Shenzhen United Testing Technology Co., Ltd. Report No.: UNIA2018050831-2FR-01

	FCC PART 22 TEST REPORT	
	FCC Part 22	
Report Reference No .:	UNIA2018050831-2FR-01	
FCC ID :	2AQP8-C50	
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Applicant's name	Shenzhen JOAN Technology Co.,	Ltd.
Address	:: Rm 201, No. 22.1 Area, 5th Industria Longhua District, Shenzhen, China	l Zone, Shangfen, Minzhi,
Test specification	:	
Standard	FCC Part 22: PUBLIC MOBILE SEF	RVICES
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TEST REPORT

Test Report No. :	UNIA	2018050831-2FR-01	Aug.02, 2018 Date of issue	5
U U		N	in .	
Equipment under Test	:	Sweam		
Model /Type	5	C50		
Listed Models	:	5		
Applicant	:	Sweam AB		
Address	:	Kistagangen 12, SE-16	440 Kista, Sweden	
Manufacturer	نی	Sweam AB		
Address	:	Kistagangen 12, SE-16	440 Kista, Sweden	

Test Result:	PASS	17.
i.		

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	2018-08-02	Initial Issue	James Zhou

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 22 Subpart H: PRIVATE LAND MOBILE RADIO SERVICES. TIA/EIA 603 D June 2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS FCCKDB971168D01 Power Meas License Digital Systems

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2.1 General Remarks

Date of receipt of test sample		July 02, 2018
2		
Testing commenced on	:	July 02, 2018
Testing concluded on	:	Aug. 02, 2018

2.2 Product Description

The Bar code Hand Terminal's Model: C50 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Bar code Hand Terminal
Model Number	C50
Modilation Type	QPSK for UMTS,
Antenna Type	Internal
UMTS Operation Frequency Band	Device supported UMTS FDD Band V
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.80VDC)
Antenna gain:	FDD Band V: -0.98dbi

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	0	120V / 60 Hz	0	115V / 60Hz
		0	12 V DC	0	24 V DC
			Other (specified in blank bel	ow	

Test frequency list

RF Channel TX/RX Test Mode Low(L) Middle (M) High (H) Channel 4182 Channel 4132 Channel 4233 TΧ 826.4 MHz 836.4 MHz 846.6 MHz WCDMA850 Channel 4407 Channel 4357 Channel 4458 RX 871.4 MHz 881.4 MHz 891.6 MHz

DC 3.8V From Battery;

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Short description of the Equipment under Test (EUT)

2.4.1 General Description

This is a Sweam.

For more details, refer to the user's manual of the EUT

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- supplied by the manufacturer
- - supplied by the lab

M/N · /	
	S
Manufacturer: /	

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AQP8-C50 filing to comply with FCC Part 22

2.7 General Test Conditions/Configurations

2.7.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
UMTS/TM1	WCDMA system, QPSK modulation
UMTS/TM2	HSDPA system, QPSK modulation
UMTS/TM3	HSUPA system, QPSK modulation

Note:

- 1. This EUT owns two SIM cards, after we perform the pretest for these two SIM cards; we found the SIM 1 is the worst case, so its result is recorded in this report.
- 2. As WCDMA, HSDPA and HSUPA with the same emission designator, test result recorded in this report at the worst case UMTS/TM1 only after exploratory scan.

2.7.2 Test Environment

Environment Parameter	Selected Valu	es During Tests
Relative Humidity	An	nbient
Temperature	TN	Ambient
	VL	3.40V
Voltage	VN	3.80V
	VH	4.20V

NOTE: VL=lower extreme test voltage VN=nominal voltage VH=upper extreme test voltage TN=normal temperature

2.8 Modifications

No modifications were implemented to meet testing criteria.

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3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd. 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao' an District, Shenzhen, China

3.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
	1
Humidity:	30-60 %

Atmospheric pressure: 950-1050mbar

(1) expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.3 Test Description

3.3.1 Cellular Band (824-849MHz paired with 869-894MHz)

Test Item	FCC Rule	Requirements	Verdict
	No.		
Effective(Isotropic)	§2.1046,		Deee
Radiated Output Power	§22.913	FCC. ERF ≤ 7 W.	Fass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges	§2.1051.	≤-13dBm/1%*EBW, in 1MHz bands immediately outside	
Compliance	§22.917	and adjacent to	Pass
	5	I he frequency block.	
Spurious Emission at	§2.1051,	FUC: ≤ -130BM/100KHZ,	Deee
Antenna Terminals	§22.917	operating frequency ranges.	Pass
Field Strength of	§2.1053,		Pass
Radiation	§22.917	1 CC. 3 - 150BH/ 100KHz.	F 855
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Pass
NOTE 1: For the verdict, the	he "N/A" denote	s "not applicable", the "N/T" de notes "not tested".	

