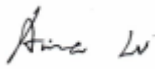


FCC PART 15.231  
EMI MEASUREMENT AND TEST REPORT  
For  
Ningbo Yinzhou Wireless Electronic Limited Company  
Shanglijia Village, Yunlong Town, Yinzhou District, Ningbo City, China

**FCC ID: SM7WRS-MRC**

April 16, 2013

|                                          |                                                                                                                                                                                                               |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| This Report Concerns:<br>Original Report | Equipment Type:<br>Electric winch wireless controller                                                                                                                                                         |
| Test Engineer:                           | Anna Lv                                                                                                                    |
| Report No.:                              | SHBST2013031506Y-1ER-3                                                                                                                                                                                        |
| Receive EUT<br>Date/Test Date:           | March 27, 2013 / March 28 - April 15, 2013                                                                                                                                                                    |
| Reviewed By:                             | Mike Moo                                                                                                                   |
| Prepared By:                             | <b>Shenzhen BST Technology Co.,Ltd.</b><br>3F,Weames Technology Building, No. 10 Kefa Road,Science<br>Park, Nanshan District,Shenzhen,Guangdong,China<br>Tel: 0755-26747751-3<br>Fax: 0755-26747751-3 ext.826 |

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## 1. GENERAL INFORMATION

### 1.1. Test Facility

The test site used to collect the radiated data is located on the address of  
Global United Technology Service Co., Ltd  
(FCC Registered Test Site Number: 600491) on  
2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District,  
Shenzhen, China 518102

The Test Site is constructed and calibrated to meet the FCC requirements.

### 1.2. Measurement Uncertainty

(95% confidence levels, k=2)

| Test Item                                               | Uncertainty        |
|---------------------------------------------------------|--------------------|
| Uncertainty for Conduction emission test                | 1.38dB             |
| Uncertainty for Radiation Emission test<br>(below 1GHz) | 4.68dB             |
| Uncertainty for Radiation Emission test<br>(above 1GHz) | 4.89dB             |
| Uncertainty for radio frequency                         | $1 \times 10^{-9}$ |
| Uncertainty for test site temperature and<br>humidity   | 0.5°C              |
|                                                         | 2%                 |

## 2. PRODUCT DESCRIPTION

### 2.1. EUT Description

|                     |                                                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Description         | : Electric winch wireless controller                                                                                           |
| Trade Name          | : WRS                                                                                                                          |
| Applicant           | : Ningbo Yinzhou Wireless Electronic Limited Company<br>Shanglijia Village, Yunlong Town, Yinzhou District, Ningbo City, China |
| Manufacture         | : Ningbo Yinzhou Wireless Electronic Limited Company<br>Shanglijia Village, Yunlong Town, Yinzhou District, Ningbo City, China |
| Model Number        | : WRS-MRC                                                                                                                      |
| Frequency           | : 315MHz                                                                                                                       |
| Modulation Type     | : ASK                                                                                                                          |
| Antenna Information | : PCB antenna, Antenna Gain: 0dBi                                                                                              |
| Power Supply        | : DC 12V                                                                                                                       |

### 2.2. Block Diagram of EUT Configuration



### 2.3. Support Equipment List

| Name | Model No | S/N | Manufacturer | Used<br>"Yes/No" |
|------|----------|-----|--------------|------------------|
| N/A  |          |     |              |                  |

Remark: "N/A" means "Not applicable."

### 2.4. Test Conditions

Ambient conditions in the laboratory:

| Items                      | Required (IEC 68-1) | Actual   |
|----------------------------|---------------------|----------|
| Temperature (°C)           | 15-35               | 20-25    |
| Humidity (%RH)             | 25-75               | 50-63    |
| Barometric pressure (mbar) | 860-1060            | 950-1000 |

### 3. FCC ID LABEL

**FCC ID: SM7WRS-MRC**

**Label Location on EUT**

**EUT View/ FCC ID Label Location**



#### 4. TEST RESULTS SUMMARY

##### FCC 15 Subpart C, Paragraph 15.231

| FCC Rules            | Description of Test      | Result    |
|----------------------|--------------------------|-----------|
| Section 15.207       | Conducted Emission       | N/A       |
| Section 15.231(b)    | Radiated Emission        | Compliant |
| Section 15.231(c)    | 20dB Bandwidth           | Compliant |
| Section 15.231(a)(1) | Release Time Measurement | Compliant |
| Section 15.203       | Antenna Requirement      | Compliant |

Remark: "N/A" means "Not applicable."

Statement: All testing was performed using the test procedures found in ANSI C63.4-2003.

##### Modifications

No modification was made.

