TEST REPORT

Reference No.	:	WTS19S06043126W001
FCC ID	:	2ATVF-MX-KS
Applicant.....	:	Hangzhou Muxi Life Technology Ltd.
Address.....	:	217 Wujiang Road, Shangcheng District, Hangzhou, China
Manufacturer	:	Guangdong Leijie Intelligent Technology Co., Ltd.
Address.....	:	Yuyuan Industry Park, Huangjiang Town, Dongguan City, Guangdong Province, China
Product.....	:	iSpark Sonic Power Toothbrush
Model(s)	:	KS-1, KS-2
Standards.....	:	FCC Part 15 subpart C
Date of Receipt sample	:	2019-07-01
Date of Test	:	2019-07-01 to 2019-07-12
Date of Issue.....	:	2019-07-12
Test Result.....	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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1. Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China.Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), ISED (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.

Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

1.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ SDOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-

Note:

1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
2. ISED CAB identifier: CN0013.

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of …	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd.	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

2. Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Spurious Emissions	15.209	PASS
Occupied Bandwidth	15.215	PASS
Antenna Requirement	15.203	PASS

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4. Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS19S06043126W001	2019-07-01	2019-07-01 to 2019-07-12	2019-07-12	original	-	Valid

5. General Information

5.1 General Description of E.U.T

Product:	iSpark Sonic Power Toothbrush
Model(s):	KS-1, KS-2
Model Difference:	Refer to section 5.3
Type of Modulation:	ASK
Frequency Range:	0.112~0.205MHz
Antenna installation:	Coil Antenna

5.2 Details of EUT

Ratings： Input: DC 5V 0.5A

5.3 Model difference descriptions

For toothbrush:

Model	The motor shell	Battery
KS-1	Aluminium alloy shell	650mAh
KS-2	Electroplate black paint shell	800mAh

For the base of charging:

They are only model names and colors are different, the others are all the same.

5.4 Test mode

Test mode	Test channel
DC 5V: Transmitting + Empty load	190.42kHz
DC 5V: Transmitting + Half load	
DC 5V: Transmitting + Full load *	
All test mode were tested and passed, “*” show the worst case mode which were record in the report.	

6. Equipment Used during Test

6.1 Equipments List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMI Test Receiver	R&S	ESCI	101155	2018-09-15	2019-09-14
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2018-09-15	2019-09-14
3	Limiter	CYBERTEK	EM5010	261115-001-0024	2018-09-15	2019-09-14
4	Cable	**Laplace**	RF300	-	2018-07-18	2019-07-17
3m Semi-anechoic Chamber for Radiation(TDK)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2019-04-20	2020-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-04-20	2020-04-19
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2019-04-17	2020-04-16
4	Amplifier	ANRITSU	MH648A	M43381	2019-04-20	2020-04-19
5	Cable	HUBER+SUHNER	CBL2	525178	2019-04-20	2020-04-19
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	Agilent	N9020A	MY49100060	2018-09-21	2019-09-20
2	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2018-09-10	2019-09-09
3	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2018-08-12	2019-08-11
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2019-04-06	2020-04-05
5	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2018-09-10	2019-09-09

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emissions	150kHz~30MHz	±3.64dB	(1)
Radiated Spurious Emissions	26KHz~30MHz	±3.03dB	(1)
Radiated Spurious Emissions	30MHz~1000MHz	±5.03dB	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TES T CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave,Tianhe District, Guangzhou, Guangdong, China.

7. Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz
	56 dBμV between 0.5MHz & 5MHz
	60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

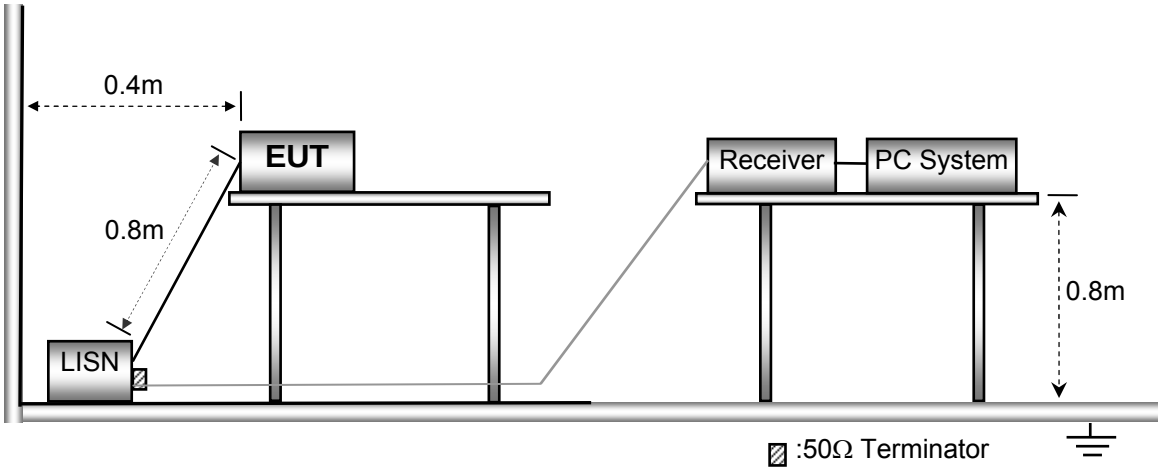
7.1 E.U.T. Operation

Operating Environment **:**

Temperature:	25.5 °C
Humidity:	51 % RH
Atmospheric Pressure:	101.2kPa
EUT Operation **:**	Refer to section 5.4

7.2 EUT Setup

The EUT was placed on the test table in shielding room.



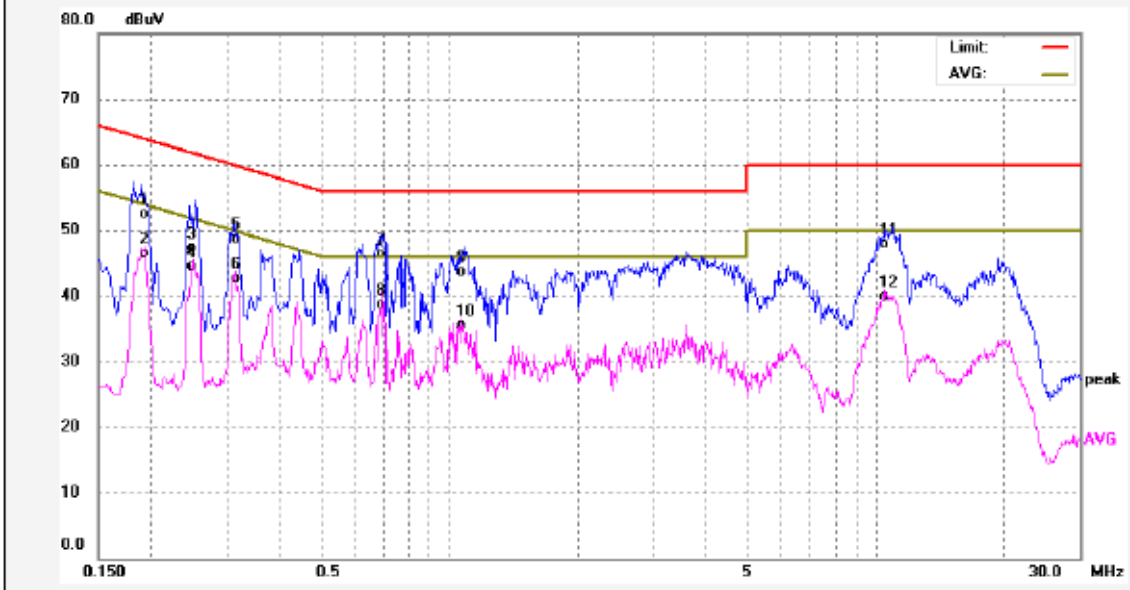
7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

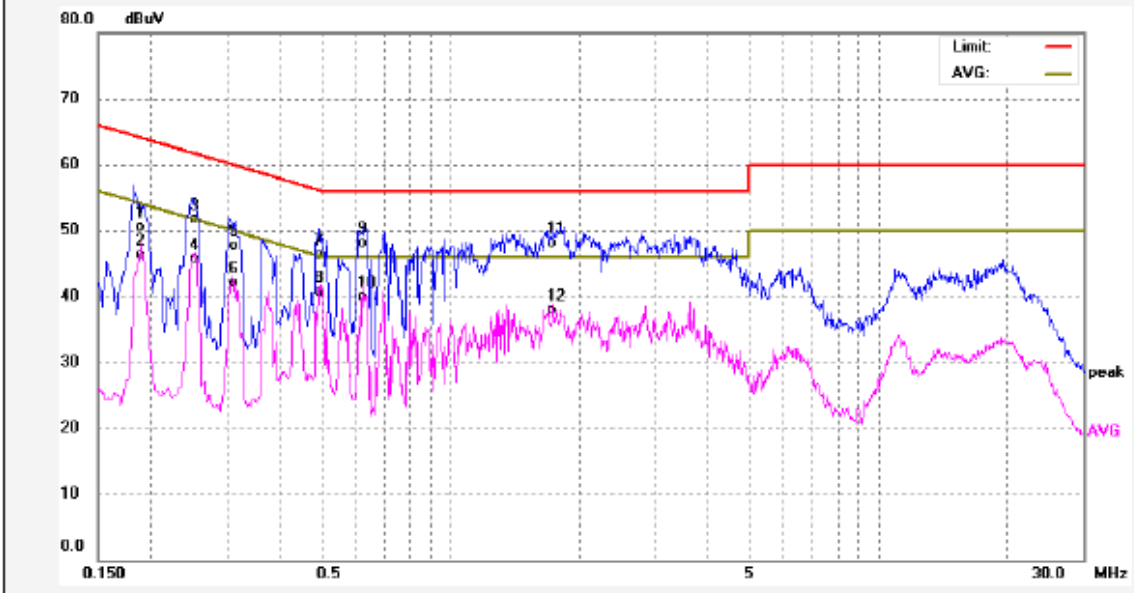
For model KS-2:

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1922	42.18	10.32	52.50	63.94	-11.44	QP	
2	0.1922	36.15	10.32	46.47	53.94	-7.47	AVG	
3	0.2500	36.94	10.39	47.33	61.75	-14.42	QP	
4	0.2500	34.06	10.39	44.45	51.75	-7.30	AVG	
5	0.3149	38.24	10.41	48.65	59.84	-11.19	QP	
6	0.3149	32.25	10.41	42.66	49.84	-7.18	AVG	
7	0.6938	35.81	10.44	46.25	56.00	-9.75	QP	
8	0.6938	28.23	10.44	38.67	46.00	-7.33	AVG	
9	1.0660	33.35	10.44	43.79	56.00	-12.21	QP	
10	1.0660	25.15	10.44	35.59	46.00	-10.41	AVG	
11	10.4859	36.64	11.20	47.84	60.00	-12.16	QP	
12	10.4859	28.63	11.20	39.83	50.00	-10.17	AVG	

