China

FCC - TEST REPORT

Report Number	:	64.790.16.00489.01	Date of Issue:	April 20, 2016
Model	:	2315-20		
Product Type	:	Inspection Camera		
Applicant	:	Shenzhen Topband Co.,Ltd		
Address	:	Topband Industrial Park,Liyuan Industrial Zone,Shiyan Town,Bao'an District Shenzhen, China		
Manufacturer	:	Shenzhen Topband Co.,Ltd		
Address	:	Topband Industrial Park,LiYuan Industrial Zone,ShiYan Town,Bao'An District Shenzhen, China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	29		

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch issued reports.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

China

1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	502708
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

3 Description of the Equipment Under Test

Product: Inspection Camera

Model no.: 2315-20

FCC ID:2ADDWMSFLEX

Rating:DC 12V (by battery M12 REDLITHIUM)

RF Transmission Frequency: 2414MHz ,2432MHz,2450MHz,2468MHz

Modulation: FM

Antenna Type: Integrated Antenna

Antenna Gain:2dBi

Description of the EUT:
The EUT is Inspection Camera designed as a 2.4G short range devices.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2015 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

China

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
15.207 Conducted emission AC power port			☐	☐	☒
§15.205(a), §15.209(a), §15.249(a), §15.249(c) Field strength of emissions and Restricted bands			☒	☐	☐
FCC §15.215(c) 20dB bandwidth			☒	☐	☐
§15.249(d) Out of band emissions			☒	☐	☐

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

6 General Remarks

Remarks
This submittal(s) (test report) is intended for FCC ID: 2ADDWMSFLEX complies with Section 15.205, 15.209, 15.249, 15.215 of the FCC Part 15, Subpart C Rules.

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:	Feb 15, 2016
Testing Start Date:	Feb 16, 2016
Testing End Date:	Mar 30, 2016

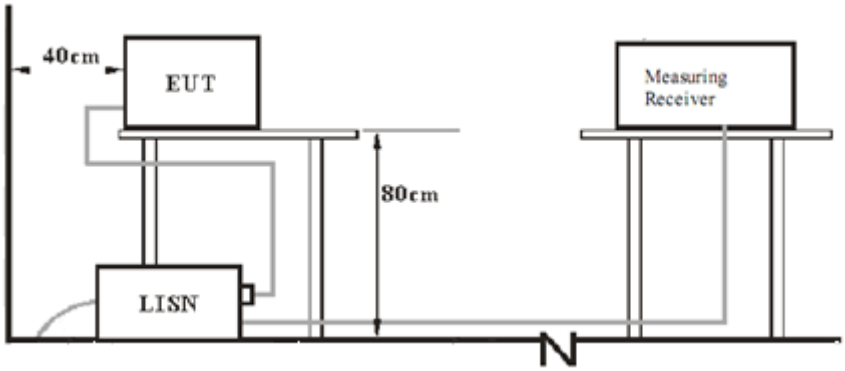
- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by:	Prepared by:
Celia Xiang	Peter Jia

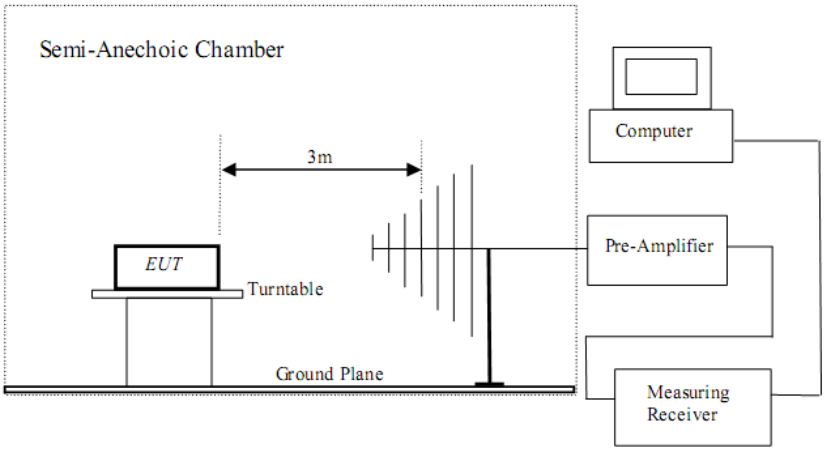
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

7 Test setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

8 Technical Requirement

8.1 Field strength of emissions and Restricted bands

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured ,RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limits

According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c), Field strength limits are specified at a distance of 3 meters.
According to §15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
According to §15.205 and Unwanted emissions falling into restricted bands in §15.205 (a) Table 3 shall comply with the limits specified in §15.209.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Field strength of fundamental

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode.

Frequency (MHz)	PK (dBµV/m)	AV (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
2414	90.52	--	114	23.48	H
2414	--	81.3	94	12.7	H
2414	95.7	--	114	18.3	V
2414	--	81.88	94	12.12	V
2450	87.77	--	114	26.23	H
2450	--	74.2	94	19.8	H
2450	94.06	--	114	19.94	V
2450	--	75.16	94	18.84	V
2468	94.59	--	114	19.41	H
2468	--	79.2	94	14.8	H
2468	94.53	--	114	19.47	V
2468	--	81.44	94	12.56	V

Field strength of emissions and Restricted bands

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2414MHz.
Comment: 30-1000MHz

Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
119.994444	23.28	43.50	20.22	H	-30.6
215.970556	33.00	43.50	10.50	H	-28.6
335.981111	32.28	46.00	13.72	H	-24.9
600.036667	31.11	46.00	14.89	H	-19.6
215.970556	25.25	43.50	18.25	V	-28.6
312.000556	24.77	46.00	21.23	V	-24.3
876.756111	34.19	46.00	11.81	V	-16.0

Field strength of emissions and Restricted bands

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2450MHz.
Comment: 30-1000MHz

Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
119.994444	22.15	43.50	21.35	H	-30.6
215.970556	36.22	43.50	7.28	H	-28.6
312.000556	30.70	46.00	15.30	H	-24.3
408.030556	31.13	46.00	14.87	H	-23.5
46.543889	18.42	40.00	21.58	V	-25.3
336.035000	22.81	46.00	23.19	V	-24.9
879.881667	33.56	46.00	12.44	V	-15.9

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Field strength of emissions and Restricted bands
EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2468MHz.
Comment: 30-1000MHz