## 5. TEST EQUIPMENT USED

| EQUIPMENT/FACILITIES          | MANUFACTURER                       | MODEL                               | SERIAL NO. | DATE OF CAL. | CAL. INTERVAL |
|-------------------------------|------------------------------------|-------------------------------------|------------|--------------|---------------|
| 3m Semi-Anechoic Chamber      | ZhongYu Electron                   | 9.2(L)*6.2(W)* 6.4(H)               | GTS250     | Mar. 20 2013 | 1 Year        |
| Control Room                  | ZhongYu Electron                   | 6.2(L)*2.5(W)* 2.4(H)               | GTS251     | N/A          | N/A           |
| EMI Test Receiver             | Rohde & Schwarz                    | ESU26                               | GTS203     | Jul. 04 2012 | 1 Year        |
| BiConiLog Antenna             | SCHWARZBECK<br>MESS-ELEKTRO<br>NIK | VULB9163                            | GTS214     | Feb. 25 2013 | 1 Year        |
| Double -ridged waveguide horn | SCHWARZBECK<br>MESS-ELEKTRO<br>NIK | 9120D-829                           | GTS208     | June 30 2012 | 1 Year        |
| Horn Antenna                  | ETS-LINDGREN                       | 3160                                | GTS217     | Mar. 20 2013 | 1 Year        |
| EMI Test Software             | AUDIX                              | E3                                  | N/A        | N/A          | N/A           |
| Cable                         | Resenberger                        | N/A                                 | NO.1       | Mar. 20 2013 | 1 Year        |
| Cable                         | SCHWARZBECK                        | N/A                                 | NO.2       | Mar. 20 2013 | 1 Year        |
| Cable                         | SCHWARZBECK                        | N/A                                 | NO.3       | Mar. 20 2013 | 1 Year        |
| Amplifier(100kHz-3GHz)        | HP                                 | 8347A                               | GTS204     | Jul. 04 2012 | 1 Year        |
| Amplifier(2GHz-20GHz)         | HP                                 | 8349B                               | GTS206     | Jul. 04 2012 | 1 Year        |
| Amplifier (18-26GHz)          | R&S                                | AFS33-1800<br>2<br>650-30-8P-4<br>4 | GTS218     | June 30 2012 | 1 Year        |
| Band filter                   | Amindeon                           | 82346                               | GTS219     | Mar. 20 2013 | 1 Year        |
| Active Loop Antenna           | Beijing Daze                       | ZN30900A                            | GTS215     | Mar. 20 2013 | 1 Year        |
| Power Meter                   | R&S                                | NRVS                                | GTS216     | Mar. 20 2013 | 1 Year        |
| Power Sensor                  | R&S                                | NRV-Z33                             | GTS220     | Mar. 20 2013 | 1 Year        |
| Shielding Room                | ZhongYu Electron                   | 7.0(L)x3.0(W)x3.0(H)                | GTS264     | Sep. 08 2012 | 1 Year        |
| EMI Test Receiver             | R&S                                | ESCS30                              | GTS223     | Jul. 04 2012 | 1 Year        |
| 10dB Pulse Limita             | R&S                                | N/A                                 | GTS224     | Jul. 04 2012 | 1 Year        |
| Coaxial Switch                | ANRITSU CORP                       | MP59B                               | GTS225     | Jul. 04 2012 | 1 Year        |
| LISN                          | SCHWARZBECK<br>MESS-ELEKTRO<br>NIK | NSLK 8127                           | GTS226     | Jul. 04 2012 | 1 Year        |
| Coaxial Cable                 | SCHWARZBECK                        | N/A                                 | NO.4       | Mar. 20 2013 | 1 Year        |
| EMI Test Software             | AUDIX                              | E3                                  | N/A        | N/A          | N/A           |
| Spectrum analyzer             | agilent                            | E4440A                              | GTS251     | N/A          | N/A           |

## 6. CONDUCTED POWER LINE TEST

### 6.1. Test Equipment

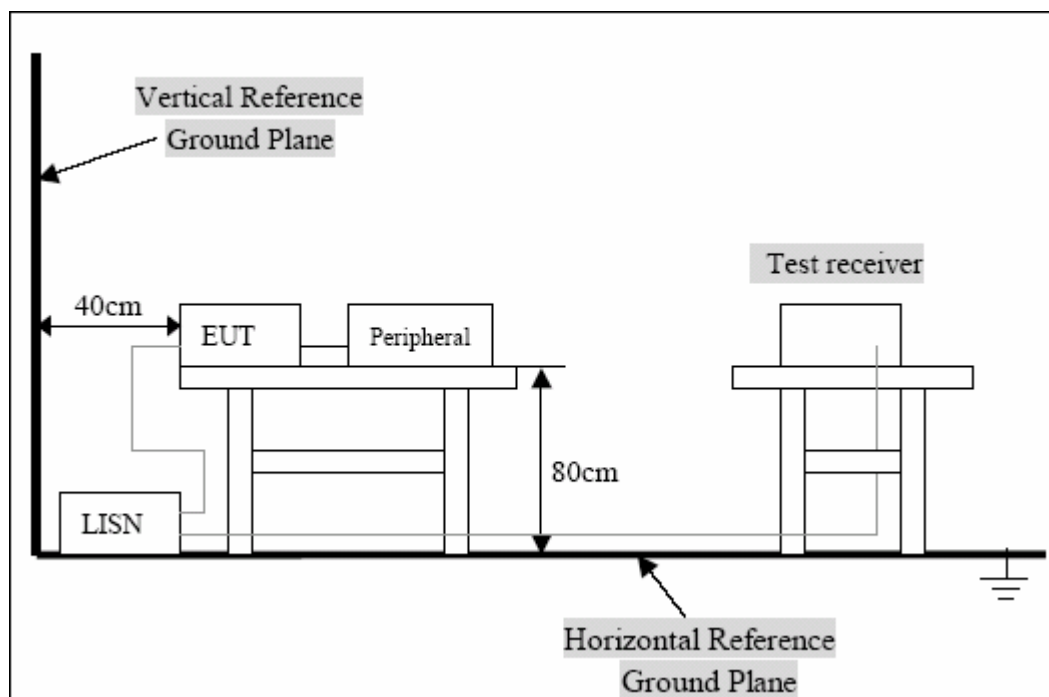
Please refer to section 5 this report.

### 6.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uh coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 6.3. Test Setup



For the actual test configuration, Please refer to the related items-Photos of testing

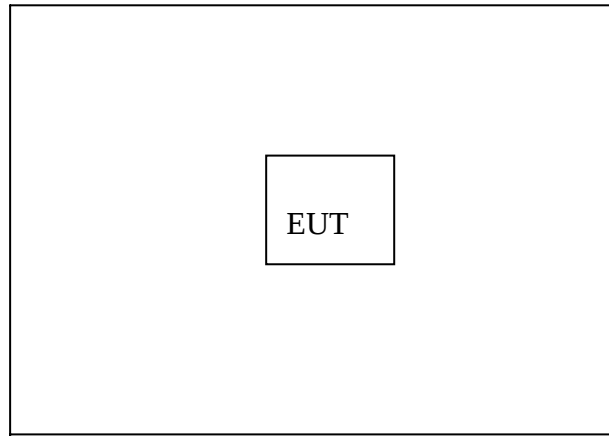
#### 6.4. EUT Operating Condition

Operating condition is according to ANSI C63.4-2003.