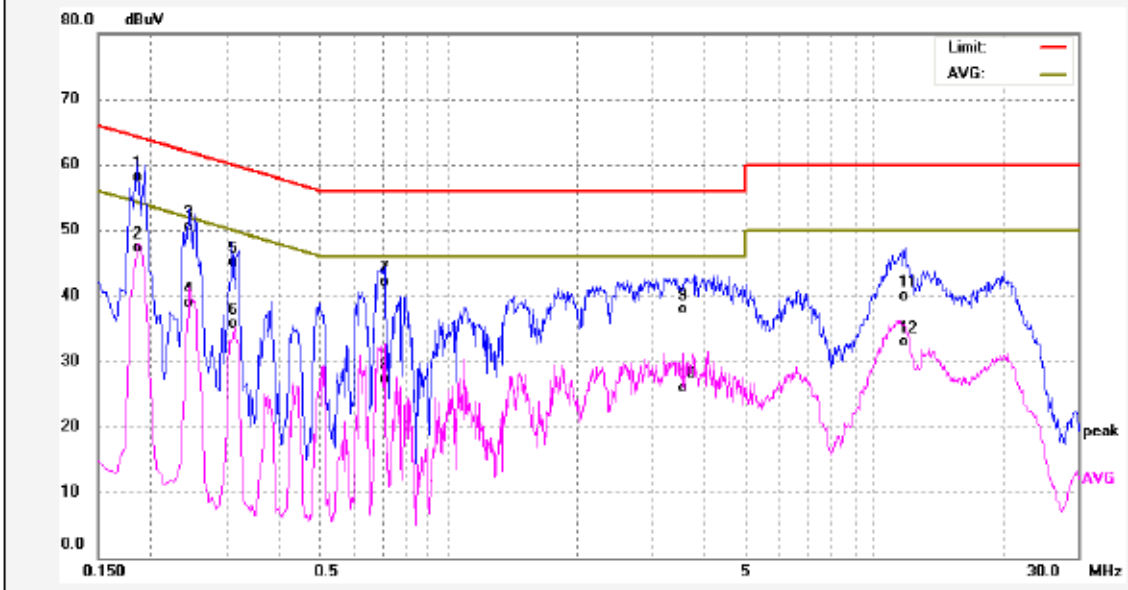
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1900	40.17	10.31	50.48	64.03	-13.55	QP	
2	0.1900	35.99	10.31	46.30	54.03	-7.73	AVG	
3	0.2540	41.37	10.39	51.76	61.62	-9.86	QP	
4	0.2540	35.24	10.39	45.63	51.62	-5.99	AVG	
5	0.3099	37.28	10.41	47.69	59.97	-12.28	QP	
6	0.3099	31.68	10.41	42.09	49.97	-7.88	AVG	
7	0.4979	35.82	10.42	46.24	56.03	-9.79	QP	
8	0.4979	30.20	10.42	40.62	46.03	-5.41	AVG	
9	0.6219	37.58	10.48	48.06	56.00	-7.94	QP	
10	0.6219	29.33	10.48	39.81	46.00	-6.19	AVG	
11	1.7338	37.51	10.52	48.03	56.00	-7.97	QP	
12	1.7338	27.42	10.52	37.94	46.00	-8.06	AVG	

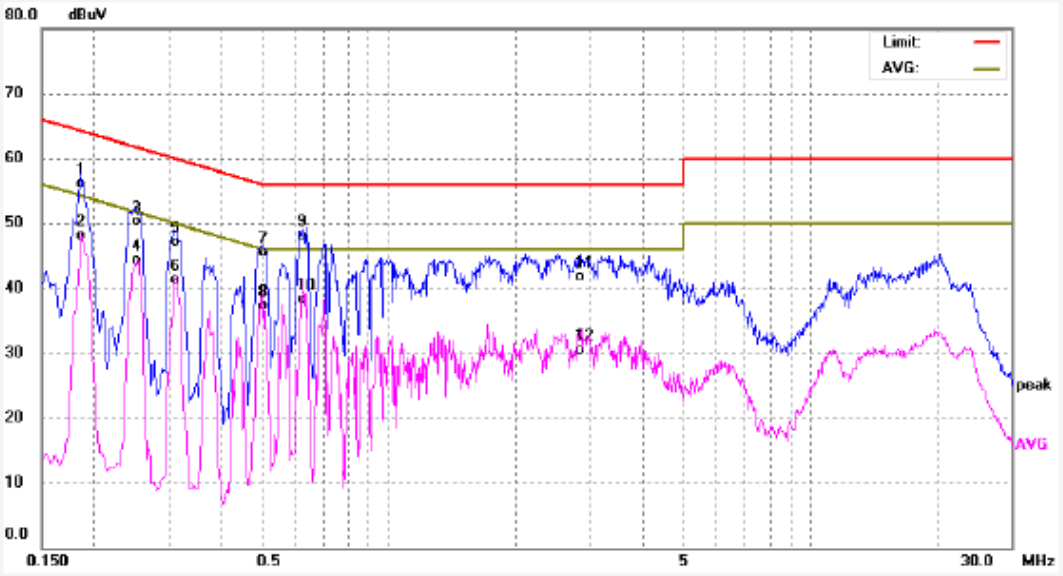
For model KS-1:

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	48.39	9.77	58.16	64.21	-6.05	QP	
2	0.1860	37.60	9.77	47.37	54.21	-6.84	AVG	
3	0.2460	40.71	9.76	50.47	61.89	-11.42	QP	
4	0.2460	29.12	9.76	38.88	51.89	-13.01	AVG	
5	0.3140	35.24	9.81	45.05	59.86	-14.81	QP	
6	0.3140	25.93	9.81	35.74	49.86	-14.12	AVG	
7	0.7060	32.18	9.83	42.01	56.00	-13.99	QP	
8	0.7060	17.55	9.83	27.38	46.00	-18.62	AVG	
9	3.5340	27.94	9.94	37.88	56.00	-18.12	QP	
10	3.5340	16.06	9.94	26.00	46.00	-20.00	AVG	
11	11.7660	29.88	10.09	39.97	60.00	-20.03	QP	
12	11.7660	22.77	10.09	32.86	50.00	-17.14	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	46.31	9.77	56.08	64.21	-8.13	QP	
2	0.1860	38.41	9.77	48.18	54.21	-6.03	AVG	
3	0.2540	40.60	9.76	50.36	61.62	-11.26	QP	
4	0.2540	34.45	9.76	44.21	51.62	-7.41	AVG	
5	0.3140	37.33	9.81	47.14	59.86	-12.72	QP	
6	0.3140	31.47	9.81	41.28	49.86	-8.58	AVG	
7	0.5060	35.71	9.81	45.52	56.00	-10.48	QP	
8	0.5060	27.42	9.81	37.23	46.00	-8.77	AVG	
9	0.6220	38.19	9.84	48.03	56.00	-7.97	QP	
10	0.6220	28.37	9.84	38.21	46.00	-7.79	AVG	
11	2.8580	31.70	9.93	41.63	56.00	-14.37	QP	
12	2.8580	20.67	9.93	30.60	46.00	-15.40	AVG	

8. Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

FCC Part15 Paragraph 15.209

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

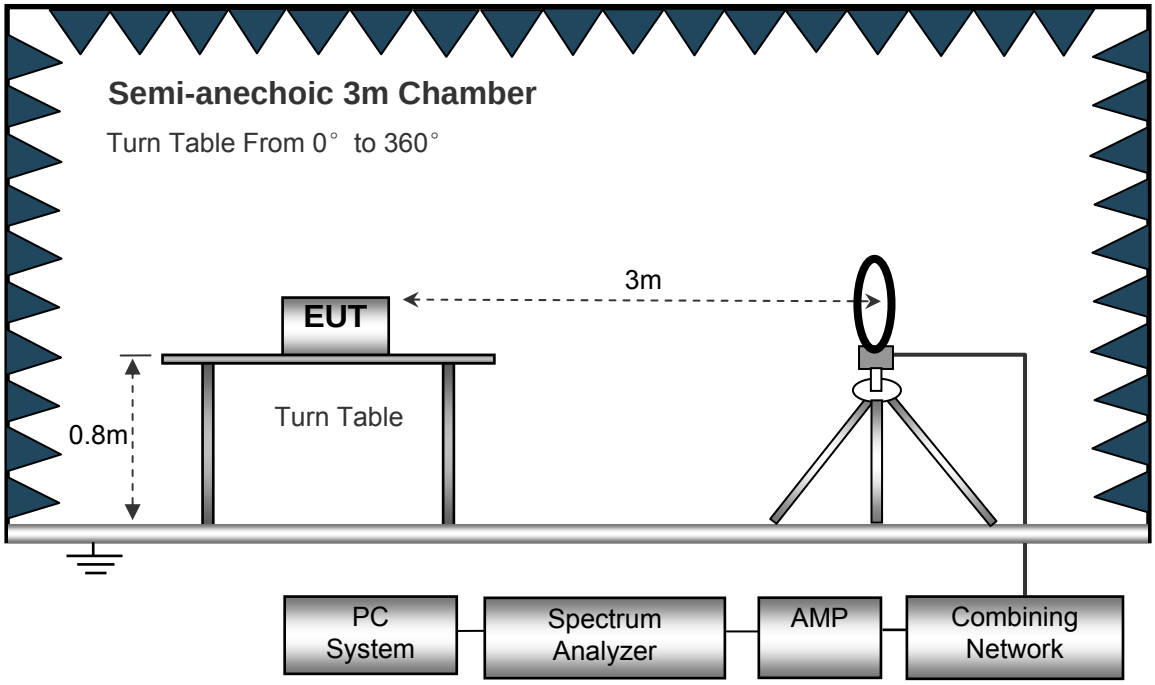
Atmospheric Pressure: 101.2kPa

EUT Operation **:** Refer to section 5.4

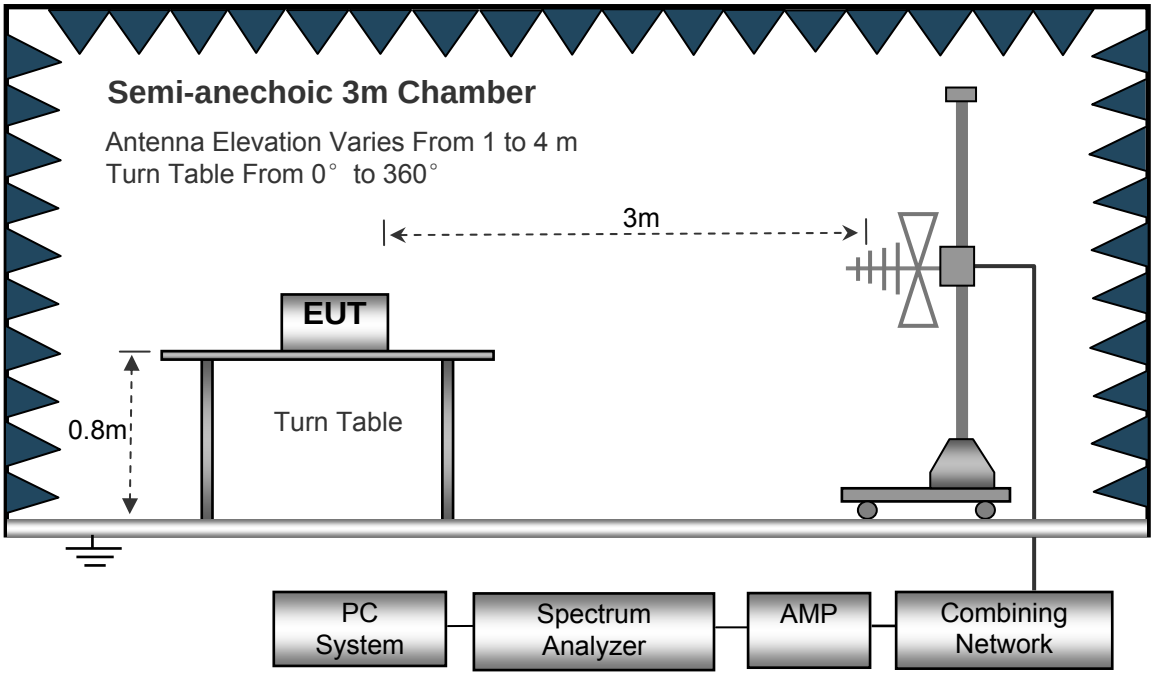
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed .....Auto
IF Bandwidth.....10kHz
Video Bandwidth.....10kHz
Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed .....Auto
Detector .....PK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8.5 Summary of Test Results

For model KS-2:

Test Frequency: 9KHz ~ 30MHz, Note: Correct factor = Cable loss + Antenna factor

Frequency (MHz)	Measurement results	Detector	Correct factor	Measurement results (calculated)	Limits	Margin
	dBμV @3m	PK/QP	dB/m	dBμV/m @3m	dBμV/m @3m	dB
0.190	44.75	QP	18.40	63.15	102.01	-38.86
0.338	4.47	QP	28.16	32.63	97.02	-64.39
4.526	10.72	QP	23.72	34.43	69.50	-35.07