Frequency (MHz)	QP (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Pol	Corr. (dB)
119.994444	21.61	43.50	21.89	H	-30.6
144.028889	24.29	43.50	19.21	H	-32.5
215.970556	35.55	43.50	7.95	H	-28.6
336.035000	30.19	46.00	15.81	H	-24.9
47.513889	18.26	40.00	21.74	V	-25.6
216.024444	18.63	46.00	27.37	V	-28.6
312.000556	21.61	46.00	24.39	V	-24.3
873.361111	32.91	46.00	13.09	V	-16.1

Field strength of emissions and Restricted bands

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2414MHz.
Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Pol	Corr. (dB)
1254.666667	32.77	74.00	41.23	H	-12.2
2389.533333	38.95	74.00	35.05	H	-6.6
3865.500000	33.73	74.00	40.27	H	-0.6
7003.500000	38.24	74.00	35.76	H	5.6
15034.00000	47.51	74.00	26.49	H	18.3
17732.00000	50.86	74.00	23.14	H	23.1
1250.600000	35.41	74.00	38.59	V	-12.2
2389.466667	42.85	74.00	31.15	V	-6.6
5058.000000	37.06	74.00	36.94	V	2.2
8094.500000	41.21	74.00	32.79	V	7.3
17879.50000	51.29	74.00	22.71	V	23.2

Field strength of emissions and Restricted bands

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2450MHz.
Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Pol	Corr. (dB)
1252.200000	32.84	74.00	41.16	H	-12.2
2425.466667	37.53	74.00	36.47	H	-6.5
4903.000000	41.64	74.00	32.36	H	1.9
7346.000000	56.48	74.00	17.52	H	5.8
9789.000000	55.18	74.00	18.82	H	8.2
1255.200000	34.45	74.00	39.55	V	-12.2
2426.266667	44.52	74.00	29.48	V	-6.5
4902.500000	44.15	74.00	29.85	V	1.9
7353.000000	55.02	74.00	18.98	V	5.9
9795.500000	52.21	74.00	21.79	V	8.2

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Field strength of emissions and Restricted bands

EUT: Inspection Camera
M/N: 2315-20
Operating Condition: continuously transmitting mode at 2468MHz.
Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV /m)	Margin (dB)	Pol	Corr. (dB)
1252.800000	33.49	74.00	40.51	H	-12.2
2476.066667	67.44	74.00	6.56	H	-6.2
7400.000000	43.94	74.00	30.06	H	6.0
9869.000000	43.28	74.00	30.72	H	8.8
17909.00000	50.54	74.00	23.46	H	23.2
1251.333333	34.30	74.00	39.70	V	-12.2
2443.400000	41.92	74.00	32.08	V	-6.4
2490.133333	44.85	74.00	29.15	V	-6.1
4933.000000	40.48	74.00	33.52	V	1.9
7400.000000	47.02	74.00	26.98	V	6.0
17953.50000	52.11	74.00	21.89	V	23.2

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

8.2 20dB Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

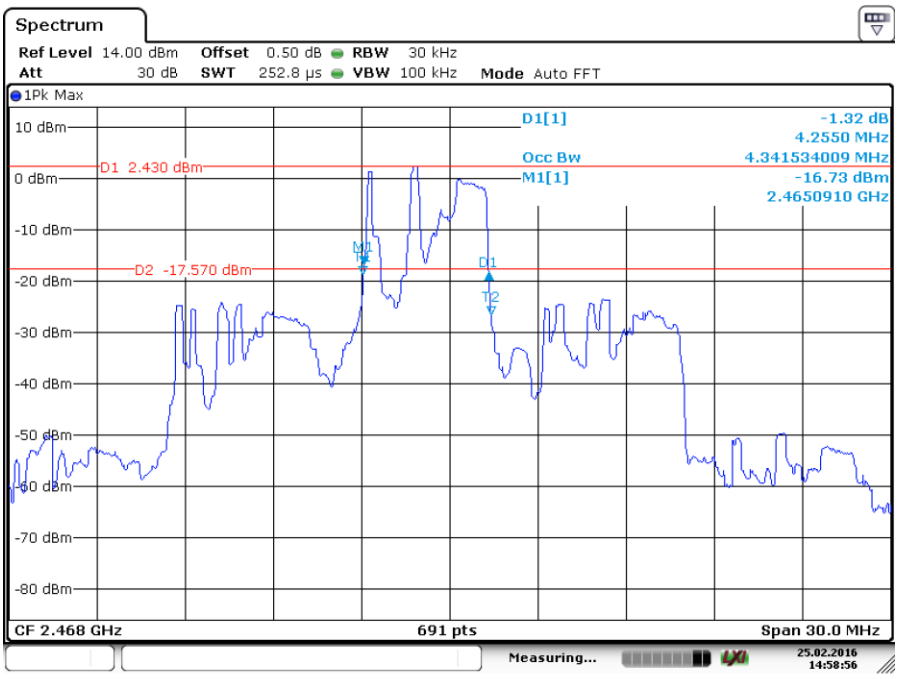
Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

20dB Bandwidth

Channel	Frequency	Occupied Channel Bandwidth (MHz)	Measured Frequency		Limit
			FL(MHz)	FH(MHz)	
Lowest	2414	4.211	2411.525	--	FL>2400MHz and FH<2483.5MHz
Highest	2468	4.342	--	2469.346	



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

China

8.3 Band edge testing

Test Method

1 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, Sweep = auto, Detector function = peak, Trace = max hold
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section. .
4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