Setup the EUT and simulators as shown on follow.

Enable RF signal and confirm EUT active.

Modulate output capacity of EUT up to specification.



#### 6.5. Conducted Power line Emission Limits

| FCC Part 15 Paragraph 15.207 (dBuv) |               |               |
|-------------------------------------|---------------|---------------|
| Frequency Range (MHZ)               | Class A QP/AV | Class B QP/AV |
| 0.15-0.5                            | 79/66         | 65-56/56-46   |
| 0.5-5.0                             | 73/60         | 56/46         |
| 5.0-30                              | 73/60         | 60/50         |

**Note:** In the above table, the tighter limit applies at the band edges.

#### 6.6. Conducted Power Line Test Result

N/A.

This EUT is only powered by the battery, therefore this test item is not applicable.

## **7. RADIATION EMISSIONS**

### **7.1. Test Equipment**

Please refer to section 5 this report.

### **7.2. Test Procedure**

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Calibrated Loop antenna is used as receiving antenna for frequencies below 30MHz, Calibrated Bilog antenna is used as receiving antenna for frequencies between 30 MHz and 1 GHz, Calibrated Horn antenna is used as receiving antenna for frequencies above 1000MHz. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit. Pretest x, y, z position of EUT, final, select the worst case Z position test and record the test results in the report.

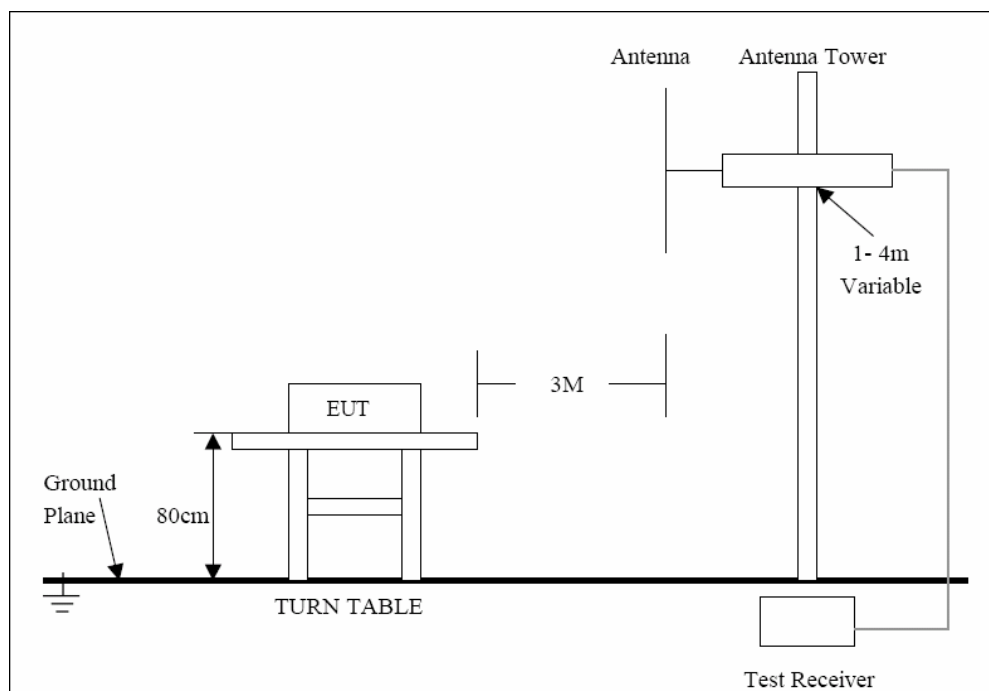
The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

In accordance with Section 15.33(a)(1), the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator. So the frequency range from 9kHz to 4000MHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

Let the EUT work in TX mode measure it.

### 7.3. Radiated Test Setup



For the accrual test configuration, please refer to the related items-photos of Testing.

### 7.4. Radiated Emission Limit

#### 7.4.1. Radiation Emission Measurement Limits According to FCC Part 15 Section 15.231(b)

| Frequency Range of Fundamental [MHz] | Field Strength of Fundamental Emission [Average] [ $\mu\text{V/m}$ ] | Field Strength of Spurious Emission [Average] [ $\mu\text{V/m}$ ] |
|--------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------|
| 40.66-40.70                          | 2250                                                                 | 225                                                               |
| 70-130                               | 1250                                                                 | 125                                                               |
| 130-174                              | 1250-3750                                                            | 125-375                                                           |
| 174-260                              | 3750                                                                 | 375                                                               |
| 260-470                              | 3750-12500                                                           | 375-1250                                                          |
| Above 470                            | 12500                                                                | 1250                                                              |

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 =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

