



## 47 CFR PART 15.225

# TEST REPORT

of

### EFT-POS

Trade Name: **SAND**  
Brand Name: **SAND**  
Model Name: **PS400**  
Report No.: **SH10040042E02**  
FCC ID.: **XLHPS400-1101**

*prepared for*

**Shanghai Sand Information Technology System Co., Ltd**  
Building 22, Germs Park, NO.487 Tianlin Road, Shanghai China



**Shenzhen Electronic Product Quality Testing Center**

**Morlab Laboratory**

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## 1. TEST CERTIFICATION

Equipment under Test: EFT-POS

Trade Name: SAND

Brand Name: SAND

Model Name: PS400

FCC ID: XLHPS400-1101

Applicant: Shanghai Sand Information Technology System Co., Ltd  
Building 22, Germs Park, NO. 487 Tianlin Road, Shanghai China

Manufacturer: Shanghai Sand Information Technology System Co., Ltd  
Building 22, Germs Park, NO. 487 Tianlin Road, Shanghai China

Test Standards: 47 CFR Part 15 Subpart C

Test Date(s): Mar 5, 2011 – Mar 10, 2011

Test Result: PASS

### \* We Hereby Certify That:

The equipment under test was tested by Shenzhen Electronic Product Quality Testing Center Morlab Laboratory. The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the requirement of related FCC rules.

The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by:

Shi Feng  
Shi Feng

Dated: 2011.3.31

Reviewed by:

Zhang Jun  
Zhang Jun

Dated: 2011.3.31

Approved by:

Wei Bei  
Wei Bei

Dated: 2011.03.31

## 2. GENERAL INFORMATION

### 2.1 EUT Description

EUT Type.....	EFT-POS
Model Name .....	PS400
Serial No.....	(n.a, marked #1 by test site)
Modulation Type.....	ASK
Frequency .....	13.56 MHz
Power Supply.....	Battery Brand Name: NARADA Model Name: NLB465082H-2S Capacitance: 2000mAh Rated voltage: 7.4V Charge Limit: 8.4V Manufacturer: Narada Power Source Co., Ltd. 9th Floor, Tower A, No. 50, Bauhinia Road, Hangzhou, Zhejiang
Ancillary Equipments.....	AC Adapter Brand Name: HuntKey Model Name: ADP036-094B Serial No.: (n.a. marked #1 by test site) Rated Input: ~ 100-240V, 1000mA, 50/60Hz Rated Output: == 9V, 4000mA, 30W Manufacturer: Shenzhen Huntkey Electronics Co., Ltd. Huntkey Industrial Park, Banxue Road, Ban Tian, Shenzhen

*Note 1:* The EUT is a RFID device. The RFID module is tested with maximum rated TX power.

*Note 2:* For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

## 2.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (RFID) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations And Radio Treaty Matters; General Rules And Regulations
2	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.225(a)- (d)	Spectrum mask	PASS
2	2.202(a)	Occupied bandwidth	PASS
3	15.215(c)	Occupied bandwidth	PASS
4	15.109 15.205(b) 15.209 15.225 (a)(d)	Radiated Emissions	PASS
5	15.107 15.207	AC power line conducted emissions	PASS
6	15.225 (e)	Frequency stability	PASS

PASS The EUT complies with the essential requirements in the standard.

FAIL The EUT does not comply with the essential requirements in the standard.

(n.a) The test was not performed.

## 2.3 Facilities and Accreditations

### 2.3.1 Facilities

Shenzhen Electronic Product Quality Testing Center Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

All measurement facilities used to collect the measurement data are located at Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055 CHINA. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

### 2.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	20 - 25
Relative Humidity (%):	40 - 60
Atmospheric Pressure (kPa):	96

