TEST REPORT

Reference No......	:	WTS18S11127947W
FCC ID.....	:	2AL7Q-GD-10T
Applicant.....	:	ShenZhen EBELONG Technology Co., Ltd
Address.....	:	ShenZhen Wisdom Innovation Center Suite A.607, Qianjin 2nd Road, Baoan District, ShenZhen, GuangDong, China
Manufacturer.....	:	ShenZhen EBELONG Technology Co., Ltd
Address.....	:	ShenZhen Wisdom Innovation Center Suite A.607, Qianjin 2nd Road, Baoan District, ShenZhen, GuangDong, China
Product.....	:	Wireless Switch Transmitter
Model(s).....	:	GD-10T, ES2154, ES2254, ES2354, ES2187, ES2287, ES2387, ES2165, ES2265, ES2365, ES2111, ES2211, ES2311
Standards.....	:	FCC CFR47 Part 15 Section 15.231: 2018
Date of Receipt sample....	:	2018-11-02
Date of Test.....	:	2018-11-02 to 2018-11-06
Date of Issue.....	:	2018-11-06
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.

Prepared By:
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Compiled by:

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Approved by:

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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 \ DOC \ VOC	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 Canada Registration No.: 7760A

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 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S11127947W	2018-11-02	2018-11-02 to 2018-11-06	2018-11-06	original	-	Valid

3 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.231(a)	PASS
Periodic Operation	15.231(a)	PASS
Emission Bandwidth	15.231(c)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

4 Contents

5 General Information

5.1 General Description of E.U.T

Product:	Wireless Switch Transmitter
Model(s):	GD-10T, ES2154, ES2254, ES2354, ES2187, ES2287, ES2387, ES2165, ES2265, ES2365, ES2111, ES2211, ES2311
Model descriptions:	Only the colors, number of the buttons are different, the others are all the same, the model GD-10T is the tested sample.
Type of Modulation:	FSK
Frequency Range:	433.32 MHz
Antenna installation:	Integrated Antenna

5.2 Details of E.U.T

Rating(s): N/A

5.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Lower channel	Middle channel	Upper channel
Transmitting	/	433.32MHz	/

6 Equipment Used during Test

6.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP	100091	2018.04.20	2019.04.19
2	Amplifier	Agilent	8447D	2944A10178	2018.01.10	2019.01.09
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2018.05.18	2019.05.17
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2018.10.15	2019.10.14
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018.05.18	2019.05.17
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2018.10.24	2019.10.23
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018.04.07	2019.04.06
8	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2018.04.07	2019.04.06
9	Signal Generater	R&S	SMP22	100102	2018.09.15	2019.09.14
3m Semi-anechoic Chamber for Radiation Emissions(TDK)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2018.04.20	2019.04.19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018.04.19	2019.04.18
3	Amplifier	ANRITSU	MH648A	M43381	2018.04.20	2019.04.19
4	Cable	HUBER+SUHNER	CBL2	525178	2018.04.20	2019.04.19
5	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2018.04.17	2019.04.16
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMI Test Receiver	R&S	ESCI	100947	2018.09.15	2019.09.14
2	LISN	R&S	ENV216	100115	2018.09.15	2019.09.14
3	Cable	Top	TYPE16(3.5M)	-	2018.09.15	2019.09.14

6.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conducted Emissions	150kHz~30MHz	±3.64dB	(1)
Radiated Spurious Emissions	30MHz~1000MHz	±5.03dB	(1)
	1000M~5000MHz	± 5.47 dB	(1)
(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

6.3 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 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.231(a)

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Fundamental Frequency (MHz)	Field Strength of Fundamental (uV/m)	Field Strength of Fundamental (dBuV/m)	Field Strength of Spurious Emission (uV/m)	Field Strength of Spurious Emission (dBuV/m)
44.66-40.70	2250	67	225	47
70-130	1250	62	125	42
130-174	1250 to 3750	62 to 71.48	125 to 375	42 to 51.48
174-260	3750	71.48	375	51.48
260-470	3750 to 12500	71.48 to 81.94	375 to 1250	51.48 to 61.94
Above 470	12500	81.94	1250	61.94
aa** linear interpolations				

