


FCC PART 15.231  
EMI MEASUREMENT AND TEST REPORT  
For  
Chiyu Technology Co., Ltd.  
No. 293, Siwei Road, Chiayi City 60085, Taiwan

**FCC ID:ZDZAC-RF400**

Mar. 23, 2011

<b>This Report Concerns:</b> Original Report	<b>Equipment Type:</b> TCPIP To Wireless Converter
<b>Test Engineer:</b>	Eric Li <i>Eric Li</i>
<b>Report No.:</b>	BST11030158Y-1ER-3
<b>Receive EUT Date/Test Date:</b>	Mar. 17,2011/ Mar. 22,2011-Mar. 23,2011
<b>Reviewed By:</b>	Christina Deng <i>Christina Deng</i>
<b>Prepared By:</b>	 <b>Shenzhen BST Technology Co.,Ltd.</b> 3F,Weames Technology Building, No. 10 Kefa Road,Science Park, Nanshan District,Shenzhen,Guangdong,China Tel: 0755-26747751~3 Fax: 0755-26747751~3 ext.826

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## TABLE OF CONTENTS

<b>1.</b>	<b>GENERAL INFORMATION .....</b>	<b>4</b>
	1.1. Report information .....	4
	1.2. Measurement Uncertainty .....	4
<b>2.</b>	<b>PRODUCT DESCRIPTION .....</b>	<b>5</b>
	2.1. EUT Description .....	5
	2.2. Block Diagram of EUT Configuration.....	5
	2.3. Support Equipment List .....	5
	2.4. Test Conditions .....	5
<b>3.</b>	<b>FCC ID LABEL.....</b>	<b>6</b>
<b>4.</b>	<b>TEST RESULTS SUMMARY .....</b>	<b>7</b>
	Modifications .....	7
<b>5.</b>	<b>TEST EQUIPMENT USED .....</b>	<b>8</b>
<b>6.</b>	<b>CONDUCTED POWER LINE TEST .....</b>	<b>9</b>
	6.1. Test Equipment .....	9
	6.2. Test Procedure .....	9
	6.3. Test Setup.....	9
	6.4. Configuring of the EUT .....	9
	6.5. EUT Operating Condition.....	11
	6.6. Conducted Power line Emission Limits.....	11
	6.7. Conducted Power Line Test Result.....	12
<b>7.</b>	<b>RADIATION EMISSIONS .....</b>	<b>14</b>
	7.1. Test Equipment .....	14
	7.2. Test Procedure .....	14
	7.3. Radiated Test Setup .....	14
	7.4. Radiated Emission Limit.....	15
	7.5. Radiated Emission Test Result .....	16
<b>8.</b>	<b>20DB OCCUPIED BANDWIDTH .....</b>	<b>17</b>
	8.1. Test Equipment .....	17
	8.2. Test Procedure .....	17
	8.3. FCC 15.231(c) 20B Bandwidth Limit.....	17
	8.4. Test Result .....	17
<b>9.</b>	<b>DURATION TIME AND SILENT PERIOD MEASUREMENT.....</b>	<b>18</b>
	9.1. Test Equipment .....	18
	9.2. Test Procedure .....	18
	9.3. Duration Time and silent period testing according to FCC Part 15 Section 15.231(e) ..	18
	9.4. Test Result .....	18
<b>10.</b>	<b>AVERAGE FACTOR MEASUREMENT .....</b>	<b>20</b>
	10.1. Test Equipment .....	20
	10.2. Test Procedure .....	20
	10.3. Average factor Measurement according to ANSI 63.4: 2003.....	20
	10.4. Test Result .....	20
<b>11.</b>	<b>ANTENNA REQUIREMENT .....</b>	<b>22</b>
	11.1. STANDARD APPLICABLE.....	22

11.2. ANTENNA CONNECTED CONSTRUCTION .....22  
11.3. Result .....22

## **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 : TCPIP To Wireless Converter

Trade Name : N/A

Applicant : Chiyu Technology Co., Ltd.

Model Number : AC-RF400M, AC-RF400S, BF-400

#### Additional Information

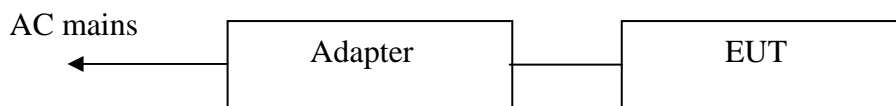
Frequency : 433.9MHz

Power Supply : DC12V (Supplied by Adapter)

Adapter : Model: PH48-333  
Input: AC 120/60Hz  
Output: DC 12V, 1000mA

Transmitter : The antenna used for this product is antenna with  
Antenna : Reverse Polarity SMA connector, no consideration of replacement other than that furnished by the responsible party. Refer to the product photo.

