

TEST REPORT

FCC ID: 2ANJH-WHCS1

Product: WYZE Contact Sensor

Model No.: WHCS1

Additional Model: N/A

Trade Mark: WYZE

Report No.: TCT190411E006

Issued Date: Apr. 22, 2019

Issued for:

TianJin HuaLai Technology Co., Ltd.

No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	WYZE Contact Sensor
Model No.:	WHCS1
Additional Model:	N/A
Trade Mark:	WYZE
Applicant:	TianJin HuaLai Technology Co., Ltd.
Address:	No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China
Manufacturer:	TianJin HuaLai Technology Co., Ltd.
Address:	No.10 JinPing Road, Ya An Street, Nankai District Tianjin, China
Date of Test:	Apr. 12, 2019 – Apr. 19, 2019
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249 ANSI C63.10:2013

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Jim Wang

Jin Wang

Date:

Apr. 19, 2019

Reviewed By:

Beryl Zhao

Beryl Zhao

Date:

Apr. 22, 2019

Approved By:



Tomsin

Date:

Apr. 22, 2019

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	N/A
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§15.249 (a) (d)/ §15.209	PASS
Band Edge	§15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§15.215 (c)	PASS

Note:

1. Pass: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product:	WYZE Contact Sensor
Model No.:	WHCS1
Additional Model:	N/A
Trade Mark:	WYZE
Hardware Version:	DWS3U-P01
Software Version:	V 0.0.0.16
Operation Frequency:	906MHz-918MHz
Number of Channel:	9
Modulation Technology:	FSK
Antenna Type:	Internal Antenna
Antenna Gain:	0.5dBi
Power Supply:	DC 3V

Operation Frequency Each of Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency
0	906MHz	3	907MHz	6	909.8MHz
1	906.6MHz	4	907.4MHz	7	915MHz
2	906.8MHz	5	909.6MHz	8	918MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	906MHz
The middle channel	907.4MHz
The Highest channel	918MHz

4. General Information

4.1. Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel
<p>The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case (Z axis) are shown in Test Results of the following pages.</p>	

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: 86-755-27673339

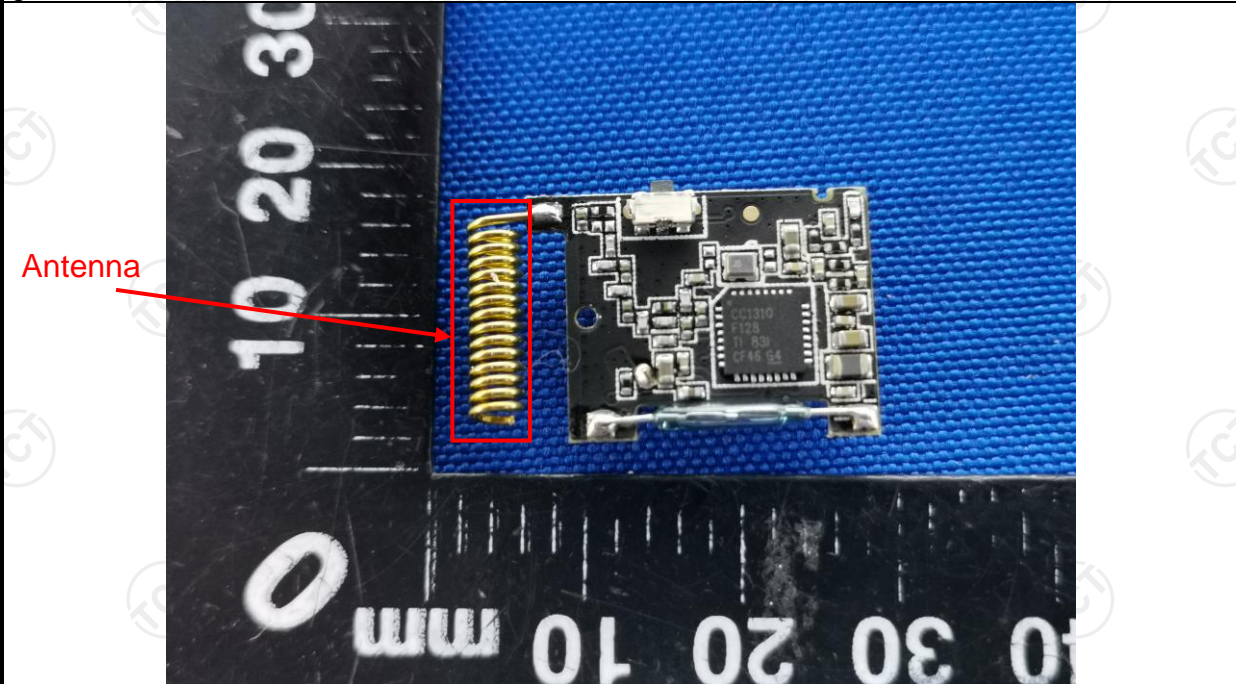
5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1GHz)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1GHz)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

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 antenna is internal antenna which permanently attached, and the best case gain of the antenna is 0.5dBi.	
	

6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	<p><i>Remark: E.U.T.: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</i></p>														
Test Mode:	Transmitting mode with modulation														
Test Procedure:	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. 														
Test Result:	N/A; Because the EUT is powered by the button cell, so the item is not applicable.														

6.3. Radiated Emission Measurement

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Frequency Range:	9 kHz to 25 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit(Field strength of the fundamental signal):	Frequency	Limit (dBuV/m @3m)		Remark	
	2400MHz-2483.5MHz	94.00		Average Value	
		114.00		Peak Value	
Limit(Spurious Emissions):	Frequency	Limit (dBuV/m @3m)		Remark	
	0.009-0.490	2400/F(KHz)		Quasi-peak Value	
	0.490-1.705	24000/F(KHz)		Quasi-peak Value	
	1.705-30	30		Quasi-peak Value	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	960MHz-1GHz	54.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
	74.0		Peak Value		
Limit (band edge) :	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.				
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 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.
4. 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.
 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
 6. 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.

