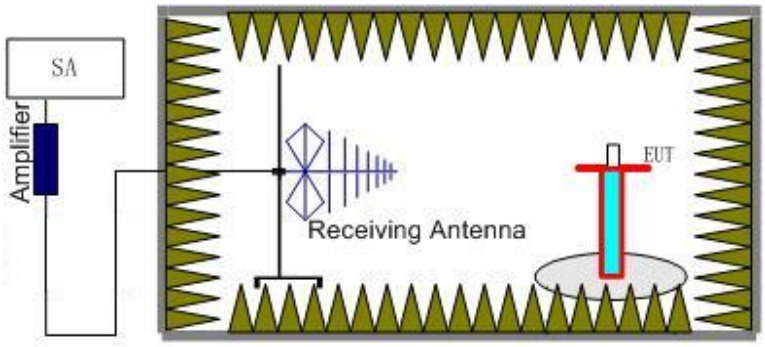
FCC: CFR 2.1053, 22.917, 24.238.

**A.2.1 Measurement Method**

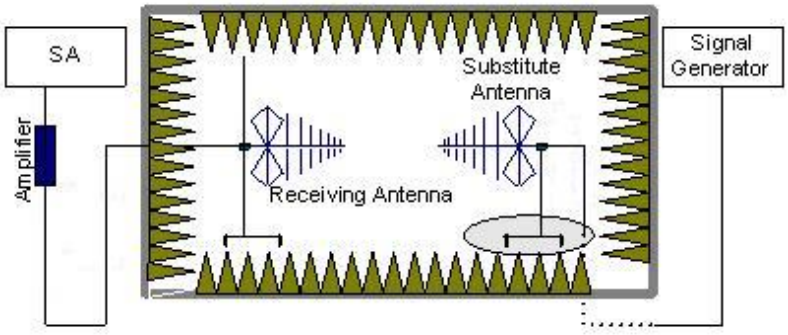
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

**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 10th 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 (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. The Path loss ($P_{pl}$) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain(dBi) ($G_a$) 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 and the gain of the amplifier.
   The measurement results are obtained as described below:
   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 -2.15dB.

**A.2.2 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.2.3 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.2.4 Measurement Results Table

| Frequency | Channel | Frequency Range | Result |
|---|---|---|---|
| GSM 850MHz | Low | 30MHz-10GHz | Pass |
| | Middle | 30MHz-10GHz | Pass |
| | High | 30MHz-10GHz | Pass |
| GSM 1900MHz | Low | 30MHz-20GHz | Pass |
| | Middle | 30MHz-20GHz | Pass |
| | High | 30MHz-20GHz | Pass |

### A.2.5 Sweep Table

| Working Frequency | Subrange (GHz) | RBW | VBW | Sweep time (s) |
|---|---|---|---|---|
| 850MHz | 0.03~1 | 100KHz | 300KHz | 10 |
| | 1-2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~10 | 1 MHz | 3 MHz | 3 |
| 1900MHz | 0.03~1 | 100KHz | 300KHz | 10 |
| | 1-2 | 1 MHz | 3 MHz | 2 |
| | 2~5 | 1 MHz | 3 MHz | 3 |
| | 5~8 | 1 MHz | 3 MHz | 3 |
| | 8~11 | 1 MHz | 3 MHz | 3 |
| | 11~14 | 1 MHz | 3 MHz | 3 |
| | 14~18 | 1 MHz | 3 MHz | 3 |
| | 18~20 | 1 MHz | 3 MHz | 2 |

**GSM Mode Channel 128/824.2MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak ERP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 7326.00 | -49.00 | 1.70 | 12.00 | -40.85 | -13.00 | V |
| 8478.00 | -48.49 | 1.80 | 11.30 | -41.14 | -13.00 | H |
| 9101.50 | -47.62 | 2.20 | 11.60 | -40.37 | -13.00 | H |
| 9232.50 | -47.01 | 2.10 | 11.60 | -39.66 | -13.00 | H |
| 9472.50 | -47.74 | 2.10 | 11.60 | -40.39 | -13.00 | V |
| 9738.50 | -47.77 | 2.20 | 11.20 | -40.92 | -13.00 | H |

**GSM Mode Channel 190/836.6MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak ERP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 8424.00 | -48.48 | 1.80 | 11.30 | -41.13 | -13.00 | H |
| 9098.50 | -48.15 | 2.20 | 11.60 | -40.90 | -13.00 | H |
| 9295.00 | -47.31 | 2.00 | 11.60 | -39.86 | -13.00 | H |
| 9475.00 | -48.12 | 2.10 | 11.60 | -40.77 | -13.00 | V |
| 9751.00 | -48.04 | 2.20 | 11.20 | -41.19 | -13.00 | H |
| 9797.00 | -47.47 | 2.30 | 11.20 | -40.72 | -13.00 | H |

**GSM Mode Channel 251/848.8MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak ERP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 8521.50 | -48.76 | 2.10 | 12.00 | -41.01 | -13.00 | H |
| 9109.50 | -47.57 | 2.10 | 11.60 | -40.22 | -13.00 | H |
| 9301.00 | -47.64 | 2.00 | 11.60 | -40.19 | -13.00 | H |
| 9478.50 | -48.08 | 2.10 | 11.60 | -40.73 | -13.00 | V |
| 9701.50 | -47.58 | 2.20 | 11.20 | -40.73 | -13.00 | H |
| 9798.00 | -47.52 | 2.30 | 11.20 | -40.77 | -13.00 | H |

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.87dB(30MHz-3GHz)/3.35dB(3GHz-18GHz)/2.68dB(18GHz-40GHz), k = 2

**GSM Mode Channel 512/1850.2MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 16938.00 | -41.77 | 2.90 | 16.50 | -28.17 | -13.00 | H |
| 17170.50 | -40.52 | 2.90 | 14.50 | -28.92 | -13.00 | H |
| 17460.00 | -39.15 | 2.90 | 14.50 | -27.55 | -13.00 | H |
| 17592.00 | -36.57 | 3.30 | 12.80 | -27.07 | -13.00 | H |
| 17772.00 | -37.13 | 3.60 | 12.80 | -27.93 | -13.00 | H |
| 17985.00 | -35.35 | 3.20 | 12.80 | -25.75 | -13.00 | H |

**GSM Mode Channel 661/1880.0MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 16965.00 | -42.22 | 2.90 | 16.50 | -28.62 | -13.00 | H |
| 17364.00 | -39.74 | 3.20 | 14.50 | -28.44 | -13.00 | H |
| 17524.50 | -36.97 | 2.90 | 12.80 | -27.07 | -13.00 | H |
| 17595.00 | -36.10 | 3.30 | 12.80 | -26.60 | -13.00 | H |
| 17838.00 | -37.04 | 3.60 | 12.80 | -27.84 | -13.00 | H |
| 17976.00 | -34.21 | 3.20 | 12.80 | -24.61 | -13.00 | H |

**GSM Mode Channel 810/1909.8MHz**

| Frequency(MHz) | $P_{Mea}$(dBm) | Path loss | Antenna Gain(dBi) | Peak EIRP(dBm) | Limit （dBm） | Polarization |
|---|---|---|---|---|---|---|
| 16984.50 | -41.86 | 2.90 | 16.50 | -28.26 | -13.00 | H |
| 17296.50 | -39.76 | 3.20 | 14.50 | -28.46 | -13.00 | H |
| 17500.50 | -37.31 | 2.90 | 12.80 | -27.41 | -13.00 | H |
| 17611.50 | -36.75 | 3.30 | 12.80 | -27.25 | -13.00 | H |
| 17800.50 | -37.76 | 3.60 | 12.80 | -28.56 | -13.00 | H |
| 17938.50 | -35.71 | 3.20 | 12.80 | -26.11 | -13.00 | H |

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.87dB(30MHz-3GHz)/3.35dB(3GHz-18GHz)/2.68dB(18GHz-40GHz), k = 2

## A.3 FREQUENCY STABILITY

**Reference**

FCC: CFR Part 2.1055, 22.355, 24.235.

**A.3.1 Method of Measurement**

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℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of PCS 1900 and GSM850, 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℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring 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℃.
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℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

**A.3.2 Measurement Limit**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. 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 3.60V and 4.35V, with a nominal voltage of 3.80V. 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 represent a tolerance from -5.56% and +12.6 %. For the purposes of measuring frequency stability these voltage limits are to be used.

### A.3.3 Measurement results

**GSM 850**

**Frequency Error vs Voltage**

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| 3.60 | 9 | 0.011 |
| 3.85 | 21 | 0.026 |
| 4.35 | -5 | 0.005 |

**Frequency Error vs Temperature**

| temperature(℃) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| -30 | 0 | 0.000 |
| -20 | -15 | 0.018 |
| -10 | 13 | 0.016 |
| 0 | -8 | 0.010 |
| 10 | 24 | 0.029 |
| 20 | -1 | 0.002 |
| 30 | -3 | 0.003 |
| 40 | 17 | 0.020 |
| 50 | -19 | 0.023 |

**EGPRS 850 - 8PSK**

**Frequency Error vs Voltage**

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| 3.60 | 13 | 0.016 |
| 3.85 | -18 | 0.022 |
| 4.35 | 4 | 0.005 |

**Frequency Error vs Temperature**

| temperature(℃) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| -30 | 11 | 0.013 |
| -20 | 15 | 0.018 |
| -10 | -8 | 0.010 |
| 0 | -3 | 0.003 |
| 10 | 15 | 0.018 |
| 20 | -16 | 0.019 |
| 30 | 16 | 0.019 |
| 40 | -4 | 0.004 |
| 50 | -18 | 0.021 |

Expanded measurement uncertainty is 10Hz, $k$ = 2

**PCS 1900**

**Frequency Error vs Voltage**

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| 3.60 | -17 | 0.009 |
| 3.85 | 6 | 0.003 |
| 4.35 | 27 | 0.014 |

**Frequency Error vs Temperature**

| temperature(℃) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| -30 | 5 | 0.003 |
| -20 | 7 | 0.003 |
| -10 | 15 | 0.008 |
| 0 | 10 | 0.005 |
| 10 | 15 | 0.008 |
| 20 | 22 | 0.012 |
| 30 | 15 | 0.008 |
| 40 | -2 | 0.001 |
| 50 | 7 | 0.004 |

**EGPRS 1900 - 8PSK**

**Frequency Error vs Voltage**

| Voltage(V) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| 3.60 | -19 | 0.010 |
| 3.85 | -5 | 0.003 |
| 4.35 | 15 | 0.008 |

**Frequency Error vs Temperature**

| temperature(℃) | Frequency error(Hz) | Frequency error(ppm) |
|---|---|---|
| -30 | -13 | 0.007 |
| -20 | 13 | 0.007 |
| -10 | 14 | 0.008 |
| 0 | 8 | 0.004 |
| 10 | -9 | 0.005 |
| 20 | 6 | 0.003 |
| 30 | 14 | 0.007 |
| 40 | 13 | 0.007 |
| 50 | 17 | 0.009 |

Expanded measurement uncertainty is 10Hz, $k$ = 2

## A.4 OCCUPIED BANDWIDTH

**Reference**

FCC: CFR Part 2.1049, 22.917, 24.238.

**A.4.1 Measurement Procedure**

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) Set the detection mode to peak, and the trace mode to max hold.

e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

**A.4.2 Occupied Bandwidth Results**

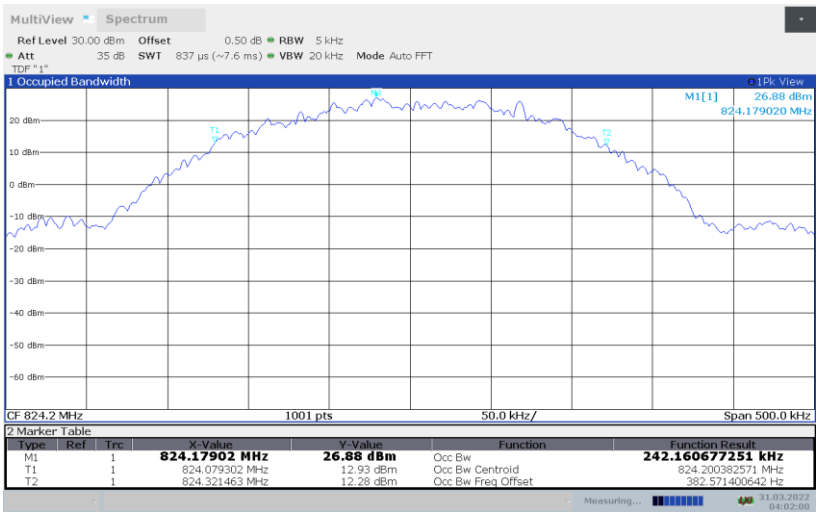
Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

**GSM 850(99% BW)**

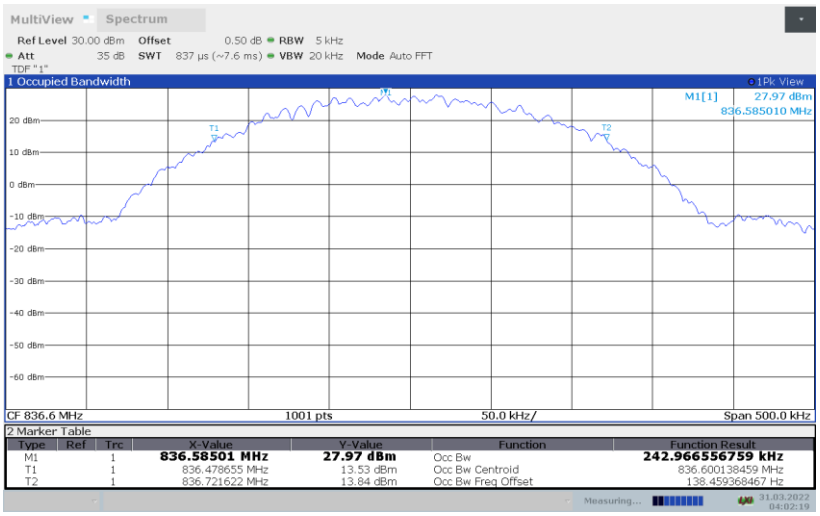
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 824.2 | 242.16 |
| 836.6 | 242.97 |
| 848.8 | 247.08 |

**GSM 850**

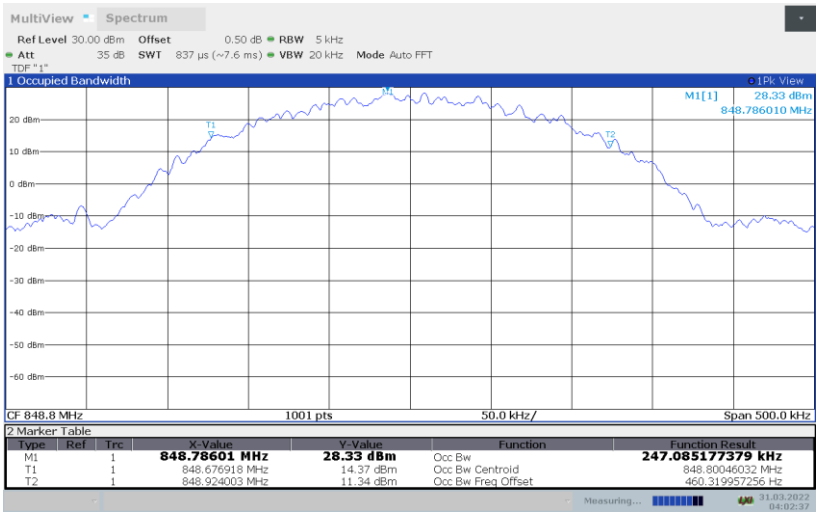
**Channel 128-Occupied Bandwidth (99% BW)**




**Channel 190-Occupied Bandwidth (99% BW)**



**Channel 251-Occupied Bandwidth (99% BW)**

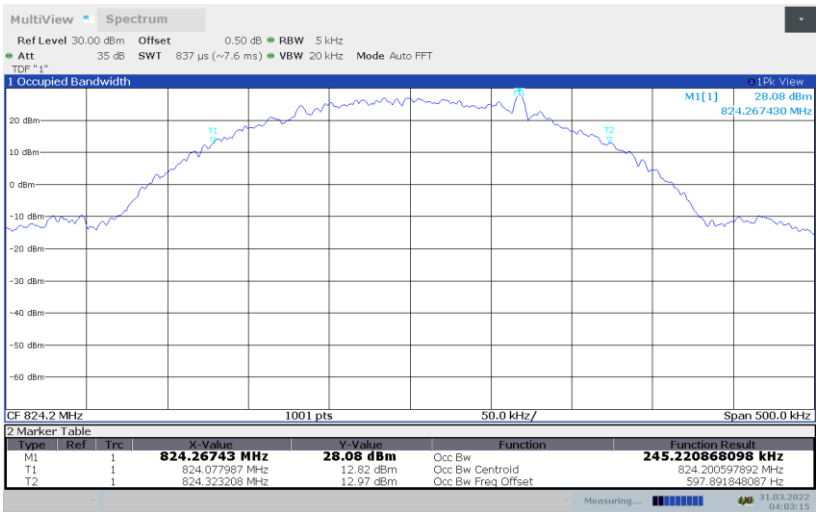


**GPRS 850(99% BW)**

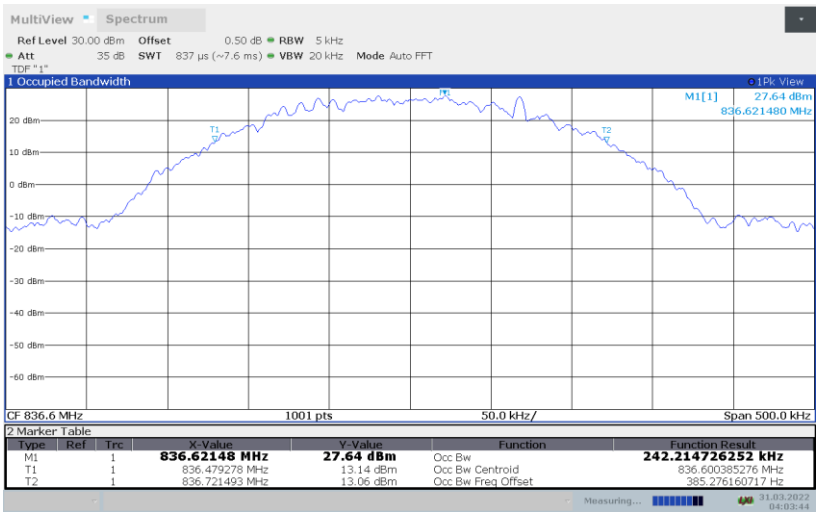
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 824.2 | 245.22 |
| 836.6 | 242.21 |
| 848.8 | 242.96 |

**GPRS 850**

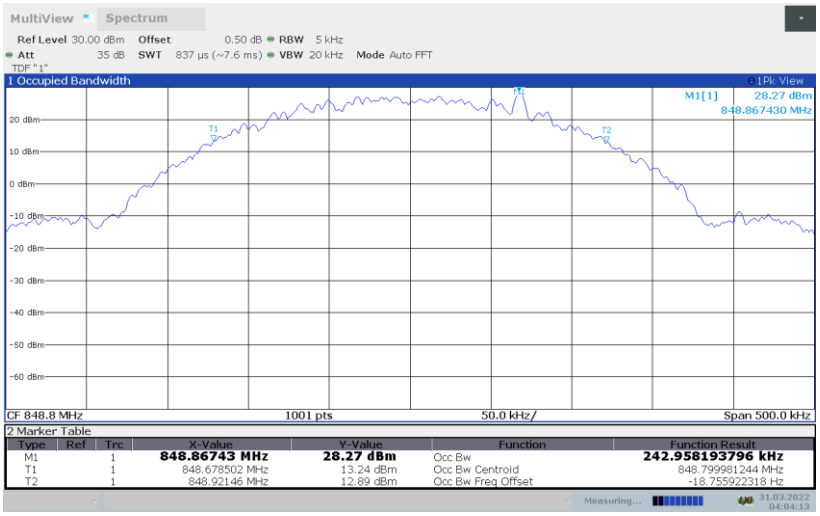
**Channel 128-Occupied Bandwidth (99% BW)**




