



## TEST REPORT OF PART15C FOR FCC AND INDUSTRY CANADA RSS-210

On Behalf of

### Wireless Environment LLC

**FCC ID:** W7DMBN580

**Product Description:** NetBright Path Lights

**Test Model:** MBN580

**Brand:** MR BEAMS®, NETBRIGHT®

**Applicant:** Wireless Environment LLC

57 E. Washington Street, Chagrin Falls, Ohio, United States,  
44022

**Manufacturer:** Ningbo Kliv Electronic Co.,Ltd

No.488 Longfei Road, Yunlong Town, YinZhou District ,Ningbo,  
China

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**Test by:**

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: **Wireless Environment LLC**  
Address of applicant: 57 E. Washington Street, Chagrin Falls, Ohio, United States, 44022  
Manufacturer: **Ningbo Kliv Electronic Co.,Ltd**  
Address of manufacturer: No.488 Longfei Road, Yunlong Town, YinZhou District ,Ningbo,China

#### General Description of E.U.T

| Items               | Description                    |
|---------------------|--------------------------------|
| EUT Description:    | NetBright Path Lights          |
| Model No.:          | MBN580                         |
| Serial No           | N/A                            |
| Trade mark:         | MR BEAMS®、NETBRIGHT®           |
| Type of Modulation: | ASK                            |
| Frequency Band:     | 433.92MHz                      |
| Model Difference    | N/A                            |
| Number of Channels  | 1                              |
| Antenna Type:       | Internal antenna, fixed on PCB |
| Antenna Gain:       | -2dBi                          |
| Rated Voltage:      | 4.5DCV from battery            |

**Note:**

\* The test data gathered are from the production sample provided by the manufacturer,

## 1.2 Test Facility

All measurement required was performed at laboratory of Centre Testing International (ShenZhen) Corporation ,Location at Building C, Sienific Innovation Park,Tiegang Reservoir, Xixiang, Baoan District, Shenzhen, Guangdong, The site and apparatus are constructed in conformance with the requirements of RSS-210 or ANSI C63.10, CISPR 16-1-1 and other equivalent standards.

The test facility is recognized, certified, or accredited by the following organizations:

### **FCC – Registration No.: 565659**

Centre Testing International (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 565659, expiration date is 01/27/2017.

### **IC Registration No.: 7408B**

The 3m alternate test site of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7408B on December 29, 2009.

### **CNAS - Registration No.: L1910**

CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION,. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.The acceptance letter from the CNAS is maintained in our files: Registration:L1910,January 12,2010.

## 1.3 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Test item                                             | Value (dB) |
|-------------------------------------------------------|------------|
| Conducted Emission Expanded Uncertainty               | 2.23       |
| Radiated emission expanded uncertainty(9kHz-30MHz)    | 3.08       |
| Radiated emission expanded uncertainty(30MHz-1000MHz) | 4.42       |
| Radiated emission expanded uncertainty(Above 1GHz)    | 4.06       |

## **2. SYSTEM TEST CONFIGURATION**

The tests documented in this report were performed in accordance with (RSS-210 and RSS-GEN) or (ANSI C63.10-2013 and FCC CFR 47 Part 15 Subpart C).

### **2.1 EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### **2.2 EUT Exercise**

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

### **2.3 General Test Procedures**

**Conducted Emissions** The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in (RSS-210 and RSS-GEN) or (ANSI C63.10-2013 and FCC CFR 47 Part 15 Subpart C) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

**Radiated Emissions** The EUT is placed on a turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m/10m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in (RSS-210 and RSS-GEN) or (ANSI C63.10-2013 and FCC CFR 47 Part 15 Subpart C).



## 2.4 List of Measuring Equipments

Test equipments list of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION.

| Shielding Room No. 1 - Conducted disturbance Test |              |          |            |            |
|---------------------------------------------------|--------------|----------|------------|------------|
| Equipment                                         | Manufacturer | Model    | Serial No. | Due Date   |
| Receiver                                          | R&S          | ESCI     | 100009     | 08/19/2017 |
| LISN                                              | ETS-LINDGREN | 3850/2   | 00051952   | 08/19/2017 |
| LISN                                              | R&S          | ENV216   | 100098     | 08/19/2017 |
| Voltage Probe                                     | R&S          | ESH2-Z3  | 100042     | 08/19/2017 |
| Current Probe                                     | R&S          | EZ17     | 100106     | 08/19/2017 |
| ISN                                               | TESEQ GmbH   | ISN T800 | 30297      | 09/04/2017 |

| Control Room - Conducted disturbance Test (10m part) |                 |          |            |            |
|------------------------------------------------------|-----------------|----------|------------|------------|
| Equipment                                            | Manufacturer    | Model    | Serial No. | Due Date   |
| Receiver                                             | R&S             | ESCI     | 100435     | 08/19/2017 |
| LISN                                                 | schwarzbeck     | NNLK8121 | 8121-529   | 08/19/2017 |
| Transient Limiter                                    | ELECTRO-METRICS | EM-7600  | 806        | 08/19/2017 |
| Voltage Probe                                        | R&S             | ESH2-Z3  | 100042     | 08/19/2017 |
| Current Probe                                        | R&S             | EZ17     | 100106     | 08/19/2017 |
| ISN                                                  | TESEQ GmbH      | ISN T800 | 30297      | 09/04/2017 |
| Horn Antenna                                         | ETS-LINGREN     | 3117     | 00057407   | 08/19/2017 |

| 3M Semi-anechoic Chamber - Radiated disturbance Test |              |           |            |            |
|------------------------------------------------------|--------------|-----------|------------|------------|
| Equipment                                            | Manufacturer | Model     | Serial No. | Due Date   |
| 3M Chamber & Accessory Equipment                     | ETS-LINDGREN | FACT-3    | 3510       | 09/09/2017 |
| Spectrum Analyzer                                    | Agilent      | E4440A    | MY46185649 | 09/07/2017 |
| TRILOG Broadband Antenna                             | schwarzbeck  | VULB 9163 | 401        | 08/21/2017 |
| Multi device Controller                              | ETS-LINGREN  | 2090      | 00057230   | N/A        |
| Horn Antenna                                         | ETS-LINGREN  | 3117      | 00057407   | 08/19/2017 |
| Microwave Preamplifier                               | Agilent      | 8449B     | 3008A02425 | 08/29/2017 |

