FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**CTA25091905101**	
FCC ID..... :	**2BE93VD800**	
Compiled by (position+printed name+signature)..:	File administrators Zoey Cao	Zoey Cao
Supervised by (position+printed name+signature)..:	Project Engineer Ace Chai	Ace chai
Approved by (position+printed name+signature)..:	RF Manager Eric Wang	Eric Wang
Date of issue.....:	Oct. 24, 2025	
Testing Laboratory Name.....:	**Shenzhen CTA Testing Technology Co., Ltd.**	
Address..... :	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China	
Applicant's name.....:	**Shenzhen vdiagtool Technology Co., Ltd.**	
Address..... :	Room 801, Block A, Zaoan Business Building, Shigu Road, Xili Residential District, Nanshan District, Shenzhen, Guangdong, China	
Test specification.....:		
Standard.....:	**FCC Part 15.247**	

Shenzhen CTA Testing Technology Co., Ltd. All rights reserved.
This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen CTA Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen CTA Testing Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Equipment description.....:	**Smart Diagnostic System**
Trade Mark.....:	VDIAGTOOL
Manufacturer.....:	Shenzhen vdiagtool Technology Co., Ltd.
Model/Type reference..... :	VD800
Listed Models..... :	Refer to page 2
Modulation ..... :	GFSK
Frequency..... :	From 2402MHz to 2480MHz
Ratings.....:	Input: 5V⎓ 3A, 9V⎓ 3A Battery: DC 7.3V, 5000mAh, 36.5Wh
Result.....:	**PASS**

TEST REPORT

Equipment under Test	:	Smart Diagnostic System
Model /Type	:	VD800
Listed Models	:	VD80, VD80S, VD80 BT, VD80 PLUS, VD80 PRO, VD80 MAX, VD80 ELITE, VD80BT PRO, VD80BT LITE, VD80BT ELITE, IM80, IM80 BT, IM80 PRO, IM80 LITE, IM80 MAX, VD80 TP, VD80 EV
Model difference	:	The PCB board, circuit, structure and internal of these models are the same, Only model number and colour is different for these model.
Applicant	:	**Shenzhen vdiagtool Technology Co., Ltd.**
Address	:	Room 801, Block A, Zaoan Business Building, Shigu Road, Xili Residential District, Nanshan District, Shenzhen, Guangdong, China
Manufacturer	:	**Shenzhen vdiagtool Technology Co., Ltd.**
Address	:	Room 801, Block A, Zaoan Business Building, Shigu Road, Xili Residential District, Nanshan District, Shenzhen, Guangdong, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1 TEST STANDARDS 4
2 SUMMARY 5
2.1 General Remarks 5
2.2 Product Description* 5
2.3 Equipment Under Test 5
2.4 Short description of the Equipment under Test (EUT) 5
2.5 EUT configuration 5
2.6 EUT operation mode 6
2.7 Block Diagram of Test Setup 6
2.8 Related Submittal(s) / Grant (s) 6
2.9 Modifications 6
3 TEST ENVIRONMENT 7
3.1 Address of the test laboratory 7
3.2 Test Facility 7
3.3 Environmental conditions 7
3.4 Summary of measurement results 8
3.5 Statement of the measurement uncertainty 9
3.6 Equipments Used during the Test 10
4 TEST CONDITIONS AND RESULTS 11
4.1 AC Power Conducted Emission 11
4.2 Radiated Emissions and Band Edge 16
4.3 Maximum Peak Output Power 25
4.4 Power Spectral Density 26
4.5 6dB Bandwidth 27
4.6 Out-of-band Emissions 28
4.7 Antenna Requirement 29
4.8 On Time and Duty Cycle 30
4.9 Emissions at Restricted Band 31
5 Test Setup Photos of the EUT 33
6 Photos of the EUT 35

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2020 +Cor. 1-2023+ C63.10a-2024+ Errata to C63.10a-2024: American National Standard for Testing Unlicensed Wireless Devices

KDB558074 D01 V05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Sep. 19, 2025
Testing commenced on	:	Sep. 19, 2025
Testing concluded on	:	Oct. 24, 2025

2.2 Product Description*

Product Description:	Smart Diagnostic System
Model/Type reference:	VD800
Power supply:	Input: 5V⎓ 3A, 9V⎓ 3A Battery: DC 7.3V, 5000mAh, 36.5Wh
Adapter 1 information:	Model: PD0202C Input:100-240V~, 50-60Hz,0.5A Max Output:5.0V⎓ 3.0A 15.0W/ 9.0V⎓ 2.22A 19.98W/ 12.0V⎓ 1.67A, 20.04W
Adapter 2 information:	Model: PD0302UC-0303 Input:100-240V~, 50-60Hz,0.8A Max Output:5.0V⎓ 3.0A, 9.0V⎓ 3.0A, 12.0V⎓ 2.5A, 15.0V⎓ 2.0A, 20.0V⎓ 1.5A(30.0W Max.)
Hardware version:	PAD01_PX30_MB_V3.0
Software version:	/
Testing sample ID:	CTA250919051-1# (Engineer sample) CTA250919051-2# (Normal sample)
Bluetooth BLE	
Supported type:	Bluetooth low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	FPC Antenna
Antenna gain:	2.97dBi(Max.) for RTL8821modular 4.86dBi(Max.) for ESP32 modular

2.3 Equipment Under Test

Power supply system utilised

Refer to section 2.2

2.4 Short description of the Equipment under Test (EUT)

This is a Smart Diagnostic System.
For more details, refer to the user's manual of the EUT.

Test Software Version	Tools software(ADB command)		
Frequency	2402 MHz	2440MHz	2480 MHz
GFSK 1M	Default	Default	Default
GFSK 2M	Default	Default	Default

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○ - supplied by the manufacturer

● - supplied by the lab

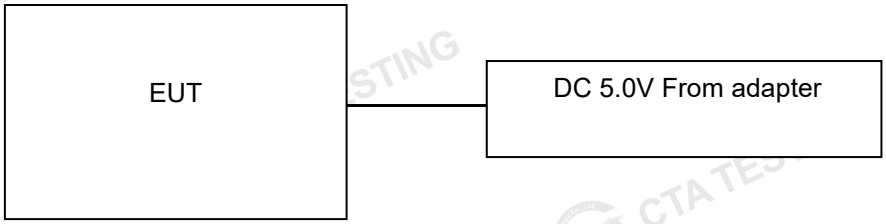
2.6 EUT operation mode

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 40 channels provided to the EUT and Channel 00/19/39 were selected to test.

Operation Frequency:

Channel	Frequency (MHz)
00	**2402**
01	2404
02	2406
⋮	⋮
19	**2440**
⋮	⋮
37	2476
38	2478
39	**2480**

2.7 Block Diagram of Test Setup



2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318
Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01
Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

Temperature:	23 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	24 ° C
Humidity:	47 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	24 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(e)	Power spectral density	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(b)(3)	Maximum output Peak power	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	Band edge compliance conducted	BLE 1&2Mpbs	☒ Lowest ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Highest	complies
§15.205	Band edge compliance radiated	BLE 1&2Mpbs	☒ Lowest ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Highest	complies
§15.247(d)	TX spurious emissions conducted	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	TX spurious emissions radiated	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	BLE 1&2Mpbs	☒ Lowest ☒ Middle ☒ Highest	complies
§15.209(a)	TX spurious Emissions radiated Below 1GHz	BLE 1&2Mpbs	-/-	BLE 1&2Mpbs	-/-	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	BLE 1&2Mpbs	-/-	BLE 1&2Mpbs	-/-	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report
3. RF Conducted test Offset= cable loss,For conducted spurious emission test, cable loss is the maximum value in the range of test.

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.02 dB	(1)
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)
Output Peak power	30MHz~18GHz	0.55 dB	(1)
Power spectral density	/	0.57 dB	(1)
Spectrum bandwidth	/	1.1%	(1)
Radiated spurious emission (30MHz-1GHz)	30~1000MHz	4.10 dB	(1)
Radiated spurious emission (1GHz-18GHz)	1~18GHz	4.32 dB	(1)
Radiated spurious emission (18GHz-40GHz)	18-40GHz	5.54 dB	(1)
Time	/	±2%	(1)

