China

FCC - TEST REPORT

Report Number	:	60.790.17.042.01	Date of Issue	:	September 20, 2017
Model	:	Glass Lock, Door lock			
Product Type	:	**Digital lock**			
Applicant	:	Merchandising Technologies Inc.			
Address	:	Unit B, 9/F., Great Wall Factory Building 11 Cheung Shun Street,Lai Chi Kok			
Production Facility	:	PS GmbH			
Address	:	Melisau 1255 , Autria , 6863 Egg			
Test Result	:	■**Positive** ☐**Negative**			
Total pages including Appendices	:	19			

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory

Company name:	TÜV SÜD CERT & TESTING (china) CO., LTD Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	514049
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299

3 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	Digital Lock
Model no.:	Glass Lock, Door lock
FCC ID:	2AA2X-150-00118
Rating:	3.0VDC (1 x 3.0 VDC size “123” Battery)
Frequency:	125kHz
Antenna gain:	0 dBi
Number of operated Channel:	1
Modulation:	FSK

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4 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-15 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart B — Unintentional Radiators

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5 FCC Part 15 Subpart C - RFID

Emission Tests				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
FCC Title 47 Part 15.209 Radiated Emission	10-11	☒	☐	☐
FCC Title 47 Part 15.207 Conduct Emission	NIL	☐	☐	☒
FCC Title 47 Part 15.203 Antenna Requirement	12	☒	☐	☐
FCC Title 47 Part 15.202 Bandwidth	13	☒	☐	☐

Remark:
(1) EUT is transmitter only

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6 General Remarks

Remarks

N/L

SUMMARY:

- All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

- The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: August 30, 2017

Testing Start Date: August 31, 2017

Testing End Date: September 20, 2017

Reviewed by: Prepared by:

Hosea CHAN	Eric LI
EMC Project Engineer	EMC Senior Project Engineer

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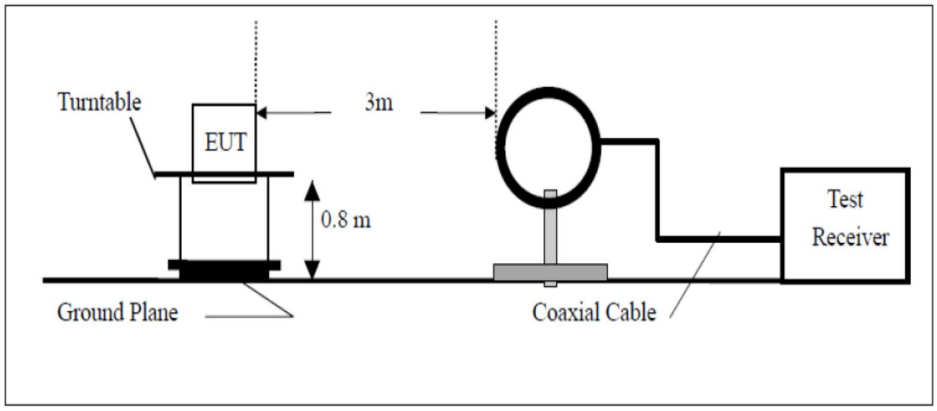
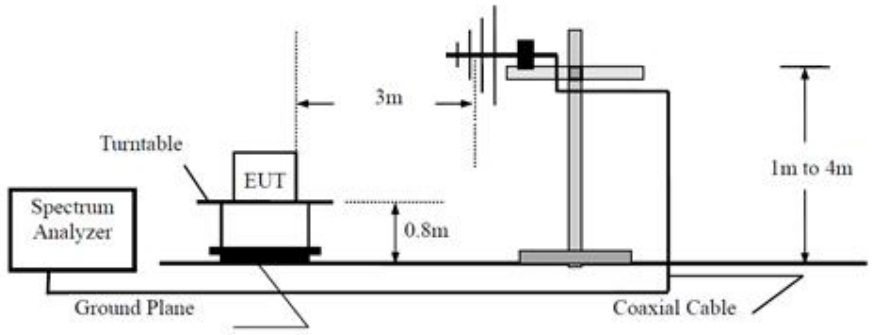
7 Test Setups

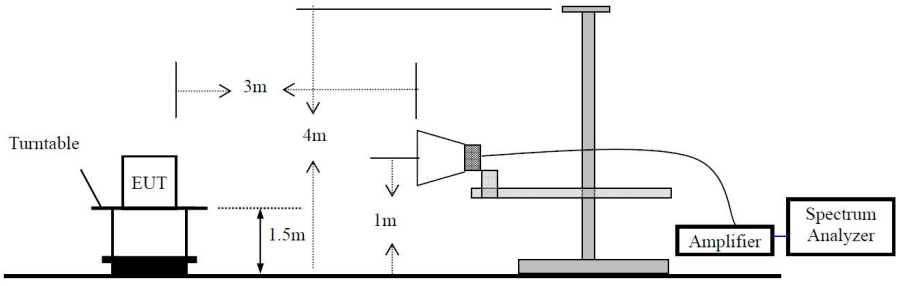
Radiated test setups Below 30MHz



Radiated test setups Below 1GHz



Radiated test setups Above 1GHz



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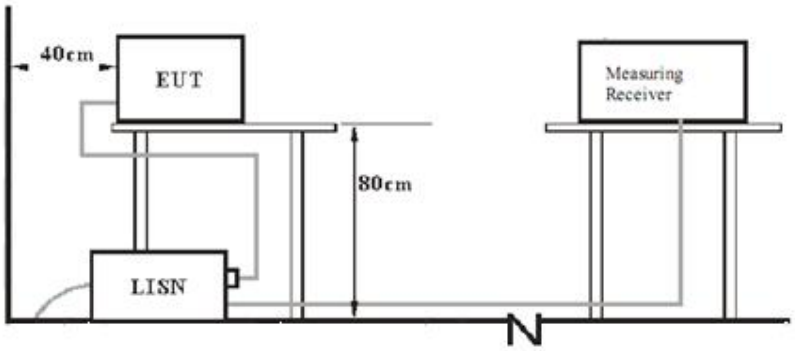
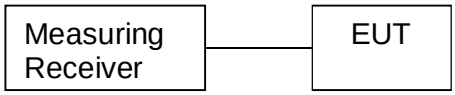
AC Power Line Conducted Emission test setups



Conducted RF test setups



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8 Spurious Radiated Emission

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna 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: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Then mark some maximum peak values to measure the QP values, set RBW=120kHz.

Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above1GHz

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9 Emission Test Results

9.1 Radiated Emission

EUT: DOOR LOCK, GLASS LOCK
Op Condition: TX Mode
Test Specification: Antenna: Horizontal
Comment: 3.0VDC
Remark: 9kHz to 30 MHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Factor
0.009	-30.13	128.5	-158.63	Peak	-30.3
0.025	-31.70	119.6	-151.30	Peak	-31.2
0.048	-31.20	113.9	-145.10	Peak	-32.4
0.204	-17.73	101.4	-119.13	Peak	-32.1
0.339	-17.65	97.0	-114.65	Peak	-32.2

Note: Result=Reading Value + Factor
Factor=Antenna Factor+ Cable Loss + Pre-Amplifier Gain

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Radiated Emission

EUT: DOOR LOCK, GLASS LOCK
Op Condition: TX Mode
Test Specification: Antenna: Horizontal
Comment: 3.0VDC
Remark: 30 MHz - 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Factor
0.125	25.27	105.6	-80.33	Peak	-32.1
51.340	18.65	40.00	-21.35	Peak	17.6
108.448	18.12	40.00	-21.88	Peak	16.2
311.300	21.37	47.00	-25.63	Peak	19.0
471.289	23.95	47.00	-23.05	Peak	22.9
991.391	33.67	47.00	-13.33	Peak	29.8

Note: Result=Reading Value + Factor
Factor=Antenna Factor+ Cable Loss + Pre-Amplifier Gain

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Radiated Emission

EUT: DOOR LOCK, GLASS LOCK
Op Condition: TX Mode
Test Specification: Antenna: Vertical
Comment: 3.0VDC
Remark: 9kHz to 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Factor
0.009	-29.92	128.5	-158.42	Peak	-30.5
0.025	-31.20	119.6	-150.80	Peak	-31.2
0.048	-31.62	113.9	-145.52	Peak	-32.3
0.204	-16.64	101.4	-118.04	Peak	-32.1
0.339	-17.99	97.0	-114.99	Peak	-32.2

Note: Result=Reading Value + Factor
Factor=Antenna Factor+ Cable Loss + Pre-Amplifier Gain

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Radiated Emission

EUT: DOOR LOCK, GLASS LOCK
Op Condition: TX Mode
Test Specification: Antenna: Vertical
Comment: 3.0VDC
Remark: 30 MHz to 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector	Factor
0.125	25.36	105.6	-80.24	Peak	-32.1
113.298	17.09	40.00	-22.91	Peak	16.2
230.547	20.41	47.00	-26.59	Peak	17.8
455.830	28.35	47.00	-18.65	Peak	24.8
715.668	31.83	47.00	-15.17	Peak	28.1
987.026	36.86	47.00	-10.14	Peak	32.8

Note: Result=Reading Value + Factor
Factor=Antenna Factor+ Cable Loss + Pre-Amplifier Gain

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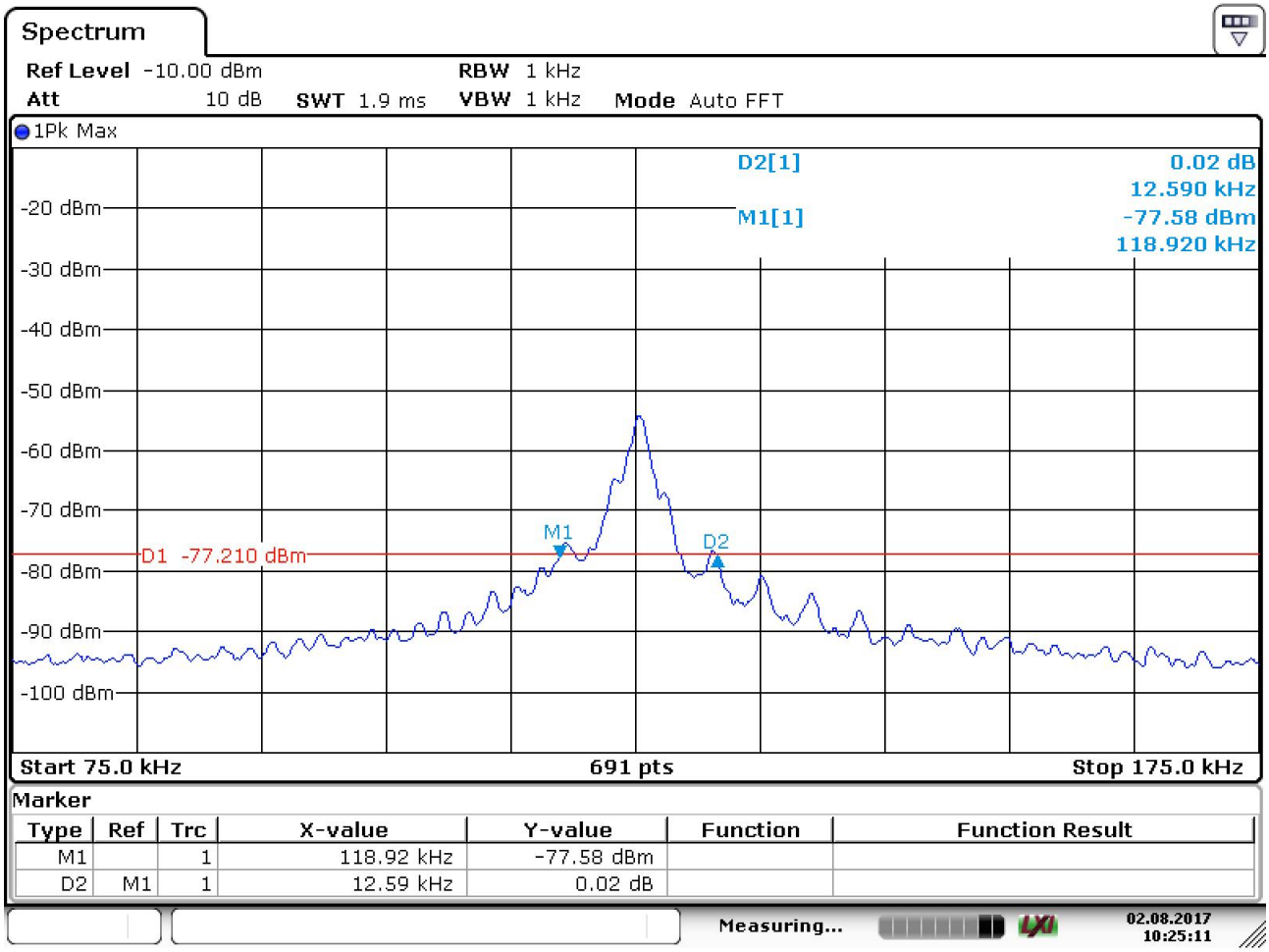
9.2 Bandwidth

EUT:	DOOR LOCK, GLASS LOCK
Op Condition:	TX Mode
Test Specification:	FCC15.202
Comment:	3.0VDC

Test Result
☒ Passed
☐ Not Passed



20db Bandwidth: 12.590khz

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9.3 Antenna Requirement

EUT:	DOOR LOCK, GLASS LOCK
Op Condition:	On Mode
Test Specification:	FCC15.203
Comment:	3.0VDC

Test Result
☒ Passed
☐ Not Passed

Limit

For intentional device, according to FCC Title 47 Part 15.203, 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.

Antenna Connector Construction

The antenna used in this product is PCB antenna, and the maximum gain of this antenna is 0.0 dBi.

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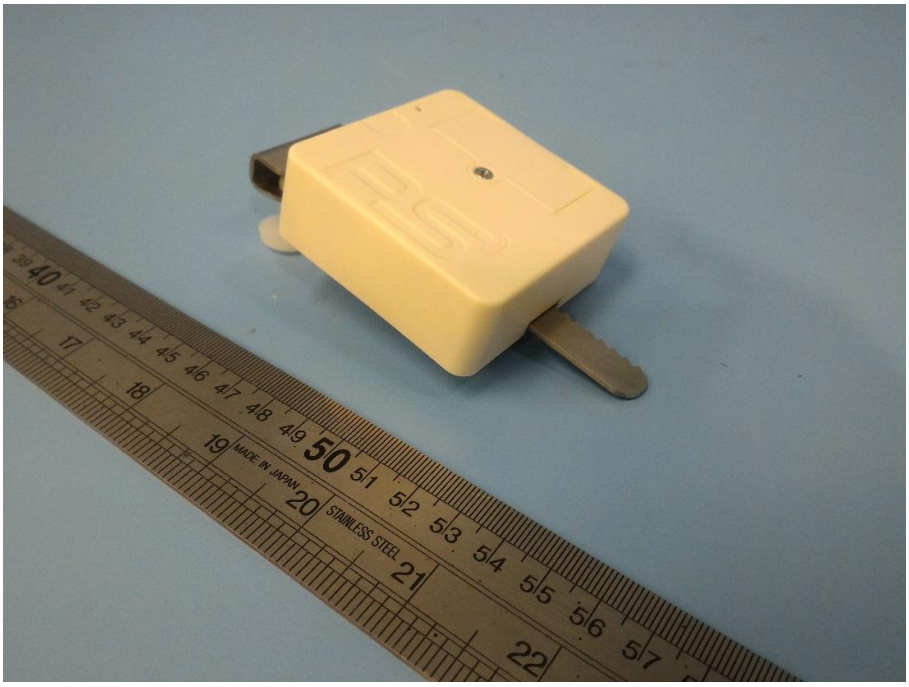
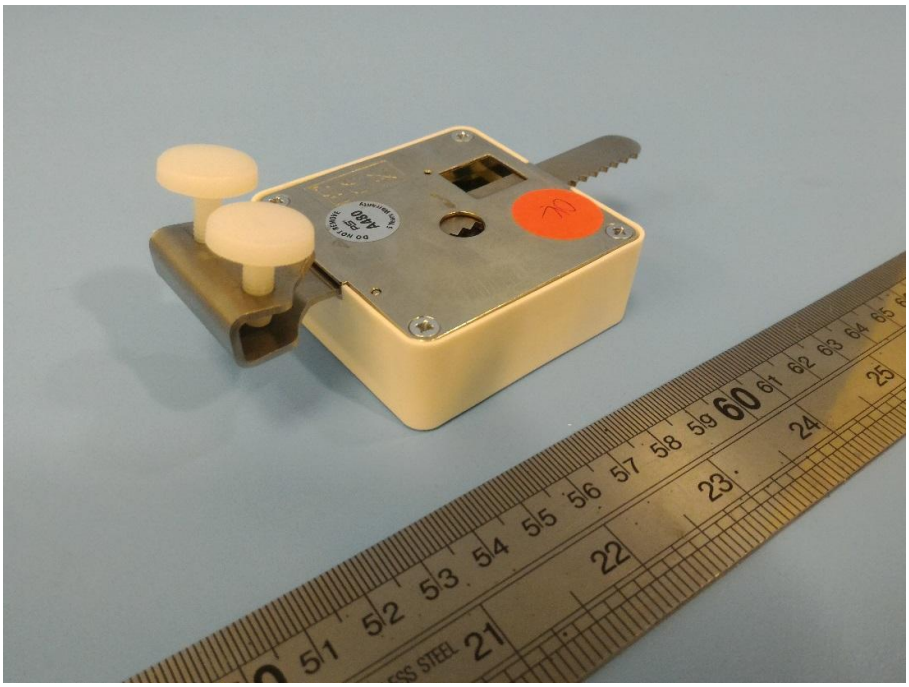
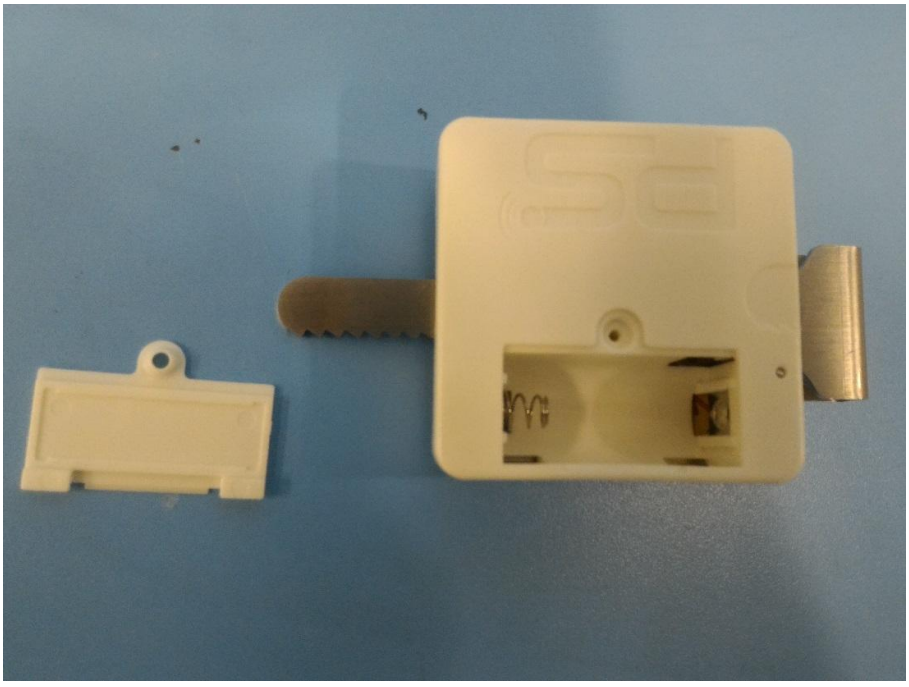
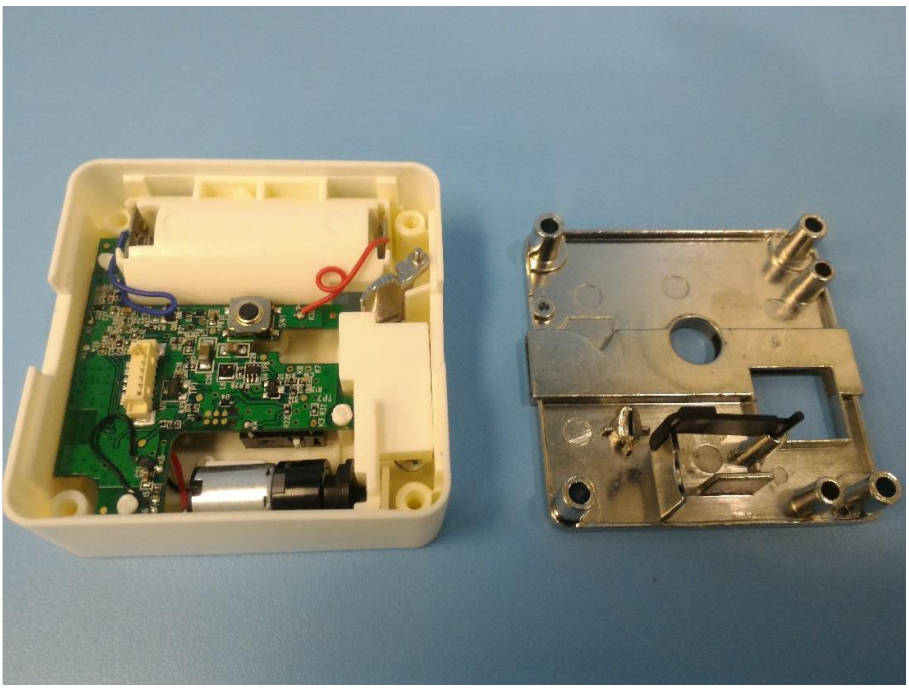
10 Appendix A - Photographs of EUT





Appendix A





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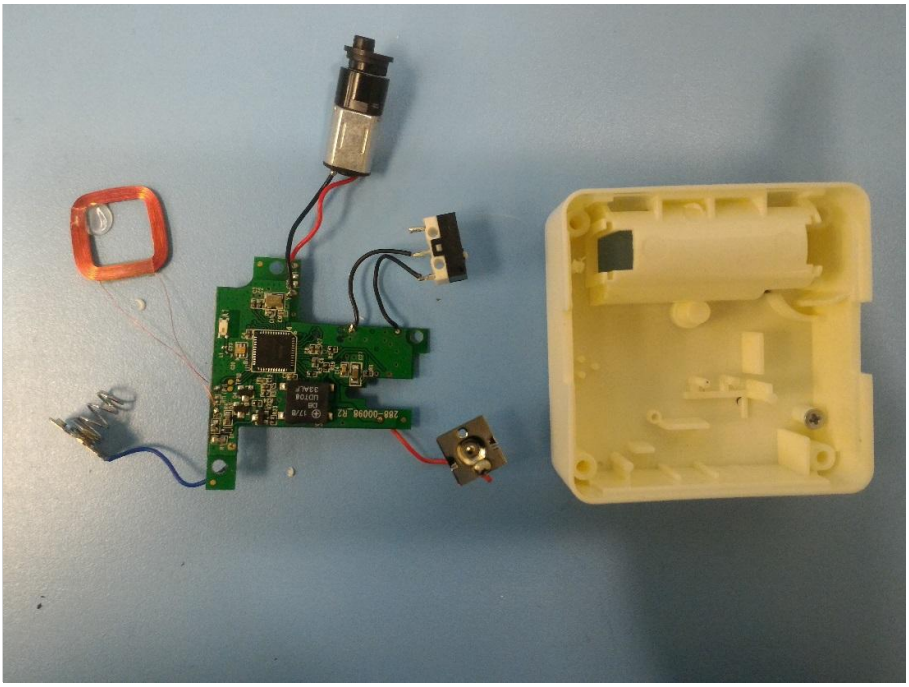
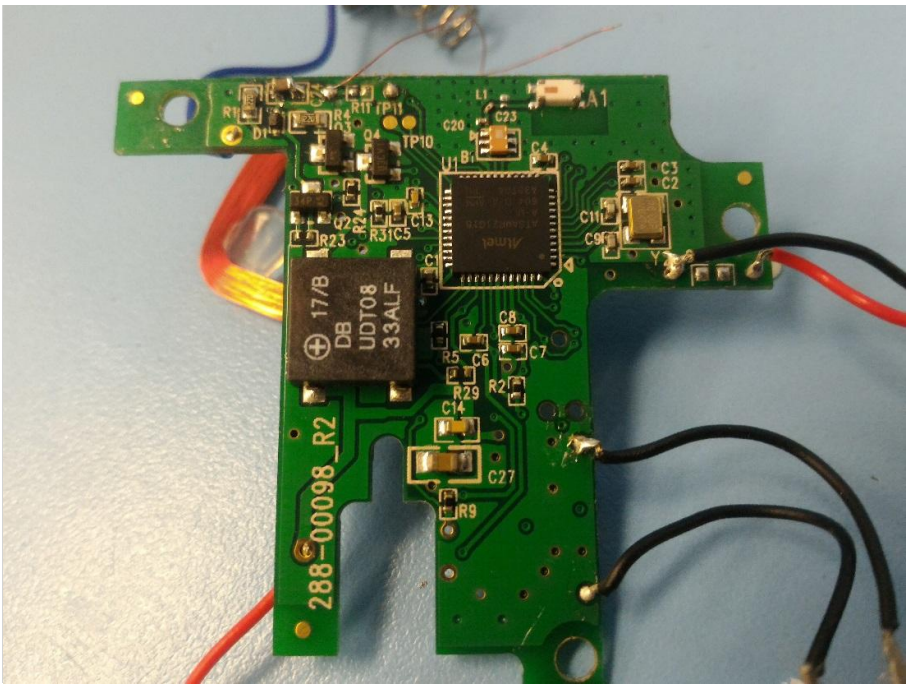
Appendix A





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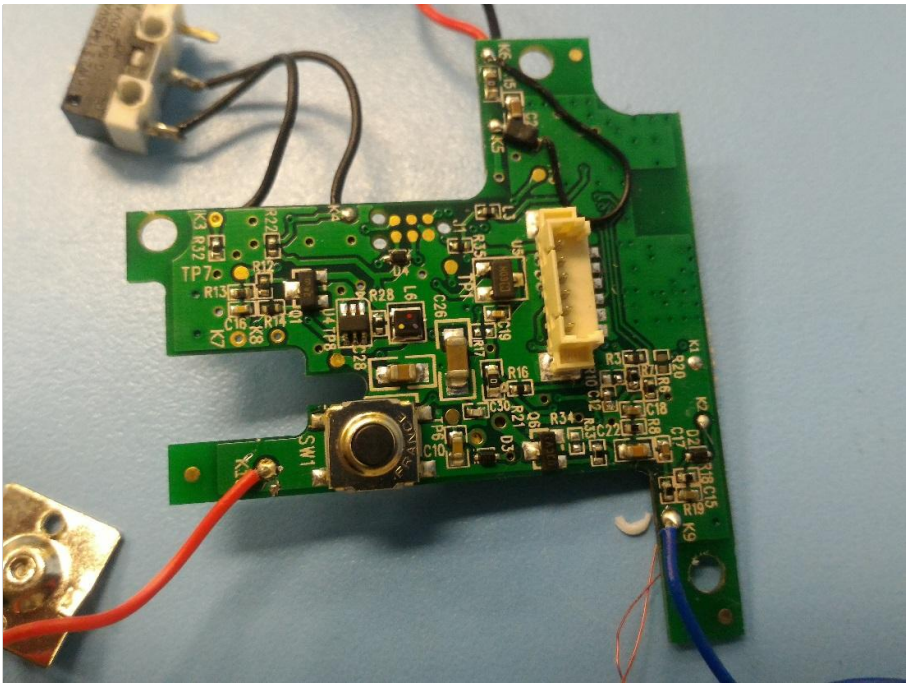
Appendix A



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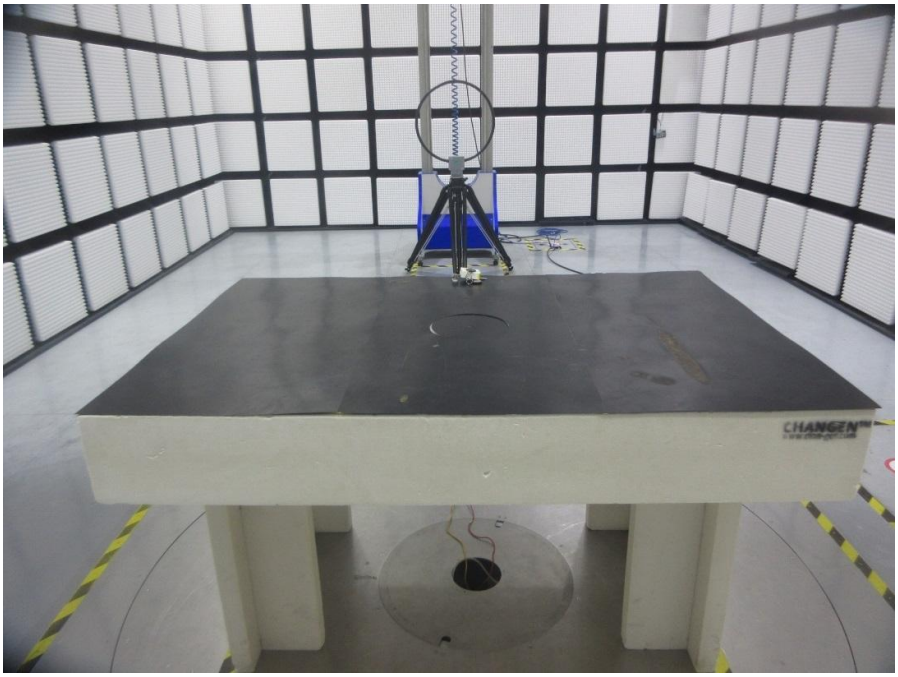
11 Appendix B - Setup Photographs of EUT

Radiated Emission



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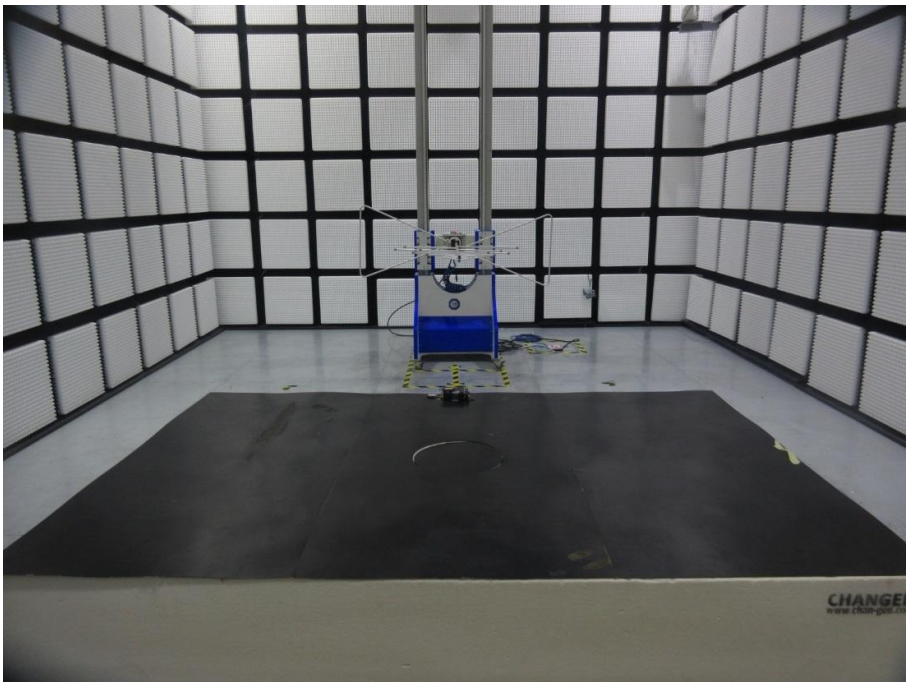
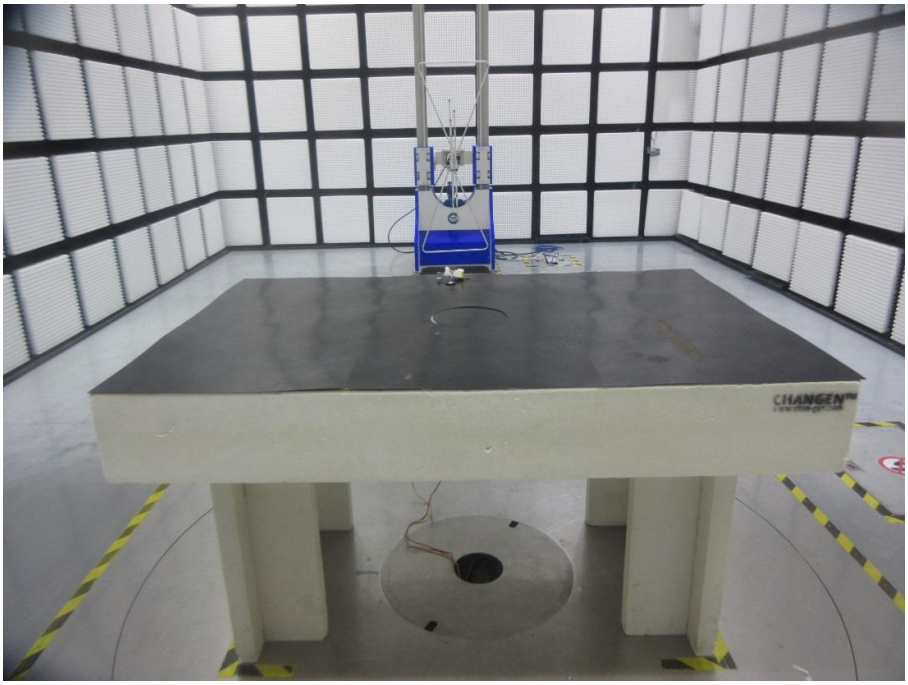
Setup Photographs of EUT

Radiated Emission





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12 Appendix C - Test Support Equipment

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13 Appendix D - General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1, For frequencies below 100 MHz and test separation distances ≤ 50 mm, the Numeric threshold is determined as:

Step a)
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

Step b)
{[Power allowed at numeric threshold for 50mm in step a)] + [(test separation distance – 50mm) · (f(MHz)/150)]} mW

Step c) 1)
For test separation distances > 50mm and < 200mm, the power threshold at the corresponding test separation distance at 100MHz in step b) is multiplied by [1 + log(100/f(MHz))]

Step c) 2)
For test separation distances ≤ 50mm, the power threshold determined by the equation in c) 1) for 50mm and 100MHz is multiplied by ½.

>> The fundamental frequency of the EUT is 125kHz, the test separation distance is ≤ 50mm.
(Manufacturer specified the separation distance is: 20mm)

Step a)
>> Numeric threshold, mW / 50mm * √0.1GHz ≤ 3.0
Numeric threshold ≤ 474.3mW

Step b)
>> Numeric threshold ≤ 474.3mW + (50mm-50mm * 100MHz/150)
Numeric threshold ≤ 474.3mW

Step c) 1) & c) 2)
>> Numeric threshold ≤ 474.3mW * [1 + log 100/100MHz] * ½
Numeric threshold ≤ 237.15mW

>> The power of EUT measured is: -79.87dBm = 0.0000103uW
Which is smaller than the Numeric threshold.
Therefore, the device is exempt from stand-alone SAR test requirements.

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Test Equipment Site List

Radiated emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7
Attenuator	Agilent	8491A	MY39264334	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2018-7-14

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
LISN	Rohde & Schwarz	ENV4200	100249	2018-7-14
LISN	Rohde & Schwarz	ENV432	101318	2018-7-14
LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
ISN	Rohde & Schwarz	ENY81-CA6	101664	2018-7-14
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2018-7-14
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2018-7-14
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2018-7-7
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2018-7-7
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2018-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2018-7-7

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Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	**Extended Uncertainty**
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted RF test	2.04dB

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