

FCC TEST REPORT

FCC ID : OZIZW-01

Applicant : **San Shih Electrical Enterprise Co., Ltd.**

Address of Applicant : No 209, Sec ,3 County Boulevard, Pan Chiao City, Taipei Hsien, Taiwan.

Equipment Under Test (EUT) :

Product description : Z-Wave bridge

Model No. : ZW-01

Standards : FCC 15 Paragraph 15.249

Date of Test : May.13, 2009

Test Engineer : Olic huang

Reviewed By : 

PERPARED BY:

Waltek Services (Shenzhen) Co., Ltd.

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3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Restricted Band	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
20-dB Bandwidth	FCC Part 15:2007	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2007	ANSI C63.4: 2003	N/A	PASS
Radiation Emission, 30MHz to 10GHz	FCC Part 15:2007	ANSI C63.4: 2003	N/A	PASS

Note : denote that for more details of the EUT , please refer to the relating test items as below .

Remark : the methods of measurement in all the test items were according to ANSI C63.4: 2003.

4 General Information

4.1 Client Information

Applicant: San Shih Electrical Enterprise Co., Ltd.
Address: No 209, Sec ,3 County Boulevard, Pan Chiao City, Taipei Hsien, Taiwan.

Manufacturer: ZongPro Electrical(ShenZhen) Ltd.
Address: No.7, Tongpro street, Pan Ten 2nd industrial Zone, Bu Ji Town, Lung Gun Zone, ShenZhen

4.2 General Description of E.U.T.

Product description: Z-Wave bridge
Model No.: ZW-01
Frequency Range 908.42MHz

4.3 Details of E.U.T.

Power Supply: AC 120V/60Hz

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a Z-Wave bridge. The standards used were FCC 15 Paragraph 15.249, Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, June 24, 2008.

- **IC – Registration No.: IC 7760**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration IC7760, July 24, 2008.

4.7 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

5 Equipment Used during Test

NO	Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
1.	EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	Aug-08	Aug-09	Wws20081596	±1dB
2.	Trilog Broadband Antenna 30-3000 MHz	SCHWARZBECK MESS-ELEKTROM/ VULB9163	336	W2008002	30-3000 MHz	Jul-08	Jul-09		±1dB
3.	Broadband Horn Antenna 1-18 GHz	SCHWARZBECK MESS-ELEKTROM/ VULB9163	667	W2008003	1-18GHz	Jul-08	Jul-09		f < 10 GHz: ±1dB 10GHz < f < 18 GHz : ±1.5dB
4.	Broadband Preamplifier 0.5-18 GHz	SCHWARZBECK MESS-ELEKTROM/ BBV 9718	9718-148	W2008004	0.5-18GHz	Jul-08	Jul-09		±1.2dB
5.	10m Coaxial Cable with N-male Connectors usable up to 18GHz,	SCHWARZBECK MESS-ELEKTROM/ AK 9515 H	-	-	-	Jul-08	Jul-09		-
6.	10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connector	SCHWARZBECK MESS-ELEKTROM/ AK 9513				Jul-08	Jul-09		
7.	Positioning Controller	C&C LAB/ CC-C-IF							
8.	Color Monitor	SUNSPOT/ SP-14C							
9.	Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Jul-08	Jul-09	Wws200809	±1dB

NO	Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
								42	
10.	EMI Receiver	Beijingkehuan	KH3931		9k-1GHz	Aug-08			
11.	Two-Line V-Network	ROHDE&SCHWARZ/ENV216	100115	W2005002	50Ω/50μH	Jul-08	Jul-09	Wws20080941	±10%
12.	V—LISN	SCHWARZBECK MESS—ELEKTRONIK	NSLK 8128	8128-259	9k-30MHz	Jul-08	Jul-09		
13.	Absorbing Clamp	ROHDE&SCHWARZ/ MDS-21	100205	W2005003	impedance 50Ω loss : 17 dB	Jul-08	Jul-09	Wws20080943	±1dB
14.	10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connectors	SCHWARZBECK MESS-ELEKTROM/AK 9514				Jul-08	Jul-09		

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	May.13, 2009
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 Test Equipment

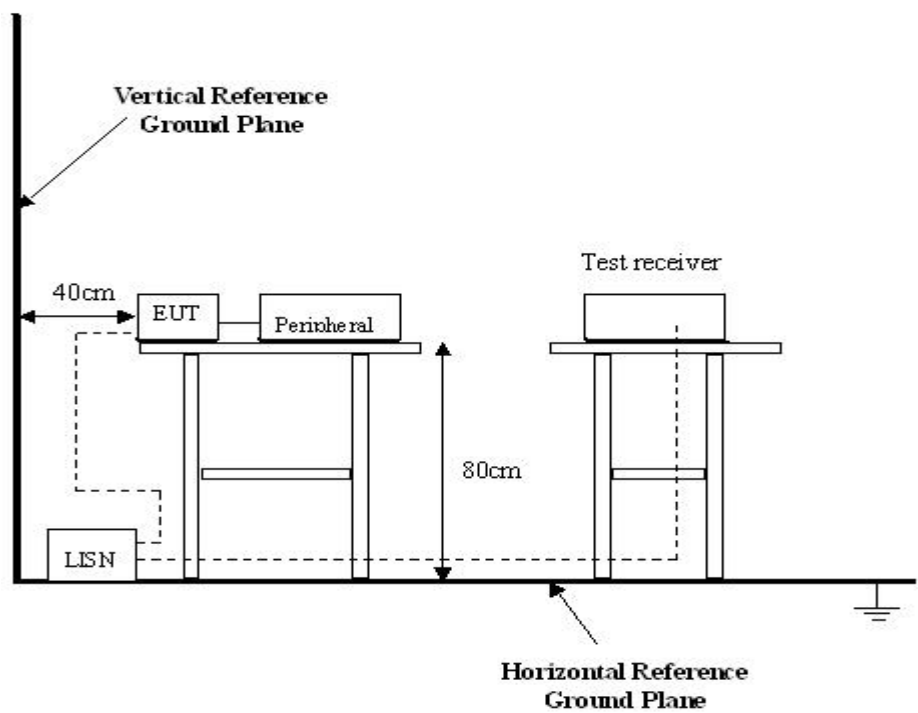
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was connected with signal generator and placed on a table.
2. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
3. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.3 Conducted Test Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 EUT Operating Condition