Test Frequency: 30MHz ~ 1GHz

Frequency (MHz)	Measurement results (dBμV @3m)	Detector (PK/QP /Ave)	Degree	Height (m)	Polar (H/V)	Correct factor (dB)	Measurement results (calculated) (dBμV/m)	Limit (dBμV/m)	Margin (dB)
34.26	33.33	QP	152	1.2	H	-14.02	19.31	40	-20.69
34.26	33.73	QP	51	1.9	V	-14.02	19.71	40	-20.29
221.13	33.87	QP	305	1.5	H	-13.00	20.87	46.5	-25.63
221.13	36.62	QP	136	1.0	V	-13.00	23.62	46.5	-22.88
520.49	36.24	QP	130	1.8	H	-5.14	31.10	46.5	-15.40
520.49	37.14	QP	260	1.8	V	-5.14	31.99	46.5	-14.51

For model KS-1:

Test Frequency: 9KHz ~ 30MHz, Note: Correct factor = Cable loss + Antenna factor

Frequency (MHz)	Measurement results	Detector	Correct factor	Measurement results (calculated)	Limits	Margin
	dBμV @3m	PK/QP	dB/m	dBμV/m @3m	dBμV/m @3m	dB
0.190	51.23	QP	18.51	69.74	102.01	-32.27
0.302	3.52	QP	28.18	31.70	97.99	-66.29
4.544	10.82	QP	23.71	34.53	69.50	-34.97

Test Frequency: 30MHz ~ 1GHz

Frequency (MHz)	Measurement results (dBμV @3m)	Detector (PK/QP /Ave)	Degree	Height (m)	Polar (H/V)	Correct factor (dB)	Measurement results (calculated) (dBμV/m)	Limit (dBμV/m)	Margin (dB)
34.40	33.22	QP	10	1.1	H	-13.86	19.36	40	-20.64
34.40	32.93	QP	14	1.4	V	-13.86	19.07	40	-20.93
220.80	34.45	QP	318	1.0	H	-13.01	21.44	46.5	-25.06
220.80	36.42	QP	30	1.4	V	-13.01	23.41	46.5	-23.09
520.23	36.93	QP	244	1.4	H	-5.58	31.35	46.5	-15.15
520.23	38.11	QP	315	1.9	V	-5.58	32.53	46.5	-13.97

9. Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215

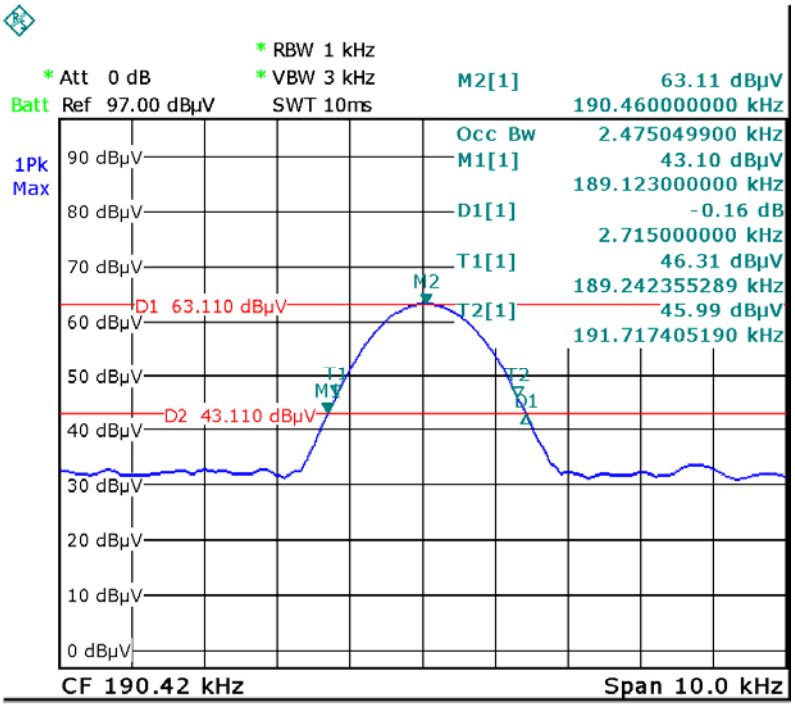
9.1 Test Procedure

1. The transmitter shall be operated at its maximum carrier power measured under normal test conditions;
2. The span of the analyzer shall be set to capture all products of the modulation process,including the emission skirts.
3. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.2 Test Result Plot:

Test Channel(kHz)	99% Bandwidth(kHz)	20dB Bandwidth Emission(KHz)
190.42	2.475	2.715

Test result plot as follows:



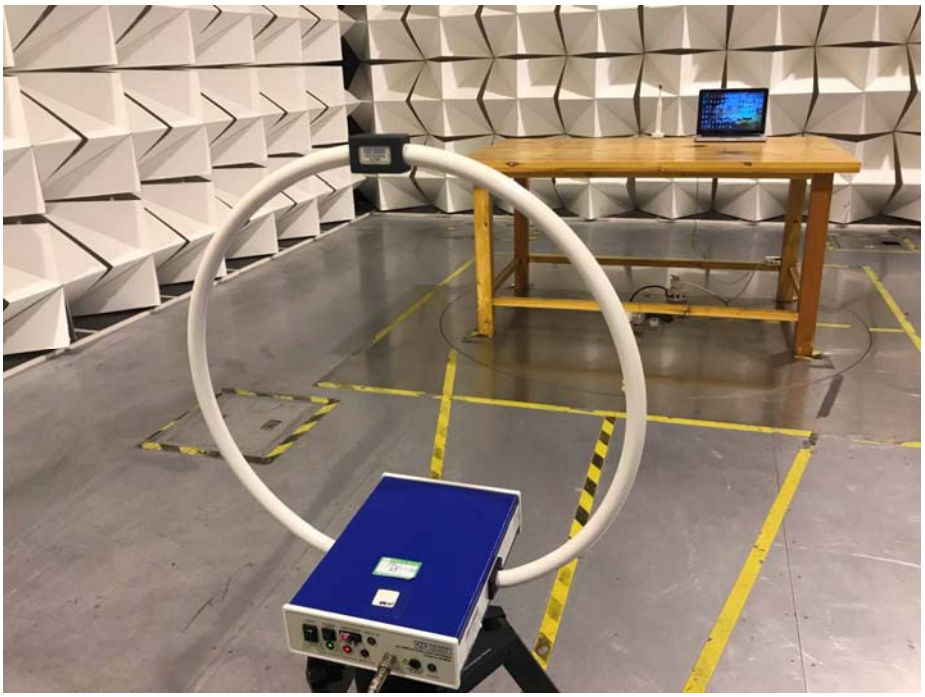
10. Antenna Requirement

According to the FCC Part 15 Paragraph 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. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a Coil antenna, fulfill the requirement of this section.

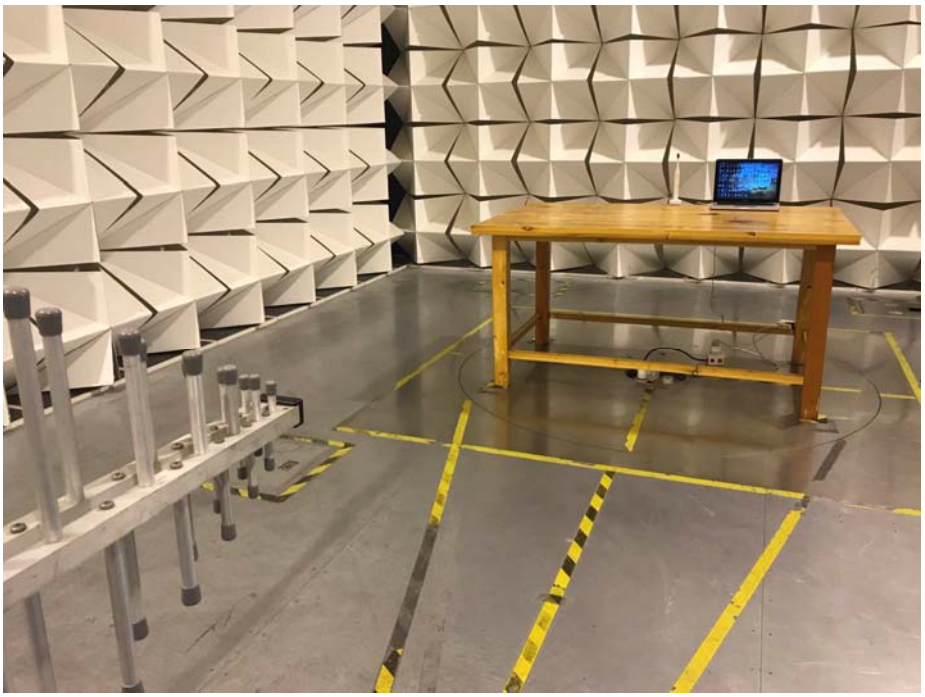
11. Photographs-Test Setup

11.1 Radiation Emission Test Setup

Below 30MHz



From 30MHz to 1GHz

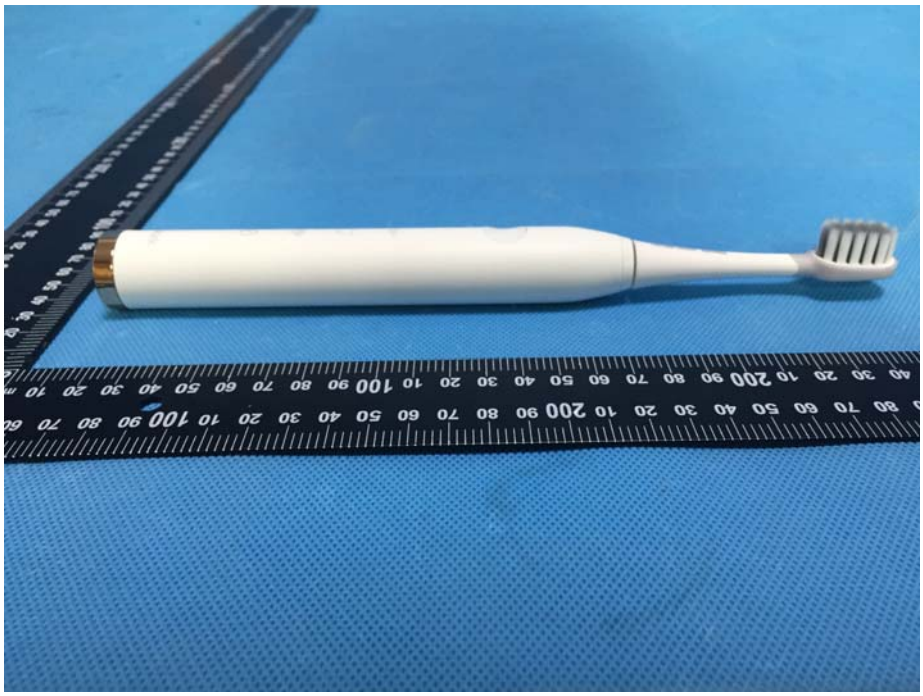


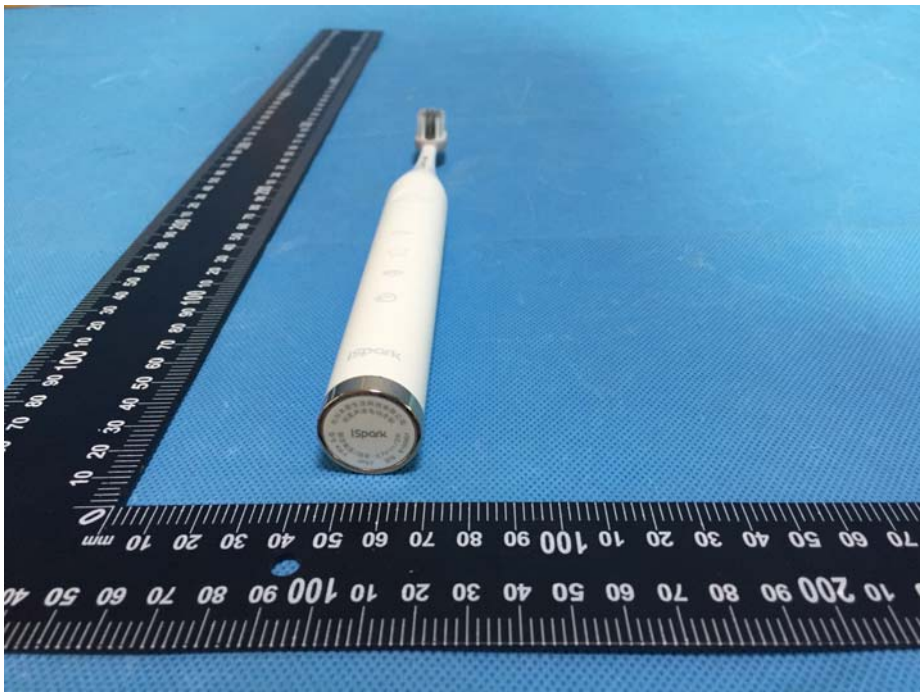
11.2 Photograph – Conducted Emission Test Setup