### 3. 47 CFR PART 15C REQUIREMENTS

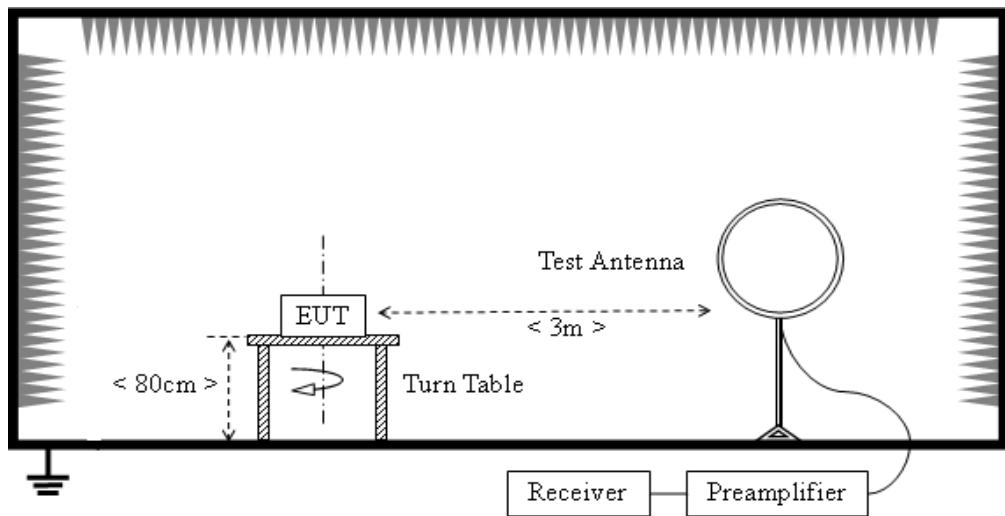
#### 3.1 Spectrum mask

##### 3.1.1 Requirement

According to FCC section 15.225 (a)-(d).

##### 3.1.2 Test Description

###### A. Test Setup:



A spectrum analyzer was used and set to a center frequency equal to transmitter frequency. The resolution bandwidth was adjusted to 9 kHz and the video bandwidth at least 3 times higher than the resolution bandwidth. Span was set to 1MHz to cover the whole spectrum mask. The detector was set to maxpeak with hold function.

The spectrum analyzer was connected to a loop antenna with vertical polarization at a measurement distance of 3m on an open area test site.

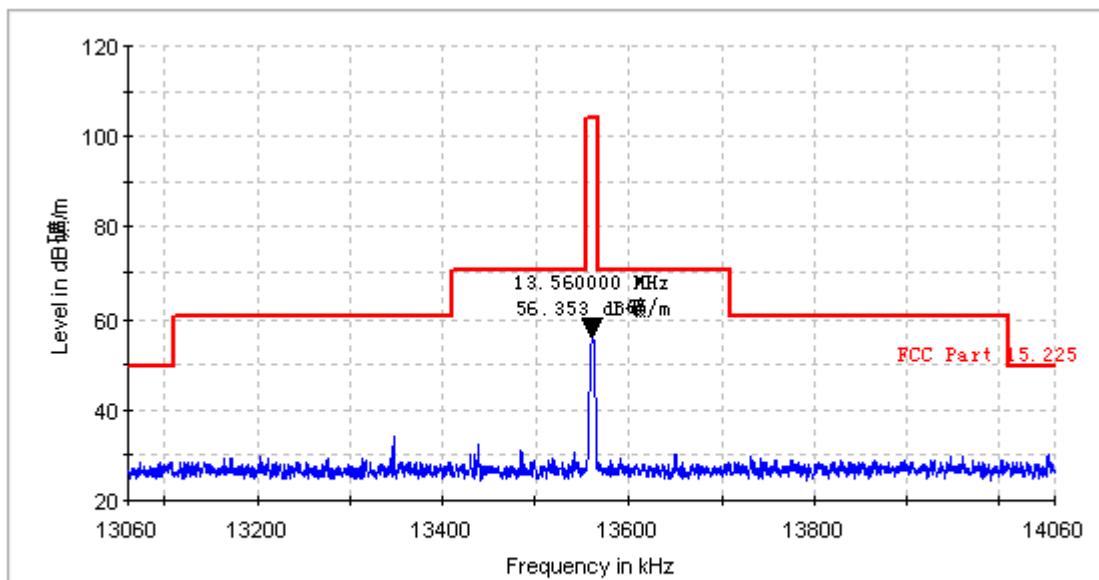
The EUT was placed on a turntable and rotate 360° to find maximum value. To find the maximum in horizontal polarization the EUT was rotated by 90°.

## B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	MY44210631	2010.10	1year
Full-Anechoic Chamber	Albatross	(n.a.)	(n.a.)	2010.9	2year
Loop antenna	R&S	HFH2-Z2	A0304224	2010.9	1year

### 3.1.3 Test results:

Plot:



## 3.2 Occupied bandwidth (99%)

### 3.2.1 Requirement

according to CFR 47 Part 2 section 2.202

### 3.2.2 Test Description

#### A. Test Setup:



The occupied bandwidth is measured as the 99% bandwidth. For this measurement the occupied bandwidth function of the spectrum analyzer was used. The resolution bandwidth of the spectrum analyzer shall be set to a greater value than 5% of the allowed bandwidth. Because no resolution bandwidth was given the following guideline from ANSI C63.4 annex H6 was consulted.

