FCC REPORT

Applicant:	Macnee Holding Group Limited
Address of Applicant:	Rm. 19C, Lockhart Ctr.,301-307 Lockhart Rd.,Wan Chai, Hong Kong
Manufacturer:	Macnee Holding Group Limited
Address of Manufacturer:	Rm. 19C, Lockhart Ctr.,301-307 Lockhart Rd.,Wan Chai, Hong Kong
Equipment Under Test (EUT)	
Product Name:	Industrial radio remote control
Model No.:	A4-CS6, A4-CS8, A4-CS10, A4-CS12, A4-TS6, A4-TS8, A4-TS10, A4-TS12
FCC ID:	2AP5P-A4
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231
Date of sample receipt:	June 05, 2018
Date of Test:	June 06-15, 2018
Date of report issued:	June 19, 2018
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This 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.

2 Version

Version No.	Date	Description
00	*June 19, 2018*	*Original*

Prepared By: Tiger. Chen ***Date:*** *June 19, 2018*

Project Engineer

Check By: Andy. wu ***Date:*** *June 19, 2018*

Reviewer

3 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 CONTENTS 3

4 TEST SUMMARY 4

4.1 MEASUREMENT UNCERTAINTY 4

5 GENERAL INFORMATION 5

5.1 GENERAL DESCRIPTION OF EUT 5
5.2 TEST MODE 6
5.3 TEST FACILITY 6
5.4 TEST LOCATION 6
5.5 OTHER INFORMATION REQUESTED BY THE CUSTOMER 6
5.6 ADDITIONAL INSTRUCTIONS 6

6 TEST INSTRUMENTS LIST 7

7 TEST RESULTS AND MEASUREMENT DATA 8

7.1 ANTENNA REQUIREMENT 8
7.2 CONDUCTED EMISSIONS 9
7.3 RADIATED EMISSION METHOD 12
7.3.1 Transmitter Field Strength of Emissions 14
7.3.2 Spurious emissions 16
7.4 20DB OCCUPY BANDWIDTH 19
7.5 DEACTIVATION TESTING 20

8 TEST SETUP PHOTO 21

9 EUT CONSTRUCTIONAL DETAILS 23

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Restricted bands of operation.	15.205	Pass
Conduction Emission	15.207	Pass
Spurious Emissions	15.231(b) &15.209	Pass
20dB Bandwidth	15.231(c)	Pass
Deactivation Testing	15.231(a)(1)	Pass

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	Industrial radio remote control
Model No.:	A4-CS6, A4-CS8, A4-CS10, A4-CS12, A4-TS6, A4-TS8, A4-TS10, A4-TS12
Test Model:	A4-CS8
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The onl difference is the model name for commercial purpose.	
Serial No.:	E10081021
Test sample(s) ID:	GTS201806000029-01
Sample(s) Status	Engineered sample
Hardware version:	V7.10M
Software version:	V7.10M
Operation Frequency:	434.47MHz
Channel numbers:	1
Modulation technology:	ASK
Antenna Type:	Integral Antenna
Antenna gain:	0dBi (declare by Manufacturer)
Power supply:	POWER ADAPTER INPUT: AC 110-240V, 50/60Hz, 1A OUTPUT: DC 5V±0.5V, 1000mA±50mA Or DC 3.7V by rechargeable battery

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode.

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	86.01	78.36	84.47

Final Test Mode:

According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”:

Y axis (see the test setup photo)

5.3 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China
Tel: 0755-27798480
Fax: 0755-27798960

5.5 Other Information Requested by the Customer

None.

5.6 Additional Instructions

EUT Software Settings:

Test software was pre built-in by manufacturer. Power set as defualt, once power on, then EUT in continuously transmitting status.

6 Test Instruments list

RF Test						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 28 2017	June 27 2018
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2017	June 27 2018
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2017	June 27 2018
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2017	June 27 2018
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 28 2017	June 27 2018
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 28 2017	June 27 2018
10	Coaxial Cable	GTS	N/A	GTS211	June 28 2017	June 27 2018
11	Coaxial cable	GTS	N/A	GTS210	June 28 2017	June 27 2018
12	Coaxial Cable	GTS	N/A	GTS212	June 28 2017	June 27 2018
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 28 2017	June 27 2018
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 28 2017	June 27 2018
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2017	June 27 2018
16	Band filter	Amindeon	82346	GTS219	June 28 2017	June 27 2018
17	Power Meter	Anritsu	ML2495A	GTS540	June 28 2017	June 27 2018
18	Power Sensor	Anritsu	MA2411B	GTS541	June 28 2017	June 27 2018

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May16 2014	May15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June 28 2017	June 27 2018
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 28 2017	June 27 2018
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June 28 2017	June 27 2018
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June 28 2017	June 27 2018

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 28 2017	June 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement

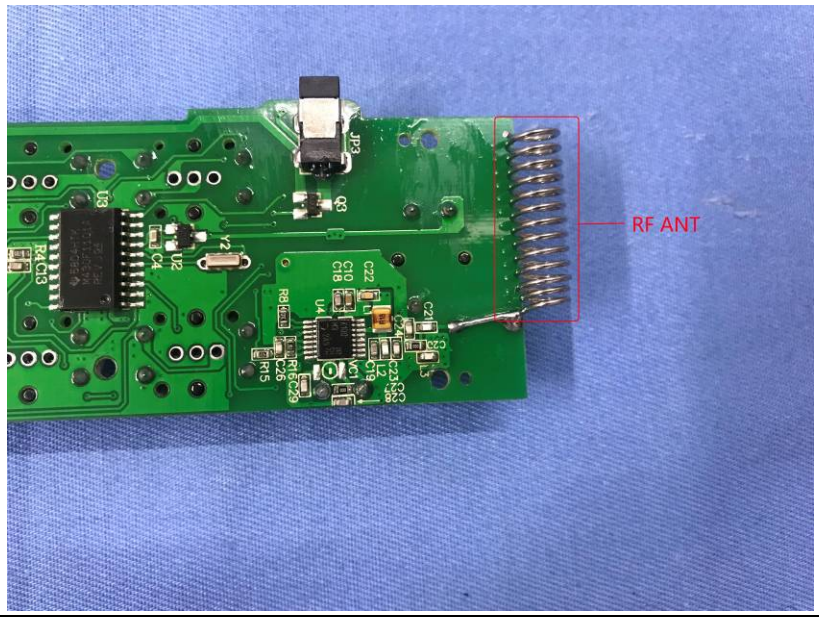
Standard requirement:	FCC Part15 C Section 15.203

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.