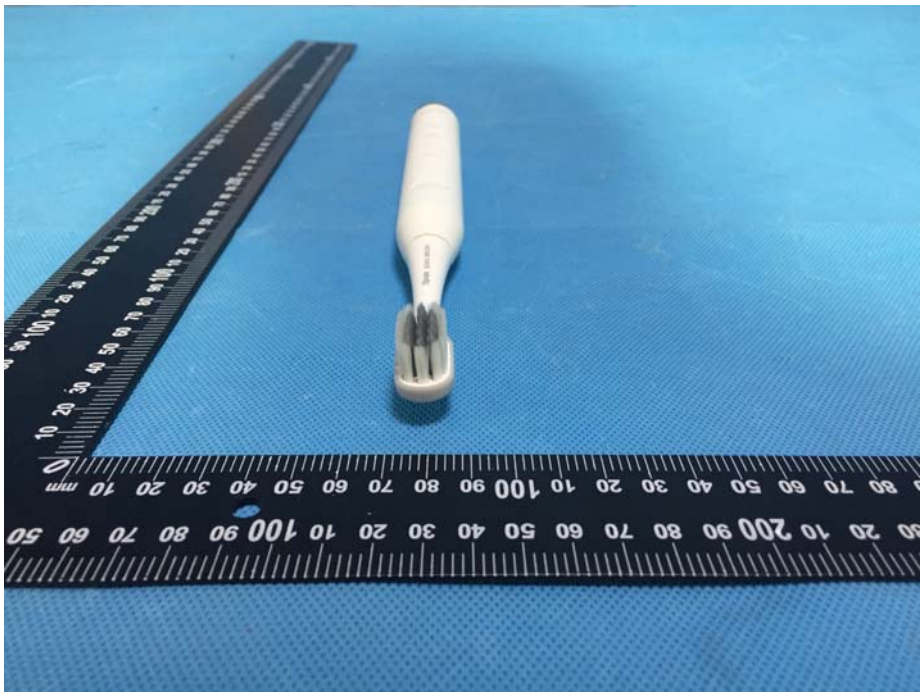
12. Photographs – Constructional Details

