

FCC TEST REPORT

FCC ID: 2BERN-MT15

Report No. : SSP24080208-3E

Applicant : TIENGINE

Product Name : OrderPad

Model Name : OrderPad-MT15

Test Standard : FCC Part 15.247

Date of Issue : 2024-09-03



Shenzhen CCUT Quality Technology Co., Ltd.

1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen,
Guangdong, China; (Tel.:+86-755-23406590 website: www.ccuttest.com)

This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen CCUT Quality Technology Co., Ltd.

Test Report Basic Information

Applicant:	TIENGINE
Address of Applicant:	9HO, 3F, SC JEIL BANK, 135, Daecheong-ro, Jung-gu, Busan, South Korea
Manufacturer:	Shenzhen Kingtex Technology Co., Ltd
Address of Manufacturer:	Building 3, 2nd Floor, Ji'antai Industrial Park, Fuhai Street, Bao'an District, Shenzhen City
Product Name:	OrderPad
Brand Name:	menu.it
Main Model:	OrderPad-MT15
Series Models:	-
Test Standard:	FCC Part 15 Subpart C ANSI C63.4-2014 ANSI C63.10-2013
Date of Test	2024-08-22 to 2024-09-02
Test Result:	PASS
Tested By	<u>Lorzix Luo</u> (Lorzix Luo)
Reviewed By:	<u>Lieber Ouyang</u> (Lieber Ouyang)
Authorized Signatory:	<u>Lahm Peng</u> (Lahm Peng)
<p>Note : This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen CCUT Quality Technology Co., Ltd.. All test data presented in this test report is only applicable to presented test sample.</p>	



CONTENTS

1. General Information.....	5
1.1 Product Information	5
1.2 Test Setup Information.....	6
1.3 Compliance Standards.....	7
1.4 Test Facilities.....	7
1.5 List of Measurement Instruments	8
1.6 Measurement Uncertainty	9
2. Summary of Test Results.....	10
3. Conducted Emissions	11
3.1 Standard and Limit.....	11
3.2 Test Procedure.....	11
3.3 Test Data and Results	12
4. Radiated Emissions	15
4.1 Standard and Limit.....	15
4.2 Test Procedure.....	15
4.3 Test Data and Results	17

Revision History

Revision	Issue Date	Description	Revised By
V1.0	2024-09-03	Initial Release	Lahm Peng

1. General Information

1.1 Product Information

Product Name:	OrderPad
Trade Name:	menu.it
Main Model:	OrderPad-MT15
Series Models:	-
Rated Voltage:	DC 3.8V by Rechargeable Lithium-Ion Battery Pack, USB 5V charging
Battery:	N/A
Test Sample No:	SSP24080208-1
Hardware Version:	EM_T6840_V1.0_L20
Software Version:	MT15_202306_V1.0
Note 1: The test data is gathered from a production sample, provided by the manufacturer.	

Wireless Specification	
Wireless Standard:	802.11b/g/n
Operating Frequency:	2412MHz ~ 2462MHz for 802.11b/g/n(HT20) 2422MHz ~ 2452MHz for 802.11n(HT40)
Number of Channel:	11/7
Channel Separation:	5MHz
Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Antenna Gain:	1.5dBi
Type of Antenna:	FPCB Antenna
Type of Device:	<input checked="" type="checkbox"/> Portable Device <input type="checkbox"/> Mobile Device <input type="checkbox"/> Modular Device

