



## FCC PART 15.231

# TEST REPORT

of

### SRWF-1021-V1.1

Trade Name: SUNRAY  
Brand Name: Sunray  
Model Name: SRWF-1021  
Report No.: SZ10030072E01  
FCC ID.: YJA-SRWF-1021

*prepared for*

### Shanghai Sunray Technology Co., Ltd

4F, 22BLDG, No.498, GuoShouJing Rd, PuDong Zhangjiang, Shanghai, 201203, P.R. China



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Change History		
Issue	Date	Reason for change
1.0	October 21, 2010	First edition
2.0	November 16, 2010	Second edition

## 1. TEST CERTIFICATION

Equipment under Test: SRWF-1021-V1.1

Trade Name SUNRAY

Brand Name: Sunray

Model Name: SRWF-1021

FCC ID: YJA-SRWF-1021

Applicant: Shanghai Sunray Technology Co., Ltd

4F, 22BLDG, No.498, GuoShouJing Rd, PuDong Zhangjiang, Shanghai,  
201203, P.R, China

Manufacturer: Shanghai Sunray Technology Co., Ltd

No.498 Guoshoujing Road, Zhangjiang, ShangHai Pudong New Zone,  
China

Test Standards: 47 CFR Part 15 Subpart C

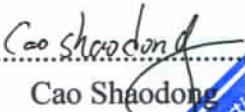
Test Date(s): June 30, 2010 – November 16, 2010

Test Result: PASS

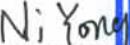
### \* We Hereby Certify That:

The equipment under test was tested by Shenzhen Morlab Communications Technology Co., Ltd. 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.

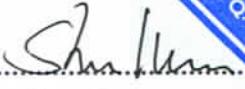
The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by: .....  Dated: 2010.11.16

Cao Shaodong

Reviewed by: .....  Dated: 2010.11.16

Ni Yong

Approved by: .....  Dated: 2010.11.16

Shu Luan



## 2. GENERAL INFORMATION

### 2.1 EUT Description

EUT Type.....: SRWF-1021-V1.1  
Model Name .....: SRWF-1021  
Serial No.....: (n.a, marked #1 by test site)  
Modulation Type.....: FSK  
Power Supply.....: USB to Serial port 3V-5V  
Frequency and Pins-setup.....:

		(MHz)
	0 (ABC remain open)	433.6128
	1	433.7128
	2	433.8128
	3	433.9128
	4	434.0128
	5	434.1128
	6	434.2128
	7	434.3128

*Note 1:* The EUT is a 433MHz wireless module, it contains wireless Module operating at 433MHz ISM band; the frequencies allocated for the Module is  $F(\text{MHz})=433.7128+0.11*n$  ( $0 \leq n \leq 7$ ). The lowest, middle, highest channel of the Module used and tested in this report are separately 0 (433.6128MHz), 3 (433.9128MHz) and 7 (434.3128MHz).

*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 for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-09 Edition)	Radio Frequency Devices

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

No.	Section	Description	Result
1	15.203	Antenna requirement	PASS
2	15.205	Restricted Band	PASS
3	15.209	General Requirement	PASS
4	15.231(a)(1)	Deactivation Testing	PASS
5	15.247(a)	20dB Bandwidth Testing	PASS
6	15.207	Conducted Emission	PASS
7	15.231(b)	Radiated Emission	PASS

### NOTE:

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 Equipment in the range of 9 kHz to 40GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

## 2.3 Facilities and Accreditations

### 2.3.1 Facilities

Shenzhen Morlab Communications Technology Co., Ltd. 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 L3572.

All measurement facilities used to collect the measurement data are located at 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 P. R. 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:

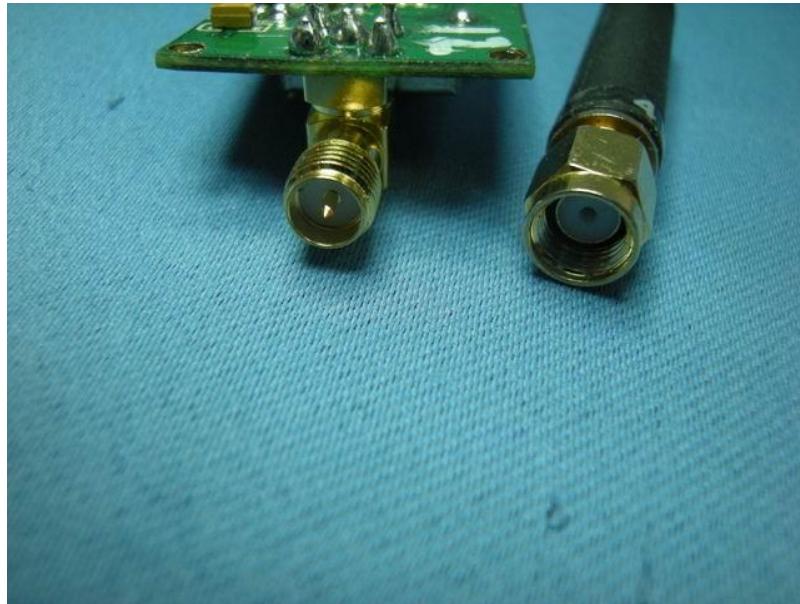
Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

### 3. 47 CFR PART 15C REQUIREMENTS

#### 3.1 Standard Applicable

According to FCC 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. This requirement does not apply to carrier current devices. And this requirement does not apply to intentional radiators that must be professionally installed.