12.1 EUT – Appearance View

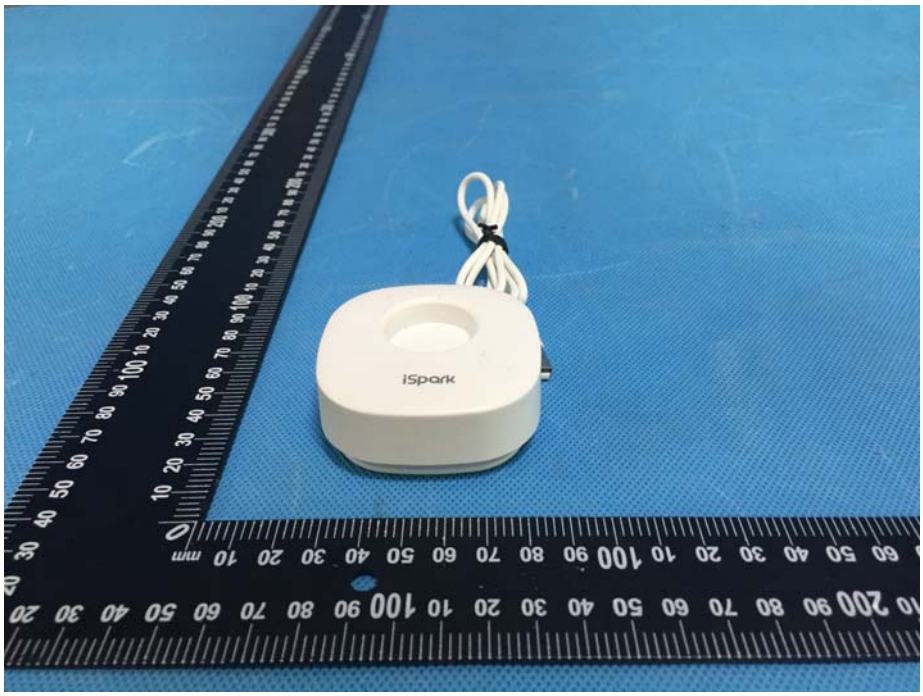
For model: KS-2



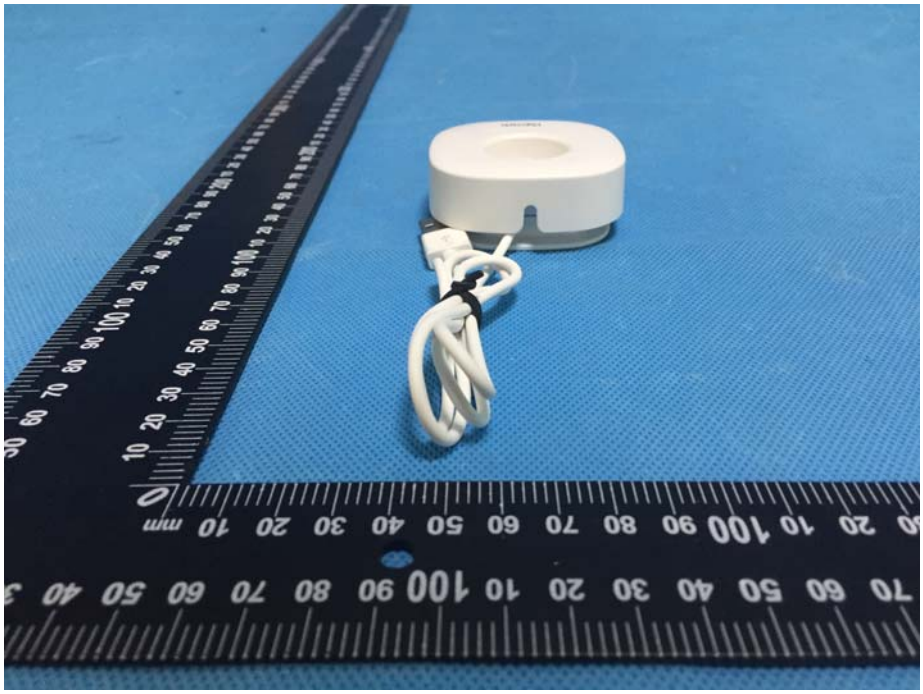


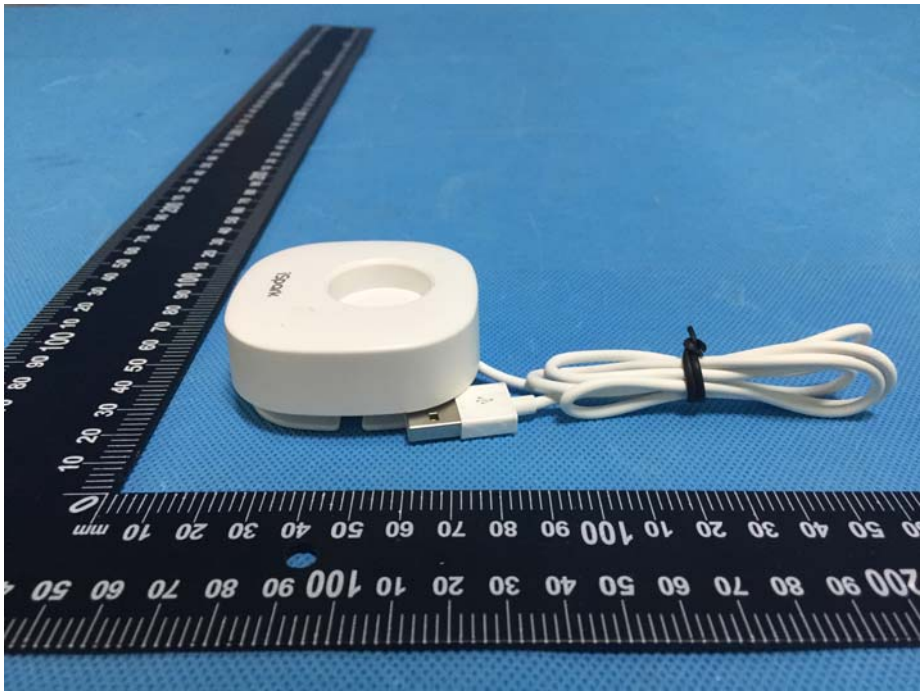


iSpark


iSpark

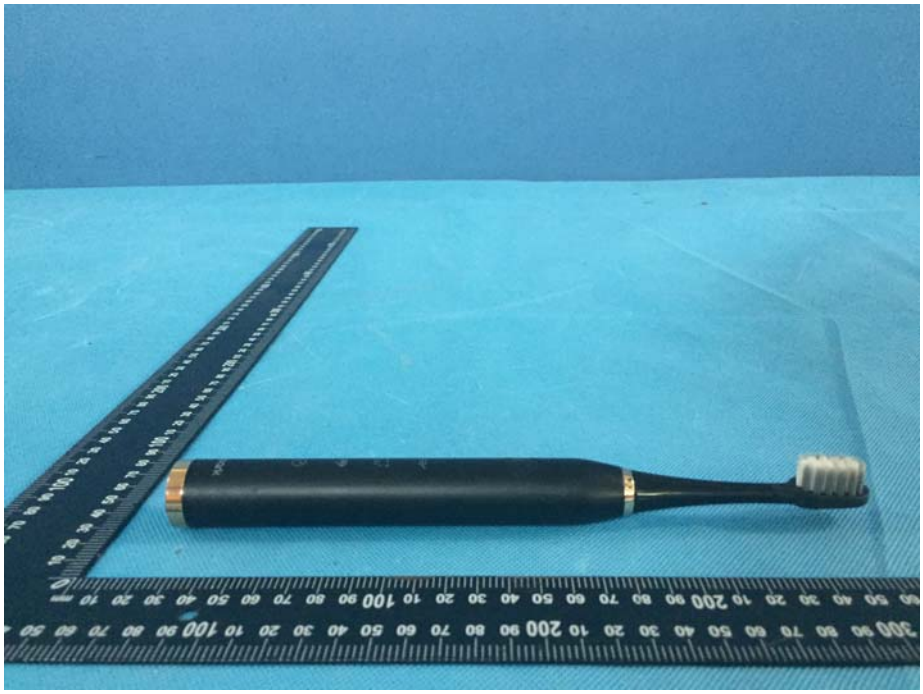
iSpark

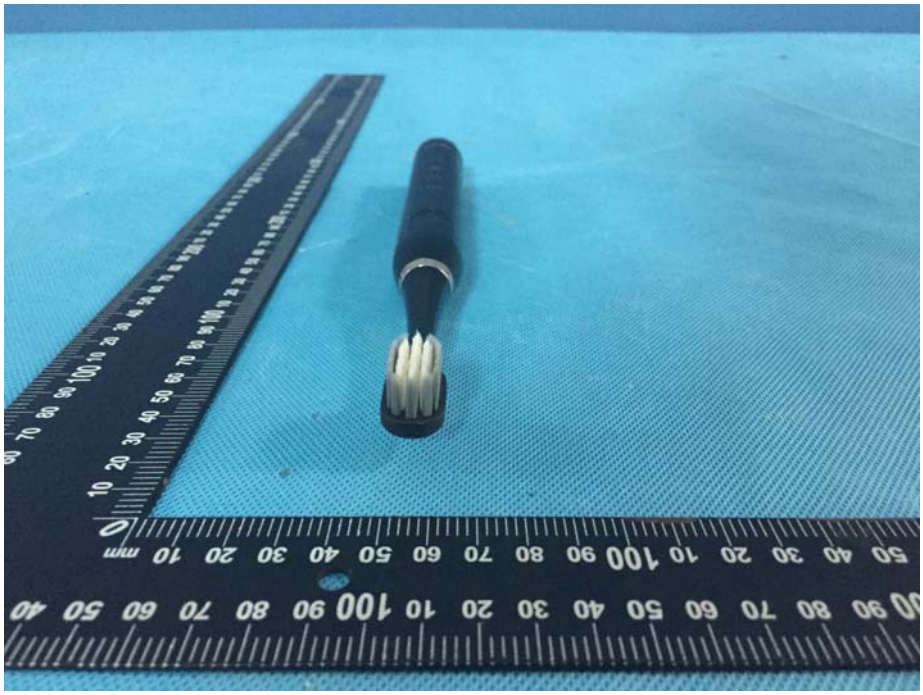


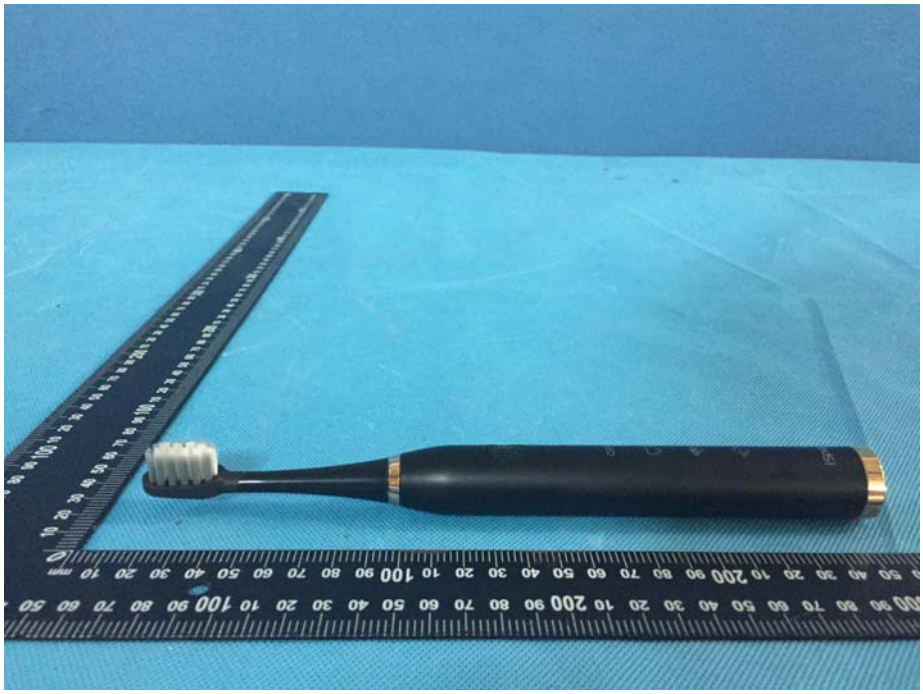


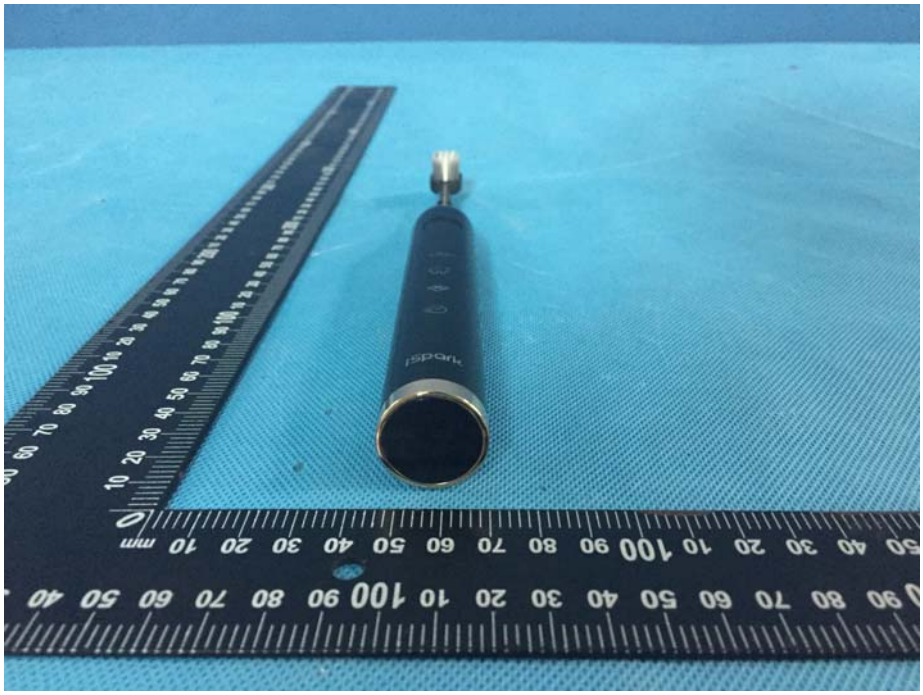
iSpark
感应式充电底座
型号:KSC-1 防水等级:IPX7
额定输入: 5V ⎓ 0.5A
制造商:广东乐洁智能科技有限公司
Designed by iSpark B190501

Model: KS-1





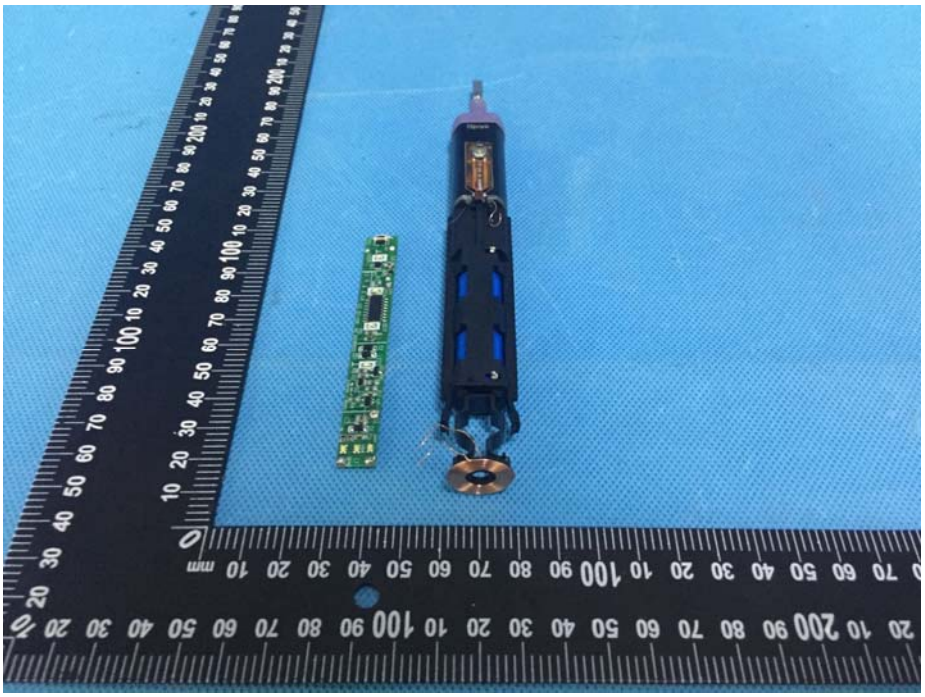


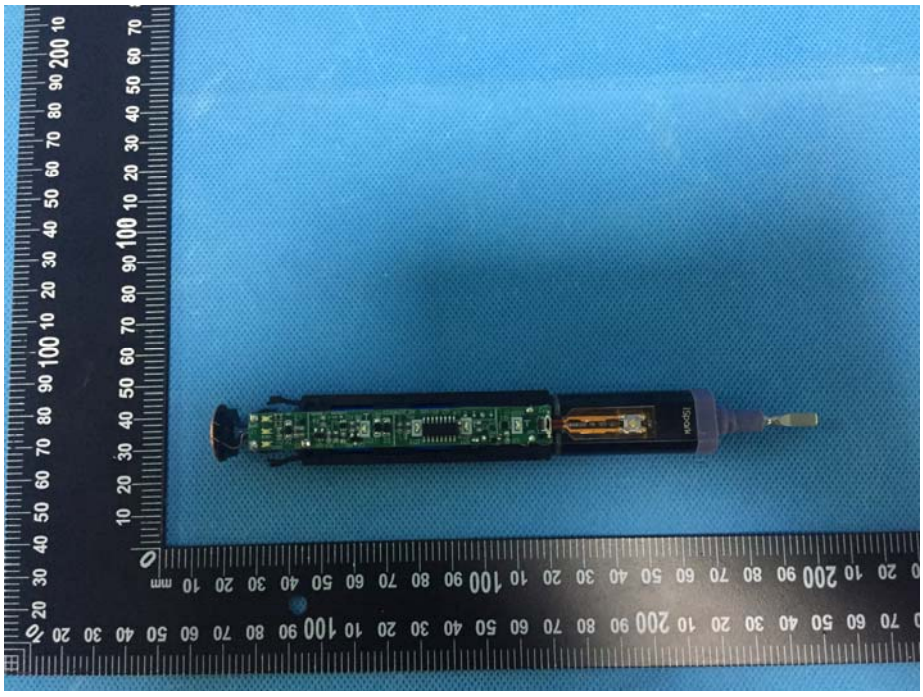


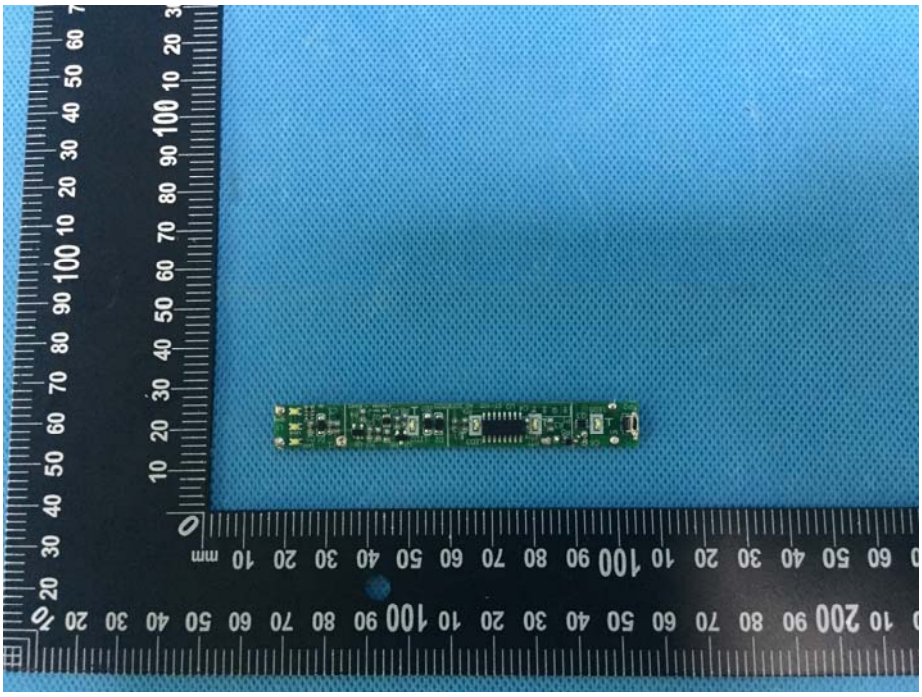
iSpark
感应式充电底座
型号:KSC-1 防水等级:IPX7
额定输入: 5V ⎓ 0.5A
制造商:广东乐洁智能科技有限公司
Designed by iSpark B190501

