

# FCC Part 15C

## Measurement And Test Report

For

### Forest Group Nederland B.V.

Arnsbergstraat 4 NL - 7418 EZ Deventer, Netherlands.

FCC ID: 2AFO8520109X46X

Jun. 24, 2015

|                                                                                     |                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report | <b>Equipment Type:</b><br>Forest Diamond RF remote                                                                                                                     |
| <b>Report Number:</b>                                                               | MTI150207004RF                                                                                                                                                         |
| <b>Test Engineer:</b>                                                               | David Chen <i>David Chen</i>                                                                                                                                           |
| <b>Reviewed By:</b>                                                                 | Tim Zhang <i>Tim Zhang</i>                                                                                                                                             |
| <b>Approved &amp; Authorized By:</b>                                                | Hebe Lee <i>Hebe Lee</i>                                                                                                                                               |
| <b>Test Date:</b>                                                                   | Jun. 01 - Jun. 24, 2015                                                                                                                                                |
| <b>Prepared By:</b>                                                                 | <b>Shenzhen Microtest Technology Co.,Ltd</b><br>6F, Zhongbao Building, Gushu, Bao'an District, Shenzhen, P.R.China<br>Tel: +86-755-8885 0135<br>Fax: +86-755-8885 0136 |

**Note:** Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of Shenzhen Microtest Technology Co.,Ltd.

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## 1.0 General Details

### 1.1 Test Lab Details

Shenzhen Toby Technology Co., Ltd.

Add.: 10/F.,A Block,Jiada R&D Bldg.,No.5 Songpingshan, Road, Science&Technology Park,  
Shenzhen, 518057

FCC Registration No.:811562

### 1.2 Applicant Details

|                              |                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------|
| <b>Product:</b>              | Forest Diamond RF remote                                                                  |
| <b>Model No.:</b>            | 520109X46X                                                                                |
| <b>Applicant:</b>            | Forest Group Nederland B.V.                                                               |
| <b>Address:</b>              | Arnsbergstraat 4 NL - 7418 EZ Deventer, Netherlands.                                      |
| <b>Manufacturer:</b>         | Shenzhen A-OK Technology Grand Development Co.,LTD                                        |
| <b>Address:</b>              | 3F, 34 Bldg, Chentian Industry Zone, Xixiang, Bao'an District, Shenzhen, Guangdong, China |
| <b>Date of Test:</b>         | Jun. 01 – Jun. 24, 2015                                                                   |
| <b>Applicable Standards:</b> | FCC Part 15.231(a)                                                                        |

## 1.3 Description of EUT

|                       |                                            |
|-----------------------|--------------------------------------------|
| Product:              | Forest Diamond RF remote                   |
| Model No.:            | 520109X46X                                 |
| Additional Model No.: | N/A                                        |
| Brand Name:           | FOREST DRAPERY HARDWARE                    |
| Rating:               | DC Battery: DC 3V (CR2450)                 |
| Operation Frequency:  | 433.92MHz                                  |
| Modulation:           | FSK                                        |
| Antenna Designation:  | An internal antenna and the gain is 0 dBi. |

## 1.4 Statement:

All models above are identical in the circuit, PCB layout, internal structure, all of the housing are made of plastic material, and just the appearance are different, different model names are different for the marketing requirement.

## 2.0 Test equipments and Associated Equipment used during the test.

### 2.1 Test Equipments

| Instrument Type        | Manufacturer    | Model  | Serial No. | Date of Cal.  | Due Date      |
|------------------------|-----------------|--------|------------|---------------|---------------|
| Spectrum Analyzer      | Agilent         | E4407B | MY45106456 | Mar. 20, 2015 | Mar. 19, 2016 |
| Spectrum Analyzer      | Rohde & Schwarz | FSP30  | DE25181    | Aug. 08, 2014 | Aug.07, 2015  |
| EMI Test Receiver      | Rohde & Schwarz | ESCI   | 101165     | Aug. 08, 2014 | Aug.07, 2015  |
| Bilog Antenna          | ETS-LINDGREN    | 3142E  | 00117537   | Mar. 07, 2015 | Mar.06, 2016  |
| Horn Antenna           | ETS-LINDGREN    | 3117   | 00143207   | Mar. 07, 2015 | Mar.06, 2016  |
| Pre-amplifier          | HP              | 11909A | 185903     | Mar. 07, 2015 | Mar.06, 2016  |
| Pre-amplifier          | HP              | 8447B  | 3008A00849 | Mar. 07, 2015 | Mar.06, 2016  |
| Cable                  | HUBER+SUHNER    | 100    | SUCOFLEX   | Mar. 07, 2015 | Mar.06, 2016  |
| Signal Generator       | Rohde & Schwarz | SML03  | IKW682-054 | Feb. 11, 2015 | Feb.10, 2016  |
| Positioning Controller | ETS-LINDGREN    | 2090   | N/A        | N/A           | N/A           |

### 2.2 AE used during the test

| Equipment type | Manufacturer | Model |
|----------------|--------------|-------|
| N.A.           |              |       |
| N.A.           |              |       |
| N.A.           |              |       |
| N.A.           |              |       |

### 2.3. Block Diagram of EUT Configuration



Note: New batteries are used for E.U.T during the test

### 3.0 Technical Details

#### 3.1 Summary of test results

The EUT has been tested according to the following specifications

| Requirement                           | CFR 47 Section                   | Result | Notes    |
|---------------------------------------|----------------------------------|--------|----------|
| Conduction Emission, 0.15MHz to 30MHz | 15.207                           | PASS   | N.A.     |
| Radiation Emission                    | 15.231(e), 15.205, 15.209, 15.35 | PASS   | Complies |
| Transmission time and silent time     | 15.23(e)                         | PASS   | Complies |
| Occupied Bandwidth                    | 15.231(c)                        | PASS   | Complies |

