

# **TEST REPORT**

APPLICANT : Shenzhen Chainway Information

Technology Co., Ltd

PRODUCT NAME : Mobile Data Terminal

MODEL NAME : C5

**BRAND NAME**: CHAINWAY

FCC ID : 2AC6AC5P

47 CFR Part 2

**STANDARD(S)** : 47 CFR Part 22 Subpart H

47 CFR Part 24 Subpart E

**RECEIPT DATE** : 2023-02-21

**TEST DATE** : 2023-02-22 to 2023-04-11

**ISSUE DATE** : 2023-07-17

Edited by:

Peng Mi (Rapporteur)

Approved by:

Shen Junsheng (Supervisor)

**NOTE:** This document is issued by Shenzhen Morlab Communications Technology Co., Ltd., the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.





# **DIRECTORY**

1. 1	Technical Information ····································
1.1.	Applicant and Manufacturer Information
1.2.	Equipment Under Test (EUT) Description
1.3.	Maximum E.R.P./E.I.R.P. and Emission Designator
1.4.	Test Standards and Results
1.5.	Environmental Conditions
2. 4	17 CFR Part 2, Part 22H,Part24E Requirements····································
2.1.	Conducted RF Output Power 7
2.2.	Occupied Bandwidth · · · · · · · · · · · · · · · · · · ·
2.3.	Frequency Stability · · · · · · · · · · · · · · · · · · ·
2.4.	Conducted Out of Band Emissions ······14
2.5.	Band Edge······16
	Determining E.R.P. and/or E.I.R.P. from conducted RF output power surements··················18
2.7.	Radiated Out of Band Emissions20
Ann	ex A Test Uncertainty ·······26
Ann	ex B Testing Laboratory Information······27

	Change History					
Version Date Reason for change						
1.0 2023-07-17		First edition				



# 1. Technical Information

Note: Provide by applicant.

## 1.1. Applicant and Manufacturer Information

Applicant: Shenzhen Chainway Information Technology Co., Ltd			
	9F Building 2, Daqian Industrial Park, District 67, XingDong		
Applicant Address:	Community, Xin'an Street, Bao'an District, Shenzhen,		
	Guangdong, China		
Manufacturer:	Shenzhen Chainway Information Technology Co., Ltd		
	9F Building 2, Daqian Industrial Park, District 67, XingDong		
Manufacturer Address:	Community, Xin'an Street, Bao'an District, Shenzhen,		
	Guangdong, China		

# 1.2. Equipment Under Test (EUT) Description

Product Name:	Mobile Data Terminal			
Sample No.:	13#			
Hardware Version:	C5_03			
Software Version:	C5P.GL.A2.HB.FHD.GIT428573e93da.2022102114.V1.03.05			
	CDMA2000 1xRTT	: BPSK,QPSK		
Modulation Type:	CDMA2000 1xEVD	OO Rev 0: BPSK		
	CDMA2000 1xEVD	OO Rev A: BPSK,QPSK,8PSK		
Operating Fraguency Benge	CDMA 2000 BC0	Tx: 824MHz-849MHz		
Operating Frequency Range:	CDIVIA 2000 BC0	Rx: 869MHz-894MHz		
Antenna Type:	PIFA Antenna			
Antenna Gain:	CDMA 2000 BC0	-2.60dBi		
	Battery			
	Brand Name:	Chainway		
	Model No.: C5			
	Serial No.:	N/A		
Accessory Information:	Capacity:	6300mAh		
	Rated Voltage:	3.6V		
	Charge Limit:	4.2V		
	Manufacturer:	DONGGUAN BOB ELECTRONICS CO.,LTD		



Tel: 86-755-36698555

Http://www.morlab.cn



	Battery 2			
	Brand Name:	ZOUYOU		
	Model No.:	501030		
	Serial No.:	N/A		
	Capacity:	100mAh		
	Rated Voltage:	3.7V		
	Charge Limit:	4.2V		
	Manufacturer:	Shenzhen Zonyou Power Co., Ltd.		
	AC Adapter	AC Adapter		
Accessory Information:	Brand Name:	ULLPOWER		
	Model No.:	NA010050020		
	Serial No.:	N/A		
	Rated Output:	5V=2A		
	Rated Input:	100-240V~50/60Hz, 0.5A		
	Manufacturer:	Shenzhen Shi Yingyuan Electronics Co.,		
		Ltd		
	USB Cable			
	Model No.:	1.8.17.095		
	Manufacturer:	King Power Electronics Co., Ltd.		