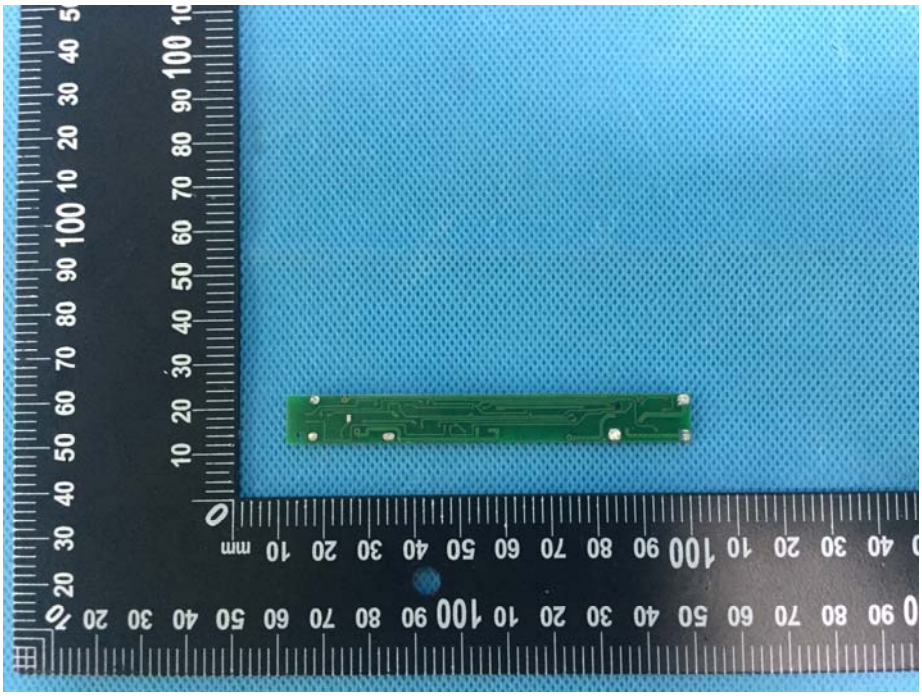
12.2 EUT – Internal View

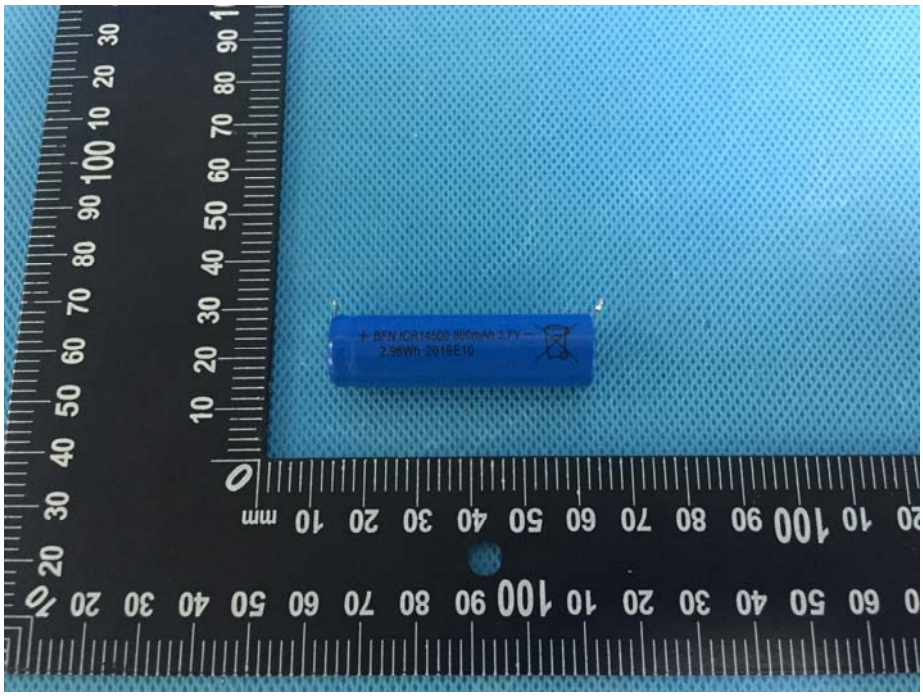
Model: KS-2

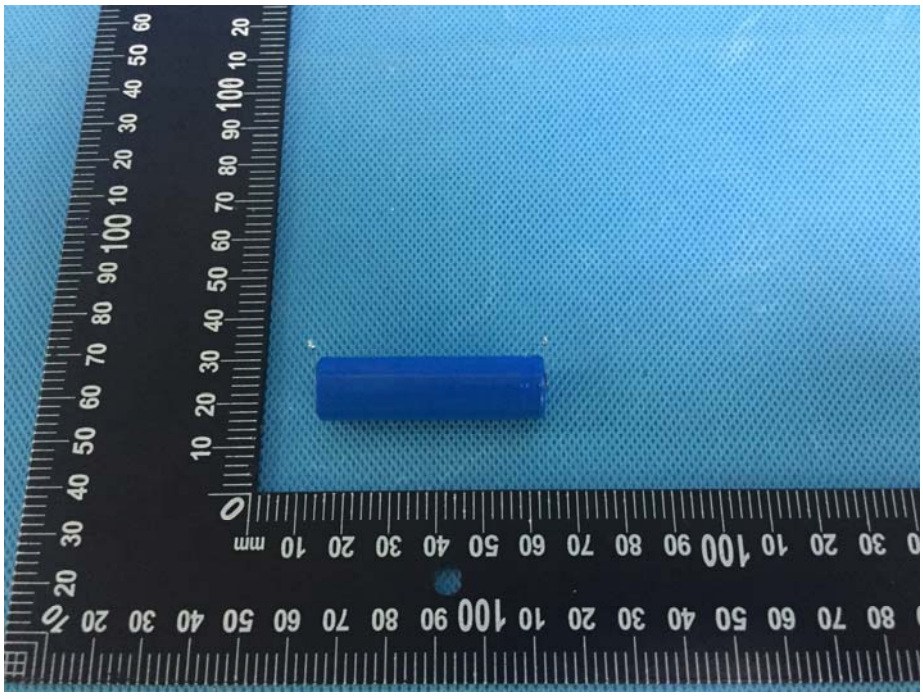




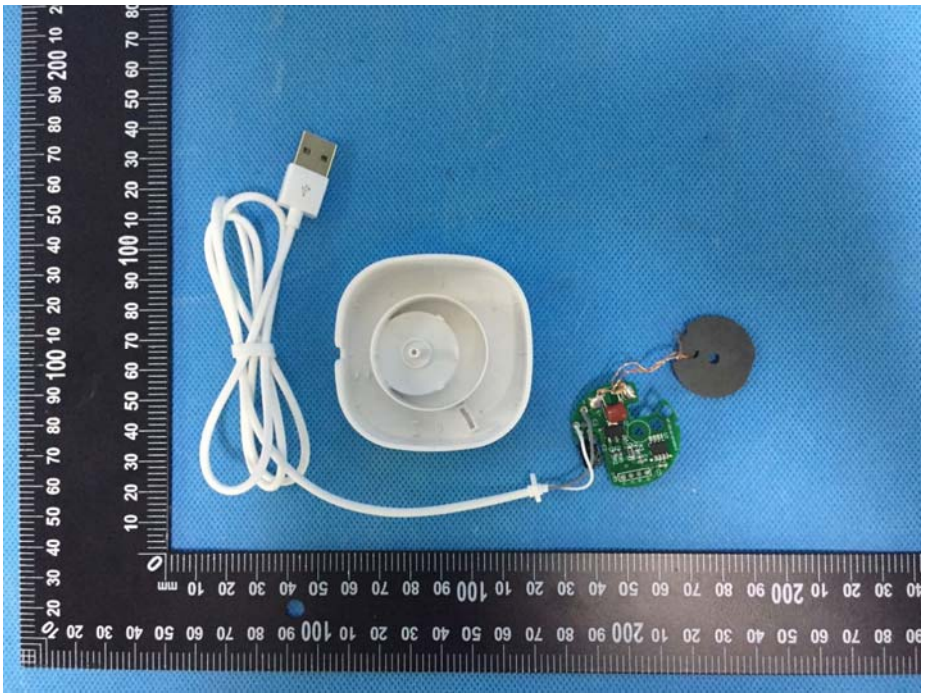


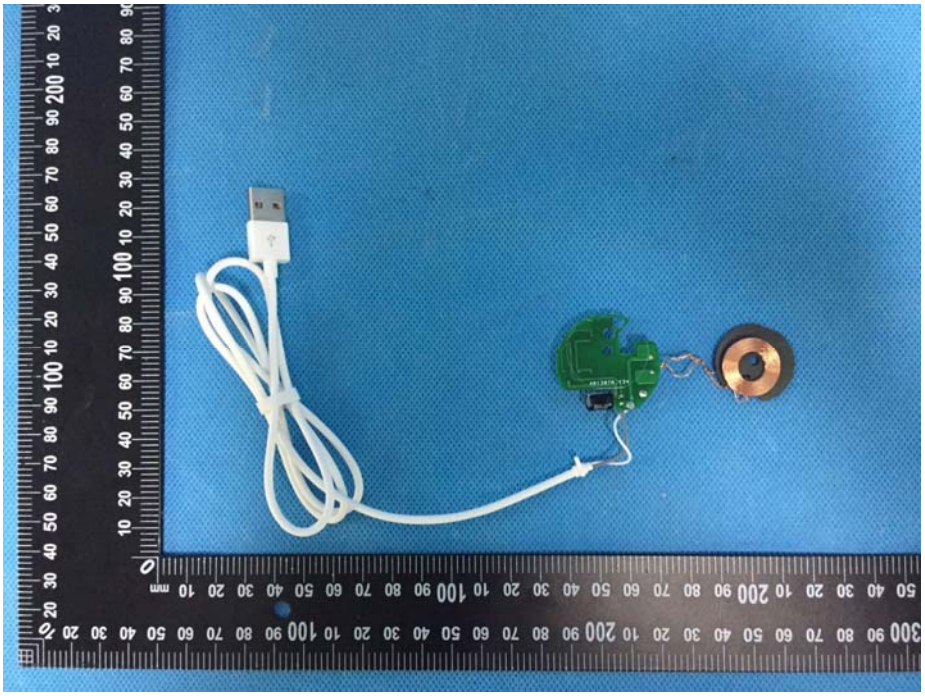


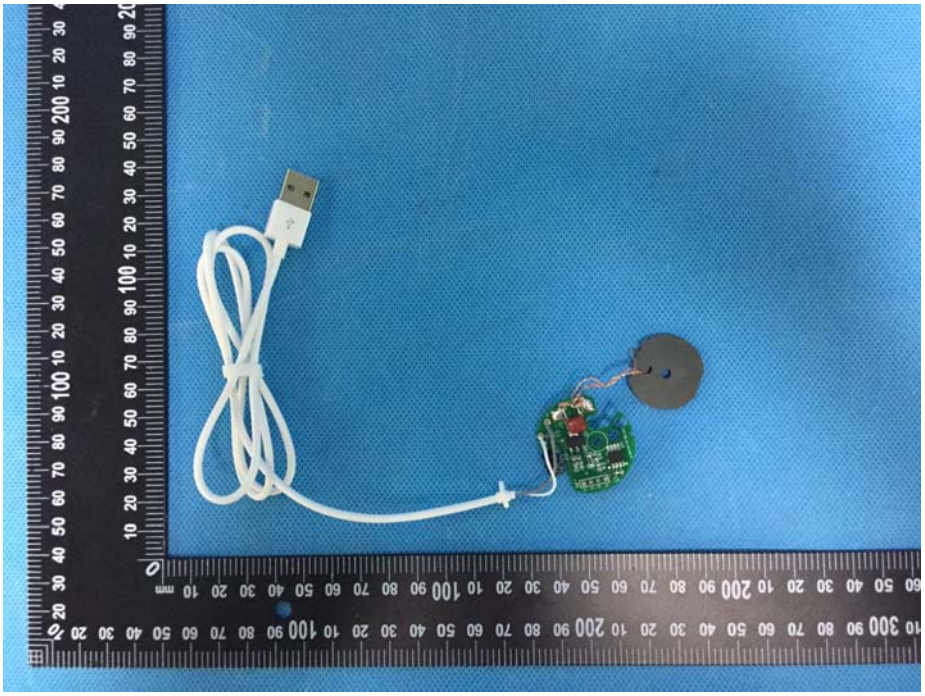


