FCC REPORT

Applicant:	Ambient, LLC dba Ambient Weather
Address of Applicant:	6845 W. Frye Road Chandler, AZ 85226
Equipment Under Test (EUT)	
Product Name:	Wireless Wind Sensor
Model No.:	F009WT,F009WT-01
FCC ID:	S2SF009WT
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231:2014
Date of sample receipt:	November 02, 2015
Date of Test:	November 03-10, 2015
Date of report issued:	November 11, 2015
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*November 11, 2015*	*Original*

Prepared By: Sam. Gao ***Date:*** *November 11, 2015*

Project Engineer

Check By: hank. yan ***Date:*** *November 11, 2015*

Reviewer

3 Contents

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (e)	Pass
Spurious emissions	15.231 (e)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (e)	Pass
Silent Period	15.231 (e)	Pass

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

Remark： Test according to ANSI C63.4:2014 and ANSI C63.10:2013

5 General Information

5.1 Client Information

Applicant:	Ambient, LLC dba Ambient Weather
Address of Applicant:	6845 W. Frye Road Chandler, AZ 85226
Manufacturer/ Factory:	Shenzhen Kello Sciece Technology Co., Ltd.
Address of Manufacturer/ Factory:	32nd Building Area B Tanglang Industrial Park Xili Shenzhen Guangdong China

5.2 General Description of EUT

Product Name:	Wireless Wind Sensor
Model No.:	F009WT,F009WT-01
Operation Frequency:	433.92MHz
Modulation technology:	ASK
Antenna Type:	Integrity Antenna
Antenna gain:	0dBi (declare by Manufacturer)
Power supply:	DC 6V(SIZE AAA 1.5V*4 battery)

5.3 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Remark: During the test, the New Battery was used.	

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	72.35	74.23	73.02

Final Test Mode:

According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”:

Y axis (see the test setup photo)

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 28, 2013.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Room 301-309, 3th Floor, Block A, Huafeng Jinyuan Business Building, No. 300 Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China
Tel: 0755-27798480
Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 27 2015	Mar. 26 2016
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	Dec. 04 2014	Dec. 03 2015
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 30 2015	June 29 2016
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 22 2015	Feb. 21 2016
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 26 2015	June 25 2016
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2015	Mar. 26 2016
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 28 2015	Mar. 27 2016
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 28 2015	Mar. 27 2016
11	Coaxial cable	GTS	N/A	GTS210	Mar. 28 2015	Mar. 27 2016
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 28 2015	Mar. 27 2016
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 30 2015	June 29 2016
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 30 2015	June 29 2016
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 26 2015	June 29 2016
16	Band filter	Amindeon	82346	GTS219	Mar. 28 2015	Mar. 27 2016
17	D.C. Power Supply	Instek	PS-3030	GTS232	Mar. 28 2015	Mar. 27 2016
18	Thermo meter	KTJ	TA328	GTS256	Dec. 04 2014	Dec. 03 2015

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	Barometer	ChangChun	DYM3	GTS257	July 07 2015	July 06 2016

7 Test results and Measurement Data

7.1 Antenna requirement

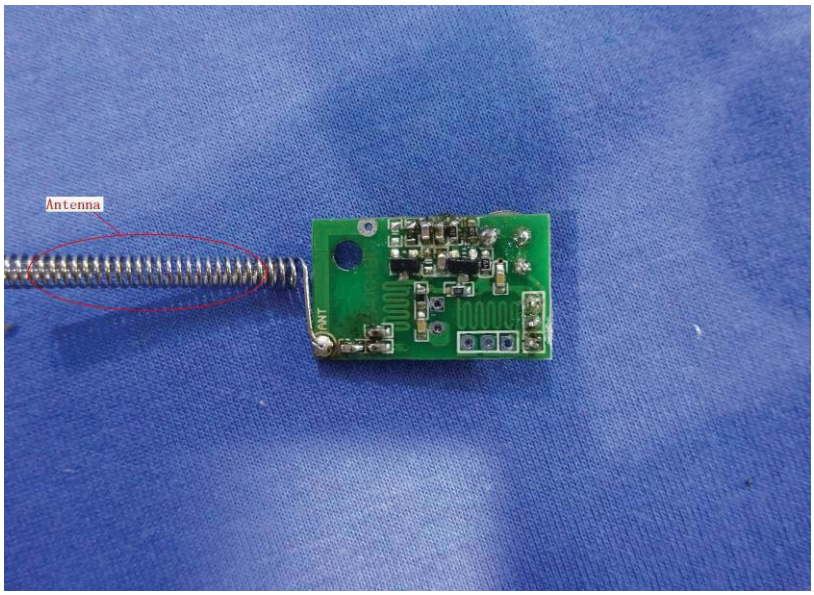
Standard requirement:	FCC Part15 C Section 15.203

15.203 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, 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.

