



FCC REPORT

Applicant: Braeburn Systems LLC
Address of Applicant: 2215 Cornell Avenue Montgomery, Illinois 60538 United States
Equipment Under Test (EUT)
Product Name: thermostast
Model No.: 7220
FCC ID: 2ADX6-7220
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2013
Date of sample receipt: November 26, 2014
Date of Test: February 02-06, 2015
Date of report issued: February 06, 2015
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.

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	February 06, 2015	Original

Prepared By:

Edward Pan

Date:

February 06, 2015

Project Engineer

Check By:

Hank Yan

Date:

February 06, 2015

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	6
5.4 DESCRIPTION OF SUPPORT UNITS	6
5.5 TEST FACILITY.....	6
5.6 TEST LOCATION	6
5.7 OTHER INFORMATION REQUESTED BY THE CUSTOMER.....	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 <i>Field Strength of The Fundamental Signal</i>	14
7.3.2 <i>Spurious emissions</i>	14
7.3.3 <i>Bandedge emissions</i>	17
7.4 20dB OCCUPY BANDWIDTH.....	18
8 TEST SETUP PHOTO	19
9 EUT CONSTRUCTIONAL DETAILS	21

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

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

5 General Information

5.1 Client Information

Applicant:	Braeburn Systems LLC
Address of Applicant:	2215 Cornell Avenue Montgomery, Illinois 60538 United States
Manufacturer:	Computime Limited
Address of Manufacturer:	17/F, Great Eagle Centre, 23 Harbour Road, Wanchai Hong Kong
Factory:	Computime Electronics (shenzhen) Company Limited
Address of Factory:	YueKenguanyu Industrial Park, Kangqiao Road 88#, Danzhutou Community, Nanwan Street Office Longgang District, Shenzhen, China

5.2 General Description of EUT

Product Name:	thermostast
Model No.:	7220
Operation Frequency:	915MHz
Modulation type:	GFSK
Antenna Type:	Integral antenna
Antenna gain:	0dBi
Power supply:	AC 24V

5.3 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>Remark: During the test, the new battery was used.</i>	

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)	87.51	88.80	85.64

Final Test Mode:

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”:
Y axis (see the test setup photo)

5.4 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC approval
ET	AC/AC Linear Transformer	ETE40310F	N/A	Verification

5.5 Test Facility

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

- **CNAS —Registration No.: CNAS L5775**

CNAS has accredited Global United Technology Services Co., Ltd. To ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **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 28, 2013.

- **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.

5.6 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

Tel: 0755-27798480

Fax: 0755-27798960

5.7 Other Information Requested by the Customer

None.

6 Test Instruments list

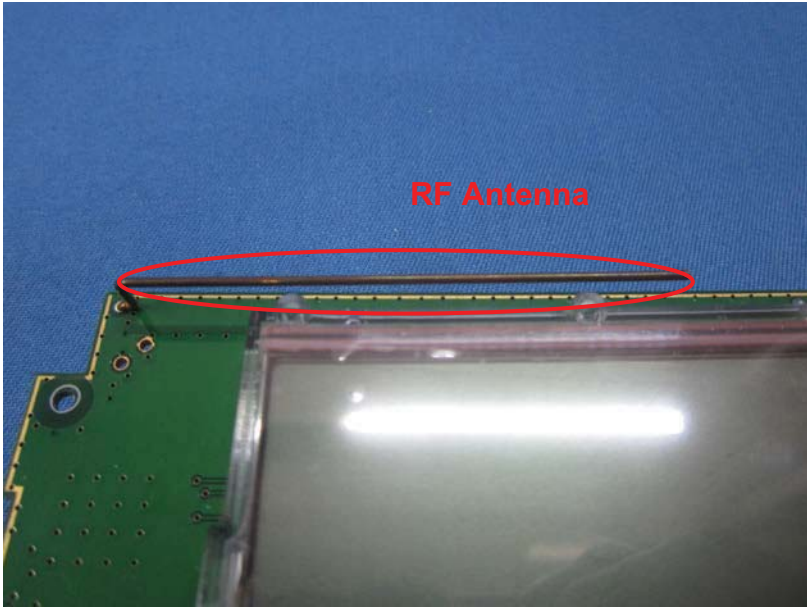
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 28 2014	Mar. 27 2015
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	July 01 2014	June 30 2015
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	July 01 2014	June 30 2015
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	July 01 2014	June 30 2015
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 27 2014	June 26 2015
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 28 2014	Mar. 27 2015
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 29 2014	Mar. 28 2015
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 29 2014	Mar. 28 2015
11	Coaxial cable	GTS	N/A	GTS210	Mar. 29 2014	Mar. 28 2015
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 29 2014	Mar. 28 2015
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	July 01 2014	June 30 2015
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	July 01 2014	June 30 2015
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 27 2014	June 26 2015
16	Band filter	Amindeon	82346	GTS219	Mar. 29 2014	Mar. 28 2015

