

# FCC Report

**Applicant:** Red Bear Company Limited

**Address of Applicant:** 1711 Block B, Wah Luen Industrial Centre, 15-21 Wong Chuk Yeung Street, Fo Tan, Hong Kong

**Equipment Under Test (EUT)**

Product Name: RedBear IoT pHAT

Model No.: PHAT-IOT

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart B:2015

**Date of sample receipt:** July 06, 2016

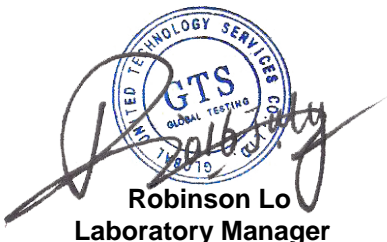
**Date of Test:** July 07-12, 2016

**Date of report issue:** July 13, 2016

**Test Result :** PASS \*

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

Authorized Signature:



**Robinson Lo**

**Laboratory Manager**

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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## 2 Version

Version No.	Date	Description
00	July 13, 2016	Original

**Prepared By:**

*Edward Pan*

**Date:**

*July 13, 2016*

**Project Engineer**

**Check By:**

*Andy Wu*

**Date:**

*July 13, 2016*

**Reviewer**

## 3 Contents

	Page
1 COVER PAGE .....	1
2 VERSION .....	2
3 CONTENTS .....	3
4 TEST SUMMARY .....	4
5 GENERAL INFORMATION .....	5
5.1 CLIENT INFORMATION.....	5
5.2 GENERAL DESCRIPTION OF EUT .....	5
5.3 TEST MODE .....	5
5.4 TEST FACILITY .....	6
5.5 TEST LOCATION.....	6
5.6 DESCRIPTION OF SUPPORT UNITS .....	6
5.7 DEVIATION FROM STANDARDS .....	6
5.8 ABNORMALITIES FROM STANDARD CONDITIONS.....	6
5.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER .....	6
6 TEST INSTRUMENTS LIST .....	7
7 TEST RESULTS AND MEASUREMENT DATA.....	8
7.1 CONDUCTED EMISSIONS .....	8
7.2 RADIATED EMISSION .....	11
8 TEST SETUP PHOTO .....	17
9 EUT CONSTRUCTIONAL DETAILS .....	19

## 4 Test Summary

Test Item	Section in CFR 47	Result
Conducted Emission	Part15.107	PASS
Radiated Emissions	Part15.109	PASS

*PASS: The EUT complies with the essential requirements in the standard.*

## 5 General Information

### 5.1 Client Information

Applicant:	Red Bear Company Limited
Address of Applicant:	1711 Block B, Wah Luen Industrial Centre, 15-21 Wong Chuk Yeung Street, Fo Tan, Hong Kong
Manufacturer/Factory:	Red Bear Company Limited
Address of Manufacturer/Factory:	1711 Block B, Wah Luen Industrial Centre, 15-21 Wong Chuk Yeung Street, Fo Tan, Hong Kong

### 5.2 General Description of EUT

Product Name:	RedBear IoT pHAT
Model No.:	PHAT-IOT
Power Supply:	DC 5.0V

### 5.3 Test mode

Test mode:	
Operation mode	Keep the EUT in normal operation mode.

## 5.4 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, June 26, 2013.

## 5.5 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

## 5.6 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC Approval
Apple	PC	A1278	C1MN99ERDTY3	FCC DoC
DELTA	ADAPTER	ADP-60ADT	N/A	FCC DoC

## 5.7 Deviation from Standards

Biconical, log.per. antenna and horn antenna were used instead of dipole antenna.  
Semi-anechoic Chamber was used as alternation of open air test sites, and all test suites were performed with radiated method in it.

## 5.8 Abnormalities from Standard Conditions

None.

## 5.9 Other Information Requested by the Customer

None.

## 6 Test Instruments list

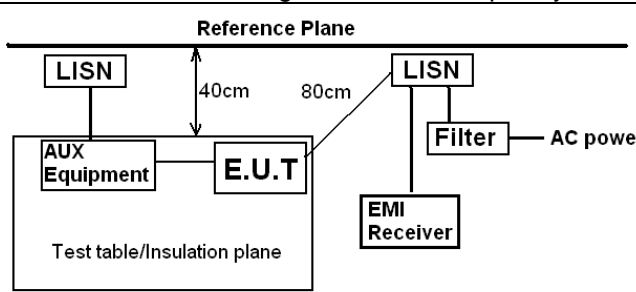
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	ESU EMI Test Receiver	R&S	ESU26	GTS203	July. 02 2016	July. 01 2017
4	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	July. 05 2016	July. 04 2017
5	Double -ridged waveguide horn	SCHWARZBECK	9120D	GTS208	July. 05 2016	July. 04 2017
6	RF Amplifier	HP	8347A	GTS204	July. 02 2016	July. 01 2017
7	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	July. 02 2016	July. 01 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial cable	GTS	N/A	GTS210	July. 04 2016	July. 03 2017
10	Coaxial Cable	GTS	N/A	GTS211	July. 04 2016	July. 03 2017
11	Thermo meter	N/A	N/A	GTS256	July. 05 2016	July. 04 2017

