



FCC PART 15.231

TEST REPORT

For

**Shenzhen Ronghua Electronic Co., Ltd.**

Building 1, Quanxinyuan Industrial Park, Huafan Road, Dalang Sub-district, Longhua,  
Bao'an District, Shenzhen, Guangdong, China

**FCC ID: QQ715920**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Removal Alert Tag (RAT)
<b>Test Engineer:</b> Back Huang	<i>Back Huang</i>
<b>Report Number:</b> RSZ110706003-00	
<b>Report Date:</b> 2012-03-16	
<b>Reviewed By:</b> EMC Engineer	<i>Merry Zhao</i>
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>

**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, or any agency of the Federal Government.  
\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

**TABLE OF CONTENTS**

**GENERAL INFORMATION.....3**  
    PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....3  
    OBJECTIVE .....3  
    RELATED SUBMITTAL(S)/GRANT(S).....3  
    TEST METHODOLOGY .....3  
    TEST FACILITY .....3

**SYSTEM TEST CONFIGURATION.....5**  
    JUSTIFICATION .....5  
    SPECIAL ACCESSORIES .....5  
    EQUIPMENT MODIFICATIONS .....5  
    CONFIGURATION OF TEST SETUP .....5  
    BLOCK DIAGRAM OF TEST SETUP .....5

**SUMMARY OF TEST RESULTS .....6**

**FCC §15.203 - ANTENNA REQUIREMENT.....7**  
    APPLICABLE STANDARD .....7

**FCC §15.205, §15.209, §15.231 (B), - RADIATED EMISSIONS .....8**  
    MEASUREMENT UNCERTAINTY .....8  
    EUT SETUP .....8  
    EMI TEST RECEIVER SETUP.....9  
    TEST PROCEDURE .....9  
    APPLICABLE STANDARD .....9  
    CORRECTED AMPLITUDE & MARGIN CALCULATION .....10  
    TEST EQUIPMENT LIST AND DETAILS.....10  
    TEST RESULTS SUMMARY .....10  
    TEST DATA .....10

**FCC §15.231(C) – 20 DB BANDWIDTH TESTING .....12**  
    REQUIREMENT .....12  
    TEST EQUIPMENT LIST AND DETAILS.....12  
    TEST PROCEDURE .....12  
    TEST DATA .....12  
    ENVIRONMENTAL CONDITIONS.....12

**FCC §15.231(A) - DEACTIVATION TESTING .....14**  
    APPLICABLE STANDARD .....14  
    EUT SETUP .....14  
    TEST EQUIPMENT LIST AND DETAILS.....14  
    TEST DATA .....15

**FCC §15.231- DUTY CYCLE .....16**  
    LIMIT .....16  
    TEST EQUIPMENT LIST AND DETAILS.....16  
    TEST PROCEDURE .....16  
    TEST DATA .....16

## GENERAL INFORMATION

---

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

The *Shenzhen Ronghua Electronic Co., Ltd.*'s product, model number: 15920 (FCC ID: QQ715920) or the "EUT" in this report is a removal alert tag (RAT), named as ITAG by applicant, which was measured approximately: 80.0 mm (L) x 62.0 mm (W) x 142.0 mm (H), rated input voltage: DC 3V Battery.

*All measurement and test data in this report was gathered from production sample serial number: 1107018 (Assigned by BACL, Shenzhen). The EUT was received on 2011-07-06.*

### Objective

This report is prepared on behalf of *Shenzhen Ronghua Electronic Co., Ltd.* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine the compliance of EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

### Related Submittal(s)/Grant(s)

No related submittal(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

---

### Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

### Special Accessories

The special accessories were provided by Bay Area Compliance Laboratories Corp. (Shenzhen).