EUT Antenna:

The antenna is integral antenna, the best case gain of the antenna is 0dBi



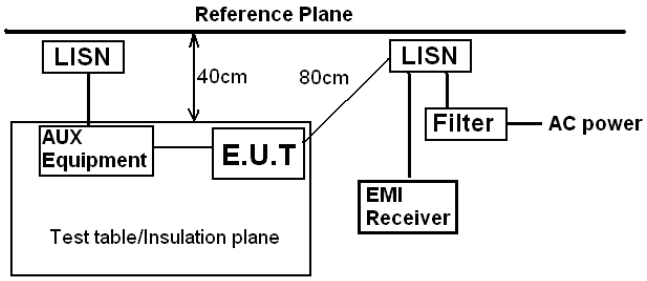
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test setup:



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

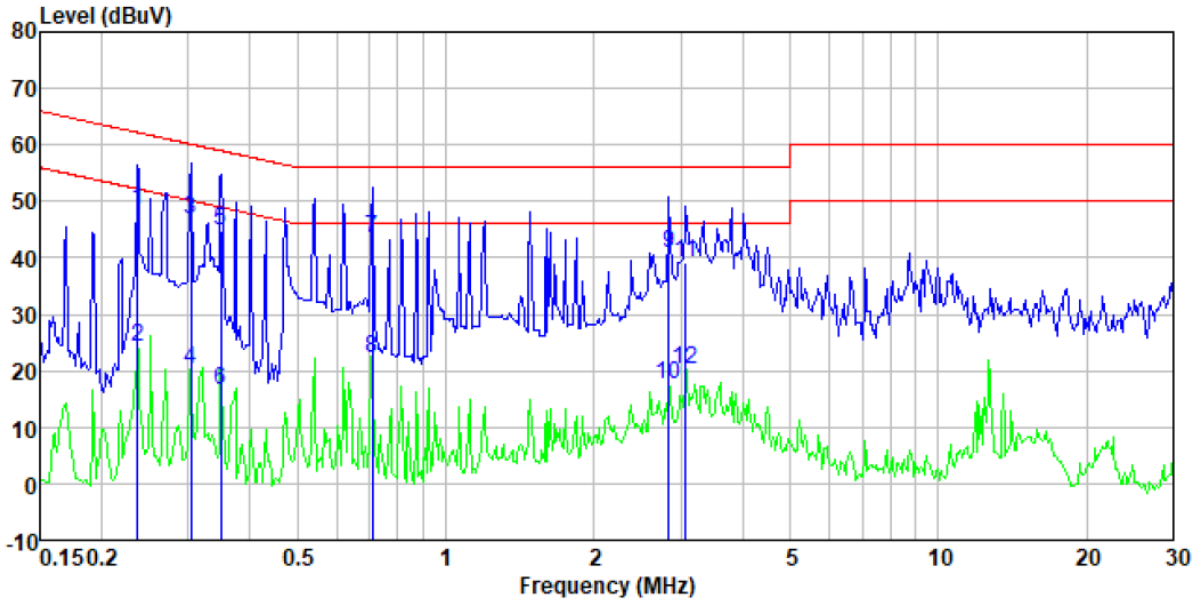
Test procedure:

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

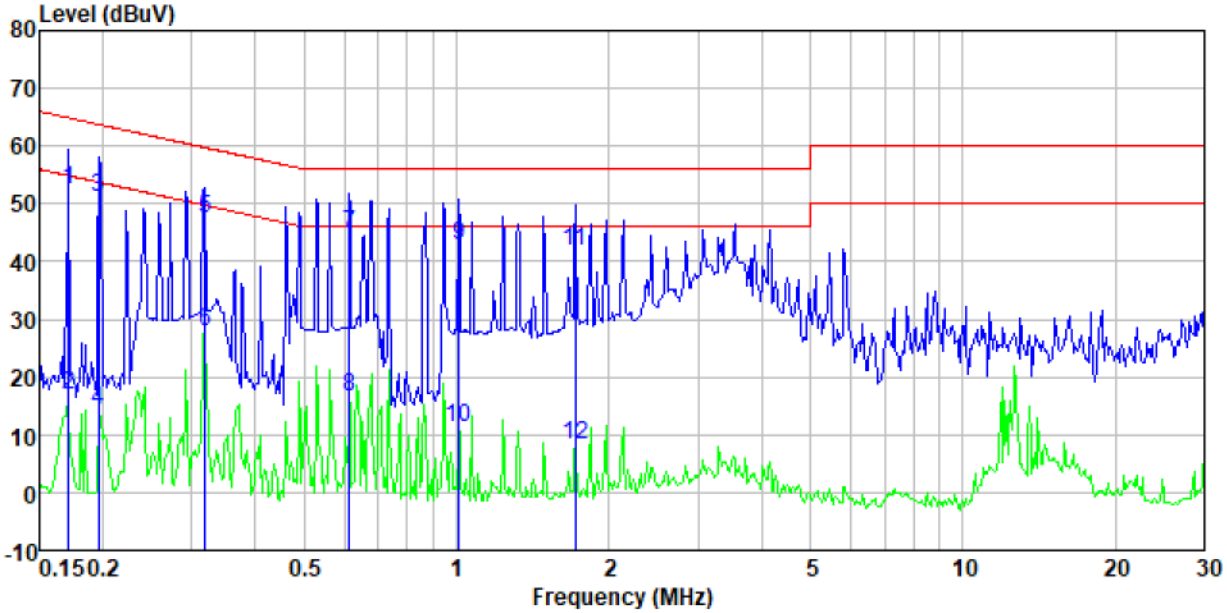
Measurement data

Polarizatioin:	Line:	Test mode	TX
Temp.:	35℃	Humidity.	55%



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.24	47.83	0.40	0.11	48.34	62.22	-13.88	QP
0.24	23.63	0.40	0.11	24.14	52.22	-28.08	Average
0.30	46.22	0.40	0.10	46.72	60.15	-13.43	QP
0.30	19.75	0.40	0.10	20.25	50.15	-29.90	Average
0.35	44.41	0.37	0.10	44.88	58.96	-14.08	QP
0.35	16.08	0.37	0.10	16.55	48.96	-32.41	Average
0.71	43.05	0.26	0.13	43.44	56.00	-12.56	QP
0.71	21.97	0.26	0.13	22.36	46.00	-23.64	Average
2.84	40.51	0.20	0.19	40.90	56.00	-15.10	QP
2.84	17.27	0.20	0.19	17.66	46.00	-28.34	Average
3.07	38.65	0.20	0.19	39.04	56.00	-16.96	QP
3.07	19.89	0.20	0.19	20.28	56.00	-35.72	Average

Polarizatioin:	Neutral:	Test mode	TX
Temp.:	35℃	Humidity.	55%



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.17	51.79	0.40	0.09	52.28	64.90	-12.62	QP
0.17	16.49	0.40	0.09	16.98	54.90	-37.92	Average
0.20	50.56	0.40	0.11	51.07	63.76	-12.69	QP
0.20	13.87	0.40	0.11	14.38	53.76	-39.38	Average
0.32	47.13	0.39	0.10	47.62	59.75	-12.13	QP
0.32	27.52	0.39	0.10	28.01	49.75	-21.74	Average
0.61	44.23	0.28	0.12	44.63	56.00	-11.37	QP
0.61	16.32	0.28	0.12	16.72	46.00	-29.28	Average
1.01	42.51	0.20	0.15	42.86	56.00	-13.14	QP
1.01	11.00	0.20	0.15	11.35	46.00	-34.65	Average
1.72	41.36	0.20	0.17	41.73	56.00	-14.27	QP
1.72	7.95	0.20	0.17	8.32	46.00	-37.68	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.205, 15.209 & 15.231(b)
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 5000MHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:
(Transmitter Field Strength of Emissions)

Frequency	Limit (dBuV/m @3m)	Remark
434.47MHz	80.84	Average Value
	100.84	Peak Value

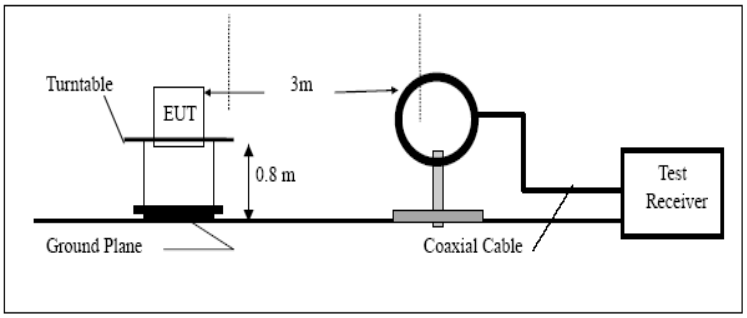
Limit:
(Spurious Emissions)

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	300m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

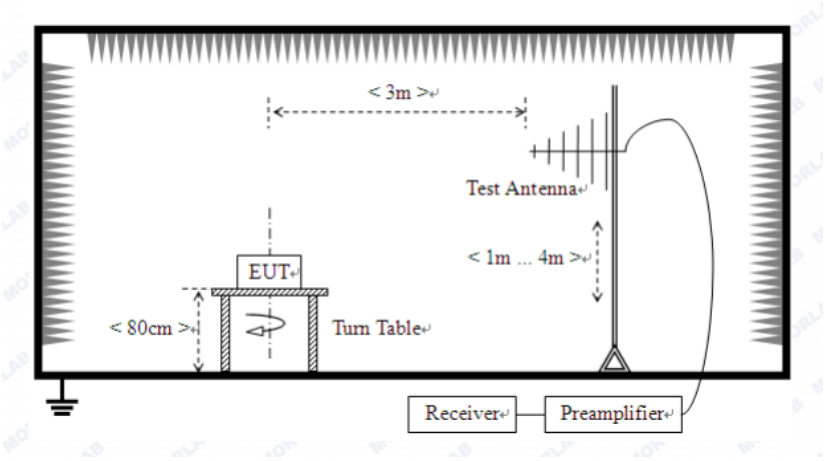
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

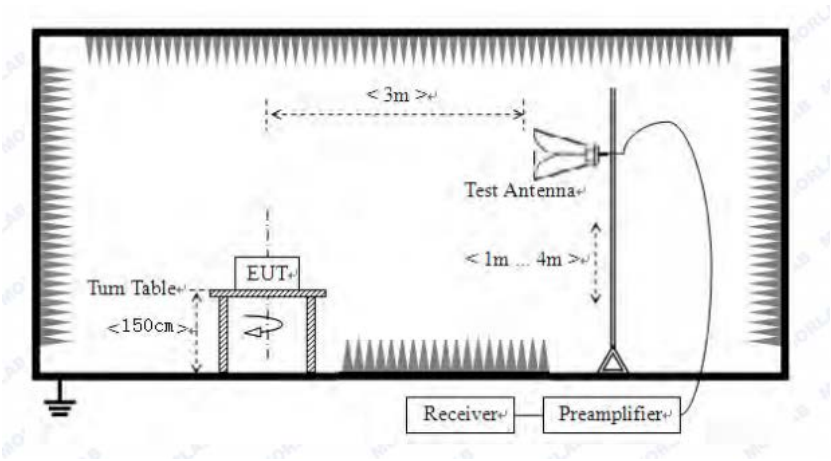
Below 30MHz



Below 1GHz



Above 1GHz



Test Procedure:

1. During the test, the New Battery was used.
2. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
4. 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.
5. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

7.3.1 Transmitter Field Strength of Emissions

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
434.47	104.42	16.08	3.03	37.52	86.01	100.84	-14.83	Horizontal
434.47	96.79	16.08	3.03	37.52	78.38	100.84	-22.36	Vertical

