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# TEST REPORT FOR GSM TESTING

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Report No.: SRTC2021-9004(F)-21053102(A)

Product Name: Smart Phone

Applicant: Sharp Corporation

Manufacturer: Sharp Corporation

Specification: FCC Part 24E, Part 22H, Part 2 (2020)

FCC ID: APYHRO00298

The State Radio\_monitoring\_center Testing Center (SRTC)  
15th Building, No.30 Shixing Street, Shijingshan District, Beijing, P.R.China

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## 1. GENERAL INFORMATION

### 1.1 Notes of the test report

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### 1.2 Information about the testing laboratory

|                      |  |
|----------------------|--|
| Company:             | The State Radio_monitoring_center Testing Center (SRTC)              |
| Address:             | 15th Building, No.30 Shixing Street, Shijingshan District, P.R.China |
| City:                | Beijing  |
| Country or Region:   | P.R.China  |
| Contacted person:    | Liu Jia  |
| Tel:                 | +86 10 57996183  |
| Fax:                 | +86 10 57996388  |
| Email:               | liujiaf@srtc.org.cn  |
| Registration number: | 239125   |

### 1.3 Applicant's details

|                    |   |
|--------------------|---|
| Company:           | Sharp Corporation   |
| Address:           | 1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan |
| City:              | Osaka   |
| Country or Region: | Japan   |
| Contacted person:  | Mr. Masaaki Nishikawa                                     |

### 1.4 Manufacturer's details

|                    |   |
|--------------------|---|
| Company:           | Sharp Corporation   |
| Address:           | 1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan |
| City:              | Osaka   |
| Country or Region: | Japan   |
| Contacted person:  | Mr. Masaaki Nishikawa                                     |

## 1.5 Test Environment

|   |            |
|---|------------|
| Date of Receipt of test sample at SRTC: | 2021-07-20 |
| Testing Start Date:                     | 2021-08-01 |
| Testing End Date:                       | 2021-08-16 |

| Environmental Data: | Temperature (°C) | Humidity (%) |
|---------------------|------------------|--------------|
| Ambient:            | 25               | 40           |
| Maximum Extreme:    | 50               | ---          |
| Minimum Extreme:    | -30              | ---          |

|  |     |
|--|-----|
| Normal Supply Voltage (V d.c.):          | 4.0 |
| Maximum Extreme Supply Voltage (V d.c.): | 4.0 |
| Minimum Extreme Supply Voltage (V d.c.): | 3.7 |

## 2 DESCRIPTION OF THE DEVICE UNDER TEST

### 2.1 Final Equipment Build Status

|                      |   |
|----------------------|---|
| Frequency Range:     | GSM850:<br>Tx:824~849MHz Rx:869~894MHz<br>PCS1900:<br>Tx:1850~1910MHz Rx:1930~1990MHz |
| Modulation Type:     | GPRS:GMSK   |
| Emission Designator: | 300KGXW/300KG7W   |
| Duplex Mode:         | FDD   |
| Duplex Spacing:      | GSM850:45MHz<br>PCS1900:80MHz   |
| Antenna Type:        | Inverted-F  |
| Antenna Gain:        | GSM850: -5.5dBi/PCS1900: -5.2dBi  |
| Power Supply:        | Charger   |
| Hardware Version:    | DVT(Remodeled to the equivalent of MP products)                                       |
| Software Version:    | A705B   |
| IMEI:                | 004401230290476/004401230325470   |

### 2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

N/A

### **3 REFERENCE SPECIFICATION**

| Specification     | Version          | Title   |
|-------------------|------------------|---|
| FCC Part2         | 2020             | Frequency allocations and radio treaty matters; general rules and regulations                     |
| FCC Part22        | 2020             | Public mobile services  |
| FCC Part24        | 2020             | Personal communications services  |
| ANSI C63.26       | 2020             | American national standard for compliance testing of transmitters used in licensed radio services |
| KDB 971168<br>D01 | April 9,<br>2018 | Measurement guidance for certification of licensed digital transmitters                           |
| TIA-603-E-2016    | March<br>2016    | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards               |

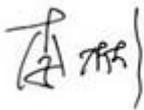
### **4 KEY TO NOTES AND RESULT CODES**

The following are the definition of the test result.

| Code | Meaning  |
|------|--|
| PASS | Test result shows that the requirements of the relevant specification have been met.     |
| FAIL | Test result shows that the requirements of the relevant specification have not been met. |
| NT   | Normal Temperature   |
| NV   | Nominal voltage  |
| HV   | High voltage   |
| LV   | Low voltage  |

## 5 RESULT SUMMARY

| No. | Test case   | FCC reference              | Verdict |
|-----|---|----------------------------|---------|
| 1   | RF Power Output   | 2.1046                     | Pass    |
| 2   | Effective Radiated Power and Effective Isotropic Radiated Power | 22.913(a)(5)/24.232(c)     | Pass    |
| 3   | Occupied Bandwidth  | 2.1049                     | Pass    |
| 4   | Emission Bandwidth  | 2.1049                     | Pass    |
| 5   | Spurious Emissions at antenna terminals                         | 2.1051/22.917(a)/24.238(a) | Pass    |
| 6   | Band Edges Compliance   | 2.1051/22.917(a)/24.238(a) | Pass    |
| 7   | Frequency Stability   | 2.1055/22.355/24.235       | Pass    |
| 8   | Radiated Spurious Emissions                                     | 2.1053/22.917(a)/24.238(a) | Pass    |
| 9   | Peak-Average Ratio  | 24.232(d)                  | Pass    |

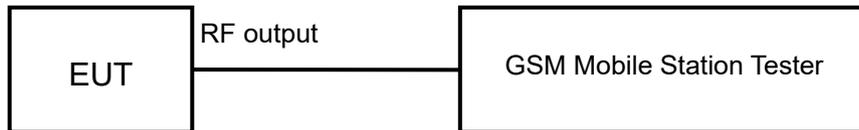
|  |   |
|--|---|
| This Test Report Is Issued by:<br>Mr. Peng Zhen<br> | Checked by:<br>Mr. Li Bin<br> |
| Tested by:<br>Mr. Liu Ce<br>                        | Issued date:<br><br>20210820  |

## **6 TEST RESULT**

### **6.1 RF Power Output**

Rule Part(s)  
FCC Part 2.1046

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration. The measurement will be conducted at three channels (Low, Middle and High channels)

Limits: No specific conduct power requirements in part 2.1046.

Test result:

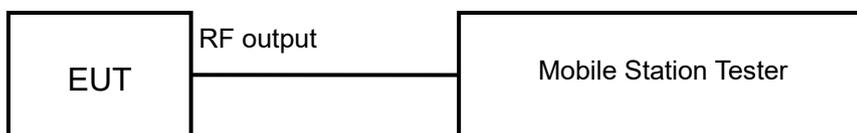
The test results are shown in Appendix A.

## 6.2 Effective Radiated Power and Effective Isotropic Radiated Power

Rule Part(s)

FCC Part 22.913(a)(5)/Part 24.232(c)

Test setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 5.6

Test Settings

Subclause 5.2.5.5 of ANSI C63.26-2015 is applicable, along with the following provisions. For personal/portable radios utilizing an integral antenna, the factor LC is typically negligible. However, in a fixed station transmit system that utilizes a long cable run between the transmitter and the transmitting antenna, this factor can be significant. The minimum cable loss should be used in this equation.

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

$$\text{ERP/EIRP} = \text{PMeas} - \text{LC} + \text{GT}$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Limits for GSM850:

| Operation Mode | Power Step | E.R.P. (dBm) |
|----------------|------------|--------------|
| GSM            | 5          | ≤38.45       |
| GPRS           | 3          | ≤38.45       |
| EDGE           | 6          | ≤38.45       |

Limits for PCS1900:

| Operation Mode | Power Step | E.I.R.P. (dBm) |
|----------------|------------|----------------|
| GSM            | 0          | ≤33            |
| GPRS           | 3          | ≤33            |
| EDGE           | 5          | ≤33            |

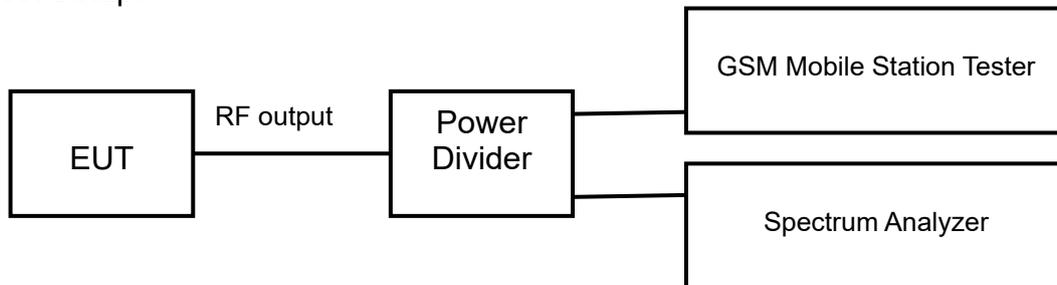
Test result:

The test results are shown in Appendix A.

### 6.3 Occupied Bandwidth

Rule Part(s)  
Part 2.1049

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 4.2

#### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

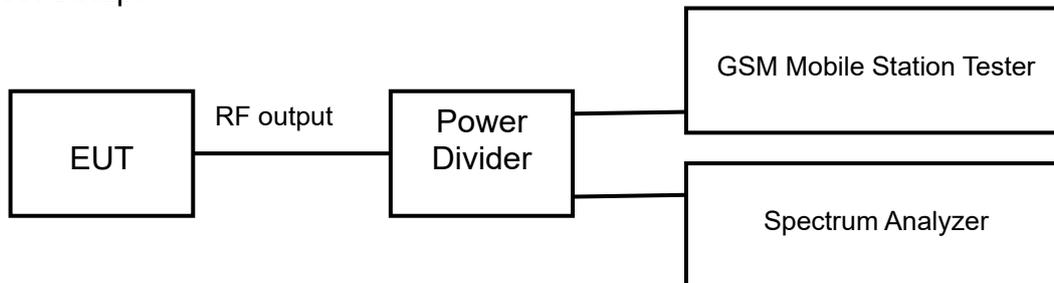
Test result:

The test results are shown in Appendix A.

## 6.4 Emission Bandwidth-

Rule Part(s)  
Part 2.1049

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 26dB occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the emission bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

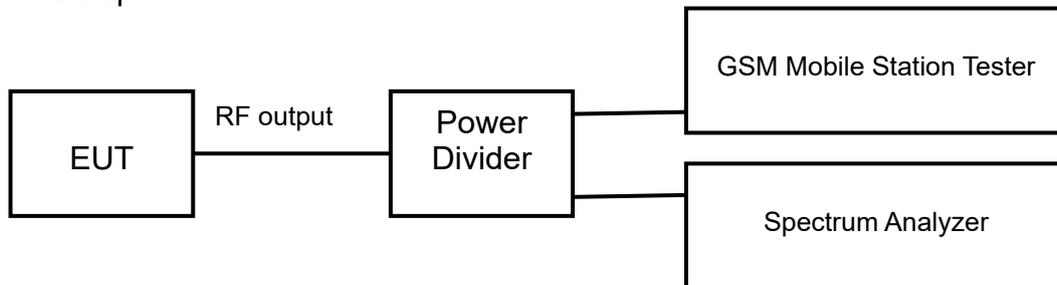
Test result:

The test results are shown in Appendix A.

## 6.5 Spurious Emissions at antenna terminal

Rule Part(s)  
FCC Part 2.1053/22.917 (a)/ 24.238(a)

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz for Cell, 20GHz for PCS
2. RBW=100 kHz (For below 1GHz), 1MHz (For above 1GHz)
3. VBW  $\geq 3 \times$  RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Limits:

The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P_{\text{[Watts]}})$ , where P is the transmitter power in Watts.

Test result:

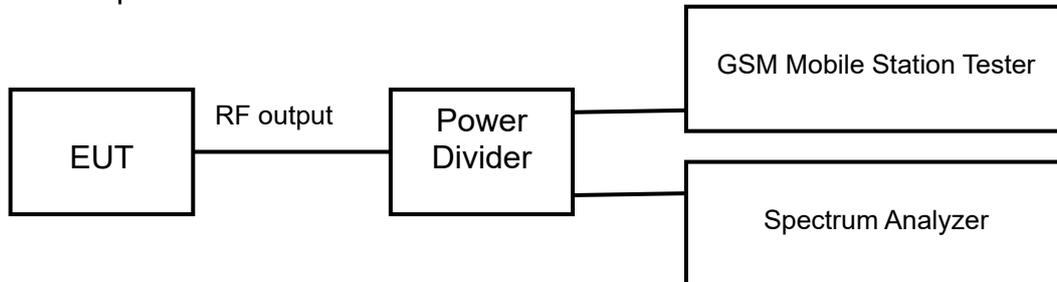
The test results are shown in Appendix A.

## 6.6 Band Edges Compliance

Rule Part (s)

FCC Part 2.1051/ 22.917(a) /Part 24.238(a)

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span=2MHz
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limit: The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P_{\text{Watts}})$ , where P is the transmitter power in Watts.

Test result:

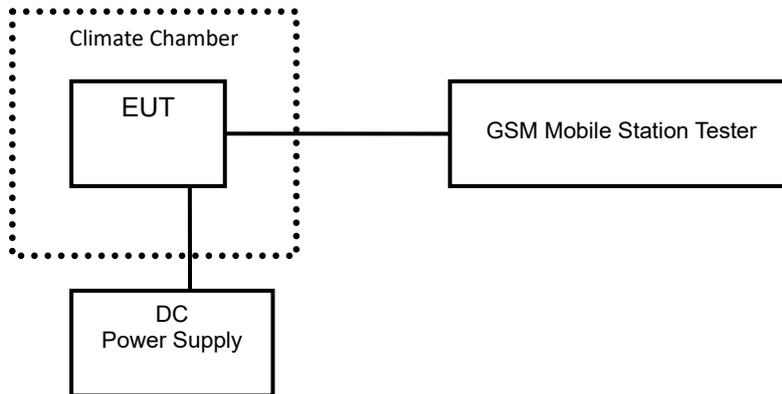
The test results are shown in Appendix A.

## 6.7 Frequency Stability

Rule Part(s)

FCC Part 2.1055/22.355 /Part 24.235

Test setup:



Test Procedure:

ANSI/TIA-603-E-2016

### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C (The temperature range can be declared by the manufacturer). A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limits: For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency. For Part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

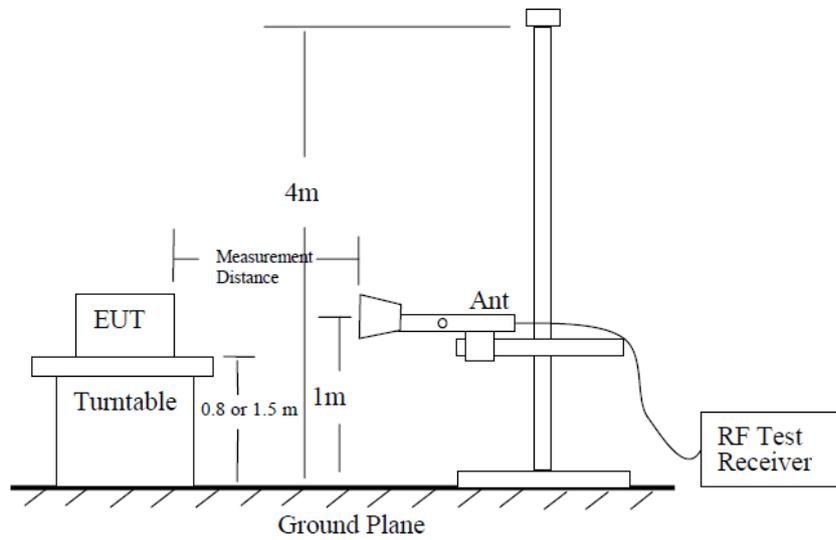
Test result:

The test results are shown in Appendix A.

