

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C  
REQUIREMENT T**

*OF*

**RTU**

**MODEL No.: RTU**

**Trademark: NANOLUX**

**FCC ID: 2ACPE-RTU**

**REPORT NO: ES140623208E**

**ISSUE DATE: September 29, 2014**

*Prepared for*

**Shenzhen Number Energy Saving Corporation**

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## VERIFICATION OF COMPLIANCE

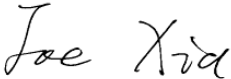
|                      |   |
|----------------------|---|
| Applicant:           | Shenzhen Number Energy Saving Corporation<br>6th, Caiyun 1st Rd., Longgang Town, Shenzhen 518172, China |
| Manufacturer:        | Shenzhen Number Energy Saving Corporation<br>6th, Caiyun 1st Rd., Longgang Town, Shenzhen 518172, China |
| Product Description: | RTU   |
| Model Number:        | RTU   |
| Serial Number:       | N/A   |
| File Number:         | ES140623208E  |
| Date of Test:        | September 10, 2014 to September 29, 2014  |

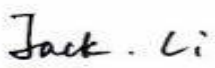
### We hereby certify that:

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : September 10, 2014 to September 29, 2014

Prepared by :   
Joe Xia/Editor

Reviewer :   
Jack Li /Supervisor

Approve & Authorized Signer :   
Lisa Wang/Manager

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## **1. GENERAL INFORMATION**

### **1.1. Product Description**

RTU (referred to as the EUT in this report) RTU, It is designed by way of utilizing the FSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 433.92MHz
- B). Modulation: FSK
- C). Antenna Type: Internal antenna
- D). Antenna Gain: 2.15dBi
- E).Power Supply: DC 5V from USB port

### **1.2. Related Submittal(s) / Grant (s)**

This submittal(s) (test report) is intended for FCC ID: 2ACPE-RTU filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

### **1.3. Test Methodology**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

### **1.4. Special Accessories**

Not available for this EUT intended for grant.

### **1.5. Equipment Modifications**

Not available for this EUT intended for grant.

## 1.6. Measurement Uncertainty

| Measurement Type                | Range              | Confidence Level (%) | Calculated Uncertainty |
|---------------------------------|--------------------|----------------------|------------------------|
| AC Conducted Spurious Emissions | 0.15 MHz to 30 MHz | 95%                  | ±3.00dB                |
| Fundamental Fieldstrength       | Not Applicable     | 95%                  | ±2.94dB                |
| Transmitter 20 dB Bandwidth     | Not Applicable     | 95%                  | ±0.92PPm               |
| Radiated Spurious Emissions     | 30 MHz to 40 GHz   | 95%                  | ±3.00dB                |

## 1.7. Test Facility

Site Description  
EMC Lab.

: Accredited by CNAS, 2013.10.29  
The certificate is valid until 2016.10.28  
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01:2006(identical to ISO/IEC17025: 2005)  
The Certificate Registration Number is L2291

Accredited by TUV Rheinland Shenzhen 2010.5.25  
The Laboratory has been assessed according to the requirements ISO/IEC 17025

Accredited by FCC, April 17, 2014  
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 5, 2010  
The Certificate Registration Number is 46405-4480.

Name of Firm  
Site Location

: SHENZHEN EMTEK CO., LTD  
: Bldg 69, Majialong Industry Zone,  
Nanshan District, Shenzhen, Guangdong, China

## **2. SYSTEM TEST CONFIGURATION**

### **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 which intends to maximize its emission characteristics in a continuous normal application.

### **2.2. EUT Exercise**

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

### **2.3. Test Procedure**

#### **2.3.1 Conducted Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### **2.3.2 Radiated Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m 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 max. Emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

## 2.4. Description of test modes

The EUT (RTU) has been tested under normal operating condition.  
Let EUT transmit during test, and the result was reported;

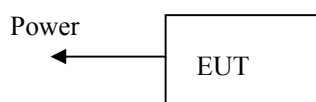
## 2.5. Summary of Test Results

| FCC Part15, Subpart C |                          |        |
|-----------------------|--------------------------|--------|
| Standard Section      | Test Item                | Result |
| FCC                   |                          |        |
| 15.207                | Conducted Emission       | Pass   |
| 15.231(a)(1)          | Transmission Requirement | Pass   |
| 15.231(b)             | Radiated Emission        | Pass   |
| 15.231(c)             | 20dB Bandwidth           | Pass   |

Note: (1) "N/A" denotes test is not applicable in this test report.

## 2.6. CONFIGURATION OF TESTED SYSTEM

**Fig. 2-1 Configuration of Tested System**



## 2.7. DESCRIPTION OF SUPPORT UNITS

| Equipment | Mfr/Brand | Model/Type No. | FCC ID / IC | Series No. | Note |
|-----------|-----------|----------------|-------------|------------|------|
| RTU       | NANOLUX   | RTU            | 2ACPE-RTU   | N/A        | EUT  |
| Adapter   | Polk      | YJS010A        | N/A         | N/A        |      |



### 3. CONDUCTED EMISSIONS TEST

#### 3.1. Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

#### 3.2. Test SET-UP (Block Diagram of Configuration)



#### 3.3. Measurement Equipment Used:

| Conducted Emission Test Site # 1 |                 |              |               |             |            |
|----------------------------------|-----------------|--------------|---------------|-------------|------------|
| EQUIPMENT TYPE                   | MFR             | MODEL NUMBER | SERIAL NUMBER | LAST CAL.   | CAL DUE.   |
| Test Receiver                    | Rohde & Schwarz | ESCS30       | 828985/018    | 05/17, 2014 | 05/16/2015 |
| L.I.S.N                          | Rohde & Schwarz | ESH2-Z5      | 834549/005    | 05/17, 2014 | 05/16/2015 |
| L.I.S.N                          | Rohde & Schwarz | ENV216       | 834549/005    | 05/17, 2014 | 05/16/2015 |
| 50ΩCoaxial Switch                | Anritsu         | MP59B        | M20531        | 05/17, 2014 | 05/16/2015 |

#### 3.4. Conducted Emission Limit

##### (7) Conducted Emission

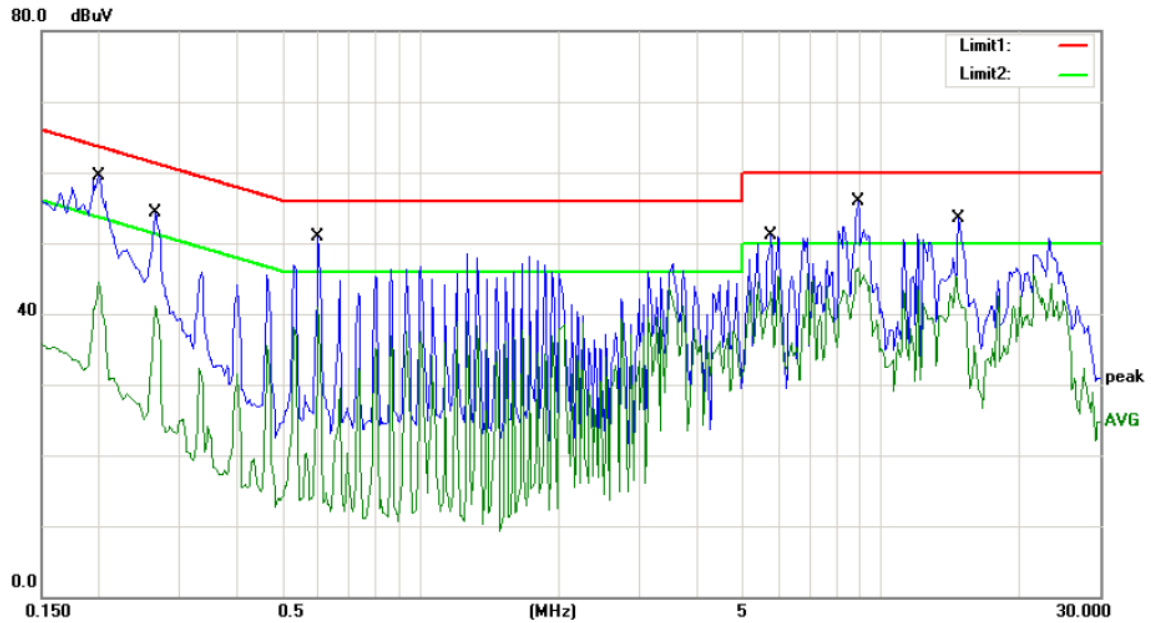
| Frequency(MHz) | Quasi-peak | Average |
|----------------|------------|---------|
| 0.15-0.5       | 66-56      | 56-46   |
| 0.5-5.0        | 56         | 46      |
| 5.0-30.0       | 60         | 50      |

##### Note:

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

#### 3.5. Measurement Result:

Pass



Site Conduction #1

Phase: **L1**

Temperature: 26

Limit: (CE)FCC PART 15 class B\_QP

Power: AC 120V/60Hz

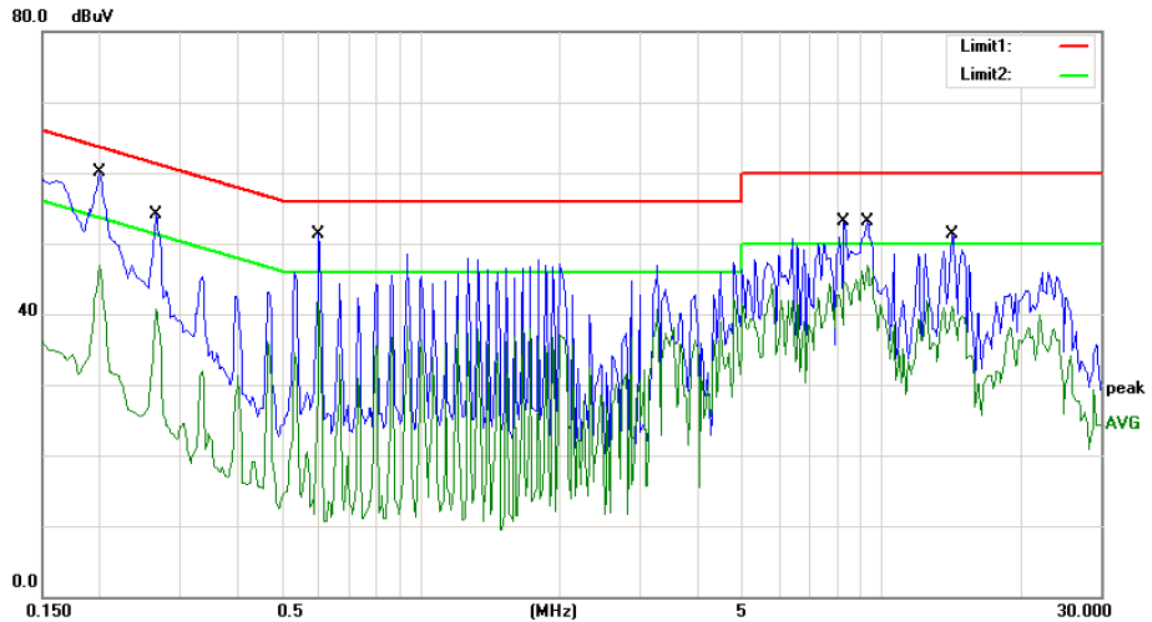
Humidity: 60 %

Mode: ON

Note:

| No. | Mk. | Freq.   | Reading | Correct | Measure- | Limit | Over   |          |         |
|-----|-----|---------|---------|---------|----------|-------|--------|----------|---------|
|     |     | MHz     | Level   | Factor  | ment     |       |        | Detector | Comment |
|     |     |         | dBuV    | dB      | dBuV     | dBuV  | dB     |          |         |
| 1   |     | 0.2000  | 59.56   | 0.00    | 59.56    | 63.61 | -4.05  | QP       |         |
| 2   |     | 0.2000  | 44.54   | 0.00    | 44.54    | 53.61 | -9.07  | AVG      |         |
| 3   |     | 0.2650  | 54.22   | 0.00    | 54.22    | 61.27 | -7.05  | QP       |         |
| 4   |     | 0.2650  | 41.12   | 0.00    | 41.12    | 51.27 | -10.15 | AVG      |         |
| 5   |     | 0.6000  | 50.82   | 0.00    | 50.82    | 56.00 | -5.18  | QP       |         |
| 6   |     | 0.6000  | 40.81   | 0.00    | 40.81    | 46.00 | -5.19  | AVG      |         |
| 7   |     | 5.7900  | 51.19   | 0.00    | 51.19    | 60.00 | -8.81  | QP       |         |
| 8   |     | 5.7900  | 43.17   | 0.00    | 43.17    | 50.00 | -6.83  | AVG      |         |
| 9   |     | 8.9200  | 56.00   | 0.00    | 56.00    | 60.00 | -4.00  | QP       |         |
| 10  | *   | 8.9200  | 46.41   | 0.00    | 46.41    | 50.00 | -3.59  | AVG      |         |
| 11  |     | 14.7750 | 53.50   | 0.00    | 53.50    | 60.00 | -6.50  | QP       |         |
| 12  |     | 14.7750 | 45.31   | 0.00    | 45.31    | 50.00 | -4.69  | AVG      |         |

\*:Maximum data    x:Over limit    !:over margin    Comment: Factor build in receiver.    Operator: ZHL



Site Conduction #1

Phase: **N**

Temperature: 26

Limit: (CE)FCC PART 15 class B\_QP

Power: AC 120V/60Hz

Humidity: 60 %

Mode: ON

Note:

| No. Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|---------|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1       | 0.2000       | 60.06                    | 0.00                    | 60.06                    | 63.61         | -3.55      | QP       |         |
| 2       | 0.2000       | 45.87                    | 0.00                    | 45.87                    | 53.61         | -7.74      | AVG      |         |
| 3       | 0.2650       | 54.12                    | 0.00                    | 54.12                    | 61.27         | -7.15      | QP       |         |
| 4       | 0.2650       | 40.79                    | 0.00                    | 40.79                    | 51.27         | -10.48     | AVG      |         |
| 5       | 0.6000       | 51.39                    | 0.00                    | 51.39                    | 56.00         | -4.61      | QP       |         |
| 6       | 0.6000       | 41.79                    | 0.00                    | 41.79                    | 46.00         | -4.21      | AVG      |         |
| 7       | 8.3200       | 53.10                    | 0.00                    | 53.10                    | 60.00         | -6.90      | QP       |         |
| 8       | 8.3200       | 44.51                    | 0.00                    | 44.51                    | 50.00         | -5.49      | AVG      |         |
| 9       | 9.3200       | 53.03                    | 0.00                    | 53.03                    | 60.00         | -6.97      | QP       |         |
| 10 *    | 9.3200       | 46.91                    | 0.00                    | 46.91                    | 50.00         | -3.09      | AVG      |         |
| 11      | 14.2500      | 51.35                    | 0.00                    | 51.35                    | 60.00         | -8.65      | QP       |         |
| 12      | 14.2500      | 39.40                    | 0.00                    | 39.40                    | 50.00         | -10.60     | AVG      |         |

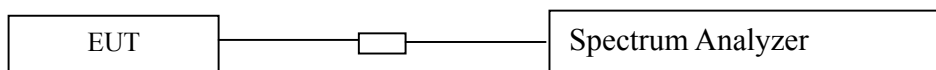
\*:Maximum data    x:Over limit    !:over margin    Comment: Factor build in receiver.    Operator: ZHL

## 4. Transmission Requirement

### 4.1. Requirement

Per 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.

### 4.2. Test SET-UP



### 4.3. Measurement Equipment Used:

| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.   | CAL DUE.   |
|-------------------|---------|--------------|---------------|-------------|------------|
| Spectrum Analyzer | Agilent | E4407B       | 88156318      | 05/17, 2014 | 05/16/2015 |

### 4.4. Test Procedure

The following table is the setting of spectrum analyzer.

| Spectrum analyzer | Setting  |
|-------------------|----------|
| Attenuation       | Auto     |
| Span Frequency    | 0Hz      |
| RB                | 100KHz   |
| VB                | 300KHz   |
| Detector          | Peak     |
| Trace             | Max hold |
| Sweep Time        | 10S      |

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz, Set Detector to Peak, Trace to Max Hold.
- Set the span to 0Hz and the sweep time to 10s and record the value.

### 4.5. Test Data

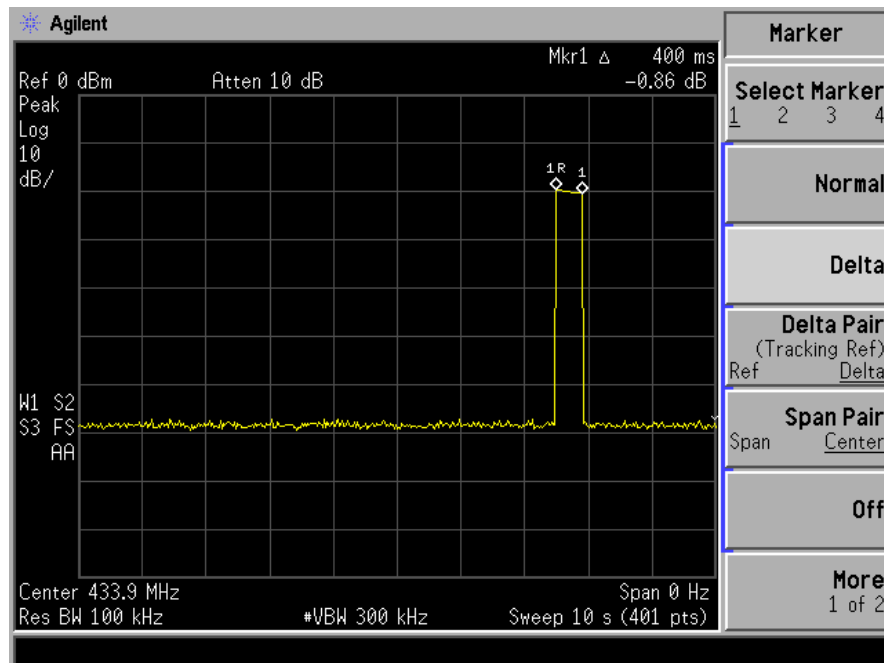
Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 52%      |
| ATM Pressure:      | 1032mbar |

Test Mode: Transmitting

| Transmitting time | Limit<br>(Second) | Result |
|-------------------|-------------------|--------|
| 0.400S            | 5                 | PASS   |

Refer to the attached plot



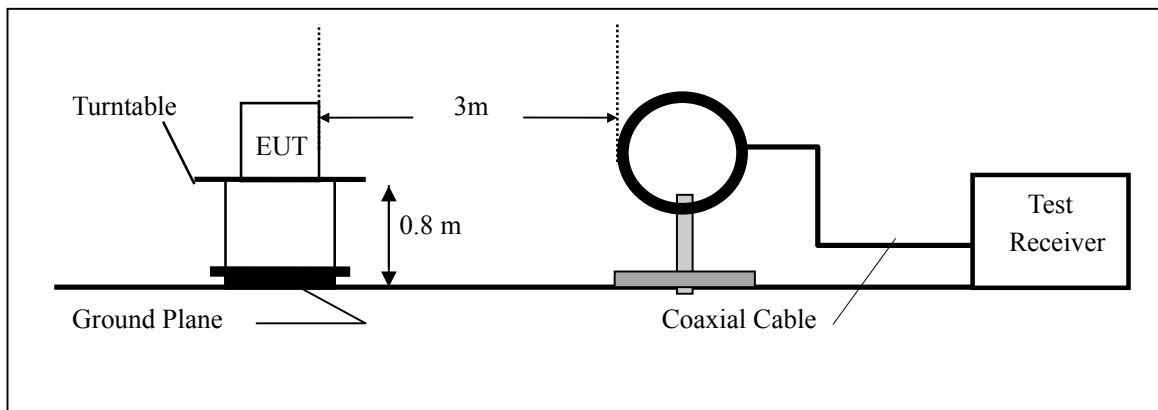
## 5. RADIATED EMISSION TEST

### 5.1. Measurement Procedure

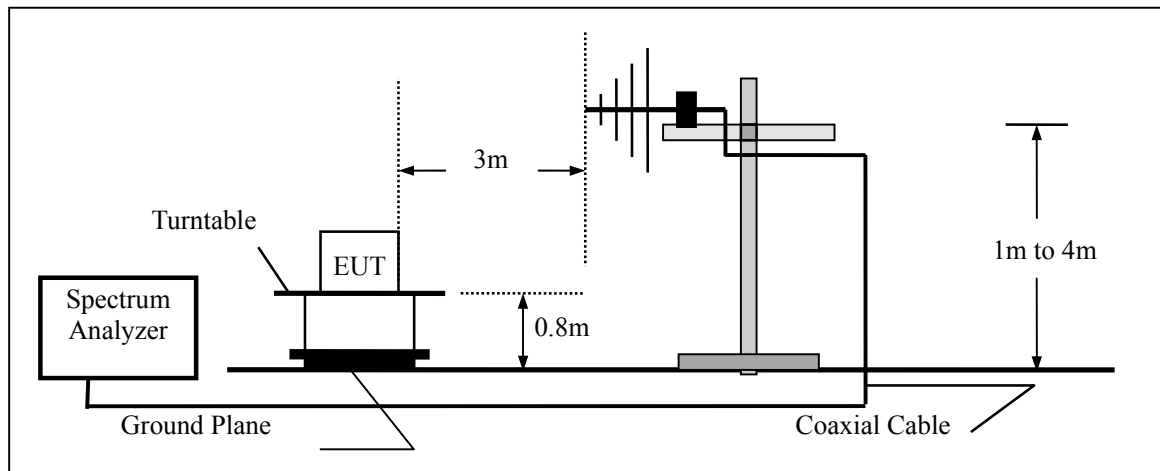
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter Semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter Semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test Antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector Mode pre-scanning the measurement frequency range. Significant peaks are then marked and then AV detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

### 5.2. Test SET-UP (Block Diagram of Configuration)

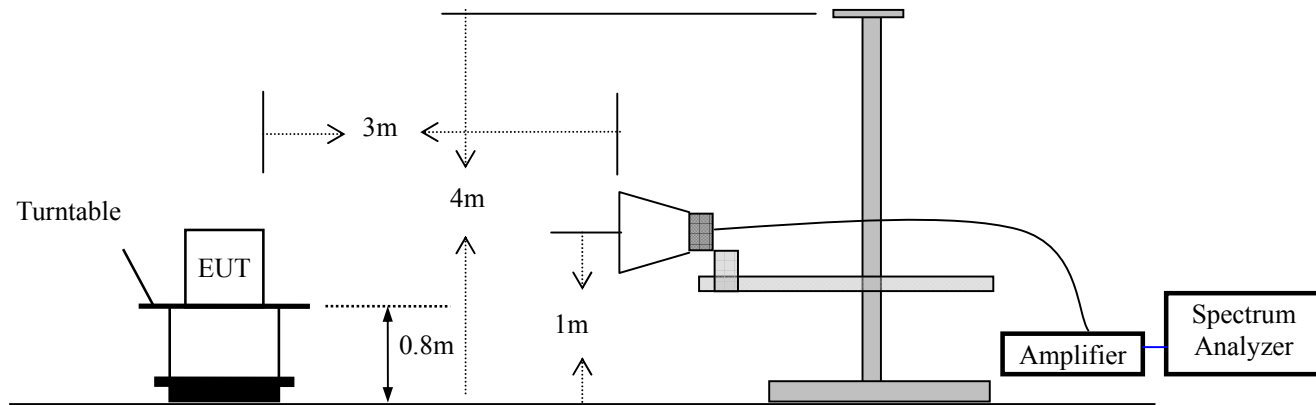
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



**5.3. Measurement Equipment Used:**

| EQUIPMENT TYPE    | MFR             | MODEL NUMBER | SERIAL NUMBER | LAST CAL.   | CAL DUE.   |
|-------------------|-----------------|--------------|---------------|-------------|------------|
| Spectrum Analyzer | Rohde & Schwarz | FSP7         | 839511/010    | 05/17, 2014 | 05/16/2015 |
| Spectrum Analyzer | HP              | E4407B       | 839840481     | 05/17, 2014 | 05/16/2015 |
| EMI Test Receiver | Rohde & Schwarz | ESCS30       | 828985/018    | 05/17, 2014 | 05/16/2015 |
| Pre-Amplifier     | HP              | 8447D        | 2944A07999    | 05/17, 2014 | 05/16/2015 |
| Bilog Antenna     | Schwarzbeck     | VULB9163     | 142           | 05/17, 2014 | 05/16/2015 |
| Loop Antenna      | ARA             | PLA-1030/B   | 1029          | 05/17, 2014 | 05/16/2015 |
| Horn Antenna      | Schwarzbeck     | BBHA 9170    | BBHA9170399   | 05/17, 2014 | 05/16/2015 |
| Horn Antenna      | Schwarzbeck     | BBHA 9120    | D143          | 05/17, 2014 | 05/16/2015 |

#### 5.4. Radiated Emission Limit

FCC 15.205 Restricted frequency band

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |

FCC 15.209 Limited

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/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                                |
| 960~1000             | 500                                     | 3                                |
| Above 1GHz           | 74 dBuV/m (PEAK)<br>54 dBuV/m (AVERAGE) |                                  |



### 15.231 Limited

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|-----------------------------|--|---|
| 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   |

\*\* linear interpolations

The field intensity in micro-volts per meter can then be determined by the following equation:  
 $FI(V/m) = 10FI(dBV/m) / 20$  The FCC specified emission limits were calculated according the EUT operating frequency and obtained by following linear interpolation equations:

(a) For fundamental frequency:

$$f_{EUT} : \text{EUT Operating Frequency Emission Limit (V/m)}$$

$$= [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{12500(\text{V/m}) - 3750(\text{V/m})}{470(\text{MHz}) - 260(\text{MHz})} + 3750(\text{V/m})$$

(b) For spurious frequencies:

$$f_{EUT} : \text{EUT Operating Frequency Emission Limit (V/m)}$$

$$= [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{1250(\text{V/m}) - 375(\text{V/m})}{470(\text{MHz}) - 260(\text{MHz})} + 375(\text{V/m})$$

Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

| FCC Part15 (15.231) , Subpart C |                                |                                      |
|---------------------------------|--------------------------------|--------------------------------------|
| Fundamental Frequency           | Field Strength Of Fundamental  | Field Strength of Spurious Emissions |
| 433.92MHz                       | AV:80.82 dBuV/m at 3m distance | AV:60.82 dBuV/m at 3m distance       |
|                                 | PK:100.82dBuV/m at 3m distance | PK:80.82 dBuV/m at 3m distance       |

### 5.5. Calculation of Average factor

The output field strengths of specification in accordance with the FCC rules specify

measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100ms or the repetition cycle period, whichever is a shorter time frame, The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Reference FCC Part15.35(c)

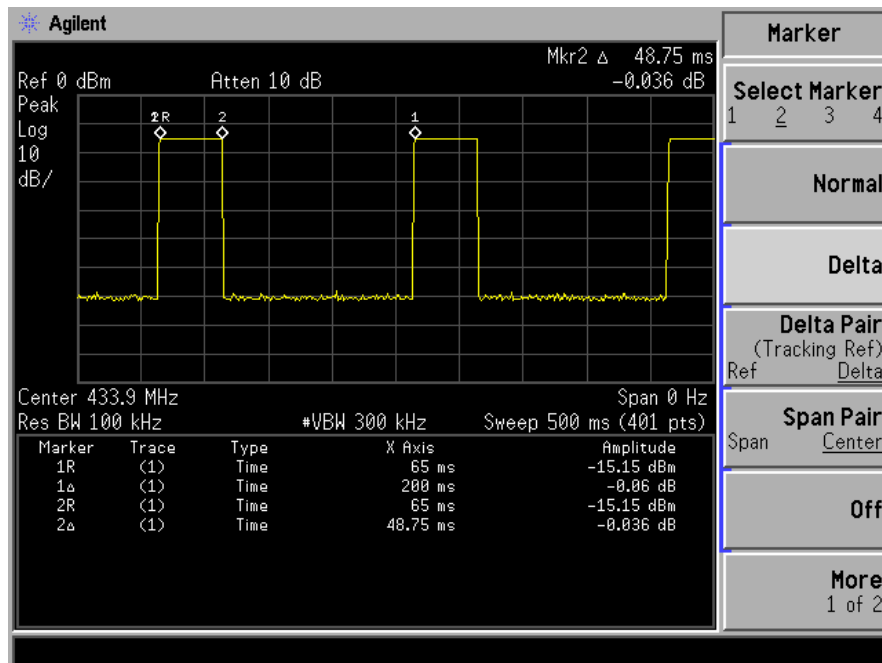
Averaging factor in dB=20log(TX ON/100ms)

Where the duty factor is calculated from following formula:

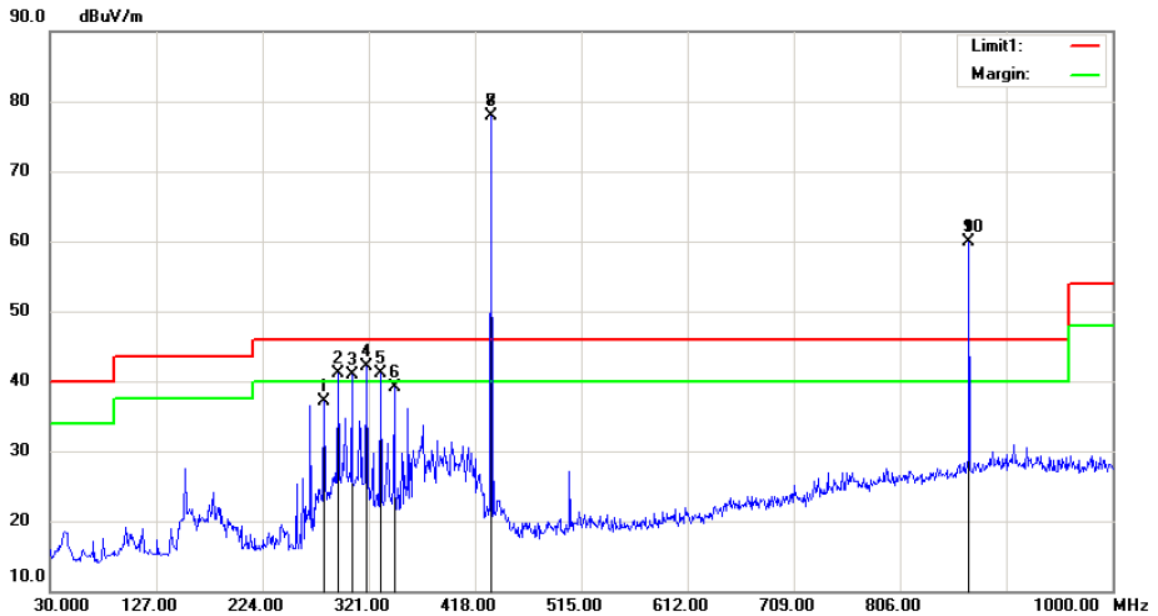
$20\log(\text{Duty cycle})=20\log(48.75/100\text{ms})=-6.24 \text{ dB}$

Therefore, the averaging factor is -6.24dB.

Please see the duty cycle diagrams below:



## 5.6. Measurement Result



Polarization: **Horizontal**

Temperature: 24 C

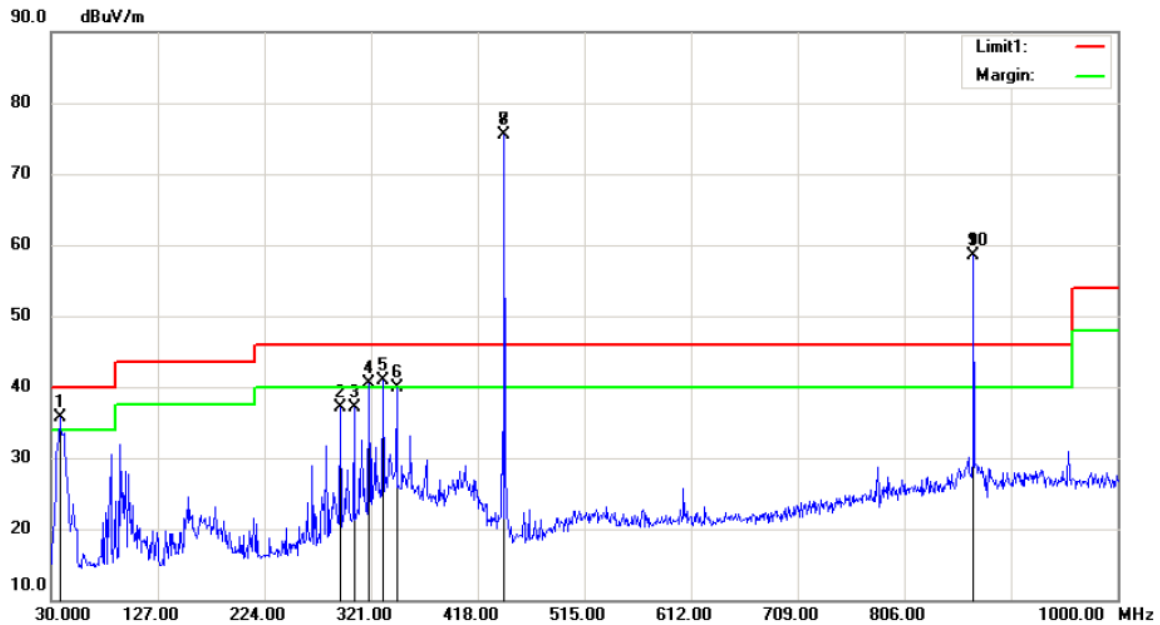
Power: DC 5V

Humidity: 53 %

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|-------------------------|---------------------------|---------|
| 1   |     | 280.2600     | 49.30                    | -12.24                  | 37.06                      | 46.00           | -8.94      | QP                      |                           |         |
| 2   | !   | 292.8700     | 53.76                    | -12.62                  | 41.14                      | 46.00           | -4.86      | QP                      |                           |         |
| 3   | !   | 305.4800     | 53.85                    | -12.95                  | 40.90                      | 46.00           | -5.10      | QP                      |                           |         |
| 4   | !   | 319.0600     | 54.44                    | -12.27                  | 42.17                      | 46.00           | -3.83      | QP                      |                           |         |
| 5   | !   | 331.6700     | 52.70                    | -11.62                  | 41.08                      | 46.00           | -4.92      | QP                      |                           |         |
| 6   |     | 344.2800     | 50.00                    | -10.98                  | 39.02                      | 46.00           | -6.98      | QP                      |                           |         |
| 7   | *   | 433.9200     | 87.35                    | -9.38                   | 77.97                      | 100.82          | -22.85     | peak                    |                           |         |
| 8   | X   | 433.9200     | 81.11                    | -9.38                   | 71.73                      | 80.82           | -9.09      | AVG                     |                           |         |
| 9   | X   | 867.8400     | 59.69                    | 0.15                    | 59.84                      | 80.82           | -20.98     | peak                    |                           |         |
| 10  | X   | 867.8400     | 53.45                    | 0.15                    | 53.60                      | 60.82           | -7.22      | AVG                     |                           |         |

\*:Maximum data x:Over limit !:over margin

Operator: Wang



Site 3m Chamber #2

Polarization: **Vertical**

Temperature: 24 C

Limit: ( RE)FCC PART 15 CLASS B

Power: DC 5V

Humidity: 53 %

EUT: RTU

M/N: RTU

Mode:TX 433.92

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|-------------------------|---------------------------|---------|
| 1   | !   | 37.7600      | 48.56                    | -12.94                  | 35.62                      | 40.00           | -4.38      | QP                      |                           |         |
| 2   |     | 292.8700     | 49.71                    | -12.62                  | 37.09                      | 46.00           | -8.91      | QP                      |                           |         |
| 3   |     | 305.4800     | 49.96                    | -12.95                  | 37.01                      | 46.00           | -8.99      | QP                      |                           |         |
| 4   | !   | 319.0600     | 52.78                    | -12.27                  | 40.51                      | 46.00           | -5.49      | QP                      |                           |         |
| 5   | !   | 331.6700     | 52.58                    | -11.62                  | 40.96                      | 46.00           | -5.04      | QP                      |                           |         |
| 6   |     | 344.2800     | 50.80                    | -10.98                  | 39.82                      | 46.00           | -6.18      | QP                      |                           |         |
| 7   | *   | 433.9200     | 85.28                    | -9.74                   | 75.54                      | 100.82          | -25.28     | peak                    |                           |         |
| 8   | X   | 433.9200     | 79.04                    | -9.74                   | 69.30                      | 80.82           | -11.52     | AVG                     |                           |         |
| 9   | X   | 867.8400     | 58.30                    | 0.15                    | 58.45                      | 80.82           | -22.37     | peak                    |                           |         |
| 10  | X   | 867.8400     | 52.06                    | 0.15                    | 52.21                      | 60.82           | -8.61      | AVG                     |                           |         |

\*:Maximum data x:Over limit !:over margin

Operator: Wang

Operation Mode: 433.92MHz Test Date : September 20, 2014  
Frequency Range: 1000~5000MHz Temperature : 24℃  
Test Result: PASS Humidity : 55 %  
Measured Distance: 3m Test By: Jack

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level(dBuV/m) |       | Limit 3m(dBuV/m) |       | Margin(dB) |        |
|----------------|-----------------|------------------------|-------|------------------|-------|------------|--------|
|                |                 | PK                     | AV    | PK               | AV    | PK         | AV     |
| 1301.79        | V               | 56.18                  | 49.94 | 74.00            | 54.00 | -17.82     | -4.06  |
| 1735.07        | V               | 49.13                  | 42.89 | 74.00            | 54.00 | -24.87     | -11.11 |
| 2166.63        | V               | 47.15                  | 40.91 | 74.00            | 54.00 | -26.85     | -13.09 |
| 1301.97        | H               | 57.13                  | 50.89 | 74.00            | 54.00 | -16.87     | -3.11  |
| 1735.06        | H               | 50.19                  | 43.95 | 74.00            | 54.00 | -23.81     | -10.05 |
| 2169.49        | H               | 48.47                  | 42.23 | 74.00            | 54.00 | -25.53     | -11.77 |

**Note:** (1) All Readings are Peak Value.

(2) Emission Level= Reading Level+Probe Factor +Cable Loss

(3) True Value = Emission Level + Duty Cycle Correction Factor

(4) DF= Duty Cycle Correction Factor

(5) Duty Cycle Correction Factor (dB) = 20 X Log 10 Duty Cycle

(6) Margin = TrueValue – limit(if margin is minus means under limit)

(7) The “\*” means restricted bands

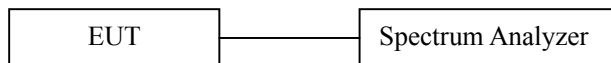
(8) All the x/y/z orientation has been investigated, and only worst case is presented in this report.

## 6. BANDWIDTH TEST

### 6.1. Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

### 6.2. Test SET-UP (Block Diagram of Configuration)



The test setup used to transmitter bandwidth measurement was the same with duty cycle test, except there is no need for digital oscilloscope in the bandwidth test. For detailed description, please reference to section 5.1, 5.2, 5.3 and 5.4 on page 11 and 12 of this report.

The resolution bandwidth of the spectrum analyzer was set to 100KHz, which is greater 5 percent of the maximum permitted bandwidth that required by the ANSI C63.4 section13. Bandwidth is determined at the point 20dB down from the modulator carrier. The maximum permitted bandwidth specified by the rule was 0.25% of the center frequency of the EUT, e.g.  $433.92\text{MHz} * 0.25\% = 1.0848\text{MHz}$ . The detector function was set to peak and hold mode to clearly observe the components.

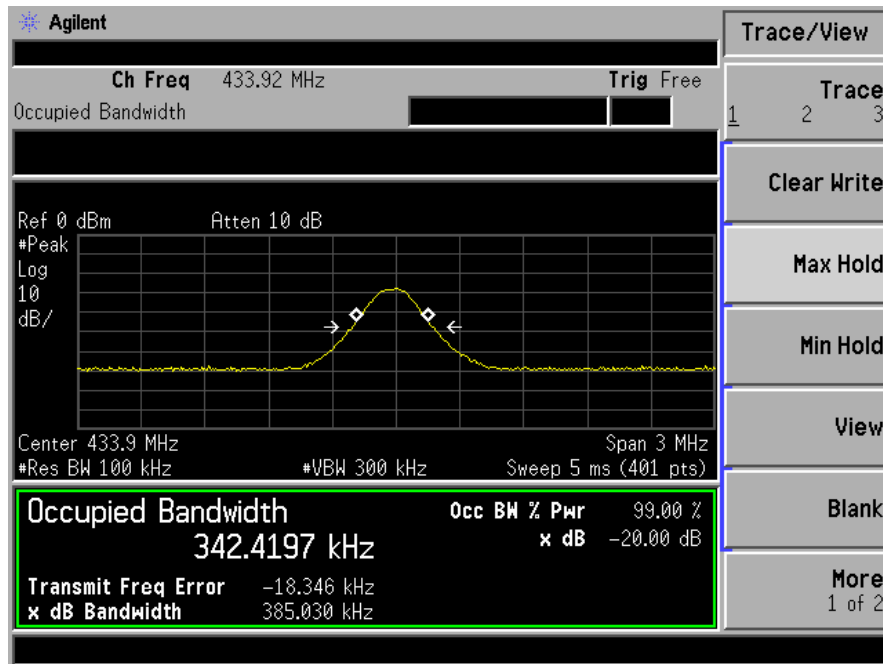
### 6.3. Measurement Equipment Used:

| EQUIPMENT TYPE    | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.   | CAL DUE.   |
|-------------------|---------|--------------|---------------|-------------|------------|
| Spectrum Analyzer | Agilent | E4407B       | 88156318      | 05/17, 2014 | 05/16/2015 |

### 6.4. Measurement Results:

|                    |      |              |                    |
|--------------------|------|--------------|--------------------|
| Spectrum Detector: | PK   | Test Date:   | September 20, 2014 |
| Test By:           | Andy | Temperature: | 24°C               |
| Test Result:       | PASS | Humidity:    | 55 %               |
| Modulation:        | FSK  |              |                    |

| Channel number | Channel frequency (MHz) | 20dB Down BW(kHz) | Limit                   |
|----------------|-------------------------|-------------------|-------------------------|
| CH1            | 433.92                  | 385.030           | $\leq 1084.8\text{KHz}$ |



## **7. Antenna Application**

### **7.1. Antenna Requirement**

For intentional device, according to FCC 47 CFR Section 15.203, 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.

### **7.2. Result**

The EUT'S antenna is Internal antenna. The antenna's gain is 2.15dBi and meets the requirement.