FCC TEST REPORT

For

Shenzhen Kaipule Technology Co., Ltd.

Z-Wave Door Sensor

Model No.: IM20-ZWAVE-USA

Prepared For	:	Shenzhen Kaipule Technology Co., Ltd.
Address	:	Bldg A, The 2nd Industry Area-Part 2, Xiahenglang, Dalang Street, Longhua District, Shenzhen, China
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China Tel: (86) 755-26066544 Fax: (86) 755-26014772
Report Number	:	R0117010057W
Date of Test	:	Jan. 03, 2017~Feb. 21, 2017
Date of Report	:	Feb. 22, 2017

Contents

TEST REPORT

Applicant	:	Shenzhen Kaipule Technology Co., Ltd.
Manufacturer	:	Shenzhen Kaipule Technology Co., Ltd.
Product Name	:	Z-Wave Door Sensor
Model No.	:	IM20-ZWAVE-USA
Trade Mark	:	N.A.
Rating(s)	:	DC 3V, “AAA” Battery *2

Test Standard(s)	**:**	**FCC Part15 Subpart C, Paragraph 15.249**
Test Method(s)	**:**	**ANSI C63.10: 2013**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : : Jan. 03, 2017~Feb. 21, 2017

Prepared by : : Baron Wen

(Tested Engineer / Baron Wen)

Reviewer : : Dolly Mo

(Project Manager / Dolly Mo)

Approved & Authorized Signer : : Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Shenzhen Kaipule Technology Co., Ltd.
Address	:	Bldg A, The 2nd Industry Area-Part 2, Xiahenglang, Dalang Street, Longhua District, Shenzhen, China
Manufacturer	:	Shenzhen Kaipule Technology Co., Ltd.
Address	:	Bldg A, The 2nd Industry Area-Part 2, Xiahenglang, Dalang Street, Longhua District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	Z-Wave Door Sensor	
Model No.	:	IM20-ZWAVE-USA	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 3V Battery	
Product Description	:	Operation Frequency:	908.4MHz
		Number of Channel:	1 Channels
		Modulation Type:	FSK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	-5.52 dBi
Remark: 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

N/A		

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01

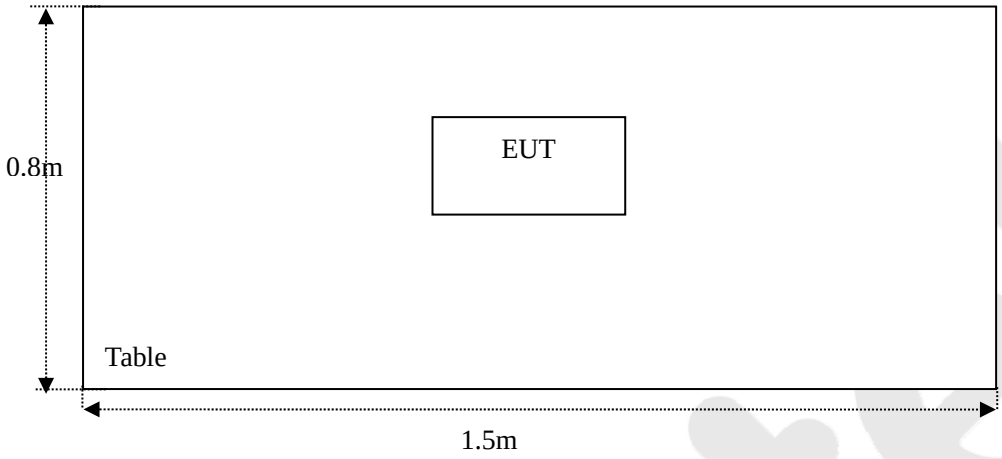
For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01

1.5. List of channels

Channel	Frequency (MHz)
01	908.4

1.6. Description Of Test Setup

RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Jul. 19, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Jun. 17, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Jun. 17, 2016	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Jul. 12, 2016	1 Year
5	Preamplifier	Instruments corporation	EMC011830	980100	Jun. 17, 2016	1 Year
6.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 06, 2016	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2016	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519	012	May 11, 2016	1 Year
10.	Pre-amplifier	SONOMA	310N	186860	Jun. 17, 2016	1 Year
11	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
12.	Power Sensor	Agilent	KFSW150502	15I00041SN045	Jun. 17, 2016	1 Year
13.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun. 17, 2016	1 Year
14.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun. 17, 2016	1 Year
15	Signal Generator	Agilent	E4421B	MY41000743	Jun. 17, 2016	1 Year
16.	DC Power supply	IV	IV-8080	YQSB0096	Jun. 17, 2016	1 Year
17.	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-150 M8	SE-0137	Jun. 17, 2016	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal)
		Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.9. Description of Test Facility

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

FCC-Registration No.: 752021

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

IC-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

2. Summary of Test Results

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.249	Spurious Emission	PASS
15.215(c)	20dB Bandwidth	PASS
15.249(c)	Band Edge	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

3. Radiation Spurious Emission and Band Edge

3.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB 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.

Test Standard	FCC Part15 C Section 15.249					
Test Limit	Frequency (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	902~928	50	-	94.0	Average	3
		-	-	114.0	Peak	3
		-	500	54.0	Average	3
		-	-	74.0	Peak	3

Remark:

(1) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB 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.

