

## TEST REPORT

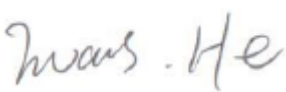
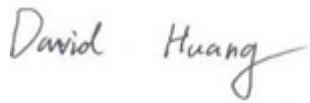
|           |                                                                                      |
|-----------|--------------------------------------------------------------------------------------|
| Applicant | Huabo Smart Living Technology Co.,Ltd                                                |
| Address   | Chenghua Industrial Zone,Wenguan Road,Chenghai District,Shantou City,Guangdong China |

|                                      |                                                                                       |
|--------------------------------------|---------------------------------------------------------------------------------------|
| Manufacturer or Supplier ID          | Huabo Smart Living Technology Co.,Ltd                                                 |
| Address                              | Chenghua Industrial Zone,Wenguan Road,Chenghai District,Shantou City,Guangdong China. |
| Product                              | Toy RC Thunder Tumbler                                                                |
| Brand Name                           | Sharper Image                                                                         |
| Model                                | HB2019E                                                                               |
| Additional Model & Model Difference: | 1010264, 1011822                                                                      |
| Date of tests                        | Aug 01 to Aug 12, 2019                                                                |

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.227**

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

|                                                                                     |                                                                                                                |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Tested by Evans He<br>Project Engineer / EMC Department                             | Approved by David Huang<br>Supervisor / EMC Department                                                         |
|  | <br><br>Date: Aug 12, 2019 |

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**BUREAU  
VERITAS**

Test Report No.:RF 190731N035

## RELEASE CONTROL RECORD

| ISSUE NO.    | REASON FOR CHANGE | DATE ISSUED  |
|--------------|-------------------|--------------|
| RF190731N035 | Original release  | Aug 12, 2019 |

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C , SECTION 15.227(2015-10) |                             |        |                              |
|--------------------------------------------------------------------|-----------------------------|--------|------------------------------|
| STANDARD SECTION                                                   | TEST TYPE AND LIMIT         | RESULT | REMARK                       |
| §15.207 (a)                                                        | AC Power Conducted Emission | N/A    | EUT is powered by battery    |
| §15.209<br>§15.227                                                 | Radiated Emission           | PASS   | Compliant                    |
| §15.215(c)                                                         | 20dB Bandwidth Test         | PASS   | Compliant                    |
| §15.203                                                            | Antenna Requirement         | N/A    | No antenna connector is used |

NOTE: Test Lab Information:

**Lab:** Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

**Test Lab Address:** Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's Republic of China

## 2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| MEASUREMENT        | FREQUENCY     | UNCERTAINTY |
|--------------------|---------------|-------------|
| Radiated emissions | 9KHz ~ 30MHz  | 2.16dB      |
|                    | 30MHz ~ 1GHz  | 3.74dB      |
|                    | 1GHz ~ 18GHz  | 4.66dB      |
|                    | 18GHz ~ 40GHz | 4.67dB      |

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

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                            |                               |
|----------------------------|-------------------------------|
| <b>PRODUCT</b>             | Toy RC Thunder Tumbler        |
| <b>MODEL NO.</b>           | HB2019E                       |
| <b>ADDITIONAL MODEL</b>    | 1010264, 1011822              |
| <b>FCC ID</b>              | 2APYEHB2019E27                |
| <b>NOMINAL VOLTAGE</b>     | DC 9V from Battery            |
| <b>MODULATION TYPE</b>     | AM                            |
| <b>OPERATING FREQUENCY</b> | 27.145MHz                     |
| <b>NUMBER OF CHANNEL</b>   | 1                             |
| <b>ANTENNA TYPE</b>        | Spring Antenna with 0dBi gain |
| <b>I/O PORTS</b>           | Refer to user's manual        |

#### NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 190731N035) for detailed product photos.
4. Additional models (see about table) are identical with the test model HB2019E except the color of the appearance、trade name and model name for trading purpose.