#### 3.2 Test Standards

FCC Part 15:2012 Subpart C, Paragraph 15.231

### 4.0 EUT Modification

No modification by Shenzhen Microtest Technology Co.,Ltd

### 5.0 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item                          | MU                        |
|-----|-------------------------------|---------------------------|
| 1.  | Radio Frequency               | $\pm 1 \times 10^{-9}$    |
| 2.  | Temperature                   | $\pm 0.1^{\circ}\text{C}$ |
| 3.  | Humidity                      | $\pm 1.0\%$               |
| 4.  | RF power, conducted           | $\pm 0.34\text{dB}$       |
| 5.  | RF power density, conducted   | $\pm 1.45\text{dB}$       |
| 6.  | Spurious emissions, conducted | $\pm 3.70\text{dB}$       |
| 7.  | All emissions, radiated       | $\pm 4.50\text{dB}$       |

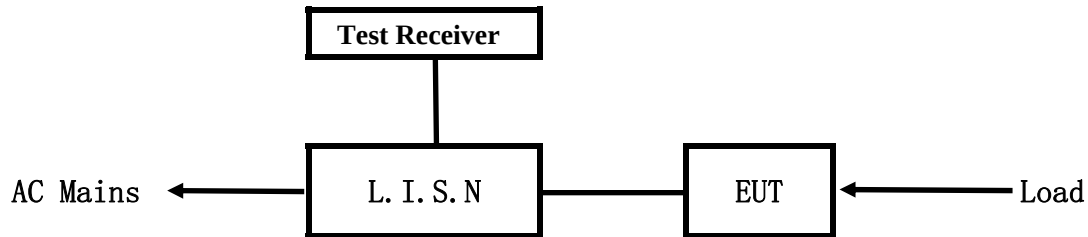
Note: 1) The EUT is powered by battery, and a New Battery was used during all tests.

2) Working transmission frequency: 433.92MHz

3) N.A. means Not Applicable.

## 6.0 Power Line Conducted Emission Test

### 6.1 Schematics of the test



EUT: Equipment Under Test

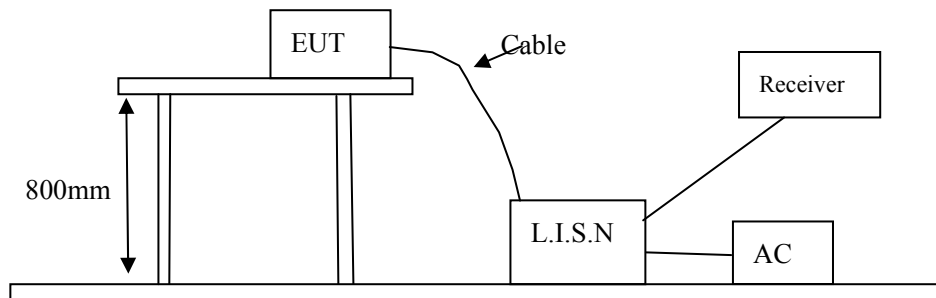
### 6.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009 and ANSI C63.4-2003.

The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



### 6.3 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009 and ANSI C63.4-2003

- 1) Setup the EUT and simulators as shown on the following
- 2) Enable AF signal and confirm EUT active to normal condition

### 6.4 Test Equipment

| Instrument Type    | Manufacturer    | Model       | Serial No. | Date of Cal.  | Due Date     |
|--------------------|-----------------|-------------|------------|---------------|--------------|
| EMI Test Receiver  | Rohde & Schwarz | ESCI        | 100321     | Aug. 08, 2014 | Aug.07, 2015 |
| 50Ω Coaxial Switch | Anritsu         | MP59B       | X10321     | Aug. 08, 2014 | Aug.07, 2015 |
| L.I.S.N            | Rohde & Schwarz | ENV216      | 101131     | Aug. 08, 2014 | Aug.07, 2015 |
| L.I.S.N            | SCHWARZBECK     | NNBL 8226-2 | 8226-2/164 | Aug. 08, 2014 | Aug.07, 2015 |

## 6.5 Conducted Emission Limit

| Frequency(MHz) | Class A Limits (dB $\mu$ V) |               | Class B Limits (dB $\mu$ V) |               |
|----------------|-----------------------------|---------------|-----------------------------|---------------|
|                | Quasi-peak Level            | Average Level | Quasi-peak Level            | Average Level |
| 0.15 ~ 0.50    | 79.0                        | 66.0          | 66.0~56.0*                  | 56.0~46.0*    |
| 0.50 ~ 5.00    | 73.0                        | 60.0          | 56.0                        | 46.0          |
| 5.00 ~ 30.00   | 73.0                        | 60.0          | 60.0                        | 50.0          |

Notes: 1) \*Decreasing linearly with logarithm of frequency.  
 2) The tighter limit shall apply at the transition frequencies

## 6.6 Test specification:

Environmental conditions: Temperature: 26° C Humidity: 55% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

The test was carried out in the following operation mode(s):

--

## 6.7 Test result

N.A.