3.2. Test Setup

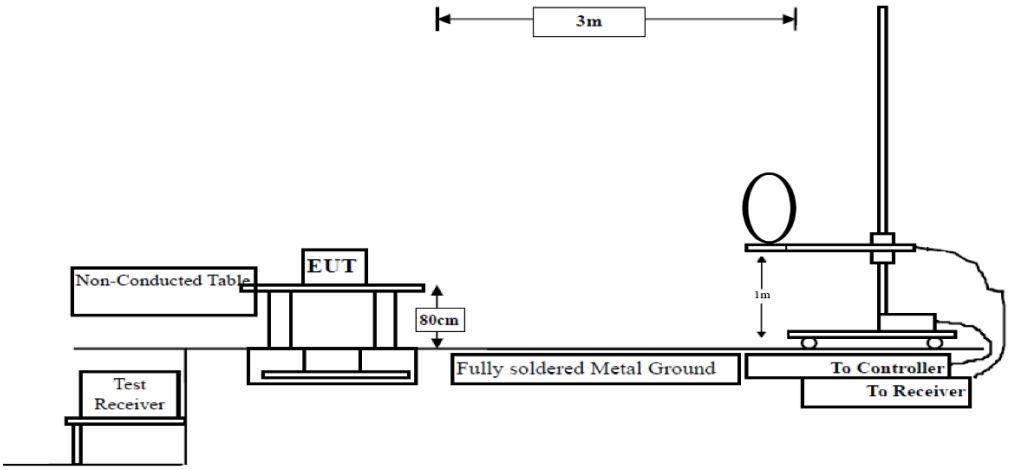


Figure 1. Below 30MHz

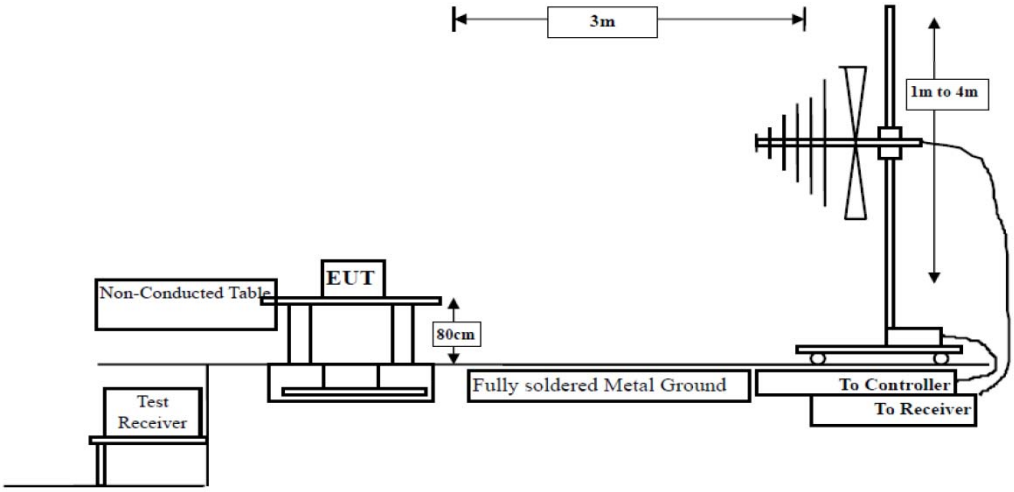


Figure 2. 30MHz to 1GHz

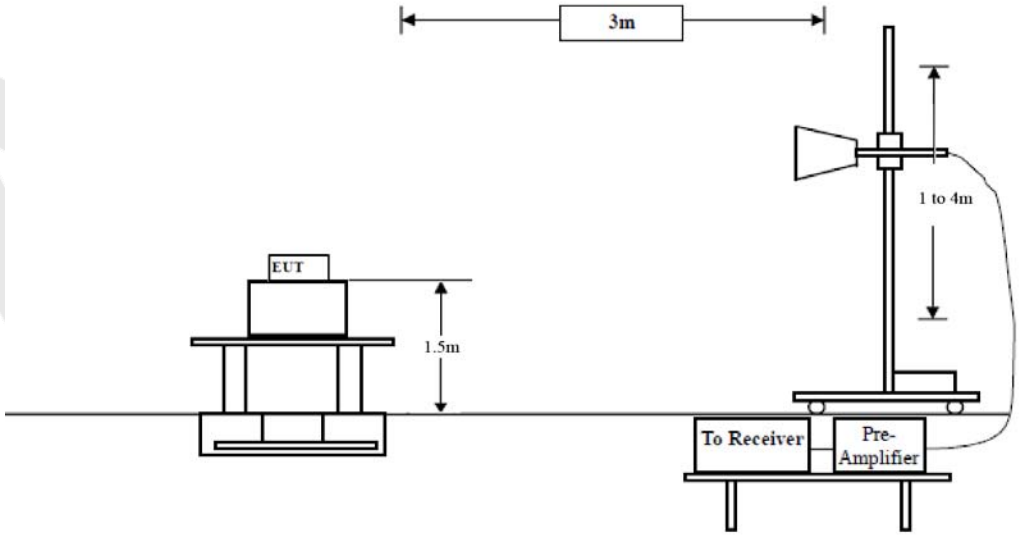


Figure 3. Above 1 GHz

3.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

3.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz and above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

Job No.:	0117010057W	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	DC 3V
Test Mode:	TX Mode	Polarization:	Horizontal

Fundamental Emission

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Mode
908.40	H	92.23	4.52	22.53	31.33	87.95	114.00	-26.05	QP
908.40	V	85.41	4.52	22.53	31.33	81.13	114.00	-32.87	QP

Remark: Level = Reading + Cable Loss+ Ant Factor-Amplifier

Radiated Emission

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
33.80	H	39.72	0.58	15.62	31.12	24.80	40.00	-15.20	PK
42.15	H	32.05	0.63	19.74	31.58	20.84	40.00	-19.16	PK
55.80	H	31.93	0.65	15.7	31.35	16.93	40.00	-23.07	PK
96.10	H	38.01	0.67	8.94	30.58	17.04	43.50	-26.46	PK
192.42	H	38.37	1.35	8.38	30.64	17.46	43.50	-26.04	PK
253.84	H	37.82	1.43	10.74	30.89	19.10	46.00	-26.90	PK
33.56	V	40.53	0.58	15.48	31.12	25.47	40.00	-14.53	PK
40.41	V	32.78	0.62	20.38	31.53	22.25	40.00	-17.75	PK
59.02	V	32.54	0.65	15.39	31.35	17.23	40.00	-22.77	PK
108.27	V	27.74	0.74	14.2	30.59	12.09	43.50	-31.41	PK
286.98	V	29.63	1.56	14.33	30.93	14.59	46.00	-31.41	PK
420.58	V	30.91	2.43	17.26	30.97	19.63	46.00	-26.37	PK

Remark: Level = Reading + Cable Loss+ Ant Factor-Amplifier

Harmonics Emissions

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
1816.80	H	46.32	7.39	28.73	26.32	56.12	74.00	-17.88	PK
1816.80	H	31.16	7.39	28.73	26.32	40.96	54.00	-13.04	AV
2725.20	H	42.98	8.08	29.71	27.01	53.76	74.00	-20.24	PK
2725.20	H	29.94	8.08	29.71	27.01	40.72	54.00	-13.28	AV
3633.60	H	--	--	--	--	--	--	--	PK
3633.60	H	--	--	--	--	--	--	--	AV
1816.80	V	48.11	7.39	28.73	26.32	57.91	74.00	-16.09	PK
1816.80	V	33.03	7.39	28.73	26.32	42.83	54.00	-11.17	AV
2725.20	V	45.35	8.08	29.71	27.01	56.13	74.00	-17.87	PK
2725.20	V	31.14	8.08	29.71	27.01	41.92	54.00	-12.08	AV
3633.60	V	--	--	--	--	--	--	--	PK
3633.60	V	--	--	--	--	--	--	--	AV

