TEST REPORT

Report No.:	**EM201200699**	**Application No.:**	**ZJ00022182**
Client:	Shanghai Sunray Technology Co., Ltd.		
Address:	8F, Bei Da 2, NO.560 Sheng Xia Rd, Pudong Zhangjiang, Shanghai, China		
Sample Description:	Micro Power Wireless Data Module		
Model:	SRWF-8009		
FCC ID:	**RBC-8009**		
Test Location:	Guangzhou GRG Metrology and Test Co., Ltd.		
Test Specification:	FCC Part 15,Subpart C:2010		
Test Date:	2012-11-01 to 2012-11-29		
Issue Date:	2012-11-28		
Test Result:	*Pass.*		

Prepared By:	**Reviewed By:**	**Approved By:**
David Li / Test Engineer	Jane Cao / Test Engineer	Gavin Wu / Manager
David Li	Jane Cao	Gavin Wu
Date:2012-12-4	Date:2012-12-4	Date:2012-12-4

Other Aspects:

/

Abbreviations: *ok / P = passed; fail / F = failed; n.a. / N = not applicable*

DIRECTIONS OF TEST

1. This station carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.

2. 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.

3. If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.

Table of Contents

1. TEST RESULT SUMMARY

Section C of FCC Part 15.231:2010			
Standard	**Item**	**Limit / Severity**	**Result**
FCC Part 15,Subpart C (15.231)	Antenna Requirement	Section 15.203	PASS
	Occupied Bandwidth	Section 15.231 (c)	PASS
	Dwell Time	Section 15.231(e)	PASS
	Field strength of fundamental	Section 15.231(e)	PASS
	Radiated Spurious Emission	Section 15.209 &15.231(b)	PASS

2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name:	Shanghai Sunray Technology Co., Ltd.
Address:	8F, Bei Da 2, NO.560 Sheng Xia Rd, Pudong Zhangjiang, Shanghai, China

2.2 MANUFACTURER

Name:	Shanghai Sunray Technology Co., Ltd.
Address:	8F, Bei Da 2, NO.560 Sheng Xia Rd, Pudong Zhangjiang, Shanghai, China

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	Micro Power Wireless Data Module
Model No.:	SRWF-8009
Trade Name:	Sunray
Power Supply:	DC 3.6V
Frequency	470MHz
Type of Modulation	FSK
Antenna Type	Spring antenna

3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests and measurements refer to this report were performed by Guangzhou GRG Metrology and Test CO., LTD.

Add. : 163 Pingyun Rd, West of Huangpu Ave, Guangzhou, 510656, P. R. China

Telephone: +86-20-38699959, 38699960, 38699961

Fax : +86-20-38695185

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC Listed Lab (No. 688188)
China	CNAS （No.L0446）
China	DILAC (No.DL175)
Canada	Registration No.:8355A-1

3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		**Frequency**	**Uncertainty**
Radiated Emission	Horizontal	30MHz～1000MHz	4.2dB
		1GHz～26.5GHz	4.2dB
	Vertical	30MHz～1000MHz	4.4dB
		1GHz～26.5GHz	4.4dB
Conducted Emission		9kHz～30MHz	3.1 dB

This uncertainty represents an expanded uncertainty factor of *k*=2.

3.4 LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Dwell Time/Occupied bandwidth				
Receiver	R&S	ESU40	100106	2013-09-26
Radiated Emissions				
Biconical Log-periodic Antenna	ETS.LINDGREN	3142C	00075971	2013-09-26
Pre-amplifier	HP	8447DOPT010	2944A06252	2013-03-11
Pre-amplifier	Agilent	8449B	3008A01649	2013-03-11
Receiver	R&S	ESU40	100106	2013-07-19
Horn antenna	SCHWARZBECK	BBHA9120D	D752	2013-10-14
Cable	GRGT	GRGT2	GRGT2	2013-07-12

NOTE: The calibration interval of the above test instruments is 12 months.

4. TEST RESULTS

4.1 E.U.T. TEST CONDITIONS

Type of antenna: Spring antenna

Temperature: 21.0 °C

Humidity: 51 % RH

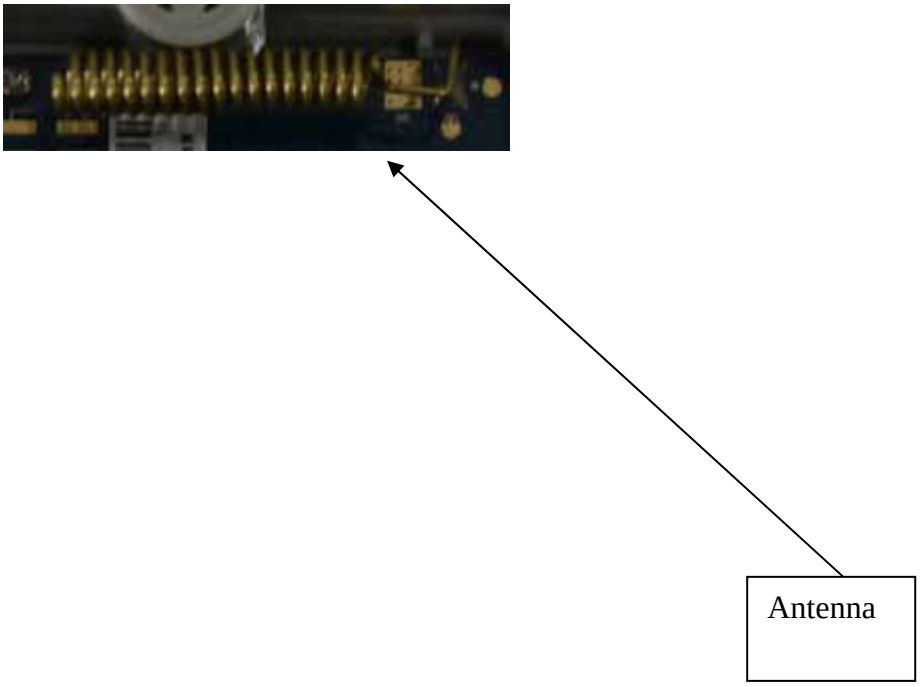
Atmospheric Pressure: 1011 mbar

Test frequencies: According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. if required. reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top. 1 near middle and 1 near bottom