**Note 1:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

# 1.3. Maximum E.R.P./E.I.R.P. and Emission Designator

Test Mode Maximum E.R.P./E.I.R.P. (W)		Emission Designator
CDMA2000 BC0	0.083	1M27F9W



### 1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22 and Part24 for the EUT FCC ID Certification:

No.	Identity	Document Title		
1 47 CFR Part 2 (10-1-12 Edition)		Frequency Allocations and Radio Treaty Matters;		
1	47 CFR Part 2 (10-1-12 Edition)	General Rules and Regulations		
2	47 CFR Part 22 (10-1-12 Edition)	Public Mobile Services		
3	47 CFR Part 24 (10-1-12 Edition)	Personal Communications Services		

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method determination/ Remark
1	2.1046	Conducted RF Output Power	Feb. 22, 2023	Chen Hao	PASS	No deviation
2	N/A	Peak -Average Ratio	N/A	N/A	N/A	N/A
3	2.1049	Occupied Bandwidth	Feb. 22, 2023	Li Huaijie	PASS	No deviation
4	2.1055, 22.355, 24.235	Frequency Stability	Feb. 22, 2023	Li Huaijie	PASS	No deviation
5	2.1051, 22.917(a), 24.238(a)	Conducted Out of Band Emissions	Feb. 22, 2023	Li Huaijie	PASS	No deviation
6	2.1051, 22.917(a), 24.238(a)	Band Edge	Feb. 22, 2023	Li Huaijie	PASS	No deviation
7	22.913(a) 24.232(c)	Transmitter Radiated Power (EIPR/E.R.P.)	Feb. 22, 2023	Li Huaijie	PASS	No deviation
8	2.1053, 22.917(a), 24.238(a)	Radiated Out of Band Emissions	Mar. 14, 2023	Su Zhan	PASS	No deviation

**Note 1:** The tests were performed according to the method of measurements prescribed in KDB971168 D01 v03r01 and ANSI/TIA-603-E-2016.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in





the test equipments. The ref offset 24.5dB contains two parts that cable loss 14.5dB and Attenuator 10dB.

**Note 3:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

**Note 4:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

### 1.5. Environmental Conditions

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

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106





# 2.47 CFR Part 2, Part 22H, Part24E Requirements

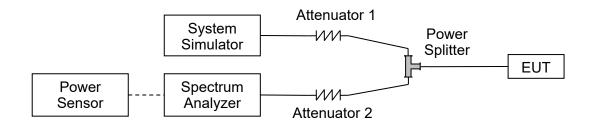
### 2.1. Conducted RF Output Power

### 2.1.1. Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

#### 2.1.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.



### 2.1.3. Test Result

CDMA2000 BC0	Δ		
TX Channel	1013	384	777
Frequency (MHz)	824.7	836.52	848.31
1xRTT RC1 SO55	23.46	23.58	23.57
1xRTT RC3 SO55	23.39	23.49	23.51
1xRTT RC3 SO32 (F+SCH)	23.20	23.22	23.29
1xRTT RC3 SO32 (+SCH)	23.14	23.22	23.22
1xEVDO RTAP 153.6Kbps	23.81	23.93	23.87
1xEVDO RETAP 4096Bits	23.44	23.55	23.56



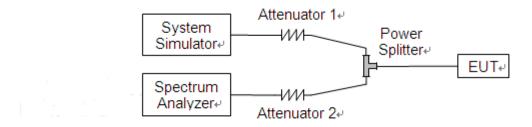
### 2.2. Occupied Bandwidth

### 2.2.1. Requirement

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Occupied bandwidth is also known as the 99% emission bandwidth.

