

FCC PART 15.231  
EMI MEASUREMENT AND TEST REPORT  
For  
Ningbo Yaling Electrical Appliance Co., Ltd.  
No. 16 Industrial Rd., Zhangqi Town, Cixi City, Zhejiang Province, China

**FCC ID: SA5YLT-15C**

July 5, 2011

|  |  |
|--|--|
| This Report Concerns:<br>Original Report | Equipment Type :<br>Remote Control   |
| Test Engineer:                           | Eric Li <i>Eric Li</i>   |
| Report No.:                              | SHBST2011060311Y-1ER-3   |
| Receive EUT<br>Date/Test Date:           | June 28, 2011/ July 1-5, 2011  |
| Reviewed By:                             | Christina <i>Christina</i>   |
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## 1. GENERAL INFORMATION

### 1.1. Report information

1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

#### Test Facility -

The test site used to collect the radiated data is located on the address of  
emitel (Shenzhen) Limited  
(FCC Registered Test Site Number: 746887) on  
Building 2, 171 Meihua Road, Futian District, Shenzhen, 518049 China  
The Test Site is constructed and calibrated to meet the FCC requirements.

### 1.2. Measurement Uncertainty

Available upon request.

## 2. PRODUCT DESCRIPTION

### 2.1. EUT Description

Description : Remote Control

Trade Name : 

Applicant : Ningbo Yaling Electrical Appliance Co., Ltd.

Model Number : YLT-15C

Frequency : 315MHz

Power Supply : DC 3V

### 2.2. Block Diagram of EUT Configuration



### 2.3. Support Equipment List

| Name | Model No | S/N | Manufacturer | Used<br>“ ” |
|------|----------|-----|--------------|-------------|
| --   |          |     |              |             |

### 2.4. Test Conditions

Temperature: 20~25

Relative Humidity: 50~63 %

### 3. TEST RESULTS SUMMARY

**FCC 15 Subpart C, Paragraph 15.231**

| <b>FCC Rules</b>     | <b>Description of Test</b> | <b>Result</b> |
|----------------------|----------------------------|---------------|
| 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."

#### **Modifications**

No modification was made.

## 4. TEST EQUIPMENT USED

| Equipment/Facilities            | Manufacturer       | Model #      | Serial no. | Date of Cal.  | Cal. Interval |
|---------------------------------|--------------------|--------------|------------|---------------|---------------|
| Cable                           | Resenberger        | N/A          | NO.1       | Mar 10 , 2011 | 1 Year        |
| Cable                           | SCHWARZBECK        | N/A          | NO.2       | Mar 10 , 2011 | 1 Year        |
| Cable                           | SCHWARZBECK        | N/A          | NO.3       | Mar 10 , 2011 | 1 Year        |
| LISN                            | Rohde & Schwarz    | ESH3-Z5      | 100305     | Mar 10 , 2011 | 1 Year        |
| 50 Coaxial Switch               | ANRITSU CORP       | MP59B        | 6200283933 | Mar 10 , 2011 | 1 Year        |
| EMI Test Receiver               | Rohde & Schwarz    | ESP13        | 100180     | Oct.11,2010   | 1 Year        |
| Spectrum Analyzer               | Rohde & Schwarz    | FSP40        | 100273     | Sep.10,2010   | 1 Year        |
| 3m Semi-Anechoic Chamber        | Albatross Projects | 9mx6mx6m     | N/A        | Feb.20,2011   | 1 Year        |
| Signal Generator                | FLUKE              | PM5418 + Y/C | LO747012   | Feb.20,2011   | 1 Year        |
| Signal Generator                | FLUKE              | PM5418TX     | LO738007   | Feb.20,2011   | 1 Year        |
| Loop Antenna                    | SCHWARZBECK        | FMZB1516     | 113        | Jan.30,2011   | 1 Year        |
| Trilog-Super Broadband Antenna  | SCHWARZBECK        | VULB9161     | 9161-4079  | Sep.22,2010   | 1 Year        |
| Broad-Band Horn Antenna         | SCHWARZBECK        | BBHA9120D    | 9120D-564  | Sep.22,2010   | 1 Year        |
| Ultra Broadband Antenna         | Rohde & Schwarz    | HL-562       | 100110     | June.15,2011  | 1 Year        |
| AMN                             | Rohde & Schwarz    | ESH3-Z5      | 100196     | Oct.11,2010   | 1 Year        |
| AMN                             | Rohde & Schwarz    | ESH3-Z5      | 100197     | Oct.11,2010   | 1 Year        |
| Pulse Limiter                   | Rohde & Schwarz    | ESH3-Z2      | N/A        | N/A           | N/A           |
| Power Meter                     | Rohde & Schwarz    | NRVD         | 100041     | Feb.20,2011   | 1 Year        |
| EMI Test Receiver               | Rohde & Schwarz    | ESCS30       | 100003     | Feb.20,2011   | 1 Year        |
| Coaxial Cable with N-connectors | SCHWARZBECK        | AK9515H      | 95549      | Sep.22,2010   | 1 Year        |
| Radio Communication Test Set    | Rohde & Schwarz    | CMS 54       | 846621/024 | Feb.20,2011   | 1 Year        |
| Modulation Analyzer             | Hewlett-Packard    | 8901B        | 2303A00362 | Feb.20,2011   | 1 Year        |
| Absorbing clamp                 | Rohde & Schwarz    | MDS-21       | N/A        | Oct.11,2010   | 1 Year        |