**Channel 190-Occupied Bandwidth (99% BW)**



**Channel 251-Occupied Bandwidth (99% BW)**

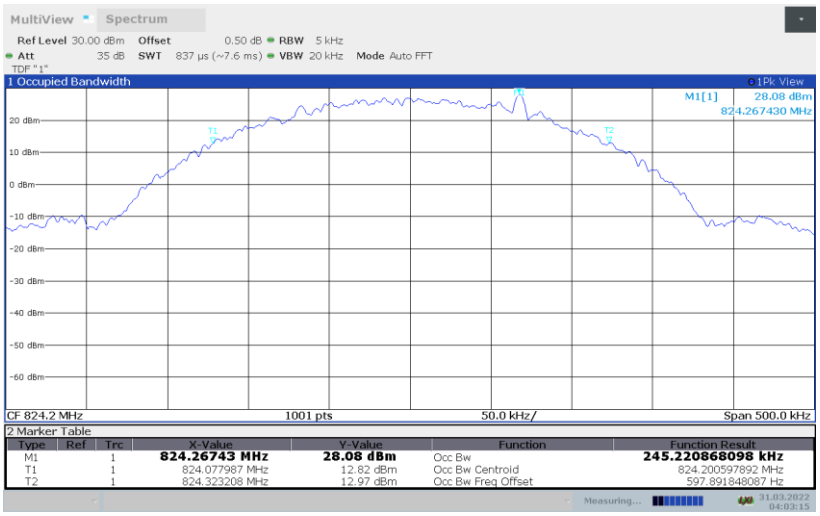


**EGPRS 850-8PSK(99% BW)**

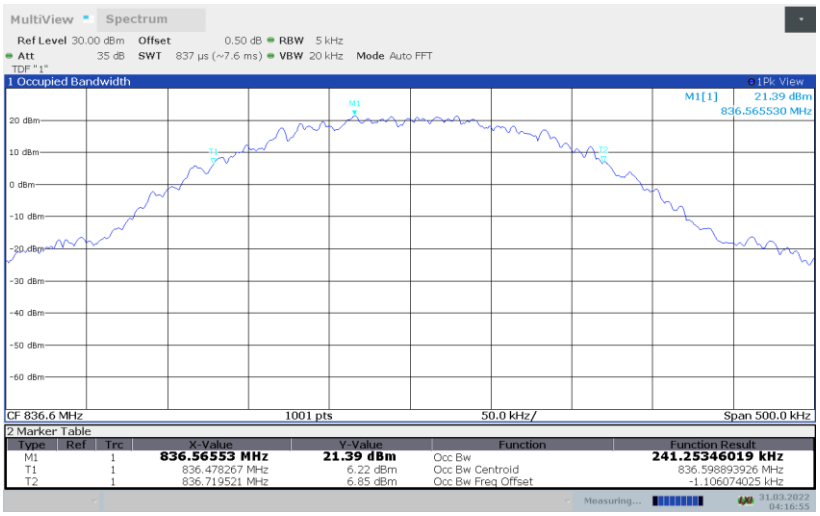
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 824.2 | 245.22 |
| 836.6 | 241.25 |
| 848.8 | 246.01 |

**EGPRS 850-8PSK**

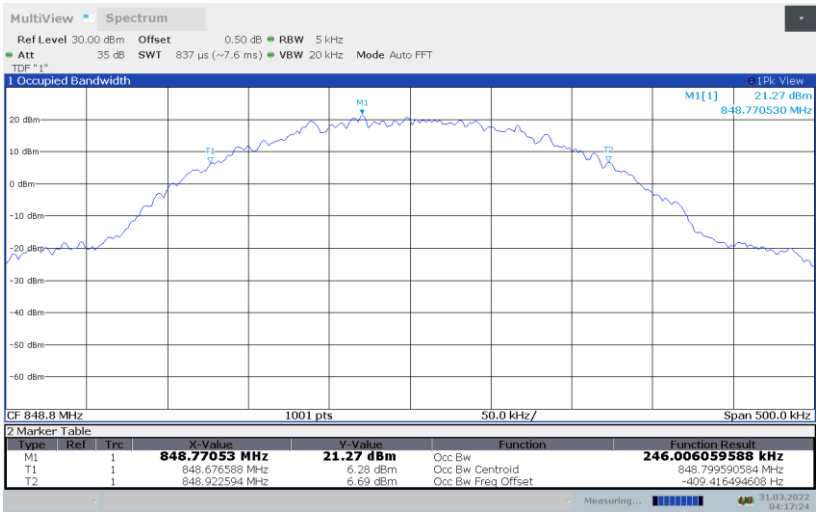
**Channel 128-Occupied Bandwidth (99% BW)**




**Channel 190-Occupied Bandwidth (99% BW)**



**Channel 251-Occupied Bandwidth (99% BW)**

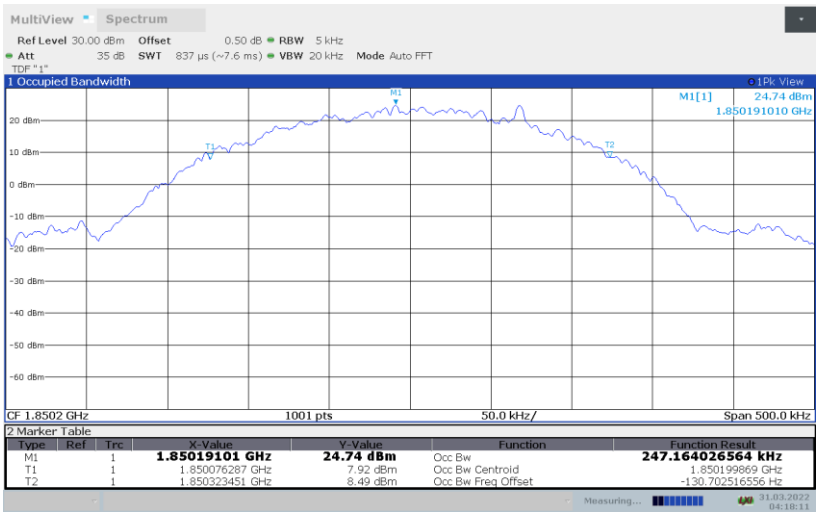


**PCS 1900(99% BW)**

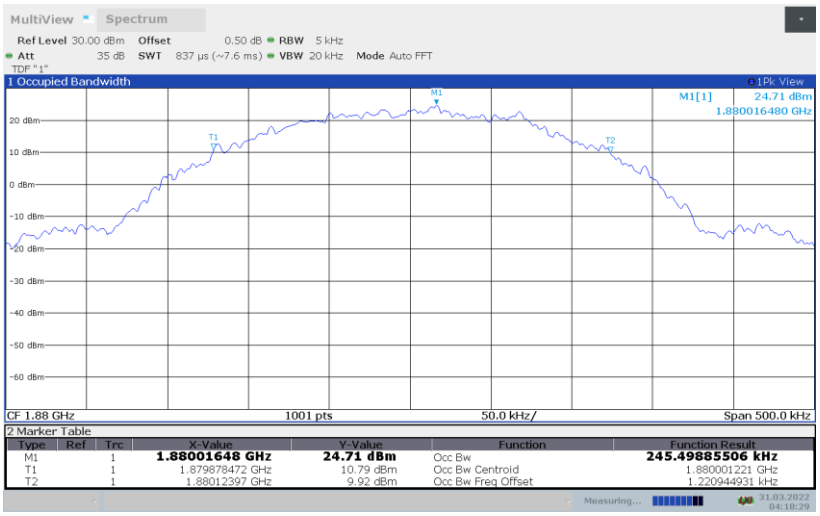
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 1850.2 | 247.16 |
| 1880.0 | 245.50 |
| 1909.8 | 243.82 |

**PCS 1900**

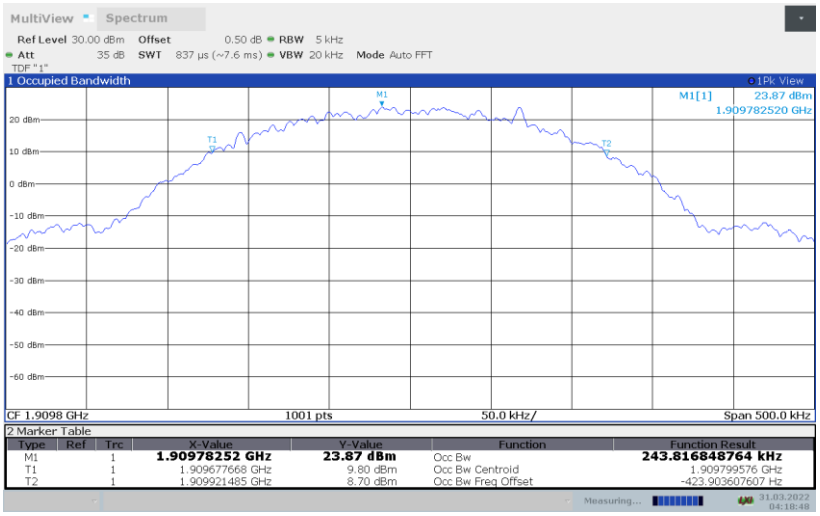
**Channel 512-Occupied Bandwidth (99% BW)**




**Channel 661-Occupied Bandwidth (99% BW)**



**Channel 810-Occupied Bandwidth (99% BW)**

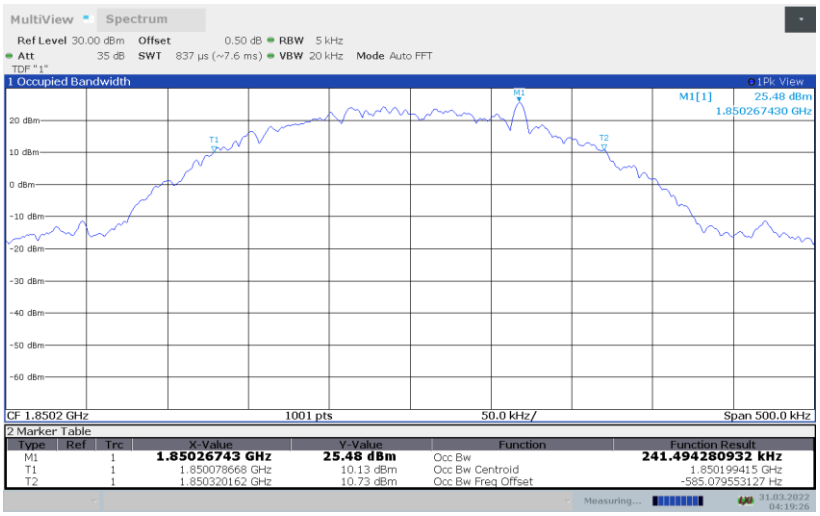


**GPRS 1900(99% BW)**

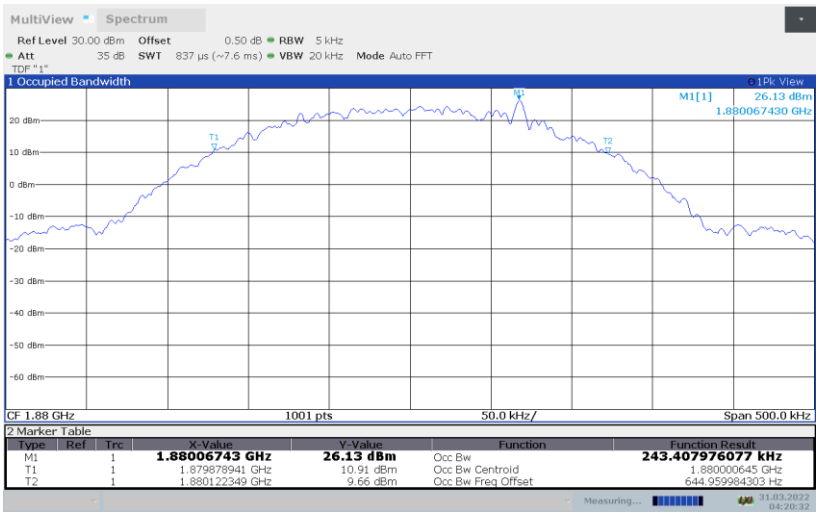
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 1850.2 | 241.49 |
| 1880.0 | 243.41 |
| 1909.8 | 242.32 |

**GPRS 1900**

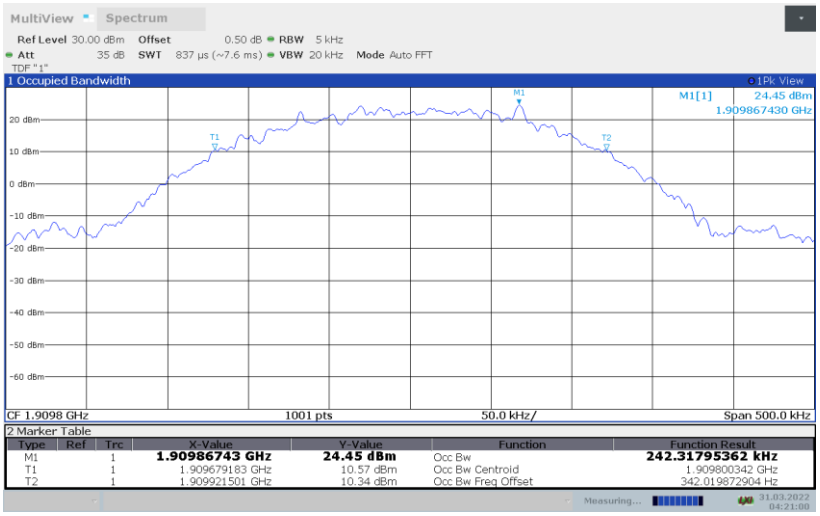
**Channel 512-Occupied Bandwidth (99% BW)**




**Channel 661-Occupied Bandwidth (99% BW)**



**Channel 810-Occupied Bandwidth (99% BW)**

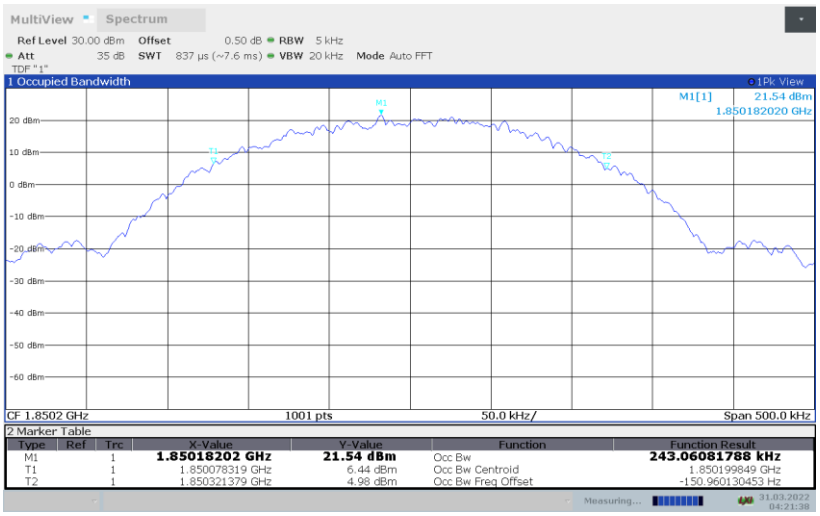


**EGPRS 1900-8PSK(99% BW)**

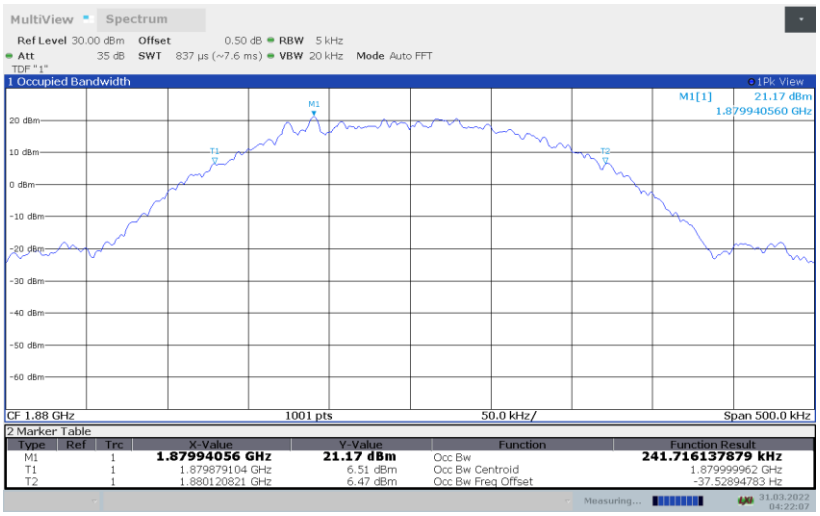
| Frequency(MHz) | Occupied Bandwidth (99% BW)( kHz) |
|---|---|
| 1850.2 | 243.06 |
| 1880.0 | 241.72 |
| 1909.8 | 245.29 |

**EGPRS 1900-8PSK**

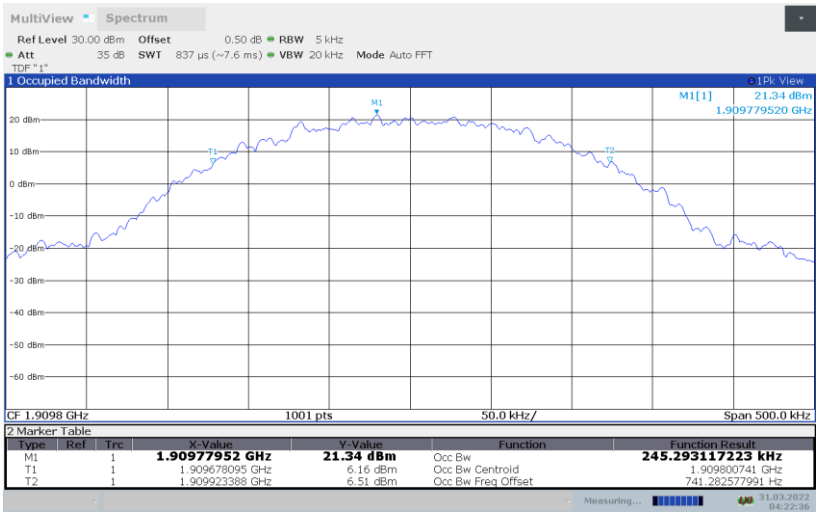
**Channel 512-Occupied Bandwidth (99% BW)**




**Channel 661-Occupied Bandwidth (99% BW)**



**Channel 810-Occupied Bandwidth (99% BW)**




Note: Expanded measurement uncertainty is $U$ = 3428Hz, $k$ = 2

## A.5 EMISSION BANDWIDTH

**Reference**

FCC: CFR Part 2.1049, 22.917, 24.238

**A.5.1 Measurement Procedure**

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) Set the detection mode to peak, and the trace mode to max hold.

e) Use the 26dB bandwidth function of the spectrum analyzer and report the measured bandwidth.

