FCC REPORT

Applicant:	Likk Technologies Inc.
Address of Applicant:	16112 NW 13 Ave. Suite A Miami, Florida 33169 USA.

Equipment Under Test (EUT)

Product Name:	Water leak alarm
Model No.:	SW02
FCC ID:	2AWC7SW02
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231(a)
Date of sample receipt:	26 May., 2020
Date of Test:	27 May., to 08 Jun., 2020
Date of report issue:	10 Aug., 2020
Test Result:	PASS*

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

2 Version

Version No.	Date	Description
00	*12 Jun., 2020*	*Original*
01	*10 Aug., 2020*	*Delete all tables, add radiation spurious test chart*

Prepared By: Janet Wei ***Date:*** *10 Aug., 2020*

Test Engineer

Check By: Winner Zhang ***Date:*** *10 Aug., 2020*

Project Engineer

3 Contents

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (a)(2)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Duration Time	15.231 (a)(2)	Pass
Conducted Emission	15.207	N/A

Remarks:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *N/A: The EUT not applicable of the test item.*
3. *The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer).*

Test Method:	*ANSI C63.4-2014* *ANSI C63.10-2013*

5 General Information

5.1 Client Information

Applicant:	Likk Technologies Inc.
Address:	16112 NW 13 Ave. Suite A Miami, Florida 33169 USA.
Manufacturer:	Shenzhen Hengxin Wulian Technology Co., Ltd.
Address:	2nd Floor, Building 2, Longfeng Industrial Park, Guanlantian, Longhua District, Shenzhen

5.2 General Description of E.U.T.

Product Name:	Water leak alarm
Model No.:	SW02
Operation Frequency:	433.8MHz
Channel numbers:	1
Modulation type:	FSK
Antenna Type:	Spring antenna
Antenna gain:	0 dBi
Power supply:	DC 3.6V (ER14505-2 battery)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

5.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with modulation（new battery used）		
Pre-Test Mode:			
CCIS has 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)	56.13	54.68	55.57
Final Test Mode:			
According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”: X axis (see the test setup photo)			

5.4 Description of Support Units

N/A

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Additions to, deviations, or exclusions from the method

No

5.7 Laboratory Facility

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

- **FCC - Designation No.: CN1211**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

- **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf

5.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No.110~116, Building B, Jinyuan Business Building, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

