


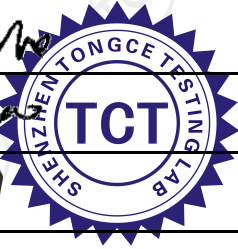


# TEST REPORT

<b>FCC ID</b> .....	2AU97NET	
<b>Test Report No</b> .....	TCT211117E037	
<b>Date of issue</b> .....	Dec. 06, 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> .....	Shenzhen Krono Digital Co., Ltd.	
<b>Address</b> .....	1319, 13th Floor, SegPlaza, Huaqiangbei, Futian District, Shenzhen, Guangdong, China	
<b>Manufacturer's name</b> ...	Shenzhen Krono Digital Co., Ltd.	
<b>Address</b> .....	1319, 13th Floor, SegPlaza, Huaqiangbei, Futian District, Shenzhen, Guangdong, China	
<b>Standard(s)</b> .....	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 FCC CFR Title 47 Part24	
<b>Test item description</b> .....	Mobile Phone	
<b>Trade Mark</b> .....	Krono	
<b>Model/Type reference</b> .....	Refer to model list of page 3	
<b>Rating(s)</b> .....	Refer to EUT description of page 3	
<b>Date of receipt of test item</b> .....	Nov. 17, 2021	
<b>Date (s) of performance of test</b> .....	Nov. 17, 2021 ~ Dec. 06, 2021	
<b>Tested by (+signature)</b> ...	Aaron MO	
<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.....	NET
Sample Number.....	TCT211117E008-0101
Tx Frequency .....	GSM/GPRS 850: 824.2MHz ~ 848.8MHz GSM/GPRS 1900: 1850.2MHz ~ 1909.8MHz
Rx Frequency .....	GSM/GPRS 850: 869.2MHz ~ 893.8MHz GSM/GPRS 1900: 1930.2MHz ~ 1989.8MHz
Maximum Output Power to Antenna.....	GSM850: 32.61dBm GSM1900: 29.86dBm GPRS850: 32.20dBm GPRS1900: 29.45dBm
99% Occupied Bandwidth.....	GSM850: 245KGXW GSM1900: 245KGXW GPRS850 Class 8: 245KGXW GPRS1900 Class 8: 245KGXW
Type of Modulation.....	GSM/GPRS: GMSK
Antenna Type.....	Internal Antenna
Antenna Gain.....	GSM/GPRS 850: -1.2dBi GSM/GPRS 1900: 0.8dBi
Rating(s).....	Adapter Information: INPUT: AC 100-240V, 50/60Hz OUTPUT: DC 5.0V, 1000mA±50mA 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

No.	Model No.	Tested with
1	NET	<input checked="" type="checkbox"/>
Other models	KR-10, KR-15, KR-20, KR-25, KR-30, KR-35, KR-40, KR-45, KR-50, K-32, KR-1, KR-8, KR-B31, KR-21, KR-2, KR-3, KR-4, KR-5, KR-6, KR-7, KR-MAX, KR SENIOR, KR RETRO, KR DELTA, KR PRO, KR MAX, KR ARMOUR, KR SLIM, MT01, MT02, MT03, MT07, TR-5, TR-6, TR-7, TR-8, TR-9, TR-10, TR-15, TR-20, TR-25-TR-30, TX-2, TX-3, TX-4, TX-5, TX-6	<input type="checkbox"/>

Note: NET is tested model, other models are derivative models. The models are identical in circuit and PCB layout, different on the model names. So the test data of NET can represent the remaining models.

### 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

## 2. Test Result Summary

Requirement	CFR 47 Section	Result
Conducted Output Power	§22.913; §2.1046 §24.232;	PASS
Peak-to-Average Ratio	§2.1046; §24.232(d) §22.913;	PASS
Effective Radiated Power	§2.1046; §22.913(a) §24.232;	PASS
Equivalent Isotropic Radiated Power	§2.1046; §22.913(a) §24.232;	PASS
Occupied Bandwidth	§2.1049	PASS
Band Edge	§2.1051 §22.917(a) §24.238(a)	PASS
Conducted Spurious Emission	§2.1051; §22.917 §24.238;	PASS
Field Strength of Spurious Radiation	§2.1053; §22.917(a) §24.238;	PASS
Frequency Stability for Temperature & Voltage	§2.1055; §22.355 §24.235;	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.
5. After pre-testing of two samples with different memory chip, we found that the one with ISOCOM memory chip is the worst case, so the results are recorded in this report.

### 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 GPRS class 12 Link	GSM Link GPRS class 12 Link
PCS 1900	GSM Link GPRS class 12 Link	GSM Link GPRS class 12 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

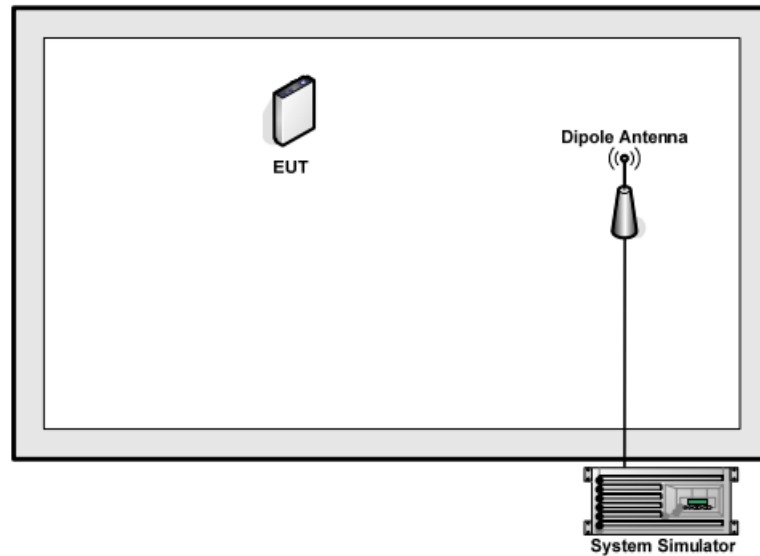
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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

