FCC Report (WIFI)

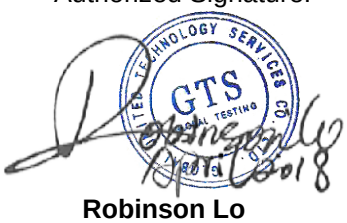
Applicant:	Braeburn Systems LLC
Address of Applicant:	2215 CORNELL AVENUE, MONTGOMERY, Illinois 60538, United States
Manufacturer/Factory:	Computime Ltd.
Address of Manufacturer/Factory:	Computime Technology Park, DanZhuTou Cun, Buji, Longgang Region, Shenzhen, China

Equipment Under Test (EUT)

Product Name:	ELECTRONIC THERMOSTAT
Model No.:	7205
FCC ID:	2ADX6-7205
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	April 25, 2018
Date of Test:	April 26-28, 2018
Date of report issued:	April 28, 2018
Test Result :	PASS *

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

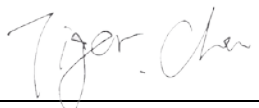
Authorized Signature:



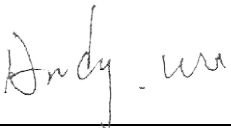
Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*April 28, 2018*	*Original*

Prepared By:  ***Date:*** *April 28, 2018*

Project Engineer

Check By:  ***Date:*** *April 28, 2018*

Reviewer

3 Contents

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	N/A
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(3)	N/A
Channel Bandwidth	15.247 (a)(2)	N/A
Power Spectral Density	15.247 (e)	N/A
Band Edge	15.247(d)	N/A
Spurious Emission	15.205/15.209	Pass

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

N/A: Not applicable.

Remark: Test according to ANSI C63.4:2014 and ANSI C63.10:2013.

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:	ELECTRONIC THERMOSTAT
Model No.:	7205
Operation Frequency:	802.11b/802.11g/802.11n(HT20): 2412MHz~2462MHz
Channel numbers:	802.11b/802.11g /802.11n(HT20): 11
Channel separation:	5MHz
Modulation technology:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n(H20) Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	PCB antenna
Antenna gain:	-0.27dBi(Declared by Applicant)
Power Supply:	AC 24V Or Battery: DC 3.0V (2 *1.5V SIZE“AA”)

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)
	802.11b/802.11g/802.11n(HT20)
Lowest channel	2412MHz
Middle channel	2437MHz
Highest channel	2462MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode

Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	802.11b	802.11g	802.11n(HT20)	
Data rate	1Mbps	6Mbps	6.5Mbps	

5.3 Description of Support Units

None

5.4 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 fuly 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.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: 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

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	June 28 2017	June 27 2018
4	Loop Antenna	Zhinan	ZN30900A	GTS534	June 28 2017	June 27 2018
5	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	June 28 2017	June 27 2018
6	Double-ridged horn antenna	SCHWARZBECK	9120D	GTS208	June 28 2017	June 27 2018
7	Horn Antenna	ETS-LINDGREN	3160-09	GTS218	June 28 2017	June 27 2018
8	RF Amplifier	HP	8347A	GTS204	June 28 2017	June 27 2018
9	RF Amplifier	HP	8349B	GTS206	June 28 2017	June 27 2018
10	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	June 28 2017	June 27 2018
11	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	June 28 2017	June 27 2018
12	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
13	Coaxial Cable	GTS	N/A	GTS210	June 28 2017	June 27 2018
14	Coaxial Cable	GTS	N/A	GTS211	June 28 2017	June 27 2018
15	Coaxial Cable	GTS	N/A	GTS210	June 28 2017	June 27 2018
16	Coaxial Cable	GTS	N/A	GTS212	June 28 2017	June 27 2018
17	Thermo meter	N/A	N/A	GTS256	June 28 2017	June 27 2018
18	D.C. Power Supply	Instek	PS-3030	GTS232	June 28 2017	June 27 2018
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	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	May.16 2014	May 15 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	High voltage probe	SCHWARZBECK	TK9420	GTS537	June 28 2017	June 27 2018
6	ISN	SCHWARZBECK	NTFM 8158	GTS565	June 28 2017	June 27 2018
7	Coaxial Cable	GTS	N/A	GTS227	June 28 2017	June 27 2018
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Thermo meter	KTJ	TA328	GTS233	June 28 2017	June 27 2018
10	10dB Pulse Limiter	Rohde & Schwarz	N/A	GTS224	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 /247(c)

15.203 requirement:

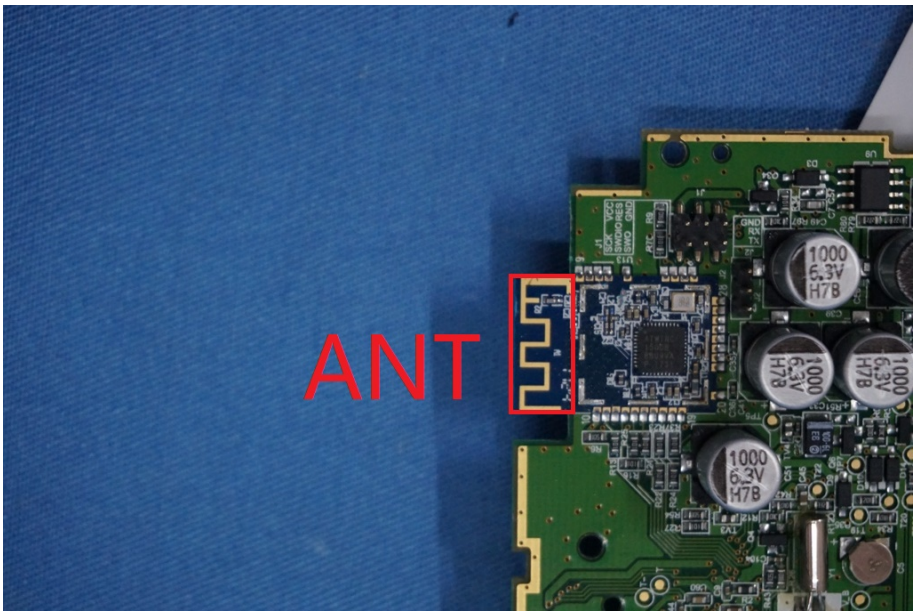
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

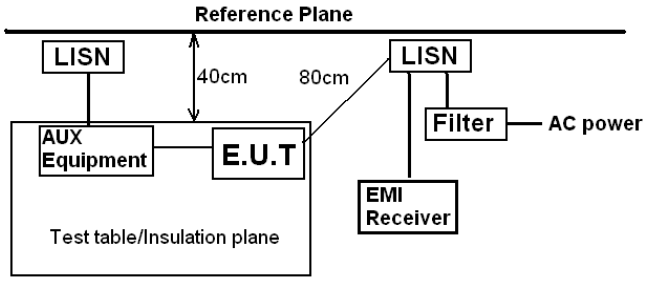
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

EUT Antenna:

The antenna is PCB antenna, the best case gain of the antenna is -0.27dBi

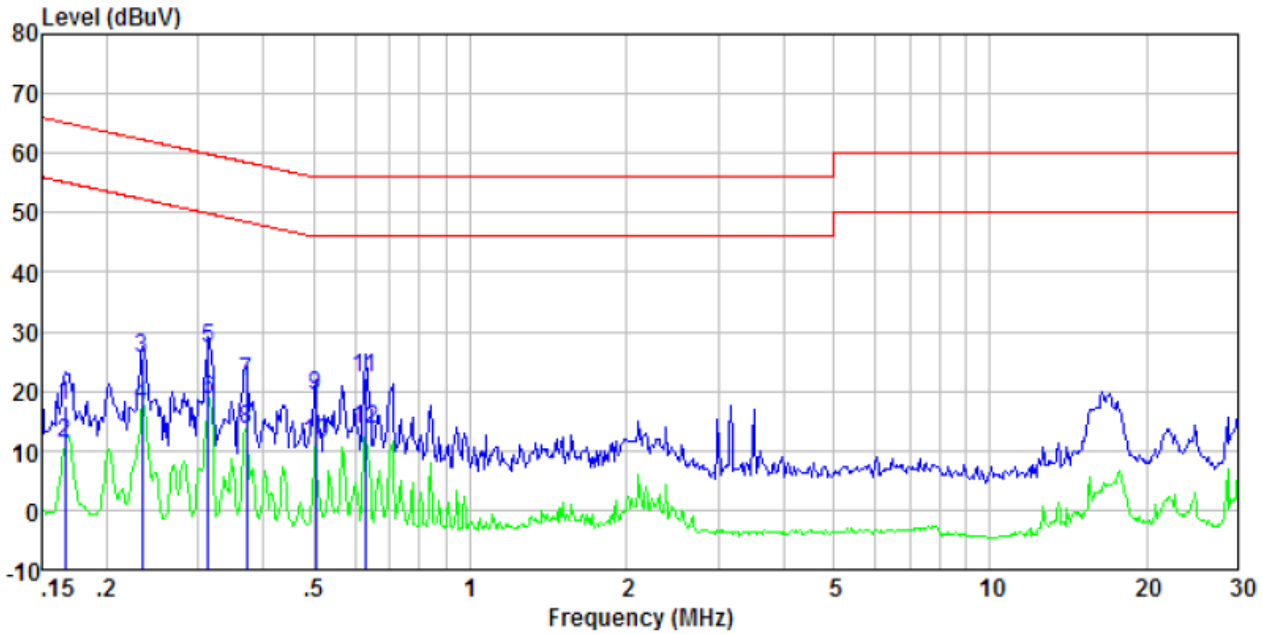


7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
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