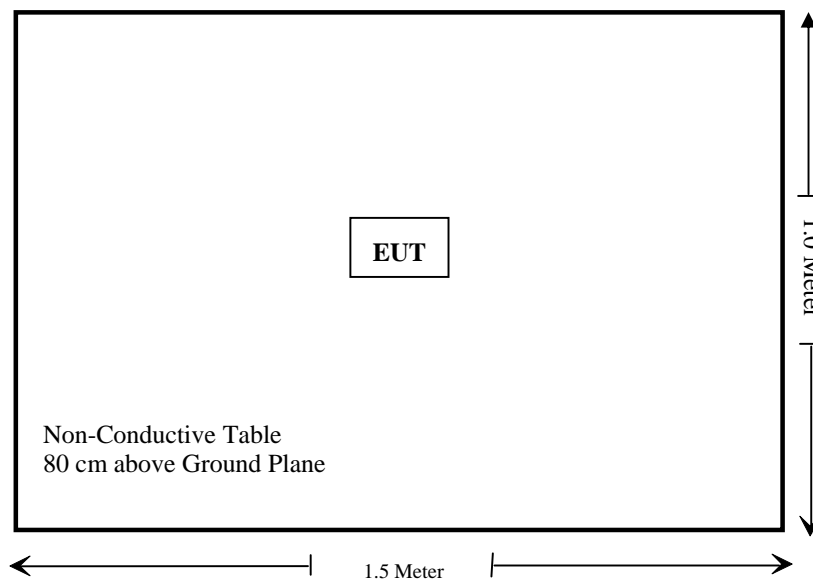
### Equipment Modifications

No modifications were made to the EUT tested.

### Configuration of Test Setup



### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable*
§15.205, §15.209, §15.231 (b)	Radiated Emissions	Compliance
§15.231 (c)	20dB Bandwidth Testing	Compliance
§15.231 (a)(1)	Deactivation Testing	Compliance
§15.231	Duty Cycle	Compliance

Not Applicable\*: The EUT is powered by battery only.

---

## **FCC §15.203 - ANTENNA REQUIREMENT**

---

### **Applicable Standard**

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.

**Result:** Compliant.

The EUT has an internal spring loaded antenna and maximum gain is 3dBi, which permanently attached to the PCB. Please refer to the EUT internal photos.

**FCC §15.205, §15.209, §15.231 (b), - RADIATED EMISSIONS**

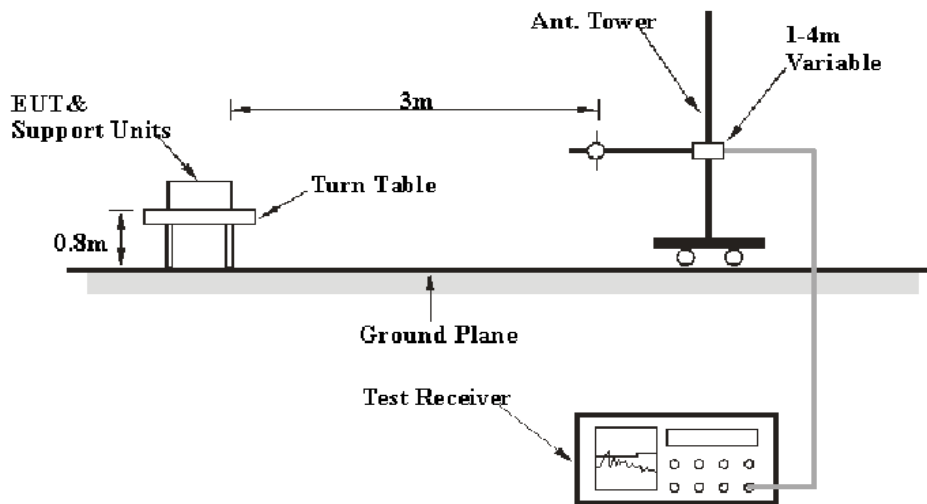
**Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

