



REPORT No. : SZ15120069E03

# FCC TEST REPORT

APPLICANT : SZ DJI TECHNOLOGY CO., LTD.  
PRODUCT NAME : Thumb Controller  
MODEL NAME : RONIN TC1  
TRADE NAME : DJI  
BRAND NAME : DJI  
FCC ID : SS3-800TC1512  
STANDARD(S) : 47 CFR Part 15 Subpart B  
TEST DATE : 2015-12-11 to 2015-12-25  
ISSUE DATE : 2015-12-29



**SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.**

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**MORLAB GROUP**

FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road,  
Block67, BaoAn District, ShenZhen , Guangdong Province, P. R. China

Tel: 86-755-36698555

Http://www.morlab.cn

Fax: 86-755-36698525

E-mail: service@morlab.cn



## DIRECTORY

|                                                               |           |
|---------------------------------------------------------------|-----------|
| <b>1. TECHNICAL INFORMATION.....</b>                          | <b>5</b>  |
| 1.1. APPLICANT INFORMATION.....                               | 5         |
| 1.2. EQUIPMENT UNDER TEST (EUT) DESCRIPTION.....              | 5         |
| <b>2. TEST RESULTS .....</b>                                  | <b>6</b>  |
| 2.1. APPLIED REFERENCE DOCUMENTS .....                        | 6         |
| <b>3. TEST CONDITIONS SETTING .....</b>                       | <b>7</b>  |
| 3.1. TEST MODE .....                                          | 7         |
| 3.2. TEST SETUP AND EQUIPMENTS LIST.....                      | 8         |
| 3.2.1. CONDUCTED EMISSION .....                               | 8         |
| 3.2.2. RADIATED EMISSION.....                                 | 9         |
| <b>4. 47 CFR PART 15B REQUIREMENTS .....</b>                  | <b>11</b> |
| 4.1. CONDUCTED EMISSION.....                                  | 11        |
| 4.1.1. REQUIREMENT .....                                      | 11        |
| 4.1.2. TEST DESCRIPTION .....                                 | 11        |
| 4.1.3. TEST RESULT .....                                      | 11        |
| 4.2. RADIATED EMISSION.....                                   | 14        |
| 4.2.1. REQUIREMENT .....                                      | 14        |
| 4.2.2. TEST DESCRIPTION .....                                 | 14        |
| 4.2.3. FREQUENCY RANGE OF MEASUREMENT .....                   | 15        |
| 4.2.4. TEST RESULT .....                                      | 15        |
| <b>ANNEX A TEST UNCERTAINTY.....</b>                          | <b>18</b> |
| <b>ANNEX B TESTING LABORATORY INFORMATION .....</b>           | <b>19</b> |
| 1. IDENTIFICATION OF THE RESPONSIBLE TESTING LABORATORY ..... | 19        |
| 2. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION.....    | 19        |



REPORT No. : SZ15120069E03

3. ACCREDITATION CERTIFICATE .....19
4. TEST ENVIRONMENT CONDITIONS .....19

| Change History |            |                   |
|----------------|------------|-------------------|
| Issue          | Date       | Reason for change |
| 1.0            | 2015-12-29 | First edition     |
|                |            |                   |



REPORT No. : SZ15120069E03

## Test Report Declaration

|                      |                                                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Applicant            | SZ DJI TECHNOLOGY CO., LTD.                                                                                                 |
| Applicant Address    | 14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan District, Shenzhen, China |
| Manufacturer         | SZ DJI TECHNOLOGY CO., LTD.                                                                                                 |
| Manufacturer Address | 14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan District, Shenzhen, China |
| Product Name         | Thumb Controller                                                                                                            |
| Model Name           | RONIN TC1                                                                                                                   |
| Brand Name           | DJI                                                                                                                         |
| HW Version           | V1.0                                                                                                                        |
| SW Version           | V1.0                                                                                                                        |
| Test Standards       | 47 CFR Part 15 Subpart B                                                                                                    |
| Test Result          | PASS                                                                                                                        |

Tested by : He Shiling  
He Shiling (Test Engineer)

Reviewed by : Xiao Xiong  
Xiao Xiong (EMC Manager)

Approved by : Zeng Dexin  
Zeng Dexin (Chief Engineer)