（1） This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

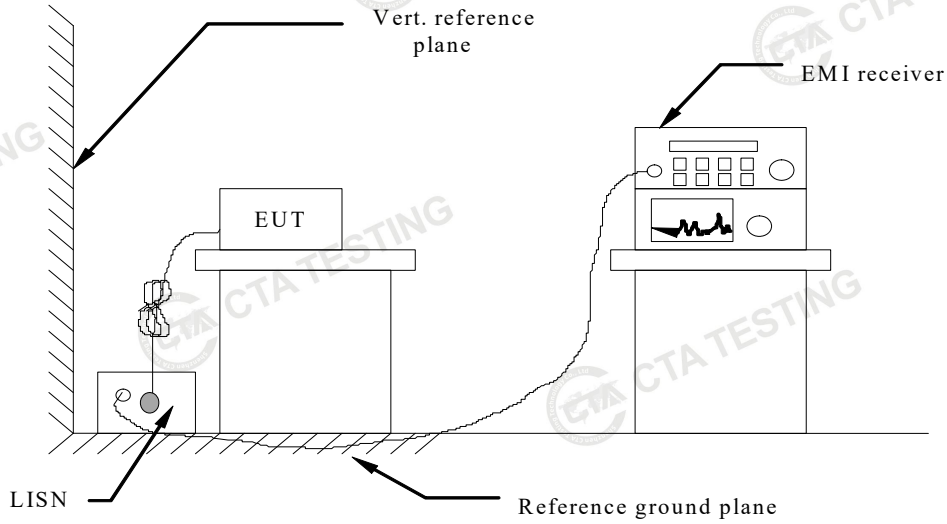
3.6 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2025/08/04	2026/08/03
LISN	R&S	ENV216	CTA-314	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESPI	CTA-307	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESCI	CTA-306	2025/07/30	2026/07/29
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/05/17	2026/05/16
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/07/30	2026/07/29
Vector Signal generator	Agilent	N5182A	CTA-305	2025/07/30	2026/07/29
Analog Signal Generator	R&S	E4421B	CTA-304	2025/07/30	2026/07/29
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	R&S	CTA-302	2025/07/30	2026/07/29
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2025/07/31	2026/07/30
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2023/10/13	2026/10/12
Loop Antenna	Zhinan	ZN30900C	CTA-311	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9170	CTA-346	2025/05/18	2028/05/17
Amplifier	Schwarzbeck	BBV9745	CTA-312	2025/07/30	2026/07/29
Amplifier	Tonscend	TAP-011840	CTA-313	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2025/07/30	2026/07/29
Automatic control unit	Tonscend	JS0806-2	CTA-351	2025/07/30	2026/07/29
Amplifier	SKET	LNPA 1840G-50	CTA-345	2025/05/17	2026/05/16
Spectrum analyzer	R&S	FSV40-N	CTA-344	2025/05/17	2026/05/16
Attenuator	XINQY	10dB	N/A	N/A	N/A
Programmable Constant Temperature And Humidity Test Chamber	DONGGUAN JINGYU	HT-H-408	CTA-053	2025/07/30	2026/07/29
EMI Test Software	Tonscend	TS®JS32-RE	5.0.0.2	N/A	N/A
EMI Test Software	Tonscend	TS®JS32-CE	5.0.0.1	N/A	N/A
RF Test Software	Tonscend	TS®JS1120-3	3.1.65	N/A	N/A
RF Test Software	Tonscend	TS®JS1120	3.1.46	N/A	N/A

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2020.
2 Support equipment, if needed, was placed as per ANSI C63.10-2020
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

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 RESULTS

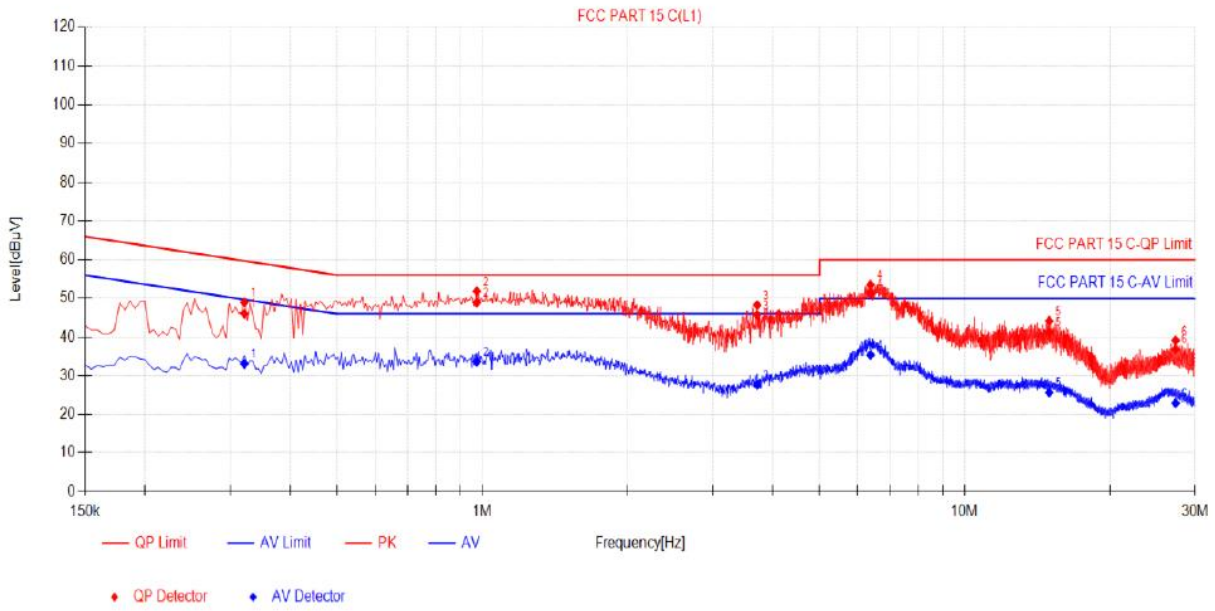
Remark:

1. BLE 1Mpbs was tested at Low, Middle, and High channel; only the worst result of BLE 1Mpbs High channel was reported as below:

2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

Adapter 1:

Polarization:	L



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.321	10.11	35.93	46.04	59.68	13.64	22.96	33.07	49.68	16.61	PASS
2	0.9735	10.42	38.48	48.90	56.00	7.10	23.17	33.59	46.00	12.41	PASS
3	3.714	10.71	35.02	45.73	56.00	10.27	16.87	27.58	46.00	18.42	PASS
4	6.378	11.03	40.34	51.37	60.00	8.63	24.33	35.36	50.00	14.64	PASS
5	14.964	12.23	28.98	41.21	60.00	18.79	13.43	25.66	50.00	24.34	PASS
6	27.357	13.39	23.46	36.85	60.00	23.15	9.53	22.92	50.00	27.08	PASS

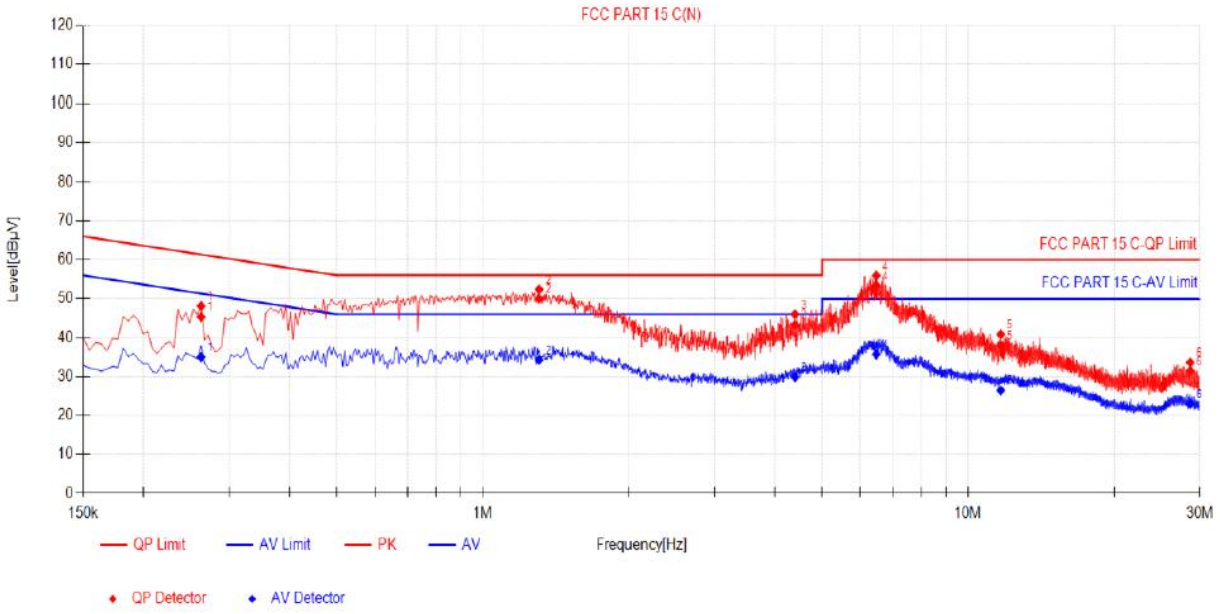
Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)

2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

Polarization:	N



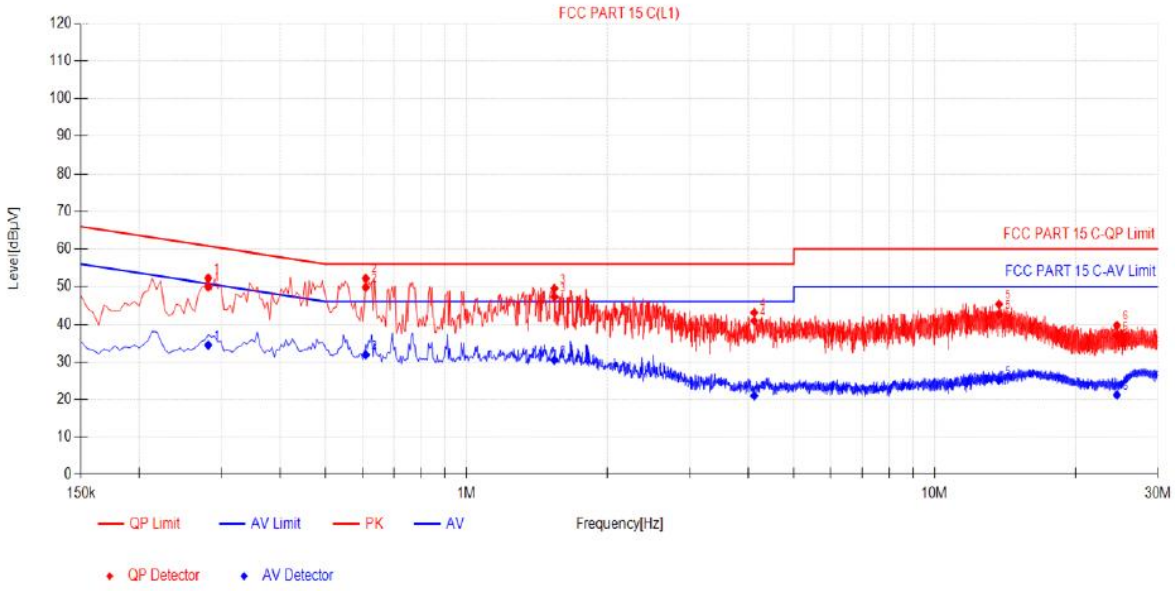
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.2625	9.70	35.61	45.31	61.35	16.04	25.29	34.99	51.35	16.36	PASS
2	1.3065	10.40	39.61	50.01	56.00	5.99	23.87	34.27	46.00	11.73	PASS
3	4.3935	10.85	32.43	43.28	56.00	12.72	19.00	29.85	46.00	16.15	PASS
4	6.468	11.11	42.22	53.33	60.00	6.67	24.60	35.71	50.00	14.29	PASS
5	11.679	11.86	26.19	38.05	60.00	21.95	14.57	26.43	50.00	23.57	PASS
6	28.6845	13.71	17.76	31.47	60.00	28.53	9.36	23.07	50.00	26.93	PASS