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	7.0(L)x3.0(W)x3.0(H)	GTS264	July 01 2014	June 30 2015
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	July 01 2014	June 30 2015
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	July 01 2014	June 30 2015
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	July 01 2014	June 30 2015
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	July 01 2014	June 30 2015
6	Coaxial Cable	GTS	N/A	GTS227	July 01 2014	June 30 2015
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

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 08 2014	July 07 2015

7 Test results and Measurement Data

7.1 Antenna requirement

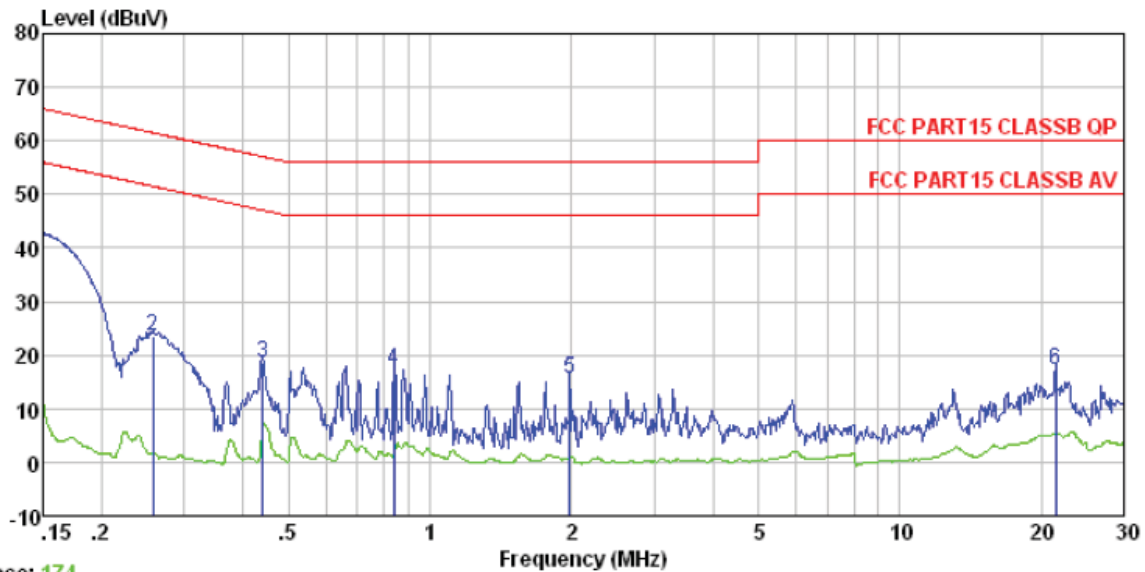
Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling 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.	
E.U.T Antenna: <i>The antenna is Integral antenna, the best case gain of the antenna is 0dBi</i>	
	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207															
Test Method:	ANSI C63.4:2009 & ANSI C63.10:2013															
Test Frequency Range:	150KHz to 30MHz															
Class / Severity:	Class B															
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto															
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>		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
	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:																
	<p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>															
Test procedure:	<ol style="list-style-type: none"> 1. The E.U.T is 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 C63.4: 2009 on conducted measurement. 															
Test Instruments:	Refer to section 6.0 for details															
Test mode:	Refer to section 5.3 for details															
Test results:	Pass															

Measurement data

Line:

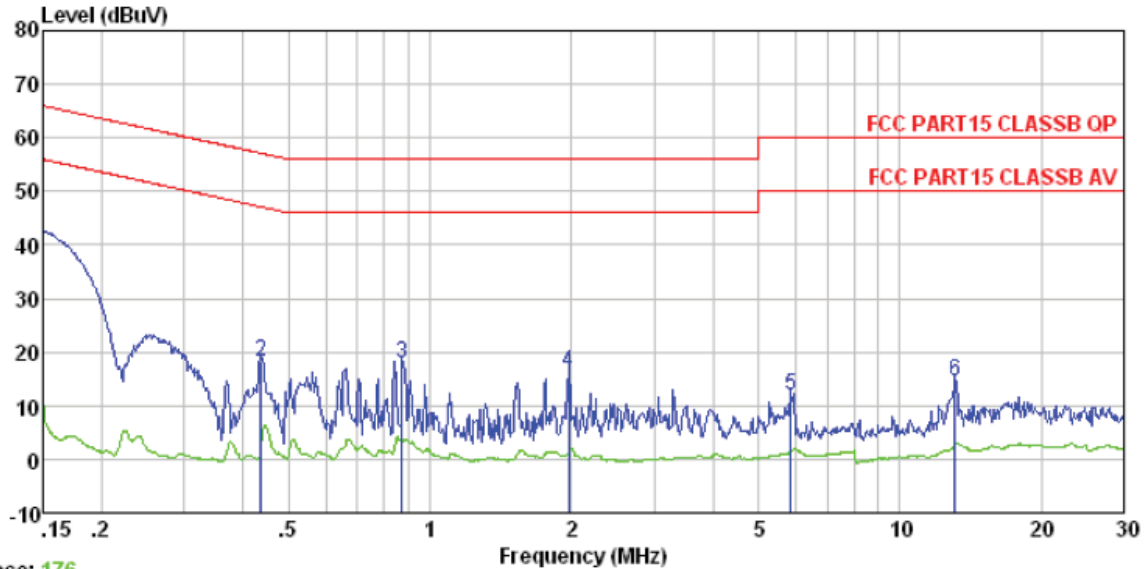


Trace: 174

Site : Shielded room
 Condition : FCC PART15 CLASSB QP LISN-2013 LINE
 Job No. : 2068RF
 Test mode : Transmitting mode
 Test Engineer: Mike

	Freq	Read Level	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.150	41.43	0.12	41.70	66.00	-24.30	QP
2	0.258	23.30	0.11	23.53	61.51	-37.98	QP
3	0.440	18.44	0.11	18.67	57.07	-38.40	QP
4	0.839	16.98	0.13	17.25	56.00	-38.75	QP
5	1.980	15.31	0.14	15.57	56.00	-40.43	QP
6	21.486	16.11	0.22	17.08	60.00	-42.92	QP

Neutral:



Trace: 176

Site : Shielded room
 Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
 Job No. : 2068RF
 Test mode : Transmitting mode
 Test Engineer: Mike

	Freq	Read Level	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.150	41.53	0.12	41.72	66.00	-24.28	QP
2	0.437	18.16	0.11	18.33	57.11	-38.78	QP
3	0.871	17.74	0.13	17.94	56.00	-38.06	QP
4	1.970	16.07	0.14	16.30	56.00	-39.70	QP
5	5.867	11.70	0.16	12.02	60.00	-47.98	QP
6	13.127	14.06	0.21	14.59	60.00	-45.41	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
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 15.209			
Test Method:	ANSI C63.4:2009 & ANSI C63.10:2013			
Test Frequency Range:	30MHz to 10GHz			
Test site:	Measurement Distance: 3m			
Receiver setup:	Frequency	Detector	RBW	VBW
	30MHz-1GHz	Quasi-peak	120KHz	300KHz
	Above 1GHz	Peak	1MHz	3MHz
Peak		1MHz	10Hz	Average Value
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)	Remark	
	902MHz ~ 928MHz	94.00	Quasi-peak	
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	
Limit: (band edge)	Above 1GHz	54.00	Average Value	
	Above 1GHz	74.00	Peak Value	
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.			
Test setup:	<p>Below 1GHz</p> <p>Above 1GHz</p>			

