



# TEST REPORT

**APPLICANT** : Shenzhen Tengfei Technology Management Ltd.

**PRODUCT NAME** : REDMAGIC MECHANICAL KEYBOARD

**MODEL NAME** : GK001J

**BRAND NAME** : REDMAGIC

**FCC ID** : 2A9QD-GK001J

**STANDARD(S)** : 47 CFR Part 15 Subpart B

**RECEIPT DATE** : 2022-11-23

**TEST DATE** : 2022-12-07 to 2022-12-09

**ISSUE DATE** : 2023-03-14

Edited by:

*Chen Bilian*  
Chen Bilian(Rapporteur)

Approved by:

*Xiao Xiong*

Xiao Xiong(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

<b>1. Technical Information</b> .....	<b>3</b>
<b>1.1. Applicant and Manufacturer Information</b> .....	<b>3</b>
<b>1.2. Equipment Under Test (EUT) Description</b> .....	<b>3</b>
<b>2. Test Results</b> .....	<b>4</b>
<b>2.1. Applied Reference Documents</b> .....	<b>4</b>
<b>2.2. EUT Setup and Operating Conditions</b> .....	<b>5</b>
<b>3. 47 CFR Part 15B Requirements</b> .....	<b>6</b>
<b>3.1. Conducted Emission</b> .....	<b>6</b>
<b>3.2. Radiated Emission</b> .....	<b>10</b>
<b>Annex A Test Uncertainty</b> .....	<b>17</b>
<b>Annex B Testing Laboratory Information</b> .....	<b>18</b>

Change History		
Version	Date	Reason for change
1.0	2023-03-14	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Shenzhen Tengfei Technology Management Ltd.
<b>Applicant Address:</b>	Room 3101, Building D1, Chuangzhi Yuncheng, Liuxian Avenue, Xili Street, Nanshan, Shenzhen, China
<b>Manufacturer:</b>	Shenzhen Tengfei Technology Management Ltd.
<b>Manufacturer Address:</b>	Room 3101, Building D1, Chuangzhi Yuncheng, Liuxian Avenue, Xili Street, Nanshan, Shenzhen, China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	REDMAGIC MECHANICAL KEYBOARD	
<b>EUT No.:</b>	1#	
<b>Hardware Version:</b>	GK001J	
<b>Software Version:</b>	GK001J_V1.1.0.35	
<b>Keyboard Tx&amp;Rx Frequency:</b>	Bluetooth: 2402 MHz ~ 2480 MHz 2.4G: 2402 MHz ~ 2480 MHz	
<b>USB Receiver Rx Frequency:</b>	2.4G: 2402 MHz ~ 2480 MHz	
<b>Accessory:</b>	<b>Battery</b> Brand Name: N/A Model No.: 606090 Serial No.: (N/A, marked #1 by test site) Capacity: 4000mAh Rated Voltage: 3.7V Charge Limit: 4.25V Manufacturer: Dongguan Heng xun Energy Technology CO., Ltd.	

**Note:**

1. For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer.



## 2. Test Results

### 2.1. Applied Reference Documents

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

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	15.107	Conducted Emission	2022.12.09	Fan Zehang	PASS	No deviation
2	15.109	Radiated Emission	2022.12.07	Lin Jiayong	PASS	No deviation

**Note 1:**The tests were performed according to the method of measurements prescribed in ANSI C63.4-2014.

**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.



## 2.2. EUT Setup and Operating Conditions

Test Item	
<b>Radiated Emission</b>	
Mode 1	EUT(Keyboard) + Bluetooth Link + 2.4G Idle + Adapter + Battery + USB Cable + PC + PC Adapter + Bluetooth Connection Mode
<b>Mode 2</b>	<b>EUT(Keyboard) + Bluetooth Idle + 2.4G Link + Adapter + Battery + USB Cable + USB Receiver + PC + PC Adapter +2.4G Connection Mode</b>
Mode 3	EUT(Keyboard) + Bluetooth Idle + 2.4G Idle + Battery + USB Cable + PC + PC Adapter + Wired Connection Mode
<b>Conducted Emission</b>	
Mode 1	EUT(Keyboard) + Bluetooth Link + 2.4G Idle + Adapter + Battery + USB Cable + PC + PC Adapter + Bluetooth Connection Mode
Mode 2	EUT(Keyboard) + Bluetooth Idle + 2.4G Link + Adapter + Battery + USB Cable + USB Receiver + PC + PC Adapter +2.4G Connection Mode
Mode 3	EUT(Keyboard) + Bluetooth Idle + 2.4G Idle + Battery + USB Cable + PC + PC Adapter + Wired Connection Mode
<b>Mode 4</b>	<b>EUT(USB Receiver) + 2.4G Link + PC + PC Adapter + Keyboard + 2.4G Connection Mode</b>
Mode 5	EUT(USB Receiver) + 2.4G Idle + PC + PC Adapter + Keyboard + Working Mode
<b>Remark:</b>	
The above test mode in boldface (Mode 4) was the worst case of conducted emission test, only the test data of these modes were reported. The above test mode in boldface (Mode 2) was the worst case of radiated emission test, only the test data of these modes were reported.	