Remark ：

1. Level = Reading + Cable Loss+Ant Factor-Amplifier
2. “ -- ” Mark indicated Background Noise Level

Radiated Band Edge:

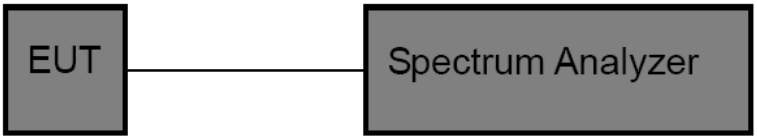
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Det.
902.00	37.12	22.45	4.48	31.33	32.72	46.00	-13.28	H	QP
928.00	37.04	22.59	4.54	31.35	32.82	46.00	-13.18	H	QP
902.00	38.62	22.45	4.48	31.33	34.22	46.00	-11.78	V	QP
928.00	38.62	22.59	4.54	31.35	34.40	46.00	-11.60	V	QP

5. 20dB Bandwidth Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.249

5.2. Test Setup



5.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:

RBW = 10kHz, VBW≥3*RBW =30kHz,

Detector= CISPR quasi-peak

Trace mode= Max hold.

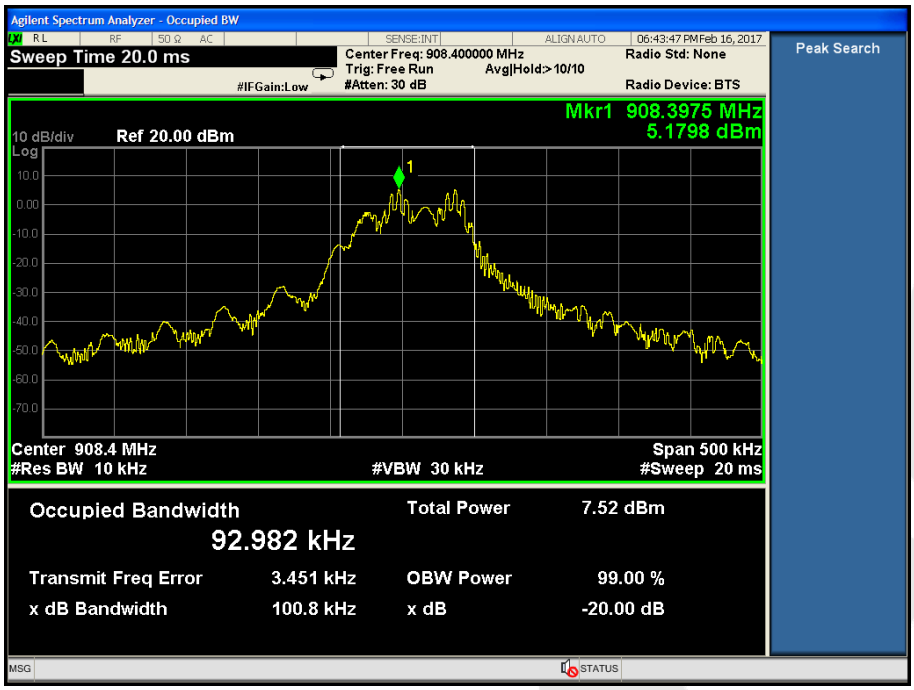
Sweep- auto couple.

4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

5.4. Test Data

Test Item	:	20dB Bandwidth	Test Mode	:	TX
Test Voltage	:	DC 4.5V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Frequency (MHz)	Bandwidth (kHz)	Result
908.4	100.8	PASS


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:43:47 PM Feb 16, 2017
Sweep Time 20.0 ms
#IFGain:Low
Center Freq: 908.400000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Peak Search
Mkr1 908.3975 MHz
5.1798 dBm
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 908.4 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 500 kHz
#Sweep 20 ms
Occupied Bandwidth
92.982 kHz
Total Power 7.52 dBm
Transmit Freq Error 3.451 kHz
OBW Power 99.00 %
x dB Bandwidth 100.8 kHz
x dB -20.00 dB
MSG
STATUS

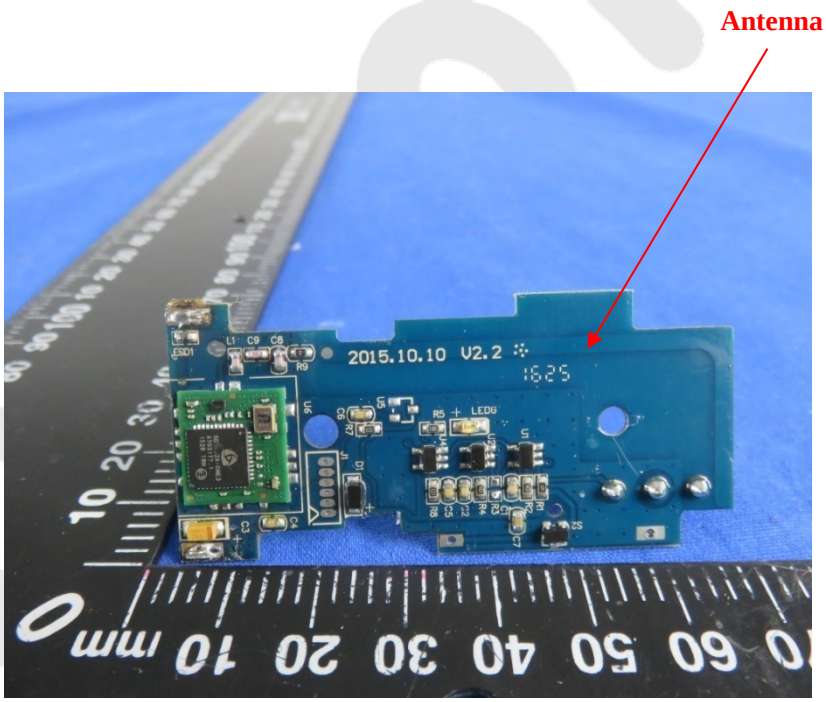
8. Antenna Requirement

8.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
Requirement	1) 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.