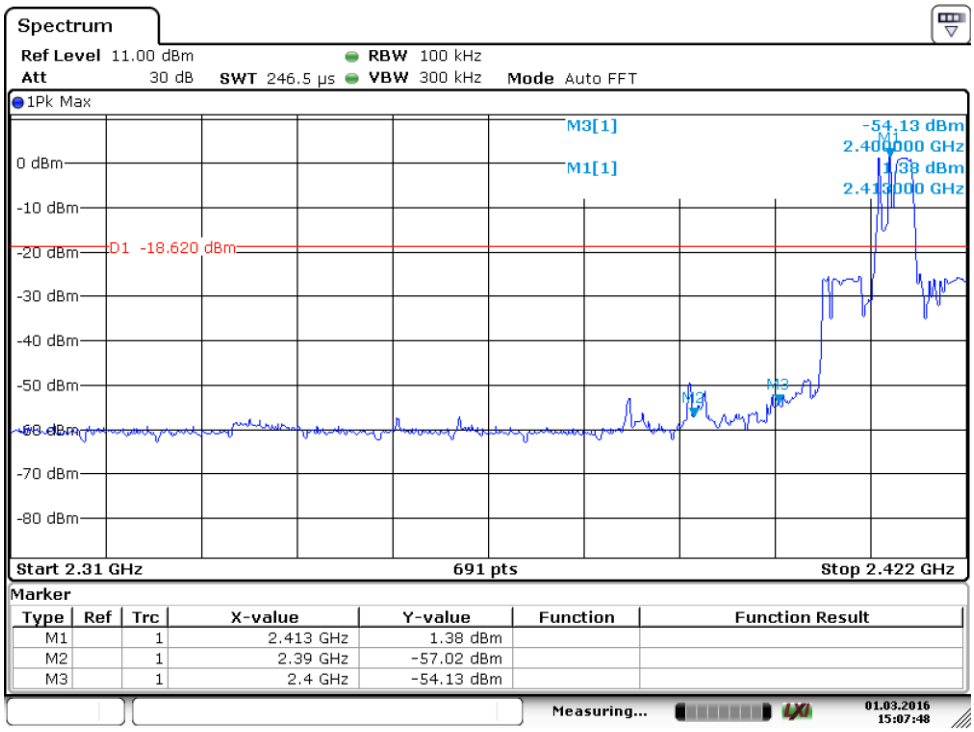
Limit:

According to §15.249(d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

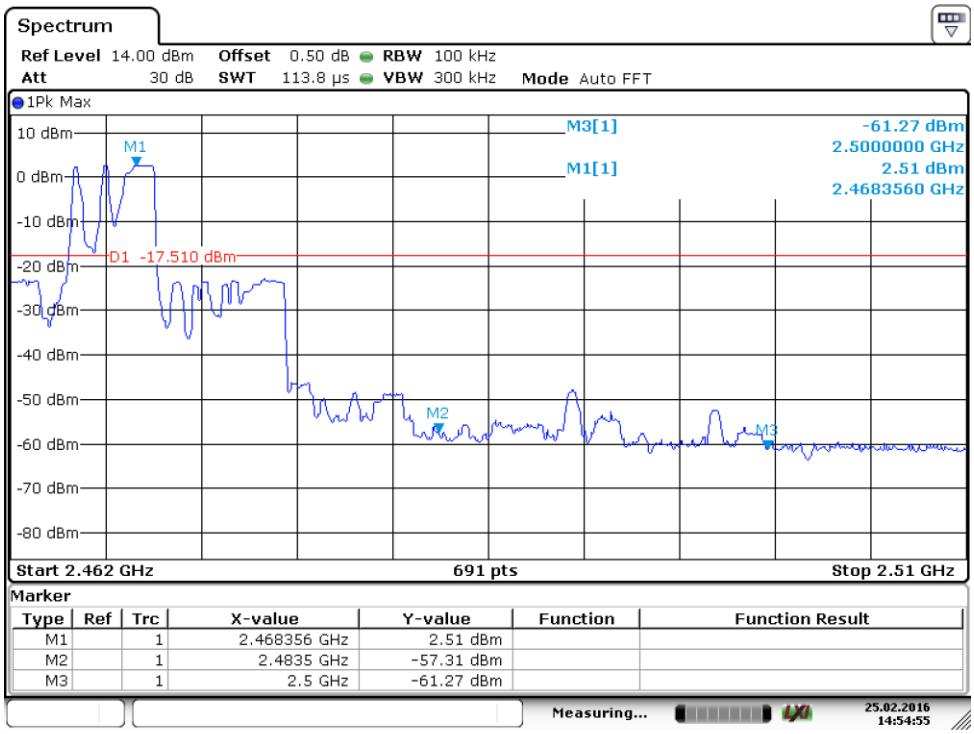
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Band edge testing

2414MHz



2468MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

China

9 Test equipment list

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101031	2016-8-17
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-8-17
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-17
	Horn Antenna	Rohde & Schwarz	HF907	102294	2017-8-17
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-8-17
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

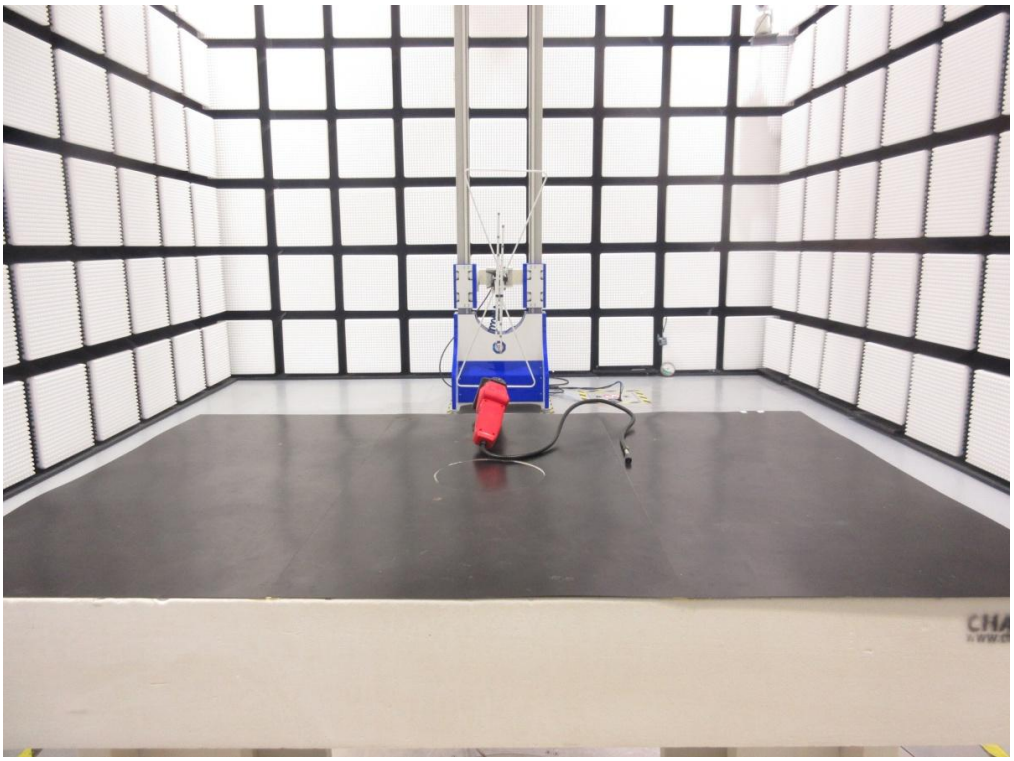
System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dBμV/m)	U=4.2dB (30MHz-1GHz) U=3.57dB (1GHz-25GHz)
CE	Disturbance Voltage (dBμV)	U=2.4dB
Bandwidth test	--	$1*10^{-9}$
Conducted emission	--	2.4dB

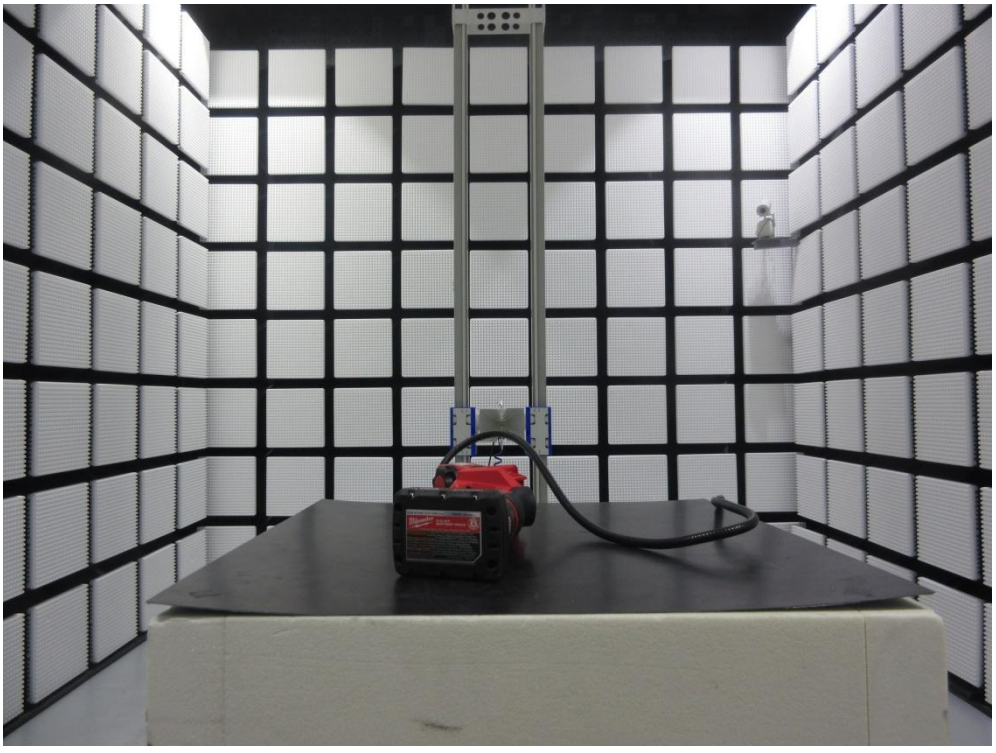
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11 Photographs of Test Set-ups

Radiated emission 30MHz-1000MHz



Radiated emission above 1GHz

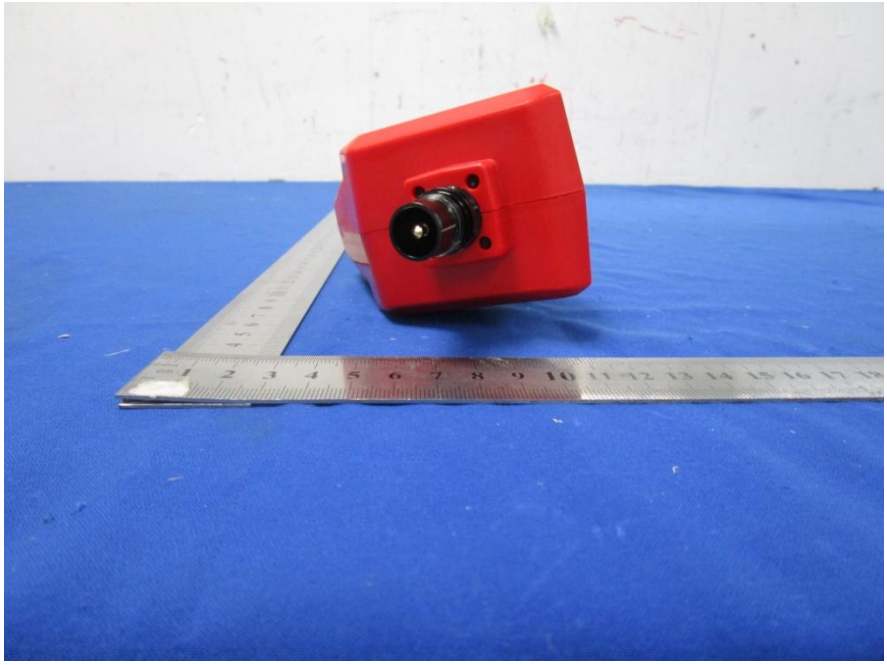


TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

12 Photographs of EUT

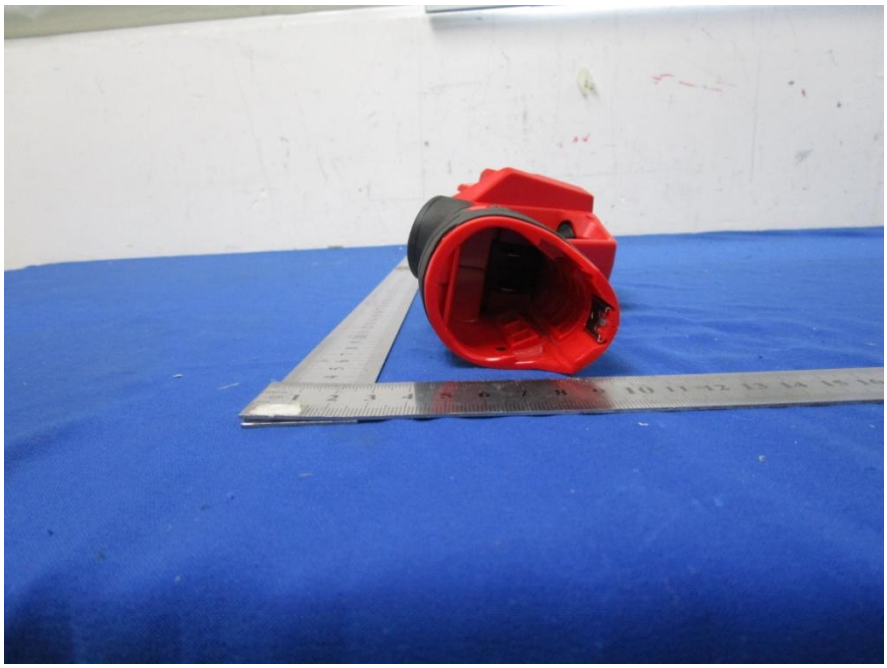
External photos

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

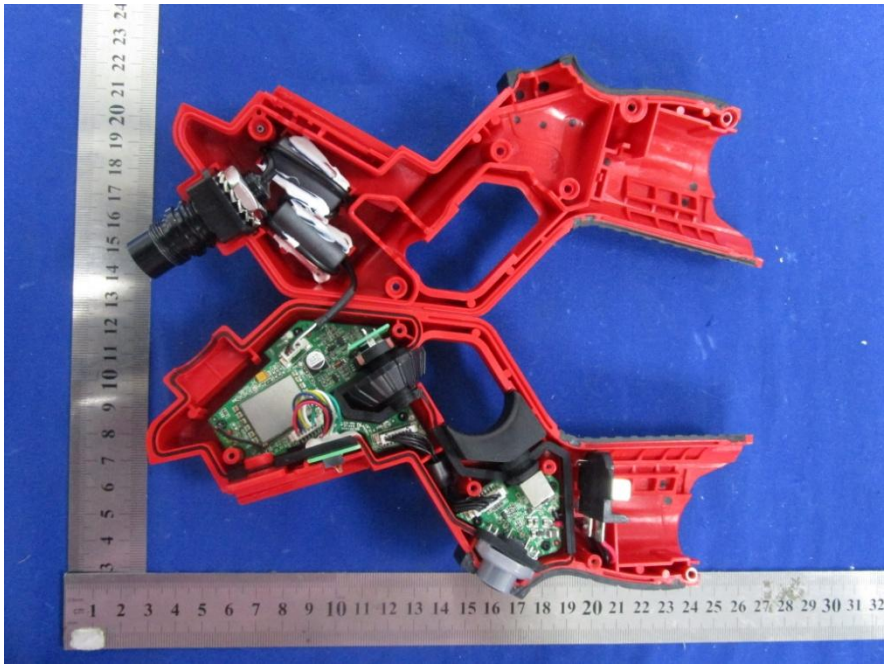
China