### 3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and packet type. The worst case was found when the EUT was positioned on Y axis for radiated emission. The EUT was tested under the following mode.

| FREQUENCY  | TEST MODES   |
|------------|--------------|
| 27.145 MHz | Transmitting |

### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C, 15.227**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

### 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessories or support units.

## 4 TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| FREQUENCIES<br>(MHz) | FIELD STRENGTH<br>(microvolts/meter) | MEASUREMENT DISTANCE<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009 ~ 0.490        | 2400/F(kHz)                          | 300                              |
| 0.490 ~ 1.705        | 24000/F(kHz)                         | 30                               |
| 1.705 ~ 30.0         | 30                                   | 30                               |
| 30 ~ 88              | 100                                  | 3                                |
| 88 ~ 216             | 150                                  | 3                                |
| 216 ~ 960            | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

According to §15.227(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Frequency Range of<br>Fundamental<br>[MHz] | Field Strength of<br>Fundamental Emission<br>[Peak]<br>[μV/m] | Field Strength of<br>Fundamental Emission<br>[Average]<br>[μV/m] |
|--------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------|
| 26.96 – 27.28                              | 100,000 (100 dBμV/m)                                          | 10,000 (80 dBμV/m)                                               |

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



## 4.1.2 TEST INSTRUMENTS

| Instrument                             | Model      | Serial #               | Cal Date    | Cal Due     |
|----------------------------------------|------------|------------------------|-------------|-------------|
| Agilent ESA-E SERIES SPECTRUM ANALYZER | E4407B     | MY45108319             | Feb 11, 19  | Feb. 10, 20 |
| EMI test receiver                      | ESL6       | 1300.5001K06-100262-eQ | Jan, 05, 19 | Jan. 04, 20 |
| SYNTHESIZED SIGNAL GENERATOR           | 8665B      | 3744A01293             | Jan, 05, 19 | Jan. 04, 20 |
| Bilog Antenna (30MHz~6GHz)             | JB6        | A110712                | Feb 08, 19  | Feb. 07, 20 |
| Bilog Antenna (30MHz~2GHz)             | JB1        | A112017                | Jan 26, 19  | Jan. 25, 20 |
| A-INFOMW Horn Antenna (1~18GHz)        | AH-118     | 71259                  | Jan 26, 19  | Jan. 25, 20 |
| Pre-Amplifier (100MHz-26.5GHz)         | EMC 012645 | 980077                 | May 18, 19  | May 17, 20  |
| Pre-Amplifier (18GHz-40GHz)            | EMC 184045 | 980102                 | Nov. 08,18  | Nov. 07,19  |
| EMCO Horn Antenna (1~18GHz)            | AH-118     | 71283                  | Feb 02, 19  | Feb. 01, 20 |
| OPT 010 AMPLIFIER (0.1~1300MHz)        | 8447E      | 2727A02430             | Dec. 09, 18 | Dec. 08, 19 |
| Horn Antenna                           | BBHA 9170  | BBHA9170147            | Mar. 13, 19 | Mar. 12, 20 |
| Microwave Preamplifier (0.5 ~ 18GHz)   | PAM-118    | 443008                 | Dec. 09, 18 | Dec. 08, 19 |
| Large Loop Antenna                     | RF300      | Rf300                  | Dec. 09, 18 | Dec. 08, 19 |
| Universal Radio Communication Tester   | CMU200     | 121393                 | Feb 11, 19  | Feb. 10, 20 |
| Positioning Controller                 | UC3000     | MF780208282            | Dec. 09, 18 | Dec. 08, 19 |
| Test Software                          | EZ-EMC     | ver.lcp-03A1           | N/A         | N/A         |

**NOTE:**

1. The test was performed in 966 Chamber (a 3m Semi-anechoic chamber).
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 749762.

#### 4.1.3 TEST PROCEDURES

The basic test procedure was in accordance with ANSI C63.10 (section 6).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. (Below 1000MHz)
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10m chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. (Below 30MHz)
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position Y, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using new battery. The turntable was rotated to maximize the emission level.
- h. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

**NOTE:**

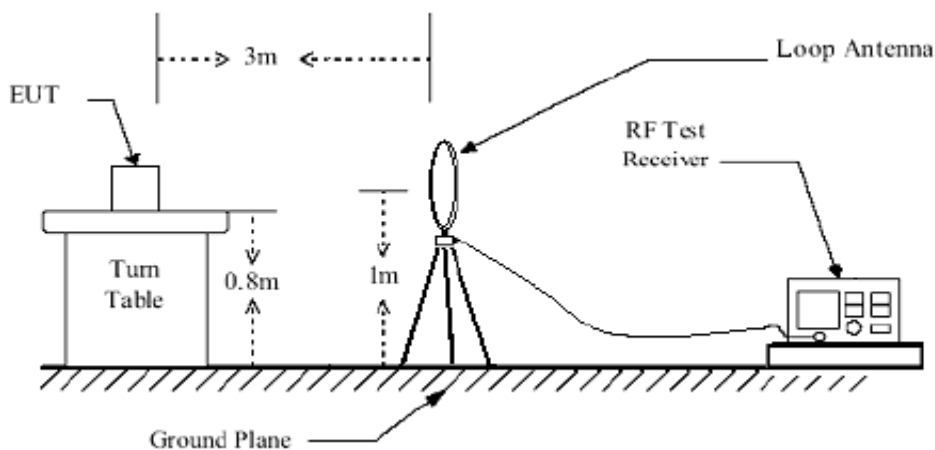
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.
5. Fundamental AV value =PK Emission +AV Factor.