EUT Antenna:

The EUT make use of a Integral Antenna, antenna gain is 0dBi.



7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.231(e) and 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	30MHz to 5000MHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value

Limit:
(Field strength of the fundamental signal)

Frequency	Limit (dBuV/m @3m)	Remark
433.92MHz	72.87	Average Value
	92.87	Peak Value

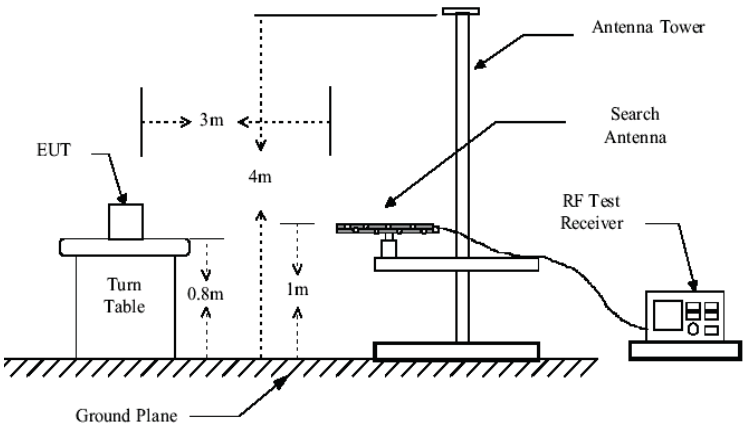
Limit:
(Spurious Emissions)

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.00	Quasi-peak Value
88MHz-216MHz	43.50	Quasi-peak Value
216MHz-960MHz	46.00	Quasi-peak Value
960MHz-1GHz	54.00	Quasi-peak Value
Above 1GHz	54.00	Average Value
	74.00	Peak Value

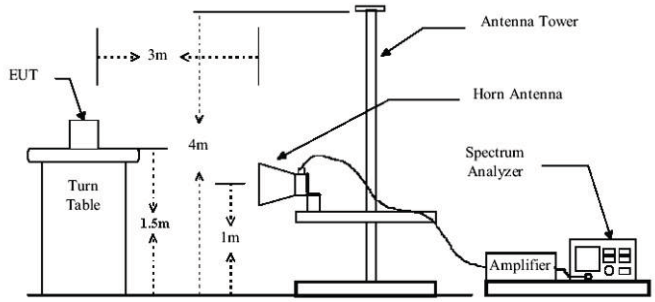
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

Below 1GHz



Above 1GHz

	
Test Procedure:	1. During the test, the New Battery was used. 2. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 3. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 4. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 7. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:(RBW 300KHz, VBW 1MHz, Peak detector)

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.92	75.18	17.53	3.02	31.77	63.96	92.87	-28.91	Horizontal
433.92	85.45	17.53	3.02	31.77	74.23	92.87	-18.64	Vertical

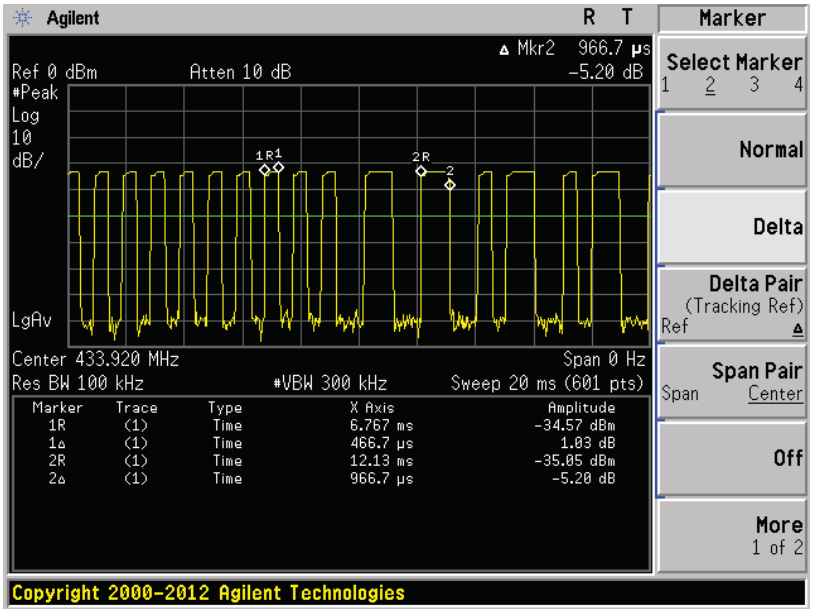
Average value:

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	63.96	-8.49	55.47	72.87	-17.40	Horizontal
433.92	74.23	-8.49	65.74	72.87	-7.13	Vertical