| 10M Semi-anechoic Chamber - Radiated disturbance Test |              |        |            |            |
|-------------------------------------------------------|--------------|--------|------------|------------|
| Equipment                                             | Manufacturer | Model  | Serial No. | Due Date   |
| 10M Chamber & Accessory Equipment                     | Rainford     | --     | --         | 09/06/2017 |
| Receiver                                              | R&S          | ESCI   | 100435     | 08/19/2017 |
| Spectrum Analyzer                                     | R&S          | FSP40  | 100416     | 09/06/2017 |
| EMI test receiver                                     | R&S          | ESIB40 | 2023282915 | 08/24/2017 |



|                          |             |           |            |            |
|--------------------------|-------------|-----------|------------|------------|
| TRILOG Broadband Antenna | schwarzbeck | VULB 9163 | 484        | 08/21/2017 |
| Horn Antenna             | ETS-LINGREN | 3117      | 00044562   | 09/07/2017 |
| Microwave Preamplifier   | Agilent     | 11909A    | 186871     | 09/06/2017 |
| Microwave Preamplifier   | HP          | HP 8447F  | 2805A03379 | 09/06/2017 |
| Microwave Preamplifier   | CD          | PAP-1G18G | 2001       | 08/29/2017 |

**Shielding Room No. 2 - Harmonic / Flicker Test (EN 61000-3-2) / (EN 61000-3-3)**

| Equipment                 | Manufacturer           | Model          | Serial No. | Due Date   |
|---------------------------|------------------------|----------------|------------|------------|
| 5KVA AC POWER SOURCE      | California instruments | 5001IX-400-413 | 57344      | 08/29/2017 |
| Flicker & Harmonic Tester | California instruments | PACS-1         | 72492      | 08/29/2017 |

**Shielding Room No. 3 - ESD Test (IEC 61000-4-2)**

| Equipment     | Manufacturer | Model  | Serial No.  | Due Date   |
|---------------|--------------|--------|-------------|------------|
| ESD Simulator | EM TEST      | ESD30C | V0603101091 | 08/30/2017 |
| ESD Simulator | TESEQ        | NSG437 | 478         | 08/22/2017 |

**3M Full-anechoic Chamber - Radio-frequency electromagnetic field Immunity Test (IEC 61000-4-3)**

| Equipment                        | Manufacturer | Model     | Serial No. | Due Date   |
|----------------------------------|--------------|-----------|------------|------------|
| 3M Chamber & Accessory Equipment | ETS-LINDGREN | FACT-3    | 3510       | 09/09/2017 |
| ESG Vector signal generators     | Agilent      | E4438C    | MY45095744 | 09/07/2017 |
| Power Amplifier                  | AR           | 150W1000  | 0322288    | 08/29/2017 |
| TRILOG Broadband Antenna         | schwarzbeck  | VULB 9163 | 401        | 08/29/2017 |
| Temperature & Humidity Chamber   | ESPEC        | DSW0540   | ER-009     | 08/29/2017 |

**Shielding Room No. 3 - EFT / Surges Test (IEC 61000-4-4) (IEC 61000-4-5)**

| Equipment            | Manufacturer | Model       | Serial No.   | Due Date   |
|----------------------|--------------|-------------|--------------|------------|
| Compact Generator    | EM-Test      | UCS500M/6B  | V0603101093  | 09/19/2017 |
| Capacitive Clamp     | EM-Test      | C Clamp HFK | 0306-43      | 08/29/2017 |
| CDN for Telecom Port | EM-Test      | CNV504S1    | V0603101094  | 08/29/2017 |
| EFT Generator        | SCHAFFNER    | NSG 2025    | 19878        | 08/19/2017 |
| SURGE Generator      | SCHAFFNER    | NSG 2050    | 200313-135AR | 08/19/2017 |
| CDN                  | SCHAFFNER    | CDN-131/133 | 34397        | 08/29/2017 |

**Shielding Room No. 2 - Radio-frequency continuous conducted Immunity Test (IEC 61000-4-6)**

| Equipment | Manufacturer | Model | Serial No. | Due Date |
|-----------|--------------|-------|------------|----------|
|-----------|--------------|-------|------------|----------|



|                  |         |           |            |            |
|------------------|---------|-----------|------------|------------|
| Signal Generator | IFR     | 2023B     | 202307/883 | 09/07/2017 |
| Power Amplifier  | AR      | 75A 250A  | 320297     | 08/19/2017 |
| Attenuator       | EM-Test | ATT6/75   | 0320837    | 08/19/2017 |
| CDN              | EM-Test | CDN M2/M3 | 0204-01    | 08/19/2017 |
| EM-Clamp         | EM-Test | EM101     | 35770      | 08/19/2017 |

**Shielding Room No. 2 - Power-frequency magnetic fields Immunity Test (IEC 61000-4-8)**

|                     |         |            |             |            |
|---------------------|---------|------------|-------------|------------|
| Compact Generator   | EM-Test | UCS500M/6B | V0603101093 | 08/19/2017 |
| Induction Coil      | EM-Test | MS100      | 0106-47     | 08/19/2017 |
| Current Transformer | EM-Test | MC2630     | 0106-02     | 08/19/2017 |

**Shielding Room No. 2 -Voltage dips and interruptions Test (IEC 61000-4-11)**

| Equipment                | Manufacturer           | Model          | Serial No. | Due Date   |
|--------------------------|------------------------|----------------|------------|------------|
| 5KVA AC POWER SOURCE     | California instruments | 5001iX-400-413 | 57344      | 08/19/2017 |
| Electronic output switch | California instruments | EOS-1          | 72616      | 08/19/2017 |



### 3. SUMMARY OF TEST RESULTS

| Test Rules                               | Description of Test                             | Result         |
|------------------------------------------|-------------------------------------------------|----------------|
| RSS-210 and RSS-GEN or FCC Part15.207(a) | Condcuted Emission                              | Not Applicable |
| RSS-210 and RSS-GEN or FCC Part15.231(a) | Electric Field Strength of Fundamental Emission | Pass           |
| RSS-210 and RSS-GEN or FCC Part15.231(a) | Electric Field Strength of Spurious Emission    | Pass           |
| RSS-210 and RSS-GEN or FCC Part15.231(b) | Duty Cycle                                      | Pass           |
| RSS-210 and RSS-GEN or FCC Part15.231(c) | 20dB bandwidth & 99% bandwidth                  | Pass           |
| RSS-210 and RSS-GEN or FCC Part15.231(a) | Deactivation Time                               | Pass           |
| RSS-210and RSS-GEN or FCC Part15.203     | Antenna Requirement                             | Pass           |



## 4. Conducted Emission

### 4.1 Applicable Standard

for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

### 4.2 Limits

Limits for Class A digital devices

| Frequency range<br>(MHz) | Limits dB( $\mu$ V) |         |
|--------------------------|---------------------|---------|
|                          | Quasi-peak          | Average |
| 0.15 to 0.50             | 79                  | 66      |
| 0.50 to 30               | 73                  | 60      |

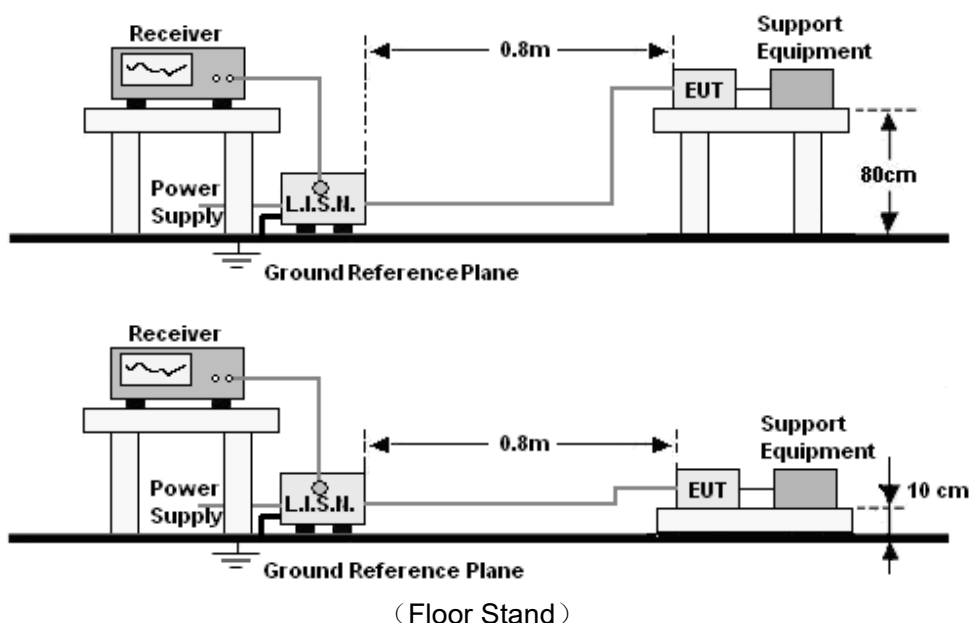
NOTE: The lower limit shall apply at the transition frequency.

Limits for Class B digital devices

| Frequency range<br>(MHz) | Limits dB( $\mu$ V) |          |
|--------------------------|---------------------|----------|
|                          | Quasi-peak          | Average  |
| 0.15 to 0.50             | 66 to 56            | 56 to 46 |
| 0.50 to 5                | 56                  | 46       |
| 5 to 30                  | 60                  | 50       |

NOTE: 1. The lower limit shall apply at the transition frequencies.  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

### 4.3 EUT Test Setup



#### **4.4 Procedure Of Conducted Emission Test**

- a. The Product was placed on a nonconductive table above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

#### **4.5 Test Result**

**N/A**

No measurement is required as the EUT is a battery operated product.



## 5. Spurious Radiated Emission

### 5.1 Applicable Standard

For intentional device, according to 15.209(a), the general requirement of field strength of radiated emission from intentional radiators shall not exceed the following tables.

**Limits for Class B digital devices**

| Frequency (MHz) | limits at 3m dB( $\mu$ V/m) |
|-----------------|-----------------------------|
| 30-88           | 40.0                        |
| 88-216          | 43.5                        |
| 216-960         | 46.0                        |
| Above 960       | 54.0                        |

- NOTE:**
1. The lower limit shall apply at the transition frequency.
  2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.
  3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

**Limits for Class B digital devices**

| Frequency (MHz) | limits at 10m dB( $\mu$ V/m) |
|-----------------|------------------------------|
| 30-88           | 30.0                         |
| 88-216          | 33.5                         |
| 216-960         | 56.0                         |
| Above 960       | 64.0                         |

- NOTE:**
1. The lower limit shall apply at the transition frequency.
  2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.
  3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

In addition to the provisions of 15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

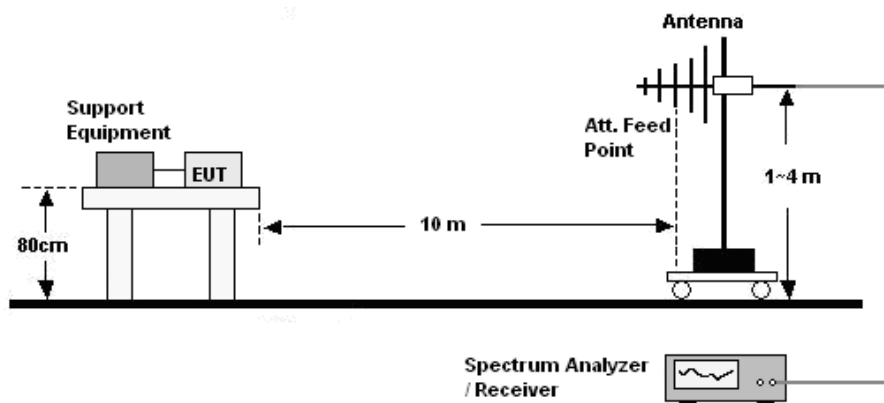
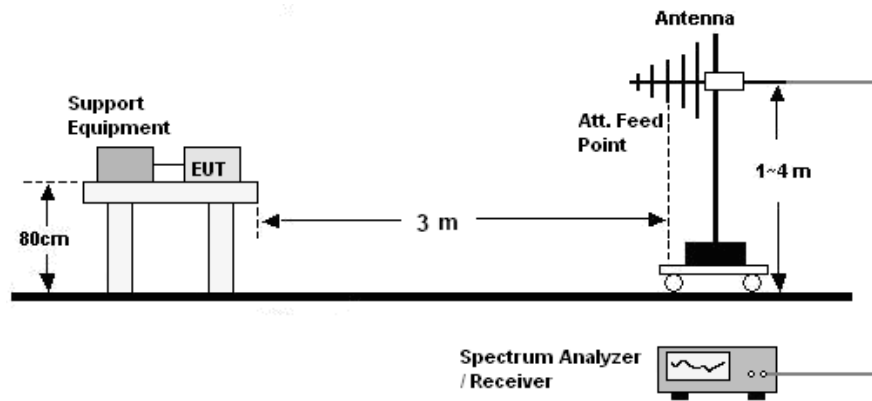
| Funda-<br>mental fre-<br>quency<br>(MHz) | Field strength of funda-<br>mental (microvolts/<br>meter) | Field strength of<br>spurious emissions<br>(microvolts/meter) |
|------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|
| 40.66–<br>40.70.                         | 2,250 .....                                               | 225                                                           |
| 70–130 .....                             | 1,250 .....                                               | 125                                                           |
| 130–174 ....                             | <sup>1</sup> 1,250 to 3,750 .....                         | <sup>1</sup> 125 to 375                                       |
| 174–260 ....                             | 3,750 .....                                               | 375                                                           |
| 260–470 ....                             | <sup>1</sup> 3,750 to 12,500 .....                        | <sup>1</sup> 375 to 1,250                                     |
| Above 470                                | 12,500 .....                                              | 1,250                                                         |

<sup>1</sup> Linear interpolations.

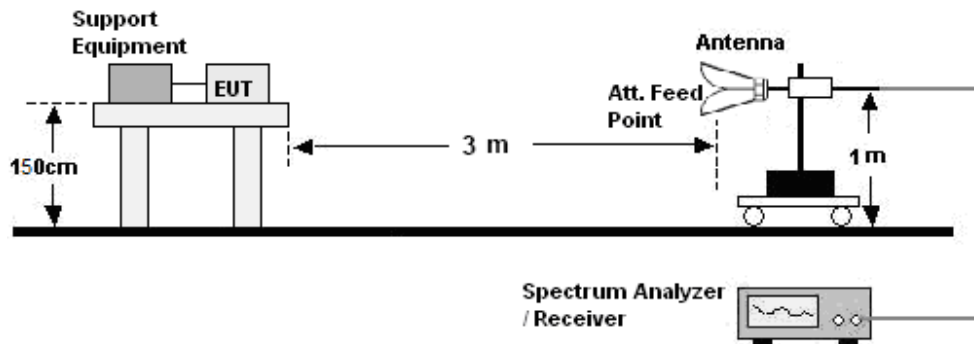
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz,  $\mu$ V/m at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

## 5.2 Radiated Measurement Setup

30MHz ~ 1GHz:



Above 1GHz:



### 5.3 Test Equipment List and Details

See section 2.4.

### 5.4 Radiated Measurement Test Procedure

#### 30MHz ~ 1GHz:

- The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

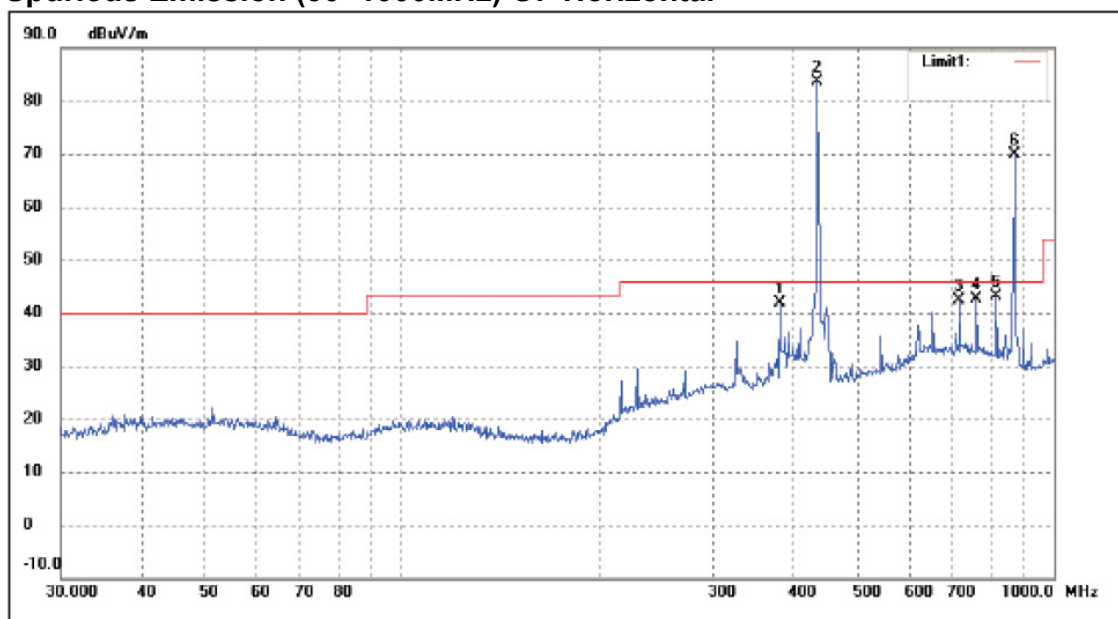
#### Above 1GHz:

- The Product was placed on the non-conductive turntable 1.5/0.1 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

### 5.5 Test Result

|                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| Temperature ( °C ) : 22~23              | EUT: NetBright® Path Lights                  |
| Humidity (%RH) : 50~54                  | M/N: MBN580                                  |
| Barometric Pressure ( mbar ) : 950~1000 | Operation Condition: Continuous Transmission |
| Test Site: 3m Chamber                   |                                              |

