



TEST REPORT

APPLICANT : Bullitt Group

PRODUCT NAME : 4G Mobile Phone

MODEL NAME : S62

BRAND NAME : CAT

FCC ID : ZL5S62

STANDARD(S) : 47 CFR Part 22 Subpart H
47 CFR Part 24 Subpart E
47 CFR Part 90, Subpart S

RECEIPT DATE : 2021-06-04

TEST DATE : 2021-07-04 to 2021-08-17

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Shen Junsheng (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2021-08-20	First edition





1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Bullitt Group
Applicant Address:	One Valpy, Valpy Street, Reading, Berkshire, RG1 1AR, United Kingdom
Manufacturer:	Bullitt Group
Manufacturer Address:	One Valpy, Valpy Street, Reading, Berkshire, RG1 1AR, United Kingdom

1.2. Equipment Under Test (EUT) Description

Product Name:	4G Mobile Phone	
Sample No.:	1#	
Hardware Version:	Q190_V1	
Software Version:	LTE_S02111.10_N_S62_0	
Modulation Type:	CDMA2000 1xRTT: BPSK,QPSK CDMA2000 1xEVDO Rev 0: BPSK CDMA2000 1xEVDO Rev A: BPSK,QPSK,8PSK	
Operating Frequency Range:	CDMA 2000 BC0	Tx: 824MHz-849MHz Rx: 869MHz-894MHz
	CDMA 2000 BC1	Tx: 1850MHz-1910MHz Rx: 1930MHz-1990MHz
	CDMA 2000 BC10	Tx: 816MHz-824MHz Rx: 861MHz-869MHz
Antenna Type:	Fixed Internal Antenna	
Antenna Gain:	CDMA 2000 BC0	-1.10dBi
	CDMA 2000 BC1	-2.00dBi
	CDMA 2000 BC10	-1.10dBi



Accessory Information:	Battery	
	Brand Name:	Gaoyuan Battery
	Model No.:	XQ6602G
	Serial No.:	N/A
	Capacity:	4000mAh
	Rated Voltage:	3.8V
	Charge Limit:	4.35V
	Manufacturer:	Hunan Gaoyuan Battery Co., Ltd.
	AC Adapter 1	
	Brand Name:	AOHAI
	Model No.:	A138-120150C-US1
	Serial No.:	N/A
	Rated Output:	5V=3A, 9V=2A, 12V=1.5A 3.3-5.9V=3A, 3.3-11V=2A
	Rated Input:	100-240V~50/60Hz, 0.5A
	Manufacturer:	Jiangxi Jian Aohai Technology Co.,Ltd.
Accessory Information:	AC Adapter 2	
	Brand Name:	N/A
	Model No.:	ZSS-018U120150
	Serial No.:	N/A
	Rated Output:	5V=3A, 9V=2A, 12V=1.5A 3.3-5.9V=3A, 3.3-11V=2A
	Rated Input:	100-240V~50/60Hz, 0.5A
	Manufacturer:	Zhuzhou Zopose Technology Co., Ltd

Note 1: This is a variant report to request a Class II Permissive change for the original report (Report No.: XM20070009W05, FCC ID: ZL5S62) which issued on Feb 19, 2021 by XIAMEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

Based on the similarity between before, modify the antenna and add an adapter. Antenna optimization, antenna pattern, antenna matching and antenna gain are different. The antenna type remains unchanged. Due to the above changes, we have evaluated and retested conducted power and worst case of radiated spurious emissions, the test results are better than before, all other test items are no need to be retested. We only recorded the conducted power, E.I.P.R./E.R.P. and worse case of radiated spurious emissions in this report.

Note 2: 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)
CDMA2000 BC0	0.105
CDMA2000 BC1	0.072
CDMA2000 BC10	0.107

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; 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
4	47 CFR Part 90	Miscellaneous Wireless 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, 90.635(b)	Conducted RF Output Power	Aug 16, 2021	Liang Yumei	PASS	No deviation
2	22.913(a), 24.232(c), 90.635(b)	Transmitter Radiated Power (EIPR/E.R.P.)	Aug 17, 2021	Huang Zhiye	PASS	No deviation
3	2.1051, 22.917(a), 24.238(a), 90.691	Radiated Out of Band Emissions	Aug 18, 2021	Lin Jiayong	PASS	No deviation

Note 1: The test results of all test items please refer to the original test report (Report No.: XM20070009W05, FCC ID: ZL5S62) which issued on Feb 19, 2021 by XIAMEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