**A.5.2Emission Bandwidth Results**

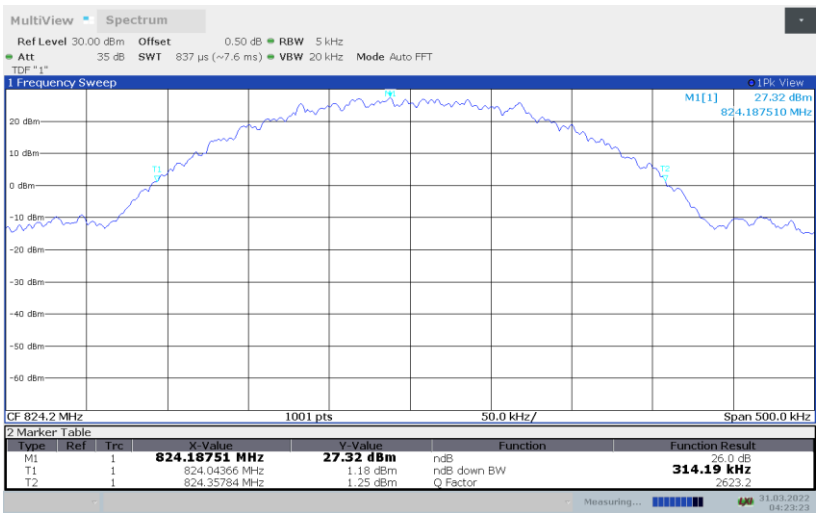
Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

**GSM 850(-26dBc BW)**

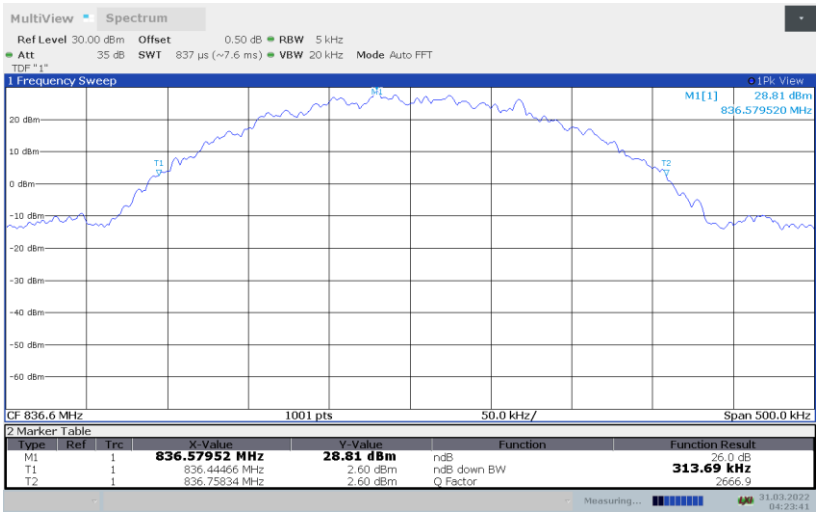
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 824.2 | 314.19 |
| 836.6 | 313.69 |
| 848.8 | 314.19 |

**GSM 850**

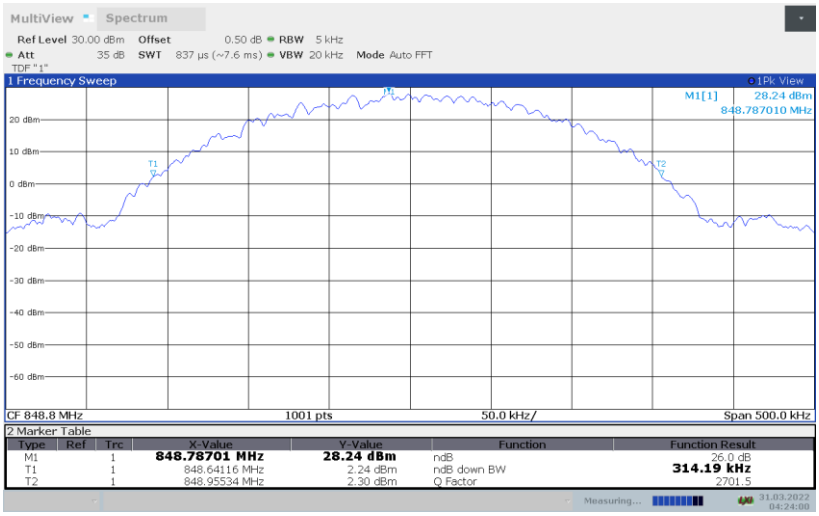
**Channel 128-Emission Bandwidth (-26dBc BW)**



**Channel 190-Emission Bandwidth (-26dBc BW)**




**Channel 251-Emission Bandwidth (-26dBc BW)**

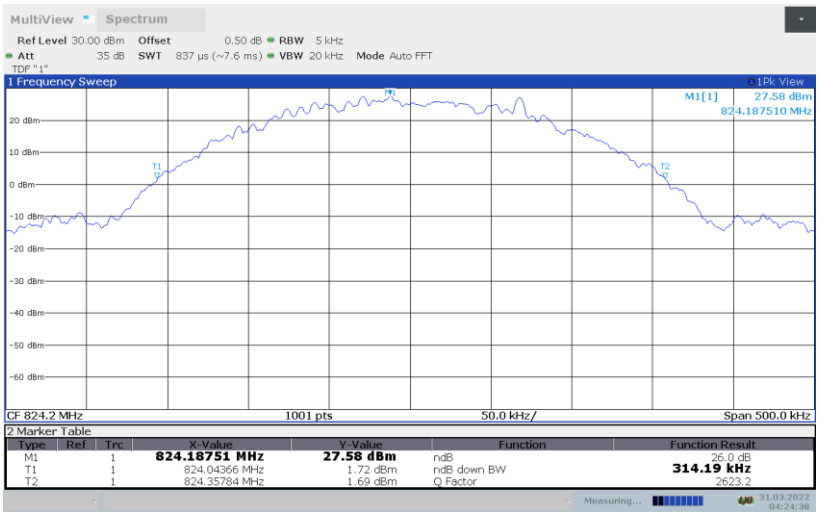


**GPRS 850(-26dBc BW)**

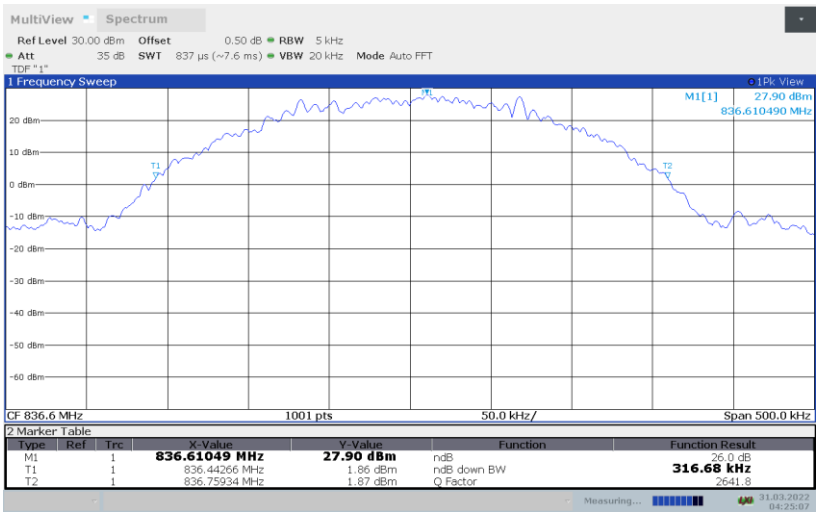
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 824.2 | 314.19 |
| 836.6 | 316.68 |
| 848.8 | 320.68 |

**GPRS 850**

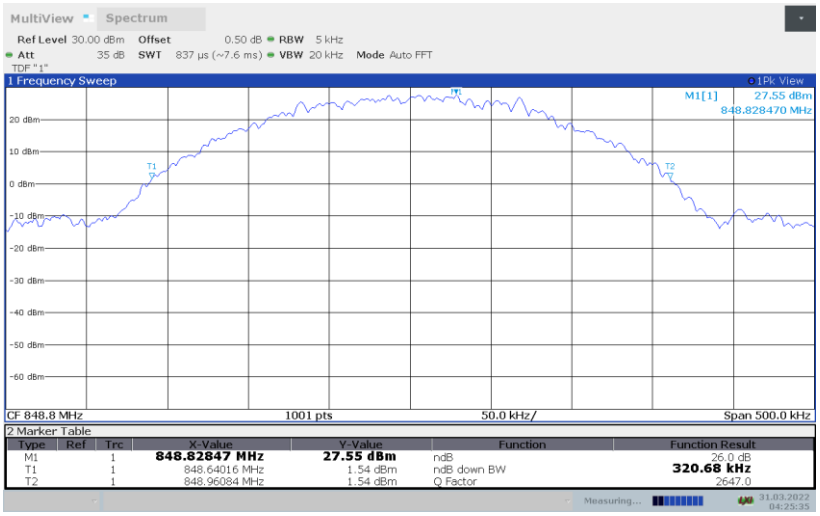
**Channel 128-Emission Bandwidth (-26dBc BW)**




**Channel 190-Emission Bandwidth (-26dBc BW)**



**Channel 251-Emission Bandwidth (-26dBc BW)**

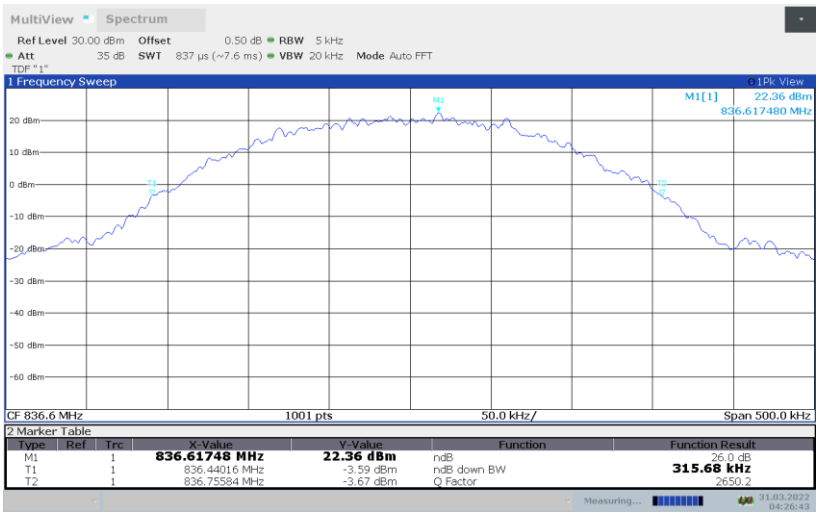


**EGPRS 850-8PSK(-26dBc BW)**

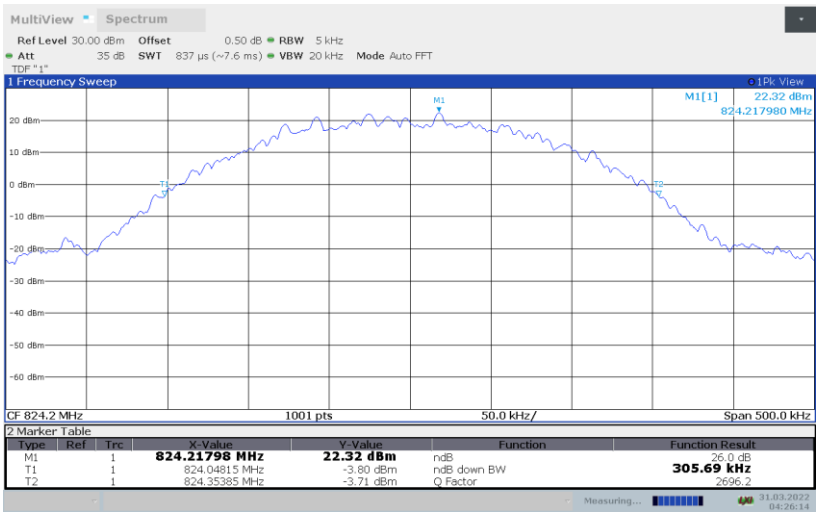
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 824.2 | 315.68 |
| 836.6 | 305.69 |
| 848.8 | 310.69 |

**EGPRS 850-8PSK**

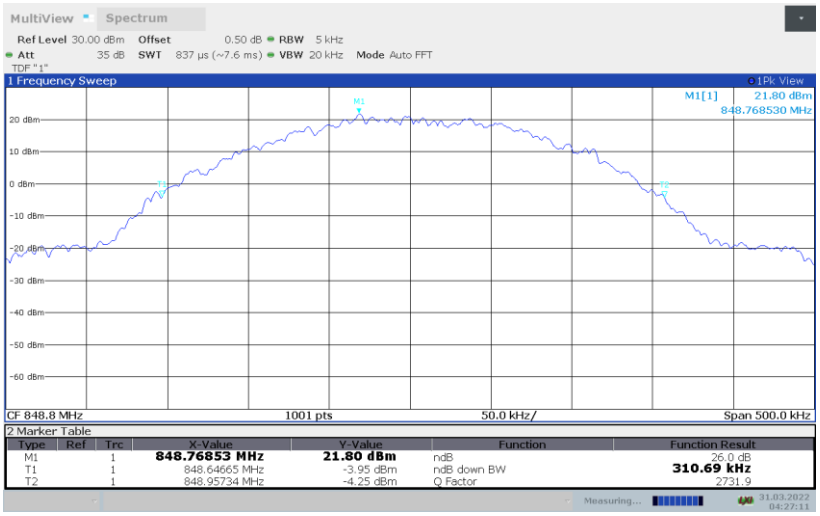
**Channel 128-Emission Bandwidth (-26dBc BW)**




**Channel 190-Emission Bandwidth (-26dBc BW)**



**Channel 251-Emission Bandwidth (-26dBc BW)**

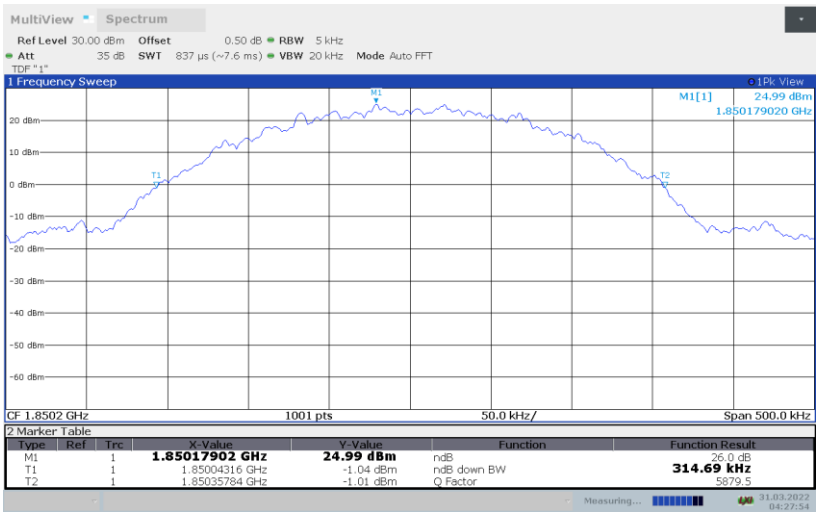


**PCS 1900(-26dBc BW)**

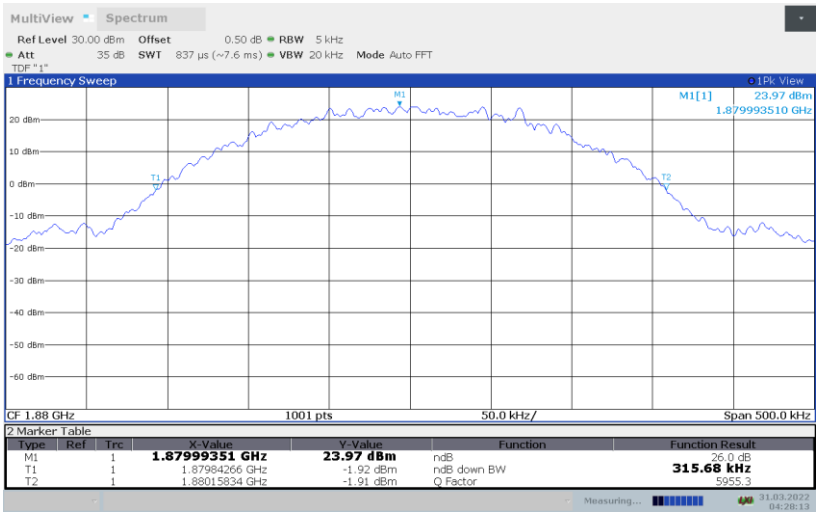
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 1850.2 | 314.69 |
| 1880.0 | 315.68 |
| 1909.8 | 316.18 |

**PCS 1900**

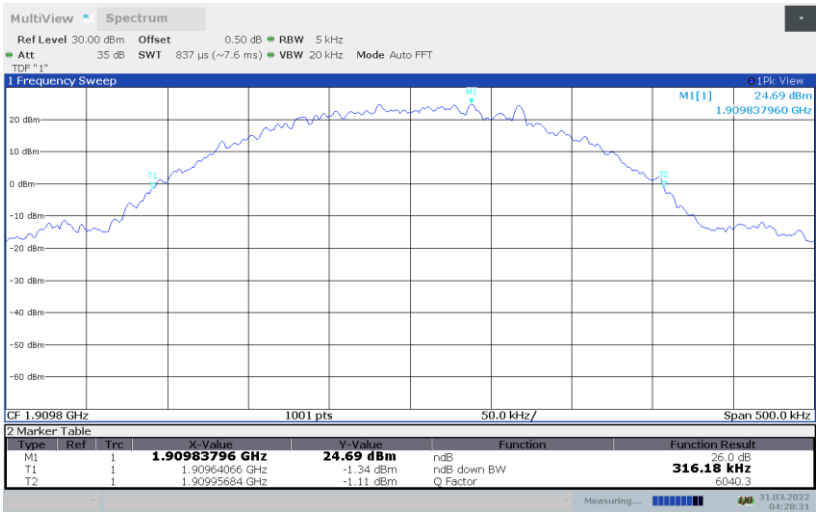
**Channel 512-Emission Bandwidth (-26dBc BW)**