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

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



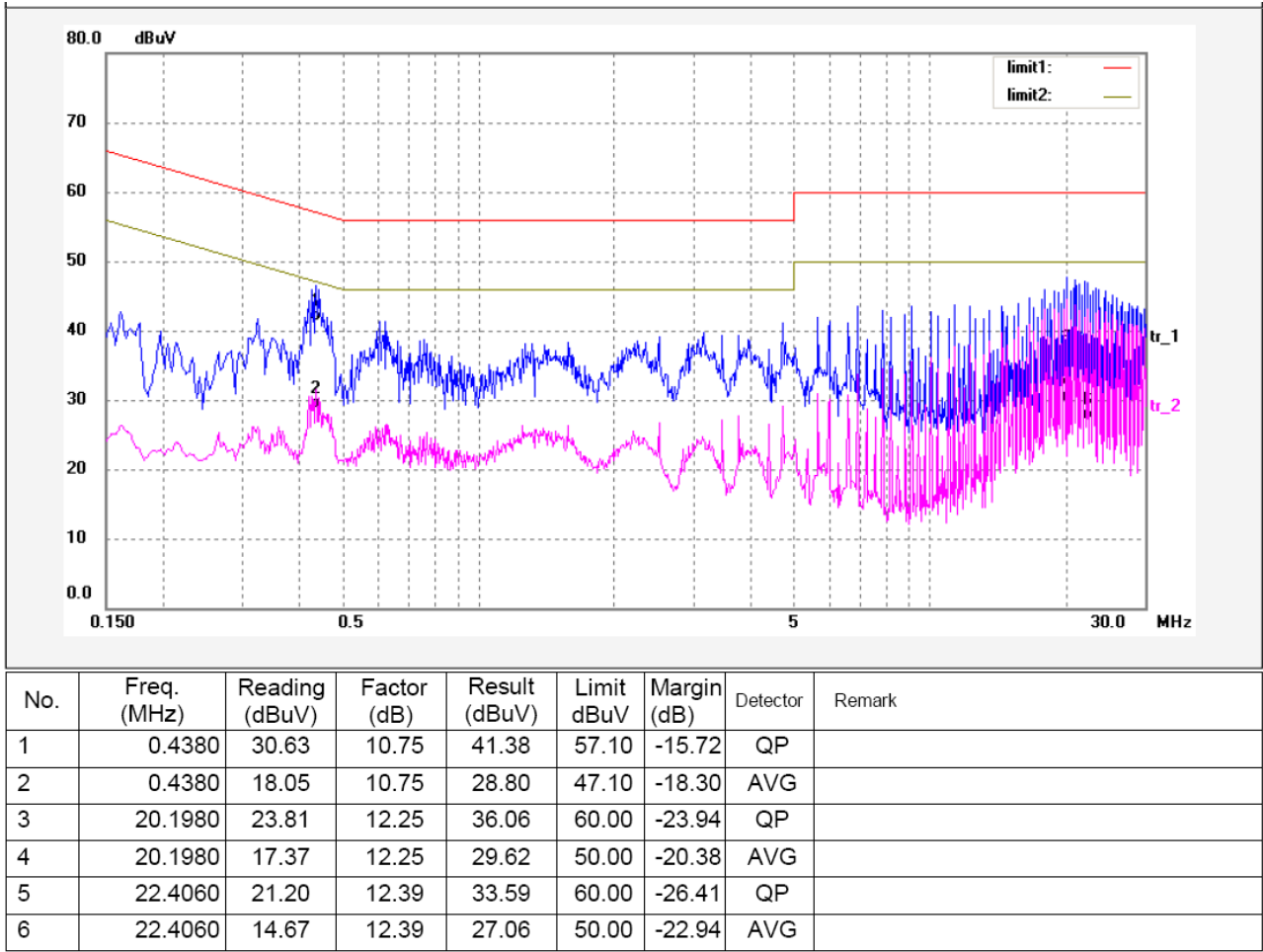
6.5 Conducted Emission Limits

66-56 dBμV between 0.15MHz & 0.5MHz
56 dBμV between 0.5MHz & 5MHz
60 dBμV between 5MHz & 30MHz