## 5. CONDUCTED POWER LINE TEST

### 5.1. Test Equipment

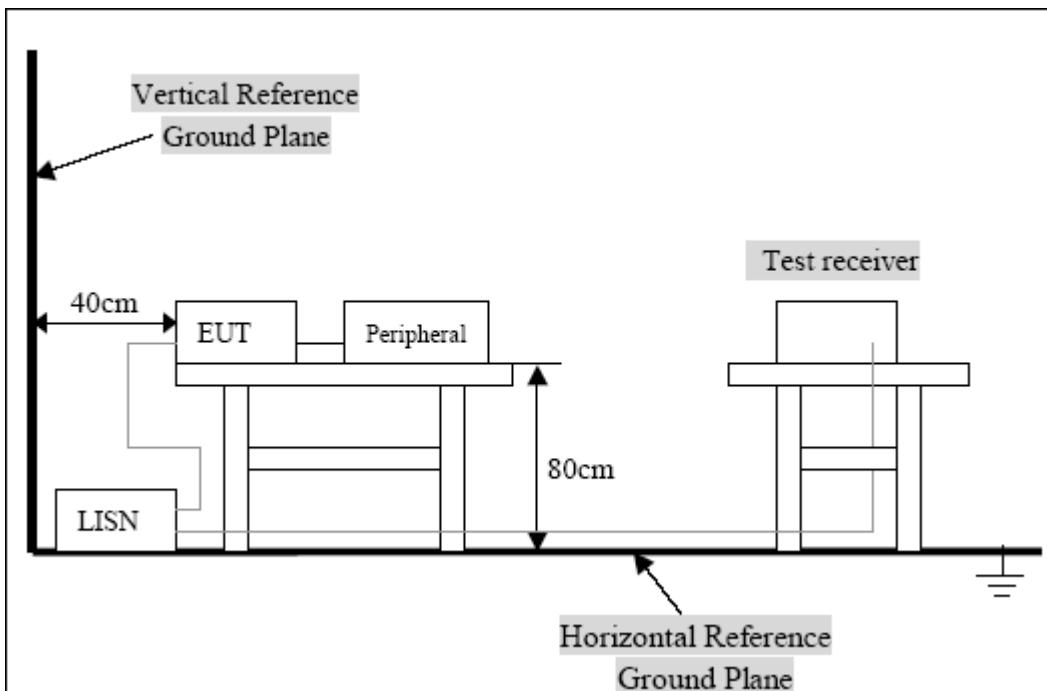
Please refer to section 4 this report.

### 5.2. 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 check 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 invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 5.3. Test Setup



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

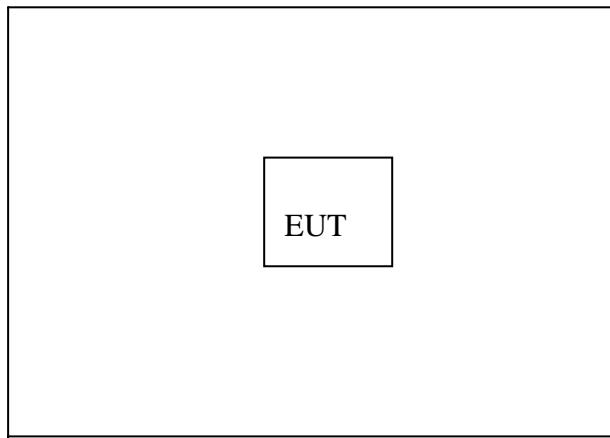
#### 5.4. EUT Operating Condition

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.



#### 5.5. 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.

#### 5.6. Conducted Power Line Test Result

N/A.