#### 7.4.2. Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section 15.209.

### 7.5. Radiated Emission Test Result

|               |                                    |                |         |
|---------------|------------------------------------|----------------|---------|
| Date of Test: | April 1, 2013                      | Temperature:   | 24°C    |
| EUT:          | Electric winch wireless controller | Humidity:      | 56%     |
| Model No.:    | WRS-MRC                            | Power Supply:  | 12V DC  |
| Test Mode:    | TX                                 | Test Engineer: | Anna Lv |

| Frequency<br>(MHz) | Average<br>Factor | Result<br>(dBμV/m) |              | Limit<br>(dBμV/m) |             | Margin(dB)   |               | Polarization |
|--------------------|-------------------|--------------------|--------------|-------------------|-------------|--------------|---------------|--------------|
|                    | (dB)              | AV                 | PEAK         | AV                | PEAK        | AV           | PEAK          |              |
| <b>315.102</b>     | <b>-6.56</b>      | <b>73.91</b>       | <b>80.47</b> | <b>75.6</b>       | <b>95.6</b> | <b>-1.69</b> | <b>-15.13</b> | Horizontal   |
| 630.204            | -6.56             | 51.97              | 58.53        | 55.6              | 75.6        | -3.63        | -17.07        |              |
| 945.306            | -6.56             | 47.75              | 54.31        | 55.6              | 75.6        | -7.85        | -21.29        |              |
| 1260.408           | -6.56             | 49.07              | 55.63        | 55.6              | 75.6        | -6.53        | -19.97        |              |
| *1575.510          | -6.56             | 46.70              | 53.26        | 54.0              | 74.0        | -7.30        | -20.74        |              |
| <b>315.102</b>     | <b>-6.56</b>      | <b>71.27</b>       | <b>77.83</b> | <b>75.6</b>       | <b>95.6</b> | <b>-4.33</b> | <b>-17.77</b> | Vertical     |
| 630.204            | -6.56             | 49.12              | 55.68        | 55.6              | 75.6        | -6.48        | -19.92        |              |
| 945.306            | -6.56             | 45.86              | 52.42        | 55.6              | 75.6        | -9.74        | -23.18        |              |
| 1260.408           | -6.56             | 47.93              | 54.49        | 55.6              | 75.6        | -7.67        | -21.11        |              |
| *1575.510          | -6.56             | 44.62              | 51.18        | 54.0              | 74.0        | -9.38        | -22.82        |              |

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. \*: Denotes restricted band of operation.

Measurements were made using a peak detector and average detector. Any emission falling within the restricted bands of FCC Part 15 Section 15.205 were compliance with the emission limit of FCC Part 15 Section 15.209.

3. FCC Limit for Average Measurement =  $41.6667(315)-7083.3333 = 6041.6772\mu\text{V/m} = 75.6\text{dB}\mu\text{V/m}$
4. Average Factor = -6.56dB, Refer to section 10.
5. The measurement is from 9kHz to 4GHz.

## **8. 20DB OCCUPIED BANDWIDTH**

### **8.1. Test Equipment**

Please refer to Section 5 this report.

### **8.2. Test Procedure**

1. The EUT was tested according C63.4-2003. The radiated test was performed at FCC Registration laboratory.
2. With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

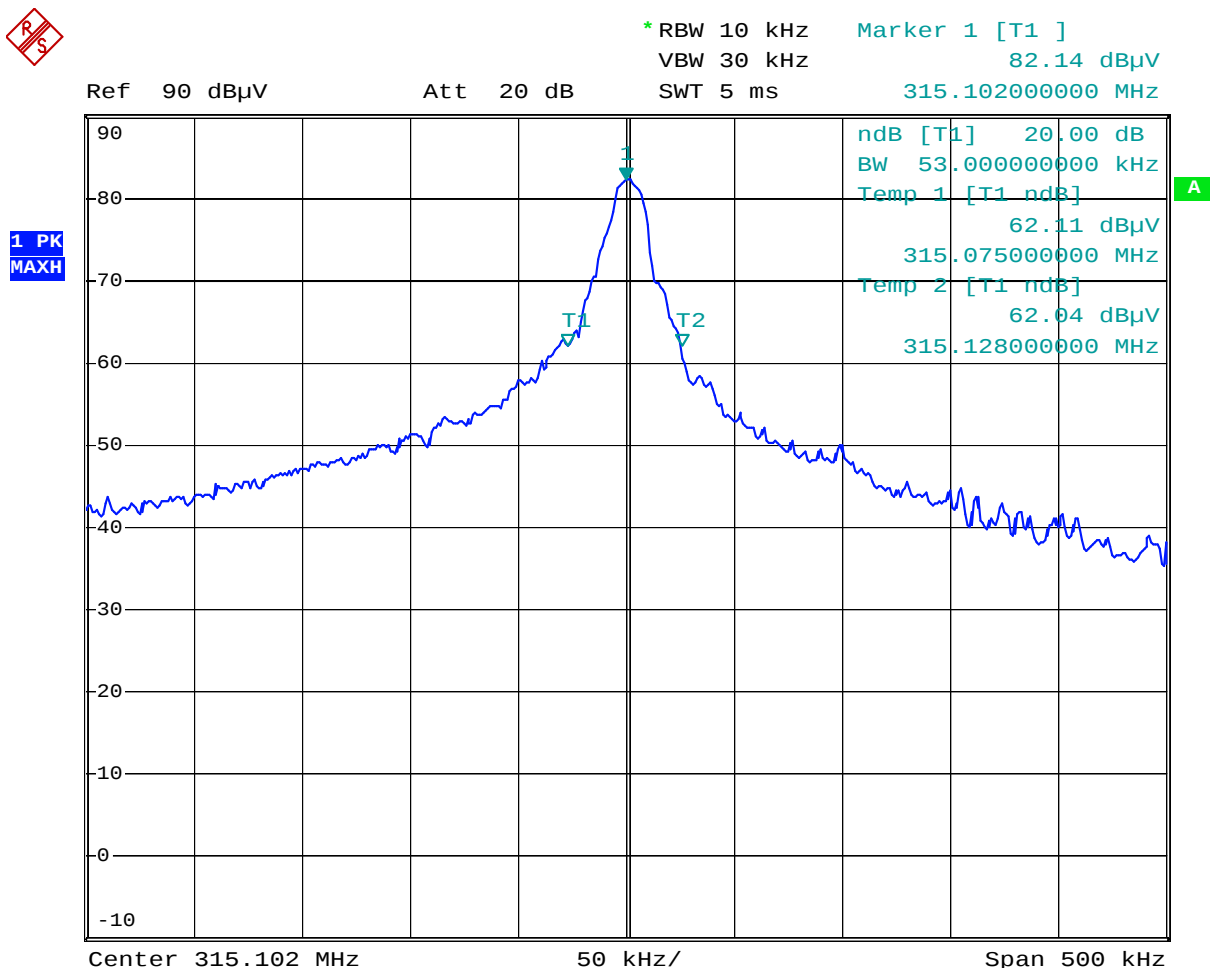
### **8.3. FCC 15.231(c) 20dB Bandwidth Limit**