#### 4.1.4 DEVIATION FROM TEST STANDARD

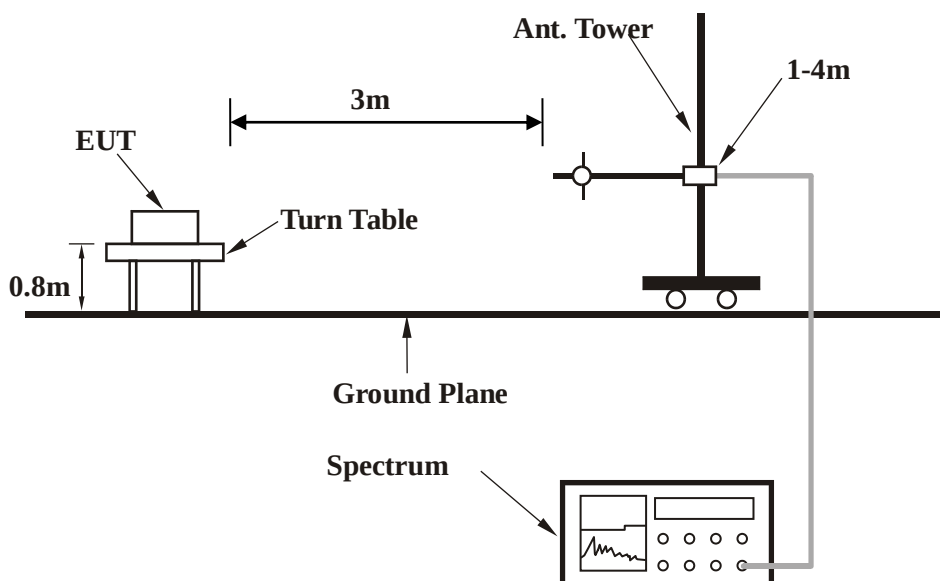
No deviation.

#### 4.1.5 TEST SETUP

##### Below 30MHz



##### 30MHz~1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of equipment.
- b. Hold down the TX of button, then the EUT was operating.
- c. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

#### 4.1.7 TEST RESULTS

##### FIELD STRENGTH OF FUNDAMENTAL

##### ANTENNA POLARITY: 0°

| No. | Freq.<br>(MHz) | Correction<br>Factor<br>(dB/m) | Raw<br>Value<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) |
|-----|----------------|--------------------------------|------------------------|-------------------------------|-------------------|----------------|
| *   | 27.145(PK)     | -11.75                         | 57.78                  | 46.03                         | 100               | -53.97         |
| *   | 27.145(AV)     | -6.01                          | -                      | 40.02                         | 80                | -39.98         |

##### ANTENNA POLARITY: 90°

| No. | Freq.<br>(MHz) | Correction<br>Factor<br>(dB/m) | Raw<br>Value<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) |
|-----|----------------|--------------------------------|------------------------|-------------------------------|-------------------|----------------|
| *   | 27.145(PK)     | -11.75                         | 51.45                  | 39.7                          | 100               | -60.3          |
| *   | 27.145(AV)     | -6.01                          | -                      | 33.69                         | 80                | -46.31         |

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
  2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
  3. Margin value = Emission level – Limit value.
  4. “ \* “: Fundamental frequency.
  5. The average value of fundamental frequency is: Average value = Peak value +AV factor, where the AV factor is calculated from following formula: AV factor=20 log (Duty cycle) = 20 log (50.04%) = -6.01dB, Please see page 12~13 for plotted duty.