Fundamental frequency	Minimum resolution bandwidth
0.009MHz to 30MHz	1kHz
30MHz to 1000MHz	10kHz
1000MHz to 40000MHz	100kHz

The video bandwidth was adjusted at least 3 times wider than the resolution Bandwidth

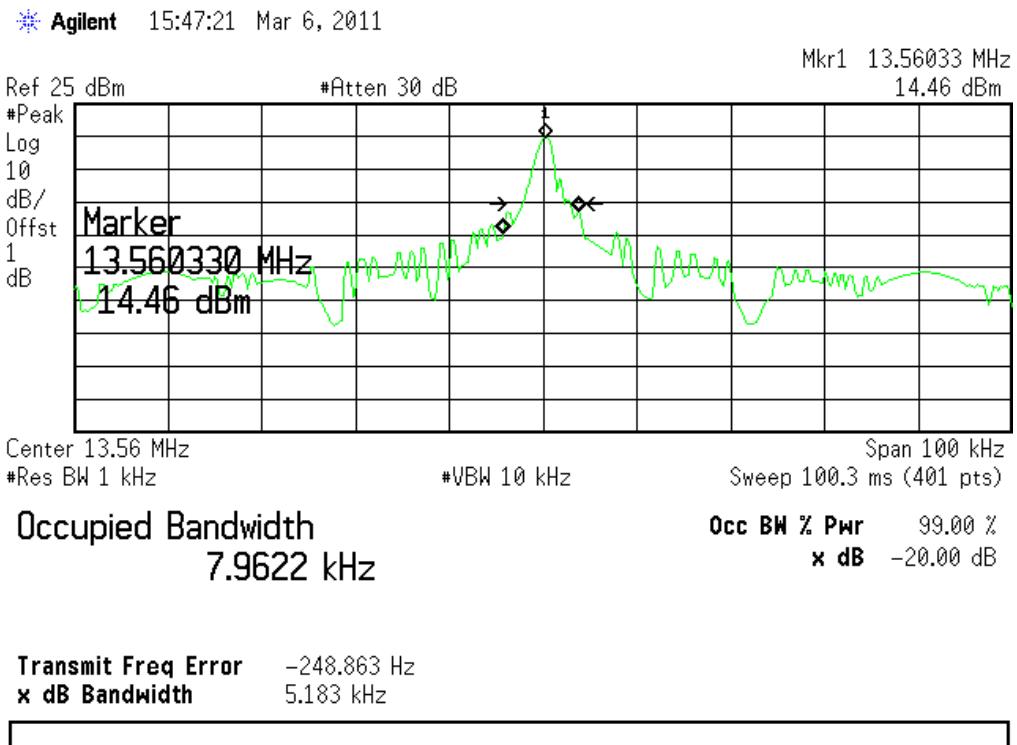
#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	MY44210631	2010.10	1year

#### 3.2.3 Test results:

Frequency (MHz)	Measured Occupied Bandwidth (99%) (kHz)
13.56025	7.9622

Plot:



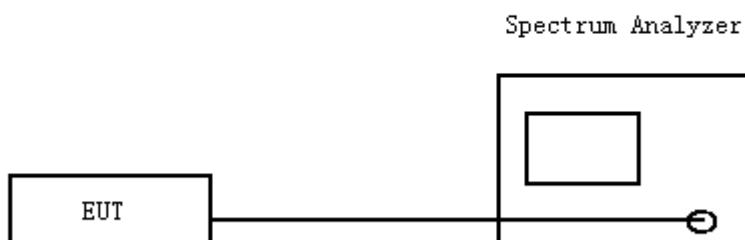
### 3.3 Occupied bandwidth (20dB)

#### 3.3.1 Requirement

according to FCC Part 15, section 15.215(c)

#### 3.3.2 Test Description

##### A. Test Setup:



The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.

For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation

The resolution bandwidth of the spectrum analyzer shall be set to a greater value than 5% of the allowed bandwidth.

Because no resolution bandwidth was given the following guideline from ANSI C63.4 annex H6 was consulted.

Fundamental frequency	Minimum resolution bandwidth
0.009MHz to 30MHz	1kHz
30MHz to 1000MHz	10kHz
1000MHz to 40000MHz	100kHz

The video bandwidth was adjusted at least 3 times wider than the resolution Bandwidth