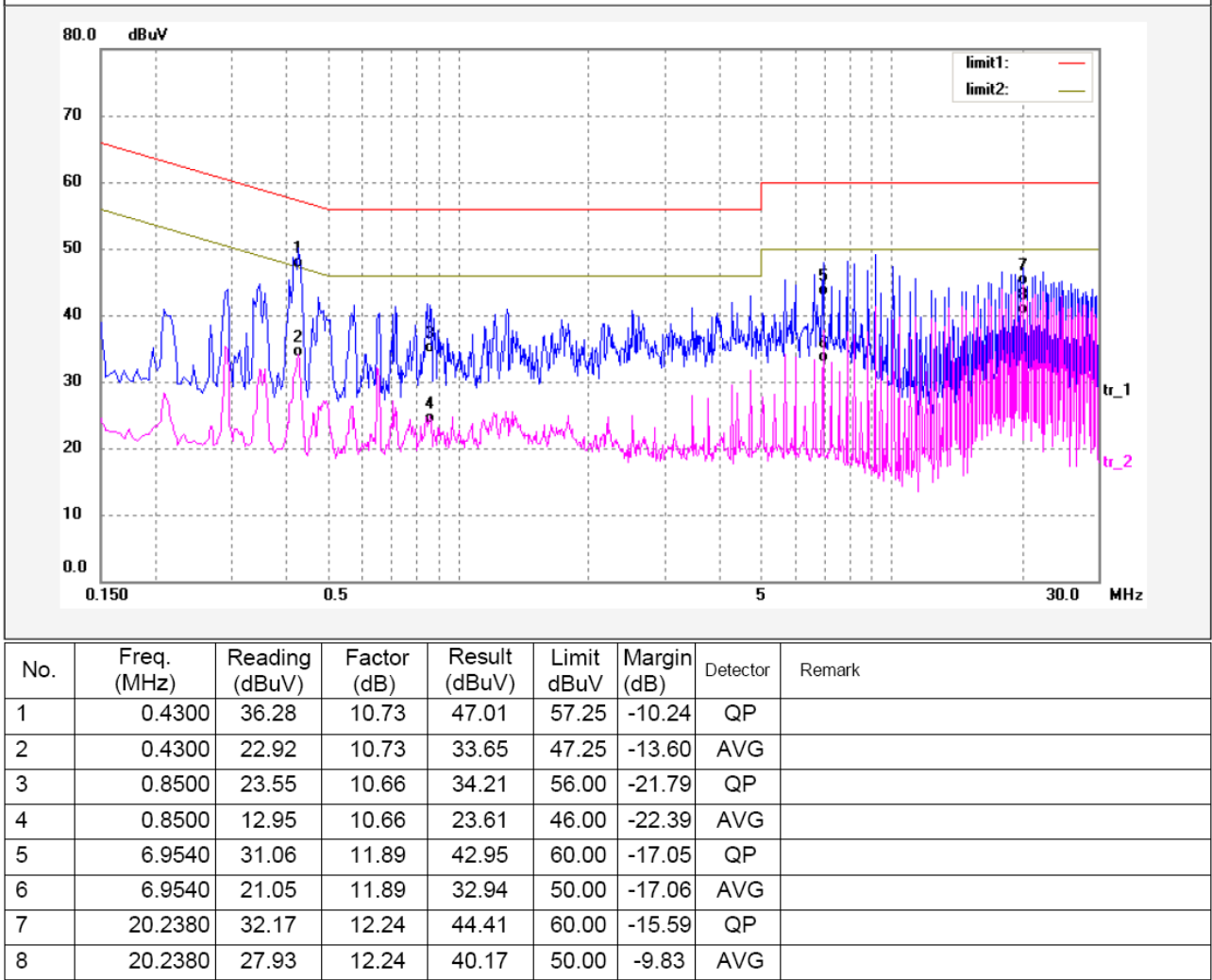
Note: In the above limits, the tighter limit applies at the band edges.

6.6 Conducted Emission Test Data

Live line



Nentual line



6.7 Conducted Emission Test Setup View



7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.249
Test Method:	Based on ANSI 63.4:2003
Test Date:	May.13,2009
Frequency Range:	30MHz to 10GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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.

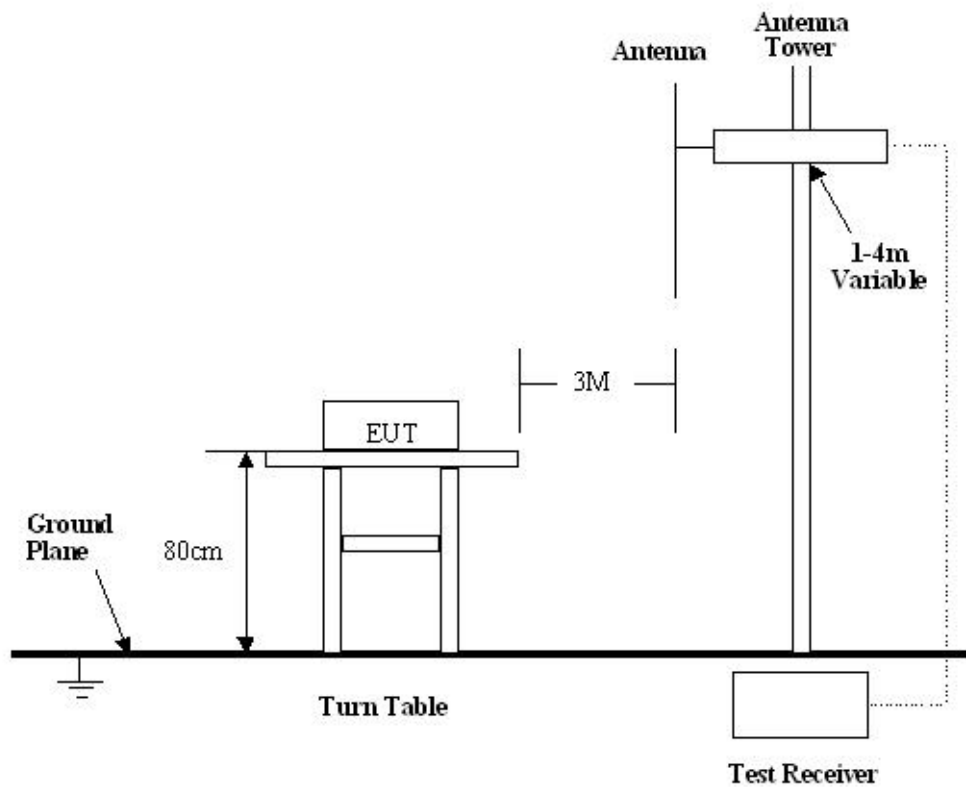
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +/-5.03 dB.