### 2.2.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

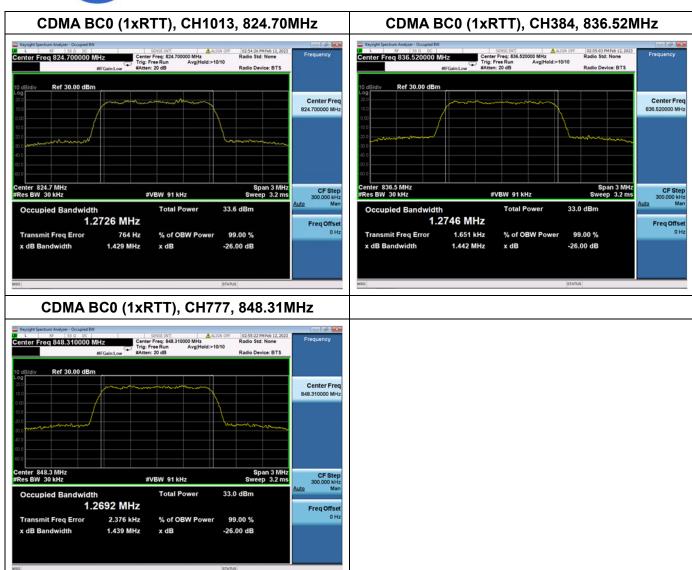
Shenzhen Morlab Communications Technology Co., Ltd.



### 2.2.3. Test Result

CDMA2000 BC0							
Mode	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)			
	1013	824.70	1.27	1.43			
1xRTT	384	836.52	1.27	1.44			
	777	848.31	1.27	1.44			









### 2.3. Frequency Stability

### 2.3.1. Requirement

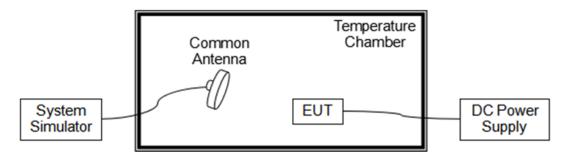
According to FCC section 22.355 the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from-30°C to +50°C at intervals of not more than 10°C.
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

**Note:** The operating temperature of EUT is from -20°C to 50°C, which are specified by the applicant.

#### 2.3.2. Test Description

Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.



### 2.3.3. Test Result

The nominal, highest and lowest extreme voltages are separately 3.60V, 4.20V and 3.00V, which are specified by the applicant; the normal temperature here used is 20°C.

	CDMA2000 BC0 (1xRTT), CH384, 836.52MHz							
	Limit =±2.5ppm							
Voltage (%)	Power (VDC)	Temp (°C)	Fre. Dev. (Hz)	Deviation (ppm)	Result			
Normal		+20(Ref)	13	0.016				
Normal		-20	-21	-0.025				
Normal		-10	5	0.006				
Normal		0	15	0.018				
Normal	3.60	+10	17	0.020				
Normal		+20	18	0.022	PASS			
Normal		+30	14	0.017				
Normal		+40	4	0.005				
Normal		+50	20	0.024	7			
High	4.20	+20	18	0.022				
BATT.ENDPOINT	3.00	+20	16	0.019				





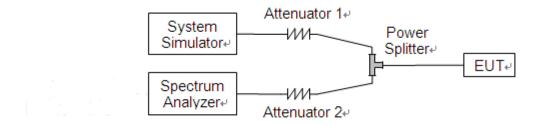
### 2.4. Conducted Out of Band Emissions

### 2.4.1. Requirement

According to FCC section 22.917(a) and 24.238(a) 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. This calculated to be -13dBm. The measurement frequency range is from 30MHz to the 10<sup>th</sup> harmonic of the fundamental frequency.