**Channel 661-Emission Bandwidth (-26dBc BW)**



**Channel 810-Emission Bandwidth (-26dBc BW)**

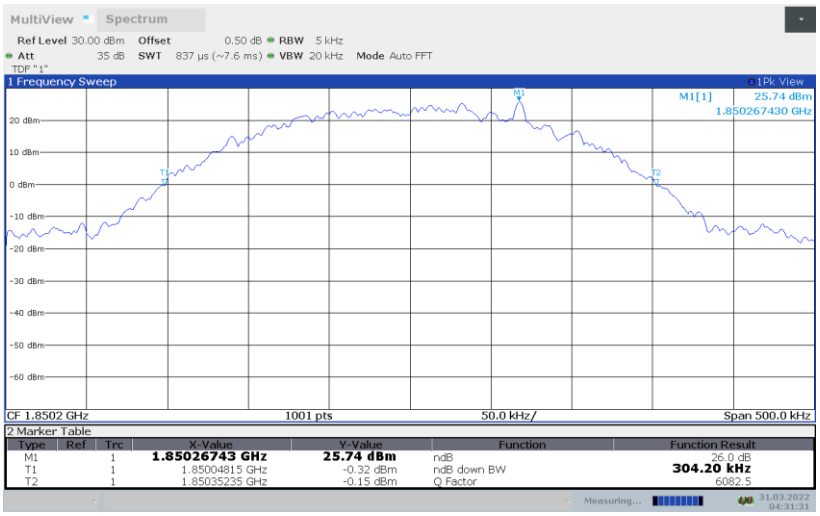


**GPRS 1900(-26dBc BW)**

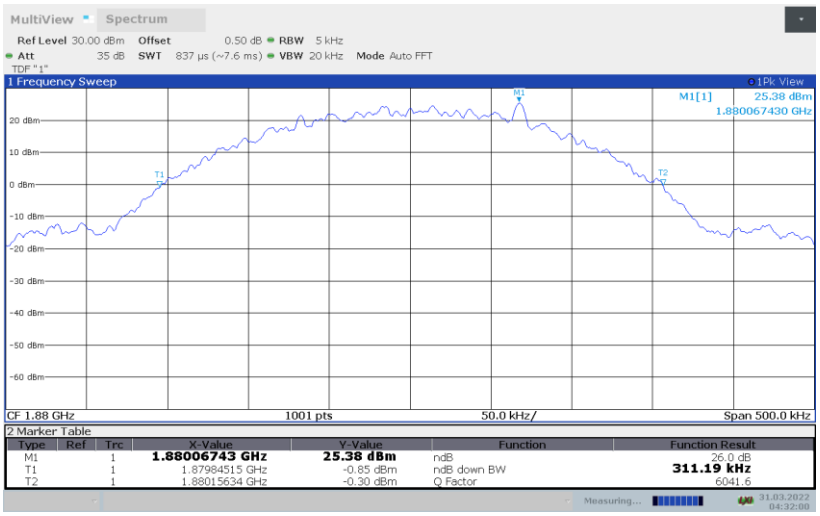
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 1850.2 | 304.20 |
| 1880.0 | 311.19 |
| 1909.8 | 309.19 |

**GPRS 1900**

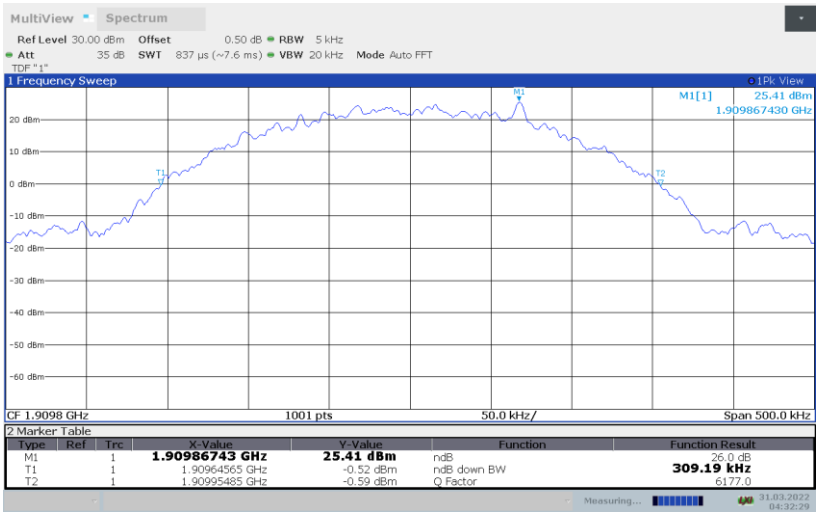
**Channel 512-Emission Bandwidth (-26dBc BW)**




**Channel 661-Emission Bandwidth (-26dBc BW)**



**Channel 810-Emission Bandwidth (-26dBc BW)**

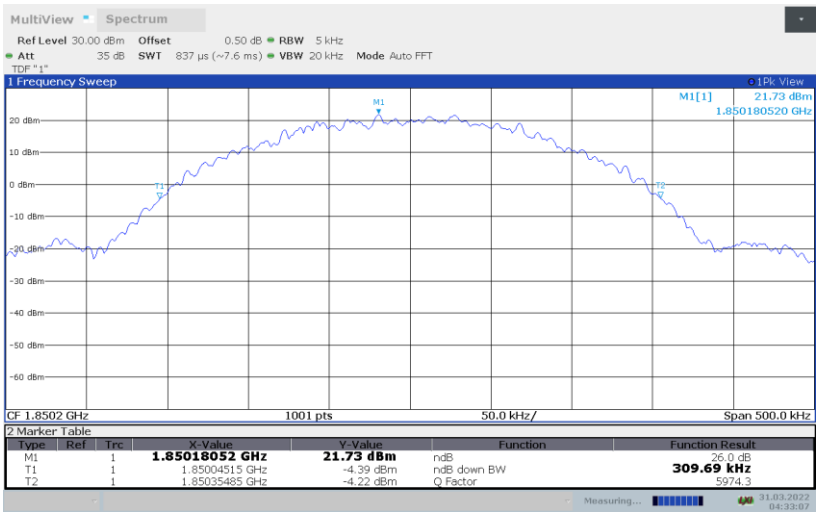


**EGPRS 1900-8PSK(-26dBc BW)**

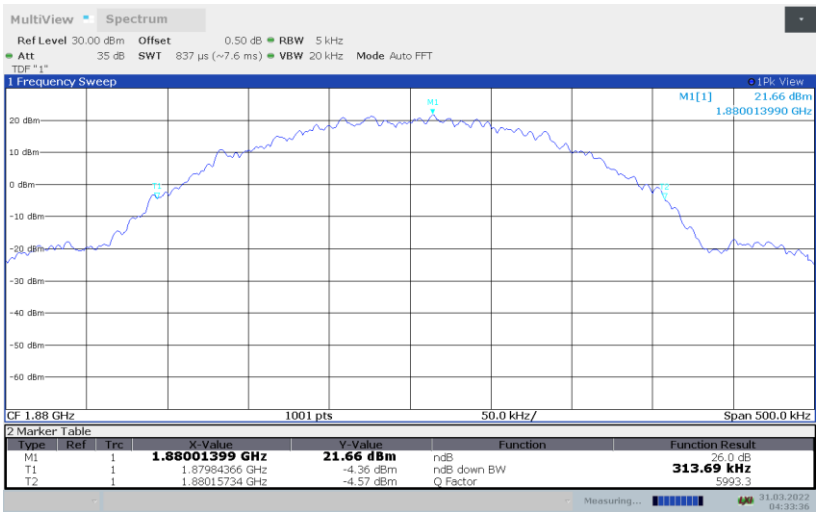
| Frequency(MHz) | Emission Bandwidth (-26dBc BW)( kHz) |
|---|---|
| 1850.2 | 309.69 |
| 1880.0 | 313.69 |
| 1909.8 | 312.69 |

**EGPRS 1900-8PSK**

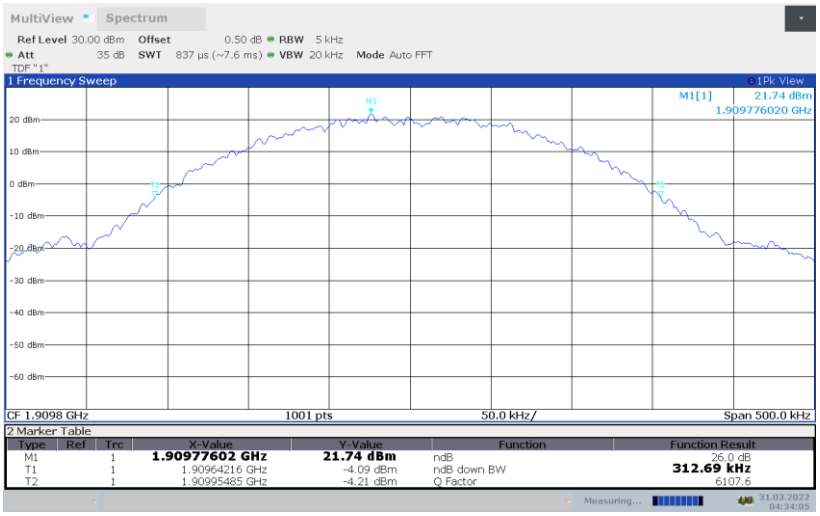
**Channel 512-Emission Bandwidth (-26dBc BW)**




**Channel 661-Emission Bandwidth (-26dBc BW)**



**Channel 810-Emission Bandwidth (-26dBc BW)**




Note: Expanded measurement uncertainty is $U$ = 3428Hz, $k$ = 2

## A.6 BAND EDGE COMPLIANCE

**Reference**

FCC: CFR Part 2.1051, 22.917, 24.238

**Measurement limit**

On any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm. A relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

**Measurement Procedure**

The testing follows ANSI C63.26

a) The EUT was connected to spectrum analyzer and system simulator via a power divider.

b) The band edges of low and high channels for the highest RF powers were measured.

c) Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.

d) Set spectrum analyzer with RMS detector.

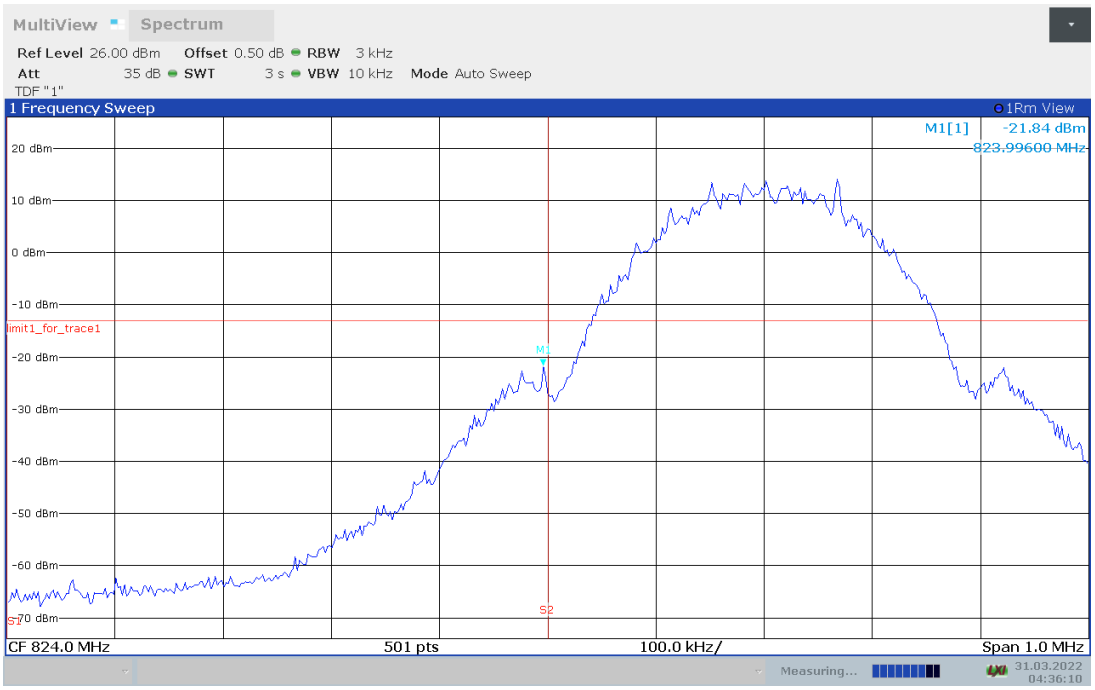
e) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

f) Checked that all the results comply with the emission limit line.

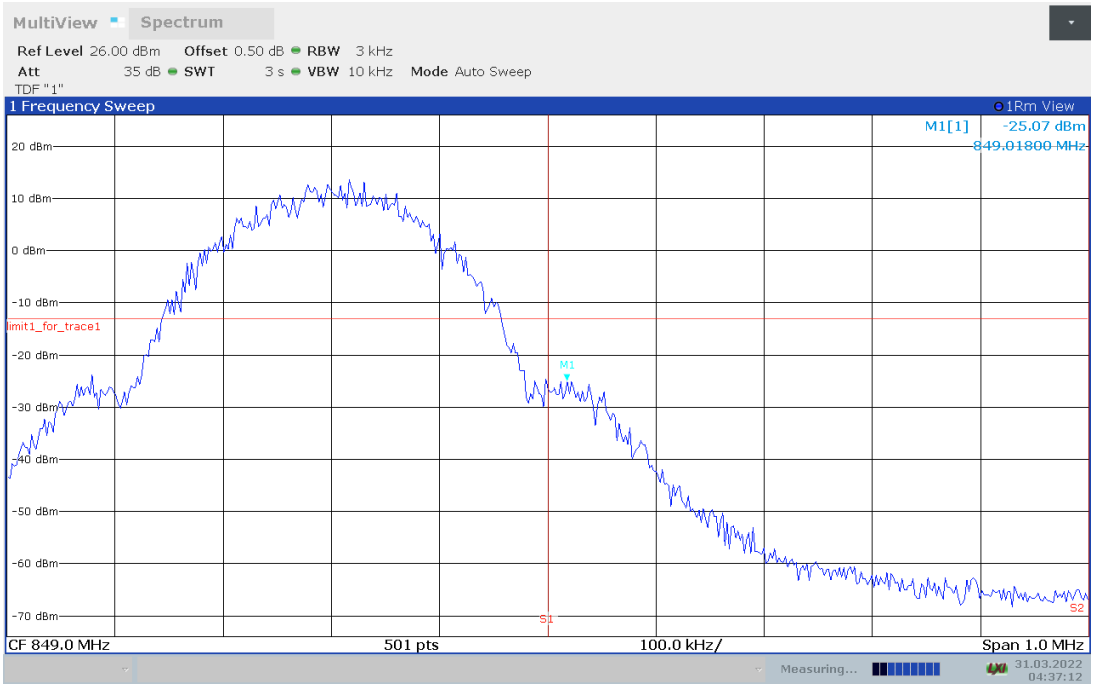
**Only worst case result is given below**