##### 3.1.1 Antenna connector



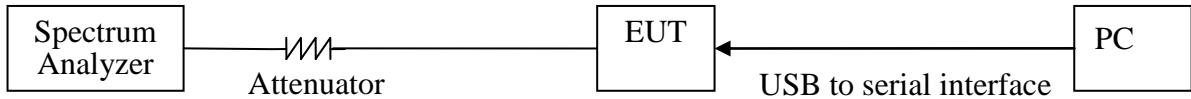
Antenna connector type: reverse SMA connector

#### 3.2 Standard Applicable

According to FCC 15.23(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. bandwidth is determined at the points 20dB down from the modulated carrier

##### 3.2.1 Test Description

###### A. Test Setup:



The EUT, which is powered by a special USB to serial interface, is coupled to the Spectrum Analyzer (SA) with Attenuators  $t$ ; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Radio Module of the EUT is activated and controlled the PC, and is set to operate under low, middle, high channel at fixed power.

### B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2009.09	2year
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
NoteBook	Lenovo	T60	(n.a.)	(n.a.)	(n.a.)

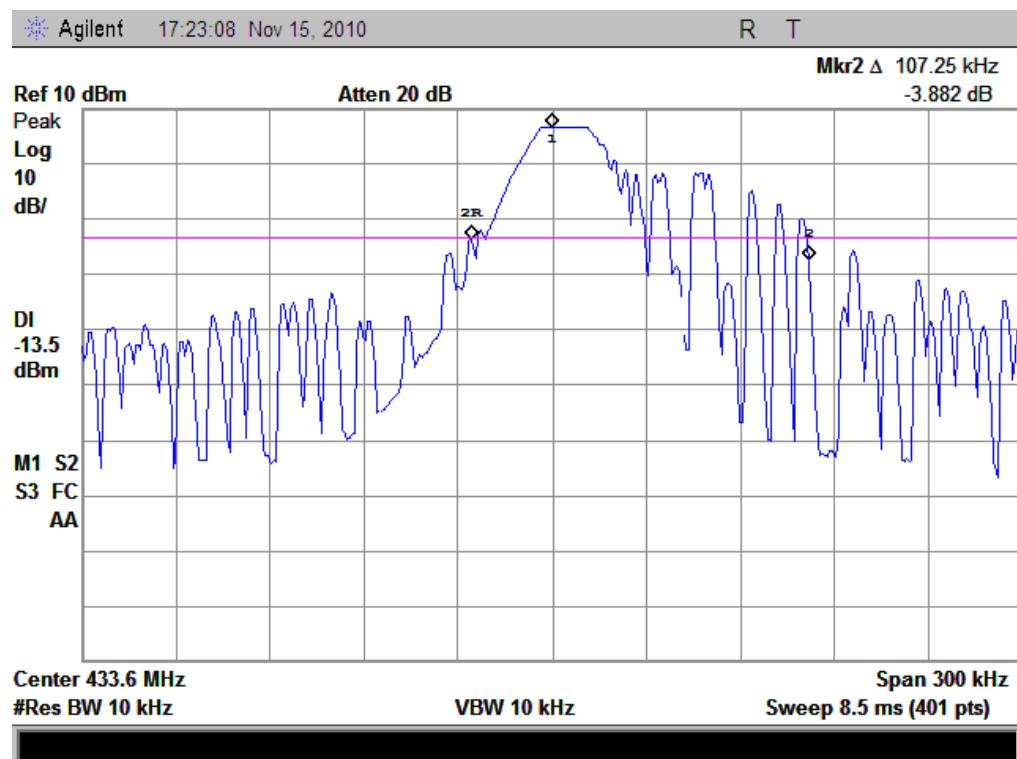
### 3.2.2 Summary of Test Result and Plots

Channel/Frequency	20dB Bandwidth	Limit	Plot
0 (433.6128MHz)	107.25 KHz	1084.63 KHz	A
3 (433.9128MHz)	106.5 KHz	1085.00 KHz	B
7 (434.3128MHz)	95.25 KHz	1081.50 KHz	C

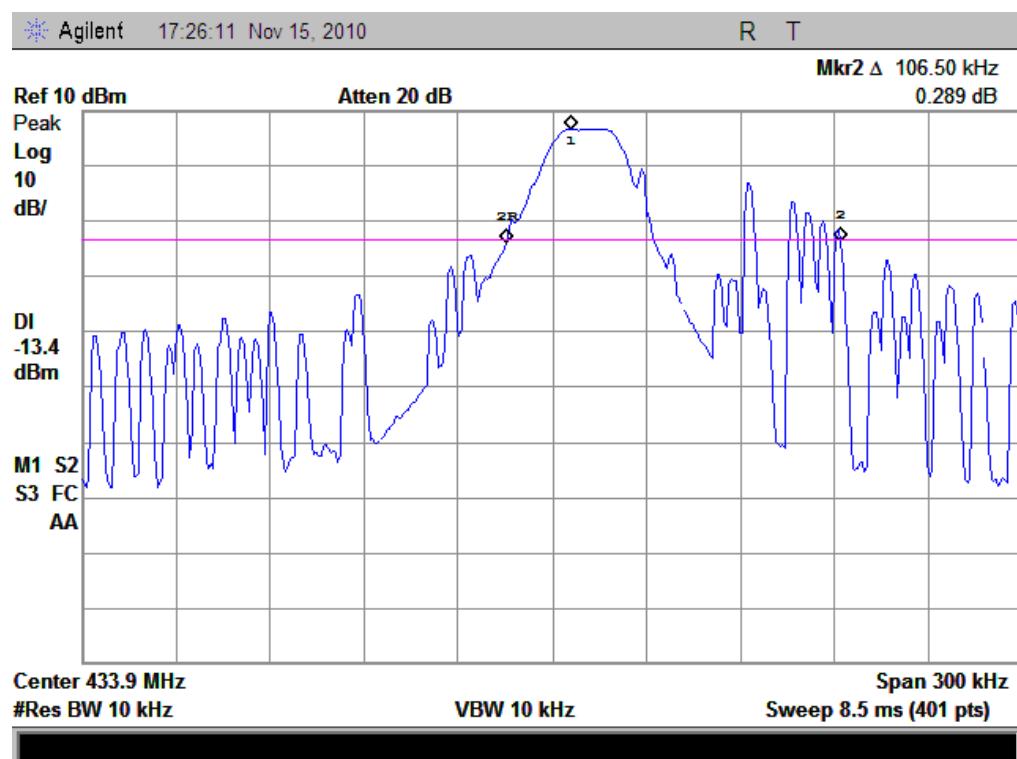
Limit = Frequency\*0.25%.

**Test Result Pass**

**Refer to the attached plots**



(Plot A: 20dB Bandwidth - Channel 0)



(Plot B: 20dB Bandwidth - Channel 3)



(Plot C: 20dB Bandwidth - Channel 7)

### 3.3 Standard Applicable

According to FCC 15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2)A transmitter activated automatically shall cease transmission within 5 seconds after activation.

#### 3.3.1 Test Description

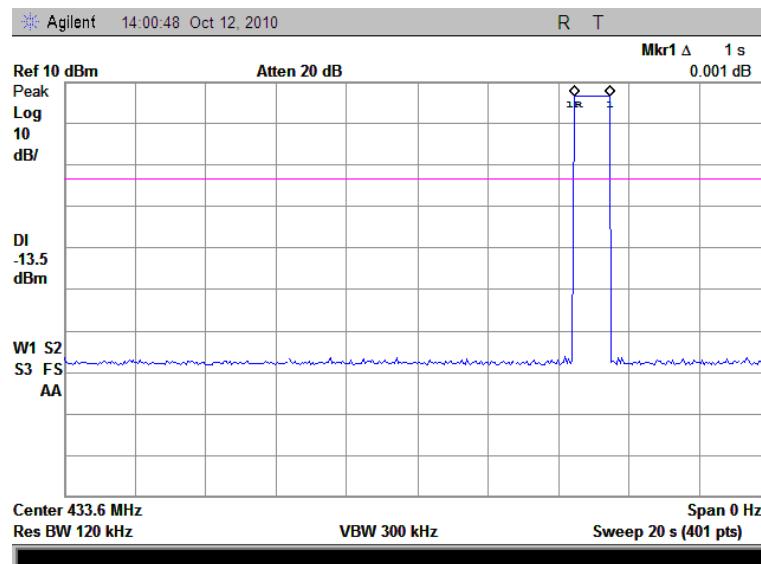
Please refer to the section 3.2.1 of this report.

#### 3.3.2 Test Procedure

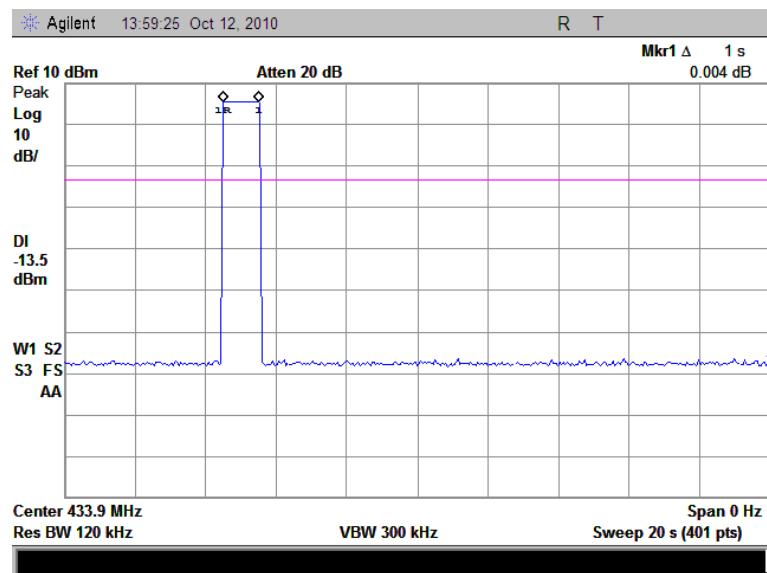
With the EUT's antenna port coupled, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to the frequency of the low, middle, high channels, than set the spectrum analyzer to zero span for the release time reading separately.

#### 3.3.3 Summary of Test results and Plots

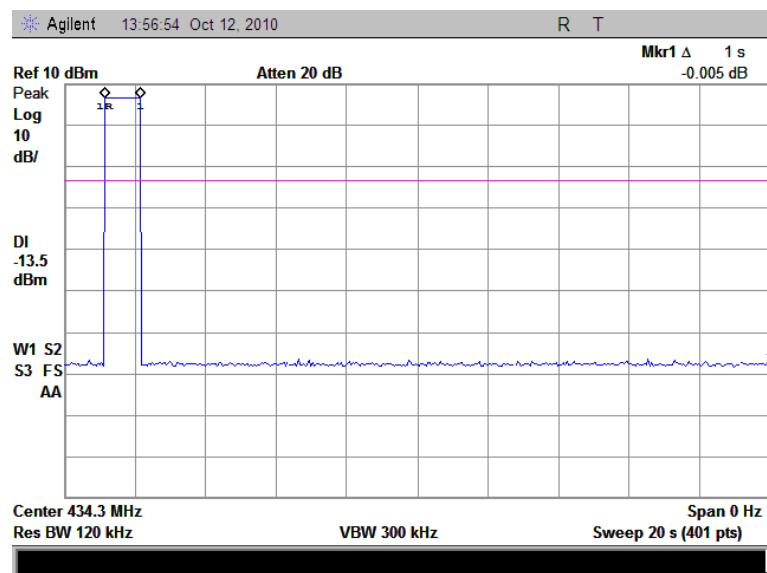
Channel/Frequency	Deactivate Time	Limit	Plot
0 (433.6128MHz)	1 s	5 s	A
3 (433.9128MHz)	1 s	5 s	B
7 (434.3128MHz)	1 s	5 s	C



(Plot A: 20dB Bandwidth - Channel 0)



(Plot B: 20dB Bandwidth - Channel 3)



(Plot C: 20dB Bandwidth - Channel 7)

### 3.4 Standard Applicable

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).

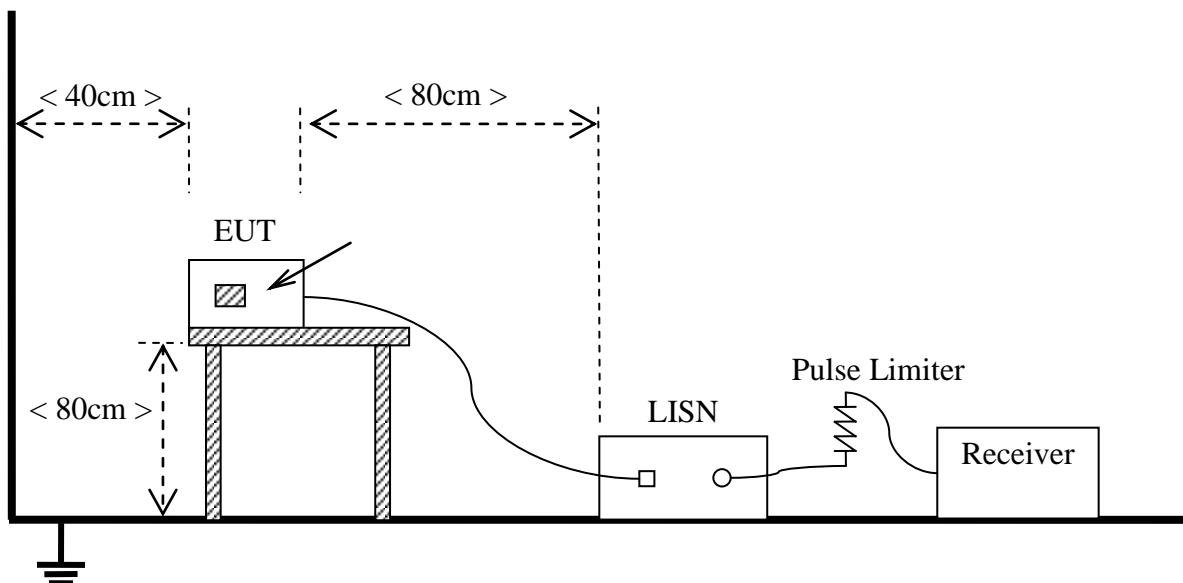
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

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.

#### 3.4.1 Test Description

##### A. Test Setup:



The 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

The EUT is connected with a PC via USB to serial port and powered by the PC, and the PC is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading.