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	May. 16 2014	May. 15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April. 29 2016	April. 28 2017
3	Pulse Limiter	R&S	ESH3-Z2	GTS224	July. 02 2016	July. 01 2017
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	July. 02 2016	July. 01 2017
5	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	July. 02 2016	July. 01 2017
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 04 2016	Jul. 03 2017
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Thermo meter	KTJ	TA328	GTS233	July. 06 2016	July. 05 2017

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	July. 06 2016	July. 05 2017

## 7 Test Results and Measurement Data

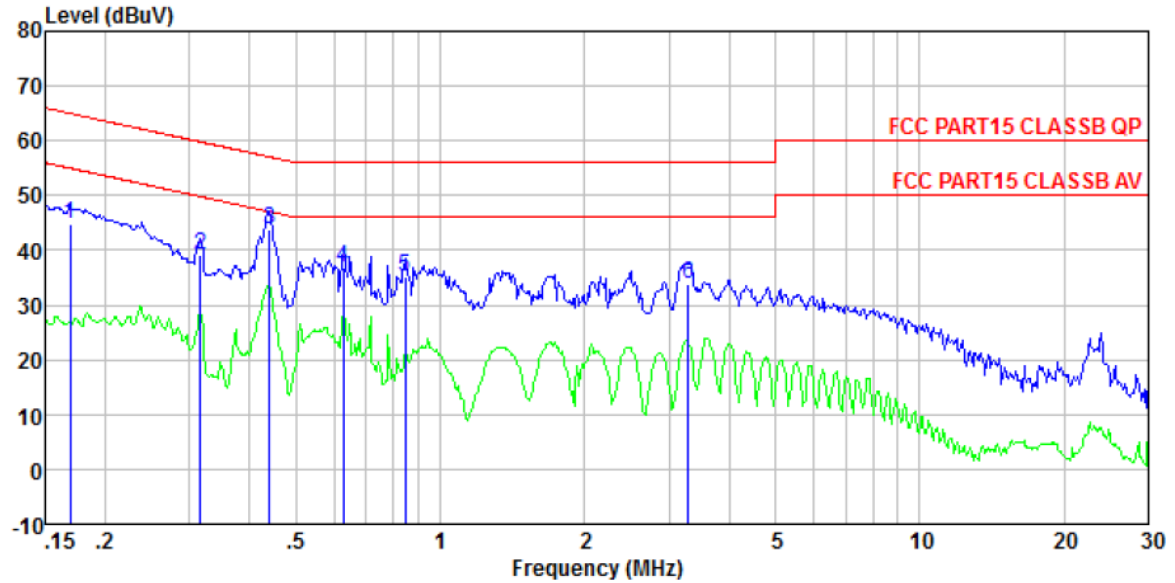
### 7.1 Conducted Emissions

Test Requirement:	FCC Part15 B Section 15.107		
Test Method:	ANSI C63.4:2014		
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:	<div><p style="text-align: center;"><b>Reference Plane</b></p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>		
Test procedure:	<div><div>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.</div><div>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).</div><div>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 C63.4: 2014 on conducted measurement.</div></div>		
Test Instruments:	Refer to section 6 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		



## Measurement Data

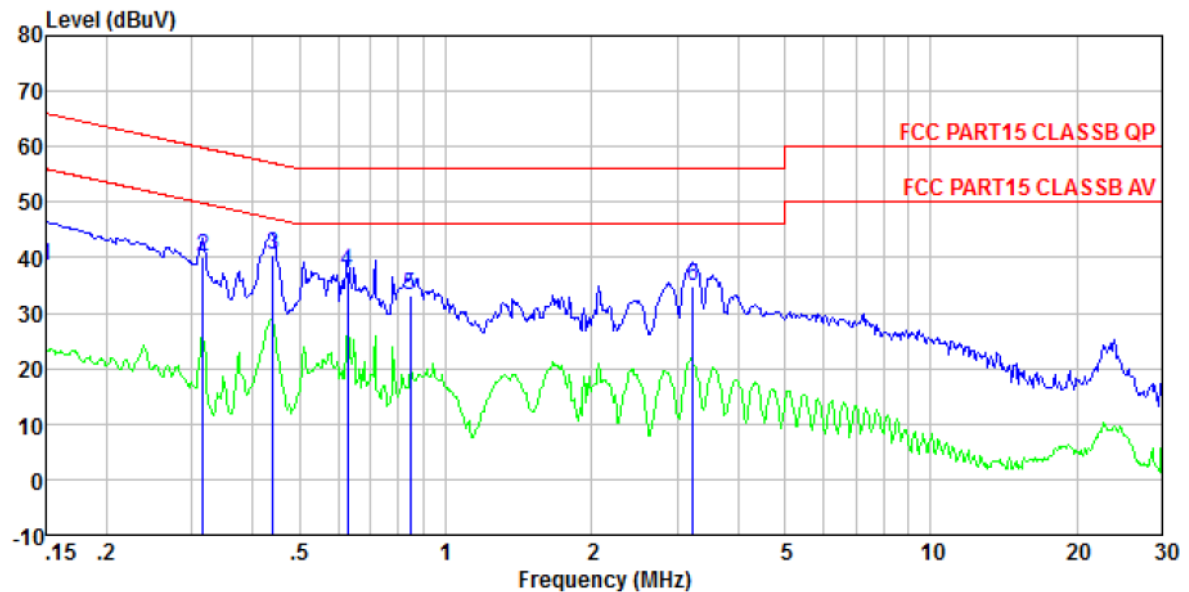
Line:



Site : Shielded room  
 Condition : FCC PART15 CLASSB QP LISN-2013 LINE  
 Job No. : 0065  
 Test mode : Operation mode  
 Test Engineer: Sky

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.169	44.58	0.15	0.12	44.85	64.99	-20.14	QP
2	0.317	38.94	0.11	0.10	39.15	59.80	-20.65	QP
3	0.440	43.52	0.12	0.11	43.75	57.07	-13.32	QP
4	0.627	36.59	0.13	0.12	36.84	56.00	-19.16	QP
5	0.844	34.87	0.14	0.13	35.14	56.00	-20.86	QP
6	3.293	33.54	0.18	0.15	33.87	56.00	-22.13	QP

**Neutral:**



Site : Shielded room  
 Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL  
 Job No. : 0065  
 Test mode : Operation mode  
 Test Engineer: Sky

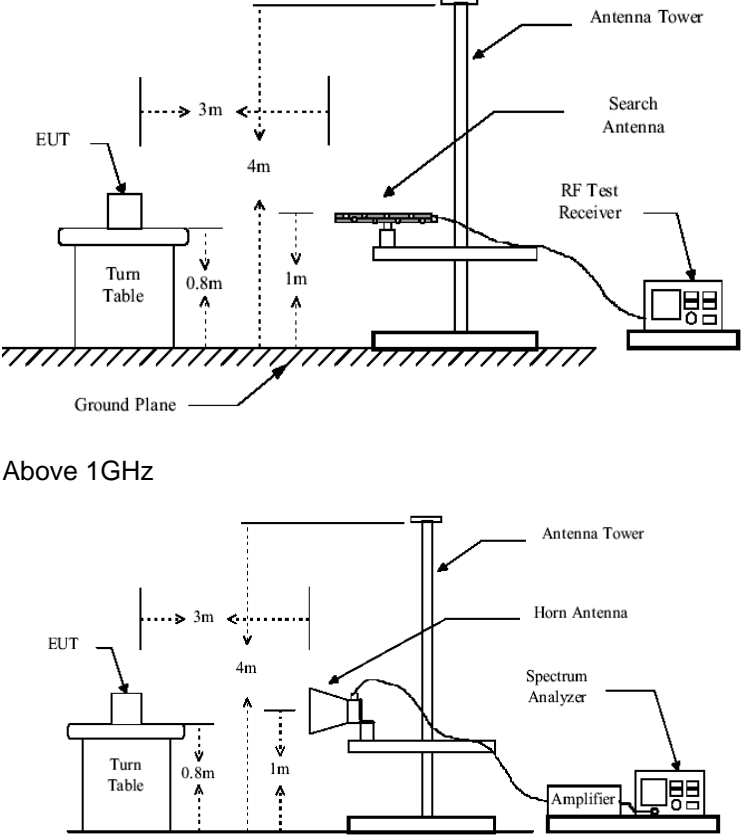
	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	38.35	0.07	0.12	38.54	66.00	-27.46	QP
2	0.317	39.87	0.06	0.10	40.03	59.80	-19.77	QP
3	0.440	40.33	0.06	0.11	40.50	57.07	-16.57	QP
4	0.627	37.16	0.07	0.12	37.35	56.00	-18.65	QP
5	0.844	32.99	0.07	0.13	33.19	56.00	-22.81	QP
6	3.241	34.65	0.13	0.15	34.93	56.00	-21.07	QP

**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

## 7.2 Radiated Emission

Test Requirement:	FCC Part15 B Section 15.109																								
Test Method:	ANSI C63.4:2014																								
Test Frequency Range:	30MHz to 6GHz																								
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)																								
Receiver setup:	<table><tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr><tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr><tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr></table>					Frequency	Detector	RBW	VBW	Remark	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value	
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Limit:	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td>30MHz-88MHz</td><td>40.00</td><td>Quasi-peak Value</td></tr><tr><td>88MHz-216MHz</td><td>43.50</td><td>Quasi-peak Value</td></tr><tr><td>216MHz-960MHz</td><td>46.00</td><td>Quasi-peak Value</td></tr><tr><td>960MHz-1GHz</td><td>54.00</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr><tr><td>74.00</td><td>Peak Value</td></tr></table>					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
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960MHz-1GHz	54.00	Quasi-peak Value																							
Above 1GHz	54.00	Average Value																							
	74.00	Peak Value																							
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. 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.</div> <div>4. 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.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. 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.</div>																								
Test setup:	Below 1GHz																								

	 <p>Above 1GHz</p>
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 1 012mbar
Measurement Record:	Uncertainty: ± 4.5dB
Test Instruments:	Refer to section 6 for details
Test mode:	Pre-scan all modes in section 5.3, and found the PC mode which is the worst mode, so only the data of worst mode was show on the test report.
Test results:	Pass