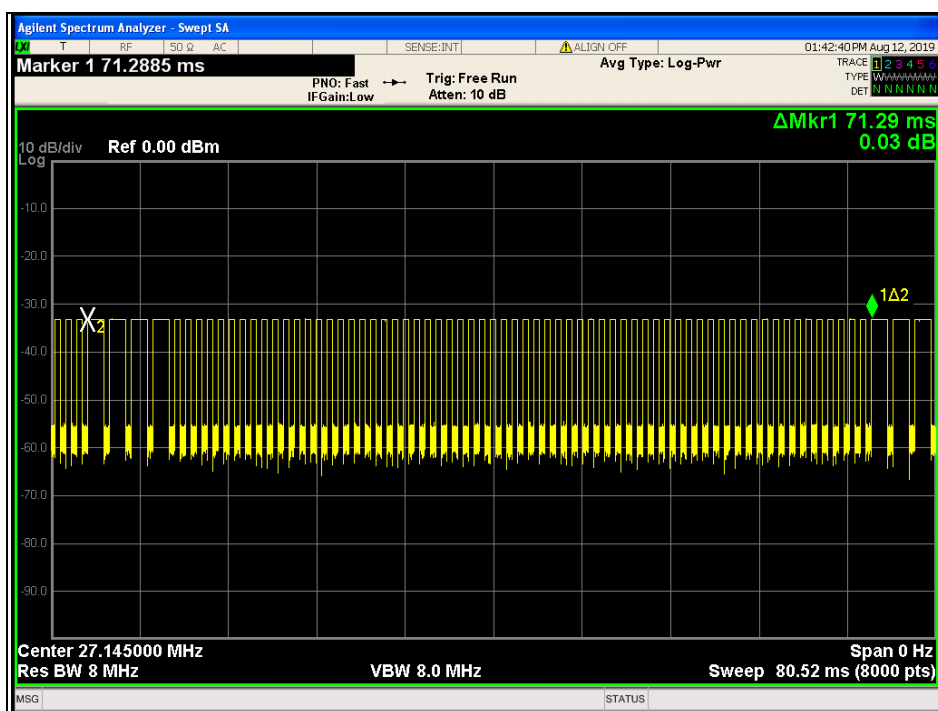
### Duty Cycle:

$$T_p = 71.29 \text{ ms}$$

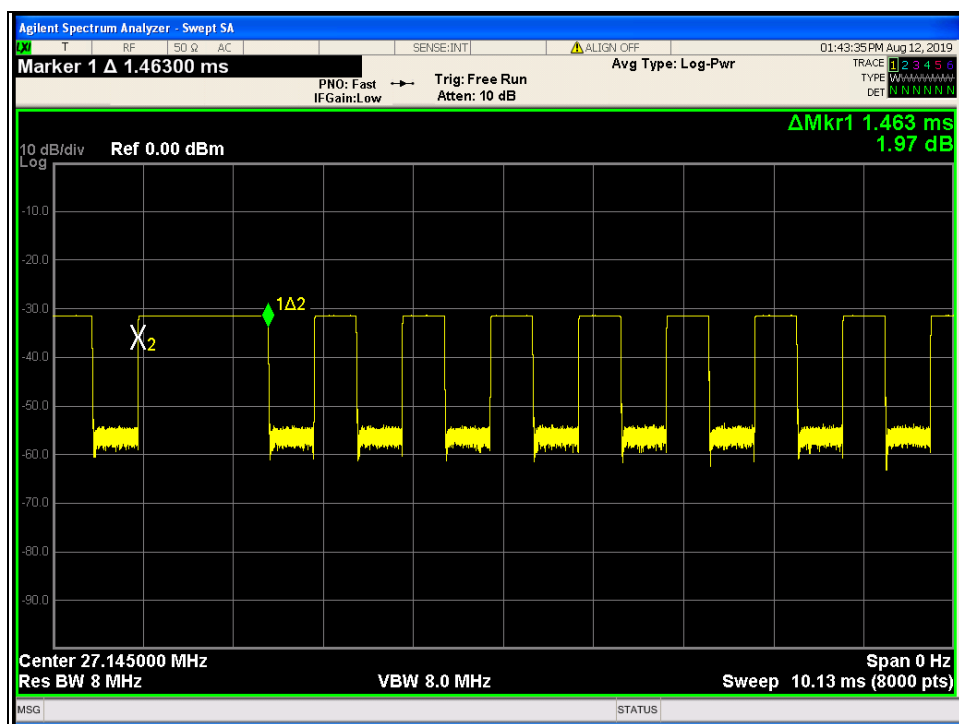
$$T_{on} = T_{on1} * \text{Number} + T_{on2} * \text{Number} + T_{on3} * \text{Number} \\ = 4 * 1.463 + 64 * 0.466 = 35.676 \text{ ms}$$