Note 2: 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 3: 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, Part90S Requirements

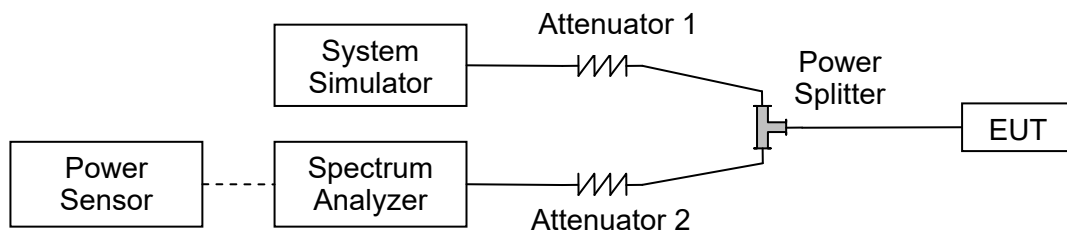
2.1. Conducted RF Output Power

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 50Ohm; 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	Average Power (dBm)		
TX Channel	1013	384	777
Frequency (MHz)	824.7	836.52	848.31
1xRTT RC1 SO55	23.26	23.23	23.33
1xRTT RC3 SO55	23.33	23.27	23.23
1xRTT RC3 SO32 (F+SCH)	23.43	23.45	23.28
1xRTT RC3 SO32 (+SCH)	23.21	23.14	23.15
1xEVDO RTAP 153.6Kbps	23.46	23.17	23.44
1xEVDO RETAP 4096Bits	22.90	23.43	22.94

CDMA2000 BC1	Average Power (dBm)		
TX Channel	25	600	1175
Frequency (MHz)	1851.25	1880	1908.75
1xRTT RC1 SO55	20.40	20.47	20.33
1xRTT RC3 SO55	20.39	20.35	20.28
1xRTT RC3 SO32 (F+SCH)	20.45	20.45	20.34
1xRTT RC3 SO32 (+SCH)	20.44	20.47	20.43
1xEVDO RTAP 153.6Kbps	20.56	20.46	20.41
1xEVDO RETAP 4096Bits	20.40	20.39	20.34

CDMA2000 BC10	Average Power (dBm)		
TX Channel	476	580	684
Frequency (MHz)	817.9	820.5	823.1
1xRTT RC1 SO55	23.49	23.47	23.42
1xRTT RC3 SO55	23.44	23.42	23.46
1xRTT RC3 SO32 (F+SCH)	23.54	23.54	23.51
1xRTT RC3 SO32 (+SCH)	23.51	23.52	23.52
1xEVDO RTAP 153.6Kbps	23.55	23.38	23.37
1xEVDO RETAP 4096Bits	23.07	23.02	23.07



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

2.2.1. Requirement

According to FCC section 22.913 for CDMA BC0, 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 for CDMA BC1, the broadband PCS mobile station is limited to 2 Watts e.i.r.p. peak power.

According to FCC section 90.635(b) for CDMA BC10, the maximum output power of the transmitter for mobile stations is 100 watts.

2.2.2. 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:

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

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_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_{T} 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.





2.2.3. Test Result

CDMA2000 BC0								
Band	Channel	Frequency (MHz)	PCL	Measured E.R.P.		Limit		Verdict
				dBm	W	dBm	W	
1xRTT	1013	824.70	5	20.18	0.104	38.5	7	PASS
	384	836.52	5	20.20	0.105			PASS
	777	848.31	5	20.03	0.101			PASS
1xEVDO Rev 0	1013	824.70	5	20.21	0.105	38.5	7	PASS
	384	836.52	5	19.92	0.098			PASS
	777	848.31	5	20.19	0.104			PASS
1xEVDO Rev A	1013	824.70	5	19.65	0.092	38.5	7	PASS
	384	836.52	5	20.18	0.104			PASS
	777	848.31	5	19.69	0.093			PASS

Note 1: Only the worst data were recorded in this report.

CDMA2000 BC1								
Band	Channel	Frequency (MHz)	PCL	Measured E.R.P.		Limit		Verdict
				dBm	W	dBm	W	
1xRTT	25	1851.25	5	18.44	0.070	33	2	PASS
	600	1880.00	5	18.47	0.070			PASS
	1175	1908.75	5	18.43	0.070			PASS
1xEVDO Rev 0	25	1851.25	5	18.56	0.072	33	2	PASS
	600	1880.00	5	18.46	0.070			PASS
	1175	1908.75	5	18.41	0.069			PASS
1xEVDO Rev A	25	1851.25	5	18.40	0.069	33	2	PASS
	600	1880.00	5	18.39	0.069			PASS
	1175	1908.75	5	18.34	0.068			PASS

Note 1: Only the worst data were recorded in this report.