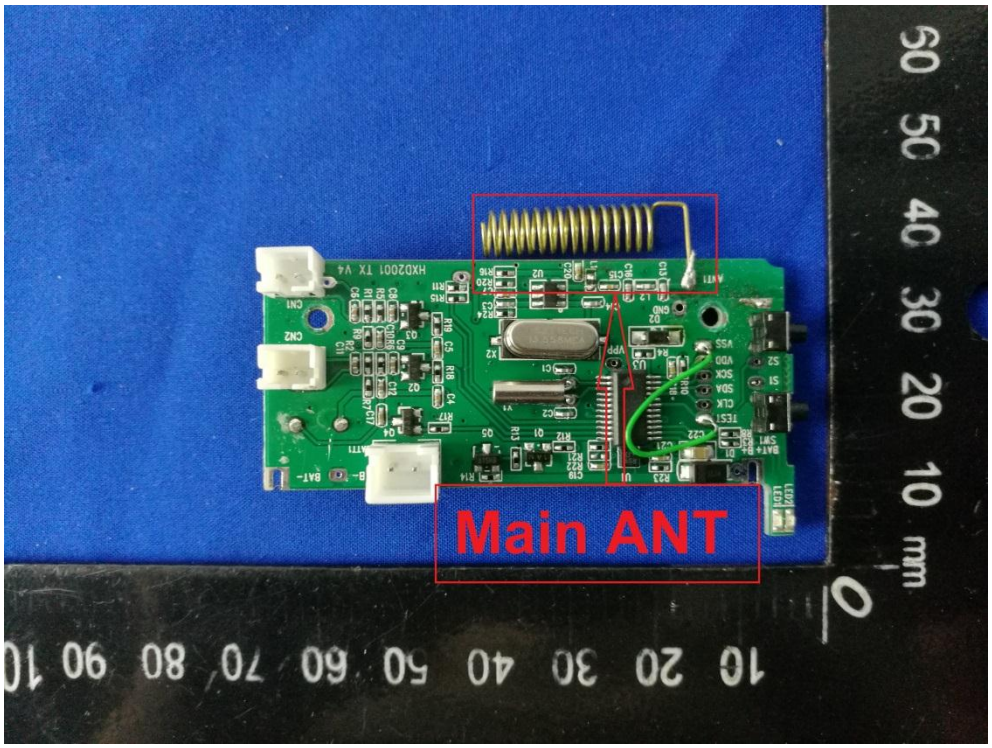
5.9 Test Instruments list

Radiated Emission:					
Test Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date (mm-dd-yy)**	**Cal. Due date (mm-dd-yy)**
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2019	11-17-2020
Loop Antenna	SCHWARZBECK	FMZB 1519 B	00044	03-07-2020	03-06-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2020	03-06-2021
Pre-amplifier	CD	PAP-1G18	11804	03-07-2020	03-06-2021
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-05-2020	03-04-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-05-2020	03-04-2021
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2020	03-06-2021
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2020	03-06-2021
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2020	03-06-2021

6 Test results and Measurement Data

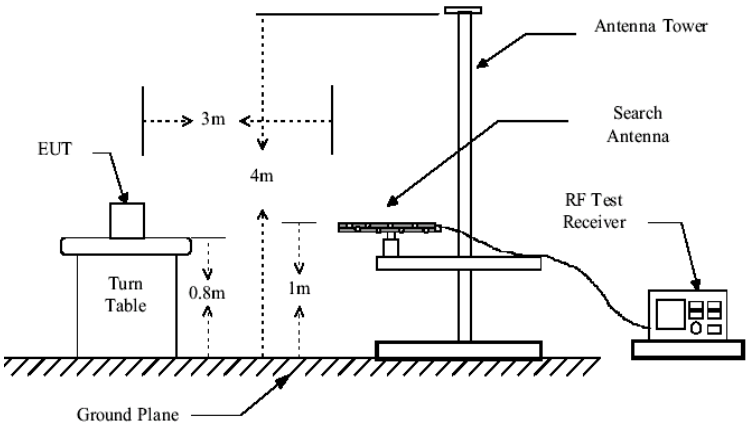
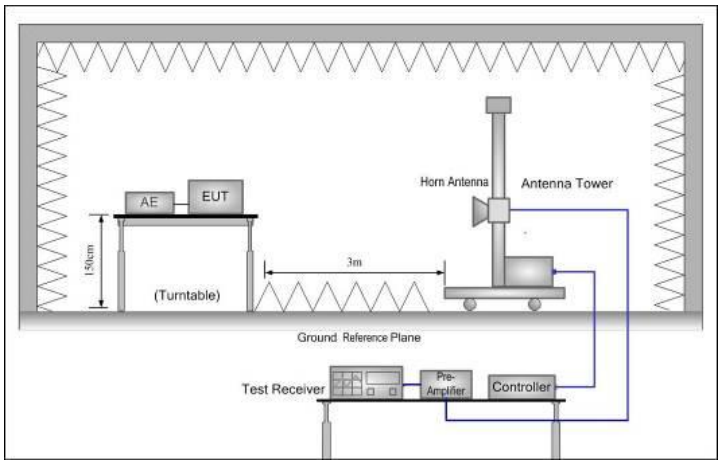
6.1 Antenna requirement

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.	
E.U.T Antenna:	
The EUT make use of an Spring Antenna, The typical gain of the antenna is 0dBi.	