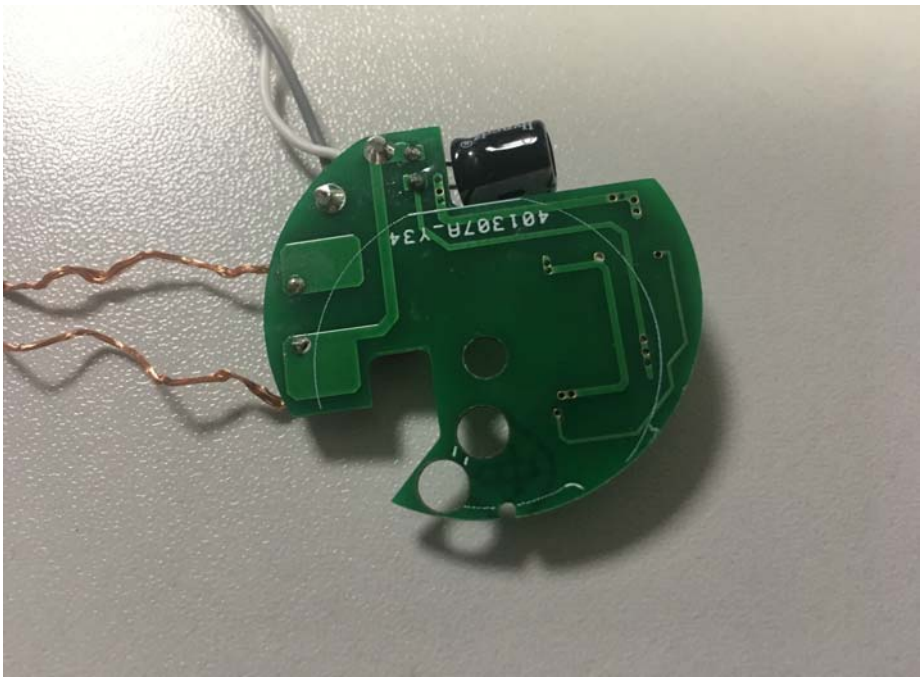


KS-2 the base of charging





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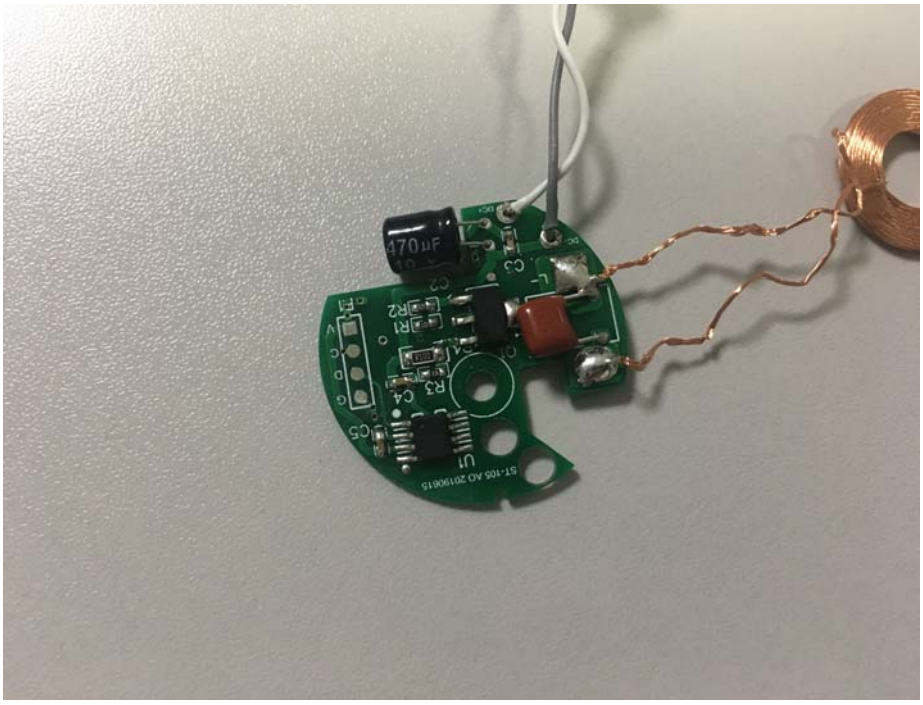
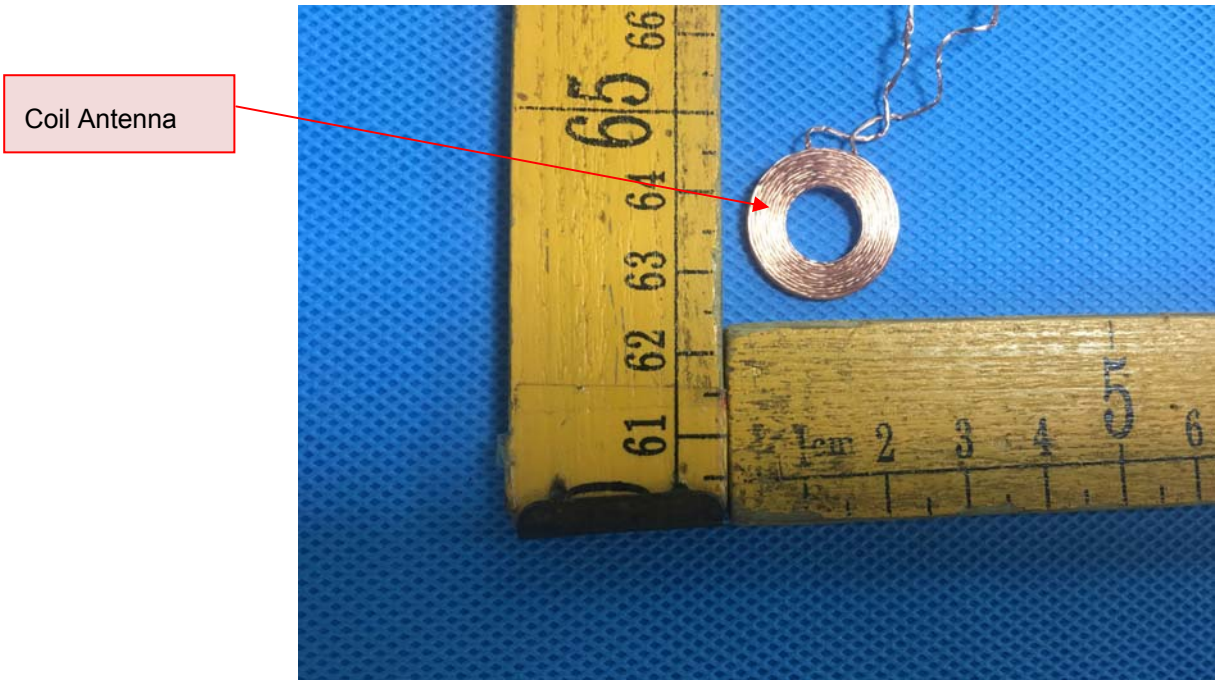
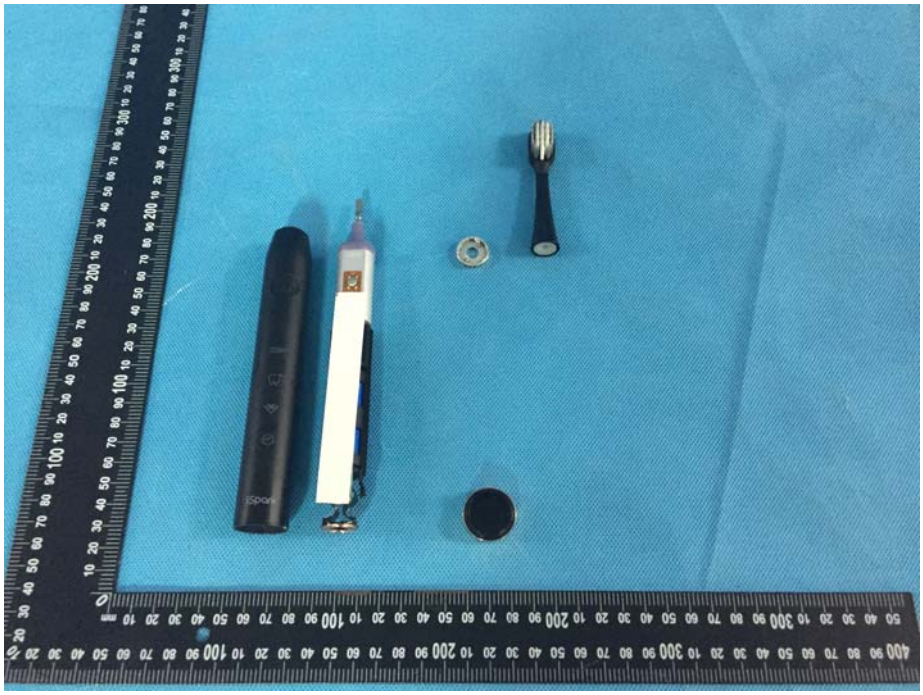
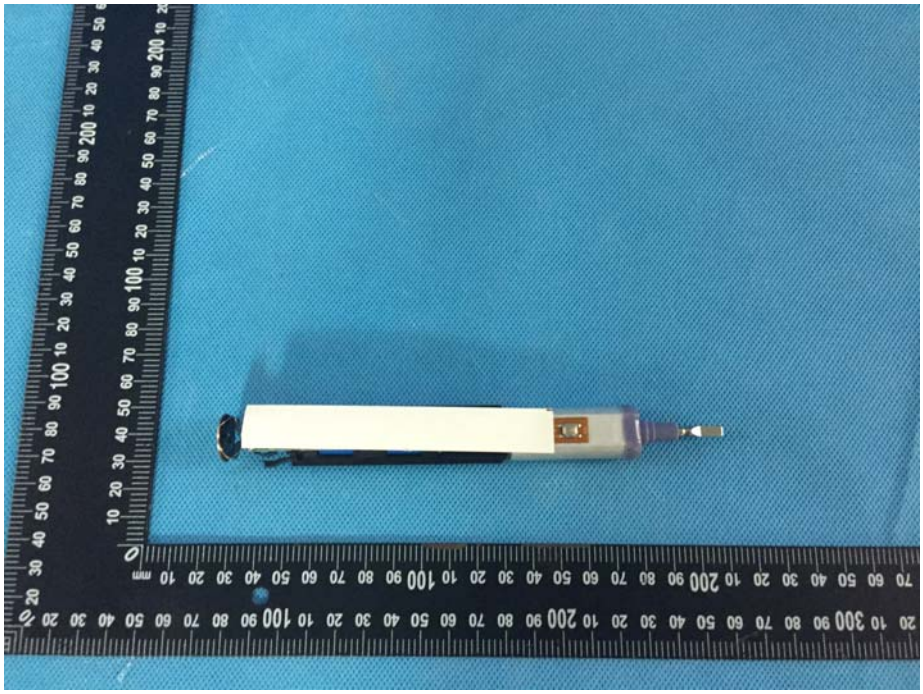
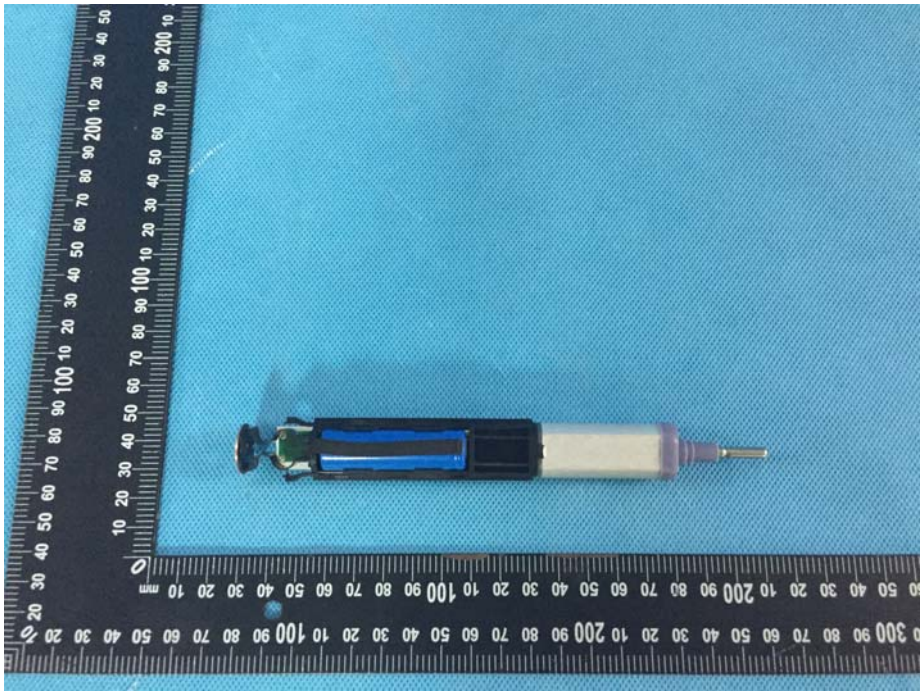