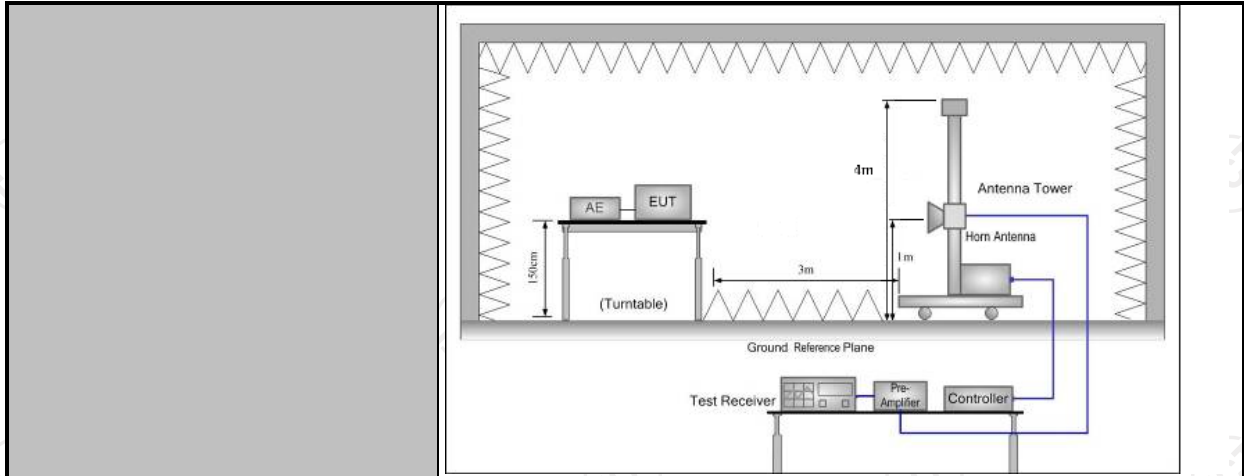
Test setup:

For radiated emissions below 30MHz

30MHz to 1GHz

Above 1GHz

(The diagram below shows the test setup that is utilized to make the measurements for emission from 1GHz to the tenth harmonic of the highest fundamental frequency or to 40GHz emissions, whichever is lower.)



Test results:

PASS

6.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESIB7	100197	Jul. 17, 2019
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ40	200061	Sep. 20, 2019
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 16, 2019
Pre-amplifier	HP	8447D	2727A05017	Sep. 16, 2019
Loop antenna	ZHINAN	ZN30900A	12024	Oct. 20, 2019
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 02, 2019
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Oct. 20, 2019
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 16, 2019
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 16, 2019
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 16, 2019
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 16, 2019
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 16, 2019
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission QP (dBuV/m)	Horizontal /Vertical	Limits QP (dBuV/m)	Margin (dB)
906	76.6	H	94	-17.4
907.4	76.8	H	94	-17.2
918	76.7	H	94	-17.3
906	74.4	V	94	-19.6
907.4	74.6	V	94	-19.4
918	74.8	V	94	-19.2

Spurious Emissions

Frequency Range (9 kHz-30MHz)

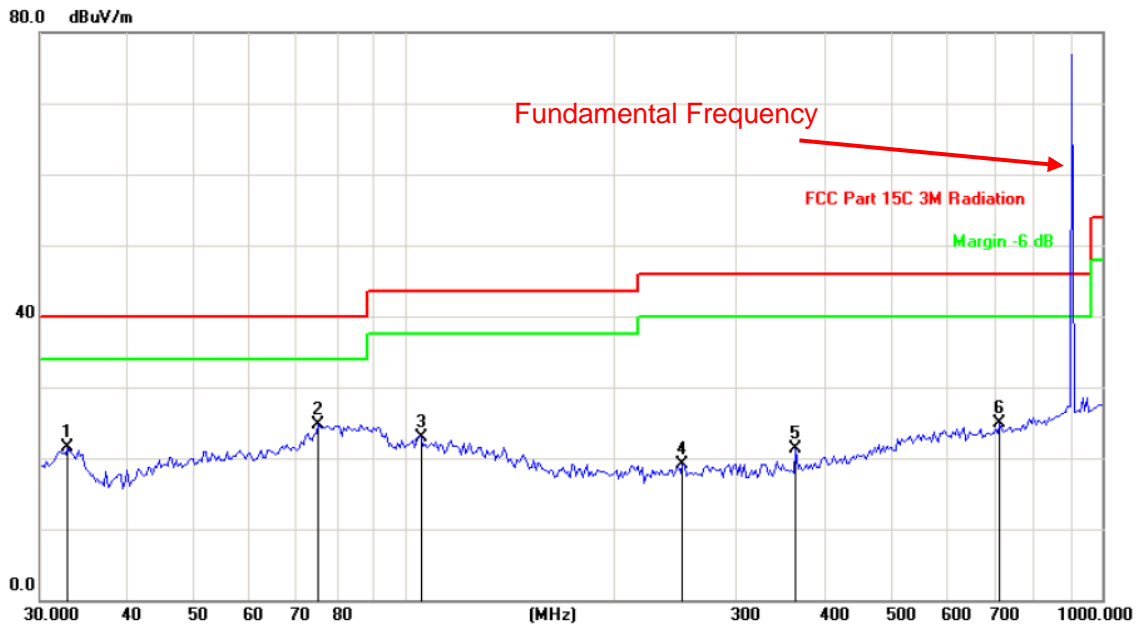
Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Frequency Range (30MHz-1GHz)

Horizontal:

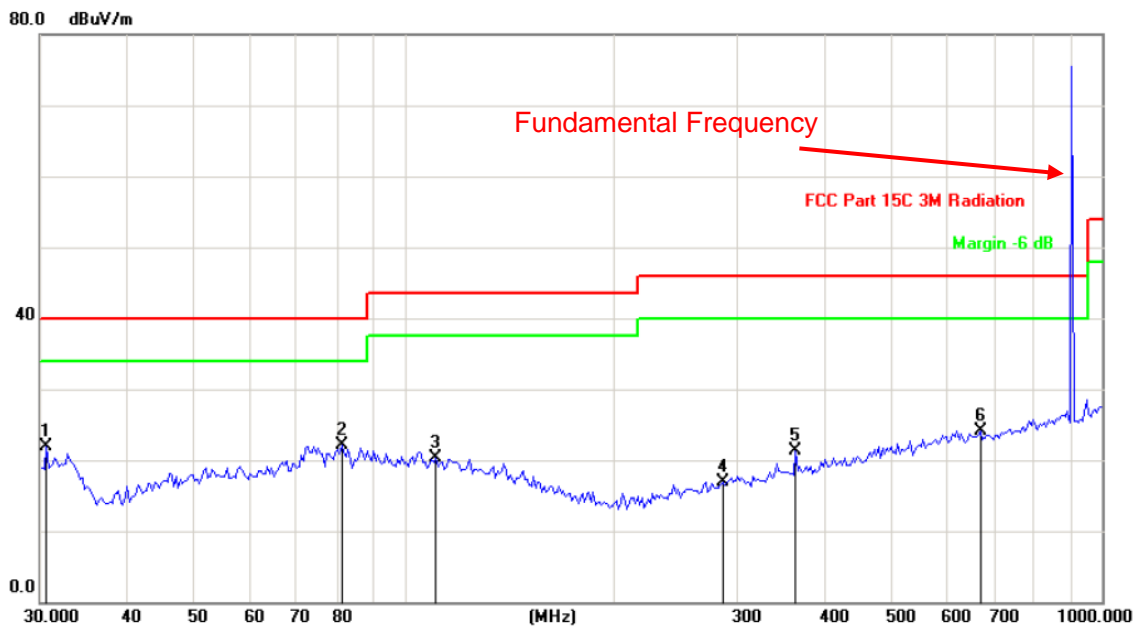


Site: Polarization: *Horizontal* Temperature: 25
Limit: FCC Part 15C 3M Radiation Power: Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		32.8697	32.43	-11.02	21.41	40.00	-18.59	peak
2	*	75.3208	40.94	-16.21	24.73	40.00	-15.27	peak
3		105.5369	31.47	-8.49	22.98	43.50	-20.52	peak
4		250.4858	31.71	-12.55	19.16	46.00	-26.84	peak
5		363.5230	30.81	-9.49	21.32	46.00	-24.68	peak
6		713.6915	30.03	-5.20	24.83	46.00	-21.17	peak



Vertical:



Site: Polarization: *Vertical* Temperature: 25
Limit: FCC Part 15C 3M Radiation Power: Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		30.6392	32.95	-11.01	21.94	40.00	-18.06	peak
2	*	81.3740	38.02	-15.84	22.18	40.00	-17.82	peak
3		110.8581	29.41	-9.10	20.31	43.50	-23.19	peak
4		286.2653	28.36	-11.36	17.00	46.00	-29.00	peak
5		363.5231	30.81	-9.49	21.32	46.00	-24.68	peak
6		669.9523	29.59	-5.54	24.05	46.00	-21.95	peak

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (middle channel) was submitted only.

Above 1GHz

Low channel: 906MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
1812.00	H	21.76	---	-3.94	17.82	---	74	54	-36.18
2718.00	H	20.19	---	0.52	20.71	---	74	54	-33.29
---	---	---	---	---	---	---	---	---	---
1812.00	V	23.84	---	-3.94	19.90	---	74	54	-34.10
2718.00	V	20.35	---	0.52	20.87	---	74	54	-33.13
---	---	---	---	---	---	---	---	---	---

Middle channel: 907.4MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
1814.80	H	22.57	---	-3.98	18.59	---	74	54	-35.41
2722.20	H	20.21	---	0.57	20.78	---	74	54	-33.22
---	---	---	---	---	---	---	---	---	---
1814.80	V	21.96	---	-3.98	17.98	---	74	54	-36.02
2722.20	V	20.45	---	0.57	21.02	---	74	54	-32.98
---	---	---	---	---	---	---	---	---	---

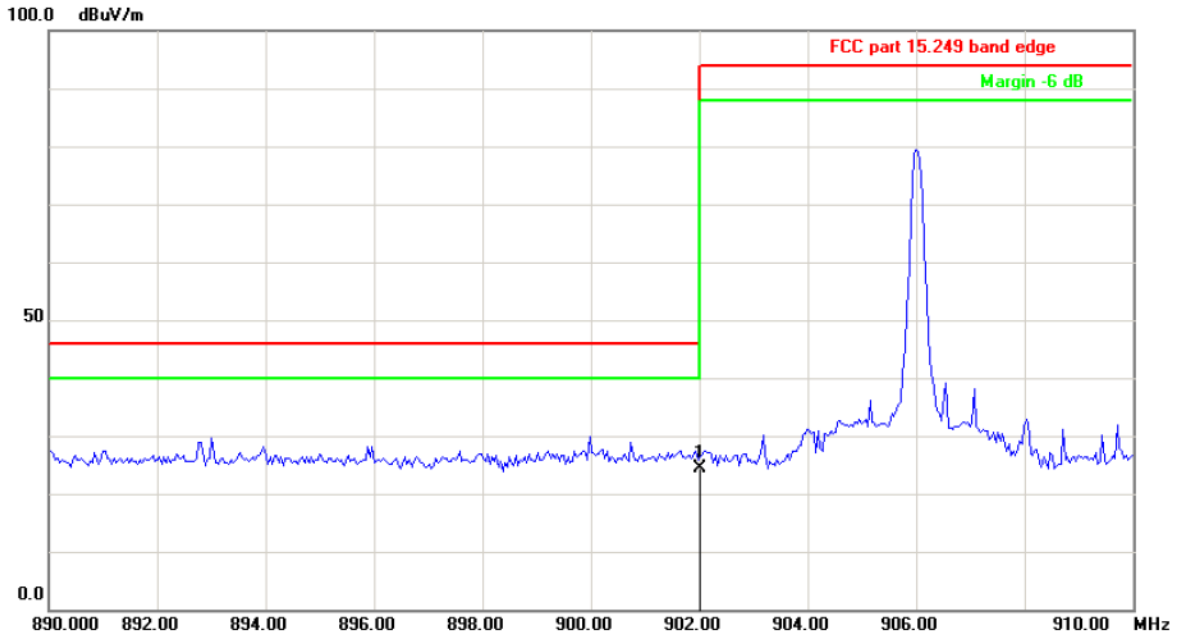
High channel: 918MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB μ V)	AV reading (dB μ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB μ V/m)	AV limit (dB μ V/m)	Margin (dB)
					Peak (dB μ V/m)	AV (dB μ V/m)			
1836.00	H	23.13	---	-3.98	19.15	---	74	54	-34.85
2754.00	H	20.02	---	0.57	20.59	---	74	54	-33.41
---	---	---	---	---	---	---	---	---	---
1836.00	V	21.25	---	-3.98	17.27	---	74	54	-36.73
2754.00	V	20.84	---	0.57	21.41	---	74	54	-32.59
---	---	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB μ V/m)-Average limit (dB μ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Band Edge Requirement