7.3 Test Procedure

1. the adapter was used in the equipment under test for radiated emissions test.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak and average detection mode.
4. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.249 limits.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.249 Rules, the system was tested to 10000 MHz.
Below 1GHz

Start Frequency30 MHz
Stop Frequency1000 MHz
Sweep Speed Auto
IF Bandwidth.....120 kHz
Video Bandwidth100KHz
Quasi-Peak Adapter Bandwidth120 kHz
Quasi-Peak Adapter Mode.....Normal
Resolution Bandwidth100KHz

Above 1GHz

Start Frequency	1000 MHz
Stop Frequency	10000MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth	1MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth	1MHz

7.6 Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor – Amplifier Gain

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

7.7 Summary of Test Results

According to the data in section 7.11, the EUT complied with the FCC Part15 Paragraph 15.249 standards.

7.8 EUT Operating Condition

The same as section 6.4 of this report.
Let the EUT work in test mode and test it.

7.9 Radiated Emissions Limit

A. FCC Part 15 subpart C Paragraph 15.249 Limit

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25GHz	250	108	2500	68

- Note:** (1) $\text{RF Voltage(dBuV)} = 20 \log \text{RF Voltage(uV)}$
- (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- (4) Above 1GHz, do a Peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to Part 15.35(b) and average is 54BuV/m.

B. Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:** (1) $\text{RF Voltage(dBuV)} = 20 \log_{10} \text{RF Voltage(uV)}$
- (2) In the Above Table, the tighter limit applies at the band edges.
- (3) Distance refers to the distance in meters between the measuring instrument antenna.

7.10 Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding
The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stated in terms of dB. The gain of the presselector was accounted
For in the spectrum analyzer meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

7.11 Radiated Emission Data

A. Test Item: Radiated Emission Data
Test Voltage: Input 3.7V DC
Test Mode: TX On
Temperature: 24 °C
Humidity: 52%RH
Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor
were detected.

And the below is the Fundamental and Harmonic .

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
908.42	AV	Vertical	86.68	94.00	7.32	1.2	100
1816.84	AV	Vertical	38.00	54.00	16.00	1.2	100
2725.26	AV	Vertical	33.01	54.00	20.99	1.8	60
3633.68	AV	Vertical	31.21	54.00	22.79	1.5	120
4542.10	AV	Vertical	31.12	54.00	22.88	1.5	120
5450.52	AV	Vertical	30.24	54.00	23.76	1.2	90
6358.54	AV	Vertical	30.28	54.00	23.72	1.8	10
7267.36	AV	Vertical	29.99	54.00	24.01	1.8	120
8175.78	AV	Vertical	30.59	54.00	23.41	1.5	100
9084.20	AV	Vertical	29.89	54.00	24.11	1.2	135
908.42	AV	Horizontal	87.58	94.00	6.42	1.4	100

1816.84	AV	Horizontal	40.25	54.00	13.75	1.6	10
2725.26	AV	Horizontal	34.02	54.00	19.98	1.8	60
3633.68	AV	Horizontal	32.03	54.00	21.97	1.0	40
4542.10	AV	Horizontal	34.21	54.00	19.79	1.8	135
5450.52	AV	Horizontal	30.36	54.00	23.64	1.0	60
6358.54	AV	Horizontal	30.74	54.00	23.26	1.8	0
7267.36	AV	Horizontal	31.22	54.00	22.78	1.5	90
8175.78	AV	Horizontal	31.53	54.00	22.47	1.5	60
9084.20	AV	Horizontal	32.75	54.00	21.25	1.0	0
908.42	PK	Vertical	95.58	114.00	18.42	1.2	0
1816.84	PK	Vertical	46.00	74.00	28.00	1.1	10
2725.26	PK	Vertical	38.01	74.00	35.99	1.4	120
3633.68	PK	Vertical	37.42	74.00	36.58	1.7	120
4542.10	PK	Vertical	35.63	74.00	38.37	1.0	180
5450.52	PK	Vertical	36.22	74.00	37.78	1.5	0
6358.54	PK	Vertical	35.89	74.00	38.11	1.0	120
7267.36	PK	Vertical	38.67	74.00	35.33	1.8	0
8175.78	PK	Vertical	38.78	74.00	35.22	1.5	0
9084.20	PK	Vertical	33.02	74.00	40.98	1.2	50
908.42	PK	Horizontal	93.24	114.00	20.76	1.3	0
1816.84	PK	Horizontal	41.26	74.00	32.74	1.2	40
2725.26	PK	Horizontal	36.25	74.00	33.75	1.5	100
3633.68	PK	Horizontal	37.33	74.00	36.67	1.0	90
4542.10	PK	Horizontal	33.19	74.00	40.81	1.0	60
5450.52	PK	Horizontal	33.62	74.00	40.38	1.5	60
6358.54	PK	Horizontal	30.73	74.00	43.27	1.8	110
7267.36	PK	Horizontal	33.57	74.00	40.43	1.8	180
8175.78	PK	Horizontal	34.00	74.00	40.00	1.8	0
9084.20	PK	Horizontal	35.81	74.00	38.19	1.0	20
908.42	PK	Horizontal	93.98	114.00	20.02	1.0	120
1816.84	PK	Horizontal	40.25	74.00	33.75	1.1	10
2725.26	PK	Horizontal	38.64	74.00	35.36	1.5	90
3633.68	PK	Horizontal	35.30	74.00	38.70	1.6	50
4542.10	PK	Horizontal	35.52	74.00	38.48	1.6	45