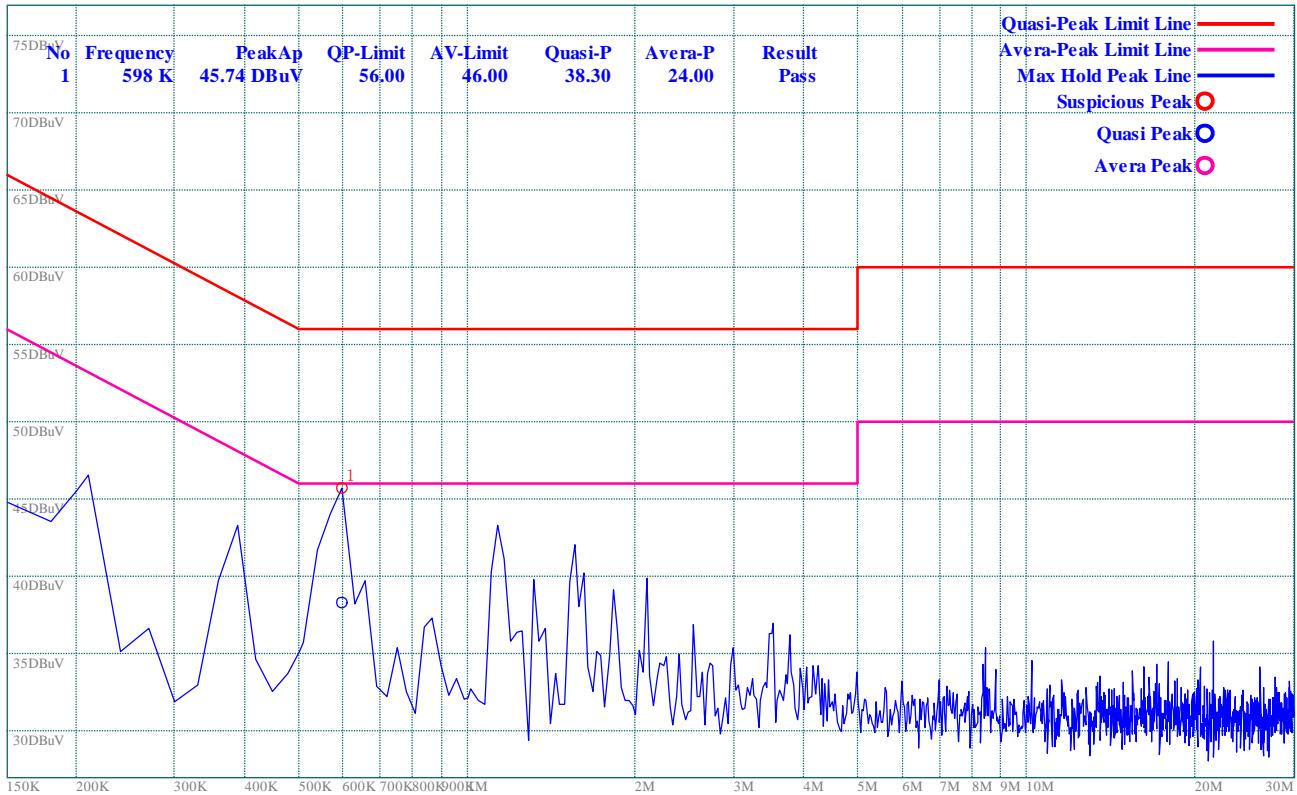
During the measurement, the Module is activated working normally and controlled by PC.

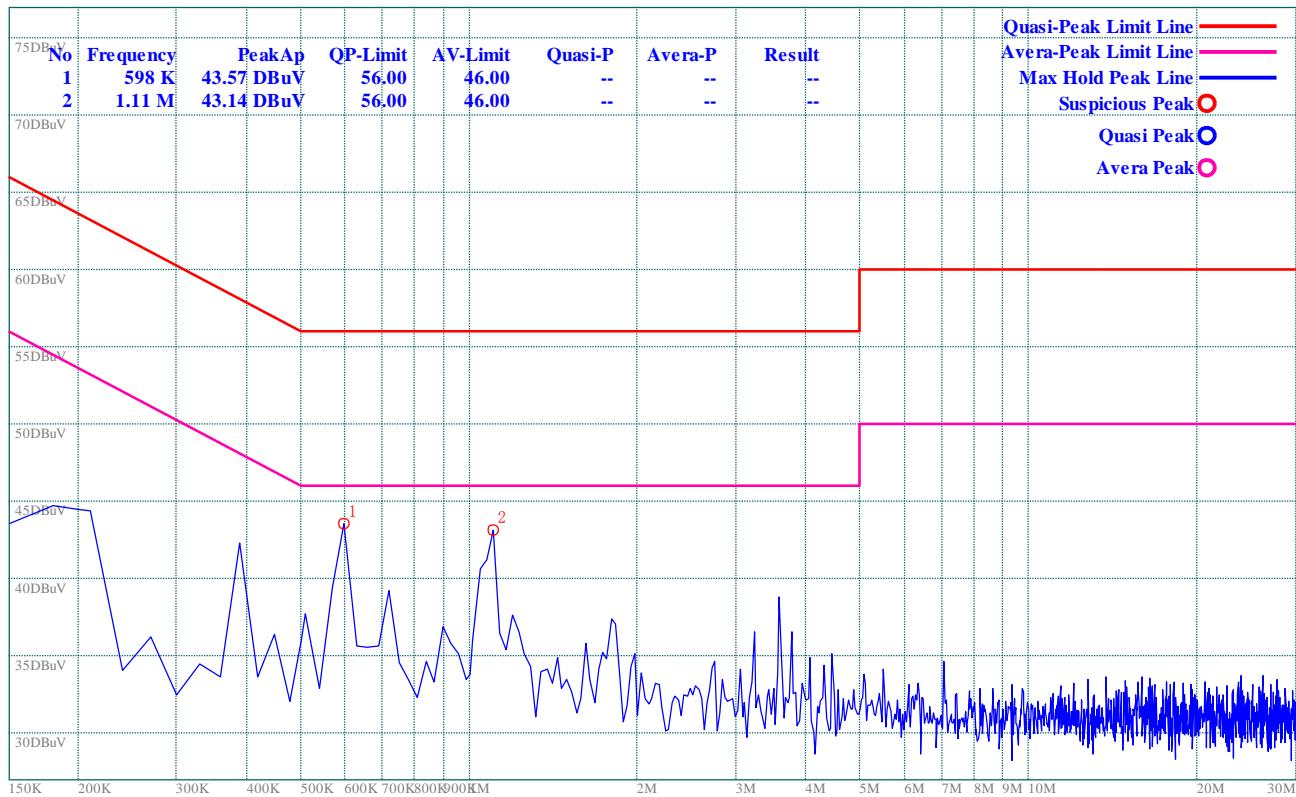
## B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2009.09	2year
LISN	Schwarzbeck	NSLK 8127	812744	2009.09	2year
Service Supplier	R&S	CMU200	100448	2009.09	2year
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)

