



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

# FCC ID TEST REPORT

## FCC PART 15.231

for

**Signal Pod or Signal N' Safe**

**MODEL: AE1103RC-C, AE1103RC,  
AE1103RC-A, AE1103RC-B, AE1103RC-D,  
AE1103RC-E, AE1103RC-F, AE1103RC-G**

**FCC ID: Z6U-AE1103RC-C**

**Test Report Number: BCTC12070347E**

**Issued Date: October 24, 2011**

Issued for

**Allegro Electronics Limited**

**Room 10-11, 8/F, Favor Industrial Centre, 2-6 Kin Hong Street,  
Kwai Chung, N.T, Hong Kong**

Issued By:

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Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

### Revision History Of Report

Rev.	Issue No.	Revisions	Effect Page	Revised By
00	BCTC12070347E	Initial Issue	ALL	Lisa Zhu



## TABLE OF CONTENTS

<b>1 TEST CERTIFICATION.....</b>	<b>4</b>
<b>4 TEST METHODOLOGY .....</b>	<b>7</b>
4.1. DECISION OF FINAL TEST MODE.....	7
4.2. EUT SYSTEM OPERATION .....	7
<b>5 SETUP OF EQUIPMENT UNDER TEST.....</b>	<b>8</b>
5.1. DESCRIPTION OF SUPPORT UNITS .....	8
5.2. CONFIGURATION OF SYSTEM UNDER TEST .....	8
<b>6 FACILITIES AND ACCREDITATIONS .....</b>	<b>9</b>
<b>6.2 MEASUREMENT UNCERTAINTY .....</b>	<b>9</b>
<b>7 TEST REQUIREMENTS.....</b>	<b>9</b>
7.1. CONDUCTED EMISSION MEASUREMENT.....	9
7.2. Radiation Emission Test .....	12
7.3. 20B Bandwidth .....	16
7.4 DEACTIVATION TESTING .....	18
7.5. Antenna requirement.....	19
7.6 DUTY CYCLE .....	20



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

## 1 TEST CERTIFICATION

<b>Product:</b>	Signal Pod or Signal N' Safe
<b>Model:</b>	AE1103RC-C, AE1103RC, AE1103RC-A, AE1103RC-B, AE1103RC-D, AE1103RC-E, AE1103RC-F, AE1103RC-G
<b>Applicant:</b>	<b>Allegro Electronics Limited</b> Room 10-11, 8/F, Favor Industrial Centre, 2-6 Kin Hong Street, Kwai Chung, N.T, Hong Kong
<b>Factory:</b>	<b>Allegro Electronics Limited</b> Room 10-11, 8/F, Favor Industrial Centre, 2-6 Kin Hong Street, Kwai Chung, N.T, Hong Kong
<b>Trade Mark:</b>	N/A
<b>Tested:</b>	October 18, 2011 - October 24, 2011
<b>Test Voltage:</b>	DC 3V Battery
<b>Applicable Standards:</b>	FCC Part 15:Subpart C ANSI C63.4:2003

The above equipment has been tested by Shenzhen BCT Technology Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

*Davis Ma*  
**Tested By:** \_\_\_\_\_

**Date:** October 24, 2011

(Davis Ma)

*Merry Zhao*  
**Check By:** \_\_\_\_\_

**Date:** October 24, 2011

(Merry Zhao)

*Lisa Zhu*  
**Approved By:** \_\_\_\_\_

**Date:** October 24, 2011

(Lisa Zhu)



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

## 2 TEST RESULT SUMMARY

### FCC 15 Subpart C, Paragraph 15.231

Test Standards	Test Items	Test Results
§15.231	Conducted test	N/A
§15.231 (b)	Radiated Emission	Pass
§15.231 (c)	20dB Band Width Testing	Pass
§15.231 (a)	Deactivation Testing	Pass
§15.203	ANTENNA REQUIREMENT	Pass
§15.231	DUTY CYCLE	Pass

**Note:**

1. The test result judgment is decided by the limit of test standard
2. The information of measurement uncertainty is available upon the customer's request.
3. "N/A" means "Not applicable."