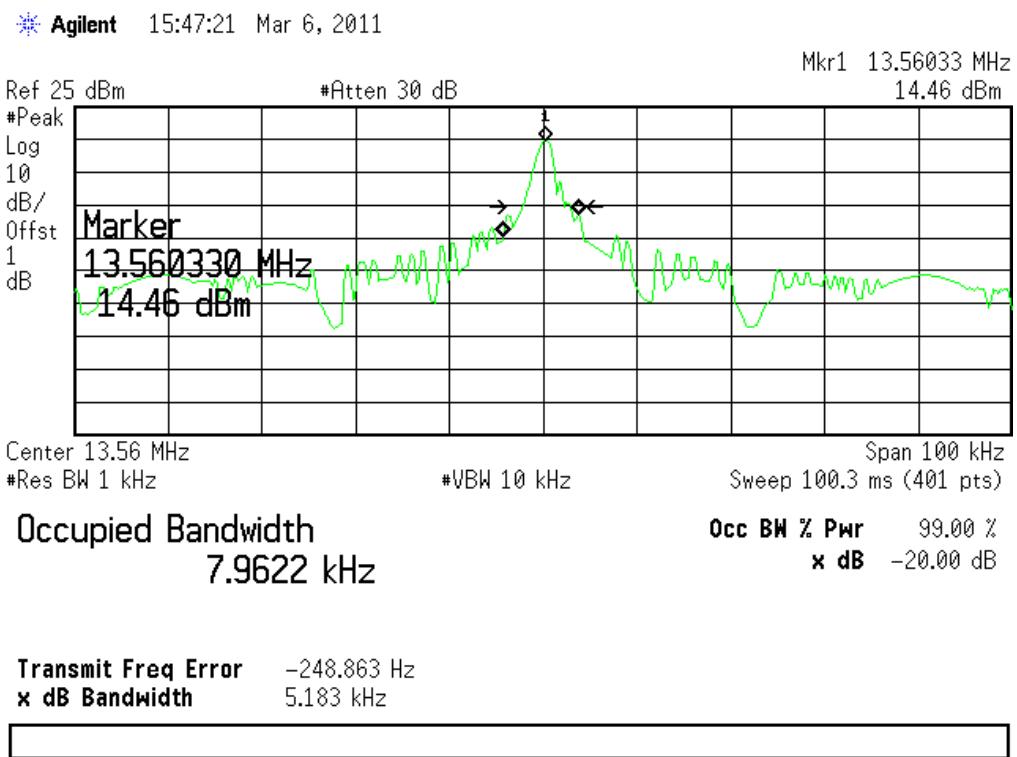
#### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	MY44210631	2010.10	1year

#### 3.3.3 Test results:

Frequency (MHz)	Measured Occupied Bandwidth (20dB) (kHz)
13.56025	5.183

Plot:



## 3.4 Radiated Emission

### 3.4.1 Requirement

According to FCC section 15.225, radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

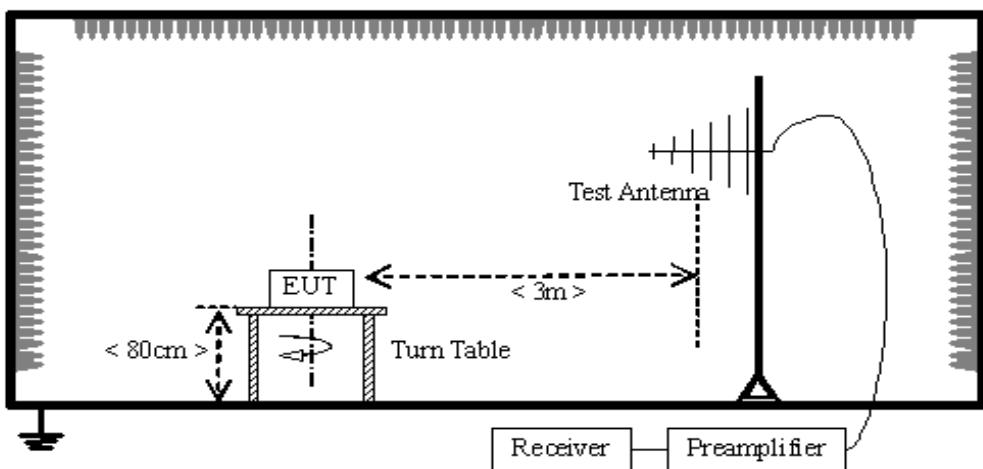
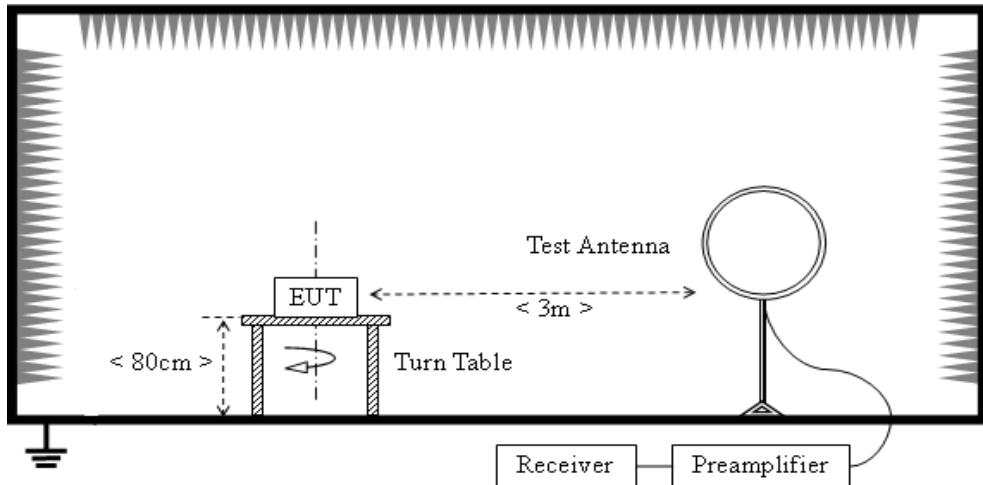
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
960 - 1000	500	3

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also

should comply with the radiated emission limits specified in Section 15.209(a)(above table)

### 3.4.2 Test Description

#### A. Test Setup:



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

For the Test Antenna: In the all frequency range, Loop Test Antenna (9KHz to 30MHz) and Bi-Log Test Antenna (above 30MHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was  $0^\circ$  to  $360^\circ$ , the receive antenna has two polarizations horizontal and vertical.