5450.52	PK	Horizontal	35.26	74.00	38.74	1.5	60
6358.54	PK	Horizontal	36.41	74.00	37.59	1.8	10
7267.36	PK	Horizontal	39.25	74.00	34.75	1.8	150
8175.78	PK	Horizontal	31.11	74.00	42.89	1.0	10
9084.20	PK	Horizontal	29.41	74.00	44.59	1.0	10

8 20-dB Bandwidth

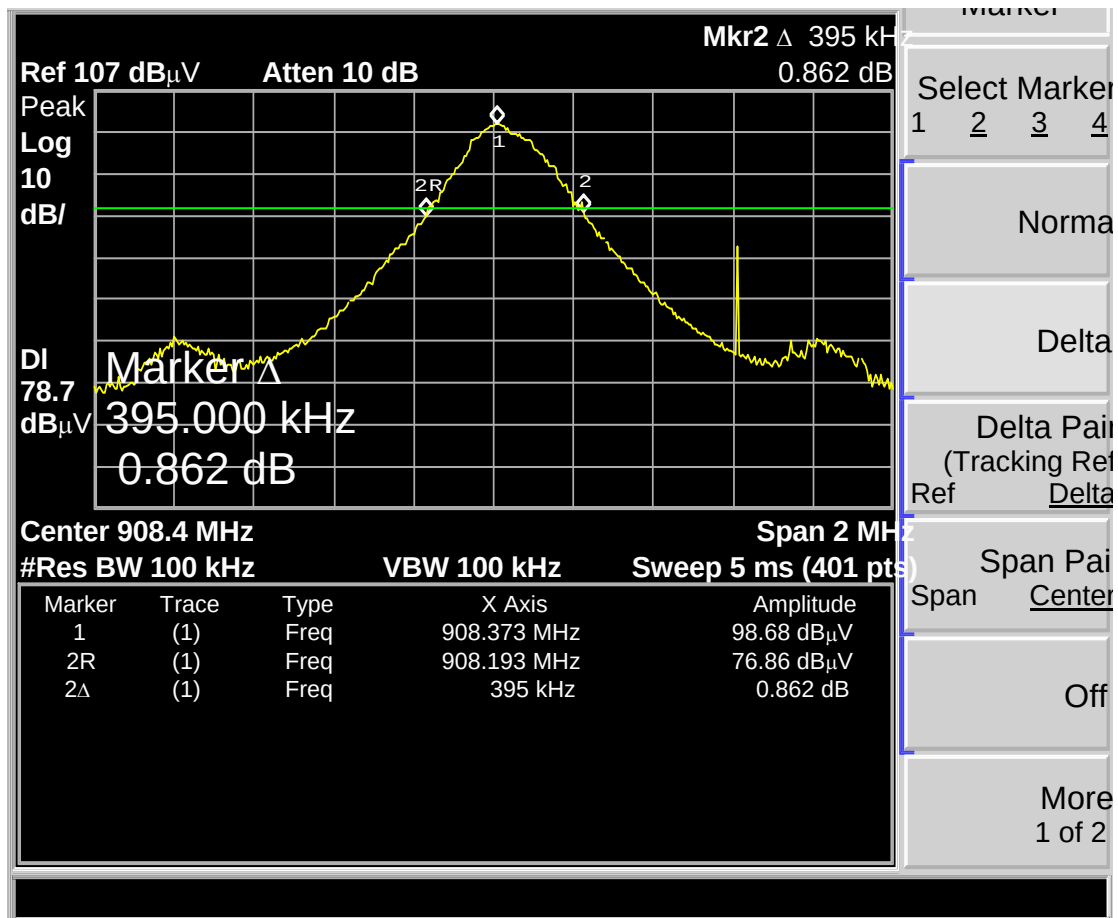
Test Requirement: FCC Part15 C
 Test Method: Based on FCC Part15 Paragraph 15.249
 Test Date: May 13,2009
 Test mode: The EUT work in test mode(Tx) and test it

Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

Test Result

Please refer the graph as below:



9 Radiated spurious emissions into adjacent restricted band

Test Requirement: FCC Part15 Paragraph 15.205
Test Method: Based on FCC Part 15 Paragraph 15.249
Test Date: May 13,2009
Requirements: The EUT work in test mode(Tx) and test it