**Note:**

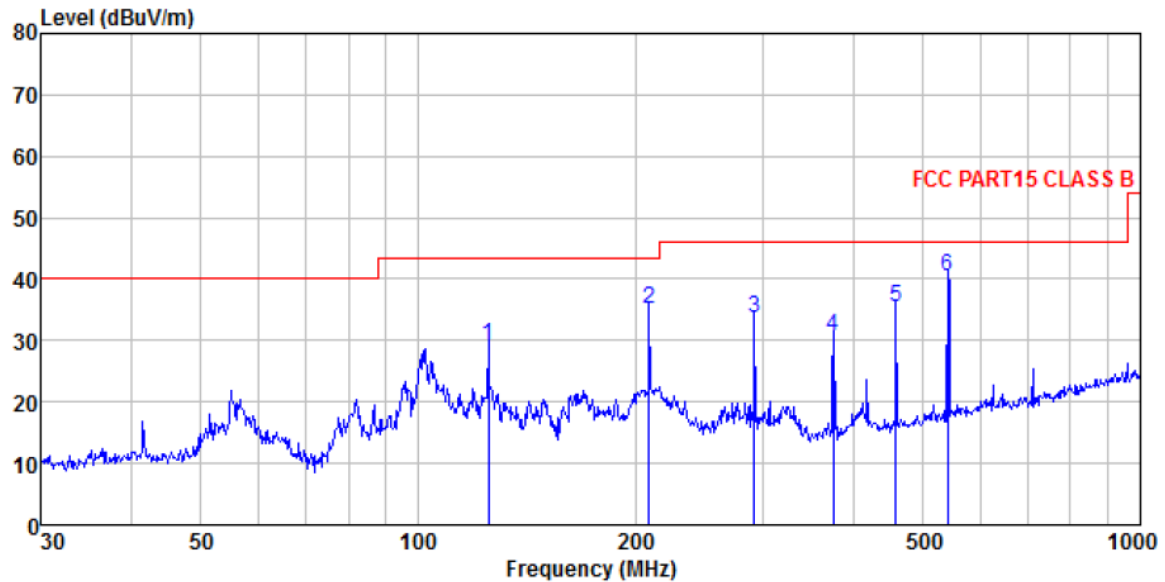
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

## Measurement Data

### Below 1G

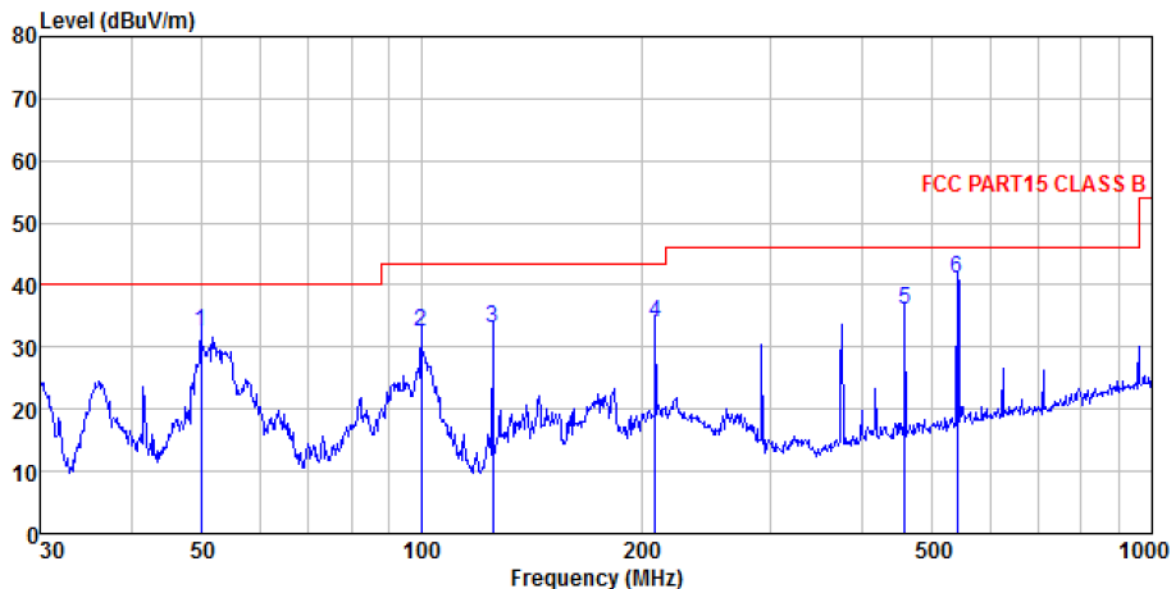
Horizontal:



Site : 3m chamber  
 Condition : FCC PART15 CLASS B VULB9163-2013M HORIZONTAL  
 Job No. : 0065  
 Test Mode : Operation mode  
 Test Engineer: Sky

