



## Test Report

Date : 2020-05-16  
No. : HMD20050001

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**Applicant** : Zhongshan Hefeng Electronics Co., Ltd.  
6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road,  
Minzhong Town, Zhongshan City, Guangdong Province, China

**Supplier / Manufacturer** : Zhongshan Hefeng Electronics Co., Ltd.  
6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road,  
Minzhong Town, Zhongshan City, Guangdong Province, China

**Description of Sample(s)** : Submitted sample(s) said to be  
Product: Fan Light Remote Control  
Brand Name: HF  
Model No.: RT36A  
FCC ID: 2AWB7-RT36A

**Date Samples Received** : 2020-04-29

**Date Tested** : 2020-05-15 to 2020-05-16

**Investigation Requested** : Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.10:2013 for FCC Certification.

**Conclusions** : The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remarks** : ---

LEUNG Kwun Hang, Joey  
Authorized Signatory



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### **1.0 General Details**

#### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate, New Territories, Hong Kong  
Telephone: 852 2666 1888  
Fax: 852 2664 4353

#### **1.2 Equipment Under Test [EUT]**

##### **Description of Sample(s)**

|               |                                                                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product:      | Fan Light Remote Control                                                                                                                                            |
| Manufacturer: | Zhongshan Hefeng Electronics Co., Ltd.<br>6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road,<br>Minzhong Town, Zhongshan City, Guangdong Province, China |
| Brand Name:   | HF                                                                                                                                                                  |
| Model Number: | RT36A                                                                                                                                                               |
| Rating:       | 3Vd.c. (Two CR2032 batteries in parallel)                                                                                                                           |

##### **1.2.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a Fan Light Remote Control. The EUT is operating at 315MHz. Test was conducted under Tx mode.

#### **1.3 Date of Order**

2020-04-29

#### **1.4 Submitted Sample(s):**

1 Sample

#### **1.5 Test Duration**

2020-05-15 to 2020-05-16

#### **1.6 Country of Origin**

China

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### 2.0 Technical Details

#### **2.1 Investigations Requested**

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.10: 2013 for FCC Certification.

This is a manually operated transmitter, Press the button to start sending signals.

#### **2.2 Test Standards and Results Summary Tables**

| <b>EMISSION<br/>Results Summary</b>                                |                     |                   |                     |                                     |                          |                          |
|--------------------------------------------------------------------|---------------------|-------------------|---------------------|-------------------------------------|--------------------------|--------------------------|
| Test Condition                                                     | Test Requirement    | Test Method       | Class /<br>Severity | Test Result                         |                          |                          |
|                                                                    |                     |                   |                     | Pass                                | Failed                   | N/A                      |
| Field Strength of<br>Fundamental Emissions &<br>Spurious Emissions | FCC 47CFR 15.231(a) | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20dB Bandwidth of<br>Fundamental Emission                          | FCC 47CFR 15.231(c) | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Radiated Emissions                                                 | FCC 47CFR 15.209    | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Manual Operated<br>Transmitter Transmission<br>Time                | FCC 47CFR 15.231(a) | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Antenna requirement                                                | FCC 47CFR 15.203    | N/A               | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Note: N/A - Not Applicable

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### 3.0 Test Results

#### 3.1 Emission

##### 3.1.1 Radiated Emissions

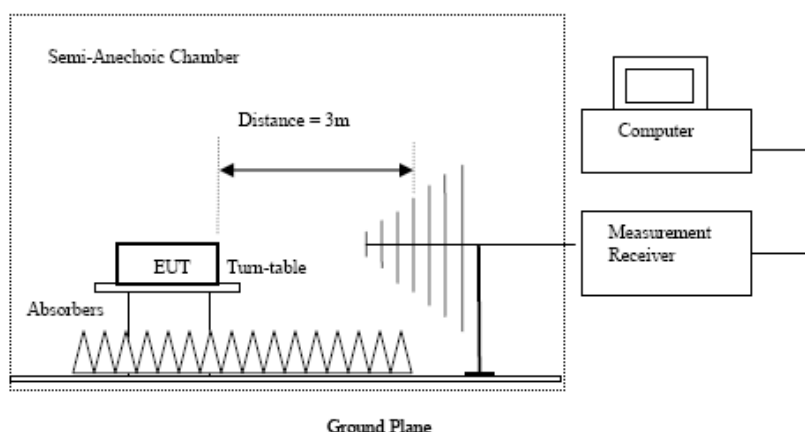
|                           |                        |                               |
|---------------------------|------------------------|-------------------------------|
| Test Requirement:         | FCC 47CFR 15.231(a)    |                               |
| Test Method:              | ANSI C63.10:2013       |                               |
| Test Date:                | 2020-05-16             |                               |
| Mode of Operation:        | Tx mode                |                               |
| Ambient Temperature: 25°C | Relative Humidity: 52% | Atmospheric Pressure: 101 kPa |