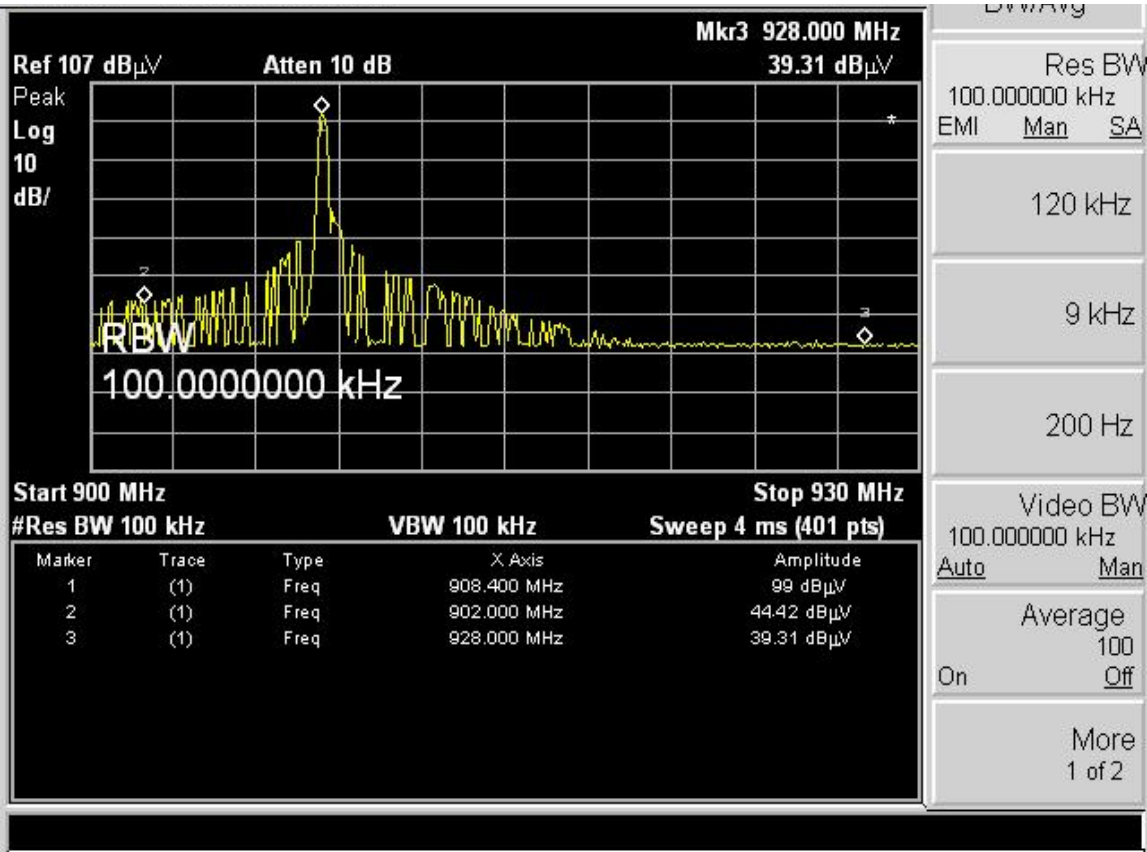
Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

Test procedure:

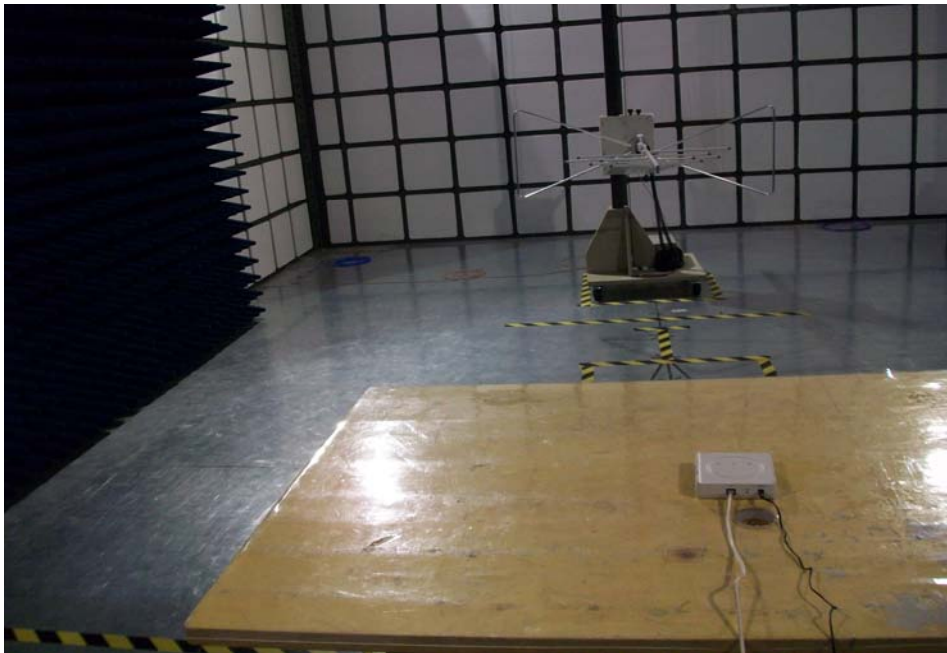
An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

