



FCC REPORT

Applicant: Trane US, Inc.
Address of Applicant: 6200 Troup Highway Tyler TX 75707

Equipment Under Test (EUT)

Product Name: Color Touchscreen Wi-Fi
Model No.: TCONT824AS52DAA, ACONT824AS52DAA

FCC ID: XVR-CONT8241

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2012

Date of sample receipt: November 25, 2013

Date of Test: November 25-29, 2013

Date of report issued: November 29, 2013

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	November 29, 2013	Original

Prepared By:



Date:

November 29, 2013

Project Engineer

Check By:



Date:

November 29, 2013

Reviewer

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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.

N/A: not applicable.

5 General Information

5.1 Client Information

Applicant:	Trane US, Inc.
Address of Applicant:	6200 Troup Highway Tyler TX 75707
Manufacturer:	Computime Limited
Address of Manufacturer:	9/F, Tower One Lippo Centre, 89 Queensway , HongKong
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
Model No.:	TCONT824AS52DAA, ACONT824AS52DAA
Operation Frequency:	908.40MHz
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 with GFSK modulation.
<i>Remark: During the test, 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.</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)	88.96	91.48	90.47

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

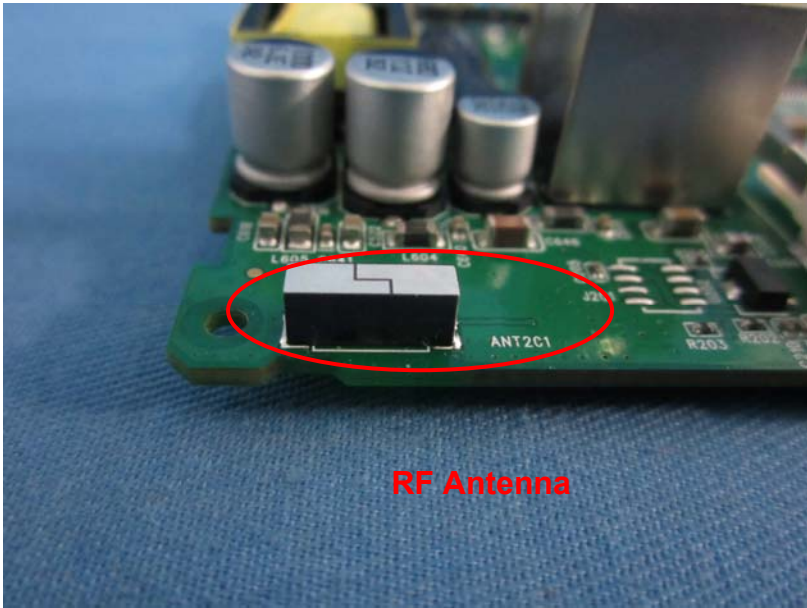
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 29 2013	Mar. 28 2014
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	Dec. 5, 2013	Dec. 4 2014
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 02 2013	Jul. 01 2014
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 24 2013	Feb. 23 2014
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2013	June 27 2014
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 29 2013	Mar. 28 2014
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 30 2013	Mar. 29 2014
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 30 2013	Mar. 29 2014
11	Coaxial cable	GTS	N/A	GTS210	Mar. 30 2013	Mar. 29 2014
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 30 2013	Mar. 29 2014
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 02 2013	Jul. 01 2014
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 02 2013	Jul. 01 2014
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2013	June 27 2014
16	Band filter	Amindeon	82346	GTS219	Mar. 30 2013	Mar. 29 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 Antenna requirement:

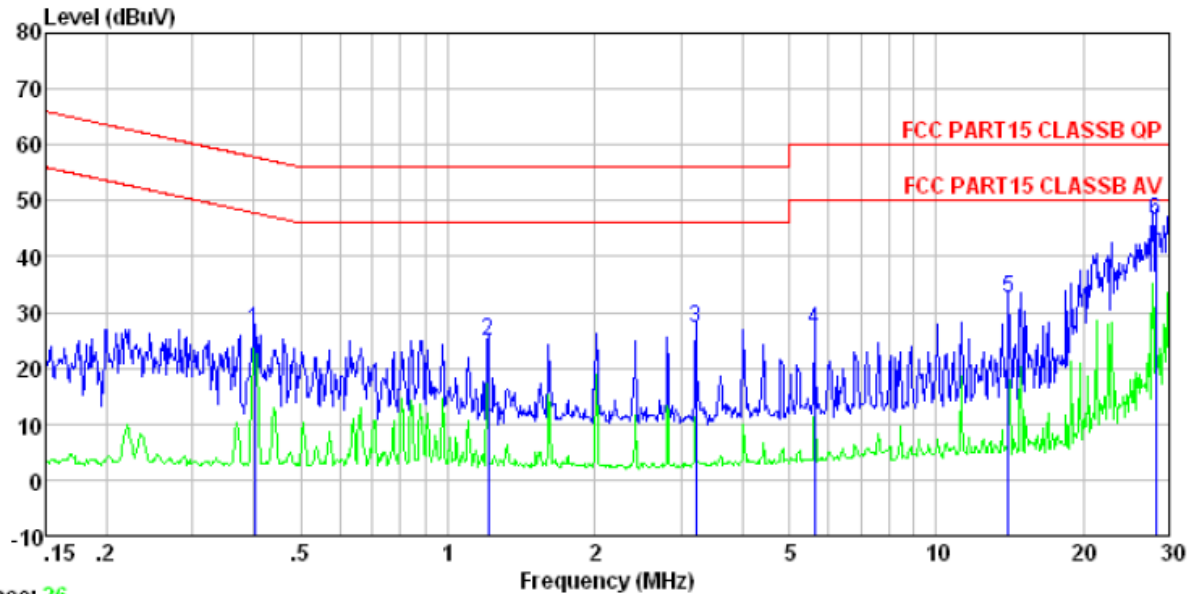
Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling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

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207			
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:	Reference Plane LISN AUX Equipment E.U.T Test table/Insulation plane 40cm 80cm LISN Filter EMI Receiver AC power Remark: E.U.T: Equipment Under Test LISN: Line Impedance 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 C63.4: 2003 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:

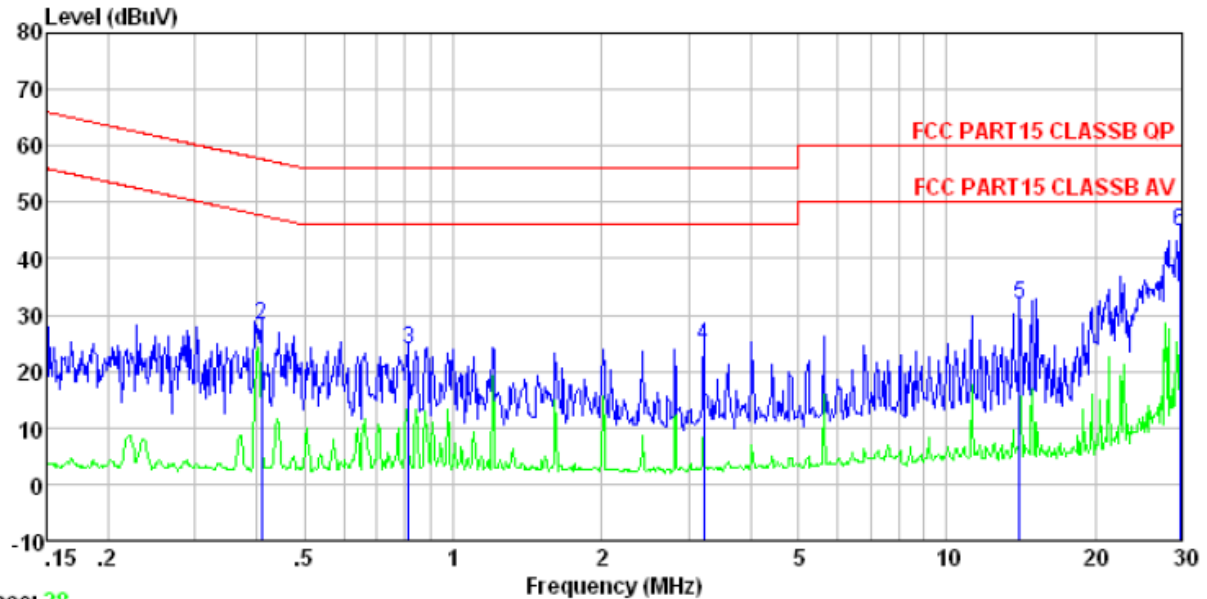


Trace: 26

Condition : FCC PART15 CLASSB QP LISN-2013 LINE
 Job No. : 1846RF
 Test mode : Z-Wave mode
 Test Engineer: Bing

	Read	LISN	Cable		Limit	Over	
Freq	Level	Factor	Loss	Level	Line	Limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.402	26.77	0.11	0.11	26.99	57.81	-30.82 QP
2	1.210	24.45	0.13	0.13	24.71	56.00	-31.29 QP
3	3.224	26.93	0.17	0.15	27.25	56.00	-28.75 QP
4	5.623	26.39	0.22	0.15	26.76	60.00	-33.24 QP
5	14.063	32.14	0.29	0.22	32.65	60.00	-27.35 QP
6	28.152	45.33	0.87	0.24	46.44	60.00	-13.56 QP

Neutral:



Trace: 28

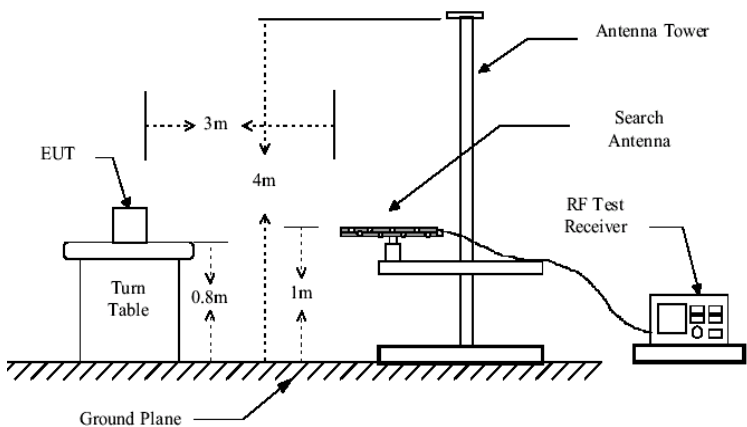
Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
 Job No. : 1846RF
 Test mode : Z-Wave mode
 Test Engineer: Bing

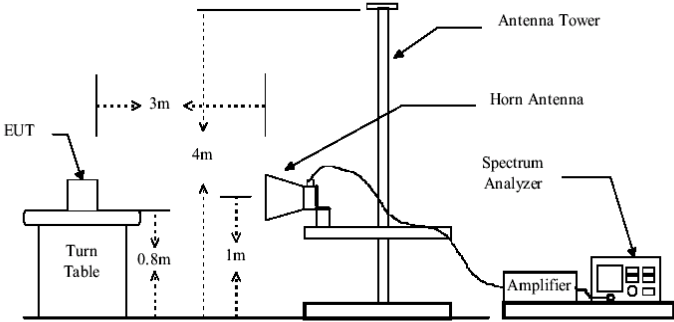
	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	29.64	0.07	0.12	29.83	66.00	-36.17	QP
2	0.408	28.01	0.06	0.11	28.18	57.68	-29.50	QP
3	0.813	23.73	0.07	0.13	23.93	56.00	-32.07	QP
4	3.224	24.19	0.12	0.15	24.46	56.00	-31.54	QP
5	14.063	31.30	0.33	0.22	31.85	60.00	-28.15	QP
6	29.684	43.76	0.68	0.24	44.68	60.00	-15.32	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 C63.4:2003				
Test Frequency Range:	30MHz to 10GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	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
	For the field strength test, the RBW and VBW were set to 300kHz and 1MHz.				
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	2400MHz-2483.5MHz	94.00		Average Value	
		114.00		Peak Value	
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	
	Above 1GHz	54.00		Average Value	
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:	Below 1GHz				
					
	Above 1GHz				

	 The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a Turn Table at a height of 0.8m. The Turn Table is rotated 360 degrees. The EUT is positioned 3m away from the Antenna Tower. The Antenna Tower has a Horn Antenna at a height of 4m. The Spectrum Analyzer is connected to the Antenna Tower via an Amplifier. The Spectrum Analyzer is also connected to the Antenna Tower. The Antenna Tower is positioned 1m away from the Turn Table.
Test Procedure:	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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.3.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
908.40	90.27	23.15	4.88	31.19	87.11	114.00	-26.89	Vertical
908.40	94.64	23.15	4.88	31.19	91.48	114.00	-22.52	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
908.40	83.14	23.18	4.90	31.19	80.03	94.00	-13.97	Vertical
908.40	87.11	23.18	4.90	31.19	84.00	94.00	-10.00	Horizontal

7.3.2 Spurious emissions

■ Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
31.96	52.12	14.32	0.57	32.06	34.95	40.00	-5.05	Vertical
48.33	48.45	15.35	0.75	31.98	32.57	40.00	-7.43	Vertical
58.20	47.13	14.80	0.84	31.94	30.83	40.00	-9.17	Vertical
119.86	50.08	12.48	1.36	31.86	32.06	43.50	-11.44	Vertical
216.02	47.03	13.07	1.93	32.15	29.88	46.00	-16.12	Vertical
550.95	40.21	19.57	3.53	31.28	32.03	46.00	-13.97	Vertical
55.81	42.52	14.97	0.82	31.95	26.36	40.00	-13.64	Horizontal
119.86	52.03	12.48	1.36	31.86	34.01	43.50	-9.49	Horizontal
125.45	54.06	11.61	1.40	31.88	35.19	43.50	-8.31	Horizontal
221.39	51.36	13.25	1.97	32.15	34.43	46.00	-11.57	Horizontal
250.30	50.60	14.07	2.12	32.16	34.63	46.00	-11.37	Horizontal
312.18	46.05	15.22	2.42	32.14	31.55	46.00	-14.45	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
1816.80	48.33	25.37	4.87	34.14	44.43	74.00	-29.57	Vertical
2725.20	38.74	28.21	5.69	33.63	39.01	74.00	-34.99	Vertical
3633.60	35.44	29.18	7.23	32.60	39.25	74.00	-34.75	Vertical
4542.00	32.68	31.42	8.38	31.96	40.52	74.00	-33.48	Vertical
5450.40	30.18	31.89	9.42	32.41	39.08	74.00	-34.92	Vertical
6358.80	29.79	33.39	10.70	32.08	41.80	74.00	-32.20	Vertical
7267.20	27.60	36.28	11.69	31.96	43.61	74.00	-30.39	Vertical
8175.60	28.22	36.99	12.39	31.59	46.01	74.00	-27.99	Vertical
9084.00	28.08	37.28	13.76	32.17	46.95	74.00	-27.05	Vertical
1816.80	53.10	25.37	4.87	34.14	49.20	74.00	-24.80	Horizontal
2725.20	37.44	28.21	5.69	33.63	37.71	74.00	-36.29	Horizontal
3633.60	35.47	29.18	7.23	32.60	39.28	74.00	-34.72	Horizontal
4542.00	33.22	31.42	8.38	31.96	41.06	74.00	-32.94	Horizontal
5450.40	30.87	31.89	9.42	32.41	39.77	74.00	-34.23	Horizontal
6358.80	29.43	33.39	10.70	32.08	41.44	74.00	-32.56	Horizontal
7267.20	27.87	36.28	11.69	31.96	43.88	74.00	-30.12	Horizontal
8175.60	29.86	36.99	12.39	31.59	47.65	74.00	-26.35	Horizontal
9084.00	28.53	37.23	13.71	32.23	47.24	74.00	-26.76	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1816.80	40.20	25.37	4.87	34.14	36.30	54.00	-17.70	Vertical
2725.20	30.93	28.21	5.69	33.63	31.20	54.00	-22.80	Vertical
3633.60	27.47	29.18	7.23	32.60	31.28	54.00	-22.72	Vertical
4542.00	24.63	31.42	8.38	31.96	32.47	54.00	-21.53	Vertical
5450.40	22.29	31.89	9.42	32.41	31.19	54.00	-22.81	Vertical
6358.80	22.22	33.39	10.70	32.08	34.23	54.00	-19.77	Vertical
7267.20	19.87	36.28	11.69	31.96	35.88	54.00	-18.12	Vertical
8175.60	20.01	36.99	12.39	31.59	37.80	54.00	-16.20	Vertical
9084.00	20.51	37.28	13.76	32.17	39.38	54.00	-14.62	Vertical
1816.80	44.66	25.37	4.87	34.14	40.76	54.00	-13.24	Horizontal
2725.20	29.31	28.21	5.69	33.63	29.58	54.00	-24.42	Horizontal
3633.60	27.19	29.18	7.23	32.60	31.00	54.00	-23.00	Horizontal
4542.00	25.25	31.42	8.38	31.96	33.09	54.00	-20.91	Horizontal
5450.40	22.74	31.89	9.42	32.41	31.64	54.00	-22.36	Horizontal
6358.80	21.62	33.39	10.70	32.08	33.63	54.00	-20.37	Horizontal
7267.20	19.90	36.28	11.69	31.96	35.91	54.00	-18.09	Horizontal
8175.60	22.13	36.99	12.39	31.59	39.92	54.00	-14.08	Horizontal
9084.00	20.64	37.23	13.71	32.23	39.35	54.00	-14.65	Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *“*” means this data is the too weak instrument of signal is unable to test.*

7.3.3 Bandedge emissions

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

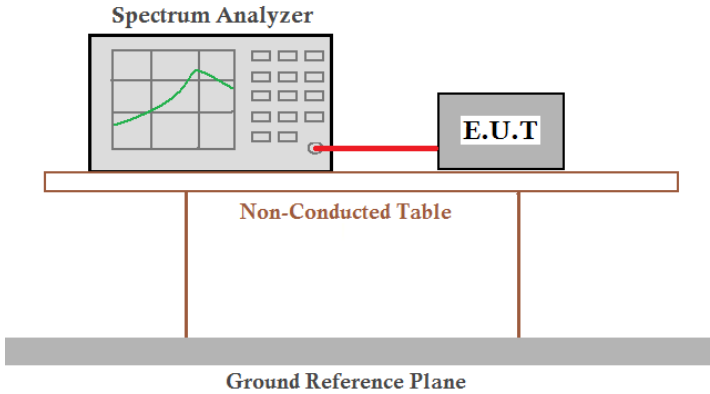
Quasi-peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
902.00	38.54	23.12	4.87	31.18	35.35	46.00	-10.65	Horizontal
928.00	38.63	23.28	4.96	31.20	35.67	46.00	-10.33	Horizontal
960.00	38.44	23.49	5.08	31.22	35.79	46.00	-10.21	Horizontal
902.00	37.68	23.12	4.87	31.18	34.49	46.00	-11.51	Vertical
928.00	37.59	23.28	4.96	31.20	34.63	46.00	-11.37	Vertical
960.00	37.27	23.49	5.08	31.22	34.62	46.00	-11.38	Vertical

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier 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.*

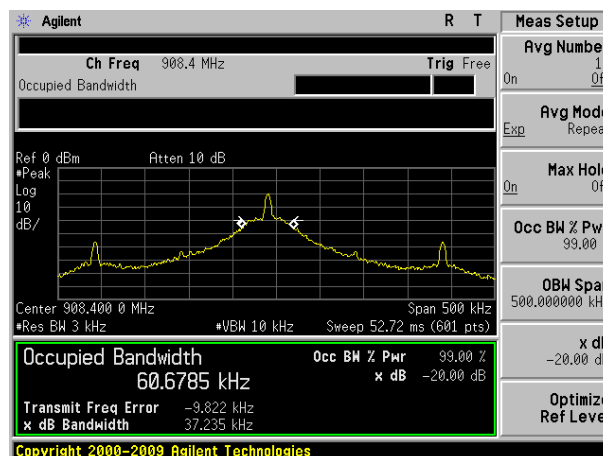
7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.4:2003
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

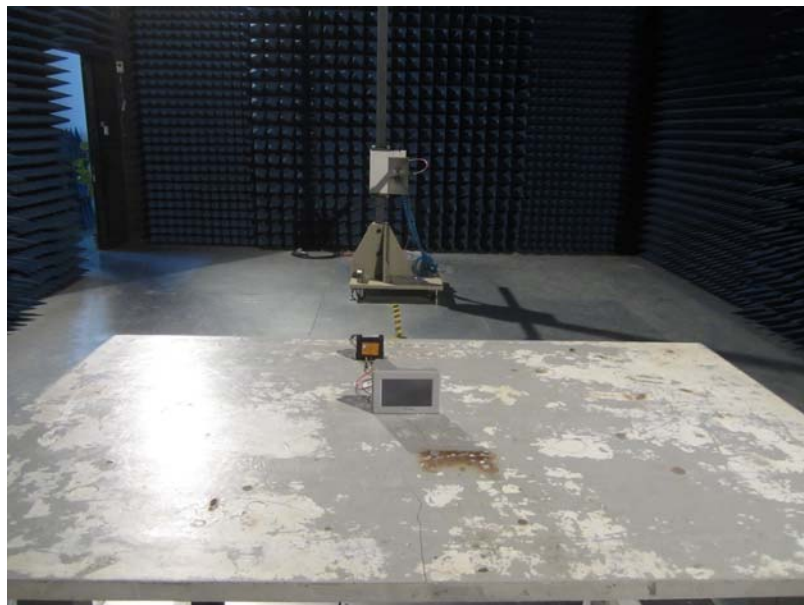
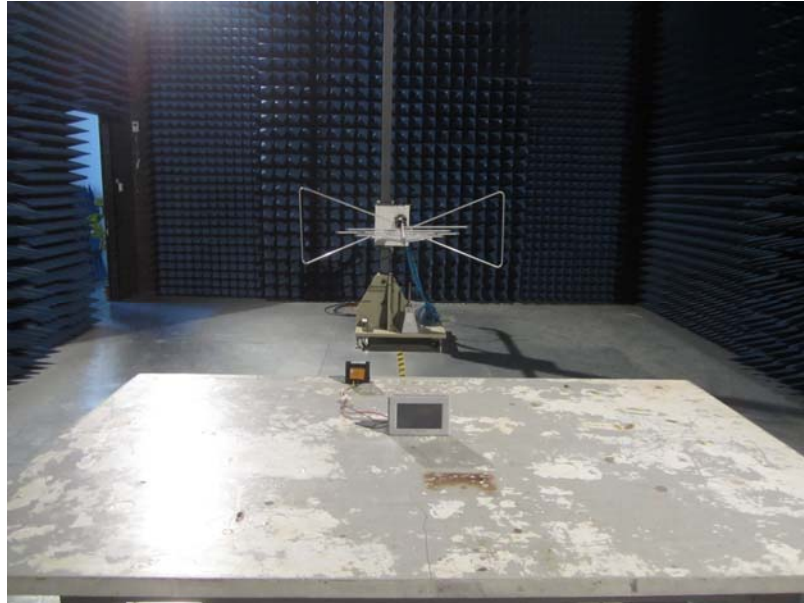
Operation Frequency	20dB bandwidth(MHz)	Result
908.40MHz	0.037	Pass

Test plot as follows:



8 Test Setup Photo

Radiated Emission



Conducted Emission



9 EUT Constructional Details

Reference to the test report No. GTSE13110184601

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