### 2.4.2. Test Description

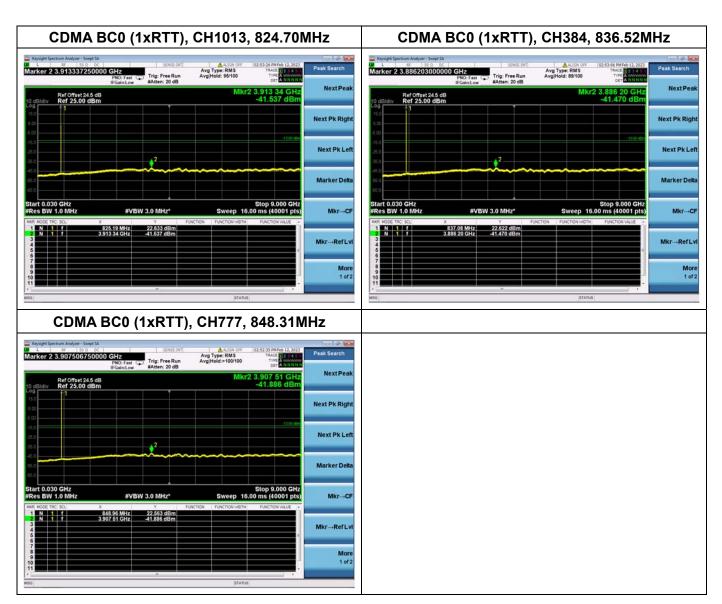
Test Setup:



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.



#### 2.4.3. Test Result







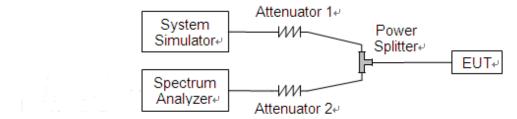
### 2.5. Band Edge

### 2.5.1. Requirement

According to FCC section 22.917(a) and 24.238(a) 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. This calculated to be -13dBm. The measurement frequency range is from 30MHz to the 10<sup>th</sup> harmonic of the fundamental frequency.

### 2.5.2. Test Description

Test Setup:



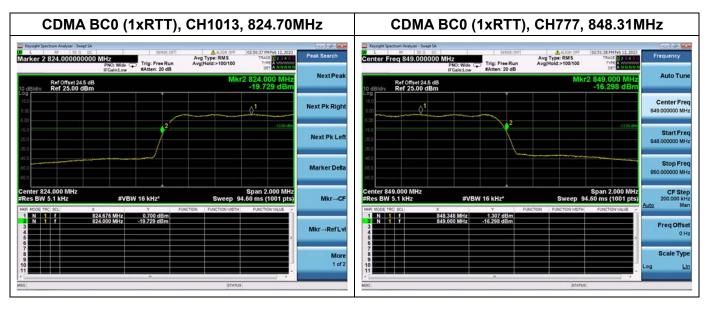
The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

E-mail: service@morlab.cn



### 2.5.3. Test Result

The lowest and highest channels are tested to verify the band edge emissions.







# 2.6. Determining E.R.P. and/or E.I.R.P. from conducted RF output power measurements

#### 2.6.1. Requirement

According to FCC section 22.913, the Effective Radiated Power (E.R.P.) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to FCC section 24.232, the broadband PCS mobile station is limited to 2 Watts e.i.r.p. peak power.

#### 2.6.2. Test Description

The test setups refer to section 2.1.3

A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power (i.e. GSM850MHz band Power Control Level (PCL) = 5/19 and Power Class = 4, GSM1900MHz band Power Control Level (PCL) = 0/15 and Power Class = 1), and only the test result of the maximum output power was recorded. Please refer to section 2.1.3 of this report.

The relevant equation for determining the maximum E.R.P. or E.I.R.P. from the measured RF output power is given in Equation (1) as follows:

E.R.P. or E.I.R.P. =  $P_{Meas} + G_{T}$ 

Where:

E.R.P. or E.I.R.P. effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as  $P_{Meas}$ , e.g., dBm or dBW)

P<sub>Meas</sub> measured transmitter output power or PSD, in dBm or dBW

G<sub>T</sub> gain of the transmitting antenna, in dBd (E.R.P.) or dBi (E.I.R.P.)