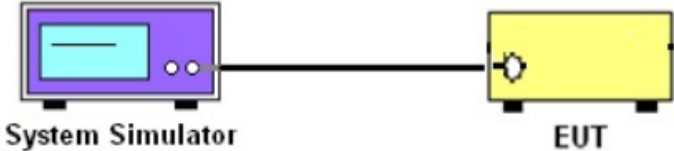
The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

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	$\pm 0.1$ °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) 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 PCS 1900: 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).</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	Jul. 07, 2022
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Jul. 07, 2022
Antenna Connector	TCT	RFC-02	N/A	Jul. 07, 2022

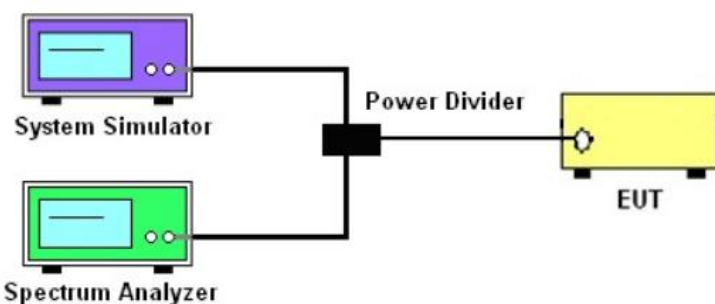
**5.1.3. Test data**

**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	32.57	32.61	32.59	29.82	29.86	29.84
GPRS class8	32.13	32.20	32.16	29.38	29.45	29.41
GPRS class10	31.35	31.41	31.38	28.60	28.66	28.63
GPRS class11	30.45	30.51	30.38	27.70	27.76	27.63
GPRS class12	29.34	29.44	29.40	26.59	26.69	26.65

## 5.2. Peak to Average Ratio

### 5.2.1. Test Specification

<b>Test Requirement:</b>	FCC part 24.232(d) ; FCC part 22.913;
<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>	 <p>The diagram illustrates the test setup. On the left, there are two instruments: a purple System Simulator and a green Spectrum Analyzer. Both are connected to a central black Power Divider. The Power Divider is then connected to a yellow EUT (Equipment Under Test) on the right.</p>
<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. 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	Jul. 07, 2022
Spectrum Analyzer	R&S	FSU	200054	Jul. 18, 2022
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Jul. 07, 2022
Antenna Connector	TCT	RFC-02	N/A	Jul. 07, 2022

**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)	7.66	7.72	7.69

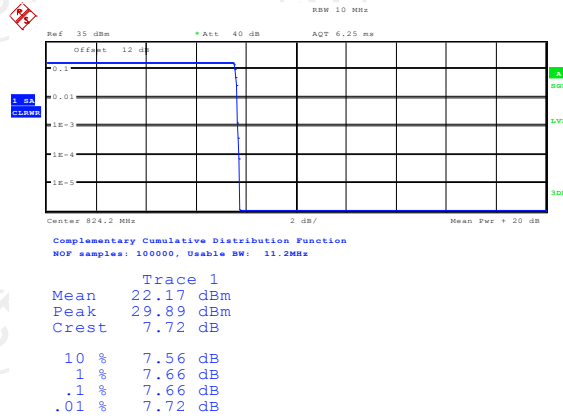
PCS Band			
Mode	GSM 1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8
Peak-to-Average Ratio (dB)	7.66	7.78	8.24

**Note:** All modes (GSM, GPRS) have been tested ,only the test data od the worst mode(GSM) have be reported .

**Test plots as follows:**

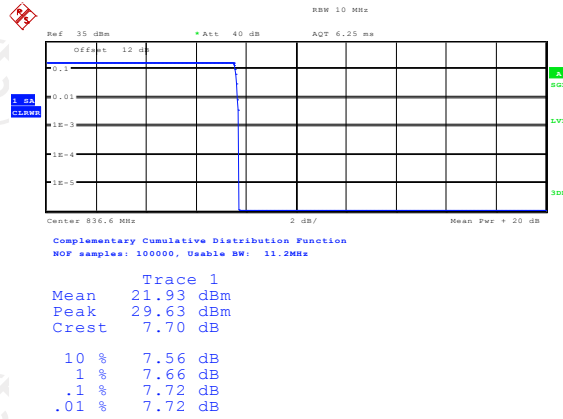
**GSM 850**

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



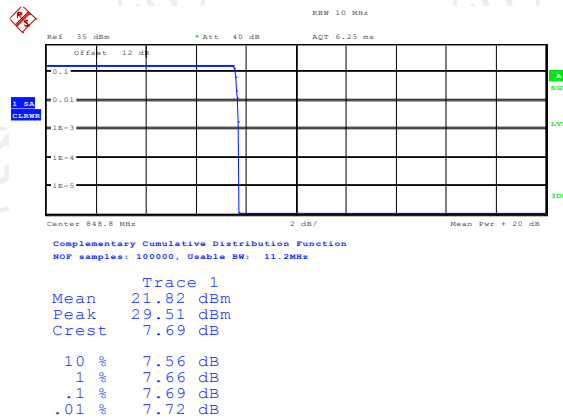
Date: 2.DEC.2021 08:44:54

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



Date: 2.DEC.2021 08:45:32

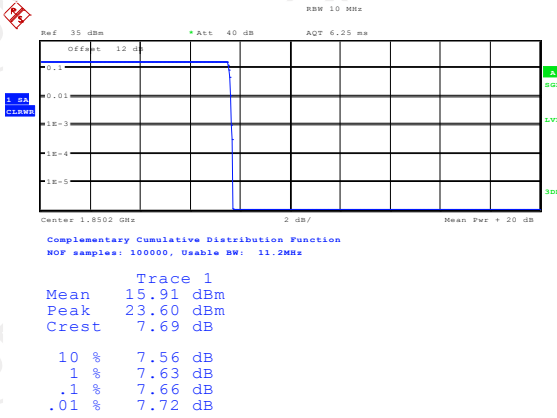
**Peak-to-Average Ratio on Channel 251**