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.4 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2018.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2018.9.29
3	PREAMP	HP	8449B	3008A00160	2018.9.9
4	PREAMP	HP	8447D	2944A07999	2018.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2018.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2018.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2018.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2018.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2018.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2018.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2018.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2018.9.9
13	RF Power sensor	DARE	RPR3006W	15100041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15100041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2018.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2018.9.28
17	Biconical antenna	Schwarzbeck	🔪 VHA 9103	91032360	2018.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2018.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2018.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2018.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2018.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10
26	Frequency Meter	VICTOR	VC2000	997406086	2019.05.10
27	DC Power Source	HYELEC	HY5020E	055161818	2019.05.10

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4 TEST CONDITIONS AND RESULTS

4.1 Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

4.1.1 Conducted Output Power

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

- a) Place the EUT on a bench and set it in transmitting mode.
- b) Connect a low loss RF cable from the antenna port to a CMU200 by an Att.
- c) EUT Communicate with CMU200 then selects a channel for testing.
- d) Add a correction factor to the display CMU200, and then test.

TEST RESULTS

Test Mode	Test Channel	Burst Average Conducted power (dBm)		
		UMTS Band V		
1	LCH	21.03		
UMTS/TM1	MCH	21.19		
	НСН	20.97		
	LCH_SubTest-1	20.96		
5. C	LCH_SubTest-2	20.36		
	LCH_SubTest-3	20.36		
	LCH_SubTest-4	20.37		
	MCH_SubTest-1	21.39		
	MCH SubTest-2	20.72		
	MCH SubTest-3	20.97		
	MCH SubTest-4	20.82		
	HCH SubTest-1	20.65		
	HCH SubTest-2	20.05		
	HCH_SubTest-3	20.05		
	HCH SubTest-4	20.16		
	LCH SubTest-1	19.76		
	LCH SubTest-2	19.45		
1	LCH SubTest-3	20.34		
	LCH_SubTest-4	19.49		
	LCH_SubTest-5	19.00		
	MCH SubTest-1	20.26		
	MCH SubTest-2	19.21		
UMTS/TM3	MCH_SubTest-3	20.34		
	MCH SubTest-4	19.12		
	MCH SubTest-5	20.34		
4	HCH SubTest-1	19.22		
0	HCH SubTest-2	19.48		
	HCH SubTest-3	19.76		
-	HCH SubTest-4	19.45		
	HCH SubTest-5	20.34		

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2 Radiated Output Power

TEST DESCRIPTION

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

Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

TEST CONFIGURATION



TEST PROCEDURE

- EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
- 2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=10MHz, VBW=10MHz, And the maximum value of the receiver should be recorded as (P_r).
- 4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

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A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below:

 $Power(E IRP) = P_{Mea} - P_{Ag} - P_{cl} + G_a$

We used SMF100A microwave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below: Power(EIRP)= P_{Mea} - P_{cl} + G_a

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

TEST LIMIT

According to 22.913(a), 24.232(c) the ERP(EIRP) should be not exceeding following table limits:

	Burst Average ERP
UMTS Band V	38.45dBm (7W)

TEST RESULTS

Remark:

- 1. We were tested all Configuration refer 3GPP TS134 121.
- 2. $EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_{a}(dBi)$
- 3. ERP = EIRP 2.15dBi as EIRP by subtracting the gain of the dipole.
- 4. Note: We test the H direction and V direction, V direction is worse.

UMTS/TM1/UMTS Band V

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	Correction (dB)	P _{Ag} (dB)	Burst Average ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.40	-15.25	2.42	8.45	2.15	36.82	25.45	38.45	13.00	V
836.40	-14.59	2.46	8.45	2.15	36.82	26.07	38.45	12.38	V
846.60	-15.16	2.53	8.36	2.15	36.82	25.34	38.45	13.11	V

4.2 Radiated Spurious Emssion

TEST APPLICABLE

According to the TIA/EIA 603D:2010 test method, The Receiver or Spectrum was scanned from 9 KHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz The resolution bandwidth is set as outlined in Part 24.238, Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II and WCDMA Band V.

TEST CONFIGURATION



TEST PROCEDURE

- EUT was placed on a 0.80 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
- 2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

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The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).

- 4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
- 5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test. The measurement results are obtained as described below:
 - Power(EIRP)=P_{Mea}- P_{Ag} P_{cl} + G_a
- 6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- 7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
- 8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
1	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
WCDMA Bond V	1~2	1 MHz	3 MHz	2
WCDMA Band V	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3

TEST LIMITS

According to 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Frequency	Channel	Frequency Range	Verdict
UMTS/TM1/ WCDMA	Low	9KHz-10GHz	PASS
	Middle	9KHz -10GHz	PASS
Band V	High	9KHz -10GHz	PASS

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Remark:

- 1. We were tested all Configuration refer 3GPP TS134 121. 2. EIRP= $P_{Mea}(dBm)$ - $P_{cl}(dB)$ + $P_{Ag}(dB)$ + $G_a(dBi)$ 3. ERP = EIRP 2.15dBi as EIRP by subtracting the gain of the dipole.
- Margin = Limit Emission Level 5.
- We test both H direction and V direction, recorded worst case direction. 6.

UMTS/TM1/ WCDMA Band V _ Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1652.8	-38.08	3.00	3.00	9.58	-31.50	-13.00	18.50	Н
2479.2	-43.09	3.03	3.00	10.72	-35.40	-13.00	22.40	N H
1652.8	-35.72	3.00	3.00	9.68	-29.04	-13.00	16.04	V
2479.2	-39.34	3.03	3.00	10.72	-31.65	-13.00	18.65	V

UMTS/TM1/ WCDMA Band V Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1672.8	-37.27	3.00	3.00	9.58	-30.69	-13.00	17.69	Н
2509.2	-42.00	3.03	3.00	10.72	-34.31	-13.00	21.31	Н
1672.8	-35.26	3.00	3.00	9.68	-28.58	-13.00	15.58	V
2509.2	-39.84	3.03	3.00	10.72	-32.15	-13.00	19.15	V

UMTS/TM1/ WCDMA Band V _ High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1693.2	-36.93	3.00	3.00	9.58	-30.35	-13.00	17.35	Н
2539.8	-40.79	3.03	3.00	10.72	-33.10	-13.00	20.10	Н
1693.2	-36.35	3.00	3.00	9.68	-29.67	-13.00	16.67	V
2539.8	-38.80	3.03	3.00	10.72	-31.11	-13.00	18.11	V

4.3 Occupied Bandwidth and Emission Bandwith

TEST APPLICABLE

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of WCDMA Band II and WCDMA band V. The table below lists the measured 99% Bandwidth and -26dBc Bandwidth.

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was set up for the max output power with pseudo random data modulation;
- 2. Set RBW=100KHz,VBW=300KHz,Span=10MHz, SWT=Auto;
- 3. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
- 4. These measurements were done at 3 frequencies for WCDMA band II /V. (low, middle and high of operational frequency range).

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Occupied Bandwidth (99% BW) (KHz)	Emission Bandwidth (-26 dBc BW) (KHz)	Verdict
UMTS/TM1/	4132	826.40	4145.0	4720	PASS
WCDMA Band	4183	836.40	4141.4	4689	PASS
V	4233	846.60	4133.5	4700	PASS

Remark:

- 1. Test results including cable loss;
- 2. please refer to following plots;



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TEST APPLICABLE

During the process of testing, the EUT was controlled via Aglient Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation.

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was set up for the max output power with pseudo random data modulation;
- 2. Set RBW=51KHz,VBW=200KHz,Span=2MHz ,Dector: RMS;
- 3. These measurements were done at 2 frequencies (low and high of operational frequency range).

TEST RESULTS

UMTS/TM1/WCDMA Band V									
Test Mode Channel Frequency (MHz) Band Edg Compliance (dBm) Limits (dBm) Verdic									
UMTS/TM1/WCDMA	4132	826.4	<-13dBm	-13dBm	DACC				
Band V	4233	846.6	<-13dBm	-13dBm	PASS				

Remark:

- 1. Test results including cable loss;
- 2. please refer to following plots;

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Channel 4233 / 846.6 MHz

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4.5 Spurious Emssion on Antenna Port

TEST APPLICABLE

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

- Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA band II data taken from 9 KHz to 20 GHz. For WCDMA Band V, data taken from 9 KHz to 9 GHz.
- 2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; if the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give an optimal sweep time according the selected span and RBW.
- The procedure to get the conducted spurious emission is as follows: The trace mode is set to MaxHold to get the highest signal at each frequency; Wait 25 seconds; Get the result.
- 4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was set up for the max output power with pseudo random data modulation;
- 2. These measurements were done at 3 frequencies (low, middle and high of operational frequency range) of each band.

TEST LIMIT

Part 24.238, Part 22.917 and Part 22.54 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBm)	Limits (dBm)	Verdict
UMTS/TM1/WCDMA Band V	4132	826.40	<-13dBm	-13dBm	1
	4183	836.40	<-13dBm	-13dBm	PASS
	4233	846.60	<-13dBm	-13dBm	



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TEST APPLICABLE

- 1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +50°C centigrade.
- According to FCC Part 2 Section 2.1055 (E) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
- 3. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried voltage equipment and the end voltage point was 3.40V.

TEST PROCEDURE

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

- 1. Measure the carrier frequency at room temperature;
- 2. Subject the EUT to overnight soak at -30°C;
- With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on middle channel of WCDMA Band V, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
- 4. Repeat the above measurements at 10 °C increments from -30 °C to +50 °C. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
- Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 0.5 hours unpowered, to allow any self-heating to stabilize, before continuing;
- 6. Subject the EUT to overnight soak at +50 $^{\circ}$ C;
- 7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming;
- 8. Repeat the above measurements at 10 °C increments from +50 °C to -30 °C. Allow at least 0.5 hours at each temperature, unpowered, before making measurements;
- 9. At all temperature levels hold the temperature to +/- 0.5 °C during the measurement procedure;

TEST CONFIGURATION



<u>TEST LIMITS</u>

For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. 深圳市优型推动起资Istability shall be sufficient to ensure that the fundamental emission stays within the authorized Shenzhen United Testing Technology Co.,Ltd. United Testing Technology (Hong Kong) Limited 证券目的 Construct Shenzhen, China Ch

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frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.40VDC and 4.20VDC, with a nominal voltage of 3.80DC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.For the purposes of measuring frequency stability these voltage limits are to be used.

For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

TEST RESULTS

UMTS/TM1/WCDMA Band V								
DC Power	Temperature (℃)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict			
3.40	20	-0.89	-0.001	2.50	PASS			
3.80	20	-2.49	-0.003	2.50	PASS			
4.20	20	2.55	0.003	2.50	PASS			
3.80	-30	-2.79	-0.003	2.50	PASS			
3.80	-20	-2.20	-0.003	2.50	PASS			
3.80	-10	1.51	0.002	2.50	PASS			
3.80	0	0.60	0.001	2.50	PASS			
3.80	10	-0.46	-0.001	2.50	PASS			
3.80	20	1.25	0.001	2.50	PASS 🗸			
3.80	30	-1.82	-0.002	2.50	PASS			
3.80	40	-0.14	-0.000	2.50	PASS			
3.80	50	-4.67	-0.006	2.50	PASS			

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4.7 Peak-to-Average Ratio (PAR)

<u>LIMIT</u>

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

- 1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- 2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
- 3. Set the number of counts to a value that stabilizes the measured CCDF curve;
- 4. Set the measurement interval as follows:
 - 1). for continuous transmissions, set to 1 ms,

2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.

5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	PAPR Value (dB)	Limits (dB)	Verdict
UMTS/TM1/ WCDMA Band V	4132	826.4	3.25	13.0	PASS
	4183	836.6	5.08	13.0	PASS
	4233	846.6	3.41	13.0 🐁	PASS

Remark

- 1. Test results including cable loss;
- 2. please refer to following plots;

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5 <u>Test Setup Photos of the EUT</u>

Reference to the annex of Test Photos.

6 External and Internal Photos of the EUT

Reference to the annex of External Photos and Internal Photos.

.....End of Report.....

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