# 1. Technical Information

Note: Provided by applicant

## 1.1. Applicant Information

Company: SZ DJI TECHNOLOGY CO., LTD.  
Address: 14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin  
South 4th Ave, Nanshan District, Shenzhen, China

## 1.2. Equipment under Test (EUT) Description

|                          |                                |
|--------------------------|--------------------------------|
| <b>EUT Type:</b>         | Thumb Controller               |
| <b>Serial No:</b>        | (n.a., marked #1 by test site) |
| <b>Hardware Version:</b> | V1.0                           |
| <b>Software Version:</b> | V1.0                           |
| <b>Working Pressure:</b> | 3.6VDC - 4.2VDC                |
| <b>Working Current:</b>  | 100mA                          |

|                      |                |                               |
|----------------------|----------------|-------------------------------|
| <b>Power supply:</b> | <b>Battery</b> |                               |
|                      | Brand Name:    | N/A                           |
|                      | Model No.:     | EU663048P                     |
|                      | Serial No.:    | (n.a. marked #1 by test site) |
|                      | Capacity:      | 1150mAh                       |
|                      | Rated Voltage: | 3.7V                          |
|                      | Charge Limit:  | 4.2V                          |

### NOTE:

1. The EUT is a Thumb Controller, it supports DSSS 2.415GHz ~2.473GHz wireless type.
2. The EUT equipped with a Micro-B USB port which can be connected to ancillary equipments for charging and software upgrading.
3. 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(10-1-13 Edition) | Radio Frequency Devices |

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

| No. | Section | Description        | Test Date  | Result |
|-----|---------|--------------------|------------|--------|
| 1   | 15.107  | Conducted Emission | 2015.12.20 | PASS   |
| 2   | 15.109  | Radiated Emission  | 2015.12.20 | PASS   |

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



## 3. Test Conditions Setting

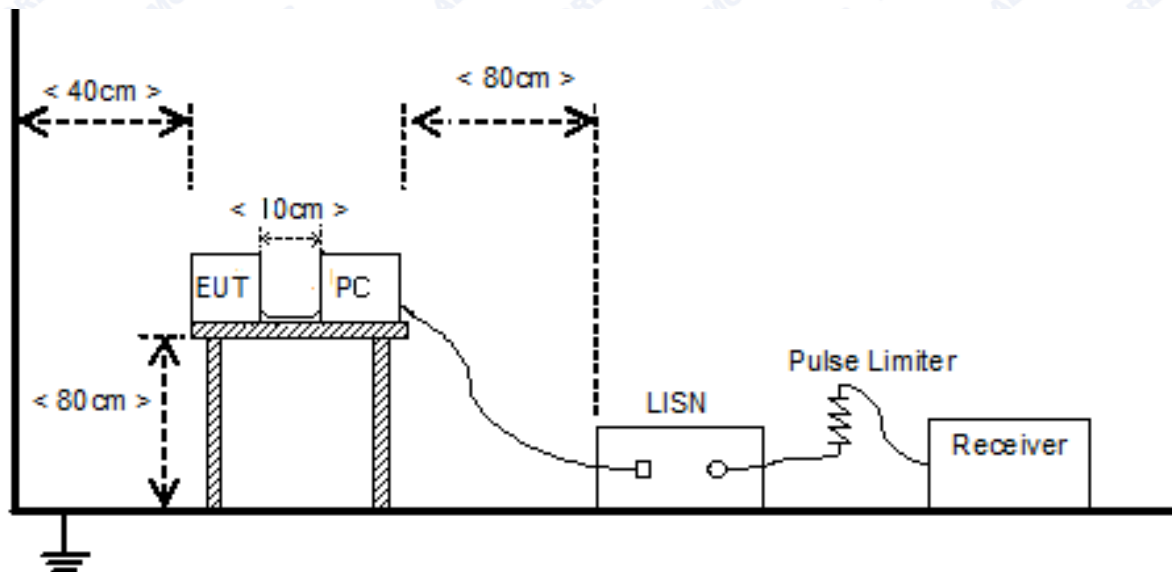
### 3.1. Test Mode

|   |                                                                                                                                                                                                                                                        |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The EUT configuration of the emission tests is EUT + Battery + PC.<br>During the measurement, the EUT was connected to a PC via the Micro-B USB port, the EUT was kept charging, meanwhile, the data was kept transmitting between the EUT and the PC. |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 3.2. Test Setup and Equipments List

### 3.2.1. Conducted Emission

#### A. Test Setup:



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.