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

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

## 3. 47 CFR Part 15B Requirements

### 3.1. Conducted Emission

#### 3.1.1. Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

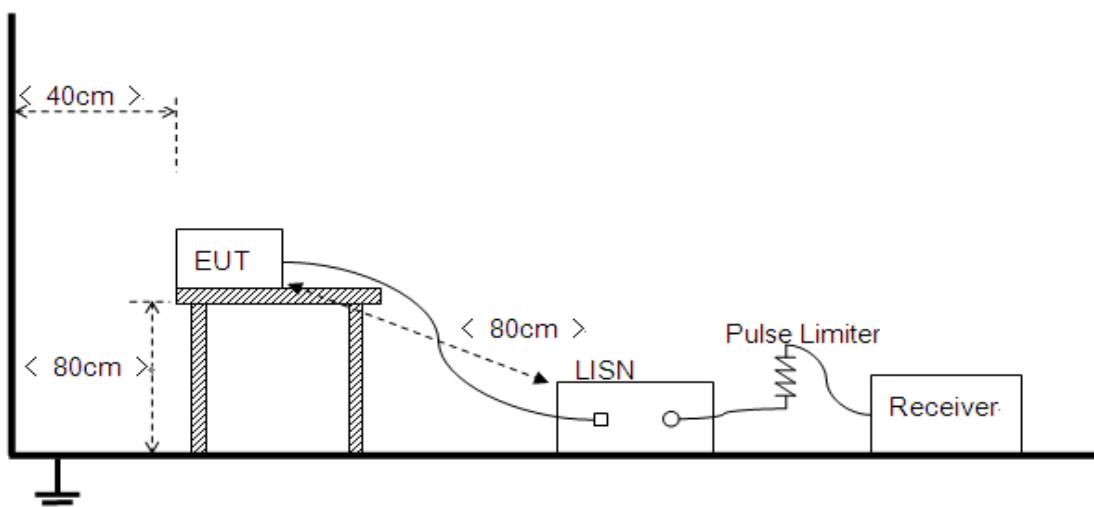
Frequency Range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

Note:

- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

#### 3.1.2. Test Setup

Please refer to Annex A for the photographs of the Test Configuration.