$$\text{Duty Cycle} = T_{on} / T_p * 100\% = 35.676 / 71.29 = 50.04\%$$

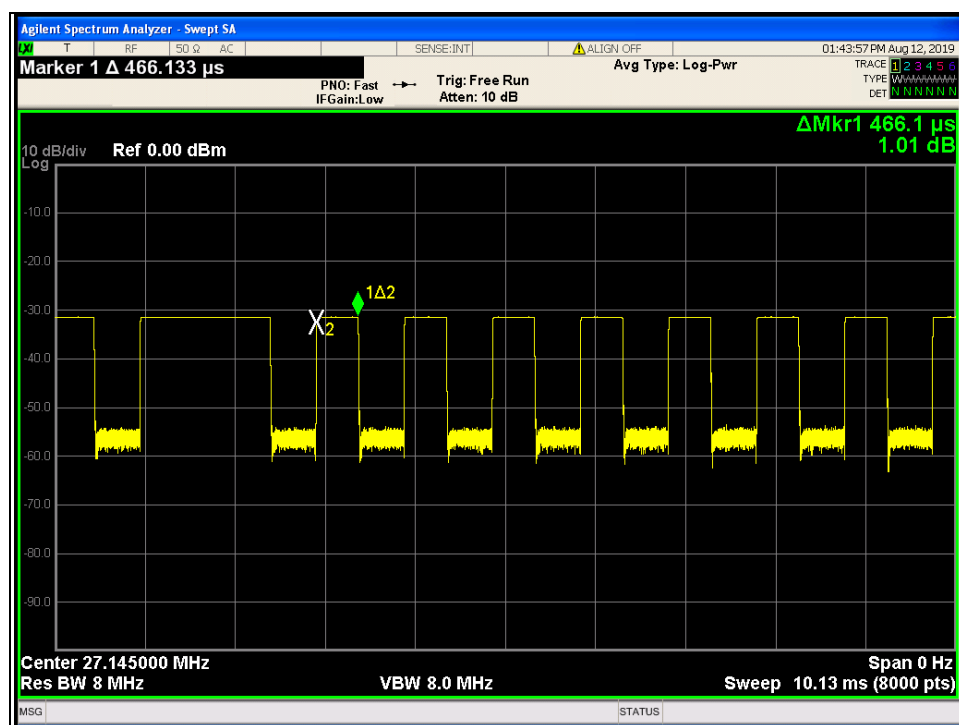
$$T_p = 71.29 \text{ ms}$$



Ton1=1.463ms



Ton2= 0.466ms





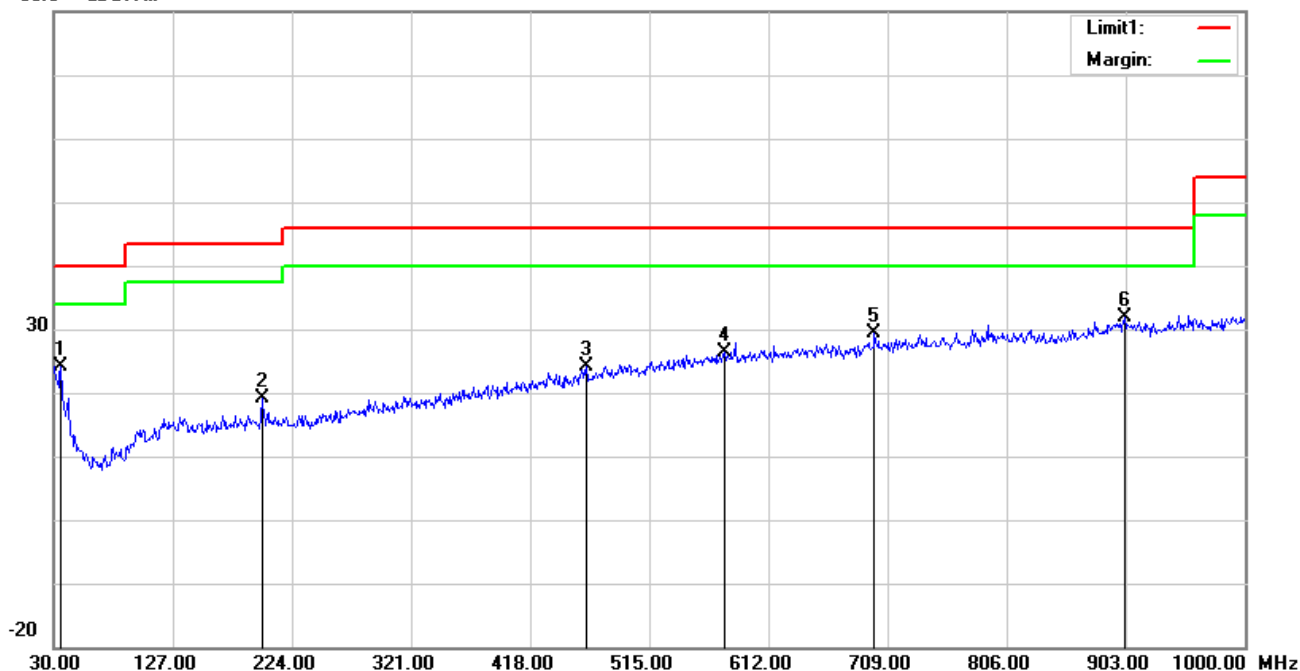
|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| FREQUENCY RANGE | 9KHz ~ 1GHz | DETECTOR FUNCTION | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m |           |          |        |       |       |          |          |        |        |        |
|-----------------------------------------------------|-----------|----------|--------|-------|-------|----------|----------|--------|--------|--------|
| No.                                                 | Frequency | Reading  | Ant_F  | PA_G  | Cab_L | Result   | Limit    | Margin | Height | Degree |
|                                                     | (MHz)     | (dBuV/m) | (dB/m) | (dB)  | (dB)  | (dBuV/m) | (dBuV/m) | (dB)   | (cm)   | ( ° )  |
| 1                                                   | 35.8200   | 30.02    | 16.21  | 22.25 | 0.16  | 24.14    | 40.00    | -15.86 | 100    | 146    |
| 2                                                   | 199.7500  | 28.48    | 11.50  | 22.38 | 1.55  | 19.15    | 43.50    | -24.35 | 100    | 138    |
| 3                                                   | 463.5900  | 26.27    | 17.81  | 21.88 | 2.04  | 24.24    | 46.00    | -21.76 | 200    | 246    |
| 4                                                   | 576.1100  | 25.63    | 20.11  | 21.63 | 2.29  | 26.40    | 46.00    | -19.60 | 100    | 279    |
| 5                                                   | 698.3300  | 26.90    | 21.43  | 21.36 | 2.41  | 29.38    | 46.00    | -16.62 | 200    | 356    |
| 6                                                   | 902.0300  | 26.32    | 23.86  | 20.88 | 2.65  | 31.95    | 46.00    | -14.05 | 100    | 129    |