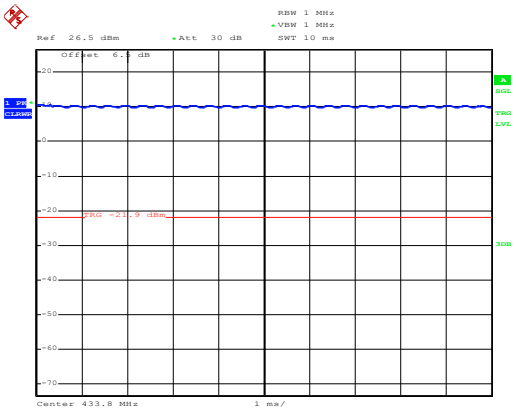
6.2 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td colspan="5">FCC Part15 C Section 15.231(a) and 15.209</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">30MHz to 5000MHz</td></tr>
<tr><td>Test site:</td><td colspan="5">Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td rowspan="3">Receiver setup:</td><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td rowspan="3">Limit:
(Field strength of the fundamental signal)</td><td colspan="2">Frequency</td><td colspan="2">Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td colspan="2" rowspan="2">433.8MHz</td><td colspan="2">80.82</td><td>Average Value</td></tr>
<tr><td colspan="2">100.82</td><td>Peak Value</td></tr>
<tr><td rowspan="8">Limit:
(Spurious Emissions)</td><td colspan="2">Frequency</td><td colspan="2">Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td colspan="2">30MHz-88MHz</td><td colspan="2">40.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">88MHz-216MHz</td><td colspan="2">43.5</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">216MHz-960MHz</td><td colspan="2">46.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">960MHz-1GHz</td><td colspan="2">54.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2" rowspan="2">Above 1GHz</td><td colspan="2">54.0</td><td>Average Value</td></tr>
<tr><td colspan="2">74.0</td><td>Peak Value</td></tr>
<tr><td colspan="5">Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.</td></tr>
<tr><td>Test Procedure:</td><td colspan="5">a. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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.</td></tr>
</table>

Test setup:	Below 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

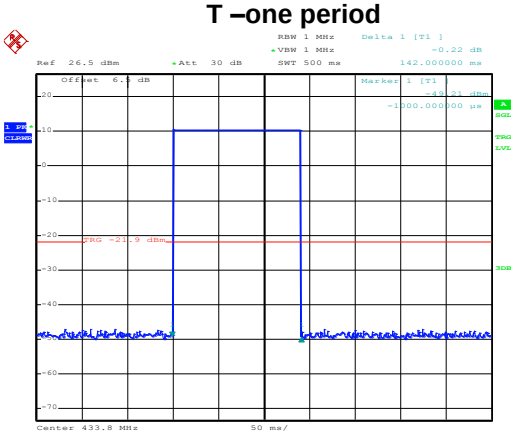
6.2.1 Field Strength Of The Fundamental Signal

T on time slot:



Date: 4.JUN.2020 15:53:50

T –one period

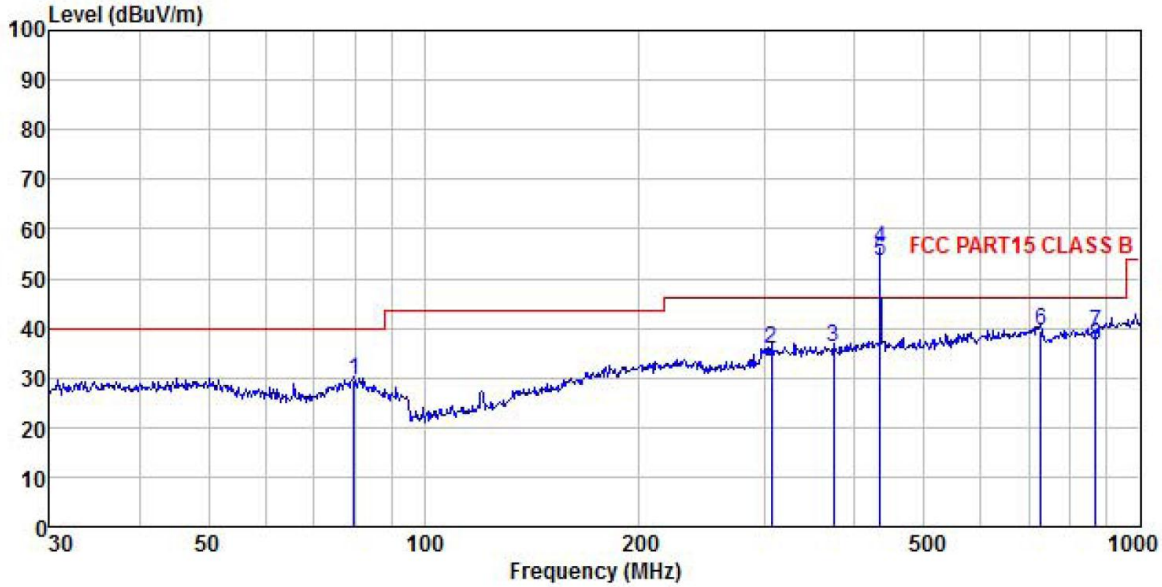


Date: 4.JUN.2020 15:57:49

6.2.2 Spurious Emissions

Test Plots:

Product Name:	Water leak alarm	Product Model:	SW02
Test By:	YT	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3.6V	Environment:	Temp: 24℃ Huni: 57%

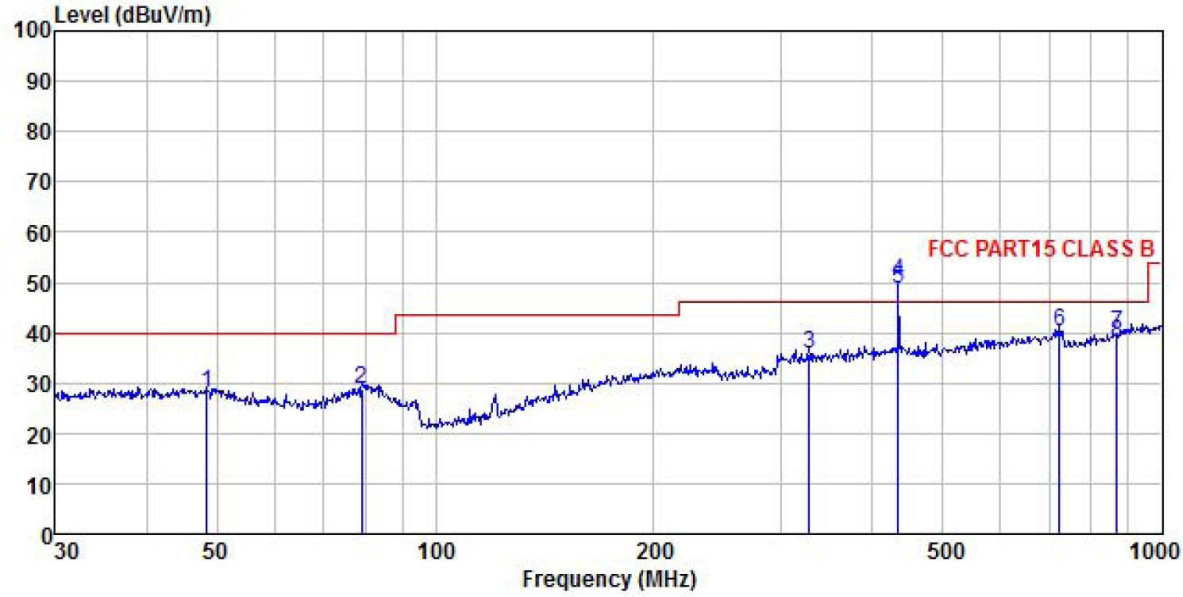


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	79.800	16.20	12.73	0.47	0.00	0.00	29.40	40.00	-10.60	QP
2	305.680	16.31	18.71	0.87	0.00	0.00	35.89	46.00	-10.11	QP
3	373.311	16.14	18.94	0.96	0.00	0.00	36.04	46.00	-9.96	QP
4 *	434.065	35.93	19.17	1.03	0.00	0.00	56.13	46.00	10.13	Peak
5 *	434.065	33.29	19.17	1.03	0.00	0.00	53.49	46.00	7.49	Average
6	726.805	17.58	20.56	1.34	0.00	0.00	39.48	46.00	-6.52	QP
7	867.600	15.96	21.77	1.45	0.00	0.00	39.18	46.00	-6.82	Peak
8	867.600	13.49	21.77	1.45	0.00	0.00	36.71	46.00	-9.29	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The Aux Factor is a notch filter switch box loss, this item is not used.*

Product Name:	Water leak alarm	Product Model:	SW02
Test By:	YT	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3.6V	Environment:	Temp: 24℃ Huni: 57%