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

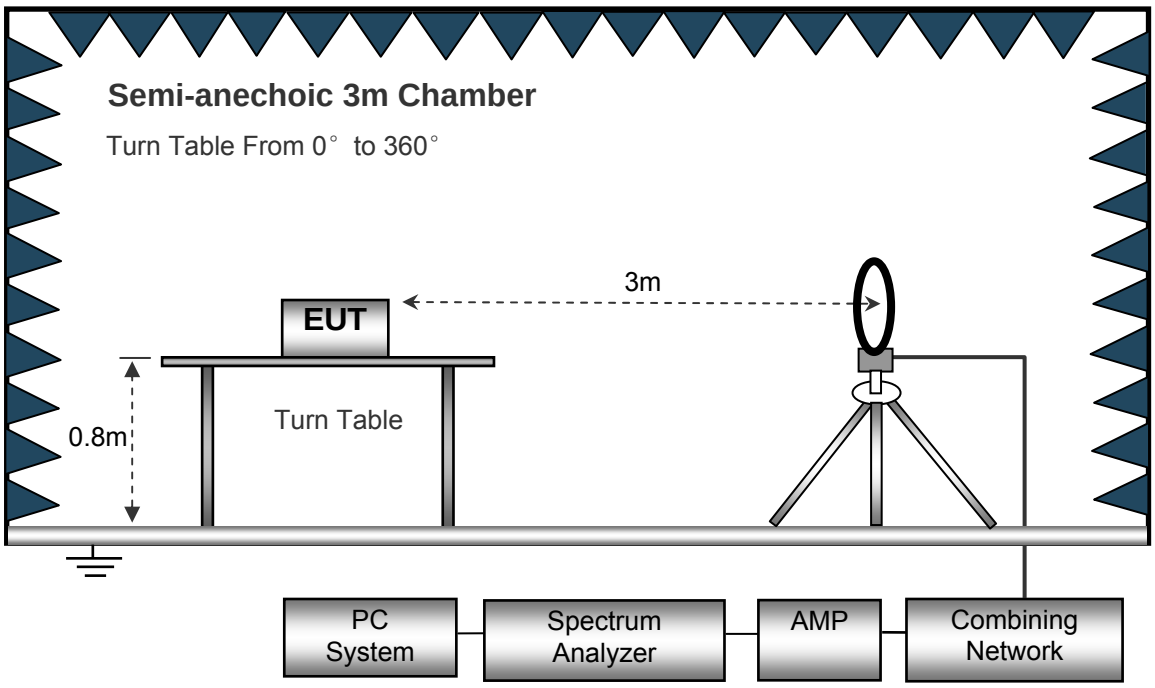
EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

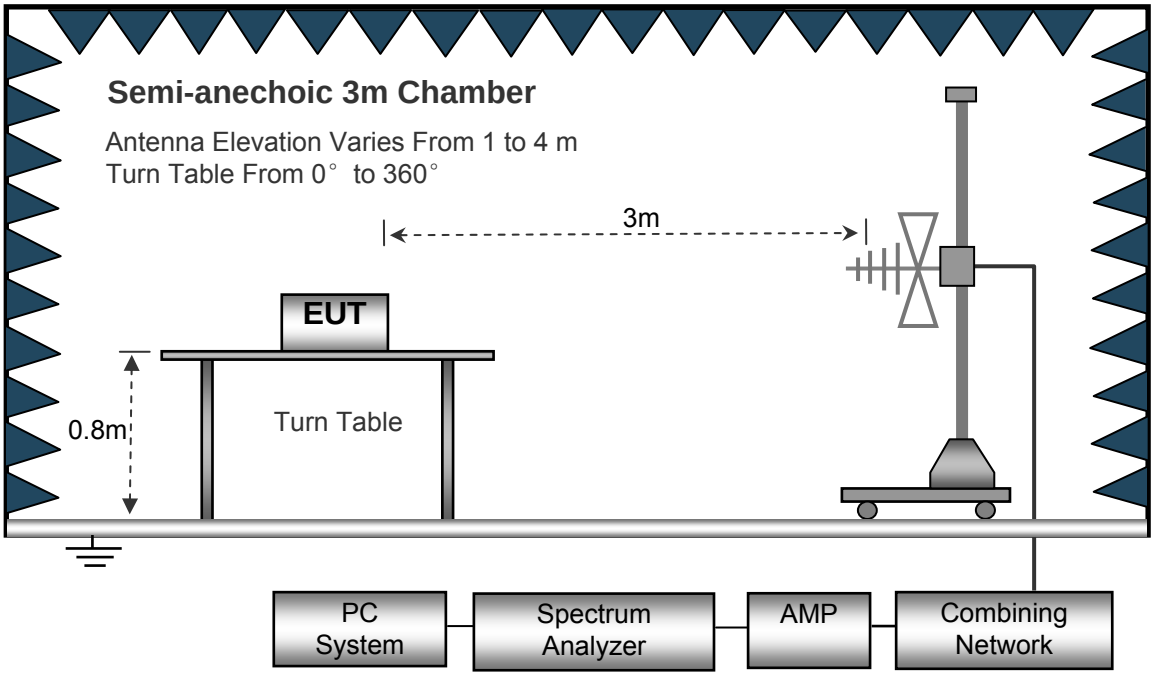
7.2 Test Setup

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

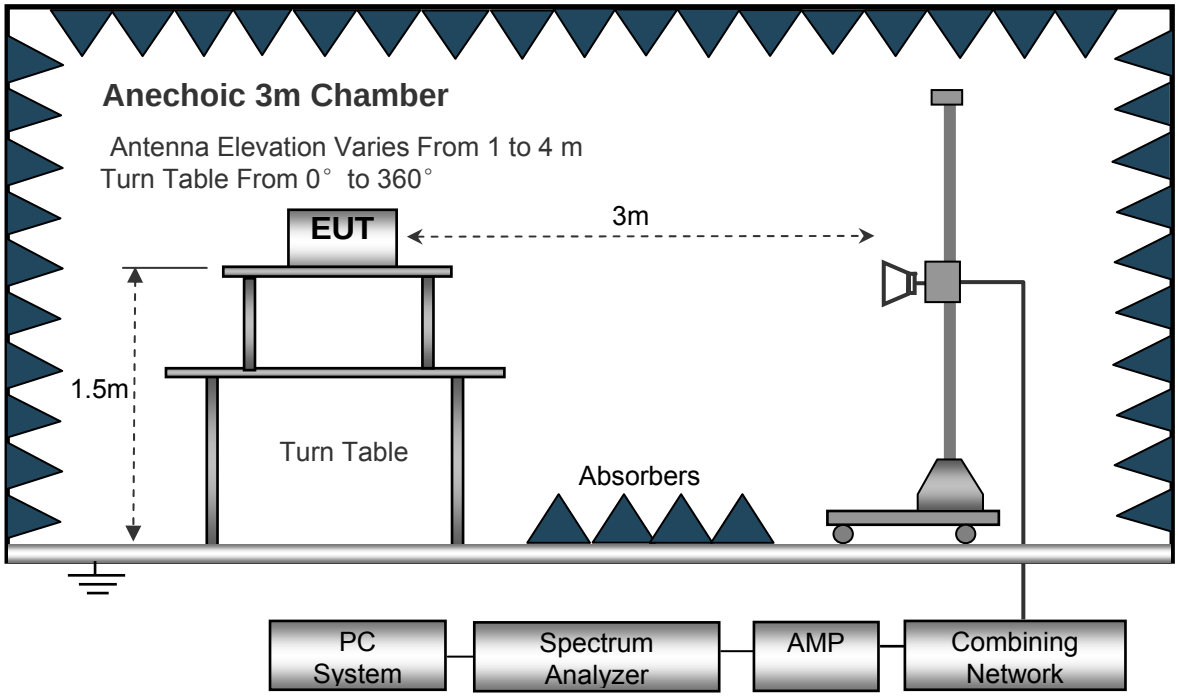
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 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

Above 1GHz

Sweep Speed .....Auto
Detector .....PK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz

7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above1GHz, the EUT is 1.5m 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.

7.5 Summary of Test Results

Test Frequency: 9KHz~ 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 6GHz

Frequency	Receiver Reading (PK)	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude (PK)	FCC Part 15.231/15.209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
433.32	89.36	156	1.5	H	-7.26	82.10	100.81	-18.71
433.32	75.85	208	1.8	V	-7.26	68.59	100.81	-32.22
866.64	42.81	255	1.4	H	0.04	42.85	80.81	-37.96
866.64	41.29	44	1.4	V	0.04	41.33	80.81	-39.48
1299.96	49.42	95	1.2	H	-16.75	32.67	80.81	-48.14
1299.96	52.36	235	1.7	V	-16.75	35.61	80.81	-45.20
1733.28	45.77	150	2.0	H	-15.03	30.75	80.81	-50.06
1733.28	47.02	274	1.9	V	-15.03	31.99	80.81	-48.82

AV = Peak +20Log$_{10}$(duty cycle) =PK+(-21.45) [refer to section 9 for more detail]

Frequency	PK	RX Antenna Polar	Duty cycle Factor	Calculated AV	FCC Part 15.231/209/205	
					Limit	Margin
(MHz)	(dBμV/m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
433.32	82.10	H	-21.45	60.65	80.81	-20.16
433.32	68.59	V	-21.45	47.14	80.81	-33.67
866.64	42.85	H	-21.45	21.40	60.81	-39.41
866.64	41.33	V	-21.45	19.88	60.81	-40.93
1299.96	32.67	H	-21.45	11.22	60.81	-49.59
1299.96	35.61	V	-21.45	14.16	60.81	-46.65
1733.28	30.75	H	-21.45	9.30	60.81	-51.51
1733.28	31.99	V	-21.45	10.54	60.81	-50.27

8 Periodic Operation

The duty cycle was determined by the following equation:

To calculate the actual field intensity, The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * %

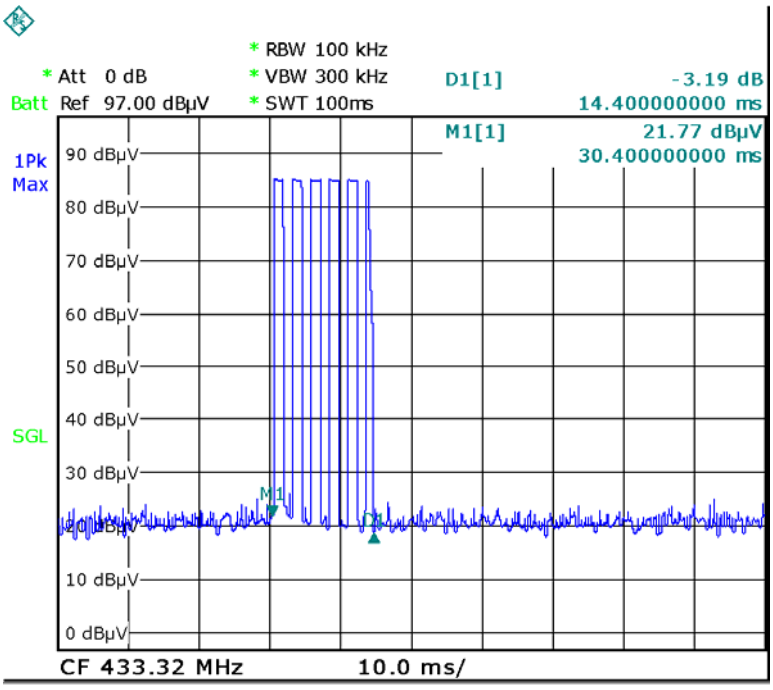
Duty Cycle Correction Factor(dB)=20 * Log_{10}(Duty Cycle(%))

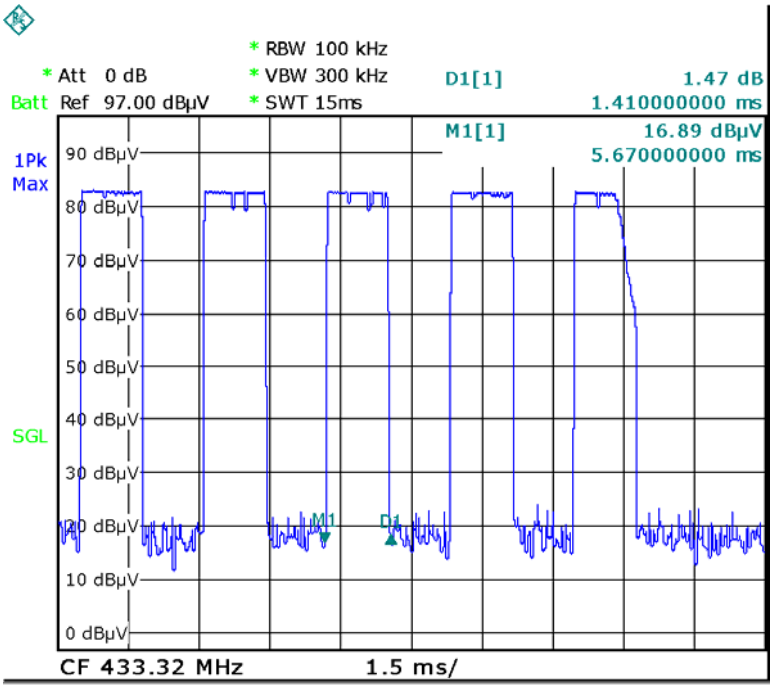
Total transmission time(ms)	1.41*6=8.46
Length of a complete transmission period(ms)	100
Duty Cycle(%)	8.46
Duty Cycle Correction Factor(dB)	-21.45

Refer to the duty cycle plot (as below),This device meets the FCC requirement.

Length of a complete pulse train:

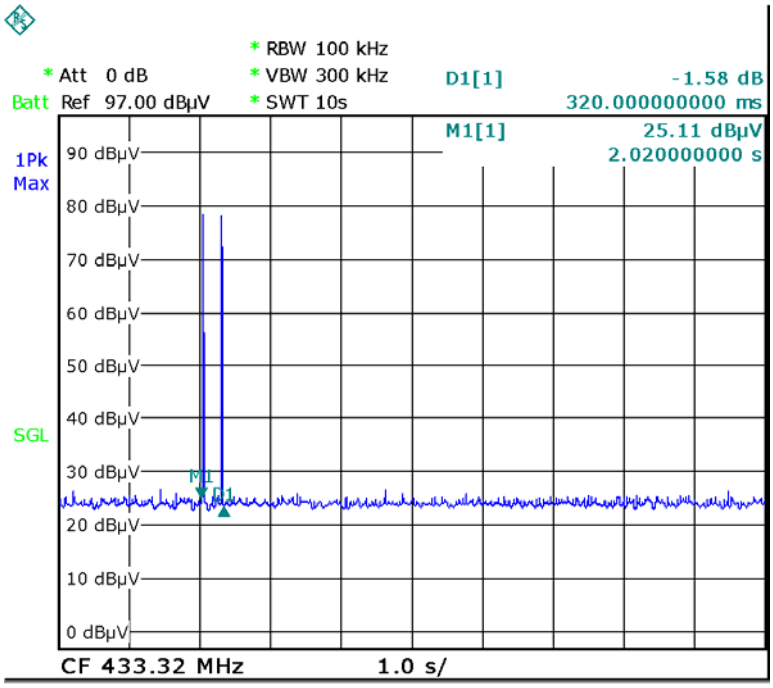
Remark: FCC part15.35(c) required that a complete pulse train is more than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.





FCC Part15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2)A transmitter activated automatically shall cease transmission within 5 seconds after activation.



9 Emission Bandwidth

Test Requirement: FCC Part15.231(c)

Test Method: FCC Part15.231(c)

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.

9.1 Test Procedure

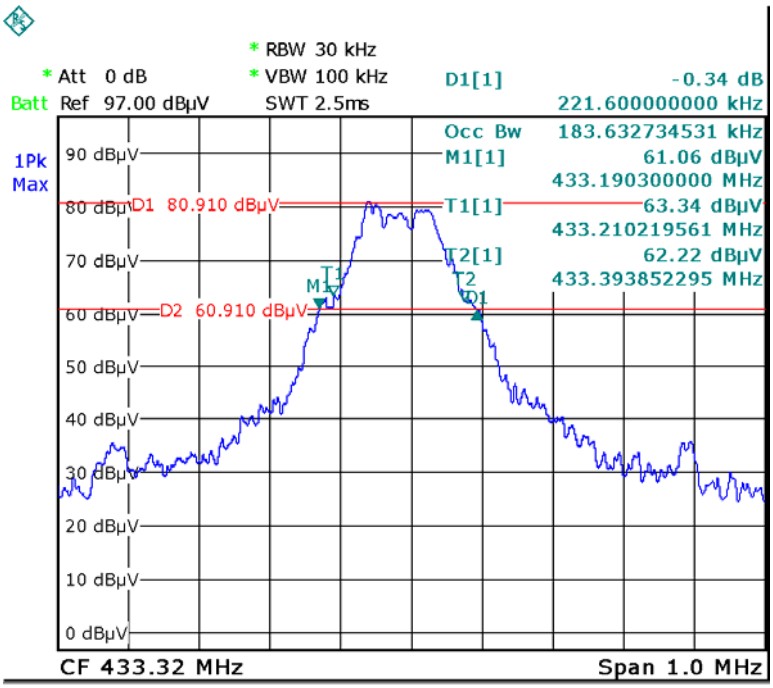
1. The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode, then test it.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 30kHz RBW and 100kHz VBW. The 20 dB bandwidth was recorded.

9.2 Test Result

Frequency (MHz)	20dB Bandwidth Emission(KHz)	Limit (KHz)	Result
433.32	221.60	1083.30	Pass

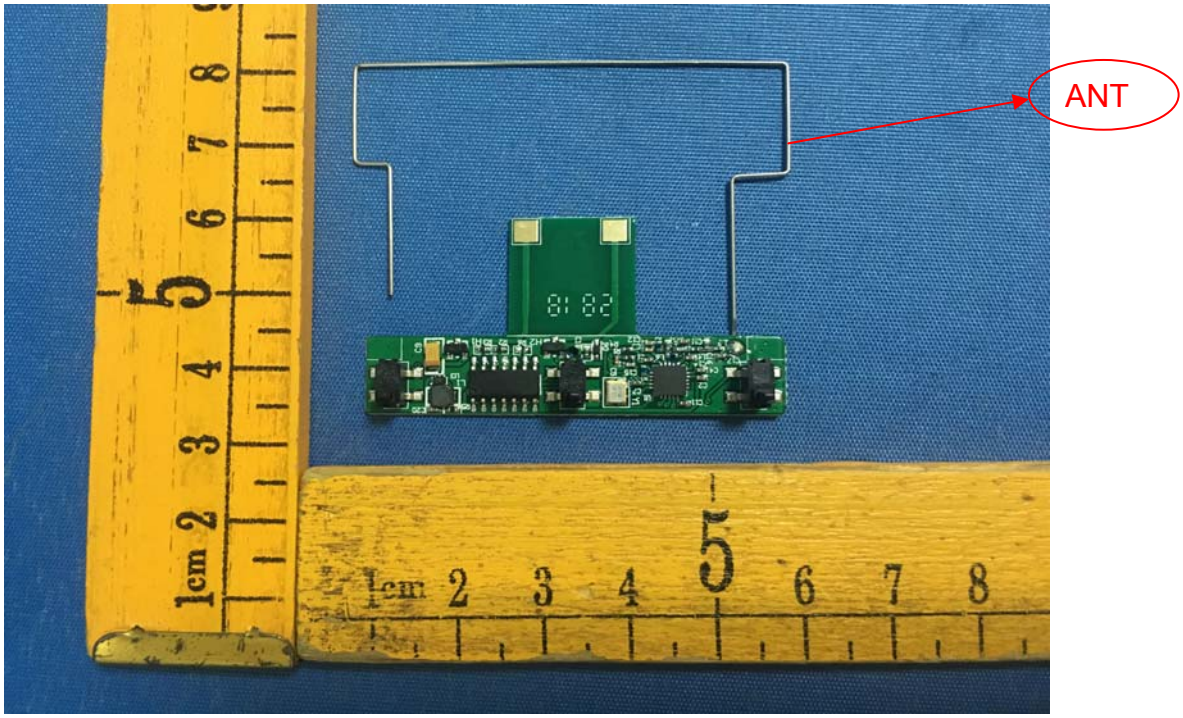
Limit=Center Frequency*0.25%

Test Plot



10 Antenna Requirement

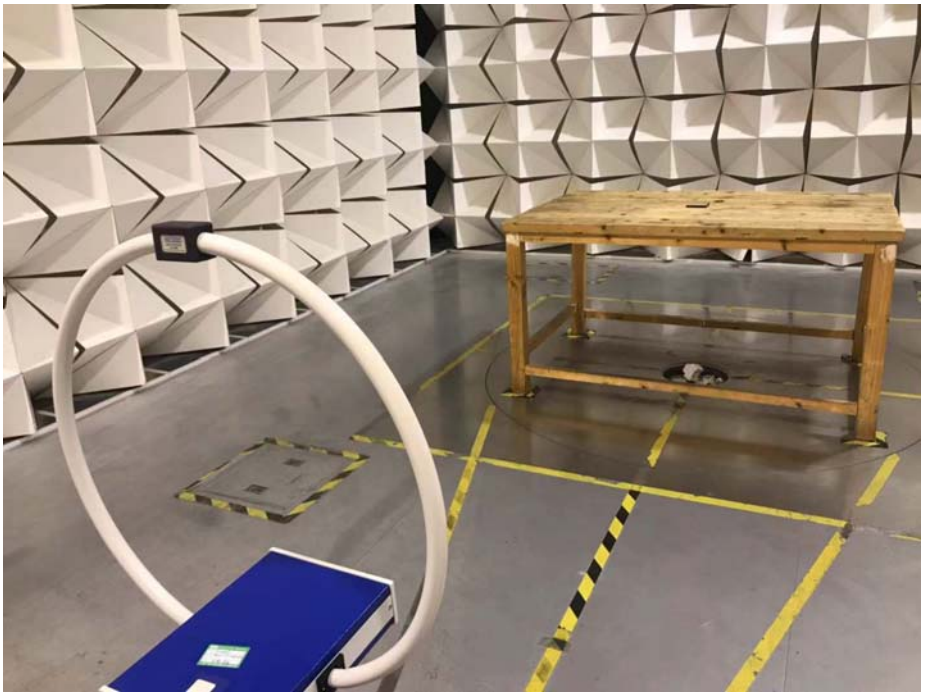
According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product use a Integrated Antenna, it only apply to this model, fulfill the requirement of this section.



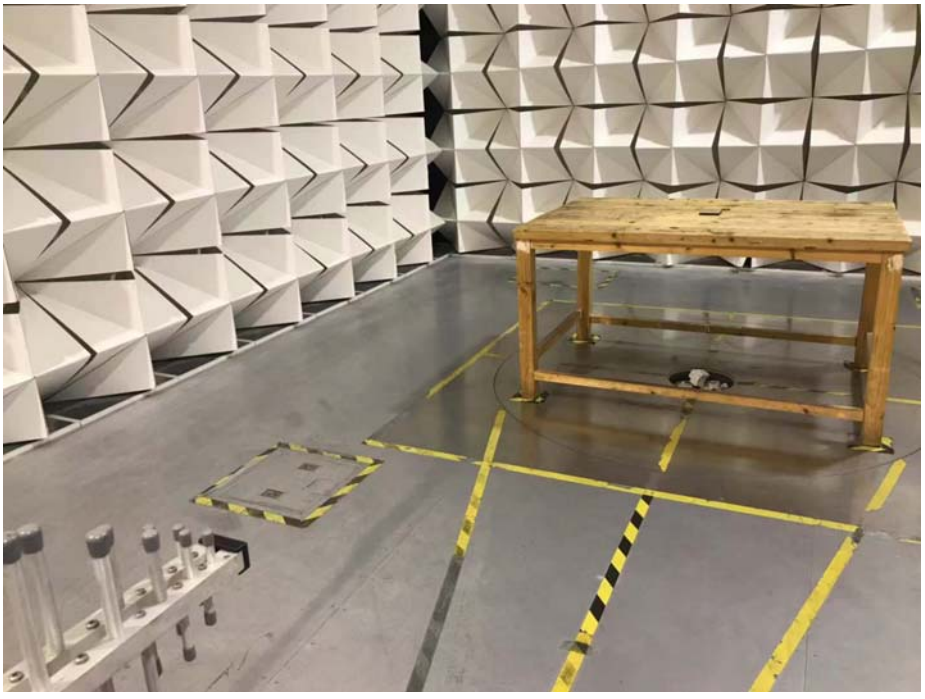
11 Photographs – Test Setup

11.1 Photograph – Radiation Spurious Emission Test Setup

From Below 30MHz



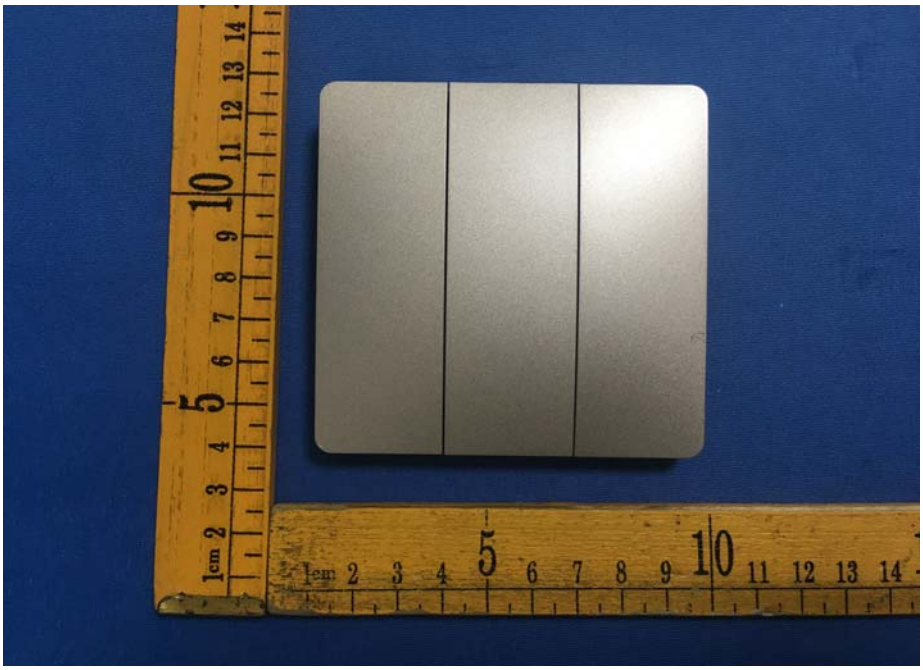