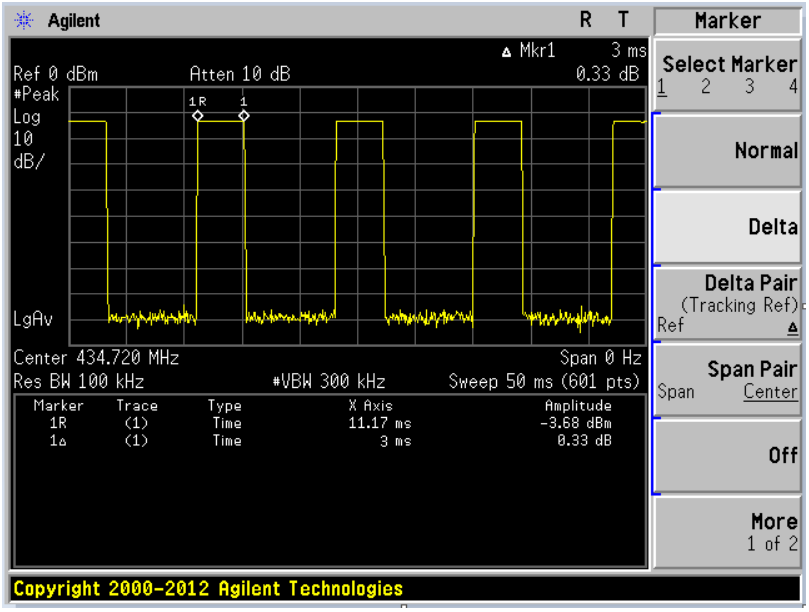
Average value:

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
434.47	86.01	-11.92	74.09	80.84	-6.75	Horizontal
434.47	78.38	-11.92	66.46	80.84	-14.38	Vertical

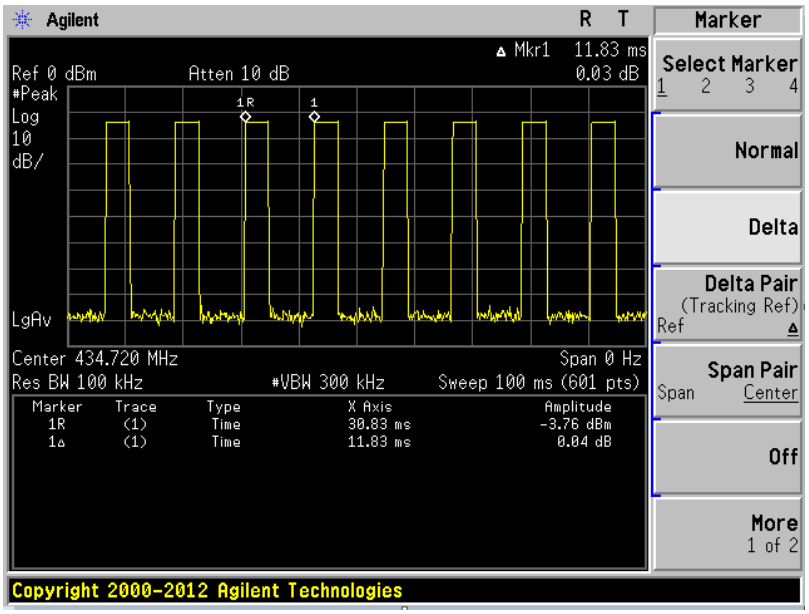
Average value:	
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle=on time/100 milliseconds or period, whichever is less
Test data:	T on time =3(ms)
	T period >11.83(ms)
	Duty cycle=0.25
	duty cycle factor=-11.92

Test plot as follows:

Ton time:



T period



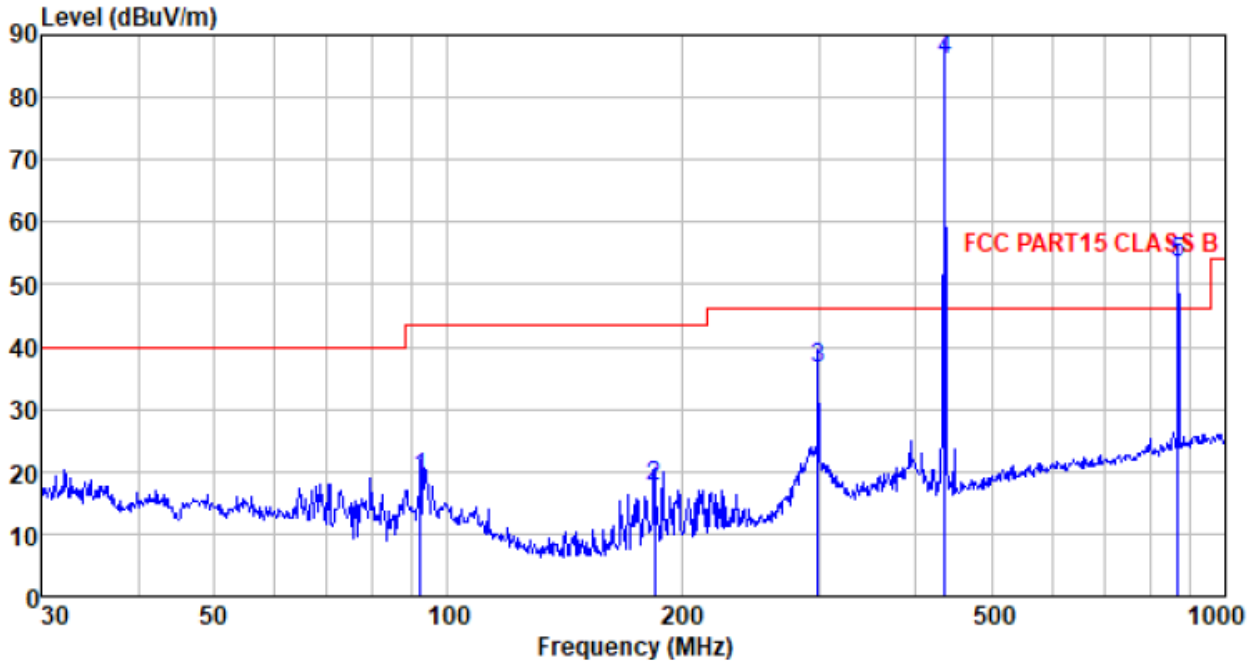
7.3.2 Spurious emissions

■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ **Below 1GHz**

Polarizatioin:	Horizontal	Test mode	TX
Temp.:	35℃	Humidity.	54%



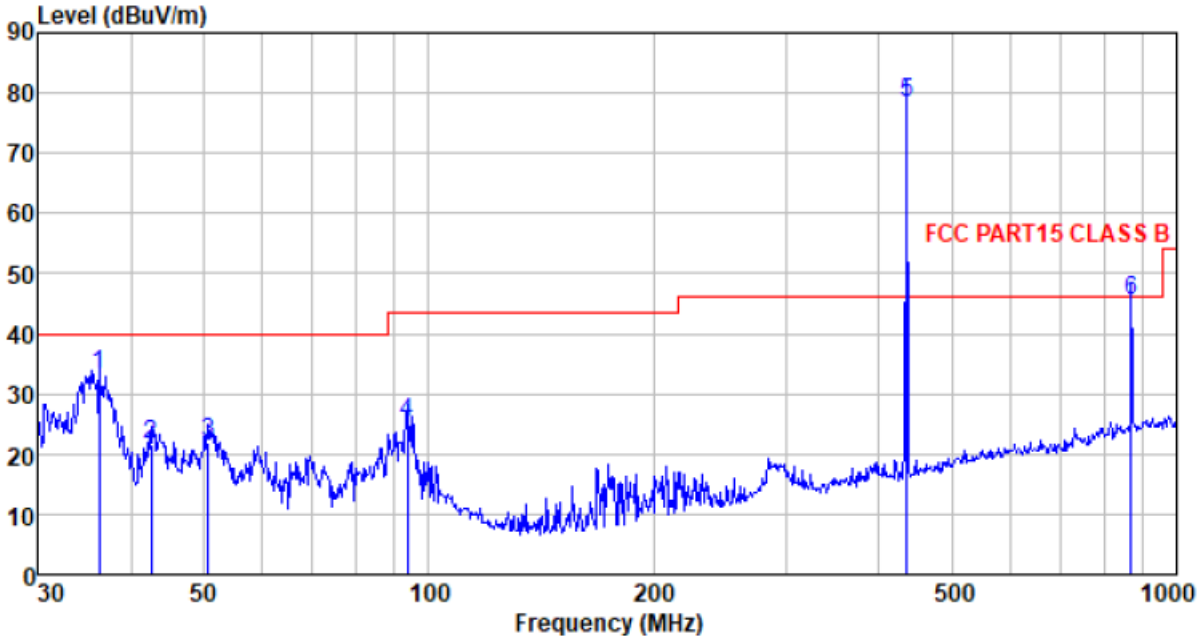
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.940	64.31	22.02	4.74	3.61	53.46	80.84	-27.38	Horizontal

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cylcle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.940	53.46	-11.92	41.54	60.84	-19.3	Vertical

Polarizatioin:	Vertical	Test mode	TX
Temp.:	35℃	Humidity.	54%



Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.940	56.22	22.02	4.74	3.61	45.37	80.84	-35.47	Vertical

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cylcle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
868.940	45.37	-11.92	33.45	60.84	-27.39	Vertical

■ **Above 1GHz**

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1040	41.64	24.6	4.33	35.82	34.75	74	-39.25	Vertical
1200	44.21	25.34	4.47	35.92	38.1	74	-35.9	Vertical
1465	37.11	25.3	4.66	36.07	31	74	-43	Vertical
1740	39.05	25.05	4.83	36.25	32.68	80.84	-48.16	Vertical
2460	32.46	27.49	5.45	36.77	28.63	80.84	-52.21	Vertical
3040	33.17	28.61	6.02	37.21	30.59	80.84	-50.25	Vertical
1065	42.92	24.66	4.35	35.84	36.09	74	-37.91	Horizontal
1215	40.94	25.42	4.48	35.93	34.91	74	-39.09	Horizontal
1435	40.57	25.4	4.64	36.06	34.55	74	-39.45	Horizontal
1712	37.13	25	4.81	36.23	30.71	80.84	-50.13	Horizontal
2385	32.19	27.61	5.38	36.7	28.48	74	-45.52	Horizontal
2965	31.71	28.44	5.89	37.17	28.87	80.84	-51.97	Horizontal

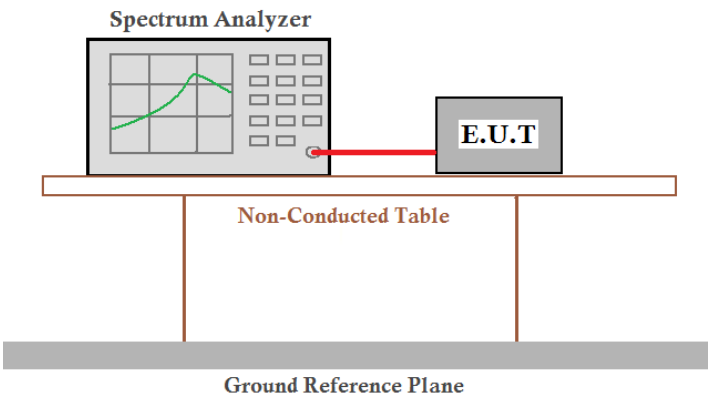
Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cylcle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1040	34.75	-11.92	22.83	54	-31.17	Vertical
1200	38.1	-11.92	26.18	54	-27.82	Vertical
1465	31	-11.92	19.08	54	-34.92	Vertical
1740	32.68	-11.92	20.76	60.84	-40.08	Vertical
2460	28.63	-11.92	16.71	60.84	-44.13	Vertical
3040	30.59	-11.92	18.67	60.84	-42.17	Vertical
1065	36.09	-11.92	24.17	54	-29.83	Horizontal
1215	34.91	-11.92	22.99	54	-31.01	Horizontal
1435	34.55	-11.92	22.63	54	-31.37	Horizontal
1710	30.71	-11.92	18.79	60.84	-42.05	Horizontal
2385	28.48	-11.92	16.56	54	-37.44	Horizontal
2965	28.87	-11.92	16.95	60.84	-43.89	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value=Peak value + Duty cycle factor*