#### **Test Method:**

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. 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, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\* Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

#### **Test Setup:**



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.  
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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### Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:

| Frequency Range of Fundamental<br>[MHz] | Field Strength of Fundamental Emission<br>[Average]<br>[μV/m] | Field Strength of Spurious Emission<br>[Average]<br>[μV/m] |
|-----------------------------------------|---------------------------------------------------------------|------------------------------------------------------------|
| 40.66-40.70                             | 2,250                                                         | 225                                                        |
| 70-130                                  | 1,250                                                         | 125                                                        |
| 130-174                                 | 1,250 to 3,750 *                                              | 125 to 375 *                                               |
| 174-260                                 | 3,750                                                         | 375                                                        |
| 260-470                                 | 3,750 to 12,500 *                                             | 375 to 1,250 *                                             |
| Above 470                               | 12,500                                                        | 1,250                                                      |

<sup>1</sup>Linear interpolations.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

### Results of Tx mode(1GHz – 18GHz): PASS

| Field Strength of Fundamental Emissions |                               |                              |                             |                           |                      |                     |
|-----------------------------------------|-------------------------------|------------------------------|-----------------------------|---------------------------|----------------------|---------------------|
| Peak Value                              |                               |                              |                             |                           |                      |                     |
| Frequency<br>MHz                        | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit<br>@3m<br>μV/m | E-Field<br>Polarity |
| 315.00                                  | 50.5                          | 15.4                         | 65.9                        | 1972.4                    | 60,430.5             | Vertical            |
| 315.00                                  | 51.6                          | 15.3                         | 66.9                        | 2213.1                    | 60,430.5             | Horizontal          |

| Field Strength of Spurious Emissions |                               |                              |                             |                           |                   |                     |
|--------------------------------------|-------------------------------|------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| Peak Value                           |                               |                              |                             |                           |                   |                     |
| Frequency<br>MHz                     | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit @3m<br>μV/m | E-Field<br>Polarity |
| 630.00                               | 34.1                          | 22.8                         | 56.9                        | 703.1                     | 6,043.05          | Vertical            |
| 630.00                               | 27.3                          | 22.5                         | 49.8                        | 308.3                     | 6,043.05          | Horizontal          |
| 945.00                               | 27.8                          | 26.8                         | 54.6                        | 537.0                     | 6,043.05          | Vertical            |
| 945.00                               | 23.4                          | 26.8                         | 50.2                        | 323.6                     | 6,043.05          | Horizontal          |
| 1575.00                              | 25.0                          | 32.9                         | 57.9                        | 781.6                     | 6,043.05          | Vertical            |
| 1575.00                              | 22.2                          | 32.7                         | 54.9                        | 552.7                     | 6,043.05          | Horizontal          |
| 2205.00                              | 17.2                          | 38.2                         | 55.4                        | 586.8                     | 6,043.05          | Vertical            |
| 2205.00                              | 17.6                          | 38.1                         | 55.7                        | 609.5                     | 6,043.05          | Horizontal          |

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Results of Tx mode(1GHz – 18GHz): PASS

| Field Strength of Fundamental Emissions |                                 |                              |                             |                           |                      |                     |
|-----------------------------------------|---------------------------------|------------------------------|-----------------------------|---------------------------|----------------------|---------------------|
| Average Value                           |                                 |                              |                             |                           |                      |                     |
| Frequency<br>MHz                        | Peak Value<br>Level @3m<br>dBμV | Duty Cycle<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit<br>@3m<br>μV/m | E-Field<br>Polarity |
| 315.00                                  | 65.9                            | -12.4                        | 53.5                        | 472.1                     | 6,043.05             | Vertical            |
| 315.00                                  | 66.9                            | -12.4                        | 54.6                        | 533.9                     | 6,043.05             | Horizontal          |