	<p>The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a turn table that is 0.8 meters above the ground. The turn table is rotated 360 degrees. The EUT is positioned 3 meters away from the antenna tower. The antenna tower is a variable-height antenna tower with a horn antenna mounted on top. The antenna height is varied from 1 meter to 4 meters above the ground. The antenna is connected to a spectrum analyzer and an amplifier.</p>
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 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. 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.
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Pass</p>

Measurement data:

7.3.1 Field Strength of The Fundamental Signal

Quasi-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
915.00	89.51	23.18	4.91	29.10	88.50	94.00	-5.50	Vertical
915.00	89.81	23.18	4.91	29.10	88.80	94.00	-5.20	Horizontal

7.3.2 Spurious emissions

■ Below 1GHz

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
38.62	39.86	15.25	0.65	30.05	25.71	40.00	-14.29	Vertical
49.36	39.64	15.29	0.77	30.00	25.70	40.00	-14.30	Vertical
95.76	40.18	14.90	1.16	29.72	26.52	43.50	-16.98	Vertical
155.91	42.07	10.51	1.60	29.38	24.80	43.50	-18.70	Vertical
366.82	40.97	16.48	2.70	29.65	30.50	46.00	-15.50	Vertical
851.04	41.47	22.60	4.66	29.15	39.58	46.00	-6.42	Vertical
33.80	40.45	14.31	0.59	30.08	25.27	40.00	-14.73	Horizontal
48.33	40.78	15.35	0.75	30.01	26.87	40.00	-13.13	Horizontal
95.43	40.00	14.87	1.16	29.72	26.31	43.50	-17.19	Horizontal
239.99	40.92	14.09	2.07	29.56	27.52	46.00	-18.48	Horizontal
441.74	40.76	17.56	3.06	29.41	31.97	46.00	-14.03	Horizontal
813.11	40.42	22.19	4.51	29.19	37.93	46.00	-8.07	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
1830.00	41.32	25.42	4.87	34.17	37.44	74.00	-36.56	Vertical
2745.00	44.56	28.24	5.71	33.61	44.90	74.00	-29.10	Vertical
3660.00	41.80	29.20	7.27	32.56	45.71	74.00	-28.29	Vertical
4575.00	36.85	31.47	8.40	31.97	44.75	74.00	-29.25	Vertical
5490.00	40.27	31.98	9.49	32.42	49.32	74.00	-24.68	Vertical
6405.00	33.54	33.49	10.78	32.11	45.70	74.00	-28.30	Vertical
7320.00	31.23	36.37	11.72	31.89	47.43	74.00	-26.57	Vertical
8235.00	30.37	36.76	12.47	31.73	47.87	74.00	-26.13	Vertical
9150.00	30.73	37.31	13.78	32.13	49.69	74.00	-24.31	Vertical
1830.00	41.49	25.42	4.87	34.17	37.61	74.00	-36.39	Horizontal
2745.00	44.72	28.24	5.71	33.61	45.06	74.00	-28.94	Horizontal
3660.00	42.98	29.20	7.27	32.56	46.89	74.00	-27.11	Horizontal
4575.00	45.91	31.47	8.40	31.97	53.81	74.00	-20.19	Horizontal
5490.00	48.23	31.98	9.49	32.42	57.28	74.00	-16.72	Horizontal
6405.00	32.79	33.49	10.78	32.11	44.95	74.00	-29.05	Horizontal
7320.00	33.35	36.37	11.72	31.89	49.55	74.00	-24.45	Horizontal
8235.00	33.43	36.76	12.47	31.73	50.93	74.00	-23.07	Horizontal
9150.00	30.22	37.31	13.78	32.13	49.18	74.00	-24.82	Horizontal

Average 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
1830.00	*							Vertical
2745.00	*							Vertical
3660.00	*							Vertical
4575.00	*							Vertical
5490.00	*							Vertical
6405.00	*							Vertical
7320.00	*							Vertical
8235.00	*							Vertical
9150.00	*							Vertical
1830.00	*							Horizontal
2745.00	*							Horizontal
3660.00	*							Horizontal
4575.00	*							Horizontal
5490.00	30.98	31.98	9.49	32.42	40.03	54.00	-13.97	Horizontal
6405.00	*							Horizontal
7320.00	*							Horizontal
8235.00	*							Horizontal
9150.00	*							Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *(*)The test result on peak is lower than average limit, then average measurement needn't be performed.*