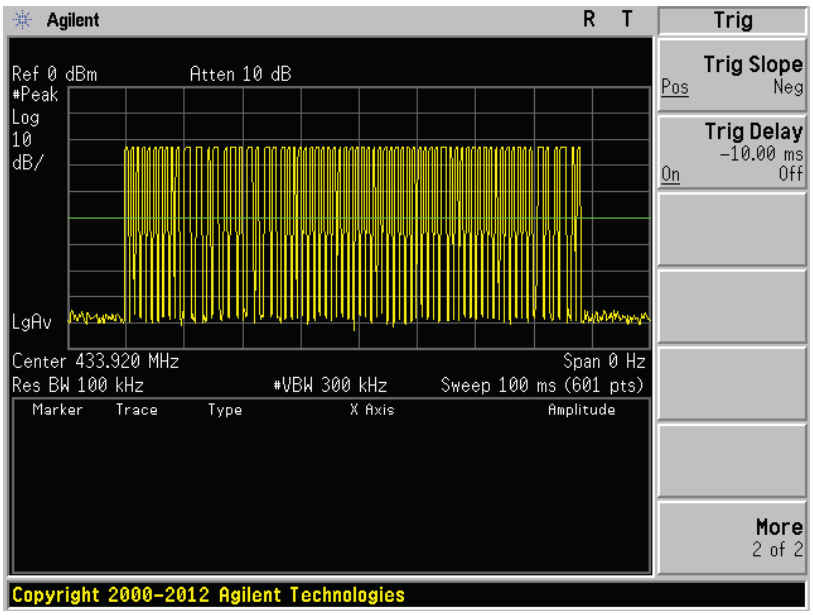
Average value:	
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	T on time =62*0.4667+9*0.9667=37.6357ms
	T period =100ms
	Duty cycle=37.6357/100=0.3763
	duty cycle factor=-8.49

Test plot as follows:

Ton time:



T period:


Agilent
R T
Trig
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
LgAv
Trig Slope
Pos
Neg
Trig Delay
-10.00 ms
On
Off
Center 433.920 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 100 ms (601 pts)
Marker
Trace
Type
X Axis
Amplitude
More
2 of 2
Copyright 2000-2012 Agilent Technologies

7.2.2 Spurious emissions

Quasi-peak Value

Quasi-peak Value Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
35.38	26.31	14.39	0.61	30.07	11.24	40.00	-28.76	Vertical
52.03	23.73	15.16	0.79	29.98	9.70	40.00	-30.30	Vertical
99.88	25.40	15.16	1.19	29.70	12.05	43.50	-31.45	Vertical
211.53	23.89	12.93	1.91	29.31	9.42	43.50	-34.08	Vertical
344.39	24.10	16.20	2.60	29.76	13.14	46.00	-32.86	Vertical
618.54	24.71	20.52	3.80	29.28	19.75	46.00	-26.25	Vertical
35.25	25.70	14.39	0.61	30.07	10.63	40.00	-29.37	Horizontal
58.82	24.58	14.76	0.85	29.93	10.26	40.00	-29.74	Horizontal
108.65	24.09	14.39	1.27	29.64	10.11	43.50	-33.39	Horizontal
209.31	24.88	12.87	1.89	29.29	10.35	43.50	-33.15	Horizontal
373.31	25.84	16.54	2.73	29.62	15.49	46.00	-30.51	Horizontal
696.86	28.11	20.80	4.08	29.20	23.79	46.00	-22.21	Horizontal

Harmonic emissions

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	61.04	25.63	4.54	33.27	57.94	72.87	-14.93	Vertical
1301.76	47.02	25.05	4.82	34.00	42.89	74.00	-31.11	Vertical
1735.68	44.69	27.67	5.15	34.27	43.24	74.00	-30.76	Vertical
2169.60	43.65	27.82	5.58	33.78	43.27	74.00	-30.73	Vertical
2603.52	42.81	28.61	6.00	33.28	44.14	74.00	-29.86	Vertical
3037.44	42.82	28.90	6.91	32.79	45.84	74.00	-28.16	Vertical
3471.36	40.23	29.52	7.69	32.29	45.15	74.00	-28.85	Vertical
3905.28	38.88	30.88	8.19	31.86	46.09	74.00	-27.91	Vertical
4339.20	43.74	25.63	4.54	33.27	40.64	74.00	-33.36	Vertical
867.84	58.42	25.05	4.82	34.00	54.29	72.87	-18.58	Horizontal
1301.76	44.20	27.67	5.15	34.27	42.75	74.00	-31.25	Horizontal
1735.68	43.70	27.82	5.58	33.78	43.32	74.00	-30.68	Horizontal
2169.60	42.50	28.61	6.00	33.28	43.83	74.00	-30.17	Horizontal
2603.52	41.36	28.90	6.91	32.79	44.38	74.00	-29.62	Horizontal
3037.44	38.92	29.52	7.69	32.29	43.84	74.00	-30.16	Horizontal
3471.36	36.75	30.88	8.19	31.86	43.96	74.00	-30.04	Horizontal
3905.28	45.13	25.63	4.54	33.27	42.03	74.00	-31.97	Horizontal
4339.20	47.02	25.05	4.82	34.00	42.89	74.00	-31.11	Horizontal