Per 15.231( c ), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Therefore, the bandwidth of the emission limit is  $315\text{MHz} \times 0.25\% = 787.5\text{kHz}$ . Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 8.4. Test Result

Temperature: 25°C  
 Limit = 315MHz\*0.25% = 787.5kHz  
 Test data: 53 kHz

Humidity: 55%RH  
 Test Result: PASS



Date: 1.APR.2013 15:35:39

## **9. RELEASE TIME MEASUREMENT**

### **9.1. Test Equipment**

Please refer to Section 5 this report.

### **9.2. Test Procedure**

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Set center frequency=315MHz

Set SPAN=0Hz

Set RBW=100kHz

Set VBW=300kHz

Set SWEET TIME=10s

### **9.3. Release time 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.

#### 9.4. Test Result

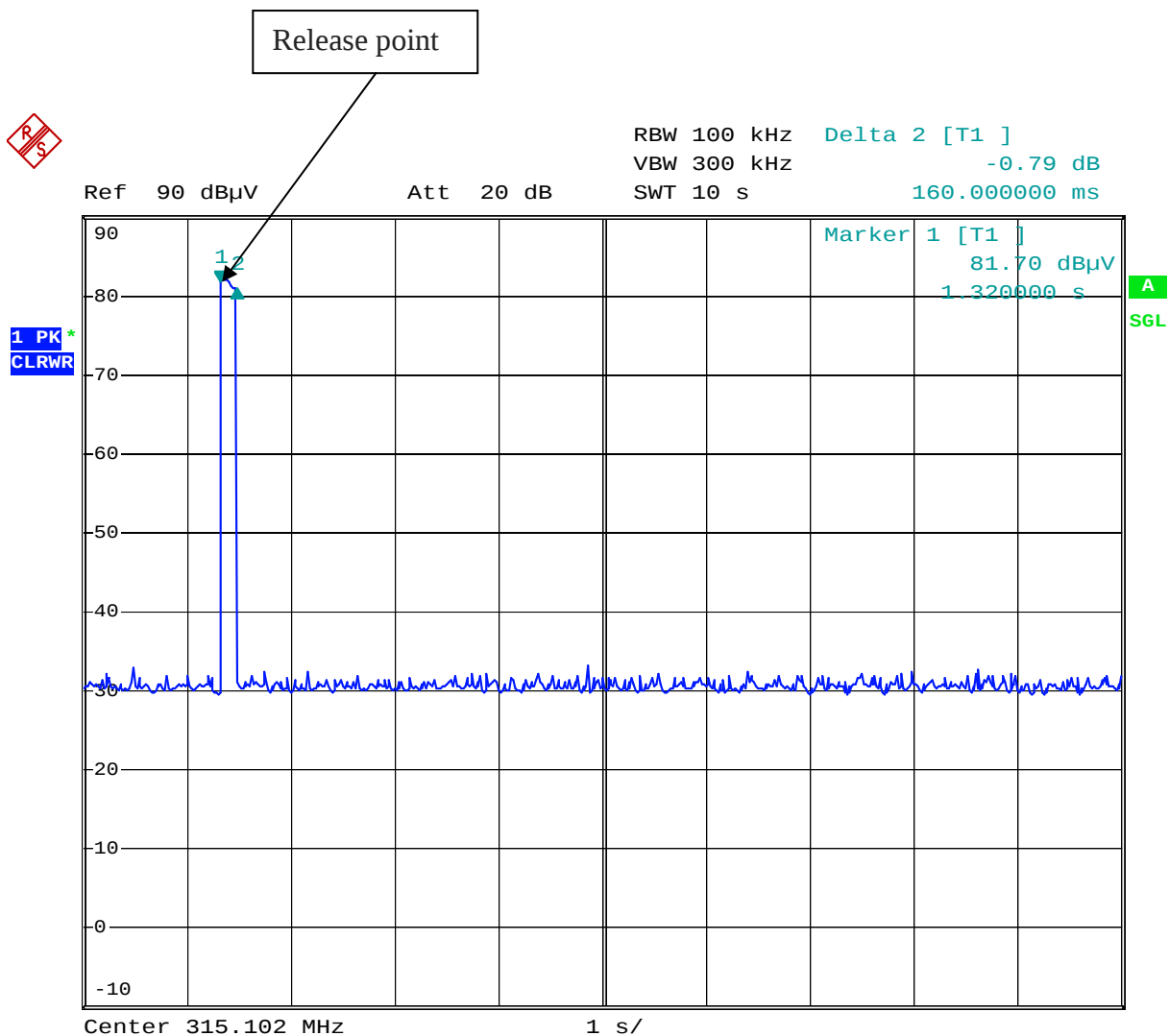
Temperature: 24°C

Humidity: 57%RH

The transmitter transmitting time not more than 5 seconds

Test time: 160 ms

Test Result: PASS



Date: 15.APR.2013 18:06:26

## 10. AVERAGE FACTOR MEASUREMENT

### 10.1. Average factor Measurement according to ANSI 63.4: 2003

**ANSI 63.4: 2003 Section 13.1.4.2** Devices transmitting pulsed emissions and subject to a limit requiring an average detector function for radiated emissions shall initially be measured with an instrument that uses a peak detector. A radiated emission measured with a peak detector may then be corrected to a true average using the appropriate factor for emission duty cycle. This correction factor relates the measured peak level to the average limit and is derived by averaging absolute field strength over one complete pulse train that is 0.1 s, or less, in length. If the pulse train is longer than 0.1 s, the average shall be determined from the average absolute field strength during the 0.1 s interval in which the field strength is at a maximum. Instructions on calculating the duty cycle of a transmitter with pulsed emissions are provided in ANSI 63.4 H.4, step j.

**Average factor in dB =  $20 \log (\text{duty cycle})$**

### 10.2. Test Procedure

1. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation.
2. Set SPA Center Frequency = Fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 0Hz.
3. Set EUT as normal operation.
4. Set SPA View. Delta Mark time.

### 10.3. Measurement Result

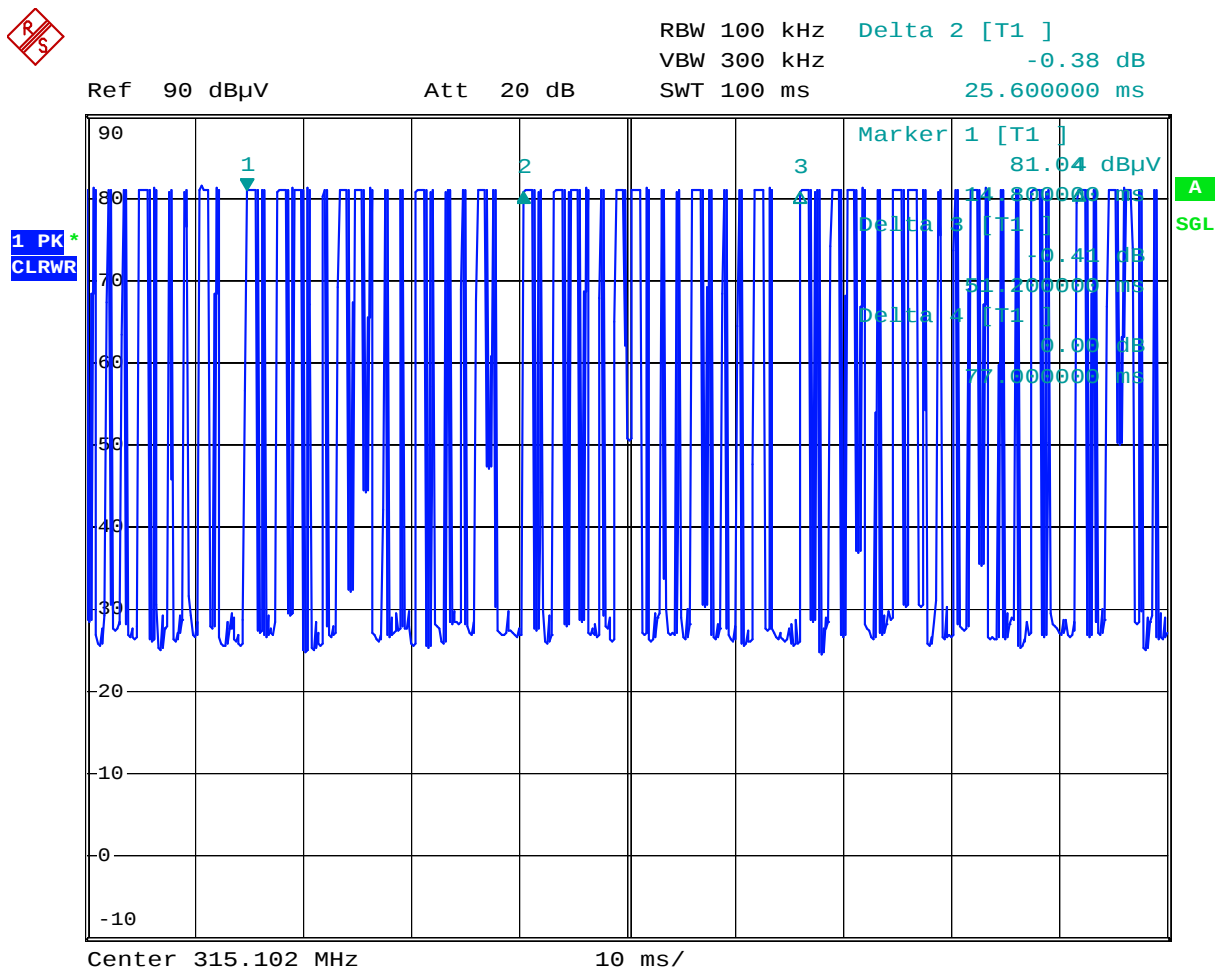
**The duty cycle is simply the on time divided by the period:**

The duration of one cycle = 25.68ms

Effective period of the cycle =  $(7 \times 1.12) + (10 \times 0.43)$  ms = 12.14ms

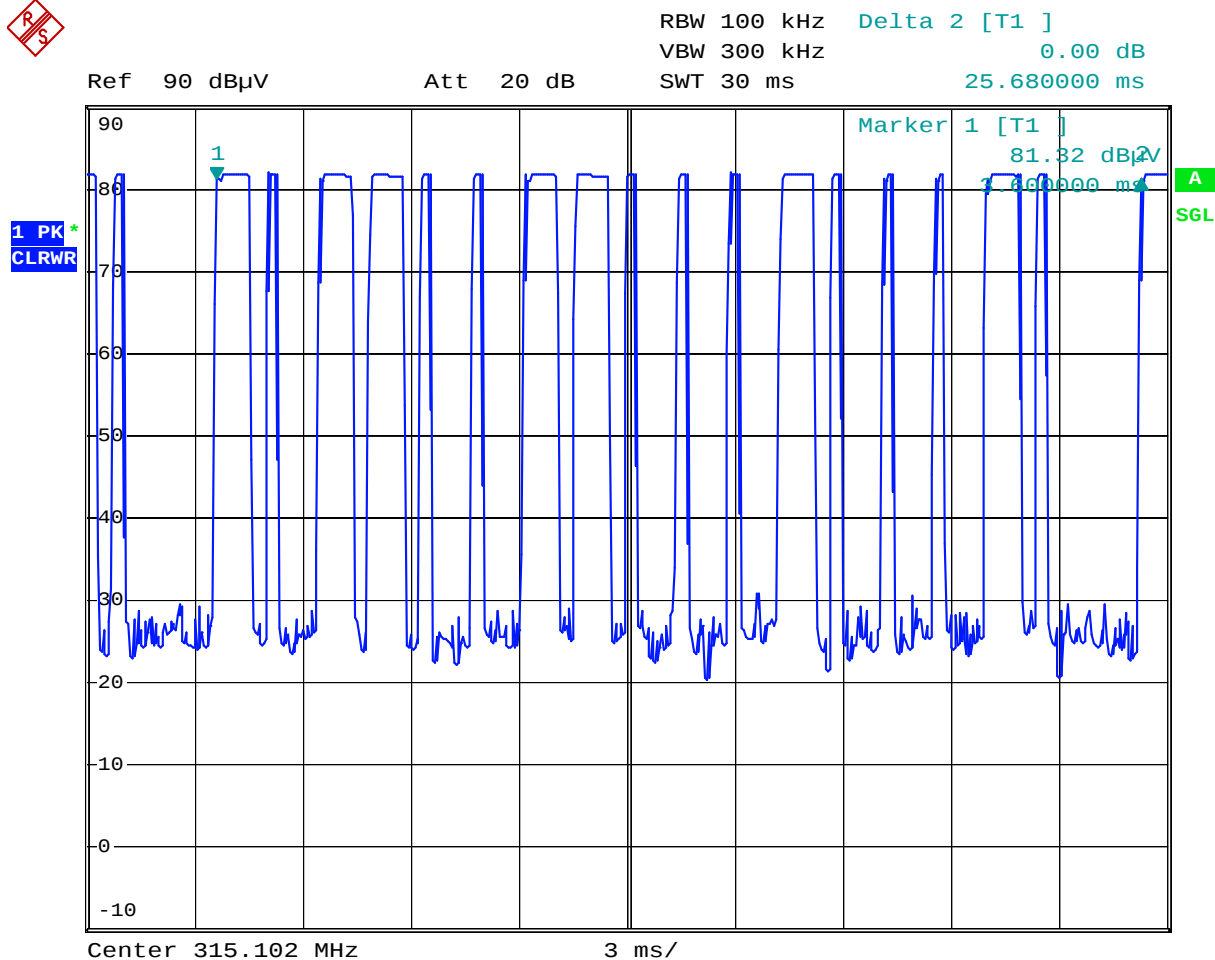
DC =  $12.14\text{ms} / 25.68\text{ms} = 0.47$

**Therefore, the average factor is found by  $20\log 0.47 = -6.56\text{dB}$**



Date: 15.APR.2013 18:03:03

The graph shows the pattern of coding during the signal transmission. It shows at least 3 periodic pulse train in 100ms, from marker 1 to marker 2 is a periodic pulse train, from marker 2 to marker 3 is a periodic pulse train, from marker 3 to marker 4 is a periodic pulse train.