Date: 2.DEC.2021 08:46:04

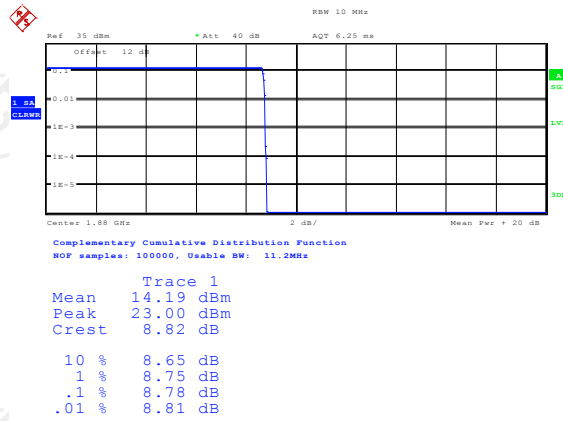
## GSM 1900

### Peak-to-Average Ratio on Channel 512



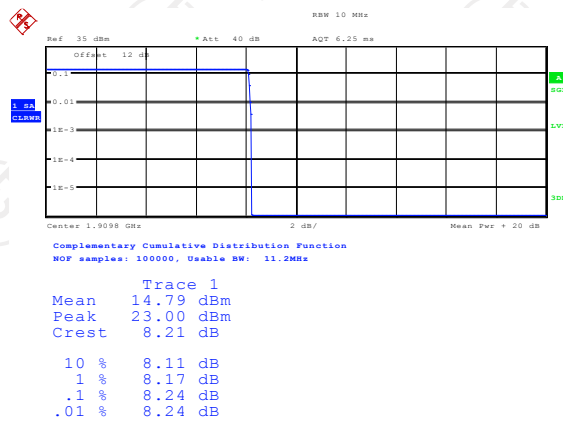
Date: 2.DEC.2021 09:30:18

### Peak-to-Average Ratio on Channel 661



Date: 2.DEC.2021 09:29:49

### Peak-to-Average Ratio on Channel 810



Date: 2.DEC.2021 09:29:22

**Note:** All modes (GSM, GPRS) have been tested, only the test data of the worst mode (GSM) have been reported.

### 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>	<p>The diagram illustrates the test setup. A System Simulator (purple box) and a Spectrum Analyzer (green box) are connected to a Power Divider (black box). The Power Divider is also connected to an EUT (yellow box).</p>
<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	Jul. 07, 2022
Spectrum Analyzer	R&S	FSU	200054	Jul. 18, 2022
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Jul. 07, 2022
Antenna Connector	TCT	RFC-02	N/A	Jul. 07, 2022



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	320.51	320.51

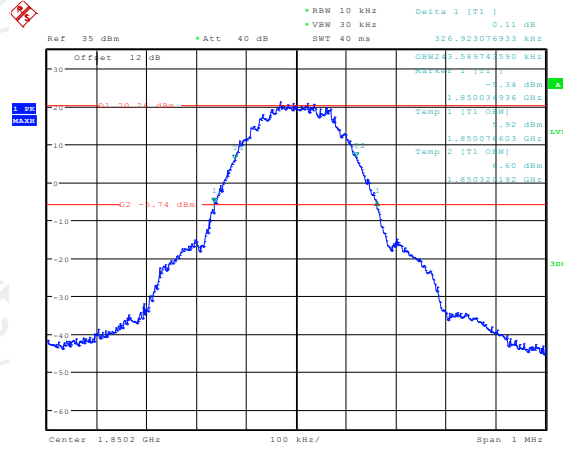
Cellular Band			
Mode	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
99% OBW (kHz)	243.59	245.19	245.19
26dB BW (kHz)	326.92	323.72	330.13

Test plots as follows:



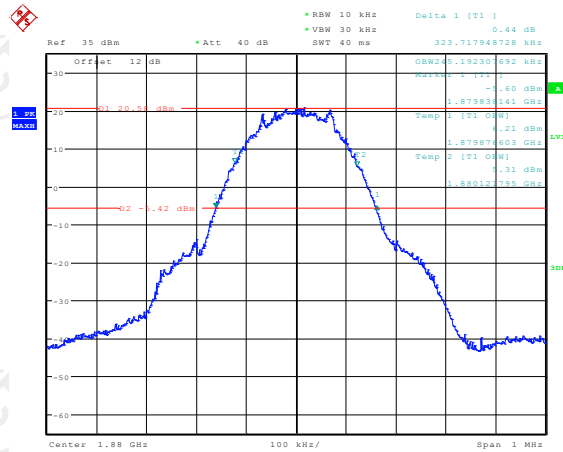
Band:	GSM 1900	Test Mode:	GSM Link (GMSK)
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26dB&99% Occupied Bandwidth Plot on Channel 512