7.4 20dB Occupy Bandwidth

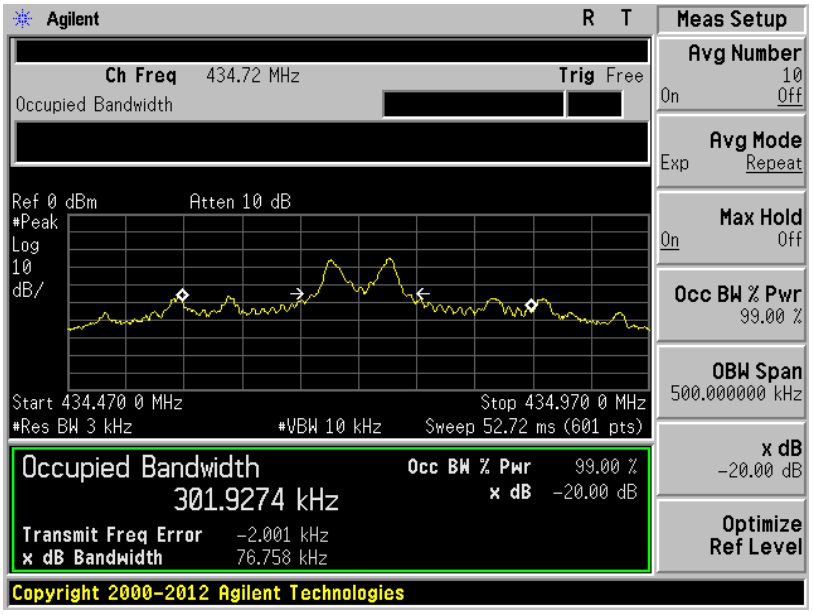
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

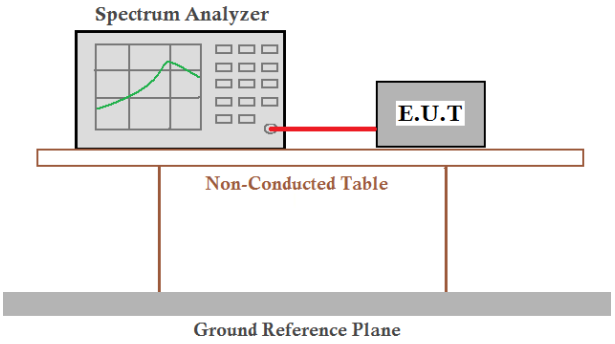
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
434.47	0.077	1.086	Pass

Note: Limit(434.47MHz)= Fundamental frequency×0.25%=434.47×0.25%=1.086MHz

Test plot as follows:



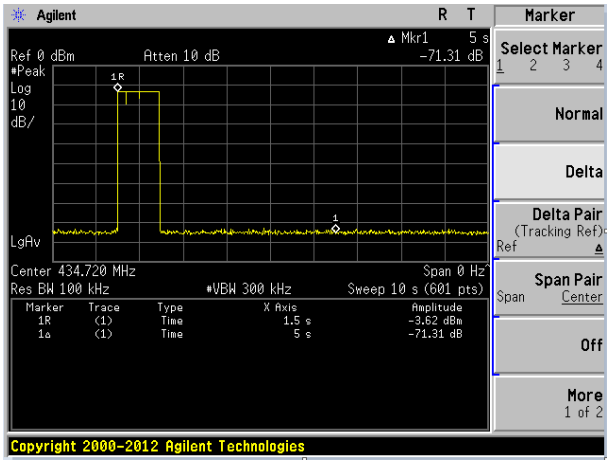
7.5 Deactivation Testing

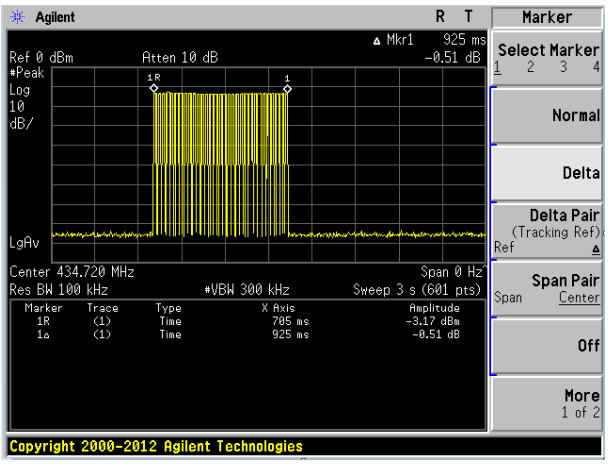
Test Requirement:	FCC Part15 C Section 15.231 (a)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Test Frequency (MHz)	Activation Time (second)	Limit (second)	Result
434.47	0.925	<5.0	Pass

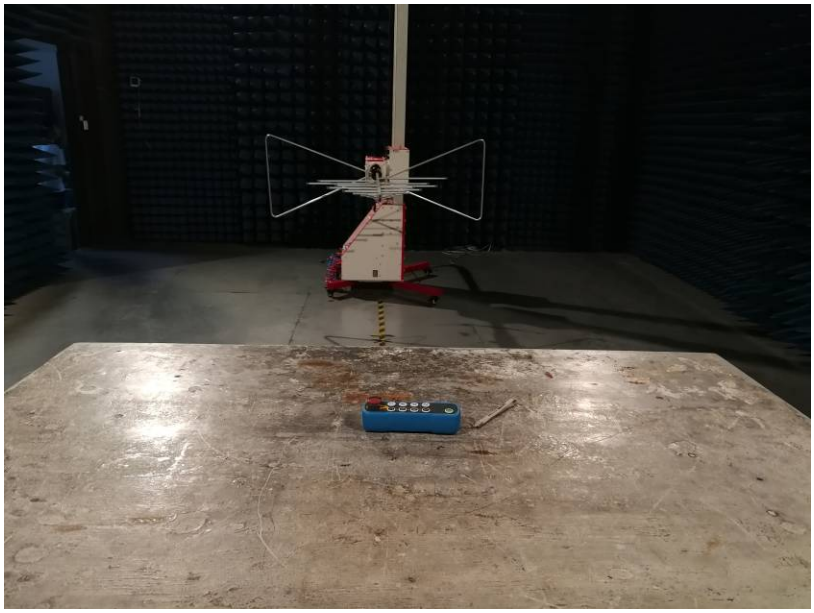
Test plot as follows:





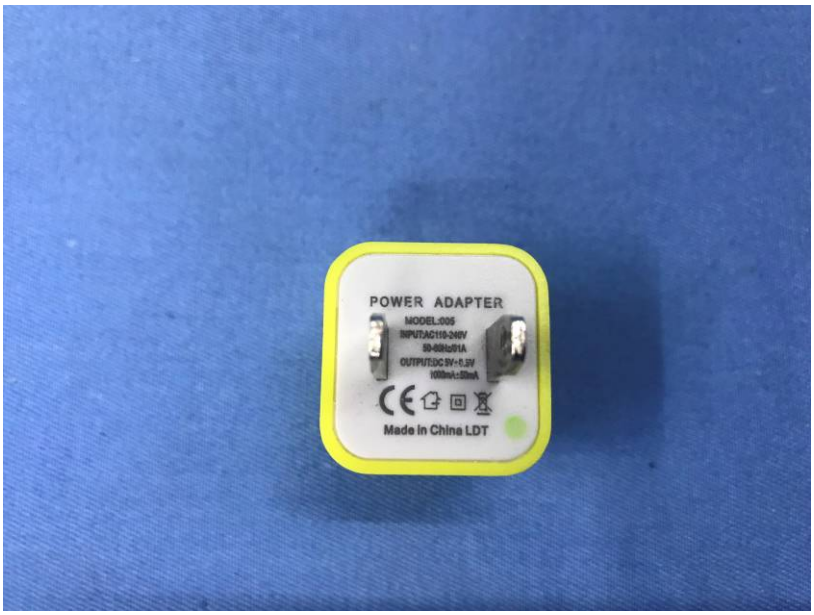
8 Test Setup Photo

Radiated Emission



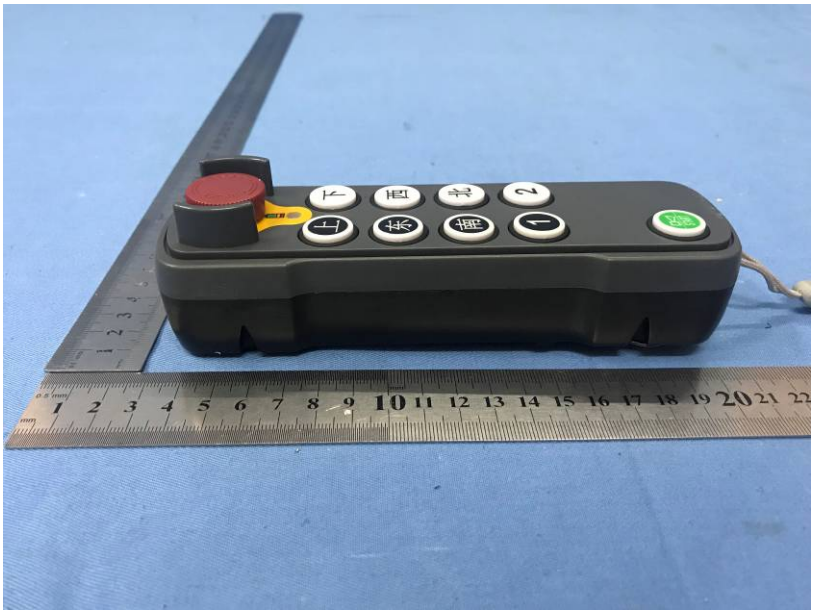
Conducted Emission

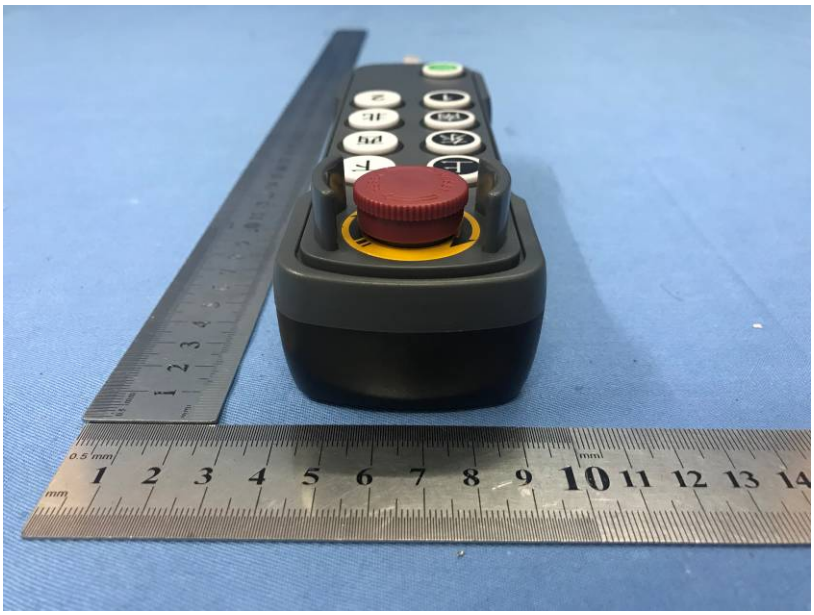
9 EUT Constructional Details

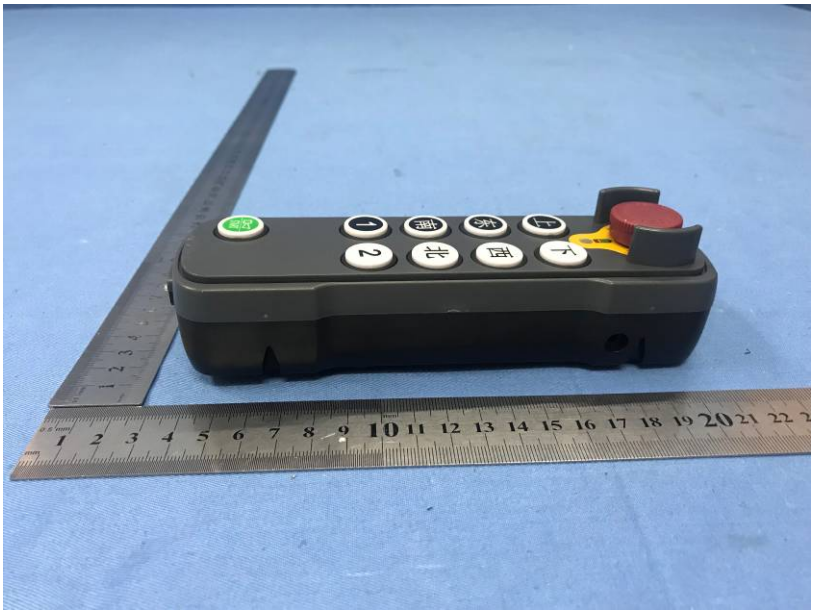


上
下
东
西
南
北
1
