FCC REPORT

Applicant:	Zhuhai Rocateq Technology Company Ltd
Address of Applicant:	D,3rd Floor 1# Factory 8,Chuang Xin Liu Road, Xiangzhou District, Zhuhai, Guangdong, China
Manufacturer:	Zhuhai Rocateq Technology Company Ltd
Address of Manufacturer:	D,3rd Floor 1# Factory 8,Chuang Xin Liu Road, Xiangzhou District, Zhuhai, Guangdong, China

Equipment Under Test (EUT)

Product Name:	Master Remote Unit
Model No.:	MRU COP, MRU
Trade Mark:	Rocateq
FCC ID:	2AGTS-MRUCOP
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231:2017
Date of sample receipt:	July 03, 2017
Date of Test:	July 03-05, 2017
Date of report issued:	July 05, 2017
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	*July 05, 2017*	*Original*

Prepared By: ***Date:*** *July 05, 2017*

Project Engineer

Check By: ***Date:*** *July 05, 2017*

Reviewer

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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	N/A
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:	Master Remote Unit
Model No.:	MRU COP, MRU
Test Model:	MRU COP
Remark:	*Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name for commercial purpose.*
Operation Frequency:	318.09MHz
Channel numbers:	1
Modulation technology:	ASK
Antenna Type:	Integral Antenna
Antenna gain:	3.0dBi (declare by Manufacturer)
Power supply:	DC9.0V (1 x 9V”6F22”Size 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
318.09MHz	Field Strength(dBuV/m)	73.35	73.98	73.59

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.: 600491**

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 600491, June 22, 2016.

● **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.

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

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

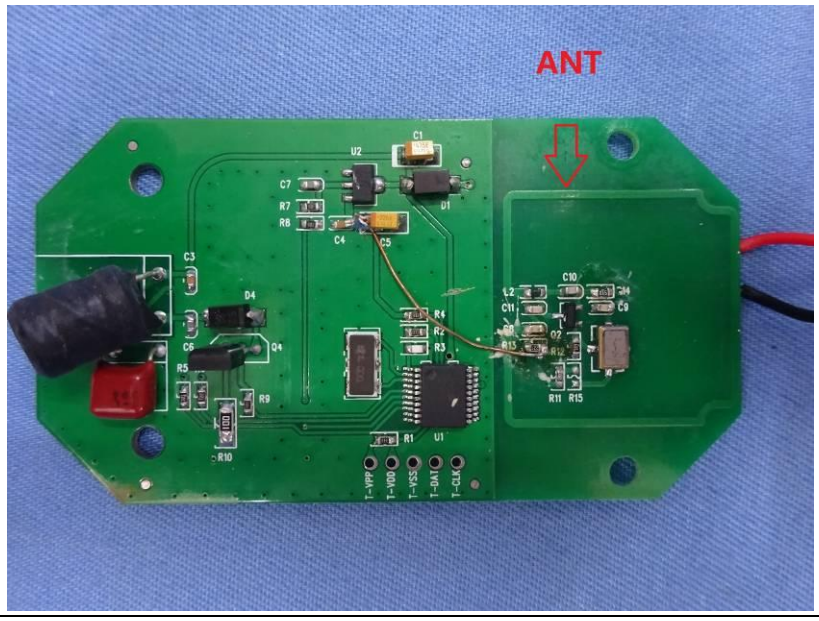
Standard requirement:	FCC Part15 C Section 15.203

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 3dBi



7.2 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:	30MHz to 5000MHz
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value

Limit:
(Transmitter Field Strength of Emissions)

Frequency	Limit (dBuV/m @3m)	Remark
318.09MHz	75.80	Average Value
	95.80	Peak Value