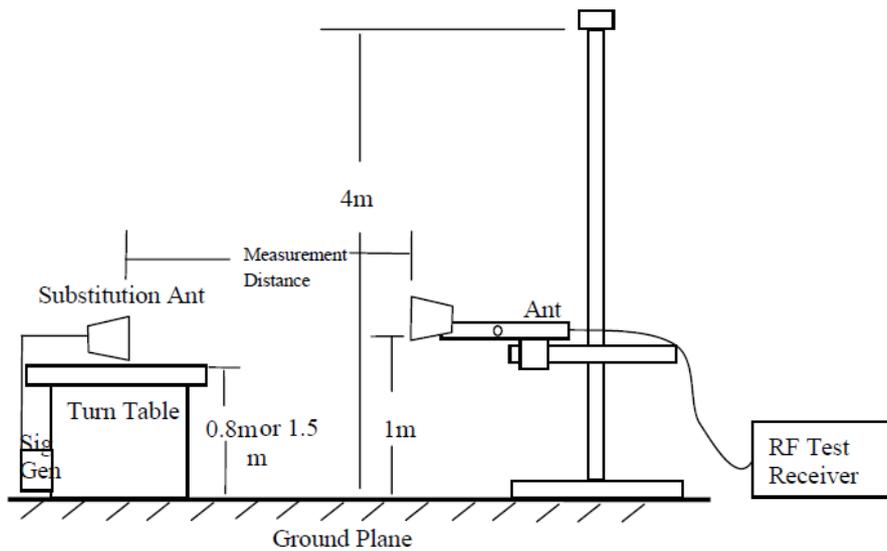
### 6.8 Radiated Spurious Emissions

Rule Part(s)  
 FCC Part 2.1053/ 22.917(a)/Part 24.238(a)

Test Setup:



Step 1



Step 2

#### Test procedure:

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

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.

#### Step 1:

The measurement is carried out in the chamber. EUT was placed on a 0.8m ( $f < 1\text{GHz}$ )/1.5m ( $f > 1\text{GHz}$ ) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100 kHz ( $f < 1\text{GHz}$ )/1MHz ( $f > 1\text{GHz}$ ). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 10th harmonic of the carrier. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

#### Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power ( $P_{mea}$ ) is applied to the input of the substitution antenna, and adjusts 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.

A "reference path loss" should be calculated after test. The attenuation of "reference path loss" is the cable loss between the Signal Source with the Substitution Antenna ( $P_{ca}$ ) and the Substitution Antenna Gain ( $G_a$ ).

#### Calculation procedure:

The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:

$$\text{Power (EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15 \text{ (dB)}$ .

Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.

$$P = P_{mea} + P_{ca} + G_a = (-20\text{dBm}) + (-30\text{dB}) + (11\text{dB}) = -39\text{dBm}$$

Note: We tested both horizontal and vertical polarization, but only the largest numerical polarity of the two polarities was recorded in the final report.

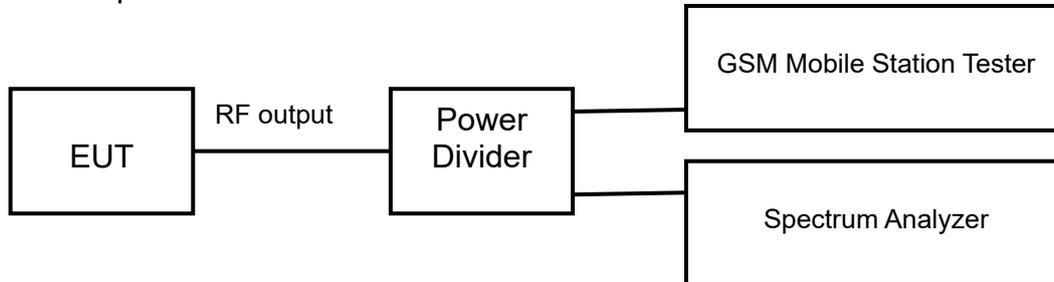
#### Test result:

The test results are shown in Appendix B.

## 6.9 Peak-Average Ratio

Rule Part(s)  
FCC Part 24.232(d)

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 5.7.1

Test settings:

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Limits: the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test result:

The test results are shown in Appendix A

## 7 MEASUREMENT UNCERTAINTIES

| Items   | Uncertainty  |        |
|---|--------------|--------|
| RF Power Output   | 0.6 dB       |        |
| Effective Radiated Power and Effective Isotropic Radiated Power | 0.6 dB       |        |
| Occupied Bandwidth  | 3kHz         |        |
| Emission Bandwidth  | 3kHz         |        |
| Peak-Average Ratio  | 0.8dB        |        |
| Frequency Stability   | 48Hz         |        |
| Band Edges Compliance   | 1.2dB        |        |
| Spurious Emissions at antenna terminal                          | 9kHz~2GHz    | 1.2dB  |
|   | 2G~3.6GHz    | 1.4dB  |
|   | 3.6G~8GHz    | 2.2dB  |
|   | 8G~12.75GHz  | 2.7dB  |
| Radiated Emission Measurement                                   | 30MHz~200MHz | 4.88dB |
|   | 200MHz~1GHz  | 4.87dB |
|   | 1GHz~18GHz   | 4.58dB |
|   | 18GHz~40GHz  | 4.35dB |

## 8 TEST EQUIPMENTS

| No. | Name/Model                                     | Manufacturer | S/N          | Calibration Date | Calibration Due Date |
|-----|--|--------------|--------------|------------------|----------------------|
| 1   | MT8820C<br>Mobile Station Tester               | Anritsu      | 6201300660   | 2020.08.20       | 2021.08.19           |
| 2   | CMW500<br>Radio Communication Station          | R&S          | 161702       | 2020.08.20       | 2021.08.19           |
| 3   | FSV40<br>Spectrum Analyzer                     | R&S          | 101065       | 2020.08.20       | 2021.08.19           |
| 4   | N9020A<br>Spectrum Analyzer                    | Agilent      | MY48010771   | 2020.08.20       | 2021.08.19           |
| 5   | 6007<br>Power Divider                          | Weinschel    | 6007-GJ-1    | 2020.08.20       | 2021.08.19           |
| 6   | DC Power Supply E3645A                         | Agilent      | MY40000741   | 2021.04.22       | 2022.04.21           |
| 7   | Temperature chamber SH241                      | ESPEC        | 92013758     | 2020.08.20       | 2021.08.19           |
| 8   | 12.65m×8.03m×7.50m<br>Fully-Anechoic Chamber   | FRANKONIA    | ----         | ----             | ----                 |
| 9   | 23.18m×16.88m×9.60m<br>Semi-Anechoic Chamber   | FRANKONIA    | ---          | ----             | ----                 |
| 10  | Turn table Diameter:1m                         | FRANKONIA    | ----         | ----             | ----                 |
| 11  | Turn table Diameter:5m                         | FRANKONIA    | ----         | ----             | ----                 |
| 12  | Antenna master FAC(MA4.0)                      | MATURO       | ----         | ----             | ----                 |
| 13  | Antenna master SAC(MA4.0)                      | MATURO       | ----         | ----             | ----                 |
| 14  | 9.080m×5.255m×3.525m<br>Shielding room         | FRANKONIA    | ----         | ----             | ----                 |
| 15  | HF 907 Double-Ridged<br>Waveguide Horn Antenna | R&S          | 100512       | 2020.08.20       | 2021.08.19           |
| 16  | HF 907 Double-Ridged<br>Waveguide Horn Antenna | R&S          | 100513       | 2020.08.20       | 2021.08.19           |
| 17  | HL562 Ultra log antenna                        | R&S          | 100016       | 2020.08.20       | 2021.08.19           |
| 18  | 3160-09 Receive antenna                        | SCHWARZ-BECK | 002058-002   | 2020.08.20       | 2021.08.19           |
| 19  | ESI 40 EMI test receiver                       | R&S          | 100015       | 2020.08.20       | 2021.08.19           |
| 20  | ESCS30 EMI test receiver                       | R&S          | 100029       | 2020.08.20       | 2021.08.19           |
| 21  | HL562 Receive antenna                          | R&S          | 100167       | 2020.08.20       | 2021.08.19           |
| 22  | ENV216 AMN                                     | R&S          | 3560.6550.12 | 2020.08.20       | 2021.08.19           |

## **APPENDIX A – TEST DATA OF CONDUCTED EMISSION**

### **1. RF Power Output**

#### **GSM850**

GSM Measured Power:

| Carrier frequency (MHz) | Channel No. | RF Power Output (dBm) |
|-------------------------|-------------|-----------------------|
| 824.2                   | 128         | 32.57                 |
| 836.4                   | 189         | 32.69                 |
| 848.8                   | 251         | 32.59                 |

GPRS Measured Power:

| Carrier frequency (MHz) | Channel No. | TX Mode          | RF Power Output (dBm) |
|-------------------------|-------------|------------------|-----------------------|
| 836.4                   | 189         | 4Downlink1uplink | 32.79                 |
| 848.8                   | 251         |                  | 32.63                 |
| 824.2                   | 128         |                  | 32.58                 |
| 836.4                   | 189         | 3Downlink2uplink | 30.11                 |
| 848.8                   | 251         |                  | 30.06                 |
| 824.2                   | 128         |                  | 29.88                 |
| 836.4                   | 189         | 2Downlink3uplink | 27.83                 |
| 848.8                   | 251         |                  | 27.66                 |
| 824.2                   | 128         |                  | 27.70                 |
| 836.4                   | 189         | 1Downlink4uplink | 27.01                 |
| 848.8                   | 251         |                  | 26.92                 |
| 824.2                   | 128         |                  | 26.95                 |

### PCS1900

#### GSM Measured Power:

| Carrier frequency (MHz) | Channel No. | RF Power Output (dBm) |
|-------------------------|-------------|-----------------------|
| 1850.2                  | 512         | 29.41                 |
| 1880                    | 661         | 29.42                 |
| 1909.8                  | 810         | 29.71                 |

#### GPRS Measured Power:

| Carrier frequency (MHz) | Channel No. | TX Mode          | RF Power Output (dBm) |
|-------------------------|-------------|------------------|-----------------------|
| 1850.2                  | 512         | 4Downlink1uplink | 29.47                 |
| 1880                    | 661         |                  | 29.51                 |
| 1909.8                  | 810         |                  | 29.79                 |
| 1850.2                  | 512         | 3Downlink2uplink | 26.72                 |
| 1880                    | 661         |                  | 26.75                 |
| 1909.8                  | 810         |                  | 27.00                 |
| 1850.2                  | 512         | 2Downlink3uplink | 24.72                 |
| 1880                    | 661         |                  | 24.80                 |
| 1909.8                  | 810         |                  | 25.18                 |
| 1850.2                  | 512         | 1Downlink4uplink | 23.77                 |
| 1880                    | 661         |                  | 23.84                 |
| 1909.8                  | 810         |                  | 24.00                 |

## 2. Occupied Bandwidth

### GSM850

#### GSM MODE:

| Carrier frequency (MHz) | Channel No. | Bandwidth of 99% Power (kHz) |
|-------------------------|-------------|------------------------------|
| 824.2                   | 128         | 244.57                       |
| 836.4                   | 189         | 248.91                       |
| 848.8                   | 251         | 251.81                       |

#### GPRS MODE:

| Carrier frequency (MHz) | Channel No. | Bandwidth of 99% Power (kHz) |
|-------------------------|-------------|------------------------------|
| 824.2                   | 128         | 253.26                       |
| 836.4                   | 189         | 240.23                       |
| 848.8                   | 251         | 246.02                       |

**PCS1900**

**GSM MODE:**

| Carrier frequency (MHz) | Channel No. | Bandwidth of 99% Power (kHz) |
|-------------------------|-------------|------------------------------|
| 1850.2                  | 512         | 251.81                       |
| 1880                    | 661         | 251.81                       |
| 1909.8                  | 810         | 246.02                       |

**GPRS MODE:**

| Carrier frequency (MHz) | Channel No. | Bandwidth of 99% Power (kHz) |
|-------------------------|-------------|------------------------------|
| 1850.2                  | 512         | 241.68                       |
| 1880                    | 661         | 241.68                       |
| 1909.8                  | 810         | 244.57                       |

**GSM850**

GSM MODE:



Date: 26.JUL.2021 11:59:29

Channel 128



Date: 26.JUL.2021 12:00:32

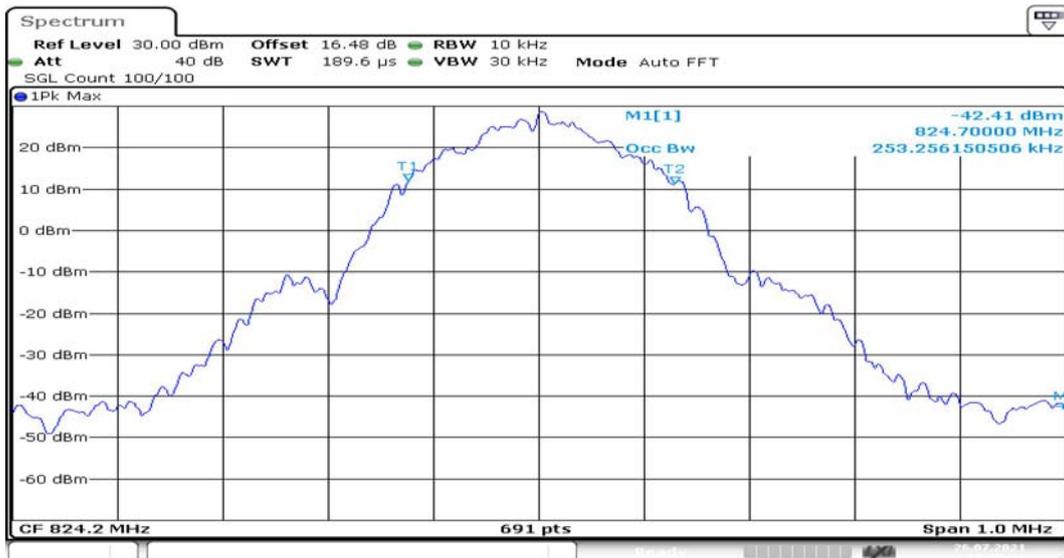
Channel 189



Date: 26.JUL.2021 12:01:16

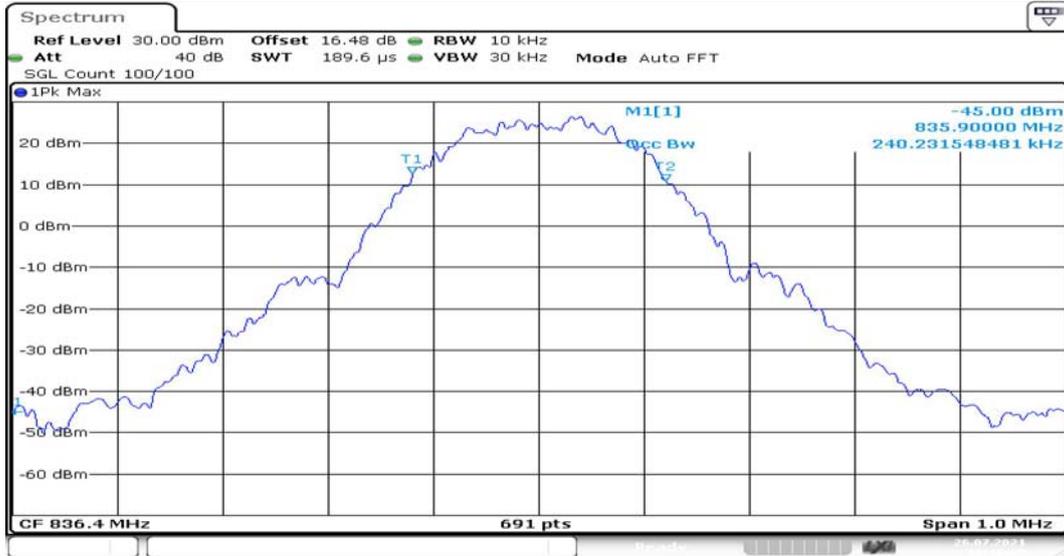
Channel 251

GPRS MODE:



Date: 26.JUL.2021 12:09:40

Channel 128

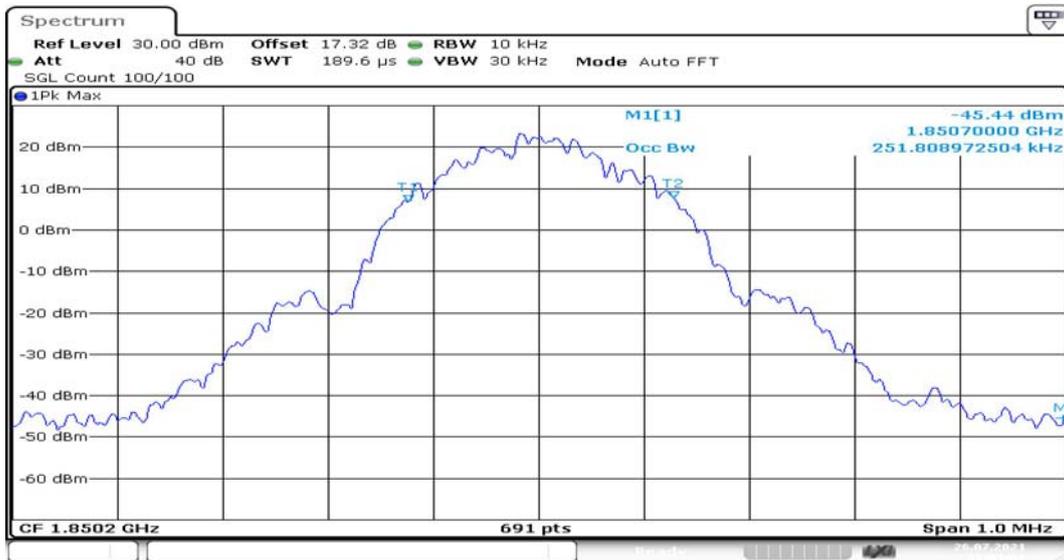


Channel 189



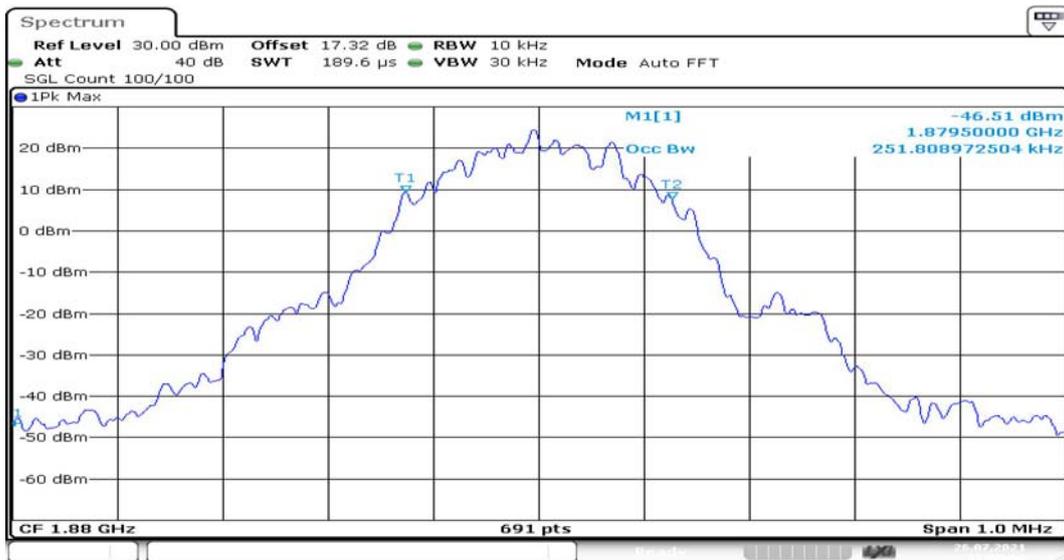
Channel 251

**PCS1900**  
GSM MODE:



Date: 26.JUL.2021 11:31:01

Channel 512



Date: 26.JUL.2021 11:32:07

Channel 661



Date: 26.JUL.2021 11:32:52

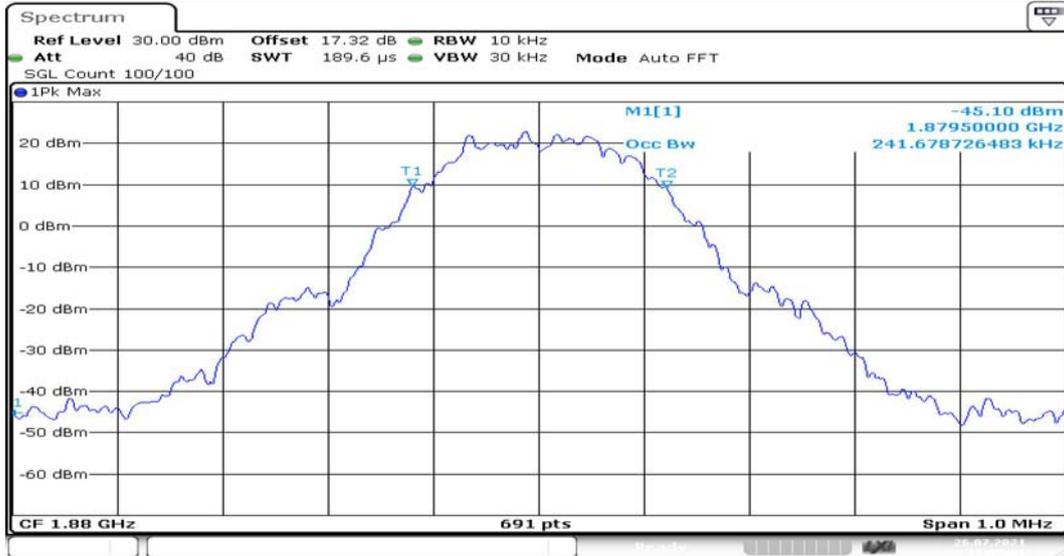
Channel 810

GPRS MODE:



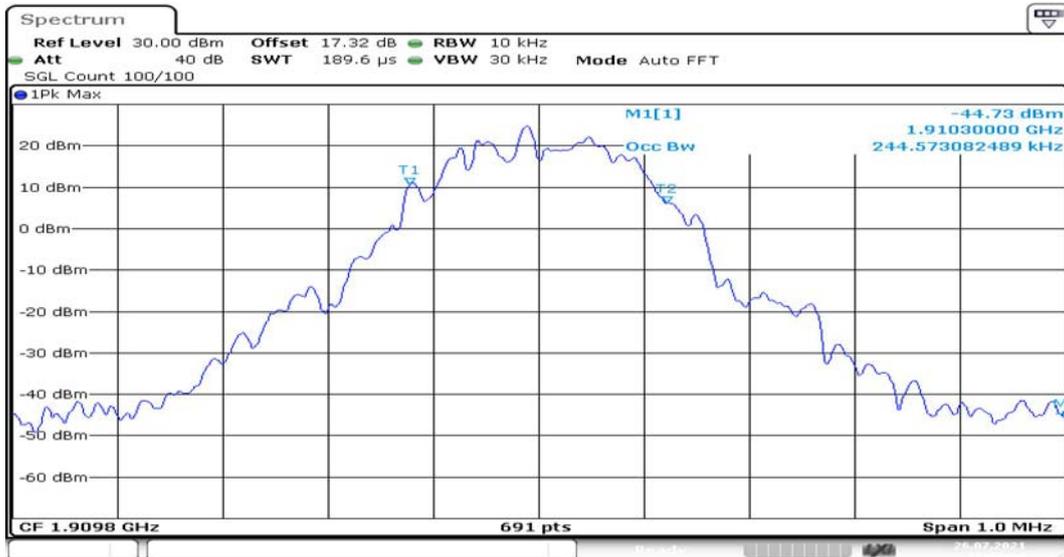
Date: 26.JUL.2021 11:34:25

Channel 512



Date: 26.JUL.2021 11:35:41

Channel 661



Date: 26.JUL.2021 11:36:38

Channel 810

### 3. Emission Bandwidth

#### GSM850

GSM MODE:

| Carrier frequency (MHz) | Channel No. | Bandwidth of -26dB transmitter power(kHz) |
|-------------------------|-------------|---|
| 824.2                   | 128         | 309.70                                    |
| 836.4                   | 189         | 312.60                                    |
| 848.8                   | 251         | 309.70                                    |

GPRS MODE:

| Carrier frequency (MHz) | Channel No. | Bandwidth of -26dB transmitter power(kHz) |
|-------------------------|-------------|---|
| 824.2                   | 128         | 316.90                                    |
| 836.4                   | 189         | 312.60                                    |
| 848.8                   | 251         | 314.00                                    |

**PCS1900**

**GSM MODE:**

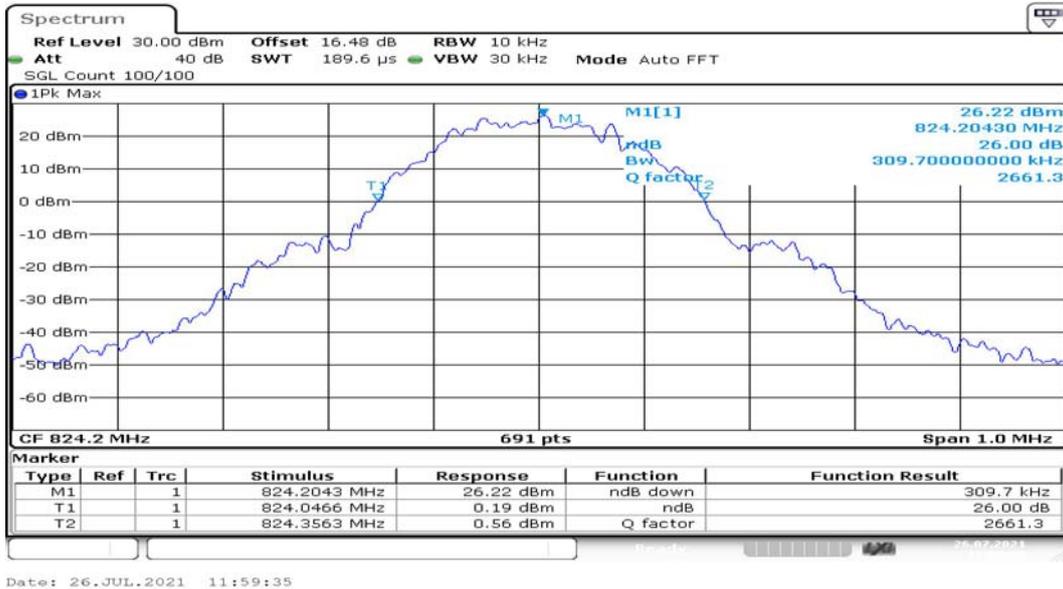
| Carrier frequency (MHz) | Channel No. | Bandwidth of -26dB transmitter power(kHz) |
|-------------------------|-------------|---|
| 1850.2                  | 512         | 298.10                                    |
| 1880                    | 661         | 318.40                                    |
| 1909.8                  | 810         | 311.10                                    |

**GPRS MODE:**

| Carrier frequency (MHz) | Channel No. | Bandwidth of -26dB transmitter power(kHz) |
|-------------------------|-------------|---|
| 1850.2                  | 512         | 308.20                                    |
| 1880                    | 661         | 309.70                                    |
| 1909.8                  | 810         | 316.90                                    |

**GSM850**

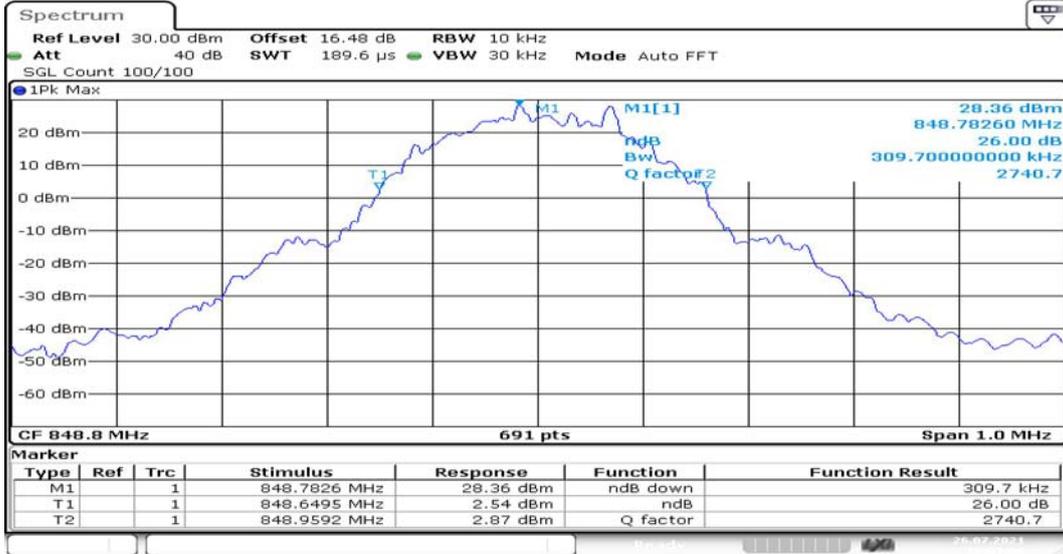
GSM MODE:



Channel 128



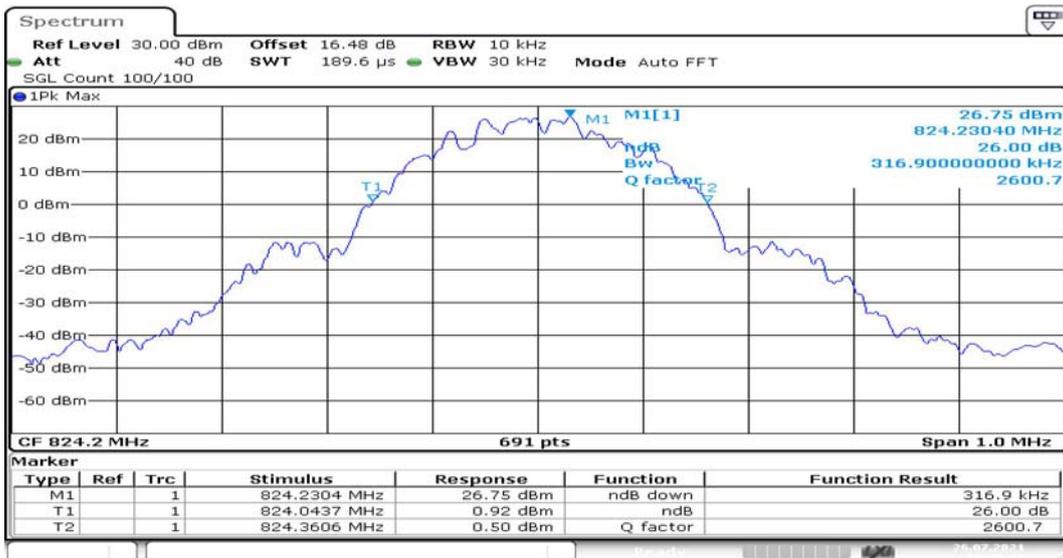
Channel 189



Date: 26.JUL.2021 12:01:22

Channel 251

GPRS MODE:



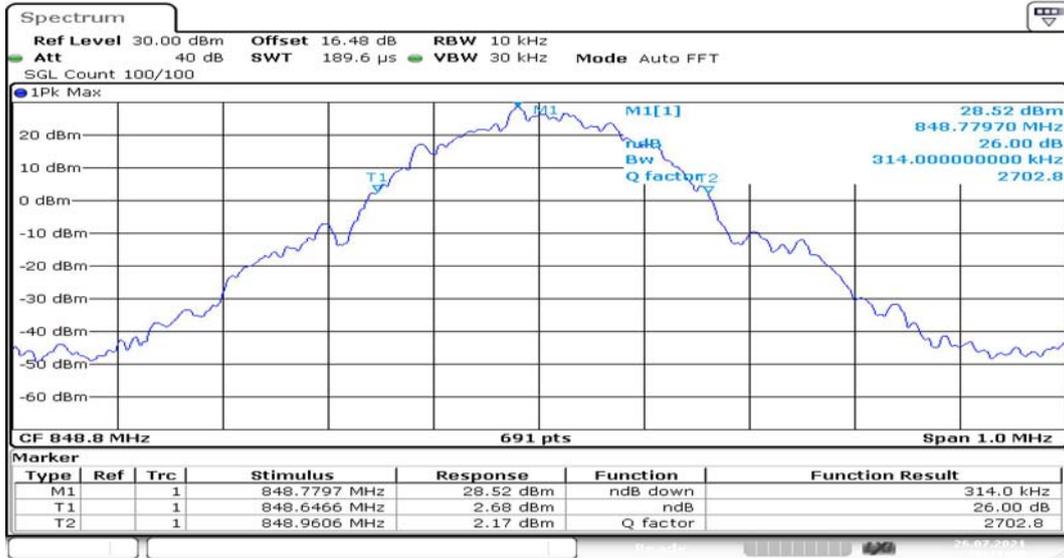
Date: 26.JUL.2021 12:09:47

Channel 128



Date: 26.JUL.2021 12:10:32

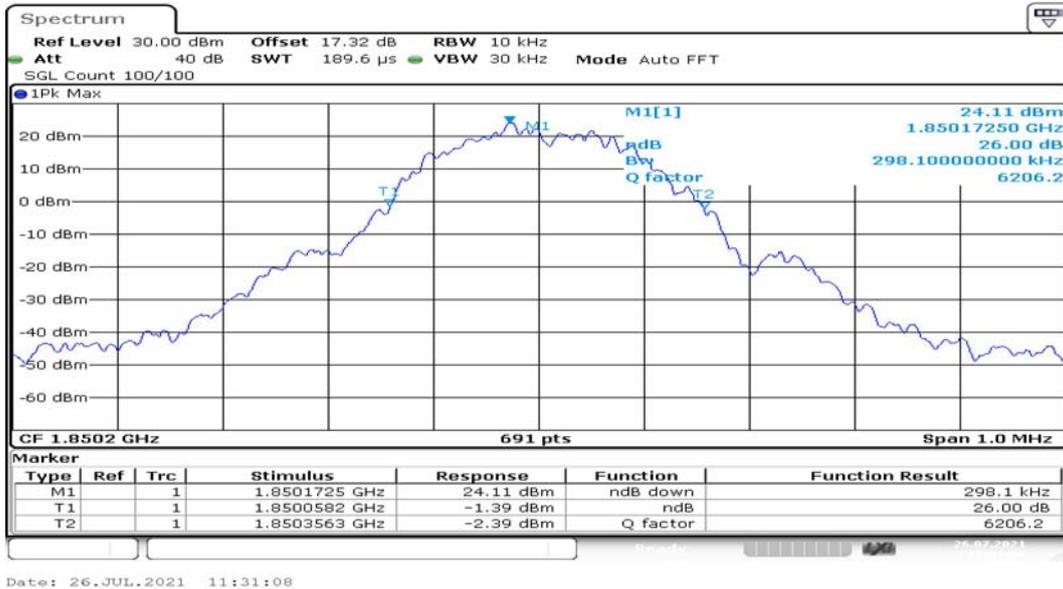
Channel 189



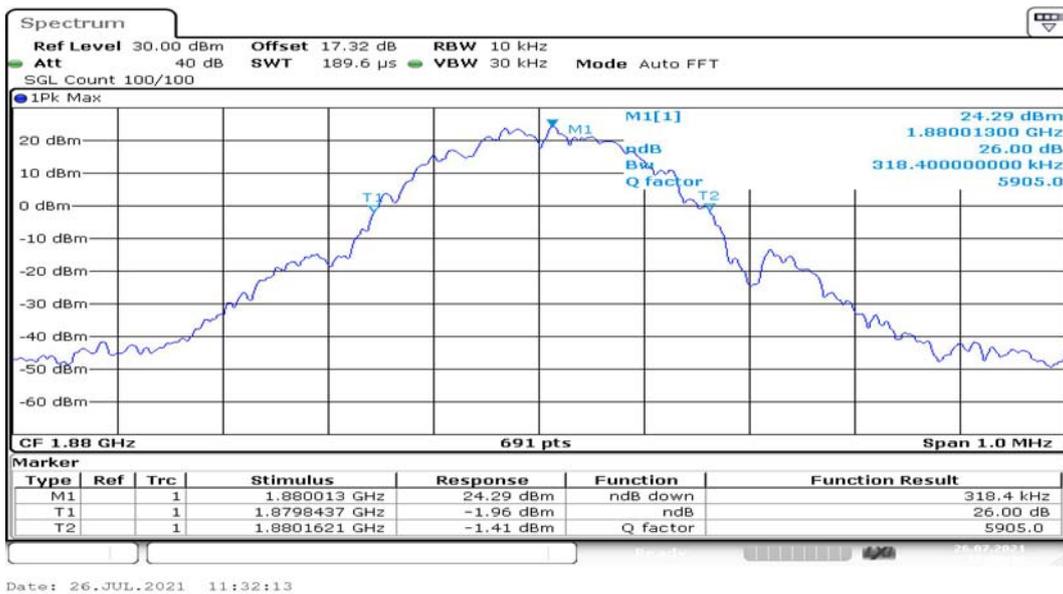
Date: 26.JUL.2021 12:11:27

Channel 251

**PCS1900**  
**GSM MODE:**



Channel 512



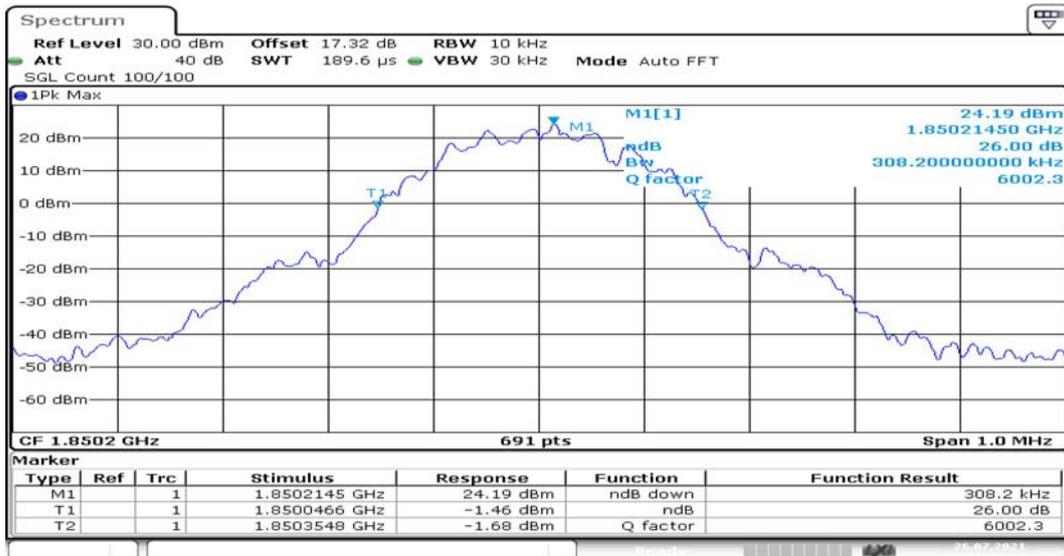
Channel 661



Date: 26.JUL.2021 11:32:58

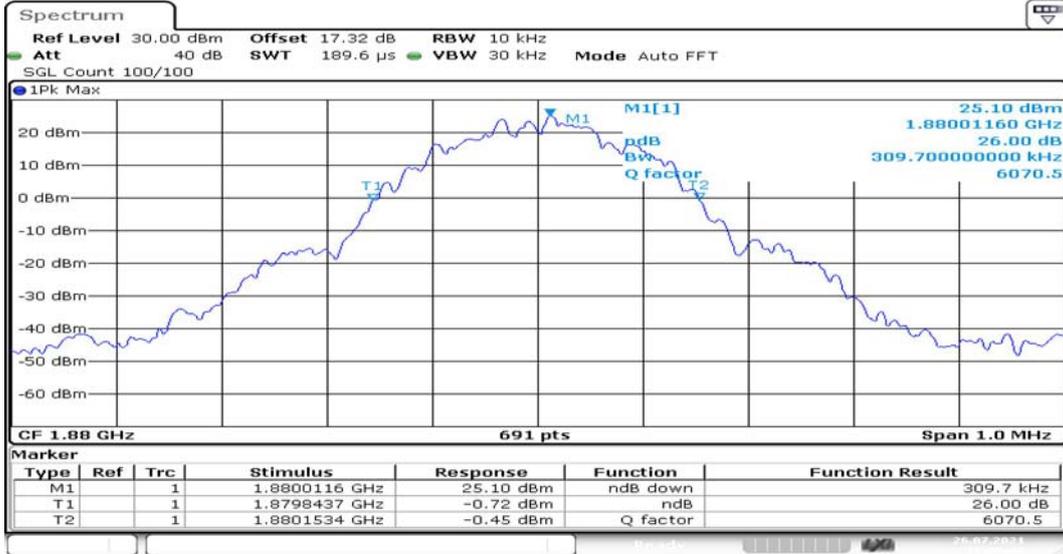
Channel 810

GPRS MODE:



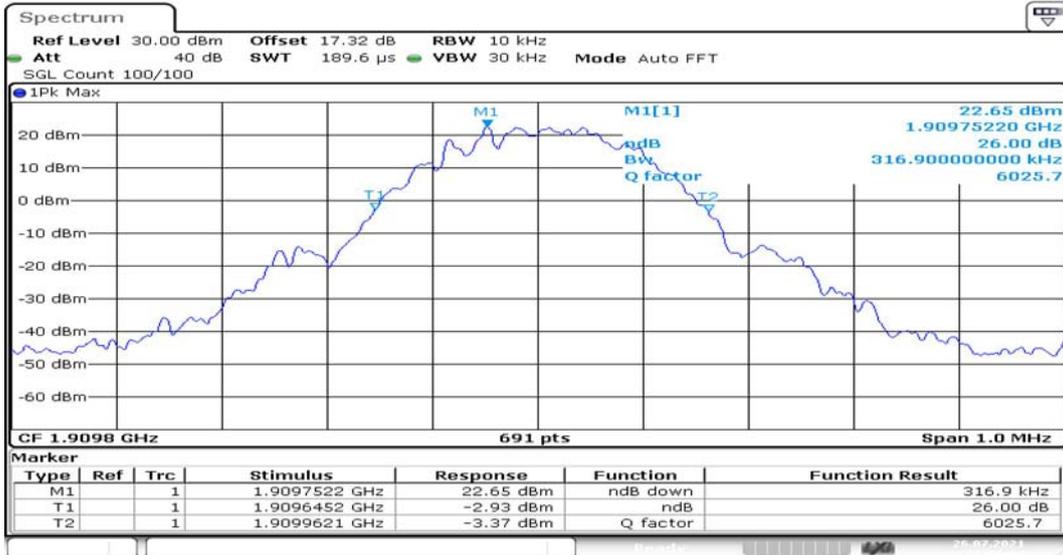
Date: 26.JUL.2021 11:34:32

Channel 512



Date: 26.JUL.2021 11:35:48

Channel 661



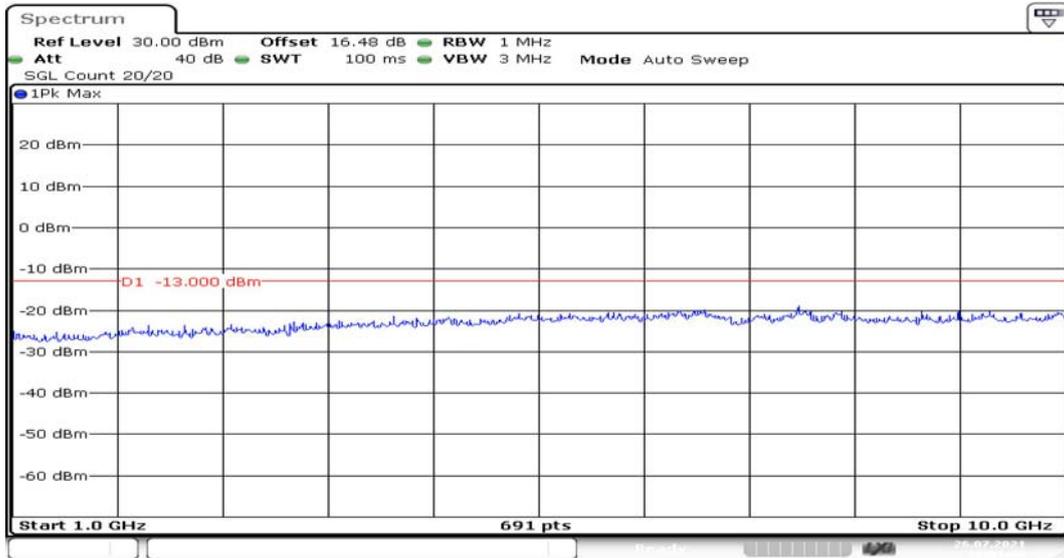
Date: 26.JUL.2021 11:36:45

Channel 810

#### 4. Spurious Emissions at antenna terminal

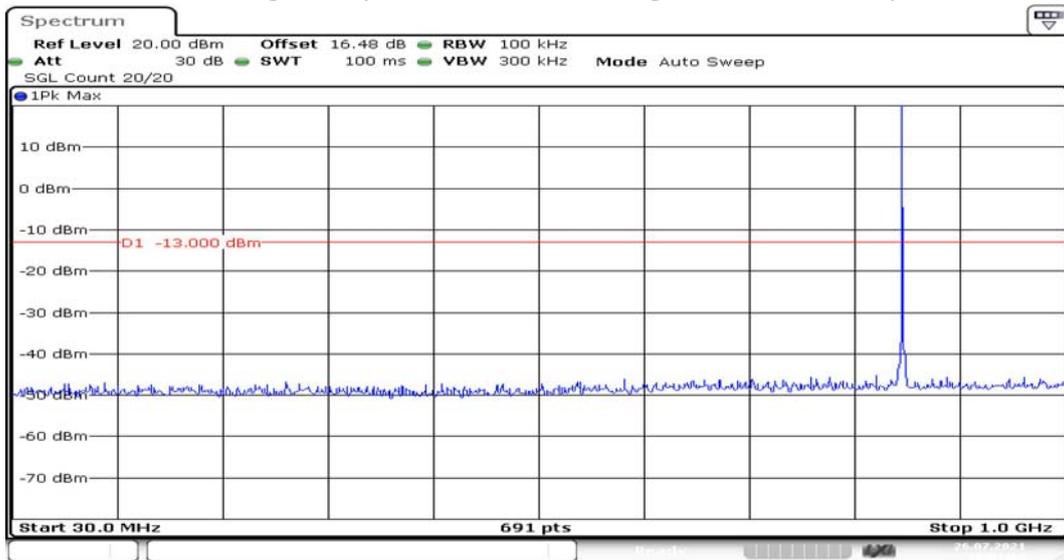
##### GSM850

GSM MODE:



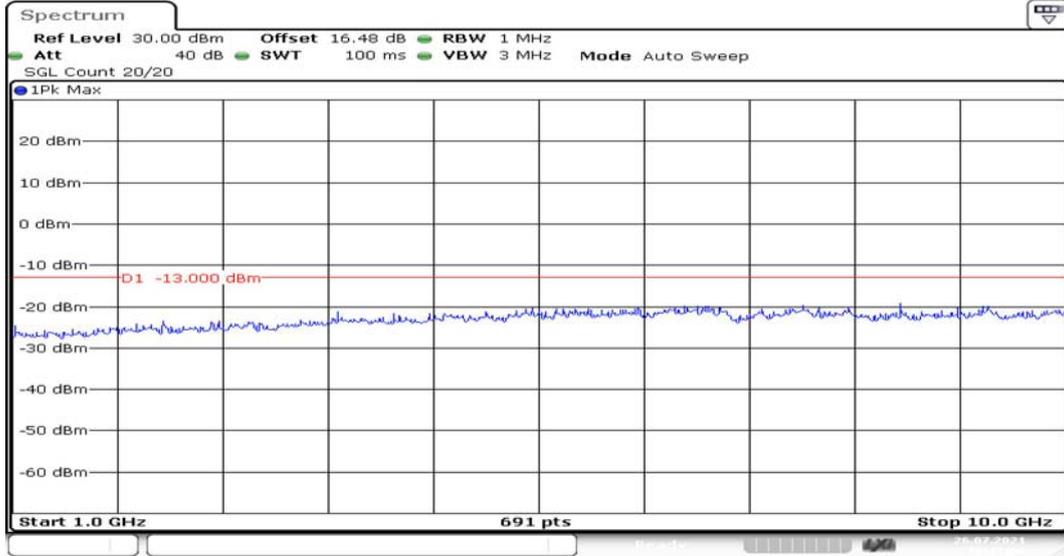
Channel 189 1GHz~10GHz(dBm)

Note: The signal beyond the limit is the signal transmitted by EUT.