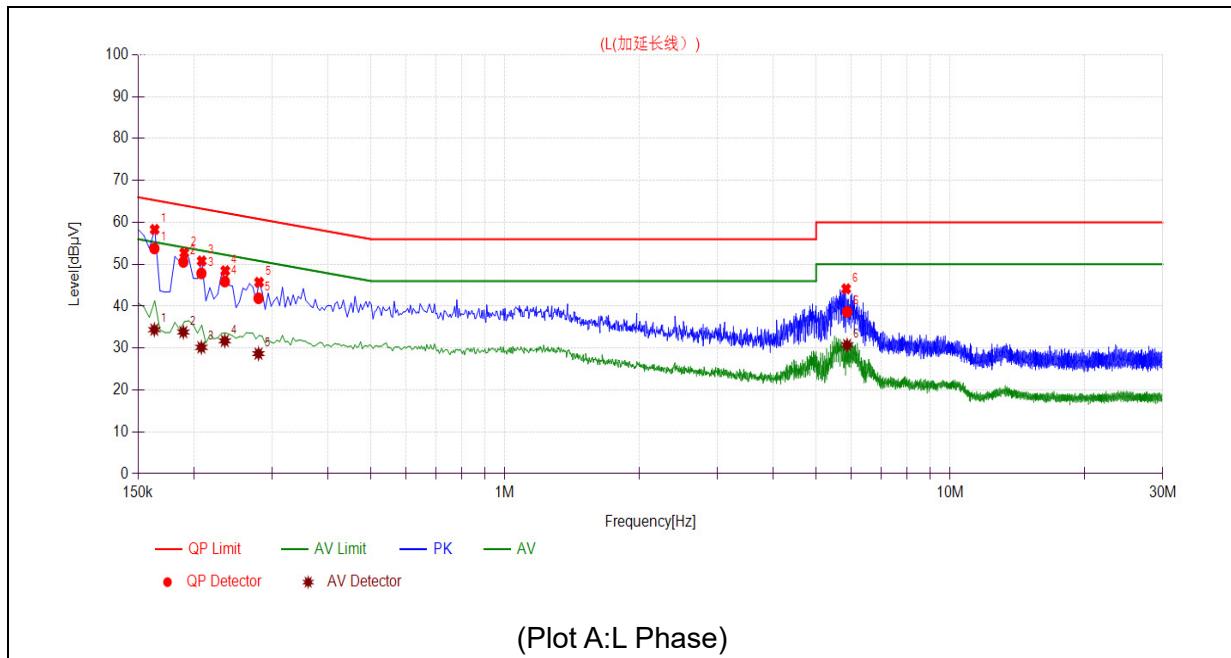


The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides  $50\Omega/50\mu\text{H}$  of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

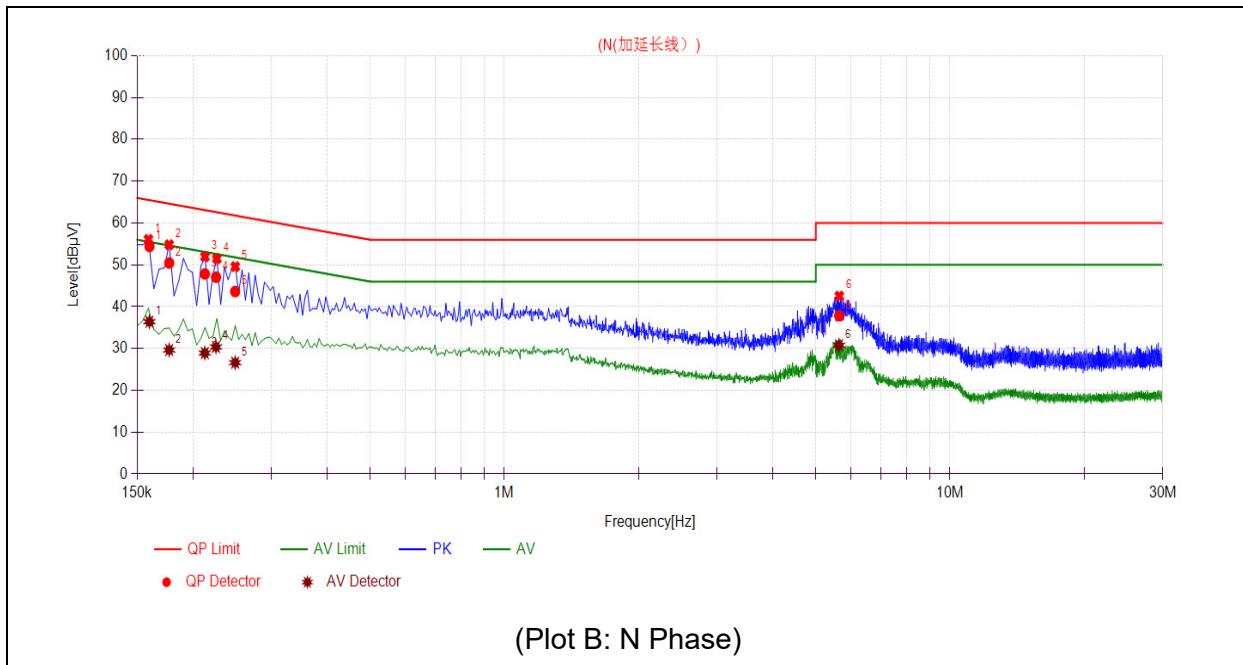
The power strip or extension cord has been investigated to make sure that the LISN integrity is maintained with respect to the impedance characteristics as prescribed in ANSI C63.4-2014 at Clause 4.3.