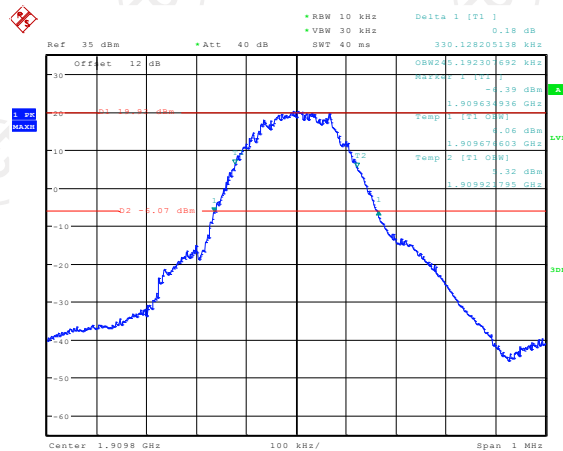
Date: 2.DEC.2021 09:24:26

26dB&99% Occupied Bandwidth Plot on Channel 661



Date: 2.DEC.2021 09:26:53

26dB&99% Occupied Bandwidth Plot on Channel 810

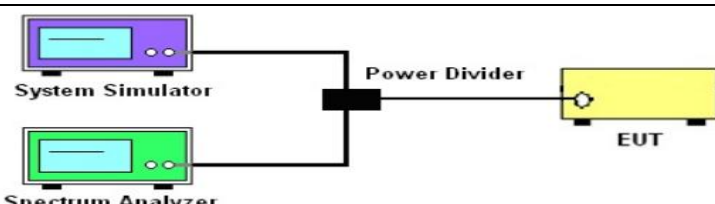


Date: 2.DEC.2021 09:28:09

**Note:** All modes (GSM, GPRS) have been tested ,only the test data od the worst mode(GSM) have be reported .

## 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)
<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 illustrates the test setup. A System Simulator (purple box) and a Spectrum Analyzer (green box) are connected to a Power Divider (black box). The Power Divider is 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  <math>P(\text{Watts}) = P(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

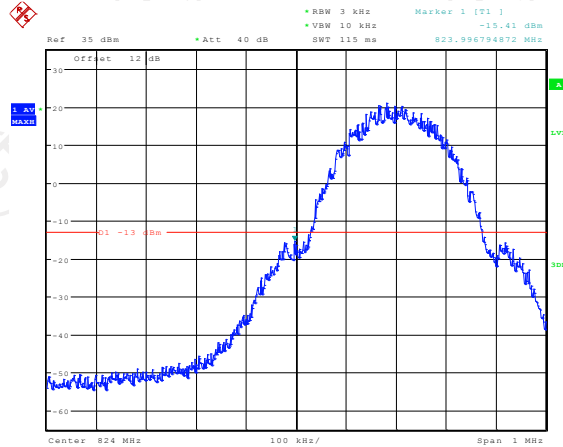
Equipment	Manufacturer	Model	Serial Number	Calibration Due
System simulator	R&S	CMU200	110188	Jul. 07, 2022
Spectrum Analyzer	R&S	FSU	200054	Jul. 18, 2022
RF cable (9kHz-40GHz)	TCT	RE-05	N/A	Jul. 07, 2022
Antenna Connector	TCT	RFC-02	N/A	Jul. 07, 2022

5.4.3. Test data

Test plots as follows:

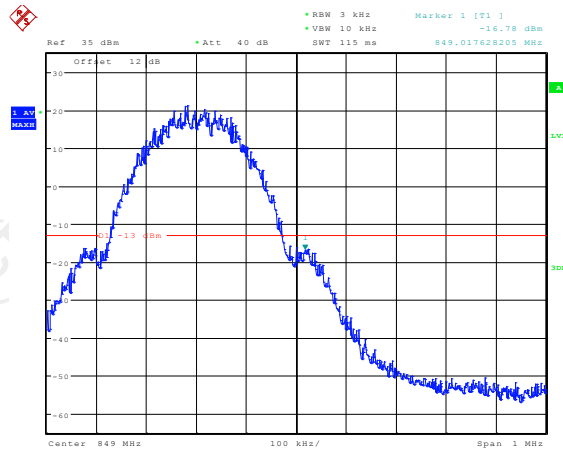
Band:	GSM 850	Test Mode:	GSM Link (GMSK)
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Lower Band Edge Plot on Channel 128



Date: 2.DEC.2021 08:35:21

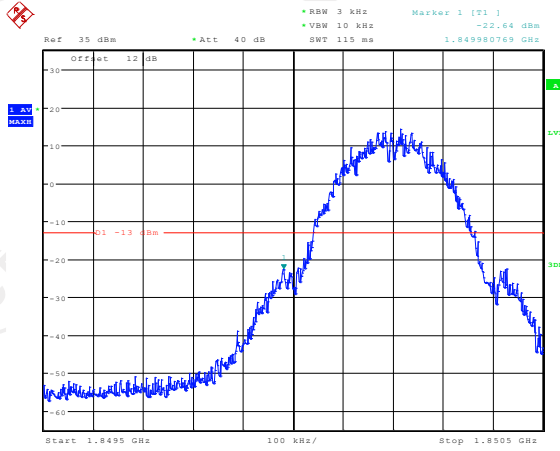
Higher Band Edge Plot on Channel 251



Date: 2.DEC.2021 08:36:21

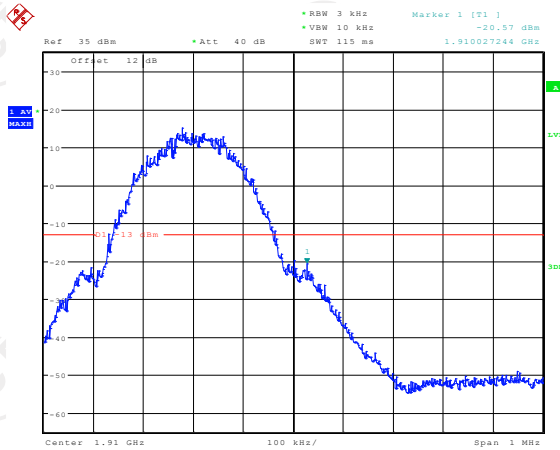
Band:	GSM 1900	Test Mode:	GSM Link (GMSK)
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Lower Band Edge Plot on Channel 512