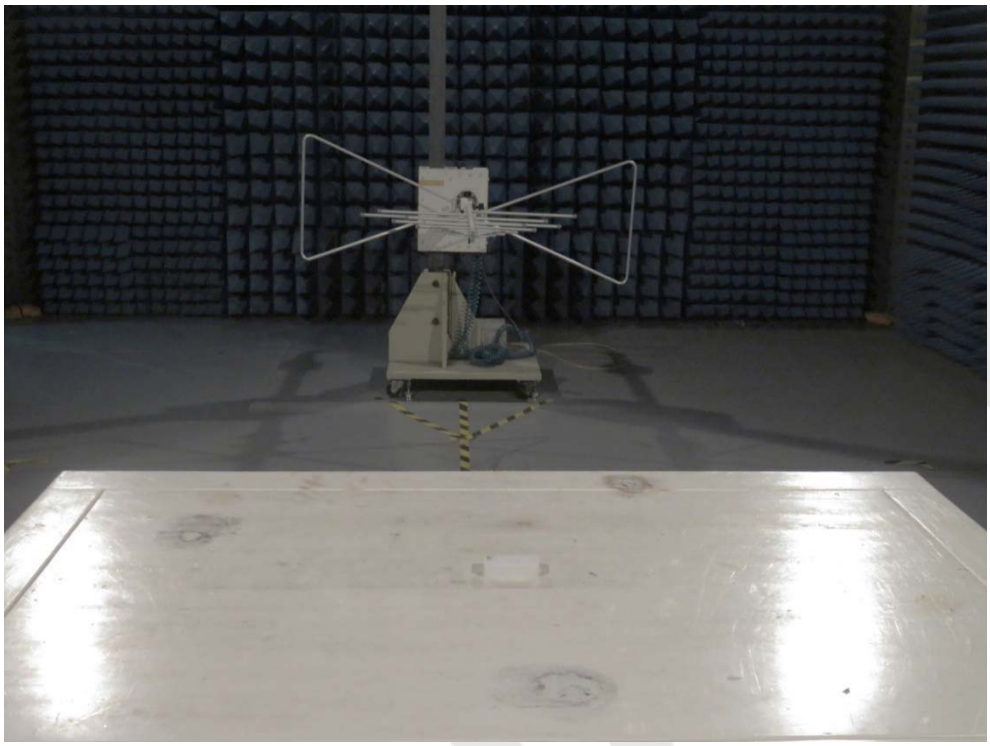
8.2. Antenna Connected Construction

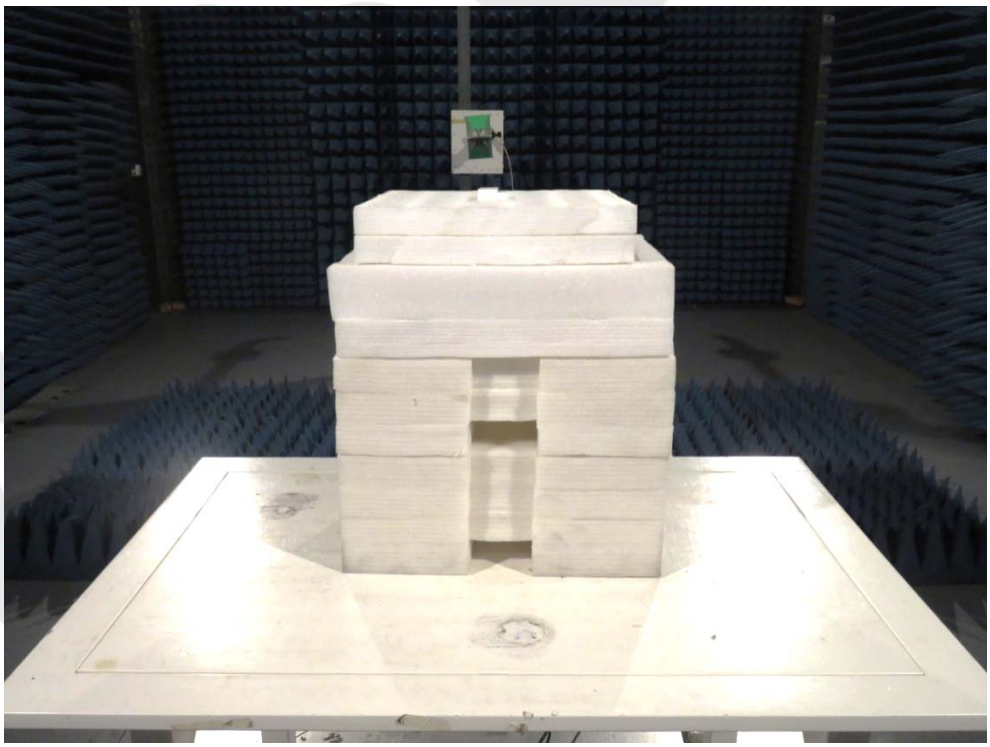
The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is -5.52dBi. It complies with the standard requirement.