**GSM 850**

**LOW BAND EDGE BLOCK-A-Channel 128**

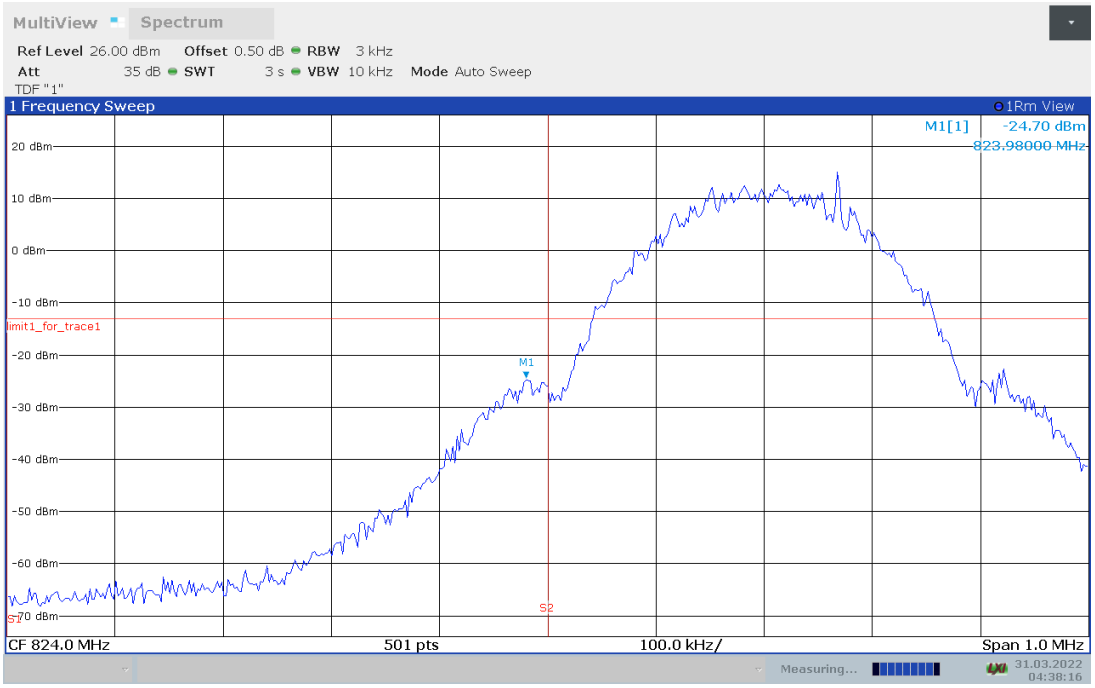


**HIGH BAND EDGE BLOCK-C –Channel 251**

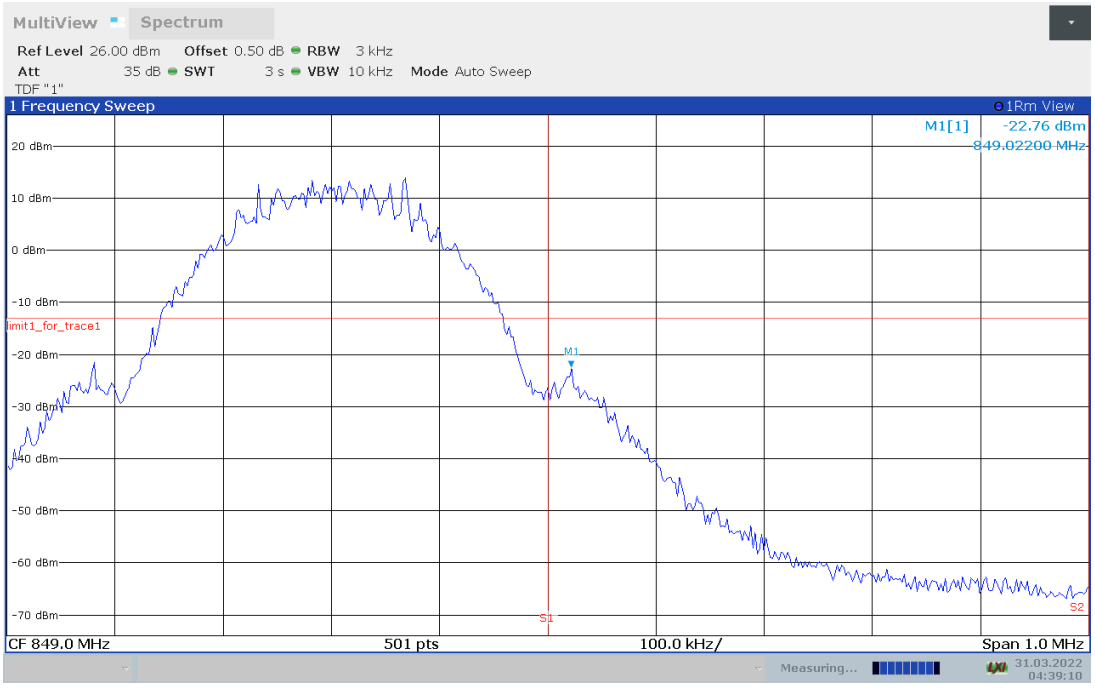


**GPRS 850**

**LOW BAND EDGE BLOCK-A-Channel 128**

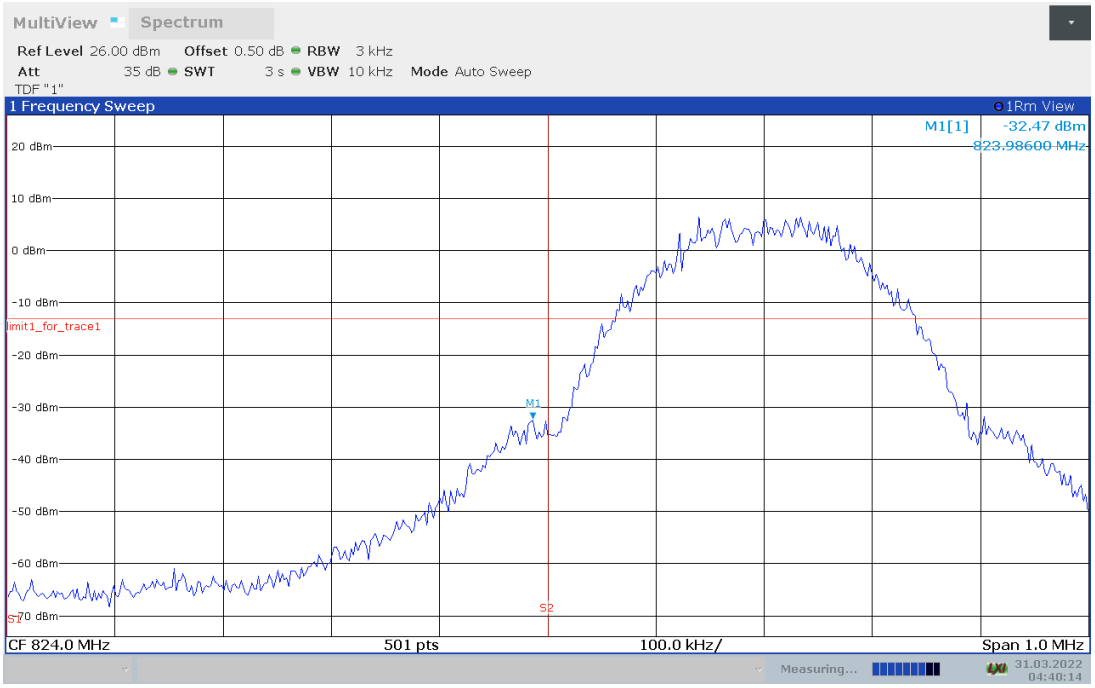



**HIGH BAND EDGE BLOCK-C–Channel 251**

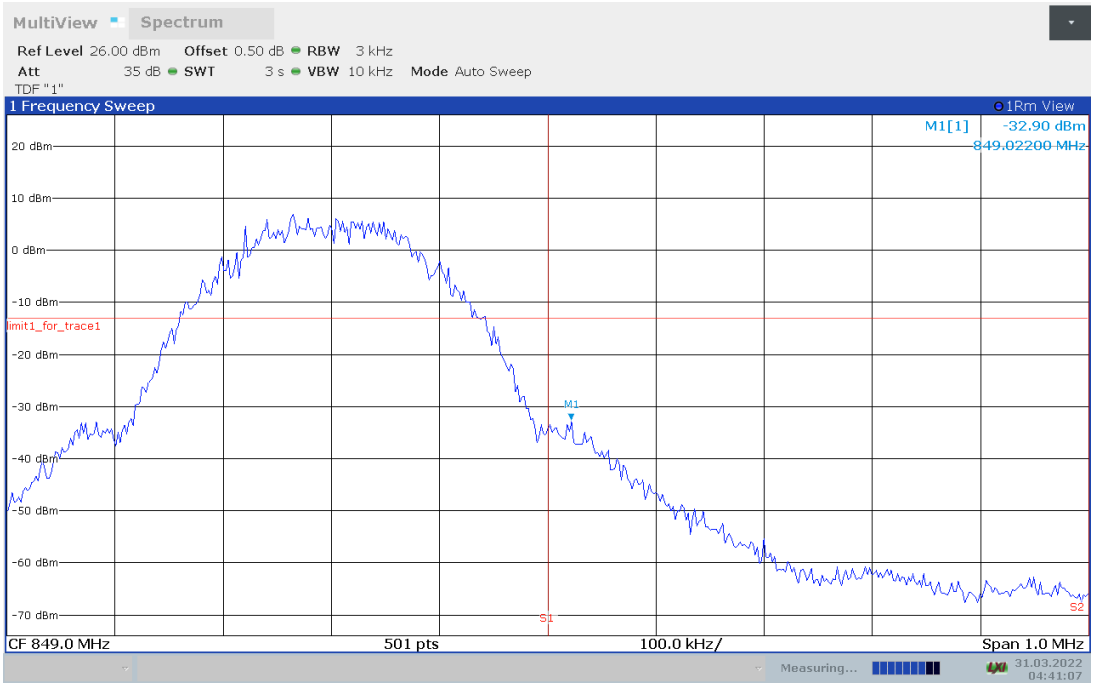


**EGPRS 850-8PSK**

**LOW BAND EDGE BLOCK-A -Channel 128**

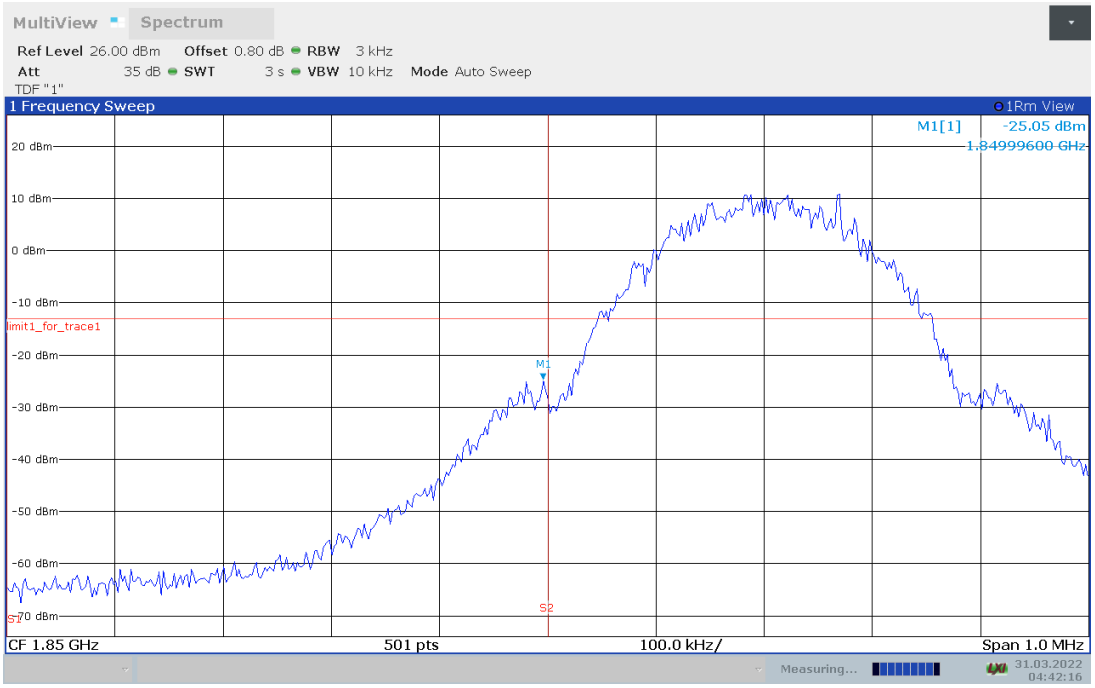



**HIGH BAND EDGE BLOCK-C –Channel 251**

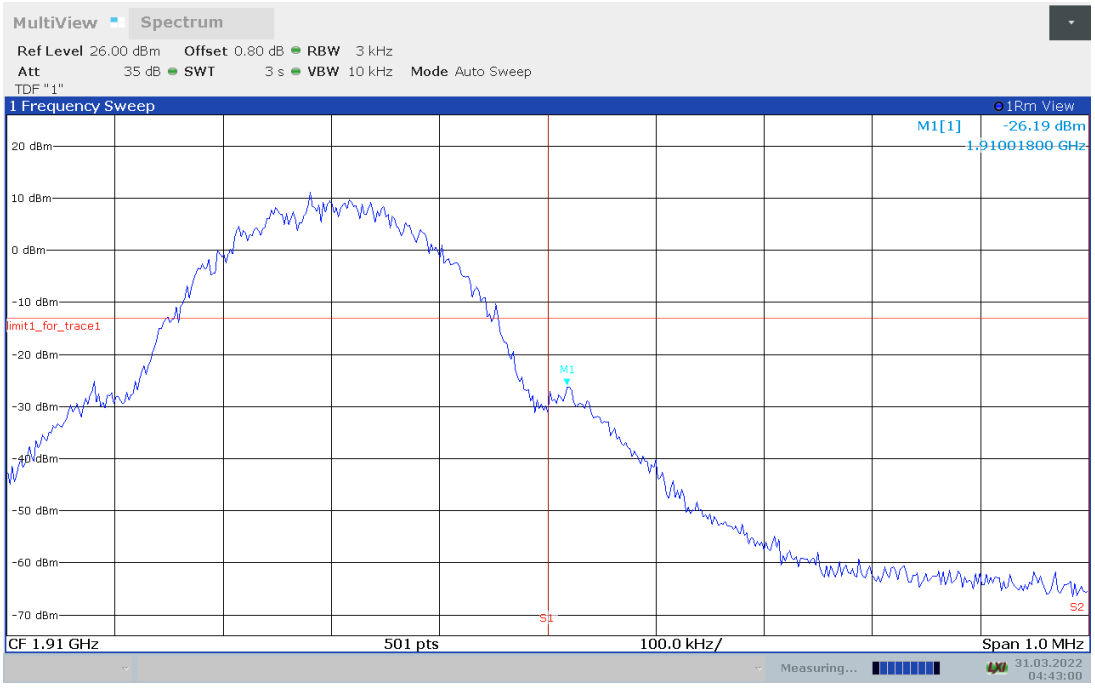


**PCS 1900**

**LOW BAND EDGE BLOCK-A-Channel 512**

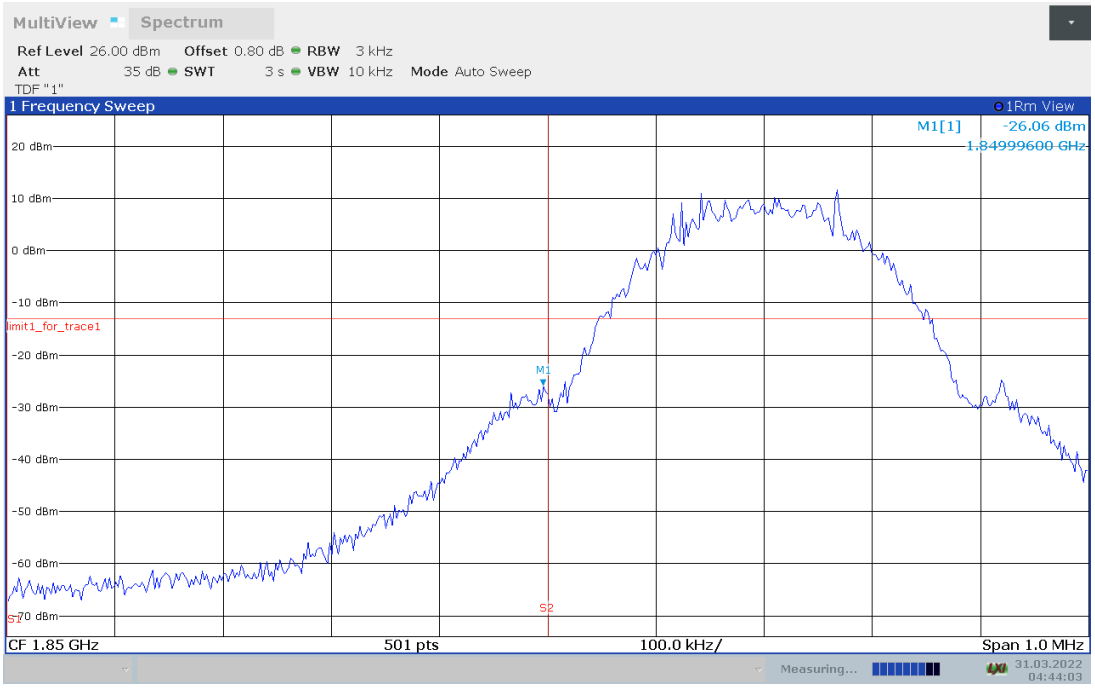



**HIGH BAND EDGE BLOCK-C–Channel 810**

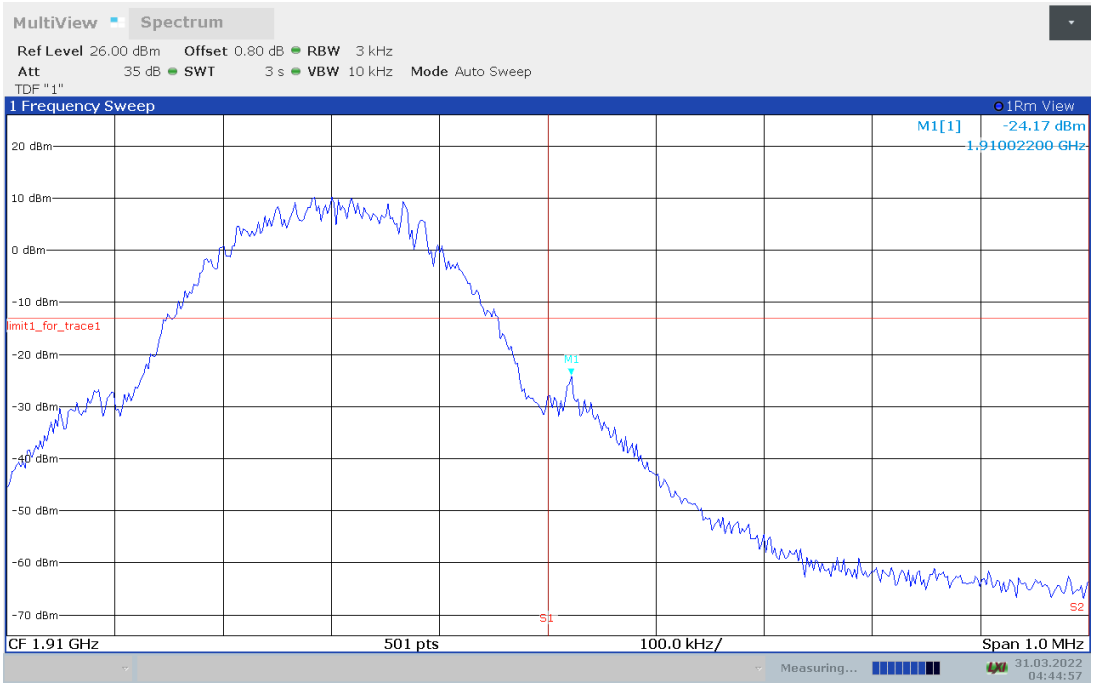


**GPRS 1900**

**LOW BAND EDGE BLOCK-A-Channel 512**

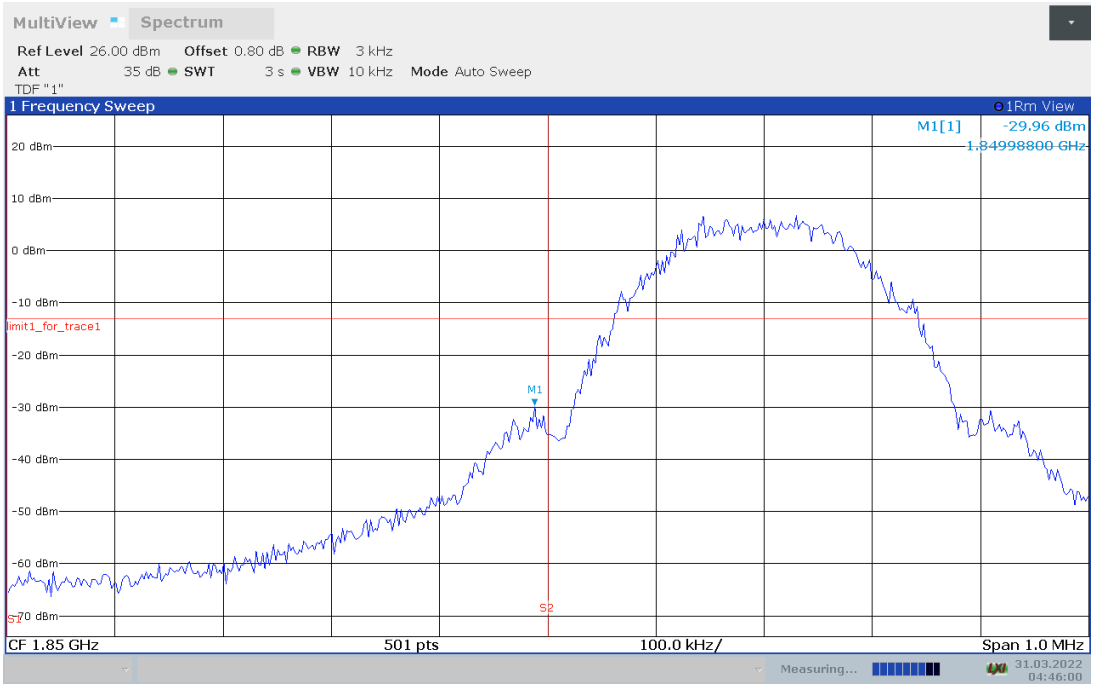



**HIGH BAND EDGE BLOCK-C–Channel 810**

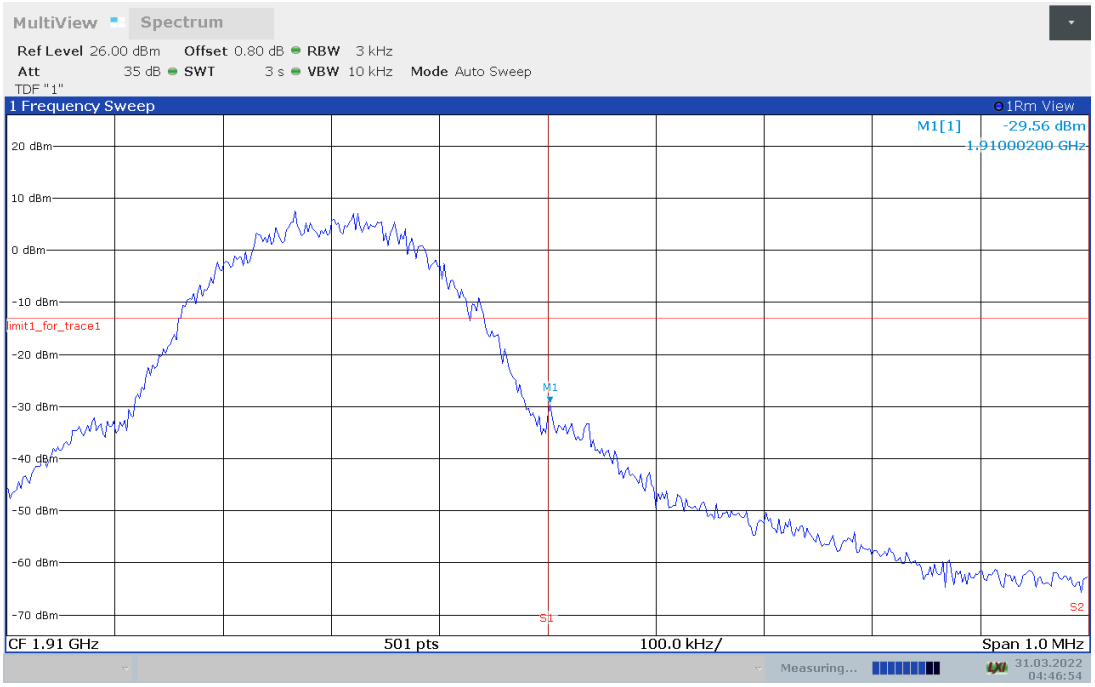


**EGPRS 1900-8PSK**

**LOW BAND EDGE BLOCK-A-Channel 512**




**HIGH BAND EDGE BLOCK-C –Channel 810**




Note: Expanded measurement uncertainty is $U$ = 0.49dB(100KHz-2GHz)/1.21dB(2GHz-26.5GHz), $k$ = 1.96

