




TEST REPORT

Report No.:	E201511046378-1	Application No.:	E201511046378
Applicant:	Shanghai Sunray Technology Co., Ltd.		
Applicant Address:	8F, Bei Da 2, NO.560 Sheng Xia Rd, Pudong Zhangjiang, Shanghai, China		
Sample Description:	Micro Power Wireless Data Module		
Model:	SRWF-8009G		
FCC ID:	RBC-8009G		
Test Specification:	FCC Part 15,Subpart C:2015		
Test Date:	2015-10-20 to 2016-01-21		
Issue Date:	2016-01-21		
Test Result:	<i>Pass.</i>		
Prepared By:	Reviewed By:	Approved By:	
Brian Xiao / Test Engineer	Lynn Xiao /Technical Manager	Yong Dai /Technical Manager	
			
Date:2016-01-21	Date:2016-01-21	Date:2016-01-21	
Other Aspects:			
/			
Abbreviations: <i>ok / P = passed; fail / F = failed; n.a. / N = not applicable</i>			
The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.			

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.

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1. TEST RESULT SUMMARY

Section C of FCC Part 15.231:2015			
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
	Field strength of fundamental	Section 15.231(e)	PASS
	Radiated Spurious Emission	Section 15.209 &15.231(b)	PASS
	Automatically Limiting Operation	Section 15.231(e)	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-8009G
Trade Name: Sunray
Power Supply: DC 3.6V
Frequency: 475MHz
Type of Modulation: FSK
Antenna Type: Linear antenna

2.4 LOCAL SUPPORTIVE INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number
5Ω loader	/	/	/

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)
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
OCCUPIED BANDWIDTH / FIELD STRENGTH OF FUNDAMENTAL / RADIATED SPURIOUS EMISSIONS /				
Receiver	R&S	ESU26	100526	2016-03-08
Loop antenna	R&S	HFH2-Z2	881058/58	2016-04-17
Biconical Log-periodic Antenna	ETS.LINDGREN	3142C	00075971	2016-04-17
Horn antenna	ETS.LINDGREN	3117C	00075824	2017-05-05
Per-Amplifier (0.1-26.5GHz)	Compliance Directions systems Inc.	PAP-0126	25002	2016-07-02
AUTOMATICALLY LIMITING OPERATION				
Spectrum analyzer	Schwarzbeck	FSV30	100526	2016-03-09

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: Linear antenna

Temperature: 23.9 °C

Humidity: 57 % RH

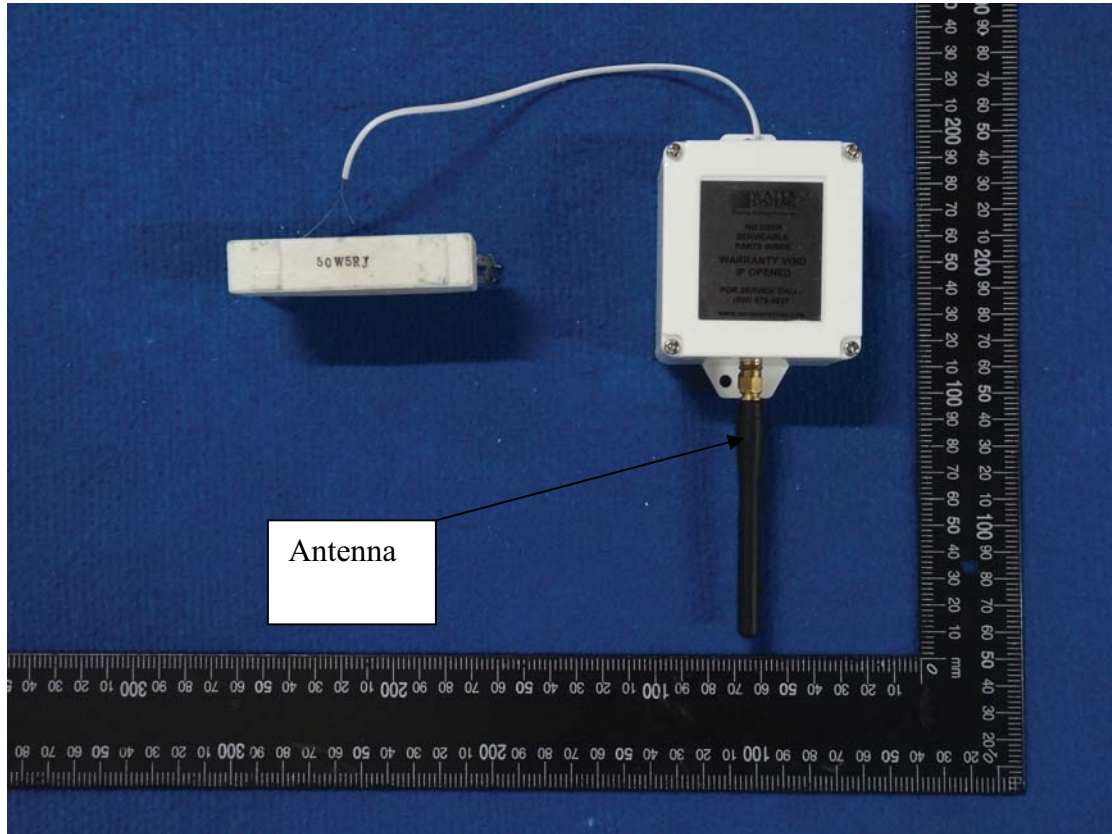
Atmospheric Pressure: 1011 mbar

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



4.3 OCCUPIED BANDWIDTH

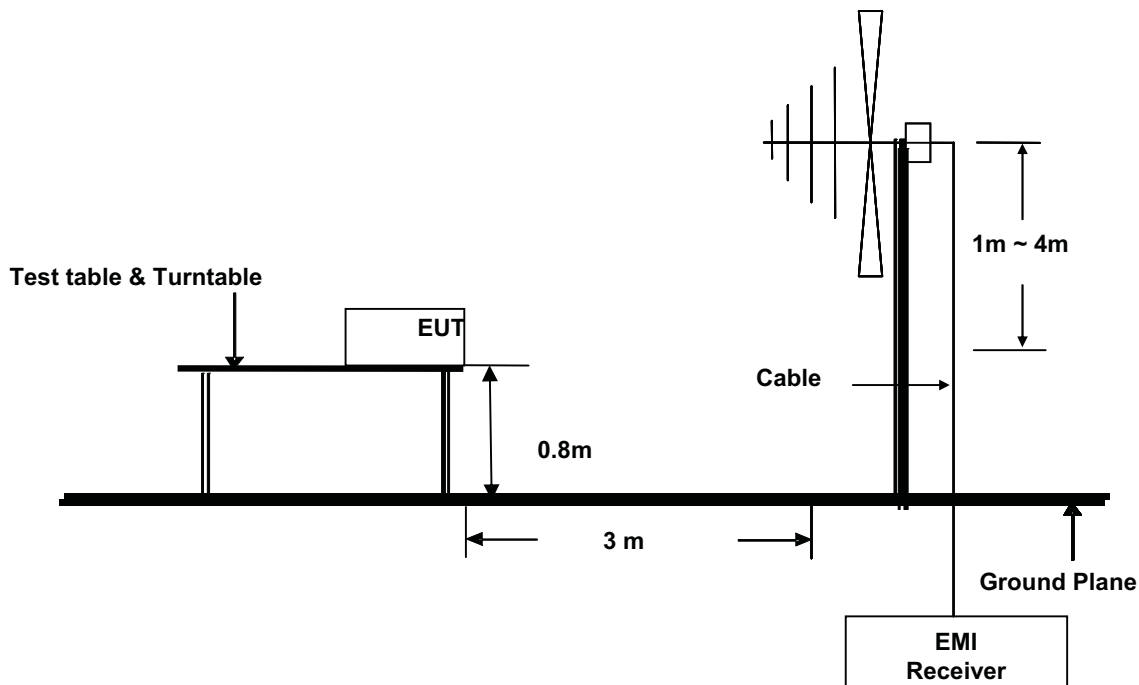
4.3.1 LIMITS

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. Make the EUT work in fixed frequency mode;
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 \geq 1% of the 20dB bandwidth (set 10kHz). VBW \geq 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



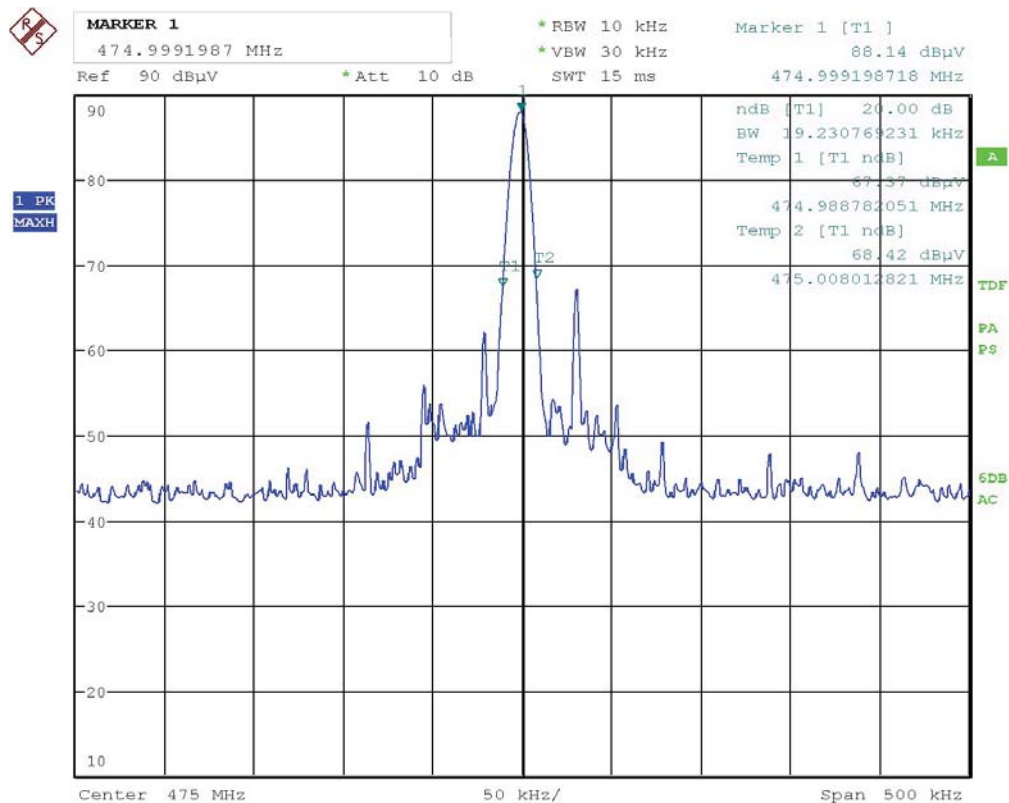
4.3.4 TEST RESULTS

Frequency (MHz)	20dB Bandwidth Emission (kHz)	Limit (kHz)	Result
475	29.23	1187.5	Pass

Limit=Frequency x 0.25%=475 x 0.25%=1.1875MHz

Refer to attached plots:

Channel 475MHz



Pre-scan Vertical and Horizontal polarization, found that Horizontal polarization is the worst case.