| Field Strength of Spurious Emissions |                                 |                              |                             |                           |                   |                     |
|--------------------------------------|---------------------------------|------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| Average Value                        |                                 |                              |                             |                           |                   |                     |
| Frequency<br>MHz                     | Peak Value<br>Level @3m<br>dBμV | Duty Cycle<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit @3m<br>μV/m | E-Field<br>Polarity |
| 630.00                               | 56.9                            | -12.4                        | 44.6                        | 169.0                     | 604.305           | Vertical            |
| 630.00                               | 49.8                            | -12.4                        | 37.4                        | 74.1                      | 604.305           | Horizontal          |
| 945.00                               | 54.6                            | -12.4                        | 42.2                        | 128.8                     | 604.305           | Vertical            |
| 945.00                               | 50.2                            | -12.4                        | 37.8                        | 77.6                      | 604.305           | Horizontal          |
| 1575.00                              | 57.9                            | -12.4                        | 45.5                        | 187.9                     | 604.305           | Vertical            |
| 1575.00                              | 54.9                            | -12.4                        | 42.5                        | 132.9                     | 604.305           | Horizontal          |
| 2205.00                              | 55.4                            | -12.4                        | 43.0                        | 141.1                     | 604.305           | Vertical            |
| 2205.00                              | 55.7                            | -12.4                        | 43.3                        | 146.7                     | 604.305           | Horizontal          |

Remarks:

- FCC Limit for Fundamental Average Measurement =  $41.67(315.0) - 7083 = 6043.05 \mu\text{V/m}$
- +: Denotes restricted band of operation.  
Measurements were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limits of FCC Rules Part 15 Section 15.209 were applied.
- \*: Adjusted by Duty Cycle = -12.38dB  
Duty Cycle Correction = -12.38dB  
Correction Factor = Cable loss Factor + Ant Factor - Amp Factor  
Average Value Final Field Strength = Peak Value Final Field Strength + Duty Cycle
- Correction Factor includes Antenna Factor and Cable Attenuation.
- Calculated measurement uncertainty (9kHz-30MHz): 2.0dB  
(30MHz -1GHz): 4.9dB  
(1GHz -6GHz): 4.02dB  
(6GHz -26.5GHz): 4.03dB
- Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### Limits for Radiated Emissions FCC 47 CFR 15.209 Class B1:

| Frequency Range | Quasi-Peak Limits |
|-----------------|-------------------|
| [MHz]           | [μV/m]            |
| 0.009-0.490     | 2400/F (kHz)      |
| 0.490-1.705     | 24000/F (kHz)     |
| 1.705-30        | 30                |
| 30-88           | 100               |
| 88-216          | 150               |
| 216-960         | 200               |
| Above 960       | 500               |

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

#### Remarks:

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty: (9kHz-30MHz): 2.0dB

(30MHz -1GHz): 4.9dB

(1GHz -6GHz): 4.02dB

(6GHz -26.5GHz): 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

#### Result of Tx mode (9kHz - 30MHz): PASS

Emissions detected are more than 20 dB below the limit line(s).

#### Results of Tx mode (30MHz – 1GHz): PASS

| Radiated Emissions<br>Quasi-Peak |                     |                        |                        |                      |                      |
|----------------------------------|---------------------|------------------------|------------------------|----------------------|----------------------|
| Emission<br>Frequency<br>MHz     | E-Field<br>Polarity | Level<br>@3m<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Level<br>@3m<br>μV/m | Limit<br>@3m<br>μV/m |
| 32.9                             | Horizontal          | 30.4                   | 40.0                   | 33.0                 | 100                  |
| 65.3                             | Horizontal          | 24.9                   | 40.0                   | 17.6                 | 100                  |
| 254.7                            | Horizontal          | 28.3                   | 46.0                   | 26.0                 | 200                  |
| 36.8                             | Vertical            | 31.3                   | 40.0                   | 36.6                 | 100                  |
| 44.1                             | Vertical            | 30.6                   | 40.0                   | 33.8                 | 100                  |
| 66.3                             | Vertical            | 27.1                   | 40.0                   | 22.5                 | 100                  |