470μF
C5
L
C2
R1
R2
R4
R3
C4
C6
U1

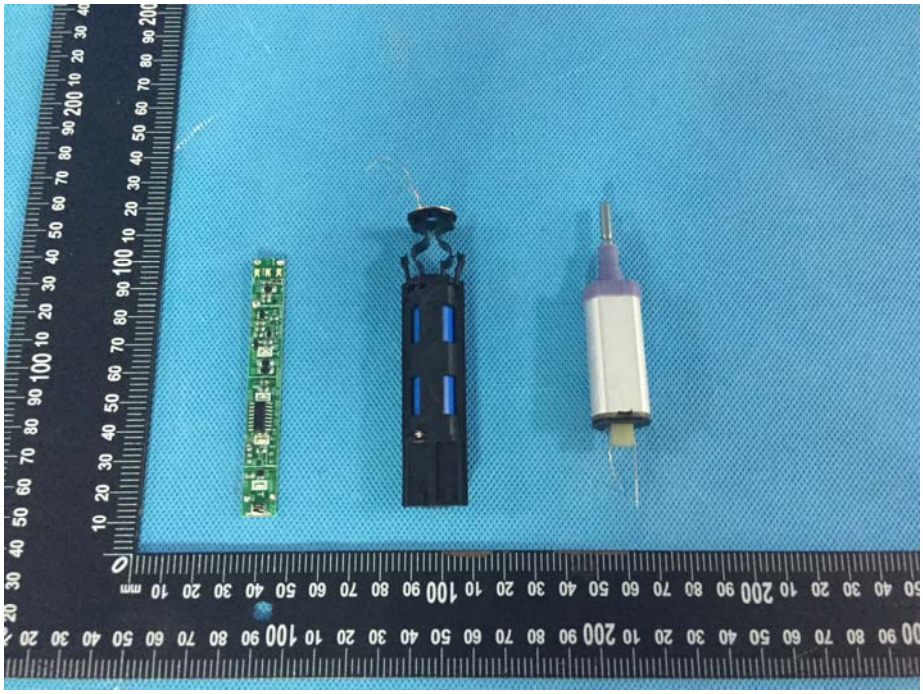


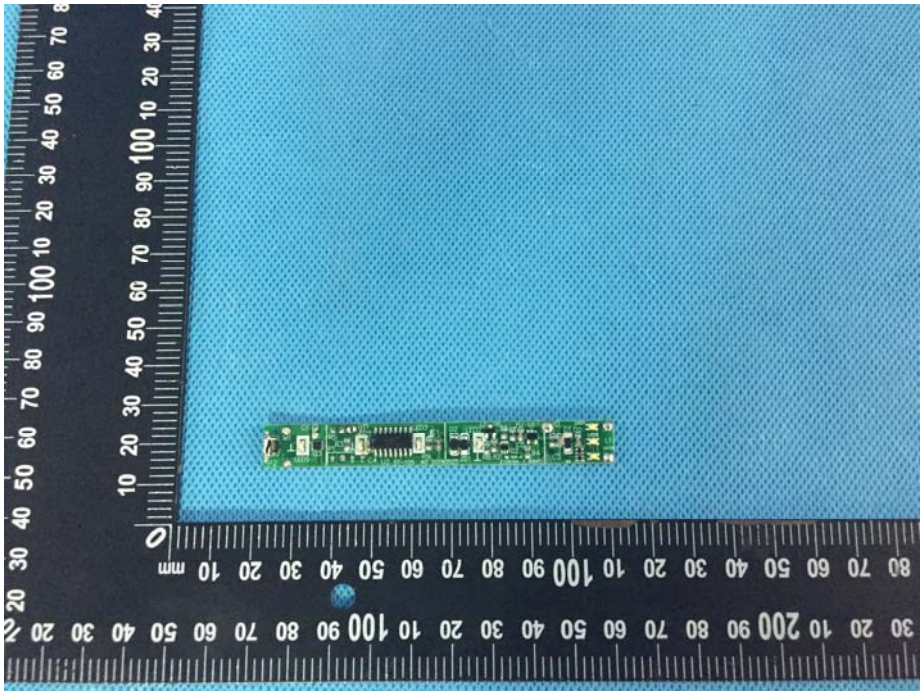
For model: KS-1

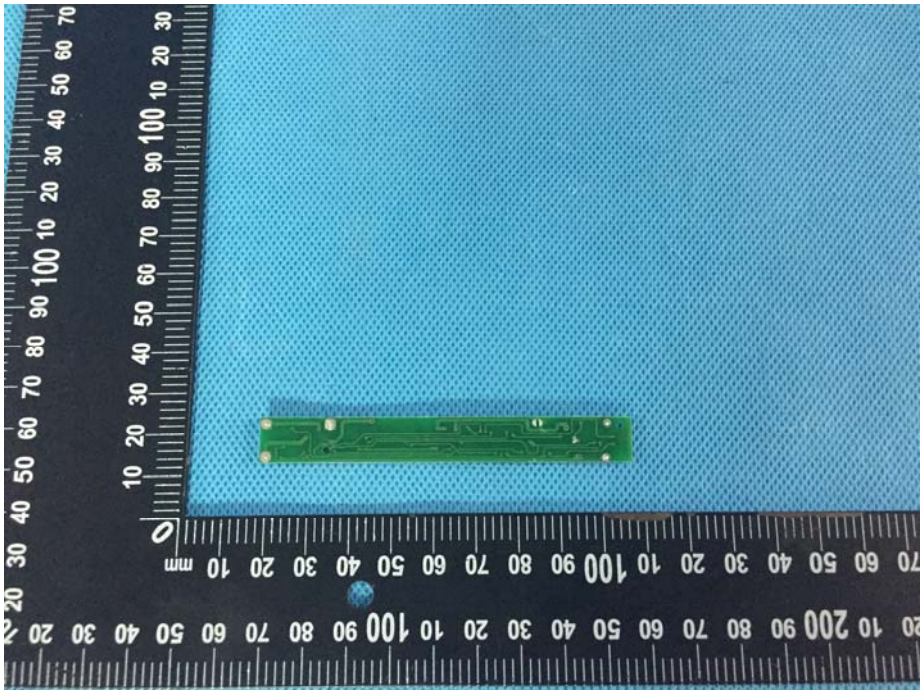


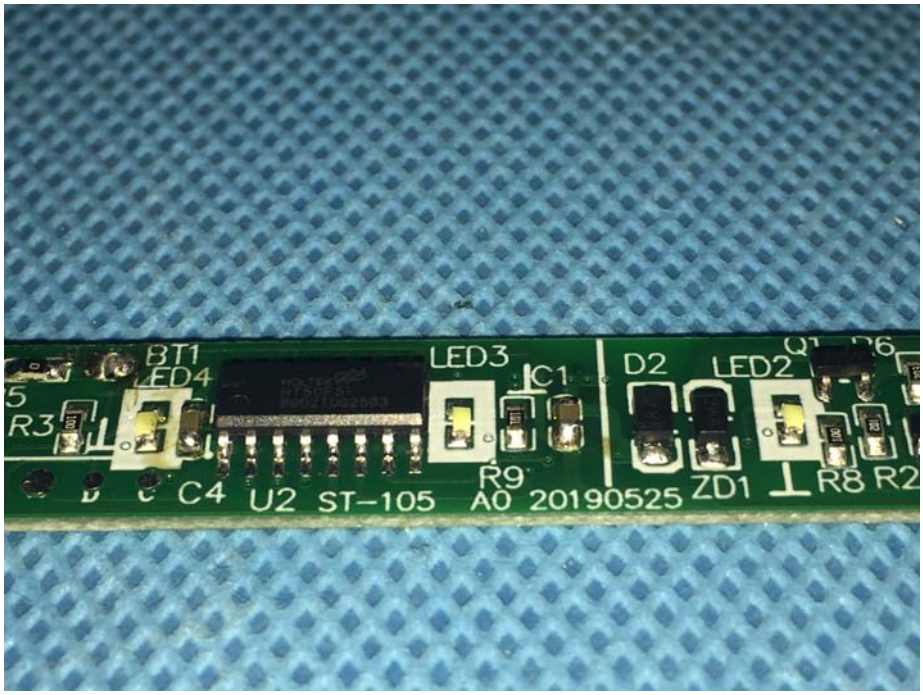











BT1
LED4
LED3
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D2
LED2
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R9
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A0
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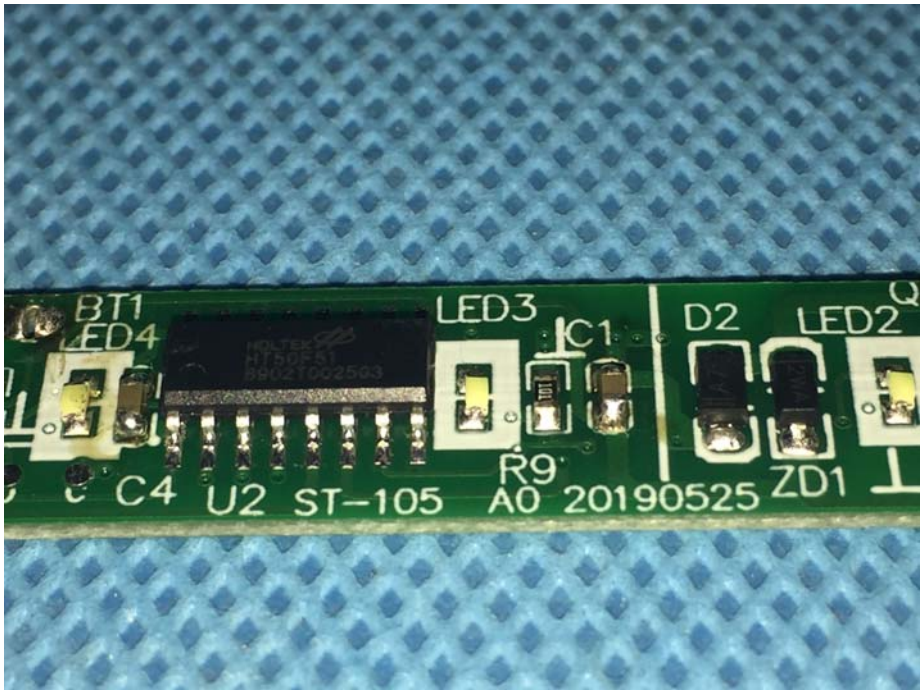

======End of Report======