4.4 FIELD STRENGTH OF FUNDAMENTAL

4.4.1 LIMITS

FCC Part 15 Subpart C Paragraph 15.231(e) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious Emission	
	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	33.98-43.52
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

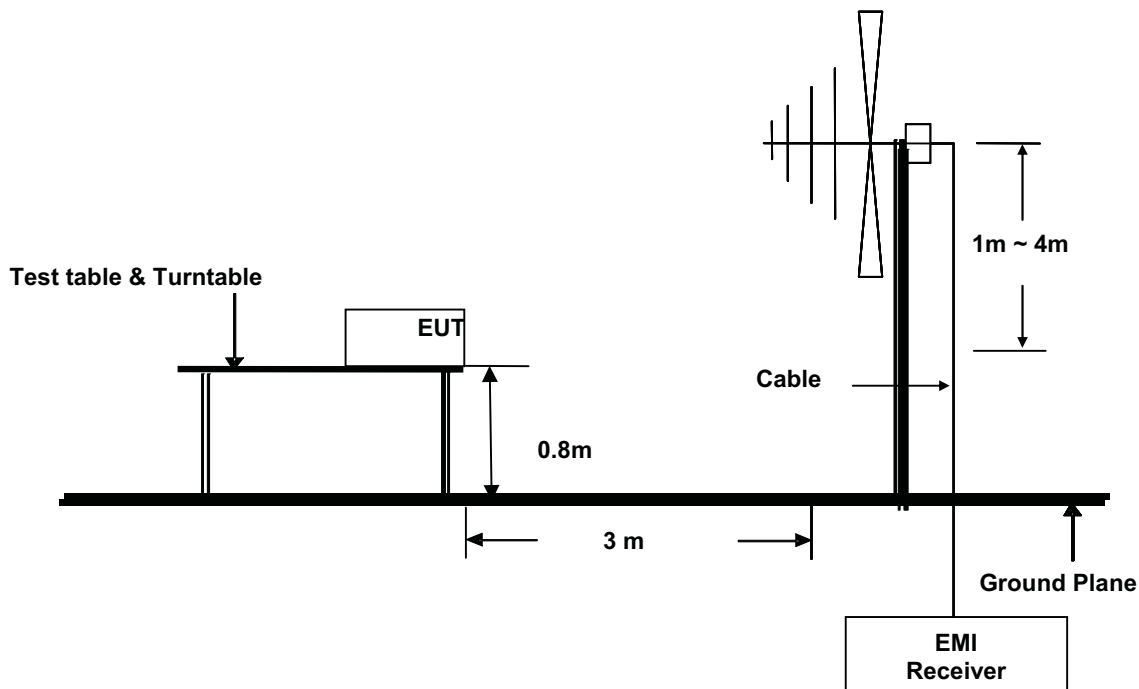
quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electro technical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission 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.

4.4.2 TEST SETUP



4.5.3 TEST RESULTS

Channel 475MHz:

Duty cycle:

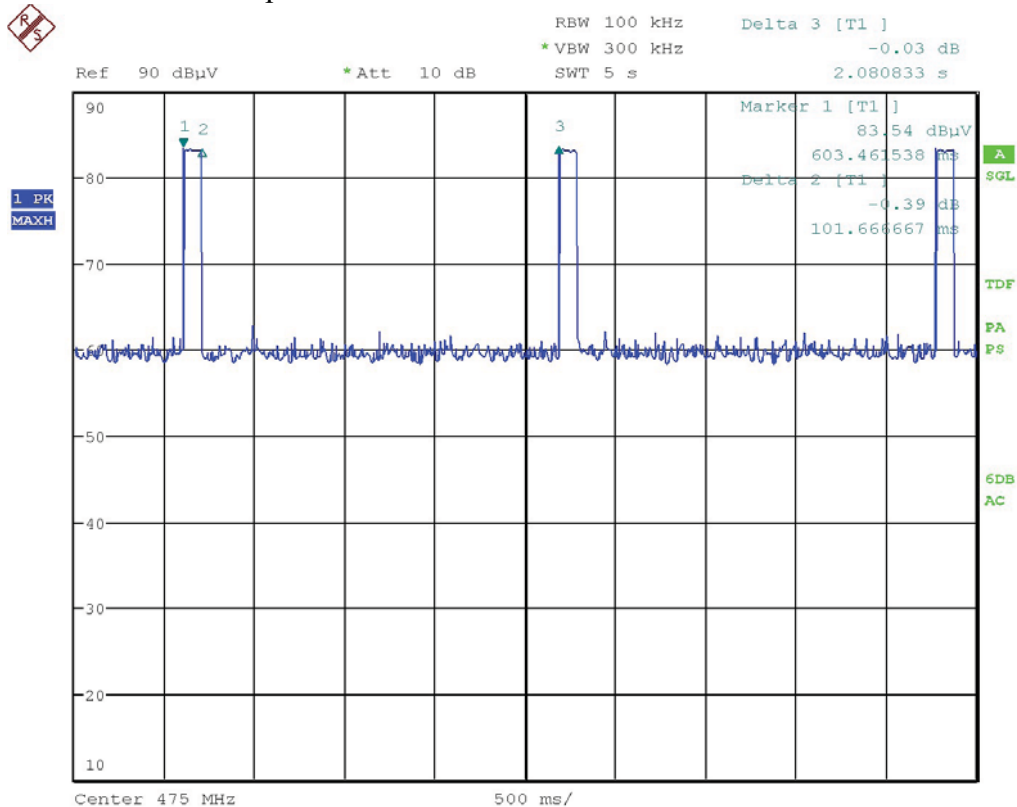
Average=peak(dBuV/m)+duty cycle (dB)