1.2 Test Setup Information

List of Test Modes							
Test Mode	Description	Remark					
TM1	802.11b	2412MHz/2437MHz/2462MHz					
TM2	802.11g	2412MHz/2437MHz/2462MHz					
TM3	802.11n(H20)	2412MHz/2437MHz/2462MHz					
TM4	802.11n(H40)	2422MHz/2437MHz/2452MHz					
List and Details of Auxiliary Cable							
Description	Length (cm)	Shielded/Unshielded	With/Without Ferrite				
USB Cable	80	Unshielded	Without Ferrite				
-	-	-	-				
List and Details of Auxiliary Equipment							
Description	Manufacturer	Model	Serial Number				
Rechargeable Lithium-Ion Battery Pack	TIENGINE	MTB01	-				
Adapter	UGREEN	CD289	90324				
List of Channels (802.11b/g/n)							
No. of Channel	Frequency (MHz)	No. of Channel	Frequency (MHz)	No. of Channel	Frequency (MHz)	No. of Channel	Frequency (MHz)
01	2412	05	2432	09	2452	13	--
02	2417	06	2437	10	2457	14	--
03	2422	07	2442	11	2462	15	--
04	2427	08	2447	12	--	16	--

1.3 Compliance Standards

Compliance Standards	
FCC Part 15 Subpart C	FEDERAL COMMUNICATIONS COMMISSION, RADIO FREQUENCY DEVICES, Intentional Radiators
All measurements contained in this report were conducted with all above standards	
According to standards for test methodology	
FCC Part 15 Subpart C	FEDERAL COMMUNICATIONS COMMISSION, RADIO FREQUENCY DEVICES, Intentional Radiators
ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Maintenance of compliance is the responsibility of the manufacturer or applicant. Any modification of the product, which result is lowering the emission, should be checked to ensure compliance has been maintained.	

1.4 Test Facilities

Laboratory Name:	Shenzhen CCUT Quality Technology Co., Ltd. 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China
CNAS Laboratory No.:	L18863
A2LA Certificate No.:	6893.01
FCC Registration No:	583813
ISED Registration No.:	CN0164
All measurement facilities used to collect the measurement data are located at 1F, Building 35, Changxing Technology Industrial Park, Yutang Street, Guangming District, Shenzhen, Guangdong, China.	

1.5 List of Measurement Instruments

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Conducted Emissions					
AMN	ROHDE&SCHWARZ	ENV216	101097	2024-08-07	2025-08-06
EMI Test Receiver	ROHDE&SCHWARZ	ESPI	100242	2024-08-07	2025-08-06
Test Cable	N/A	Cable 5	N/A	2024-08-07	2025-08-06
EMI Test Software	FARA	EZ-EMC	EMEC-3A1+	N/A	N/A
Radiated Emissions					
EMI Test Receiver	ROHDE&SCHWARZ	ESPI	100154	2024-08-07	2025-08-06
Spectrum Analyzer	KEYSIGHT	N9020A	MY48030972	2024-08-07	2025-08-06
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40-N	101692	2024-08-07	2025-08-06
Amplifier	SCHWARZBECK	BBV 9743B	00251	2024-08-07	2025-08-06
Amplifier	HUABO	YXL0518-2.5-45	--	2024-08-07	2025-08-06
Amplifier	COM-MW	DLAN-18G-4G-02	10229104	2024-08-07	2025-08-06
Loop Antenna	DAZE	ZN30900C	21104	2024-08-03	2025-08-02
Broadband Antenna	SCHWARZBECK	VULB 9168	01320	2024-08-03	2025-08-02
Horn Antenna	SCHWARZBECK	BBHA 9120D	02553	2024-08-03	2025-08-02
Horn Antenna	COM-MW	ZLB7-18-40G-950	12221225	2024-08-03	2025-08-02
Attenuator	QUANJUDA	6dB	220731	2024-08-07	2025-08-06
Test Cable	N/A	Cable 1	N/A	2024-08-07	2025-08-06
Test Cable	N/A	Cable 2	N/A	2024-08-07	2025-08-06
Test Cable	N/A	Cable 3	N/A	2024-08-07	2025-08-06
Test Cable	N/A	Cable 4	N/A	2024-08-07	2025-08-06
Test Cable	N/A	Cable 8	N/A	2024-08-07	2025-08-06
Test Cable	N/A	Cable 9	N/A	2024-08-07	2025-08-06
EMI Test Software	FARA	EZ-EMC	FA-03A2 RE+	N/A	N/A
Conducted RF Testing					
RF Test System	MWRFTTest	MW100-RFCB	220418SQS-37	2024-08-07	2025-08-06
Spectrum Analyzer	KEYSIGHT	N9020A	ATO-90521	2024-08-07	2025-08-06
RF Test Software	MWRFTTest	MTS 8310	N/A	N/A	N/A
Laptop	Lenovo	ThlnkPad E15 Gen 3	SPPOZ22485	N/A	N/A