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)
4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

Adapter 2:

Polarization:	L

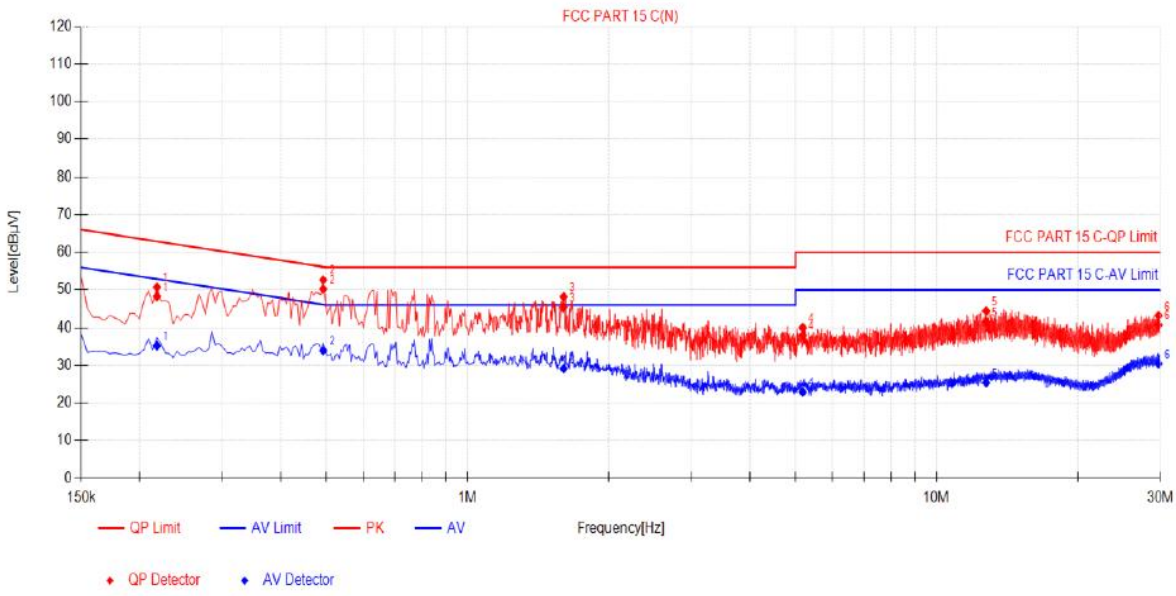


Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.2805	9.87	40.06	49.93	60.80	10.87	24.60	34.47	50.80	16.33	PASS
2	0.609	10.15	39.69	49.84	56.00	6.16	21.73	31.88	46.00	14.12	PASS
3	1.5405	10.46	36.78	47.24	56.00	8.76	20.02	30.48	46.00	15.52	PASS
4	4.119	10.76	30.13	40.89	56.00	15.11	10.26	21.02	46.00	24.98	PASS
5	13.7355	12.06	30.49	42.55	60.00	17.45	13.05	25.11	50.00	24.89	PASS
6	24.5445	13.19	23.74	36.93	60.00	23.07	8.05	21.24	50.00	28.76	PASS

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)
4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

Polarization:	N



Final Data List

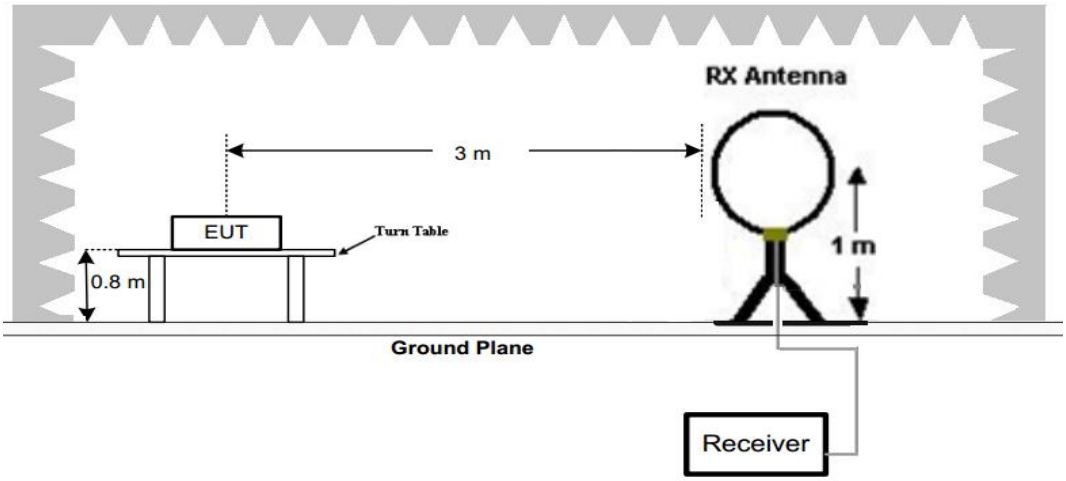
NO.	Freq. [MHz]	Factor [dB]	QP Reading[dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.2175	9.84	38.45	48.29	62.91	14.62	25.36	35.20	52.91	17.71	PASS
2	0.492	10.26	39.99	50.25	56.13	5.88	23.60	33.86	46.13	12.27	PASS
3	1.6035	10.42	35.03	45.45	56.00	10.55	18.71	29.13	46.00	16.87	PASS
4	5.1855	10.95	27.00	37.95	60.00	22.05	11.95	22.90	50.00	27.10	PASS
5	12.7635	12.01	29.55	41.56	60.00	18.44	13.35	25.36	50.00	24.64	PASS
6	29.76	13.78	26.90	40.68	60.00	19.32	16.63	30.41	50.00	19.59	PASS

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)
2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)
4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)