For devices utilizing multiple antennas, see ANSI C63.25-2015 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

The following equations demonstrate the mathematical relationship between E.R.P. and E.I.R.P.:

- a) E.R.P. = E.I.R.P. 2.15, where E.R.P. and E.I.R.P. are expressed in consistent units.
- b) E.I.R.P. = E.R.P. + 2.15, where E.R.P. and E.I.R.P. are expressed in consistent units.





### 2.6.3. Test Result

			CD	MA2000 BC0				
Band	Channel	Frequency	DCI	Measured E.R.P. Limit		nit	Vardiat	
Бапа	Channel	(MHz)	PCL	dBm	W	dBm	W	Verdict
	1013	824.70	5	18.71	0.074		7	PASS
1xRTT	384	836.52	5	18.83	0.076	38.5		PASS
	777	848.31	5	18.82	0.076			PASS
1vE\/D0	1013	824.70	5	18.45	0.070		7	PASS
1xEVDO Rev 0	384	836.52	5	18.47	0.070	38.5		PASS
Revu	777	848.31	5	18.54	0.071			PASS
1vE\/D0	1013	824.70	5	19.06	0.081			PASS
1xEVDO	384	836.52	5	19.18	0.083	38.5	7	PASS
Rev A	777	848.31	5	19.12	0.082			PASS
Note 1: O	nly the wors	t data were red	corded i	n this report.				

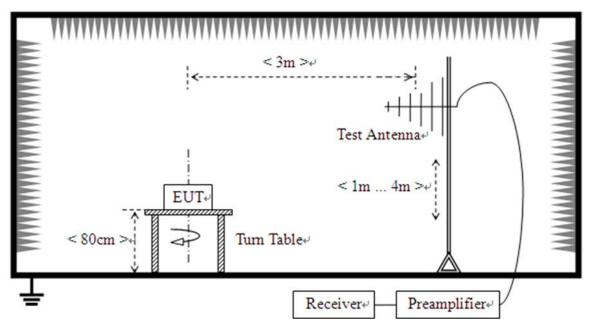


### 2.7. Radiated Out of Band Emissions

### 2.7.1. Requirement

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. This calculated to be -13dBm. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency.

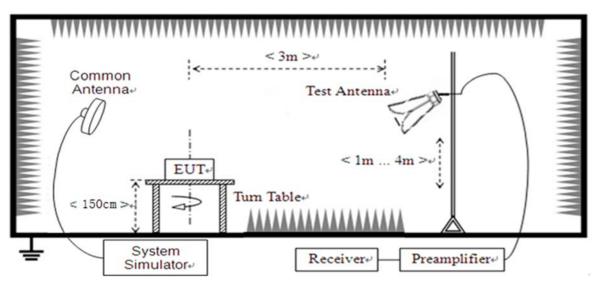
### 2.7.2. Test Description



(For the test frequency from 30MHz to1GHz)

Shenzhen Morlab Communications Technology Co., Ltd.





(For the test frequency above 1GHz)

The EUT is located in a 3m Full-Anechoic Chamber, the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading.

A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power, and only the test result of the maximum output power was recorded.

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground and the Turn Table is actuated to turn from 0° to 360° to determine the maximum value of the radiated power. The emission levels at both horizontal and vertical polarizations should be tested. The Filters consists of Notch Filters and High Pass Filter.

**Note:** When doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

#### 2.7.3. Test Procedure

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements.





#### 2.7.4. Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions.

The substitution corrections are obtained as described below:

A<sub>SUBST</sub> = P<sub>SUBST</sub> TX - P<sub>SUBST</sub> RX - L<sub>SUBST</sub> CABLES + G<sub>SUBST</sub> TX ANT

 $A_{TOT} = L_{CABLES} + A_{SUBST}$ 

Where A<sub>SUBST</sub> is the final substitution correction including receive antenna gain.