Shenzhen BCTC Technology Co., Ltd.  
3 EUT DESCRIPTION

Report No.: BCTC12070347E

<b>Product</b>	Signal Pod or Signal N' Safe
<b>Trade Mark</b>	N/A
<b>Model</b>	AE1103RC-C, AE1103RC, AE1103RC-A, AE1103RC-B, AE1103RC-D, AE1103RC-E, AE1103RC-F, AE1103RC-G
<b>Applicant</b>	Allegro Electronics Limited
<b>Serial Number</b>	N/A
<b>Antenna Type</b>	PCB Antenna
<b>EUT Power Rating</b>	DC 3V Battery
<b>Temperature Range(Operating)</b>	+15 ~+ 35°C
<b>Operating Frequency</b>	433.92MHz
<b>Number of Channels</b>	1 Channels

*Note: N/A stand for no applicable.*

### Models difference

All models have the same constructions, circuit diagram and PCB layout. Only model name are different.



## 4 TEST METHODOLOGY

### 4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the below additional components, and configuration, which produced the worst emission levels, was selected and recorded in this report.

The measurement was performed at 3 axis for lie orientation, side orientation and stand orientation. The lie orientation is the worst mode, so only the worst mode test data was reported.

The following test mode was recorder in this report.

Test item	Test mode
Conducted emission Test	N/A
Radiation Emission Test	TRANSMITTING
20dB Band Width Testing	TRANSMITTING
Deactivation Testing	TRANSMITTING

### 4.2. EUT SYSTEM OPERATION

1. Set up EUT with the support equipments.
2. Make sure the EUT transmitting continuously during the test.



## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Manufacturer	Description	Model	Serial Number	FCC
N/A	N/A	N/A	N/A	N/A

**Note:**

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 5.2. CONFIGURATION OF SYSTEM UNDER TEST

EUT



## 6 FACILITIES AND ACCREDITATIONS

### 6.1 FACILITIES

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.

### 6.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency		Uncertainty
Conducted emissions	9kHz~30MHz		+/- 3.59dB
Radiated emissions	Horizontal	30MHz ~ 200MHz	+/- 4.77dB
		200MHz ~1000MHz	+/- 4.93dB
	Vertical	30MHz ~ 200MHz	+/- 5.04dB
		200MHz ~1000MHz	+/- 4.93dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 7 TEST REQUIREMENTS

### 7.1. CONDUCTED EMISSION MEASUREMENT

#### 7.1.1. LIMITS

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

#### NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.



### 7.1.2. TEST INSTRUMENTS

Conducted Emission Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100005	06/23/2012
LISN	AFJ	LS16	16010222119	09/29/2012
LISN(EUT)	Mestec	AN3016	04/10040	09/28/2012

**NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

2. N.C.R = No Calibration Request.

### 7.1.3. TEST PROCEDURES

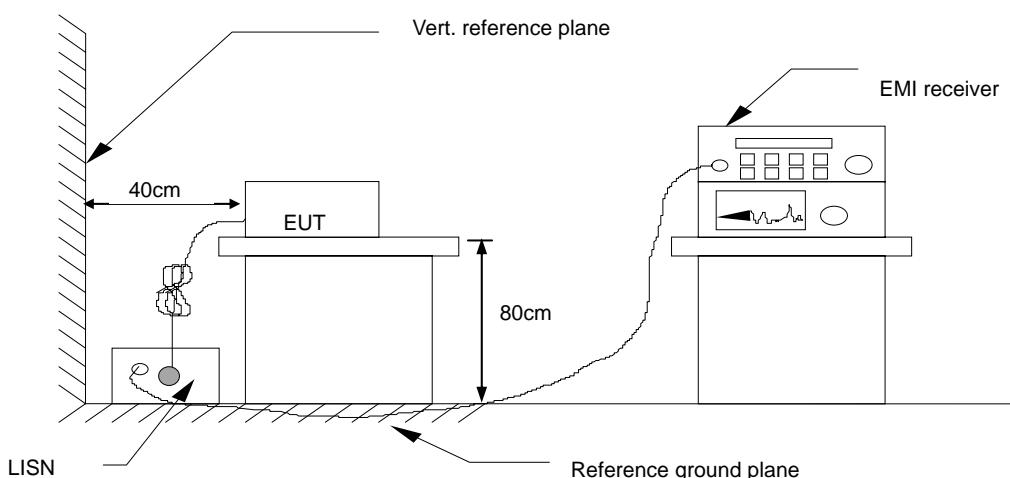
The EUT was put on a wooden table which was 0.8metre high above the ground and connected to the AC mains through a Artificial Mains Network (A.M.N). The mains lead in excess of 1 m separating the EUT from the AMN was folded back and forth parallel to the lead so as to form a bundle with a length of 0.3m to 0.4m. The EUT was kept 0.4m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during conducted emission test.