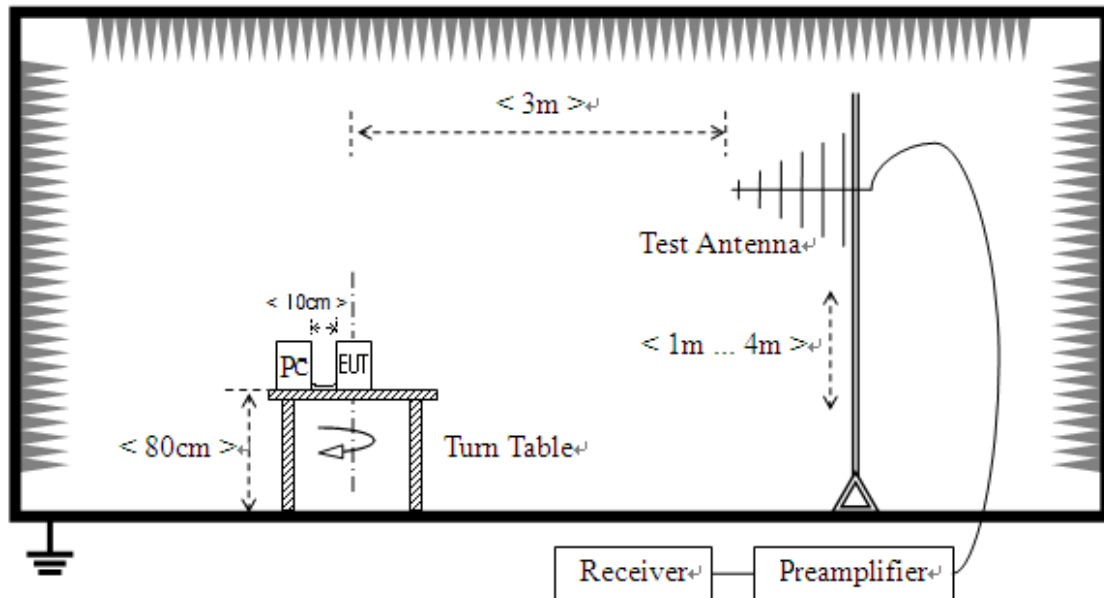
#### B. Equipments List:

| Description             | Manufacturer | Model          | Serial No.   | Cal. Date | Due. Date |
|-------------------------|--------------|----------------|--------------|-----------|-----------|
| Receiver                | Narda        | PMM 9060       | 001WX11001   | 2015.2.21 | 2016.2.20 |
| Receiver                | Narda        | PMM 9010       | 595WX11007   | 2015.2.21 | 2016.2.20 |
| LISN                    | Schwarzbeck  | NSLK 8127      | 812744       | 2015.2.24 | 2016.2.23 |
| Pulse Limiter<br>(20dB) | Schwarzbeck  | VTSD<br>9561-D | 9391         | (n.a.)    | (n.a.)    |
| PC                      | Apple        | A1370          | C02FQ2PYDDQW | (n.a.)    | (n.a.)    |