### 3.1.3. Test Result

Set RBW=9 kHz, VBW=30 kHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

**A. Test Plot and Suspicious Points:**


No.	Fre. (MHz)	Emission Level (dB $\mu$ V)		Limit (dB $\mu$ V)		Power-line	Verdict
		Quasi-peak	Average	Quasi-peak	Average		
1	0.1632	53.77	34.39	65.30	55.30	Line	PASS
2	0.1896	50.55	33.83	64.05	54.05		PASS
3	0.2081	47.82	30.17	63.28	53.28		PASS
4	0.2349	45.88	31.72	62.27	52.27		PASS
5	0.2796	41.88	28.67	60.83	50.83		PASS
6	5.8666	38.66	30.73	60.00	50.00		PASS



No.	Fre. (MHz)	Emission Level (dB $\mu$ V)		Limit (dB $\mu$ V)		Power-line	Verdict
		Quasi-peak	Average	Quasi-peak	Average		
1	0.1598	54.41	36.41	65.48	55.48	Neutral	PASS
2	0.1770	50.45	29.66	64.62	54.62		PASS
3	0.2128	47.84	28.92	63.10	53.10		PASS
4	0.2254	47.06	30.38	62.62	52.62		PASS
5	0.2489	43.63	26.62	61.79	51.79		PASS
6	5.6381	37.84	30.79	60.00	50.00		PASS



## 3.2. Radiated Emission

### 3.2.1. Requirement

According to FCC section 15.109 (a), the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency Range (MHz)	Field Strength Limitation at 3m Measurement Dist	
	( $\mu$ V/m)	(dB $\mu$ V/m)
30.0 - 88.0	100	20log 100
88.0 - 216.0	150	20log 150
216.0 - 960.0	200	20log 200
Above 960.0	500	20log 500

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dB $\mu$ V/m is calculated by 20log Emission Level( $\mu$ V/m).

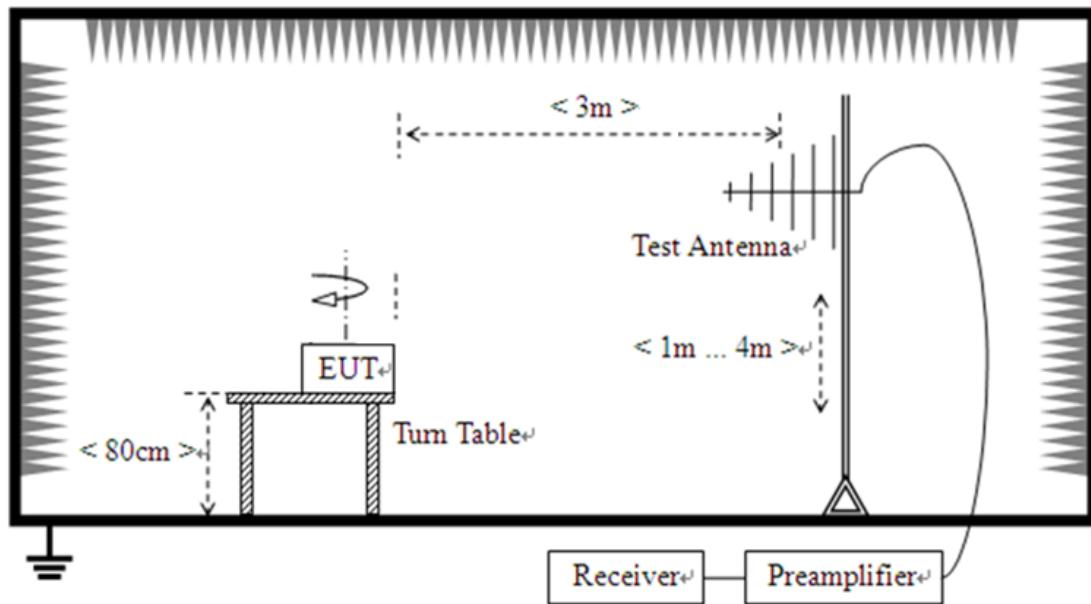
### 3.2.2. Frequency Range of Measurement

According to 15.33(b)(1), the frequency range of radiated measurement for the EUT is listed in the following table:

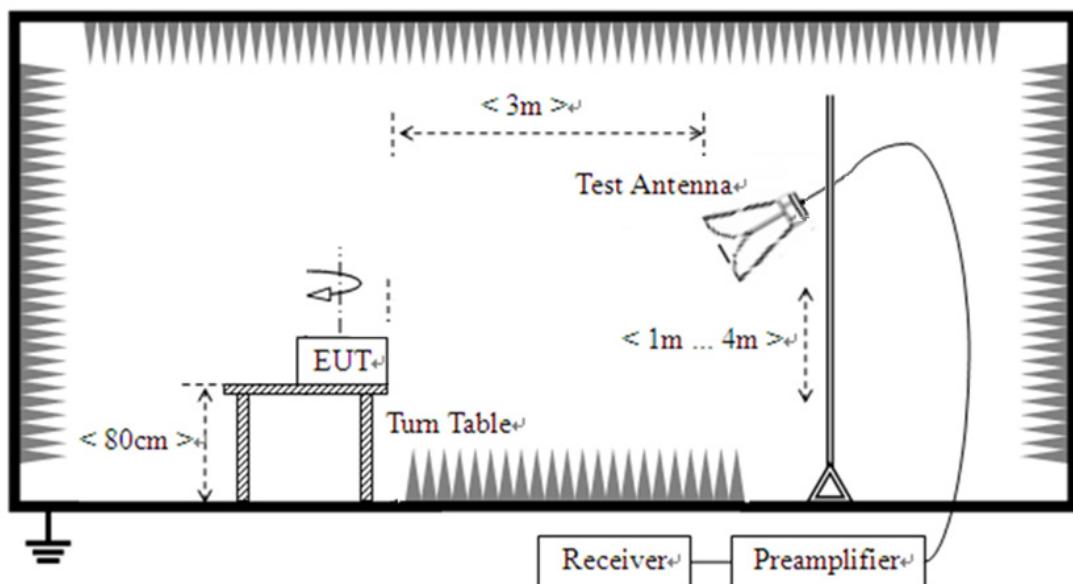
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705 .....	30.
1.705–108 .....	1000.
108–500 .....	2000.
500–1000 .....	5000.
Above 1000 .....	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

### 3.2.3. Test Setup

- 1) For radiated emissions from 30MHz to1GHz



- 2) For radiated emissions above 1GHz





The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

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 to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

For measurements below 1GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

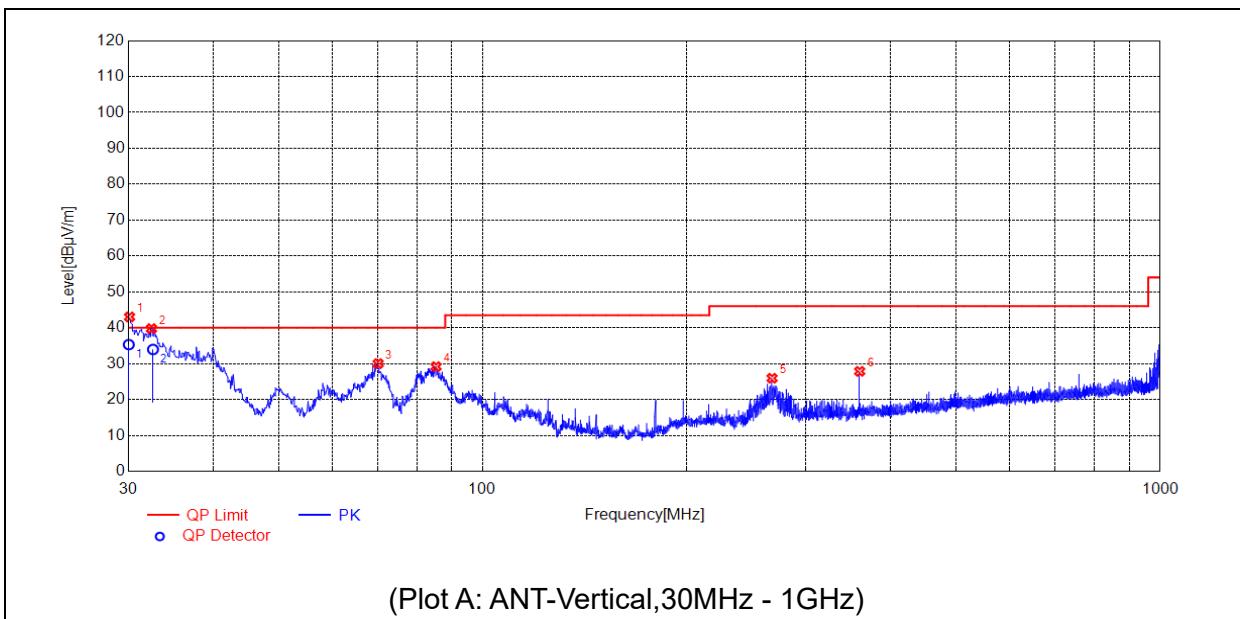
For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video bandwidth is set to 3MHz for peak measurements and as applicable for average measurements.