4.2 ANTENNA REQUIREMENT

The EUT antenna is Spring antenna. Antenna gain is -1dBi .which accordance 15.203.is considered sufficient to comply with the provisions of this section



4.3 OCCUPIED BANDWIDTH

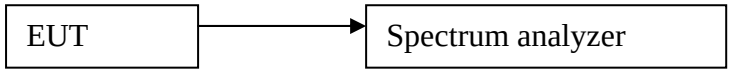
4.3.1 LIMITS

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

4.3.2 TEST PROCEDURES

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel;
3. Set the spectrum analyzer: RBW >= 1% of the 20dB bandwidth (set 100kHz). VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points or 99% bandwidth.
5. bandwidth value is OBW value.

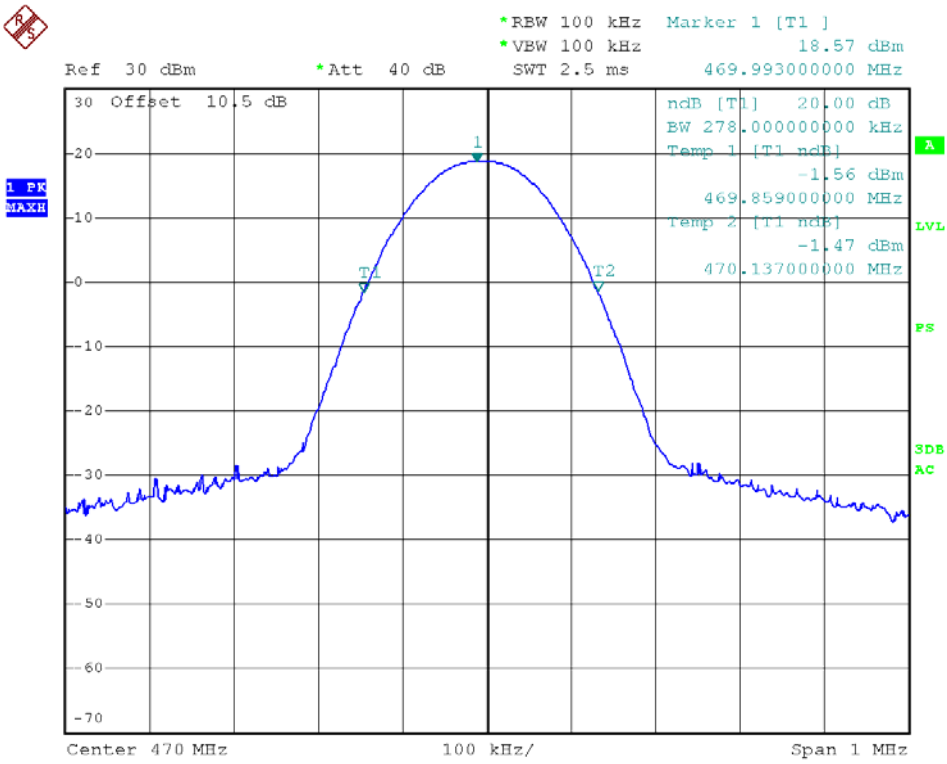
4.3.3 TEST SETUP



4.3.4 TEST RESULTS

Frequency （MHz）	20dB Bandwidth Emission (kHz)	Limit (MHz)	Limit (MHz)
470	278	1.175	Pass

Limit=Frequency x 0.25%=470.005 x 0.25%=1.175MHz
Refer to attached plots:


*RBW 100 kHz
*VBW 100 kHz
SWT 2.5 ms
Marker 1 [T1]
18.57 dBm
469.993000000 MHz
Ref 30 dBm
*Att 40 dB
30 Offset 10.5 dB
ndB [T1] 20.00 dB
BW 278.000000000 kHz
Temp 1 [T1 ndB]
-1.56 dBm
469.859000000 MHz
Temp 2 [T1 ndB]
-1.47 dBm
470.137000000 MHz
1 PK
MAXH
A
LVL
PS
SDB
AC
T1
T2
Center 470 MHz
100 kHz/
Span 1 MHz

4.4 DWELL TIME

4.4.1 LIMITS

Per 15.231(e) In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

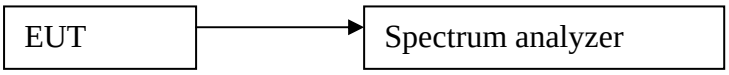
4.4.2 TEST PROCEDURES

1.Set spectrum analyzer span = 0. centered on a hopping channel;

2.Set RBW = 30KHz and VBW = 100KHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold;