From 30MHz to 1GHz



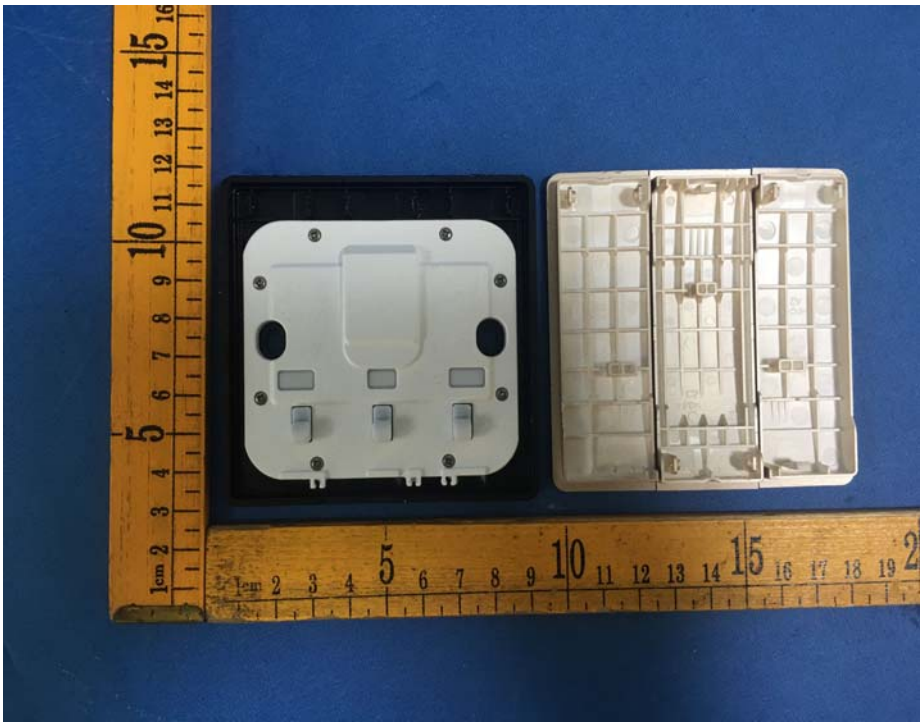
Above 1GHz

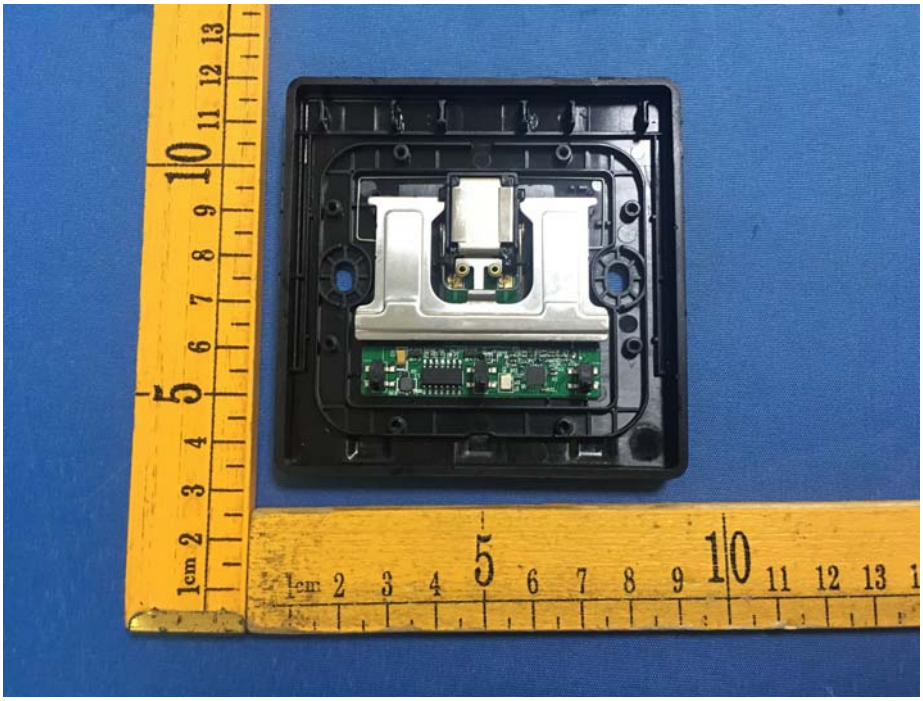
12 Photographs - Constructional Details

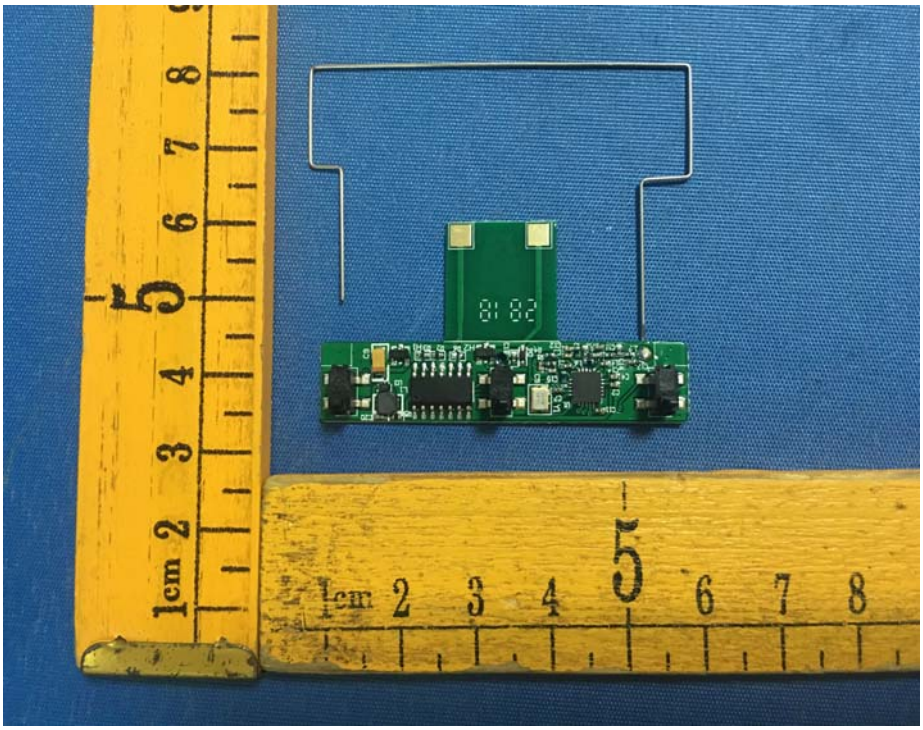
12.1 External Photos