	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	125.007	45.63	11.70	1.40	29.54	29.19	43.50	-14.31	QP
2	208.580	49.67	12.84	1.89	29.29	35.11	43.50	-8.39	QP
3	292.058	46.52	14.89	2.32	29.95	33.78	46.00	-12.22	QP
4	375.939	41.02	16.56	2.75	29.61	30.72	46.00	-15.28	QP
5	459.114	44.00	17.59	3.13	29.38	35.34	46.00	-10.66	QP
6	541.373	46.77	19.41	3.49	29.30	40.37	46.00	-5.63	QP

Vertical:

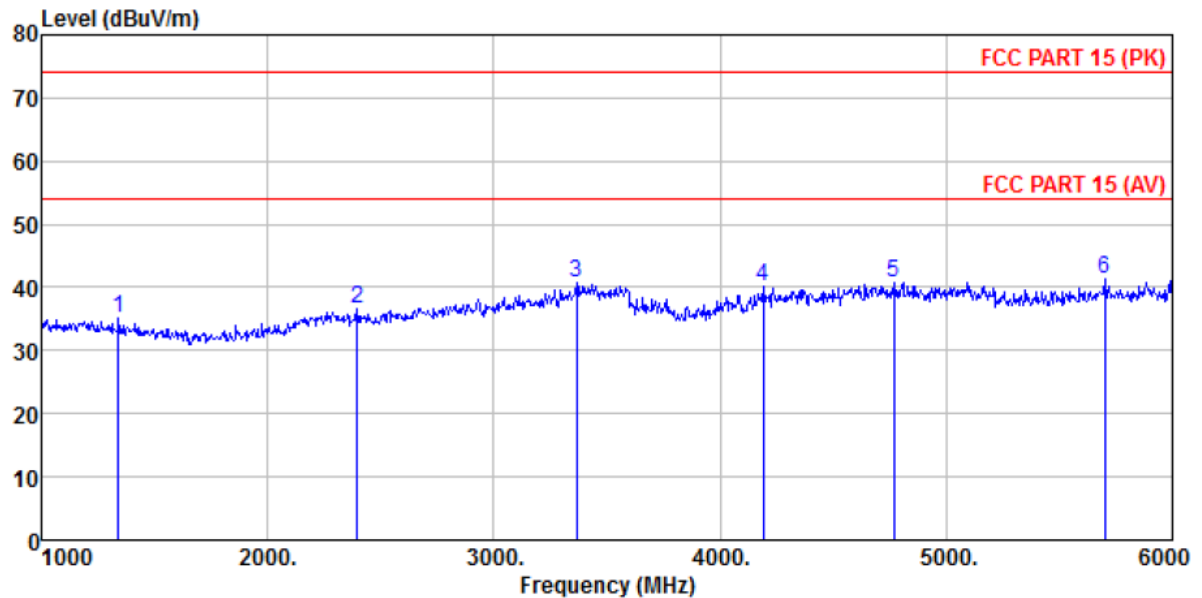


Site : 3m chamber  
 Condition : FCC PART15 CLASS B VULB9163-2013M VERTICAL  
 Job No. : 0065  
 Test Mode : Operation mode  
 Test Engineer: Sky

	Freq	ReadAntenna	Cable Preamp		Limit	Over	
		Level Factor	Loss Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB
1	49.881	46.48	15.26	0.77	30.00	32.51	40.00 -7.49 QP
2	99.878	45.82	15.16	1.19	29.70	32.47	43.50 -11.03 QP
3	125.007	49.39	11.70	1.40	29.54	32.95	43.50 -10.55 QP
4	208.580	48.63	12.84	1.89	29.29	34.07	43.50 -9.43 QP
5	459.114	44.56	17.59	3.13	29.38	35.90	46.00 -10.10 QP
6	541.373	47.56	19.41	3.49	29.30	41.16	46.00 -4.84 QP

## Above 1G

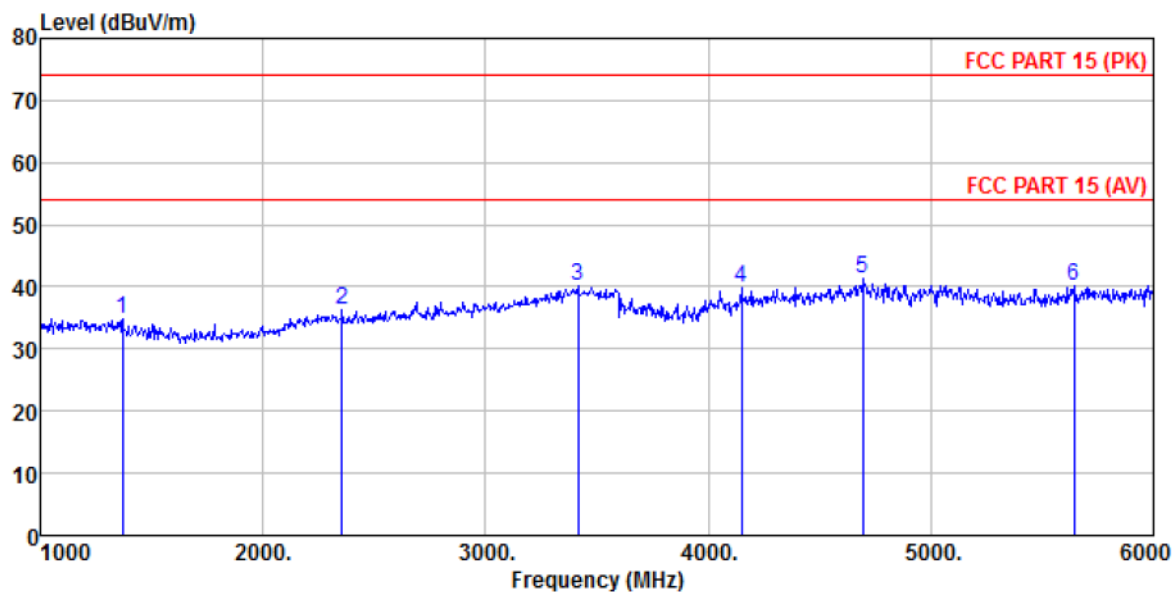
Horizontal:



Site : 3m chamber  
 Condition : FCC PART 15 (PK) BBHA9120D ANT(>1GHZ) HORIZONTAL  
 Job No. : 0065  
 Test Mode : Operation mode  
 Test Engineer: Sky

	ReadAntenna	Cable	Preamp		Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1340.000	38.26	25.69	4.57	33.33	35.19	74.00
2	2395.000	37.66	27.59	5.39	34.01	36.63	74.00
3	3365.000	38.31	28.51	6.70	32.91	40.61	74.00
4	4190.000	33.74	30.18	8.05	31.96	40.01	74.00
5	4770.000	32.56	31.73	8.58	32.07	40.80	74.00
6	5700.000	31.30	32.50	9.79	32.31	41.28	74.00

Vertical:



Site : 3m chamber  
 Condition : FCC PART 15 (PK) BBHA9120D ANT(>1GHZ) VERTICAL  
 Job No. : 0065  
 Test Mode : Operation mode  
 Test Engineer: Sky

Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1370.000	37.88	25.66	4.59	33.39	34.74	74.00	-39.26 Peak
2	2355.000	37.19	27.69	5.34	34.05	36.17	74.00	-37.83 Peak
3	3415.000	37.44	28.67	6.80	32.85	40.06	74.00	-33.94 Peak
4	4150.000	33.67	30.06	8.01	32.01	39.73	74.00	-34.27 Peak
5	4695.000	33.19	31.65	8.51	32.03	41.32	74.00	-32.68 Peak
6	5645.000	30.52	32.36	9.72	32.35	40.25	74.00	-33.75 Peak

Note:

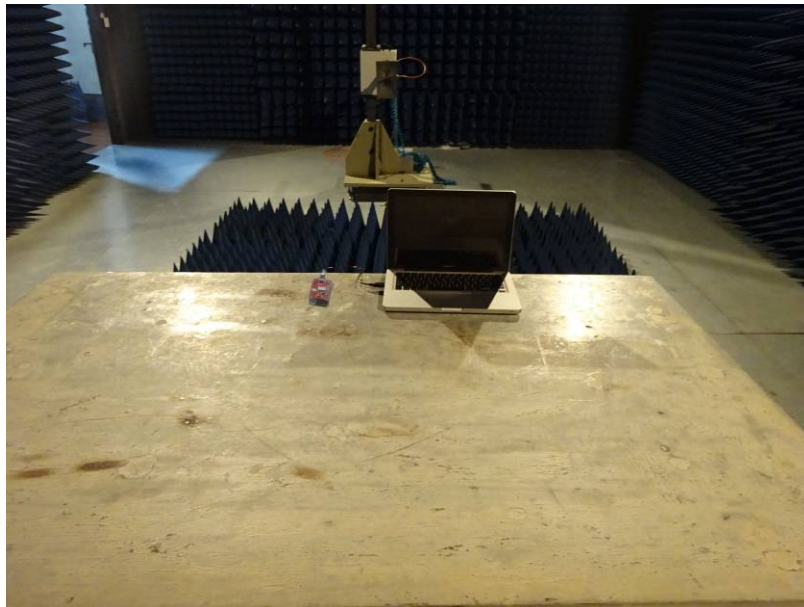
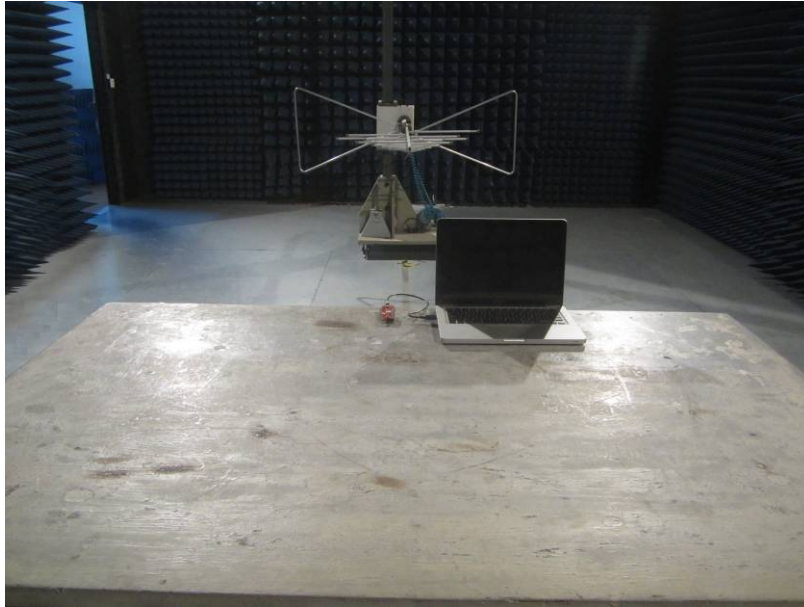
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor



## 8 Test Setup Photo

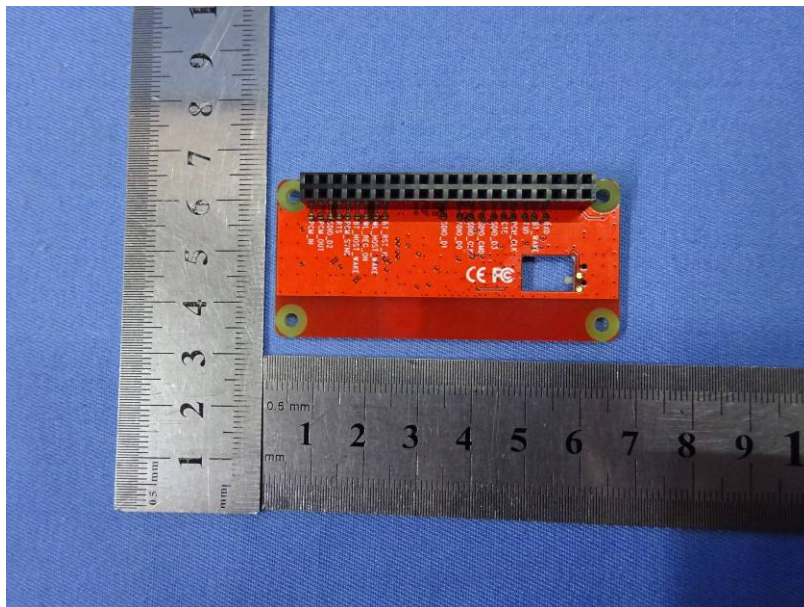
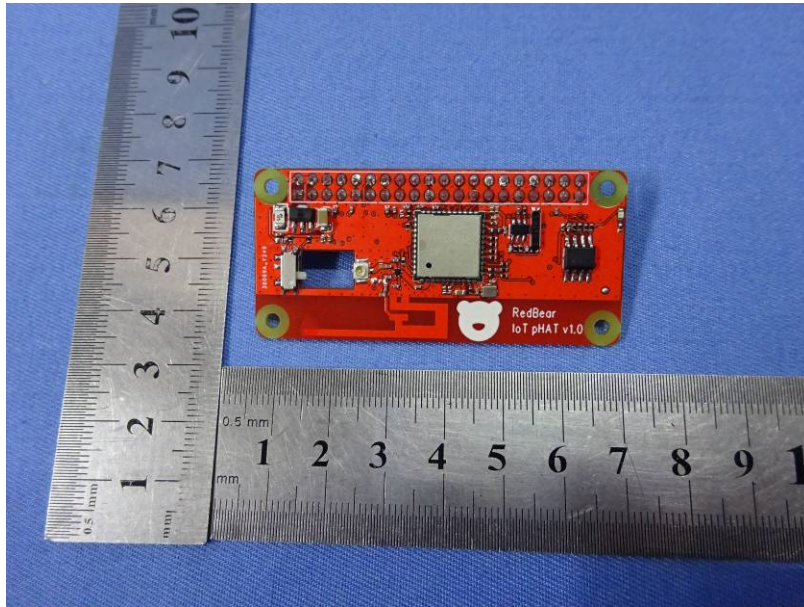
Radiated Emission