REMARKS:

1. Result (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant\_F (dB/m) + Cab\_L (dB) - PA\_G (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value

80.0 dBuV/m



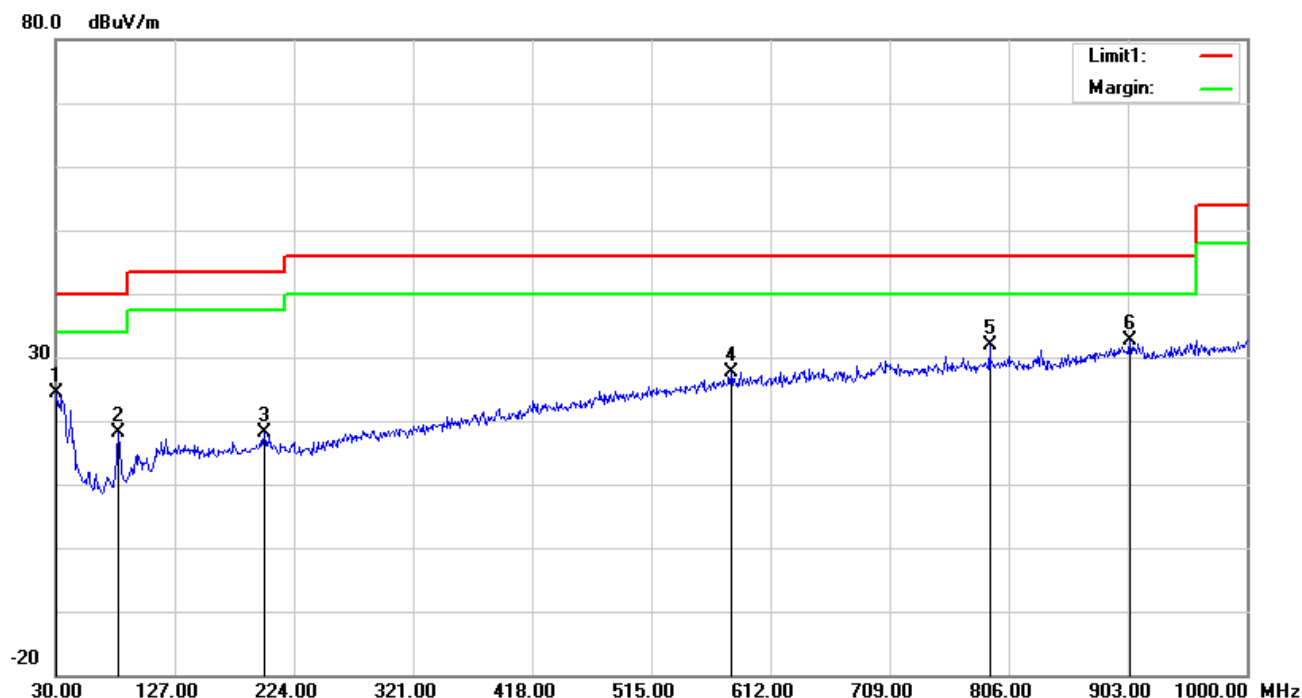


|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| FREQUENCY RANGE | 9KHz ~ 1GHz | DETECTOR FUNCTION | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m |           |          |        |       |       |          |          |        |        |        |
|---------------------------------------------------|-----------|----------|--------|-------|-------|----------|----------|--------|--------|--------|
| No.                                               | Frequency | Reading  | Ant_F  | PA_G  | Cab_L | Result   | Limit    | Margin | Height | Degree |
|                                                   | (MHz)     | (dBuV/m) | (dB/m) | (dB)  | (dB)  | (dBuV/m) | (dBuV/m) | (dB)   | (cm)   | ( ° )  |
| 1                                                 | 30.9700   | 26.94    | 19.48  | 22.27 | 0.13  | 24.28    | 40.00    | -15.72 | 100    | 181    |
| 2                                                 | 80.4400   | 33.37    | 6.74   | 22.42 | 0.54  | 18.23    | 40.00    | -21.77 | 100    | 48     |
| 3                                                 | 199.7500  | 27.39    | 11.50  | 22.38 | 1.55  | 18.06    | 43.50    | -25.44 | 100    | 356    |
| 4                                                 | 579.9900  | 26.81    | 20.14  | 21.63 | 2.29  | 27.61    | 46.00    | -18.39 | 100    | 33     |
| 5                                                 | 790.4800  | 28.41    | 22.11  | 21.17 | 2.54  | 31.89    | 46.00    | -14.11 | 100    | 16     |
| 6                                                 | 904.9400  | 27.05    | 23.80  | 20.87 | 2.65  | 32.63    | 46.00    | -13.37 | 100    | 144    |

**REMARKS:**

1. Result (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant\_F (dB/m) + Cab\_L (dB) - PA\_G (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value





## 4.2 BANDWIDTH MEASUREMENT

### 4.2.1 LIMITS OF BANDWIDTH MEASUREMENT

The field strength of any emissions appearing between the band edges and out of band shall be attenuated at least 20 dB below the level of the unmodulated carrier or to the general limits in Section 15.209.

| FREQUENCY<br>(MHz) | Limits             |
|--------------------|--------------------|
|                    | [MHz]              |
| 27.145             | within 26.96-27.28 |