## 6. RADIATION EMISSIONS

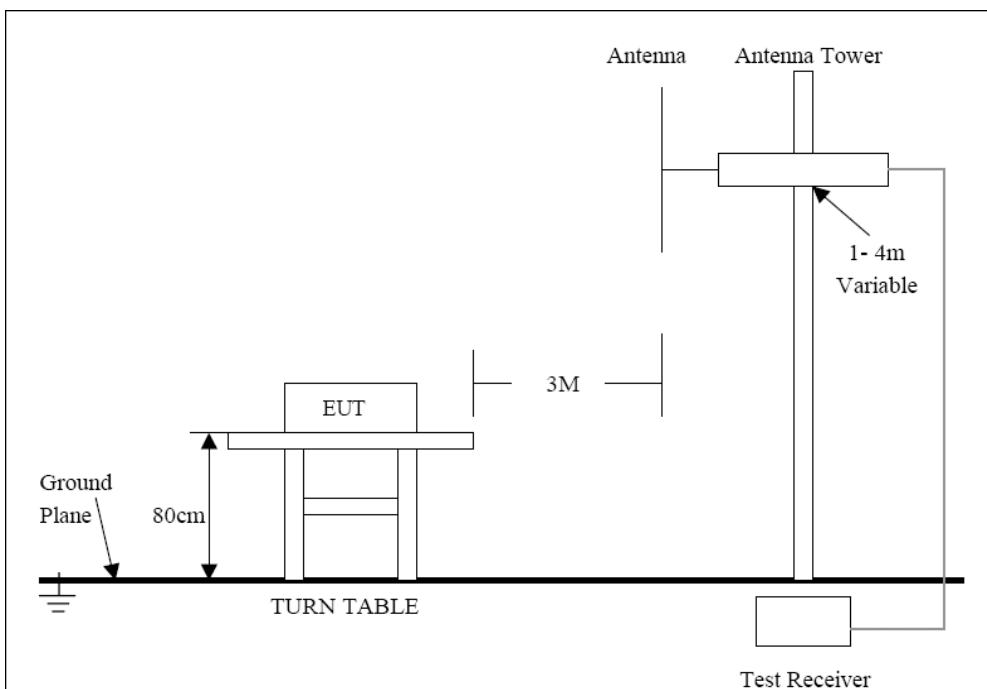
### 6.1. Test Equipment

Please refer to section 4 this report.

### 6.2. Test Procedure

The emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part Subpart C limits. through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

### 6.3. Radiated Test Setup



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

### 6.4. Radiated Emission Limit

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

| 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 3,370.....                               | 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 for frequency ranges 130 - 174 MHz and 260 - 470 MHz.

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

### 6.5. Radiated Emission Test Result

|               |                |                |                             |
|---------------|----------------|----------------|-----------------------------|
| Date of Test: | July 5, 2011   | Temperature:   | 25°C                        |
| EUT:          | Remote Control | Humidity:      | 55%                         |
| Model No.:    | YLT-15C        | Power Supply:  | 3V DC ("CR2032" battery 1×) |
| Test Mode:    | TX             | Test Engineer: | Eric Li                     |

| Frequency<br>(MHz) | Average<br>Factor<br>(dB) | Result<br>(dB $\mu$ V/m) |              | Limit<br>(dB $\mu$ V/m) |             | Margin(dB)  |              | Polarization |
|--------------------|---------------------------|--------------------------|--------------|-------------------------|-------------|-------------|--------------|--------------|
|                    |                           | AV                       | PEAK         | AV                      | PEAK        | AV          | PEAK         |              |
| <b>315.0162</b>    | <b>-10.1</b>              | <b>70.28</b>             | <b>80.38</b> | <b>75.6</b>             | <b>95.6</b> | <b>5.32</b> | <b>15.22</b> | Horizontal   |
| 630.0235           | -10.1                     | 49.28                    | 59.38        | 55.6                    | 75.6        | 6.32        | 16.22        |              |
| 945.0363           | -10.1                     | 44.95                    | 55.05        | 55.6                    | 75.6        | 10.65       | 20.55        |              |
| 1260.044           | -10.1                     | 42.27                    | 52.37        | 55.6                    | 75.6        | 13.33       | 23.23        |              |
| *1575.061          | -10.1                     | 42.01                    | 52.11        | 54.0                    | 74.0        | 11.99       | 21.89        |              |
| <b>315.0162</b>    | <b>-10.1</b>              | <b>69.52</b>             | <b>79.62</b> | <b>75.6</b>             | <b>95.6</b> | <b>6.08</b> | <b>15.98</b> |              |
| 630.0235           | -10.1                     | 47.22                    | 57.32        | 55.6                    | 75.6        | 8.38        | 18.28        | Vertical     |
| 945.0363           | -10.1                     | 45.23                    | 55.33        | 55.6                    | 75.6        | 10.37       | 20.27        |              |
| 1260.044           | -10.1                     | 41.25                    | 51.35        | 55.6                    | 75.6        | 14.35       | 24.25        |              |
| *1575.061          | -10.1                     | 40.89                    | 50.99        | 54.0                    | 74.0        | 13.11       | 23.01        |              |

## 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: Refer to section 9.

## 7. 20DB OCCUPIED BANDWIDTH

### 7.1. Test Equipment

Please refer to Section 4 this report.