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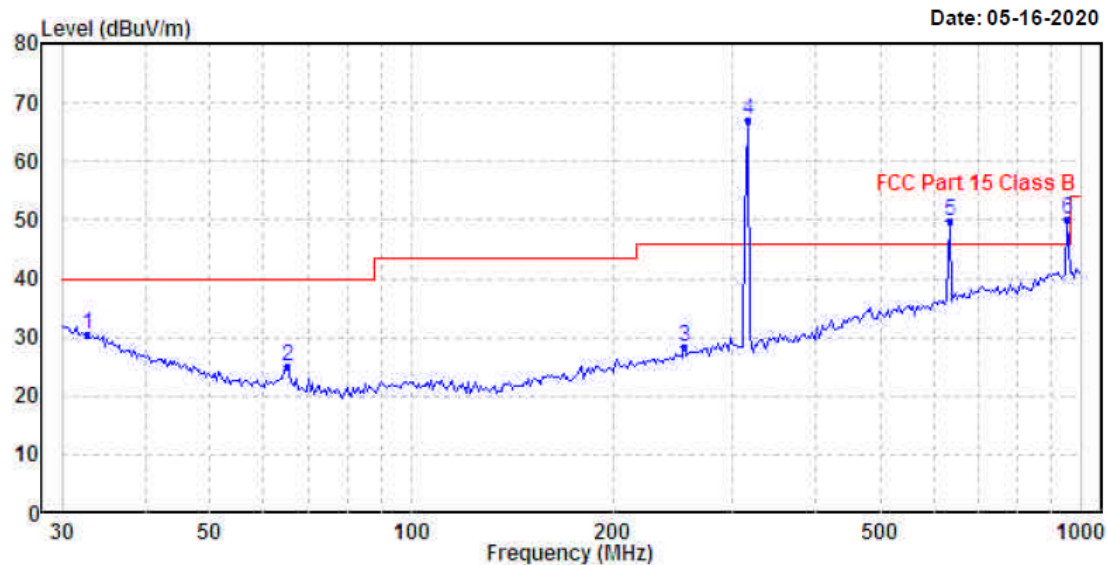


## Test Report

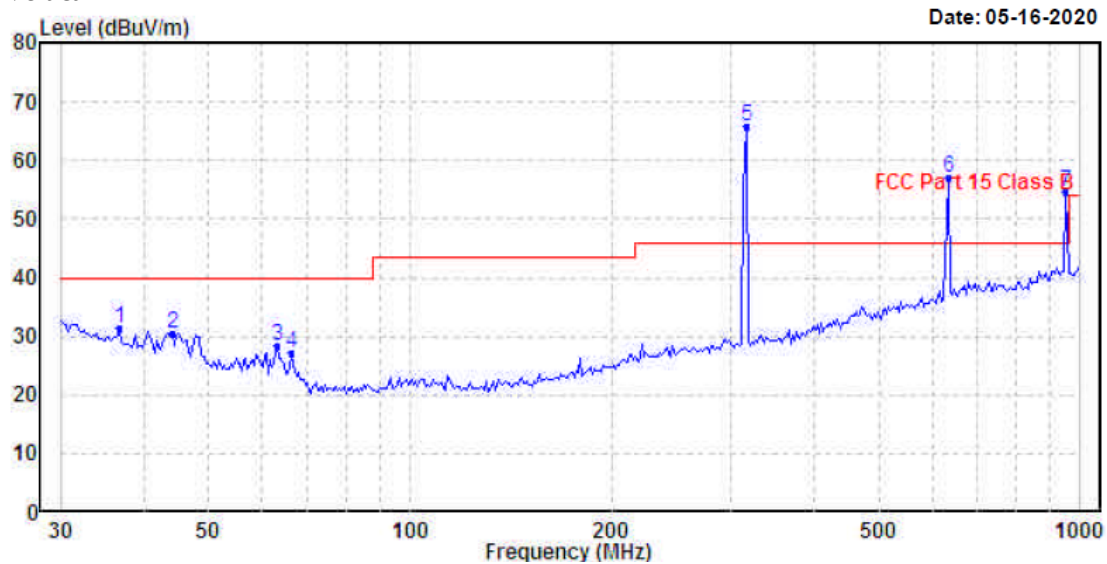
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Horizontal



Vertical



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### 3.1.2 Antenna Requirement

Ambient Temperature: 25°C

Relative Humidity: 51%

Atmospheric Pressure: 101 kPa

**Test Requirements:** § 15.203

#### **Test Specification:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### **Test Results:**

This is PCB antenna. There is no external antenna, the antenna gain = 0dBi. User is unable to remove or changed the Antenna.

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### **3.2 20dB Bandwidth of Fundamental Emission**

Test Requirement: FCC 47 CFR 15.231(c)  
Test Method: ANSI C63.10:2013  
Test Date: 2020-05-15  
Mode of Operation: Tx mode

Ambient Temperature: 25°C      Relative Humidity: 52%      Atmospheric Pressure: 101 kPa

#### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

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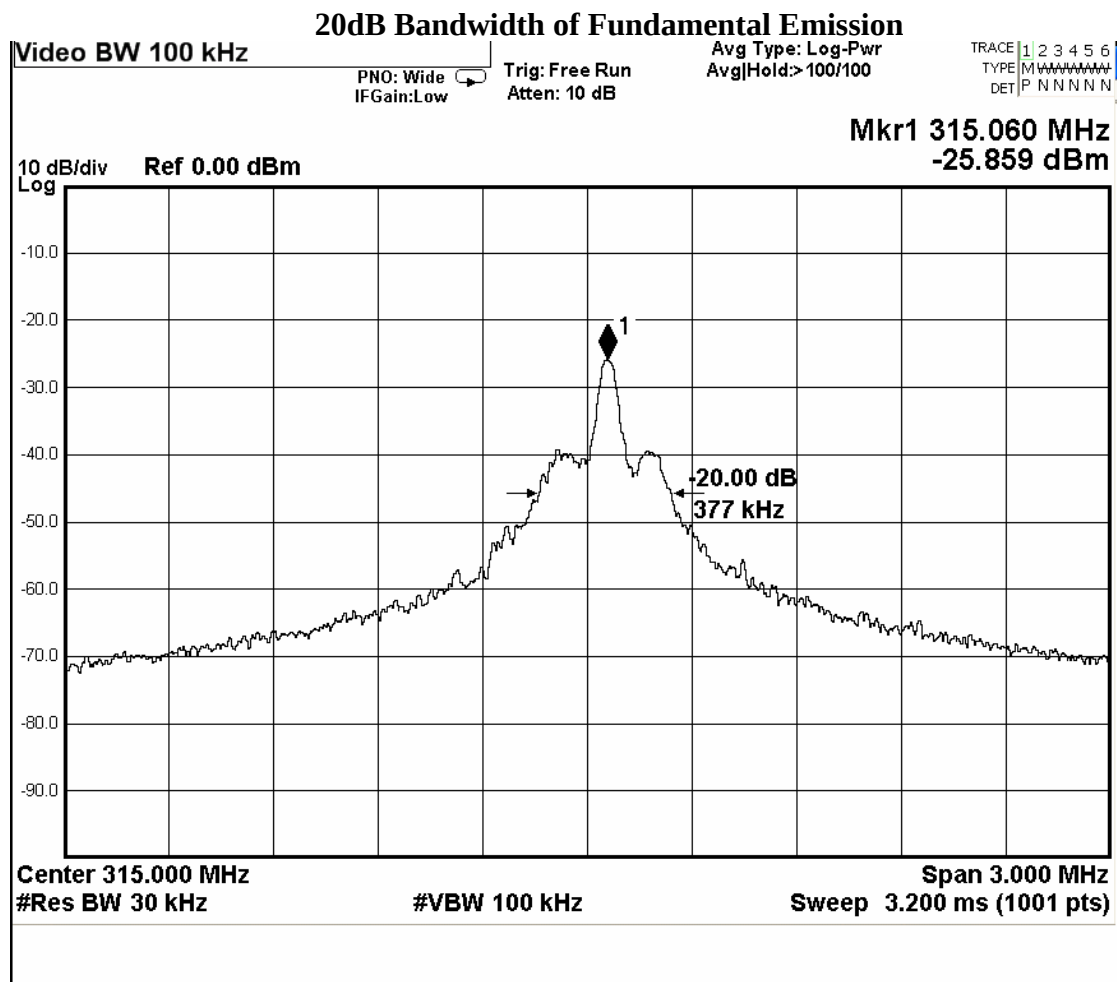
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### Limits for 20 dB Bandwidth of Fundamental Emission:

| Frequency Range<br>[MHz] | 20dB Bandwidth<br>[kHz] | FCC Limits *<br>[MHz] |
|--------------------------|-------------------------|-----------------------|
| 315.0                    | 377                     | 0.7875                |

\*: FCC Limit for Bandwidth measurement  
 = (0.25%)(Center Frequency)  
 = (0.0025)(315.0)  
 = 0.7875MHz