### 3.4.2 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.





(Plot B: N Phase)

### 3.5 Standard Applicable

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

Fundamental frequency(MHz)	Field strength of fundamental (Microvolts/meter)	Fied strength of spurious emissions(Microvolts/meter)
260-470	3750 to 1250	375 to 1250

Linear interpolations

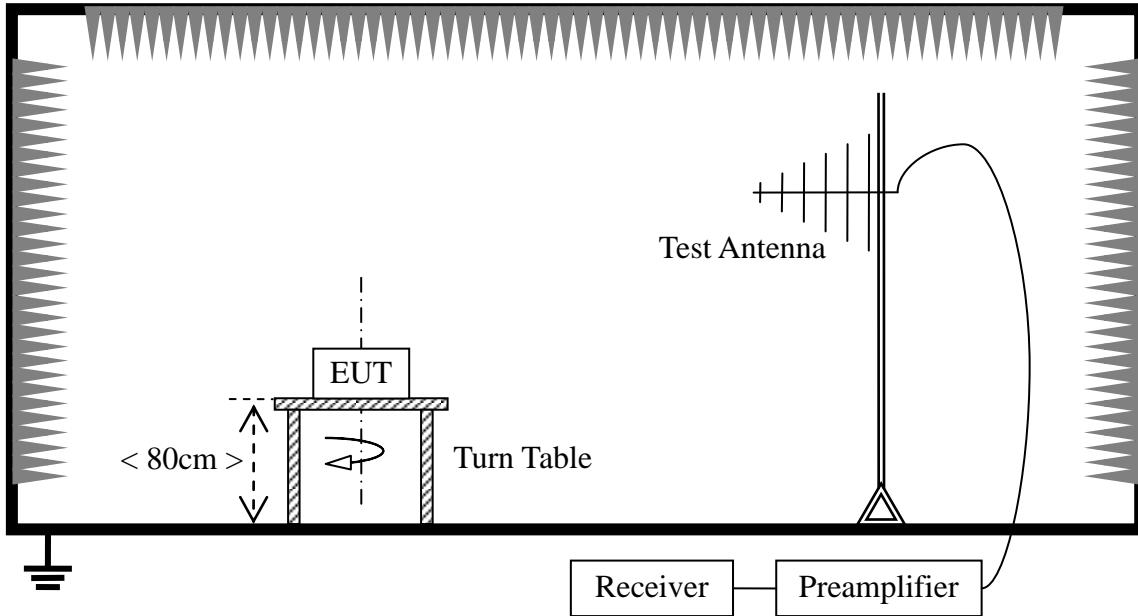
According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu$ V/m)	Measurement Distance (m)
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

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

#### 3.5.1 Test Description

The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the EUT was connected with a notebook and powered by the USB to Serial interface, the PC send the data through the serial port, the EUT received the data and send the data via radio.



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:

- (a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- (b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) 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. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.4 for Radiated Emissions and the worst-case data was presented.

### 3.5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	R&S	CMU200	100448	2009.9	2year
Receiver	Agilent	E7405A	US44210471	2009.9	2year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2009.9	2year
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2009.9	2year
Test Antenna - Horn	Schwarzbeck	BBHA 9120C	9120C-384	2009.9	2year

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
NoteBook	Lenovo	T60	(n.a.)	(n.a.)	(n.a.)