CDMA2000 BC10								
Band	Channel	Frequency (MHz)	PCL	Measured E.R.P.		Limit		Verdict
				dBm	W	dBm	W	
1xRTT	476	817.9	5	20.29	0.107	50	100	PASS
	580	820.5	5	20.29	0.107			PASS
	684	823.1	5	20.26	0.106			PASS
1xEVDO Rev 0	476	817.9	5	20.30	0.107	50	100	PASS
	580	820.5	5	20.13	0.103			PASS
	684	823.1	5	20.12	0.103			PASS
1xEVDO Rev A	476	817.9	5	19.82	0.096	50	100	PASS
	580	820.5	5	19.77	0.095			PASS
	684	823.1	5	19.82	0.096			PASS

Note 1: Only the worst data were recorded in this report.

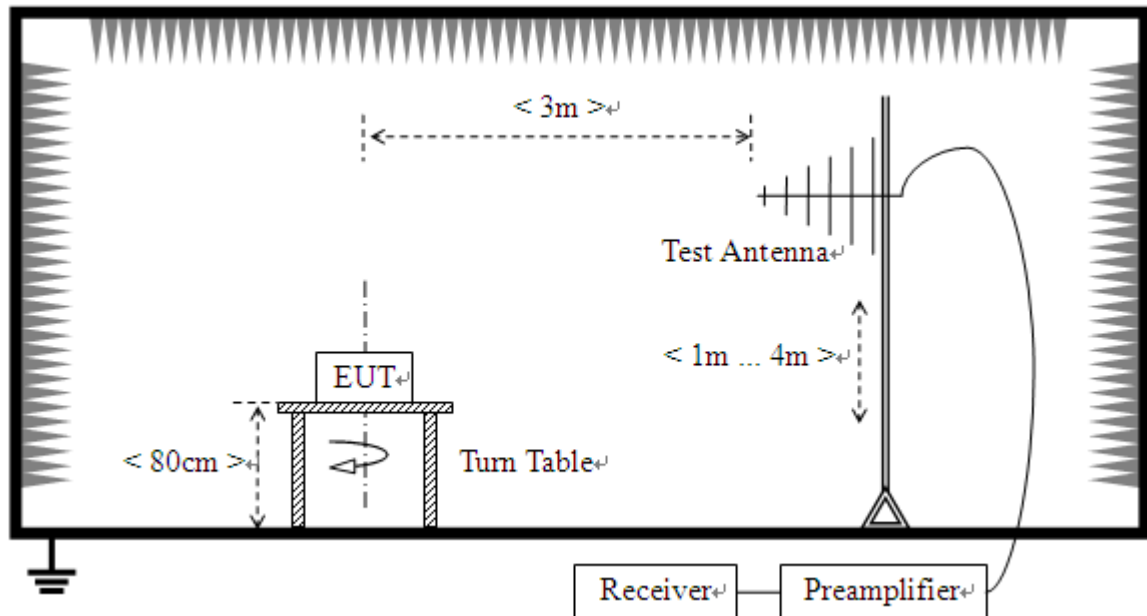


2.3. Radiated Out of Band Emissions

2.3.1. Requirement

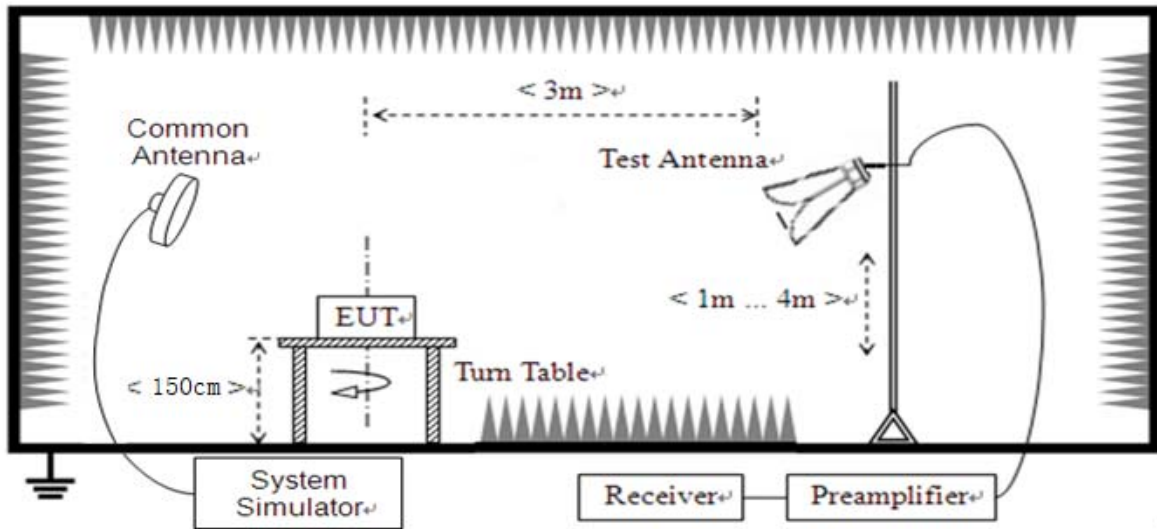
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43+10*\log(P)$ dB. This calculated to be -13dBm. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency.

2.3.2. Test Description



(For the test frequency from 30MHz to 1GHz)





(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.

2.3.3. 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.





2.3.4. 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:

$$A_{\text{SUBST}} = P_{\text{SUBST_TX}} - P_{\text{SUBST_RX}} - L_{\text{SUBST_CABLES}} + G_{\text{SUBST_TX_ANT}}$$