7.3.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

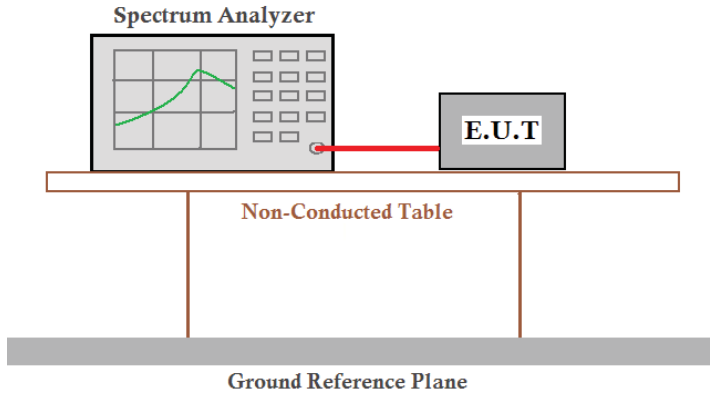
Quasi-peak value:

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
902.00	28.92	23.12	4.87	29.10	27.81	46.00	-18.19	Horizontal
928.00	27.74	23.28	4.96	29.10	26.88	46.00	-19.12	Horizontal
902.00	26.28	23.12	4.87	29.10	25.17	46.00	-20.83	Vertical
928.00	27.44	23.28	4.96	29.10	26.58	46.00	-19.42	Vertical

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor*
2. *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.*

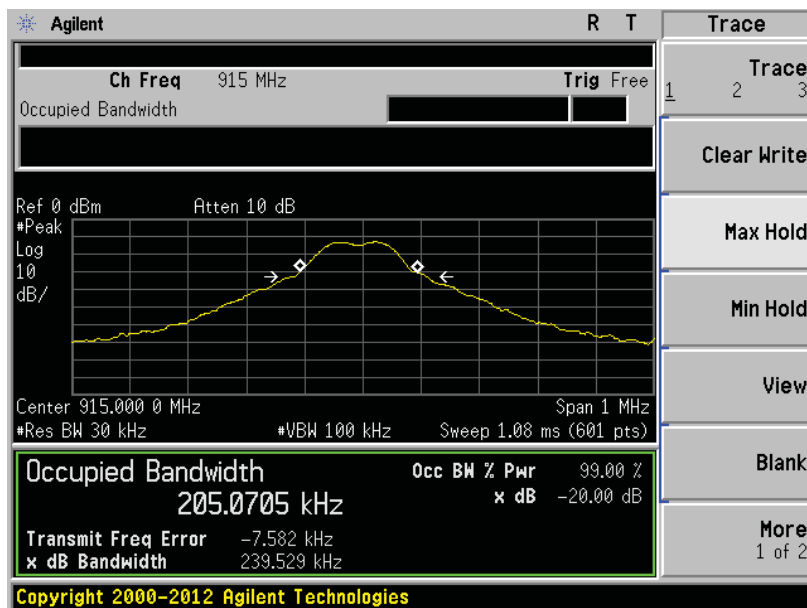
7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.4:2009 & ANSI C63.10:2013
Limit:	Operation Frequency range 902MHz ~ 928MHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