The bandwidth of the test receiver (ESCI) was set at 9KHz.

The frequency range from 150 KHz to 30 MHz was investigated.

The test data of the worst-case condition(s) was recorded.

### 7.1.4. TEST SETUP





Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### **7.1.5. Test Result**

N/A



## 7.2. Radiation Emission Test

### 7.2.1. Limits

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.

### 7.2.2. TEST INSTRUMENT

966 Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	ROHDE&SCHWARZ	ESCI	100005	06/23/2012
Spectrum Analyzer	R&S	FSU	100114	04/14/2012
Pre Amplifier	H.P.	HP8447E	2945A02715	06/23/2012
Pre-Amplifier	Compliance	PAM0118	1360976	06/04/2012
Bilog Antenna	SUNOL Sciences	JB3	A021907	06/10/2012
Horn Antenna	Compliance	CE18000	001	06/10/2012
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	06/09/2012
Cable	TIME MICROWAVE	--	--	06/09/2012
System-Controller	CCS	N/A	N/A	N.C.R
Turn Table	CCS	N/A	N/A	N.C.R
Antenna Tower	CCS	N/A	N/A	N.C.R



### 7.2.3. Test procedure

The EUT was placed on a turn table which was 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. At the frequency band of 30MHz to 1GHz, The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 to 4 m for horizontal and vertical polarizations. The broadband antenna (calibrated by dipole antenna) was used as a receiving antenna. At the frequency band of 1GHz to 18GHz, The measuring antenna moved from 1 to 4 m for horizontal and vertical polarization. The horn antenna was used as a receiving antenna.

The resolution bandwidth and video bandwidth of the test receiver was 120 KHz and 300KHz for Quasi-peak detection at frequency below 1GHz.

The resolution bandwidth and video bandwidth of the test receiver was 1MHz and 3MHz for Peak emission measurement above 1GHz .

For Average emission above 1GHz , the resolution bandwidth and video bandwidth of the test receiver was 1MHz and 10Hz.

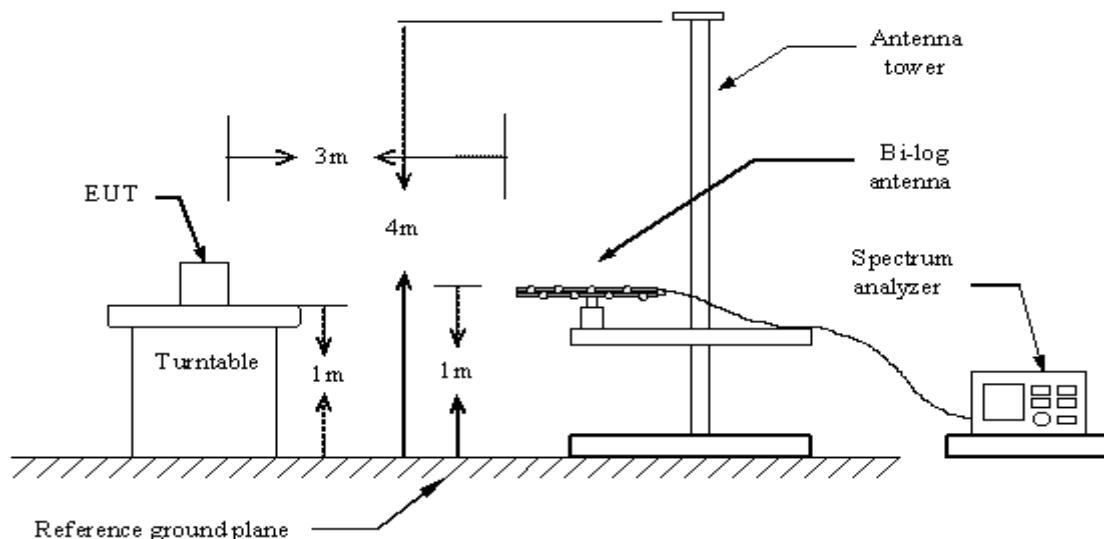
The EUT was tested in Chamber Site.