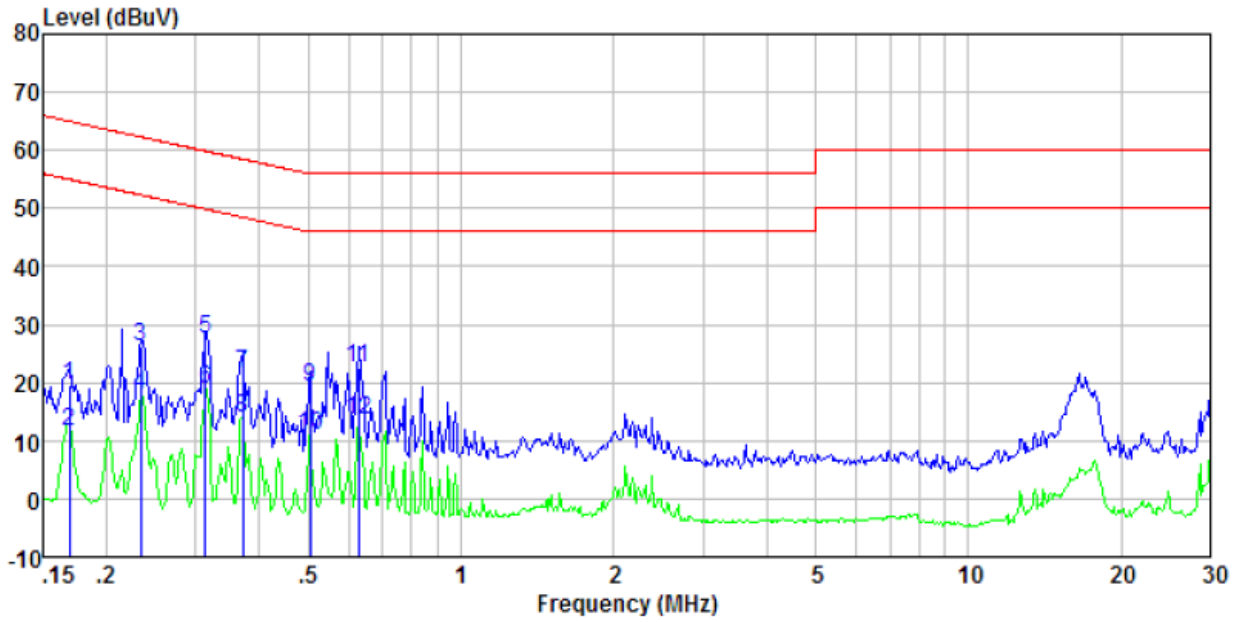
Measurement data

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.17	17.17	0.40	0.08	17.65	65.16	-47.51	QP
0.17	10.77	0.40	0.08	11.25	55.16	-43.91	Average
0.23	25.13	0.40	0.11	25.64	62.30	-36.66	QP
0.23	17.00	0.40	0.11	17.51	52.30	-34.79	Average
0.31	26.79	0.39	0.10	27.28	59.88	-32.60	QP
0.31	18.11	0.39	0.10	18.60	49.88	-31.28	Average
0.37	20.93	0.36	0.10	21.39	58.47	-37.08	QP
0.37	13.07	0.36	0.10	13.53	48.47	-34.94	Average
0.50	18.84	0.31	0.11	19.26	56.00	-36.74	QP
0.50	10.84	0.31	0.11	11.26	46.00	-34.74	Average
0.63	21.87	0.28	0.12	22.27	56.00	-33.73	QP
0.63	13.04	0.28	0.12	13.44	46.00	-32.56	Average

Neutral:



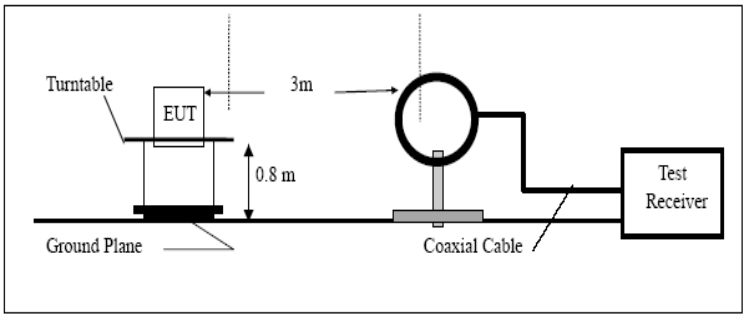
Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.17	19.18	0.40	0.09	19.67	64.99	-45.32	QP
0.17	11.10	0.40	0.09	11.59	54.99	-43.40	Average
0.23	25.64	0.40	0.11	26.15	62.30	-36.15	QP
0.23	17.40	0.40	0.11	17.91	52.30	-34.39	Average
0.31	26.97	0.39	0.10	27.46	59.88	-32.42	QP
0.31	18.29	0.39	0.10	18.78	49.88	-31.10	Average
0.37	21.20	0.36	0.10	21.66	58.47	-36.81	QP
0.37	13.38	0.36	0.10	13.84	48.47	-34.63	Average
0.50	18.79	0.31	0.11	19.21	56.00	-36.79	QP
0.50	10.63	0.31	0.11	11.05	46.00	-34.95	Average
0.63	22.06	0.28	0.12	22.46	56.00	-33.54	QP
0.63	13.10	0.28	0.12	13.50	46.00	-32.50	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 Spurious Emission