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### Appendix A

#### List of Measurement Equipment

##### Radiated Emission

| EQP NO. | DESCRIPTION                             | MANUFACTURER                | MODEL NO.           | SERIAL NO.         | LAST CAL   | DUE CAL    |
|---------|-----------------------------------------|-----------------------------|---------------------|--------------------|------------|------------|
| EM215   | MULTIDEVICE CONTROLLER                  | EMCO                        | 2090                | 00024676           | N/A        | N/A        |
| EM217   | ELECTRIC POWERED<br>TURNABLE            | EMCO                        | 2088                | 00029144           | N/A        | N/A        |
| EM218   | ANECHOIC CHAMBER                        | ETS-LINDGREN                | FACT-3              | --                 | 2020/04/20 | 2021/04/20 |
| EM356   | ANTENNA<br>POSITIONING TOWER            | ETS-LINDGREN                | 2171B               | 00150346           | N/A        | N/A        |
| EM336   | PRECISION CONICAL DIPOLE                | SEIBERSDORF<br>LABORATORIES | PCD 3100            | 6236/M             | 2018/06/28 | 2020/06/28 |
| EM229   | EMI TEST RECEIVER                       | R&S                         | ESIB40              | 100248             | 2020/05/13 | 2021/05/13 |
| EM276   | BROADBAND HORN ANTENNA                  | A-INFOMW                    | JXTXLB-<br>10180-SF | J203109090300<br>7 | 2019/03/20 | 2021/03/29 |
| EM300   | PYRAMIDAL STANDARD GAIN<br>HORN ANTENNA | ETS-LINDGREN                | 3160-09             | 00130130           | 2020/04/28 | 2022/04/28 |
| EM301   | PYRAMIDAL STANDARD GAIN<br>HORN ANTENNA | ETS-LINDGREN                | 3160-10             | 00130988           | 2020/04/28 | 2022/04/28 |
| EM022   | LOOP ANTENNA                            | ETS_LINDGREN                | 6502                | 00206533           | 2019/11/30 | 2021/11/30 |
| EM045   | POWER METER                             | ROHDE & SCHWARZ             | NRVD                | 843246/028         | 2018/06/01 | 2020/06/01 |

#### Remarks:-

CM Corrective Maintenance  
N/A Not Applicable  
TBD To Be Determined

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### Appendix B

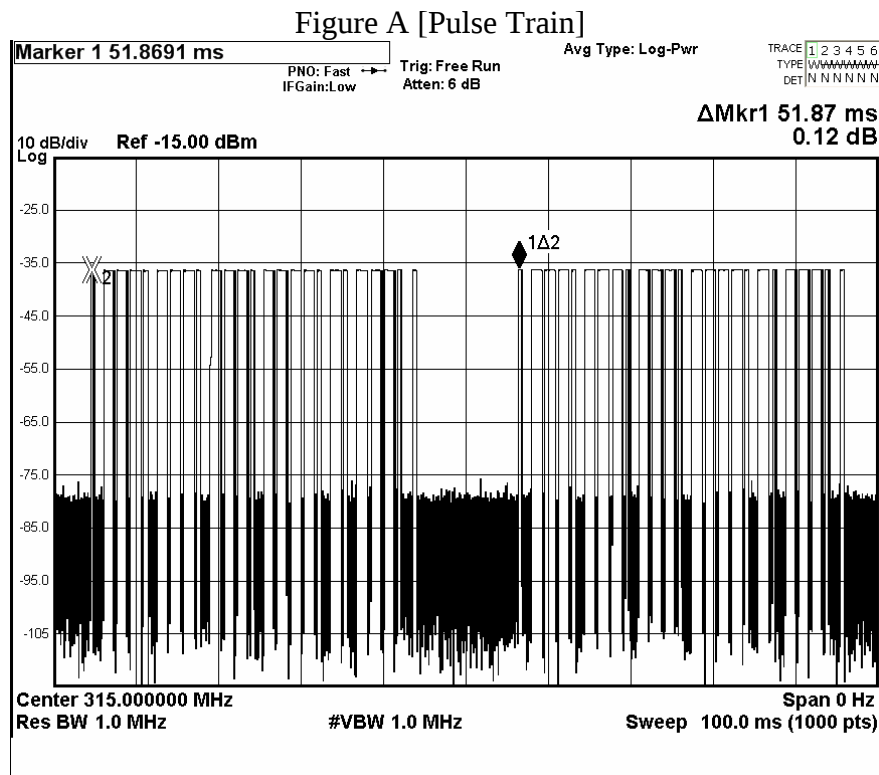
#### Duty Cycle Correction During 100msec

Each packet period (51.87msec) never exceeds a series of 17(1.202msec) long and 8(0.4506msec) short pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered  $(1.202 \times 17 + 0.4506 \times 8)$  msec per 51.87msec = 46.34% duty cycle.

Remarks:

Duty cycle factor =  $20\text{Log} [(1.202 \times 17 + 0.4506 \times 8) / 51.87] = -12.38\text{dB}$

The following figures [Figure A to Figure D] showed the characteristics of the pulse train for one of these functions.