## A.7 CONDUCTED SPURIOUS EMISSION

**Reference**

FCC: CFR Part 2.1051, 22.917, 24.238

**A.7.1 Measurement Method**

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

1. Determine frequency range for measurements: From CFR 2.1051 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 mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**GSM850 Transmitter**

| Channel | Frequency (MHz) |
|---|---|
| 128 | 824.2 |
| 190 | 836.6 |
| 251 | 848.8 |

**PCS1900 Transmitter**

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

**A. 7.2 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.7.3 Measurement result**

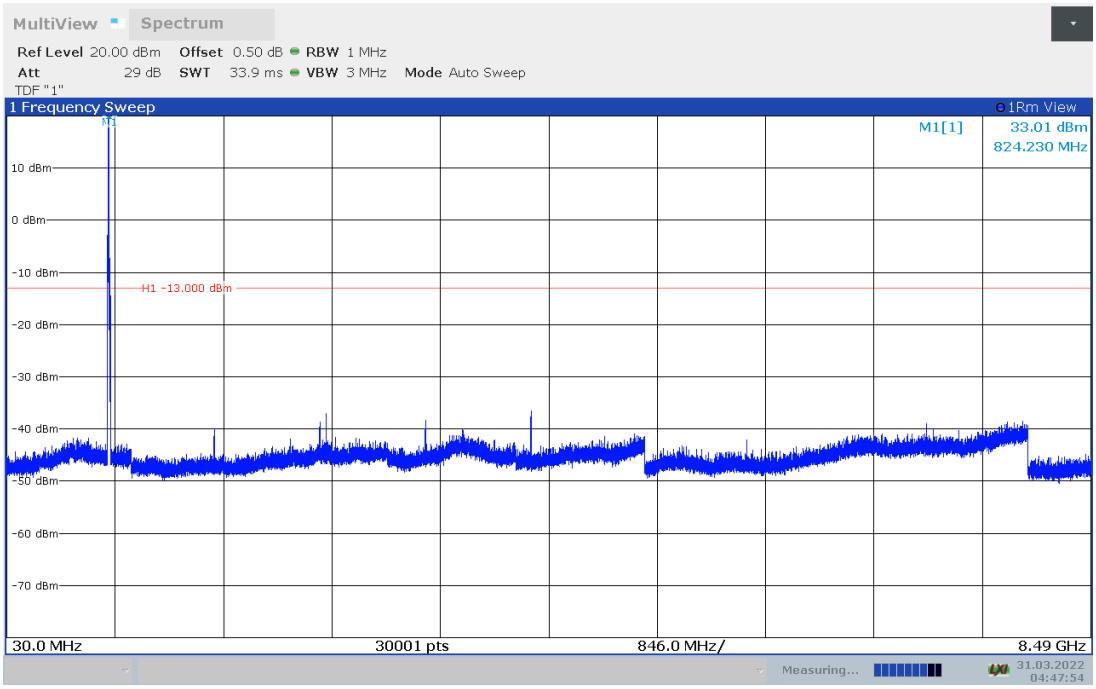
**Only worst case result is given below**

**GSM850**

**Channel 128: 30MHz–8.49 GHz**

Spurious emission limit –13dBm

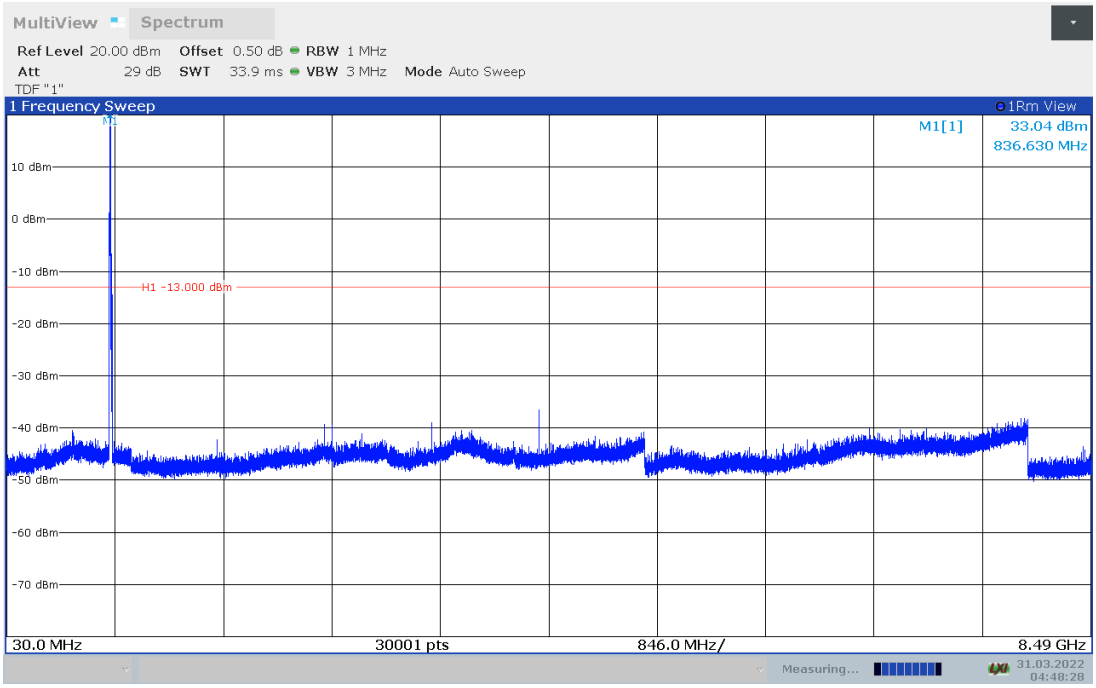
**NOTE: peak above the limit line is the carrier frequency.**.




**Channel 190: 30MHz – 8.49GHz**

Spurious emission limit –13dBm

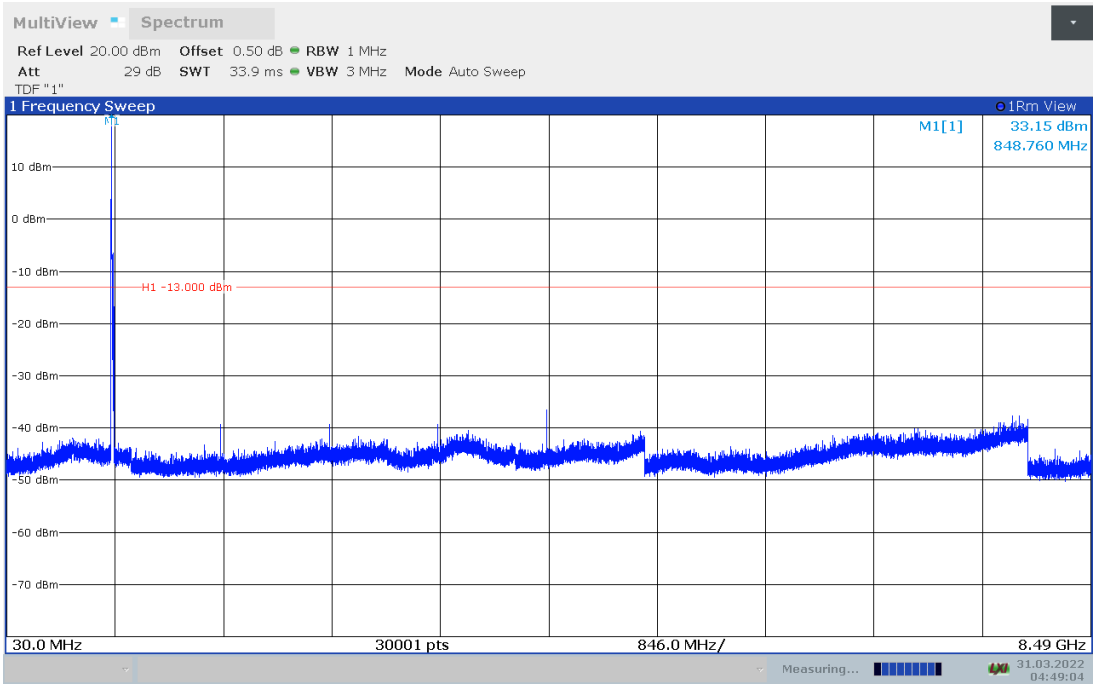
**NOTE: peak above the limit line is the carrier frequency.**



**Channel 251: 30MHz – 8.49 GHz**

Spurious emission limit –13dBm.

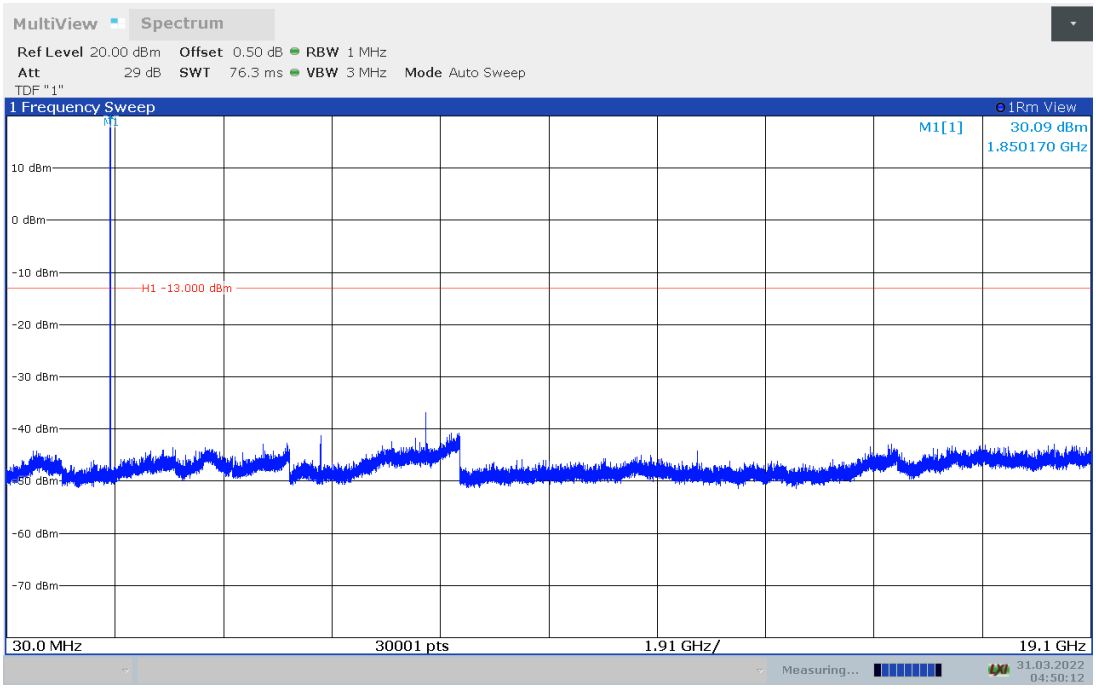
**NOTE: peak above the limit line is the carrier frequency.**




**PCS1900**

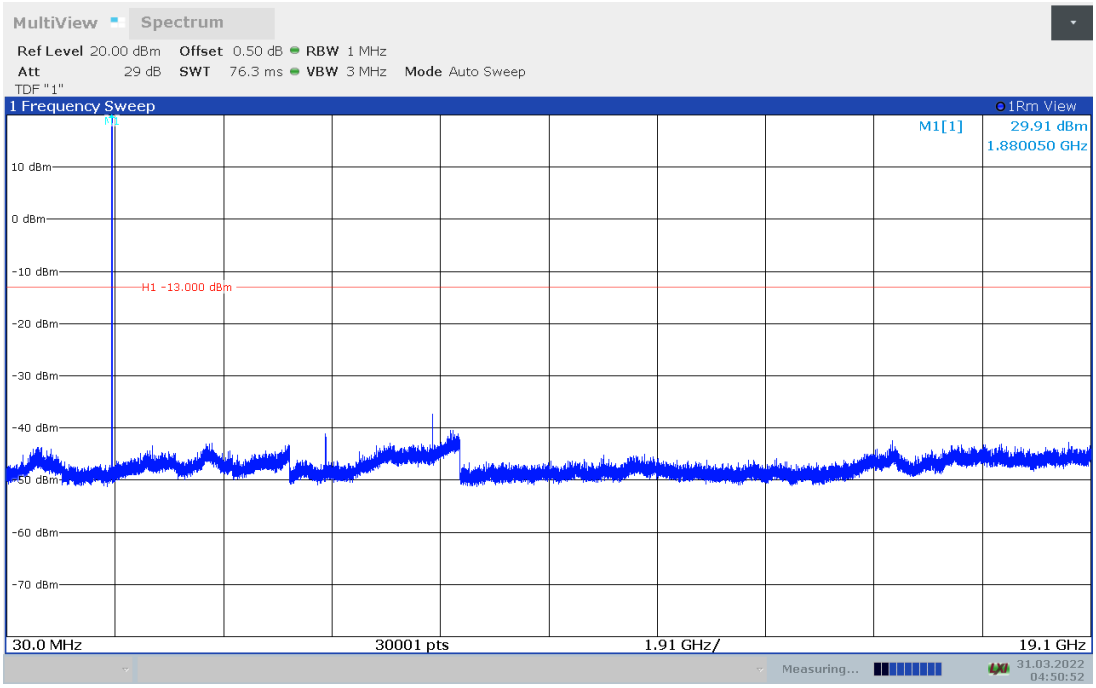
**Channel 512: 30MHz – 19.1GHz**

Spurious emission limit –13dBm.



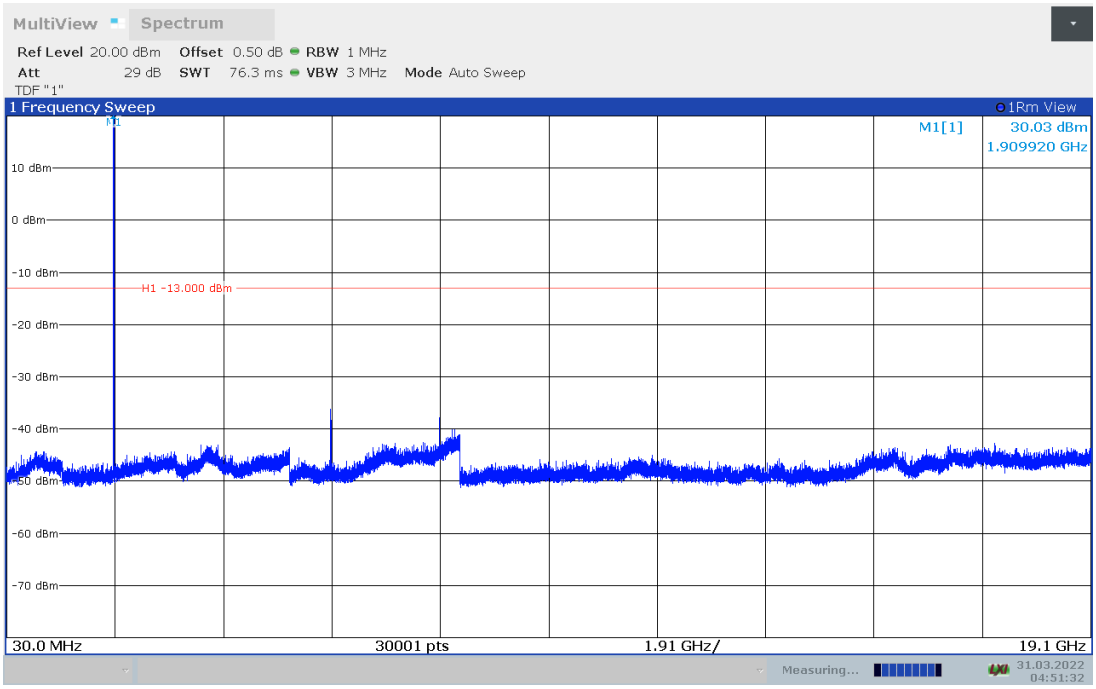
**Channel 661: 30MHz –19.1GHz**

Spurious emission limit –13dBm




**Channel 810: 30MHz –19.1GHz**

Spurious emission limit –13dBm.




Note: Expanded measurement uncertainty is *U* = 0.49dB(100KHz-2GHz)/1.21dB(2GHz-26.5GHz), *k* = 1.96

## A.8 PEAK-TO-AVERAGE POWER RATIO

**Reference**

FCC: CFR Part 24.232, KDB971168 D01.