### 7.2. 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.

### 7.3. 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 7.4. Test Result

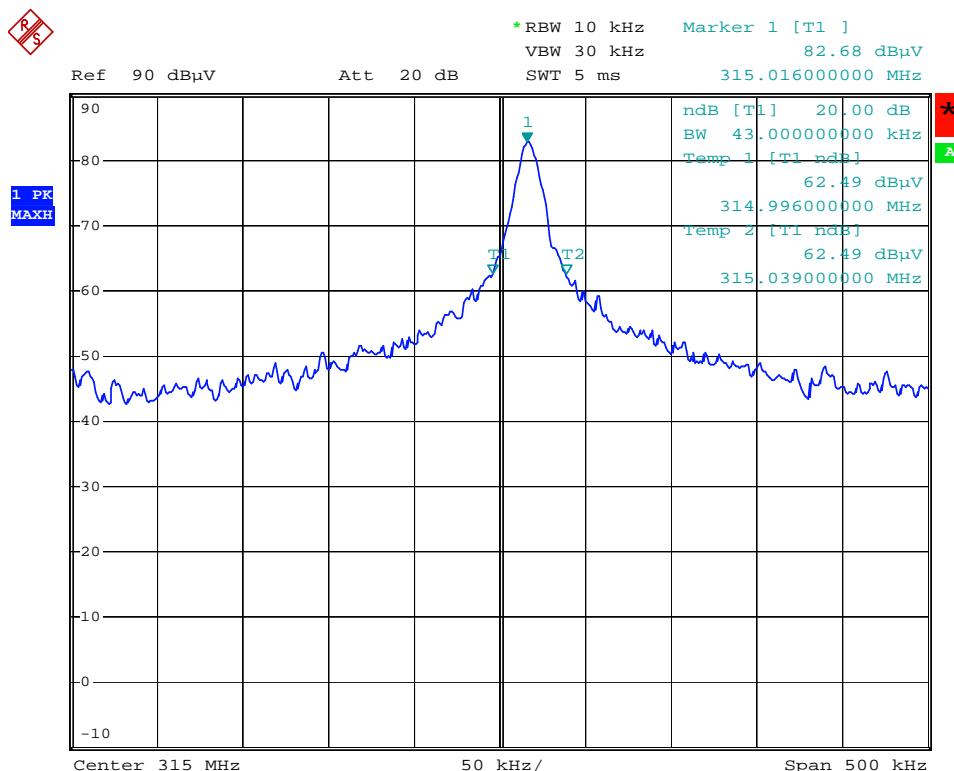
Temperature: 25

Humidity: 55%RH

Limit=Frequency×0.25%=315×0.25%=787.5 kHz

Test data: 43 kHz

Test Result: PASS



Date: 5.JUL.2011 09:22:23

## 8. RELEASE TIME MEASUREMENT

### 8.1. Test Equipment

Please refer to Section 4 this report.