Channel 189 30MHz~1GHz(dBm)

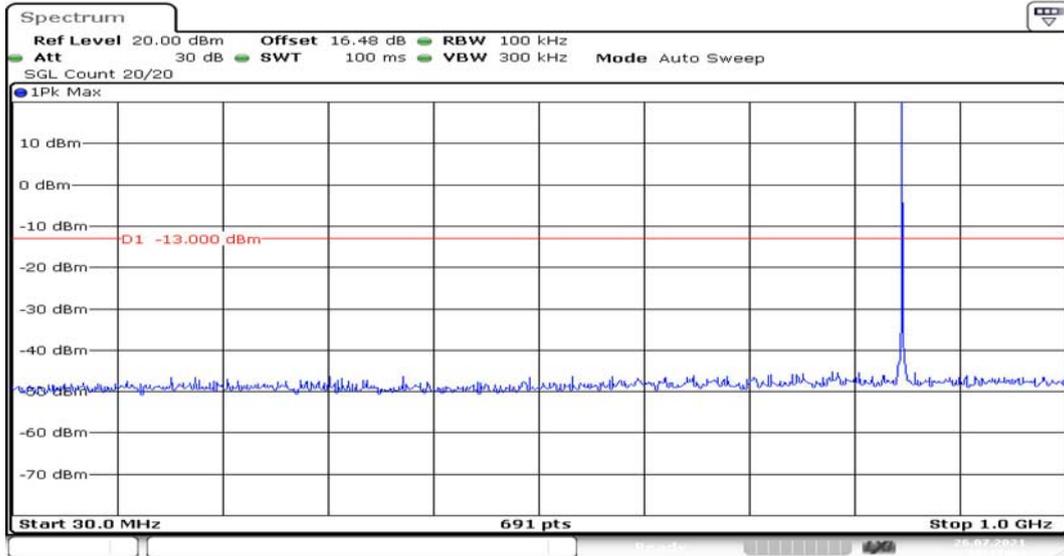
GPRS MODE:



Date: 26.JUL.2021 12:11:51

Channel 189 1GHz~10GHz(dBm)

Note: The signal beyond the limit is the signal transmitted by EUT.

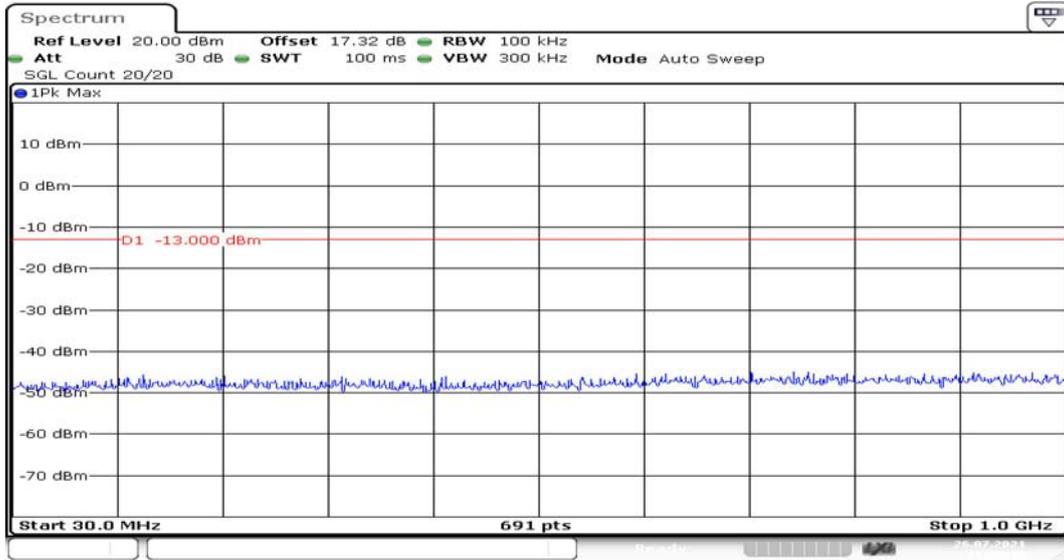


Date: 26.JUL.2021 12:11:43

Channel 189 30MHz~1GHz(dBm)

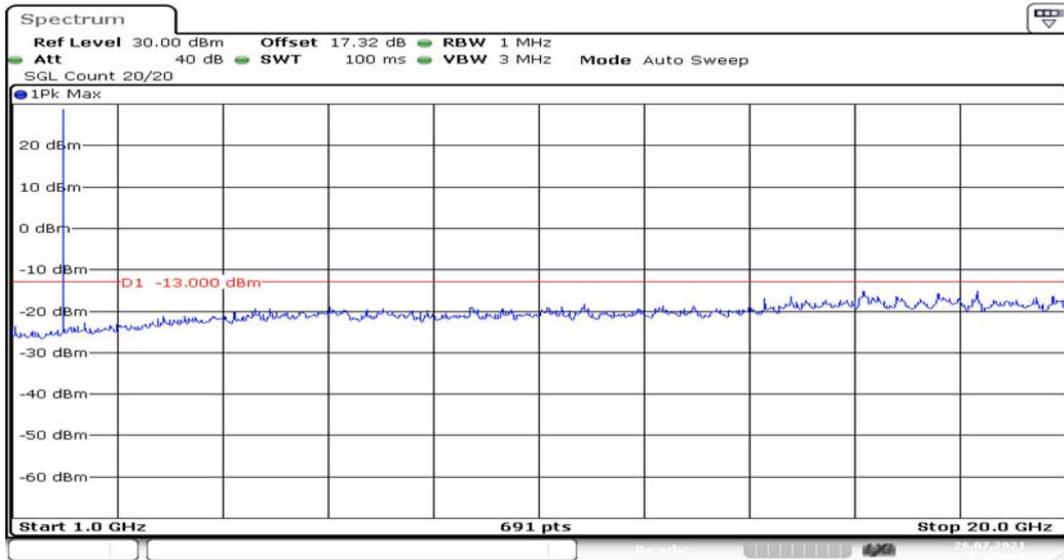
**PCS1900**

GSM MODE:



Date: 26.JUL.2021 11:33:15

Channel 661 30MHz~1GHz(dBm)

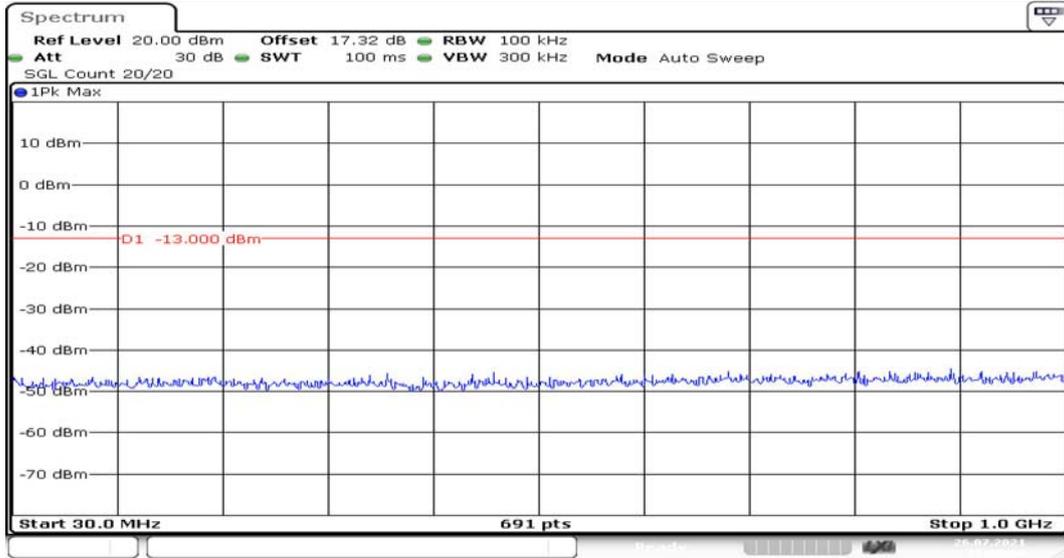


Date: 26.JUL.2021 11:33:24

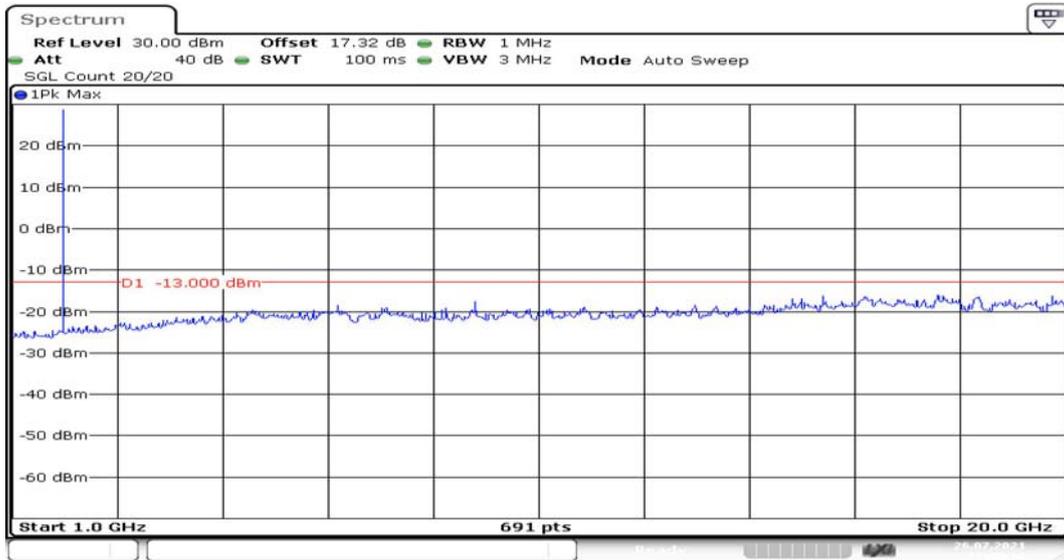
Channel 661 1GHz~20GHz(dBm)

Note: The signal beyond the limit is the signal transmitted by EUT.

GPRS MODE:



Channel 661 30MHz~1GHz(dBm)



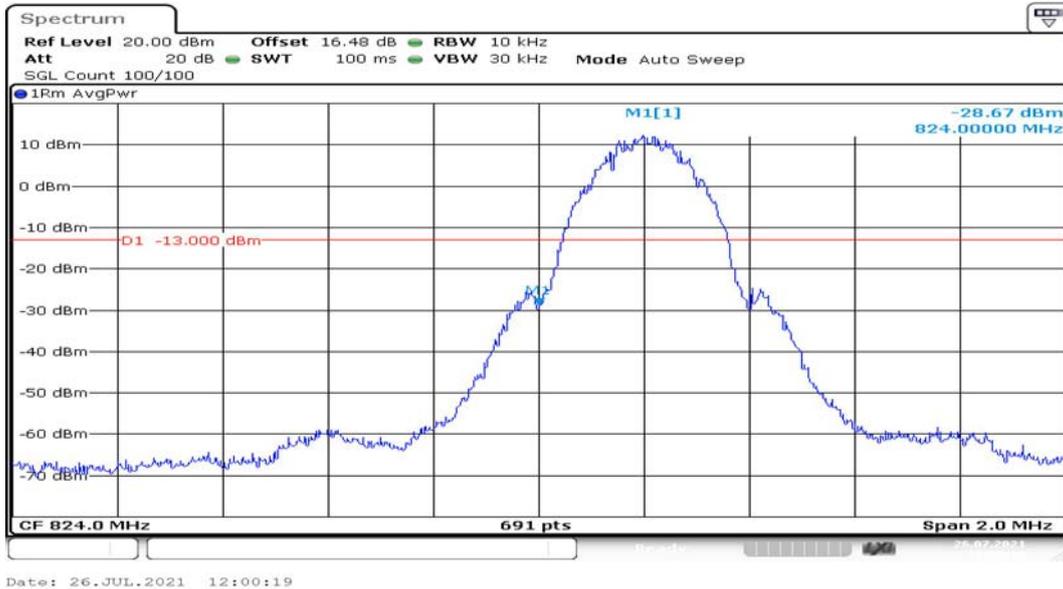
Channel 661 1GHz~20GHz(dBm)

Note: The signal beyond the limit is the signal transmitted by EUT.