### 4.2.2 TEST INSTRUMENTS

| Instrument                                | Model             | Serial #                   | Cal Date    | Cal Due     |
|-------------------------------------------|-------------------|----------------------------|-------------|-------------|
| Power Sensor                              | Dare RPR3006C/P/W | N/A                        | Jan. 05, 19 | Jan. 04, 20 |
| Power Sensor                              | Dare RPR3006C/P/W | N/A                        | Jan. 05, 19 | Jan. 04, 20 |
| Agilent ESA-E SERIES<br>SPECTRUM ANALYZER | E4407B            | MY45108319                 | Feb. 11, 19 | Feb. 10, 20 |
| EMI test receiver                         | ESL6              | 1300.5001K06-<br>100262-eQ | Jan. 05, 19 | Jan. 04, 20 |
| Power Splitter                            | 1#                | 1#                         | Dec. 09, 18 | Dec. 08, 19 |
| SYNTHESIZED SIGNAL<br>GENERATOR           | 8665B             | 3744A01293                 | Jan. 05, 19 | Jan. 04, 20 |
| DC Power Supply                           | E3640A            | MY40004013                 | Jan. 05, 19 | Jan. 04, 20 |
| Bilog Antenna<br>(30MHz~6GHz)             | JB6               | A110712                    | Feb. 08, 19 | Feb. 07, 20 |
| Bilog Antenna<br>(30MHz~2GHz)             | JB1               | A112017                    | Jan. 26, 19 | Jan. 25, 20 |
| A-INFOMW Horn<br>Antenna (1~18GHz)        | AH-118            | 71259                      | Jan. 26, 19 | Jan. 25, 20 |
| Pre-Amplifier<br>(100MHz~26.5GHz)         | EMC 012645        | 980077                     | May 18, 19  | May 17, 20  |
| Pre-Amplifier<br>(18GHz~40GHz)            | EMC 184045        | 980102                     | Nov. 08, 18 | Nov. 07, 19 |
| EMCO Horn Antenna<br>(1~18GHz)            | AH-118            | 71283                      | Feb. 02, 19 | Feb. 01, 20 |
| OPT 010 AMPLIFIER<br>(0.1~1300MHz)        | 8447E             | 2727A02430                 | Dec. 09, 18 | Dec. 08, 19 |
| Horn Antenna                              | BBHA 9170         | BBHA9170147                | Mar. 13, 19 | Mar. 12, 20 |
| Microwave Preamplifier<br>(0.5 ~ 18GHz)   | PAM-118           | 443008                     | Dec. 09, 18 | Dec. 08, 19 |
| Attenuator                                | MINI              | N/A                        | Dec. 09, 18 | Dec. 08, 19 |
| Test Software                             | EZ-EMC            | ver.lcp-03A1               | N/A         | N/A         |

