

TEST REPORT

FCC ID.	2A2TN-210868
Test Report No.	TCT210721E024
Date of issue	Aug. 16, 2021
Testing laboratory	SHENZHEN TONGCE TESTING LAB
Testing location/ address:	TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China
Applicant's name	ShenZhen newpas Intelligent Technology Co., Ltd
Address	A/3F building 1, Tianxing Dongzheng Industrial Park, No. 1514, GuangGuan Road, Longhua District, Shenzhen, China
Manufacturer's name	ShenZhen newpas Intelligent Technology Co., Ltd
Address	A/3F building 1, Tianxing Dongzheng Industrial Park, No. 1514, GuangGuan Road, Longhua District, Shenzhen, China
Standard(s)	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part22 FCC CFR Title 47 Part24
Test item description	Handheld POS Terminal
Trade Mark	JICAI, NEWPAS
Model/Type reference	Q3PRO, Q1, Q2, Q3, Q4, Q5PRO, Q6, Q7, Q8, Q9, Q2i, Q2X, N01, N02, N03, N04, N05, N06, N07, N08, N09, N10, N11, N12, N13, N14, N15, N16, N17, N18, N19, N20
Rating(s)	Refer to EUT description of page 3
Date of receipt of test item	Jul. 21, 2021
Date (s) of performance of test	See dates for each test case
Tested by (+signature)	Rleo
Check by (+signature)	Beryl Zhao
Approved by (+signature) :	Tomsin

General disclaimer:

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Appendix A: Photographs of Test Setup

Appendix B: Photographs of EUT

1. General Product Information

1.1. EUT description

Test item description	Handheld POS Terminal
Model/Type reference.....	Q3PRO
Sample Number.....	TCT210721E008-0101
3G Version	WCDMA: R99 HSDPA: Release 5 HSUPA: Release 6
Tx Frequency.....	GPRS 850: 824.2MHz ~ 848.8MHz WCDMA Band V: 826.4MHz ~ 846.6MHz
Rx Frequency	GPRS 850: 869.2MHz ~ 893.8MHz WCDMA Band V: 871.4MHz ~ 891.6MHz
Maximum Output Power to Antenna.....	GPRS850: 32.06dBm WCDMA Band V: 22.40dBm
99% Occupied Bandwidth.....	GPRS850 Class 8: 244KGXW WCDMA Band V RMC 12.2Kbps: 4M22F9W
Type of Modulation.....	GPRS: GMSK WCDMA/HSDPA/HSUPA: QPSK
Antenna Type.....	PIFA Antenna
Antenna Gain.....	GPRS 850: -0.8dBi WCDMA Band V: -0.8dBi
Rating(s).....	Adapter Information: Model: ADP-18H12 Input: AC 100-240V, 50/60Hz, 0.8A Output: DC 12V, 1.5A Rechargeable Li-ion Battery DC 7.2V

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	Q3PRO	<input checked="" type="checkbox"/>
Other models	Q1, Q2, Q3, Q4, Q5PRO, Q6, Q7, Q8, Q9, Q2i, Q2X, N01, N02, N03, N04, N05, N06, N07, N08, N09, N10, N11, N12, N13, N14, N15, N16, N17, N18, N19, N20	<input type="checkbox"/>

Note: Q3PRO is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of Q3PRO can represent the remaining models.

1.3. Operation Frequency

GSM 850	
Channel:	Frequency (MHz)
128	824.20
129	824.40
....
190	836.40
190	836.60
191	836.80
...	...
250	848.60
251	848.80

WCDMA Band V	
Channel:	Frequency (MHz)
4132	826.40
4133	826.60
....
4182	836.40
4182	836.60
4184	836.80
...	...
4233	846.60

2. Test Result Summary

Requirement	CFR 47 Section	Result
Conducted Output Power	§22.913; §2.1046 §24.232; §27.50(d)	PASS
Peak-to-Average Ratio	§2.1046; §24.232(d) §22.913; §27.50(d)	PASS
Effective Radiated Power	§2.1046; §22.913(a) §24.232; §27.50(d)	PASS
Equivalent Isotropic Radiated Power	§2.1046; §22.913(a) §24.232; §27.50(d)	PASS
Occupied Bandwidth	§2.1049	PASS
Band Edge	§2.1051 §22.917(a) §24.238(a) §27.53(g)	PASS
Conducted Spurious Emission	§2.1051; §22.917 §24.238; §27.53(h)	PASS
Field Strength of Spurious Radiation	§2.1053; §22.917(a) §24.238; §27.53(g)	PASS
Frequency Stability for Temperature & Voltage	§2.1055; §22.355 §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	GPRS class 12 Link	GPRS class 12 Link
WCDMA Band V	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

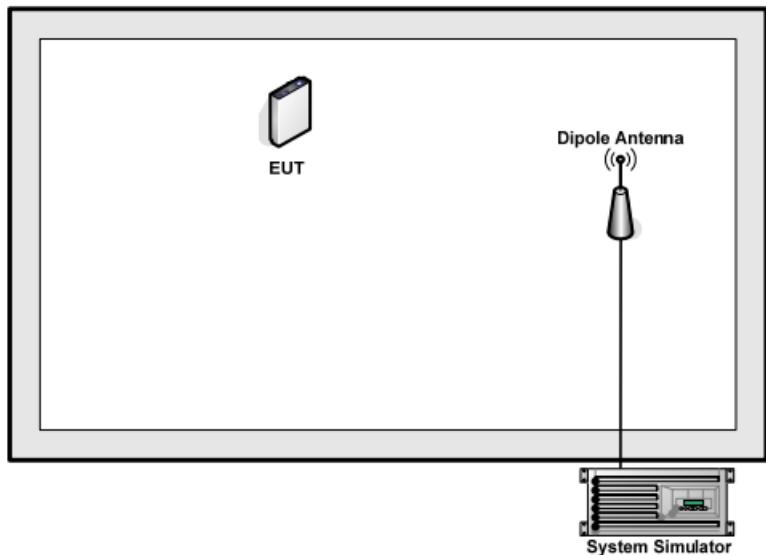
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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: $\text{Offset (dB)} = \text{RF cable loss (dB)} + \text{attenuator factor (dB)}$.
= 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