Low channel: 906MHz
Horizontal:

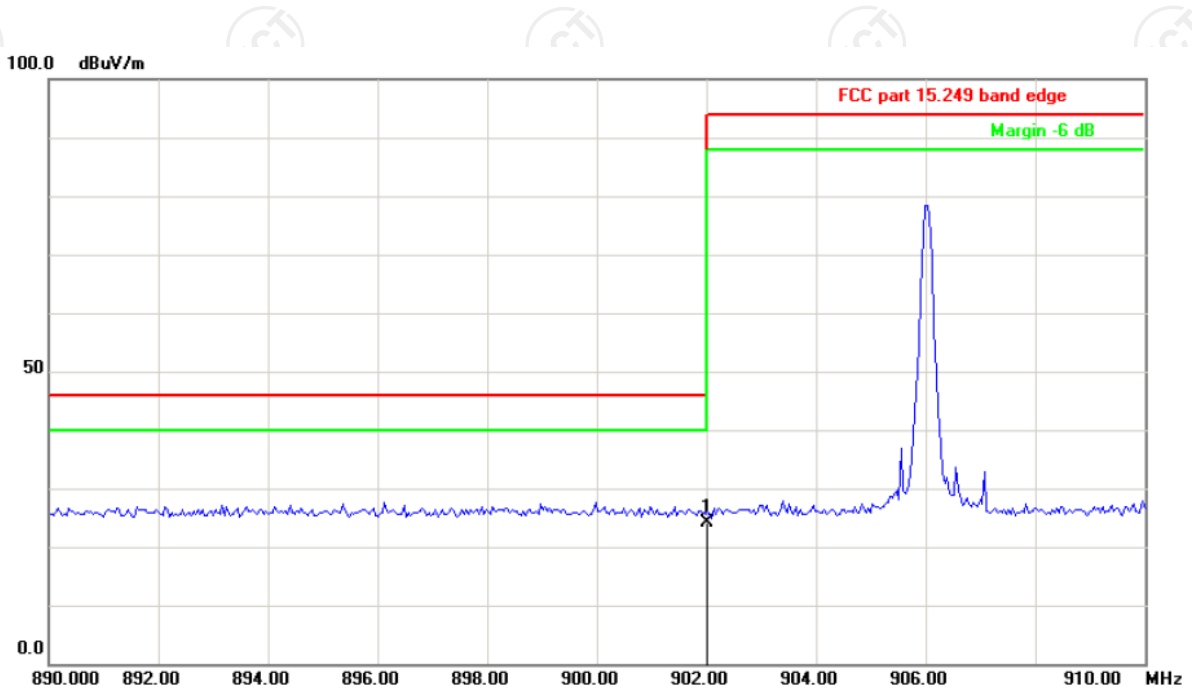


Site: Polarization: *Horizontal* Temperature: 25
Limit: FCC part 15.249 band edge Power: DC 3V Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB	dBuV/m	dB/m	dB	
1	*	902.0000	27.56	-3.26	24.30	46.00	-21.70	QP

Low channel: 906MHz

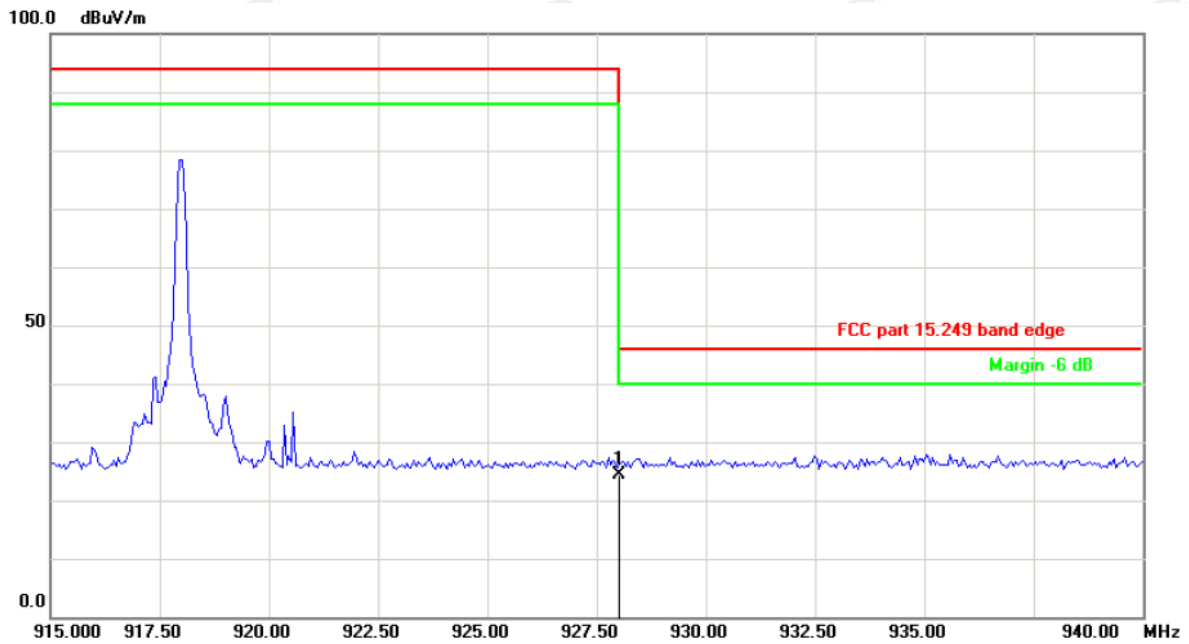
Vertical:



Site: _____ Polarization: **Vertical** Temperature: 25
 Limit: FCC part 15.249 band edge Power: DC 3V Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB	dBuV/m	dB/m	dB	
1	*	902.0000	27.36	-3.26	24.10	46.00	-21.90	QP

High channel: 918MHz
Horizontal:

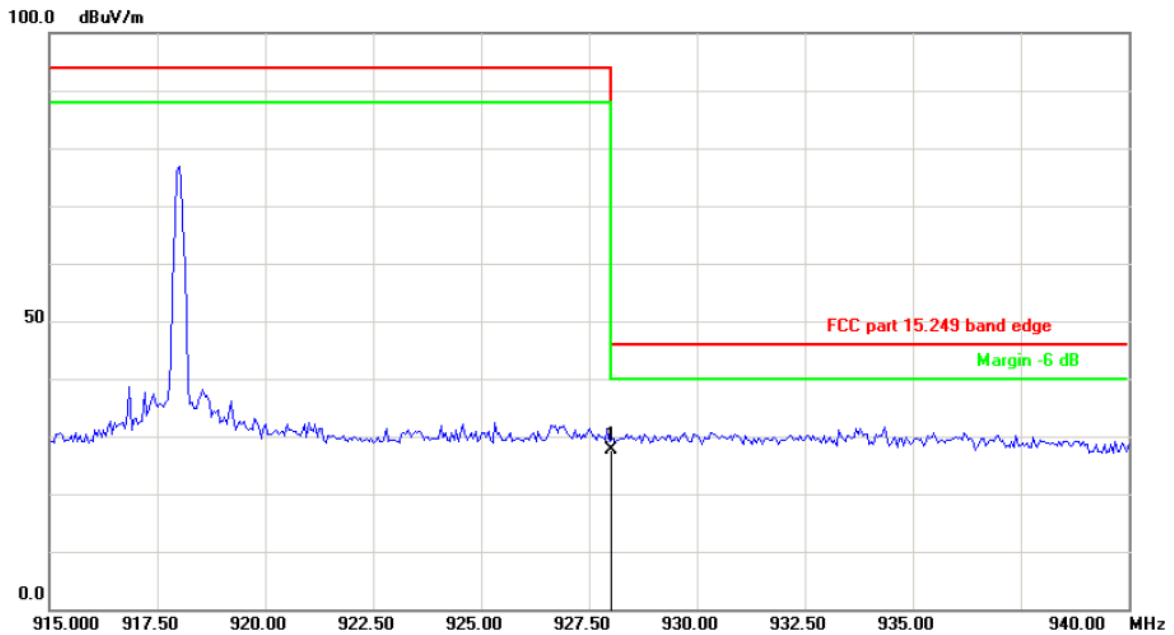


Site: Polarization: **Horizontal** Temperature: 25
Limit: FCC part 15.249 band edge Power: DC 3V Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	*	928.0000	27.59	-3.19	24.40	46.00	-21.60	QP



Low channel: 918MHz
Vertical:



Site: Polarization: **Vertical** Temperature: 25
Limit: FCC part 15.249 band edge Power: DC 3V Humidity: 55 %

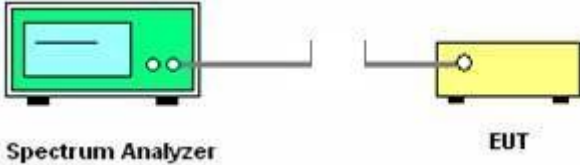
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	928.0000	30.79	-3.19	27.60	46.00	-18.40	peak

Note:

- Emission Level=Measurement Reading + Correction Factor;
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- Margin (dB) = Measurement Level (dBuV/m)- limit (dBuV/m)

6.4. 20dB Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.10: 2013
Limit:	N/A
	<ol style="list-style-type: none"> 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW\geq1% of the 20 dB bandwidth; VBW\geqRBW; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	 <p>The diagram illustrates the test setup. On the left is a Spectrum Analyzer, represented by a green rectangular box with a screen and two knobs. On the right is the EUT (Equipment Under Test), represented by a yellow rectangular box. A horizontal line with a small circle in the middle connects the two boxes, representing a cable or antenna connection.</p>
Test Mode:	Transmitting mode with modulation
Test results:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 20, 2019

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

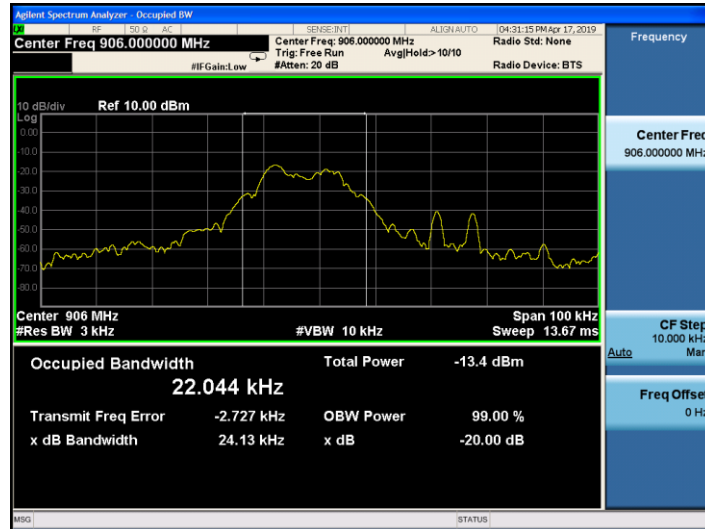
6.4.3. Test data

Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion
Lowest	24.13	---	PASS
Middle	25.85	---	PASS
Highest	25.35	---	PASS

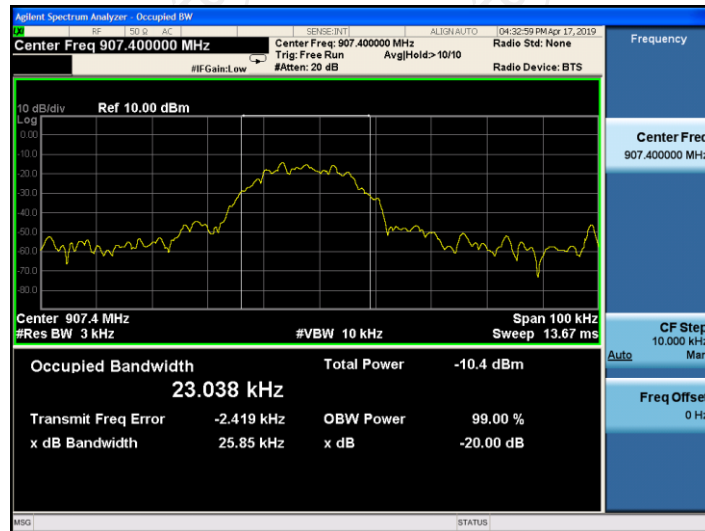
Test plots as follows:



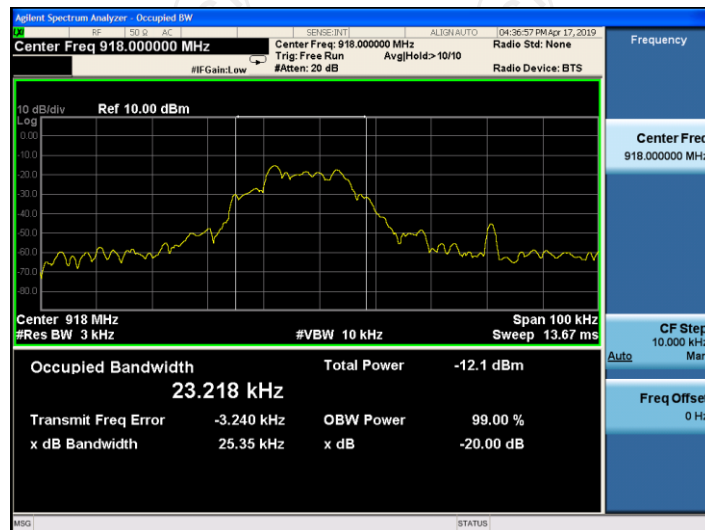
Lowest channel



Middle channel



Highest channel

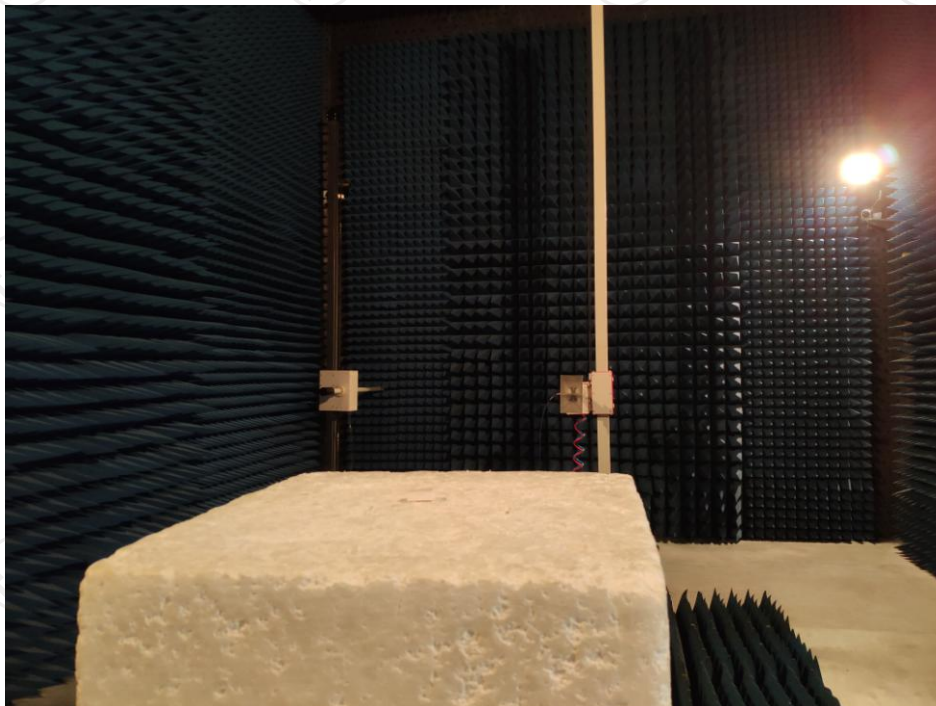
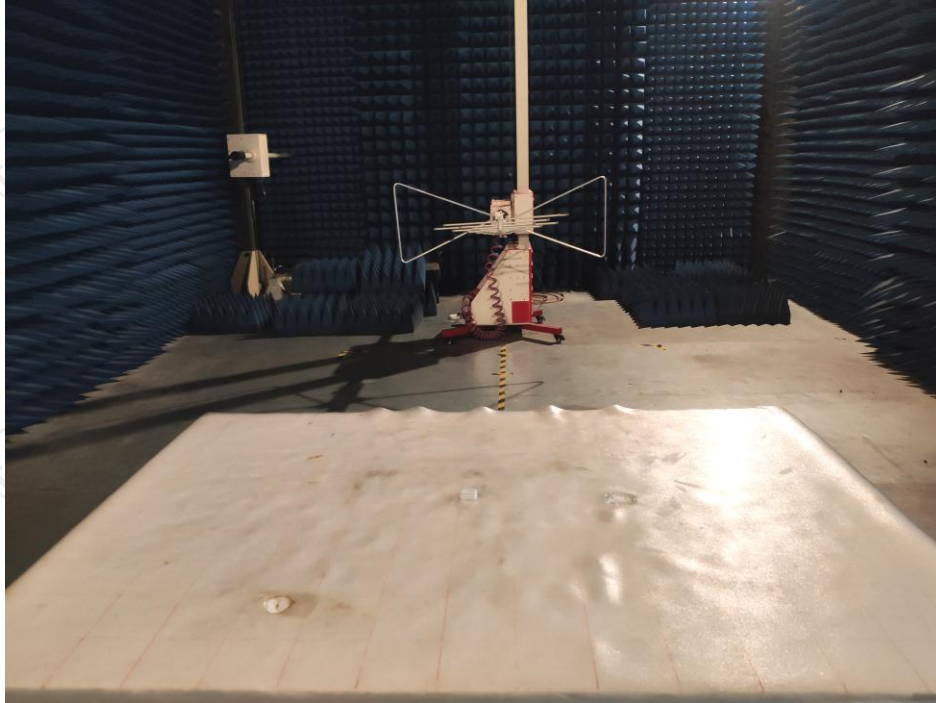