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Figure B [Long Pulse]

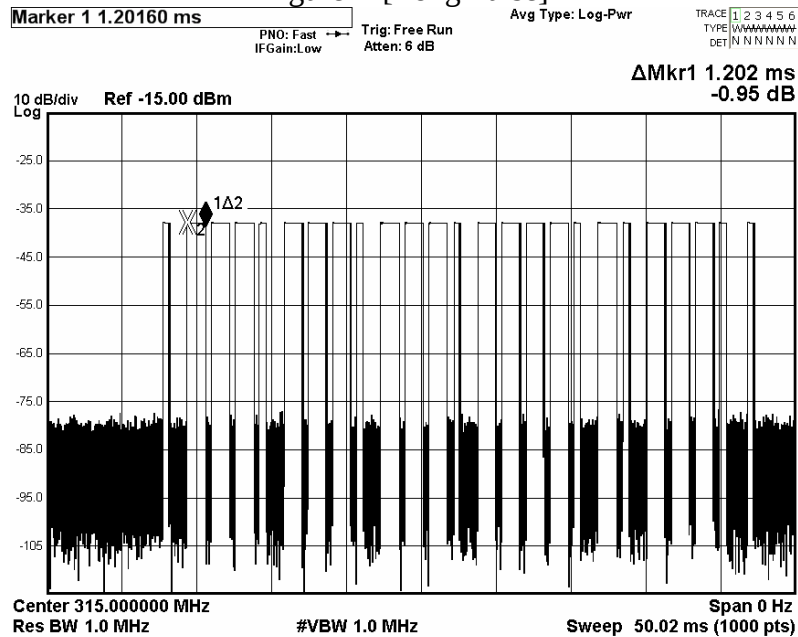
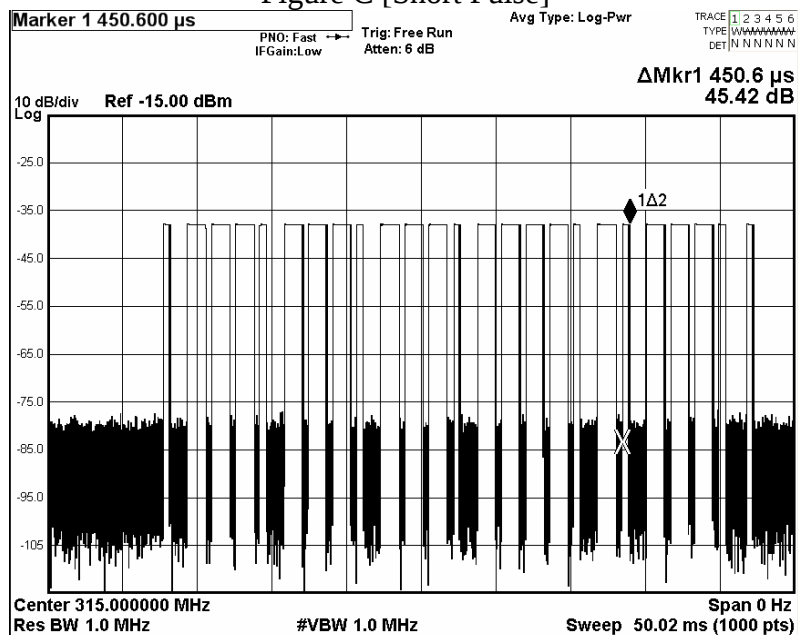


Figure C [Short Pulse]