Date: 2.DEC.2021 09:22:40

Higher Band Edge Plot on Channel 810

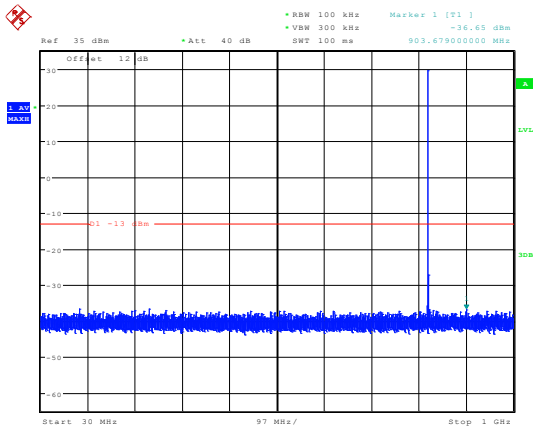


Date: 2.DEC.2021 09:21:56

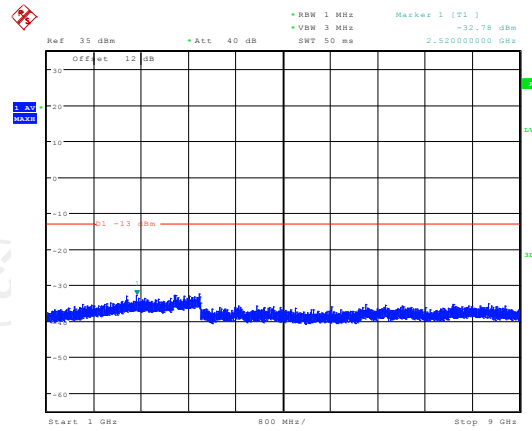
**Note:** All modes (GSM, GPRS) have been tested, only the test data of the worst mode(GSM) have been reported.