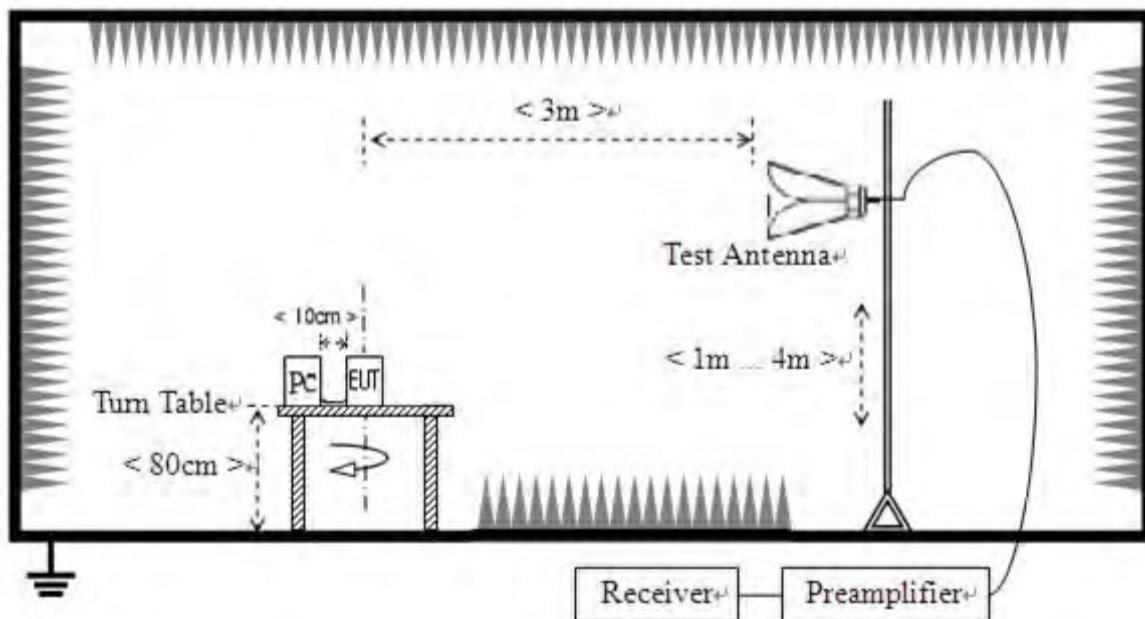
### 3.2.2. Radiated Emission

#### A. Test Setup:

1. For radiated emissions from 30MHz to 1GHz



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.

#### B. Equipments List:

| Description           | Manufacturer | Model      | Serial No.   | Cal. Date | Due. Date |
|-----------------------|--------------|------------|--------------|-----------|-----------|
| MXE EMI Receiver      | Agilent      | N9038A     | MY54130016   | 2015.2.21 | 2016.2.20 |
| Semi-Anechoic Chamber | Albatross    | 9m*6m*6m   | (n.a.)       | 2015.2.21 | 2016.2.20 |
| Test Antenna - Bi-Log | Schwarzbeck  | VULB 9163  | 9163-274     | 2015.2.25 | 2016.2.24 |
| Test Antenna - Horn   | Schwarzbeck  | BBHA 9120D | 9120D-963    | 2015.2.25 | 2016.2.24 |
| PC                    | Apple        | A1370      | C02FQ2PYDDQW | (n.a.)    | (n.a.)    |

## 4. 47 CFR Part 15B Requirements

### 4.1. Conducted Emission

#### 4.1.1. 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<br>(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:

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

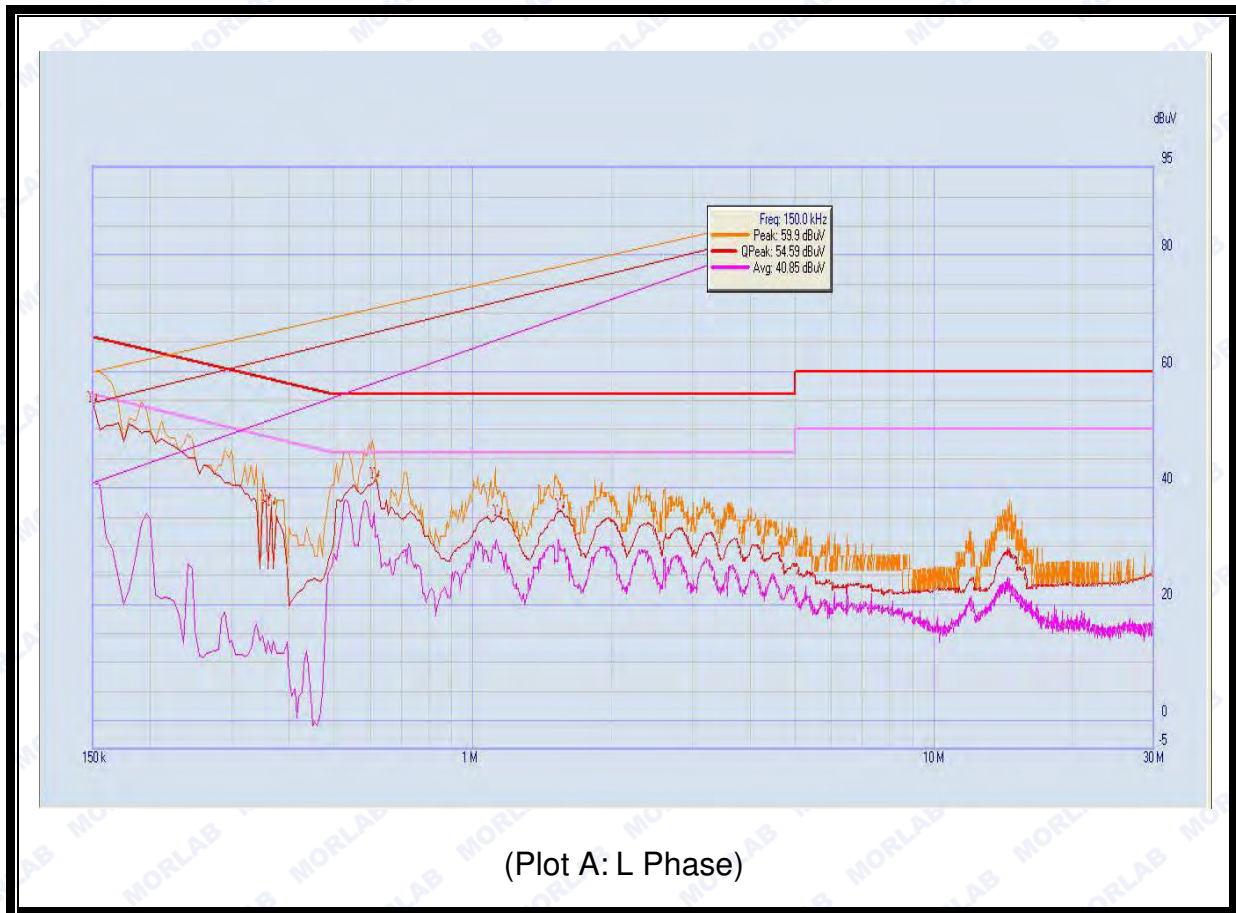
#### 4.1.2. Test Description

See section 3.2.1 of this report.