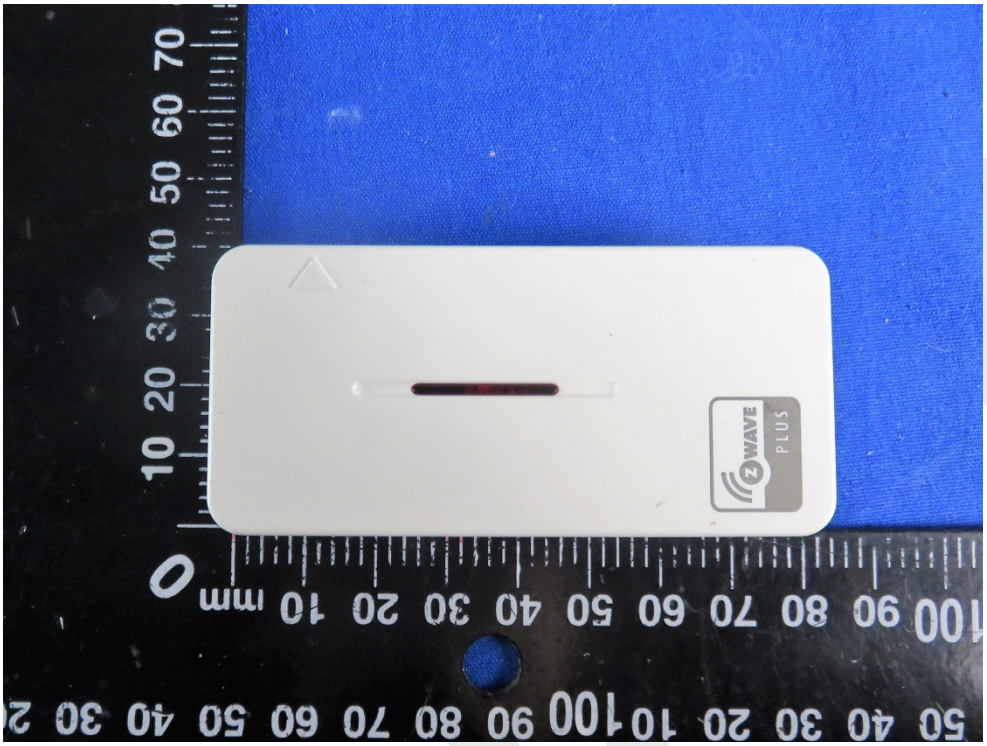
APPENDIX I -- TEST SETUP PHOTOGRAPH

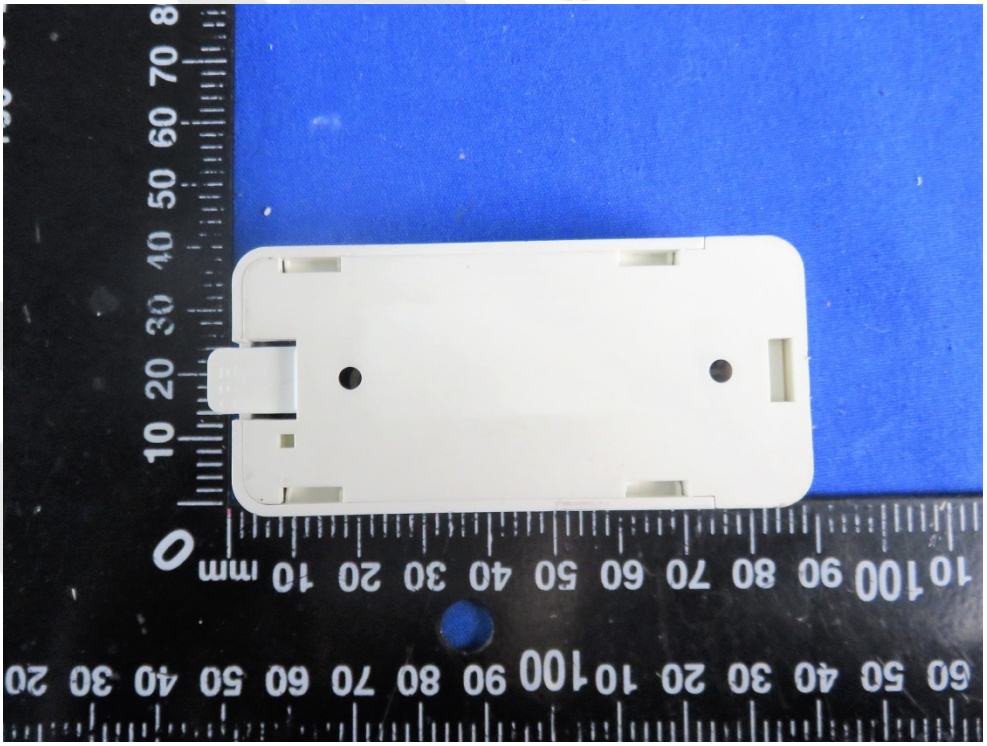
Photo of Radiation Emission Test

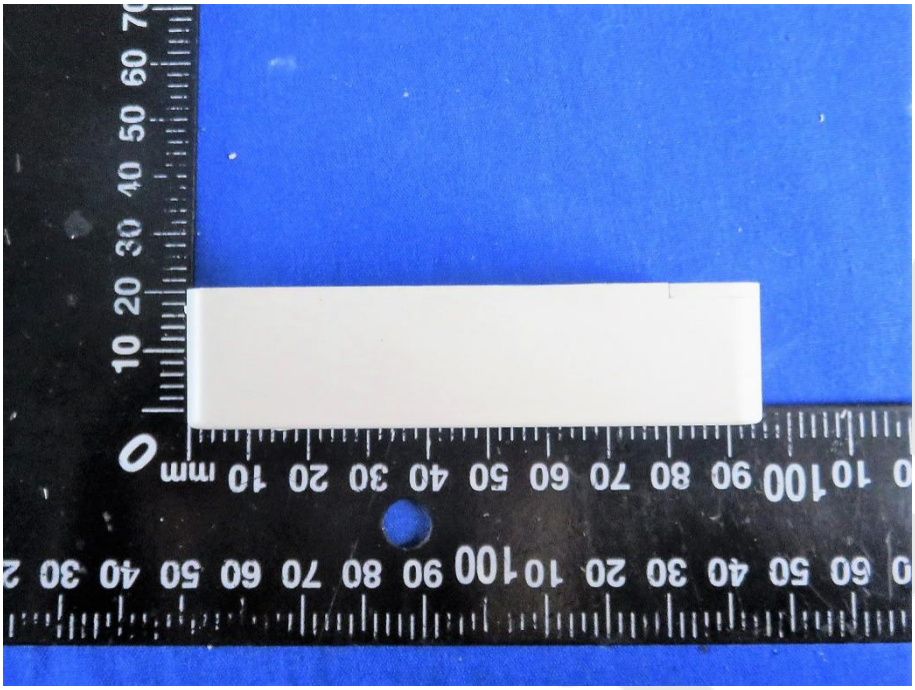


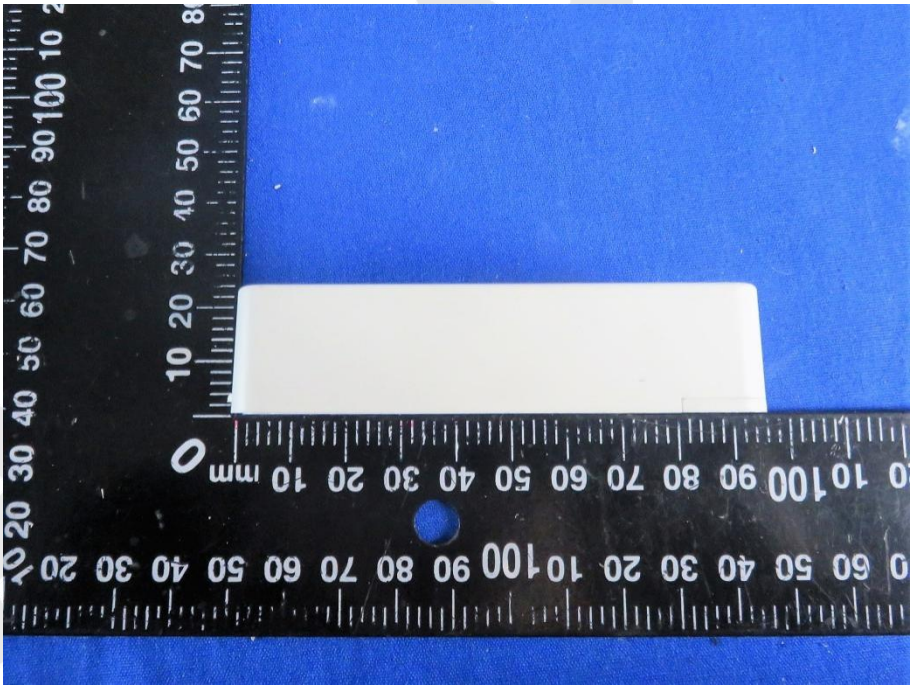