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

Conducted Spurious Emission on Channel 128

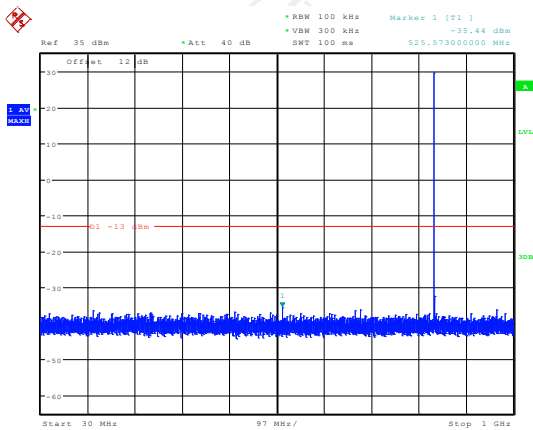


Date: 2.DEC.2021 08:53:10

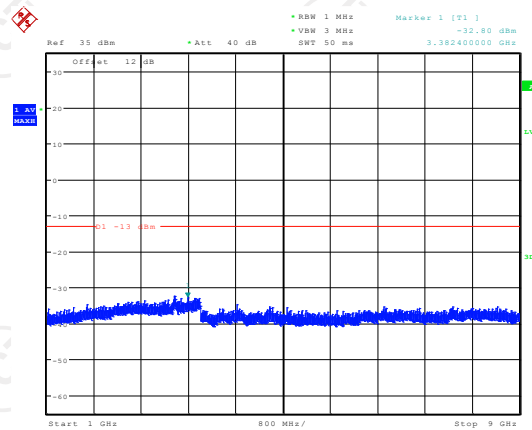


Date: 2.DEC.2021 08:52:33

Conducted Spurious Emission on Channel 190

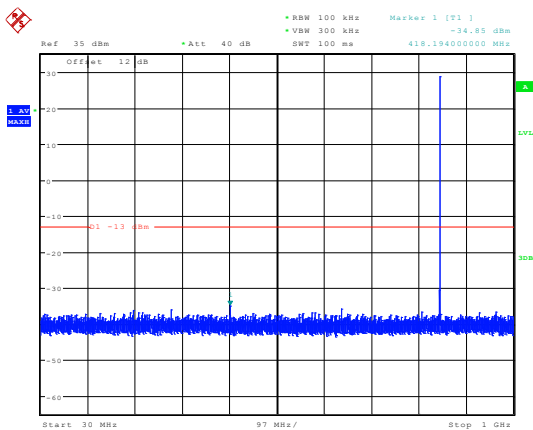


Date: 2.DEC.2021 08:53:35

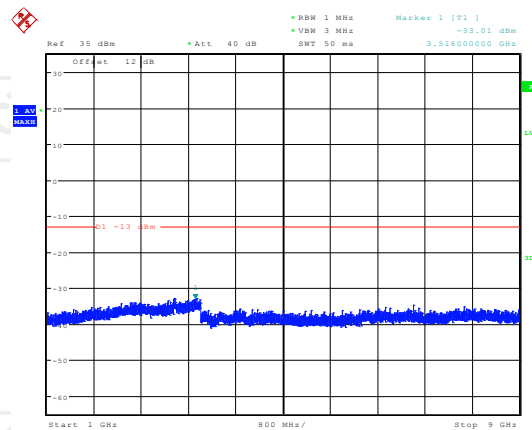


Date: 2.DEC.2021 08:52:05

Conducted Spurious Emission on Channel 251



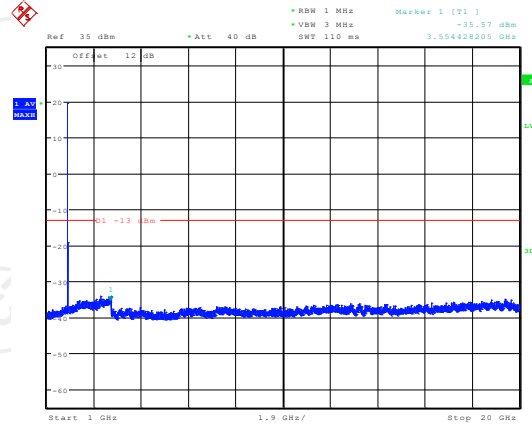
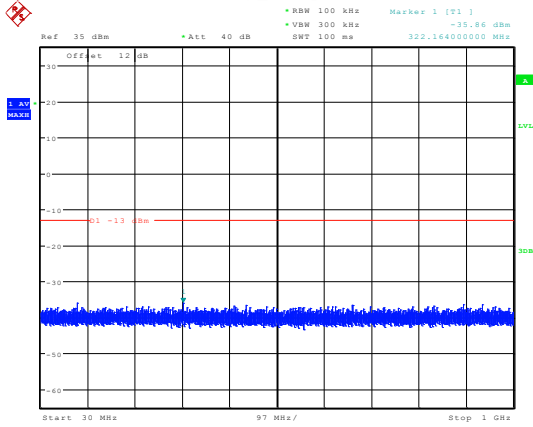
Date: 2.DEC.2021 08:54:05



Date: 2.DEC.2021 08:51:33

Band: GSM 1900 Test Mode: GSM Link (GMSK)

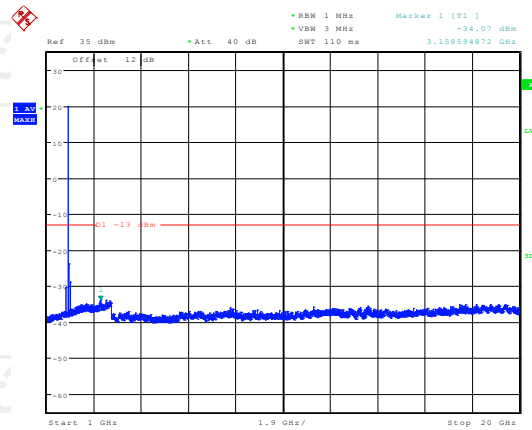
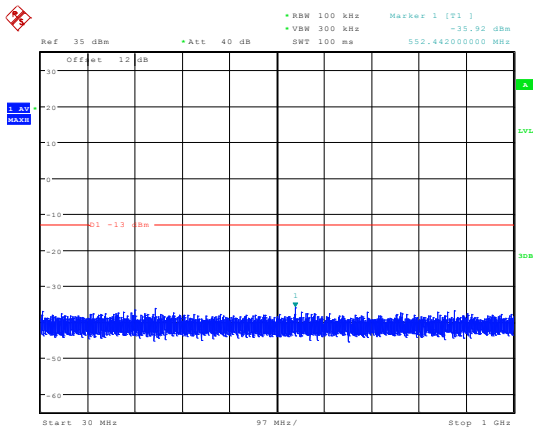
Conducted Spurious Emission on Channel 512



Date: 2.DEC.2021 09:13:43

Date: 2.DEC.2021 09:16:22

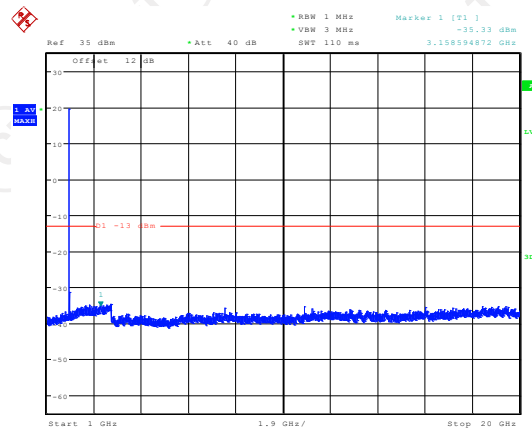
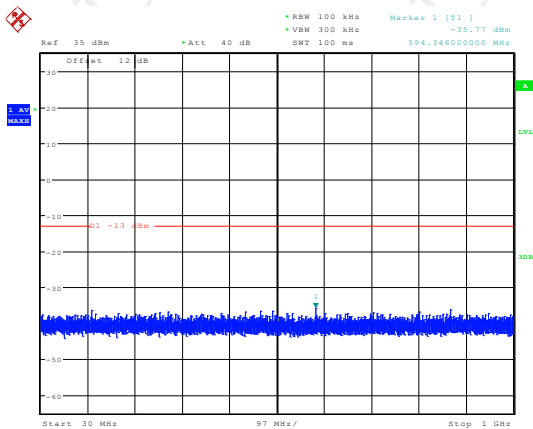
Conducted Spurious Emission on Channel 661



