FCC REPORT

Applicant:	Shenzhen Transtar Electronics Co., LTD
Address of Applicant:	Colinda Industrial Park, Opposite Side of No. 15, Furong Road,Songgang, Bao'an, Shenzhen, China
Manufacturer/Factory:	Shenzhen Transtar Electronics Co., LTD
Address of Manufacturer/Factory:	Room 501, 1st building, Yingfeng Industrial Zone, Tantou Village, Songgang Street, Bao’an District, Shenzhen City, China

Equipment Under Test (EUT)

Product Name:	window robot
Model No.:	WA7, WA3, WA5, WA6, WA8, WA9, W611, W612, W615, W616, W618, W619, W600, W610, W620, W630, W660, W680, W65, W66, W66S, W67, W68, S5, S6
FCC ID:	2AI2SWA7
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249
Date of sample receipt:	April 16, 2020
Date of Test:	April 16- 28, 2020
Date of report issued:	April 28, 2020
Test Result :	PASS *

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

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*April 28, 2020*	*Original*

Prepared By: ***Date:*** *April 28, 2020*

Project Engineer

Check By: ***Date:*** *April 28, 2020*

Reviewer

3 Contents

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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	N/A
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

Remarks:

1. Test according to ANSI C63.10: 2013.

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

3. N/A；not applicable

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	±3.8039dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 3.9679dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.29dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	window robot
Model No.:	WA7, WA3, WA5, WA6, WA8, WA9, W611, W612, W615, W616, W618, W619, W600, W610, W620, W630, W660, W680, W65, W66, W66S, W67, W68, S5, S6
Test model:	WA7
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. Th only difference is model name and color.	
Serial No.:	QSD-WA7-TS
Test sample(s) ID:	GTS202004000108-1
Sample(s) Status	Engineered sample
Operation Frequency:	2450MHz
Channel numbers:	1
Modulation type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	1.5dBi(declare by applicant)
Power supply:	DC3.0V(2*1.5V, SIZE”AAA”)

Operation Frequency each of channel	
Channel	Frequency
1	2450MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: New battery is used during all test.	

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)	86.43	88.70	87.32

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

● **IC —Registration No.: 9079A**

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 .

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

RF Conducted Test:

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

General used equipment:

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020

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.

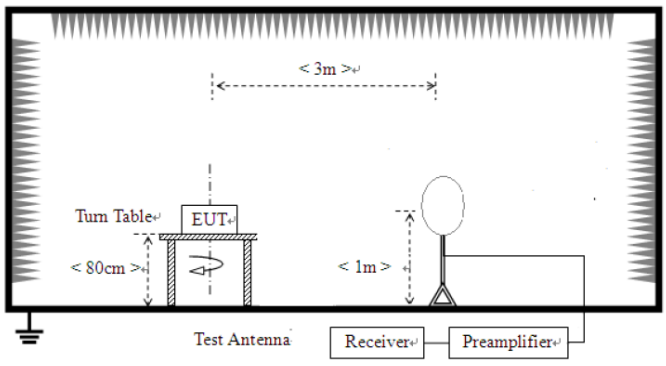
15.247(c) (1)(i) requirement:

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

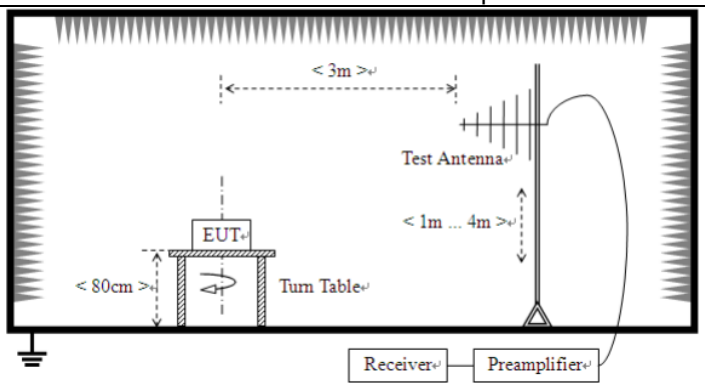
EUT Antenna:

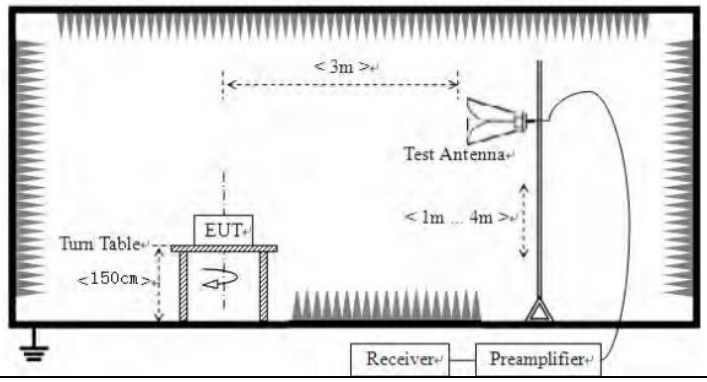
The antenna is PCB antenna, the best case gain of the antenna is 1.5dBi, reference to the appendix II for details

7.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>9kHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>9kHz-150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>300Hz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>10kHz</td><td>Quasi-peak Value</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>
</td></tr>
<tr><td>Limit:
(Field strength of the fundamental signal)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td rowspan="2">2400MHz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr>
<tr><td>114.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(Spurious Emissions)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (uV/m)</th><th>Remark</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(kHz) @300m</td><td>Quasi-peak Value</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(kHz) @30m</td><td>Quasi-peak Value</td></tr>
<tr><td>1.705MHz-30.0MHz</td><td>30 @30m</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-88MHz</td><td>100 @3m</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>150 @3m</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>200 @3m</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>500 @3m</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500 @3m</td><td>Average Value</td></tr>
<tr><td>5000 @3m</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(band edge)</td><td>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.</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz
 

For radiated emissions from 30MHz to1GHz</td></tr>
</table>

<table>
<tr><td></td><td>


For radiated emissions above 1GHz


</td></tr>
<tr><td>Test Procedure:</td><td>1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) 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.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 6.0 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 5.2 for details</td></tr>
<tr><td>Test environment:</td><td>Temp.: | 25 °C | Humid.: | 52% | Press.: | 1012mbar</td></tr>
<tr><td>Test voltage:</td><td>DC 3.0V</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

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
2450.00	74.32	27.55	2.96	30.14	74.69	114.00	-39.31	Vertical
2450.00	88.33	27.55	2.96	30.14	88.70	114.00	-25.3	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
2450.00	66.47	27.55	2.96	30.14	66.84	94.00	-27.16	Vertical
2450.00	80.37	27.55	2.96	30.14	80.74	94.00	-13.26	Horizontal

Note: RBW 3MHz VBW 10MHz PK detector is for PK value， RMS detector is for AV value .

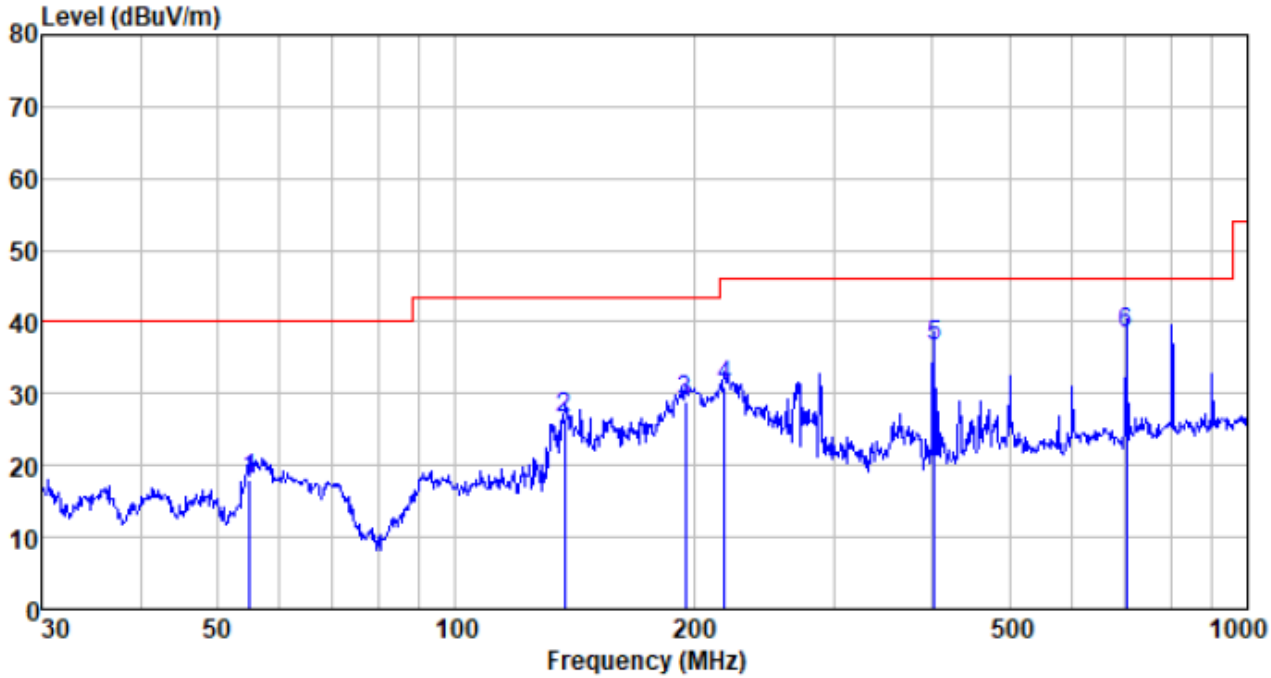
7.2.2 Spurious emissions

■ **Below 30MHz**

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

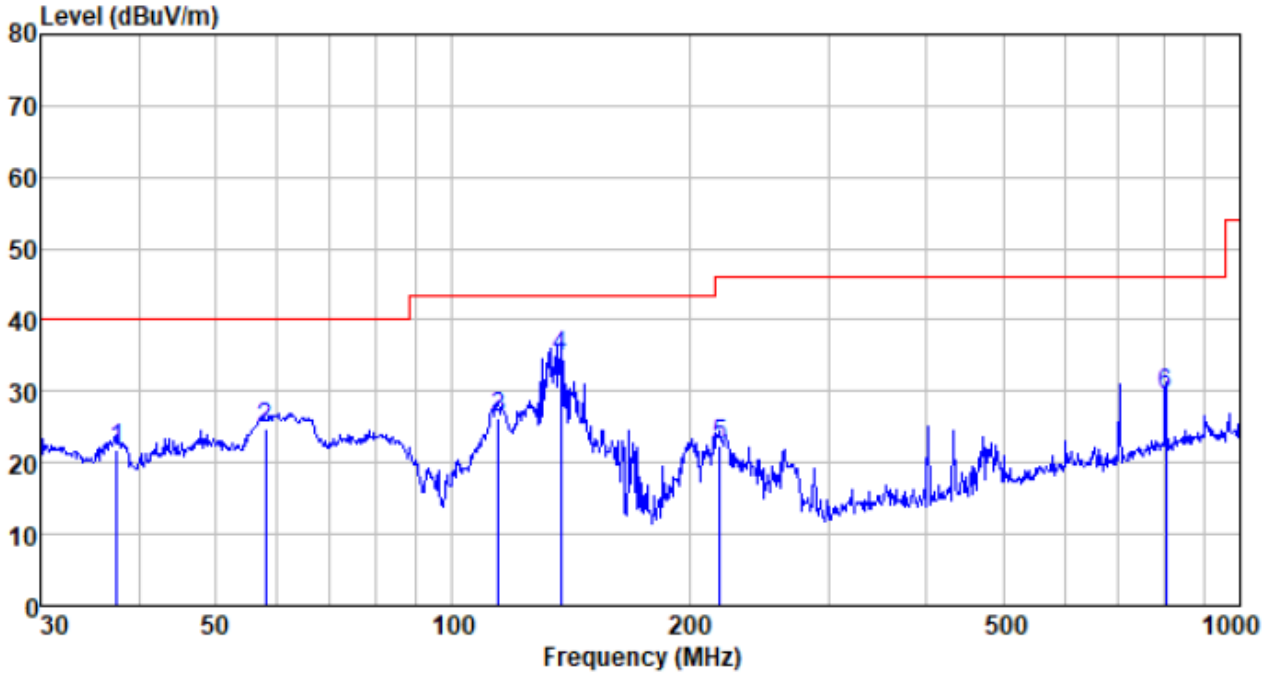
■ **Below 1GHz**

Horizontal:



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
55.027	41.65	11.78	0.82	36.25	18.00	40.00	-22.00	QP
137.420	54.58	7.64	1.49	37.00	26.71	43.50	-16.79	QP
195.137	54.40	10.17	1.81	37.31	29.07	43.50	-14.43	QP
218.309	55.39	11.09	1.95	37.35	31.08	46.00	-14.92	QP
401.839	55.86	15.34	2.86	37.52	36.54	46.00	-9.46	QP
701.761	52.30	19.66	4.09	37.63	38.42	46.00	-7.58	QP

Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
37.548	44.96	11.80	0.64	35.52	21.88	40.00	-18.12	QP
57.999	48.88	11.50	0.84	36.30	24.92	40.00	-15.08	QP
114.515	51.57	10.34	1.31	36.84	26.38	43.50	-17.12	QP
137.420	62.67	7.64	1.49	37.00	34.80	43.50	-8.70	QP
218.309	46.85	11.09	1.95	37.35	22.54	46.00	-23.46	QP
804.603	41.09	21.43	4.48	37.62	29.38	46.00	-16.62	QP

■ Above 1GHz

Test Frequency:	2450MHz

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
4900	44.72	31.35	4.71	37.76	43.02	74.00	-30.98	Vertical
7350	38.75	36.48	6.67	35.59	46.31	74.00	-27.69	Vertical
9800	31.38	38.17	8.05	35.07	42.53	74.00	-31.47	Vertical
12250	32.16	38.6	8.96	36.36	43.36	74.00	-30.64	Vertical
14700	30.72	41	9.97	35.71	45.98	74.00	-28.02	Vertical
17150	30.98	40.48	11.3	36.28	46.48	74.00	-27.52	Vertical
4900	52.57	31.35	4.71	37.76	50.87	74.00	-23.13	Horizontal
7350	40.73	36.48	6.67	35.59	48.29	74.00	-25.71	Horizontal
9800	31.54	38.17	8.05	35.07	42.69	74.00	-31.31	Horizontal
12250	30.73	38.6	8.96	36.36	41.93	74.00	-32.07	Horizontal
14700	30.81	41	9.97	35.71	46.07	74.00	-27.93	Horizontal
17150	30.54	40.48	11.3	36.28	46.04	74.00	-27.96	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
4900	40.56	31.35	4.71	37.76	38.86	54.00	-15.14	Vertical
7350	33.11	36.48	6.67	35.59	40.67	54.00	-13.33	Vertical
9800	20.22	38.17	8.05	35.07	31.37	54.00	-22.63	Vertical
12250	19.93	38.6	8.96	36.36	31.13	54.00	-22.87	Vertical
14700	20.67	41	9.97	35.71	35.93	54.00	-18.07	Vertical
17150	19.76	40.48	11.3	36.28	35.26	54.00	-18.74	Vertical
4900	40.32	31.35	4.71	37.76	38.62	54.00	-15.38	Horizontal
7350	33.22	36.48	6.67	35.59	40.78	54.00	-13.22	Horizontal
9800	20.67	38.17	8.05	35.07	31.82	54.00	-22.18	Horizontal
12250	19.85	38.6	8.96	36.36	31.05	54.00	-22.95	Horizontal
14700	20.5	41	9.97	35.71	35.76	54.00	-18.24	Horizontal
17150	19.65	40.48	11.3	36.28	35.15	54.00	-18.85	Horizontal

Remarks:

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.*

7.2.3 Bandedge emissions

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

Test Frequency:	2450MHz

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
2310	40.15	27.14	2.81	30.43	39.67	74.00	-34.33	Horizontal
2390	39.35	27.37	2.91	30.24	39.39	74.00	-34.61	Horizontal
2400	38.72	27.41	2.91	30.26	38.78	74.00	-35.22	Horizontal
2483.5	40.11	27.66	2.99	30.12	40.64	74.00	-33.36	Horizontal
2500	39.17	27.7	3.01	30.13	39.75	74.00	-34.25	Horizontal
2310	39.56	27.14	2.81	30.43	39.08	74.00	-34.92	Vertical
2390	38.38	27.37	2.91	30.24	38.42	74.00	-35.58	Vertical
2400	39.40	27.41	2.91	30.26	39.46	74.00	-34.54	Vertical
2483.5	38.54	27.66	2.99	30.12	39.07	74.00	-34.93	Vertical
2500	39.59	27.7	3.01	30.13	40.17	74.00	-33.83	Vertical

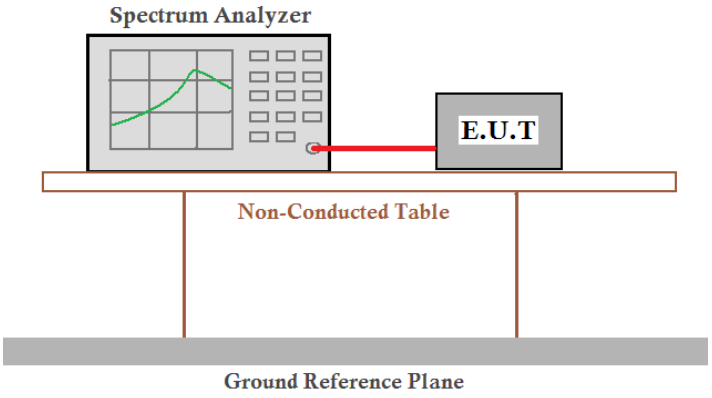
Average value:

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
2310	29.13	27.14	2.81	30.43	28.65	54.00	-25.35	Horizontal
2390	29.32	27.37	2.91	30.24	29.36	54.00	-24.64	Horizontal
2400	29.84	27.41	2.91	30.26	29.90	54.00	-24.10	Horizontal
2483.5	29.16	27.66	2.99	30.12	29.69	54.00	-24.31	Horizontal
2500	28.7	27.7	3.01	30.13	29.28	54.00	-24.72	Horizontal
2310	28.48	27.14	2.81	30.43	28	54.00	-26	Vertical
2390	28.16	27.37	2.91	30.24	28.2	54.00	-25.8	Vertical
2400	30.14	27.41	2.91	30.26	30.20	54.00	-23.80	Vertical
2483.5	28.8	27.66	2.99	30.12	29.33	54.00	-24.67	Vertical
2500	28.16	27.7	3.01	30.13	28.74	54.00	-25.26	Vertical

Remark:

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

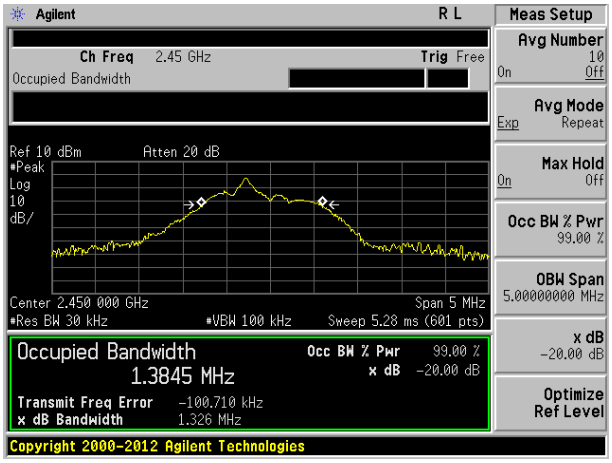
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test Frequency:	20dB bandwidth(MHz)	Result
2450MHz	1.326	Pass

Test plot as follows:



2450MHz

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

------End------