



FCC TEST REPORT

FCC ID: 2AP3A-OPTIMA

On Behalf of

A-Technology Ltd.

POS-terminal

Model No.: Optima

Prepared for : A-Technology Ltd.
Address : Bld 1, Butyrskaya street 67, Moscow, Russian Federation 127015

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

Report Number : T1880563 10
Date of Receipt : April 13, 2018
Date of Test : April 13, 2018-June 22, 2018
Date of Report : June 22, 2018
Version Number : REV0

Contents

	Page
1 TEST SUMMARY	5
2 GENERAL INFORMATION	6
2.1 GENERAL DESCRIPTION OF EUT	6
2.2 TEST MODE	8
2.3 TEST FACILITY.....	8
2.4 DESCRIPTION OF SUPPORT UNITS.....	8
2.5 ADDITIONAL INSTRUCTIONS	9
3 TEST INSTRUMENTS LIST	10
4 TEST RESULTS AND MEASUREMENT DATA	11
4.1 ANTENNA REQUIREMENT	11
4.2 CONDUCTED EMISSIONS	12
4.3 CONDUCTED OUTPUT POWER	15
4.4 CHANNEL BANDWIDTH	17
4.5 POWER SPECTRAL DENSITY.....	19
4.6 BAND EDGES.....	21
4.6.1 <i>Conducted Emission Method</i>	<i>21</i>
4.6.2 <i>Radiated Emission Method</i>	<i>22</i>
4.7 SPURIOUS EMISSION.....	24
4.7.1 <i>Conducted Emission Method</i>	<i>24</i>
4.7.2 <i>Radiated Emission Method</i>	<i>26</i>
5 TEST SETUP PHOTO.....	33
6 EUT CONSTRUCTIONAL DETAILS.....	35

TEST REPORT DECLARATION

Applicant : A-Technology Ltd.
 Address : Bld 1, Butyrskaya street 67, Moscow, Russian Federation 127015
 Manufacturer : A-Technology Ltd.
 Address : Bld 1, Butyrskaya street 67, Moscow, Russian Federation 127015
 EUT Description : POS-terminal
 (A) Model No. : Optima
 (B) Trademark : N/A

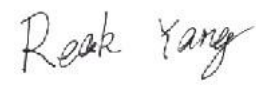
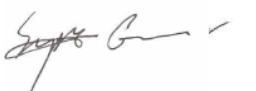
Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2016,
 ANSI C63.10-2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....:	Reak Yang Project Engineer	
Approved by (name + signature).....:	Simple Guan Project Manager	
Date of issue.....	June 19, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	June 22, 2018	Initial released Issue	Simple Guan

1 Test Summary

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

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

Remark: Test according to 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%.

2 General Information

2.1 General Description of EUT

Product Name:	POS-terminal
Model No.:	Optima
Test Model No:	Optima
<i>Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.</i>	
Sample(s) Status:	Engineer sample
Quantity of tested samples	1
Serial No.:	N/A
Tested Sample(s) ID:	N/A
Hardware Version:	V1.1
Software Version:	V1.0
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version	Bluetooth V4.0 (This Report for BLE)
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Antenna Type:	PIFA Antenna
Antenna Gain:	2.0dBi
Power Supply:	12V $\overline{\text{---}}$ 3.0A (Powered by an approved adaptor)

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

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:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

2.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<p><i>Remark:</i></p> <p>1. 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.</p> <p>2. Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%).</p>	

2.3 Test Facility

<p>Shenzhen Alpha Product Testing Co., Ltd Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China</p> <p>June 21, 2018 File on Federal Communication Commission Registration Number: 293961</p> <p>July 25, 2017 Certificated by IC Registration Number: 12135A</p>
--

2.4 Description of Support Units

Accessories1	:	AC/DC ADAPTER
Manufacturer	:	SHAN SHUNDE GUANYUDA POWER SUPPLY CO., LTD
Model	:	GM42-120300-D
Power supply	:	Input: AC 100-240V, 50/60Hz, 1.5A Output: 12V $\overline{=}$, 3.0A

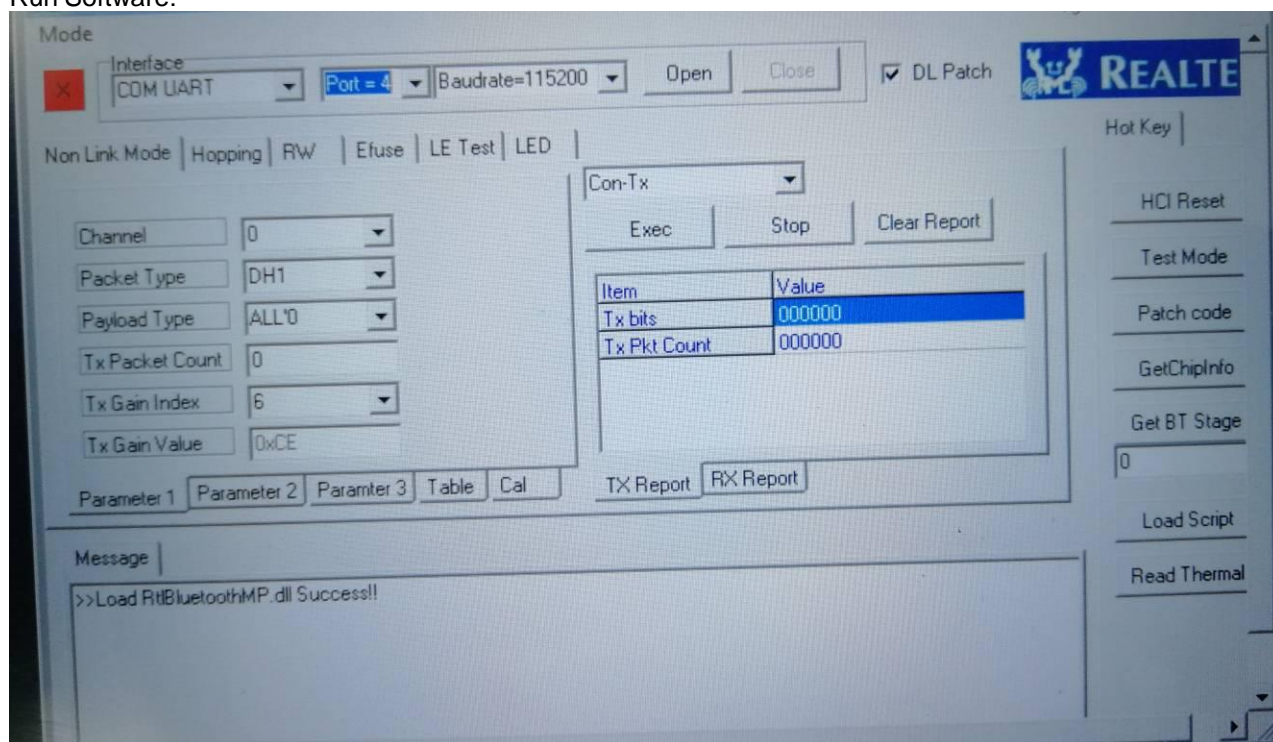
2.5 Additional instructions

Software (Used for test) from client

Mode	Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.
------	--

Power level setup in software			
Test Software Name	MP_Kit_RTL11n		
Test Software Version	v0.04		
Support Units (Software installation media)	Description	Manufacturer	Model
	Laptop	Apple	A1278
Mode	Channel	Frequency (MHz)	Soft Set
GFSK	CH1	2402	TX LEVEL is built-in set parameters and cannot be changed and selected.
	CH21	2442	
	CH40	2480	

Run Software:

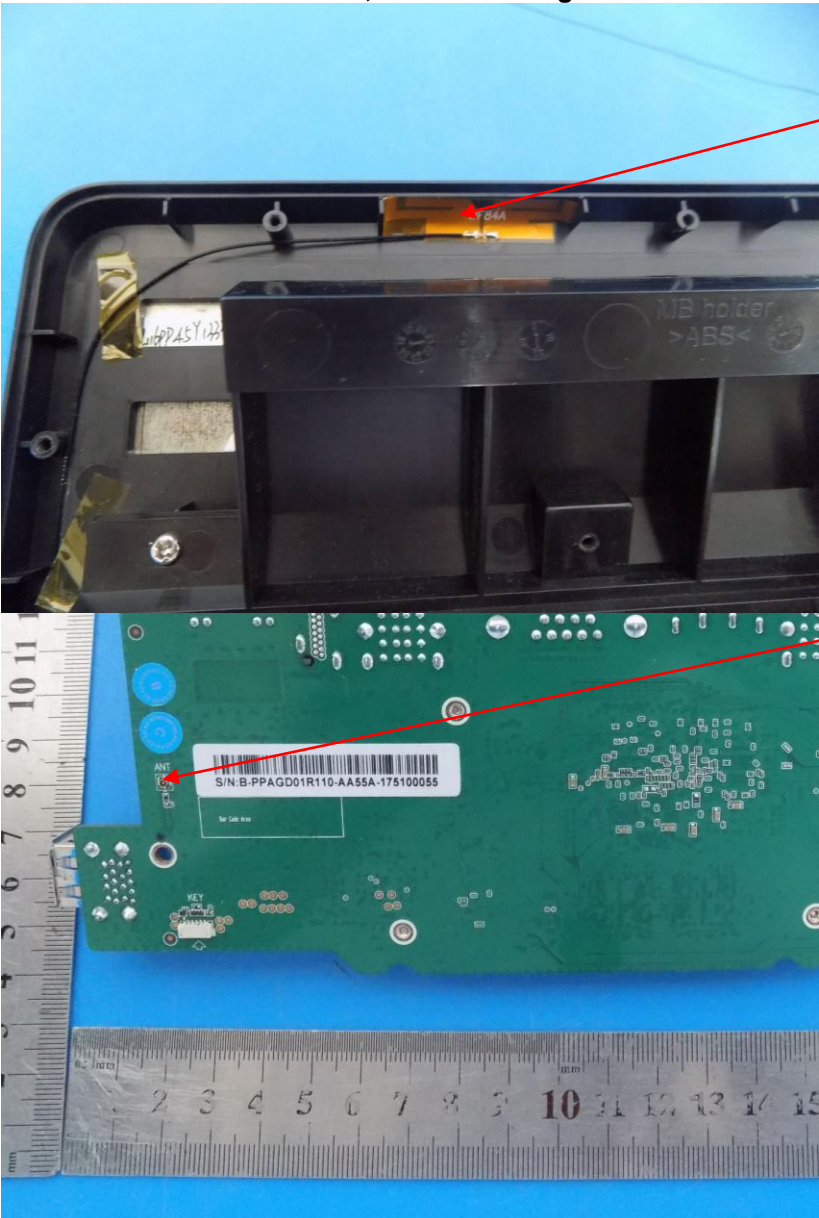


3 Test Instruments list

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2017.09.22	1Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2017.09.22	1Year
Receiver	R&S	ESCI	1166.5950K03-1011	2017.09.22	1Year
Receiver	R&S	ESCI	101202	2017.09.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2016.09.30	2Year
Horn Antenna	EMCO	3115	640201028-06	2016.09.30	2Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2016.09.30	2Year
Cable	Resenberger	N/A	No.1	2017.09.22	1Year
Cable	SCHWARZBECK	N/A	No.2	2017.09.22	1Year
Cable	SCHWARZBECK	N/A	No.3	2017.09.22	1Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2017.09.22	1Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2017.09.22	1Year
Temperature controller	Terchy	MHQ	120	2017.09.22	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2017.09.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2017.09.22	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2017.09.22	1 Year
18-40 Horn Antenna	18-40G antenna	Sas-574	571	2018-3-15	3 Year

4 Test results and Measurement Data

4.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>15.203 requirement:</p> <p>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.</p> <p>15.247(c) (1)(i) requirement:</p> <p>(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.</p>	
<p>E.U.T Antenna:</p>	
<p>The antenna is PIFA antenna, the best case gain of the antenna is 2.0dBi</p>  <p>BT Antenna</p> <p>Antenna connector</p>	

4.2 Conducted Emissions

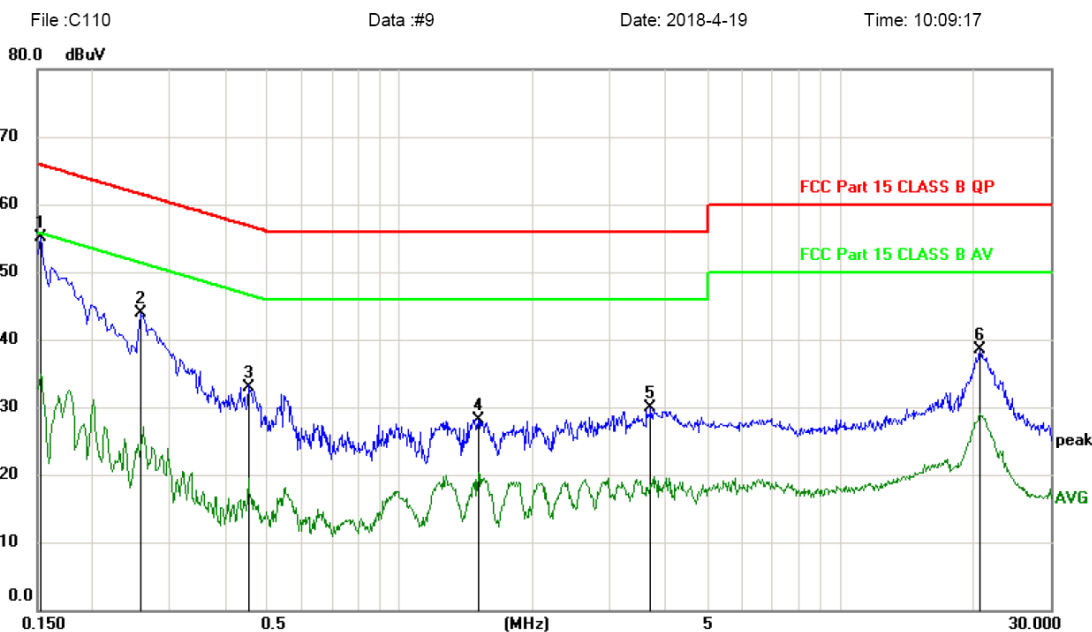
Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Test Frequency Range:	150KHz to 30MHz														
Class / Severity:	Class B														
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto														
Limit:	<table border="1"> <thead> <tr> <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> <p>* Decreases with the logarithm of the frequency.</p>	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													
Test setup:	<p>Remark 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 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 C63.10:2009 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

Test result for BT4.0 (Channel 2440MHz), AC 120V/ 60Hz

Line:

Conducted Emission Measurement



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1529	54.82	0.20	55.02	65.84	-10.82	peak	
2		0.2580	43.67	0.20	43.87	61.50	-17.63	peak	
3		0.4560	32.67	0.20	32.87	56.77	-23.90	peak	
4		1.5059	27.98	0.20	28.18	56.00	-27.82	peak	
5		3.7050	29.59	0.24	29.83	56.00	-26.17	peak	
6		20.7927	37.74	0.74	38.48	60.00	-21.52	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Test result for BT4.0 (Channel 2440MHz), AC 120V/ 60Hz

Neutral:

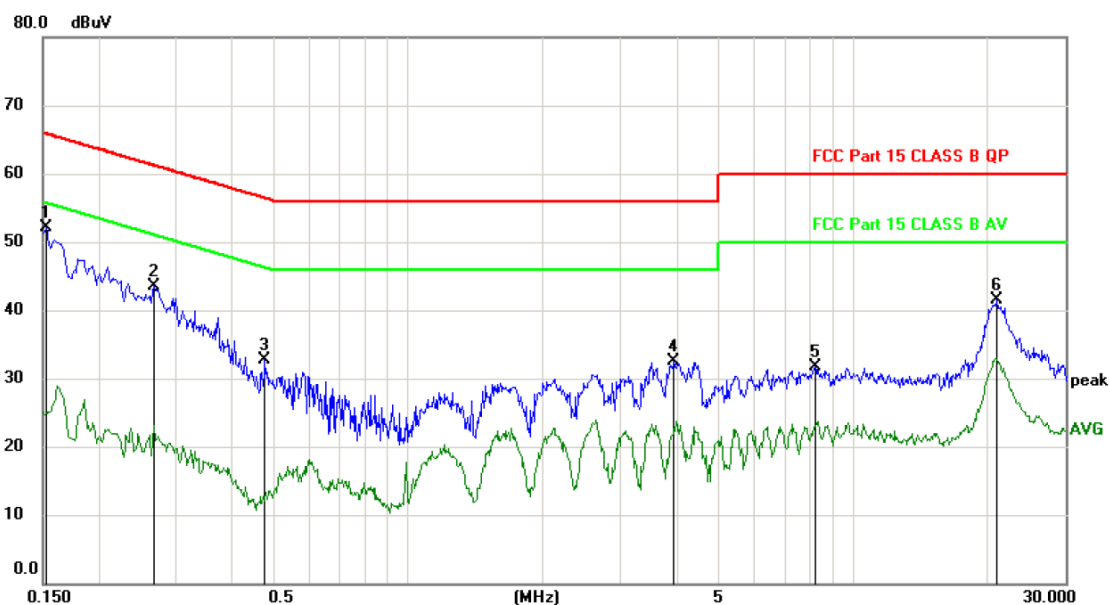
Conducted Emission Measurement

File :C110

Data :#10

Date: 2018-4-19

Time: 10:10:47

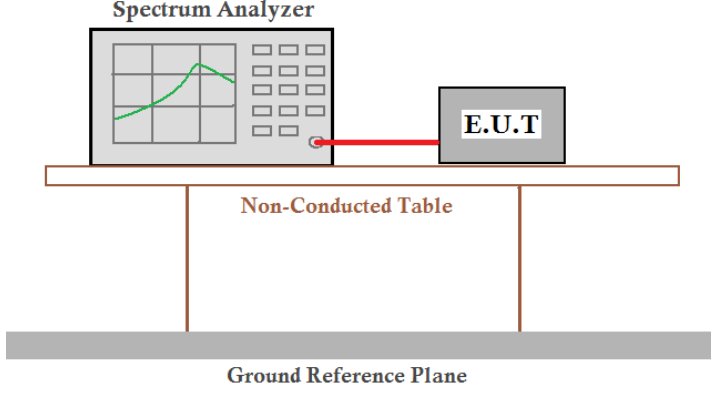


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1529	52.00	0.20	52.20	65.84	-13.64	peak	
2		0.2671	43.21	0.20	43.41	61.21	-17.80	peak	
3		0.4737	32.55	0.20	32.75	56.45	-23.70	peak	
4		3.9569	32.35	0.24	32.59	56.00	-23.41	peak	
5		8.2050	31.30	0.34	31.64	60.00	-28.36	peak	
6		21.0654	40.74	0.74	41.48	60.00	-18.52	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

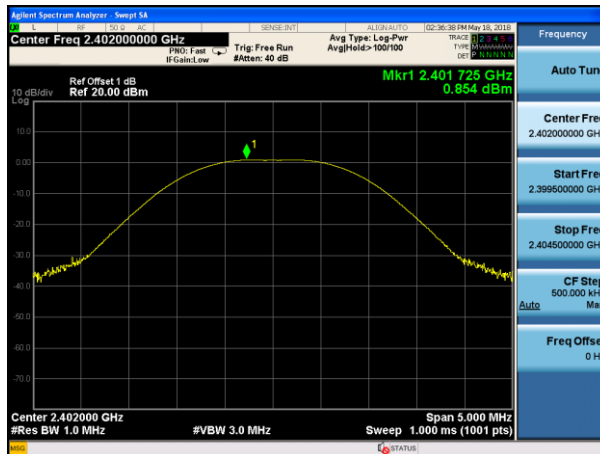
4.3 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V04
Limit:	30dBm
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

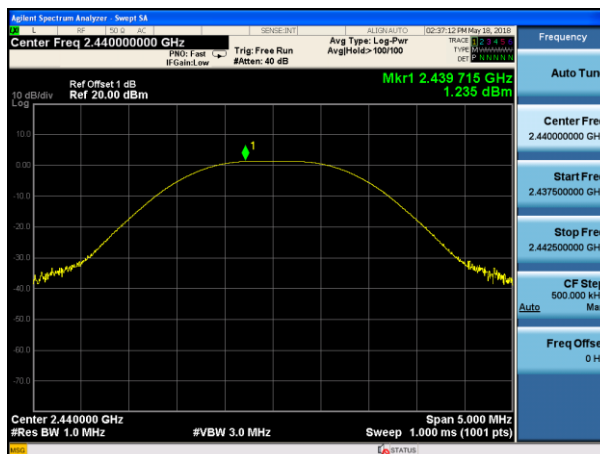
Measurement Data

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	0.854	30.00	Pass
Middle	1.235		
Highest	-0.536		

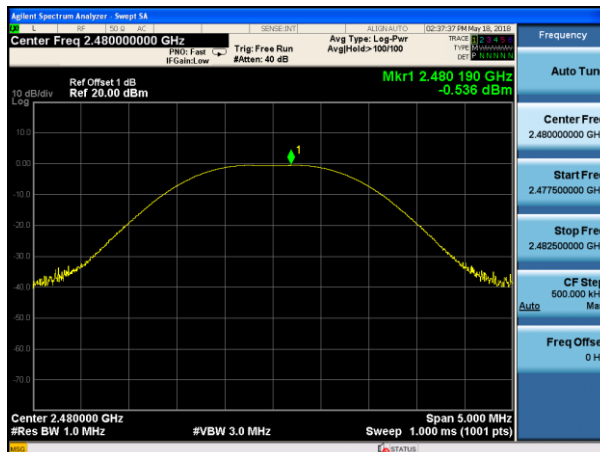
Test plot as follows:



Lowest channel

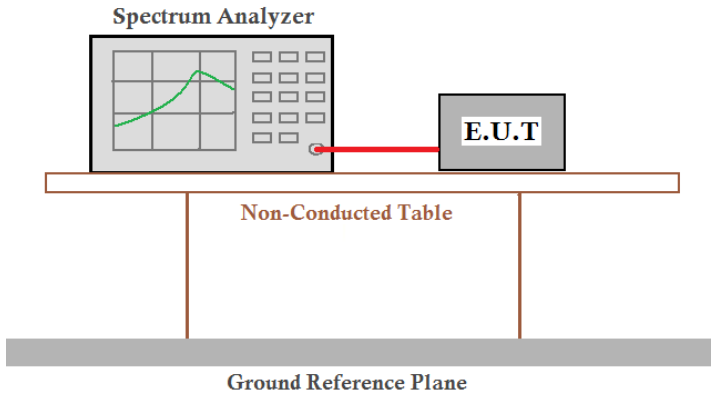


Middle channel



Highest channel

4.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V04
Limit:	>500KHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

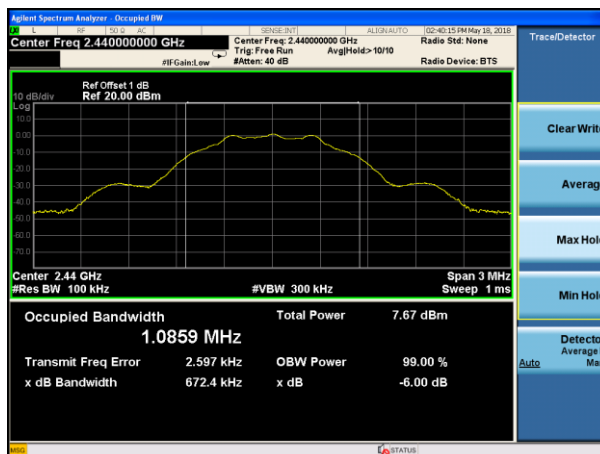
Measurement Data

Test channel	Channel Bandwidth (MHz)	Limit(KHz)	Result
Lowest	0.6742	>500	Pass
Middle	0.6724		
Highest	0.6754		

Test plot as follows:



Lowest channel

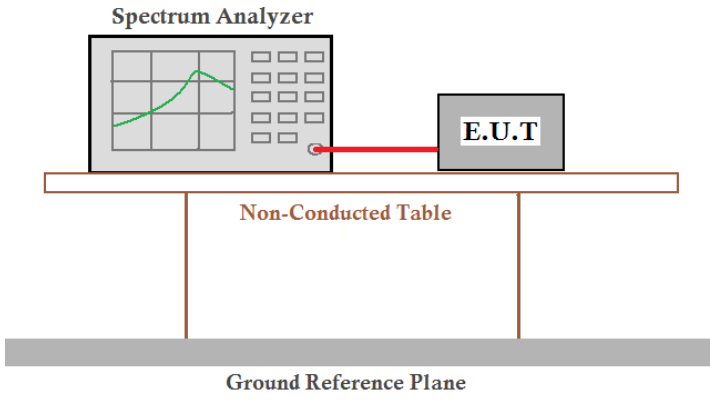


Middle channel



Highest channel

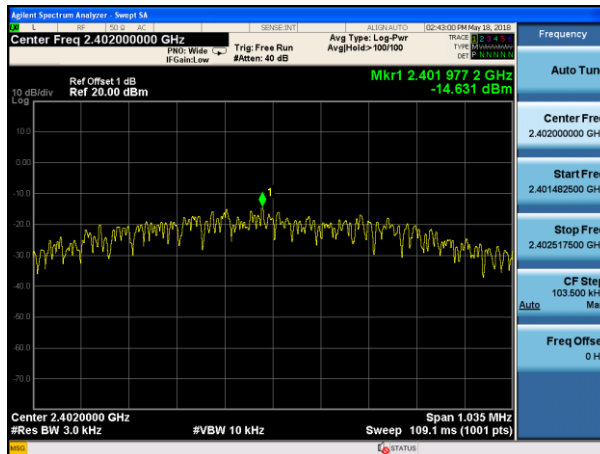
4.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V04
Limit:	8dBm/3kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

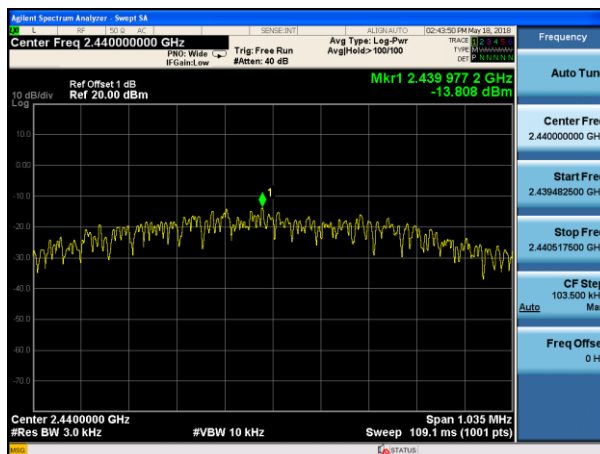
Measurement Data

Test channel	Power Spectral Density (dBm)	Limit(dBm/3kHz)	Result
Lowest	-14.631	8.00	Pass
Middle	-13.808		
Highest	-15.666		

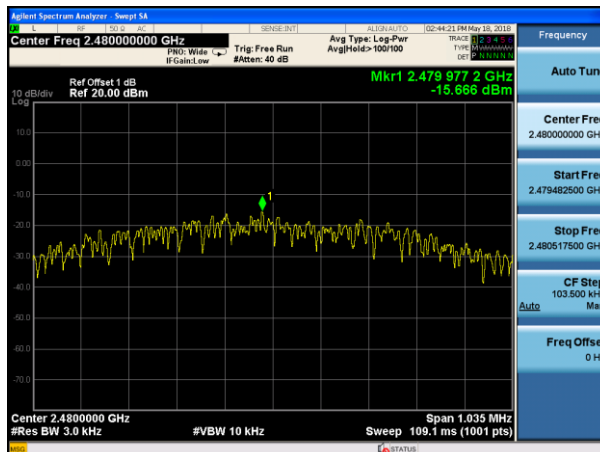
Test plot as follows:



Lowest channel



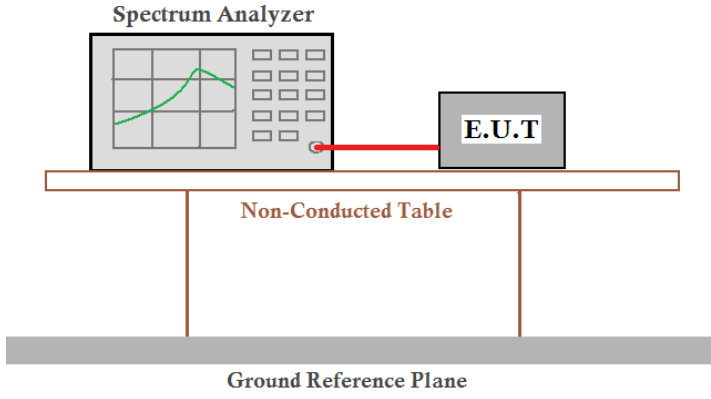
Middle channel



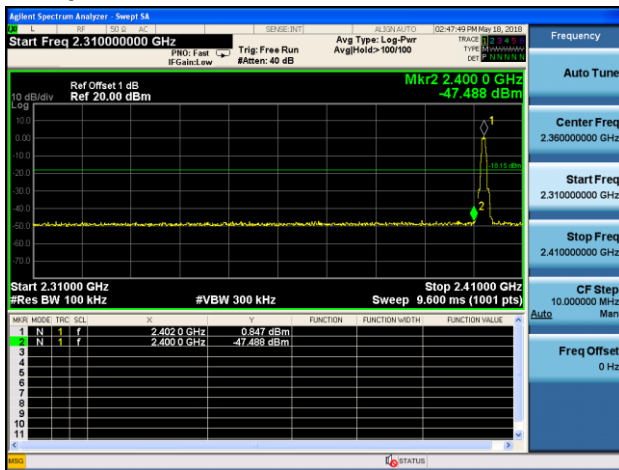
Highest channel

4.6 Band edges

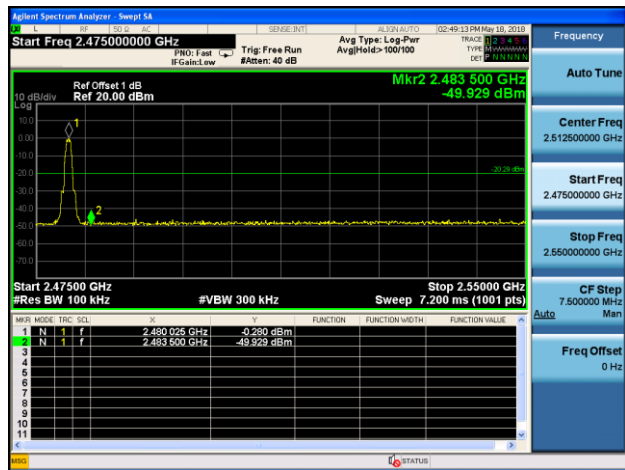
4.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V04
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
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. The table is supported by two legs and sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

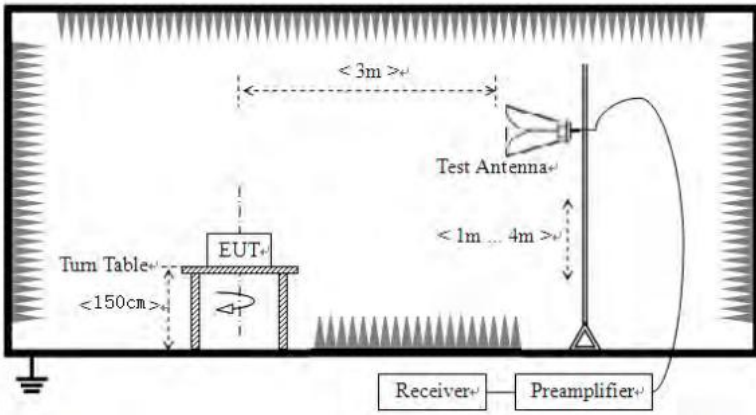


Lowest channel



Highest channel

4.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak	1MHz	3MHz	Peak
RMS		1MHz	3MHz	Average	
Limit:	Frequency		Limit (dBuV/m @3m)		Value
	Above 1GHz		54.00		Average
			74.00		Peak
Test setup:					
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 1.5 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. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. 				
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test results:	Pass				

Measurement data:

Remark: The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.

Test channel:	Lowest
---------------	--------

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
2390.00	45.84	27.59	5.38	30.18	48.63	74.00	-25.37	Horizontal
2400.00	50.76	27.58	5.39	30.18	53.55	74.00	-20.45	Horizontal
2390.00	46.40	27.59	5.38	30.18	49.19	74.00	-24.81	Vertical
2400.00	50.28	27.58	5.39	30.18	53.07	74.00	-20.93	Vertical

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
2390.00	35.83	27.59	5.38	30.18	38.62	54.00	-15.38	Horizontal
2400.00	36.92	27.58	5.39	30.18	39.71	54.00	-14.29	Horizontal
2390.00	35.94	27.59	5.38	30.18	38.73	54.00	-15.27	Vertical
2400.00	38.39	27.58	5.39	30.18	41.18	54.00	-12.82	Vertical

Test channel:	Highest
---------------	---------

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
2483.50	48.31	27.53	5.47	29.93	51.38	74.00	-22.62	Horizontal
2500.00	47.18	27.55	5.49	29.93	50.29	74.00	-23.71	Horizontal
2483.50	49.93	27.53	5.47	29.93	53.00	74.00	-21.00	Vertical
2500.00	48.37	27.55	5.49	29.93	51.48	74.00	-22.52	Vertical

Average value:

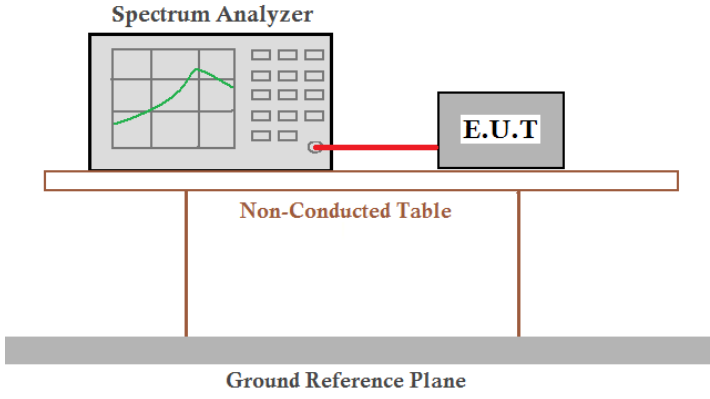
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	38.17	27.53	5.47	29.93	41.24	54.00	-12.76	Horizontal
2500.00	36.09	27.55	5.49	29.93	39.20	54.00	-14.80	Horizontal
2483.50	40.20	27.53	5.47	29.93	43.27	54.00	-10.73	Vertical
2500.00	36.03	27.55	5.49	29.93	39.14	54.00	-14.86	Vertical

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.

4.7 Spurious Emission

4.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 DTS Meas Guidance V04
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	 <p>The diagram illustrates the test setup for conducted emission measurement. It shows a Spectrum Analyzer connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

Lowest channel



30MHz~25GHz

Middle channel



30MHz~25GHz

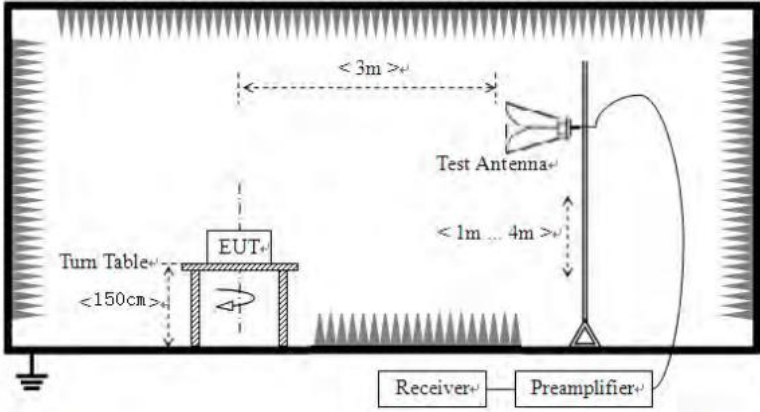
Highest channel



30MHz~25GHz

4.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	30MHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
RMS		1MHz	3MHz	Average	
Limit:	Frequency	Limit (dBuV/m @3m)		Value	
	0.009-0.490MHz	2400/F(KHz)		300	
	0.490-1.705MHz	24000/F(KHz)		30	
	1.705-30MHz	30		30	
	30MHz-88MHz	40.00		Quasi-peak	
	88MHz-216MHz	43.50		Quasi-peak	
	216MHz-960MHz	46.00		Quasi-peak	
	960MHz-1GHz	54.00		Quasi-peak	
	Above 1GHz	54.00		Average	
		74.00		Peak	
Test setup:	Below 1GHz				
	<p>The diagram illustrates the test setup for frequencies below 1GHz. It shows an Equipment Under Test (EUT) placed on a turn table. The EUT is positioned at a height of less than 80cm. A test antenna is located at a distance of 3m from the EUT. The antenna is positioned at a height of 1m to 4m. The antenna is connected to a receiver with a preamplifier. The setup is enclosed in a shielded chamber.</p>				
	Above 1GHz				

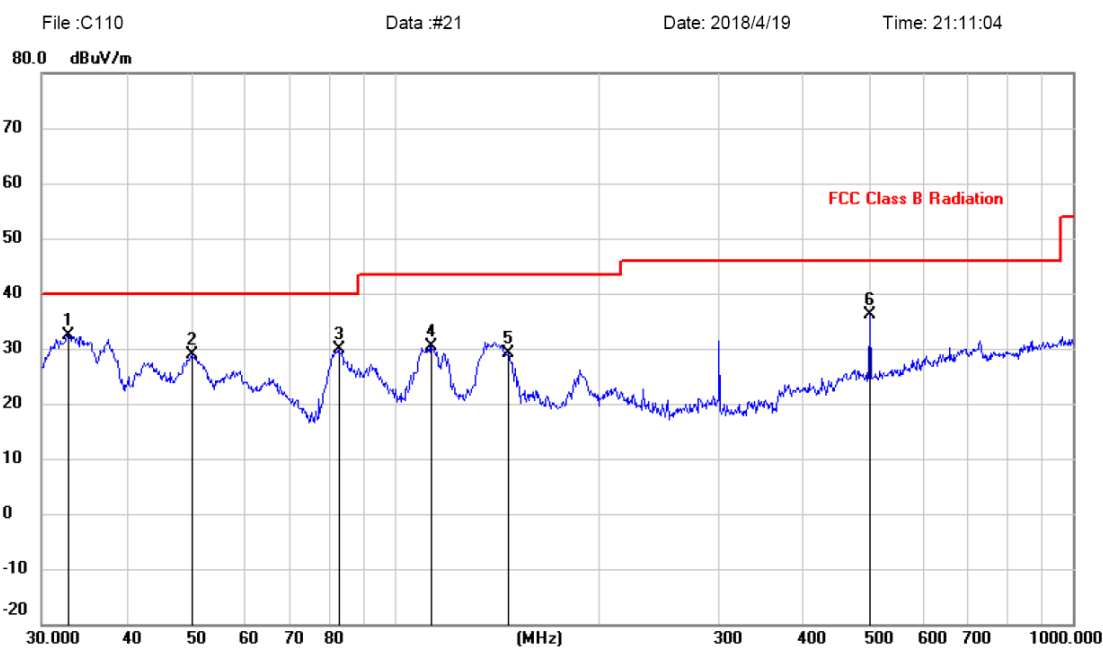
	
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table (0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters 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. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.
2. The test data below 30MHz is too lower than the limit, so not show in this report.
3. This Report only show the test plots of the worst case.

Measurement Data

Test result for BT4.0 (Channel 2440MHz), AC 120V/ 60Hz

Vertical:**Radiated Emission Measurement**

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	32.8637	18.98	13.43	32.41	40.00	-7.59	peak		
2		50.0566	15.14	13.71	28.85	40.00	-11.15	peak		
3		82.6478	20.24	9.56	29.80	40.00	-10.20	peak		
4		112.9196	18.64	11.82	30.46	43.50	-13.04	peak		
5		146.8874	14.92	14.33	29.25	43.50	-14.25	peak		
6		501.1788	18.81	17.22	36.03	46.00	-9.97	peak		

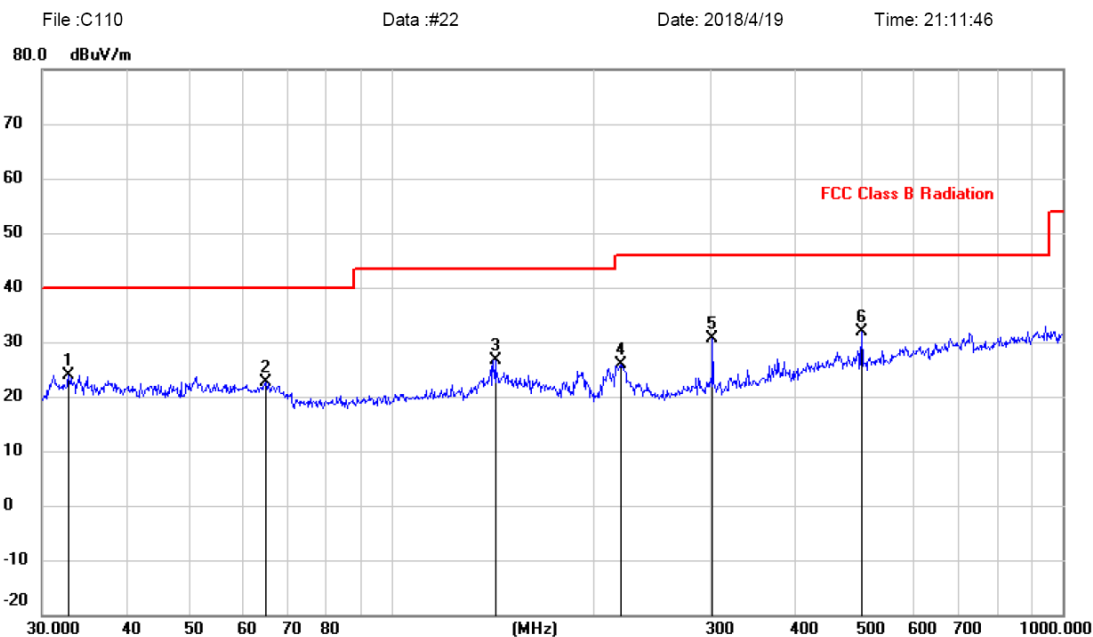
Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Test result for BT4.0 (Channel 2440MHz), AC 120V/ 60Hz

Horizontal:

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		32.8637	10.53	13.43	23.96	40.00	-16.04			peak
2		64.6594	10.73	11.97	22.70	40.00	-17.30			peak
3		142.3242	12.71	14.00	26.71	43.50	-16.79			peak
4		219.0751	14.56	11.26	25.82	46.00	-20.18			peak
5		301.4223	17.05	13.51	30.56	46.00	-15.44			peak
6	*	501.1788	14.56	17.22	31.78	46.00	-14.22			peak

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

■ Above 1GHz

Test channel:	Lowest
---------------	--------

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
4804.00	38.38	31.78	8.6	32.09	46.67	74.00	-27.33	Vertical
7206.00	32.44	36.15	11.65	32	48.24	74.00	-25.76	Vertical
9608.00	31.54	37.95	14.14	31.62	52.01	74.00	-21.99	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	42.19	31.78	8.6	32.09	50.48	74.00	-23.52	Horizontal
7206.00	34.74	36.15	11.65	32	50.54	74.00	-23.46	Horizontal
9608.00	31.63	37.95	14.14	31.62	52.10	74.00	-21.90	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		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
4804.00	26.50	31.78	8.6	32.09	34.79	54.00	-19.21	Vertical
7206.00	21.43	36.15	11.65	32	37.23	54.00	-16.77	Vertical
9608.00	19.68	37.95	14.14	31.62	40.15	54.00	-13.85	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	30.95	31.78	8.6	32.09	39.24	54.00	-14.76	Horizontal
7206.00	23.24	36.15	11.65	32	39.04	54.00	-14.96	Horizontal
9608.00	20.14	37.95	14.14	31.62	40.61	54.00	-13.39	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					54.00		Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor*
2. *“*”, means this data is the too weak instrument of signal is unable to test.*

Test channel:	Middle
---------------	--------

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
4880.00	38.05	31.78	8.6	32.09	46.34	74.00	-27.66	Vertical
7320.00	32.52	36.15	11.65	32	48.32	74.00	-25.68	Vertical
9760.00	31.81	37.95	14.14	31.62	52.28	74.00	-21.72	Vertical
12200.00	*					74.00		Vertical
14640.00	*					74.00		Vertical
4880.00	42.49	31.78	8.6	32.09	50.78	74.00	-23.22	Horizontal
7320.00	33.86	36.15	11.65	32	49.66	74.00	-24.34	Horizontal
9760.00	31.71	37.95	14.14	31.62	52.18	74.00	-21.82	Horizontal
12200.00	*					74.00		Horizontal
14640.00	*					74.00		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
4880.00	26.47	31.78	8.6	32.09	34.76	54.00	-19.24	Vertical
7320.00	20.92	36.15	11.65	32	36.72	54.00	-17.28	Vertical
9760.00	19.55	37.95	14.14	31.62	40.02	54.00	-13.98	Vertical
12200.00	*					54.00		Vertical
14640.00	*					54.00		Vertical
4880.00	30.66	31.78	8.6	32.09	38.95	54.00	-15.05	Horizontal
7320.00	23.55	36.15	11.65	32	39.35	54.00	-14.65	Horizontal
9760.00	20.24	37.95	14.14	31.62	40.71	54.00	-13.29	Horizontal
12200.00	*					54.00		Horizontal
14640.00	*					54.00		Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *“*”*, means this data is the too weak instrument of signal is unable to test.

Test channel:	Highest
---------------	---------

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
4960.00	37.57	31.78	8.6	32.09	45.86	74.00	-28.14	Vertical
7440.00	32.22	36.15	11.65	32	48.02	74.00	-25.98	Vertical
9920.00	31.90	37.95	14.14	31.62	52.37	74.00	-21.63	Vertical
12400.00	*					74.00		Vertical
14880.00	*					74.00		Vertical
4960.00	42.51	31.78	8.6	32.09	50.80	74.00	-23.20	Horizontal
7440.00	34.01	36.15	11.65	32	49.81	74.00	-24.19	Horizontal
9920.00	31.35	37.95	14.14	31.62	51.82	74.00	-22.18	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					74.00		Horizontal

Average value:

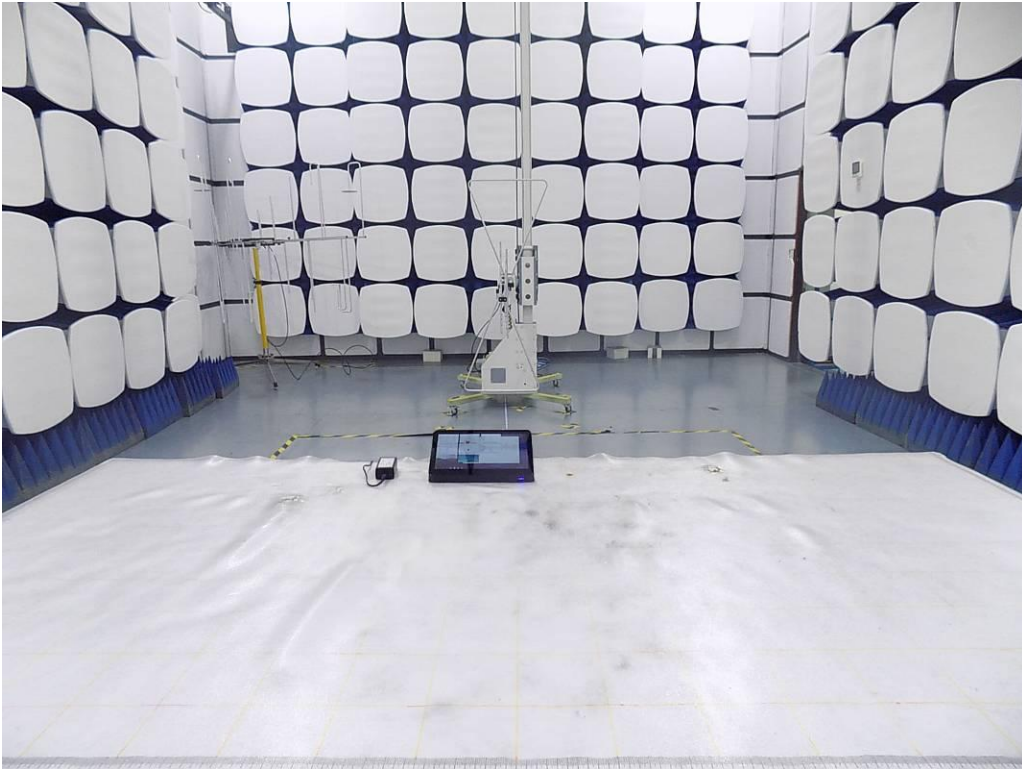
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	26.42	31.78	8.6	32.09	34.71	54.00	-19.29	Vertical
7440.00	20.75	36.15	11.65	32	36.55	54.00	-17.45	Vertical
9920.00	19.75	37.95	14.14	31.62	40.22	54.00	-13.78	Vertical
12400.00	*					54.00		Vertical
14880.00	*					54.00		Vertical
4960.00	31.11	31.78	8.6	32.09	39.40	54.00	-14.60	Horizontal
7440.00	23.45	36.15	11.65	32	39.25	54.00	-14.75	Horizontal
9920.00	19.09	37.95	14.14	31.62	39.56	54.00	-14.44	Horizontal
12400.00	*					54.00		Horizontal
14880.00	*					54.00		Horizontal

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *“*”*, means this data is the too weak instrument of signal is unable to test.

5 Test Setup Photo

Radiated Emission



Conducted Emission



6 EUT Constructional Details

Please refer to report T1880563 08

-----End-----