Date: 2.DEC.2021 09:14:35

Date: 2.DEC.2021 09:19:10

Conducted Spurious Emission on Channel 810



Date: 2.DEC.2021 09:14:12

Date: 2.DEC.2021 09:19:44

**Note:** All modes (GSM, GPRS) have been tested ,only the test data od the worst mode(GSM) have be reported .



GSM1900(GSM) Conducted Spurious Emission for Below 1G

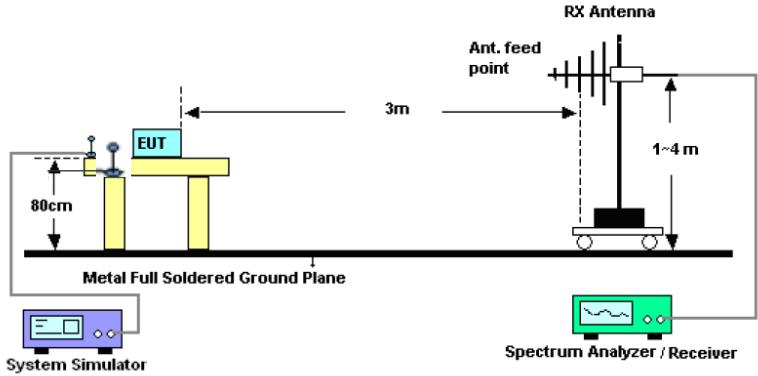
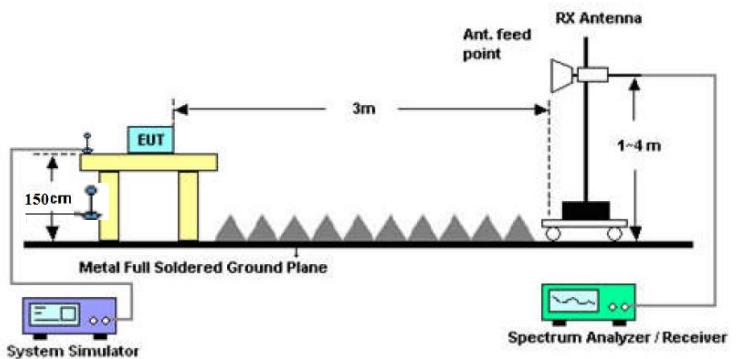
Channel	RBW (KHz)	Test result (dBm)	RBW (MHz)	Calculate result (dBm)	Limit (-13dBm)
512	100	-35.86	1	-25.86	Pass
661	100	-35.92	1	-25.92	Pass
810	100	-35.77	1	-25.77	Pass

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

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

### 5.5.1. Test Specification

<b>Test Requirement:</b>	FCC part 22.913(a) and FCC part 24.232(c)																								
<b>Test Method:</b>	FCC KDB 971168 D01v03r01																								
<b>Receiver Setup:</b>	<table border="1"> <thead> <tr> <th></th> <th>GSM/GPRS/EDGE</th> <th>WCDMA/HSPA</th> </tr> </thead> <tbody> <tr> <td>SPAN</td> <td>500kHz</td> <td>10MHz</td> </tr> <tr> <td>RBW</td> <td>10kHz</td> <td>100kHz</td> </tr> <tr> <td>VBW</td> <td>30kHz</td> <td>300kHz</td> </tr> <tr> <td>Detector</td> <td>RMS</td> <td>RMS</td> </tr> <tr> <td>Trace</td> <td>Average</td> <td>Average</td> </tr> <tr> <td>Average Type</td> <td>Power</td> <td>Power</td> </tr> <tr> <td>Sweep Count</td> <td>100</td> <td>100</td> </tr> </tbody> </table>		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
		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																							
<b>Limit:</b>	GSM850: 7W ERP PCS1900: 2W EIRP WCDMA Band V: 7W ERP WCDMA Band II: 2W EIRP																								
<b>Test Setup:</b>	From 30MHz to 1GHz  Above 1GHz 																								
<b>Test Procedure:</b>	1. The testing follows FCC KDB 971168 D01v03r01 Section 5.8. and ANSI / TIA-603-D-2010 Section																								

	<p>2.2.17.</p> <ol style="list-style-type: none"> <li>2. 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>3. 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>4. 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>5. 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. LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)</li> <li>6. Determine the effective radiated output power at each angular position from the readings in steps 3) and 5) using the following equation: ERP (dBm) = LVL (dBm) + LOSS (dB)</li> <li>7. The maximum ERP is the maximum value determined in the preceding step.</li> <li>8. Calculating ERP: ERP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBd) Antenna Gain (dBd) = Antenna Gain (dBi) - 2.15 EIRP = ERP + 2.15</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
Universal Radio Communication Tester	R&S	CMU200	110188	Jul. 07, 2022
Spectrum Analyzer	R&S	FSQ40	200061	Jul. 07, 2022
Signal Generator	HP	83623B	3614A00396	Jul. 18, 2022
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	Schwarzbeck	BBHA 9170	00956	Apr. 10, 2023
Coaxial cable	SKET	RC_DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC40G-N	N/A	Jul. 07, 2022
Antenna Mast	Keleto	RE-AM	N/A	N/A
EMI Test Software	Shurple 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	9.97	21.66	29.48	0.89
836.6	H	10.12	21.54	29.51	0.89
848.8	H	10.35	21.46	29.66	0.92
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.2	H	10.16	21.66	29.67	0.93
836.6	H	10.34	21.54	29.73	0.94
848.8	H	10.03	21.46	29.34	0.86

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	9.47	21.66	28.98	0.79
836.6	H	9.53	21.54	28.92	0.78
848.8	H	9.91	21.46	29.22	0.84
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.2	H	9.71	21.66	29.22	0.84
836.6	H	9.45	21.54	28.84	0.77
848.8	H	9.93	21.46	29.24	0.84

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

\* 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	7.27	21.66	28.93	0.78
1880.0	H	7.43	21.54	28.97	0.79
1909.8	H	7.56	21.46	29.02	0.80
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	H	6.98	21.66	28.64	0.73
1880.0	H	7.14	21.54	28.68	0.74
1909.8	H	7.52	21.46	28.98	0.79

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	7.05	21.66	28.71	0.74
1880.0	H	7.19	21.54	28.73	0.75
1909.8	H	7.32	21.46	28.78	0.76
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
1850.2	H	7.07	21.66	28.73	0.75
1880.0	H	7.14	21.54	28.68	0.74
1909.8	H	7.53	21.46	28.99	0.79

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

\* 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)
<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 RBW = 1MHz, VBW = 3MHz, taking record of</li> </ol>