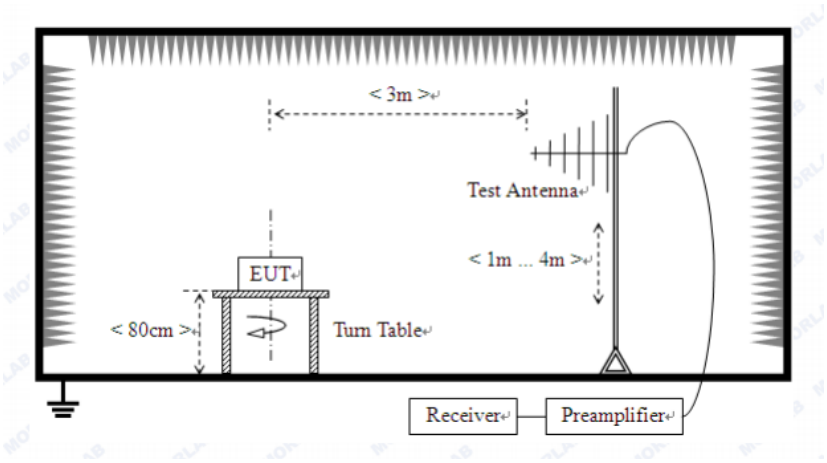
Limit:
(Spurious Emissions)

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.00	Quasi-peak Value
88MHz-216MHz	43.50	Quasi-peak Value
216MHz-960MHz	46.00	Quasi-peak Value
960MHz-1GHz	54.00	Quasi-peak Value
Above 1GHz	54.00	Average Value
	74.00	Peak Value

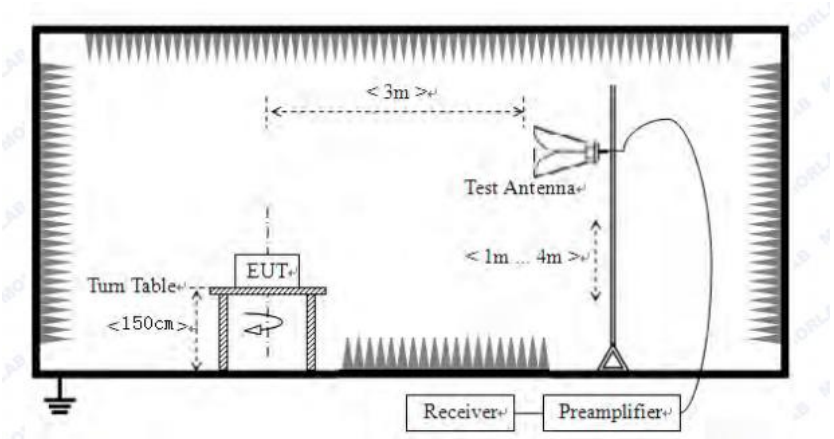
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.

Test setup:

Below 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:

7.2.1 Transmitter Field Strength of Emissions

318.09MHz:

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	polarization
318.09	86.12	13.85	2.46	29.89	72.54	75.80	3.26	Horizontal
318.09	76.60	13.85	2.46	29.89	63.02	75.80	12.78	Vertical

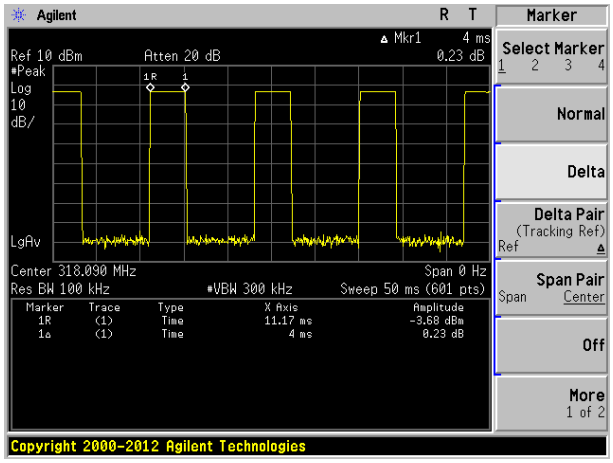
Harmonic emissions

Peak value:

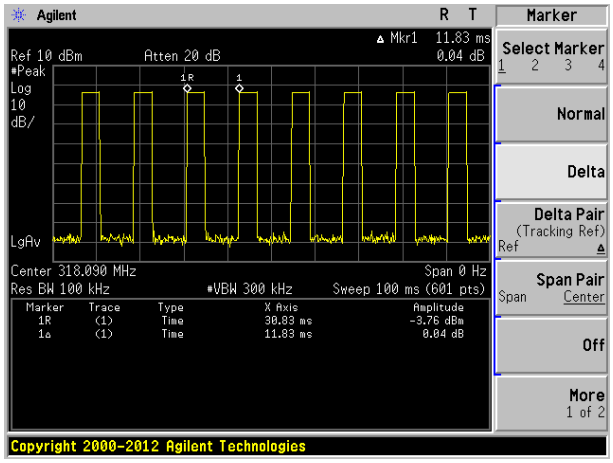
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	QP Limit (dBuV/m)	polarization
636.18	37.87	19.48	3.86	29.26	31.95	46	Horizontal
636.18	41.38	19.48	3.86	29.26	35.46	46	Vertical
954.27	45.59	22.54	5.06	29.10	44.09	46	Horizontal
954.27	40.75	22.54	5.06	29.10	39.25	46	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 =4(ms)
	Duty cycle=4X8/100=0.32
	Duty cycle=20log（0.32）
	duty cycle factor=-9.897

Test plot as follows:
Ton time:



T period:



7.2.2 Spurious emissions

Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Quasi-peak Value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
38.75	31.36	12.30	0.65	30.05	14.26	40.00	-25.74	Vertical
95.76	34.16	11.35	1.16	29.72	16.95	43.50	-26.55	Vertical
167.82	37.25	8.33	1.67	29.33	17.92	43.50	-25.58	Vertical
410.38	26.89	15.68	2.91	29.48	16.00	46.00	-30.00	Vertical
636.18	40.38	19.48	3.86	29.26	34.46	46.00	-11.54	Vertical
954.27	39.75	22.54	5.06	29.10	38.25	46.00	-7.75	Vertical
42.60	28.42	12.27	0.69	30.03	11.35	40.00	-28.65	Horizontal
95.76	30.85	11.35	1.16	29.72	13.64	43.50	-29.86	Horizontal
167.82	32.27	8.33	1.67	29.33	12.94	43.50	-30.56	Horizontal
280.02	25.00	12.82	2.27	29.86	10.23	46.00	-35.77	Horizontal
636.18	36.87	19.48	3.86	29.26	30.95	46.00	-15.05	Horizontal
954.27	44.59	22.54	5.06	29.10	43.09	46.00	-2.91	Horizontal

Above 1GHz

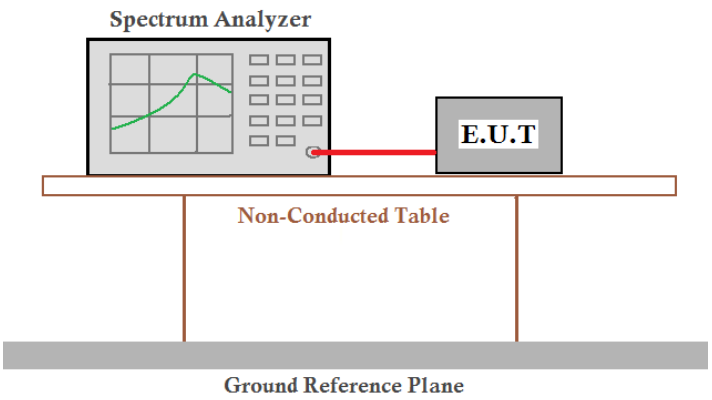
Peak value:

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
1540.00	42.06	25.13	4.71	33.68	38.22	54.00	-15.78	Vertical
2285.00	39.03	27.99	5.28	34.13	38.17	54.00	-15.83	Vertical
3165.00	37.61	28.82	6.29	33.14	39.58	54.00	-14.42	Vertical
4190.00	32.01	30.18	8.05	31.96	38.28	54.00	-15.72	Vertical
5335.00	30.06	31.73	9.26	32.35	38.70	54.00	-15.30	Vertical
5820.00	27.85	32.68	9.95	32.23	38.25	54.00	-15.75	Vertical
1670.00	43.05	24.91	4.78	33.88	38.86	54.00	-15.14	Horizontal
2300.00	39.22	27.97	5.29	34.13	38.35	54.00	-15.65	Horizontal
3520.00	35.41	29.01	6.99	32.73	38.68	54.00	-15.32	Horizontal
4160.00	33.26	30.10	8.02	32.00	39.38	54.00	-14.62	Horizontal
4990.00	29.81	31.95	8.75	32.18	38.33	54.00	-15.67	Horizontal
5410.00	31.49	31.84	9.38	32.38	40.33	54.00	-13.67	Horizontal

Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

7.3 20dB Occupy Bandwidth

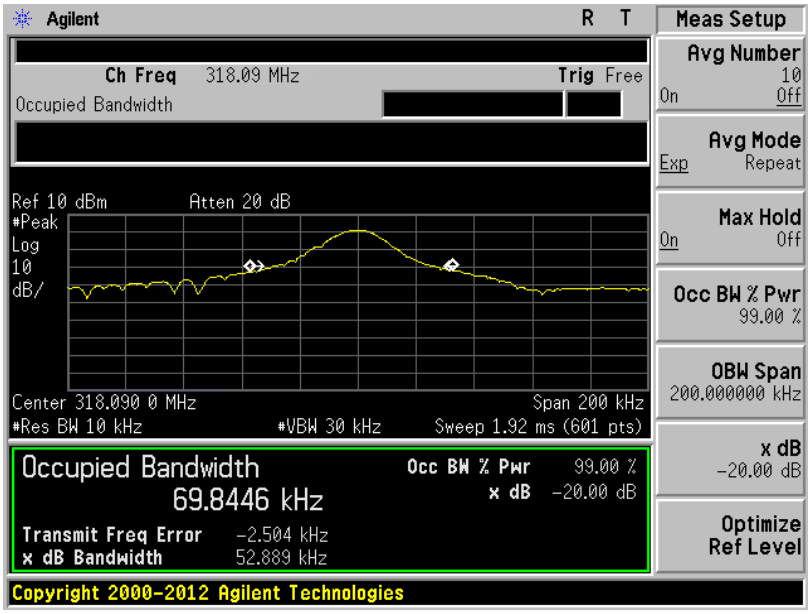
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% 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

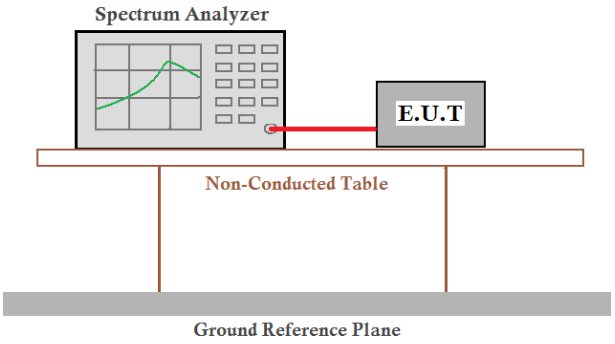
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
318.09	0.0529	0.7952	Pass

Note: Limit(318.09MHz)= Fundamental frequency×0.25%=318.09×0.25%=0.7952MHz

Test plot as follows:



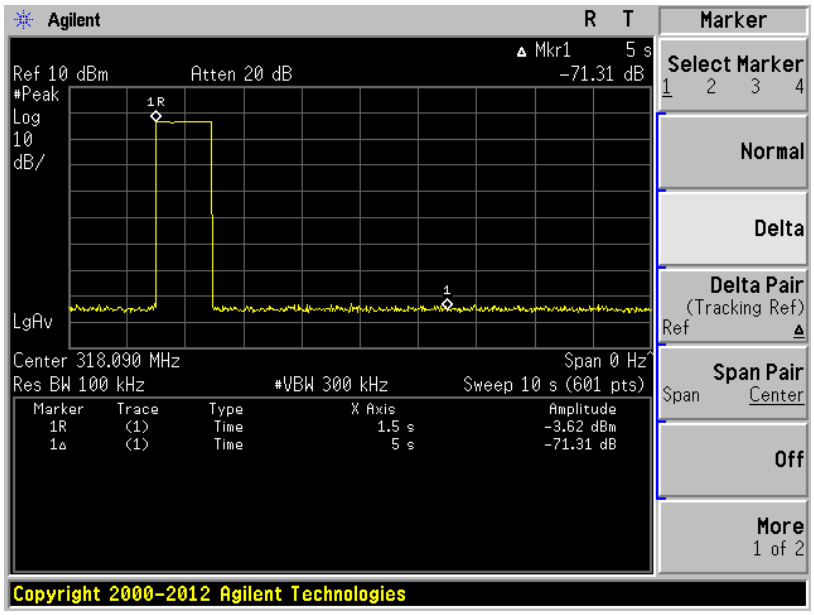
7.4 Deactivation Testing

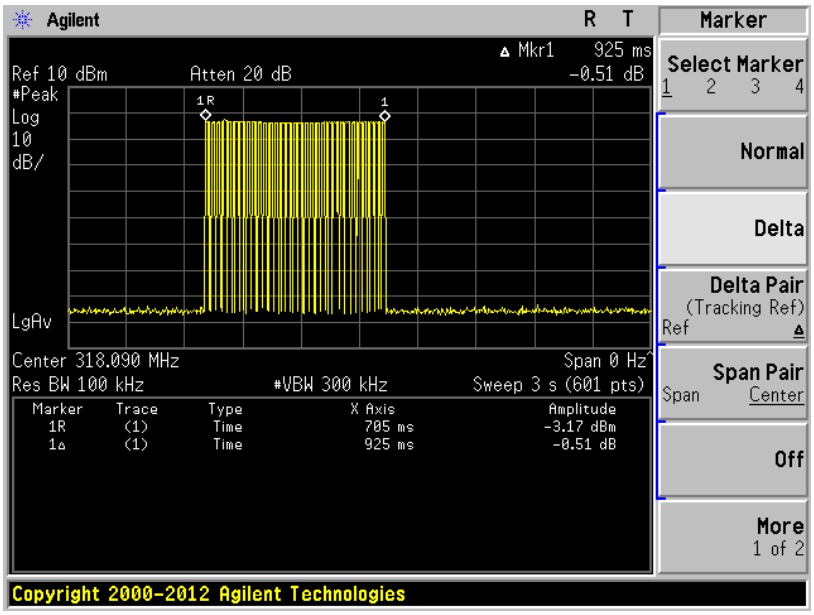
Test Requirement:	FCC Part15 C Section 15.231 (a)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, Detector: Peak
Limit:	Not more than 5 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Test Frequency (MHz)	Activation Time (second)	Limit (second)	Result
318.09	0.925	<5.0	Pass

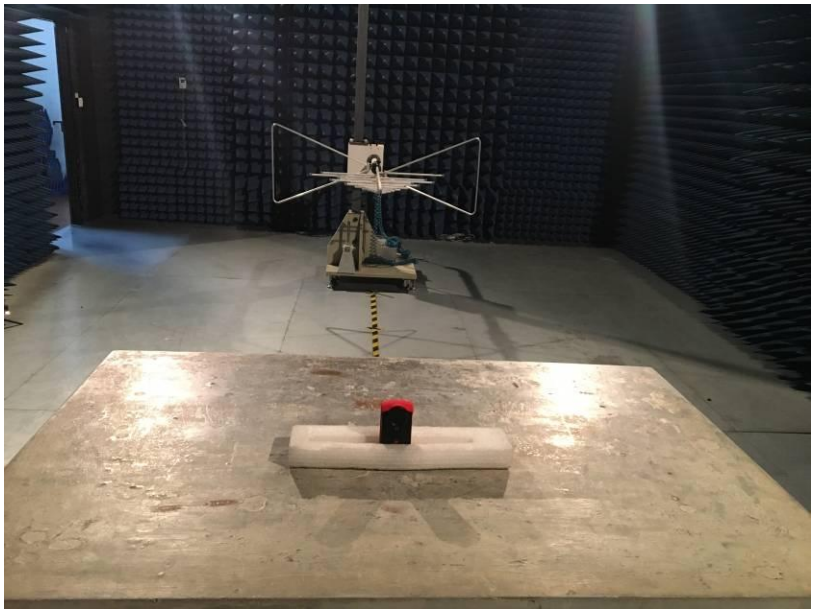
Test plot as follows:

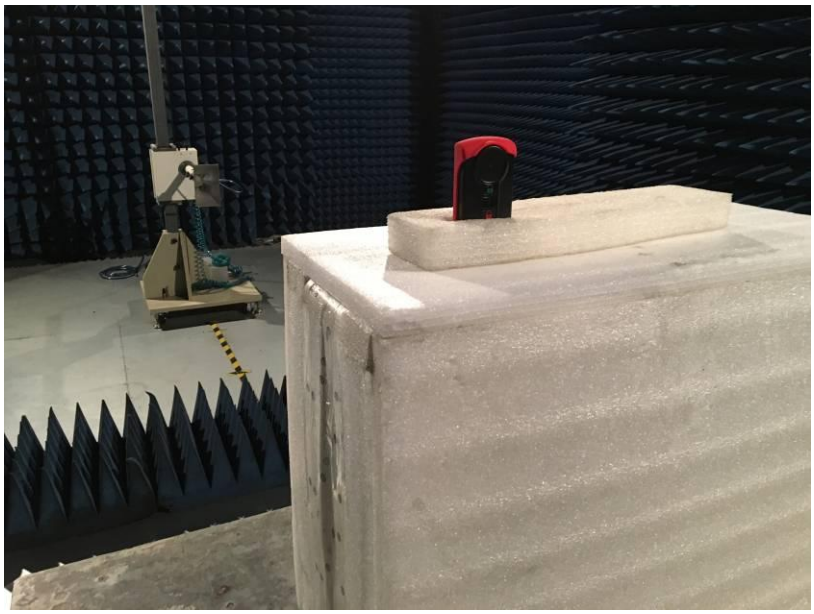




8 Test Setup Photo

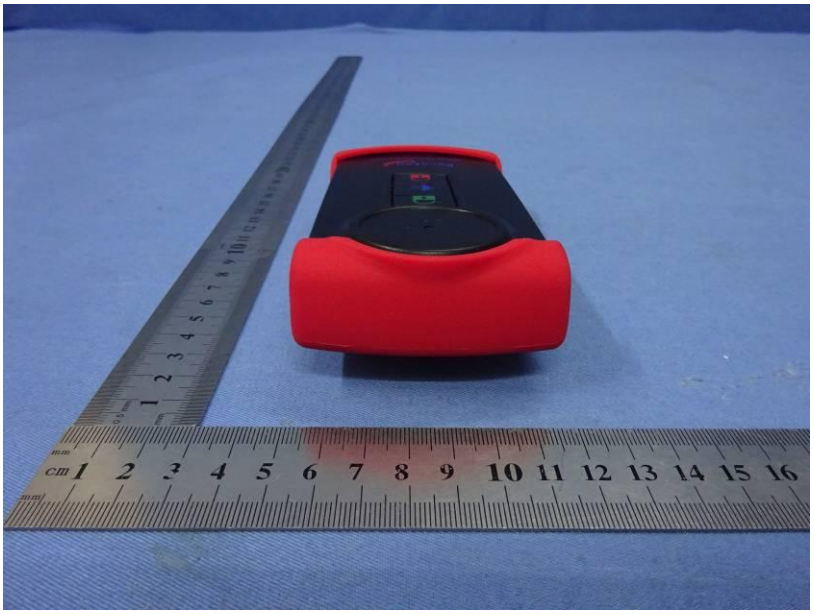
Radiated Emission

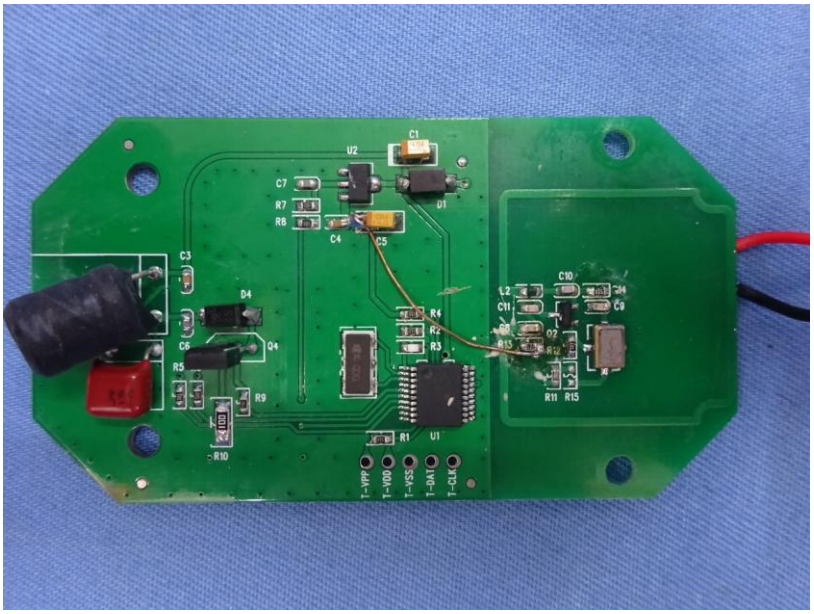


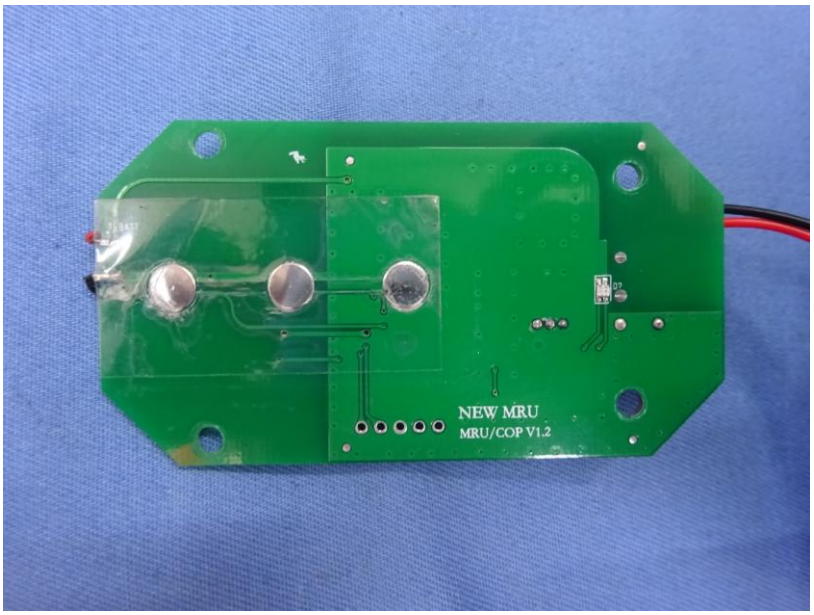