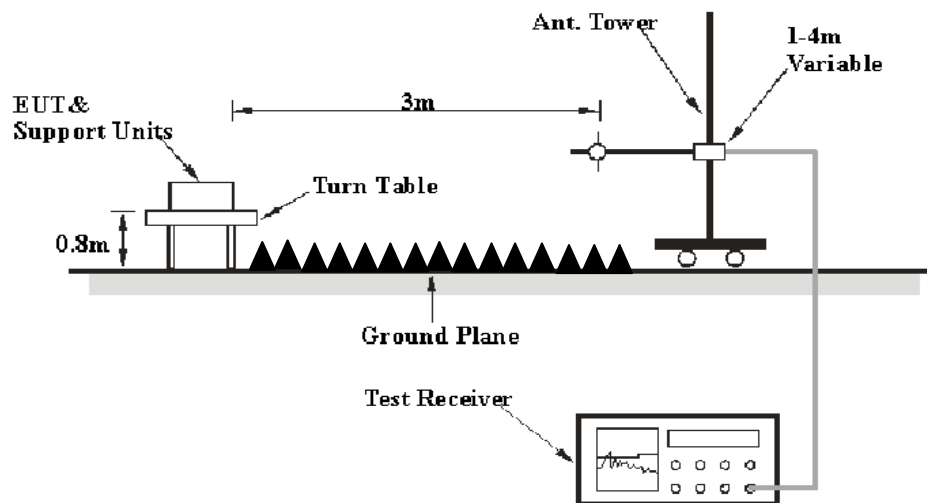
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emission measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB.

**EUT Setup**

**Below 1 GHz:**



**Above 1 GHz:**





The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4 - 2009. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Detector</i>
30MHz – 1000 MHz	120 kHz	300 kHz	QP
1000 MHz – 5000 MHz	1 MHz	3 MHz	PK
1000 MHz – 5000 MHz	1 MHz	10 Hz	PK

### Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak detection mode above 1 GHz.

### Applicable Standard

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

<b>Fundamental frequency (MHz)</b>	<b>Field Strength of Fundamental (Microvolts /meter)</b>	<b>Field Strength of spurious emissions ((Microvolts /meter)</b>
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.

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

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
HP	Amplifier	HP8447E	1937A01046	2011-08-02	2012-08-02
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-07-05	2012-07-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07
Mini-Circuits	Pre-amplifier	ZVA-213+	N/A	2011-09-12	2012-09-11
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b), with the worst margin reading of:

**21.6 dB at 947.992500 MHz in the Horizontal polarization**

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

*The testing was performed by Back Huang on 2011-09-19.*

Test mode: Transmitting

Indicated		Detector (PK/Ave.)	Direction (Degree)	Test Antenna			Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.231(b)/209/205		
Frequency (MHz)	S.A. Reading (dBµV)			Height (m)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)	Remarks
30 MHz – 1000 MHz												
868.12	41.68	PK	206	1.2	V	19.9	3.86	25.96	39.48	80.80	41.32	Harmonic
868.12	40.12	PK	161	1.0	H	19.9	3.86	25.96	37.92	80.80	42.88	Harmonic
434.06	82.54	PK	224	1.3	V	14.5	1.73	25.64	73.13	100.80	27.67	Fund.
434.06	67.65	PK	172	1.0	H	14.5	1.73	25.64	58.24	100.80	42.56	Fund.
1 GHz-5 GHz												
1302.18	37.12	PK	105	1.2	V	26.50	2.09	26.49	39.22	74.00	34.78	Harmonic
1302.18	36.28	PK	36	1.0	H	26.00	2.09	26.49	37.88	74.00	36.12	Harmonic

Field Strength (Average)

Frequency (MHz)	Peak Measurement @ 3m (dBµV/m)	Antenna Polar (H/V)	Duty Cycle Correction (dB)	Average Amp. (dBµV/m)	FCC 15.231(b)/209/205		Comment
					Limit (dBµV/m)	Margin (dB)	
30 MHz – 1000 MHz							
868.12	39.48	V	-16.57	22.91	60.80	37.89	Harmonic
868.12	37.92	H	-16.57	21.35	60.80	39.45	Harmonic
434.06	73.13	V	-16.57	56.56	80.80	24.24	Fund.
434.06	58.24	H	-16.57	41.67	80.80	39.13	Fund.
1 GHz-5 GHz							
1302.18	39.22	H	-16.57	22.65	54.00	31.35	Harmonic
1302.18	37.88	V	-16.57	21.31	54.00	32.69	Harmonic

Note: \*Calculate Average value based on Duty Cycle correction factor:

Duty cycle=Ton/(Ton+Toff)= 14.84/100 =0.1484

Duty Cycle Factor = 20lg (Duty cycle) = 20lg0.1484= -16.57

Average = Peak + Duty Cycle Factor

## FCC §15.231(c) – 20 dB BANDWIDTH TESTING

### Requirement

Per FCC 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.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
HP	Amplifier	HP8447E	1937A01046	2011-08-02	2012-08-02
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-07-05	2012-07-04

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 ° C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.9 kPa

The testing was performed by Back Huang on 2011-09-17.