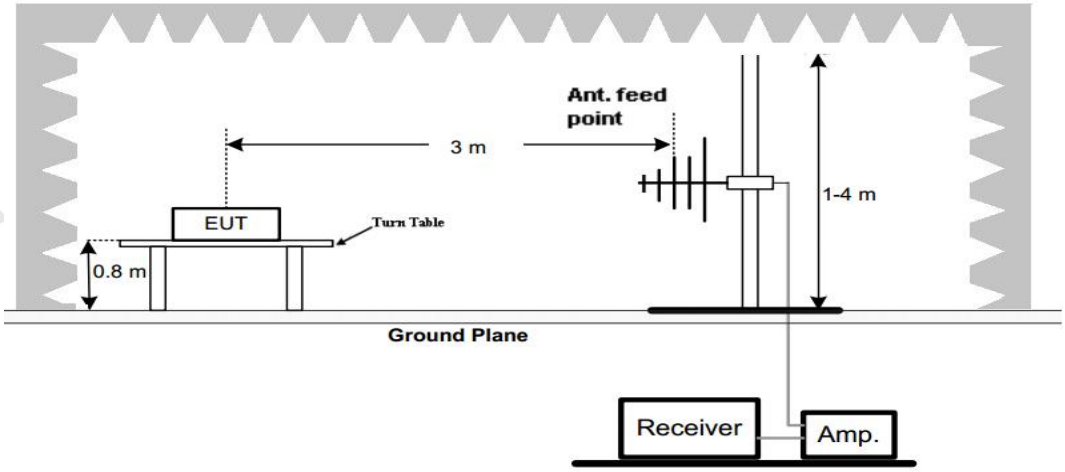
4.2 Radiated Emissions and Band Edge

TEST CONFIGURATION

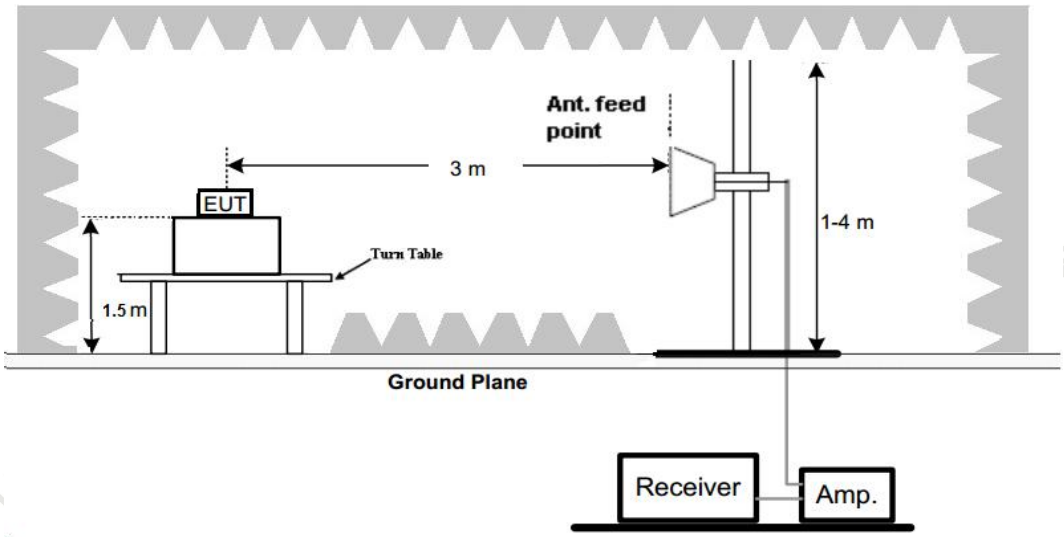
Frequency range 9 KHz – 30MHz

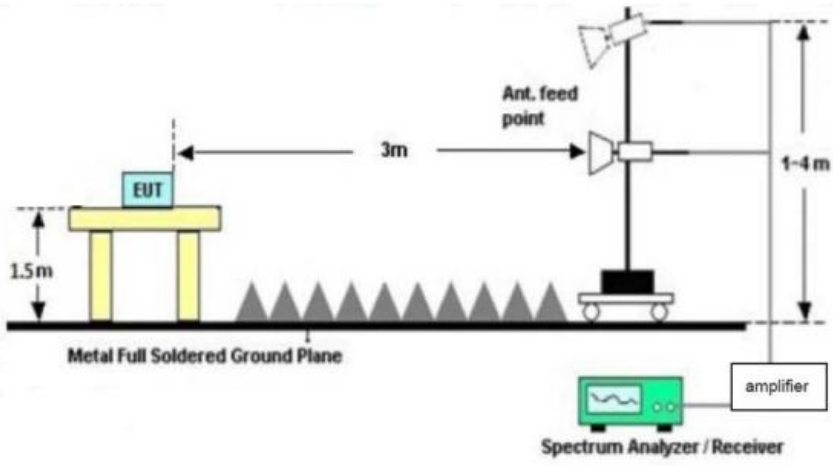


Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz





TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

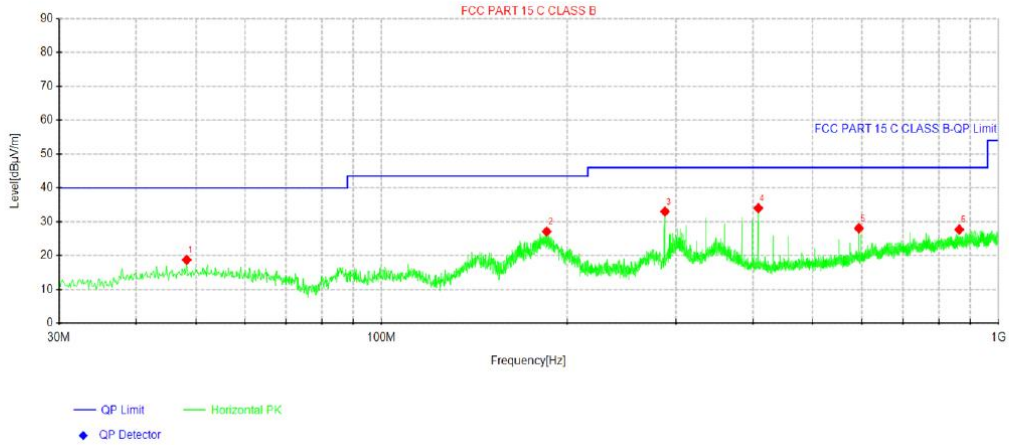
Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. BLE 1Mpbs were tested at Low, Middle, and High channel for all models and recorded worst mode at the High channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

Adapter 1:

For 30MHz-1GHz

Horizontal



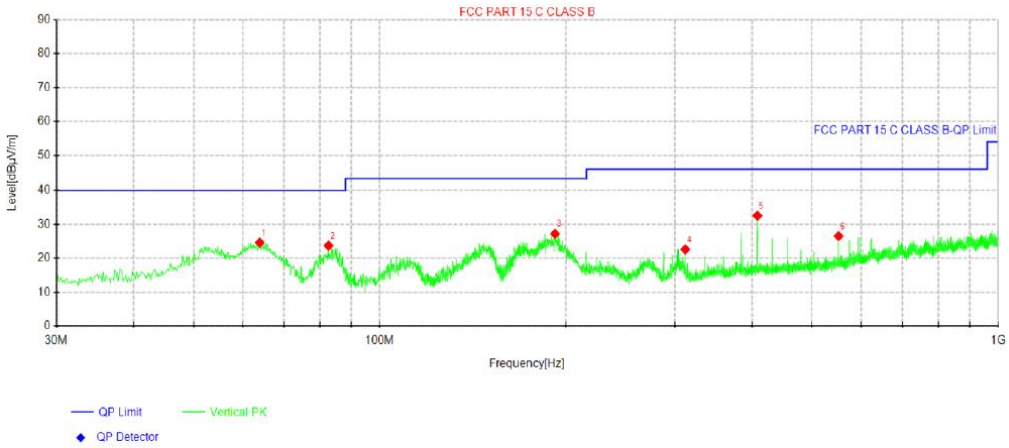
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.3088	29.30	18.74	-10.56	40.00	21.26	100	85	Horizontal
2	185.2	41.95	27.14	-14.81	43.50	16.36	100	294	Horizontal
3	288.02	45.29	33.00	-12.29	46.00	13.00	100	294	Horizontal
4	408.057	43.97	34.00	-9.97	46.00	12.00	100	331	Horizontal
5	594.055	34.75	28.10	-6.65	46.00	17.90	100	112	Horizontal
6	864.078	30.17	27.71	-2.46	46.00	18.29	100	94	Horizontal

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	63.95	37.38	24.65	-12.73	40.00	15.35	100	175	Vertical
2	82.6225	40.18	23.74	-16.44	40.00	16.26	100	80	Vertical
3	191.99	41.40	27.26	-14.14	43.50	16.24	100	45	Vertical
4	312.027	34.42	22.66	-11.76	46.00	23.34	100	11	Vertical
5	408.057	42.51	32.54	-9.97	46.00	13.46	100	36	Vertical
6	552.102	34.56	26.57	-7.99	46.00	19.43	100	218	Vertical

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

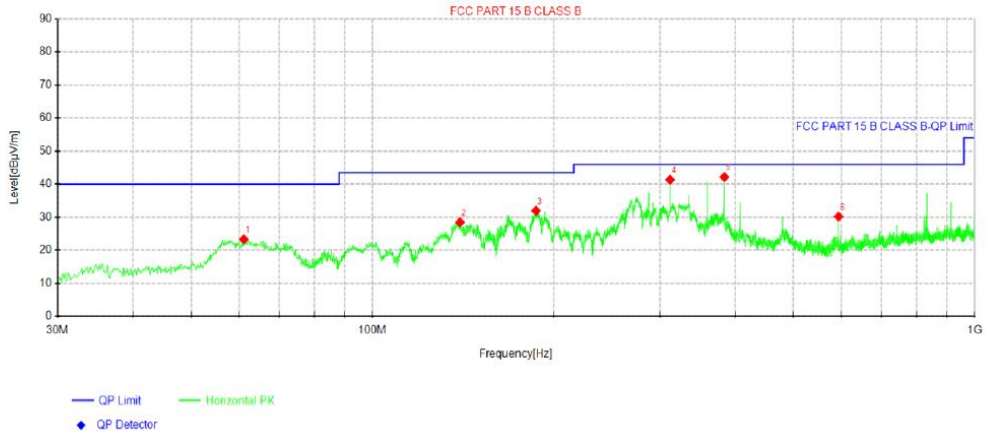
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Adapter 2:

For 30MHz-1GHz

Horizontal



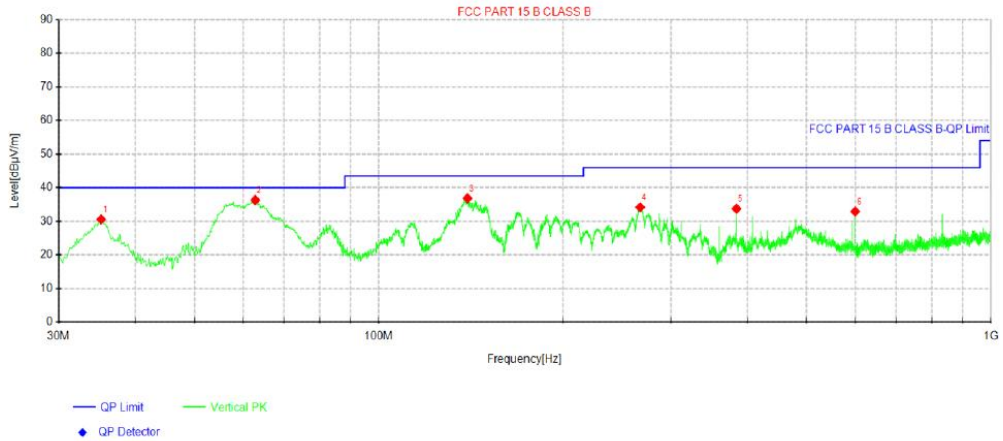
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	61.1612	35.68	23.29	-12.39	40.00	16.71	100	62	Horizontal
2	139.731	45.55	28.48	-17.07	43.50	15.02	100	141	Horizontal
3	186.897	46.77	31.98	-14.79	43.50	11.52	100	105	Horizontal
4	312.027	53.10	41.34	-11.76	46.00	4.66	100	19	Horizontal
5	384.05	52.68	42.16	-10.52	46.00	3.84	100	175	Horizontal
6	594.055	36.86	30.21	-6.65	46.00	15.79	100	45	Horizontal