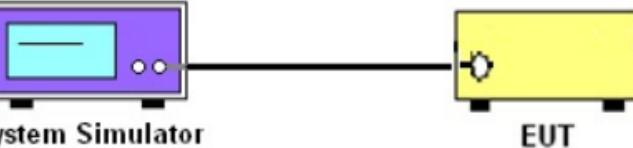
The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	All emissions, radiated(<1 GHz)	± 4.56 dB
5	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
6	All emissions, radiated(18 GHz- 40 GHz)	± 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

Test Requirement:	FCC part 22.913(a) and FCC part 24.232(b) FCC part 27.50(d);
Test Method:	FCC KDB 971168 D01 v03r01
Operation mode:	Refer to item 4.1
Limits:	GSM 850: 7W WCDMA Band V:7W
Test Setup:	
Test Procedure:	<ol style="list-style-type: none">1. The transmitter output port was connected to the system simulator.2. Set EUT at maximum power through system simulator.3. Select lowest, middle, and highest channels for each band and different modulation.4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.
Test Result:	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		
Channel	128	190	251
Frequency(MHz)	824.2	836.6	848.8
GPRS class8	31.99	32.05	32.06
GPRS class10	31.22	31.30	31.35
GPRS class11	29.95	30.02	30.07
GPRS class12	29.35	29.41	29.46

Average Conducted Power (*Unit: dBm)			
Band	WCDMA Band V		
Channel	4132	4182	4233
Frequency(MHz)	826.4	836.4	846.6
WCDMA RMC 12.2K	22.40	22.24	22.25
HSDPA Subtest-1	21.85	21.85	21.75
HSDPA Subtest-2	21.62	21.64	21.62
HSDPA Subtest-3	21.33	21.29	21.33
HSDPA Subtest-4	20.75	20.68	20.80
HSUPA Subtest-1	21.88	21.96	21.73
HSUPA Subtest-2	21.67	21.64	21.63
HSUPA Subtest-3	21.58	21.53	21.56
HSUPA Subtest-4	21.47	21.44	21.44
HSUPA Subtest-5	21.36	21.35	21.36

5.2. Peak to Average Ratio

5.2.1. Test Specification

Test Requirement:	FCC part 24.232(d) ; FCC part 22.913; FCC part 27.50(d);
Test Method:	ANSI C63.26:2013
Operation mode:	Refer to item 4.1
Limit:	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
Test Setup:	<p>The diagram illustrates the test setup. A 'System Simulator' (represented by a purple box with a screen and buttons) is connected to a 'Power Divider' (represented by a black rectangle). The 'Power Divider' is connected to a 'Spectrum Analyzer' (represented by a green box with a screen and buttons) and an 'EUT' (Equipment Under Test, represented by a yellow box with a screen and buttons).</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 5.7.1. 2. The EUT was connected to spectrum analyzer and system simulator via a power divider. 3. Set EUT to transmit at maximum output power. 4. For GSM/EGPRS operating modes, signal gating is implemented on the spectrum analyzer by triggering from the system simulator. 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%.
Test Result:	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

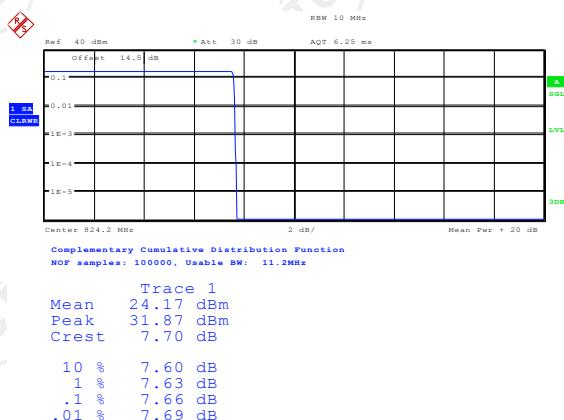
Cellular Band			
Mode	GSM850		
Channel	128	190	251
Frequency (MHz)	824.2	836.6	848.8
Peak-to-Average Ratio (dB)	7.66	7.66	7.69

Mode	WCDMA Band V (RMC 12.2Kbps)		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
Peak-to-Average Ratio (dB)	2.82	2.85	2.82

Test plots as follows:

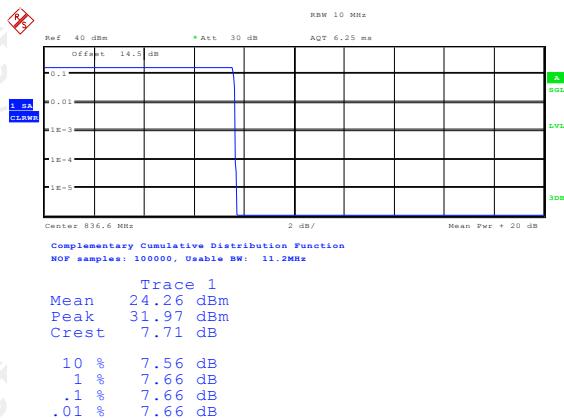
GSM 850

Peak-to-Average Ratio on Channel 128



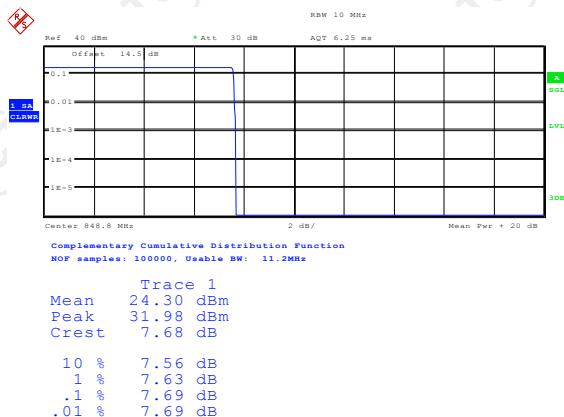
Date: 11 AUG 2021 17:56:37

Peak-to-Average Ratio on Channel 190



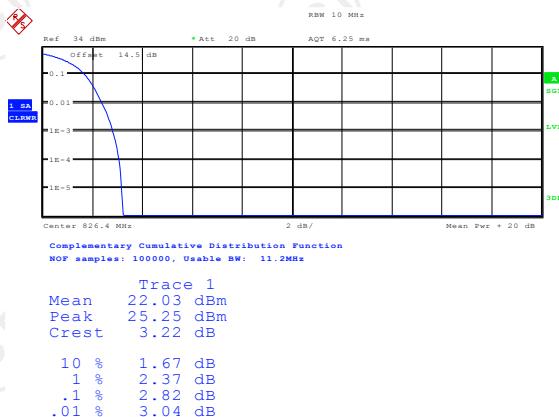
Date: 11 AUG 2021 17:57:02

Peak-to-Average Ratio on Channel 251



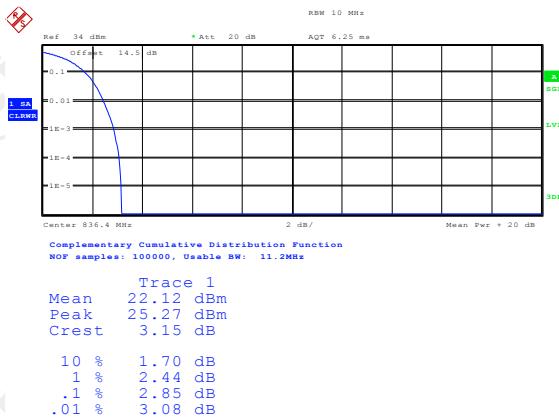
Date: 11 AUG 2021 17:58:01

Peak-to-Average Ratio on Channel 4132



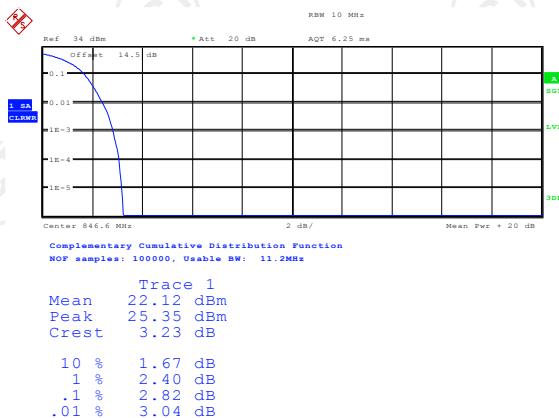
Date: 11.AUG.2021 17:15:01

Peak-to-Average Ratio on Channel 4182



Date: 11.AUG.2021 17:14:34

Peak-to-Average Ratio on Channel 4233



Date: 11.AUG.2021 17:13:47

5.3. 99% Occupied Bandwidth and 26dB Bandwidth Measurement

5.3.1. Test Specification

Test Requirement:	FCC part 2.1049
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	N/A
Test Setup:	<p>System Simulator</p> <p>Spectrum Analyzer</p> <p>Power Divider</p> <p>EUT</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 4.2. 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider. 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. 4. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold. 5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.
Test Result:	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)	243.00	242.00	244.00
26dB BW (kHz)	342.54	343.15	350.74

Cellular Band			
Mode	WCDMA Band V (RMC 12.2Kbps)		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
99% OBW (MHz)	4.21	4.22	4.20
26dB BW (MHz)	4.89	4.86	4.88

Test plots as follows:

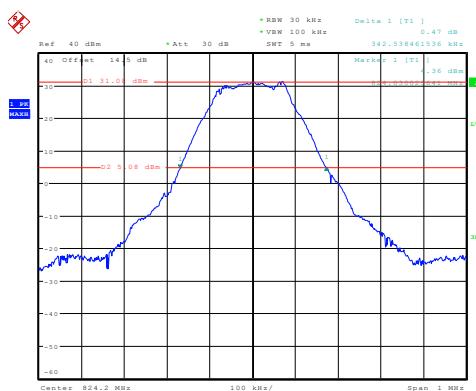
Band:

GSM 850

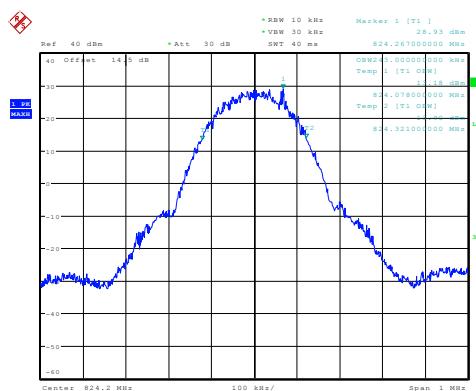
Test Mode:

 GPRS class 12 Link
(GMSK)

26dB&99% Occupied Bandwidth Plot on Channel 128

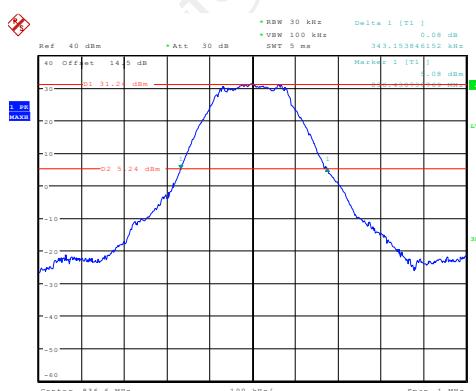


Date: 11.AUG.2021 18:03:43

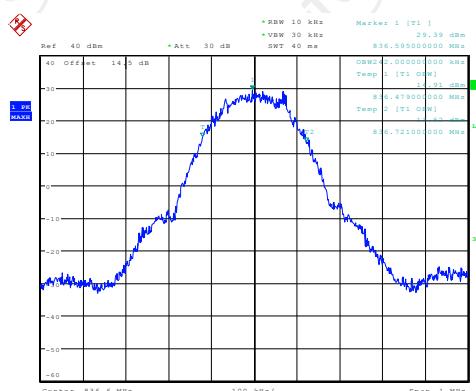


Date: 11.AUG.2021 18:04:30

26dB&99% Occupied Bandwidth Plot on Channel 190

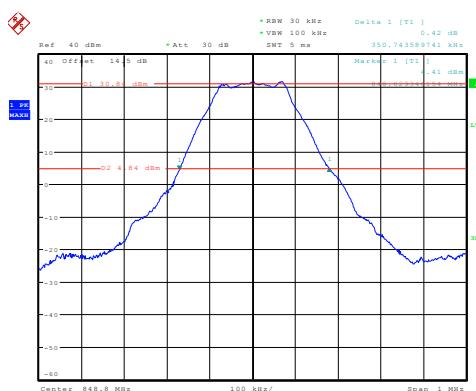


Date: 11.AUG.2021 18:02:53

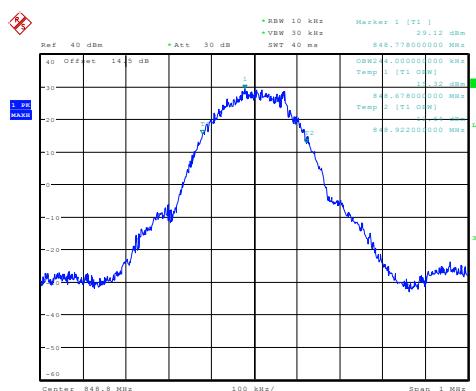


Date: 11.AUG.2021 18:05:11

26dB&99% Occupied Bandwidth Plot on Channel 251



Date: 11.AUG.2021 18:01:55



Date: 11.AUG.2021 18:05:50

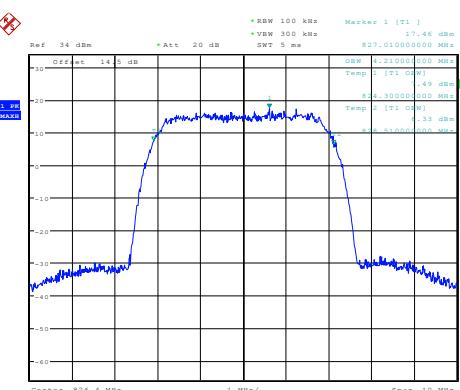
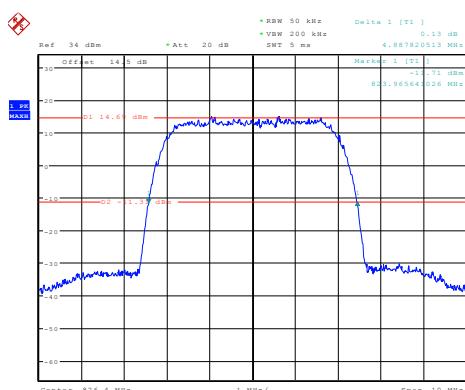
Band:

WCDMA Band V

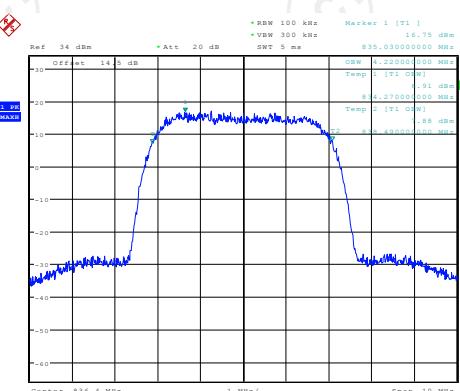
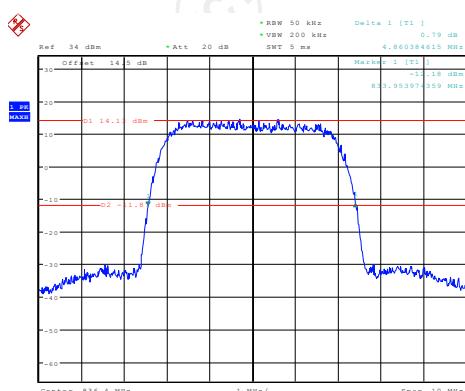
Test Mode:

 RMC 12.2Kbps Link
(QPSK)

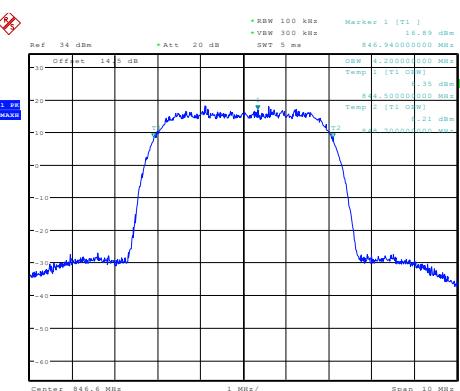
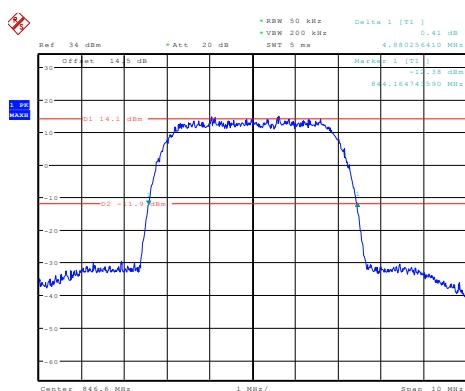
26dB&99% Occupied Bandwidth Plot on Channel 4132



26dB&99% Occupied Bandwidth Plot on Channel 4182



26dB&99% Occupied Bandwidth Plot on Channel 4233



5.4. Band Edge and Conducted Spurious Emission Measurement

5.4.1. Test Specification

Test Requirement:	FCC part22.917(a) and FCC part24.238(a) FCC part27.53(g)
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	-13dBm
Test Setup:	<p>The diagram shows a 'System Simulator' (purple box) and a 'Spectrum Analyzer' (green box) connected to a 'Power Divider' (black rectangle). The 'Power Divider' is connected to the 'EUT' (yellow box).</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 6.0. 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider. 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. 4. The band edges of low and high channels for the highest RF powers were measured. 5. The conducted spurious emission for the whole frequency range was taken. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band. 7. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power $P(\text{Watts}) = P(\text{W}) - [43 + 10\log(P)] \text{ (dB)} = [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}$.
Test Result:	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:

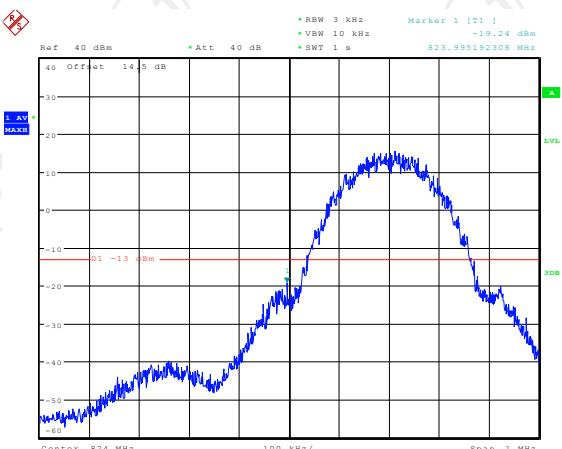
Band:

GSM 850

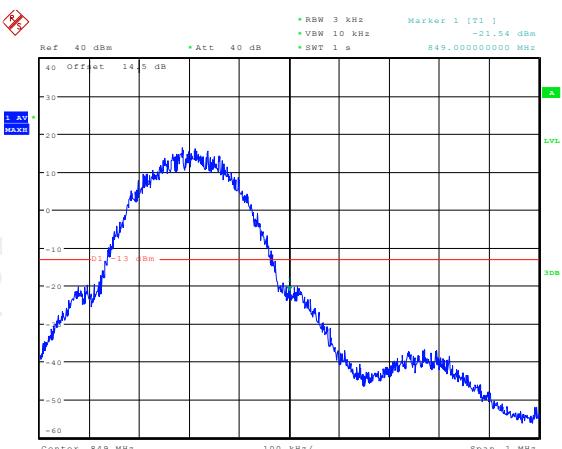
Test Mode:

GPRS class 12 Link
(GMSK)

Lower Band Edge Plot on Channel 128



Higher Band Edge Plot on Channel 251



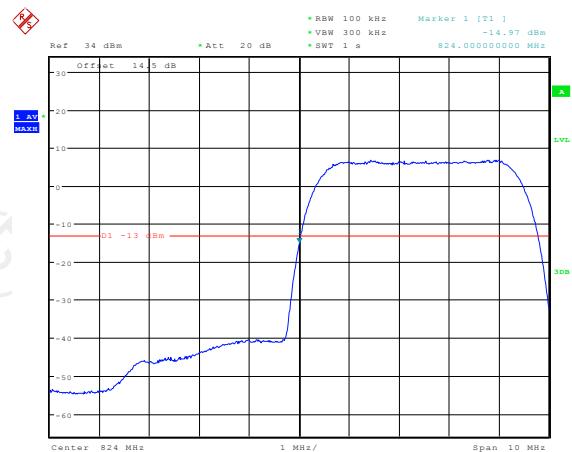
Band:

WCDMA Band V

Test Mode:

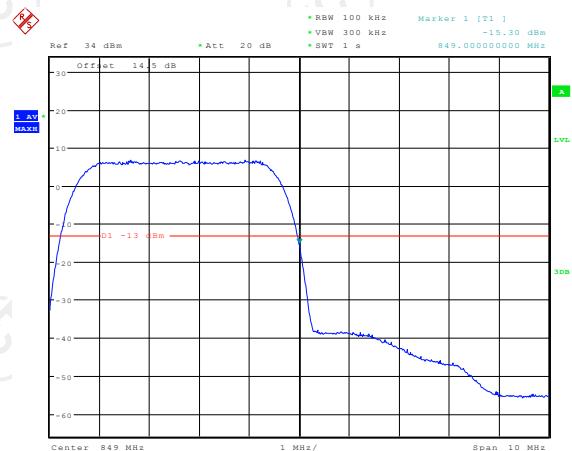
 RMC 12.2Kbps Link
(QPSK)

Lower Band Edge Plot on Channel 4132



Date: 11 AUG 2021 17:41:15

Higher Band Edge Plot on Channel 4233



Date: 11 AUG 2021 17:43:01

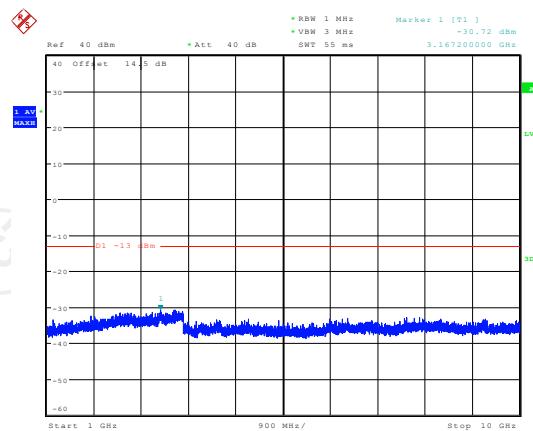
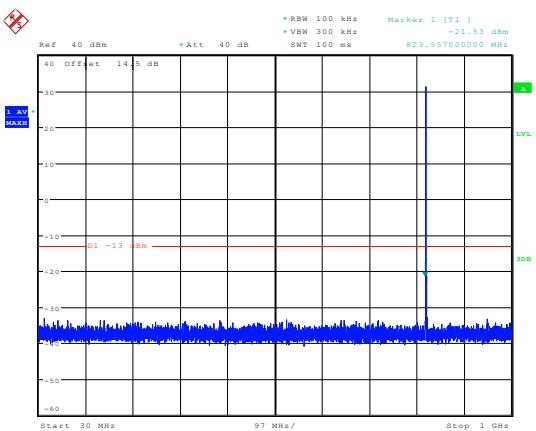
Band:

GSM 850

Test Mode:

 GPRS class 12 Link
(GMSK)

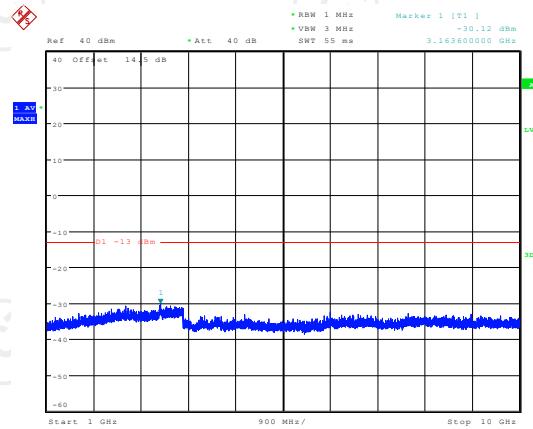
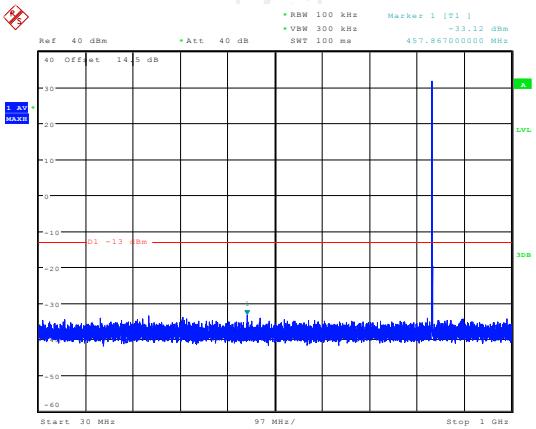
Conducted Spurious Emission on Channel 128



Date: 11.AUG.2021 18:14:12

Date: 11.AUG.2021 18:14:37

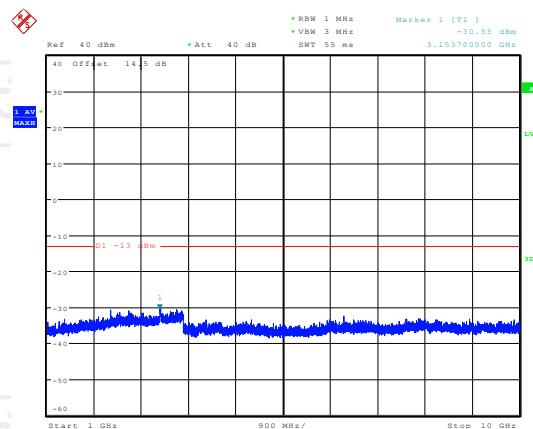
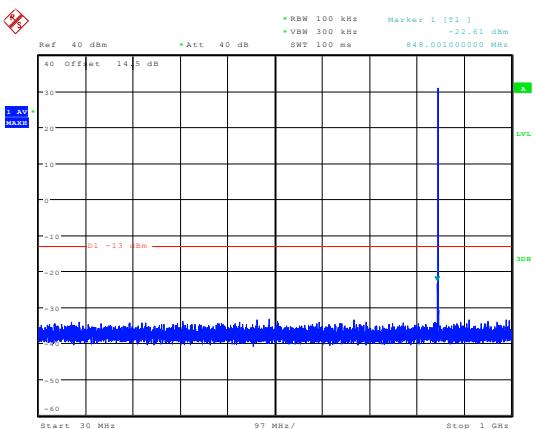
Conducted Spurious Emission on Channel 190



Date: 11.AUG.2021 18:15:38

Date: 11.AUG.2021 18:15:16

Conducted Spurious Emission on Channel 251



Date: 11.AUG.2021 18:16:44

Date: 11.AUG.2021 18:17:06

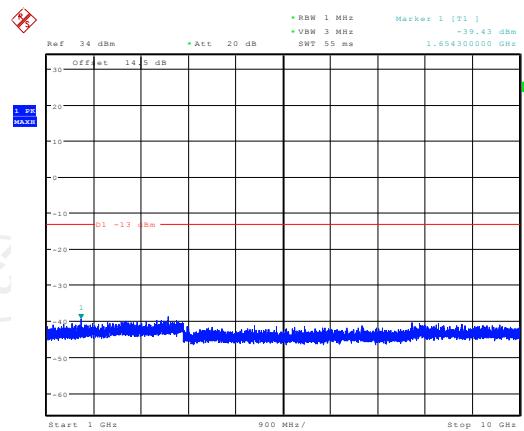
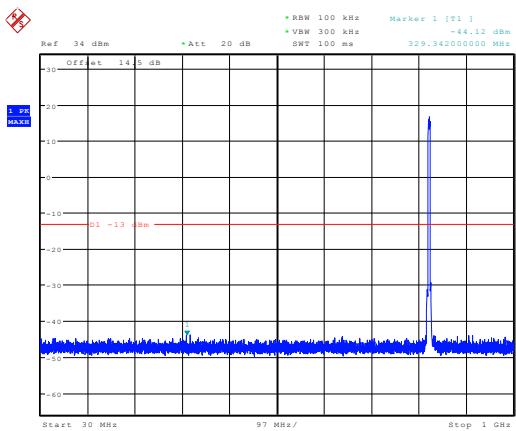
Band:

WCDMA Band V

Test Mode:

 RMC 12.2Kbps Link
(QPSK)

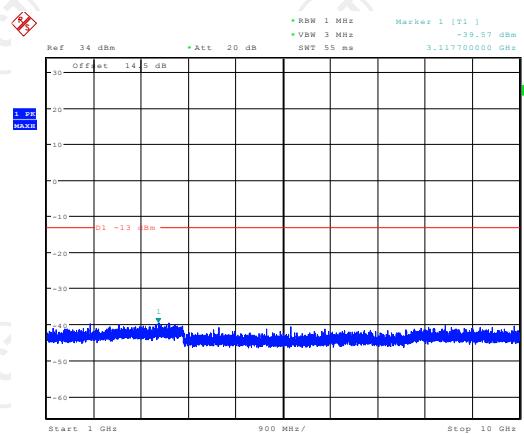
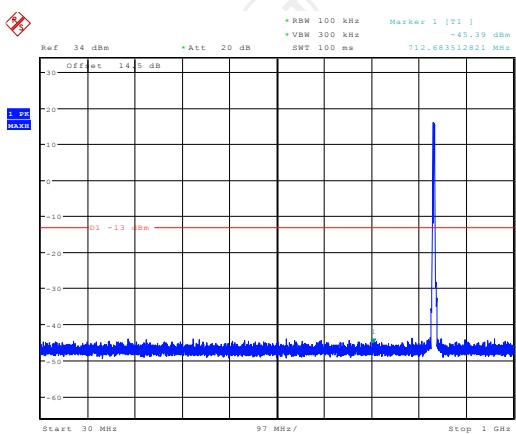
Conducted Spurious Emission on Channel 4132



Date: 11.AUG.2021 17:47:45

Date: 11.AUG.2021 17:48:06

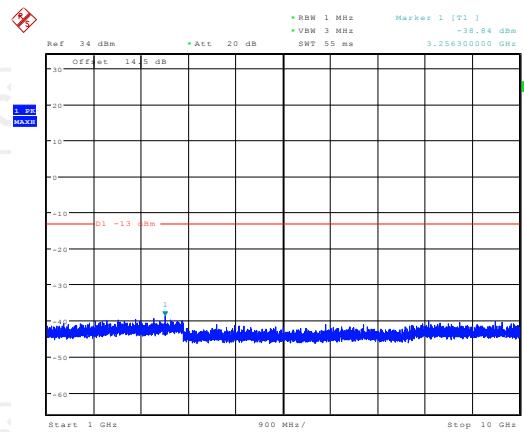
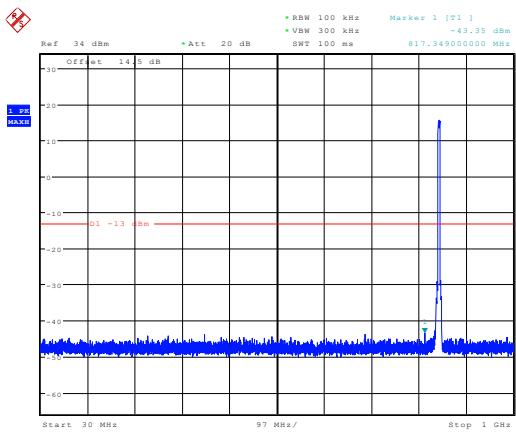
Conducted Spurious Emission on Channel 4182



Date: 11.AUG.2021 17:46:51

Date: 11.AUG.2021 17:45:35

Conducted Spurious Emission on Channel 4233

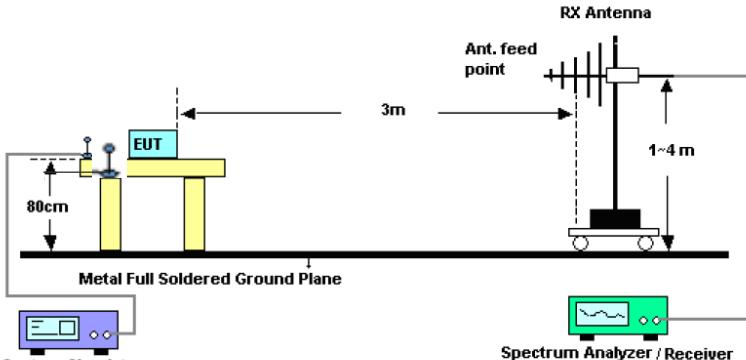
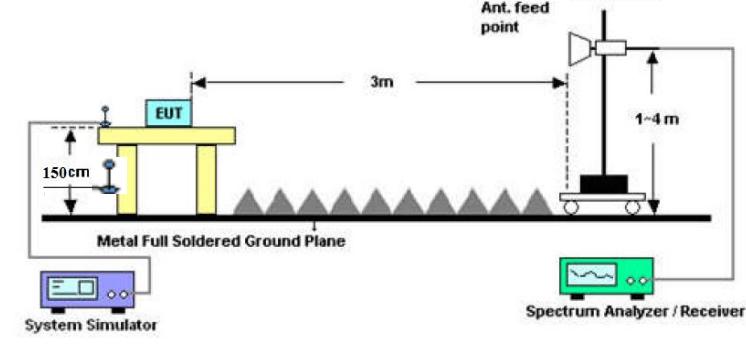


Date: 11.AUG.2021 17:44:38

Date: 11.AUG.2021 17:45:09

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) FCC part 27.50(d)																								
Test Method:	FCC KDB 971168 D01v03r01																								
Receiver Setup:	<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																							
Limit:	GSM850: 7W ERP WCDMA Band V: 7W ERP																								
Test Setup:	<p>From 30MHz to 1GHz</p>  <p>Above 1GHz</p> 																								
Test Procedure:	1. The testing follows FCC KDB 971168 D01v03r01 Section 5.8. and ANSI / TIA-603-D-2010 Section 2.2.17.																								

	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)</p> <p>6. Determine the effective radiated output power at each angular position from the readings in steps 3) and 5) using the following equation:</p> <p>ERP (dBm) = LVL (dBm) + LOSS (dB)</p> <p>7. The maximum ERP is the maximum value determined in the preceding step.</p> <p>8. Calculating ERP:</p> <p>ERP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBd)</p> <p>Antenna Gain (dBd) = Antenna Gain (dBi) - 2.15</p> <p>EIRP = ERP + 2.15</p>
Test results:	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
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 02, 2021
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	Shurples Technology	EZ-EMC	N/A	N/A

5.5.3. Test Data

Test Result of ERP

GPRS 850 (1-solt) Radiated Power ERP					
Horizontal Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.2	H	9.68	21.66	29.19	0.83
836.6	H	9.81	21.54	29.20	0.83
848.8	H	9.96	21.46	29.27	0.85
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
824.2	H	9.75	21.66	29.26	0.84
836.6	H	9.93	21.54	29.32	0.86
848.8	H	10.08	21.46	29.39	0.87

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

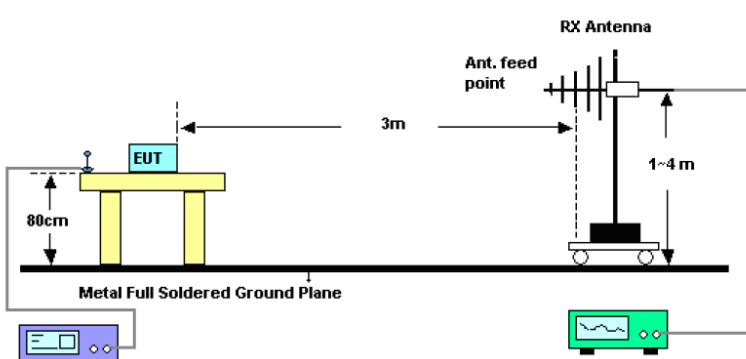
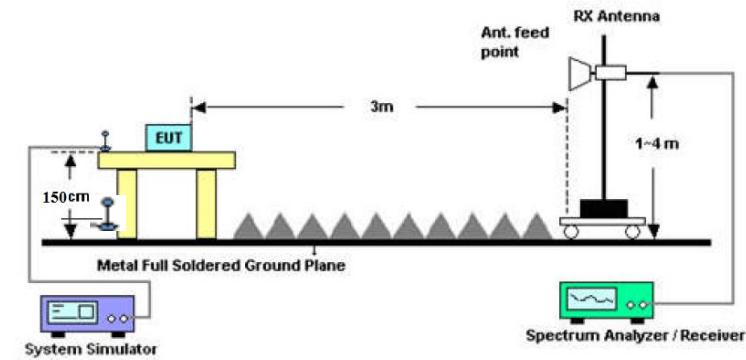
WCDMA Band V (RMC 12.2Kbps) Radiated Power ERP					
Horizontal Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
826.4	H	0.41	21.62	19.88	0.10
836.4	H	0.63	21.54	20.02	0.10
846.6	H	0.79	21.44	20.08	0.10
Vertical Polarization (Antenna Pol.)					
Frequency (MHz)	(EUT Pol.)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (W)
826.4	H	0.37	21.62	19.84	0.10
836.4	H	0.51	21.54	19.90	0.10
846.6	H	0.82	21.44	20.11	0.10