	<p>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. <math>EIRP (dBm) = S.G. Power - Tx Cable Loss + Tx Antenna Gain</math></p> <p>12. <math>ERP (dBm) = EIRP - 2.15</math></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 <math>43 + 10\log(P)</math> dB below the transmitter power P(Watts)</p> <p><math>= P(W) - [43 + 10\log(P)] (dB)</math></p> <p><math>= [30 + 10\log(P)] (dBm) - [43 + 10\log(P)] (dB)</math></p> <p><math>= -13dBm.</math></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
Universal Radio Communication Tester	R&S	CMU200	110188	Jul. 07, 2022
Spectrum Analyzer	R&S	FSQ40	200061	Jul. 07, 2022
Signal Generator	HP	83623B	3614A00396	Jul. 18, 2022
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	Schwarzbeck	BBHA 9170	00956	Apr. 10, 2023
Coaxial cable	SKET	RC_DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC18G-N	N/A	Apr. 08, 2022
Coaxial cable	SKET	RC-DC40G-N	N/A	Jul. 07, 2022
Antenna Mast	Keleto	RE-AM	N/A	N/A
EMI Test Software	Shurple 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)
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--	--	--
--	--	--
--	--	--

**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

<b>Band</b>	<b>GSM 850</b>	<b>Test channel:</b>	<b>Lowest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-57.53	23.12	-34.41	-13.00	PASS
2472.6	V	-63.92	23.20	-40.72		
3296.8	V	-77.12	23.28	-53.84		
1648.4	Horizontal	-56.13	23.12	-33.01		
2472.6	H	-62.95	23.20	-39.75		
3296.8	H	-75.37	23.28	-52.09		

<b>Band</b>	<b>GSM 850</b>	<b>Test channel:</b>	<b>Middle</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-56.94	23.17	-33.77	-13.00	PASS
2509.8	V	-68.20	23.26	-44.94		
3346.4	V	-77.06	23.38	-53.68		
1673.2	Horizontal	-55.81	23.17	-32.64		
2509.8	H	-63.14	23.26	-39.88		
3346.4	H	-76.61	23.38	-53.23		

<b>Band</b>	<b>GSM 850</b>	<b>Test channel:</b>	<b>Highest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-59.75	23.23	-36.52	-13.00	PASS
2546.4	V	-68.67	23.32	-45.35		
3395.2	V	-76.85	23.44	-53.41		
1697.6	Horizontal	-54.66	23.23	-31.43		
2546.4	H	-63.15	23.32	-39.83		
3395.2	H	-77.98	23.44	-54.54		

<b>Band</b>	<b>PCS 1900</b>	<b>Test channel:</b>	<b>Lowest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-64.30	23.49	-40.81	-13.00	PASS
5550.6	V	-72.39	23.75	-48.64		
7400.8	V	-78.24	23.89	-54.35		
3700.4	Horizontal	-59.88	23.49	-36.39		
5550.6	H	-66.29	23.75	-42.54		
7400.8	H	-76.61	23.89	-52.72		

<b>Band</b>	<b>PCS 1900</b>	<b>Test channel:</b>	<b>Middle</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-64.01	23.58	-40.43	-13.00	PASS
5640.0	V	-73.98	23.85	-50.13		
7520.0	V	-72.36	23.99	-48.37		
3760.0	Horizontal	-59.31	23.58	-35.73		
5640.0	H	-73.99	23.85	-50.14		
7520.0	H	-78.15	23.99	-54.16		

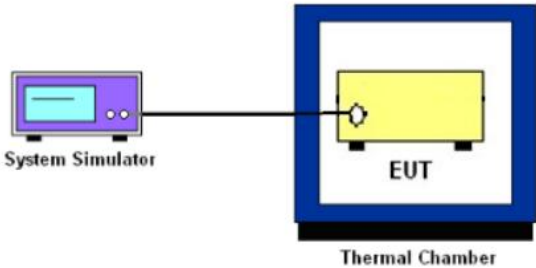
<b>Band</b>	<b>PCS 1900</b>	<b>Test channel:</b>	<b>Highest</b>
<b>Test mode:</b>		<b>Temperature :</b>	<b>25°C</b>
		<b>Relative Humidity:</b>	<b>56%</b>

**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	-61.27	23.64	-37.63	-13.00	PASS
5729.4	V	-70.82	23.93	-46.89		
7639.2	V	-78.04	24.08	-53.96		
3819.6	Horizontal	-60.02	23.64	-36.38		
5729.4	H	-66.13	23.93	-42.20		
7639.2	H	-77.83	24.08	-53.75		

## 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
<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 FCC Part 24.235 : 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 illustrates the test setup. On the left, a purple box labeled 'System Simulator' is connected by a black line to a yellow box labeled 'EUT' (Equipment Under Test). The EUT is positioned inside a blue square frame labeled '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	Jul. 07, 2022
Programable tempratuce and humidity chamber	JQ	MHU-80L	N/A	Jul. 18, 2022
DC power supply	Kingrang	KR3005K	N/A	Jul. 18, 2022
RF cable (9kHz-40GHz)	TCT	RE-04	N/A	Jul. 18, 2022
Antenna Connector	TCT	RFC-03	N/A	Jul. 18, 2022

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	0.020		PASS
40	0.016		
30	0.015		
20	0.019		
10	0.018		
0	0.019		
-10	0.016		
-20	0.014		
-30	0.018		

<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	0.024		PASS
40	0.021		
30	0.020		
20	0.016		
10	0.019		
0	0.023		
-10	0.021		
-20	0.018		
-30	0.025		

**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	4.2	+0.017	2.5	PASS
		3.7	+0.015		
		BEP	+0.013		
GSM 1900 CH661	GSM	4.2	+0.021	(Note 3.)	
		3.7	+0.018		
		BEP	+0.014		

**Note:**

1. Normal Voltage = 3.7V.
2. Battery End Point (BEP) = 3.3V.
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

Refer to the test report No. TCT211117E008

## Appendix B: Photographs of EUT

Refer to the test report No. TCT211117E008

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