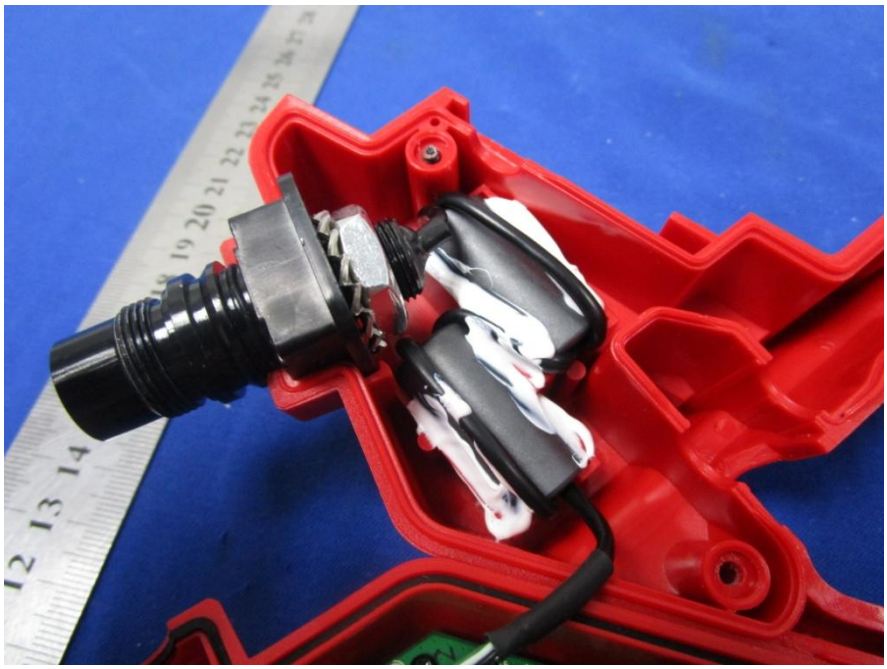


TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

China

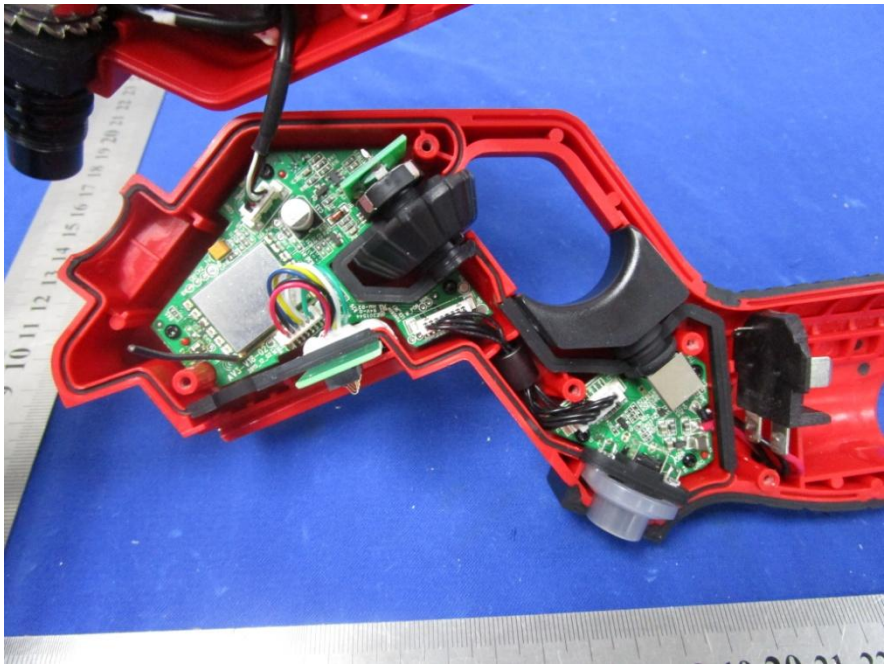
Internal photos

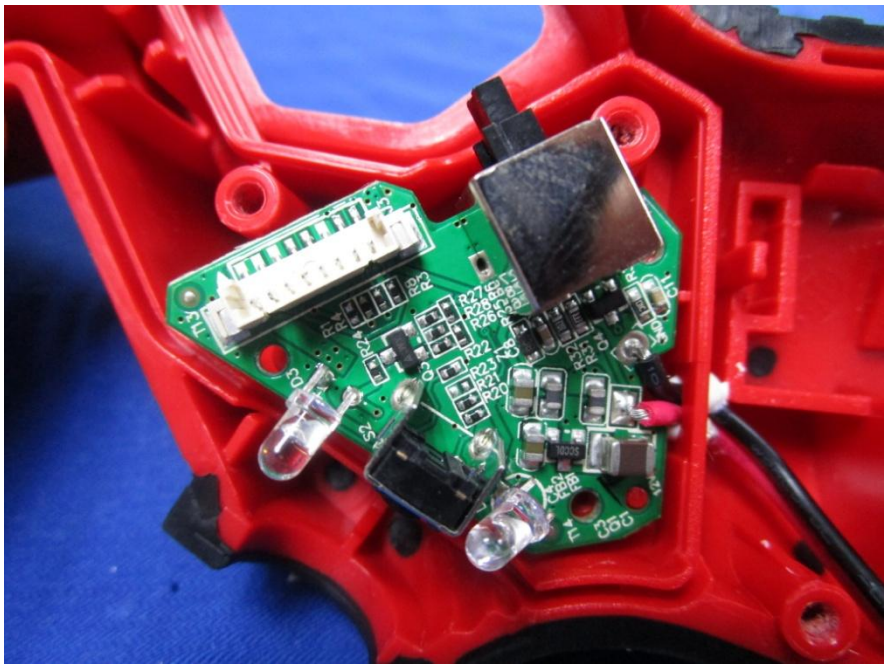




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

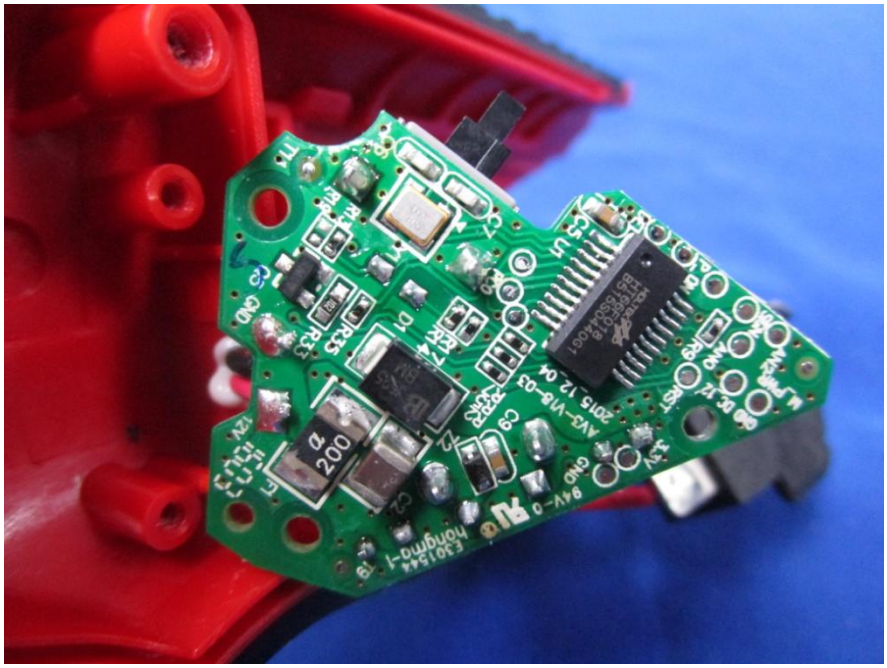
China

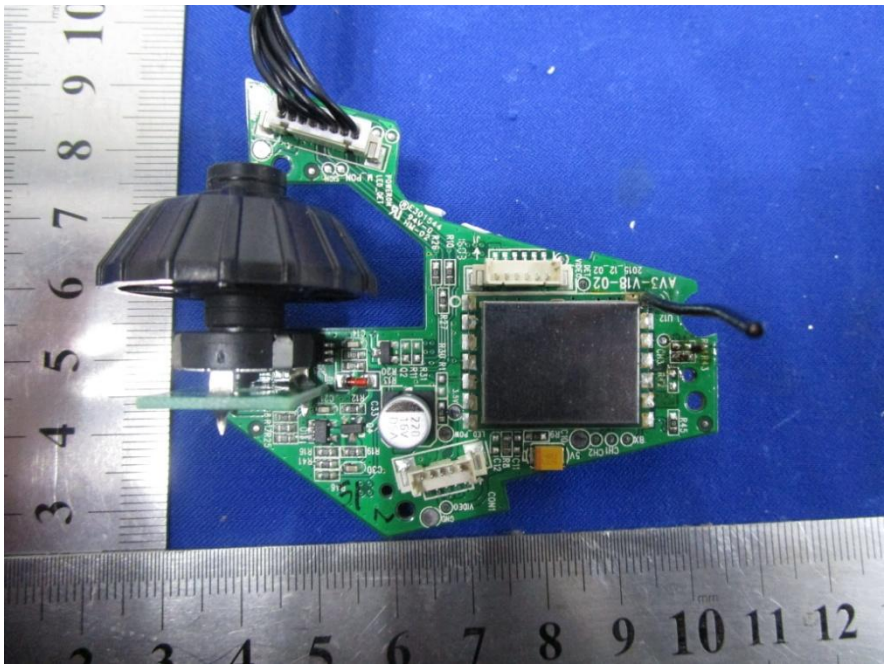