The test data of the worst case condition(s) was reported on the following pages.

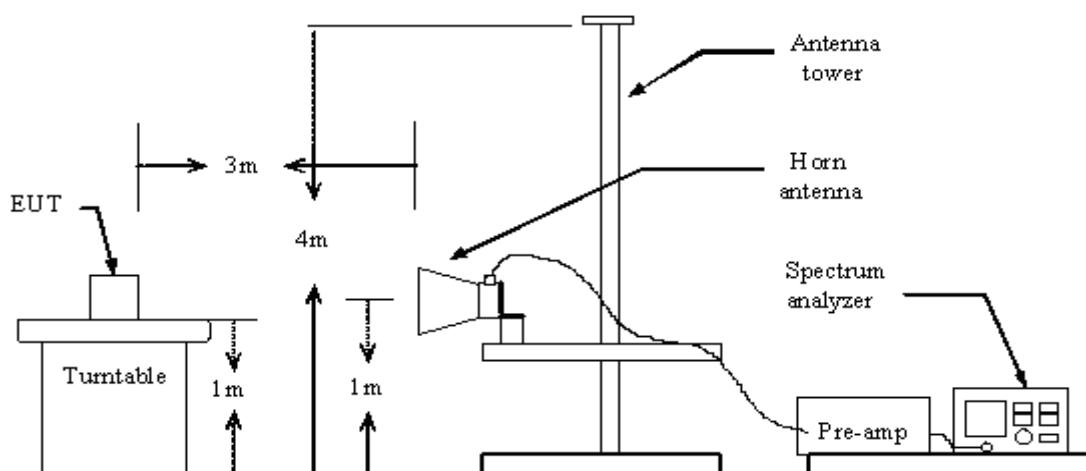


## 7.2.4 Test setup diagram

### Below 1GHz



### Above 1GHz





## 7.2.5. Test Result

### A. Fundamental Radiated Emission Data

Product:	Signal Pod or Signal N' Safe	Test mode:	TRANSMITTING
Test Item:	Fundamental Radiated Emission Data	Temperature:	25°C
Test Voltage:	DC 3V Battery	Humidity:	56%RH
Test Result: PASS			

Frequency (MHz)	Antenna Polarization	Emission Level (AV/PK)(dBuV/m)	FCC 15 Subpart C Limit (AV/ PK)(dBuV/m)
433.92	V	72.38	80.59
433.92	H	62.02	70.23
867.64	V	36.34	44.55
867.64	H	34.31	42.52
1301.76	V	33.94	42.15
1301.76	H	32.91	41.12
1735.68	V	31.93	40.14
1735.68	H	30.96	39.17
2169.60	V	----	----
2169.60	H	----	----
2603.52	V	----	----
2603.52	H	----	----
3037.44	V	----	----
3037.44	H	----	----
3471.36	V	----	----
3471.36	H	----	----
3905.28	V	----	----
3905.28	H	----	----
4339.2	V	----	----
4339.2	H	----	----

**Note:**

----means the emission is too low,more than 20dB from the limit.

---- Duty Cycle Factor =  $20 * \log ( Ton / Tp ) = 20 * \log ( 6.633 / 17.068 ) = -8.21\text{dB}$

---- The signal bandwidth was measured and less then 100KHz RBW so PDCF factor is not required to correct the fundamental signal peak result.



