

FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

Shanghai Zenkore Electronic Technology Co., Ltd.

Contactless Reader System

Model No.: ZMR100-ZMT120

Prepared for	:	Shanghai Zenkore Electronic Technology Co., Ltd.
Address	:	General Building, No.89, Youdong Road, Xinzhuang Industrial Park, Shanghai, China
Prepared by	:	SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
Address	:	Xingyuan Industrial Park, Tongda Road, Bao' an Blvd, Bao' an District, Shenzhen, Guangdong, China
Report Number	:	LCS1111042907F
Number of tested samples	:	1
Date of Test	:	November 04,2011 - November 23,2011
Date of Report	:	November 23,2011

TEST REPORT
FCC CFR 47 PART 15 C(15.249)

Report Reference No. : LCS1111042907F

Date of issue : November 23, 2011

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address : Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an District, Shenzhen, Guangdong, China

Testing location/ procedure : Full application of Harmonised standards Partial application of Harmonised standards
Other standard testing method

Applicant's name..... : Shanghai Zenkore Electronic Technology Co., Ltd.

Address : General Building, No.89, Youdong Road, Xinzhuang Industrial Park, Shanghai, China

Test specification

Standard : FCC CFR 47 PART 15 Subpart C: 2011, ANSI C63.4-2009

Test Report Form No. : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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Test item description..... : Contactless Reader System

Trade Mark : N/A

Manufacturer : Shanghai Zenkore Electronic Technology Co., Ltd.

Model/Type reference : ZMR100-ZMT120

Ratings : DC 12V/2405.00-2475.00MHz, MSK

Result : **Positive**

Compiled by:



Bobo Li/ File administrators

Supervised by:



Vito Cao/ Technique principal

Approved by:



Gavin Liang/ Manager

EMC -- TEST REPORT

Test Report No. : LCS1111042907F	<u>November 23, 2011</u> Date of issue
---	---

Type / Model..... : **ZMR100-ZMT120**

EUT..... : **Contactless Reader System**

Applicant..... : Shanghai Zenkore Electronic Technology Co., Ltd.

Address..... : General Building, No.89, Youdong Road, Xinzhuang
Industrial Park, Shanghai, China

Telephone..... : /

Fax..... : /

Contact..... : /

Manufacturer..... : Shanghai Zenkore Electronic Technology Co., Ltd.

Address..... : General Building, No.89, Youdong Road, Xinzhuang
Industrial Park, Shanghai, China

Telephone..... : /

Fax..... : /

Contact..... : /

Factory..... : /

Address..... : /

Telephone..... : /

Fax..... : /

Contact..... : /

Test Result: Positive

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	Contactless Reader System
Model Number	ZMR100-ZMT120
Power Supply	DC 12V
Frequency Range	2405.00 ~ 2475.00 MHz
Modulation Technique	MSK
Modulation Bandwidth	60KHz

1.2. Test Facility

Site

Description

EMC Lab.

: Accredited by CNAS, June 04, 2010

The Certificate Registration Number. is L4595.

Accredited by FCC, July 14, 2011

The Certificate Registration Number. is 899208.

Accredited by Industry Canada, May. 02, 2011

The Certificate Registration Number. is 9642A-1

Name of Firm : SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

Site Location : Xingyuan Industrial Park, Tongda Road, Bao'an Blvd,
Bao'an District, Shenzhen, Guangdong, China

1.3. Measurement Uncertainty

Radiation Uncertainty (30M~1GHz)	: Ur = $\pm 4.26\text{dB}$
Radiation Uncertainty (1G~3GHz)	: Ur = $\pm 2.66\text{dB}$
Radiation Uncertainty (3G~18GHz)	: Ur = $\pm 2.83\text{dB}$
Conduction Uncertainty	: Uc = $\pm 2.61\text{dB}$

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2003, 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.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4

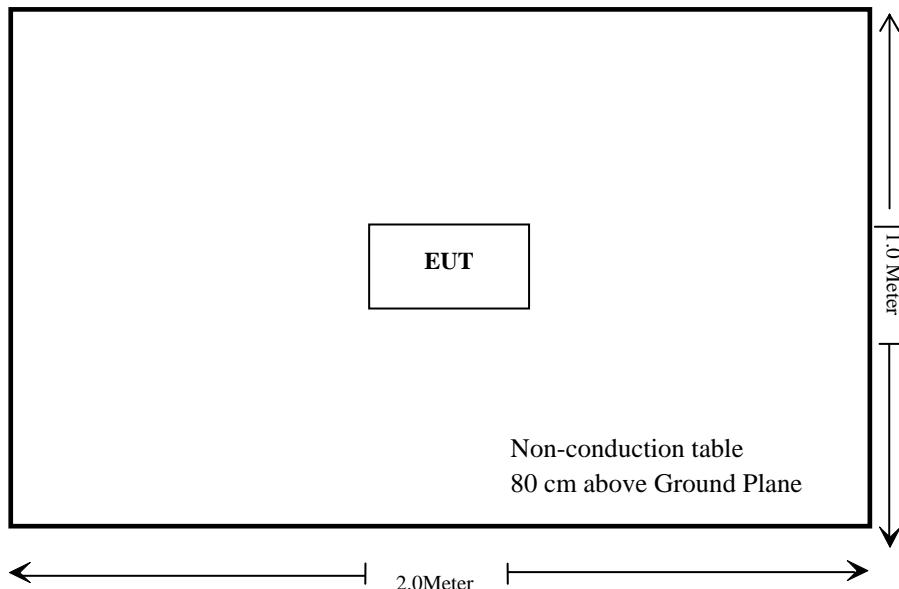
2.4. Description Of Test Modes

The EUT has been tested under operating condition.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

Then, the worst case is MSK (2450MHz) , these were chosen for full testing.