### 3.5.3 Summary of test Results and Plots

#### The Fundamental Emissions

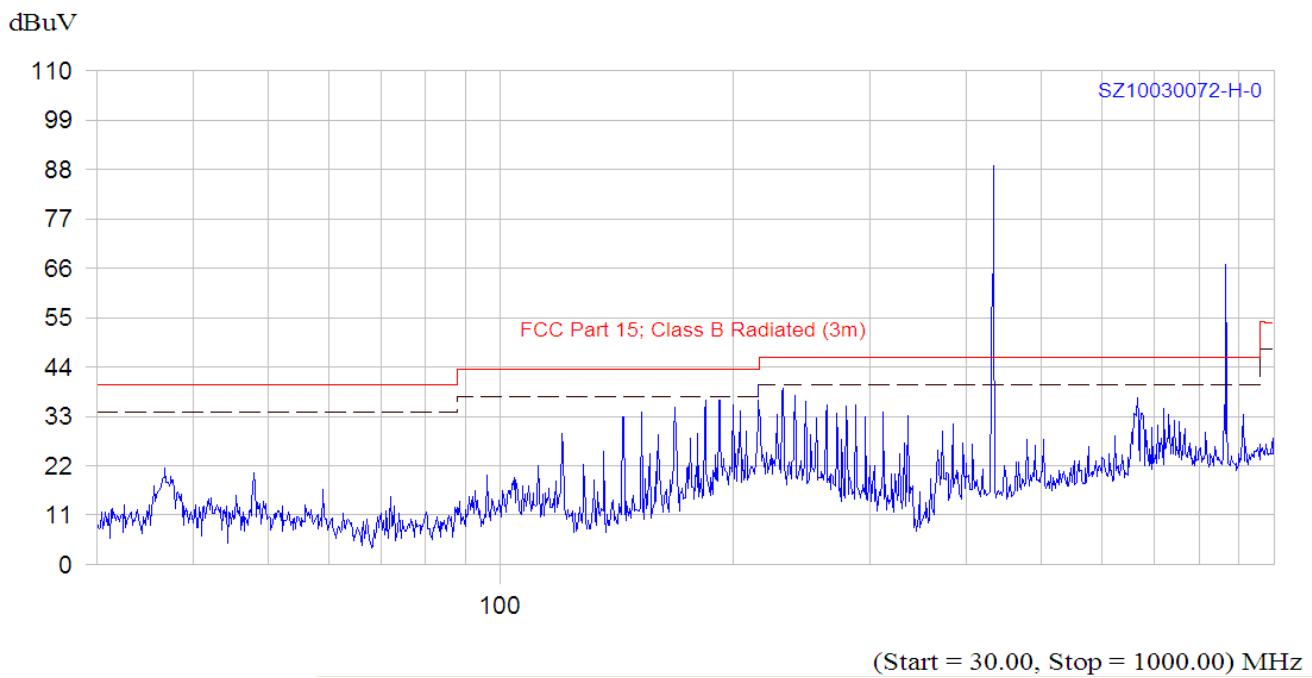
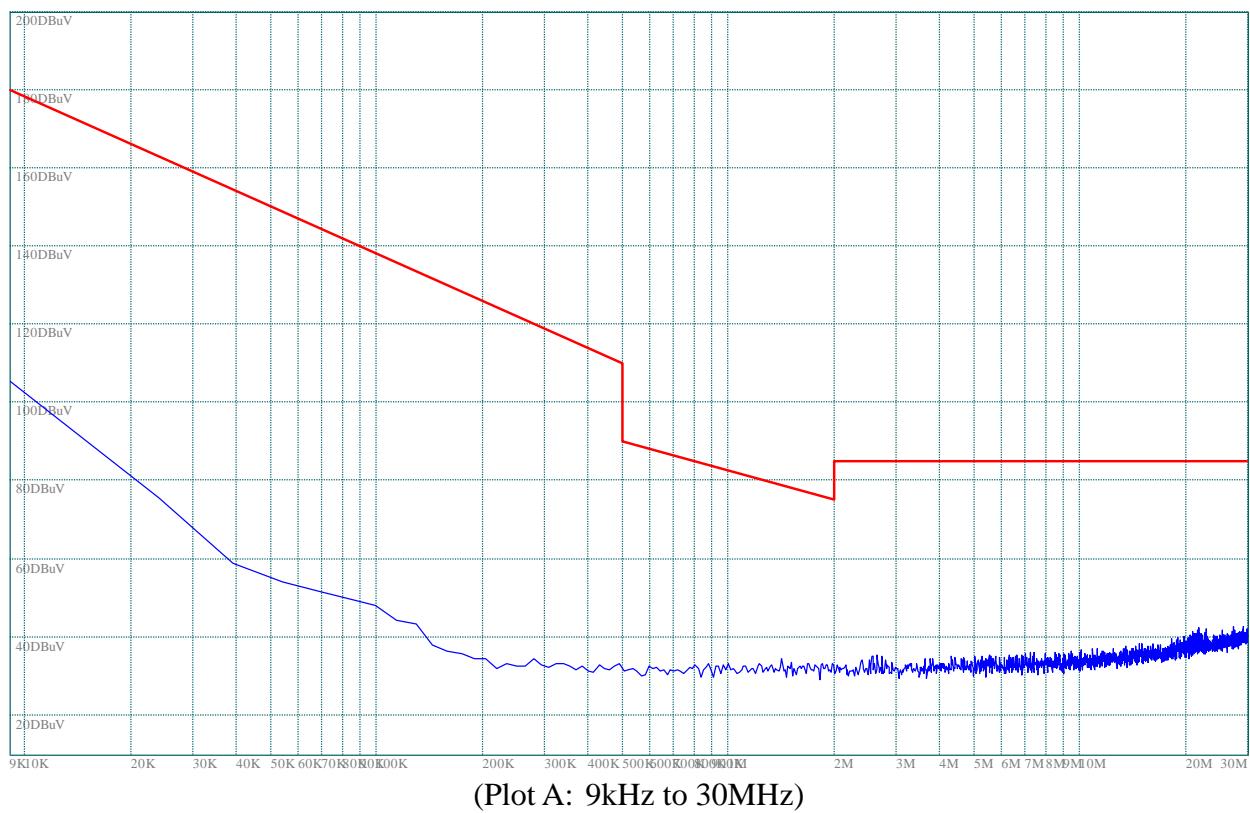
Channel	Frequency (MHz)	Fundamental Emission (dB $\mu$ V/m)		Limits		Ant Polarization	Refer to Plot
		PK	AV	PK	AV		
3	433.9128MHz	88.2	76.2	100.8	80.8	H	Plot A
		76.9	63.7			V	Plot B