7.3.1 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td colspan="5">FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td colspan="5">ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">30MHz-1GHz</td></tr>
<tr><td>Test site:</td><td colspan="5">Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td colspan="5"><table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Value</td></tr>
<tr><td>9KHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>600Hz</td><td>Quasi-peak</td></tr>
<tr><td>150KHz-30MHz</td><td>Quasi-peak</td><td>9KHz</td><td>30KHz</td><td>Quasi-peak</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average</td></tr>
</table></td></tr>
<tr><td>Limit:
(Spurious Emissions)</td><td colspan="5"><table>
<tr><td>Frequency</td><td>Limit (uV/m)</td><td>Value</td><td>Measurement Distance</td></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="6">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table></td></tr>
<tr><td>Test setup:</td><td colspan="5">Below 30MHz
 

Below 1GHz</td></tr>
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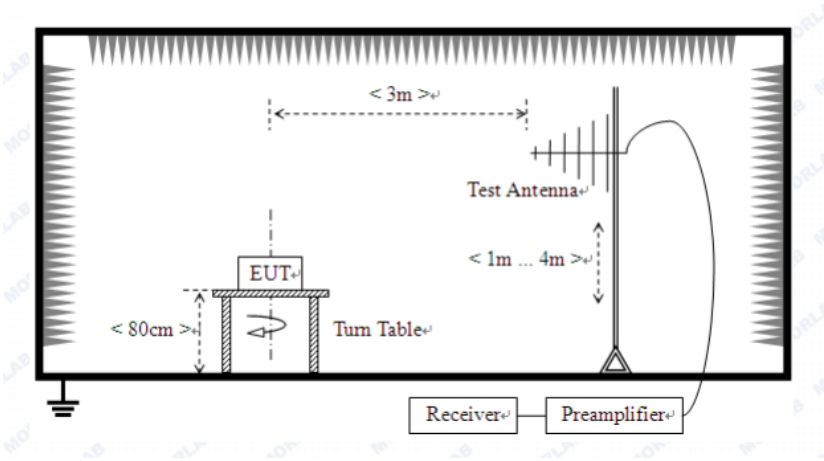
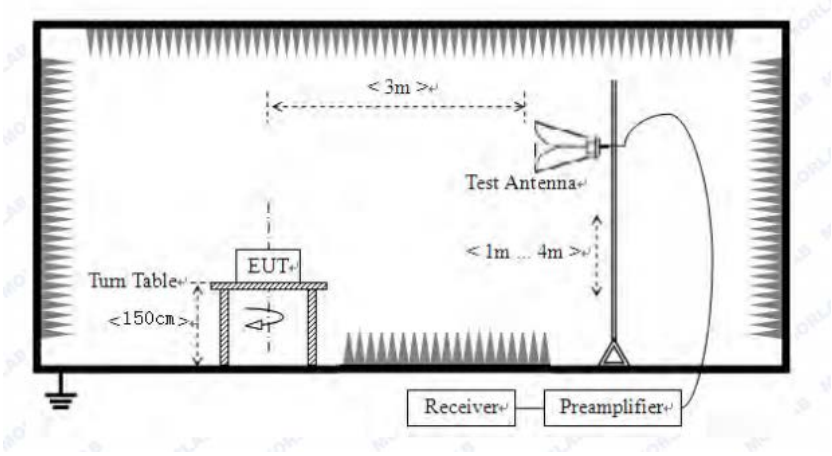


Above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table(0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 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. 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. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