P<sub>SUBST\_TX</sub> is signal generator level,

P<sub>SUBST RX</sub> is receiver level,

L<sub>SUBST CABLES</sub> is cable losses including TX cable,

G<sub>SUBST TX</sub> ANT is substitution antenna gain.

A<sub>TOT</sub> is total correction factor including cable loss and substitution correction

During the test, the data of  $A_{TOT}$  was added in the test spectrum analyze, so spectrum analyze reading is the final values which contain the data of  $A_{TOT}$ .

**Note1:** The power of the EUT transmitting frequency should be ignored.

**Note2:** All test mode and condition mentioned were considered and evaluated respectively by performing full test, only the worst data were recorded and reported.

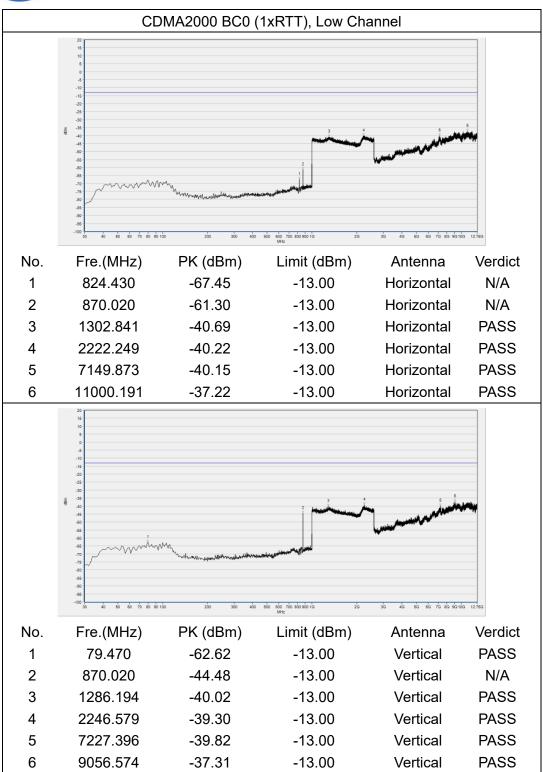
**Note3:** All spurious emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

**Note4:** N/A means the frequency is the basic frequency or the base station frequency, they are no need to verdict.

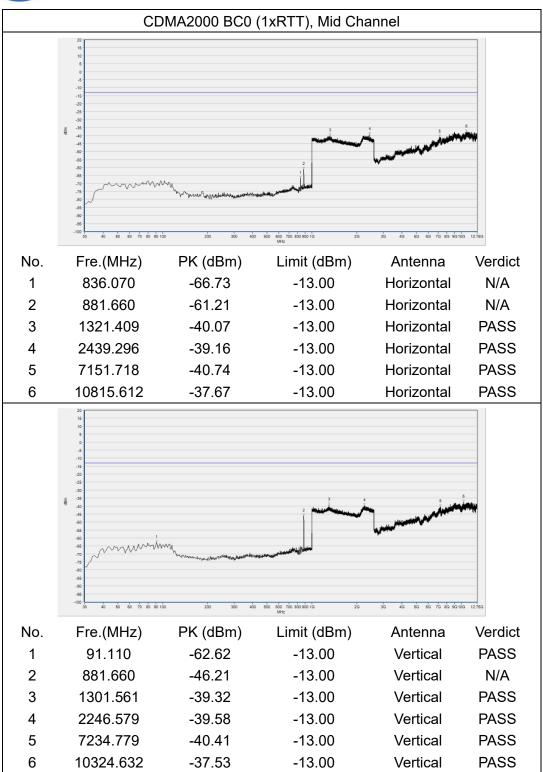
**Note5:** The amplitude of emissions(18GHz to 10th harmonics) which are attenuated more than 20 dB below the limit are not be reported.