Appendix A: Photographs of Test Setup

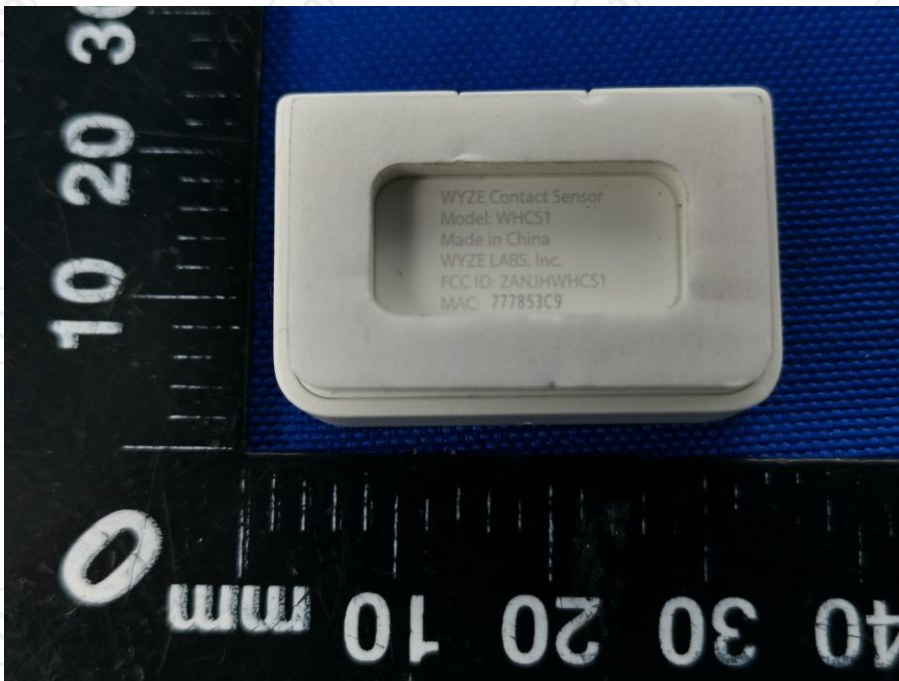
Product: WYZE Contact Sensor

Model: WHCS1

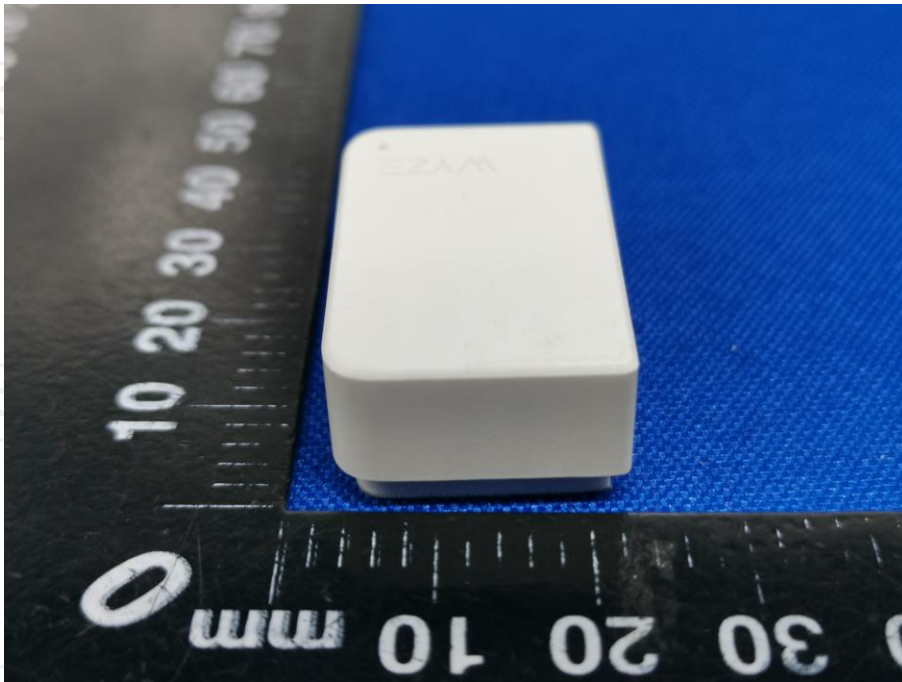
Radiated Emission



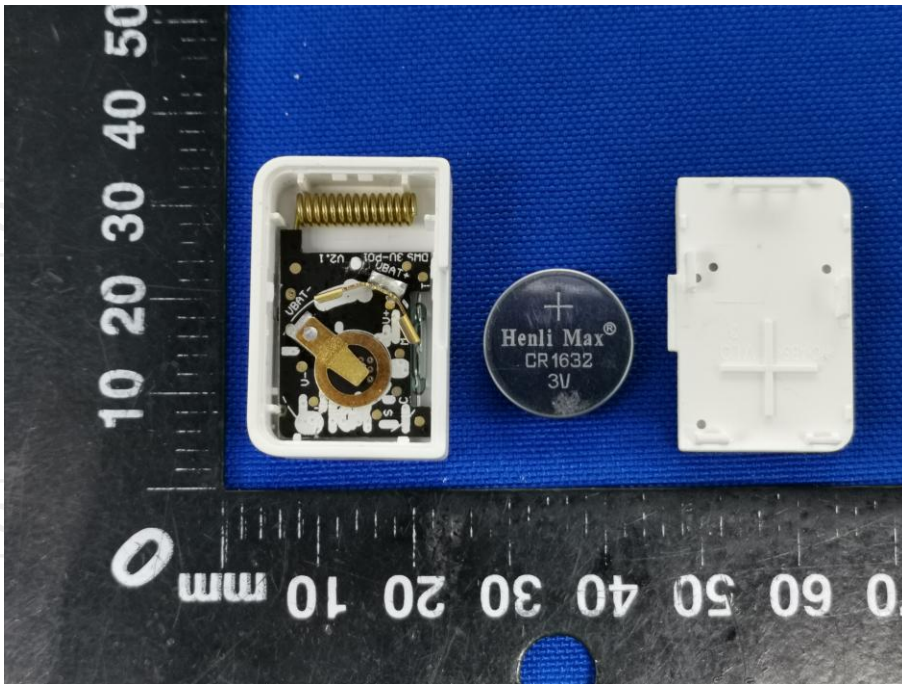
Appendix B: Photographs of EUT
Product: WYZE Contact Sensor
Model: WHCS1
External Photos