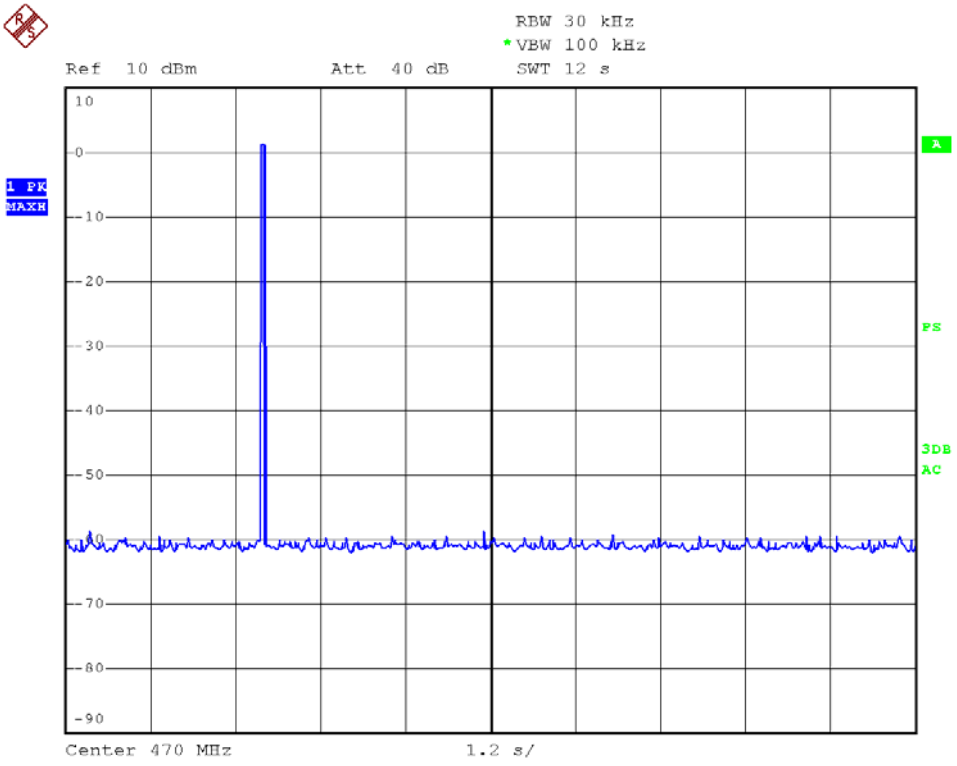
3.Use the marker-delta function to determine the dwell time.

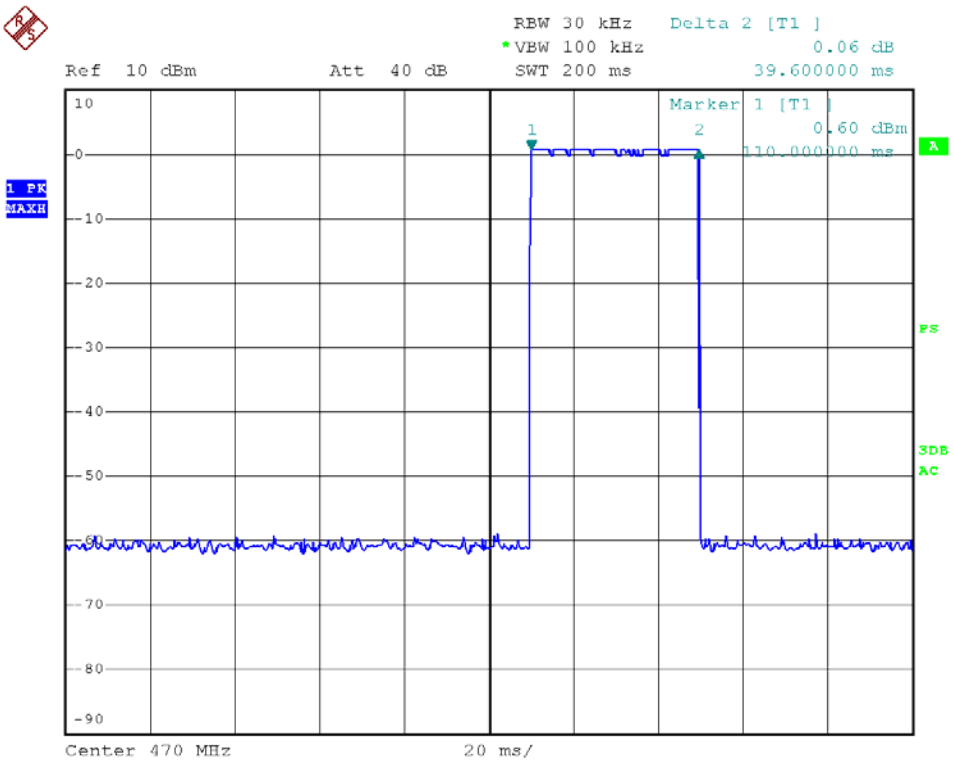
4.4.3 TEST SETUP



4.4.4 TEST RESULTS

Please refer the graph as below:



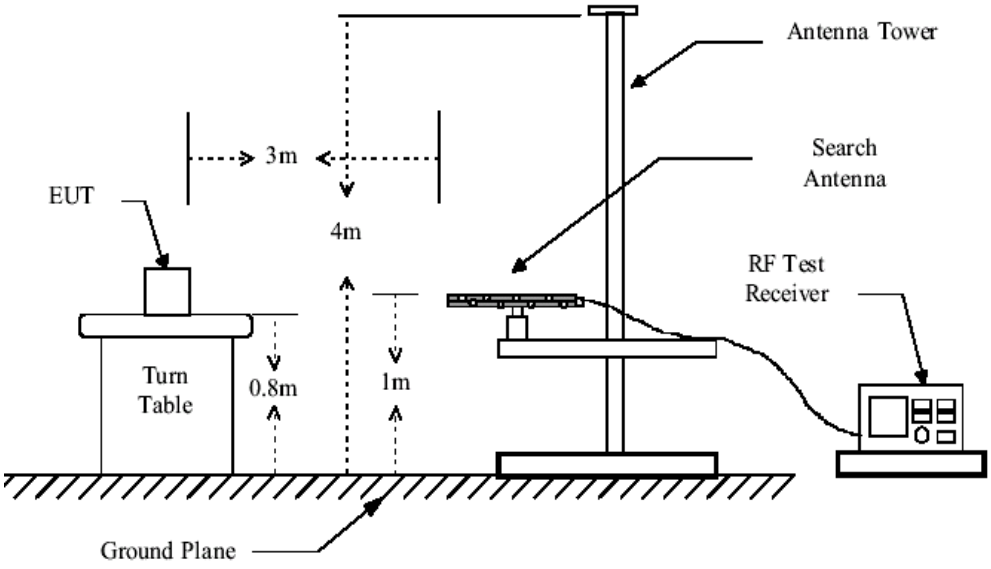


4.5 FIELD STRENGTH OF FUNDAMENTAL

4.5.1 LIMITS

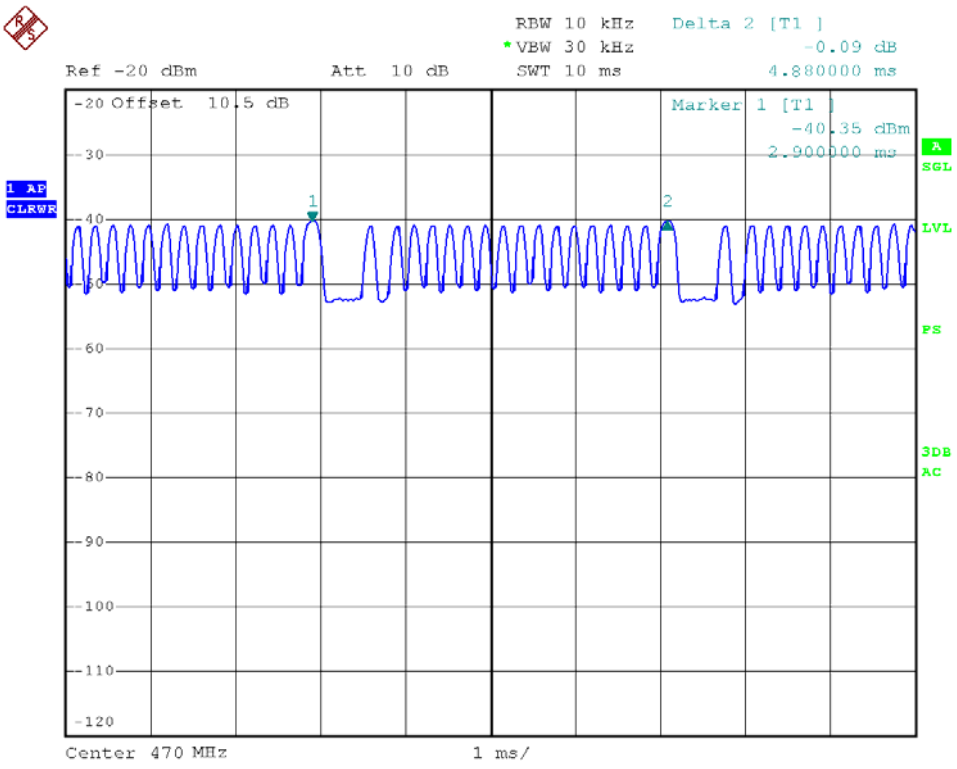
All emission from a digital device, including any network of conductors and apparatus shall not exceed the level of field strength specified

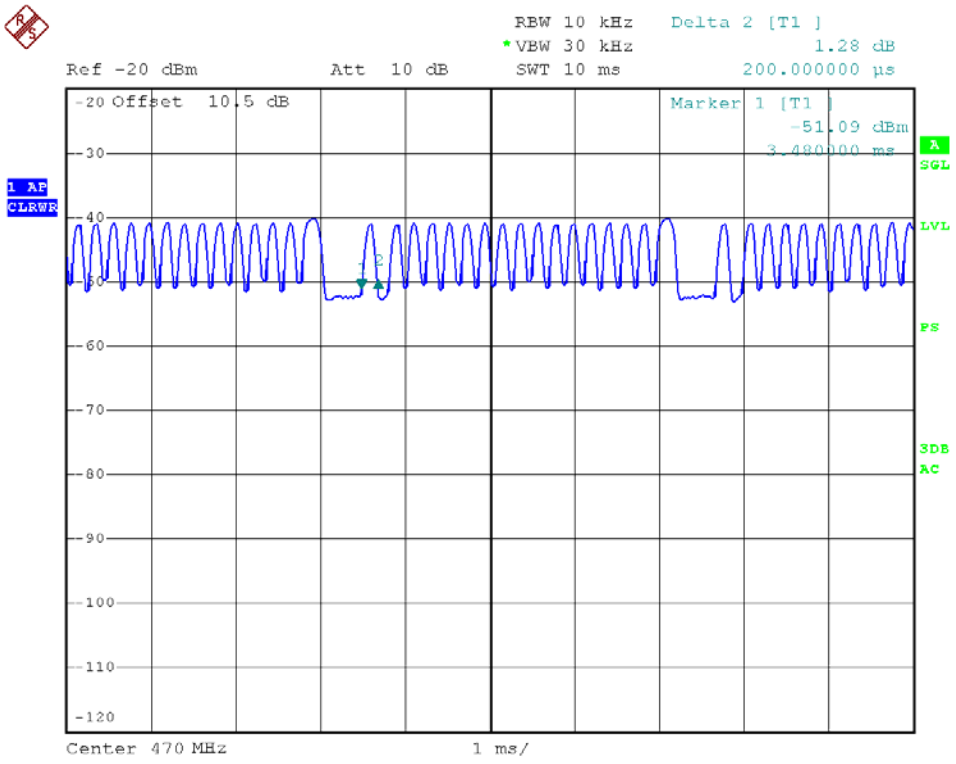
4.5.2 TEST CONFIGURATION:

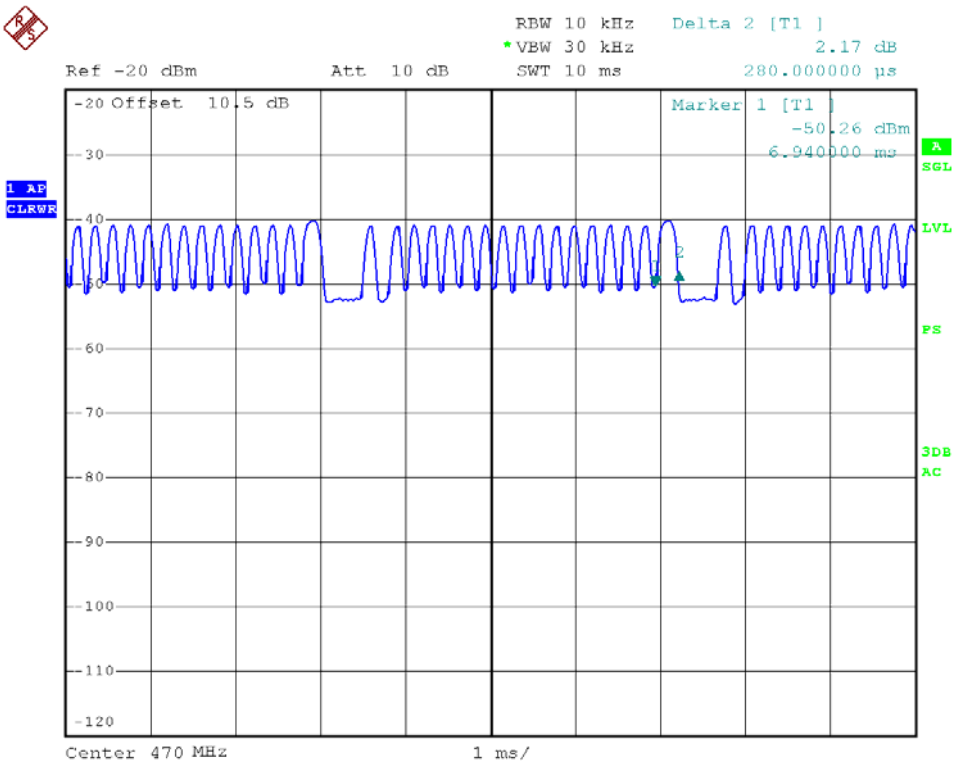


Duty cycle:
Average=peak(dBuV/m)+duty cycle (dB)
Tp=4.88ms
Ton1=200μs*16=3.2ms
Ton2=280μs=0.28ms
Ton=3.2+0.28=3.48ms
Factor=20log(Ton/Tp)=20log(3.48/4.88)= -2.94

Refer to attached plots for detail




RBW 10 kHz
*VBW 30 kHz
SWT 10 ms
Delta 2 [T1]
1.28 dB
200.000000 µs
Ref -20 dBm
Att 10 dB
-20 Offset 10.5 dB
Marker 1 [T1]
-51.09 dBm
3.480000 ms
1 AP
CLRWR
A
SGL
LVL
PS
3DB
AC
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
Center 470 MHz
1 ms/


RBW 10 kHz
*VBW 30 kHz
SWT 10 ms
Delta 2 [T1]
2.17 dB
280.000000 µs
Ref -20 dBm
Att 10 dB
-20 Offset 10.5 dB
Marker 1 [T1]
-50.26 dBm
6.940000 ms
1 AP
CLRWR
A
SGL
LVL
PS
3DB
AC
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
Center 470 MHz
1 ms/

4.5.3 TEST RESULTS

FCC Part 15 Subpart C Paragraph 15.231(e) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental **(microvolts/meter)**		Field Strength of Spurious Emission **(micronolts/meter)**	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	1000	60	100	40
70-130	500	53.98	50	33.98
130-174	500-1500	53.98-63.52	50-150	33.98-51.48
174-260	1500	63.52	150	43.52
260-470	1500-5000	63.52-73.98	150-500	43.52-53.98
Above 470	5000	73.98	500	53.98

Note: 1. RF Field Strength (dBuV) = 20 log 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.
4.Linear interpolations for frequency ranges 130-174MHz and 260-470MHz
5.the above field strength limits are specified at a distance of 3-meters and the tighter limits apply at the band edges
(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR
quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electro technical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated
using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.
(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function . Unless otherwise specified, measurements above 1000 MHz shall be performed using a

minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, *e.g.*, see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, *e.g.*, the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

Peak Measurement:

Frequency (MHz)	**Reading (dBuV/m)**	**Correct Factor(dB/m)**	**Result (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna polarization**
470	53.97	19.87	73.84	93.38	19.54	Vertical
470	54.88	19.87	74.75	93.38	18.63	Horizontal

AV Measurement:

Frequency (MHz)	**Duty cycle (factor)**	**Peak (dBuV/m)**	**AV (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB))**	**Antenna polarization**
470	-2.94	73.84	70.90	73.38	2.48	Vertical
470	-2.94	74.75	71.81	73.38	1.57	Horizontal

4.6 RADIATED SPURIOUS EMISSIONS

4.6.1 LIMITS

Frequency (MHz)	Quasi-peak(dBμV/m)
30 ~ 88	40
88~216	43.5
216 ~ 960	46
Above 960	54

NOTE: (1) The lower limit shall apply at the transition frequencies.

Frequency (GHz)	Quasi-peak(dBμV/m)
1 ~ 5	74
1~ 5	54

4.6.2 TEST PROCEDURES

Procedure of Preliminary Test

Radiated emission tests shall be made with the receive or transmit antenna located at a horizontal distance of 3 m plus half of the maximum width of the EUT being tested, measured from the centre of the EUT. The tests shall be performed with the equipment configured as closely as possible to its typical, practical operation. Unless stated otherwise, cables and wiring shall be as specified by the manufacturer and the equipment shall be in its housing (or cabinet) with all covers and access panels in place. Any deviation from normal EUT operating conditions shall be included in the test report.