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

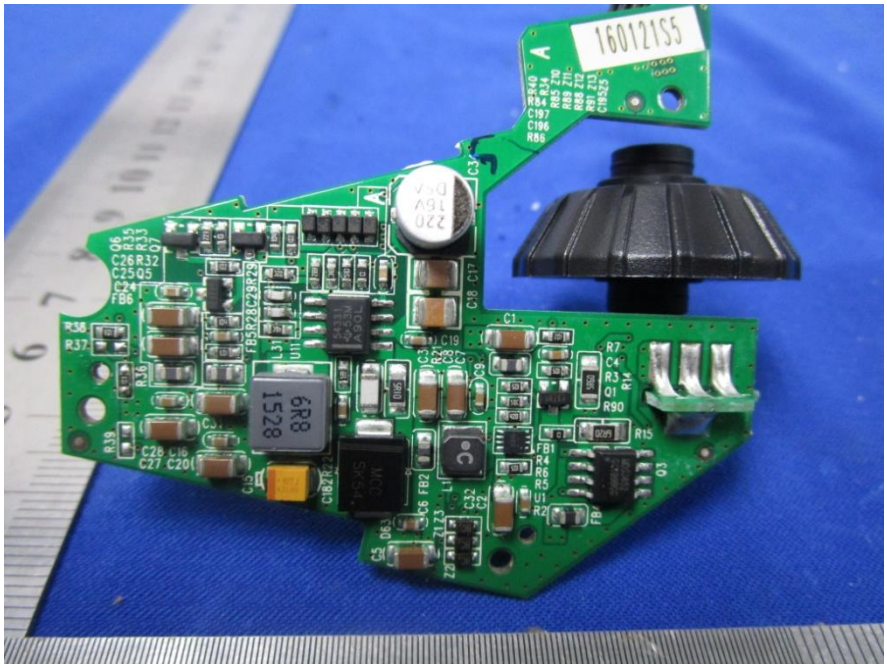
China

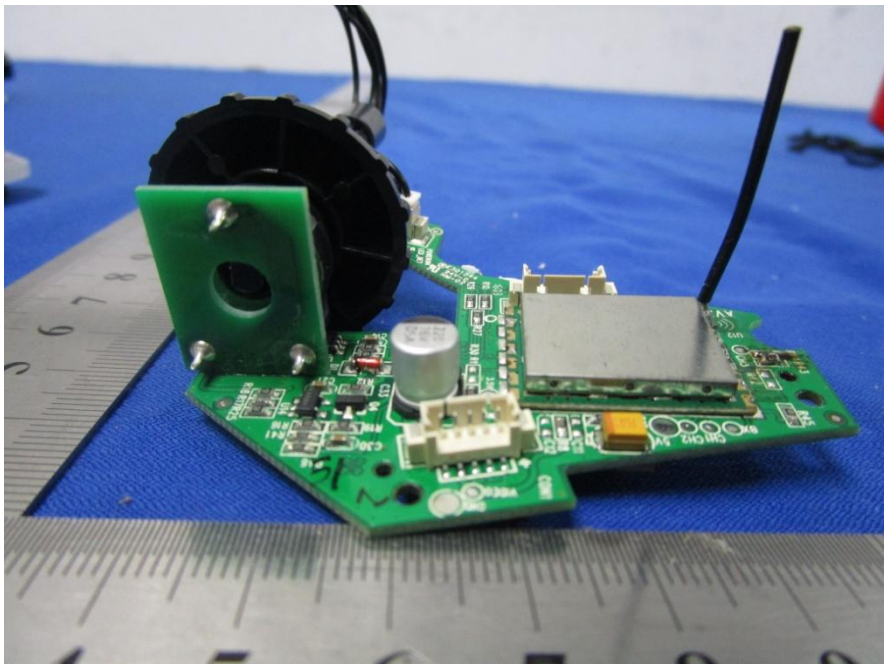




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

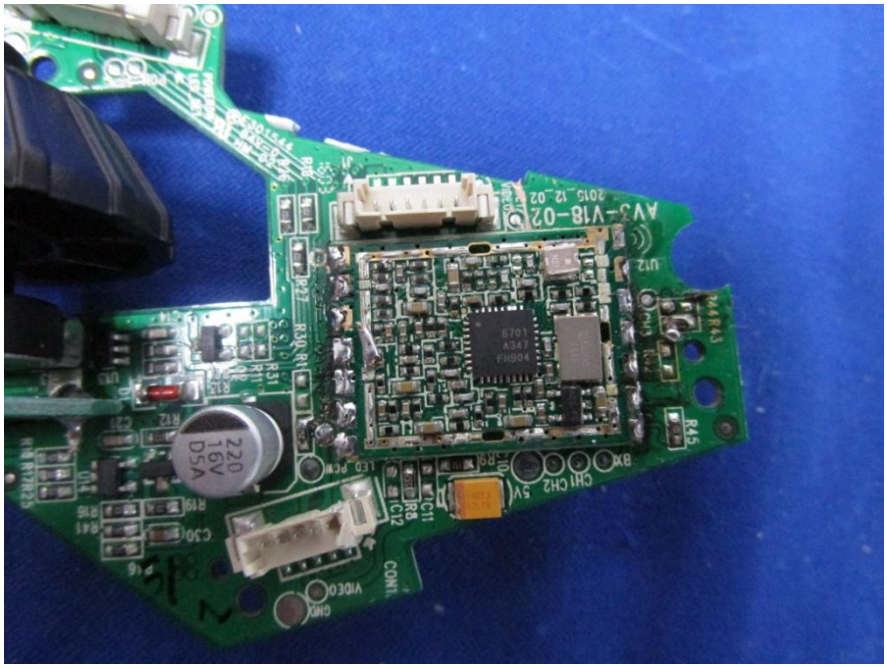
China

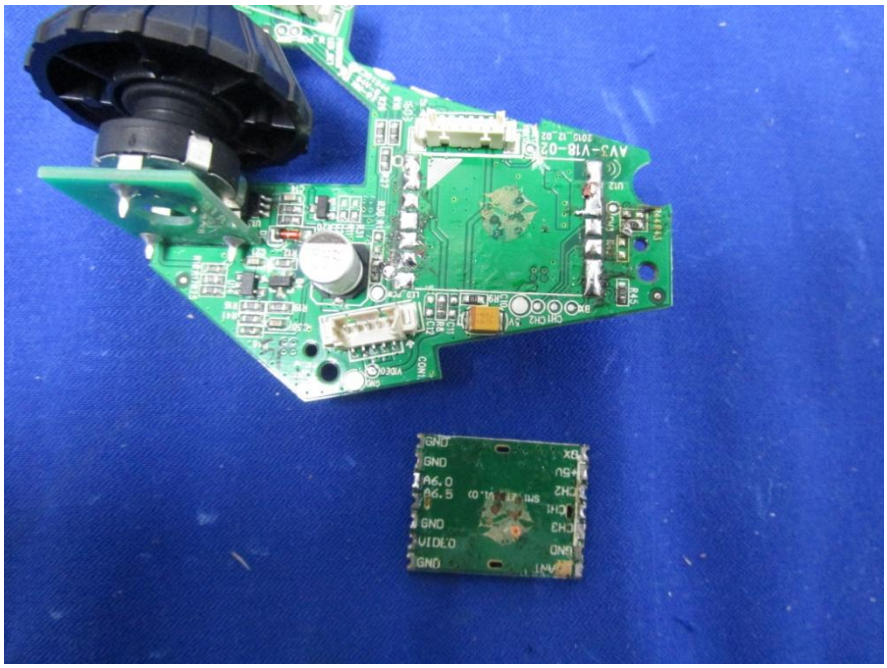




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

