TEST REPORT

FCC Part15C

Intentional Radiators equipment

Report	
Report reference No .....:	SCC (08)-472-12
Tested by.....:	Davy Lee
Reviewed by .....:	
Date of issue.....:	Dec 09, 2008
Testing laboratory	
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Client	
Name ..... :	Shanghai Research Institute of Postal Science
Address ..... :	3185 Zhongshan Road (N), Shanghai, P.R.China
Test specification	
Standard..... :	FCC Part15C (15.249)
Test procedure ..... :	Commission test
Procedure deviation ..... :	N.A.
Non-standard test method ..... :	N.A.
Test report form / blank test report	
Test report form No.....:	SCC (08)-472-12
Master TRF.....:	
Copyright blank test report.....:	CHINA CEPREI (SICHUAN) COMPLIANCE LAB

TABLE OF CONTENTS

1. CERTIFICATE OF COMPLIANCE 3

1.1 CLIENT INFORMATION 3
1.2 TEST INFORMATION 3
1.3 TEST SETUP 3
1.4 PRODUCT DETAILS 4
1.5 MODE OF OPERATION 4

2. PROVISIONS APPLICABLE 5

2.1 DEFINITION 5
2.2 REQUIREMENT FOR COMPLIANCE 6
2.3 DESCRIPTION OF TEST MODE 7

3. SITE DESCRIPTION 8

3.1 TEST SITE(S): 1 8
3.2 TEST CONFIGURATIONS (RADIATED EMISSIONS TEST) 9

4. TEST RESULT 10

4.1 CONDUCTED EMISSIONS MEASUREMENT 10
4.1.1 Standard Applicable 10
4.1.2 Test Procedures 10
4.1.3 Test Deviation 11
4.1.4 Result of AC Power Line Conducted Emission Measurement 11
4.2 RADIATED EMISSIONS MEASUREMENT 12
4.2.1 Standard Applicable 12
4.2.2 Measurement Procedure 12
4.2.3 Measuring Instrument Setup 14
4.2.4 Radiated Emission data of RF Portion 14
4.2.5 Radiated Emission data of Other Spurious 16
4.3 FIELD STRENGTH OF FUNDAMENTAL EMISSIONS MEASUREMENT 17
4.3.1 Limit 17
4.3.2 Test Procedures 17
4.3.2 Test Procedures 18
4.4 BAND EDGES MEASUREMENT 19
4.4.1 Standard Applicable 19
4.4.2 Measurement Procedure 19
4.4.3 Test Data 20
4.5 ANTENNA REQUIREMENT 21
4.5.1 Standard Applicable 21
4.5.2 Antenna Construction 21

5. INFORMATION ON THE TESTING EQUIPMENT 22

1. CERTIFICATE OF COMPLIANCE

1.1 Client Information

Company	:	Shanghai Research Institute of Postal Science
Street Address	:	3185 Zhongshan Road (N)
City/State/Zip	:	Shanghai/P.R.China/200122/
Contact	:	Yan Sheng
Telephone	:	+86 21 62970498
Web		N/A

1.2 Test Information

Disclaimer	:	The test results relate only to the items tested.
Purpose of Report	:	To demonstrate the EUT complies with FCC Pt 15.249 requirement for a low power unlicensed device.
Applicable Standard	:	Part 15.249, ANSI C63.4: 2003
Related Report/Approval	:	N/A
Test Environment	:	Temperature: 21ºC; Humidity: 65%

1.3 Test Setup

Test Supporting Equipment	:	Description: N/A Manufactured by: Model or FCC ID: N/A
Software discription	:	The EUT was put in the testing mode by using applicant's software and instruction.
Deviation from the standard(s)	:	No deviation
Modification to the DUT	:	No modification