1.6 Measurement Uncertainty

Test Item	Conditions	Uncertainty
Conducted Emissions	9kHz ~ 30MHz	±1.64 dB
Radiated Emissions	9kHz ~ 30MHz	±2.88 dB
	30MHz ~ 1GHz	±3.32 dB
	1GHz ~ 18GHz	±3.50 dB
	18GHz ~ 40GHz	±3.66 dB
Conducted Output Power	9kHz ~ 26GHz	±0.50 dB
Occupied Bandwidth	9kHz ~ 26GHz	±4.0 %
Conducted Spurious Emission	9kHz ~ 26GHz	±1.32 dB
Power Spectrum Density	9kHz ~ 26GHz	±0.62 dB

2. Summary of Test Results

FCC Rule	Description of Test Item	Result
FCC Part 15.207	Conducted Emissions	Passed
FCC Part 15.209, 15.247(d)	Radiated Emissions	Passed
Passed: The EUT complies with the essential requirements in the standard Failed: The EUT does not comply with the essential requirements in the standard N/A: Not applicable		

3. Conducted Emissions

3.1 Standard and Limit

According to the rule FCC Part 15.207, Conducted emissions limit, the limit for a wireless device as below:

Frequency of Emission (MHz)	Conducted emissions (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz
 Note 2: The lower limit applies at the band edges

3.2 Test Procedure

Test is conducting under the description of ANSI C63.10 - 2013 section 6.2.



Test Setup Block Diagram

a) The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b) The following is the setting of the receiver

Attenuation: 10dB

Start Frequency: 0.15MHz

Stop Frequency: 30MHz

IF Bandwidth: 9kHz

c) The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

d) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

e) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

f) LISN is at least 80 cm from nearest part of EUT chassis.

g) For the actual test configuration, please refer to the related Item - photographs of the test setup.

3.3 Test Data and Results

Based on all tested data, the EUT complied with the FCC Part 15.207 standard limit for a wireless device, and with the worst case as below:

Remark: Level = Reading + Factor, Margin = Level - Limit

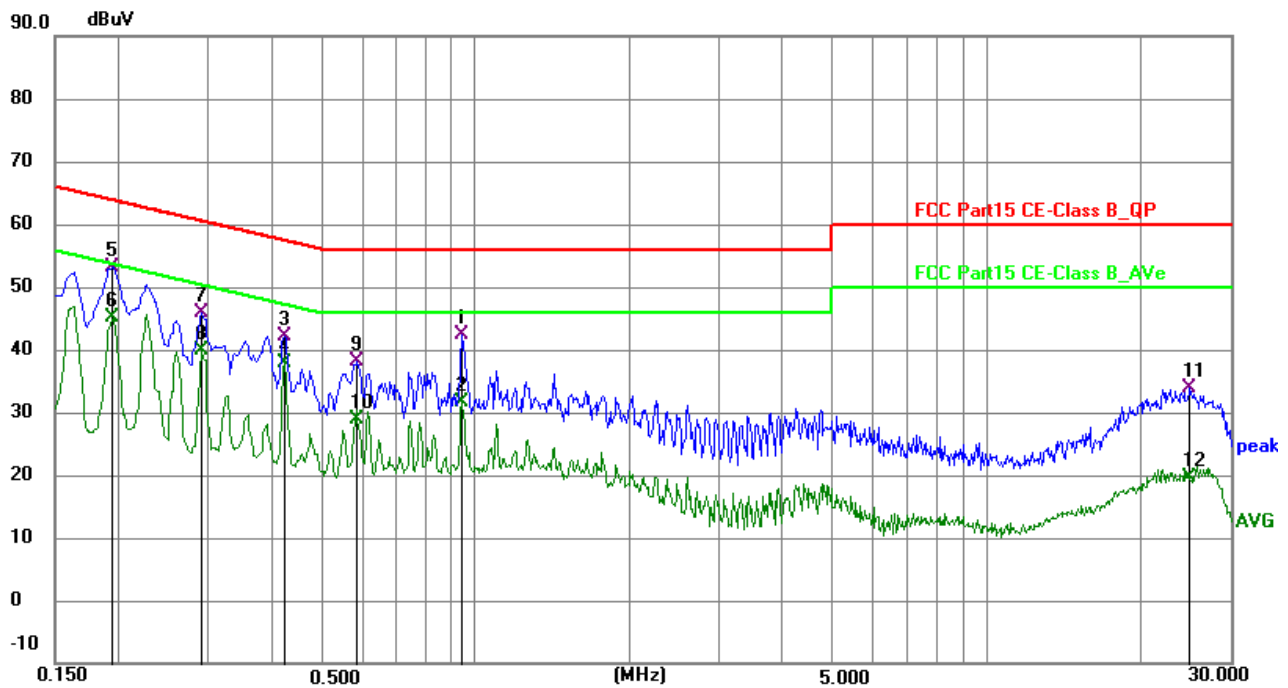
Test Plots and Data of Conducted Emissions

Tested Mode: TM1(2412MHz)

Test Voltage: AC 120V/60Hz

Test Power Line: Neutral

Remark:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.9420	33.05	9.40	42.45	56.00	-13.55	QP	P	
2	0.9420	22.20	9.40	31.60	46.00	-14.40	AVG	P	
3	0.4200	32.77	9.38	42.15	57.45	-15.30	QP	P	
4	0.4200	28.61	9.38	37.99	47.45	-9.46	AVG	P	
5	0.1949	43.87	9.21	53.08	63.83	-10.75	QP	P	
6 *	0.1949	35.92	9.21	45.13	53.83	-8.70	AVG	P	
7	0.2894	36.57	9.38	45.95	60.54	-14.59	QP	P	
8	0.2894	30.43	9.38	39.81	50.54	-10.73	AVG	P	
9	0.5865	28.82	9.37	38.19	56.00	-17.81	QP	P	
10	0.5865	19.44	9.37	28.81	46.00	-17.19	AVG	P	
11	25.0214	23.79	10.05	33.84	60.00	-26.16	QP	P	
12	25.0214	9.70	10.05	19.75	50.00	-30.25	AVG	P	