The requirements are FULFILLED

Remarks: The power supply of this equipment is a battery, so this test item is not applicable

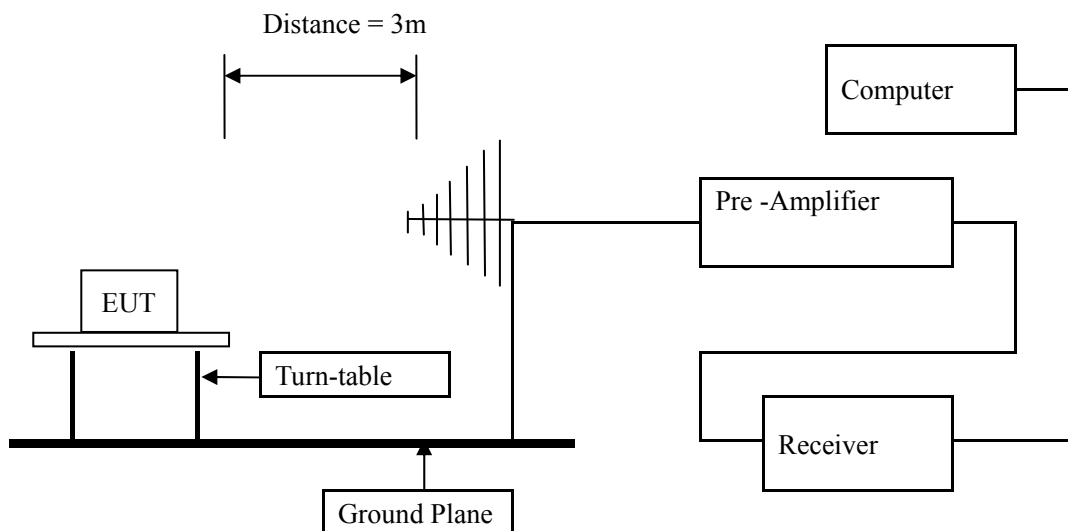
## 7.0 Radiated Emission Test

### 7.1 Test Method and test Procedure:

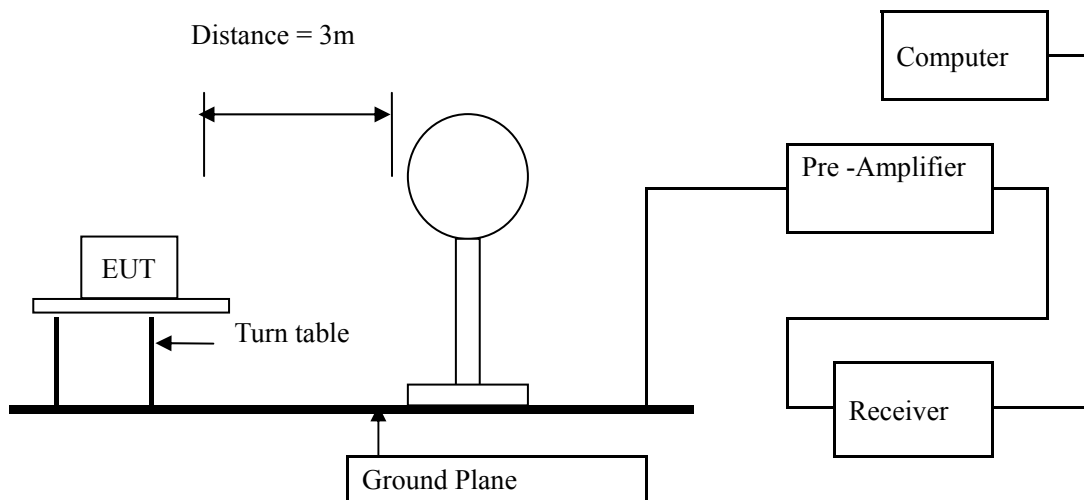
- 1) The EUT was tested according to ANSI C63.10 –2009 and ANSI C63.4-2003.
- 2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009 and ANSI C63.4-2003.
- 3) The frequency spectrum from 9kHz to 5GHz was investigated. All readings from 9kHz to 30MHz are quasi-peak values with a resolution bandwidth of 10 kHz, measured with loop antenna. All readings from 30MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz, measured with Bi-log antenna. All readings are above 1 GHz are peak values with a resolution bandwidth of 1 MHz, measured with horn antenna.
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for above 30MHz each frequency. The antenna high is 1 m to find the maximum emission for each frequency below 30MHz
- 5) Tested distance: 3 meters
- 6) The antenna polarization: Vertical polarization and Horizontal polarization.
- 7) Each azimuth of E.U.T will be tested.

### 7.2 Block diagram of Test setup

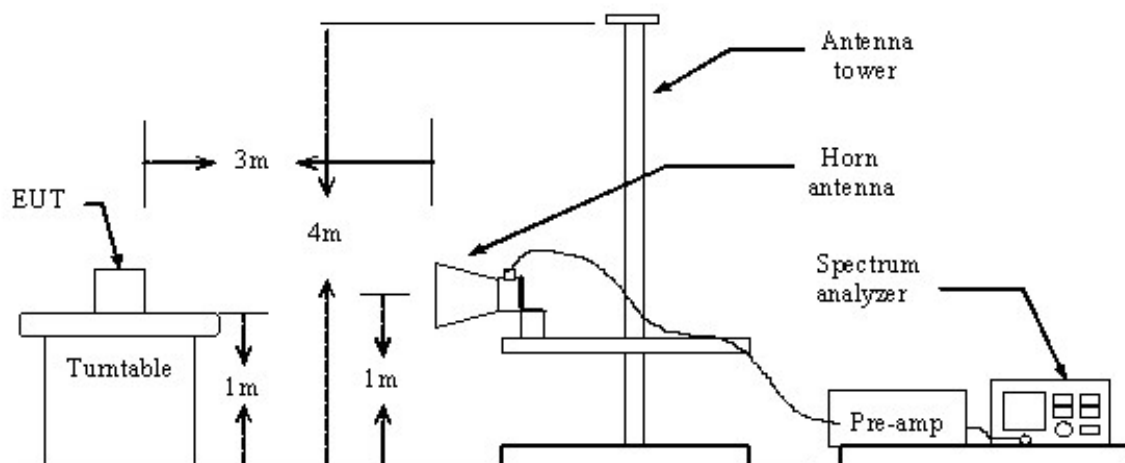
Block diagram of Test setup for frequency 30-1000MHz



Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



### 7.3 Limit

According to 15.231(e) requirements, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following

| Fundamental Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                   | Filed Strength of Fundamental (microvolts/meter) | Filed Strength of Spurious Emission (microvolts/meter) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------|
| 40.66-40.70                                                                                                                                                                                                                                                                                                                                                                                                   | 1,000                                            | 100                                                    |
| 70-130                                                                                                                                                                                                                                                                                                                                                                                                        | 500                                              | 50                                                     |
| 130-174                                                                                                                                                                                                                                                                                                                                                                                                       | 500 to 1,500                                     | 50 to 150                                              |
| 174-260                                                                                                                                                                                                                                                                                                                                                                                                       | 1,500                                            | 150                                                    |
| 260-470                                                                                                                                                                                                                                                                                                                                                                                                       | 1,500 to 5,000                                   | 150 to 500                                             |
| Above 470                                                                                                                                                                                                                                                                                                                                                                                                     | 5,000                                            | 500                                                    |
| *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 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $22.7273(F) - 2454.5455$ ; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $16.6667(F) - 2833.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.] |                                                  |                                                        |

For this E.U.T

| Working Frequency(MHz)                                                                                                                                                                                                                   | Filed Strength of Fundamental(dB $\mu$ V/m) | Filed Strength of Spurious Emission(dB $\mu$ V/m) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------|
| 433.92                                                                                                                                                                                                                                   | 72.87                                       | 52.87                                             |
| Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. |                                             |                                                   |

According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits Shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.

According to 15.231(e) , The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

Frequencies in restricted band are complied to limit on Paragraph 15.209.

| Frequency Range (MHz) | Distance (m) | Field strength (dB $\mu$ V/m) |
|-----------------------|--------------|-------------------------------|
| 0.009-0.490           | 3            | $20\log 2400/F$ (kHz) + 80    |
| 0.490-1.705           | 3            | $20\log 24000/F$ (kHz) + 40   |
| 1.705-30              | 3            | $20\log 30$ + 40              |
| 30-88                 | 3            | 40.0                          |
| 88-216                | 3            | 43.5                          |
| 216-960               | 3            | 46.0                          |
| Above 960             | 3            | 54.0                          |

- Note:
- 1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
  - 2) In the Above Table, the tighter limit applies at the band edges.
  - 3) Distance refers to the distance in meters between the measuring instrument antenna and the EUT
  - 4) The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
  - 5) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula  $Ld1 = Ld2 * (d2/d1)$

#### 7.4 Test Equipment

| Instrument Type        | Manufacturer    | Model  | Serial No. | Date of Cal.  | Due Date      |
|------------------------|-----------------|--------|------------|---------------|---------------|
| Spectrum Analyzer      | Agilent         | E4407B | MY45106456 | Mar. 20, 2015 | Mar. 19, 2016 |
| Spectrum Analyzer      | Rohde & Schwarz | FSP30  | DE25181    | Aug. 08, 2014 | Aug.07, 2015  |
| EMI Test Receiver      | Rohde & Schwarz | ESCI   | 101165     | Aug. 08, 2014 | Aug.07, 2015  |
| Bilog Antenna          | ETS-LINDGREN    | 3142E  | 00117537   | Mar. 07, 2015 | Mar.06, 2016  |
| Horn Antenna           | ETS-LINDGREN    | 3117   | 00143207   | Mar. 07, 2015 | Mar.06, 2016  |
| Pre-amplifier          | HP              | 11909A | 185903     | Mar. 07, 2015 | Mar.06, 2016  |
| Pre-amplifier          | HP              | 8447B  | 3008A00849 | Mar. 07, 2015 | Mar.06, 2016  |
| Cable                  | HUBER+SUHNER    | 100    | SUCOFLEX   | Mar. 07, 2015 | Mar.06, 2016  |
| Signal Generator       | Rohde & Schwarz | SML03  | IKW682-054 | Feb. 11, 2015 | Feb.10, 2016  |
| Positioning Controller | ETS-LINDGREN    | 2090   | N/A        | N/A           | N/A           |

#### 7.5 Test specification

Environmental conditions: Temperature 25° C Humidity: 50% Atmospheric pressure: 103kPa

## 7.6 Test result

Result: Pass

**A Fundamental Radiated Emission**

| Frequency (MHz) | Emission Level@3m<br>(dB $\mu$ V/m) | Antenna Polarity | Limit@3m<br>(dB $\mu$ V/m) | Remark |
|-----------------|-------------------------------------|------------------|----------------------------|--------|
| 433.92          | 74.35                               | H                | 92.87                      | Peak   |
| 433.92          | 68.21                               | V                | 92.87                      | Peak   |

| Frequency<br>(MHz) | Peak Emission<br>Level@3m<br>(dB $\mu$ V/m) | AV<br>Factor<br>(dB) | AV Emission<br>Level@3m<br>(dB $\mu$ V/m) | Antenna<br>Polarity | Limit@3m<br>(dB $\mu$ V/m) | Remark |
|--------------------|---------------------------------------------|----------------------|-------------------------------------------|---------------------|----------------------------|--------|
| 433.92             | 74.35                                       | -4.0                 | 70.35                                     | H                   | 72.87                      | AV     |
| 433.92             | 68.21                                       | -4.0                 | 64.21                                     | V                   | 72.87                      | AV     |