restricted band

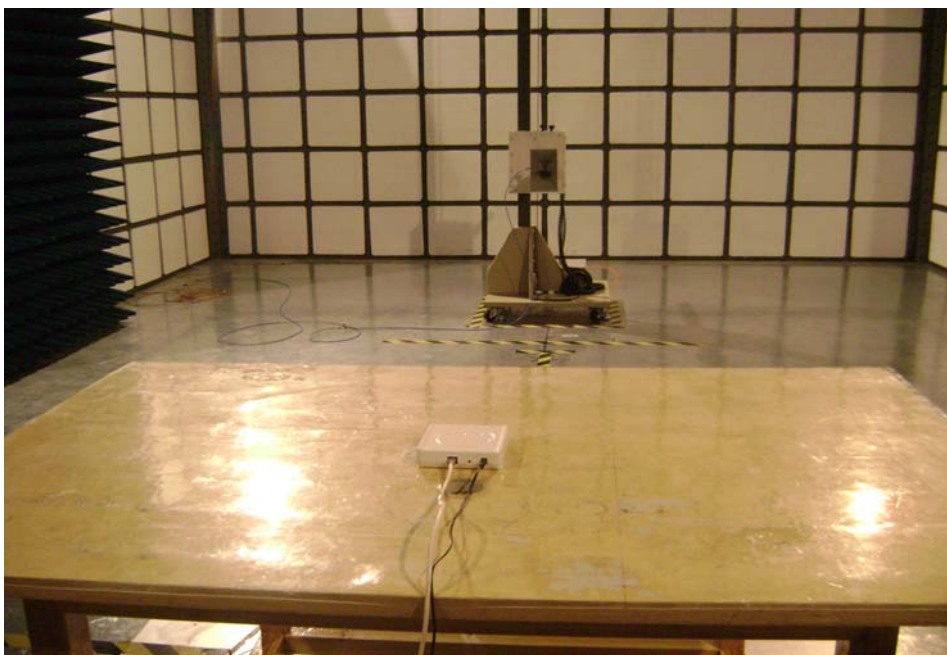


10 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz

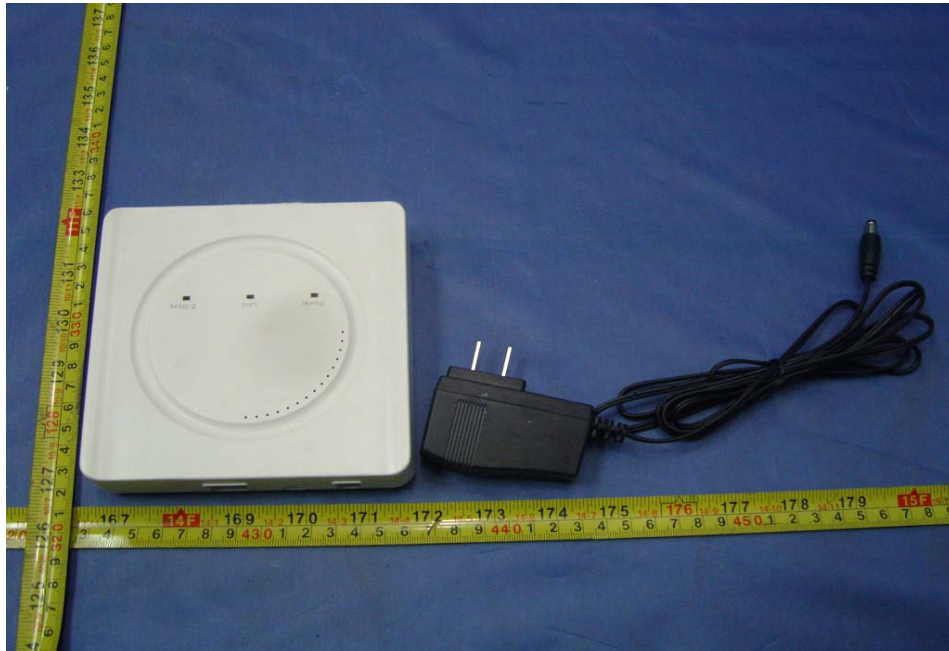


Radiation Emission Test View For 1GHz-10GHz



11 Photographs - Constructional Details

11.1 EUT - Component View



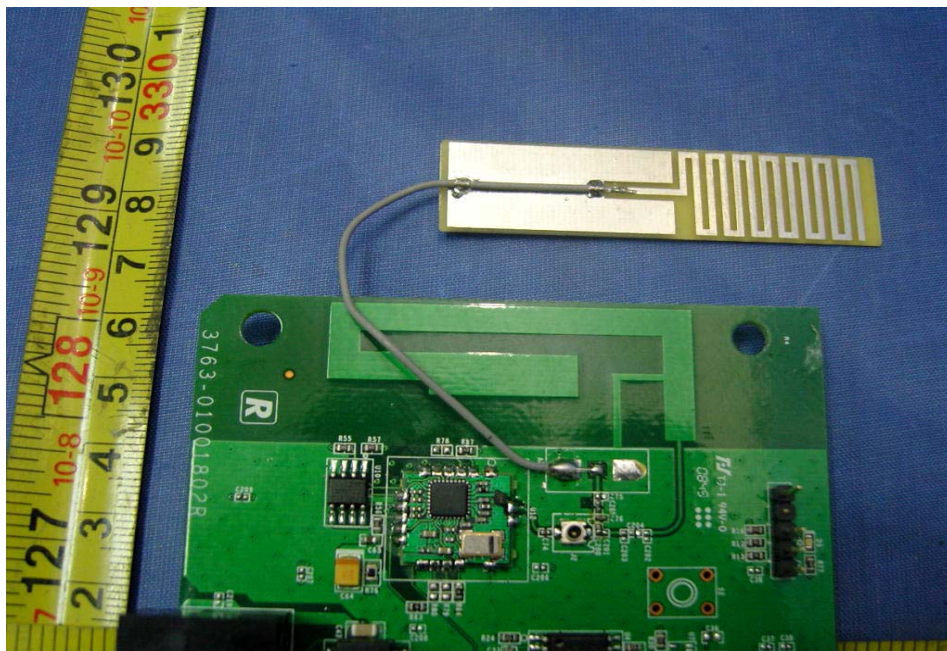
11.2 EUT - Front View