1.4 Product Details

Product Type	:	MW RFID READER SYSTEM
Radio Type	:	Intentional Transmitter
Product Description	:	A wireless device intended to be used for the real-time location of objects. It transmits wideband pulses which are picked up by a network of base stations, allowing the 3D position of the tag to be found to an accuracy of six inches (15 cm).
FCC ID	:	WYSGC921515
Model Number		RF-3000
Brand Name		N/A
Operating Frequency		2400-2483.5
Modulation		GFSK
Power Output		<0.001W
EUT Power Source		3.3 V Battery (coin type cell)
Test Item		Prototype
Type of Equipment		Portable
Antennas		Printed Antenna

1.5 Mode of operation

The TAG was activated from a fresh 3.0V lithium battery. Only one battery is required for system operation. The EUT was continuously transmitting on low, mid, and high channels and was manipulated in three orthogonal axes. The EUT does not have an antenna port.

2. PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device:

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note: A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For a low-power Radio-frequency Device which is designed to connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies with the band 150 kHz to 30MHz shall not exceed below limits table.

Frequency(MHz)	QP Limit (dBuV)	AV limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dBuV/m	Radiated uV/m
30~88	3	40.0	100
88~216	3	43.5	150
216~960	3	46.0	200
above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters sha11 not exceed the above table.

For intentional radiator device, per §15.249(a), the field strength of emissions shall comply with the following:

Frequency MHz	Distance Meters	Fundamental dBuV/m	Harmonic dBuV/m
902 — 928	3	94	54
2400 — 2483.5	3	94	54
5725 — 5875	3	94	54
24000 — 24250	3	108	68

In accordance with §15.249(d), limits shown in above table are based on average limts for frequencies above 1000MHz, and frequencies below 1000MHz are based on quasi peak. However, the peak field strength of any emission shall not exceed the maximum permitted anverage limits by more than 20dB

(3) Band Edge Emissions

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section §15.209, whichever is the lesser attenuation

(4) Antenna Requirement

For intentional device, according to §15.203, an intentioal radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with device.

2.3 Description of Test Mode

The EUT had been tested under operating Condition.

There are three channels have been tested as following:

Channel	Frequency(MHz)
Lowest	2403
Middle	2435
Highest	2472

3. SITE DESCRIPTION

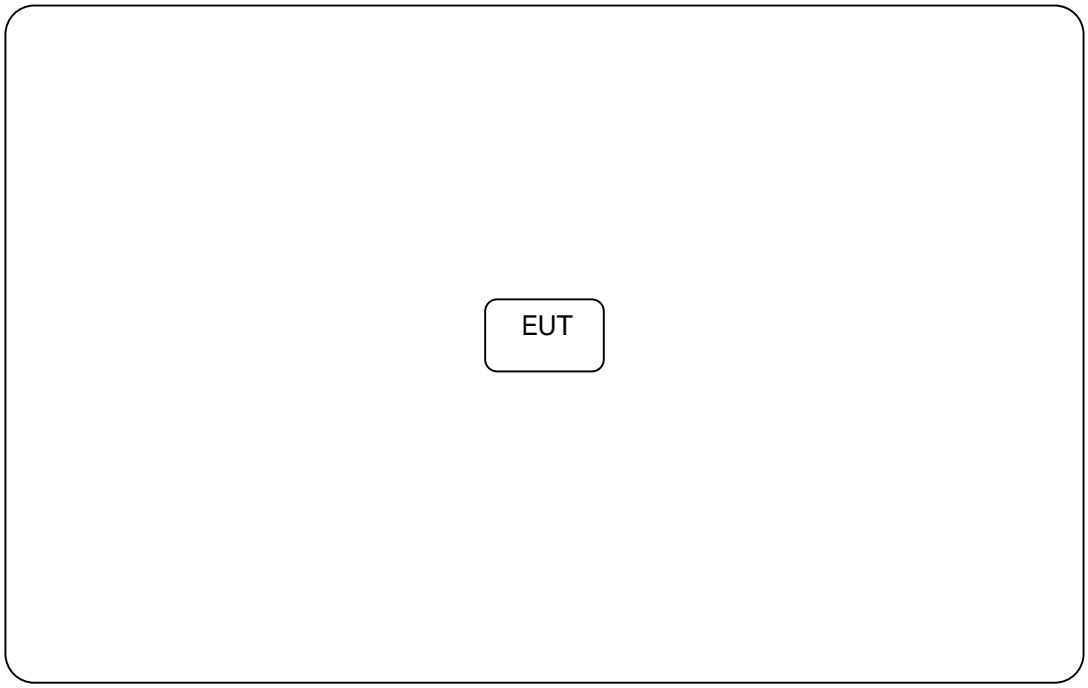
3.1 Test Site(s): 1

The test facility is located at 35, East Mianxing Road Mianyang 621000, Sichuan, China

The FCC site registration number for this site is 547926.

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16/ ANSI 63.4 and the measuring antenna correlates to a balanced dipole.
Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m.
An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.
The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings. The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane.
The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.
Equipment setup for radiated disturbance tests followed the guidelines of CISPR 16 and ANSI 63.4.

3.2 Test Configurations (Radiated Emissions Test)



Figrue 1 : Test Setup

4. TEST RESULT

4.1 Conducted Emissions Measurement

4.1.1 Standard Applicable

For intentional device, Line Conducted Emission Limits are in accordance with to 15.207(a).

4.1.2 Test Procedures

1 .Setup the configuration per figure 2.

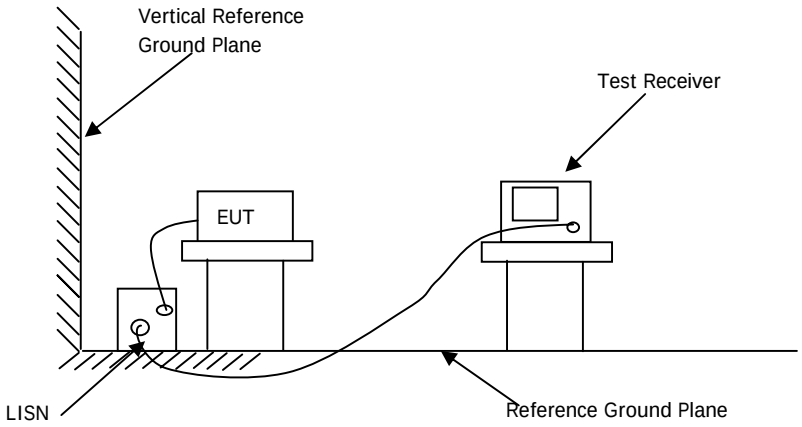
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.

3. Record the 6 or 8 highest emissions relative to the limit.

4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.

5. Confirm the highest three emissions with variation of the EUT cable configuration and record the f nal data.

6. Repeat all above procedures on measuring each operation mode of EUT.



Figrue 2 : Conducted Emission Test Setup

4.1.3 Test Deviation

There is no deviation with the original standard.

4.1.4 Result of AC Power Line Conducted Emission Measurement

The transmitter is battery powered; there is no need to do this testing.

4.2 Radiated Emissions Measurement

4.2.1 Standard Applicable

For intentional radiators, according to 15.249 (a), operation within the frequency band of 2.4 to 2.4835 GHz, the fundamental field strength shall not exceed 94 dBuVlm and the harmonics shall not exceed 54 dBuVlm. For out band emission except for harmonics shall be comply with 15.209 or at least attenuated by 50 dB below the level of the fundamental.

4.2.2 Measurement Procedure

1 .Setup the configuration per figure 3 and 4 for frequencies measured below and above 1 GHz respectively.

2. Far emission frequencies measured below I GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above I GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2, fixed Horn Antenna at 1m height.