$T_p=2.08083s$

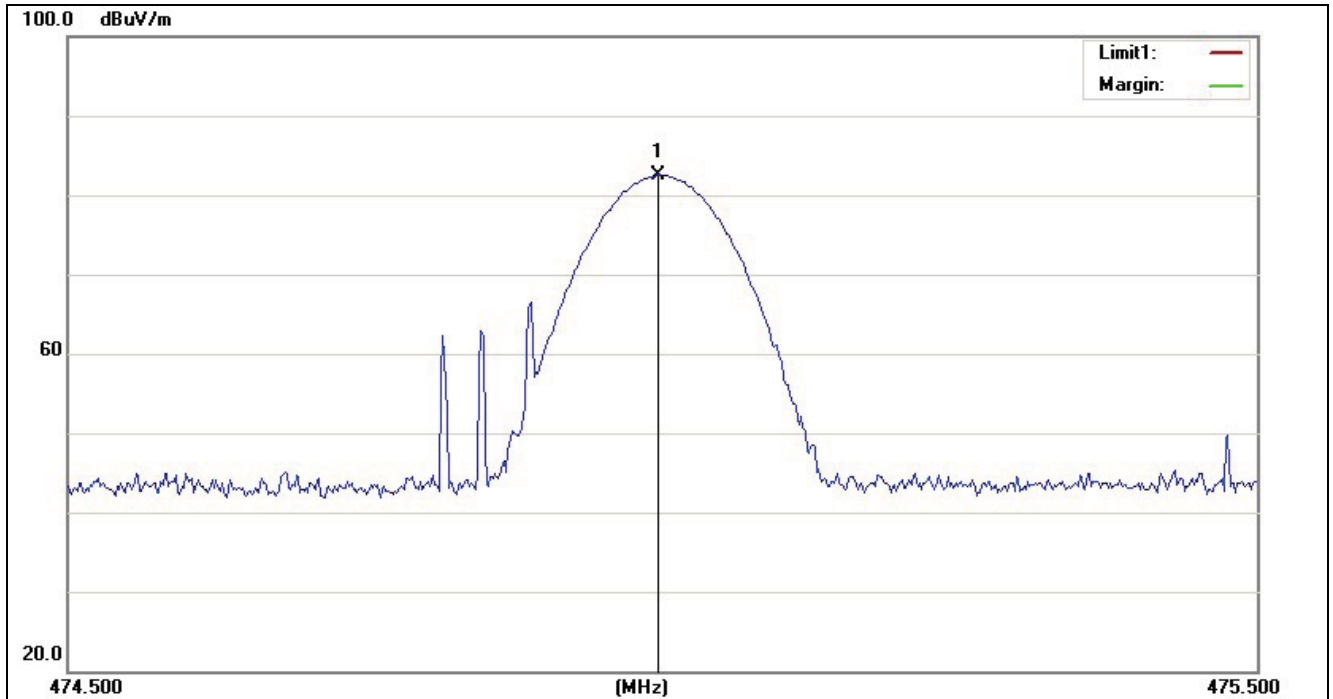
$T_{on}=101.67ms=0.10167s$

Factor= $20\log(T_{on}/T_p)=20\log(0.10167/2.08083)=-26.22$

Refer to attached plots for detail

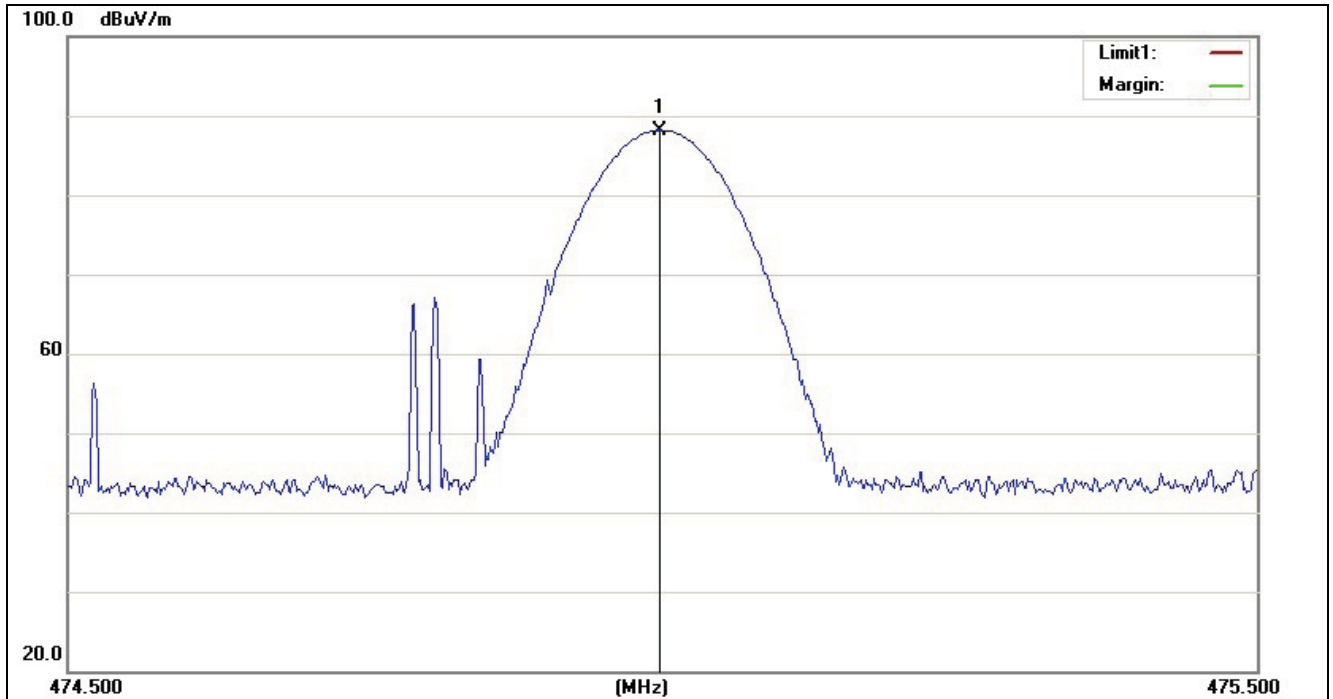


Project No.:	E201511046378	Polarization:	Vertical
Standard:	/	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	14:59:03
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	474.9968	63.79	18.68	82.47	93.98	-11.51	peak
2	474.9968	82.47	-26.22	56.25	73.98	-17.73	Avg

Project No.:	E201511046378	Polarization:	Horizontal
Standard:	/	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	15:04:01
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	474.9984	69.52	18.68	88.20	93.98	-5.78	peak
1	474.9984	88.20	-26.22	61.98	73.98	-12.00	Avg

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

According to ANSI C63.10:2013, a calibrated, linearly polarized antenna shall be positioned at the specified distance from the periphery of the EUT. The specified distance is the distance between the horizontal projection onto the ground plane of the closest periphery of the EUT and the projection onto the ground plane of the center of the axis of the elements of the receiving antenna.

Measurements shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna shall be varied in height above the reference ground plane to obtain the maximum signal strength. Unless otherwise specified, the measurement distance shall be 3 m. The EUT put on a 0.8m tabel below 1GHz, on 1.5m table above 1GHz. At any measurement distance, the antenna height shall be varied from 1 m to 4 m. These height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. For a tuned dipole, the minimum heights as measured from the center of the antenna are those specified in the NSA measurement requirements.

For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation.

Table-top equipment is placed on a non-conductive set-up table with height 0, 8/1.5 m ± 0, 01 m,

ANSI C63.10:2013 specifies the method to determine the impact of the non-conductive set-up table on test results. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions. For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 m and 4 m, antenna polarization, EUT azimuth, and cable or wire placement shall be explored to produce the emission that has the highest amplitude relative to the limit.

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 \geq RBW, Span = enough to catch the trace. Sweep = auto; Detector Function = QP. Trace = Max-hold.

Above 1GHz Set the spectrum analyzer: RBW =1MHz VBW \geq RBW, Span = enough to catch the trace. Sweep = auto; Detector Function = Peak and AVG. Trace = Max-hold.