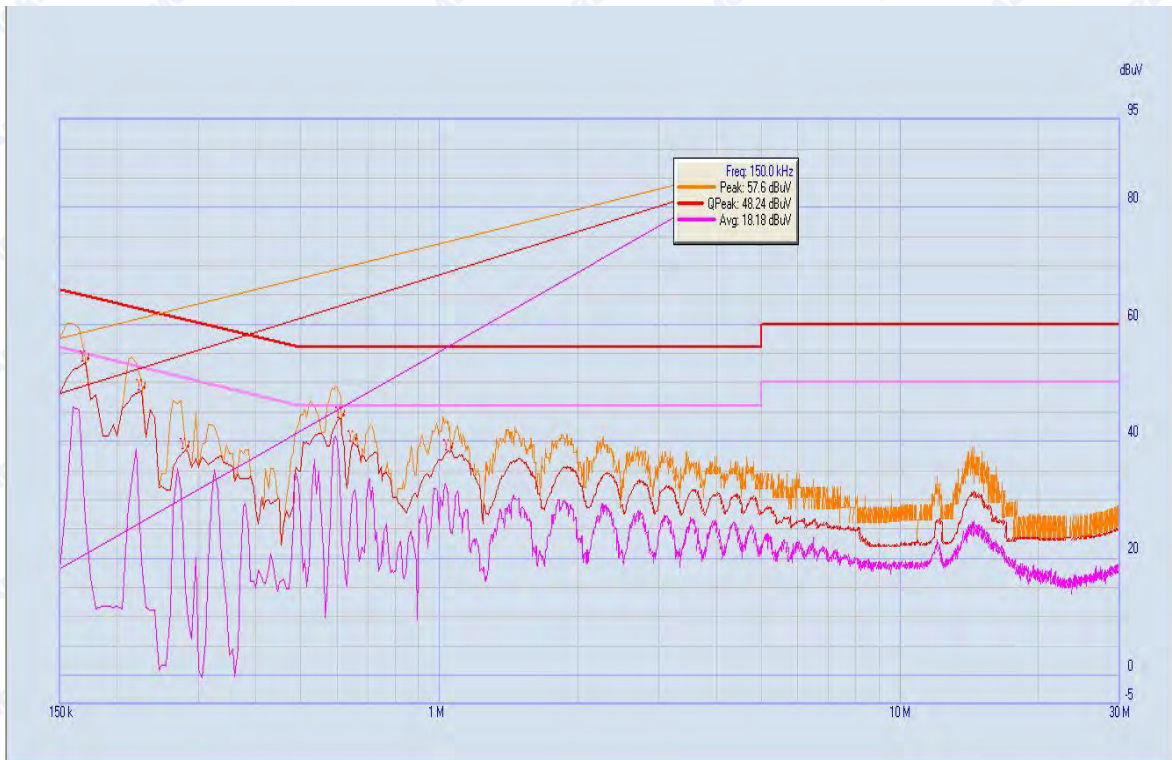
#### 4.1.3. Test Result

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.<br>(MHz) | Emission Level (dBμV) |         | Limit (dBμV) |         | Power-line | Verdict |
|-----|---------------|-----------------------|---------|--------------|---------|------------|---------|
|     |               | Quai-peak             | Average | Quai-peak    | Average |            |         |
| 1   | 0.15          | 54.59                 | 40.85   | 66.00        | 56.00   | Line       | PASS    |
| 2   | 0.355         | 37.77                 | 11.46   | 60.14        | 50.14   |            | PASS    |
| 3   | 0.365         | 36.77                 | 12.38   | 59.86        | 49.86   |            | PASS    |
| 4   | 0.615         | 41.64                 | 31.55   | 56.00        | 46.00   |            | PASS    |
| 5   | 1.135         | 35.14                 | 29.89   | 56.00        | 46.00   |            | PASS    |
| 6   | 1.55          | 36.09                 | 29.64   | 56.00        | 46.00   |            | PASS    |



(Plot B: N Phase)

| NO. | Fre.<br>(MHz) | Emission Level (dBμV) |         | Limit (dBμV) |         | Power-line | Verdict |
|-----|---------------|-----------------------|---------|--------------|---------|------------|---------|
|     |               | Quai-peak             | Average | Quai-peak    | Average |            |         |
| 1   | 0.17          | 53.54                 | 26.62   | 65.43        | 55.43   | Neutral    | PASS    |
| 2   | 0.225         | 48.51                 | 19.56   | 63.86        | 53.86   |            | PASS    |
| 3   | 0.28          | 38.59                 | 14.72   | 62.29        | 52.29   |            | PASS    |
| 4   | 0.61          | 44.00                 | 28.58   | 56.00        | 46.00   |            | PASS    |
| 5   | 0.65          | 39.75                 | 31.26   | 56.00        | 46.00   |            | PASS    |
| 6   | 1.05          | 38.42                 | 27.04   | 56.00        | 46.00   |            | PASS    |

**Test Result: PASS**



## 4.2. Radiated Emission

### 4.2.1. 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 |                       |
|-----------------------|--------------------------------------------------|-----------------------|
|                       | ( $\mu\text{V/m}$ )                              | (dB $\mu\text{V/m}$ ) |
| 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 $\mu\text{V/m}$  is calculated by 20log Emission Level( $\mu\text{V/m}$ ).
- 3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of  $L_{d1} = L_{d2} * (d_2/d_1)^2$ .

Example:

F.S Limit at 30m distance is 30 $\mu\text{V/m}$ , then F.S Limitation at 3m distance is adjusted as

$$L_{d1} = L_1 = 30\mu\text{V/m} * (10)^2 = 100 * 30\mu\text{V/m}$$

### 4.2.2. Test Description

See section 3.2.2 of this report.



### 4.2.3. 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. |

The highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1G.