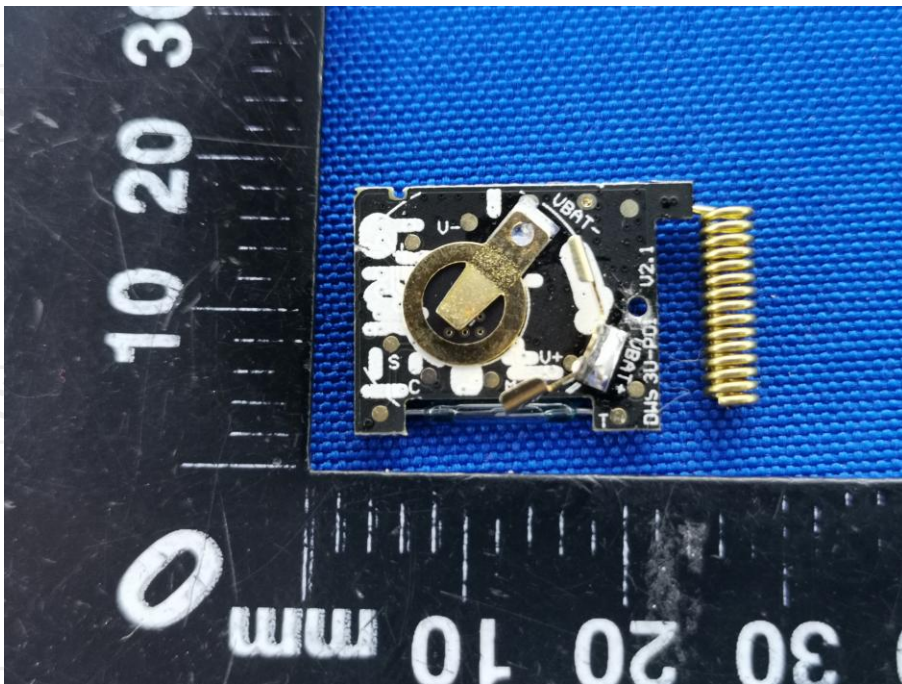
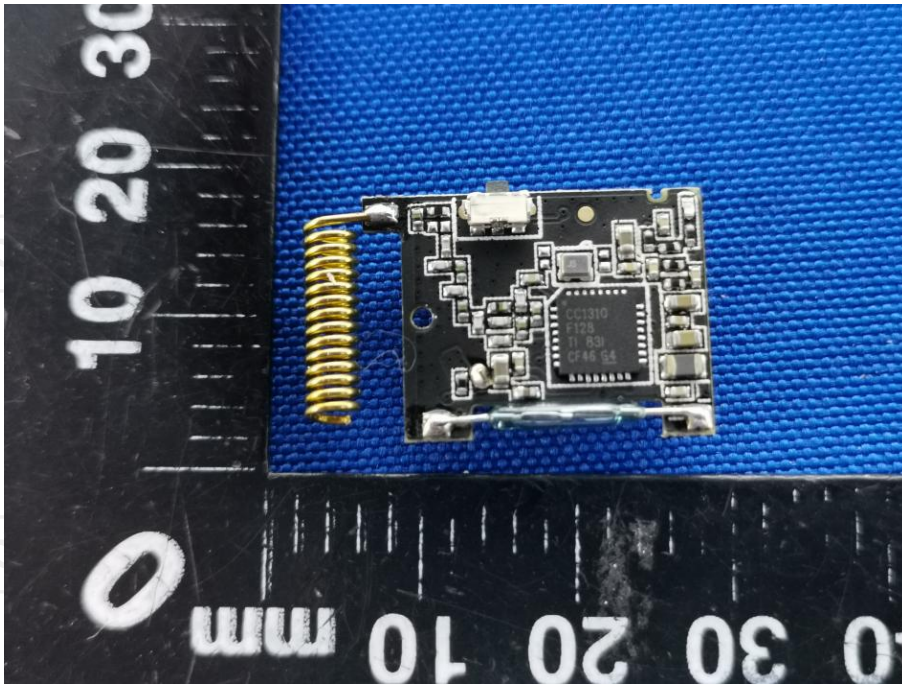


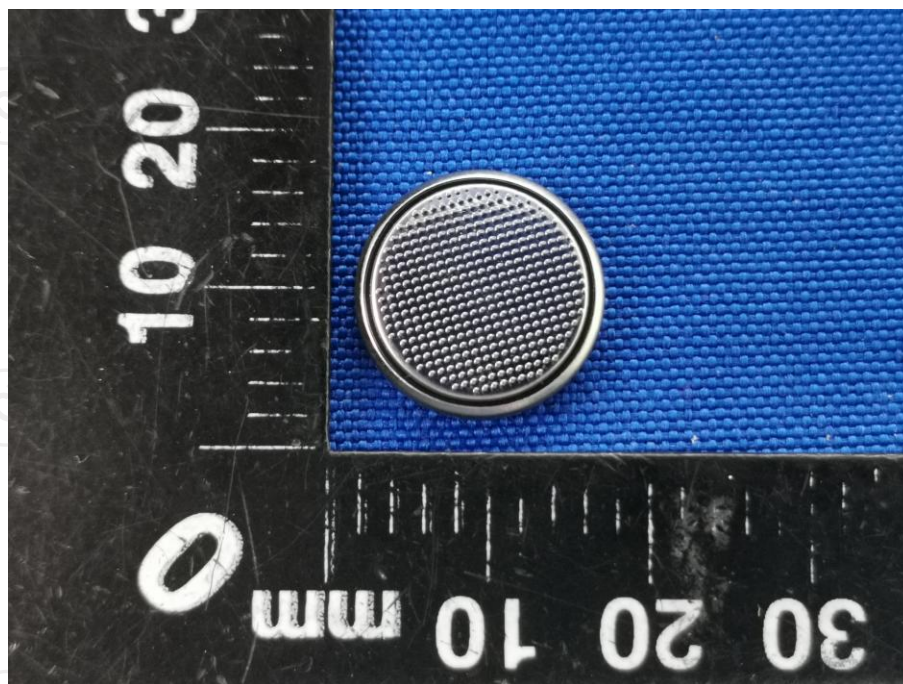




Product: WYZE Contact Sensor
Model: WHCS1
Internal Photos







*******END OF REPORT*******