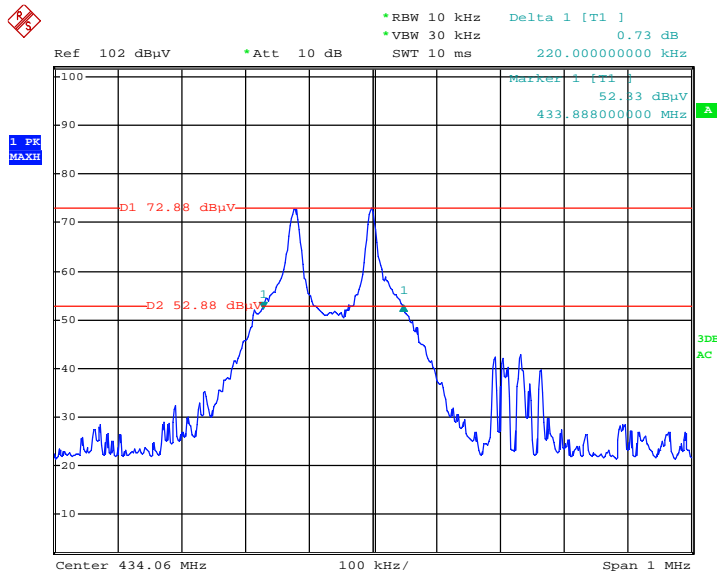
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz )	20 dB Bandwidth (kHz)	Limit (kHz)	Result
434.06	220.0	1085.15	Pass

**Note:** Limit = 0.25% \* center frequency = 0.25% \* 434.06MHz =1.08515 MHz  
20 dB Bandwidth = 220.0 kHz <1.08515MHz

### 20 dB Bandwidth



EUT

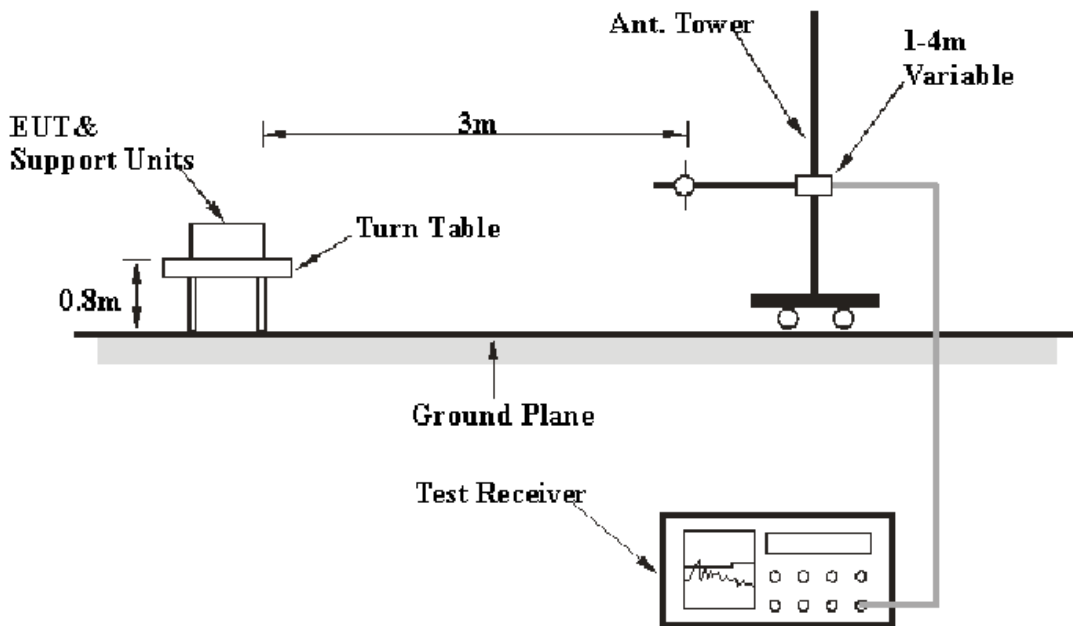
Date: 17.SEP.2011 14:02:28

## FCC §15.231(a) - DEACTIVATION TESTING

### Applicable Standard

Per FCC 15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### EUT Setup



The deactivation test was performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4 - 2009. The specification used was the FCC 15.231(a) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	837405/023	2011-01-14	2012-01-13
HP	Amplifier	8447E	1937A01046	2011-08-02	2012-08-02
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-07-05	2012-07-04

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

**Test Data**

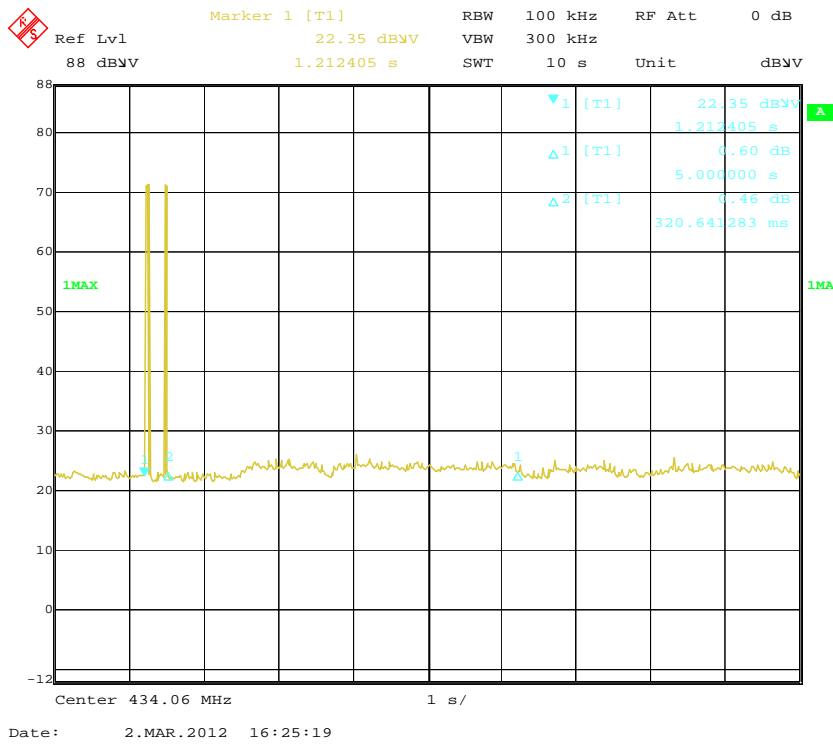
**Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101 kPa

The testing was performed by Back Huang on 2012-03-02.

Test Mode: Transmitting

**Test Result:** Compliance, please refer to following plot



## FCC §15.231- DUTY CYCLE

### Limit

Nil (No dedicated limit specified in the Rules).

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	837405/023	2011-01-14	2012-01-13

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

### Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Span=0 Hz.
5. Repeat above procedures until all frequency measured was complete.

### Test Data

#### Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Back Huang on 2012-03-02.

Test Mode: Transmitting

**Test Result:** Compliance, please refer to following plots.

$$\text{Duty cycle} = T_{\text{on}} / T_{\text{p}}$$

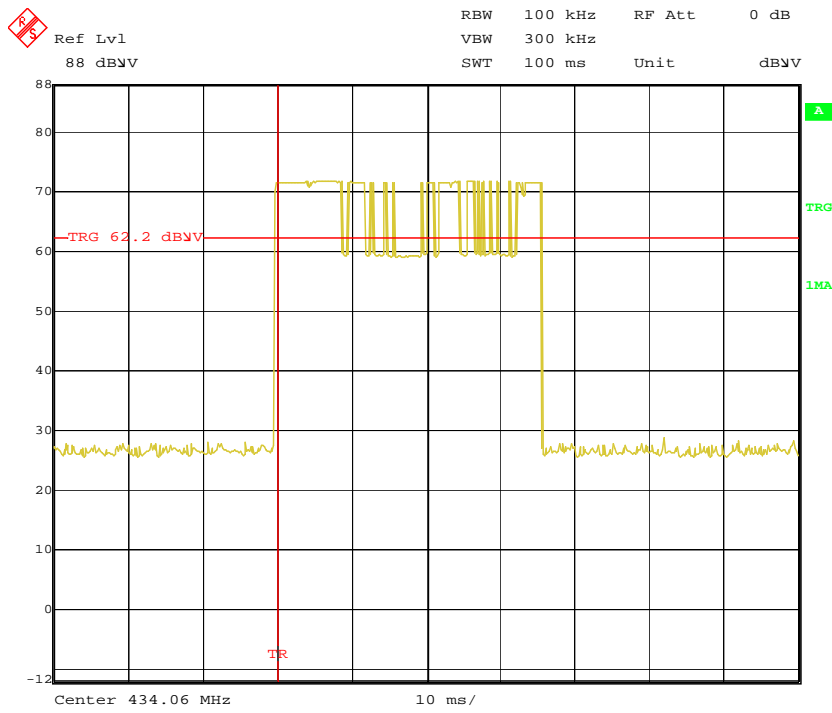
$$\begin{aligned} T_{\text{on}} &= (T_{\text{on1}} \times N_1 + T_{\text{on2}} \times N_2 + T_{\text{on3}} \times N_3 + T_{\text{on4}} \times N_4) \\ &= 4.41 \times 1 + 0.621 \times 1 + 0.401 \times 5 + 0.200 \times 39 \\ &= 4.41 + 0.621 + 2.01 + 7.80 \\ &= 14.84 \text{ ms} \end{aligned}$$

$$T_{\text{p}} = 100 \text{ ms}$$

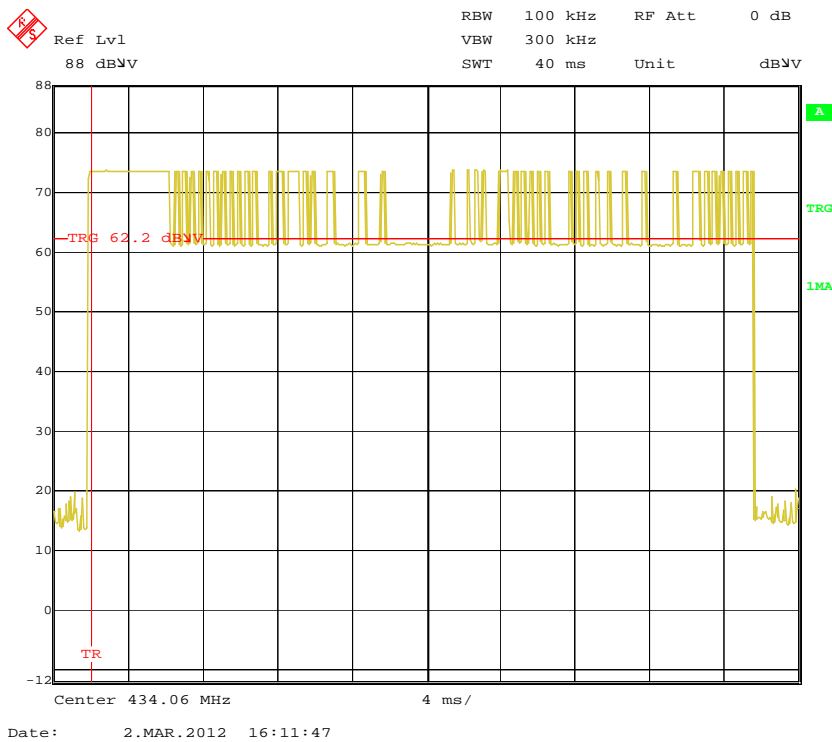
$$\text{Duty cycle factor} = 20 \times \text{Log}(T_{\text{on}}/T_{\text{p}}) = 20 \times \text{log}(14.84/100) = -16.57$$



### Duty Cycle 1 (Tp1)

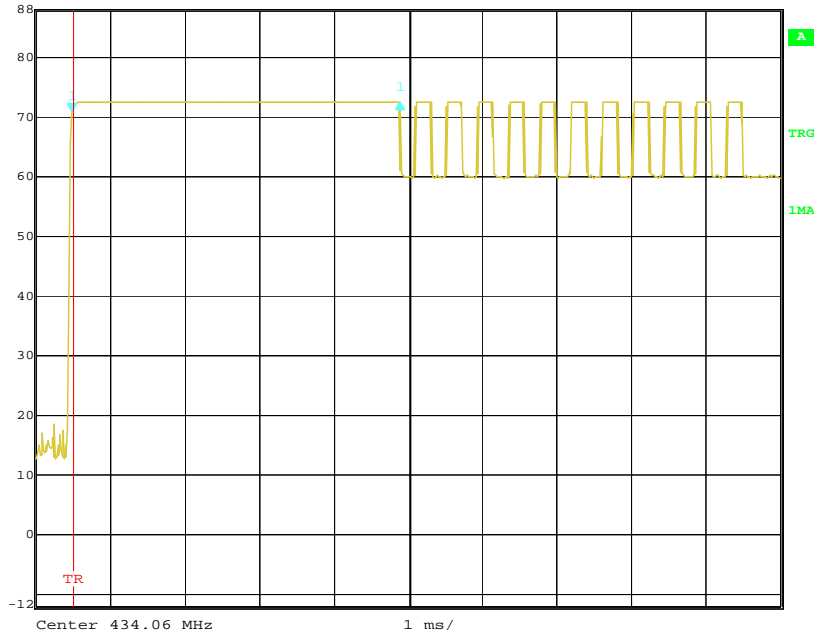


### Duty Cycle 2 (Tp2)



### Duty Cycle 3 (T<sub>on1</sub>)

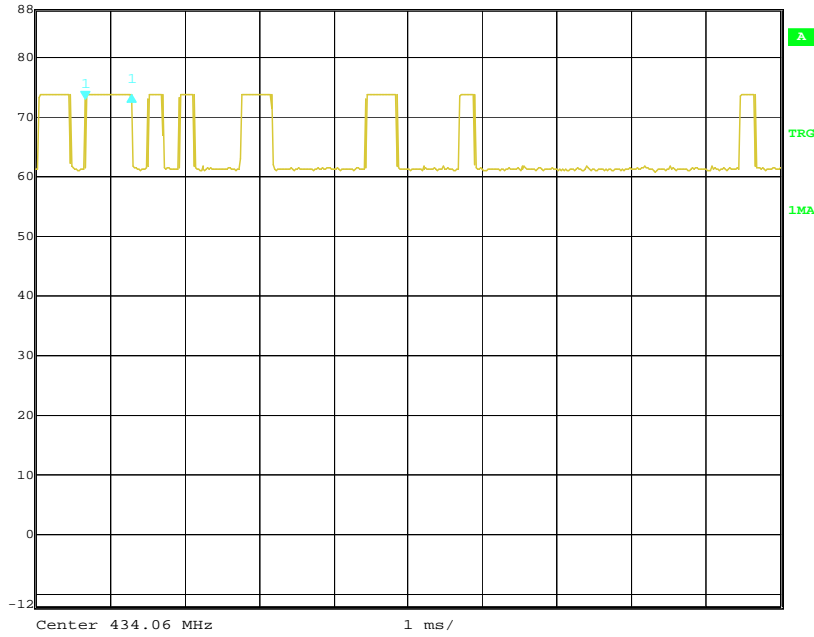
**FS** Delta 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 1.39 dB VBW 300 kHz  
88 dBV 4.408818 ms SWT 10 ms Unit dBV