4.6.3 TEST SETUP

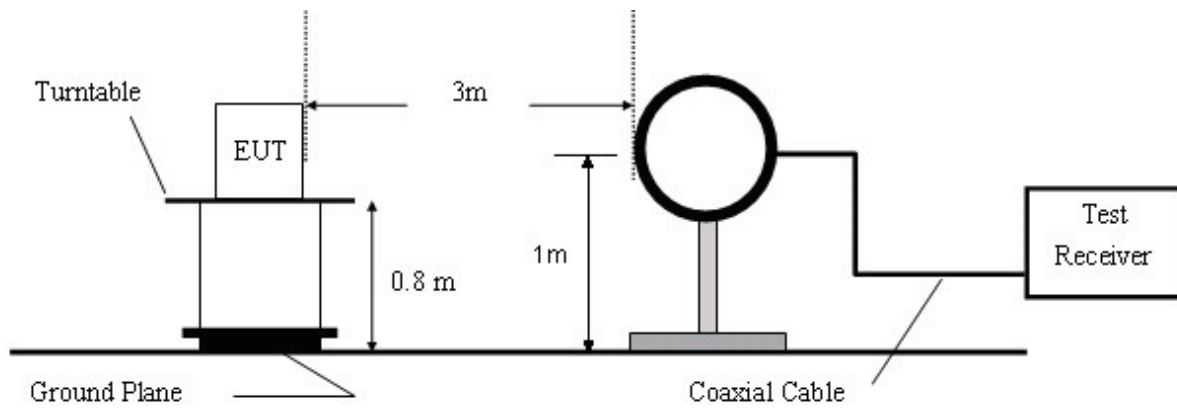


Figure 1. 9KHz to 30MHz radiated emissions test configuration

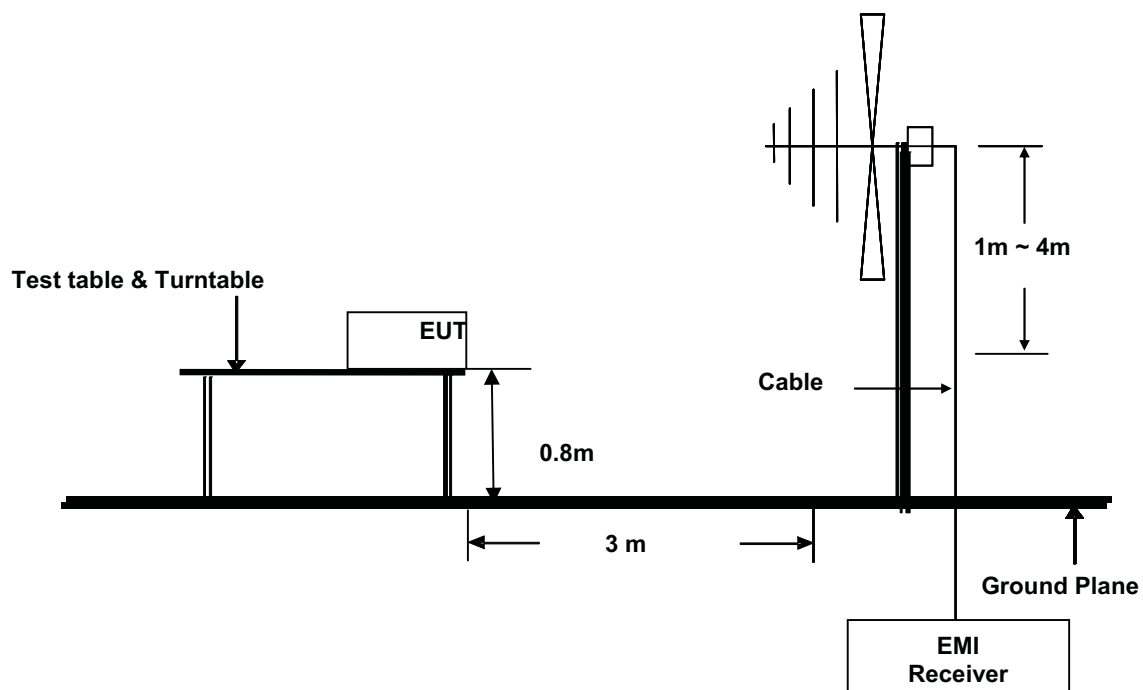


Figure 2. 30MHz to 1GHz radiated emissions test configuration

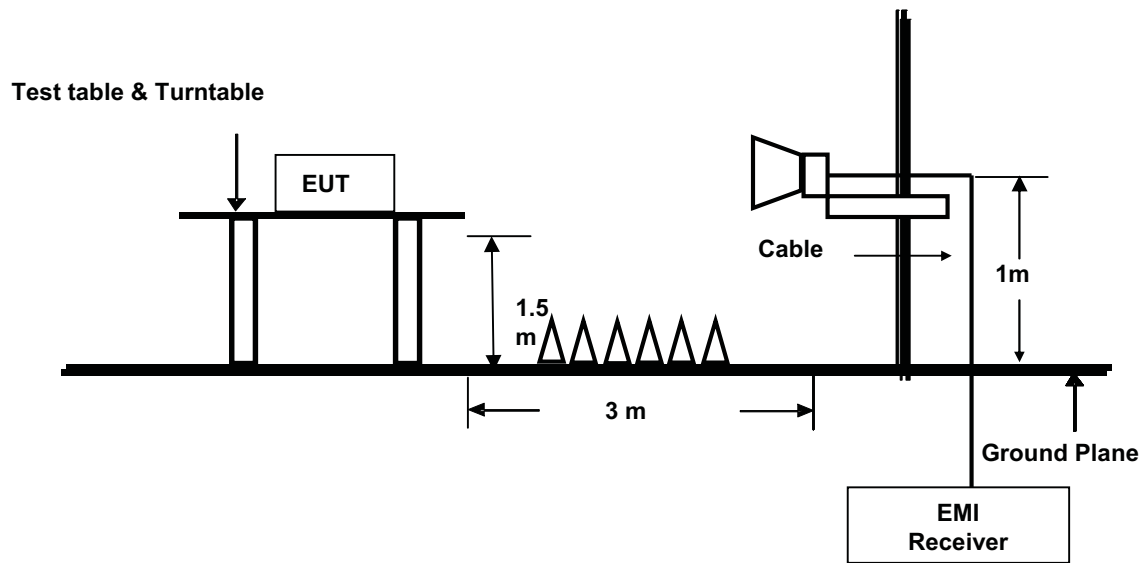
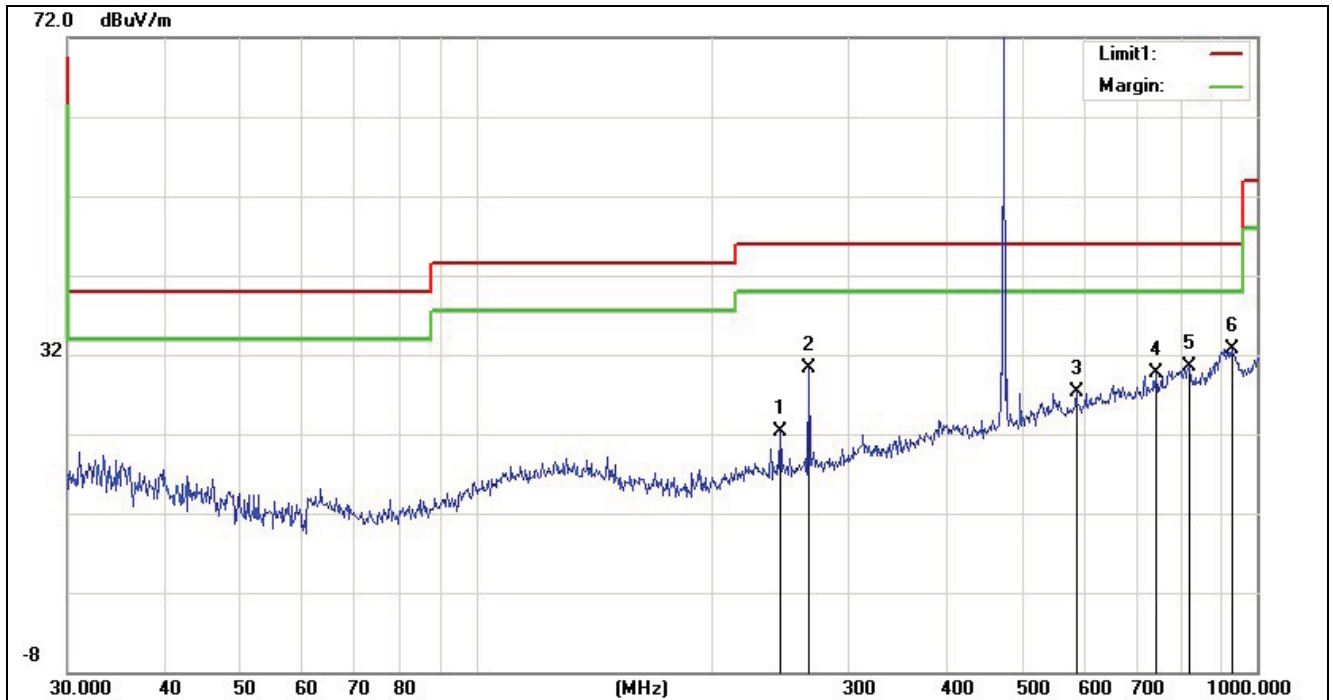


Figure 3. Above 1GHz radiated emissions test configuration

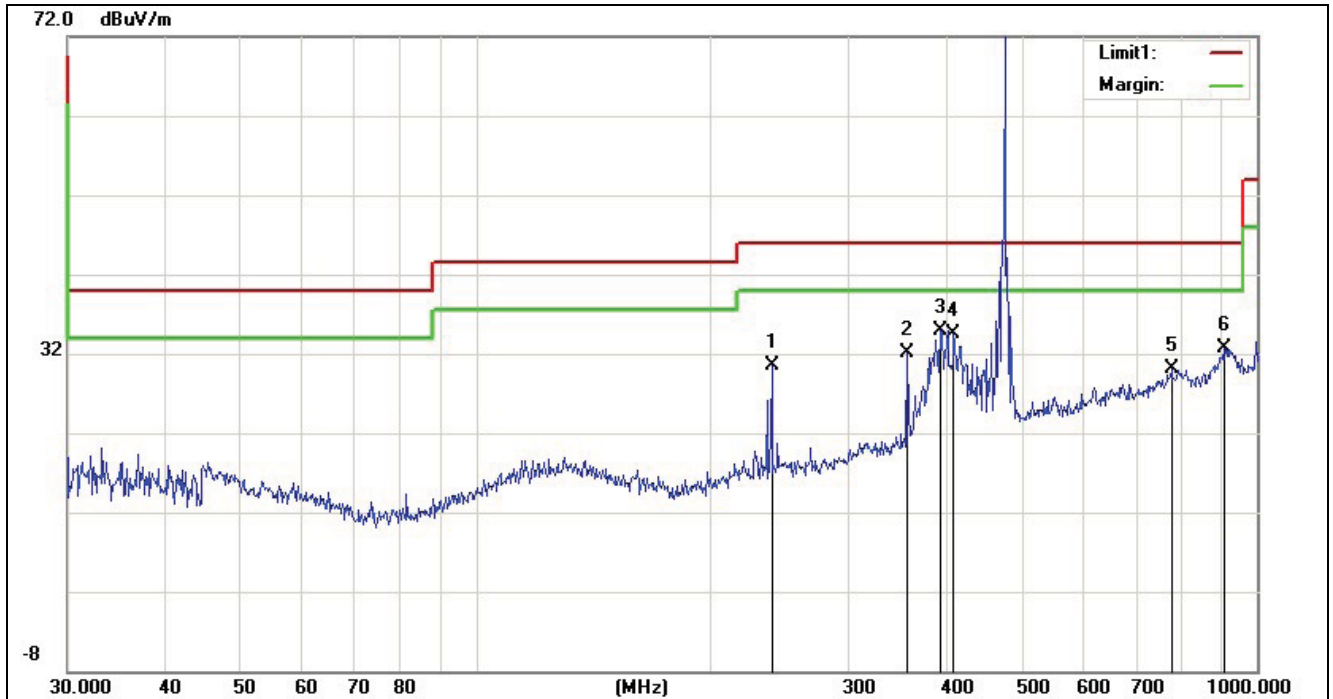
4.6.4 TEST RESULTS

Project No.:	E201511046378	Polarization:	Vertical
Standard:	(RE)FCC PART 15 class B 3m	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	9:22:36
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



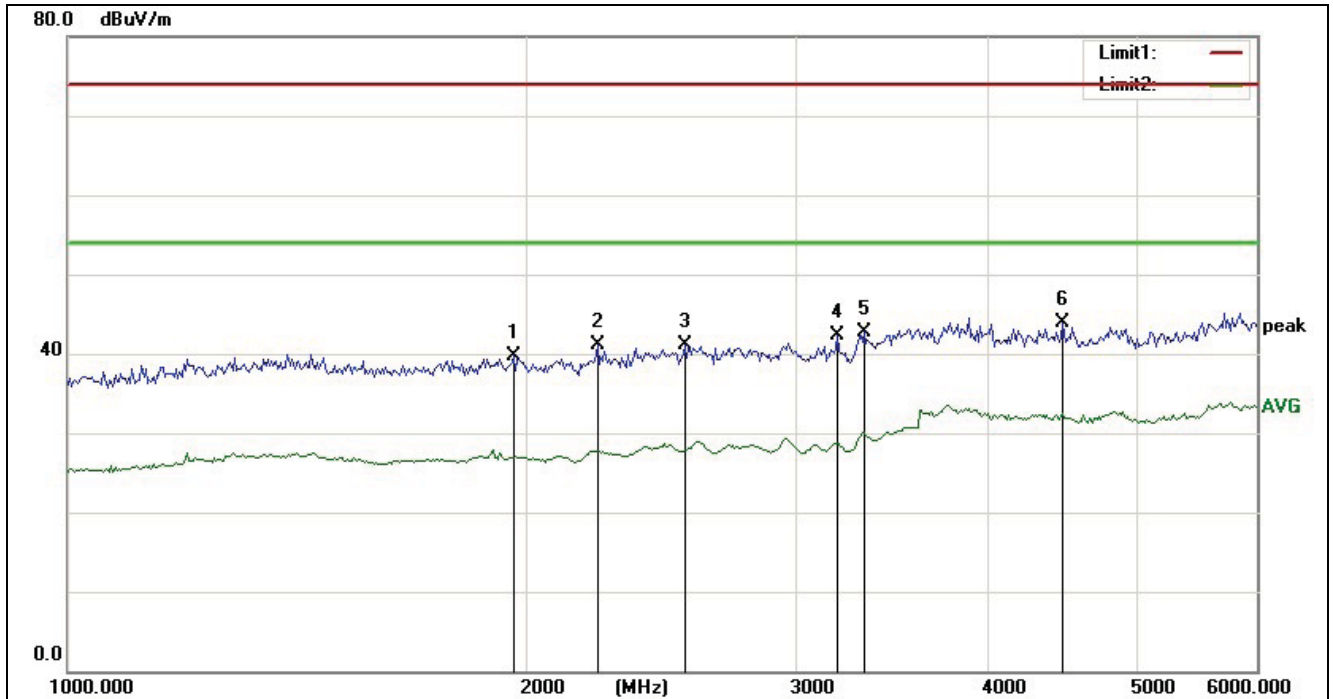
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	245.0900	9.05	13.32	22.37	46.00	-23.63	peak
2	266.6089	16.69	13.54	30.23	46.00	-15.77	peak
3	586.8437	7.01	20.31	27.32	46.00	-18.68	peak
4	742.2587	6.84	22.78	29.62	46.00	-16.38	peak
5	818.8341	6.76	23.72	30.48	46.00	-15.52	peak
6	929.0082	5.84	26.82	32.66	46.00	-13.34	peak