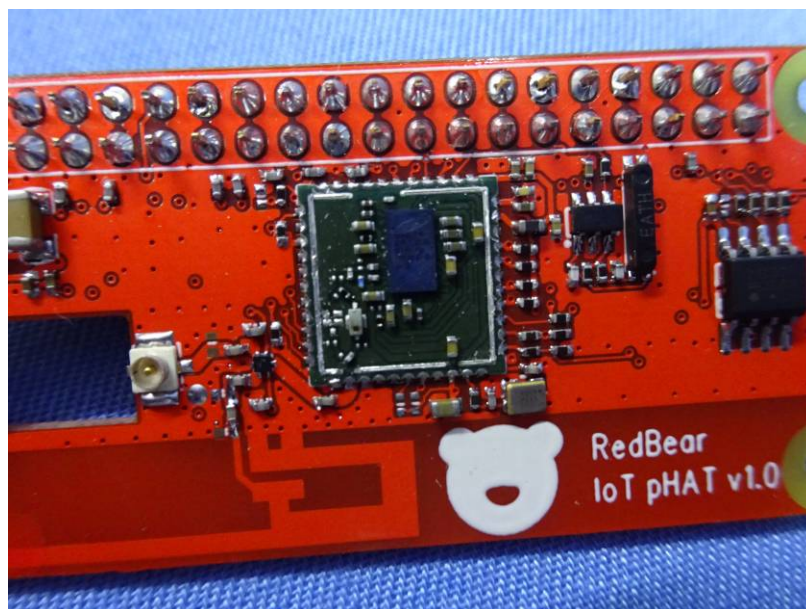
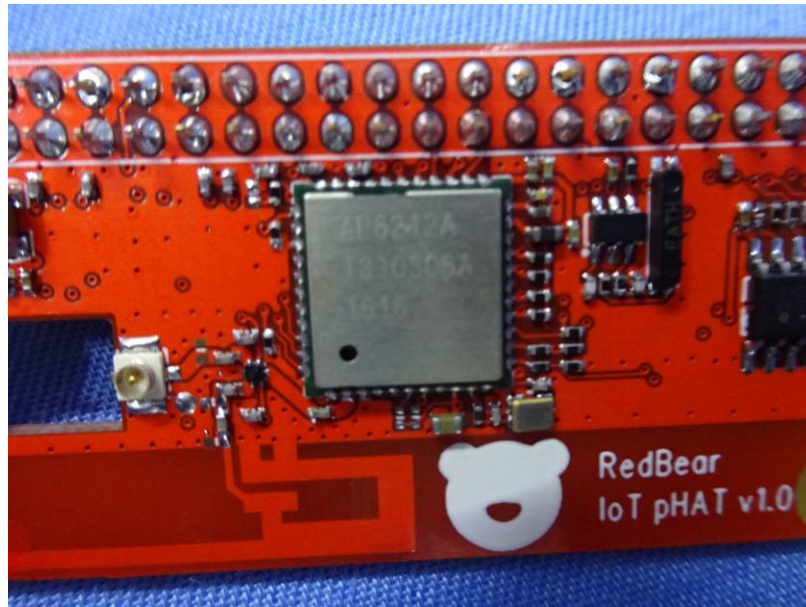
## Conducted Emission

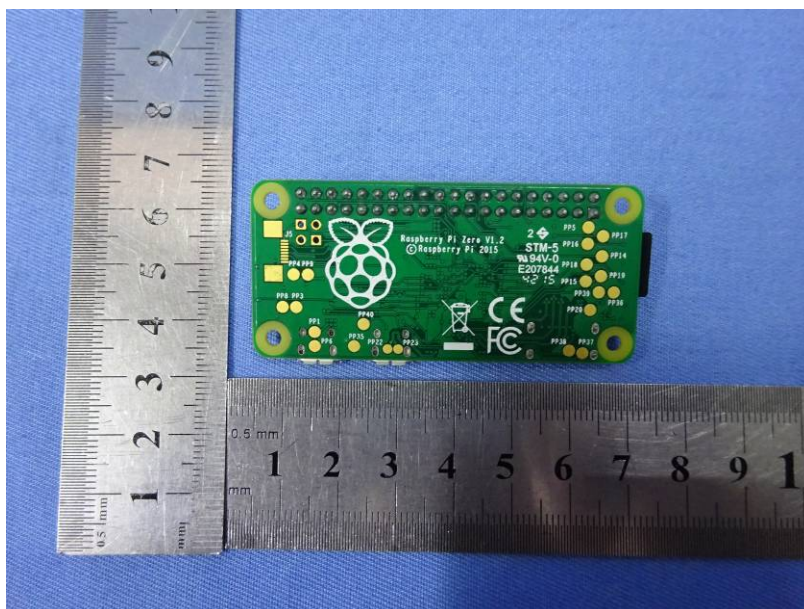
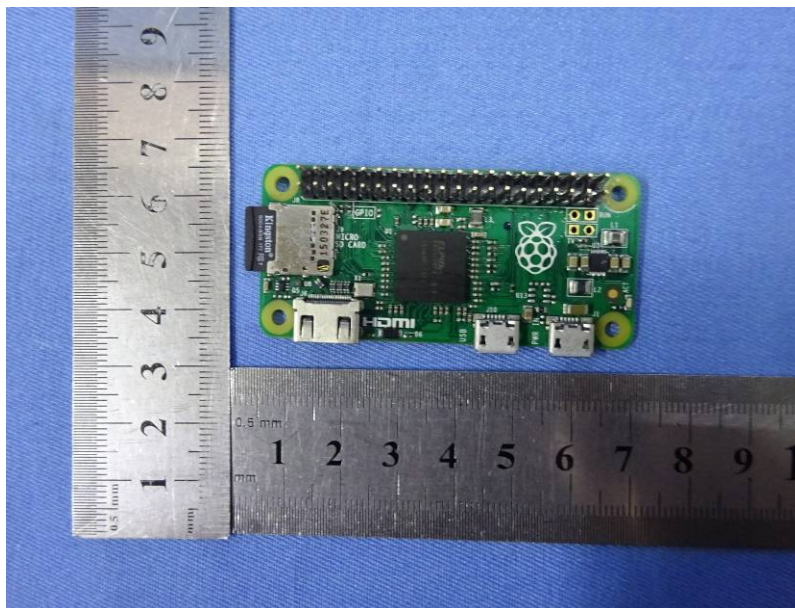


## 9 EUT Constructional Details









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