### B. Equipments List:

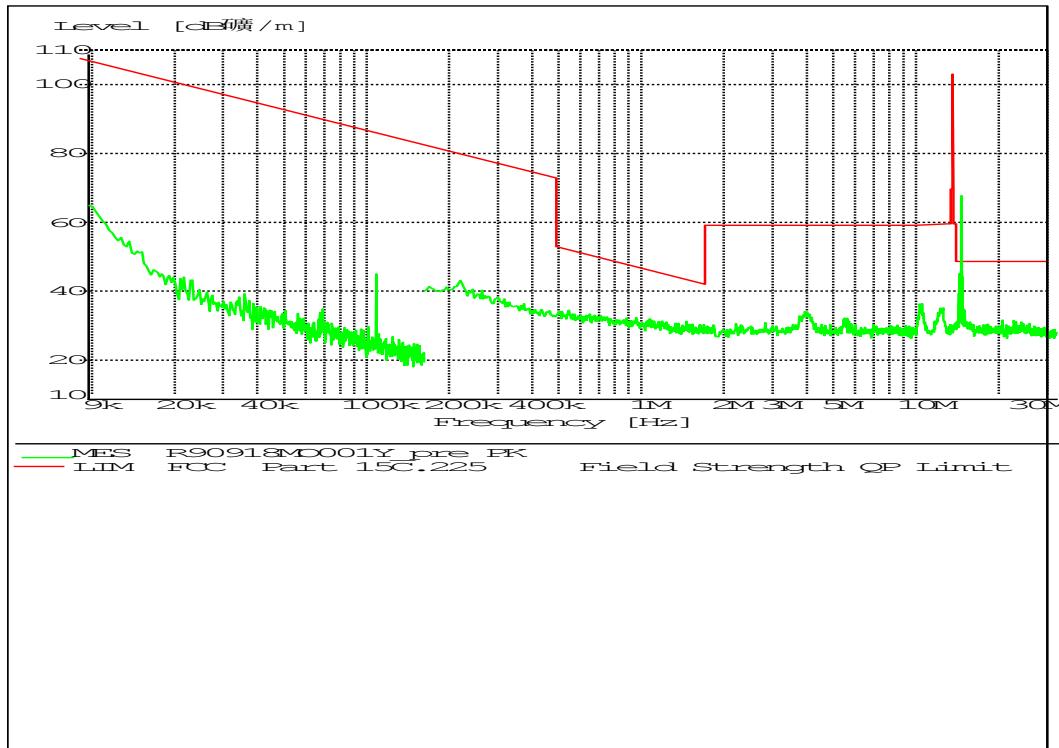
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	MY44210631	2010.10	1year
Full-Anechoic Chamber	Albatross	(n.a.)	(n.a.)	2010.9	2year
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2010.9	1year
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2010.9	1year
Loop antenna	R&S	HFH2-Z2	A0304224	2010.9	1year

#### 3.4.3 Test results:

9KHz-30MHz:

Frequency (MHz)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin(dB $\mu$ V/m)
13.56	69.24	124	54.76

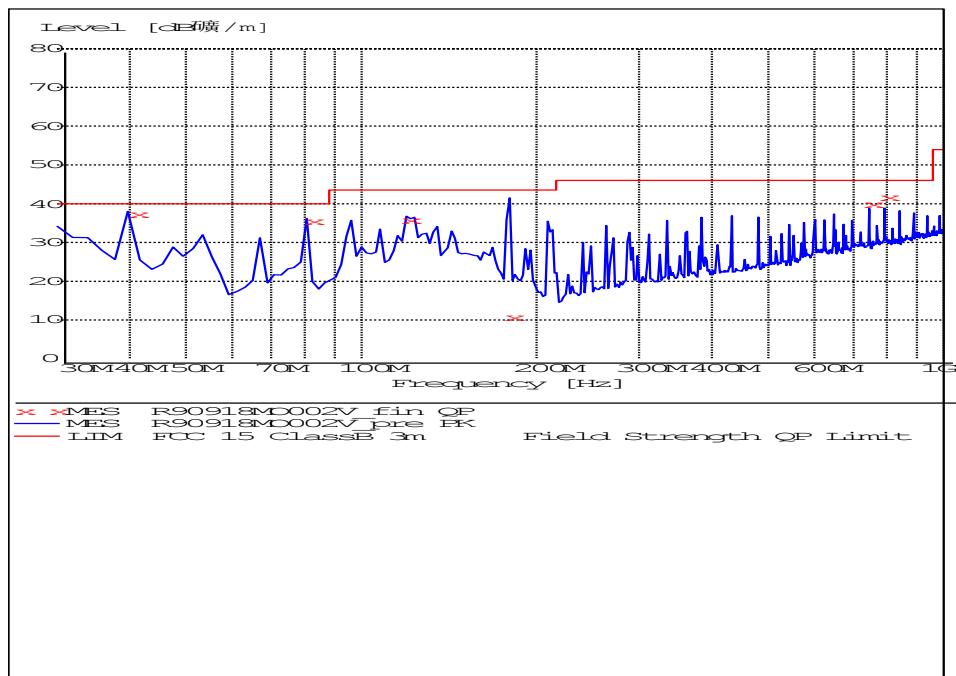
Plots:



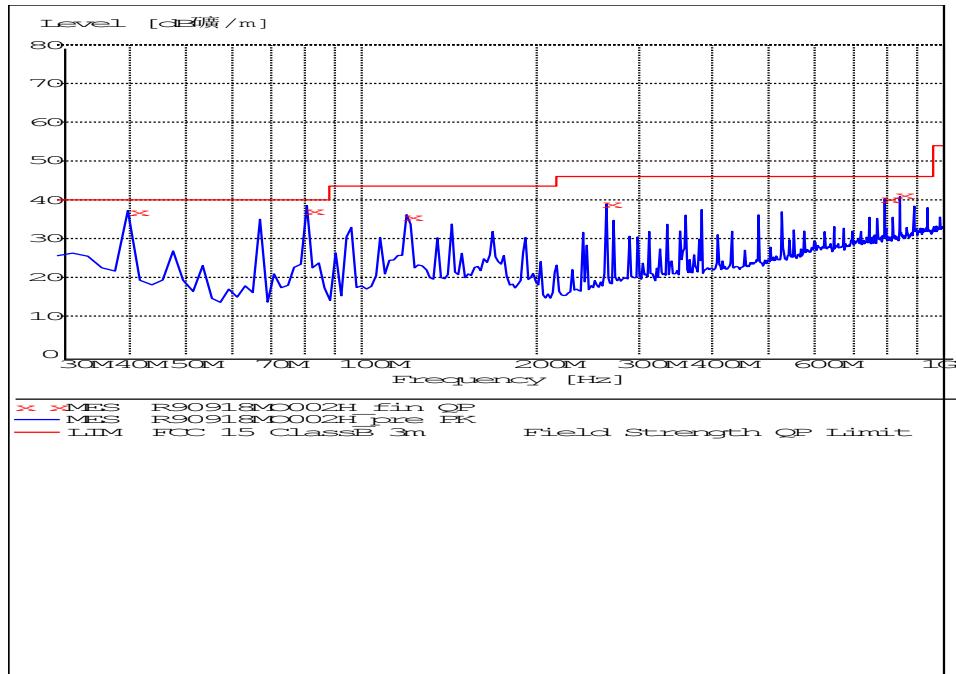
30MHz-1GHz:

No.	Frequency (MHz)	Measured Emission Level (dB $\mu$ V)		Limit (dB $\mu$ V)	Verdict
		QP	Polarity		
1	40.691383	37.32	V	40.0	PASS
2	81.372745	35.51	V	40.0	PASS
3	119.418838	35.74	V	43.5	PASS
4	179.789579	10.58	V	43.5	PASS
5	744.028056	39.92	V	46.0	PASS
6	792.034068	42.03	V	46.0	PASS
7	40.671343	36.81	H	40.0	PASS
8	81.372745	36.87	H	40.0	PASS
9	120.010020	35.22	H	43.5	PASS
10	264.008016	39.08	H	46.0	PASS
11	792.004008	40.18	H	46.0	PASS
12	840.030060	41.22	H	46.0	PASS

Plots :



(Test Antenna Vertical)



(Test Antenna Horizontal)

