FCC TEST REPORT

Product	:	WIRELESS DOOR CHIME PUSH BUTTON
Trade mark	:	N/A
Model/Type reference	:	2322TX, 2323TX
Serial Number	:	N/A
Report Number	:	EED32I001930
FCC ID	:	2AEOF-WLDB2323TX
Date of Issue	:	Aug. 15, 2016
Test Standards	:	47 CFR Part 15 Subpart C (2015)
Test result	:	PASS

Prepared for:

DONGGUAN SMART HERO ELECTRONIC PRODUCTS CO LTD
118 LI XIANG ROAD WEST, SHUI PING VILLAGE, DALANG, DONGGUAN, GUANGDONG, CHINA.

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China
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Tested By: Tom chen (Test Project)

Compiled by: Kevin yang (Project Engineer)

Reviewed by: Kevin Ian (Reviewer)

Approved by: Sheek Luo (Lab supervisor)

Date: Aug. 15, 2016

Check No.: 2447637977

2 Version

Version No.	Date	Description
00	Aug. 15, 2016	Original

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A*
Field Strength of the Fundamental Signal	47 CFR Part 15 Subpart C Section 15.231 (b)	ANSI C63.10-2013	PASS
Spurious Emissions	47 CFR Part 15 Subpart C Section 15.231 (b)/15.209	ANSI C63.10-2013	PASS
20dB Bandwidth	47 CFR Part 15 Subpart C Section 15.231 (c)	ANSI C63.10-2013	PASS
Deactivated Time	47 CFR Part 15 Subpart C Section 15.231 (a)	ANSI C63.10-2013	PASS

Remark:

* The device is battery operated and not connected to AC mains, so the conducted emission is not applicable.

The tested samples and the sample information are provided by the client.

N/A: Not applicable for test device.

Model No.: 2322TX, 2323TX

Only the model 2323TX was tested, since the PCBA were identical for the above models, with difference being Plastic shell.

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5 General Information

5.1 Client Information

Applicant:	DONGGUAN SMART HERO ELECTRONIC PRODUCTS CO LTD
Address of Applicant:	118 LI XIANG ROAD WEST, SHUI PING VILLAGE, DALANG, DONGGUAN, GUANGDONG, CHINA.
Manufacturer:	UNIVERSAL CONSUMER PRODUCTS
Address of Manufacturer:	2801 EAST BELTLINE NE, GRAND RAPIDS, MI 49525, USA
Factory:	DONGGUAN SMART HERO ELECTRONIC PRODUCTS CO LTD
Address of Factory:	118 LI XIANG ROAD WEST, SHUI PING VILLAGE, DALANG, DONGGUAN, GUANGDONG, CHINA.

5.2 General Description of EUT

Product Name:	WIRELESS DOOR CHIME PUSH BUTTON
Mode No.:	2322TX, 2323TX
Test Mode No.:	2323TX
Trade Mark:	N/A
EUT Primary Function:	The DOORBELL transmit a 315MHz ASK modulated signal to control the corresponding receiver
Power Supply:	3.0V DC (3.0V “CR2032” button battery)

5.3 Product Specification subjective to this standard

Frequency Range:	315MHz
Modulation Type:	ASK
Sample Type:	Portable production
Antenna Type:	Integral
Test voltage:	DC 3.0V
Sample Received Date:	Jul. 05, 2016
Sample tested Date:	Jul. 05, 2016 to Aug. 12, 2016

5.4 Test Environment and Mode

Operating Environment:	
Temperature:	24°C
Humidity:	52% RH
Atmospheric Pressure:	1010mbar
Test mode:	
TX mode:	Keep the EUT transmitted the continuous modulation test signal at the specific channel(s).

5.5 Description of Support Units

The EUT has been tested independently.

5.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101
Telephone: +86 (0) 755 3368 3668 Fax:+86 (0) 755 3368 3385
No tests were sub-contracted.

5.7 Test Facility

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

CNAS-Lab Code: L1910

Centre Testing International Group Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories..

A2LA-Lab Cert. No. 3061.01

Centre Testing International Group Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 886427

Centre Testing International Group Co., Ltd. EMC Laboratory has been registered 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 886427.

IC-Registration No.: 7408A-2

The 3m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408A-2 .

IC-Registration No.: 7408B-1

The 10m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408B-1.

NEMKO-Aut. No.: ELA503

Centre Testing International Group Co., Ltd. has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

VCCI

The Radiation 3 &10 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-4096.

Main Ports Conducted Interference Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-4563.

Telecommunication Ports Conducted Disturbance Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-2146.

The Radiation 3 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-758

5.8 Deviation from Standards

None.

5.9 Abnormalities from Standard Conditions

None.

5.10 Other Information Requested by the Customer

None.

5.11 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.31dB (30MHz-1GHz)
		0.57dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-12.75GHz)
4	Conduction emission	3.6dB (9kHz to 150kHz)
		3.2dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	2.8%
7	DC power voltages	0.025%

6 Equipment List

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-05-2016	06-05-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	05-23-2016	05-22-2017
Microwave Preamplifier	Agilent	8449B	3008A02425	02-04-2016	02-03-2017
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015	07-18-2018
Loop Antenna	ETS	6502	00071730	07-30-2015	07-28-2017
Spectrum Analyzer	R&S	FSP40	100416	06-16-2016	06-15-2017
Receiver	R&S	ESCI	100435	06-16-2016	06-15-2017
Multi device Controller	maturo	NCD/070/10711112	---	01-12-2016	01-11-2017
LISN	schwarzbeck	NNBM8125	81251547	06-16-2016	06-15-2017
LISN	schwarzbeck	NNBM8125	81251548	06-16-2016	06-15-2017
Signal Generator	Agilent	E4438C	MY45095744	04-01-2016	03-31-2017
Signal Generator	Keysight	E8257D	MY53401106	04-01-2016	03-31-2017
Temperature/ Humidity Indicator	TAYLOR	1451	1905	04-27-2016	04-26-2017
Communication test set	Agilent	E5515C	GB47050534	04-01-2016	03-31-2017
Cable line	Fulai(7M)	SF106	5219/6A	01-12-2016	01-11-2017
Cable line	Fulai(6M)	SF106	5220/6A	01-12-2016	01-11-2017
Cable line	Fulai(3M)	SF106	5216/6A	01-12-2016	01-11-2017
Cable line	Fulai(3M)	SF106	5217/6A	01-12-2016	01-11-2017
Communication test set	R&S	CMW500	152394	04-01-2016	03-31-2017
High-pass filter	Sinoscite	FL3CX03WG18NM12-0398-002	---	01-12-2016	01-11-2017
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA09CL12-0395-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA08CL12-0393-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX02CA04CL12-0396-002	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX02CA03CL12-0394-001	---	01-12-2016	01-11-2017

RF Conducted test					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Spectrum Analyzer	R&S	FSP40	100416	06-16-2016	06-15-2017
Receiver	R&S	ESCI	100435	06-16-2016	06-15-2017
Signal Generator	Agilent	E4438C	MY45095744	04-01-2016	03-31-2017
Signal Generator	Keysight	E8257D	MY53401106	04-01-2016	03-31-2017
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-12-2016	01-11-2017
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA09C L12-0395-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA08C L12-0393-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX02CA04C L12-0396-002	---	01-12-2016	01-11-2017