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

a)Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1 ms

e)Record the maximum PAPR level associated with a probability of 0.1%

**A.8.1 Measurement limit**

not exceed 13 dB

**A.8.2 Measurement results**

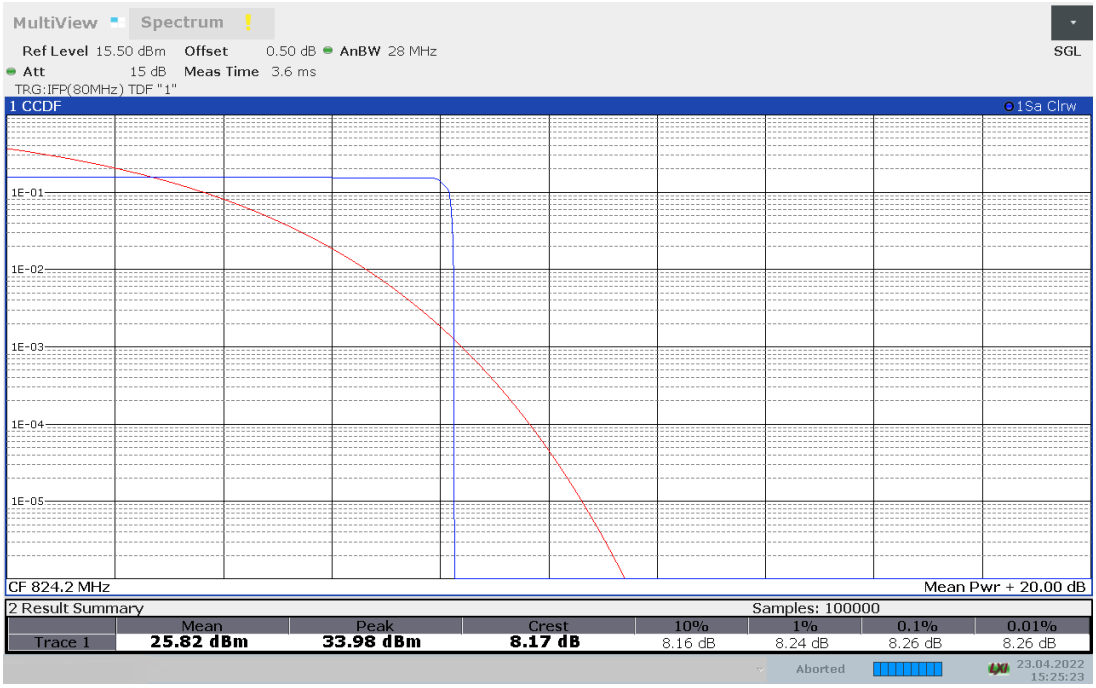
**Only worst case result is given below**

GSM850

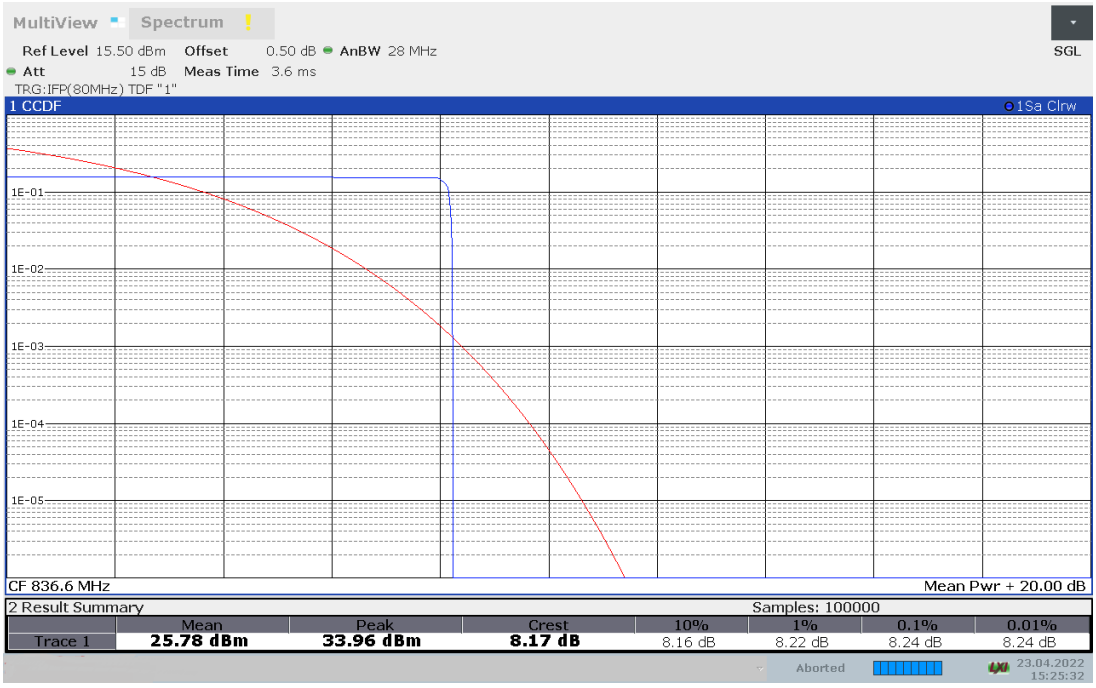
| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 824.2 | 8.26 |
| 836.6 | 8.24 |
| 848.8 | 8.34 |

**GSM 850**

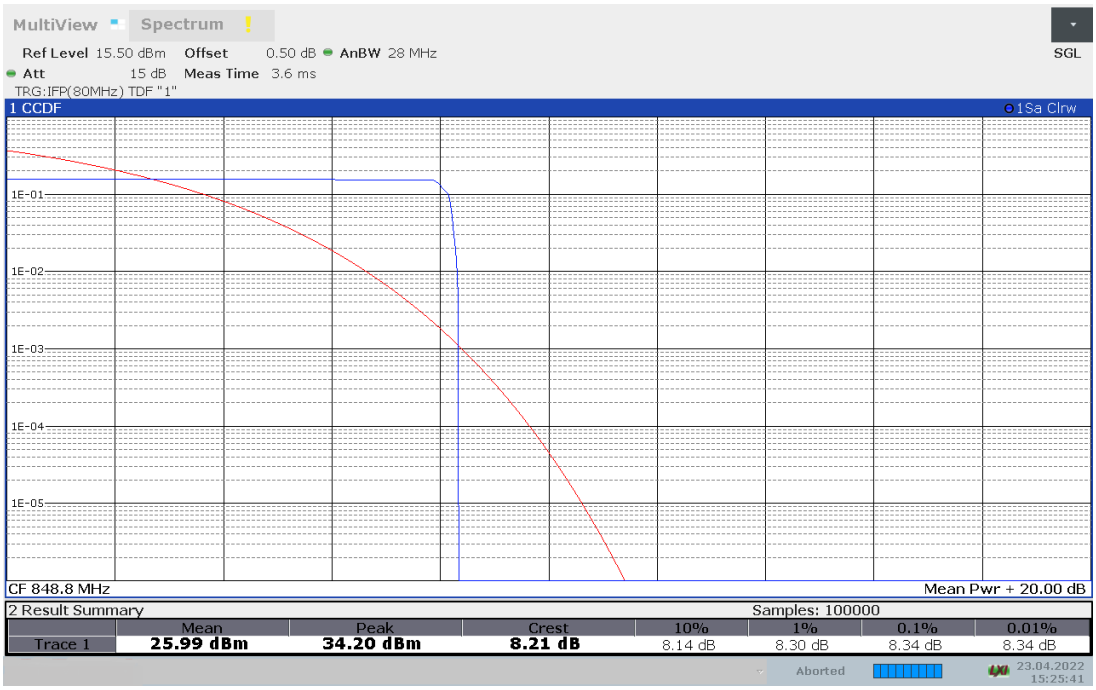
**Channel 128- Peak-to-average Power Ratio**




**Channel 190- Peak-to-average Power Ratio**



**Channel 251- Peak-to-average Power Ratio**

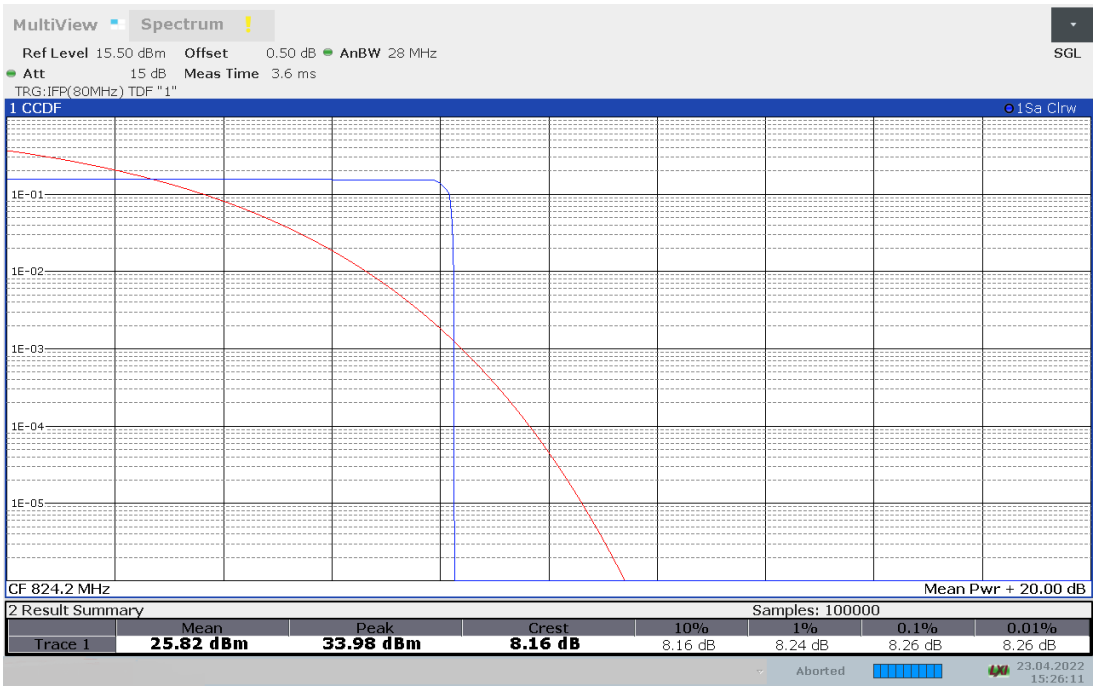


**GPRS 850 (PAPR)**

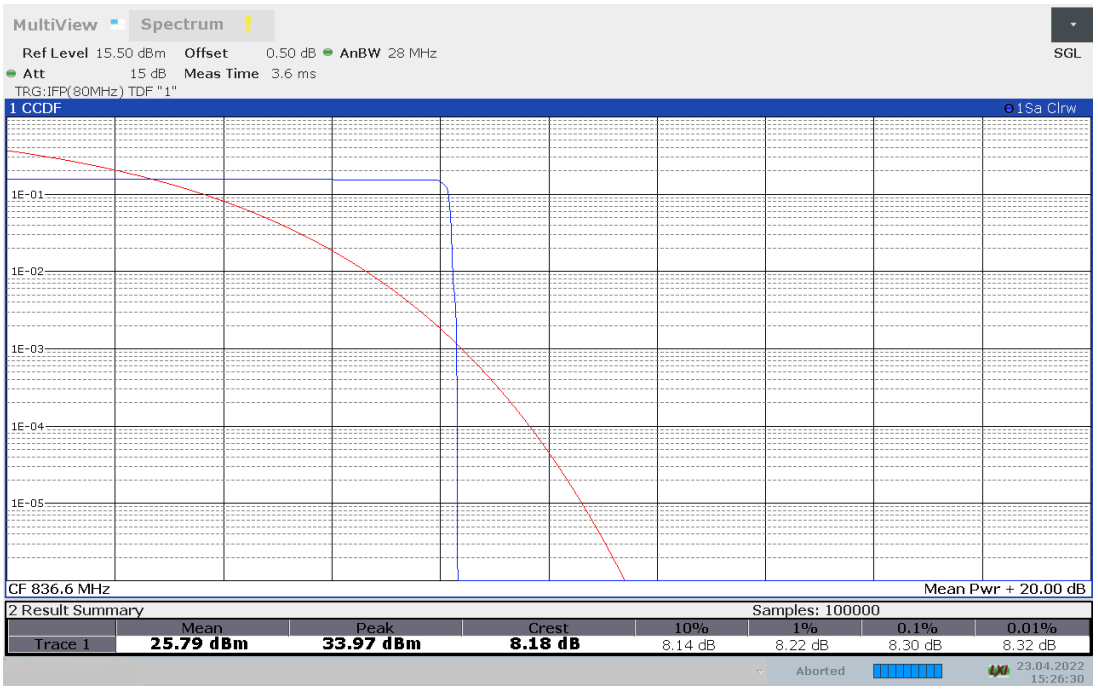
| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 824.2 | 8.26 |
| 836.6 | 8.30 |
| 848.8 | 8.32 |

**GPRS 850**

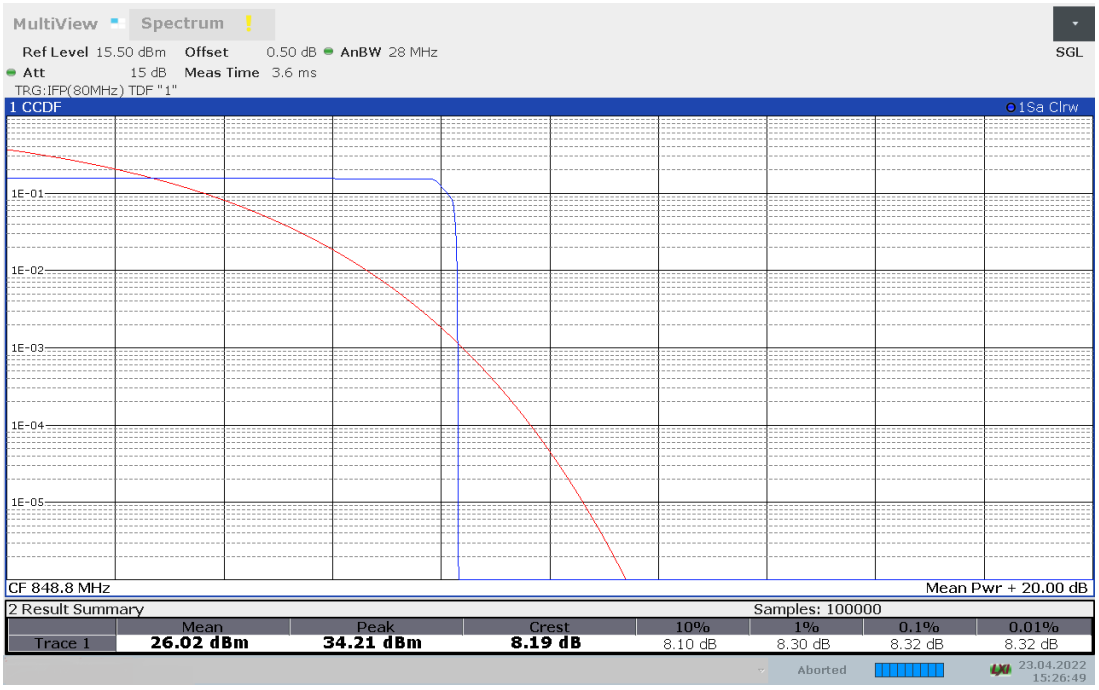
**Channel 128- Peak-To-Average Power Ratio(PAPR)**



**Channel 190- Peak-To-Average Power Ratio(PAPR)**




**Channel 251- Peak-To-Average Power Ratio(PAPR)**



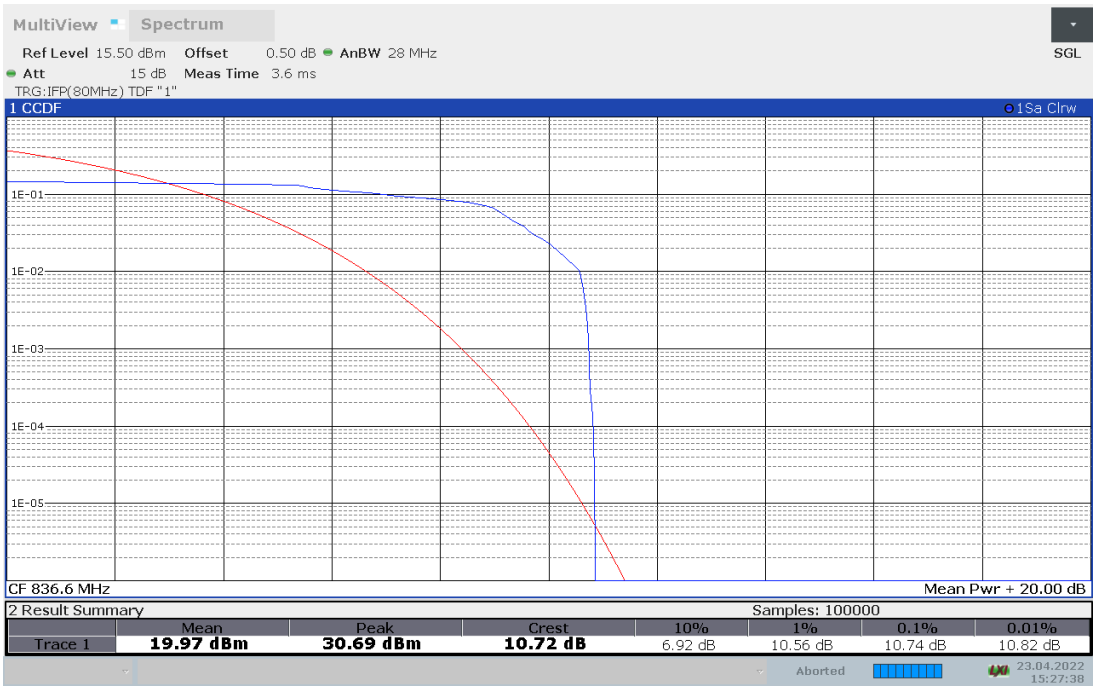
**EGPRS 850 (PAPR)**

| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 824.2 | 10.92 |
| 836.6 | 10.74 |
| 848.8 | 11.22 |

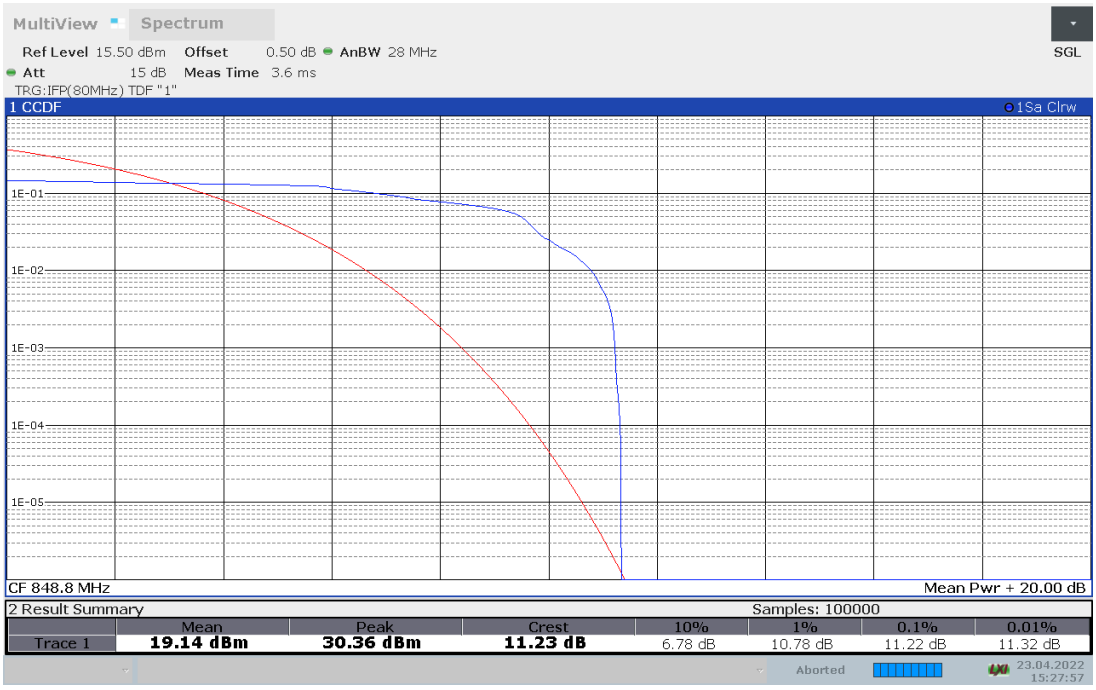
**EGPRS 850**

**Channel 128- Peak-To-Average Power Ratio(PAPR)**

## Channel 190- Peak-To-Average Power Ratio(PAPR)




## Channel 251- Peak-To-Average Power Ratio(PAPR)

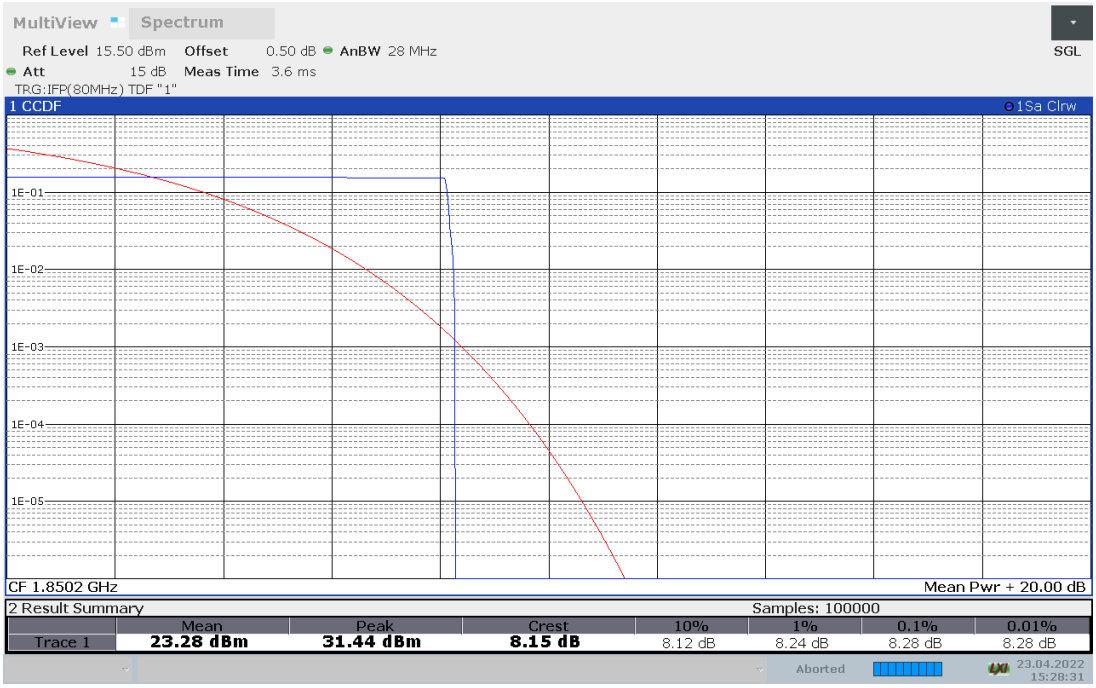


**PCS1900 (PAPR)**

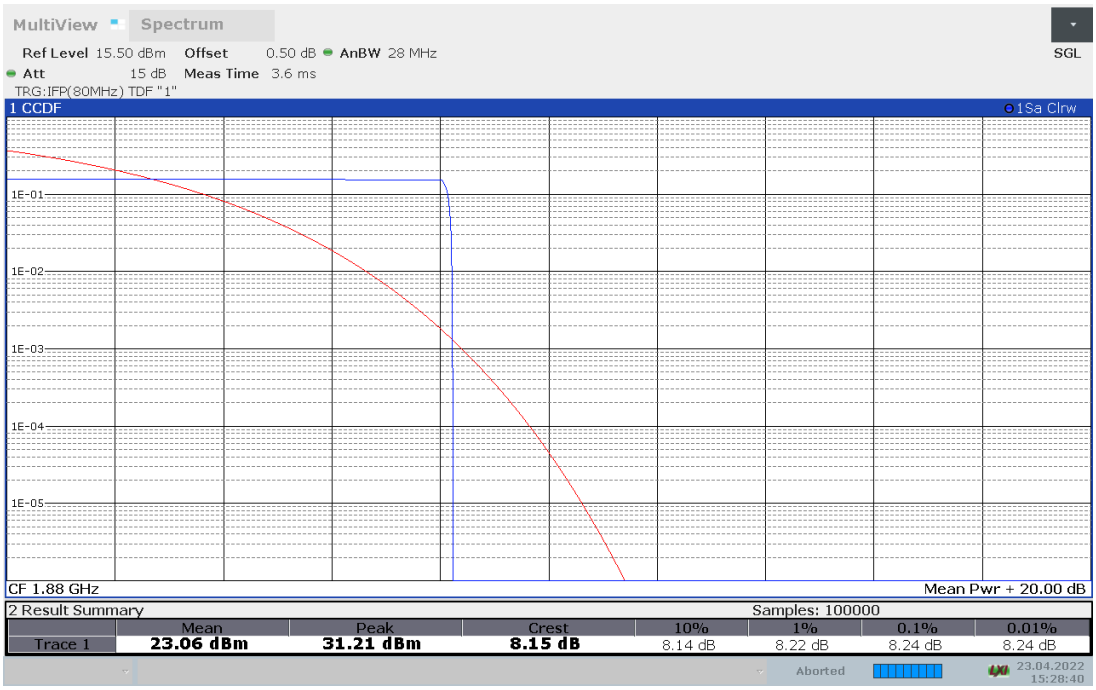
| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 1852.4 | 8.28 |
| 1880.0 | 8.24 |
| 1909.7 | 8.28 |

**PCS 1900**

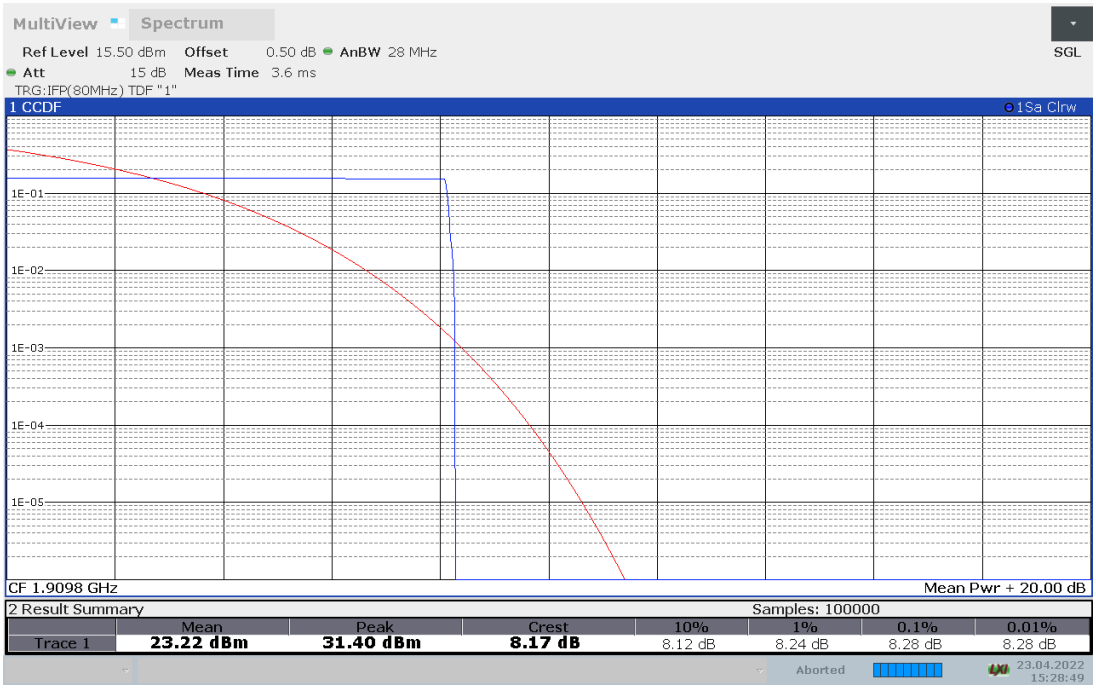
**Channel 512- Peak-To-Average Power Ratio(PAPR)**



**Channel 661- Peak-To-Average Power Ratio(PAPR)**




**Channel 810- Peak-To-Average Power Ratio(PAPR)**

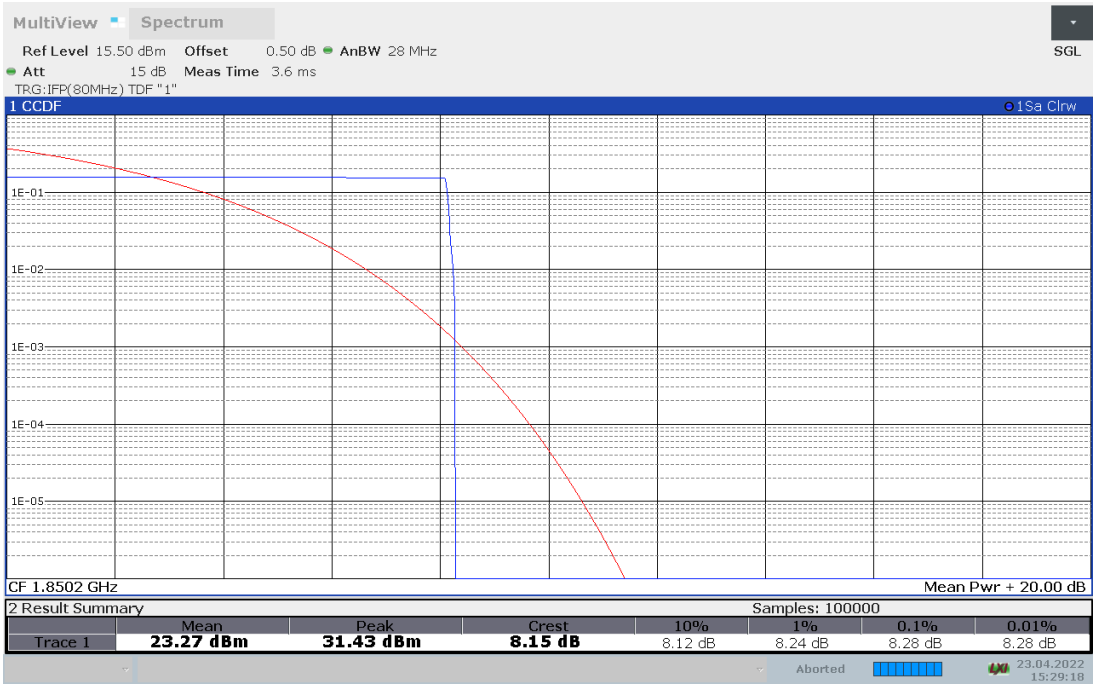


**GPRS1900 (PAPR)**

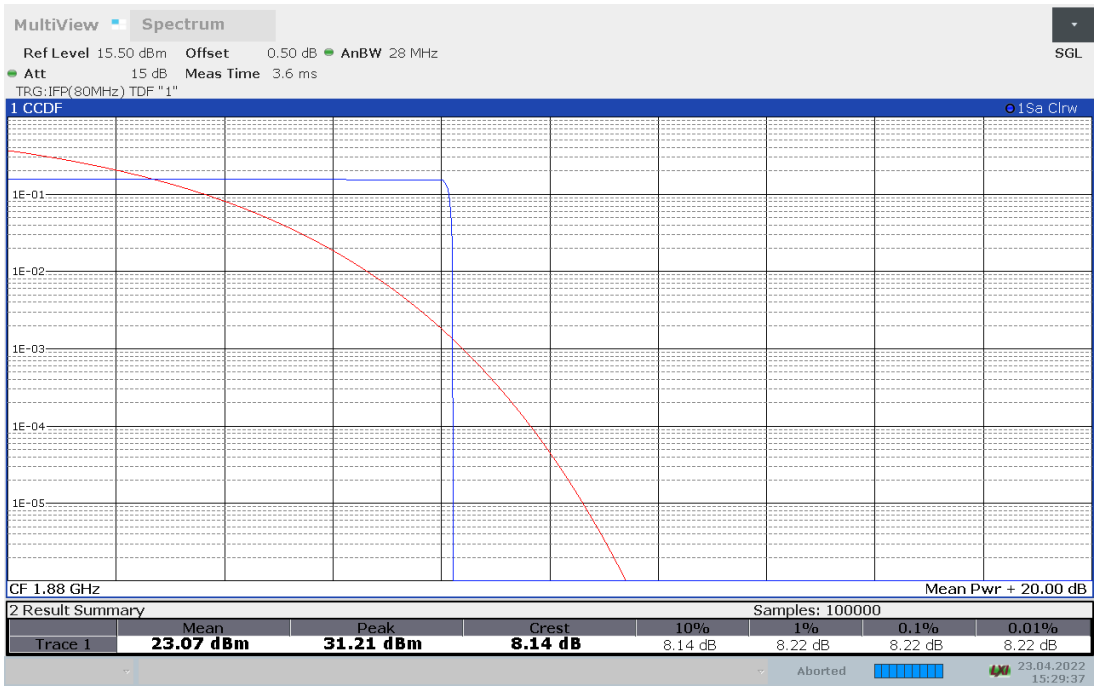
| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 1852.4 | 8.28 |
| 1880.0 | 8.22 |
| 1909.7 | 8.28 |

**GPRS 1900**

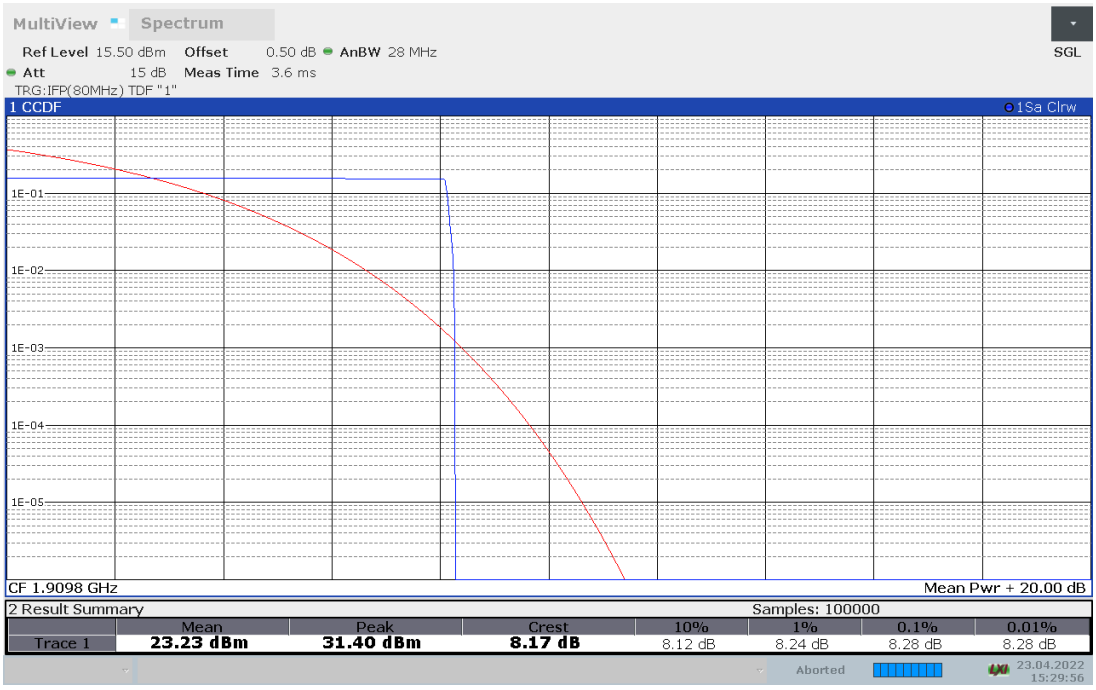
**Channel 512- Peak-To-Average Power Ratio(PAPR)**



## Channel 661- Peak-To-Average Power Ratio(PAPR)




## Channel 810- Peak-To-Average Power Ratio(PAPR)



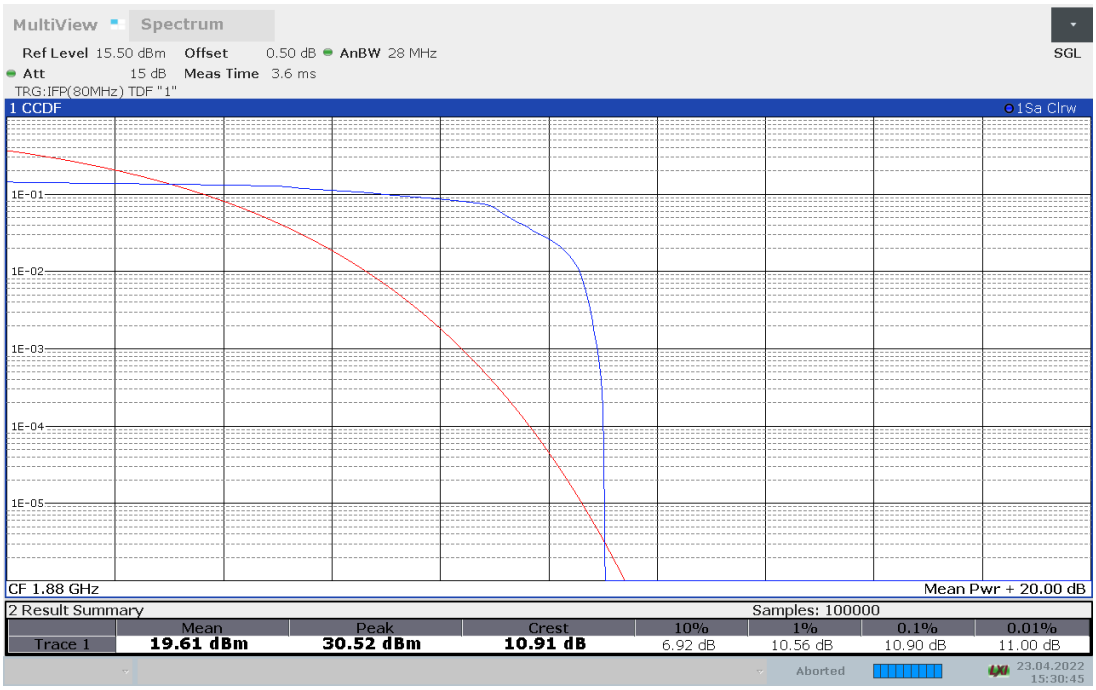
**EGPRS 1900 (PAPR)**

| Frequency(MHz) | Peak-To-Average Power Ratio(PAPR)(dB) |
|---|---|
| 1852.4 | 10.84 |
| 1880.0 | 10.90 |
| 1909.7 | 10.50 |

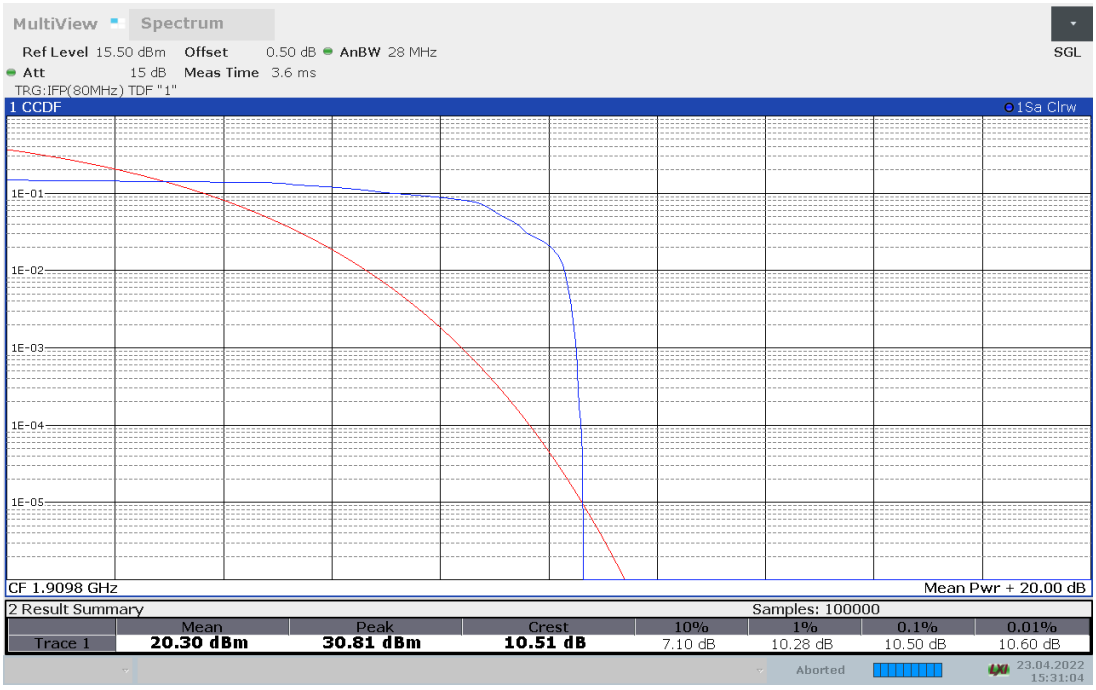
**EGPRS 1900**

**Channel 512- Peak-To-Average Power Ratio(PAPR)**

**Channel 661- Peak-To-Average Power Ratio(PAPR)**




**Channel 810- Peak-To-Average Power Ratio(PAPR)**




Note: Expanded measurement uncertainty is $U$ = 0.49 dB, $k$ = 2

*****END OF REPORT*****