The EUT (on a non-conductive support structure, where applicable) shall be placed on a remotely operated turntable, to allow the EUT to be rotated. The height of the EUT above the ground plane shall be according to the following requirements.

• Table-top equipment is placed on a non-conductive set-up table with height 0,8 m ± 0,01 m, ANSI C63.4 specifies the method to determine the impact of the non-conductive set-up table on test results.

• Floor-standing equipment is placed on a non-conductive support, as specified in the applicable product standard. If there are no EUT height placement requirements in the product standard, the EUT shall be placed on a non-conductive support at a height of 5 cm to 15 cm above the ground plane.

Interface cables, loads, and devices should be connected to at least one of each type of the interface ports of the EUT and, where practical, each cable shall be terminated in a device typical for its actual use. Where there are multiple interface ports of the same type, a typical number of these devices shall be connected to devices or loads. It is sufficient to connect only one of the loads, provided that it can be shown, for example by preliminary testing, that the connection of further ports would not significantly increase the level of disturbance (that is, more than 2 dB) or significantly degrade the immunity level.

The test mode(s) described in Item 2.4 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.4 producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

EUT and support equipment were set up on the turntable as per the configuration with highest

emission level in the preliminary test. The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level. Record at least six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only QP reading is presented. The test data of the worst-case condition(s) was recorded.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

Below 1GHz Set the spectrum analyzer: RBW =100KHz VBW >= RBW , Span = enough to captch the trace. Sweep = auto; Detector Function = Peak. Trace = Max,hold.

Above 1GHz Set the spectrum analyzer: RBW =1MHz VBW >= RBW , Span = enough to captch the trace. Sweep = auto; Detector Function = Peak. Trace = Max,hold.