### 2.2. Block Diagram of EUT Configuration



### 2.3. Support Equipment List

- |    |    |       |
|----|----|-------|
| 1. | -- | ----- |
| 2. | -- | ----- |
| 3. | -- | ----- |

### 2.4. Test Conditions

Temperature: 23~25°C

Relative Humidity: 55~63 %

### 3. FCC ID LABEL

**FCC ID:ZDZAC-RF400**

**This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions:**

- 1. This device may not cause harmful interference, and**
- 2. This device must accept any interference received,including interference that may cause undesired operation.**

#### Label Location on EUT

#### EUT Bottom View/ FCC ID Label Location



#### 4. TEST RESULTS SUMMARY

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

Test Standards	Test Items	Test Results
Section 15.207	Conducted test	Pass
Section 15.231(e)	Radiated Emission	Pass
Section 15.231(c)	20dB Bandwidth	Pass
Section 15.231(e)	Duration time and silent period	Pass
Section 15.203	Antenna Requirement	Pass

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

##### **Modifications**

No modification was made.

## 5. 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 $\Omega$ 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	9m $\times$ 6m $\times$ 6m	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.15,2010	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



## 6. CONDUCTED POWER LINE TEST

### 6.1. Test Equipment

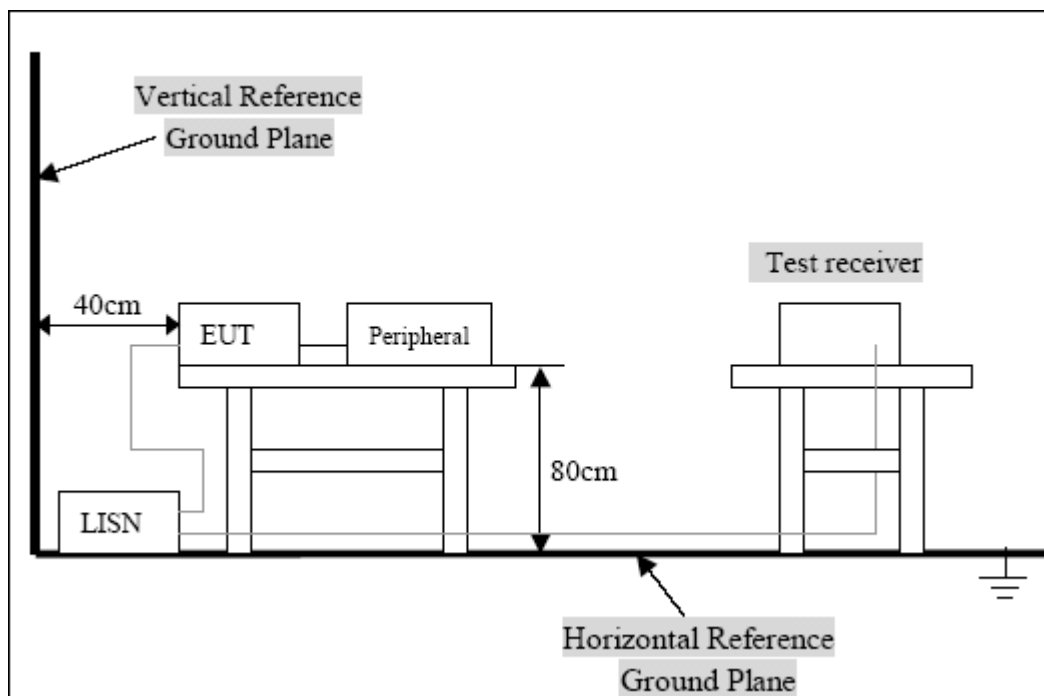
Please refer to section 5 this report.

### 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 inpedance for the measuring equipment.The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling inpedance 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.

### 6.3. Test Setup



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

### 6.4. Configuring of the EUT

The EUT was configured according to ASIN C63.4:2003. Enable the signal transmitted from the external antenna from EUT to receiver. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A.EUT

Device	Manufacturer	Model #	FCC ID
TCPIP To Wireless Converter	Chiyu Technology Co., Ltd.	AC-RF400M, AC-RF400S, BF-400	ZDZAC-RF400

B.Internal Devices

Device	Manufacturer	Model #	FCC ID
N/A			

C.Peripherals

Device	Manufacturer	Model # Serial #	FCC ID/ Doc	Cable
N/A				

### 6.5. 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.

### 6.6. 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

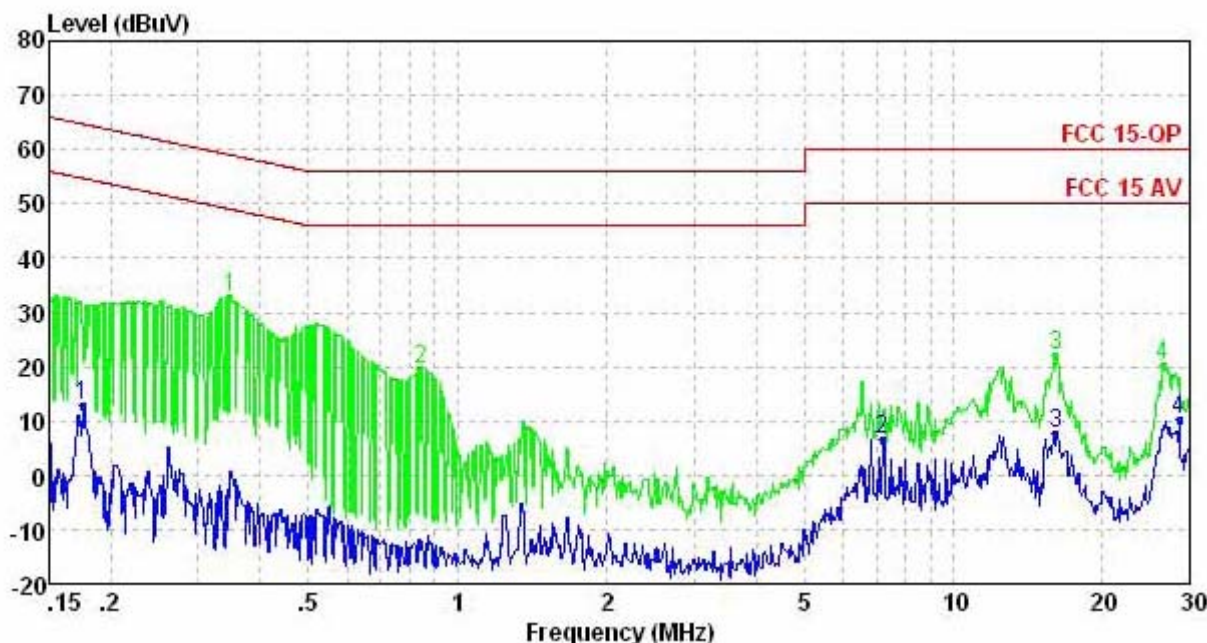
**Note:** In the above table, the tighter limit applies at the band edges.

### 6.7. Conducted Power Line Test Result

Temperature: 25°C

Humidity: 56%RH

Test Result: PASS



Condition:

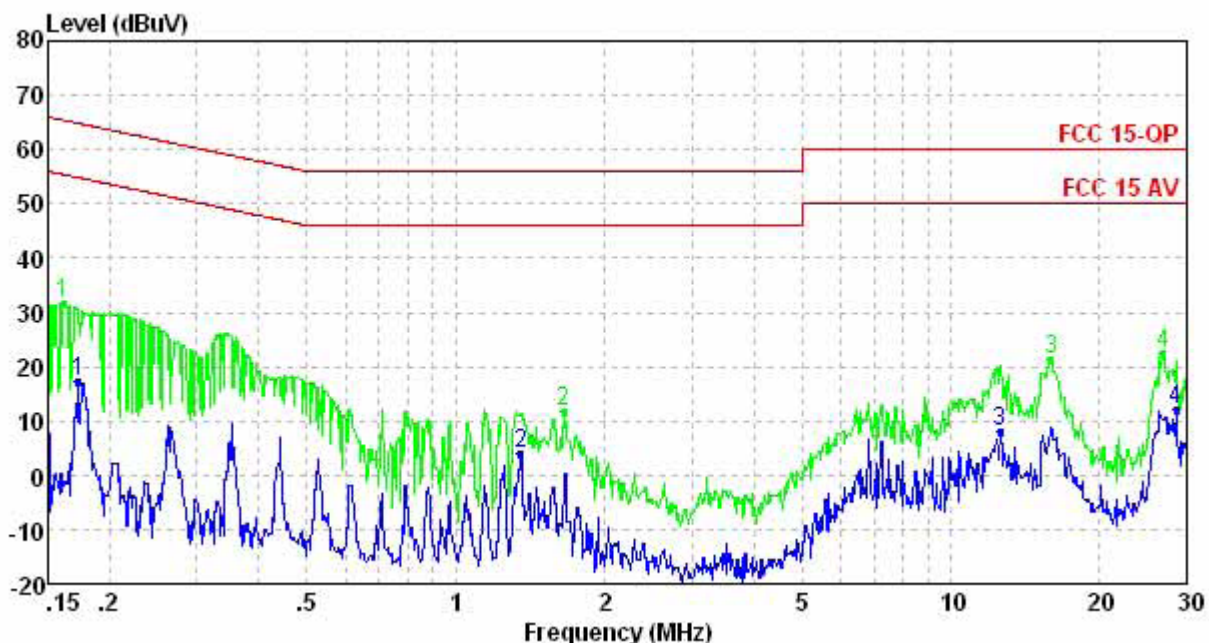
: RBW:9.000KHz VBW:30.000KHz

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB		
1	0.17	12.87	54.72	-41.85	Average	LINE
2	7.21	6.44	50.00	-43.56	Average	LINE
3	16.14	7.67	50.00	-42.33	Average	LINE
4 Max	28.60	10.13	50.00	-39.87	Average	LINE

Condition:

: RBW:9.000KHz VBW:30.000KHz

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB		
1 Max	0.35	32.65	59.00	-26.35	Peak	LINE
2	0.84	19.53	56.00	-36.47	Peak	LINE
3	16.14	22.05	60.00	-37.95	Peak	LINE
4	26.56	20.06	60.00	-39.94	Peak	LINE



Condition:

: RBW:9.000KHz VBW:30.000KHz

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB		
1 Max	0.17	17.29	54.81	-37.52	Average	NEUTRAL
2	1.35	3.98	46.00	-42.02	Average	NEUTRAL
3	12.58	7.99	50.00	-42.01	Average	NEUTRAL
4	28.60	12.14	50.00	-37.86	Average	NEUTRAL

Condition:

: RBW:9.000KHz VBW:30.000KHz

	Freq	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB		
1 Max	0.16	31.51	65.38	-33.87	Peak	NEUTRAL
2	1.65	11.88	56.00	-44.12	Peak	NEUTRAL
3	15.97	21.43	60.00	-38.57	Peak	NEUTRAL
4	26.84	22.51	60.00	-37.49	Peak	NEUTRAL

## 7. RADIATION EMISSIONS

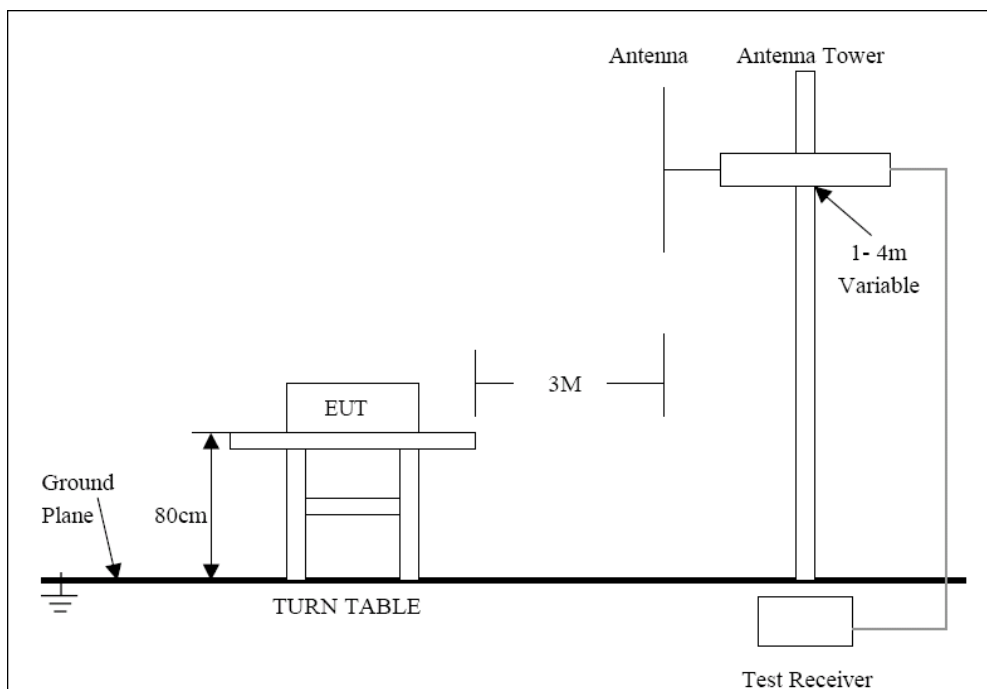
### 7.1. Test Equipment

Please refer to section 5 this report.

### 7.2. Test Procedure

The emission tests were performed in the 3-meter semi-anechoic 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.

### 7.3. Radiated Test Setup



Setup below 30MHz, refer to 7.3; For the accrual test configuration, please refer to the related items-photos of Testing.

**7.4. Radiated Emission Limit**

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

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	1000	100
70-130	500	50
130-174	500 - 1500	50-150
174-260	1500	150
260-470	1500-5000	150-500
Above 470	5000	500

Where F is the frequency in MHz, The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174MHz,  $\mu\text{V/m}$  at 3 meters= $22.72727(F)-2454.545$ ; For the band 260-470MHz,  $\mu\text{V/m}$  at 3 meters= $16.6667(F)-2833.3333$ . The maximum permissible unwanted emission level is 20dB below the maximum permitted fundamental level.

Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section15.209.

## 7.5. Radiated Emission Test Result

Temperature: 25°C

Humidity: 56%RH

Test Result: PASS

Frequency (MHz)	Reading (dB $\mu$ V/m)	Factor Corr.	Average Factor	Result(dB $\mu$ V/m)		Limit(dB $\mu$ V/m)		Margin(dB)		Polarization
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
<b>433.9600</b>	<b>61.16</b>	<b>22.95</b>	<b>-13.4</b>	<b>70.71</b>	<b>84.11</b>	<b>72.8</b>	<b>92.8</b>	<b>-2.09</b>	<b>-8.69</b>	Horizontal
867.9180	34.92	28.64	-13.4	50.16	63.56	52.8	72.8	-2.64	-9.24	
*1301.878	63.64	-12.20	-13.4	38.04	51.44	54.0	74.0	-15.96	-22.56	
1735.840	68.62	-10.39	-13.4	44.83	58.23	52.8	72.8	-7.97	-14.57	
2169.802	63.23	-8.38	-13.4	41.45	54.85	52.8	72.8	-11.35	-17.95	
2603.758	65.60	-6.72	-13.4	45.48	58.88	52.8	72.8	-7.32	-13.92	
3037.720	58.28	-4.90	-13.4	39.98	53.38	52.8	72.8	-12.82	-19.42	
3471.682	66.15	-3.30	-13.4	49.45	62.85	52.8	72.8	-3.35	-9.95	
*3905.638	60.98	-2.07	-13.4	45.51	58.91	54.0	74.0	-8.49	-15.09	
*4339.596	60.46	-1.91	-13.4	45.15	58.55	54.0	74.0	-8.85	-15.45	
<b>433.9600</b>	<b>60.71</b>	<b>22.95</b>	<b>-13.4</b>	<b>70.26</b>	<b>83.66</b>	<b>72.8</b>	<b>92.8</b>	<b>-2.54</b>	<b>-9.14</b>	Vertical
867.9180	34.68	28.64	-13.4	49.92	63.32	52.8	72.8	-2.88	-9.48	
*1301.878	66.51	-12.20	-13.4	40.91	54.31	54.0	74.0	-13.09	-19.69	
1735.840	65.41	-10.39	-13.4	41.62	55.02	52.8	72.8	-11.18	-17.78	
2169.802	54.38	-8.38	-13.4	32.60	46.00	52.8	72.8	-20.20	-26.80	
2603.758	58.94	-6.72	-13.4	38.82	52.22	52.8	72.8	-13.98	-20.58	
3037.720	49.98	-4.90	-13.4	31.68	45.08	52.8	72.8	-21.12	-27.72	
3471.682	58.29	-3.30	-13.4	41.59	54.99	52.8	72.8	-11.21	-17.81	
*3905.638	53.78	-2.07	-13.4	38.31	51.71	54.0	74.0	-15.69	-22.29	
*4339.596	54.89	-1.91	-13.4	39.58	52.98	54.0	74.0	-14.42	-21.02	

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. Average results were calculated by using average factor calculation method. 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. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

4. FCC Limit for Average Measurement =  $16.6667(433.92) - 2833.3333 = 4398.68\mu\text{V/m} = 72.8\text{dB}\mu\text{V/m}$

5. The spectral diagrams in appendix I display the measurement of peak values.



## 8. 20DB OCCUPIED BANDWIDTH

### 8.1. Test Equipment

Please refer to Section 5 this report.

### 8.2. Test Procedure

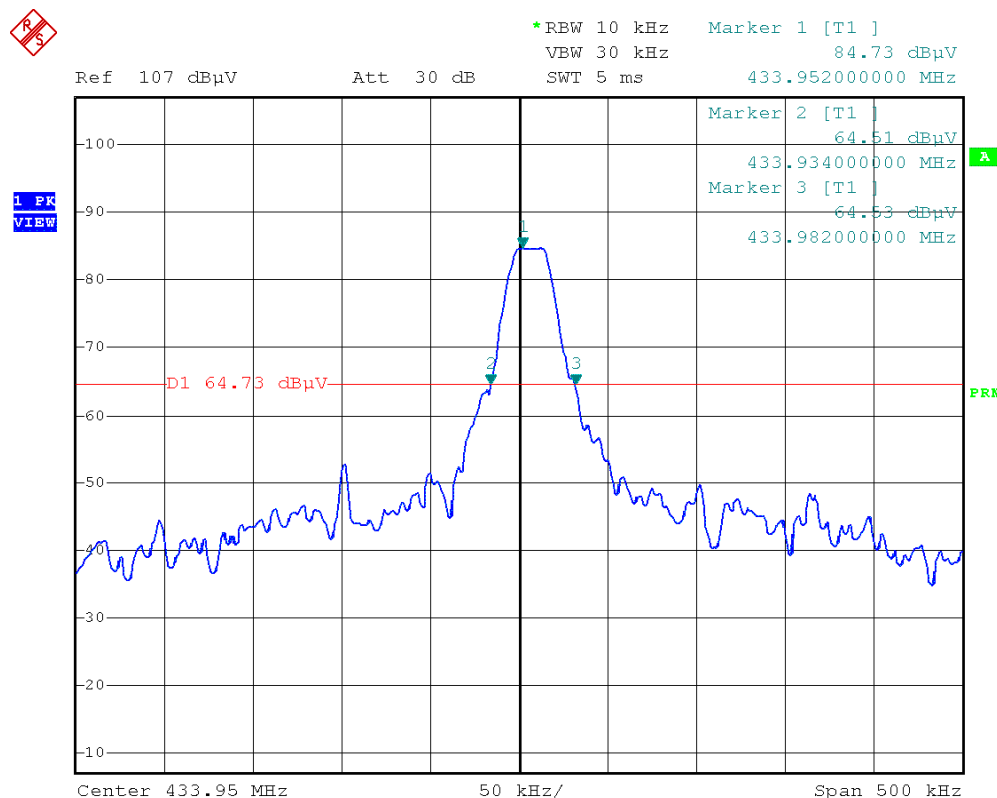
1. The EUT was tested according C63.4-2003.The radiated test was performed at FCC Registration laboratory.
2. With the EUT’s antenna attached, the EUT’s 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT’s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

### 8.3. FCC 15.231(c) 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.

### 8.4. Test Result

Temperature:	25°C	Humidity:	56%RH
Limit=Frequency×0.25%=433.900×0.25%=1084.8 kHz			
Test data:	48.0kHz	Test Result:	PASS



### 9. DURATION TIME AND SILENT PERIOD MEASUREMENT

#### 9.1. Test Equipment

Please refer to Section 5 this report.