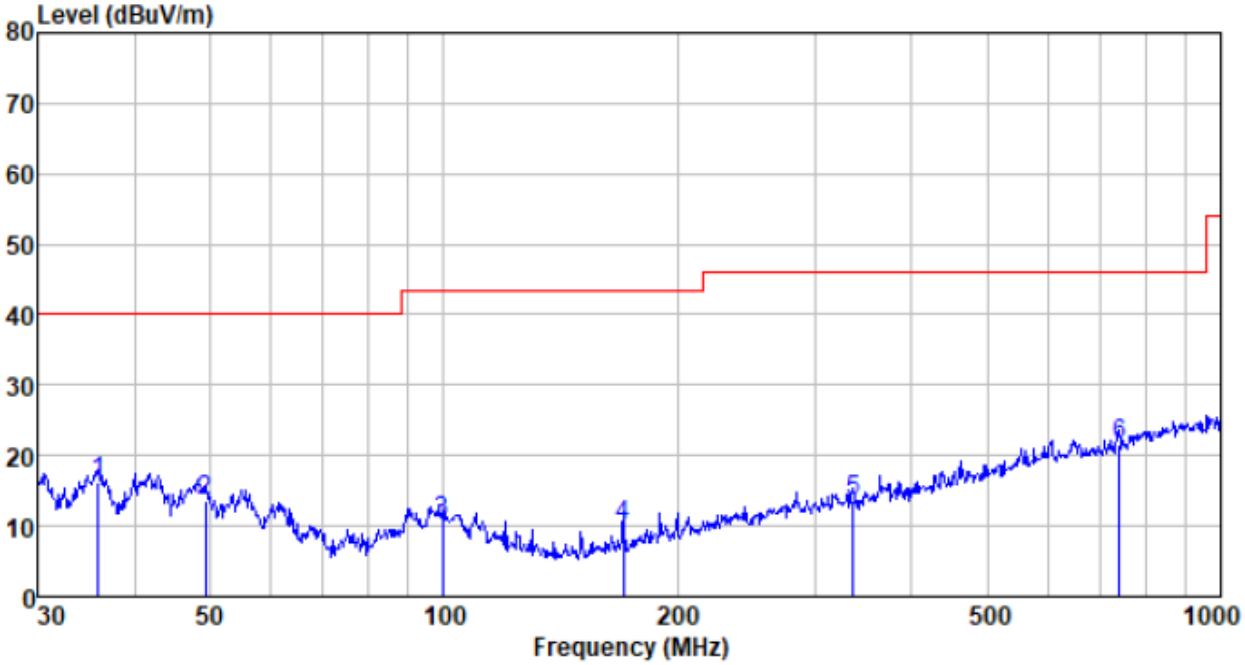
Measurement data:

■ **9 kHz ~ 30 MHz**

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.

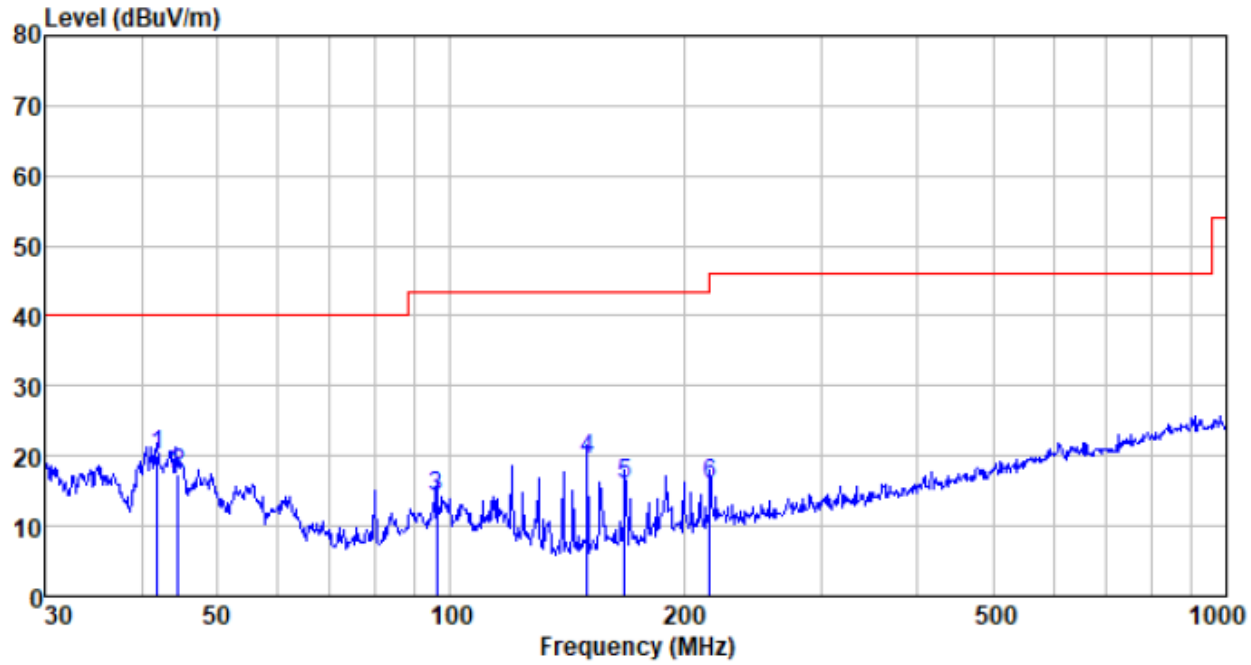
■ **Below 1GHz**

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
35.875	39.44	11.49	0.62	35.41	16.14	40.00	-23.86	QP
49.359	36.79	12.29	0.77	36.15	13.70	40.00	-26.30	QP
99.528	33.91	12.13	1.19	36.72	10.51	43.50	-32.99	QP
170.195	37.15	8.50	1.69	37.19	10.15	43.50	-33.35	QP
336.035	34.08	14.29	2.55	37.46	13.46	46.00	-32.54	QP
739.661	34.61	20.34	4.24	37.63	21.56	46.00	-24.44	QP