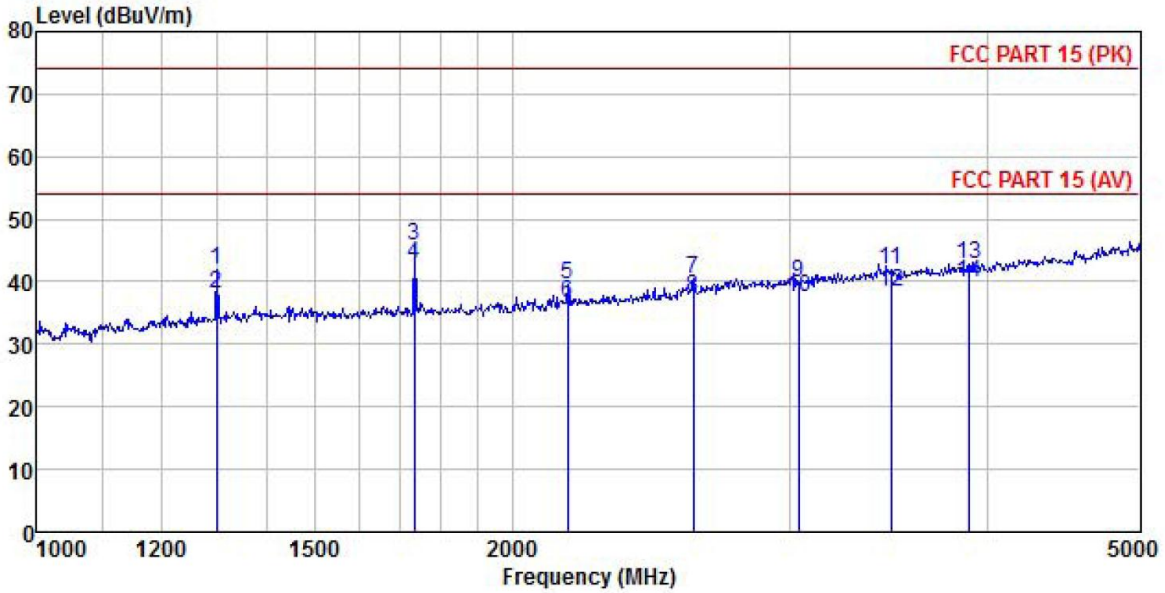


		Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1		48.502	14.70	13.11	0.38	0.00	0.00	28.19	40.00	-11.81	QP
2		79.243	15.72	12.59	0.47	0.00	0.00	28.78	40.00	-11.22	QP
3		326.740	16.08	18.75	0.90	0.00	0.00	35.73	46.00	-10.27	QP
4	*	434.065	30.13	19.17	1.03	0.00	0.00	50.33	46.00	4.33	Peak
5	*	434.065	28.64	19.17	1.03	0.00	0.00	48.84	46.00	2.84	Average
6		724.261	18.40	20.55	1.34	0.00	0.00	40.29	46.00	-5.71	QP
7		867.600	16.72	21.77	1.45	0.00	0.00	39.94	46.00	-6.06	Peak
8		867.600	14.87	21.77	1.45	0.00	0.00	38.09	46.00	-7.91	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The Aux Factor is a notch filter switch box loss, this item is not used.*

Product Name:	Water leak alarm	Product Model:	SW02
Test By:	YT	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Vertical
Test Voltage:	DC 3.6V	Environment:	Temp: 24℃ Huni: 57%