#### 9.2. Test Procedure

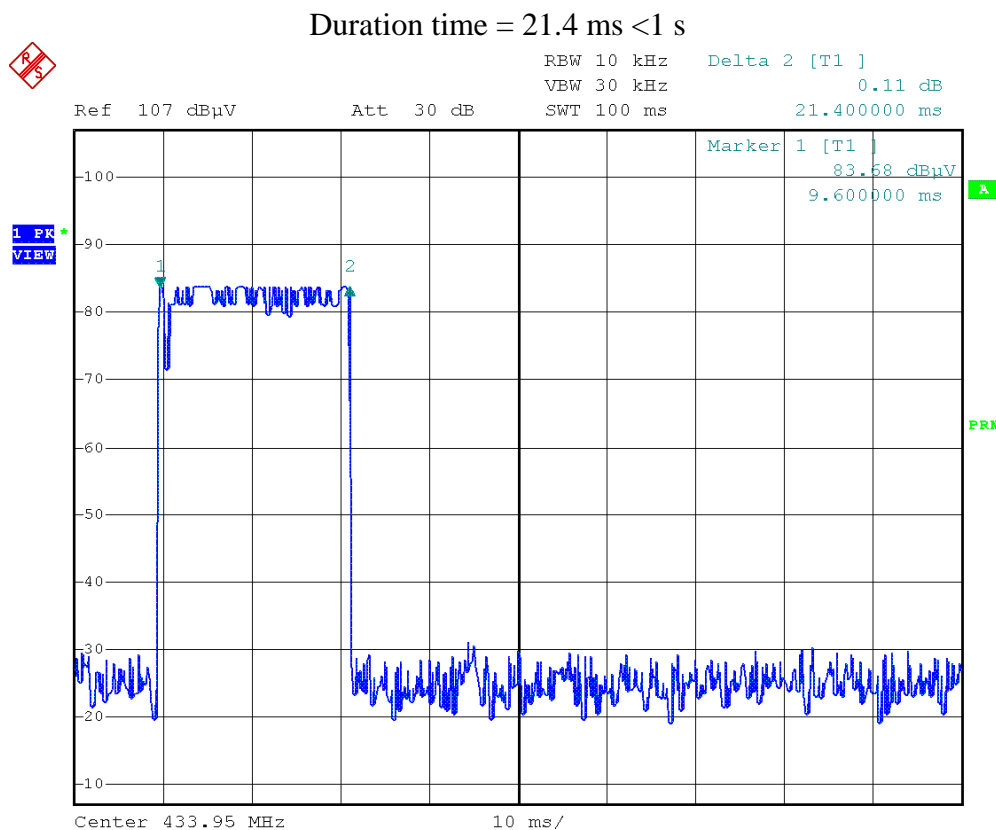
Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

#### 9.3. Duration Time and silent period testing according to FCC Part 15 Section 15.231(e)

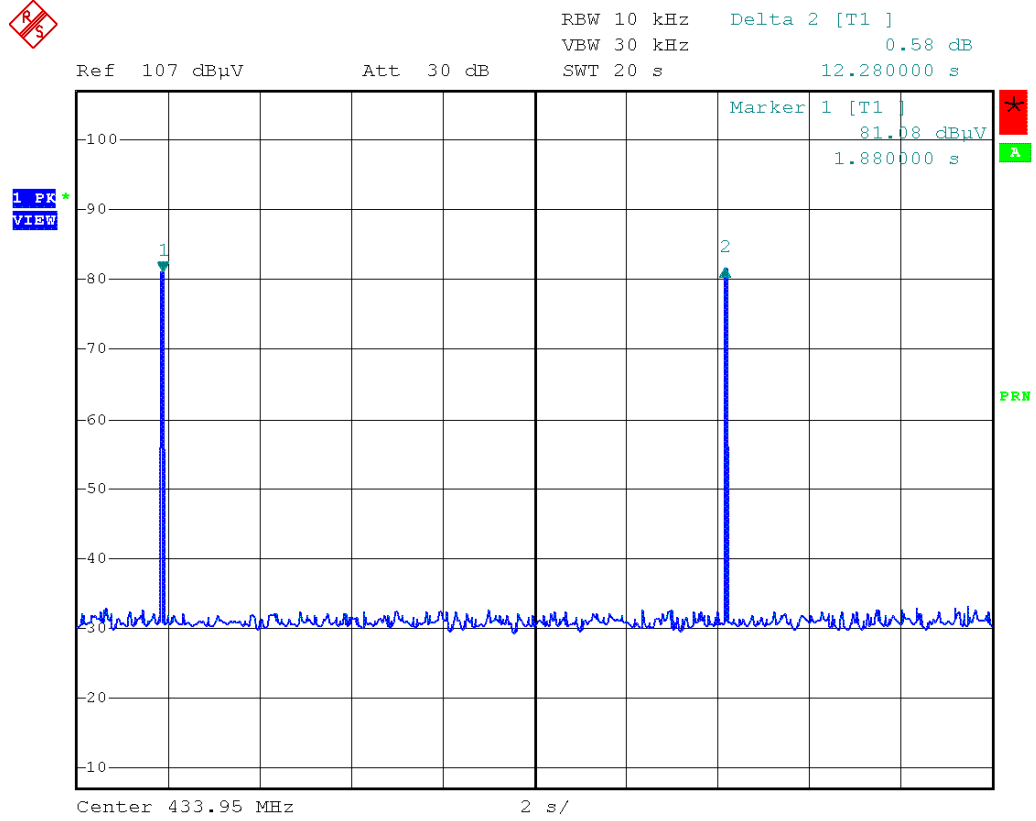
Section 15.231(e) In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times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

