

# TEST REPORT

|                                              |                                                                                                                                               |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FCC ID.</b> .....                         | 2AT3DCOSMASX                                                                                                                                  |
| <b>Test Report No.</b> .....                 | TCT210609E049                                                                                                                                 |
| <b>Date of issue</b> .....                   | Jul. 08, 2021                                                                                                                                 |
| <b>Testing laboratory</b> .....              | SHENZHEN TONGCE TESTING LAB                                                                                                                   |
| <b>Testing location/ address:</b>            | TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China |
| <b>Applicant's name</b> .....                | CT Cellutions, Inc                                                                                                                            |
| <b>Address</b> .....                         | 5705 Commerce Blvd, Alpharetta, Georgia 30004, United States                                                                                  |
| <b>Manufacturer's name</b> ...               | ZTECH COMMUNICATION(SZ) CO LTD                                                                                                                |
| <b>Address</b> .....                         | FL 7 BLOCK D BAO'AN ZHIGU INNOVATION PARK YIN'TIAN ROAD NO.4 XI'XIANG STR' BAO'AN DISTRICT SZ CHINA                                           |
| <b>Standard(s)</b> .....                     | FCC CFR Title 47 Part 2<br>FCC CFR Title 47 Part22<br>FCC CFR Title 47 Part24                                                                 |
| <b>Test item description</b> .....           | Mobile phone                                                                                                                                  |
| <b>Trade Mark</b> .....                      | CELLUTION                                                                                                                                     |
| <b>Model/Type reference</b> .....            | COSMAS X                                                                                                                                      |
| <b>Rating(s)</b> .....                       | Refer to EUT description of page 3                                                                                                            |
| <b>Date of receipt of test item</b> .....    | Jun. 09, 2021                                                                                                                                 |
| <b>Date (s) of performance of test</b> ..... | See dates for each test case                                                                                                                  |
| <b>Tested by (+signature)</b> ...            | Brave Zeng                                                                                                                                    |
| <b>Check by (+signature)</b> ....            | Beryl Zhao                                                                                                                                    |
| <b>Approved by (+signature):</b>             | Tomsin                                                                                                                                        |

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## 1. General Product Information

### 1.1. EUT description

|                                      |                                                                                                                                                                           |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test item description .....          | Mobile phone                                                                                                                                                              |
| Model/Type reference.....            | COSMAS X                                                                                                                                                                  |
| Sample Number.....                   | TCT210609E032-0102                                                                                                                                                        |
| 3G Version .....                     | WCDMA: R99<br>HSDPA: Release 5<br>HSUPA: Release 6                                                                                                                        |
| Tx Frequency .....                   | GSM/GPRS 850: 824.2MHz ~ 848.8MHz<br>GSM/GPRS 1900: 1850.2MHz ~ 1909.8MHz<br>WCDMA Band V: 826.4MHz ~ 846.6MHz<br>WCDMA Band II: 1852.4MHz ~ 1907.6MHz                    |
| Rx Frequency .....                   | GSM/GPRS 850: 869.2MHz ~ 893.8MHz<br>GSM/GPRS 1900: 1930.2MHz ~ 1989.8MHz<br>WCDMA Band V: 871.4MHz ~ 891.6MHz<br>WCDMA Band II: 1932.4MHz ~ 1987.6MHz                    |
| Maximum Output Power to Antenna..... | GSM850: 32.65dBm<br>GSM1900: 29.96dBm<br>GPRS850: 32.42dBm<br>GPRS1900: 28.85dBm<br>WCDMA Band V: 23.06dBm<br>WCDMA Band II: 22.62dBm                                     |
| 99% Occupied Bandwidth.....          | GSM850: 245KGXW<br>GSM1900: 246KGXW<br>GPRS850 Class 8: 245KGXW<br>GPRS1900 Class 8: 246KGXW<br>WCDMA Band V RMC 12.2Kbps: 4M20F9W<br>WCDMA Band II RMC 12.2Kbps: 4M20F9W |
| Type of Modulation.....              | GSM/GPRS: GMSK<br>WCDMA/HSDPA/HSUPA: QPSK                                                                                                                                 |
| Antenna Type.....                    | FPC Antenna                                                                                                                                                               |
| Antenna Gain.....                    | GSM/GPRS: 0.82dBi<br>GSM/GPRS: 0.78dBi<br>WCDMA Band V: 0.77dBi<br>WCDMA Band II: 0.83dBi                                                                                 |
| Rating(s).....                       | Adapter Information:<br>Model: COSMAS X<br>Input: AC 100-240V, 50/60Hz, 0.2A<br>Output: DC 5V, 700mA<br>Rechargeable Li-ion Battery DC 3.7V                               |

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

### 1.2. Model(s) list

None.

### 1.3. Operation Frequency

| GSM 850  |                 | PCS1900  |                 |
|----------|-----------------|----------|-----------------|
| Channel: | Frequency (MHz) | Channel: | Frequency (MHz) |
| 128      | 824.20          | 512      | 1850.20         |
| 129      | 824.40          | 513      | 1850.40         |
| ....     | ....            | ....     | ....            |
| 189      | 836.40          | 660      | 1879.80         |
| 190      | 836.60          | 661      | 1880.00         |
| 191      | 836.80          | 662      | 1880.20         |
| ...      | ...             | ...      | ...             |
| 250      | 848.60          | 809      | 1909.60         |
| 251      | 848.80          | 810      | 1909.80         |

| WCDMA Band V |                 | WCDMA Band II |                 |
|--------------|-----------------|---------------|-----------------|
| Channel:     | Frequency (MHz) | Channel:      | Frequency (MHz) |
| 4132         | 826.40          | 9262          | 1852.40         |
| 4133         | 826.60          | 9263          | 1852.60         |
| ....         | ....            | ....          | ....            |
| 4182         | 836.40          | 9399          | 1879.80         |
| 4183         | 836.60          | 9400          | 1880.00         |
| 4184         | 836.80          | 9401          | 1880.20         |
| ...          | ...             | ...           | ...             |
| 4233         | 846.60          | 9538          | 1907.60         |

## 2. Test Result Summary

| Requirement                                   | CFR 47 Section                                   | Result |
|-----------------------------------------------|--------------------------------------------------|--------|
| Conducted Output Power                        | §22.913; §2.1046<br>§24.232; §27.50(d)           | PASS   |
| Peak-to-Average Ratio                         | §2.1046; §24.232(d)<br>§22.913; §27.50(d)        | PASS   |
| Effective Radiated Power                      | §2.1046; §22.913(a)<br>§24.232; §27.50(d)        | PASS   |
| Equivalent Isotropic Radiated Power           | §2.1046; §22.913(a)<br>§24.232; §27.50(d)        | PASS   |
| Occupied Bandwidth                            | §2.1049                                          | PASS   |
| Band Edge                                     | §2.1051<br>§22.917(a)<br>§24.238(a)<br>§27.53(g) | PASS   |
| Conducted Spurious Emission                   | §2.1051; §22.917<br>§24.238; §27.53(h)           | PASS   |
| Field Strength of Spurious Radiation          | §2.1053; §22.917(a)<br>§24.238; §27.53(g)        | PASS   |
| Frequency Stability for Temperature & Voltage | §2.1055; §22.355<br>§24.235; §27.54              | PASS   |

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. General Information

#### 3.1. Test environment and mode

**Operating Environment:**

|                       |           |
|-----------------------|-----------|
| Temperature:          | 25.0 °C   |
| Humidity:             | 56 % RH   |
| Atmospheric Pressure: | 1010 mbar |

Remark: This product has a built-in rechargeable battery, so in an independent test, the EUT battery was fully-charged. This EUT owns two SIM cards, after we perform the pretest for these two SIM card; we found the SIM 1 is the worst case, so its result is recorded in this report.

Keep the EUT in communication with CMU200 and select channel with modulation All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

| Test Mode    |                                |                                |
|--------------|--------------------------------|--------------------------------|
| Band         | Radiated TCs                   | Conducted TCs                  |
| GSM 850      | GSM Link<br>GPRS class 12 Link | GSM Link<br>GPRS class 12 Link |
| PCS 1900     | GSM Link<br>GPRS class 12 Link | GSM Link<br>GPRS class 12 Link |
| WCDMA Band V | RMC 12.2Kbps Link              | RMC 12.2Kbps Link              |
| WCDM Band II | RMC 12.2Kbps Link              | RMC 12.2Kbps Link              |

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power. Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission. The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarization. The emissions worst-case (Z axis) are shown in Test Results of the following pages.

### 3.2. Description of Support Units

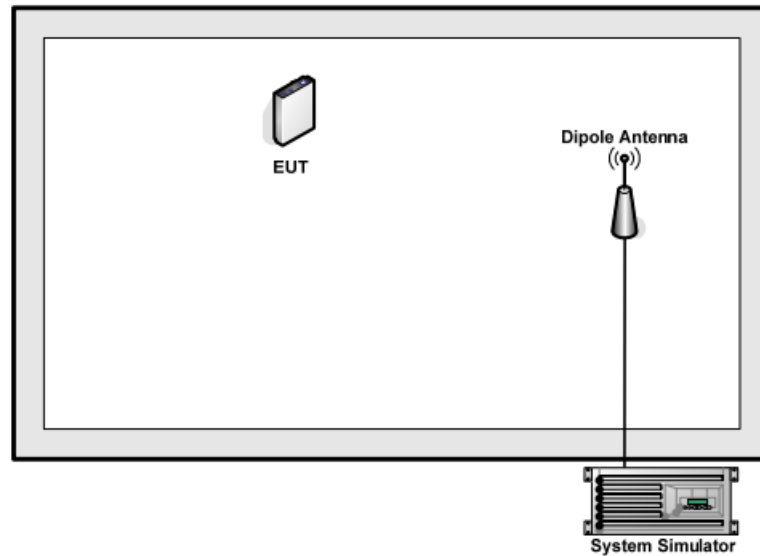
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|-----------|-----------|------------|--------|------------|
| /         | /         | /          | /      | /          |

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 3.3. Configuration of Tested System



### 3.4. Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level. The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

The following shows an offset computation example with RF cable loss 3 dB and a 5dB attenuator.

Example: *Offset (dB) = RF cable loss (dB) + attenuator factor (dB).*  
*= 8(dB)*



## 4. Facilities and Accreditations

### 4.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

SHENZHEN TONGCE TESTING LAB

Designation Number: CN1205

The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

SHENZHEN TONGCE TESTING LAB

CAB identifier: CN0031

The testing lab has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

### 4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

### 4.3. Measurement Uncertainty

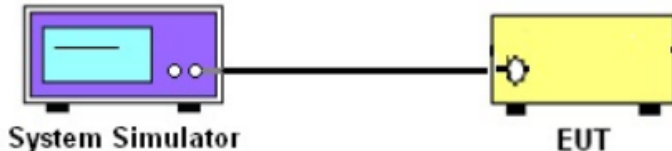
The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                                    | MU                        |
|-----|-----------------------------------------|---------------------------|
| 1   | Conducted Emission                      | $\pm 3.10$ dB             |
| 2   | RF power, conducted                     | $\pm 0.12$ dB             |
| 3   | Spurious emissions, conducted           | $\pm 0.11$ dB             |
| 4   | All emissions, radiated(<1 GHz)         | $\pm 4.56$ dB             |
| 5   | All emissions, radiated(1 GHz - 18 GHz) | $\pm 4.22$ dB             |
| 6   | All emissions, radiated(18 GHz- 40 GHz) | $\pm 4.36$ dB             |
| 7   | Temperature                             | $\pm 0.1^{\circ}\text{C}$ |
| 8   | Humidity                                | $\pm 1.0\%$               |

## 5. Test Results and Measurement Data

### 5.1. Conducted Output Power Measurement

#### 5.1.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 22.913(a) and FCC part 24.232(b)<br>FCC part 27.50(d);                                                                                                                                                                                                                                                                                                                                           |
| <b>Test Method:</b>      | FCC KDB 971168 D01 v03r01                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Limits:</b>           | GSM 850: 7W<br>PCS 1900: 2W<br>WCDMA Band V: 7W<br>WCDMA Band II: 2W                                                                                                                                                                                                                                                                                                                                      |
| <b>Test Setup:</b>       |  <p>The diagram illustrates the test setup. On the left is a purple box labeled 'System Simulator' with a screen and two buttons. A black line representing a cable connects it to a yellow box on the right labeled 'EUT' (Equipment Under Test), which has a single port on its side.</p>                             |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The transmitter output port was connected to the system simulator.</li> <li>2. Set EUT at maximum power through system simulator.</li> <li>3. Select lowest, middle, and highest channels for each band and different modulation.</li> <li>4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                      |

#### 5.1.2. Test Instruments

| Equipment                | Manufacturer | Model  | Serial Number | Calibration Due |
|--------------------------|--------------|--------|---------------|-----------------|
| System simulator         | R&S          | CMU200 | 110188        | Sep. 11, 2021   |
| RF cable<br>(9kHz-40GHz) | TCT          | RE-05  | N/A           | Sep. 02, 2021   |
| Antenna Connector        | TCT          | RFC-02 | N/A           | Sep. 02, 2021   |

### 5.1.3. Test data

#### Conducted Power Measurement Results:

| Average Conducted Power (*Unit: dBm) |              |       |       |               |        |        |
|--------------------------------------|--------------|-------|-------|---------------|--------|--------|
| Band                                 | GSM850       |       |       | PCS 1900      |        |        |
| Channel                              | 128          | 190   | 251   | 512           | 661    | 810    |
| Frequency(MHz)                       | 824.2        | 836.6 | 848.8 | 1850.2        | 1880.0 | 1909.8 |
| GSM                                  | 32.65        | 32.58 | 32.60 | 29.96         | 28.96  | 28.87  |
| GPRS class8                          | 32.33        | 32.38 | 32.42 | 28.85         | 28.43  | 28.44  |
| GPRS class10                         | 31.35        | 31.49 | 31.24 | 28.33         | 27.62  | 27.61  |
| GPRS class11                         | 30.21        | 30.45 | 30.29 | 27.42         | 26.62  | 26.70  |
| GPRS class12                         | 29.25        | 29.43 | 29.45 | 26.35         | 25.55  | 25.66  |
| Average Conducted Power (*Unit: dBm) |              |       |       |               |        |        |
| Band                                 | WCDMA Band V |       |       | WCDMA Band II |        |        |
| Channel                              | 4132         | 4183  | 4233  | 9262          | 9400   | 9538   |
| Frequency(MHz)                       | 826.4        | 836.6 | 846.6 | 1852.4        | 1880.0 | 1907.6 |
| WCDMA RMC 12.2K                      | 22.88        | 23.06 | 22.94 | 22.35         | 22.50  | 22.62  |
| HSDPA Subtest-1                      | 22.66        | 22.66 | 22.85 | 22.19         | 22.44  | 22.50  |
| HSDPA Subtest-2                      | 22.33        | 22.58 | 22.66 | 21.68         | 22.33  | 22.45  |
| HSDPA Subtest-3                      | 22.22        | 22.54 | 22.45 | 21.74         | 22.22  | 21.88  |
| HSDPA Subtest-4                      | 21.88        | 22.48 | 21.88 | 21.57         | 21.66  | 21.85  |
| HSUPA Subtest-1                      | 21.77        | 21.75 | 21.75 | 21.52         | 21.65  | 21.56  |
| HSUPA Subtest-2                      | 21.65        | 21.66 | 21.46 | 21.63         | 21.48  | 21.46  |
| HSUPA Subtest-3                      | 21.63        | 21.55 | 21.33 | 21.33         | 21.44  | 21.35  |
| HSUPA Subtest-4                      | 21.55        | 21.42 | 21.25 | 21.26         | 21.42  | 21.32  |
| HSUPA Subtest-5                      | 21.66        | 21.38 | 21.11 | 21.12         | 21.38  | 21.22  |