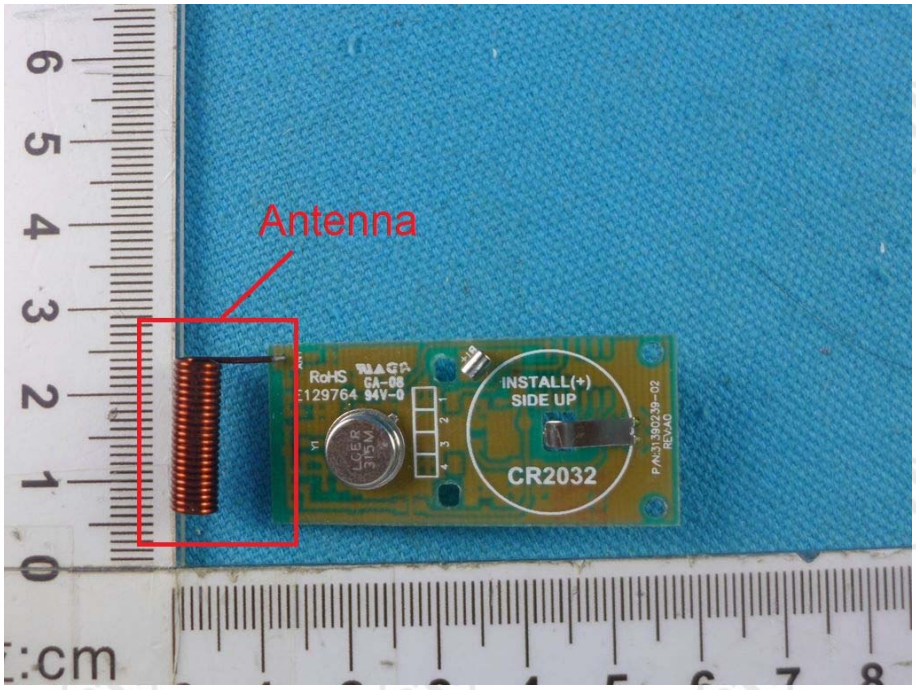
7 Test results and Measurement Data

7.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C 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.



Result: PCB antenna is used. It is permanently attached antenna and not be replaced by user.

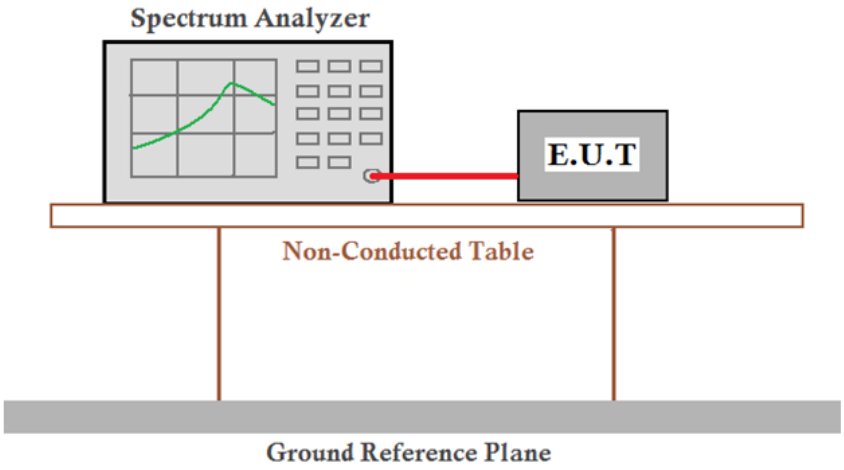
7.2 Radiated Transmitter Emissions

7.2.1 Duty Cycle

Test Requirement: 47 CFR Part 15C Section 15.35 (c)

Test Method: ANSI C63.10

Test Setup:

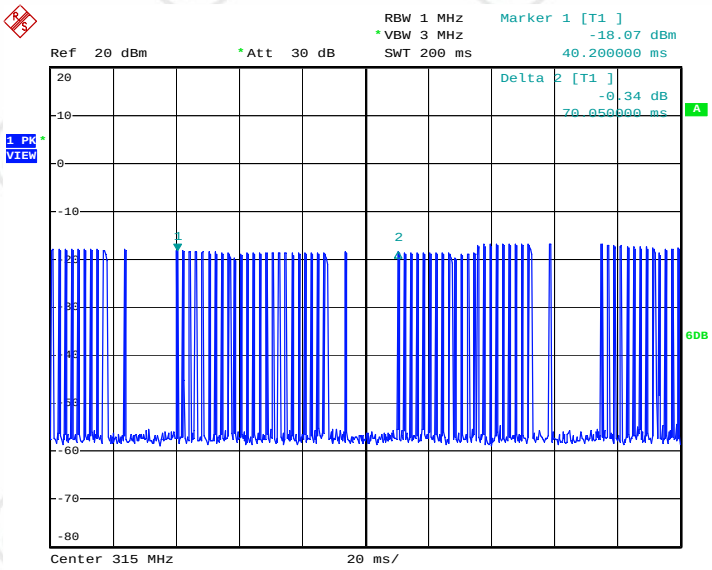


Limit: N/A

Test Mode: TX mode

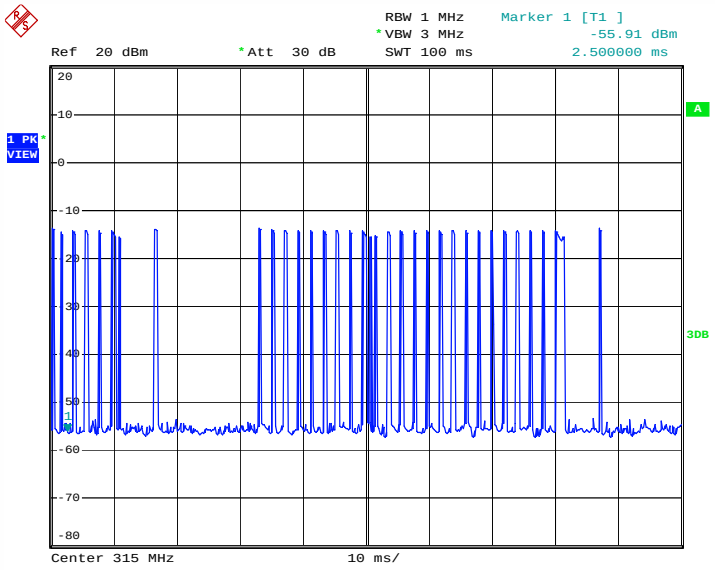
Instruments Used: Refer to section 6 for details

Test plot as follows:

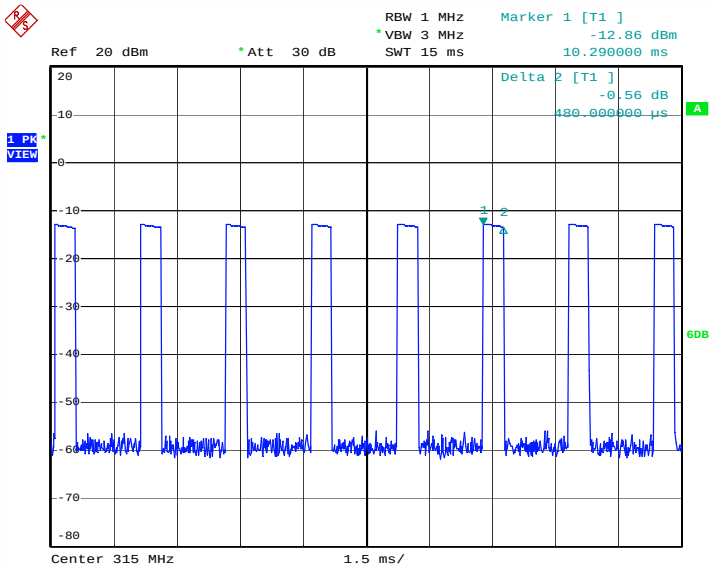


Date: 10.AUG.2016 09:00:40

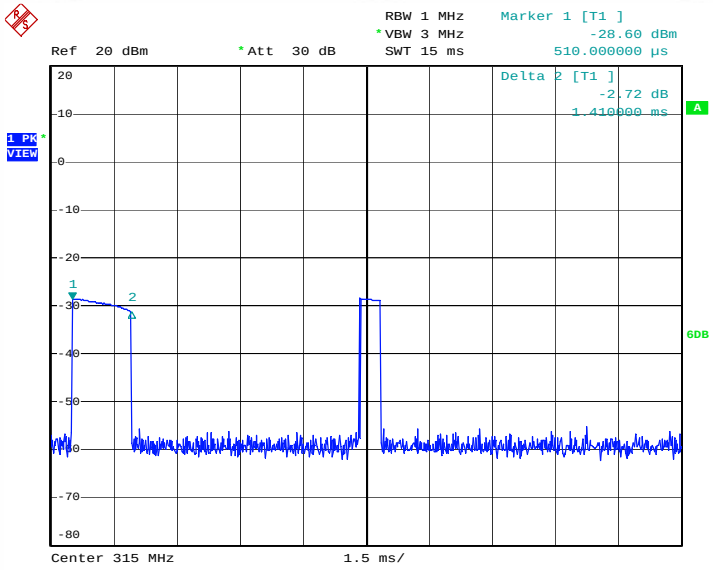
Time slot:



Date: 10.AUG.2016 14:43:08



Date: 10.AUG.2016 08:55:42



Average factor:	
Calculate Formula:	Average value=Peak value + PDCF(in 100ms time frame)
	PDCF=20 log(Duty cycle in 70.05ms time frame)
	Duty cycle(in 100ms time frame)= T on time / 70.05ms
Calculated average factor:	Ton time (the worst case) = (19*0.48+7*1.41)ms=16.26ms
	PDCF(in 70.05ms time frame) = 20 log(16.26/70.05)=-12.7dB

7.2.2 Radiated Emissions

Test Requirement: 47 CFR Part 15C Section 15.231(b) and 15.209

Test Method: ANSI C63.10

Test Site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Setup:

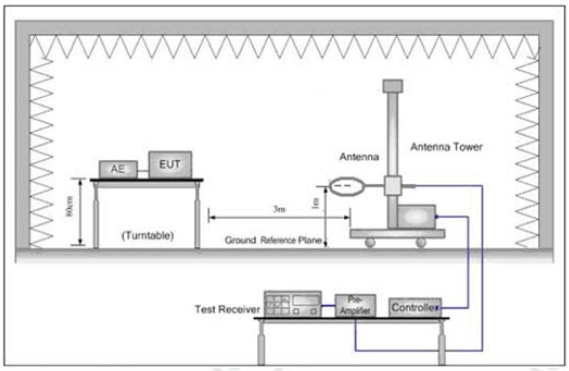


Figure 1. Below 30MHz

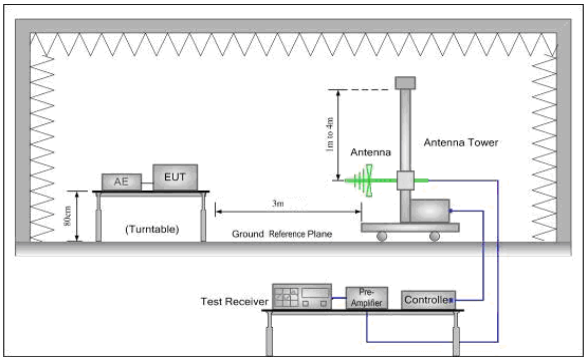


Figure 2. 30MHz to 1GHz

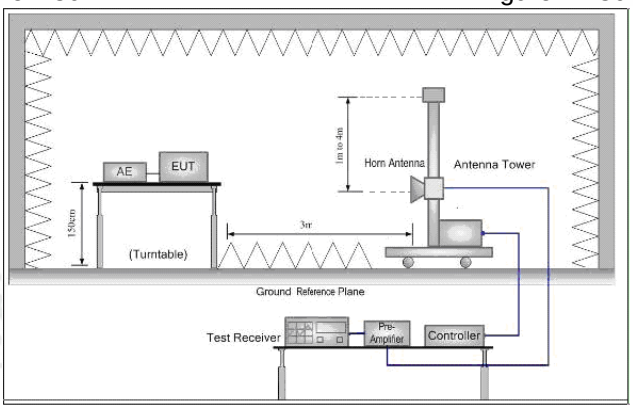


Figure 3. Above 1GHz

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) 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.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel ,middle channel, the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit: (Spurious)

Frequency	Limit (dBμV/m @3m)	Detector
30MHz - 10th harmonics	55.62	Average
	75.62	Peak

Note: 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.

Limit: (Fundamental)

Frequency	Limit (dBμV/m @3m)	Detector
315MHz	75.62	Average
	95.62	Peak

Test Mode: TX mode

Instruments Used: Refer to section 6 for details

Test Results: **PASS**

Test data

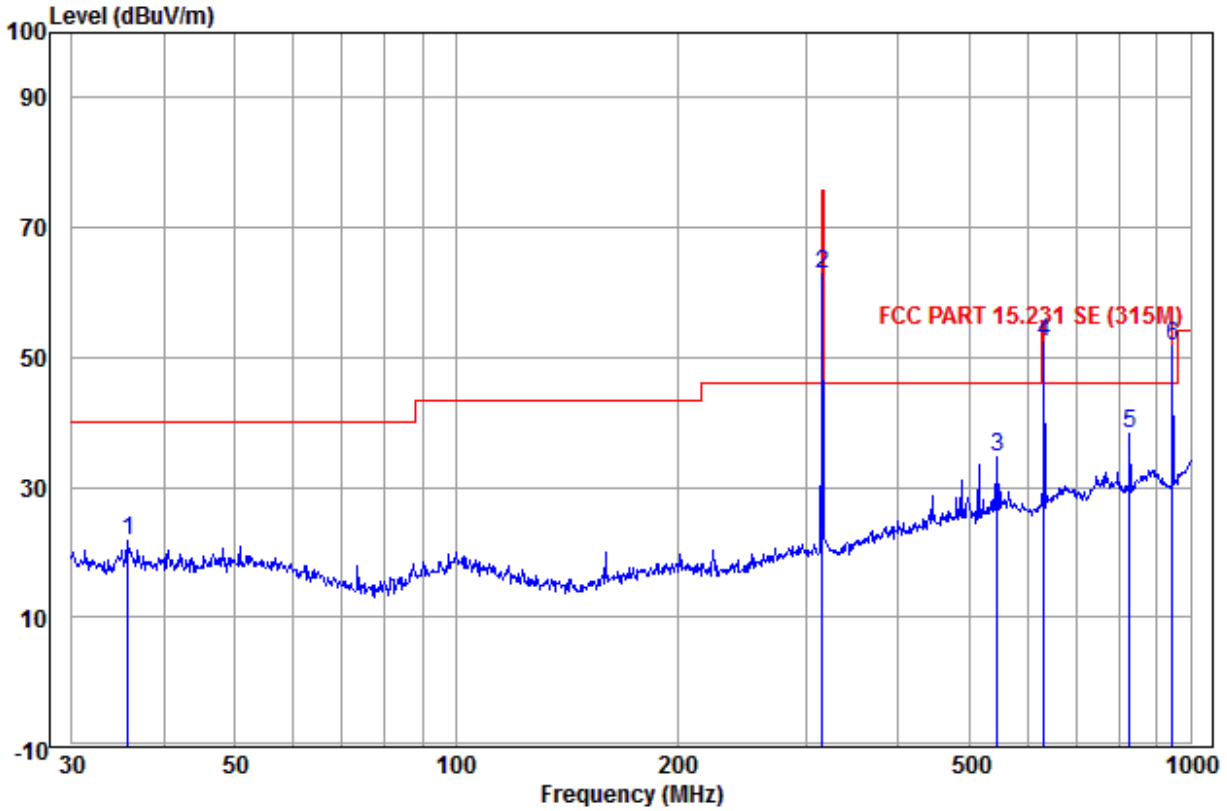
Fundamental Emission

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Read Level (dBµV)	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Over Limit (dB)	Polarization
315	13.92	2.49	46.3	62.71	75.62	-12.91	Horizontal
315	13.92	2.49	54.06	70.47	75.62	-5.15	Vertical

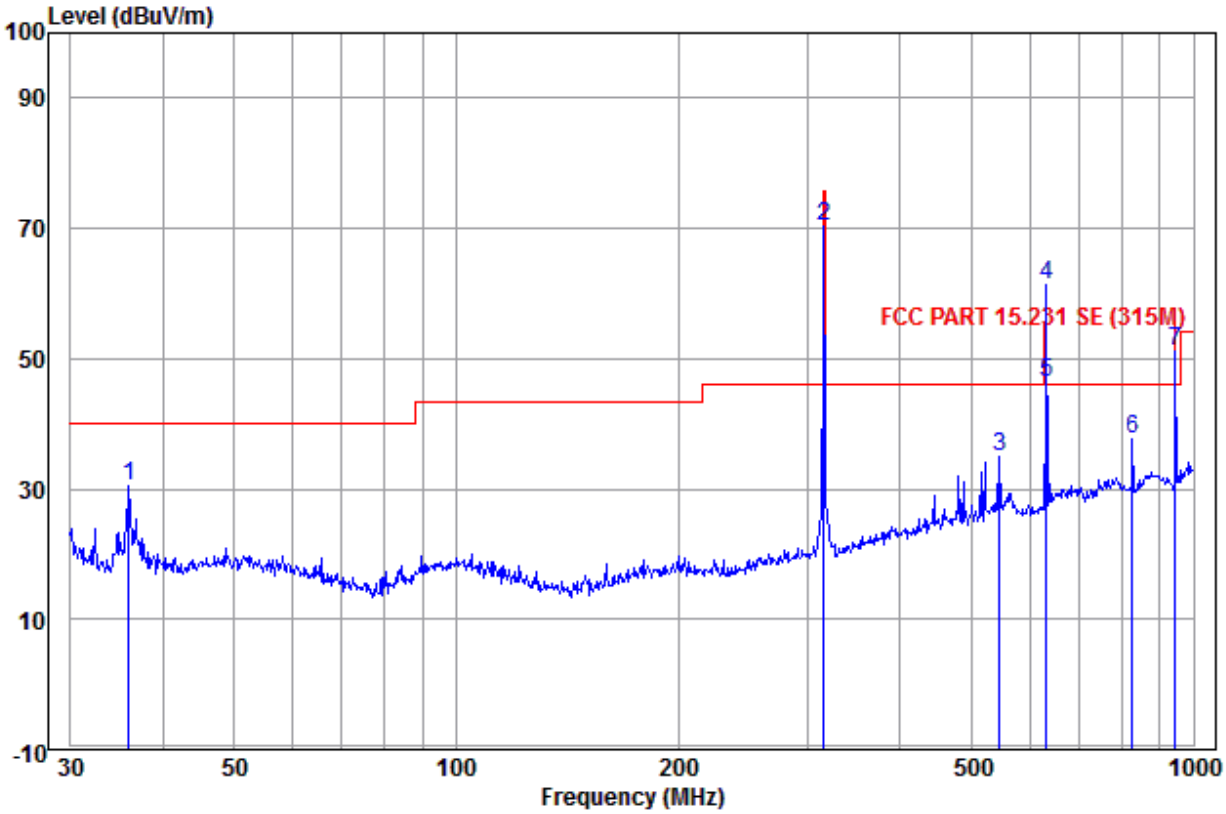
Remark: As shown in this section, for field strength of the fundamental signal measurements, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above. So, only the peak value is measured.

Spurious Emissions

30MHz-1GHz



Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Read Level (dBuV)	Peak Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
35.749	13.54	0.79	7.48	21.81	40.00 (QP)	-18.19	Horizontal
545.183	18.58	3.20	12.95	34.73	46.00 (QP)	-11.27	Horizontal
631.688	19.31	3.55	29.38	52.24	55.62 (AVG)	-3.38	Horizontal
827.493	21.77	4.03	12.53	38.33	46.00 (QP)	-7.67	Horizontal
945.440	22.40	4.32	25.16	51.88	55.62 (AVG)	-3.74	Horizontal



Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Read Level (dBuV)	Peak Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
36.001	13.58	0.77	16.03	30.38	40.00 (QP)	-9.62	Vertical
545.183	18.58	3.20	13.28	35.06	46.00 (QP)	-10.94	Vertical
827.493	21.77	4.03	11.79	37.59	46.00 (QP)	-8.41	Vertical
945.440	22.40	4.32	24.46	51.18	55.62 (AVG)	-4.44	Vertical

Average value:

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Read Level (dBuV)	Peak Value (dBµV/m)	PDCF (from P.12)	Calculated Average value (dBuV/m)	Average Limit (dBµV/m)	Over Limit (dB)	Polarization
631.688	19.31	3.55	38.43	61.29	-12.7	48.59	55.62	-7.03	Vertical

Above 1GHz

2323TX:

Peak value:

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Average Limit (dBμV/m)	Over Limit (dB)	Polarization
3153.515	33.46	5.59	34.52	50.78	55.31	55.62	-0.31	Horizontal
4408.690	33.80	5.27	34.47	48.34	52.94	55.62	-2.68	Horizontal
4096.425	33.05	5.40	34.57	47.13	51.01	54.00	-2.99	Horizontal
4408.687	33.80	5.27	34.47	50.83	55.43	55.62	-0.19	Vertical

Average value:

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Peak Value (dBμV/m)	PDCF (from P.12)	Calculated Average value (dBuV/m)	Average Limit (dBμV/m)	Over Limit (dB)	Polarization
3467.664	33.20	5.53	34.55	57.04	-12.7	44.34	55.62	-11.28	Horizontal
2837.161*	33.34	5.29	34.47	58.27	-12.7	45.57	54.00	-8.43	Horizontal
3779.099*	32.96	5.48	34.58	58.40	-12.7	45.7	54.00	-8.3	Horizontal
3153.515	33.46	5.59	34.52	55.93	-12.7	43.23	55.62	-12.39	Vertical
3467.664	33.20	5.53	34.55	58.83	-12.7	46.13	55.62	-9.49	Vertical
2837.161*	33.34	5.29	34.47	60.91	-12.7	48.21	54.00	-5.79	Vertical
3779.099*	32.96	5.48	34.58	59.68	-12.7	46.98	54.00	-7.02	Vertical
4096.425*	33.05	5.40	34.57	55.19	-12.7	42.49	54.00	-11.51	Vertical

Remark:

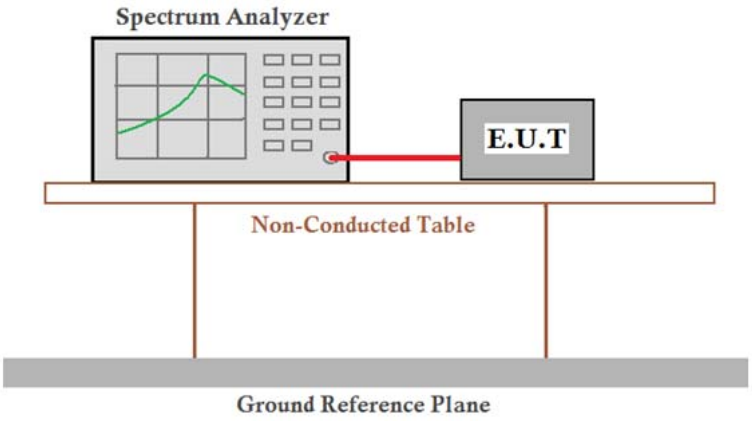
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading - Correct Factor
   Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor
2) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak values are measured.
3) "*" The emission is falling in FCC restricted band of section 15.205, the general limit of 15.209 shall be used instead of the limit of spurious emission under 15.231(b)

7.3 20dB Bandwidth

Test Requirement: 47 CFR Part 15C Section 15.231 (c)

Test Method: ANSI C63.10

Test Setup:



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 Mode: TX mode

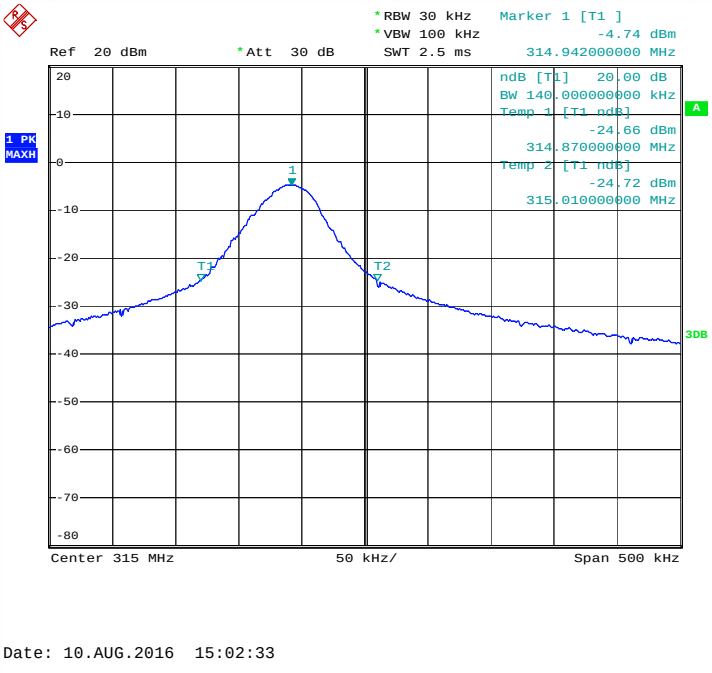
Instruments Used: Refer to section 6 for details

Test Results: Pass

Test data

20dB bandwidth (kHz)	Limit (kHz)	Results
140	787.5	Pass

Test plot as follows:



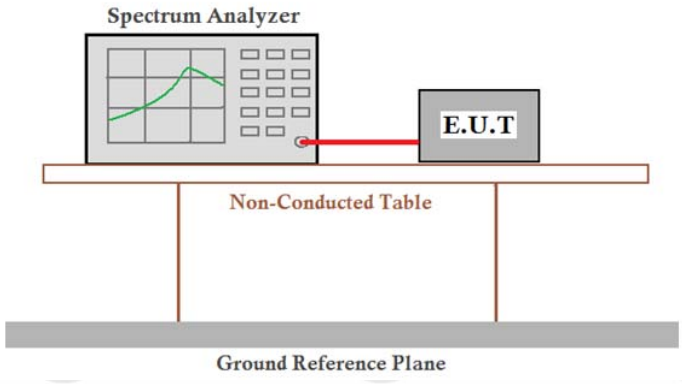
Date: 10.AUG.2016 15:02:33

7.4 Deactivated Time

Test Requirement: 47 CFR Part 15C Section 15.231 (a)

Test Method: ANSI C63.10

Test Setup:



Limit: Automatically deactivate the transmitter within 5 seconds of being released

Test Mode: Press and release the button immediately with the normal sample

Instruments Used: Refer to section 6 for details

Test Results: **PASS**

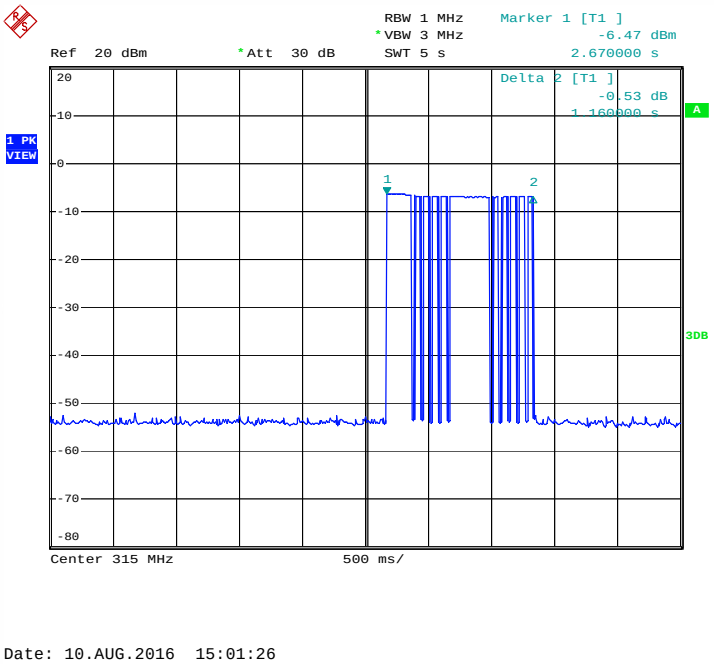
Remark:

1) Only manually switching and no automatic activation.
2) No Periodic transmission
3) No emergencies function.
4) No transmission of setup-information for security system exceed transmission during limit in (a)(1) and (a)(2).

Test data:

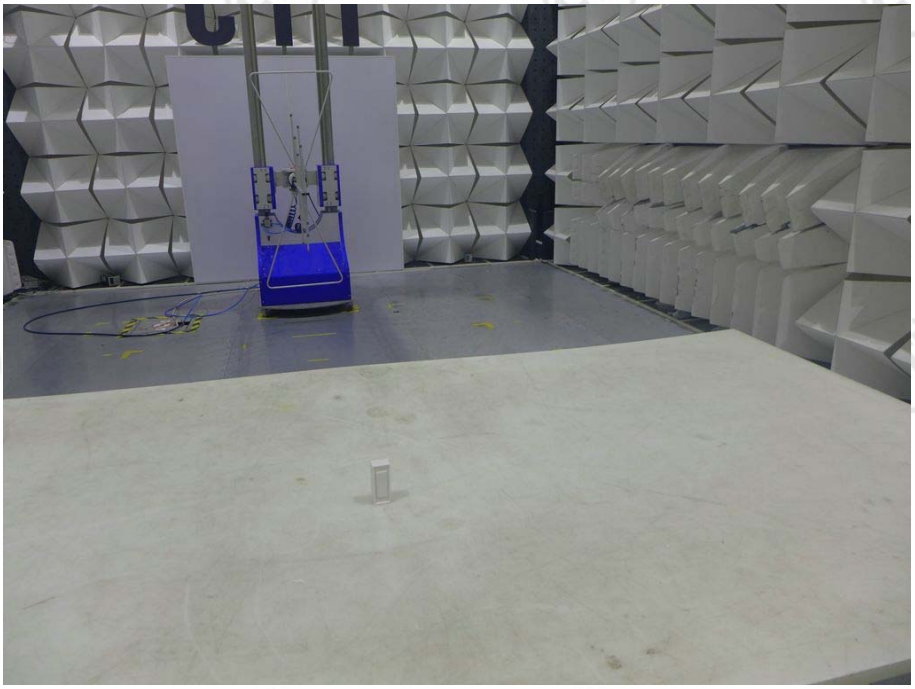
Test item	Test value	Limit (s)	Results
Normal operation mode	1.16s	⩽5s	Pass

Test plot as follows:



APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Test Model No.: 2323TX

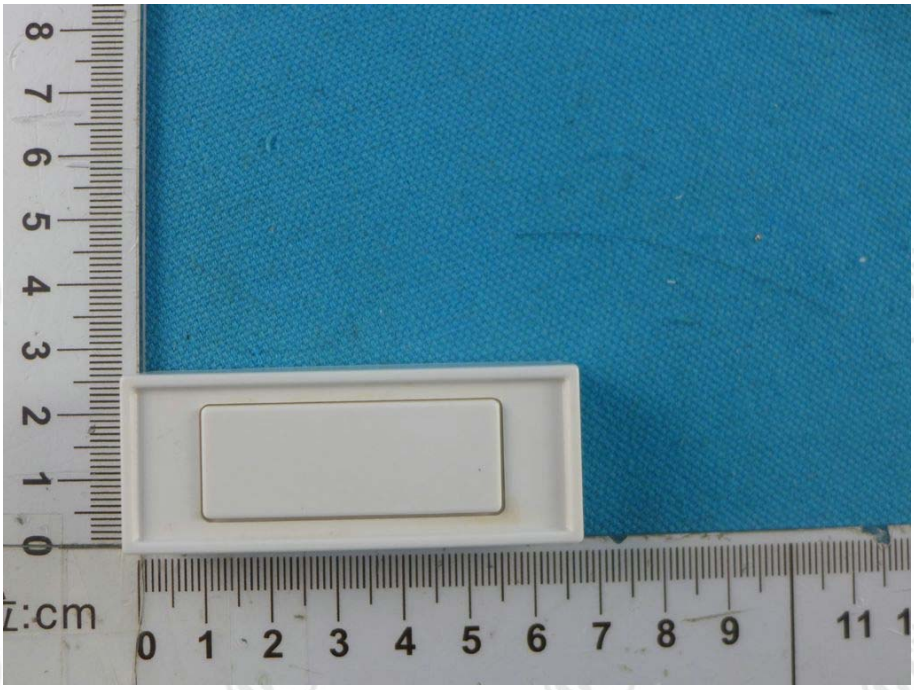


Radiated emission Test Setup-1(30MHz～1GHz)

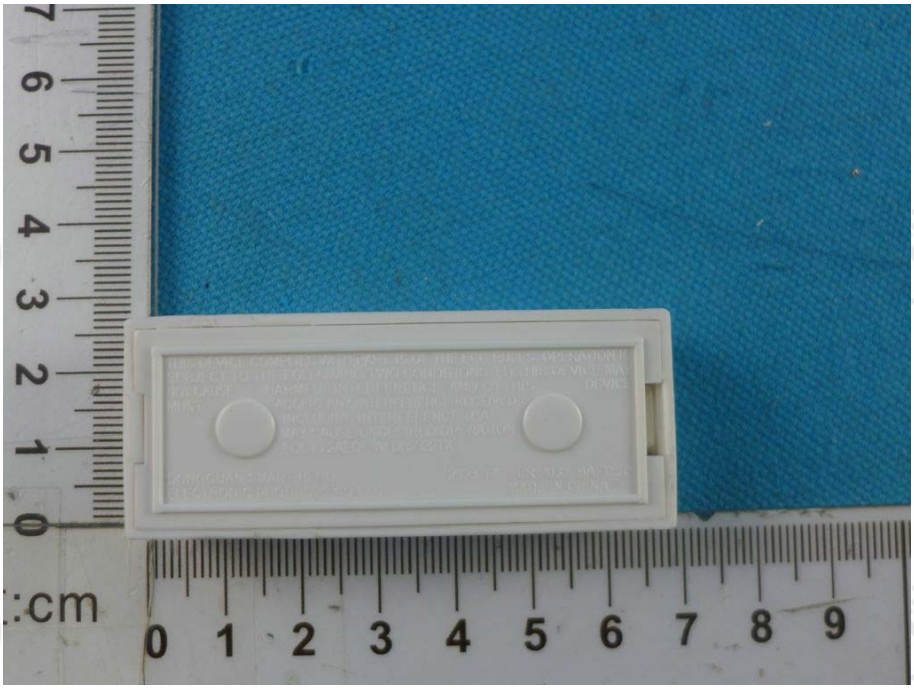
Radiated emission Test Setup-2(Above 1GHz)

APPENDIX 2 PHOTOGRAPHS OF EUT

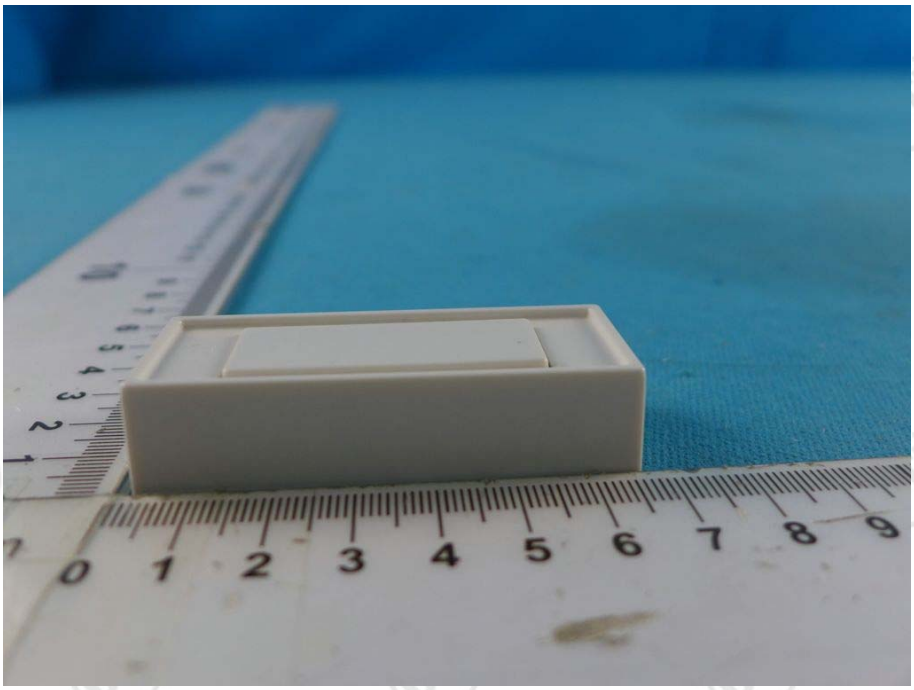
Test mode No.: 2323TX



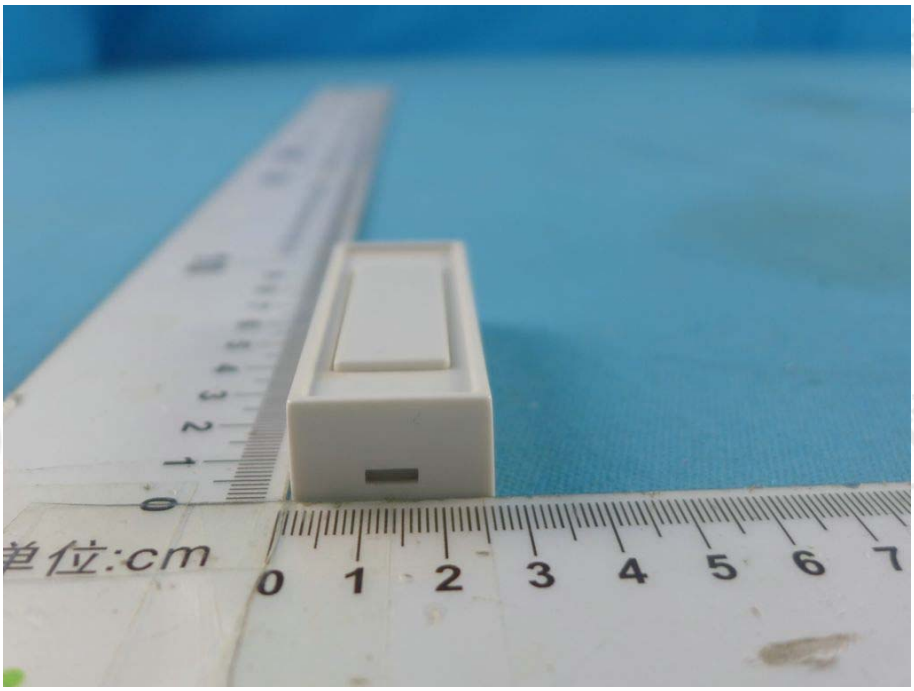
View of Product-1



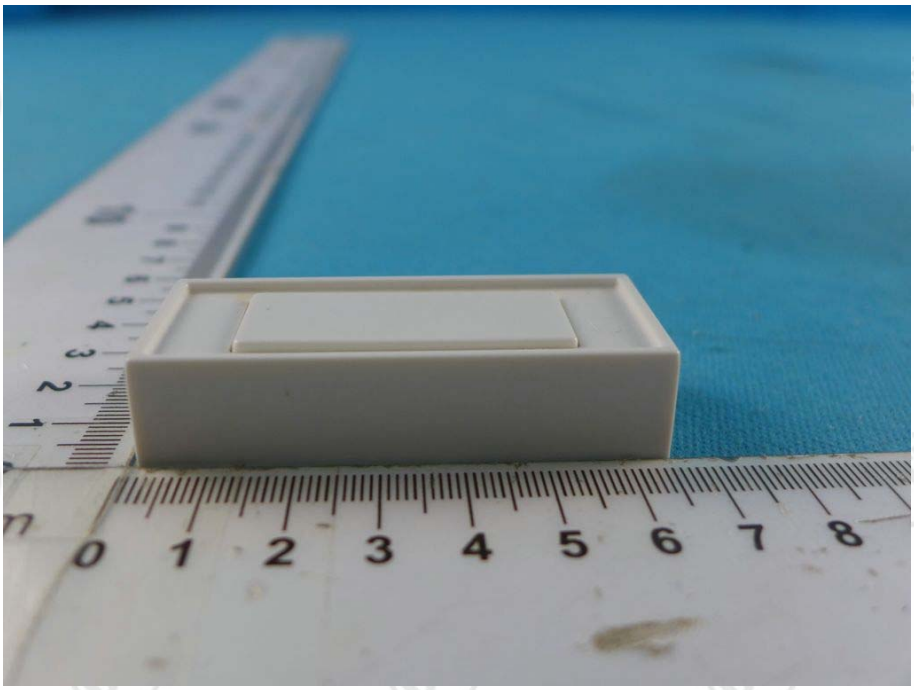
View of Product-2



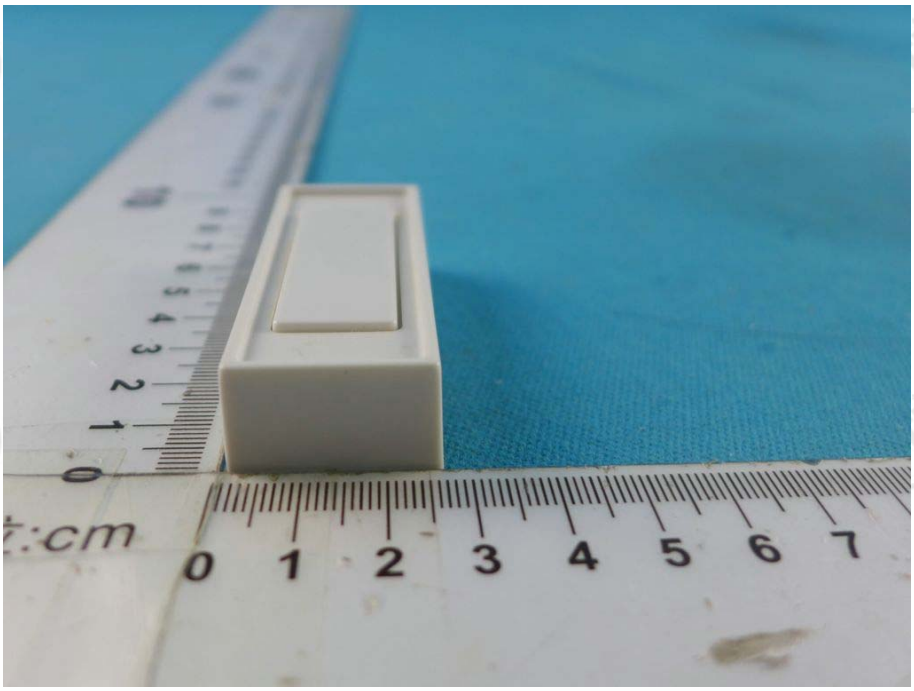
View of Product-3



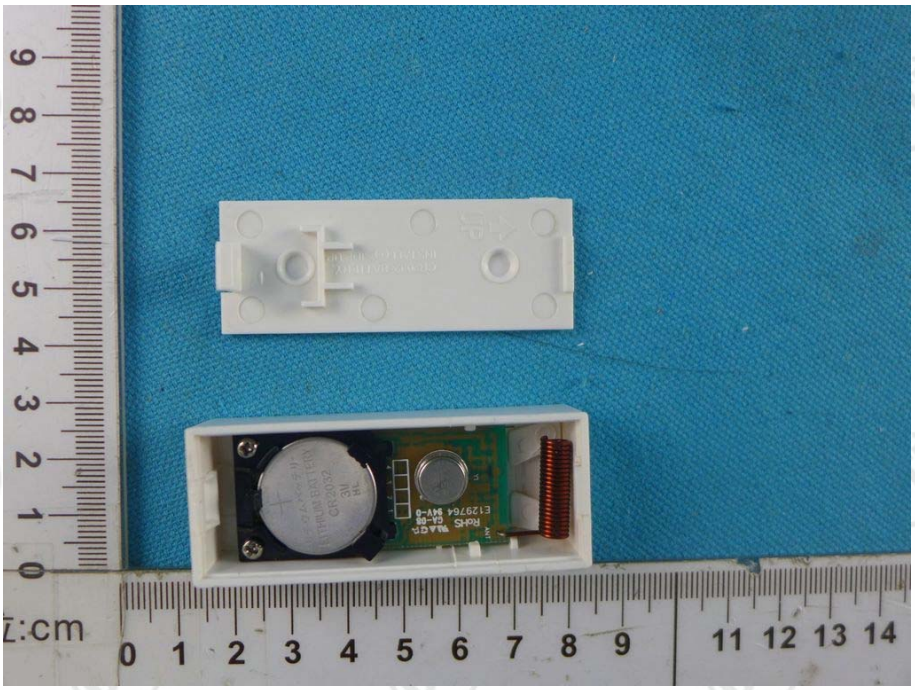
View of Product-4



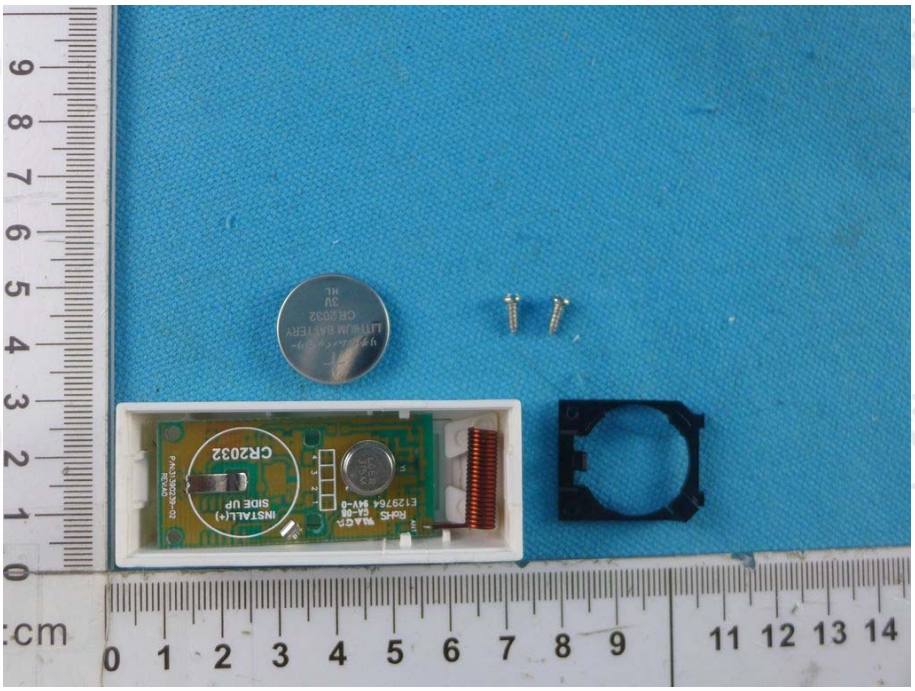
View of Product-5



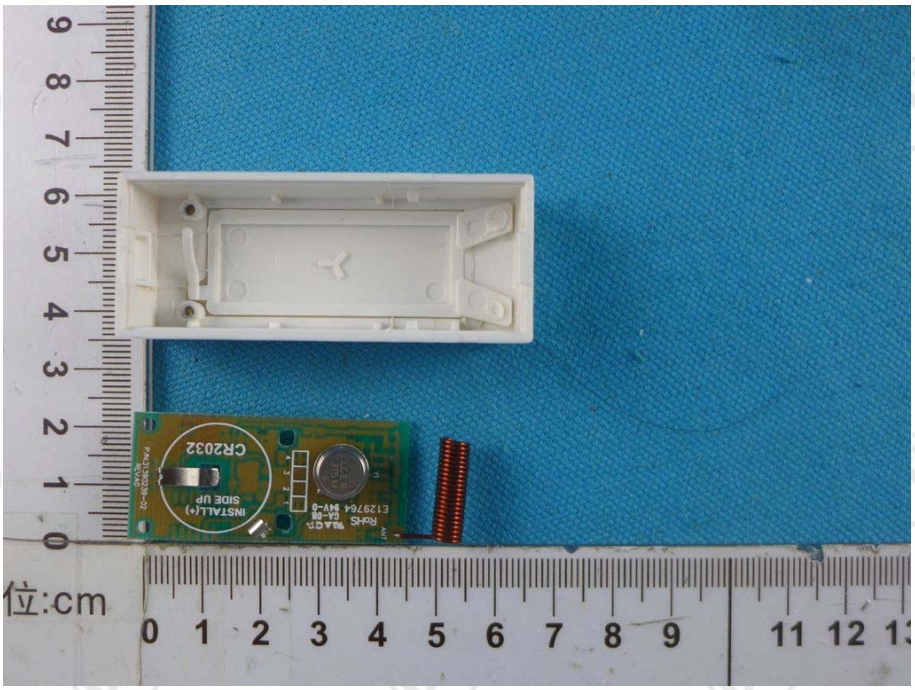
View of Product-6



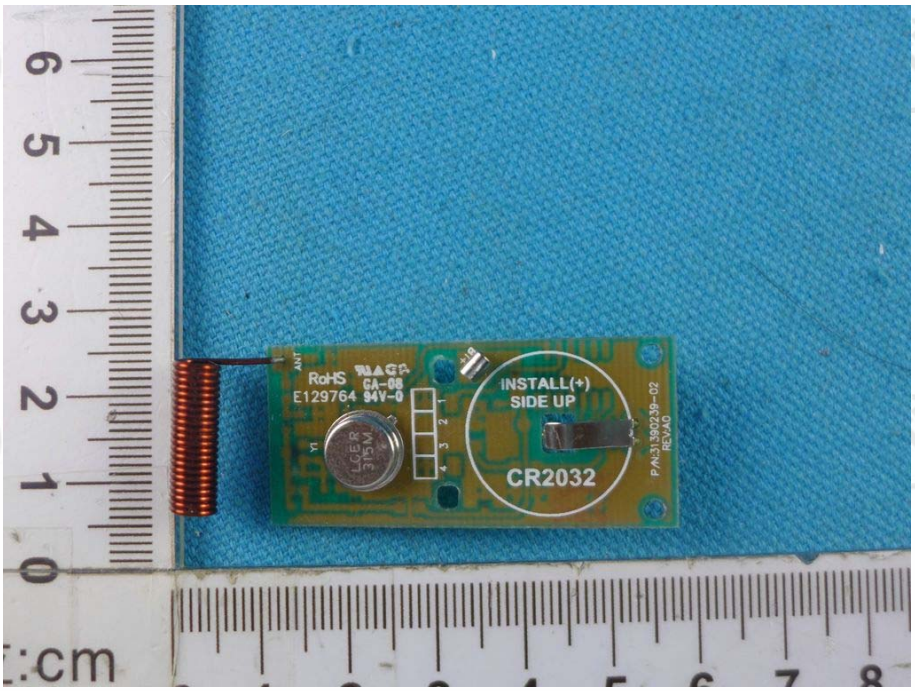
View of Product-7



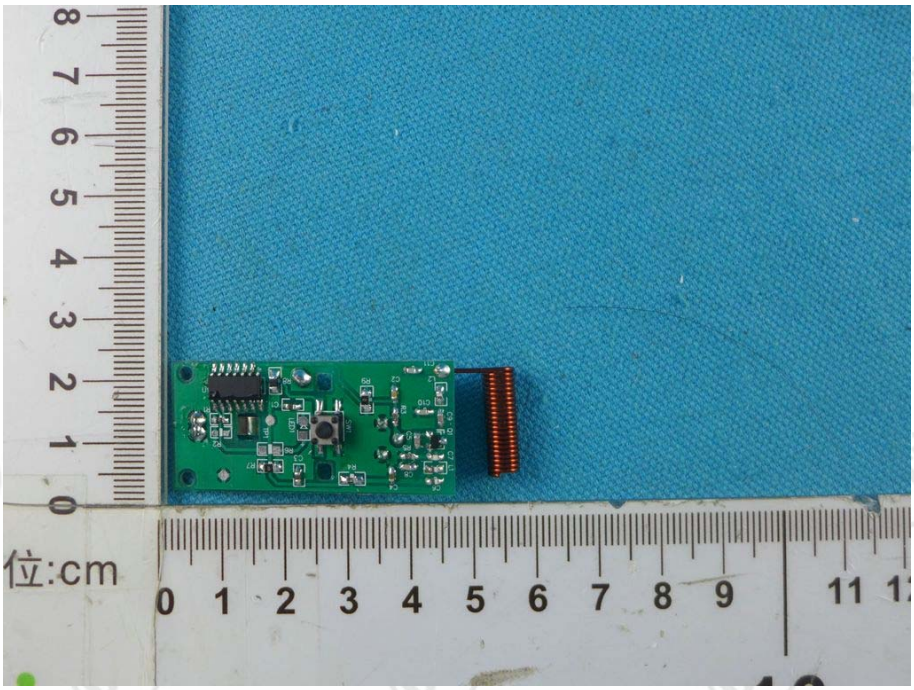
View of Product-8



View of Product-9



View of Product-10



View of Product-11

*** End of Report ***

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