### 8.2. Test Procedure

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

Set center frequency=315.0MHz

Set SPAN=0Hz

Set RBW=100kHz

Set VBW=300kHz

Set SWEET TIME=5s

### 8.3. 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.

### 8.4. Test Result

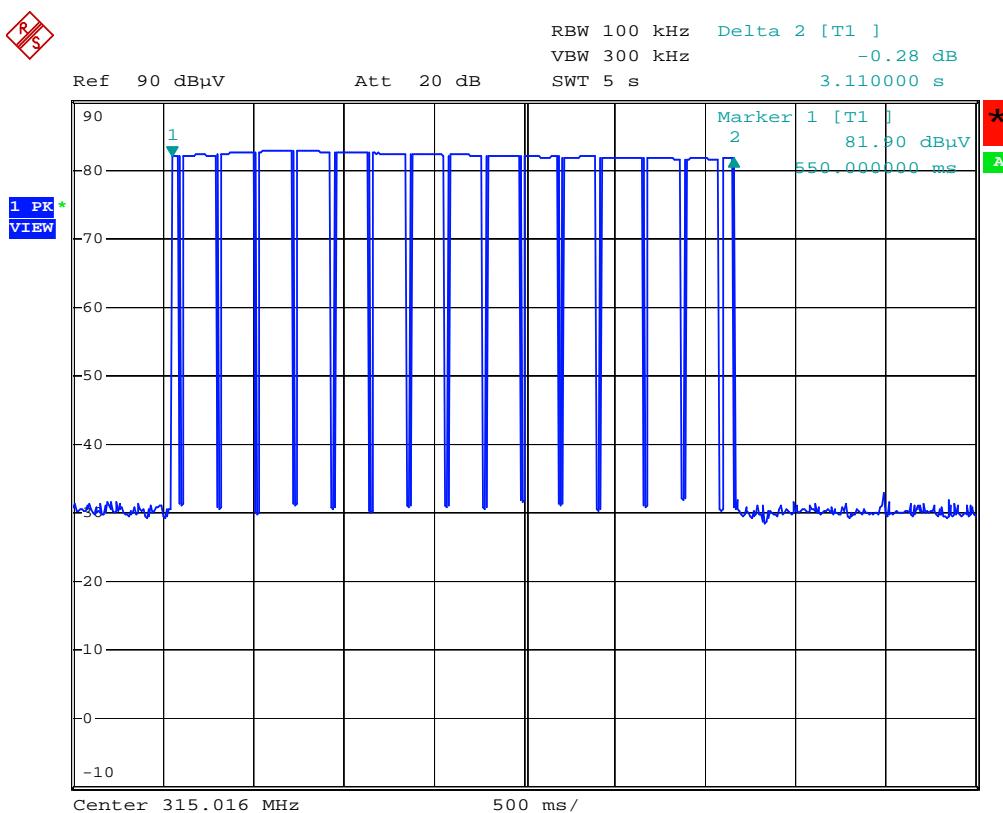
Temperature: 25

Humidity: 55%RH

THE TRANSMITTER TRANSMITTING TIME NOT MORE THAN 5 SECONDS

Test time: 3.11 s

Test Result: PASS



Date: 5.JUL.2011 09:30:54

## 9. AVERAGE FACTOR MEASUREMENT

### 9.1. 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 =  $20 \log (\text{duty cycle})$**

### 9.2. 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.

### 9.3. Measurement Result

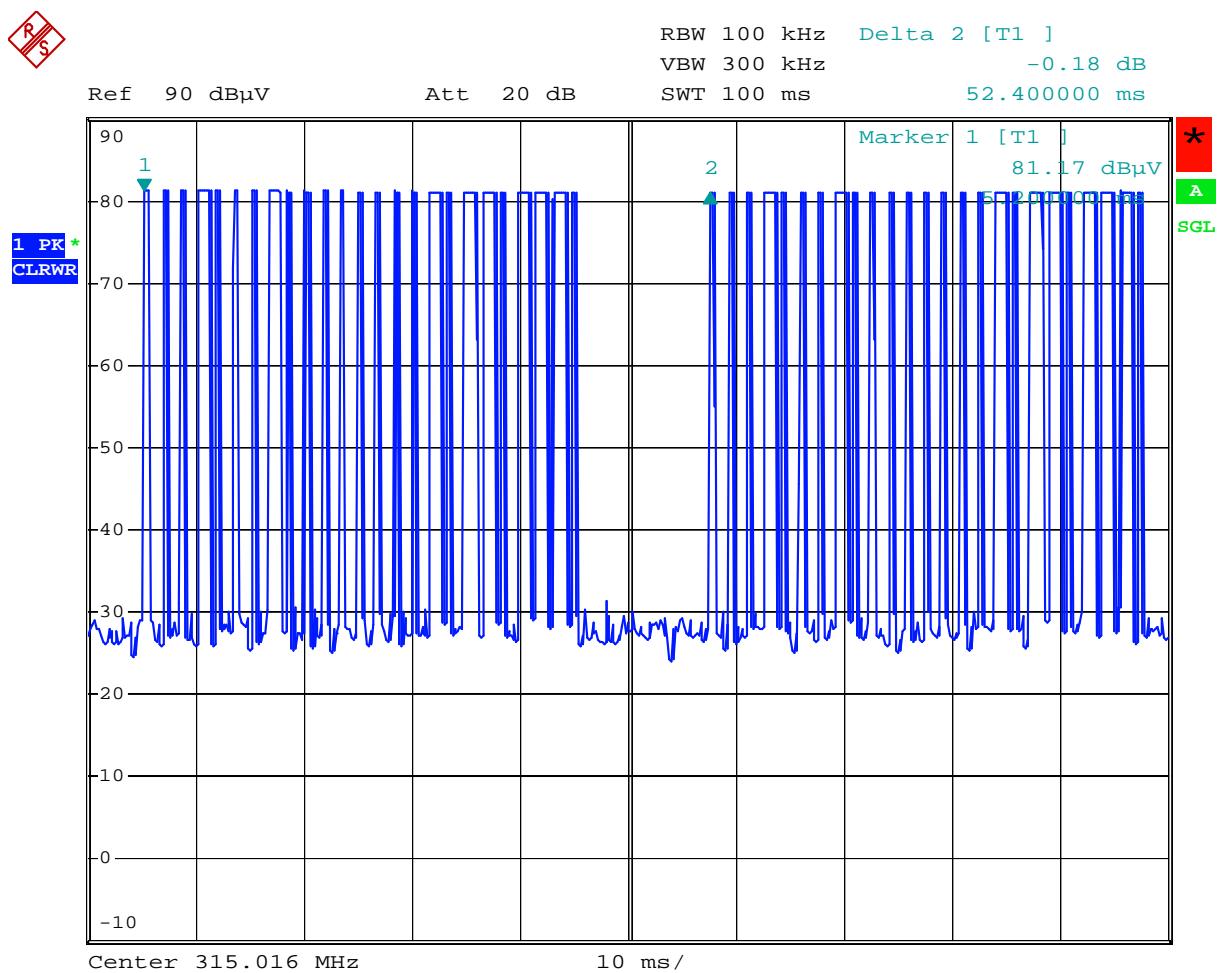
**The duty cycle is simply the on time divided by the period:**