**NOTE:**

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

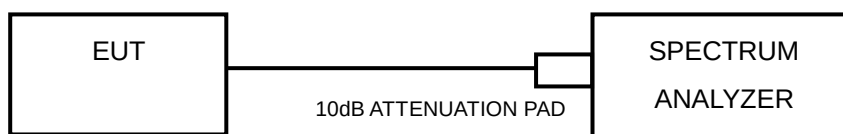
#### 4.2.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



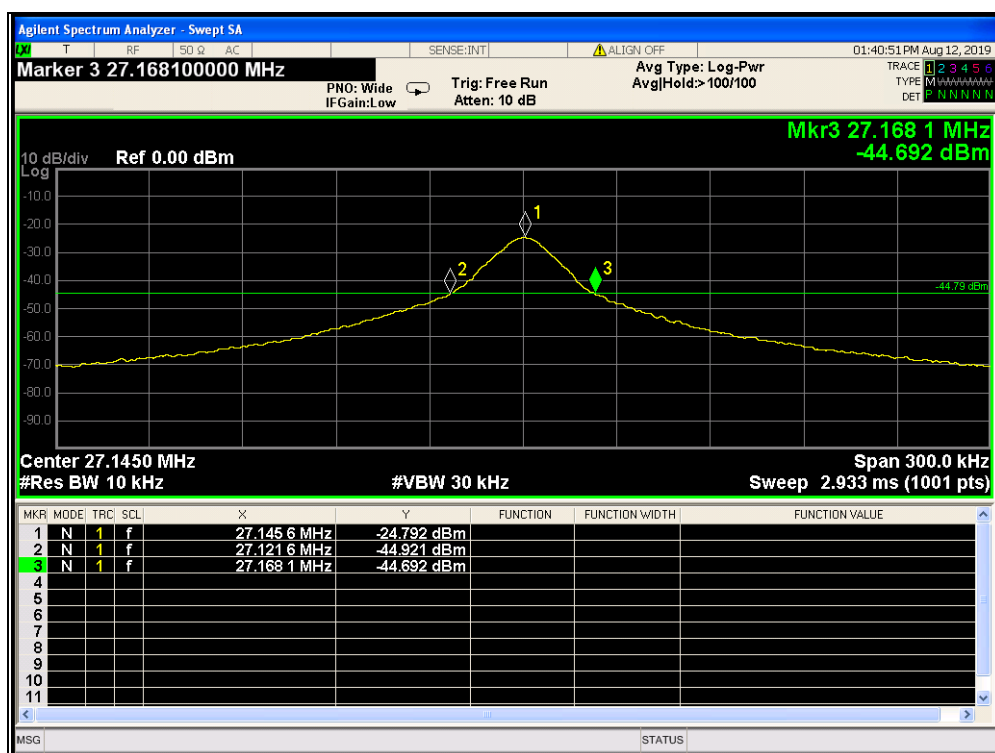
#### 4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6

## 4.2.7 TEST RESULTS

| Lower & Upper Test Frequency Point (MHz) | Test Frequency (MHz) | P/F  |
|------------------------------------------|----------------------|------|
| Lower                                    | 27.1216              | PASS |
| Upper                                    | 27.1681              | PASS |

### Test Data:





## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



## **6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

**---END---**