Note: * ERP = LVL (dBm) + Correction Factor (dB) - 2.15

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

5.6. Field Strength of Spurious Radiation Measurement

5.6.1. Test Specification

Test Requirement:	FCC part 22.917(a) and FCC part 24.238(a) FCC part 27.53(g)
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	-13dBm
Test setup:	<p>For 30MHz~1GHz</p>  <p>Above 1GHz</p> 
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 6 and ANSI / TIA-603-D-2010 Section 2.2.12. 2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground. 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower. 4. The table was rotated 360 degrees to determine the position of the highest spurious emission. 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. 6. Make the measurement with the spectrum analyzer's

	<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 $43 + 10\log(P)$ dB below the transmitter power P(Watts)</p> $= P(W) - [43 + 10\log(P)] \text{ (dB)}$ $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$ $= -13\text{dBm}.$
Test results:	PASS
Remark:	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
Dipole Antenna	TCT	TCT-RF	N/A	Sep. 02, 2021
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	Shurples Technology	EZ-EMC	N/A	N/A

5.6.3. Test Data

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
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Note: 1. Emission Level=Reading+ Cable loss+Antenna factor-Amp factor

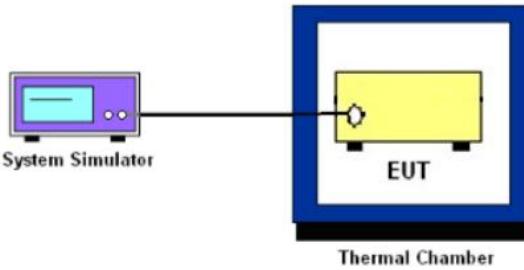
2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

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	-58.15	23.12	-35.03	-13.00	PASS
2472.6	V	-64.03	23.20	-40.83		
3296.8	V	-77.42	23.28	-54.14		
1648.4	Horizontal	-57.18	23.12	-34.06		
2472.6	H	-62.64	23.20	-39.44		
3296.8	H	-76.16	23.28	-52.88		
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	-56.89	23.17	-33.72	-13.00	PASS
2509.8	V	-68.64	23.26	-45.38		
3346.4	V	-77.59	23.38	-54.21		
1673.2	Horizontal	-56.33	23.17	-33.16		
2509.8	H	-64.51	23.26	-41.25		
3346.4	H	-77.72	23.38	-54.34		
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	-59.06	23.23	-35.83	-13.00	PASS
2546.4	V	-68.94	23.32	-45.62		
3395.2	V	-76.36	23.44	-52.92		
1697.6	Horizontal	-54.71	23.23	-31.48		
2546.4	H	-64.46	23.32	-41.14		
3395.2	H	-79.50	23.44	-56.06		

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)		
1652.8	Vertical	-69.17	23.14	-54.43	-13.00
2479.2	V	-77.66	23.23	-52.68	
3305.6	V	-76.02	23.34	-43.76	
1652.8	Horizontal	-66.90	23.14	-53.20	
2479.2	H	-76.43	23.23	-55.31	
3305.6	H	-78.65	23.34	-54.43	
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)		
1673.2	Vertical	-67.31	23.17	-44.14	-13.00
2509.8	V	-76.84	23.26	-53.58	
3346.4	V	-77.31	23.38	-53.93	
1673.2	Horizontal	-65.53	23.17	-42.36	
2509.8	H	-79.04	23.26	-55.78	
3346.4	H	-77.09	23.38	-53.71	
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)		
1693.2	Vertical	-71.44	23.20	-48.24	-13.00
2539.8	V	-77.86	23.29	-54.57	
3386.4	V	-80.76	23.42	-57.34	
1693.2	Horizontal	-67.73	23.20	-44.53	
2539.8	H	-77.82	23.29	-54.53	
3386.4	H	-80.98	23.42	-57.56	

5.7. Frequency Stability Measurement

5.7.1. Test Specification

Test Requirement:	FCC Part 2.1055 ; FCC Part 22.355 ; FCC Part 24.235 FCC Part 27.54
Test Method:	FCC KDB 971168 D01v03r01
Operation mode:	Refer to item 4.1
Limit:	FCC Part 22.355 : ± 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.
Test Setup:	
Test Procedure:	<p>Test Procedures for Temperature Variation</p> <ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0. 2. The EUT was set up in the thermal chamber and connected with the system simulator. 3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute. 4. With power OFF, the temperature was raised in 10°C steps up to 50°C. 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. <p>Test Procedures for Voltage Variation</p> <ol style="list-style-type: none"> 1. The testing follows FCC KDB 971168 D01v03r01 Section 9.0. 2. The EUT was placed in a temperature chamber at $25\pm 5^{\circ}\text{C}$ and connected with the system simulator. 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. 4. The variation in frequency was measured for the worst case.
Test Result:	PASS
Remark:	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 temprature 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**

Band :	GSM 850	Channel:	190	
Limit (ppm) :	2.5	Frequency:	836.6MHz	
Temperature (°C)	Deviation (ppm)		Result	
50	0.014		PASS	
40	0.011			
30	0.010			
20	0.011			
10	0.013			
0	0.017			
-10	0.012			
-20	0.013			
-30	0.015			

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

Band :	WCDMA Band V	Channel:	4182	
Limit (ppm) :	2.5ppm	Frequency:	836.4MHz	
Temperature (°C)	RMC 12.2Kbps Deviation (ppm)		Result	
50	0.015		PASS	
40	0.014			
30	0.008			
20	0.012			
10	0.016			
0	0.014			
-10	0.011			
-20	0.012			
-30	0.010			

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	GPRS class 12	4.4	+0.016	2.5	PASS	
		3.85	+0.010			
		BEP	+0.013			
WCDMA Band V CH4182	RMC 12.2Kbps	4.4	-0.009	2.5		
		3.85	-0.013			
		BEP	-0.016			

Note:

1. Normal Voltage = 7.2V.
2. Battery End Point (BEP) = 8.4V.
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. TCT210721E008

Appendix B: Photographs of EUT

Refer to the test report No. TCT210721E008

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