

RF Exposure

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: EN 62311:2008

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.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 1999/5/EC are considered.



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.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of GTS or testing done by GTS in connection with, distribution or use of the product described in this report must be approved by GTS in writing.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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 GENERAL INFORMATION	4
4.1 CLIENT INFORMATION	4
4.2 GENERAL DESCRIPTION OF EUT	4
4.3 TEST FACILITY	5
4.4 TEST LOCATION	5
4.5 DESCRIPTION OF SUPPORT UNITS	5
4.6 DEVIATION FROM STANDARDS	5
4.7 ABNORMALITIES FROM STANDARD CONDITIONS	5
4.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER	5
5 TECHNICAL REQUIREMENTS SPECIFICATION IN EN 62311	6

4 General Information

4.1 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

4.2 General Description of EUT

Product Name:	RedBear IoT pHAT
Model No.:	PHAT-IOT
Bluetooth	
Operation Frequency:	2402~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	3.3dBi (declare by Applicant)
WIFI	
Operation Frequency:	2412MHz~2472MHz(802.11b/802.11g/802.11n(H20))
Channel Numbers:	13 for 802.11b/802.11g/802.11n(HT20)
Channel Separation:	5MHz
Modulation Type: (IEEE 802.11b)	Direct Sequence Spread Spectrum(DSSS)
Modulation Type: (IEEE 802.11g/802.11n)	Orthogonal Frequency Division Multiplexing(OFDM)
Antenna Type:	PCB Antenna
Antenna Gain:	3.3dBi (declare by Applicant)
Power Supply:	DC 5.0V

4.3 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, June 26, 2013.

4.4 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 518102

Tel: 0755-27798480

Fax: 0755-27798960

4.5 Description of Support Units

The EUT has been tested as an independent unit.

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

5 Technical Requirements Specification in EN 62311

Test Requirement:	EN 62311																																																												
Test Method:	EN 62311																																																												
General Description of Applied Standards	EN 62311 Generic standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0 Hz–300 GHz) is to demonstrate the compliance of apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields as well as induced and contact current.																																																												
Limit:	<p>According to EN 62311, the criteria listed in the below table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified table 2 of Council Recommendation 1999/519/EC.</p> <p style="text-align: center;">Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms values)</p> <table><tr><th>Frequency range</th><th>E-field strength (V/m)</th><th>H-field strength (A/m)</th><th>B-field (μT)</th><th>Equivalent plane wave power density S_{eq} (W/m²)</th></tr><tr><td>0-1 Hz</td><td>—</td><td>$3,2 \times 10^4$</td><td>4×10^4</td><td>—</td></tr><tr><td>1-8 Hz</td><td>10 000</td><td>$3,2 \times 10^4/f^2$</td><td>$4 \times 10^4/f^2$</td><td>—</td></tr><tr><td>8-25 Hz</td><td>10 000</td><td>$4\,000/f$</td><td>$5\,000/f$</td><td>—</td></tr><tr><td>0,025-0,8 kHz</td><td>$250/f$</td><td>$4/f$</td><td>$5/f$</td><td>—</td></tr><tr><td>0,8-3 kHz</td><td>$250/f$</td><td>5</td><td>6,25</td><td>—</td></tr><tr><td>3-150 kHz</td><td>87</td><td>5</td><td>6,25</td><td>—</td></tr><tr><td>0,15-1 MHz</td><td>87</td><td>$0,73/f$</td><td>$0,92/f$</td><td>—</td></tr><tr><td>1-10 MHz</td><td>$87/f^{1/2}$</td><td>$0,73/f$</td><td>$0,92/f$</td><td>—</td></tr><tr><td>10-400 MHz</td><td>28</td><td>0,073</td><td>0,092</td><td>2</td></tr><tr><td>400-2 000 MHz</td><td>$1,375 \cdot f^{1/2}$</td><td>$0,0037 \cdot f^{1/2}$</td><td>$0,0046 \cdot f^{1/2}$</td><td>$f/200$</td></tr><tr><td>2-300 GHz</td><td>61</td><td>0,16</td><td>0,20</td><td>10</td></tr></table> <p>Notes:</p> <p>1. f as indicated in the frequency range column.</p>	Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m ²)	0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—	1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—	8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—	0,025-0,8 kHz	$250/f$	$4/f$	$5/f$	—	0,8-3 kHz	$250/f$	5	6,25	—	3-150 kHz	87	5	6,25	—	0,15-1 MHz	87	$0,73/f$	$0,92/f$	—	1-10 MHz	$87/f^{1/2}$	$0,73/f$	$0,92/f$	—	10-400 MHz	28	0,073	0,092	2	400-2 000 MHz	$1,375 \cdot f^{1/2}$	$0,0037 \cdot f^{1/2}$	$0,0046 \cdot f^{1/2}$	$f/200$	2-300 GHz	61	0,16	0,20	10
Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m ²)																																																									
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—																																																									
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—																																																									
8-25 Hz	10 000	$4\,000/f$	$5\,000/f$	—																																																									
0,025-0,8 kHz	$250/f$	$4/f$	$5/f$	—																																																									
0,8-3 kHz	$250/f$	5	6,25	—																																																									
3-150 kHz	87	5	6,25	—																																																									
0,15-1 MHz	87	$0,73/f$	$0,92/f$	—																																																									
1-10 MHz	$87/f^{1/2}$	$0,73/f$	$0,92/f$	—																																																									
10-400 MHz	28	0,073	0,092	2																																																									
400-2 000 MHz	$1,375 \cdot f^{1/2}$	$0,0037 \cdot f^{1/2}$	$0,0046 \cdot f^{1/2}$	$f/200$																																																									
2-300 GHz	61	0,16	0,20	10																																																									
Test method:	<p>According to the Far field calculation formula:</p> <p style="text-align: center;">Far Field Calculation Formula</p> <div>$E = \frac{\sqrt{30PG(\theta, \phi)}}{r}$<div><div>$G$ = antenna gain relative to an isotropic antenna</div><div>θ, ϕ = elevation and azimuth angles to point of investigation</div><div>r = distance from observation point to the antenna</div></div></div> <p>The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement of the user for keeing 20cm separation distance and the prohibition of operating to a person has been printed on the user manual. So, this product under normal use is located on electromagnetic far field between the human body.</p>																																																												
Result:	Pass																																																												

Measurement Data:

802.11b mode					
Frequency (MHz)	Output Power (dBm)	Output Power (mW)	E Field Strength (V/m)	Limit (V/m)	Result
2412	16.31	42.76	5.66	61.00	Pass
2442	16.68	46.56	5.91		
2472	16.67	46.45	5.90		
802.11g mode					
Frequency (MHz)	Output Power (dBm)	Output Power (mW)	E Field Strength (V/m)	Limit (V/m)	Result
2412	15.03	31.84	4.89	61.00	Pass
2442	15.12	32.51	4.94		
2472	15.23	33.34	5.00		
802.11n(H20) mode					
Frequency (MHz)	Output Power (dBm)	Output Power (mW)	E Field Strength (V/m)	Limit (V/m)	Result
2412	13.94	24.77	4.31	61.00	Pass
2442	13.86	24.32	4.27		
2472	14.07	25.53	4.38		
Bluetooth V4.0 mode					
Frequency (MHz)	Output Power (dBm)	Output Power (mW)	E Field Strength (V/m)	Limit (V/m)	Result
2402	6.09	4.06	1.75	61.00	Pass
2440	6.56	4.53	1.84		
2480	6.44	4.41	1.82		

-----End-----