The duration of one cycle = 52.56ms

Effective period of the cycle =  $(8 \times 1.20) + (17 \times 0.40)$  ms = 16.40ms

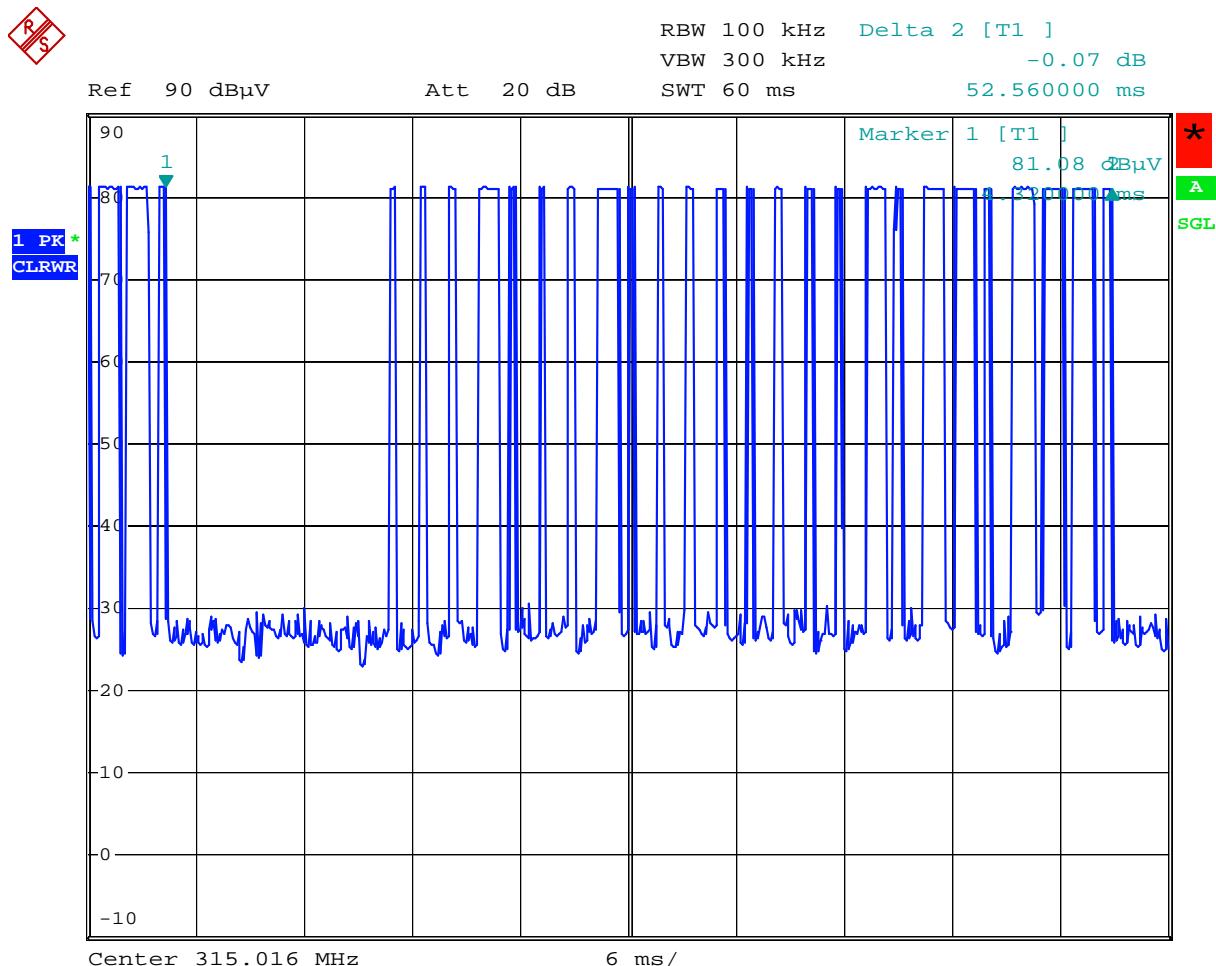
DC = 16.40ms/52.56ms = 0.312

**Therefore, the average factor is found by  $20 \log 0.312 = -10.1 \text{dB}$**



Date: 5.JUL.2011 09:24:50

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