Vertical:



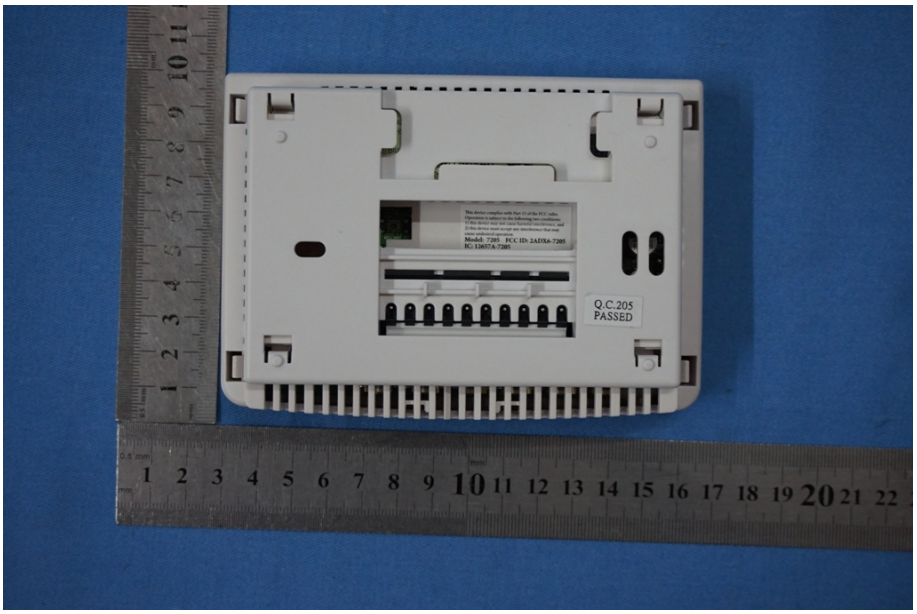
Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
41.860	42.84	12.22	0.68	35.77	19.97	40.00	-20.03	QP
44.587	40.41	12.25	0.72	35.92	17.46	40.00	-22.54	QP
96.099	38.02	11.65	1.16	36.69	14.14	43.50	-29.36	QP
150.011	47.27	7.65	1.57	37.08	19.41	43.50	-24.09	QP
167.824	43.09	8.46	1.67	37.18	16.04	43.50	-27.46	QP
216.024	40.29	11.02	1.93	37.35	15.89	46.00	-30.11	QP