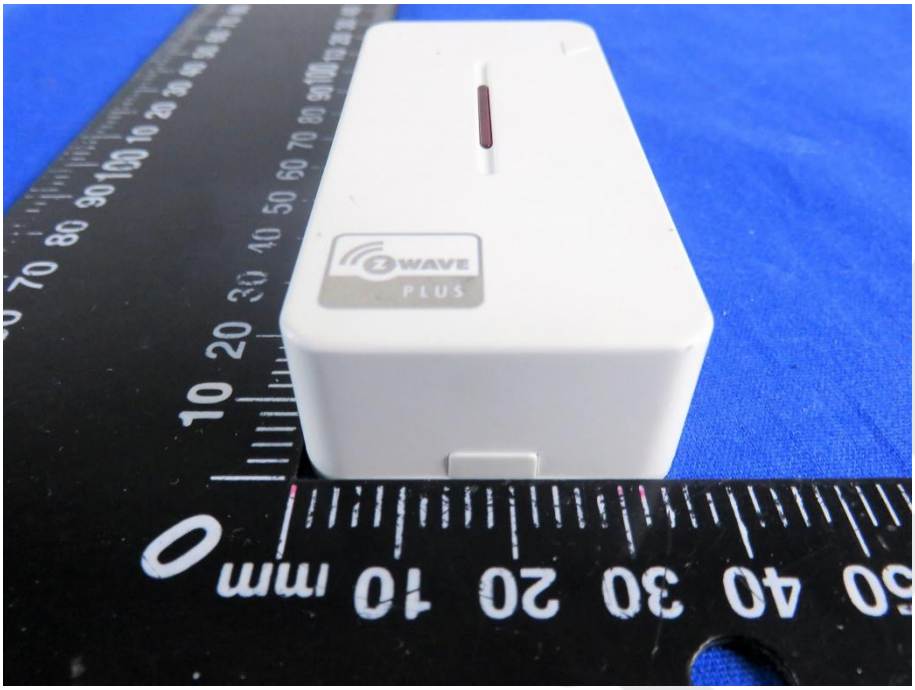
APPENDIX II -- EXTERNAL PHOTOGRAPH

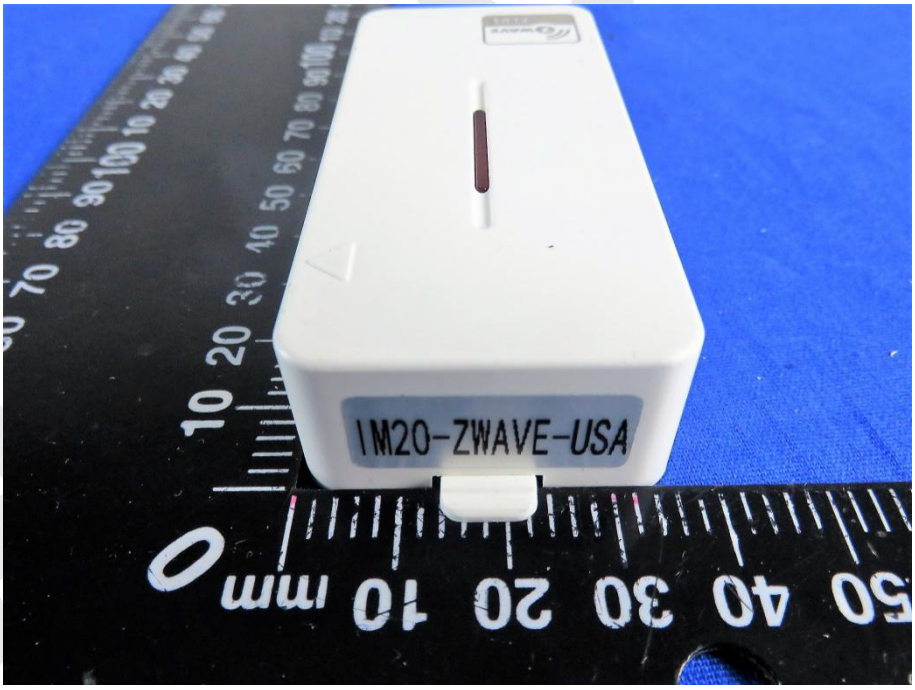




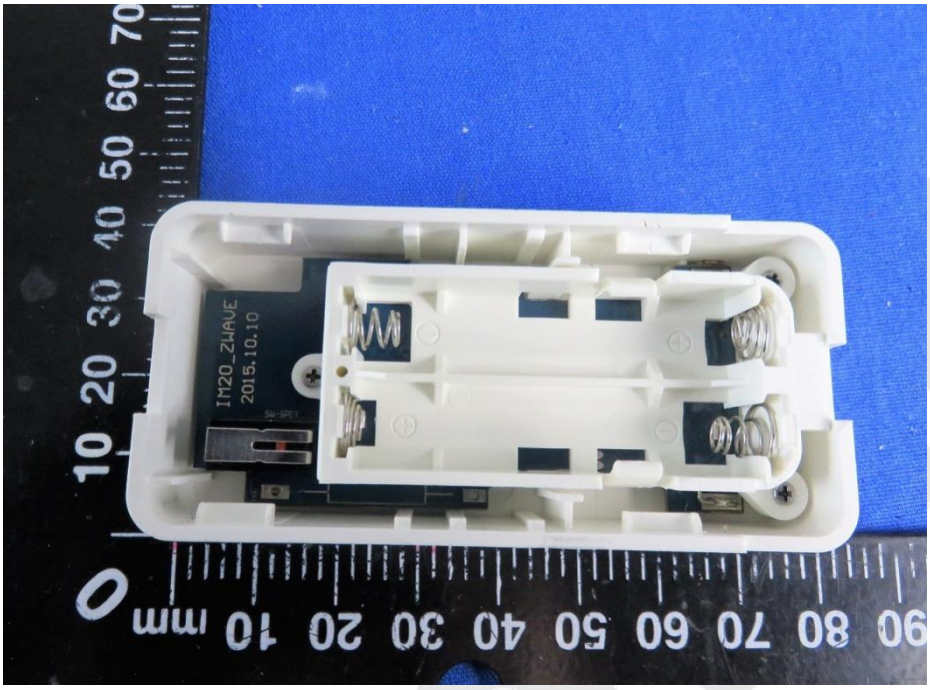


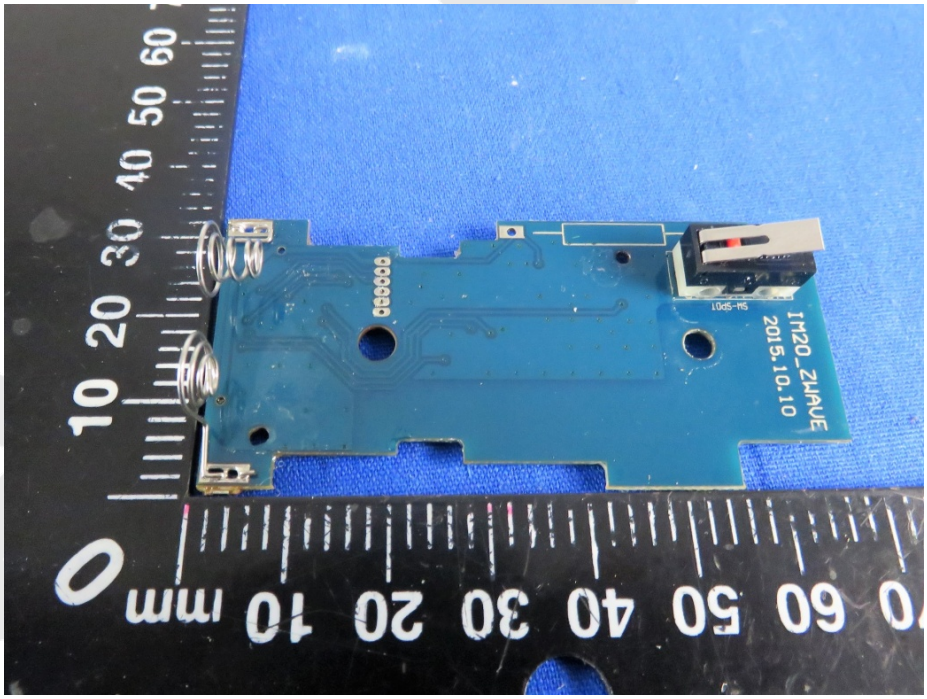


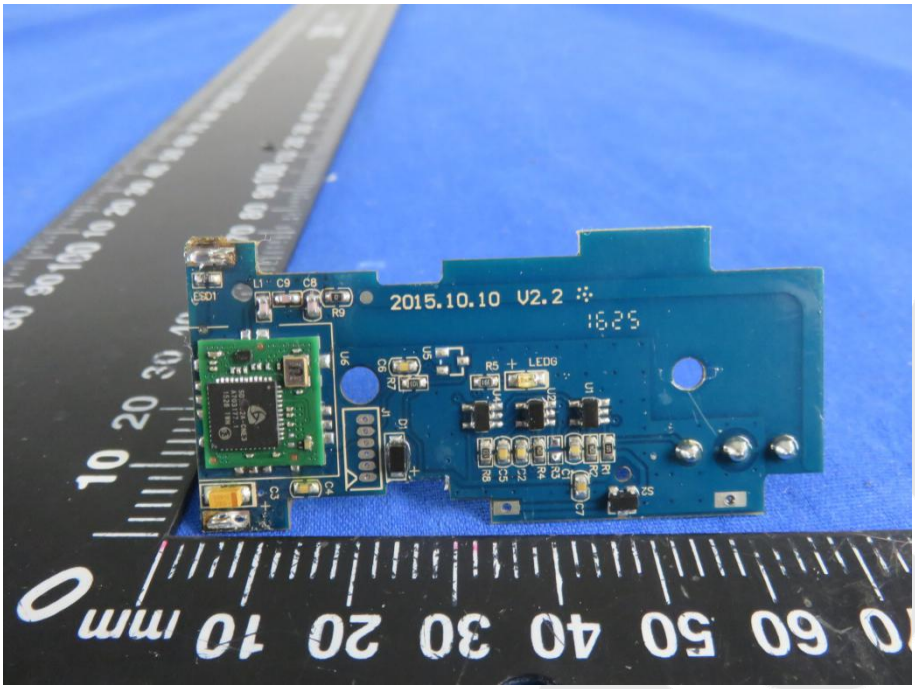