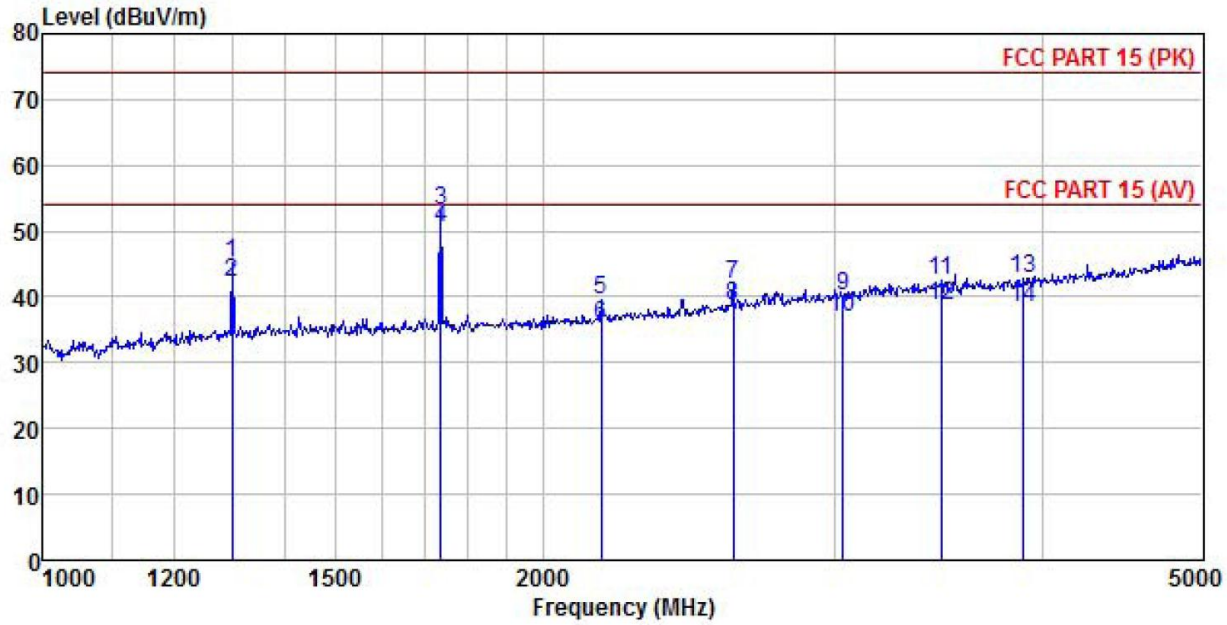


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	1299.966	53.93	24.83	3.08	1.25	41.04	42.05	74.00	-31.95	Peak
2	1299.966	50.02	24.83	3.08	1.25	41.04	38.14	54.00	-15.86	Average
3	1733.995	56.73	25.10	3.62	1.47	41.14	45.78	74.00	-28.22	Peak
4	1733.995	53.65	25.10	3.62	1.47	41.14	42.70	54.00	-11.30	Average
5	2168.725	49.15	26.47	4.06	1.64	41.68	39.64	74.00	-34.36	Peak
6	2168.725	46.25	26.47	4.06	1.64	41.68	36.74	54.00	-17.26	Average
7	2605.477	48.64	27.54	4.49	1.75	41.88	40.54	74.00	-33.46	Peak
8	2605.477	45.44	27.54	4.49	1.75	41.88	37.34	54.00	-16.66	Average
9	3040.803	46.15	28.43	4.93	1.92	41.49	39.94	74.00	-34.06	Peak
10	3040.803	43.57	28.43	4.93	1.92	41.49	37.36	54.00	-16.64	Average
11	3475.384	47.19	28.69	5.28	2.18	41.43	41.91	74.00	-32.09	Peak
12	3475.384	43.79	28.69	5.28	2.18	41.43	38.51	54.00	-15.49	Average
13	3902.372	47.53	29.19	5.68	2.20	41.80	42.80	74.00	-31.20	Peak
14	3902.372	44.46	29.19	5.68	2.20	41.80	39.73	54.00	-14.27	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Product Name:	Water leak alarm	Product Model:	SW02
Test By:	YT	Test mode:	Tx mode
Test Frequency:	1 GHz ~ 5 GHz	Polarization:	Horizontal
Test Voltage:	DC 3.6V	Environment:	Temp: 24℃ Huni: 57%