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

### **7.3. 20B Bandwidth**

#### **7.3.1. TEST INSTRUMENT**

Same as 7.2.2

#### **7.3.2. 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

#### **7.3.3. FCC 15.231(c) 20B 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.



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

### 7.3.4. Test result

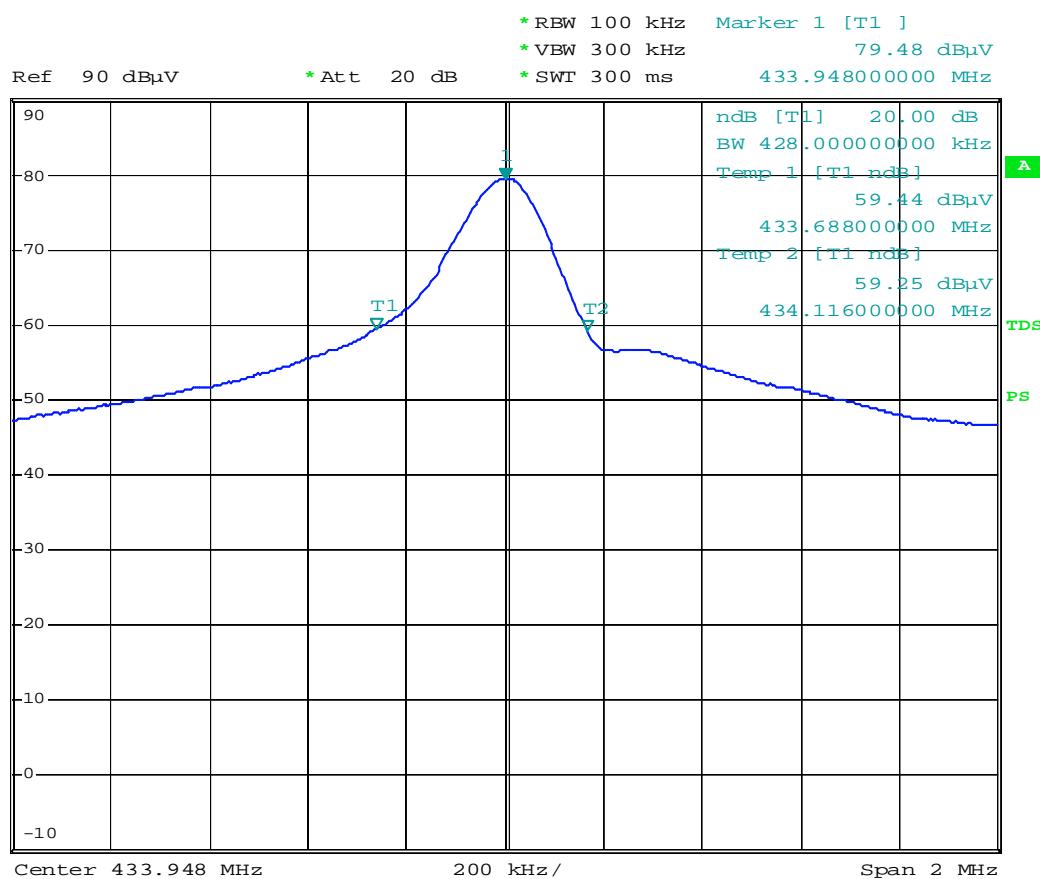
Temperature: 25°C

Humidity: 56%RH

Limit=Frequency×0.25%=433.9200×0.25%=1084.8 kHz

Test data: 428KHz

Test Result: PASS





Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

## 7.4 DEACTIVATION TESTING

### 7.4.1 Test Equipment

Please refer to Section 7.2.2 this report.

### 7.4.2 Test Procedure

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

### 7.4.3 Deactivation 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.

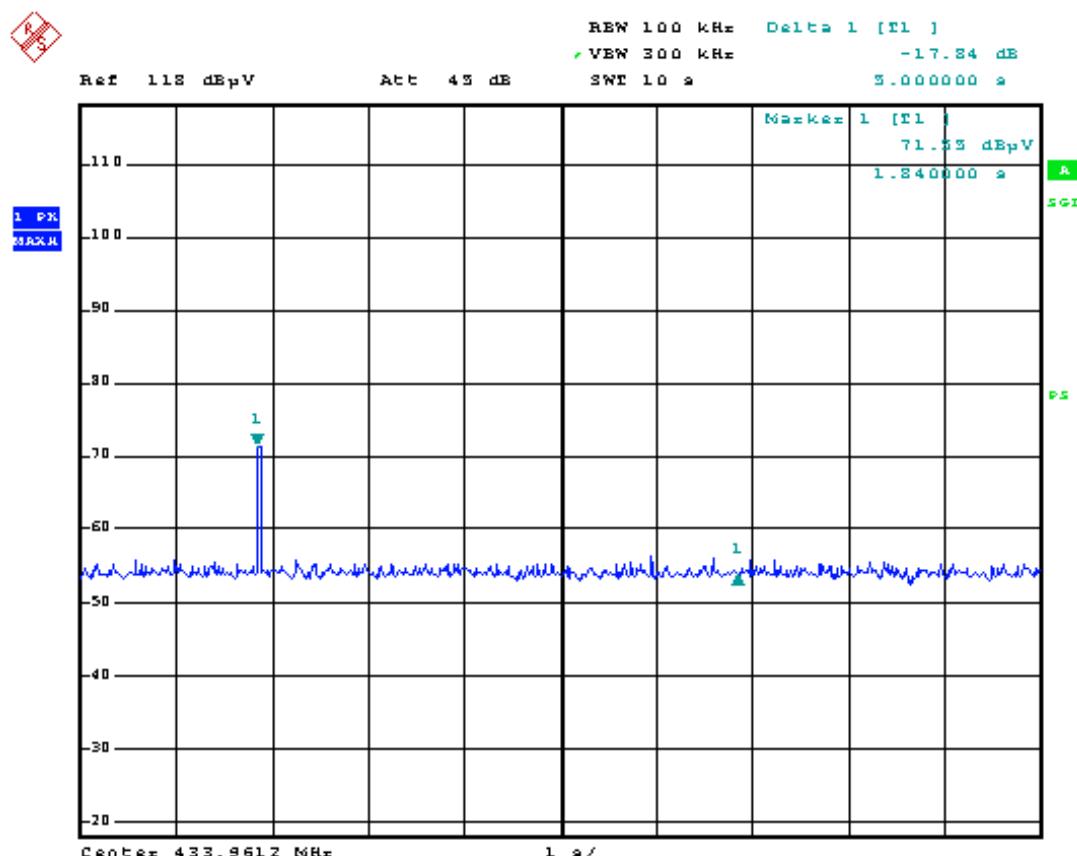
### 7.4.4 Test Result

Temperature: 25°C

Humidity: 56%RH

*THE TRANSMITTER TRANSMITTING TIME NOT MORE THAN 5 SECONDS*

Test Result: PASS





Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

## 7.5. Antenna requirement

### 7.5.1. 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.

### 7.5.2. Antenna connected construction

The antenna used in this product is PCB antenna and no consideration of replacement.

### Result :

Compliance



## 7.6 DUTY CYCLE

### 7.6.1 Test Equipment

Please refer to Section 7.2.2 this report.

### 7.6.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Span=0Hz.
5. Repeat above procedures until all frequency measured was complete.

### 7.6.3 Duty Cycle Test Data :

Test Data :

$$Tp = T_{on} + T_{off} = 17.068\text{ms}$$

$$T_{on} = T_1 * 10 + T_2 * 15 = 0.4158 * 10 + 0.165 * 15 = 12.93 + 6.165 = 6.633\text{ms}$$