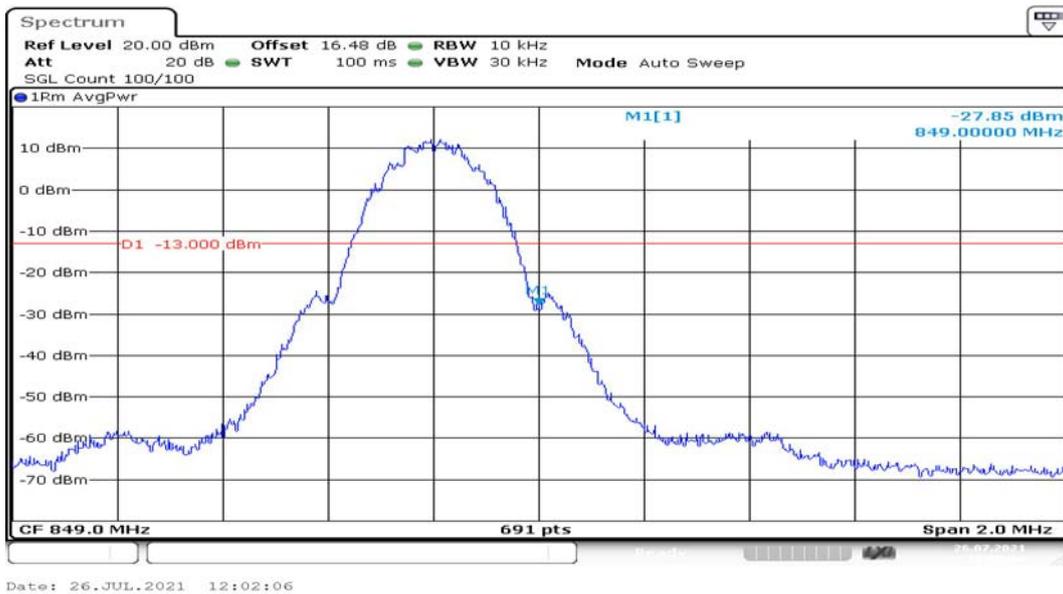
## 5. Band Edges Compliance

### GSM850

GSM MODE:

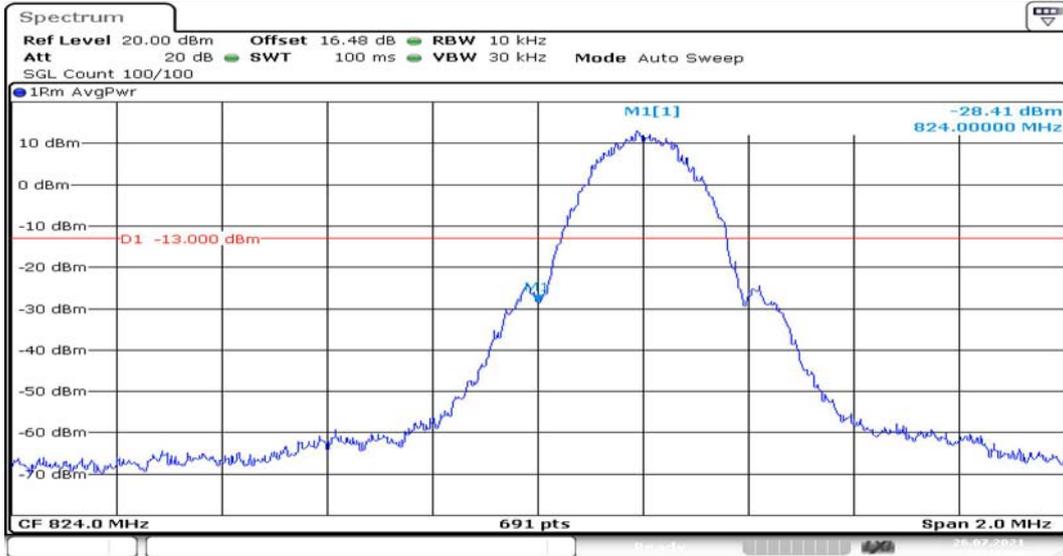


Channel 128



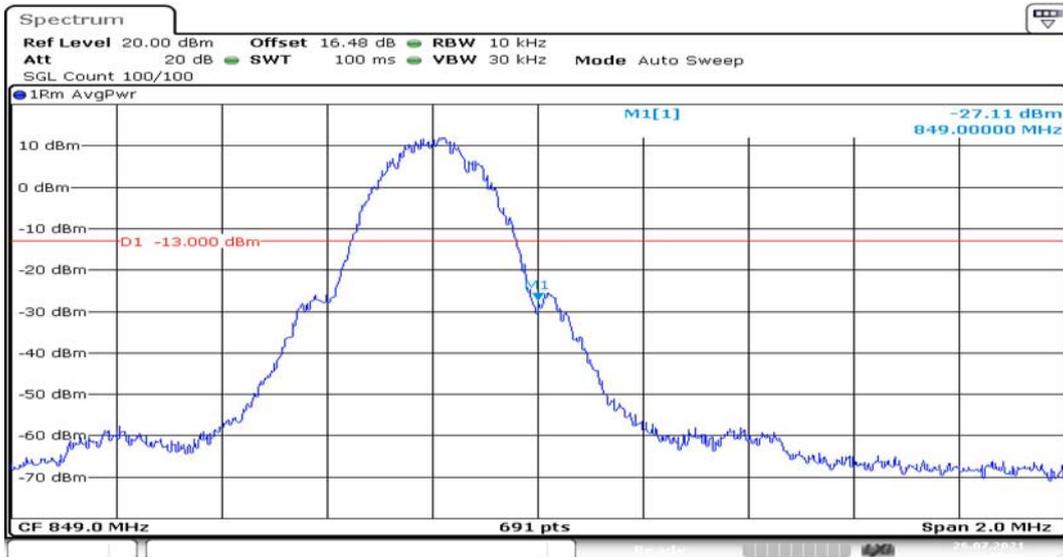
Channel 251

GPRS MODE:



Date: 26.JUL.2021 12:10:30

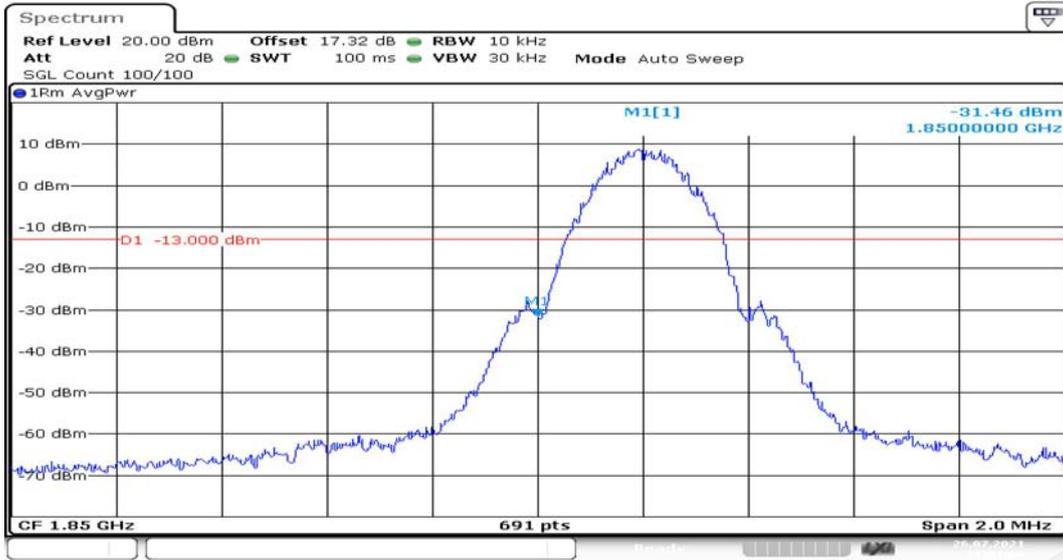
Channel 128



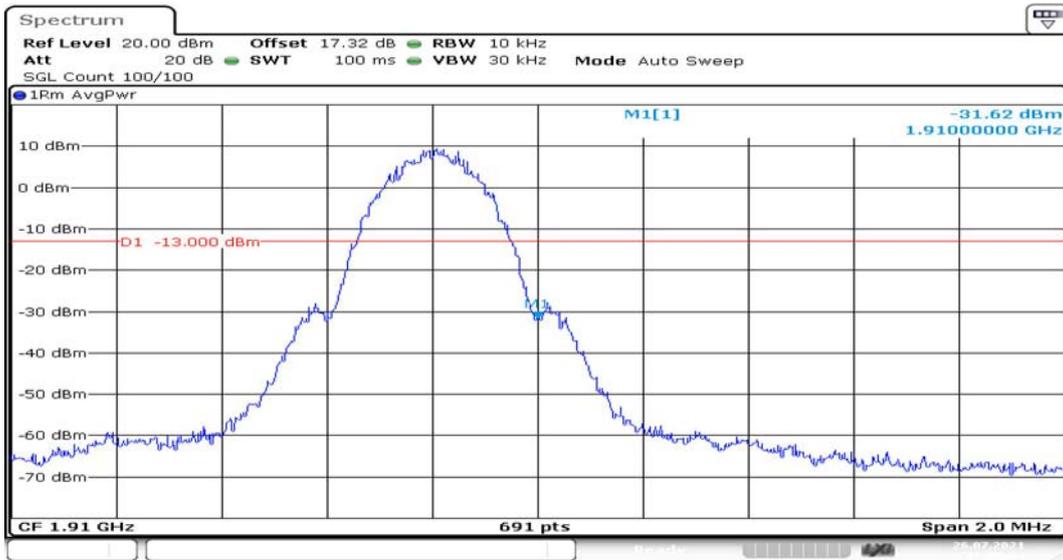
Date: 26.JUL.2021 12:12:10

Channel 251

**PCS1900**  
**GSM MODE:**

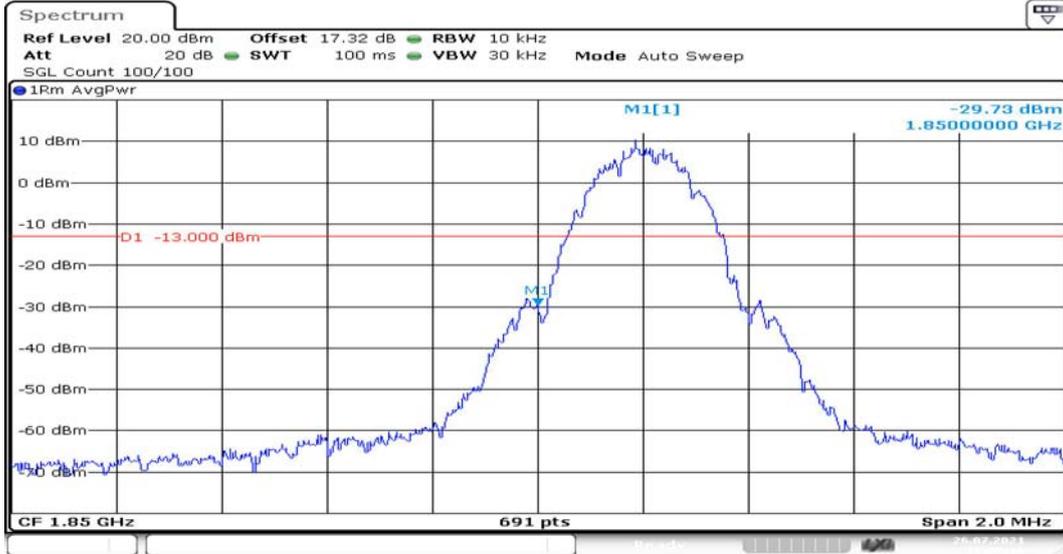


Channel 512

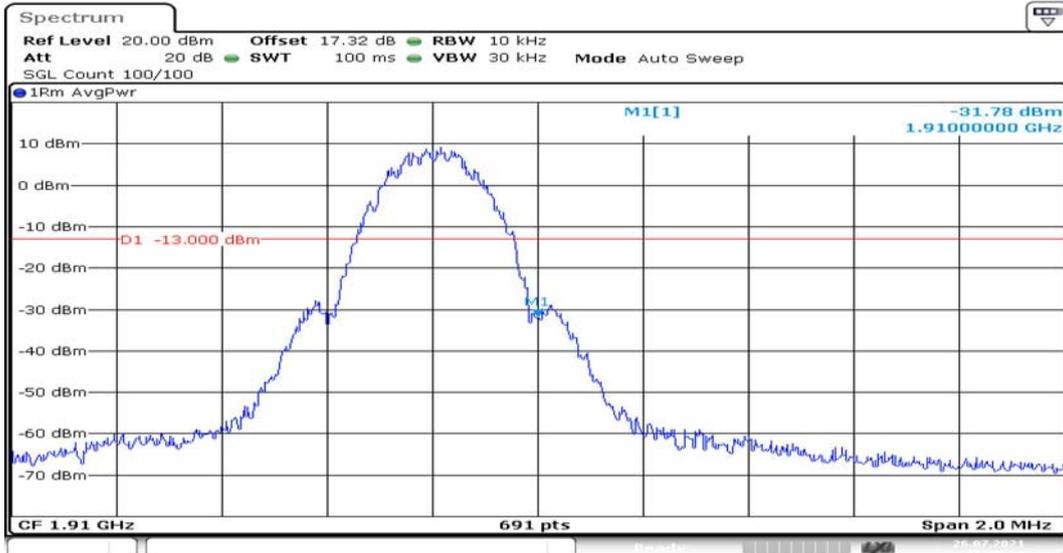


Channel 810

**GPRS MODE:**



Channel 512



Channel 810

## 6. Frequency Stability

### GSM850

GSM MODE:

| Temperature(°C) | Test Result (ppm)@NV |             |             |
|-----------------|----------------------|-------------|-------------|
|                 | Channel 128          | Channel 189 | Channel 251 |
| -30             | 0.014                | 0.009       | 0.015       |
| -20             | 0.022                | -0.007      | -0.006      |
| -10             | 0.007                | 0.000       | -0.005      |
| 0               | 0.014                | -0.008      | -0.003      |
| +10             | 0.005                | 0.001       | 0.006       |
| +20             | 0.000                | 0.000       | 0.000       |
| +30             | 0.005                | 0.000       | 0.000       |
| +40             | 0.003                | -0.010      | -0.005      |
| +50             | 0.005                | -0.005      | -0.002      |
| Voltage         | Test Result (ppm)@NT |             |             |
|                 | Channel 128          | Channel 189 | Channel 251 |
| LV              | 0.005                | -0.002      | -0.005      |
| HV              | 0.003                | -0.006      | -0.006      |

GPRS MODE:

| Temperature(°C) | Test Result (ppm)@NV |             |             |
|-----------------|----------------------|-------------|-------------|
|                 | Channel 128          | Channel 189 | Channel 251 |
| -30             | 0.017                | 0.01        | 0.012       |
| -20             | -0.002               | 0.005       | 0.002       |
| -10             | 0.009                | 0.001       | 0.002       |
| 0               | -0.004               | 0.002       | 0.004       |
| +10             | 0.011                | 0.003       | 0.001       |
| +20             | 0.000                | 0.000       | 0.000       |
| +30             | 0.004                | 0.003       | 0.007       |
| +40             | 0.000                | 0.001       | 0.005       |
| +50             | 0.002                | -0.002      | 0.005       |
| Voltage         | Test Result (ppm)@NT |             |             |
|                 | Channel 128          | Channel 189 | Channel 251 |
| LV              | 0.002                | 0.003       | 0.002       |
| HV              | -0.002               | 0.003       | 0.004       |

**PCS1900**

**GSM MODE:**

| Temperature(°C) | Test Result (ppm)@NV |             |             |
|-----------------|----------------------|-------------|-------------|
|                 | Channel 512          | Channel 661 | Channel 810 |
| -30             | 0.025                | 0.004       | 0.002       |
| -20             | -0.001               | -0.002      | -0.003      |
| -10             | 0.008                | 0.000       | -0.002      |
| 0               | 0.003                | 0.006       | -0.001      |
| +10             | 0.005                | -0.001      | 0.003       |
| +20             | 0.000                | 0.000       | 0.000       |
| +30             | 0.004                | -0.001      | -0.001      |
| +40             | 0.002                | -0.004      | 0.000       |
| +50             | 0.000                | -0.001      | -0.002      |
| Voltage         | Test Result (ppm)@NT |             |             |
|                 | Channel 512          | Channel 661 | Channel 810 |
| LV              | 0.002                | -0.002      | 0.000       |
| HV              | 0.001                | 0.002       | 0.000       |