**B Harmonics and spurious Radiated Emission**

| Frequency (MHz) | Emission Level@3m<br>(dB $\mu$ V/m) | Antenna Polarity | Limit@3m<br>(dB $\mu$ V/m) | Remark |
|-----------------|-------------------------------------|------------------|----------------------------|--------|
| 317.49          | 31.47                               | H                | 66.00                      | Peak   |
| 867.840         | 32.52                               | H                | 72.87                      | Peak   |
| 1302.610        | 34.38                               | H                | 74.00                      | Peak   |
| 325.471         | 30.15                               | V                | 66.00                      | Peak   |
| 867.840         | 37.38                               | V                | 72.87                      | Peak   |
| 1302.610        | 35.61                               | V                | 74.00                      | Peak   |

| Frequency<br>(MHz) | Peak Emission<br>Level@3m<br>(dB $\mu$ V/m) | AV<br>Factor<br>(dB) | AV Emission<br>Level@3m<br>(dB $\mu$ V/m) | Antenna<br>Polarity | Limit@3m<br>(dB $\mu$ V/m) | Remark |
|--------------------|---------------------------------------------|----------------------|-------------------------------------------|---------------------|----------------------------|--------|
| 1302.610           | 34.38                                       | -4.0                 | 30.38                                     | H                   | 54.00                      | AV     |
| 1735.680           | 33.57                                       | -4.0                 | 29.57                                     | H                   | 52.87                      | AV     |
| 2169.600           | 32.85                                       | -4.0                 | 28.85                                     | H                   | 52.87                      | AV     |
| 1302.610           | 35.61                                       | -4.0                 | 31.61                                     | V                   | 54.00                      | AV     |
| 1735.680           | 34.52                                       | -4.0                 | 30.52                                     | V                   | 52.87                      | AV     |
| 2169.600           | 33.97                                       | -4.0                 | 29.97                                     | V                   | 52.87                      | AV     |

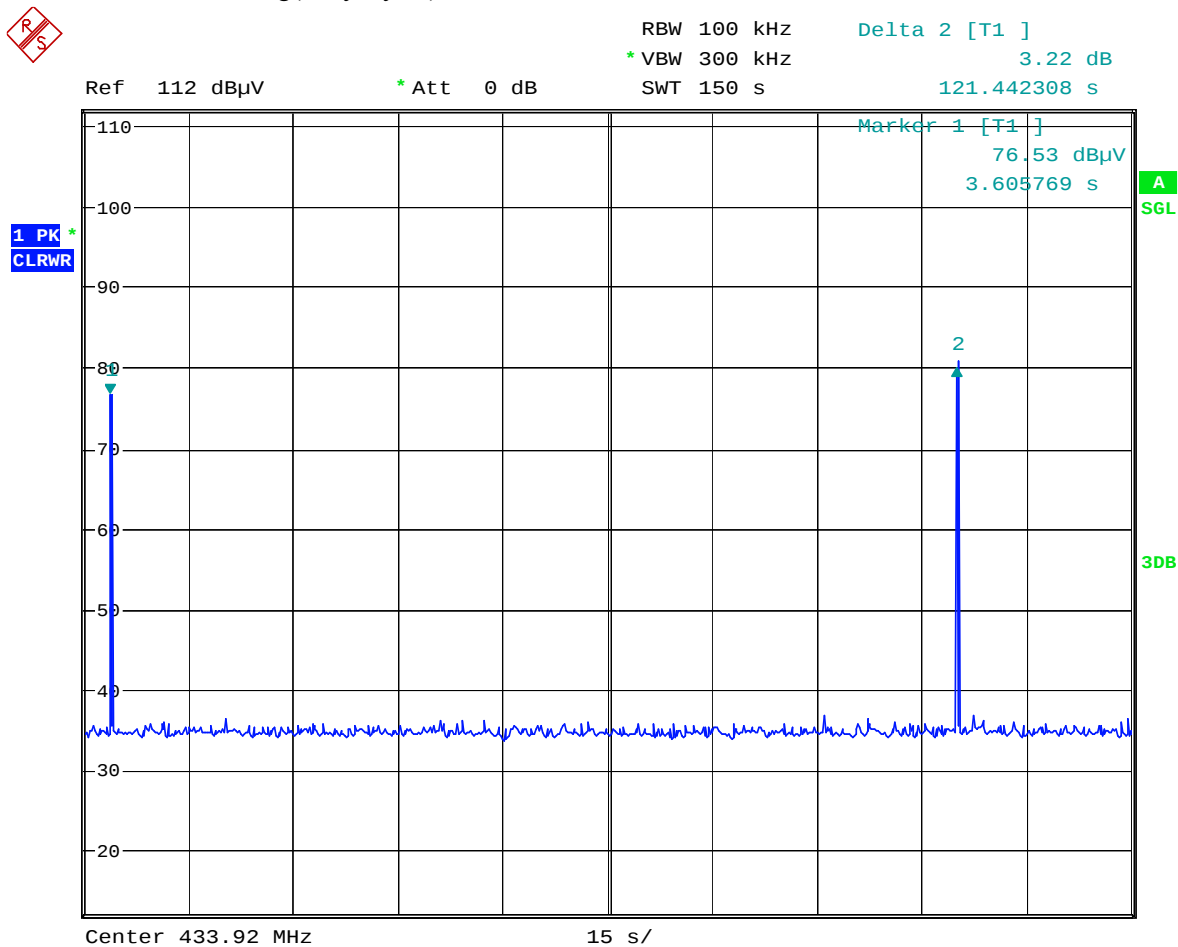
- Note:
- 1) Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor
  - 2) Test Frequency form 9kHz to 5GHz, the emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement
  - 3) AV=Average
  - 4) AV Emission level = Peak Emissions level +AV Factor
  - 5) AV Factor =  $20 \log(\text{Duty Cycle})$

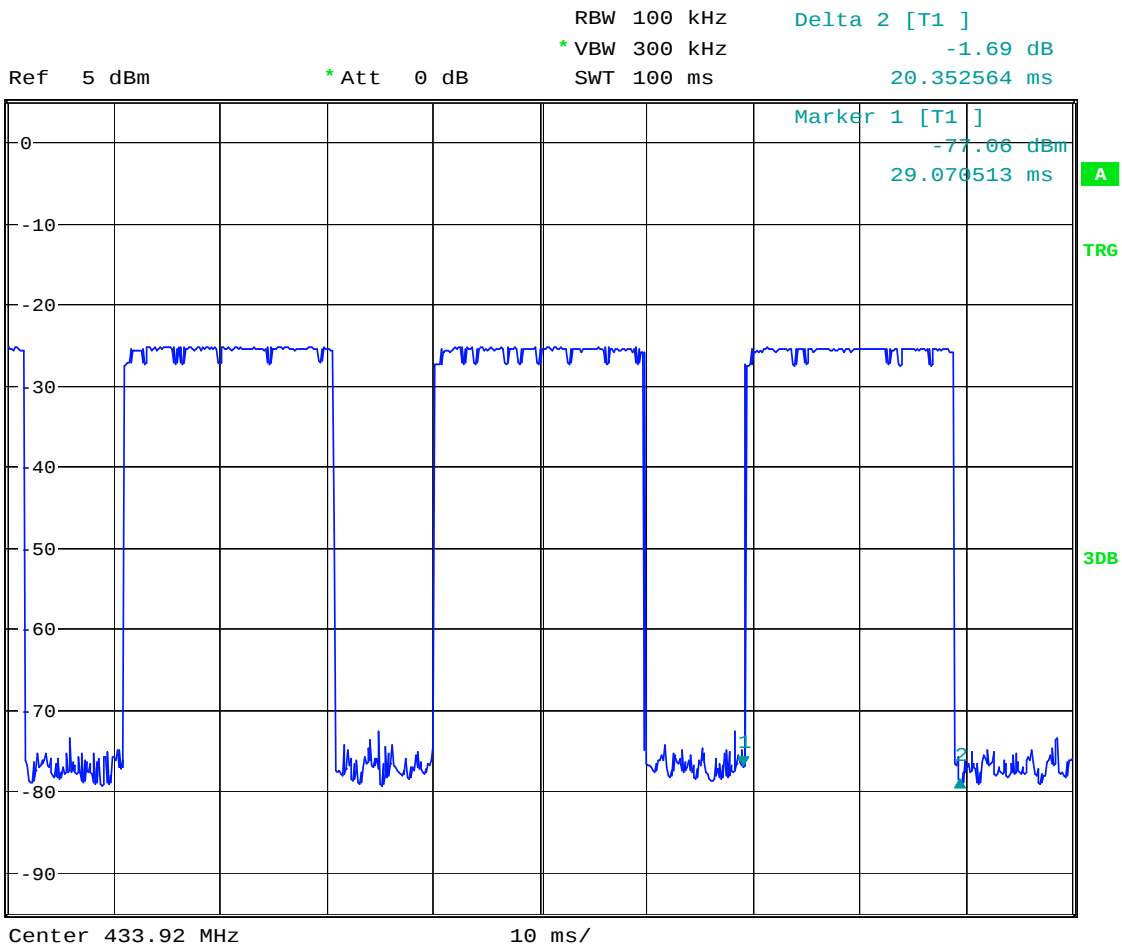
Duty cycle test data as follows

Note: Effective time one cycle= $2.24+20.35*3=63.29\text{ms}$

Duty Cycle= Effective time one cycle/ 100 or period time (which is less) =0.6329

AV Factor =  $20 \log(\text{Duty Cycle})=-4.0$





Period time

Pulse time 1

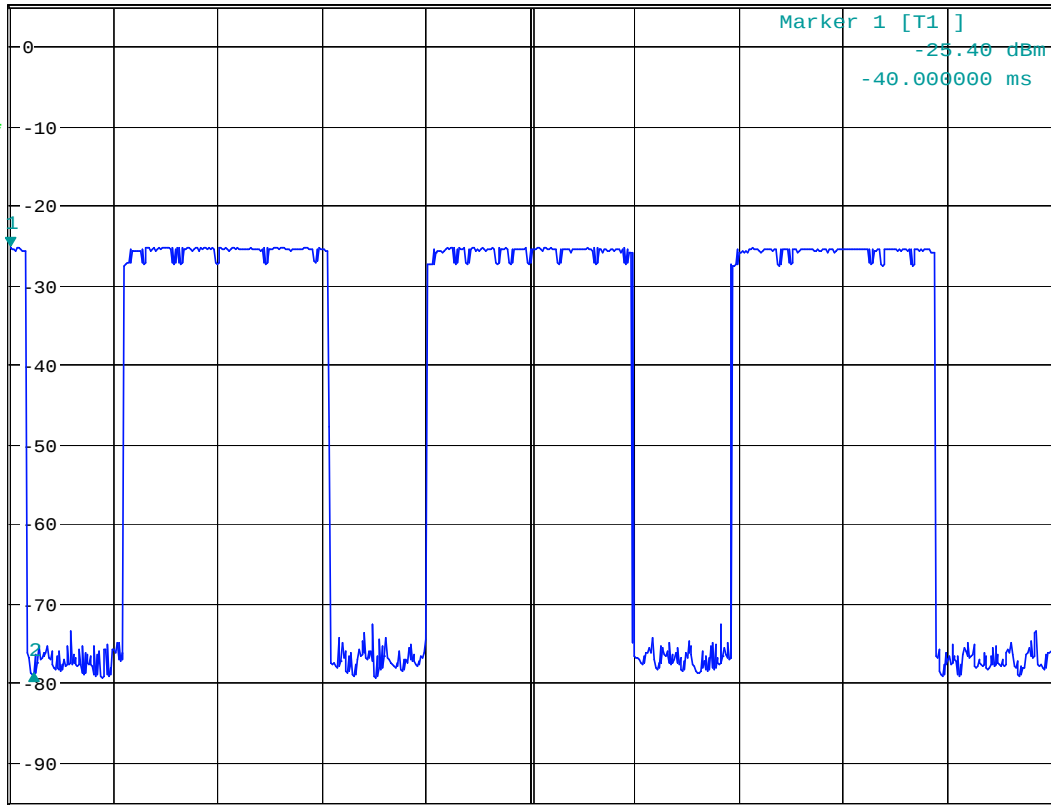


RBW 100 kHz Delta 2 [T1 ]  
\* VBW 300 kHz -53.55 dB  
SWT 100 ms 2.243590 ms

Ref 5 dBm

\* Att 0 dB

1 PK \*  
CLRWR



Center 433.92 MHz

10 ms/

Pulse time 2

## 8.0 Limit of Transmission Time

### 8.1 Block diagram of Test setup



### 8.2 Test Specification

Environmental conditions: Temperature 22° C Humidity: 50% Atmospheric pressure: 103kPa

### 8.3 Test Equipment

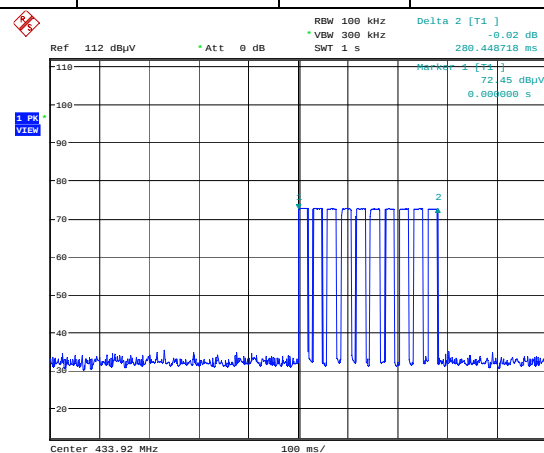
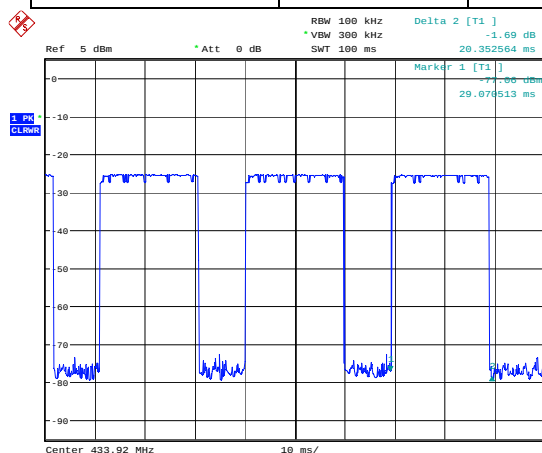
| Instrument Type   | Manufacturer  | Model | Serial No. | Date of Cal.  | Due Date     |
|-------------------|---------------|-------|------------|---------------|--------------|
| Spectrum Analyzer | ROHDE&SCHWARZ | FSP30 | DE25181    | Aug. 08, 2014 | Aug.07, 2015 |

### 8.4 Limit

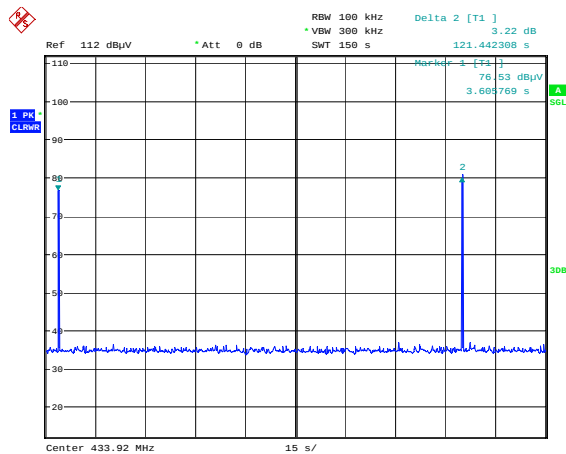
15.231(e) In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

## TEST RESULTS

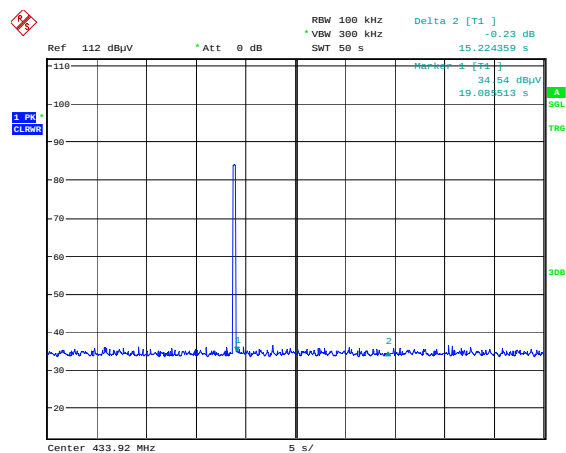
| Channel Frequency (MHz) | Pulse Width (ms) | Number of Pulse | Transmission Time (ms) | Limit (Second) | Test conclusion |
|-------------------------|------------------|-----------------|------------------------|----------------|-----------------|
| 433.92                  | 20.35            | 10              | 203.5                  | 1s             | PASS            |



| Channel Frequency (MHz) | Silent Period (Second) | Limit 30 Times Of The Transmission Time | Limit (Second) | Test conclusion |
|-------------------------|------------------------|-----------------------------------------|----------------|-----------------|
| 433.92                  | 121.44                 | 6105                                    | >10s           | PASS            |

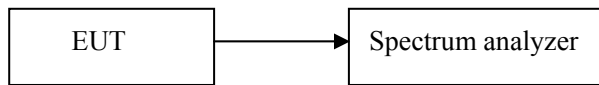


Silent period



## 9.0 Occupied Bandwidth

### 9.1 Block diagram of Test setup



### 9.2 Test Specification

Environmental conditions: Temperature 22° C Humidity: 50% Atmospheric pressure: 103kPa

### 9.3 Test Equipment

| Instrument Type   | Manufacturer  | Model | Serial No.   | Date of Cal. | Due Date     |
|-------------------|---------------|-------|--------------|--------------|--------------|
| Spectrum Analyzer | ROHDE&SCHWARZ | FSU   | 1166.1660.03 | July 3, 2015 | July 2, 2016 |

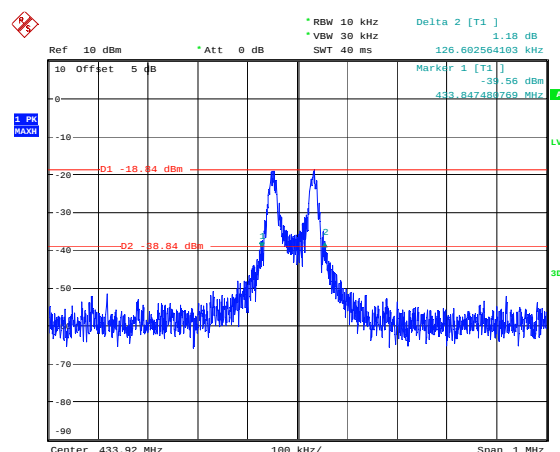
### 9.4 Limit

According to 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 9.5 Test Result

| Channel | 20dB Bandwidth (kHz) | Limit (kHz) | Conclusion |
|---------|----------------------|-------------|------------|
| (Low)   | 126.6                | 1084.8      | PASS       |

Note: Limit = 433.92MHz \*0.25% = 1084.8 kHz



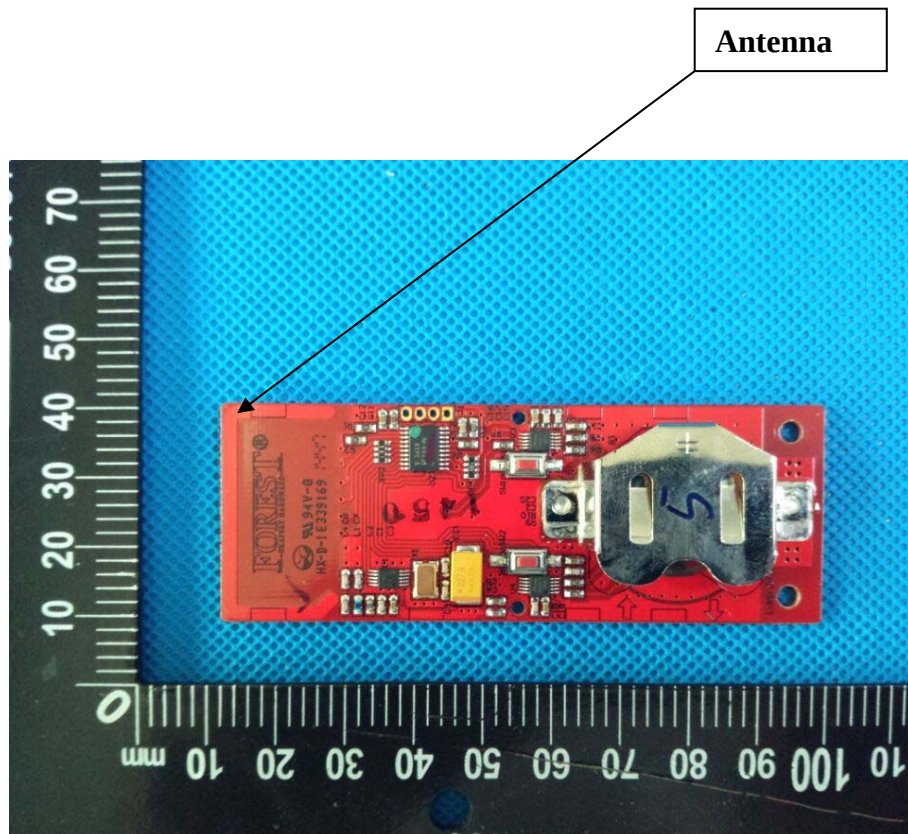
## 10.0 Antenna Requirement

### 10.1 Standard Applicable

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.

### 10.2 Antenna Specification

According to the manufacturer declared, the EUT has an internal antenna; the directional gain of antenna is 0 dBi, and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.



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