#### 9.4. Test Result

Temperature:	25°C	Humidity:	56%RH
Duration time =	21.4 ms < 1 s		
Silent period =	12.28 seconds > 30 times the duration of the transmission	> 10 seconds	
		Test Result:	PASS



Silent period = 12.28 seconds > 30 times the duration of the transmission > 10 seconds



## 10. AVERAGE FACTOR MEASUREMENT

### 10.1. Test Equipment

Please refer to Section 5 this report.

### 10.2. Test Procedure

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

### 10.3. 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 =  $20 \log (\text{duty cycle})$**

### 10.4. Test Result

Temperature:	25°C	Humidity:	56%RH
		Test Result:	-13.4dB

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

Effective period of one cycle = 100ms

Sum of pulse width = 21.4ms

Duty Cycle = 21.4ms/100ms = 0.214

Therefore, the average factor is found by  $20\log 0.214 = -13.4\text{dB}$

Duty Cycle = 21.4ms/100ms = 0.214.

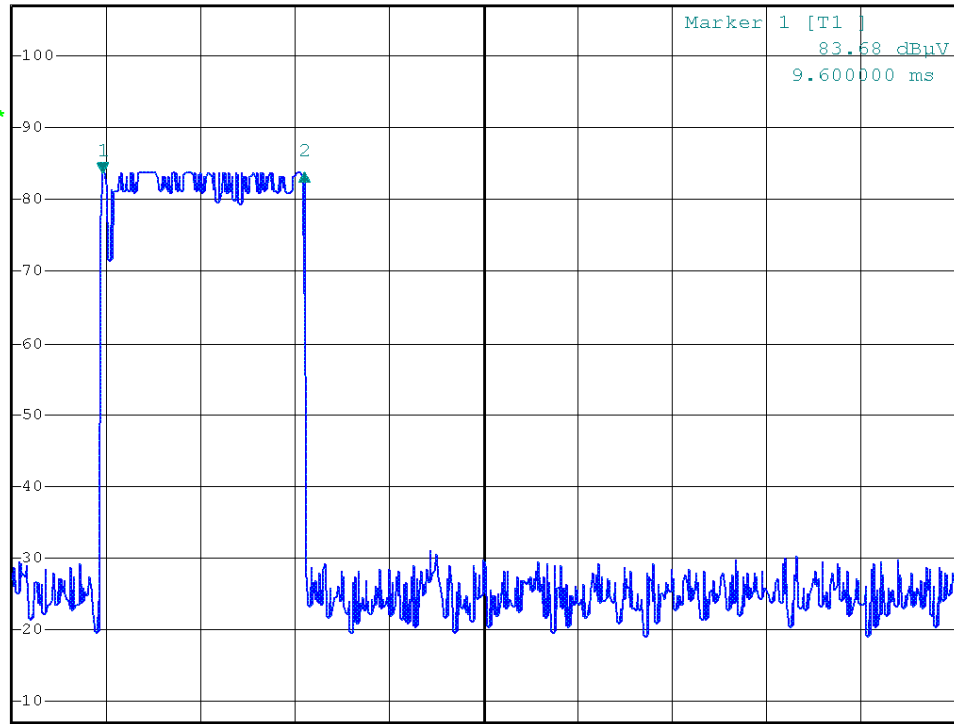


RBW 10 kHz Delta 2 [T1 ]  
VBW 30 kHz 0.11 dB  
SWT 100 ms 21.400000 ms

Ref 107 dBμV

Att 30 dB

1 FM\*  
VIEW



A

ERN

Center 433.95 MHz

10 ms/

## **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 antenna with Reverse Polarity SMA connector. The connector is unique. The antenna is permanently attached. Refer to the product photo.

### **11.3.Result**

Compliance.