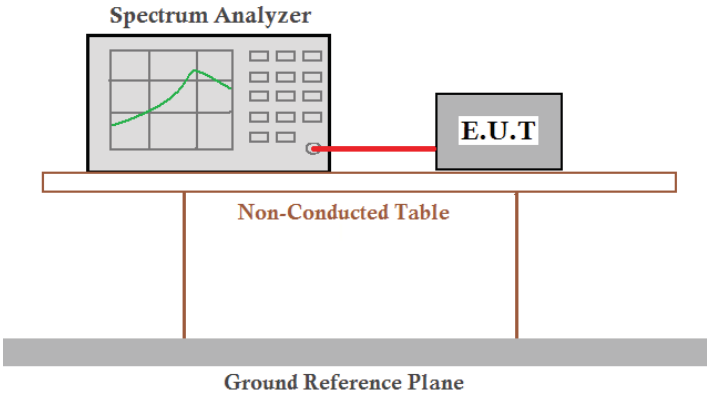
Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	57.94	-8.49	49.45	52.87	-3.42	Vertical
1301.76	42.89	-8.49	34.40	54.00	-19.60	Vertical
1735.68	43.24	-8.49	34.75	54.00	-19.25	Vertical
2169.60	43.27	-8.49	34.78	54.00	-19.22	Vertical
2603.52	44.14	-8.49	35.65	54.00	-18.35	Vertical
3037.44	45.84	-8.49	37.35	54.00	-16.65	Vertical
3471.36	45.15	-8.49	36.66	54.00	-17.34	Vertical
3905.28	46.09	-8.49	37.60	54.00	-16.40	Vertical
4339.20	40.64	-8.49	32.15	54.00	-21.85	Vertical
867.84	54.29	-8.49	45.80	52.87	-7.07	Horizontal
1301.76	42.75	-8.49	34.26	54.00	-19.74	Horizontal
1735.68	43.32	-8.49	34.83	54.00	-19.17	Horizontal
2169.60	43.83	-8.49	35.34	54.00	-18.66	Horizontal
2603.52	44.38	-8.49	35.89	54.00	-18.11	Horizontal
3037.44	43.84	-8.49	35.35	54.00	-18.65	Horizontal
3471.36	43.96	-8.49	35.47	54.00	-18.53	Horizontal
3905.28	42.03	-8.49	33.54	54.00	-20.46	Horizontal
4339.20	42.89	-8.49	34.40	54.00	-19.60	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value=Peak value + Duty cycle factor*

7.3 20dB Occupy Bandwidth

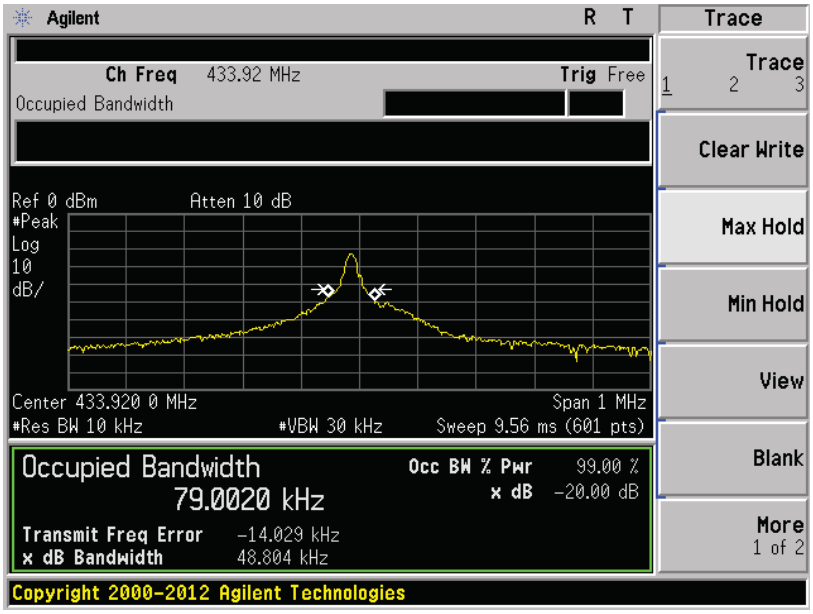
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