Z-WAVE
PLUS


IM20-ZWAVE-USA

APPENDIX III -- INTERNAL PHOTOGRAPH



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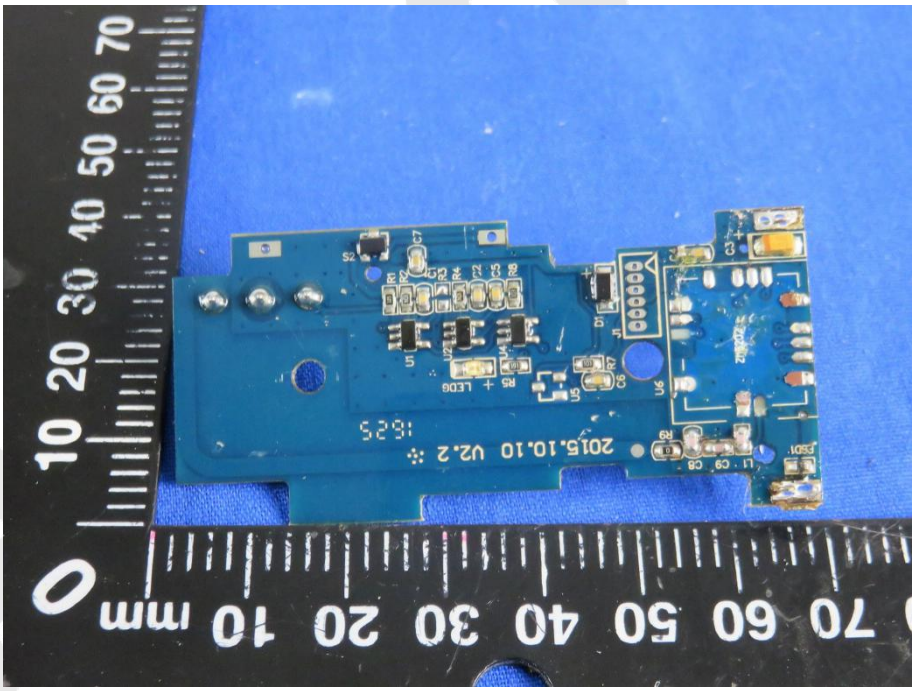
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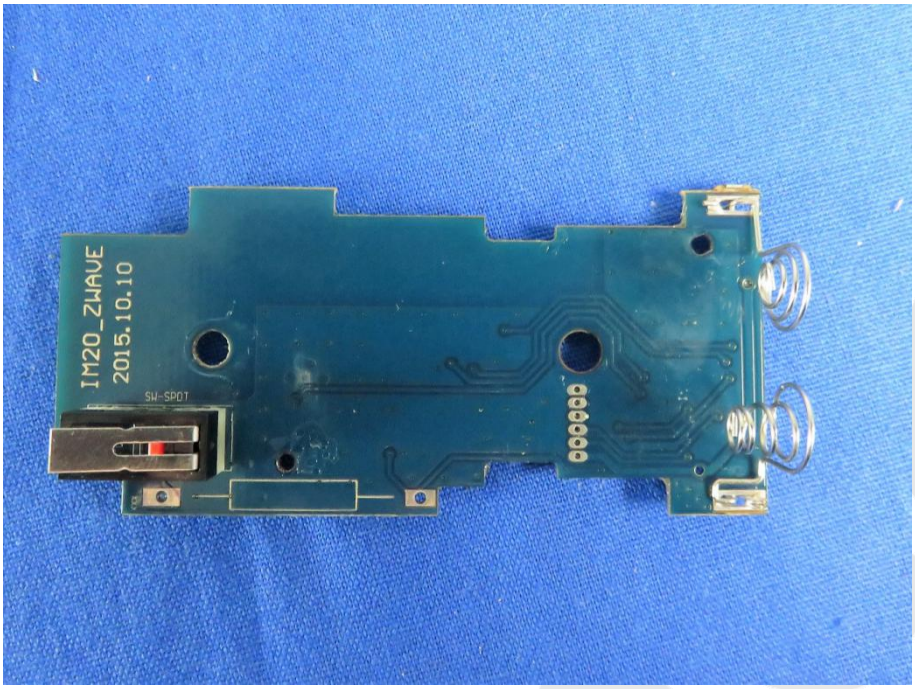