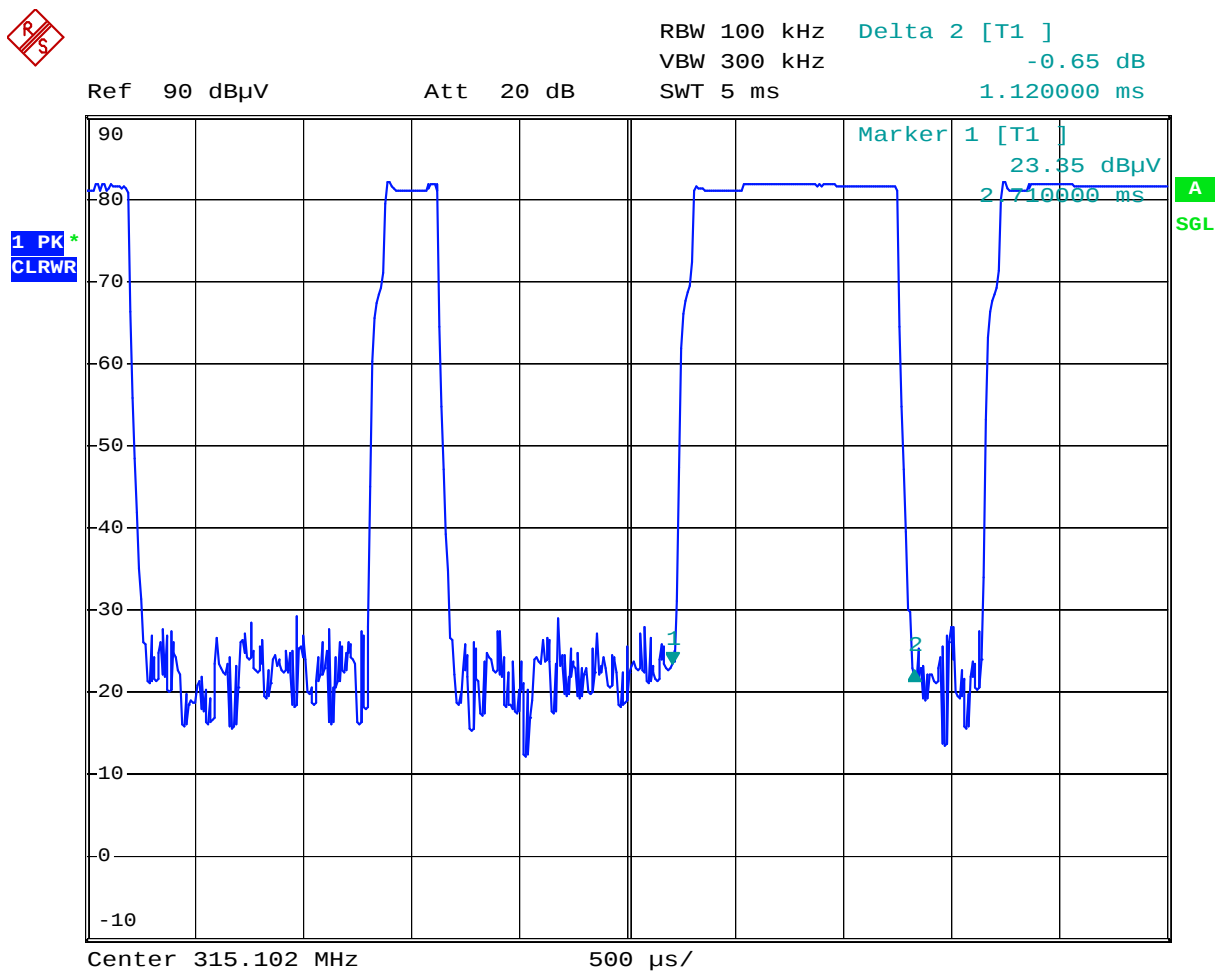


Date: 1.APR.2013 15:56:02

The graph shows the pattern of coding during the signal transmission.

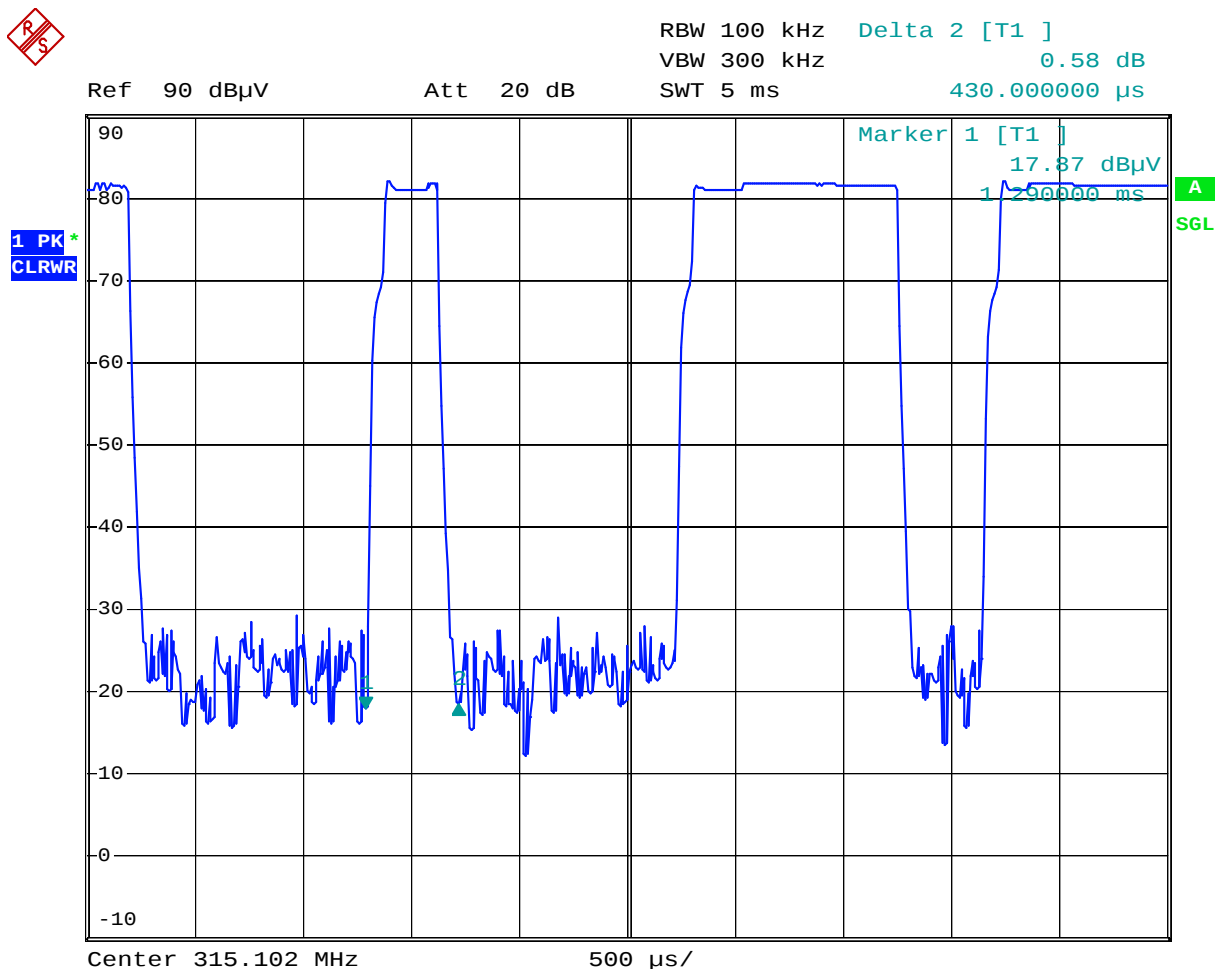
The duration of one cycle = 25.68ms.

It sums of 7 long 'on' signals and 10 short 'on' signals.



Date: 1.APR.2013 15:57:32

The graph shows the duration of long 'on' signal. From marker 1 to marker 2, duration is 1.12ms.



Date: 1.APR.2013 15:57:57

The graph shows the duration of short 'on' signal. From marker 1 to marker 2, duration is 0.43ms.

## **11. ANTENNA REQUIREMENT**

### **11.1. 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.

### **11.2. Antenna Connected Construction**

According to § 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. 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.

The antenna used for this product is a PCB antenna. The antenna is permanently attached. Refer to the product photo.

### **11.3. Result**

Compliance