Date: 2.MAR.2012 16:14:17


### Duty Cycle 4 (T<sub>on2</sub>)

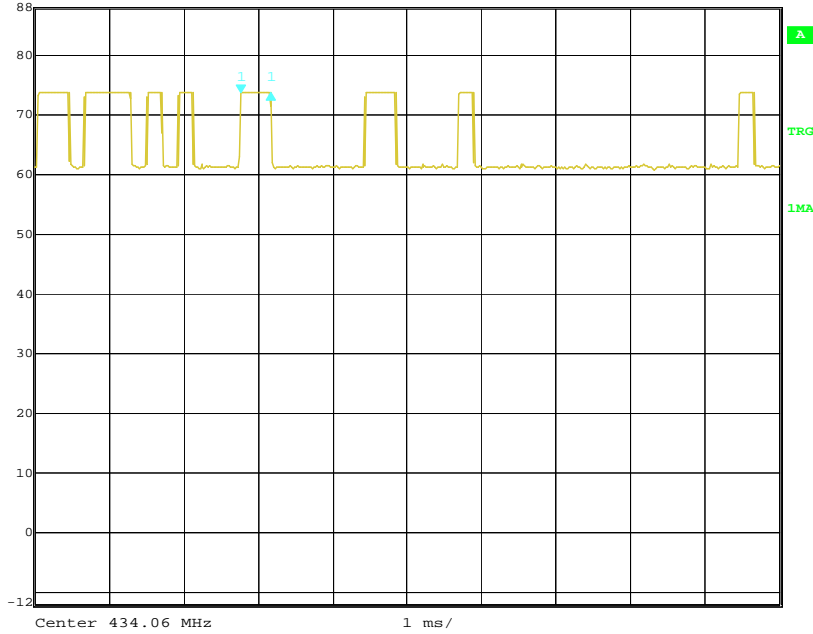
**FS** Delta 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 0.67 dB VBW 300 kHz  
88 dBV 621.242485  $\mu$ s SWT 10 ms Unit dBV



Date: 2.MAR.2012 16:17:26


### Duty Cycle 5 (Ton3)

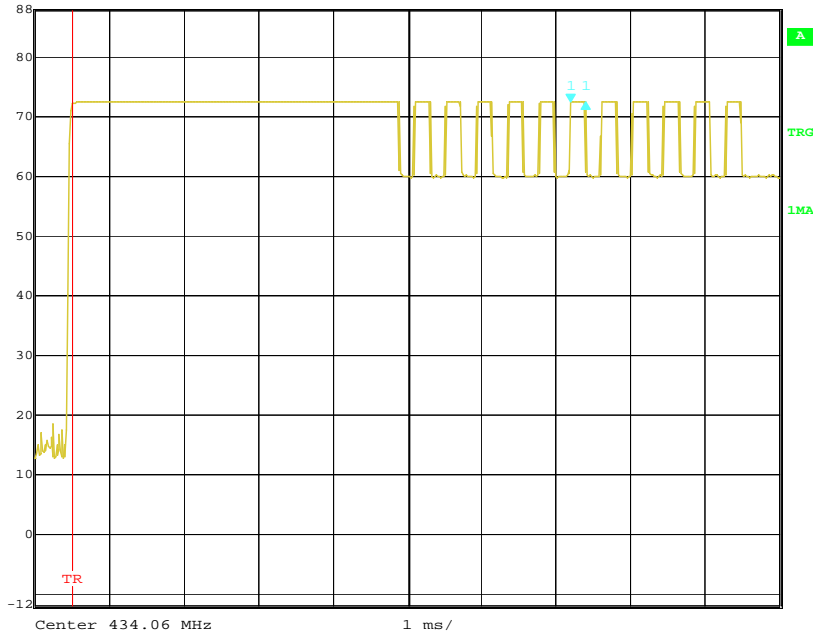
 Delta 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 0.00 dB VBW 300 kHz  
88 dBV 400.801603  $\mu$ s SWT 10 ms Unit dBV



Date: 2.MAR.2012 16:18:10

### Duty Cycle 6 (Ton4)

 Delta 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 0.02 dB VBW 300 kHz  
88 dBV 200.400802  $\mu$ s SWT 10 ms Unit dBV



Date: 2.MAR.2012 16:15:08

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