## 5.2. Peak to Average Ratio

### 5.2.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 24.232(d) ; FCC part 22.913;<br>FCC part 27.50(d);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Test Method:</b>      | ANSI C63.26:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Limit:</b>            | The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Test Setup:</b>       | <pre> graph LR     SS[System Simulator] --- PD[Power Divider]     SA[Spectrum Analyzer] --- PD     PD --- EUT[EUT]         </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 5.7.1.</li> <li>2. The EUT was connected to spectrum analyzer and system simulator via a power divider.</li> <li>3. Set EUT to transmit at maximum output power.</li> <li>4. For GSM/EGPRS operating modes, signal gating is implemented on the spectrum analyzer by triggering from the system simulator.</li> <li>5. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer.<br/>Record the maximum PAPR level associated with a probability of 0.1%.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 5.2.2. Test Instruments

| Equipment                | Manufacturer | Model  | Serial Number | Calibration Due |
|--------------------------|--------------|--------|---------------|-----------------|
| System simulator         | R&S          | CMU200 | 110188        | Sep. 11, 2021   |
| Spectrum Analyzer        | R&S          | FSU    | 200054        | Sep. 11, 2021   |
| RF cable<br>(9kHz-40GHz) | TCT          | RE-05  | N/A           | Sep. 02, 2021   |
| Antenna Connector        | TCT          | RFC-02 | N/A           | Sep. 02, 2021   |

### 5.2.3. Test Data

| Cellular Band              |        |       |       |
|----------------------------|--------|-------|-------|
| Mode                       | GSM850 |       |       |
| Channel                    | 128    | 189   | 251   |
| Frequency (MHz)            | 824.2  | 836.6 | 848.8 |
| Peak-to-Average Ratio (dB) | 10.67  | 8.56  | 7.66  |

| PCS Band                   |          |       |        |
|----------------------------|----------|-------|--------|
| Mode                       | GSM 1900 |       |        |
| Channel                    | 512      | 661   | 810    |
| Frequency (MHz)            | 1850.2   | 1880  | 1909.8 |
| Peak-to-Average Ratio (dB) | 10.71    | 10.67 | 10.71  |

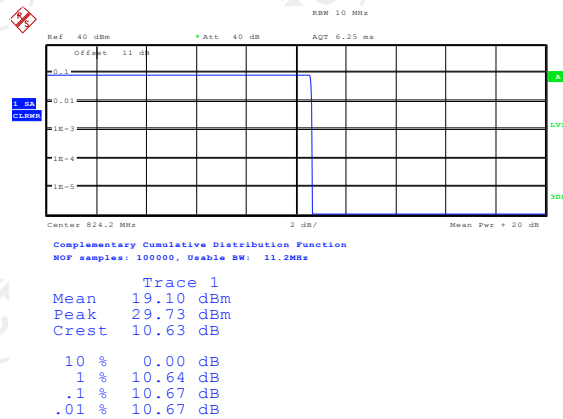
| Mode                       | WCDMA Band V<br>(RMC 12.2Kbps) |       |       | WCDMA Band II<br>(RMC 12.2Kbps) |      |        |
|----------------------------|--------------------------------|-------|-------|---------------------------------|------|--------|
| Channel                    | 4132                           | 4183  | 4233  | 9262                            | 9400 | 9538   |
| Frequency (MHz)            | 826.4                          | 836.6 | 846.6 | 1852.4                          | 1880 | 1907.6 |
| Peak-to-Average Ratio (dB) | 3.27                           | 3.59  | 3.37  | 3.65                            | 3.53 | 3.30   |

**Note:** Measurements were conducted in all GMSK modulation (GSM/GPRS) and the worst case Mode (GSM) was submitted only.

Test plots as follows:

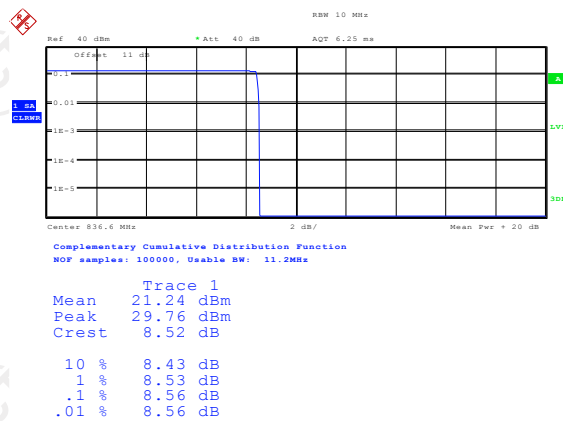
## GSM 850

### Peak-to-Average Ratio on Channel 128



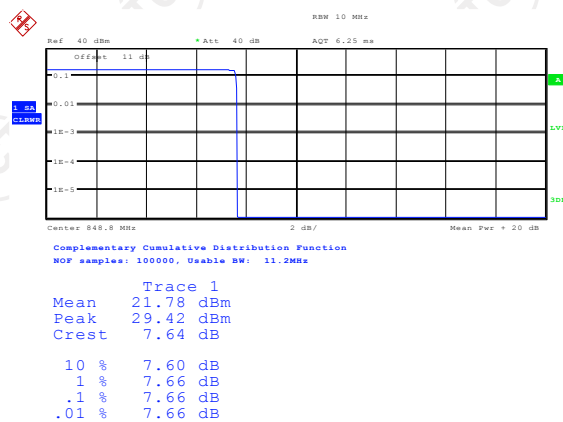
Date: 16 JUN 2021 19:06:44

### Peak-to-Average Ratio on Channel 190



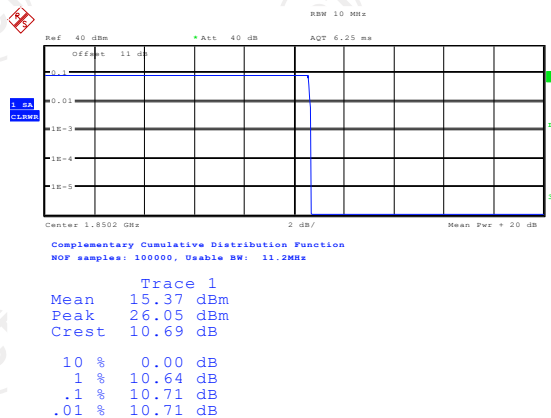
Date: 16 JUN 2021 19:07:08

### Peak-to-Average Ratio on Channel 251



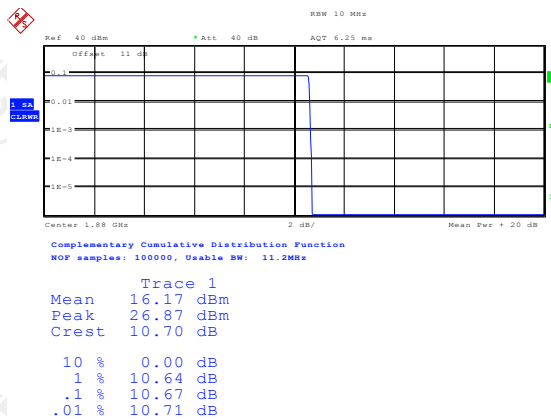
Date: 16 JUN 2021 19:07:27

## Peak-to-Average Ratio on Channel 512



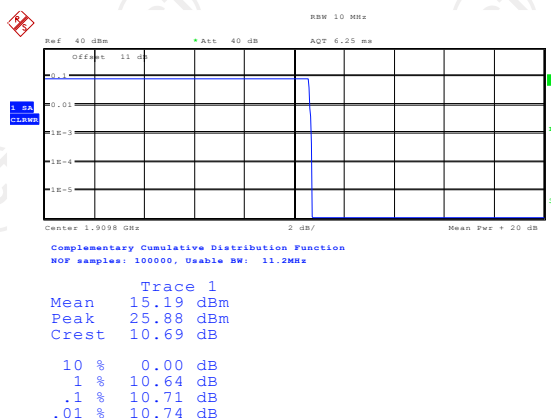
Date: 16.JUN.2021, 19:09:49

## Peak-to-Average Ratio on Channel 661



Date: 16.JUN.2021 19:10:09

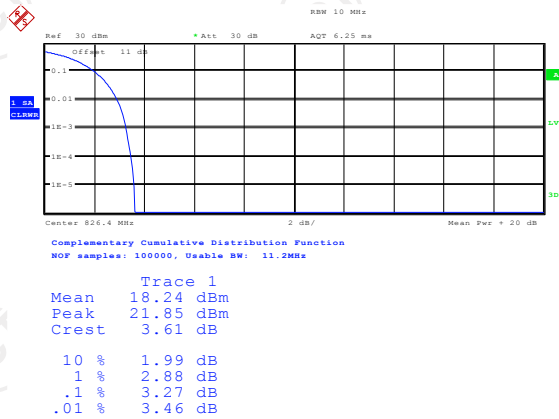
## Peak-to-Average Ratio on Channel 810



Date: 16.JUN.2021 19:10:30

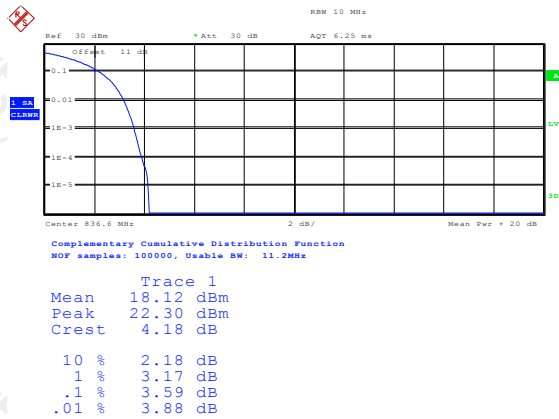
## WCDMA Band V 12.2K

### Peak-to-Average Ratio on Channel 4132



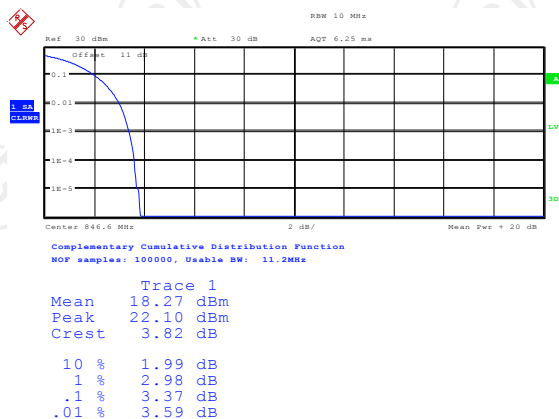
Date: 24.JUN.2021, 16:39:46

### Peak-to-Average Ratio on Channel 4183



Date: 24.JUN.2021 16:40:05

### Peak-to-Average Ratio on Channel 4233

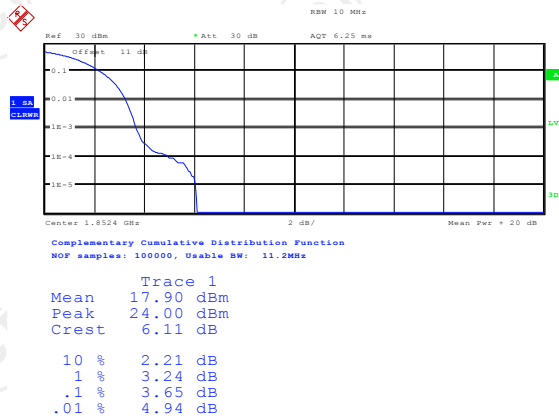


Date: 24.JUN.2021 16:40:23



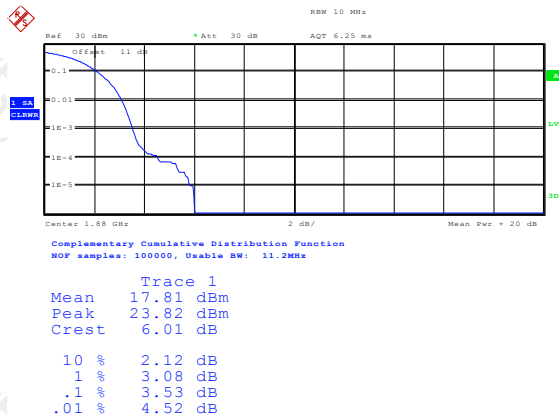
## WCDMA Band II 12.2Kbps

### Peak-to-Average Ratio on Channel 9262



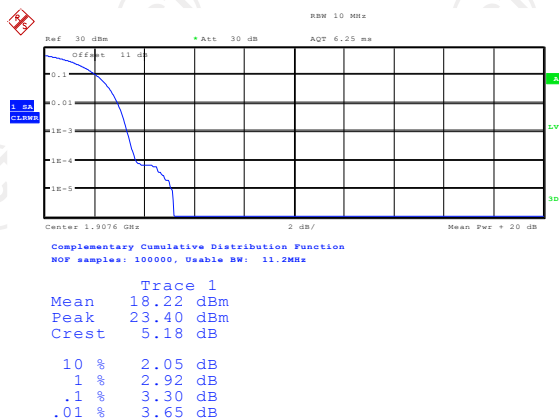
Date: 24.JUN.2021 16:42:20

### Peak-to-Average Ratio on Channel 9400



Date: 24.JUN.2021 16:42:39

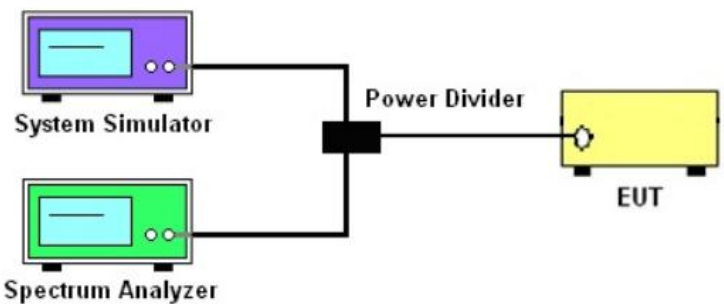
### Peak-to-Average Ratio on Channel 9538