2
START

START



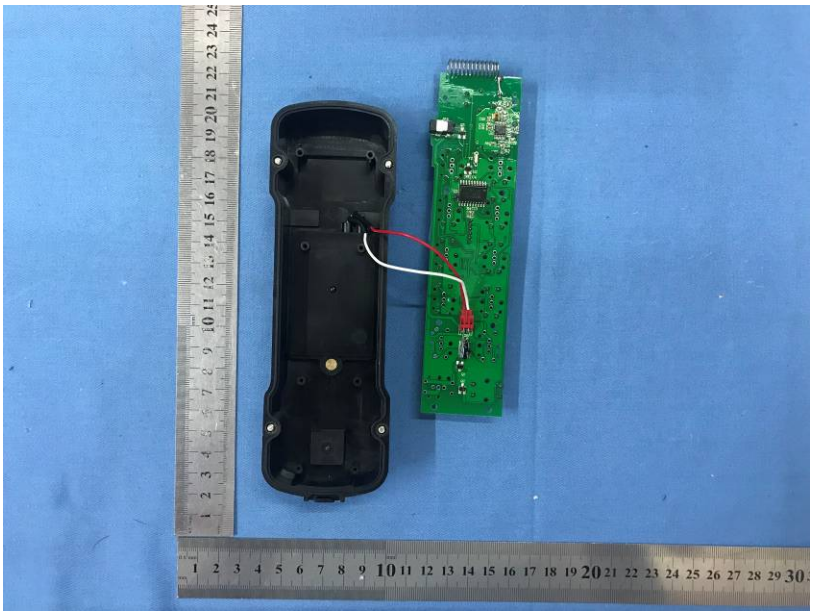


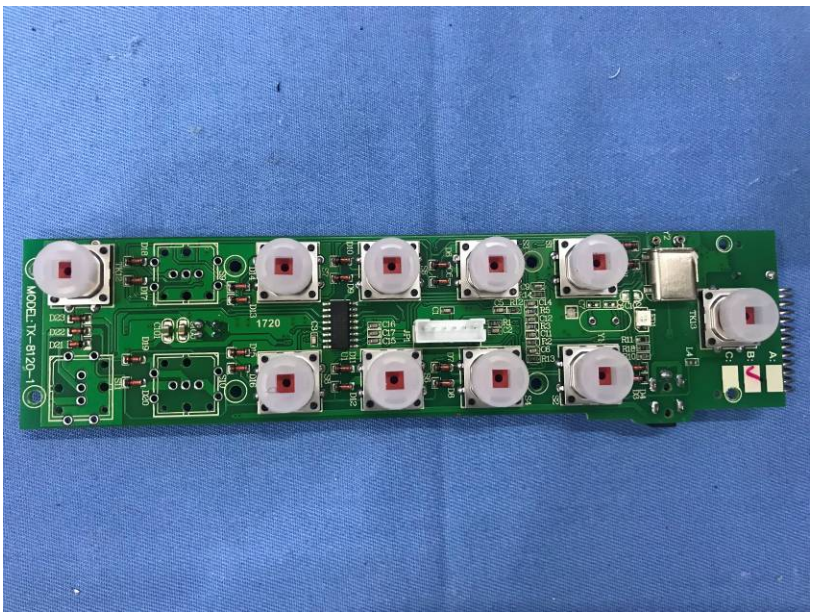


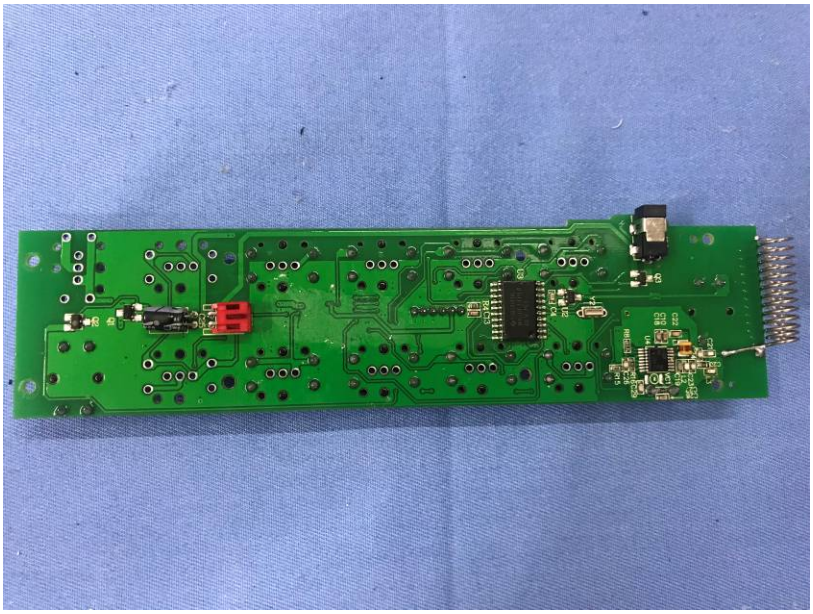
MACNEE
REMOTE CONTROL
MODEL:A4-CS8
SN:E10081021 CH:134
CE FC

MACNEE
MACNEE

MACNEE
A4H
SN:B17VER0001







------ End ------