4.6.3 TEST SETUP

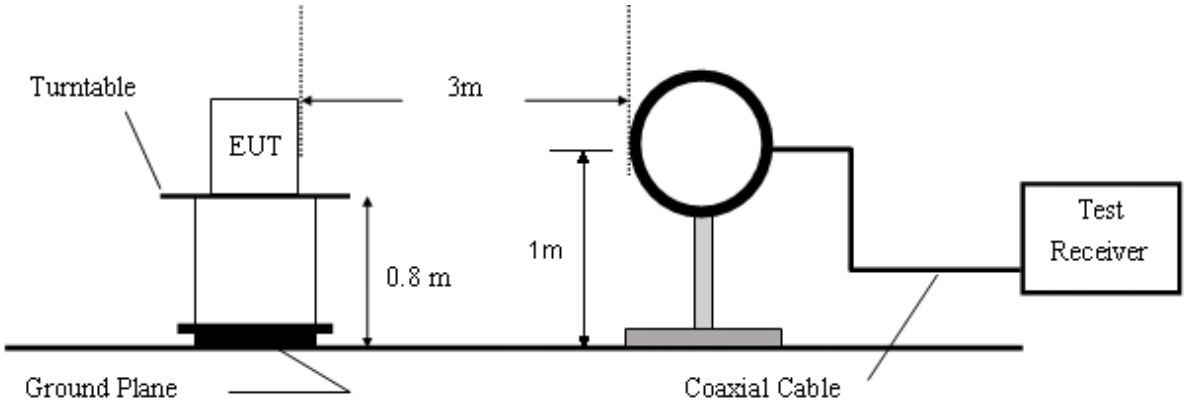


Figure 1. 9KHz to 30MHz radiated emissions test configuration

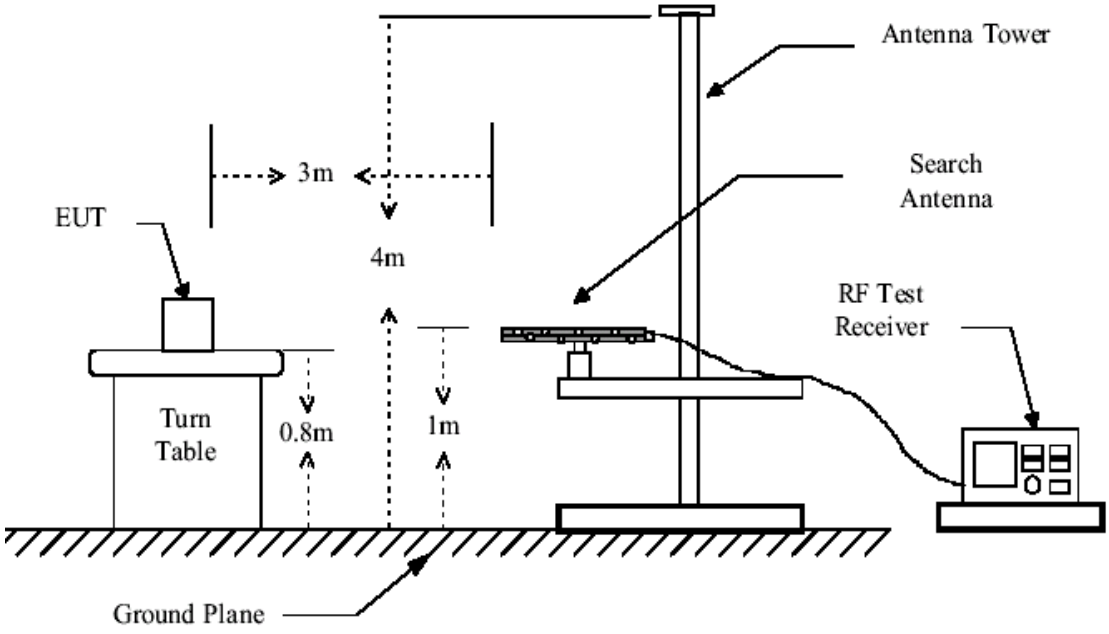


Figure 2. 30MHz to 1GHz radiated emissions test configuration

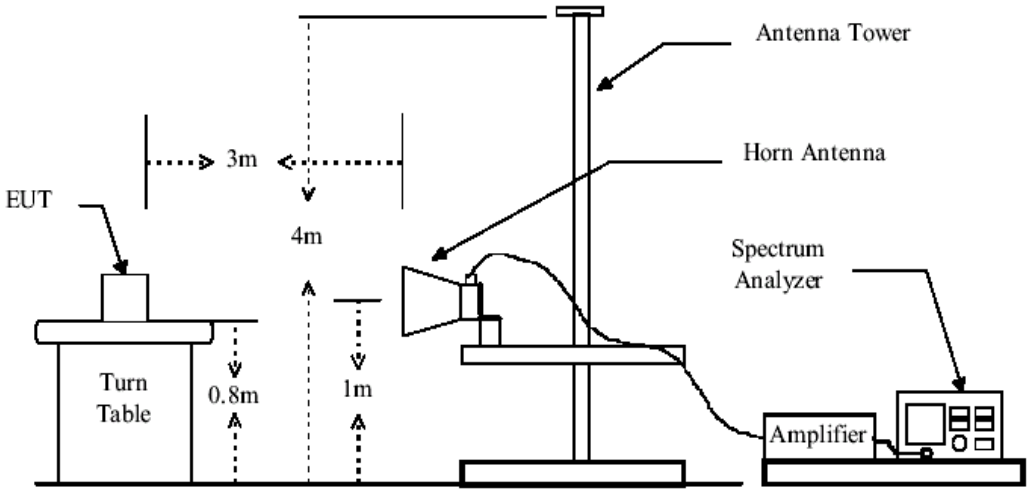


Figure 3. Above 1GHz radiated emissions test configuration

4.6.4 TEST RESULTS

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	162.8226	6.05	10.65	16.70	43.50	-26.80	Vertical
2	645.1195	4.41	22.79	27.20	46.00	-18.80	Vertical
3	812.2712	4.32	25.18	29.50	46.00	-16.50	Vertical
6	173.2050	6.12	10.68	16.80	43.50	-26.70	Horizontal
7	532.9208	2.84	20.86	23.70	46.00	-22.30	Horizontal
8	709.7883	3.13	24.27	27.40	46.00	-18.60	Horizontal

1~5 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1833.302	36.06	13.45	49.51	74.00	-24.49	Horizontal
2	3716.665	30.46	24.74	55.20	74.00	-16.80	Horizontal
3	4699.877	28.05	27.44	55.49	74.00	-17.51	Horizontal
4	1833.302	34.62	13.45	48.07	74.00	-25.93	Vertical
5	3697.542	30.13	24.69	54.82	74.00	-19.18	Vertical
6	4712.015	28.05	27.47	55.52	74.00	-17.48	Vertical

AV Measurement:

No.	Frequency (MHz)	Duty cycle (factor)	Peak (dBuV/m)	AV (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1833.302	-2.94	49.51	46.57	54.00	-7.43	Horizontal
2	3716.665	-2.94	55.20	52.26	54.00	-1.74	Horizontal
3	4699.877	-2.94	55.49	52.55	54.00	-1.45	Horizontal
4	1833.302	-2.94	48.07	45.13	54.00	-8.87	Vertical
5	3697.542	-2.94	54.82	51.88	54.00	-2.12	Vertical
6	4712.015	-2.94	55.52	52.26	54.00	-1.74	Vertical

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Peak =Receiver Reading + Correct Factor