### 3.2.4. Test Result

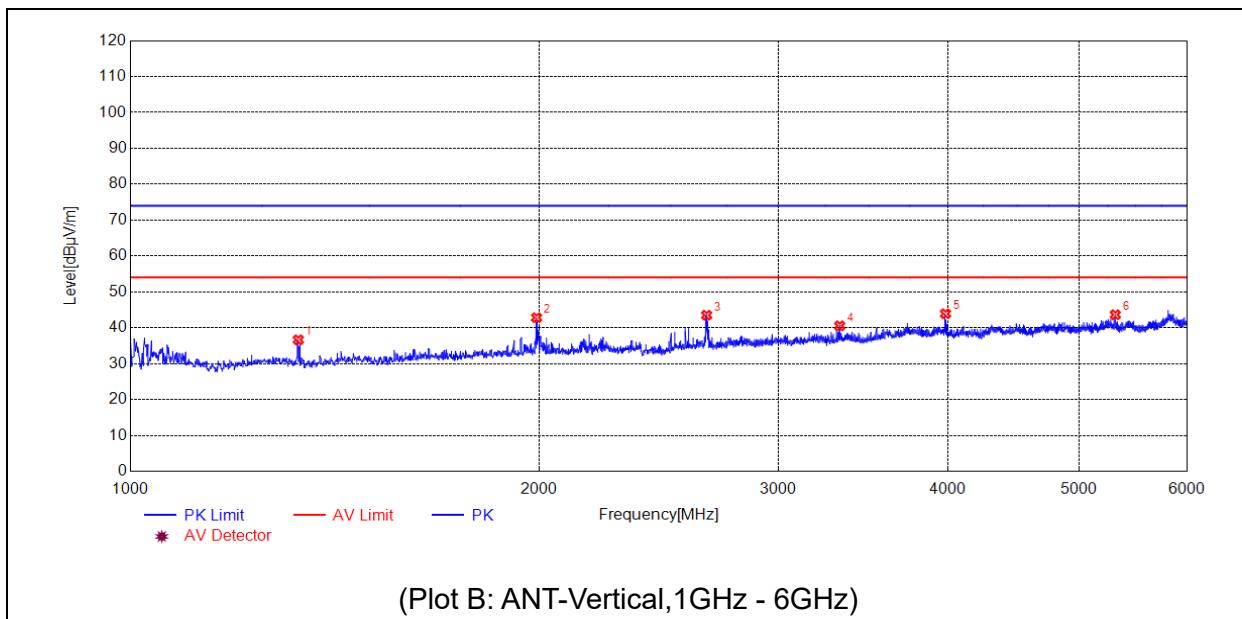
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

The amplitude of emissions (6GHz-12.5GHz) which are attenuated more than 20 dB below the permissible value need not be reported.

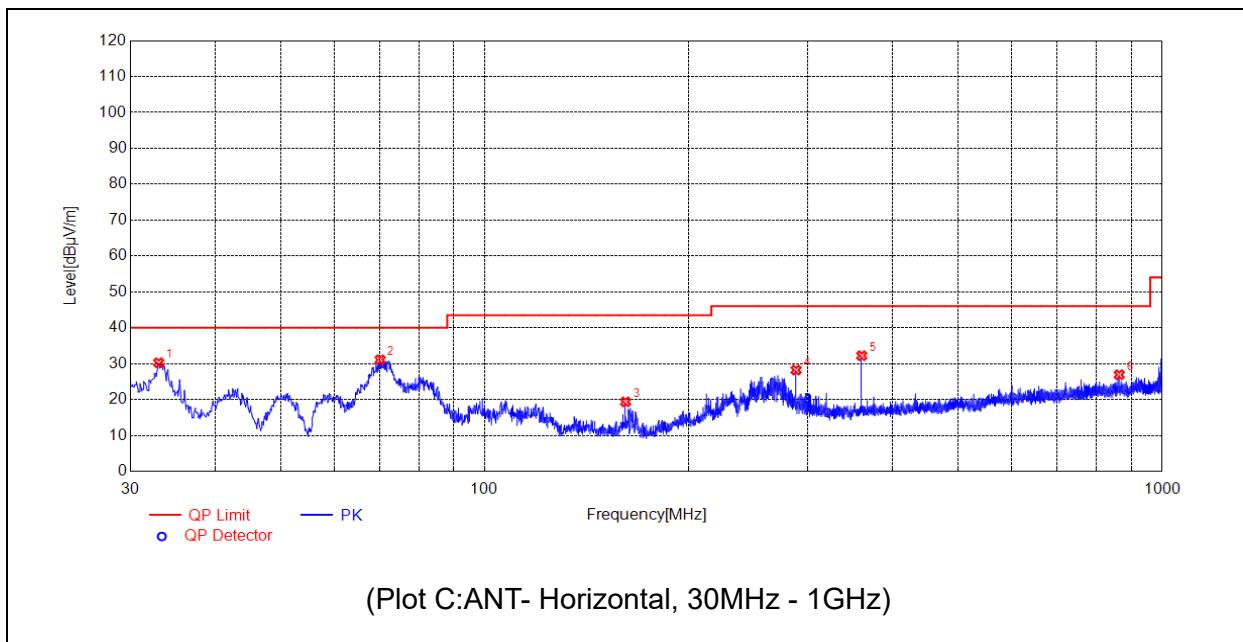
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.