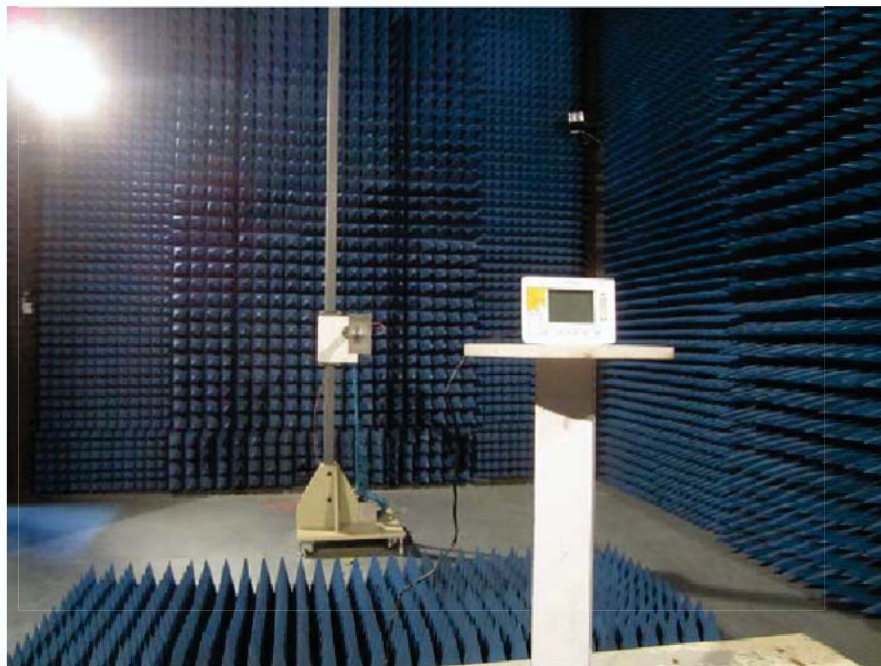
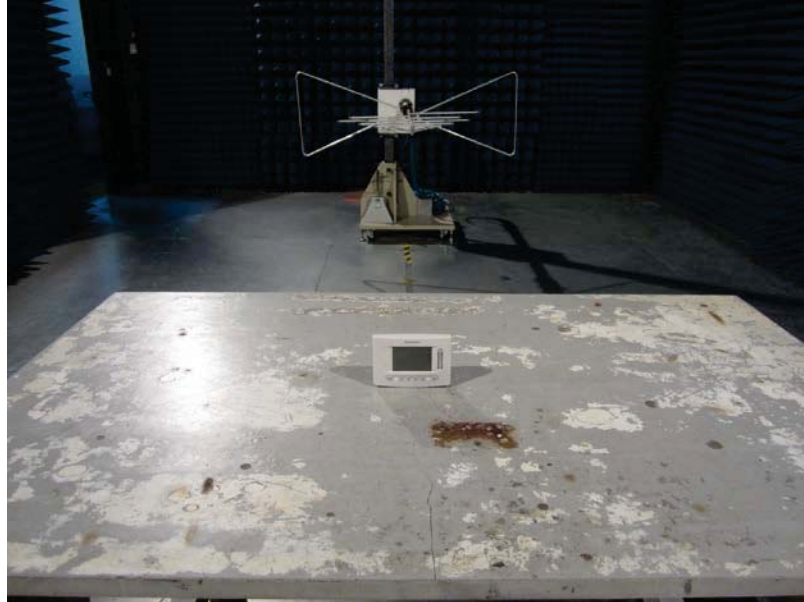
Operation Frequency	20dB bandwidth(MHz)	Result
915MHz	0.240	Pass

Test plot as follows:



8 Test Setup Photo

Radiated Emission

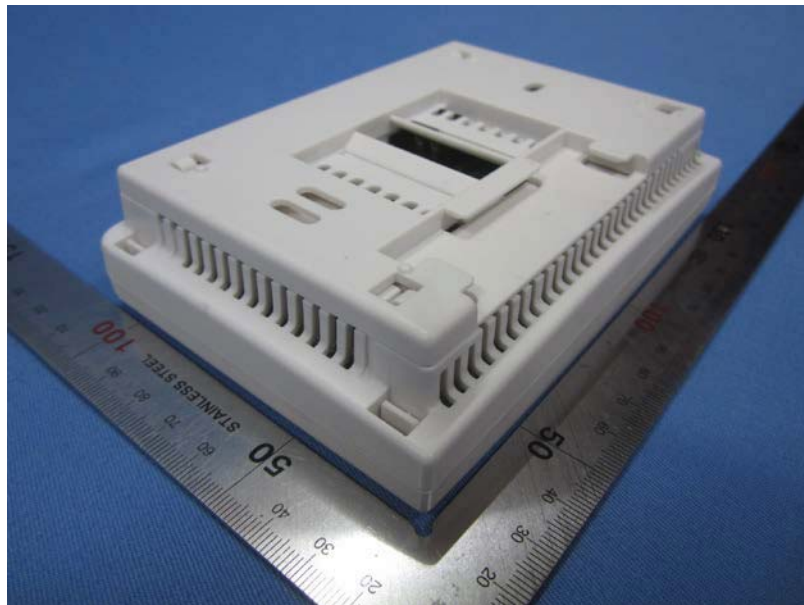


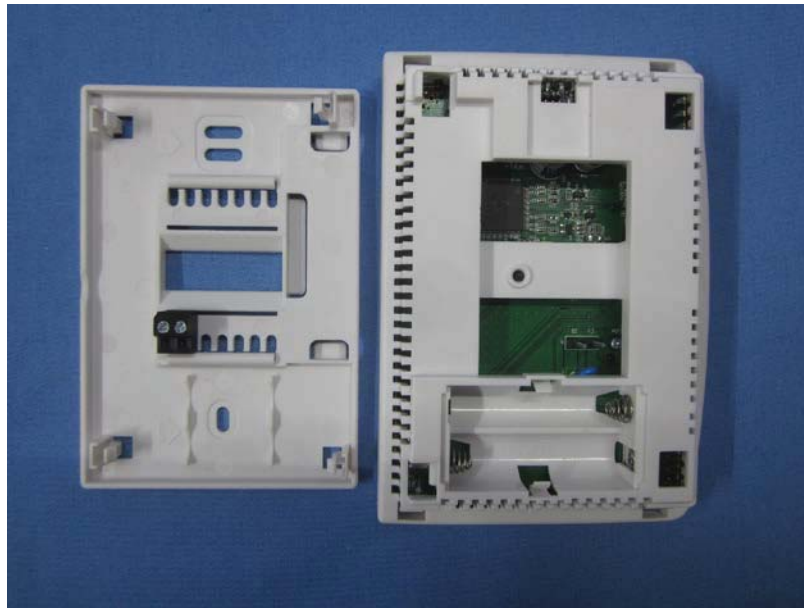
Conducted Emission

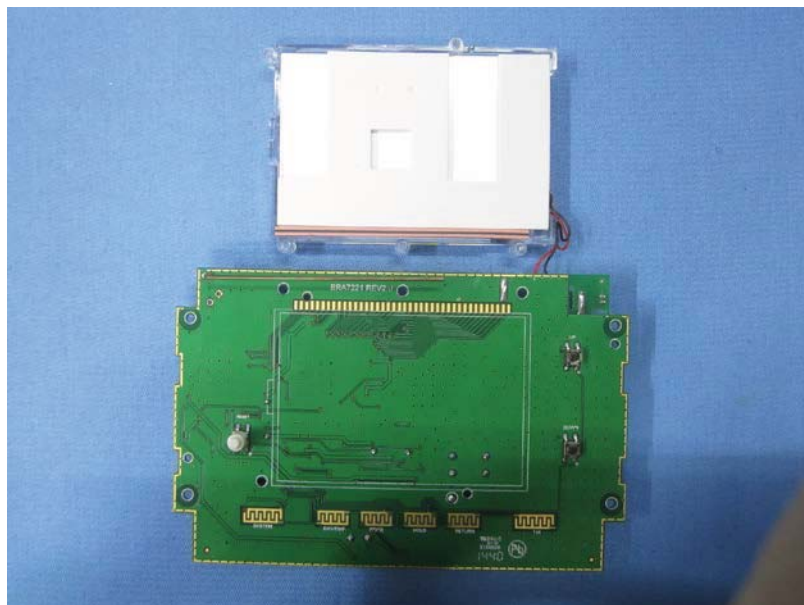