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.2138	43.88	30.58	-13.30	40.00	9.42	100	72	Vertical
2	62.8588	48.83	36.32	-12.51	40.00	3.68	100	247	Vertical
3	139.61	53.89	36.84	-17.05	43.50	6.66	100	177	Vertical
4	267.286	46.78	34.19	-12.59	46.00	11.81	100	333	Vertical
5	384.05	44.28	33.76	-10.52	46.00	12.24	100	45	Vertical
6	600.117	39.43	32.93	-6.50	46.00	13.07	100	202	Vertical

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

For 1GHz to 25GHz

GFSK (above 1GHz)

Frequency(MHz):			2402		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	61.92	PK	74	12.08	66.19	32.33	5.12	41.72	-4.27
4804.00	44.82	AV	54	9.18	49.09	32.33	5.12	41.72	-4.27
7206.00	53.93	PK	74	20.07	54.45	36.6	6.49	43.61	-0.52
7206.00	43.60	AV	54	10.40	44.12	36.6	6.49	43.61	-0.52

Frequency(MHz):			2402		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	60.33	PK	74	13.67	64.60	32.33	5.12	41.72	-4.27
4804.00	42.90	AV	54	11.10	47.17	32.33	5.12	41.72	-4.27
7206.00	52.09	PK	74	21.91	52.61	36.6	6.49	43.61	-0.52
7206.00	41.61	AV	54	12.39	42.13	36.6	6.49	43.61	-0.52

Frequency(MHz):			2440		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	61.42	PK	74	12.58	65.30	32.6	5.34	41.82	-3.88
4880.00	44.30	AV	54	9.70	48.18	32.6	5.34	41.82	-3.88
7320.00	53.29	PK	74	20.71	53.40	36.8	6.81	43.72	-0.11
7320.00	43.07	AV	54	10.93	43.18	36.8	6.81	43.72	-0.11

Frequency(MHz):			2440		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4880.00	59.69	PK	74	14.31	63.57	32.6	5.34	41.82	-3.88
4880.00	41.99	AV	54	12.01	45.87	32.6	5.34	41.82	-3.88
7320.00	51.26	PK	74	22.74	51.37	36.8	6.81	43.72	-0.11
7320.00	41.21	AV	54	12.79	41.32	36.8	6.81	43.72	-0.11

Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	60.70	PK	74	13.30	63.78	32.73	5.66	41.47	-3.08
4960.00	43.60	AV	54	10.40	46.68	32.73	5.66	41.47	-3.08
7440.00	52.60	PK	74	21.40	52.15	37.04	7.25	43.84	0.45
7440.00	42.37	AV	54	11.63	41.92	37.04	7.25	43.84	0.45

Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	59.01	PK	74	14.99	62.09	32.73	5.66	41.47	-3.08
4960.00	42.05	AV	54	11.95	45.13	32.73	5.66	41.47	-3.08
7440.00	50.87	PK	74	23.13	50.42	37.04	7.25	43.84	0.45
7440.00	40.75	AV	54	13.25	40.30	37.04	7.25	43.84	0.45

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. The other emission levels were very low against the limit.
5. Both modes of BLE 1Mpbs and 2Mpbs were tested at Low, Middle, and High channel and recorded worst mode at BLE 1Mpbs.

4.3 Maximum Peak Output Power

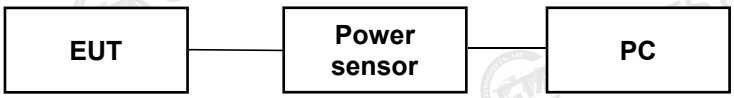
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.
Method PM is Measurement using an RF Peak power sensor. The procedure for this method is as follows:
1. The testing follows the ANSI C63.10 Section 11.9.1.2
2. The maximum peak conducted output power may be measured using a broadband peak RF power sensor.
3. The power sensor shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

Test Configuration



Test Results

Please refer to FCC Appendix RF Test Data for BLE

Note: 1.The test results including the cable loss.

4.4 Power Spectral Density

Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

The testing follows the ANSI C63.10 2020 section 11.10.2:
a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span >1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = No faster than coupled (auto) time.
g) Trace mode = max-hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

Test Configuration

Test Results

Please refer to FCC Appendix RF Test Data for BLE

4.5 6dB Bandwidth

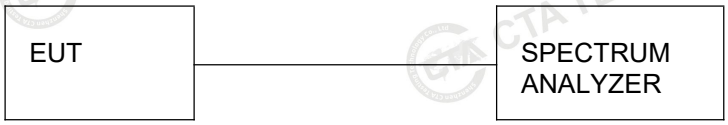
Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedure

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max-hold.
e) Sweep = No faster than coupled (auto) time.
f) Allow the trace to stabilize.

Test Configuration



Test Results

Please refer to FCC Appendix RF Test Data for BLE

4.6 Out-of-band Emissions

Limit

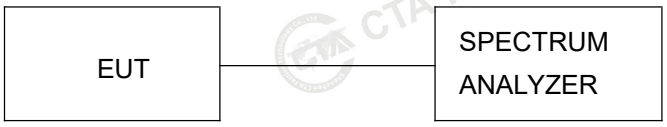
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies 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.

Test Procedure

The testing follows the ANSI C63.10 Section 11.11.2 and 11.11.3 and 6.10.4:
●Reference level measurement
Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to≥1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW≥[3*RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

●Emission level measurement
Establish an emission level by using the following procedure:
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW≥[3*RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Test Configuration



Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

Please refer to FCC Appendix RF Test Data for BLE

4.7 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

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

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(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.

Antenna Connected Construction

The FPC Antenna maximum gain of antenna was 2.97dBi(Max.) for RTL8821modular
4.86dBi(Max.) for ESP32 modular.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen CTA Testing Technology Co., Ltd. does not assume any responsibility.

4.8 On Time and Duty Cycle

Standard Applicable

None; for reporting purpose only.

TEST CONFIGURATION

Test Procedures

1). Set the Centre frequency of the spectrum analyzer to the transmitting frequency;
2). Set the span=0MHz, RBW=8MHz, VBW=8MHz, Sweep time=Auto;
3). Detector = peak;
4). Trace mode = Single hold.

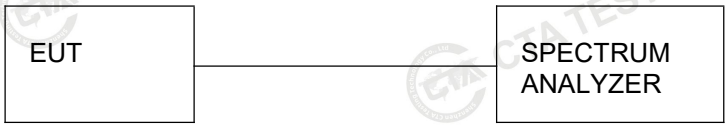
Please refer to FCC Appendix RF Test Data for BLE

4.9 Emissions at Restricted Band

Standard Applicable

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)).

TEST CONFIGURATION



Test Procedures

According to ANSI C63.10 Field Strength Approach (linear terms):

$eirp = p_t \times g_t = (E \times d)^2/30$

Where:

p_t = transmitter output power in watts,

g_t = numeric gain of the transmitting antenna (unit less),

E = electric field strength in V/m,

d = measurement distance in meters (m).

$erp = eirp/1.64 = (E \times d)^2/(30 \times 1.64)$

Where all terms are as previously defined.

1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/T for Peak detector.
4). Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5). Repeat above procedures until all measured frequencies were complete.
6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10). Compare the resultant electric field strength level to the applicable regulatory limit.
11). Perform radiated spurious emission test duress until all measured frequencies were complete.

Test Results

Please refer to FCC Appendix RF Test Data for BLE

Remark:

1). Test results including cable loss;

2). Measured at difference Packet Type for each mode and recorded worst case for each mode.

3). "---"means that the fundamental frequency not for 15.209 limits requirement.

4). Measured at Hopping and Non-Hopping mode, recorded worst at Non-Hopping mode.

5). The other emission levels were very low against the limit.

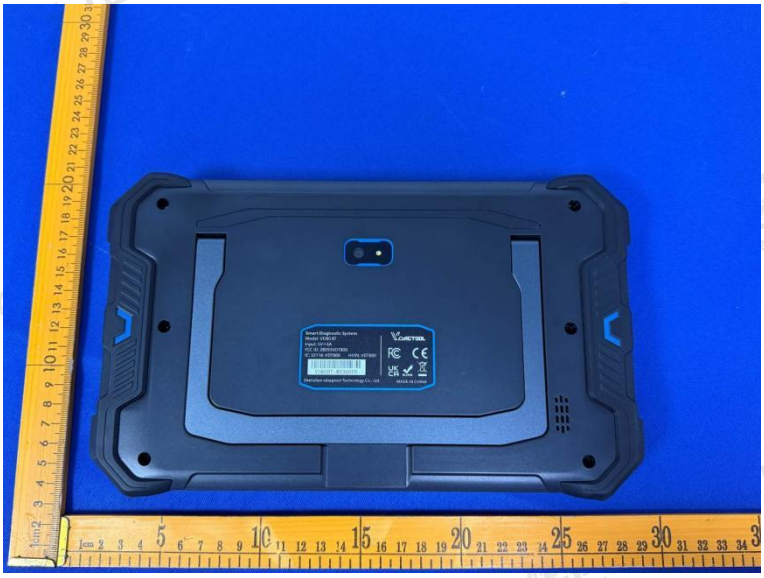
6). The average measurement was not performed when the peak measured data under the limit of average detection.