3. CONNECTION DIAGRAM OF TEST SYSTEM



4. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	N/A
§15.205(a)§15.209(a), §15.249(a), §15.249(c)	Radiated Emissions	Compliant*
§15.249(d)	Out of band emissions	Compliant
§15.249	Band Edges emissions	Compliant

* Within the measurement uncertainty

5. §15.203 ANTENNA REQUIREMENT

5.1. Standard Applicable

According to §15.203, Antenna requirement.

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 1.5dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

Result: Compliance.

6. §15.205 §15.209(A) §15.249(A) §15.249(C) - RADIATED EMISSIONS

6.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1000KHz / 1000KHz for peak

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

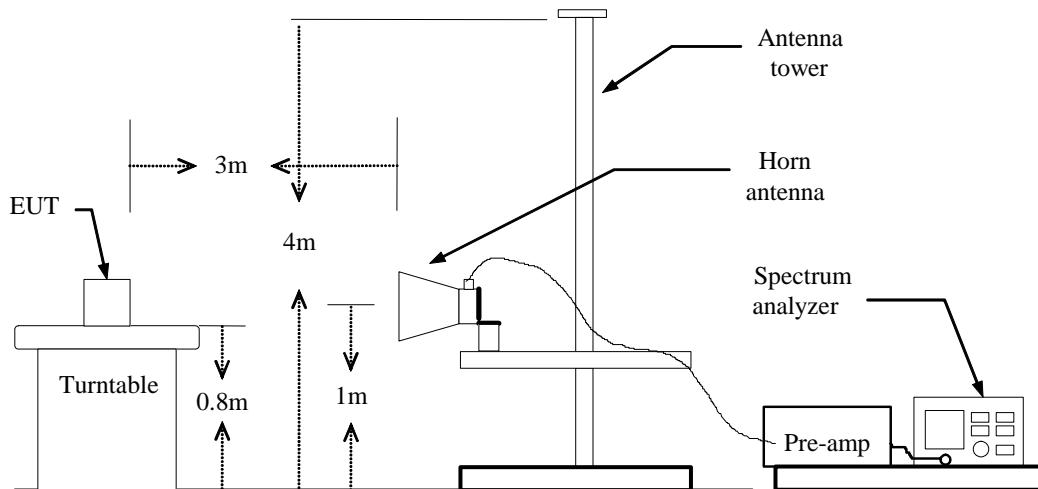
6.3. Test Procedures

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. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. 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.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

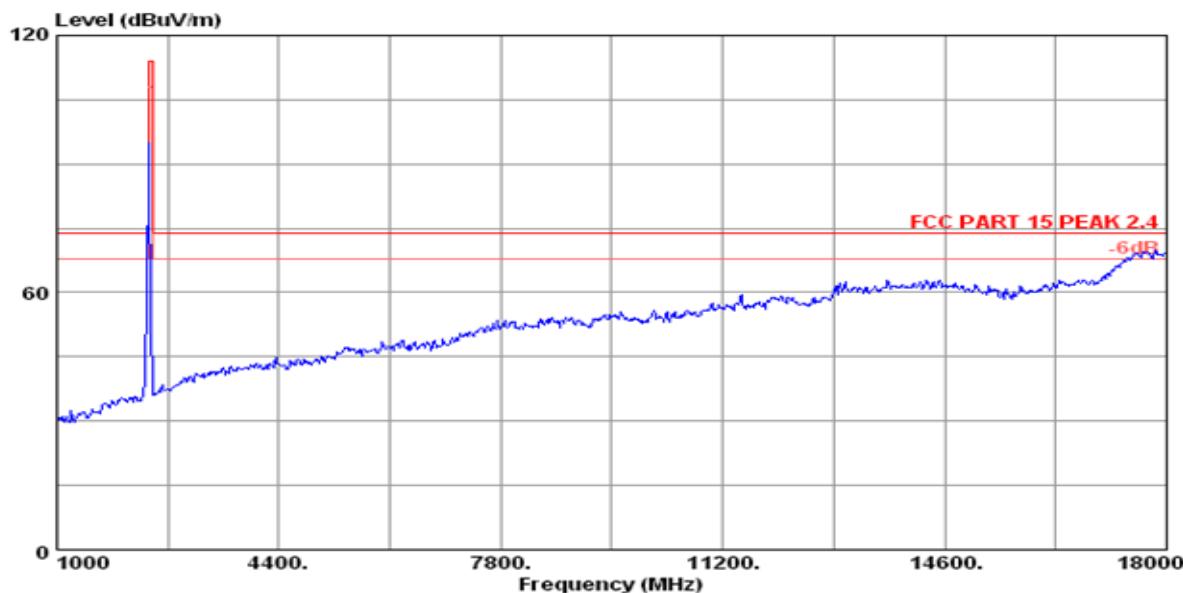
6.4. Test Equipment List and Details

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2011/06
2	Amp	HP	8449B	3008A00863	2011/06
3	Log per Antenna	ROHDE & SCHWARZ	VULB9163	9163-470	2011/06
4	Amplifier	SCHWARZBECK	PAP-0001	21002	2011/06
5	Antenna	EMCO	3115	9607-4877	2011/06
6	Spectrum	Agilent	E4407B	MY41440292	2011/06

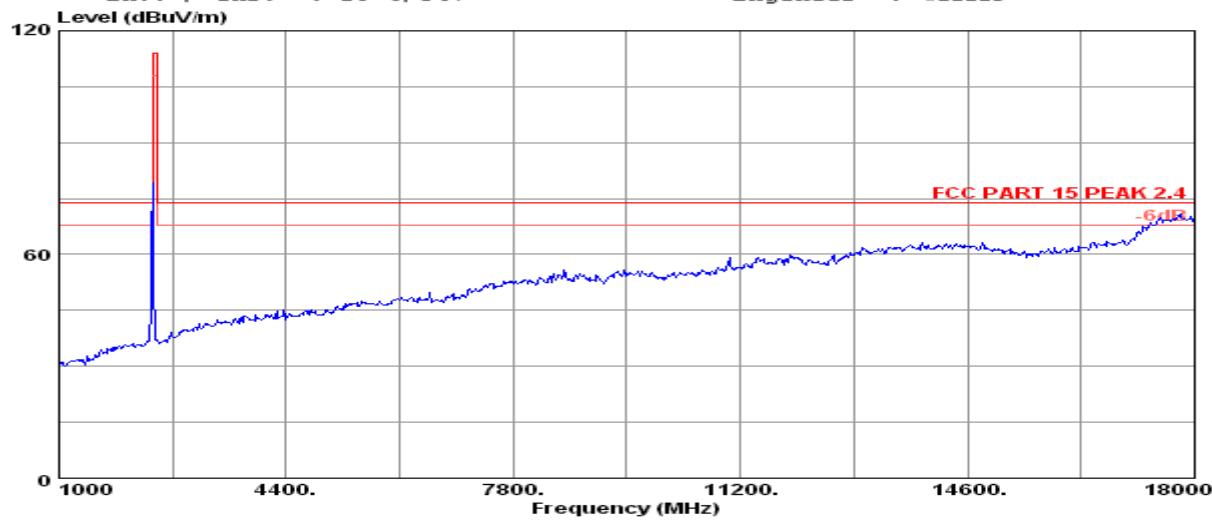
6.5. Test Setup



6.6. Test Data

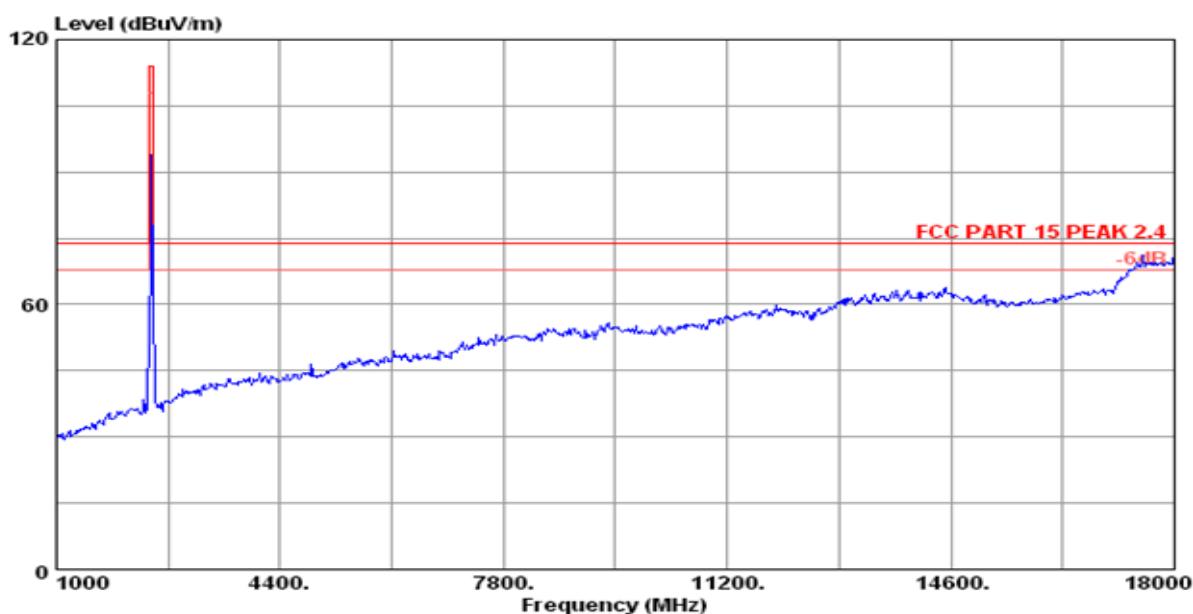


Site no. : RF Chamber Data no. : 1
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis

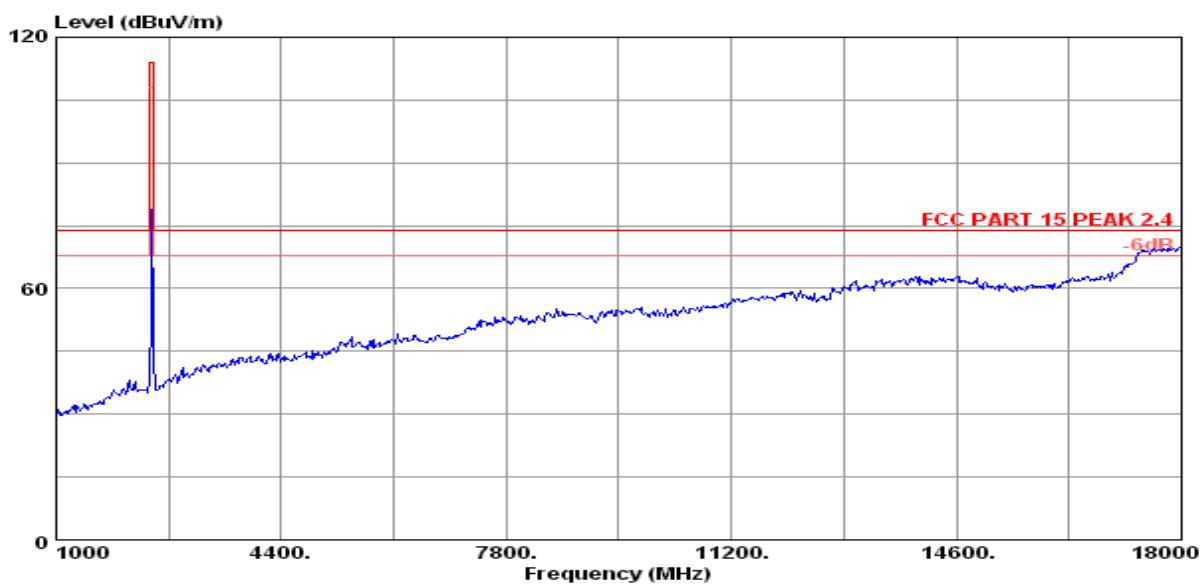


Site no. : RF Chamber Data no. : 3
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : VERTICAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis

Freq. (MHz)	Level (dBuV/m)	Read Level (dBuV)	Ant. Fac (dB/m)	Pre. Fac (dB)	Cab.Los (dB)	Over limit (dB)	Limits		Remark	Pol/Phase
							(dBuV/m)	Peak		
2405.00	94.19	93.76	29.49	36.60	7.54	-19.81	114.00	Peak	Horizontal	
2405.00	91.30	90.87	29.49	36.60	7.54	-3.13	94.00	Average	Horizontal	
2405.00	86.72	86.29	29.49	36.60	7.54	-27.28	114.00	Peak	Vertical	
2405.00	84.99	85.42	29.49	36.60	7.54	-9.01	94.00	Average	Vertical	
4810.00	58.89	48.54	34.52	34.95	10.78	-15.11	74.00	Peak	Vertical	
4810.00	40.08	29.73	34.52	34.95	10.78	-13.92	54.00	Average	Vertical	

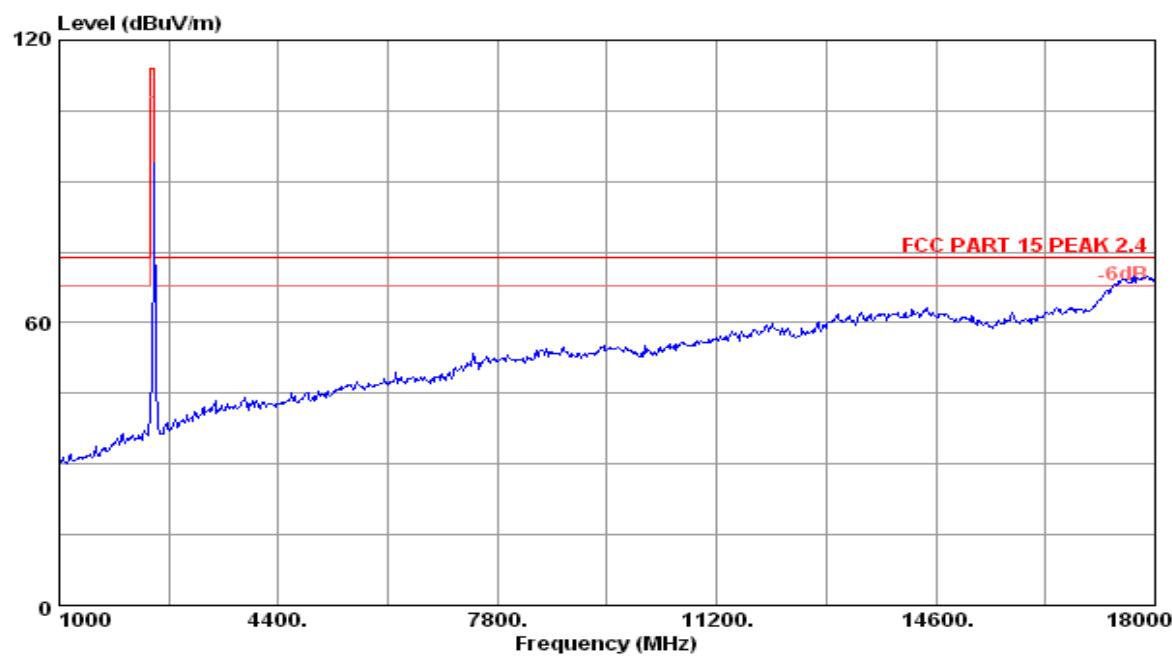


Site no. : RF Chamber Data no. : 5
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis

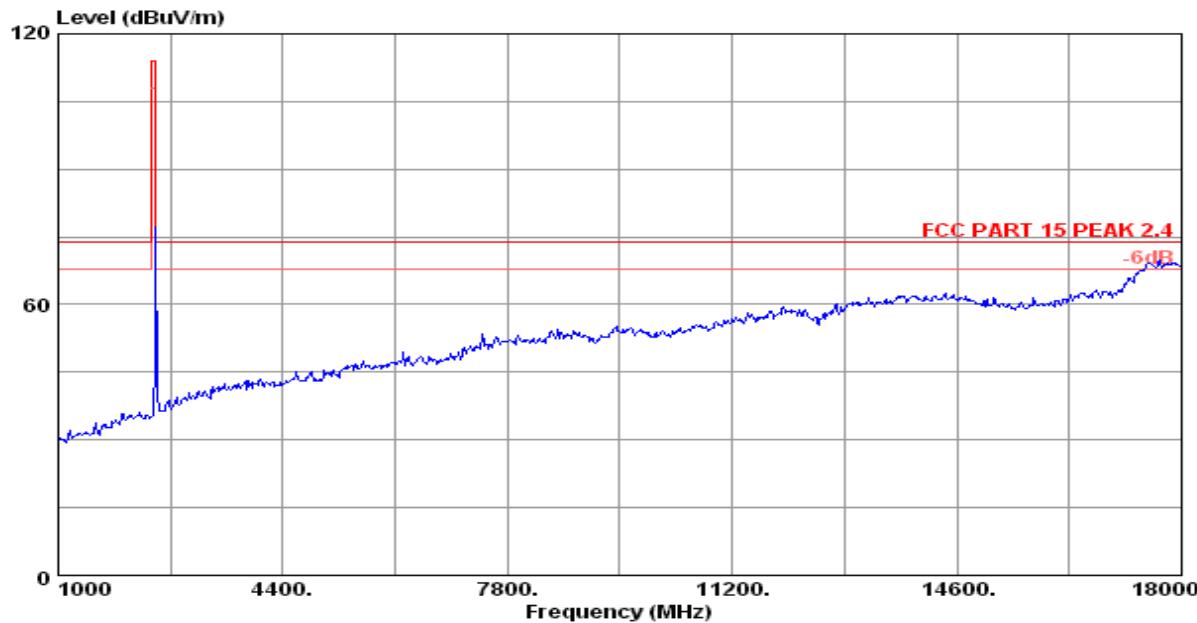


Site no. : RF Chamber Data no. : 7
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : VERTICAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis

Freq. (MHz)	Level (dBuV/ m)	Read Level (dBuV)	Ant. Fac (dB/m)	Pre. Fac (dB)	Cab.Los (dB)	Over limit (dB)	Limits		
							Remark	Pol/Phase	
2450.00	92.80	92.37	29.49	36.60	7.54	-21.20	114.00	Peak	Horizontal
2450.00	89.29	88.86	29.49	36.60	7.54	-5.14	94.00	Average	Horizontal
2450.00	91.26	90.83	29.49	36.60	7.54	-22.74	114.00	Peak	Vertical
2450.00	87.90	87.47	29.49	36.60	7.54	-6.10	94.00	Average	Vertical
4900.00	57.23	46.88	34.52	34.95	10.78	-16.77	74.00	Peak	Vertical
4900.00	37.98	27.63	34.52	34.95	10.78	-16.02	54.00	Average	Vertical



Site no. : RF Chamber Data no. : 11
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis



Site no. : RF Chamber Data no. : 9
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : VERTICAL
 Limit : FCC PART 15 PEAK 2.4
 Env. / Ins. : 23°C/54% Engineer : Willis

Freq. (MHz)	Level (dBuV/m)	Read Level (dBuV)	Ant. Fac (dB/m)	Pre. Fac (dB)	Cab.Los (dB)	Over limit (dB)	Limits (dBuV/m)	Remark	Pol/Phase
2475.00	87.60	91.52	25.10	36.70	7.68	-26.40	114.00	Peak	Horizontal
2475.00	86.05	89.97	25.10	36.70	7.68	-7.95	94.00	Average	Horizontal
2475.00	86.42	82.50	25.10	36.70	7.68	-27.58	114.00	Peak	Vertical
2475.00	84.83	80.91	25.10	36.70	7.68	-9.17	94.00	Average	Vertical
4950.00	55.23	44.81	34.63	35.02	10.81	-18.77	74.00	Peak	Vertical
4950.00	35.71	25.29	34.63	35.02	10.81	-18.29	54.00	Average	Vertical

7. §15.249(D) – OUT OF BAND EMISSIONS

7.1. Limit

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 §15.209, whichever is the lesser attenuation.

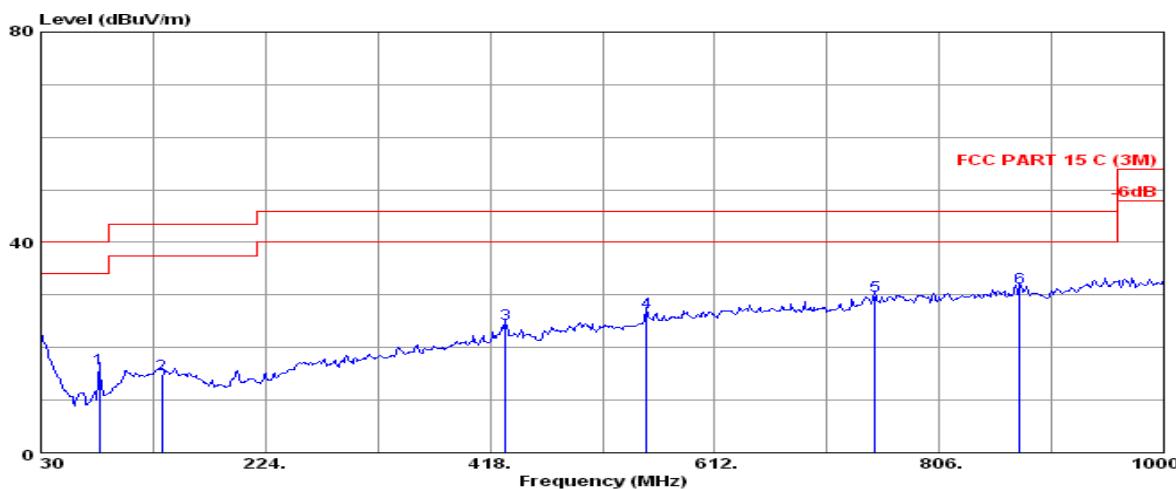
7.2. Test Procedures

- 7.2.1 Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 7.2.2 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.
- 7.2.3 Set the RBW to 1 MHz and VBW of spectrum analyzer to 3 MHz for PK Detector, Set the RBW to 1 MHz and VBW of spectrum analyzer to 10 Hz for AV Detector with a convenient frequency span including the specified frequencies of band edges.
- 7.2.4 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.
- 7.2.5 Repeat above procedures until all measured frequencies were complete.

7.3. Test Equipment List and Details

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2011/06
2	EMI Test Receiver	ROHDE & SCHWARZ	ESPI	1164.6407.03	2011/06
3	Log per Antenna	ROHDE & SCHWARZ	VULB9163	9163-470	2011/06
4	Amplifier	SCHWARZBECK	PAP-0001	21002	2011/06
5	EMI Test Software	AUDIX	E3	N/A	2011/06
6	Amplifier	HP	8449B	3008A00277	2011/06
7	Antenna	EMCO	3115	9607-4877	2011/06

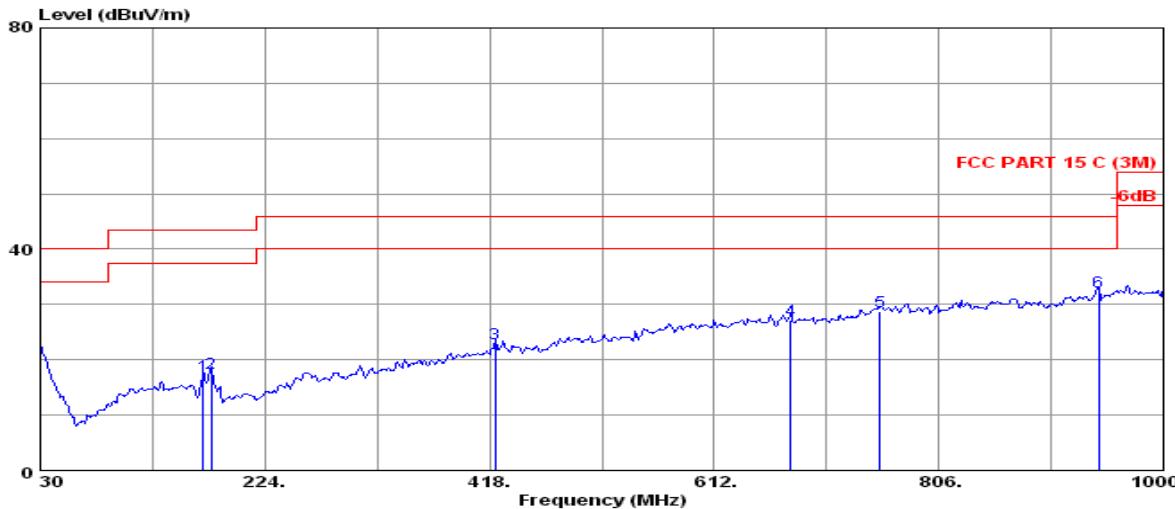
7.4. Test Data



Site no. : 3m Chamber Data no. : 1
 Dis. / Ant. : 3m 2010 CBL6111C Ant. pol. : VERTICAL
 Limit : FCC PART 15 C (3M)
 Env. / Ins. : 24*C/56% Engineer : Willis

No.	Freq. (MHz)	Ant.	Cable	Emission			Margin (dB)	Remark
		Factor (dB/m)	Loss (dB)	Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)		
1	80.440	7.80	0.99	7.28	16.07	40.00	23.93	QP
2	134.760	12.10	1.13	1.77	15.00	43.50	28.50	QP
3	431.580	17.45	3.11	3.84	24.40	46.00	21.60	QP
4	552.830	19.29	3.85	3.60	26.74	46.00	19.26	QP
5	750.710	22.00	4.70	3.11	29.81	46.00	16.19	QP
6	875.840	22.80	5.13	3.43	31.36	46.00	14.64	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 2
 Dis. / Ant. : 3m 2010 CBL6111C Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 C (3M)
 Env. / Ins. : 24*C/56% Engineer : Willis

No.	Freq. (MHz)	Ant.	Cable	Emission			Margin (dB)	Remark
		Factor (dB/m)	Loss (dB)	Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)		
1	170.650	10.10	1.38	5.70	17.18	43.50	26.32	QP
2	177.440	9.55	1.46	6.70	17.71	43.50	25.79	QP
3	422.850	17.15	3.06	2.74	22.95	46.00	23.05	QP
4	677.960	20.72	4.42	2.12	27.26	46.00	18.74	QP
5	755.560	22.00	4.72	1.94	28.66	46.00	17.34	QP
6	943.740	23.92	5.37	2.96	32.25	46.00	13.75	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

8. §15.249 BAND EDGES MEASUREMENT

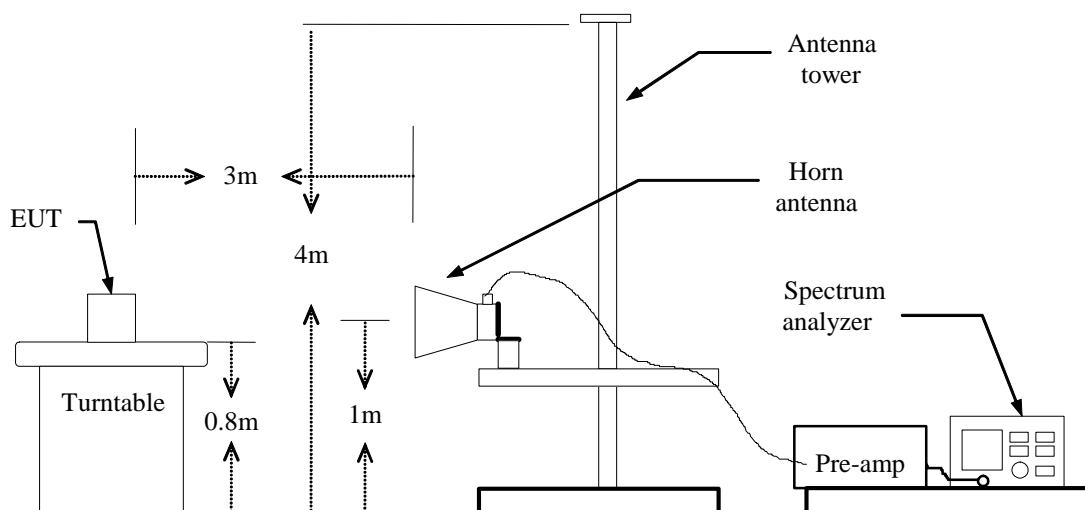
8.1. Limit

According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

8.2. Test Equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2011/06
2	Amp	HP	8449B	3008A00863	2011/06
3	Log per Antenna	ROHDE & SCHWARZ	VULB9163	9163-470	2011/06
4	Amplifier	SCHWARZBECK	PAP-0001	21002	2011/06
5	Antenna	EMCO	3115	9607-4877	2011/06
6	Spectrum	Agilent	E4407B	MY41440292	2011/06

8.3. Block Diagram of Test Setup



8.4. Test Procedure

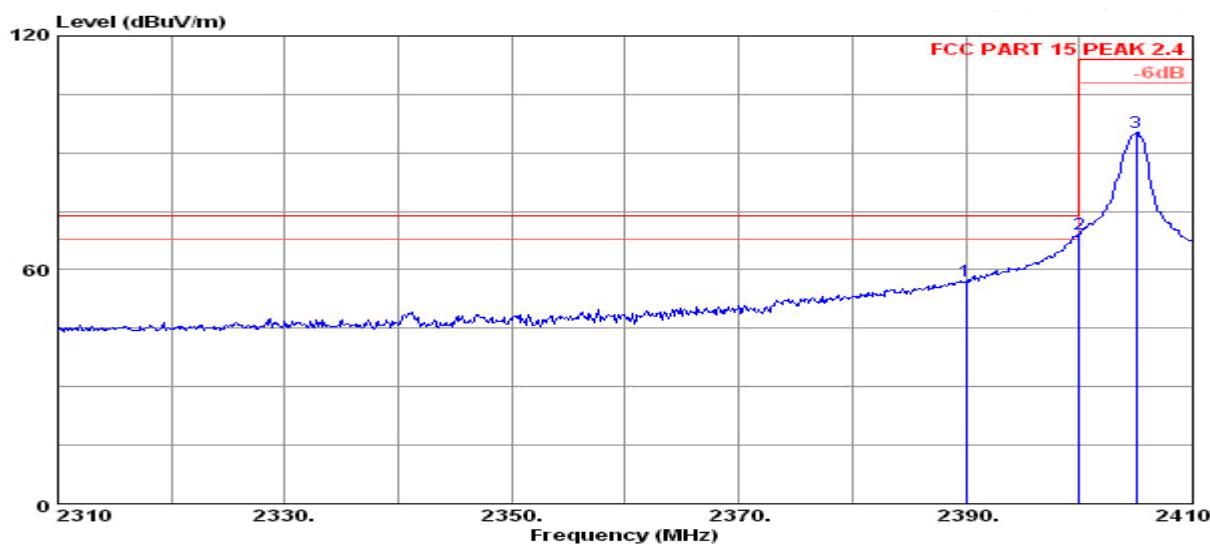
The EUT is placed on a turntable, which is 0.8m above the ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

Peak: RBW=VBW=1MHz / Sweep=AUTO

Repeat the procedures until the peak versus polarization are measured.

8.5. Test Results

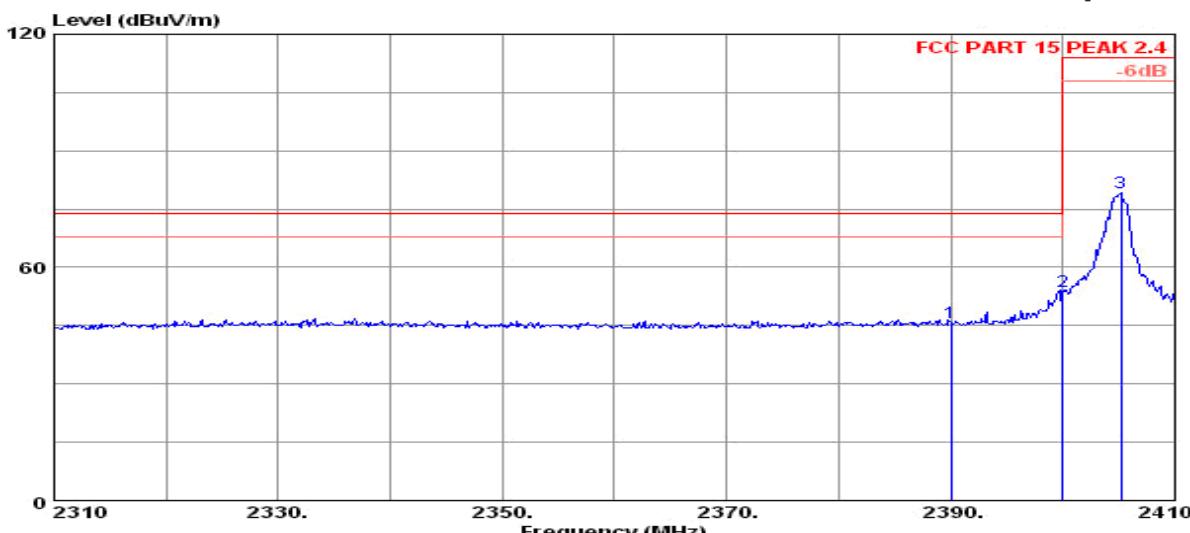


Site no. : RF Chamber Data no. : 13
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 PEAK 2.4

	Ant.	Cable	Amp.	Emission			
	Freq. Factor	loss	Factor	Reading	Level	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
1	2390.000	29.44	7.39	36.62	56.78	56.99	74.00 17.01 Peak
2	2400.000	29.44	7.43	36.62	68.78	69.03	74.00 4.97 Peak
3	2405.000	29.45	7.43	36.62	94.89	95.15	114.00 18.85 Peak

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : RF Chamber Data no. : 14
 Dis. / Ant. : 3m 3115(0911) Ant. pol. : VERTICAL
 Limit : FCC PART 15 PEAK 2.4

	Ant.	Cable	Amp.	Emission			
	Freq. Factor	loss	Factor	Reading	Level	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
1	2390.000	29.44	7.39	36.62	45.66	45.87	74.00 28.13 Peak
2	2400.000	29.44	7.43	36.62	53.46	53.71	74.00 20.29 Peak
3	2405.200	29.45	7.43	36.62	78.98	79.24	114.00 34.76 Peak

Remarks:

1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

9. MANUFACTURER/ APPROVAL HOLDER DECLARATION

The following identical model(s):

ZMR100-ZMT120、ZMR100-ZMT130、ZMR100-ZMT140、ZMR100-ZMT150、
ZMR110-ZMT120、ZMR110-ZMT130、ZMR110-ZMT140、ZMR110-ZMT150、
ZMR120-ZMT120、ZMR120-ZMT130、ZMR120-ZMT140、ZMR120-ZMT150、
ZMR130-ZMT120、ZMR130-ZMT130、ZMR130-ZMT140、ZMR130-ZMT150.

Belong to the tested device:

Product description : Contactless Reader System
Model name : ZMR100-ZMT120

No additional models were tested.

----- THE END OF REPORT -----