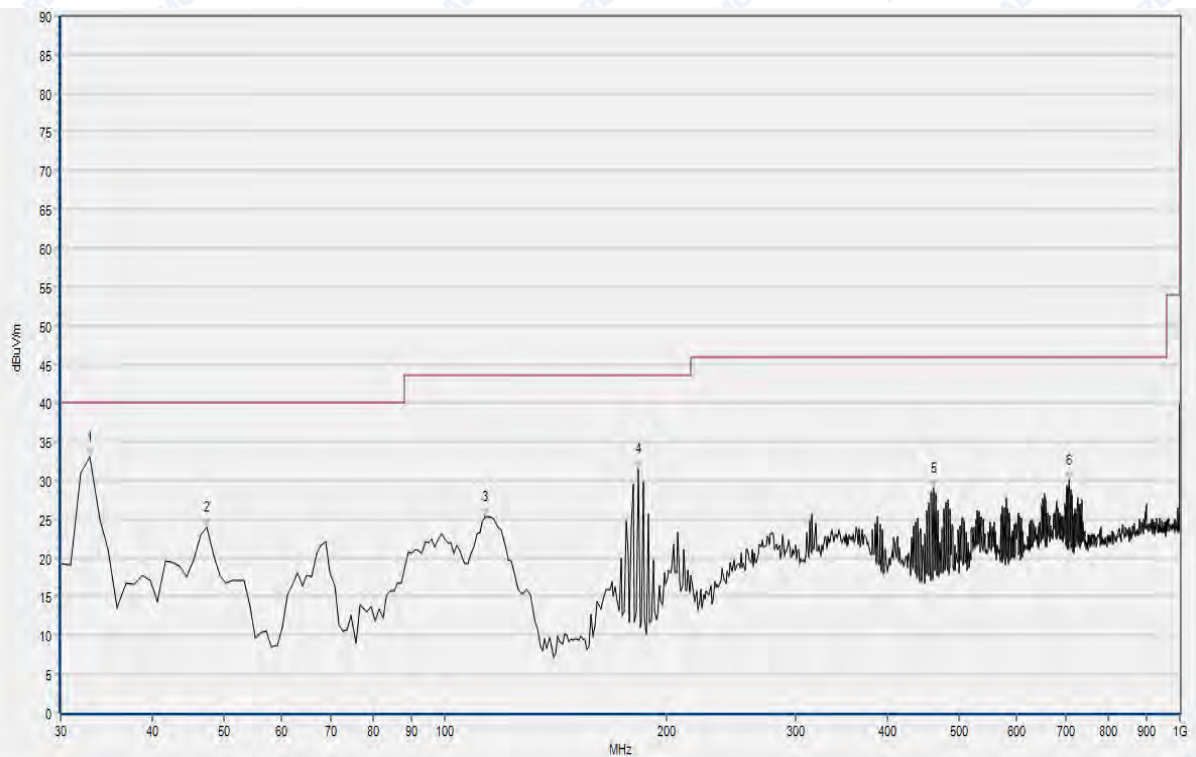
### 4.2.4. Test Result

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 spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

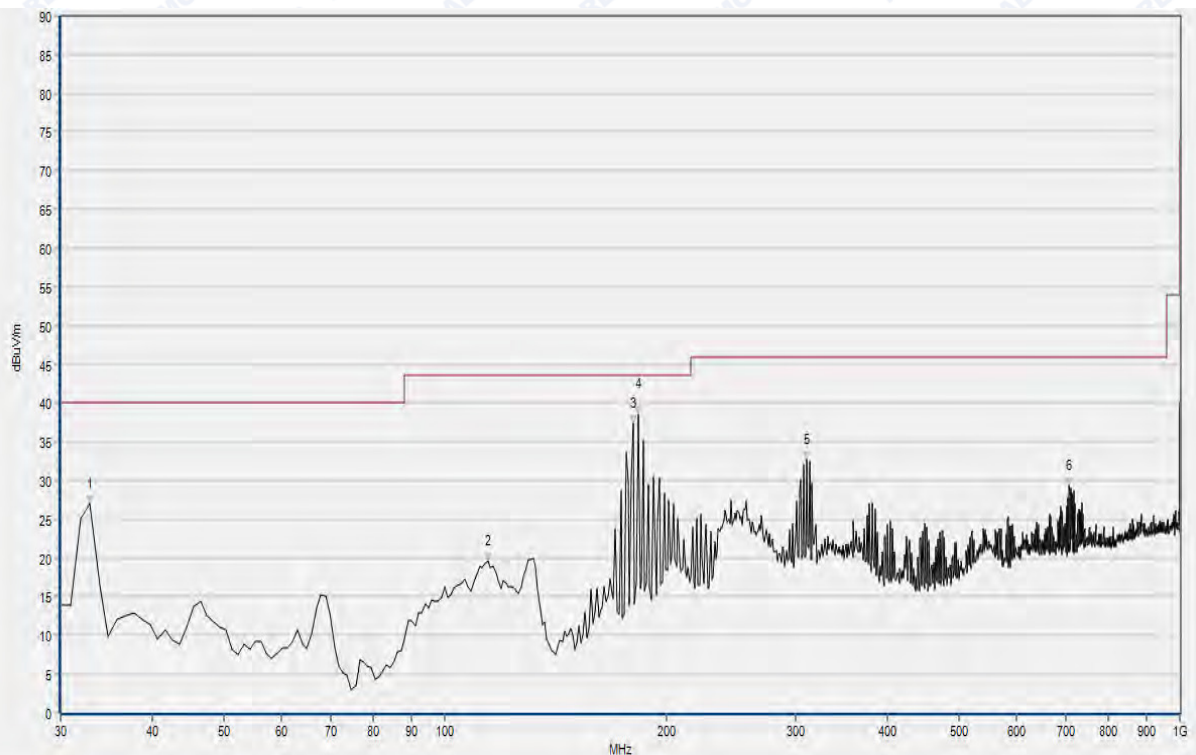
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