Project No.:	E201511046378	Polarization:	Horizontal
Standard:	(RE)FCC PART 15 class B 3m	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	9:46:30
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



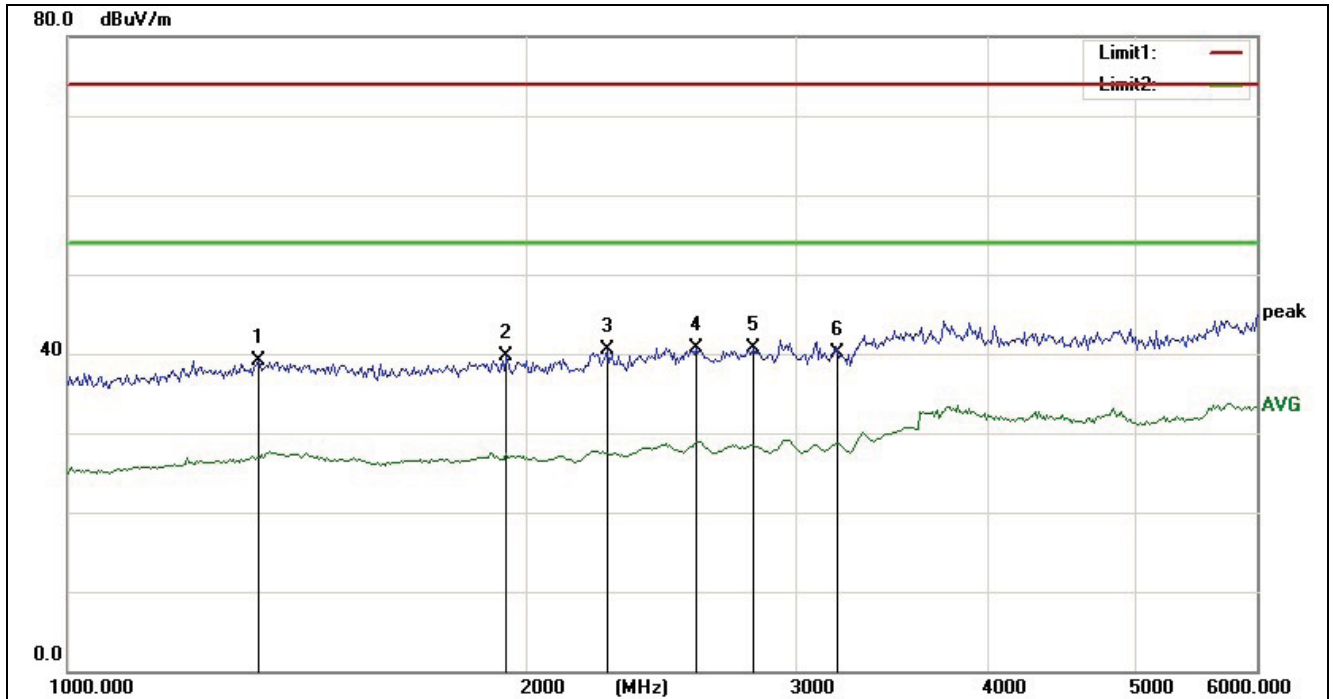
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	239.1473	17.41	13.17	30.58	46.00	-15.42	peak
2	356.6758	16.06	16.03	32.09	46.00	-13.91	peak
3	393.4723	17.44	17.49	34.93	46.00	-11.07	peak
4	408.9460	16.38	18.17	34.55	46.00	-11.45	peak
5	776.8778	6.30	23.75	30.05	46.00	-15.95	peak
6	906.4824	5.85	26.86	32.71	46.00	-13.29	peak

Project No.:	E201511046378	Polarization:	Vertical
Standard:	(RE)FCC PART 15 class B 3m_PEAk	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	10:03:21
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1957.973	29.66	10.07	39.73	74.00	-34.27	peak
2	2221.654	30.14	11.01	41.15	74.00	-32.85	peak
3	2535.363	29.08	12.01	41.09	74.00	-32.91	peak
4	3190.091	29.74	12.66	42.40	74.00	-31.60	peak
5	3320.944	29.76	12.85	42.61	74.00	-31.39	peak
6	4476.653	27.30	16.60	43.90	74.00	-30.10	peak

Project No.:	E201511046378	Polarization:	Horizontal
Standard:	(RE)FCC PART 15 class B 3m_PEAK	Power Source:	DC 3.6V
Test item:	Radiation Test	Date:	2015-12-3
Temp./Hum.(%RH):	23.9/57%RH	Time:	10:05:03
EUT:	Micro Power Wireless Data Module	Distance:	3m
Model:	SRWF-8009G	Test Result:	Pass
Note:	Mode: fixed frequency		
Test By:	Brian Xiao		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1332.612	30.53	8.59	39.12	74.00	-34.88	peak
2	1935.613	29.82	9.97	39.79	74.00	-34.21	peak
3	2253.780	29.34	11.13	40.47	74.00	-33.53	peak
4	2579.421	28.66	12.12	40.78	74.00	-33.22	peak
5	2811.470	28.03	12.58	40.61	74.00	-33.39	peak
6	3190.091	27.43	12.66	40.09	74.00	-33.91	peak

4.7 AUTOMATICALLY LIMITING OPERATION

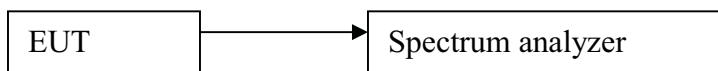
4.7.1 LIMITS

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.

4.7.2 TEST PROCEDURES

- 1.Set spectrum analyzer span = 0. centered on a hopping channel;
- 2.Set RBW = 1MHz and VBW = 1MHz.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 transmission time and silent period.

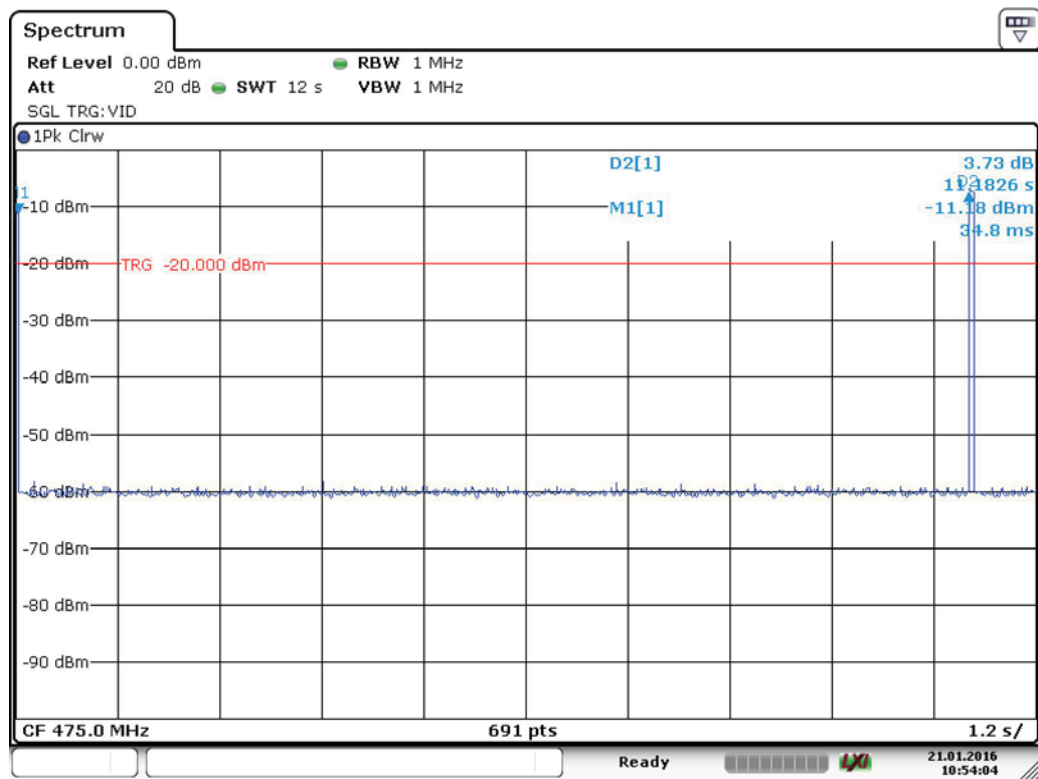
4.7.3 TEST SETUP



4.7.4 TEST RESULTS

Frequency (MHz)	Transmission time(ms)	Limit	Silent period(s)	Limit	Result
475	34.8	1s	10.83	10s	Pass