### 3.5 Conducted Emission

#### 3.5.1 Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

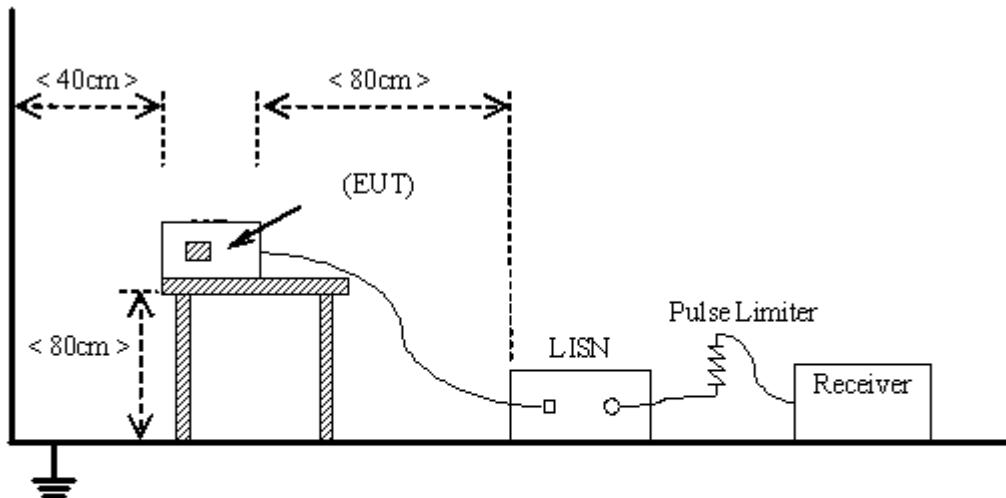
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

#### 3.5.2 Test Description

##### A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2003

### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	MY44210631	2010.10	1year
LISN	Schwarzbeck	NSLK 8127	812744	2010.9	1year
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)

### 3.5.3 Test Result

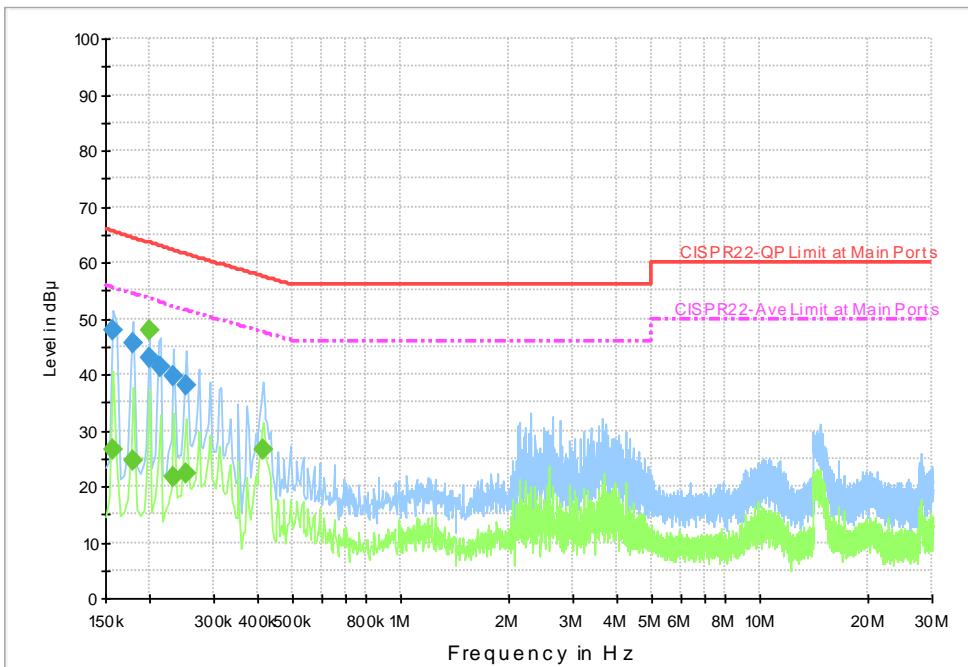
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Band width (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.153731	48.7	150.000	9.000	N	9.7	17.1	65.8	PASS
0.176119	51.4	150.000	9.000	N	9.6	13.2	64.6	PASS
0.194775	58.0	150.000	9.000	N	9.6	5.7	63.7	PASS
0.205969	45.6	150.000	9.000	N	9.6	17.6	63.2	PASS
0.247012	50.8	150.000	9.000	N	9.6	10.9	61.7	PASS
0.321638	52.0	150.000	9.000	N	9.7	7.5	59.5	PASS
0.157462	47.9	150.000	9.000	L	9.5	17.7	65.6	PASS
0.179850	45.6	150.000	9.000	L	9.6	18.8	64.4	PASS
0.198506	43.0	150.000	9.000	L	9.6	20.5	63.5	PASS
0.213431	41.2	150.000	9.000	L	9.6	21.7	62.9	PASS
0.232088	39.5	150.000	9.000	L	9.6	22.7	62.2	PASS
0.250744	38.1	150.000	9.000	L	9.6	23.5	61.5	PASS