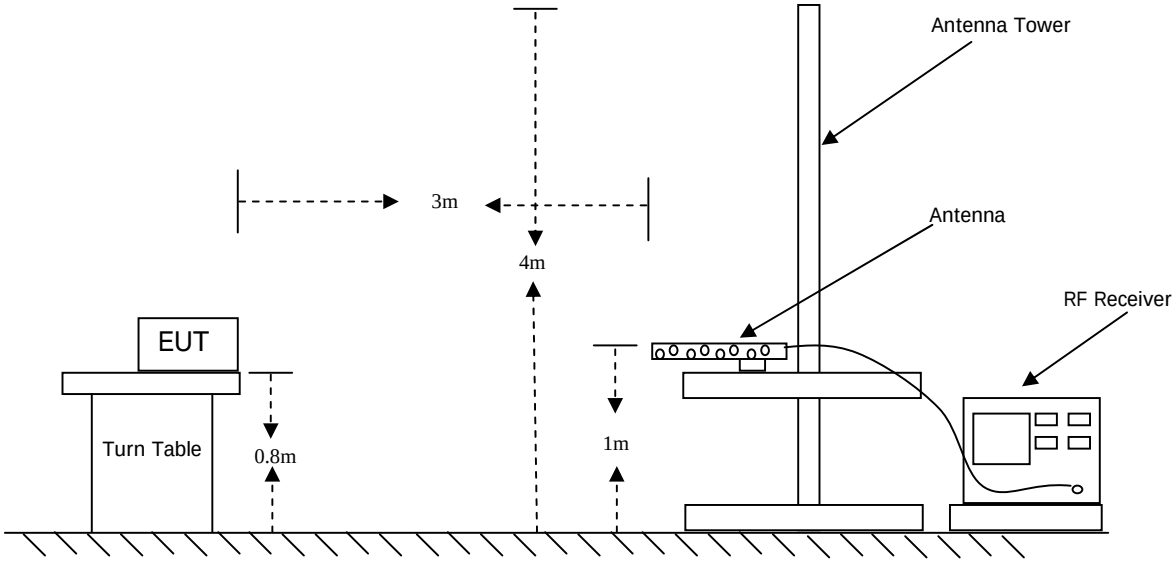
4. The search antenna is to he raised and lowered over a range from1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 to 360 0 with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

Note: A band pass filter was used to avoid pre-amplifier saturated when measure TX operation mode in frequency band above 1 GHz.

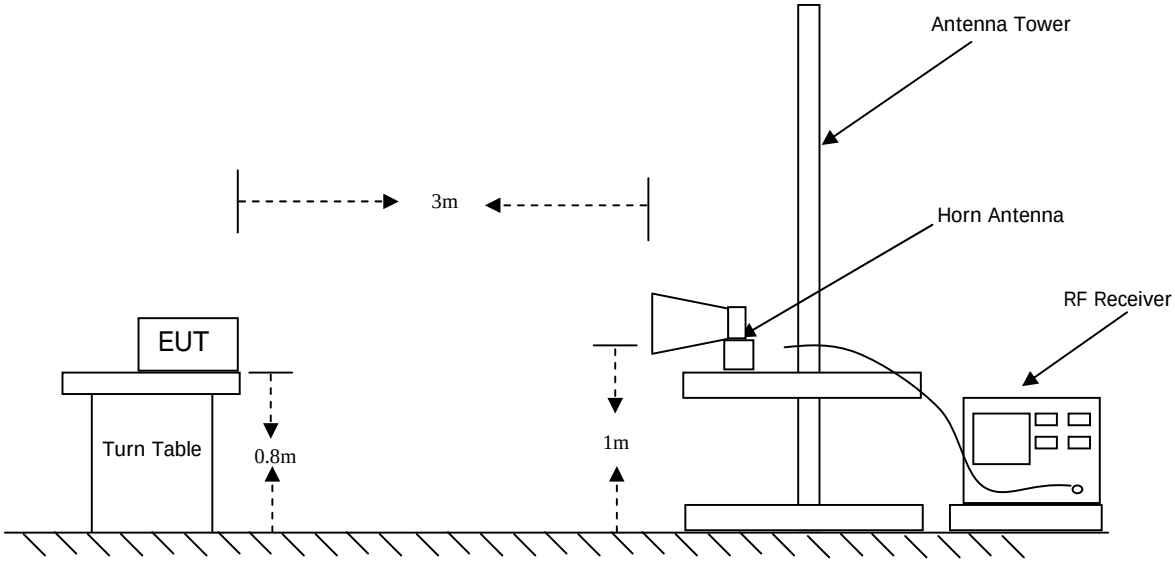
5. Repeat step 4 until alI frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.