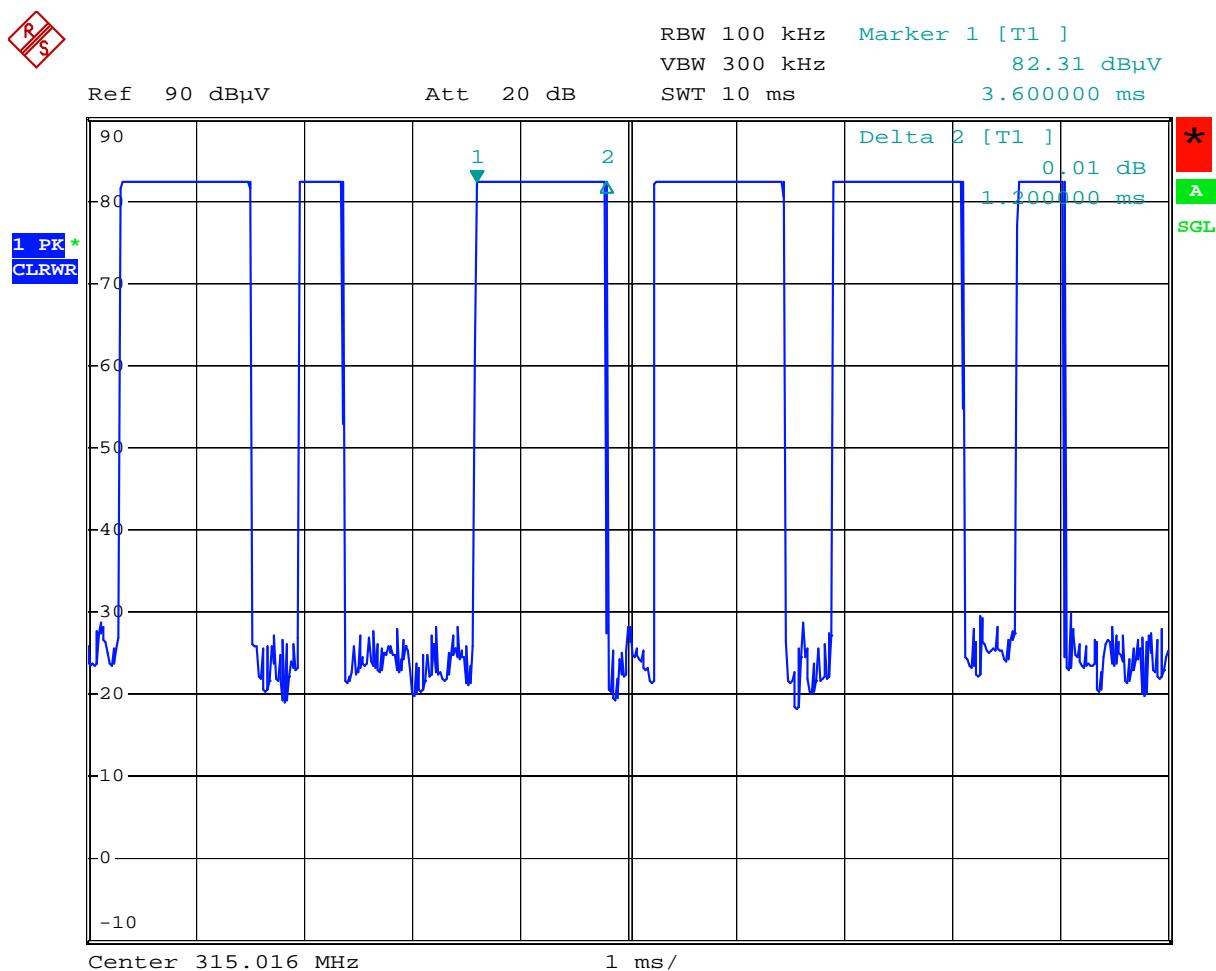


Date: 5.JUL.2011 09:26:38

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

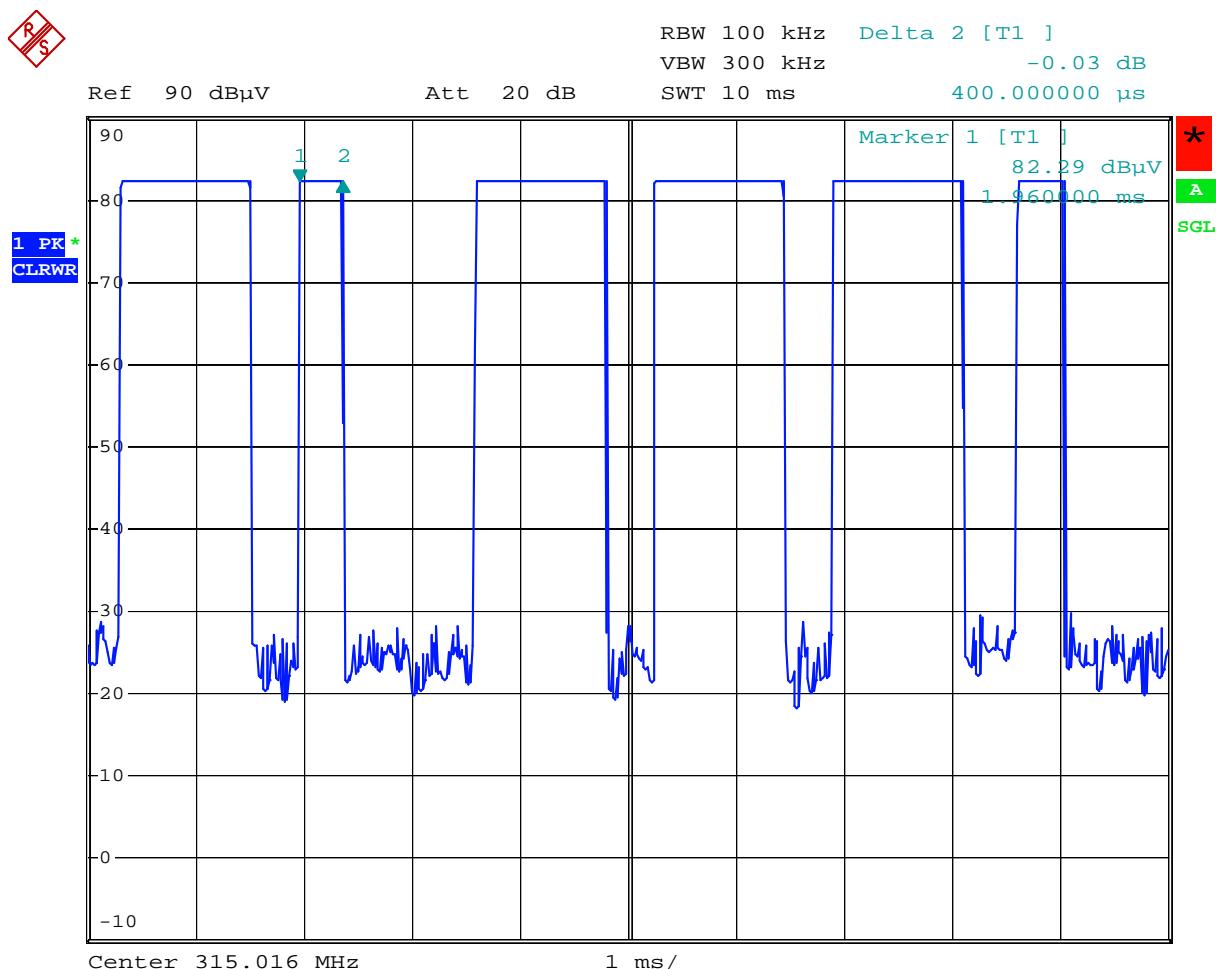
The duration of one cycle = 52.56ms.

It sums of 8 long 'on' signals and 17 short 'on' signals.



Date: 5.JUL.2011 09:28:21

The graph shows the duration of long 'on' signal. From marker 1 to marker 2, duration is 1.20ms.



Date: 5.JUL.2011 09:28:54

The graph shows the duration of short 'on' signal. From marker 1 to marker 2, duration is 0.40ms.

## **10. 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 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 short metal soldered wire. The antenna is permanently attached. Refer to the product photo.

### **10.3. Result**

Compliance