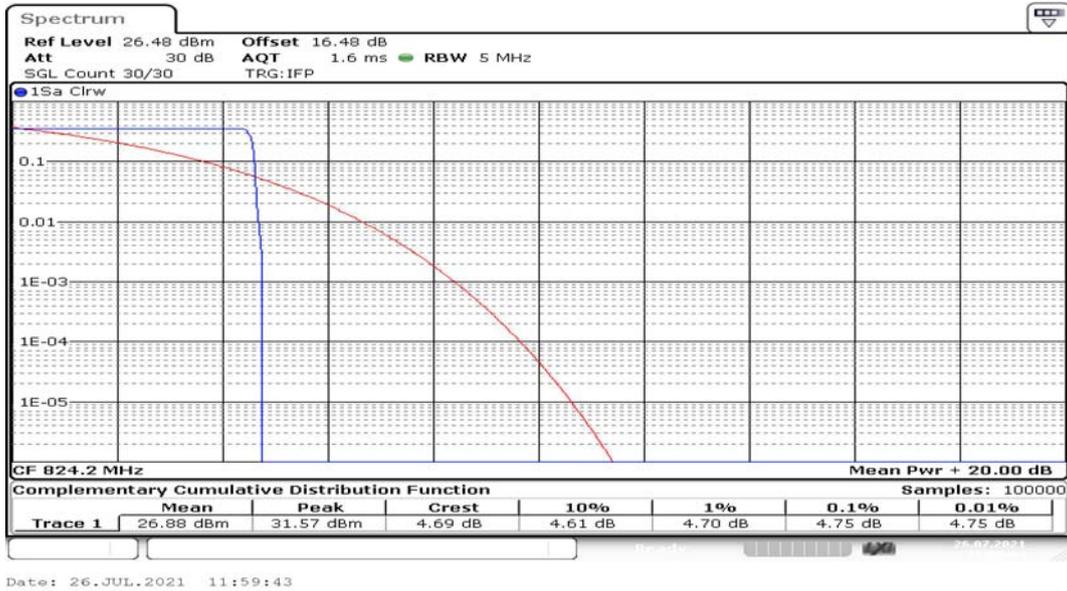
**GPRS MODE:**

| Temperature(°C) | Test Result (ppm)@NV |             |             |
|-----------------|----------------------|-------------|-------------|
|                 | Channel 512          | Channel 661 | Channel 810 |
| -30             | 0.008                | 0.008       | 0.006       |
| -20             | 0.002                | 0.000       | 0.002       |
| -10             | 0.003                | 0.003       | 0.006       |
| 0               | 0.005                | 0.001       | 0.004       |
| +10             | 0.003                | -0.002      | 0.000       |
| +20             | 0.000                | 0.000       | 0.000       |
| +30             | 0.001                | -0.002      | 0.002       |
| +40             | 0.002                | -0.002      | 0.000       |
| +50             | 0.001                | -0.002      | 0.000       |
| Voltage         | Test Result (ppm)@NT |             |             |
|                 | Channel 512          | Channel 661 | Channel 810 |
| LV              | 0.002                | 0.000       | 0.002       |
| HV              | 0.001                | -0.003      | 0.001       |

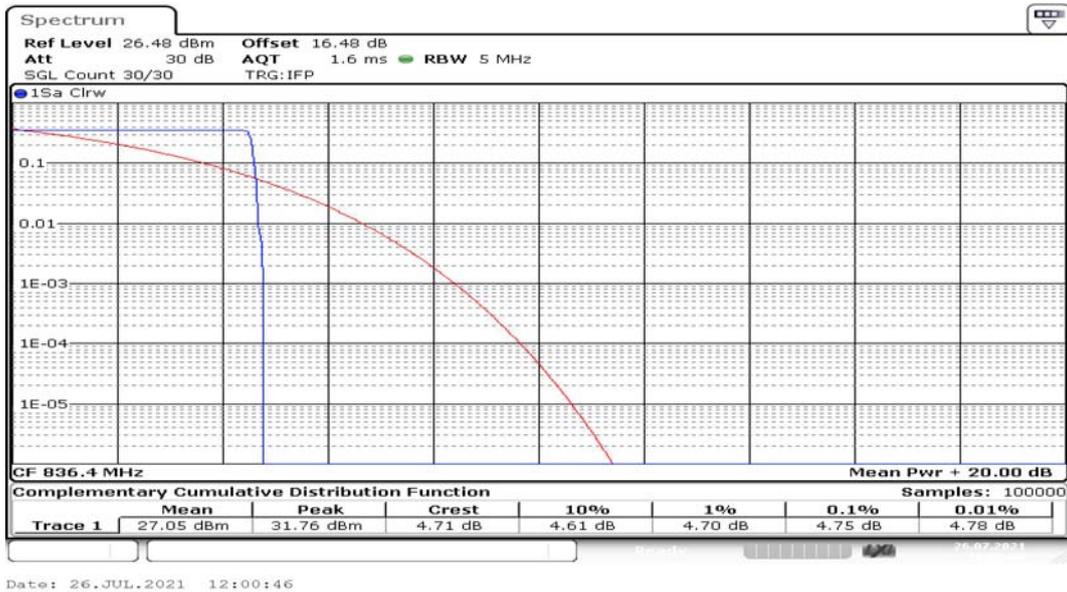
## 7. Peak-Average Ratio

### GSM850

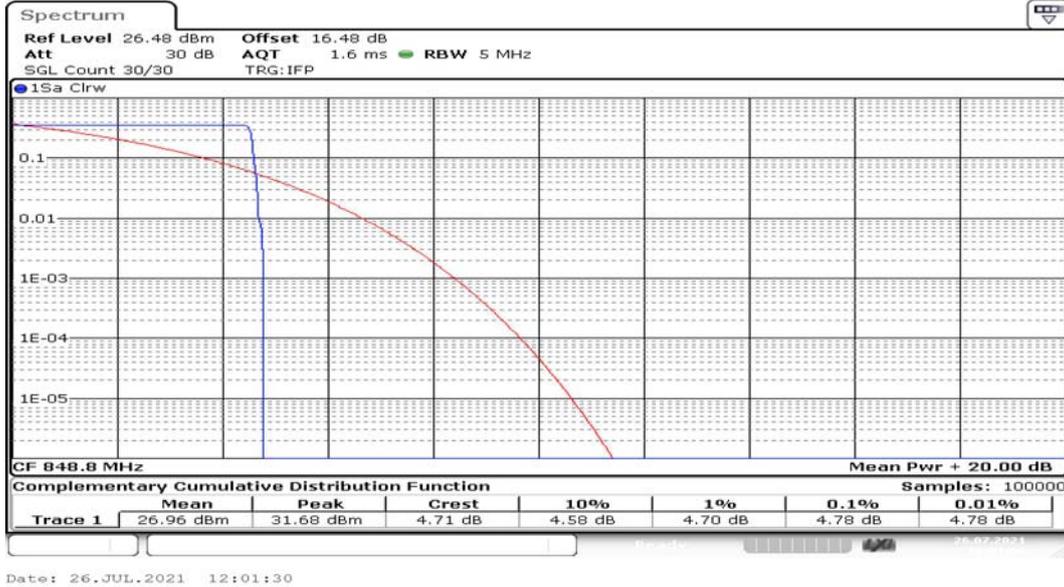
GSM MODE:



Channel 128

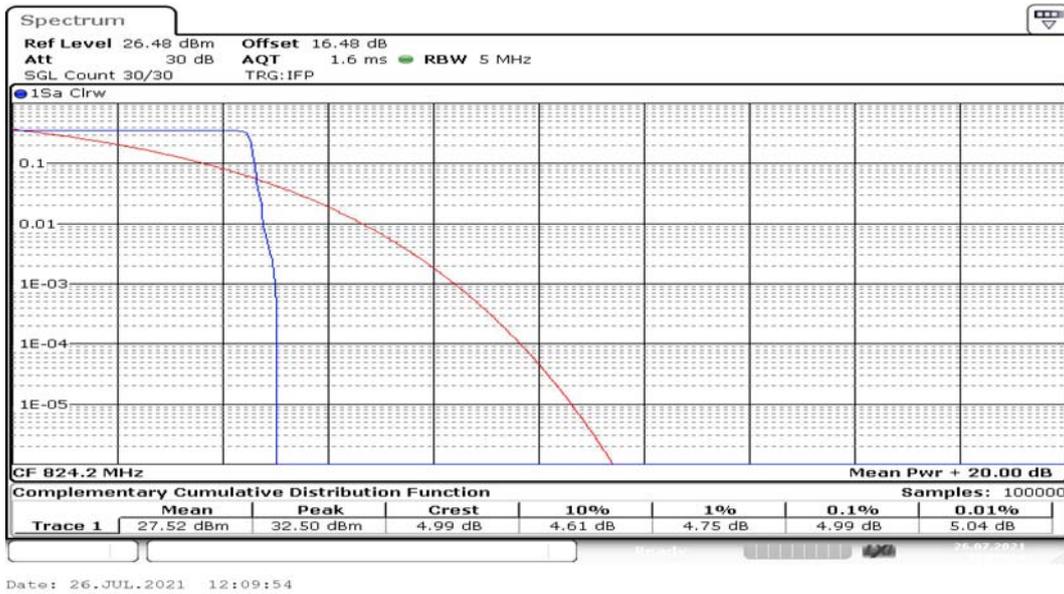


Channel 189

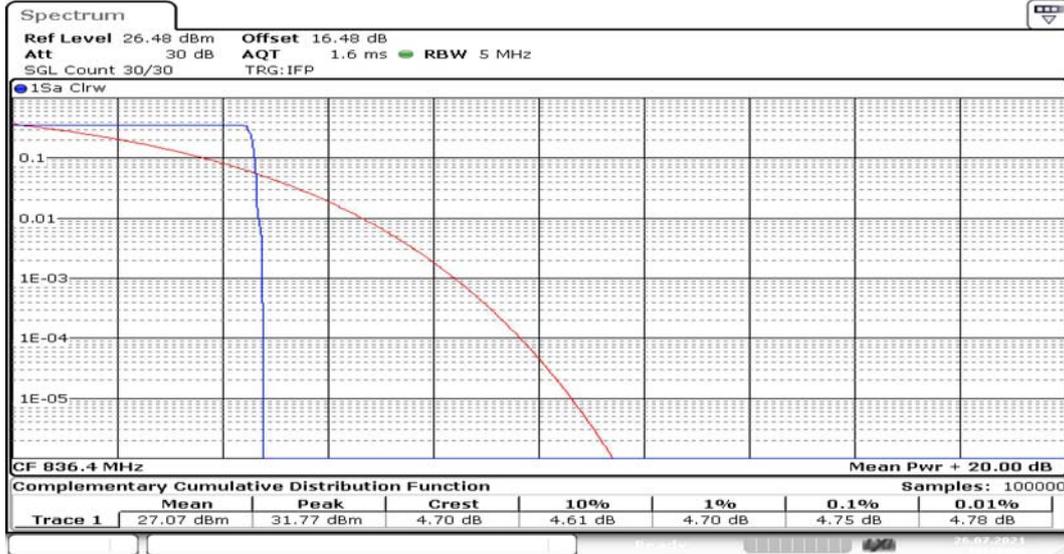


Channel 251

GPRS MODE:

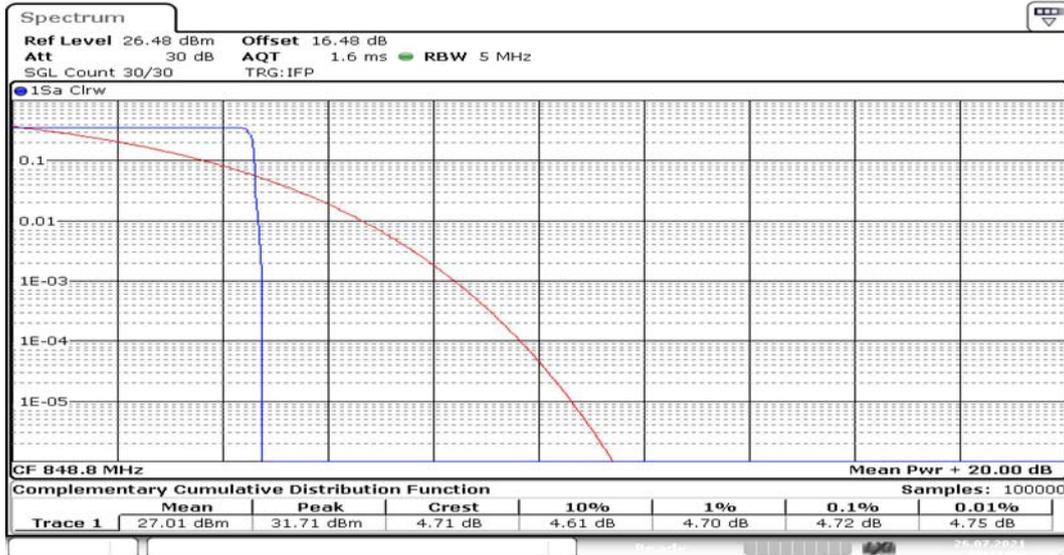


Channel 128



Date: 26.JUL.2021 12:10:39

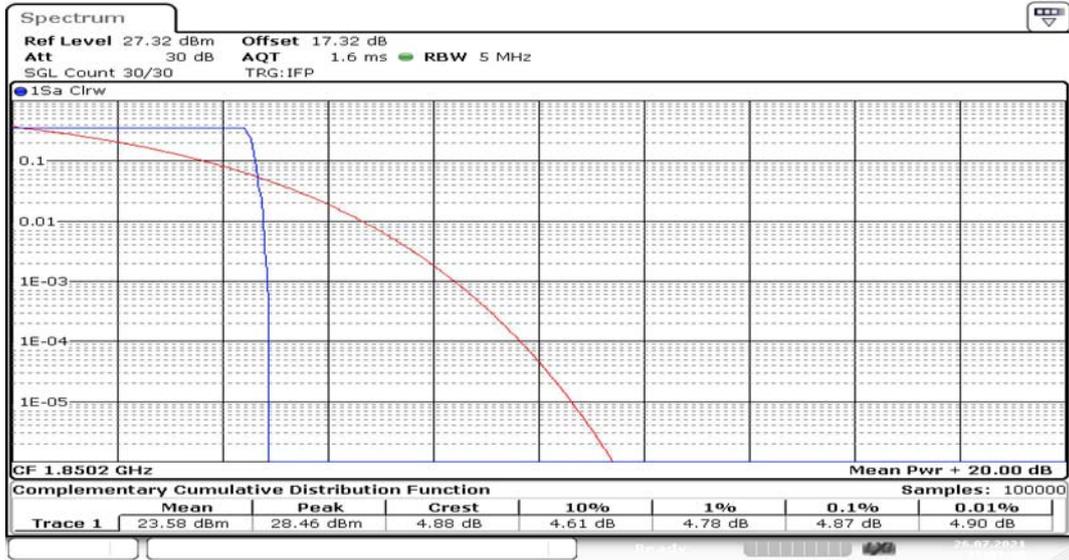
Channel 189



Date: 26.JUL.2021 12:11:34

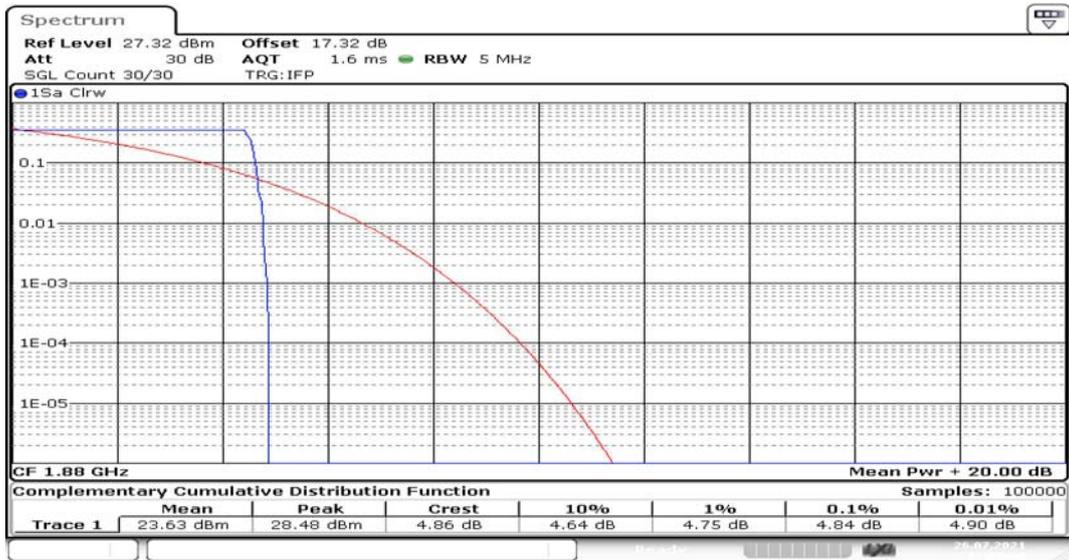
Channel 251

**PCS1900**  
**GSM MODE:**



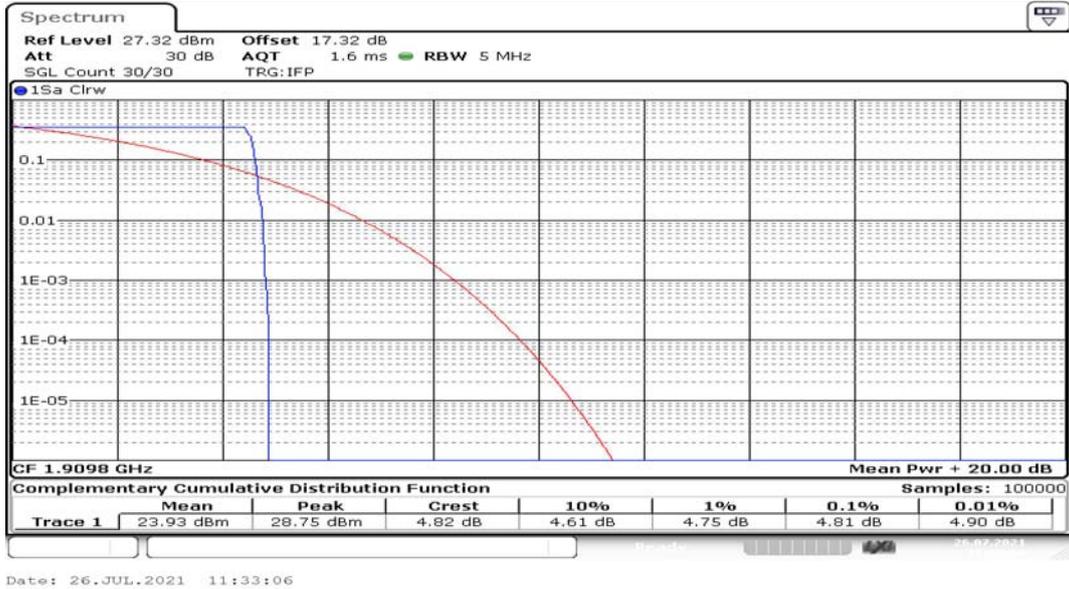
Date: 26.JUL.2021 11:31:15

Channel 512



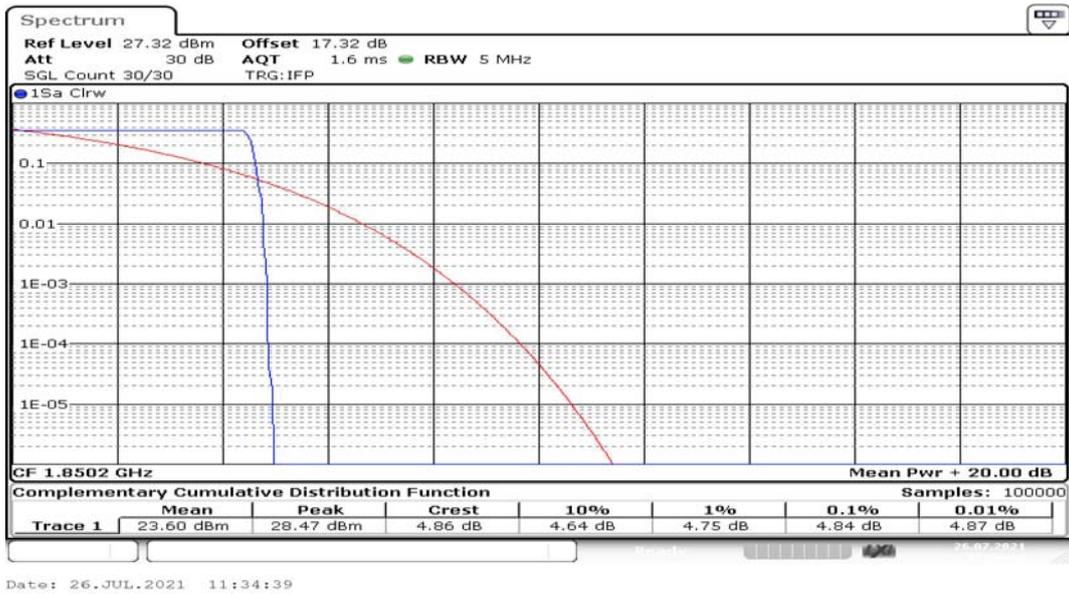
Date: 26.JUL.2021 11:32:20

Channel 661

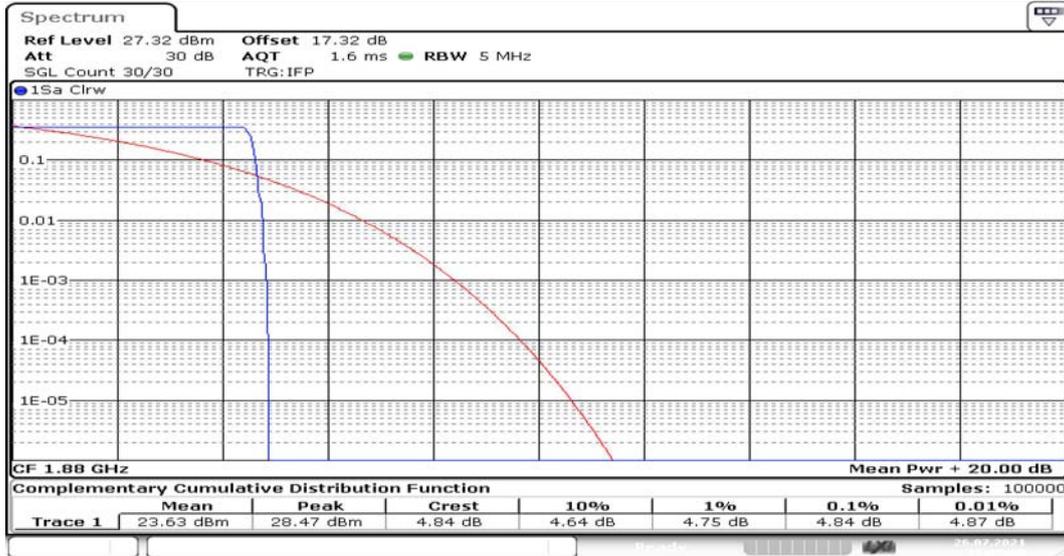


Channel 810

GPRS MODE:

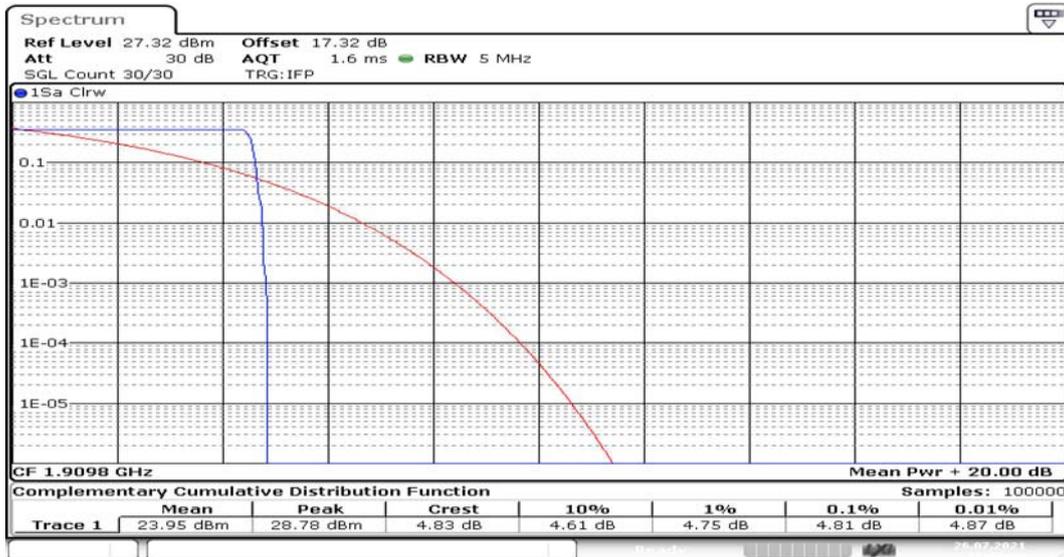


Channel 512



Date: 26.JUL.2021 11:35:55

Channel 661



Date: 26.JUL.2021 11:36:52

Channel 810

## 8. Effective Radiated Power and Effective Isotropic Radiated Power GSM850

GSM Measured Power:

| Carrier frequency (MHz) | Channel No. | Conducted Power (dBm) | ERP/EIRP (dBm) | ERP/EIRP (W) |
|-------------------------|-------------|-----------------------|----------------|--------------|
| 824.2                   | 128         | 32.57                 | 24.92          | 0.310        |
| 836.4                   | 189         | 32.69                 | 25.04          | 0.319        |
| 848.8                   | 251         | 32.59                 | 24.94          | 0.312        |

GPRS Measured Power:

| Carrier frequency (MHz) | Channel No. | TX Moce           | Conducted Power (dBm) | ERP/EIRP (dBm) | ERP/EIRP (W) |
|-------------------------|-------------|-------------------|-----------------------|----------------|--------------|
| 836.4                   | 189         | 4Downlink1up link | 32.79                 | 25.14          | 0.327        |
| 848.8                   | 251         |                   | 32.63                 | 24.98          | 0.315        |
| 824.2                   | 128         |                   | 32.58                 | 24.93          | 0.311        |
| 836.4                   | 189         | 3Downlink2up link | 30.11                 | 22.46          | 0.176        |
| 848.8                   | 251         |                   | 30.06                 | 22.41          | 0.174        |
| 824.2                   | 128         |                   | 29.88                 | 22.23          | 0.167        |
| 836.4                   | 189         | 2Downlink3up link | 27.83                 | 20.18          | 0.104        |
| 848.8                   | 251         |                   | 27.66                 | 20.01          | 0.100        |
| 824.2                   | 128         |                   | 27.70                 | 20.05          | 0.101        |
| 836.4                   | 189         | 1Downlink4up link | 27.01                 | 19.36          | 0.086        |
| 848.8                   | 251         |                   | 26.92                 | 19.27          | 0.084        |
| 824.2                   | 128         |                   | 26.95                 | 19.30          | 0.085        |

### PCS1900

GSM Measured Power:

| Carrier frequency (MHz) | Channel No. | Conducted Power (dBm) | ERP/EIRP (dBm) | ERP/EIRP (W) |
|-------------------------|-------------|-----------------------|----------------|--------------|
| 1850.2                  | 512         | 29.41                 | 24.21          | 0.264        |
| 1880                    | 661         | 29.42                 | 24.22          | 0.264        |
| 1909.8                  | 810         | 29.71                 | 24.51          | 0.282        |

GPRS Measured Power:

| Carrier frequency (MHz) | Channel No. | TX Moce           | Conducted Power (dBm) | ERP/EIRP (dBm) | ERP/EIRP (W) |
|-------------------------|-------------|-------------------|-----------------------|----------------|--------------|
| 1850.2                  | 512         | 4Downlink1up link | 29.47                 | 24.27          | 0.267        |
| 1880                    | 661         |                   | 29.51                 | 24.31          | 0.270        |
| 1909.8                  | 810         |                   | 29.79                 | 24.59          | 0.288        |
| 1850.2                  | 512         | 3Downlink2up link | 26.72                 | 21.52          | 0.142        |
| 1880                    | 661         |                   | 26.75                 | 21.55          | 0.143        |
| 1909.8                  | 810         |                   | 27.00                 | 21.80          | 0.151        |
| 1850.2                  | 512         | 2Downlink3up link | 24.72                 | 19.52          | 0.090        |
| 1880                    | 661         |                   | 24.80                 | 19.60          | 0.091        |
| 1909.8                  | 810         |                   | 25.18                 | 19.98          | 0.100        |
| 1850.2                  | 512         | 1Downlink4up link | 23.77                 | 18.57          | 0.072        |
| 1880                    | 661         |                   | 23.84                 | 18.64          | 0.073        |
| 1909.8                  | 810         |                   | 24.00                 | 18.80          | 0.076        |

## **APPENDIX B – TEST DATA OF RADIATED EMISSION**

### **Radiated Spurious Emissions**

#### **850 Test result:**

Test result:

GSM/GPRS MODE Channel 128:

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 1647.15         | -52.58      | -13           | Vertical     |
| 1665.50         | -51.08      | -13           | Vertical     |
| 2534.51         | -44.06      | -13           | Vertical     |
| 2577.47         | -44.19      | -13           | Vertical     |
| 8964.34         | -39.92      | -13           | Vertical     |
| 9970.81         | -36.81      | -13           | Vertical     |

GSM/GPRS MODE Channel 189:

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 1647.10         | -52.82      | -13           | Vertical     |
| 1666.38         | -51.67      | -13           | Vertical     |
| 2535.95         | -44.46      | -13           | Vertical     |
| 2576.59         | -44.32      | -13           | Vertical     |
| 8961.13         | -39.74      | -13           | Vertical     |
| 9972.33         | -36.76      | -13           | Vertical     |

GSM/GPRS MODE Channel 251:

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 1648.42         | -52.84      | -13           | Vertical     |
| 1667.19         | -50.96      | -13           | Vertical     |
| 2532.74         | -44.54      | -13           | Vertical     |
| 2578.67         | -43.67      | -13           | Vertical     |
| 8961.96         | -39.93      | -13           | Vertical     |
| 9973.46         | -36.01      | -13           | Vertical     |

**1900:**

Test result:

**GSM/GPRS MODE Channel 512**

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 2461.54         | -49.01      | -13           | Vertical     |
| 2781.68         | -47.45      | -13           | Vertical     |
| 3725.04         | -41.24      | -13           | Vertical     |
| 6677.24         | -39.22      | -13           | Vertical     |
| 9959.44         | -37.37      | -13           | Vertical     |
| 17819.31        | -33.75      | -13           | Vertical     |

**GSM/GPRS MODE Channel 661:**

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 2459.40         | -49.14      | -13           | Vertical     |
| 2779.92         | -46.91      | -13           | Vertical     |
| 3727.91         | -40.60      | -13           | Vertical     |
| 6676.14         | -39.62      | -13           | Vertical     |
| 9963.20         | -37.71      | -13           | Vertical     |
| 17821.54        | -34.21      | -13           | Vertical     |

**GSM/GPRS MODE Channel 810:**

| Frequency (MHz) | Power (dBm) | Limited (dBm) | Polarization |
|-----------------|-------------|---------------|--------------|
| 2458.15         | -48.82      | -13           | Vertical     |
| 2780.31         | -47.79      | -13           | Vertical     |
| 3727.94         | -40.80      | -13           | Vertical     |
| 6675.11         | -39.21      | -13           | Vertical     |
| 9961.54         | -37.02      | -13           | Vertical     |
| 17819.36        | -34.31      | -13           | Vertical     |

---End of Test Report---