### The Spurious Emission (30~1000MHz) Of Horizontal

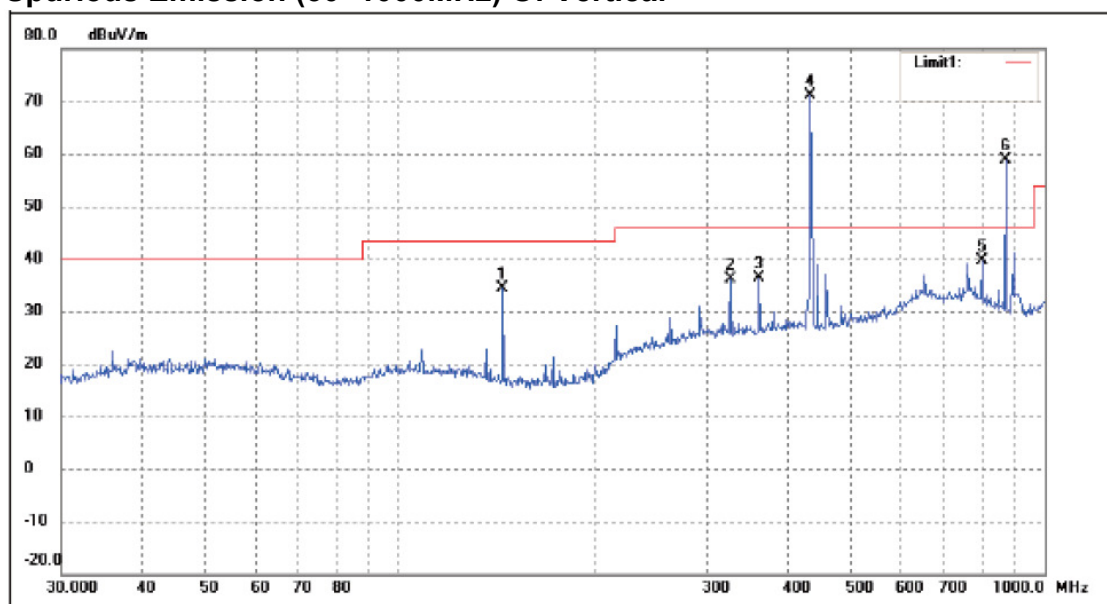


| No. | Frequency<br>MHz | Reading<br>dBuV/m | Corr.<br>(dB) | Dutycycle<br>Factor<br>(dB) | Result<br>dBuV/m | Limit<br>dBuV/m | Margin<br>(dB) | Deg.<br>(°) | Height<br>(cm) | Remark |
|-----|------------------|-------------------|---------------|-----------------------------|------------------|-----------------|----------------|-------------|----------------|--------|
| 1   | 379.9141         | 29.98             | 11.79         | N/A                         | 41.77            | 46.00           | -4.23          | 175         | 100            | peak   |
| 4   | 433.9200         | 73.83             | -3.09         | N/A                         | 83.74            | 100.83          | -17.09         | 145         | 100            | peak   |
|     | 433.9200         | /                 | /             | -12.18                      | 71.56            | 80.83           | -9.37          | 300         | 100            | Ave    |
| 3   | 716.6820         | 24.77             | 17.70         | N/A                         | 42.47            | 46.00           | -3.53          | 200         | 100            | peak   |
| 4   | 760.7036         | 24.47             | 18.10         | N/A                         | 42.57            | 46.00           | -3.43          | 310         | 100            | peak   |
| 5   | 815.9678         | 27.42             | 15.80         | N/A                         | 43.22            | 46.00           | -2.78          | 205         | 100            | peak   |
| 6   | 867.8400         | 53.97             | 15.94         | N/A                         | 69.91            | 80.83           | -8.08          | 212         | 100            | peak   |
|     | 867.8400         | /                 | /             | -12.18                      | 57.73            | 60.83           | -3.10          | 227         | 100            | Ave    |

### The Spurious Emission (Above 1GHz) Of Horizontal

| No. | Frequency<br>MHz | Reading<br>dBuV/m | Corr.<br>Factor<br>(dB) | Dutycycle<br>Factor<br>(dB) | Result<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Deg.<br>(°) | Height<br>(cm) | Remark |
|-----|------------------|-------------------|-------------------------|-----------------------------|------------------|-----------------|--------------|-------------|----------------|--------|
| 1   | 1301.7600        | 71.49             | -13.14                  | N/A                         | 58.35            | 80.83           | -22.48       | 210         | 150            | Peak   |
| 2   | 1735.6800        | 65.25             | -9.34                   | N/A                         | 52.66            | 80.83           | --28.17      | 180         | 150            | Peak   |
| 3   | 2169.6000        | 64.16             | -2.86                   | N/A                         | 61.30            | 80.83           | -19.53       | 210         | 150            | Peak   |
|     | 1301.7600        | /                 | /                       | -12.18                      | 46.17            | 60.83           | -14.66       | 123         | 150            | Ave    |
|     | 1735.6800        | /                 | /                       | -12.18                      | 40.48            | 60.83           | -20.35       | 228         | 150            | Ave    |
|     | 2169.6000        | /                 | /                       | -12.18                      | 49.12            | 60.83           | -11.71       | 159         | 150            | Ave    |

### The Spurious Emission (30~1000MHz) Of Vertical



| No. | Frequency<br>MHz | Reading<br>dBuV/m | Corr.<br>(dB) | Dutycycle<br>Factor<br>(dB) | Result<br>dBuV/m | Limit<br>dBuV/m | Margin<br>(dB) | Deg.<br>( ° ) | Height<br>(cm) | Remark |
|-----|------------------|-------------------|---------------|-----------------------------|------------------|-----------------|----------------|---------------|----------------|--------|
| 1   | 144.8418         | 31.40             | 2.96          | N/A                         | 34.36            | 43.50           | -9.14          | 310           | 100            | peak   |
| 2   | 325.5958         | 24.42             | 11.77         | N/A                         | 36.19            | 46.00           | -9.81          | 172           | 100            | peak   |
| 3   | 361.7139         | 24.37             | 11.90         | N/A                         | 36.27            | 46.00           | -9.73          | 190           | 100            | peak   |
| 4   | 434.0651         | 58.83             | 12.31         | N/A                         | 71.14            | 100.83          | -29.69         | 256           | 100            | peak   |
|     | 433.9200         | /                 | /             | -12.18                      | 58.96            | 80.83           | -21.93         | 321           | 100            | Ave    |
| 5   | 798.9796         | 23.22             | 16.34         | N/A                         | 39.56            | 46.00           | -6.44          | 241           | 100            | peak   |
| 6   | 867.8400         | 43.03             | 15.94         | N/A                         | 58.97            | 80.83           | -21.94         | 89            | 100            | peak   |
|     | 867.8400         | /                 | /             | -12.18                      | 46.79            | 60.83           | -14.04         | 178           | 100            | Ave    |

### The Spurious Emission (Above 1GHz) Of Vertical

| No. | Frequency<br>MHz | Reading<br>dBuV/m | Corr.<br>(dB) | Dutycycle<br>Factor<br>(dB) | Result<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Deg.<br>( ° ) | Height<br>(cm) | Remark |
|-----|------------------|-------------------|---------------|-----------------------------|------------------|-----------------|--------------|---------------|----------------|--------|
| 1   | 1301.7600        | 71.53             | -13.14        | N/A                         | 58.39            | 80.83           | -22.44       | 211           | 150            | Peak   |
| 2   | 1735.6800        | 62.01             | -9.35         | N/A                         | 52.66            | 80.83           | -28.17       | 123           | 150            | Peak   |
| 3   | 2169.6000        | 61.34             | -2.79         | N/A                         | 58.55            | 80.83           | -22.28       | 256           | 150            | Peak   |
|     | 1301.7600        | /                 | /             | -12.18                      | 46.21            | 60.83           | -14.62       | 143           | 150            | Ave    |
|     | 1735.6800        | /                 | /             | -12.18                      | 40.48            | 60.83           | -20.35       | 258           | 150            | Ave    |
|     | 2169.6000        | /                 | /             | -12.18                      | 46.37            | 60.83           | -14.46       | 149           | 150            | Ave    |

Note:

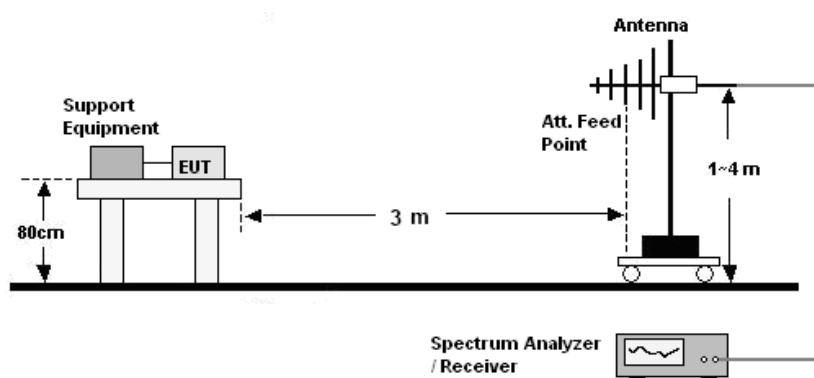
- Testing is carried out with frequency rang 9kHz to the tenth harmoinics,other than listed in the table above are attenuated more than 20dB below the permitted limits or the field strength is too small to be measured.
- Calculation of result is:  
Measurement value(dBμV/m) = Reading Value(dBμV/m) + Correction Factor (dB)
- The Measurement value must be less than limit,the result is Pass.

## 6. Duty Cycle

### 6.1 Applicable Standard

According to RSS-210 or FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

### 6.2 EUT Setup



### 6.3 Test Equipment List and Details

See section 2.4.

### 6.4 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

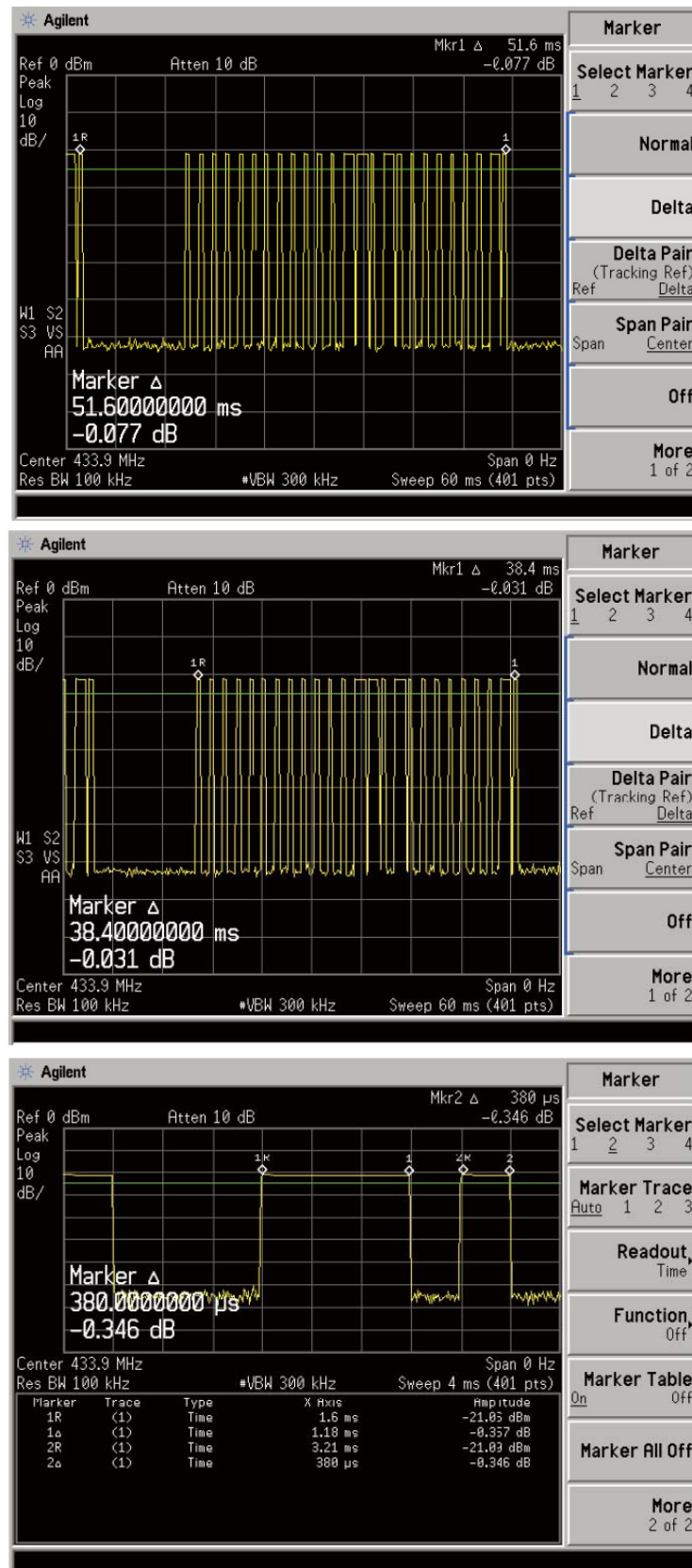
### 6.5 Test Result

| Type Of Pulse   | Width Of Pulse (ms) | Quantity Of Pulse | Transmission Time (ms) | Total Time( $T_{on}$ ) (ms) |
|-----------------|---------------------|-------------------|------------------------|-----------------------------|
| Pulse 1(Wide)   | 1.18                | 4                 | 4.72                   | 12.70                       |
| Pulse 2(Narrow) | 0.38                | 21                | 7.98                   |                             |

| Test Period( $T_p$ ) (ms) | Total Time( $T_{on}$ ) (ms) | Duty Cycle (%) | Duty Cycle Factor (dB) |
|---------------------------|-----------------------------|----------------|------------------------|
| 51.60                     | 12.70                       | 24.61          | -12.18                 |