Figrue 3 : Radiated Emission below 1GHz Test Setup



Figrue 4 : Radiated Emission Above 1GHz Test Setup

Note: for making exploratory and final measurements, we used a directional double-ridged waveguide antenna to kept the emission within the illumination area of the 3 dB beamwidth, so that the maximum emission from the EUT is measured.

4.2.3 Measuring Instrument Setup

Frequency Band MHz	Instrument	Function	Resolution bandwidth	Video bandwidth
30 to 1000	RF Test Receiver	QP	120 KHz	N/A
	Spectrum Analyzer	Peak	100 KHz	100 KHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	MHz	300Hz

4.2.4 Radiated Emission data of RF Portion

(a) Low Channel

Operation Mode : Transmitting

Fundamental Frequency : 2403 MHz

Test Data : Nov 27, 2008 Temperatrue: 21℃ Humidity: 64%

Freq MHz	Level dBuV/m	Over Limit dB	Read Level dBuV	Limit Line dBuV/m	Cable Loss dB	Antenna Factor dB/m	Preamp Factor dB	Remark	Plolar H/V
7204.000	61.00	-13.00	52.14	74	5.31	35.90	32.35	Peak	V
7204.000	59.74	-14.26	50.88	74	5.31	35.90	32.35	Peak	H
4804.000	58.33	-15.67	53.55	74	4.22	33.10	32.54	peak	H
4804.000	57.56	-16.24	52.98	74	4.22	33.10	32.54	peak	V
4804.000	28.96	-25.04	24.19	54	4.22	33.10	32.54	Average	H
4804.000	28.39	-25.61	23.62	54	4.22	33.10	32.54	Average	V
2718.000	41.55	-32.45	42.39	74	3.01	29.14	32.99	Peak	V
2718.000	40.13	-33.87	40.97	74	3.01	29.14	32.99	Peak	H

(b) Middle Channel

Operation Mode : Transmitting

Fundamental Frequency : 2435 MHz

Test Data : Nov 27, 2008 Temperatrue: 21℃ Humidity: 64%

Freq MHz	Level dBuV/m	Over Limit dB	Read Level dBuV	Limit Line dBuV/m	Cable Loss dB	Antenna Factor dB/m	Preamp Factor dB	Remark	Plolar H/V
7304.000	62.69	-11.31	53.87	74	5.24	36.14	32.56	Peak	V
4872.000	61.38	-12.62	56.48	74	4.25	33.21	32.55	peak	V
4872.000	58.38	-15.62	53.48	74	4.25	33.21	32.55	peak	H
7304.000	57.72	-16.28	48.90	74	5.24	36.14	32.56	Peak	H
4872.000	32.01	-21.99	27.10	54	4.25	33.21	32.55	Average	V
4872.000	29.01	-24.99	24.10	54	4.25	33.21	32.55	Average	H
2718.000	44.68	-29.32	45.52	74	3.01	29.14	32.99	Peak	V
2718.000	42.67	-31.33	43.51	74	3.01	29.14	32.99	Peak	H