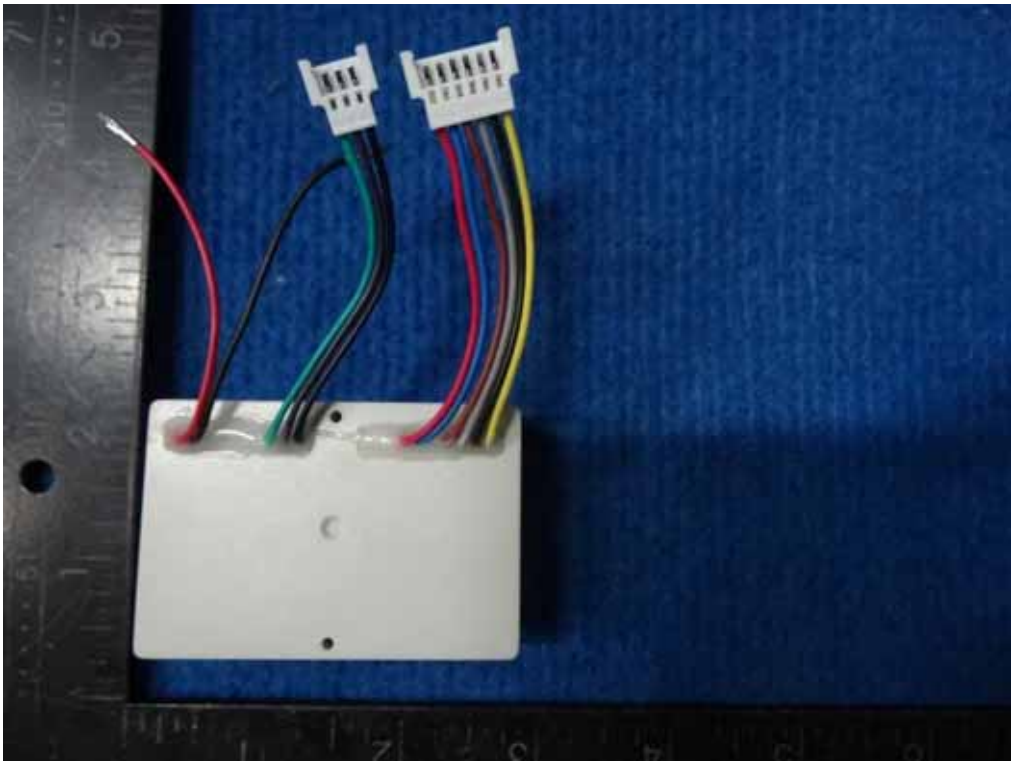
AV=Peak+ Duty cycle

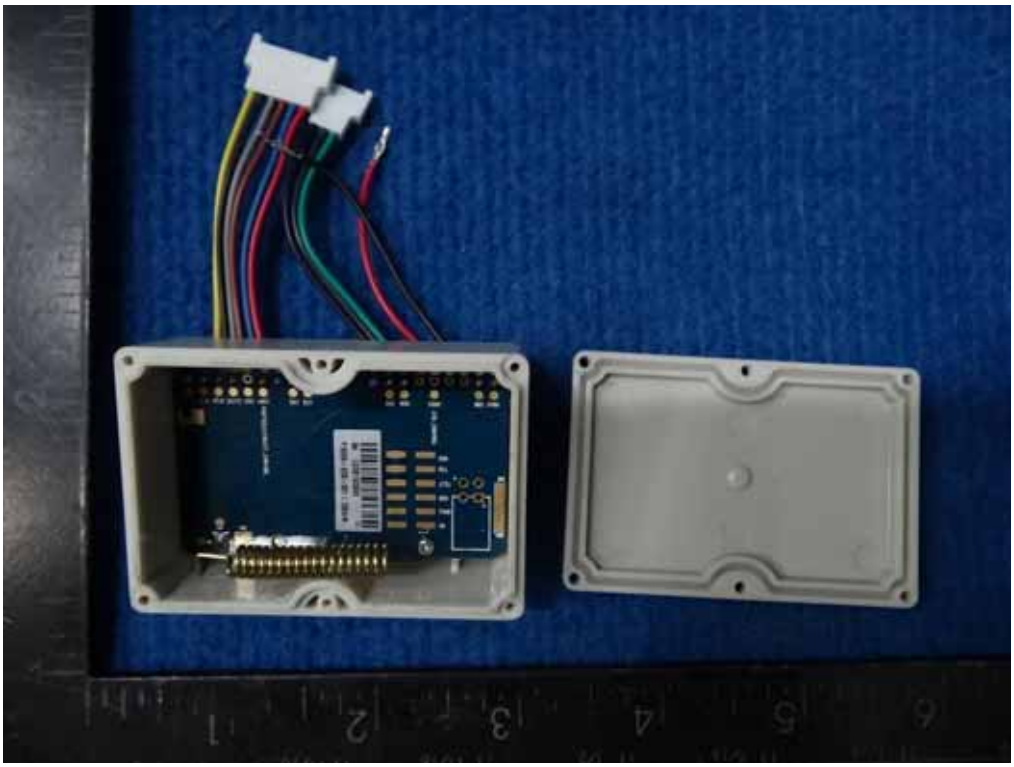
APPENDIX A: PHOTOGRAPH OF THE TEST ARRANGEMENT

RADIATED SPURIOUS EMISSION TEST（Below 1GHz）

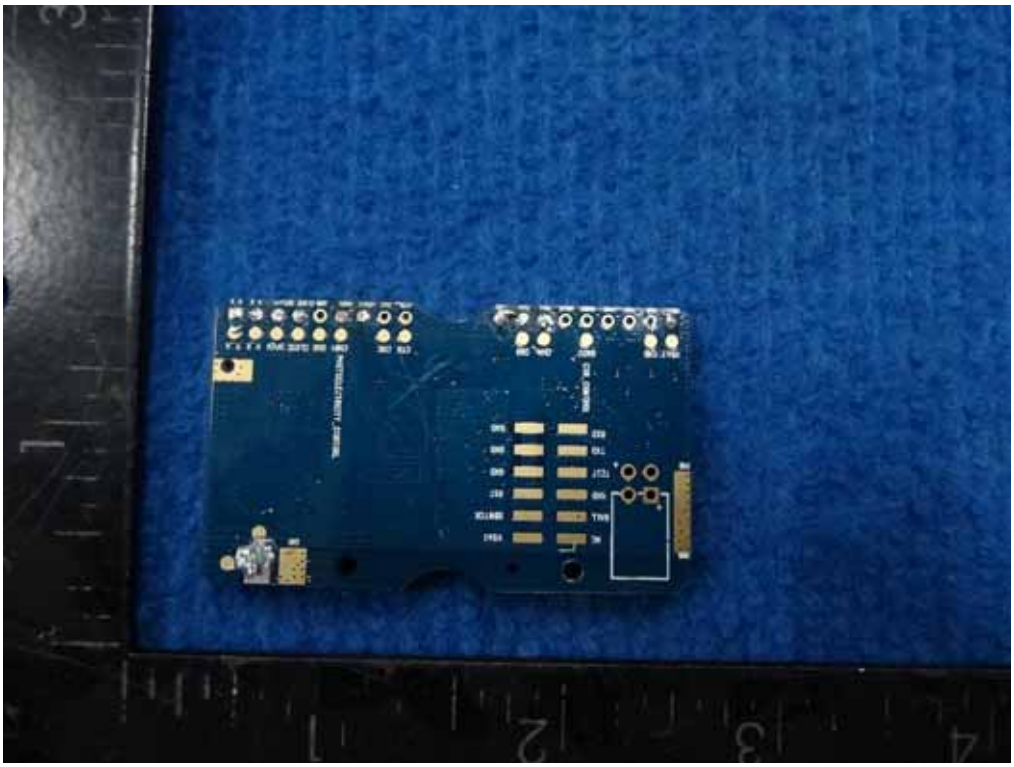
RADIATED SPURIOUS EMISSION TEST（Above 1GHz）

APPENDIX B: PHOTOGRAPH OF THE EUT






SRWF-8009-V1.4
1207



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