#### A. Test Plots and Suspicious Points:



(Plot A: 30MHz – 1GHz, Test Antenna Vertical)

| No. | Fre.<br>MHz | Pk<br>dBμV/m | QP<br>dBμV/m | AV<br>dBμV/m | Limit-PK<br>dBμV/m | Limit-QP<br>dBμV/m | Limit-AV<br>dBμV/m | ANT | Verdict |
|-----|-------------|--------------|--------------|--------------|--------------------|--------------------|--------------------|-----|---------|
| 1   | 32.910      | N.A          | 32.94        | N.A          | N.A                | 40.00              | N.A                | V   | PASS    |
| 2   | 47.460      | N.A          | 24.00        | N.A          | N.A                | 40.00              | N.A                | V   | PASS    |
| 3   | 113.420     | N.A          | 25.30        | N.A          | N.A                | 43.50              | N.A                | V   | PASS    |
| 4   | 183.260     | N.A          | 31.59        | N.A          | N.A                | 43.50              | N.A                | V   | PASS    |
| 5   | 462.620     | N.A          | 29.00        | N.A          | N.A                | 46.00              | N.A                | V   | PASS    |
| 6   | 707.060     | N.A          | 29.93        | N.A          | N.A                | 46.00              | N.A                | V   | PASS    |



(Plot B: 30MHz – 1GHz, Test Antenna Horizontal)

| No. | Fre.<br>MHz | Pk<br>dBμV/m | QP<br>dBμV/m | AV<br>dBμV/m | Limit-PK<br>dBμV/m | Limit-QP<br>dBμV/m | Limit-AV<br>dBμV/m | ANT | Verdict |
|-----|-------------|--------------|--------------|--------------|--------------------|--------------------|--------------------|-----|---------|
| 1   | 32.910      | N.A          | 26.96        | N.A          | N.A                | 40.00              | N.A                | H   | PASS    |
| 2   | 114.390     | N.A          | 19.69        | N.A          | N.A                | 43.50              | N.A                | H   | PASS    |
| 3   | 180.350     | N.A          | 35.21        | N.A          | N.A                | 43.50              | N.A                | H   | PASS    |
| 4   | 183.260     | N.A          | 36.48        | N.A          | N.A                | 43.50              | N.A                | H   | PASS    |
| 5   | 310.330     | N.A          | 32.67        | N.A          | N.A                | 46.00              | N.A                | H   | PASS    |
| 6   | 707.060     | N.A          | 29.37        | N.A          | N.A                | 46.00              | N.A                | H   | PASS    |

**Result: 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: | $\pm 1.8\text{dB}$ |
| Uncertainty of Radiated Emission:  | $\pm 3.1\text{dB}$ |



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

|                               |                                                                                                                                  |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Company Name:                 | Shenzhen Morlab Communications Technology Co., Ltd.                                                                              |
| Department:                   | Morlab Laboratory                                                                                                                |
| Address:                      | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, Guangdong Province, P. R. China |
| Responsible Test Lab Manager: | Mr. Su Feng                                                                                                                      |
| Telephone:                    | +86 755 36698555                                                                                                                 |
| Facsimile:                    | +86 755 36698525                                                                                                                 |

### 2. Identification of the Responsible Testing Location

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

### 3. Accreditation Certificate

Accredited Testing Laboratory: The FCC registration number is 695796.  
(Shenzhen Morlab Communications Technology Co., Ltd.)

### 4. Test Environment 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 |

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