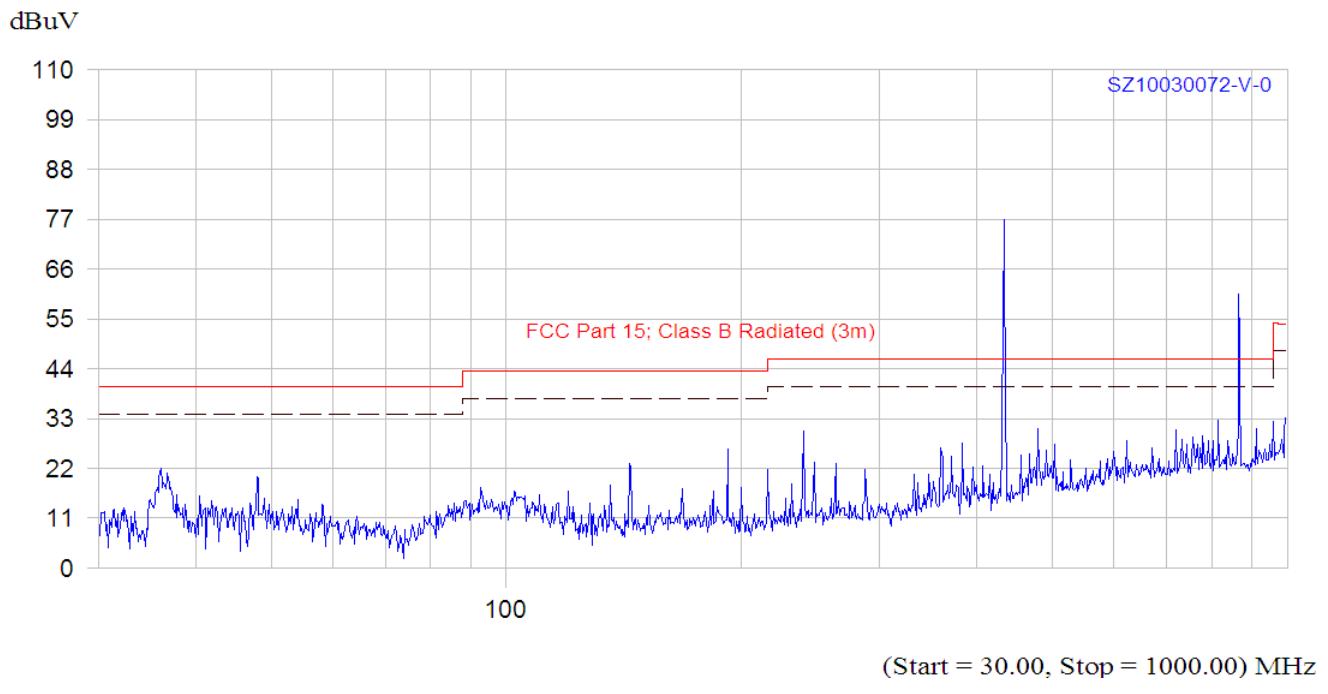
#### The un-wanted Emissions:

Frequency (MHz)	Detector(AV/Peak) (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Azimuth (deg)	Height (cm)	Ant Polarization
866.5	49.7(AV)	60.8	11.1	230	100	H
1299.8	25.3	74	48.7	180	120	H
1733.0	30.1	74	43.9	160	150	H
2166.3	31.7	74	42.3	215	100	H
2599.5	33.5	74	40.5	18	200	H
3032.8	38.5	74	35.5	180	180	H
3466.0	35.7	74	38.3	190	100	H
866.5	47.8(AV)	60.8	13	75	200	V
1299.8	26.8	74	47.2	150	220	V
1733.0	30.3	74	43.7	96	160	V
2166.3	31.4	74	42.6	65	100	V
2599.5	33.7	74	40.3	215	100	V
3032.8	38.6	74	35.4	170	160	V
3466.0	35.5	74	38.5	230	100	V

Note: the EUT was tested in all three orthogonal planes and frequency range 30MHz to the tenth harmonics, here we ranged to 5GHz.

Emissions attenuated closely to the noise base above 1GHz are not reported here.





Emission above 1GHz is closing to the base and omitted here.

\*\* END OF REPORT \*\*