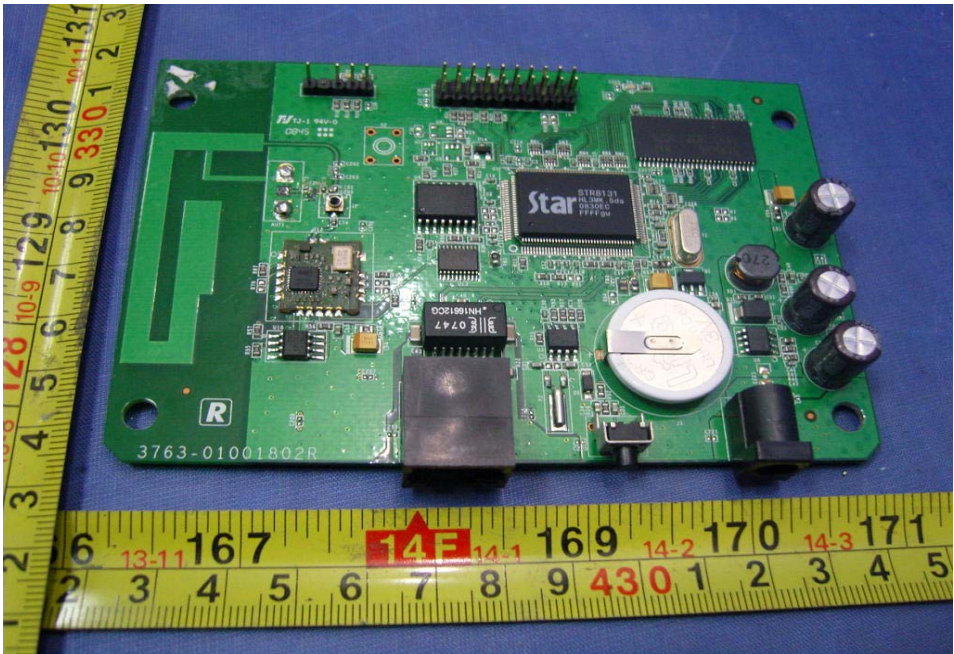
11.3 EUT - Back View



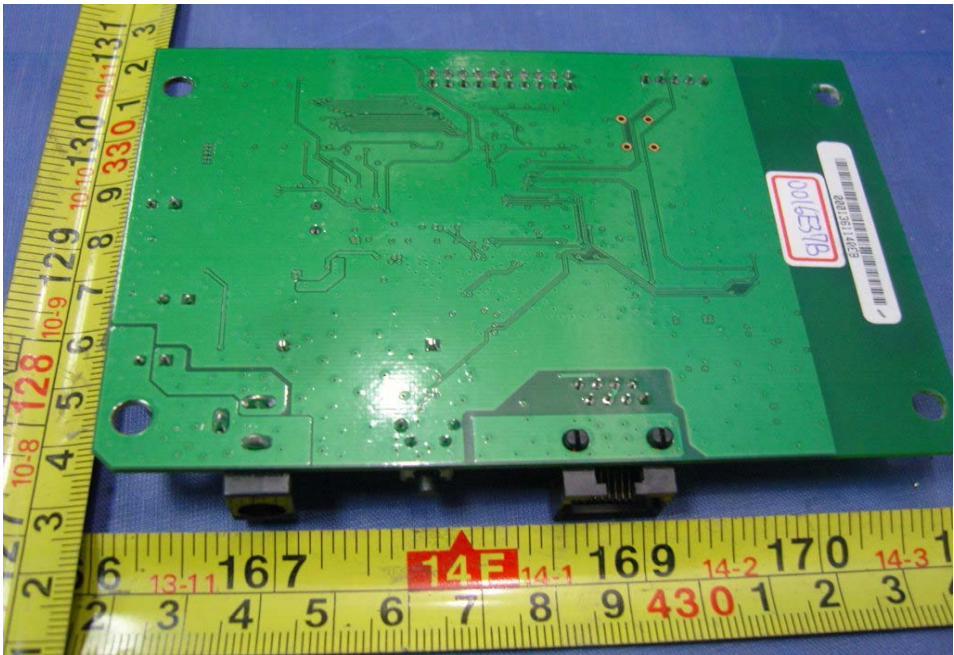
11.4 Antenna View



11.5 PCB - Front View



11.6 PCB - Back View



12 FCC ID Label

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.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT
EUT Bottom View/proposed FCC Mark Location