8 Test Setup Photo

Radiated Emission

Conducted Emission

9 EUT Constructional Details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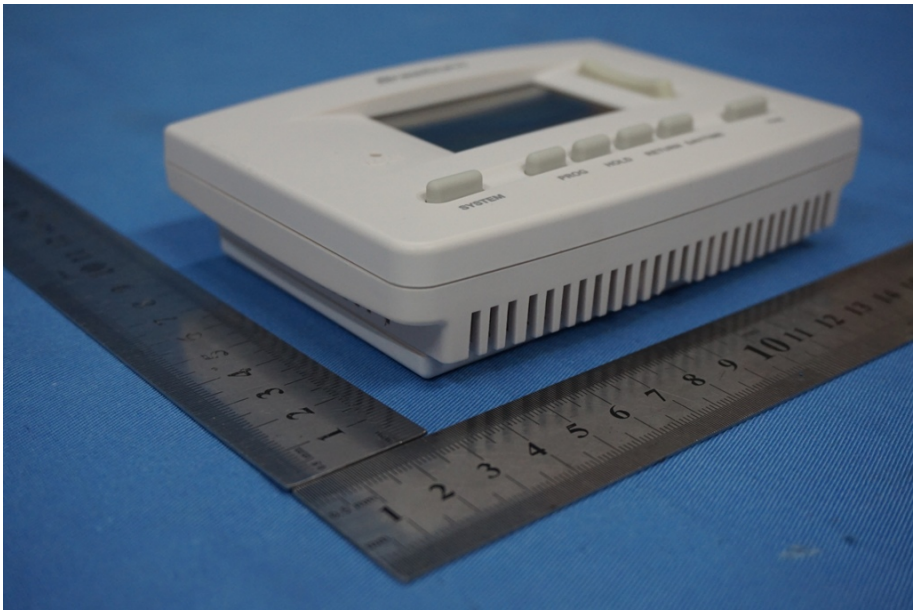
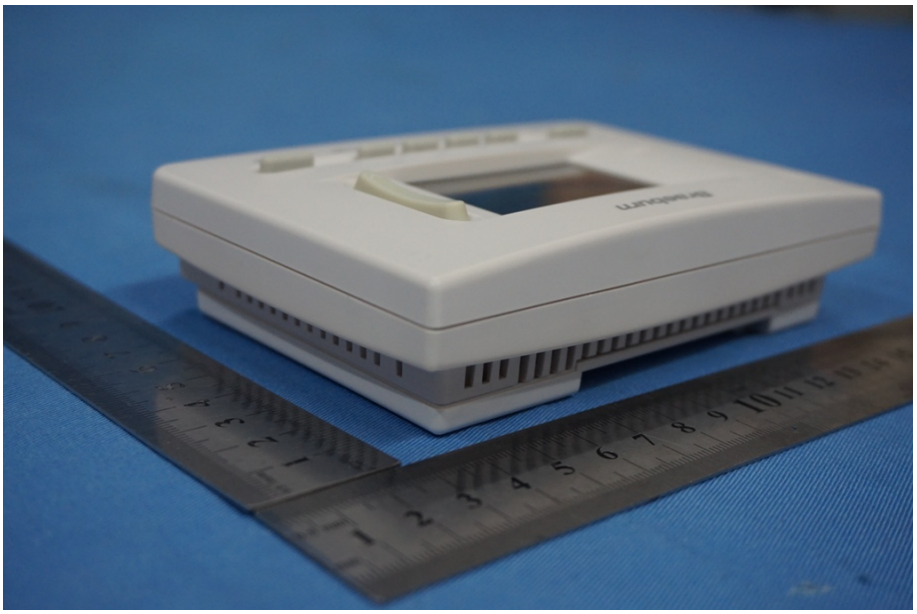