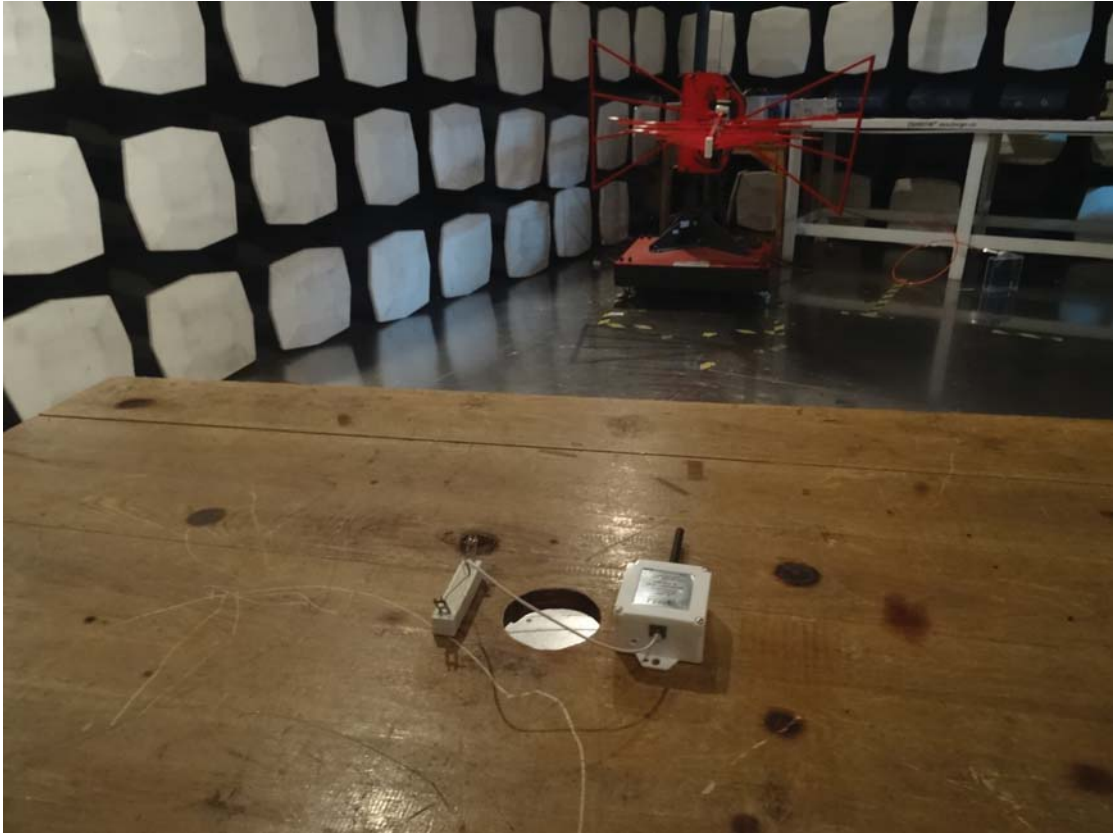
Please refer the graph as below:
Channel 475MHz



Date: 21.JAN.2016 10:54:05

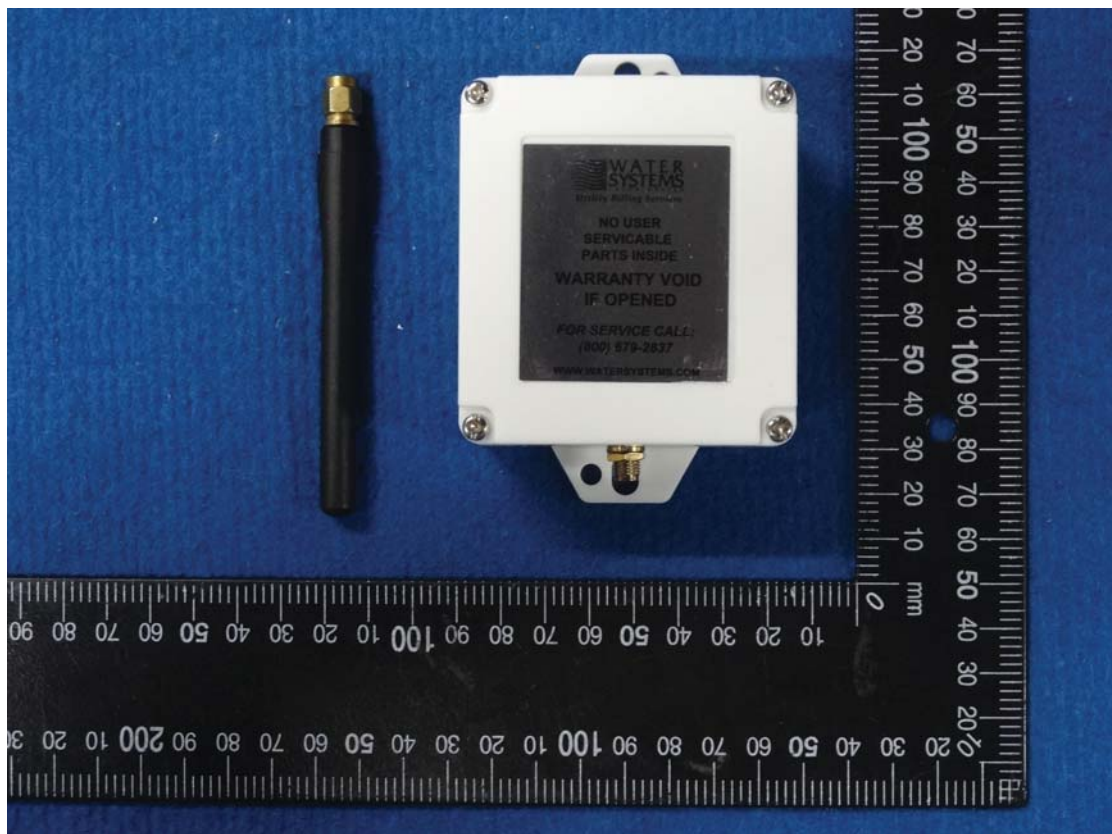
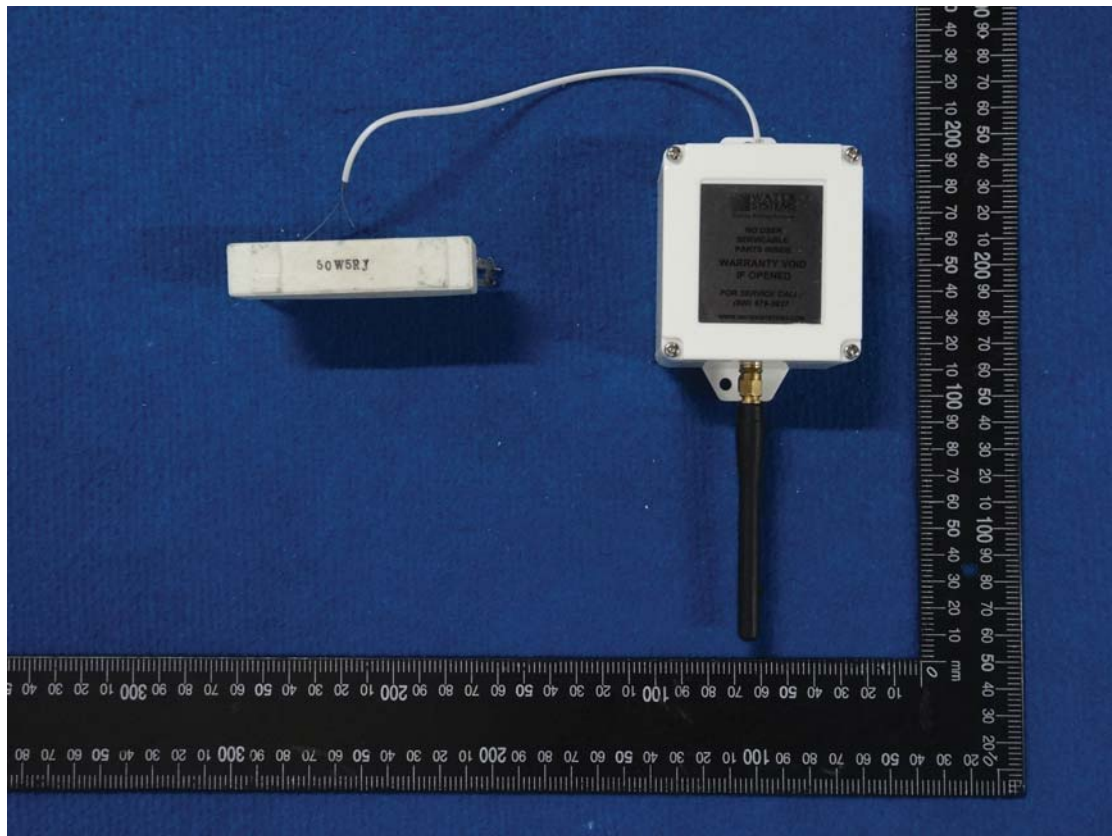
APPENDIX A: PHOTOGRAPH OF THE TEST ARRANGEMENT