(C) Hight Channel

Operation Mode : Transmitting

Fundamental Frequency : 2472 MHz

Test Data : Nov 27, 2008 Temperatrue: 21℃ Humidity: 64%

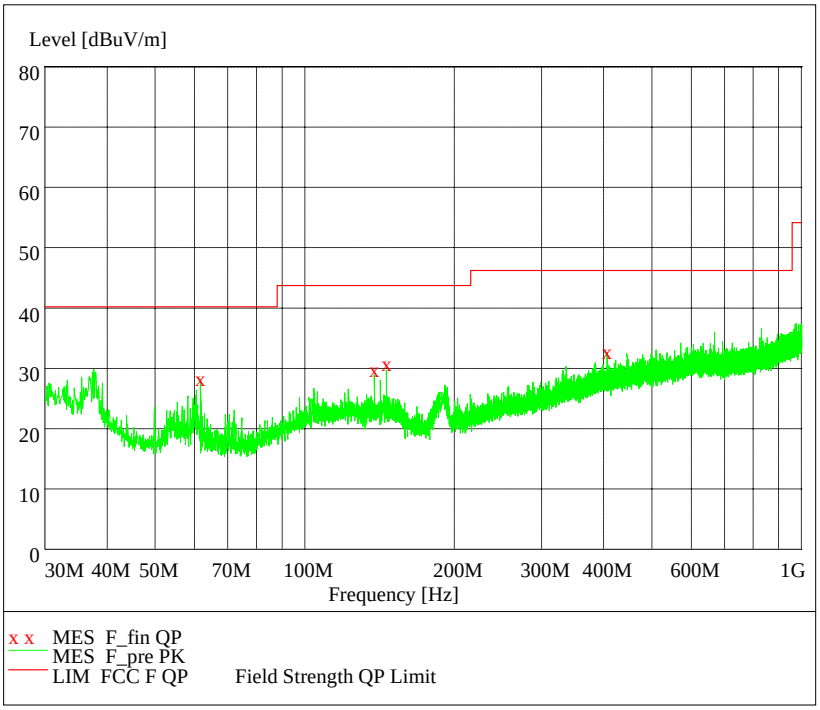
Freq MHz	Level dBuV/m	Over Limit dB	Read Level dBuV	Limit Line dBuV/m	Cable Loss dB	Antenna Factor dB/m	Preamp Factor dB	Remark	Plolar H/V
4940.000	60.95	-13.05	55.93	74	4.26	33.32	32.56	peak	V
7408.000	59.06	-14.14	51.07	74	5.16	36.39	32.76	Peak	V
7408.000	59.11	-14.89	50.32	74	5.16	36.39	32.76	Peak	H
4940.000	57.45	-16.55	52.43	74	4.26	33.32	32.56	peak	H
4940.000	31.56	-22.42	26.56	54	4.26	33.32	32.56	Average	V
4940.000	28.08	-25.92	23.06	54	4.26	33.32	32.56	Average	H
2718.000	42.48	-31.52	43.32	74	3.01	29.14	32.99	Peak	V
2718.000	41.43	-32.57	42.72	74	3.01	29.14	32.99	Peak	H

4.2.5 Radiated Emission data of Other Spurious

Operation Mode : Transmitting

Test Data : Nov 27, 2008 Temperatrue: 21℃ Humidity: 64%

Freq MHz	Level dBuV/m	Transd dB	Limit Line dBuV/m	Over Limit dB	Height cm	Azimuth deg	Ploar H/V
152.062500	30.2	17.00	43.50	-13.3	167.00	90.00	H
409.637500	32.1	23.80	46.00	-13.9	100.00	350.00	V
64.125000	25.8	10.50	40.00	-14.2	143.00	299.00	H
148.45000	28.7	27.30	43.50	-14.8	106.00	44.00	V



4.3 Field Strength of Fundamental Emissions Measurement

4.3.1 Limit

The field strength of emissions within these bands specified at a distance of 3 meters shall comply with the following table.