SYSTEM




BRAEBURNPAT.COM
RoHS Compliant
7205
7205-150-02
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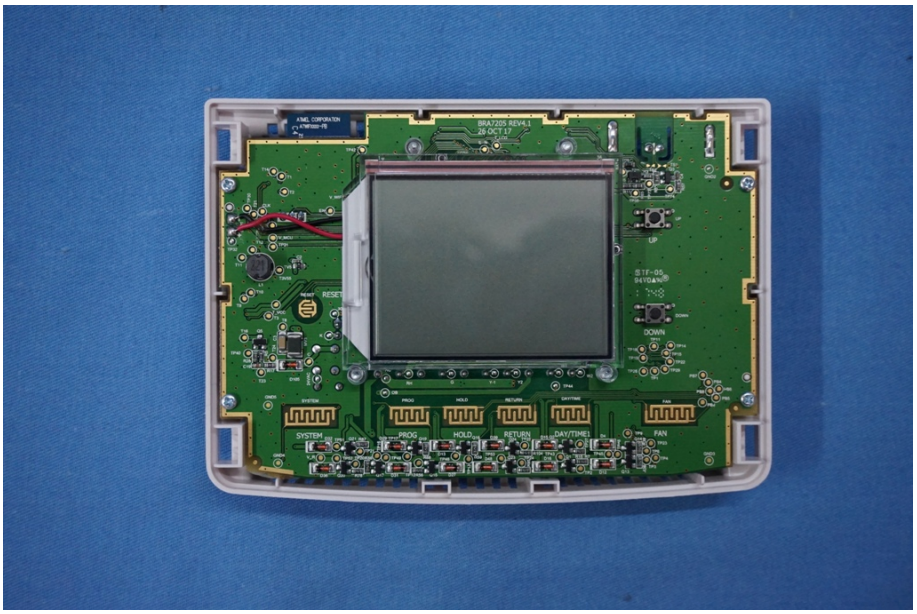
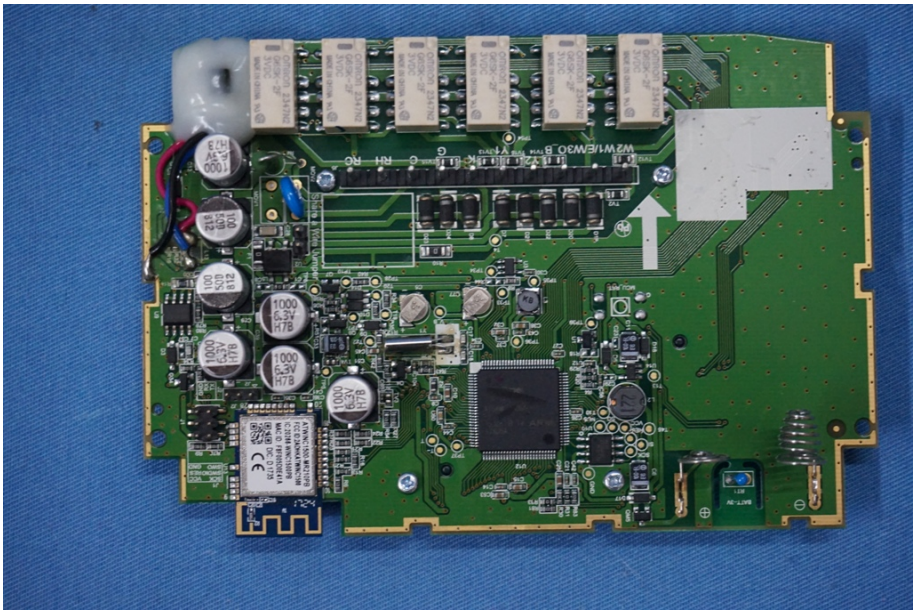
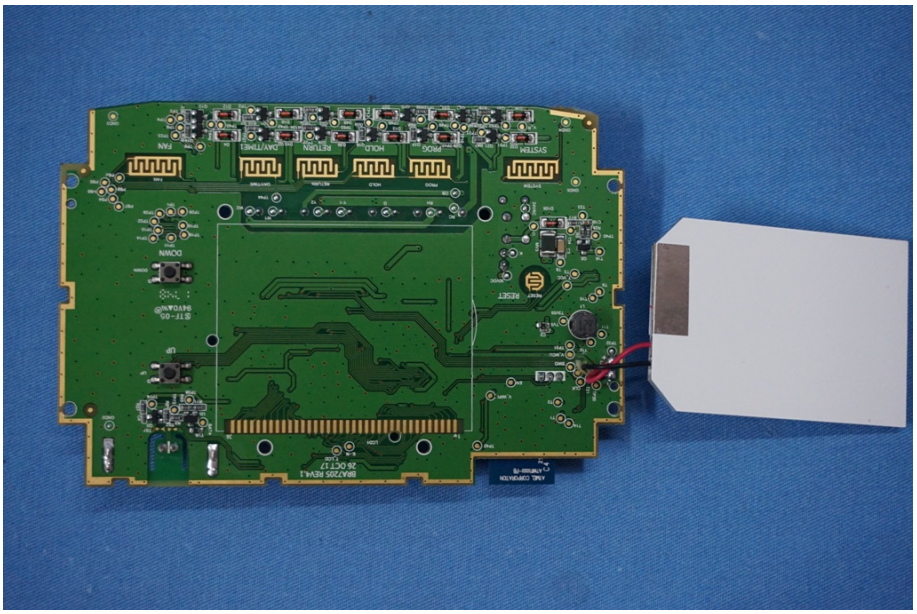
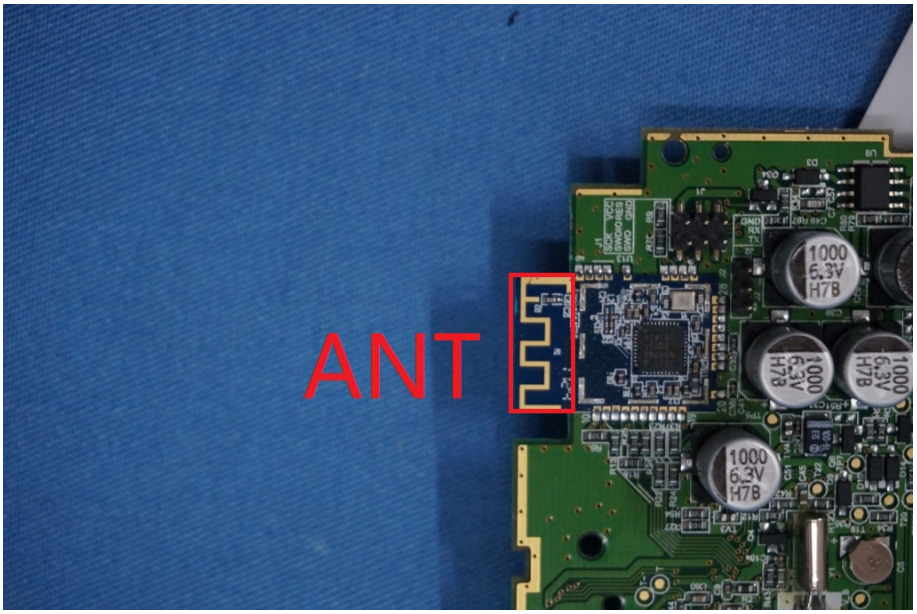
7205-152-01
7205-153-01


SYSTEM
PROG
HOLD
RETURN
DAY/TIME
FAN
UP
DOWN
RESET







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