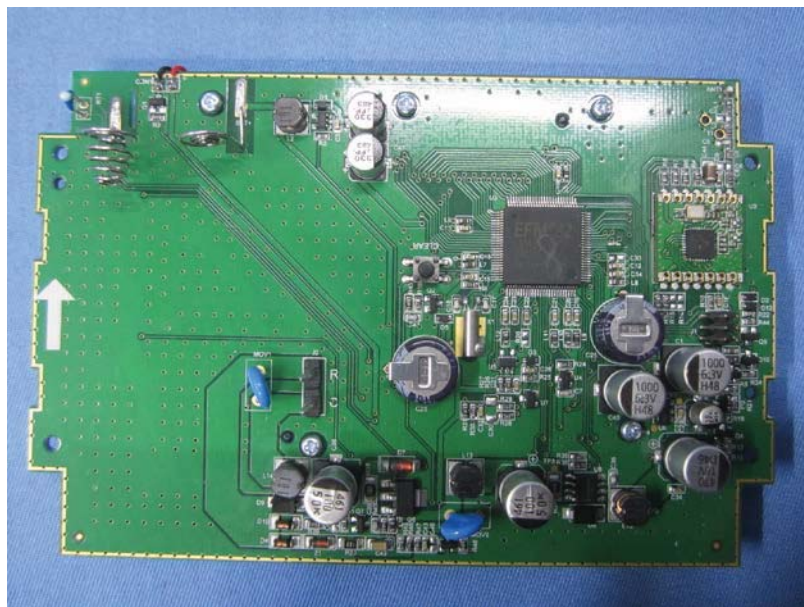
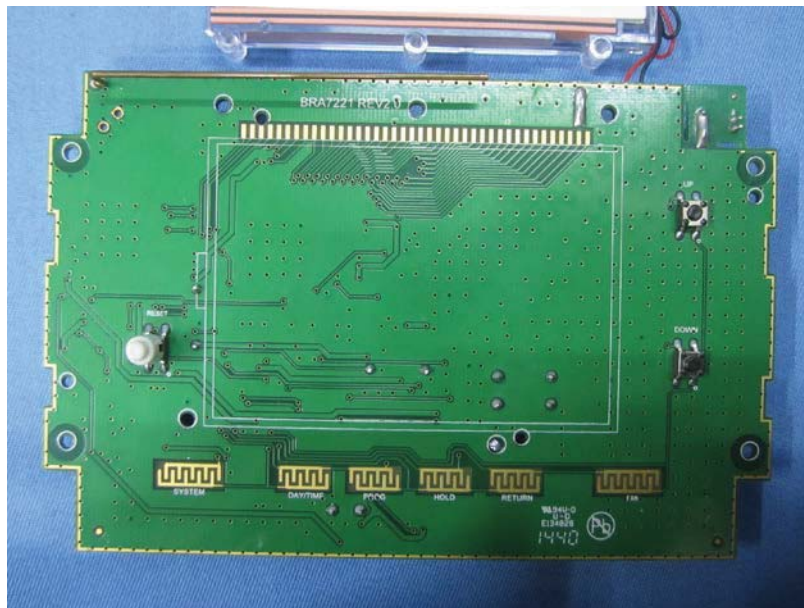
9 EUT Constructional Details

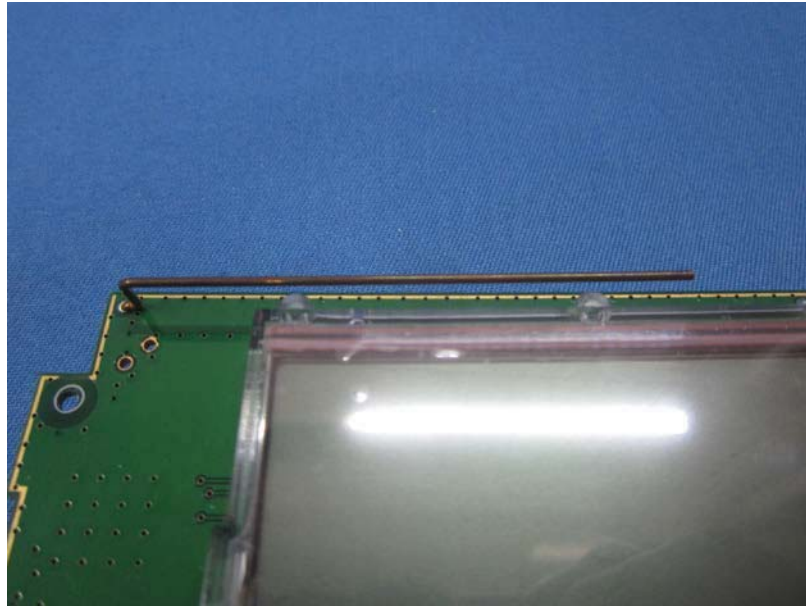












-----End-----