Date: 24.JUN.2021 16:43:26

### 5.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

#### 5.3.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 2.1049                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Test Method:</b>      | FCC KDB 971168 D01v03r01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Limit:</b>            | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Test Setup:</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 4.2.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>4. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.</li> <li>5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

#### 5.3.2. Test Instruments

| Equipment                | Manufacturer | Model  | Serial Number | Calibration Due |
|--------------------------|--------------|--------|---------------|-----------------|
| System simulator         | R&S          | CMU200 | 110188        | Sep. 11, 2021   |
| Spectrum Analyzer        | R&S          | FSU    | 200054        | Sep. 11, 2021   |
| RF cable<br>(9kHz-40GHz) | TCT          | RE-05  | N/A           | Sep. 02, 2021   |
| Antenna Connector        | TCT          | RFC-02 | N/A           | Sep. 02, 2021   |

### 5.3.3. Test data

| Cellular Band   |        |        |        |
|-----------------|--------|--------|--------|
| Mode            | GSM850 |        |        |
| Channel         | 128    | 190    | 251    |
| Frequency (MHz) | 824.2  | 836.6  | 848.8  |
| 99% OBW (kHz)   | 243.59 | 245.19 | 245.19 |
| 26dB BW (kHz)   | 320.51 | 323.72 | 326.92 |

| Cellular Band   |         |        |        |
|-----------------|---------|--------|--------|
| Mode            | GSM1900 |        |        |
| Channel         | 512     | 661    | 810    |
| Frequency (MHz) | 1850.2  | 1880.0 | 1909.8 |
| 99% OBW (kHz)   | 245.19  | 245.19 | 246.79 |
| 26dB BW (kHz)   | 320.51  | 322.12 | 322.12 |

| Cellular Band   |                             |       |       |
|-----------------|-----------------------------|-------|-------|
| Mode            | WCDMA Band V (RMC 12.2Kbps) |       |       |
| Channel         | 4132                        | 4183  | 4233  |
| Frequency (MHz) | 826.4                       | 836.6 | 846.6 |
| 99% OBW (MHz)   | 4.20                        | 4.18  | 4.18  |
| 26dB BW (MHz)   | 4.74                        | 4.70  | 4.73  |

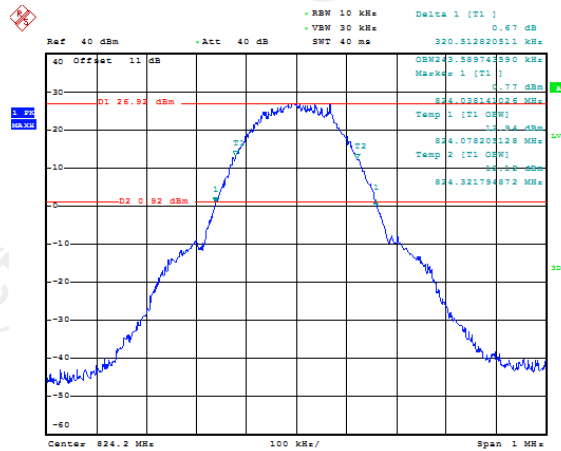
| Cellular Band   |                              |      |        |
|-----------------|------------------------------|------|--------|
| Mode            | WCDMA Band II (RMC 12.2Kbps) |      |        |
| Channel         | 9262                         | 9400 | 9538   |
| Frequency (MHz) | 1852.4                       | 1880 | 1907.6 |
| 99% OBW (MHz)   | 4.20                         | 4.18 | 4.20   |
| 26dB BW (MHz)   | 4.71                         | 4.78 | 4.71   |

**Note:** Measurements were conducted in all GMSK modulation (GSM/GPRS) and the worst case Mode (GSM) was submitted only.

Test plots as follows:

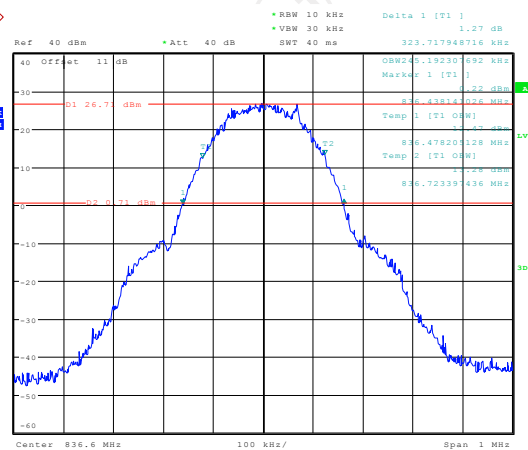
|       |         |            |                 |
|-------|---------|------------|-----------------|
| Band: | GSM 850 | Test Mode: | GSM Link (GMSK) |
|-------|---------|------------|-----------------|

26dB&99% Occupied Bandwidth Plot on Channel 128



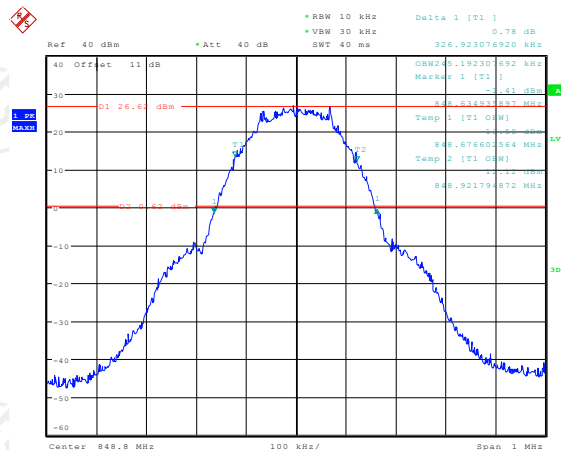
Date: 16.JUN.2021 18:55:13

26dB&99% Occupied Bandwidth Plot on Channel 190



Date: 16.JUN.2021 18:56:44

26dB&99% Occupied Bandwidth Plot on Channel 251



Date: 16.JUN.2021 18:57:49

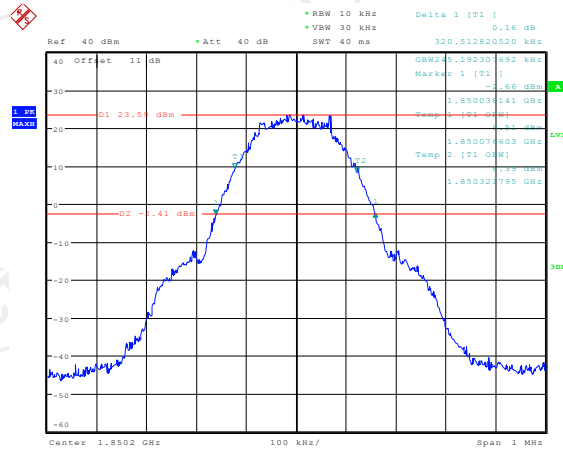
Band:

GSM 1900

Test Mode:

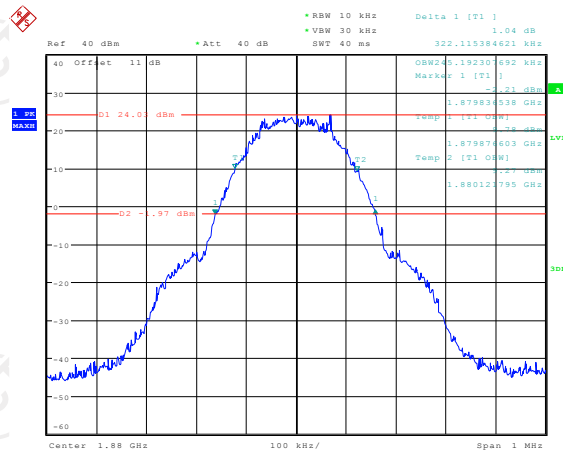
GSM Link (GMSK)

## 26dB&99% Occupied Bandwidth Plot on Channel 512



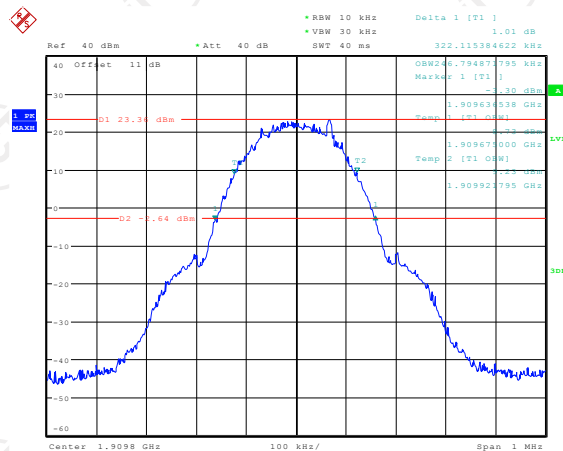
Date: 16.JUN.2021 19:17:31

## 26dB&99% Occupied Bandwidth Plot on Channel 661



Date: 16.JUN.2021 19:18:34

## 26dB&99% Occupied Bandwidth Plot on Channel 810



Date: 16.JUN.2021 19:19:46

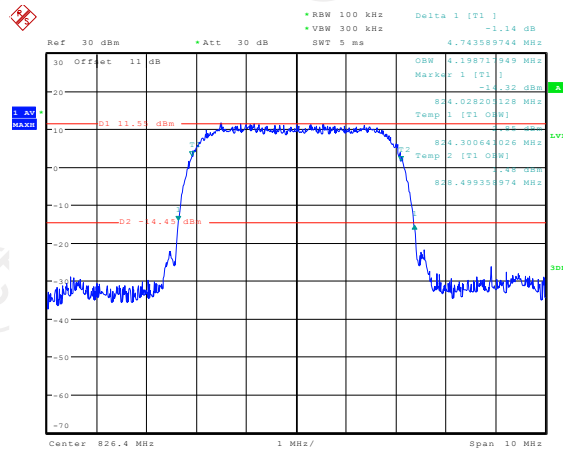
Band:

WCDMA Band V

Test Mode:

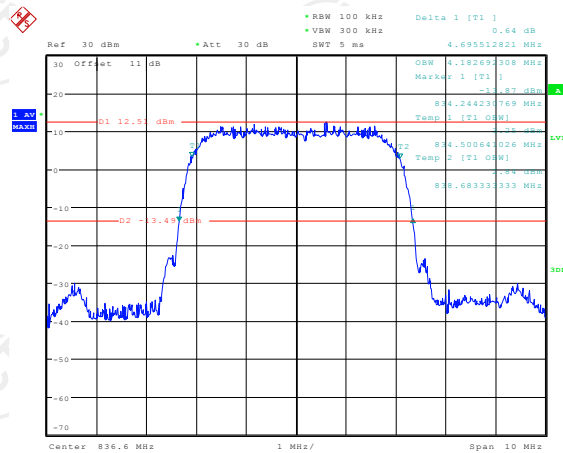
RMC 12.2Kbps Link  
(QPSK)

## 26dB&99% Occupied Bandwidth Plot on Channel 4132



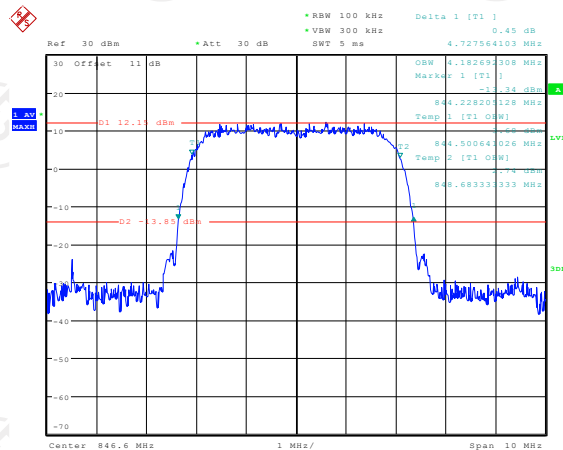
Date: 24.JUN.2021 17:00:06

## 26dB&99% Occupied Bandwidth Plot on Channel 4183



Date: 24.JUN.2021 17:01:22

## 26dB&99% Occupied Bandwidth Plot on Channel 4233



Date: 24.JUN.2021 17:02:20

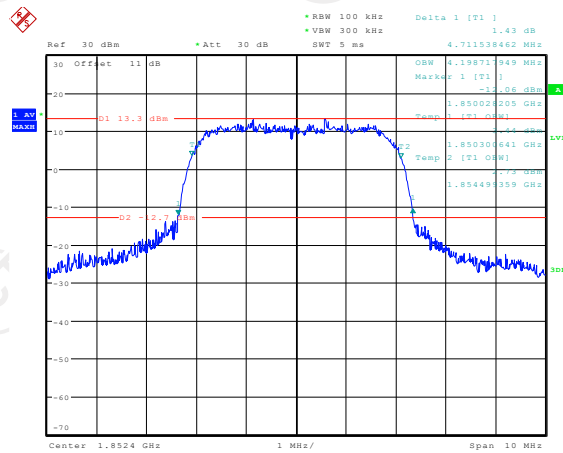
Band:

WCDMA Band II

Test Mode:

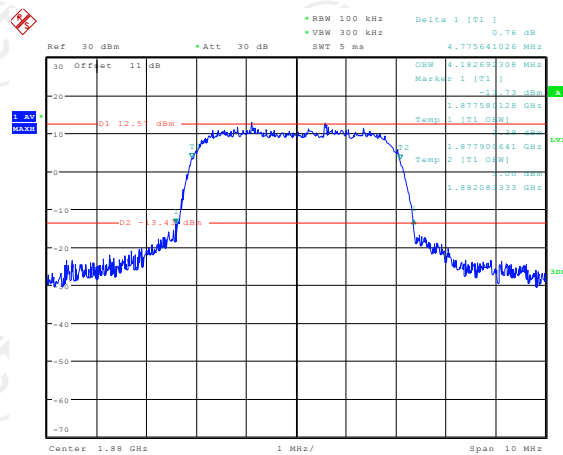
RMC 12.2Kbps Link  
(QPSK)

## 26dB&99% Occupied Bandwidth Plot on Channel 9262



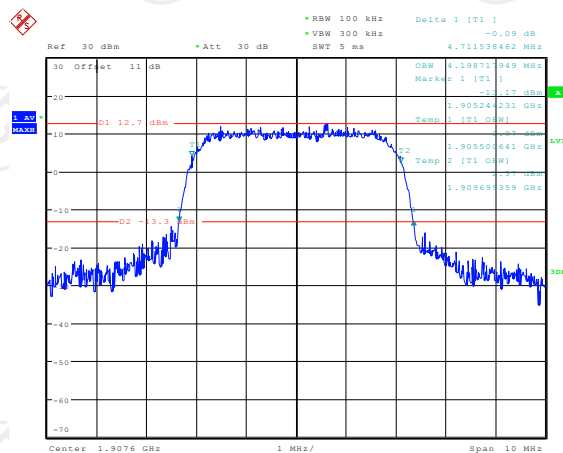
Date: 24.JUN.2021 16:54:26

## 26dB&99% Occupied Bandwidth Plot on Channel 9400



Date: 24.JUN.2021 16:55:37

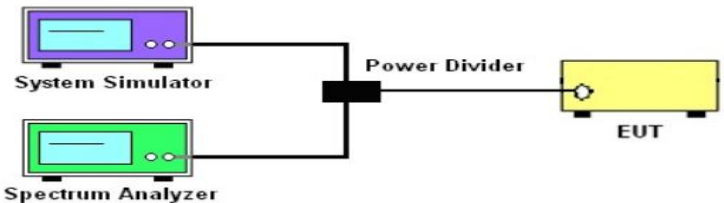
## 26dB&99% Occupied Bandwidth Plot on Channel 9538



Date: 24.JUN.2021 16:56:55

## 5.4. Band Edge and Conducted Spurious Emission Measurement

### 5.4.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part22.917(a) and FCC part24.238(a)<br>FCC part27.53(g)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Test Method:</b>      | FCC KDB 971168 D01v03r01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Limit:</b>            | -13dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Test Setup:</b>       |  <p>The diagram shows a System Simulator (purple box) and a Spectrum Analyzer (green box) connected to a Power Divider (black box). The Power Divider is also connected to the EUT (yellow box).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 6.0.</li> <li>2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.</li> <li>3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>4. The band edges of low and high channels for the highest RF powers were measured.</li> <li>5. The conducted spurious emission for the whole frequency range was taken.</li> <li>6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> <li>7. The limit line is derived from <math>43 + 10\log(P)</math> dB below the transmitter power<br/> <math>P(\text{Watts}) = P(\text{W}) - [43 + 10\log(P)] (\text{dB}) = [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB}) = -13\text{dBm}.</math> </li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### 5.4.2. Test Instruments

| Equipment                | Manufacturer | Model  | Serial Number | Calibration Due |
|--------------------------|--------------|--------|---------------|-----------------|
| System simulator         | R&S          | CMU200 | 110188        | Sep. 11, 2021   |
| Spectrum Analyzer        | R&S          | FSU    | 200054        | Sep. 11, 2021   |
| RF cable<br>(9kHz-40GHz) | TCT          | RE-05  | N/A           | Sep. 02, 2021   |
| Antenna Connector        | TCT          | RFC-02 | N/A           | Sep. 02, 2021   |

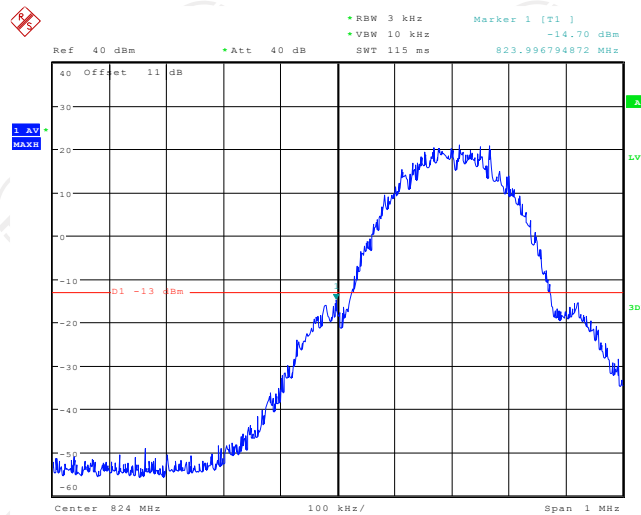


## 5.4.3. Test data

Test plots as follows:

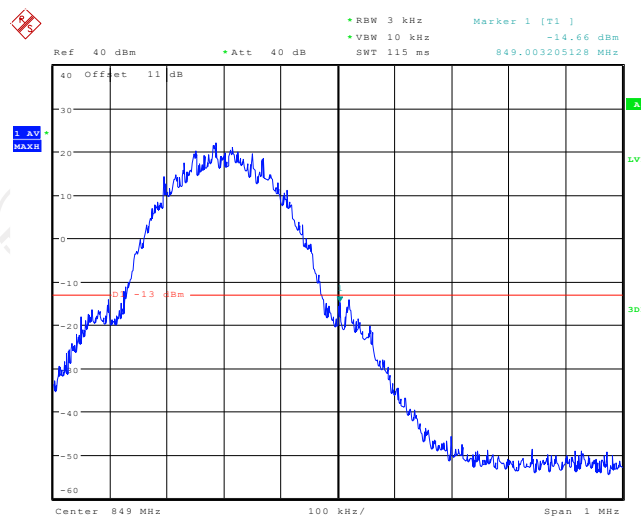
|       |         |            |                 |
|-------|---------|------------|-----------------|
| Band: | GSM 850 | Test Mode: | GSM Link (GMSK) |
|-------|---------|------------|-----------------|

Lower Band Edge Plot on Channel 128



Date: 24.JUN.2021 15:35:24

Higher Band Edge Plot on Channel 251



Date: 24.JUN.2021 15:36:59

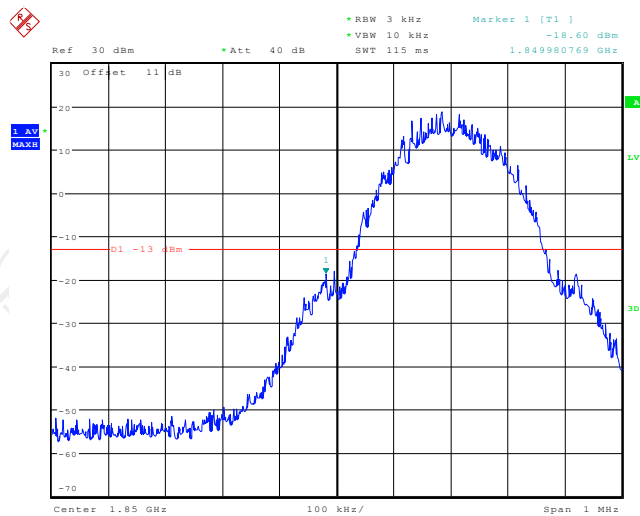
Band:

GSM 1900

Test Mode:

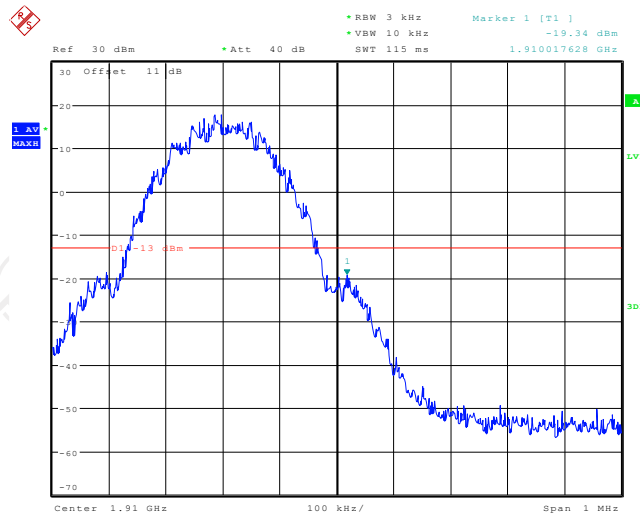
GSM Link (GMSK)

## Lower Band Edge Plot on Channel 512



Date: 24.JUN.2021 16:01:23

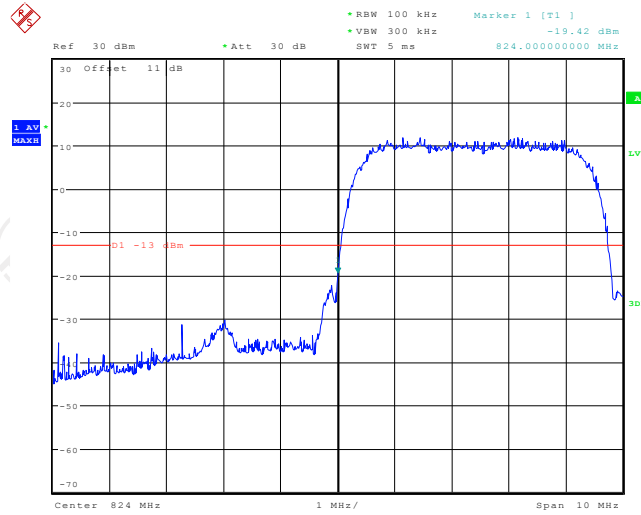
## Higher Band Edge Plot on Channel 810



Date: 24.JUN.2021 16:00:26

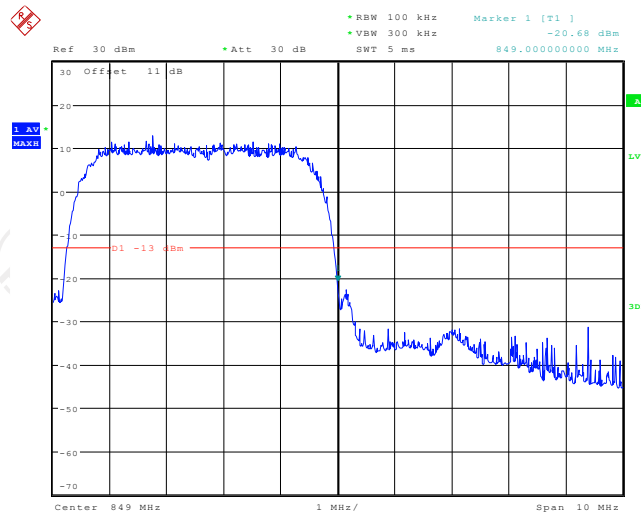
|       |              |            |                          |
|-------|--------------|------------|--------------------------|
| Band: | WCDMA Band V | Test Mode: | RMC 12.2Kbps Link (QPSK) |
|-------|--------------|------------|--------------------------|

## Lower Band Edge Plot on Channel 4132



Date: 24 JUN 2021 16:32:19

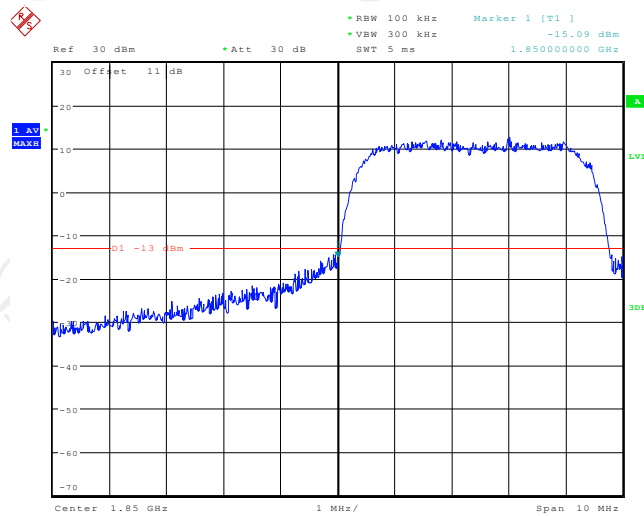
## Higher Band Edge Plot on Channel 4233



Date: 24 JUN 2021 16:33:13

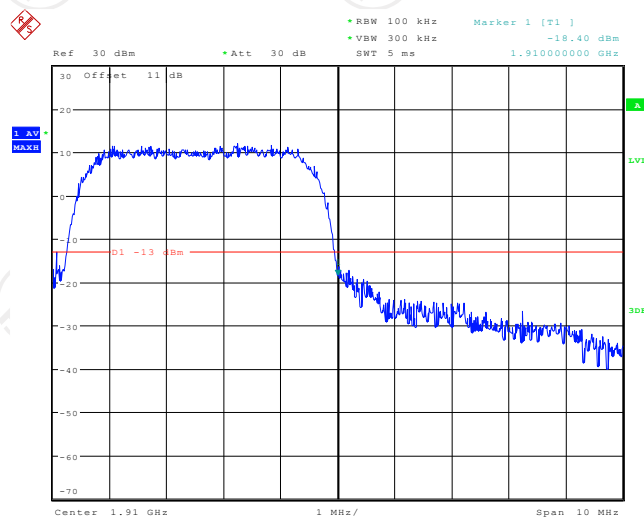
|       |               |            |                          |
|-------|---------------|------------|--------------------------|
| Band: | WCDMA Band II | Test Mode: | RMC 12.2Kbps Link (QPSK) |
|-------|---------------|------------|--------------------------|

## Lower Band Edge Plot on Channel 9262



Date: 24 JUN 2021 16:29:04

## Higher Band Edge Plot on Channel 9538



Date: 24 JUN 2021 16:31:06

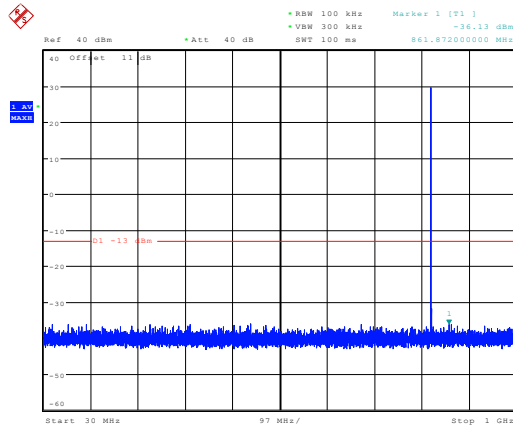
Band:

GSM 850

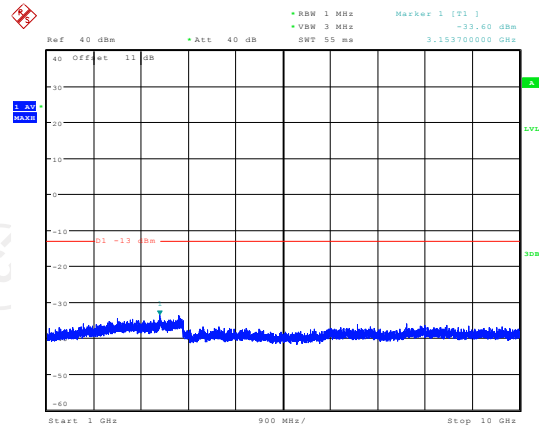
Test Mode:

GSM Link (GMSK)

## Conducted Spurious Emission on Channel 128

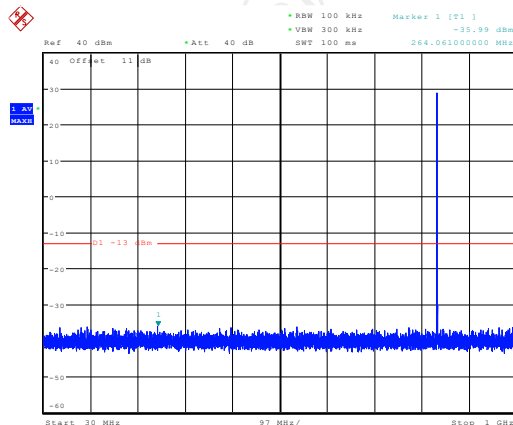


Date: 24.JUN.2021 16:08:25

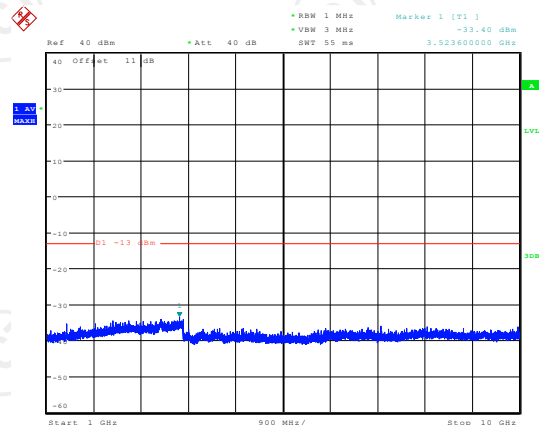


Date: 24.JUN.2021 16:08:46

## Conducted Spurious Emission on Channel 190

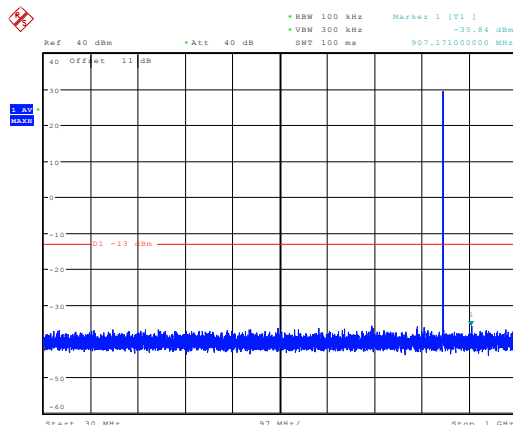


Date: 24.JUN.2021 16:09:51

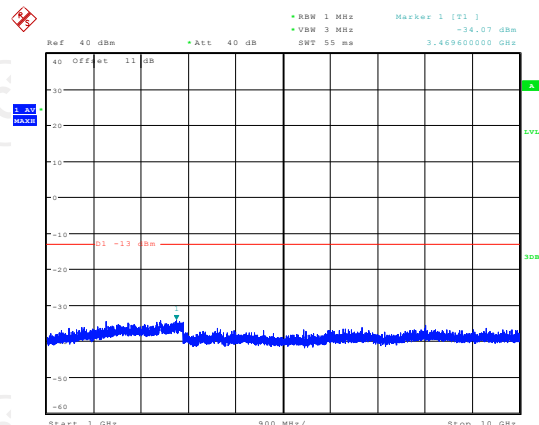


Date: 24.JUN.2021 16:09:29

## Conducted Spurious Emission on Channel 251



Date: 24.JUN.2021 16:10:31



Date: 24.JUN.2021 16:10:56

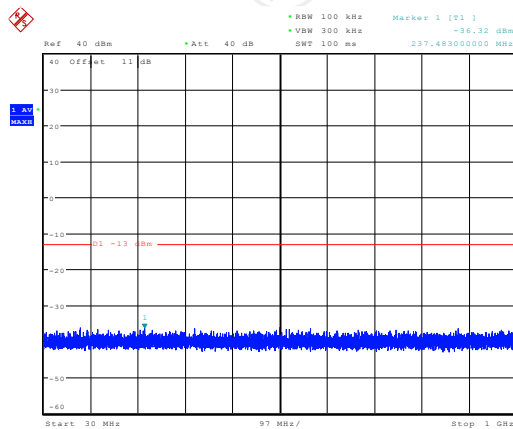
Band:

GSM 1900

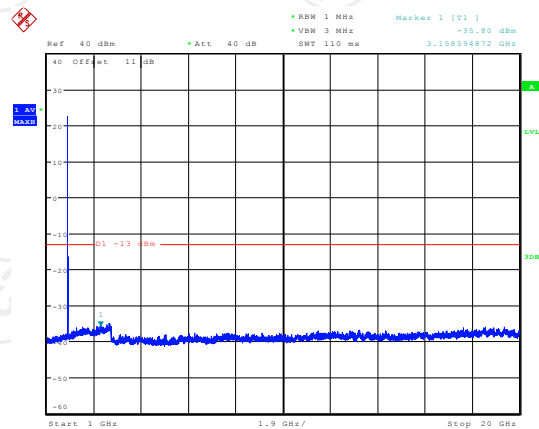
Test Mode:

GSM Link (GMSK)

## Conducted Spurious Emission on Channel 512

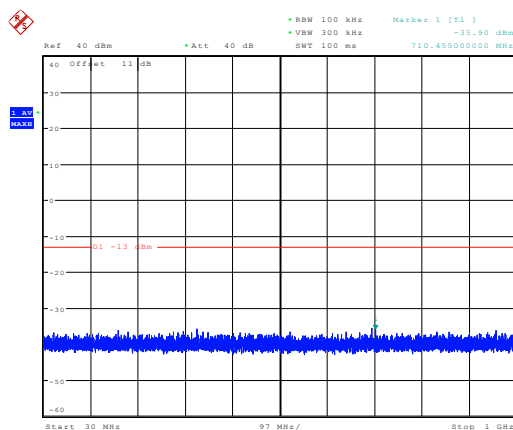


Date: 24.JUN.2021 16:02:25

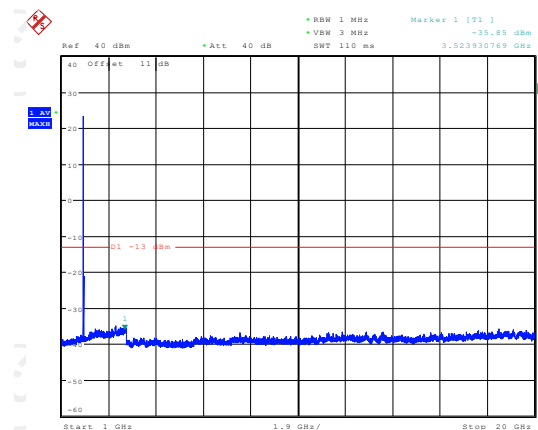


Date: 24.JUN.2021 16:04:02

## Conducted Spurious Emission on Channel 661

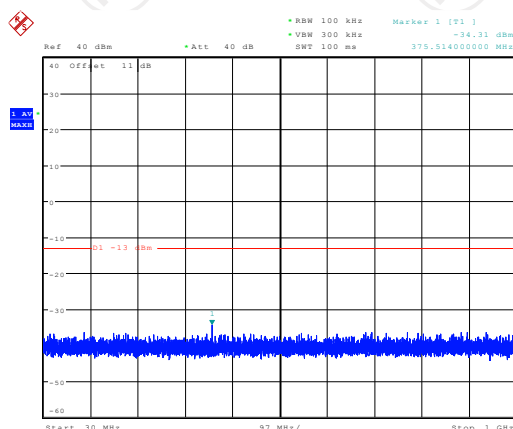


Date: 24.JUN.2021 16:06:08

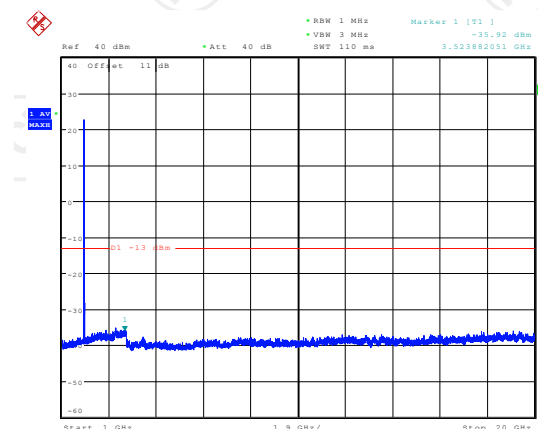


Date: 24.JUN.2021 16:05:28

## Conducted Spurious Emission on Channel 810



Date: 24.JUN.2021 16:06:36



Date: 24.JUN.2021 16:07:01

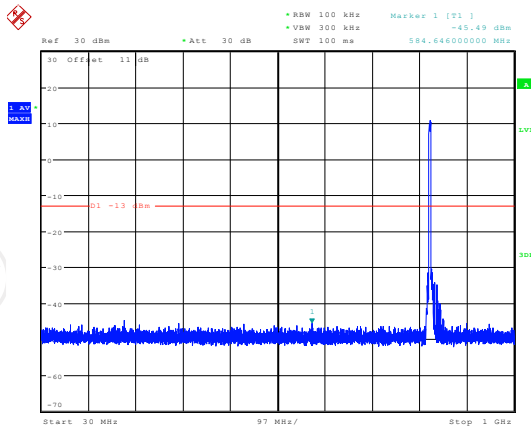
Band:

WCDMA Band V

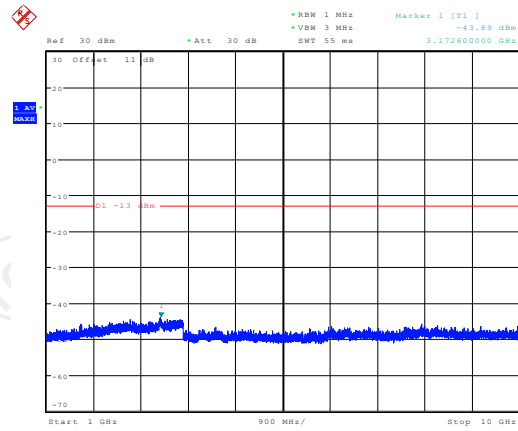
Test Mode:

RMC 12.2Kbps Link  
(QPSK)

## Conducted Spurious Emission on Channel 4132

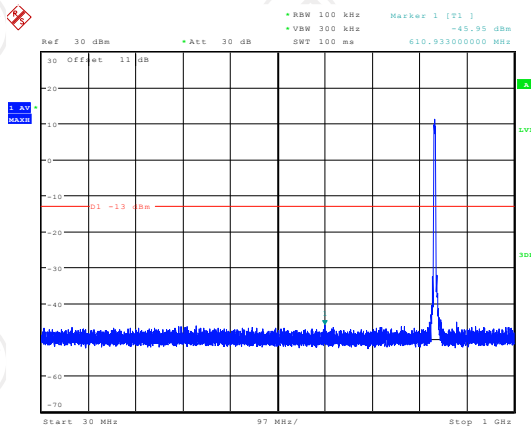


Date: 24.JUN.2021 16:35:14

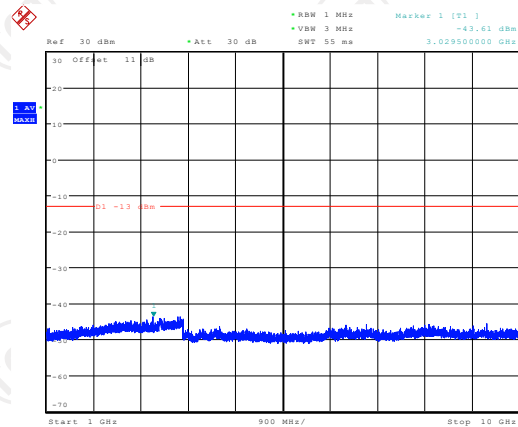


Date: 24.JUN.2021 16:35:45

## Conducted Spurious Emission on Channel 4183

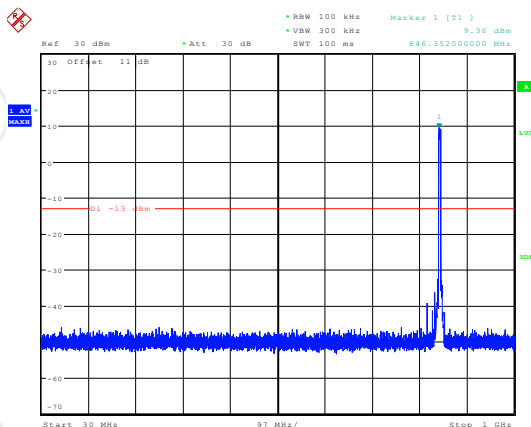


Date: 24.JUN.2021 16:37:18

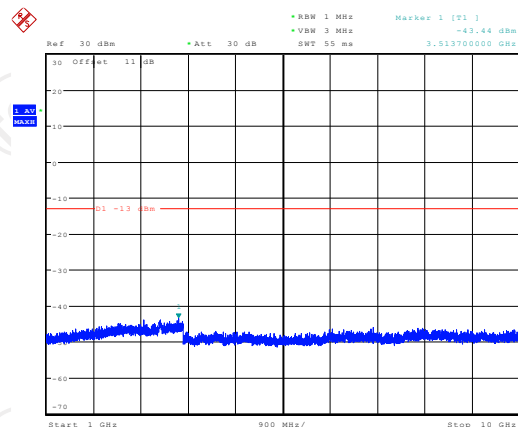


Date: 24.JUN.2021 16:36:29

## Conducted Spurious Emission on Channel 4233



Date: 24.JUN.2021 16:38:01



Date: 24.JUN.2021 16:38:23

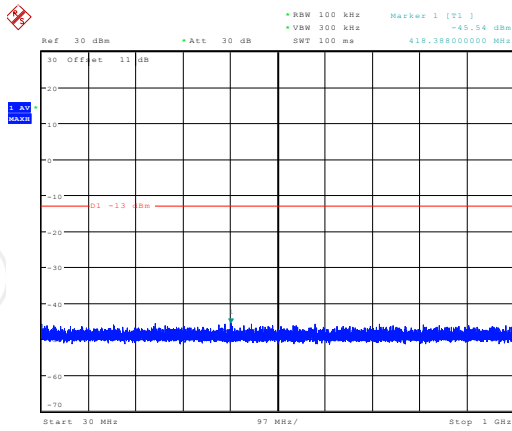
Band:

WCDMA Band II

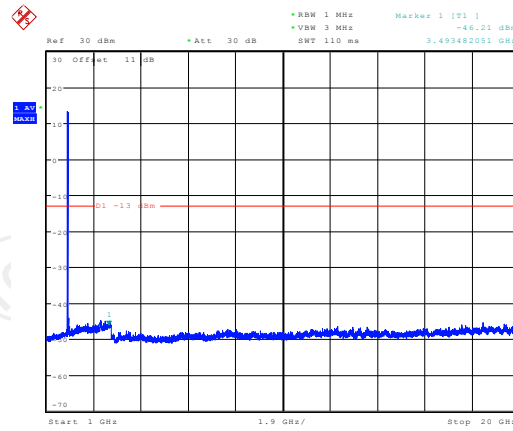
Test Mode:

RMC 12.2Kbps Link  
(QPSK)

## Conducted Spurious Emission on Channel 9262

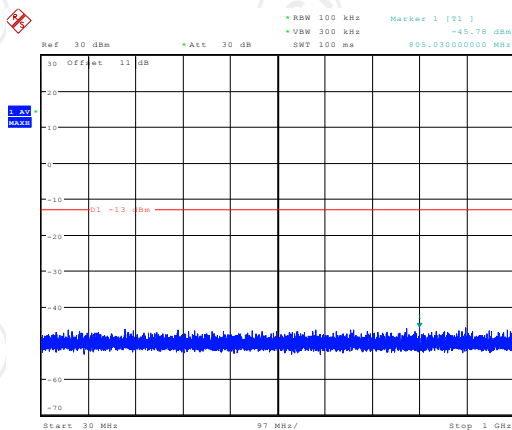


Date: 24.JUN.2021 16:19:50

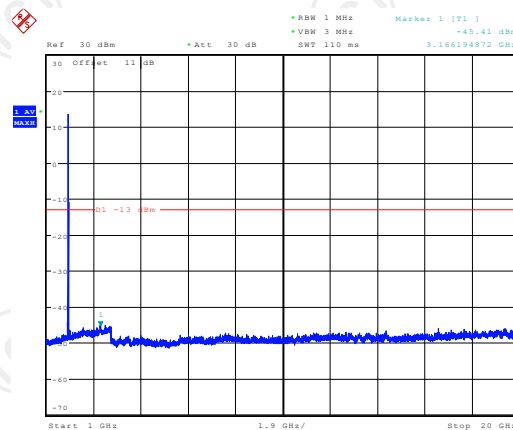


Date: 24.JUN.2021 16:21:06

## Conducted Spurious Emission on Channel 9400

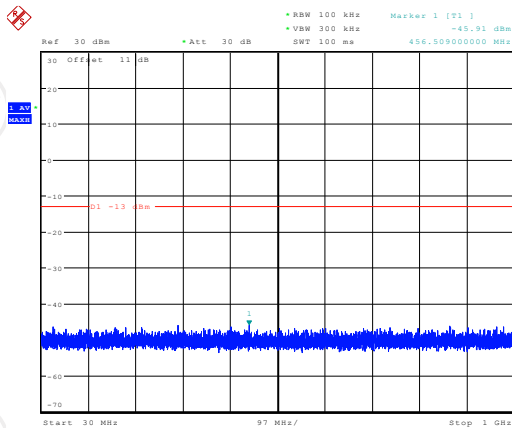


Date: 24.JUN.2021 16:22:47

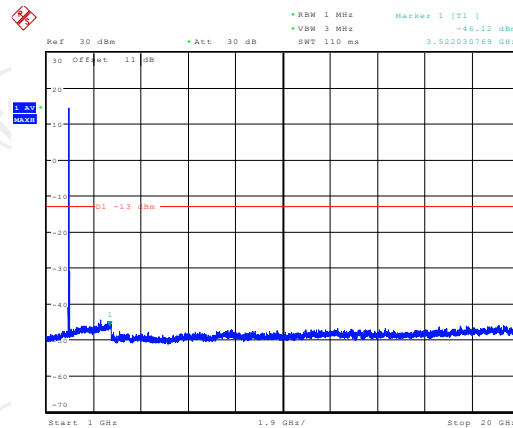


Date: 24.JUN.2021 16:21:53

## Conducted Spurious Emission on Channel 9538



Date: 24.JUN.2021 16:23:21



Date: 24.JUN.2021 16:24:30



GSM1900(GSM) Conducted Spurious Emission for Below 1G

| Channel | RBW (KHz) | Test result (dBm) | RBW (MHz) | Calculate result (dBm) | Limit (-13dBm) |
|---------|-----------|-------------------|-----------|------------------------|----------------|
| 512     | 100       | -36.32            | 1         | -26.32                 | Pass           |
| 661     | 100       | -35.90            | 1         | -25.90                 | Pass           |
| 810     | 100       | -34.31            | 1         | -24.31                 | Pass           |

WCDMA Band II(RMC 12.2Kbps) Conducted Spurious Emission for Below 1G

| Channel | RBW (KHz) | Test result (dBm) | RBW (MHz) | Calculate result (dBm) | Limit (-13dBm) |
|---------|-----------|-------------------|-----------|------------------------|----------------|
| 9262    | 100       | -45.54            | 1         | -35.54                 | Pass           |
| 9400    | 100       | -45.78            | 1         | -35.78                 | Pass           |
| 9538    | 100       | -45.91            | 1         | -35.91                 | Pass           |

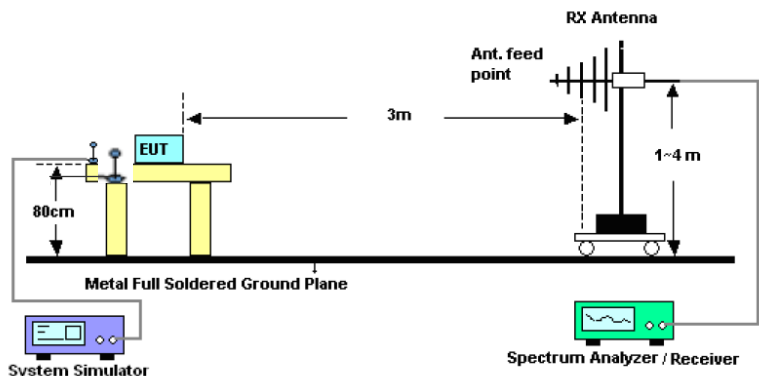
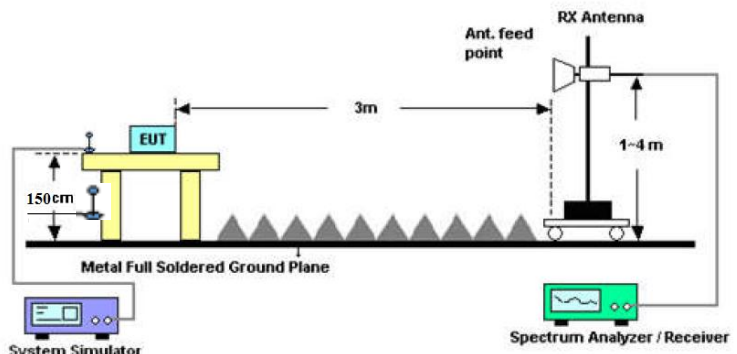
Compensate 10dB is for Exchange rate of RBW

Exchange rate of RBW =  $10 \cdot \log_{10}(\text{Reference bandwidth}/\text{RBW at measurement}) = 10[\text{dB}]$   
where Reference bandwidth = 1 MHz

**Note:** Measurements were conducted in all GMSK modulation (GSM/GPRS) and the worst case Mode (GSM) was submitted only.

## 5.5. Effective Radiated Power and Effective Isotropic Radiated Power Measurement

### 5.5.1. Test Specification

|                   |                                                                                      |               |            |
|-------------------|--------------------------------------------------------------------------------------|---------------|------------|
| Test Requirement: | FCC part 22.913(a) and FCC part 24.232(c)<br>FCC part 27.50(d)                       |               |            |
| Test Method:      | FCC KDB 971168 D01v03r01                                                             |               |            |
| Receiver Setup:   |                                                                                      | GSM/GPRS/EDGE | WCDMA/HSPA |
|                   | SPAN                                                                                 | 500kHz        | 10MHz      |
|                   | RBW                                                                                  | 10kHz         | 100kHz     |
|                   | VBW                                                                                  | 30kHz         | 300kHz     |
|                   | Detector                                                                             | RMS           | RMS        |
|                   | Trace                                                                                | Average       | Average    |
|                   | Average Type                                                                         | Power         | Power      |
|                   | Sweep Count                                                                          | 100           | 100        |
| Limit:            | GSM850: 7W ERP<br>PCS1900: 2W EIRP<br>WCDMA Band V: 7W ERP<br>WCDMA Band II: 2W EIRP |               |            |
| Test Setup:       | From 30MHz to 1GHz                                                                   |               |            |
|                   |  |               |            |
| Test Setup:       | Above 1GHz                                                                           |               |            |
|                   |  |               |            |
| Test Procedure:   | 1. The testing follows FCC KDB 971168 D01v03r01                                      |               |            |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | <p>Section 5.8. and ANSI / TIA-603-D-2010 Section 2.2.17.</p> <ol style="list-style-type: none"> <li>The EUT was placed on a non-conductive rotating platform 0.8 meters high in a semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RMS detector per section 5. of KDB 971168 D01v03.</li> <li>Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment.</li> <li>Replace the transmitter under test with a substitution antenna. The center of the antenna should be at the same location as the center of the antenna under test.</li> <li>Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.<br/> <math display="block">\text{LOSS} = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}</math> </li> <li>Determine the effective radiated output power at each angular position from the readings in steps 3) and 5) using the following equation:<br/> <math display="block">\text{ERP (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}</math> </li> <li>The maximum ERP is the maximum value determined in the preceding step.</li> <li>Calculating ERP:<br/> <math display="block">\text{ERP (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBd)}</math> <math display="block">\text{Antenna Gain (dBd)} = \text{Antenna Gain (dBi)} - 2.15</math> <math display="block">\text{EIRP} = \text{ERP} + 2.15</math> </li> </ol> |
| <b>Test results:</b> | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

### 5.5.2. Test Instruments

| Radiated Emission Test Site (966) |                       |              |               |                 |
|-----------------------------------|-----------------------|--------------|---------------|-----------------|
| Name of Equipment                 | Manufacturer          | Model        | Serial Number | Calibration Due |
| System simulator                  | R&S                   | CMU200       | 110188        | Sep. 11, 2021   |
| Spectrum Analyzer                 | ROHDE&SCHW<br>ARZ     | R&S          | FSQ40         | Sep. 11, 2021   |
| Signal Generator                  | HP                    | 83623B       | 3614A00396    | Sep. 02, 2021   |
| Broadband Antenna                 | Schwarzbeck           | VULB9163     | 340           | Sep. 04, 2022   |
| Horn Antenna                      | Schwarzbeck           | BBHA 9120D   | 631           | Sep. 04, 2022   |
| Broadband Antenna                 | Schwarzbeck           | VULB9163     | 412           | Sep. 04, 2022   |
| Horn Antenna                      | Schwarzbeck           | BBHA 9120D   | 1201          | Sep. 04, 2022   |
| Horn Antenna                      | A-INFO                | LB-180400-KF | J211020657    | Sep. 04, 2022   |
| Dipole Antenna                    | TCT                   | TCT-RF       | N/A           | Sep. 02, 2021   |
| Line-4                            | TCT                   | RE-high-04   | N/A           | Sep. 02, 2021   |
| Line-8                            | TCT                   | RE-01        | N/A           | Jul. 27, 2021   |
| Antenna Mast                      | Keleto                | RE-AM        | N/A           | N/A             |
| EMI Test Software                 | Shurple<br>Technology | EZ-EMC       | N/A           | N/A             |

### 5.5.3. Test Data

#### Test Result of ERP

| GSM850 (GSM) Radiated Power ERP        |            |           |                        |           |         |
|----------------------------------------|------------|-----------|------------------------|-----------|---------|
| Horizontal Polarization (Antenna Pol.) |            |           |                        |           |         |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2                                  | H          | 10.08     | 21.66                  | 29.59     | 0.91    |
| 836.6                                  | H          | 10.36     | 21.54                  | 29.75     | 0.94    |
| 848.8                                  | H          | 10.25     | 21.46                  | 29.56     | 0.90    |
| Vertical Polarization (Antenna Pol.)   |            |           |                        |           |         |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2                                  | H          | 10.11     | 21.66                  | 29.62     | 0.92    |
| 836.6                                  | H          | 10.28     | 21.54                  | 29.67     | 0.93    |
| 848.8                                  | H          | 10.31     | 21.46                  | 29.62     | 0.92    |

| GPRS 850 (1-slot) Radiated Power ERP   |            |           |                        |           |         |
|----------------------------------------|------------|-----------|------------------------|-----------|---------|
| Horizontal Polarization (Antenna Pol.) |            |           |                        |           |         |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2                                  | H          | 10.45     | 21.66                  | 29.96     | 0.99    |
| 836.6                                  | H          | 10.36     | 21.54                  | 29.75     | 0.94    |
| 848.8                                  | H          | 10.19     | 21.46                  | 29.5      | 0.89    |
| Vertical Polarization (Antenna Pol.)   |            |           |                        |           |         |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 824.2                                  | H          | 10.47     | 21.66                  | 29.98     | 1.00    |
| 836.6                                  | H          | 10.55     | 21.54                  | 29.94     | 0.99    |
| 848.8                                  | H          | 10.42     | 21.46                  | 29.73     | 0.94    |

**Note:** All GPRS slot have been tested, but only the worst GPRS 1-slot show in this test item.

| WCDMA Band V (RMC 12.2Kbps) Radiated Power ERP |            |           |                        |           |         |
|------------------------------------------------|------------|-----------|------------------------|-----------|---------|
| Horizontal Polarization (Antenna Pol.)         |            |           |                        |           |         |
| Frequency (MHz)                                | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 826.4                                          | H          | 2.00      | 21.62                  | 21.47     | 0.14    |
| 836.6                                          | H          | 1.76      | 21.54                  | 21.15     | 0.13    |
| 846.6                                          | H          | 1.66      | 21.44                  | 20.95     | 0.12    |
| Vertical Polarization (Antenna Pol.)           |            |           |                        |           |         |
| Frequency (MHz)                                | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | ERP (dBm) | ERP (W) |
| 826.4                                          | H          | 1.37      | 21.62                  | 20.84     | 0.12    |
| 836.6                                          | H          | 1.58      | 21.54                  | 20.97     | 0.13    |
| 846.6                                          | H          | 1.62      | 21.44                  | 20.91     | 0.12    |

**Note:** \* ERP = LVL (dBm) + Correction Factor (dB) - 2.15  
Correction Factor= S.G. Power - Cable loss + Antenna Gain- SPA. Reading

Test Result of EIRP

| GSM1900 (GSM) Radiated Power EIRP      |            |           |                        |            |          |
|----------------------------------------|------------|-----------|------------------------|------------|----------|
| Horizontal Polarization (Antenna Pol.) |            |           |                        |            |          |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2                                 | H          | 7.00      | 21.66                  | 28.66      | 0.73     |
| 1880.0                                 | H          | 7.12      | 21.54                  | 28.66      | 0.73     |
| 1909.8                                 | H          | 7.31      | 21.46                  | 28.77      | 0.75     |
| Vertical Polarization (Antenna Pol.)   |            |           |                        |            |          |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2                                 | H          | 6.68      | 21.66                  | 28.34      | 0.68     |
| 1880.0                                 | H          | 6.89      | 21.54                  | 28.43      | 0.70     |
| 1909.8                                 | H          | 7.23      | 21.46                  | 28.69      | 0.74     |

| GPRS1900 (1-slot) Radiated Power EIRP  |            |           |                        |            |          |
|----------------------------------------|------------|-----------|------------------------|------------|----------|
| Horizontal Polarization (Antenna Pol.) |            |           |                        |            |          |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2                                 | H          | 6.55      | 21.66                  | 28.21      | 0.66     |
| 1880.0                                 | H          | 6.68      | 21.54                  | 28.22      | 0.66     |
| 1909.8                                 | H          | 6.71      | 21.46                  | 28.17      | 0.66     |
| Vertical Polarization (Antenna Pol.)   |            |           |                        |            |          |
| Frequency (MHz)                        | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1850.2                                 | H          | 6.32      | 21.66                  | 27.98      | 0.63     |
| 1880.0                                 | H          | 6.56      | 21.54                  | 28.1       | 0.65     |
| 1909.8                                 | H          | 6.63      | 21.46                  | 28.09      | 0.64     |

**Note:** All GPRS slot have been tested, but only the worst GPRS 1-slot show in this test item

| WCDMA Band II (RMC 12.2Kbps) Radiated Power EIRP |            |           |                        |            |          |
|--------------------------------------------------|------------|-----------|------------------------|------------|----------|
| Horizontal Polarization (Antenna Pol.)           |            |           |                        |            |          |
| Frequency (MHz)                                  | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1852.4                                           | H          | 0.69      | 21.62                  | 22.35      | 0.17     |
| 1880.0                                           | H          | 0.81      | 21.54                  | 22.35      | 0.17     |
| 1907.6                                           | H          | 1.00      | 21.48                  | 22.46      | 0.18     |
| Vertical Polarization (Antenna Pol.)             |            |           |                        |            |          |
| Frequency (MHz)                                  | (EUT Pol.) | LVL (dBm) | Correction Factor (dB) | EIRP (dBm) | EIRP (W) |
| 1852.4                                           | H          | 0.75      | 21.62                  | 22.41      | 0.17     |
| 1880.0                                           | H          | 0.87      | 21.54                  | 22.41      | 0.17     |
| 1907.6                                           | H          | 1.04      | 21.48                  | 22.5       | 0.18     |

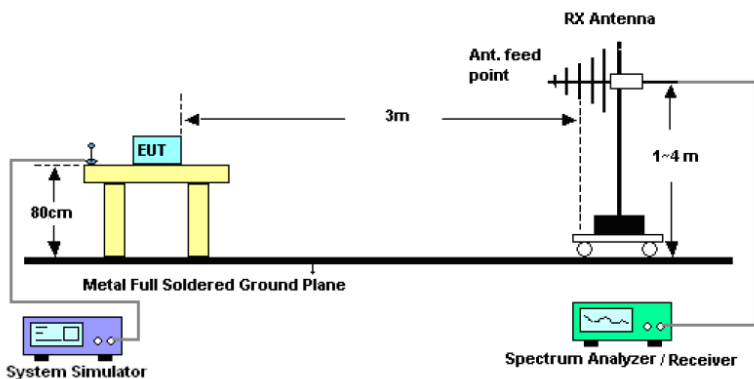
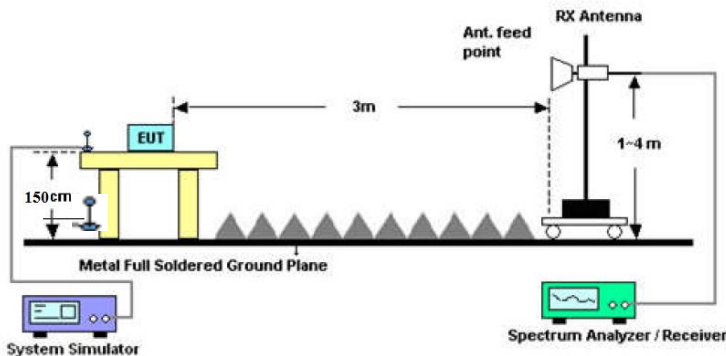
**Note:** \* EIRP = LVL (dBm) + Correction Factor (dB)

Correction Factor= S.G. Power - Cable loss + Substitution Antenna Gain- SPA. Reading



## 5.6. Field Strength of Spurious Radiation Measurement

### 5.6.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC part 22.917(a) and FCC part 24.238(a)<br>FCC part 27.53(g)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Test Method:</b>      | FCC KDB 971168 D01v03r01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Limit:</b>            | -13dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Test setup:</b>       | <p>For 30MHz~1GHz</p>  <p>Above 1GHz</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Test Procedure:</b>   | <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 6 and ANSI / TIA-603-D-2010 Section 2.2.12.</li> <li>2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.</li> <li>3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.</li> <li>4. The table was rotated 360 degrees to determine the position of the highest spurious emission.</li> <li>5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.</li> <li>6. Make the measurement with the spectrum analyzer's</li> </ol> |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | <p>RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.</p> <p>7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.</p> <p>8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.</p> <p>9. Taking the record of output power at antenna port.</p> <p>10. Repeat step 7 to step 8 for another polarization.</p> <p>11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain</p> <p>12. ERP (dBm) = EIRP - 2.15</p> <p>13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</p> <p>14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)</p> <p>= P(W) - [43 + 10log(P)] (dB)</p> <p>= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)</p> <p>= -13dBm.</p> |
| <b>Test results:</b> | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Remark:</b>       | All modulations have been tested, but only the worst modulation show in this test item.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 5.6.2. Test Instruments

| Radiated Emission Test Site (966) |                       |              |               |                 |
|-----------------------------------|-----------------------|--------------|---------------|-----------------|
| Name of Equipment                 | Manufacturer          | Model        | Serial Number | Calibration Due |
| System simulator                  | R&S                   | CMU200       | 110188        | Sep. 11, 2021   |
| Spectrum Analyzer                 | ROHDE&SCHW<br>ARZ     | R&S          | FSQ40         | Sep. 11, 2021   |
| Signal Generator                  | HP                    | 83623B       | 3614A00396    | Sep. 02, 2021   |
| Broadband Antenna                 | Schwarzbeck           | VULB9163     | 340           | Sep. 04, 2022   |
| Horn Antenna                      | Schwarzbeck           | BBHA 9120D   | 631           | Sep. 04, 2022   |
| Broadband Antenna                 | Schwarzbeck           | VULB9163     | 412           | Sep. 04, 2022   |
| Horn Antenna                      | Schwarzbeck           | BBHA 9120D   | 1201          | Sep. 04, 2022   |
| Horn Antenna                      | A-INFO                | LB-180400-KF | J211020657    | Sep. 04, 2022   |
| Dipole Antenna                    | TCT                   | TCT-RF       | N/A           | Sep. 02, 2021   |
| Line-4                            | TCT                   | RE-high-04   | N/A           | Sep. 02, 2021   |
| Line-8                            | TCT                   | RE-01        | N/A           | Jul. 27, 2021   |
| Antenna Mast                      | Keleto                | RE-AM        | N/A           | N/A             |
| EMI Test Software                 | Shurple<br>Technology | EZ-EMC       | N/A           | N/A             |

### 5.6.3. Test Data

#### Frequency Range (9 kHz-30MHz)

| Frequency (MHz) | Level@3m (dB $\mu$ V/m) | Limit@3m (dB $\mu$ V/m) |
|-----------------|-------------------------|-------------------------|
| --              | --                      | --                      |
| --              | --                      | --                      |
| --              | --                      | --                      |
| --              | --                      | --                      |

**Note:** 1. Emission Level=Reading+ Cable loss+Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

| Band                                                                                   | GSM 850           |             |                        |                          | Test channel:      | Lowest  |
|----------------------------------------------------------------------------------------|-------------------|-------------|------------------------|--------------------------|--------------------|---------|
| Test mode:                                                                             |                   |             |                        |                          | Temperature :      | 25°C    |
|                                                                                        |                   |             |                        |                          | Relative Humidity: | 56%     |
| Note: Spurious emissions within 30-1000MHz were found more than 20dB below limit line. |                   |             |                        |                          |                    |         |
| Frequency (MHz)                                                                        | Spurious Emission |             |                        |                          | Limit (dBm)        | Result  |
|                                                                                        | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |                    |         |
| 1648.4                                                                                 | Vertical          | -57.28      | 23.12                  | -34.16                   | -13.00             | PASS    |
| 2472.6                                                                                 | V                 | -63.51      | 23.20                  | -40.31                   |                    |         |
| 3296.8                                                                                 | V                 | -76.63      | 23.28                  | -53.35                   |                    |         |
| 1648.4                                                                                 | Horizontal        | -56.72      | 23.12                  | -33.60                   |                    |         |
| 2472.6                                                                                 | H                 | -61.99      | 23.20                  | -38.79                   |                    |         |
| 3296.8                                                                                 | H                 | -75.86      | 23.28                  | -52.58                   |                    |         |
| Band                                                                                   | GSM 850           |             |                        |                          | Test channel:      | Middle  |
| Test mode:                                                                             |                   |             |                        |                          | Temperature :      | 25°C    |
|                                                                                        |                   |             |                        |                          | Relative Humidity: | 56%     |
| Note: Spurious emissions within 30-1000MHz were found more than 20dB below limit line. |                   |             |                        |                          |                    |         |
| Frequency (MHz)                                                                        | Spurious Emission |             |                        |                          | Limit (dBm)        | Result  |
|                                                                                        | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |                    |         |
| 1673.2                                                                                 | Vertical          | -56.32      | 23.17                  | -33.15                   | -13.00             | PASS    |
| 2509.8                                                                                 | V                 | -67.91      | 23.26                  | -44.65                   |                    |         |
| 3346.4                                                                                 | V                 | -76.87      | 23.38                  | -53.49                   |                    |         |
| 1673.2                                                                                 | Horizontal        | -55.55      | 23.17                  | -32.38                   |                    |         |
| 2509.8                                                                                 | H                 | -63.93      | 23.26                  | -40.67                   |                    |         |
| 3346.4                                                                                 | H                 | -76.90      | 23.38                  | -53.52                   |                    |         |
| Band                                                                                   | GSM 850           |             |                        |                          | Test channel:      | Highest |
| Test mode:                                                                             |                   |             |                        |                          | Temperature :      | 25°C    |
|                                                                                        |                   |             |                        |                          | Relative Humidity: | 56%     |
| Note: Spurious emissions within 30-1000MHz were found more than 20dB below limit line. |                   |             |                        |                          |                    |         |
| Frequency (MHz)                                                                        | Spurious Emission |             |                        |                          | Limit (dBm)        | Result  |
|                                                                                        | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |                    |         |
| 1697.6                                                                                 | Vertical          | -58.74      | 23.23                  | -35.51                   | -13.00             | PASS    |
| 2546.4                                                                                 | V                 | -68.60      | 23.32                  | -45.28                   |                    |         |
| 3395.2                                                                                 | V                 | -76.15      | 23.44                  | -52.71                   |                    |         |
| 1697.6                                                                                 | Horizontal        | -54.49      | 23.23                  | -31.26                   |                    |         |
| 2546.4                                                                                 | H                 | -64.11      | 23.32                  | -40.79                   |                    |         |
| 3395.2                                                                                 | H                 | -78.82      | 23.44                  | -55.38                   |                    |         |

| Band       | PCS 1900 | Test channel:      | Lowest |
|------------|----------|--------------------|--------|
| Test mode: |          | Temperature :      | 25°C   |
|            |          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3700.4          | Vertical          | -63.87      | 23.49                  | -40.38                   | -13.00      | PASS   |
| 5550.6          | V                 | -72.12      | 23.75                  | -48.37                   |             |        |
| 7400.8          | V                 | -78.63      | 23.89                  | -54.74                   |             |        |
| 3700.4          | Horizontal        | -60.47      | 23.49                  | -36.98                   |             |        |
| 5550.6          | H                 | -66.76      | 23.75                  | -43.01                   |             |        |
| 7400.8          | H                 | -77.20      | 23.89                  | -53.31                   |             |        |

| Band       | PCS 1900 | Test channel:      | Middle |
|------------|----------|--------------------|--------|
| Test mode: |          | Temperature :      | 25°C   |
|            |          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3760.0          | Vertical          | -63.42      | 23.58                  | -39.84                   | -13.00      | PASS   |
| 5640.0          | V                 | -73.96      | 23.85                  | -50.11                   |             |        |
| 7520.0          | V                 | -72.03      | 23.99                  | -48.04                   |             |        |
| 3760.0          | Horizontal        | -60.28      | 23.58                  | -36.70                   |             |        |
| 5640.0          | H                 | -73.71      | 23.85                  | -49.86                   |             |        |
| 7520.0          | H                 | -77.92      | 23.99                  | -53.93                   |             |        |

| Band       | PCS 1900 | Test channel:      | Highest |
|------------|----------|--------------------|---------|
| Test mode: |          | Temperature :      | 25°C    |
|            |          | Relative Humidity: | 56%     |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3819.6          | Vertical          | -61.55      | 23.64                  | -37.91                   | -13.00      | PASS   |
| 5729.4          | V                 | -70.77      | 23.93                  | -46.84                   |             |        |
| 7639.2          | V                 | -78.31      | 24.08                  | -54.23                   |             |        |
| 3819.6          | Horizontal        | -59.66      | 23.64                  | -36.02                   |             |        |
| 5729.4          | H                 | -66.14      | 23.93                  | -42.21                   |             |        |
| 7639.2          | H                 | -77.60      | 24.08                  | -53.52                   |             |        |

| Band       | WCDMA Band V             | Test channel:      | Lowest |
|------------|--------------------------|--------------------|--------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C   |
|            |                          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 1652.8          | Vertical          | -68.14      | 23.14                  | -45.00                   | -13.00      | PASS   |
| 2479.2          | V                 | -77.28      | 23.23                  | -54.05                   |             |        |
| 3305.6          | V                 | -75.76      | 23.34                  | -52.42                   |             |        |
| 1652.8          | Horizontal        | -66.44      | 23.14                  | -43.30                   |             |        |
| 2479.2          | H                 | -75.88      | 23.23                  | -52.65                   |             |        |
| 3305.6          | H                 | -77.71      | 23.34                  | -54.37                   |             |        |

| Band       | WCDMA Band V             | Test channel:      | Middle |
|------------|--------------------------|--------------------|--------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C   |
|            |                          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 1673.2          | Vertical          | -66.88      | 23.17                  | -43.71                   | -13.00      | PASS   |
| 2509.8          | V                 | -76.34      | 23.26                  | -53.08                   |             |        |
| 3346.4          | V                 | -76.90      | 23.38                  | -53.52                   |             |        |
| 1673.2          | Horizontal        | -65.11      | 23.17                  | -41.94                   |             |        |
| 2509.8          | H                 | -78.68      | 23.26                  | -55.42                   |             |        |
| 3346.4          | H                 | -76.82      | 23.38                  | -53.44                   |             |        |

| Band       | WCDMA Band V             | Test channel:      | Highest |
|------------|--------------------------|--------------------|---------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C    |
|            |                          | Relative Humidity: | 56%     |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 1693.2          | Vertical          | -70.89      | 23.20                  | -47.69                   | -13.00      | PASS   |
| 2539.8          | V                 | -77.36      | 23.29                  | -54.07                   |             |        |
| 3386.4          | V                 | -80.47      | 23.42                  | -57.05                   |             |        |
| 1693.2          | Horizontal        | -67.80      | 23.20                  | -44.60                   |             |        |
| 2539.8          | H                 | -76.21      | 23.29                  | -52.92                   |             |        |
| 3386.4          | H                 | -80.64      | 23.42                  | -57.22                   |             |        |



| Band       | WCDMA Band II            | Test channel:      | Lowest |
|------------|--------------------------|--------------------|--------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C   |
|            |                          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3704.8          | Vertical          | -66.55      | 23.53                  | -43.02                   | -13.00      | PASS   |
| 5557.2          | V                 | -78.32      | 23.78                  | -54.54                   |             |        |
| 7409.6          | V                 | -80.84      | 23.92                  | -56.92                   |             |        |
| 3704.8          | Horizontal        | -68.67      | 23.53                  | -45.14                   |             |        |
| 5557.2          | H                 | -76.50      | 23.78                  | -52.72                   |             |        |
| 7409.6          | H                 | -80.43      | 23.92                  | -56.51                   |             |        |

| Band       | WCDMA Band II            | Test channel:      | Middle |
|------------|--------------------------|--------------------|--------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C   |
|            |                          | Relative Humidity: | 56%    |

**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3760.0          | Vertical          | -77.96      | 23.58                  | -54.38                   | -13.00      | PASS   |
| 5640.0          | V                 | -80.62      | 23.85                  | -56.77                   |             |        |
| 7520.0          | V                 | -69.39      | 23.99                  | -45.40                   |             |        |
| 3760.0          | Horizontal        | -76.25      | 23.58                  | -52.67                   |             |        |
| 5640.0          | H                 | -80.58      | 23.85                  | -56.73                   |             |        |
| 7520.0          | H                 | -77.31      | 23.99                  | -53.32                   |             |        |

| Band       | WCDMA Band II            | Test channel:      | Highest |
|------------|--------------------------|--------------------|---------|
| Test mode: | RMC 12.2Kbps Link (QPSK) | Temperature :      | 25°C    |
|            |                          | Relative Humidity: | 56%     |

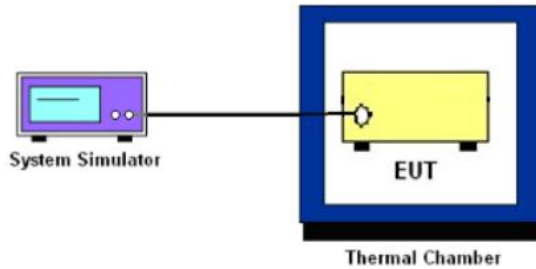
**Note:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

| Frequency (MHz) | Spurious Emission |             |                        |                          | Limit (dBm) | Result |
|-----------------|-------------------|-------------|------------------------|--------------------------|-------------|--------|
|                 | Polarization      | Level (dBm) | Correction Factor (dB) | Spurious emissions (dBm) |             |        |
| 3815.2          | Vertical          | -70.29      | 23.62                  | -46.67                   | -13.00      | PASS   |
| 5722.8          | V                 | -80.85      | 23.90                  | -56.95                   |             |        |
| 7630.4          | V                 | -81.32      | 24.05                  | -57.27                   |             |        |
| 3815.2          | Horizontal        | -68.60      | 23.62                  | -44.98                   |             |        |
| 5722.8          | H                 | -76.56      | 23.90                  | -52.66                   |             |        |
| 7630.4          | H                 | -80.81      | 24.05                  | -56.76                   |             |        |



## 5.7. Frequency Stability Measurement

### 5.7.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part 2.1055 ; FCC Part 22.355 ; FCC Part 24.235<br>FCC Part 27.54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Test Method:</b>      | FCC KDB 971168 D01v03r01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Operation mode:</b>   | Refer to item 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Limit:</b>            | FCC Part 22.355 : $\pm 2.5$ ppm<br>FCC Part 24.235 :<br>The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Test Setup:</b>       |  <p>The diagram shows a 'System Simulator' (a small computer-like device) connected by a cable to a yellow rectangular 'EUT' (Equipment Under Test). The EUT is positioned inside a blue-outlined 'Thermal Chamber'.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Test Procedure:</b>   | <p><b>Test Procedures for Temperature Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0.</li> <li>2. The EUT was set up in the thermal chamber and connected with the system simulator.</li> <li>3. With power OFF, the temperature was decreased to <math>-30^{\circ}\text{C}</math> and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.</li> <li>4. With power OFF, the temperature was raised in <math>10^{\circ}\text{C}</math> steps up to <math>50^{\circ}\text{C}</math>. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.</li> </ol> <p><b>Test Procedures for Voltage Variation</b></p> <ol style="list-style-type: none"> <li>1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0.</li> <li>2. The EUT was placed in a temperature chamber at <math>25 \pm 5^{\circ}\text{C}</math> and connected with the system simulator.</li> <li>3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.</li> <li>4. The variation in frequency was measured for the worst case.</li> </ol> |
| <b>Test Result:</b>      | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Remark:</b>           | All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### 5.7.2. Test Instruments

| Equipment                                   | Manufacturer | Model   | Serial Number | Calibration Due |
|---------------------------------------------|--------------|---------|---------------|-----------------|
| System simulator                            | R&S          | CMU200  | 110188        | Sep. 11, 2021   |
| Programable tempratuce and humidity chamber | JQ           | JQ-2000 | N/A           | Sep. 02, 2021   |
| DC power supply                             | Kingrang     | KR3005K | N/A           | Sep. 02, 2021   |
| RF cable (9kHz-40GHz)                       | TCT          | RE-04   | N/A           | Sep. 02, 2021   |
| Antenna Connector                           | TCT          | RFC-03  | N/A           | Sep. 02, 2021   |

### 5.7.3. Test Data

#### Test Result of Temperature Variation

|                         |                        |                   |                 |
|-------------------------|------------------------|-------------------|-----------------|
| <b>Band :</b>           | <b>GSM 850</b>         | <b>Channel:</b>   | <b>190</b>      |
| <b>Limit (ppm) :</b>    | <b>2.5</b>             | <b>Frequency:</b> | <b>836.6MHz</b> |
| <b>Temperature (°C)</b> | <b>Deviation (ppm)</b> | <b>Result</b>     |                 |
| 50                      | 0.012                  | PASS              |                 |
| 40                      | 0.010                  |                   |                 |
| 30                      | 0.009                  |                   |                 |
| 20                      | 0.011                  |                   |                 |
| 10                      | 0.012                  |                   |                 |
| 0                       | 0.016                  |                   |                 |
| -10                     | 0.010                  |                   |                 |
| -20                     | 0.011                  |                   |                 |
| -30                     | 0.013                  |                   |                 |

|                         |                        |                   |                |
|-------------------------|------------------------|-------------------|----------------|
| <b>Band :</b>           | <b>GSM 1900</b>        | <b>Channel:</b>   | <b>661</b>     |
| <b>Limit (ppm) :</b>    | <b>Note</b>            | <b>Frequency:</b> | <b>1880MHz</b> |
| <b>Temperature (°C)</b> | <b>Deviation (ppm)</b> | <b>Result</b>     |                |
| 50                      | 0.023                  | PASS              |                |
| 40                      | 0.019                  |                   |                |
| 30                      | 0.016                  |                   |                |
| 20                      | 0.014                  |                   |                |
| 10                      | 0.018                  |                   |                |
| 0                       | 0.021                  |                   |                |
| -10                     | 0.019                  |                   |                |
| -20                     | 0.016                  |                   |                |
| -30                     | 0.024                  |                   |                |

**Note:** The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

|                         |                                     |                   |                 |
|-------------------------|-------------------------------------|-------------------|-----------------|
| <b>Band :</b>           | <b>WCDMA Band V</b>                 | <b>Channel:</b>   | <b>4183</b>     |
| <b>Limit (ppm) :</b>    | <b>2.5ppm</b>                       | <b>Frequency:</b> | <b>836.6MHz</b> |
| <b>Temperature (°C)</b> | <b>RMC 12.2Kbps Deviation (ppm)</b> | <b>Result</b>     |                 |
| 50                      | 0.016                               | PASS              |                 |
| 40                      | 0.015                               |                   |                 |
| 30                      | 0.009                               |                   |                 |
| 20                      | 0.013                               |                   |                 |
| 10                      | 0.017                               |                   |                 |
| 0                       | 0.015                               |                   |                 |
| -10                     | 0.014                               |                   |                 |
| -20                     | 0.013                               |                   |                 |
| -30                     | 0.011                               |                   |                 |

|                  |                              |            |         |
|------------------|------------------------------|------------|---------|
| Band :           | WCDMA Band II                | Channel:   | 9400    |
| Limit (ppm) :    | Note                         | Frequency: | 1880MHz |
| Temperature (°C) | RMC 12.2Kbps Deviation (ppm) | Result     |         |
| 50               | 0.015                        | PASS       |         |
| 40               | 0.017                        |            |         |
| 30               | 0.016                        |            |         |
| 20               | 0.019                        |            |         |
| 10               | 0.021                        |            |         |
| 0                | 0.024                        |            |         |
| -10              | 0.016                        |            |         |
| -20              | 0.022                        |            |         |
| -30              | 0.018                        |            |         |

**Note:** The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

### Test Result of Voltage Variation

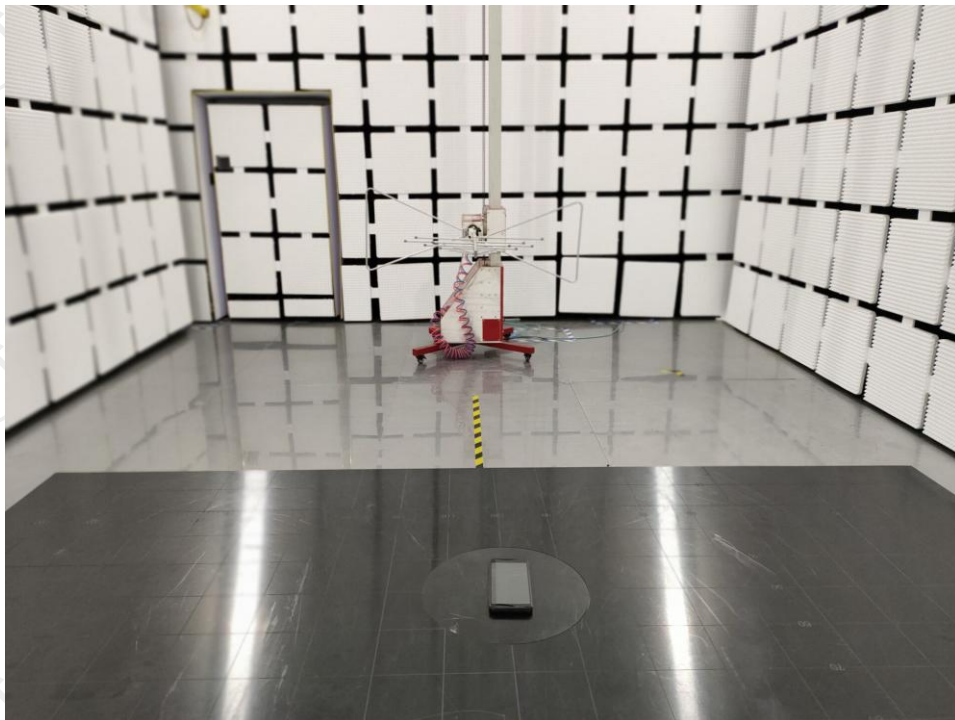
| Band & Channel       | Mode         | Voltage (Volt) | Deviation (ppm) | Limit (ppm) | Result |
|----------------------|--------------|----------------|-----------------|-------------|--------|
| GSM 850 CH190        | GSM          | 4.4            | +0.017          | 2.5         | PASS   |
|                      |              | 3.85           | +0.011          |             |        |
|                      |              | BEP            | +0.014          |             |        |
| GSM 1900 CH661       | GSM          | 4.4            | +0.020          | (Note 3.)   |        |
|                      |              | 3.85           | +0.022          |             |        |
|                      |              | BEP            | +0.016          |             |        |
| WCDMA Band V CH4182  | RMC 12.2Kbps | 4.4            | -0.007          | 2.5         |        |
|                      |              | 3.85           | -0.011          |             |        |
|                      |              | BEP            | -0.014          |             |        |
| WCDMA Band II CH9400 | RMC 12.2Kbps | 4.4            | -0.018          | (Note 3.)   |        |
|                      |              | 3.85           | -0.015          |             |        |
|                      |              | BEP            | -0.021          |             |        |

**Note:**

1. Normal Voltage = 3.8V.
2. Battery End Point (BEP) = 4.2V.
3. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

## Appendix A: Photographs of Test Setup

Product: Mobile phone  
Model: COSMAS X  
Radiated Emission



## Appendix B: Photographs of EUT

Refer to the test report No. TCT210609E032

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