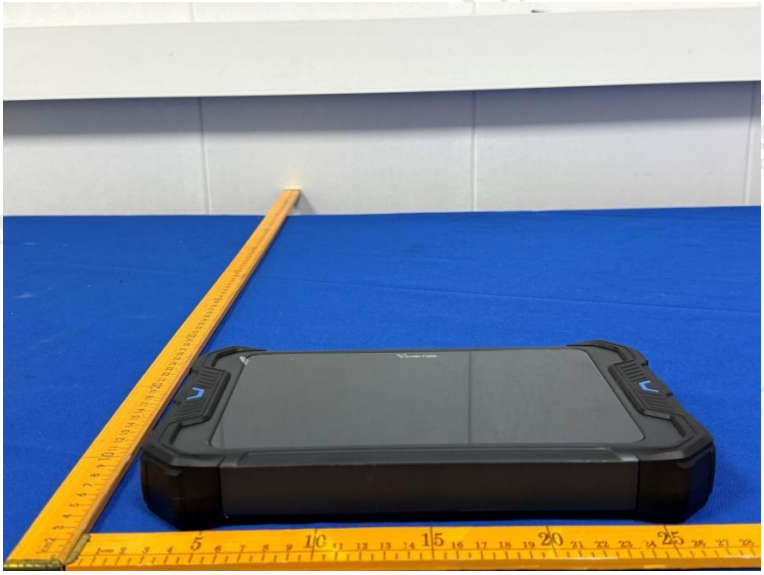
7). Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=1/T/Sweep time=Auto/Detector=Peak.

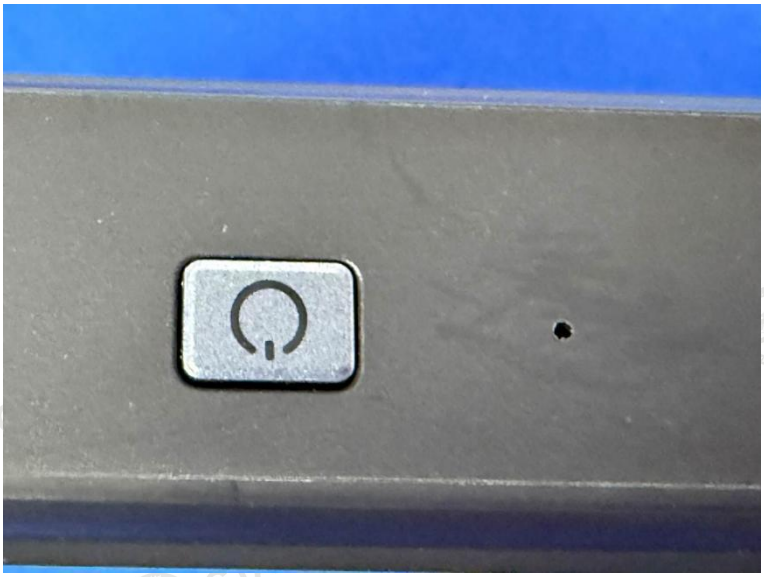
8). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