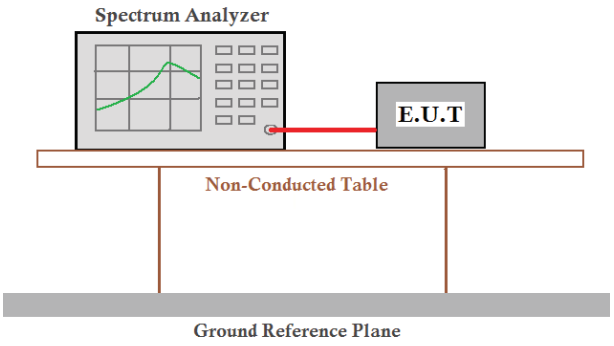
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.049	1.0848 MHz	Pass

Note: Limit= Fundamental frequency×0.25%=433.92×0.25%=1.0848MHz

Test plot as follows:



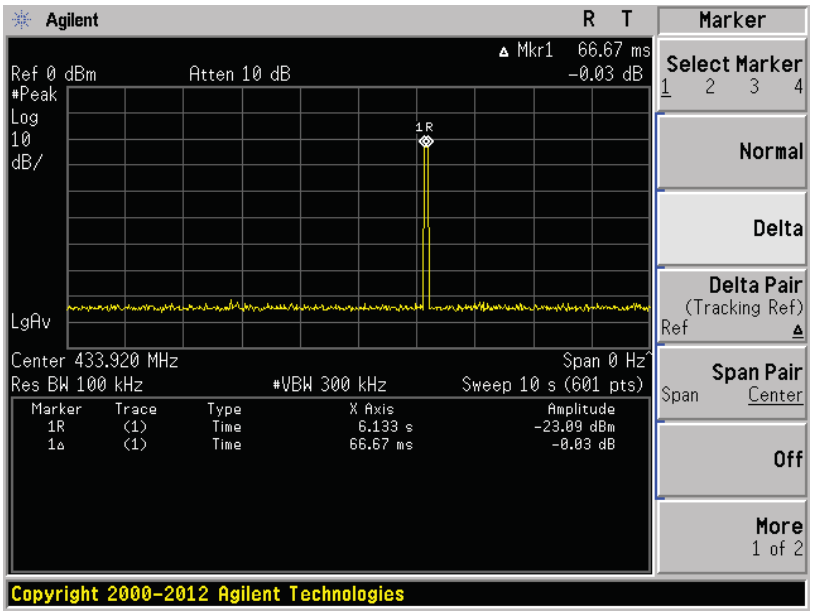
7.4 Dwell time

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	Not more than 1 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

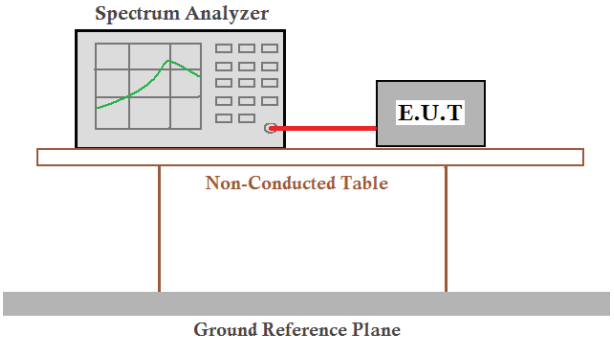
Measurement data:

Duration of each TX(second):	Limit (second)	Result
0.07	<1.0	Pass

Test plot as follows:



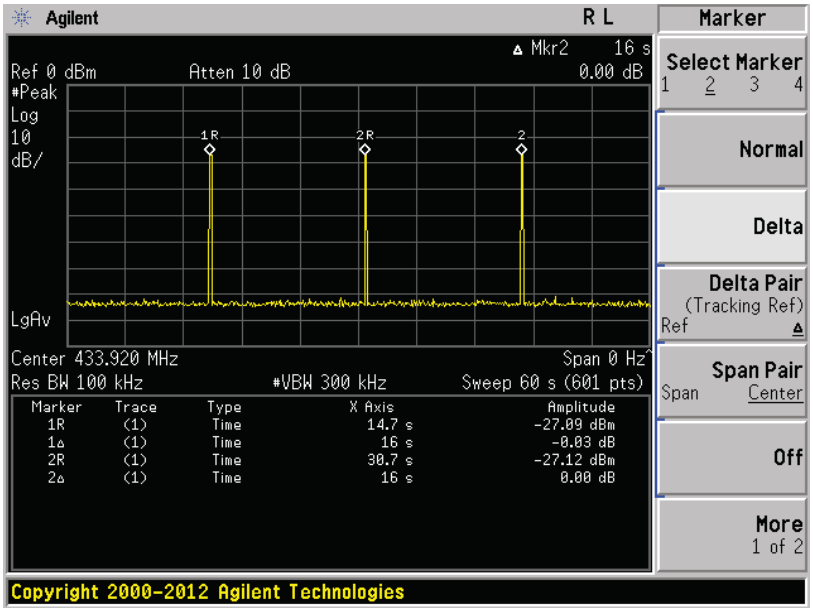
7.5 Silent period

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	at least 30 times the duration of the transmission or more than 10 seconds
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmit, and read the transmission time.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