The spectrum analyzer plots are attached as below:

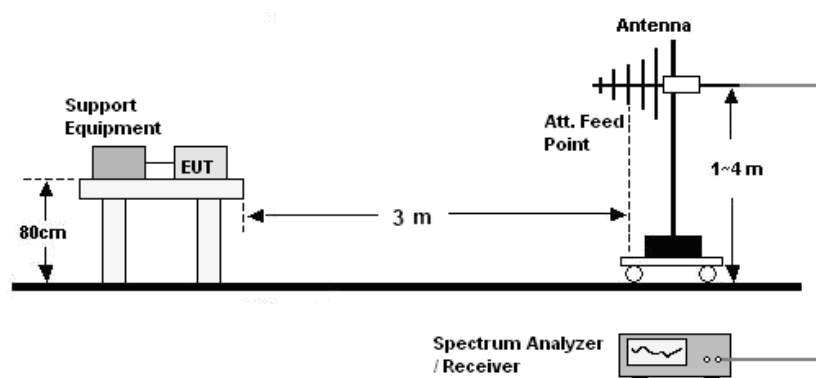


## 7. Occupied Bandwidth Measurement

### 7.1 Applicable Standard

According to RSS-210 or 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

### 7.2 EUT Setup



### 7.3 Test Equipment List and Details

See section 2.4.

### 7.4 Test Procedure

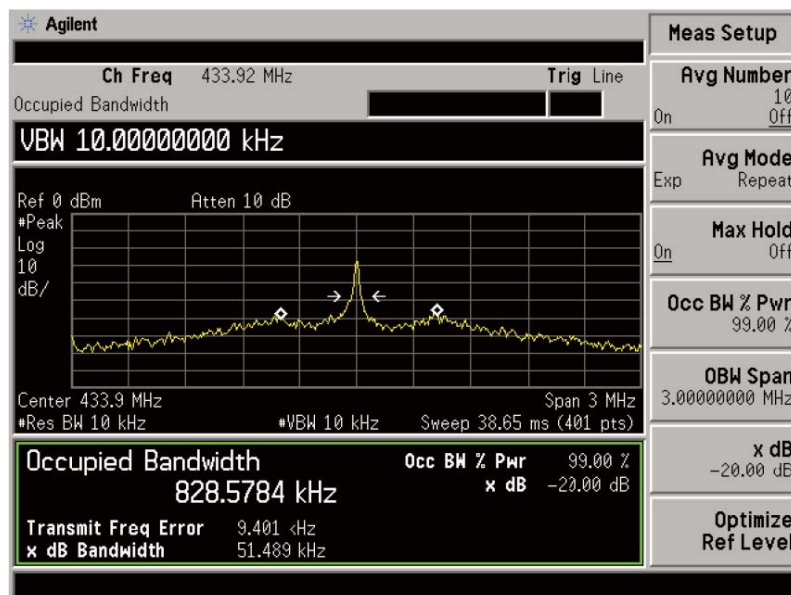
- The 20dB bandwidth and 99% bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode
- The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 7.5 Test Result

| Channel Frequency (MHz) | Modulation | 20dB bandwidth (KHz) | Limit (KHz)                     | Result |
|-------------------------|------------|----------------------|---------------------------------|--------|
| 433.92MHz               | ASK        | 51.489               | $433.92 \times 0.25\% = 1084.8$ | Pass   |



The spectrum analyzer plots are attached as below:

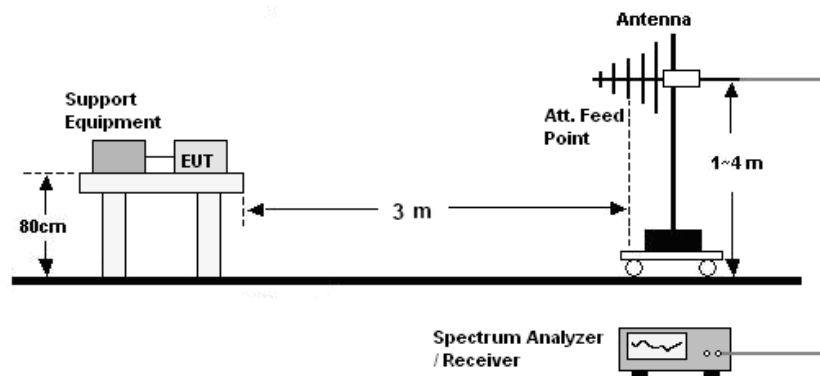


## 8. Deactivation Time

### 8.1 Applicable Standard

According to RSS-210 or FCC §15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released

### 8.2 EUT Setup



### 8.3 Test Equipment List and Details

See section 2.4.

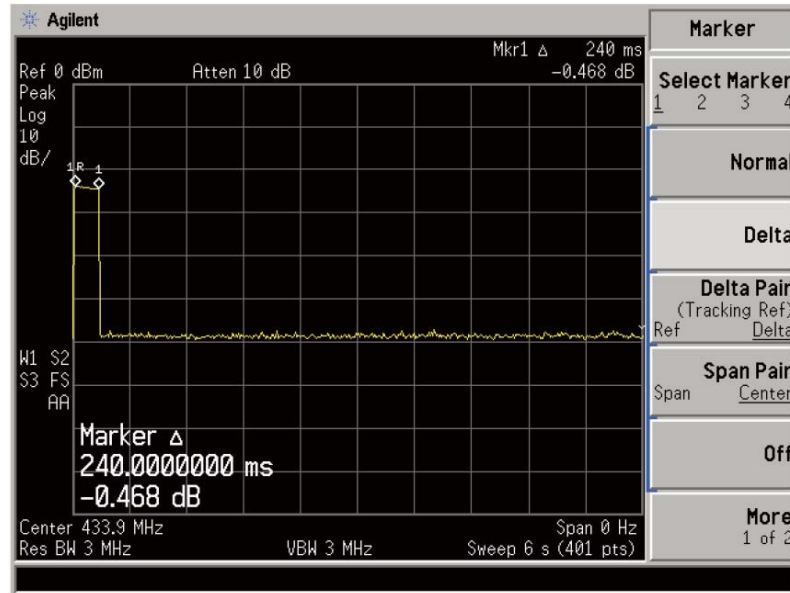
### 8.4 Test Procedure

- The EUT was placed on a wooded table which is 0.8m height and close to receiver antenna of spectrum analyzer
- The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was set to 1 MHz to encompass all significant spectral components during the test. The spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

### 8.5 Test Result

| Transmission Type | Test Frequency (MHz) | Transmission Time (s) | Limit (s) | Result |
|-------------------|----------------------|-----------------------|-----------|--------|
| Manually          | 433.92               | 0.240                 | 5         | Pass   |

The spectrum analyzer plots are attached as below:



## 9. ANTENNA REQUIREMENT

### 9.1 Standard Applicable

Section 15.203 or RSS-210:

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.