5 Test Setup Photos of the EUT

6 Photos of the EUT

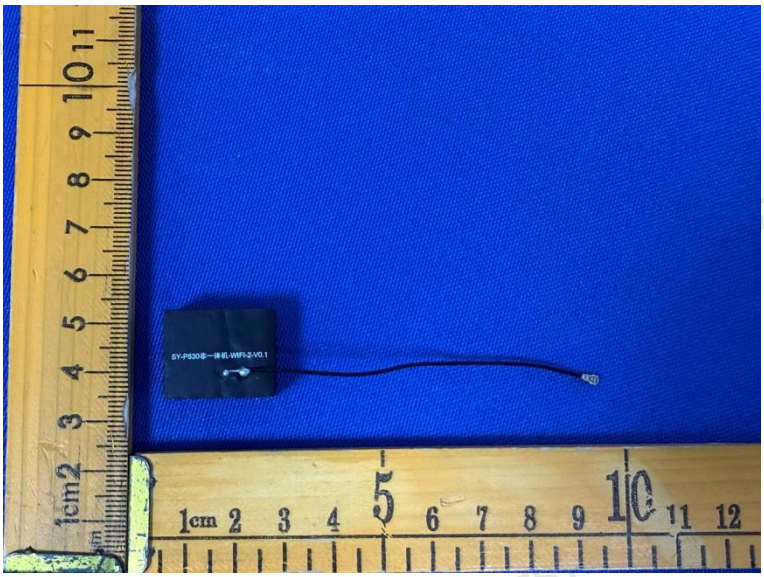


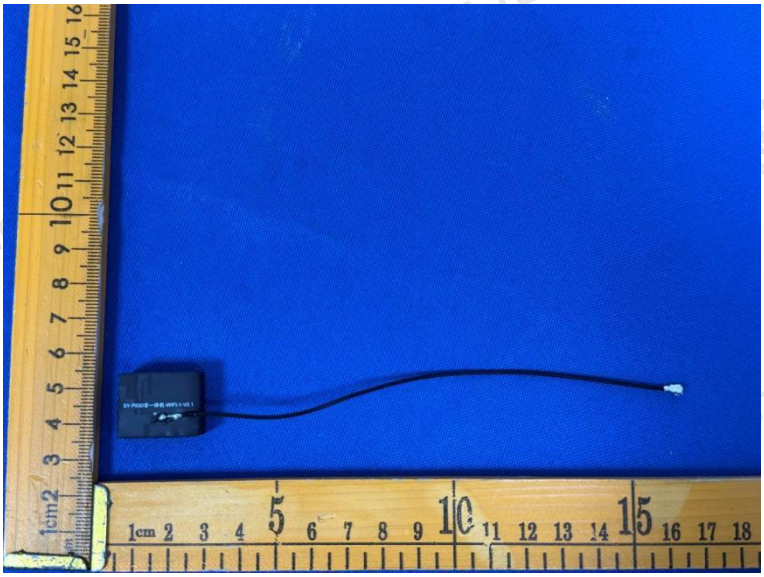


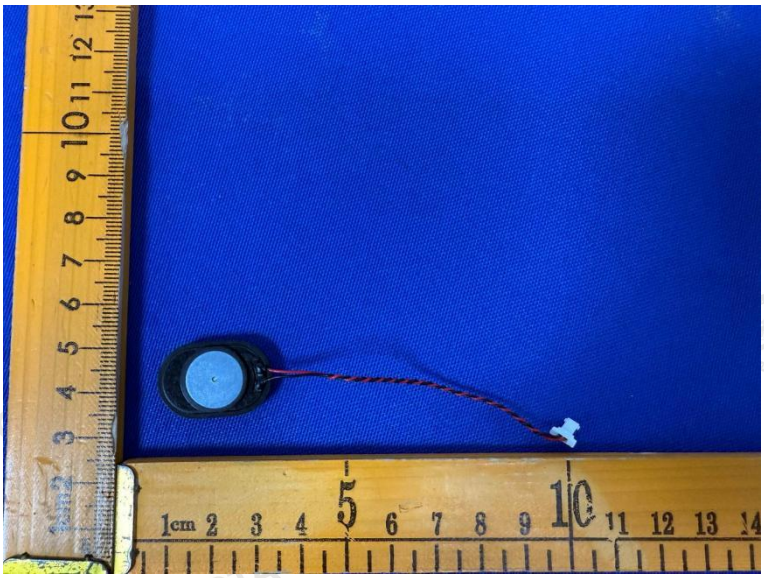


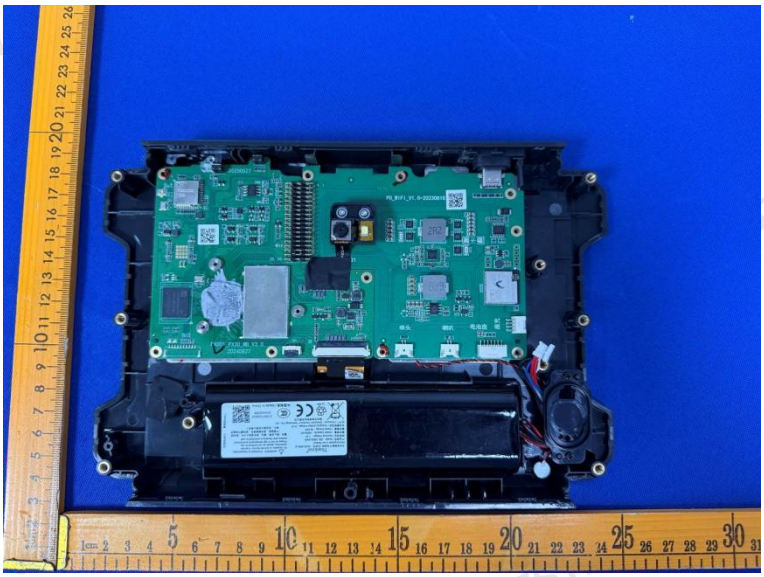
体机-WIFI-1-V0.1

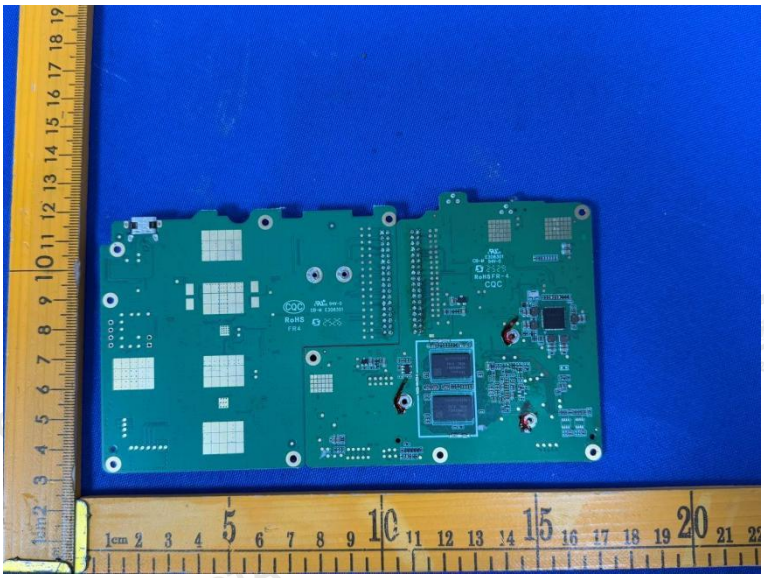
SY-P830非一体机-WIFI-2-V0.1



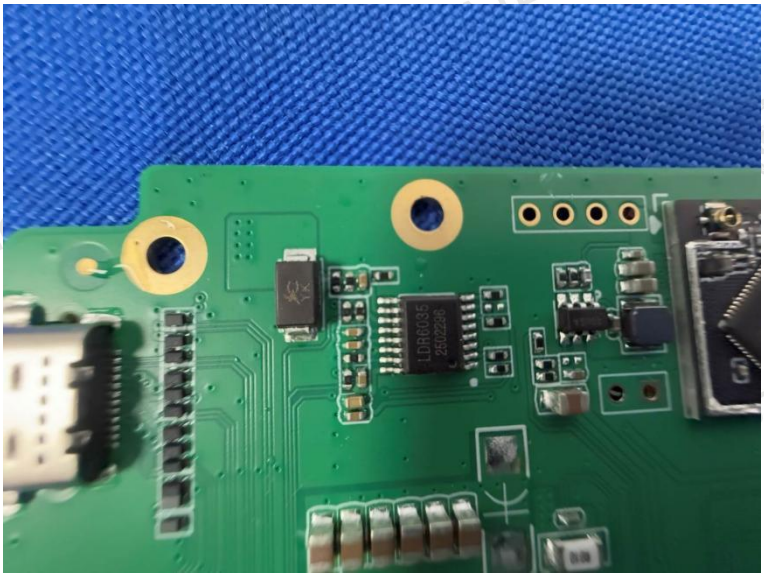


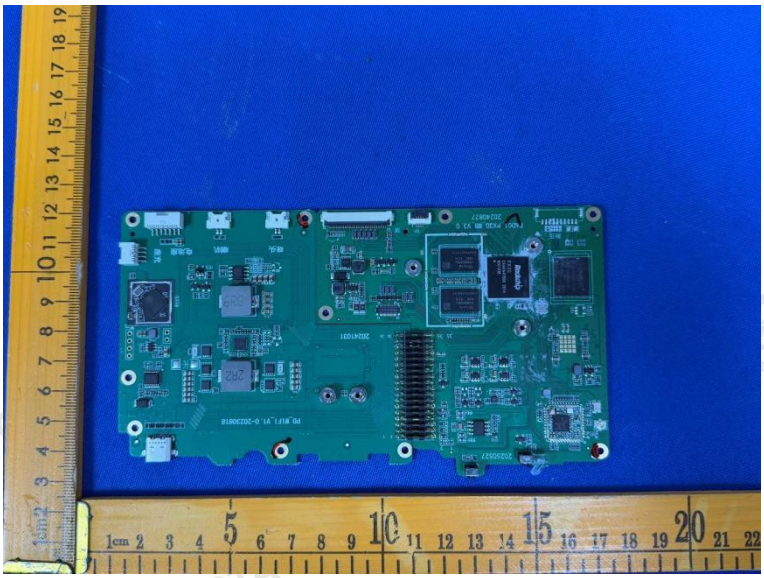


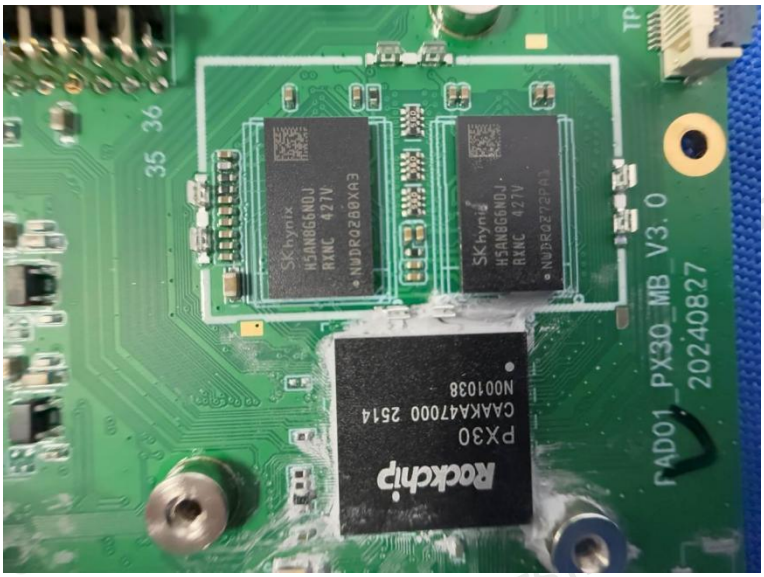


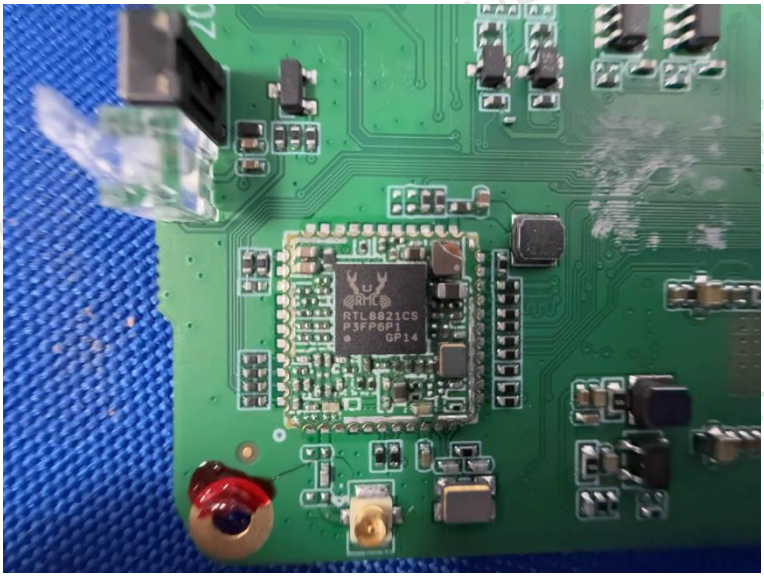


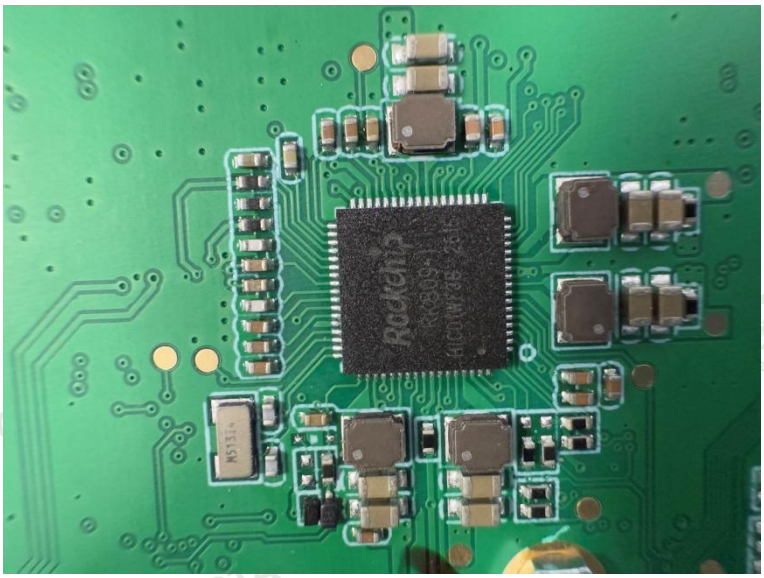
SKhynix
H5AN8G6NDJ
RXNC 414V
SKhynix
H5AN8G6NDJ
RXNC 414V

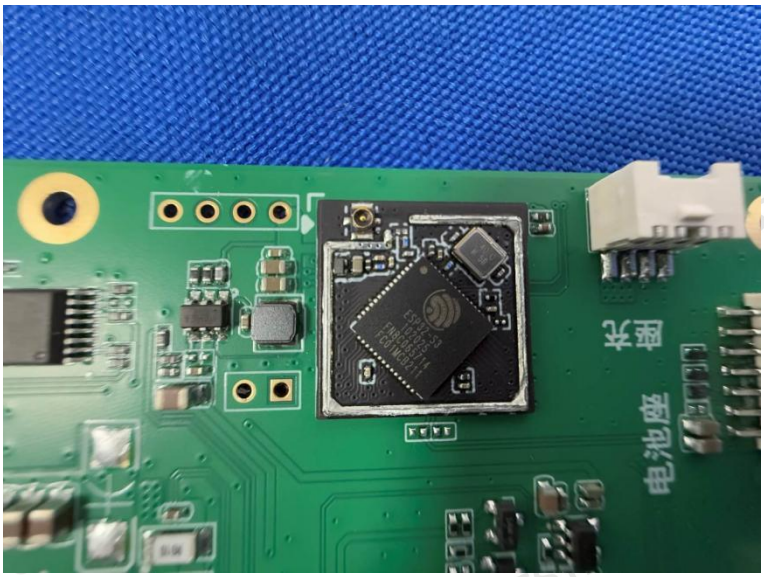


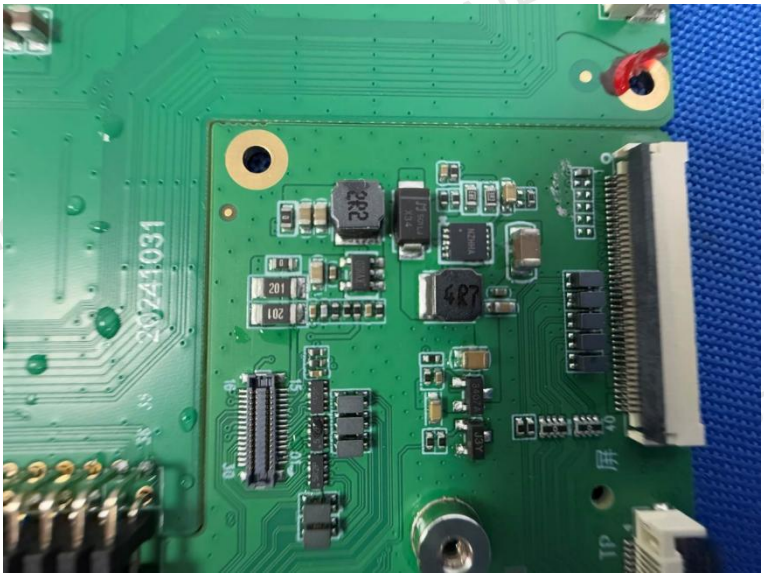


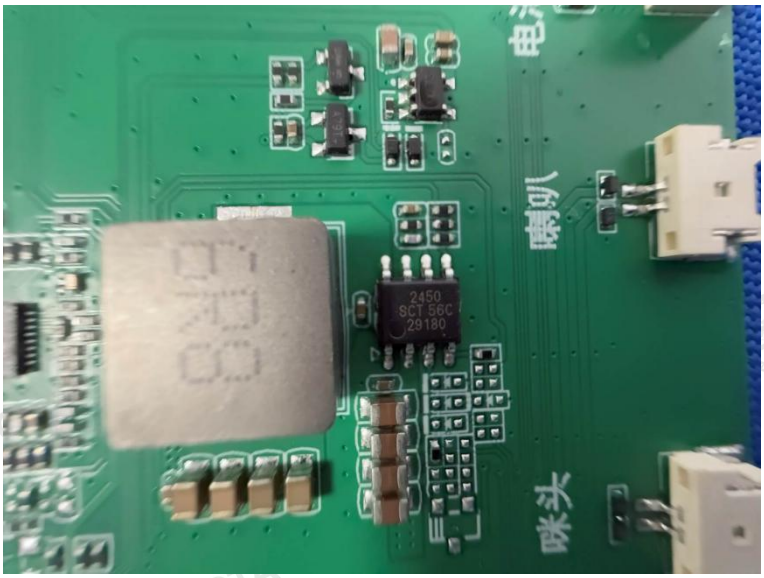

SKhynix
H5AN8G6NDJ
RXNC 427V
NUDRQ280XA3
SKhynix
H5AN8G6NDJ
RXNC 427V
NUDRQ272PA1
Rockchip
PX30
CAAKA47000 2514
N00103B
RAD01_PX30_MB_V3.0
20240827

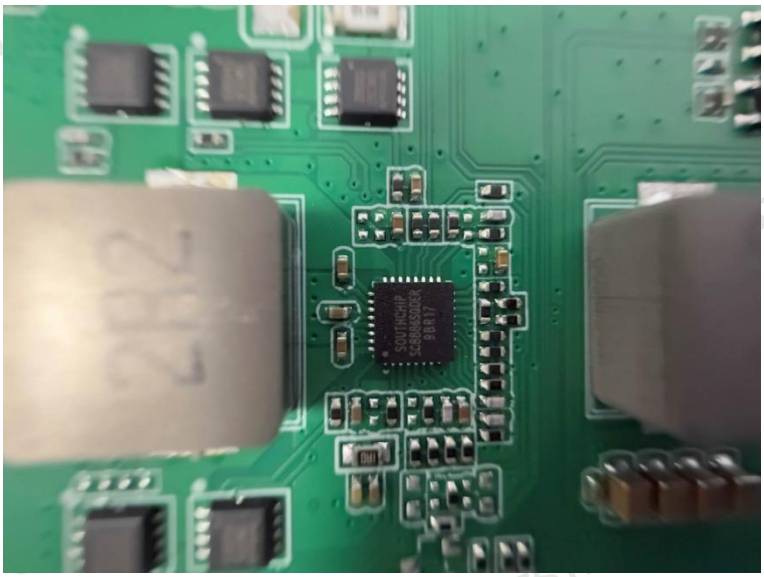

RTL8821CS
P3FP6P1
GP14

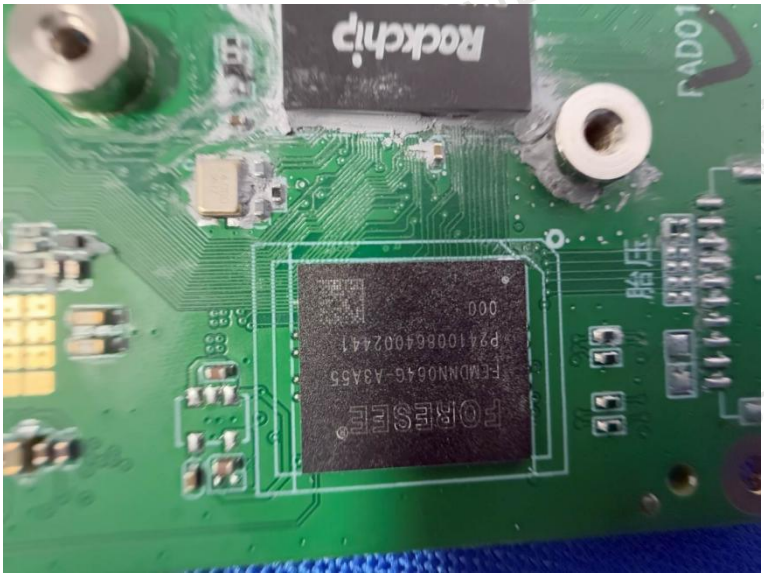

Rockchip


电池座


2R2
4R7
20241031


2450
SCT 56C
29180
咪头

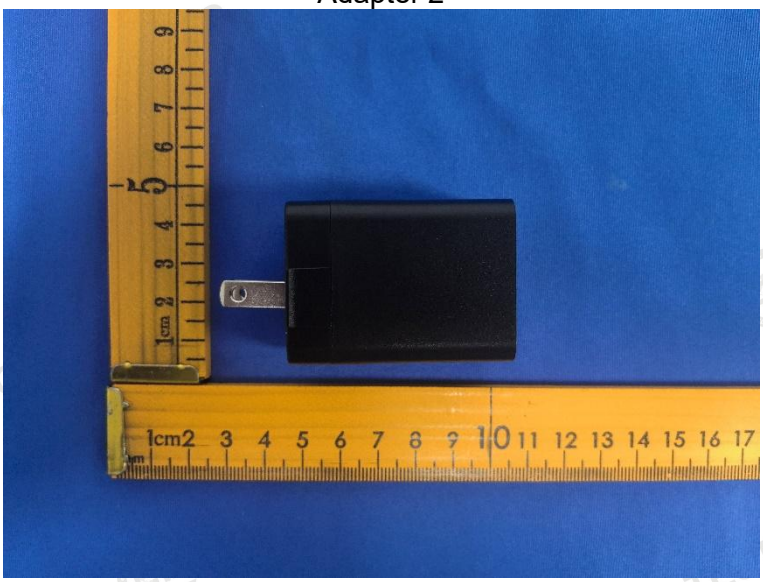



Rockchip
FORESEE
胎压

Thanksun®
可充电锂离子电池组 (目录号：2ICR19/66-2)
Rechargeable Li-ion Battery
产品型号 / Model：XBL18650-5000
标称电压 / Nominal Voltage： 7.3V
额定容量 / Rated Capacity：5000mAh
额定能量 / Rated Energy：36.5Wh
充电限制电压 / Charging Limited Voltage：8.4V
生产厂 / Producer：Shenzhen Thanksun Technology Co., Ltd.
深圳市恩商科技有限公司
WARNING：Prohibited to disassemble, hit, squeeze, or put into the fire. If severe ballooning, please do not continue to use. Please do not in high temperature environment. Battery after flooding is prohibited to use!
警告：禁止拆解、撞击、挤压或投入火中，若出现严重鼓胀，请勿继续使用，请勿置于高温环境中，电池浸水后禁止使用！
红色Red(+)
黑色Black(-)
Li-ion
210907009004
NG2A00069
中国制造 / Made In China

Adapter 1

Adapter 2



Power Supply
MODEL:PD0302UC-0303
INPUT:100-240V~ 50-60Hz 0.8A Max
OUTPUT:5.0V⎓3.0A,9.0V⎓3.0A,12.0V⎓2.5A,
15.0V⎓2.0A,20.0V⎓1.5A(30.0W Max.)
VI
UK CA
FC
Intertek
5003982
Conforms to UL
Std.62368-1
Certified to CSA Std.
C22.2 No.62368-1
110901003002AFBT00342
Manufacturer:Shenzhen ABP Technology Co.,Ltd.
Add:2nd Floor, 3&4 Building,Xinhaosheng Industrial Zone,
Yonghe Road, Qiaotou Fuhai Street, Bao'an District,
Shenzhen City,Guangdong, P.R. China Made in China
2411

********** End of Reprt **********