Frequency (MHz)	Average (dB $\mu$ V)	Meas. Time (ms)	Band width (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)	Comment
0.191044	23.3	150.000	9.000	N	9.6	30.5	53.8	PASS
0.202238	24.2	150.000	9.000	N	9.6	29.1	53.3	PASS
0.247012	23.0	150.000	9.000	N	9.6	28.6	51.6	PASS
0.302981	22.3	150.000	9.000	N	9.6	27.6	49.9	PASS
0.325369	20.2	150.000	9.000	N	9.7	29.1	49.3	PASS
0.381338	18.3	150.000	9.000	N	9.7	29.8	48.1	PASS
0.157462	26.5	150.000	9.000	L	9.5	29.1	55.6	PASS
0.179850	24.6	150.000	9.000	L	9.6	29.8	54.4	PASS
0.198506	48.0	150.000	9.000	L	9.6	5.5	53.5	PASS
0.232088	21.7	150.000	9.000	L	9.6	30.4	52.1	PASS
0.250744	22.2	150.000	9.000	L	9.6	29.3	51.5	PASS
0.411188	26.5	150.000	9.000	L	9.7	21.0	47.5	PASS

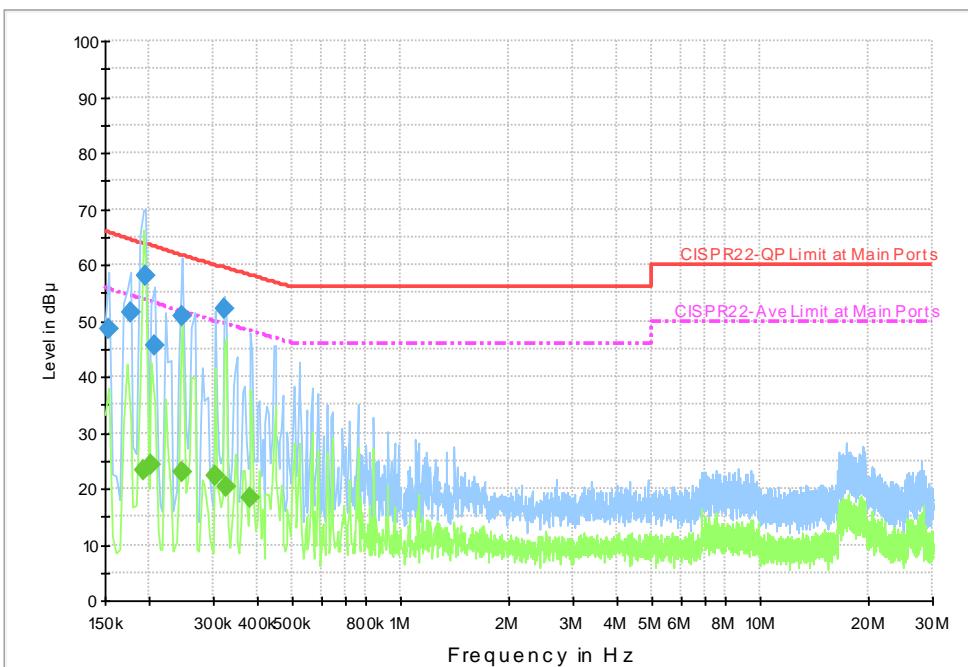
Plots:

## EMI\_ENV216 AutoTest-L CISPR22



(Plot:L Phase)

## EMI\_ENV216 AutoTest-N CISPR22



(Plot:N Phase)

### 3.6 Frequency Stability

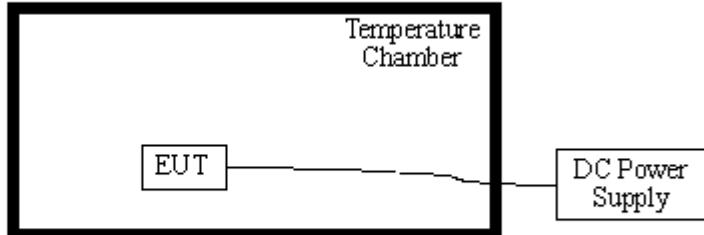
#### 3.6.1 Requirement

According to FCC section 15.225(e), the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 3.6.2 Test Description

##### A. Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power

##### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
DC Power Supply	Good Will	GPS-3030DD	EF920938	2010.9	2year
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2010.9	1year

#### 3.6.3 Test Verdict

The nominal, highest and lowest extreme voltages are separately 7.4VDC, 10VDC and 6.5VDC,

which are specified by the applicant; the normal temperature here used is 25°C. The frequency deviation limit of RFID is  $\pm 0.01\%$

Voltage [V]	Temperature [°C]	Frequency [MHz]	Deviation [KHz]	Deviation [%]	Result
7.4	40	13.56072	0.61	0.00450	PASS
	30	13.56033	0.41	0.00302	
	20	13.56064	0.56	0.00413	
	10	13.56028	0.42	0.00310	
	5	13.56064	0.38	0.00280	
	10	13.56037	0.45	0.00332	
	6.5	13.56023	0.44	0.00324	

**Note:**

1. The EUT stops transmitting at temperatures 0°C, -10°C, -20°C, -30°C and 50°C.
2. The manufacturer declared that the EUT could work properly between temperatures 5°C~40°C.

\*\* END OF REPORT \*\*