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

Where A_{SUBST} is the final substitution correction including receive antenna gain.

$P_{\text{SUBST_TX}}$ is signal generator level,

$P_{\text{SUBST_RX}}$ is receiver level,

$L_{\text{SUBST_CABLES}}$ is cable losses including TX cable,

$G_{\text{SUBST_TX_ANT}}$ is substitution antenna gain.

A_{TOT} 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.

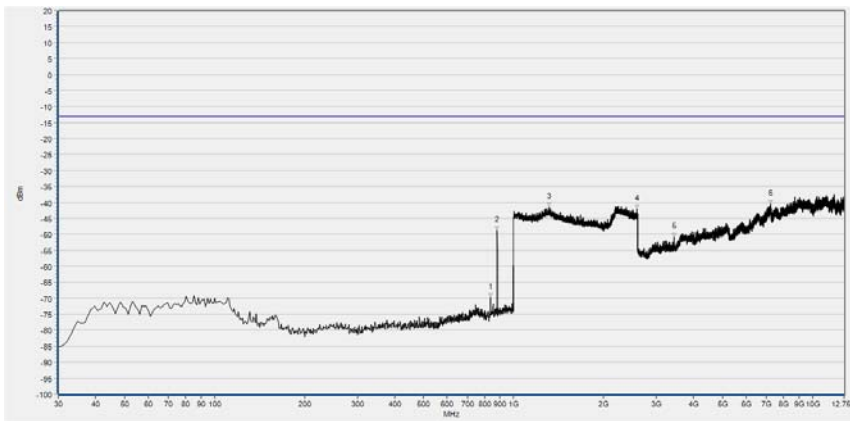
Note2: All test mode and condition mentioned were considered and evaluated respectively by performing full test, only the worst data were recorded and reported.

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.

Note 4: N/A means the frequency is the basic frequency or the base station frequency, they are no need to verdict.

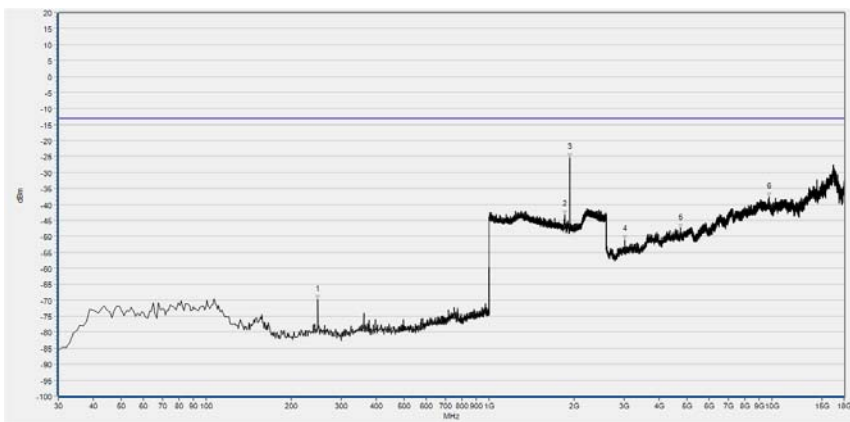


CDMA2000 BC0 (1xRTT), Mid Channel



No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	836.070	-69.79	-13.00	Horizontal	N/A
2	881.660	-48.91	-13.00	Horizontal	N/A
3	1314.366	-41.52	-13.00	Horizontal	PASS
4	2578.872	-42.19	-13.00	Horizontal	PASS
5	3441.680	-50.86	-13.00	Horizontal	PASS
6	7232.933	-40.60	-13.00	Horizontal	PASS