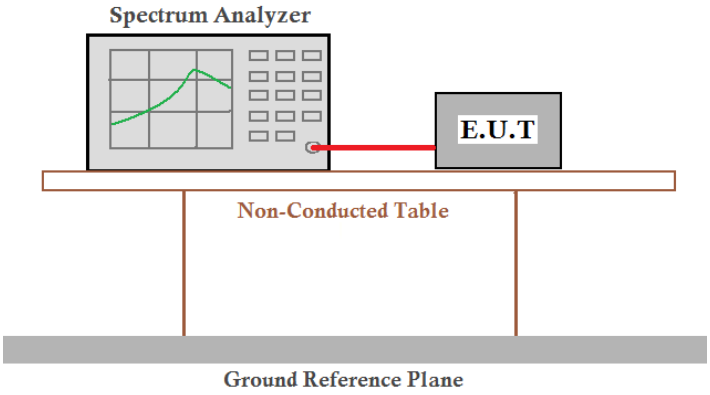


	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	1299.966	57.18	24.83	3.08	1.25	41.04	45.30	74.00	-28.70	Peak
2	1299.966	54.20	24.83	3.08	1.25	41.04	42.32	54.00	-11.68	Average
3	1736.788	64.18	25.11	3.62	1.47	41.15	53.23	74.00	-20.77	Peak
4	1736.788	61.55	25.11	3.62	1.47	41.15	50.60	54.00	-3.40	Average
5	2168.725	48.94	26.47	4.06	1.64	41.68	39.43	74.00	-34.57	Peak
6	2168.725	45.36	26.47	4.06	1.64	41.68	35.85	54.00	-18.15	Average
7	2605.477	49.97	27.54	4.49	1.75	41.88	41.87	74.00	-32.13	Peak
8	2605.477	46.75	27.54	4.49	1.75	41.88	38.65	54.00	-15.35	Average
9	3035.913	46.46	28.42	4.92	1.92	41.49	40.23	74.00	-33.77	Peak
10	3035.913	43.14	28.42	4.92	1.92	41.49	36.91	54.00	-17.09	Average
11	3475.384	47.89	28.69	5.28	2.18	41.43	42.61	74.00	-31.39	Peak
12	3475.384	44.06	28.69	5.28	2.18	41.43	38.78	54.00	-15.22	Average
13	3902.372	47.46	29.19	5.68	2.20	41.80	42.73	74.00	-31.27	Peak
14	3902.372	43.17	29.19	5.68	2.20	41.80	38.44	54.00	-15.56	Average

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

6.3 20dB Bandwidth

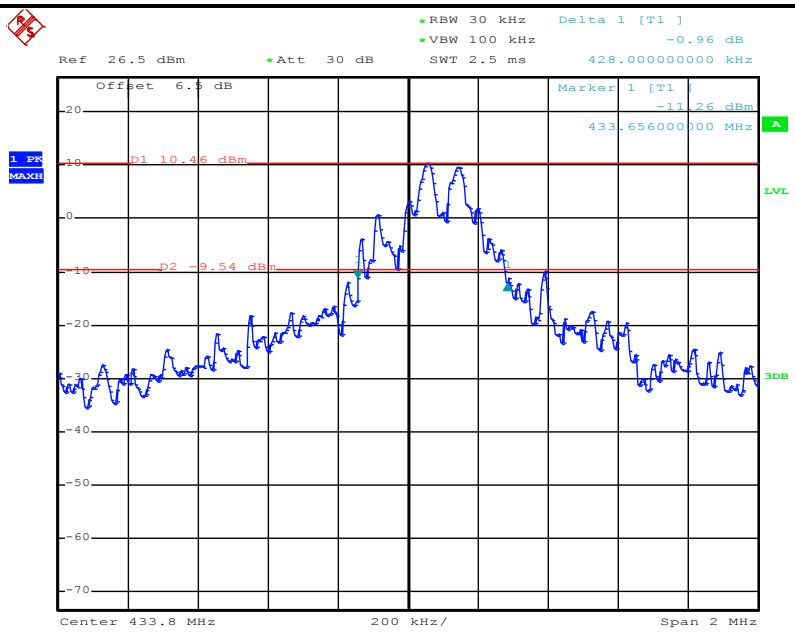
Test Requirement:	FCC Part15 C Section 15.231 (c)
Receiver setup:	RBW=1kHz, VBW=3kHz, detector: Peak
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test 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. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points. 4. Read 20dB bandwidth.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

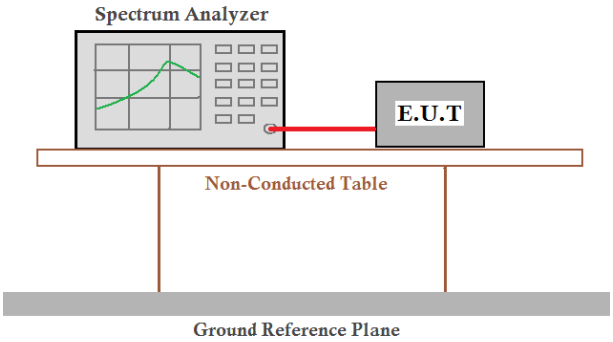
20dB bandwidth (MHz)	Limit (MHz)	Results
0.428	1.0845	Passed

Note: Limit= Fundamental frequency×0.25%=433.8×0.25%=1.0845MHz

Test plot as follows:



6.4 Duration Time

Test Requirement:	FCC Part15 C Section 15.231 (a) (2)
Receiver setup:	RBW=100kHz, VBW=300kHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test mode:	Transmitting mode
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 transmission, and read the transmission time.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Duration time (second)	Limit (second)	Result
0.176	<5.0	Pass

Test plot as follows: