



# TEST REPORT

**Applicant:** Trane US, Inc.

**Address of Applicant:** 6200 Troup Highway Tyler TX 75707

**Equipment Under Test (EUT)**

Product Name: Color Touchscreen Wi-Fi Thermostat

Model No.: TCONT850AC52UAA, ACONT850AC52UAA

**FCC ID:** XVR-CONT8501

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart B:2013

**Date of sample receipt:** November 25, 2013

**Date of Test:** March 03-06, 2014

**Date of report issue:** March 06, 2014

**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.

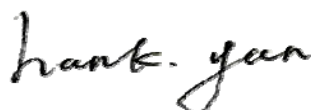
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## 2 Version

Version No.	Date	Description
00	March 06, 2014	Original

Prepared By:



Date:

March 06, 2014

Project Engineer

Check By:



Date:

March 06, 2014

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 .....	18

## 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:	Trane US, Inc.
Address of Applicant:	6200 Troup Highway Tyler TX 75707
Manufacturer:	COMPUTIME LTD.
Address of Manufacturer:	9/F, Tower One, Lippo Centre, 89 Queensway, 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:	Color Touchscreen Wi-Fi Thermostat
Model No.:	TCONT850AC52UAA, ACONT850AC52UAA
Power supply:	AC 24V

### 5.3 Test mode

Test mode:	
Operation mode	Keep the EUT in operation mode.
PC mode	Keep the EUT in data exchanging with PC mode.

## 5.4 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.

## 5.5 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

## 5.6 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC approval
HP	Printer	CB495A	05257893	DoC
Lenovo	PC Host	M6900	EA05257893	DoC
DELL	KEYBOARD	SK-8115	N/A	DoC
DELL	MOUSE	MOC5UO	N/A	DoC
DELL	MONITOR	E178FPC	N/A	DoC
ET	AC/AC Linear Transformer	ETE40310F	N/A	Verification

## 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	Mar. 29 2013	Mar. 28 2014
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	Jul. 06 2013	Jul. 05 2014
4	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	Mar. 09 2013	Mar. 08 2014
5	Double -ridged waveguide horn	SCHWARZBECK	9120D	GTS208	Mar. 09 2013	Mar. 08 2014
6	RF Amplifier	HP	8347A	GTS204	Jul. 06 2013	Jul. 05 2014
7	Preamplifier	HP	8349B	GTS206	Jul. 06 2013	Jul. 05 2014
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial cable	GTS	N/A	GTS210	Jul. 06 2013	Jul. 05 2014
10	Coaxial Cable	GTS	N/A	GTS211	Jul. 06 2013	Jul. 05 2014
11	Thermo meter	N/A	N/A	GTS256	Jul. 06 2013	Jul. 05 2014

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	Sep. 07 2013	Sep. 06 2015
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jul. 02 2013	Jul. 01 2014
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jul. 02 2013	Jul. 01 2014
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jul. 02 2013	Jul. 01 2014
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jul. 02 2013	Jul. 01 2014
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 02 2013	Jul. 01 2014
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 09 2013	July 08 2014

## 7 Test Results and Measurement Data

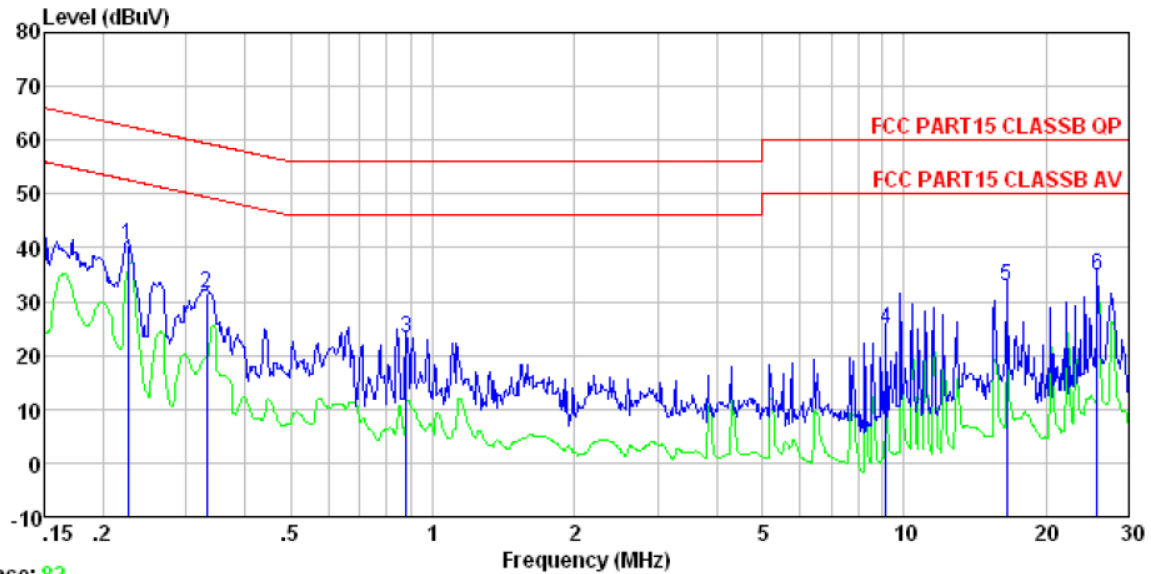
## 7.1 Conducted Emissions

Test Requirement:	FCC Part15 B Section 15.107		
Test Method:	ANSI C63.4:2003		
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>The diagram illustrates the test setup. A horizontal line at the top represents the 'Reference Plane'. Below it, a 'Test table/Insulation plane' is shown. On the table, there is a box for 'E.U.T.' (Equipment Under Test) and a box for 'AUX Equipment'. A 'LISN' (Line Impedance Stabilization Network) is connected to the 'E.U.T.' and the 'Reference Plane'. The distance between the 'Reference Plane' and the 'LISN' is marked as '40cm'. Another 'LISN' is connected to the 'Reference Plane' and a 'Filter', which is then connected to 'AC power'. The distance between the 'Reference Plane' and this second 'LISN' is marked as '80cm'. An 'EMI Receiver' is connected to the 'Filter'.</p><p><i>Remark</i> 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: 2003 on conducted measurement.</div></div>		
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		



## Measurement Data

Line:



Trace: 82

Condition : FCC PART15 CLASSB QP LISN-2013 LINE

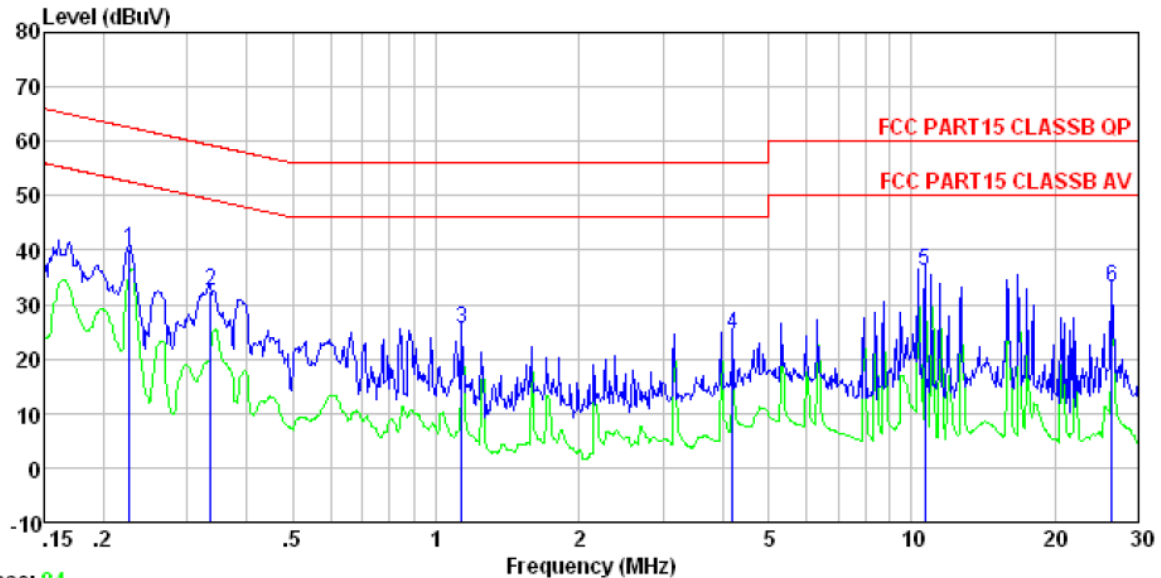
Job No. : 1847RF

Test mode : PC mode

Test Engineer: Bing

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.226	40.26	0.12	0.12	40.50	62.61	-22.11	QP
2	0.332	31.22	0.11	0.10	31.43	59.40	-27.97	QP
3	0.880	23.08	0.14	0.13	23.35	56.00	-32.65	QP
4	9.156	24.32	0.28	0.19	24.79	60.00	-35.21	QP
5	16.486	32.13	0.39	0.22	32.74	60.00	-27.26	QP
6	25.727	33.46	1.11	0.23	34.80	60.00	-25.20	QP

**Neutral:**



Trace: 84

Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL  
 Job No. : 1847RF  
 Test mode : PC mode  
 Test Engineer: Bing

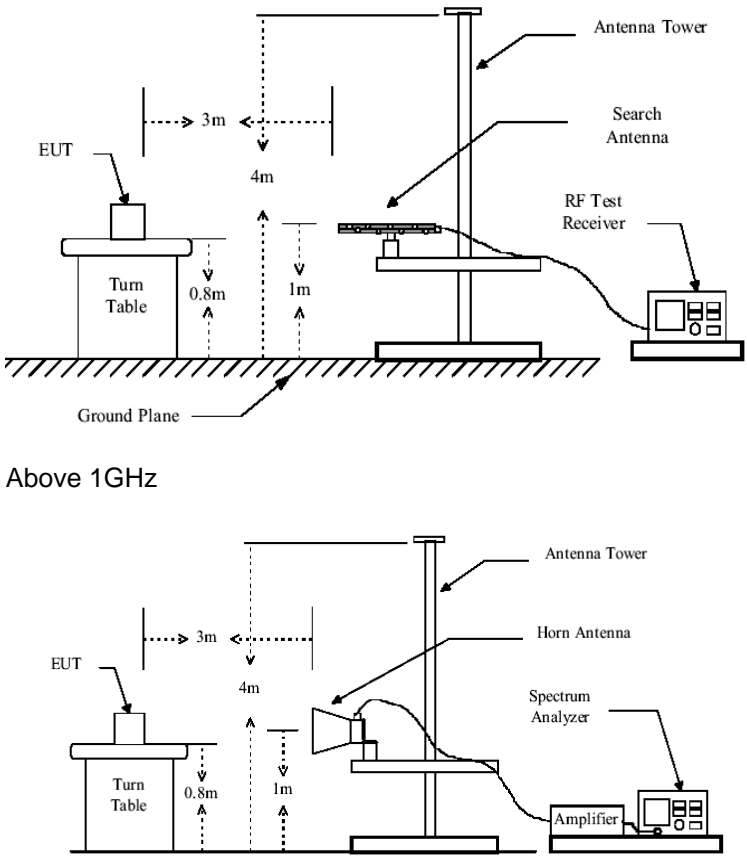
	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.227	39.92	0.06	0.12	40.10	62.57	-22.47	QP
2	0.336	32.26	0.06	0.10	32.42	59.31	-26.89	QP
3	1.135	25.46	0.08	0.13	25.67	56.00	-30.33	QP
4	4.202	24.13	0.14	0.15	24.42	56.00	-31.58	QP
5	10.676	35.79	0.27	0.19	36.25	60.00	-23.75	QP
6	26.418	32.15	0.96	0.23	33.34	60.00	-26.66	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.

## 7.2 Radiated Emission

Test Requirement:	FCC Part15 B Section 15.109																								
Test Method:	ANSI C63.4:2003																								
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	
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																					
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
Frequency	Limit (dBuV/m @3m)	Remark																							
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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:

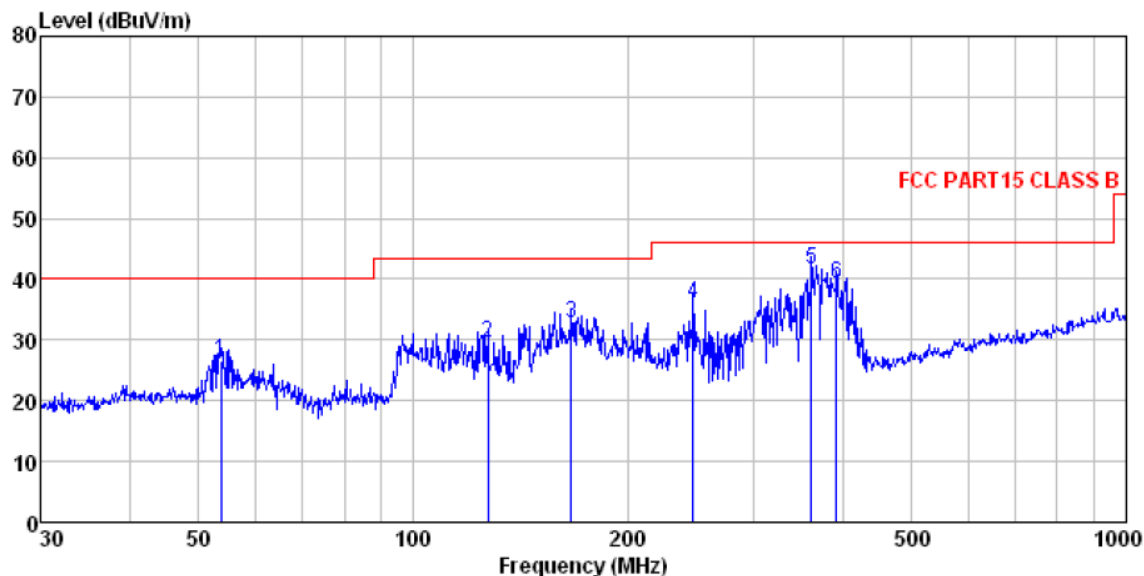
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

## Measurement Data

Below 1GHz

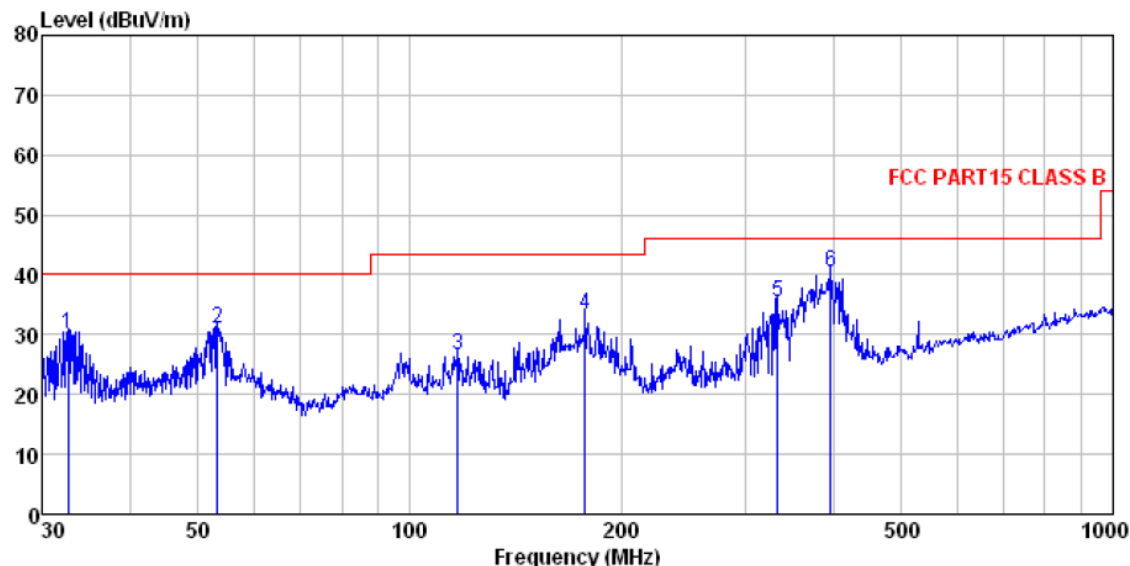
Horizontal:



Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163-2013M HORIZONTAL  
 Job No. : 1847RF  
 Test Mode : PC mode  
 Test Engineer: Yang

	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	53.693	42.62	15.07	0.81	31.95	26.55	40.00 -13.45 QP
2	127.218	48.81	11.32	1.41	31.89	29.65	43.50 -13.85 QP
3	166.651	52.29	10.87	1.67	32.04	32.79	43.50 -10.71 QP
4	246.815	51.88	14.08	2.11	32.16	35.91	46.00 -10.09 QP
5	361.714	54.65	16.43	2.68	31.99	41.77	46.00 -4.23 QP
6	392.095	51.56	16.87	2.82	31.91	39.34	46.00 -6.66 QP

Vertical:

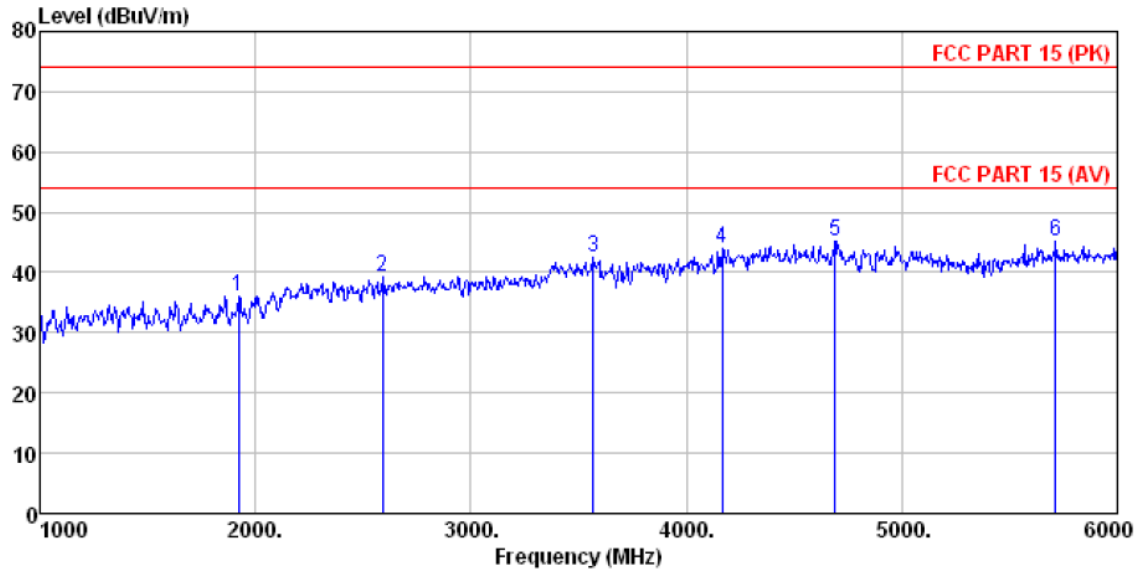


Site : 3m chamber  
 Condition : FCC PART15 CLASS B 3m VULB9163-2013M VERTICAL  
 Job No. : 1847RF  
 Test Mode : PC mode  
 Test Engineer: Yang

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	32.634	47.18	14.31	0.58	32.06	30.01	40.00	-9.99	QP
2	53.318	47.02	15.10	0.80	31.95	30.97	40.00	-9.03	QP
3	116.950	44.16	13.00	1.34	31.84	26.66	43.50	-16.84	QP
4	177.509	52.11	11.49	1.73	32.07	33.26	43.50	-10.24	QP
5	333.687	49.06	15.92	2.54	32.07	35.45	46.00	-10.55	QP
6	396.242	52.50	16.97	2.83	31.90	40.40	46.00	-5.60	QP

Above 1GHz

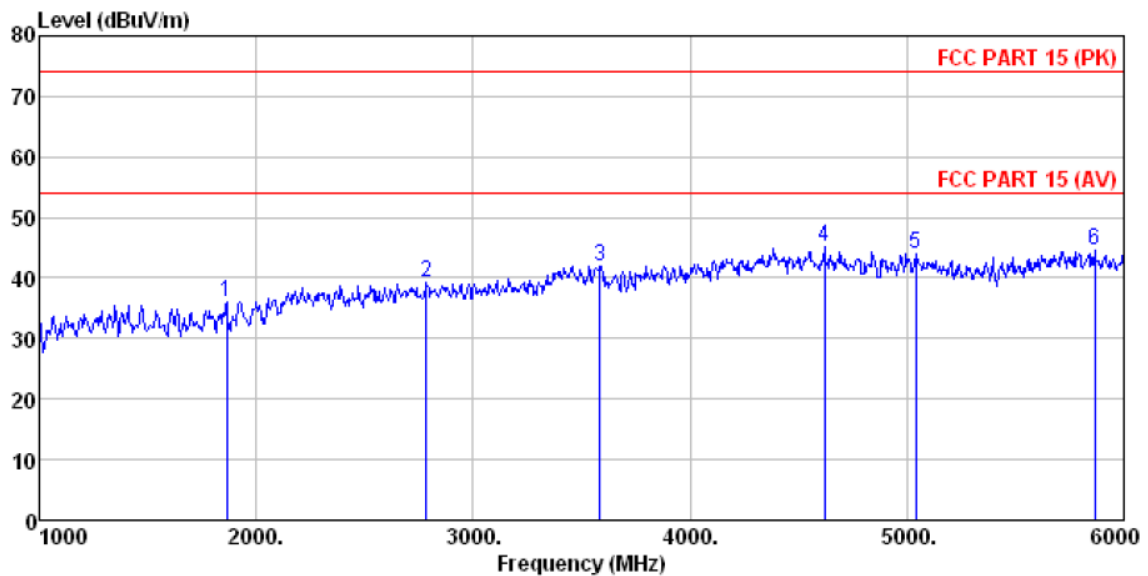
Horizontal:



Site : 3m chamber  
 Condition : FCC PART 15 (PK) 3m BBHA9120D ANT(>1GHZ) HORIZONTAL  
 Job No. : 1847RF  
 Test Mode : PC mode  
 Test Engineer: Yang

	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	1920.000	39.62	25.84	4.92	34.32	36.06	74.00
2	2590.000	39.56	27.77	5.57	33.78	39.12	74.00
3	3570.000	39.06	29.10	7.09	32.67	42.58	74.00
4	4165.000	37.80	30.10	8.03	32.00	43.93	74.00
5	4690.000	37.05	31.65	8.51	32.03	45.18	74.00
6	5715.000	35.02	32.50	9.81	32.30	45.03	74.00

Vertical:



Site : 3m chamber  
 Condition : FCC PART 15 (PK) 3m BBHA9120D ANT(>1GHZ) VERTICAL  
 Job No. : 1847RF  
 Test Mode : PC mode  
 Test Engineer: Yang

	ReadAntenna	Cable Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level
MHz	dBuV	dB/m	dB	dB	dBuV/m
1	1865.000	39.80	25.58	4.89	34.23
2	2785.000	38.65	28.37	5.74	33.57
3	3585.000	38.45	29.12	7.13	32.66
4	4620.000	37.13	31.55	8.44	32.00
5	5040.000	35.48	31.98	8.83	32.21
6	5865.000	34.01	32.72	10.02	32.21

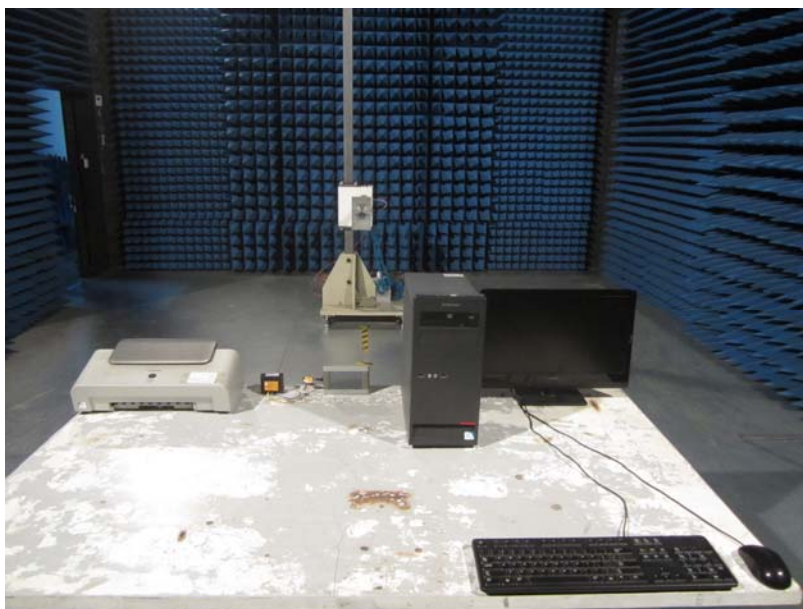
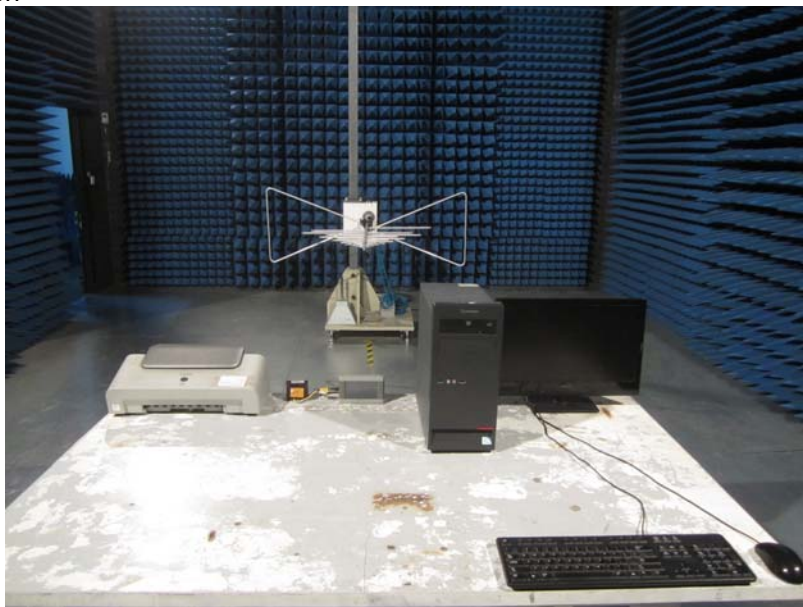
Remark:

1. The EUT was test at 3m in field chamber.
2. If the average limit is met when using a Peak detector, the EUT shall be deemed to meet both peak and average limits. And measurement with the average detector is unnecessary.



## 8 Test Setup Photo

Radiated Emission



## Conducted Emission



## 9 EUT Constructional Details

Reference to the test report No. GTSE13110184701

----- end-----