Section 15.247(b)/(c) or RSS-210:

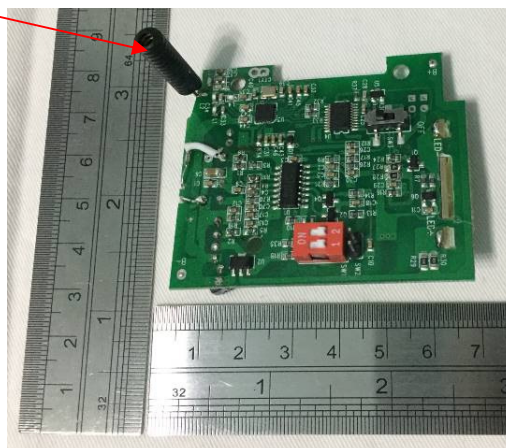
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### 9.2 Antenna Connected Construction

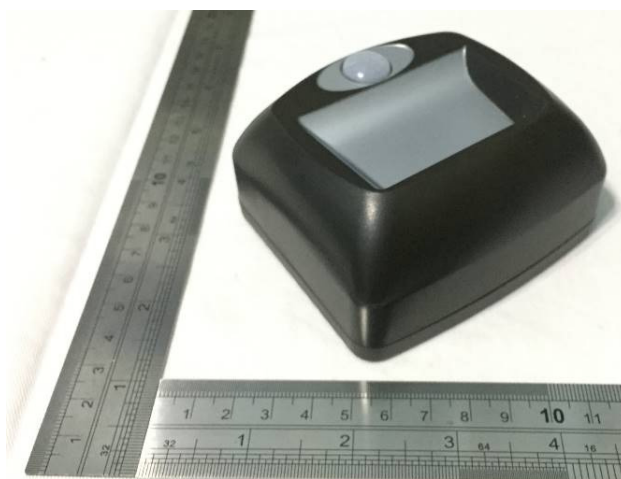
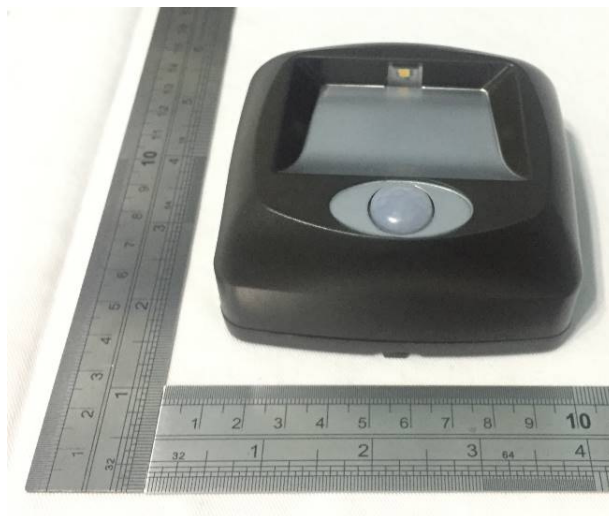
The antenna used in this product is complied with Standard. The maximum Gain of the antenna lower than 6.0dBi and the antenna is integrated, fixed by enclosure, can not be changed except take apart the product.

Antenna





## APPENDIX A - External Photographs

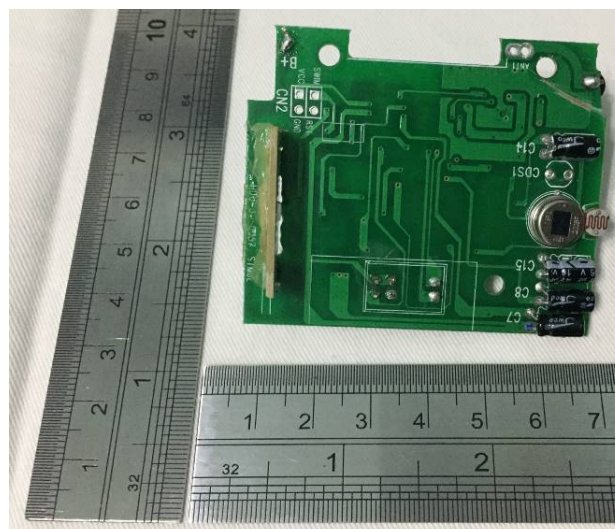
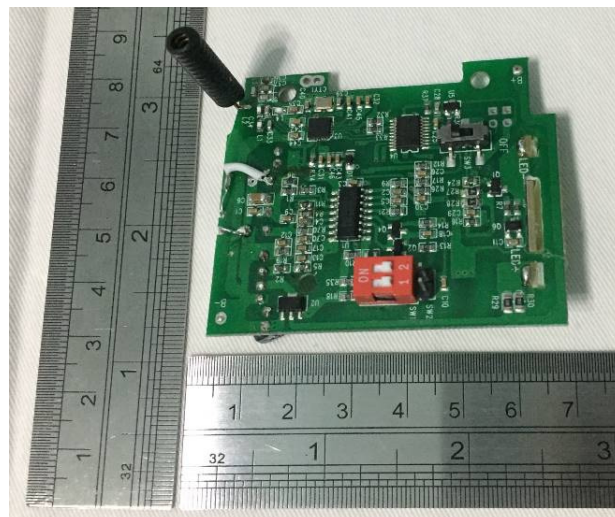


## APPENDIX B - Internal Photographs

### EUT –Uncovered View



### EUT –PCB View



## APPENDIX C - Test Setup Photographs

### Radiated Emission Test