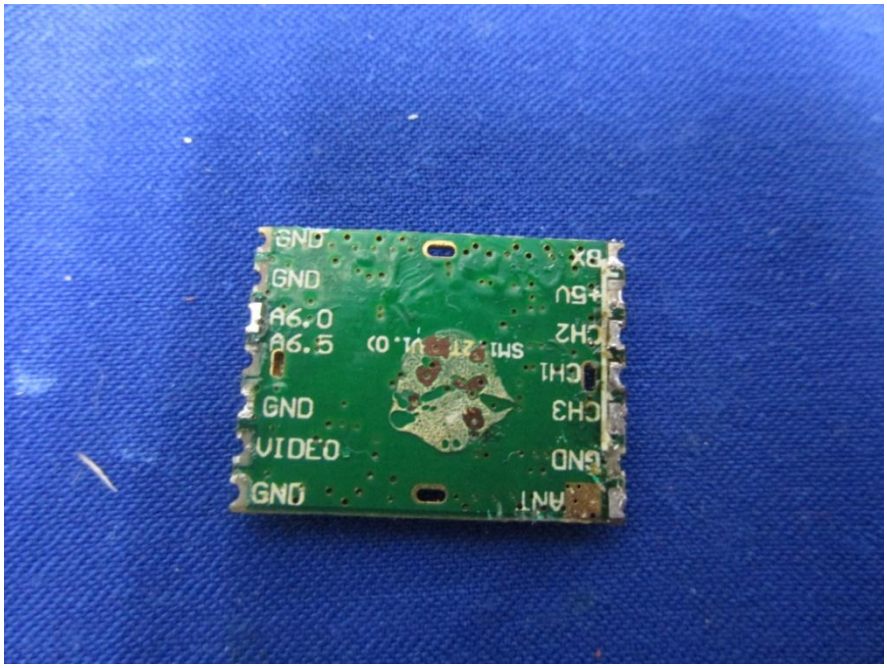
China

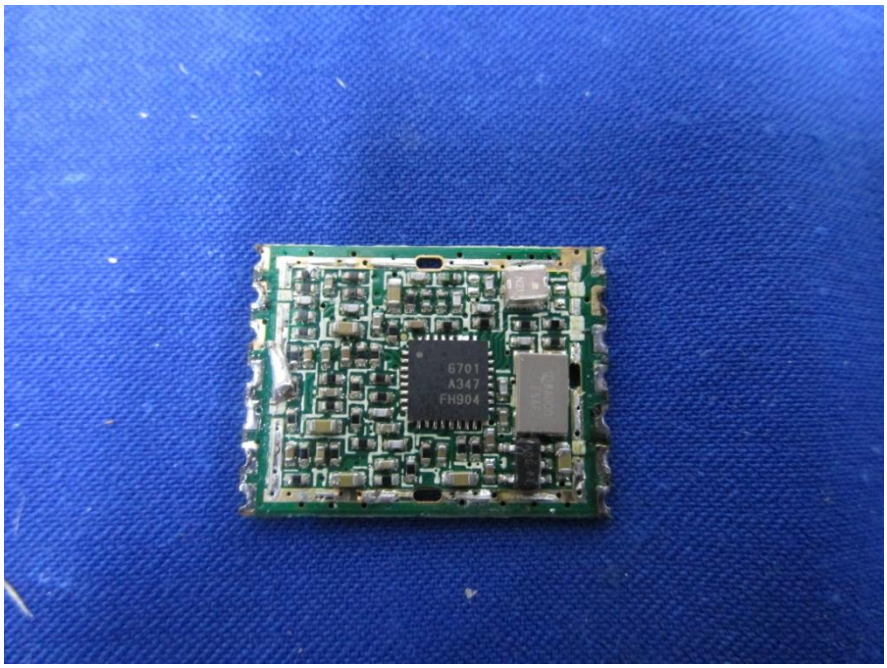




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

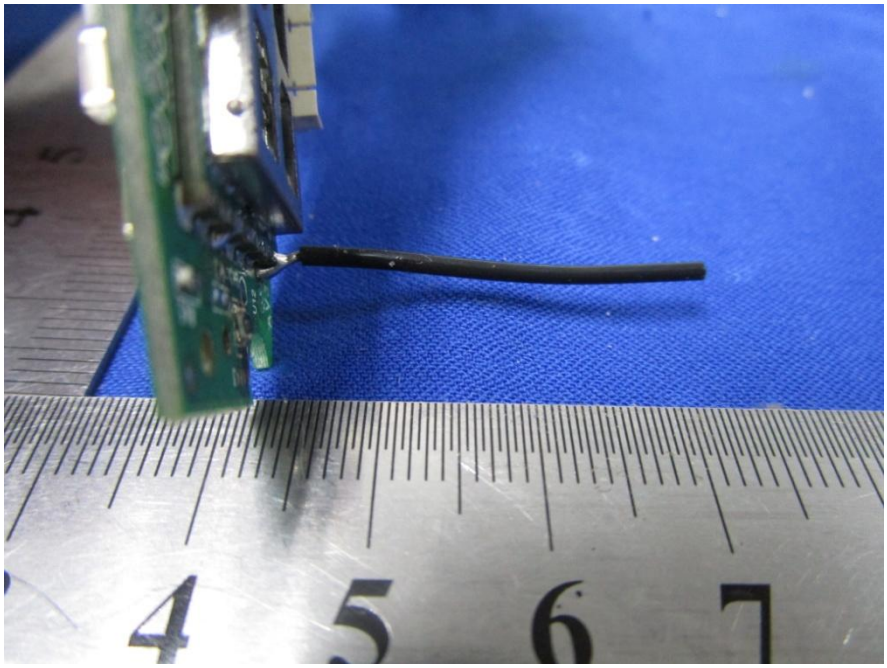
China





TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Antenna



----------The End----------

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478