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## Test Report

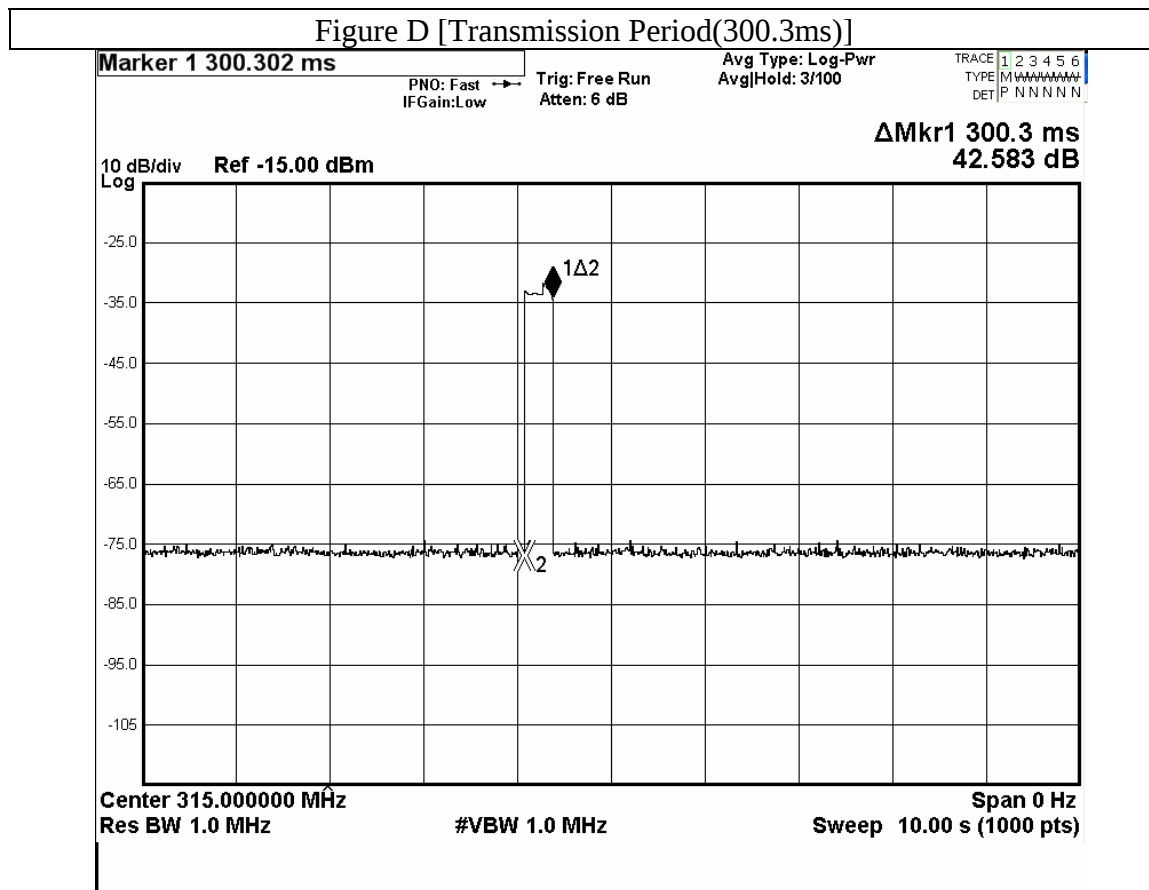
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### Appendix C

#### Manual Operated Transmitter Transmission Time [FCC 47CFR 15.231(a)]

According to FCC 47CFR15.231 (a). A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.  
The EUT ceases transmission almost immediately upon being released and appears to finish the current packet being transmitted. Therefore the longest period of time the transmitter should take to deactivate is a packet length.



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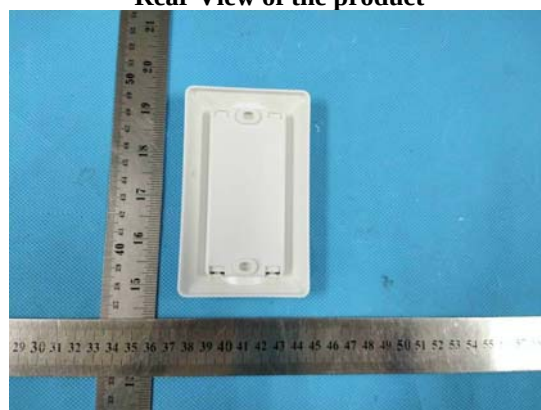
### Appendix D

#### Photographs of EUT

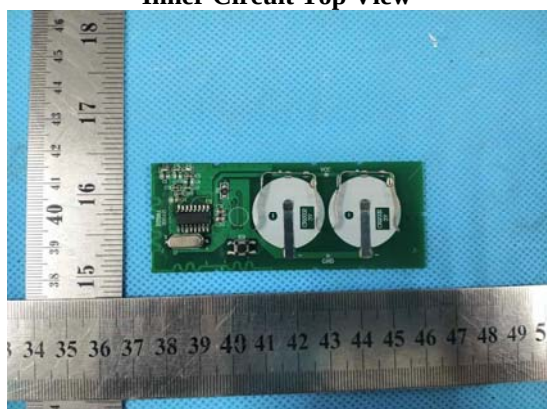
**Front View of the product**



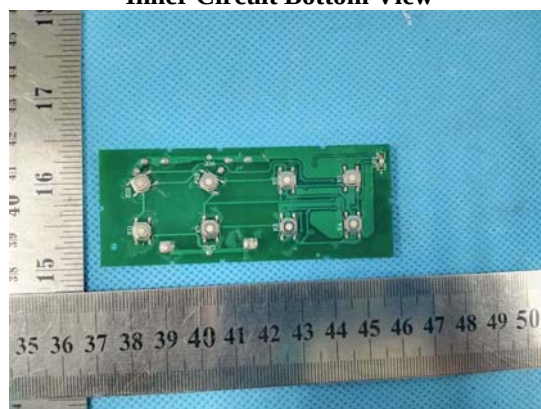
**Rear View of the product**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up (9kHz – 30MHz)**



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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up (30MHz – 1000MHz)**



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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up (above 1000MHz)**



**\*\*\*\*\* End of Test Report \*\*\*\*\***

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