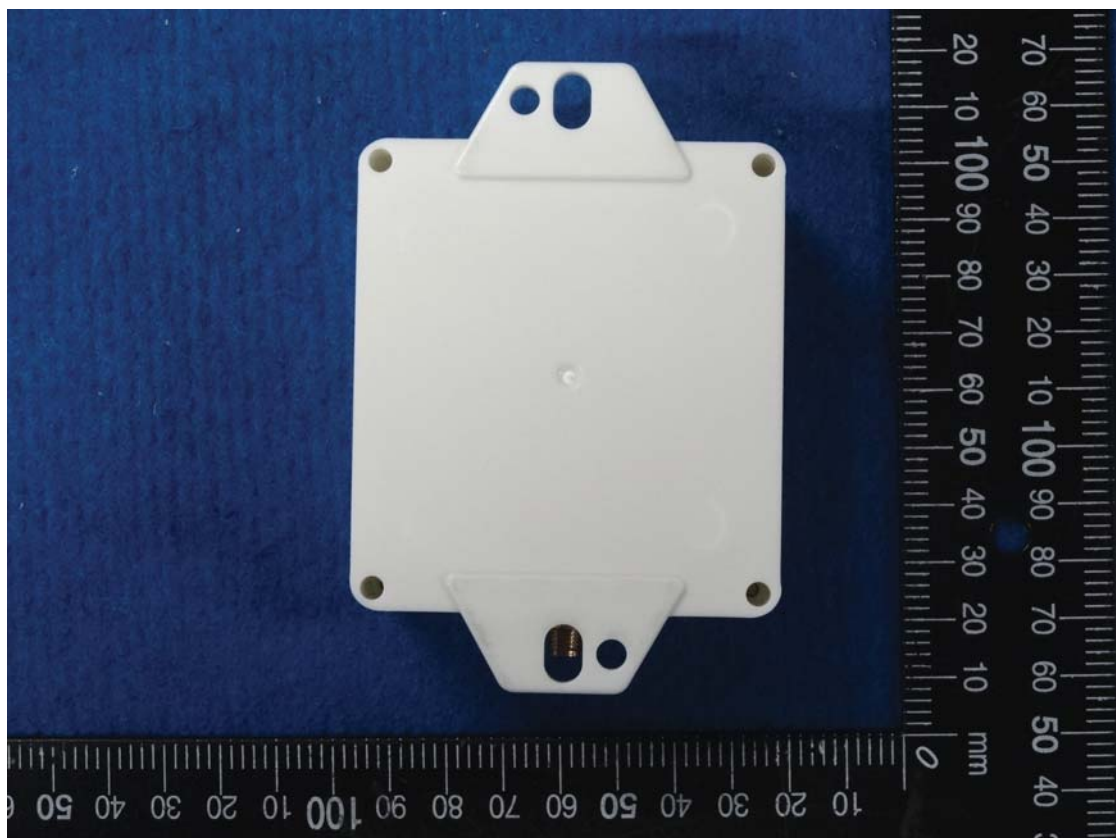
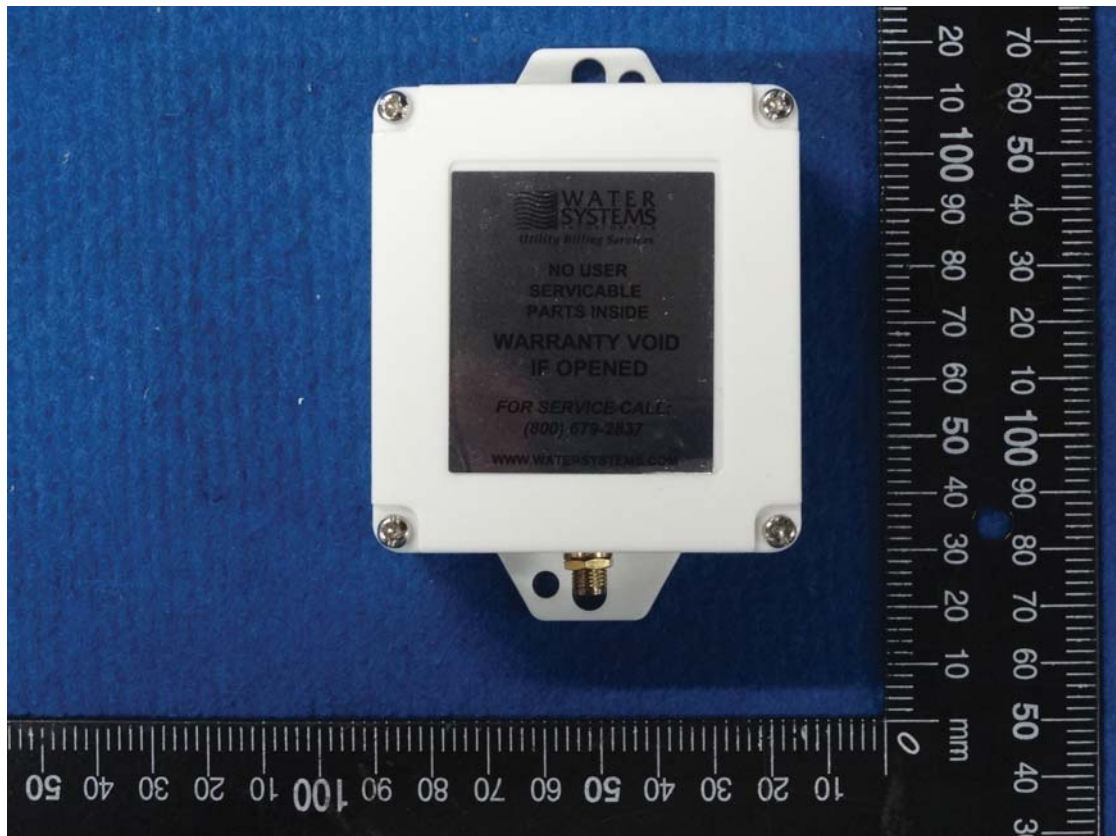
RADIATED SPURIOUS EMISSION TEST (Below 1GHz)

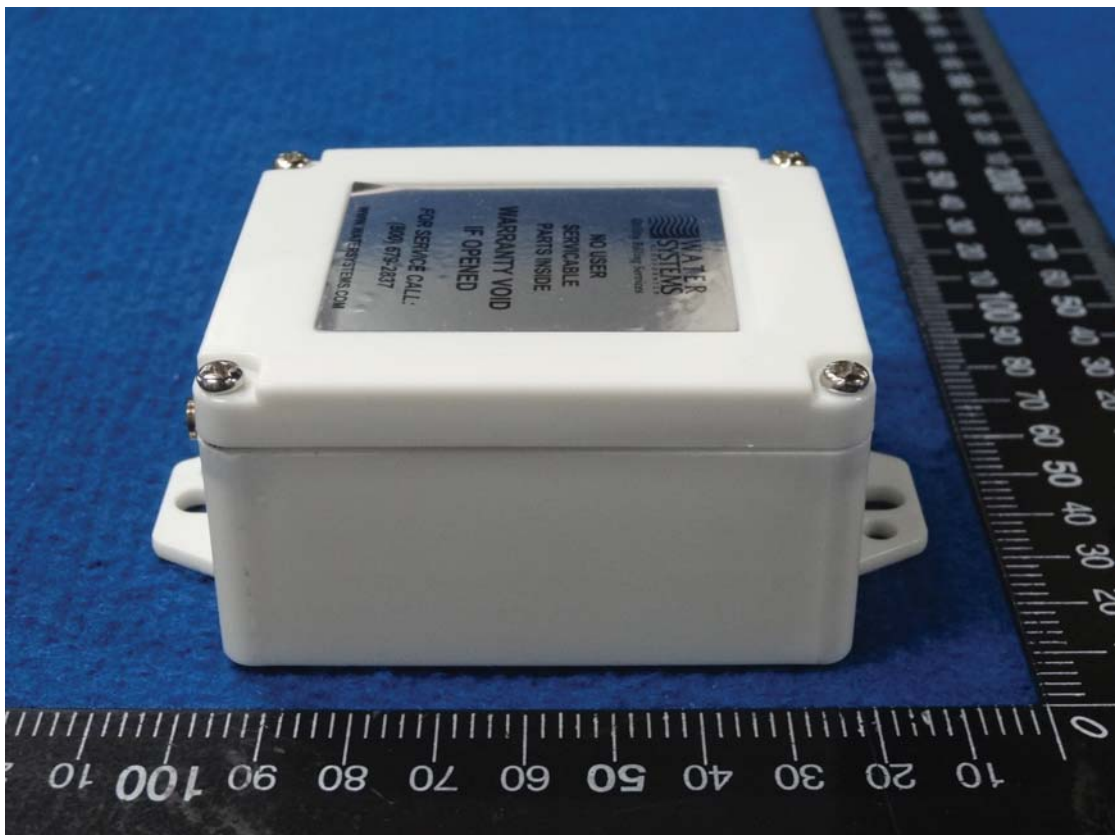


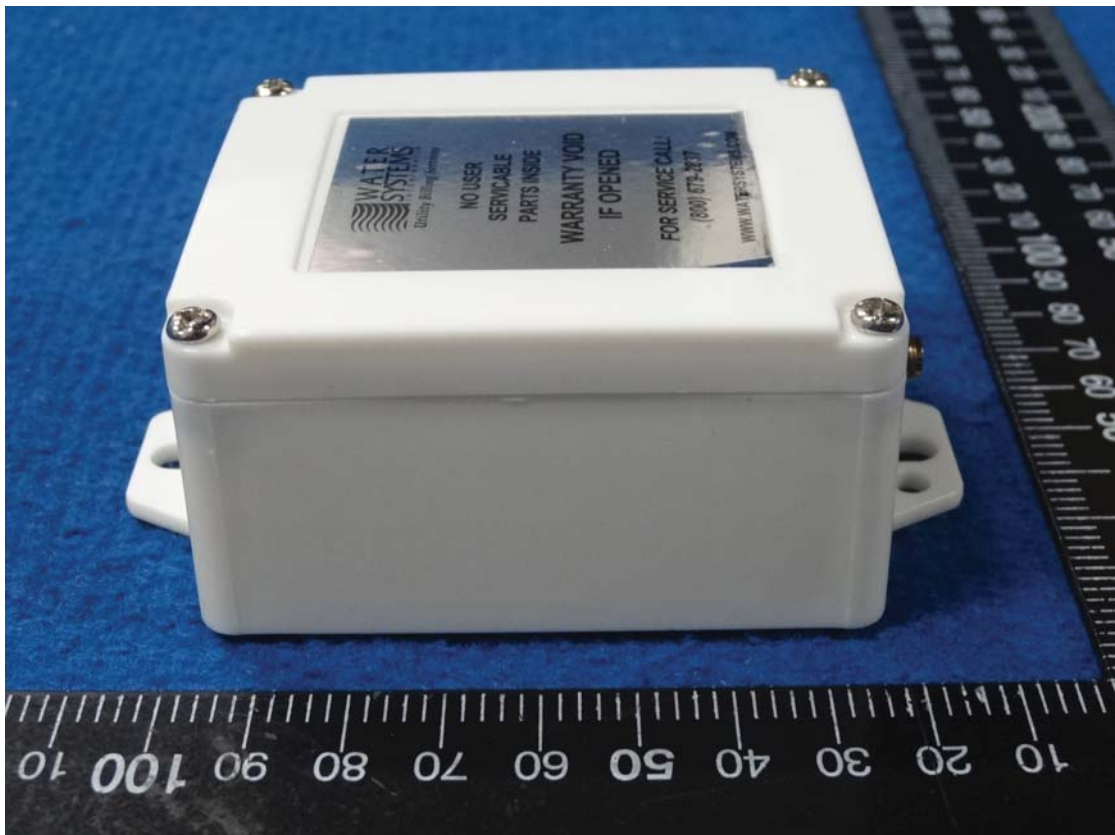
RADIATED SPURIOUS EMISSION TEST (Above 1GHz)