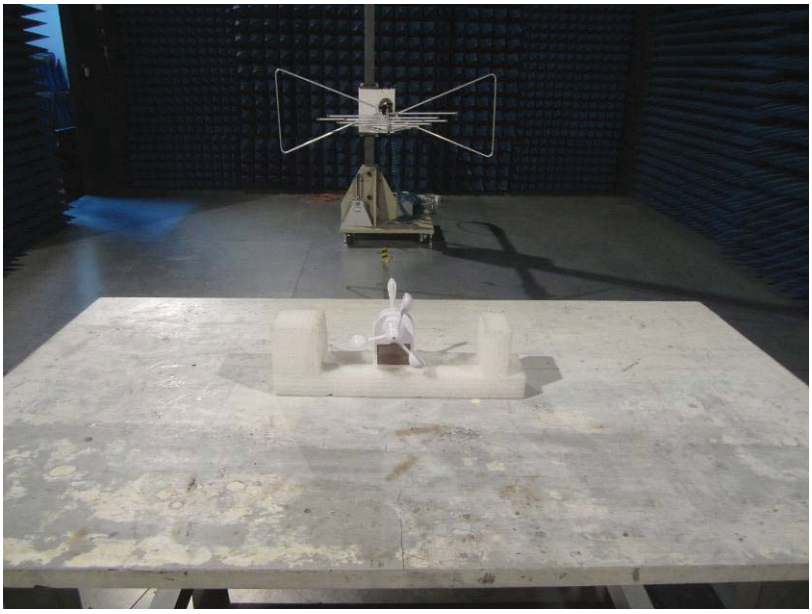
Silent period (second)	Limit (second)	Result
16	>10	Pass

Test plot as follows:

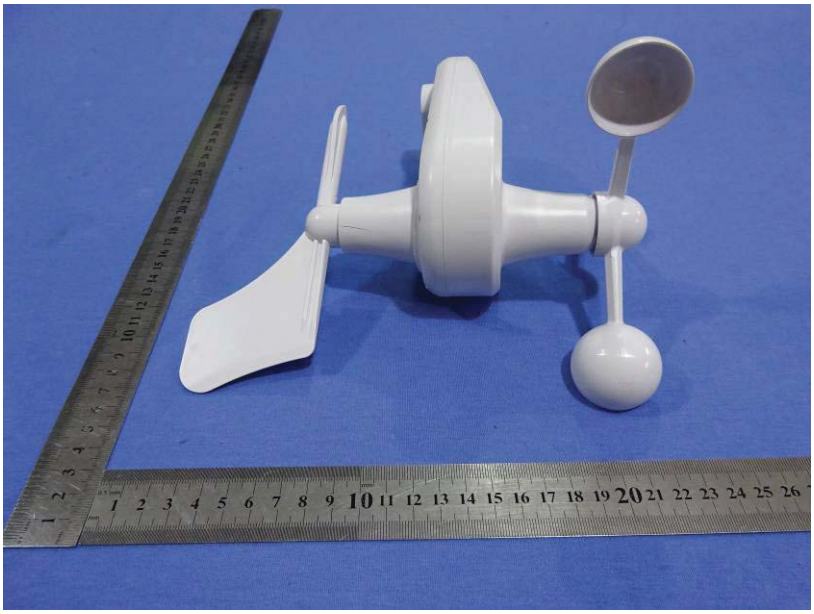


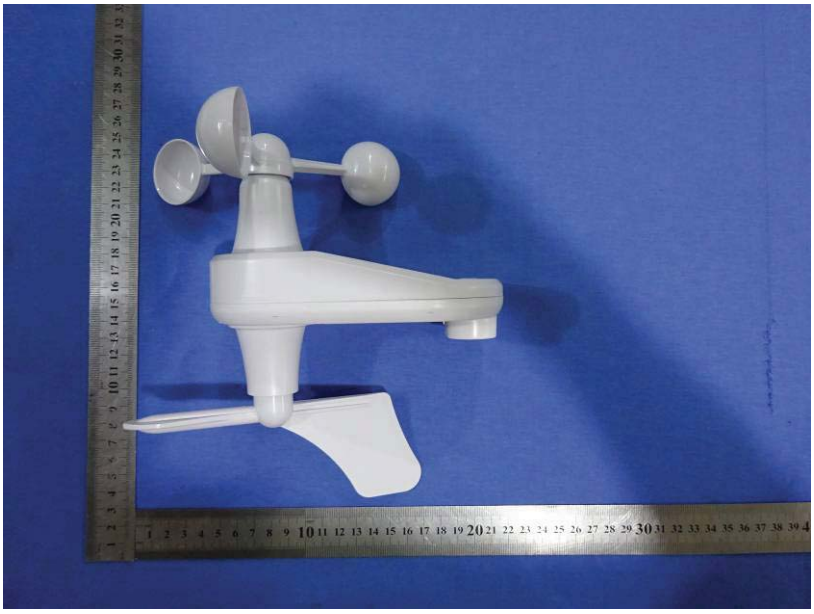
8 Test Setup Photo

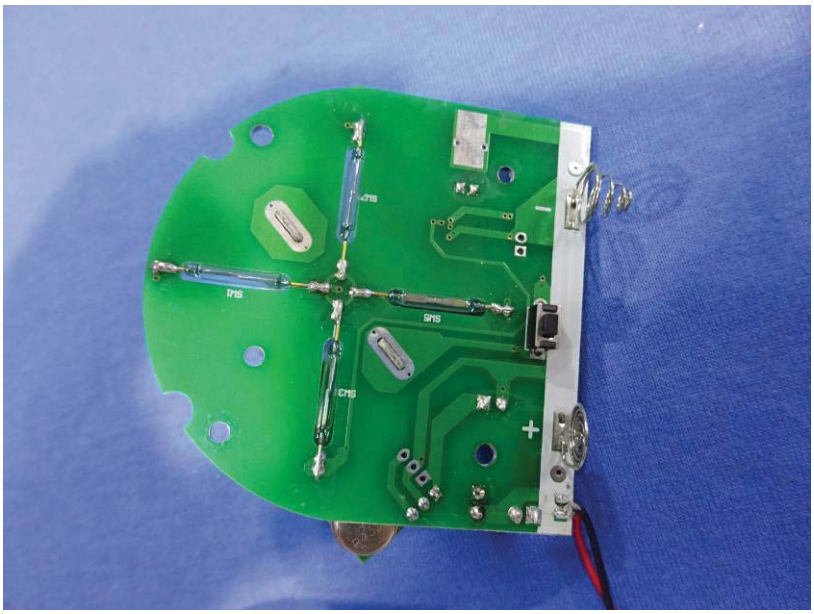
Radiated Emission

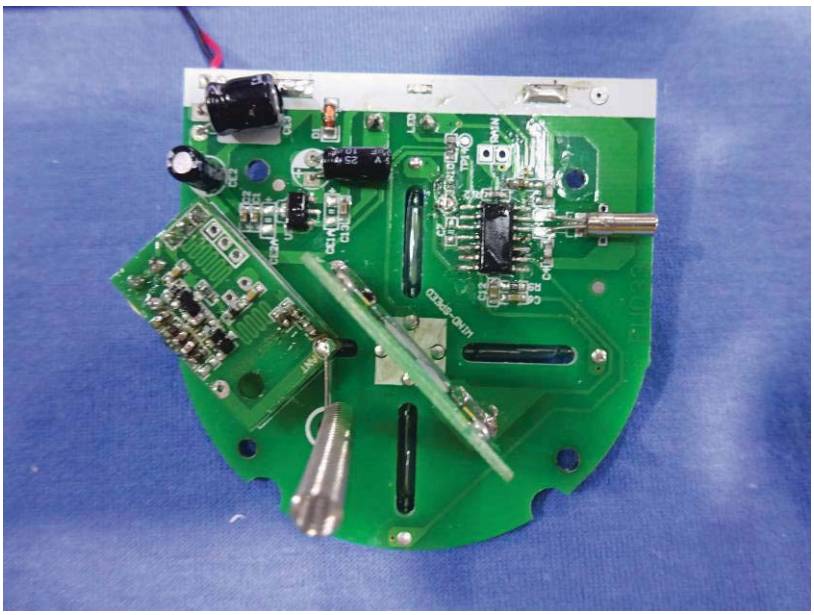


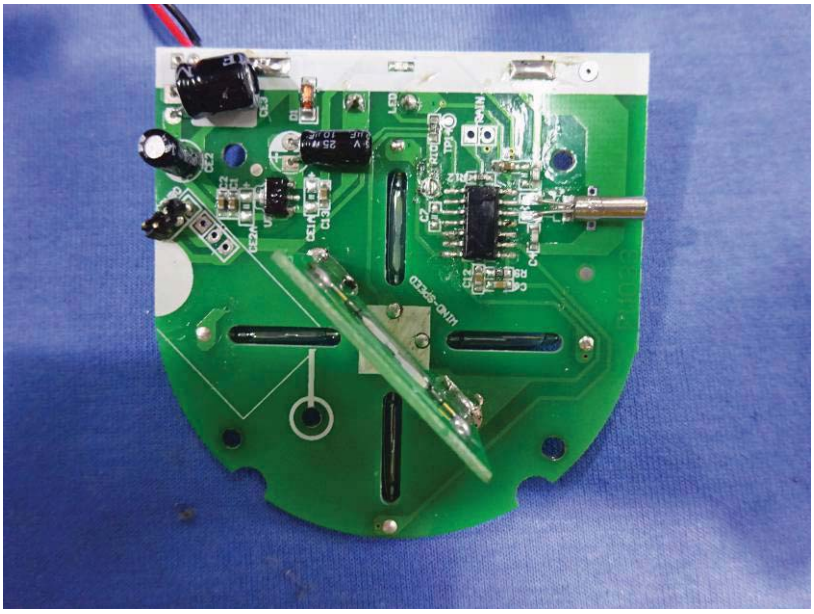