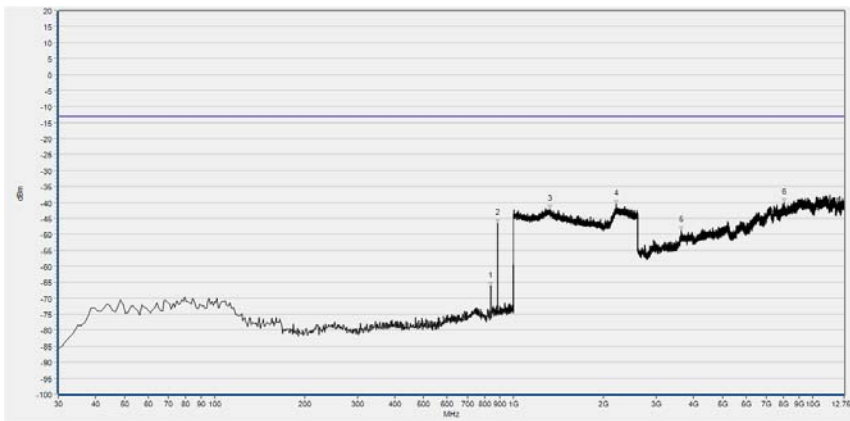
CDMA2000 BC1 (1xRTT), Low Channel



No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	248.250	-69.80	-13.00	Horizontal	PASS
2	1851.541	-43.14	-13.00	Horizontal	N/A
3	1930.932	-25.27	-13.00	Horizontal	N/A
4	3014.475	-51.13	-13.00	Horizontal	PASS
5	4753.592	-47.39	-13.00	Horizontal	PASS
6	9755.301	-37.72	-13.00	Horizontal	PASS



CDMA2000 BC10 (1xRTT), Low Channel



No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	838.980	-66.25	-13.00	Horizontal	N/A
2	884.570	-46.56	-13.00	Horizontal	N/A
3	1320.768	-42.16	-13.00	Horizontal	PASS
4	2198.559	-40.58	-13.00	Horizontal	PASS
5	3642.871	-48.92	-13.00	Horizontal	PASS
6	8024.777	-40.21	-13.00	Horizontal	PASS





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	$\pm 2.22\text{dB}$
Radiated Emission	$\pm 2.95\text{dB}$

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.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang 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.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang 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

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Power Splitter	NW521	1506A	Weinschel	N/A	N/A
Attenuator 1	(N/A.)	10dB	Resnet	N/A	N/A
Attenuator 2	(N/A.)	3dB	Resnet	N/A	N/A
EXA Signal Analyzer	MY51511149	N9020A	Agilent	2020.07.27	2021.07.26
				2021.07.26	2022.07.25
System Simulator	6200995016	MT8820C	Anritsu	2020.10.28	2021.10.27
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial Cable	CB02	RF02	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Temperature Chamber	20171112102	HZ-2019	Dongguan Lixian Instrument Technology Co., Ltd	2020.10.26	2021.10.25
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 List of Software Used

Description	Manufacturer	Software Version
Morlab FCC Test System	MORLAB	V2.8
MORLAB EMCR V1.2	MORLAB	V1.0





4.3 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
System Simulator	152038	CMW500	R&S	2020.11.19	2021.11.18
Receiver	MY54130016	N9038A	Agilent	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Coaxial cable (N male) (9kHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L3203	Tonscend	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
18-26.5GHz pre-Amplifier	46732	S10M100L3802	Tonscend	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
26-40GHz pre-Amplifier	56774	S40M400L4002	Tonscend	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-CDMA BC0	Wainwright	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-CDMA BC1	Wainwright	2020.07.21	2021.07.20
				2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-CDMA BC10	Wainwright	2020.07.21	2021.07.20
				2021.07.16	2022.07.15





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Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Anechoic Chamber	N/A	9m*6m*6m	CRT	2019.07.13	2022.07.12

_____ END OF REPORT _____