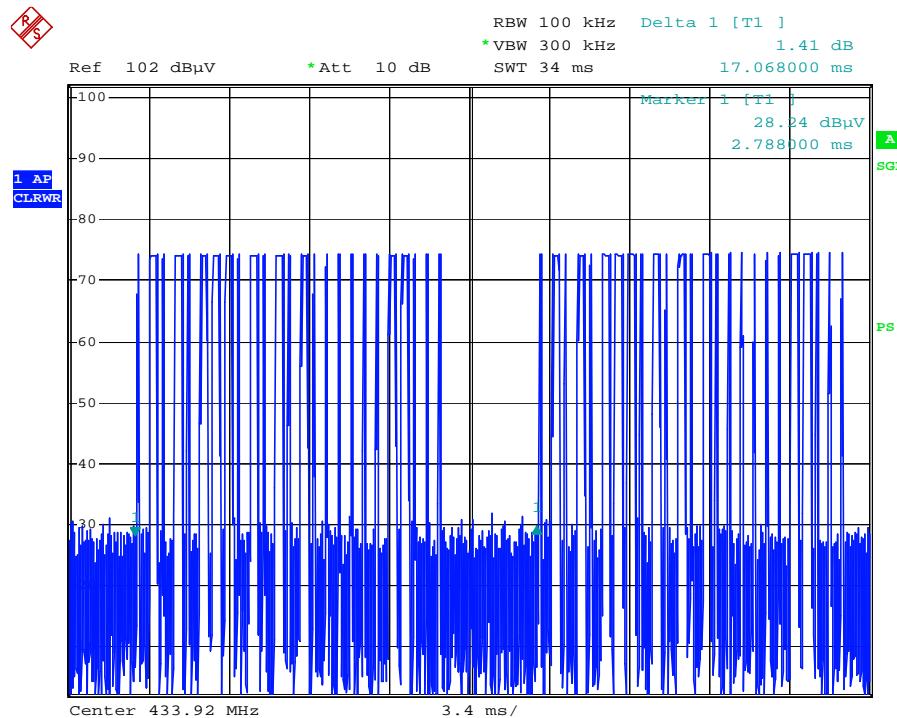
$$\text{Duty Cycle Factor} = 20 * \log ( T_{on} / Tp ) = 20 * \log ( 6.633 / 17.068 ) = -8.21\text{dB}$$

**Duty-Cycle- Tp**

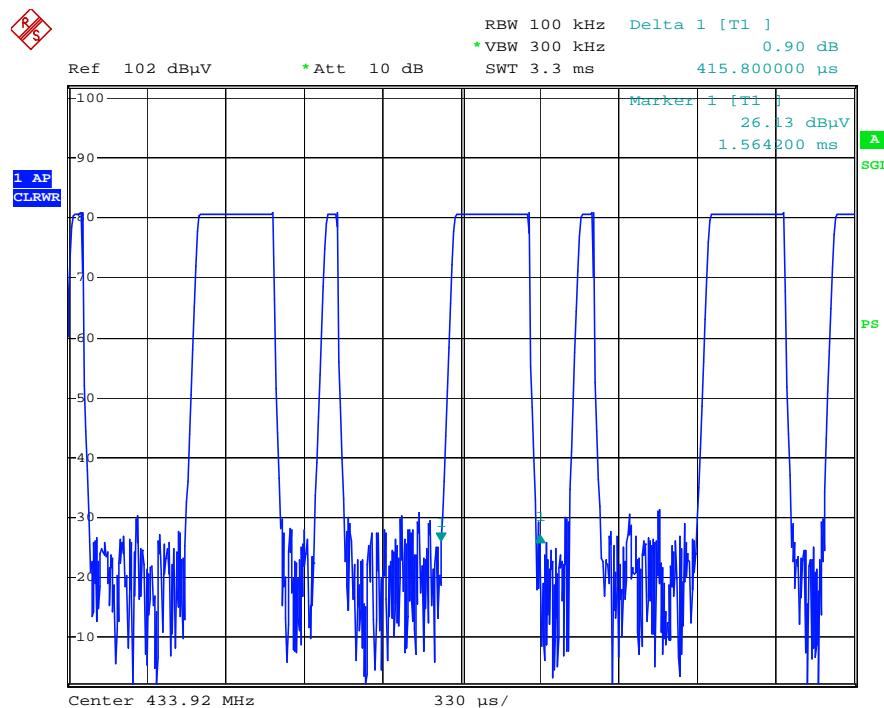


Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E



### Duty-Cycle- Ton(1)



### Duty-Cycle- Ton(2)



Shenzhen BCTC Technology Co., Ltd.

Report No.: BCTC12070347E