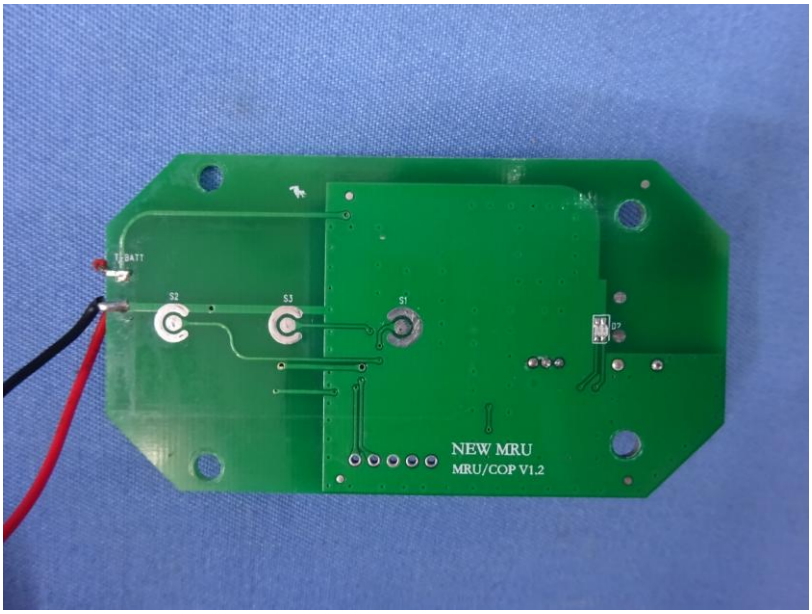
9 EUT Constructional Details

Rocateq
www.rocateq.com




T-VPP
T-VDD
T-VSS
T-DAT
T-CLK


NEW MRU
MRU/COP V1.2



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