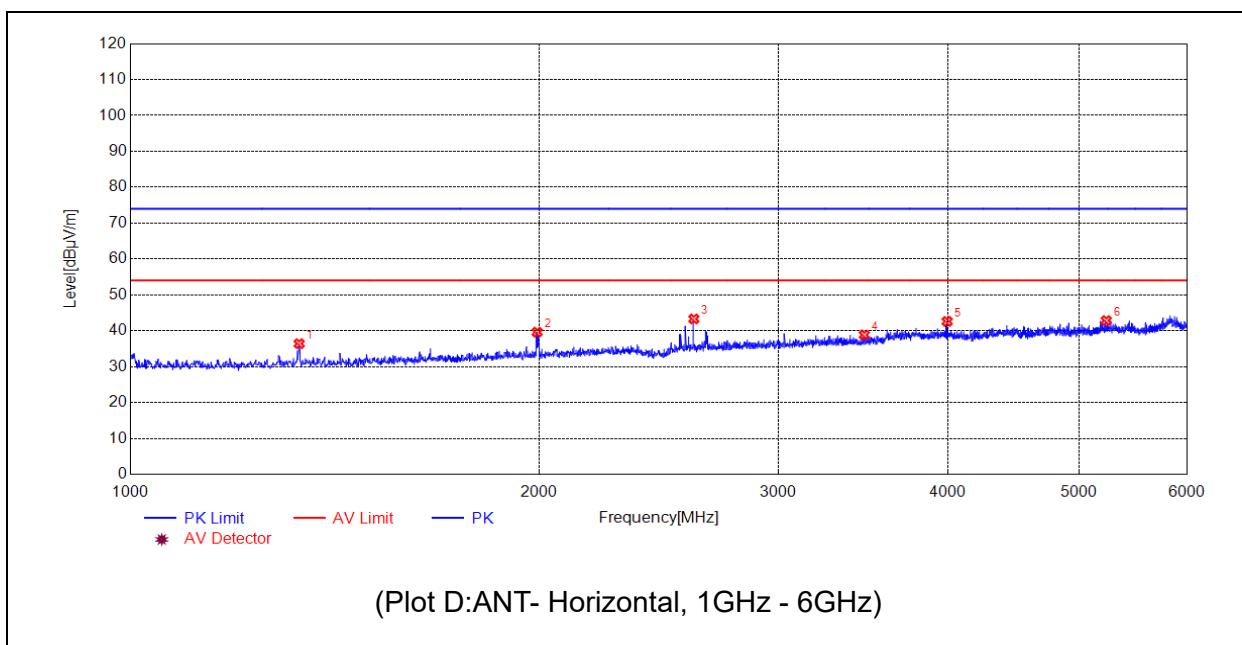
No.	Fre. MHz	PK dB $\mu$ V/m	QP dB $\mu$ V/m	AV dB $\mu$ V/m	Limit-PK dB $\mu$ V/m	Limit-QP dB $\mu$ V/m	Limit-AV dB $\mu$ V/m	ANT	Verdict
1	30.0970	43.02	35.31	N.A.	N.A.	40.00	N.A.	V	PASS
2	32.4252	39.77	33.96	N.A.	N.A.	40.00	N.A.	V	PASS
3	70.0650	30.01	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
4	85.2955	29.17	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
5	267.2857	25.94	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
6	360.0270	27.86	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS



No.	Fre. MHz	PK dB $\mu$ V/m	QP dB $\mu$ V/m	AV dB $\mu$ V/m	Limit-PK dB $\mu$ V/m	Limit-QP dB $\mu$ V/m	Limit-AV dB $\mu$ V/m	ANT	Verdict
1	1329.0658	36.65	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
2	1991.1982	42.81	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
3	2657.3315	43.51	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
4	3330.4661	40.55	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
5	3985.5971	43.91	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
6	5315.8632	43.64	N.A.	N.A.	74.00	N.A.	54.00	V	PASS