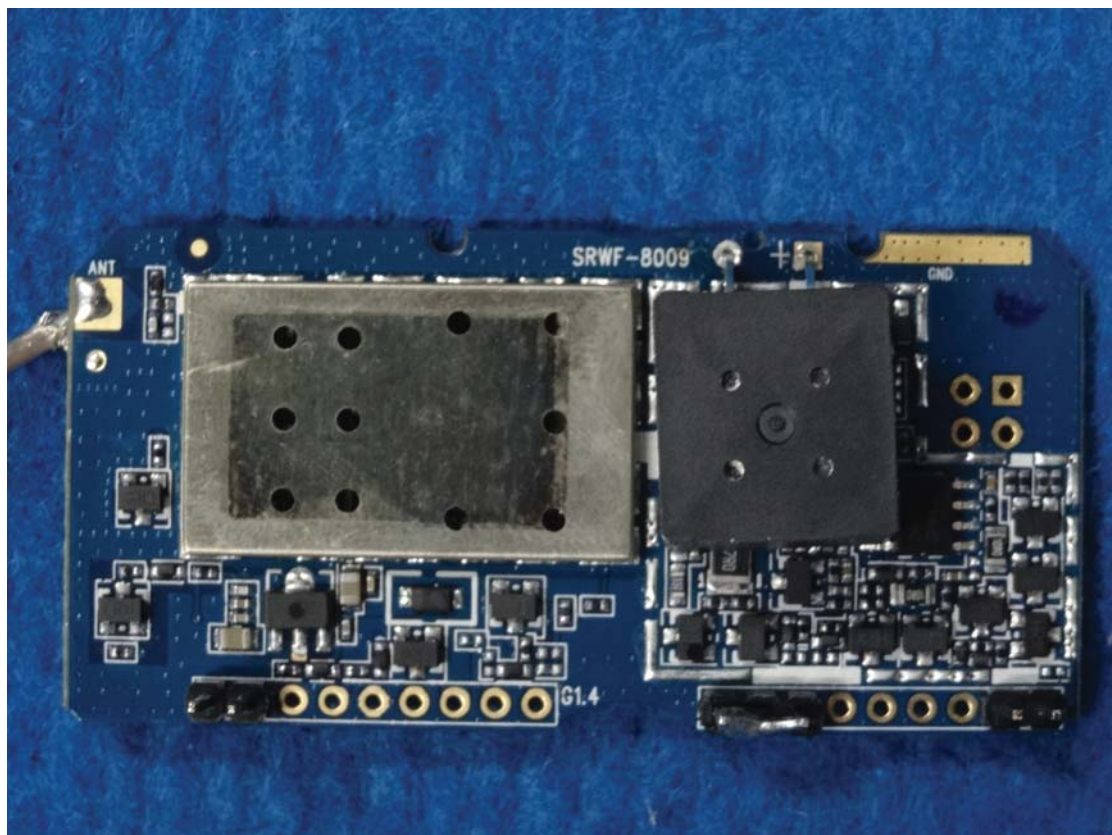
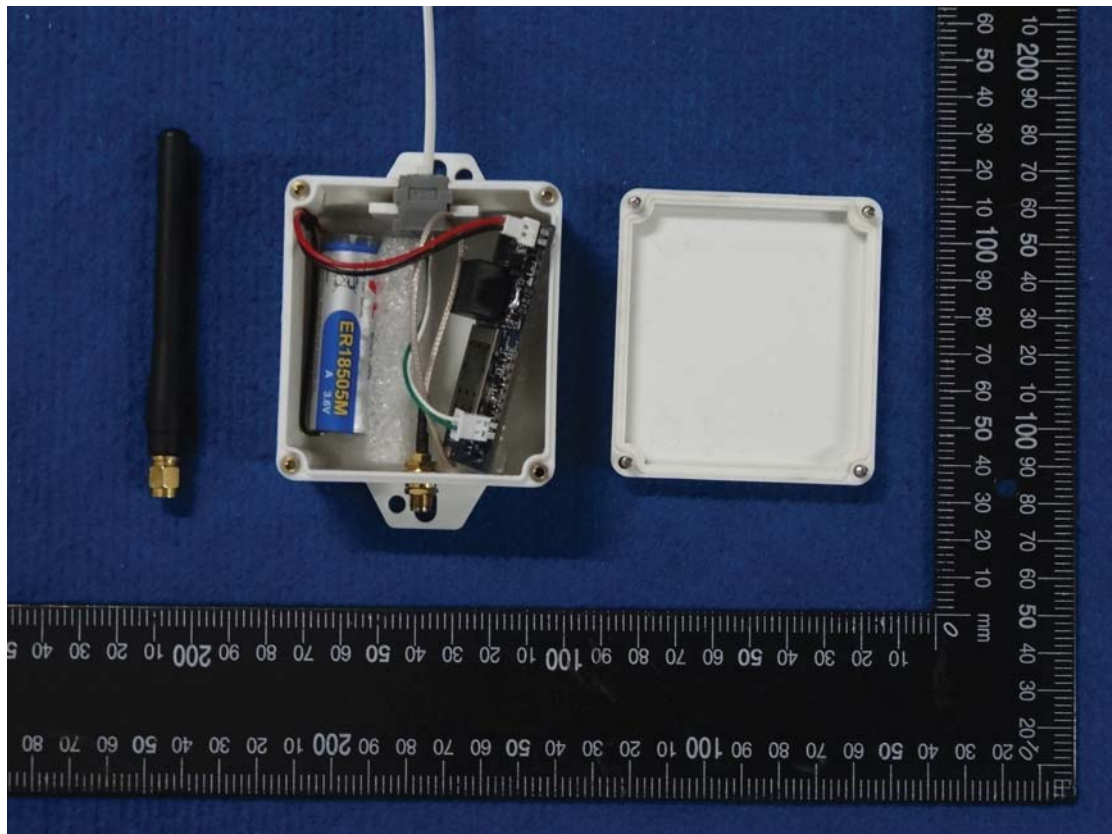


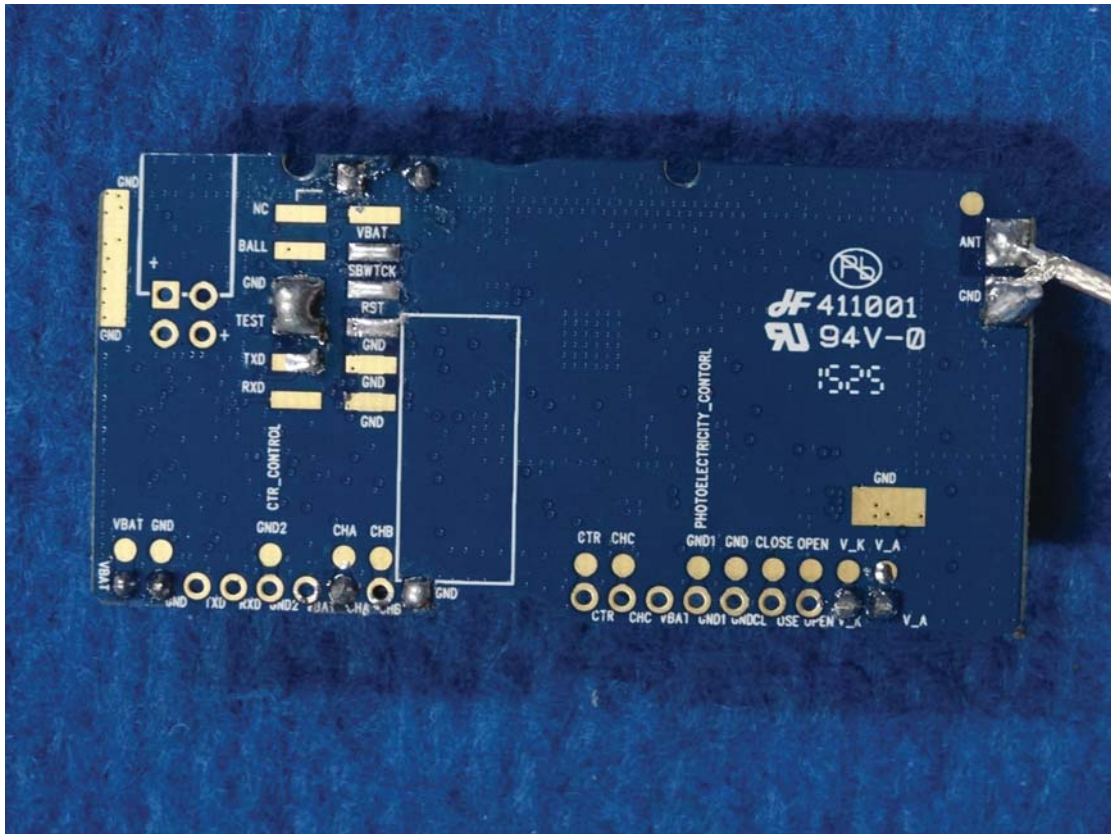
APPENDIX B: PHOTOGRAPH OF THE EUT











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