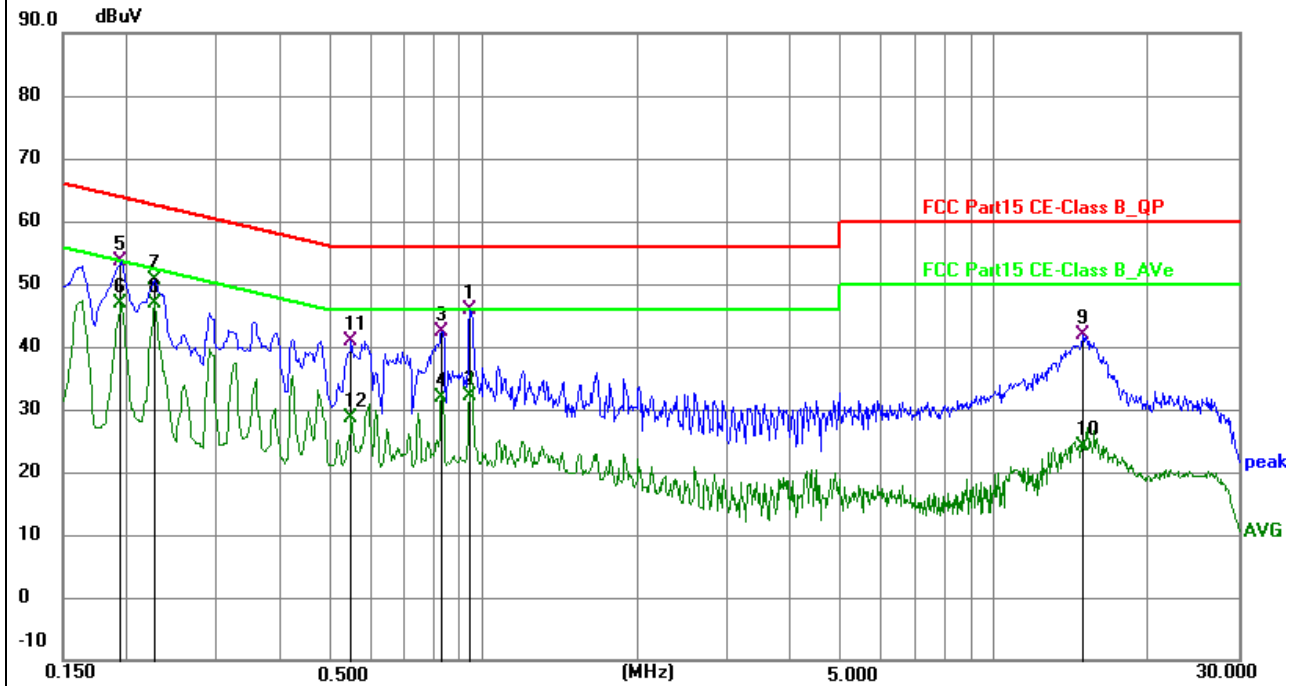
Test Plots and Data of Conducted Emissions

Tested Mode: TM1(2412MHz)

Test Voltage: AC 120V/60Hz

Test Power Line: Live

Remark:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.9420	36.29	9.59	45.88	56.00	-10.12	QP	P	
2	0.9420	22.65	9.59	32.24	46.00	-13.76	AVG	P	
3	0.8295	32.88	9.60	42.48	56.00	-13.52	QP	P	
4	0.8295	22.24	9.60	31.84	46.00	-14.16	AVG	P	
5	0.1949	44.15	9.39	53.54	63.83	-10.29	QP	P	
6	0.1949	37.60	9.39	46.99	53.83	-6.84	AVG	P	
7 *	0.2265	41.21	9.44	50.65	52.58	-1.93	AVG	P	
8	0.2265	37.36	9.44	46.80	52.58	-5.78	AVG	P	
9	14.8830	32.05	9.72	41.77	60.00	-18.23	QP	P	
10	14.8830	14.34	9.72	24.06	50.00	-25.94	AVG	P	
11	0.5503	31.26	9.57	40.83	56.00	-15.17	QP	P	
12	0.5503	18.98	9.57	28.55	46.00	-17.45	AVG	P	

4. Radiated Emissions

4.1 Standard and Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

According to the rule FCC Part 15.209, Radiated emission limit for a wireless device as below:

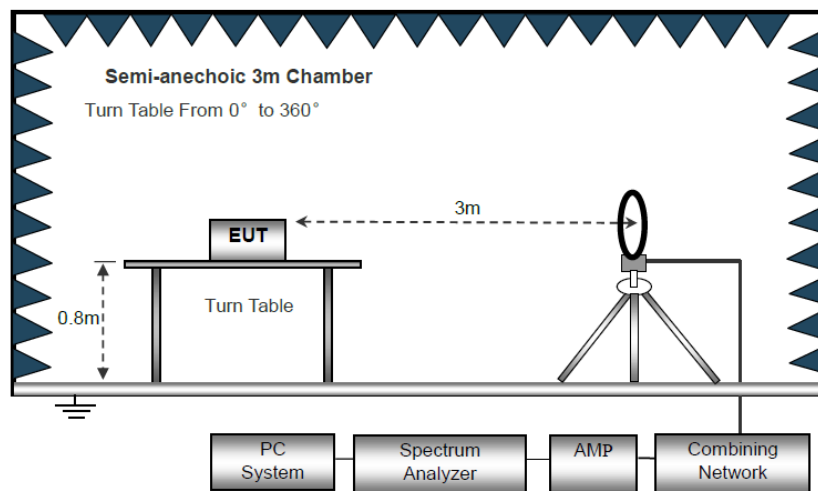
Frequency of Emission (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3
Note: The more stringent limit applies at transition frequencies.		

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

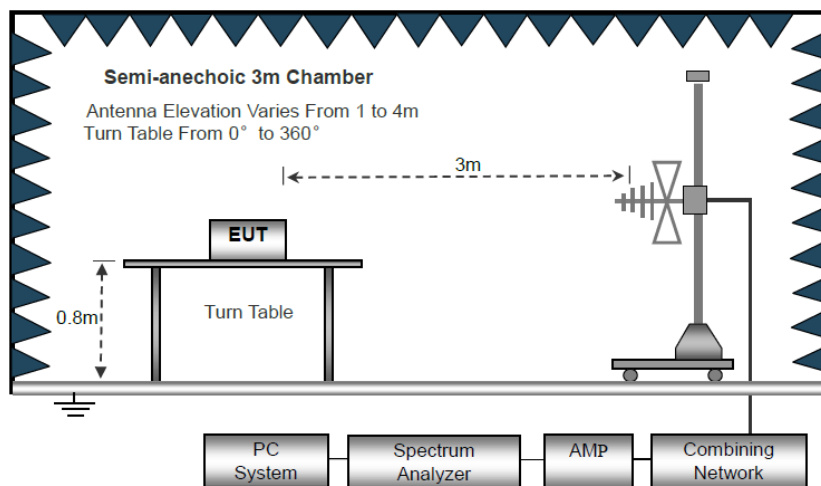
Note: Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

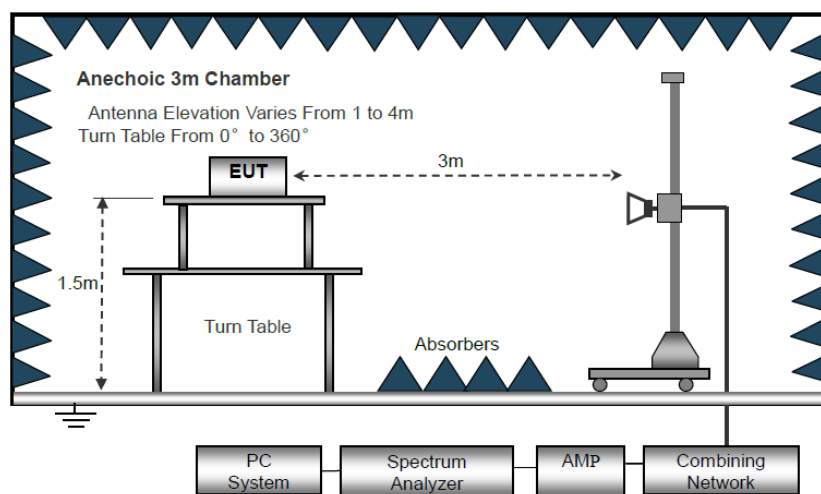
Test is conducting under the description of ANSI C63.10 - 2013 section 6.3 to 6.6.



Block Diagram of Radiated Emission Below 30MHz



Block Diagram of Radiated Emission From 30MHz to 1GHz



Block Diagram of Radiated Emission Above 1GHz

- a) The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.
- b) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- c) Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{GHz}$, 10kHz for $f < 30\text{MHz}$
VBW \geq RBW, Sweep = auto
Detector function = peak
Trace = max hold
- d) Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- e) The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 10Hz, Detector = PK for AV value, while maintaining all of the other instrument settings.
- f) For the actual test configuration, please refer to the related item - EUT test photos.

4.3 Test Data and Results

Based on all tested data, the EUT complied with the FCC Part 15.247 standard limit for a wireless device, and with the worst case as below:

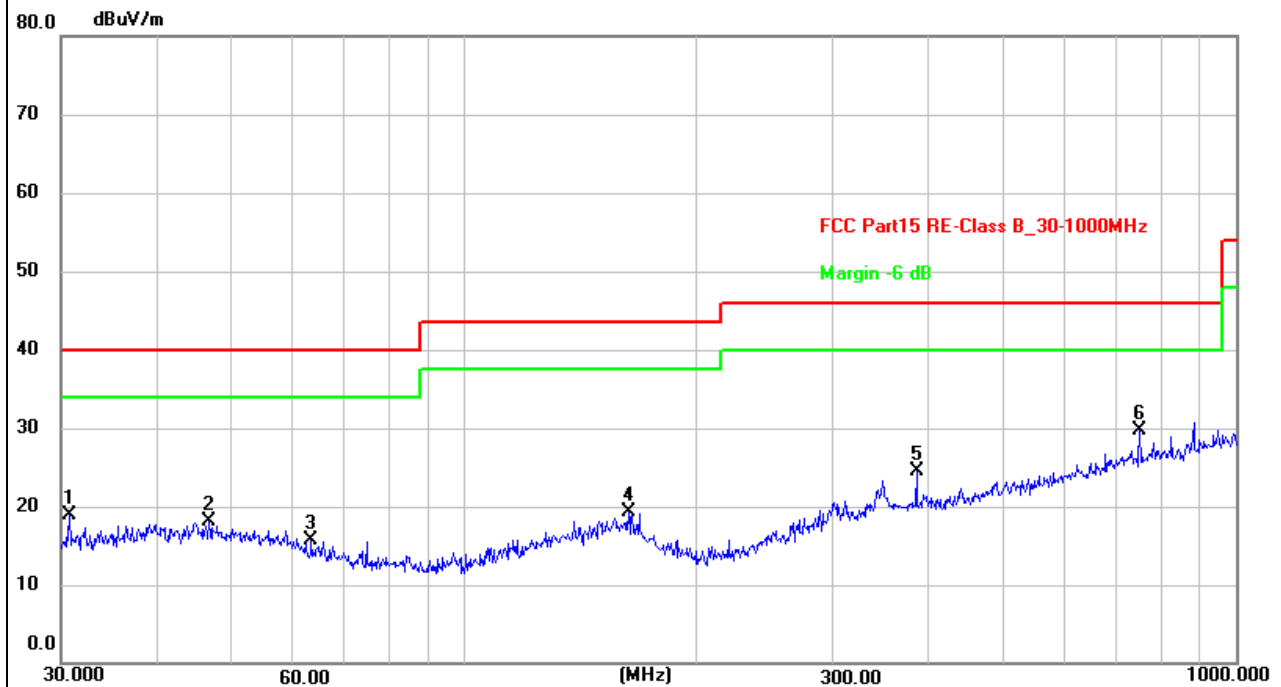
Remark: Level = Reading + Factor, Margin = Level - Limit

Radiated Emission Test Data (30MHz to 1GHz)

Tested Mode: TM1(2412MHz)

Test Antenna Polarization: Horizontal

Remark:



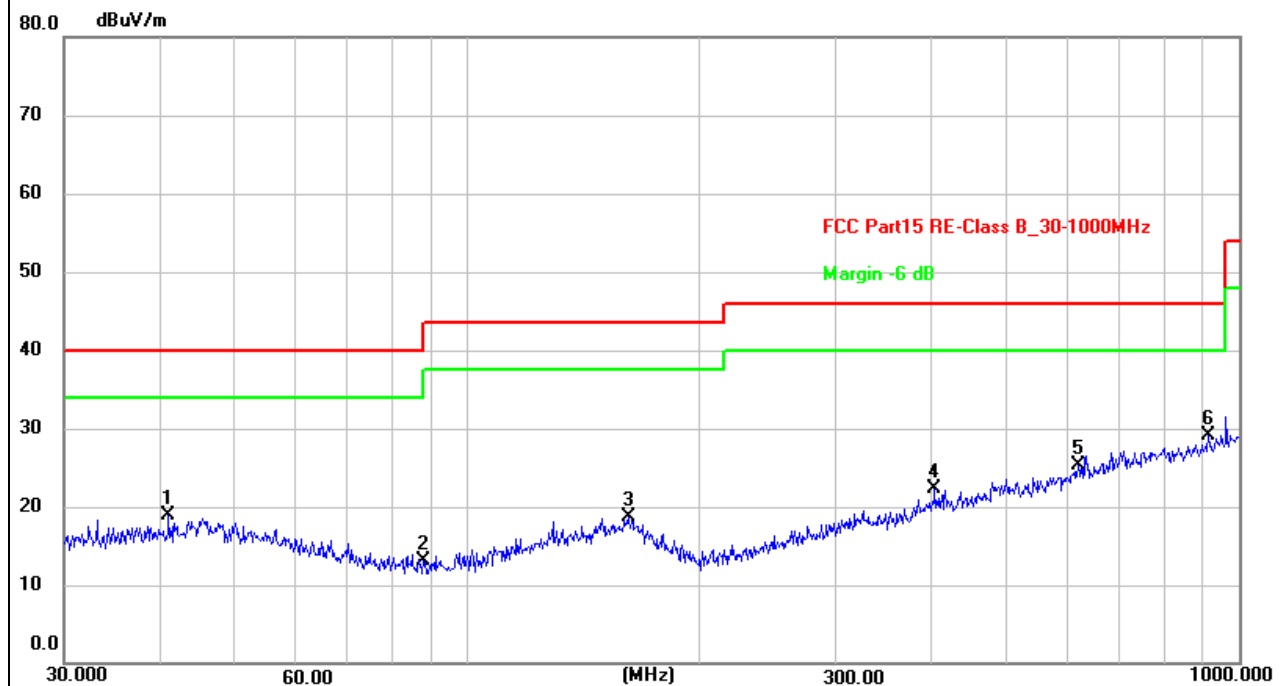
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.7455	27.86	-8.92	18.94	40.00	-21.06	QP	100	278	P	
2	46.6664	26.31	-8.30	18.01	40.00	-21.99	QP	100	8	P	
3	63.3132	26.20	-10.54	15.66	40.00	-24.34	QP	100	55	P	
4	163.1818	27.48	-8.16	19.32	43.50	-24.18	QP	100	318	P	
5	385.2805	30.56	-6.08	24.48	46.00	-21.52	QP	100	24	P	
6 *	750.1083	28.81	0.87	29.68	46.00	-16.32	QP	100	217	P	

Radiated Emission Test Data (30MHz to 1GHz)

Tested Mode: TM1(2412MHz)

Test Antenna Polarization: Vertical

Remark:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	40.9881	27.20	-8.29	18.91	40.00	-21.09	QP	100	359	P	
2	87.7248	26.21	-13.03	13.18	40.00	-26.82	QP	100	163	P	
3	161.4742	26.67	-8.01	18.66	43.50	-24.84	QP	100	337	P	
4	403.2500	27.75	-5.51	22.24	46.00	-23.76	QP	100	62	P	
5	618.5369	26.62	-1.33	25.29	46.00	-20.71	QP	100	359	P	
6 *	912.8620	26.44	2.76	29.20	46.00	-16.80	QP	100	72	P	

***** END OF REPORT *****