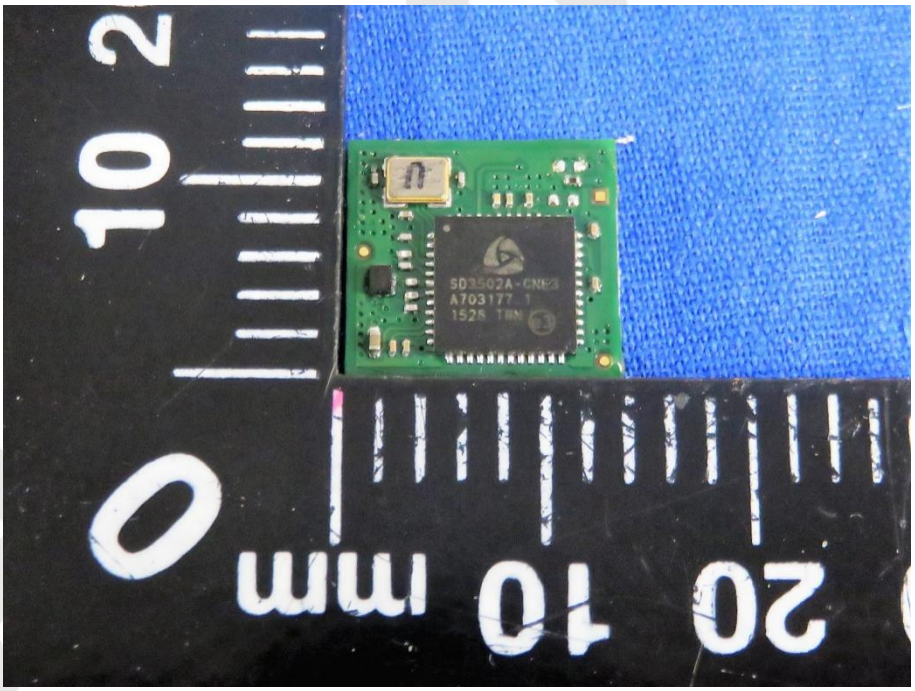

IM20_ZWAVE
2015.10.10
SW-SPDT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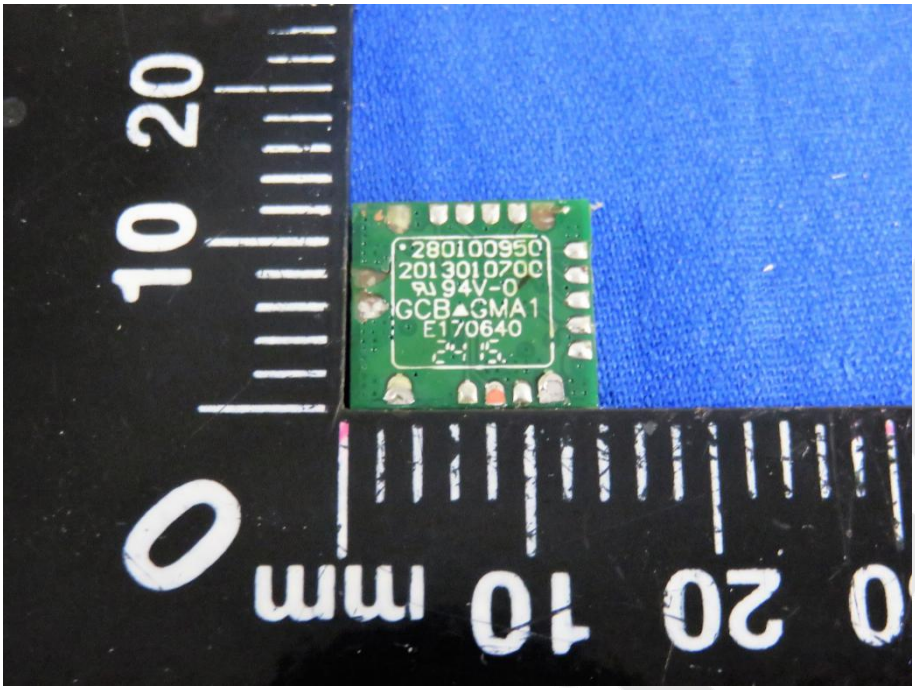
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