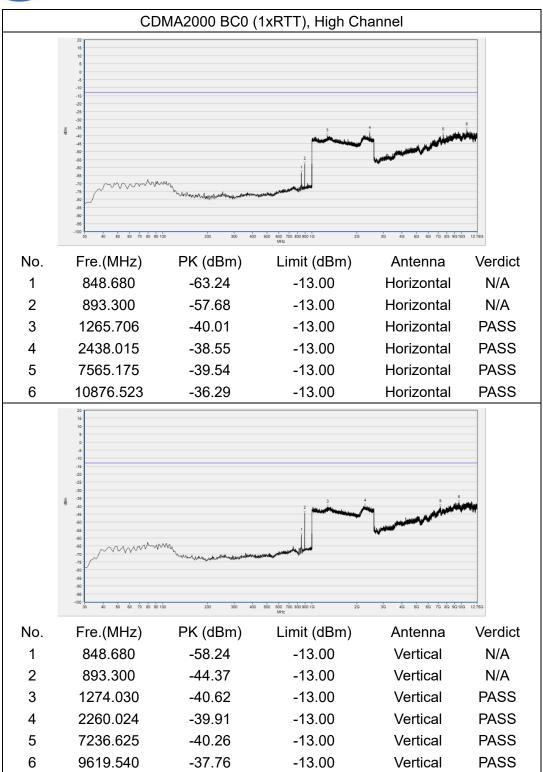














# **Annex A Test Uncertainty**

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Output Power	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77dB
Radiated Emission	±2.95dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.





# **Annex B Testing Laboratory Information**

### 1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
	FL.3, Building A, FeiYang Science Park, No.8 LongChang
Laboratory Address:	Road, Block 67, BaoAn District, ShenZhen, GuangDong
	Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

### 2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
	FL.3, Building A, FeiYang Science Park, No.8 LongChang
Address:	Road, Block 67, BaoAn District, ShenZhen, GuangDong
	Province, P. R. China

#### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.





### 4. Test Equipments Utilized

### **4.1 Conducted Test Equipments**

<b>Equipment Name</b>	Serial No.	Type	Manufacturer	Cal. Date	Due Date
EXA Signal Analyzer	MY51511149	N9020A	Agilent	2022.07.04	2023.07.03
System Simulator	6200995016	MT8820C	Anritsu	2022.10.10	2023.10.09
Temperature Chamber	20171112102	HZ-2019	Dongguan Lixian Instrument Technology Co., Ltd	2022.10.10	2023.10.09

### 4.2 List of Software Used

Description	Manufacturer	Software Version
MORLAB EMCR V1.2	MORLAB	V1.0



### 4.3 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
System Simulator	152038	CMW500	R&S	2022.10.11	2023.10.10
Receiver	Receiver MY54130016 N9038A		Agilent	2022.07.07	2023.07.06
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2022.05.25	2025.05.24
Test Antenna - Horn	9120D-963	BBHA 9120D	Schwarzbeck	2022.05.23	2025.05.24
RF Coaxial Cable (DC-18GHz)	MRE001	PE330	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-18GHz)	MRE002	CLU18	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-18GHz)	MRE003	CLU18	Pasternack	2022.07.08	2023.07.07
RF Coaxial Cable (DC-40GHz)	22290045	QA360-40-K K-0.5	Qualwave	2022.07.08	2023.07.07
RF Coaxial Cable (DC-40GHz)	22290046	QA360-40-K KF-2	Qualwave	2022.07.08	2023.07.07
Preamplifier (10MHz-6GHz)	46732	S10M100L38 02	LUCIX CORP.	2022.07.08	2023.07.07
Preamplifier (2GHz-18GHz)	61171/61172	S020180L32 03	LUCIX CORP.	2022.07.08	2023.07.07
Preamplifier (18GHz-40GHz)	DS77209	DCLNA0118- 40C-S	Decentest	2022.07.23	2023.07.22
Notch Filter	N/A	WRCG-CDM A2000 BC0	Wainwright	2022.07.08	2023.07.07
Notch Filter	N/A	WRCG-CDM A2000 BC1	Wainwright	2022.07.08	2023.07.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2022.05.10	2025.05.09

END OF REPORT _
-----------------