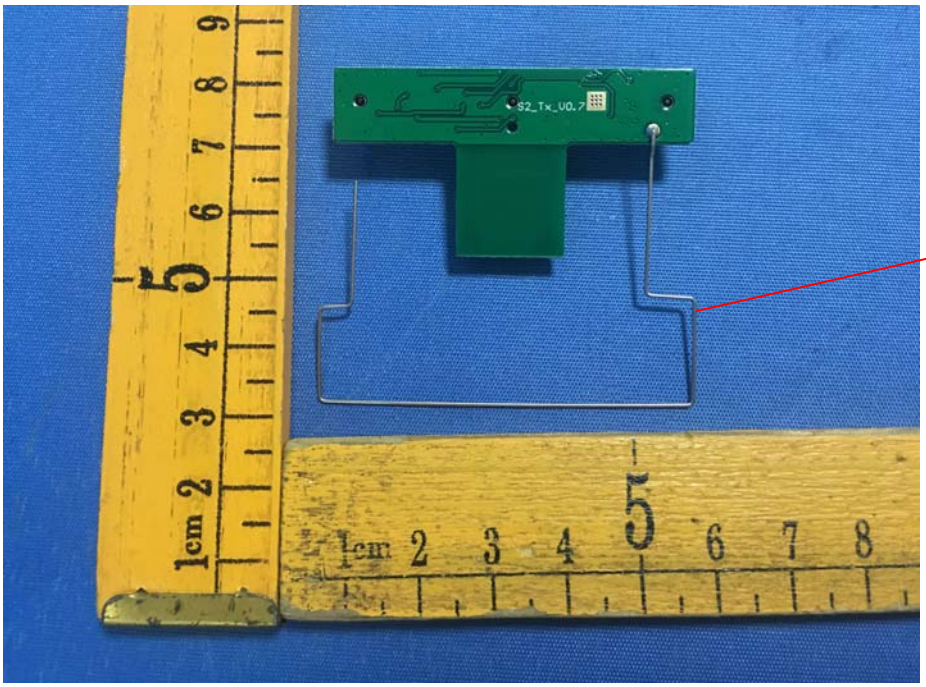


12.2 Internal Photos





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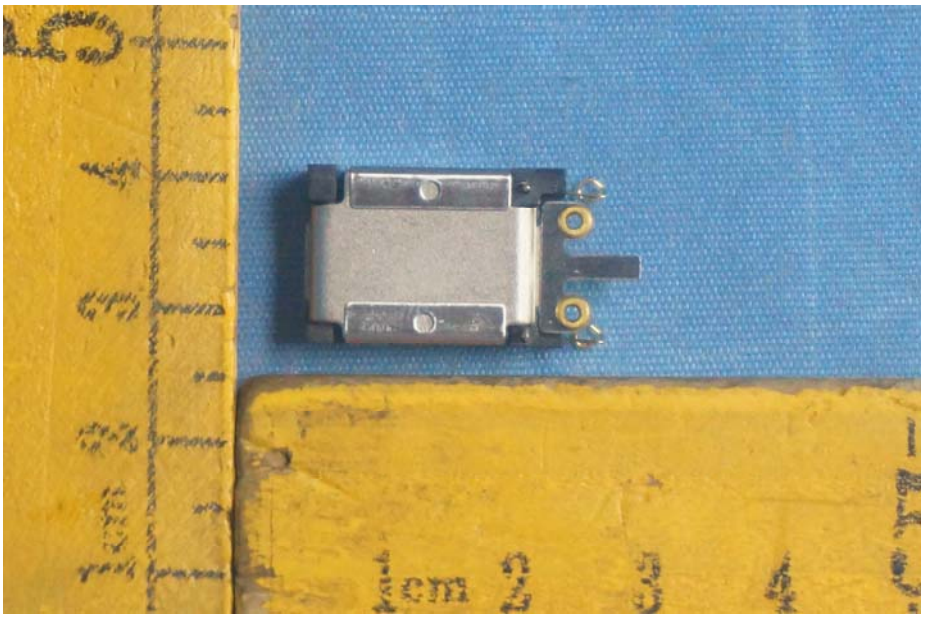

======End of Report======