No.	Fre. MHz	PK dB $\mu$ V/m	QP dB $\mu$ V/m	AV dB $\mu$ V/m	Limit-PK dB $\mu$ V/m	Limit-QP dB $\mu$ V/m	Limit-AV dB $\mu$ V/m	ANT	Verdict
1	33.0073	30.26	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
2	70.0650	31.09	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
3	161.3511	19.35	N.A.	N.A.	N.A.	43.50	N.A.	H	PASS
4	288.0458	28.21	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
5	360.0270	32.22	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
6	863.9924	26.92	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS



No.	Fre. MHz	PK dB $\mu$ V/m	QP dB $\mu$ V/m	AV dB $\mu$ V/m	Limit-PK dB $\mu$ V/m	Limit-QP dB $\mu$ V/m	Limit-AV dB $\mu$ V/m	ANT	Verdict
1	1331.0662	36.41	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
2	1993.1986	39.62	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
3	2600.3201	43.31	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
4	3472.4945	38.84	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
5	3996.5993	42.60	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
6	5234.8470	42.86	N.A.	N.A.	74.00	N.A.	54.00	H	PASS



## Annex A Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

### Uncertainty of Conducted Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	9kHz-150kHz	±3.3dB
	150kHz-30MHz	±2.8dB

### Uncertainty of Radiated Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	30MHz-200MHz	±5.06dB
	200MHz-1000MHz	±5.04dB
	1GHz-6GHz	±5.18dB
	6GHz-18GHz	±5.48dB



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

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

### 2. Identification of the Responsible Testing Location

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

### 3. Accreditation Certificate

<b>Accredited Testing Laboratory:</b>	The FCC designation number is CN1192. Test firm registration number is 226174. (Shenzhen Morlab Communications Technology Co., Ltd.)
---------------------------------------	--

### 4. Test Software Utilized

Model	Version Number	Producer
TS+ -[JS32-RE]	Version 2.5.0.6	Tonscend
TS+ -[JS32-CE]	Version 2.5.0.0	Tonscend



## 5. Test Equipments Utilized

Description	Model	Serial No.	Manufacturer	Cal. Date	Due. Date
Bi-Log Antenna	VULB 9163	9163-274	SCHWARZBECK	2022/11/7	2025/11/6
Bi-Log Antenna	VULB 9163	9163-519	SCHWARZBECK	2022/5/25	2025/5/24
Horn Antenna	BBHA 9120D	9120D-963	SCHWARZBECK	2022/5/25	2025/5/24
Horn Antenna	BBHA 9120D	01774	SCHWARZBECK	2022/7/13	2025/7/12
Horn Antenna	BBHA9170 #773		SCHWARZBECK	2022/7/14	2025/7/13
Receiver	N9038A	MY541300 16	Agilent	2022/7/7	2023/7/6
Receiver	N9038A	MY564000 93	KEYSIGHT	2022/3/3	2023/3/2
6db Attenuator	BW-N6W5+	E191001	Mini-circuits	2022/10/11	2023/10/10
Preamplifier	S020180L3203	61171/611 72	LUCIX CORP.	2022/7/8	2023/7/7
Preamplifier	S10M100L3802	46732	LUCIX CORP.	2022/7/8	2023/7/7
Preamplifier	DCLNA0118-40 C-S	DS77209	Decentest	2022/7/23	2023/7/22
RF Coaxial Cable	PE330	MRE001	Pasternack	N/A	N/A
RF Coaxial Cable	CLU18	MRE002	Pasternack	N/A	N/A
RF Coaxial Cable	CLU18	MRE003	Pasternack	N/A	N/A
RF Coaxial Cable	QA360-40-KK-0.5	22290045	Qualwave	N/A	N/A
RF Coaxial Cable	QA360-40-KKF -2	22290046	Qualwave	N/A	N/A
RF Coaxial Cable	QA500-18-NN-5	22120181	Qualwave	N/A	N/A
RF Coaxial Cable	BNC	MRE04	Qualwave	N/A	N/A
Receiver	ESPI	101052	R&S	2022/7/7	2023/7/6
LISN	NSLK 8127	8127449	Schwarzbeck	2022/3/3	2023/3/2
10dB Pulse Limiter	VTSD 9561-F	VTSD 9561 F-B #206	SCHWARZBECK	2022/7/6	2023/7/5



REPORT No.: SZ22110173E01

## 6. Ancillary Equipment Utilized

Description	Manufacturer	Model	Serial No.
PC Adapter	Lenovo	ADLX45DLC3A	SA10M42529
PC	Lenovo	BJB2017044	E740C I3-6006U
PC	APPLE	A1466	C2QJJ1X1DRV
PC Adapter	APPLE	A1436	N/A
Adapter	N/A	AD05W050100	WOZ008

———— END OF REPORT ————