9 EUT Constructional Details

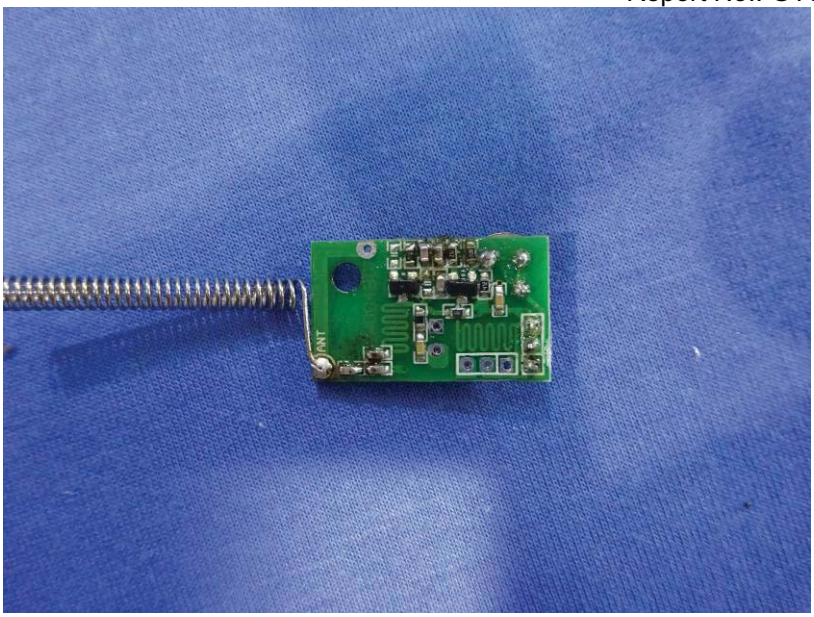








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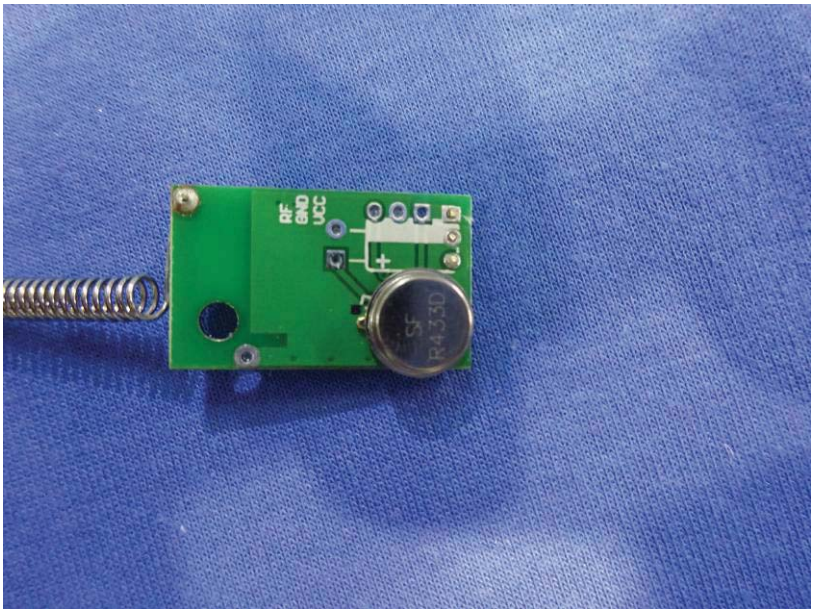
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