Frequency Band(MHz)	Fundamental Emissions Average Limit (dBuV/m)
2400-2483.5	94
5725-5875	94

4.3.2 Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For Fundamental emissions, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

4.3.2 Test Data

Freq MHz	Level dBuV/m	Over Limit dB	Read Level dBuV	Limit Line dBuV/m	Cable Loss dB	Antenna Factor dB/m	Remark	Plolar H/V
2403.000	96.32	-18.32	65.26	114	2.82	28.24	peak	V
2403.000	68.68	-25.32	57.62	94	2.82	28.24	average	V
2472.000	97.04	-16.96	65.86	114	2.84	28.34	peak	V
2435.000	87.64	-26.36	56.54	114	2.81	28.29	peak	V
2472.000	65.26	-28.74	34.08	94	2.84	28.34	average	V
2435.000	55.42	-38.58	24.32	94	2.81	28.29	average	V

4.4 Band Edges Measurement

4.4.1 Standard Applicable

According to 15.249(c), out band emission except for harnnonics shall be comply withg 15.209 or at least attenuated by 50 dB below the level of the fundamental.

4.4.2 Measurement Procedure

1 .Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

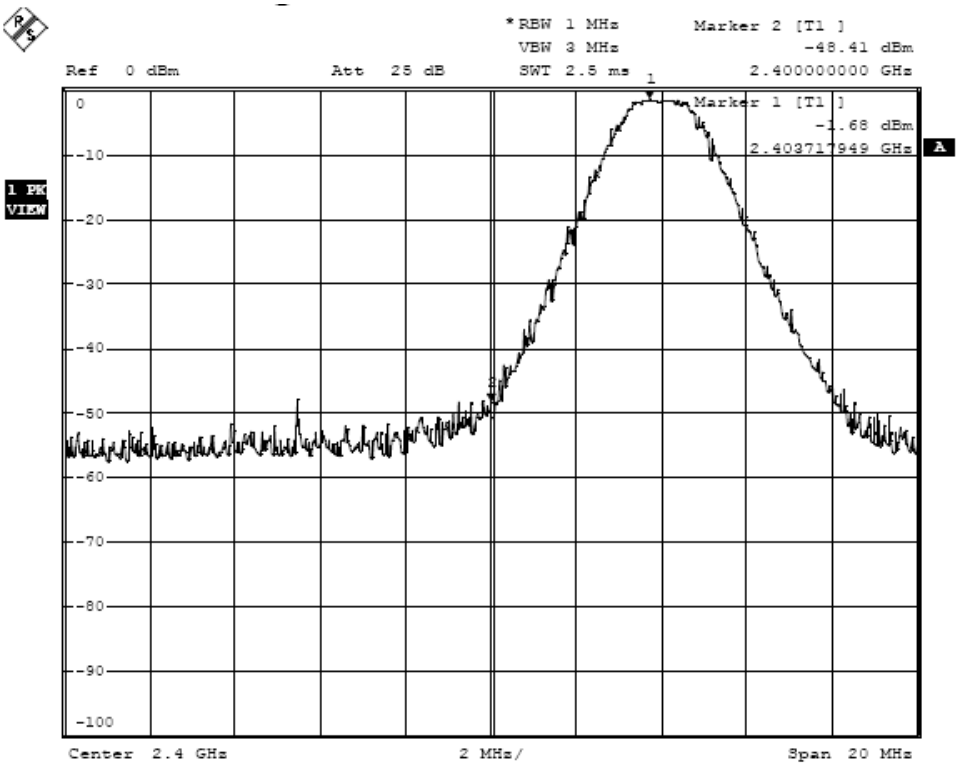
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

3. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

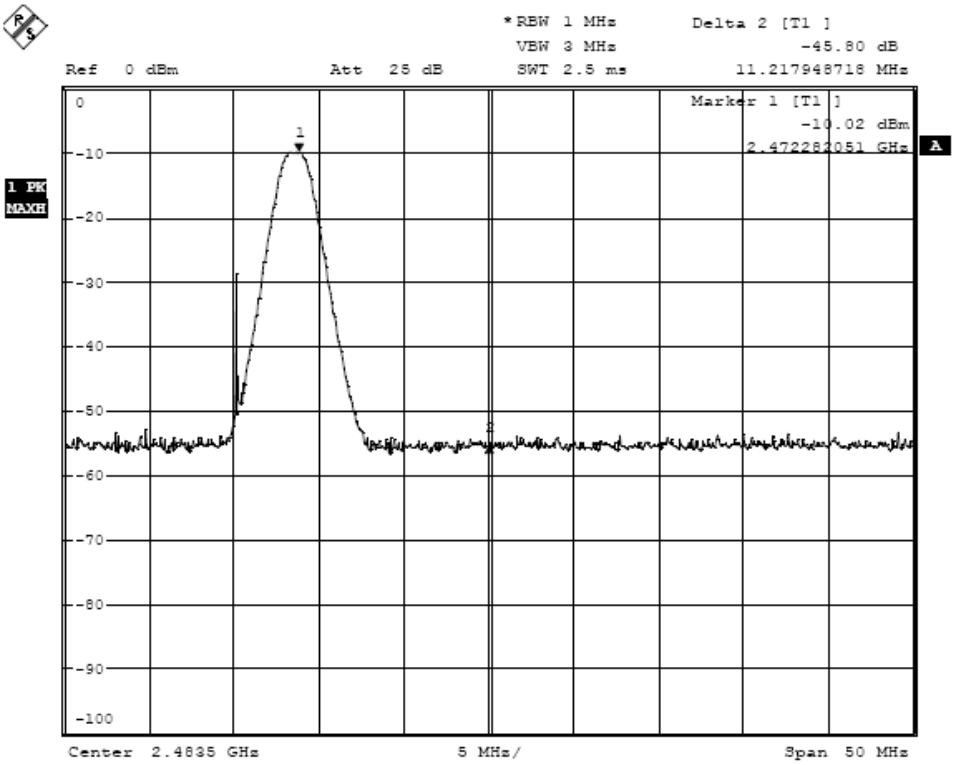
4. Repeat above procedures until all measured frequencies were complete.

4.4.3 Test Data

Lower Band Edge:



Upper Band Edge



4.5 Antenna Requirement

4.5.1 Standard Applicable

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.

4.5.2 Antenna Construction

The antenna is permanently printed on PCB, no consideration of replacement.

5. INFORMATION ON THE TESTING EQUIPMENT

Manufacturer	Description	Model	Serial Number	Cal. Due Date
USA/AR	Sensor	PF4000	08-03-01-0001	10/Oct/09
USA/AR	Transmit-antenna	N/S	18-03-01-0001	10/Oct/09
BONN	Power Amplifier	BLWA0810-160/50D	10-32-02-0001	10/Oct/09
R/S	Power Meter	NRVD	10-31-01-0001	10/Oct/09
EM TEST	RF Generator	CWS550	15-31-14-0001	08/Oct/09
R/S	Signal Generator	SMY01	15-21-16-0002	08/May/09
R/S	Audio Generator	808G	15-01-12-1	08/May/09
R/S	Milli-voltage Meter	URV5	02-21-13-0001	10/May/09
SCHAFFNER	Audio Analyzer	UPA	15-91-04-0001	10/Oct/09
R/S	Spectrum Analyzer	FSP	13-31-14-0001	08/May/09
R/S	EMI Receiver	ESCS30	08-31-01-0001	09/May/09
R/S	AMN	ESH2-Z5	17-72-01-0001	08/May/09
R/S	AMN	ESH3-Z5	17-72-02-0001	08/May/09
SCHAFFNER	Antenna	GBL6112B	/	08/May/09
EMCO	Horn Antenna	3115	/	08/May/09
Electro-Metrics	Horn 18 – 26.5 GHz	SH-50/60-1	/	08/May/09